

MATRIX[®] PRO

BOOMPILOT[®] SETUP GUIDE

For use with software version 2.0x and 2.5x.

Refer to the Matrix Pro GS User Manual for details
on setup with software version 3.x.

MATRIX[®] PRO_{840G}



MATRIX[®] PRO_{570G}



TeeJet[®]
TECHNOLOGIES

BoomPilot[®]
Automatic Boom Section Control

A Subsidiary of  Spraying Systems Co.[®]

Table of Contents

GENERAL MATRIX® PRO INFORMATION

1

| | |
|---|---|
| Setup Option Information..... | 1 |
| Drop Down Menu Selections..... | 1 |
| Keyboard Entry Screen..... | 2 |
| Unavailable Options When Job is Active..... | 2 |
| Unit Setup Mode Availability..... | 2 |













GPS IS REQUIRED

3

| | |
|---|---|
|  GPS Type..... | 3 |
|  GPS Port..... | 3 |
| External Receiver Minimum Configuration Requirements..... | 4 |
| GGA Requirements..... | 4 |

BOOMPILOT CONFIGURATION

5

| | |
|--|----|
| Vehicle Setup..... | 5 |
|  Vehicle Type..... | 6 |
|  Antenna Height..... | 6 |
|  Direction to Boom..... | 6 |
|  Distance to Boom..... | 6 |
| Implement..... | 7 |
| Switch Box, Work On-Off Switch..... | 7 |
| Implement – Single Section Setup..... | 7 |
|  Guidance Width..... | 8 |
|  Spray Width..... | 8 |
| Implement – SmartCable or Section Driver Module Setup..... | 9 |
|  Number of Boom Sections..... | 10 |
|  Guidance Width..... | 10 |
|  Spray Width..... | 10 |
|  Overlap..... | 11 |
|  Delay On..... | 11 |
|  Delay Off..... | 11 |

BOOMPILOT OPERATION

12

| | |
|-----------------------------|----|
| SmartCable or SDM..... | 12 |
| Off/Manual & Automatic..... | 12 |
| All Sections On Mode..... | 12 |
| Single Section..... | 12 |
| BoomPilot Status..... | 13 |

APPENDIX - FACTORY SETTINGS & RANGES

13

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Safety Information

TeeJet Technologies is not responsible for damage or physical harm caused by failure to adhere to the following safety requirements.

As the operator of the vehicle, you are responsible for its safe operation.

The BoomPilot is not designed to replace the vehicle's operator.

Do not leave a vehicle while the BoomPilot is engaged.

Be sure that the area around the vehicle is clear of people and obstacles before and during engagement.

The BoomPilot is designed to support and improve efficiency while working in the field. The driver has full responsibility for the quality and work related results.

Matrix Pro GS Software Version 3.x

All information on settings to configure BoomPilot can be found in the Matrix Pro GS User Manual.

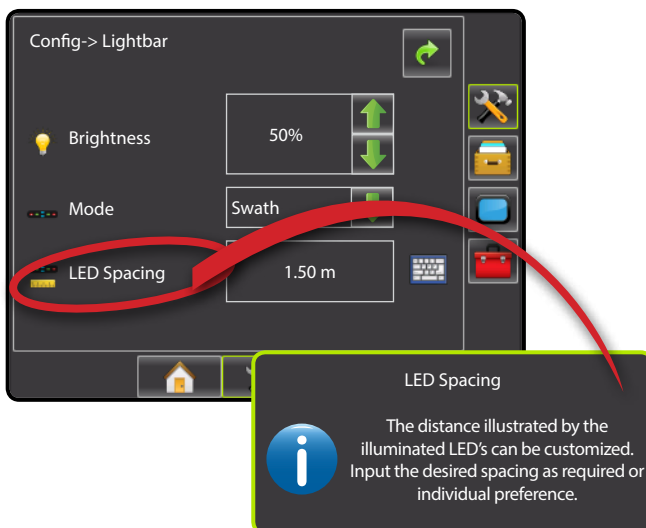
GENERAL MATRIX® PRO INFORMATION

The Matrix Pro is used to configure the vehicle and its implements.

Setup Option Information

Press the option's icon or option's name of any menu item to display a definition and range values of that item. To remove the information box, press anywhere on the screen.

Figure 1-1: Example of Information Text Box



Drop Down Menu Selections




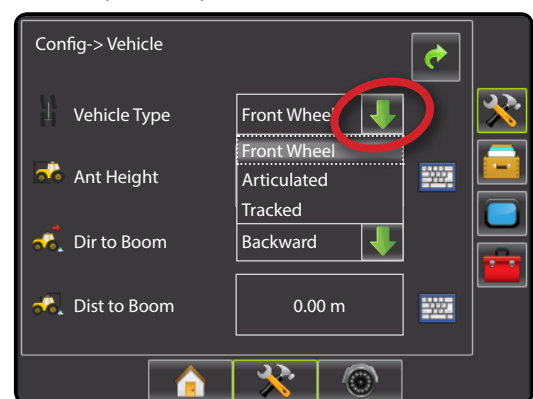
Press DOWN arrow  to access the list of options. Use the UP/DOWN arrows   or slide bar if necessary to scroll through the extended list. Select the appropriate option. To close the list without selecting an option, press anywhere on the screen outside the drop down menu.

Figure 1-2: Example of Drop Down Menu



Keyboard Entry Screen




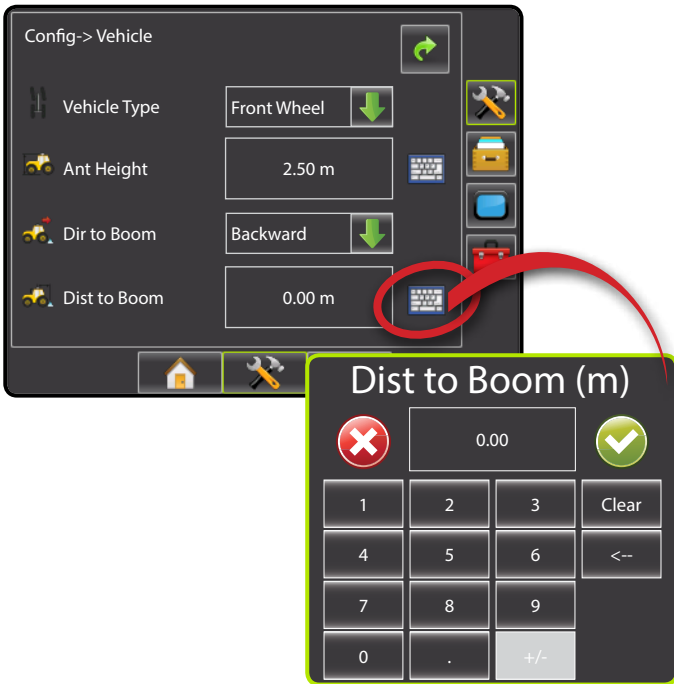
Press the KEYPAD icon  to use a numeric keypad to enter a value. Press **Clear** to erase the existing value. Press the ACCEPT icon  to save the settings or the CANCEL icon  to leave the keypad without saving

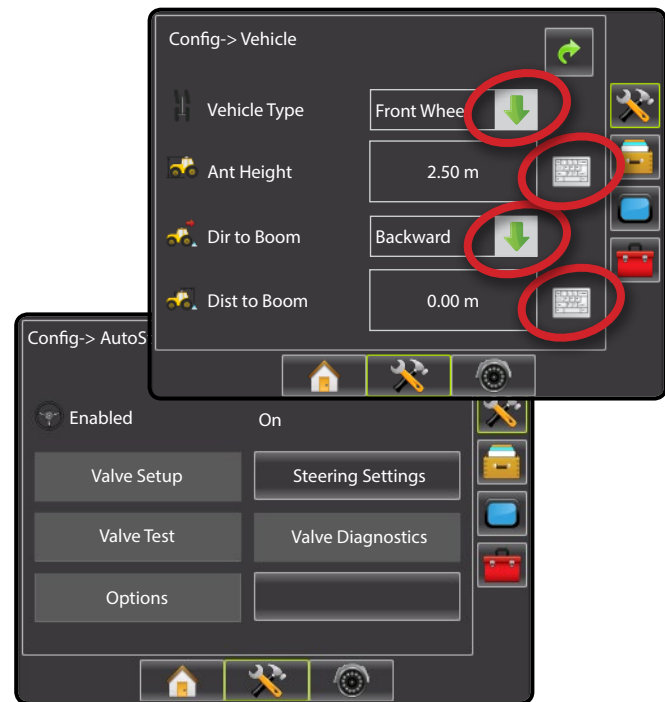
Figure 1-3: Example of Keyboard




























Unavailable Options When Job is Active

When a job is active some setup options are unavailable. See the Unit Setup Mode Availability Chart for indication of which options are not accessible.

Figure 1-4: Example of Unavailable Options



Unit Setup Mode Availability

| | | | | |
|------------|-------------------|--|---|---|
| Vehicle | - |  Vehicle Type | ✗ | |
| | - |  Antenna Height | ✗ | |
| | - |  Direction to Boom | ✗ | |
| | - |  Distance to Boom | ✗ | |
| Implement | - |  Number of Sections | ✗ | |
| | - |  Guidance Width | ✗ | |
| | - |  Spray Width | ✗ | |
| | - |  Overlap | ✓ | |
| | - |  Delay On | ✓ | |
| | - |  Delay Off | ✓ | |
| Auto Steer | - |  Enable | ✓ | |
| | Valve Setup | - |  Valve Type | ✗ |
| | | - |  Frequency | ✗ |
| | | - |  Minimum Duty Cycle Left | ✗ |
| | | - |  Minimum Duty Cycle Right | ✗ |
| | | - |  Maximum Duty Cycle | ✗ |
| | Steering Settings | - |  Coarse Adjustment | ✓ |
| | | - |  Deadband | ✓ |
| | | - |  Fine Adjustment | ✓ |
| | | - |  Lookahead | ✓ |
| | - | - | Valve Test | ✗ |
| | - | - | Valve Diagnostics | ✗ |
| | - | Options | -  Steering Wheel Sensor | ✗ |
| - | - | Angle Sensor | ✓ | |
| Tilt | - |  Enabled | ✓ | |
| | - | • Field Level | ✓ | |
| GPS | - |  GPS Type | ✗ | |
| | - |  GPS Port | ✗ | |
| | - |  GPS Status | ✓ | |

✓ Available during an active job

✗ Not Available during an active job

GPS IS REQUIRED

GPS is used to configure GPS Type and GPS Port.

NOTE: These settings are required for auto steering and tilt sensor operation, as well as proper implement operation.







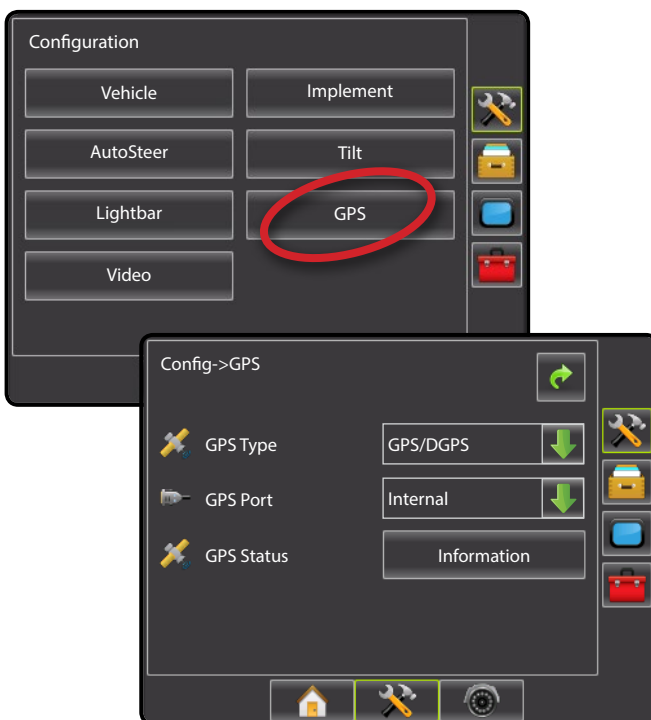
1. Press CONFIGURATION side tab .
2. Press **GPS**.
3. Select from:
 - ▶ GPS Type  – select GPS source transmissions
 - ▶ GPS Port  – sets (D)GPS COM port
 - ▶ GPS Status  – displays information for TeeJet Customer Service use on GGA/VTG (Data Rates), Number of Satellites, HDOP, PRN, GGA Quality, GPS Receiver and Receiver Version.
4. Press RETURN arrow  or CONFIGURATION side tab  to return to the main Configuration screen.

Figure 1-5: GPS



GPS Type

GPS Type customizes the system to accept GPS source or DGPS source transmissions.


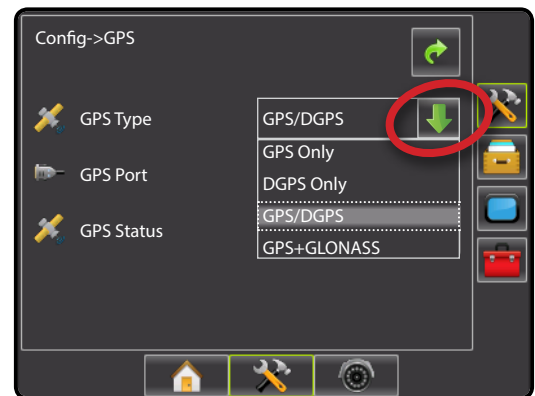

1. Press DOWN arrow  to access the list of options.
2. Select:
 - ▶ GPS Only – uncorrected signals
 - ▶ DGPS Only – differentially corrected signals
 - ▶ GPS/DGPS – either type of signal
 - ▶ GPS+GLONASS – uncorrected signals from both the GPS and GLONASS systems

Figure 1-6: GPS Type



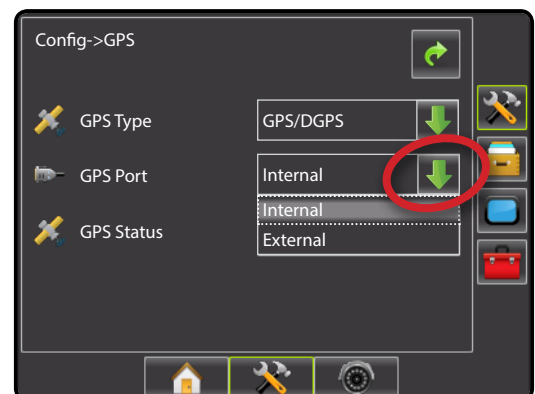
GPS Port

GPS Port sets port transmission to Internal or External.

1. Press DOWN arrow  to access the list of options.
2. Select:
 - ▶ Internal – use the internal (D)GPS (if equipped) and transmit out
 - ▶ External – receive external (D)GPS data

NOTE: Working with GPS signals such as Omnistar HP/XP or RTK will require GPS port to be set to External.

Figure 1-7: GPS Port



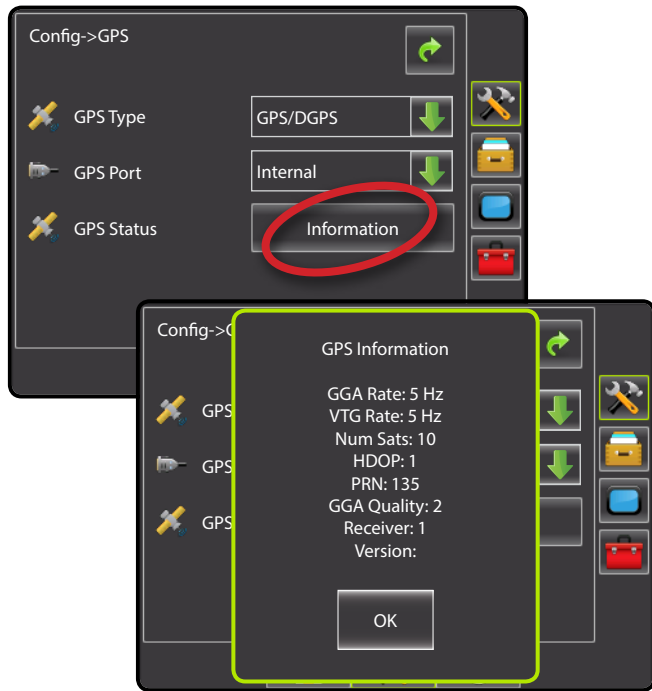
GPS Status

GPS Status displays information regarding data rates, number of satellites in view, and satellite quality and ID.

1. Press **Information**.
2. View data including:
 - ◀ GGA/VTG (Data Rates) – the number of GPS positions per second.
 - ◀ Num Sats – the number of GPS satellites in view (minimum of 4 are required for DGPS)
 - ◀ HDOP – a measure of satellite geometry strength in the horizontal plane. A HDOP value of less than 2 is preferred.
 - ◀ PRN – the current DGPS satellite ID
 - ◀ GGA Quality – the current quality indicator of the GPS signal (see GGA chart)
 - ◀ Receiver – the current indicator of the receiver
 - ◀ Version – the software version installed on the receiver
3. Press **OK** to return to GPS setup screen

NOTE: If GPS is not available, all entries will be "Invalid"

Figure 1-8: GPS Status



External Receiver Minimum Configuration Requirements

Before the Matrix will connect and work with an external GPS receiver, these minimum configuration requirements must be met.

| Serial Port Settings | |
|---|-----------------|
| Baud rate: | 19,200 |
| Data Bits: | 8 |
| Parity: | None |
| Stop Bits: | 1 |
| Serial Port connection requirements | |
| Male 9 pin RS-232 serial cable | |
| <i>NOTE: May require Null modem adapter depending on pin out of receiver.</i> | |
| NMEA Strings | |
| GGA | 5 Hz |
| Optional VTG | 5 Hz, 2 Hz, Off |
| ZDA | 0.2 Hz |

GGA Requirements

GGA Quality required to be able to work with various types of signal can vary. See table below for requirements.

| Service | Indicator | Accuracy |
|-------------------|-----------|----------|
| GPS only | 1 | <3 m |
| WAAS/EGNOS/Beacon | 2 | <1 m |
| RTK | 4 | 4 cm |
| Omnistar HP/XP | 5 | 10 cm |
| Glide/ClearPath | 9 | <1 m |

BOOMPILOT CONFIGURATION

The Matrix Pro is used to configure the vehicle and its implements.

To access Matrix Pro BoomPilot configuration options:










1. Press UNIT SETUP bottom tab .
2. Press CONFIGURATION side tab .
3. Select from:
 - ▶ Vehicle – used to establish vehicle type, antenna height, direction to boom and distance to boom.
 - ▶ Implement – used to establish number of boom sections, guidance width, spray width, overlap percentage, implement delay on time and implement delay off time.

Figure 1-9: Configuration Options



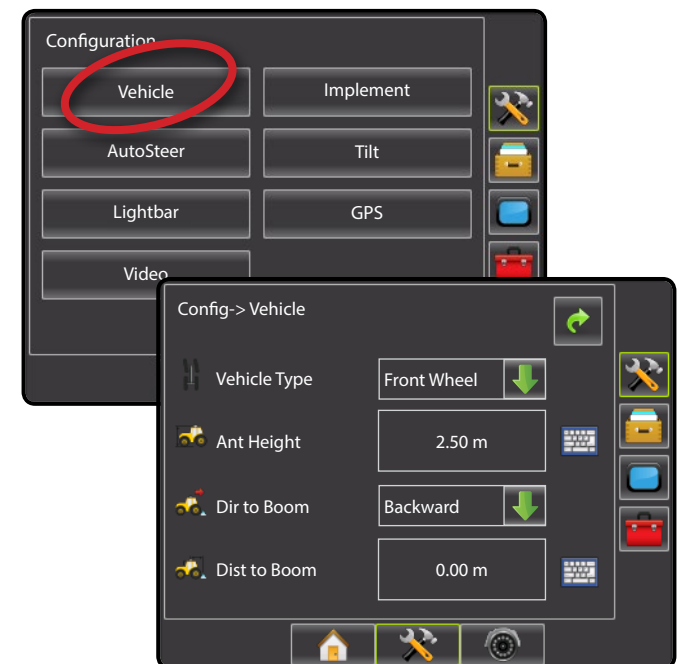
Vehicle Setup

Vehicle Setup is used to configure Vehicle Type, Antenna Height, Direction to Boom and Distance to Boom.

1. Press CONFIGURATION side tab .
2. Press **Vehicle**.
3. Select from:
 - ▶ Vehicle Type  – used to select the type of vehicle steering that most closely represents your vehicle
 - ▶ Antenna Height  – used to enter the height of the antenna from the ground
 - ▶ Direction to Boom  – used to select whether the boom is located behind or in front of the GPS antenna
 - ▶ Distance to Boom  – used to enter the distance from the GPS antenna to the boom
4. Press RETURN arrow  or CONFIGURATION side tab  to return to the main Configuration screen.

NOTE: All settings under Vehicle Setup are required for autosteer and tilt sensor operation, as well as proper BoomPilot operation.

Figure 1-10: Vehicle Setup Options



Vehicle Type

Vehicle Type selects the type of vehicle steering that most closely represents your vehicle. Default is Front Wheel.


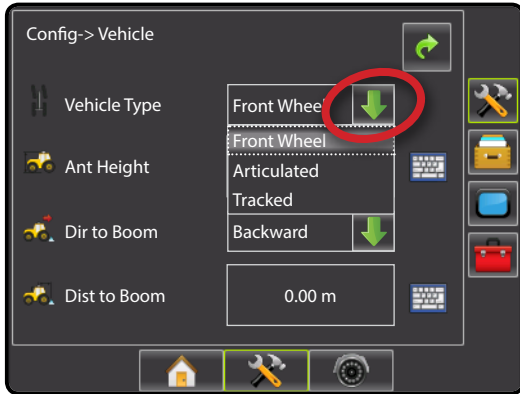
1. Press DOWN arrow  to access the list of options.
2. Select vehicle type.

Figure 1-11: Vehicle Type



Antenna Height

Antenna Height sets the height of the antenna from the ground. Range is 0.0 - 10.0 meters. Default is 3.81 meters.

NOTE: This setting is required for auto steering and tilt sensor operation.


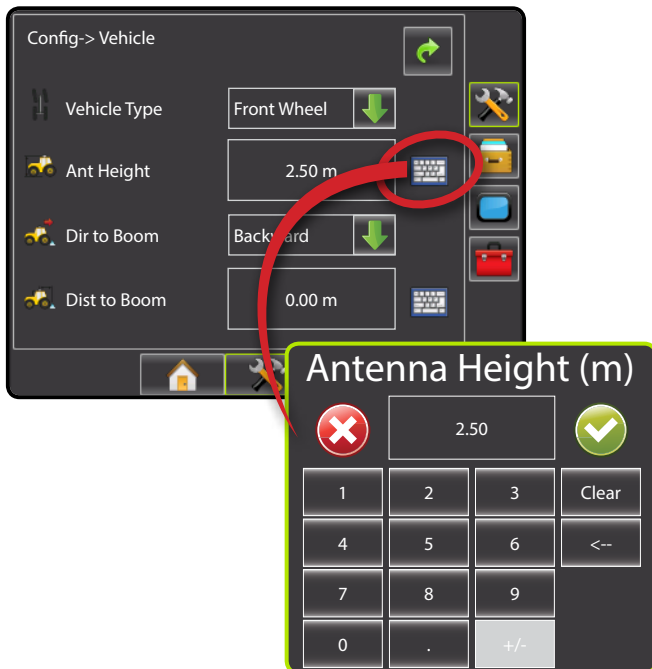
1. Press the KEYPAD icon .
2. Use the entry screen to establish the antenna height.

Figure 1-12: Antenna Height



Direction to Boom

Direction to Boom sets whether the boom is located behind or in front of the GPS antenna as the vehicle moves in a forward direction. Default is Backward.


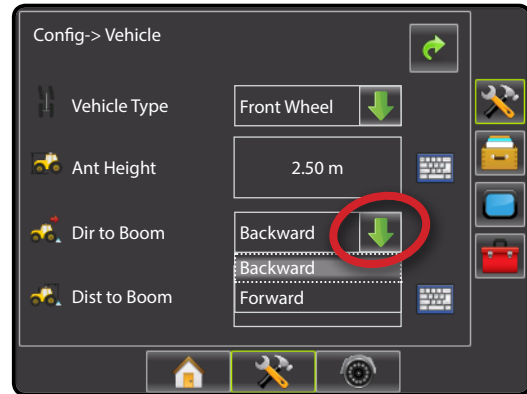
1. Press DOWN arrow  to access the list of options.
2. Select:
 - ▶ Backward – indicates the boom is located behind the GPS antenna
 - ▶ Forward – indicates the boom is located in front of the GPS antenna

Figure 1-13: Direction to Boom



Distance to Boom

Distance to Boom defines the distance from the GPS antenna to the boom. Range is 0.0 - 50.0 meters. Default is 0.0 meter.


1. Press the KEYPAD icon .
2. Use the entry screen to establish the distance from the GPS antenna to the boom.

Figure 1-14: Distance to Boom



Implement

Implement Setup is used to establish the various settings associated with the vehicle's implement.

Settings will vary depending on if a SmartCable or Section Driver Module (SDM) is present.

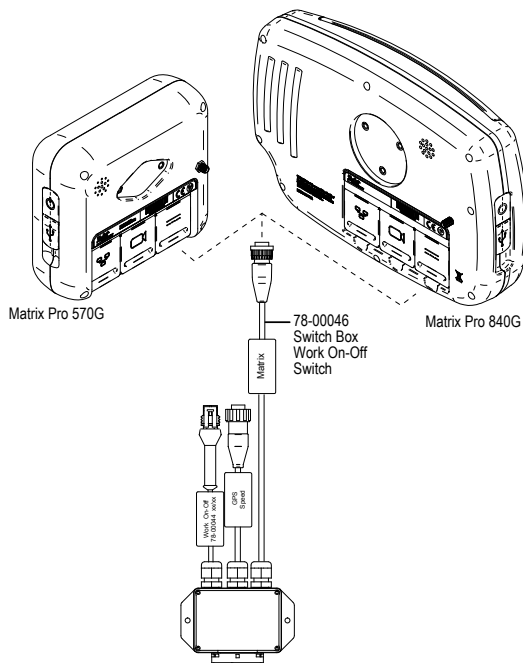
Switch Box, Work On-Off Switch

This cable is **REQUIRED** to start application mapping (painting the screen).

It allows the user to operate the area applied function of the Matrix Pro in series with a remote master connection or existing apply on/off toggle in a single swath manner. However if the previous connections are not available the supplied toggle switch allows area applied functionality without the need to connect to a functional application implement.

The cable also sends a radar speed signal to an external device.

Figure 1-15: Switch Box, Work On-Off Switch



Implement – Single Section Setup

Implement for a single boom is used to establish guidance width and spray width.

NOTE: If a SmartCable or Section Driver Module (SDM) is present, refer to "SmartCable or Section Driver Module Setup" to view setup steps.







1. Press CONFIGURATION side tab .
2. Press **Implement**.
3. Select from:
 - ▶ Guidance Width  – used to enter the width between the guidelines
 - ▶ Spray Width  – used to enter the width of the implement
4. Press RETURN arrow  or CONFIGURATION side tab  to return to the main Configuration screen.

Figure 1-16: Implement Setup Options with No SDM



Guidance Width

Guidance Width establishes the width between the guidelines. Range is 0.9 - 75.0 meters. Default is 18.29 meters.

1. Press the KEYPAD icon .
2. Use the entry screen to establish the guidance width.


NOTE: This setting is required for auto steering and tilt sensor operation.

Figure 1-17: Guidance Width



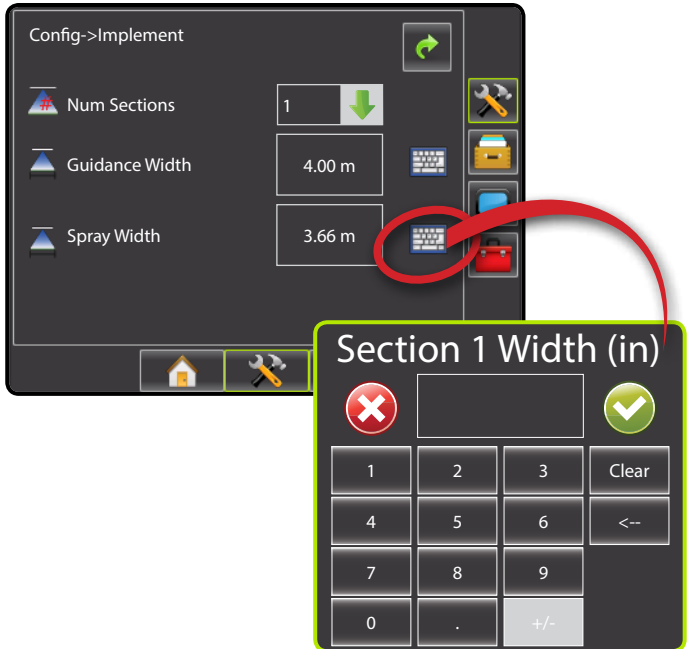
Spray Width

Spray Width establishes the width of the implement. Range is 0.9 - 75.0 meters. Default is 3.66 meters.

1. Press the KEYPAD icon .
2. Use the entry screen to establish the spray width.

NOTE: This setting is required for auto steering and tilt sensor operation.










Figure 1-18: Spray Width





Implement – SmartCable or Section Driver Module Setup

Implement is used to establish number of boom sections, guidance width, spray width, overlap percentage, implement delay on time and implement delay off time.

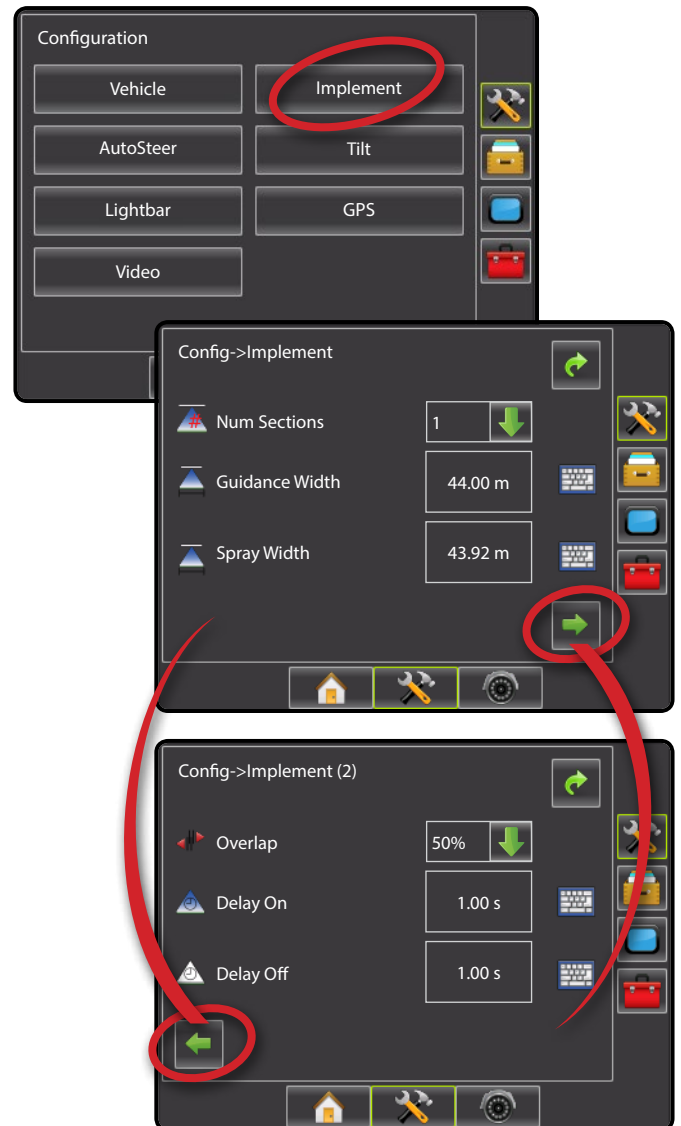
NOTE: If a SmartCable or Section Driver Module (SDM) is not present, refer to “Single Section Setup” to view setup steps.

1. Press CONFIGURATION side tab .
2. Press **Implement**.
3. Select from:
 - ▶ Number of Boom Sections  – used to select the number of available boom sections
 - ▶ Guidance Width  – used to enter the width between the guidelines
 - ▶ Spray Width  – used to enter the width of each implement section
 - ▶ Overlap  – used to select the amount of overlap allowed when the boom sections are turned on and off
 - ▶ Delay On  – used to enter the timing for the boom section valves to switch on
 - ▶ Delay Off  – used to enter the timing for the boom section valves to switch off
4. Press RETURN arrow  or CONFIGURATION side tab  to return to the main Configuration screen.

NOTE: Press  or  to switch between Implement setup screens.

NOTE: Implement settings are only visible and necessary if a SmartCable or SDM is installed. If neither is present, see Single Boom Setup section.

Figure 1-19: Implement Setup Options with SmartCable or SDM



Number of Boom Sections

Number of Boom Sections establishes the number of available boom sections. If a SmartCable or Section Driver Module (SDM) is present, 1 to 6 or 1 to 15 section widths can be entered (depending on which SmartCable or Section Driver Module (SDM) is detected). Default is 1.


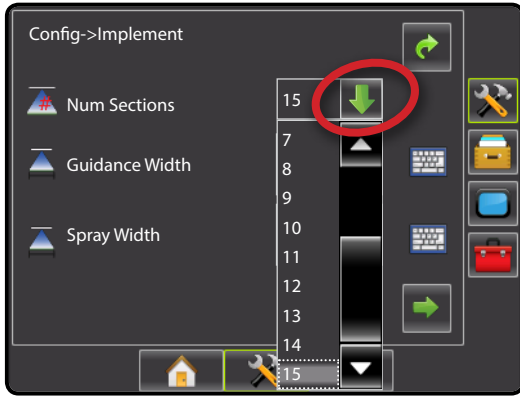
1. Press DOWN arrow  to access the list of options.
2. Select the number of boom sections on the implement:

Figure 1-20: Number of Boom Sections



Guidance Width

Guidance Width establishes the width between the guidelines. Range is 0.9 - 75.0 meters. Default is 18.29 meters.

NOTE: This setting is required for auto steering operation.




1. Press the KEYPAD icon .
2. Use the entry screen to establish the guidance width.

Figure 1-21: Guidance Width



Spray Width

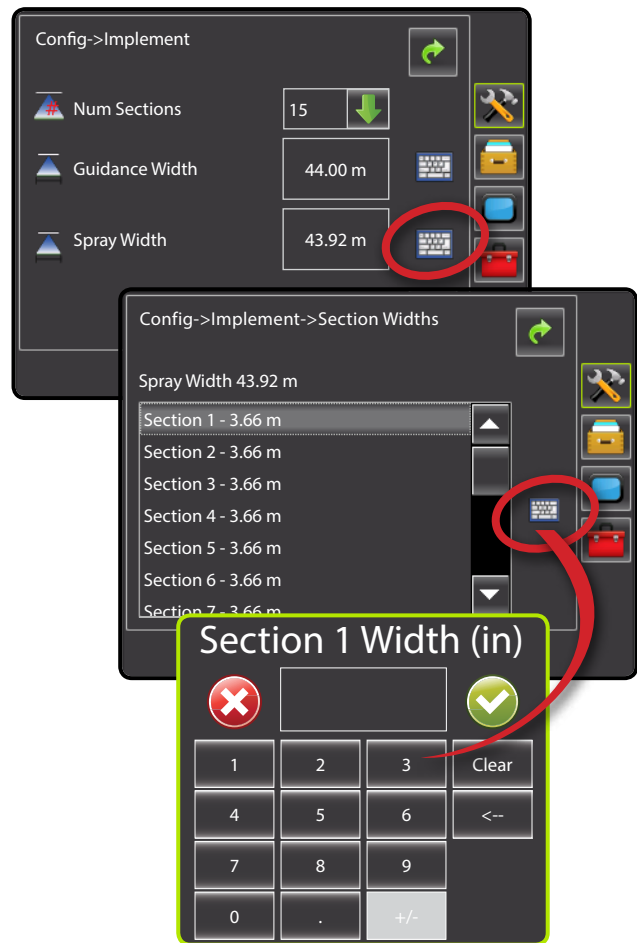
Spray Width establishes the width of each implement section. Range is 0.0 - 75.0 meters. Default per section is 3.66 meters. When facing forward, boom sections are ordered from left to right along the boom.

1. Press the KEYPAD icon .
2. Highlight the section to be established.
3. Press the KEYPAD icon .
4. Use the entry screen to establish the spray width.
5. Repeat steps 2 to 4 until all sections have been established.

NOTE: When entering a boom section width, the total of all sections must be greater than 34 inches / 0.9 meters.

NOTE: Individual boom sections can be set to different widths.

Figure 1-22: Spray Width



Overlap

Overlap determines the amount of overlap allowed when the each boom section is turned on and off using Automatic Boom Section Control. Default is 50%.


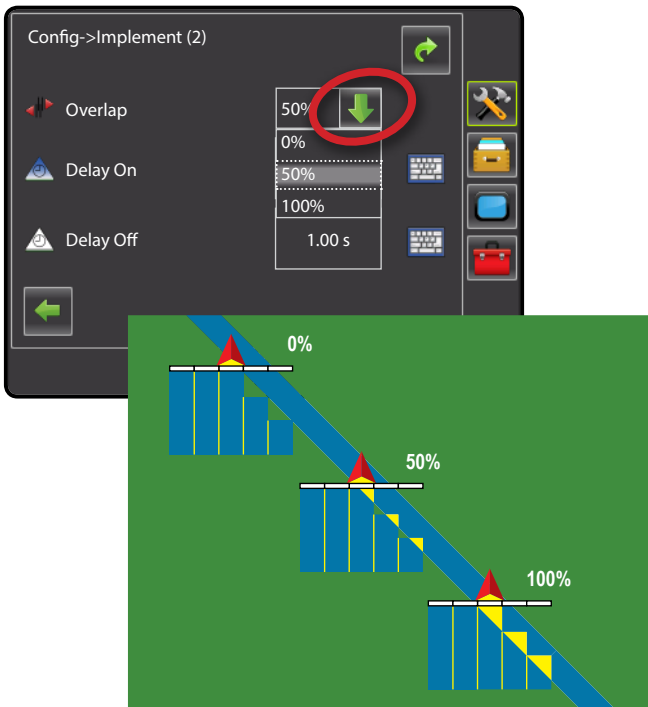
1. Press DOWN arrow  to access the list of options.
2. Select:
 - ▶ 0%
 - ▶ 50%
 - ▶ 100%

Figure 1-23: Overlap



Delay On

Delay On functions as a “look ahead” for establishing the timing for the boom section valves to switch on exactly when entering an area that has not been applied. If the boom turns on too soon when entering a non-applied area, decrease the Delay On setting. If the boom turns on too late when entering a non-applied area, increase the Delay On setting. Range is 0.0 - 10.0 seconds. Default is 1.00 second.


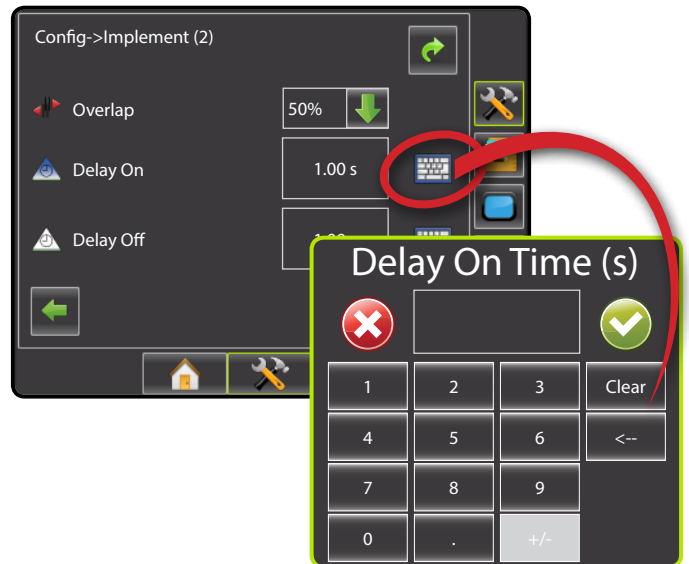
1. Press the KEYPAD icon .
2. Use the entry screen to establish the delay on time.

Figure 1-24: Delay On



Delay Off

Delay Off functions as a “look ahead” for establishing the timing for the boom section valves to switch off exactly when entering an area that has been applied. If the boom turns off too soon when entering an applied area, decrease the Delay Off setting. If the boom turns off too late when entering an applied area, increase the Delay Off setting. Range is 0.0 - 10.0 seconds. Default is 1.00 second.


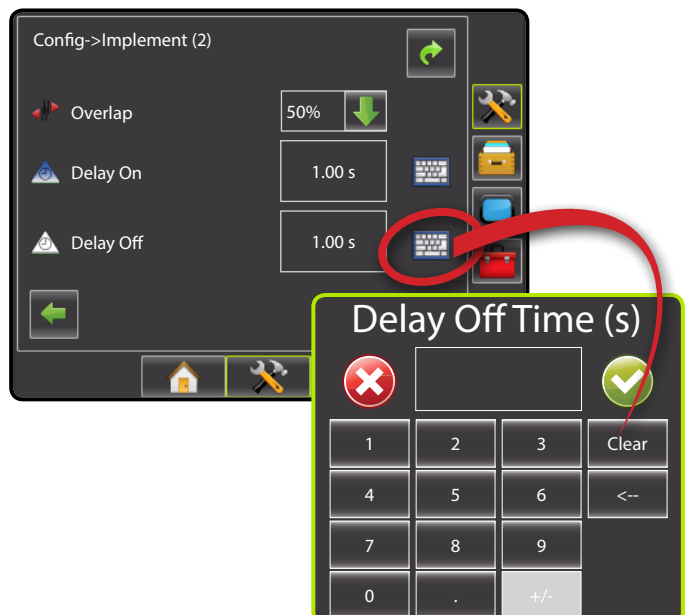



1. Press the KEYPAD icon .
2. Use the entry screen to establish the delay off time.



Figure 1-25: Delay Off



BOOMPILOT OPERATION

SmartCable or SDM

If a SmartCable or Section Driver Module (SDM) is present, BoomPilot is used to set BoomPilot to Off/Manual , Automatic  or All On .

NOTE: GPS is unavailable when the BOOMPILOT icon is grey . BoomPilot status bar icon will be Off/Manual .





If a SmartCable or Section Driver Module (SDM) is not present, please refer to Single Section to view example.

If Work On/Off Switch is in the "On" position, improper application may occur.



If the individual boom section switches are in the "On" position, BoomPilot application control will not control those sections.

Off/Manual & Automatic

To switch BoomPilot between off/manual  and automatic :

1. Work On/Off Switch should remain in the "Off" position.
2. Turn the controller master switch to the "On" position. The individual boom section switches should remain in the "Off" position.
3. Press NAVIGATION AND GUIDANCE OPTIONS icon  to display navigation options.
4. Press BOOMPILOT icon .
 - ◀ Off/Manual – Status Bar Icon will change to red .
 - ◀ Automatic – Status Bar Icon will change to green .

In areas where application is not desired:

- ◀ Manually turn "off" the rate controller master switch to shut off the booms. Turn the master switch "on" to resume application.
- ◀ Press BOOMPILOT icon . Press the BOOMPILOT icon  again to resume application.

All Sections On Mode

To turn all sections on :





1. Press NAVIGATION AND GUIDANCE OPTIONS icon  to display navigation options.
2. Press and hold BOOMPILOT icon .
 - ◀ All On – Status Bar Icon will change to yellow .

Figure 1-26: Automatic to All Sections On Mode





Single Section


If a SmartCable or Section Driver Module (SDM) is not present, BoomPilot is used to turn all booms on or off. BoomPilot can be overridden by using the Work On/Off Switch. Only one Boom Section width will be illustrated and the Status Bar will have no icon.


NOTE: GPS is unavailable when the BOOMPILOT icon is grey .

If a SmartCable or Section Driver Module (SDM) is present, please refer to SmartCable or SDM Section for more information.

To switch application off or on using the console:

1. Work On/Off Switch should remain in the "Off" position.
2. Press NAVIGATION AND GUIDANCE OPTIONS icon  to display navigation options.
3. Press BOOMPILOT icon .

NOTE: If the Work On/Off Switch is in the "On" position, the entire section will be activate and the BOOMPILOT icon  will have no affect.

If the Work On/Off Switch is not present on the system, the BOOMPILOT icon  will control the application on/off functions.

In areas where application is not desired:



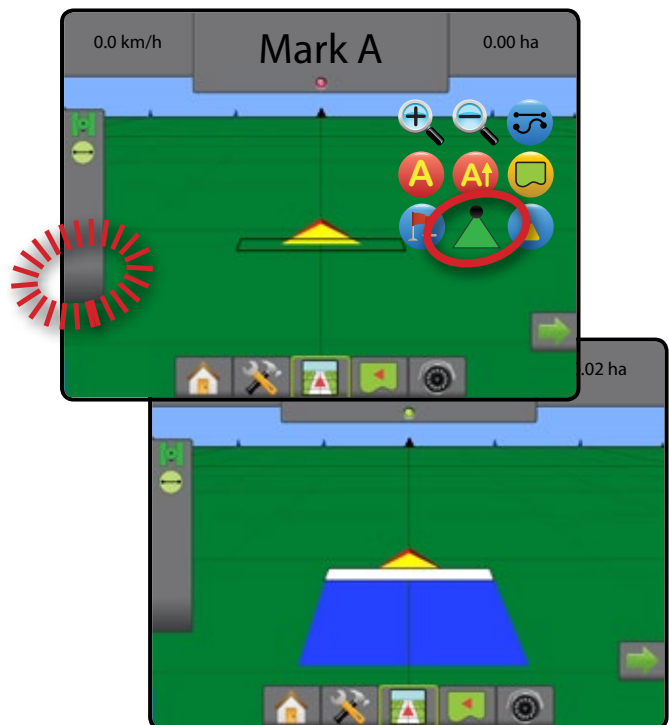
- ◀ Press BOOMPILOT icon . Press the BOOMPILOT icon  again to resume application.
- ◀ Turn the Work On/Off Switch to the "On" position and back to the "Off" position. Turn the Work On/Off Switch "on" to resume application.

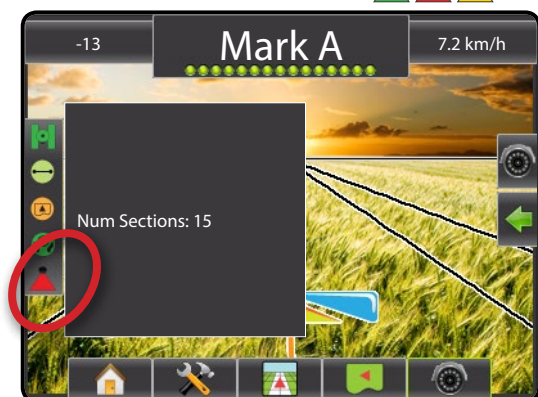
Figure 1-27: All Booms Off/On – No SDM






BoomPilot Status

BoomPilot Status displays information regarding the current status of the BoomPilot system.

1. Press BOOMPILOT STATUS icon    to view the number of sections.



| BoomPilot Status | |
|---|--|
|  | Red = Off/Manual |
|  | Green = Automatic |
|  | Yellow = All On |
| | No icon = Single Boom Section (no SmartCable or SDM installed on system) |

APPENDIX - FACTORY SETTINGS & RANGES

Vehicle Setup Settings

| Description | Factory Setting | Range | User Settings |
|----------------------|-----------------|--------------|---------------|
| Vehicle Type | Front Wheel | | |
| Antenna Height | 3.66 m | 0.0 - 10.0 m | |
| Direction to Boom | Forward | | |
| Boom Offset Distance | 0.0 m | 0.0 - 50.0 m | |

Implement Setup Settings

| Description | Factory Setting | Range | User Settings |
|-------------------------|-----------------|--------------|---------------|
| Number of Boom Sections | 1 | 1-15 | |
| Guidance Width | 18.29 m | 1.0 - 75.0 m | |
| Spray Width | 3.66 m | 1.0 - 75.0 m | |
| Boom Section Width(s) | 3.66 m | 0.0 - 75.0 m | |
| Overlap | 50% | | |
| Delay Off | 1.0 s | 0.0-10.0 s | |
| Delay On | 1.0 s | 0.0-10.0 s | |

MATRIX® PRO

BOOMPILOT® SETUP GUIDE

This guide contains the instructions to setup the automatic boom section control (ABSC) or BoomPilot options on the vehicle through the Matrix Pro console. Please review this manual thoroughly after completing the installation process.



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