



# Operations Manual

## iBOS<sup>®</sup> Plus 6 Series



November  
2019  
Version 1.3



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**iBOS® Plus 6 Series**

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# 1. Introduction

## 1.1 System Overview

This manual will give you all the information you need to operate the iBOS® battery management system. This system helps create a smooth-running battery room and provides valuable management information on the batteries and chargers.

## 1.2 Organization of this Manual

- Section 2 – iBOS® Plus 6 Series Overview
- Section 3 – Operating Instructions
- Section 4 – Troubleshooting

## 1.3 Contact Information

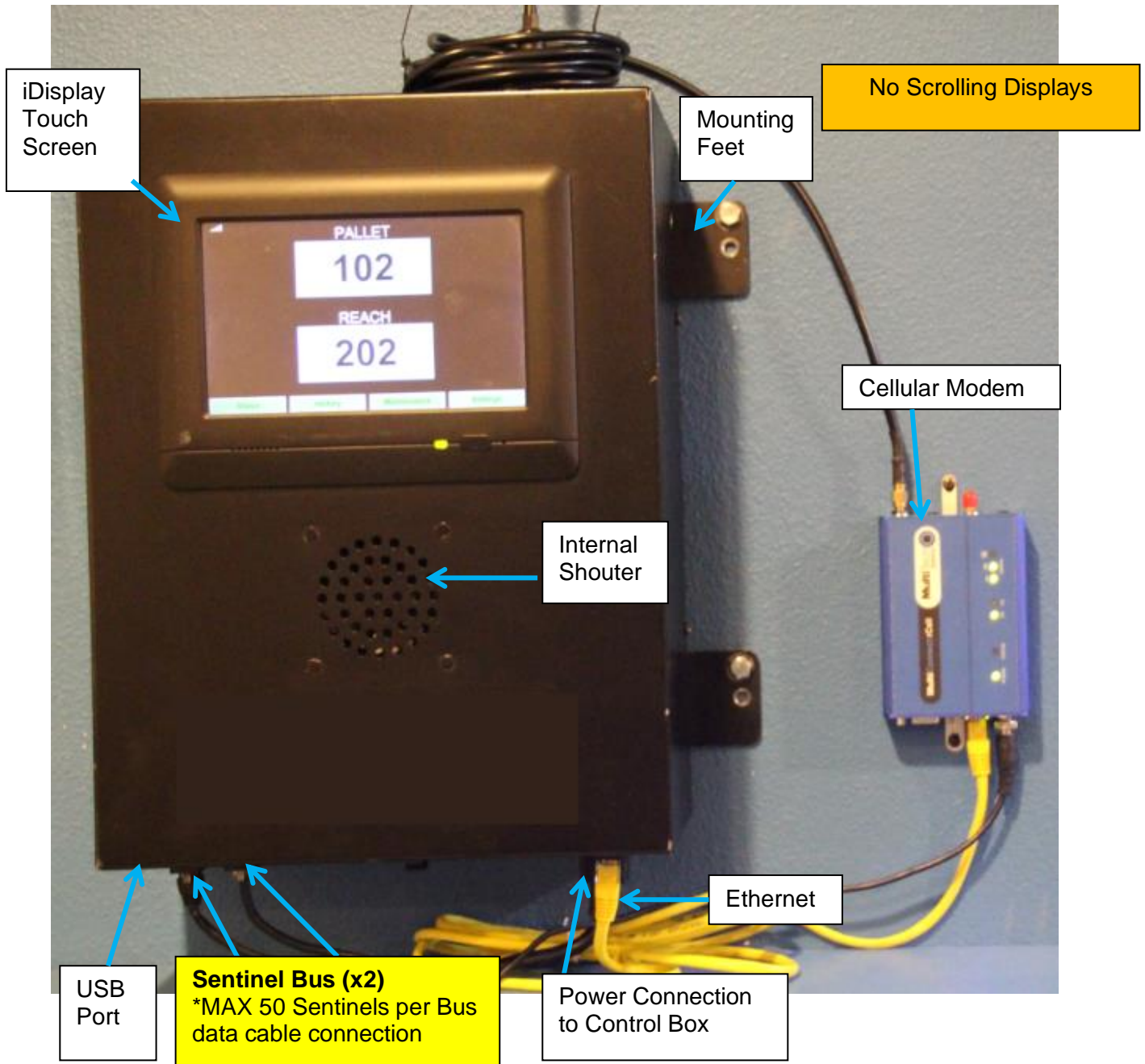
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## 2. iBOS® Plus 6 Series Overview

### 2.1 System Components



**Sentinel™**  
BOS-SU6003



## 2.2 System Details

Every charger has a small monitoring device attached to it called a Sentinel™ that works on all voltages (12-80v). The Sentinel's™ basic function is to detect when the charger finishes charging and to tell the Control Box that a fully charged battery is now available for use.

The Sentinel™ also detects when a battery is connected without the charger starting. After 24 hours in this state, the Sentinel™ will terminate with a “Charger No Start” status and place the battery in Quarantine status. After 72 hours the system will return the battery to the rotation, even though the battery was not charged, to avoid stranding the battery indefinitely. A charger no-start record will appear on the iBOSworld Web Service website indicating charger #, date, and time. These can also be seen by viewing the Status screen on the control box.

All Sentinels™ are wired via a daisy chained bus into the Control Box which keeps track of all the charged batteries. The chargers are grouped into pools, one pool for each type/size of battery in the facility. The touchscreen on the control box tells the operator which battery to pick next. The battery that is fully charged and that has been cooled down the longest will appear on the display, assuming that there are no “Charger No-Start” batteries. There is also a built-in shouter which announces a message in several languages telling the operator when they have picked an incorrect battery while a good pick sounds a pleasant chime. This enables the system to ensure proper battery rotation.

The procedure for the operators is:

- When a truck comes in for a new battery, the operator looks at the touch screen display for that pool or a blue light on a Sentinel™.
- It will tell him/her which battery to take. For example: “REACH 102.”
- The operator goes to the slot marked “102” to get the battery for that type of truck.

The Control Box is also capable of sending data to a website where it can be processed and reports are generated. These reports contain information necessary for keeping the battery selection process running smoothly and can be used to predict when a drift in process is due to too many/too few batteries, malfunctioning chargers, and operators following instructions improperly. The connection to the internet is either a standard direct network Ethernet or via cellular modem. The Ethernet method saves money over the cellular service but requires IT department approval and installation. The cellular modem requires a signal to a cell tower but can be a quick and reliable alternative.



Once data is being sent to the website, users who have the proper login permission can log into the website and see information about the performance of the battery room. This information can help determine if the site is running short of batteries or has too many, if all of the chargers are working properly, and if the operators are correctly following the instructions.

## 3. Operating Instructions

### 3.1 Selecting the Next Available Battery

Keep all batteries plugged in until they are selected unless they are selected for maintenance. The system detects when a battery is connected to the charger, when the charger starts, when the charger finishes, and how long the battery is connected to the charger before it is picked.



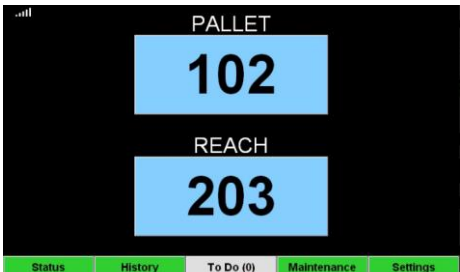

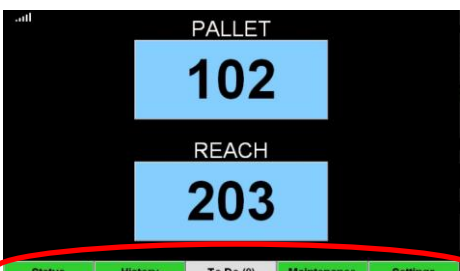
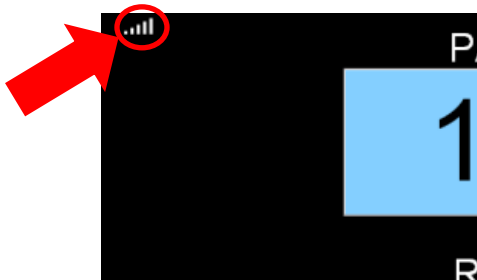
How to select next available battery:

<p>Touchscreen Display</p> <ul style="list-style-type: none"><li>• The touchscreen display is located on the control box.</li><li>• Select the battery listed for the specific pool.</li></ul>	
<p>Blue LED</p> <ul style="list-style-type: none"><li>• Search for the charger with a Sentinel™ that has a blue LED illuminated. This is the most ready battery.</li><li>• For example, in the photo to the right, the operator should pick battery 125 as the next battery.</li></ul>	


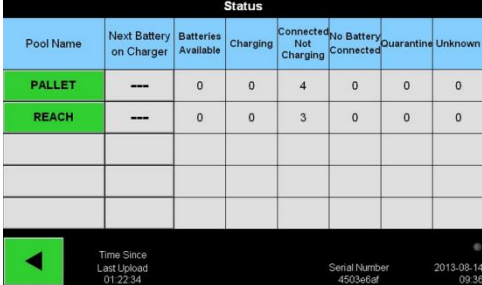
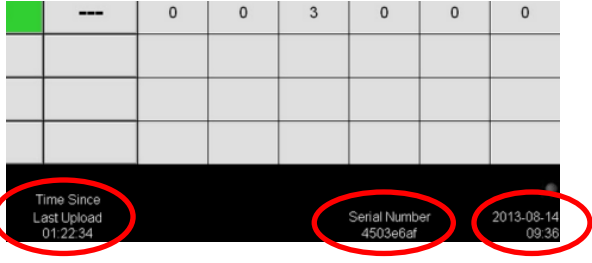
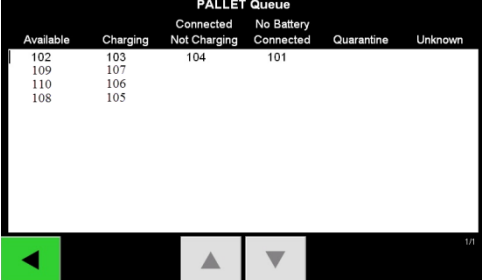
### 3.2 System Feedback

- The shouter on the control box sounds with a pleasant chime when the battery indicated by the system is selected.
- The shouter on the control box sounds with an alarm and message when a battery other than the one indicated by the system is selected. When this occurs, the system considers it a “mispick”.
- All mispicks are logged by the system and can be viewed through the History tab on the Home Screen of the touchscreen display or through the website, iBOSworld.

### 3.3 Touchscreen Display

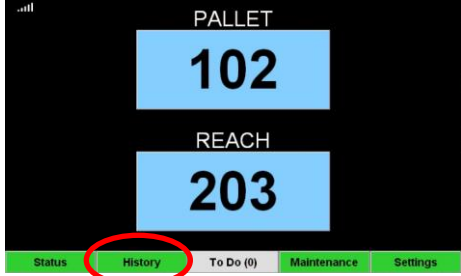




<p>Green LED</p> <ul style="list-style-type: none"> <li>Shows that the unit is powered.</li> </ul>	
<p>The power button is next to the green LED. This is the power button for the display only and not the control box.</p>	
<p>Home Screen</p> <ul style="list-style-type: none"> <li>Shows a list of pools and the next battery to pick from each pool</li> </ul>	
<p>Dashes are shown for a particular pool on the display when no batteries are available. Dashes for all pools can indicate that the system is in Maintenance Mode.</p>	
<p>When a button is green, it is an indication that the button can be pressed.</p>	
<p>The connectivity indicator is located in the upper left of the Home screen. When it is at full strength as shown, it shows that the touchscreen is communicating normally with the control box.</p>	

### 3.4 Status

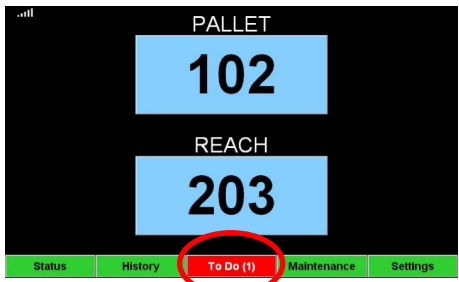
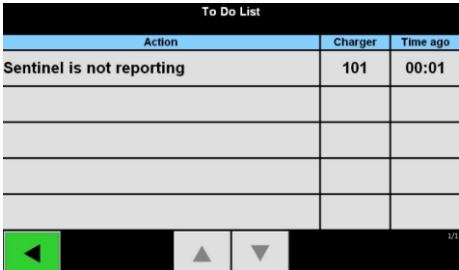
<p>The Status button is located in the lower left of the Home Screen.</p>	
<p>Status Button</p> <ul style="list-style-type: none"> <li>Takes the user to a screen that shows the current status of all of the chargers and the queue.</li> </ul>	
<p>The bottom of the Status screen lists the following:</p> <ul style="list-style-type: none"> <li>Time since the last data was uploaded to iBOSworld.</li> <li>The control box serial number.</li> <li>The current time/date.</li> </ul>	
<p>Pressing on one of the Pool Names in green causes the queue screen to appear.</p> <p>The queue screen displays which chargers are in each group.</p>	



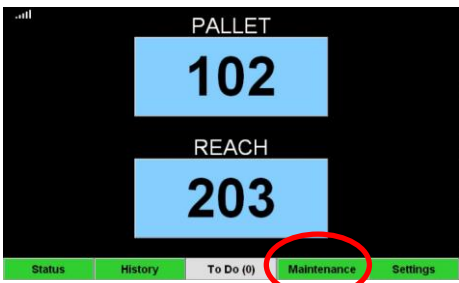

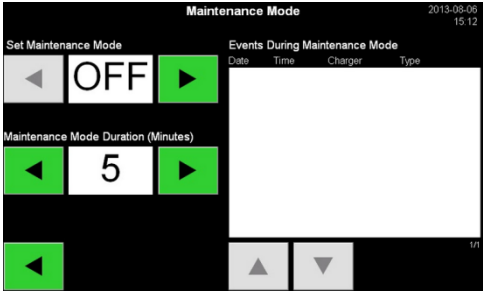
### 3.5 History

<p>The History button is located in the lower center left of the Home Screen.</p>																																					
<p>History Button</p> <ul style="list-style-type: none"> <li>• Takes the user to a screen that shows the record of picks, mispicks, zero available picks, and minimum batteries available for the last 7 days.</li> </ul>	 <table border="1"> <thead> <tr> <th colspan="5">7 Day Statistics</th> </tr> <tr> <th>Pool Name</th> <th>Selections</th> <th>Mispicks</th> <th>Zero Available Picks</th> <th>Minimum Batteries Available</th> </tr> </thead> <tbody> <tr> <td>PALLET</td> <td>4</td> <td>2</td> <td>0</td> <td>Graph</td> </tr> <tr> <td>REACH</td> <td>3</td> <td>2</td> <td>0</td> <td>Graph</td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	7 Day Statistics					Pool Name	Selections	Mispicks	Zero Available Picks	Minimum Batteries Available	PALLET	4	2	0	Graph	REACH	3	2	0	Graph																
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<ul style="list-style-type: none"> <li>• Pressing a button highlighted in green under one of the columns opens a screen that provides more detailed information for the respective pool.</li> </ul>	 <table border="1"> <thead> <tr> <th colspan="4">TURRET - Mispicks</th> </tr> <tr> <th>Date</th> <th>Time</th> <th>Charger</th> <th>Type</th> </tr> </thead> <tbody> <tr> <td>12/08/2015</td> <td>09:07:05</td> <td>209A</td> <td>Mispick</td> </tr> <tr> <td>12/08/2015</td> <td>14:36:44</td> <td>209B</td> <td>Mispick</td> </tr> <tr> <td>12/09/2015</td> <td>09:55:51</td> <td>209B</td> <td>Mispick</td> </tr> <tr> <td>12/09/2015</td> <td>10:05:33</td> <td>209A</td> <td>Mispick</td> </tr> <tr> <td>12/09/2015</td> <td>10:20:59</td> <td>209A</td> <td>Mispick</td> </tr> <tr> <td>12/10/2015</td> <td>12:19:00</td> <td>209A</td> <td>Mispick</td> </tr> <tr> <td>12/10/2015</td> <td>13:20:45</td> <td>209B</td> <td>Mispick</td> </tr> </tbody> </table>	TURRET - Mispicks				Date	Time	Charger	Type	12/08/2015	09:07:05	209A	Mispick	12/08/2015	14:36:44	209B	Mispick	12/09/2015	09:55:51	209B	Mispick	12/09/2015	10:05:33	209A	Mispick	12/09/2015	10:20:59	209A	Mispick	12/10/2015	12:19:00	209A	Mispick	12/10/2015	13:20:45	209B	Mispick
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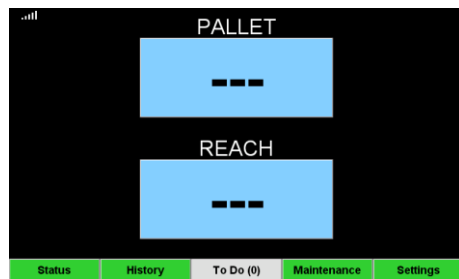
### 3.6 To Do

<p>The To Do button is located in the center of the Home Screen. It will turn red to alert the user when the following conditions exist:</p> <ul style="list-style-type: none"> <li>• Chargers in Quarantine</li> <li>• Sentinels not reporting</li> <li>• Chargers to be switched</li> </ul>																
<p>Pressing the To Do button will display a list of the alerts.</p>	 <table border="1"> <thead> <tr> <th>Action</th> <th>Charger</th> <th>Time ago</th> </tr> </thead> <tbody> <tr> <td>Sentinel is not reporting</td> <td>101</td> <td>00:01</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Action	Charger	Time ago	Sentinel is not reporting	101	00:01									
Action	Charger	Time ago														
Sentinel is not reporting	101	00:01														

### 3.7 Maintenance Mode

<p>The Maintenance Mode button is located in the lower center right of the Home Screen.</p> <p>Maintenance Mode</p> <ul style="list-style-type: none"> <li>• Used to pick batteries that need service without causing the shouter to activate.</li> </ul>																			
<p>The default setting has the mode password protected. The default password is "11111", or it can set to not require a password.</p>																			
<p>The duration of Maintenance Mode can be set from 5-120 minutes. An auto timer then returns the system to normal operating mode. Maintenance Mode can also be cancelled manually.</p> <p>All picks are still recorded during maintenance mode.</p>	 <table border="1"> <thead> <tr> <th colspan="2">Set Maintenance Mode</th> <th colspan="4">Events During Maintenance Mode</th> </tr> <tr> <th>Date</th> <th>Time</th> <th>Charger</th> <th>Type</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Set Maintenance Mode		Events During Maintenance Mode				Date	Time	Charger	Type								
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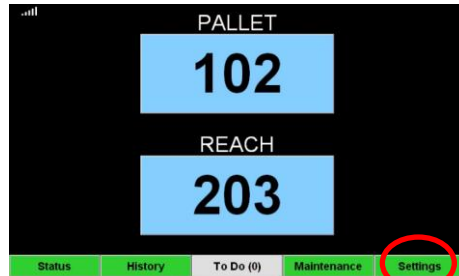
While Maintenance Mode is on, the system does not show which battery to pick next. You will see 3 dashes.



### 3.8 Settings

The Settings button is located in the lower right of the Home Screen. The Settings screen is password protected, and its use is covered in detail in the Installation Manual.


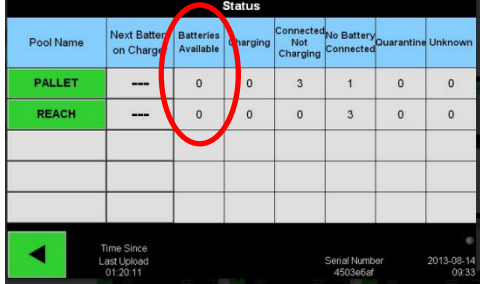
(See DOC0024 – iBOS® Plus 6 Series Installation Manual for more details.)




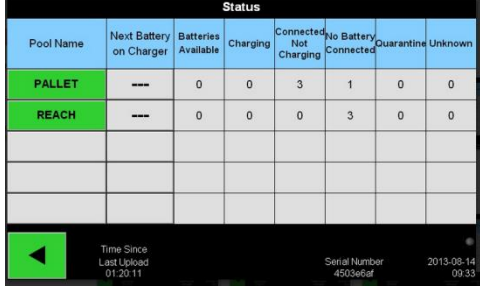
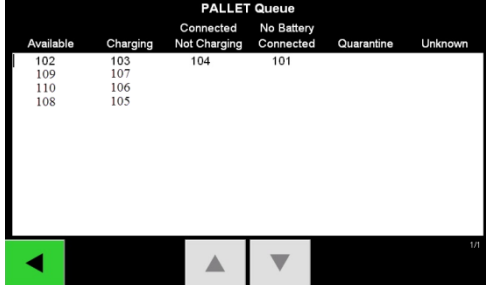
## 4. Troubleshooting

The first step in determining the status of a battery room is to go to the iBOS® control box or wireless display and look at the touch screen display.

### 4.1 The Display Shows Dashes

<p>If the Home screen shows dashes instead of a charger number, check the Status screen.</p> <p>Press the “Status” button.</p>	
<p>Once you have pressed the “Status” button, the Status screen appears.</p> <p>Check to see if there are any batteries available.</p>	

### 4.2 Troubleshooting from the Status Screen

<p>In the lower left-hand portion of the screen is a green button that shows the word “Status”.</p> <p>Press the “Status” button.</p>	
<p>Once you have pressed the “Status” button, the Status screen appears.</p> <p>(Note: The information may not be displayed immediately. The display asks the control box for the information and displays it once it has received it.)</p>	
<p>To find out which chargers are in each group, press one of the Pool Names in green.</p> <p>You will see the queue screen appear.</p>	

The first two columns show the available batteries and the batteries that are on charge. When

troubleshooting, focus your attention on the following columns:

- Connected Not Charging
- No Battery Connected
- Quarantine
- Unknown

#### 4.2.1 Connected Not Charging

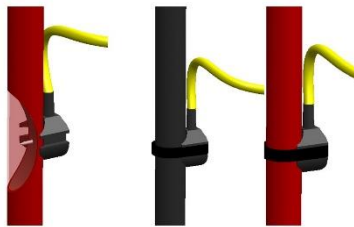
This could mean that a battery has just been connected and that the charger has not had time to turn on, but it could also mean that there is an issue with the battery or charger such that the charger will not start its charge cycle.

- If any charger ID's are listed in the column marked "Connected Not Charging", check to see if the charger indicates a fault.
- Confirm that the amber LED is illuminated on the Sentinel™, and that a battery is connected.
- If the display and all indicator lights on the charger are blank, check to see if there is power to the charger.
- Check to see if the charger is set for a delayed start.
- If the charger is functioning properly, check the voltage of the battery as some chargers will not recognize an over discharged battery.

#### 4.2.2 No Battery Connected

The system does not indicate that a battery has been connected.

- If a charge ID is listed in the column marked "No Battery Connected", check to see if a battery is in the charging slot on the battery rack.
- If there is a battery, check to see if it is connected to the charger listed.
- If a battery is connected, look at the amber LED on the Sentinel™ to be sure that it is on.
- If a battery is connected, and the amber LED is not on,
  - Check the battery connector to be sure that it is not broken.
  - Check the Flexi-Taps on the Sentinel™ to be sure that the pins have penetrated the cable and are not bent.



Flexi-Tap Installation

#### 4.2.3 Quarantine

The Quarantine column shows the quantity of chargers where a battery has been connected, but the charger has not started within 24 hours. The system quarantines the battery by taking it out of the queue, and if the issue is not resolved within 72 hours, the battery is returned to the queue. This time is Quarantine can be adjusted by the user. (See DOC0024 – iBOS® Plus 6 Series Installation Manual for more details.)

- If any charger ID's are listed in the column marked "Quarantine", check to see if the charger indicates a fault.
- Confirm that the amber LED is illuminated on the Sentinel™, and that a battery is connected.
- If the display and all indicator lights on the charger are blank, check to see if there is power to the charger.

- If the charger is functioning properly, check the voltage of the battery as some chargers will not recognize an over discharged battery.
- To take a battery out of quarantine, disconnect the battery from the charger and reconnect the battery.

#### 4.2.4 Unknown

The Unknown column shows the number of chargers with an unknown status according to the system.

- If any charger ID's are listed in the column marked "Unknown", check to see if the Sentinel™ shows a steady green light. If it does, wait a few minutes and check the "Status" screen again. There could have been a miscommunication between the control box and the Sentinel™ in which case the status will update the next time the control box polls the Sentinels™.
- If the Sentinel™ does not have its green LED illuminated,
  - Check the data cables to make sure that they are secure and have not been broken or pinched.
  - Be sure that the data cable is plugged into the control box.
  - Be sure that the data cable is connected to the first Sentinel™ and that the cable is connected between each Sentinel™.
  - Make sure that the control box has power.
- If the green light is flashing, be sure that the Sentinel™ has been assigned to a Pool through the charger configuration. (See DOC0024 – iBOS® Plus 6 Series Installation Manual for more details.)

### 4.3 Sentinel™ Lights

Following is a description of the LED indicators:

#### 4.3.1 Green LED – Communication status

- Off – No power to the Sentinel™.
- Solid – Sentinel™ is communicating properly with Controller.
- Flashing – Sentinel™ is not communicating properly with the Controller.

#### 4.3.2 Amber LED – Charging status

- Off – No battery connected.
- Solid – Battery is connected. (If the amber light is on, but no battery is connected, check the charger for a voltage leak to the DC cables.)

#### 4.3.3 Blue LED – Termination status

- Off – Battery is not at the top of the queue.
- Bright with Momentary Flashing – This is the correct battery to pick next.

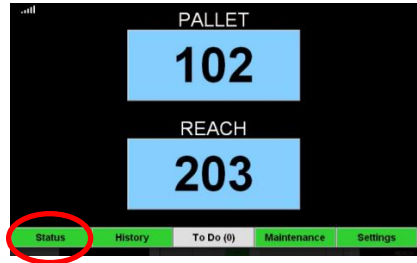
#### 4.3.4 Red LED – Bad communication cable

- Solid – Power wires reversed in the data cable.
- If the red light is on, replace the data cable.

# Appendix A – iBOS® System Daily Checks or Per Shift

Check the system Status Screen at the beginning of the day or at the beginning of the shift.

To check the Status screen, press the “Status” button on the Home Screen.



Determine if the following conditions exist:

1. No batteries available
2. Batteries connected but not charging
3. Chargers with no battery connected
4. Batteries in Quarantine
5. Unknown

If any of these conditions exist, see **Section 4, Troubleshooting**.

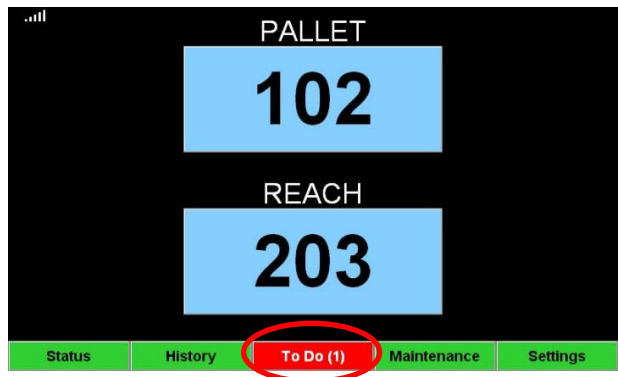
Pool Name	Next Battery on Charger	Batteries Available	Charging	Connected Not Charging	No Battery Connected	Quarantine	Unknown
PALLET	---	0	0	4	0	0	0
REACH	---	0	0	3	0	0	0

6. If you have a iBOSworld Web Service and “Time Since Last Upload” reads 99:59:59, the system is not uploading. Please call your servicing distributor.

Pool Name	Next Battery on Charger	Batteries Available	Charging	Connected Not Charging	No Battery Connected	Quarantine	Unknown
PALLET	---	0	0	3	1	0	0
REACH	---	0	0	0	3	0	0

Check the To Do button at the beginning of the day or at the beginning of the shift to see if it is red.

If the To Do button is red, press it to see what alerts are present.



# iBOS® System Checklist

<p>1. Are there batteries available?</p>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>	<p><u>Quantity available:</u>                  Pool 1 ____ Pool 4 ____ Pool 7 ____                  Pool 2 ____ Pool 5 ____ Pool 8 ____                  Pool 3 ____ Pool 6 ____ Pool 9 ____</p>	
<p>Are there any pools with no batteries available?</p>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>	<p>List pools                  _____</p>	
<p>2. Are there batteries connected but not charging?</p>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>	<p>List Chargers</p>	<p>Action Taken</p>
<p>3. Are there chargers with no battery connected?</p>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>	<p>List Chargers</p>	<p>Action Taken</p>
<p>4. Are there chargers in Quarantine?</p>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>	<p>List Chargers</p>	<p>Action Taken</p>
<p>5. Are there chargers with Unknown status?</p>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>	<p>List Chargers</p>	<p>Action Taken</p>
<p>6. Time since last upload</p>	<p>_____</p>		

Name: \_\_\_\_\_ Date: \_\_\_\_\_



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