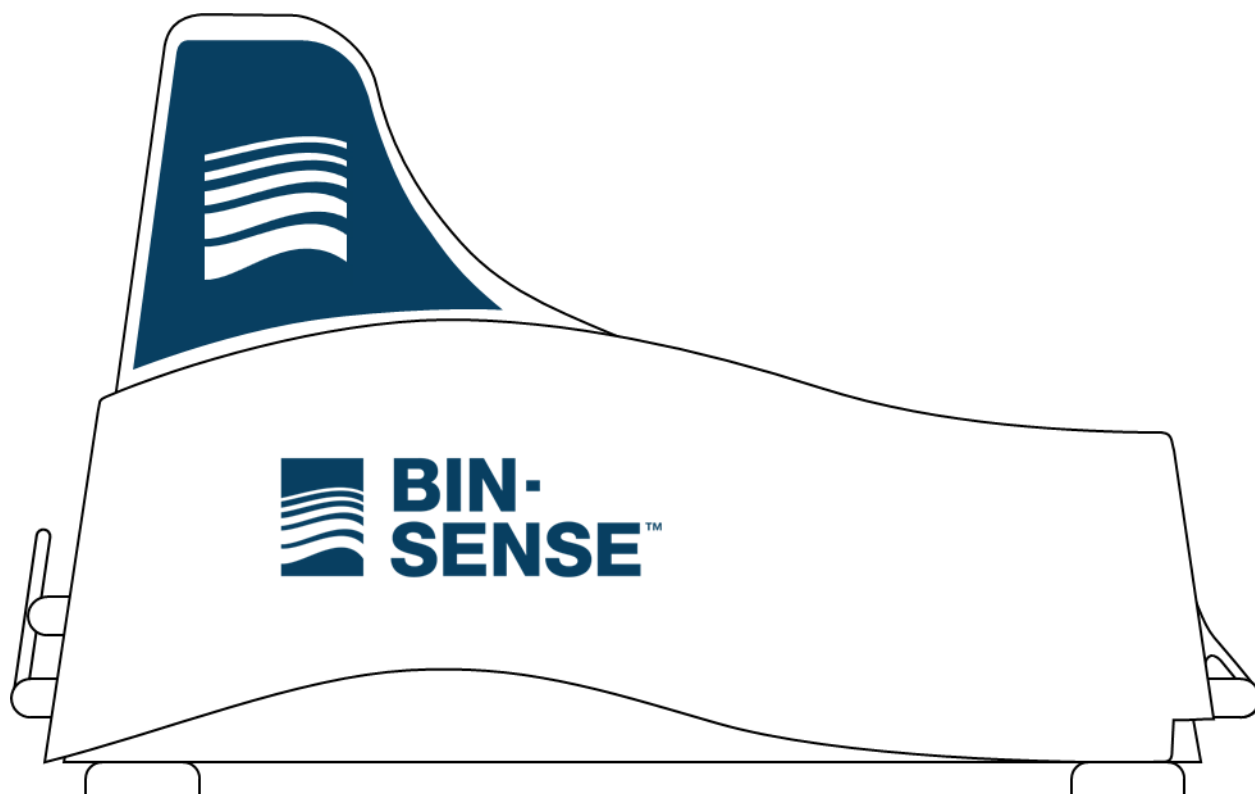




MASTER UNIT

USER MANUAL

FOR THIRD GENERATION MASTER UNITS



Ce manuel est également disponible en français.



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CUSTOMER SUPPORT

For warranty service, please contact your local dealer.

For product support, troubleshooting, or additional questions with your Bin-Sense™ device, please contact your local dealer (www.binsense.com/locate-a-dealer) or Calian Agriculture Ltd. at:



support.agriculture@calian.com



1.833.570.7979



www.binsense.com

BIN-SENSE MASTER CERTIFICATIONS

FCC ID: 2AUTY-106103-V3

IC: 27173-106103V3

This device complies with Part 15 Subpart (C) of the FCC Rules and; ISED RSS-247 Issue 4.

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(S).

Operation is subject to the following two conditions:

(1) This device may not cause interference, and

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

Changes or modifications not expressly approved by Calian Agriculture could void the user's authority to operate the equipment.

CAUTION: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

CAUTION: Radio-frequency radiation exposure risk. This equipment complies with radiation exposure limits prescribed for an uncontrolled environment for fixed and mobile use conditions. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and the body of the user or nearby persons. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter except as authorized in the certification of the product.



MANUFACTURER'S WARRANTY

CALIAN AGRICULTURE LIMITED TWO-YEAR WARRANTY

Calian Agriculture Ltd. (Calian Agriculture) warrants that for a period of two (2) years from the date of original purchase, this product will be free from defects in material and workmanship. Calian Agriculture, at its option, will repair or replace this product or any component of the product found to be defective during this warranty period. Replacement will be made with a new or re-manufactured product or component. No warranty is provided for batteries.

WHAT THIS WARRANTY DOES NOT COVER

This warranty does not cover normal wear of parts or any damage resulting from any of the following: negligent use or misuse of the product; damage in transport, natural disaster, improper installation or use, improper abuse or improper handling. This warranty is limited to only those manufacturing defects that were caused or allowed by Calian Agriculture.

HOW TO OBTAIN WARRANTY SERVICE

Please contact the local dealer you purchased the product from. For additional support, please contact Calian Agriculture at 1.833.570.7979 or visit www.binsense.com

CONTACT US

For support questions, troubleshooting, or help with your Bin-Sense device, please contact your local dealer for more information and assistance, or Calian Agriculture at support.agriculture@calian.com or 1.833.570.7979.

SAFETY

READ AND FOLLOW ALL INSTRUCTIONS.

SAVE THESE INSTRUCTIONS.

Use the Bin-Sense device for its intended use only, as described in this manual. Do not use attachments not recommended by the manufacturer.

STANDARDS

This manual uses the following standard safety terms and conventions to indicate conditions:

WARNING: INDICATES A HAZARDOUS SITUATION RESULTING IN SERIOUS INJURY OR DEATH.

CAUTION: Indicates a hazardous situation which, if not avoided, could result in moderate injury and/or property damage.

Note: Indicates an important message not related to personal injury or property damage.

OVERVIEW

Master units are the central hardware component used in Bin-Sense Live systems. Master units read cables and communicate with Remote units to collect grain temperature and moisture data for an entire Bin-Sense Live site. The Master unit sends the data to the Bin-Sense website through a cellular data connection.

Master units are marked with a blue antenna fin with a white logo.

PACKAGE CONTENTS

- Master Unit
- Master Unit battery
- 2 x solar panels
- Solar panel mounting plate with screws

MASTER UNIT OVERVIEW

- A. LID LATCH CLIPS
- B. MAGNETIC FEET
- C. PRIMARY (EXTERNAL) REMOTE ANTENNA
- D. BATTERY CABLE
- E. SENSOR LINK CABLE
- F. SOLAR PANEL CONNECTORS

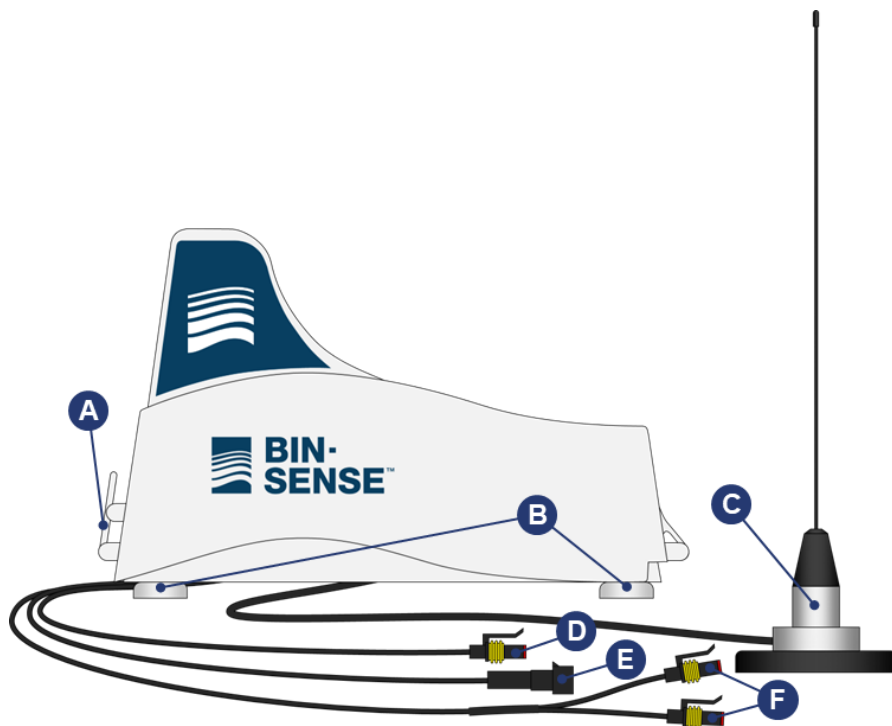


Figure 1: Master Unit Components

INSIDE THE MASTER UNIT

- A. CELLULAR ANTENNA
- B. SECONDARY (INTERNAL) REMOTE ANTENNA
- C. DIAGNOSTIC PUSHBUTTON
- D. DIAGNOSTIC LED
- E. J2 - SPARE SENSOR CABLE CONNECTION
- F. J1 - SENSOR CABLE CONNECTION
- G. J11 - SOLAR CONNECTION
- H. VENT
- I. USER BUTTON
- J. RADIO CHANNEL DIP SWITCHES
- K. J9 - BATTERY CONNECTION
- L. MODEM STATUS LEDS

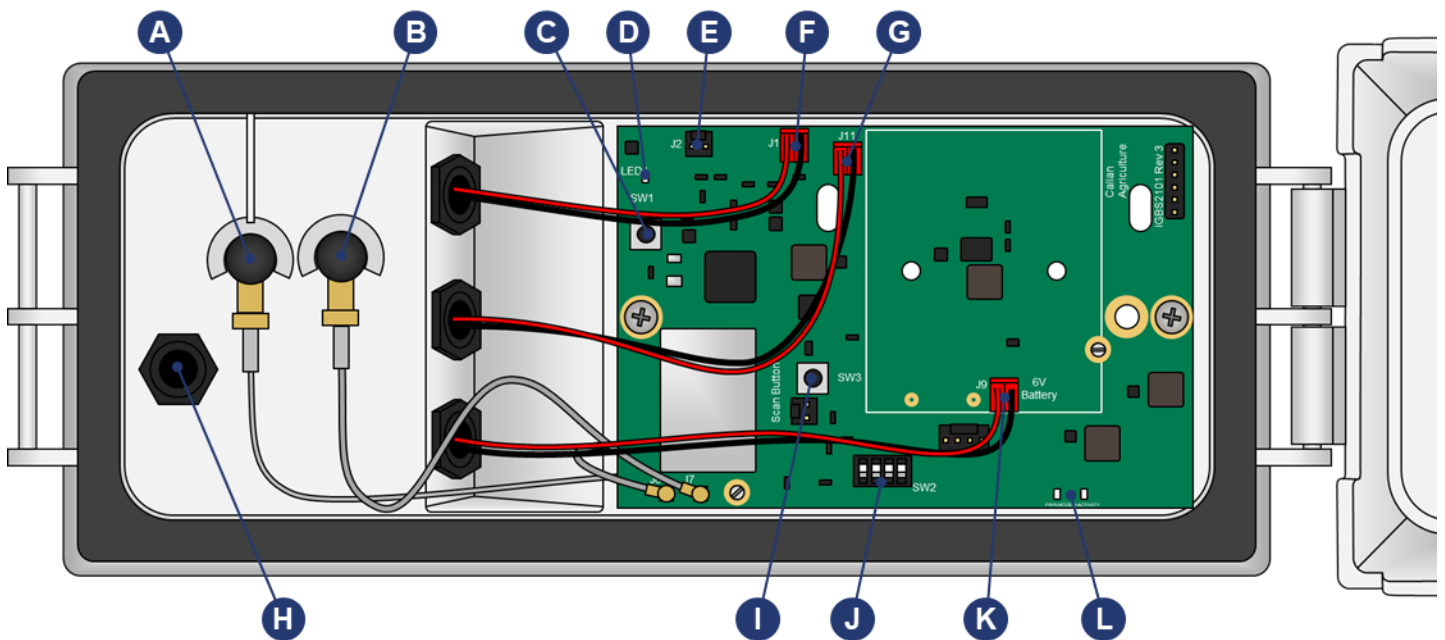


Figure 2: Master Unit Circuit Board

INSTALLATION



WARNING: FALL HAZARD - EXTREME CARE AND CAUTION MUST BE USED WHEN CLIMBING IN A BIN OR SILO. BE SURE TO USE APPROVED SAFETY PROCEDURES AND MATERIALS. WHEN WORKING ABOVE 1.2 METERS, WEAR A SAFETY HARNESS OR PERSONAL PROTECTIVE EQUIPMENT. AN APPROVED TOOL BELT MUST BE WORN TO KEEP BOTH HANDS FREE WHEN CLIMBING UP AND DOWN A LADDER.

INSTALLATION TIPS

- When possible, position the Master unit near the bin roof ladder so that it is easily accessible for future service and maintenance.
- The solar panels will provide power to run the Master unit and to recharge the Master unit battery. Ensure the solar panels have good sun exposure to keep the Master unit battery properly charged. Ensure solar panels are positioned as close as possible to each other and pointed in the same direction.
- When positioning the Master unit and related accessories, remember to consider things like bin lid movement and the path the auger will take and avoid placing components where they will interfere.
- Whenever possible, secure link cables so that they run downward, away from the enclosure and cable grip. This will prevent water from running along the cable and towards the Master unit enclosure.
- If you open the enclosure lid during installation, make sure you prevent moisture (e.g. rain, snow) from entering the enclosure.
- When finished with the installation, make sure the enclosure lid is closed and latched securely and there are no wires, tags, or other objects caught between the lid and the enclosure which could cause water ingress.

MASTER UNIT INSTALLATION

Carry the Master unit and all included accessories to the top of the bin in a backpack or by using another method that allows you to keep both hands free to safely climb the bin.

1. Place the Master unit on the top of the bin with the lid latches and link cables pointing towards the ground. Place the unit where it is easily accessible for future service and maintenance. The magnetic feet will hold the unit in place on the roof of the bin.
2. Install the external remote antenna in a location that provides coverage to as many remote units as possible. Maintain unobstructed line-of-sight between the antenna and the units. For optimal performance, consider using a mounting plate to keep the antenna oriented vertically.
3. Mount the two solar panels side-by-side on the bin facing the direction of maximum sunlight (face south in the northern hemisphere, face north in the southern hemisphere).
4. Place the Master unit battery on the roof of the bin close enough to the master unit that the battery cable will reach the Master unit power cable.
5. Connect the Master unit sensor link cable to all the sensing cables and to any other Bin-Sense accessories (e.g. Fan Controllers). You'll need to use a terminal box or splitter to connect more than one device to the sensor link cable.

Note: For bins with more than four sensing cables, bins where there is more than 50ft of link cable between the Master Unit and a Bin-Sense Fan Controller, and on bins on commercial sites with powered grain handling equipment located near the Bin-Sense system, use a Sensor Lead Grounding Cable installed between the sensing cables/accessories and the sensor link cable.

6. Connect the Master unit power cable to the Master unit battery.
7. Connect the Master unit solar panel connections to both solar panels. Both solar panel connections are identical and can be connected to either solar panel.
8. Refer to the Bin-Sense Live Startup Manual for further instructions on how to get the Bin-Sense Live system up and running.

OPERATION

CONNECTING TO REMOTE UNITS

Master units connect wirelessly to Bin-Sense Remote units using a radio system similar to Wi-Fi. In order to connect to Remote units, the units must be associated through the Bin-Sense app or website and must be on the same radio channel.

The radio channel is set using the radio channel DIP switches. Channels 12 through 23 are available with the default channel being 23. The radio channel only needs to be changed if there are other Bin-Sense Live systems installed nearby (within roughly 2 km).

12 ↓1 ↓2 ↓3 ↓4	13 ↓1 ↓2 ↓3 ↓4	14 ↓1 ↓2 ↓3 ↓4	15 ↓1 ↓2 ↓3 ↓4	16 ↑1 ↓2 ↓3 ↓4	17 ↑1 ↓2 ↓3 ↓4
18 ↑1 ↓2 ↓3 ↓4	19 ↑1 ↓2 ↓3 ↓4	20 ↑1 ↓2 ↓3 ↓4	21 ↑1 ↓2 ↓3 ↓4	22 ↑1 ↓2 ↓3 ↓4	23 ↑1 ↓2 ↓3 ↓4

Figure 4: DIP Switch Settings

Note: Remote units should be located no more than 600 meters from the Master unit and must have a clear line of sight to ensure a consistent wireless connection.

More details about connecting to Remote units can be found in the Bin-Sense Live Startup Manual.

MASTER UNIT CYCLE TIMELINE

Master units operate on a repeating 68-minute cycle. In each cycle, the Master unit will read its own cables, communicate with each Remote unit, and call-in to the Bin-Sense servers. When not performing one of these tasks, the Master unit will go into a low power sleep mode to preserve battery life.

Master units communicate with Remote units one at a time and communicate with Remote units in the same order every cycle.

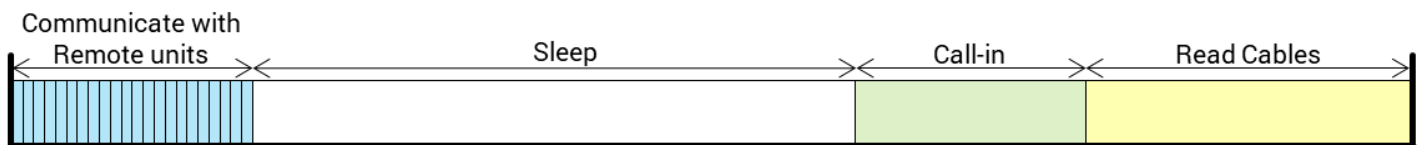


Figure 5: Master Unit Cycle Timeline

STARTUP MODES

When a Master unit is powered up, it can enter **normal mode** or **listener mode** depending on whether there are Remote units associated.

NORMAL MODE

When starting up in normal mode, the Master unit will read the attached cables, perform the diagnostic LED blinking pattern, and then start the normal operating cycle by communicating with Remote units.

LISTENER MODE

Listener mode allows a Master unit to reconnect to a running Bin-Sense Live site if the Master unit power is interrupted. This allows the site to resume normal operation without requiring all the Remote units to restart. A Master unit will start up in listener mode when it has Remote units associated and was previously operating normally.

In listener mode, the diagnostic LED will blink green once per second and the Master unit will listen for wireless signals from Remote units still running on the site. If the Master unit detects a Remote unit while in listener mode, it will enter normal mode at the appropriate place in the operating cycle. If no Remote units are detected within one hour, the Master unit will enter normal mode.

FORCING A UNIT TO START IN NORMAL MODE

If a Master unit starts up in listener mode and you want it to enter normal mode, simply press the user button while the diagnostic LED is flashing green and the unit will switch into normal mode.

Note: For more details about starting up a Bin-Sense Live site, please refer to the Bin-Sense Live System Startup Manual

DIAGNOSTICS

LED DIAGNOSTICS

The diagnostic LED on the Master unit circuit board flashes different patterns to give information about what the device is connected to. Most of the information is related to what the unit detects on the sensor cable interface.

The diagnostic LED will automatically start the flashing pattern shortly after powering on the Master unit, and once the Master unit has finished scanning all the attached cables and accessories. The flashing pattern can be triggered at any time by pressing and holding the diagnostic button for four seconds.

The diagnostic LED flashes different colors to convey different information. Red flashes indicate what equipment is being scanned, and orange and green flashes indicate the number of items. The LED will flash red first, and then orange and/or green. The process will repeat until all the information has been communicated.

LED FLASH SEQUENCE

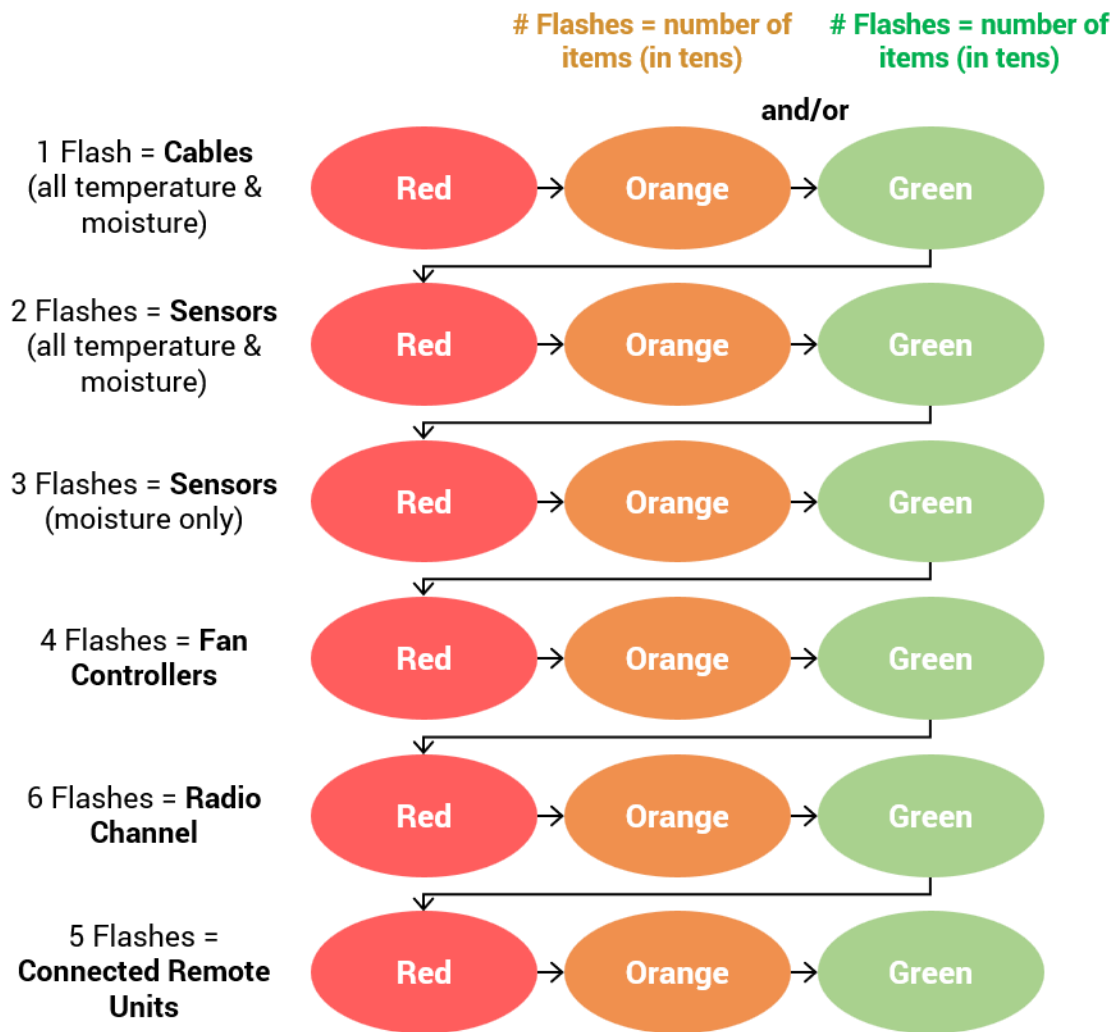


Figure 6: Master Unit Cycle Timeline

The diagnostic LED will only flash a specific number of red flashes if the corresponding number is not zero. For example, if there are no moisture cables connected to the Master unit, the LED will not flash three red flashes. If nothing is detected on the sensor cable interface, the LED will flash one red flash followed by a long pause, and then six red flashes for the radio channel.

EXAMPLE:

If you have one eight-sensor temperature cable, and one eight-sensor moisture cable connected to a Master unit that is set to radio channel 22, you would expect the following flashing pattern:

- **One** red flash (for total temperature & moisture cables) followed by two green flashes (for number of cables).
- **Two** red flashes (for the total number of sensors) followed by one orange flash (for 10) and six green flashes (for a total value of 16).

- **Three** red flashes (for the number of moisture sensors) followed by eight green flashes (for eight).
- **Six** red flashes (for the radio channel) followed by two orange flashes (for 20) and 2 green flashes (for a total value of 22).

TROUBLESHOOTING

Problem	Possible Cause	Suggested Solutions
Unit won't power on.	Battery is not properly connected.	Ensure the battery link cable connection is connected to J9 on the PCB. Ensure the link cable from the external battery enclosure is securely connected to the Master unit battery link cable.
	Battery charge is depleted and solar power is not available.	Open the external battery enclosure and use a multimeter to measure the battery voltage. If it is below 5.5V, use an appropriate 6V lead-acid battery charger to recharge the battery.
	Solar panels are not connected properly.	Ensure the solar link cable connection is connected to J11 on the PCB. Ensure the link cables from the external solar panels are securely connected to the Master unit solar panel link cables.
Diagnostic LED repeatedly flashes green after powering on.	Unit is in listener mode. (See "Listener Mode" on page 12.)	Press the user button to enter normal mode.
Master unit does not detect sensing cables.	Link cables are not connected properly.	Ensure all link cable connections are secure. Use a Bin-Sense Direct unit to check whether the sensing cables can be read at each connection starting as close as possible to the sensing cable and working towards the Master unit.
	Cable wiring short circuit or defective cable.	Check wiring for obvious signs of a short circuit. Disconnect all sensing cables but one and test if the Master unit reads the cable. Reconnect sensing cables one at a time testing for reading after each to single out the defective cable.

Problem	Possible Cause	Suggested Solutions
Battery voltage is low and not recharging.	Solar panels are not connected properly.	Ensure the solar link cable connection is connected to J11 on the PCB. Ensure the link cables from the external solar panels are securely connected to the Master unit solar panel link cables.
	Solar panels are blocked from direct sunlight. Solar panels require unobstructed direct sunlight for at least a few hours a day to maintain the battery voltage. Shade or indirect daylight are not sufficient to charge the battery.	Ensure solar panels are not blocked, shadowed, or dirty.
	Solar panels are not located side-by-side. Both solar panels must receive sunlight at the same time to charge the battery. If one solar panel is exposed to sunlight and the other is shaded, charging will not occur.	Ensure solar panels are located side-by-side with no obstructions causing partial shading of one of the solar panels.
	A solar panel has failed.	Use a multimeter to measure the voltage of each solar panel individually. The output voltage should be at least 7.0V when the panel is exposed to full sunlight. Replace failed solar panels as required. Note that failed solar panels may be covered by warranty.

Manufactured in Canada by



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