



**MODEL 3100  
DISSOLVED OXYGEN ANALYZER**

**MODEL 30  
OPTICAL DISSOLVED OXYGEN  
SENSOR**

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## **GENERAL INFORMATION**

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### **Product Description**

The Model 3100 Dissolved Oxygen Analyzer is a handheld analyzer designed for the measurement of dissolved oxygen (D.O.) in aqueous solutions. The microprocessor-based electronics of the Model 3100 analyzer provide a high degree of flexibility and ease of use. The instrument will display dissolved oxygen content in PPM, MG/L, or %SATURATION. The resolution in PPM or MG/L mode is 0.01 over the range of 0.00 to 3.99 and 0.1 over the range of 4.0 to 20.0. The resolution in %SAT mode is 0.1% over the range of 0.0 to 99.9 %SAT and 1% over the range of 100 to 400 %SAT. Temperature is displayed in 0.1 degree Celsius increments over a 0.0 to 50.0 degree Celsius range or 1 degree Fahrenheit increments over a 32 to 122 degree Fahrenheit range.

The microprocessor based electronics of the Model 30 provide a high degree of flexibility and ease of use. The sensor is an optical type sensor that measures the fluorescence and quenching reactions of a ruthenium complex that is immobilized in a sol-gel matrix. Calibration is not required on a routine basis, nor is calibration required after initial startup and commissioning.

The Model 3100 has built-in data logging. Up to 50 points may be logged with a time stamp. Each point may be labeled with a six character location description.

### **Packaging**

The analyzer is housed in a watertight handheld enclosure and is designed for harsh environments.

### **Batteries and Charging**

The Model 3100 is powered by a three cell rechargeable NIMH battery pack. A battery charger is included with the Model 3100. The red LED on the charger's connector indicates the batteries are in quick charge mode when illuminated or trickle charge when not illuminated. Fully discharged batteries will take about four hours to charge. The Model 3100 may be connected to the charger for extended periods of time without damage.

A fully charged battery can provide approximately 10 to 12 hours of continuous use. A low battery message appears on the display when recharge is necessary.

### **Automatic Shutoff**

If no keys are pressed, the Model 3100 will automatically shut off after 15 minutes.

### **Display Backlighting**

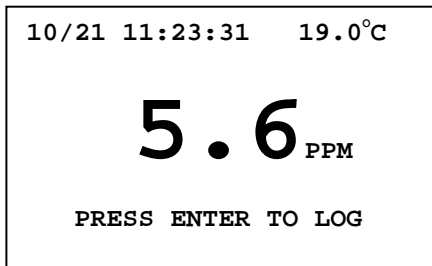
The Model 3100 has a backlit display, but this backlighting is the main power consumer of the analyzer. To conserve battery power, this backlight turns itself off after 2 minutes. It can easily be turned on again without disturbing the operating mode of the analyzer by pressing the ON key.

## OPERATION

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### Run Mode

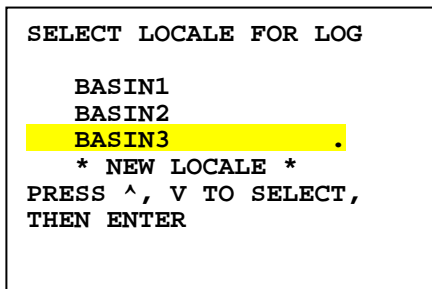
The RUN mode is the normal operating mode of the analyzer and is entered upon power-up. When the Run mode is entered, the analyzer will begin displaying the D.O. value. When running in measurement modes, the D.O. reading takes about 60 seconds to stabilize. The display is continuously updated with the current date, time, temperature and D.O. value. In the event of an error or alarm condition the display will indicate the problem in plain English text.



10/21 11:23:31 19.0°C  
**5.6** PPM  
PRESS ENTER TO LOG

The analyzer and sensor have been fully calibrated at the factory and given a default span characteristics. No further calibration should be necessary.

Once a D.O. reading is stable, the operator may log the current D.O. value. Pressing the ENTER key will display the Select Log Locale screen.



SELECT LOCALE FOR LOG  
BASIN1  
BASIN2  
**BASIN3** .  
\* NEW LOCALE \*  
PRESS ^, V TO SELECT,  
THEN ENTER

A log locale may be selected by pressing the UP and DOWN keys until the desired locale is highlighted. Pressing the ENTER key will display a Log conformation screen.

```
LOG 5.6 TO BASIN3

PRESS ENTER TO LOG,
PRESS MENU TO CANCEL.
```

Pressing the ENTER key a second time will log the D.O. value and temperature to the selected locale along with a timestamp. Up to 50 D.O. values may be logged at any one time. If 50 values have been logged and a new value is desired to be logged, a Log Full message will be displayed. The operator will have the option of overwriting the oldest log entry or cancel the log operation.

If a new locale entry is desired, highlight the NEW LOCALE selection and press the ENTER key. The operator is prompted to enter a six character locale description. Up to 50 locales may be entered. To return to the normal Run screen, press the MENU key.

```
LOCALE ENTRY
BASIN4

ENTER A LABEL OF
UP TO 6 CHARACTERS
USING ^, V AND ENTER
```

## Main Menu

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The Main Menu is accessed by pressing the "MENU" key while in the RUN mode of operation. There are five options available from the main menu. Use the arrow keys to switch between RUN, VIEW LOG, PC EXTRACT, SETUP, & TEST and then press the "ENTER" key to select.

```
MAIN MENU
  RUN
VIEW LOG
PC EXTRACT
SETUP
TEST
PRESS ^, V TO SELECT,
THEN ENTER.
```

To return to the RUN MODE from the MAIN MENU, use the "ARROW" keys to move the cursor to the run option, then press the "ENTER" key.

## View Log

---

This mode of operation allows the operator to view all logged D.O. values with locales and timestamps.

LOGGED DATA			
LOCALE	PPM	DAY	TIME
BASIN1	2.48	05	08:38
BASIN2	3.26	05	08:02
BASIN3	5.6	05	07:32
BASIN4	4.8	05	06:29

PRESS ^, V TO SELECT,  
THEN ENTER TO REMOVE.

The operator may scroll through the logged values by using the UP and DOWN arrow keys. The logged value may be removed by first highlighting the value and then pressing the ENTER key. Pressing the ENTER key a second time will remove the selected entry or pressing the MENU key will cancel the remove.

## PC Extract

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When the Model 3100 is in the PC extract mode, a PC may extract the logged data. The download kit includes a cable and an Excel spreadsheet with embedded extract function.

The Insite IG DOLog (version 3.0) spreadsheet is a convenient tool for extracting logged data from the Model 3100. It is a Microsoft Excel spreadsheet with an embedded Visual Basic program (macro) capable of reading the logged data from the Model 3100 through a serial port and sorting it into location worksheets. The user must have Microsoft Windows 98 (2<sup>nd</sup> edition) or later versions with Microsoft Excel 97 or later versions to use this utility.

### Installation

There are 2 steps that the user must complete before using the Insite IG DO Log Data spreadsheet for the first time:

1. **Copying the included files to the computer's hard drive:**
  - Insert the InsiteIG CD into the CDROM drive.
  - After a few seconds, an installation SETUP program should run automatically.
  - If the Setup program does not start automatically, click your Windows START button, then click RUN...BROWSE. Find the IIGSetup.exe file on the CDROM drive and select it and click OPEN...OK to run it.
  - Follow the installation instructions on the screen.
2. **Enabling the use of "macros" in Microsoft Excel. (Excel 2000 and 2002 only; Excel 97 users may ignore)**
  - Start Excel
  - Click on Tools...Macro...Security
  - Choose the Medium Security option
  - Click OK

## Startup

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You should now be ready to use the Insite IG DOLog30.xls spreadsheet. The file is loaded into Excel like any other spreadsheet. The CD SETUP routine copied the file to C:\InsiteIG\, but the file can be moved using Windows Explorer if it is more convenient to the user. The file itself can be dragged to the Windows desktop for convenience, or a shortcut to the file can be created on the desktop. To create a shortcut from Windows Explorer, right-click on the file and choose "Create Shortcut". A shortcut will be added to the file list. Drag this shortcut to the desktop.

If you have adjusted MACRO security according to step 2 of the installation procedure, Excel will present a pop-up box every time you load the Insite IG DOLog spreadsheet. The box will ask if you would like to enable macros for this spreadsheet. You must choose ENABLE MACROS or the serial port function will not work!

### Setting COM port

On the right side of the "Main" worksheet is a box for selecting the serial port to be used for communications with the Model 3100. Using the supplied cable, connect the Model 3100 to an available serial port 9 pin connector on your computer. If you know the "COM" number for your computer's connector, click this COM number on the spreadsheet. If not, the simplest approach is to find the correct number by trial and error. Turn on the Model 3100, press the MENU button, then choose the "PC Extract" option and press ENTER. The Model 3100 screen should read "Waiting for request from PC..."

You are now ready to click on the spreadsheet button that reads "Click here to retrieve data from the Model 3100". If you have chosen the wrong COM port, you will get a communications error box on the screen after about 5 seconds. Try choosing another COM port number in the spreadsheet, and click the "...retrieve.." button again.

### Normal Operation

Once Excel has been properly configured for using this spreadsheet, the operation should be very intuitive. Pressing the "...Retrieve.." button causes all of the following actions to take place:

- The PC will read all stored data points (as many as 50) from the Model 3100. This action does not erase these data points from the Model 3100 memory.
- The newly extracted data points will appear on the "Main" worksheet of the Excel file for review. (Previously extracted data will be erased from the Main worksheet at this time. Only the currently extracted data appears on the Main Worksheet.) Each log point contains a location name, a time stamp, and a DO value.
- All data will be archived by adding it to a worksheet named after the "locale" or location name given to each data point. If a worksheet for the location does not exist, it will automatically be created. If a data point has the same time stamp as one that has already been archived, a new entry will not be created in the worksheet.

Note: The time stamp given to each point uses the month/day/hour/minute that was stored in the Model 3100. However the year is deduced from the PC system clock

Once the data is retrieved into the .xls file, it can be treated as any other spreadsheet data with normal Excel copy, graphing, and computational functions available.

The .xls file should be saved after every use for continued archiving of data.

## Setup Mode

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To enter the setup mode a passcode is required. The passcode screen will prompt for a three digit code to be entered. If the code entered matches the passcode, the setup menu will be displayed.

This mode of operation allows the user to customize the unit to the specific operation and needs of the facility. There are a total of eight options that may be adjusted.

```
      SETUP
  CLEAR ALL LOGS
  SENSOR REF CAL
  SENSOR SLOPE
  DEFAULT SPAN

PRESS ^, V TO SELECT,
THEN ENTER.
```

Operation of the Setup MODE proceeds as follows:

First, after pressing the "MENU" key, use the "ARROW" keys to move the cursor to the setup option, then press the "ENTER" key. A menu with four of the eight options will be displayed. The options are;

```
CLEAR ALL LOGS
SENSOR REF CAL
SENSOR SLOPE
DEFAULT SPAN
TEMP. UNITS
REMOVE LOCALE
REMOVE ALL LOCALES
SET SALINITY
SET DISPLAY MODE
SET LOG MODE
SET CLOCK
PASSCODE
```

Second, use the "ARROW" keys to move the cursor to the desired setup option, then press the "ENTER" key. When the user is finished making the adjustment, press the "MENU" key to return to the previous page.

Finally, to return to the RUN MODE, press the "MENU" key until the MAIN MENU is displayed. Use the "ARROW" keys to move the cursor to the run option, then press the "ENTER" key.

### **Clear All Logs**

This option will erase all logged data entries (but not the locale names).

### **Sensor Ref Cal**

See Sensor Calibration section.

### **Sensor Slope**

See Sensor Calibration section.

### **Default Span**

See Sensor Calibration section.

**Temp. Units**

This option will toggle between Celsius and Fahrenheit by pressing the arrow keys.

**Remove Locale**

This option will remove a single locale and its data. After choosing this option, the list of locale names is presented. The operator may then choose the locale to remove.

**Remove All Locales**

This option will erase all locales and data from the log memory.

**Set Salinity**

This option allows for the correction of salts in the water. The salinity correction range is 0 to 45 ppt with a resolution of 1 ppt.

**Set Display Mode**

This option allows the dissolved oxygen to be displayed in PPM, MG/L, or %SAT.

**Set LOG Mode**

This option is used to select either manual or automatic log mode (see autolog mode section).

**Set Clock**

This option is used to set the real time clock used for time stamping of the logged data.

**Passcode**

The passcode is a three digit security number which will disallow unauthorized access to the setup mode. To change the passcode, press UP or DOWN until the desired code is displayed, and then press ENTER. The value of "000" will disable the passcode function.

## Autolog Mode

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The Autolog Mode will cause the Model 3100 to automatically log up to 50 entries at the selected interval. After 50 entries are logged the Model 3100 will turn off.

**Note:** The Model 3100 should be fully charged prior to the start of an auto log session, because it must remain on for the entire auto log session.

To select the AUTOLOG mode select Log Mode from the Setup menu, then select auto.

```
      SETUP
REMOVE ALL LOCALES
SET SALINITY
SET DISPLAY MODE
SET LOG MODE

PRESS ^, V TO SELECT,
THEN ENTER.
```

```
      LOG MODE
      AUTO

PRESS ^, V TO CHANGE,
THEN ENTER.
```

**Note:** When auto log mode is selected, all previous logged entries will be erased.

The Model 3100 will prompt for the log interval and then the locale.

```
      LOG MODE
LOG INTERVAL  5  MIN

PRESS ^, V TO CHANGE,
THEN ENTER.
```

After the log interval and the locale have been selected, the Model 3100 will return to the main menu.

```
MAIN MENU
AUTOLOG START
VIEW LOG
PC EXTRACT
SETUP
TEST
PRESS ^, V TO SELECT,
THEN ENTER.
PRESS ^, V TO CHANGE,
THEN ENTER.
```

The RUN selection is replaced by the AUTOLOG START selection. When AUTOLOG START is selected, the Model 3100 will log the current D.O. and temperature readings and 49 additional readings at the selected interval. After 50 entries have been logged, the Model 3100 will return to the manual log mode and turn off.

```
04/09 09:34:14
AUTOLOG LOC. BASIN1

LOG 1 OF 50
PPM TEMP DAY TIME
3.56 19.7 09 09:34

NEXT LOG 09:39
```

Pressing the MENU while in the autolog mode, will display the main menu and the options available. Logging is suspended until the AUTOLOG RESUME is selected.

## Sensor Calibration

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The three setup options for sensor calibration are Sensor Calibration to a Reference, "SENSOR REF CAL", Sensor Slope Adjustment, "SENSOR SLOPE", and Factory Default, "DEFAULT SPAN".

**Note: The Model 30 sensor undergoes a thorough and accurate test and calibration procedure before shipment from the factory. Calibration of the system at startup is not necessary and is not recommended.**

The Model 30 sensor has been designed to require very infrequent calibration. Unlike polarographic systems, light fouling of the sensing element should not affect the accuracy of the reading, but should only slow the response time of the system. (However, heavy biological fouling that prevents reasonable sensor contact with the water will cause erroneous readings.) With the sensor kept reasonably clean, the calibration should hold for 6 months to 2 years, depending upon conditions.

The Model 3100 analyzer allows the user to select from 2 different calibration procedures. The procedure can be selected by choosing SETUP from the main menu. Once the SETUP menu appears, use the arrow keys to choose the desired option.

### Sensor Calibration to a Reference

Calibration to a known reference is the easiest, simplest, and also the preferred method of calibration when calibration is required. Calibration option "SENSOR REF CAL" allows the operator to make adjustments to the D.O. reading to agree with any other source of D.O. information. THIS CALIBRATION PROCEDURE MUST ONLY BE USED ON A CLEAN SENSOR. IF THE SENSOR IS READING ERRONEOUSLY DUE TO HEAVY BIOLOGICAL FOULING, USE OF THIS CALIBRATION METHOD WILL RESULT IN UNRELIABLE RESULTS. The sensor must be stable in the water to be used as a reference before beginning this procedure. From the SETUP menu, choose the "SENSOR REF CAL" option, and press ENTER. The analyzer will now read the sensor for the period of time indicated by the dampening, and display the result as D.O. in PPM. If this result matches the reference, simply press ENTER to exit. Otherwise, use the arrow keys to adjust the reading to match the reference value, and then press ENTER to store this new value. This procedure is primarily an adjustment to the offset value of the sensor, but an adjustment in slope will also be made when this procedure is performed.

### Sensor Slope Adjustment (NOT RECOMMENDED)

If performed correctly, the previously described "Sensor Calibration to a Reference" should be all that is required by the user. "Sensor slope adjustment" should only be attempted upon recommendation from the factory.

Sensor calibration option "Sensor Slope" allows the user to adjust the span of the sensor, but this procedure must only be used immediately AFTER the sensor has been "zeroed" using "SENSOR REF CAL" option with the sensor submerged in a zero oxygen solution. This zero solution may be prepared by adding two tablespoons of sodium sulfite salt to a gallon of tap water in an open container (bucket). The sodium sulfite salt will remove all oxygen from the water as it dissolves. Stir the water for about one minute to dissolve the salt. Note that some of the salt may not dissolve, but will sink to the bottom of the container. This is normal and of no concern. Submerge the Model 30 sensor in this water and allow it to rest for at least 30 minutes. For best accuracy, the sensor should be resting face down in the bottom of the container. (The solution stratifies over time at rest, and the dissolved oxygen content will be closest to zero at the bottom of the container, while slightly above zero nearer the surface.) Also make sure that no air bubbles are trapped on the face of the sensing element during the soak. Once the sensor is stable, use the "Sensor Calibration to a Reference" procedure described previously to set the D.O. reading to 0.00 PPM. YOU MUST ACTUALLY

PERFORM THE CAL TO REFERENCE PROCEDURE IN ZERO WATER EVEN IF THE SENSOR READS ZERO FROM THE RUN MODE.

[NOTE: If the user's application requires a zero that is absolutely accurate (frequent readings below 0.5 PPM), then the zero solution needed for this procedure should be mixed 12 to 24 hours before use, and distilled water should be used in place of tap water. Freshly mixed solution actually has a value of about 0.10 PPM, but a calm solution at rest for 12 hours will drop down very close to absolute zero.]

Once a sensor has been properly zeroed, a slope adjustment may be made. Place the sensor in a solution of known D.O. concentration, and allow about 15 minutes to fully stabilize. Choose the sensor slope adjustment calibration procedure as option "SENSOR SLOPE" from the SETUP menu, and press ENTER. Press ENTER again to bypass the "!Warning! Proper Zero Required" message. The analyzer will now read the sensor for the period of time indicated by the dampening, and display the result as D.O. in PPM. If this result matches the reference, simply press ENTER to exit. Otherwise, use the arrow keys to adjust the reading to match the reference value, and then press ENTER to store this new value.

#### **Fact. Default**

The Factory Default parameter allows the user to restore the sensor characteristic values of zero and slope to the original factory settings.

## **Test Mode**

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This mode of operation allows the user to perform basic test functions to aid in troubleshooting. There are four tests which may be performed.

Operation of the Test MODE proceeds as follows. From the Main Menu use the arrow keys to move the cursor to the TEST option, then press the "ENTER" key. Use the arrow keys to select the desired test, and then press the "ENTER" key.

### **View Sensor Data**

This test is intended primarily to aid the Insite IG technical support engineers in troubleshooting. This test displays the values for "MIAN", "REF", "TEMP", and "TAU". Press the MENU key to exit.

### **View Sensor Char.**

This test displays the sensor characteristics. This is primarily to aid the Insite IG technical support engineers in troubleshooting. Press the MENU key to exit.

### **View Sensor Cal.**

This test displays the sensor calibration factors, "R" & "G". This is primarily to aid the Insite IG technical support engineers in troubleshooting. Press the MENU key to exit.

### **Software Version**

Software Version displays the current version of software in the analyzer. To exit, press the "MENU" key.

## ERROR MESSAGES

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During operation, the Model 3100 analyzer may determine that an error condition exists. If this happens, the display will contain an error message. The 3 possible error messages are as follows:

**\*\*Sensor not Responding\*\***

This error message indicates that the analyzer is not receiving any data from the sensor. This would most likely be caused by a faulty sensor cable or possibly a faulty sensor or analyzer electronics.

**\*\*Zero Sensor\*\***

The analyzer is indicating that a zero cal operation is required for proper operation. This can occur if the sensor was not properly zeroed and the current sensor reading is 5% above (negative) the previous stored zero value.

**\*Ambient Error\***

This error message will be displayed if the sensor is exposed to too much ambient light (exposed to direct sunlight). Or the sensor LED is faulty.

## **MAINTENANCE**

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The analyzer does not require any periodic maintenance. The sensor must be kept clean for accurate readings.

## **GUARANTEE AND REPAIR POLICY**

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Model 3100 Dissolved Oxygen Analyzer & Model 30 Dissolved Oxygen sensors and related items are guaranteed for two years against defective materials and workmanship. They will be replaced or repaired at Insite IG's discretion free of charge during the guarantee period. Freight to our factory is to be paid by the customer.

All shipments are insured. If you receive a damaged unit, please notify Insite IG so that we may authorize return of the equipment. Shipments to Insite IG should be protected and insured by the customer.

Repairs to the equipment not covered by the guarantee will be billed per standard service charges. Please request service price sheet and/or spare parts price list.