1. **Read and understand all safety warnings**
   Make sure you fully understand all the safety warnings before installing and using RANGER. See page 2.

2. **Check package contents**
   Refer to the Kit Contents page in this guide to confirm you have received all parts of your RANGER install kit. See page 3.

3. **Install RANGER**
   Use the instructions in this guide to install RANGER. See page 4.

4. **Power on and use RANGER**
   Turn on RANGER and learn how RANGER helps you efficiently work your field using GPS guidance. See page 7.

5. **Get help when needed**
   Visit handsfreefarm.com to learn more about RANGER or to download the full RANGER documentation suite.
   Have a question or issue? Submit your question anytime on handsfreefarm.com or call Customer Service at 1-866-888-4472 (U.S. or Canada) during business hours.
Safety Warnings

The warnings below provide information that identifies hazards associated with potential injury or death and tells you how to avoid them. The warnings apply whenever you use RANGER. Read and understand this manual and all the warnings below before installing, operating, or performing maintenance or service on RANGER. Do not allow anyone to operate without instruction. For questions or further assistance, contact Customer Service. Keep this manual and all related safety information with the manuals for your tractor and other implements.

## Warnings

<table>
<thead>
<tr>
<th>Warning</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Role of Operator</strong></td>
<td>As with other navigation guidance systems within vehicles, pay attention to driving the vehicle. To avoid serious injury or death, do not become distracted by other tasks and always be prepared to respond to field conditions. Stay seated while the vehicle is moving.</td>
</tr>
<tr>
<td><strong>Manual Override</strong></td>
<td>Stop following the path displayed by RANGER if it is unsafe to proceed, such as when an obstacle is in the line of travel or there is an emergency. RANGER cannot identify obstacles or hazards in the field; only you can do this.</td>
</tr>
<tr>
<td><strong>Tractor Overturns</strong></td>
<td>Accounting for the largest number of agricultural vehicle-related fatalities each year on farms, overturns are more likely to occur on slopes. RANGER cannot identify environments that pose an increased risk of overturn; only you can do this.</td>
</tr>
<tr>
<td><strong>Collisions with People and Objects</strong></td>
<td>The second leading cause of agricultural vehicle-related fatalities occurs when vehicles run over people. RANGER cannot identify bystanders or other objects, such as trees, fences, boulders, and other equipment. Stop following the path indicated by RANGER to avoid people and objects.</td>
</tr>
<tr>
<td><strong>Operator Position</strong></td>
<td>You must manually control the direction and speed of the tractor. Always remain in the operator position in the tractor when using RANGER.</td>
</tr>
<tr>
<td><strong>Installing RANGER</strong></td>
<td>Before installing RANGER inspect the vehicle and perform any needed maintenance, such as a loose steering wheel, wheels out of alignment, uneven tire pressure, and contaminated hydraulic fluid. RANGER may not perform as intended on a vehicle that is not properly maintained. Errors in vehicle performance while following RANGER guidance increase the risk of operator and bystander injury or death. Turn off the vehicle and disengage RANGER when installing or performing maintenance. Before attempting to install any RANGER components, park the vehicle on a clean level floor with adequate clearance to work all around. Use an appropriate ladder or platform when installing or performing maintenance on cables, the antenna, and other RANGER components. Before you perform any drilling, cutting or fastening, ensure that no other vehicle components, such as electrical wiring, will be damaged. Failure to follow this warning may cause physical injury and/or damage to the machine. To avoid burns or electric shock injury when installing or removing RANGER, do not touch parts of the vehicle that are heated or electrically energized.</td>
</tr>
<tr>
<td><strong>Mounting the Console</strong></td>
<td>Mount the RANGER console where it can be seen clearly and is within reach. Do not place in a location where it interferes with seeing other information, controls, or the field. Looking at the screen for too long while operating the vehicle can cause a crash.</td>
</tr>
<tr>
<td><strong>Attaching the Battery</strong></td>
<td>Avoid contact with cables that carry high current. Connect RANGER power cables to a stable 12 V power supply.</td>
</tr>
<tr>
<td><strong>Operating RANGER</strong></td>
<td>To avoid serious injury or death be prepared to respond to field conditions. Do not become distracted by other tasks. Always pay attention to the task of driving the vehicle and stay seated while the vehicle is in motion.</td>
</tr>
</tbody>
</table>
### Kit Contents

Unpack your RANGER kit and identify the parts as shown.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Qty</th>
<th>Description</th>
<th>Photograph</th>
</tr>
</thead>
<tbody>
<tr>
<td>802-0111-01</td>
<td>1</td>
<td>Console</td>
<td></td>
</tr>
<tr>
<td>150-1013-000#</td>
<td>1</td>
<td>Antenna, 1575.42 MHz</td>
<td></td>
</tr>
<tr>
<td>604-0019-000#</td>
<td>1</td>
<td>Console mounting (suction cup) hardware</td>
<td></td>
</tr>
<tr>
<td>675-1123-000#</td>
<td>4</td>
<td>Screw, machine, 8-32, 7/16&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Attach mounting ball to back of console</td>
<td></td>
</tr>
<tr>
<td>051-0167-000#</td>
<td>1</td>
<td>Main power (power/ground speed) cable</td>
<td></td>
</tr>
<tr>
<td>054-0100-000#</td>
<td>1</td>
<td>Power (cigarette lighter) adapter cable</td>
<td></td>
</tr>
<tr>
<td>601-0003-005#</td>
<td>1</td>
<td>Disk, zinc, 3-3/8&quot; diameter, 3/16&quot; thick</td>
<td></td>
</tr>
<tr>
<td>683-0001-008#</td>
<td>1</td>
<td>Foam pad, circular, 3&quot; diameter, 0.045&quot; thick</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(antenna mounting hardware)</td>
<td></td>
</tr>
</tbody>
</table>
Installing RANGER

Note: Proper installation is critical for safe and optimal RANGER operation.

The following sections represent typical installation order; however, install components in your preferred order.

Mounting the Antenna

Mount the antenna in a location that will optimize its performance—typically along the left/right centerline of the vehicle as high and as far forward as possible (usually along the leading edge of the vehicle cab). Do not place the antenna within two feet of a transmitting radio antenna (such as a two-way or business band radio).

To mount the antenna:
1. Clean and dry the vehicle surface where you will attach the antenna mounting plate.
2. Remove the paper backing from one side of the adhesive disk then affix the disk to the bottom of the antenna mounting plate.
3. Remove the other paper backing from the adhesive disk (see at right).
4. Position the mounting plate in your preferred location then press down hard for proper adhesion.
5. Place the magnetic mounted antenna on the plate, making sure the antenna is on the left/right centerline of the vehicle (see at right).

Routing the Antenna Cable

When routing the antenna cable:
- Make sure the RANGER console is powered off before attaching the cables.
- DO NOT bend the cable to a radius of less than 6”.
- DO NOT route the cable within 12” of radio wires, power generator wires, a heat source, or moving parts.
- Coil excess cable in a protected location and secure the installation with tie straps.

To route the antenna cable:
1. Route the cable through a cab opening where rubber protection exists that will protect the cable (see top right).
2. Attach the other end of the antenna cable to the console (see bottom right).
Connecting the Console to a Power Source
Connect the console to your preferred power source using one of the two options below.

**Option 1**
Connect to 12 V Power Source

1. Connect one end of the main power cable to the console.
2. Connect the other end to the power adapter cable.
3. Plug the cigarette lighter plug of the power adapter cable into the cigarette lighter port or available 12 V power port in your cab.
4. Coil excess cable in a protected location then secure the installation with tie straps.

**Option 2**
Connect to Compatible Rate Controller

1. Connect one end of the main power cable to the console.
2. Connect the other end of the main power cable to a compatible rate controller speed sensor port. Note: The main power cable is compatible with rate controllers that require a Dickey John speed sensor connection. An optional cable is available from Outback Guidance to allow connection to rate controllers that require a Raven speed sensor connection.
3. Coil excess cable in a protected location then secure the installation with tie straps.
Mounting the Console

Before mounting the console, determine an appropriate mounting location. Typically, you mount the console above and behind the center of the steering wheel just below your line of sight. The simplest installation is on the front glass of the cab, but you can vacuum mount the console to any non-porous (metal) surface.

**WARNING:** Do not mount the console in a location where it interferes with seeing other information, controls, or the field. Looking at the screen for too long while operating the vehicle can cause a crash.

To mount the console:

1. Using the four machine screws, attach the RAM ball mount securely to the back of the RANGER console.

2. Using the two self-tapping screws, install the RAM pedestal to the vacuum cup. Tighten the screws securely.

3. Attach the RAM pedestal to the RAM ball on the back of the RANGER console.

4. Thoroughly clean the inside cab window surface directly in front of the steering wheel.

5. Press the vacuum mount to the window and twist the actuator until it clicks over center to create adhesion to the glass.

6. Loosen the RAM mount and adjust the console to the proper viewing angle.

**CAUTION** Do not leave the console unattended for extended periods of time. If possible, remove the console from the glass when it is not in use. Continued exposure to the elements (such as direct sunlight) may damage the suction cup. To extend the life of the suction cup clean it periodically per manufacturer’s instructions.
Using Ranger

The following sections get you up and running quickly to use RANGER to optimize your guided-steering work.

- “Powering RANGER and Verifying Your GPS Signal” (below)
- “Console Overview” on page 8
- “Guidance Mode Feature Comparison” on page 9
- “Setting Up RANGER” on page 10
- “Using Straight Guidance” on page 13
- “Using Contour Guidance” on page 15
- “Displaying Field and Driving Information While Receiving Guidance” on page 16
- “Performing Additional Tasks with RANGER” on page 17
- “Support” on page 18

Powering RANGER and Verifying Your GPS Signal

The RANGER power switch is on right side of the console (circled at right).

- Flip the switch to ON to power up RANGER
- Flip the switch to OFF to power down RANGER

Upon power up and with your antenna having a clear view of the sky, RANGER automatically begins acquiring a GPS signal (see indicators at right). When RANGER has acquired a GPS signal the yellow (GPS) LED illuminates. When RANGER acquires a more accurate differentially-corrected (DGPS) signal, the green LED illuminates. This startup process may take several minutes.

The green DGPS LED must be illuminated for RANGER to provide guidance.

With startup complete, the RANGER display appears similar to that at right with the following information:

- Vertical bars in upper right indicate GPS signal strength, where more black bars means greater signal strength
- ‘Ready’ status - RANGER is ready to provide guidance
- Number of satellites being tracked (‘5 Sats’ at right)
- Memory (storage space) available to log (store) field data
# Console Overview

The following table shows the front and rear views of the RANGER terminal and describes each numbered feature.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Views</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Steering guide (LEDs arc)</td>
<td><img src="image1" alt="Image of the RANGER terminal showing the steering guide" /></td>
</tr>
<tr>
<td></td>
<td>Illuminated LEDs left/right of center indicate direction you need to steer to become centered on pass</td>
<td><img src="image2" alt="Image of the RANGER terminal showing the illuminated LEDs" /></td>
</tr>
<tr>
<td>2</td>
<td>Crosstrack (LEDs row)</td>
<td><img src="image3" alt="Image of the RANGER terminal showing the crosstrack LEDs" /></td>
</tr>
<tr>
<td></td>
<td>Illuminated LEDs left/right of center indicate pass is certain distance left/right of vehicle</td>
<td><img src="image4" alt="Image of the RANGER terminal showing the illuminated crosstrack LEDs" /></td>
</tr>
<tr>
<td>3</td>
<td>MENU button</td>
<td><img src="image5" alt="Image of the RANGER terminal showing the MENU button" /></td>
</tr>
<tr>
<td></td>
<td>Display the menu and navigate the submenus</td>
<td><img src="image6" alt="Image of the RANGER terminal showing the display" /></td>
</tr>
<tr>
<td>4</td>
<td>Down/up arrows</td>
<td><img src="image7" alt="Image of the RANGER terminal showing the down/up arrows" /></td>
</tr>
<tr>
<td></td>
<td>Navigate menus or cycle through guidance screens</td>
<td><img src="image8" alt="Image of the RANGER terminal showing the down/up arrows in action" /></td>
</tr>
<tr>
<td>5</td>
<td>Display</td>
<td><img src="image9" alt="Image of the RANGER terminal showing the display" /></td>
</tr>
<tr>
<td></td>
<td>Shows menus or guidance information</td>
<td><img src="image10" alt="Image of the RANGER terminal showing the menu" /></td>
</tr>
<tr>
<td>6</td>
<td>Contour button</td>
<td><img src="image11" alt="Image of the RANGER terminal showing the contour button" /></td>
</tr>
<tr>
<td></td>
<td>Start Contour guidance mode</td>
<td><img src="image12" alt="Image of the RANGER terminal showing the contour guidance mode" /></td>
</tr>
<tr>
<td>7</td>
<td>Straight button</td>
<td><img src="image13" alt="Image of the RANGER terminal showing the straight button" /></td>
</tr>
<tr>
<td></td>
<td>Start Straight guidance mode</td>
<td><img src="image14" alt="Image of the RANGER terminal showing the straight guidance mode" /></td>
</tr>
<tr>
<td>8</td>
<td>STOP Guidance button</td>
<td><img src="image15" alt="Image of the RANGER terminal showing the stop guidance button" /></td>
</tr>
<tr>
<td></td>
<td>Stop guidance/logging and display menu of additional functionality</td>
<td><img src="image16" alt="Image of the RANGER terminal showing the stop guidance button in action" /></td>
</tr>
<tr>
<td>9</td>
<td>ENTER button</td>
<td><img src="image17" alt="Image of the RANGER terminal showing the enter button" /></td>
</tr>
<tr>
<td></td>
<td>Confirm menu selections</td>
<td><img src="image18" alt="Image of the RANGER terminal showing the confirm menu selections" /></td>
</tr>
<tr>
<td>10</td>
<td>GPS indicators/LEDs</td>
<td><img src="image19" alt="Image of the RANGER terminal showing the GPS indicators/LEDs" /></td>
</tr>
<tr>
<td></td>
<td>Top (red) = no GPS</td>
<td><img src="image20" alt="Image of the RANGER terminal showing the top LED" /></td>
</tr>
<tr>
<td></td>
<td>Middle (yellow) = GPS</td>
<td><img src="image21" alt="Image of the RANGER terminal showing the middle LED" /></td>
</tr>
<tr>
<td></td>
<td>Bottom (green) = DGPS</td>
<td><img src="image22" alt="Image of the RANGER terminal showing the bottom LED" /></td>
</tr>
<tr>
<td>11</td>
<td>Headland indicator/LED</td>
<td><img src="image23" alt="Image of the RANGER terminal showing the headland indicator/LED" /></td>
</tr>
<tr>
<td></td>
<td>Illuminates red when the vehicle crosses into a previously applied area</td>
<td><img src="image24" alt="Image of the RANGER terminal showing the headland indicator/LED in action" /></td>
</tr>
<tr>
<td>12</td>
<td>Power port</td>
<td><img src="image25" alt="Image of the RANGER terminal showing the power port" /></td>
</tr>
<tr>
<td></td>
<td>Connect main power cable</td>
<td><img src="image26" alt="Image of the RANGER terminal showing the power port in action" /></td>
</tr>
<tr>
<td>13</td>
<td>COM1 (serial) port</td>
<td><img src="image27" alt="Image of the RANGER terminal showing the COM1 port" /></td>
</tr>
<tr>
<td></td>
<td>Connect to external devices or transfer data</td>
<td><img src="image28" alt="Image of the RANGER terminal showing the COM1 port in action" /></td>
</tr>
<tr>
<td>14</td>
<td>Power (ON/OFF) switch</td>
<td><img src="image29" alt="Image of the RANGER terminal showing the power switch" /></td>
</tr>
<tr>
<td>15</td>
<td>Antenna port</td>
<td><img src="image30" alt="Image of the RANGER terminal showing the antenna port" /></td>
</tr>
<tr>
<td></td>
<td>Connect antenna cable</td>
<td><img src="image31" alt="Image of the RANGER terminal showing the antenna port in action" /></td>
</tr>
</tbody>
</table>
Guidance Mode Feature Comparison

RANGER supports two guidance options: Straight guidance mode and Contour guidance mode. Use the table below to learn about each mode.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Straight Mode</th>
<th>Contour Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guidance mode button and type</td>
<td>![Straight Mode Icon] Predefined parallel and numbered passes, where passes can be straight or circular.</td>
<td>![Contour Mode Icon] Freestyle, where RANGER guides relative to any previous pass.</td>
</tr>
<tr>
<td>Guidance display</td>
<td>![Straight Mode Display] GPS signal quality (3-4 bars typical with SBAS)</td>
<td>![Contour Mode Display] GPS signal quality (3-4 bars typical with SBAS)</td>
</tr>
<tr>
<td>Work recorded (logged) in memory?</td>
<td>Yes Although recorded work in Straight mode is not used for guidance, it is used if you switch to Contour mode and then want to make a pass along previous work.</td>
<td>Yes The recorded pass defines guidance for the next pass.</td>
</tr>
<tr>
<td>A and B points required?</td>
<td>Yes A/B points define the first pass; subsequent passes are laid out automatically.</td>
<td>No Guidance is based on previous passes.</td>
</tr>
<tr>
<td>Guide from previous pass?</td>
<td>No Straight guidance looks only at predefined parallel lines spaced by the implement width, as entered in the Swath Width menu.</td>
<td>Yes If RANGER recognizes a previous pass nearby, it automatically begins guiding on that pass. Wherever the previous pass goes guides the next pass.</td>
</tr>
<tr>
<td>Numbered passes?</td>
<td>Yes The first A=B line is pass 0 (zero). Passes to the right increment +1, +2, etc. and passes to the left decrement -1, -2, etc.</td>
<td>No</td>
</tr>
<tr>
<td>Swath width integrity across the field?</td>
<td>Yes All passes are equally spaced in multiples of the swath width (ideal for planting, harvesting, ditching, and furrowing).</td>
<td>No Guidance works from the last pass, so driving errors add as you work across the field. Each pass redefines the next pass.</td>
</tr>
<tr>
<td>Switch modes?</td>
<td>Yes Switch from Straight to Contour mode at any time by pressing the Contour button. Contour mode recognizes previous passes driven in Straight mode.</td>
<td>Yes Switch from Contour to Straight mode by pressing the Straight button. You then have the option of using a previous A=B line or setting a new A=B line.</td>
</tr>
<tr>
<td>Skip passes?</td>
<td>Yes You can complete passes in any order and they will still be equally spaced across the field.</td>
<td>Yes, however... If you skip an area, RANGER recognizes it as a new pass and continues logging. RANGER can guide using the new pass or continue guiding using previous passes.</td>
</tr>
<tr>
<td>Calculate field area?</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Setting Up RANGER

RANGER includes several settings that enable you to tailor your system to your needs. Review the following sections to quickly set up RANGER for your field.

- “Settings Overview” (below) - shows all the settings in a single map and describes the buttons you use to access the menu, navigate the menu, and change/view settings
- “Setup Menu” on page 11 - describes items on the Setup menu
- “Service Menu” on page 12 - describes items on the Service menu

Settings Overview

The map at right shows all available RANGER settings. The map enables you to quickly identify what settings are available and where they are in the menu system.

Use the map in conjunction with the button descriptions below to quickly change any applicable settings.

### Setup Menu

<table>
<thead>
<tr>
<th>Button</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Press MENU</td>
<td>to initially display the Setup menu (top menu in figure above).</td>
</tr>
<tr>
<td>When on the Setup menu, press MENU to exit the menu system.</td>
<td></td>
</tr>
<tr>
<td>When on the Diagnostics or Service menu, press MENU to return to the Setup menu.</td>
<td></td>
</tr>
<tr>
<td>When editing Swath Width, press MENU to move one place to the left (see Swath Width on the next page). For example, if the tens place is the current editable value, press MENU to move to the hundreds place.</td>
<td></td>
</tr>
</tbody>
</table>

### Service Menu

<table>
<thead>
<tr>
<th>Button</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use the arrows to move down or up the list of menu items. The selected menu item is preceded by ‘&gt;’.</td>
<td></td>
</tr>
<tr>
<td>When editing Swath Width, press the arrows to decrease (down arrow) or increase (up arrow) the current place (such as hundreds or tenths).</td>
<td></td>
</tr>
</tbody>
</table>

### Diagnostics

* The Diagnostics menu is read-only (you cannot change any Diagnostics values).
Setup Menu

To display the Setup menu, press

<table>
<thead>
<tr>
<th>Menu Item</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brightness</td>
<td>Range: 1 (low) to 10 (high) Default: 5</td>
<td>Display brightness. The LEDs indicate the level as you change it.</td>
</tr>
<tr>
<td>Swath Width</td>
<td>Default: 30.00 ft</td>
<td>Width of the implement or boom.</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Options: Low, Medium, or High Default: Medium</td>
<td>Guidance sensitivity level that determines how aggressively the RANGER steering guide LEDs guide you toward your pass when approaching it from close proximity.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Low: Smooth guidance adjustments, eventual lack of crosstrack accuracy (in this sense, crosstrack is the real-time, constantly changing perpendicular offset of the vehicle to the desired position on your pass).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Medium: Good compromise between smooth guidance and crosstrack accuracy; typical setting for most vehicles.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• High: Aggressive guidance adjustments with highest crosstrack accuracy.</td>
</tr>
<tr>
<td>Perimeter Setup</td>
<td>Options: Left, Center, or Right Default: Right</td>
<td>Edge of your swath width used in field area calculation. See &quot;Calculating the Area of a Field&quot; on page 15.</td>
</tr>
<tr>
<td>Diagnostics</td>
<td></td>
<td>See “Diagnostics Menu” on page 18.</td>
</tr>
<tr>
<td>Service Menu</td>
<td></td>
<td>See “Service Menu” on the next page.</td>
</tr>
</tbody>
</table>

To set Brightness, Sensitivity, Perimeter Setup:

1. Press **MENU**, then press the up/down arrows to select an item (the selected item is preceded by ‘>’).
2. Press **ENTER** to make the item editable.
3. Press the up/down arrows to change the value, then press **ENTER** to confirm the change.
4. Press **MENU** to exit the menu.

To set Swath Width:

1. Press **MENU**, then press the up/down arrows to select Swath width (preceded by ‘>’).
2. Press **ENTER** to display the swath width value with hundreds selected (underlined editable value).
3. Press the up/down arrows to change the selected value.
4. Press **ENTER** or **MENU** to select the next place to the right or left, respectively.
5. Press the up/down arrows to change the selected value.
6. Repeat steps 5 and 6 to change any other places.
7. Press **ENTER** until the hundredths place is selected, press **ENTER** again to return to the menu, then press **MENU** to close the menu.
Service Menu

To display the Service menu, press until Service is selected.

<table>
<thead>
<tr>
<th>Menu Item</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correction Type</td>
<td>Options: SBAS, e-Dif Default: SBAS</td>
<td>Differential correction type used by RANGER to improve GPS positioning accuracy.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- SBAS (default) is available throughout most of North America and does not require any configuration.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- e-Dif is most relevant outside North America and is intended only for relative guidance applications and is not recommended for data recording and subsequent comparative analysis.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>It is recommended that North America customers use the default (SBAS).</td>
</tr>
<tr>
<td>SBAS Satellite</td>
<td>Options: AUTO, W122, W134, W135, W138, E120, E124, E126, E131, M129, M137 Default: AUTO</td>
<td>Menu item appears only when correction type is SBAS. If not using AUTO (default), for North America SBAS coverage use a WAAS satellite (W122, W134, W135, or W138).</td>
</tr>
<tr>
<td>NMEA Port Setup</td>
<td>Options (defaults in bold): NMEA Port Baud: 19200, 9600, 4800 GGA: OFF, .2 HZ, 1 HZ, 5 HZ GLL: OFF, .2 HZ, 1 HZ, 5 HZ VTG: OFF, .2 HZ, 1 HZ, 5 HZ RMC: OFF, .2 HZ, 1 HZ, 5 HZ GSA: OFF, .2 HZ, 1 HZ, 5 HZ ZDA: OFF, .2 HZ, 1 HZ, 5 HZ</td>
<td>Baud and GPS message output rates used by RANGER:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- NMEA Port Baud: Data transfer speed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Messages (GGA through ZDA): Set the frequency of message data. For example, set GGA to 5 Hz to transmit GGA message data five times per second (once every 0.2 seconds).</td>
</tr>
<tr>
<td>Unit of Measure</td>
<td>Options: Feet, Meters Default: Feet</td>
<td>Unit of measure used throughout the display.</td>
</tr>
<tr>
<td>Language</td>
<td>Options: Multiple languages supported. Default: English</td>
<td>Language used throughout the display. Language options vary depending on the language group installed. Contact Customer Service for questions regarding language groups.</td>
</tr>
<tr>
<td>Reset Defaults</td>
<td>N/A</td>
<td>Reset factory defaults.</td>
</tr>
</tbody>
</table>

Note: RANGER supports third-party applications designed to receive DGPS signals from an external receiver over an RS-232 serial interface using NMEA 0183 messages. Various third-party connecting cables and kits are available for such applications as yield monitors, rate controllers, and laptops. Make sure RANGER and the external application use the same baud rate. When using an output rate of 5 HZ use a higher baud rate (such as 19200) than the default (4800).
To set Correction Type, SBAS Satellite, Unite of Measure, or Language:

1. From the Service menu, press down arrow until the item you want to edit is selected. When you first display the Service menu, Correction Type is selected.
2. Press ENTER to make the item editable.
3. Press the up/down arrows to change the value, then press ENTER to confirm the change.
4. Press MENU twice to exit the menu (return to ‘Ready’ screen).

To set NMEA Port Setup options:

1. From the Service menu, press down arrow until NMEA Port Setup is selected.
2. Press ENTER. NMEA Port Baud is selected.
3. Press ENTER to make the item editable, press the up/down arrows to change the value, then press ENTER to confirm the selection and return to the Service menu with the same item (NMEA Port Setup) selected.
4. Repeat steps 1 through 3 for each message (starting with GGA) that you want to change the message output rate.
5. Press MENU three times to exit the menu (return to ‘Ready’ screen).

To reset default settings:

1. From the Service menu, press down arrow until Reset Defaults is selected.
2. Press ENTER twice. * Please Wait * appears briefly then Reset Defaults is selected.
3. Press MENU twice to exit the menu (return to ‘Ready’ screen).

Using Straight Guidance

Drive the first pass along a straight side of the field or down the middle of the field to divide the field with a straight swath working out to each side.

Tip! Before driving A=B lines to work your field, you typically drive a perimeter along the edges of the field. You must use Contour guidance mode to drive the perimeter. This calculates the field area at the same time. See “Calculating the Area of a Field” on page 15.

Driving an A=B Line

An A=B line is an imaginary line that passes through two points to define the first pass. All other passes are uniformly spaced on both sides of the first pass.

Once an A=B line is established, RANGER generates an invisible array of equally spaced swath lines in multiples of the swath width parallel to and emanating from both sides of the A=B line (see figure at right) and provides guidance along any line you steer the tractor to.

While turning around at the headland, the nearest pass number is displayed. You can work passes in any order.

Note: Remember to press STOP Guidance when you no longer want RANGER to guide (no longer log data).
To drive an A=B line:

1. Position the vehicle at the beginning of the first pass.
2. Press **Straight**. Set New AB Pt is selected (preceded by ‘>’).
   
   *Note: If this is the first time using RANGER or if you have erased memory, only ‘Set New AB Pt’ appears and is selected. Otherwise, ‘Use Previous’ appears above ‘Set New AB Pt’ and is selected. Press the down arrow to select ‘Set New AB Pt’.*

3. With Set New AB Pt selected, press **ENTER**.
4. Press **ENTER** to mark Point A.
5. Drive the first pass, then at the end of the pass press **ENTER** to mark Point B. Upon marking Point B, RANGER automatically begins guiding and the screen indicates you are on pass 0 (zero).
6. Turn around and drive toward the next pass. RANGER auto-detects the pass and begins guiding.
   
The steering guide indicates if you are centered on your pass (vertical yellow LEDs) or if you need to steer left or right to become centered on your pass (red LEDs on left = steer to left; green LEDs on right = steer to right).

   The crosstrack bar indicates the pass is a certain distance left (red LEDs on left) or right (green LEDs on right) of your vehicle. As you steer toward your pass, fewer crosstrack LEDs are illuminated and when you are centered on your pass the center crosstrack LED is illuminated.

7. When you have finished your field press **STOP Guidance** to stop guiding (stop logging data). You are done, so you can press **MENU** to return to the ‘Ready’ screen.
Snapping the A=B Line to Your Current Position

While in Straight guidance mode, you can move (or ‘snap’) the A=B line to your current position (parallel to the original A=B line) on-the-go without interrupting guidance operation. This is typically used to correct for DGPS drift over time or to insert a desired gap (such as a conservation barrier strip) between consecutive parallel swaths.

1. While in Straight guidance mode, press up arrow once to display the snap screen.
2. Press Straight to align the nearest A=B line with the current vehicle position (AB LINE SNAPPED appears), then press down arrow to return to the Straight guidance screen.

Using Contour Guidance

You typically use Contour guidance when driving perimeters, turning around, and following contoured (uneven) fields. You can drive an initial pass or guide from a previous pass. When driving your initial pass, you do not need the steering guide lights as there is no previous pass to follow. When following a previous pass, RANGER provides guidance.

1. Press Contour before beginning the initial pass. The display shows “Logging Pass”.
2. Make the initial pass without using the steering guide.
3. At the end of the current pass, turn around and begin the next pass. RANGER automatically detects the previous pass and begins guiding on a new pass.

Guiding on Subsequent Passes

Anytime the vehicle is within half a swath width of a previously logged pass, RANGER automatically begins to guide. In Contour mode, RANGER can guide from any previous pass, even those made in Straight guidance mode.

Making A New First Pass (Starting a New Contour Pass)

While working a field in Contour mode, you may need to drive a pass that follows a different path than the previous passes. Simply drive the new path. Once RANGER recognizes the new pass, it starts logging data for this pass (displays ‘Logging Pass’ for the pass). Subsequent passes are guided from this newly defined pass.

Calculating the Area of a Field

At the beginning of each new field, you can use RANGER to calculate the field perimeter area of the first contour pass around the field. If you set units to feet, the area is in acres; if units are meters, the area is in hectares.

⚠️ CAUTION ⚠️ The following procedure involves erasing memory. You cannot recover erased memory.

To calculate the area of a field:

1. Erase any existing field data: Press STOP Guidance, press down arrow until Erase Memory is selected, then press ENTER. ‘Erasing Swaths’ may appear briefly on the screen before RANGER exits the menu.
2. Set the swath position used to calculate the perimeter: Press MENU, press either arrow (up or down) until Perimeter Setup is selected, then press ENTER. Press either arrow (up or down) until your preferred perimeter position (Left, Right, or Center) is selected, then press ENTER.
3. Drive the perimeter in Contour mode: Press Contour, then drive the vehicle around the outside edge of the field. During this time RANGER logs data (calculating the field area) and the screen displays ‘Contour Mode Logging Pass’. RANGER continuously updates the area calculation until the vehicle is within one swath width of the starting point. RANGER then automatically closes the perimeter and displays the final field area calculation.
   Note: You can press down arrow while driving your perimeter to view a constantly updated area calculation on the screen. Otherwise, wait until RANGER closes the perimeter (see next step).
4. Press down arrow to display the perimeter area calculations. The displayed AREA-’x’ shows the current perimeter setup selection where ‘x’ is L=left, C=center, or R=right.
Displaying Field and Driving Information While Receiving Guidance

While in either Straight or Contour guidance mode, use the up/down arrows to display the following field and vehicle information:

- Field area (calculated from driving a perimeter while in Contour mode—see “Calculating the Area of a Field” on page 15)
- Vehicle ground speed and heading (Speed units are based on the Units of Measure setting—mph if units are feet, kph if units are meters—see “Service Menu” on page 12)
- Snap (A=B TO SNAP) distance—this screen appears only if you are in Straight guidance mode and it enables you to move (‘snap’) the A=B line to your current position (if you are no longer on your A=B line)—see “Snapping the A=B Line to Your Current Position” on page 15

Repeatedly pressing an arrow button cycles through the screens at right; repeatedly pressing the other arrow button cycles through the same screens in reverse order.

Repeatedly pressing an arrow button cycles through the screens at right; repeatedly pressing the other arrow button cycles through the same screens in reverse order.
Performing Additional Tasks with RANGER

RANGER provides additional functionality via menu items that are available upon pressing STOP Guidance.

Pausing then Resuming Guidance

Pause guidance when you need to stop logging data, such as during turns or when relocating to another section of the field. This is useful during Contour guidance where you may want RANGER to suspend logging while driving toward a different pass.

1. Press STOP Guidance. Do not select any available menu items.
2. To resume guiding and logging data, press Straight or Contour. RANGER prompts to use the previously defined A=B line (Use Previous is selected on the menu).
3. Press ENTER to have RANGER provide guidance and start logging data.

Saving a Return Point

Whether suspending application at a preferred stopping point (such as to reload product) or at the end the day, you can record the end point so RANGER can later guide you to that stopping point.

1. Press STOP Guidance to stop guiding (stop logging data) and display additional menu items.
2. Press up/down arrow until Return Here is selected, then press ENTER (Will Guide Back To This Point appears onscreen).
3. (Optional) Press MENU to return to the ‘Ready’ screen.

Returning to a Saved Point

RANGER can guide you to a previously saved point, such as the point you needed to reload product to finish working your field.

1. Press STOP Guidance to stop guiding (stop logging data) and display additional menu items.
2. Press down arrow until Rtrn Prev Pt is selected, then press ENTER. RANGER provides guidance to the saved point (direction to turn and distance from point appear onscreen).
3. When you have reached the saved point, press Straight or Contour. RANGER prompts to use the previously defined A=B line (Use Previous is selected on the menu).
4. Press ENTER to have RANGER provide guidance and start logging data.

Switching Modes

You can switch from one guidance mode to the other.

1. While in one guidance mode (Str aight or Contour), press the other guidance mode button (Contour or Straight). RANGER displays menu options to use the previous A=B line or to set a new one.
2. Use the up/down arrows to select your preferred option (Use Previous or Set New AB Pt), then press ENTER.

Erasing Memory

Erasing memory removes all recorded passes and points for the job to prepare for a new job. You typically do this at the end of each field. There are 30.56 hours of total memory available. If you do not erase memory between fields, you may run out of memory during a job. If this happens, a ‘Memory Full’ message appears.

1. Press STOP Guidance.
2. Press down arrow until Erase Memory is selected, then press ENTER. ‘Erasing Swaths’ appears briefly then RANGER exits the menu (returns to ‘Ready’ screen).
Support
Use the following sections to:

- Review diagnostics information (below)
- Troubleshoot possible issues (page 19)
- Test antenna voltage or check DGPS position accuracy (page 20)

Diagnostics Menu

To display the Diagnostics menu, press until Diagnostics is selected.

The following table provides helpful RANGER operating/ troubleshooting information.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correction Type</td>
<td>Type of differential correction being used. RANGER supports two corrections types: SBAS (default) and e-Dif. Use e-Dif when/where SBAS is unavailable.</td>
</tr>
<tr>
<td>Sats</td>
<td>Number of GPS satellites currently visible in the sky (does not include correction satellites).</td>
</tr>
<tr>
<td></td>
<td>- Trk = number of satellites RANGER is tracking</td>
</tr>
<tr>
<td></td>
<td>- Use In Calc = number of tracked satellites used in the position calculation</td>
</tr>
<tr>
<td>STDEV</td>
<td>Pseudo-estimate of the DGPS solution accuracy determined as the RMS value of the positional residual errors. STDEV is valid only if six or more satellites are used in the solution calculation. Typical values for SBAS correction are 0.15 m - 0.45 m (0.5 ft - 1.5 ft).</td>
</tr>
<tr>
<td>HDOP</td>
<td>(Horizontal Dilution of Precision) Indicates the influence of the current GPS satellite constellation geometry on the horizontal accuracy of the position solution. Lower values of HDOP indicate better geometry. Typical values are 0.8 - 2.0.</td>
</tr>
<tr>
<td>Diff Age</td>
<td>Age (in seconds) of the DGPS corrections calculation. Optimal operating values are &lt; 7 sec.</td>
</tr>
<tr>
<td>Bit Error Rate</td>
<td>(Available only when SBAS is the correction type) Often abbreviated as BER, the bit error rate is the relative strength of the correction satellites. Two numbers are shown separated by a hyphen, where each number ranges from 0 to 500 with 0 being the best and 500 the worst. If BER &gt; 20 verify the antenna has a clear view of the sky to properly find and track correction satellites.</td>
</tr>
<tr>
<td>GPS Software</td>
<td>GPS software version.</td>
</tr>
<tr>
<td>App Software</td>
<td>Application software version.</td>
</tr>
<tr>
<td>Serial Number</td>
<td>RANGER console serial number.</td>
</tr>
<tr>
<td>Memory</td>
<td>Amount of remaining memory (in hours). All passes are recorded in memory until erased at the end of each field. To clear the memory, press STOP Guidance, press down arrow until Erase Memory is selected, then press ENTER.</td>
</tr>
</tbody>
</table>
Troubleshooting Flowchart

Use the flowchart below to help you troubleshoot RANGER, if necessary.

START

- Turn power switch on

- Does RANGER power on and stay on?
  - Yes: No
  - No: Is power switch off?
    - Yes: Is proper power present on power cable?
      - Yes: Does RANGER power on and stay on?
        - Yes: Can you achieve a GPS position?
          - Yes: Can you achieve a DGPS position?
            - Yes: Does antenna have clear view of sky?
              - Yes: Move antenna to better viewing location
              - No: Check WAAS Bit Error Rates (BER)
                - Yes: Change to SBAS mode
                - No: SBAS mode?
                  - Yes: Replace antenna cable
                  - No: Check WAAS Bit Error Rates (BER)
        - No: Is antenna power present?
          - Yes: Is antenna cable properly connected?
            - Yes: Check integrity of antenna cable connections
            - No: Replace antenna cable
          - No: Is the cable damaged?
            - Yes: Replace antenna cable
            - No: Check integrity of antenna cable connections
    - No: Is proper power present on power cable?
      - Yes: Verify power input voltage is 9 – 36 VDC
      - No: Check integrity of power cable connections
  - No: Is power cable properly connected?
    - Yes: Move antenna to better viewing location
    - No: Check integrity of power cable connections

- Is power cable properly connected?
  - Yes: Is proper power present on power cable?
    - Yes: Does RANGER power on and stay on?
      - Yes: Can you achieve a GPS position?
        - Yes: Can you achieve a DGPS position?
          - Yes: Does antenna have clear view of sky?
            - Yes: Move antenna to better viewing location
            - No: Check WAAS Bit Error Rates (BER)
              - Yes: Change to SBAS mode
              - No: SBAS mode?
                - Yes: Replace antenna cable
                - No: Check WAAS Bit Error Rates (BER)
        - No: Is antenna power present?
          - Yes: Is antenna cable properly connected?
            - Yes: Check integrity of antenna cable connections
            - No: Replace antenna cable
          - No: Is the cable damaged?
            - Yes: Replace antenna cable
            - No: Check integrity of antenna cable connections
      - No: Is proper power present on power cable?
        - Yes: Verify power input voltage is 9 – 36 VDC
        - No: Check integrity of power cable connections
  - No: Is proper power present on power cable?
    - Yes: Verify power input voltage is 9 – 36 VDC
    - No: Check integrity of power cable connections

- Is proper power present on power cable?
  - Yes: Verify power input voltage is 9 – 36 VDC
  - No: Check integrity of power cable connections

- Is power switch off?
  - Yes: Is power cable properly connected?
    - Yes: Move antenna to better viewing location
    - No: Check integrity of power cable connections
  - No: Is proper power present on power cable?
    - Yes: Verify power input voltage is 9 – 36 VDC
    - No: Check integrity of power cable connections

- Is power cable properly connected?
  - Yes: Move antenna to better viewing location
  - No: Check integrity of power cable connections

- Does RANGER power on and stay on?
  - Yes: No
  - No: Is power switch off?
    - Yes: Is proper power present on power cable?
      - Yes: Does RANGER power on and stay on?
        - Yes: Can you achieve a GPS position?
          - Yes: Can you achieve a DGPS position?
            - Yes: Does antenna have clear view of sky?
              - Yes: Move antenna to better viewing location
              - No: Check WAAS Bit Error Rates (BER)
                - Yes: Change to SBAS mode
                - No: SBAS mode?
                  - Yes: Replace antenna cable
                  - No: Check WAAS Bit Error Rates (BER)
        - No: Is antenna power present?
          - Yes: Is antenna cable properly connected?
            - Yes: Check integrity of antenna cable connections
            - No: Replace antenna cable
          - No: Is the cable damaged?
            - Yes: Replace antenna cable
            - No: Check integrity of antenna cable connections
      - No: Is proper power present on power cable?
        - Yes: Verify power input voltage is 9 – 36 VDC
        - No: Check integrity of power cable connections
    - No: Is proper power present on power cable?
      - Yes: Verify power input voltage is 9 – 36 VDC
      - No: Check integrity of power cable connections
  - No: Is proper power present on power cable?
    - Yes: Verify power input voltage is 9 – 36 VDC
    - No: Check integrity of power cable connections

- Is power switch off?
  - Yes: Is proper power present on power cable?
    - Yes: Does RANGER power on and stay on?
      - Yes: Can you achieve a GPS position?
        - Yes: Can you achieve a DGPS position?
          - Yes: Does antenna have clear view of sky?
            - Yes: Move antenna to better viewing location
            - No: Check WAAS Bit Error Rates (BER)
              - Yes: Change to SBAS mode
              - No: SBAS mode?
                - Yes: Replace antenna cable
                - No: Check WAAS Bit Error Rates (BER)
        - No: Is antenna power present?
          - Yes: Is antenna cable properly connected?
            - Yes: Check integrity of antenna cable connections
            - No: Replace antenna cable
          - No: Is the cable damaged?
            - Yes: Replace antenna cable
            - No: Check integrity of antenna cable connections
      - No: Is proper power present on power cable?
        - Yes: Verify power input voltage is 9 – 36 VDC
        - No: Check integrity of power cable connections
    - No: Is proper power present on power cable?
      - Yes: Verify power input voltage is 9 – 36 VDC
      - No: Check integrity of power cable connections
  - No: Is proper power present on power cable?
    - Yes: Verify power input voltage is 9 – 36 VDC
    - No: Check integrity of power cable connections
Testing Antenna Voltage

The RANGER antenna is powered by the console via the antenna wire. Using a voltmeter, test the antenna voltage to verify the console is supplying power to the antenna and that the antenna cable is not damaged.

1. Power off the console, disconnect the antenna cable from the antenna (leaving the antenna connected to the console), then power on the console.
2. Set the voltmeter to VDC, then measure the voltage output across the antenna cable. It should measure +5 VDC between the center conductor and exterior connector shell.
   - If the measurement is +5 VDC across the antenna cable, then neither the cable nor the console is damaged (antenna voltage test complete).
   - If the measurement is not +5 VDC across the antenna cable, continue at step 3.
3. Power off the console, disconnect the antenna cable from the console (the antenna cable should not be connected to the antenna or the console), then power on the console.
4. Using a voltmeter set to VDC, measure the voltage output across the antenna output on the console. It should measure +5 VDC between the center conductor and exterior housing.
   - If the measurement is +5 VDC at the console connector, but not at the end of the antenna cable, the cable is damaged. Replace the antenna cable and return to step 1.
   - If the measurement is not +5 VDC from the RANGER console, contact Customer Service to return the console for servicing.

Checking the DGPS Position by Verifying the BER

You can check the bit error rate (BER) via the BER value on the Diagnostics menu.

BER is a check of correction signal reception quality using a scale of 0 to 500. BER < 20 is ideal. If BER > 20 verify the antenna has a clear view of the sky to properly find and track correction satellites. When using SBAS for the correction type, RANGER tracks one or two correction satellites. Each satellite has a different BER and the BER value on the Diagnostics menu represents the values separated by a hyphen.

For example, a value of 8-500 means the RANGER has a very good signal on one satellite (BER=8) and is not receiving corrections from the other satellite (BER=500, the lowest reception value). Only one satellite must have a low BER value (less than 20) to provide differential corrections.