



# Sprayer Boom Height

## Control System

User Manual

Rev. 1A

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## WARRANTY AND LIABILITY:

Bestway, Inc. makes every effort to ensure that the highest quality materials and workmanship are used in the manufacturing of all its products including AutoGlide™ systems. Bestway Inc. provides a limited warranty on the AutoGlide™ System.

### **Valid Period:**

The limited warranty is valid for twelve (12) months from the date of retail to the original purchaser.

### **What is Covered:**

Under the limited warranty, Bestway, Inc. at its sole discretion will provide new components or repair defective components when AutoGlide™ system failures occur within the warranty period and such failures are due to defective components or poor workmanship in the manufacturing process. Any or all warranty coverage will be void if one or more of the regulations below are not observed, or if one or more of the exclusions below apply.

### **Regulations:**

1. Defective AutoGlide™ system components must be returned within thirty (30) days from the date of failure to Bestway, Inc. Hiawatha, Kansas through the dealer or distributor from whom the product was purchased; transportation charges prepaid.
2. A completed Owner's Registration Form from the original purchaser must have been received by Bestway, Inc. within 30 days from the purchase date to activate warranty coverage. Failure to submit this form may void any and all warranty coverage. AutoGlide™ warranty coverage is non-transferable.
3. Genuine Bestway, Inc. replacement parts and components thereof will be warranted for a period of ninety (90) days from date of purchase, or the remainder of the original equipment warranty period, whichever is longer to the original purchaser.
4. All AutoGlide™ warranty work is to be performed at an authorized Bestway dealer's location unless otherwise agreed upon by Bestway Inc.

### **Exclusions:**

1. Under no circumstances will warranty cover any merchandise or component thereof, which, in the opinion of Bestway, Inc., has been subjected to misuse, unauthorized modifications, alteration, an accident, collision with obstruction or ground, installed improperly, or if repairs have been made with parts other than those obtainable through Bestway, Inc. (*example: sonar sensors with signs of mechanical damage*).
2. This warranty shall not be interpreted to render Bestway, Inc. liable for injury or damages of any kind or nature to person or property. This warranty does not extend to the loss of crops, loss because of delay in harvesting, spraying, or any expense or loss incurred for labor, substitute machinery, rental, or for any other reason.
3. Except as set forth above, **Bestway, Inc. shall have no obligation or liability of any kind on account of its equipment and shall not be liable for special or consequential damages. Bestway, Inc. makes no other warranty, expressed or implied, and, specifically, Bestway, Inc. disclaims any implied warranty or merchantability or fitness for a particular purpose. Some states or provinces do not permit limitations or exclusions of implied warranties or incidental or consequential damages, so the limitations or exclusion in this warranty may not apply.**
4. This warranty is subject to any existing conditions of supply, which may directly affect our ability to obtain materials or manufacture replacement parts.
5. Bestway reserves the right to make improvements in design or changes in specifications at any time. Without incurring any obligation to owners of units previously sold.
6. No one is authorized to alter, modify, or enlarge this warranty nor the exclusions, limitations, and reservations. For more information, please call Bestway Inc. at (877) 390-4480.

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# 1 Introduction

The AutoGlide™ Sprayer Boom Controller system is intended for use on agricultural sprayers and other equipment where a constant height needs to be maintained. The AutoGlide™ Controller automatically adjusts the sprayer's booms up and down to maintain a fixed distance above the ground or crop canopy. This relieves the operator of the need to constantly adjust boom height in uneven or hilly terrain. It also allows the operator to select the optimal spraying height to maintain an even spray pattern.

The AutoGlide™ system consists of the following major components:

- Controller, for mounting in the cab.
- Interface box, for mounting on the sprayer.
- Two or more sonar (ultrasonic) range sensors, mounted on the booms.

The Controller has a backlit LCD display to show information messages to the operator. It uses a simple operator interface, and an alarm buzzer to alert the operator when an alarm condition occurs. The Controller has a detachable power cable to connect to + 12V in the cab, and a detachable communication cable to connect to the Interface box on the sprayer.

The Interface box connects to the sonar sensors, and to the hydraulic valves that control the up and down motion of the booms. The Interface box also requires a power connection to supply the current needed to operate the hydraulic valves. Connections in the Interface box are made using screw terminals. All cables enter the Interface box through liquid-tight cable glands to protect the Interface box electronics from moisture and dust.

The sonar sensors have a quick-disconnect connector to simplify sensor installation and replacement. Mounting brackets are supplied for the sonar sensors to facilitate easy mounting.

## 2 Installation --- see page 35 for specific Bestway Installation Information

*CAUTION: While installing the AutoGlide™ system and while doing tests on the installed system, you MUST follow all safety precautions as listed in the operator's manual for your machine model. These safety precautions are designed to keep you, any bystanders, and the equipment itself safe while doing repairs, installing components, and testing various functions.*

**WARNING:** *If you are installing on a late model John Deere sprayer, be sure to read the warning note in section 2.5 below!*

### 2.1 Overview of Installation Procedure\*\*

To install the AutoGlide™ system on your sprayer, follow these steps:

1. Install the Controller in the cab, and connect it to 12V DC power.
2. Install the Interface Box near the valve bank, and connect it to 12V DC power.
3. Route the Controller-to-Interface cable from the Interface Box to the Controller.
4. Connect the solenoid valves to the Interface Box.
5. Mount the sonar sensors on the booms, and route their cables to the Interface Box.

**\*\*Contact Bestway, Inc. if you have ANY questions regarding installation. (877) 390-44880**

6. Test the sensor and solenoid connections.
7. Run the Self Calibration procedure to calibrate the system to your sprayer.
8. Test the system, and adjust its response to suit your needs.

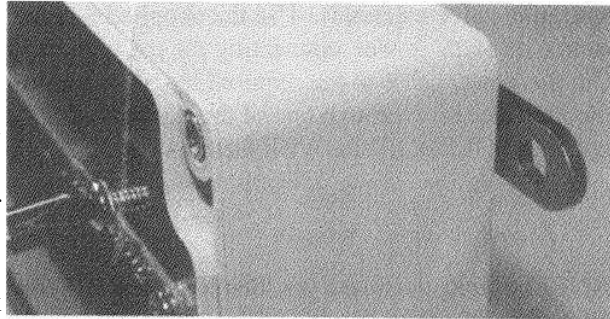
Please read through all of the installation instructions before starting the installation work. You will also need to read section 3 to learn how to operate the Controller.

If you have excess length on any of the cables, you can simply coil it up and tie it in place in any convenient location. Alternatively, you can cut off the excess cable length at the Interface box, cut back the cable jacket, and strip the wire ends. However, note that the shielded cables (RH223 and RH229) use a bare drain wire. You will need to insulate this bare wire using heat shrink tubing or similar insulating sleeve to avoid accidental short circuits in the Interface Box.

## **2.2 Controller Installation**

The Controller should be mounted in a position where the operator can easily see the display. Because the Controller is quite light, it can be conveniently mounted using strips of industrial strength self-adhesive Velcro.

You can also bolt the Controller in place using the supplied mounting brackets. The mounting brackets provide pre-drilled mounting ears on either side of the case that make it easy to mount the case. To use the brackets, first remove the lid from the Controller box. There are 4 mounting holes near the corners of the box. Use the supplied #6 machine screws (with lock washers) to attach the mounting brackets to the Controller.



Connect the Controller to 12V power using the supplied power cord (part # RH230). Connect the black wire to Ground and the red wire to + 12V. It is usually preferable to use a source of power that turns off with the ignition to avoid draining the vehicle battery if the Controller is accidentally left on.

Be sure to turn off power to the Controller before connecting the cable to the Interface Box. Working with the power on can result in sparks, blown fuses, and destroyed electronics.

## **2.3 Interface Box Installation**

The Interface Box should be mounted in a location that minimizes the distance to the +12V power and hydraulic valve connections. Voltage loss increases as cable lengths increase. Some solenoid valves are quite sensitive to low voltage and will not work properly. This problem is avoided by keeping distances to a minimum.

The Interface Box should be protected as much as possible from the elements and from pressure washing.

Mount the Interface Box using the supplied mounting brackets. Attach the mounting brackets to the box in the same way as for the Controller (described above).

*NOTE: The Interface Box is supplied with all necessary cables pre-wired, eliminating the work of connecting each wire inside the Interface Box. The following detailed instructions are included in case you need to disconnect one or more cables during installation.*

Take a look at the circuit board in the Interface Box, and the labels beside the various screw terminal blocks. These labels match the wiring instructions in this manual and on the inside of the Interface Box lid.

Route the Interface cable (part # RH229) from the Controller to the Interface Box. The 4- pin connector of this cable will plug into the Controller. Run the other end of this cable into the Interface Box using the top right cable gland. Connect the four wires to the 4- position "MON" terminal block as follows:

|      |           |
|------|-----------|
| COMA | Black     |
| COMB | White     |
| +12V | Red       |
| GNO  | Bare wire |

The Interface Box requires its own source of + 12V power to provide power to drive the hydraulic valve solenoids. Use the supplied 2-conductor cable (RH224) to connect to a source of + 12V power, connecting the red wire to + 12V and the black wire to Ground. Cut the power cable to the required length to minimize voltage drop. Run the cable into the Interface box through one of the bottom cable glands. Connect the two wires to the 2- position SOLENOID POWER terminal block as follows:

|      |       |
|------|-------|
| +12V | Red   |
| GNO  | Black |

*NOTE: Some equipment (eg. **Brandt, Double L**) uses a common +12V connection for the hydraulic solenoids instead of the usual common ground. If you have this kind of electrical setup, connect both the red and black wires of the RH224 cable to Ground. You must also select "LOW" for the OUTPUTS ACTIVE setting of the MACHINE SETUP menu.*

Use the 6-conductor cable (RH225A) to connect to the hydraulic solenoid valves that control raising and lowering of the booms. Cut the solenoid cable to the required length to minimize voltage drop. Run this cable into the Interface box through one of the bottom cable glands and connect it to the output terminal block as follows: *(see pg. 32 for Bestway sprayer)*

|     |       |                                                            |
|-----|-------|------------------------------------------------------------|
| CDN | Blue  | Lowers the center boom <i>(or Secondary Shuttle)</i>       |
| CUP | Brown | Raises the center boom <i>(or Raise/Lower w. Shuttle)</i>  |
| RDN | Green | Lowers the right boom                                      |
| RUP | White | Raises the right boom <i>(or Raise/Lower with Shuttle)</i> |
| LDN | Black | Lowers the left boom                                       |
| LUP | Red   | Raises the left boom <i>(or Raise/Lower with Shuttle)</i>  |

**Bestway Sprayer Use Only**

|                        |
|------------------------|
| FASSE block = Not Used |
| FASSE block = BLUE     |
| FASSE block = Not Used |
| FASSE block = WHITE    |
| FASSE block = Not Used |
| FASSE block = BROWN    |

The CDN and CUP outputs are only used in installations where the center rack height is to be controlled. *(Ex: 3 or 5 sensor systems)*

Note that for Lift/Tilt control of a combine header, the "Left" outputs are used to control lift, while the "Right" outputs are used to control tilt.

If your sprayer has an open center hydraulic system or uses a shuttle valve, use the remaining 2-conductor cable (RH226) to connect these valves:

*\*(only SHUTTLE required on Closed Center Bestway Sprayers – both required for Open Center systems)*

MSTR            Black    Master valve – (attach to RED Wire on Fasse Block – O.C. Only)

SH                Red        Shuttle valve – (attach to YELLOW Wire on Fasse Block - ALWAYS)

The *Master valve* output is used in open center hydraulic systems. In an open center hydraulic system, when no valves are activated, the oil is permitted to flow freely through the center of the valve block. When a valve is activated, the valve block's center opening must be closed to force the hydraulic oil through the activated valve. This is done by activating a solenoid valve that blocks this center flow. The *Master* output is provided to activate this solenoid. It can also be used to drive a "jam valve" or "priority valve" used in some hydraulic systems.

A *shuttle valve* is used in some hydraulic valve blocks to choose the direction of oil flow. With this arrangement, a bank of non-directional valves is used to select which cylinder to move, while the shuttle valve chooses the direction the selected cylinder will move. In this configuration, outputs LUP, RUP, and CUP are used to power the valves that select the Left, Right, and center boom cylinders, respectively. Each output will be activated for both raising and lowering of its boom. The shuttle valve output will determine whether the boom is raised or lowered.

If your sprayer's shuttle valve uses two solenoid valves, connect one solenoid to SH, and the other to CDN. One valve is activated to raise the booms, and the other to lower the booms. SH is the primary shuttle output, and will be activated according to your Shuttle configuration (see "Shuttle Valve" in section 10). Whenever a boom function is raised or lowered, CDN will be activated if SH is not, mirroring the action of the primary shuttle output.

There are some (rare) machines that use a shuttle valve as well as two solenoid valves per boom. In this case, connect the Raise and Lower outputs to each solenoid pair, and the Shuttle output (SH) to the shuttle solenoid.

If not all wires in each cable are used, insulate the unused wire ends with some electrical tape.

If not all of the cable entry glands of the Interface box are used, be sure to "plug" each unused gland with a short piece of cable. This prevents dirt and moisture from entering the Interface box.

## **2.4 Junction Box Installation (optional)**

If you have purchased a 4 or 5 sensor system, a small Junction Box is supplied to connect the extra sonar range sensors. Mount the Junction Box close to the Interface Box. Fasten it using two #6 screws through the mounting holes in the back of the box. Route Junction Box-to-Interface Box cable into Interface Box and connect to Sensor 3 Block. If Center Rack Sensor is optioned then it is reconnected through the Junction Box. **NOTE: It does not matter where a sensor cable is routed. Only requirement is each LABELED sensor MUST mount in a specific location as noted in Section 2.6.\***

## **2.5 Wiring the Control Solenoids**

**WARNING:** If you are installing on a late model John Deere sprayer, you need to install a diode kit. Failure to use the diode kit may result in damage to the sprayer's control electronics as well as to the AutoGlide™ system. As of this writing, the diode kit is known to be required on models 4630,4730,4830,4920,4930, and 4940. If in doubt, contact Bestway, Inc. before proceeding with the installation.

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After connecting the 6-conductor solenoid cable to the Interface Box, you must connect the wires at the other end of the cable to the respective solenoids.

You can make these wire connections at the control switches you use to manually control the boom height. However, these switches are often mounted on a control joystick or console that is difficult to open or work within.

It is therefore generally much easier to connect directly to the hydraulic solenoid valves. You can determine which solenoid valve controls which function from a diagram of the hydraulic connections on the sprayer, which might be found in the owner's manual for the sprayer. Alternatively, you can follow the hydraulic lines from the control cylinders back to the solenoid valves to find out which solenoid controls which function. You may want to label each solenoid as you identify it (Left Up, Left Down, Right Up, Right Down, and optionally Center Up and Center Down). *See hydraulic block schematic for Bestway sprayers on pg 32.*

Once you have located all the solenoids, connect the respective wires from the RH-225A cable to each of the solenoids. Sometimes these wires can connect directly to the terminals on the solenoids. **Special Y-Cables are provided for Bestway Sprayers to be used with FASSE hydraulic blocks.** You can also splice into the existing wires using self stripping tap connectors, crimp connectors, or by soldering the wires together. Make sure that all connections are secure, and that all exposed conductors are insulated with electrical tape or heat shrink tubing.

If your sprayer uses an open center hydraulic system, or a shuttle valve, you may need to refer to the owner's manual for your sprayer to determine the location of these solenoid valves. If your sprayer uses a shuttle valve, be sure to read the "Machine Setup Shuttle Valve" description in section 10. *See hydraulic block schematic for Bestway sprayers.*

## **2.6 Sonar Range Sensor Installation**

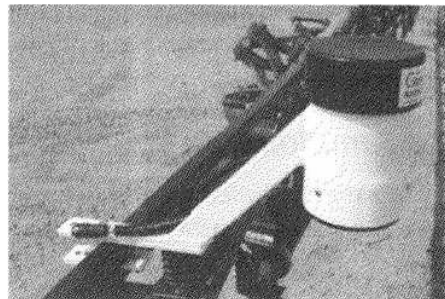
The sonar range sensors measure the distance between each boom and the ground or crop canopy. The sensors should be mounted near the tip of each boom. To reduce the possibility of damage to the sensors, it is best not to mount the sensors right at the boom tip, but to mount them some distance from the tip. *Approximately 12"-36" in from boom tip is a good place to start.* One can always move wing sensors to get the best results for particular operation.

If you have purchased a 4 or 5 sensor system, install the "Left 2" and "Right 2" sensors near the mid-point of each boom.

If you have a sensor for the center section, mount it anywhere on the center section that gives the sensor a clear view of the ground. On Bestway sprayers, center sensor must be mounted facing front of sprayer with main sensor strap underneath frame.

**Sensor will hit H-Frame if not properly installed.**

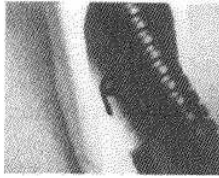
To minimize the possibility of interference from spray, it is best to mount the sonar sensors midway between spray nozzles.



The sonar sensors are supplied pre-installed in their mounting brackets. The sensor mounting brackets provide for easy mounting on most sprayer booms, and provide a break-away feature to protect the sensors in case of a collision. For smooth functioning of the break-away swivel action, apply a little grease between the bracket's two curved plates to allow them to slide freely.

When deciding where to mount the sonar sensors, keep in mind that the sensors need an unobstructed view of the ground. Also note that the sensors cannot measure any distance less than 12 inches. If you plan to operate very low above the crop canopy, you may wish

to mount the sonar sensor brackets to the top of the boom.



At the base of the riser tube of each sensor bracket, each bracket is labeled "L" for *Left*, "R" for *Right*, or "C" for *Center*. Mount the *Left* sensor on the left boom, the *Right* sensor on the right boom, and the *Center* sensor on the centre section. If you have purchased a 4 or 5 sensor system, install the "L2" sensor near the mid-point of the left boom, and the "R2" sensor near the mid-point of the right boom.

The sensor mounting brackets provide a simple two-plate clamp to fit around the square or round tubing used in the construction of most sprayer booms. Position the top and bottom clamp plates around the boom's tubing in the selected location, and insert the rear bolt through the plates as close as possible to the tubing. Tighten the nuts on both clamp bolts until the bracket assembly is held securely in place.

The cable to the Interface Box plugs into the connector on the sonar sensor's short cable. When fastening the sensor cables in place, leave enough slack cable to allow the bracket to swing both ways without putting stress on the cable.

To provide protection for the sensor connector, you can push the cable into the sensor riser tube so that the connectors are inside the riser tube. To do this, first remove the cap from the top of the sensor bracket. Remove the screws holding the cap, and lift off the cap. Gently pull the cable up the riser tube until the connector pair is hidden inside the riser tube. Coil the excess cable inside the bracket, and replace the cap on the sensor bracket, securing it with its mounting screws.

Route the sensor cables (RH223) to the Interface box, and insert them into the Interface box using two (or three) cable glands on the right of the box. Connect 4 wires of each cable to one of the three 4-position U-SENSORS terminal blocks as follows:

|     |           |
|-----|-----------|
| A   | Black     |
| B   | White     |
| V+  | Red       |
| GND | Bare wire |

It does not matter which terminal block is used for each sensor.

**\*For a 4 sensor or 5 sensor installations, a Junction Box is supplied to connect the extra sensors. Route 2 of the sensor cables directly into the Interface Box. The remaining 2 or 3 sensors will connect to the Junction Box. A short cable from the Junction Box connects to the Interface Box at the open sensor block. Wire colors and terminal block names are identical between the Junction Box and the Interface Box.**

## **2.7 Tilt Sensor Installation (optional) NOTE:**

*The tilt sensor is not used in sprayer installations.*

If you have the optional tilt sensor, mount it to the side of the boom so that the sensor rotates clockwise when the boom is lowered.

Plug the tilt sensor into the tilt sensor cable's 3-pin connector. Run the tilt sensor cable to the Interface Box, using a spare cable gland to enter the Interface Box.

Connect the 3 wires from the tilt sensor cable to the ANALOG IN terminal block in the Interface Box as follows:

|     |       |
|-----|-------|
| +5V | Red   |
| A1  | Green |
| GND | Black |

Be sure to perform Sonar Arm Level calibration and configure the Sonar Tilt Arm in the Machine Setup menu.

## **2.8 Test the Connections**

Once everything is installed and connected, you should test the connections to ensure that everything is connected correctly. Use the TEST menu to check that each part of the system is working correctly (see section 8). Refer to the Troubleshooting section for more information about how to diagnose and correct problems.

Use the SENSORS option of the TEST menu to check the sonar sensors. All sonar sensors should show correct distance readings with the booms extended and at a reasonable working height. Ensure the Sensitivity is set to at least 90%. If a sensor does not show a good reading, check the connection to that sensor.

To check the connections to the solenoids, use the SHOW OUTPUTS option of the TEST menu. Activate the up and down controls for each boom in turn, and the display. As you activate each function, the corresponding output name should appear: LU for Left Up, LD for Left Down, etc. If you have connected a Master and/or Shuttle solenoid, its status will be indicated in the top line of the display (showing MSTR and SH).

If you have a Shuttle solenoid, configure its operation in the Shuttle Valve option of the Machine Setup menu (see section 10). Required on all Bestway sprayers.

If all the solenoid connections look right, use the OUTPUTS option of the TEST menu to test the AutoGlide™ system's ability to raise and lower each boom (Left, Right, and Center).

Once you have confirmed all the connections, ensure that both booms are extended and put the system in Automatic mode. Both booms should be moved to the target height.

## **2.9 Perform Self-Calibration**

After you have confirmed that all the system connections are correct, run the Self Calibration procedure to calibrate the AutoGlide™ system to your sprayer. Refer to section 11 below for more information.

## **2.10 Field Test and Adjust Operating Parameters**

As the final installation step, take your sprayer for a test drive. Extend the booms and activate Automatic mode. Watch the control of the booms as you drive, and see how the booms respond to changes in the terrain. You can speed up or slow down the response to changes by adjusting the DELAY parameters of the CONFIG menu. You can change how closely the system maintains the target height by adjusting the DEAD BAND parameter.

# **3 How to Use the Controller**

## **3.1 User Controls**

The Controller has a simple membrane keypad with 7 buttons.

The PWR button is used to turn the system on and off. When the Controller is off, briefly pressing the PWR button will turn on power to the Controller. To turn off Controller power, press the PWR button and hold it down for 2 second until the Controller displays:

Power off . . .

When you see this message, release the PWR button, and the Controller will turn off. The left and right arrow buttons are used to move to the previous or next item in a menu. The up and down arrow buttons are used to change the value of a parameter.

The ENT button is used to accept the current selection.

The ESC button exits the current menu without saving the current selection.

### **3.2 Using the Menu System**

During normal operation, you will generally not need to make any changes to the Controller's configuration settings. However, for initial configuration and adjusting operating parameters, and for problem diagnosis, you will need to use the Controller's menu system.

To get the most out of the instructions below, read through them with the Controller in front of you and powered up.

When the Controller is powered up, it starts up in Manual mode, displaying the main menu. Use the left and right arrow buttons to highlight the desired menu option, and then press ENT to select that menu option.

You can always return to the main menu by pressing ESC several times.

In the main menu the first option is named "Enable Auto". Selecting this option will put the Controller into Automatic mode, where it controls boom height. *Be sure to have both booms fully extended before engaging Automatic mode. **IMPORTANT:** Engaging Automatic mode with booms stowed may cause damage to boom, sprayer, or tractor.*

The Controller's display has two lines of text. In each menu, the top line is used to display the name of the menu. The bottom line is used to display the currently selected menu item. As you choose different menu items, the bottom line changes to show the newly selected item. Arrows at the far left and right of the bottom line indicate whether there are more items to be selected to the "left" or "right".

Changing a parameter value works in a similar way to selecting a menu item. Use the Up and Down arrow buttons to choose the desired value, and then press ENT to save that value and return to the previous menu.

## **4 Automatic Mode Operation**

When you turn on the Controller, it will start up showing the main menu "Enable Auto" option. Pressing ENT will put the Controller into Automatic mode. *Be sure to have both booms fully extended before engaging Automatic mode.* In Automatic mode the Controller will raise or lower the booms to maintain the desired height above the ground or crop canopy.

You can exit Automatic mode by pressing ESC. If the OVERRIDE configuration option is set to "Exit Auto" (see section 7.8), then you can also exit Automatic mode by manually briefly raising or lowering a boom.

In Automatic mode, the display will show something like the following:

```
AUTO: 38.0
      37      39      40
```

The first line of the display indicates the Controller is in AUTO (Automatic) mode, and shows the "target height" -- that is, the height above the ground or crop canopy that the Sprayer Boom Controller is trying to maintain.

In Automatic mode the up/down arrow buttons are used to adjust the target height up or down. This is useful for making on-the-go height adjustments. Note that this adjusted value is not saved when the Controller is turned off. To make a permanent change to the target height, use the HEIGHT option of the CONFIG menu.

If the center sonar sensor is used as the height reference, the target height is set by the center sensor, and cannot be adjusted manually. No separate target height is displayed in the top line in this configuration. Instead, the center sensor height displayed on the second display line defines the target height.

The second line of the display is the status line. The status line is always used to display the status of the system, or to display alarm messages. In normal operation, the height measured by each sonar sensor is displayed (Left, Left 2, Center, Right 2, Right).

If a sensor cannot provide a good distance reading, it will show "--". If a sensor does not provide a good distance reading, the Controller will normally not adjust the height of that boom, and may sound an alarm (depending on the SENSOR ALARM setting). If the NO-RANGE LOWER option is enabled, the Controller will lower the boom in an attempt to get the sonar sensor back in range.

When the Controller activates one of its outputs to raise or lower a boom, it will indicate this by showing U or D (for "Up" or "Down") beside the respective sensor distance reading on the status line.

If the OVERRIDE configuration option is set to "Enable/Disable" or a time-out value, each sensor reading will be replaced by "Man" (for "Manual") whenever the respective boom is not under automatic control (see section 7.8).

If the Controller encounters an error condition, an alarm message will be displayed on the status line, and the alarm buzzer will sound. In most cases the control outputs are turned off when an alarm is active. Refer to the Error Messages section for details about each error.

## 5 Error Messages

Following is a list of error messages you may encounter, and their meaning.

```
FAULT on LUP: Open Circuit
```

This message may be displayed upon entering Auto, Test, or Self Calibration. It indicates the LUP output is not connected to a solenoid. The LUP output must always be connected for the system to function. Press ESC to clear this message.

#### FAULT on LUP: Short Circuit

This message may be displayed upon entering Auto, Test, or Self Calibration. It indicates the LUP output is shorted to ground. Some late model John Deere sprayers require a diode kit to isolate the AutoGlide's outputs from the sprayer's controls. Contact Bestway, Inc. for details. Press ESC to clear this message.

#### Output FAULT:

The system attempted to activate the output, but the output did not show the expected voltage. The line following the message lists the affected output(s). This may indicate a missing or inadequate power supply to the Interface box. It may also indicate a short circuit in the output wiring. Press ESC to clear this message.

#### L/R/C Raise time-out

The measured boom height is too low, but the controller was unable to raise the boom to correct it within the time set by the RAISE timeout configuration parameter. The boom may have reached its maximum height. This alarm can be disabled by the TIMEOUT ALARM configuration option.

#### L/R/C Lower time-out

The measured boom height is too high, but the controller was unable to lower the boom to correct it within the time set by the LOWER timeout configuration parameter. The boom may have reached its minimum height. This alarm can be disabled by the TIMEOUT ALARM configuration option.

#### Interface error

The Controller is not receiving data from the Interface Box. If you see this message, check that the Interface box cable is correctly connected to the Controller, and that the cable has not been pinched or damaged. Refer to the Troubleshooting section for more information.

#### IFU Power low

The Interface Box requires a separate power supply connection to supply the high current needed to drive the hydraulic solenoid valves. This error message indicates that this power supply voltage is too low (or missing altogether). Check that the Interface Box power supply is connected to a good source of power with sufficient current supply to drive all the solenoids. If this message appears briefly whenever an output is activated, there may be too much voltage drop in the power supply wiring to the Interface Box. Ensure that the power supply cable is as short as possible.

When a sonar sensor reading shows dashes, it means that sensor is not getting a valid distance reading. This usually happens when the boom is too far above the ground, or the sonar sensor sensitivity is set too low. It can also happen if dirt or debris builds up on or in front of the sensor.

XX

A sonar sensor reading of XX indicates the sonar sensor is not responding. Check the wiring to the sonar sensor.

WW

If a VALID WINDOW is configured, this display means the sensor reading is outside the valid range.

## 6 Main Menu

When the Controller is in Automatic mode, pressing the ESC button brings up the main menu, which has the following options:

Main:

Enable Auto  
CONFIG  
TEST  
MACHINE SETUP  
SELF CAL.

The CONFIG menu is used to configure various operating parameters of the Controller. The TEST menu provides options to test sensors and connections to help in diagnosing problems. The MACHINE SETUP menu is used to set the Controller up for the connections made to the sprayer. The SELF CAL. option is used to initiate automatic calibration of the controller to optimize its performance on your sprayer.

## 7 Configuration Menu

Selecting CONFIG from the main menu brings up the configuration menu:

Config:

DEAD BAND  
DELAY FOR UP  
DELAY FOR DOWN  
HEIGHT  
QUICK RAISE HT  
SENSOR SENS.  
SENSOR ALARM  
OVERRIDE  
OVERRIDE ALARM  
LOWER T.O.  
RAISE T.O.  
TIMEOUT ALARM  
MOTION CONTROL  
OFF ANT. T

BOOM INTERACT  
B.I. DIRECTION  
VALID WINDOW  
NO-RANGE LOWER (NOT USED ON SPRAYERS)

Note that all height parameters are in units of inches. Time parameters are in units of seconds.

### **7.1 Config Dead Band**

The DEAD BAND option of the CONFIG menu allows you to change the amount of error allowed in the measured boom height before the Controller will adjust the boom. The Controller will not raise or lower the boom unless the measured height is greater than the Target Height plus the Dead Band or less than Target Height minus the Dead Band.

Dead band=  
5.0"

Choose the desired maximum error in the range of 0.5" to 10.0", in steps of 0.5", and press ENT to save the new value. The default value is 6.0", Typical values are in the range of 3.0" to 8.0".

### **7.2 Config De/lay for Up**

The DELAY FOR UP option of the CONFIG menu allows you to change the time the Controller waits before raising the boom when it is too low. When the system sees the distance is below the acceptable range, it will wait this amount of time before raising the boom. This avoids frequent small adjustments.

Delay for up=  
0.9 sec

Choose the desired delay in the range of 0.1 seconds to 5.0 seconds, in steps of 0.1 second, and press ENT to save the new delay time. The default value is 1.0 sec. Typical values are in the range of 0.5 to 1.5 sec,

### **7.3 Config De/lay for Down**

The DELAY FOR DOWN option of the CONFIG menu allows you to change the time the Controller waits before lowering the boom when it is too high. When the system sees the distance is above the acceptable range, it will wait this amount of time before lowering the boom. This avoids frequent small adjustments.

Delay for down=  
0.9 sec

Choose the desired delay in the range of 0.1 seconds to 5.0 seconds, or choose "default", and press ENT to save the new delay time. If you choose "default", the Delay for Down will be the same value as "Delay for Up" (see above).



## **7.4 Config Target Height**

The HEIGHT option of the CONFIG menu allows you to change the default target height. This is the height of the sensors above the ground or crop canopy that the Controller attempts to maintain in Automatic mode.

Target height= 23.5"

Choose the desired distance in the range of 15.0" to 90.0", in steps of .5", and press ENT to save the new target distance. The default value is 40.00".

Note that the minimum possible value is reduced if an Offset value is set in the Machine Setup menu.

## **7.5 Config Quick Raise Ht.**

The QUICK RAISE HT option of the CONFIG menu allows you to change the minimum height the Controller will accept for normal operation. If a sonar sensor reads a height smaller than this height, the Controller will immediately raise the boom without waiting for the usual DELAY time.

Quick Raise ht.= 15.0"

Choose the desired height in the range of 15.00" to 90.00", in steps of .5", and press ENT to save the new minimum height. Selecting "Disabled" will turn off the Quick Raise feature. The default value is 15.0".

Note that the minimum possible value is reduced if an Offset value is set in the Machine Setup menu.

*NOTE: The Quick Raise Height is intended as a kind of emergency override when the boom gets too close to the ground. It should normally be set much lower than the Target Height. Setting Quick Raise Height close to the Target Height may result in unstable operation.*

## **7.6 Config Sensor Sensitivity**

The SENSOR SENS. option of the CONFIG menu allows you to adjust how sensitive the sonar sensors are. The higher the value of this parameter, the more sensitive the sensors will be.

Sensor Sens.=

85%

Choose the desired sensitivity in the range of 5% to 100%, in steps of 5%, and press ENT to save the new value. The default value is 90%. Typical values are in the range of 60% to 100%. See section 8 for more information.

Note that the Sensor Sensitivity can also be adjusted in the Test Sensors display screen.

## **7.7 Config Sensor Alarm Delay**

The SENSOR ALARM option of the CONFIG menu allows you to change how quickly the Controller sounds an alarm when it encounters an out-of-range sensor reading. Choose from the following options:

Sensor alrm dly=

0 sec

1 sec

2 sec

3 sec

4 sec

5 sec

Never

The default setting is 1 sec. This means that when the Controller detects an out-of-range sensor reading, it will wait 1 second before sounding an alarm. Brief out-of-range readings will therefore not cause any activation of the alarm, avoiding nuisance alarms.

Choose the alarm delay setting that best suits your operation. Choosing "Never" means the Controller will never sound an alarm to indicate an out-of-range condition (and you may therefore have to keep an eye on the readings).

## **7.8 Config Override**

The OVERRIDE option of the CONFIG menu allows you to change how the Controller responds when you manually activate the boom hydraulics in Automatic mode. Choose from the following options for Override:

Override=

Exit Auto

Enable/Disable

1 sec

2 sec

3 sec

4 sec

5 sec

The simplest setting is "Exit Auto". This means that when the Controller detects manual activation of the boom hydraulics it will exit Automatic mode and return to the main menu. You will need to press ENT to re-engage Automatic mode.

The default setting is "Enable/Disable". In this mode the Controller interprets manual activation of the boom hydraulics as a trigger to enable or disable automatic control of each boom. Pressing the Up switch for a boom will disable automatic control of that boom. The sonar distance display for that boom will be replaced by "Man." to remind you that the boom is under manual control, and automatic control of that boom is disabled. Pressing the Down switch will re-enable automatic control.

You can also select a time-out value (in the range of 1 to 5 seconds). This is useful if you frequently need to temporarily override the operation of the AutoGlide™ system to deal with obstructions or other unusual features in the field. If a time-out value is selected, the Controller will temporarily suspend automatic control of a boom when it detects manual activation of the boom hydraulics. The sonar distance display for that boom will be replaced by "Man." to remind you that the boom is not under automatic control. After the time period expires, it will resume automatic control of the boom.

Every time automatic mode is disabled or enabled for a boom, a short beep will sound to alert you to the change in control mode. If these beeps are unnecessary, you can disable them by disabling the Sensor Alarm (see below).

### **7.9 Config Override Alarm**

The OVERRIDE ALARM option of the CONFIG menu allows you to control whether an alarm beep is sounded when manual override turns automatic mode off or on for a boom. Choose from the following options for Override Alarm:

```
Override alarm=
```

```
Disabled
```

```
Enabled
```

The default setting is "Enabled". If you find the beeps more annoying than useful, change this option to "Disabled" to turn off these audible alerts.

### **7.10 Config Lower Time-Out**

The LOWER T.O. option of the CONFIG menu allows you to change the maximum amount of time the Controller will keep its Lower output on to try to achieve the desired target distance. If the measured distance is not within the target distance range after the time set by Lower timeout, the Controller will turn off its Lower output and raise an alarm to alert the operator (unless disabled by the Time-Out Alarm option).

```
Lower timeout= 8 sees
```

Choose the desired time-out in the range of 1 second to 20 seconds, in steps of 1 second, and press ENT to save the new value. The default value is 10 sees,

### **7.11 Config Raise Time-Out**

The RAISE T.O. option of the CONFIG menu allows you to change the maximum amount of time the Controller will keep its Raise output on to try to achieve the desired target distance. If the measured distance is not within the target distance range after the time set by Raise timeout, the Controller will turn off its Raise output and raise an alarm to alert the operator (unless disabled by the Time-Out Alarm option).

```
Raise timeout=
```

```
10 sees
```

Choose the desired time-out in the range of 1 second to 20 seconds, in steps of 1 second, and press ENT to save the new value. The default value is 10 sees,

## **7.12 Config Time-Out Alarm**

The TIMEOUT ALARM option of the CONFIG menu controls whether or not the Controller sounds an alarm when the Lower or Raise Time-Out expires. If the Time-Out alarms are disabled, the Controller will not sound an alarm when a time-out occurs, but will display a "T" behind the sensor reading.

Time-Out Alarm=

Disabled

Enabled

Choose the desired option and press ENT to save the new value. The default value is Enabled.

## **7.13 Config Motion Control**

The MOTION CONTROL option of the CONFIG menu allows you to change how aggressively the Controller makes corrections to the boom height.

Choose from the following options:

Boom Control= Fast

Medium

Slow

Choose the desired value and press ENT to save the new value. The default value is "Medium" which strikes a balance between quick corrections and safe boom control. With Motion Control set to "Medium", the system will typically make two separate small corrections to return the boom to the target height.

*Note that stable operation requires running the Self Calibration procedure!*

On many sprayers the "Fast" setting can be used, which returns the boom to the target height with a single large correction, and therefore returns the boom to the target height more quickly. However, on some sprayers this quicker operation can result in unstable operation, with a continuous back-and-forth rocking motion. If you see this happen, change the Motion Control back to "Medium".

If the operation of the system is still unstable, change Motion Control to "Slow". This will cause the Controller to make height corrections in smaller steps, leading to reduced overshoot and less back-and-forth rocking. The drawback is that it will take somewhat longer to reach the target height.

## **7.14 Config Off Anticipation Time**

The OFF ANT. T option of the CONFIG menu configures how quickly the boom slows down after the hydraulics are turned off.

Off Ant. Time= 0.0

sees

0.2 sec

0.4 sec

0.8 sec

1.6 sec

Choose the desired value and press ENT to save the new value. The default value is 0.4 seconds, which is suitable for most sprayers.

**If** your sprayer has very "stiff" booms that stop very quickly when the hydraulic valve is closed, you can reduce this time to provide faster operation.

**If**, on the other hand, the booms on your sprayer are very loosely suspended and continue to move a lot after the hydraulic valve is closed, you can increase this time to produce more stable operation.

### **7.15 Config Boom Interaction**

The BOOM INTERACT option of the CONFIG menu defines how much interaction there is between the left and right booms.

Boom Interact.=

0%

Choose the desired value, in the range of 0% to 80%, and press ENT to save the new value. The default value is 0%.

Some sprayers with loosely suspended booms exhibit a lot of interaction between the left and right booms. That is, when one boom is raised, the other boom also moves (either up or down). If there is substantial interaction between the booms, it is difficult for the Controller to achieve stable operation, and back-and-forth rocking can happen. The Boom Interaction parameter is used to help the Controller cope with this situation.

To assess the interaction between the left and right booms on your sprayer, fold out the booms and raise them to a normal working height. Using the manual controls of your sprayers, raise the left boom a little but watch the right boom. The right boom may move up, down, or not move at all.

**If** the right boom moved up (even if only temporarily), the Boom Interaction Direction (see below) parameter should be set to SAME. **If** the right boom moved down, the B.I. Direction should be set to OPPOSITE. **If** the right boom moves very little, then the Boom Interaction should be left at 0% and the B.I. Direction at SAME.

**If** you do see significant motion of the right boom while moving the left boom, you need to change the Boom Interaction setting from its default of 0%. The Boom Interaction parameter should be set to the percentage of motion of the "other" boom. For example, if you raise the left boom by 10 inches, and the right boom moves up by 4 inches, you should set the Boom Interaction to 40% (and the B.I. Direction to SAME). There is no need to try to measure this exactly - a good eyeball estimate is generally sufficient.

## 7.16 Config Boom Interaction Direction

The B.I. DIRECTION option of the CONFIG menu defines the direction of interaction between the left and right booms.

```
B.I. Direction=  
  
SAME  
  
OPPOSITE
```

Choose the desired value and press ENT to save the new value. The default value is SAME.

This parameter works together with the Boom Interaction parameter. Refer to the above description of the Boom Interaction parameter for details.

## 7.17 Config Valid Window

*NOTE: This option is not intended for sprayer boom height control!*

The VALID WINDOW option of the CONFIG menu limits the range of sonar sensor height readings that is accepted. Any height reading outside the valid range will be rejected.

```
Valid Window=  
  
Disabled
```

Choose "Disabled" or a value in the range of 0.5" to 40.00", in steps of 0.5", and press ENT to save the new Valid Window. The default value is "Disabled".

When set to "Disabled", the Valid Window has no effect. When set to some other value, the valid range of heights is calculated based on the current Target Height plus or minus the Valid Window. For example, if the Target Height is 35.0" and the Valid Window is set to 4.0", only height readings between 31.0" and 39.0" will be accepted. Readings outside this range will be treated as out-of-range.

This feature is intended for height control applications with a limited range of operation. For example, when controlling header depth on a potato harvester, the Valid Window can be used to exclude too-short readings due to tall weeds.

## 7.18 Config No-Range Lower

*NOTE: This option is not available for sprayer boom height control.*

The NO-RANGE LOWER option of the CONFIG menu controls the behavior of the system when a sonar sensor does not report a distance reading ("No Range"). This usually happens when the boom swings too high above the ground. When the distance to the ground is beyond the sonar sensor's range, or if the received echo is too weak, the sonar sensor will not be able to provide a distance reading. This shows up on the Controller display as "--.-".

This option provides the following display:

```
No-Range Lower=  
  
Disabled
```

Choose "Disabled", or a value in the range of 0.5" to 10.00", in steps of 0.5", and press ENT to save the new value. The default value is "Disabled".

When No-Range Lower is set to "Disabled", the system will take no action when a sonar sensor reports No Range.

If a different value is chosen, the system will lower the boom whenever the sonar sensor reports No Range. The larger the value selected, the more quickly the boom will be lowered.

**CAUTION:** *Be careful in using this option. It is possible for a sonar sensor to report No Range for other reasons, such as dirt or moisture build-up on or near the sensor. This could cause the boom to be lowered unexpectedly!*

## 8 Test Menu

Selecting TEST from the main menu brings up the test menu:

```
Test :  
  
SENSORS  
OUTPUTS  
SHOW OUTPUTS  
SONAR ARM TILT
```

### 8.1 Test Sensors

Selecting the SENSORS option from the test menu brings up the Sensors display:

```
Sens : 90%  
38 41 36 29 33
```

The top line shows the sonar sensor sensitivity. You can change the sensitivity using the Up and Down arrow buttons. This allows you to experiment with different sensitivity settings while viewing the sensors' distance readings. See below for an explanation of the sensitivity setting.

The second line of the diagnostic display shows the distance measured by each of the sonar sensors (Left, Left 2, Center, Right 2, and Right). When a sonar sensor reading shows dashes ("--"), it means that sensor is not getting a valid distance reading. This usually happens when the boom is too far above the ground, or the sonar sensor sensitivity is set too low. It can also happen if dirt or debris builds up on or in front of the sensor.

If a sensor reading shows XX, there is a problem communicating with the sensor. Check the connections and wiring to the sensor.

## Sonar Sensor Operation and Sensitivity Settings

The sonar sensors use sound pulses to measure the distance from the sensor to the ground (or crop canopy). The sonar sensor sends out a short sound pulse and then waits for the echo to return to the sensor. The longer it takes for the echo to return, the farther away the object that reflected the sound back to the sensor.

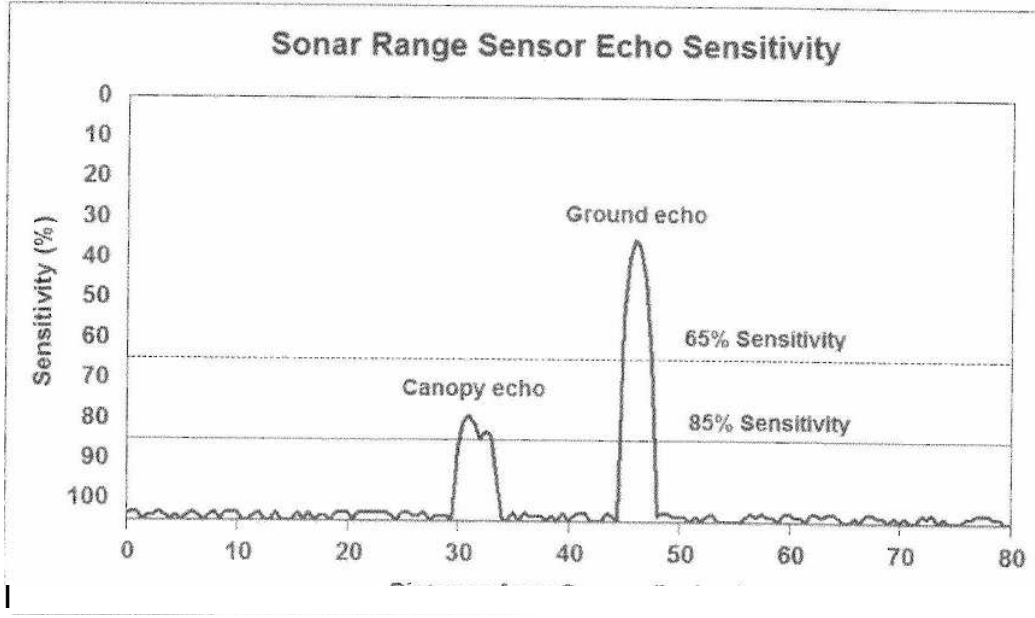
The diagram shows a sample graph of the sound echo signal received by a sonar sensor. In this case, there is partial crop canopy, so there are echoes from both the canopy and the ground.

The first echo received is from the canopy, at a distance of 30 inches. Because it's a partial canopy, the echo is relatively weak. A little later the sensor receives a second echo, which was reflected by the ground, at a distance of 45 inches. Because the ground offers a bigger surface to reflect the sound, this echo is much stronger.

Given the two different echoes, how does the sonar sensor determine whether the correct distance is 30 inches or 45 inches? This is determined by the Sensitivity setting. The Sensitivity sets a threshold that determines the minimum size of echo the sensor will accept. The sonar sensor always uses the first echo that exceeds this threshold.

If the Sensitivity is set to 85% (indicated by the lower line in the diagram), the echo from the canopy exceeds the threshold, and the sonar sensor will indicate a distance of 30 inches.

c.



If the Sensitivity is set to 65% (indicated by the upper line in the diagram), the weak echo from the canopy does not exceed the minimum, and the sonar sensor will ignore this first echo. The later echo from the ground does exceed the threshold, so the sonar sensor will indicate a distance of 45 inches.

## 8.2 Test Outputs

Selecting the OUTPUTS option from the test menu brings up the Test display:

```
TEST
Left
```

The OUTPUTS option is used to exercise the outputs to confirm that the Controller is able to raise and lower the booms.

The bottom line shows the currently selected boom section. Use the Left and Right arrow buttons to select the Left, Right, or Center boom section.

Press the Up or Down arrow button to raise or lower the selected boom section. **If** all connections are correctly made and the AutoGlide™ system is configured correctly, the selected boom section should respond.



If there is no response, or an incorrect response, check the connections from the Interface box to the solenoids.

If there is no response at all, you may have an open-center hydraulic system that requires the Master output to be connected to the Master valve.

Incorrect response may also be due to incorrect configuration of the Shuttle valve.

### **8.3 Test Show Outputs**

The SHOW OUTPUTS option of the test menu is used to show the state of the solenoid valves connected to the Interface Box. This is useful to confirm that all the connections have been made correctly. The Controller does not activate any outputs in this mode. Instead, you activate solenoid valves using the manual controls, and observe whether the expected display appears. This can also be used to determine how the Shuttle valve should be controlled.

Selecting SHOW OUTPUTS brings up the following display:

```
OUTPUTS: MSTR SH
          RD
```

The top line shows the state of the Master (MSTR) and Shuttle (SH) solenoids.

The bottom line shows the state of the six Up and Down solenoids: LU for Left Up, LD for Left Down, RU for Right Up, RD for Right Down, CU for Center Up, and CD for Center Down.

In the example above, the right boom is being lowered, and both the Master and Shuttle valves are active. As you activate each hydraulic function in turn, you should see the corresponding name appear on the display.

### **8.4 Test Sonar Arm Tilt**

The SONAR ARM TILT display shows the angle measured by the tilt sensor:

```
Sonar arm tilt:
                24 degrees
```

When the boom is level, the display should show 0 degrees. Tilting the boom down from level should show a positive angle. Tilting the boom up from level should show a negative angle.

If the display shows "XXX" degrees, no tilt sensor was detected. Check the connections to the tilt sensor.

## **9 Machine Setup Menu**

Selecting MACHINE SETUP from the main menu brings up the following menu:

```
Machine Setup:
CONTROL TYPE
OFFSET L/R
OFFSET CENTER
SHUTTLE VALVE
```

SHUTTLE LEFT  
SHUTTLE RIGHT  
SHUTTLE CENTER  
MASTER  
OUTPUTS ACTIVE  
SONAR TILT ARM

## **9.1 Machine Setup Control Type**

The CONTROL TYPE option of the MACHINE SETUP menu defines the number of booms to be controlled. Choose from the following options:

Control Type=

Left/Right  
L/R Center Ref  
L/R Center Ctrl  
Single  
Lift/Tilt

Each option is used for a different type of installation.

Most options allow using either 1 or 2 sensors to control each function. After you select an option, you will be prompted to select 1 or 2 Sensors. **If** you select 2, height will be controlled based on the shortest of the two sensor readings.

**Left/Right:** Controls the left and right booms of a sprayer, with manually selected target height. When the center section is raised or lowered, the target height must be adjusted to match.

**L/R Center Ref** (Left/Right control with Center Reference): Controls the left and right booms of a sprayer, and uses an extra sonar sensor mounted on the center section as a reference to set the target height. When the center section is raised or lowered, the system will automatically adjust to the new target height.

**L/R Center Ctrl** (Left/Right and Center control) : Controls the left and right booms of a sprayer as well as the center section, using an extra sonar sensor mounted on the center section. The target height is selected manually, so when the center section is raised or lowered, the target height must be adjusted to match.

**Single:** For non-sprayer applications, this option controls a single function, with manually selected target height. The single function is treated as the "Left" boom, so the height is displayed in the place of the Left sensor, and the Left control outputs are used to adjust the height of the controlled function.

**Lift/Tilt:** This option is intended for automated control of combine headers that have the ability to lift the header as well as tilt the header. The "Left" outputs are used to control lift, while the "Right" outputs are used to control tilt. One sensor is mounted near each end of the header. Lift and tilt are controlled to keep both sensors at the selected distance above the ground.

## 9.2 Machine Setup Offset Left/Right

The OFFSET LIR option of the MACHINE SETUP menu sets the height offset of the left and right boom sonar sensors above the spray tips. This offset is subtracted from the sensor readings so that the Controller displays the net height of the spray tips above the ground or crop canopy.

```
L/R Snsr Offset=  
14.5 "
```

Measure the vertical distance (in inches) between the spray tips and the face of the sonar sensor. Select the measured distance, in steps of 0.5", and press ENT to save the new target distance. The default value is 0.0".

## 9.3 Machine Setup Offset Center

The OFFSET CENTER option of the MACHINE SETUP menu sets the height offset of the center section sonar sensor above the spray tips. This offset is subtracted from the sensor readings so that the Controller displays the net height of the spray tips above the ground or crop canopy. Since the center section sonar sensor is often mounted differently from the left and right boom sensors, a separate offset setting is provided.

```
Ctr Snsr Offset=  
11.0 "
```

Measure the vertical distance (in inches) between the spray tips and the face of the sonar sensor. Select the measured distance, in steps of 0.5", and press ENT to save the new target distance. The default value is 0.0".

## 9.4 Machine Setup Shuttle Valve

The SHUTTLE VALVE option of the MACHINE SETUP menu allows you to define how the Shuttle valve output works. Choose from the following options:

```
Shuttle valve=  
None  
  
1 Valve/Cyl. <= (required setting on Bestway sprayers)  
2 Valves/Cyl.
```

Option "None", the default setting, means the system will not activate its Shuttle output. Use this option if your sprayer does not have a shuttle valve. This means the booms operate independently, so that they can be activated simultaneously. Selecting either of the other Shuttle options will force the system to operate only one boom at a time.

If your sprayer does have a shuttle valve, you will most likely use the "1 Valve/CyL" option. This is for sprayers with a single valve to select each hydraulic function, and a shuttle valve to determine the direction of flow. The "Up" output is activated for both raising and lowering the boom, with the Shuttle output determining the direction. To support shuttle valves with two solenoids, the Center Down output is used to drive the secondary shuttle solenoid.

There are some (rare) machines that use two solenoid valves per hydraulic function in addition to the shuttle valve. Use the "2 Valves/CyL" option for this situation. The Up and Down outputs will be operated to Raise and Lower each boom, in addition to the

Shuttle output. Because the Center Down output is used to control the center section, no secondary shuttle output is available in this mode.

### **9.5 Machine Setup Shuttle Left**

The SHUTTLE LEFT option of the MACHINE SETUP menu defines how the Shuttle valve works to operate the left boom. The Shuttle valve will be activated for one direction, and not activated for the other. Choose from the following options:

Shuttle Left=

Down

Up

Choose "Down" if the Shuttle valve needs to be activated to move the left boom down. Choose "Up" if the Shuttle valve needs to be activated to move the left boom up.

### **9.6 Machine Setup Shuttle Right**

The SHUTTLE RIGHT option defines how the Shuttle valve works to operate the right boom, just like the SHUTTLE LEFT option described above.

### **9.7 Machine Setup Shuttle Center**

The SHUTTLE CENTER option defines how the Shuttle valve works to operate the center section, just like the SHUTTLE LEFT option described above.

### **9.8 Machine Setup Master**

The MASTER option of the MACHINE SETUP menu allows you to define how the Master valve output works. Choose from the following options:

Activate Master=

All outputs <= (required setting on Bestway sprayers w/ OC)

Up outputs

By default, the MASTER option is set to "All Outputs", which means the Master valve output is activated whenever the AutoGlide system activates any of its control outputs. This is useful in open-center hydraulic systems to activate the master valve.

The "Up outputs" option is useful in hydraulic systems that require activation of a central valve or pump only when a boom needs to be lifted. With this option selected, the Master output will be activated only when the system makes an up adjustment to one of the booms.

### **9.9 Machine Setup Outputs Active**

The OUTPUTS ACTIVE option of the MACHINE SETUP menu defines how the electrical connections to the solenoid valves are made on the machine. Choose from the following options:

Outputs active= HIGH

LOW

The default setting of HIGH works for the vast majority of equipment that uses a common ground connection.

Some equipment (eg. Brandt and Double L) uses a common +12V connection for the hydraulic solenoids instead of the usual common ground. **If** you have this kind of electrical setup, change the OUTPUTS ACTIVE setting to LOW. You must also connect both the red and black wires of the RH224 cable to Ground.

## **9.10 Machine Setup Sonar Tilt Arm**

*NOTE: This option is not available for sprayer installations.*

In some installations, the sonar sensors is installed on a bracket that extends beyond the end of the boom being controlled. When the boom is tilted up or down, the height measured by the sonar sensor will not be the same as the height at the end of the boom. To compensate for this, a tilt sensor can be installed on the boom and connected to the Interface Box. The Controller will make use of the Tilt Sensor when the Sonar Tilt Arm option is set to a non-zero length.

The SONAR TILT ARM option of the MACHINE SETUP menu shows the following:

```
Sonar Tilt Arm=  
Disabled
```

Select "Disabled", or a length in the range of 0.5" to 90.0".

The default setting of "Disabled" disables tilt compensation of the sonar sensor readings. To enable tilt compensation, set Sonar Tilt Arm to the distance between the end of the boom and the location of the sonar sensor(s).

## **10 Self Calibration**

*NOTE: Do not attempt Self Calibration in a rough field. The uneven surface will produce erratic sensor readings that make it impossible to obtain an accurate calibration.*

The SELF CAL menu is used to initiate the Self Calibration procedure. This procedure is used by the Controller to learn how quickly the booms respond when the hydraulics are activated, and how far the booms continue to travel after the hydraulics are turned off. Without running the Self Calibration, the controller may move the booms too quickly, resulting in excess adjustments. In some cases the booms may go into a constant back-and-forth rocking motion. It is therefore imperative to run Self Calibration before attempting to use the AutoGlide™ system.

Note that on some sprayers with loosely suspended booms, the Self Calibration may not correctly gauge the response of the booms. **If** you find the booms are still overshooting or rocking back and forth after Self Calibration, try adjusting the MOTION CONTROL parameter to "Medium" or "Slow". \*

When you select SELF CAL you are prompted to select which boom to calibrate:

```
Start Self Cal:  
LEFT
```

In a 2-sensor installation only the left boom need to be calibrated, because both booms behave the same way. If you have a third sensor to control the center rack, you should

also calibrate the center rack by selecting CENTER.

Note: That for Lift/Tilt control of a combine header, the SELF CAL menu shows the options LIFT and TILT to calibrate the two header control functions.

After selecting the function you want to calibrate, press ENT to proceed with Self Calibration (or ESC to return to the main menu).

Before you initiate Self Calibration, ensure that both booms are fully extended, and are reasonably level and at approximately the selected target distance above the ground.

**IMPORTANT:** The hydraulic fluid should be at normal working temperature, and the hydraulic pump should be running at normal operating speed.

Ensure that the sonar sensors are pointed to clear level ground. A paved yard is ideal. Once you initiate Self Calibration, the system will begin a series of up and down motions of the boom. Each successive up and down cycle will be a little larger than the preceding one. After 4 cycles the Controller will save the calibration values for your sprayer and display a message indicating successful completion. The entire procedure typically takes 2 to 3 minutes.

You can interrupt the Self Calibration procedure at any time by pressing the ESC button. This will leave the calibration values unchanged.

**\*If at any time you are having Self Calibration problems please call Bestway, Inc.**

### **10.1 Testing for Control Stability**

After running the Self Calibration, you should check the stability of the system's boom control.

***CAUTION:*** *Be careful when testing the boom operation, as the booms can move up and down rapidly. Be sure to stay clear of the boom when the AutoGlide™ system is engaged, and always be prepared to disengage the AutoGlide™ system (by pressing ESC).*

For best results, perform the test over a fairly flat surface such as a paved yard. Extend both booms and raise the booms to normal working height. Engage Automatic mode on the Controller, and set the target height to normal working height so that the booms are at rest and the system is not making any corrections.

Now use some large flat object to trick the sensor into seeing a reduced height. A cardboard box works well. Have a helper place or hold the object about 12 inches off the ground. The AutoGlide™ system should raise the boom to maintain the target height above the object. The boom should move up to its new position with very little overshoot. Depending on the boom construction, the other boom may move up and down somewhat, but it should stay close to its target position.

Now withdraw the object. The boom should move back to its original height, again without much overshoot, and without much action of the other boom.

**If** there is a lot of overshoot, or if the booms start rocking back and forth, boom control needs to be stabilized. Refer to the Troubleshooting section for information on how to correct instability.

### **10.2 Sonar Arm Level**

**NOTE:** *This option is not available for sprayer installations.*

**If** you have installed the optional tilt sensor, the SONAR ARM LEV. option is used to calibrate the level position of the tilt sensor. When this option is selected, the Controller

displays:

```
Level sonar arm,  
then press ENT
```

Move the boom into a level position. Use a spirit level to check, and adjust until the boom is level. Then press ENT to save the new level position.

## **11 Troubleshooting**

### **11.1 Connection between Controller and Interface Box**

The Controller communicates with the Interface box to obtain sensor data. If there is a problem with the communication with the Interface box, the status line will show:

```
Interface error
```

If you see this message, check that the Interface box cable is correctly connected to the Controller, and that the cable has not been pinched or damaged.

In the Interface box, check the red and orange LEDs. The red LED is on whenever power is applied to the Interface box. If the solenoid power supply connected to the Interface Box has too low a voltage (or is missing altogether), the red LED will blink.

The orange "Comm." LED is on during normal operation. If the "Comm." LED is off or is blinking, there is a problem with communication. Check that the COMA and COMB wires are correctly connected.

### **11.2 Sensor Operation**

You can check the operation of the sonar range sensors in the Test Sensors display. Note that the sensors have a limited range. If there is no object within 99" of the sensor, it will not show a reading ("--"). Even if there is an object closer than 99 inches, the sensor may still not show a reading because many objects do not provide a good reflection. A typical soil surface or crop canopy should provide reliable readings out to 60 inches or more.

If you get a reading of "--" even when there is an object close to the sensor, there may be dirt or debris very close to the sensor. The sensors cannot reliably detect objects closer than about 14 inches, and may not give a reading when there is an object closer than 14 inches.

Similarly, if the reading seems to be stuck at a very low value, check for dirt or debris in front of the sensor.

If the displayed distance readings do not appear correct and there is no obvious problem with dirt or debris, try increasing the Sensitivity. Also check that the sensors are correctly plugged into their respective sensor cables, and that the cables' wires are connected to the right terminals in the Interface box. Also check for damage to the sensors and their cables.

If a sensor reading shows "XX", there is a problem communicating with the sensor. Check the connections and wiring to the sensor.

### 11.3 Boom Rocking or Overshooting

On some sprayers you may find that the AutoGlide™ system is moving the booms too far when making height adjustments. This produces poor height control, and can result in a back-and-forth rocking motion of the booms. There are a number of ways to correct this behavior:

First make sure you have run the Self Calibration procedure (refer to section 9).

Check the level of boom interaction. Ensure that you have set the correct DIRECTION for Boom Interaction, and that you have chosen a reasonably representative value for the percentage of interaction.

Check the value of the OFF ANT. T parameter and check that it matches the speed of response of your boom.

Ensure that the Delay configuration parameters are not set too low. For an unstable boom, the Delay for Up should be at least 1.0 seconds. Also try setting the Delay for Down to a bigger value than Delay for Up (eg. 2.0 seconds).

Try changing the MOTION CONTROL setting to Slow.

Check the QUICK RAISE HT setting and make sure it is not set too close to the target HEIGHT.

You can help stabilize boom control operation by minimizing uncontrolled motion of the boom. Ensure that any shock absorbers are in good condition, and replace them if necessary. If the boom has an auto-leveling feature, adjust it for minimum action or consider locking it out completely.

If your boom hydraulics are very fast, it may be necessary to install flow restrictors. This reduces the hydraulic flow rate, helping to achieve stable control.

## 12 System Components & Replacement Parts

|           |                                                                  |
|-----------|------------------------------------------------------------------|
| 61317     | Controller Monitor                                               |
| 61309     | Interface Box                                                    |
| 61303     | Sonar sensor <b>*MUST NOTE LOCATION*</b> (L, L2, C, R, R2)       |
| 61304     | Sensor mounting bracket (less hardware and bottom strap – 70806) |
| 61311     | Sensor cable: 90ft                                               |
| 61312     | Sensor cable: 50ft                                               |
| 61307     | Cable: Interface box power, 2-conductor, 20ft                    |
| 61313     | Cable: Interface box to solenoids, 6-conductor, 20ft             |
| 61314     | Cable: Interface box Master/Shuttle, 2-conductor, 20ft           |
| 61315     | Cable: Interface to Monitor, 50ft                                |
| 61316     | Cable: Controller power, 2-conductor, 10ft                       |
| 61302     | Cable, Monitor Disconnect                                        |
| AB883     | Cable, Interface Power Disconnect Harness                        |
| 70801     | Monitor & Power Disconnect Cable Kit (includes 61302 & AB883)    |
| 61310     | Junction Box 4/5 Sensor                                          |
| 70806     | Sensor Hardware Kit (includes 61308, 61306, B56.6C, LN56NYLSS)   |
| 61308     | FASSE Block Y-Cable Harness (only required on Bestway sprayers)  |
| 61306     | Sensor Mount Hammerstrap, Bottom                                 |
| B56.6C    | Bolt, Carriage 5/16NCx6 Full Thread                              |
| LN56NYLSS | Nut, Lock 5/16NC SS Nylon                                        |

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## 13 Specifications

Supply voltage: +12VDC, 1.0A max.

Boom height sonar sensors:

Type: Ultrasonic sonar range sensor, 8 degree beam angle  
Range: 12" to 96" (max. range depends on field conditions)  
Environmentally sealed to IP67, mounted in protective casing  
Temperature: -20C to +65C

Solenoid Control Outputs: Normally open, + 12VDC, 4A max. current

Controller Case:

SizeLx H x D: 160 x 90 x 65 mm (6.3 x 3.5 x 2.5 inches)

Made of impact resistant and flame retardant polycarbonate

Gasketed to keep out moisture and dirt

Integral mounting holes, mounting brackets supplied

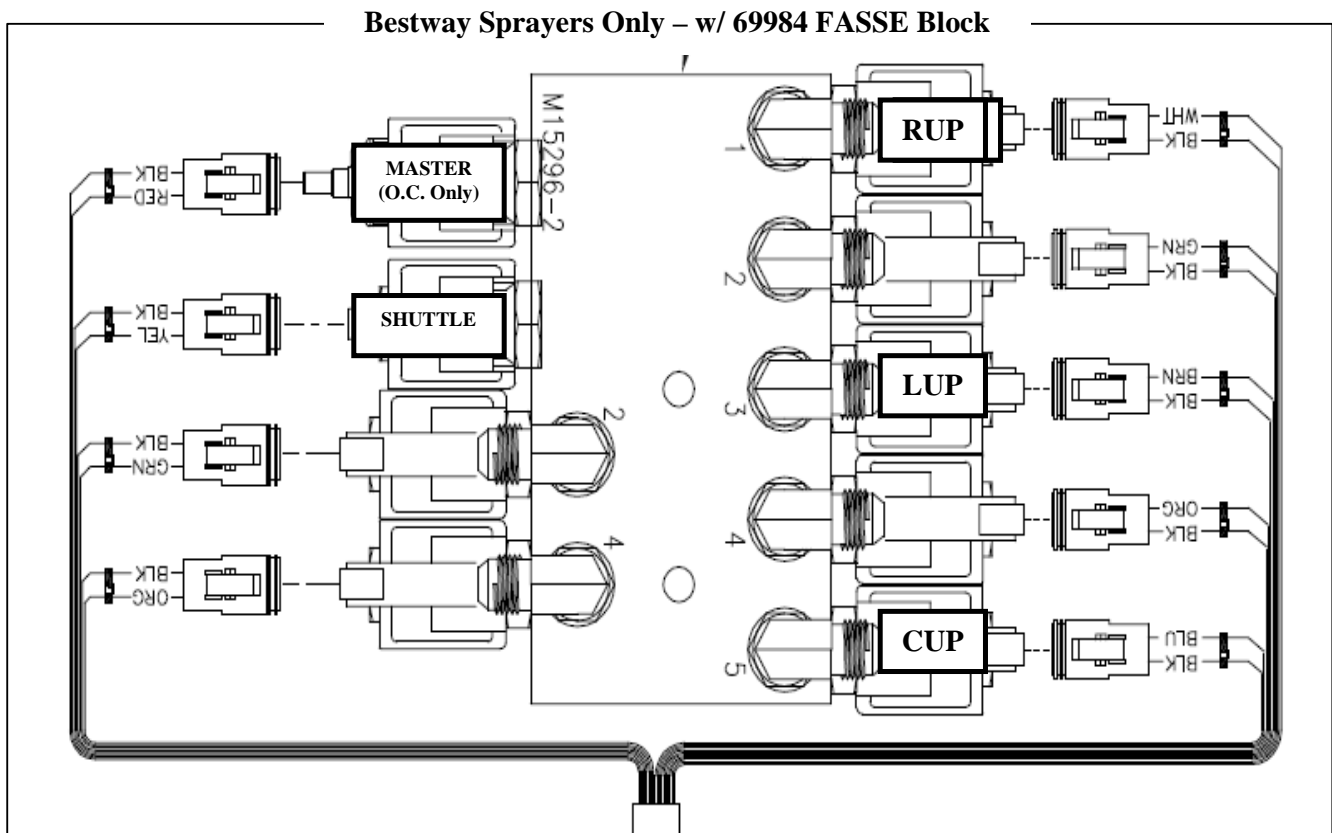
Interface Box Case:

SizeLx Hx D: 160 x 160 x 65 mm (6.3 x 6.3 x 2.5 inches)

Made of impact resistant and flame retardant ABS

Gasketed to seal out moisture and dirt

Liquid tight cable glands for all cable entries  
Integral mounting holes, mounting brackets supplied



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# NOTES:

# AutoGlide™ Installation Procedures for Bestway Sprayer

AutoGlide™ systems are shipped 1 of 3 ways. A 2-Sensor (70802) system contains only Figure 1. A 3-Sensor (70803) system contains Figures 1 & 3. A 4-Sensor (70804) system contains Figures 1 & 2. A 5-Sensor (70805) system contains Figures 1, 2 & 3.



Figure 1  
2-Sensor System



Figure 2  
Dual Wing Sensor Option



Figure 3  
Center Sensor Option

**Step 1:** Open the interface box in Figure 1. (*see red arrow*) In the 2-Sensor system shipping box is an unattached wire harness labeled SH/MASTER SOLENOIDS. Attach one end of the provided SH/MASTER SOLENOIDS wire harness to the terminal blocks marked MSTR & SH seen in Figure 4. (*see red arrow*)

**RED = SHUTTLE / BLACK = MASTER**

**Step 2: For 3-Sensor Systems Only!** Attach the center sensor cable from the shipping box in Figure 3 (*see red arrow*) to the open sensor terminal block in the Interface Box in Figure 4. (*see blue arrow*) There will be 4-wire ends to connect. The colored wires attach identically to the other sensor wires.

**Step 3: For 4 & 5 Sensor Systems Only!** Open the Auxiliary Box from Figure 2. (*see red arrow*) Attach the open ended (bare 4-wire harness) from the Auxiliary Box to the open sensor terminal block in the Interface Box from Figure 4. (*see blue arrow*) The colored wires attach identically to the other sensor wires. If installing a 5-Sensor system; attach the center sensor cable from the shipping box in Figure 3 to an open terminal block in the Auxiliary Box in Figure 5. (*see red arrow*)



Figure 4  
Open Interface Box



Figure 5  
Open Auxiliary Box

**Step 4:** Attach provided Interface Bracket to Interface Box for mounting. Use additional provided bracket(s) for template when drilling mounting holes. Hardware has been provided for attaching the Interface Box bracket. Reattach cover of Interface Box.

**NOTE:** Interface Box can be mounted anywhere you deem necessary. Bestway factory installs the Interface Box and Auxiliary Box on the Right Hand side of the sprayer on the tank saddle as in Figure 6.



Figure 6  
Factory Installed Interface Box & Auxiliary Box

**Step 5:** With all wires/cables still coiled and secured, mount the Interface Box (*and Auxiliary Box if 4/5 sensor system*) to predetermine location. You will not install the cover of the Auxiliary Box until it is mounted on the sprayer. There is no bracket for this box.

**Step 6:** Mount sensors in locations. Each sensor will be marked with specific location it must be mounted. The marking is at the base of the bracket arm. (*see below*) Outside sensors should be within 30” of boom tip for best performance. Inner wing sensors should be mounted close to middle of boom wing for best performance. Center sensor **MUST** be mounted on the center section **UNDER** the main tube otherwise sensor will hit when rising center section. All sensors should face forward – spraying direction.

L = OUTSIDE LEFT / L2 = INSIDE LEFT / C = CENTER / R2 = RIGHT INSIDE / R = RIGHT OUTSIDE

**Step 7:** Begin running cables to required locations. Sensor cables are not specific to a sensor BUT some cables are longer than others. There will be two cables running to the hydraulic block along with two cables running to the tractor. Total number of sensor cables will depend on sensor options ordered.

**HINT: When in doubt; follow solutions lines to prevent pinching.**

**IT IS IMPRTANT TO CHECK CABLES DURING FIRST FOLD/UNFOLD TO ENSURE NO PINCHES.**

**Step 8:** Provided in the 2-Sensor System box will be 3 or 4 small Y-Cable harnesses designed to plug into your sprayers hydraulic block. These will be wired to the UP/DOWN Solenoid harness and SHUTTLE/MASTER Solenoid harness then attached to the Fasse hydraulic block. Wires should attach as follows: (*only use red wire on Y-Cable*)

| <u>Function</u> | <u>AutoGlide™ UP/DOWN SOLENOID Harness</u>   | <u>Fasse Block Harness</u> |
|-----------------|----------------------------------------------|----------------------------|
| LUP             | RED                                          | BROWN                      |
| RUP             | WHITE                                        | WHITE                      |
| CUP             | BROWN                                        | BLUE                       |
| <u>Function</u> | <u>AutoGlide™ SH/MASTER SOLENOID Harness</u> | <u>Fasse Block Harness</u> |
| SHUTTLE         | RED                                          | YELLOW                     |
| MASTER          | BLACK                                        | RED                        |

**NOTE:** Master wire is only connected to the hydraulic block if you are running an OPEN CENTER tractor. *Master wire Y-Cable sold separately.* Wires not labeled for above use can be cut and taped to prevent corrosion or contact. **If unsure; DO NOT CUT.**

**Step 9:** Once cables/wires are ran and attached; coil excess cable/wire up and stow in desired location to prevent damage.

**Step 10:** If you ordered the Disconnect Cable Kit (part no. 70801) it will attach to the cable/wires ends running forward. Disconnection is designed to occur at the tongue of the sprayer. If no disconnect cable kit was ordered, the system is designed to be hard-wired.

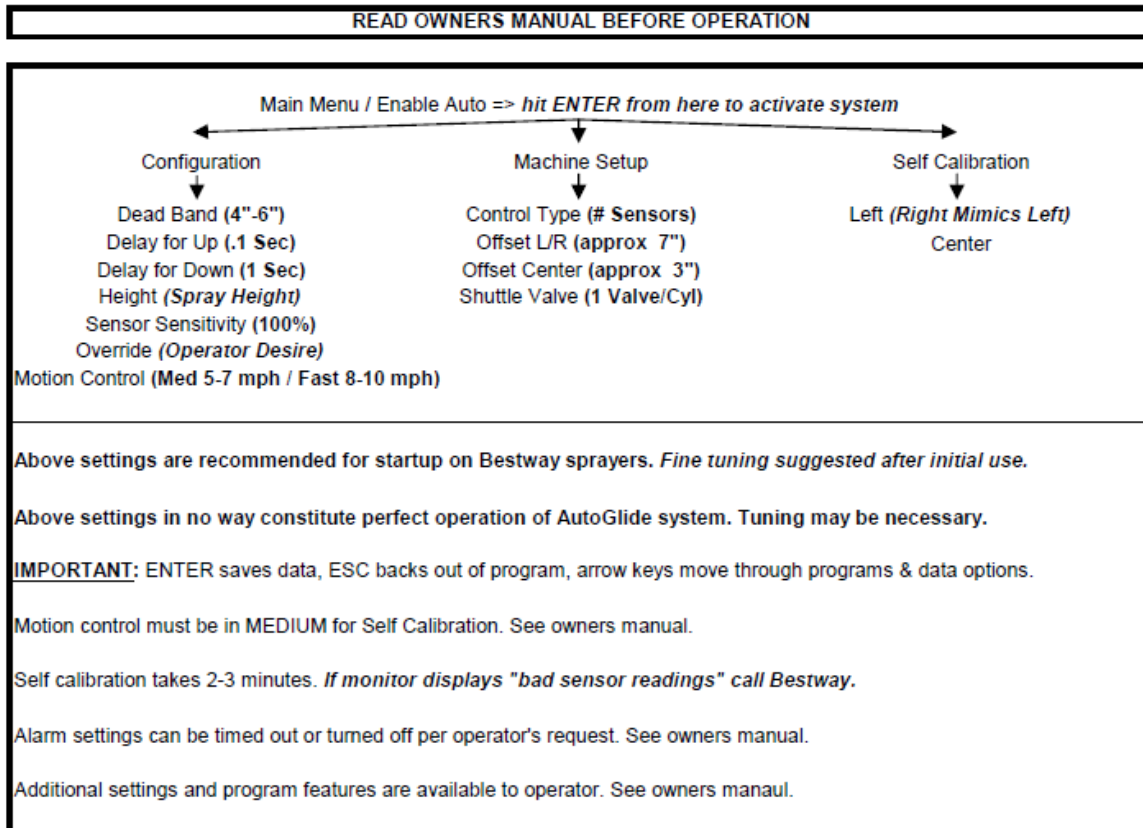
**DO NOT CUT OR SPLICE ANY CABLE OR WIRES WITHOUT AUTHORIZATION FROM BESTWAY.**

*Information subject to change without notice.  
Bestway, Inc. – Hiawatha, KS.*

**Step 11:** Attach power cables to a solid 12v source on the tractor. There will be one power cable running from the Interface Box and one cable running from the Cab Control Monitor. These must be powered with **NO MORE** than 12v.

**Step 12:** Mount the Cab Control Monitor in the cab of the tractor. Monitor may be installed using the provided bracket or industrial strength Velcro. *User to determine.*

**Step 13:** Ensure all cabling is properly attached and all electrical connections are secure. Power on the AutoGlide™ Cab Control Monitor. The AutoGlide™ system is preset with various default settings; however, there are a few you **MUST** change to allow the system to work with your sprayer. See below:



Please call Bestway, Inc if you have any questions regarding installation or operation of your AutoGlide™ system – (877) 390-4480.