

RECON

ZONE BLOCKAGE MONITOR

INSTALLATION MANUAL

Document revision: 1.4

Last revised: September 21, 2018



Recon Zone Blockage and Flow Monitor Installation Manual

© 2017 - 2018 Intelligent Agricultural Solutions. All Rights Reserved.

Recon Zone Blockage and Flow Monitor Installation Manual. All content within is copyrighted by Intelligent Agricultural Solutions, and may not be reprinted without permission.

The content of this manual is furnished for informational use only, is subject to change without notice, and should not be construed as a commitment by Intelligent Agricultural Solutions. Intelligent Agricultural Solutions assumes no responsibility or liability for any errors or inaccuracies that may appear in the content contained in this guide.

U.S. Patent #8,950,260B2, and foreign patents pending. Recon and Zone Blockage and Flow Monitor, Intelligent Agricultural Solutions, Intelligent Ag, Intelligent Ag Monitoring Solutions, IAS, and the IAS logo are trademarks or registered trademarks of Intelligent Agricultural Solutions. iPad is a registered trademark of Apple Inc., registered in the U.S. and other countries. App Store is a service mark of Apple Inc. All other trademarks are property of their respective owner.

Intelligent Agricultural Solutions, 1810 NDSU Research Circle North, Fargo, ND 58102 USA.

Visit us on the web at www.intelligentag.com
Questions? E-mail us at info@intelligentag.com

Table of Contents

1.	Introduction	5
1.1.	About Recon Zone Blockage and Flow Monitor	5
1.2.	Additional required tools and equipment	5
1.3.	Installation Overview	5
2.	Install Recon Zone Blockage and Flow Monitor	6
2.1.	Install ECUs	6
2.2.	Install flow sensors	7
2.3.	Connect auditory hoses to ECUs	13
2.4.	Install Gateway 300	14
2.5.	Install Wi-Fi antenna	15
2.6.	Install the work switch	17
3.	Connect harnessing	20
3.1.	Connect Tractor and Intermediary harnesses	20
3.2.	Connect gateway harness	21
3.3.	Connect ECU wiring harnesses	21
4.	Install the iPad and Blockage Monitor app	22
4.1.	Install the iPad	22
4.2.	Download the Blockage Monitor app	23
4.3.	Connect to the Gateway 300	23

List of Figures

Figure 1:	Parts needed to install ECUs	6
Figure 2:	Installing ECUs	6
Figure 3:	Sensor types	7
Figure 4:	Spacing flow sensors on a manifold	7
Figure 5:	Installing Streamline 1-inch and 1.25-inch flow sensors on a manifold	8
Figure 6:	Correctly placing the hose clamps	9
Figure 7:	Installing 90 degree flow sensors on an air seeder	10
Figure 8:	Installing 1.25-inch flow sensors on an air seeder	11
Figure 9:	Preparing the adapters	11
Figure 10:	Securing hose pieces into adapter	12
Figure 11:	Connecting auditory hoses to the ECU on a manifold	13
Figure 12:	Installing the Gateway 300	14
Figure 13:	Mounting the Wi-Fi antenna	15
Figure 14:	Work switch assemblies	17
Figure 15:	Mounting location for work switch (900000-000001)	18
Figure 16:	Installing a magnetic work switch on an implement with no existing work switch	19
Figure 17:	Assembling the magnetic work switch assembly	19
Figure 18:	Installing a drip loop	20
Figure 19:	Installing the iPad mount	22
Figure 20:	6 manifold wiring diagram	24
Figure 21:	12 manifold wiring diagram	25
Figure 22:	Tow-between air cart wiring diagram	26

Glossary

Abbreviation	Term	Definition
App	Software application	A computer program, especially one designed for a mobile device
ECU	Electronic Control Unit	A component of the Zone Blockage and Flow Monitor that allows for the communication of the flow sensors to the iPad software app via a LAN connection
	Gateway 300 (gateway)	A computing platform that enables communication from the system to an iPad
LED	Light Emitting Diode	A semiconductor diode that converts applied voltage to light. In the Zone Blockage and Flow Monitor, an LED is used to signify the status of the ECU
	Primary	Tube that feeds multiple secondary runs, usually leading to a manifold that splits the product flow to the secondaries
	Product A/ Product B	When running two different products through two different airstreams, one product is product A and the other product is product B. Product types are assigned to their respective manifolds during app configuration
	Section	Section of the toolbar, usually defined by the primary (or manifold) that is feeding that section
	Work Switch	A component of the implement that signifies when the equipment is enabled (in the ground) or disabled (out of the ground). When the work switch is disabled, the Zone Blockage and Flow Monitor's audible alarm that alerts the operator to blockage of flow in the equipment's runs will automatically be silenced

1. Introduction

1.1. About Recon Zone Blockage and Flow Monitor

The Recon Zone Blockage and Flow Monitor enables you to monitor for major blockages on your air seeder without monitoring every run.

1.2. Additional required tools and equipment

You will need the following tools and equipment to install the Recon Zone Blockage and Flow Monitor:

- Standard wrench and socket sets
- Measuring tape
- Cutting tool, such as a box cutter or shears
- Cordless drill with 5/16 driver and/or flathead screwdriver (optional)
- Paint pen or other permanent marking tool (optional)
- Dielectric grease (optional)

1.3. Installation Overview

The Recon Zone Blockage and Flow Monitor is installed through the following steps:

- Install ECUs
- Install flow sensors
- Connect auditory hoses to ECUs
- Install Gateway 300
- Install antennas
- Install work switch
- Connect harnessing
- Install iPad and Blockage Monitor app

NOTE: Detailed wiring diagrams are found in Appendix A.

For videos, current documentation, and other resources, visit www.intelligentag.com/support.

2. Install Recon Zone Blockage and Flow Monitor

2.1. Install ECUs

The Electronic Control Units (ECUs) communicate the flow measurement data recorded by the flow sensors to the Gateway 300. For each manifold that will be monitored, complete the steps below.

Part name	Part number	Quantity needed
ECU	153510-000045	varies
U-bolt	356070-000064 <i>or</i> 356070-000065 <i>or</i> 356070-000066	varies

Figure 1: Parts needed to install ECUs

Installation location: Manifold towers

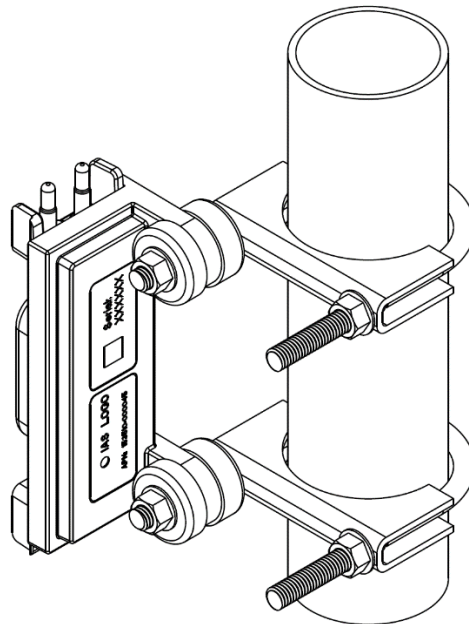


Figure 2: Installing ECUs

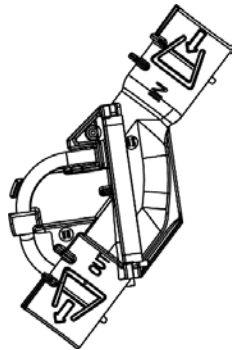
1. Position two U-bolts (356070-000064, 356070-000065, or 356070-000066) on the mounting location as shown in Figure 2 and place the saddle clamp overtop of the U-bolt.
2. Secure the unused end of the U-bolts with nuts.
3. Place the ECU (153510-000045) on the other end of the U-bolts so that the LED is facing the cab. If this orientation is not possible, position the ECU so that the LED does not face the ground. Secure with nuts.

NOTE: ECUs can be mounted in any order; however, installing the ECUs in numeric order based on the ECU's serial number (located on the front of the ECU) is an easy way to remember which ECU is on each tower. Use the table in Appendix B to record your system setup.

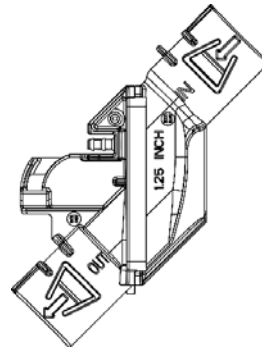
2.2. Install flow sensors

Flow sensors detect when seed or fertilizer is flowing through the run.

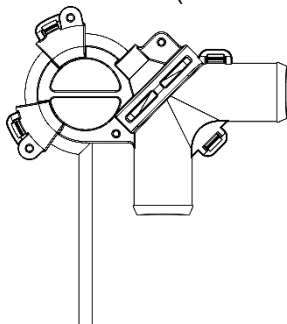
The system uses either 1-inch, 90 degree, or 1.25-inch flow sensors (and adapters, if needed) based on your implement and blockage and flow monitoring preferences. Identify your sensor type and part number by looking at your pack slip or the images below. Refer to the correct installation instructions in this section based on your flow sensor size.



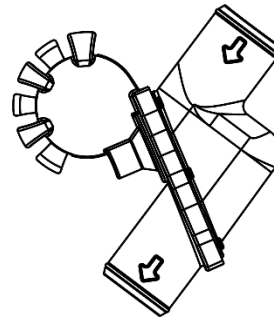
Streamline 1" sensor (153510-000022)



Streamline 1.25" sensor (153510-000066)



90 degree sensor (153570-000015)



1.25" inline sensor (153570-000016)

Figure 3: Sensor types

Installation location: On each manifold being monitored. Distribute flow sensors evenly around the manifold.

EXAMPLE: Spacing 2 sensors (left) and 4 sensors (right) on a 16-opener manifold

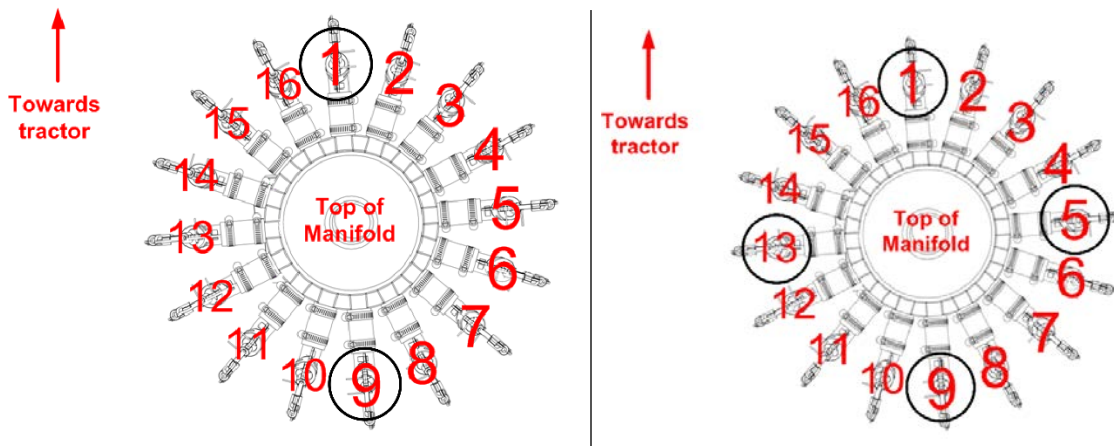


Figure 4: Spacing flow sensors on a manifold

Installing Streamline 1-inch and 1.25-inch flow sensors (153510-000022 and 153510-000066)

Part name	Part number	Quantity needed
Streamline 1-inch flow sensor <i>or</i> Streamline 1.25-inch flow sensor	153510-000022 <i>or</i> 153510-000066	1/run
Adapter (optional)	353070-000038 <i>or</i> 353070-000112 <i>or</i> 353070-000113	2/run
Hose clamp	356060-000025	2/run

Table 1: Parts needed to install Streamline 1-inch and 1.25-inch flow sensors

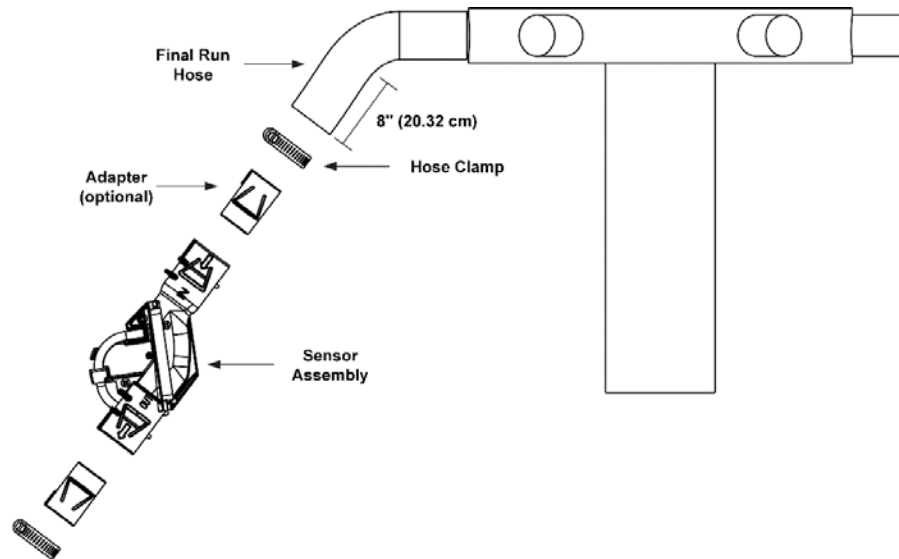


Figure 5: Installing Streamline 1-inch and 1.25-inch flow sensors on a manifold

For each run that will be monitored:

1. If you are using adapters, snap adapters into the sensor as shown in Figure 5.
2. Cut the original run hose to about 8 inches (20.32 cm), or other length that allows a downward flow and appropriate fit once the sensor and adapters (if applicable) are installed. Reattach the hose piece to the manifold.
3. Orient the sensor so that the flow arrows point away from the manifold. Slide the sensor assembly on the final run hose piece attached to the manifold until the hose piece hits the backstop inside the adapter or sensor. Try to keep the sensor mounted vertically.
4. Secure using a hose clamp between the two ridges on the end of the sensor assembly, ensuring that the hose clamp lays flat and the head (worm drive) does not hit the sensor ridge, as shown in Figure 6.



Figure 6: Correctly placing the hose clamps

5. Slide the remaining final hose piece into the lower end of the sensor assembly until the hose piece hits the backstop inside the adapter or sensor. Secure using a hose clamp between the two ridges on the end of the sensor assembly, ensuring that the hose clamp lays flat and the head (worm drive) does not hit the sensor ridge.

Installing 90 degree flow sensors (153570-000015)

Part name	Part number	Quantity needed
90 degree flow sensor	153570-000015	1/run
Adapter (optional)	351060-000008	1/run
Hose clamp	352013-000010	2-4/run

Table 2: Parts needed to install 90 degree flow sensors

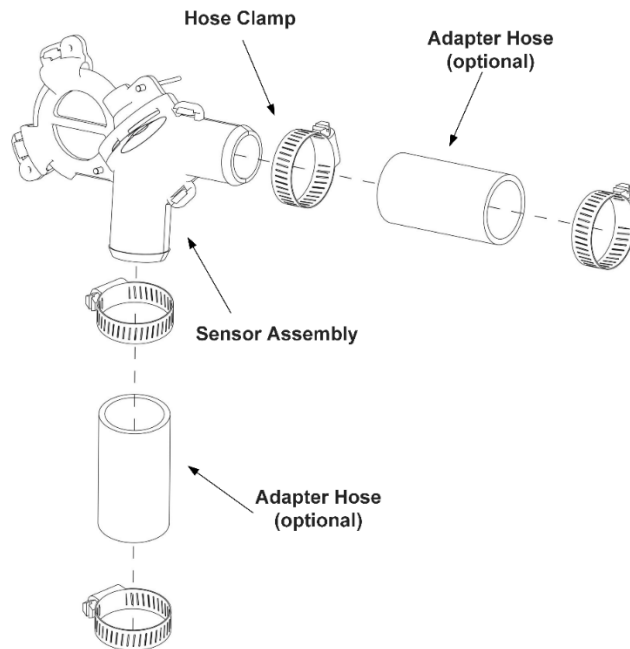


Figure 7: Installing 90 degree flow sensors on an air seeder

For each run that will be monitored:

1. Detach the existing hose from the manifold.
2. Place a sensor (153570-000015) on the manifold, orienting the sensor so that auditory hose routes down. If the sensor does not fit directly on the manifold, cut a 2 inch piece of the final hose run and attach it to the manifold, then attach the sensor to the 2 inch hose piece. Secure with a hose clamp (352013-000010).
3. Slide the remaining final hose piece into the other end of the sensor. If the hose doesn't fit on the sensor, attach an adapter to the sensor. Secure with a hose clamp.

Installing 1.25-inch flow sensors (153570-000016)

Part name	Part number	Quantity needed
1.25-inch flow sensor	153570-000016	1/run
Adapter (optional)	353070-000029 <i>or</i> 353070-000031 <i>or</i> 353070-000022 <i>or</i> 353070-000030 <i>or</i> 353070-000032	2/run
Hose clamp	352013-000010 <i>or</i> 356060-000025	2-4/run

Table 3: Parts needed to install 1.25-inch flow sensors

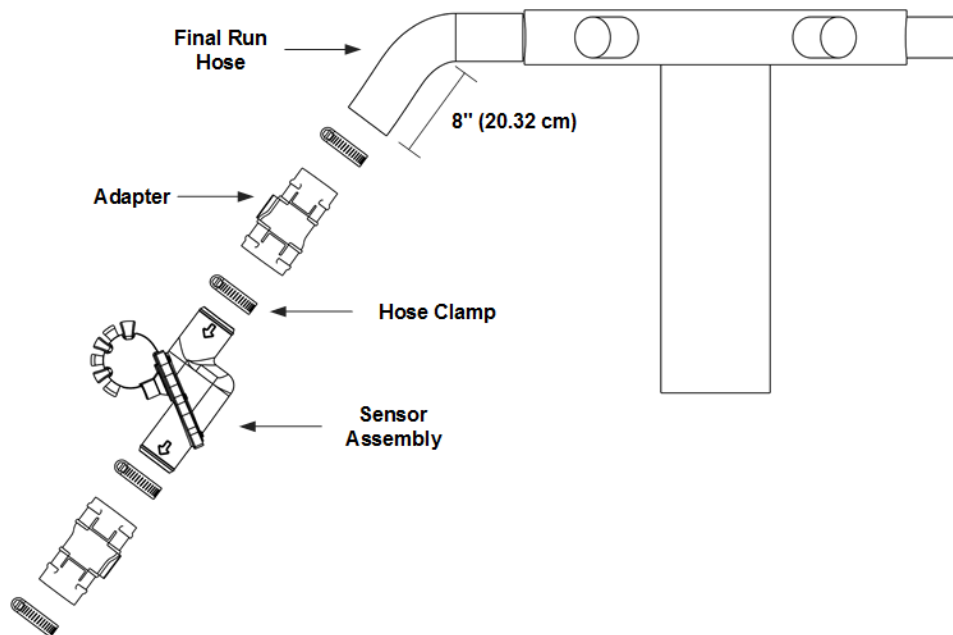


Figure 8: Installing 1.25-inch flow sensors on an air seeder

For each run that will be monitored:

1. Bend each adapter in half until the center seam holding the two halves together snaps. Align the two halves to make a cylinder.

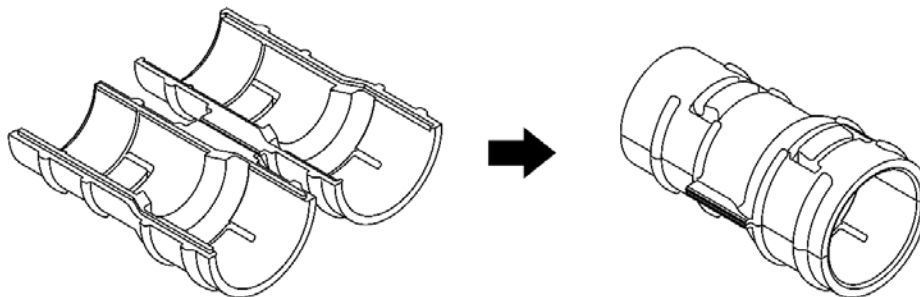


Figure 9: Preparing the adapters

2. Attach an adapter to each end of the sensor (153570-000016) and secure with a hose clamp (352013-000010 or 356060-000025).
3. Cut the original run hose about 8 inches (20.32 cm), or other length to ensure a downward flow and appropriate fit once the sensor and adapters (if applicable) are installed.
4. Orient the sensor so that the flow arrows point away from the manifold. Place the upper adapter on the final run hose piece, making sure that the hose is pushed into the adapter past the retaining ring and locking tabs until it hits the backstop (about 2 inches). Try to keep the sensor mounted as vertically as possible. Secure using a hose clamp.

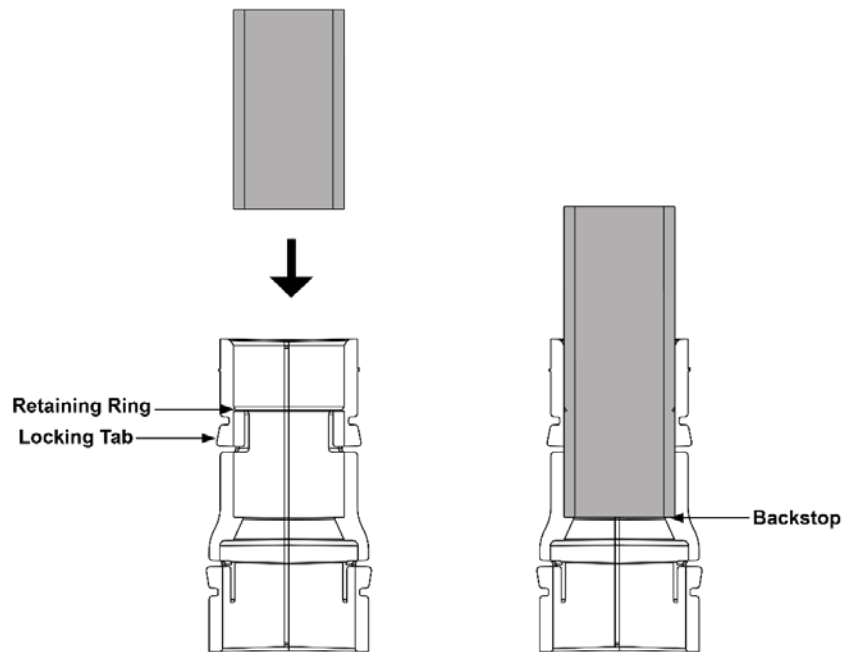


Figure 10: Securing hose pieces into adapter

5. Slide the remaining final hose piece into the lower adapter until it hits the backstop. Secure using a hose clamp between the two ridges on the end of the sensor assembly.

2.3. Connect auditory hoses to ECUs

The sensor's auditory hoses allow the sound to be transmitted from the sensor to the ECU. For each sensor, complete the steps below.

1. Remove the caps from the ECU ports that you will be using, beginning with ECU port 1. The number of ECU ports that you will use is equal to the number of sensors installed on the manifold.
2. Remove and discard the cap at the end of each auditory hose (if it has a cap). Push each sensor's auditory hose on top of its corresponding ECU port. ECU ports should be connected in a clockwise order.

EXAMPLE: 2 sensors (left) and 4 sensors (right) on a 16-opener manifold

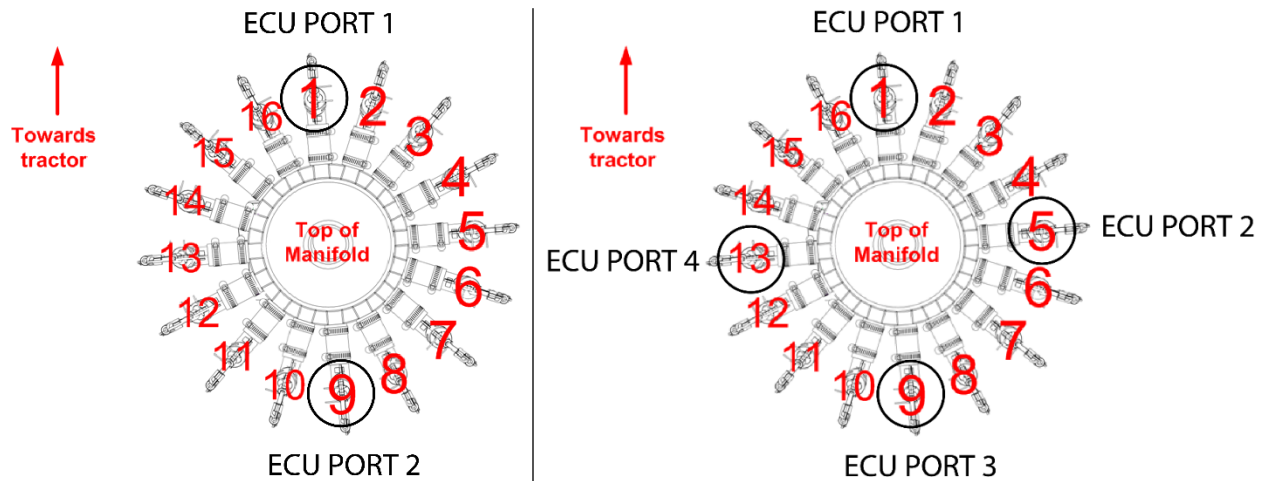


Figure 11: Connecting auditory hoses to the ECU on a manifold

NOTE: If all auditory hoses are too short, pull the existing auditory hoses off of the sensors and replace them with the 10' hoses included with the kit. **All auditory hoses on the entire system must be the same length.**

3. **OPTIONAL:** Mark the associated ECU port number on each flow sensor hose using a paint pen or other marking tool.

2.4. Install Gateway 300

The Gateway 300 is a computing platform that allows for the communication from the ECUs to the iPad. To install the gateway, complete the steps below.

Part name	Part number	Quantity needed
Gateway 300	153010-000042	1
¼" flat washer	352012-000002	8
U-bolt and mounting hardware	356070-000064 <i>or</i> 356070-000065 <i>or</i> 356070-000066	2
Gateway mounting bracket	353070-000079	1
¼-20 x 1 1/2" screw	356060-000033	4
¼"-20 nut	356060-000075	4

Table 4: Parts needed to install Gateway 300

Installation location: The toolbar or on the air cart (if using a tow between air cart). The mounting location must be at least 8 inches (20 cm) away from the operator to ensure safe operation.

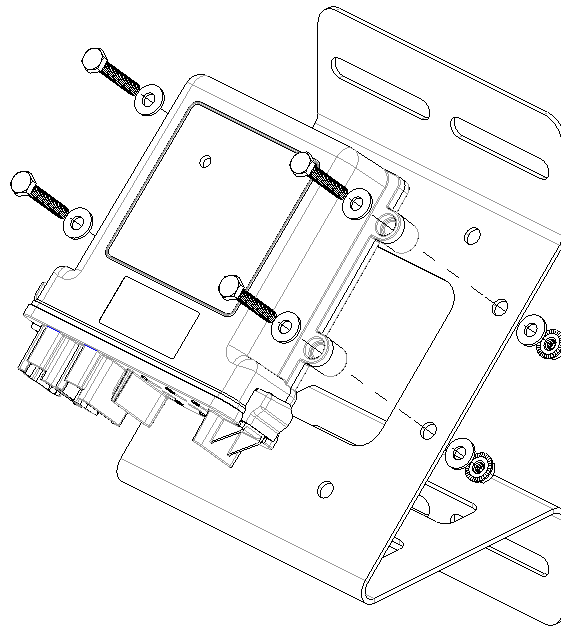


Figure 12: Installing the Gateway 300

1. Position the Gateway 300 (153010-000042) on the mounting bracket (353070-000079). The gateway can be mounted on the bracket in any direction, but the connectors should not face up when the bracket is mounted on the implement or air cart.
2. Secure the gateway to the mounting bracket using the provided screws (356060-000033), washers (352012-000002), and nuts (356060-000075) as shown in Figure 12.
3. Mount the gateway to the toolbar or on the air cart (if using a tow between air cart) using the provided u-bolts and mounting hardware (356070-000064, 356070-000065, or 356070-000066). The mounting location must provide the gateway with a clear view of the sky.

2.5. Install Wi-Fi antenna

The Wi-Fi antenna sends information to the Gateway 300.

Part name	Part number	Quantity needed
SMA cap	251015-000139	3
Wi-Fi antenna	252005-000010	1
U-bolts and mounting hardware	352013-000007	2
Wi-Fi antenna bracket	353070-000083	1

Table 5: Parts needed to install Wi-Fi antenna

Installation location: Mounted on the air cart frame or railing, at least 2 feet (60 cm) away from the operator and at least 8 inches (20 cm) from the Gateway 300 to ensure safe operation.

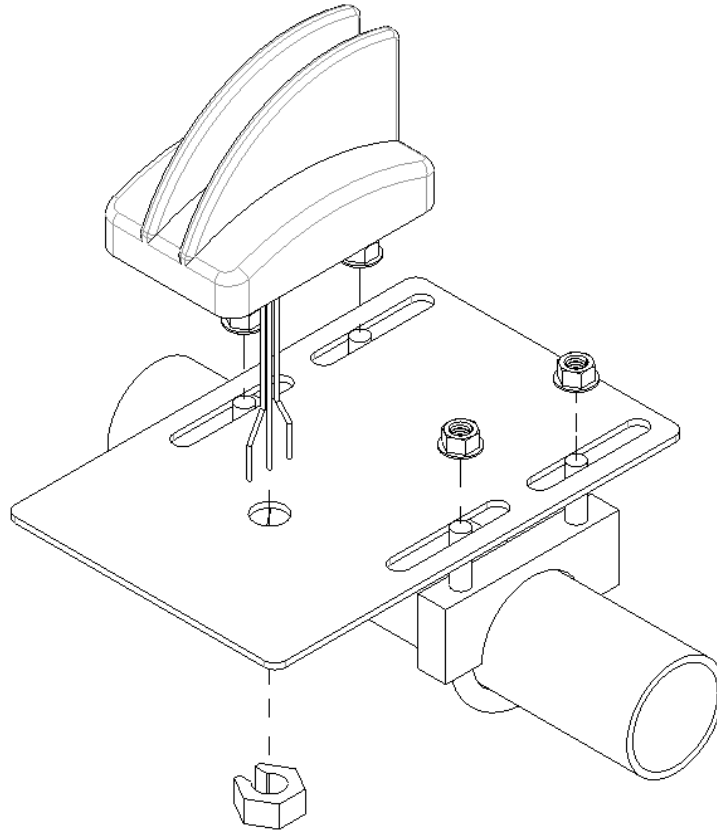


Figure 13: Mounting the Wi-Fi antenna

1. Thread the Wi-Fi antenna (252005-000010) cables through the hole on the antenna bracket (353070-000083) and through the nut. Tighten the nut to secure the antenna to the bracket.
2. Mount the bracket to the implement using the u-bolts and mounting hardware (352013-000007).

3. Connect the antenna cables to the gateway. Refer to the table below for the associated gateway connectors.

Gateway Connector	Function
1	Wi-Fi
2	Iridium
3	433-MHz
4	Cellular Main
5	GPS
6	Cellular Diversity

Table 6: Gateway connectors

4. Cap any unused gateway connectors using caps (251015-000139).

2.6. Install the work switch

The work switch signals to the Blockage Monitor app when the implement is in or out of the ground.

Types of work switches

Intelligent Ag sells two different types of work switches: a whisker switch and the magnetic work switch. Identify your work switch type and part number by looking at your pack slip or the images below.

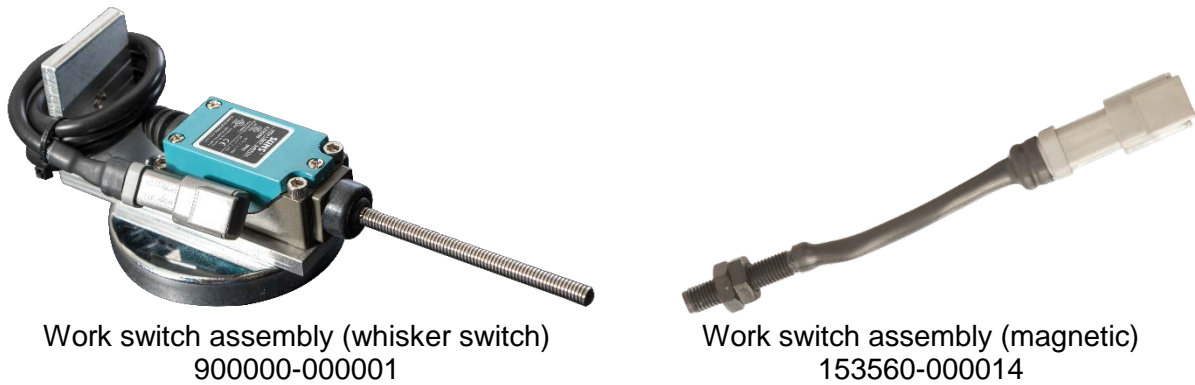


Figure 14: Work switch assemblies

Installation location

Next to the implement's existing work switch, if one exists. The existing work switch is typically found towards the center of the implement's frame on a hydraulic cylinder. If the implement does not have an existing work switch, find a location on the hydraulic cylinders that are used to lift the implement in and out of the ground at the end of rows.

2.6.1. Installing the work switch (900000-000001)

NOTE: Skip this step and follow the instructions in Section 2.6.2 if you are using the magnetic work switch with part number 153560-000014. Refer to Figure 14 to identify your work switch.

Part name	Part number	Quantity needed
Work switch ECU harness	355020-000018	1
Work switch assembly	900000-000001	1

Table 7: Parts needed to install the work switch (whisker switch)

Mount the work switch (900000-000001) in a location where the work switch is triggered when the toolbar is in the lowered position.

TIP: You can mount the work switch onto an existing work switch bracket, if one exists.

NOTE: You can unscrew the work switch magnet from the bracket and re-attach it to the other end of the bracket to allow for other mounting orientations.



Figure 15: Mounting location for work switch (900000-000001)

About work switch methods

The work switch uses one of two methods to determine when the implement is in the ground:

- **Default method:** the work switch is engaged (the work switch is triggered by the height sensor) when the implement is in the ground. Likewise, the work switch is disengaged (the work switch is not triggered) when the implement is out of the ground.
- **Inverted method:** the work switch is disengaged (the work switch is not triggered) when the implement is in the ground. Likewise, the work switch is engaged (the work switch is triggered by the height sensor) when the implement is out of the ground.

Your work switch method will be configured during configuration in the Blockage Monitor app.

2.6.2. Installing the work switch (153560-000014)

Part name	Part number	Quantity needed
Work switch assembly	153560-000014	1
Work switch bracket	351050-000016	1
¼"-20 x ¾" steel bolt	352010-000084	2
¼"-20 steel locknut	352011-000040	2
¼" steel washer	352012-000024	4
Work switch magnet	359035-000001	1

Table 8: Parts needed to install the work switch (magnetic work switch)

Installation location: Near the implement's existing work switch, if there is one. Otherwise, in a location on the hydraulic cylinder where you can mount the work switch and magnet so that they will be moved apart when the implement is out of the ground.

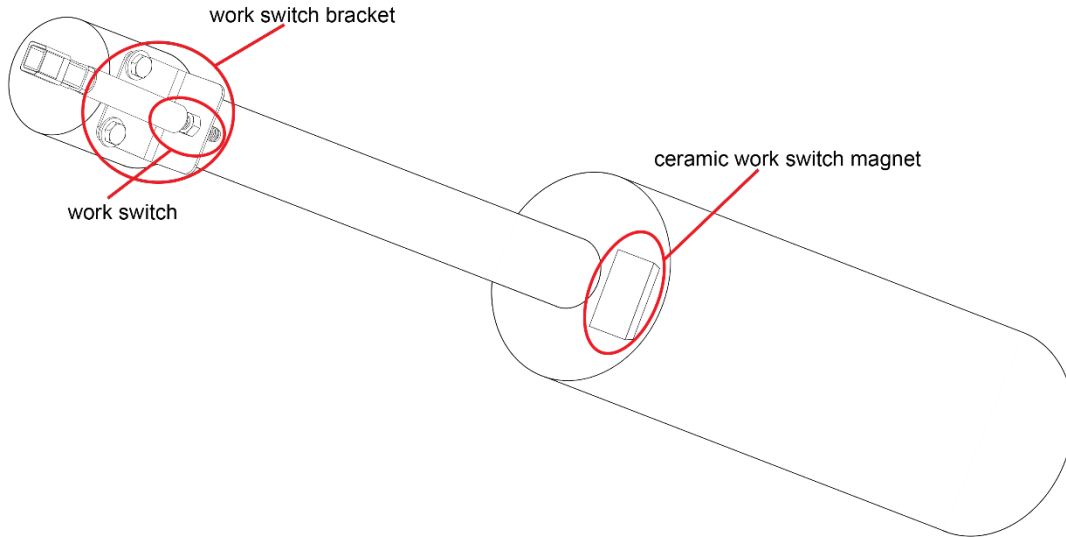


Figure 16: Installing a magnetic work switch on an implement with no existing work switch

1. Place the work switch magnet (359035-000001) on the hydraulic cylinder or frame.
2. Remove the front locknut from the work switch assembly (153560-000014) and insert it into the work switch bracket (351050-000016). Replace the locknut.

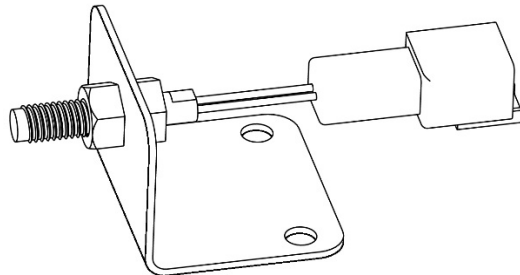


Figure 17: Assembling the magnetic work switch assembly

3. Attach the work switch bracket to the cylinder using bolts (352010-000084), washers (352012-000024) and locknuts (352011-000040), or using zip ties. The mounting location should allow at least 4 inches of movement when you're lifting or lowering the tool. To adjust the length of the work switch, adjust the locknuts on the work switch assembly.
 - Moving the locknuts closer to the end of the work switch moves the work switch farther from the magnet.
 - Moving the locknuts away from the end of the work switch moves the work switch closer to the magnet.

3. Connect harnessing

Refer to Appendix A for wiring diagrams.

TIP: Leave a drip loop for harnessing parallel to the ground.

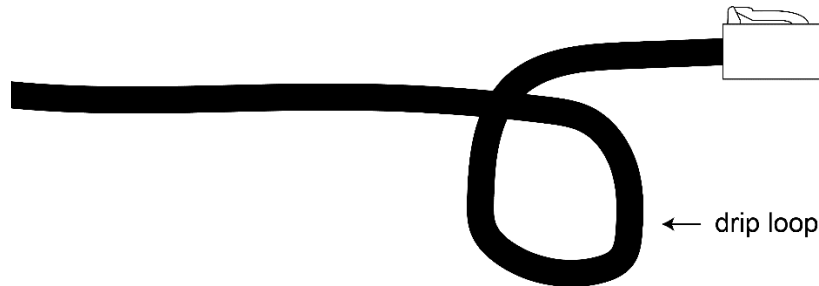


Figure 18: Installing a drip loop

TIP: Apply dielectric grease to connectors to provide a better seal.

Part name	Part number	Quantity needed
Sealing plug	153510-000019	2
CAN termination plug	153510-000051	2
Tractor harness	353050-000010	1
Work Switch Extension harness (optional)	353050-000011	varies
Gateway harness	353050-000024	1
10' ECU harness	353050-000025	1
20' ECU harness (optional)	353050-000027	varies
Power/CAN Split harness	353050-000028	1
Intermediary harness (optional)	353050-000030	varies

Table 9: Parts needed to connect harnessing

3.1. Connect Tractor and Intermediary harnesses

1. Connect S2 of the Tractor harness (353050-000010) into the convenience outlet of the tractor.
2. Insert a sealing plug (153510-000019) into S1 of the Tractor harness.
3. Connect S3 of the Tractor harness to S1 of the Gateway harness (353050-000024).

If you need more harnessing to reach the Gateway harness, connect S3 of the tractor harness to S1 of the Intermediary harness (353050-000030). Then, connect S2 of the Intermediary harness to S1 of the Gateway harness.

3.2. Connect gateway harness

1. Connect S3 of the Gateway harness into Port A of the Gateway 300.
2. Connect S4 of the Gateway harness into Port B of the Gateway 300.
3. Connect S2 of the Gateway harness into S1 of the Power/CAN Split harness (353050-000028).
4. Connect S5 of the Gateway harness into the work switch.

If you need more harnessing to reach the work switch, connect S5 of the Gateway harness into S1 of the Work Switch Extension harness (353050-000011). Then, connect S2 of the Work Switch Extension harness to the work switch.

3.3. Connect ECU wiring harnesses

1. Connect S3 of a 10' ECU harness (353050-000025) to each ECU.
2. Connect S1 of each ECU harness to S2 of the nearest ECU harness to form a daisy chain on each half of the toolbar. Leave S1 of the centermost ECU harnesses open. There will be one unused S2 connector on each half.
NOTE: If there are areas where you need a longer ECU harness, use a 20' ECU harness (353050-000027) instead of a 10' harness.
3. Insert a CAN termination plug (153510-000051) into the two unused S2 ends of the ECU harness.
4. Connect S2 and S3 of the Power/CAN Split harness (353050-000028) to S1 of each of the two centermost ECU harnesses.
5. Route loose harnessing toward the tractor and secure using zip ties.

4. Install the iPad and Blockage Monitor app

4.1. Install the iPad

Part name	Part number	Quantity needed
Tablet mount arm	352004-000003	1
Rail attachment	352004-000004	1
iPad mount (for iPad Air and iPad Air 2)	356070-000004	1

Table 10: Parts to install the iPad mount



Figure 19: Installing the iPad mount

1. Connect the base of the tablet mount arm (352004-000003) to the back of the iPad mount (356070-000004) using the screws provided with the mount.
2. Insert the ball of the rail attachment (352004-000004) into the other end of the mount arm. Twist the knob on the rail attachment to tighten the mount.
3. Mount the rail attachment to the tractor cab's mounting bar, or other desired installation location, using the u-bolts provided with the rail attachment.
4. Place the iPad in the iPad mount.
5. **OPTIONAL:** Intelligent Ag recommends keeping the iPad plugged into a USB charger in the cab to keep the iPad charged while using the system.

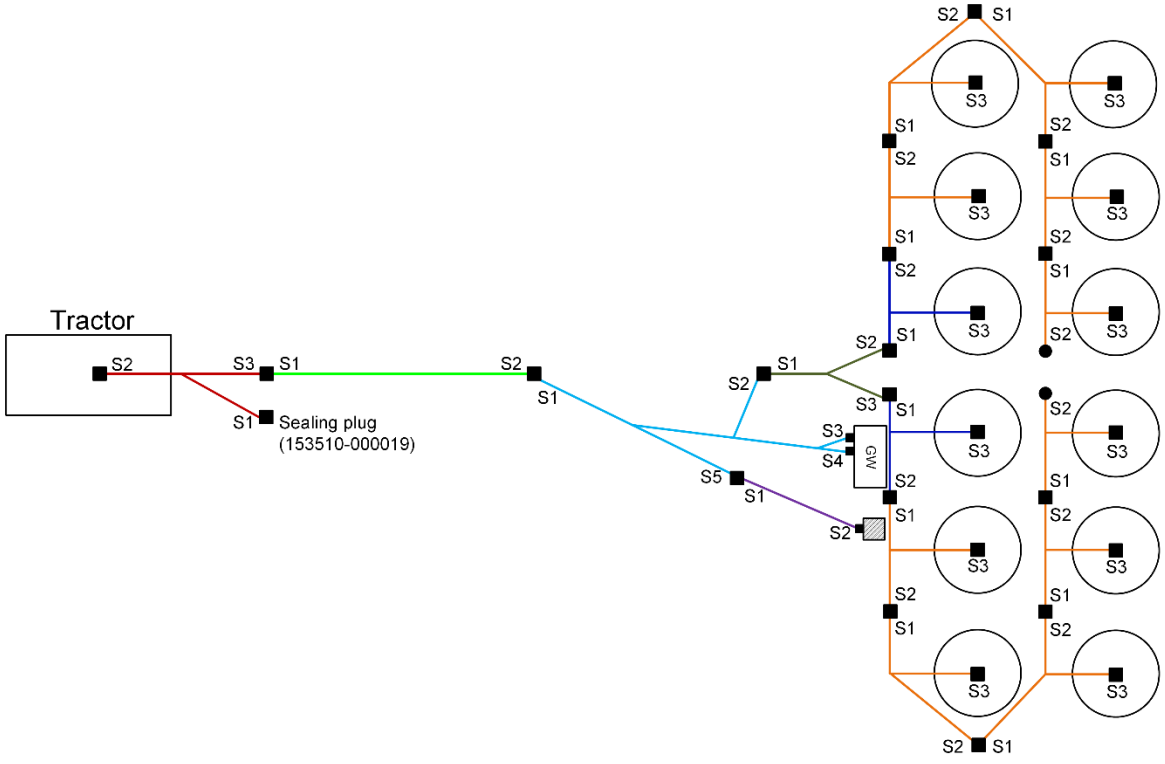
4.2. Download the Blockage Monitor app

To interface with the system, you need to download the Blockage Monitor app from the Apple App Store and install it onto your iPad. To install the app:

1. Connect the iPad to the internet.
2. Tap the **App Store** icon on the iPad's home screen.
3. Tap the **Search** field in the top right corner of the App Store screen.
4. Type *Intelligent Ag* in the search field and tap the **Search** button.
5. Tap the Recon Wireless Blockage and Flow Monitor app when it appears in your search results.
6. Tap the **Get** button and tap **Install**. Enter your Apple ID and password, if prompted. A progress bar will appear over the app's icon while it is downloading.

4.3. Connect to the Gateway 300

1. Ensure that you have power to the ECUs and gateway.
2. Tap the **Settings** icon on your iPad's home screen.
3. Tap **Wi-Fi**.
4. Connect to the **IASBlockage** network.
5. Press the iPad's Home button and open the Blockage Monitor app. Follow the on-screen prompts to begin configuring your system.

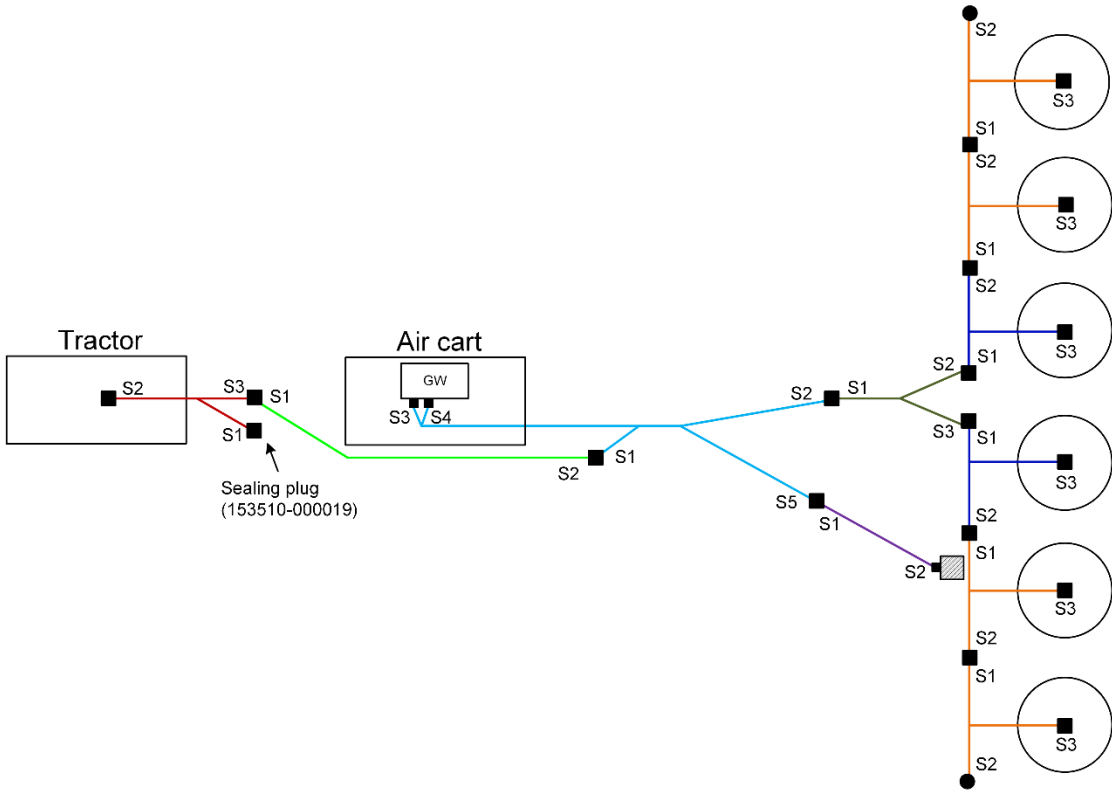


GUIDE	
	Manifold (ECU)
	Work switch
	Connection point
	CAN termination
	Tractor harness
	Work switch extension harness*
	Gateway harness
	ECU harness 10'
	ECU harness 20**
	Power/CAN split
	Intermediary harness

*optional based on your system configuration

Figure 21: 12 manifold wiring diagram

Ten ECU harness 10', two ECU harness 20', one each all other harnesses



GUIDE	
○	Manifold (ECU)
▨	Work switch
■	Connection point
● 153510-000051	CAN termination
— 353050-000010	Tractor harness
— 353050-000011	Work switch extension harness
— 353050-000024	Gateway harness
— 353050-000025	ECU harness 10'
— 353050-000027	ECU harness 20**
— 353050-000028	Power/CAN split
— 353050-000030	Intermediary harness*

*optional based on your system configuration

Figure 22: Tow-between air cart wiring diagram

