HarvestMaster™

BY JUNIPER SYSTEMS

alvo™

Field Applicator

USER'S GUIDE

Alvo Field Applicator User's Guide

Part Number: 27024-04

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Disclaimer

Information is subject to change without notice.

Cautions

CAUTION: This symbol indicates that failure to follow directions could result in damage to equipment or loss of information.

WARNING: This symbol indicates that failure to follow directions could result in serious injury.

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Field Applicator

CHAPTER ONE

Prepare the Software

1 Prepare the Software

The HarvestMaster Alvo Field Applicator automates the application of treatments on field research plots using multi-boom and in-furrow applicators in conjunction with a GPS receiver.

The Alvo Field Applicator along with Mirus software uses HarvestMaster actuator modules to control the equipment hardware. This versatile system can be easily moved to different equipment throughout the year as needed.

Compared to using multiple control systems, this system uses a single software program called Mirus and a simplified control system. This saves time and money because there is no need to retrain personnel on multiple systems. Essentially, a user can use the Mirus software across almost all research data collection and equipment control needs.

1.1 Install Mirus

Mirus provides the user interface and software control of the Alvo Field Applicator and is designed to run on a rugged tablet under the Microsoft Windows 10 or later operating system.

1.1.1 System Requirements

- Operating system: Windows® 10 or higher; 32-bit or 64-bit OS
- Processor Speed: 2.0 GHz Quad Core
- Memory: 8 GB or more recommended
- Data Storage: 500 MB available disk space
- Display Resolution: 1280 x 800 or higher
- Video Playback: Windows Media Player version 11 or higher

1.1.2 Download and Install Mirus

- Download Mirus from *www.harvestmaster.com*.
- Run the Mirus software installation on your rugged tablet computer and follow the prompts on the screen.
- Activate Mirus online at *www.harvestmaster.com/activate*.

1.2 Install GNSS Attachment and Alvo Field Applicator

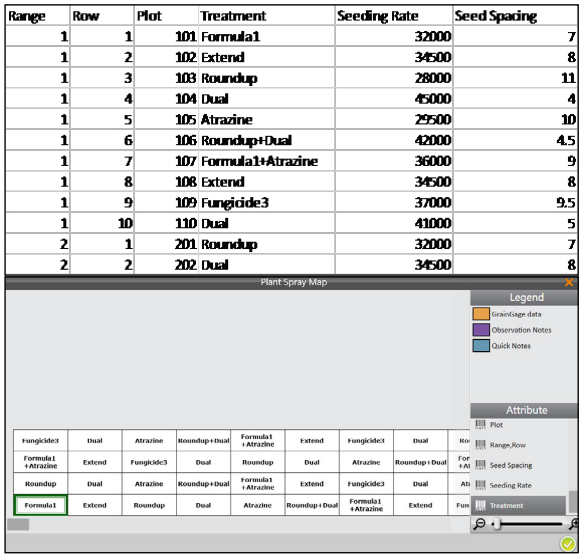
Mirus software requires the GNSS Attachment and the Alvo Field Applicator Plugin to control the Alvo Field Applicator. You must install Mirus before installing these plugins.

- Download the GNSS Attachment and the Alvo Field Applicator from *www.harvestmaster.com*. The files use the .mbp file extension.
- Run the .mbp file for the GNSS Attachment, and run the .mbp file for the Alvo Field Applicator Plugin.
- Activate the software online at *www.harvestmaster.com/activate*.

1.3 Create Treatment Maps

Mirus identifies the treatments for each plot based on a map file. Create your map file outside of Mirus in a spreadsheet or a text editor and use Mirus to import the map. Map files must use either the .csv or .txt format.

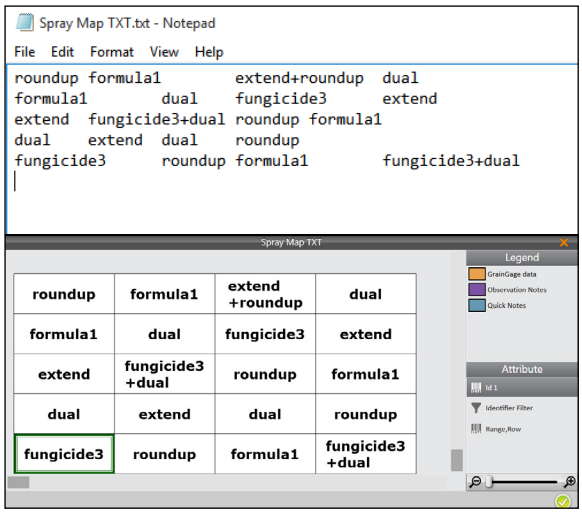
A treatment is identified by a name consisting of alphanumeric characters (letters and numbers only). To identify multiple treatments for a plot use a plus character between treatment names (for example, "roundup+formula1").



Range	Row	Plot	Treatment	Seeding Rate	Seed Spacing
1	1	101	Formula1	32000	7
1	2	102	Extend	34500	8
1	3	103	Roundup	28000	11
1	4	104	Dual	45000	4
1	5	105	Atrazine	29500	10
1	6	106	Roundup+Dual	42000	4.5
1	7	107	Formula1+Atrazine	36000	9
1	8	108	Extend	34500	8
1	9	109	Fungicide3	37000	9.5
1	10	110	Dual	41000	5
2	1	201	Roundup	32000	7
2	2	202	Dual	34500	8

For a map in .csv format,

- Create columns to identify the range, row, and treatments for each plot.
- For each column created, a corresponding attribute will be created in Mirus.



roundup	formula1	extend +roundup	dual
formula1	dual	fungicide3	extend
extend	fungicide3 +dual	roundup	formula1
dual	extend	dual	roundup
fungicide3	roundup	formula1	fungicide3 +dual

For a map in .txt format,

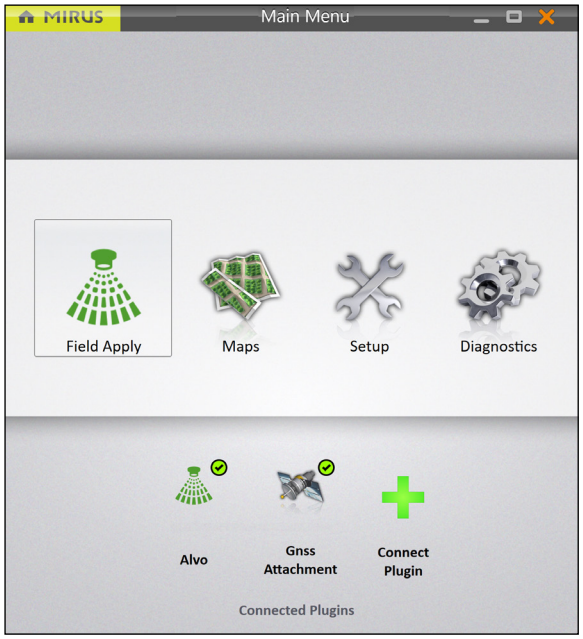
Identify the treatments for each plot in a spatial or grid layout.

- Plots on a row are separated by a tab.
- The information input into the text editor will appear in Mirus the same way it was written.

For a map exported from trial design software,

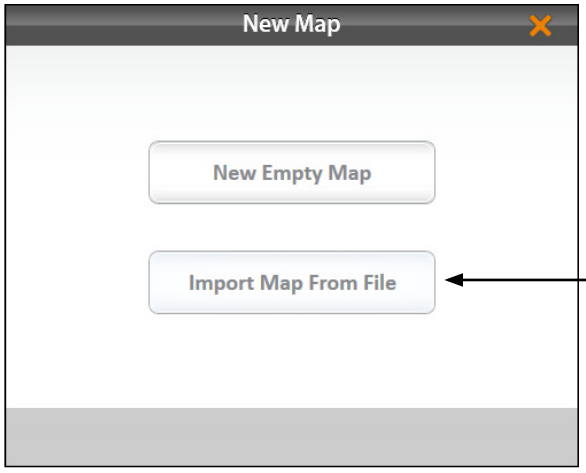
- Use a .csv format to export the map.
- Follow the software instructions for electronic data collection export.

1.3.1 Import Treatment Maps

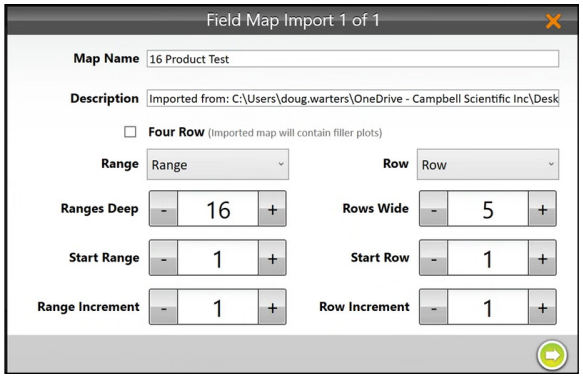


After creating a treatment map, import it into Mirus.

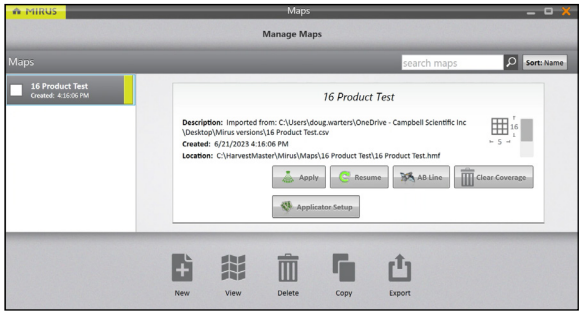
1. Open Mirus.
2. Tap **Maps**.
3. Tap the new icon to create a new map.



4. Tap **Import Map From File**.
5. Locate the desired map file. Open it.



6. Check that Mirus recognizes and interprets the information as you intend.
7. Tap the next arrow.



Mirus displays the Manage Maps screen.

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Field Applicator

CHAPTER TWO

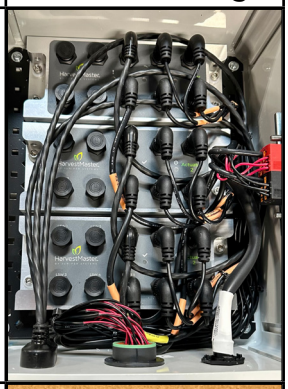
Set Up the Alvo Field Applicator

2 Set Up the Alvo Field Applicator

The Alvo Field Applicator uses a rugged tablet computer connected to a system controller. The system controller connects to the actuator modules, allowing control of up to 24 solenoids or actuators that activate the applicator.

2.1 System Parts

The following table lists the system parts.

PN	Qty	Description	Notes / Purpose	Photo / Drawing
n/a	1	H2 actuator modules with wiring and connectors in enclosure	An enclosure with two actuator modules mounted inside. The actuator modules are wired to connector plugs in the wall of the enclosure. • A CAN connector on the enclosure is used for connection to the system controller. • A Deutsch connector is used for connection to the actuators on the applicator.	
25030	1	H2 system controller with RAM mount and two button head screws	The system controller provides the primary interface between the tablet computer and the other components in the system.	
15332	1	HM8 12 V DC power cable, 20 ft	The power cable connects between the battery (or other 12 V DC power source) and the system controller.	
31754	1	HM8 CAN terminator	The terminator is used to terminate the unused CAN connection on the outside of the enclosure.	

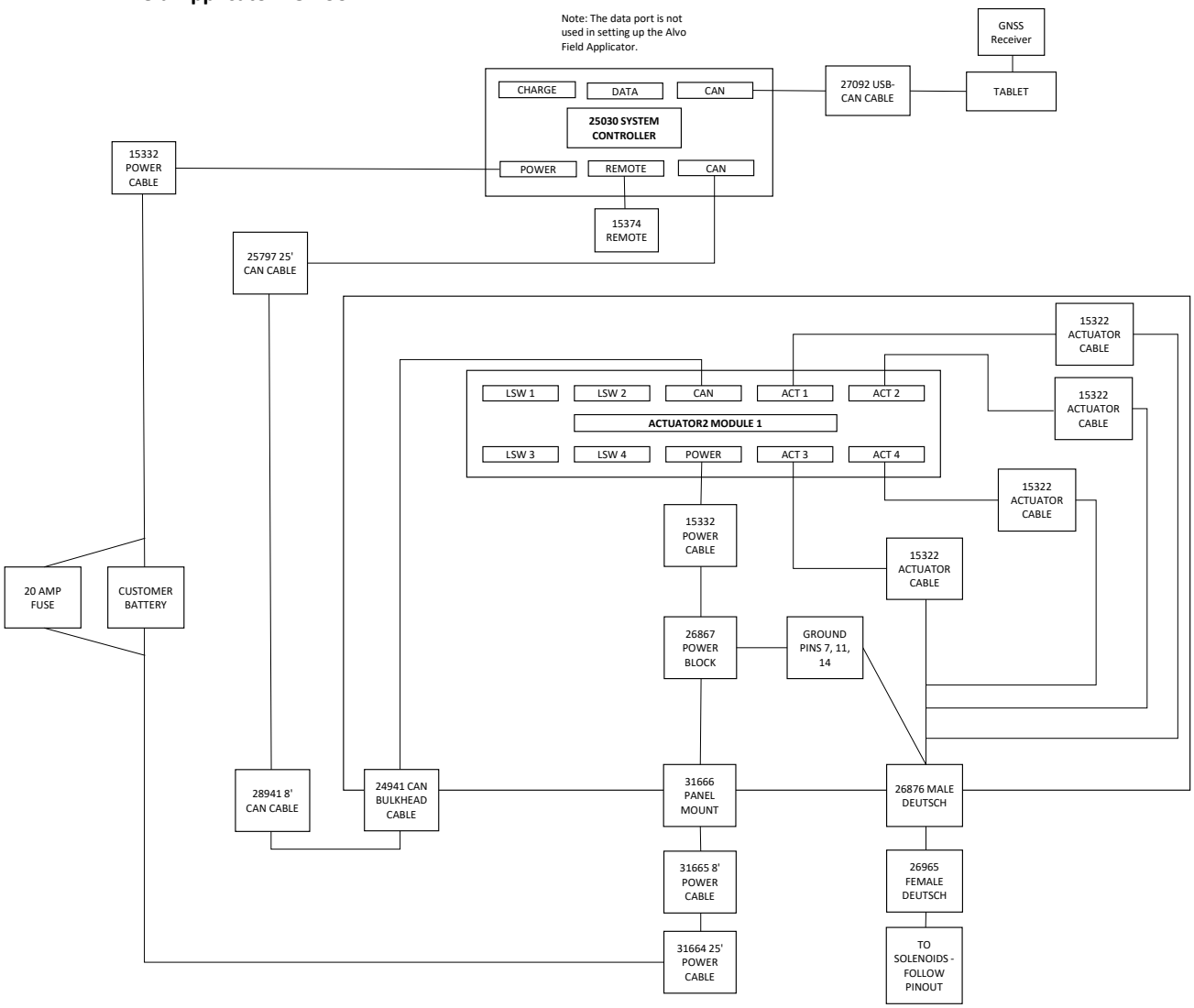
PN	Qty	Description	Notes / Purpose	Photo / Drawing
25797	1	HM800 CAN extension cable	The CAN communications cable connects to the system controller to the 8 ft CAN patch cable at the hitch.	
28941	1	HM800 CAN patch cable 8 ft	The CAN communications cable that connects from bottom of enclosure to the CAN communications cable at the hitch.	
15374	1	HM8 HMA-400 remote enter button and cable assembly	The remote enter button connects to the system controller, allowing the operator to manually trigger the applicator to start or stop.	
20363	1	HM8 USB CAN converter cable	The CAN converter cable connects the tablet PC to the system controller.	
31664	1	25' 8AWG	Power cable from battery to hitch area	
31665	1	8' 8AWG Power Cable	The power cable that connects from bottom of enclosure to the main power cable at the hitch.	
31686	varies	H2 Actuator2 Module	H2 actuator 2 module for controlling the solenoid.	
27736		Alvo license		

PN	Qty	Description	Notes / Purpose	Photo / Drawing
27753		GNSS license		
31735	1	Souriau plug cap	Cover for the plug end of the CAN cable.	
31734	1	Souriau receptacle cap	Cover for the receptacle end of the CAN cable.	

2.2 Wiring Diagram and Connections

The system requires the following connections for eight booms:

Field Applicator - 8 Boom



Connections		
Step	**Cable**	**Connect**
1	USB-CAN Cable	The tablet and the system controller
2	Remote enter cable	The system controller

Connections		
Step	**Cable**	**Connect**
3	12 V DC power cable	The battery or power source and the system controller
4	CAN cable	The system controller and one of the CAN ports on the bottom of the actuator module enclosure
5	CAN terminator	The unused CAN port on the bottom of the actuator module enclosure
6	Actuators on the applicator	The Deutsch connector (See **Chapter 2.3 Actuator Wiring Connections on page 15.**)
7	Deutsch connector	The matching connector on the actuator enclosure
8	Chassis ground	The actuators on the booms of the applicator

2.3 Actuator Wiring Connections

The actuator modules in the enclosure are wired to the Deutsch connector in the wall of the enclosure. The following table describes the wiring for this connector.

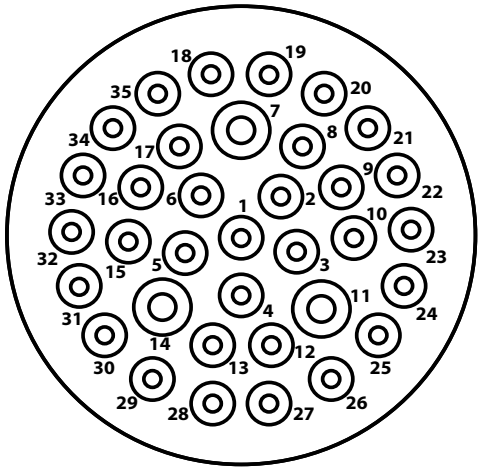
Wiring for the Deutsch Connector					
Deutsch Connector Pin Out	**Signal**	**HM Module Reference**	**Port**	**Pin**	**HM Wire Color**
1	Boom 1	Actuator 1	1	1	Red
2	Boom 5	Actuator 1	1	2	Black
3	Boom 2	Actuator 1	2	1	Red
4	Boom 6	Actuator 1	2	2	Black
5	Boom 3	Actuator 1	3	1	Red
6	Boom 7	Actuator 1	3	2	Black
7	Ground				Black
8	Boom 4	Actuator 1	4	1	Red

Wiring for the Deutsch Connector					
Deutsch Connector Pin Out	**Signal**	**HM Module Reference**	**Port**	**Pin**	**HM Wire Color**
9	Boom 8	Actuator 1	4	2	Black
10	Boom 9	Actuator 2	1	1	Red
11	Ground				Black
12	Boom 13	Actuator 2	1	2	Black
13	Boom 10	Actuator 2	2	1	Red
14	Ground				Black
15	Boom 14	Actuator 2	2	2	Black
16	Boom 11	Actuator 2	3	1	Red
17	Boom 15	Actuator 2	3	2	Black
18	Boom 12	Actuator 2	4	1	Red
19	Boom 16	Actuator 2	4	2	Black
20	Boom 17	Actuator 3	1	1	Red
21	Boom 21	Actuator 3	1	2	Black
22	Boom 18	Actuator 3	2	1	Red
23	Boom 22	Actuator 3	2	2	Black
24	Boom 19	Actuator 3	3	1	Red
25	Boom 23	Actuator 3	3	2	Black
26	Boom 20	Actuator 3	4	1	Red
27	Boom 24	Actuator 3	4	2	Black

The supplies needed to wire the actuators to the Deutsch connector include

- Wire strippers
- Deutsch HDT-48-00 crimp tool (pictured on left).

Note: For instructions on how to set and use the crimp tool, open YouTube and enter the address: www.youtube.com/MqXcaNVwpvI.



To wire the actuators to the Deutsch HDP26-24-35SN connector,

- Use the information in the pin out table (See **2.3 Actuator Wiring Connections** on page 15) to populate the Deutsch HDP26-24-35SN connector.
- Pins 7, 11, and 14 can be used as actuator grounds.
- Connect the Deutsch connector to the matching connector on the enclosure.
- The drawing to the left shows the physical layout of the pins in the Deutsch connector.

2.4 Set Up the GNSS/GPS Receiver

The GNSS/GPS receiver may need to be configured to communicate with Mirus. Follow the instructions provided for your GNSS/GPS receiver.

On the receiver,

- Enable GGA.
- Enable VTG.
- Set output rate to 5 Hz.
- Disable other NMEA message types.

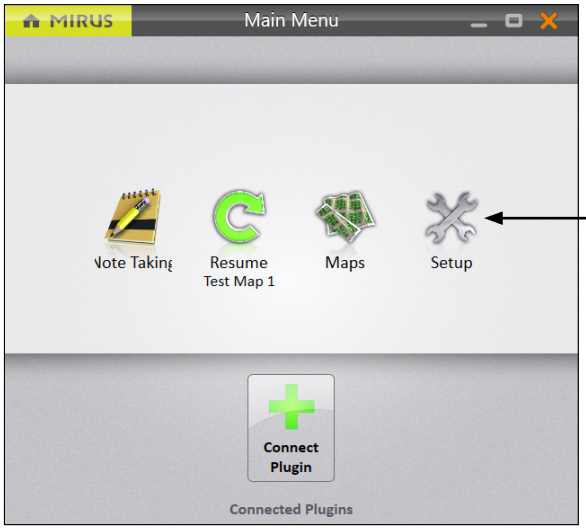
You also need to configure Mirus to communicate with the GNSS/GPS.

With wiring complete and connected, power on your receiver and the Alvo Field Applicator. Connect your receiver.

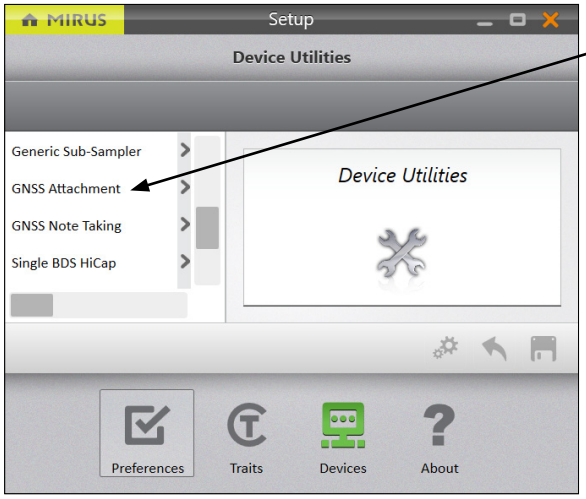
2.4.1 Connect the GNSS/GPS Receiver

To connect your GNSS/GPS receiver,

1. Open Mirus from your Windows desktop. Mirus opens the Main Menu screen.
2. Disconnect any plugins.



3. Tap **Setup**.



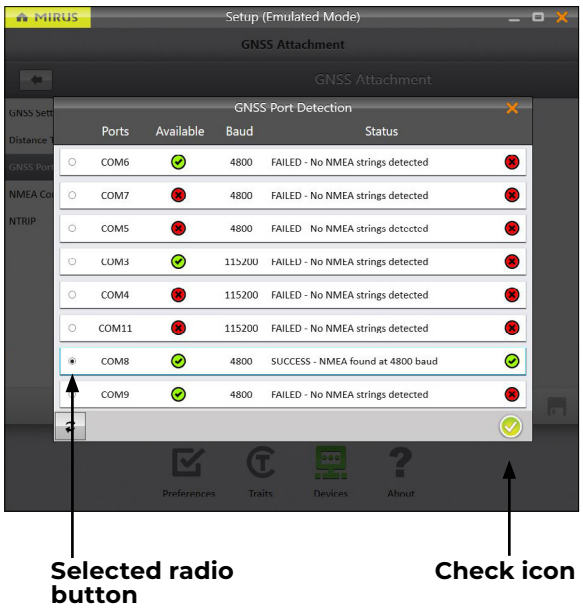
4. Tap **GNSS Attachment**.

On the **Setup** > **GNSS Attachment** screen,

5. Tap **GNSS Port Detector** > **COM Port Detection**.

Mirus opens the GNSS Port Detection box and detects the ports.

When the COM port detection is completed, you see the name of each port, its availability and baud rate, and the status of NMEA messages. The port in use is indicated by the selected radio button.



If you want to use a different port,

6. Select a port for the receiver to use. Note the port for calibrating the setback. (See **4.1.1 Calibrate the Offsets on page 30**.)

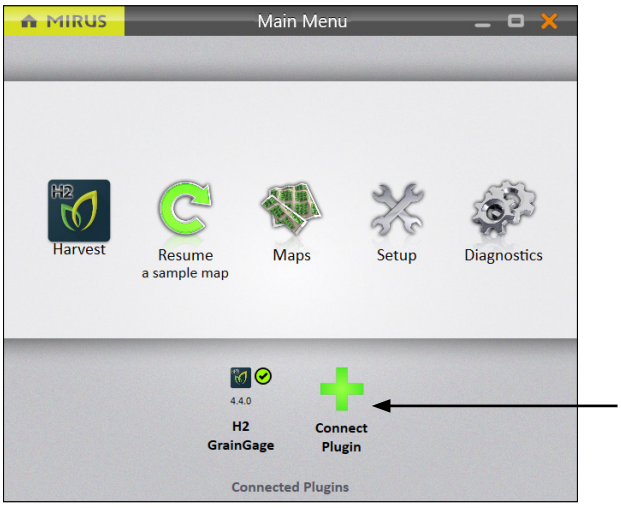
   Note: The first time that you use the GNSS Attachment you select the receiver that you want to use.

7. Tap the check icon to apply the selected port.

   The following settings are automatically filled in, except for offsets:

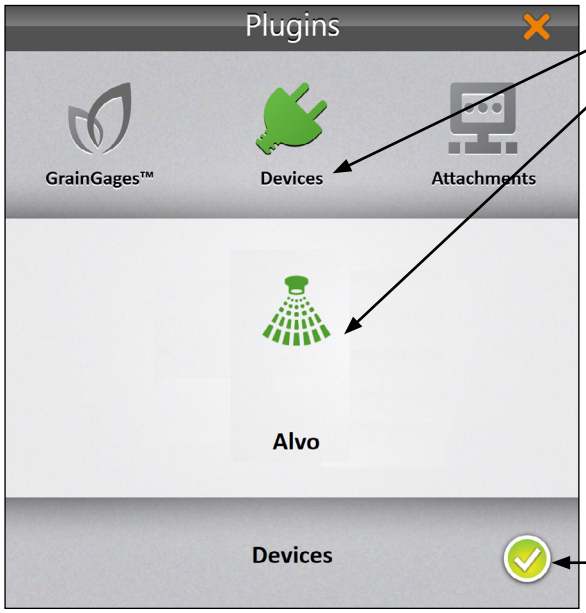
   - Collection Type: Plot Events
   - Capture Cycles: No
   - Additional Trip Action: None
   - Trip Origin: Antenna
   - Receiver Type: Generic

2.4.2 Add the Alvo Field Applicator and GNSS Attachment

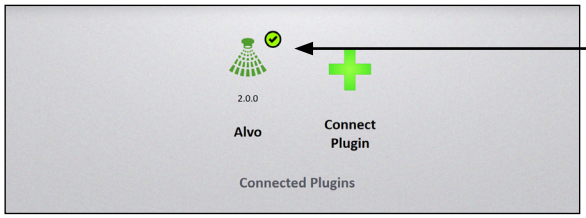


To add the Alvo Field Applicator and GNSS Attachment in Mirus,

1. Tap **Connect Plugin** on the Mirus Main Menu screen.



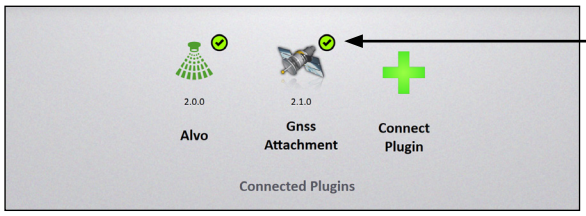
2. Tap **Devices**.
3. Tap **Alvo**.
4. Tap the check icon .



Alvo has a green check mark.

5. Tap **Connect Plugin**.

6. Tap **Attachments**.
7. Tap **GNSS Attachment**.
8. Tap the check icon .

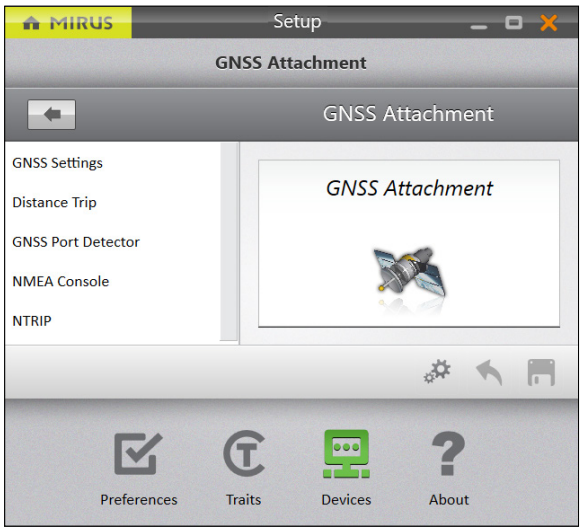


The GNSS Attachment has a green check mark.

2.4.3 Enter Receiver Offset

On the **Setup** > **GNSS Attachment** screen,

1. Tap **GNSS Settings**.



2. Enter the front/back offset..

GNSS Settings Screen	
Setting	**Description and Options**
Front/Back Offset	Enter the distance between the center dome of the GNSS antenna and boom 1, the first boom to enter the plot as you drive. • Use positive numbers for equipment placed in front of the GNSS antenna. • Use negative numbers for equipment located behind the GNSS antenna.
Left/Right Offset	Enter the distance between the GNSS antenna and the center line (laterally) of the equipment swath. • Use positive numbers for equipment to the right of the antenna. • Use negative numbers for equipment to the left of the antenna. Right and left are determined by the driver facing the direction of travel.

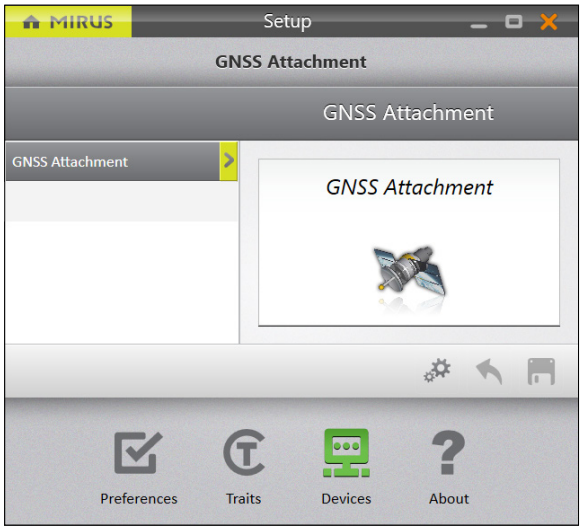
To determine the offsets, use a tape measure to find the distance from the spot on the ground directly below the items noted below.

1. Boom 1 to the center of the GNSS/GPS receiver. This is the front/back offset.
2. The GNSS/GPS receiver antenna to the center of the working equipment. This is the left/right offset.

Measure as closely as possible, even though the receiver is in the air and the boom is near the ground.

Note: The offset is a fixed, real-world value. Do not artificially adjust the offset value to align spray placement because this can introduce error when changing speeds.

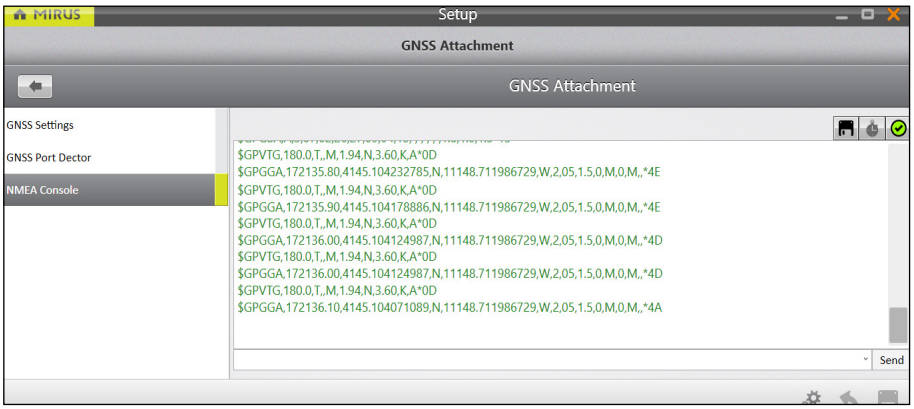
2.4.4 View NMEA Messages from the GNSS/GPS Receiver



To view the NMEA messages from the GNSS/GPS receiver,

1. Open the **Setup** > **GNSS Attachment** screen.
2. Tap **NMEA Console**.

Mirus displays the NMEA Console.



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CHAPTER THREE

Define Settings in Mirus

3 Define Settings in Mirus

3.1 Set Up the Actuators

To set up the actuators in Mirus,

1. In Mirus, open **Setup** > **Applicator** > **Actuator**.

2. Set the desired values for each boom actuator.

Boom Actuator		
Item	**Default Value**	**Description**
Actuator Function	None	By default each boom is defined as inactive (set to none). Select the actuator function. • None: Inactive boom • Boom: Active application boom • Air: Manual mode switch within Mirus to open the air supply solenoid • Wash: Manual mode switch within Mirus to open the wash solution supply solenoid
Auxiliary 1.1 Name	Boom order	Customize the name of each actuator boom. The default name of the booms is their order, i.e. *boom 1*. You might call yours *In Furrow* or *Banding*. Note: If booms are renamed, the name cannot be *Boom #*.
Auxiliary 1.1 Open State Name	Off	By default the open actuator is not powered. You can customize the name of this field.

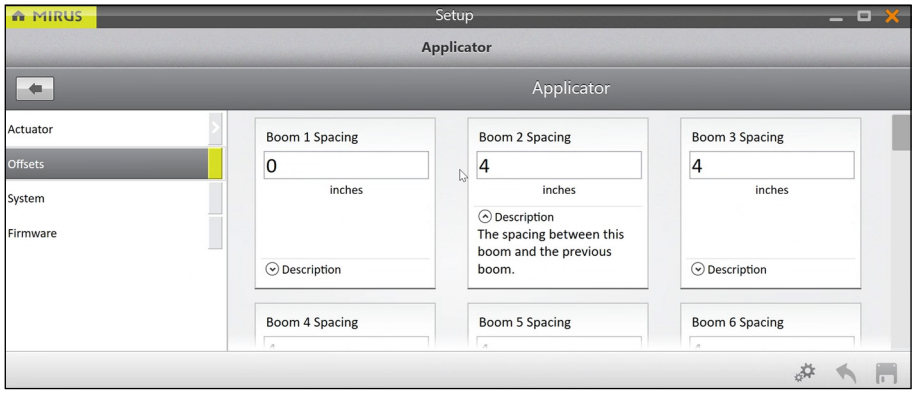
Boom Actuator		
Item	**Default Value**	**Description**
Auxiliary 1.1 Close State Name	On	By default the closed actuator is supplied power. You can customize the name of this field.

3.2 Define the Applicator Offsets

When measuring the booms to determine offset amounts, begin with the boom that leads in the direction of travel. The leading boom is always Boom 1 in Mirus. The offset measurement for Boom 1 is always 0, because it is your starting measurement. For all other booms, measure the distance between that boom and the one in front of it. For example, if the distance between boom 1 and boom 2 is four inches, enter 4 for Boom 2 spacing.

To define the applicator offsets in Mirus,

1. In Mirus, open **Setup** > **Applicator** > **Offsets**.



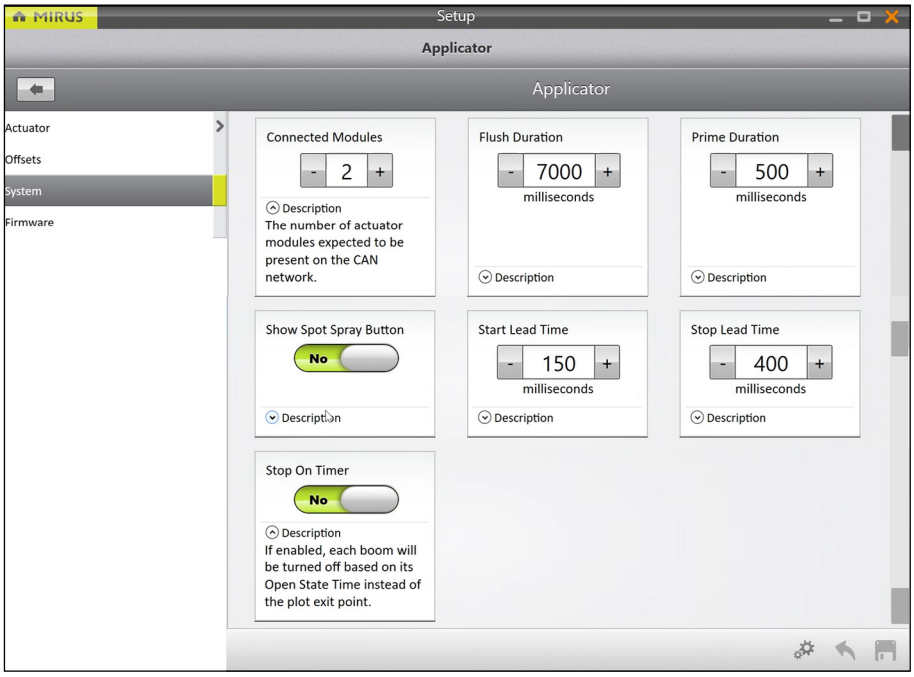
2. Enter the application settings, as explained in the table below.

Applicator Configuration	
Item	**Definition**
Boom 1 Spacing	Always set to 0. Boom 1 should always lead in the direction of travel.
Boom 2–24 Spacing	For Boom 2 and higher, set the spacing to the actual measured distance between one boom and the next.

3.3 Define Applicator System

To set up the actuators in Mirus,

1. In Mirus, open **Setup** > **Applicator** > **System.**



Applicator Configuration	
Item	**Definition**
Connected modules	Each module can support eight booms. Set the number of modules. • 1: up to 8 booms • 2: up to 16 booms • 3: up to 24 booms
Flush duration	Set the amount of time for each boom to fire when running wash solution (up to 30,000 msec).
Prime duration	Define the duration to prime each boom. The duration set here applies to all active booms.
Show spot spray button	When enabled, the Spot Spray button appears on the Main Menu, allowing control over individual booms.
Start lead time	Time needed to establish the desired flow or application pattern.

Applicator Configuration	
Item	**Definition**
Stop lead time	Time needed to terminate the flow or application pattern.
Stop On Timer	If enabled, each boom turns off when the set time has expired instead of when reaching the plot exit point.

3.4 Check Firmware Versions

The firmware version on each actuator module is displayed. Ensure that all modules have the same version of firmware.

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CHAPTER FOUR

Calibrate the System

4 Calibrate the System

4.1 Calibrate the Alvo Field Applicator and GNSS Attachment

When properly calibrated, the Alvo Field Applicator works at different speeds and with plots and alleys of different dimensions.

To calibrate the Alvo Field Applicator and GNSS Attachment, calibrate the offsets and align the applicator.

4.1.1 Calibrate the Offsets

Generally calibration is only required once unless the system changes. The following changes require recalibration:

- The GNSS/GPS receiver is changed to a different model. Recalibrate to account for changes in communication delay.
- The applicator is being used with a different tractor, the GNSS/GPS antenna is moved to a new position, or the GNSS/GPS is recalibrated. Recalibrate to account for changes in the offsets.
- New solenoids, actuators, nozzles, or change to system pressure. Recalibrate to account for changes.

Before calibration,

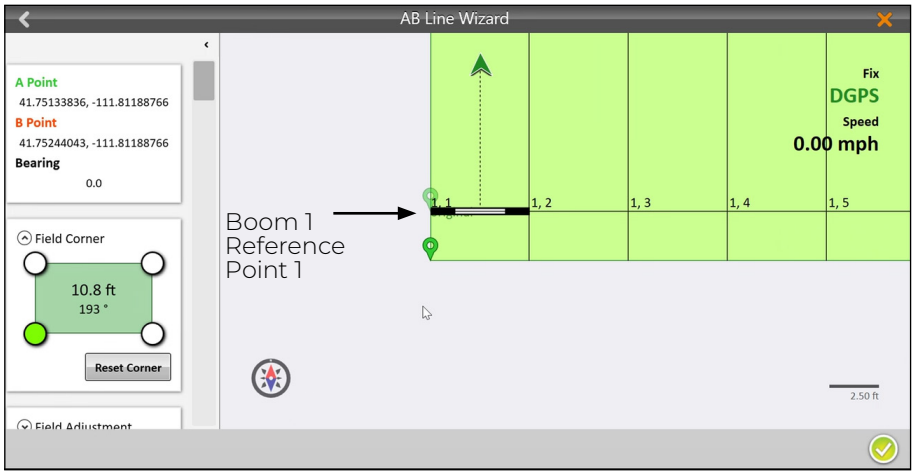
1. Ensure all solenoids or actuators are in good condition. Valves that are sticky or do not shut off completely adversely affect your application and make calibration extremely difficult.
2. Inspect for proper shut off. Turn on the boom or spray nozzle and wait for product to come out, and then shut it off. Verify that product stops flowing in less than one second.
3. Solenoid valves should be located as close to the nozzles as possible to limit the amount of hose or pipe length that is pressurized with product. Having an unnecessary amount of product in the hose or piping increases the amount of time for the system to stop spraying.

Verify the Front/Back Offset

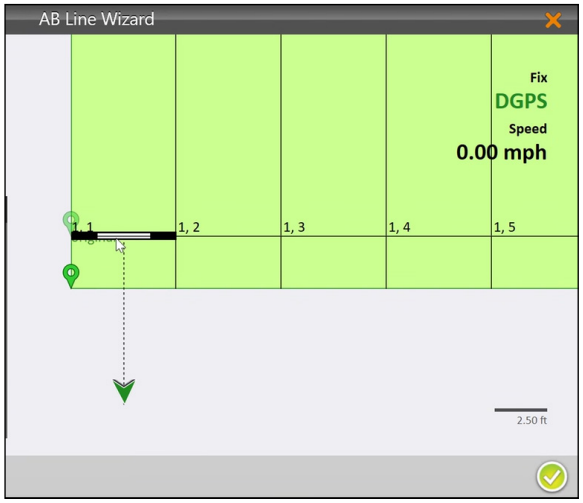
Verify the front/back offset to ensure that the GPS receiver locations received and displayed in Mirus match the locations in your field that are represented on the electronic map. To set the front/back offset, see **2.4.3 Enter Receiver Offset** on page 21.)

To verify the front/back offset,

1. In Mirus, import a multiple range map. (See **1.3.1 on page 8**.)
2. Create an AB line using actual plot dimensions.
    - From the Manage Maps screen, select **AB Line**.
    - Enter the plot dimensions in the AB Line Wizard.
    - Position boom 1 at the edge of the first plot (Range 1, Row 1 on the Mirus map).



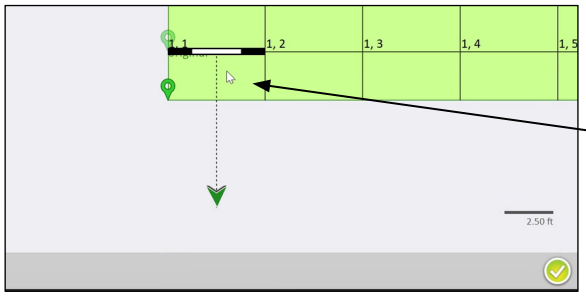
3. Mark the position of boom 1 with a flag or stake in the ground. (Reference Point 1)
4. Tap **Capture Point A**. Tap the next arrow .
5. Turn the tractor around 180 degrees.



Plot baseline

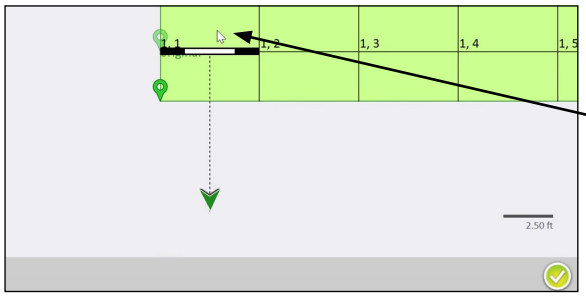
6. Position the tractor so that boom 1 matches the plot baseline in Mirus.

7. Measure from the boom 1 to the stake set previously. Note the measurement.
   - The front/back offset is correct if boom 1 aligns with the stake set previously (within the GPS level of accuracy, usually 1–4 cm).
   - If the boom and the stake do not align within the GPS level of accuracy, edit the front/back offset in the appropriate direction and repeat steps 2–7 until the offset is correct.
     To adjust the offset measurement in Mirus (**2.4.3 Enter Receiver Offset** on page 21), enter the combination of half of the distance between the in-ground marker and boom and the current offset distance.



If the offset is too small, your in-ground marker would be where the cursor is pointing.

In-ground marker position when offset is too small.



If the offset is too big, your flag in-ground marker would be where the cursor is pointing.

In-ground marker position when offset is too big.

4.1.2 Align the Application with the Plots

With the front/back offsets verified, check that the spray starts as the boom enters the plot and to stops as the boom leaves the plot. Three key factors—GNSS accuracy, GNSS communication delay, and start/stop lead time—influence how precisely the spray can be aligned to start as the boom enters the plot and stop as the boom leaves the plot.

- GNSS/GPS Accuracy.
  The accuracy of the GNSS/GPS receiver affects how well the applicator aligns to the plots. Mirus cannot compensate for misalignment that is due to lack of accuracy from the GNSS/GPS receiver. For example, a system using an RTK receiver that provides accuracy of 2 cm will have up to 2 cm of stagger in both directions. It could appear to be off by as much as 4 cm. Allow for the accuracy of your GNSS receiver when aligning the application with your plot.
- GNSS/GPS Communication Delay
  Under typical conditions GNSS signal, cable, and amplifier delays are negligible. However, if an operator wanted to compensate for a communication delay, this field allows that. The units of measure are in milliseconds.
- Start/Stop Lead Time
  The mechanics of the actuator cause a slight delay between the time that Mirus sends the signal to start/stop applying a product and the time when the product application begins or ends. Mirus provides settings to adjust the boom start lead time and the boom stop lead time. See **3.3 Define Applicator System on page 27**. The exact amount of time may not be the same for starting and ending the application.

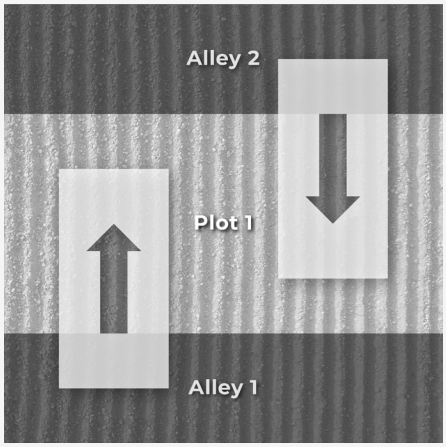
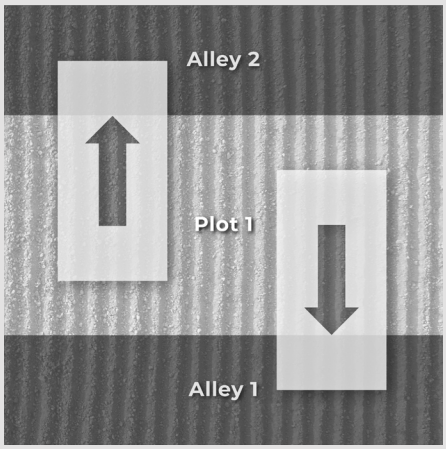
Verify Start/Stop Lead Times in Mirus

To properly calibrate the application,

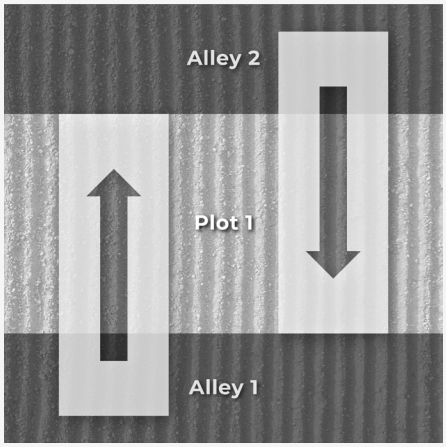
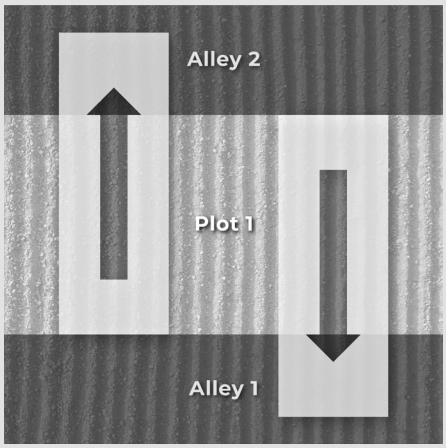
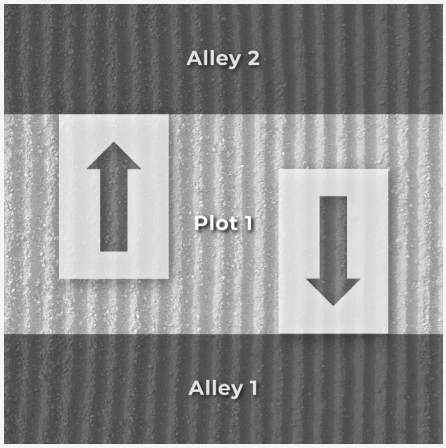
1. Create and import a map with 2 ranges and 10 rows, containing multiple treatments.
2. Load the treatments into the applicator. (See **5.1 Set Up Map Selection and Treatment on page 38**.)
3. Prime the booms. Ensure there is no air present in the system.
4. Create an AB line. (Follow steps 1–9 of **5.3 Use Automatic GNSS/GPS Cycling on page 41**.)
5. Mark the location of boom 1 with a flag or stake in the ground.
6. Drive two passes (preferably at the speed at which you will apply product). Mark where the application pattern starts and stops.

If the application patterns do not line up exactly as expected, the following table outlines likely issues and provides guidance for making adjustments in the Mirus settings. Change the start/stop lead time as described in **3.3 Define Applicator System on page 27**.

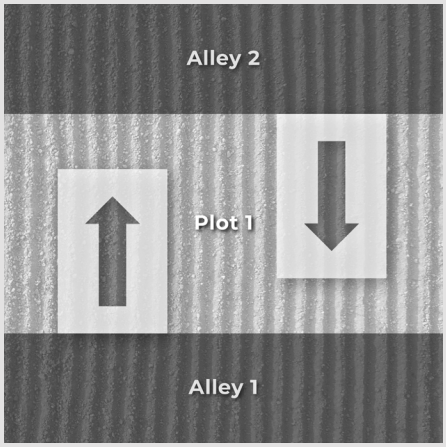
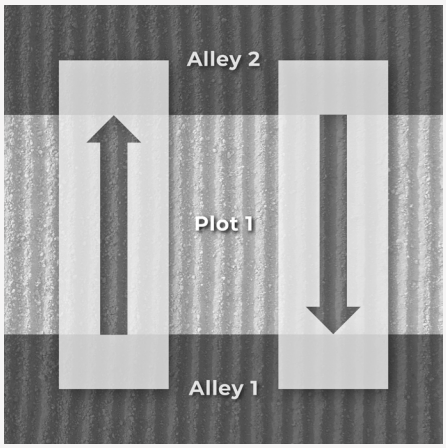
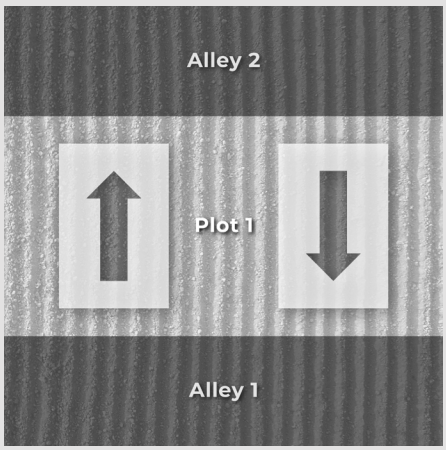
Likely Start/Stop Issues

Application Description	Possible Cause(s)	Diagram	Mirus Action
Start: early (before entering plot) End: early (before leaving plot) Length: correct Stagger: backward	• Both start/stop lead time are set too long. • Offset is too short. (Unlikely) Use your driving speed to determine the cause of the problem. Drive at varying speeds. • If the application gets longer with higher speed, the start/stop lead time is too long. • If the stagger remains consistent at varied speeds, the offset is too short.		Decrease start/stop lead time. Or increase the front/back offset.
Start: late End: late Length: correct Stagger: forward	• Both start/stop lead time are set too short. • Offset is set too long. (Unlikely) Use your driving speed to determine the cause of the problem. Drive at varying speeds. • If the application gets longer with higher speed, the start/stop lead time is too short. • If the stagger remains consistent at varied speeds, the offset is too short.		Increase the start lead time. Increase the stop lead time. Or increase the front/back offset.

Likely Start/Stop Issues

Application Description	Possible Cause(s)	Diagram	Mirus Action
Start: early Stop: correct Length: long Stagger: n/a	The boom start lead is too long. It takes less time to start the application than what is set as the start lead time.		Decrease the start lead time in Mirus.
Start: correct Stop: late Length: long Stagger: n/a	The boom stop lead time is too short. It takes less time to stop application than what is set as the stop lead time.		Increase stop lead time.
Start: late End: correct Length: short Stagger: n/a	The boom start lead is too short. It takes more time for the actuator to move and the application to form than what is set as the start lead time.		Increase the start lead time.

Likely Start/Stop Issues

Application Description	Possible Cause(s)	Diagram	Mirus Action
Start: correct End: Early Length: Short Stagger: n/a	The stop lead time is too long. It takes less time for the actuator to move and the application to form than the time set as the stop lead time.		Decrease the stop lead time.
Start: early End: late Length: long Stagger: n/a	The start lead time is too long, and the stop lead time is too short.		Decrease the start lead time. Increase the stop lead time.
Start: late End: early Length: short Stagger: n/a	The start lead time is too short, and the boom stop lead time is too long.		Increase start lead time. Decrease stop lead time.

alvo™

Field Applicator

CHAPTER FIVE

Apply Treatments

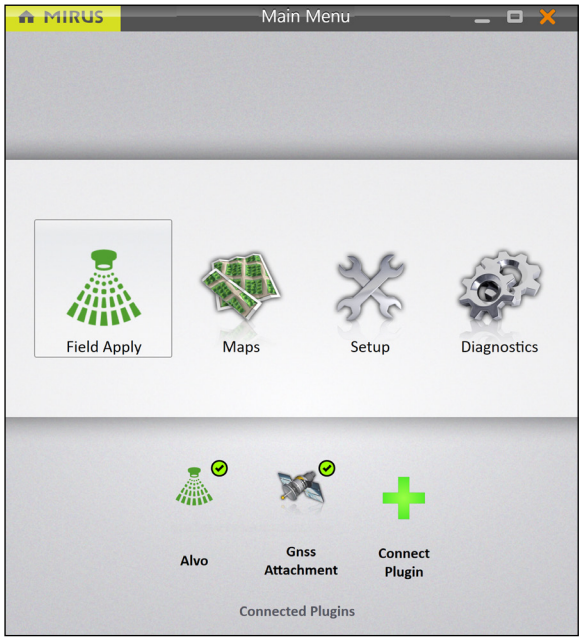
5 Apply Treatments

This section covers instructions for field application. Be sure that calibration and system setup have already been completed.

After selecting a map and setting up treatments, set up the system for automatic cycling or manual cycling. Automatic cycling triggers the applicator system automatically using GNSS/GPS.

5.1 Set Up Map Selection and Treatment

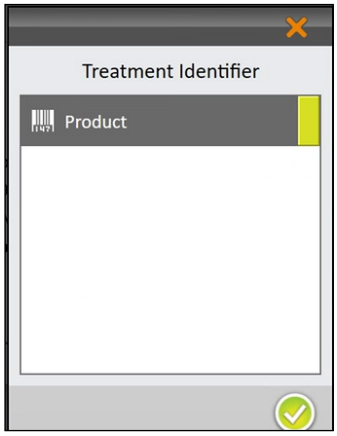
For manual cycling and automatic GNSS/GPS cycling, open the map and identify the treatments. Each Alvo actuator module can apply one or two products simultaneously. A treatment conflict warning appears if you have three or more products assigned to one actuator module.



To set up the map and treatments,

1. Open Mirus.
2. Tap **Maps** .

3. Select the map.
4. Tap **Applicator Setup**.



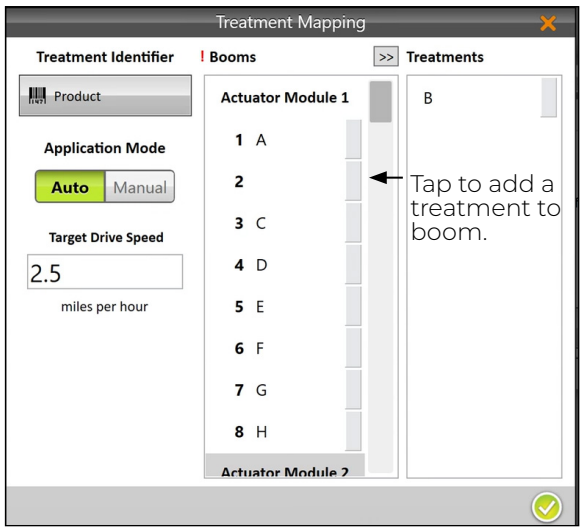
The Treatment Identifier window displays all of the treatments you have defined. You can only select one at a time.

5. Select the Treatment Identifier.

   In the example to the left, the map was imported from a .csv file and the column was labeled "Product."

   If the map was imported from a .txt file, the identifier would be "Id 1."

6. Tap the check icon .



Mirus displays the Treatment Mapping window with all of the treatment names from the map file associated with a boom number in alphanumeric order.

Any conflicts are noted with a red exclamation point. (See **5.2 Resolve Treatment Conflicts** on page 39.)

7. To change the order or placement in the booms.,
   - Tap the treatment you want to move.
   - Tap >.
     The treatment shows in the other column leaving the boom number empty.
   - Repeat to create an empty boom.
   - Select the unassigned treatment from the right column.
   - Tap the arrow for the empty boom where you want the treatment to go.
8. When the treatments are listed with the correct boom numbers, tap the check icon .

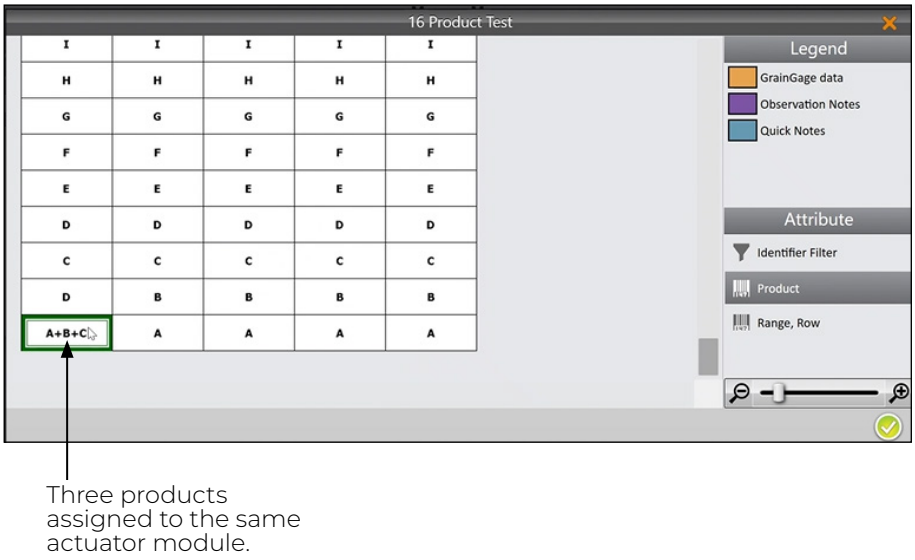
5.2 Resolve Treatment Conflicts

If more than two products are assigned to the same actuator module, Mirus marks the products with red exclamation marks in the Booms column on the Treatment Mapping window.

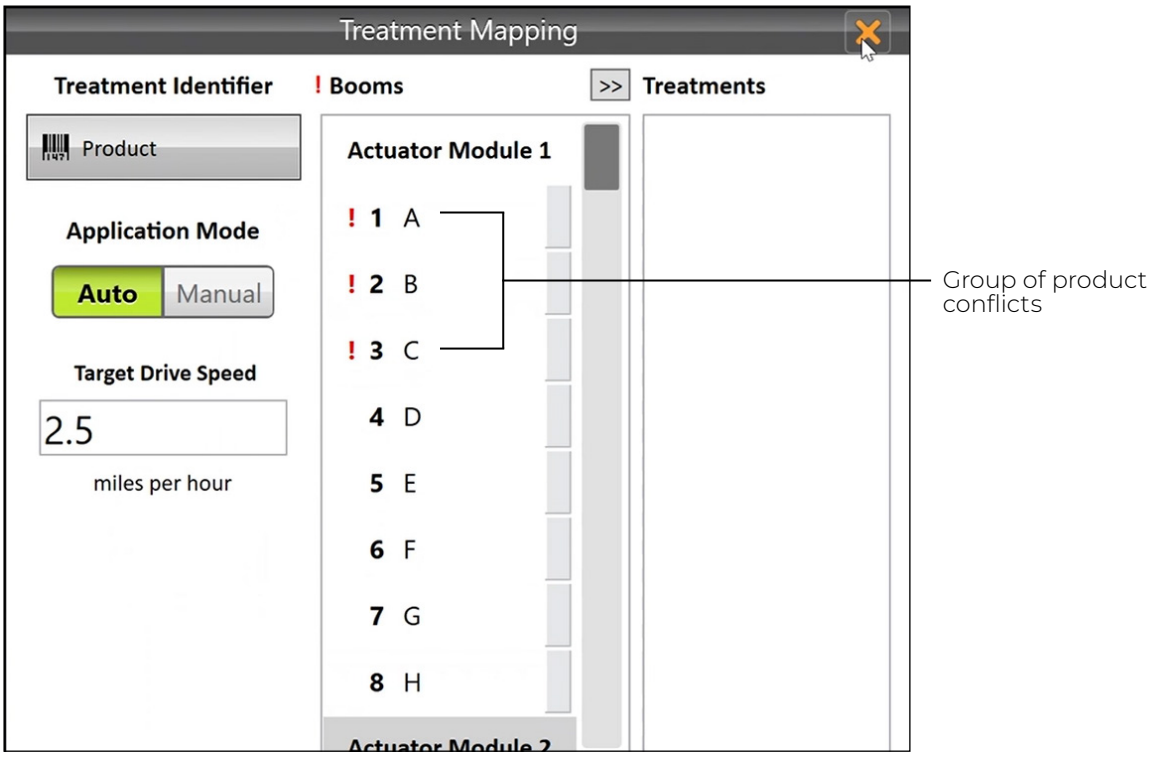
To resolve the conflict from the Treatment Mapping window,

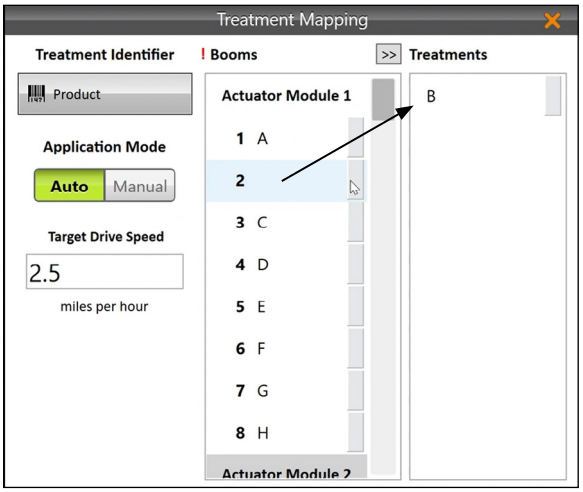
1. Close the Treatment Mapping window.
2. From the Manage Maps screen, select the map associated with the treatment.
3. Tap **View**.
4. Under Attribute, tap **Product**.

5. Scan the map for three or more products assigned to the same actuator module.



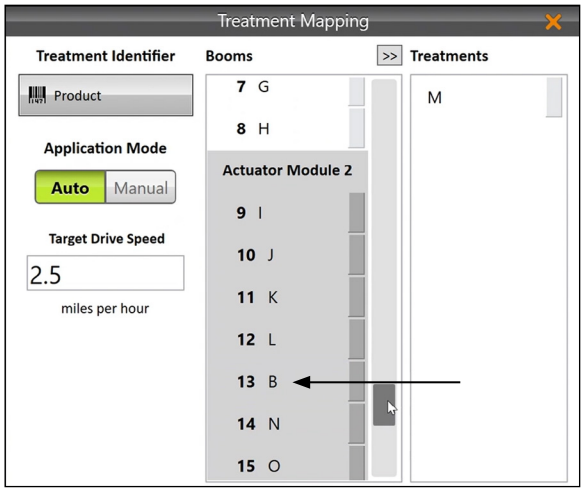
6. Tap the check icon.
7. Tap **Applicator Setup**.
8. In the Treatment Identifier window, tap **Product** and tap the check icon.
9. Locate the group(s) of conflicts, marked by red exclamation marks. Each actuator module can apply up to two products simultaneously.





10. Tap one product (from a group of conflicts).
11. Tap the arrow > to move the product to the Treatments column. This leaves the space by the boom number empty.

    Repeat this step for each group of conflicts.



12. Tap a product in the Treatments column.
13. Tap an empty space on a different module in the Booms column.

    Note: If no empty space exists on a different module, move a product from a different module to the Treatments column. Now, you have two products in the Treatments column. Then, trade the module assigned to each product.

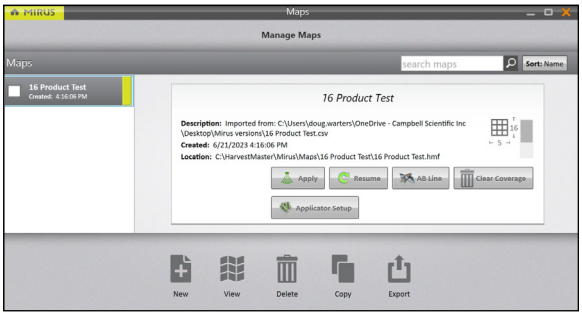
After you resolve the product conflicts, the red exclamation marks disappear.

14. Tap the check icon ✓.

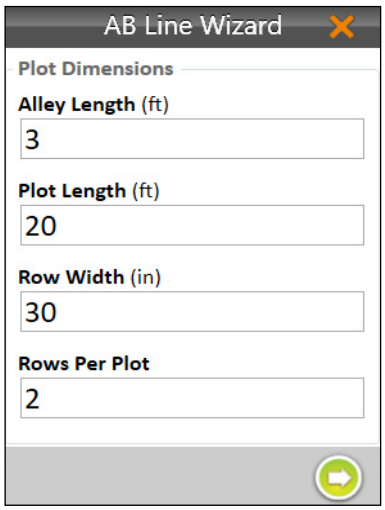
5.3 Use Automatic GNSS/GPS Cycling

After selecting a map and setting up treatments, you can setup the system for automatic cycling or manual cycling. Automatic cycling triggers the applicator automatically using GNSS/GPS.

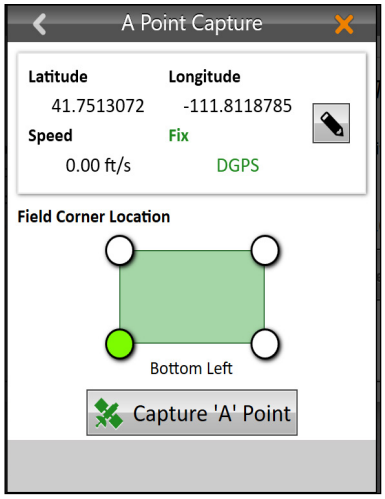
Mirus uses the AB line to calculate the locations of plots in the field to automatically start the applicator when entering a plot and to automatically stop the applicator when leaving a plot.



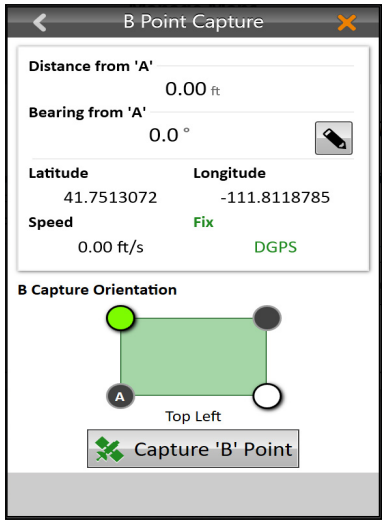
1. In the Manage Maps screen, tap **AB Line** to open the AB Line Wizard.



2. Enter the plot dimensions
3. Tap the next arrow to save this information.



4. Position boom 1 to be ready to enter at the edge of the first plot (Range 1, Row 1).
5. Tap **Capture A Point**.
6. Tap the next arrow .



7. Establish a bearing by either entering a bearing (if known) or by moving several plots through the field to capture the B point.

   To enter a bearing,

   - Tap the edit icon .
   - Enter your manual bearing from A.
   - Tap the next arrow .

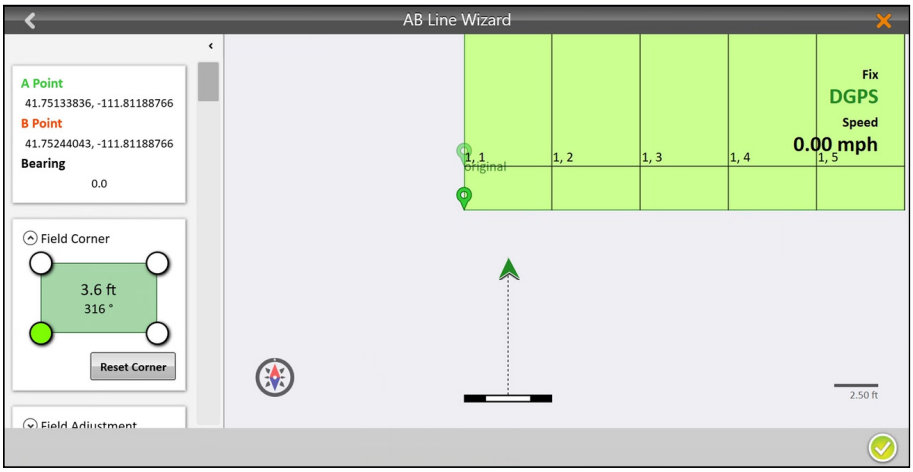
   To capture the B point,

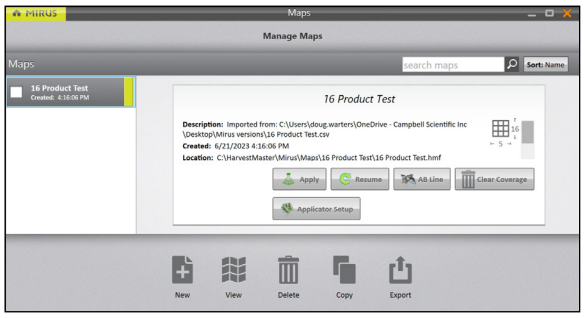
   - Move several plots through the field.
   - Tap **Capture B Point**.
   - Tap the next arrow .

The accuracy of the bearing is better when there is a long distance between the A point and the B point. If these points are captured at a short distance, the bearing could have some error in it.

In the AB Line Wizard, you can see the A and B Points, Bearing, Field Corner, Field Adjustment, GNSS Offsets, and Field Dimensions.

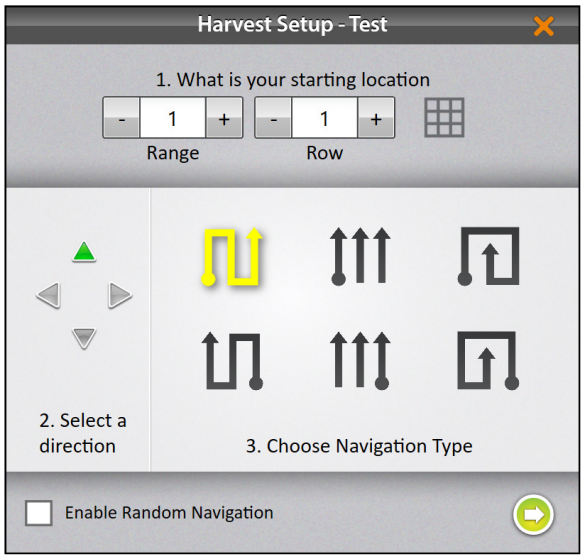
8. Back the applicator out of the plot.





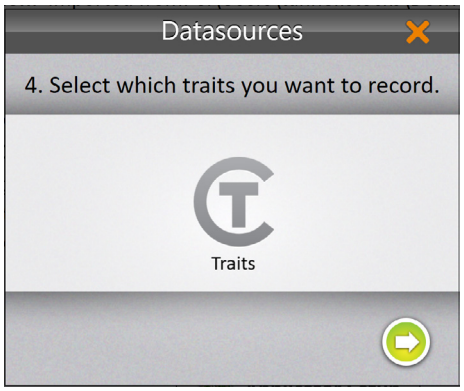
9. Tap the check icon to save the AB Line.
10. Tap **Apply**.

Mirus displays the Manage Maps screen.



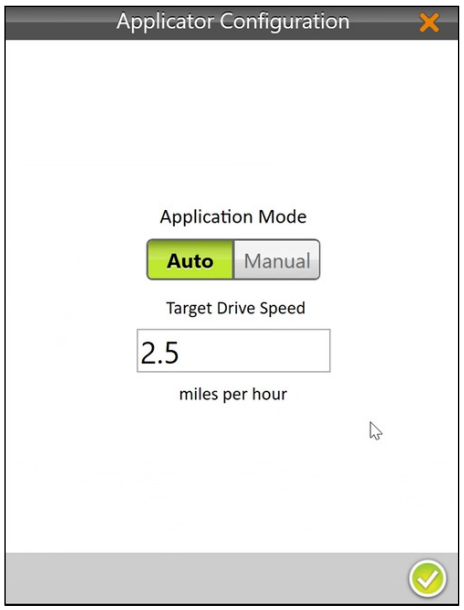
In the Harvest Setup screen,

11. Select your starting location.
12. Select a direction.
13. Choose your navigation type.
14. Tap the next arrow.



In the Datasources screen,

15. Tap the next arrow again.

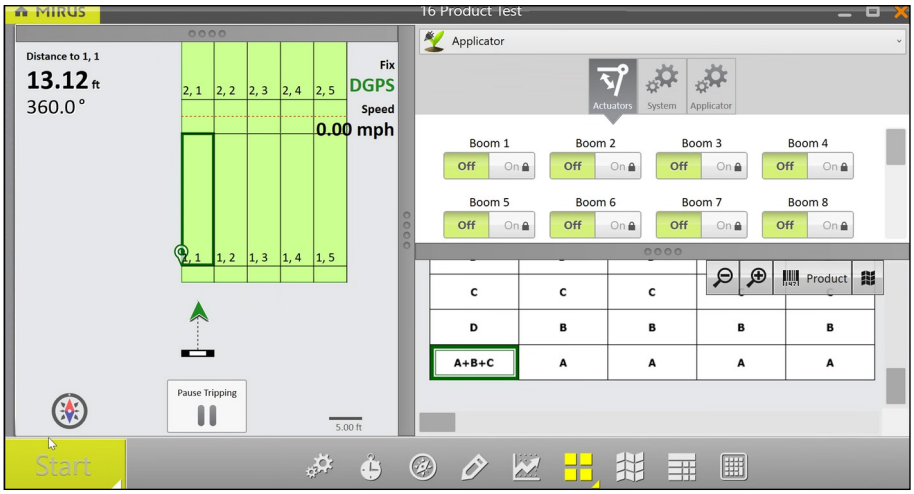


In the Applicator Configuration screen,

16. Select **Auto**.
17. Tap the check icon .

Note: Manual operation is covered in the following section.

Mirus displays the Map screen.



You can see four sections of information in the quad view. If you use the spatial view in your quad view setup, it displays plots labeled with "Range, Row" by default. But you can select from a list of different spatial attributes by tapping the spatial attribute button in that quad. To visually distinguish plots that have been treated, select the "Treatment" or "Id 1" spatial attribute with the green custom trait icon.

When you are ready to begin,

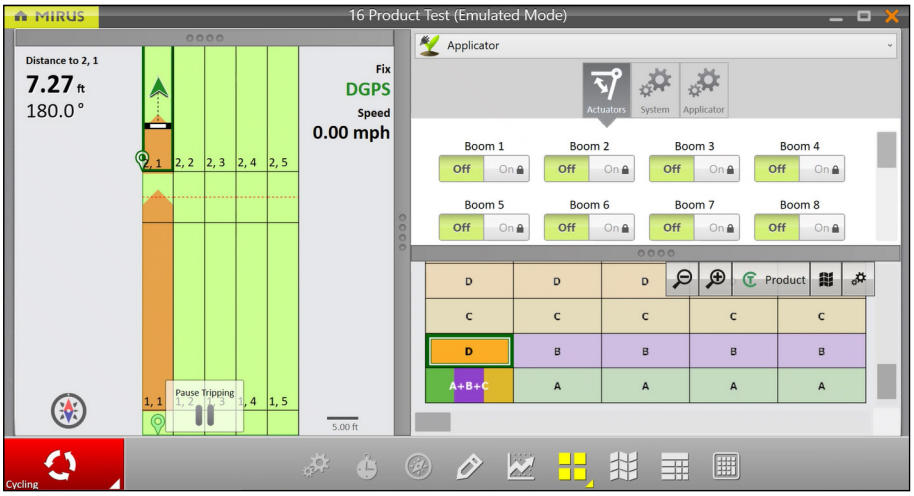
18. Tap **Start** Start.

    The system immediately begins applying product when boom 1 enters the first plot.

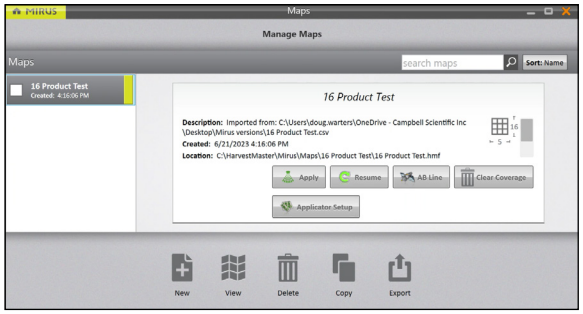
19. Start moving into and through the plots at your target speed. Mirus triggers the applicators automatically.

5.4 Clear Application Coverage

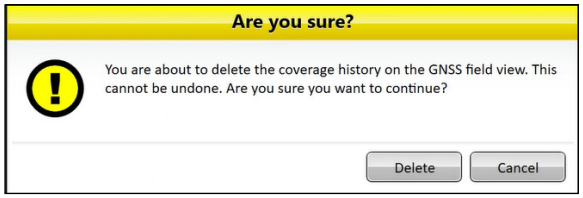
If you make multiple timing applications through the trial using the same map, you may want to remove the color indicating application coverage. By default coverage remains visible indefinitely.



From the Manage Maps screen,

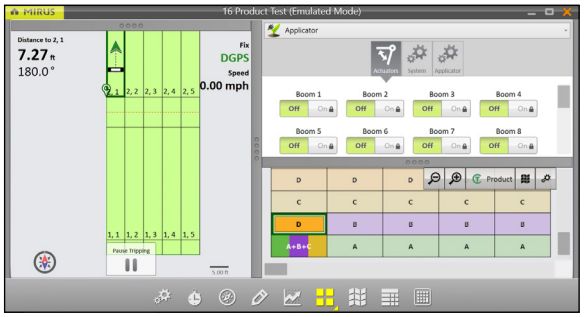


1. Tap **Clear coverage**.



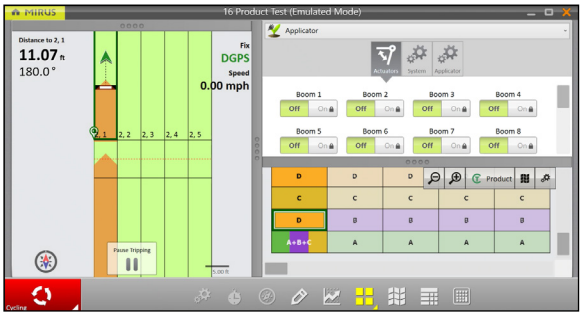
Mirus asks whether you are sure.

2. Tap **OK**.



The coverage color is removed.

5.5 Interrupt Application Cycle



If you stop mid-application. As soon as you stop, the boom stops.

1. Tap the **Cycle** button.

Mirus asks whether you want to abort the application cycle.

2. Tap **Abort**.

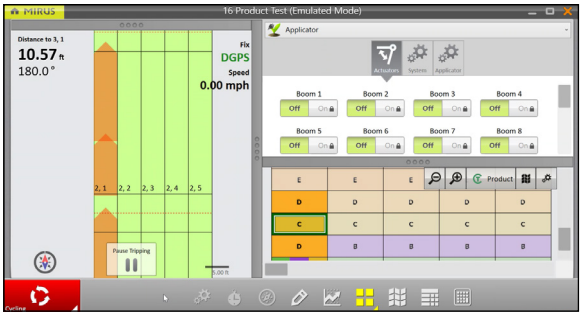
The Application Cycle Aborted warning box appears.

Scenario 1: Resume application from current plot.

In some situations, you will resume application from where you stopped.

1. Tap **Resume at current plot**.
2. Tap **Resume tripping** 

.

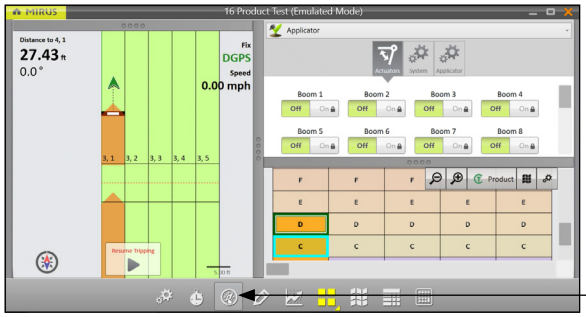


3. Continue driving. The application coverage picks up from where you stopped.

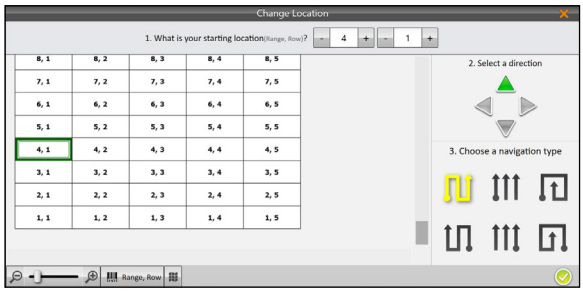
Scenario 2: Discard data for current trial and resume application at the next plot.

In some situations, you will resume application and discard this plot.

1. Tap **Resume at next plot**.
2. Tap the compass to change your location.



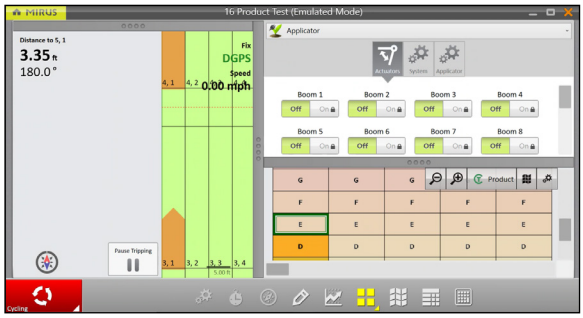
Compass



3. Tap the plot where you will begin application. The green box indicates the next plot to enter.

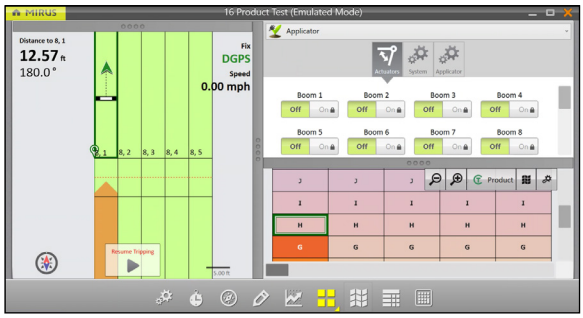
4. Check the direction of travel. Check the pattern of travel.
5. Tap the check icon ✓.
6. Tap **Resume Tripping** 

.
7. Continue driving.

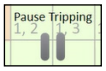


The plot is discarded. The application resumes at the beginning of the selected plot.

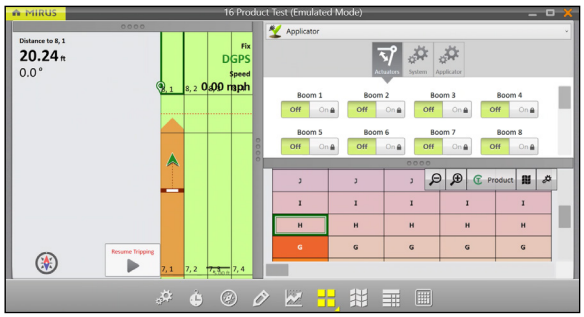
5.6 Pause Application



If you need to pause the spraying,

1. Tap **Pause Tripping** 

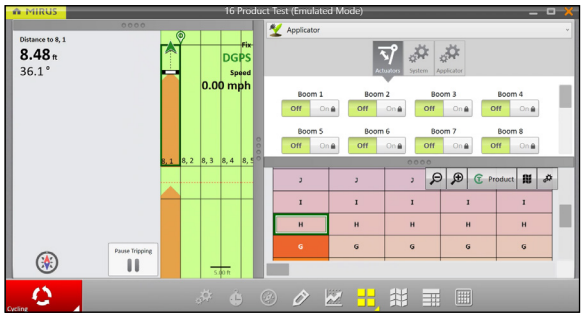
.
2. Finish the plot application. When you drive into the next plot, no product is applied.



3. When you are ready to resume application, drive the applicator into the previous plot.

4. Tap the compass  to verify navigation.
5. Tap **Resume Tripping** 

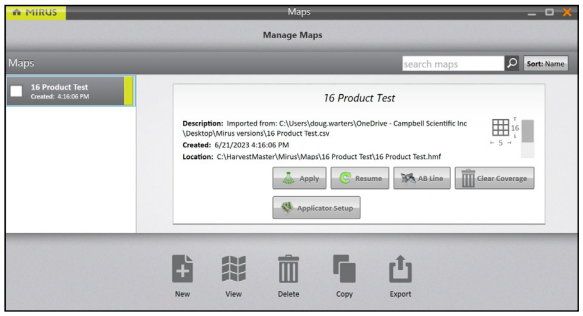
.



6. Begin driving. No product is applied until you enter the next plot.

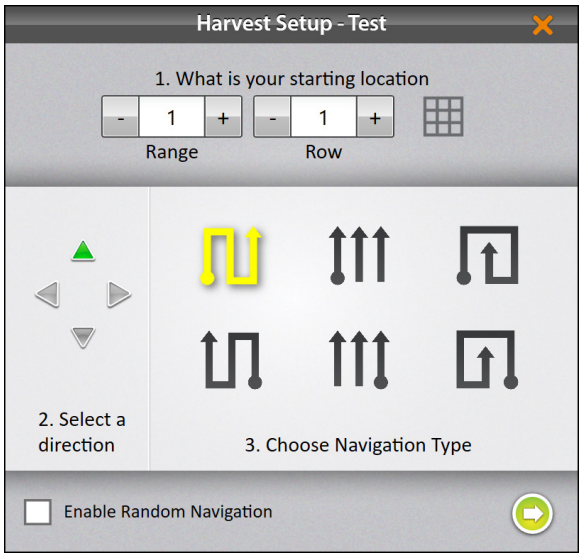
5.7 Use Manual Cycling

Manual cycling triggers the applicator when using the remote enter button. Ensure the remote enter button is connected to the system controller.



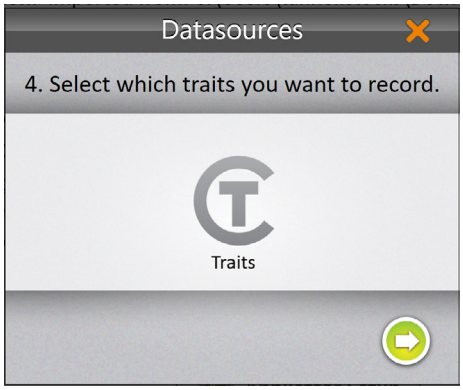
On the Manage Maps screen,

1. Tap **Spray**.



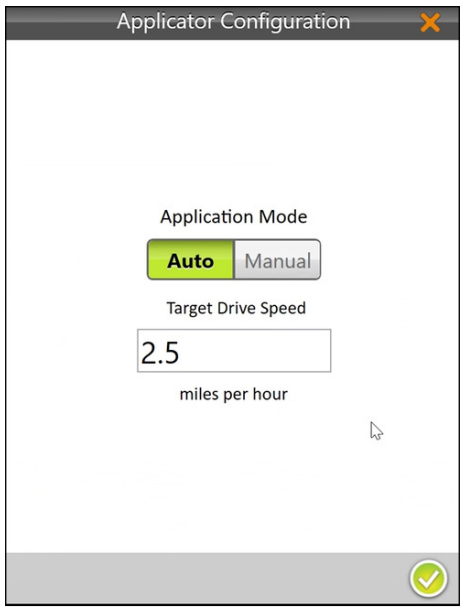
In the Harvest Setup screen,

2. Select your starting location.
3. Select a direction.
4. Choose your navigation type.
5. Tap the next arrow .



In the Datasources screen,

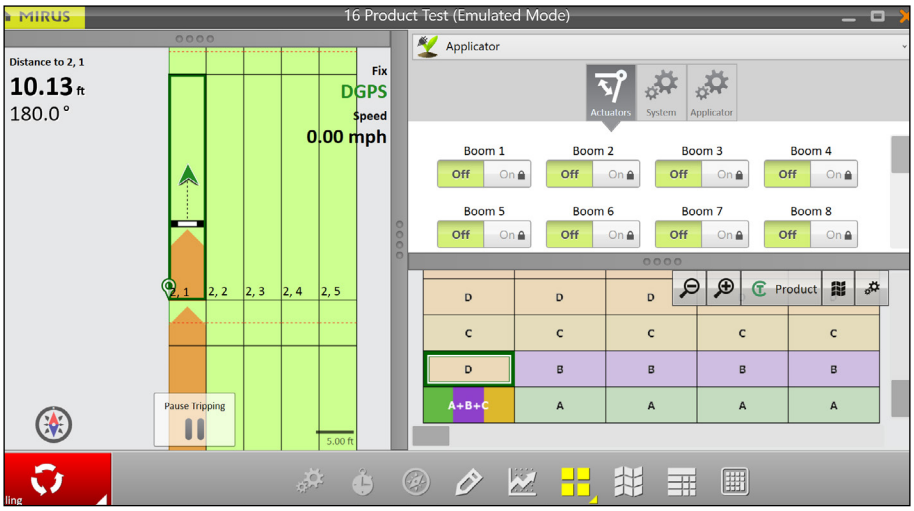
6. Tap the next arrow again.



In the Applicator Configuration screen,

7. Tap **Manual**.
8. Tap the check icon .

If you use the spatial view in your Quad View setup, it displays plots labeled with "Range, Row" by default. You can select from a list of different spatial attributes by clicking on the spatial attribute button in that quad. To visually distinguish plots that have been treated, select the "Treatment" or "Id 1" spatial attribute with the green custom trait icon.



When you are ready to begin,

1. Tap **Start** Start.
2. Tap the green cycle button to start the spray application for the plot.
3. Drive through the plot while spraying.
4. Tap the red cycle button to stop the spray application.
5. Continue to drive through the plots using the remote enter button to cycle the applicator on and off.

Manual Spray

Button Stage	Operator Action	Spray Stage
Start	Enter press	Start at the edge of the plot.
	Enter press	Start the spray application for the plot.
	Drive	Drive through the plot while spraying.
	Enter press	Stop the spray application at the end of the plot.
	Drive	Continue to drive through plots using the remote enter button to turn the applicator on and off.

alvo™

Field Applicator

CHAPTER SIX

Export Information

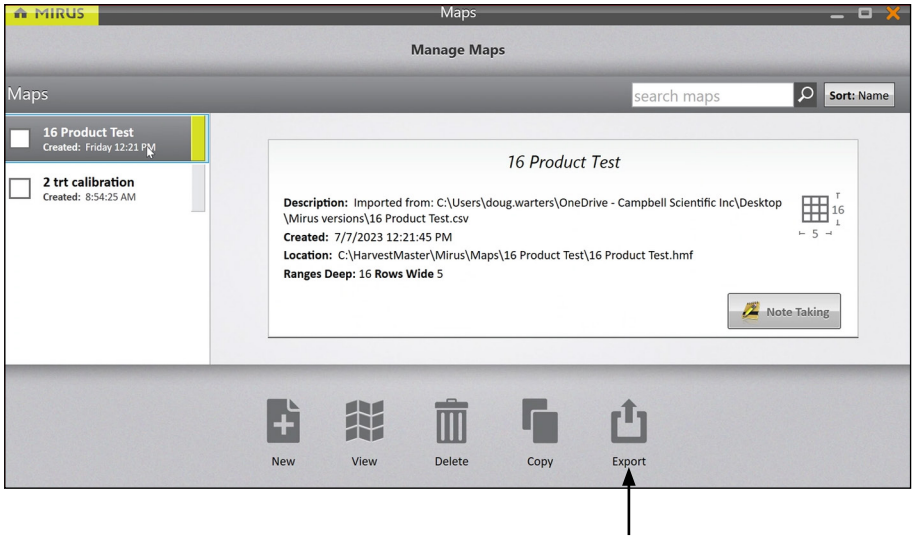
6 Export Information

Mirus can export information that it has collected to allow you to work with the data in different ways.

6.1 Map Data

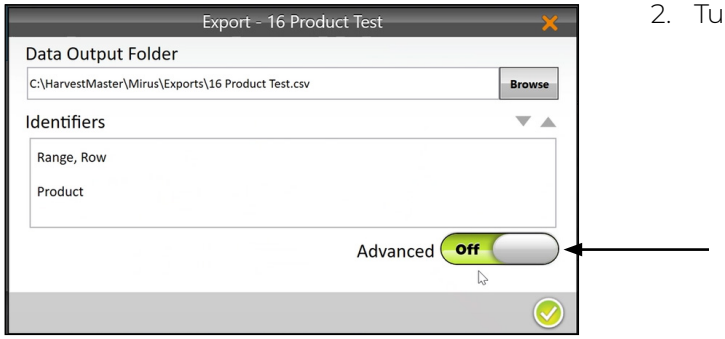
You can export map data including various key location points.

From the Manage Maps screen, choose the map you want to export data from.

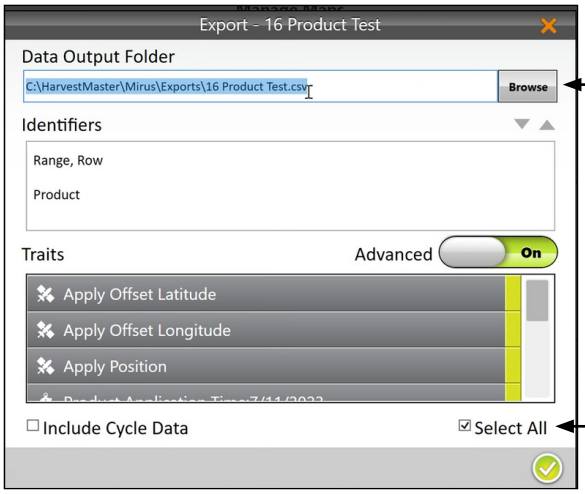


1. Tap Export.

   Mirus displays the Export box.



2. Turn the Advanced slider on.



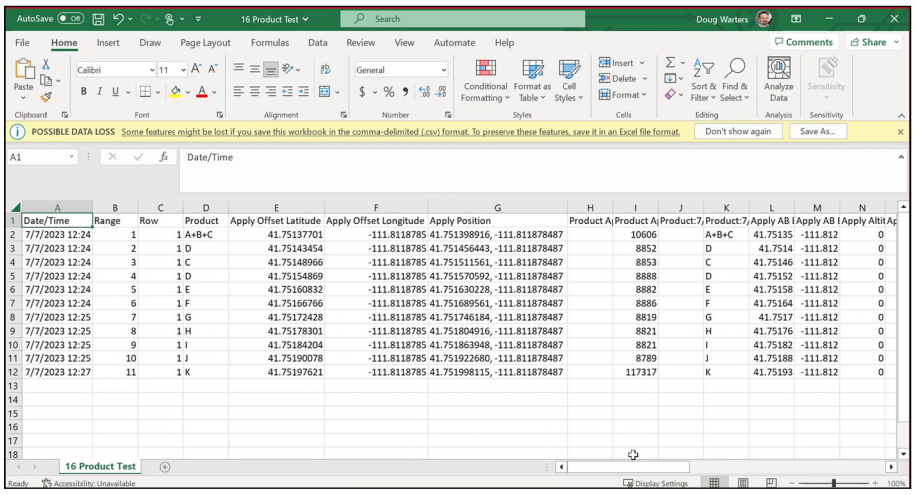
3. Check the box to select all.

The exported information saves as a csv file with the name of the map you selected at C:\HarvestMaster\Mirus\Exports\. Use the Browse button to choose a different location.

Mirus displays the Export Successful box.

4. Tap **Open** to view the exported information.

Mirus opens a program to display the CSV file.



Date/Time	Range	Row	Product	Apply Offset Latitude	Apply Offset Longitude	Apply Position
7/7/2023 12:24	1	1	A+B+C	41.75137701	-111.8118785	41.751398916, -111.811878487
7/7/2023 12:24	2	1	D	41.75143454	-111.8118785	41.751456443, -111.811878487
7/7/2023 12:24	3	1	C	41.75148966	-111.8118785	41.751511561, -111.811878487
7/7/2023 12:24	4	1	D	41.75154869	-111.8118785	41.751570592, -111.811878487
7/7/2023 12:24	5	1	E	41.75160832	-111.8118785	41.751630228, -111.811878487
7/7/2023 12:24	6	1	F	41.75166766	-111.8118785	41.751689561, -111.811878487
7/7/2023 12:25	7	1	G	41.75172428	-111.8118785	41.751746184, -111.811878487
7/7/2023 12:25	8	1	H	41.75178301	-111.8118785	41.751804916, -111.811878487
7/7/2023 12:25	9	1	I	41.75184204	-111.8118785	41.751863948, -111.811878487
7/7/2023 12:25	10	1	J	41.75190078	-111.8118785	41.751922680, -111.811878487
7/7/2023 12:27	11	1	K	41.75197621	-111.8118785	41.751998115, -111.811878487

Each category of data specific to your field applicator included in the CSV file is described below.

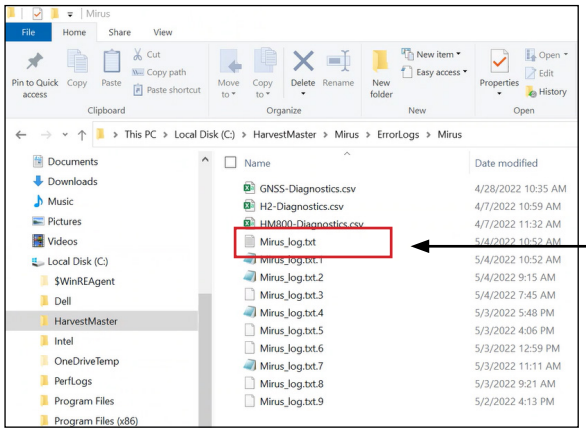
Map Export	
Field Name	**Description**
Apply Offset Latitude/ Longitude	The averaged offset position of boom 1 from the time the plot is entered to the time it is exited.

Map Export	
Field Name	**Description**
Apply Position	The averaged antenna position from plot entry to exit without any offsets applied.
Apply AB Bottom Left Latitude/ Longitude	Coordinates of the bottom left corner of the plot as projected by the AB line. They are not captured in real time by the GNSS receiver.
Start Latitude/ Longitude	The coordinates of your GNSS/GPS antenna when boom 1 enters the plot.
End Latitude/ Longitude	The coordinates of your GNSS/GPS antenna when application to the plot ends.
Start Offset Latitude/ Longitude	The coordinates of the left side of boom 1 when it begins application to the plot. A larger start lead time will put the coordinates further away from the plot boundary. If the start lead time is set to 200ms, the coordinates will be approximately 200ms ahead of the plot boundary If you are applying overlapping treatments, these coordinates will be somewhere in the next plot and not very useful to you. The coordinates are the position of boom 1 when all of the treatments for the plot have been applied (or the application is aborted).
End Offset Latitude/ Longitude	The coordinates of the left side of boom 1 when application to the plot ends. A larger stop lead time will put the coordinates further away from the plot boundary.
Treatment	The Treatment Identifier that you selected during the Applicator Setup. See step 5 in **5.1 Set Up Map Selection and Treatment** on page 38.
Treatment Application Time	The total time that the specific boom was on while traveling through the plot.

6.2 Error Logs

If you encounter a problem while installing or operating the Alvo Field Applicator, contact a HarvestMaster Field Service Engineer. If the HarvestMaster Field Service Engineer needs to look through the GrainGage error logs, you can find them saved on your device.

1. Insert a USB into your tablet.
2. Open File Explorer.



3. Go to C:\HarvestMaster\Mirus\ErrorLogs\Mirus

The most recent error log is saved under Mirus_log.txt. The Mirus_log.txt file holds up to 15 MB before it is saved again as Mirus_log.txt.1. When the next Mirus_log.txt fills up, Mirus_log.txt.1 becomes Mirus_log.txt.2 and so on. Mirus_log.txt.9 is the last log maintained by the system.

4. Select the Mirus_log.txt the HarvestMaster Field Service Engineer requested.
5. Copy the selected file to the USB.
6. Email the file to the HarvestMaster Field Service Engineer.