HydroLynx

ScadaLynx 50386 Toolbox

User's Manual

A102712-17

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Table of Contents

Table of Contents

Table of Contents

Table of Contents

Table of Contents

Table of Contents

Table of Contents

Table of Contents

1. Program Description

The ScadaLynx 50386 Toolbox is a windows based program designed to configure and test a ScadaLynx 50386 DCU. The Toolbox reads and writes DCU configurations to files, reads and sends configuration parameters to a connected DCU, and tests DCU sensors and communication equipment.

A DCU configuration includes sensor definitions, reporting intervals, control activity, communication ports, and DCU operation.

The Toolbox can communicate with a ScadaLynx 50386 DCU through COM ports directly connected to the DCU, over a dial-up modem, through a radio network, or through an office network connection.

1.1 Software Installation

1. Insert the 5073TBX ScadaLynx 50386 Toolbox Software CD in your CD-Rom drive.
2. If AutoRun is enabled on your CD drive, the installation program starts automatically. If not, use Windows Explorer to view the CD contents and run the ScadaLynxToolbox.msi application.
3. The ScadaLynx 50386 Toolbox software is installed on your workstation drive directory C:\Program Files\ScadaLynx Toolbox. The program selection ScadaLynx Toolbox is added to your Start menu.

1.2 ScadaLynx Toolbox Start Menu

The software installation program puts the following entries on your computer start menu under ScadaLynx Toolbox:

- 50386 HyperTerminal Connection
- ScadaLynx 50386 DCU Operating Manual
- ScadaLynx 50386 DCU Version Updates
- ScadaLynx 50386 Toolbox User's Manual
- ScadaLynx Toolbox
-

50386 HyperTerminal Connection starts the HyperTerminal program to communicate with your ScadaLynx 50386 DCU at 38400 baud on the COM1 communication port. Change the communication port and baud rate as needed to match your computer and DCU setup. This program's use is documented in the ScadaLynx 50386 DCU Operating Manual. *ScadaLynx 50386 DCU Operating Manual* displays this manual using Adobe Acrobat Reader.

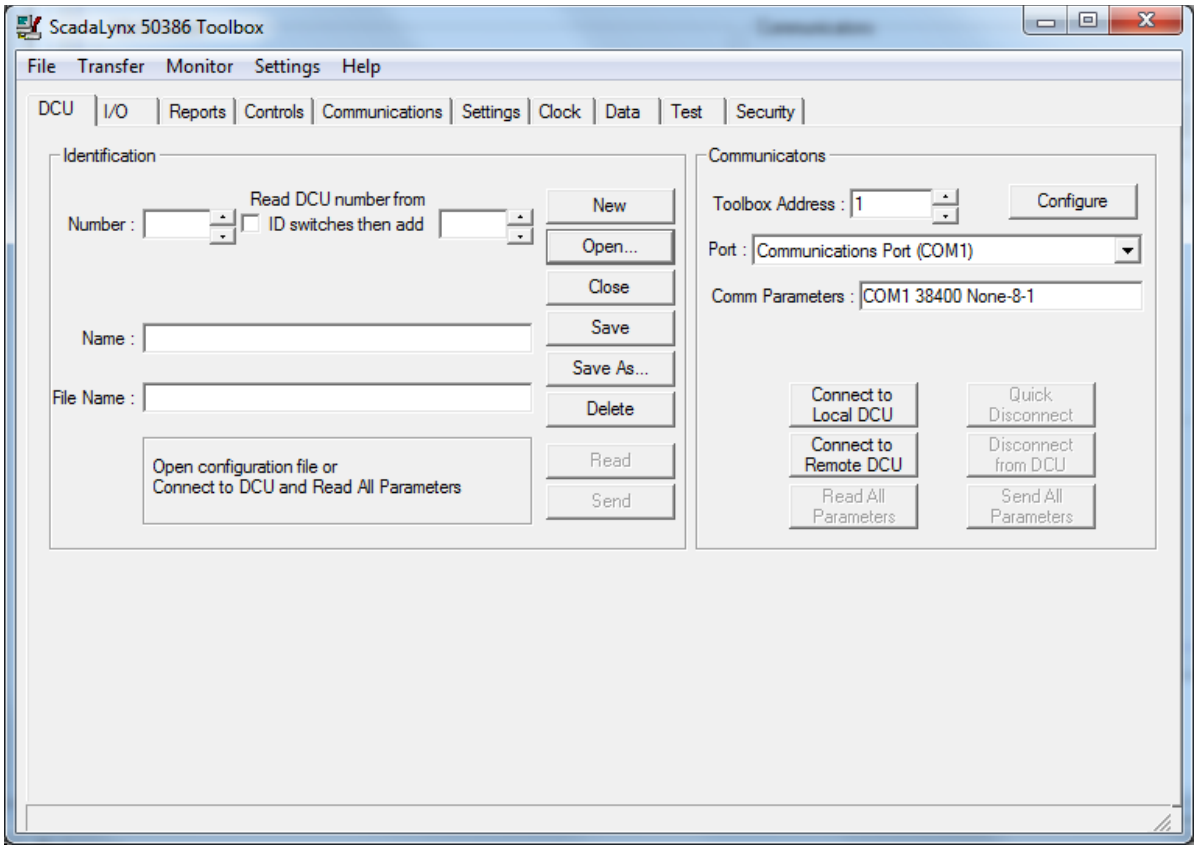
ScadaLynx 50386 DCU Version Updates displays the version changes to the 50386 application and toolbox programs using Adobe Acrobat Reader.

ScadaLynx 50386 Toolbox User's Manual displays this manual using Adobe Acrobat Reader.

ScadaLynx Toolbox starts the Toolbox program.

1.3 Starting the ScadaLynx Toolbox

The ScadaLynx 50386 Toolbox is started from ScadaLynx Toolbox in the start menu or from directory C:\Program Files\ScadaLynx Toolbox by executing the application ScadaLynx.exe.



1.4 ScadaLynx Toolbox Program Menu and Screen

The Toolbox program menu provides the following features:

- File — Configuration file operations and printing
- Transfer — DCU connect and transfer operations
- Monitor — DCU communication and file activity display
- Settings — Communication port setup
- Help — Program help

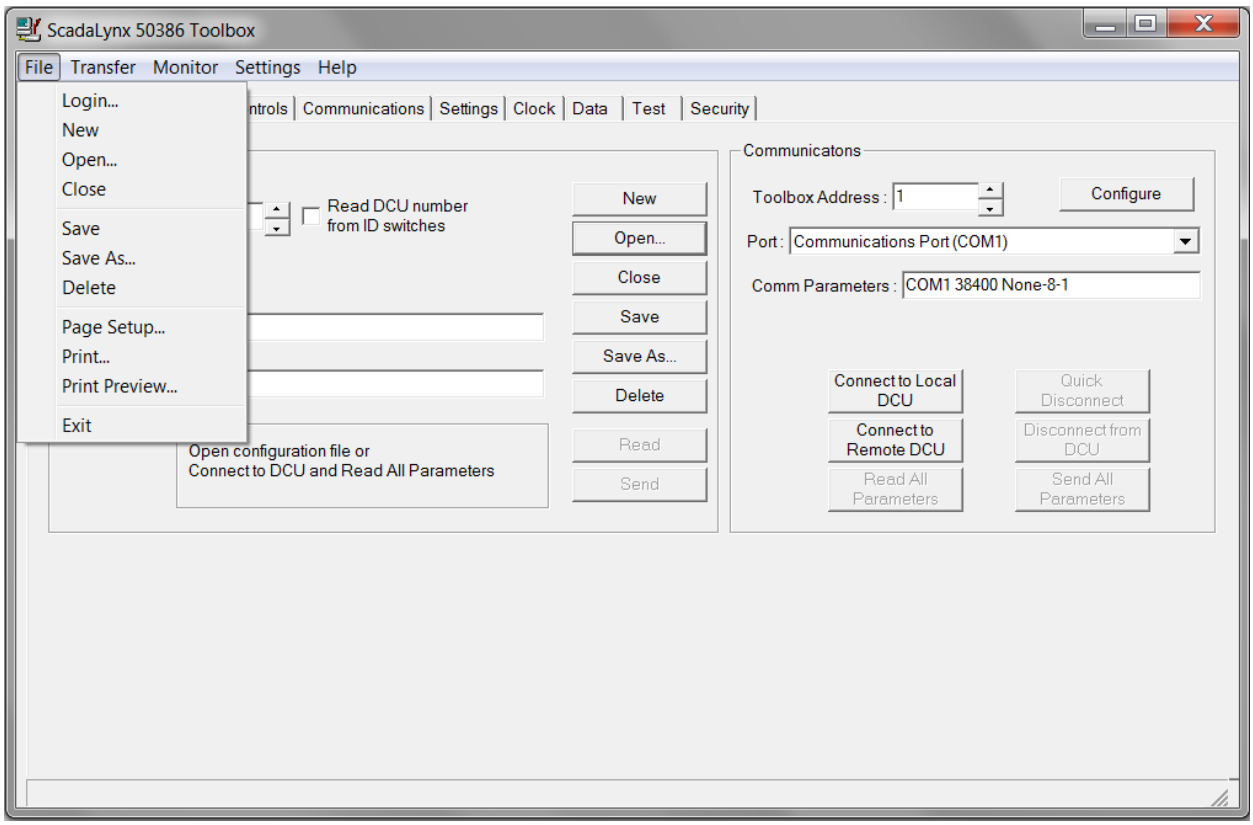
The Toolbox screen is divided into pages to organize the DCU configuration parameters:

- DCU — Identification and connection
- I/O — I/O points
- Reports — Reporting schemes
- Controls — Control groups
- Communications — Communication ports
- Settings — Miscellaneous DCU settings
- Clock — Real-time clock
- Data — DCU data display
- Test — DCU testing
- Security — User name, password, and access level

2. Configuration Files

The Toolbox starts with an empty configuration file. You must open and read a configuration file on your computer or connect to a DCU and read the DCU configuration into the Toolbox memory.

All configuration file disk management is done in *Identification* on the *DCU* page or from the *File* menu pull-down.



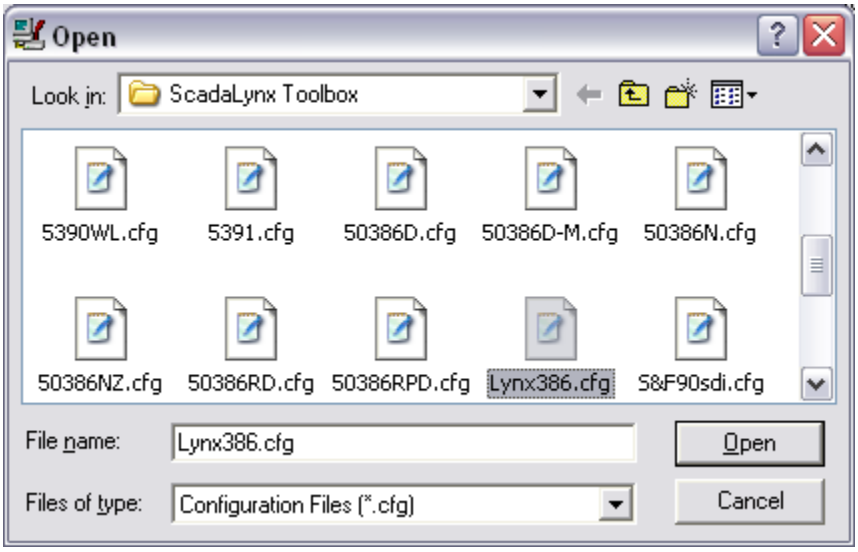
Toolbox file operations are:

- Login — Enter a login name and password for DCU security access.
- New — Clear the Toolbox memory of the current configuration, edit enabled.
- Open — Open and read a configuration file into Toolbox memory.
- Close — Clear the Toolbox memory of the current configuration, edit disabled.
- Save — Save the configuration in Toolbox memory to the opened file.
- Save As — Save the configuration in Toolbox memory to a new file.
- Delete — Delete a configuration file.

Changes to the configuration are held in the Toolbox memory until saved to a computer disk file or sent to the connected DCU.

2.1 Open a Configuration File

Open displays a dialogue box that shows the configuration files in the current folder. Toolbox configuration files have a .cfg file extension. The standard configuration file for the 50386 application program, Lynx386.exe, is named Lynx386.cfg.



Pick a file and click Open to read the configuration file into the Toolbox memory.

The configuration file format is documented in Appendix A.

2.2 Login after Configuration File Open

If security has been enabled for the configuration file, the toolbox program will prompt you for a user name and password.

Enter the user name and password then click the **OK** button.

The user name you enter will determine your access to the file parameters. Three access levels are available:

- Administrator
- Operator
- Guest

Administrator access level has full access to all DCU programming. Operator access level can view and set data values, download logged data, and test the DCU. Guest access level can view data and download logged data.

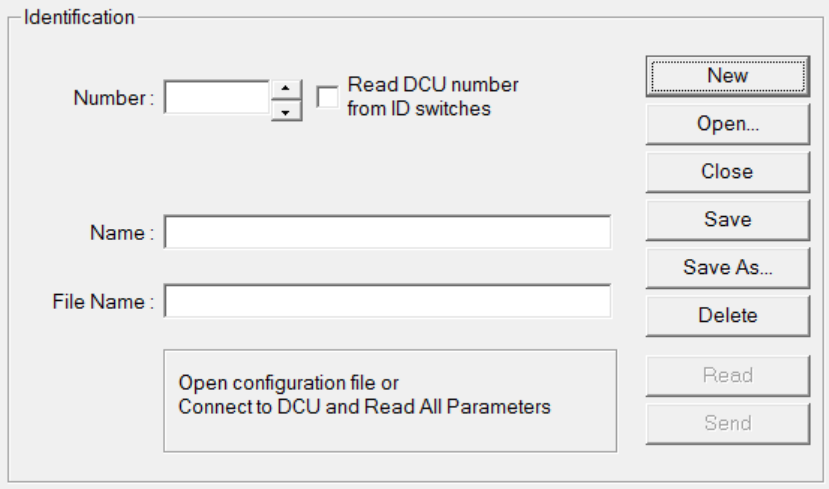
DCU security control and user login management is described in the Security Section.

2.3 Close a Configuration File

Close clears the Toolbox memory of the current configuration file. Use close to clear the Toolbox memory and prevent confusion when connecting to a new DCU. If any changes have been made, the Toolbox asks if you want to save them. A save writes the configuration to the disk file name shown in *DCU Identification*. After a close you must **Open** a configuration file or click **New** to create a new configuration before any fields may be changed.

2.4 Create a New Configuration File

New clears the Toolbox memory of the current configuration file and enables field editing. You must enter all the DCU configuration parameters. It is easier to open an existing configuration file, save it to a new file name, and then modify new configuration file parameters.

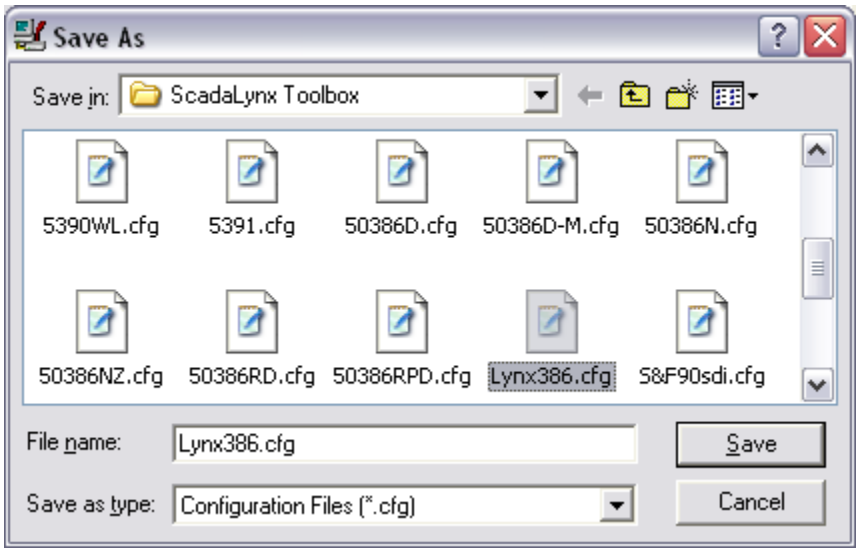


2.5 Save a Configuration File

Save writes the entire DCU configuration to the disk file name shown in *DCU Identification*.

Save As opens a dialogue box that lets you pick or enter configuration file name.

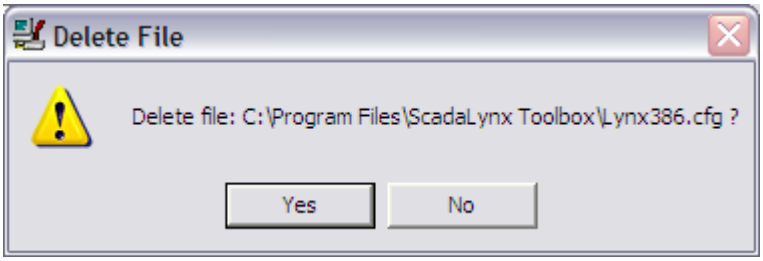
Select or enter a file name and click **Save**. Toolbox configuration files have a .cfg file extension.



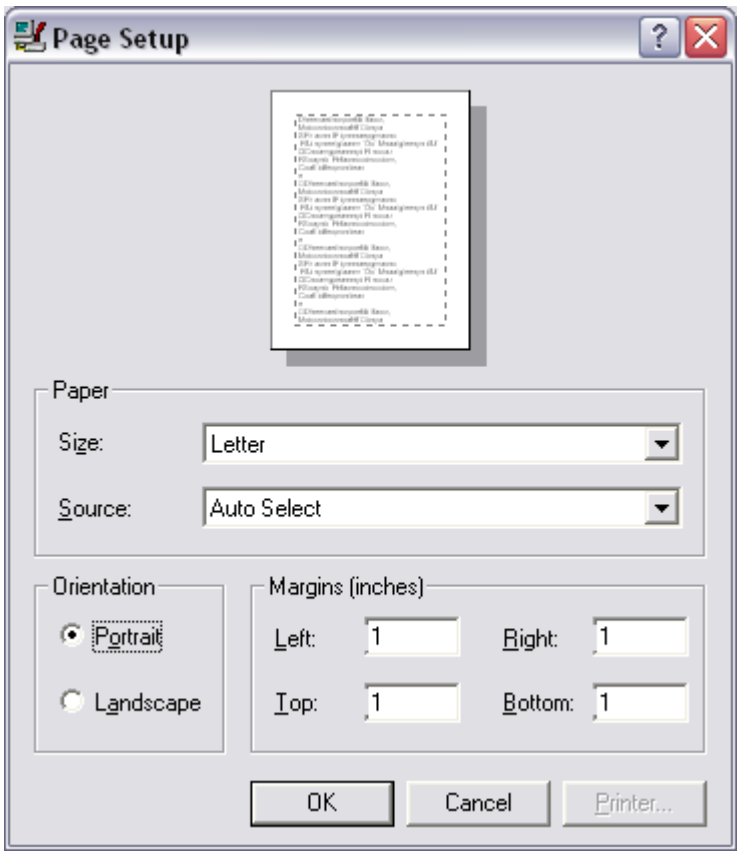
2.6 Delete a Configuration File

Delete removes the configuration file name shown in DCU Identification. The Toolbox asks for verification before it deletes the configuration file.

Click **Yes** to delete the file.



2.7 Print Page Setup

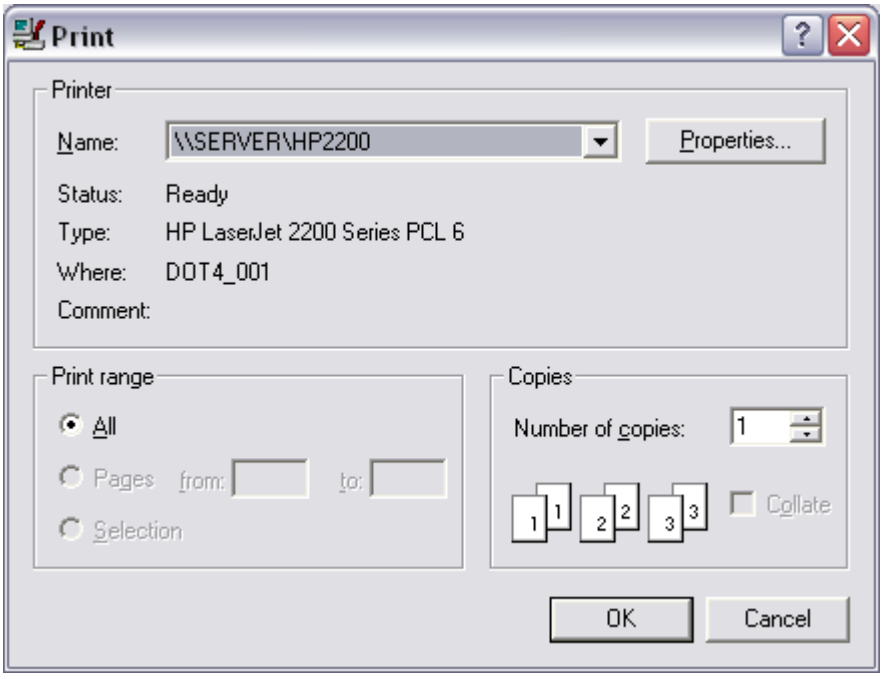


Select Page Setup in the File menu to prepare the Toolbox program for printing. Page setup parameters are saved in the Toolbox INI file.

The Page Setup parameters are:

- Paper
  - Size
  - Source
- Orientation
  - Portrait
  - Landscape
- Margins
  - Left
  - Right,
  - Top,
  - Bottom

2.8 Print Configuration



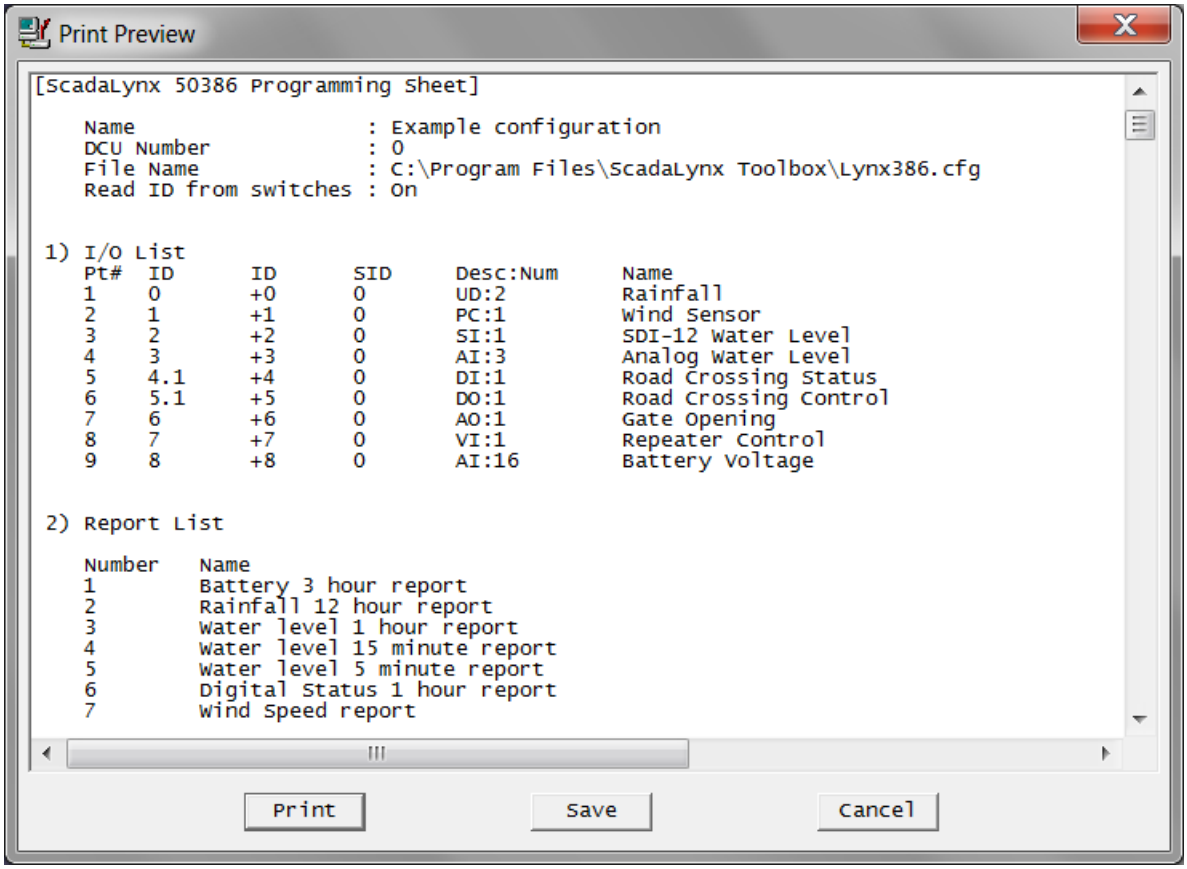
Select *Print...* in the *File* menu to print the Toolbox configuration in program memory. The print dialogue is opened to let you select your printer.

The Toolbox prepares the DCU configuration parameters for print to make the information more readable.

Configuration parameters are printed in sections that follow the Toolbox screen page organization.

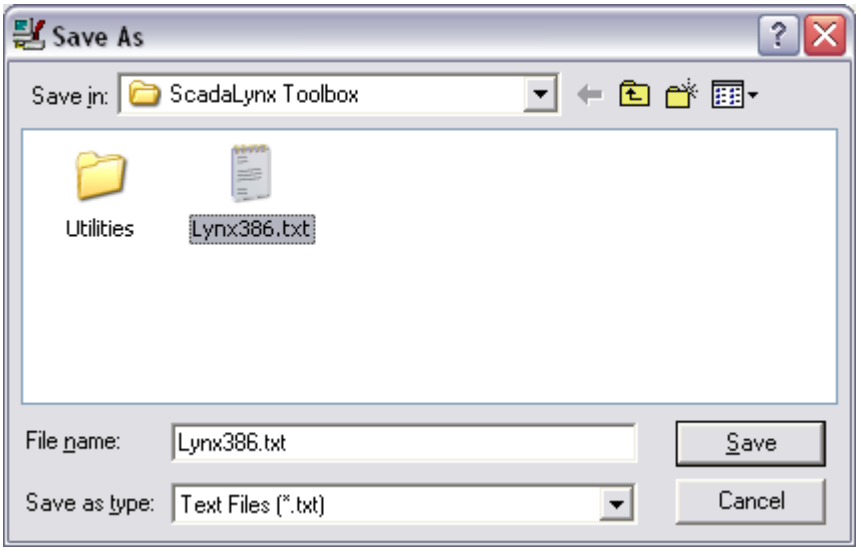
2.9 Print Preview

Select *Print Preview* in the *File* menu to preview the configuration print layout.



Click **Print** to print the configuration shown in the preview window. The print dialogue is opened that lets you select your printer (see Print Configuration above).

Click **Save** to save the printed configuration to a file. A dialogue box is opened that lets you pick or enter the print file name. Print files use a .txt extension.



Click **Save** to print to the file.

Click **Cancel** to close the dialogue box without printing.

Click **Cancel** to close the print preview window without printing.

3. Communication

The Toolbox communicates with a ScadaLynx 50386 DCU through the following connections:

- Direct connect with a NULL modem cable
- Dial up through a computer modem
- Network connection

3.1 Communication Protocol

Toolbox communication with a ScadaLynx 50386 DCU uses the ScadaLynx communication protocol (see Appendix B). This protocol is designed for multi-point, peer to peer communication. It uses packets that contain:

- Leader for protocol identification
- Header that contains:
  - Source address
  - Destination address
  - Command,
  - Command length
  - Status
- Command data
- CRC for communication error detection

When the Toolbox sends a command packet to a DCU, the DCU replies to the Toolbox address. Commands received by the Toolbox that are not addressed to it are ignored. The exception is the all-call address number 0. All DCUs and Toolbox programs respond to the all-call address.

3.2 Communications Port Selection

When then Toolbox is started for the first time, it searches your computer hardware for compatible serial communication (COM) ports or modems and places them in the port list.

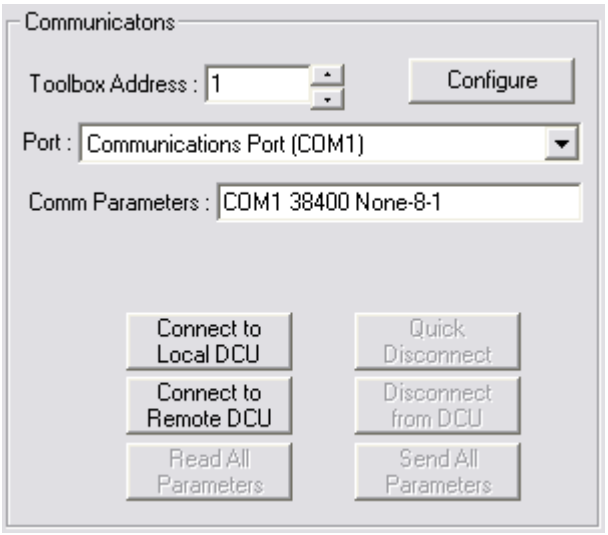
3.2.1 Direct connection

Select a direct connect communication port from the Port list. Communication parameters for the selected port are displayed under the port name.

If you need to change the communication parameters or add a communication port, click the Configure button or on the Settings menu select Communications.

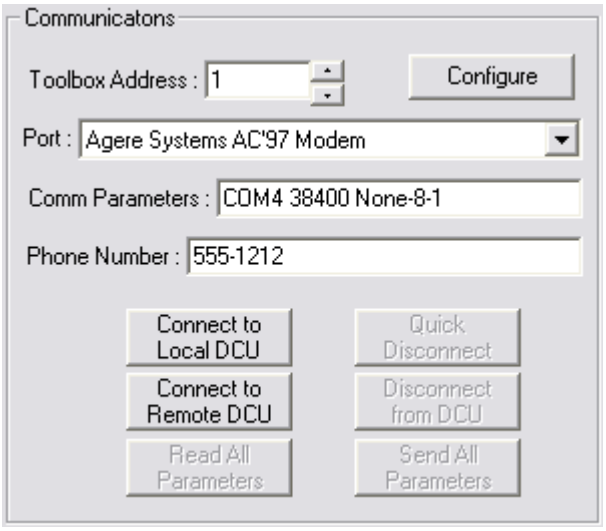
The default communication port is set to COM1

If you are using a USB to serial port adapter, you can change the COM port assigned to the



USB device in the control panel to COM1 or you can select the assigned port.

3.2.2 Modem connection



Modem connection parameters are:

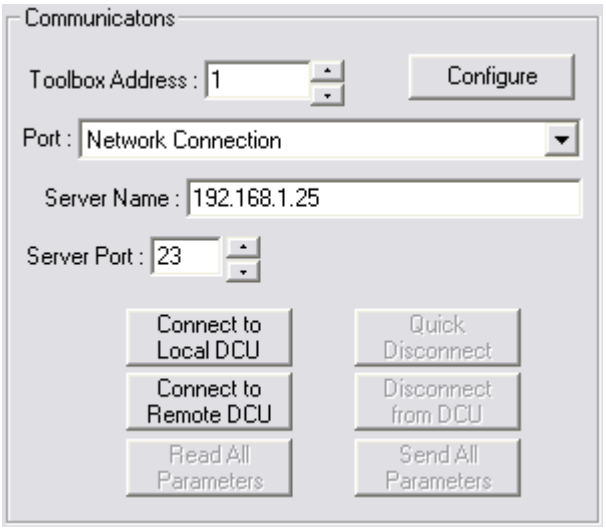
- Phone Number

Phone Number is the telephone number to dial to connect to the remote DCU. If necessary, enter the area code and numbers to get an outside line.

The telephone number is dialed when the Connect to Local DCU or Connect to Remote DCU buttons are clicked.

The Phone Number is saved in the DCU configuration file.

3.2.3 Network connection



Network connection parameters are:

- Server Name
- Server Port

Enter the *Server Name* or a dotted TcpIP address for the network connection

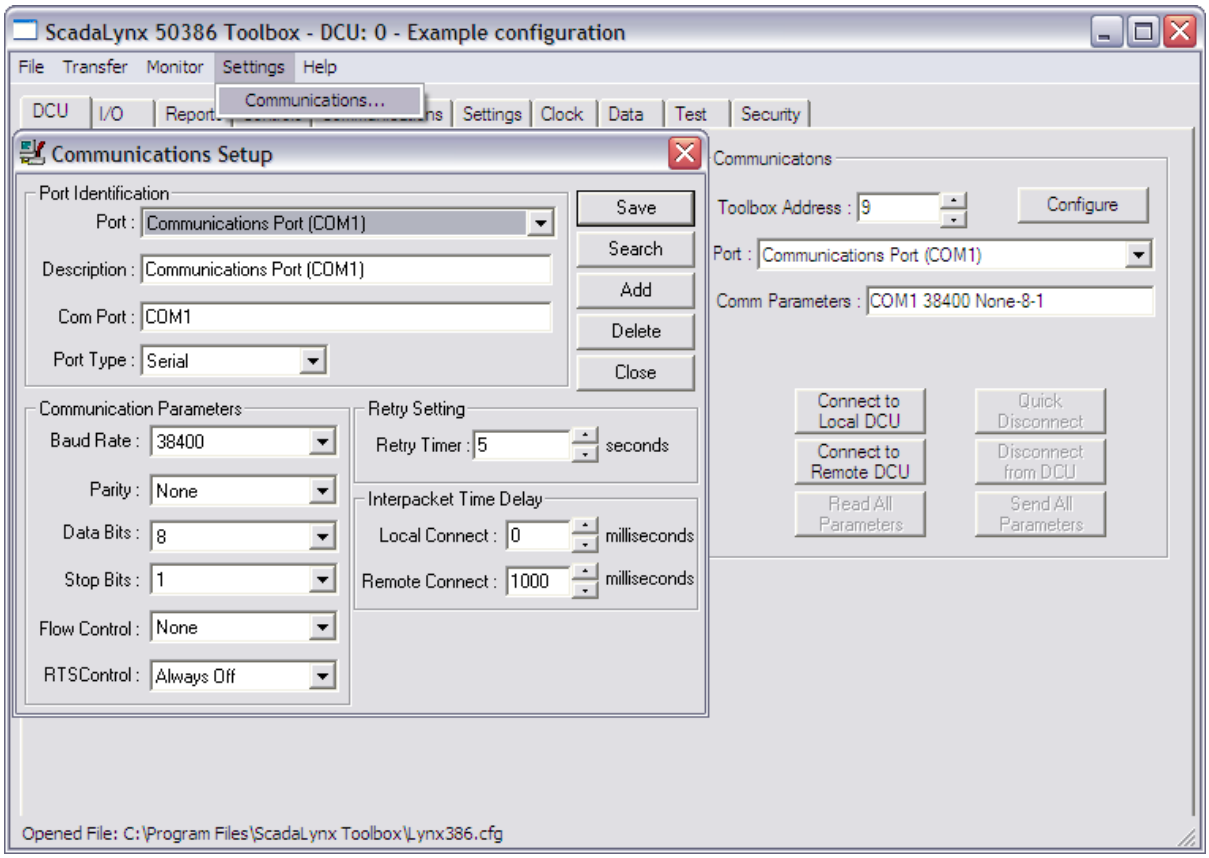
Enter the *Server Port* number for a TcpIP network connection. For example, port 23 is the telnet port number.

The Server Name and Server Port number are saved in the DCU configuration file.

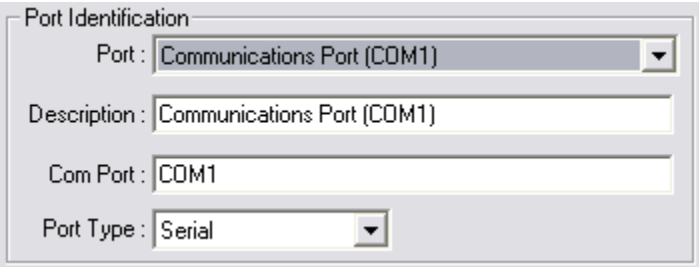
The *Toolbox Address* becomes important when more then one operator is connecting to the DCU through a network connection. Each Toolbox operator should use a unique *Toolbox Address*. The default *Toolbox Address* is 1.

3.3 Communication Port Setup

To setup a communication port, select the port from the port list on the *DCU* page under *Communications* and click **Configure** or select *Communications* in the *Settings* menu pull-down.



3.3.1 Port Identification



Port Identification parameters are:

- Description
- Com Port
- Port Type

Description lets you name the port configuration. For example, you can create more than one configuration for a COM port with different baud rates (e.g. 38400 and 9600). Change the port description to include the configured baud rate. For example:

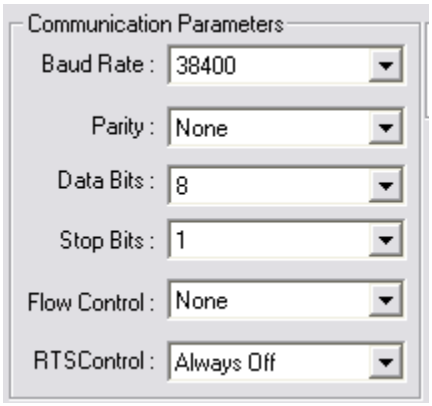
Communications Port (COM1) at 9600

Com Port displays the COM port number (COM1, COM2, ...).

Port Type describes the method of connection:

- Serial Direct connect through a COM port
- Modem Dial up connection through an internal or external modem
- TcpIP Network connection

3.3.2 Communication Parameters



Communication Parameters are:

- Baud Rate
- Parity
- Data Bits
- Stop Bits
- Flow Control
- RTS Control

The default communication Baud Rate is 38400. Change if necessary to match DCU configuration for COM1 communication port.

The default *Parity* is *None*. The default *Data Bits* are *8*. The default *Stop Bits* is *1*.

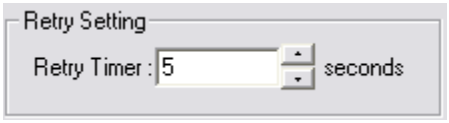
Flow Control is set depending on the connection type:

- None Use for null-modem connections.
- RTS/CTS Hardware flow control. Use for modem connections.
- Xon/Xoff Software flow control. Use only if needed by communication equipment.

RTS Control is set depending on the connection type:

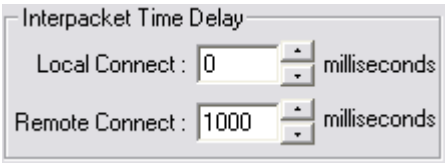
- Always Off Use for null-modem connections.
- Always On Use for modem connections.
- RTS Toggle Turns RTS on for transmit and waits for CTS to come on before transmitting. Turns RTS off to receive. Use for half-duplex communication devices.

3.3.3 Communication Retries



Retry Timer defines the time to wait in seconds for a response from the DCU before the Toolbox sends a command again. Set to zero to disable retries.

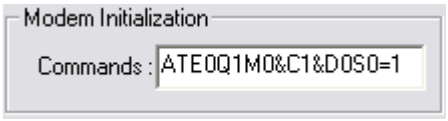
3.3.4 Interpacket Time Delay



Local Connect defines the time to wait in milliseconds between packets sent to a locally connected DCU. Set to zero for the fastest local communication.

Remote Connect defines the time to wait in milliseconds between packets sent to a remotely connected DCU. Set a delay long enough to satisfy communication equipment requirements.

3.3.5 Modem Initialization



Modem Initialization defines the AT commands to set up your computer modem for dialing.

3.3.6 Search for Communication Ports.

The Toolbox can search for communication ports on you computer and add them to the port list.

1. Click **Search** to start the search for communication ports.
2. Search for Communication ports… is displayed on the status bar and in the monitor.
3. Ports that are found are listed on the status bar and in the monitor.
4. When the search is complete, Search for Communication ports Success is displayed on the status bar and in the monitor.

3.3.7 Add a Communication Port

It is easier to copy a communication port with all its parameters than to create a new one.

1. Select the communication port to copy in the *Port List*.
2. Enter the name of the new communication port and click **Add**.
3. Change the communication port parameters.
4. Click **Save** to write the port parameters to the Toolbox INI file.

3.3.8 Delete a Communication Port

1. Select the communication port in the *Port List* and click **Delete**.
2. Click **Save** to delete the communication port from the Toolbox INI file.

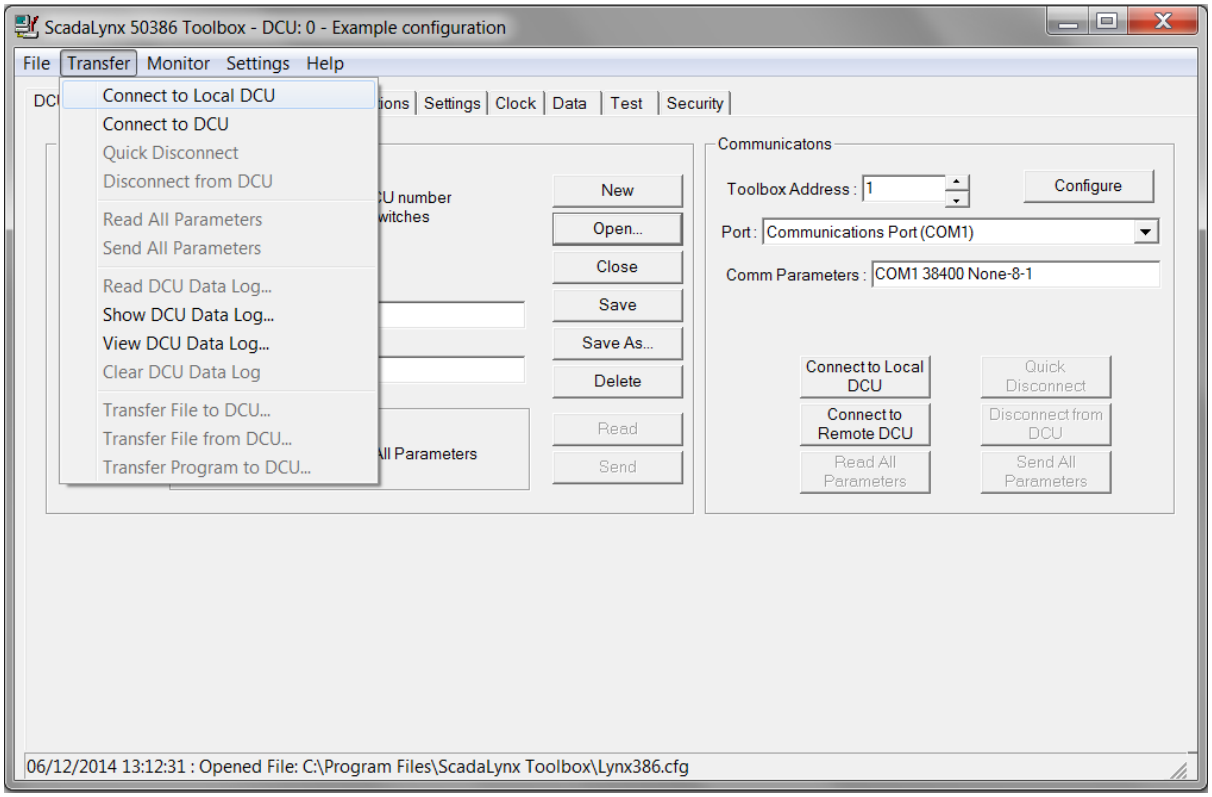
3.4 Connecting to a DCU

Before programming a ScadaLynx 50386 DCU you must first connect to it. On the *DCU* page choose the local communication port (e.g. COM1).

3.4.1 Local Connection

Click **Connect to Local DCU** to communicate with the ScadaLynx 50386 DCU directly connected to your computer.

When the Toolbox sends a command to a DCU it displays a dialogue box that shows it is waiting for a response. Click **Cancel** to quit waiting or **Retry** to try again. When a valid response is received, the waiting box is closed, *Connect - Success* is displayed on the Status line, the **Disconnect** buttons become visible, and the DCU number field is updated. Toolbox buttons that allow parameter and data reads and writes are un-dimmed.



3.4.2 Remote Connection

Connect to Remote DCU connects to the DCU number shown in *DCU Identification*. This can be a DCU other than the one directly connected, for example through the radio of the directly connected DCU. If a modem port is selected, the DCU telephone number is dialed and the Toolbox waits for the remote modem to answer before sending the Connect command.

If either Connect button is clicked after the Toolbox is connected, the Connect command is sent to the DCU again. Do this after the DCU has been reset to restore the Toolbox communication monitor capability. The communication monitor displays and processes messages from the DCU.

Connect to Local DCU and *Connect to Remote DCU* can be executed from the Transfer menu.

3.4.3 Login after Connection

If connection security has been enabled on the DCU, the toolbox program will prompt you for a user name and password.

Enter the user name and password then click the **OK** button.

The user name you enter will determine your access to the DCU. Three access levels are available:

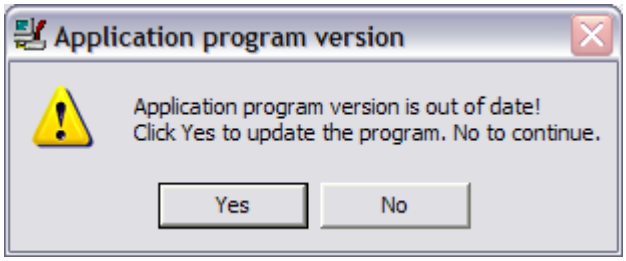
- Administrator
- Operator
- Guest

Administrator access level has full access to all DCU programming. Operator access level can view and set data values, download logged data, and test the DCU. Guest access level can view data and download logged data.

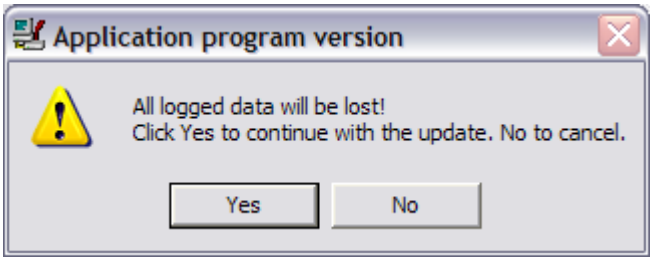
DCU security control and user login management is described in the Security Section.

3.4.4 Application Program Version Out of Date Warning

After the toolbox has connected to a DCU it requests the DCU application program version and compares it to the toolbox program version. If the DCU application program version is out of date a warning messages is displayed.

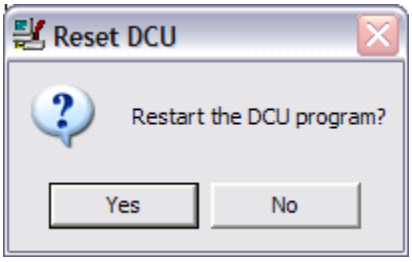


Click **Yes** to download the newer application program to the connected DCU.



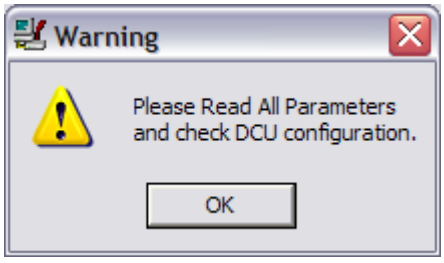
In order to make room for the new application program download the toolbox will clear the DCU data log. If you need to download the logged data then click **No** to cancel the application program update and allow the toolbox to finish the DCU connection. Download the DCU logged data (see Read DCU Data Log) clear the DCU data log (see Clear DCU Data Log), disconnect from the DCU and re-connect.

If you allow the application program update to continue it will finish in a few minutes and then ask you if the toolbox can restart the connected DCU. Click **Yes** and the new application program will start when the DCU is restarted. The toolbox will re-connect with the restarted program. You will have to log onto the DCU again if DCU security is enabled.

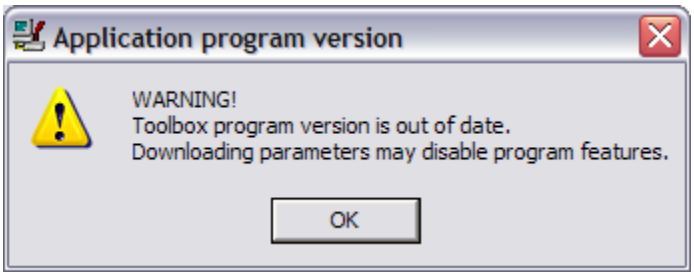


After the toolbox reconnects to the restarted DCU it will warn you to read all the configuration parameters and check that all parameters are correct.

Click OK to complete the application program update procedure.



3.4.5 Toolbox Program Version Out of Date Warning



After the toolbox has connected to a DCU it requests the DCU application program version and compares it to the toolbox program version. If the toolbox program version is out of date a warning messages is displayed.

It is highly recommended that you update your ScadaLynx Toolbox program on your computer before using it to connect with this DCU.

If you send any parameters to the connected DCU you may disable some application program features.

Click **OK** to continue with the DCU connection but do not send any parameters to the DCU.

3.5 Disconnecting from a DCU

Click **Quick Disconnect** on the *DCU* page to close the communication port and discontinue communications with the DCU. After you disconnect, the serial port can be used by other programs. Toolbox buttons that allow parameter and data reads and writes are dimmed when the DCU is disconnected.

Click **Disconnect from DCU** to send a disconnect command to the DCU before closing the communication port. This stops the DCU from sending status messages to the Toolbox.

Both disconnect buttons hang up on a modem port connection.

Both *Quick Disconnect* and *Disconnect from DCU* can be executed from the Transfer menu pull-down.

3.6 Connection Problem Troubleshooting

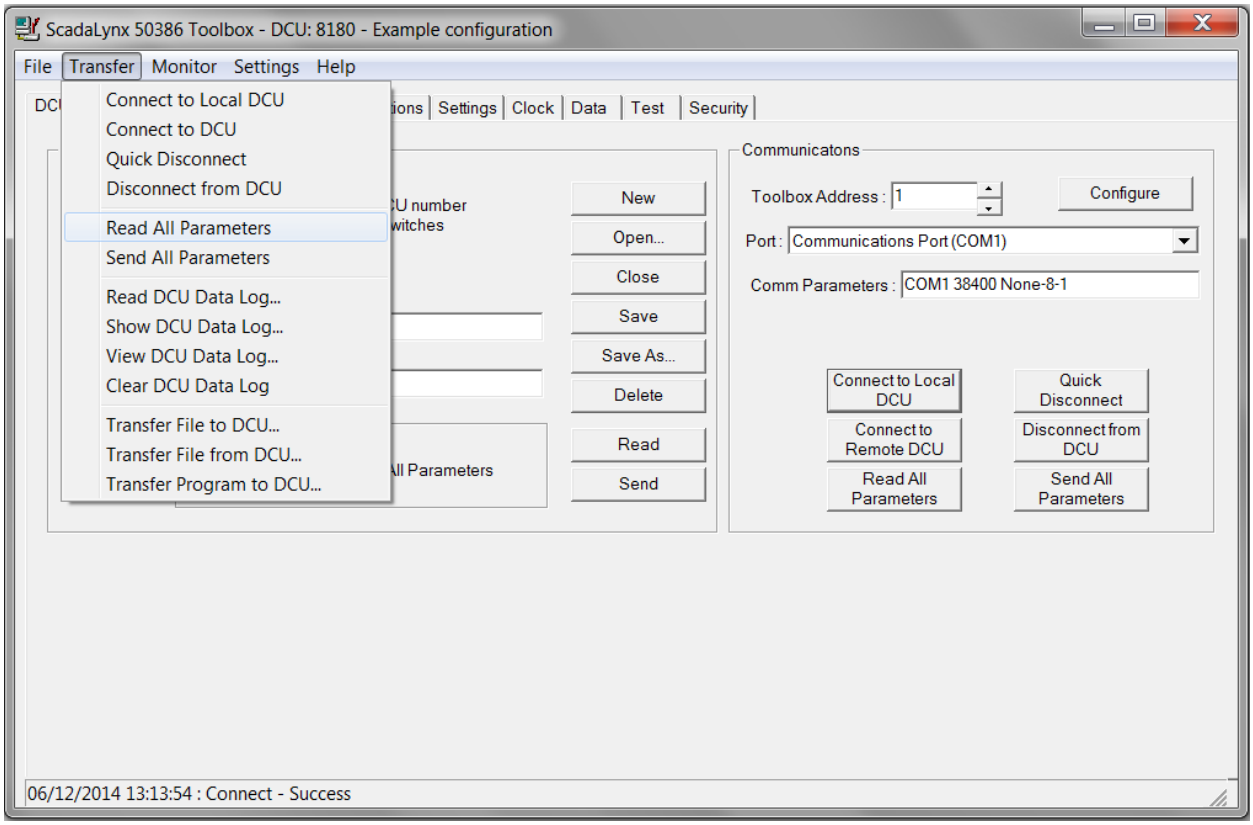
The Toolbox displays the Connect failed message: *Access is denied*. You cannot have HyperTerminal or any other program connected on the same Com port that the Toolbox uses to connect to the DCU. Click the **Disconnect** button on HyperTerminal or quit the program and try again.

No response from the DCU. Test your NULL modem cable with HyperTerminal. Connect at 38400 and press the [Enter] key once to wake up the ScadaLynx 50386 DCU then a second time to get a command prompt: >. This proves that your cable is good. Check the Toolbox communication port selection and configuration.

No response from the DCU and HyperTerminal displays a C:\> prompt. The ScadaLynx 50386 DCU application program is not running on the DCU. Type the command USER to start the application program or check that the Run/Debug switch is in the Run position and press the DCU reset button.

3.7 Read DCU Configuration

Read All Parameters sends a series of commands to the connected DCU to read the configuration parameters into the Toolbox memory. The Toolbox screens are updated as parameters are received. If any changes have been made to the current configuration in the Toolbox memory, the Toolbox asks if you want to save changes.



Reading all the configuration parameters takes several commands. As each command is sent to the DCU and the response is received, the status line is updated to show you its progress. If the DCU does not respond to a command, the Toolbox re-sends the command after the retry timer expires. The retry timer is defined in the Communication Port Setup (see above).

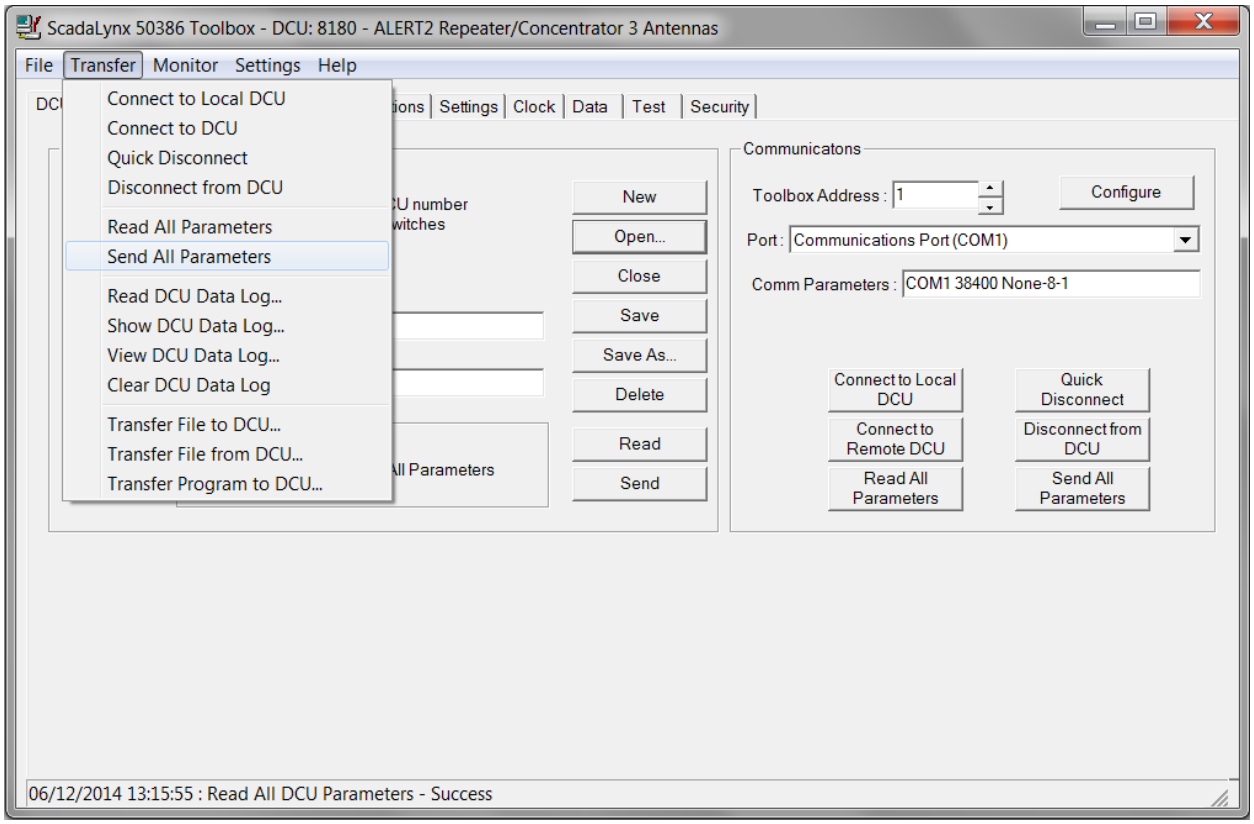
Warning! If the Read All Parameters command does not successfully complete, do not save the configuration parameters to file or send them to another DCU. An incomplete configuration can cause unpredictable behavior in the ScadaLynx 50386 DCU.

3.8 Send DCU Configuration

Send All Parameters sends all the current configuration parameters in the Toolbox memory to the connected DCU. The current configuration is also saved to the disk file name shown in *DCU Identification*.

Sending all the configuration parameters takes several commands. As each command is sent to the DCU and the response is received, the status line is updated to show you its progress. If the DCU does not respond to a command, the Toolbox re-sends the command after the retry timer expires. The retry timer is defined in the Communication Port Setup (see above).

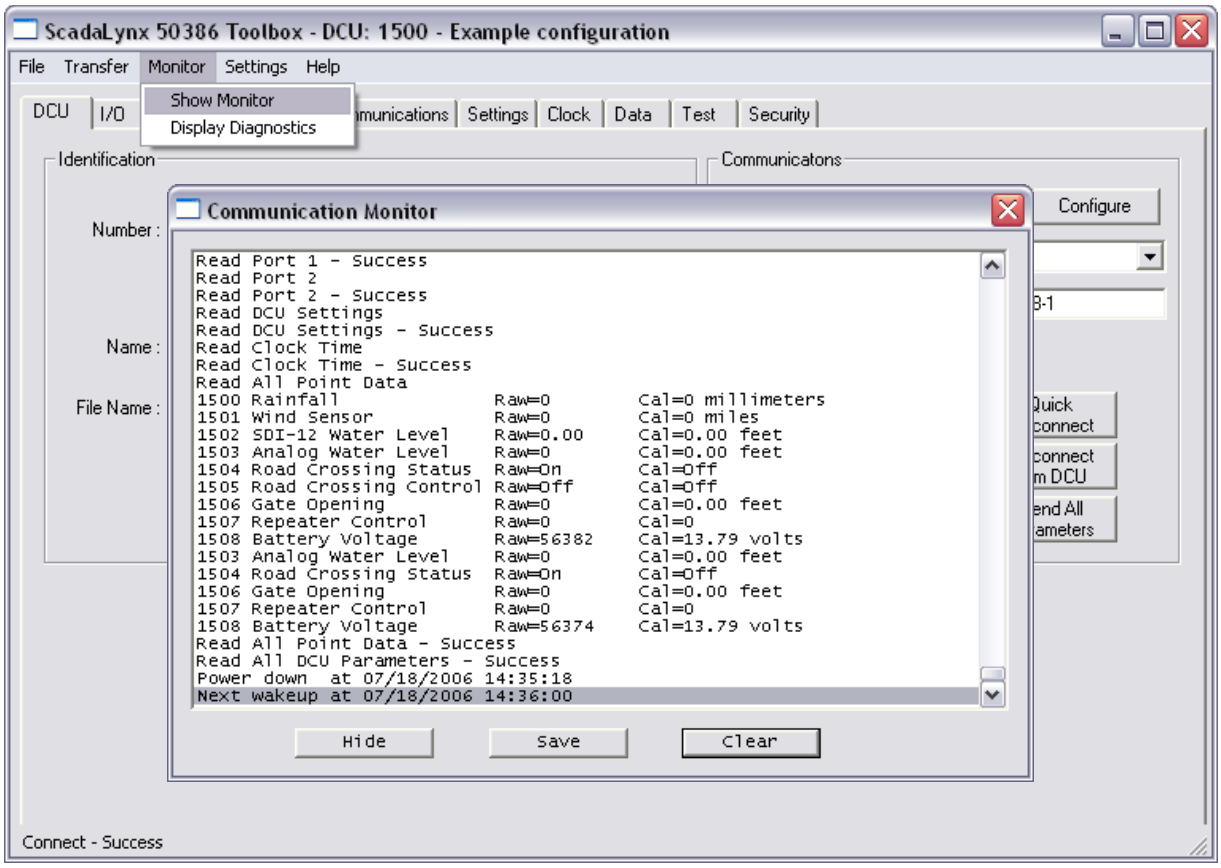
After all parameters have been sent, the Toolbox sends a command to the connected DCU to re-write the configuration and INI files to the DCU flash disk. The TEST LED turns on while these files are written. The INI file on the DCU stores the configuration file name that is read when the DCU program restarts on reset or power up.



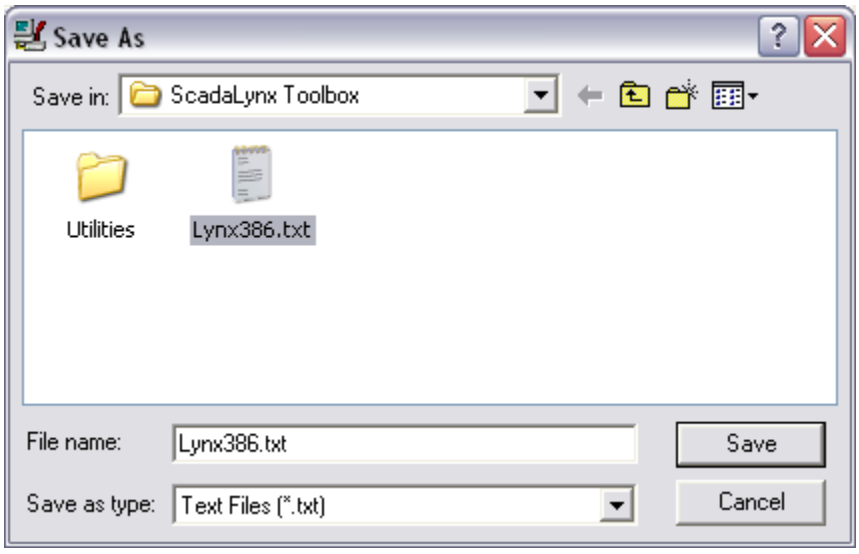
Warning! Do not reset the DCU until both the configuration and INI files have been written to the flash disk. An incomplete write can cause unpredictable behavior in the ScadaLynx 50386 DCU.

3.9 Communication Monitor

The Communication Monitor shows DCU communication and disk file activity for the Toolbox.



Select *Show Monitor* on the Monitor pull-down menu to display the Communication Monitor.



Hide closes the monitor window but saves the information in the list.

Save writes the monitor contents to a file. A Save As dialogue box is opened to let you pick or enter a file name.

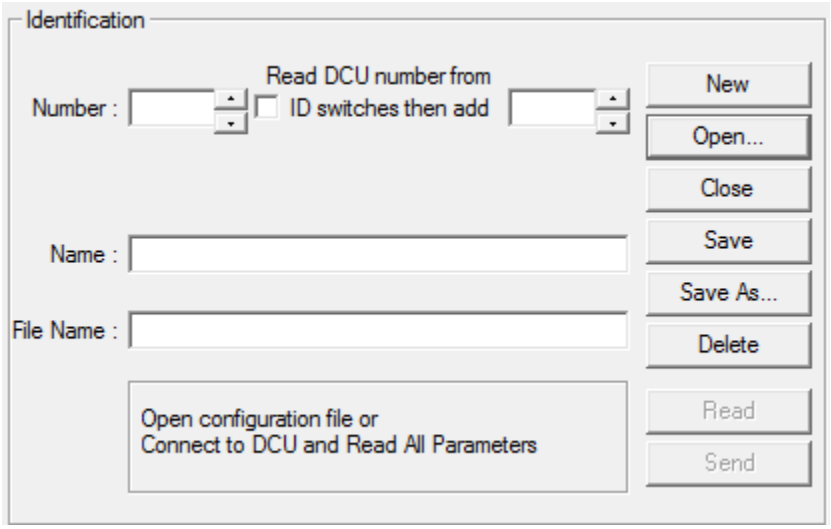
Clear erases all information in the list.

Check *Display Diagnostics* on the Monitor pull-down menu to increase the information displayed when reading and sending commands to the connected DCU.

4. DCU Identification

The Toolbox identifies a DCU by number when using the ScadaLynx communication protocol.

4.1 DCU Identification Parameters



DCU identification parameters are:

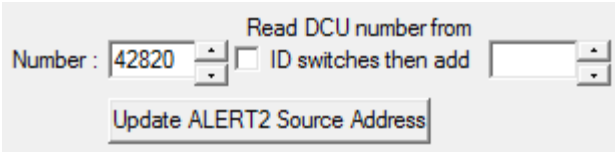
- DCU number
- Read DCU number from ID switches then add
- Name
- Configuration File Name

4.1.1 Fixed DCU Number

The *DCU number* is used to address the DCU from the Toolbox. Each DCU in your system should have a unique DCU number. The DCU number can be fixed and saved in the configuration file or it can be relative and read from the ID switches.

To use a fixed DCU number, enter the number in *Number* under *DCU Identification*.

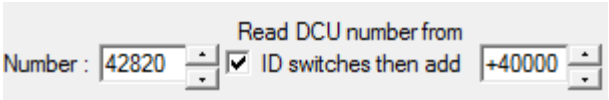
If the DCU number is changed on an ALERT2 transmitter, a button will appear to update the ALERT2 transmitter source address to match the new DCU. Click this button to copy the new DCU number to the ALERT2 transmitter source address.



4.1.2 Relative DCU Number

To use a relative DCU number, leave the DCU number blank and check *Read DCU number from ID switches then add*. Enter a n umber to add to the ID switches to compute the DCU number. The add term allows you to define DCU numbers greater than 10,000 since the ID switch range is 0 to 9999.

For example, to set the DCU number to 42820, set the ID switches to 2820, check this box, and enter +40000 for the add value.



Note: When you connect to a local DCU, the Toolbox reads the DCU number and displays it after *Number* in *DCU Identification*. The remainder of the DCU identification parameters can be read using the Read button (see below).

4.1.3 DCU Name

Name describes the DCU configuration. It can be up to 40 characters long.

4.1.4 DCU Configuration File Name

File Name shows the disk file name that stores the DCU configuration on your computer and on the DCU flash disk. Configuration file names must end in .cfg. The full path including any file folders is shown on the Toolbox Status line and in the Communication Monitor but only the file name is displayed in this identification field.

Note: Limit your file name to 8 characters. The 50386 PCOS DOS file system limits file names to 8 characters so longer names are truncated when saved to the DCU flash disk.

4.2 Read DCU Identification Parameters

The **Read** button under *DCU Identification* reads the DCU identification parameters into the Toolbox memory from the connected DCU and updates the Toolbox display.

This button does not read all the DCU configuration parameters. Use the **Read All Parameters** button on the *DCU* page or *Read All Parameters* in the Transfer menu pull-down to read all parameters.

Note: Configuration file saves will use the new file name shown under *DCU Identification*.

4.3 Send DCU Identification Parameters

The **Send** button sends the identification parameters in the Toolbox memory to the connected DCU. The current configuration is also saved to the disk file name shown in *DCU Identification*. After the parameters have been sent, the Toolbox sends a command to the connected DCU to re-write the configuration and INI files to the DCU flash disk.

This button does not send all the DCU configuration parameters. Use the **Send All Parameters** button on the *DCU* page or *Send All Parameters* in the Transfer menu pull-down to send all parameters.

Warning: Changing the file name and sending just the identification parameters to the connected DCU forces it to save its current configuration in the new file name and write the new file name in the INI file. Take care that you do not overwrite a configuration file without updating all the DCU configuration parameters.

4.4 Change a DCU ID Number

4.4.1 Change a fixed DCU ID number

1. Connect to the DCU. The current DCU number is displayed.
2. Uncheck *Read DCU number from ID switches*.
3. Enter the new DCU number.
4. Click **Send** and wait for the DCU to write the configuration and INI files.
5. Press the RESET button on the DCU and wait for it to restart.
6. Reconnect to the DCU and verify that the DCU number is correct.

4.4.2 Change a relative DCU ID number

1. Connect to the DCU. The current DCU number is displayed.

2. Check Read DCU number from ID switches.
3. Click Send and wait for the DCU to write the configuration and INI files.
4. Set the new DCU number in the ID switches on the SLB.
5. Press the RESET button on the DCU and wait for it to restart.
6. Reconnect to the DCU and verify that the DCU number is correct.

5. I/O Points

The ScadaLynx 50386 DCU uses points to manage data. Point data is read from a sensor, from another point, set by a control or set by a communication packet. A point is classified as:

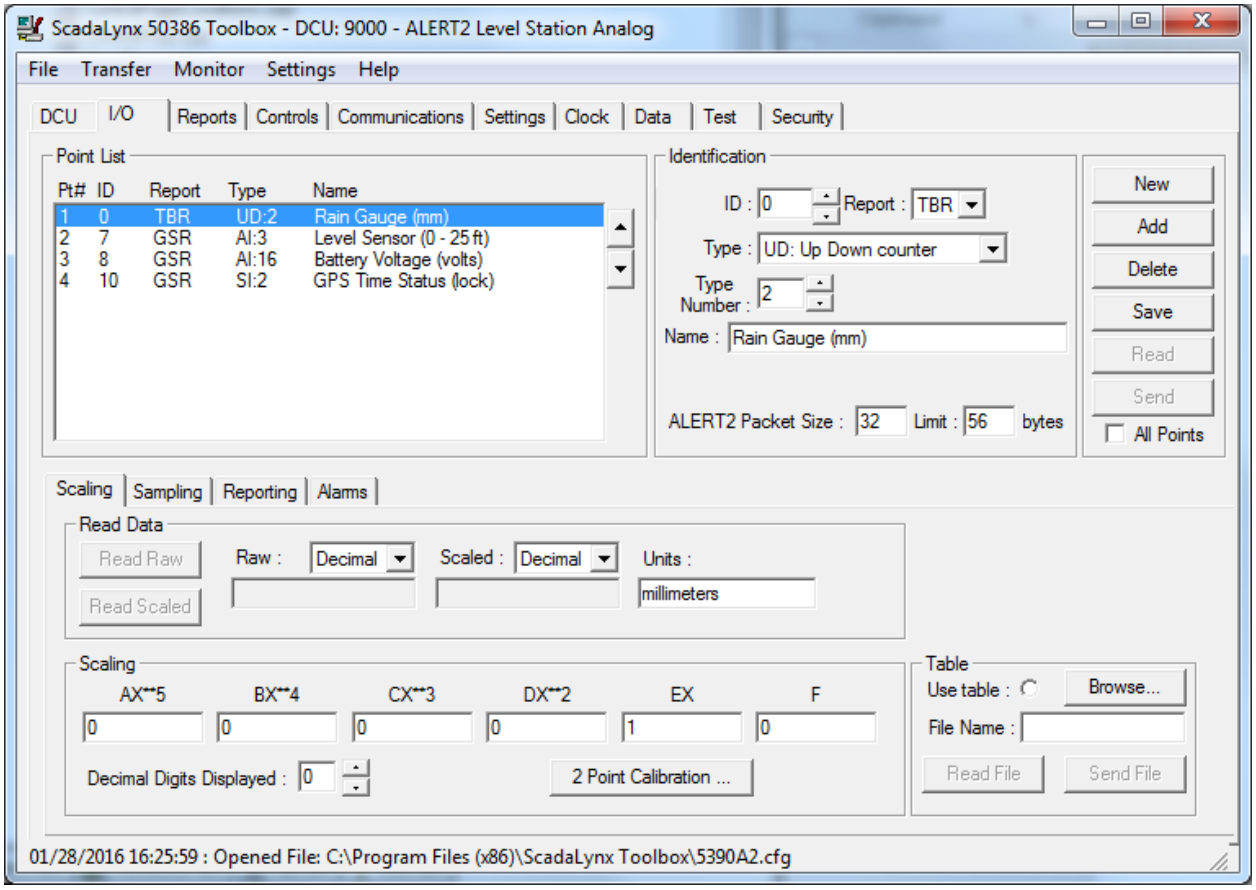
- Input Data is read from a sensor or serial interface.
- Output Data is written to a physical output.
- Virtual Data is set by program control or a communication packet.

An input point reads its data from a sensor or serial interface. More than one point can read data from the same sensor but use different calibrations or computations on the sensor readings.

Output and virtual points can be assigned to read data from an input point. When the input point data is read and calibrated, the scaled data value is saved in the output or virtual point.

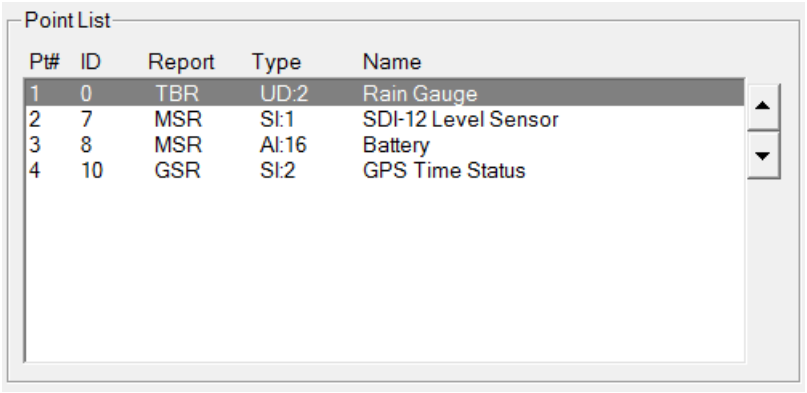
Control actions can set the scaled data value of output and virtual points. When point alarm criteria are met, controls are turned on and control actions set control point states. When point alarms reset, controls are turned off and control actions reset control point states. All point data values can be set by data packets received on a communication port. Toolbox commands and other communication protocols (MODBUS, ALERT1 Complementary Pair, ALERT2) can set counter, output or virtual point data values. Other input point data values can be set but they are reset by the next sensor sample.

Select the *I/O* page to view, edit, add, delete, save, read, or send points.



5.1 Point Identification

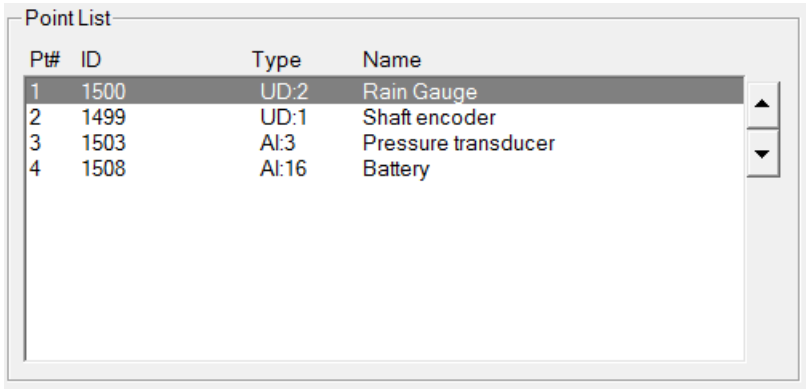
The *Point List* displays the point identification:



- Point Number
- Sensor ID
- Report type
- Point Type:Number
- Point Name

The point *Number* shows the position of the point in the *Point List*. Points are sampled and reported in the order defined in the list. The type of information displayed in the Point List depends on the transmit format (see Communication Port Transmit Parameters in section 8.7.2). The example above is for the ALERT2 transmit format. For example, point number 1 is assigned sensor ID number 0 and uses the TBR report type. The point data is read from up/down counter input number 2. The point name is Rain Gauge.

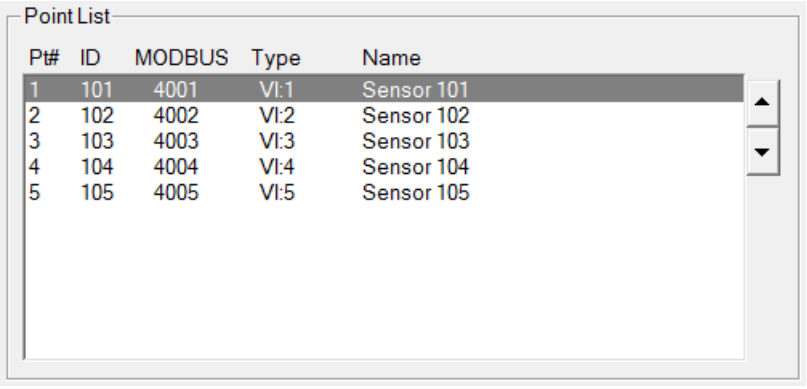
If the ALERT1 or ScadaLynx format is selected, then the Point List shows the Point ID transmitted.



- Point Number
- Point ID
- Point Type:Number
- Point Name

For example, point number 1 is assigned point ID number 1500. The point data is read from up/down counter input number 2. The point name is Rain Gauge.

If point data is transmitted in the MODBUS format, the MODBUS register for each point is displayed.



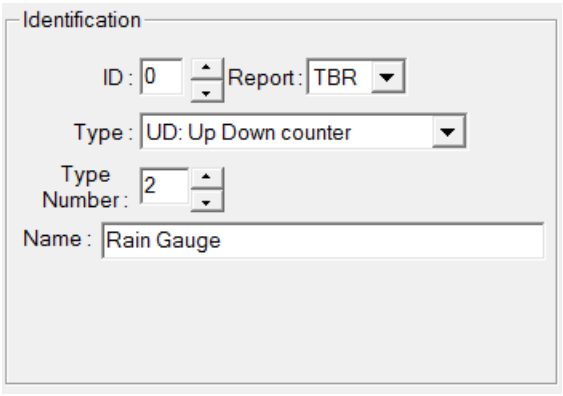
- Point Number
- Point ID
- MODBUS register
- Point Type:Number
- Point Name

For example, point number 1 is assigned point ID number 101 and MODBUS register 4001. The point data is set from data received for Point ID 101 and is read by MODBUS register 4001.

To change a point position in the list (*point number)*, select the point in the list and click the *Point List* up/down arrow buttons to the right of the list.

To change point identification, select a point in the list and edit the identification parameters to the right of the list.

5.1.1 Point ID

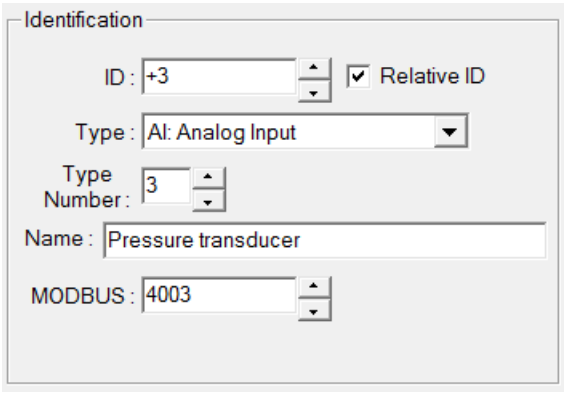


The point *ID* identifies the point data when it is logged or transmitted on an ALERT2, ALERT1, or ScadaLynx communications port.

ALERT2 point data is identified by the DCU number (source address) and point *ID* (sensor number) which can be from 0 to 254 (255 is reserved for a timestamp offset).

ID	Sensor Type
0	Rain
1	Air Temperature
2	Relative Humidity
3	Barometric Pressure
4	Wind Speed
5	Wind Direction
6	Peak Wind Speed
7	Stage
8	Battery Voltage

ALERT1 and ScadaLynx point data is identified by the point *ID*. The point *ID* can be fixed or relative to the DCU number using an offset. For example, point number 3 has a relative offset of +3. This is added to the DCU number 1500 to compute the point ID number 1503.



Check the *Relative ID* box to use a relative ID. The relative offset can be a positive or negative number or even 0. The *Point List* shows the computed ID (using the DCU number) and the ID field shows the relative offset with a plus or minus sign. You can mix fixed and relative ID numbers in a DCU point configuration.

If point data is also transmitted in the MODBUS format, the MODBUS register for the point is displayed. The MODBUS register number is 4003 in this example.

5.1.2 Report Type

The report type sets the ALERT2 self reporting format which can be:

- GSR General Sensor Report
- TBR Tipping Bucket Rain Gage Report
- MSR Multi-Sensor Report – English Units
- MMR Multi-Sensor Report – Metric Units

The General Sensor Report is the default report format that can be used by any I/O type. Data values can be transmitted as a one, two, or four byte signed or unsigned integers, four byte single precision floating point or eight byte double precision floating point. The type of data transmitted is set in the Point Scaling (see Section 5.6).

The Tipping Bucket Rain Gage Report is reserved for incremental rainfall sensors. This report format allows multiple sensor data reports to be transmitted in a compressed format that includes the latest one, tow, or four byte data value and one byte time offsets of preceding data values. To recover the actual time of each tip, the receiving application software subtracts each time offset from the report time stamp. The data value of each tip is the latest data value decremented by 1 for each time offset from the last.

The Multi-Sensor Reports are specialized reporting schemes that efficiently combine eight sensor data values in a compressed format. This report format is very effective for weather stations. The sensor positions in the report, the data format, resolution, and units are fixed for the report type.

Sensor	Bytes	Format	Resolution	Units
Air Temperature	2	Signed Integer	0.1	deg F
Relative Humidity	1	Unsigned Integer	1	%
Barometric Pressure	2	Unsigned Integer	0.1	hPa
Wind Speed	1	Unsigned Integer	1	mph
Wind Direction	2	Unsigned Integer	1	deg
Peak Wind	1	Unsigned Integer	1	mph
Stage	2	Signed Integer	0.01	ft
Battery Voltage	1	Unsigned Integer	0.1	V

MSR Multi-Sensor Report – English Units

Sensor	Bytes	Format	Resolution	Units
Air Temperature	2	Signed Integer	0.1	deg C
Relative Humidity	1	Unsigned Integer	1	%
Barometric Pressure	2	Unsigned Integer	0.1	hPa
Wind Speed	2	Unsigned Integer	1	km/hr
Wind Direction	2	Unsigned Integer	1	deg
Peak Wind	2	Unsigned Integer	1	km/hr
Stage	3	Signed Integer	0.001	m
Battery Voltage	1	Unsigned Integer	0.1	V

MMR Multi-Sensor Report – Metric Units

5.1.3 Point Type

The point *Type* determines where the point gets its data. All point types except the Virtual point are attached to sensor I/O. Refer to the ScadaLynx 50386 DCU Operating Manual for a physical description of the sensor I/O types:

- AI Analog Input
- AO Analog Output
- DI Digital Input
- DO Digital Output
- UD Up Down Counter
- PC Pulse Counter
- SI Serial Input
- VI Virtual Point

5.1.3 Point Type Number

The point *Type Number* determines the sensor type physical connection. In the *Point List* the point type number is shown after the point type following a colon. For example, point 4 (Analog Water Level) is attached to AI:3 and reads its data from Analog Input channel 3.

Serial Inputs share a common connection such as the SDI-12 port or a serial communication port. In this case the point type number is used for identification instead of the physical connection. The assigned type numbers should start with 1 and be increased for each point of the same type. For example, the first serial input SI:1 reads water level data from a SDI-12 sensor, the second serial input SI:2 reads temperature data from the same SDI-12 sensor, and the third serial input SI:3 reads rainfall from a different SDI-12 sensor.

Virtual points are not attached to physical connections so the point type number is used only for identification. The assigned type numbers should start with 1 and be increased for each point of the same type.

5.1.4 Point Data Bit

The point *data bit* field is shown for digital input and digital output point types only. The data for these point types is a binary value (0 or 1). The *data bit* field defines which bit in the data report to set for the point binary data value. The *data bit* field allows several digital input and output points to pack their readings into one data report. Use the same point *ID* but set unique *data bit* numbers for points to share data reports.

The *data bit* range is 1 - 32 where 1 is the least significant bit. Remember that some communication protocols further limit the data range. For example the ALERT1 protocol has a data range of 0 - 2047 which is data bits 1 - 11.

The *Point List* displays the point data bit after the point ID with a period separator. For example point 5 (Road Crossing Status) has the ID 1504.1 (computed ID = 1504 and data bit = 1). To add a second digital input to read intrusion status and store its binary value in bit two of the same ID, use data bit 2. The intrusion status point ID would be displayed as 1504.2.

5.1.5 Point Name

Name describes the point. The name is limited to 40 characters.

5.1.6 ALERT2 Packet Size

If the configuration has points assigned to report in the ALERT2 format, the number of bytes used and the byte limit are computed and displayed. The limit is computed using the TDMA slot length defined in the Communication Transmit tab.

The bytes used is computed using the standard Airlink, MANT, and PDU header sizes (12 bytes), the I/O point report type headers, and I/O point data byte requirements.

GSR and TBR reports headers are combined for timed reports and require a 2 byte header. Each point uses 2 bytes for identification, format and length. The bytes required for the data value depends on the data value format and size.

GSR points with Decimal Digits Displayed > 0 in the Scaling tab always use a 4 byte single precision floating point. GSR points with Decimal Digits Displayed = 0 in the Scaling tab use the fewest bytes possible for the data value:

Decimal Digits Displayed	Data value range	Bytes
0	-128 >= data <= 255	1
0	-32768 >= data <= 32767	2
0	-32768 < data > 32767	4
>0	Single precision floating point	4

The MSR and MMR reports require a 3 byte header. The number of bytes per point are defined in the tables in Section 5.1.2 above.

5.2 Add a Point

It is easier to copy a point of the same point type than to create a new point. When a point is copied, all the point parameters in the *I/O* sub-pages are also copied.

1. Select a point to copy in the *Point List*; click **Add** to copy or click **New** to add a blank point.
2. Change the point identification.
3. Reposition the point with the *Point List* up/down arrow buttons and click **Save**.

Each point must have a unique ID. Multiple points can be attached to the same point type and type number. For example, define three points to read a water level sensor on AI:3 and report the maximum, minimum, and mean level for a sample interval. Each point would have a unique ID number but all three points would have the same point type and type number AI:3.

Note: After adding, deleting, or repositioning a point, send all points to the DCU.

5.3 Delete a Point

1. Select a point to delete in the *Point List*; click **Delete**. Check **All Points** and click **Delete** to delete all points.

2. The Toolbox will ask for delete confirmation. Click **OK** to delete.
3. Click **Save** to delete the point from the configuration file.

Deleting a point in the middle of the *Point List* renumbers the points.

Note: After adding, deleting, or repositioning a point, send all points to the DCU.

5.4 Read Point Parameters

The **Read** button on the *I/O* page reads the selected point parameters into the Toolbox memory from the connected DCU and updates the Toolbox display. Point parameters include the identification, all parameters in the *I/O* sub-pages, and point raw and scaled data values. Check the **All Points** box to read all points.

This button does not read all the DCU configuration parameters. Use the **Read All Parameters** button on the *DCU* page or *Read All Parameters* in the Transfer menu pull-down to read all DCU parameters.

5.5 Send Point Parameters

The **Send** button on the *I/O* page sends the selected point parameters in the Toolbox memory to the connected DCU. The current configuration is also saved to the disk file name shown in *DCU Identification*. Point parameters include the identification, all parameters in the *I/O* sub-pages, and point raw and scaled data values. Check the **All Points** box to send all points.

Note: If point data values have not been read or set in the Toolbox memory, they are not sent to the connected DCU when the point parameters are sent. This is to prevent accidental zeroing of point data.

If a point uses a script or table file (e.g. Serial Input points for SDI-12 sensors), the file is sent when the point parameters are sent. To reduce DCU programming time the file is automatically sent only once per connection. The file will not be sent again if the point parameters are sent again unless the file name is changed or the Toolbox disconnects and reconnects to the DCU.

This button does not send all the DCU configuration parameters. Use the **Send All Parameters** button on the *DCU* page or *Send All Parameters* in the Transfer menu pull-down to send all parameters.

5.6 Point Scaling

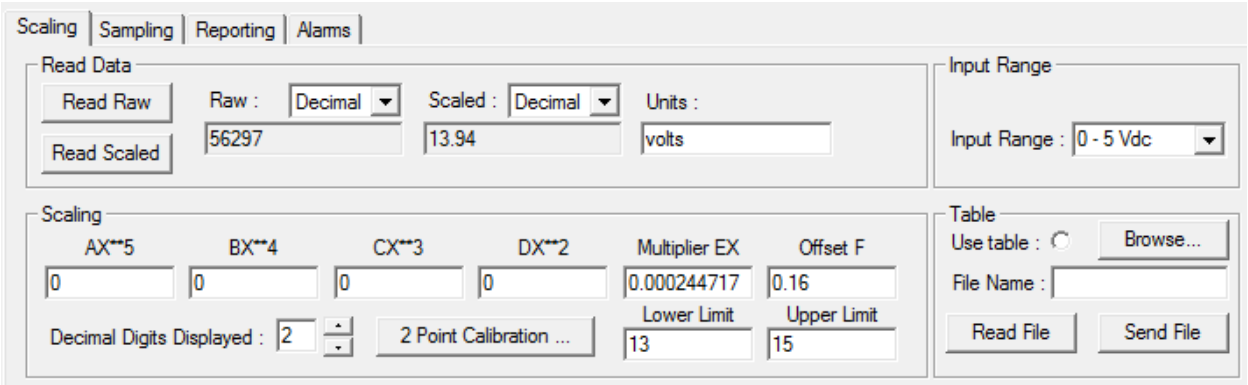
Raw data for an input point type (AI, DI, UD, PC, SI) is read from its assigned sensor input or set by a communication packet. Point scaling converts the *Raw* data to *Scaled* data. Scaled data is used for data display, reporting, and alarm testing. The input point raw data ranges are:

- AI Raw range is 0 - 65535 (16bit ADC).
- DI Raw range is 0 for open, 1 for closed.
- UD Raw range is 0 - 4294967296 (32bits).
- PC Raw range is 0 - 4294967296 (32bits).
- SI Raw range is a 32 bit floating point number.

Scaled data for an output or virtual point type (AO, DO, VI) is read from an input point, set by a control action, or set by a communication packet. Point scaling converts the *Scaled* data to *Raw* data. Raw data is used to set the physical output value. The output and virtual raw data ranges are:

- AO Raw range is 0 - 65535 for 4 - 20 mA or 0 - 20 mA output.
- DO Raw range is 0 for open, 1 for closed.
- VI Raw range is a 32 bit floating point number.

Select the *Scaling* sub-page on the *I/O* page to display the selected point scaling. To review all points, select each point in the *Point List* and check the scaling parameters as they are displayed.

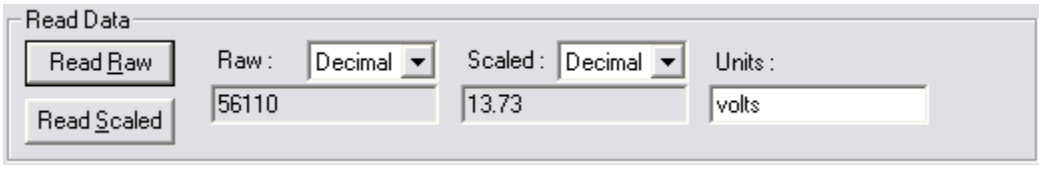


Point scaling parameters include:

- Raw and Scaled data display format
- Point scaled data units description
- Point scaling equation
- Decimal digits to display in data reports
- Lower and upper limit for scaled data value.
- Open/close state for digital inputs and outputs
- Analog input Range
- Analog output range
- Table transformation

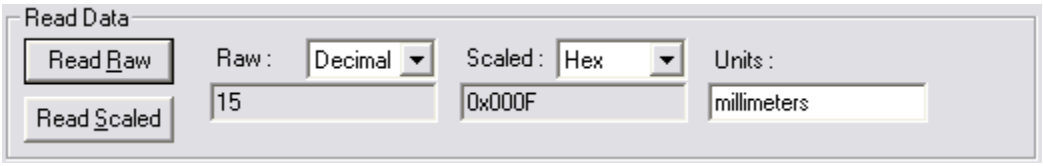
5.6.1 Data Display Format

The display format of point raw and scaled data can be selected:

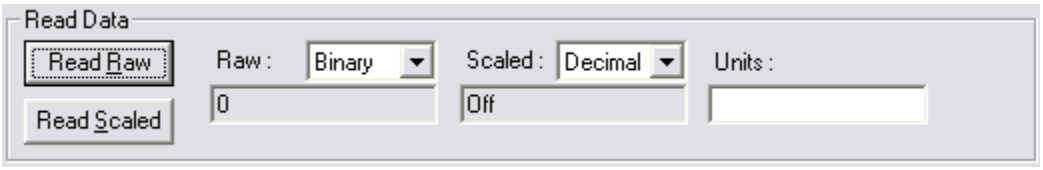


- Decimal Data is displayed in decimal (base 10) using the following point type rules:
  - DI, DO Raw and scaled data displayed as On or Off.
  - AI, AO, UD, PC Raw data display as integer and scaled data with decimal points.

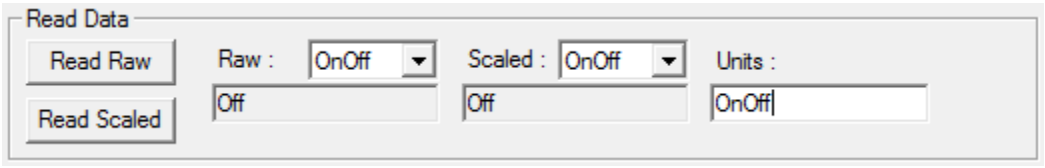
- SI, VI Raw and scaled data displayed with a decimal point.



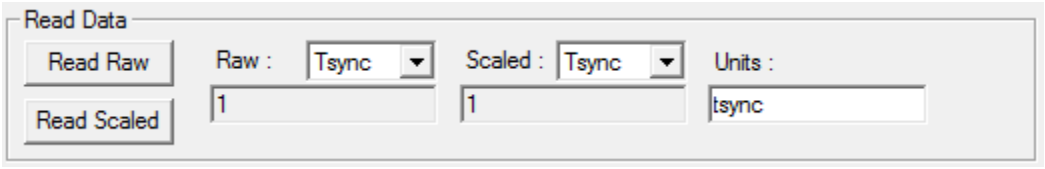
- Hex Data is displayed in hexadecimal (base 16) using the following point type rules:
  - DI , DO Raw and scaled data displayed as 1 or 0.
  - All other types Integer part of raw and scaled data displayed as a 4 digit, zero padded, hexadecimal number prefixed by 0x. For example:
    0 is displayed as 0x0000
    51902 is displayed as 0xc794
    12.50 is displayed as 0x000c
    (integer part of 12.50 is 12 = 000c)



- Binary Data is display in binary (base 2) using the following point type rules:
  - DI, DO Raw and scaled data displayed as 1 or 0.
  - All other types Integer part of raw and scaled data displayed as a 16 digit, zero padded, binary number. For example:
    0 is displayed as 0000000000000000
    51902 is displayed as 1100011110010101
    12.50 is displayed as 0000000000001100
    (integer part of 12.50 is 12 = 01100)

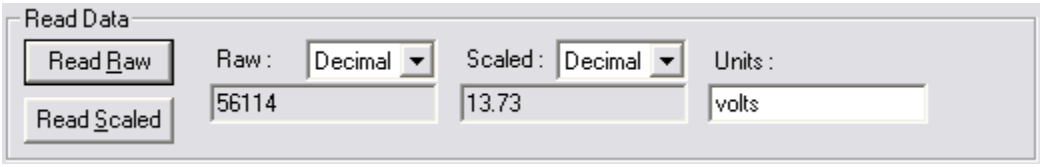


- OnOff Data is displayed as On if not zero or Off if zero for all types.



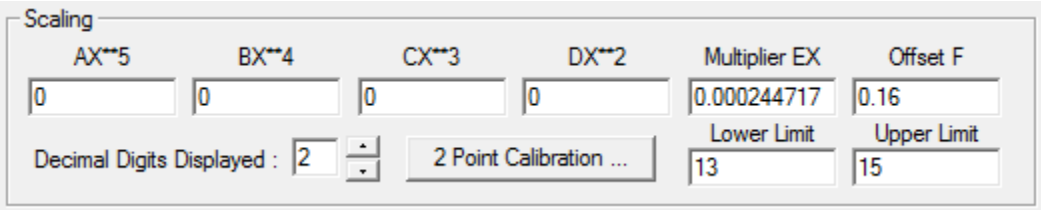
- Tsync data has the point data report time set the the current time when transmitted. This data type is used to synchronized time between DCUs.

5.6.2 Scaled Data Units



The scaled data units are displayed in data reports following the data value. The data units are limited to 40 characters.

5.6.3 Scaling Equation



The ScadaLynx 50386 DCU uses a 5 level polynomial to calibrate point data:

$$\text{Scaled data} = A*X^5 + B*X^4 + C*X^3 + D*X^2 + E*X^1 + F$$

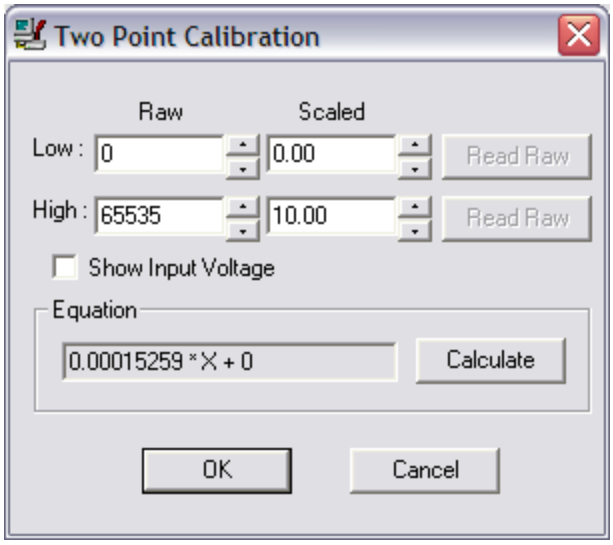
A, B, C, D, E, and *F* are the calibration constants, * is the multiplication operator, raw data is shown as X followed by an exponential operator. For example, $A*X^5$ computes the raw data to the fifth power, X^5, and multiplies it by the constant A.

Point scaling can use a linear calibration by setting fields *A* - *D* to zero. The multiplier is entered in the *E* field and the adder in the *F* field. The calibration equation then becomes:

$$\text{Scaled data} = EX + F$$

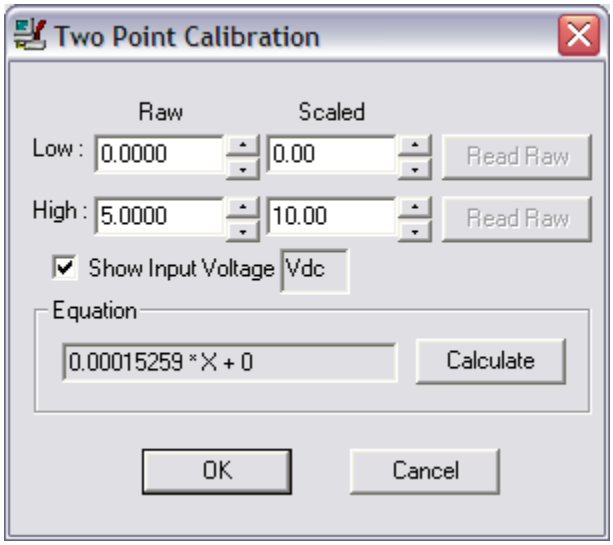
Analog, serial, and virtual input points can have a lower and upper limit set for the scaled data computations. If the limits are not equal and the scaled data value is less than the lower limit, the value is set to the limit and if the scaled data value is greater than the upper limit the value is set to the limit.

Click the **2 Point Calibration** button to get help in computing the E and F scaling factors for a linear equation. A dialogue box is displayed that lets you read or enter a low and high *Raw* value and then enter a low and high *Scaled* value.



1. Position the sensor at a low reading point and click **Read Raw** to read the raw data value or enter the known low raw data value.
2. Enter the scaled data value for the low reading.
3. Position the sensor at a high reading point and click **Read Raw** to read the raw data value or enter the known high raw data value.
4. Enter the scaled data value for the high reading.
5. Click **Calculate** to compute the scaling factors.
6. Click **OK** to save the scaling factors or click **Cancel** to close the window without saving.

In the example above, the calibration for a 0 - 10 foot pressure transducer is computed. If the multiplier for point scaling is known and the offset needs to be computed:



Enter the *Low Raw* and *Low Scaled* values but leave the *High Scaled* value blank. Click **Calculate**. Only the offset (F value) is computed, the multiplier (E value) is not changed.

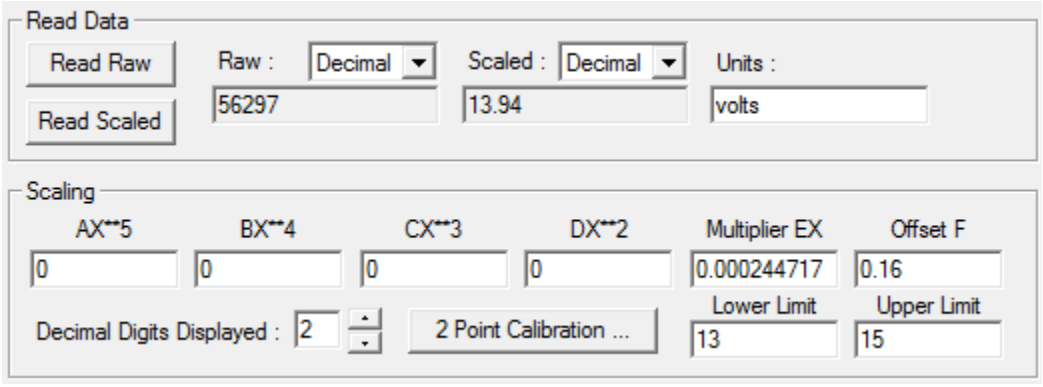
Check the **Show Input Voltage** box to display the *Low Raw* and *High Raw* values as a voltage instead of ADC counts.

Note: Computed scaling factors are held in Toolbox memory until you click Save or Send.

Warning! Point data scaling may result in negative data values or data values higher than some communication protocols support. Communication protocols that only transmit integer data change negative data to zero before it is transmitted. A data value that exceeds a communication protocol limit is truncated before it is transmitted; only the low order bits that fit within the protocol limit are transmitted.

5.6.4 Decimal Digit Display

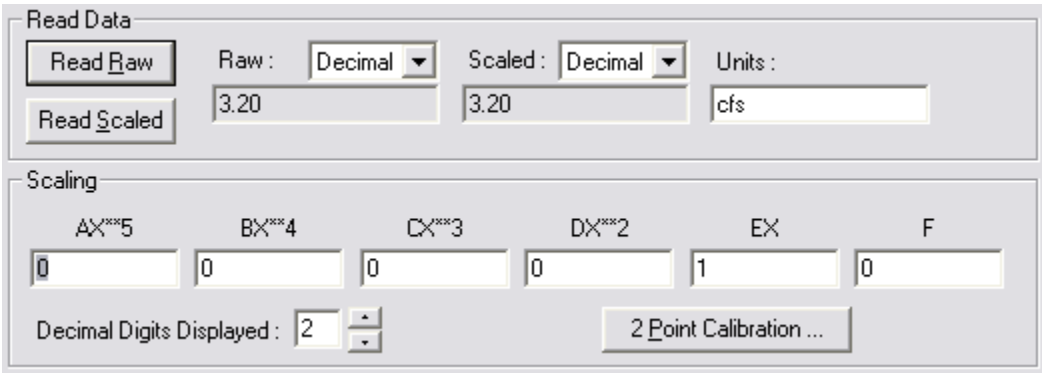
Set the *Decimal Digits Displayed* field to the number of digits displayed to the right of the decimal point for data display.



This parameter is used to convert decimal data for communication protocol data formats that only transmit integer data (e.g. ALERT1 or MODBUS formats). For example, the scaled battery voltage reading 13.73 is displayed with two digits to the right of the decimal point. The scaled data is converted to 1373 for transmission using the ALERT1 format.

The ALERT2 GSR report will transmit integer data when the *Decimal Digits Displayed* is 0. One or more decimal digits will transmit floating point data.

MODBUS data is received in an integer format. If a data value of 320 is received and the decimal digits displayed is 2, then the integer data is converted to the scaled data value 3.20. Do not use the scaling coefficients to set the MODBUS data decimal position.



Warning! An integer converted data value that exceeds a communication protocol limit is truncated before it is transmitted; only the low order bits that fit within the protocol limit are transmitted.

5.6.5 Read Raw and Scaled Data

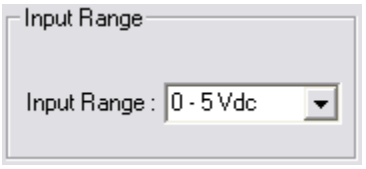
Click **Read Raw** to read and display the last sampled *Raw* data value from the connected DCU. The *Scaled* data value is computed and displayed. Note that the *Scaled* data is not read from the connected DCU.

Click **Read Scaled** to read and display the last sampled *Scaled* data value from the connected DCU. The *Raw* data value is computed and displayed. Note that the *Raw* data is not read from the connected DCU.

Warning! If you change the scaling parameters in the Toolbox memory, the *Raw* or *Scaled* data displayed in the Toolbox will not match the data in the DCU until you send

the point parameters to the DCU.

5.6.6 Scaling for Analog Inputs



Analog inputs can be read by the Analog to Digital Converter using one of five voltage ranges:

- 0 – 25 mVdc
- 0 – 55 mVdc
- 0 - 100 mVdc
- 0 – 1 Vdc
- 0 – 5 Vdc

All input ranges use the full 16 bit conversion range. The default range is 0 – 5 Vdc. Each analog input range must be calibrated before it can be used accurately. See ADC Calibration.

5.6.7 Scaling for Digital Inputs

Digital input raw data is read from the assigned sensor and set to 0 for open (off) and 1 for closed (on). Point scaling can reverse the state of the raw data value when setting the scaled value.

Check the digital input scaling radio button to either:

- On when open Scaled data is set to the raw data value
- On when closed Scaled data is set to the opposite of the raw data value

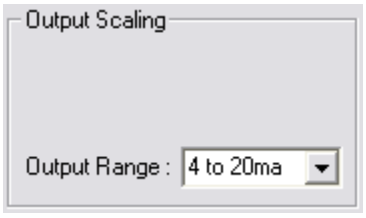
5.6.8 Scaling for Digital Outputs

Digital output raw data sets the state of the physical output to open for 0 (off) or closed for 1 (on). Point scaling can reverse the scaled data value to meet physical connection requirements.

Check the digital output scaling radio button:

- Closed when On Raw data is set to the scaled data value
- Closed when Off Raw data is set to the opposite of the scaled data value

5.6.9 Scaling for Analog Outputs

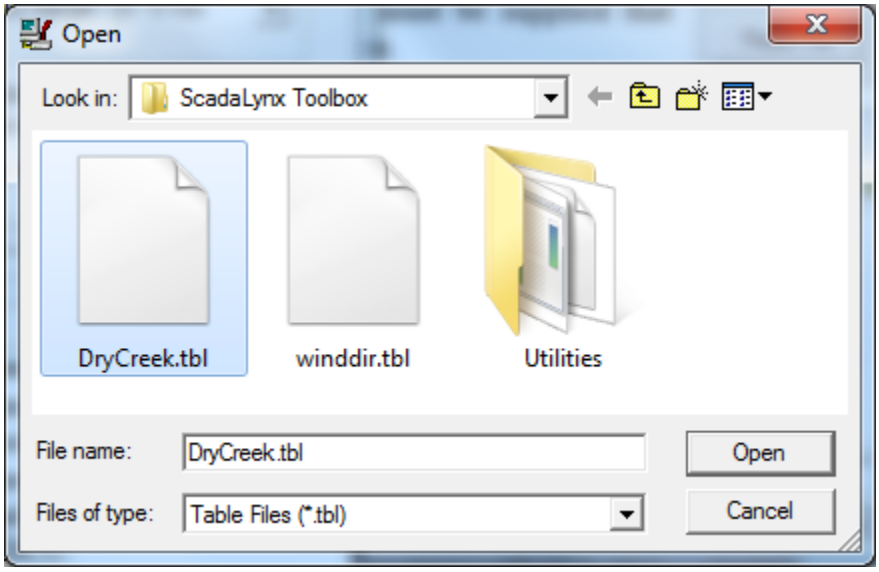


Analog output raw data sets the value of the physical output current as a percentage of the output range:

- 4 - 20 mA
- 0 - 20 mA

5.6.10 Table Computation

Scaled point data can be transformed using a curve computation or table interpolation. For example, transform water level gage height to discharge data. A table file must be supplied that contains the curve rules or table pair data.



Enter the file name or click **Browse** to list table files in the current folder. Table files have a .tbl file extension. Pick a file and click **Open** to select it.

The DCU must have the table file stored in its memory to do table computations. Click **Send File** to force the toolbox to send a table file to the connected DCU. Click **Read File** to read a table file from the connected DCU.

Table files are automatically sent to the connected DCU when the point parameters are sent. To reduce DCU programming time the file is automatically sent only once per connection. The file will not be sent again if the point parameters are sent again unless the file name is changed or the Toolbox disconnects and reconnects to the DCU.

A special table named winddir.tbl is supplied to manage the wind direction sensor data when an offset is used to adjust the northern direction alignment. This table adjusts negative wind directions by adding them to 360 degrees.

The *Use table* radio button must be checked for the DCU to use the table. Table file contents and computation methods are explained in Appendix G.

5.6.11 Point Scaling Examples

5.6.11.1 Pressure Transducer Scaling

Compute an AI point type multiplier scaling factor E by dividing the Calibrated range by the 16 bit ADC range which is 65535. For example, compute a 10 foot water level pressure transducer multiplier factor E with the equation 10 / 65535 = 0.00015259. Set the number of *Decimal Digits Displayed* to 2 to display hundredths of feet.

Use the adder in the F field to add an offset to the scaled data value. For example if the pressure transducer orifice is 1.5 feet above the stream bed, set the F field to 1.5.

You can also set an elevation in the F field but take care that the scaled data value does not exceed the transmission format limit. For example, the ALERT1 format can only transmit data

values from 0 to 2047. If the point decimal digit display is 2 to display hundredths of feet then the transmission format limit is 0 to 20.47 feet.

The ALERT2 or ScadaLynx formats do not have a transmission format limit.

Logged data and the ScadaLynx format do not have data limits.

5.6.11.2 Battery Voltage Scaling

The battery voltage point (AI:16) measures voltage using a resistor network installed on the SLB. A 5 Vdc supply on this resistor network provides a measured voltage range of 0 - 16.037528 Vdc. Compute the multiplier factor E with the equation 16.037528 / 65535 = 0.000244717. Set the number of *Decimal Digits Displayed* to 2 to display hundredths of volts.

Set the adder field F to adjust for voltage loss in the battery reading. For example if the battery voltage point scaled data reading is 13.10 but your voltage meter across the battery leads reads 13.35 volts, set the adder field F to 13.35 – 13.10 = .25.

5.6.11.3 Shaft Encoder Scaling

Shaft encoder points can use 1.0 as the multiplier factor E to return counts. Set the number of *Decimal Digits Displayed* to 0 to display integer counts.

For a shaft encoder that has 100 counts per foot, set the multiplier to 0.01 to display the scaled data in feet. Set the number of *Decimal Digits Displayed* to 2 to display hundredths of feet.

For a shaft encoder that has a different number of counts per revolution or a water level change per revolution that is not one foot, use the following equation to compute the multiplier factor:

water level change per revolution / counts per revolution

For example, if the water level change per revolution is one foot and the number of counts per revolution is 400, the multiplier factor E is 1.00 / 400 = 0.0025.

5.6.11.4 Rain Gauge Scaling

Single state change (FormC) rain gauges can use 1.0 as the multiplier factor E to return counts. Set the number of *Decimal Digits Displayed* to 0 to display integer counts.

To display .01 inch two wire tipping bucket counts in inches, set the multiplier factor E to 0.01 and set the number of *Decimal Digits Displayed* to 2.

5.6.11.5 SDI-12 Sensor Scaling

SDI-12 points store floating point raw data. Use 1.0 as the multiplier factor to copy the raw data unchanged. You can re-calibrate the point readings if you want to change the engineering units. Set the number of *Decimal Digits Displayed* to match the sensor data range.

For example, to convert the data units of an SDI-12 pressure transducer water level from PSI to feet set the multiplier factor E to 2.307.

5.6.11.6 Wind Direction Sensor Scaling

The wind direction sensor north direction can be adjusted by a negative adder field F. When this is done, you must assign the winddir.tbl table to the scaling to adjust negative scaled wind direction values by adding them to 360 degrees.

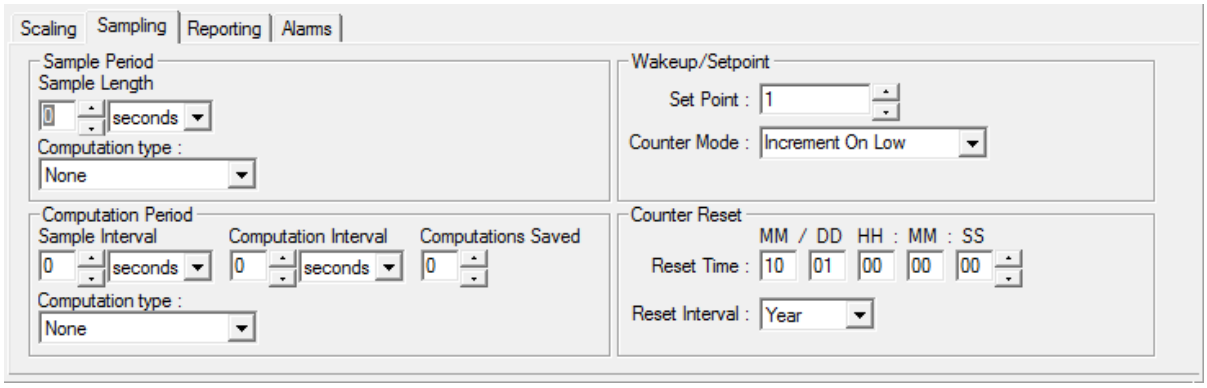
For example, if the raw wind direction is 20 degrees and the adder is -25 degrees then the scaled wind direction without the table computation would be -5 degrees. The winddir.tbl computation will add 360 to the -5 value to compute a wind direction of 355 degrees.

5.7 Point Sampling

Point sampling defines when and how input point data is read. Point data is read at every test and transmit interval (see Point Reporting), and at point sample and computation intervals. Point sampling parameters are:

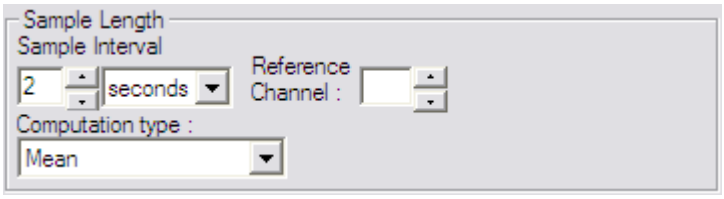
- Sample Period, Computation Period, Computations Saved, Reference Channel
- Sensor Power On Wait
- Wakeup State
- Counter Set Point and Mode
- High Speed Counter Prescale, ALERT Wind Format and Wind Direction Channel
- Sample Input Point
- Counter Reset

Select the *Sampling* sub-page on the *I/O* page to display the selected point sampling. To review all points, select each point in the *Point List* and check the sampling parameters as they are displayed.



5.7.1 Sample Length

Set the *Sample Length* parameter to read the sensor more than once per sample. Multiple readings can be taken to smooth out sensor readings that fluctuate. The sensor is continuously sampled during the *Sample Length* interval. Analog sensors can be sampled 6 times per second.



The *Computation Type* defines how the sample reading result is computed. Computations always use the scaled data value. See Sample Computations in the section

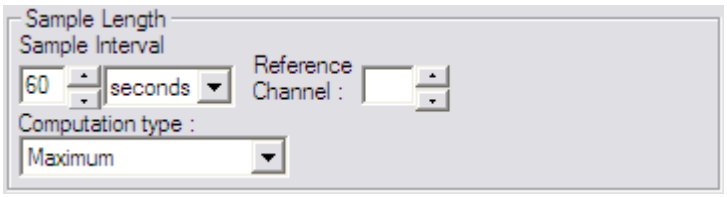
below. Set the *Sample Length* to zero to take one reading per sample.

5.7.1.1 Sample Averaging

In the example above the sensor is read continuously for 2 seconds and the mean reading is computed.

5.7.1.2 Sample Wave Height

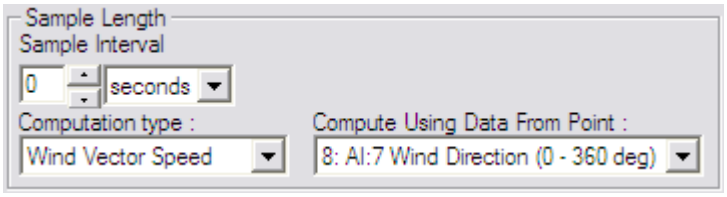
The sample length can be used to compute the maximum, minimum and mean wave height for a tidal station. Define three points and assign them to the tidal level sensor.



1. Set the *Sample Length* to 60 seconds for each point.
2. Set the *Sample Computation* to *Maximum* for the first point, *Minimum* for the second point and *Mean* for the third.

5.7.1.3 Sample Wind Speed

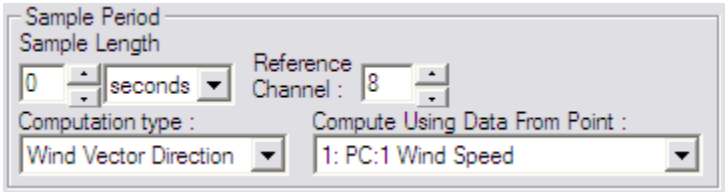
The wind speed or wind vector speed can be computed at the sample time and then additional computations such as maximum, minimum, or mean can be made at the computation period. Set the *Sample Length* to 0 seconds to take one reading per sample.



1. Set the *Sample Length* to 0 seconds to take one reading per sample.
2. Set the *Computation Type* to Wind Vector Speed for the wind speed sensor.
3. Set *Compute Using Data From Point* to the instantaneous (not averaged) wind direction sensor.

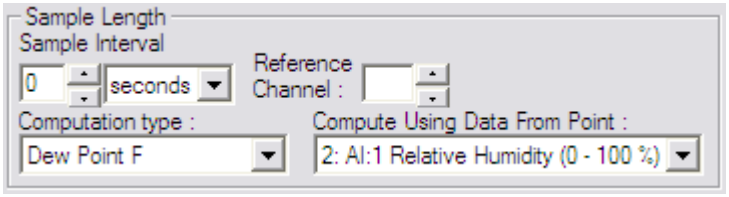
5.7.1.4 Sample Wind Direction

The wind vector direction can be computed at the sample time and then additional computations such as maximum, minimum, or mean can be made at the computation period. Set the *Sample Length* to 0 seconds to take one reading per sample.



1. Set the *Sample Length* to 0 seconds to take one reading per sample.
2. Set the *Computation Type* to Wind Vector Direction for the wind direction sensor.
3. Set *Compute Using Data From Point* to the instantaneous (not averaged) wind speed sensor.

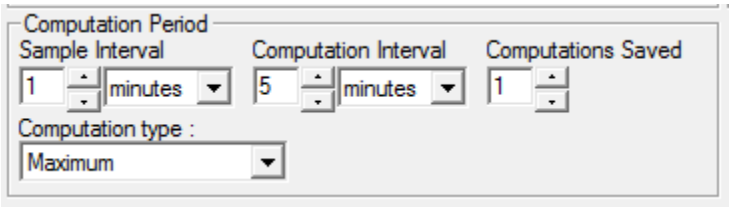
5.7.1.5 Sample Dew Point Temperature



Dew point temperature can be computed from a temperature and relative humidity sensor at the sample time and then additional computations such as maximum, minimum, or mean can be made at the computation period. The air temperature point units must match the computation type (degrees C or F). The dew point temperature computation requires relative humidity as well as air temperature. Select the point used to get the relative humidity as a percentage.

1. Set the *Sample Length* to 0 seconds to take one reading per sample.
2. Set the *Computation Type* to Dew Point F or C for the temperature sensor point.
3. Set *Compute Using Data From Point* to the instantaneous (not averaged) relative humidity sensor point.

5.7.2 Sample Computation Period



Set the *Sample Interval* and *Computation Interval* when multiple samples are taken to compute a final data value. Sensor data is read at the *Sample Interval* (using the *Sample Period* parameters, see above). A final computation is done at the *Computation Interval*. Computations always use the scaled data value. The result of the computation is saved as the scaled value for display, reporting, and alarm testing. Set the *Computations Saved* to the number of samples to saved for use in a report format.

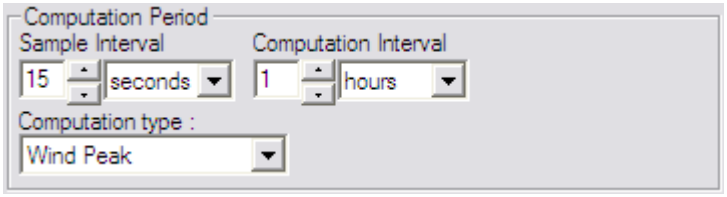
Note: It is not necessary to define a *Sample Interval* or *Computation Interval* if no additional computation is needed. The reporting timed and test intervals define when the point data is sampled.

The computation logic restarts at the end of a computation interval. For example, if a sensor is sampled every minute and a maximum computation is done for a five minute interval, at the end of the five minutes the maximum value is saved and the maximum testing logic restarts with the next sample.

Note: The *Computation Interval* is usually the same as the *Test* or *Transmit Interval*.

5.7.3 Sample Computations

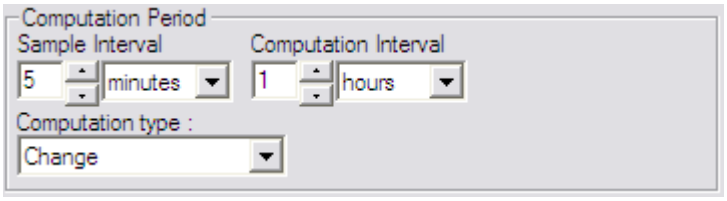
The *Computation Type* defines how the sample data readings are used to compute the final data value for a *Sample* or *Computation Interval*. Computations always use the scaled data value. Computation types and their results are:



- None — Data is unchanged.
- Change — Change in data value over the computation period.
- Change Maximum — Maximum change between readings.
- Change Minimum — Minimum change between readings.
- Dew Point C — Temperature dew point in degrees C from relative humidity.
- Dew Point F — Temperature dew point in degrees F from relative humidity.
- ETO degrees C — Evapotranspiration Index in millimeters for degrees C.
- ETO degrees F — Evapotranspiration Index in inches for degrees F.
- Maximum — Maximum reading during the computation period.
- Mean — Mean of readings taken in the computation period.
- Minimum — Minimum reading during the computation period.
- Runtime — Length of time the reading is not zero.
- Total — Sum all readings during the computation period.
- Wind Peak — Maximum wind speed computed during the sample interval.
- Wind Speed — Average wind speed in units per hour.
- Wind Vector Direction — Average wind direction using vector computation.
- Wind Vector Speed — Average wind direction using vector computation.

5.7.3.1 Change Computation

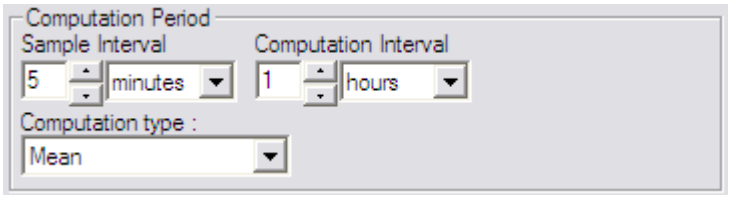
To compute hourly interval rainfall from an accumulated rainfall count, set:



1. *Sample Interval* to 5 minutes.
2. *Computation Interval* to 1 hour.
3. *Computation Type* to *Change*.

5.7.3.2 Maximum, Minimum, and Mean Computations

To compute hourly average maximum, minimum, and mean point data, set:

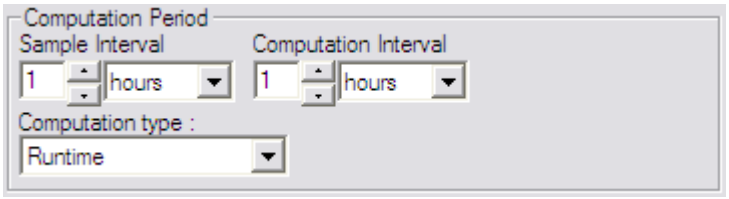


1. *Sample Interval* to 5 minutes.
2. *Computation Interval* to 1 hour.
3. *Computation Type* to Maximum, Minimum, or Mean.

5.7.3.3 Runtime Computations

To compute the hourly runtime for a pump run status point, set:

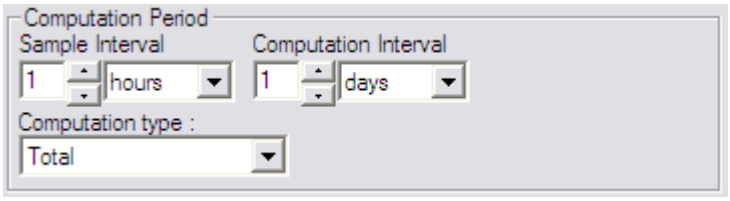
1. *Sample Interval* to 1 hour.
2. *Computation Interval* to 1 hour.
3. *Computation Type* to Runtime.



5.7.3.4 Total Computation

To compute daily rainfall for an hourly rainfall interval point, set:

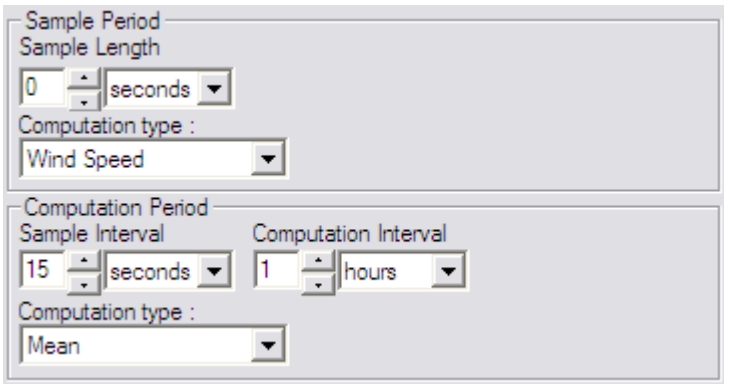
1. *Sample Interval* to 1 hour.
2. *Computation Interval* to 1 day.
3. *Computation Type* to Total.



5.7.3.5 Wind Speed Computation

To compute hourly average wind speed, set:

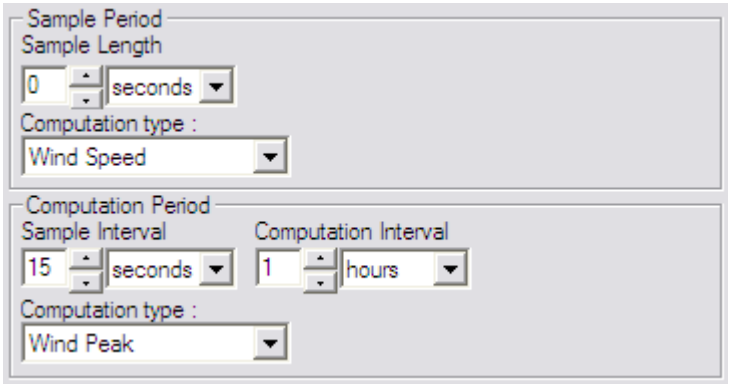
1. Sample *Computation Type* to Wind Speed.
2. Computation Period *Sample Interval* to 15 seconds.
3. *Computation Interval* to 1 hour.
4. Final *Computation Type* to Mean.



5.7.3.6 Peak Wind Computation

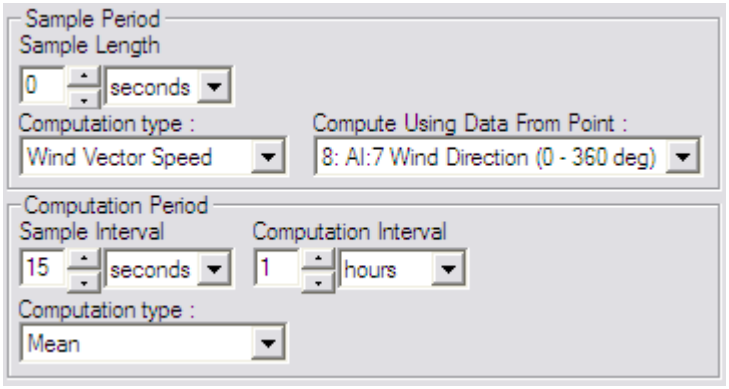
To compute hourly peak wind speed, set:

1. Sample *Computation Type* to Wind Speed.
2. Computation Period *Sample Interval* to 15 seconds.
3. *Computation Interval* to 1 hour.
4. Final *Computation Type* to Wind Peak.



5.7.3.7 Wind Vector Speed Computation

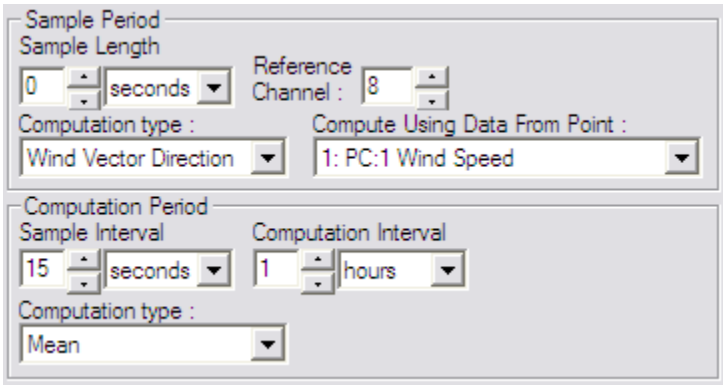
To compute hourly vector averaged wind speed for a wind speed point, set:



1. Sample *Computation Type* to Wind Vector Speed.
2. *Compute Using Data From Point* to instantaneous (not averaged) wind direction sensor point.
3. Computation Period *Sample Interval* to 15 seconds.
4. *Computation Interval* to 1 hour.
5. Final *Computation Type* to Mean.

5.7.3.7 Wind Vector Direction Computation

To compute hourly vector averaged wind direction for a wind direction point, set:

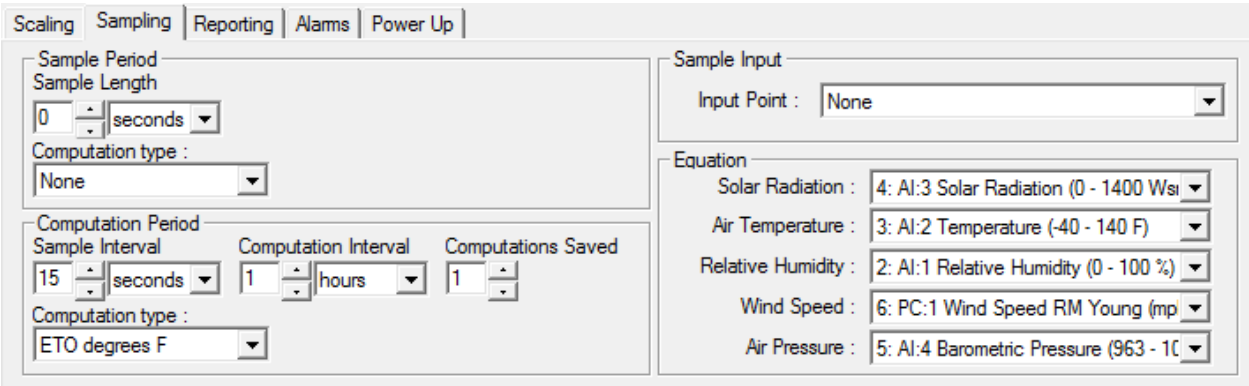


1. Sample *Computation Type* to Wind Vector Direction.
2. *Compute Using Data From Point* to instantaneous (not averaged) wind speed sensor point.
3. Computation Period *Sample Interval* to 15 seconds.
4. *Computation Interval* to 1 hour.
5. Final Computation Type to Mean.

5.7.3.8 Evapotranspiration Index Computation

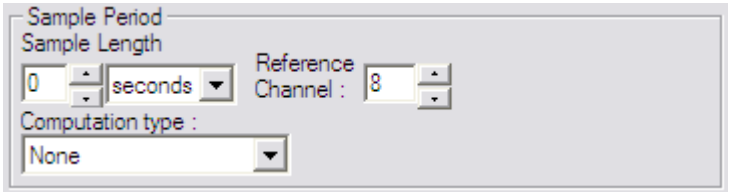
An evapotranspiration index can be computed using the Pruitt / Doorenbos Modified Penman Equation defined in the Food and Agriculture Organization, Irrigation and Drainage Paper #24, 1977 from CIMIS at UC Davis, CA. The equation uses scaled data from sensors: solar radiation, air temperature, relative humidity, wind speed, and air pressure. The equation is provided for sensors in English units (ETO degrees F) and metric units (ETO degrees C).

Sensor	ETO degrees F	ETO degrees C
Solar Radiation	Watts per sq. meter	Watts per sq. meter
Air Temperature	degrees F	degrees C
Relative Humidity	%	%
Wind Speed	miles per hour	kilometers per hour
Barometric Pressure	millibars	millibars
Computed ETO	inches	millimeters



1. Set Final *Computation Type* to ETO degrees F.
2. Select the equation points in the equation panel.
3. Computation Period *Sample Interval* to 15 seconds, matching the wind speed interval.
4. *Computation Interval* to 1 hour, matching the wind speed interval.

5.7.4 Sample Reference Channel



Analog input (AI) ratio metric sensors must have their data readings compared to a reference voltage. The 5050WD wind direction and 3003 evaporation pan sensors are examples of ratio metric sensors.

Set the *Reference Channel* on which to read the reference voltage. The default *Reference Channel* on the DCU is 8 (AI:8).

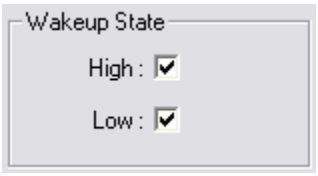
5.7.5 Sensor Power On Wait

Analog input (AI) and serial (SI) sensors need sensor power turned on before samples are taken. The DCU program must then wait for the sensor to power up and stabilize before taking a reading. If one sensor requires a longer power on wait than others, enter the *Sensor Power On Wait* in milliseconds in this field. Enter 0 to use the default wait time (see DCU Settings, Sensor Power).

The HydroLynx 2048 Temperature and Relative Humidity sensor requires a 3000 millisecond power on wait before taking a sensor sample.

Ultrasonic sensors may also require long sensor power on wait to allow the sensor sampling cycle to complete.

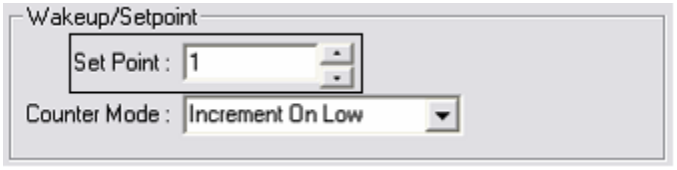
5.7.6 Digital Input Wakeup State



Digital Input (DI) points that are read by the SLB I/O PIC can wake up the DCU main processor (PCOS) when a digital input changes state to high or low. The point event flag is set when the state changes. The event flag can trigger a data report or control action.

Select both *High* and *Low* wakeup states for Digital Input (DI) type numbers 1 – 8.

5.7.7 Counter Wakeup Set point



Up/down (UD) and Pulse (PC) counters are read by the SLB I/O PIC. This PIC wakes up and notifies the DCU main processor (PCOS) when a counter changes value by a required amount. The change in value required to wake up the DCU is set in the Wakeup *Set point*. The point event flag is set when the state changes. The event flag can trigger a data report or control action.

Use a set point of 1 for rain gauge tipping bucket sensors. Use a set point greater than one for sensors that fluctuate between counts. For example, if a shaft encoder water level sensor fluctuates between one, two, or three counts, set the Wakeup *Set point* to 5 to prevent unnecessary DCU wake-ups. The wakeup set point does not change the number of pulses per count for Up/down counters. If the I/O PIC wakes up the DCU after a set point change of five counts, the point counter is incremented by five counts (not one). Use the *Prescale* (see below) for Pulse Counters to set the number of pulses per count.

Note: The set point count is not the change to generate a transmission. This is defined in the reporting test for the point.

5.7.8 Up/down Counter Mode

Up/down Counters (UD) use a direction line to determine whether a pulse increments or decrements the counter. Set the direction line state in *Counter Mode*:

- Increment On Low — Increment the counter when the direction line state is low.
- Increment On High — Increment the counter when the direction line state is high.
- Increment Only — Increment the counter regardless of the direction line state.
- Decrement Only — Decrement the counter regardless of the direction line state.

Rain gauges should be set to *Increment Only*. This mode only increments the counter regardless of the direction line state. It disregards additional counts within one second. This handles two wire and momentary pulse three wire rain gauges. It also provides a filter to eliminate tipping bucket bounces or noise on the line caused by lightning or static discharge.

Most shaft encoders should be set to *Increment On Low*. If a shaft encoder installation is reversed, the counter will decrement when the water level increases. Set the *Counter Mode* to *Increment On High* to compensate.

5.7.9 Pulse Counter Prescale

High speed Pulse Counters (PC) connected to wind speed sensors use a *Prescale* to define the number of pulses to increment the counter. In this example, the wind sensor pulses 2094 times for count.

The HydroLynx 5050WS wind speed sensor pulses 2094 times per mile (1308 times per kilometer) of wind run. The HydroLynx 200-05103 R.M. Young wind speed sensor pulses 16327 times per mile (10204 times per kilometer) of wind run.

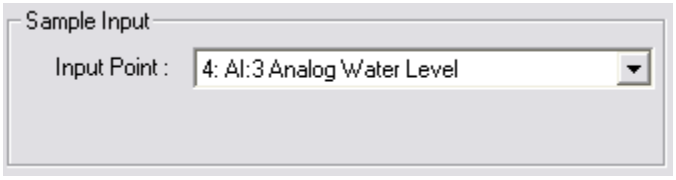
Note: Only one prescale count can be defined per Pulse Counter input number. Multiple points can read the same Pulse Counter input but they must all use the same prescale count. For example, one point may read and report the wind run while another point computes and reports the peak wind speed.

5.7.10 Pulse Counter ALERT1 Wind Format

The ALERT1 communication protocol includes an ALERT wind format that combines a wind run counter with the wind direction. Check *ALERT Wind Format* to use this format during ALERT1 transmissions.

Set the *Wind Direction Channel* (AI) connected to the wind direction sensor. The wind direction sensor in the 50386 MS connector package is connected to AI:7. This wind direction sensor is selected in the example above.

5.7.11 Sample Input Point



Digital output (DO), Analog output (AO), and Virtual (VI) points can read their scaled data values from other point scaled data values. The Raw data is then computed from the Scaled data and used to set the physical output state. The input point's event flag is copied to the output point that reads its data value. The event flag can trigger a data report or control action.

Set the *Input Point* to read data from. In this example a point reads its scaled data value from point 4: AI:3 Analog Water Level.

5.7.12 Counter Reset

Up/down (UD) and Pulse (PC) counters increment or decrement continuously until reset to zero by a communication packet or at the counter reset interval. Set the date and time for the *Reset Time*. Then set the *Reset Interval* to:

- None No reset.
- Hour Reset every hour at the minute and second.
- Day Reset every day at the hour, minute, and second.
- Month Reset every month at the day, hour, minute, and second.
- Year Reset every year at the month, day, hour, minute, and second.

The point event flag is set when the counter is reset. The event flag can trigger a data report or control action. In the example above the counter is reset on October 10 at 00:00:00 every year.

5.8 Point Reporting

Point reporting logs data to the DCU flash disk or transmits data reports on communication ports. Reporting can be done at timed intervals regardless of data change, at test intervals when test criteria are met, on event or alarm when test or alarm criteria are met.

Point reporting uses one or more *Report Tests* to define reporting parameters:

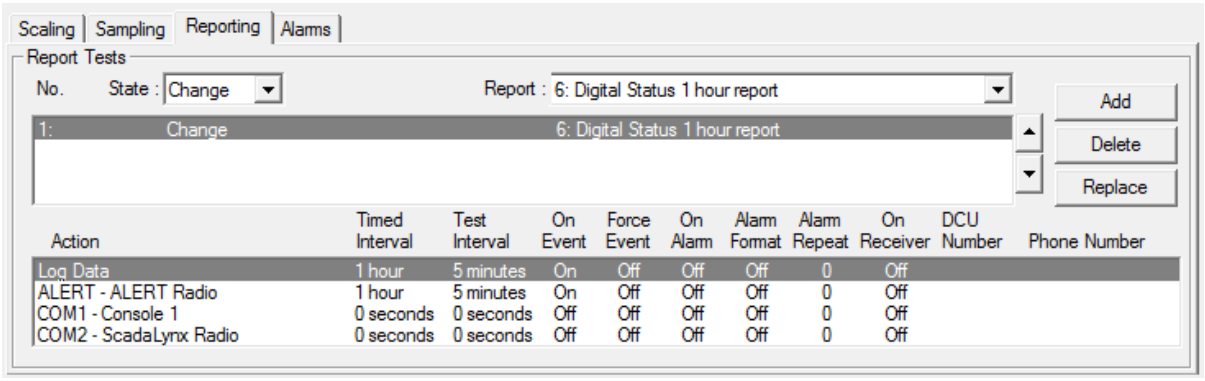
- Change/State to generate a report
- Data limit for change test
- Reporting scheme

At least one *Report Test* must be assigned to a point to define a point reporting scheme.

Note: Report schemes cannot be edited on this page. Select the *Reports* tab to edit reporting schemes.

Select the *Reporting* sub-page on the *I/O* page to display the selected point reporting. To review all points, select each point in the *Point List* and check the reporting parameters as they are displayed.

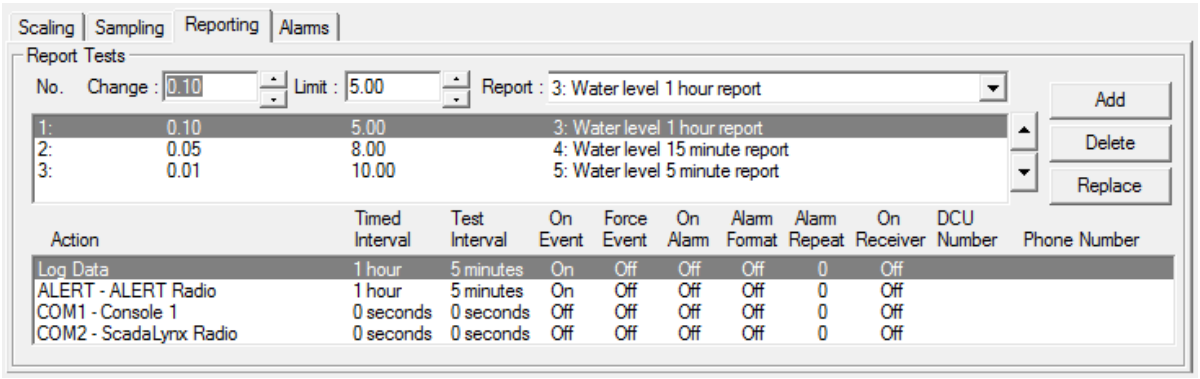
5.8.1 Digital Point Reporting



Digital point (DI, DO) reporting parameters are:

- State Required change in scaled data value to report on test interval.
  - High Report when scaled data state is 1 (on).
  - Low Report when scaled data state is 0 (off).
  - Change Report when scaled data state changes.
- Report Reporting scheme used for data logging and communication port reporting.

5.8.2 Non-Digital Point Reporting



Non-digital point (AI, AO, UD, PC, SI, VI) reporting parameters are:

- Change Required change in scaled data value to report on test interval.
- Limit Upper data limit for this report test. Limit is ignored for last report test.
- Report Reporting scheme used for data logging and communication port reporting.

5.8.3 Edit a Report Test

1. Select the report test to edit from the *Report Tests* list.
2. Edit the report test parameters.
3. Click **Replace** to copy the edit fields to the selected report test.
4. Reposition the report test with the *Report Tests* list up/down arrow buttons.

5.8.4 Add a Report Test

1. Enter the new report test parameters in the edit fields.

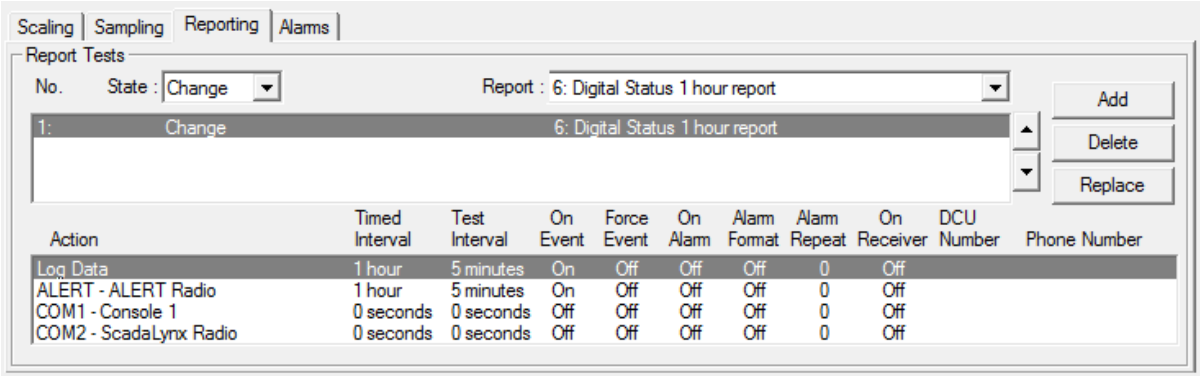
2. Click **Add** to append the report test to the list.
3. Reposition the test with the *Report Tests* list up/down arrow buttons.

5.8.5 Delete a Report Test

1. Select the report test to delete from the *Report Tests* list and click **Delete**.

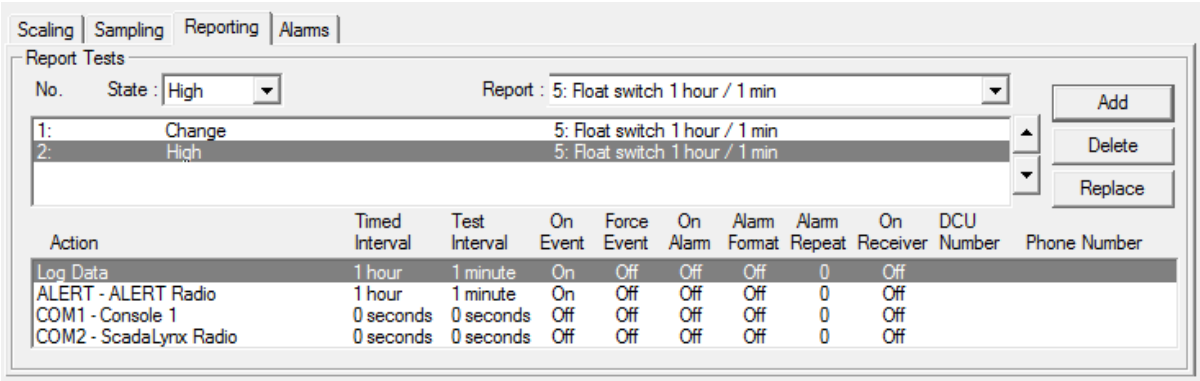
5.8.6 Point Reporting Examples

5.8.6.1 Digital Input Report on Change



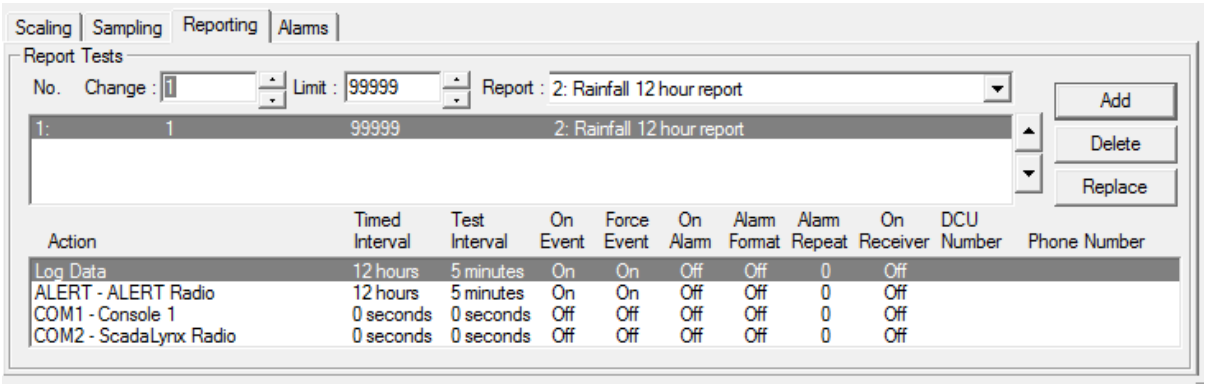
The digital input has one *Report Test*. The point reports on one hour timed intervals defined in reporting scheme 6 and on an event state change. The 5 minute test interval is not used since event reporting will report the state change.

5.8.6.2 Float Switch Report on Change and High State



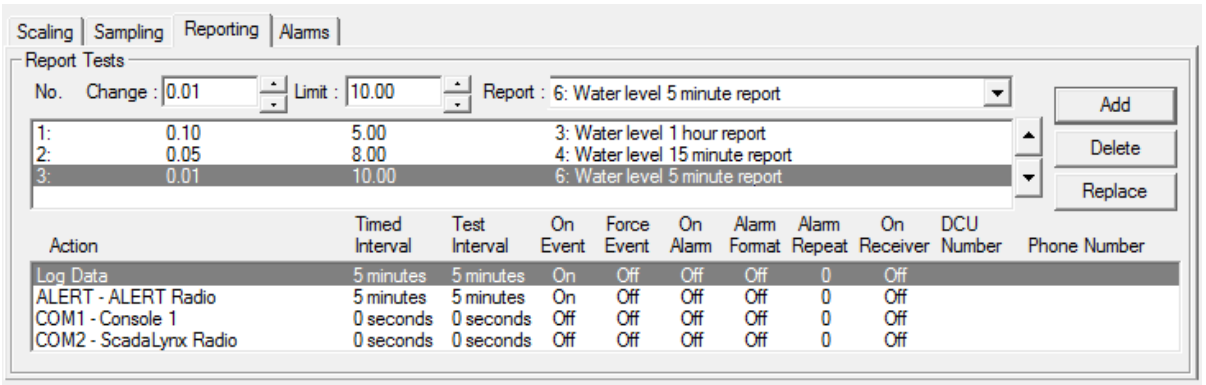
The float switch digital input has two *Report Tests*. The first test reports on one hour timed intervals defined in reporting scheme 5 and on an event state change. The second test reports every minute when the state is *High*. When the point state changes to *Low*, the point reports once and then hourly until the next change to a *High* state.

5.8.6.3 Rain Gauge Report on a tip and Twice Daily



The rain gauge up down counter point has one *Report Test* that reports on an event and every twelve hours. The limit is not used since there is only one report test.

5.8.6.4 Water Level Report Interval Changes with Level.



The water level analog input point has three *Report Tests*. The report test is use changes depending on the water level point scaled data value.

Report Test	Required Change	Test Limit	Reporting Scheme
1.	0.10 feet	0 – 4.99 feet	3: Water level 1 hour timed report interval
2.	0.05 feet	5 – 8.99 feet	4: Water level 15 minute timed report interval
3.	0.01 feet	8 - 10 feet	5: Water level 5 minute timed report interval

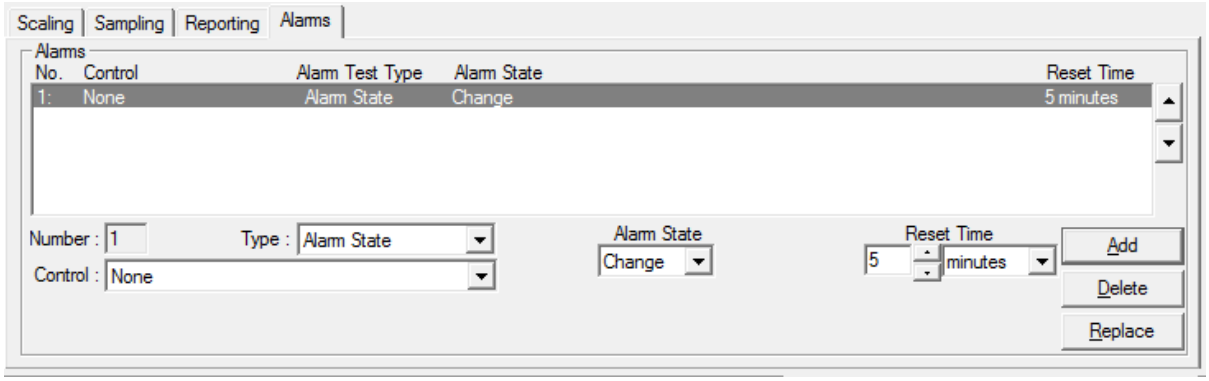
5.9 Point Alarms

Alarms can be set for point data to report using an alarm format or turn on controls when alarm criteria are met. When the point data falls back to reset levels or after a reset interval has passed, the control is turned off. Multiple alarms can be set for a point.

While an alarm is active, the point alarm flag is set. The alarm flag effects point reporting by using an alarm format, repeats alarm reports, and ignores radio hold-off timers. The alarm format reporting and repeated alarm reports can be used to control a remote 50386 DCU (see Control Action Examples). Alarm format reporting will cause random channel reporting for GOES transmitters.

Select the *Alarms* sub-page on the *I/O* page to display the selected point alarms. To review all points, select each point in the *Point List* and check the alarm parameters as they are displayed.

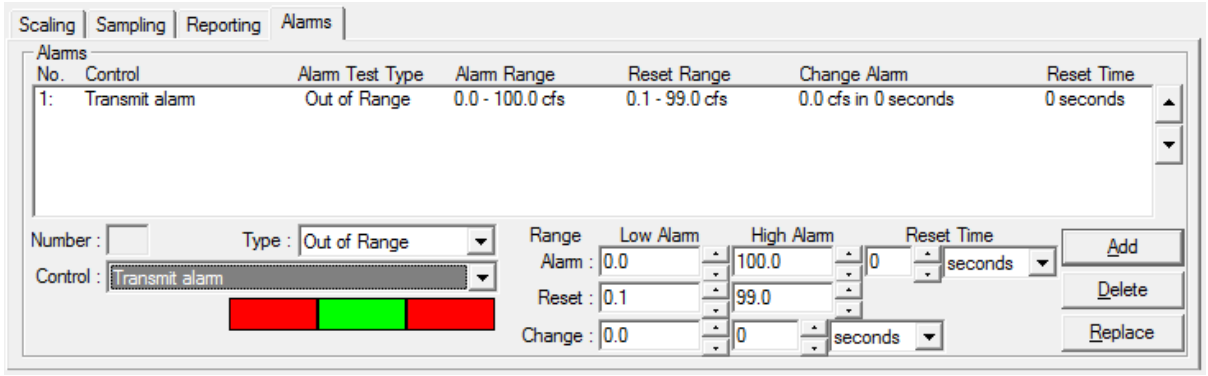
5.9.1 Digital Point Alarms



Digital point (DI, DO) alarm parameters are:

- Number — Alarm number for point, assigned by toolbox.
- Type — Alarm trigger type.
  - Alarm State — Trigger alarm based on digital point state or change.
  - Timeout — Trigger alarm if no data report sampled or received in interval.
- Control — Control group for alarm. Select None for no control action.
- Alarm State — Alarm data state to trigger alarm.
  - None — Disable alarm.
  - High — 1 (On). Reset when 0 (Off).
  - Low — 0 (Off). Reset when 1 (On).
  - Change — Change in state. Reset after Reset Time interval.
- Reset Time — Alarm is reset after this interval passes.

5.9.2 Non-Digital Point Alarms



Non-digital point (AI, AO, UD, PC, SI, VI) alarm parameters are:

- Number — Alarm number for point, assigned by toolbox.
- Type — Data range for active alarm.
  - In Range — Alarm when data is between Low and High Alarm limits. Reset when data is outside Low and High Alarm Reset limits.
  - Out of Range — Alarm when data is outside Low and High Alarm limits.

Reset when data is between Low and High Alarm Reset limits.

- Timeout — Trigger alarm if no data report sampled or received in interval.
- At Limit — Trigger alarm if data is at limit. Reset when not at limit.
- Lower Limit — Trigger alarm if data is at or below limit. Reset when at or above reset limit.
- Upper Limit — Trigger alarm if data is at or above limit. Reset when at or below reset limit.
- Change Limit — Trigger alarm if data changes by amount in defined interval. Reset after time limit.

- Control — Control group for alarm. Select None for no control action
- Trigger — Select point to use for alarm trigger limit.
- Alarm Range — Low and High alarm limits.
- Reset Range — Low and High reset limits.
- Change Alarm — Alarm if data changes by amount in defined interval.
- Reset Time — Alarm is reset after this interval passes.

5.9.3 Edit a Point Alarm

1. Select the point alarm to edit from the *Alarms* list.
2. Edit the point alarm parameters.
3. Click **Replace** to copy the edit fields to the selected point alarm.
4. Reposition the point alarm with the *Alarms* list up/down arrow buttons.

5.9.4 Add a Point Alarm

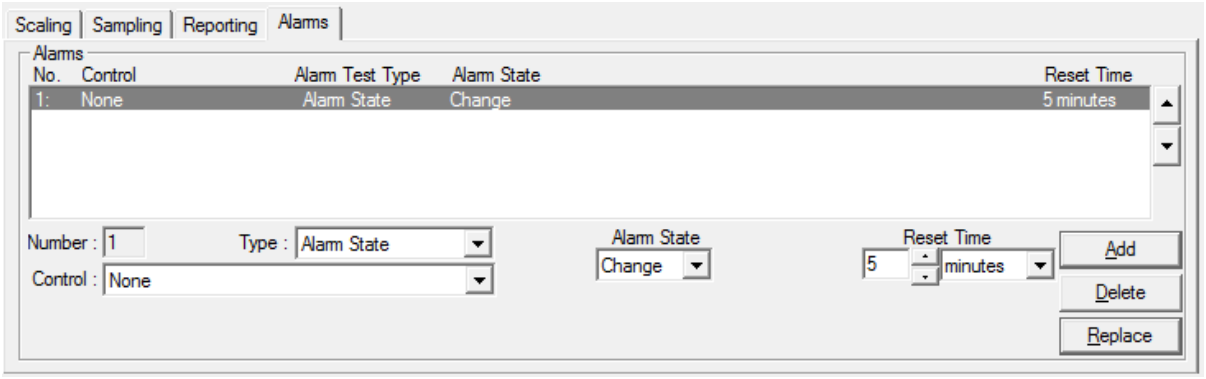
1. Enter the new point alarm parameters in the edit fields.
2. Click **Add** to append the point alarm to the list.
3. Reposition the point alarm with the *Alarms* list up/down arrow buttons.

5.9.5 Delete a Point Alarm

1. Select the point alarm to delete from the *Alarms* list and click **Delete**.

5.9.6 Point Alarm Examples

5.9.6.1 Digital Input Alarm Reporting



The digital input has one *Alarm*. The alarm criterion is met when the scaled data value changes

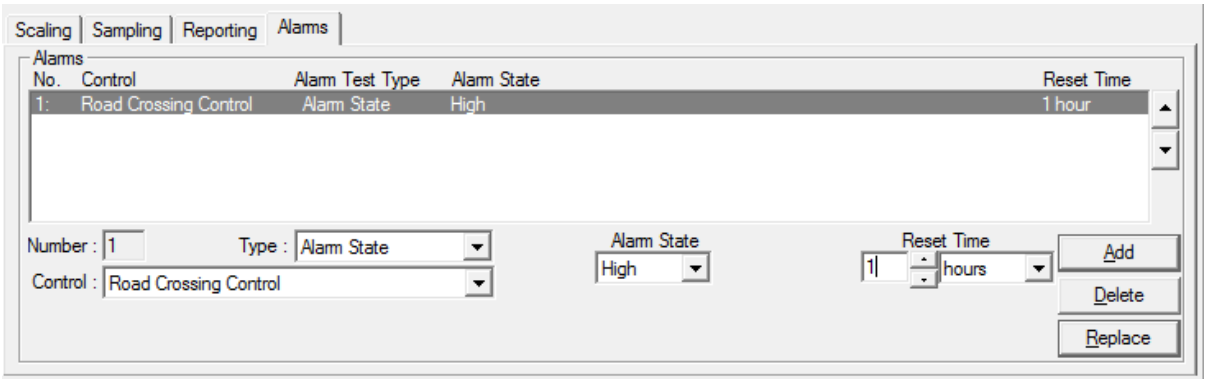
state. No control action is taken. The alarm is reset in 5 minutes.

No *Control* is taken in the alarm example above when the change alarm criteria is met. However, the report alarm flag is set which effects point reporting by ignoring radio hold-off timers, report using an alarm format, and repeated alarm reports.

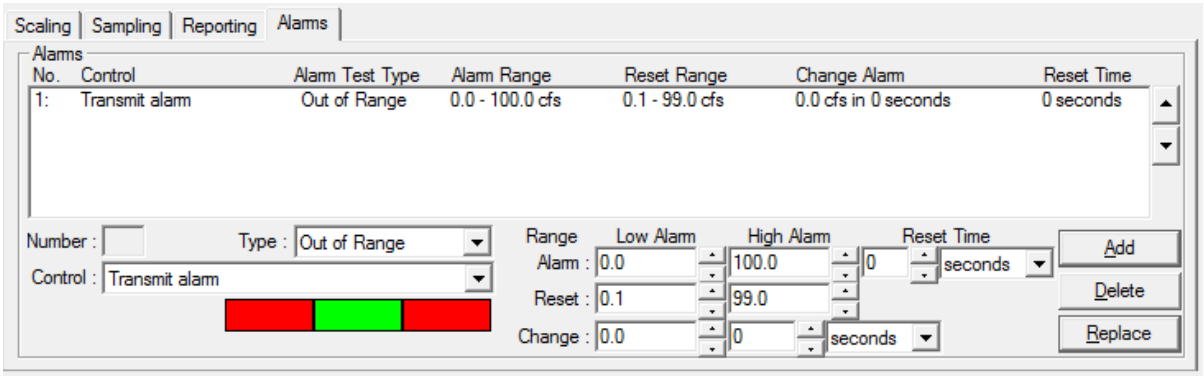
5.9.6.2 Float Switch Local Control Alarm

The *Road Crossing Control* is turned on when the float switch digital input data value is *High*. The *Road Crossing Control* is defined in the *Control* page.

The alarm is reset and the *Road Crossing Control* is turned off when the data is *Low*. After one hour, the alarm is reset and the control is turned off. If the point data value is still high, then the control is turned back on.



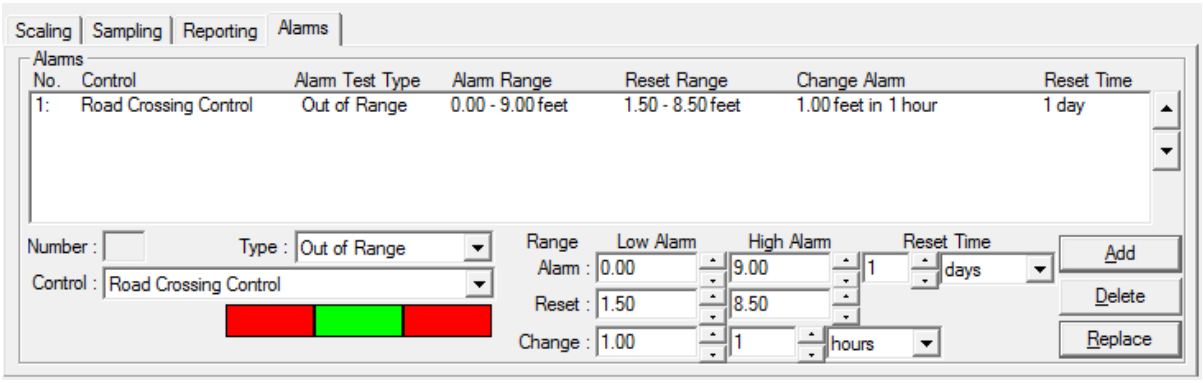
5.9.6.3 Water Level Remote Control Alarm



The *Transmit alarm* control is turned on when the point data value rises above 100 cfs. This control sets the state of an alarm control virtual point which then transmits to control a remote DCU. The *Transmit alarm* control is defined in the *Control* page.

The control is turned off when the value falls below 100. There is no timed reset.

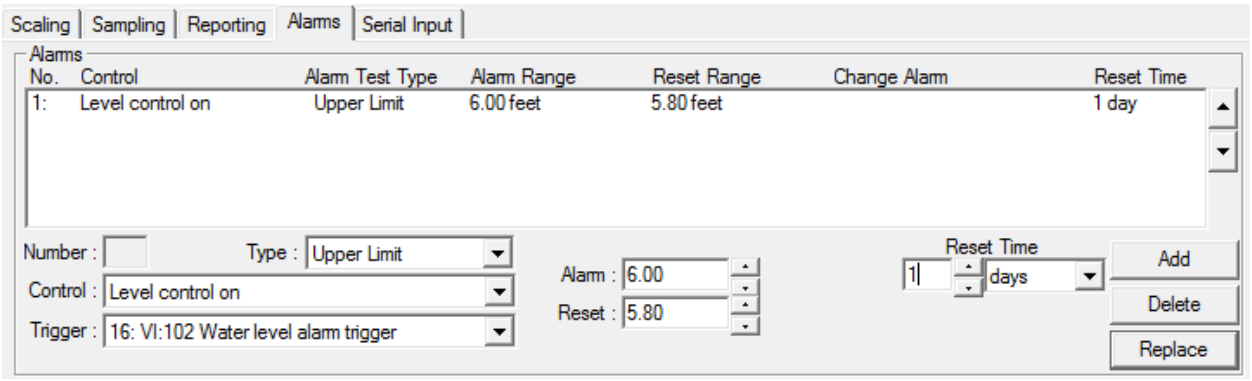
5.9.6.4 Water Level Local Control Out of Range Alarm



The *Road Crossing Control* is turned on when the point data value is *Out of Range* (data value is less than 0.00 or greater than 9.00) or changes by 1 foot in 1 hour. The *Road Crossing Control* is defined in the *Control* page.

The alarm is reset and the *Road Crossing Control* is turned off when the data falls between 1.50 and 8.50 feet. After one day, the alarm is reset and the control is turned off. If the point data value is still in the alarm range, then the control is turned back on.

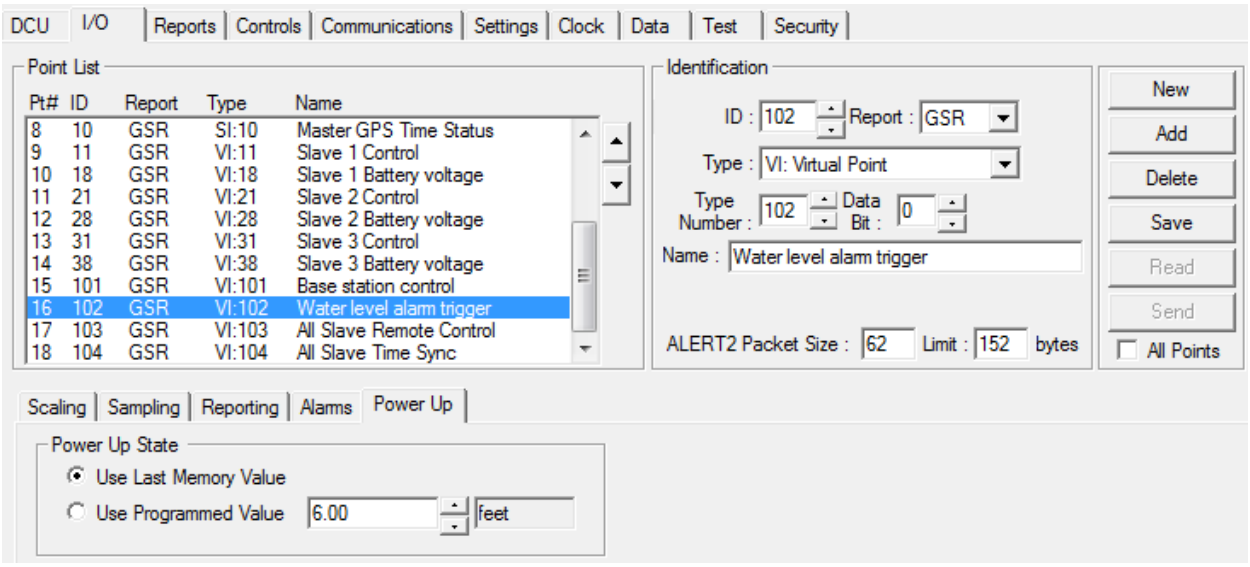
5.9.6.5 Water Level Local Control Upper Limit Alarm With Point Trigger Limit



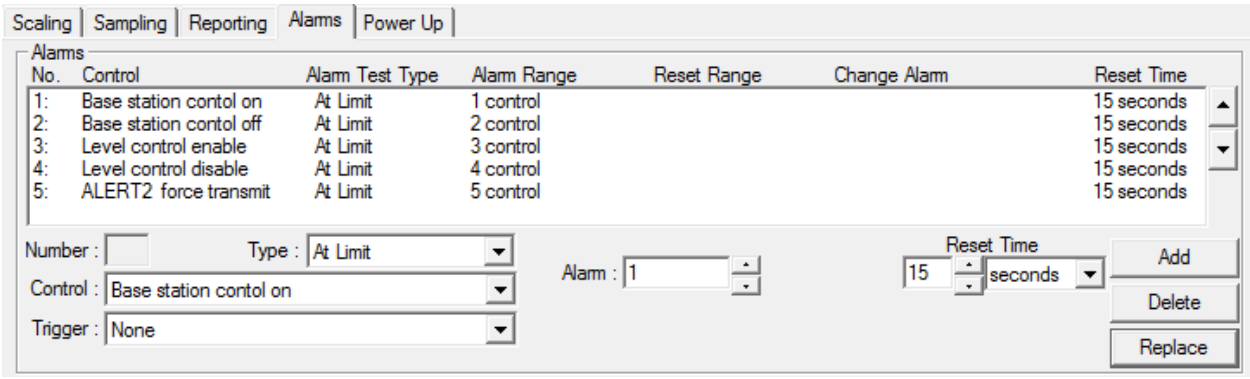
The *Level control on* is turned on when the point data value is at or above the alarm limit defined by the trigger point. The upper limit in this example is set to 6.00 feet. The *Level control on* is defined in the *Control* page.

The alarm is reset and the *Level control on* is turned off when the data falls to or below 5.80 feet. After one day, the alarm is reset and the control is turned off. If the point data value is still in the alarm range, then the control is turned back on.

The alarm trigger limit is set by the *Water level alarm trigger* point scaled data value. An alarm trigger point is a virtual input sensor whose data value can be changed by the ScadaLynx Toolbox or a remote control command. On the first time startup, the power up programmed value is used. After the value has been set by the ScadaLynx Toolbox or a remote control command, the last memory value is used.



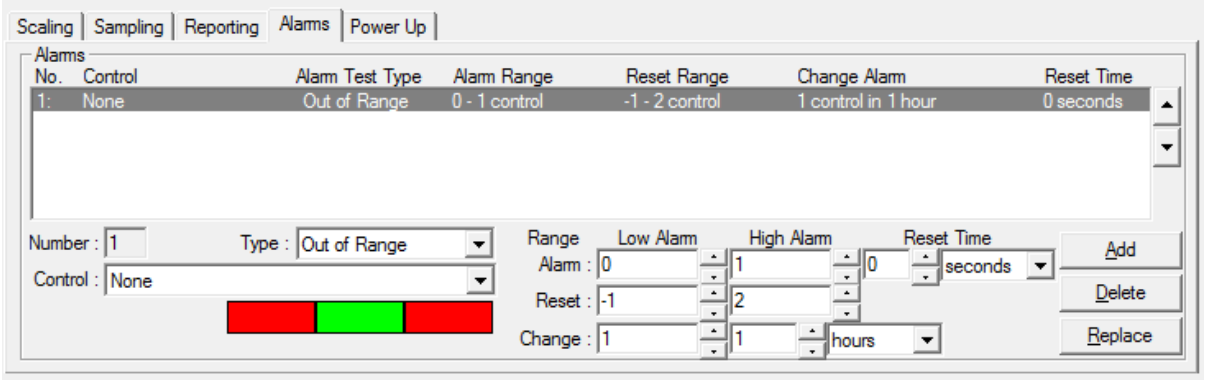
5.9.6.6 Remote Control At Limit Alarms



The *Base station control on* is turned on when the point data value is set to 1, *Base station control off* is turned on when the point data value is set to 2, *Level control enable* is turned on when the point data value is set to 3, *Level control disable* is turned on when the point data value is set to 4, *ALERT2 force transmit* is turned on when the point data value is set to 5. All controls are defined on the *Control* page.

The alarm is reset and the controls are turned off when the point data changes from the limit. After 15 seconds, the alarm is reset and the control is turned off.

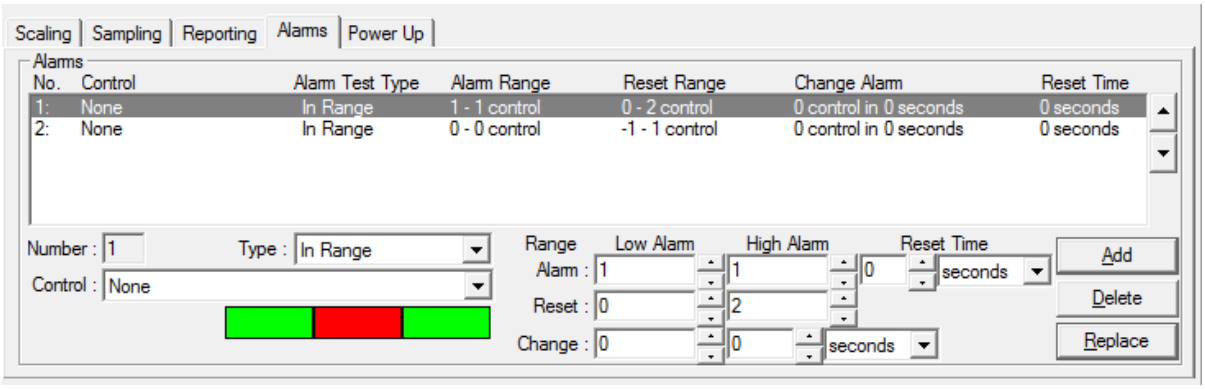
5.9.6.7 Remote Control Alarm Reporting on Change



An alarm control virtual point will transmit to a remote DCU using an alarm format when it changes from 0 to 1 or from 1 to 0. The *Change* parameter is set to 1 and the interval to 1 hour. No *Control* is turned on for this alarm.

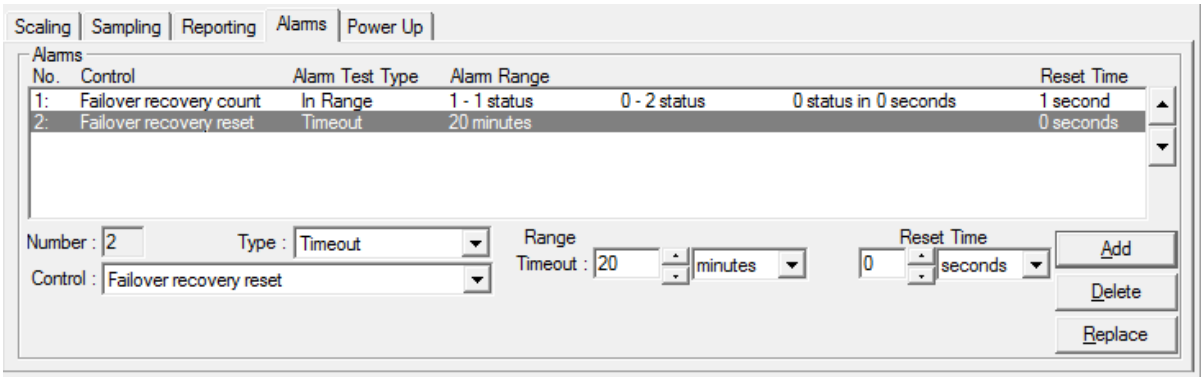
When the point value first changes an alarm report is sent. For the following hour, an alarm report is sent with each sample.

5.9.6.8 Remote Control Alarm Reporting on Value



An alarm control virtual point will transmit to a remote DCU using an alarm format when its value is 0 or 1. No *Control* is turned on for this alarm.

5.9.6.9 Timeout Alarm



If a report is not received in 20 minutes from a remote site, the timeout alarm will execute the Failover recovery reset control.

5.10 Point Serial Input Setup

Serial input points read data from SDI-12 sensors or from a DCU communication port connected to a serial data device.

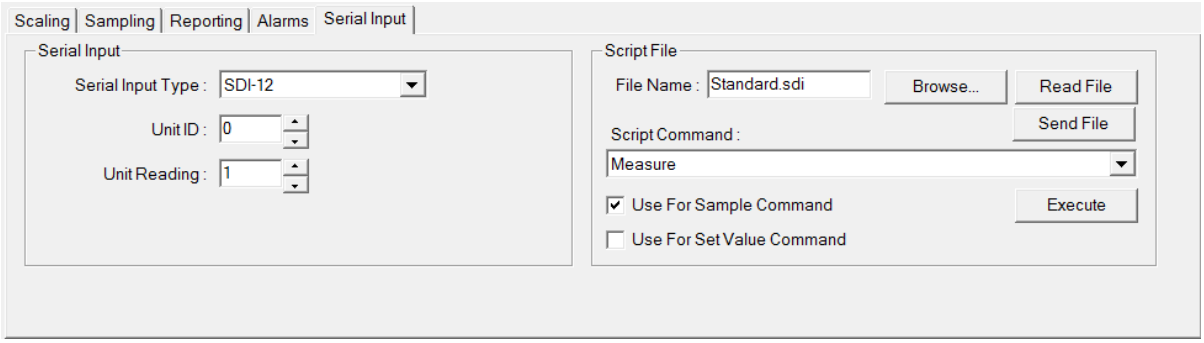
Select the Serial Input Type:

- SDI-12
- Serial Port Input

Select the *Serial Input* sub-page on the *I/O* page to display the selected point serial input

parameters. To review all points, select each point in the *Point List* and check the serial input parameters as they are displayed.

5.10.1 SDI-12 Serial Input



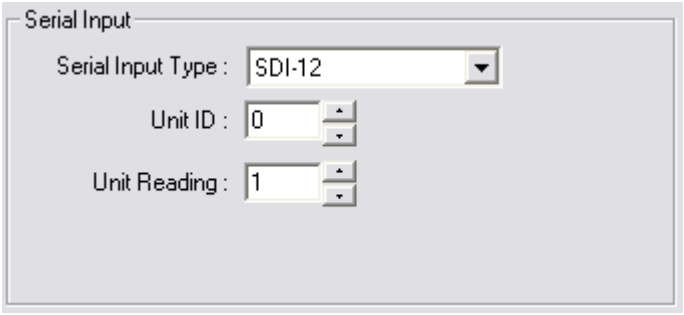
SDI-12 Serial Input parameters are:

- Unit ID — SDI-12 sensor address.
- Unit Reading — Sensor reading position.
- Serial Input Port — DCU communication port connected to a serial data device.
- Script File Name — File containing SDI-12 commands.
- Use for Sample — Script command used to read sensor data.
- Use for Set Value — Script command used to set sensor data value.

5.10.1.1 SDI-12 Sensor Address

Multiple SDI-12 sensors can be connected to the DCU SDI-12 connector. The sensors are addressed with the *Unit ID*. The default SDI-12 address is 0. The SDI-12 Unit ID address range is:

0 - 9, A - Z, a - z.



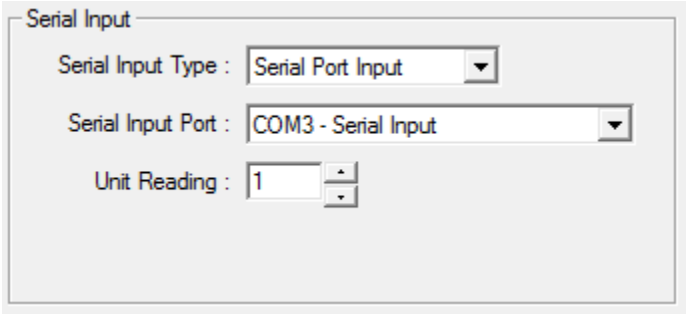
5.10.1.2 SDI-12 Sensor Reading

Some SDI-12 sensors report more than one data reading. Each data reading must be defined as a separate point. Select the *Unit Reading* for the point. Use 1 for the first reading.

5.10.2 Serial Port Inputs

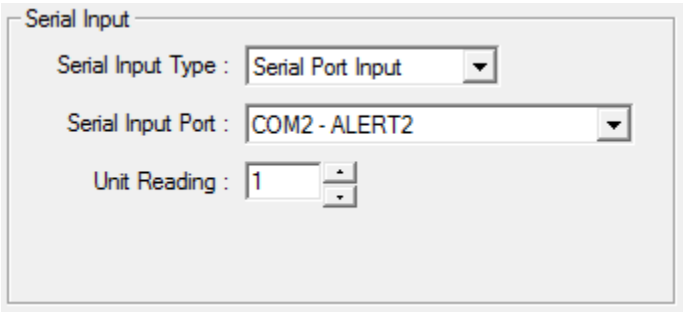
Multiple parameter sensor data values can be read from a serial port at timed intervals. Connect the sensor to a ScadaLynx 50386 DCU serial port.

Set the ScadaLynx 50386 DCU communication port receive format to *Serial Port Input* (see



Communications, Receiver).

5.10.2.1 Serial Port Input



Select the *Serial Input Port* connected to the external data logger. The serial port receive format must be set to *Serial Port Input*.

The ALERT2 Encoder GPS time and status can be read from a serial port. The serial port receive format must be set to *ALERT2*.

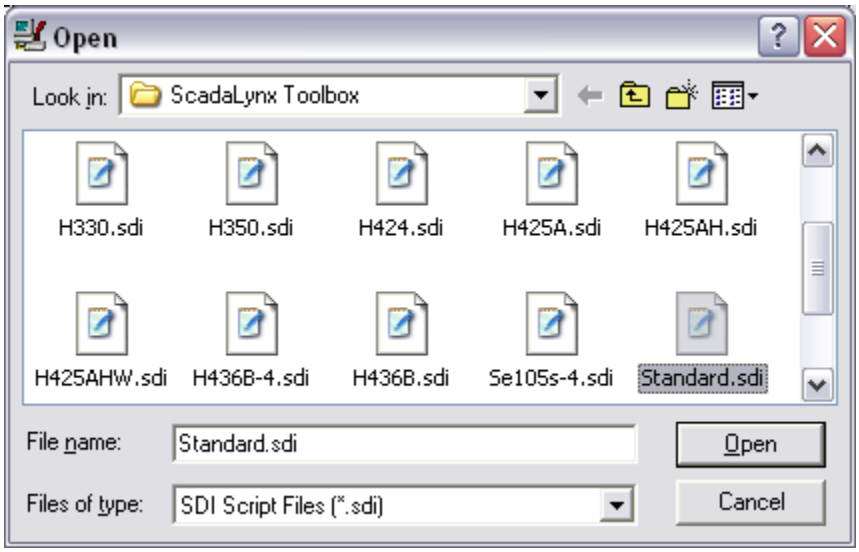
5.10.2.2 Serial Port Input Reading

The *Unit Reading* defines the point data position in the serial report message. Use 1 for the first reading.

5.10.3 Serial Input Script Files

Enter the Script *File Name* for the sensor read by this point.

Serial input points require a *Script File* that contains the command language used to get data from the sensor. The script files usually contain several commands to take a measurement, identify the point, set the unit ID number, and set point data values.



Click **Browse** to pick a file from the list of files provided with the Toolbox. Script files have been provided for serial input sensors tested with the ScadaLynx 50386 DCU. The general purpose script file is named: **Standard.sdi**.

This script file contains documentation on how to write other script files. Serial input script files are documented in Appendix F.

The DCU must have the script file stored in its memory to use the script commands to take an serial input sensor reading. Click **Send File** to force the toolbox to send the script file to the

connected DCU. Click **Read File** to read a script file from the connected DCU.

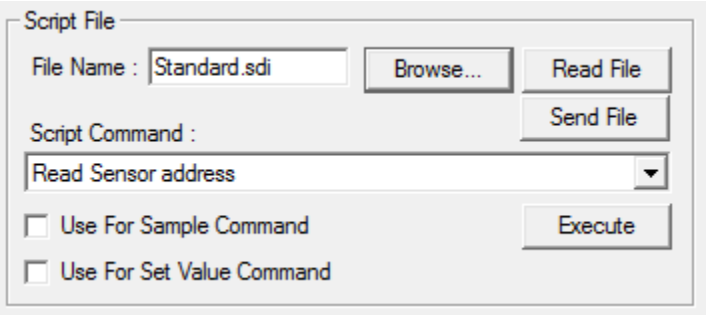
Script files are automatically sent to the connected DCU when the point parameters are sent. To reduce DCU programming time the file is automatically sent only once per connection. The file will not be sent again if the point parameters are sent again unless the file name is changed or the Toolbox disconnects and reconnects to the DCU.

Select the *Script Command* to read the sensor value and check *Use for Sample Command*. This is usually the first command in the script file and often starts with the word *Measure*.

Select the *Script Command* to set the sensor value and check *Use for Set Value Command*. This is usually the a command in the script file with the name *Set Current Value*.

5.10.4 SDI-12 Script Commands

SDI-12 sensors can be read, tested, and programmed with SDI-12 script commands.



To execute a script command on the connected DCU, select the *Script Command* and click **Execute**.

In this example, the SDI-12 sensor address will be read.

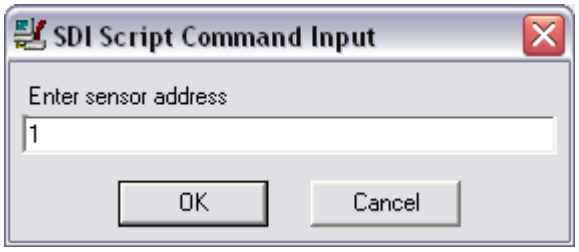
The following commands are available for all SDI-12 scripts:

- Measure - Read the sensor and send a service request when data is available. The sensor responds to this command with a time to wait before data is available and the number of readings that will be returned. The DCU will send a data command to the sensor after waiting the specified time or after a service request is received.
- Concurrent - Available for sensors that support SDI-12 Version 1.2. This command allows the DCU to command several sensors to take readings and then request the sensor data after waiting the specified time. The sensor responds to this command with a time to wait before data is available and the number of readings that will be returned. The sensor will not send a service request when data is available as in the Measure command. The advantage of the Concurrent command is that it frees the DCU to read other sensors while waiting for the SDI-12 sensor measurement to complete.
- Verify - Respond with a sensor dependent self diagnostic message.
- Read Identification - Respond with a string that identifies the sensor and version.
- Read Sensor Address - Send a command using a wild card address to command the connected sensor to respond with its SDI-12 address. Use this command to find a sensor's programmed address. Only one SDI-12 sensor can be connected to the DCU for this command to work.

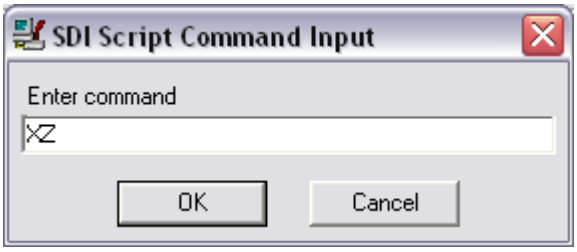
- Write Sensor Address - Set the SDI-12 sensor address. Enter address when prompted by the toolbox program and click **OK** to send the command. In this example, the sensor address is set to 1.

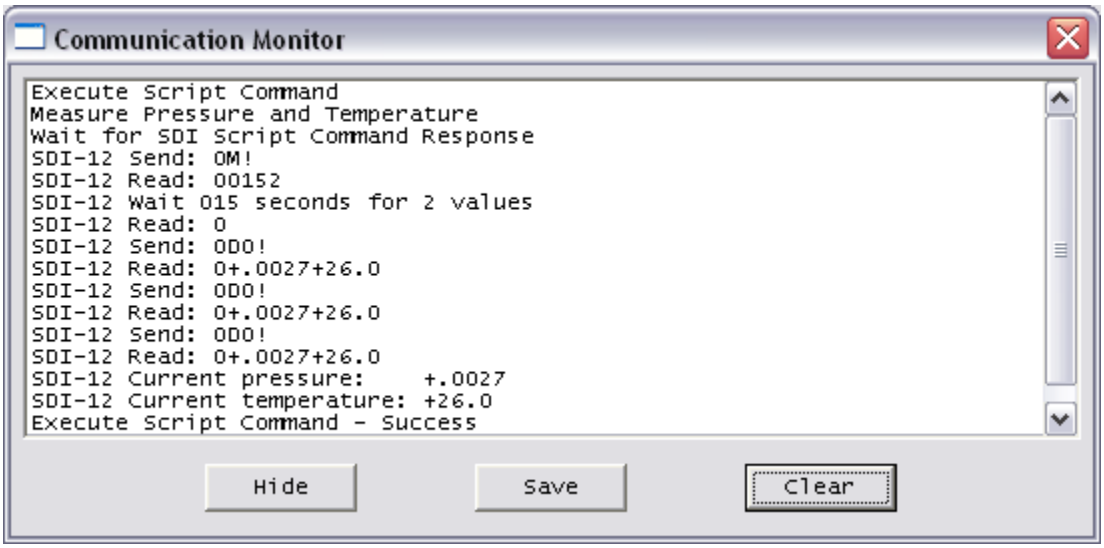
Warning! You must set the SDI unit address for the point to the new address sent to the sensor and send the point parameters to the DCU before you can continue programming the sensor.

- Enter Sensor Address - By default SDI-12 commands are sent using the address assigned to the selected point. Use this command to force the DCU to use a new address when sending SDI-12 commands. Click **OK** to send the command. In this example, the sensor address will be forced to 1.



- Enter Command - Enter a command to send to the SDI-12 sensor. Do not include the sensor address or the end of command character (!). These are added by the DCU program before sending the command to the sensor. In this example, the XZ command is sent to the sensor to force a zero offset.





The Communications Monitor is displayed when an SDI-12 command is executed. Commands sent to the SDI-12 sensor are labeled with SDI-12 Send and sensor responses are labeled with SDI-12 Read. Some commands are repeated by the script to provide redundant responses for error checking. A repeated response must be matched by at least one other response before it is accepted by the DCU. Mismatched responses or timeouts terminate the script command.

5.10.5 Serial Input Examples

5.10.5.1 SDI-12 Single Sensor

Define a single generic SDI-12 sensor as point SI:1. Program the SDI-12 sensor to use address one, set the *Unit ID* to 1, set the *Unit Reading* to 1, select the Standard.sdi script file, and select the *Measure* command.

Point	Unit ID	Unit Reading	Script file	Script Command
SI:1	1	1	Standard.sdi	Measure

5.10.5.2 Multiple SDI-12 Sensors

Define two H350 pressure transducers sensors as points SI:1 and SI:2. Program the first SDI-12 sensor to use address one, set the *Unit ID* to 1, set the *Unit Reading* to 1, select the H350.sdi script file, and the *Measure Pressure* command. Program the second SDI-12 sensor to use address two, set the *Unit ID* to 1, set the *Unit Reading* to 1, select the H350.sdi script file, and the *Measure Pressure* command.

Point	Sensor	Unit ID	Unit Reading	Script file	Script Command
SI:1	Water Level	1	1	H350.sdi	Measure Pressure
SI:2	Water Level	2	1	H350.sdi	Measure Pressure

5.10.5.3 Multiple Readings on one SDI-12 Multi-parameter Sensor

Water quality sensors have multiple parameters in one SDI-12 sensor. Define each water quality parameter as a different point. The parameters and the order they are defined vary with each water quality sensor configuration. For example, define SI:1 for water temperature, SI:2 for conductivity, SI:3 for dissolved oxygen, SI:4 for Ph, and SI:5 for turbidity. Set the Unit ID for each point to 1 and the Unit readings to 1 – 5. Select the Standard.sdi script command and select the *Concurrent* command.

Point	Sensor	Unit ID	Unit Reading	Script file	Script Command
SI:1	Water Temperature	1	1	Standard.sdi	Concurrent
SI:2	Conductivity	1	2	Standard.sdi	Concurrent
SI:3	Dissolved Oxygen	1	3	Standard.sdi	Concurrent
SI:4	Ph	1	4	Standard.sdi	Concurrent
SI:5	Turbidity	1	5	Standard.sdi	Concurrent

5.10.5.4 SDI-12 Wireless Lynx

An SDI-12 Wireless Lynx DCU uses a master radio to communicate with remote sensors. When the master radio is turned on, the remote sensor radios power up and are ready to receive commands. The master radio turns on when it is sent the *Wakeup Remotes* command in the H424.sdi script file.

To insure that the master and remote radios are on when doing remote sensor reads, position the master radio point above all remote sensor points in the *Point List* and set the Script Sample

Command to *Wakeup Remotes.*

Point	Sensor	Unit ID	Unit Reading	Script file	Script Command
SI:1	Wireless Lynx	1	1	H424.sdi	Wakeup Remotes
SI:2	Water Level	2	1	H310.sdi	Measure Pressure and Temperature
SI:3	Water Temperature	2	2	H310.sdi	
SI:4	Remote Battery	2	3	H310.sdi	Measure 12V PS

5.10.5.5 ALERT2 GPS Status

The ALERT2 GPS time and status are read from the serial port connected to the ALERT2 Encoder. The GPS status can be transmitted to the base station on event change and timed intervals by adding the GPS status point as a Serial Input sensor type using the GPSSER.sdi script file. This script file has only one command: *Measure.*

Point	Sensor	Serial Input Port	Unit Reading	Script file	Script Command
SI:10	GPS Time Status (lock)	COM2	1	GPSSER.sdi	Measure

5.11 Point Power Up

Select the *Power Up* sub-page on the *I/O* page to display the selected point power up parameters. To review all points, select each point in the *Point List* and check the power up parameters as they are displayed.

The *Power Up State* of a digital output, analog output, or virtual point type can be defined to:

- Use Last Memory Value Use last state set by an input point, control action or communication packet.
- Use Programmed Value Set the state to the Power Up Programmed Value.

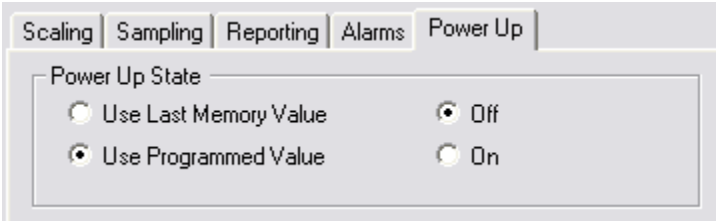
Point power up states are set when the DCU is powered up, reset, or the point parameters are sent to the connected DCU by the Toolbox. The power up state or value sets the point scaled data value. The raw data is computed using the point scaling.

The power up state or value of an input point (AI, DI, UD, PC, SI) is the last data value read from the sensor. The data value is not valid until the sensor is read at the next sample time. Digital Inputs (DI) and counters (UD, PC) are read from the I/O PIC at power up.

5.11.1 Digital Point Power Up

Digital output Power Up *Programmed Values* are:

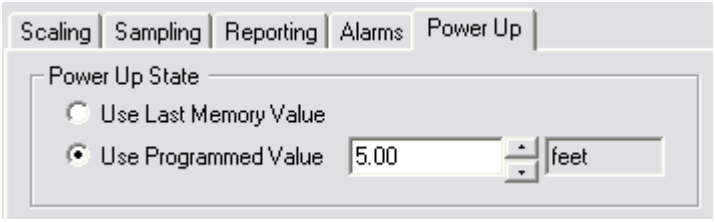
- Off
- On



In this example, the digital output point is set to the *Off* state at power up or reset.

5.11.2 Non-Digital Point Power Up

Analog output or Virtual point *Power Up Programmed Values* are defined in scaled data units. In this example the analog output point scaled data value is set to 5.0 feet at power up or reset.

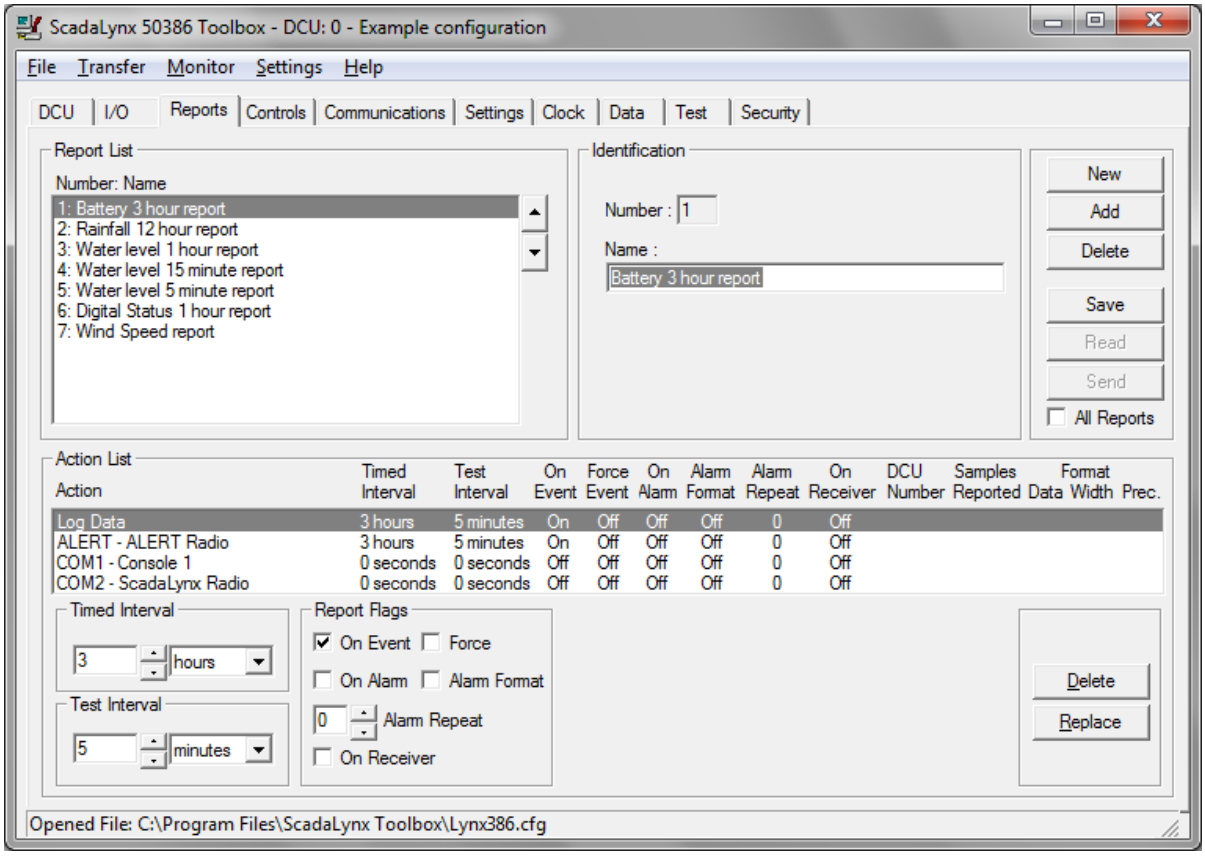


6. Reports

A reporting scheme defines when point data is read, logged and transmitted on communication ports. Reporting schemes contain a set of report actions. The first report action defines when point data is logged. The other report actions define when point data reports are transmitted on communication ports. Each report action defines timed and test intervals, event and alarm report flags, format use, repeat count, and DCU report parameters.

Point reporting assigns a reporting scheme to a point report test (see Point Reporting). More than one point can be assigned to the same reporting scheme.

Select the *Reports* page to view, edit, add, delete, save, read or send reporting schemes.



6.1 Reporting Scheme Identification

Reporting schemes are numbered starting with the *Number* 1. The Toolbox assigns the reporting scheme numbers as new reporting schemes are added. Renumber a reporting scheme by changing its position with the *Report List* up/down arrow buttons.

The reporting scheme *Name* identifies the reporting scheme when assigning it to point reporting. Reporting scheme names should be unique and can be up to 40 characters long.

6.2 Add a Reporting Scheme

It is easier to copy a reporting scheme with all its report actions than to create a new one.

5. Select the reporting scheme to copy in the *Report List* and click **Add** or Click **New** to append a blank reporting scheme.
6. Change the reporting scheme *Name*.
7. Reposition the reporting scheme with the *Report List* up/down arrow buttons and click **Save**.

6.3 Delete a Reporting Scheme

3. Select the reporting scheme in the *Report List* and click **Delete** or check **All Reports** and click Delete to delete all reporting schemes.
4. The Toolbox will ask for delete confirmation. Click **OK** to delete.
5. Click **Save** to delete the reporting scheme(s) from the configuration file.

Deleting a reporting scheme in the middle of the *Report List* renumbers the reporting schemes. When a reporting scheme is deleted or repositioned, reporting scheme numbers are renumbered in point reporting.

Note: After adding, deleting, or repositioning a reporting scheme, send all reports to the DCU. If point reporting schemes are renumbered, send all points to the DCU.

Warning! Deleting a reporting scheme that is assigned to a point prevents the point from logging or reporting data. Check that all point reporting assignments are still defined.

6.4 Read Reporting Schemes

The **Read** button on the *Reports* page reads the selected reporting scheme report actions into the Toolbox memory from the connected DCU and updates the Toolbox display. Check **All Reports** to read all reporting schemes.

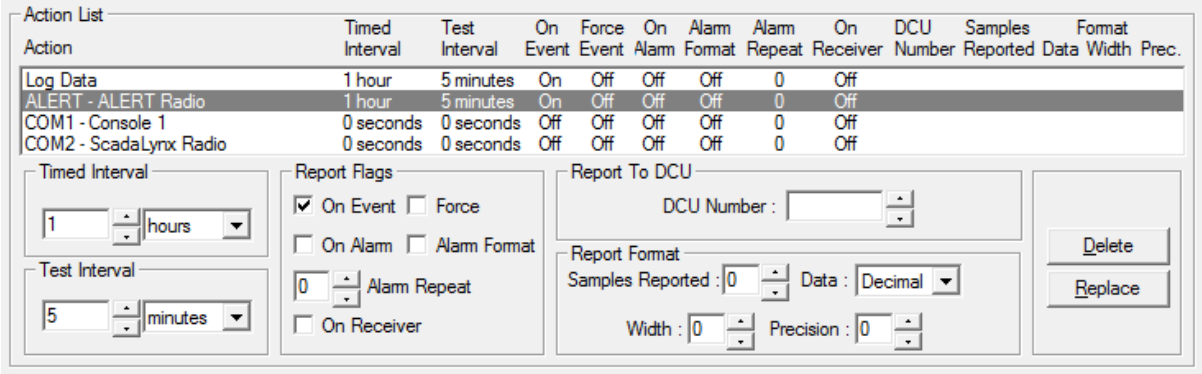
This button does not read all the DCU configuration parameters. Use the **Read All Parameters** button on the *DCU* page or *Read All Parameters* in the Transfer menu pull-down to read all parameters.

6.5 Send Reporting Schemes

The **Send** button on the *Reports* page sends the selected reporting scheme report actions in the Toolbox memory to the connected DCU. The current configuration is also saved to the disk file name shown in *DCU Identification*. Check **All Reports** to send all reporting schemes.

This button does not send all the DCU configuration parameters. Use the **Send All Parameters** button on the *DCU* page or *Send All Parameters* in the Transfer menu pull-down to send all parameters.

6.6 Report Actions



Each report action can have different intervals and flags set. For example, point data can be logged at a different interval than it is transmitted on a communication port.

6.6.1 Edit a Report Action

1. Select a report action in the Action List.
2. Edit the report action parameters.
3. Click **Replace**.

Report action intervals are:

- Timed Interval — Sample point data on this interval and report without testing point data. Enter zero to disable timed interval reporting.
- Test Interval — Sample point data on this interval and report if point reporting test criteria is met. Enter zero to disable test interval reporting.

Reporting scheme report flags are:

- On Event — Report when a point event flag is set. Events are point data changes that occur other than on the timed or test intervals. Digital inputs and counters can be programmed to set the event flag on change. Communication and control commands that change point data values also set the point event flag.
- Force — Report immediately on events, do not use event offset delays.
- On Alarm — Report when a point alarm flag is set. A point alarm flag is set when an alarm criteria is active. The point alarm flag overrides communication port hold off timers. It will also change the reporting format if the use alarm format box below is checked.
- Alarm Format — Check to use the communication port alarm format when a point alarm flag is set. For example, the Complementary Pair alarm format can be used to control a remote station. The alarm format on a GOES radio will transmit the data using the random reporting channel.
- Alarm Repeat — Number of times to repeat an alarm report. The default is to report with no repeats. A repeat count of 1 will transmit 2 reports.
- On Receiver — Report on receiver radio, not transmit radio.

Reporting scheme Report to DCU parameters are:

- DCU Number Destination DCU number for a self report packet. Required by reporting protocols use destination addressing (e.g. ScadaLynx). For ALERT2 remote control set the source address of the remote station to be controlled. This number is transmitted as the destination address on the ALERT2 MANT header. Leave this field blank if not required.

Reporting scheme Report Format parameters (Orbcomm format only) are:

- Samples Reported Number of samples in data packet .
- Data Data format: decimal, hexadecimal, 64base binary.
- Width Data field width.
- Precision Shift data decimal to right by this precision then report integer.

6.6.2 Delete a Report Action

1. Select a report action in the Action List.
2. Click Delete. The report action parameters are cleared.

6.6.3 Report Action Examples

Several reporting scheme examples are described below.

6.6.3.1 Timed and Sample Interval Reporting

Action List

Action	Timed Interval	Test Interval	On Event	Force Event	On Alarm	Alarm Format	Alarm Repeat	On Receiver	DCU Number	Samples Reported	Format Data	Format Width	Format Prec.
Log Data	3 hours	5 minutes	On	Off	Off	Off	0	Off					
ALERT - ALERT Radio	3 hours	5 minutes	On	Off	Off	Off	0	Off					
COM1 - Console 1	0 seconds	0 seconds	Off	Off	Off	Off	0	Off					
COM2 - ScadaLynx Radio	0 seconds	0 seconds	Off	Off	Off	Off	0	Off					

- Log and transmit point data on ALERT1 radio every 3 hours.
- Sample point data every 5 minutes, log report and transmit on ALERT1 radio if point reporting criteria are met.
- Do not report on events.
- Do not report alarms or use alarm formatting.

Assign this reporting scheme to analog, digital, and serial point types.

6.6.3.2 Timed and Event Reporting

Action List

Action	Timed Interval	Test Interval	On Event	Force Event	On Alarm	Alarm Format	Alarm Repeat	On Receiver	DCU Number	Samples Reported	Format Data	Format Width	Format Prec.
Log Data	12 hours	5 minutes	On	Off	Off	Off	0	Off					
ALERT - ALERT Radio	12 hours	5 minutes	On	On	Off	Off	0	Off					
COM1 - Console 1	0 seconds	0 seconds	Off	Off	Off	Off	0	Off					
COM2 - ScadaLynx Radio	0 seconds	0 seconds	Off	Off	Off	Off	0	Off					

- Log and transmit point data on ALERT1 radio every 12 hours.
- No sample interval.

- When a point event flag is set, log report and transmit on ALRET radio.
- Force report, override transmit event offset.
- Do not report alarms or use alarm formatting.

Assign this reporting scheme to rainfall sensors.

6.6.3.3 Event Only Reporting

Action List

Action	Timed Interval	Test Interval	On Event	Force Event	On Alarm	Alarm Format	Alarm Repeat	On Receiver	DCU Number	Samples Reported	Format Data Width	Format Prec.
Log Data	0 seconds	0 seconds	On	Off	Off	Off	0	Off				
ALERT - ALERT Radio	0 seconds	0 seconds	On	Off	Off	Off	0	Off				
COM1 - Console 1	0 seconds	0 seconds	Off	Off	Off	Off	0	Off				
COM2 - ScadaLynx Radio	0 seconds	0 seconds	Off	Off	Off	Off	0	Off				

- Log and transmit point data on ALERT1 radio on events only.
- No timed or sample interval or alarm reporting.

Assign this reporting scheme to ALERT1 wind sensors.

6.6.3.4 Alarm Reporting

Action List

Action	Timed Interval	Test Interval	On Event	Force Event	On Alarm	Alarm Format	Alarm Repeat	On Receiver	DCU Number	Samples Reported	Format Data Width	Format Prec.
Log Data	1 hour	5 minutes	On	Off	Off	Off	0	Off				
ALERT - ALERT Radio	1 hour	5 minutes	On	Off	On	On	2	Off				
COM1 - Console 1	0 seconds	0 seconds	Off	Off	Off	Off	0	Off				
COM2 - ScadaLynx Radio	0 seconds	0 seconds	Off	Off	Off	Off	0	Off				

- Log and transmit point data on ALERT1 radio every 1 hour.
- Sample point data every 5 minutes, log report and transmit on ALERT1 radio if point reporting criteria are met.
- When a point event flag is set, log report and transmit on ALERT1 radio. Force event is not required for alarms since alarms always override event transmit offset.
- When a point alarm flag is set, log report and transmit on ALERT1 radio using alarm format with 2 alarm repeats (3 reports total).

Assign this reporting scheme to points with alarms defined to transmit a control command in an alarm format to a remote DCU.

6.6.3.5 Log Data Only Reporting

Action List

Action	Timed Interval	Test Interval	On Event	Force Event	On Alarm	Alarm Format	Alarm Repeat	On Receiver	DCU Number	Phone Number
Log Data	1 hour	5 minutes	On	Off	Off	Off	0	Off		
ALERT - ALERT Radio	0 seconds	0 seconds	Off	Off	Off	Off	0	Off		
COM1 - Console 1	0 seconds	0 seconds	Off	Off	Off	Off	0	Off		
COM2 - ScadaLynx Radio	0 seconds	0 seconds	Off	Off	Off	Off	0	Off		

- Log point data every 1 hour. Do not transmit on ALERT1 radio.
- Sample point data every 5 minutes, log report if point reporting criteria are met.
- When a point event or alarm flag is set, log report

Assign this reporting scheme to points with alarms that trigger control actions but whose data is not needed at the base station.

6.6.3.6 ALERT1 and GOES Radio Reporting

Action List

Action	Timed Interval	Test Interval	On Event	Force Event	On Alarm	Alarm Format	Alarm Repeat	On Receiver	DCU Number	Phone Number
Log Data	15 minutes	5 minutes	Off	Off	Off	Off	0	Off		
ALERT - ALERT Transmitter	1 hour	5 minutes	Off	Off	Off	Off	0	Off		
COM1 - Console 1	0 seconds	0 seconds	Off	Off	Off	Off	0	Off		
COM2 - GOES Radio	15 minutes	0 seconds	Off	Off	Off	Off	0	Off		

- Log point data every 15 minutes.
- Transmit point data on ALERT1 radio every 1 hour.
- Sample point data every 5 minutes, log report and transmit on ALERT1 radio if point reporting criteria are met.
- Transmit point data to the GOES radio buffer every 15 minutes. The GOES radio will transmit its buffered data using parameters defined in the communication port configuration.

Assign this reporting scheme to points that transmit data reports on the ALERT1 and GOES radio.

6.6.3.7 Log Data for Polled Reporting

Action List

Action	Timed Interval	Test Interval	On Event	Force Event	On Alarm	Alarm Format	Alarm Repeat	On Receiver	DCU Number	Phone Number
Log Data	1 hour	5 minutes	On	Off	Off	Off	0	Off		
ALERT - ALERT Radio	0 seconds	0 seconds	Off	Off	Off	Off	0	Off		
COM1 - Console 1	0 seconds	0 seconds	Off	Off	Off	Off	0	Off		
COM2 - ScadaLynx Radio	0 seconds	0 seconds	Off	Off	Off	Off	0	Off		

- Log point data every 1 hour. Do not transmit on ALERT1 or ScadaLynx radio.
- Sample point data every 5 minutes, log report if point reporting criteria are met.
- When a point event flag is set, log report.

Assign this reporting scheme to points that do not self report but are polled to retrieve logged data.

6.6.3.8 ALERT1 and ScadaLynx Radio Reporting

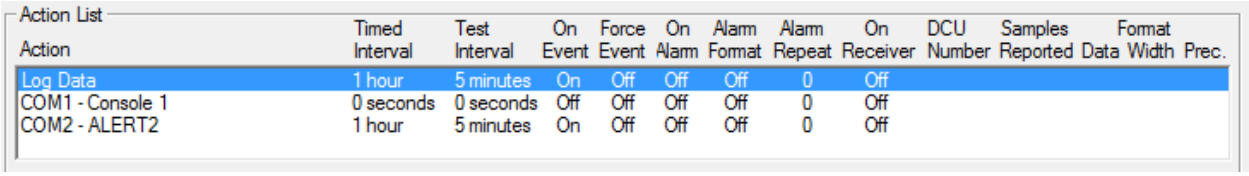
Action List

Action	Timed Interval	Test Interval	On Event	Force Event	On Alarm	Alarm Format	Alarm Repeat	On Receiver	DCU Number	Phone Number
Log Data	1 hour	5 minutes	On	On	Off	Off	0	Off		
ALERT - ALERT Radio	12 hours	0 seconds	On	On	Off	Off	0	Off		
COM1 - Console 1	0 seconds	0 seconds	Off	Off	Off	Off	0	Off		
COM2 - ScadaLynx Radio	1 hour	5 minutes	On	Off	Off	Off	0	Off		

- Log and transmit point data on ScadaLynx radio every 1 hour.
- Transmit point data on ALERT1 radio every 12 hours.
- Sample point data every 5 minutes, log report and transmit on ALERT1 and ScadaLynx radio if point reporting criteria are met.
- When a point event flag is set, log and transmit point data on ALERT1 and ScadaLynx radio.

Assign this reporting scheme to points that report on the ALERT1 and ScadaLynx radio.

6.6.3.9 ALERT2 Radio Reporting



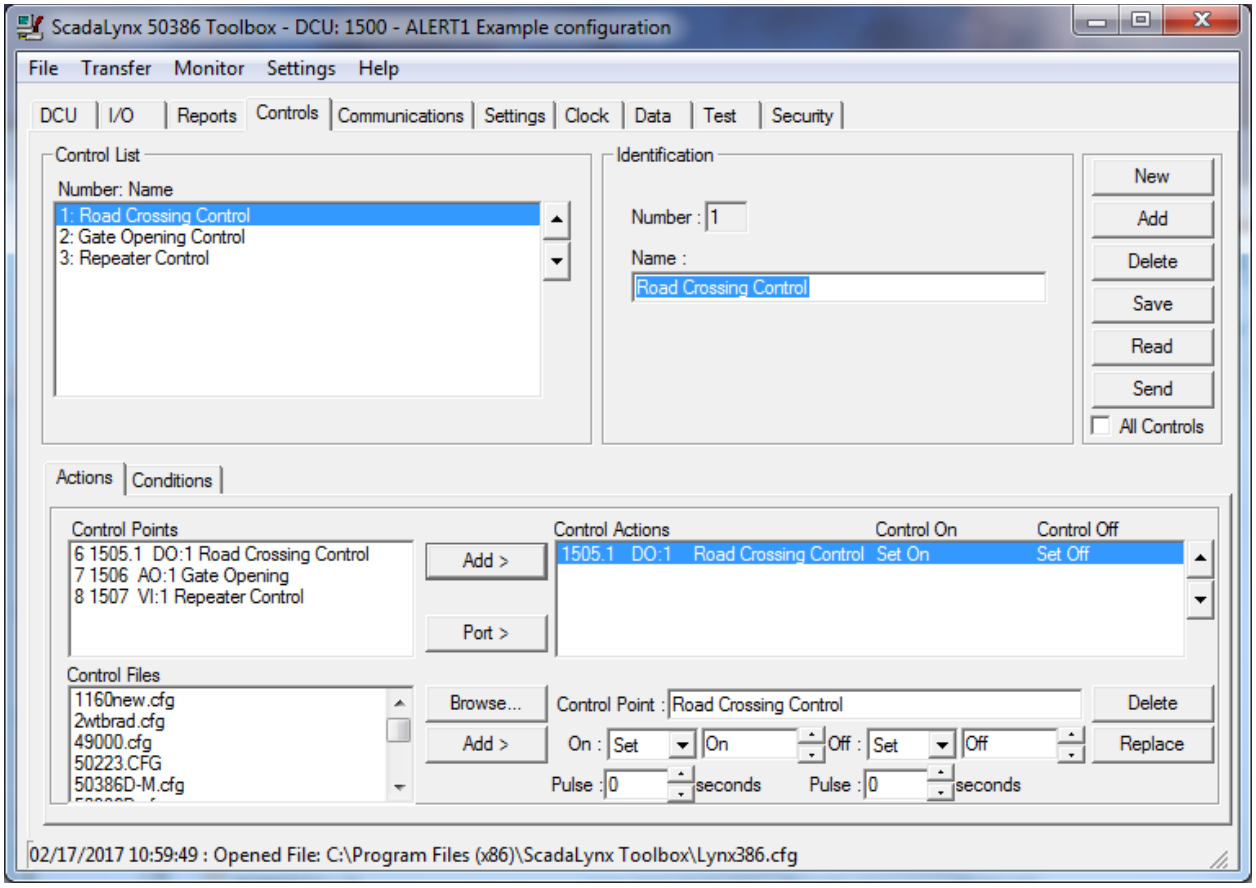
- Log and transmit point data on ALERT2 radio every 1 hour.
- Sample point data every 5 minutes, log report and transmit on ALERT2 radio if point reporting criteria are met.
- When a point event flag is set, log and transmit point data on ALERT2 radio.

Assign this reporting scheme to points that report on the ALERT2 radio.

7. Controls

A control group defines control actions that are executed when the control is turned on or off. More than one control action can be assigned to a control group. Control actions include turning a digital output on or off, writing a value to an analog output or virtual point, and changing the DCU configuration file. Control actions are executed when point alarm criteria are met. A point alarm is assigned to a control group. More than one point alarm can be assigned to the same control group.

Select the *Controls* page to view, edit, add, delete, save, read or send control group.



7.1 Control Group Identification

Control groups are numbered starting with the *Number* 1. The Toolbox assigns the control group numbers as new control groups are added. Renumber a control group by changing its position with the *Control List* up/down arrow buttons.

The control group *Name* identifies the control group when assigning it to a point alarm. Control group names should be unique and can be up to 40 characters long.

7.2 Add a Control Group

It is easier to copy a control group with similar control parameters than to create a new one. When a control group is copied, all the control group parameters in the *Control* sub-pages are also copied.

1. Select the control group to copy in the *Control List* and click **Add** or click **New** to append a blank control group.
2. Change the control group *Name*.
3. Reposition the control group with the *Control List* up/down arrow buttons and click **Save**.

Note: After adding, deleting, or repositioning a control group, send all controls to the DCU. If point alarm control groups are renumbered, send all points to the DCU

7.3 Delete a Control Group

1. Select the control group to delete in the *Control List* and click **Delete** or check **All Controls** and click **Delete** to delete all control groups**.**
2. The Toolbox will ask for delete confirmation. Click **OK** to delete.
3. Click **Save** to delete the control group in the configuration file.

Deleting a control group in the middle of the *Control List* renumbers the control groups. When a control group is deleted or repositioned, control group numbers are renumbered in point alarms.

Note: After adding, deleting, or repositioning a control group, send all controls to the DCU. If point alarm control groups are renumbered, send all points to the DCU.

Warning! Deleting a control group that is assigned to a point alarm prevents the point alarm from executing a control. Check that all point alarm controls are still defined.

7.4 Read Control Groups

The **Read** button on the *Controls* page reads the selected control group parameters into the Toolbox memory from the connected DCU and updates the Toolbox display. Check **All Controls** to read all control groups.

This button does not read all the DCU configuration parameters. Use the **Read All Parameters** button on the *DCU* page or *Read All Parameters* in the Transfer menu pull-down to read all parameters.

7.5 Send Control Groups

The **Send** button on the *Controls* page sends the selected control actions in the Toolbox memory to the connected DCU. The current configuration is also saved to the disk file name shown in *DCU Identification*. Control parameters include the identification, actions, and condition parameters in the *Control* sub-pages. Check **All Controls** to send all control groups.

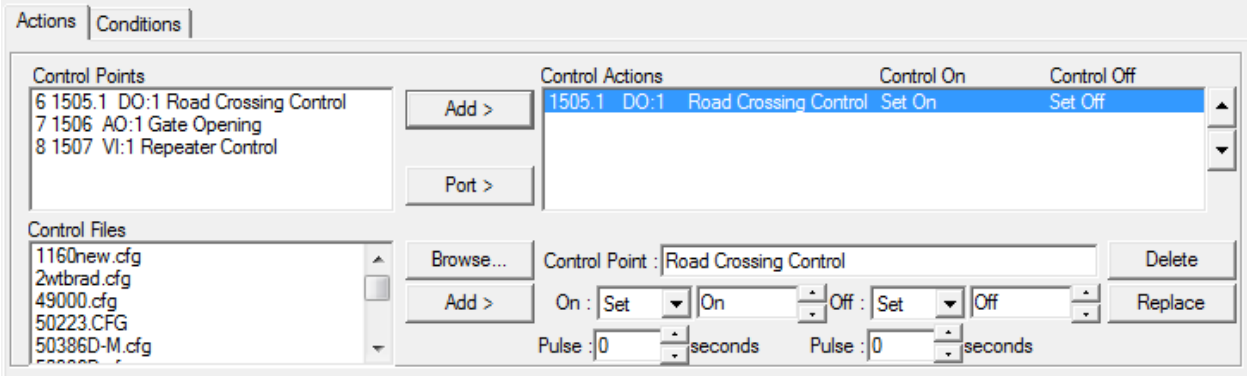
If a control action uses a configuration file, the file is sent when the control parameters are sent. To reduce DCU programming time the file is automatically sent only once per connection. The file will not be sent again if the point parameters are sent again unless the file name is changed or the Toolbox disconnects and reconnects to the DCU.

This button does not send all the DCU configuration parameters. Use the **Send All Parameters** button on the *DCU* page or *Send All Parameters* in the Transfer menu pull-down to send all parameters.

7.6 Control Actions

Multiple control actions can be assigned to a control group. Control actions types are:

- Digital output point control — Set scaled state of a digital output point.
- Analog output point control — Set scaled data value of an analog output point.
- Remote control — Set scaled data value of a virtual point to be reported on a communication port using an alarm format.
- File control action — Load a new configuration file.
- Port control action — Transmit data on a communication port.



7.6.1 Edit a Control Action

1. Select the control action in the *Control Actions* list.
2. Edit the control action parameters and click **Replace**.
3. Reposition the action with the *Control Actions* list up/down arrow buttons and click **Save**.

The control action parameters are:

- On — Control action and scaled data value when control is turned on.
  - Set — Set scaled data value in control point.
  - None — No action, do not change control point data value.
  - Add — Add scaled data value to control point data value.
  - Tsync — Set the DCU time to the point report time.
  - Reset — Restart the DCU application program.
- Off — Control action and scaled data value when control is turned off.
  - Set — Set scaled data value in control point.
  - None — No action, do not change control point data value.
  - Add — Add scaled data value to control point data value
- Pulse — Turn off control after number of seconds.
- Control File — Configuration file to load when control is turned on. There is no control off action.

7.6.2 Add a Control Action

1. Select an output point from the *Control Points* list or a configuration file from the *Control Files* list. Click **Browse** to search for a control file. An open file dialogue window is opened. Select the file and click **Open**.

2. Click **Add** to append the control point or file to the *Control Actions* list.
3. Edit the control action parameters and click **Replace**.
4. Reposition the action with the Control Actions list up/down arrow buttons and click **Save**.

7.6.3 Delete a Control Action

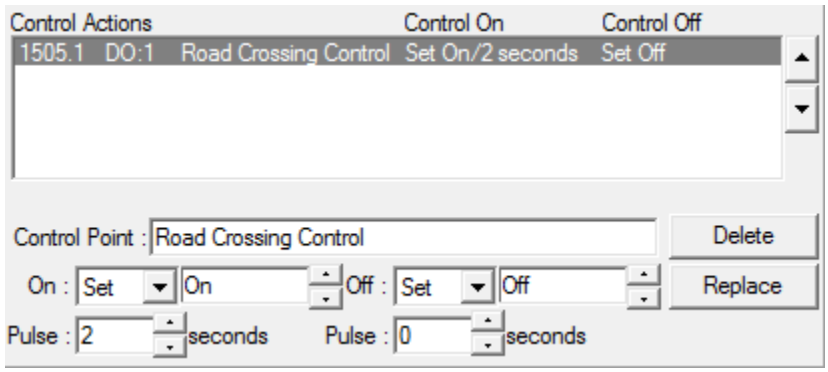
1. Select the control action in the *Control Actions* list.
2. Click **Delete** to remove it from the *Control Actions* list.

7.6.4 Control Action Examples

7.6.4.1 Digital Output Control Action

In this example, when the control is turned on the Road Crossing Control digital output scaled data state is set to 1 (on) for two (2) seconds and then turned off.

When the control is turned off the Road Crossing Control digital output scaled data state is set to 0 (off).

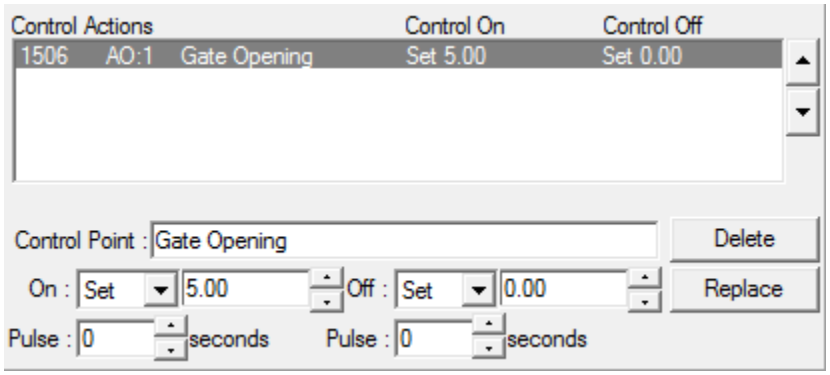


Note: The scaled control state is converted to the raw state with point scaling before the physical output state is set.

7.6.4.2 Analog Output Control Action

In this example, when the control is turned on the Gate Opening analog output scaled data is set to 5.00 feet.

When the control is turned off the Gate Opening analog output scaled data is set to 0.00 feet.

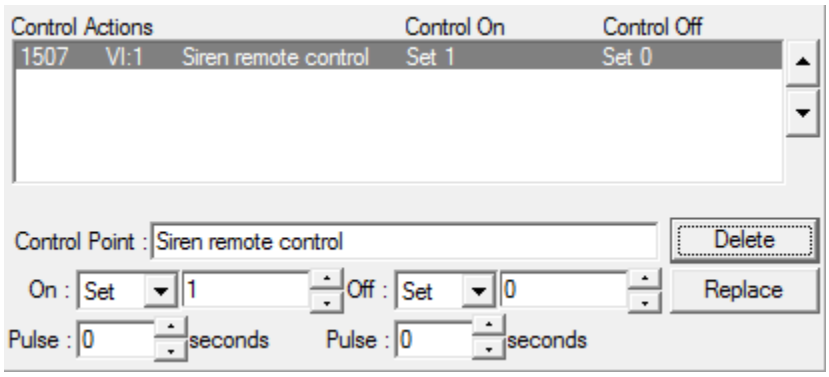


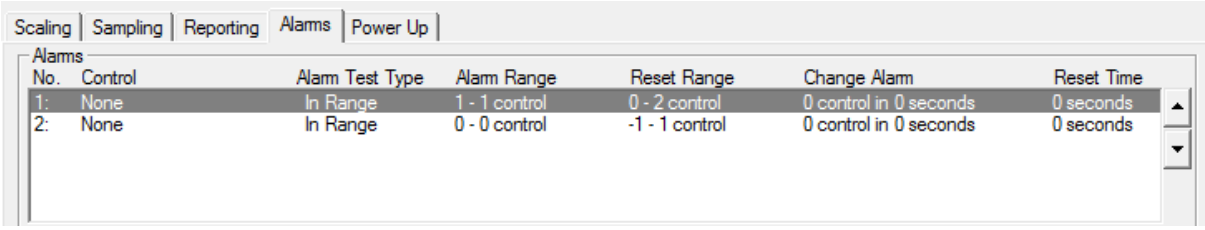
Note: The scaled control data value is converted to the raw data value with point scaling before the physical output value is set.

7.6.4.3 Remote Control Action

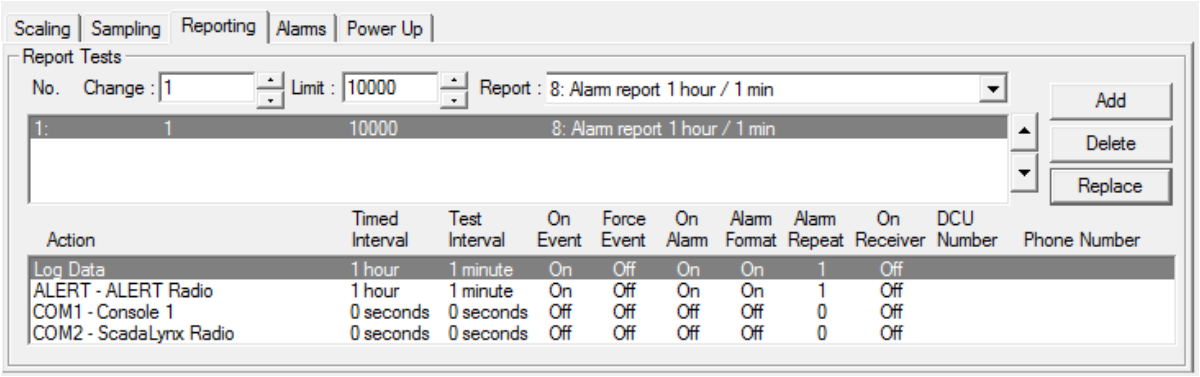
Remote Control Actions set virtual point scaled data to control on and off states.

The control point must have alarms defined for the control states to force a report on a communication port using an alarm format.





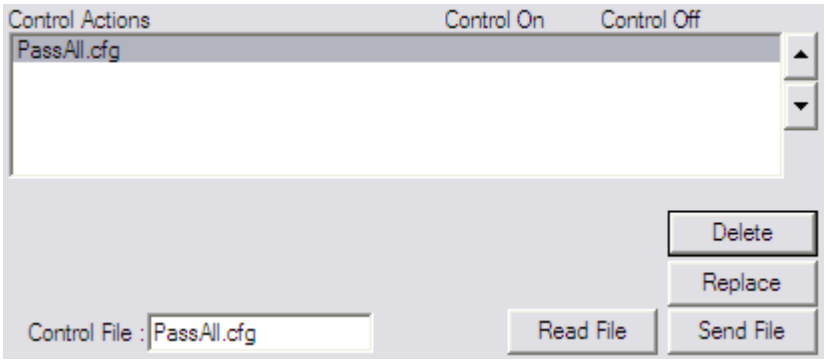
In this example, the Siren remote control point has on control on state of 1 and a control off state of 0. Both the control on and off states are defined as alarm conditions but are not assigned to another control. The point alarm flag is set to force a report using the alarm format and alarm repeat count as shown below.



The alarm format is define in the communication port transmit sub-page.

7.6.4.4 File Control Action

In this example, the PassAll.cfg configuration file is loaded to change the ALERT1 radio port repeater pass/block list to pass all reports.



Note: The control file action forces the DCU to read a new configuration file and restart its operations for the new configuration.

The DCU must have the configuration file stored in its memory to read when the control action is executed. Click **Send File** to force the toolbox to send the configuration file to the connected DCU. Click **Read File** to read a configuration file from the connected DCU.

Control configuration files are automatically sent to the connected DCU when the control parameters are sent. To reduce DCU programming time the file is automatically sent only once per connection. The file will not be sent again if the control parameters are sent again unless the file name is changed or the Toolbox disconnects and reconnects to the DCU.

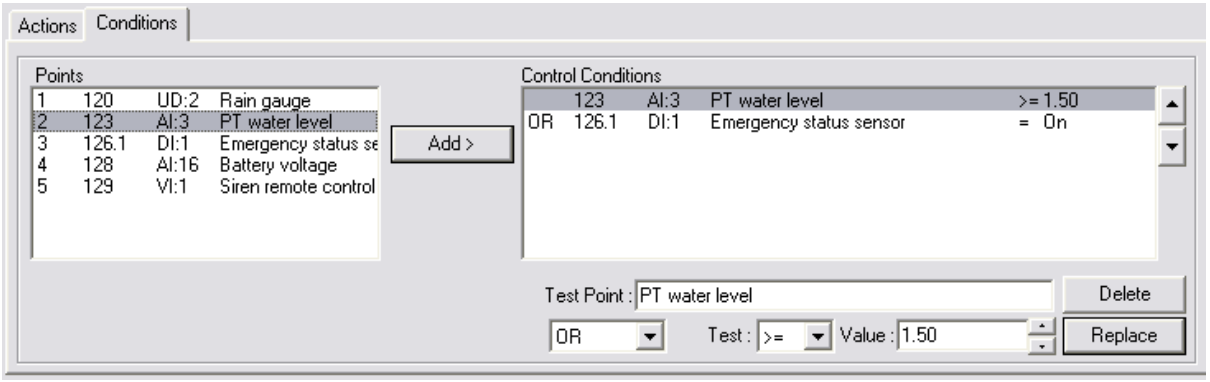
7.6.4.5 Port Control Action

Select the communication port to transmit data when the control action is turned on.

The current data values for points that normally report on this communication port are transmitted.

7.7 Control Conditions

Control conditions can be defined that set criteria to be met before a control is turned on. Multiple control conditions can be defined for different points or the same point.



7.7.1 Edit a Control Condition

1. Select the control condition in the *Control Conditions* list.
2. Edit the control condition parameters and click **Replace**.
3. Reposition the control condition with the *Control Conditions* list up/down arrow buttons and click **Save**.

The selected point scaled data value is compared to a test value using the test criteria. The control is turned on if the test criteria are met.

- OR/AND Multiple condition Boolean test.
  - OR Turn on control if any criterion is met. Turn off when all criteria are not met.

  - AND Turn on control if all criteria are met. Turn off if any criterion is not met.
- Test Test criteria operator
  - = equal
  - != not equal
  - > greater than
  - >= greater or equal
  - < less than
  - <= less or equal
- Value Test value compared to point scaled data value.

7.7.2 Add a Control Condition

1. Select a point from the *Points* list.
2. Click **Add** to append the point to the *Control Conditions* list.
3. Edit the control condition parameters and click **Replace**.
4. Reposition the control condition with the *Control Conditions* list up/down arrow buttons and click **Save**.

7.7.3 Delete a Control Condition

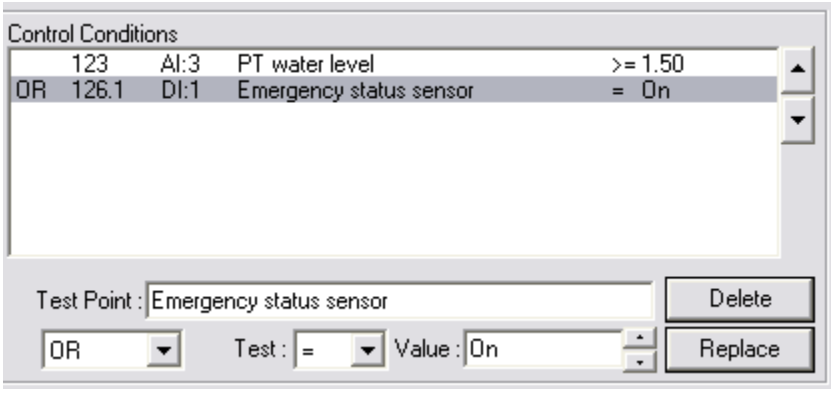
1. Select the control condition in the *Control Conditions* list.
2. Click **Delete** to remove it from the *Control Conditions* list.

7.7.4 Control Condition Examples

7.7.4.1 Turn on Control When Any Condition Met

The control is turned on when the PT water level reaches 1.50 feet **or** if the Emergency status sensor turns on.

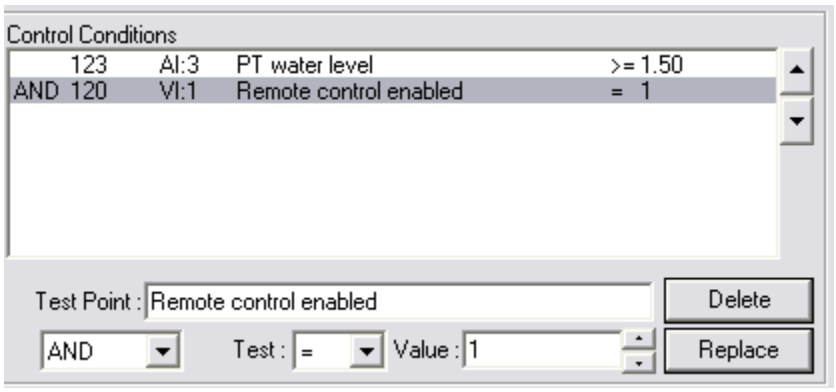
The control is turned off if the PT water level drops below 1.50 feet **and** the Emergency status sensor turns off.



7.7.4.2 Turn on Control When All Conditions Met

The control is turned on when the PT water level reaches 1.50 feet **and** if the Remote control enabled sensor value is 1.

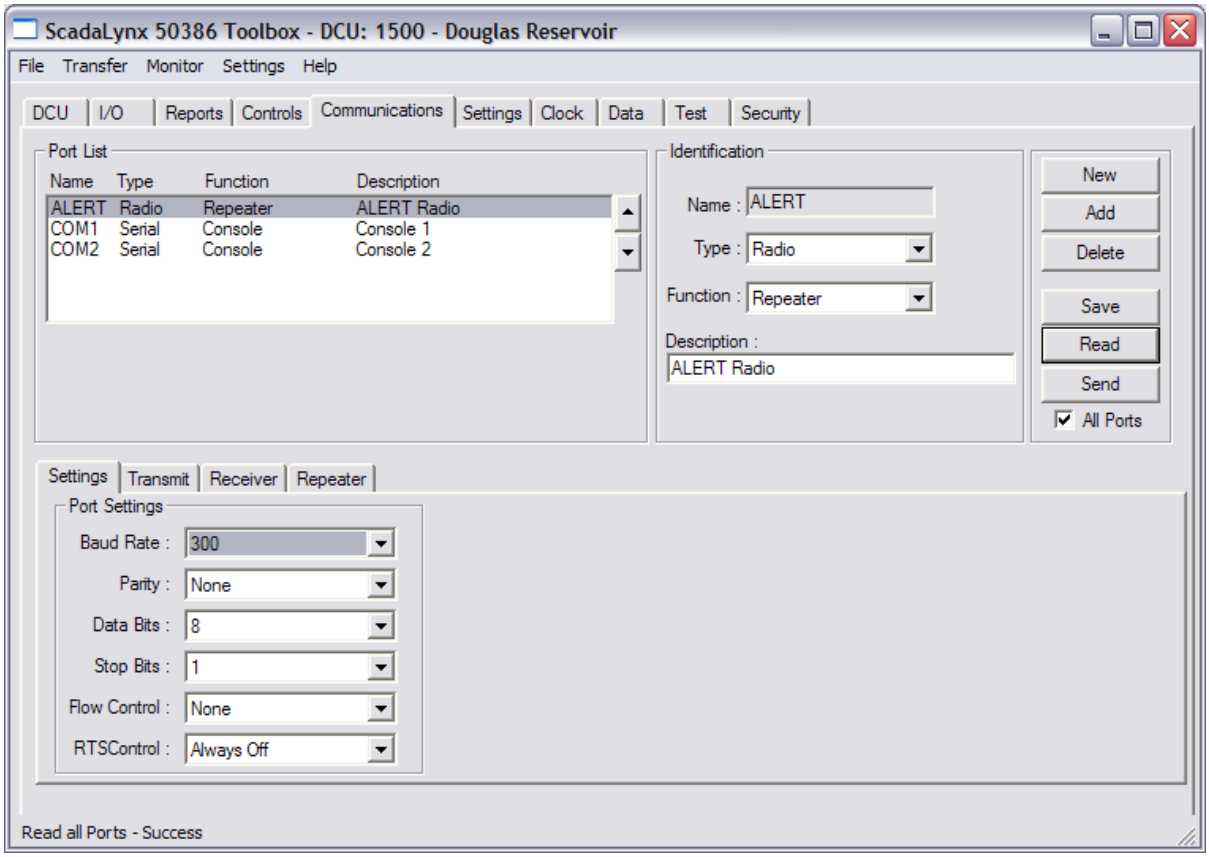
The control is turned off if the PT water level drops below 1.50 feet **or** the Remote control enabled sensor value is not 1.



8. Communication Ports

The ScadaLynx 50386 DCU has an ALERT1 radio port and up to 6 communication ports (two ports are standard) that can be setup as consoles, transmitters, receivers, or repeaters.

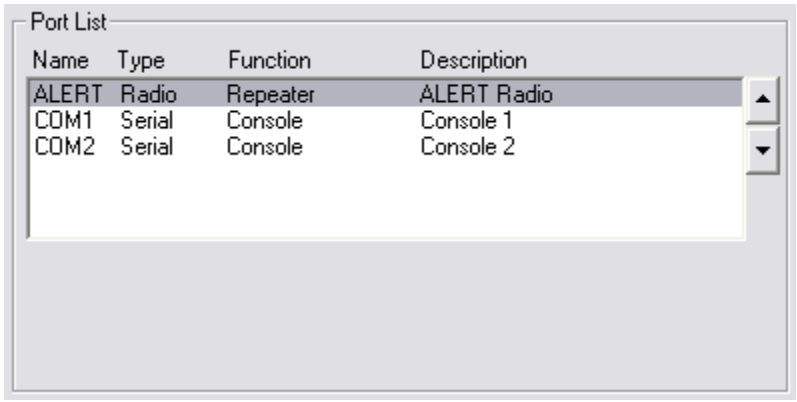
Select the *Communications* page to view, edit, add, delete, save, read or send port parameters.



8.1 Communication Port Identification

The *Port List* displays the port identification:

- Port Name
- Port Type
- Port Function
- Port Description



Select a port on the *Port List* to display its parameters on the *Communication* sub-pages.

8.1.1 Port Name

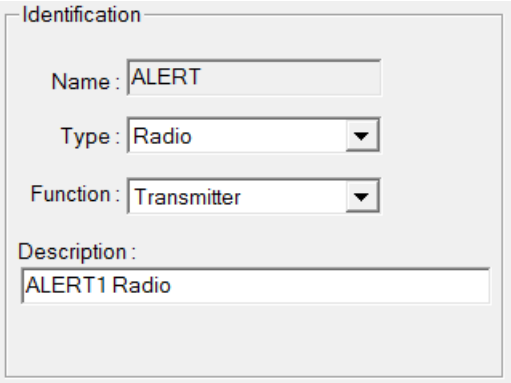
The port *Name* describes the physical port connection:

- ALERT DCU radio port for ALERT1 transmitter and receiver.
- COM1 DCU SLB COM1 port. Used primarily for Toolbox programming.
- COM2 DCU SLB COM2 port. Used to connect to modems or radios.
- COM3 DCU Communication Add-on board COM3 port.
- COM4 DCU Communication Add-on board COM4 port.
- COM5 DCU Communication Add-on board COM5 port.
- COM6 DCU Communication Add-on board COM6 port.

8.1.2 Port Type

The port *Type* describes the equipment connected to the communication port:

- Disabled Port is not used.
- Serial Direct connect to a Toolbox computer or serial modem device.
- Modem Dial-in or dial-out with a serial modem device.
- Radio Control the transmit power, key outputs before sending data.



8.1.3 Port Function

The port *Function* determines how the DCU uses the communication port:

- Console DCU programming/monitor with the Toolbox or HyperTerminal program.
- Transmitter Send data reports based on reporting schemes.
- Receiver Receive reports, process and/or repeat them on other ports.
- Repeater Receive and retransmit reports on the same or other ports.

8.1.4 Port Description

Description is for display only to describe the communications port, limited to 40 characters.

8.2 Add a Communications Port

It is easier to copy a port with all its sub-pages than to create a new one. When a port is copied, all the port parameters in the *Communications* sub-pages are also copied.

1. Select the port to copy in the *Port List* and click **Add** or click **New** to append a blank port.
2. Change the port identification parameters.
3. Reposition the port with the *Port List* up/down arrow buttons and click **Save**.

Note: After adding, deleting, or repositioning a port, send all ports to the DCU.

8.3 Delete a Communications Port

1. Select the port in the *Port List* and click **Delete** or check **All Ports** and click **Delete** to delete all ports**.**
2. The Toolbox will ask for delete confirmation. Click **OK** to delete.
3. Click **Save** to delete the port from the configuration file.

Deleting a port in the middle of the *Port List* renumbers and renames the remaining ports.

Warning! When a communication port is deleted or repositioned, report actions are not automatically renumbered. Check that report actions are defined correctly and resend them to the DCU.

Note: After adding deleting, or repositioning a port, send all ports to the DCU.

8.4 Read a Communications Port

The **Read** button on the *Communications* page reads the selected port parameters into the Toolbox memory from the connected DCU and updates the Toolbox display. Port parameters include the identification and sub-page parameters on the *Communications* page. Check **All Ports** to read all ports.

This button does not read all the DCU configuration parameters. Use the **Read All Parameters** button on the *DCU* page or *Read All Parameters* in the Transfer menu pull-down to read all parameters.

8.5 Send a Communications Port

The **Send** button on the *Communications* page sends the selected port parameters in the Toolbox memory to the connected DCU. The current configuration is also saved to the disk file name shown in *DCU Identification*. Port parameters include the identification and sub-page parameters on the *Communications* page. Check **All Ports** to send all ports.

This button does not send all the DCU configuration parameters. Use the **Send All Parameters** button on the *DCU* page or *Send All Parameters* in the Transfer menu pull-down to send all parameters.

8.6 Communications Port Settings

Select the *Settings* sub-page to setup a communications parameters:

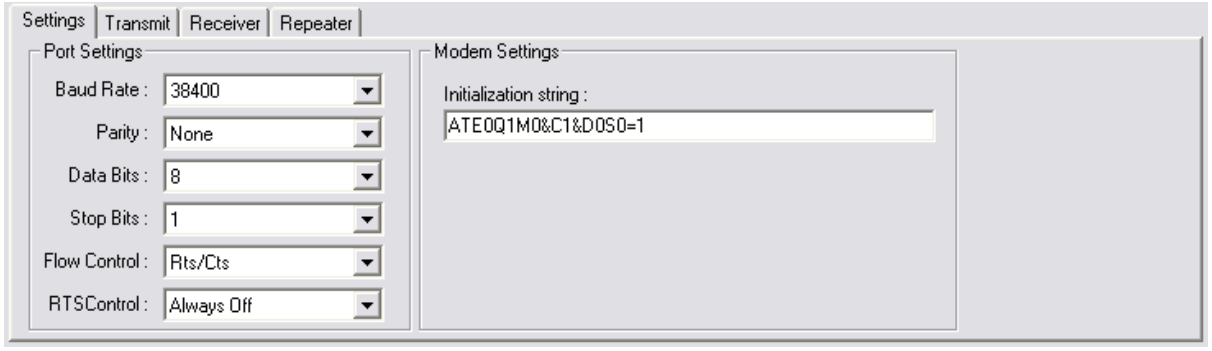
- Port Settings Port communication parameter settings.
- Modem Settings Modem communication parameter settings.

8.6.1 Port Settings

The *Port Settings* are:

- Baud Rate — Communication baud rate: 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600.
- Parity — Communication parity: None, Odd, Even, Mark, Space.
- Data Bits — Communication data bits: 5, 6, 7, 8.
- Stop Bits — Communication stop bits: 1, 2.
- Flow Control
  - None — Use for null-modem connections.
  - RTS/CTS — Hardware flow control for ports connected to modems.
  - Xon/Xoff — Software flow control.
- RTS Control
  - Always Off — Use for null-modem connections.
  - Always On — Use for modem connections.
  - RTS Toggle — Turn RTS on for transmit and wait for CTS on before transmitting. Turn RTS off to receive. Use for half-duplex communication. The wait time is limited by the RTS timer described in the Transmit sub-page below. The transmission is cancelled if CTS does not turn on and Flow Control is RTS/CTS. If Flow Control is None the transmission proceeds after the RTS timer expires.

Equipment Type	Baud Rate	Parity	Data Bits	Stop Bits	Flow Control	RTS Control
ALERT1 Radio	300	none	8	1	none	Always off
ALERT1 Serial GPS	4800	none	8	1	none	Always off
ALERT2 Repeater	19200	none	8	1	none	Always off
ALERT2 Transmitter	9600	none	8	1	none	Always off
GOES Seimac Radio	9600	none	8	1	none	RTS Toggle
GOES Signal Radio	9600	none	8	1	none	RTS Toggle
Microwave Analog Modem	1200	none	8	1	none	RTS Toggle
MODBUS	9600	none	8	1	none	Always off
Orbcomm Quake 1000	19200	none	8	1	none	RTS Toggle
ScadaLynx Radio	9600	none	8	1	none	RTS Toggle



8.6.2 Modem Settings

The *Modem Settings* are:

- Initialization string

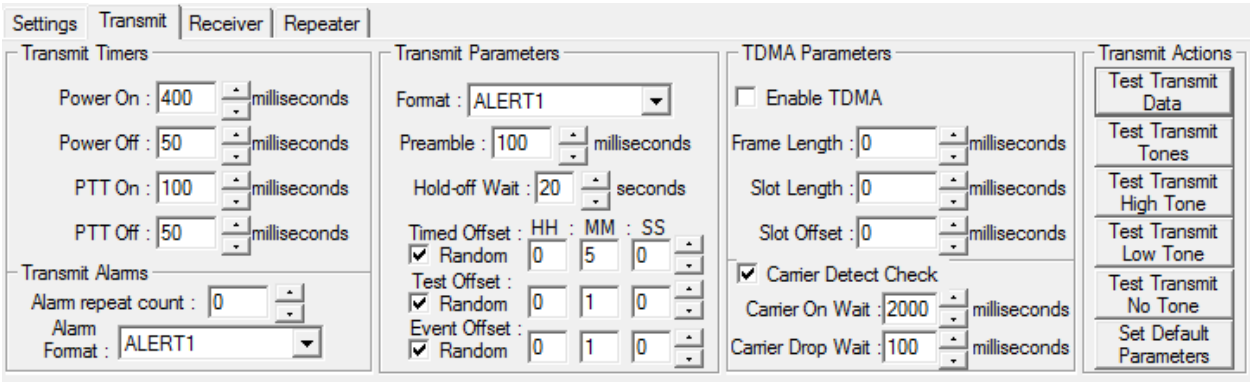
The *Initialization string* is sent to the modem when the communications port is enabled. It is a list of modem AT commands that setup the modem operation for use with the DCU. In the example above the AT command performs the following modem initialization:

- E0 Echo off. Modem does not echo DCU commands.
- Q1 Quiet mode. Modem does not send messages to the DCU.
- &C1 Carrier Detect mode shows state of carrier.
- &D0 DTR signal ignored. Required because DTR is off when DCU powers down.
- S0=1 Answer call after one ring.

8.7 Communications Port Transmit Setup

Select the *Transmit* sub-page to setup transmitter parameters. ALERT2 transmit formats will show an additional ALERT2 sub-page, see Section 8.10. GOES transmit formats will show an additional ALERT2 sub-page, see Section 8.10.

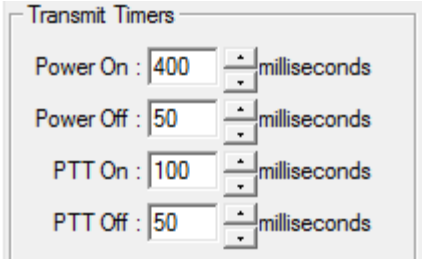
- Transmit Timers Radio and Serial port communication timers.
- Transmit Alarms Alarm repeat count and alarm format.
- Transmit Parameters Preamble length, transmit format, hold-off wait, offsets.
- TDMA Parameters TDMA enable and transmit timers.
- Carrier Detect Carrier detect enable, on and drop wait.
- Transmit Actions Test transmits command for radio type.



8.7.1 Transmit Timers

Transmit Timers are dependent on the port type: Radio, Serial, Modem and format.

8.7.1.1 ALERT1 Radio Port Transmit Timers



ALERT1 Radio *Transmit Timers* are:

- Power On
- Power Off
- PTT On
- PTT Off

The *Power On* timer defines the time to wait in milliseconds after turning on the radio transmit power before turning on the radio PTT (radio key).

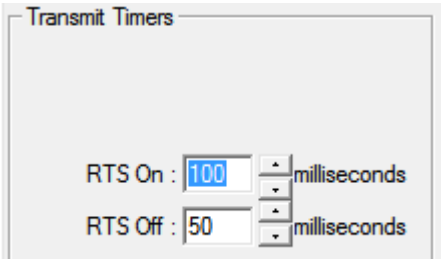
The *Power Off* timer defines the time to wait in milliseconds after the radio PTT is turned off before the radio transmit power is turned off. The default is 50 milliseconds. Set to 0 if the *Power On* wait is 0. The Radio *Power On* and *Power Off* timers are dependent on the radio type.

Radio Type	Power On Wait (milliseconds)	Power Off Wait (milliseconds)
Motorola Arnet	25	50
Maxon	400	50
Ritron	400	50
Radio receiver is powered on	0	0

The *PTT On* timer defines the time to wait in milliseconds after turning on the radio PTT before transmitting preamble (tone) or data. The default is 100 milliseconds. Increase this time if the receiving equipment needs more time to power up after receiving carrier detect.

The *PTT Off* timer defines the time to wait time in milliseconds after a transmission is sent before the radio PTT is turned off. The default is 50 milliseconds.

8.7.1.2 Serial Port Transmit Timers



Serial port *Transmit Timers* are:

- RTS On Wait
- RTS Off Wait

The *RTS On* and *RTS Off* timers are used when the port settings have *RTS Control* set to RTS Toggle. Set the timers to zero otherwise.

The *RTS On* timer defines the time to wait in milliseconds after turning on RTS for the CTS signal to go high. If CTS does not go high, the transmission is terminated.

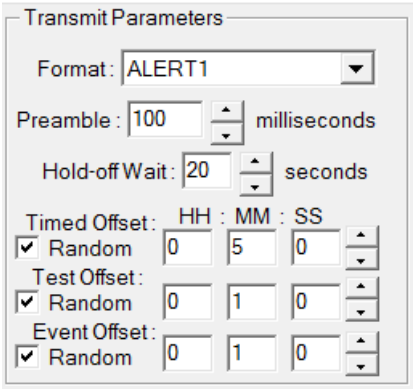
The *RTS Off* timer defines the time to wait in milliseconds after a transmission is sent before RTS is turned off. Use a long enough wait to prevent data transmission truncation.

8.7.1.3 Modem Port Transmit Timers

Modem port *Transmit Timers* are the same as serial port types.

Modem Type	RTS On Wait (milliseconds)	RTS Off Wait (milliseconds)
ScadaLynx radio	100	500
Microwave modem	200	100
GOES radio	100	50
Orbcomm Quake 1000 radio	10000	50

8.7.2 Transmit Parameters



Transmit Parameters are:

- Format
- Preamble
- Hold-off Wait
- Timed Interval Transmit Offset and Random Option
- Test Interval Transmit Offset and Random Option
- Event Transmit Offset and Random Option

Format selects the data packet format transmitted on this port, Transmit formats are:

- ALERT1 NWS ALERT1 protocol (see Appendix C)
- ALERT1 Comp Pair ALERT1 control format (see Receiver Control and Appendix C)
- ALERT2 Encoder NHWC ALERT2 protocol transmit or legacy repeater.
- ALERT2 Network NHWC ALERT2 protocol on network, not radio.
- ALERT2 Repeater NHWC ALERT2 protocol on HDR repeater.
  ALERT2 transmit formats open the ALERT2 sub-page.
- GOES Seimac Seimac GOES radio transmitter (see Appendix D)
- GOES Signal Signal Engineering GOES radio transmitter (see Appendix D)
  GOES transmit formats open the GOES sub-page.
- MODBUS Standard MODBUS packet format (see Appendix E)
- Orbcomm Orbcomm Serial Interface for Quake 1000 satellite radio
- ScadaLynx ScadaLynx 50386 DCU protocol (see Appendix B)
- Serial GPS Serial GPS protocol
- Serial Port Output ASCII text protocol

Note: The transmit format does not have to be the same as the receive format. The DCU will reformat received data packets before re-transmitting them.

Preamble defines the length of time in milliseconds the preamble is transmitted. The default is 100 milliseconds. Preambles are required by receiving decoders to detect the start of a data packet. Longer preambles are needed to wait up DCUs that power down. The default for the ALERT1 radio port is 100 milliseconds.

Hold-off Wait defines the time to wait in seconds after a data packet is transmitted before another data packet is sent. The hold-off timer only applies to self reporting data packets. The default is 20 seconds. Alarm reports override the hold-off timer.

Equipment type	Preamble (ms)	Format	Hold-off Wait (secs)
ALERT1 Radio	100	ALERT1	20
ALERT1 Radio TDMA	100	ALERT1	0
ALERT2 Radio	13	ALERT2 Encoder ALERT2 Network ALERT2 Repeater	0
Console	3	ScadaLynx	0
ScadaLynx Radio	100	ScadaLynx	0
GOES Seimac Radio	0	GOES Seimac	0
GOES Signal Radio	0	GOES Signal	0
SCADA PLC	11	MODBUS	0
Quake 1000 Radio	0	Orbcomm	0
Serial GPS	0	Serial GPS	0
Serial Output	0	Serial Output	0

Timed Offset delays timed interval transmissions on this port.

Test Offset delays test interval and transmissions on this port.

Event Offset delays event and write triggered transmissions on this port.

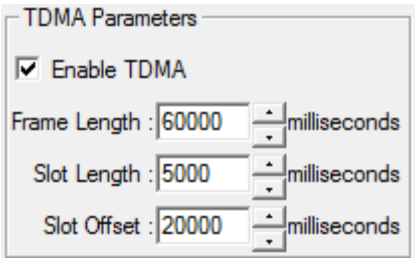
The transmit offsets allow sensor samples to be taken on even time intervals but transmitted later. If the *Random* box is checked the delay is randomly picked between 1 second and the maximum delay. In the example above, timed transmission are delayed by 5 minutes. Test interval and event transmissions are randomly delayed from 1 to 60 seconds (1 minute).

Alarm transmissions override transmit offsets, reporting schemes for Forced Event override the event offset on events.

8.7.3 Transmit TDMA Parameters

Transmit *TDMA Parameters* are:

- Enable TDMA
- Frame Length
- Slot Length
- Slot Offset



TDMA parameters define the time slot and frequency of ALERT1, MODBUS, ScadaLynx, and Serial Output transmissions from the remote station or repeater. ALERT2 transmit TDMA is defined in section 8.10.3. Each time slot in the frame is assigned to a single station or repeater. No other station will transmit in this time slot. This prevents collisions by multiple stations transmitting at the same time. The GPS is required on the station to keep its time clock accurate to less than 25 milliseconds to allow this feature to work.

If a repeater uses TDMA to transmit both ALERT1 and ALERT2 data packets, then the TDMA slot offsets must be different and not overlap.

Enable TDMA when checked uses the TDMA time slot parameters to transmit data. If

unchecked, then random transmissions with the time frame are made. The default is unchecked for ALERT1.

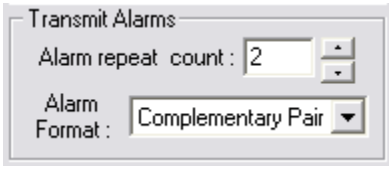
Frame Length is how often a station can transmit in milliseconds. For example a frame length of 60000 milliseconds allows a transmission every 1 minute, and a frame length of 120000 milliseconds allows a transmission every 2 minutes. The station does not have to transmit this often, it can transmit timed reports every hour and when it does it will be in the 1 or 2 minute frame after the hour that the sensor samples are taken.

Slot Length is the length of the time slot in milliseconds. Most stations can use a 500 millisecond time slot length which can transmit up to 56 bytes of packet headers and data. This is enough time to transmit a rain gauge, weather station sensors, level, battery and GPS status using the TBR, MSR, and one GSR report. It is also enough time for 6 general sensors of floating point data or 10 sensors of integer data. A slot length of 1000 milliseconds can transmit 152 bytes of packet headers and data or up to 17 sensors with floating point data.

Slot Offset is the length of time in milliseconds after the start of the frame when this station can transmit. For example a slot offset of 2000 milliseconds will transmit 2 seconds after the top of the minute in a 1 minute frame.

8.7.4 Transmit Alarms Parameters

ALERT1 *Transmit Alarms* parameters are:



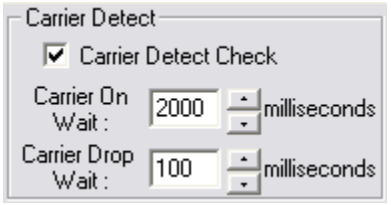
- Alarm repeat count
- Alarm Format

Alarm repeat count sets the number of additional times a report is transmitted when an alarm condition is met. For example, use zero (0) to transmit reports once or use two (2) to transmit reports three times when alarm conditions are met. This parameter is used to send multiple alarm reports to a remote control station that requires multiple report confirmation before controls are turned on.

Alarm format defines the data format for alarm packets. It is recommended that the *ALERT1* transmit format use the *Complementary Pair* alarm format to provide data checking at the receiving site. Transmit formats that contain CRC or checksums such as *ALERT2*, *ScadaLynx,* and *MODBUS* can use the same format for alarms.

8.7.5 Carrier Detect Parameters

ALERT1 *Carrier Detect* parameters are:



- Carrier Detect Check
- Carrier On Wait
- Carrier Drop Wait

Carrier Detect Check enables carrier detect monitoring. The DCU checks for radio carrier before transmitting. If carrier is detected, the transmitter waits until the carrier drops. The default is disabled, carrier detect not checked.

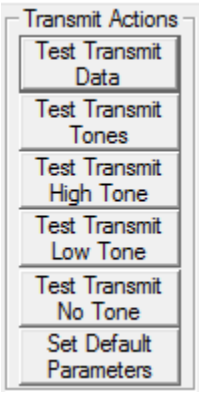
Carrier On Wait defines the time to wait in milliseconds for carrier drop after detecting carrier.

When this timer expires, the DCU proceeds with the data transmission regardless of the carrier detect state. The default is 2,000 milliseconds (2 seconds).

Carrier Drop Wait defines the time to wait in milliseconds after carrier drop before the data transmission starts. If carrier is detected again during this wait, the DCU waits for it to drop again or for the *Carrier On Wait* timer to expire. The default is 100 milliseconds.

8.7.6 Transmit Actions

The ALERT1 and ALERT2 *Transmit Action* buttons can be used to test the radio transmitter:

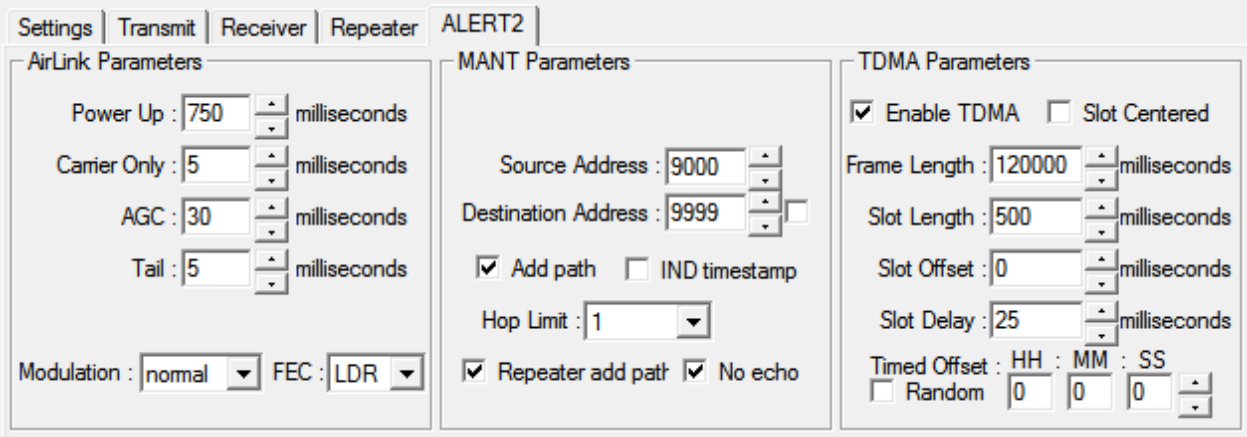


- Test Transmit Data — Read and transmit point data for points reporting on port.
- Test Transmit Tones — Transmit data tones for 5 seconds to allow watt meter testing of radio power.
- Test Transmit High Tone — Transmit 5 seconds of high tone on port. **ALERT1 only.**
- Test Transmit Low Tone — Transmit 5 seconds of low tone on port. **ALERT1 only.**
- Test Transmit No Tone — Transmit 5 seconds with no tone, carrier only. **ALERT1 only.**
- Set Default Parameters — Assign default parameters for the transmit format.

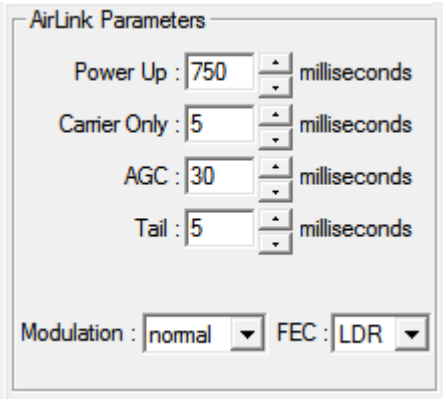
8.7.7 ALERT2 Transmitter Setup

When an ALERT2 transmit format is selected on the *Transmit Parameters* section, the ALERT2 sub-page is displayed. Select the *ALERT2* sub-page to setup ALERT2 transmitter parameters. Transmit Timers Radio and Serial port communication timers.

- AirLink Parameters — ALERT2 radio parameters.
- MANT Parameters — ALERT2 Network parameters.
- TDMA Parameters — ALERT2 TDMA enable and transmit timers.



8.7.7.1 ALERT2 AirLink Parameters



ALERT2 *AirLink Parameters* are:

- Power Up
- Carrier Only
- AGC
- Tail
- Modulation
- FEC

The *Power Up* parameter defines the time to wait in milliseconds after turning on the radio transmitter power before turning on the radio PTT (radio key). The default is 750 milliseconds.

The *Carrier Only* parameter defines the carrier only transmit time in milliseconds after turning on the radio PTT before transmitting preamble (AGC) or data. The default is 10 milliseconds.

The *AGC* parameter defines the preamble (AGC) time in milliseconds after turning on the transmitter carrier and before the data. The default is 25 milliseconds.

The *Tail* parameter defines the time to wait in milliseconds after the radio PTT is turned off

The *Modulation* parameter defines the type of modulation required for the radio type. See the table below:

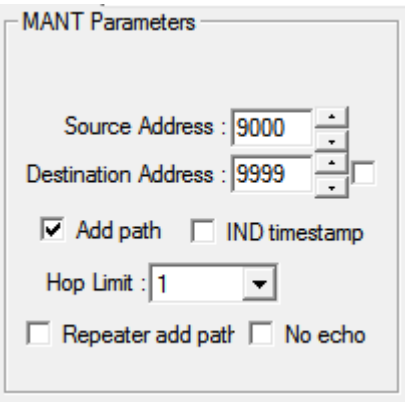
Radio Type	**Modulation**
Maxon SD125	Normal
Maxon SD125E	Inverted
Ritron	Normal

The *FEC* parameter defines the type of forward error correction type. If you use FEC type other than 0=LDR, your repeaters and base station receivers must be HDR (high data rate) compatible. If they are not, then an ALERT2 packet will not be decoded by receiving radio equipment.

The ALERT2 receiver sensitivity is also changed by the FEC Type. If your station radio path is weak, and not all data is received, reduce the FEC Type to 1=MDR or 0=LDR. You may need to increase your TDMA slot length when you decrease the FEC type.

RF FEC Type	**RX Sensitivity**
0=LDR	0dB
1=MDR	-1.5dB
2=HDR	-2.5dB

8.7.7.2 ALERT2 MANT Parameters



ALERT2 *MANT Parameters* are:

- Source Address
- Destination Address, Add check box
- Add path
- IND timestamp
- Hop Limit
- Repeater add path (repeater only)
- No echo (repeater only)

Source Address is the ALERT2 station identifier. This number is assigned by your system manager. It is used by the base station to identify the remote station so it must be unique in your radio network. It is also used by repeaters to allow or prevent repeating. The number range is 1 – 65534.

Destination Address is the remote ALERT2 station identifier to receive the data. The *Add* check box must be checked to send the destination address in transmitted packets. The default destination address is 9999. This parameter is used to send control packets to a remote station that is able to receive ALERT2 packets. The remote station must have the Receiver Control Address set to this destination address.

Add path when checked allows repeaters to add their source address to the ALERT2 MANT header. This allows the base station to see which repeaters an ALERT2 data packet passed through. The *Repeater add path* parameter will override this in a repeater to force the add path on regardless of the remote station parameter.

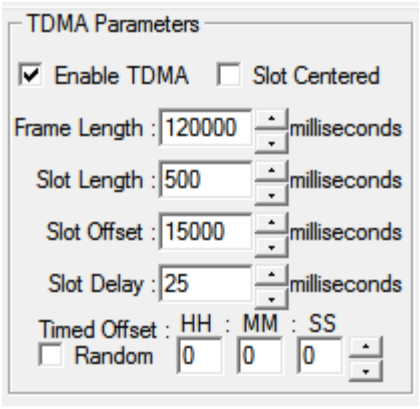
IND timestamp when checked allows ALERT2 encoder to add its GPS time stamp to ALERT2 data packets transmitted. The default is unchecked to allow the 50386 to add its GPS time to the ALERT2 data packets. This insures that the logged data timestamps match the transmitted data timestamps.

Hop Limit is the number of times a data packet can be repeated. The range is 0 – 6 and disabled (7). Use 0 to prevent data packet repeating when the remote station transmits directly to the base station. Use 1 to allow one repeat of the data packet when a single repeater is used to repeat the data packet to the base station. Increase the hop limit up to 6 to allow up to 6 repeats of the data packet. Select *disable* (value 7 in the ALERT2 protocol) for unlimited repeat of the data packet.

Repeater add path will override the remote station *Add path* selection for a repeater. It forces the repeater to add its source address to the ALERT2 MANT header. This parameter is only valid on a repeater and has no meaning on a remote transmitter.

No echo when checked will prevent a repeater from repeating a packet it has already transmitted. This parameter is only valid on a repeater and has no meaning on a remote transmitter.

8.7.7.3 ALERT2 TDMA Parameters



ALERT2 *TDMA Parameters* are:

- Enable TDMA
- Slot Centered
- Frame Length
- Slot Length
- Slot Offset
- Slot Delay
- Timed Offset

TDMA parameters define the time slot and frequency of ALERT2 transmissions from the remote station or repeater. Each time slot in the frame is assigned to a single station or repeater. No other station will transmit in this time slot. This prevents collisions by multiple stations transmitting at the same time. The GPS on the ALERT2 encoder allows each station to keep its time clock accurate to less than 25 milliseconds to allow this feature to work.

If a repeater uses TDMA to transmit both ALERT1 and ALERT2 data packets, then the TDMA slot offsets must be different and not overlap.

If the GPS on the ALERT2 encoder fails to get GPS time sync lock when the GPS antenna is damaged, the remote station will failover to random transmission within the TDMA frame. Timed reports transmit in the following frame to prevent collision with other timed station reports. Event reports transmit in the current frame.

Enable TDMA when checked uses the TDMA time slot parameters to transmit data. If unchecked, then random transmissions with the time frame are made. The default is checked for ALERT2.

Slot Centered when checked transmits the data packet centered in the time slot to reduce the chance of data transmission overlap. The default is not checked.

Frame Length is how often a station can transmit in milliseconds. For example, a frame length of 60000 milliseconds allows a transmission every 1 minute, and a frame length of 120000 milliseconds allows a transmission every 2 minutes. The station does not have to transmit this often, it can transmit timed reports every hour and when it does it will be in the 1 or 2 minute frame after the hour that the sensor samples are taken.

Slot Length is the length of the time slot in milliseconds. The smallest time slot length is 500 milliseconds for FEC type 0=LDR. The smallest time slot length is 250 milliseconds for FEC types 1=MDR and 2-HDR. Slot lengths are multiples of 250. The amount of data that can be transmitted in a time slot depends on the time slot length and the FEC type.

Sensor bytes per TDMA slot				
	Slot Length in milliseconds			
RF FEC Type	**250**	**500**	**1000**	**2000**
0=LDR	NA	61	163	362
1=MDR	30	90	230	510
2=HDR	40	117	282	612

An integer sensor report requires 4 bytes, a floating point sensor report requires 6 bytes. The GPS status report requires 3 bytes. The FEC type 0=LDR and 500 millisecond time slot length can transmit up to 61 bytes of sensor data. This is enough time to transmit a rain gauge, weather station sensors, level, battery and GPS status using the TBR, MSR, and one GSR report. It is also enough time for 10 floating point sensor reports.

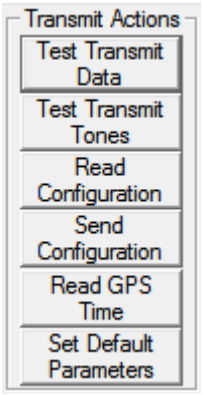
Slot Offset is the length of time in milliseconds after the start of the frame when this station can transmit. For example a slot offset of 2000 milliseconds will transmit 2 seconds after the top of the minute in a 1 minute frame.

Slot Delay is the length of time in milliseconds from the start of the time slot before data is transmitted (ALERT2 TDMA only). This provides a time buffer to prevent data transmission overlap. The FEC type 0=LDR and 1=MDR minimum slot delay is 25 milliseconds. The FEC type 2=HDR minimum slot delay is 12 milliseconds. The *Slot Delay* is not used if the *Slot Centered* parameter is checked.

TDMA Timed Offset delays timed interval transmissions. Sensor samples are read on the timed interval and the data is time stamped, but the timed transmission will be delayed by this timed offset. The timed offset does not apply to test sample intervals or event reports. If the *Random* box is checked the delay is randomly picked between 1 second and the maximum delay. In the example above, timed transmissions are delayed by 5 minutes.

8.7.7.4 ALERT2 Transmit Actions

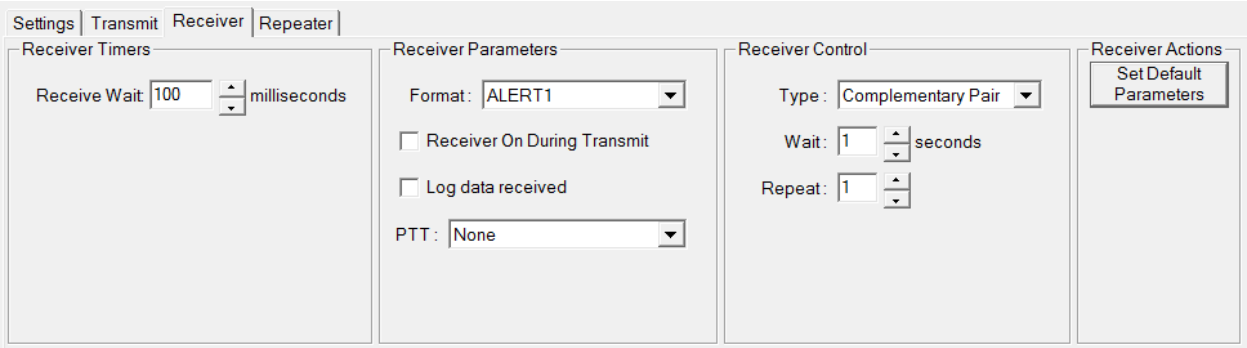
- Test Transmit Data — Read and transmit point data for points reporting on port.
- Test Transmit Tones — Transmit data tones for 5 seconds to allow watt meter testing of radio power.
- Read Configuration — Read the ALERT2 parameters from the ALERT2 encoder or repeater and display for verification.
- Send Configuration — Send the ALERT2 parameters to the ALERT2. This is done automatically on 50386 reboot and when ALERT2 com port parameters are sent to the 50386.
- Read GPS Time — Read and display the GPS time and status from the ALERT2 encoder.



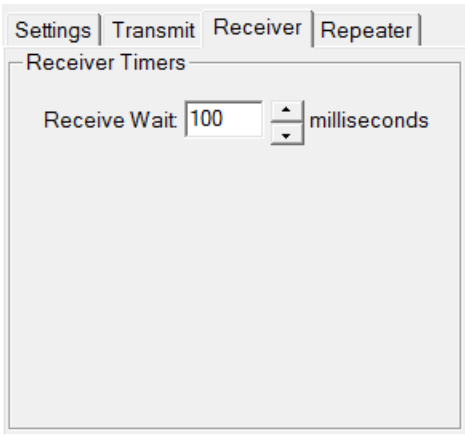
8.8 Communications Port Receiver Setup

Select the *Receiver* sub-page to setup receiver parameters:

- Receiver Timers Receiver wait timer.
- Receiver Parameters Receiver format, receiver on during transmit, log data received.
- Receiver Control Receiver control type and control parameters.
- Receiver Actions Receiver action buttons.



8.8.1 Receiver Timers

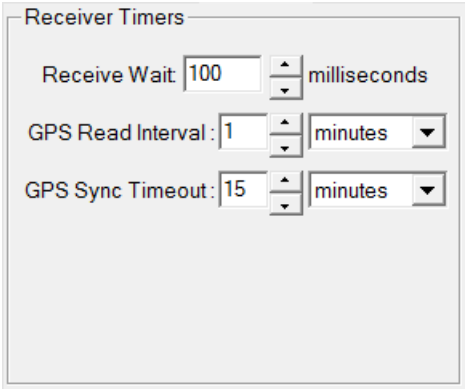


ALERT1/ALERT2 ALERT1 *Receiver Timers* are:

- Receive Wait
- GPS Read Interval
- GPS Sync Timeout

The *Receive Wait* timer defines the time in milliseconds the receiver stays active after the last byte is received. The DCU will not transmit on the port and will not power down while a communication port receiver is active. The default is 100 milliseconds.

8.8.1.1 GPS Receiver Timers



ALERT1 Serial GPS, ALERT2 Encoder, ALERT2 Repeater, GOES Transmitter GPS *Receiver Timers* are:

- GPS Read Interval
- GPS Sync Timeout

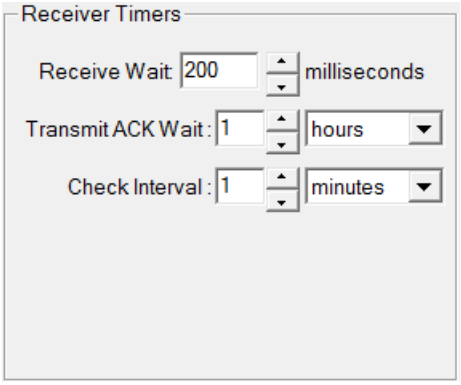
The *GPS Read Interval* sets how often the GPS time is read to keep the DCU time in sync. The default interval depends on the receiver equipment type:

Equipment type	Format	Default
ALERT1 Serial GPS	Serial GPS Input	1 hour
ALERT2 Encoder	ALERT2	1 minute
GOES Transmitter	GOES Signal	1 hour

The *GPS Sync Timeout* sets how long the GPS read will wait for GPS time sync. The default interval depends on the receiver equipment type:

Equipment type	Format	Default
ALERT1 Serial GPS	Serial GPS Input	1 minute
ALERT2 Encoder	ALERT2	15 minutes

8.8.1.2 Orbcomm Receiver Timers



Orbcomm *Receiver Timers* are:

- Transmit ACK Wait
- Check Interval

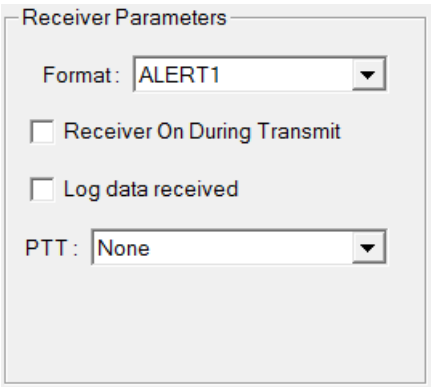
The *Transmit ACK Wait* interval sets how long the DCU will keep the Orbcomm radio on, waiting for an acknowledgement that a data packet has been transmitted. If the data packet does not transmit within this time interval, it is buffered by the DCU and is transmitted with the next time sample. The default interval depends on the receiver equipment type:

Equipment type	Format	Default
Quake 1000 Radio	Orbcomm	1 hour

The *Check Interval* sets how often the DCU will wake up to check for a transmit ACK from the Orbcomm radio. The DCU powers down between checks but does not turn off the Orbcomm radio power until the *Transmit ACK Wait* interval expires. The default interval depends on the receiver equipment type:

Equipment type	Format	Default
Quake 1000 Radio	Orbcomm	1 minute

8.8.2 Receiver Parameters



Receiver Parameters are:

- Format
- Receiver On During Transmit
- Log Data Received
- PTT

Receiver *Formats* are:

- ALERT1 NWS ALERT1 protocol (see Appendix C)
- ALERT1 Comp Pair NWS ALERT1 complementary pair protocol
- ALERT2 Encoder NHWC ALERT2 protocol transmit or legacy repeater.
- ALERT2 Network NHWC ALERT2 protocol on network, not radio.
- ALERT2 Repeater NHWC ALERT2 protocol on HDR repeater.
- GOES Seimac Seimac GOES radio transmitter (see Appendix D)
- GOES Signal Signal Engineering GOES radio transmitter (see Appendix D)
- MODBUS MODBUS RTU packet format (see Appendix E)
- Orbcomm Orbcomm Serial Interface for Quake 1000 satellite radio
- ScadaLynx ScadaLynx 50386 DCU protocol (see Appendix B)
- Serial GPS Serial GPS protocol
- Serial Input Serial text from an external data logger (see Appendix F)

Note: The receive format does not have to be the same as the transmit format. The DCU will reformat received data packets before re-transmitting them.

Receiver on During Transmit keeps the receiver on while transmitting. Single ALERT1 radio repeaters must turn off the receiver before transmitting. Dual ALERT1 radio repeaters (separate receive and transmit radios and antennas) can leave the receiver on during a transmission. The default is receiver off during transmit (not checked).

Note: The GOES Signal and Orbcomm receive format must have the *Receiver on During Transmit* checked.

Log Data Received writes received data reports to the log data file on the DCU flash storage. These logged data reports can be downloaded by the Toolbox to check on receiver performance.

Warning! Logging data to DCU flash storage will affect DCU repeater performance. When the DCU writes received data reports to flash storage it may miss additional data reports that follow.

PTT sets the control digital output used to turn on the receiver PTT when transmitting on the receiver radio in a two radio unit. A repeater with separate receive and transmit radios can be forced to transmit on the receive radio for repeater failover checking. The reporting scheme must have the *On Receiver* box checked to report on the receiver radio.

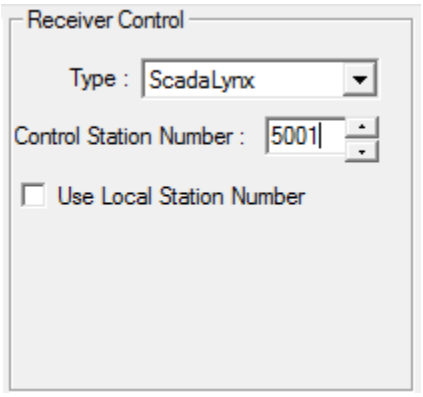
8.8.3 Receiver Control

Receiver Control types are:

- ALERT1
- ALERT1 Comp Pair
- ALERT2
- MODBUS
- ScadaLynx
- Serial Input

The receiver control *Type* defines the type of report packet that can set DCU point data values. When a report packet sets an output point data value, the physical output state is set. The point data is transmitted if report actions are flagged for event. Alarms are checked and controls turned on if alarm criteria are met.

8.8.3.1 Receiver Control Type ScadaLynx



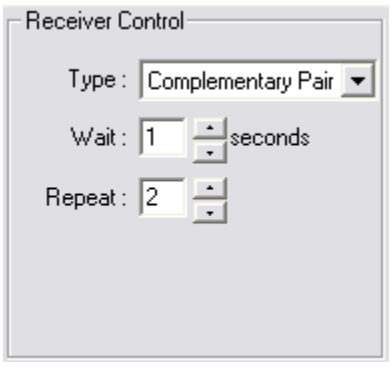
ScadaLynx data report packets set point data values for point numbers or point IDs.

- Control Station Number
- Use Local Station Number

Control Station Number defines the DCU station number that the DCU accepts on this port to set point data values. DCU station numbers are 0 - 65535.

Check *Use Local Station Number* to only use the local DCU ID number to set point data values.

8.8.3.2 Receiver Control Type ALERT1 Complementary Pair



Complementary Pair Receiver Control parameters are:

- Wait
- Repeat

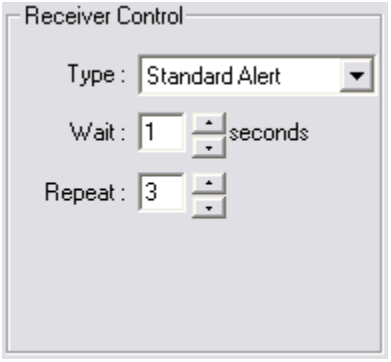
ALERT1 reports set point data values when matching complementary report pairs are received within the wait interval and are repeated for the repeat count.

A complementary report pair is two reports with the same ID and complementary data values that add up to 2047. The high data bit (0x400) must be set in the data of the first report. The data in the second report is set to the point scaled data value.

Wait defines the time in seconds the receiver waits for a matching complementary report.

Repeat defines the number of matching complementary pairs that must be received to set a point data value.

8.8.3.3 Receiver Control Type ALERT1



ALERT1 Receiver Control parameters are:

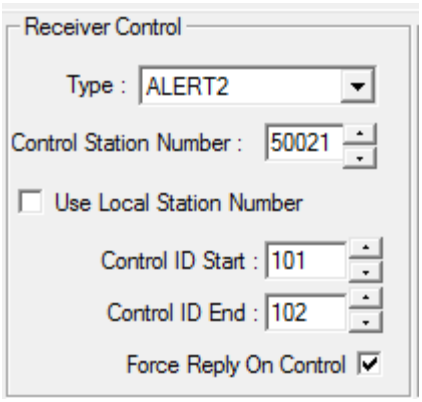
- Wait
- Repeat

ALERT1 reports set point data values when matching report are received within the wait interval and are repeated for the repeat count.

Wait defines the time in seconds the receiver waits for a matching complementary report.

Repeat defines the number of matching data reports that must be received to set a point data value.

8.8.3.4 Receiver Control Type ALERT2



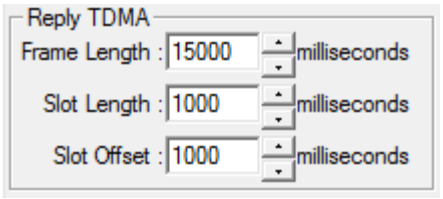
ALERT2 Receiver Control parameters are:

- Control Station Number
- Use Local Station Number
- Control ID Start
- Control ID End
- Force Reply On Control

Control Station Number defines the ALERT2 MANT destination address that the DCU accepts on this port to set point data values. ALERT2 destination address numbers are 1 - 65534.

Check *Use Local Station Number* to only use the local DCU ALERT2 *Source Address* defined in the transmit parameters to set point data values.

ALERT2 reports set point data values when the ALERT2 MANT destination address matches the *Control Address* and the point sensor ID numbers are between the *Control ID Start* and *Control ID End* numbers.



Check *Force Reply On Control* to reply immediately to a control command by transmitting the control ID data value back to the source address in the control packet received. Use the reply TDMA parameters for the reply.

- Frame Length
- Slot Length
- Slot Offset

Frame Length is how often a station can transmit a control reply in milliseconds. For example, a frame length of 15000 milliseconds allows a transmission reply every 15 seconds. The station will reply once in the next reply frame after receiving an ALERT2 data report for a control ID in the control range with the destination address set to the *Control Station Number*.

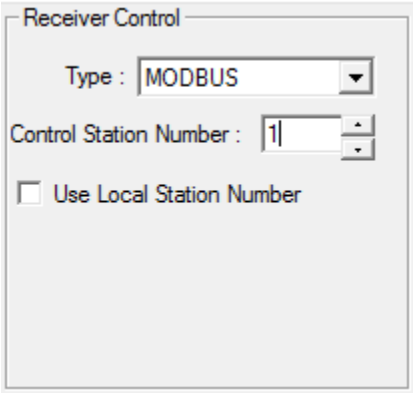
Slot Length is the length of the time slot in milliseconds. The smallest time slot length is 500 milliseconds for FEC type 0=LDR. The smallest time slot length is 250 milliseconds for FEC types 1=MDR and 2-HDR. Slot lengths are multiples of 250. The amount of data that can be transmitted in a time slot depends on the time slot length and the FEC type.

Sensor bytes per TDMA slot				
	Slot Length in milliseconds			
RF FEC Type	**250**	**500**	**1000**	**2000**
0=LDR	NA	61	163	362
1=MDR	30	90	230	510
2=HDR	40	117	282	612

Slot Offset is the length of time in milliseconds after the start of the frame when this station can transmit. For example, a slot offset of 1000 milliseconds will transmit at 1 second, 16 seconds, 31 seconds, and 46 seconds in a 15 second frame.

The Reply TDMA parameters must work within the transmit TDMA plan but the frame length can be shorter as a repeater frame is shorter than a transmitter frame.

8.8.3.5 Receiver Control Type MODBUS



MODBUS Receiver Control parameters are:

- Control Station Number
- Use Local Station Number

Control Station Number defines the MODBUS station address that the DCU accepts on this port to set point data values. MODBUS station numbers are 1 - 255.

Check *Use Local Station Number* to use the DCU ID number as the MODBUS address. The DCU ID number is set in the configuration file or read from the SLB ID switches. Only the lower 8 bits of the DCU ID number are used when checking MODBUS packets.

Modbus register assignment to points is done on the point identification panel as ID2.

8.8.4 Receiver Actions

Receiver Actions are:

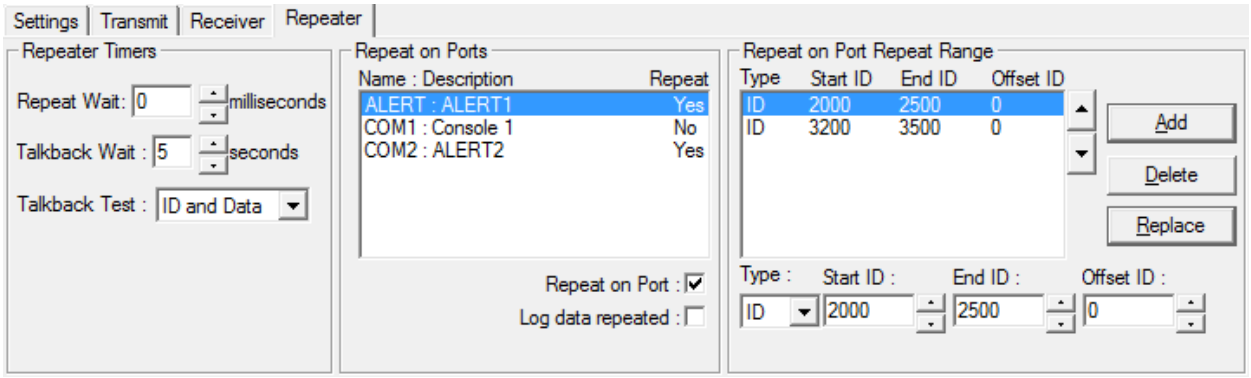
- Set Default Parameters

Click the *Set Default Parameters* button to set the receiver timers, parameters, and controls to the default for the port type and receiver format.

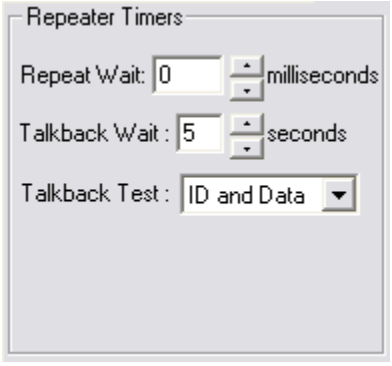
8.9 Communications Port Repeater Setup

Select the *Repeater* sub-page to setup repeater parameters:

- Repeater Timers Repeater wait timer
- Repeat on Ports List of ports on which to repeat report packets.
- Repeat Range List of IDs to repeat on port.



8.9.1 Repeater Timers



Repeater Timers are:

- Repeat Wait
- Talkback Wait
- Talkback Test

Repeat Wait defines the time to wait in milliseconds after the repeater buffer is loaded before a repeat transmission is started. The default is 0 milliseconds (no wait). Use this timer to delay repeating when multiple repeaters receive and repeat the same data packets.

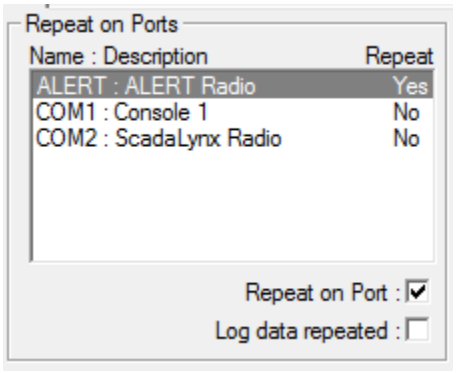
Talkback Wait defines the length of time in seconds that duplicate report packets are not repeated. The default is 5 seconds. Duplicate report packets have matching ID and data.

Talkback Test defines the type of talkback packet test:

- ID and Data The report ID and Data must both match for talkback detection.
- ID Only Only the report ID number must match for talkback detection.

The *Talkback Test* type is *ID and Data* by default. Select *ID Only* if your repeater system talk back problem corrupts report data values.

8.9.2 Repeater Repeat on Ports



Repeat on Ports defines the DCU communication ports on which report packets are repeated.

Select a communication port and check *Repeat on Port* to enable repeating. Uncheck the box to disable repeating.

A report packet is repeated on a communication port only if the *Repeat on Port Repeat Range* criteria are met.

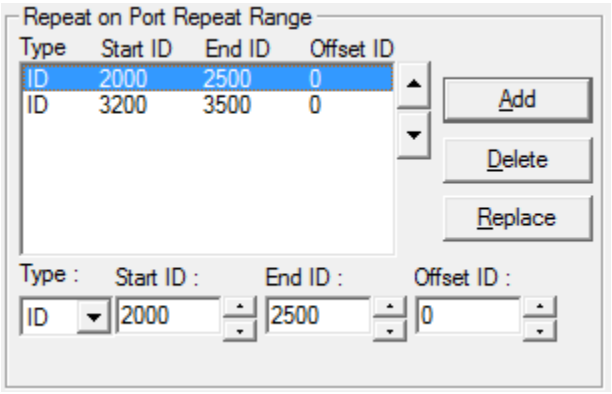
In the example above, report packets received on the ALERT1 port are repeated on the ALERT1 radio port and the COM2 Serial Decoder port.

Note: Repeated packets use the repeat port transmit format.

Log Data Repeated writes repeated data reports to the log data file on the DCU flash storage. These logged data reports can be downloaded by the Toolbox to check on repeater performance.

Warning! Logging data to DCU flash storage will affect DCU repeater performance. When the DCU writes repeated data reports to flash storage it may miss additional data reports that follow.

8.9.3 Repeater Repeat Range



Each communication port has a unique list of repeat ranges. Select a port in the *Report on Port* list to display and edit the *Repeat on Port Repeat Range*.

Repeat range parameters are:

- Type
- Start ID
- End ID
- Offset ID

Multiple repeat ranges can be defined. It is recommended that repeat ranges be ordered from smallest to largest Start ID.

The range *Type* determines whether the DCU checks the DCU address in the packet or the ID number in the data packet. Check the *DCU* or *ID* box under *Type*. Use DCU ranges for ALERT2 and ScadaLynx protocols and ID ranges for ALERT1 protocols.

A repeat range includes all ID numbers between the *Start ID* and the *End ID*.

Offset ID is a signed number that is added to the received ID before it is repeated. Use 0 to repeat the ID number without change.

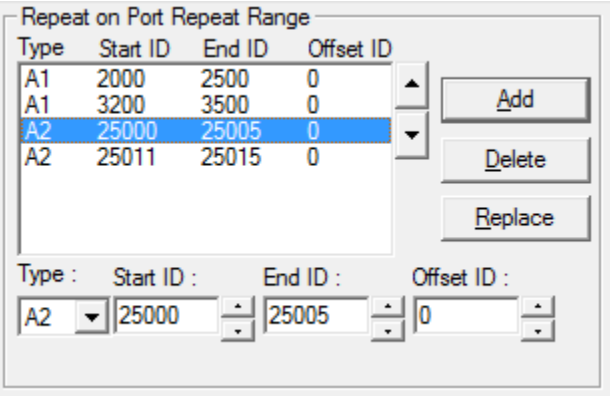
In the example above, ID numbers in the range 2000 to 2500 and 3200 to 3499 are repeated with no change to their ID numbers.

Note: If no repeat range is defined, all received packets are repeated.

ALERT2 repeater range types are labeled A1 and A2

- A1 – ALERT1 repeat range of sensor ID numbers.
- A2 – ALERT2 repeat range of station source addresses.

ALERT1 data reports are repeated in ALERT2 concentrator packets.



8.9.3.1 Add a Repeat Range

It is easier to copy and existing repeat range than adding a new range. To copy a repeater repeat range:

1. Select the repeat range to copy from the list.
2. Change the Type, Start ID, End ID, or Offset ID and click **Add**.
3. Reposition the repeat range with the up/down arrow buttons and click **Save**.

8.9.3.2 Edit a Repeat Range

1. Select a repeat range from the list.
2. Change the Type, Start ID, End ID, or Offset ID and click **Replace**.
3. Reposition the repeat range with the up/down arrow buttons and click **Save**.

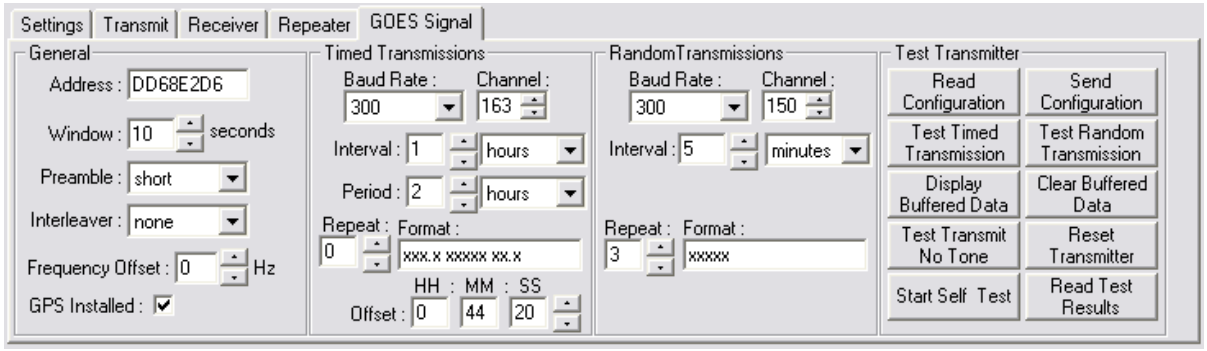
8.9.3.3 Delete a Repeat Range

1. Select a repeat range from the list.
2. Click **Delete** then click **Save**.

8.10 Communications Port GOES Transmitter Setup

The *GOES* sub-page appears on the *Communication*s page when the communication port transmit format is set to *GOES Seimac* or *GOES Signal*. Select the *GOES* sub-page to setup GOES transmitter parameters:

- General GOES transmitter general parameters.
- Timed Transmissions Timed transmission parameters.
- Random Transmissions Random transmission parameters.
- Test Transmitter Test command buttons.



8.10.1 GOES Transmitter General Setup

General parameters are:

- Address
- Window
- Preamble
- Interleaver
- Frequency Offset
- GPS Installed

Address defines the GOES transmitter DCP ID in hexadecimal. In the example above, the DCP ID is **DD68E2D6**.

Window defines the transmit time limit in seconds. This time is usually no longer than 1 minute. For higher baud rates (300 and 1200) the time limit is usually reduced. In the example above, the transmit time limit is **10** seconds.

Preamble defines the transmit preamble as: *Short* or *Long*. The default is *Short*.

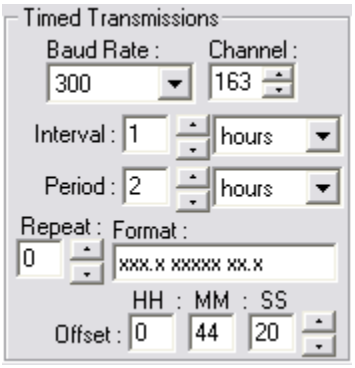
Interleaver defines the transmit interleaver as: *None*, *Long*, or *Short*. The default is *None*.

Frequency Offset defines the radio frequency adjustment in Hz. The range is -500 to 500 Hz. This parameter only applies to Signal Engineering GOES High Data Rate radios.

Check the *GPS Installed* box if the GOES radio has an internal GPS. If the radio has GPS, the 50386 DCU will read its time from the GOES radio. If the radio does not have a GPS the 50386 DCU will set the time in the GOES radio.

8.10.2 GOES Transmitter Timed Transmissions Setup

Timed Transmissions parameters are:



- Baud Rate
- Channel
- Interval
- Period
- Repeat
- Format
- Offset

Baud Rate defines the timed transmission rate as: *100, 300*, or *1200*.

Channel is the GOES transmitter channel assigned by NESDIS for timed transmissions.

Interval defines the time between transmissions. The minimum interval is 15 minutes and the maximum is 14 days. Low data rate radios have transmission intervals of 3 or 4 hours. High data rate radios have transmission intervals of 1 hour.

Period defines the length of time of the data transmitted. The GOES radio can transmit more than one set of point samples per transmission. For example, the point can be sampled and sent to the GOES radio every 15 minutes. If the transmit period is set to 2 hours as in the example above the number of sample periods sent per GOES radio transmission is 8 (4 samples per hour * 2 hours = 8 samples).

The *Repeat* count lets you repeat the transmission period samples more than once for data comparison checking at the receive end. For example, if the repeat count was set to 1 then the 8 sample periods sent in the example above would be repeated for a total of 16 sample lines.

Format defines the timed transmission data format. The data format can be ASCII or binary. An ASCII format string defines the number of digits per reading and the number of decimal precision (number of digits to the right of the decimal point). A binary format strings defines the number of binary format digits. The format string can specify different format lengths for each point data value sent to the GOES radio timed transmit buffer. Separate the point formats with a space. The last format string is repeated if more point data is encoded than are defined by the format strings. The GOES radio formats are described in detail in Appendix D.

- The ASCII format is selected by using the ‘x’ character to select the field width and decimal precision. For example, the **xxx.x** format string will encode the first point data in a 5 character field with 1 digit to the right of the decimal point. The second **xxxxx** format string will encode the second point data in a 5 character field with no decimal digits and no decimal point. The third **xx.x** format string will encode the third point data in a 4 character field with 1 digit to the right of the decimal point. Point data will be rounded and zero padded to achieve the field width and decimal data precision. For example, if the first, second, and third data values were 123.68, 127, and 12.86 then the data string sent to the GOES radio would be: **123.7 00127 12.9**

- The binary format is select by using the ‘b’ character to set the field width. For example,

enter **bbb** to send the data as a 3 character binary word. Binary data is sent as an integer with no decimal digits. The binary data field width numeric range is shown in the table below.

Field width	Lowest number	Highest number
1	0	63
2	-2047	2047
3	-131008	131008

The data conversion from decimal floating point to integer is done by using the number of decimal digits displayed in the point scaling configuration. For example, if the battery voltage has a reading of 12.86 and the number of decimal digits displayed is 2 then the binary data value sent to the GOES radio is 1286. If the number of decimal digits displayed is 1 then the binary data value is 129 with rounding. See Appendix D for a description of the GOES binary format.

Offset aligns timed transmission with the hour, minute, and second entered. The default is 0:0:0. The offset is in the DCU time zone. In the example above the GOES radio will transmit the contents of its timed buffer at 44 minutes and 20 seconds after each hour.

8.10.3 GOES Transmitter Random Transmissions Setup

Random Transmissions parameters are:

- Baud Rate
- Channel
- Interval
- Repeat
- Format

Baud Rate defines the random transmission rate as: *100*, *300*, or *1200*.

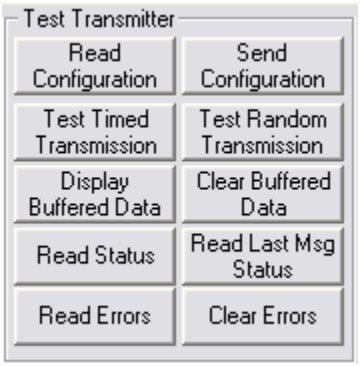
Channel is the GOES transmitter channel assigned by NESDIS for random transmissions. Channel 0 disables random transmissions.

Interval defines the time between random transmissions. The minimum interval is 1 minute and the maximum is 24 hours. The GOES transmitter randomly picks a time to transmit within this interval.

Repeat defines the number of times a random transmission is repeated. For example, a random interval of 5 minutes and repeat count 3 will transmit the random buffer 3 times; once in the first 5 minutes, a second time in the interval from 5 to 10 minutes, and a third time in the interval from 10 to 15 minutes.

Format defines the random transmission data format. The data format specification is described in the timed transmission section above and in Appendix D. In the example above, only one point is expected to have random transmission with a format **xxxxx**. This format transmits a 5 character integer value (no decimal digits or decimal point).

8.10.4 GOES Seimac Transmitter Test



The GOES Seimac *Test Transmitter* test buttons are:

- Read Configuration
- Send Configuration
- Test Timed Transmission
- Test Random Transmission
- Display Buffered Data
- Clear Buffered Data
- Read Status
- Read Last Msg Status
- Read Errors
- Clear Errors

Read Configuration reads and displays the current GOES transmitter configuration in the Communication Monitor window:

GOES Radio Platform ID:	DD68E2D6
Self-timed bit rate:	100
Self-timed channel:	151
Self-timed interval:	000 00:15:00
Self-timed offset:	00:05:10
Self-timed message window:	60 seconds
Self-timed preamble length:	short
Self-timed interleaver	none
Random bit rate:	100
Random channel:	151
Random interval:	00:15:00
Random preamble length:	long
Random interleaver:	none
GPS Time:	23:46:01
DCU time:	16:46:01

The GOES transmitter time is in GMT. It is converted to the DCU timezone and the DCU time is set. In the example above if the DCU configuration timezone is PST (-8 hour offset from GMT) with DST (daylight savings time) enabled and in effect (+1 hour), the DCU time is using a -7 hours offset from GMT.

Send Configuration forces the DCU to send the GOES radio configuration parameters to the GOES radio. When the DCU program initializes a GOES Seimac radio port it first checks if the configuration is correct and writes the configuration parameters if a change is required. A port is initialized at power up, after a reset or after port parameters are sent by the Toolbox to the connected DCU. The configuration parameters sent are:

GOES DCP ID
Timed Transmission Baud Rate
Timed Transmission Channel
Timed Transmission Interval
Timed Transmission Offset

Message Window Length
Preamble Length
Timed Transmission Interleaver Length
Random Transmission Baud Rate
Random Transmission Channel
Random Transmission Interval
Random Transmission Interleaver Length
Set mode to Online

Test Timed Transmission samples all points that report to the GOES radio and appends their data values to the GOES radio timed transmission buffer. The data is transmitted at the next timed transmission time.

Test Random Transmission samples all points that have alarm reports to the GOES radio, sends their data values to the GOES radio, and schedules a random transmission.

Display Buffered Data displays the data reports buffered in the GOES radio timed and random transmission buffer in the Communication Monitor window. In the example below, a buffered timed transmission is displayed. The transmit start time is displayed in GMT. The transmission tag shows the transmission type and when the transmission was scheduled.

GOES Radio Timed Buffer Data:
Transmit start time :00:44:20
Transmit data length :72
123.7 00127 12.9
123.7 00127 ////
123.8 00128 ////
123.9 00130 ////
GOES Radio Random Buffer Data:
Transmit start time :00:25:00
Transmit data length :7
00130

Clear Buffered Data clears the timed and random transmission buffer data in the GOES radio.

Read Status reads and displays the GOES transmitter status in the Communication Monitor:

Bytes in self-timed buffer:	19
Time to next timed message:	000 00:04:09
Bytes in random buffer:	0
Time to next random message:	06:42:14
Failsafe position:	0
Power supply level:	13.6 volts
Average GPS acquisition time:	20 seconds

Read Message Status reads and displays the GOES transmitter last message status in the Communication Monitor window:

Message type:	self-timed or random
Bytes transmitted:	9

Forward RF power level:	156
Reflected RF power level:	79
Power supply level:	12.9 volts
Average GPS acquisition time:	20 seconds
Oscillator drift:	0 Hz
Latitude:	128 35 12
Longitude:	058 25 57

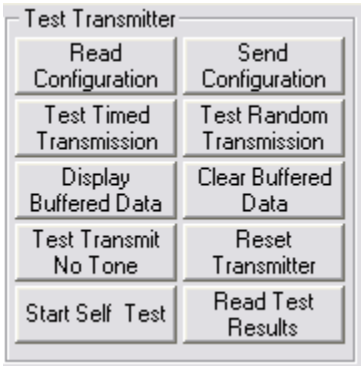
Read Errors reads and displays the GOES transmitter errors in the Communication Monitor window. Click on **Clear Errors** to clear the GOES radio errors.

Error count:	1
Enable random message transmission:	Command rejected

Clear Errors resets the GOES transmitter error count.

8.10.5 GOES Signal Transmitter Test

The GOES Signal *Test Transmitter* test buttons are:



- Read Configuration
- Send Configuration
- Test Timed Transmission
- Test Random Transmission
- Display Buffered Data
- Clear Buffered Data
- Test Transmit No Tone
- Reset Transmitter
- Start Self Test
- Read Test Results

Read Configuration reads and displays the current GOES transmitter configuration in the Communication Monitor window:

GOES Radio Platform ID:	DD68E2D6
GOES Radio Frequency offset:	0
GOES Radio Runtime code select:	RS232 Runtime Code Image
GOES Radio Transmitter time:	23:46:01
DCU time correction:	1 second
DCU time updated:	16:46:01
GOES Radio Software build time:	HH:MM:SS
GOES Radio Software build date:	MM/DD/YYYY

The GOES transmitter time is displayed in GMT. If the GOES radio has GPS installed then the GPS time is converted to the DCU timezone and the DCU time is set. In the example above if the DCU configuration timezone is PST (-8 hour offset from GMT) with DST (daylight savings time) enabled and in effect (+1 hour), the DCU time is using a -7 hours offset from GMT.

Send Configuration forces the DCU to send the GOES radio configuration parameters to the

GOES radio. When the DCU program initializes a GOES Signal radio port it sends the configuration parameters. A port is initialized at power up, after a reset or after port parameters are sent by the Toolbox to the connected DCU. The configuration parameters sent are:

GOES Radio DCP ID
GOES Radio Frequency offset
GOES Radio Runtime code select
Set mode to Online

Test Timed Transmission samples all points that report to the GOES radio and appends their data values to the GOES radio timed transmission buffer. The data is transmitted at the next timed transmission time.

Test Random Transmission samples all points that have alarm reports to the GOES radio, sends their data values to the GOES radio, and schedules a random transmission.

Display Buffered Data displays the data reports buffered in the GOES radio timed and random transmission buffer in the Communication Monitor window. In the example below, a buffered timed transmission and three random transmissions are displayed. The transmit start time is displayed in GMT. The transmission tag shows the transmission type and when the transmission was scheduled.

```
GOES Radio Transmit queue:1 parameters
Number of free pages :76
Transmission type    :Timed
Transmit start time  :00:44:20
Transmission tag     :Timed:16:44:20
Transmit preamble    :Short
Transmit channel     :163
Transmit data length :72
Transmit baud rate   :300
Transmit interleave  :None
GOES Radio Transmit queue:1 data
123.7 00127 12.9
123.7 00127 ////
123.8 00128 ////
123.9 00130 ////
GOES Radio Transmit queue:2 parameters
Number of free pages :76
Transmission type    :Random
Random repeat count  :3
Transmit start time  :00:20:35
Transmission tag     :Random:16:18:00
Transmit preamble    :Short
Transmit channel     :150
Transmit data length :7
Transmit baud rate   :300
Transmit interleave  :None
GOES Radio Transmit queue:2 data
00130
```

GOES Radio Transmit queue:3 parameters
Number of free pages :76
Transmission type :Random
Random repeat count :3
Transmit start time :00:26:10
Transmission tag :Random:16:18:00
Transmit preamble :Short
Transmit channel :150
Transmit data length :7
Transmit baud rate :300
Transmit interleave :None
GOES Radio Transmit queue:3 data
00130
GOES Radio Transmit queue:4 parameters
Number of free pages :76
Transmission type :Random
Random repeat count :3
Transmit start time :00:31:55
Transmission tag :Random:16:18:00
Transmit preamble :Short
Transmit channel :150
Transmit data length :7
Transmit baud rate :300
Transmit interleave :None
GOES Radio Transmit queue:4 data
00130

Clear Buffered Data clears the timed and random transmission buffer data in the GOES radio.

Test Transmit No Tone commands the GOES radio to transmit an unmodulated carrier on the timed transmission channel and baud rate. This command can be used to check the transmit frequency deviation. Click the **Reset Transmitter** button to terminate the test.

Reset Transmitter cancels the GOES radio **Test Transmit No Tone** test.

Start Self Test commands the GOES radio to perform a self test. Read the results of the self test with the **Read Test Results** command.

Read Test Results displays the results of the Start Self Test command in the Communication Monitor window:

GOES Radio Transmitter self test results:
Error message
GOES Radio GPS installed: yes or no
GOES Radio Transmitter type: GOES 100/300 bps or GOES 100/300/1200 bps

Error message is not displayed if there are no errors. Otherwise one or more of the following error messages are displayed:

Battery voltage < 10.0 volts
Software boot code flash CRC error

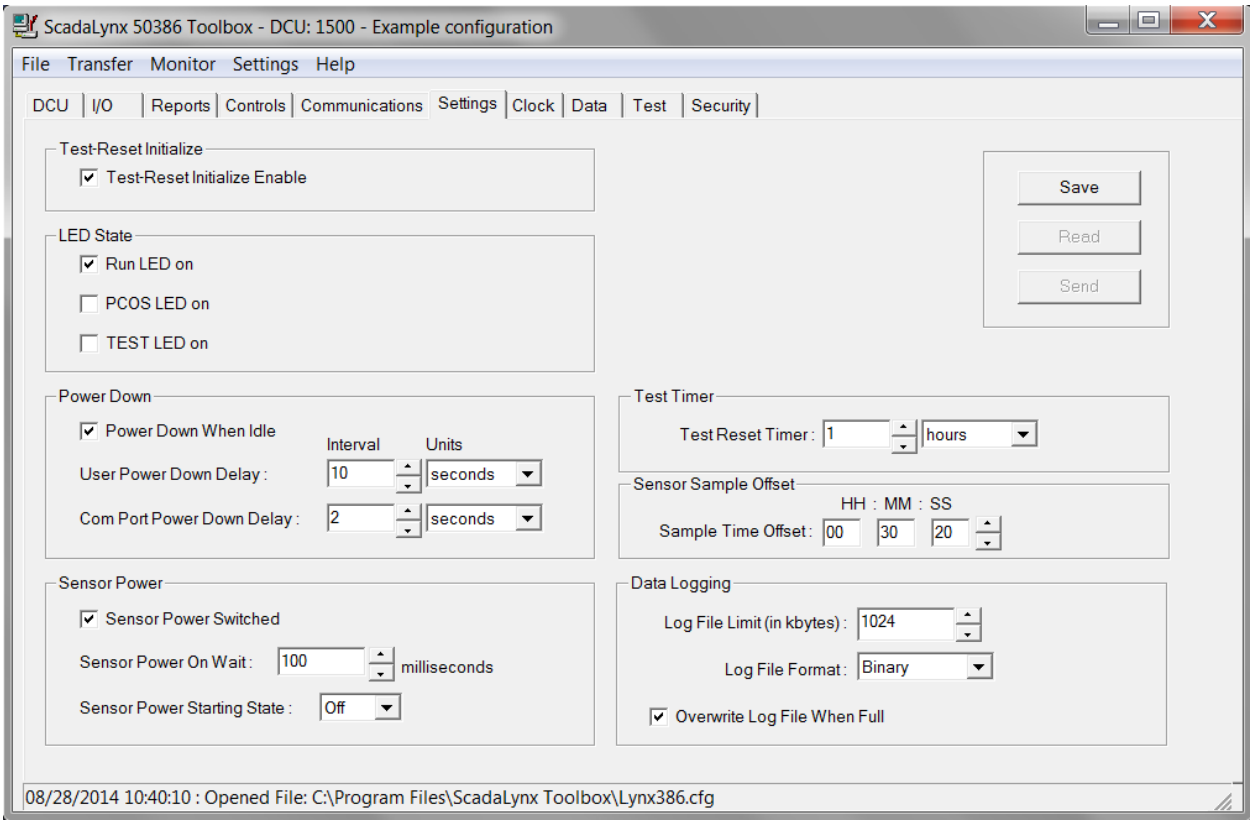
RS232 software flash CRC error
Temperature sensor test failure
TCX0 DAC test failure
HSB software flash CRC error
RF PLL lock failure
TOD interrupt test failure
Modulation interrupt test failure
Manufacturing data flash CRC error

9. DCU Settings

DCU Settings define miscellaneous DCU parameters:

- Test-Reset Initialize
- LED State
- Power Down
- Sensor Power
- Test Reset Timer
- Sensor Sample Offset
- Data Logging

Select the *Settings* page to setup miscellaneous DCU parameters.



9.1 Read DCU Settings

The **Read** button on the *Settings* page reads the DCU settings into the Toolbox memory from the connected DCU and updates the Toolbox display.

This button does not read all the DCU configuration parameters. Use the **Read All Parameters** button on the *DCU* page or *Read All Parameters* in the Transfer menu pull-down to read all parameters.

9.2 Send DCU Settings

The **Send** button on the *Settings* page sends the DCU settings in the Toolbox memory to the

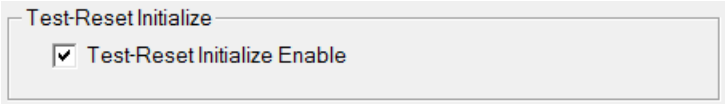
connected DCU. The current configuration is also saved to the disk file name shown in *DCU Identification*. After the parameters have been sent, the Toolbox sends a command to the connected DCU to re-write the configuration file to the DCU flash disk.

This button does not send all the DCU configuration parameters. Use the **Send All Parameters** button on the *DCU* page or *Send All Parameters* in the Transfer menu pull-down to send all parameters.

9.3 DCU Settings Parameters

9.3.1 Test-Reset Initialize

When *Test-Reset Initialize* is enabled, point data values are reset to zero when the SLB TEST switch is held down at program start.

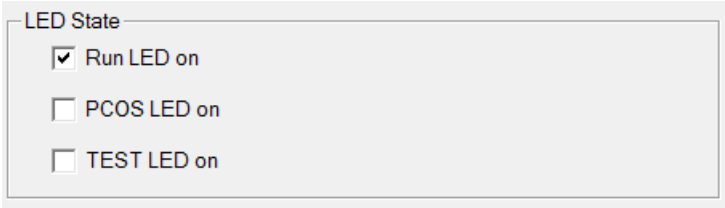


1. Set the RUN/DEBUG to the RUN position.
2. Press and hold the RESET switch S7 and the TEST switch S8.
3. Release the RESET switch S7 and wait for the DCU to start:
   a. PCOS red and green LEDs and SLB Run LED 4 blink.
   b. PCOS red and green LEDs and SLB Run LED 4 stay on.
   c. PCOS green LED turns off leaving PCOS red LED and SLB Run LED 4 on.
4. Release the TEST switch S8.

9.3.2 LED State

Set the start up states of the DCU LEDs:

- Run LED on
- PCOS LED on
- Test LED on



Run LED on controls the SLB Run LED 4 and the PCOS red LED.

PCOS LED on controls the PCOS green LED.

Test LED on controls the SLB Test LED 5.

Program the DCU to turn on LED states are power up or reset. Normally only the Run LED is turned on at power up.

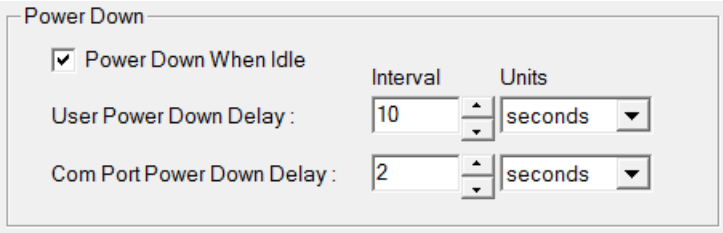
The normal LED states under program control are:

LED	Off state	On state
SLB Run LED 4 and PCOS Red	DCU powered down.	DCU powered on.
PCOS green	Startup.	Data received on a communication port.
SLB Test LED 5	Startup.	Test active or program is writing to the flash disk.

9.3.3 Power Down

Power Down settings control:

- Power Down When Idle
- User Power Down Delay
- Com Power Down Delay



Power Down When Idle enables the DCU to power down when idle. Enable power down for battery powered sites and disable for AC powered sites.

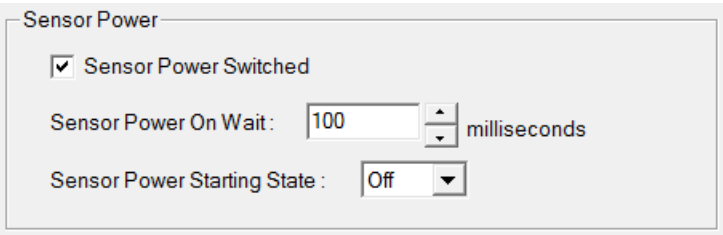
User Power Down Delay defines the time to wait in seconds after a console or Toolbox command before a power down can occur. The default is 10 seconds.

Com Power Down Delay defines the time to wait in seconds after a data packet is received on a communication port before a power down can occur. The default is 2 seconds.

9.3.4 Sensor Power

Sensor Power settings control:

- Sensor Power Switched
- Sensor Power On Wait
- Sensor Power Starting State

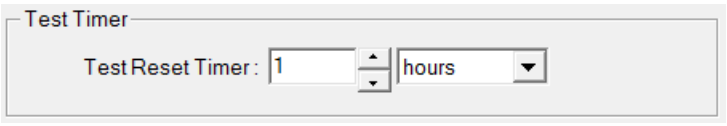


Sensor Power Switched enables switched sensor power. Sensor power turns on while taking sensor samples and then turns off. Enable switched sensor power for battery powered sites and disable for AC powered sites.

Sensor Power On Wait defines the time to wait in milliseconds after the sensor power is turned on before taking sensor samples. This wait allows sensors to power up and stabilize before readings are taken. A short wait is 100 milliseconds. Some sensors require a longer wait of 2000 milliseconds (2 seconds) or a very long wait of 30000 milliseconds (30 seconds).

Sensor Power Starting State defines the sensor power state when the DCU program is started. Select *Off* if using switched sensor power, *On* if not switched.

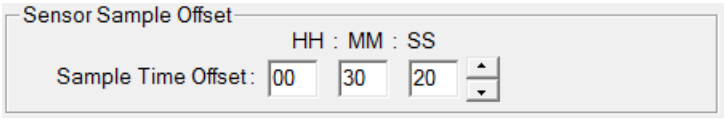
9.3.5 Test Timer



- Test Reset Timer

The *Test Reset Timer* sets the time interval when the DCU test state is turned off after being turned on. When the DCU test state is *On* it transmits ALERT2 data packets with the test flag set and overrides hold off conditions such as waiting for GPS time sync.

9.3.6 Sensor Sample Offset



Sample Time Offset parameters:

- Sample Time Offset

Sample Time Offset aligns sample, computation, and reporting intervals with the offset hour, minute, and second. The default offset is 0:0:0 (no offset).

For example, if timed interval samples are taken every 6 hours and the sample time offset is 1:30:20 the samples times are:

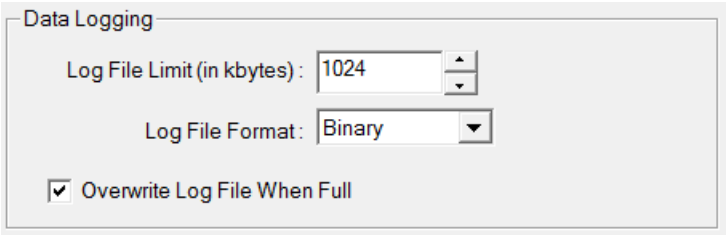
01:30:20, 07:30:20, 13:30:20, 19:30:20

The DCU real time clock is very accurate. Set different sensor sample offsets for each DCU to avoid radio contention that would occur if several DCUs tried to self report at the same time.

9.3.7 Data Logging

Data Logging settings control:

- Log File Limit
- Log File Format
- Overwrite Log File When Full



Log File Limit limits the data logging in Kbytes. The default of 1024 Kbytes uses half the available flash disk storage (2MB) on the PCOS. Increase the storage limit only if your PCOS is upgraded to a larger flash size.

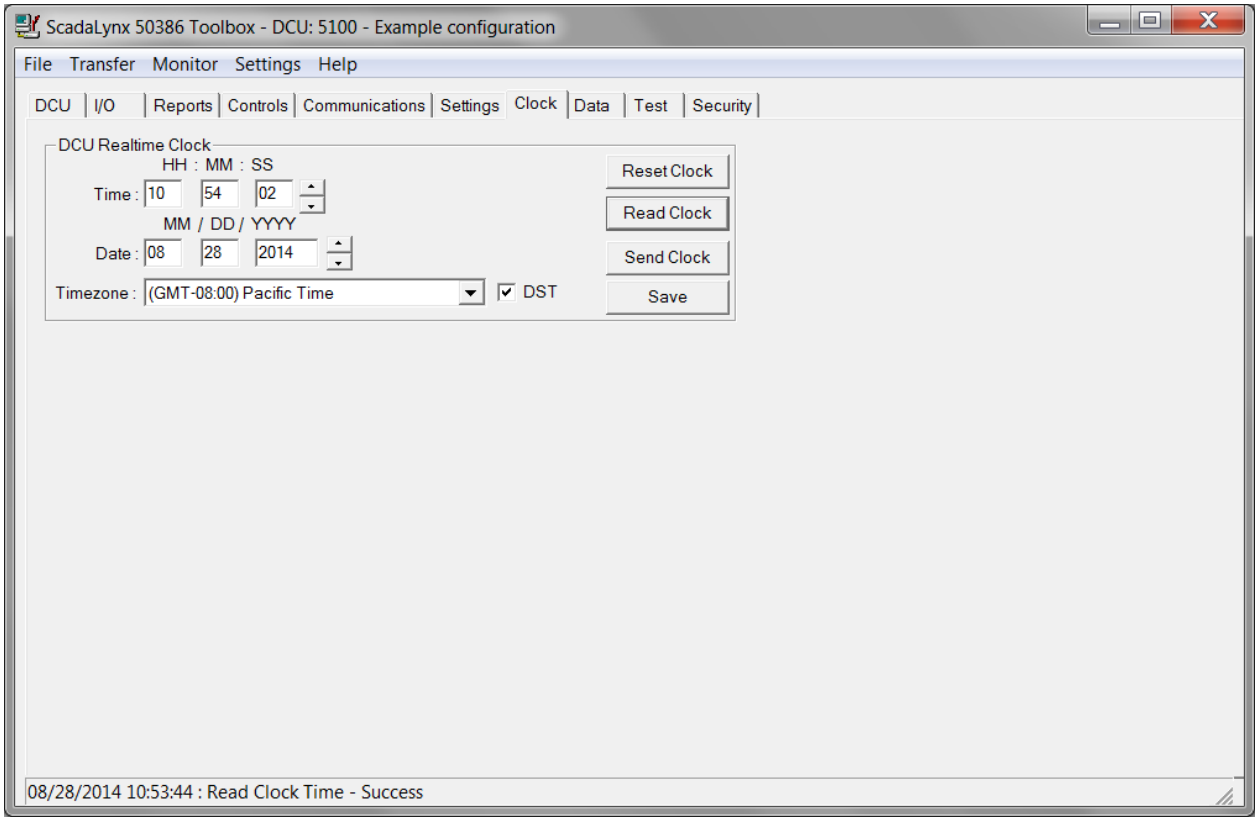
Log File Format is either ASCII or Binary. The ASCII format writes 64 byte data reports in a readable format ending in a carriage return and line feed. The Binary format writes 16 byte data reports and requires the Toolbox to decode the logged data reports.

Overwrite Log File When Full when enabled overwrites older data when the log file limit is reached. If overwriting is disabled, data logging stops when the log file limit is reached.

The DCU data log uses multiple 64 Kbytes files. The most recent data is stored in the file Lynx386.dat. The next older data is stored in the file Lynx386.d1, then .d2 and so on.

10. Clock Setup

Select the *Clock* page to setup the DCU clock time and display parameters.



10.1 Read DCU Clock Time

The **Read Clock** button on the *Clock* page reads the DCU time and time zone into the Toolbox memory from the connected DCU and updates the Toolbox display.

This button does not read all the DCU configuration parameters. Use the **Read All Parameters** button on the *DCU* page or *Read All Parameters* in the Transfer menu pull-down to read all parameters.

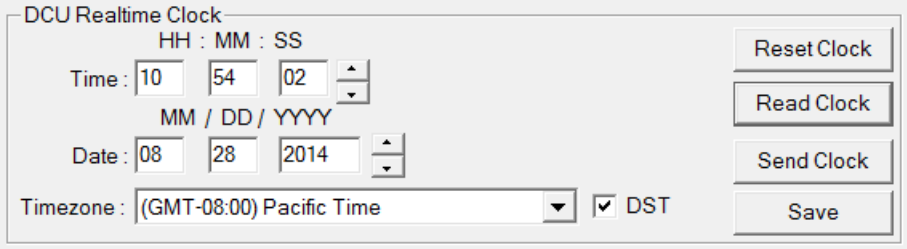
10.2 Send DCU Clock Time

The **Send Clock** button on the *Clock* page sends the time and time zone in the Toolbox memory to the connected DCU. The current configuration is also saved to the disk file name shown in *DCU Identification*. After the parameters have been sent, the Toolbox sends a command to the connected DCU to re-write the configuration file to the DCU flash disk. The DCU resets all timers for the new time.

This button does not send all the DCU configuration parameters. Use the **Send All Parameters** button on the *DCU* page or *Send All Parameters* in the Transfer menu pull-down to send all parameters.

10.3 Clock Parameters

DCU Realtime Clock parameters:



- Time
- Date
- Timezone
- DST

Time and *Date* display the DCU realtime clock time when it is read from the DCU. The time displayed will increment every second while the *Clock* page is visible until you click on any date or time field or click on the time or date up/down arrow buttons. Clock time increments resume after the DCU clock time is reset, read or sent.

Timezone sets the DCU time display to use the selected time zone. The internal DCU time uses GMT (Universal) time. The DCU display and sample times are adjusted to the selected time zone. For example, if timed interval samples are taken every 6 hours and the sample time offset is 1:30:20 the samples times for the selected time zone are:

01:30:20, 07:30:20, 13:30:20, 19:30:20

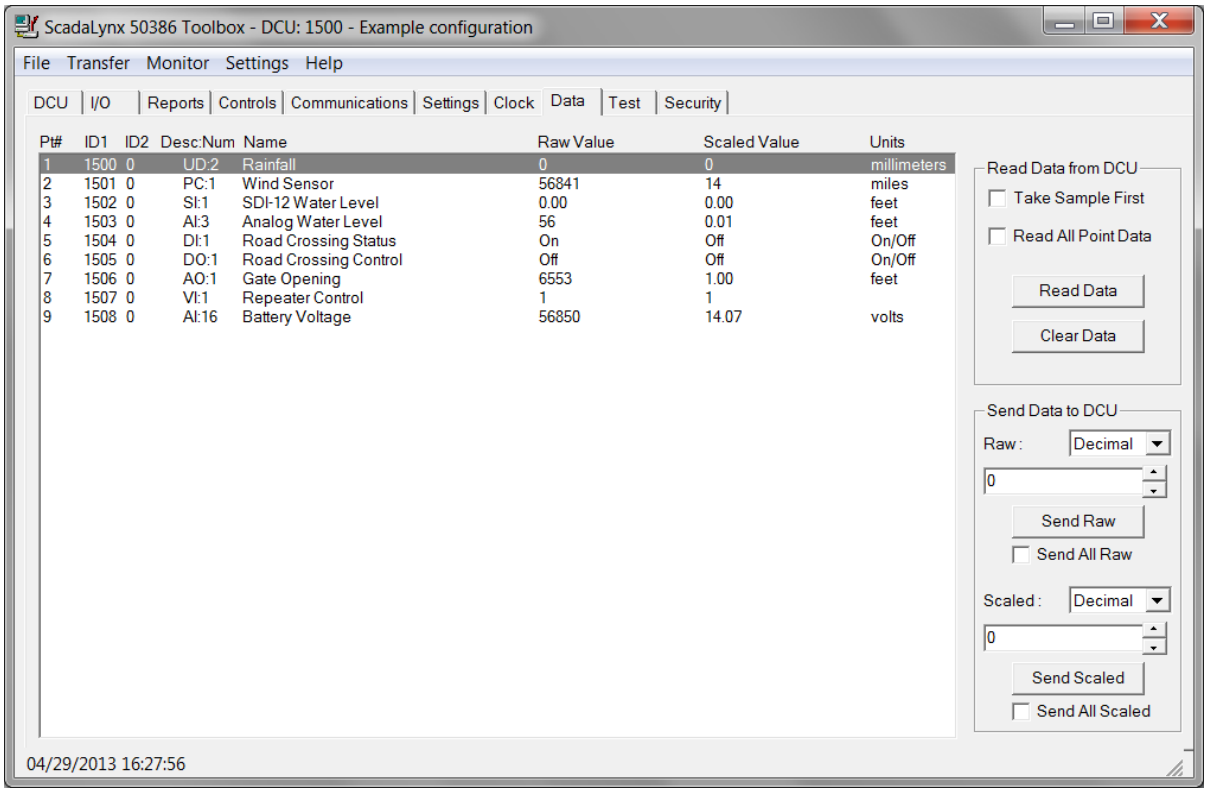
Check *DST* to display DCU time with daylight savings time in effect when appropriate.

The **Reset Clock** button sets the displayed clock time to your computer time.

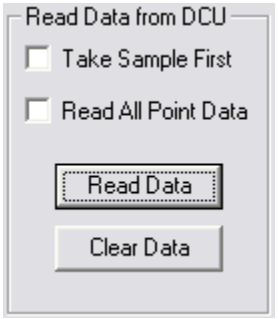
The **Save** button saves the Timezone and DST parameters to the configuration file. The DCU realtime clock time is not saved to the configuration file.

11. Data Display

The *Data* page displays point raw and scaled data values read from the connected DCU. As data values change, the DCU sends reports to the Toolbox and the Toolbox updates the data display. Point raw or scaled data values can be set from the *Data* page. Select the *Data* page to display a connected DCU's point data values. The current clock time is shown in the lower left corner.



11.1 Read Data from DCU



Read Data from DCU parameters are:

- Take Sample First
- Read All Point Data

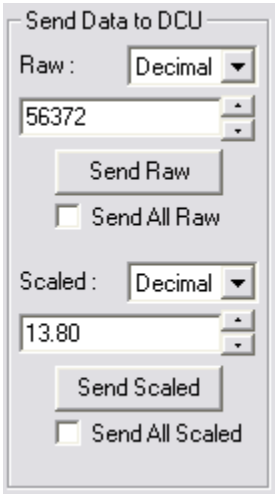
Check *Take Sample First* to force a read of point sensor data before reporting the data, otherwise the last sampled data value is returned. Reading the last sampled value is faster, when reading SDI-12 or analog points with long sensor power on wait times.

Check *Read All Point Data* to read data from all points, not just the point selected.

Read Data reads data for the selected point in the list and displays its raw and scaled data values. If *Read All Point Data* is checked, all point data is read and displayed.

Clear Data clears all point data values from the data display window.

11.2 Send Data to DCU



Send Data to DCU actions are:

- Send Raw
- Send Scaled

11.2.1 Send Raw Data

To modify a point's raw data value:

1. Select the point in the list. Its raw and scaled data values are displayed in the edit fields.
2. Change the *Raw* data value and click **Send Raw**.
3. The point raw and scaled data values are updated when the send command completes

Send raw data to set input point counter (UD, PC) data value. For example, reset a rain gauge Up/down (UD) raw data count to zero; set a shaft encoder raw data count to the current level in its integer form. Other input point types (AI, DI, SI) can have their raw data values set but the data is overwritten when a point sample reads the sensor.

Raw data sent to a point sets the point event flag. The event flag can trigger a data report. Scaled data is computed and tested for point alarm criteria. If alarm criteria are met the alarm flag is set and the assigned control is turned on. The alarm flag can trigger a data report.

Check *Send All Raw* to send raw data from all points, not just the point selected.

11.2.2 Send Scaled Data

To modify a point's scaled data value:

1. Select the point in the list. Its raw and scaled data values are displayed in the edit fields.
2. Change the *Scaled* data value and click **Send Scaled**.
3. The point raw and scaled data values are updated when the send command completes.

Send scaled data to set an output point (DO, AO, VI) or input point counters (UD, PC) scaled data value. Raw data is computed and sets the physical state of the output.

Scaled data sent to a point sets the point event flag. The event flag can trigger a data report. The scaled data value is tested for point alarm criteria. If alarm criteria are met the alarm flag is set and the assigned control is turned on. The alarm flag can trigger a data report.

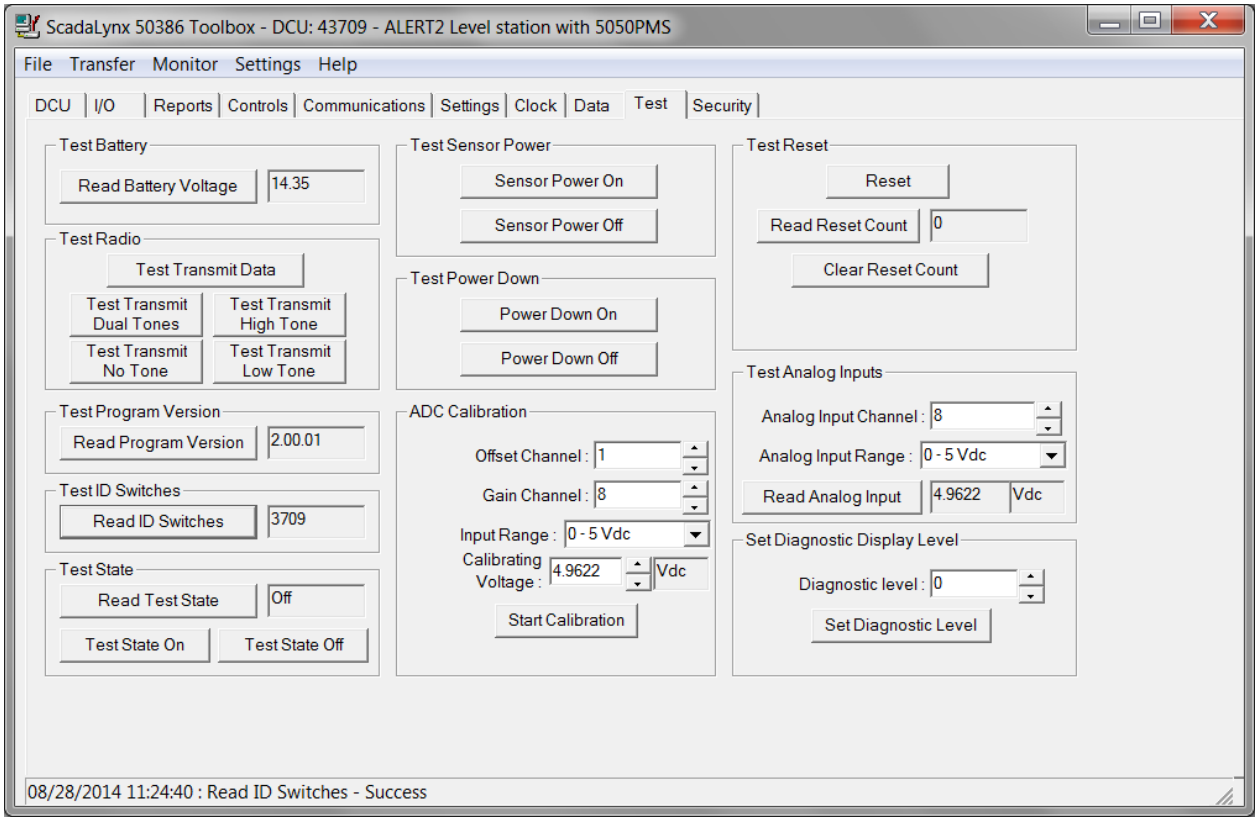
Check *Send All Scaled* to send scaled data from all points, not just the point selected.

11.3 Data Display Monitor

While the Toolbox is connected to the DCU, the data display shows point data value changes as they are sent by the DCU. Click on a point in the list to stop scrolling during updates.

12. DCU Test

Select the *Test* page to test a DCU.



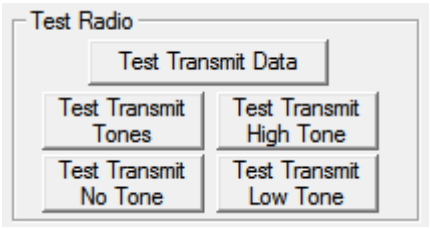
The *Test* page is useful in testing the operation of the ScadaLynx 50386 DCU. The tests are divided into the following sections:

- Test Battery — Read the battery voltage under load.
- Test Radio — Transmit data, tone and no tone on the ALERT1 radio.
- Test Program Version — Read and display the DCU application program version
- Test ID Switches — Read the DCU ID switches.
- Test State — Read and set the DCU test state.
- Test Sensor Power — Turn DCU sensor power on and off.
- Test Power Down — Enable and disable the DCU power down.
- ADC Calibration — Re-calibrate the Analog to Digital Converter, ADC.
- Test Reset — Reset the DCU, read and clear the reset count.
- Test Analog Inputs — Read and display an analog input reading.
- Set Diagnostic Display Level — Increase the number of diagnostic messages displayed.

12.1 Test Battery

Read Battery Voltage sends a command to read the DCU battery voltage while it is under load. ALERT1 radio transmit power is turned and the DCU waits until the radio power on timer expires (see Communications Port Transmit Setup, Radio Port Transmit Timers). The battery voltage is then read from AI:16 and displayed.

12.2 Test Radio



Test Transmit Data sends a command to read and transmit all point data on the active radio port. Use this command to check radio transmissions to the base station.

Test Transmit Tones sends a command to transmit alternating tones without data for 5 seconds on the ALERT1 or ALERT2 radio port. Use this command to check radio deviation and transmit and reflected power with a watt meter.

Test Transmit High Tone sends a command to transmit the high ALERT1 radio tone without data for 5 seconds on the ALERT1 or ALERT2 radio port. Use this command to check data receiver input.

Test Transmit Low Tone sends a command to transmit the low ALERT1 radio tone without data for 5 seconds on the ALERT1 or ALERT2 radio port. Use this command to check data receiver input.

Test Transmit No Tone sends a command to turn on the ALERT1 or ALERT2 radio power and key on the radio without generating tone for 5 seconds. Use this command to check the radio frequency and transmit and reflected power with a watt meter

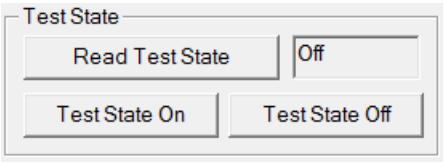
12.3 Test Program Version

Read Program Version sends a command to read and display the DCU application program version number. Use this command to check if the DCU application program is compatible with the Toolbox version. The Toolbox and application version numbers must match in the first and second elements to be compatible. For example, a Toolbox version number 1.28.00 is compatible with an application version number 1.28.01 but not with version number 1.27.00.

12.4 Test ID Switches

Read ID Switches sends a command to read and display the DCU ID switches. Use this command to test the SLB ID switches. This test does not reset the DCU number. Reset the DCU after changing the ID switches to reset the DCU number.

12.5 Test State



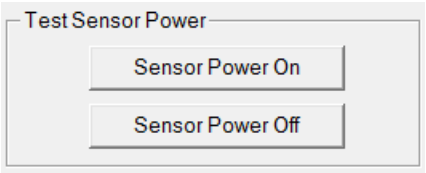
Read Test State sends a command to read and display the DCU test state: *Off* or *On*. When the DCU test state is on it transmits ALERT2 data packets with the test flag set and overrides hold off conditions such as waiting for GPS time sync.

Test State On sends a command to the DCU to turn the test state on. The Test state timer is started, and the test state turns off after the timer expires (Default: 1hour).

Test State Off sends a command to the DCU to turn the test state off.

A restart of the DCU application program on RESET or power up, turns off the test state.

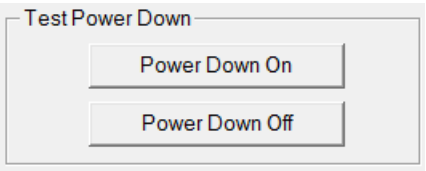
12.6 Test Sensor Power



Sensor Power On sends a command to turn on the switched sensor power. Sensor power remains on until turned off or the DCU powers down. Use this command to test analog sensors. These sensors must be powered on to be tested.

Sensor Power Off sends a command to turn off the switched sensor power. The sensor power is also turned off by a power down or reset.

12.7 Test Power Down

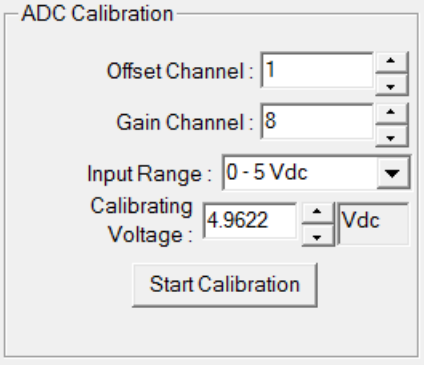


Power Down On sends a command to force a DCU power down. The DCU is powered on by the SLB I/O PIC when a wake-up event is detected. Wake-up events are data received on communication port COM1, carrier detect, digital input event, counter event, and wake-up timer. Use this command to test DCU wakeup events. Any Toolbox communication on COM1 wakes up the DCU. **Note: Toolbox communication on COM2 does not wake up the DCU.**

Power Down Off sends a command to disable DCU power down. Use this command when testing sensors to prevent a DCU power down from turning off switched sensor power. Click

Power Down On to re-enable power down or reset the DCU (see DCU Reset).

12.8 ADC Calibration



The Analog to Digital Converter, ADC, converts an analog input sensor DC volt signal to a digital reading from 0 - 65535. The 50386 ADC has 5 voltage input ranges:

- 0 – 25 mVdc
- 0 – 55 mVdc
- 0 - 100 mVdc
- 0 – 1 Vdc
- 0 – 5 Vdc

The precision 16 bit ADC must be calibrated for each input voltage range that will be used. Each ScadaLynx 50386 DCU has its ADC calibrated for the 0 – 5 Vdc range at the factory prior to shipment. The calibration parameters are saved in the NVRAM on the PCOS board.

If you change the PCOS board on your DCU or want to use another voltage input range, re-calibrate the ADC to save the calibration parameters in the new PCOS NVRAM.

The calibration process computes an offset and a gain parameter. The offset is computed by shorting an analog input channel to ground then reading the voltage on that channel. The gain offset is computed by putting a known voltage source into an analog input channel, reading the voltage on that channel, and adjusting the reading to match the measured voltage.

Short an analog input channel to ground on the sensor terminal strip or on the resistor socket X2 for analog input channels 1 - 8 (see the SLB Board Layout). Analog input channel 1 is the farthest from the edge of the board.

Use analog input channel 8 for the 0 – 5 Vdc gain calibration. Analog input channel 8 is connected to Vref on the sensor connector package or on the terminal strip. Measure the Vref voltage with a 4 digit meter on the sensor terminal strip or on the resistor socket X2 (see the SLB Board Layout). Analog input channel 8 is the closest to the edge of the board.

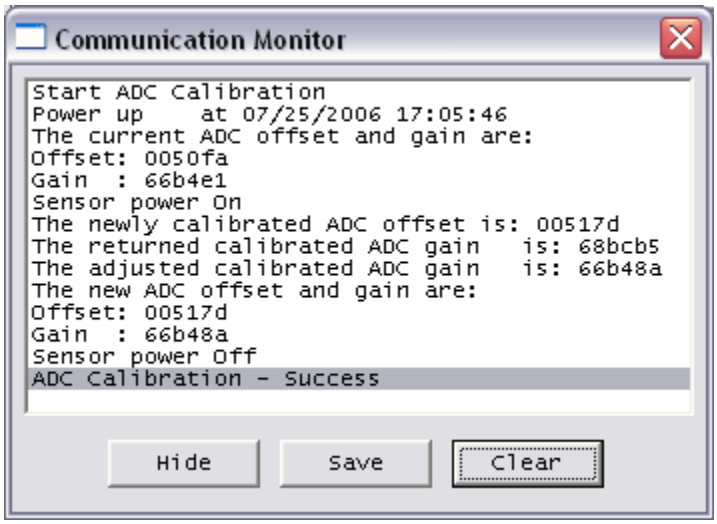
Select the offset and gain analog input channels and enter the measured gain voltage (Vref) before starting the calibration.

Offset Channel: Enter the analog input channel number shorted to ground to compute the ADC offset. For example enter channel 1.

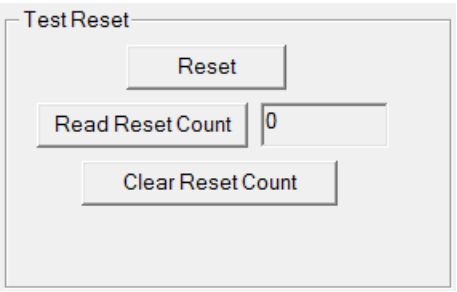
Gain Channel: Enter the Analog Input channel number connected to the known voltage source (e.g. Vref) to compute the ADC gain. For example enter channel 8.

Calibrating Voltage: Enter the measured gain calibration voltage in Vdc (e.g. Vref) on the analog input gain channel. For example enter 4.903.

Start Calibration sends a command to start the ADC calibration. The ADC calibration results are displayed in the monitor window.



12.9 Test Reset



Reset sends a command to restart the DCU application program. This command has the same effect as pressing the RESET button on the SLB. Note that after a reset, the Toolbox connection stays active but the DCU is not aware of the connection. You can send commands to the DCU but you cannot monitor DCU activity. Reconnect to restore the Toolbox Communication Monitor (see Connecting to a DCU).

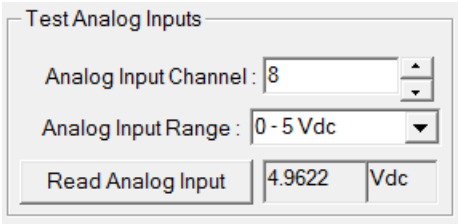
Read Reset Count sends a command to read and display the DCU reset counter. This counter is incremented each time the DCU powers up or resets. The counter lets you check how often the DCU is resetting. Too many resets should be investigated. Unexpected resets can be caused by:

- Power disruption to the DCU.
- Power spikes through an AC power adaptor.
- Static discharge on the SLB or sensor connect board.
- Radio transmissions with a weak battery.
- Program hangs that are restarted by the watchdog timer.
- Invalid sensor calibration parameters (e.g. divide by zero).

Clear Reset Count sends a command to reset the DCU reset count to zero.

12.10 Test Analog Inputs

Test analog input sensors by reading and displaying the analog input channel voltage in the range 0 - 5 Vdc. Select the *Analog Input Channel* number to test (1 - 16) and the input voltage range. Analog input channel 8 is connected to Vref. Analog input 16 is connected to the battery voltage.

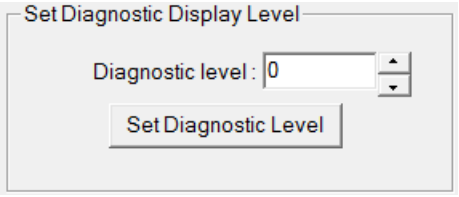


Read Analog Input sends a command to read and display the selected analog input voltage. The DCU program performs the following steps:

1. Switched sensor power is turned on.
2. The DCU program waits for the *Sensor Power on Wait* timer to expire (see DCU Settings, Sensor Power).
3. The analog input channel is read from the ADC and displayed as a voltage in the selected range.

To avoid waiting for a long *Sensor Power on Wait*, turn on the sensor power before reading the analog input channel (see Sensor Power On above).

12.11 Set Diagnostic Display Level



The Communication Monitor displays DCU activity when the Toolbox is connected to the DCU. Increase the amount of information displayed by increasing the diagnostic level.

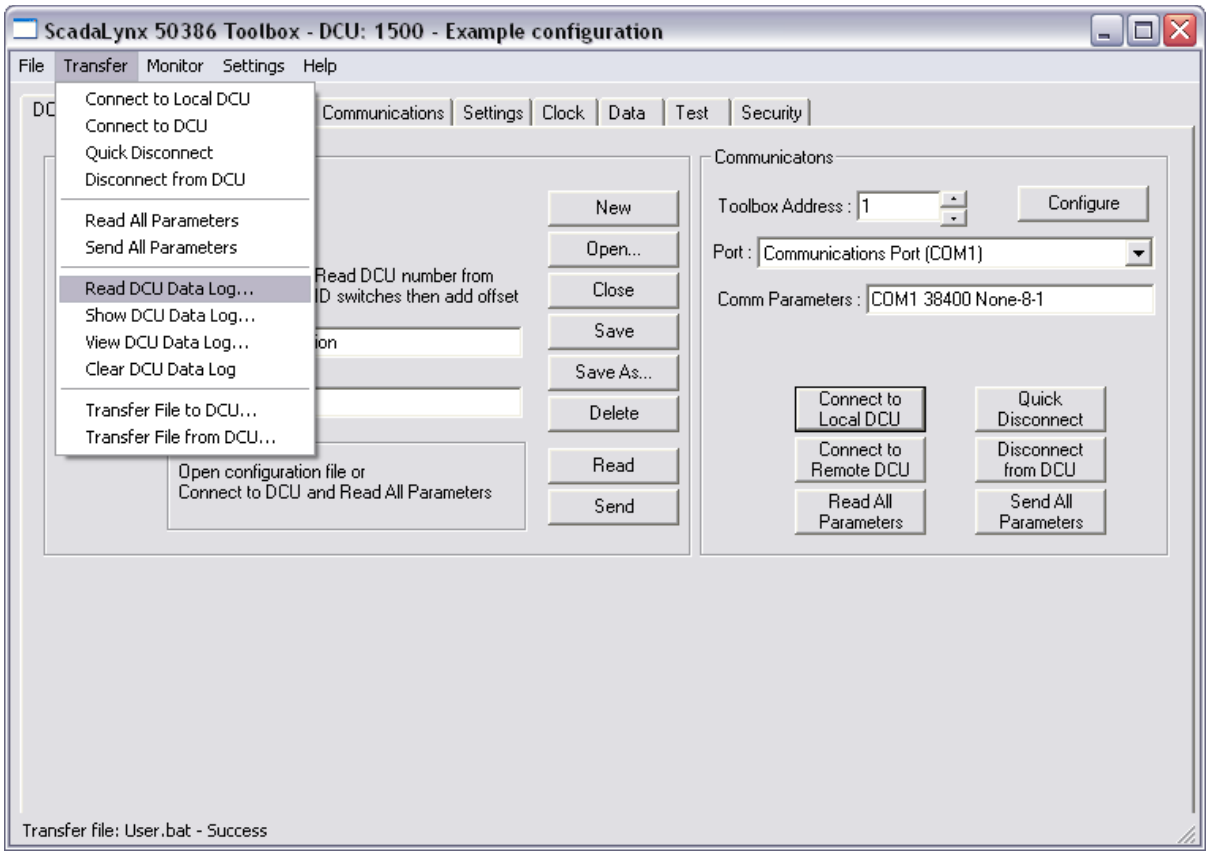
Set the *Diagnostic level*. Level 0 shows the minimum information.

Set Diagnostic Level sends a command to set the DCU diagnostic display level.

13. Logged Data

The ScadaLynx 50386 DCU logs data reports in its flash disk. Download and display logged data with the DCU Data Log entries on the Transfer pull-down menu:

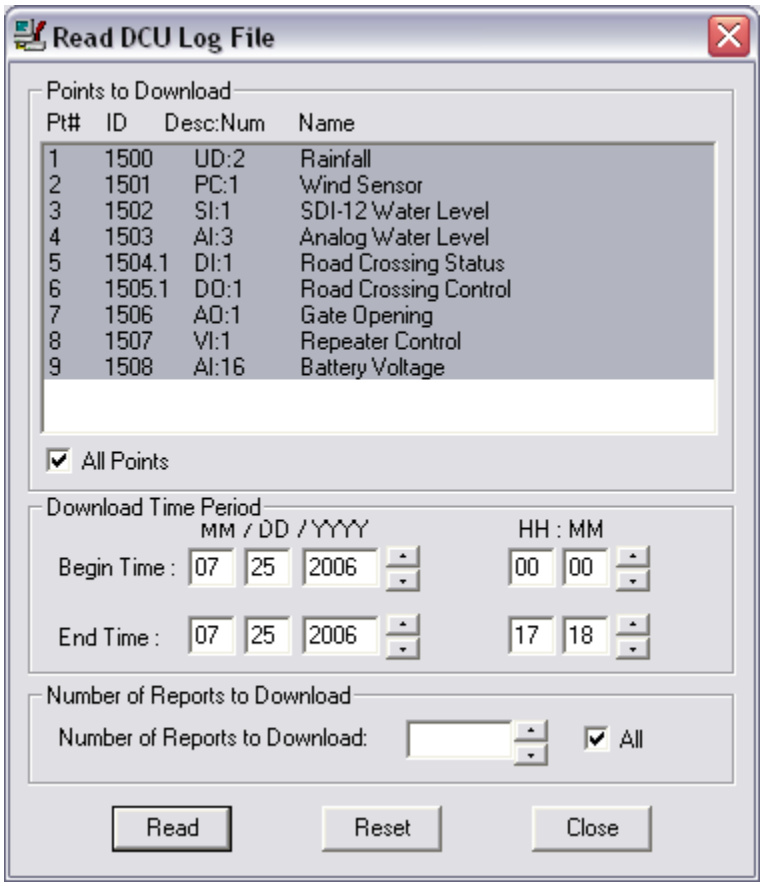
- Read DCU Data Log Download the DCU logged data into the Toolbox memory.
- Show DCU Data Log Display the window showing the downloaded data reports.
- View DCU Data Log Display logged data already saved to a disk file on your computer.
- Clear DCU Data Log Clear logged data memory on the DCU.



The DCU stores logged data reports in ASCII or binary format. The format is selected in the *Settings* page under *Data Logging*, *Log File Format* (see DCU Settings, Data Logging). When ASCII data is downloaded, it is displayed as received. When binary data is downloaded, it is reformatted using the following rules and the current configuration in the Toolbox memory (not in the connected DCU):

1. Report times are displayed in the time zone defined in the current configuration.
2. Report data is formatted to display the decimal point and data units for point ID numbers defined in the current configuration.
3. Report data is displayed as an integer number with no decimal points and no data units if the point ID number is not defined in the current configuration.

13.1 Read DCU Data Log



Select *Read DCU Data Log* to display the Read DCU Log File window to the right. The command parameters are:

- Points to download
- Download time period
- Number of reports to download

Read sends the read log data command to the connected DCU.

Reset sets default command parameters.

Close closes window.

13.1.1 Download Point Selection

Points to Download parameters are:

- Points to Download list
- All

Select points in the list whose data you want to download All points are selected by default. Click on a point to de-select it or uncheck *All Points* to de-select all points. Click on points to re-select or check *All Points* to select all points again.

Note: When downloading data from a repeater that has logged received data, select *All points* to allow all logged points to download.

13.1.2 Download Time Period

Download Time Period parameters are:

- Begin Time
- End Time

Select the time period to download in the *Begin Time* and *End Time* fields. These times use the time zone defined in the current configuration in the Toolbox memory. Times are converted to GMT (Universal Time), before they are sent to the DCU. Click on a time element (month, day, year, hour, or minute) then click the up/down arrow buttons to increment or decrement that time element.

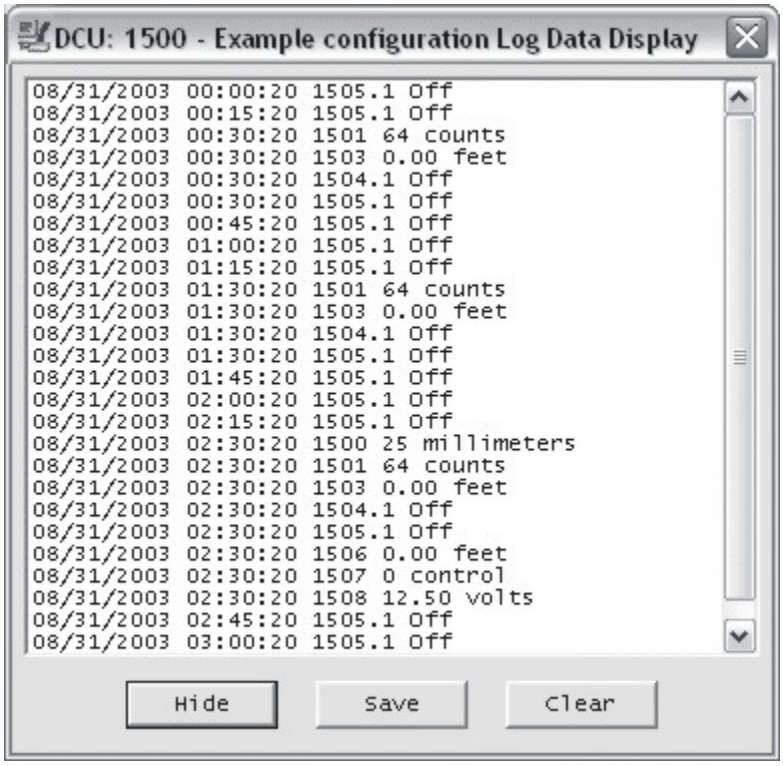
13.1.3 Number of reports to download

Number of Reports to Download parameters are:

- Number of Reports to Download
- All

Limit the number of reports to download in the Number of Reports to Download or check All to download all reports for the selected time period.

13.1.4 Read DCU Data Log



Click **Read** to send the read logged data request to the connected DCU.

The Read command displays the Log Data Display window. When the Toolbox receives a block of logged data reports from the DCU, the data reports are appended to the Log Data Display window. Data report formatting uses the rules defined above.

The Toolbox continues by requesting the next block of logged data until the DCU responds that all logged data requested has been sent.

If a logged data block is missed due to communication errors, the Toolbox tries again after waiting the communication port retry timeout (see Communication Configuration). Click retry on the communication dialogue box to immediately resend the logged data block request.

Note: Searching for and reading historic logged data from the flash disk is slow. There is a noticeable delay in the DCU response when older logged data is requested.

Each logged data read request appends to the Logged Data Display window until it is cleared. Hiding or closing the window does not clear the data reports in it.

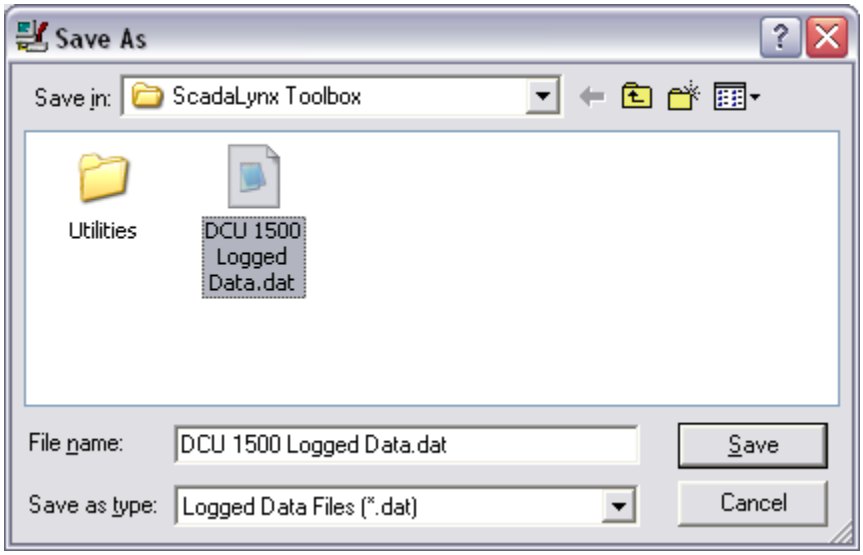
13.2 Show DCU Data Log

Select *Show DCU Data Log* to display the Log Data Display window (see above).

Hide closes the Log Data Display window but keeps the logged data in the list.

Save writes the data reports in the Log Data Display window to a file.

A dialogue box is opened to let you pick or enter a file name. Logged data files are given a .dat extension. Enter or pick a file name and click **Save**.

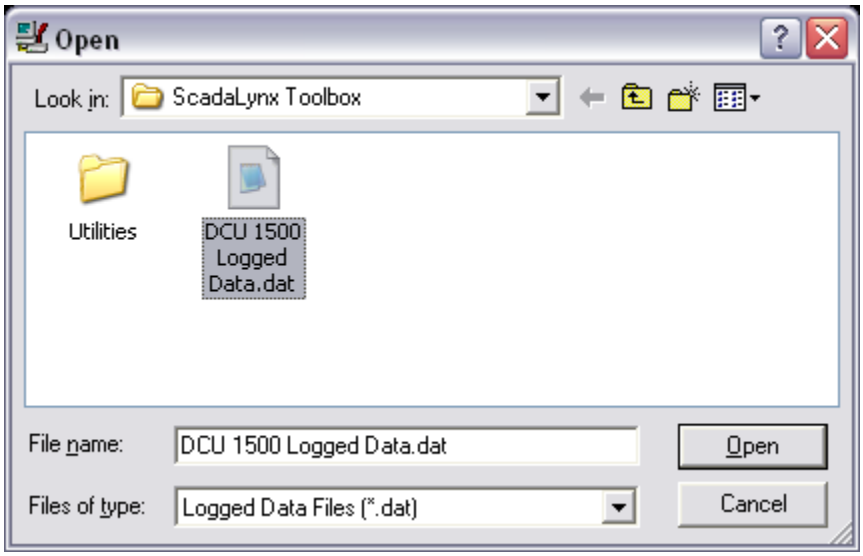


Cancel closes the Save As dialogue box without saving the logged data reports.

Clear erases logged data reports in the list. It does not erase logged data in the connected DCU.

13.3 View DCU Data Log

Select *View DCU Data Log* to read and display logged data reports from a file saved on your computer.

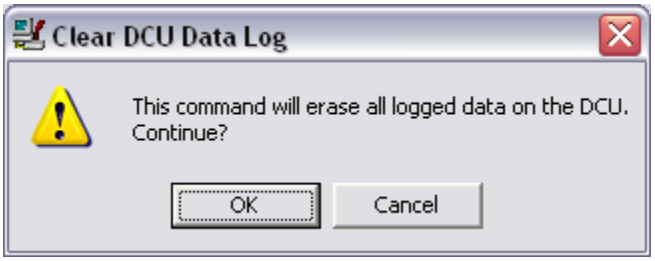


A dialogue box is opened to let you pick or enter a file name. Logged data files are given a .dat extension. Enter or pick a file name and click **Open**. A Log Data Display window is opened to display the logged data reports (see above).

Cancel closes the Open dialogue box without opening the logged data file.

13.4 Clear DCU Data Log

Select *Clear DCU Data Log* to send a command to erase all logged data on the connected DCU.



The Toolbox asks for verification before it sends this command. Click **OK** to send the command.

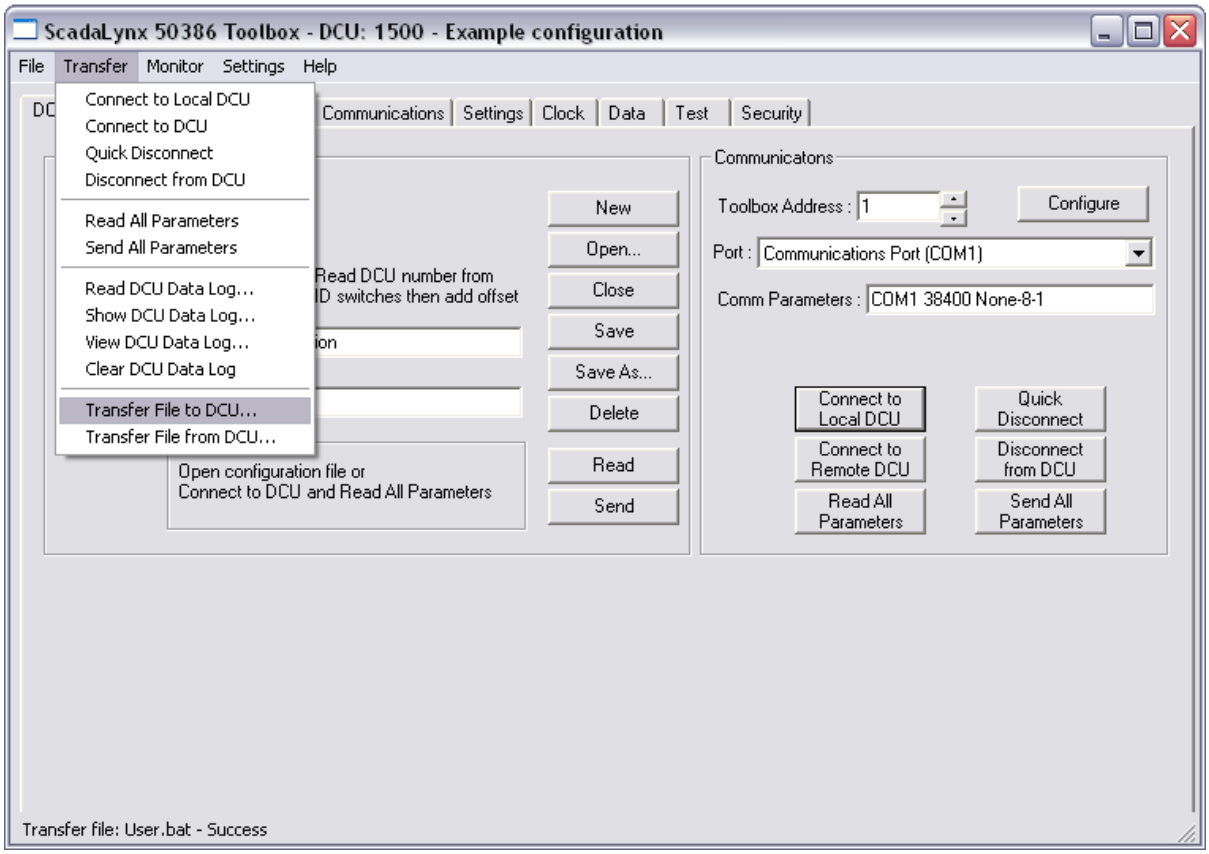
Cancel closes the message box and does not send the command.

Warning! There is no recovery from this command. Download and save the logged data before clearing the DCU data log.

14. File Transfer

The Toolbox can transfer files to the DCU for storage on the flash disk or from the DCU for storage on your workstation or notebook computer. The types of files to transfer are:

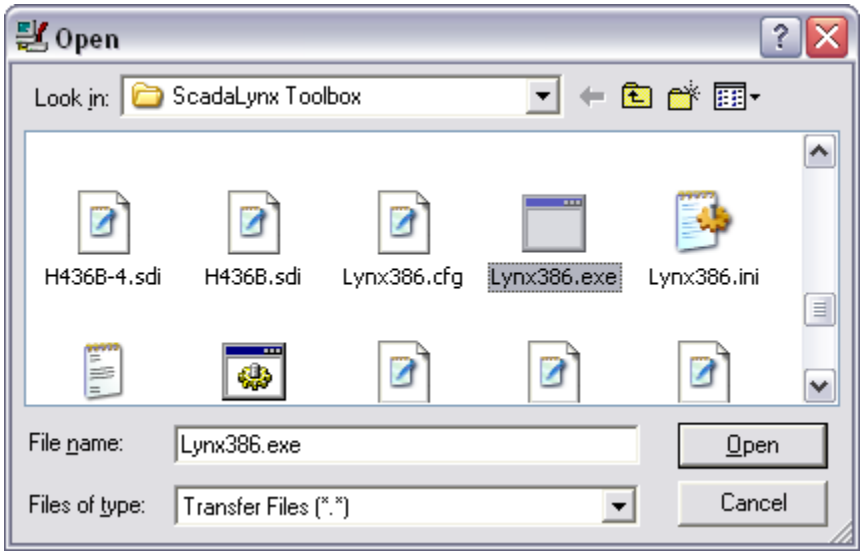
- Configuration, SDI-12 script, and table files
- Log files
- DCU application program update



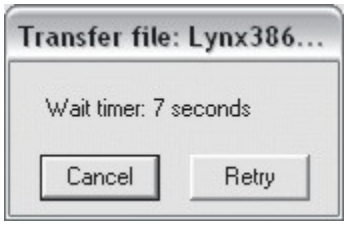
14.1 Transfer File to DCU

Select *Transfer File to DCU* in the Transfer menu pull-down to select and send a file to the connected DCU.

A dialogue box is opened to let you pick or enter a file name. Program application files are given an .exe extension. The DCU application program name is Lynx386.exe.



Enter or pick a file name and click **Open** to start the file transfer. **Cancel** closes the Open dialogue box and does not start a file transfer.



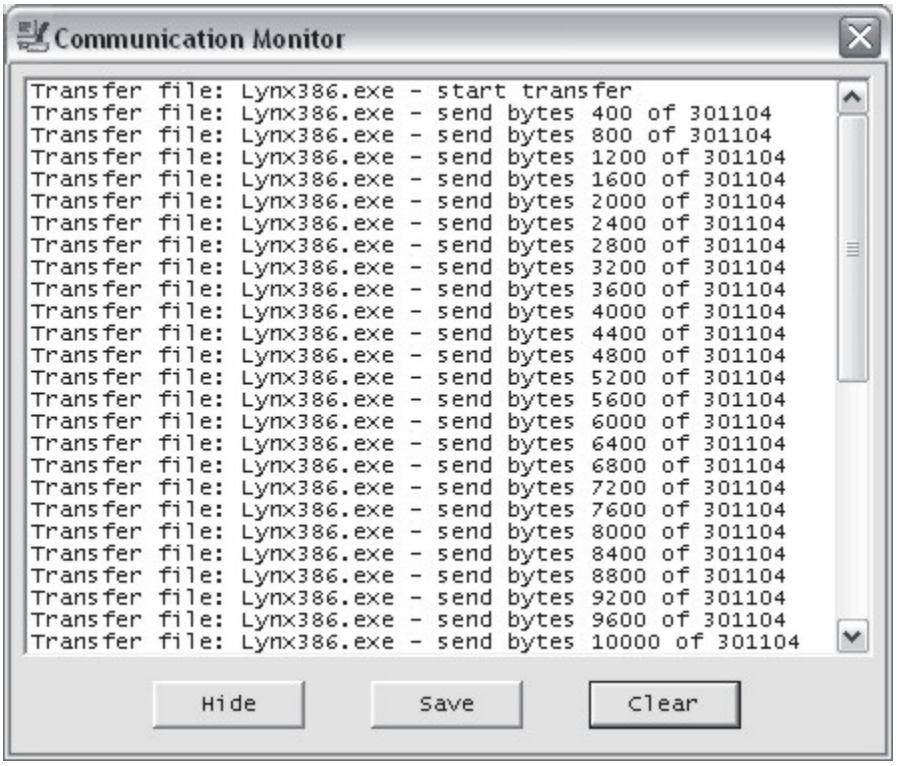
The file is transferred in block of 400 bytes.

A wait dialogue window shows the time elapsed for the file transfer.

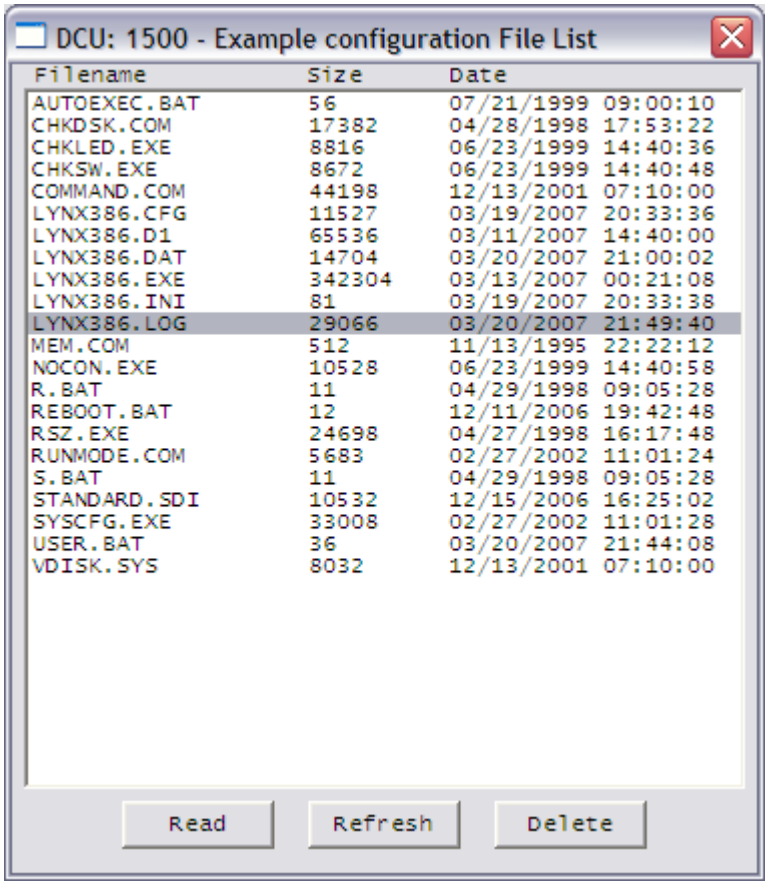
Click **Cancel** to quit the file transfer.

If the file transfer stalls, click the **Retry** button to resend the file block

Show the Communication Monitor to view the file transfer progress.



14.2 Transfer File from DCU



Select *Transfer File from DCU* in the Transfer menu pull-down to request a file transfer from the connected DCU.

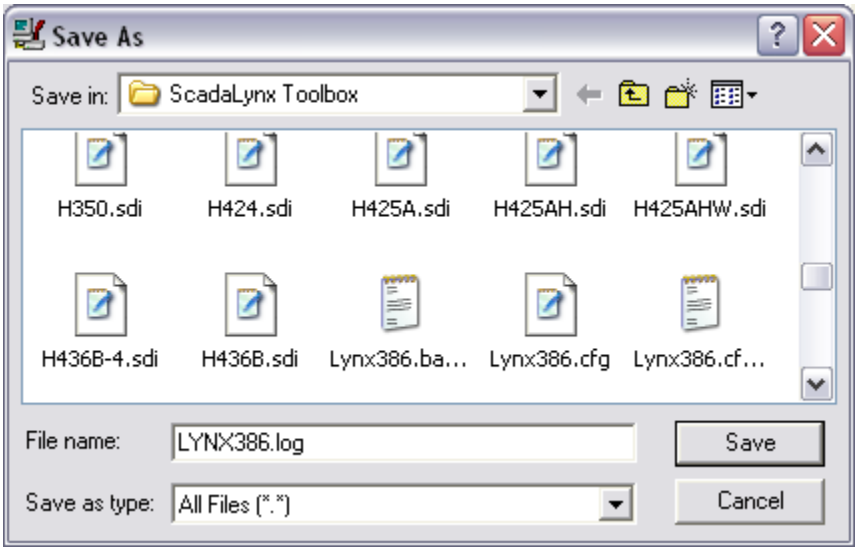
The toolbox will request a list of files from the connected DCU. A dialogue box is opened to let you pick a file name from the list downloaded from the connected DCU.

Pick a file name and click **Read** to start the file transfer.

Refresh requests the file list from the connected DCU.

Click **Delete** to remove the file from the DCU flash disk.

Before the file transfer is started, another dialogue box is opened to let you pick the storage folder and file name on your workstation or notebook computer. Make you selection and then click **Save** to start the file transfer.

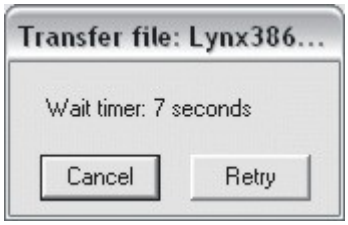


The file is transferred in block of 400 bytes.

A wait dialogue window shows the time elapsed for the file transfer.

Click **Cancel** to quit the file transfer.

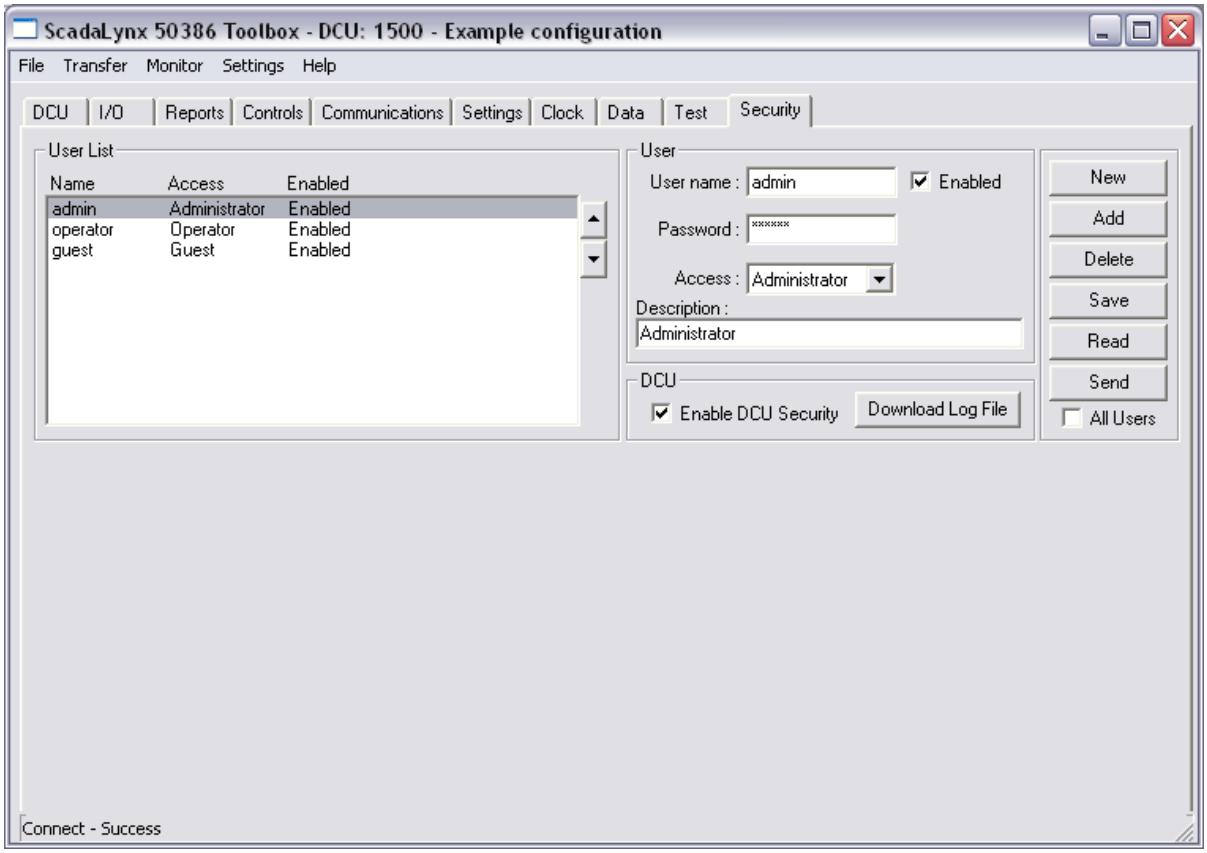
If the file transfer stalls, click the **Retry** button to resend the file block


Transfer file: Lynx386...
Wait timer: 7 seconds
Cancel
Retry

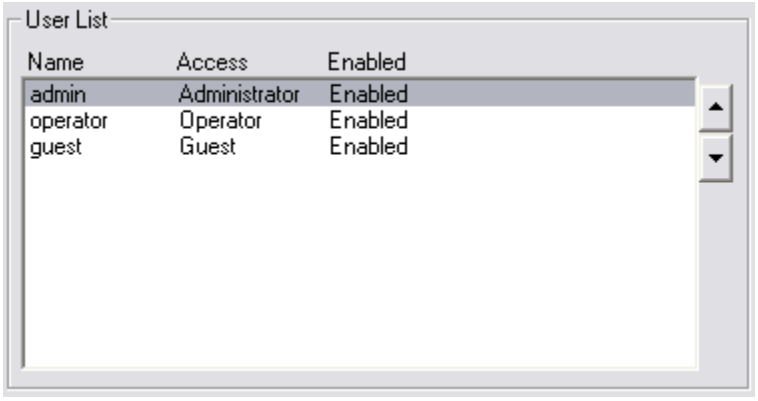
15. Security

Security access to 50386 DCU programming can be enabled. When security is enabled an operator must enter a login name and password after connecting to the DCU. The access level assigned to the login name determines what actions the operator can take.

Select the *Security* page to view, edit, add, delete, save, read or send user names.



15.1 User Information



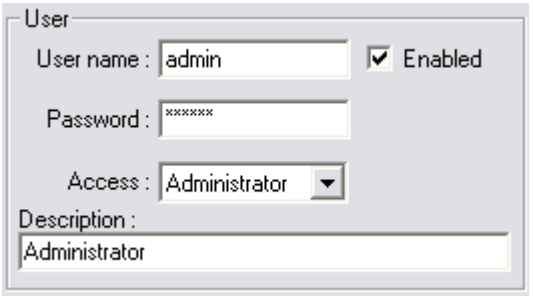
The *User List* displays the user login information:

- User Name
- User Access
- User Login Enabled

The order of user names in the list does not affect login access. To change the order select the user name list and click the *User List* up/down arrow buttons to the right of the list.

To change user login information, select a user in the list and edit the user login parameters to the right of the list.

15.1.1 User Name



The user login name can be up to 20 characters long. It is not case sensitive.

Check the *Enabled* box to allow this user name access to the DCU.

15.1.2 User Password

The user password can be blank or between 6 and 20 characters. The password is encrypted and is displayed as stars '*'.

15.1.3 User Access

The 50386 DCU security has three access levels

- Administrator Full read/write access to configuration and data
- Operator Read access to configuration, write access for data and test features
- Guest Read access to data only

15.1.4 User Description

This field can be used to describe the user. The description can be up to 80 characters.

15.2 Add a User

It is easier to copy a user of the same access type than to create a new user. When a user is copied, all the user parameters are also copied.

1. Select the user to copy in the *User List* and click **Add** to copy or click **New** to append a blank user.
2. Change the user login parameters.
3. Reposition the user with the *User List* up/down arrow buttons and click **Save**.

Each user must have a unique name.

Note: After adding, deleting, or repositioning a user, send all users to the DCU.

15.3 Delete a User

1. Select the user to delete in the *User List* and click **Delete** or check **All Users** and click **Delete** to delete all users.
2. The Toolbox will ask for delete confirmation. Click **OK** to delete.
3. Click **Save** to delete the user from the configuration file.

Deleting a user in the middle of the *User List* renumbers the users.

Note: After adding, deleting, or repositioning a user, send all users to the DCU.

15.4 Read User Parameters

The **Read** button on the *Security* page reads the DCU security enable state and the selected user login parameters into the Toolbox memory from the connected DCU and updates the Toolbox display. Check the **All Users** box to read all users.

This button does not read all the DCU configuration parameters. Use the **Read All Parameters** button on the *DCU* page or *Read All Parameters* in the Transfer menu pull-down to read all DCU parameters.

15.5 Send User Parameters

The **Send** button on the *Security* page sends the DCU security enable state and the selected user login parameters in the Toolbox memory to the connected DCU. The current configuration is also saved to the disk file name shown in *DCU Identification*. Check the **All Users** box to send all users.

This button does not send all the DCU configuration parameters. Use the **Send All Parameters** button on the *DCU* page or *Send All Parameters* in the Transfer menu pull-down to send all parameters.

15.6 DCU Security

15.6.1 Enable DCU Security

Security is enabled on the DCU when the *Enable Security* box is checked.

Click the **Send** button to send any change in security to the connected DCU.

15.6.2 View DCU Security Log

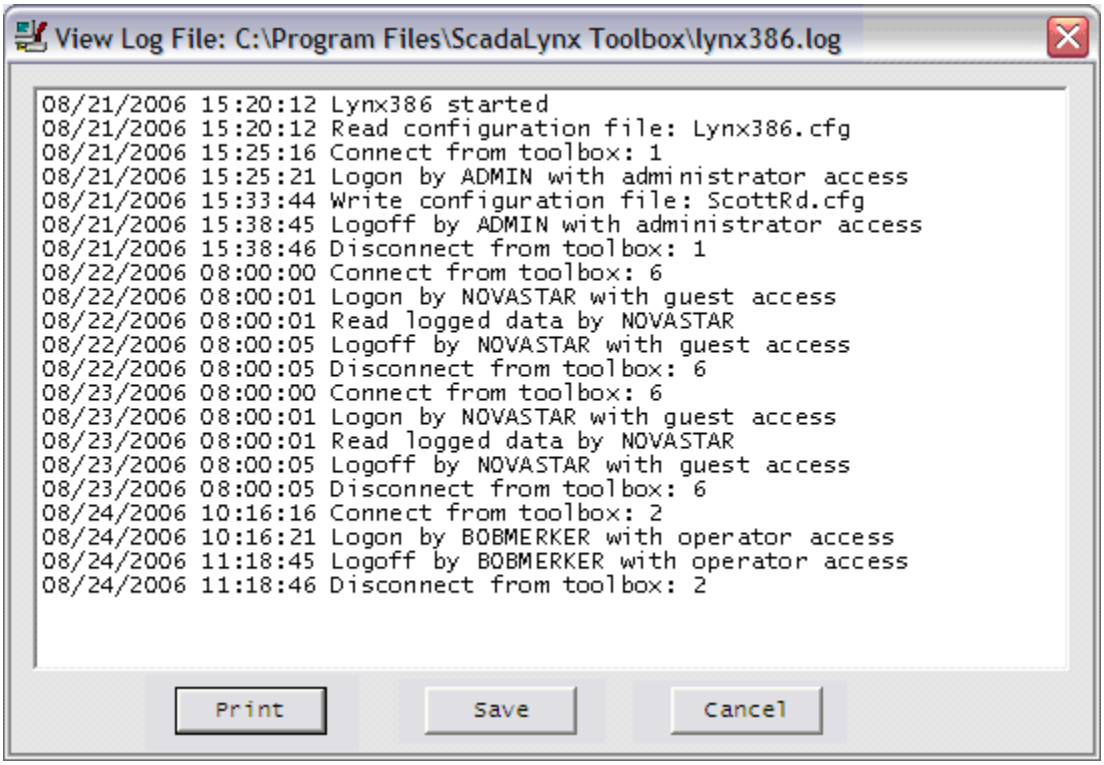
A record log of DCU activities is stored on the DCU flash in a file named Lynx386.log. The activities logged include:

- DCU program file start
- Configuration file read and writes
- Toolbox connection and disconnect
- User log on and log off

This file can be downloaded for viewing by clicking the **Download Log File** button. Before the file transfer is started, another dialogue box is opened to let you pick the storage folder and file name on your workstation or notebook computer. Make you selection and then click **Save** to start the file transfer.

The file is transferred in block of 400 bytes. A wait dialogue window shows the time elapsed for the file transfer. Click **Cancel** to quit the file transfer. If the file transfer stalls, click the **Retry** button to resend the file block

When the download completes, the file will be displayed in a window.

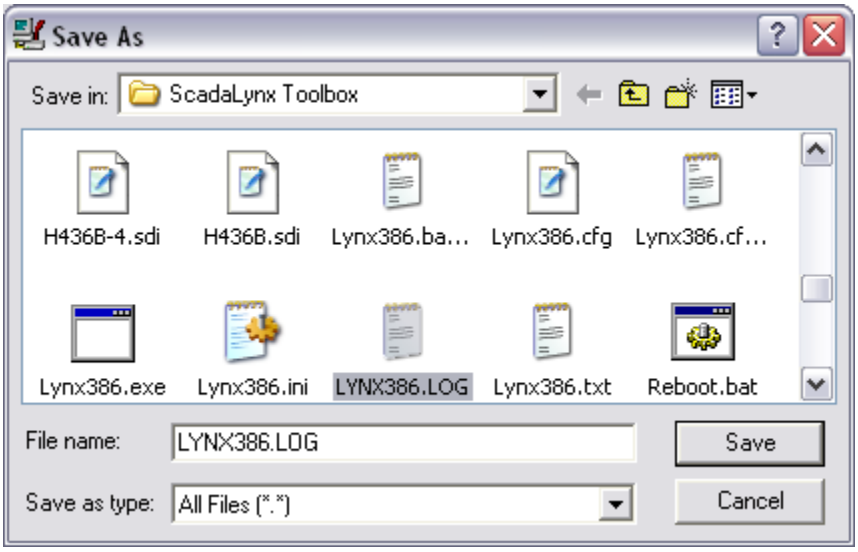


Print opens a print dialogue box.

Cancel closes the display window.

Save writes the log records in the View DCU Log File window to a file.

A dialogue box is opened to let you pick or enter a file name. Enter or pick a file name and click **Save**.



Cancel closes the Save As dialogue box without saving the DCU log reports.

Clear erases the DCU log reports in the list. It does not erase logged data in the connected DCU.

The DCU log file is allowed to grow to 64 Kbytes and then its oldest records are truncated.

Index

Index

Index

Index

Index

Index

Index

Index

Index

Index

Index

Index