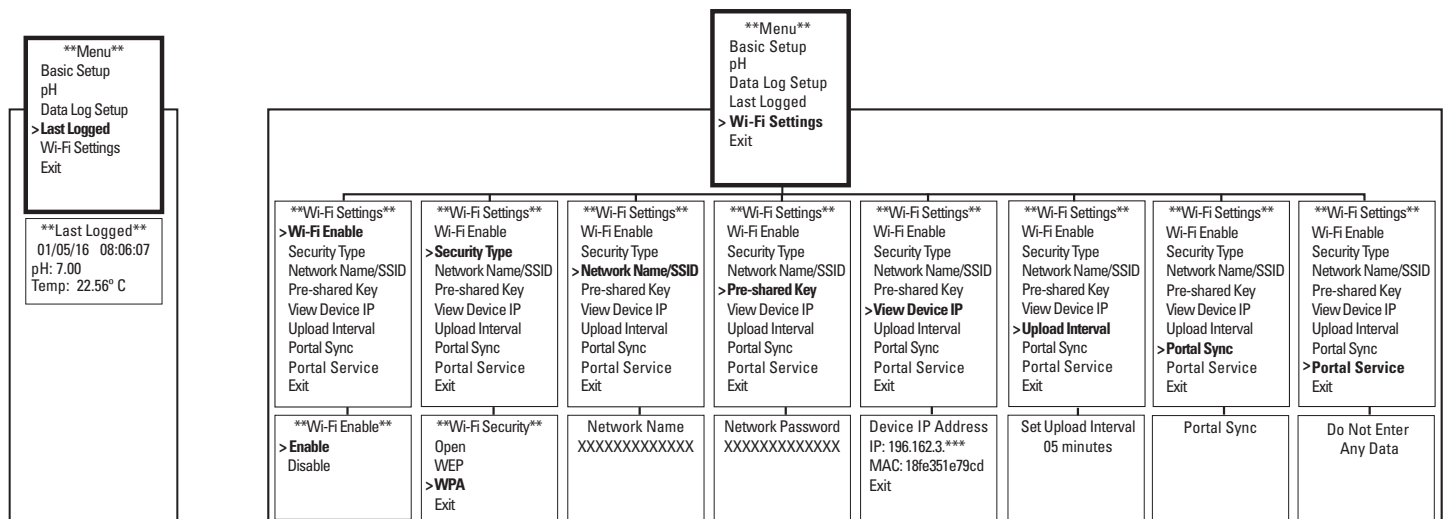
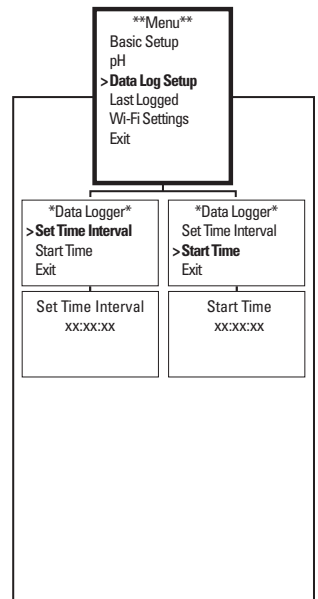
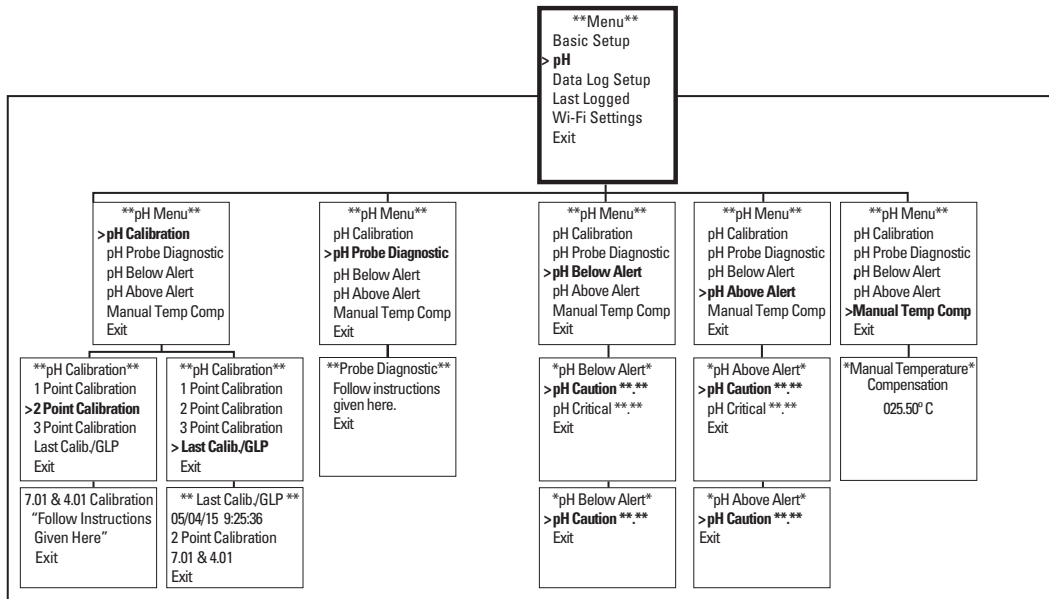
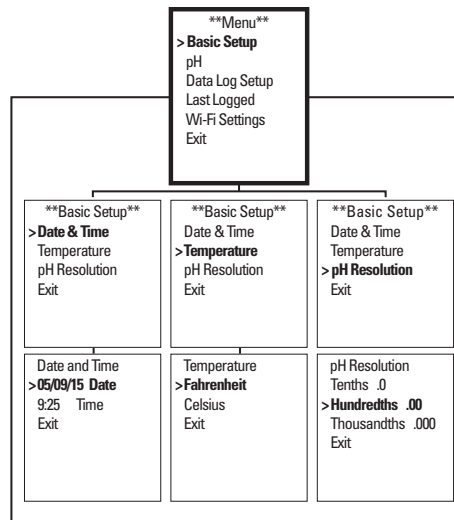


**Milwaukee**  
**DL100 BLACK BOX**  
**DATA LOGGING MONITOR**  
**pH/Temperature**



**Set Up / Operation Manual**

# DL100 MENU MAP



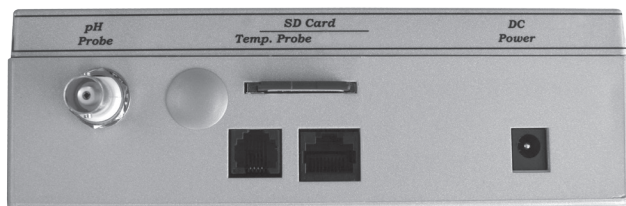
**Please make sure you have all the components listed below. If not, call your dealer.**

- DL100 Data Logging Monitor
- #MA911B/2 pH probe with 2m cable
- #RJ11 temperature probe with 3m cable
- 9VDC power supply
- 4GB SD card
- International power supply kit

## DL100 Quick-Start Hardware Setup

- 1) Plug the pH probe into the BNC connector on the controller.
- 2) Insert the 4GB SD card (included), *printed side down*, making certain that it snaps into place.
- 3) Connect RJ11 temperature probe.
- 4) Connect 9VDC power supply into unit first, then plug into 120VAC wall outlet.

Note: To enable Wi-Fi, you will need to know your Wi-Fi network Security Type, Name, and Password.



*Milwaukee Instruments, designer and manufacturer of the DL100, recommends you read this manual from start-to-finish, without skipping sections. Many of the instructions in later sections are based on knowledge you will acquire in the earlier sections of this manual.*

## Getting to know the DL100

Once you have connected all the cords, inserted the SD card, and plugged the DL100 into a wall socket, please read this section, taking a few moments to learn about the screen and keypad.

Note there is no ON/OFF switch; the unit is ON as soon as it is plugged in. The only way to deactivate the unit is to unplug it. Recorded data on the SD card will remain intact when the unit is unplugged.

**THE SCREEN** When the unit is first powered up, you will see a WELCOME message. In a few seconds, the unit will automatically switch to the primary display screen. This screen gives the date, time, and real-time readings of pH and Temperature. If activated, the word Wi-Fi will appear in the upper right corner. Unless you are changing settings, this is the screen that should always be displaying.



### Primary Display Screen

If temperature probe is plugged in, ATC (Automatic Temperature Compensation) will appear in the lower right portion of screen. If not, MTC (Manual Temperature Compensation) will display.

On the menu screens, only four lines will be visible at a time. To see more options, scroll the list by using up/down arrows on the keypad. When the cursor (>) appears beside the appropriate function or setting, press **SELECT**.

**THE KEYPAD** Pressing the **Menu** button brings up a screen featuring the full menu. At the bottom of all menu screens, there will be an "Exit" option. The "Exit" option, when selected, takes you back to the previous screen you were viewing. For informational screens, there is no "Exit" option. Press **SELECT** to return to previous screen.

Pressing the **Menu** button takes you all the way back to the primary display screen, bypassing other screens you may have used. Pressing the **Menu** button also allows you to toggle between the primary display screen and the full menu screen.



The **left/right arrows** (◀▶) allow you to move the blinking cursor horizontally through a line of settings to the numbers you want to reset, while the **up/down arrows** (⬆⬇⬆) allow you to move through the function listings and numbers, and toggle between yes/no options. When new settings are entered, press **SELECT**, there will be a short pause and the screen will read SAVED! In just a moment, the unit will revert to the previous screen.

The **Lights** button allows you to turn off the screen and status lights (lights to the left and right of screen, behind grills). The unit is still functional when lights are off. Pressing **Lights** again will reactivate all lights.

**IMPORTANT:** When in the Lights OFF mode, the status lights (caution and critical) will not activate on the unit; however, since the unit is still operational, it will continue to log data and, if web portal is activated, send text or email alerts, or both. The only way to turn off data logging and the alerts system is to unplug the unit.

The **Snap Shot** button allows you to instantly log a real-time reading on both the SD card and the portal. When you press the **Snap Shot** button on the keypad, "Snap Shot" will appear for a few seconds in the lower right corner of the screen, indicating the real-time data has been logged.

## Getting Started with Basic Setup

**This is a very important step, allowing you to enter the correct Date and Time, select Fahrenheit or Celsius Temperature readings, and calibrate for pH.**

This unit comes with factory presets, but before using you must reset to meet your specific requirements. If you ever wish to revert to factory settings (a factory reset), simply unplug unit, then plug back in while holding the **Lights** button down for 3 seconds.

**Breadcrumbs**, or the navigation path, shown at the beginning of each section of this manual, will take you from the Menu screen to the screen where you will be entering changes.

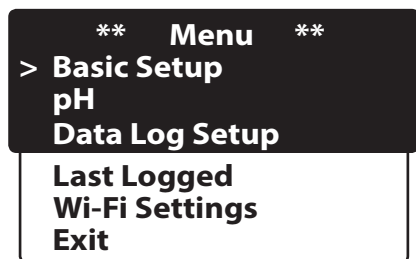
### Setting Date and Time

**Menu Button>Basic Setup>Date and Time**

1) Press the **Menu** button on the keypad and the full menu will appear on screen.

2) The cursor appears beside the first option on each new screen, and since “Basic Setup” is the first option listed, you can press the **SELECT** button on the keypad.

*Please note that the Full Menu lists six options, but only three will be visible on the screen. To see other options, scroll with the down arrow to bring other options into view.*



3) The \*\*Basic Setup\*\* screen will appear and the cursor will be beside the first option, which is “Date and Time.” Press **SELECT**.

4) The “Date and Time” screen will now appear. Both the date and the time will be shown, but they may not be correct.

5) To change the date, make sure cursor is beside the Date line and press **SELECT**.

6) To set the “Date,” use the left/right arrows on the keypad to move the blinking cursor through the line. Be sure to skip over slashes. Use the up/down arrows to find the correct numbers for the month, day, and year. Once you have set all numbers to match today’s date, press the **SELECT** button and the SAVED! screen should appear for a few moments. It will then go back to the “Date and Time” screen.

7) Now you are ready to set the time. Scroll down to the next option, which is “Time.” Press **SELECT**.

8) Again, work across the Hours:Minutes (00:00) using left/right arrows, picking the number you want to change, then using up/down arrows to select the appropriate number.

*Note that this unit displays in military time (24-hour); there is no am/pm option, that is, 9AM is 09:00 and 2:05PM is 14:05. 10:30PM is 22:30.*

9) Once complete, press **SELECT** to enter the new time. A screen will appear indicating that your change has been SAVED!

10) Scroll to “Exit” and press **SELECT** to return to \*\*Basic Setup\*\* screen, or press the **Menu** button to return to the primary display screen.

**Important:** When utilizing portal, date on monitor and portal dashboard must be the same, and times should be set as close as possible (within ten minutes).

### Setting Temperature – Fahrenheit or Celsius

**Menu Button>Basic Setup>Temperature**

Work your way to the “Temperature” screen and, using up/down arrows, select Fahrenheit or Celsius, then press **SELECT**. The SAVED! screen will appear, then go back to the “Temperature” screen. Scroll to “Exit” and press **SELECT** to return to \*\*Basic Setup\*\* screen, or press the **Menu** button to return to the primary display screen.

### Setting “pH Resolution” – Tenths, Hundredths, or Thousandths

**Menu Button>Basic Setup>pH Resolution**

On the “pH Resolution” screen, use up/down arrows to select tenths, hundredths, or thousandths, and press **SELECT**. The SAVED! screen will appear, then go back to the “pH Resolution” screen. Scroll to “Exit” and press **SELECT** to return to \*\*Basic Setup\*\* screen, or press the **Menu** button to return to the primary display screen.

This completes the Basic Setup of your DL100.

\*\*\*\*\*

## Setting Up for pH Readings

The \*\*pH Menu\*\*, as shown below:

- allows you to set for 1, 2, or 3 point calibration
- allows you to check the last calibration – date, time, number of points, and which points
- provides pH probe diagnostic
- allows you to set caution and critical alerts for readings getting too high or too low
- allows you to manually enter temperature of solution





## Setting Calibration Points

### Menu Button>pH>pH Calibration

Before selecting calibration point(s), you may want to review the **\*\*Last Calib./GLP\*\*** screen. Scroll down to the "Last Calib./GLP" option and press **SELECT**. (Menu Button>pH>pH Calibration>Last Calib./GLP) The **\*\*Last Calib./GLP\*\*** screen will then give you the date and time of the last calibration; indicate 1, 2, or 3 point calibration; and give you the calibration points, as shown below.

**\*\* Last Calib./GLP \*\***  
**05/04/15 9:25**  
**2 Point Calibration**  
**7.01 & 4.01**

**Acid Slope: 000.0**  
**Base Slope: 000.0**  
**>Exit**

In accordance with GLP (Good Laboratory Practices), you can scroll down on this screen to view Acid Slope and Base Slope once calibration is complete.

1) On **\*\*pH Calibration\*\*** screen, select 1, 2, or 3 point calibration.

2) Depending on your selection, the **\*\*1 Pt Calibration\*\***, **\*\*2 Pt Calibration\*\***, or **\*\*3 Pt Calibration\*\*** screen will appear. Each of these screens lists the calibration points - various combinations of 4.01, 7.01, and 10.01. Place the cursor beside your desired point or combination of points and press **SELECT**.

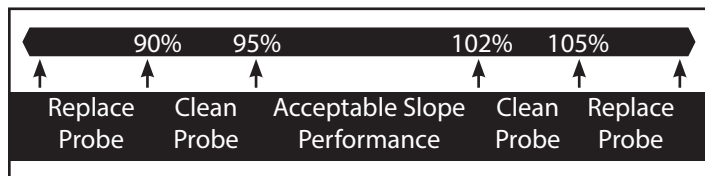
As an example, if you select 2 Point Calibration, a new screen will appear listing 7.01 & 4.01 Calib and 7.01 & 10.01 Calib. If you **SELECT** 7.01 & 4.01 Calib, another screen will appear which will take you through the calibration process.

- You will be instructed to "Place probe in 7.01 calibration solution. Press Select."
- A "Please Wait..." message will appear on screen.
- Once the probe calibrates in the 7.01 solution, you will then be instructed to "Place probe in 4.01 calibration solution. Press Select."
- Once the probe has calibrated in the 4.01 solution, calibration is complete.

## Using Acid/Base Slopes to Assess pH Probe Performance

In addition to displaying date, time, number of calibration points and specific points, the **\*\*Last Calib./GLP\*\*** screen provides readings for Acid Slope and Base Slope. Slopes are given as percentages and tell you how closely your freshly calibrated pH probe is reading as compared with an "ideal" probe.

A new probe can get very close to "ideal" probe readings, but with aging and coating becomes less accurate. The following graph shows the acceptable range and indicates what should be done if the reading falls outside this range. If your probe is good in one range (acid or base), but bad in the other, it should be replaced.



A 3-point calibration will always give you an acid and a base slope: however, when using 1- or 2-point calibration, depending on points chosen, you may get an acid OR a base slope reading. In this case, the other reading will show as a default 99.9.

## pH Probe Diagnostic

### Menu Button>pH>pH Probe Diagnostic

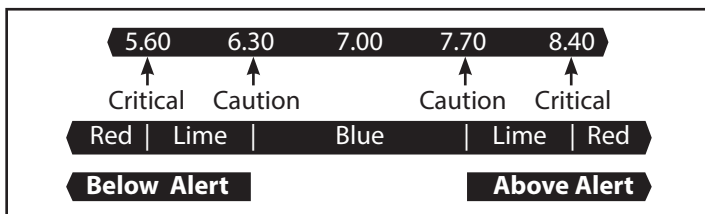
pH probes have a limited lifetime and must be replaced periodically to maintain accurate readings. If you suspect incorrect readings, work your way to the pH Probe Diagnostic screen. Press **SELECT**. Follow instructions on the screen and the unit will run a diagnostic test, then a message will appear on the screen, such as "Probe or solution is bad!" Replace your solution, run diagnostic again, and if you get the same message, replace the probe.

## Understanding pH Alerts (Caution and Critical)

The DL100 is designed to efficiently monitor the pH value of a solution and generate caution and critical alerts as needed. The status lights located beside the screen will change color to signal these alerts and, if you have enabled Wi-Fi and subscribe to the interface portal, the monitor will send out your choice of emails or text messages, or both, to alert you. See "Setting up Wi-Fi" section for details on connecting to the interface portal.

A Caution is intended to alert you when the pH reading is getting too high or too low. A Critical Alert is to let you know that a reading has reached a critical level and you have a serious problem needing immediate attention.

It is your responsibility to set the pH alerts for your specific requirements. This is a balancing act and may require some experimentation on your part. You want to receive the alerts when needed, but you don't want the DL100 to be sending out alerts too frequently. See the diagram below for a typical setup.



If the value for pH is within the Caution parameters you have set, the status lights on both sides of the screen will remain blue.

If the blue changes to lime, this signals that the value has reached the Caution level. If the reading continues to drift further from the target value and reaches the Critical level, the lime lights will turn red, indicating a critical condition.

## Setting pH Below Alerts (Caution & Critical)

### Menu Button>pH>pH Below Alert

1) Work your way to the \*pH Below Alert\* screen. You will see two options: "pH Caution" and "pH Critical." If the settings shown beside each are the desired settings, you may "Exit" the screen.

2) If you want to change the Caution setting, place the cursor beside "pH Caution" and press **SELECT**.

3) On this screen, use the keypad arrows to create the new setting, and press **SELECT**. The SAVED! screen will appear and you will be taken back to the \*pH Below Alert\* screen.

4) Move the cursor to the "pH Critical" option; press **SELECT**, then enter the new setting.

5) Press **SELECT** and you have completed the setup for the pH Below Alerts. Scroll down and select "Exit" to go back to \*\*pH Menu\*\* screen or press **Menu** button to go back to primary display screen.

## Setting pH Above Alerts (Caution & Critical)

### Menu Button>pH>pH Above Alert

1) Work your way to the \*pH Above Alert\* screen. You will see two options: "pH Caution" and "pH Critical." If the settings shown beside each are the desired settings, you may "Exit" the screen.

2) If you want to change the Caution setting, place the cursor beside "pH Caution" and press **SELECT**.

3) On this screen, use the keypad arrows to create the new setting, and press **SELECT**. The SAVED! screen will appear and you will be taken back to the \*pH Above Alert\* screen.

4) Move the cursor to the "pH Critical" option; press **SELECT**, then enter the new setting.

5) Press **SELECT** and you have completed the setup for the pH Above Alerts. Scroll down and select "Exit" to go back to \*\*pH Menu\*\* screen or press **Menu** button to go back to primary display screen.

## Setting Manual Temperature Compensation

### Menu Button>pH>Manual Temp. Comp.

Work your way to the \*Manual Temperature Compensation\* screen. Using left/right arrows to scroll blinking cursor through temperature and up/down arrows to change numbers, enter the temperature of your solution, being sure to note if it is set for Fahrenheit or Celsius scale. When complete, press **SELECT** and the SAVED! screen will appear.

When manual temperature compensation has been set, MRC will appear in the lower right corner of the primary display screen.

## Setting up the Data Logger (Time Interval & Start Time)

Please note that if you remove the SD card when the unit is ON, the unit will remain operational. However, before re-inserting the SD card, disconnect the unit from its power source. Once you have the SD card snapped back in place, restore power to the unit. If you re-insert the SD card while the unit is operational, you must still momentarily disconnect from power,

then reconnect, allowing the unit to properly communicate with the SD Card.

Also note that the internal SD card is fixed at two-minute logging intervals. The following instructions refer to the portal only.

	Date	Time	pH	Temperature
	A	B	C	D
1	5/18/16	9:08:26	7.44	70.92F
2	5/18/16	9:08:31	7.438	70.92F
3	5/18/16	9:29:52	7.406	71.03F
4	5/18/16	10:30:35	7.361	76.77F
5	5/18/16	10:30:45	7.36	76.88F
6	5/18/16	10:31:31	7.36	77.33F
7				

Example of Logged Data on SD Card

### Menu Button>Data Log Setup>Data Logger

1) Work your way to the \*\*Data Logger\*\* screen. The cursor will appear beside "Set Time Interval." Press **SELECT**.

2) On the "Set time interval" screen, using the keypad arrows, enter the amount of time between logs, in Hours: Minutes:Seconds (00:00:00). Logging is restricted to a 5-minute minimum upload interval (except for Snap Shots); however, Milwaukee Instruments recommends a wider interval, typically 00:10:00 to 00:15:00. For most applications, this 10- to 15-minute interval is frequent enough to gather meaningful data without collecting too much data, which can often make evaluation cumbersome.

3) Press **SELECT** to save this interval. Screen will read SAVED! and go back to the \*\*Data Logger\*\* screen with the cursor beside "Start Time."

4) Press **SELECT** to advance to the Start Time screen. Using the keypad arrows, enter the start time and press **SELECT** to save.

5) Press the **Menu** button to return to the primary display screen.

Note: To capture a real-time reading, press the Snap Shot button. A snap shot will not interfere with scheduled data logging. When you press the **Snap Shot** button on the keypad, "Snap Shot" will appear for a few seconds in the lower right corner of the screen, indicating the real-time data has been logged.

## Checking Last Logged Screen

Place cursor beside "Last Logged" and press **SELECT**. The \*\*Last Logged\*\* screen will appear. Press **Menu** button to return to primary display screen.

**\*\* Last Logged \*\***  
**01/05/16 08:06:07**  
**pH: 7.105**  
**Temperature: 77.56° F**

## Setting up Wi-Fi

In addition to displaying real-time data, the Wi-Fi and portal provide email and text alerts, store redundant data, and offer remote control of unit.

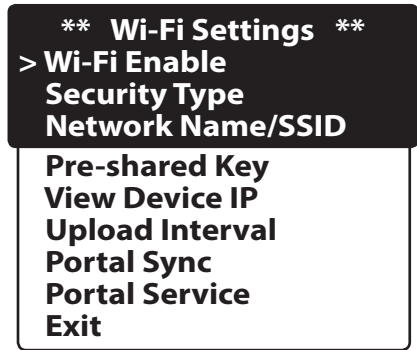
Use of Wi-Fi and portal is optional; it is not required. Not utilizing

the portal will not affect operation of the unit.

Your DL Monitor is set up to transmit in the 2.4GHz frequency range only. If you are using a wireless router with two or more channels, please be sure to enter the "Network Name / SSID" that will access the 2.4GHz frequency channel only. The unit will **not** communicate at 5.0GHz.

Before beginning Wi-Fi setup, make sure you have the following:

- Wi-Fi Network Security Type (Open, WEP, or WPA)
- Wi-Fi Name, and
- Wi-Fi Password



**IMPORTANT:** Although "Wi-Fi Enable" is the first option listed, you should enter all Wi-Fi information with the unit in Wi-Fi Disabled mode. Enable Wi-Fi as the last step, otherwise the unit may begin uploading information before you finish entering it.

**Menu Button>Wi-Fi Settings>Wi-Fi Enable**

- 1) Work your way to the **\*\*Wi-Fi Enable\*\*** screen.
- 2) On the **\*\*Wi-Fi Enable\*\*** screen, place cursor beside "Enable" and press **SELECT**.
- 3) Use the same procedure to Disable Wi-Fi.

**Menu Button>Wi-Fi Settings>Security Type**

- 1) Work your way to the **\*\*Wi-Fi Security\*\*** screen and press **SELECT**.

- 2) On the **\*\*Wi-Fi Security\*\*** screen, you will have the following options: Open, WEP, and WPA. WPA is the most common. Place cursor beside the appropriate security type and press **SELECT**.

**Menu Button>Wi-Fi Settings>Network Name/SSID**  
(Remember to use 2.4 GHz only)

- 1) Work your way to the "Network Name/SSID" screen and press **SELECT**.
- 2) When the "Network Name/SSID" screen opens, fill in your Wi-Fi name using the keypad arrows, and press **SELECT**.

**Menu Button>Wi-Fi Settings>Pre-shared Key (Password)**

- 1) Work your way to the **\*\*Pre-shared Key\*\*** screen and press **SELECT**.

- 2) When the screen opens, the heading will read "Network Password."

- 3) Fill in your Wi-Fi password using the keypad arrows, and press **SELECT**.

**Menu Button>Wi-Fi Settings>View Device IP**

When Wi-Fi is set up and you have logged in, you will be able to view the Device IP and MAC Addresses.

**Menu Button>Wi-Fi Settings>Upload Interval**

This screen will show upload interval, that is, how often the DL100 sends new information to the portal. Five minutes is the minimum upload interval.

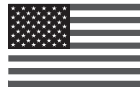
**Menu Button>Wi-Fi Settings>Portal Sync**

**Menu Button>Wi-Fi Settings>Portal Service**

**IMPORTANT:** Do not open the Portal Service screen unless you are instructed to do so by Milwaukee Instruments. If you accidentally open this screen, press MENU to back out. **Do NOT enter any data!** Doing so will permanently disconnect you from the portal.

## DL100 BLACK BOX SPECIFICATIONS

Range	.001 pH to 14.000 pH
Resolution - User Select	Tenths (0.1 pH); Hundredths (0.01 pH); Thousandths (0.001) pH
Accuracy @ 77°F	0.02 pH
Setpoint Range	0.01 pH to 14.00 pH
Activation Parameter	User Select above or below activation setpoint
Visual Alerts	LED backlight blue = normal; lime = caution; red = critical
Probe Protection	On Master Board GLP chipset ( Ground Loop Preventer )
Circuit Board Protection	On Master Board RJ45 Backfeed Prevention Chipset
Operational Environment	15°F to 180°F (-10°C to 85°C)
Temperature Accuracy	0.5°F
Power Supply	International Plug Set - No Converter Needed
pH Electrode	MA911B/2
<b>Main Board</b>	Atmel SAM3X8E ARM Cortex-M3 CPU
Operating Voltage	3.3 volts
Clock Speed	84 MHz clock
S Ram	96 KBytes of SRAM (two banks: 64KB and 32KB)
Flash Memory	512 KB
Data Retention	100 years at 25° C
Station and Access Point, Wi-Fi	802.11 b/g/n Roles with Integrated Radio, Baseband, and MAC
TCP/IP	Embedded TCP/IP stack
Circuit Board Protection	RJ45 Back Feed Protection with Short Circuit Protection
GLP (Ground Loop Prevention)	Dual Ground Loop Prevention Circuit and Chipset
Input Power Supply	7V to 12VDC Recommended --- International Plug Set - No Converter Needed
Input Min. & Max.	6V to 20VDC
Logic Load Shifter	Provides Higher LCD Screen Resolution and Fast Response Time



Manufactured/Assembled  
in the USA

