iPERL™ Water Management System Technical Manual

Rev. 1.1

Revisions

Rev No.	Date	Description
Rev 1	3/19/2010	Initial Release
Rev 2	5/13/2010	Removed TouchReader+ information from installation instructions.

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Table of Contents

1 Overview

This chapter provides an overview of the iPERL™ system and its functionality.

1.1 About the iPERL System

The iPERL system is an innovative residential water management system with unparalleled low flow accuracy, high flow durability and minimal wear and maintenance needs. The system is a solid state device designed with no moving parts to decrease the wear. The iPERL system's body is comprised of a composite material ensuring that it is 100% lead free and stable across a wide range of temperatures. The iPERL system contains an electronic register with embedded AMI functionality.

1.2 Basic Components

Figure 1-1 shows the basic components of the iPERL system.

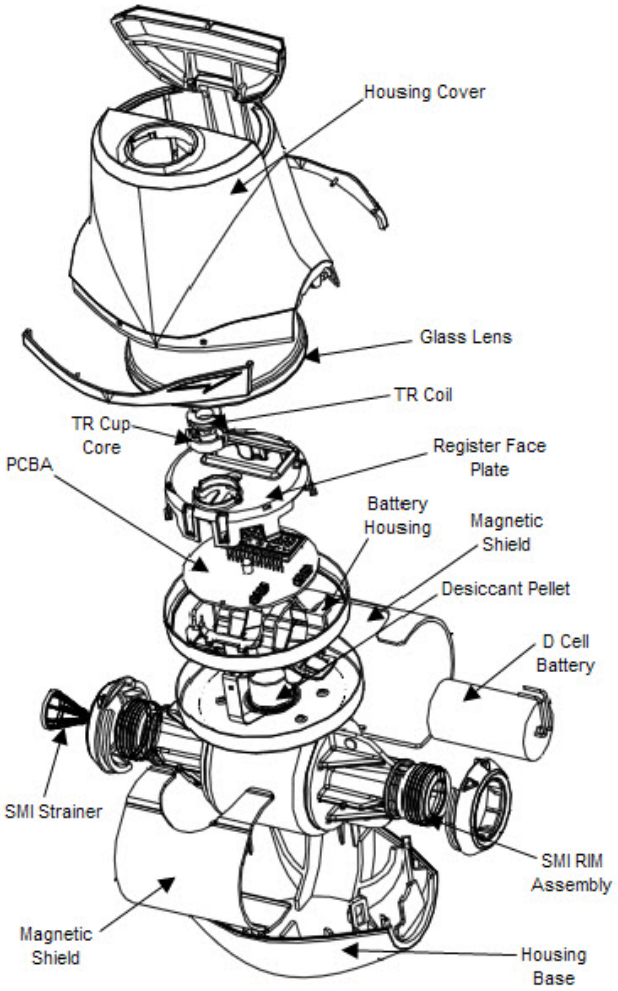


Figure 1-1: iPERL System Basic Components

1.3 Features

The iPERL system contains the following features and functionality.

1.3.1 Security Method

A security system has been devised to ensure that only the proper people are allowed to modify system settings.

1.3.2 Usage Data Logging

Data logging is defined as volume used and maximum flow rate per unit of time. Unit of time is programmable with a default of one hour intervals. Usage data can be extracted from the system via a handheld device.

1.3.3 Error Handling

1.3.3.1 Reading Recovery

The system reading is stored on an hourly basis for recovery purposes.

1.3.3.2 Reboot

If the system reboots for any reason, all of the settings will be saved to their latest settings.

1.3.3.3 Reprogram

The iPERL system logs up to five programming sessions.

1.3.3.4 Dead Battery

If, for any reason, the system loses power, the system is able to be powered through the touch couple to retrieve the last reading.

1.3.3.5 Memory and/or Self Monitoring Alarms

The iPERL system is equipped with self monitoring alarms that detect and report any memory failures.

1.3.4 Leak Detection

Leak detection is defined as the absence of the transition from active flow to below the defined starting flow over a configurable time interval. By default, this setting is enabled and the time interval is set to 24 hours. If the transition to zero flow is not seen during the defined time interval, a leak detection flag is set. The alarm is then saved for a predetermined amount of time after the alarm condition goes away and after the alarm condition is read.

1.3.5 Reverse Flow

This feature is to alert the utility of a consistent backwards flow. If the system sees a constant reverse flow of water for more than 15 minutes, a reverse flow flag is set. The alarm is then saved for a predetermined amount of time after the alarm condition goes away and after the alarm condition is read.

1.3.6 Air In Service

This feature is to alert the utility of air in the system. If the system sees no conductivity between the electrodes an entrapped air flag is set. The alarm is then saved for a predetermined amount of time after the alarm condition goes away and after the alarm condition is read.

1.3.7 Magnetic Tampering

If the system sees the presence of an external magnet for more than 15 minutes, a magnetic tampering flag is set. The alarm is then saved for a predetermined amount of time after the alarm condition goes away and after the alarm condition is read.

1.3.8 Resettable Reading

The system reading may be reset via the bi-directional TouchRead® connection.

1.4 iPERL System Display

The iPERL system display is a fully electronic display with embedded AMI technology. Figure 1-2 shows the different components of the iPERL system display.

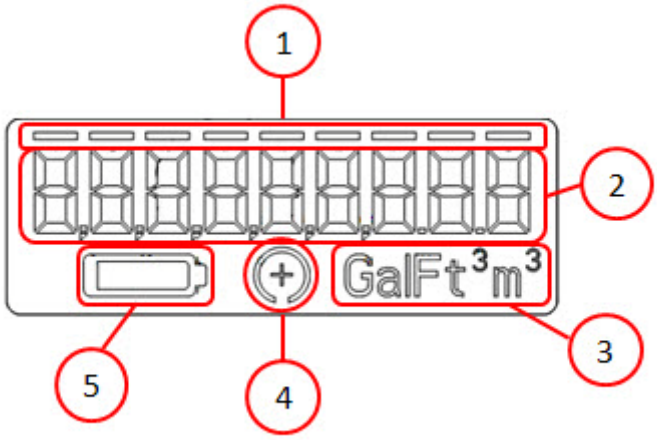


Figure 1-2: iPERL System Display

1. AMR Digits
2. Reading
3. Units of Measure
4. Flow Direction and Empty Pipe Indicator
5. Battery Life

2 Installation

This chapter provides information on:

- Installation tools
- Installation guidelines
- Installing a new iPERL™ system
- Replacing an existing meter

2.1 Installation Tools

Standard water installation tools should be used to install the iPERL system. Other installation tools include a TouchReader+ or a 5002 Handheld device with CommandLink™ installed.

2.2 Installation Guidelines

To ensure proper performance, the following factors should be considered when installing an iPERL system:

- Systems should be installed on the discharge side of a pump with the flow directional arrow pointed downstream.
- If a pump is installed on the outlet side of the system, a minimum of ten diameters of straight pipe should be immediately downstream of the system to obtain valid system registration.
- Suitable shutoff valves should be installed adjacent to the inlet and outlet of the system so that the service may be shutoff if it is necessary to remove the system.
- Clean and flush the service line thoroughly on the inlet side before installing the system.
- Make sure that metallic water service plumbing is properly grounded as per local electrical codes. If installing indoors, install an electrical grounding strap for safety.

2.3 Installing a New iPERL System

The iPERL system is designed to be installed in either an outdoor pit setting or in an indoor basement setting. To install a new iPERL system:

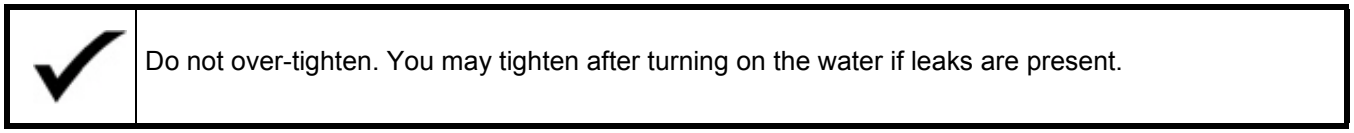
1. Unpack the system from the packaging.
2. Inspect the system for any parts that may have been damaged during shipping.
3. Thoroughly flush new water service plumbing before installing the system.

Make sure that metallic water service plumbing is properly grounded as per local electrical codes. If installing indoors, install an electrical grounding strap for safety.

4. Turn off the water supply valves.
5. Orientate the system so that the direction of the flow arrow on the system body is aligned with the direction of the flow arrow in the plumbing system.

6. Install new system connection gaskets in both meter couplings.

7. Insert two washers into the pit setter, line the threads and tighten the bolts an extra 1/4 to 1/2 turn.



8. After the new system is installed, shut the outlet shut-off valve.
9. Open the inlet shut-off valve slowly until the system is full of water and ensure that there are no leaks.
10. Open the outlet valve slowly until air is out of the meter and service line.
11. Open a valve downstream of the system to ensure that no foreign debris in the water obstructs the operations of the system.
12. Check the read on the system to make sure it is registering a positive number. If it is not, make sure the system is installed in the correct direction.
13. Attach an endpoint to the system via a coupler cable.
14. Record read information as required by the utility.

2.4 Replacing an Existing Meter

To replace an existing meter with the iPERL system:

1. Unpack the new iPERL system from the packaging.
2. Inspect the system for any parts that may have been damaged during shipping.
3. Turn off the water supply valves.
4. Pull the current meter out of the pit or disassemble current meter.
5. Orientate the new system so that the direction of the flow arrow on the system body is aligned with the direction of the flow arrow in the plumbing system.
6. Install new system connection gaskets in both meter couplings.

7. Insert two washers into the pit setter, line the threads and tighten the bolts an extra 1/4 to 1/2 turn.

Do not over-tighten. You may tighten after turning on the water if leaks are present.

8. After the new system is installed, shut the outlet shut-off valve.
9. Open the inlet shut-off valve slowly until the system is full of water and ensure that there are no leaks.
10. Open the outlet valve slowly until air is out of the meter and service line.
11. Open a valve downstream of the system to ensure that no foreign debris in the water obstructs the operations of the system.
12. Check the read on the system to make sure it is registering a positive number. If it is not, make sure the system is installed in the correct direction.
13. Attach an endpoint to the system via a coupler cable.
14. Record read information as required by the utility.

3 Programming

This chapter provides information on:

- The system parameters that may be programmed.
- How to connect the iPERL™ system to your PC.
- How to set default parameters.
- How to program the iPERL system.

3.1 Programmable Parameters

Certain features of the iPERL system may be programmed using the Sensus Universal Programmer (Unipro™) software application. Table 3-1 describes the parameters on the iPERL system that may be programmed.

Table 3-1: Programmable Parameters

System Parameter	Definition
Customer ID	Identifies the particular system to the data retrieval system.
Programmable Text	A user defined description or identification of the device.
Reading Digits	The number of digits reported via the AMR. The iPERL can display and report up to 9 digits.
Units of Measure	The units of measure in which to display flow data. Also, the units of measure in conjunction with the size of the system defined where the decimal place appears on the display.
Reading Mode	With a normal reading string, the data stream from the register contains the meter reading and meter ID only. With an extended reading string, the data stream includes information such as the manufacturer fields and/or meter register specific data. With the fixed reading string, the data stream contains the meter reading and the 8 digit customer ID.
Alarm Save Duration (Days)	The period of time an error is retained in the system between reads.
Leak Duration (Hours)	The amount of time that defines a detectable leak.
Datalog Interval	The interval to collect flow data in the datalog interval entry. A valid value is either 15 minutes or between 1-24 hours.
History Mask	The events that can be recorded by the system. The options are reboot, touchread, radio read, alarm, configuration change and status change.

System Parameter	Definition
Alarm Mask	The types of alarms that will be recorded by the system. The options are reboot, low battery, very low battery, configuration error, empty pipe, magnetic tamper, reverse flow, leak, EMF range, low battery volts, high temperature, flow field, high current, glide slope, ADC failure, and touchread failure.

3.2 Connecting the iPERL System to a PC

You will need an OMNI Communicator 100A and drivers to connect the iPERL system to your PC. To obtain these tools, please see your Sensus representative. To connect the iPERL system to your PC:

1. Attach the USB connector from the OMNI Communicator 100A to any available USB port on your PC.
2. Check your **Device Manager** to determine the USB port's COM port settings.
3. Go to **Start | Control Panel | System | Hardware | Device Manager.**
4. Expand the **Ports** option to view the COM port assignment for the **USB Serial Port.**
5. In the Unipro application, click the **Defaults** menu option.
   The **Defaults** screen appears, as shown in Figure 3-1.

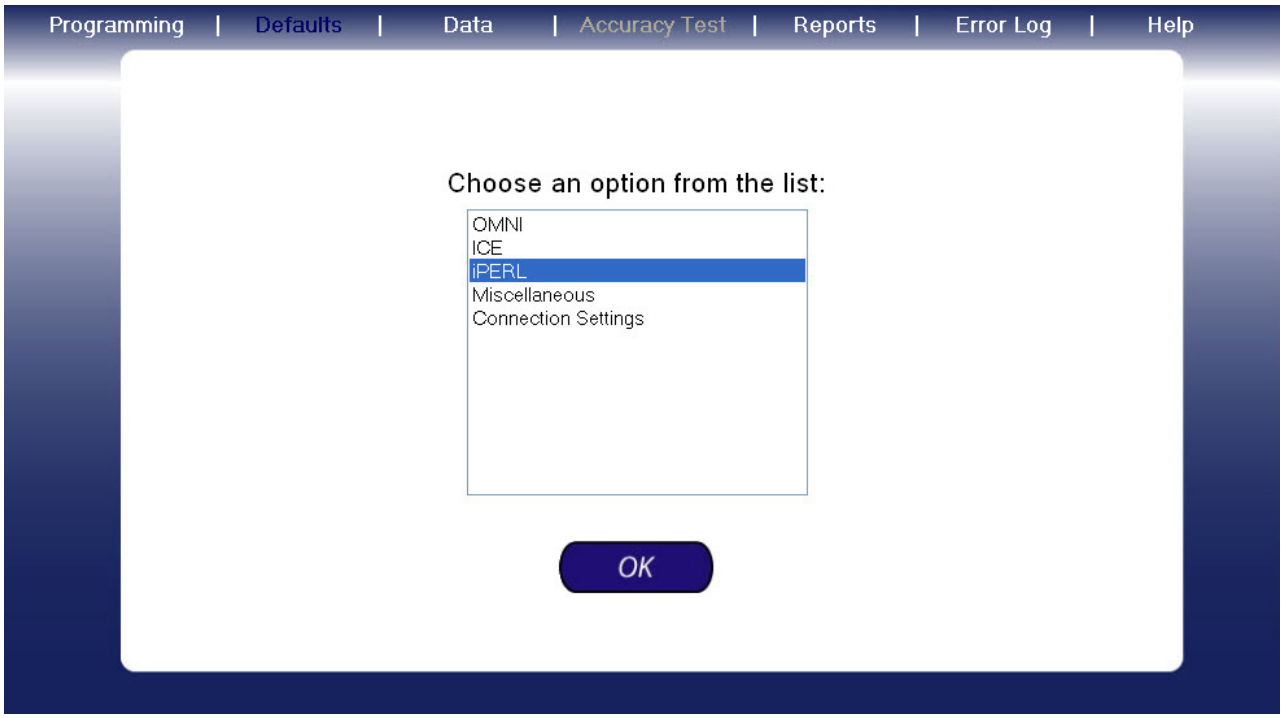


Figure 3-1: Defaults Screen

6. Choose **Connection Settings** from the list.

7. Click the **OK** button.
   The **Connection Settings** screen appears, as shown in Figure 3-2.

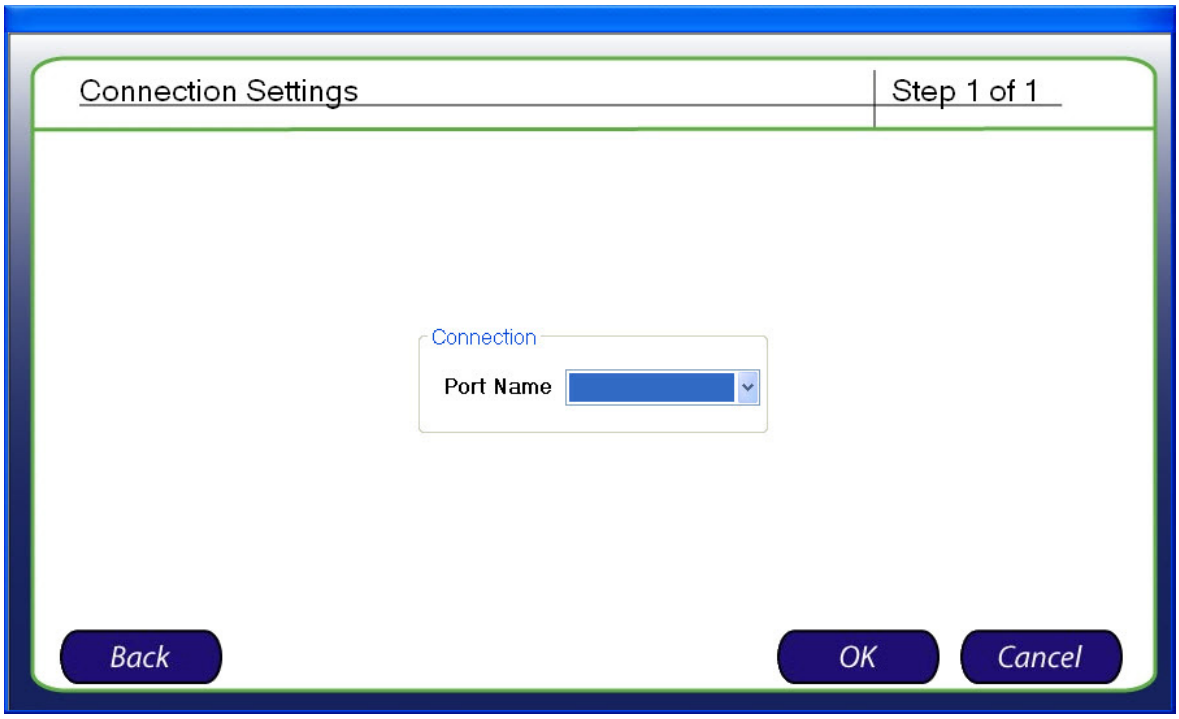


Figure 3-2: Connection Settings Screen

8. Choose the COM port that you noted in the **Device Manager** in step 4.
9. Click the **OK** button.

3.3 Setting Default Parameters in Unipro

The Unipro application allows you to set default parameters that you will use during system programming. It may be beneficial to define these parameters ahead of time in order to save time during programming.

To set default parameter in the Unipro application:

1. From the **Main** screen, click the **Defaults** menu option.
   The **Defaults** screen appears, as shown in 1..
2. Choose the **iPERL** option from the list.
3. Click the **OK** button.
   The **Enter New Values (Step 1)** screen appears, as shown in Figure 3-3.

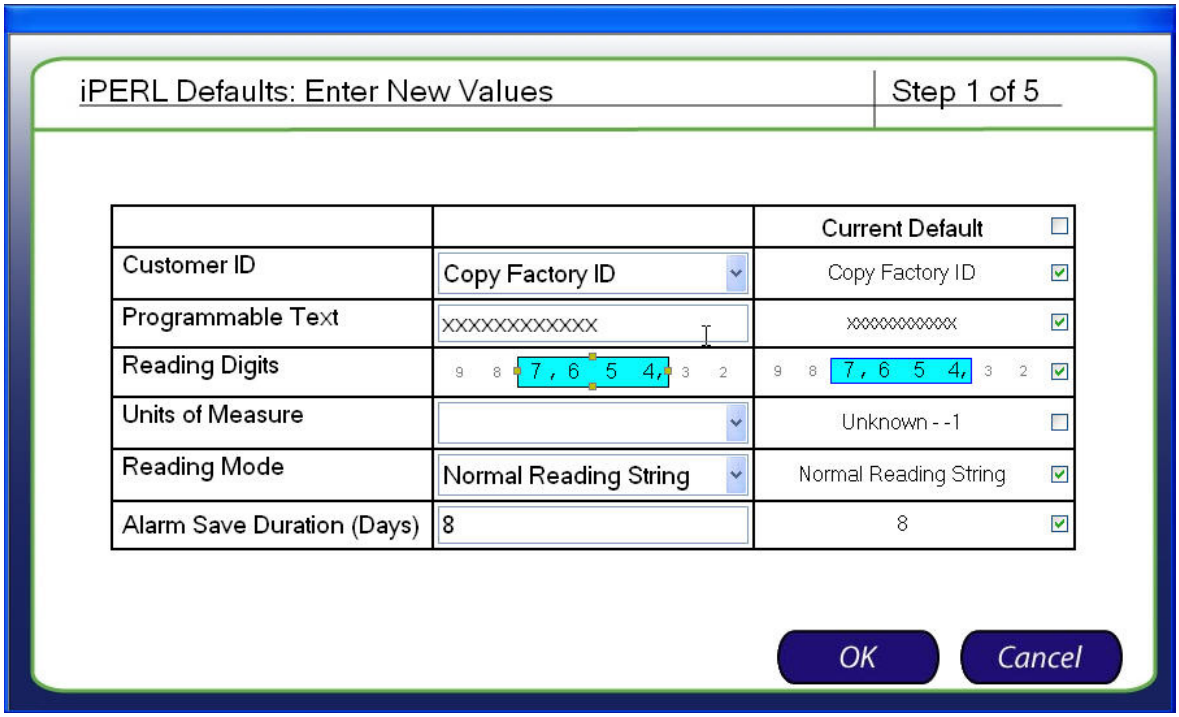


Figure 3-3: Enter New Values (Step 1) Screen

4. For each system parameter, designate a new default parameter, or check the checkbox in the **Current Default** column to use the current default setting.

5. Click the **OK** button.
   The **Enter New Values (Step 2)** screen appears, as shown in Figure 3-4.

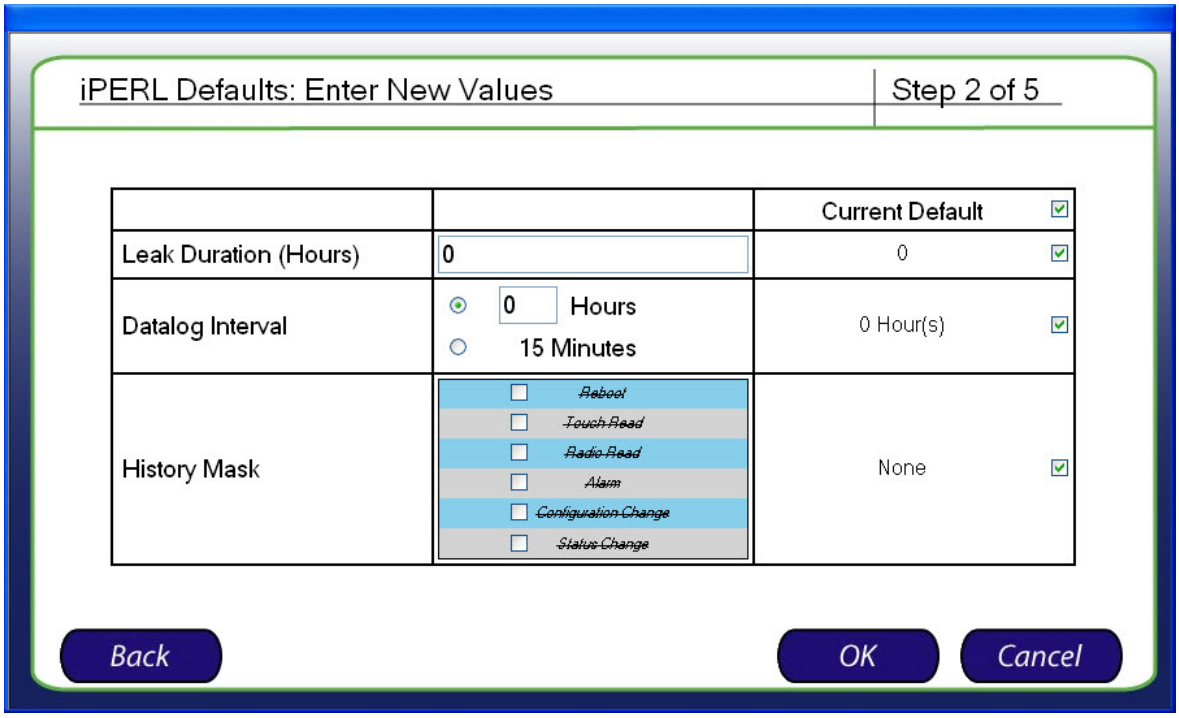


Figure 3-4: Enter New Values (Step 2) Screen

6. For each system parameter, designate a new default parameter, or check the checkbox in the **Current Default** column to use the current default setting.

7. Click the **OK** button.
   The **Enter New Values (Step 3)** screen appears, as shown in Figure 3-5.

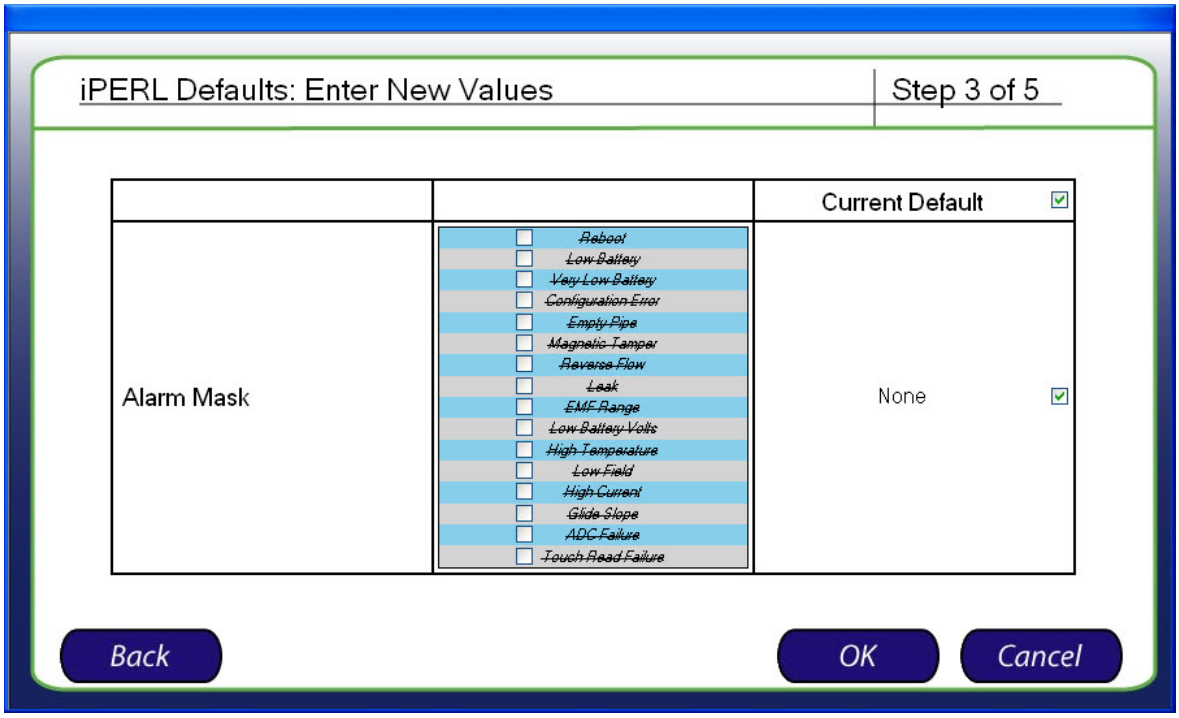


Figure 3-5: Enter New Values (Step 3) Screen

8. In the **Alarm Mask** row, designate a new alarm, or check the checkbox in the **Current Default** column to use the current default setting

9. Click the **OK** button.
   The **Summary** screen appears, as shown in Figure 3-6.

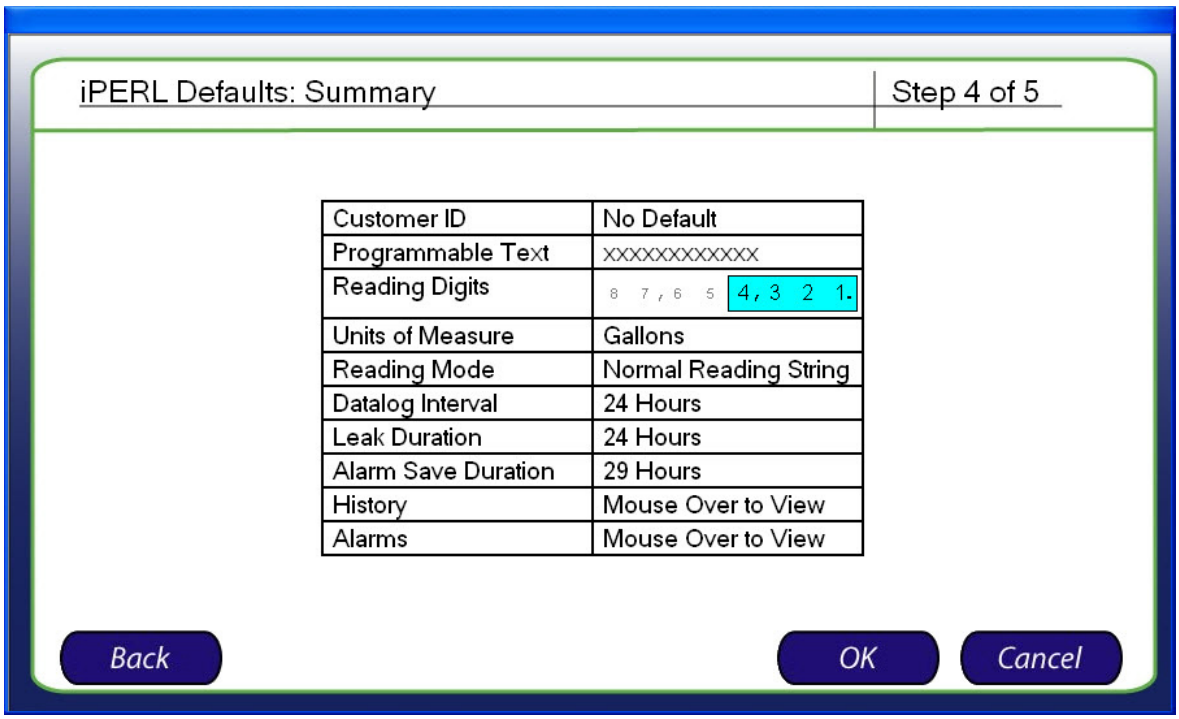


Figure 3-6: Summary Screen

10. Review the defaults listed in the table.
11. Click the **OK** button to continue, or click the **Back** button to make changes to the default selections.
    The **Finished** screen appears, validating that the default settings have been saved.
12. Click the **OK** button to finish setting the defaults.

3.4 Programming the iPERL System

To program an iPERL system with the Unipro application:

1. From the **Main** screen, click the **Programming** menu option. The **Connection** screen will appear, as shown in Figure 3-7.

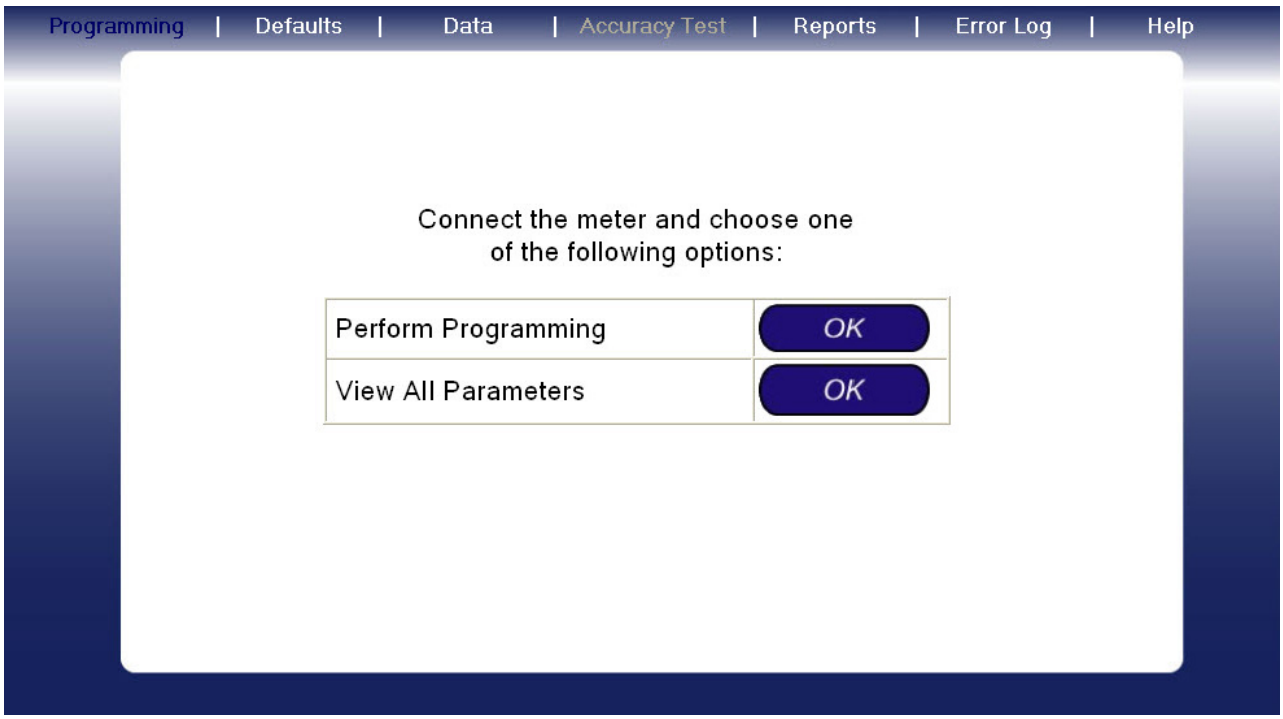


Figure 3-7: Connection Screen

2. Click the **OK** button next to the **Perform Programming** option.
   The **Enter New Values (Step 2)** screen appears after the system values are read, as shown in Figure 3-8.

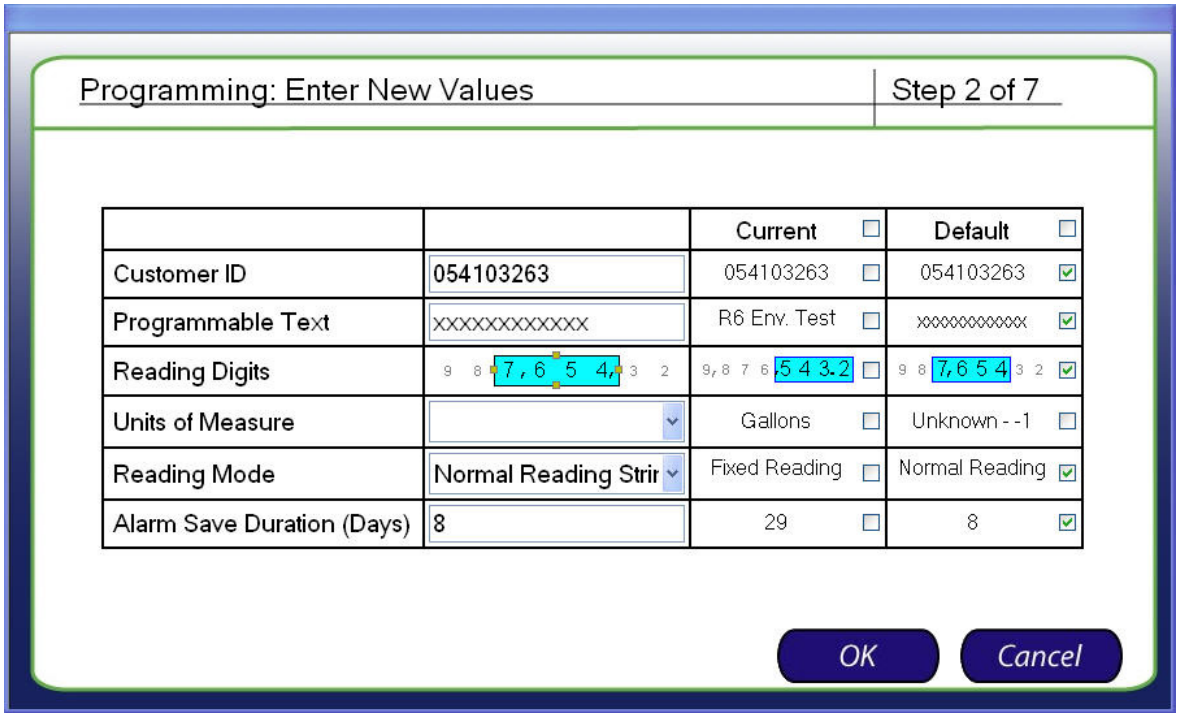


Figure 3-8: Enter New Values (Step 2) Screen

3. For each meter parameter, designate a new parameter, check the checkbox in the **Current** column to use the current setting, or check the checkbox in the **Default** column to use the saved default setting.

✓	If you choose **Fixed Reading String** for the **Reading Mode** parameter, the customer ID must be 8 digits long and only include alphanumeric characters.

4. Click the **OK** button to continue.
   The **Enter New Values (Step 3)** screen appears, as shown in Figure 3-9.

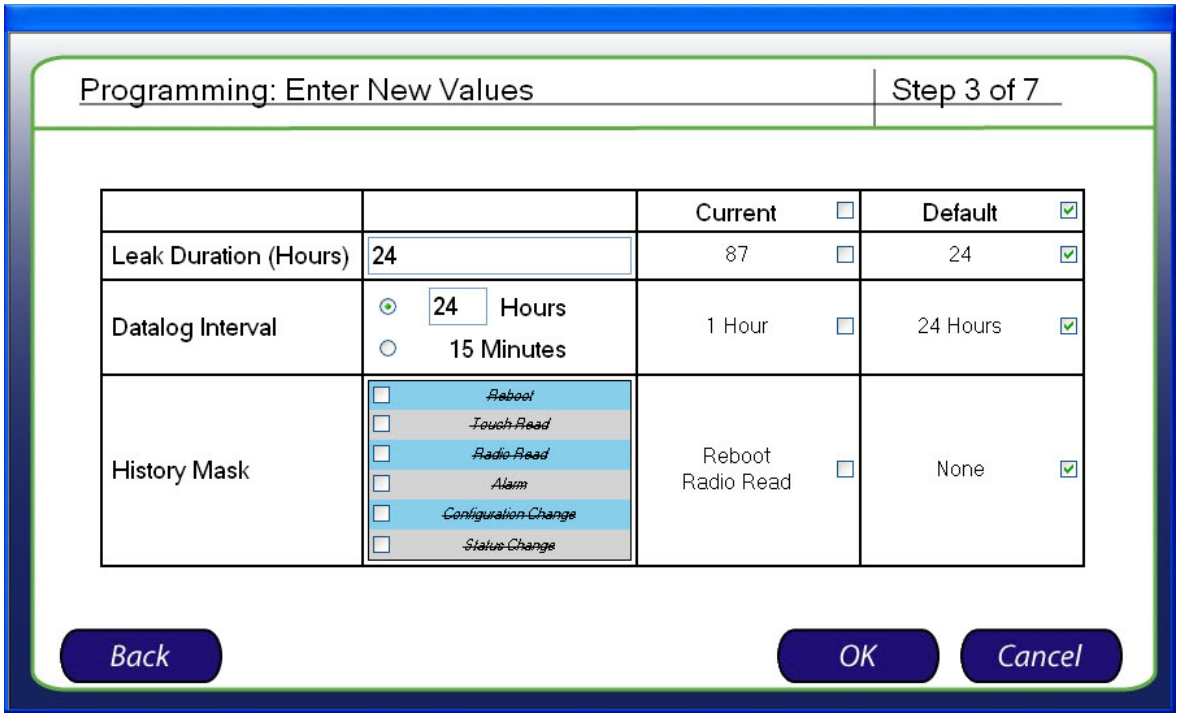


Figure 3-9: Enter New Values (Step 3) Screen

5. For each system parameter, designate a new parameter, check the checkbox in the **Current** column to use the current setting, or check the checkbox in the **Default** column to use the saved default setting.

6. Click the **OK** button.
   The **Enter New Values (Step 4)** screen appears, as shown in Figure 3-10.

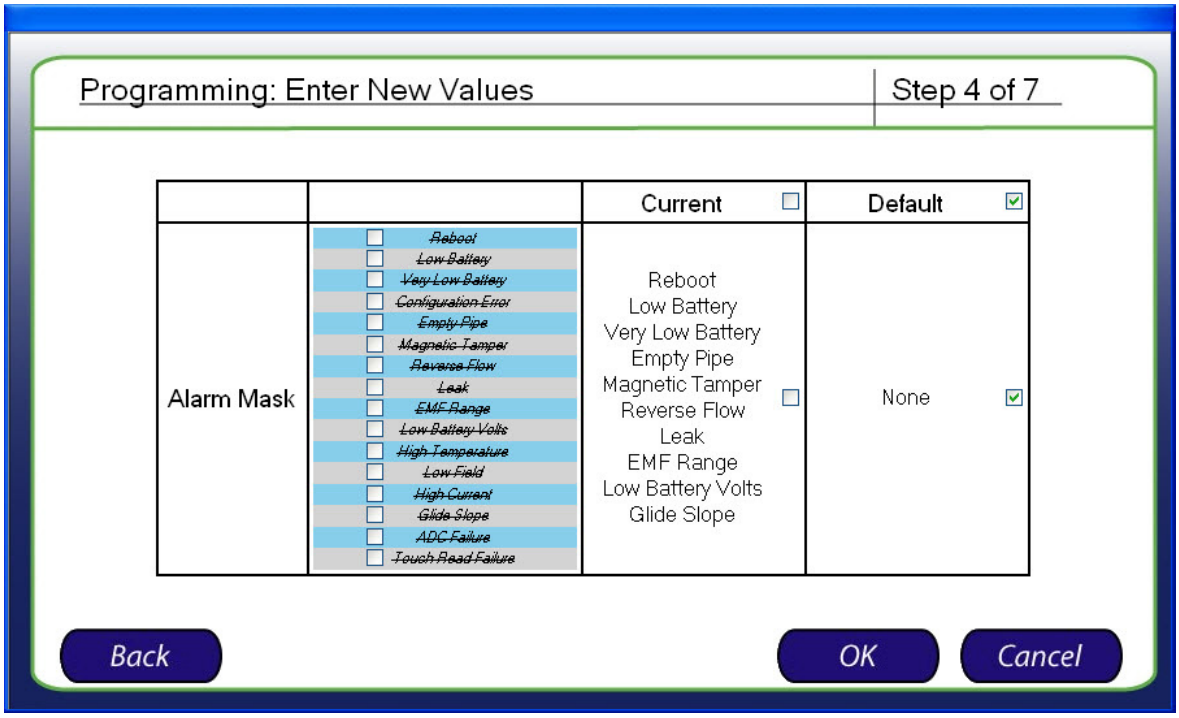


Figure 3-10: Enter New Values (Step 4) Screen

7. In the **Alarm Mask** row, designate a new alarm, check the checkbox in the **Current** column to use the current setting, or check the checkbox in the **Default** column to use the saved default setting.

8. Click the **OK** button.
   The **Summary** screen appears, as shown in Figure 3-11.

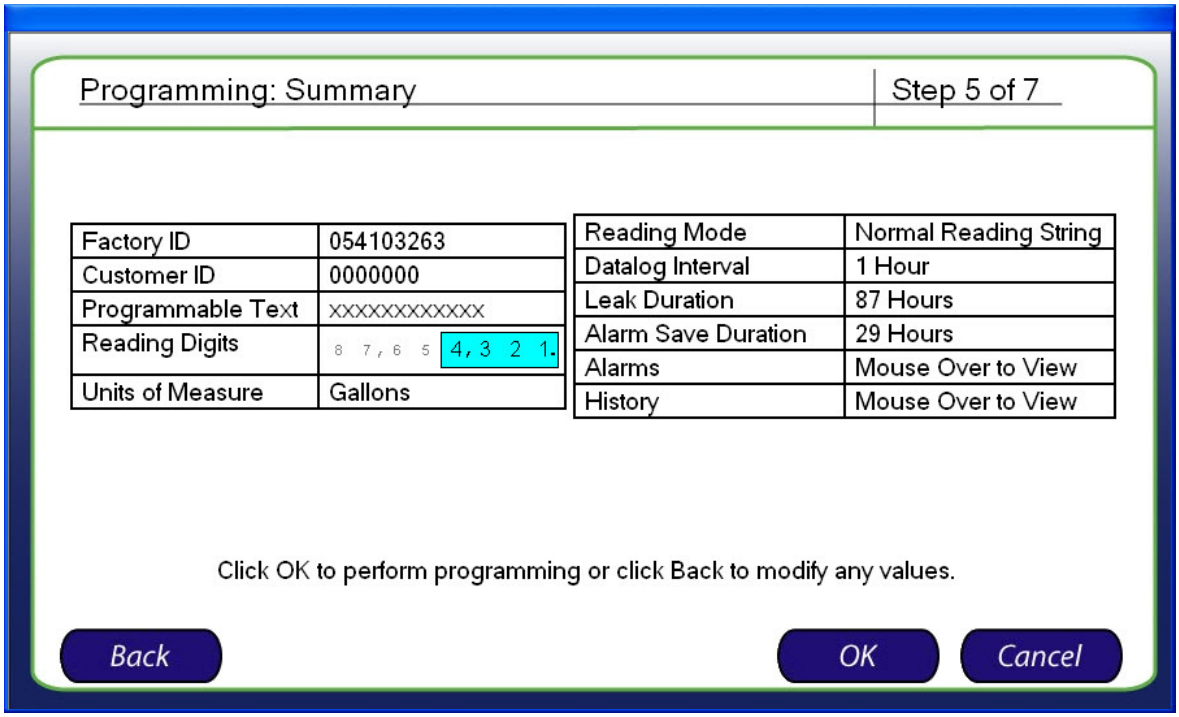


Figure 3-11: Summary Screen

9. Review the parameters listed in the table.
10. Click the **OK** button to continue and program the system, or click the **Back** button to make changes to the selections.
    The **Finished** screen appears, validating that the system has been programmed.
11. Click the **OK** button to finish programming the system.

4 Reporting

This chapter provides information on:

- The types of default reports available in the iPERL™ system.
- How to view reports in the Unipro™ application.
- How to print reports.

4.1 Default Data Reports

Each time the iPERL system is programmed, a report is automatically generated and saved to the default folder. The report contains all the parameter settings that were downloaded to the register. In addition, each time a log data is retrieved from the register, the tabular data is automatically saved to a file in the default folder.

The iPERL system allows you to view the following data reports:

- Meter Programming
- Data Logging
- Alarms
- History
- Diagnostics
- Lifetime

4.2 Viewing Reports

To view an iPERL system report in the Unipro application:

1. From the **Main** screen, click the **Reports** menu option.
   The **Reports** screen appears, as shown in Figure 4-1.

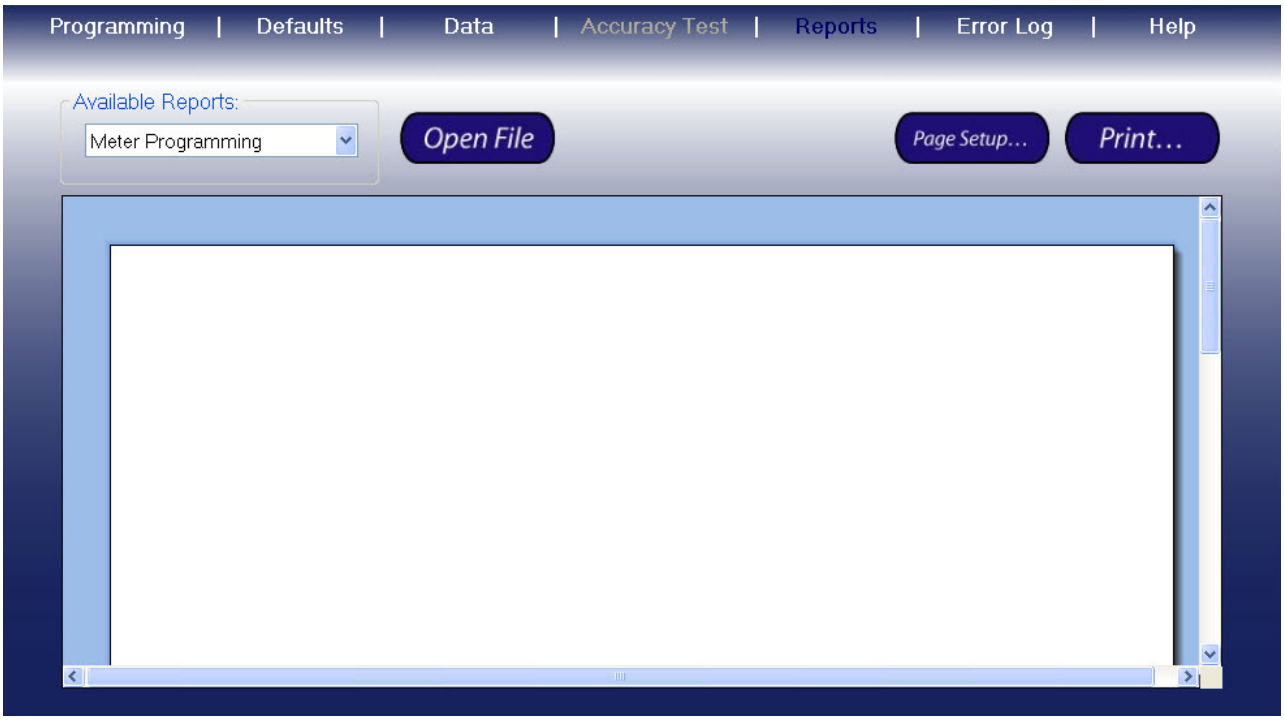


Figure 4-1: Reports Screen

2. Choose a report to view from the **Available Reports** dropdown box.
3. Click the **Open File** button.
   A **Dialog Box** appears, listing the stored reports. The reports are listed by the programmable ID and the date/time that the report was stored. For example, a data log listed as 06230138_2007112680834 opens a report for meter ID 06230138 stored on 11/26/2007 at 8:08:34 a.m.
4. Choose the appropriate report.
5. Click the **Open** button.
   The report will appear in the Unipro application.

4.3 Printing Reports

To print an iPERL system report from the Unipro application:

1. From the **Main** screen, click the **Reports** menu option.
   The **Reports** screen appears, as shown in Figure 4-1.
2. Choose a report to view from the **Available Reports** dropdown box.
3. Click the **Open File** button.
   A **Dialog Box** appears, listing the stored reports. The reports are listed by the programmable ID and the date/time that the report was stored. For example, a data log listed as 06230138_2007112680834 opens a report for meter ID 06230138 stored on 11/26/2007 at 8:08:34 a.m.
4. Choose the appropriate report.
5. Click the **Open** button.
   The report will appear in the Unipro application.
6. Click the **Page Setup...** button to view the printing parameters.
7. Click the **OK** button.
8. Click the **Print...** button to print the report.

5 Logs

This chapter provides information on:

- The types of logs available.
- Viewing system data.
- Exporting logs.
- Viewing history data.
- Viewing alarm data.
- Viewing lifetime data.
- Viewing diagnostic data.

5.1 Available Logs

The system register retains up to 30 days of data. When data is read from the system, it is automatically saved to a .rft file that can be viewed in the Unipro™ application. Table 5-1 describes the different ways you may view logs.

Table 5-1: Log Views

Log Name	Definition
Graph	Displays retrieved flow data on a graph.
Tabular	Displays retrieved flow data as a list.
History	Displays retrieved data that describes the type of events and alarms that have occurred in a system in a defined period of time.
Alarms	Displays which alarms are tracked, active, or saved.
Lifetime	Displays a visual representation of the system lifetime data.
Diagnostics	Displays a visual representation of the system diagnostics.

5.2 Viewing Logs

To view logs in the Unipro application:

1. From the **Main** screen, click the **Data** menu option.
   The **Controls** tab appears, as shown in Figure 5-1.

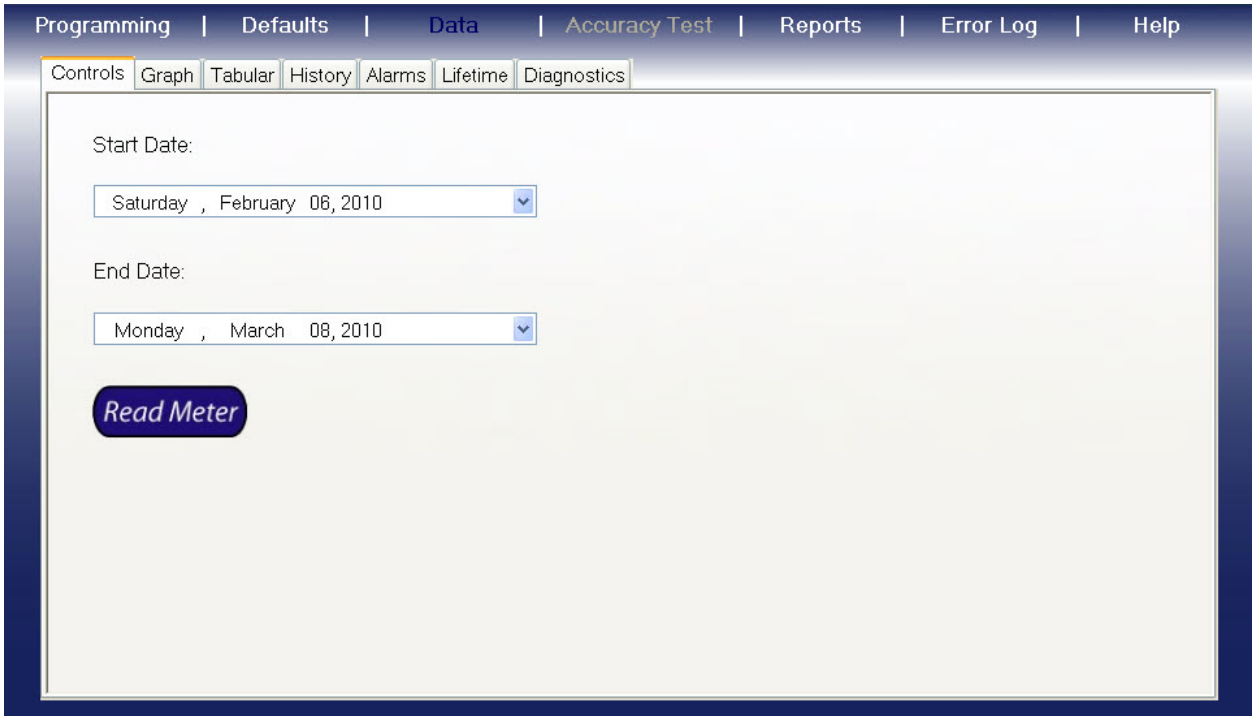


Figure 5-1: Controls Tab

2. Choose a **Start Date** and **End Date** for the data you would like to view.
3. Click the **Read Meter** button.
4. Once the meter data has been read, you may choose to view the data in a graph from the **Graph** tab or in a table from the **Tabular** tab.

5.3 Exporting Data

If you would like to save the system data in a format other than the automatic .rtf file, you may export the data to a comma delimited or an XML file.

To export data from the Unipro application:

1. Follow the steps in “Viewing Logs” to read the meter.
2. Click the **Tabular** tab.
   The **Tabular** screen appears, as shown in Figure 5-2.

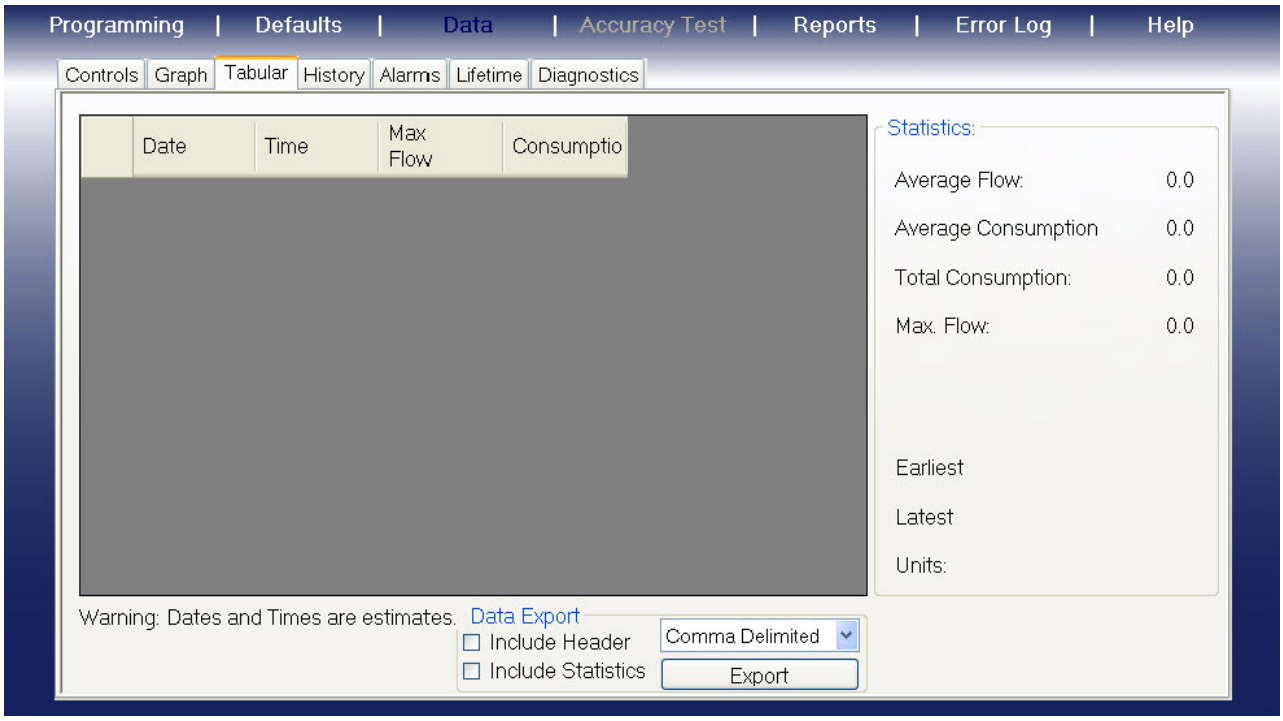


Figure 5-2: Tabular Screen

3. In the **Data Export** section, choose how you would like to view the data from the dropdown box. Your available options are comma delimited and XML.
4. Check the **Include Header** checkbox if you would like to have a header.
5. Check the **Include Statistics** checkbox if you would like to include the summary information from the **Statistics** section.

✓	Statistics may not be included in an XML file.

6. Click the **Export** button to view the file.

5.4 Viewing History Data

To view system history data:

1. From the **Main** screen, click the **Data** menu option.
2. Click the **History** tab.
   The **History** screen appears, as shown in Figure 5-3.

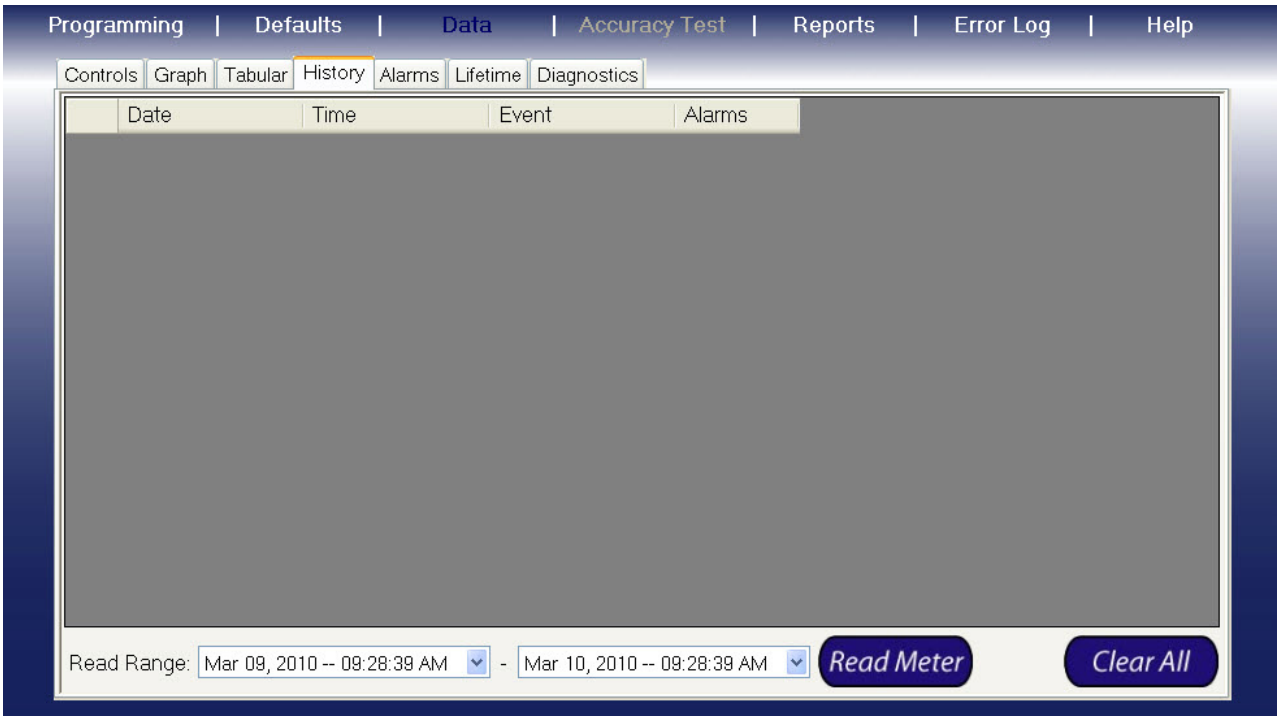


Figure 5-3: History Screen

3. Choose a start and end date from the **Read Range** dropdown boxes.
4. Click the **Read Meter** button.
   The history data will appear.

5.5 Viewing Alarm Data

To view system alarm data:

1. From the **Main** screen, click the **Data** menu option.
2. Click the **Alarms** tab.
   The **Alarms** screen appears, as shown in Figure 5-4.

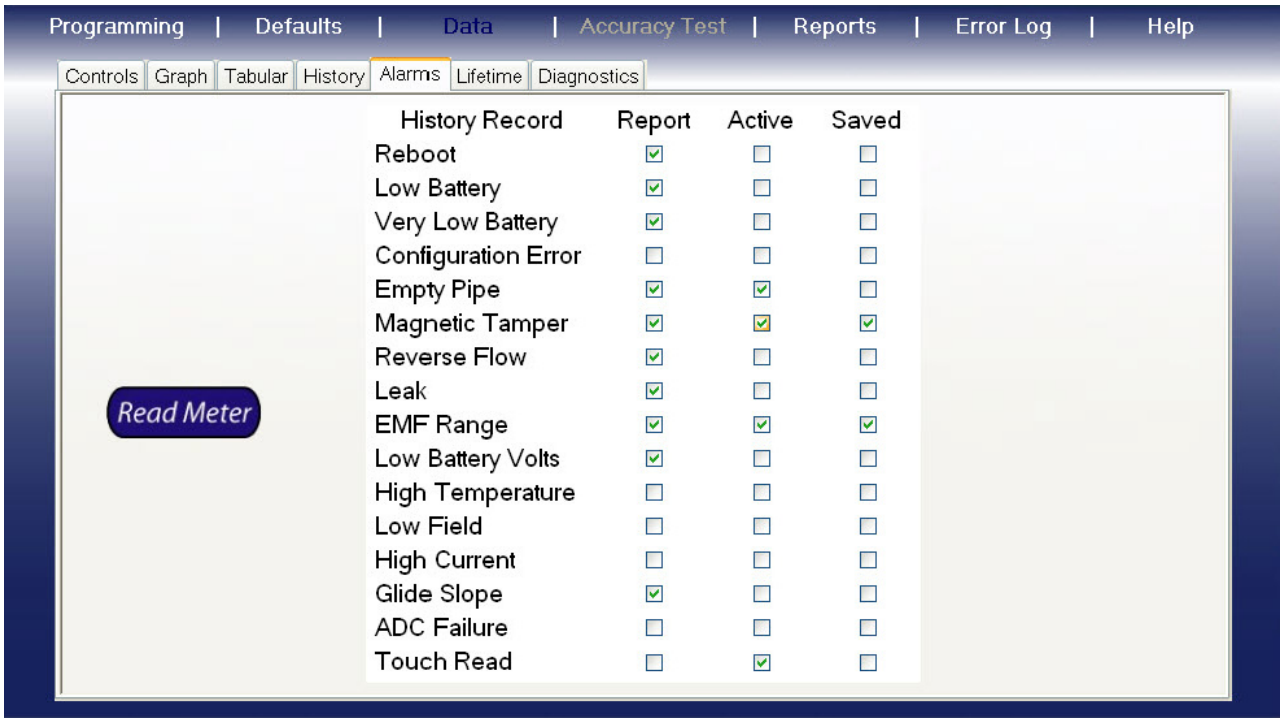


Figure 5-4: Alarms Screen

3. Click the **Read Meter** button.
   The alarm data will appear. Table 5-2 describes the different alarm data types.

Table 5-2: Alarm Data Types

Alarm Data Type	Definition
Report	Defines which alarms are to be tracked.
Active	Alarms that are currently triggered.
Saved	Alarms that have occurred within the persistence time since the last unidirectional read. In other words, if an empty pipe occurs, this alarm is latched until the next read, then remains for a period of time until which the alarm flag is cleared.

5.6 Viewing Lifetime Data

The iPERL system collects data from its manufactured date. The data can be read from the meter and then reviewed, but cannot be changed.

To view system lifetime data:

1. From the **Main** screen, click the **Data** menu option.
2. Click the **Lifetime** tab.
   The **Lifetime** screen appears, as shown in Figure 5-5.

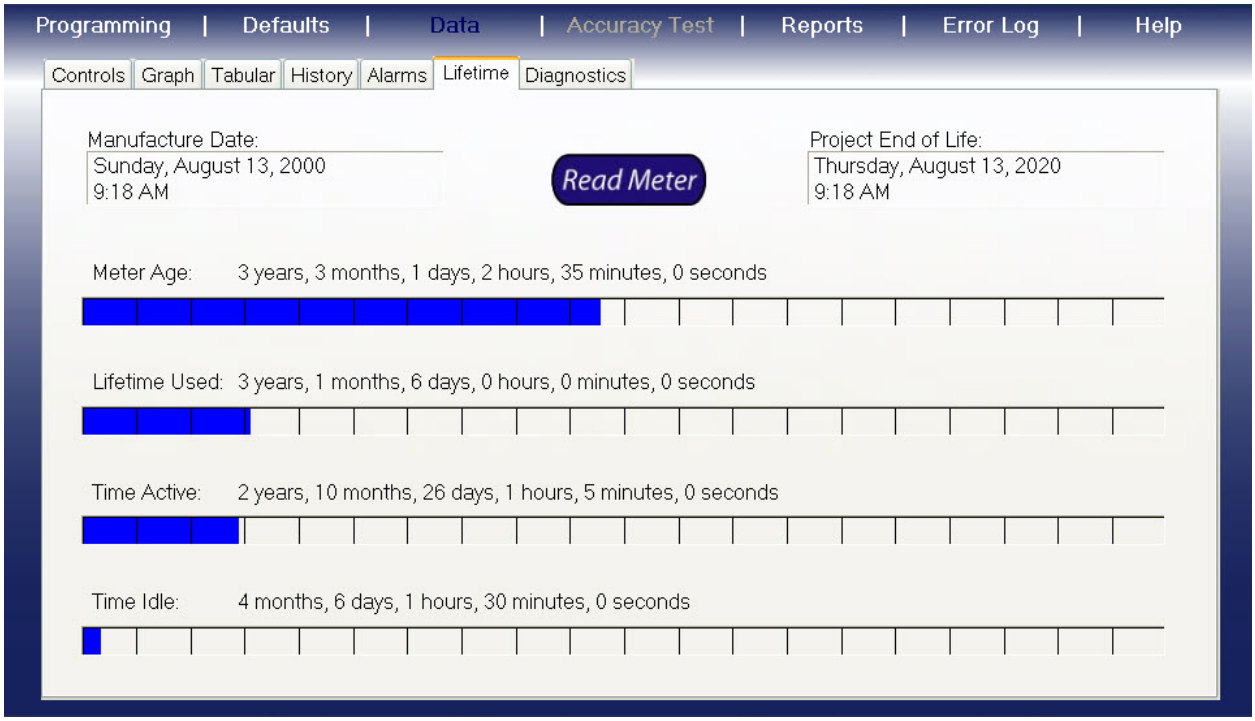


Figure 5-5: Lifetime Screen

3. Click the **Read Meter** button.
   The manufacture date, projected end of life, meter age, lifetime used, time active, and time idle information appears.

5.7 Viewing Diagnostic Data

To view system diagnostic data:

1. From the **Main** screen, click the **Data** menu option.
2. Click the **Diagnostics** tab.
   The **Diagnostics** screen appears, as shown in Figure 5-6.

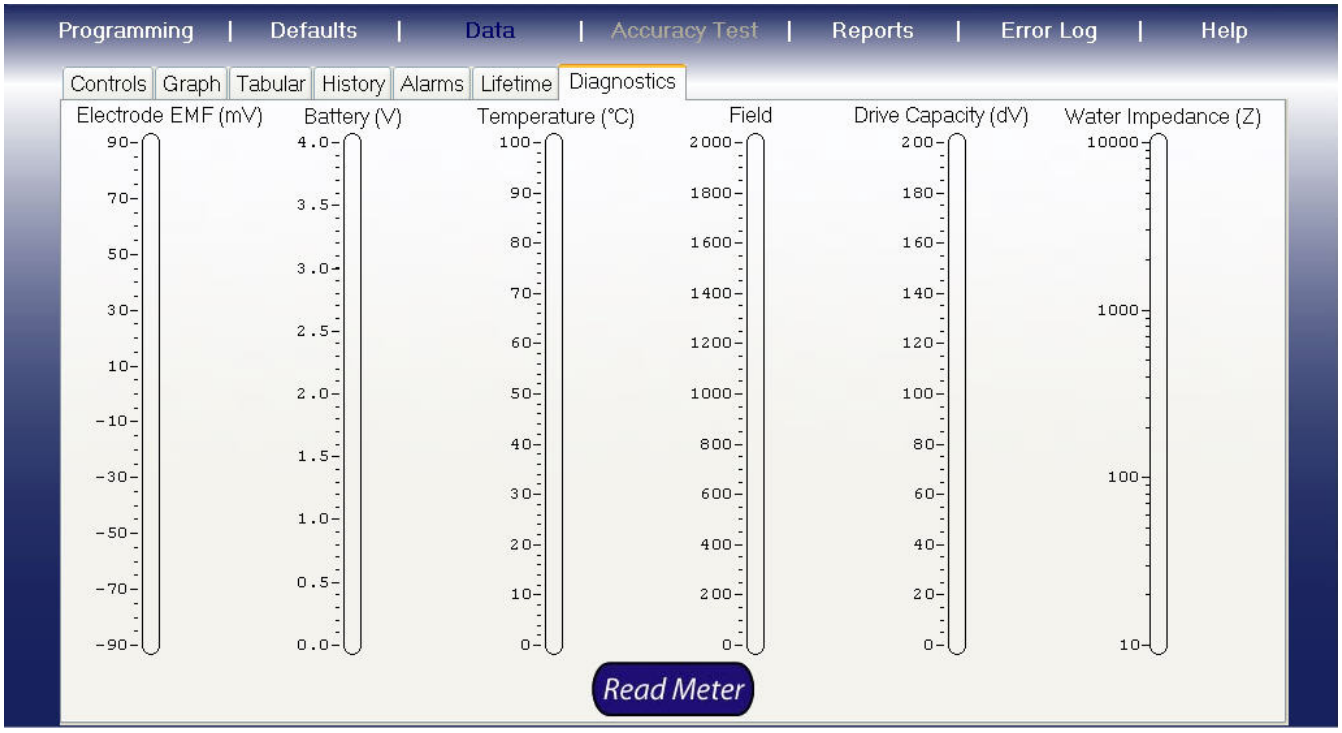


Figure 5-6: Diagnostics Screen

3. Click the **Read Meter** button.
   The meter diagnostic information appears.

6 Error Log

The Unipro™ application allows you to view a list of communication errors that have occurred in the application.

This chapter provides information on how to:

- View an error log in the Unipro application.
- Acknowledge errors.

6.1 Viewing an Error Log

To view an error log in the Unipro application:

1. From the **Main** screen, click the **Error Log** menu option.
   The **Error Log** screen appears, as shown in Figure 6-1.

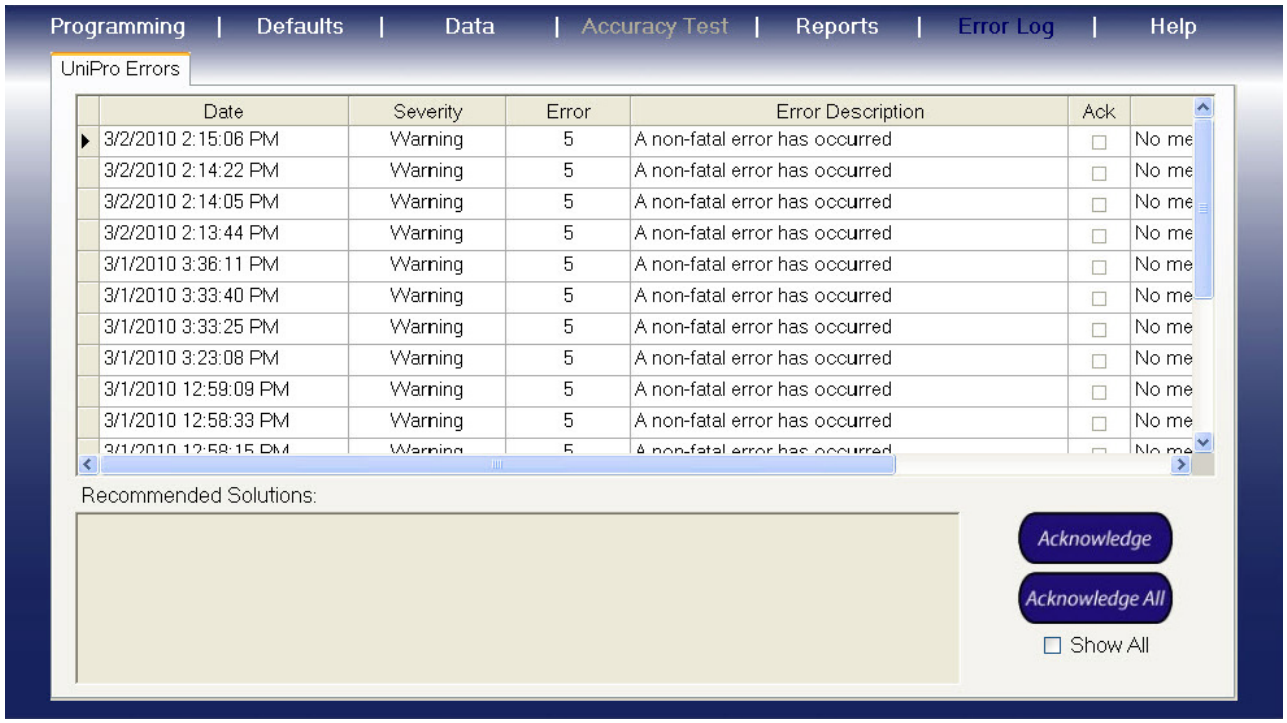


Figure 6-1: Error Log Screen

6.2 Acknowledging Errors

To acknowledge errors in the Unipro application:

1. Follow the steps in “Viewing an Error Log”.
2. Select the row for the error you would like to acknowledge by clicking the black arrow on the left side of the table.

To select more than one error, hold down the **Ctrl** key while selecting rows.

3. Click the **Acknowledge** button to acknowledge a single error or click the **Acknowledge All** button to acknowledge all errors in the list.
   The error(s) will be removed from the table.

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