

RDC-CI CHEMICAL INJECTION DATA-LOGGER USER MANUAL



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Chapter 1

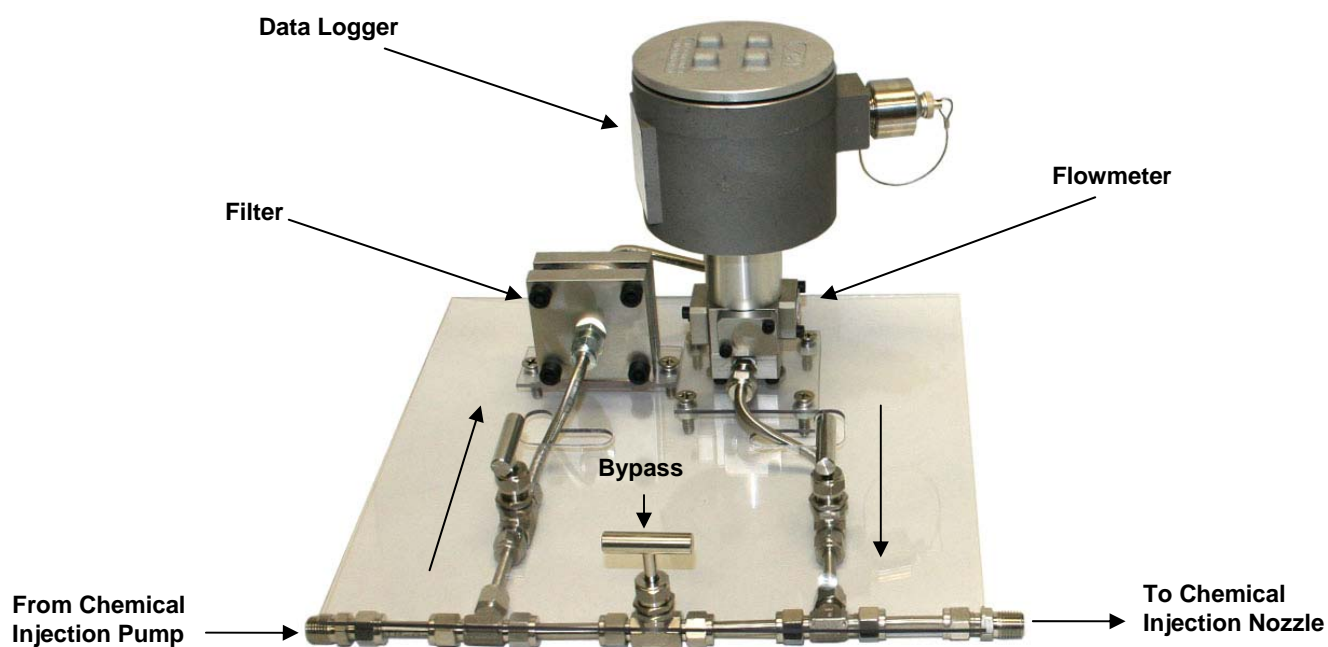
Introduction

General

The RDC-CI Data Logger accurately monitors chemical flow through injection quills and nozzles using a positive displacement flow meter to calculate chemical delivery rates. It was designed to benefit plant operators in the optimization of chemical inhibitors, especially in remote locations. Its purpose is to ensure that the correct chemical injection rate is being supplied to the chemical injection quills and nozzles. It can be permanently mounted to the pipeline or installed temporarily using an accessory kit that includes two flexible six foot hoses and quick-connect couplings.

Equipment Configuration

The RDC-CI Data Logger consists of several components, including the data logger, flow meter, filter, valves, and piping (tubing). These components are connected by a series of couplings and mounted onto a stainless steel plate. The equipment can then be mounted in a convenient location or moved easily from location to location.



Data Logger

The RDC-CI Data-Logger uses the same technology as the Microcor Data-Logger, providing an autonomous data collection system. A low current consumption sensor measures the volume data in 5.86×10^{-5} US Gallon increments, yielding very accurate flow rates over user-selectable reading intervals ranging from two minutes to one day. The data-logger is powered by a 3.6 V Lithium battery. See data sheet for further specifications.

Flowmeter

The flowmeter portion of the RDC-CI Data Logger uses a positive displacement mechanism (pistons) to measure the volume of the fluid by dividing the media into fixed volumes or piston strokes.

The flowmeter can handle chemicals or fluids with a viscosity of up to 500 cPs (centipoise) at 100 gpd and temperatures up to 500 °F (260 °C). There are two pressure ratings available, one for pressures up to 1000 psi and the other handles pressures up to 3000 psi.

Piston strokes are converted into revolutions of the flow meter shaft which are counted by the electronic sensor. The flowmeter data-logger range covers 0.5 to 100 US gal/day.

Note: The flowmeter requires the fluid being measured as a lubricant. Oil based fluids provide this naturally. Water-based fluids are also useable provided the pump is kept fully submerged in fluid. Water and oxygen in the pump can cause bearing corrosion and pump failure. If a pump with water-based fluids is used it should be drained and flushed with alcohol or similar cleaning fluid before being left.

Warning: Do not use air through the flowmeter, even for cleaning, since the lack of lubrication can cause the pump to seize up due to the small clearances in the pump.

Filter

A filter is supplied to block any particles or debris from passing through to the flow meter to prevent damage or blockage. The filter is a 10 micron stainless steel woven mesh with an allowable operating pressure of up to 2000 psi. Filter replacement is recommended when there is an increase in pressure differential or on regular scheduled intervals as a preventive maintenance measure. Replaceable filter element kits are available.

Tubing

The system is connected by 1/4" stainless steel tubing, the same material widely used in chemical injection systems.

Valves

The system has three valves, an inlet, outlet, and by-pass valve. Two valves provide isolation for pump removal and also required at start-up. The by-pass valve is required during start-up and shut down of the system. At start-up flow should first be established through the bypass valve to clear the air in the system before opening the pump inlet and outlet valves and then closing the bypass valve to direct flow through the meter.

Stainless Steel Plate

The system is mounted on a durable, long lasting stainless steel plate. It can be easily mounted onto a wall or pipe by custom drilling holes into the plate as required.

Flexible Connection Hoses

These are used where a pump is to be moved from location to location at intervals for sampling inhibitor injection rates. The quick connect hoses enable easy connection and disconnection of the system. For pump locations where periodic testing will be done, the two hoses can be connected together with an adapter, so hoses stay in place and there is no need for removal/installation each time testing needs to be resumed.



RDC-CI shown in the field installed with flexible connection hoses

Chapter 2

Specifications

- **Flow Rate:** 0.5 to 100 US gpd
- **Viscosity Range:** Up to 500CPS at 100 US gpd
- **Temperature Range:** Fluid 500 F (260 C)
- **Upstream Filter:** 10 microns
- **Pressure Rating:** Standard 1000 psi
High pressure 3000 psi
- **Flowmeter Material:** Stainless Steel Type 303
- **Connections:** ¼" NPT Male
- **Flowmeter Seals:** Teflon
- **Battery:** 3.6 V Lithium (1)
- **Resolution:** 5.85865×10^{-5} US gal/pulse
- **Accuracy:** At 1 US gal/day and 10 min sampling interval (Pulses = 118)
accuracy better than 1%
- **Rate Sampling Interval:** Settable 2 to 1440 min
- **Reading Storage:** Up to 8000
- **Hazardous Area Rating:** System Certification for Class 1 Div 2 and Zone 2 in process.
Uses currently rated area certified components.

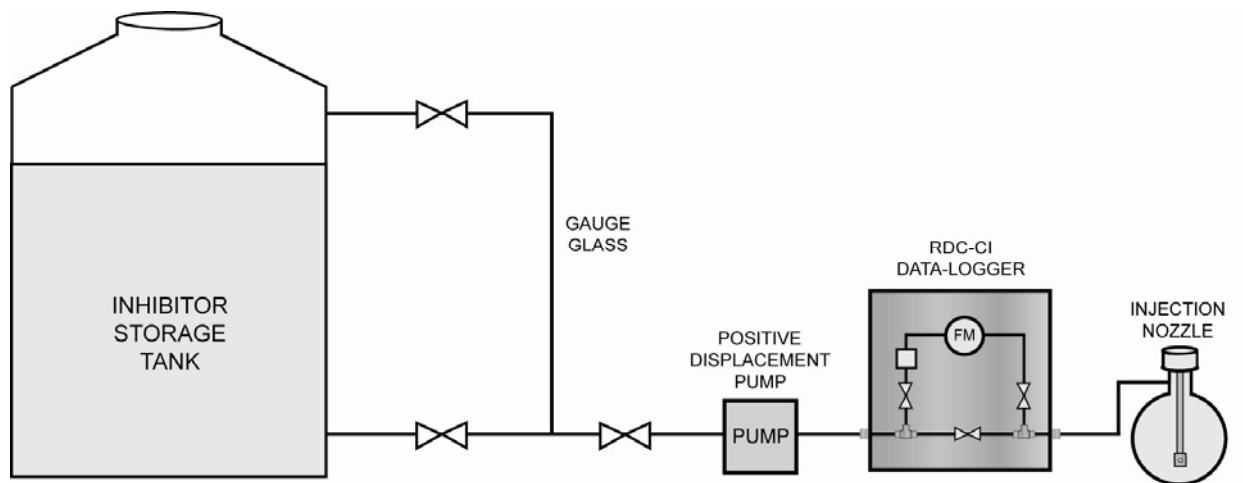
Chapter 3

Setup and Installation

Permanent Installation

The RDC-CI may be permanently installed at an injection pump to continuously monitor the flow, or it may be set up for occasional monitoring with rapid connection and removal with quick connect hoses (RCS PN 001696). See Diagram below for typical permanent installation configuration.

Typical Permanent Installation

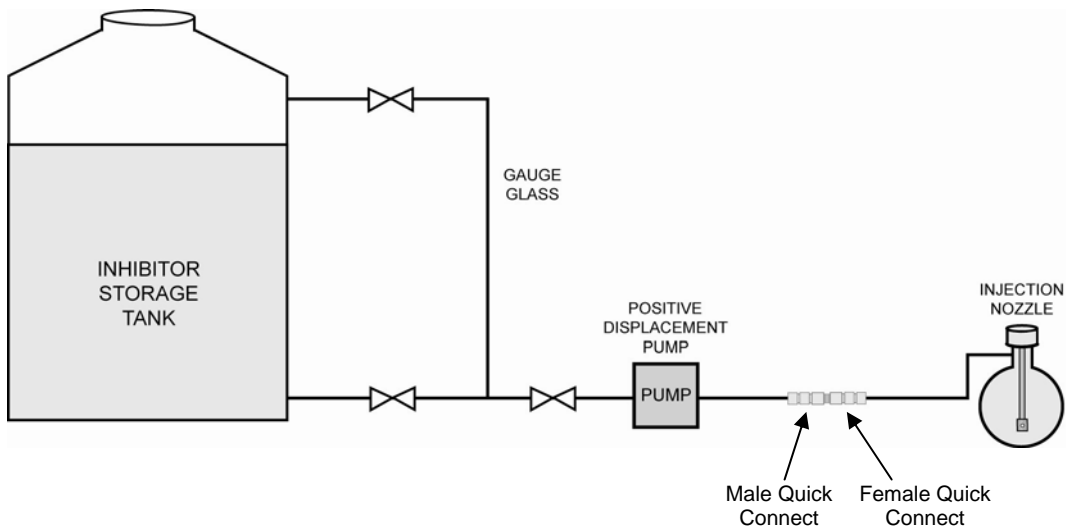
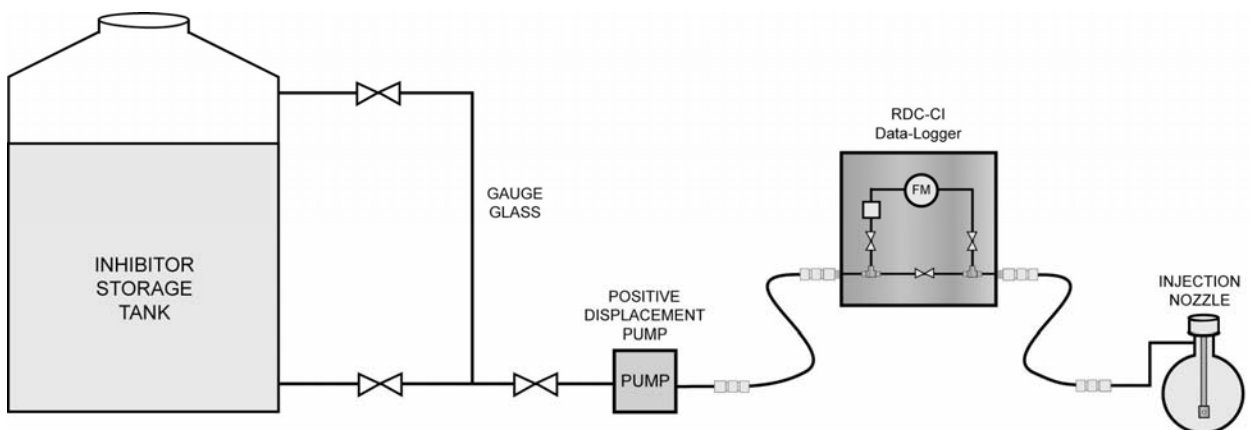


Occasional Installation

The following setup is based on 1/4" tubing before Chemical Injection Data-Logger installation. Your particular setup may vary. The flowmeter and data logger come pre-assembled on a stainless steel plate with compression tube fittings. Two six foot quick connect hoses are included for connection between the RDC-CI and the chemical injection pump. Hose length should be considered when placement and mounting of RDC-CI are to be determined. The stainless steel plate can be mounted in a convenient location by custom drilling holes into the plate and using appropriate mounting hardware for your location. See diagram below for typical semi-permanent installation.

Semi-Permanent Installation

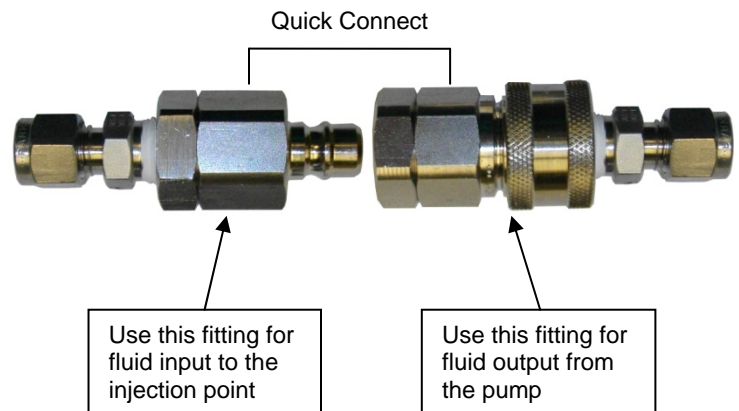
With Flowmeter and Flexible Hose Kit (PN: 001696)



Without Flowmeter

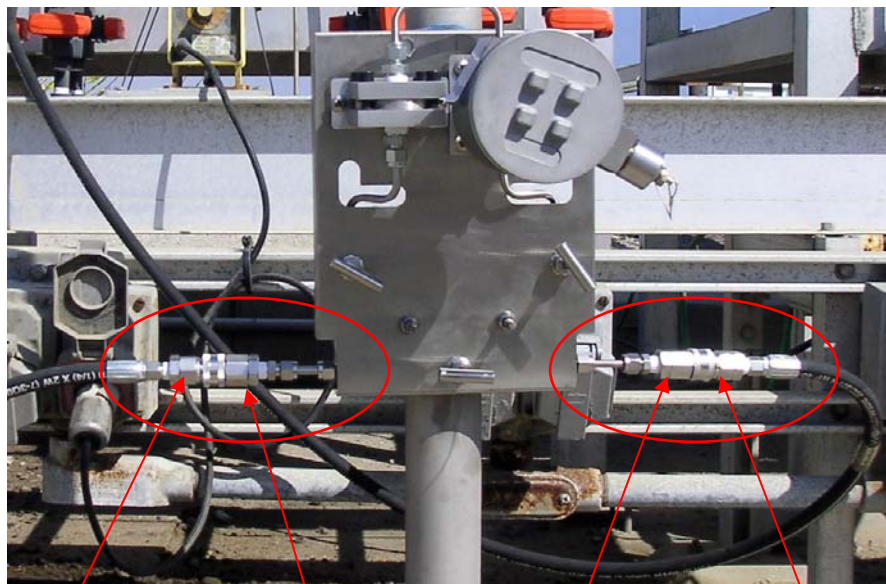
Assembling Hardware for Flow Meter

1. First you will need to attach the hydraulic hoses included with the RDC-CI to both the chemical injection pump and to the RDC-CI. Make sure you have completely shut off the chemical injection pump.
2. Attach hose couplings using compression tube fittings on chemical injection pump outlet (as shown below). Compression tube fittings can be removed from steel plate.



Note: Orientation of hose fittings on Chemical Injection Data Logger. Hydraulic hose will not fit if hose couplings are not installed properly from the previous step.

3. Next connect the hydraulic hoses to the Chemical Injection Data Logger as shown below.



Male Quick
Connect on hose

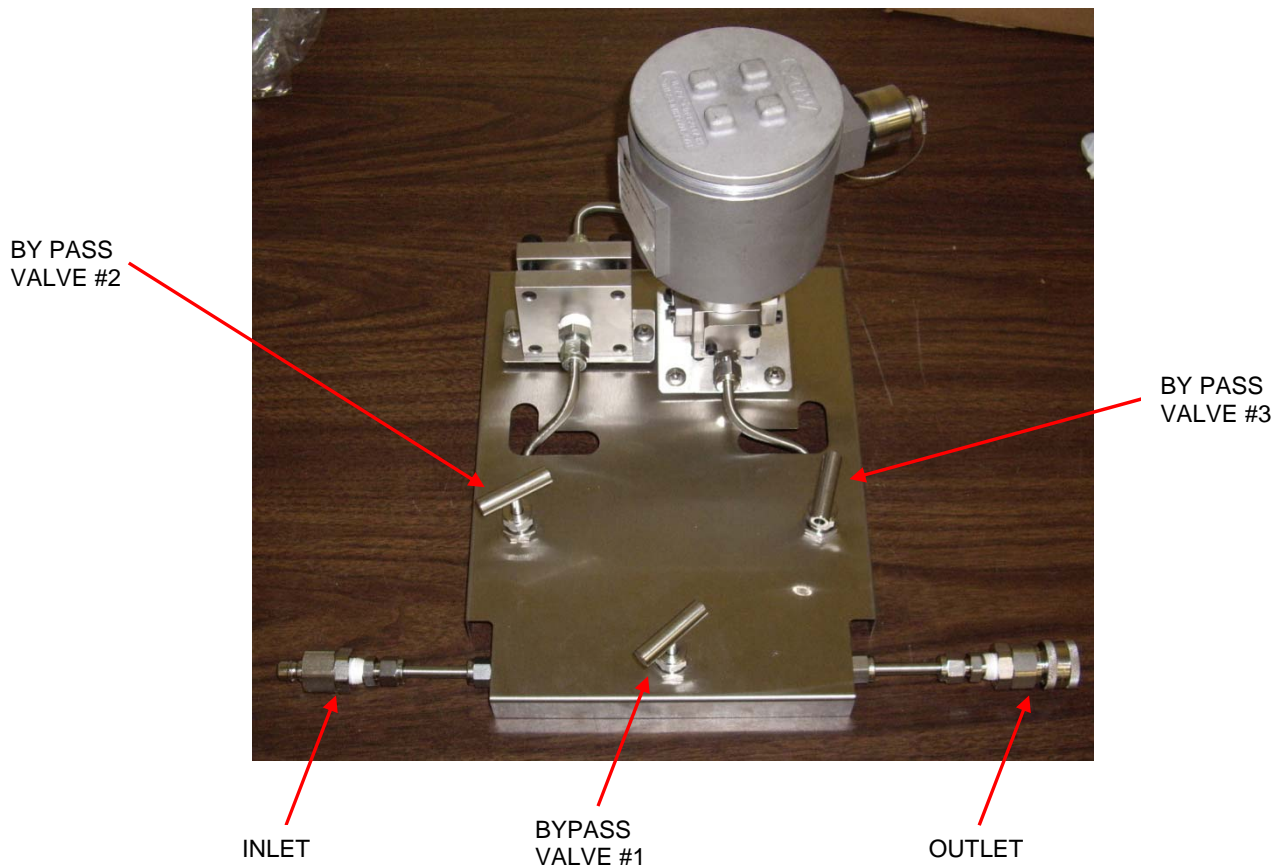
Female Quick
Connect on Pump

Male Quick
Connect on Pump

Female Quick
Connect on Hose

Flow Meter Plumbing

4. When installing you will need to bypass the Flow Meter by opening Valve #1 and closing bypass valves #2 and #3. This will ensure continuous flow of chemicals until the Data-Logger has been configured.
5. Once the Data-Logger has been configured and is ready to for circulation through the Flow Meter, close bypass valve #1 and open bypass valves #2 and #3. (See below)



Chapter 4

Operation

Battery Installation

The RDC-CI is powered using (1) Lithium battery. The data-logger comes with the battery already installed, but not connected. Remove the lid from the data-logger by unscrewing it and connect the battery.

The RDC-CI can be programmed using either a Checkmate DL handheld unit or with a portable laptop computer using Data Logger Interface Manager Software.

If you are using an existing Checkmate DL you will need to ensure that it is configured to work with Microcor Systems. If it is currently configured for use with Corrdata Systems you will need to switch it over to Microcor. Please consult your Checkmate DL User Manual for instruction.

If your Checkmate DL came with your RDC-CI it should be pre-configured for Microcor from the factory.

Note: When switching Checkmate DL between Microcor and Corrdata Systems, all stored data will be erased! Be sure to transfer all stored data to the PC prior to changing the data collection system

The **Standby** display screen for the Microcor System and the Corrdata System is shown below:

| |
|---|
| <p>ROHRBACK COSASCO SYS Corrdata MMM DD, YYYY HH:MM:SS Read Disp Dump SetUp</p> |
|---|

| |
|--|
| <p>ROHRBACK COSASCO SYS Microcor MMM DD, YYYY HH:MM:SS Read Conf Data Mate</p> |
|--|

Programming the RDC-CI Using a Checkmate DL

1. Connect Checkmate-to-RDC cable (PN: 723623) from Checkmate DL unit to the Data-Logger unit.
2. Power on both the Checkmate DL and Data-Logger.

3. Once the Checkmate DL is configured for Microcor the following screen will appear:

```

Microcor
Free Readings xxxxx
Exit

```

4. Press **Exit (F4)** to proceed to the next screen shown below:

```

Standard Time Zone
|
| UTC +0:00
DTZ Up Down OK

```

It is required to set the **Time Zone** into the Checkmate DL from this screen to configure the Checkmate DL to accurately date and time stamp the readings acquired from the RDC-CI. Set the **Time Zone** to either **Standard** or **Daylight** mode on the Checkmate DL by pressing **DTZ (F1)** to toggle between **Standard** and **Daylight** (the active mode is shown on the top line of the display). Then use the **Up (F2)** or **Down (F3)** buttons to set the UTC offset for the time zone where the data loggers are located. The correct time zone data is required because the underlying architecture the Data-Logger Interface Manager is based on uses a UTC time reference. UTC (GMT) time information is found on computers in the 'Date and Time' settings in Control Panel on Windows Operating Systems.

5. Set the time and then press **(F4) OK**
6. From the **Standby** display, press **Conf (F2)** to proceed to the **Set Data Logger ID** display:

```

Set Data Logger ID
  < >
Enter Clr BkSp Exit

```

7. Enter a the desired ID number from 0 to 99 and press **Enter (F1)** to proceed to the **Set Data Logger Tag** display.

```

Enter Data Logger Tag
  > <
Enter Clr BkSp Exit

```

In the **Enter Data Logger Tag** display, enter up to twelve (12) alpha/numeric characters to uniquely identify the monitoring location. This can be a tag number, location or process name. Pressing **Clr (F2)** clears a previously entered ID. Pressing **BkSp (F3)** backs up one space for each time it is pressed so that a change can be made. Pressing **Exit (F4)** returns to the **Standby** display.

- Press **Enter (F1)** to proceed to the **Set Sample Rate** display:

Set Sample Rate
> < minutes

Enter Clr BkSp Exit

- Enter a desired "Sample Rate", for example "2", for two minute data collecting cycles, press **Enter (F1)**.
- Wait for configuration to complete then press **Exit (F4)**.
- To start Data-Logging, disconnect the cable from the Data-Logger unit.

Retrieving Data from the Chemical Injection Data-Logger Using a Checkmate DL

- While keeping the Data-Logger powered on, connect Checkmate DL handheld unit to Data-Logger using the Checkmate-to-RDC cable.



- Press **Exit (F4)** to proceed to the next screen.
- Select your Time-Zone as noted above, then press OK.

4. Press **Read (F1)**, Press **Read Data (F2)**,

```

ID: XX XXXXXX
   MMM DD,YYYY HH:MM:SS
Read  Read  Set
Stat  Data  Clock Exit

```

5. Press **Start (F1)**. Download of data will take a few moments.

```

Data Logger ID: XX
Tag: XXXX

Start                               Exit

```

6. The following screen will appear showing the readings:

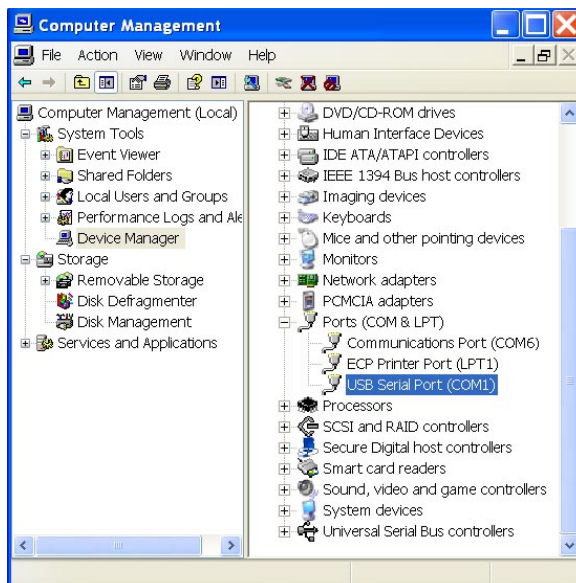
```

Last Reading XXXXXX
   MMM DD,YYYY HH:MM:SS
Number Reads XXX
Clear                               Menu

```

Programming the Chemical Injection Data Logger Using a PC

1. Connect the RDC/Wireless to PC cable (PN: 748110-9A) from Laptop to Data-Logger. If the laptop does not have a DB9-Serial port, use the included USB to Serial adapter. A laptop with an included serial port normally uses COM 1. If the USB to Serial adapter is used, the COM port number allocated will need to be checked in Windows Device Manager. To access Windows Device Manager, right-click My Computer, select Manage and the Device Manager button.



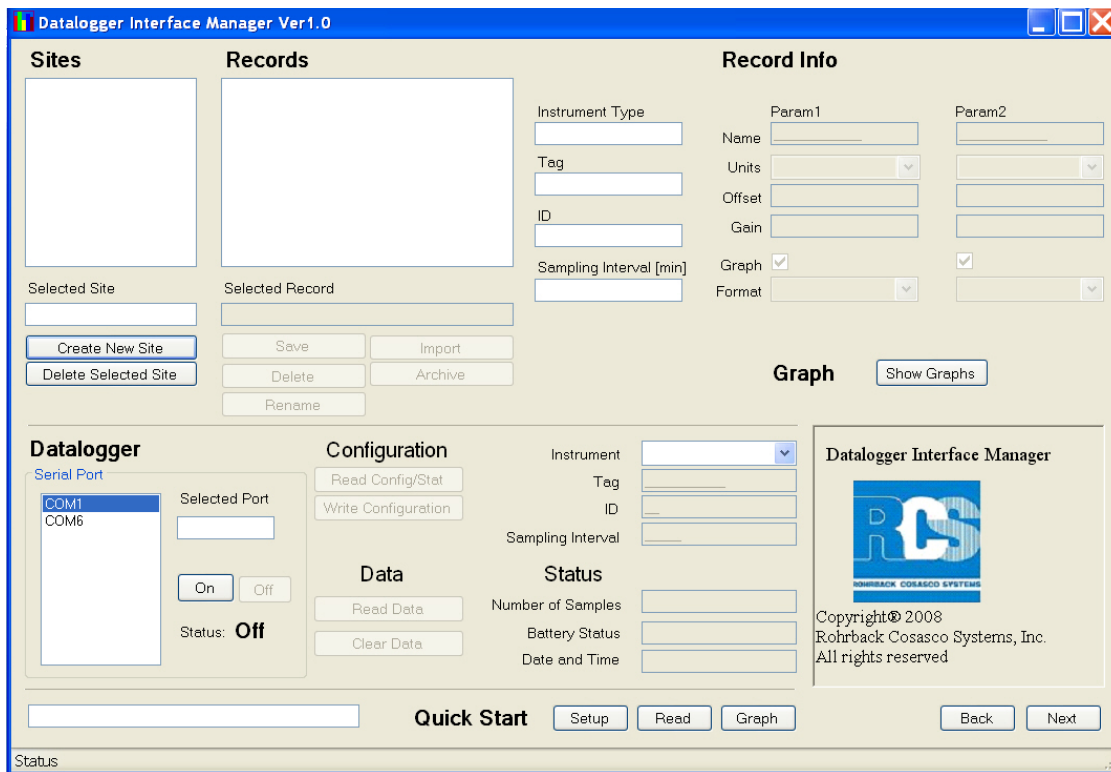
Go to Ports to view the COM port number. This COM Port # needs to match with the COM port # you select when using the Data-Logger Interface Manager software.

Data Logger Interface Manager Software

Install the provided Data-Logger Interface Manager software from the CD onto the laptop that is to be used to collect the Data from the Data-Logger. This software is capable of operating on several types of data-loggers of which the RDC-CI is one.

Software Program Overview

When starting the Datalogger Interface Manager, the screen appears as follows:



- Sites and Records

The upper left of the screen allows set up of multiple Sites, and multiple data-loggers or records at each site. Each record includes information on the type of data-logger, and its configuration. The upper right of the screen allows parameter inputs for graphing data.

- Record Info

This section in the upper right of the screen allows input of specific data for each monitored point.

- Data-logger

The lower left hand portion of the screen sets up, open and closes the communication port between the laptop and the Data-Logger unit. Note that an RS 232 serial port connection is used. Many laptops do not have serial ports, but only USB ports. A USB to serial port converter and software is provided with the unit to operate with laptops that do not have a serial port. If this converter is required, install this software before running the Data-logger Interface Manager.

- Configuration

The lower middle portion of the screen, labeled Configuration applies to setting and reading a data-logger configuration where applicable. The portion labeled Data applies to reading the data from the data-logger and if required clearing the data from the data-logger.

The portion of the screen to the lower right displays the software details and provides access to simple on-line help screens.

The bottom section of the screen has a status bar to display port status and communication progress.

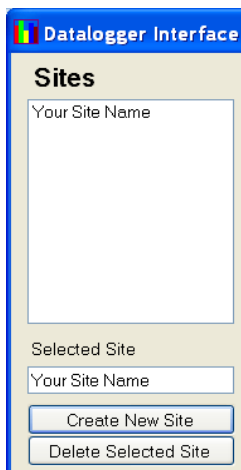
The Quick Start buttons gives brief overview of how to Setup, Read, and Graph data.

The very bottom left corner of the screen identifies operation of the communication port and related operations; the picture on previous page shows as “Completed” (Port Closed).

Configuration

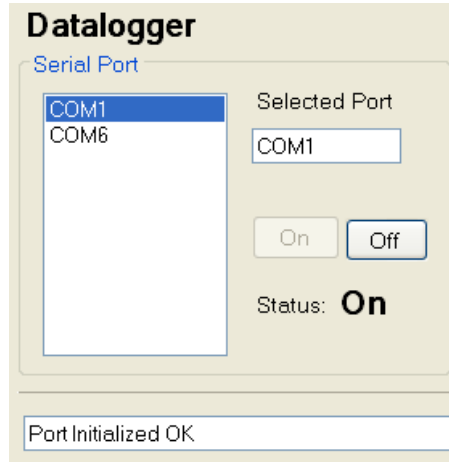
1. Site Setup

Place the mouse cursor inside the **Selected Site** box and type in the desired site name. In this example “Your Site Name” has been used for demonstration. Select the **Create New Site** button. The new site will appear inside the Sites box. To delete this site first select the created site inside the Sites box and select the **Delete Selected Site** button.



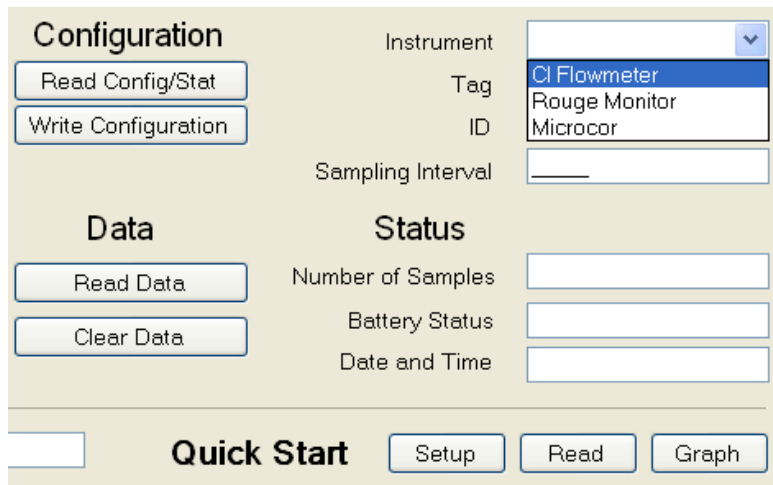
2. Communication Port Configuration

To collect data from the Data-Logger, connect the serial or USB port from the laptop to the communication port on the Data-Logger. Assuming COM1 is your selected comport, select COM1 port. Click on the On button. Status should show "On". Status bar at bottom left of screen should show "Port Initialized OK".



3. Instrument Selection

Click on the down-arrow in the Instrument box. Select CI-Flowmeter from the drop down menu.



4. Data File Naming Tag and ID

The data file name is created automatically from allocated instrument Tag and ID #. For example if the instrument tag is called “A” and the instrument ID is called “01”, the stored data file will be named CI01A.csv.

To assign your own Tag and ID say Tag “A” and ID “01” for example; type “A” in the Tag box and “01” in the ID box. Press the Write Configuration button then wait for progress bar at bottom-left corner to complete. This writes the configuration to the Data-Logger.

Configuration

Instrument: CI Flowmeter

Tag: A

ID: 01

Sampling Interval: 5

Data

Read Data

Clear Data

Status

Number of Samples

Battery Status

Date and Time

Datalogger

Serial Port

COM1

COM6

Selected Port: COM1

On Off

Status: **On**

Configuration

Instrument: CI Flowmeter

Tag: A

ID: 01

Sampling Interval: 5

Data

Read Data

Clear Data

Status

Number of Samples

Battery Status

Date and Time

Quick Start

Setup Read Graph

Writing Tag

5. Data Collection

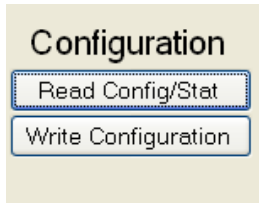
After configuration of the data-logger, leave the instrument to collect data by disconnecting the Data Logger to PC Communication cable. The Data-logger has a storage capacity of 8000 readings. Once full, the oldest reading is discarded so that always the last 8000 readings are stored.

Data logging Capacity:

- 28 days at Cycle Time set to 5 min
- 55.5 days at Cycle Time set to 10 min
- 111 days at Cycle Time set to 20 min
- 167 days at Cycle Time of 30 min

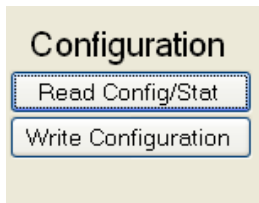
6. Transferring Accumulated Data

To collect accumulated data, reconnect the Data-Logger to PC Communication Cable then select the Read Config/Stat button.

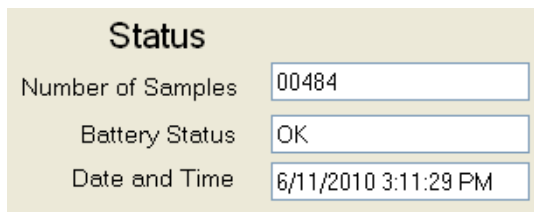


7. Collecting Accumulated Data

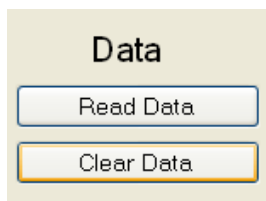
When returning to collect accumulated data, plug in the laptop to the Communication Port, Start the Data-logger Interface Manager, select Site from which date is to be collected. The data from the Data-Logger will automatically align with the data file name on the laptop. Select the Read/Config Stat button.



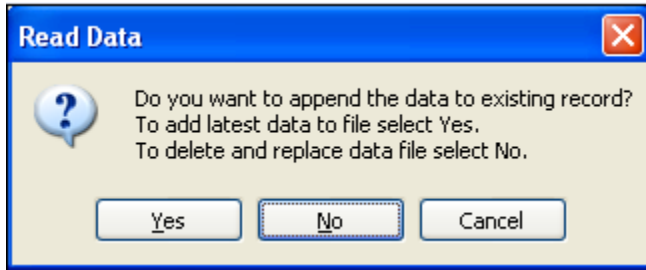
The lower-right section of the display screen will show a **STATUS** summary with a **Number of Samples**; for example "484". The **Date and Time** box displays current time inside the Data-Logger unit.



To read the data, press the Read Data button.

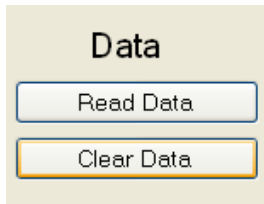


A message prompts you to either Append the New Data or Delete the existing data. Select **Yes** for normal data accumulation or **No** to delete and overwrite existing data.



8. Transfer Data

To transfer the data across from the Data-Logger to the laptop, press the **Read Data** button shown below.

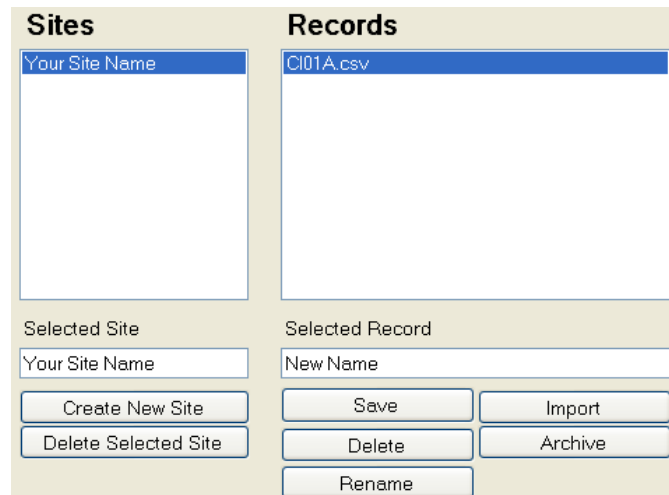


The communication status bar should show this brief progress. This data file gets automatically saved. This is not normally required as old data is automatically overwritten, so that up to 8000 most recent readings are stored.

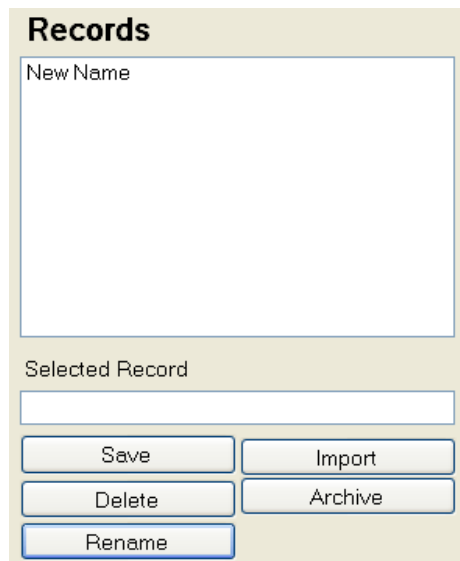
The **Clear Data** button is to erase data logged on the data-logger unit.

9. Renaming Records

As mentioned earlier, the data name inside the records box as "CI01A.csv" is created automatically. To rename, first select the site name inside the Sites box, and the Data file inside the Records box, then move the cursor inside the Selected Record box and type the new file name; for example "New Name".



Select the **Rename** button.



Records

New Name

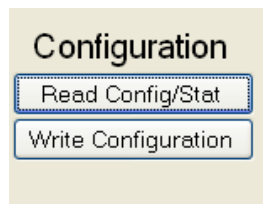
Selected Record

Save Import

Delete Archive

Rename

To save the configuration, select the new file name inside the Record box and click Save button. To update the new file name into the Data-Logger unit, select Write Configuration



Configuration

Read Config/Stat

Write Configuration

Note: After renaming the file, old file should be deleted from Records to prevent confusion.

10. Archiving Data and Importing Data

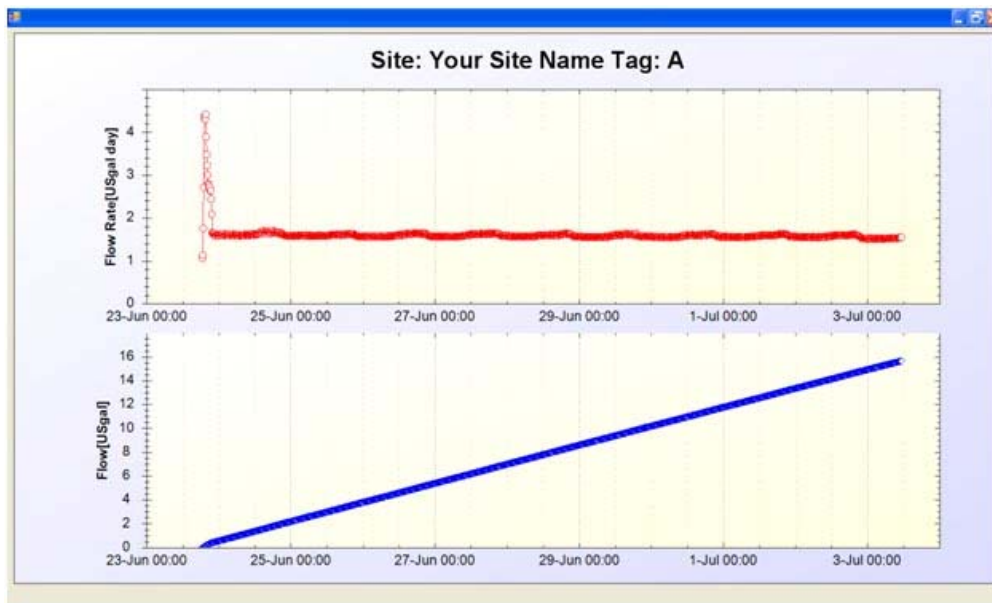
Your data file can be archived into a default folder by selecting the **Archive** button. To recall your archived file from “Your Site Name” folder or other location such as an external USB drive, simply select the **Import** button and navigate to C:\Program Files\RCS\Datalogger Interface Manager\data\Your Site Name\archives, or to the external USB drive to open your file.

11. Displaying Collected Data

To display graphs of the transferred data, select your data file inside the Records box. **Param1** displays **Flow Rate** and **Param2** displays **Cumulative Flow**. Check the Graph box under either or both Param1 and Param2. Select from the drop-down menu inside the **Format box** then select a numbering scale, say “00000.00” then select the **Show Graphs** button to see graphed data as shown below.

| Records | | Record Info | | | |
|--|-------------------------|---|----------|-------------------------------------|-------------------------------------|
| New Name | | Instrument Type | Param1 | Param2 | |
| <div style="border: 1px solid black; height: 100px; width: 100%;"></div> | | CI Flowmeter | Name | Flow_Rate__ | Flow_____ |
| | | Tag | Units | USgal day | USgal |
| | | A | Offset | 00000.00000 | 00000.00000 |
| | | ID | Gain | 5.859e-5 | 5.859e-5 |
| | | 01 | Graph | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Selected Record | Sampling Interval [min] | Format | 00000.00 | 00000.00 | |
| 00005 | | | | | |
| New Name | | Graph <input type="button" value="Show Graphs"/> | | | |
| <input type="button" value="Save"/> <input type="button" value="Import"/> | | | | | |
| <input type="button" value="Delete"/> <input type="button" value="Archive"/> | | | | | |
| <input type="button" value="Rename"/> | | | | | |

The names for Param1 and Param2 are by default Flow Rate and Flow. These can be changed if required and saved using the Save button.



Data is saved at “C:\Program Files\RCS\Datalogger Interface Manager\data\Your Site Name” in CSV format which may be viewed in MS Excel.

The default unit of measurement for Flow Rate (Param1) is **US Gallons per day**. The default unit for Flow (Param2) is **US Gallons**. Different units may be used and scale

factor in the Gain box is automatically changed when a different unit type is selected. For example if Flow Rate is to be displayed in Liters per day, the gain would need to be 2.2178×10^{-4} to convert gallons (gal) to Liters (l). The gain value corresponds to the volume per pulse in the selected units.

Param1: Three main types of units readily available from the drop-down menu with corresponding Gains are US gallons per day, cubic centimeters per day, and liters day.

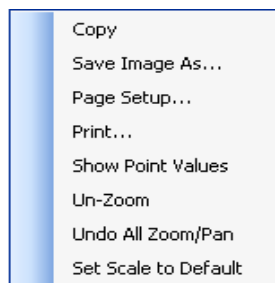
Param2: Three main types of units readily available from the drop-down menu with corresponding Gains are US Gallon, cubic centimeter, and liter.

The screenshot shows a 'Record Info' dialog box with two columns for Param1 and Param2. Each column has fields for Name, Units, Offset, Gain, Graph, and Format. Param1 is configured with Name 'Flow_Rate', Units 'USgal day', Offset 'USgal day', Gain 'liter day', Graph checked, and Format '00000.00'. Param2 is configured with Name 'Flow', Units 'USgal', Offset 'USgal', Gain 'liter', Graph checked, and Format '00000.00'.

| | Param1 | Param2 |
|--------|-------------------------------------|-------------------------------------|
| Name | Flow_Rate | Flow |
| Units | USgal day | USgal |
| Offset | USgal day | USgal |
| Gain | liter day | liter |
| Graph | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Format | 00000.00 | 00000.00 |

12. Print Graph

Place mouse over graph, right-click then select print. You may also copy, save image, page setup, zoom/un-zoom or set scale back to default as shown.

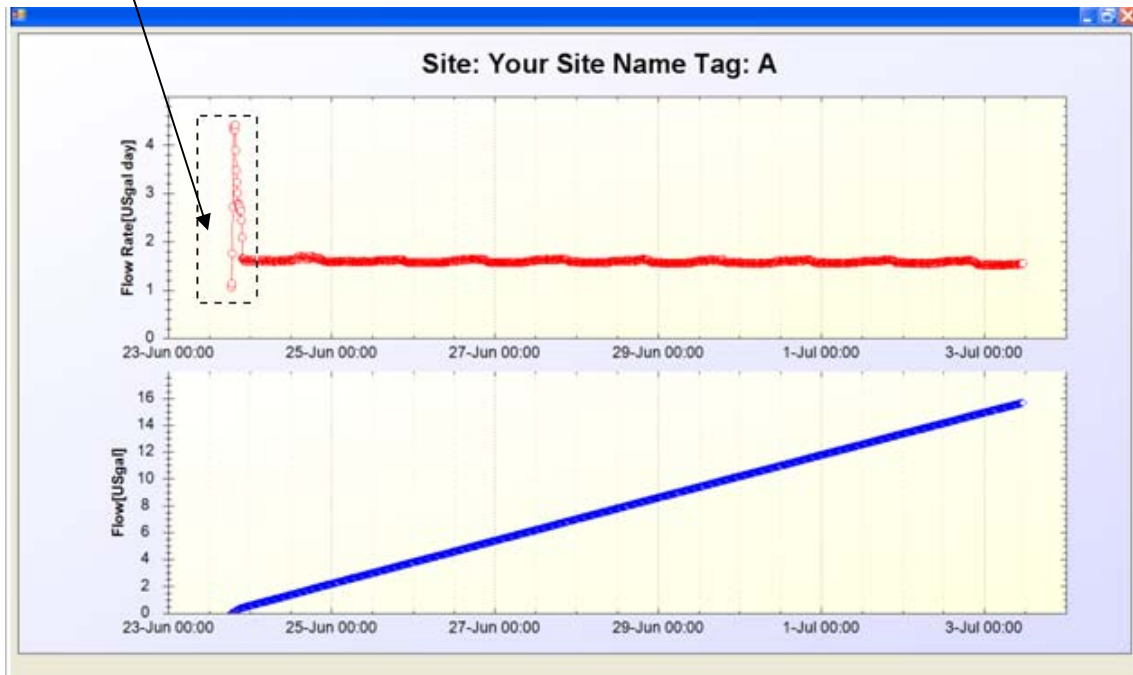


You may also save/copy this graph to the clipboard to put in say a word document by simultaneously pressing the ALT and Print Screen keys on your laptop.

13. Zoom-in On Graph

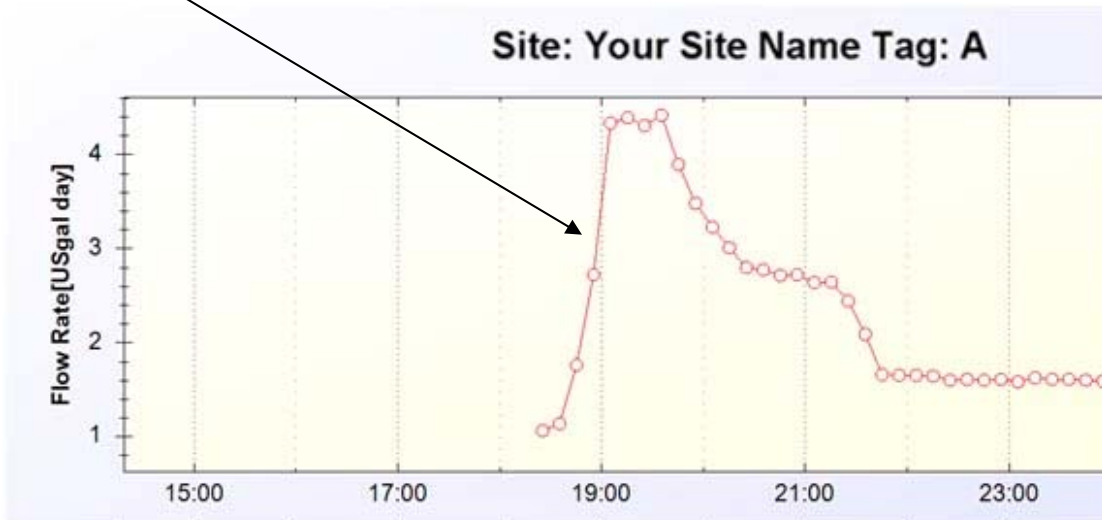
Section(s) of the graph may be zoomed in/out by dragging the mouse cursor across an area to be selected for zooming while holding down the left mouse button as shown.

Selected Area to be Zoomed-in.



Note: Zooming in the Rouge graph as shown above will automatically zoom in on the Flow Rate graph as shown below.

Zoomed-in Graph Section.



Chapter 5

Troubleshooting Guide

1. No communication between Data-Logger and PC

Possible Cause:

- Wrong Com Port selected.
- Battery is not connected or needs to be replaced.
- PC to Data Logger serial cable disconnected.
- Drivers for USB to DB9 adapter not installed or not installed correctly.

2. Set to log data but no data collected when select “Read Data” in Data-logger Interface Manager program.

Possible cause:

- COM Port setting in Windows Device Manager not matching with COM Port selected in Data-logger Interface Manager program (see page 13 for instruction).
- Battery is not connected or needs to be replaced.

