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RAVEN

Installation & Operation Manual

SmartYield™

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CHAPTER 1

Important Safety Information

NOTICE

Read this manual carefully before installing the SmartYield™ system.

- Follow all safety information presented within this manual.
- If you require assistance with any portion of the installation or service of the SmartYield sensor system, contact a local Raven dealer for support.
- Follow all safety labels affixed to system components. Be sure to keep safety labels in good condition and replace any missing or damaged labels. To obtain replacements for missing or damaged safety labels, contact a local Raven dealer.

When operating the machine after installing SmartYield, observe the following safety measures:

- Be alert and aware of surroundings at all times.
- Do not operate any agricultural equipment while under the influence of alcohol or an illegal substance.

Please review the operation and safety instructions included with the implement and/or controller.

⚠ CAUTION

Electrical Safety

Do not reverse power leads. Doing so could cause severe damage to equipment. Always make sure that the power leads are connected to the correct polarity as marked or instructed in this document. Ensure that the power cable is the last cable to be connected.

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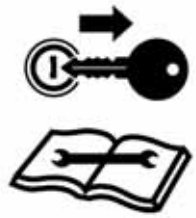
CHAPTER 2

Introduction

Congratulations on the purchase of the Raven SmartYield™ system. This document is provided to assist with the proper connection of the SmartYield system with a Raven control console such as a Cruizer II or Envizio Pro series field computer.



CAUTION

Before calibrating the SmartYield system, be sure that all installation procedures have been completed. Refer to the Loup Electronics Software, Installation and Support Information disc or contact a local Raven dealer for assistance.

To provide accurate yield information for harvest operations, both the Raven controller and the SmartYield system must be properly calibrated for the specific machine. Be sure to review all instructions for the specific Raven control console and use the table of contents for assistance with locating additional information and system diagrams.

SmartYield™ Overview

The Raven SmartYield may be used with the following Raven control consoles:

- Cruizer II™
- Envizio Pro™, Envizio Pro II™, or Envizio Pro XL™

Setup and operation of the SmartYield system is done directly through the Raven control console for ease of operation and for data logging functions.

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Data Entry

Use the on-screen alpha-numeric keypad displayed to the right of the SmartYield configuration display to enter data and calibration values. To enter text, touch the corresponding key between 2 to 5 times to enter the desired letter.

Some keys have additional or special characters not shown on the key icon:

- The * key will either toggle between lower and upper case characters or, when preceding a numerical entry, will set a MINUS value.
- The 0 key will toggle between 0 and a SPACE.
- The — key will BACKSPACE the screen cursor to remove or re-enter a character.
- The ↵ key is the RETURN key and is normally pressed to confirm the data entry into memory.
- The key accesses the SETUP menu which contains calibration factors and calibration settings.

Screen Displays

Refer to Chapter 10, *SmartYield™ Operation*, for detailed harvest set up and operation instructions. Additional features of the SmartYield system are detailed in Chapter 11, *SmartYield™ Calibration*, for details on the SmartYield screen displays.

AccuHeader

To accurately calculate the bushels per acre [kilograms per hectare], the width of the header currently cutting crop, or the working width, must be adjusted as the header passes in and out of uncut crop. To simplify this task during harvest operations, the Raven SmartYield system features AccuHeader, automatic header section monitoring.

During a harvest operation, the Raven SmartYield system monitors the location of the header and each header section. As a section passes out of uncut crop, the AccuHeader feature automatically reduces the working width which is used to tally the coverage area. As the section passes back into uncut crop area, the AccuHeader feature expands the working width. This feature allows the SmartYield system to accurately tally the coverage area while monitoring the harvest yields and calculating the bushels per acre [kilograms per hectare].

Refer to the *Harvest Width Setting and AccuHeader* section on page 74 for more information on configuring the AccuHeader feature for SmartYield operations.

Note: *The SmartYield junction box will require software version 36 or newer to allow the AccuHeader feature for harvesting operations. Refer to the Diagnostics Settings section on page 87 for more information on locating the junction box software version or Appendix B, Updating the SmartYield™ Junction Box, for assistance with updating the junction box for the AccuHeader feature.*

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Updates

Updates for Raven manuals as well as software updates for Raven consoles are available at the Applied Technology Division web site:

www.ravenhelp.com

Sign up for e-mail alerts to receive notice when updates for your Raven products are available on the Raven web site.

At Raven Industries, we strive to make your experience with our products as rewarding as possible. One way to improve this experience is to provide us with feedback on this manual.

Your feedback will help shape the future of our product documentation and the overall service we provide. We appreciate the opportunity to see ourselves as our customers see us and are eager to gather ideas on how we have been helping or how we can do better.

To serve you best, please send an email with the following information to

techwriting@ravenind.com

-SmartYield™ Installation & Operation Manual
-Manual No. 016-0171-451 Rev. C
-Any comments or feedback (include chapter or page numbers if applicable).
-Let us know how long have you been using this or other Raven products.

We will not share your email or any information you provide with anyone else. Your feedback is valued and extremely important to us.

Thank you for your time.

Installation Overview

Installation of the SmartYield system may vary slightly depending upon the specific machine make, model and model year. Despite variations, the installation of the SmartYield system will require the following steps:

1. Install the Raven field computer in the vehicle cabin within reach of the vehicle operator. Review the display installation manual for specific instructions.
2. Mount the SmartYield junction box on the outside of the vehicle cabin. Before mounting the junction box, review Chapter 3, *SmartYield™ Junction Box Installation*.
3. Mount the yield sensors to the clean grain elevator.
4. Mount the optional moisture sensor to the clean grain elevator or to the grain tank loading auger in the grain hopper.
5. Install any required header switch hardware required for the specific harvester make and model.

Point of Reference

The instructions in this manual assume that you are standing behind the machine, looking toward the vehicle cabin or operator's position.

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Kit Contents

TABLE 1. **SmartYield™ Kit Contents**

Item Description	Part Number	Cruizer II Standard SmartYield Kit - P/N 117-0171-365	Cruizer II Low Profile SmartYield Kit - P/N 117-0171-474	Envizio Pro Series Standard SmartYield Kit - P/N 117-0171-366	Envizio Pro Series Low Profile SmartYield Kit - P/N 117-0171-473
Junction Box, SmartYield (w/ power cable)	063-0173-283	1	1	1	1
Cable, SmartYield to Cruizer II Interface	115-0171-950	1	1	-	-
Cable, SmartYield to Envizio Pro Series Interface	115-0171-971		-	1	1
Kit, Standard Yield Sensor	117-0171-370	1	-	1	-
Kit, Low Profile Yield Sensor	117-0171-466		1	-	1
Kit, Moisture Sensor	117-0171-368	1	1	1	1
Kit, Header Cutout Switch[a]	117-0171-369	1	1	1	1

a. Depending upon the machine make and model, additional options for the header cutout switch may be available. Contact a local Raven dealer for more information.

Additional Hardware Components

TABLE 2. **Paddle Extension Plates (P/N 117-0171-462)**

Item Description	Part Number	Qty.
Plate, SmartYield Paddle Extension	107-0172-129	40

Note: *An extension plate kit will be required for installations on Gleaner, New Holland or Massey Ferguson harvesters. Plates may also be necessary for other harvesters if the SmartYield system has difficulty achieving a good calibration. Refer to the Yield Sensor Setup section on page 54 for details on the calibration and to help determine if extension plates are necessary for your specific harvester.*

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Optional Components

TABLE 3. SmartYield™ Installation Tool Kit (P/N 117-0171-468)

Item Description	Part Number	Qty.
Bit, 1/4” Pilot Drill	321-0000-388	1
Bit, 3/16” to 7/8” Stepper	321-0000-394	1
Saw, 3-3/8” Hole	321-0000-395	1
Square, 8” x 12”	321-0000-396	1

TABLE 4. SmartYield™ Junction Box Magnetic Mounting Kit (P/N 117-0171-476)

Item Description	Part Number	Qty.
Bracket, SmartYield Junction Box Mounting	107-0172-145	2
Plate, SmartYield Junction Box Mounting	107-0172-140	1
Magnet, Ceramic	418-0000-013	4
Bolt, 1/4”-20 x 3/4” Hex	311-0049-103	8
Nut, 1/4”-20 Nylon Lock	312-4000-057	8

TABLE 5. Yield Sensor Magnetic Mounting Kit (P/N 117-0171-475)

Item Description	Part Number	Qty.
Bracket, Yield Sensor	107-0172-134	2
Bracket, Yield Sensor Universal	107-0172-143	2
Magnet, Ceramic	418-0000-013	4
Bolt, 1/4”-20 x 3/4” Hex	311-0049-103	4
Nut, 1/4”-20 Nylon Lock	312-4000-057	4

Care and Maintenance

To achieve the best possible accuracy from the Raven SmartYield™ system, be sure to perform daily and seasonal maintenance of the system:

- When harvesting particularly oily crops, make sure that the grain sensor lenses and moisture sensor stay reasonably clean.
- Cross-check moisture readings and grain density settings by measuring reference samples of the crop when first starting harvest operations.
- Check and, if required, tare (zero) the yield reading with the clean grain elevator running empty.
- The clean grain elevator chain should be in good condition and properly tensioned before starting harvest operations.

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CHAPTER 3

SmartYield™ Junction Box Installation

Junction Box Installation Recommendations

Keep the following items in mind when selecting a location to mount the SmartYield™ junction box:

- The junction box features a weather resistant enclosure and may be mounted outside of the vehicle cabin. Although the junction box is weather resistant, it is recommended to select a mounting location which is at least partially protected from weather and field conditions.
- The junction box must be mounted in a location where the unit will not interfere with normal machine operation. The box must not be jarred or struck by any vehicle components during operation.
- The junction box features an internal tilt sensor. It is recommended to mount the junction box with the large, round connector facing toward the ground and the Loup Electronics label facing toward the right side (as observed from the operator's position) of the vehicle to maintain the factory calibration of the internal tilt sensor.

  If the junction box cannot be mounted in the recommended orientation, the junction box may be reconfigured for mounting with the Loup Electronics label facing toward the front of the harvester. Refer to the *Reconfiguring the Internal Tilt Sensor* section on page 11.
- An optional magnetic mounting kit (P/N 117-0171-476) is available to allow the junction box to attach to any magnetic surface on the harvester.

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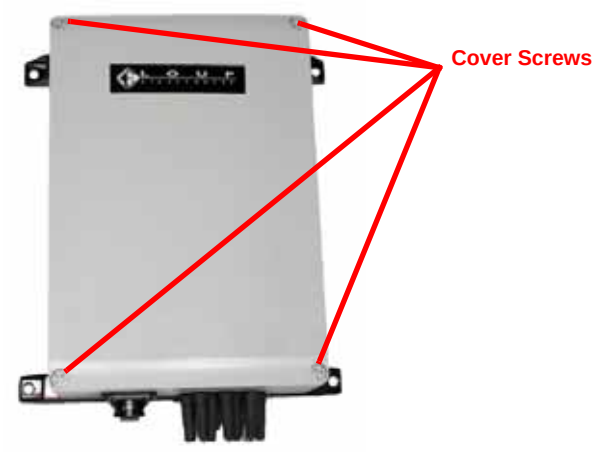
Optional Magnetic Junction Box Mounting

Refer to the following procedure to mount the SmartYield junction box using the optional magnetic junction box mounting kit (P/N 117-0171-476).

Note: *The ceramic magnets in the magnetic mounting kit may be attached to the existing interface brackets for quick mounting of the junction box. For equipment with limited space to mount the junction box, use the bracket and plate provided in the kit to minimize the space necessary for mounting the junction box.*

1. Loosen the four screws and remove the cover from the junction box.

FIGURE 1. **SmartYield™ Junction Box Cover Screws**



2. Locate and remove the four nuts on the back of the junction box. Use an extended slotted or flat screw driver to reach the recessed screws underneath the cover screw locations.
3. Remove the existing straight brackets from the back of the junction box.
4. Place the supplied junction box mounting brackets (P/N 107-0172-145) onto the back of the junction box and secure using the existing bracket hardware. Use an extended slotted or flat screw driver to reach the recessed screws underneath the cover screw locations.
5. Locate the three inner predrilled holes in the junction box mounting plate (P/N 107-0172-140).
6. Using the three 1/4” nuts (P/N 312-4000-057) and three 1/4” bolts (P/N 311-0049-103), mount the three of the provided magnets (P/N 418-0000-013) to the junction box mounting plate.

Note: *If the magnets stick to the mounting plate, they will not hold the junction box properly. Flip the magnets over before proceeding.*

7. Secure the mounting plate to the installed brackets using four 1/4” nuts (P/N 312-4000-057) and four 1/4” bolts (P/N 311-0049-103). Mount the plate so that the magnets face away from the junction box.

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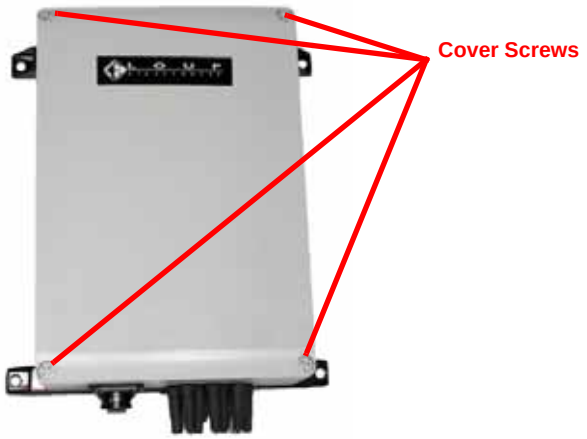
Reconfiguring the Internal Tilt Sensor

Refer to the following procedure to reconfigure the internal tilt sensor if the junction box cannot be mounted with the large, round connector facing toward the ground and the label facing toward the front of the harvester.

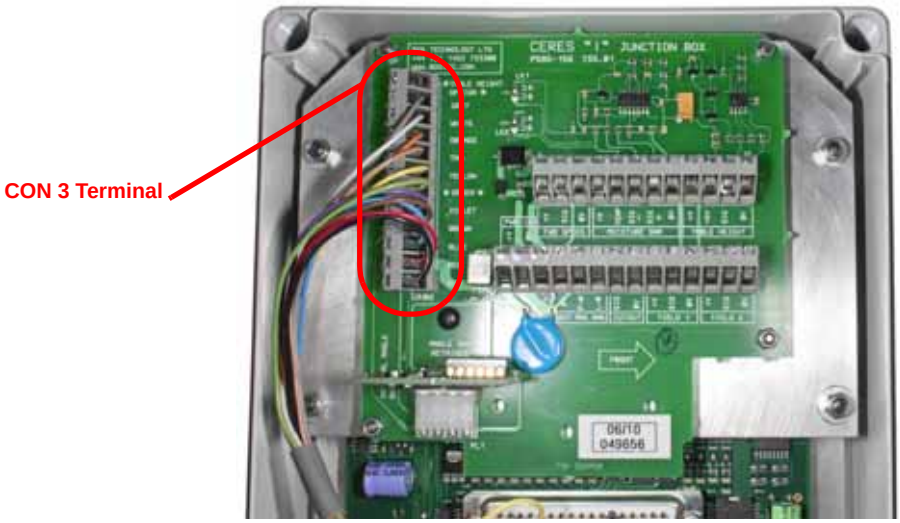
1. Loosen the four screws and remove the cover from the junction box.

FIGURE 2. SmartYield™ Junction Box Cover Screws



2. Locate the brown and violet wires on the terminal bank labeled ‘CON 3’ in the junction box.

FIGURE 3. SmartYield™ Junction Box Internal Circuit Board



3. Using a precision flat head screw driver, carefully loosen the brown and violet terminal posts.

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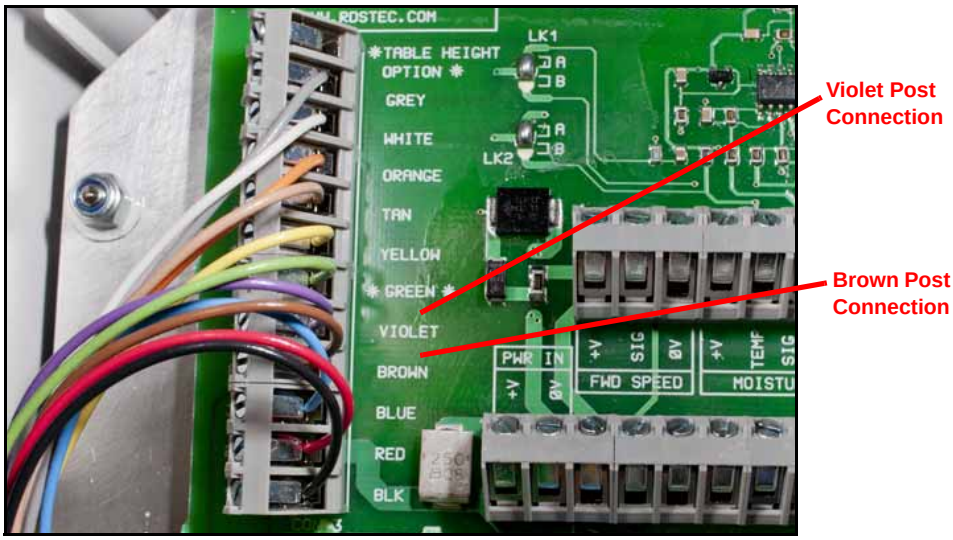
FIGURE 4. **SmartYield™ Junction Box CON 3 Terminal**



4. Switch the brown and violet lead wires to reverse the internal tilt sensor for the SmartYield monitor. Swapping these leads will allow the junction box to be mounted with the large, round connector facing toward the ground and the label facing toward the front of the harvester.
5. Carefully tighten the brown and violet terminal posts using a precision flat head screw driver.
6. Replace the cover and tighten the cover screws to secure the junction box.

Note: *Check that the cover gasket is in place when securing the junction box to help prevent water and dust from penetrating the enclosure.*

Powering the Junction Box

The Raven control console will connect to the large, round connector on the bottom of the SmartYield junction box. If one of the following cables is used with the SmartYield system, the junction box will be powered through the 9-pin connector on the junction box.

- Cruizer II to SmartYield cable (P/N 115-0171-950) Rev B or later
- Envizio Pro Series SmartYield cable (P/N 115-0171-971) Rev C or later

Refer to Chapter 7, *Cruizer II™ Connection*, or Chapter 8, *Envizio Pro™ Series Connection*, for details on connecting the junction box with the specific Raven control console.

The junction box power cable is required to power the junction box if the display cable is older than the revisions listed above. Proceed to the *Junction Box Power Cable* section on page 13 to connect the junction box to power.

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Junction Box Power Cable

Refer to the following procedure to install the junction box power cable if necessary.

⚠ CAUTION

Do not connect the junction box to power until the remaining components are properly mounted and connected to the junction box.

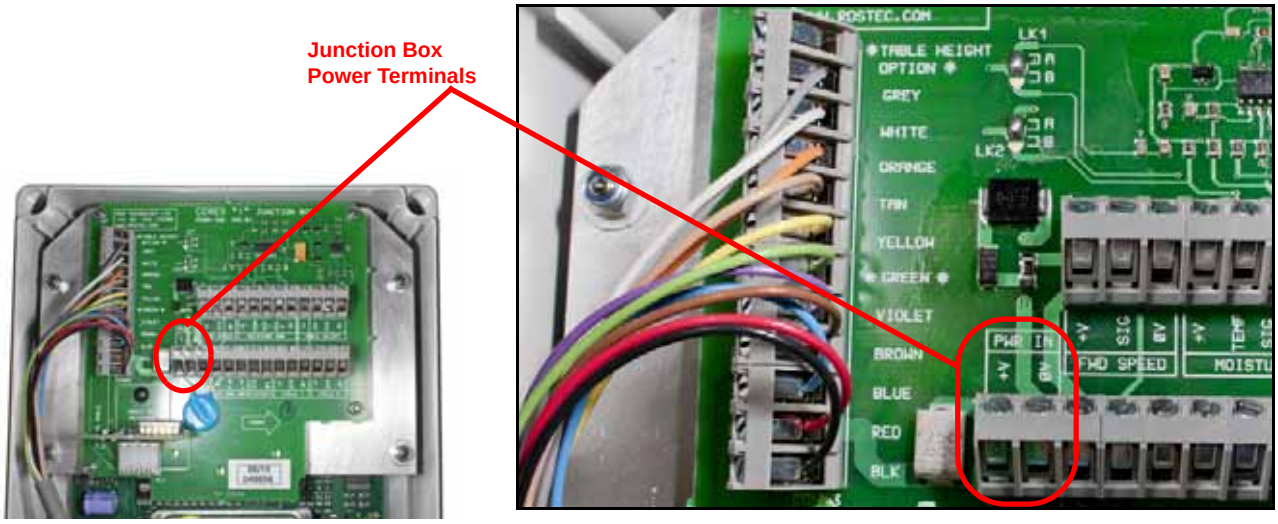
Be sure to connect the power leads to the appropriate power terminals. Reversing the power leads may cause severe damage to the equipment.

1. Locate the spade connectors furthest from the fuse holders. Clip these spade connectors from the cable.

FIGURE 5. Junction Box Power Cable Spade Connectors

2. Loosen the four screws and remove the cover from the junction box.
3. Locate the terminals labeled ‘PWR IN’ within the junction box.

FIGURE 6. SmartYield™ Junction Box Power Input Terminals



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4. Select one of the rubber seals at the bottom of the junction box. Using a wire cutter, clip the seal as close to the end as possible.
5. Feed enough of the junction box power cable through the rubber seal to reach the power terminals.
6. Strip back the wire insulation on each of the lead wires enough to allow the leads to connect to the power terminals.
7. Connect the blue lead to the terminal labeled ‘0V’ (ground).
8. Connect the brown lead to the terminal labeled ‘+V’ (power).
9. Route the post connectors with the fuse holders to the nearest source of switched power.

   The junction box power should be toggled on and off using the vehicle ignition switch to avoid draining the battery.

Note: *Power for the junction box also may be obtained by tying into the switched power connector on the Raven display or chassis cable. Connect the white wire on the cable to the ground terminal and the solid orange wire to the power terminal.*

10. Replace the cover and tighten the cover screws to secure the junction box.

Note: *Check that the cover gasket is in place when securing the junction box to help prevent water and dust from penetrating the enclosure.*

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CHAPTER 4

Yield Sensor Installation

Yield Sensor Installation Recommendations

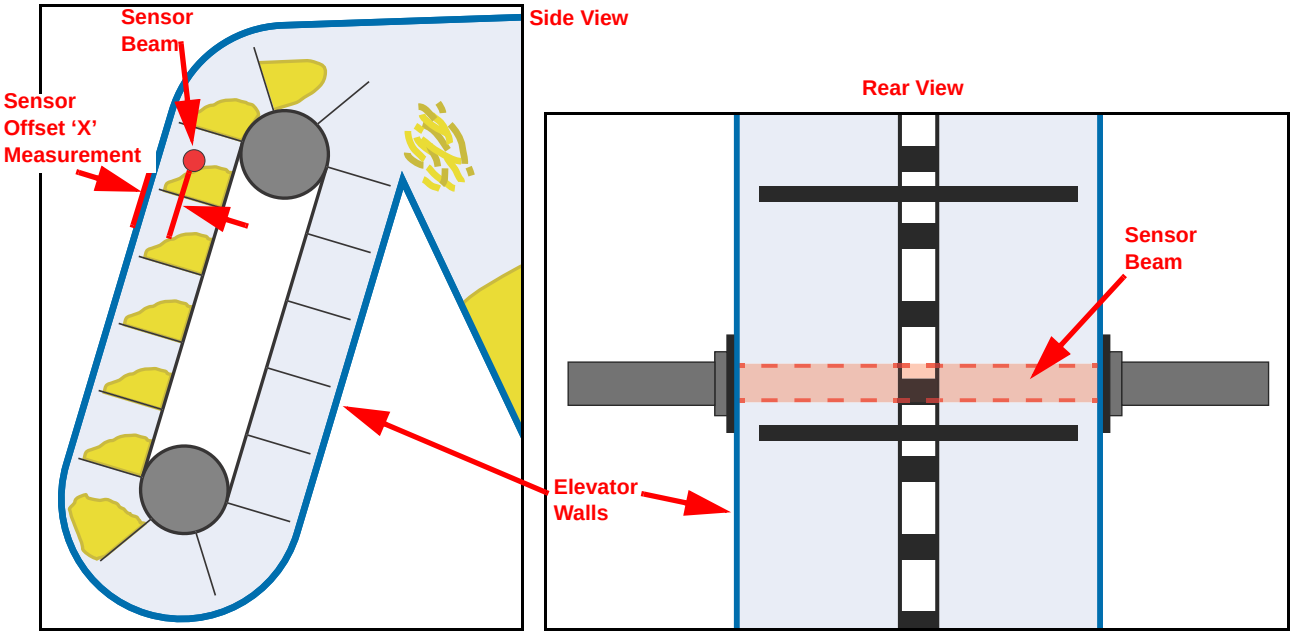
It is highly recommended to inspect the harvester and clean grain elevator prior to drilling any holes or mounting any brackets to the clean grain elevator. Keep the following items in mind when selecting a location to mount the yield sensors:

- Yield sensor mounting location is critical for proper performance of the SmartYield system. The sensors should be mounted as high as possible on the clean grain elevator and should be offset from the side wall on grain lift side of the elevator by a measurement 'X' specific for each make and model of harvester. Refer to the *Yield Sensor Locations* section on page 16 for a table of yield sensor offset values.

Note: *The 'X' measurement must be made perpendicular from the side wall on the lift side of the clean grain elevator.*

If your specific harvester make and model is not listed, contact a local Raven dealer or the Raven technical support center for additional instructions.

FIGURE 1. Recommended SmartYield™ Yield Sensor Mounting and Sensor Beam Alignment



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- While the yield sensors do provide some tolerance for misalignment when installed, it is highly recommended to take precautions to align and level the sensors and as carefully as possible. A SmartYield installation tool kit (P/N 117-0171-468) is available with drill bits and a square which may be helpful with leveling and aligning the yield sensors during installation.

  Ideally, the yield sensors should be mounted parallel with the ground when the vehicle is parked on a level surface with the sensors aligned directly across the clean grain elevator from each other. Use a carpenters square, level and any other tools to help level, align and mark the yield sensor installation locations before drilling any holes in the clean grain elevator.
- Check for moving components such as belts, chains and access panels on the clean grain elevator. Ensure the yield sensors and mounting brackets will not interfere with, or be struck during, normal equipment operation.

  It may be necessary to assemble the yield sensors and brackets and rough out the yield sensor installation to verify acceptable clearances at the selected mounting location.
- It may be necessary to disconnect or move some components on some machine makes or models to allow for installation of the yield sensors. Contact a local dealership or the machine manufacturer for additional assistance with factory equipment.
- The yield sensors must consistently register individual paddles as they pass the sensor lenses. It is recommended to open the clean grain elevator door and check or measure the location of the elevator chain and verify the location for the yield sensors in the clean grain elevator wall.

Note: *An extension tab kit (P/N 117-0171-462) will be required for installations on Gleaner, New Holland or Massey Ferguson harvesters. Tabs may also be necessary for other harvesters if the SmartYield system has difficulty achieving a good calibration.*

Refer to the Yield Sensor Setup section on page 54 for details on the calibration and to help determine if tabs are necessary for your specific harvester. See the Yield Sensor Paddle Extension Plates section on page 27 for details on installation of the paddle extension plates.

Yield Sensor Locations

Review the following table for the offset measurement required for each specific harvester make and model. The offset value (X) is measured from the wall on the lift side of the clean grain elevator.

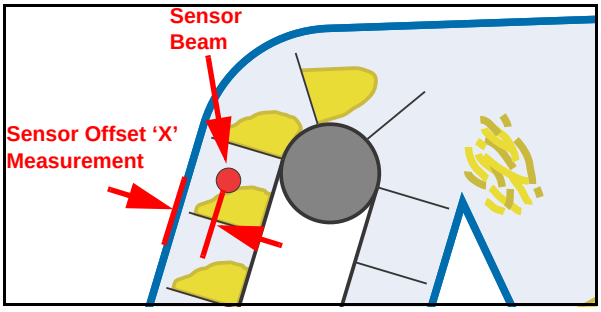

TABLE 1. Harvester Make and Model Offset Measurements

Make	Model	'X' Measurement	
		Inches	Millimeters
Case IH	1460	1-3/8	35
	1660, 2166	1-9/16	40
	1680	2-3/8	60
	2188/2388	2-3/8 inside 1-15/16 outside	60 inside 50 outside
Claas	Dominator 86, 96, 98	1-9/16	40
	Dominator 106, 108, 118, 204, 218, Lexion, Tucano	1-3/4	45
	Dominator 112 CS, Comm 116 CS, 228	2-3/8	60
	Avero 240	1-3/16	30
CNH	CS, CSX	2-3/16	55

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Make	Model	'X' Measurement	
		Inches	Millimeters
Duetz Fahr	4080	1-3/8	35
	8XL	2-3/8	60
	5690 HTS, 6095 HTS	2-9/16	65
Fiat	L517	2-3/8	60
Fortschritt	E514, E517	1-3/4	45
	E524	1-9/16	40
Gleaner	R-72	2-9/16	65
John Deere	1000 Series, 4425	1-3/16	30
	1100 Series	1-15/16	50
	Z Series (Belt/Chain) Drive, 2258, 9750 STS, 9660, 9760	2-9/16	65
	4400	1	25
	7720 Turbo	1-3/8	35
	9500, 9600, 9650	2-3/8	60
Laverda	306LS, 25.5	2-3/8	60
Massey Ferguson	38, 40	2-3/8	60
	29	2-3/16	55
	760, 850	1-3/8	35
New Holland	TX34, 36, 62, 64, 65, 66, 68, 78 TF42, 44, 46, 76, Elektra, TC, CX, 8070, 8080	2-3/16	55
	TR	1-3/4	44

Yield Sensor Mounting

The SmartYield™ yield sensors must be mounted to the clean grain elevator using one of the following methods:

- Optional magnetic sensor mounting brackets
- Riveted yield sensor bracket assemblies

Both the standard and low profile sensor kits may be mounted using either the riveted or optional magnetic mounting kits.

Optional Magnetic Sensor Mounting Brackets

The optional magnetic mounting kit (P/N 117-0171-475) provides the following benefits for installing the yield sensors:

- Relatively quick and easy installation
- Fewer holes to drill into the harvester clean grain elevator
- Independent and compact mounting brackets can be mounted closer to existing harvester components without interfering with harvester operation
- Maintains easy access to yield sensors for maintenance or replacement if necessary

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Two sensor mounting bracket types are supplied in the magnetic mounting kit:

FIGURE 2. Magnetic Sensor Bracket Types

Select the type of bracket best suited for each yield sensor location and the clean grain elevator configuration. Review the *Yield Sensor Installation Recommendations* section on page 15 and ensure that the sensors are properly aligned before drilling any holes in the clean grain elevator. To mount the yield sensors using the magnetic mounting brackets:

1. Insert a 1/4” bolt (P/N 311-0049-103) through the recessed side of the ceramic magnet assembly (P/N 418-0000-013). The threaded side of the bolt should extend past the flat side of the magnet assembly.
2. Insert the bolt through the predrilled holes or slot in the mounting bracket tab.

Note: *If the magnet sticks to the bracket, it will not hold the bracket to the grain elevator. Flip the magnet over before proceeding.*

When on the elevator, the bracket will recess the sensor away from the elevator wall.

3. Secure the magnet to the bracket using a 1/4” nut (P/N 312-4000-057). Repeat as necessary to secure magnets to the remaining bracket tabs.
4. Measure and mark the desired installation location on the outside wall of the clean grain elevator. Refer to the *Yield Sensor Locations* section on page 16 for machine specific measurements required for the yield sensors.
5. Draw a line around the clean grain elevator to help locate the sensor installation location on the inside of the clean grain elevator. Use a carpenters square (provided in optional installation tool kit) or level to ensure that the sensors will be aligned properly.

Note: *Check for any existing components which may interfere with or damage the yield sensors before proceeding. Adjust or relocate the yield sensor mounting locations as necessary.*

6. Measure from the side wall along the line on the lift side of the clean grain elevator. Mark the same distance from the side wall as measured on the outside of the elevator to align the yield sensor mounting points. If necessary, review the *Yield Sensor Locations* section on page 16 for machine specific measurements required for the yield sensors.
7. Drill pilot holes (pilot hole bit provided in optional installation tool kit) at the marked locations. Use caution when drilling the pilot holes and do not push the drill bit to full depth.
8. Once the pilot hole is drilled, use the bit to feel for a paddle or other components of the clean grain elevator. If necessary, operate the elevator to move the paddles or other obstructions away from the drilling area.
9. Using the pilot holes as a guide, drill a 7/8 inch [22.5 mm] hole for the yield sensor at each of the marked locations. A stepper bit is provided in the optional installation tool kit for drilling the yield sensor holes.

Note: *For elevators with limited access to the inside wall, an extended bit may be used to drill the sensor hole on the inside side of the elevator wall if the dimensions of the grain elevator allow. Be careful to level the bit or drill to ensure that the sensors will be aligned.*

10. Proceed to the *Mounting Standard Yield Sensors* section on page 19 or the *Mounting Low Profile Yield Sensors* section on page 20 for details on securing the yield sensors to the magnetic mounting brackets

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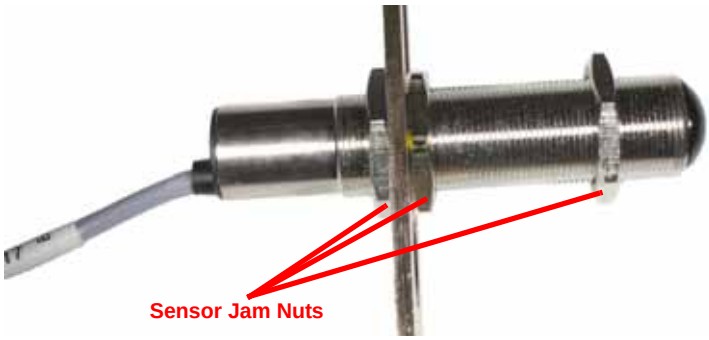
Mounting Standard Yield Sensors

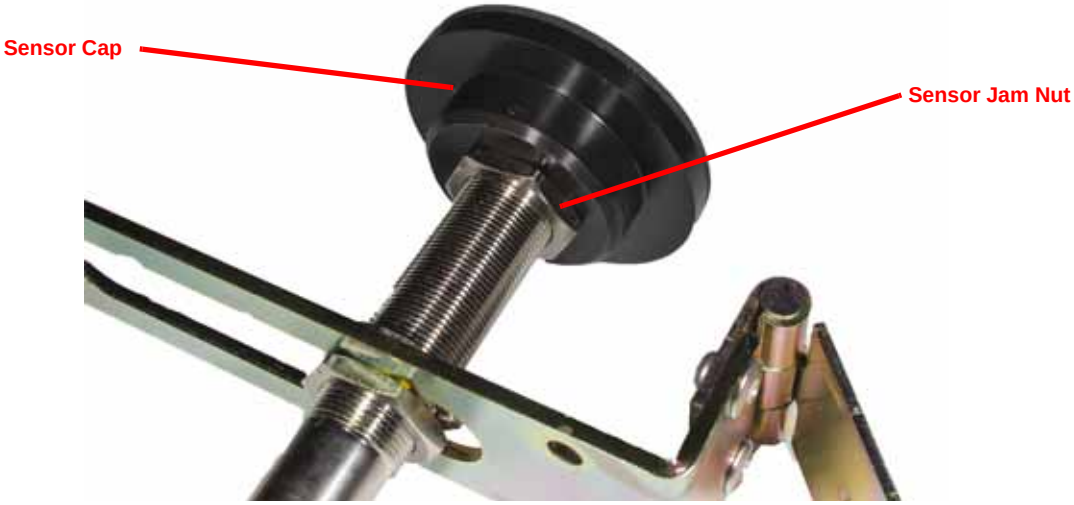
1. Remove the two jam nuts nearest to the sensor eye.
2. Slide the sensor body through the mounting bracket and replace the jam nuts. Leave the sensor body loose until the sensor depth can be properly adjusted.

FIGURE 3. Yield Sensor Body Jam Nuts



3. Thread the sensor cap onto the sensor body and tighten four to six turns. Use the jam nut nearest to the sensor eye to secure the cap to the sensor body.

FIGURE 4. Yield Sensor Hinged Mounting Bracket



Note: *Overtightening the sensor cap on the sensor body may dislodge the lens from the cap. It is only necessary to thread the sensor cap onto the body a few turns. If the lens is dislodged from the cap, loosen the cap and press the lens back into the sensor cap. Unscrew the remaining jam nut to secure the sensor cap to the sensor body.*

4. Adjust the depth of the sensor cap so that is approximately flush with the magnets on the bracket.
5. Align the senor eye with the holes drilled in the clean grain elevator and carefully set the magnetic brackets in place.
6. Adjust the sensor depth to secure the sensor cap firmly to the elevator wall and tighten the jam nuts. It is not necessary to exert significant force against the elevator wall. When properly adjusted, the sensor cap should be flush with the elevator wall without any gaps.
7. Proceed to the *Yield Sensor Connections* section on page 26 to continue the SmartYield™ system installation.

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Mounting Low Profile Yield Sensors

FIGURE 5. Low Profile Yield Sensor Assembly

1. Remove the jam nut from the yield sensor body.
2. Slide the threaded end of the sensor body through the bracket so that the sensor eye faces the same direction as the magnets.
3. Replace and tighten the jam nut to secure the sensor to the bracket.
4. Align the senor eye with the holes drilled in the clean grain elevator and carefully set the magnetic brackets in place. Proceed to the *Yield Sensor Connections* section on page 26 to continue the SmartYield™ system installation.

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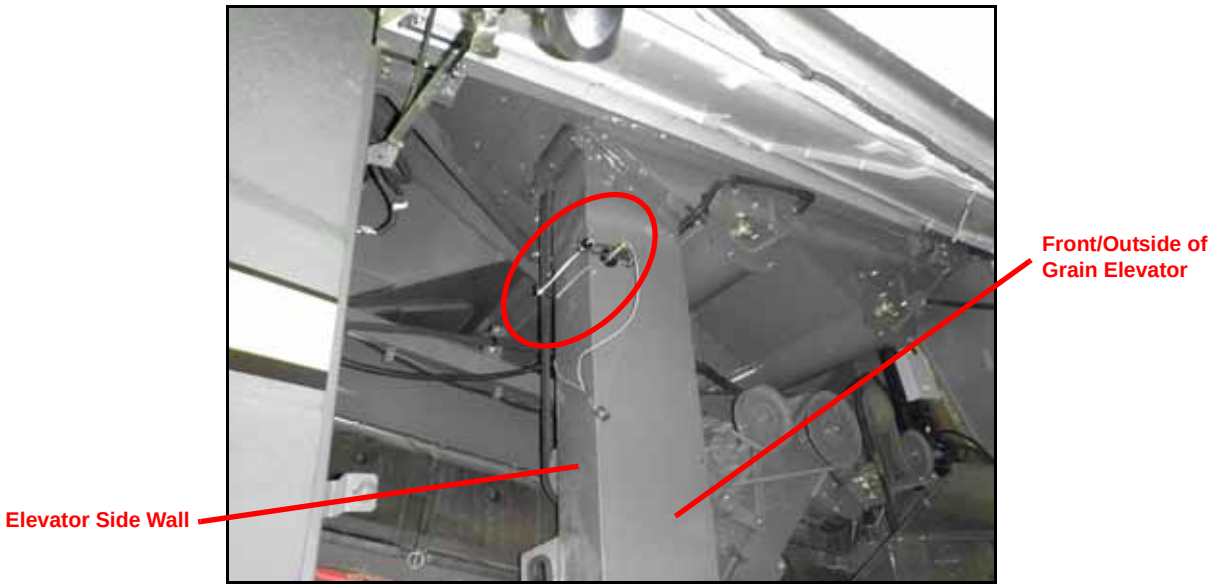
Rivet Yield Sensor Bracket Assemblies

Note: *The following procedure is an example of the best practices for measuring and installing the yield sensors in the clean grain elevator using the riveted mounting bracket assemblies. It is highly recommended to rough out as much of the installation as possible before drilling or mounting any components to ensure that the sensors are mounted correctly. Measure carefully.*

Drilling Holes for the Yield Sensors

1. Measure from the side wall of the clean grain elevator to allow enough space for the sensor lens cap and mark the desired sensor installation location.

FIGURE 6. **Example Yield Sensor Mounting Location**



Note: *Double check the clean grain elevator and paddle configuration to ensure that the sensors will register individual paddles and the chain will not interfere with the sensor beam.*

2. Mark the desired installation location on the outside wall of the clean grain elevator. Refer to the *Yield Sensor Locations* section on page 16 for machine specific measurements required for the yield sensors.
3. Draw a line around the clean grain elevator to help locate the sensor installation location on the inside of the clean grain elevator. Use a carpenters square (provided in optional installation tool kit) or level to ensure that the sensors will be aligned properly.
4. Measure from the side wall along the line on the inside wall of the clean grain elevator. Mark the same distance from the side wall as measured on the front of the elevator to align the yield sensor mounting points. If necessary, review the *Yield Sensor Locations* section on page 16 for machine specific measurements required for the yield sensors.

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FIGURE 7. **Example of Locating and Marking Centers of Yield Sensor Pilot Holes**

5. Visually check and remeasure the marked yield sensor installation locations as appropriate to ensure the sensors are as level and aligned as possible.
6. At each of the marked sensor locations, drill a small pilot hole (pilot hole bit provided in optional installation tool kit). Use caution when drilling the pilot holes and do not push the drill bit to full depth.

   Once the pilot hole is drilled, use the bit to feel for a paddle or other components of the clean grain elevator. If necessary, operate the elevator to move the paddles or other obstructions away from the drilling area.
7. Using the pilot holes as a guide, drill a 7/8 inch [22.5 mm] holes for the yield sensor on each side of the clean grain elevator. A stepper bit is provided in the optional installation tool kit for drilling the yield sensor holes.

Note: *For elevators with limited access to the inside wall, an extended bit may be used to drill the sensor hole on the inside side of the elevator wall if the dimensions of the grain elevator allow. Be careful to level the bit or drill to ensure that the sensors will be aligned.*

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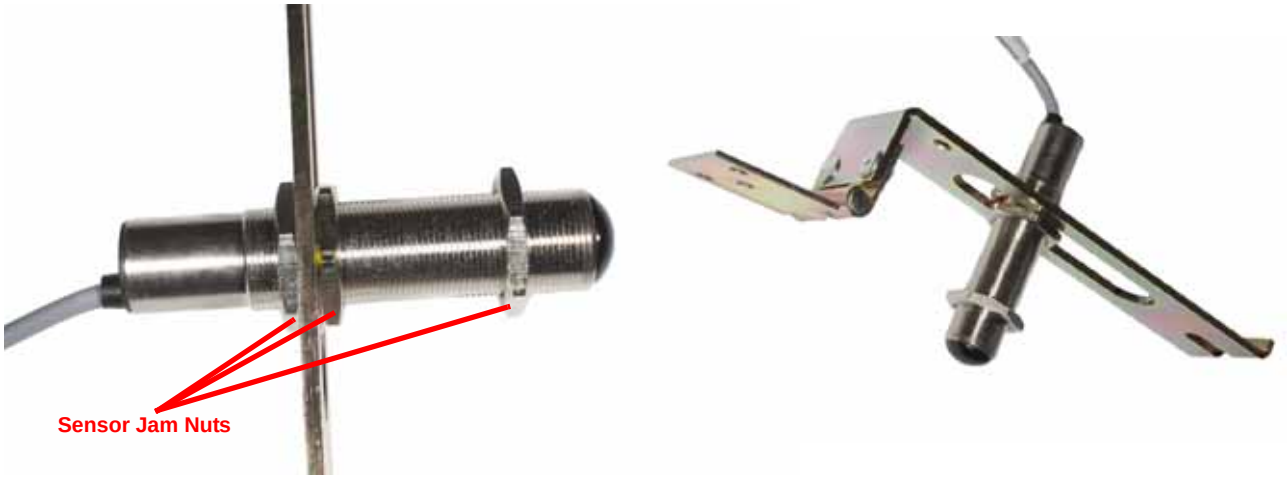
Mounting the Yield Sensors and Hinged Bracket

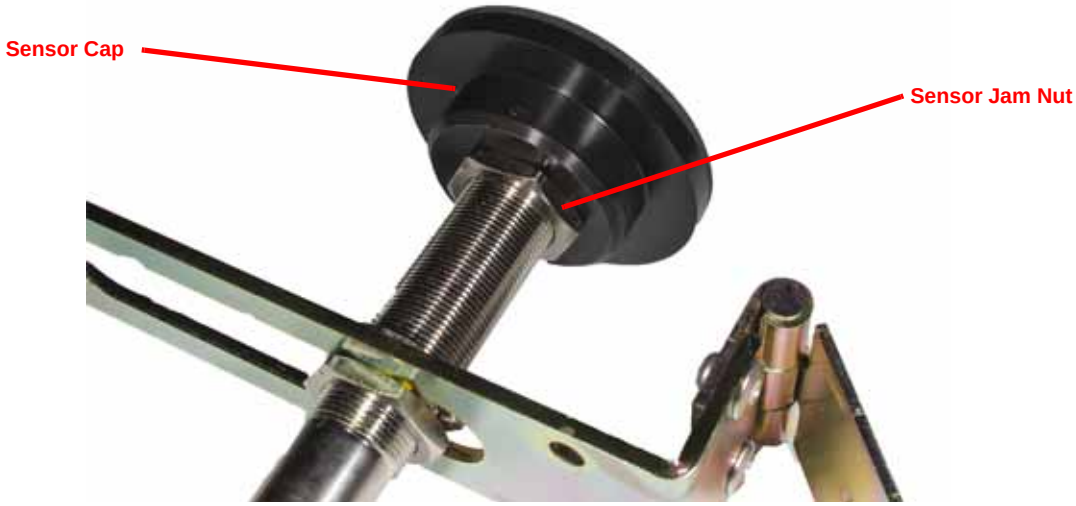
1. Remove the jam nut(s) from the sensor body. When using the standard yield sensors, remove the two jam nuts nearest to the sensor eye.
2. Slide the sensor body through the mounting bracket. The sensor should be oriented with the eye facing toward the same side of the hinged bracket as the small flange with three predrilled holes (refer to Figure 8 on page 23).

FIGURE 8. Yield Sensor Hinged Mounting Bracket



3. Loosely secure the sensor body to the mounting bracket using the jam nut(s).
4. When installing the standard yield sensors, thread the sensor cap onto the sensor body and tighten four to six turns. Use the jam nut nearest to the sensor eye to secure the sensor cap to the sensor body.

FIGURE 9. Yield Sensor Hinged Mounting Bracket



Note: *Overtightening the sensor cap on the sensor body may dislodge the lens from the cap. It is only necessary to thread the sensor cap onto the body a few turns. If the lens is dislodged from the cap, loosen the cap and press the lens back into the sensor cap. Unscrew the remaining jam nut to secure the sensor cap to the sensor body.*

5. Place the bracket and sensor assembly on the clean grain elevator with the sensor cap centered over the 7/8 inch [22.5 mm] hole.

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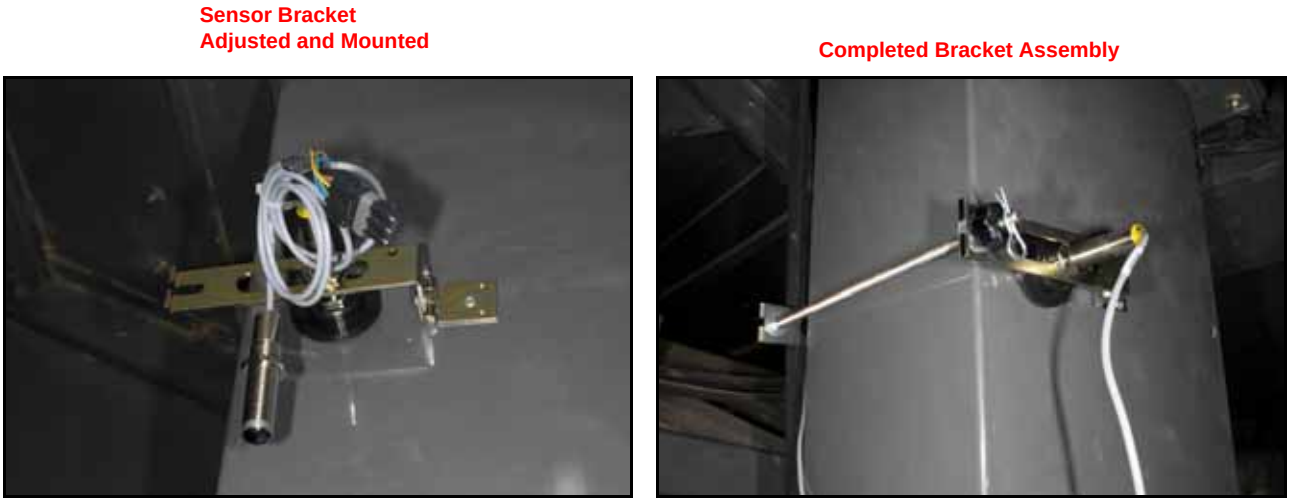
6. While keeping the sensor cap centered over the 7/8 inch [22.5 mm] hole in the clean grain elevator, adjust the jam nuts (if applicable) to the appropriate depth for the sensor bracket. When adjusted properly, the sensor cap and small flange on the mounting bracket should be flush on the clean grain elevator.
7. Before securing the sensor body, adjust the bracket so that the slot end clears the side wall of the clean grain elevator. The threaded rod supplied with the yield sensors must clear the elevator side wall and remain clear of any moving components.
8. Tighten the jam nut(s) on the senor body to secure the sensor body in place.

FIGURE 10. Example of Installed Yield Sensors and Mounting Bracket



9. Mark the bracket mounting holes and remove the sensor and bracket assembly.
10. Drill 3/16 inch [4.8 mm] holes for the mounting bracket and use a rivet gun and the supplied rivets to secure the mounting bracket to the clean grain elevator.

Assembling the Yield Sensor Bracket

The following procedure is provided to assist with completing the assembly of the SmartYield™ sensor bracket after both yield sensors and hinged brackets are mounted to the clean grain elevator.

1. Locate the threaded rod, thumb screw, cotter pin and supplied nuts, flat washers and lock washers supplied with the yield sensors.
2. Locate the predrilled hole in the threaded rod.
3. Thread one nut, two flat washers and the supplied thumb screw onto the rod at the end with the hole.
4. Push the supplied cotter pin through the hole in the threaded rod. This end of the rod may be used to quickly disconnect the mounting brackets to check or maintain the yield sensors. When attaching the rod to the hinged brackets, it is recommended to keep this end accessible.

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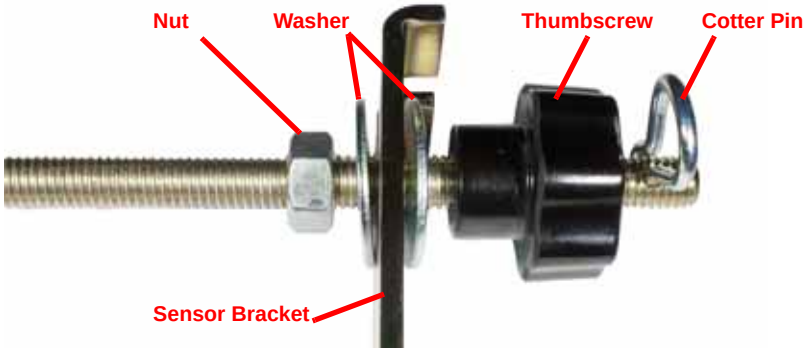
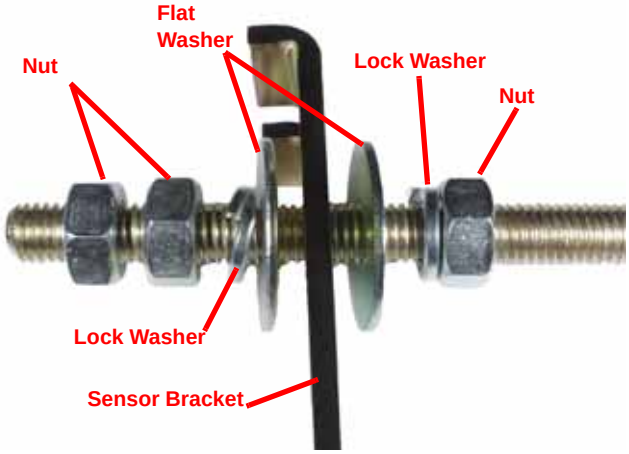
FIGURE 11. **Yield Sensor Bracket Assembly (Quick Disconnect)**



5. On the opposite end of the rod, thread one nut, one lock washer, two flat washers, followed by one lock washer and two nuts onto the threaded rod. This end will remain fixed to the hinged bracket and will not be disassembled to check or maintain the yield sensors.

FIGURE 12. **Yield Sensor Bracket Assembly (Fixed)**



6. Place the threaded rod onto the sensor mounting brackets. The sensor bracket should be placed between the two flat washers on each end of the rod (refer to Figure 11 and Figure 12 above).
7. Tighten the thumb screw and the two nuts on the opposite side of the threaded rod in turns until the yield sensor caps are held flush to the clean grain elevator. It is not necessary to apply significant pressure to the sensors with the mounting bracket. Only tighten the thumb screw enough to keep the sensors in place during operation.
8. Finish securing the mounting bracket using the inside nuts.

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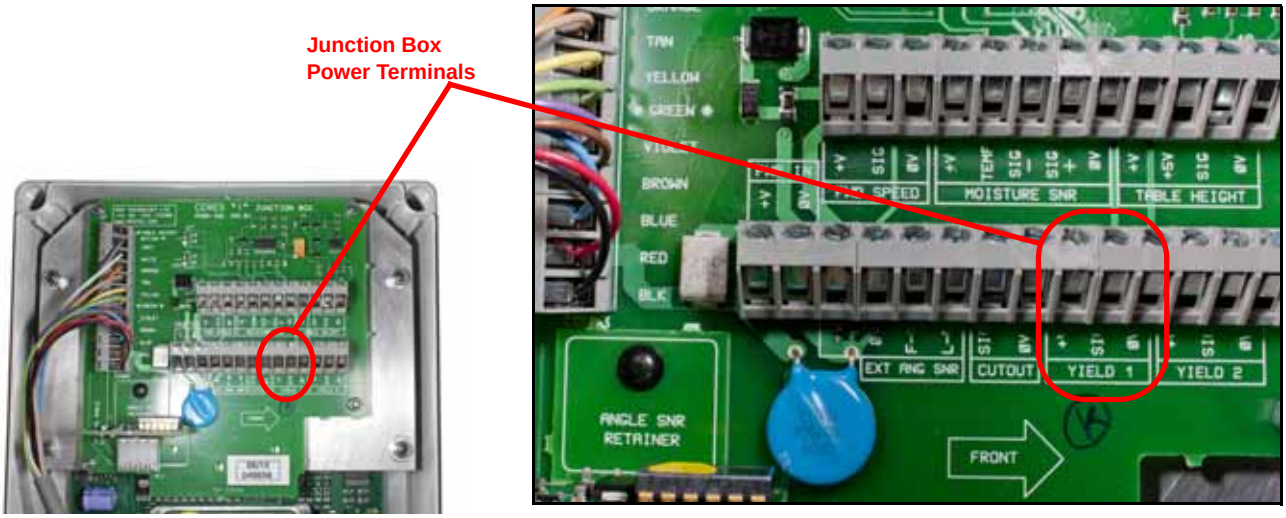
Yield Sensor Connections

Refer to the following procedure to connect the yield sensors to the SmartYield™ junction box:

1. Use the provided zip ties to secure the sensor cable leads to the mounting bracket.
2. Connect the supplied extension cable to the yield sensors and route toward the harvester cabin. It is recommended to route the extension cable along existing wiring or hydraulic hoses. Use the cable ties provided to secure the extension cable as necessary and be sure the cable will not be damaged by moving components during normal equipment operation.
3. Loosen the four screws and remove the cover from the junction box.
4. Locate the terminals labeled ‘YIELD 1’ within the junction box.

FIGURE 13. SmartYield™ Junction Box Yield 1 Terminals



5. Locate the spade connectors on the end of the yield sensor cable to be fed into the junction box. Clip these spade connectors from the cable.
6. Select one of the rubber seals at the bottom of the junction box. Using a wire cutter, clip the seal as close to the end as possible.
7. Feed enough of the yield sensor extension cable through the rubber seal to reach the yield terminals.
8. Strip back the wire insulation on each of the lead wires enough to allow the leads to connect to the terminals as necessary.
9. Connect the brown lead to the terminal labeled ‘+V.’
10. Connect the blue lead to the terminal labeled ‘0V.’
11. Connect the yellow/green lead to the terminal labeled ‘SIG.’
12. Replace the cover and tighten the cover screws to secure the junction box.

Note: *Check that the cover gasket is in place when securing the junction box to help prevent water and dust from penetrating the enclosure.*

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Yield Sensor Paddle Extension Plates

Due to the paddle configuration on some makes or models, a paddle extension plate kit (P/N 117-0171-462) may be required to ensure the yield sensors register a clean reading off of each grain paddle.

Note: *An extension tab kit will be required for installations on Gleaner, New Holland or Massey Ferguson harvesters. Tabs may also be necessary for other harvesters if the SmartYield system has difficulty achieving a good calibration. Refer to the Yield Sensor Setup section on page 54 for details on the calibration and to help determine if tabs are necessary for your specific harvester.*

Models on which the elevator paddles are riveted to the elevator chain will require the tabs to be welded onto the paddle brackets.

Bolt-on Paddle Chains

To attach the paddle extension plates to bolt-on elevator paddles:

1. Open the access panel or clean out door in the bottom of the clean grain elevator.
2. Manually operate the elevator until a paddle is easily accessible through the access panel.
3. Use a socket or impact wrench to remove the bolt from one side of the elevator chain and paddle.
4. Place the sensor tab between the paddle and elevator chain bracket.
5. Replace the nut and bolt.
6. Retighten the elevator paddle.
7. Manually advance the elevator to the next paddle and repeat the above process for each paddle on the clean grain elevator.

FIGURE 14. Example View of Clean Grain Elevator and Paddles

Before

After

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Riveted Paddle Chains

Use one of the following procedures to attach extension plates to paddles riveted to the elevator chain.

Welding Extension Plates

1. Open the access panel or clean out door in the bottom of the clean grain elevator.
2. Manually operate the elevator until a paddle is easily accessible through the access panel.
3. Use a wire feed or arc welder to tack the extension plates at the rivet holding the paddle onto the chain. The plate weld should not bind or inhibit operation of the chain.
4. Manually advance the elevator to the next paddle and repeat the above process for each paddle on the clean grain elevator.

Convert the Paddle to Bolt-on Mounting

1. Use a small drill bit to remove one of the rivets holding the paddle to the elevator chain.
2. Place the sensor tab between the paddle and elevator chain bracket.
3. Secure the elevator paddle and extension plate using a nut and bolt (not supplied).
4. Manually advance the elevator to the next paddle and repeat the above process for each paddle on the clean grain elevator.

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CHAPTER 5

Moisture Sensor Installation

Moisture Sensor Installation Recommendations

The moisture sensor is provided with all Raven SmartYield™ kits to monitor the moisture content of harvested grain. Keep the following items in mind when selecting a location to mount the moisture sensor:

- The moisture sensor should be mounted to either the clean grain elevator or the grain tank loading auger.

  When mounting to the clean grain elevator, the access panel or clean out door in the bottom of the clean grain elevator is generally one of the best places to mount the sensor. This location will allow easy access to clean off the moisture sensor when harvesting especially dirty or wet crops.

  The grain tank loading auger is also an acceptable mounting location. Mounting the sensor to the loading auger will generally keep the sensor cleaner when harvesting dustier or dirtier crops, but may not be as accessible for cleaning or maintenance. This location may also require fabrication of a mounting bracket if the sensor cannot be secured using the mounting bolts.
- Use the provided moisture sensor installation sheet (P/N 016-0171-529) to help with the moisture sensor alignment and as a guide when drilling the moisture sensor pilot holes.
- For best results and to help protect the moisture sensor from field debris during harvest operations, mount the sensor toward the loaded paddle side of the elevator and toward the rear of the machine.
- Generally, the center of the clean grain elevator access panel is the best place to mount the SmartYield moisture sensor. Keep the sensor surface clear of the elevator walls and ensure adequate clearance for the mounting hardware.
- Route the moisture sensor cable up the rear of the clean grain elevator. Secure the cable away from moving components and allow enough slack to open and close the access panel without damaging the cable or connectors.

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Moisture Sensor Revisions

As of 2012, there are two hardware revisions of the grain moisture sensor available for use with the Raven SmartYield system. The sensor revisions require different gain and offset values to be programmed via the field computer to ensure system accuracy.

FIGURE 1. Moisture Sensor Identification

All newer sensors will have a "Y" inscribed into the back of the sensor body or a silver part identification tag with the date of manufacture, serial number and part number as shown in Figure 1 on page 30.

Note: *Refer to the Moisture Sensor Setup (Optional) section on page 57 for more information on configuring the moisture sensor after the installation process is completed.*

Moisture Sensor Mounting

Note: *Mounting the moisture sensor to clean grain elevator access panel is generally recommended over mounting the sensor to the loading auger. However, if typical field or crop conditions are anticipated to be especially dirty or wet, mounting the sensor to the loading auger may help to keep the sensor cleaner during harvest operations.*

If the field or crop conditions are in doubt, mount the moisture sensor to the clean grain elevator access panel on a trial basis. If the sensor collects excessive dirt or debris, or requires frequent cleaning to obtain accurate moisture readings during harvesting, consider moving the sensor to the loading auger.

Access Panel Mounting

1. Select a location on the clean grain elevator access panel where the moisture sensor and mounting hardware will not interfere with the operation of the access panel and the sensor surface is not covered by the elevator walls.

Note: *The moisture sensor is approximately 5 in [13 cm] in diameter. The mounting bolts must not impede with closing the access panel.*

2. Measure any critical dimensions to help ensure clearance for the moisture sensor. Use the provided moisture sensor installation sheet (P/N 016-0171-529) to help with the moisture sensor alignment and as a guide when drilling the moisture sensor pilot holes.

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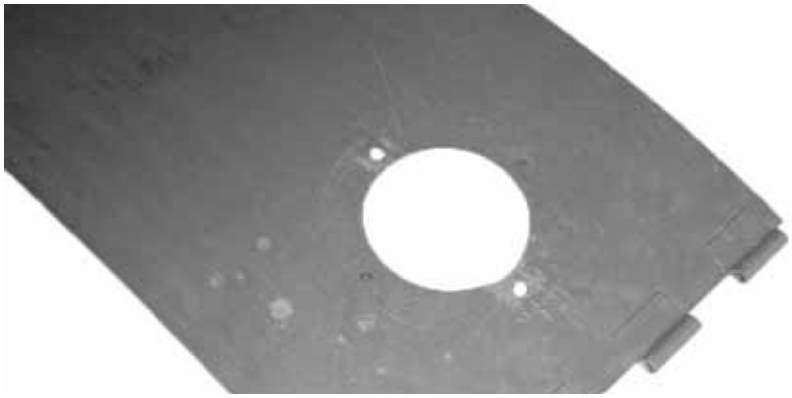
3. Remove the access panel from the clean grain elevator.
4. Use a 3-3/8 in [85.75 mm] hole saw bit to drill a hole in the access panel for the moisture sensor. It is highly recommended to double check clearances with the sensor on the clean grain elevator before drilling any holes. Measure carefully.

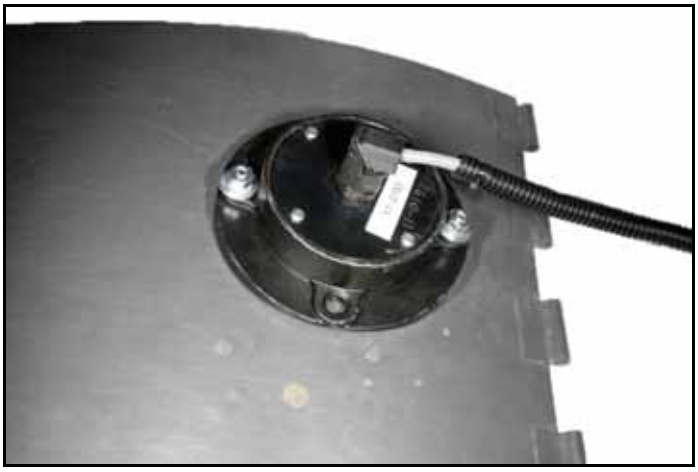
FIGURE 2. Example of Moisture Sensor Mounting Location and Hole Drilling



5. Set the moisture sensor in the hole and use the sensor housing to mark the position of the mounting bolts.
6. Drill two 5/16 in [8 mm] mounting holes in the access panel at the marked locations.
7. Set the moisture sensor in the hole in the access panel and use the provided carriage bolts, washers and lock nuts to secure the sensor in place.

Note: *The carriage bolts are long to accommodate various access door thicknesses. It is recommended to cut the bolts down to the necessary length after the install is complete.*

FIGURE 3. Example of Mounted Moisture Sensor



8. Replace the access panel on the clean grain elevator.

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Grain Tank Loading Auger Mounting

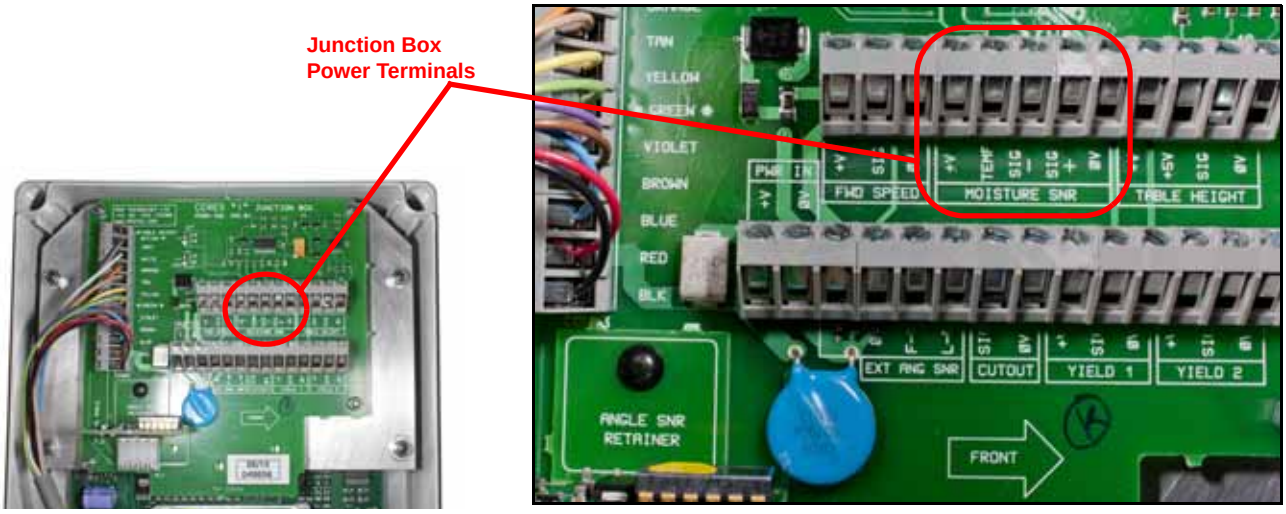
Note: *You will need to fabricate a custom bracket to mount the sensor to the loading auger as the standard mounting bolts may seize the loading auger.*

1. Select a location on the loading auger where the moisture sensor and mounting hardware will not interfere with the operation of the auger or other components in the grain tank.
2. Measure any critical dimensions to help ensure clearance for the moisture sensor.
3. Use a 3-3/8 in [85.75 mm] hole saw bit to drill a hole in the auger for the moisture sensor. Use caution not to damage the auger when drilling through the auger enclosure. It is highly recommended to double check clearances with the sensor on the auger before drilling any holes. Measure carefully.
4. Use strap iron or other available materials and any necessary hardware to fabricate a bracket to secure the sensor to the auger enclosure. Review the mounting requirements to assist with bracket fabrication. The bracket only needs to keep the moisture sensor from moving or vibrating during normal equipment operation.

Moisture Sensor Connection

1. Connect the moisture sensor extension cable and route the cable to the SmartYield™ junction box. Route the cable along existing wires or hydraulic hoses and avoid moving components on the harvester. Secure the extension cable as necessary with the provided cable ties.
2. Loosen the four screws and remove the cover from the junction box.
3. Locate the terminals labeled ‘MOISTURE SNR’ within the junction box.

FIGURE 4. SmartYield™ Junction Box Moisture SNR Terminals



4. Select one of the rubber seals at the bottom of the junction box. Using a wire cutter, clip the seal as close to the end as possible.

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5. Feed enough of the moisture sensor extension cable through the rubber seal to reach the moisture terminals.
6. Locate the grey and white wires within the junction box.
   a. If the grey and white wires are connected to the terminal bank labeled ‘CON 3,’ proceed to the *Moisture Sensor Terminal Connection* section on page 32 to complete the moisture sensor connections.
   b. If the grey and white wires are not connected to the board, refer to the *Spade Terminal Connection* section on page 33 to complete the moisture sensor connections.

Moisture Sensor Terminal Connection

1. Strip back the wire insulation on each of the lead wires enough to allow the leads to connect to the terminals as necessary.
2. Connect the black lead to the terminal labeled ‘0V.’
3. Connect the red lead to the terminal labeled ‘+V.’
4. Connect the clear lead to the terminal labeled ‘TEMP.’
5. Connect the green lead to the terminal labeled ‘SIG +.’

Note: *The remaining ‘SIG -’ terminal will not be used.*

6. Replace the cover and tighten the cover screws to secure the junction box.

Note: *Check that the cover gasket is in place when securing the junction box to help prevent water and dust from penetrating the enclosure.*

Spade Terminal Connection

1. Locate the spade crimp connectors provided with the moisture sensor mounting hardware.
2. Verify that the moisture sensor extension cable has been fed through the junction box seal.
3. Install the provided crimp connectors on the green and clear leads on the extension cable.
4. Connect the green wire from the moisture sensor to the grey wire in the junction box.
5. Connect the clear wire from the moisture sensor to the white wire in the junction box.
6. Connect the black lead from the moisture sensor extension cable to the terminal labeled ‘0V.’
7. Connect the red lead from the moisture sensor extension cable to the terminal labeled ‘+V.’

Note: *The remaining terminals (eg. ‘TEMP’, ‘SIG -’ and ‘SIG +’) will not be used.*

8. Replace the cover and tighten the cover screws to secure the junction box.

Note: *Check that the cover gasket is in place when securing the junction box to help prevent water and dust from penetrating the enclosure.*

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CHAPTER 6

Header Cutout Switch Installation

The SmartYield™ system monitors the header cutout switch to automatically start and stop totalizing yield information during the harvest operation when the header is raised or lowered. The header cutout switch is required for proper operation of the SmartYield system.

A mechanical header cutout switch is provided with the Raven SmartYield system. Depending upon the specific harvester make and model, there are a few additional cutout switch options which may provide additional features when used with the SmartYield system. For additional information on the available header cutout switch options, contact a local Raven dealer or the Raven technical support center.

Mechanical Cutout Switch

Installation Recommendations

The mechanical cutout switch provided with the SmartYield kit is a versatile switch option and may be installed on any harvest machine to monitor the header position. Keep the following items in mind when selecting a location to mount the mechanical cutout switch:

- The mechanical cutout switch assembly must be connected between a point on the harvester chassis or framework (e.g. walkway or chassis member) and a point on the feeder house.
- Select a mounting position that will protect the switch housing from being crushed when the feeder house is raised. The switch plunger and spring should not be over extended when the feeder house is lowered. If necessary, additional lengths of chain may be used to connect the switch to the feeder house.
- Field debris can build up around the feeder house mounting point which could cause damage to the mechanical switch. To help protect the switch, connect the chain end of the header cut out switch to the feeder house to protect the switch housing.
- To avoid binding the switch plunger, the chain must pull the switch mechanism straight toward the mounting point. A direct line of sight or straight line must exist between the feeder house and switch mounting points.
- The mechanical switch chain requires manual adjustment when changing between crops. Severe damage may occur to the switch mechanism if the chain is not adjusted properly.

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Installing the Mechanical Cutout Switch

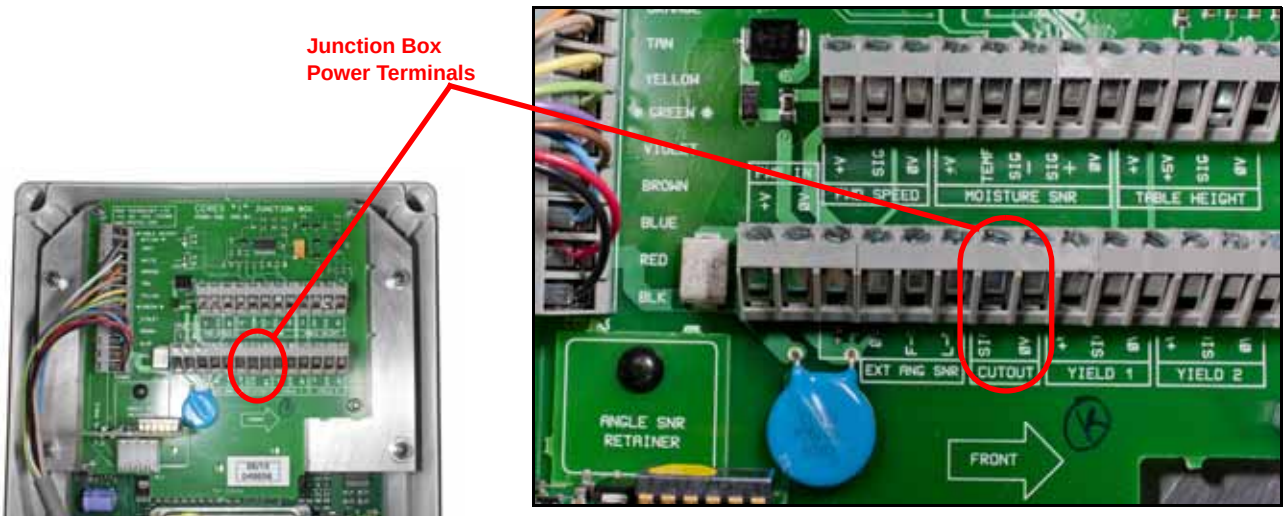
1. Using the above guidelines, select two points to mount or attach the mechanical header cutout switch. Select one point on the feeder house and a fixed point on the harvester chassis or frame.

   There must be a straight line of sight between the two selected points and the switch must be mounted so the force applied to the switch plunger pulls straight toward the mounting point.
2. If necessary, drill a hole for the switch mounting bracket.
3. Mount the switch bracket to the selected point.
4. Position the switch housing on the mounting bracket and stretch the chain to the feeder house mounting point. Adjust the switch housing so that the switch plunger is aligned with the chain between the two selected points.
5. Align the switch housing with two of the predrilled holes in the mounting bracket while keeping the chain and switch plunger aligned.
6. Use a rivet gun to secure the mechanical switch housing to the mounting bracket.
7. Lower the feeder house to the desired harvest height for a specific crop type.
8. Stretch the switch chain to the feeder house and attach the chain using a bolt and nut. The operator must be able to disconnect and adjust the chain based on the required header height for the crop type.

Connecting the Mechanical Cutout Switch

1. Connect one end of the header cutout switch cable to the mechanical switch terminals.
2. Route the switch cable to the junction box and use a wire cutter to remove the spade terminals from the cable.
3. Loosen the four screws and remove the cover from the junction box.
4. Locate the terminals labeled ‘CUTOUT’ within the junction box.

FIGURE 1. SmartYield™ Junction Box Yield 1 Terminals



5. Select one of the rubber seals at the bottom of the junction box. Using a wire cutter, clip the seal as close to the end as possible.
6. Feed enough of the cutout switch cable through the rubber seal to reach the cutout terminals.
7. Strip back the wire insulation on each of the lead wires enough to allow the leads to connect to the terminals as necessary.
8. Using a precision flat head screw driver, carefully loosen the cutout terminal posts.

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9. Connect the brown lead to the terminal labeled ‘SIG.’
10. Connect the blue lead to the terminal labeled ‘0V.’
11. Replace the cover and tighten the cover screws to secure the junction box.

Note: *Check that the cover gasket is in place when securing the junction box to help prevent water and dust from penetrating the enclosure.*

Factory Rotary Switch

Some harvester manufacturers utilize a rotary potentiometer to monitor the header position during harvest operations. The Raven SmartYield system is capable of monitoring this potentiometer to replace the header cutout switch. The factory rotary switch option allows the operator to make adjustments to the header cutout height on the Raven field computer or display console.

Note: *The SmartYield™ junction box will require software version 36 or newer to operate with the factory rotary switch option. Refer to the Header Cutout Switch section on page 50 to configure the SmartYield system for the rotary switch option.*

Connecting a Factory Rotary Switch Cable

Note: *To utilize this switch option, you will need to assemble an adapter cable for your specific harvester using the specific connector type already used by the manufacturer.*

1. Inspect the feeder house and locate the rotary potentiometer.

Note: *If the feeder house does not have a rotary potentiometer installed from the factory, the mechanical cutout switch or an aftermarket rotary potentiometer must be installed and connected to the SmartYield junction box. Refer to the Mechanical Cutout Switch section on page 35 or the Connecting an Aftermarket Rotary Switch section on page 39 for additional information.*

2. Use a volt meter or multimeter to locate the signal, power and ground leads on the potentiometer. Normally, the signal wire will be located in port B on weather pack connectors or port 2 on Deutsch style connectors and should have voltage around 2.5 VDC when the header is raised about half way between the minimum and maximum height.

DANGER

Operating the header functions with bystanders around the header or feeder house may cause serious injury or death. Use extreme caution when operating the header functions and alert anyone around the equipment before raising or lowering the header or feeder house.

To confirm the signal, power and ground lead wires, operate the header functions. When testing between power and ground leads, a volt meter should read a constant regardless of header position. Testing between signal and ground, a volt meter should read voltage between 0 and 5 VDC depending upon header height.

3. Using the same connectors as available on the combine feeder house, build a short “pass through” adapter cable. The adapter cable must pass signal straight through to the factory rotary sensor connectors. Use the same gauge wire as provided on the factory sensor for the pass through cable.

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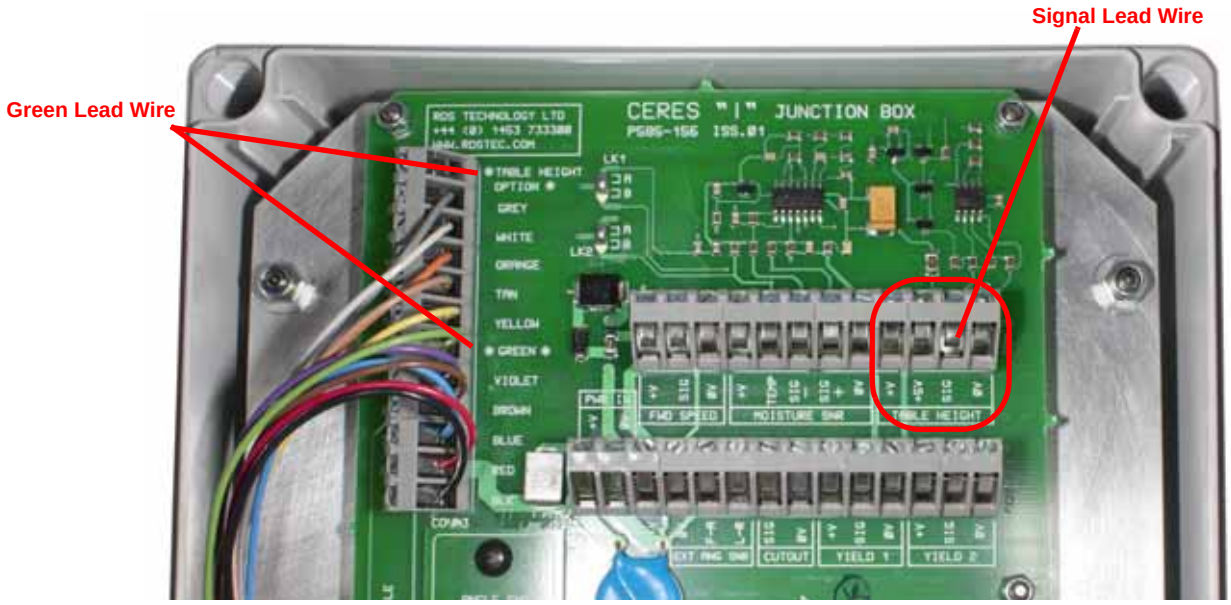
4. Create a branch on the signal wire and route the wire to the junction box.

Note: *If desired, the extension cable provided for the mechanical header switch may be used for the rotary sensor.*

5. Loosen the four screws and remove the cover from the junction box.
6. Locate the terminal labeled '*GREEN*' within the junction box and the green lead wire.

FIGURE 2. SmartYield™ Junction Box Yield 1 Terminals



7. Using a precision flat head screw driver, carefully disconnect the green lead wire and reconnect the wire to the terminal post labeled '*TABLE HEIGHT OPTION*.'
8. Locate the terminals labeled 'TABLE HEIGHT.'
9. Select one of the rubber seals at the bottom of the junction box. Using a wire cutter, clip the seal as close to the end as possible.
10. Feed enough of the rotary signal cable through the rubber seal to reach the signal terminal.
11. Strip back the wire insulation enough to allow the lead to connect to the terminal as necessary.
12. Using a precision flat head screw driver, carefully connect the rotary signal cable to the signal terminal post.
13. Replace the cover and tighten the cover screws to secure the junction box.

Note: *Check that the cover gasket is in place when securing the junction box to help prevent water and dust from penetrating the enclosure.*

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Connecting an Aftermarket Rotary Switch

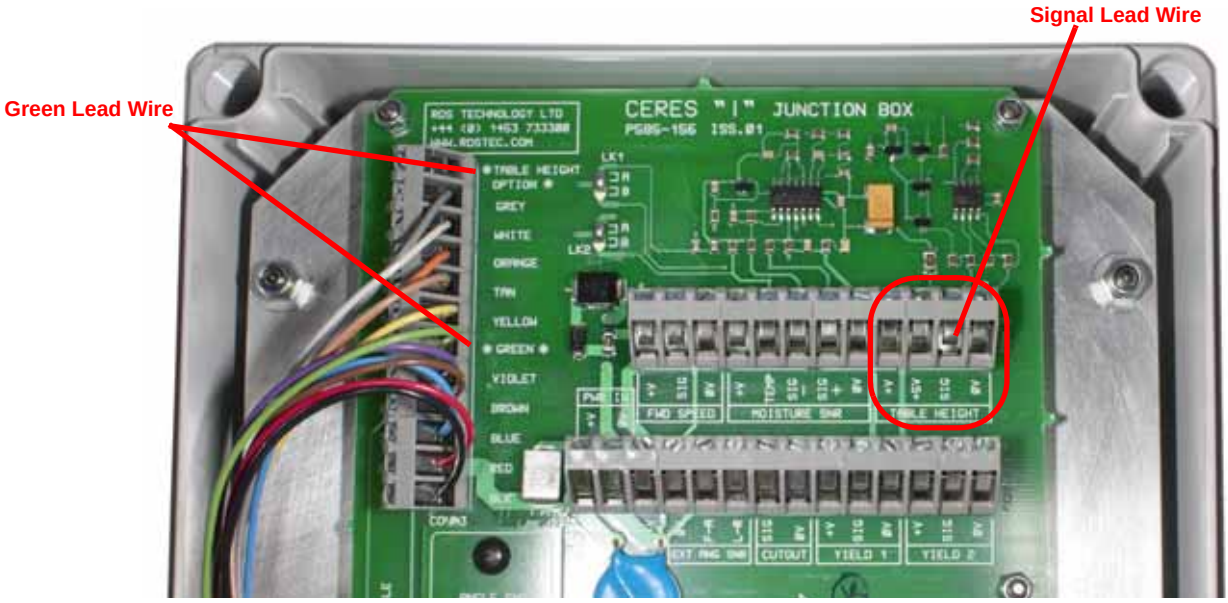
Note: *To utilize this switch option, you will need to install an aftermarket potentiometer onto the feeder house and connect it to the SmartYield junction box. Contact an equipment dealer for information on an aftermarket option. Please read the following procedure before starting the installation process.*

1. Inspect the feeder house and verify that a factory potentiometer is not available for the SmartYield cutout switch. If a factory potentiometer is available, refer to *Connecting a Factory Rotary Switch Cable* section on page 37 for instructions on connecting the factory potentiometer to the SmartYield system.
2. Contact a local equipment dealer for available aftermarket potentiometer options and refer to the installation instructions to mount the potentiometer to the harvester.

Note: *The potentiometer power, ground and signal leads should be routed to the SmartYield junction box. Continue with the following procedure to properly power and connect an aftermarket potentiometer to the SmartYield junction box.*

3. Loosen the four screws and remove the cover from the junction box.
4. Locate the terminal labeled '*GREEN*' within the junction box and the green lead wire.

FIGURE 3. SmartYield™ Junction Box Yield 1 Terminals



5. Using a precision flat head screw driver, carefully disconnect the green lead wire and reconnect the wire to the terminal post labeled '*TABLE HEIGHT OPTION*.'
6. Locate the terminals labeled 'TABLE HEIGHT.'
7. Select one of the rubber seals at the bottom of the junction box. Using a wire cutter, clip the seal as close to the end as possible.
8. Feed enough of the potentiometer power, ground and signal leads through the rubber seal to reach the table height terminals.
9. Strip back the wire insulation enough to allow the leads to connect to the terminals.

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10. Using a precision flat head screw driver, carefully connect the rotary potentiometer leads to the terminal as follows:
    a. Connect the power lead to the terminal labeled ‘+5V.’
    b. Connect the signal lead to the terminal labeled ‘SIG.’
    c. Connect the ground lead to the terminal labeled ‘0V.’
11. Replace the cover and tighten the cover screws to secure the junction box.

Note: *Check that the cover gasket is in place when securing the junction box to help prevent water and dust from penetrating the enclosure.*

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CHAPTER 7

Cruizer II™ Connection

Note: *Complete the installation procedures provided with the Cruizer II console prior to connecting the SmartYield system.*

1. Locate the round connector on the Cruizer II yield monitor cable (P/N 115-0171-950) and connect it to the round port on the SmartYield junction box.
2. Route the cable to the Cruizer II console and connect the 9-pin serial connector labeled ‘To Port A’ to port A on the back of the Cruizer II console.
3. Connect the 9-pin serial connector labeled ‘To Port B’ to port B on the back of the Cruizer II console.

Note: *If a cable is already connected to the back of a Cruizer II previously installed in the harvester, disconnect the cable from port B on the Cruizer II and reconnect it to the remaining 9-pin serial connector on the Cruizer II yield monitor cable.*

4. The remaining serial connector may be used to connect an optional light bar or steering system to the Cruizer II console with the SmartYield system. Contact a local Raven dealer for more information.

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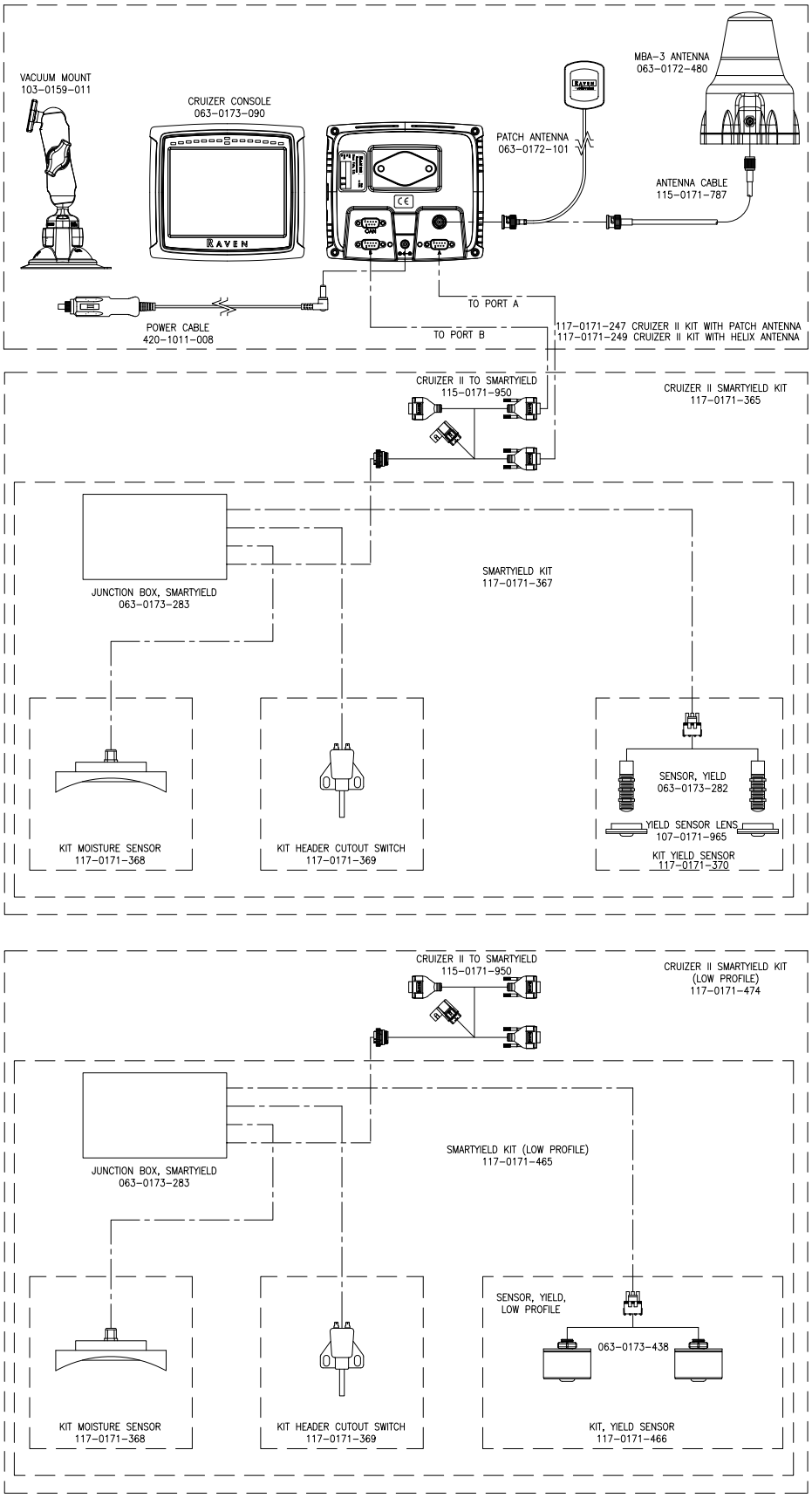
FIGURE 1. SmartYield™ with Cruizer II Cable Connection Diagram



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CHAPTER 8

Envizio Pro™ Series Connection

Note: *Complete the installation procedures provided with the Envizio Pro series field computer prior to connecting the SmartYield system.*

An optional adapter cable (P/N 115-0171-972) is available for using RTK level corrections with an Envizio Pro II field computer. Contact a local Raven dealer for more information.

1. Locate the round 9-pin connector on the Envizio Pro series yield monitor cable (P/N 115-0171-971) and connect it to the round port on the SmartYield junction box.
2. Route the cable to the Envizio Pro series field computer.
3. Connect the serial connector labeled ‘Yield Monitor Calibration’ to the COM2 connector on the field computer cable.
4. Connect the serial connector labeled ‘Yield Monitor Data’ to the COM3 connector on the field computer cable.
5. Connect the 2-pin Deutsch connector on the yield monitor cable to the connector labeled ‘Switched Power’ on the field computer cable.

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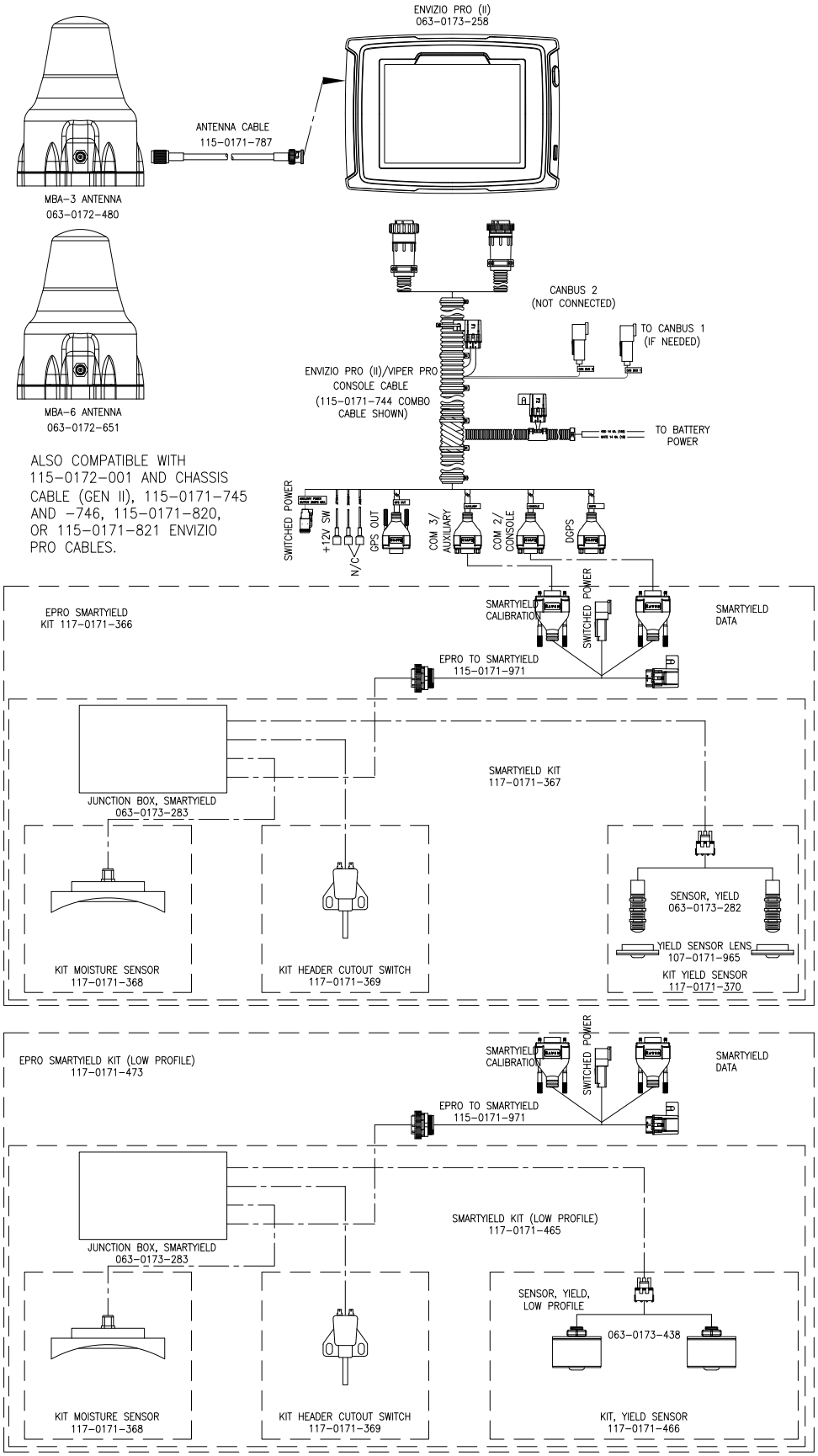
FIGURE 1. SmartYield™ with Envizio Pro Series Cable Connection Diagram (Combo Cable)



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CHAPTER 9

Initial Startup and Calibration

The following sections are provided to assist with the initial set up and calibration of the SmartYield™ system and Raven display. Be sure to perform the necessary steps in the following sections before beginning a harvest operation using the SmartYield system.

Raven Display Setup

The SmartYield system comes from the factory ready to interface with the Raven Cruizer II or Envizio Pro field computers. Refer to the following sections to setup the Raven display for operation with the SmartYield system.

Control Interface

When controlling the SmartYield system with the Envizio Pro field computers, the Control Interface setting must be set to 'Yield Monitor.'

To change the Control Interface from the Home screen:

1. Touch the Tools Menu icon.
2. Select the Control Interface icon from the System menu.
3. If necessary, use the scroll buttons next to the list of available control types to locate and select the 'Yield Monitor' option.
4. Touch the ✓ to accept the 'Yield Monitor' setting and return to the Tools Menu.

Note: *The 'Yield Monitor' option is only available on field computers with software version 3.0 or newer. Refer to the Updates section on page 5 or the Envizio Pro Installation and Operation Manual for more information.*

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Width

If the Raven display will be used to provide swath guidance during harvest operations, the ‘Width’ (Cruizer II) or ‘Guidance Width’ (Envizio Pro) calibration value must be set for the width of the header on the combine.

To change the guidance width setting from the Home screen:

1. Touch the Tools Menu icon.
2. Select the ‘Width’ or ‘Guidance Width’ icon from the Vehicle menu.
3. Use the on-screen keypad to enter the measured width of the header in the units displayed on the screen.

Offsets

The ‘Offsets’ settings are used to calibrate the Raven display to the relative location of the center of the header in the case of harvesting equipment and combines.

Note: *Refer to the specific Raven display manual for additional instructions on measuring the antenna offset values.*

To access the ‘Offset’ settings from the Home screen:

1. Touch the Tools Menu icon.
2. Select the ‘Offsets’ icon from the Vehicle menu.
3. Be sure the ‘Implement in Front’ option is selected to configure the offset for a front mounted header.
4. Touch the desired setting to modify and use the on-screen keypad to enter the new offset value in the units displayed on the Offsets Setup screen.

Sections

The Section Configuration settings must configured for the header used for harvesting operations.

To access the Section Configuration from the Home screen:

1. Touch the Tools Menu icon.
2. Select the Sections icon from the Vehicle menu to display the Combine Summary screen.
3. Review the Guidance Width and Header Width values on the first screen.
4. To configure header sections for the AccuHeader feature, touch the icon to view the Number of Sections screen and proceed with the following instructions to complete the header section setup.

Note: *The junction box will require software version 36 or newer to enable the AccuHeader feature. Refer to Appendix B, Updating the SmartYield™ Junction Box, for more information on updating the junction box.*

   If the AccuHeader feature will not be used, skip to the *NMEA Messages and Baud Rates* section on page 47 to proceed with the initial display setup.
5. If the header width displayed on the Combine Summary screen does not match the programmed guidance width, touch the Header Width button and use the on-screen keypad to enter the header width.

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6. Use the up or down arrows to adjust the number sections up to 16 individual header sections.

   The Raven display will divide the header width into equal sections based upon the number of sections programmed.

Note: *Keep in mind the accuracy of corrections used on the combine during harvesting operations and the row width (if applicable). The header should not be divided into sections smaller than one row or than the differential source can accurately provide GPS location.*

NMEA Messages and Baud Rates

When controlling the SmartYield system, the Display and NMEA baud rate settings must be properly set.

Envizio Pro Series

To set the baud rates from the Home screen:

1. Select the ‘SmartYield’ icon from the System menu.
2. Touch the ‘Baud Rates’ button.
3. Set the Display baud rate to 38400.
4. Set the NMEA baud rate to either 19200 or 38400.

   The NMEA baud rate setting on both the Raven display and SmartYield junction box must be set to the same value. By default, the junction box is set to 19200 for software versions 27b or older. For newer software versions, set the baud rate to 38400.

   Refer to the *Log Settings* section on page 86 to access the SmartYield junction box baud rate settings. For assistance verifying the software version installed on the junction box, refer to the *Diagnostics Settings* section on page 87 and review the Select Instrument item at the end of the section.

Cruizer II

To set the baud rates from the Home screen:

1. Select the ‘SmartYield’ icon along the top of the Home screen and select the Baud Rates button on the Yield Configuration screen.
2. Set the Display baud rate to 38400.
3. Set the NMEA baud rate to either 19200 or 38400.

   The NMEA baud rate setting on both the Raven display and SmartYield junction box must be set to the same value. By default, the junction box is set to 19200 for software versions 27b or older. For newer software versions, set the baud rate to 38400.

   Refer to the *Log Settings* section on page 86 to access the SmartYield junction box baud rate settings. For assistance verifying the software version installed on the junction box, refer to the *Diagnostics Settings* section on page 87 and review the Select Instrument item at the end of the section.

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SmartYield™ Initial System Configuration

To access the SmartYield interface screens on the Raven display:

1. Touch the Tools Menu icon on the Home screen.
2. Touch the 'Yield' icon in the System menu.

Note: *If the 'Yield' icon is not displayed in the System menu, review Chapter 7, Cruizer II™ Connection, or Chapter 8, Envizio Pro™ Series Connection, and check that the system is properly connected and the SmartYield junction box is properly powered. Review the NMEA Messages and Baud Rates section on page 47 and check the baud rate or control interface settings on the control console.*

The following items are required to complete the SmartYield initial calibration process:

1. Select the display language and units for the SmartYield system.
2. Select the combine type.
3. Speed sensor setup.
4. Header setup.
5. Yield sensor setup.
6. Yield delay and smoothing.
7. Moisture and temperature sensor setup.
8. Angle sensor setup.

Note: *Once the initial calibration is complete, follow the steps outlined in the Harvest Checklist section on page 67 to set up SmartYield system for a given crop.*

Language

The language displayed on the SmartYield interface screens should be selected to match the operation of the Raven control console or field computer.

From the SmartYield Main screen:

1. Touch the icon and select the icon.
2. Use the down arrow to select the 'Language' option and press .
3. Select the desired display language and press to lock in the selection.

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Units

Information for the SmartYield monitoring system may be displayed in the following units by selecting the desired option in the Setup Menu.

Note: *Refer to the field computer or console manual for information on setting the console display units.*

TABLE 1. Display Unit Options

Function	Units		
	US Imperial	**UK Imperial**	**Metric**
Yield	bushels/acre	tons/acre	tonnes/hectare
Output	bushels/hour	tons/hour	tonnes/hour
Work Rate	acres/hour	acres/hour	hectares/hour
Forward Speed	miles/hour	miles/hour	kilometers/hour
Part/Total Area	acres	acres	hectares
Part/Total Weight	x1000 bushels	tones	tonnes
Crop Density	pounds/bushel	pounds/bushel	kilograms/hectoliter
Distance	inches	inches	meters
Speed	miles/hour	miles/hour	kilometers/hour

From the SmartYield Main screen:

1. Touch the icon and select the icon.
2. Use the down arrow to select the ‘Units’ option and press .
3. Select the desired display units and press to lock in the selection.

Combine Type

If a specific combine type is available from the preset list, selecting the combine make and model will automatically configure the PC points, moisture gain and offset, and some of the crop factors.

From the SmartYield Main screen:

1. Touch the icon and select the icon.
2. Enter the PIN code (default PIN is 1234) to access the configuration screens.
3. Press on the ‘Combine Select’ option.
4. Use the left or right arrow icons to scroll through the list of available models.

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Default Combine Type

If a specific combine type is not available for the machine on which SmartYield will be used, select the 'Default Combine Type.' Generic PC points, angle sensor factors and crop calibration factors are set.

Note: *To accurately calibrate the default combine type, perform the 'AutoCal' process before the initial calibration process is completed. Refer to the Yield Sensor Setup section on page 54 for more information on the AutoCal process.*

If the 'Default Combine Type' is selected, the machine description may be modified.

Speed Sensor

Note: *The default baud rate for GPS speed is 19200.*

From the SmartYield Main screen:

1. Touch the icon and select the icon.
2. Use the down arrow to select the 'Speed Factor' option and press .
3. Use the left or right arrows to toggle the 'GPS Speed On/Off' to 'ON.'

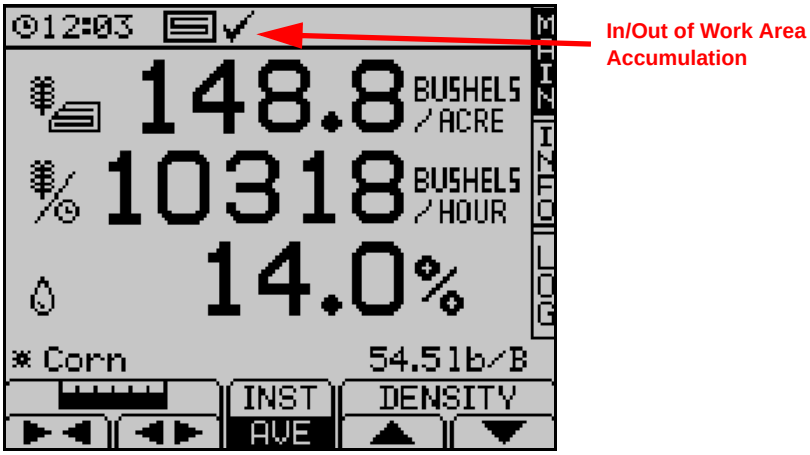
Note: *The GPS Speed must be set to 'ON' when connected to a Raven control console.*

Header Setup

The following sections offer a description of the header setup process. Be sure to complete this process as instructed to ensure the best possible results for monitoring harvest operations.

Header Cutout Switch

With the cutout switch connected to the SmartYield system, verify that the Main screen displays a check with the header in the cut position and an 'X' when raised.



The operator must select the type of cutout switch installed must be selected to ensure that the SmartYield system tallies yield area properly during harvesting operations.

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To set the cutout switch type from the SmartYield Main screen:

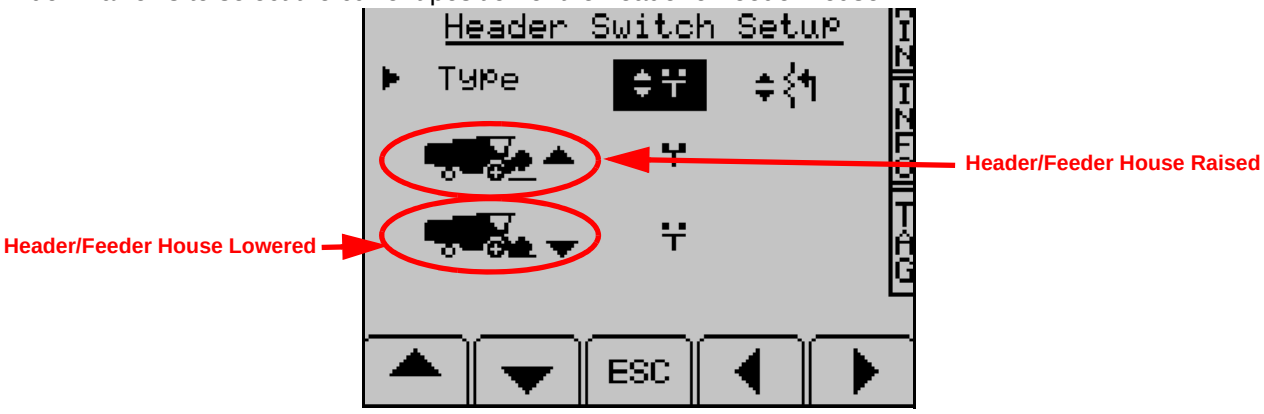
1. Touch the icon and select the icon.
2. Enter the PIN code (default PIN is 1234) to access the configuration screens.
3. Touch the button on the on-screen keypad to display more options and then touch on the 'Header Switch Set' option to display the Header Switch Setup screen.
4. With the header 'type' selected, use the left or right arrows to select the type of cutout switch used with the SmartYield system. Highlight the icon to select the mechanical pull switch or the to select a rotary potentiometer or factory rotary switch.
5. Refer to the *Setting the Mechanical Pull Switch* section on page 51 or the *Setting the Rotary Switch or Potentiometer* section on page 52 to configure the header switch area accumulation.

Setting the Mechanical Pull Switch. To configure the in/out of work area accumulation for a mechanical pull switch:

Important: *To avoid damage to the switch assembly or mechanism, be careful not to exceed the switch limits while configuring the switch polarity.*

1. While viewing the Header Switch Setup screen, raise or lower the header or feeder house and verify that the header cutout switch toggles the accumulation display at the top of the SmartYield interface screen.

2. If the accumulation display shows the incorrect status when the header is raised or lowered, use the up or down arrows to select the current position of the header or feeder house.



3. Touch the key to toggle the switch position. The accumulation status should toggle and display the correct status for the current header or feeder house position. Raise or lower the header or feeder house to verify that the display toggles as expected.

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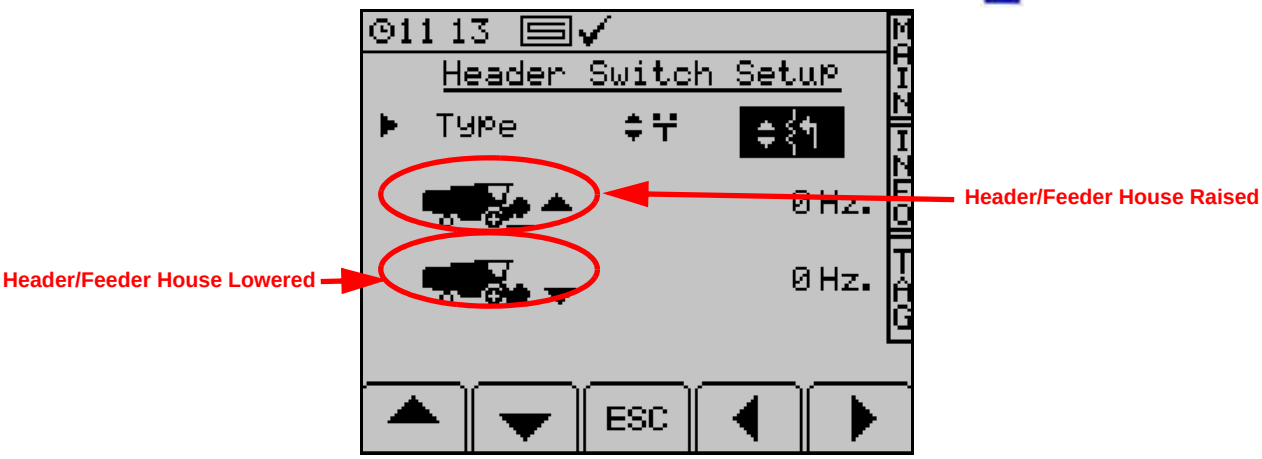
Setting the Rotary Switch or Potentiometer. To configure the in/out of work area accumulation for a rotary switch or potentiometer:

1. Raise the header or feeder house to the fully up position.
2. Touch the down arrow to move the cursor to the header up setting and touch the key.



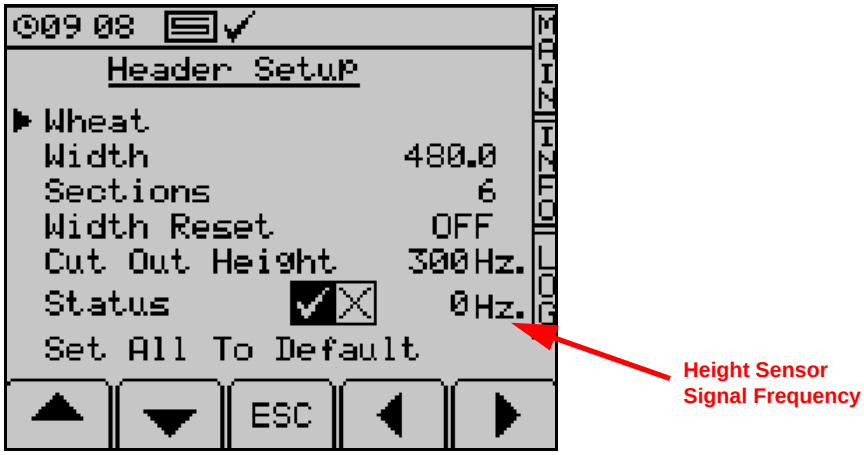
3. Lower the header or feeder house to the fully down position.
4. Touch the down arrow on the screen to move the cursor to the header down setting and touch the key.
5. Refer to the *Table or Header Height Sensor (Optional)* section on page 52 to set the “Cut Out Height” value for a specific crop type.

Note: *When the cut out height is set correctly, the accumulation display at the top of the screen should toggle between a check mark when the header is in an “in work” position and an ‘X’ when the header is in an “out of work” position.*

Table or Header Height Sensor (Optional). If a table or header height sensor is installed with the SmartYield system, the sensor may be used to toggle area and yield data accumulation when the header is lowered into a cut height. To calibrate the table or header height sensor from the SmartYield Main screen:

Note: *The SmartYield™ junction box will require software version 37 or newer to operate with the factory rotary switch option. Refer to the Header Cutout Switch section on page 50 to configure the SmartYield system for the rotary switch option.*

1. Touch the icon and select the icon.
2. Use the down arrow to select the ‘Header Setup’ option and press to display the Header Setup screen.



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3. The top line of the Header Setup screen displays the currently selected crop type. Use the left or right arrow keys to cycle through the preset or user defined crop types.

Note: *To properly calibrate the SmartYield system, verify that the specific crop type is selected for each crop before proceeding.*

4. Use the down arrow key to select the ‘Cut Out Height’ setting.
5. Position the header at the maximum desired cutting height. The ‘Status’ line displays the frequency signal received from the height sensor.
6. Use the on-screen keypad to enter the displayed frequency value from the ‘Status’ line as the ‘Cut Out Height’ value and touch to save the new setting. During a harvest operation, the SmartYield system will accumulate area information when the header is at or below the set ‘Cut Out Height’ frequency.

Note: *If the header height will be adjusted throughout the harvest operation, it may be necessary to set a ‘Cut Out Height’ just above the maximum cut height to ensure that the SmartYield system is accumulating area and yield data as the header is adjusted.*

7. Repeat as necessary for each crop type.

Header Width and Number of Sections

The SmartYield system allows to operator to set up crop specific headers for each of the preset crops. It is recommended to modify the crop specific header settings rather than the ‘Default’ header when possible.

Important: *Do not enter a header width or sections if the AccuHeader feature will be used to automatically adjust the header during harvesting operations.*

To setup crop specific headers from the SmartYield Main screen:

1. Touch the icon and select the icon.
2. Use the down arrow to select the ‘Header Setup’ option and press to display the Header Setup screen.

3. The top line of the Header Setup screen displays the currently selected crop type. Use the left or right arrow keys to cycle through the preset or user defined crop types.

Note: *To properly calibrate the SmartYield system, verify that the specific crop type is selected for each crop before proceeding.*

4. Use the down arrow to select the ‘Width’ option.

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5. Use the on-screen keypad to enter the actual harvesting width of the header or cutting surface unit in inches [meters] and press to set the entered value. This value may vary depending upon the operator but is typically 10 inches [0.25 m] less than the maximum width of the header.

   The default header width value is 236” [6.00 m].
6. Arrow down to the ‘Sections’ setting and use the on-screen keypad to enter the number of equal sections into which the header is divided. These sections will be selected by the operator on the Main screen when harvesting using less than the full header width.

   The default section value is 6. The operator may prefer to gauge the part width using the number of actual sections of the crop.
7. Arrow down to the ‘Width Reset’ option and use the left or right arrow to toggle the reset feature on or off.

   Turn the width reset option on to automatically reset the header to full width after the header is raised and then lowered. It is recommended to set this option to ‘On.’

Yield Sensor Setup

Note: *Before setting the yield sensor, be sure to select the combine type. Refer to the Combine Type section on page 49. The combine type setting will automatically populate the following yield sensor readings.*

There are six calibration points, or PC points, which enable the SmartYield system to accurately measure grain on the clean grain elevator. These points are derived from the measurement of grain throughput tests of a wide range of combine makes and models.

If a specific combine make and model is entered for the combine type selection, the yield sensor calibration points normally do not need to be adjusted.

Note: *The ‘PC Tare’ value is the zero point or no grain on the elevator determined during the throughput tests. This value should be checked as this value may vary slightly between machines. After adjusting the ‘PC Tare’ value, the remaining PC points will be adjusted by the difference between the existing and new tare values.*

Default values for the ‘Default Combine Type’ are:

PC Point	Value[a]
PC Tare	0.000
PC 1	5.790
PC 2	10.10
PC 3	17.29
PC 4	23.76
PC 5	30.12

a. The PC Point value is expressed as the percentage of time which the yield sensor beam is broken by grain on the clean grain elevator.

To calibrate the PC points or enable a second yield sensor from the SmartYield Main screen:

1. Touch the icon and select the icon.
2. Enter the PIN code (default PIN is 1234) to access the configuration screens.
3. Press on the ‘PC Line Points’ option to begin setup of the yield sensors. Refer to the following sections for information on selecting the number of sensors or calibrating the yield sensors.

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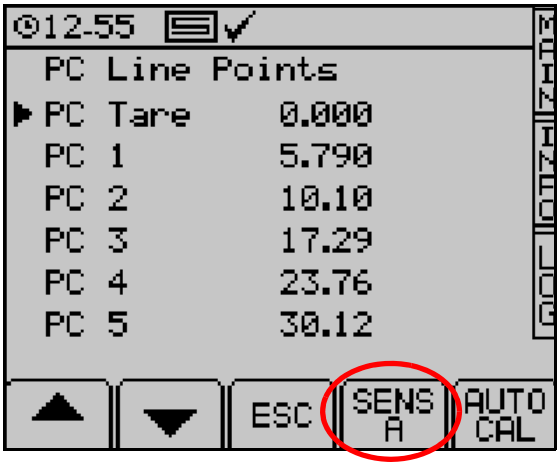
Number of Grain Sensors

If the combine is fitted with a second grain sensor, the calibration points, or PC points, may be adjusted for each sensor independently or for both sensors simultaneously.



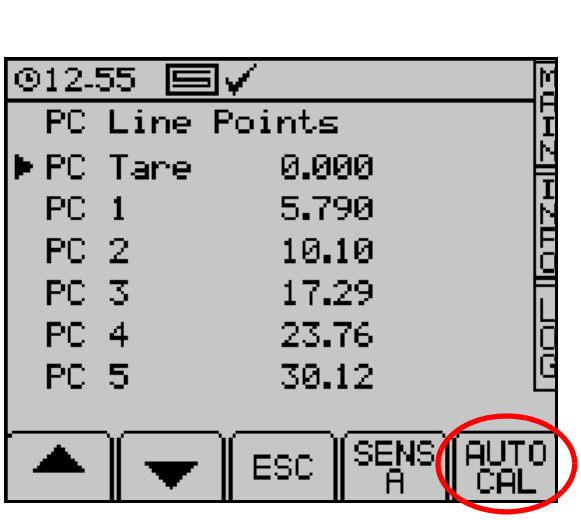
The default setting for a single sensor installation is for this tab to display ‘Sens A.’ Touch this tab to toggle the display to the PC line points for the second, or B, sensor. Select the option for ‘Both Sens’ to program PC points for both sensors together.

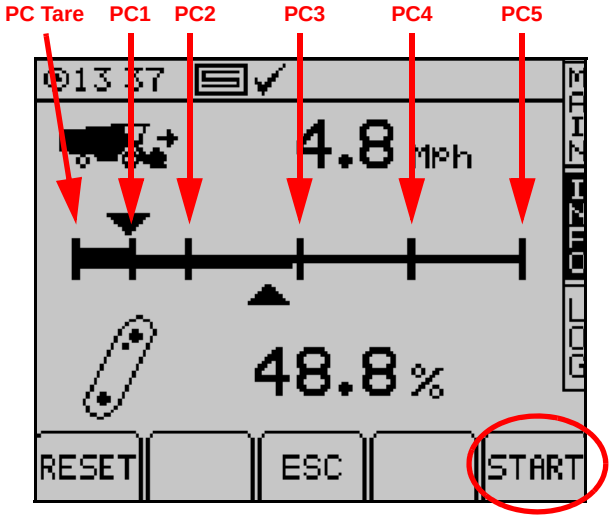
AutoCal

The AutoCal procedure should be performed only when the ‘Default Combine Type’ is selected. This process will calibrate the yield sensor(s) in a field under actual harvest conditions.

Before starting the AutoCal process, position the combine in an area of a field with a good, uniform crop conditions (wheat or barley will provide the best results).

1. With the combine on level ground and the clean grain elevator empty, run the machine at threshing RPM and set the tare. Refer to the *Set Tare* section on page 69 for detailed instructions on setting the tare.
2. Select the ‘AutoCal’ option on the PC Line Points screen.





The AutoCal screen displays the vehicle forward speed and the throughput of the clean grain elevator as a percentage of time the sensor beam is broken by grain on the elevator. The bar on the AutoCal screen displays these parameters relative to the calibration points (PCt and PC1 to PC5).

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3. With the combine at operating RPM, begin harvesting at the maximum forward vehicle speed and press the ‘START’ button to begin calibration. The speed (top) and throughput (bottom) indicators should go to the PC5 point.
4. Allow the indicators to stabilize on the display. When the indicators remain steady for 10 seconds, the SmartYield system will beep three times and the throughput value is saved for PC5.
5. Reduce the forward vehicle speed until the speed indicator is at the PC4 point. The throughput indicator will gradually move toward PC4. When both indicators remain steady for 10 seconds, SmartYield will again beep three times and the throughput value is saved for PC4.
6. Repeat step 5 for the remaining calibration points (PC3, PC2 and PC1).
7. When the PC1 point throughput value is saved, the AutoCal procedure is complete.

Note: *Press the ‘RESET’ tab displayed on the AutoCal screen to restart the AutoCal process from the beginning.*

Yield Delay

The yield sensors are measuring grain which was cut by the header and entered the combine several seconds earlier. To properly log the yield data at the correct location, a yield delay value must be programmed to match the work rate for the machine. This setting is critical for a correct display of the yield map on the Raven control console.

The default yield delay is 15 seconds. It is important to adjust this value to display accurate position information and yield maps on the Raven control console.

To determine the correct delay time:

1. During a harvesting operation, note the time interval between the header entering uncut crop area and when the throughput reading begins increasing.
2. At the end of the swath, note the time between the header leaving the uncut crop and when the throughput reading begins decreasing.
3. Calculate the average time interval.
4. Touch the icon and select the icon.
5. Use the down arrow to select ‘More’ and press .
6. Use the down arrow to select ‘Yield Delay’ and press .
7. Use the on-screen keypad to enter the average time interval as the yield delay and press to save the new value.

Smoothing

The smoothing feature may be used to reduce fluctuations in the yield displayed on the console. Set the smoothing value to the amount of time to average the yield display on the console between 1 and 10 seconds.

Default time for smoothing feature is four seconds.

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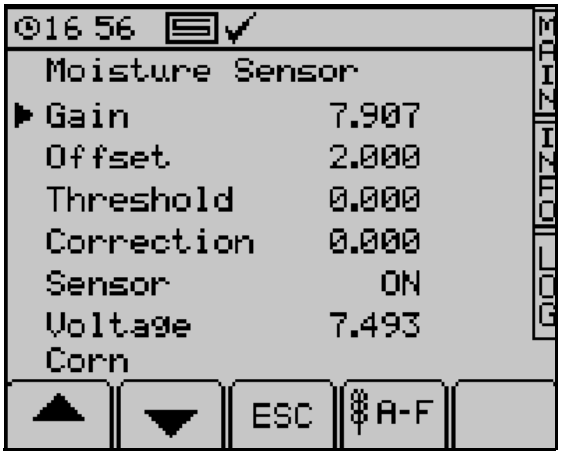
Moisture Sensor Setup (Optional)

The ‘Gain,’ ‘Offset,’ ‘Threshold’ and ‘Correction’ values configure the moisture sensor for specific crop types.

Note: *These settings are specific to each crop type. Be sure to select the desired crop type before modifying the moisture sensor settings. The currently selected crop type displays at the bottom of the Moisture Sensor screen.*

To access these settings from the SmartYield Main screen:

1. Touch the icon and select the icon.
2. Enter the PIN code (default 1234) and use the down arrow to select the ‘Moisture Sensor’ option.
3. Press to access the Moisture Sensor screen.



Gain and Offset

The default gain and offset values set for each crop type have been determined by a series of calibration tests and normally will not require modification.

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TABLE 2. Default Gain and Offset Values for Crop Types

Crop Reference	Earlier Revision Sensors		Revision "Y" Sensors	
	Gain	Offset	Gain	Offset
Wheat	3.6	2.4	6.0	2.4
Barley	1.9	9.3	3.167	9.3
Oats	2.975	3.0	4.968	3.0
Canola	1	9.5	1.667	9.5
Soybeans	3.37	0	3.417	0.6
Corn	4	0	6.667	0.0
Field Peas	5.8	-4.5	9.67	-4.5
Sunflowers	3.937	0	6.56	0
Milo	4.5	-3.2	7.5	-3.2
Flax	3.2	-1.2	5.33	-1.2

Note: *It is not possible to enter a negative offset value in the moisture sensor calibration screen. To enter a negative value, use the Crop Select page and enter a negative correction equal to the offset.*

Review the Moisture Sensor Revisions section on page 29 for assistance with identifying the sensor revision installed with the SmartYield system.

Threshold and Correction

The threshold and correction factors enable the SmartYield system to maintain accurate yield readings to be maintained in exceptionally wet crop conditions (typically 25% or more).

The 'Correction' factor will take effect when the moisture content rises above the 'Threshold' value.

The default value for the correction factor is 0.000 and is expressed as the percentage of time the yield sensor beam is broken by crop on the clean grain elevator per percent moisture content above the threshold value.

Sensor and Voltage

If no moisture sensor is fitted, the sensor setting should be set to 'Off.' The sensor voltage is displayed for diagnostic purposes and may be used to determine if the sensor is functioning properly.

Temperature Setup

The moisture sensor also senses temperature of the yield to maintain the correct moisture content measurement. The temperature at the moisture sensor location may be significantly greater than ambient temperature. Measure the temperature at the sensor location and enter it in degrees Celsius (C°).

To enter the temperature measurement from the SmartYield Main screen:

1. Touch the icon and select the icon.
2. Enter the PIN code (default 1234) and use the down arrow to select the 'Temperature Sensor' option.
3. Press to access the Temperature Sensor screen.
4. (For revision 'Y' sensors) Verify that the temperature displayed on this screen is the observed temperature ±5° Celsius. If the sensor displays this value, do not make any manual entry.

Note: *If the temperature display shows values of 2.5 Volts and -23° C, the sensor is not functioning properly and should be replaced.*

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5. (For previous revision sensors) Use the on-screen keypad to enter the current temperature at the moisture sensor in degrees Celsius (C°).

Note: *Use the formula Celsius (C°) = (Fahrenheit (F°) - 32) x 0.555 to convert a Fahrenheit measurement into Celsius.*

If the moisture sensor is replaced at any time with a 'Y' revision sensor, review Appendix C, Replacing the Moisture Sensor, before using the SmartYield system for harvesting operations.

Angle Sensor Setup

When harvesting on uneven or sloping terrain, the distribution of grain flowing past the yield sensor may be affected by the angle at which the vehicle is operating. An angle sensor may be used to correct for the angle of the machine during operation and adjust the detected yield for this angle.

The SmartYield system has four 'Slope' factors which may be used to compensate for the effects of terrain on the yield measurement.

- Left (LH) Slope
- Right (RH) Slope
- Forward (FW) Slope
- Backward (BW) Slope

Note: *The left and right slope factors are automatically set by the Combine Type selection and do not normally need to be altered.*

Set Zero

The angle sensor should be calibrated for level ground. To calibrate the sensor from the SmartYield Main screen:

1. Park the combine on known level ground.
2. Touch the icon and select the icon.
3. Enter the PIN code (default 1234) and use the down arrow to select the 'Angle Sensor' option.
4. Press to access the Angle Sensor screen.
5. Use the down arrow to select the 'V LH/RH' and 'V FW/BW' settings in turn and touch the 'Set Now' button.

Note: *The 'V LH/RH' and 'V FW/BW' values displayed on the angle sensor screen are for diagnostic purposes only and may be used to determine if the sensor is working properly. These values display the voltage output and corresponding angle reading for the angle sensor in the sensor range (± 66mV per degree of slope).*

Additional Calibration or Feature Settings

Calibration or set up of additional features or options may be necessary for optional equipment or for optional feature operation. Refer to Chapter 11, *SmartYield™ Calibration*, for more information.

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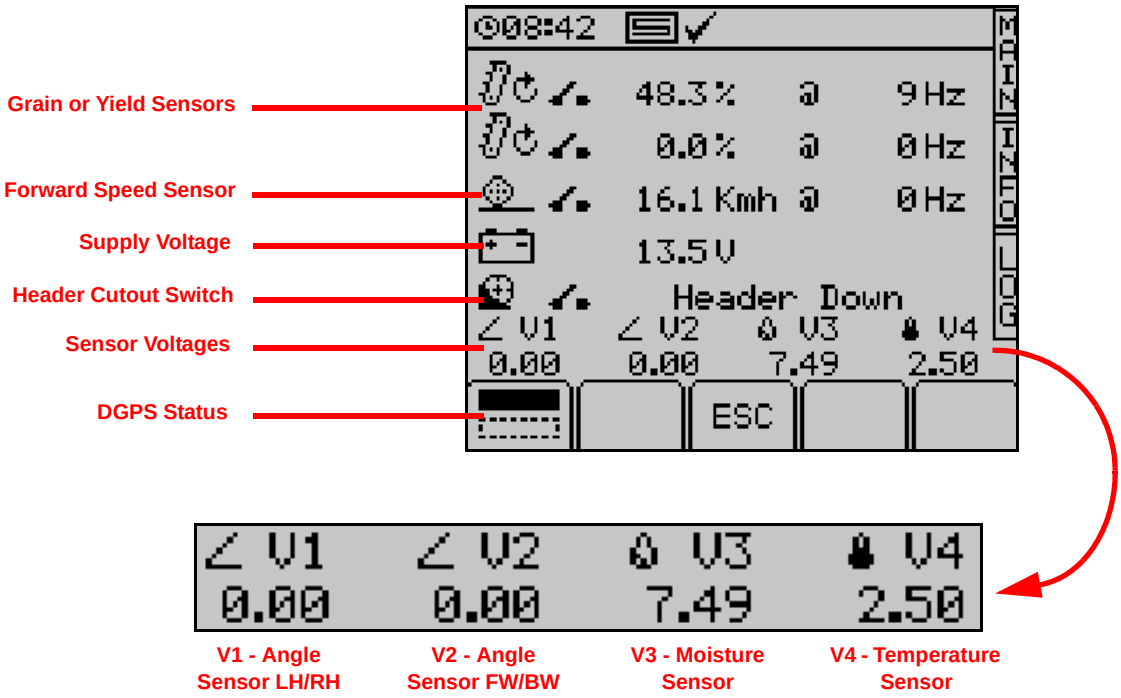
CHAPTER 10

SmartYield™ Operation

Pre-Harvest Checklist

Before starting to harvest crops using the SmartYield system, verify that the SmartYield sensors and switches are operating correctly. Each of these may be checked via the diagnostics screen. To check the sensors and switches from the SmartYield Main screen:

1. Touch the icon and select the icon.
2. Touch the 'Diag' icon in the lower, right corner of the screen to display the diagnostics screen.



3. Check the **Forward Speed Sensor** by driving the machine forward. The forward speed displayed on the diagnostics screen should correspond to the actual vehicle forward speed.

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4. Check the **Header Cutout Switch** or **Table Height Sensor** by raising the header to the full up position. The SmartYield display should display ‘Header Up’ on the diagnostics screen. Lower the header fully down. The diagnostics screen should toggle to ‘Header Down’ automatically.
   - If a header cutout switch is installed, lift the header to a suitable trip height and adjust the header cutout switch to toggle at this position. The switch should toggle just above the actual cut height for the specific crop being harvested.
   - If a table height sensor is installed, select the appropriate crop setting and lift the header to the desired cut height. Program the sensor as described in *Table or Header Height Sensor (Optional)* section on page 52.
5. Check the **Grain** or **Yield Sensor(s)** by operating the combine at normal harvesting RPM with the clean grain elevator empty. The diagnostics screen should indicate a frequency for each sensor currently connected to the system. This value indicates the number of elevator paddles passing the sensor each second and a corresponding percentage of time which the sensor beam is broken by the paddles.

   Operation of the grain or yield sensor may be verified by observing the LEDs on each sensor body. The green LED on the transmitter element should be on continuously and the red LED should be flashing.
6. Check the **Angle Sensor** with the combine on a known level surface. The ‘V1’ and ‘V2’ display values. A voltage reading in both displays indicates that the angle sensor is functioning in both axes.
7. Check the **Moisture Sensor** by observing the ‘V3’ display value. A voltage reading indicates that the sensor is functioning.
8. Check the **Temperature Sensor** by observing the ‘V4’ display value. A voltage reading indicates that the sensor is functioning.

Beginning a Job

Once the pre-harvest checklist is complete, and the combine is located in the field where harvesting operations will be monitored, the Raven control console is ready to begin datalogging and mapping yield information. To start mapping yield data on the Raven console, a job must be started. A job also allows the operator to utilize the guidance features of the console and create harvest reports for review or printing on a home or office PC.

Refer to the Raven control console operation manual or operator’s guide for detailed job set up instructions. The following sections cover specific SmartYield job set up and use features.

Note: *It is highly recommended to verify that the SmartYield system is set up properly on the SmartYield settings screens prior to beginning a job.*

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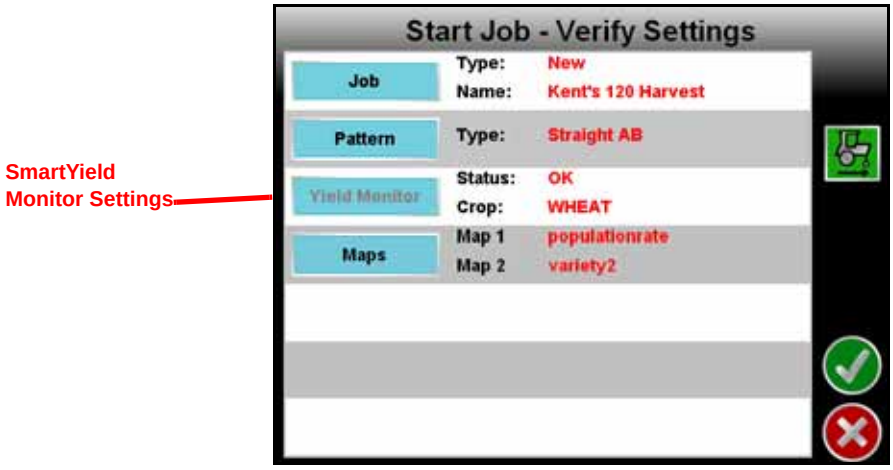
Envizio Pro Series

The Start Job - Verify Settings screen on the Envizio Pro with the SmartYield screen displays the current crop type selected and the communication status with the SmartYield system.



To begin a new job:

1. Touch the ‘Job’ button and select a new or existing job file for the harvest operation. Refer to the *Envizio Pro Installation and Operation Manual* for more information on setting up jobs and job names.

Note: *Renaming new job files is highly recommended if a specific job will be referenced at a later date. The operator should enter field location, product or any other information which may help identify specific job files. Names of job files entered on the field computer cannot begin with a space.*

2. Touch the ‘Pattern’ button to select the desired guidance pattern for the harvest operation. Refer to the *Envizio Pro Installation and Operation Manual* for more information on available guidance patterns.
3. The ‘Yield Monitor’ area displays the status of communication with the SmartYield junction box and the currently set crop type. Verify that the communication status displays ‘OK’ and the correct crop type.
4. Touch the Maps button to select up to two maps (e.g. population or variety) to load into the SmartYield job.

   The maps must be stored on the field computer in a shapefile format. When loaded into the job, the maps may be used by the vehicle operator to compare the yield information to the crop input maps.
5. Verify that the displayed settings or maps are correct before touching the ✓ to begin the job.

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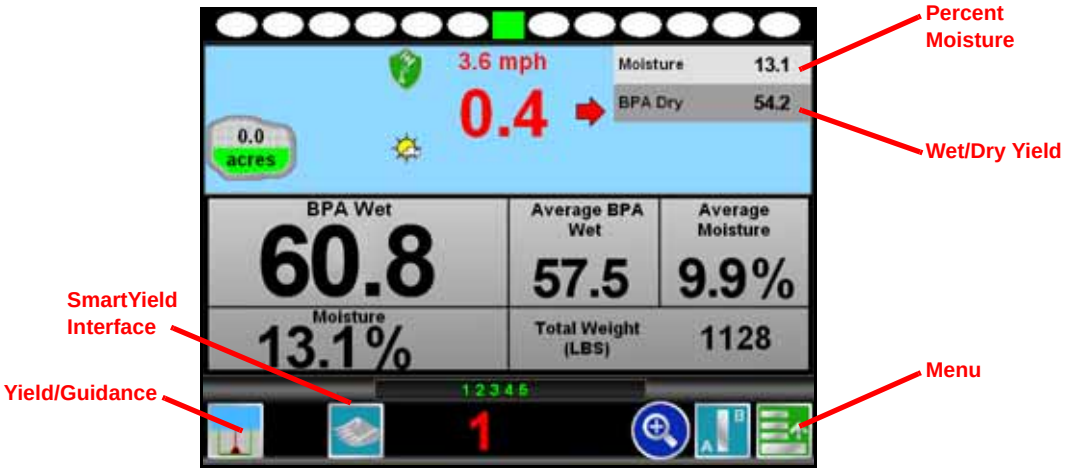
Envizio Pro Guidance Display

The yield information displayed in the upper, right corner of the Guidance screen and in the detailed yield data display prompt is displayed as grain travels past the SmartYield yield sensors on the clean grain elevator.



Note: *Yield information is only available after grain is measured by the yield and moisture sensors. Refer to the Yield Delay section on page 56 to properly set the yield delay for the combine on which the SmartYield system is installed.*

- The percent moisture value is the measured moisture level in the harvested grain.
- Touch the wet or dry yield display to toggle the display between measured wet yield or a calculated dry yield.

  Refer to the *Storage Moisture Content* section on page 71 and enter a storage moisture content value to allow the SmartYield system to calculate the dry yield during the harvest operation.
- Touch the SmartYield icon at the bottom of the Guidance screen to quickly access SmartYield settings during a job.

Note: *A legend of the yield rates is available by accessing the 'Field Review Mode' through the Menu icon in the lower, right corner of the Guidance screen. Refer to the Envizio Pro Installation and Operation Manual for more information about using the guidance displays.*

- Touch the icon in the lower, left corner of the screen to toggle the display between detailed yield data and the standard field guidance screen. Review the field computer operation manual for more information on using the guidance features.
- If a population or variety map is loaded into the job, the map will be displayed on the guidance and field review screen below the harvest coverage map.

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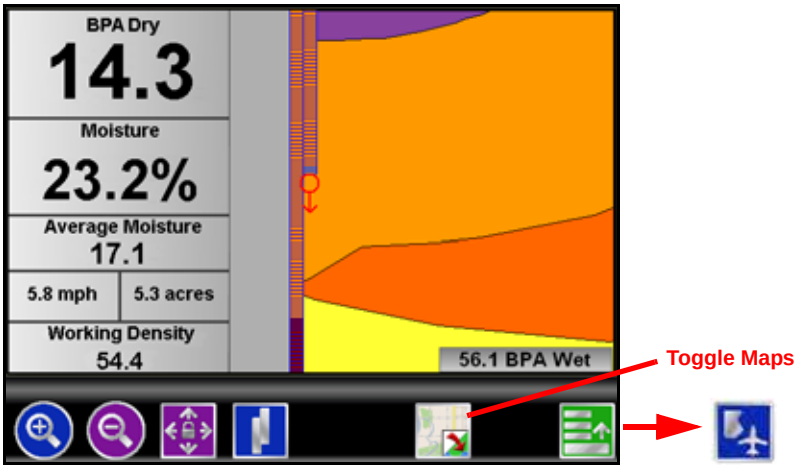
Field Review

While operating with the SmartYield system, the Field Review screen may be used to compare the harvest coverage map with any loaded crop input maps.

Note: *Review the Beginning a Job section on page 62 for more information about loading maps for SmartYield harvest operations.*

As the coverage map is completed during the harvest operation, the loaded maps will be covered. The input map information will not be accessible once the coverage map is completed.

To access the Field Review screen, touch the Menu icon in the lower, right corner of the Guidance screen and select the Field Review icon.



If a second map was selected during the start job procedure, the Toggle Maps icon will be available at the bottom of the Field Review screen. Touch the icon to toggle the active map and access the information available in the next input map.

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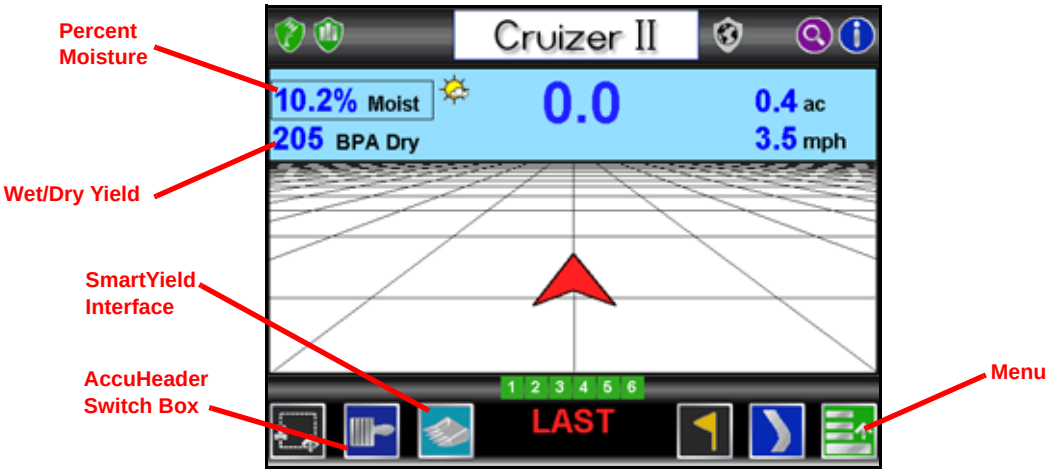
Cruizer II

Refer to the Cruzier II Operation Guide for instructions on starting a job on the Cruizer II console.

Note: *It is highly recommended to check the crop type and header width settings on the SmartYield settings screens prior to beginning a job.*

Cruizer II Guidance Display

The yield information in the upper, left corner of the Guidance screen is displayed as grain travels past the SmartYield sensors on the clean grain elevator.



Note: *Yield information is only available after grain is measured by the yield and moisture sensors. Refer to the Yield Delay section on page 56 to properly set the yield delay for the combine on which the SmartYield system is installed.*

- The percent moisture value is the measured moisture level in the harvested grain.
- Touch the wet or dry yield display to toggle the display between measured wet yield or a calculated dry yield.

  Refer to the *Storage Moisture Content* section on page 71 and enter a storage moisture content value to allow the SmartYield system to calculate the dry yield during the harvest operation.

Note: *A legend of the yield rates is available by accessing the 'Field Review Mode' through the Menu icon in the lower, right corner of the Guidance screen. Refer to the Cruizer II Operation Guide for more information about using the guidance displays.*

- Touch the SmartYield icon along the bottom of the screen to display the SmartYield interface screens.

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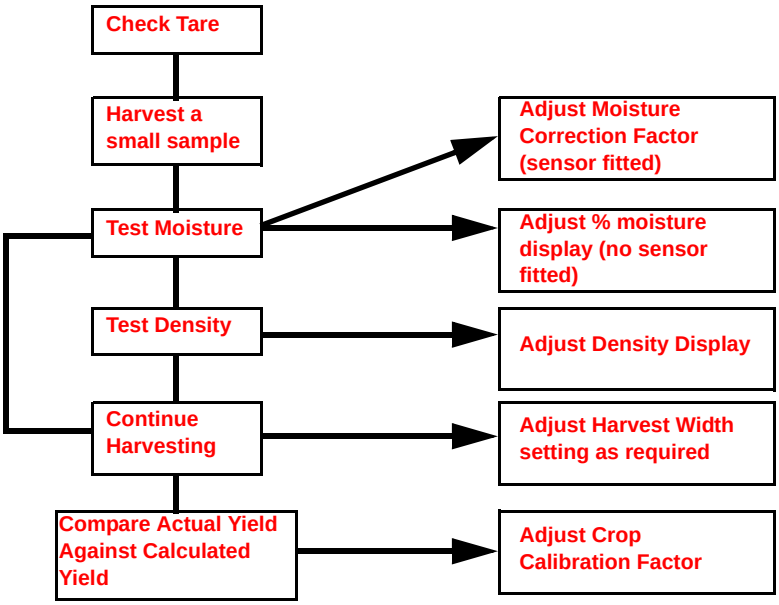
Harvest Checklist

Due to natural variations in crop conditions, it is highly recommended to check moisture content and crop density at regular intervals during daily operations. If a moisture sensor will be used to monitor yield of oily or green crops, check for unusual moisture readings which may indicate that the moisture sensor requires cleaning.

Use the following flow chart as a reference daily system checks and testing.

FIGURE 1. Harvest Checklist



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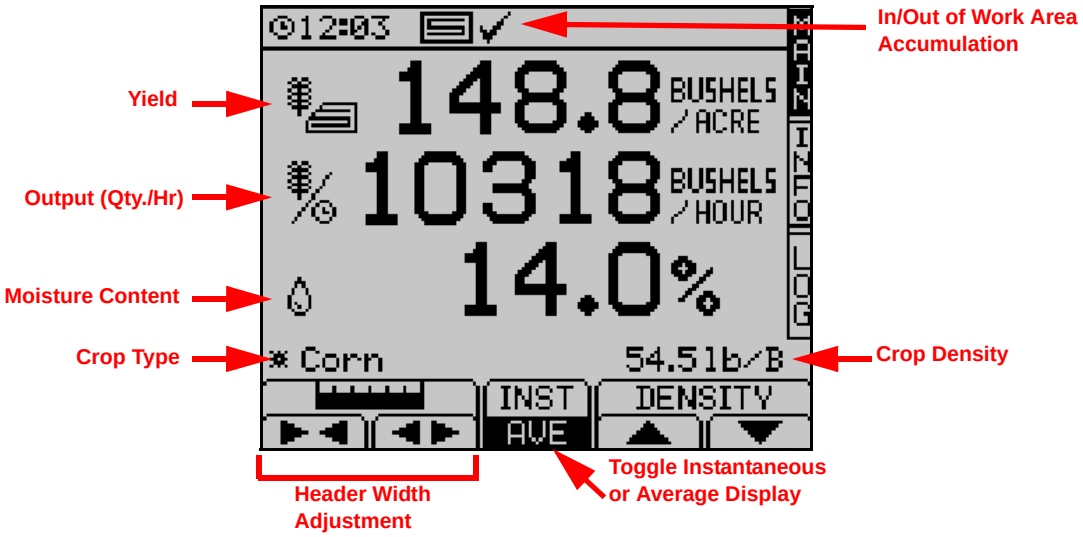
Screen Displays

While using the SmartYield system, the Main and Info screens display the measured crop yield and harvest operation information.

Main Screen Display

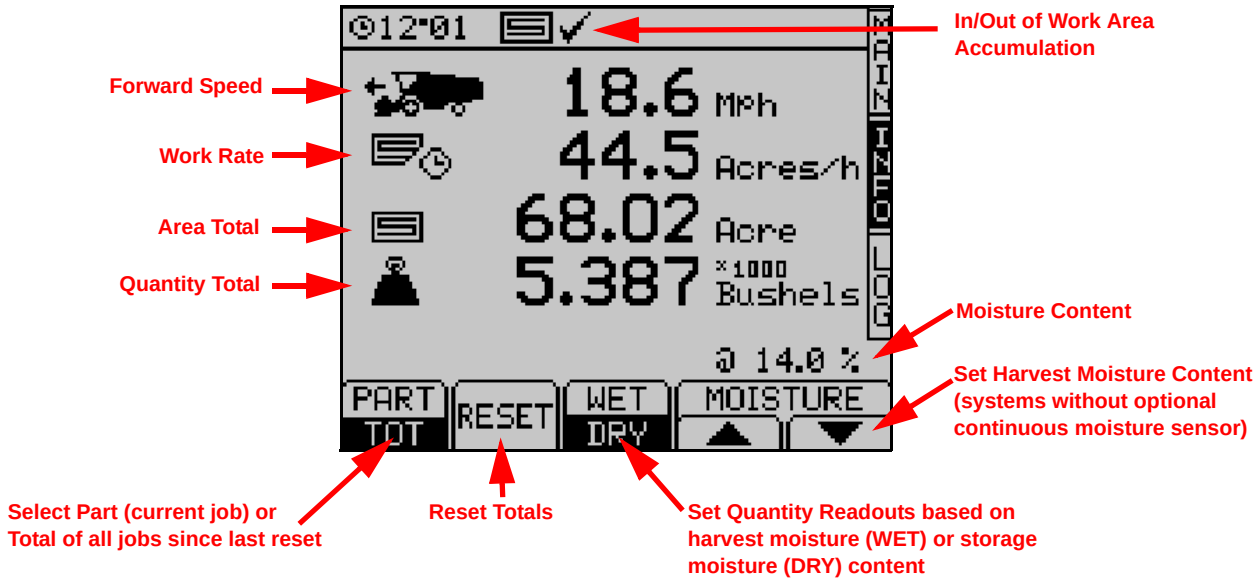
The SmartYield system will default to the Main screen on startup and is the screen primarily used during harvest operation. The Main screen displays the following harvest information:



Note: *The header width adjustment feature on this main screen is not used with the SmartYield system with the AccuHeader feature enabled. Review the Harvest Width Setting and AccuHeader section on page 74 for more information regarding the AccuHeader feature.*

Info Screen Display

Additional work measurement functions are accessible by touching the Info display.



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Set Tare

The tare should be checked at least once per day during harvest operations. When harvesting oily or dirty crops, the tare should be checked more frequently to avoid errors. Significant yield errors may occur as a result of build up of crop residues or a worn/badly adjusted elevator chain.

To set the tare:

1. Position the combine on level ground.
2. Run the machine at normal threshing RPM with the clean grain elevator empty.
3. Touch the icon, touch ‘Crop Calibration’ tab and select the ‘Set Tare’ option.

The tare value is displayed as a percentage of time that the sensor beam is broken by elevator paddles or any material on the grain elevator.

4. If the ‘Current Tare’ value is significantly different from the ‘Current % MS’ value, press the ‘SET NOW’ key to perform tare. The console will recalibrate the tare value for the observed clean grain elevator conditions. The ‘Current Tare’ and ‘Current % MS’ values should be nearly equal.

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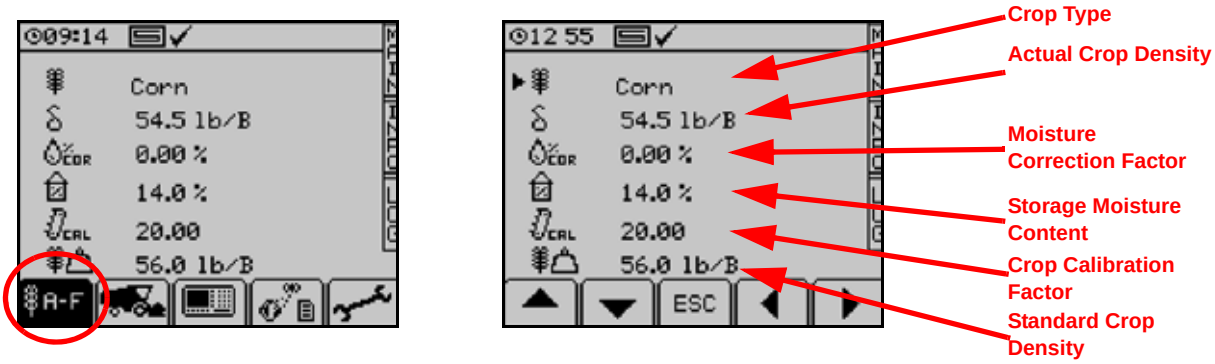
Crop Settings

Touch the icon and select the ‘Crop Settings’ tab to set crop information for a harvest operation.



Pre-programmed Crop Types

The SmartYield system has pre-programmed settings for the following crops:

• Corn	• Canola
• Wheat	• Linseed
• Barley	• Soybeans
• Oats	• Peas

Two user defined crop types, ‘Crop Name 1’ and ‘Crop Name 2’ are also available for custom crop types.

Note: *The pre-programmed settings may require some adjustment for specific crops and crop conditions. The crop setting cannot be altered during a job. To make adjustments during a job, close the job, make the necessary adjustments and resume the job file previously in progress.*

Refer to the *Standard Crop Density*, *Moisture Correction Factor* and *Storage Moisture Content* sections for more information about adjusting these settings within the crop type.

Note: *The user defined crop types, ‘Crop Name 1’ and ‘Crop Name 2,’ presets may be set up for additional crop types not covered by the pre-set types above. Names of the user defined crop types cannot be changed.*

Standard Crop Density

The crop density value displayed on the Crop Settings screen is the pre-set standard density for the crop.

Note: *The standard crop density displayed on the Crop Settings screen should not be modified or adjusted.*

Actual Crop Density

The crop density displayed on the Main screen is the actual density. The actual crop density should be checked and adjusted regularly during harvest operations.

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Moisture Correction Factor

The moisture correction factor is only required if a moisture sensor is installed. Enter a correction factor if the SmartYield moisture reading is different from that of a reference moisture meter. The moisture correction factor must be calculated for each crop by subtracting the SmartYield moisture reading from the reference meter reading. Enter the difference as the correction factor.

For Example:

SmartYield reading = 20%
Reference Meter reading = 18.5%

Thus, the moisture correction factor = (18.5-20) = -1.5%

Note: *If a large offset is required, check that the moisture sensor is clean before adjusting the moisture correction factor. If the sensor is clean, the sensor may need to be re-calibrated.*

Position the cursor in front of the moisture correction factor value and use the on-screen keypad to enter the new moisture correction factor. Touch the key to save the new moisture correction factor to memory.

Note: *If the system does not have an automatic moisture sensor installed (or the sensor is disabled in the calibration menu), the default harvest moisture content is programmed to 16% for all crops.*

Storage Moisture Content

The storage moisture content value is used to calculate the corresponding dry yield. A default value is entered for the storage moisture content value for each crop type.

Note: *If the harvest moisture content falls below the programmed storage moisture content, the harvest weight will remain at the dry weight value.*

To adjust the storage moisture content value, use the up or down buttons in the lower, left corner of the SmartYield display until the screen cursor is in front of the storage moisture content value. Use the on-screen keypad to enter the new storage moisture content value and press the key to set the value.

Crop Calibration Factor

The crop calibration factor adjusts the SmartYield system for the actual yield from a given crop. The default value is set using test information (if available) for the specific make and model of combine. Due to natural variations within a particular crop, crop varieties and operating characteristics of each individual combine, the crop calibration factor should be adjusted for each specific harvest operation.

Note: *Inaccurate tare, crop density or moisture content settings will affect the accuracy of the SmartYield system and are more likely to be the cause for any discrepancies with yield data. Check these values before considering an adjustment to the crop calibration factor.*

If the above factors are correctly set, refer to the Adjusting the Crop Calibration Factor section on page 83 to adjust the crop calibration factor.

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Crop Density

The actual crop density is adjustable from the Main screen display. The control console displays the crop density in pounds per bushel (lbs./B) or kilograms per hectolitre (kg/hl).

During operation of the SmartYield system, check the crop density regularly and adjust the value displayed on the Main screen as necessary. An incorrect density value will cause inaccurate yield data from the SmartYield monitoring system. A grain weight scale is provided with the SmartYield system.

Note: *Full instructions for use, including a unit conversion chart, are provided on the side of the measuring container.*

To adjust the actual crop density, touch and hold the up or down arrow keys next to the displayed density value to adjust the crop density setting.

Note: *Adjusting the actual crop density value does not correct or adjust previously accumulated data.*

Standard Crop Density - Bushel Weight

The standard crop density or bushel weight for each crop is pre-configured and displayed on the ‘Crop Select’ screen. The standard crop density should not be adjusted.

Moisture Content Display

To accurately monitor yield, the SmartYield system must be calibrated for the moisture content of the crop being harvested. The system may be calibrated manually by the operator or with a moisture sensor for automatic and continuous adjustment throughout the harvesting operation.

Note: *When using a moisture sensor with the SmartYield system, the harvest or wet moisture should be checked periodically against a reference moisture meter. The moisture sensor may report false readings if extraneous materials begin collecting on the sensor. Check and clean the sensor periodically to avoid inaccuracies in the yield statistics.*

The operator displays the monitored harvest (wet) yield as either an instantaneous live display or an average since the last reset. The operator may also toggle the yield information to a calculated storage (dry) yield which is calculated from the average harvest moisture content since the last job was started.

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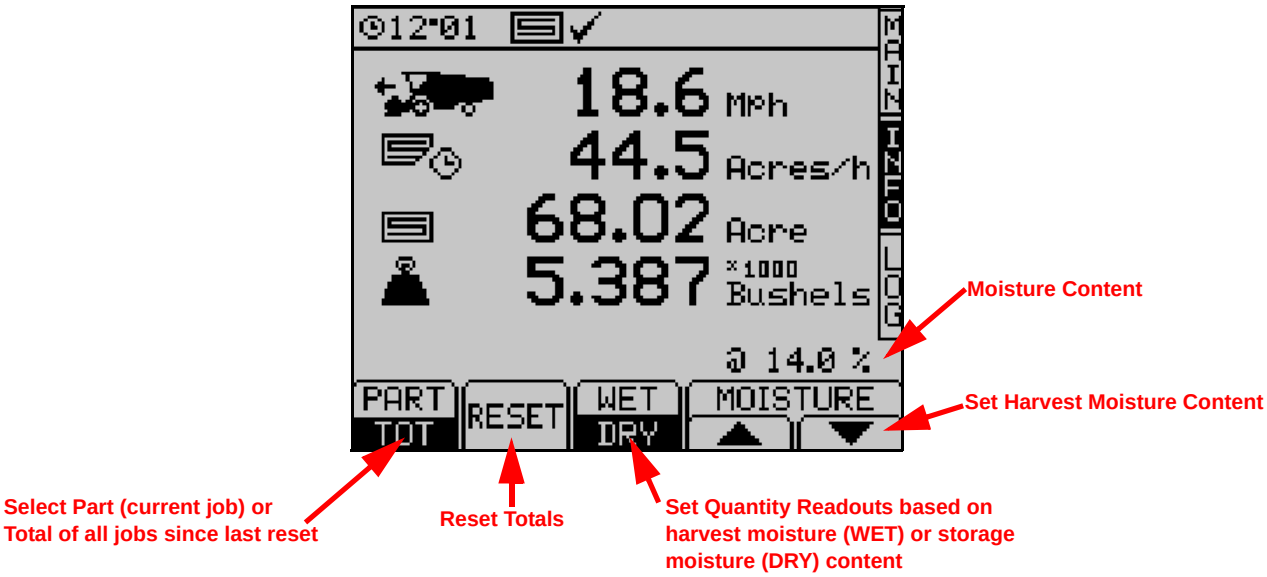
Setting the Harvest (Wet) Moisture Content

If a moisture sensor has been installed on the combine, the harvest moisture value is calibrated via the ‘Moisture Correction Factor’ displayed on the ‘Crop Select’ screen. Refer to the *Moisture Correction Factor* section on page 71 for more information.

If a moisture sensor has not been installed, the harvest moisture content must be manually adjusted on the Info screen. Touch the Info tab along the right side of the SmartYield display and use the up or down arrows adjacent to



Setting the Harvest (Wet) or Storage (Dry) Weight Readout

The harvest, or wet, yield and weight totals are calculated using the moisture content entered by the operator or measured with the continuous moisture sensor.

The SmartYield system calculates the storage, or dry, yield and weight totals using the moisture content values set during the harvest operation. Touch the ‘WET/DRY’ icon on the Info screen do toggle between the harvest wet yield and weight tally to the dry storage yield and weight tally.

Holding the Moisture Content Reading

If the automatic moisture sensor is producing erratic readings, touch the button to freeze the moisture content display on the current value. Touch the icon again to resume a live moisture content display.

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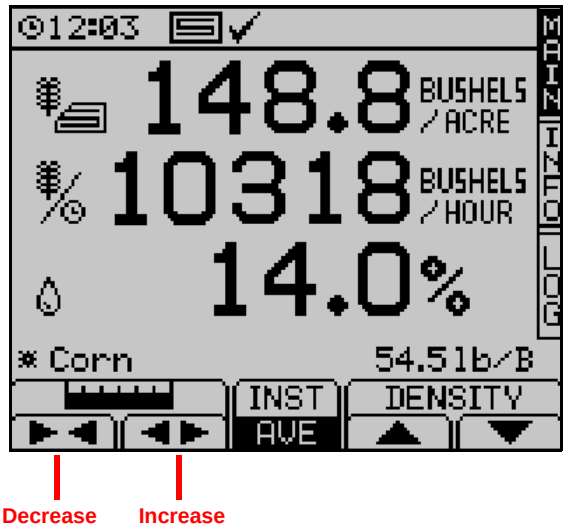
Harvest Width Setting and AccuHeader

Normally, the SmartYield system is tracking area harvested according to the full header width when the system is accumulating harvest information. If the full header width is not in an uncut area, the operator must adjust the system to tally yield data for the actual header width, or number of sections, currently cutting crop.

Note: *The header width is adjusted according to the number of sections of equal width programmed during the initial calibration process. Review the Header Width and Number of Sections section on page 53 for more information.*



Full Harvest Width Used

Half Harvest Width Used

Touch the increase or decrease icons in the lower, left corner of the Main screen display to adjust the header working width used to accumulate area and calculate yield information during the harvesting operation.

Note: *Toggle the 'Width Reset' feature 'ON' to allow the SmartYield system to reset the active header width to the full header width when the header is raised and lowered again such as when turning around on the headland. Refer to the Header Width and Number of Sections section on page 53 for assistance locating and setting the 'Width Reset' feature.*

If the AccuHeader feature is enabled, manually setting or resetting the header width is not necessary.

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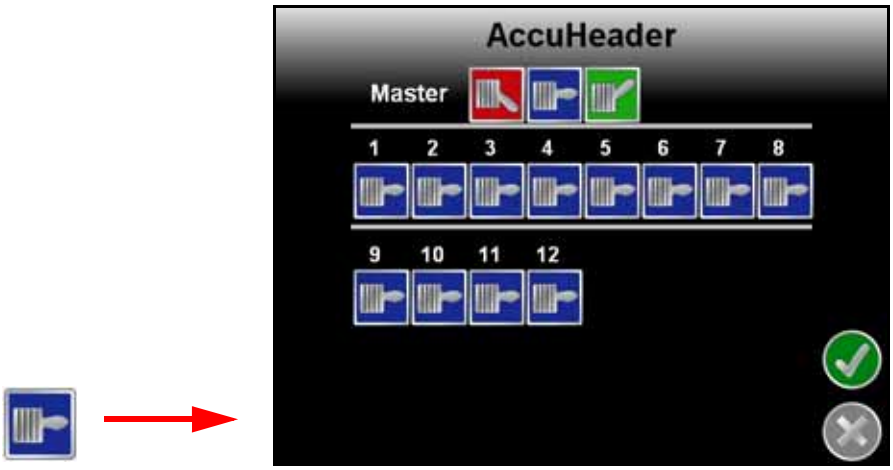
AccuHeader On-Screen Switch Box

By default, the AccuHeader feature is configured to automatically adjust the header working width during field operations. If necessary, the operator can manually override sections on or off using the on-screen switch box. To display the on-screen switch box, touch the AccuHeader switch icon along the bottom of the screen.



Note: *The SmartYield junction box will require software version 36 or newer to allow the AccuHeader feature for harvesting operations. Refer to the Diagnostics Settings section on page 87 for more information on locating the junction box software version or Appendix B, Updating the SmartYield™ Junction Box, for assistance with updating the junction box for the AccuHeader feature.*

AccuHeader On-Screen Switch Box

The section or master switch is off. If a section switch is in the off position, the section will not be included in the header working width and the AccuHeader feature will not automatically include the section when increasing the working width.

If the master switch is set to off, the AccuHeader feature is manually overriding all sections off. The AccuHeader feature will not automatically increase or decrease the working width as sections cross in or out of uncut crop areas.

The master switch icon on the Guidance screen will display off if one or more header sections are in the manual off position.

Sections or master switch is on. If the master switch is toggled on, the AccuHeader feature will not automatically increase or decrease the working width.

The master switch displays on if one or more sections are in the manual on position.

The On/Off icon will be displayed if at least one section is in the manual on position and at least one section is in the manual off position.

Sections or master switch is in the automatic position. The AccuHeader feature will automatically increase or decrease the working width based upon previous coverage.

This icon is only displayed for the master switch status if all sections are set to the automatic mode.

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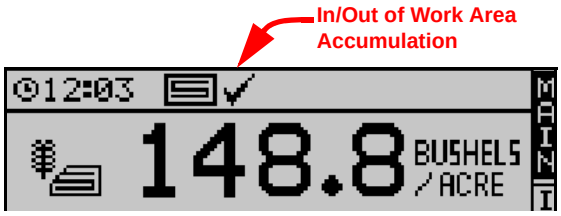
Instantaneous/Average Displays

The operator may use the SmartYield Main screen display to view instantaneous or average yield information during a harvest operation by touching the INST/AVE icon at the bottom of the screen.

The yield, work rate, and harvest or wet moisture content information displayed on the Main screen will be toggled between an instantaneous, or live, display or an average value for the period since the start of the current job.

In/Out of Work Indicator

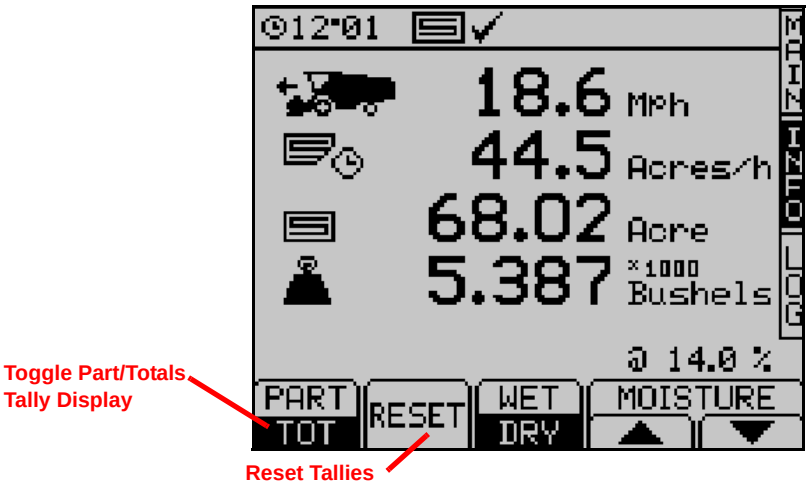
The SmartYield system utilizes the header cut out switch or header height sensor to toggle area accumulation on or off based upon the header position. If the header is raised up (such as when turning around on headlands), the system will toggle area accumulation off. When the header is lowered into cutting position, the system toggles area accumulation back on.



Note: *The yield, work rates and harvest moisture information displayed on the Main screen automatically toggles to display the average tally since the beginning of the job.*

Weight and Area Tally

The SmartYield system may be used to record tally information for two separate registers.



Note: *The tally for bushels and area are linked to the selected crop. When the total values are reset, only the information for the selected crop will be reset.*

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Part Tally

The part tally function is useful to track the area and weight output total for a single field or a days harvest operation. To display the part tally, touch the PART/TOT icon in the lower, left corner of the Info display until the 'Part' option is selected.

Note: *To display appropriate part tally information, the part tally must be reset before beginning another tally period.*

Resetting the part tally will reset the field averages.

Totals Tally

The totals tally function is useful to track the area and weight output over a longer period than the part tally such as a week or a harvest season. To display the totals tally, touch the PART/TOT icon in the lower, left corner of the Info display until the 'TOT' option is selected.

Reset Tallies

To reset the part or totals tally:

1. Touch the PART/TOT icon in the lower, left corner until the desired tally to reset is selected.
2. Touch the 'Reset' button.
3. Touch the icon to confirm the tally reset or touch 'ESC' to return to the Info screen.

Shapefile Reporting

The Raven control console may be configured to output SmartYield job reports in a shapefile format for use in may GIS (geographic information system) software packages. Refer to the Raven Help web site below for additional information on the shapefile data columns populated in the report files.

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CHAPTER 11

SmartYield™ Calibration

Optional Raven Display Settings

To access optional settings for use with the SmartYield system from the Raven display Home screen:

1. Touch the Tools Menu icon.
2. Select the ‘SmartYield’ icon from the System menu to display the Yield Configuration screen.

The following sections provide information on the settings and features available on this screen.

Yield Monitor

Touch the Yield Monitor button to access the SmartYield system interface. Review the *SmartYield™ Initial System Configuration* section on page 48 for additional information.

Smoothing Time

The smoothing time feature allows the operator to adjust the yield data display based upon user preferences. When the smoothing time value is set to zero, the Raven display will show live yield data collected by the yield sensors.

Enter a non-zero value to average the yield data over the entered time in seconds. The SmartYield system will display the average yield for the previous time entered. The default value for the smoothing time feature is 3 seconds.

Off Percent

The off percent value sets the width of a header section that must be in a previously harvested area before the AccuHeader feature automatically reduces the header width. The default value for the off percent value is 100.

Using the default setting, when 100% of a header section is no longer harvesting crop, AccuHeader will no longer use the section width when tallying covered area and therefore provide more accurate yield per area data for the actual header width currently harvesting crop.

Note: *If the value is set to 0%, the AccuHeader will not automatically adjust the header width during harvest operations.*

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Moisture Legend

During harvesting operations, the SmartYield system collects moisture data and creates an as-harvested, or coverage, map containing the moisture content percentage of the harvested crop.

The map legend, as well as the as the coverage map, may be adjusted during a harvest operation by touching the Moisture Legend button and adjusting the minimum and maximum moisture values. The Raven display will automatically divide the entered range into six equal moisture ranges and adjust the legend and coverage map for the user settings.

Note: *The moisture legend should be adjusted to display the smallest range of moisture values while accurately portraying yield data for the entire field.*

Minimum (Min) Moisture

The minimum moisture value sets the maximum moisture content for the lowest moisture range displayed on the moisture content map. For example, a minimum value of 14% means the Raven display will show moisture content between 0% and 14% using the lowest moisture range color as shown in the moisture legend.

It is recommended to enter the lowest expected moisture content before starting a harvest operation and making small adjustments from the initial value as necessary to display the desired moisture ranges during the harvest operation.

Maximum (Max) Moisture

The maximum moisture value sets the minimum moisture content for the highest moisture range displayed on the moisture content map. For example, a maximum value of 22% means the Raven display will show moisture content at or above 22% using the highest moisture range color as shown in the moisture legend.

It is recommended to enter the highest expected moisture content before starting a harvest operation and making small adjustments from the initial value as necessary to display the desired moisture ranges during the harvest operation.

Reset Defaults

Press the Reset Defaults button to reset the default min and max moisture settings for the selected crop type.

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Yield Legend

During a harvest operation, yield data is collected and displayed on the Raven field computer in an as-harvested, or coverage, map containing the bushels/acre [kg/ha] for the harvested crop.

The yield legend, as well as the coverage map, may be adjusted during a harvest operation by touching the Yield Legend button and adjusting the minimum and maximum yield values. The Raven display will automatically divide the entered range into six equal yield ranges and adjust the legend and coverage map for the entered settings.

Note: *The yield legend should be adjusted to display the smallest range of yield values while accurately portraying data for the entire field.*

Minimum (Min) Yield

The minimum yield value sets the maximum yield in bushels/acre [kg/ha] for the lowest yield range displayed on the coverage map. For example, a minimum value of 50 bushels/acre [3000 kg/ha] means the Raven display will show yield data between 0 and 50 bushels/acre [0 and 3000 kg/ha] using the lowest yield range color as shown in the yield legend.

It is recommended to enter the lowest expected yield before starting a harvest operation and making small adjustments from the initial value as necessary to display the desired yield ranges during the harvest operation.

Maximum (Max) Yield

The maximum yield value sets the minimum yield in bushels/acre [kg/ha] for the highest yield range displayed on the coverage map. For example, a maximum value of 250 bushels/acre [15,500 kg/ha] means the Raven display will show yield data at or above 250 bushels/acre [15,500 kg/ha] using the highest yield range color as shown in the yield legend.

It is recommended to enter the highest expected yield before starting a harvest operation and making small adjustments from the initial value as necessary to display the desired yield ranges during the harvest operation.

Reset Defaults

Press the Reset Defaults button to reset the default yield min and max yield values for the selected crop type.

Baud Rates

The baud rates for the Raven display and NMEA messages between the junction box and display must be set at the same signal rates. For more information, review the *NMEA Messages and Baud Rates* section on page 47.

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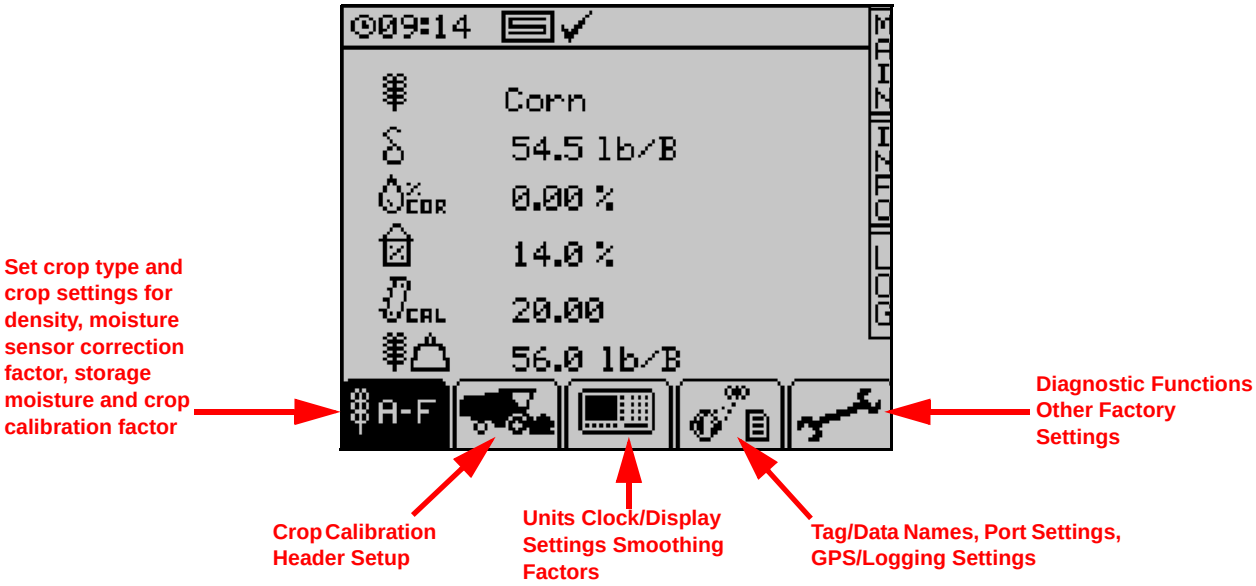
SmartYield™ Interface Settings

Setup Screen

Touch the to access the Setup menu for calibration factors and settings specific to particular crops (except for density which is set from the Main screen).



Some settings entered during the initial programming of the system may not need to be modified unless significant modifications are made to harvest operations or if default settings are restored. To prevent accidental adjustments, these settings require a PIN number to access and edit the settings. The PIN number for most menus is ‘1234.’ Enter the PIN number and touch the key.

Other settings will be modified on a regular basis as port of the normal or daily operating routine. As observed crop conditions change, regular checks must be performed and the crop settings adjusted as necessary. Review the *Harvest Checklist* section on page 67, for adjustments necessary during a harvest operation.

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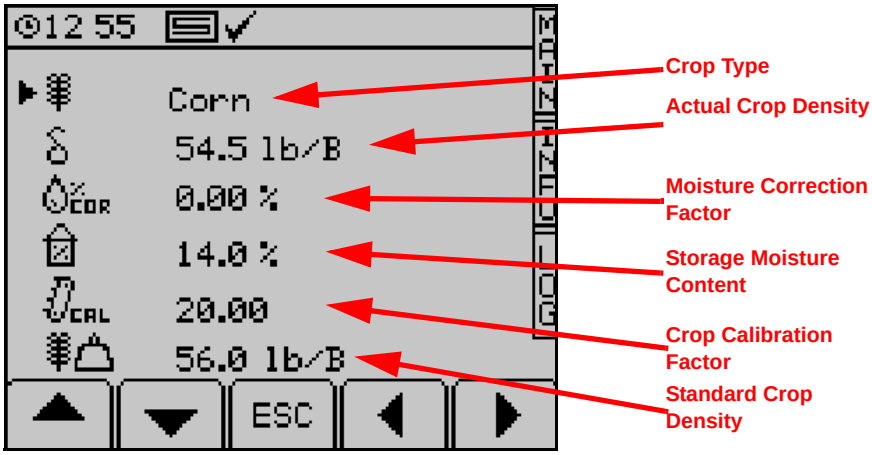
Crop Settings

Touch the and select the icon to set the crop settings for a specific harvest operation.



- Crop Type - The currently selected crop type is displayed. Set the desired crop type for the harvest operation.
- Actual Crop Density - The actual crop density calculated for each crop. This value should be checked and adjusted regularly during a harvest operation.
- Moisture Correction Factor - Set the moisture correction factor only if a moisture sensor is installed with the SmartYield system. Refer to the *Moisture Sensor Setup (Optional)* section on page 57 to set up this sensor.
- Storage Moisture Content - Set to the desired moisture content for grain storage. The SmartYield system will calculate dry yield based upon this value.
- Crop Calibration Factor - The crop calibration factor is derived from test data for the specific make and model of combine wherever possible. See the *Adjusting the Crop Calibration Factor* section on page 83 to calibrate the crop calibration factor.
- Standard Crop Density - When the SmartYield system is configured to display bushel units, the bushel weight for each pre-programmed crop is displayed on the Crop Select screen. This value is the standard bushel weight and should not be adjusted.

Adjusting the Crop Calibration Factor

The crop calibration factor may need to be adjusted if the actual yield is consistently different from the yield registered by the SmartYield system.

Inaccurate tare, crop density or moisture content settings will affect the accuracy of the SmartYield system and are more likely to be the cause for any discrepancies with yield data. Check these values before considering an adjustment to the crop calibration factor.

The crop calibration factor is adjusted using the following equation:

$$NewCal = \frac{ExistingCal \times ActualWeight}{MeasuredWeight}$$

The operator may use the above equation to manually calculate the new crop calibration factor or have the SmartYield system calculate the calibration factor automatically.

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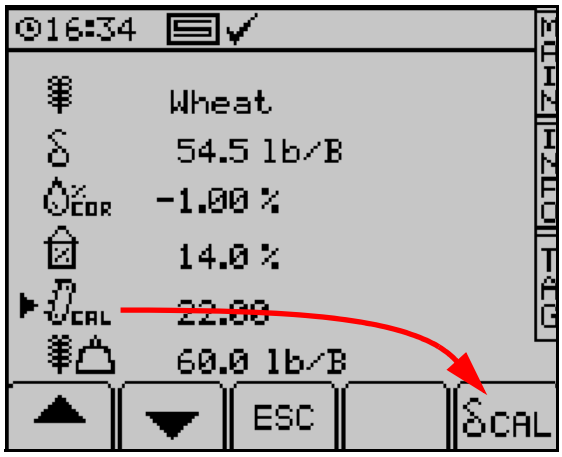
Use the following procedure to recalibrate the crop calibration factor:

Note: *The partial weight display may be used to keep a tally of the weight measured by the SmartYield system. Refer to the Weight and Area Tally section on page 76 and reset the partial weight with an empty grain hopper. The hopper or truck weight may then be compared to the partial weight displayed on the SmartYield screen.*

3. Touch the and select the icon.
4. Verify that the correct crop type is displayed at the top of the settings list.
5. Use the down arrow key until the cursor is in front of the crop calibration factor setting.



Note: *If the new calibration factor is already calculated, enter the new calibration factor and touch the key. To have the SmartYield system calculate the new value automatically, proceed with the following steps.*

6. Touch the icon.
7. Enter the load weight registered by the SmartYield system and press .
8. Enter the actual measured load weight and press .
9. The SmartYield system will calculate and display the new crop calibration factor. Press again to accept the new value and return to the

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Machine Settings

Touch the and select the icon to access the machine settings screen.

- Set Tare - The tare setting is used to re-zero the yield sensor for the percentage of time which the beam is broken by grain on the clean grain elevator. Refer to the *Set Tare* section on page 69 for detailed instructions.
- Header Setup - Select the Header setup option to configure the SmartYield system for the header width and sections. Refer to the *Header Setup* section on page 50 for detailed instructions.
- Speed Factor - The speed factor calibrates the SmartYield system for the speed sensor type and signal. Refer to the *Speed Sensor* section on page 50 for detailed instructions.
- Machine ID - Enter an identification number for the current machine setup. This ID number can be used to save and quickly restore machine profiles.

Display Settings

Touch the and select the icon to access the display settings screen.

- Clock Set - Set the date and time for the SmartYield system. The date and time settings on this screen are not required for operation of the SmartYield system.
- Display - The display setting contains a brightness and contrast setting for a stand alone console and are not used with the SmartYield system.

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- Smoothing - Refer to the *Smoothing* section on page 56 for detailed information on the SmartYield smoothing feature.
- Language - Select the desired language for display on the SmartYield interface screens. Refer to the *Language* section on page 48 for detailed information.
- Units - Select the desired units for SmartYield operation. Refer to the *Units* section on page 49 for detailed information.
- Print Cal Data - This option is not used with the Raven SmartYield system.

Log Settings

Touch the and select the icon to access the communications settings screen.

- Function Name/Value - Function names and values will not be used with the SmartYield system.
- Tag Name - The tagging feature is not used with the Raven SmartYield system.
- NMEA - Select the baud rate for GPS NMEA messages from the GPS receiver.

  The NMEA baud rate setting on both the Raven display and SmartYield junction box must be set to the same value. By default, the junction box is set to 19200 for software versions 27b or older. For later software versions, set the baud rate to 38400. Review the *NMEA Messages and Baud Rates* section on page 47 for assistance with the Raven display settings.
- DISP - The display baud rate for communication between the Raven control console or field computer is displayed. **Do not adjust** this setting when operating the SmartYield system. The default value is 38400.

  Review the *NMEA Messages and Baud Rates* section on page 47 for assistance with the Raven display settings.
- DIFF Alarm - The SmartYield junction box can sound an audible alarm if differential corrections are not received. Check connections between the Raven control console or field computer and the junction box.

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- More - Select the ‘More’ entry to access additional Log Settings screens

- Log by Time/Distance - Yield data is logged by the Raven control console or field computer. This feature is not used with the SmartYield system.
- Log Trigger - This value is not used with the SmartYield system.
- Yield Delay - To accurately map yield data on the Raven control console or field computer, the yield delay must be calibrated for the specific combine on which the SmartYield system is installed. Refer to the *Yield Delay* section on page 56 for detailed information.
- Work Record - This feature is not used with the SmartYield system.
- Logging - This option does not require adjustment with the SmartYield system.

Diagnostics Settings

Touch the and select the icon to access the diagnostics settings screens.

- Diagnostics - Touch the ‘Diag’ tab in the lower, right corner of the SmartYield display to view a diagnostics screen which may be used to check the SmartYield system prior to operation. See the *Pre-Harvest Checklist* section on page 61 for detailed information.

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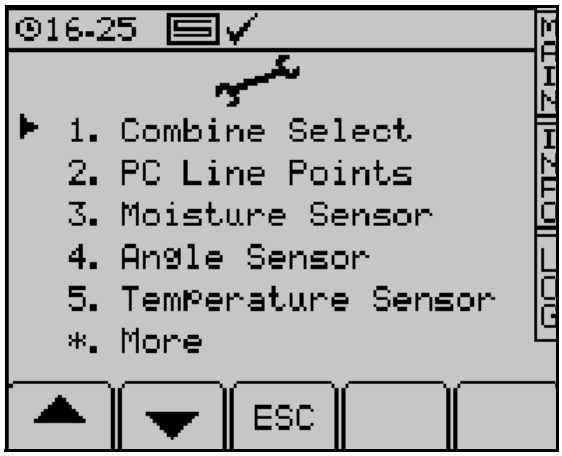
- PIN - Some settings are protected by a PIN code to prevent accidental modification. Enter the PIN code (default ‘1234’) and touch to access the diagnostics settings screen.



- Combine Select - The combine select option contains a list of preset machine makes and models. For best results, select the specific machine type on which the SmartYield system is operating. Refer to the *Combine Type* section on page 49 for additional information.
- PC Line Points - Select the ‘PC Line Points’ to setup or adjust the yield sensors for observed harvest conditions. Refer to the *Yield Sensor Setup* section on page 54 for detailed information.
- Moisture Sensor - If an optional moisture sensor is installed on the machine, select the ‘Moisture Sensor’ option to set up the sensor for use with the SmartYield system. Refer to the *Moisture Sensor Setup (Optional)* section on page 57 for detailed information.
- Angle Sensor - An angle sensor should be used when harvesting in rough or hilly terrain such as side hills or slopes. Refer to *Angle Sensor Setup* section on page 59 for detailed information.
- Temperature Sensor - The moisture content reading observed by the moisture sensor may be affected by the ambient temperature at the yield sensors. To adjust the temperature display, select the ‘Temperature Sensor’ option and refer to the *Temperature Setup* section on page 58 for detailed information.
- More - Select the ‘More’ option to advance to the next diagnostics settings screen.

- Header Switch Set - Select the ‘Header Switch Set’ option to set up the header cutout switch. Refer to the *Header Cutout Switch* section on page 50 for detailed information.
- Factor Reset - This option should be used by technicians only or if a total software reset is necessary. All Cal data and operation information will be lost. It is highly recommended to keep a record of all calibration factors for each combine.

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- Factor Stores - Each time the SmartYield system is powered down, the calibration data is automatically stored to the ‘Store A’ entry. Select the ‘Restore from A’ option to reload calibration information entered during the last SmartYield operation.

  For an extra backup of calibration data, calibration values can be stored to the ‘Store B’ entry. This data must be manually overwritten and may be used to secure a backup of calibration data for restoration at any time. Select the ‘Restore from B’ option to reload the calibration data stored manually on the system.
- PIN Change - To change the code necessary to access the diagnostics settings screen, select the ‘PIN Change’ option. Be sure to write down the new PIN code for future reference.
- Select Instrument - While the select instrument option is not used with the SmartYield system, the Select Instrument screen may be accessed to view the software version currently installed on the SmartYield junction box.

  The Select Instrument screen will display a device ID. (e.g. PS702-000r36). The value displayed after the ‘r’ is the current software version installed on the SmartYield junction box.

Note: *Software versions 27b and earlier will not display the software version of the junction box on this screen.*

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APPENDIX

A

SmartYield™ Setup Menu Quick Reference

The following charts may be useful to help navigate the SmartYield Setup Menus and to reset a calibration or setting to the default value. For detailed information on these settings, refer to Chapter 11, *SmartYield™ Calibration*.

TABLE 1. Crop Settings Tab

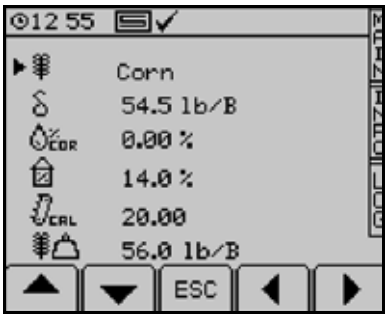
	1st Level	2nd Level	Parameter	Default Setting
		Crop Settings	Select Crop	‘Default’
			Set Density	[56 lb/b]
			Moisture Correction Factor	[0%]
			Storage Moisture Content	[14%]
			Crop Calibration Factor	[20.00]

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TABLE 2. Machine Settings Tab

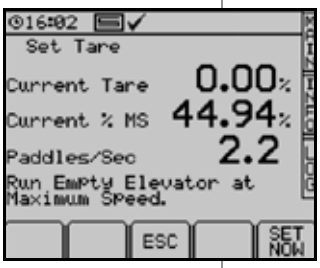
	1st Level	2nd Level	Parameter	Default Setting
		Set Tare		
		Header Setup	Width	[236.4]
			Number of Sections	[6]
			Width Reset	[OFF]
			Cutout Height	0-500 Hz [300[
			Status	(In/Out of Work)
			Set all to default	
		Speed Factor	GPS Speed On/Off	On
			S.S.F.	[1.0000] m/pulse
			Auto-Cal Routine	
		Machine Number		0-34463 [0]

TABLE 3. Display Settings Tab

	1st Level	2nd Level	Parameter	Default Setting
		Clock Set		
		Display	Contrast	
			Brightness	
		Smoothing	Yield Display	[4 Seconds]
		Language		[English]
		Units	Metric	[Bushels]
			Imperial	
			Bushels	
		Print Cal Data		

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TABLE 4. GPS and Logging Settings Tab

	1st Level	2nd Level	Parameter	Default Setting
		Function Name/Value	F1 - F12	
		Tag Name	Description	Blackgrass
				Wild Oats
				Cleavers
				Thistles
				Spare Tags 1, 2, 3, 4
		NMEA Baud Rate (Top Port)	4800/9600/19200/ 38400	[19200]
		Display Baud Rate (Bottom Port)	Remote PSi @38400*	PF Enabled (*no card)
			Remote PSi @166667*	PF Enabled (*no card)
			RDS PrinterICP200	Printer Only (no PF)
		Diff Alarm	On/Off	[On]
	*More			
		Log by Time or Distance	Log by Time/ Log by Distance	[Log by Time]
		Log Time	1 second/ 6 m	[1s]
		Yield Delay		15 seconds
		Work Record	On/Off	[Off]
		Logging	Multi/Multi+/Single/ Single+	[Multi]

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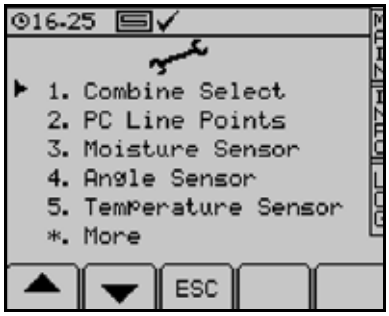
TABLE 5. Configuration Settings Tab

	1st Level	2nd Level	Parameter	Default Setting
		Combine Select	Select Combine Type	'Default Combine Type'
		PC Line Points	Select Sensor	A/B/Both
			PC Tare	0.000
			PC1	5.790
			PC2	10.10
			PC3	17.29
			PC4	23.76
			PC5	47.32
			AutoCal	
		Moisture Sensor	Select Crop	Wheat
			Gain	7.037
			Offset	4.100
			Threshold	0.000
			Correction	0.000
			Sensor	ON
			Voltage	
		Angle Sensor	For selected combine type ('Factory' Menu)	'Default Combine Type'
			LH Slope	
			RH Slope	
			FW Slope	
			BW Slope	
			V LH/RH	
			V FW/RW	
		Temperature Sensor	Temperature	
			Voltage	
	*More			
		Header Switch Set	Sensor Type	
			On/Off Switch	Select Sense [Header Up - Closed] Header Down - Closed
			Height Sensor	View Signal Input Header Up - Hz Header Down - Hz
		Factor Reset		
		Factor Stores		
		PIN Change		
		Select Instrument	Select Software	(Secondary Software Module Required)

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APPENDIX

B

Updating the SmartYield™ Junction Box

Preparation

The following sections contain steps to be performed before attempting to update the SmartYield junction box. Complete these steps to ensure the update process goes smoothly.

Important: *Settings saved on the SmartYield junction box will be lost when updating the firmware. Before updating the firmware, be sure to write down any customized settings. Review the SmartYield™ Initial System Configuration section on page 48, for details on the settings configured and saved on the junction box.*

The following items are required to successfully update the SmartYield junction box software:

- Laptop computer with:
  - serial port or USB to serial adapter
  - RDS Update or junction box flash software installed (Loup Electronics Software, Installation and Support Information disc)
  - updated junction box firmware
- SmartYield junction box
- 12 V power source (e.g. vehicle battery)
- Raven SmartYield cable part number 115-0171-950 or 115-0171-971

Note: *Before starting the update procedure, it is recommended to power up the SmartYield system and verify that the Raven display and junction box are operating properly. Verify that the SmartYield interface screens are displayed on the Raven field computer or display console.*

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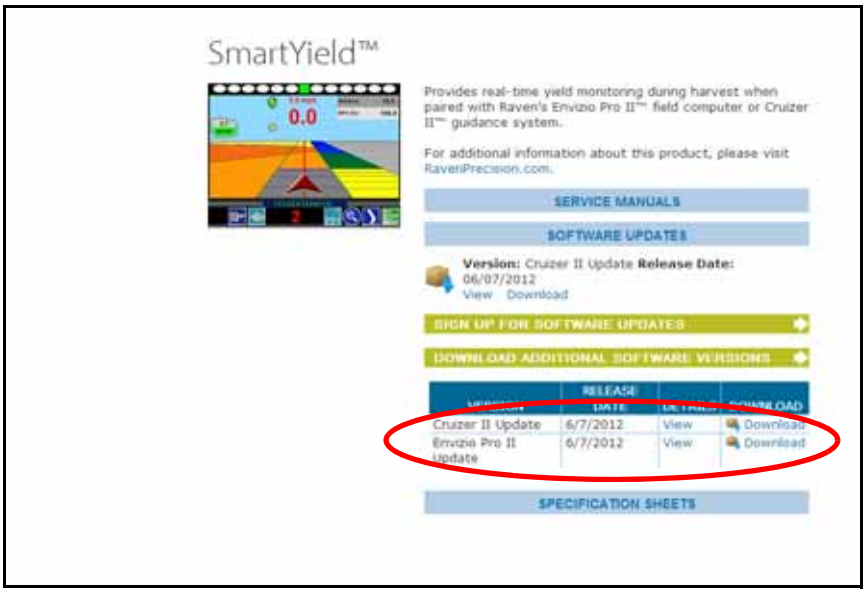
Download and Extract the Firmware Update

Updates for the SmartYield junction box will be made available on the Raven Industries web site:

www.ravenhelp.com

Note: *Contact the Raven technical support center for additional assistance with the firmware update files.*

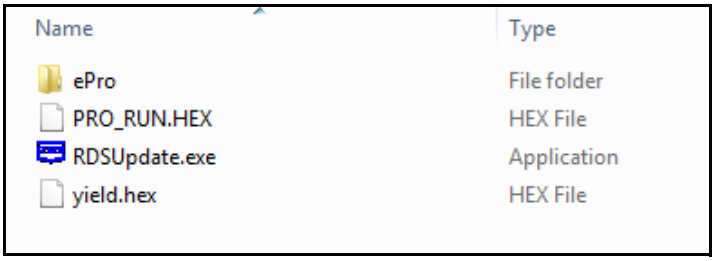
1. Locate the specific download for the control console used with the SmartYield system on the Raven website.



2. Be sure to save the download to a drive location or folder you will be able to find easily once the download is complete.
3. Once the download has finished, unzip or extract the software update to a USB flash drive.

Note: *Unzip the software update directly to the flash drive's root directory (i.e. "F:\", where F is the drive letter of the USB flash drive). The field computer will not search subdirectories or folders to find these updates.*

4. Verify that the following files are all located at the root directory of the USB flash drive.



5. Remove the flash drive from the computer and proceed to the *Update the Junction Box Firmware* section on page 97 to complete the update process.

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Update the Junction Box Firmware

To update the firmware on the junction box:

1. Insert the USB flash drive with the extracted update files into the Raven control console.
2. Refer to the Raven control console documentation for information on updating the console. The SmartYield junction box firmware update process will be initiated from the Updates screen on the control console.
3. Select the “SmartYieldRevXX” update from the list of available updates where XX is the revision number of the junction box firmware.
4. Touch the **Next** icon to begin the update process. The update should take approximately five minutes to complete. When the update is finished, the control console will display a prompt to restart the display or field computer.
5. Restart the control console and review the *SmartYield™ Initial System Configuration* section on page 48 and enter the calibration settings and values for the SmartYield system.

Note: *Refer to the Diagnostics Settings section on page 87 to check that the firmware update has been applied correctly. The current firmware version is indicated by the last 2 digits of the product number under the “Select Instrument” option.*

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APPENDIX

C

Replacing the Moisture Sensor

If any revision sensor is replaced with a ‘Y’ revision sensor, the following procedure must be performed before connecting the new sensor:

1. Disconnect the old sensor and remove the sensor from the harvester.
2. Using the Raven display console, access the SmartYield screen and touch the icon and select the icon.
3. Enter the PIN code (default 1234) and use the down arrow to select the ‘Temperature Sensor’ option.
4. Press to access the Temperature Sensor screen.
5. Verify that the temperature display shows a value of -23° C. If the temperature value is any other value, use the up or down arrows and enter -23 (*23.0) with the on-screen keypad and press .
6. Verify that the voltage display shows a value of 2.5.
7. Mount and connect the ‘Y’ revision moisture sensor. Review Chapter 5, *Moisture Sensor Installation*, for details on installing and connecting the moisture sensor.
8. Using the Raven display console, access the SmartYield screen and touch the icon and select the icon.
9. Enter the PIN code (default 1234) and use the down arrow to select the ‘Moisture Sensor’ option.
10. Press to access the Moisture Sensor screen.
11. Change the displayed gain and offset values to the default or recommended values shown in Table 2 on page 58 for the preset crop types as necessary. It is recommended to reprogram all preset crop types at this time to avoid calibration errors for future harvest operations.
12. Exit the moisture sensor menu and use the up or down arrows to select the ‘Temperature Sensor’ option.
13. Verify that the temperature display is roughly at outdoor ambient air temperature (in °C).

Note: *If the temperature display shows the outdoor air temperature (±5° C), the sensor is operating correctly and no further action is required.*

If the temperature displays a grossly inaccurate air temperature value, the sensor should be replaced before beginning any harvesting operations with the SmartYield system.

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14. Navigate to the Crop Select screen and set the moisture correction factor to ‘0.’
15. During a harvesting operation, adjust the moisture reading as necessary. The moisture reading may be adjusted in either of the following methods.
    a. Use the up or down arrow icons on the SmartYield “Info” tab to adjust the moisture reading.
    b. Measure the difference between the yield monitor and a bench tester moisture readings and enter the correction factor on the crop select screen.

Note: *Enter negative correction factors using the * key. For example, to enter ‘-2.0,’ enter ‘*2.0.’*

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RAVEN

Limited Warranty

What Does this Warranty Cover?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Division product under normal use, maintenance, and service when used for intended purpose.

How Long is the Coverage Period?

Raven Applied Technology products are covered by this warranty for 12 months from the date of retail sale. In no case will the Limited Warranty period exceed 24 months from the date the product was issued by Raven Industries Applied Technology Division. This warranty coverage applies only to the original owner and is non-transferable.

How Can I Get Service?

Bring the defective part and proof of purchase to your Raven dealer. If the dealer approves the warranty claim, the dealer will process the claim and send it to Raven Industries for final approval. The freight cost to Raven Industries will be the customer's responsibility. The Return Materials Authorization (RMA) number must appear on the box and all documentation (including proof of purchase) must be included inside the box to be sent to Raven Industries.

What Will Raven Industries Do?

Upon confirmation of the warranty claim, Raven Industries will (at our discretion) repair or replace the defective product and pay for the standard return freight, regardless of the inbound shipping method. Expedited freight is available at the customer's expense.

What is not Covered by this Warranty?

Raven Industries will not assume any expense or liability for repairs made outside our facilities without written consent. Raven Industries is not responsible for damage to any associated equipment or products and will not be liable for loss of profit, labor, or other damages. The obligation of this warranty is in lieu of all other warranties, expressed or implied, and no person or organization is authorized to assume any liability for Raven Industries.

Damages caused by normal wear and tear, misuse, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty.

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Extended Warranty

What Does this Warranty Cover?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Division product under normal use, maintenance, and service when used for intended purpose.

Do I Need to Register My Product to Qualify for the Extended Warranty?

Yes. Products/systems must be registered within 30 days of retail sale to receive coverage under the Extended Warranty. If the component does not have a serial tag, the kit it came in must be registered instead.

Where Can I Register My Product for the Extended Warranty?

To register, go online to www.ravenhelp.com and select Product Registration.

How Long is the Extended Warranty Coverage Period?

Raven Applied Technology products that have been registered online are covered for an additional 12 months beyond the Limited Warranty for a total coverage period of 24 months from the date of retail sale. In no case will the Extended Warranty period exceed 36 months from the date the product was issued by Raven Industries Applied Technology Division. This Extended Warranty coverage applies only to the original owner and is non-transferable.

How Can I Get Service?

Bring the defective part and proof of purchase to your Raven dealer. If the dealer approves the warranty claim, the dealer will process the claim and send it to Raven Industries for final approval. The freight cost to Raven Industries will be the customer's responsibility. The Return Materials Authorization (RMA) number must appear on the box and all documentation (including proof of purchase) must be included inside the box to be sent to Raven Industries. In addition, the words "Extended Warranty" must appear on the box and all documentation if the failure is between 12 and 24 months from the retail sale.

What Will Raven Industries Do?

Upon confirmation of the product's registration for the Extended Warranty and the claim itself, Raven Industries will (at our discretion) repair or replace the defective product and pay for the standard return freight, regardless of the inbound shipping method. Expedited freight is available at the customer's expense.

What is Not Covered by the Extended Warranty?

Raven Industries will not assume any expense or liability for repairs made outside our facilities without written consent. Raven Industries is not responsible for damage to any associated equipment or products and will not be liable for loss of profit, labor, or other damages. Cables, hoses, software enhancements, and remanufactured items are not covered by this Extended Warranty. The obligation of this warranty is in lieu of all other warranties, expressed or implied, and no person or organization is authorized to assume any liability for Raven Industries.

Damages caused by normal wear and tear, misuse, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty.

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SmartYield™
Installation & Operation Manual
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