

# **PROCOM User Manual**

173-230-0001/B

PROCOM User Manual			

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# **Chapter 1. Introduction**

The PROCOM software allows you to control one or more PROCOM controllers. This manual explains how the software and the controller work together and guides you from installation of the software through basic setup to configuration and day-to-day usage of the system.

# 1.1. Features

The PROCOM is an advanced, computer controlled irrigation controller that will manage up to 500 valves distributed over up to eight miles of water pipe. The communication between the controller and the decoders that control the valves in the field happens over a two-wire path - more on this in Section 1.2, "The Two-wire Technology" [page ?]. The PROCOM software lets you manage one or more controllers from your PC.

Here are a few selected features of the PROCOM that can be controlled from your PC:

- · Creation of irrigation schedules.
- Creation of a layout map for the hydraulic grid of pipes through a graphical interface.
- Configuration of booster pumps and decoders (valves).
- "Installation Data" and "User Data" protected by separate passwords more on the distinction between the two in Section 1.3, "PROCOM Concepts" [page 2].
- All settings and configurations are transferred directly to a controller via a COM port on your PC, or remotely via a modem.
- Tests of both the two-wire and remote decoders can be performed directly from the PC.

All settings are handled via the software - the controller itself has no controls on the cabinet. This means that even if your controller gets damaged, you can continue running your irrigation schedules - just transfer all your settings and schedules to a replacement controller and you're ready to go.

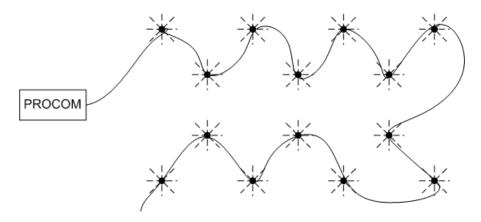


# **Important**

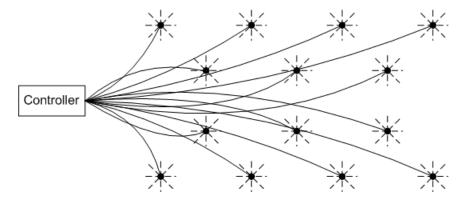
Since the PC is the authoritative source of all configuration data, you should back up the settings after initial setup and after any changes you make to your system (See Section 6.2, "Backing up your Installation" [page 135] for instructions).

# 1.2. The Two-wire Technology

The PROCOM uses two-wire transmission technology to tell the field decoders when to act. This means that instead of laying out a wire to each individual valve, just one single wire is laid out, and the field decoders all connect to the same wire:



In contrast, this is how the above system would look using a conventional irrigation system that needs a dedicated wire to each individual valve:



The two-wire technology has several obvious advantages over a conventional system:

- Ease of installation: You avoid the hassle of turning your park into a mess, digging in wires everywhere.
- Ease of expansion: When you need to add a decoder in the field, you don't have to dig in a new wire and risk damaging the existing web of wires already in the ground you simply attach the new decoder to the existing wire.
- Cost reduction: You save loads of money on expensive copper wire typically as much as 80 percent compared to traditional cabling.

# 1.3. PROCOM Concepts

This manual refers to two different types of settings and configurations - "Installation Data" and "User Data". Since there's a distinct difference between the two, they each have their own chapter:

Installation Data (Chapter 3, Installation Data - Setup Guide [page 17])

Installation data is all about the available resources at a site. This is where you tell the controller about pipes, valve types, decoders, pumps and sensors. The installation data forms the basis of what you can do with your irrigation schedules - the schedules are utilizing the resources declared in the installation data.

Often the installation data are set up by the people setting up the physical irrigation system, since they know how the system is designed. The data is then left untouched and password protected until a change of the physical installation takes place.

User Data (Chapter 4, User Data - Day to Day Usage [page 39])

User data is what controls the day-to-day usage of the system. Based on what hardware is available, as described by the installation data, this is where you build your irrigation schedules and transfer them to the PROCOM controller.

#### 1.3.1. Behavior of the PROCOM Software

This section contains a few brief notes on how the PROCOM software works in general.

## 1.3.1.1. Icons in System Tray

When the software is launched, two icons appear in the system tray:



These icons represent the two main components of the software: the "Control Server" and the "Database Server". These icons are your indication that the software is running.



#### Note

When you close down the software, the icons will stay in the system tray for about 20 seconds, so don't worry that you haven't closed the software correctly when the icons don't disappear immediately.

#### 1.3.1.2. Different Password Levels

The PROCOM allows to granulate the access to it's functionality through different levels of passwords.

By default all passwords are blank, but you can change them on both user and installation level. Access the installation level should be limited to the people setting up the system, defining pipes, pumps, decoders etc, whereas access at the user level should be granted to the people working with the system on a daily basis.

Both user and installation level passwords can be set per site, and if no site is selected, a few general settings can be accessed with the system wide user and installation passwords.

The table belows summarizes what can be done at the different levels.

	User Level	Installation Level
No site selected	Select Site	Parameters
	Phone Book	Change Password
	Select COM Port	
	Extract and view monitor log	
	View monitor log	
	Extract monitor log	
	Change Password	
Site selected	Connect to Controller	Site Parameters

User Level	Installation Level
Irrigation Schedules	Change Installation Password
Manage Sectors	Delete all Data
Change Pump Status	Erase Sensor Decoder Data
Change Sensor Status	Manage  phonoid of coldbooks in months and a coldbooks in months a coldbooks in months and a coldbooks in months a coldbooks in months and a coldbooks in months and a coldbooks in months a coldbooks in months and a coldbooks in months and a coldbooks in months a coldbooks in months and a coldbooks in months and a coldbooks in months and a coldbooks in months a coldbooks in months a coldbooks in months and a coldbooks in months a coldbooks in months a coldbooks in months and a coldbooks in months a coldbooks in months a coldbooks in months and a coldbook
Manual start of Decoder/Schedule	pipes/valves/decoders/pumps/sensors/sensor decoders.
Set Date/Time on Controller	
Change User Password	
Use Test Functions	
Weather Station Functions	
Change Irrigation Status	

As a rule of thumb everyone will have read access to everything, but the passwords are needed at the different levels if you want to change anything.

The User Passwd and Inst. Passwd buttons in the main window will be green or red depending on what level of access you have. A couple of examples:

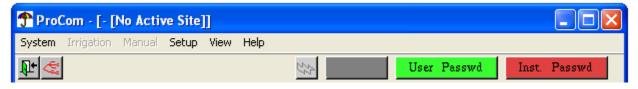
Connected to the SIENNA site and online. User access but no installation access:



Connected to the SIENNA site and online. Full access:



Not connected to a site. User access but no installation access:

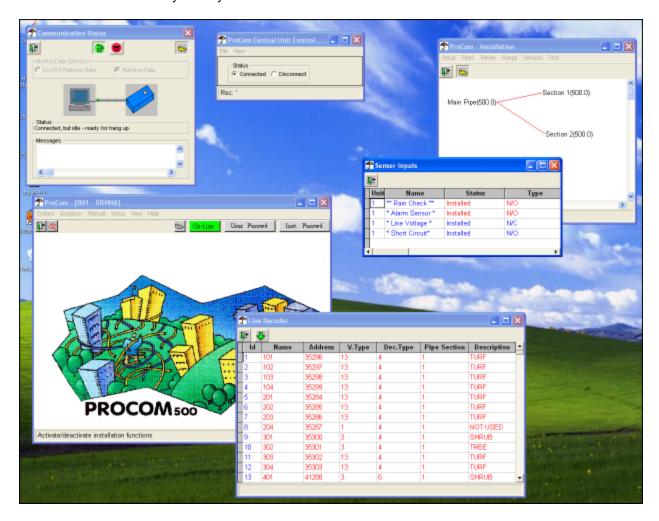


To toggle the access level, click the buttons - if you go from red to green you will be prompted for the appropriate password. If the password fields are grayed out, the passwords are still just blank. To change

the passwords, follow the instructions in Section 4.3, "Setting the User Level Password" [page 44] and Section 3.1.3, "Password" [page 21].

# 1.3.1.3. Dialogs

The PROCOM software operates with non-modal dialogs. This means that you don't have to close windows in backwards order of how you opened them - you can shift freely between all open windows and work with the data in each one in any order you like:



This flexibility means that the data you enter in a dialog is saved as soon as you leave the field you've entered the data in - an important difference.



# **Important**

Due to the non-modal design, you can't just close a dialog and "forget about the changes" - all changes are saved when the cursor leaves the field that holds the data.

# **Chapter 2. Installing the PROCOM**

# 2.1. Installing the software

The PROCOM software runs on Microsoft Windows 2000 and Windows XP operating systems.

You can install the PROCOM software independent of the hardware it will be controlling, meaning that you can install the software and start mapping in your hydraulic system, creating irrigation schedules and so forth without being connected to a physical controller.

# 2.1.1. Running the Installer

Your PROCOM software comes as a standard Windows installer - you should be able to just put in the CD and follow the instructions, but here's an explanation of the steps involved:

1. Put the CD in your CD-Rom drive and wait for the installer to pop up. If it doesn't happen automatically, navigate to the CD in the Windows Explorer and double-click the **Setup.exe** icon.

Before the installation starts, your computer is scanned for any previously installed version of this software - you might see this for a few minutes, depending on the configuration of your machine:



After the scan is over, you'll see the following welcome screen:



Just click the Next button here.

2. The next step is just to fill in your name - this has no effect on the way the software will work:



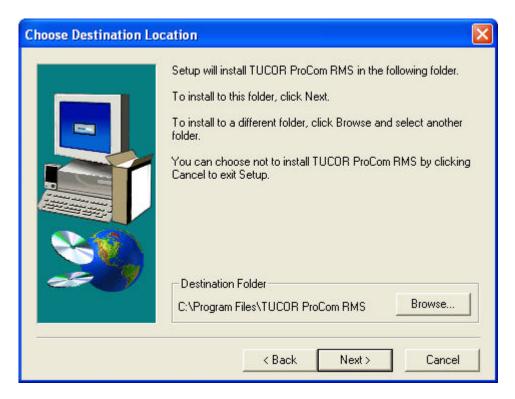
Fill in your name and click Next.

3. Now you're prompted for where the software should be installed. If you have any specific requirements to this, select the desired location by clicking the **Browse...** button and selecting a folder. If you're OK with the default, just click **Next**:



## **Note**

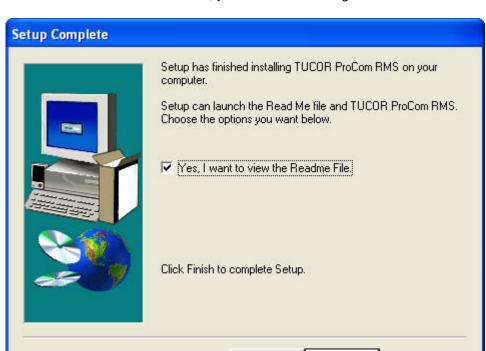
If you're upgrading an existing installation, we recommend installing in a fresh directory. See Section 2.2, "Upgrading from older versions" [page 16] for more on upgrading.



4. The next step is asking you for the "Program Folder" to put the Tucor software in. This determines where the application will show up in the program listing - you should be fine with accepting the default:



5. That's it, the installer will transfer the files to your machine. Again, this might take a few minutes, depending on your configuration.



When the installation is all finished, you'll see the following screen:

You're encouraged to review the README file as suggested, but you can move on to Section 2.1.2, "Entering the Software License Key" [page 10] to start using your Tucor software.

Finish

# 2.1.2. Entering the Software License Key

Before you can start using your PROCOM software you need to enable it by entering a license key. Later you will need a separate key for each controller you wish to communicate with. Keys are obtained from Tucor and the procedure is explained in Section 2.1.3, "Entering Controller License Keys" [page 11].

To enable the software, follow these steps:

 Launch the PROCOM software by opening the start menu and selecting All Programs > TUCOR ProCom RMS > ProCom

This is assuming that you're running Windows XP and that you didn't change the Program Folder when running the installation described in Section 2.1.1, "Running the Installer" [page 7].

2. Since your software is not yet unlocked the startup sequence will be halted and you'll be prompted for a license key:



3. Push the Load button to open a file chooser - this will let you locate your registration file and load the registration data automatically.

Alternatively you can type in the registration details manually, though this is more error prone.



## **Important**

The registration data is case sensitive.

4. Push the OK button.

If the registration data are valid, your software is now unlocked and you can launch the application again without being prompted for registration data.

Now the software is unlocked and you can start editing a few basic settings. However, before you can start building configurations for real sites, you need to enter a license key for each site in question. This is described in Section 2.1.3, "Entering Controller License Keys" [page 11].

# 2.1.3. Entering Controller License Keys

For each site/controller you wish to control with the PROCOM software, you need to enter a license key. License keys are obtained from Tucor and come as either plain text information you can enter manually or a registration file you can point the software to.

Site licenses are managed in the "Phone Book" - to enter a key, follow this procedure:



## **Note**

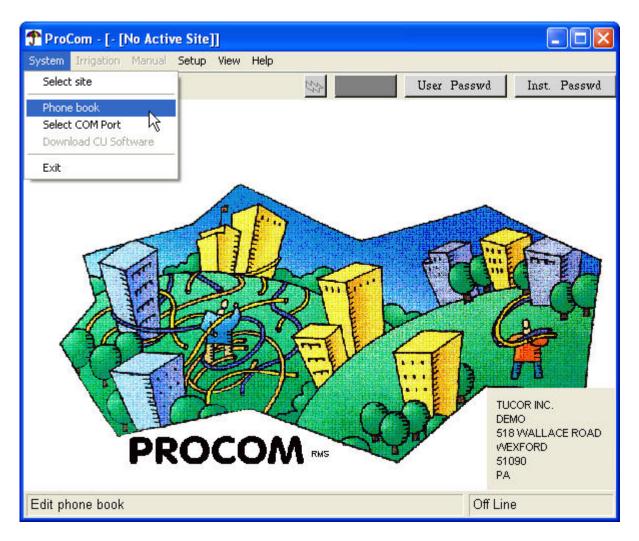
You can start configuring your PROCOM even though you don't have a valid license key yet - you just can't connect to the controller and transfer the settings.

1. Launch the PROCOM software:

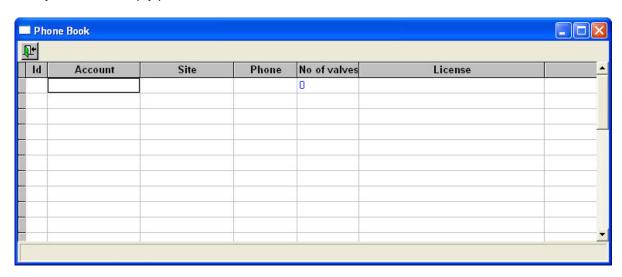


Most menus are greyed out since no site is active and thus only limited configuration is possible.

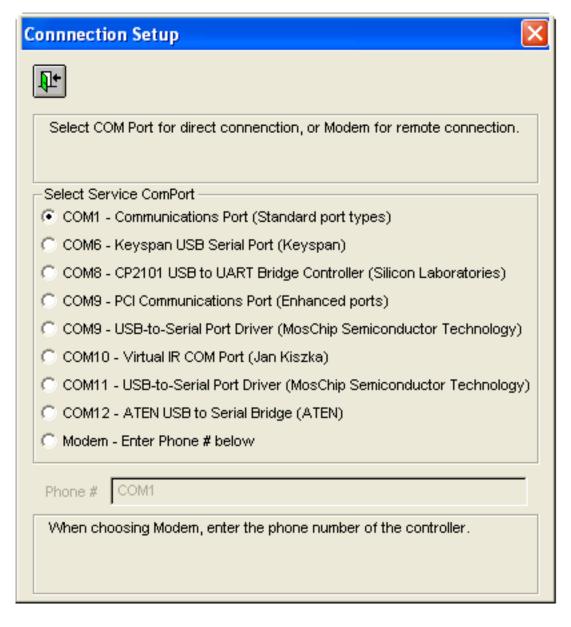
2. Open the **System** menu and select **Phone Book**:



Now you'll se the empty phone book:



3. Type in an account name, site name and phone number. When entering the Phone column, a helper dialog will pop up:



If you're connecting directly to the controller, select one of the available COM ports. If you're using a modem, select Modem and enter the phone number below.



## Tip

If you're behind a switchboard or need to wait for a dial tone, you can use commas to make the modem wait for a little while before dialing (i.e. "9,,,,61789034").

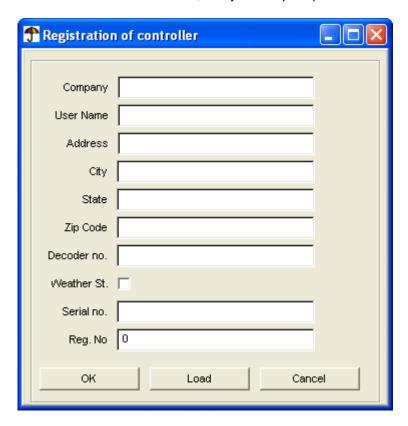


### **Important**

You *must* enter the account name before anything else - only when an account name is entered is the database ready to store the remaining data.

If you're having problems connecting to a controller, check out Section A.1, "Troubleshooting the connection" [page 137] for help.

4. Now click in the "License" field, and you'll be prompted for the licensing information:



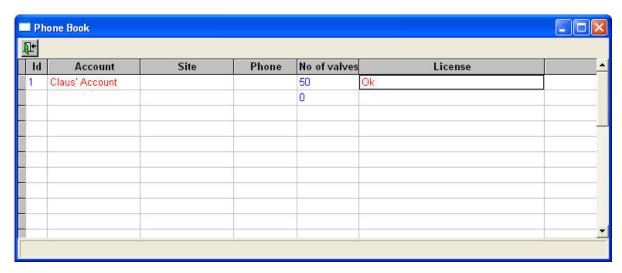
Click the Load button to locate a registration file or type in the data manually - then click OK.



# **Important**

The registration data is case sensitive.

5. The "No of valves" field will be filled in automatically depending on how many valves your license allows. If the license information is approved, you'll end up with a phone book looking something like this:



Type in a name for your site and you're ready to select a site and start configuring.

# 2.2. Upgrading from older versions

Upgrading the PROCOM software is pretty a straight forward process:

- 1. Install the new software in a directory different from the one containing the old installation. (Example: Your original copy was installed in C:\Program Files\ProCom install the new software in C:\Program Files\ProCom2).
- 2. Copy the following files from the original installation to the new one:
  - procom.ldb
  - monitor.ldb
  - ProcomRMS.ini
- 3. Now double-click the upgrade script called upgradedb.bat in the new installation folder, and the PROCOM database will be upgraded to run with the new software.



#### Note

If you're installing on top of an existing installation (installing in the same location), the installer will automatically run <code>upgradedb.bat</code> for you. However, we recommend never to overwrite an existing installation.

# **Chapter 3. Installation Data - Setup Guide**

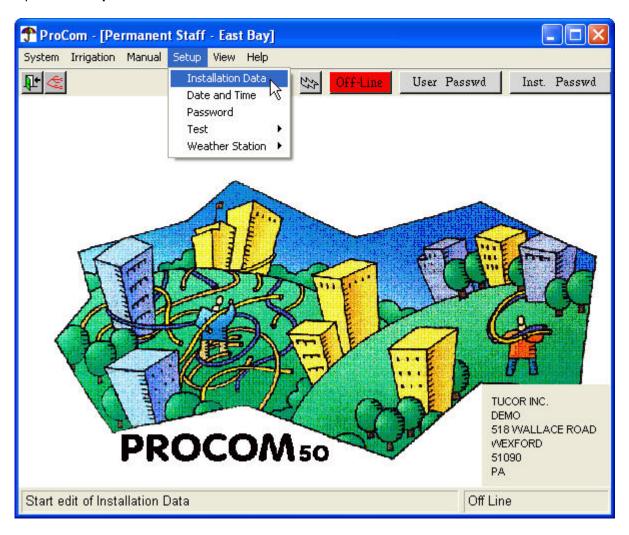
To configure the Installation Data for a site, follow this procedure:



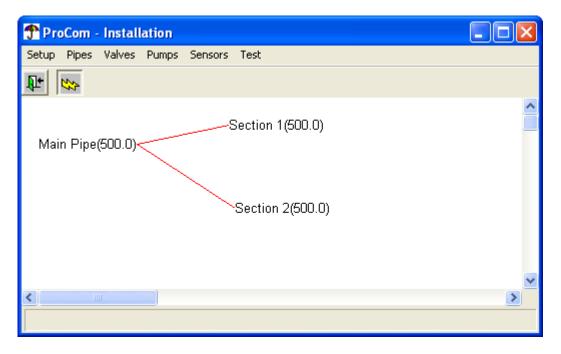
#### **Note**

You can start entering installation data even if you don't have the license key for the controller you need to transfer the data to. Only when you actually perform the transfer is the license key needed.

- 1. Select a site to configure, as described in Section 4.1, "Selecting a site" [page 39].
- 2. Open the **Setup** menu and select **Installation Data**:



This will open a new window from which you'll configure the Installation Data:



What you see in this window is the grid of pipes in the selected site.

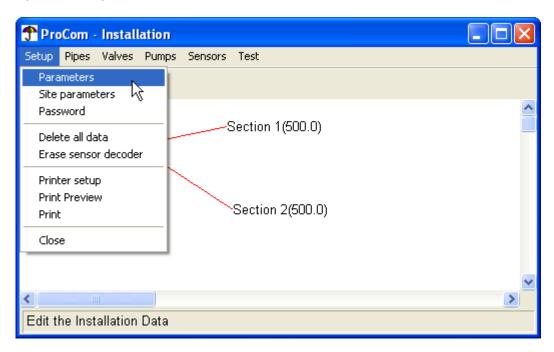
The following sections describe each menu option in turn.

# 3.1. Setup

This section contains explanations of a few very high level settings in the system.

## 3.1.1. Parameters

1. Open the Setup menu and select Parameters:



This opens the following dialog:



#### 2. The parameters are:

### System Name

A label for the system that will shop up in the title bar of the main window. If you're a contractor running multiple PROCOMs for clients off of several installations of the PROCOM software, it's nice with a label to distinguish the installations.

#### Max. number of active solenoids

The maximum number of valves that can run simultaneously in each electrical section. This is used by the flow management mechanisms and you must make sure that your hydraulic system has enough capacity for this many valves to run at once. Enter a value between 1 and 20 (the PROCOM can run up to 40 decoders simultaneously, but only if they are distributed on two different wires - see instructions on how to add a new pipe for details on electrical sections).

#### **Legal Characters**

List of valid characters to use with the Field Access Unit (FA/RFA).

#### Measurement units

This is the units used to enter values throughout the system.



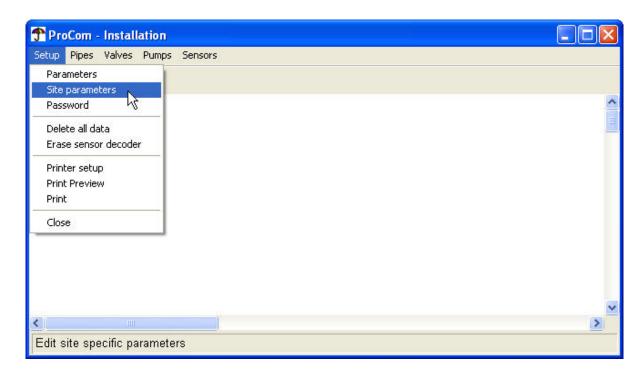
## **Important**

If you change this later on, entered values will not be converted, so make sure to pick the right scale once and for all, or the data can be misleading.

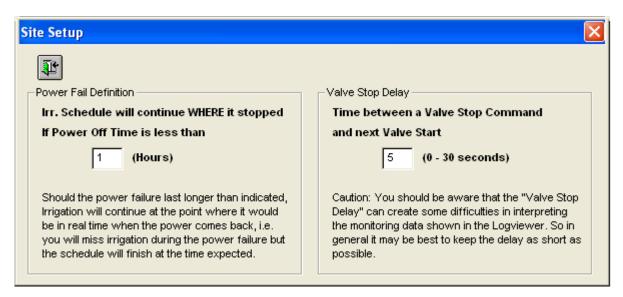
Type in your settings and click the OK button.

## 3.1.2. Site Parameters

1. Open the Setup menu and select Site parameters:



This opens the following dialog:



#### 2. Power Fail Definition

The Power Fail Definition allows you to set a time limit for how long a power failure should be able to delay irrigation.

Say you set the limit to one hour. If the power fails and return after 45 minutes, the irrigation will resume where it was abrupted, thus pushing the end time 45 minutes back. If this causes an overlap with one or more following schedules, these will not be started.

If you set the limit to one hour and the power fails for more than that, irrigation will pick up where it would have been, had there been no power failure.

So, in short, you need to determine how much you can "afford" to delay irrigation in the case of a power failure.

## Valve Stop Delay

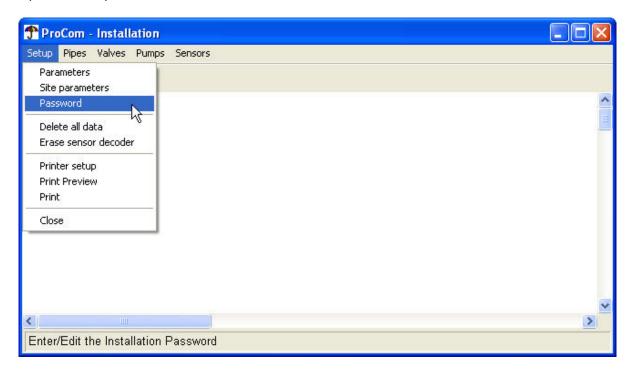
Putting a delay between stopping a valve and starting the next can be helpful to ensure that you don't run more valves than intended, which can lead to too much pressure in the pipes and potentially damage your pumps.

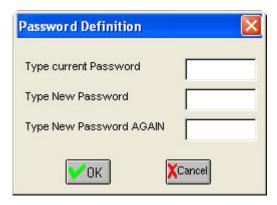
Once done, click the exit button.

# 3.1.3. Password

Follow this procedure to set the installation level password for this site. (Check out Section 1.3.1.2, "Different Password Levels" [page 3] for more details on passwords.).

1. Open the Setup menu and select Password:





2. Type in the current password in the first box, followed by the new password repeated in the next two boxes and click the OK button.



#### Note

When you start using the software the password is blank, so to set the password, leave the "Current Password" blank, type in your new password in the two following fields and click the OK button.

## 3.1.4. Delete All Data

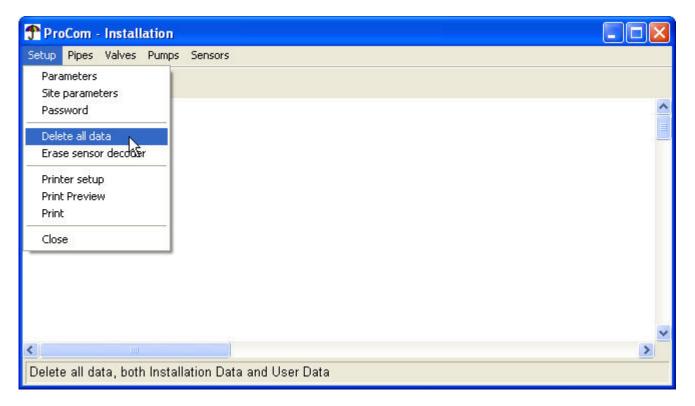
This procedure will permanently delete all installation and irrigation data for the site you are logged in to. You would never do this on a running system, but it comes in handy if you have just been playing around with the features of the software and want to start over from a clean slate.



## Warning

There is no option of undoing this action, so show caution before performing this procedure.

1. Open the Setup menu and select Delete all data:





2. Click the Yes button to delete all data, or the No button to abort.

## 3.1.5. Delete Sensor Decoder

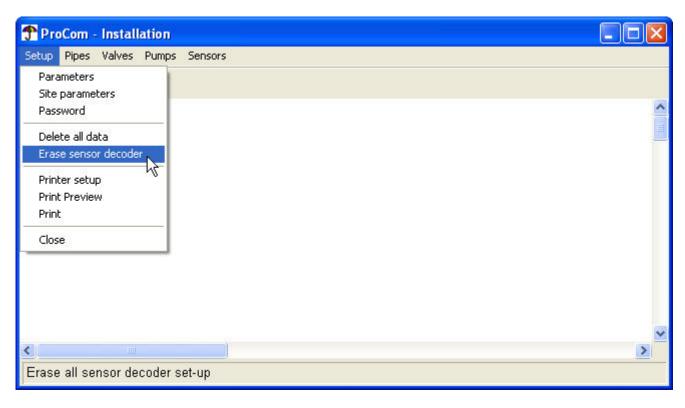
This procedure erases setup data for all sensor decoders in the current site.



# Warning

There is no option of undoing this action, so show caution before performing this procedure.

1. Open the Setup menu and select Erase sensor decoder:

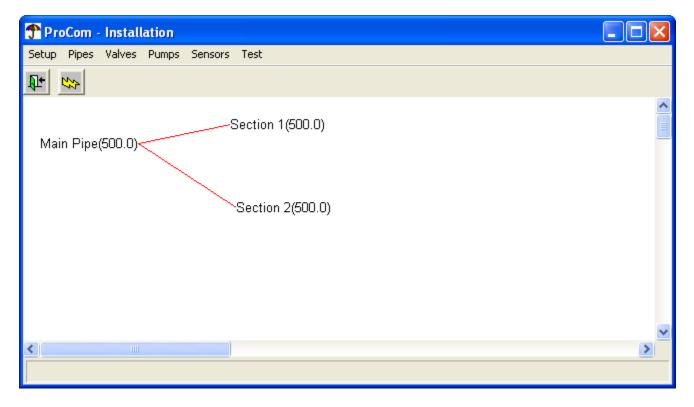




2. Click the Yes button to delete all sensor decoder data, or the No button to abort.

# 3.2. Pipes

The grid of pipes is what you see when you first open the window to modify installation data:

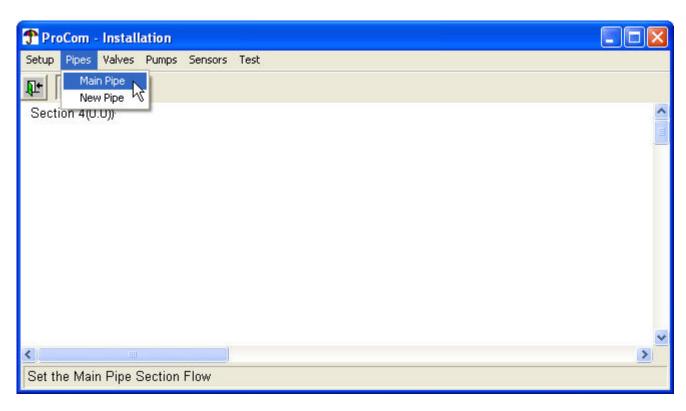


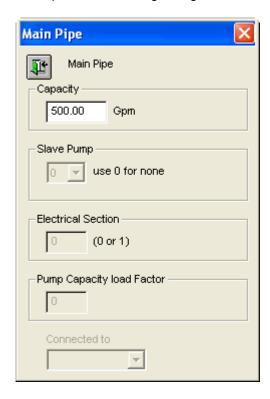
To edit the existing pipes you can simply click them in the graphical overview. The two following sections describe in detail how you configure the pipes.

# **3.2.1. Main Pipe**

To configure the main pipe follow this procedure:

1. Open the Pipes menu and select Main Pipe:







### Note

You can also open this dialog by double clicking the pipe in the graphical view of the pipes on the site.

2. Fill in the Capacity property:

How much water can this pipe transport per time unit (measured in gallons per minute or cubic meters per hour, depending on how you configured your installation.



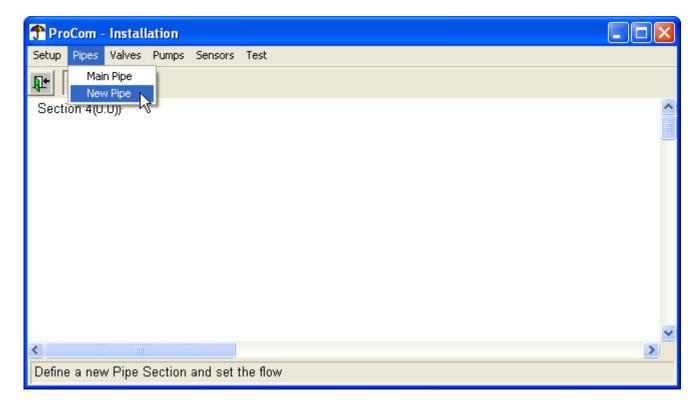
#### **Note**

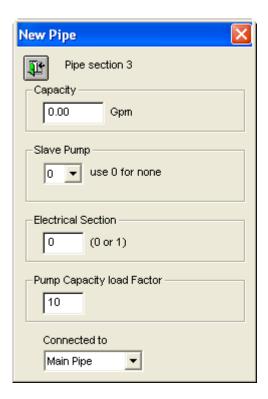
The rest of the fields are dimmed out here because they don't apply to the main pipe - only to subsequent pipes connected to the main pipe.

3. Click the exit button to save your settings and close the dialog.

# **3.2.2. New Pipe**

1. Open the Pipes menu and select New Pipe:

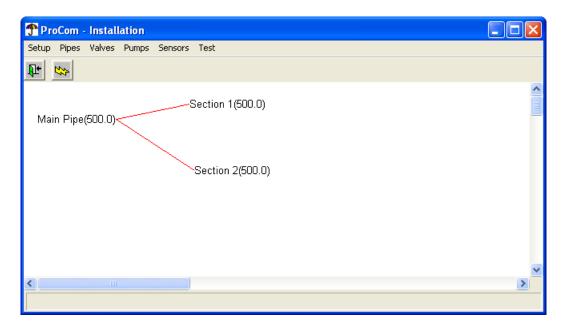






# **Note**

You can also open this dialog by double clicking the pipe in the graphical view of the pipes on the site:



2. Fill in the following properties:

# Capacity

Amount of water this pipe can transport per time unit (measured in gallons per minute or cubic meters per hour, depending on how you configured your installation).

#### Slave Pump

The slave/booster pump associated with this pipe. The selected pump will be activated whenever a valve is opened on this pipe or any of its connected pipes.

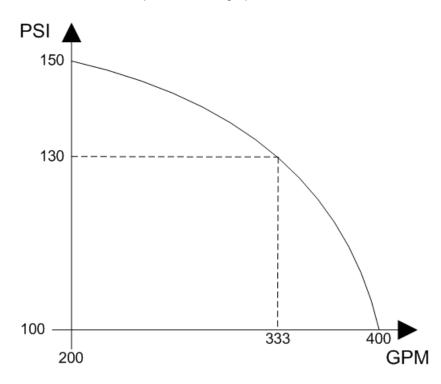
#### **Electrical Section**

You can declare two electrical sections in a system - connect two two-wire paths to the controller instead of just one to avoid maxing out the capacity of the cable. In this field you tell the controller which electrical section (which cable) the pipe (and its decoders) is connected to, and the controller will then take this into consideration when performing flow management.

#### Pump Capacity Load Factor (optional)

If the pipe is running up/downhill you may adjust the pump load factor accordingly. This is easiest understood by looking at a scenario:

Suppose the booster pump activated for this pipe can maintain a pipe pressure of 100 PSI while delivering 400 GPM. If the pipe elevates 60 feet, the pressure drops 30 PSI. To maintain the pressure at 100 PSI at the top of the hill, the pump must then deliver 130 PSI at the foot of the hill, meaning that the GPM will drop to 333 - the graph below illustrates this relationship:



The pump capacity load factor is then calculated as: 400/333 = 1.2. When you type in the value, leave out the decimal - 1.2 becomes 12, 1.0 becomes 10 etc. Valid values are between 1 and 99.

Flow management then uses this number to calculate how many fewer valves can be open on the pipe while pressure is maintained.

#### Connected to

Select the pipe that this pipe is connected to.



## **Note**

Main Pipes won't appear as connected to anything - only "sub pipes" can connect.

3. Click the exit button to save the new pipe and close the dialog.

# 3.3. Valves

There are two steps to configuring the valves in the system and this section explains how to manage both:

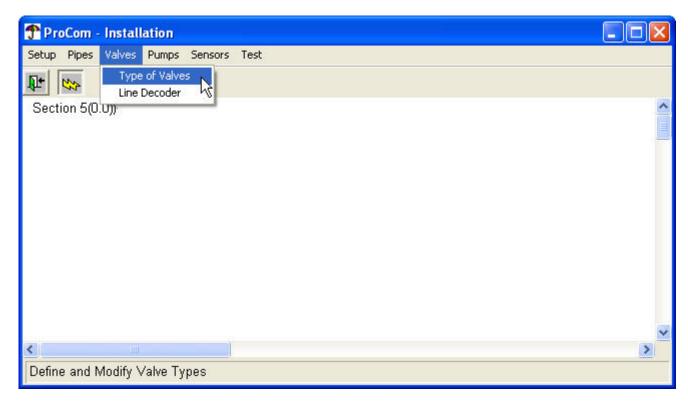
- 1. Describing the different valve types in your system is explained in Section 3.3.1, "Types of Valves" [page 29].
- 2. Configuring the individual valves, based on type is explained in Section 3.3.2, "Line Decoder" [page 30].

# 3.3.1. Types of Valves

Before you can add valves to your system you must define which valve types you are using - this is a handy way of not re-entering the data for each valve. Once you've defined the types of valves, adding a single valve is just a matter of telling the system which type it is, and the system will know how to treat it.

To manage the various types of valves used in your system, follow this procedure:

1. Open the Valves menu and select Type of valves:





2. Now you must fill in all the columns of the grid, describing a valve on each line:

ld

The ID of each valve type is determined by the software - you shouldn't fill anything in here. You will need to know the ID of the valve types when you have to configure the individual decoders.

#### Capacity

The flow capacity in the system unit selected in Section 3.1.1, "Parameters" [page 18] - Gallons or Liters per Minute.

#### Applic. Rate

How much water should be applied per time unit? The units can be inches per hour or millimeters per hour depending on how you set up the system wide parameters (described in Section 3.1.1, "Parameters" [page 18]).

#### Resistance

The resistance in the coil on the solenoid. The unit here is Ohms, and though not mandatory, you should always supply this data as it will help the PROCOM function more correctly.

If the resistance is set between 1 and 50 Ohms, the PROCOM will automatically check that the solenoids are activated correctly.

#### Switch

This is the switch code used to control the solenoid - please see Appendix B, *Switch Codes* [page 139] for a complete reference.

#### No Solenoids

The number of solenoids attached to this valve. Flow management uses this number calculate capacity and power consumption.

#### Description

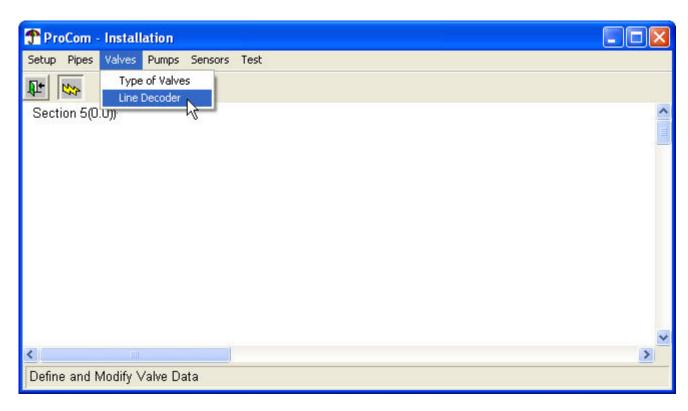
This is a free text area you can use for your own descriptive purposes. You have 200 characters available.

3. Click the exit button to save your settings and close the dialog.

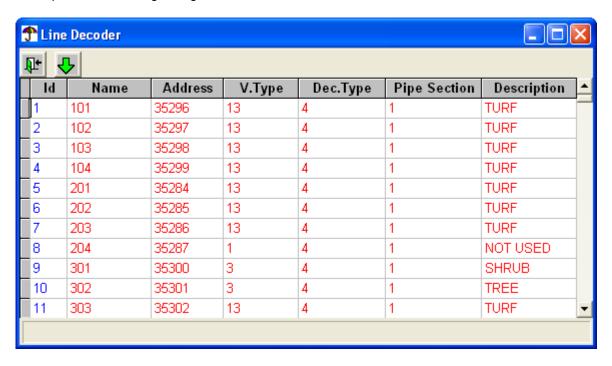
### 3.3.2. Line Decoder

This procedure describes how you define the individual line decoders that will activate valves in the field. Before you can do this, you must define the types of valves in your system as described in Section 3.3.1, "Types of Valves" [page 29].

1. Open the Valves menu and select Line decoders:



This opens the following dialog:



2. Now you must fill in all the columns of the grid, describing a decoder on each line:

ID

This is auto generated when ever you add another decoder, so don't touch this.

#### Name

An arbitrary name you provide for the decoder - max. eight characters.

#### Address

The unique address for this decoder - valid range is 0-65535. The PROCOM will send commands to this address to control this decoder.

#### V. Type

Type of valve connected to this decoder. Valves are identified by ID number, so the values in this column are mapped against the ID column of the valve types.

#### Dec. Type

The type of this decoder. This is used to calculate the power consumption. Here's a list of decoder types and the values you should type in for each:

For this decoder type	type in this number
LD-050/LD-100	1
LD-200	2
LD-400	4
LD-600	6



#### **Note**

When running the Line Survey test, the PROCOM will assume that all decoders are "full", meaning that the calculations for an LD-600 will assume that six valves are connected. If that is not the case. Please refer to Section 5.1.4, "Line Survey" [page 119] for the full details.

#### Pipe Section

Which (hydraulic) pipe section is this decoder attached to?

#### Description

Your own free text description of up to 200 characters.

Click the exit button to save your decoders and close the dialog.

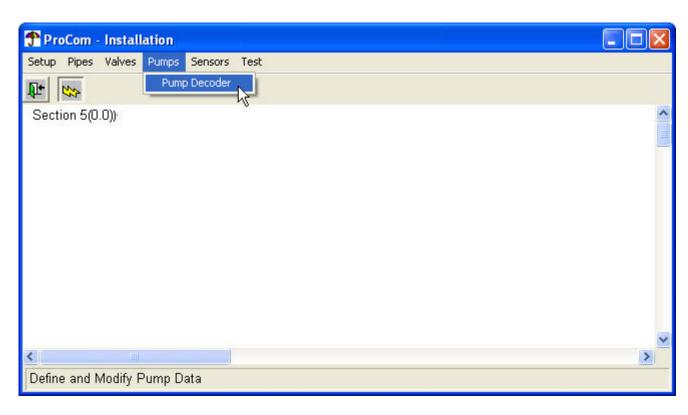
# **3.4. Pumps**

# 3.4.1. Pump Decoders

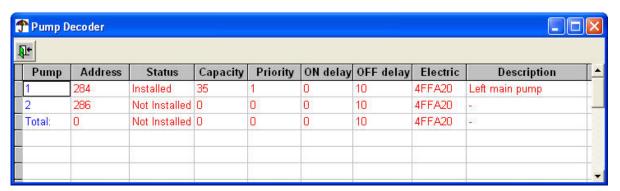
Though you could use a regular decoder to control pumps as well, typically you will use a dedicated "pump decoder". A pump decoder is typically not encapsulated for field placement like regular decoders, and is equipped with a relay.

To maintain your pump decoders, follow this procedure:

1. Open the Pumps menu and select Pump Decoder:



This opens the following dialog:



2. Now you can add or modify the pump decoders in your system - here's a description of the fields:

#### Pump

The ID number of the pump - this is assigned automatically and you can not change it manually.

#### Address

The decoder address. This is automatically filled in but can be changed manually. The type of pump decoder normally used with a PROCOM system have 10 predefined addresses which start at 284, skip 285 and then continue for nine more slots - the suggested values will adhere to this scheme.

#### Status

Choose between Installed and Not Installed. If you choose Not installed, the pump is known to the system but can not be managed by users with only user level access. See Section 1.3.1.2, "Different Password Levels" [page 3] for details on the different access levels.

#### Capacity

The capacity of the pump this decoder is running. The unit is what you have chosen in Section 3.1.1, "Parameters" [page 18].

#### **Priority**

Select between the following values:

Setting	Description
0	Select zero when the pump is not installed / not available.
1-6	Choosing a number in this range sets the priority of the pump decoder. Pumps run by decoders with priority 1 are started first, then priority 2 decoders etc. Once the needed capacity is met, no more decoders are activated.  If two or more pumps have identical priorities, the PROCOM will try to burden them equally by alternating between them. This will make sure that one pump doesn't get worn down by always
	being run while the other pumps are idling.
S	Select "S" for slave pump.

#### On delay

Number of seconds the pump should stand by before activating when a valve is opened on its pipe.

#### Off delay

Number of seconds the pump should delay its termination after the last valve on its pipe has closed. This is useful to ensure that a pump doesn't shut down only to start again when a new valve opens just a few seconds later.

#### Electric

Switch codes - please see Appendix B, Switch Codes [page 139].

#### Description

Free text description of up to 200 characters.

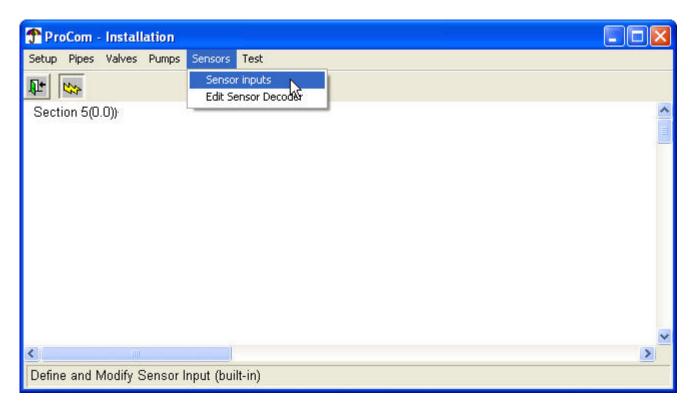
Once you're done, click the exit button to save your pump decoders and close the dialog.

# 3.5. Sensors

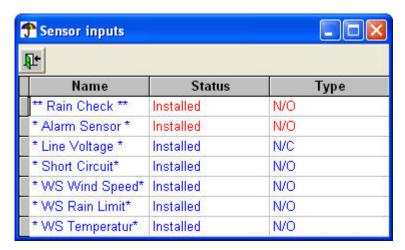
# 3.5.1. Sensor Inputs

The PROCOM will accept input from a number of sources. The following procedure shows you how to configure the controller to interpret these inputs.

1. Open the Sensors menu and select Sensor inputs:



This opens the following dialog:



2. Now you can configure the different input sensors:

#### Name

his sensor receives any input on the input erminal labeled "Rain Sensor".
This sensor receives any input on the input erminal labeled "General Alarm". Typically this where you feed the controller any alarms from umps.
3

Sensor	Description
Line Voltage	Built-in alarm for leaks on the two-wire path.
Short Circuit	Built-in alarm for shorts on the two-wire path.
WS Wind Speed	Weather Station alarm for high winds exceeding the configured maximum.
WS Rain Limit	Weather Station alarm for rain level exceeding the configured maximum.
WS Temperature	Weather Station alarm for temperature dropping below the configured minimum.



#### **Note**

The Weather Station (WS) Sensors are only listed if your controller is licensed to run a weather station. Check out Section 4.13.4, "Weather Station Setup" [page 106] for details on how to configure the limits mentioned above.

#### Status

Choose between Installed and Not Installed.

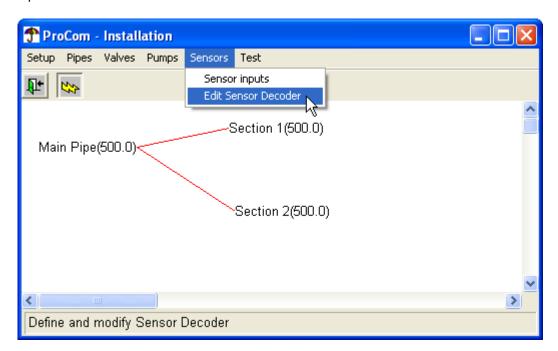
#### Type

Choose between Normally Open (N/O) and Normally Closed (N/C).

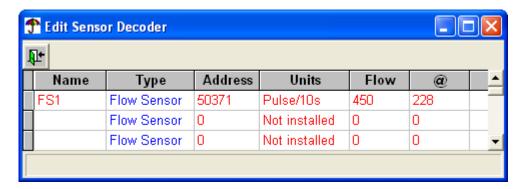
Once you're done, click the exit button to save your pump settings and close the dialog.

### 3.5.2. Edit Sensor Decoder

1. Open the Sensors menu and select Edit sensor decoder:



This opens the following dialog:



2. Now edit the settings for each decoder:

#### Name

Your own name for the sensor decoder. No more than six characters - don't use "special characters" here.

#### Type

The type is fixed - all sensors in a PROCOM system are flow sensors.

#### Address

Value between 0 and 65535

#### Units

Select between Pulse/10s and mA.

#### Flow

The flow in the units selected in Section 3.1.1, "Parameters" [page 18].

The physical reading of either number of pulses per 10 seconds or mA, depending on what you choose above.

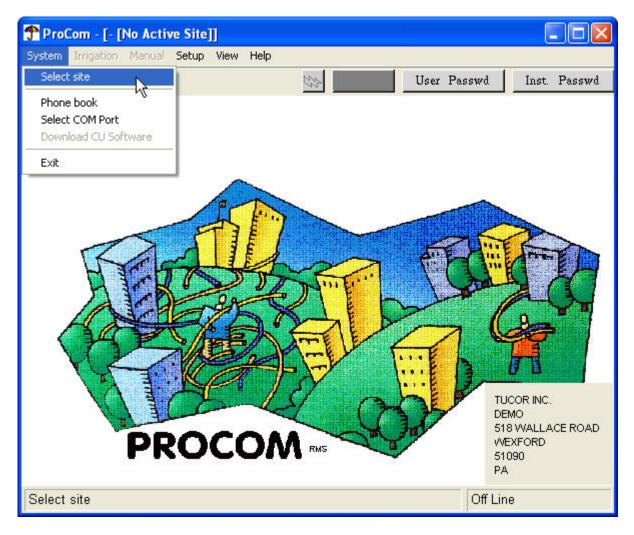
3. Once you're done, click the exit button to save your settings and close the dialog.

# Chapter 4. User Data - Day to Day Usage

# 4.1. Selecting a site

To select a site to work on, follow this procedure:

1. Open the **System** menu and select **Select site**:



Now you'll see a list of available sites:



2. Select the site you wish to configure and click **OK**. Now you'll see more active menus in the main window:





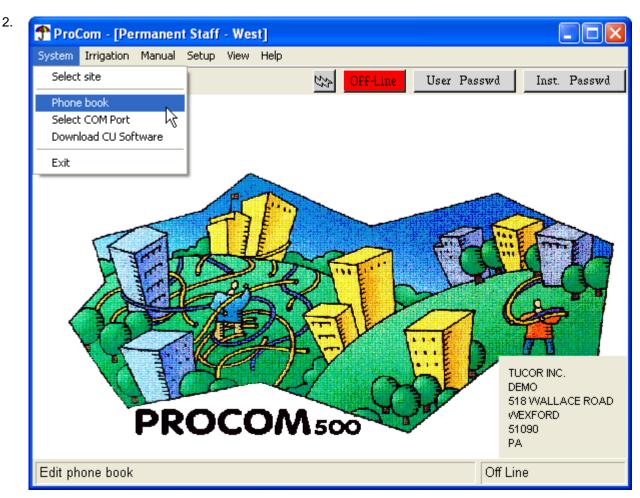
### **Note**

You can select and configure sites that don't have a valid controller license key. Only when you need to transfer the configuration will you need a valid license key for the controller.

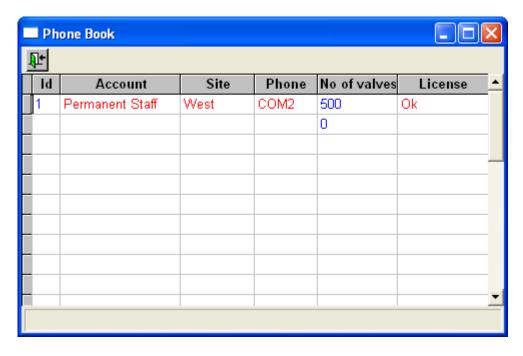
# 4.2. Maintaining Accounts and Sites

Accounts, sites and licenses are maintained in the "Phone Book". To access the Phone Book:

1. Open the System menu and select Phone book:



This brings up the Phone Book:



3. Now you can edit the fields for each account in the Phone Book:



# **Important**

You must enter the account name as the first thing when creating a new account. Only when the account name is entered is the database ready to receive the remaining data.

ld

This is automatically filled in when you enter a new account name.

#### Account

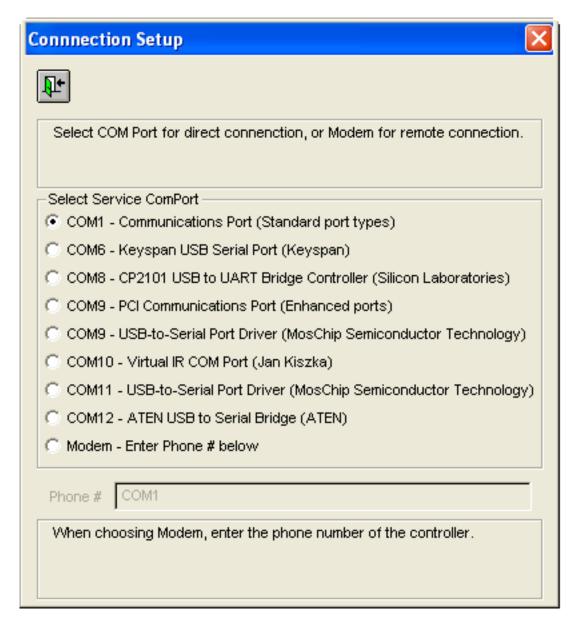
This is your name of choice to identify an account.

#### Site

Your own name for the site.

#### Phone

This is the number the software will need to connect to the PROCOM. It can be a phone number when using a modem, or a COM port when connecting directly to the controller. Clicking in this field will bring up an assisting dialog:



If you're connecting directly to the controller, select one of the available COM ports. If you're using a modem, select Modem and enter the phone number below.



### Tip

If you're behind a switchboard or need to wait for a dial tone, you can use commas to make the modem wait for a little while before dialing (i.e. "9,,,,61789034").

#### No of valves

This is set automatically based on the license you have acquired for the controller.

#### License

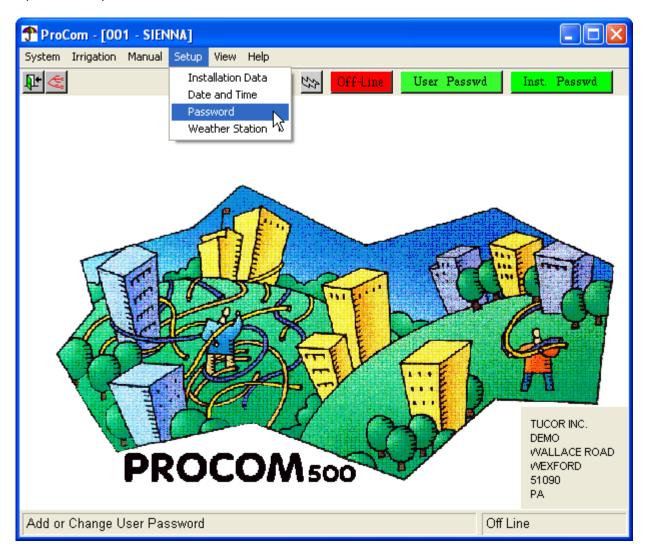
Clicking in this column will bring up a dialog for you to enter the license information in.

See the details on how to enter the license key in Section 2.1.3, "Entering Controller License Keys" [page 11].

# 4.3. Setting the User Level Password

You can protect the user level settings by changing the blank default password to something else. (Read more about passwords in Section 1.3.1.2, "Different Password Levels" [page 3]).

- 1. If you want to set the user level password for a specific site, connect to the site as explained in Section 4.1, "Selecting a site" [page 39] otherwise ignore this step.
- 2. Open the Setup menu and select Password:



3. Now the dialog for changing the password pops up:



If this is the first time you change the password, leave the Type current Password field empty.

# 4.4. Communicating with Controllers

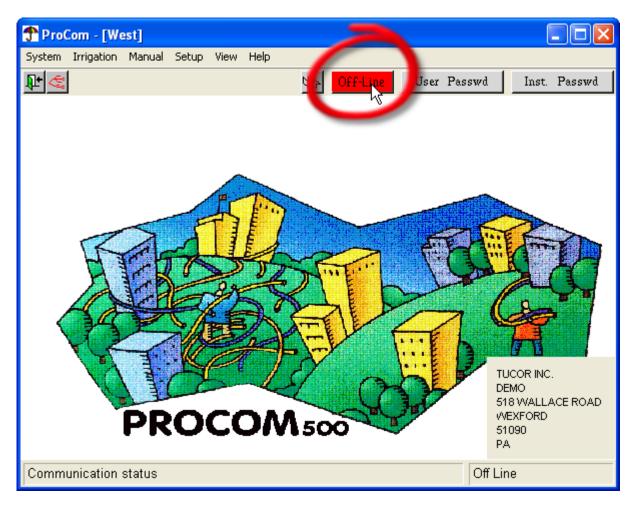
The PROCOM software will communicate with controllers in the field in order to do two things:

- Transfer configurations, irrigation schedules etc. from your PC to the controller.
- Transfer monitor data from the controller to the PC this data can then be analyzed with the log viewer
  or your own tools.

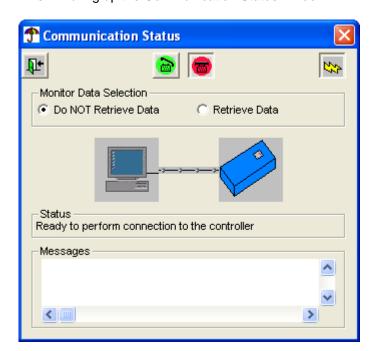
To enable the controller and the PROCOM software to communicate, you must connect your PC to the controller via either a modem or a direct connection - Section 4.2, "Maintaining Accounts and Sites" [page 41] has the details on how to configure the communication.

Once configured, here's how you connect the software to a controller (If you're having problems connecting, check out Section A.1, "Troubleshooting the connection" [page 137]):

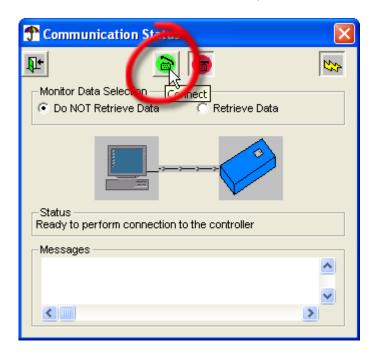
- 1. Sign in to a site as described in Section 4.1, "Selecting a site" [page 39].
- 2. Click the Offline button in the main window to try to connect and change the state to Online:



This will bring up the Communication Status window:



3. To connect to the current site's controller, click the Connect button:



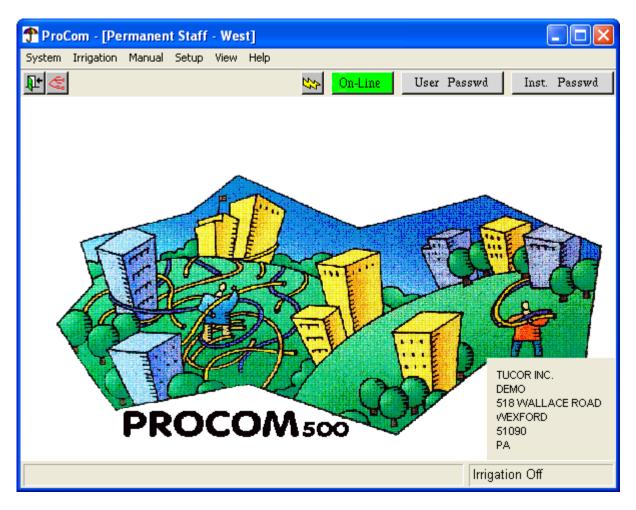


#### **Note**

When you select "Retrieve Data" all monitor data in the controller will be transferred to the PC and deleted in the controller. Though this is a good thing since the controller does not have unlimited memory, keep in mind that it might not be what you want to do if you're just connecting to check ET data or something minor.

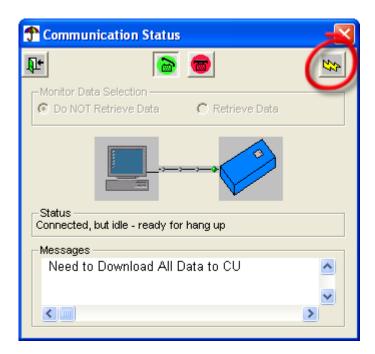
Now the Status field will say "Connecting to controller" and you will have to wait a little while for the connection to be established. If you can't seem to get a connection, check out Section A.1, "Troubleshooting the connection" [page 137].

4. Once the connection is established the Disconnect button will pop out and the Connect button is now pressed instead. You will also see that the Offline button in the main window changes to green and says On-line:



5. Now the software tries to find out whether the settings on the controller matches those on the PC. If you have made configuration changes in the software, you'll see the Messages field say "Need to Download All Data to CU"

To synchronize the configuration in the controller, click the Download button:





#### **Note**

"CU" is short for "Central Unit" - the controller.

You can follow the process in the Messages field.

6. Once you're done synchronizing, click the Disconnect button to disconnect and the Exit button to close the dialog.

# 4.5. Irrigation Schedules

Based on the hardware defined in the installation data, you design irrigation schedules to perform the actual irrigation. These schedules are highly configurable and really lets you fine tune how the system resources are used.

The following sections describe how you create, maintain, test and optimize irrigation schedules.

# 4.5.1. Managing Irrigation Schedules

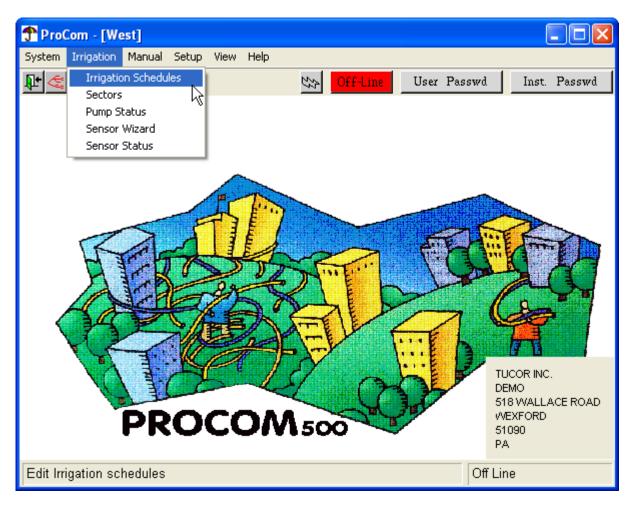
Follow this procedure to add new irrigation schedules or view/modify existing ones:



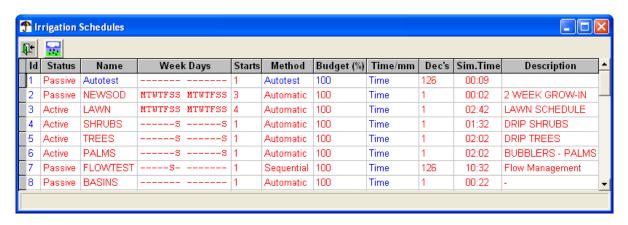
#### Note

When ever you have added or modified an irrigation schedule it's a good idea to perform a dry run as explained in Section 4.5.4, "Dry Run All Schedules" [page 60] to ensure that no overlaps or resource shortnesses will interfere with your irrigation.

1. Open the Irrigation menu and select Irrigation Schedules:



Now you'll see the list of irrigation schedules:





#### **Note**

The Autotest schedule is a built-in schedule for which you can only edit included decoders and weekly activation days. The Autotest will test all included decoders in turn, like the test described in Section 5.2.1, "LD Response" [page 123]. You must set the run time for each decoder to "1" - this won't be treated as one minute, but just indicates that the decoder must be run.

2. In the dialog you can add new schedules or edit the existing ones. To edit existing schedules, simply click in the fields you wish to change. To add a new schedule, click in the Name field and type in the name for your new schedule.

Here's a description of the fields in the dialog:

ld

ID of the schedule - this is assigned automatically and you can not change this. Though the PROCOM support up to 30 schedules only, the numbers will keep incrementing if you delete schedules and add new ones - that way you can still identify old entries in your logs even if the schedules no longer exist.

#### Status

Select between Passive and Active. Note that passive schedules can still be run manually.

#### Name

Your own short name for the schedule.

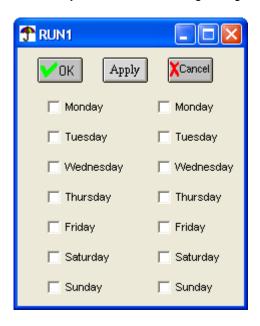


#### Note

The name can be no more than eight characters long. If you try to type in a longer name you'll be blocked and hear an alert beep.

#### Week Days

This field describes which week days in a two week cycle the schedule will run. When you click in this field, you'll see the following dialog:

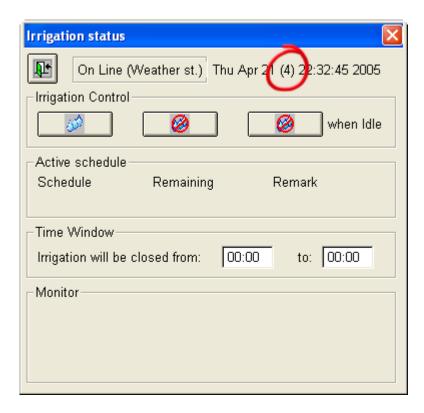


Check the days you want the schedule to run and click OK to save your selection.



#### Note

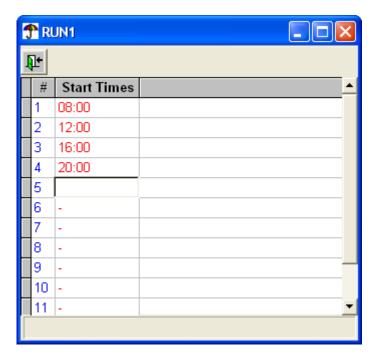
When your schedules are running you can always check which day of the cycle you are at by bringing up the Status dialog and looking at the number between the date and the time:



In this example we're at day four, which means that it is Thursday in the first week of the cycle.

#### Starts

This field describes the times during the selected days that your schedule will run. When you click in this field, you'll see the following dialog:



Add the start times and click the Exit button to save your entries and close the dialog.



#### Note

All times are assigned in military time. If you're unfamiliar with military time notation, check out Appendix C, *AM/PM to Military time conversion* [page 141].

#### Method

This field describes how the decoders in the schedule will be run. You can choose between the following values:

#### Sequential

One decoder at a time, in the order they are assigned to the schedule.

#### **Priority**

Let the flow management decide when the decoders run, but run them in the assigned order.

#### Automatic

Let the flow management take complete control of how the schedule is run. The approach here is to open the biggest valves first, and then "fill up the pipe" with smaller and smaller valves until the maximum pipe capacity is reached. If you want finer grained control over the order in which valves get run, you should use the Priority method.

#### Budget (%)

This field describes the water budget for the schedule. The budget is provided in percentage and you can set the value to anything between 0 and 300.

What this means is that the schedule will be run either shorter or longer than it was originally configured to.



#### Caution

If you increase the budget to an extent where a schedule will overlap another schedule, the next schedule will simply not be run. To check for overlapping schedules, do a "Dry Run All" as described in Section 4.5.4, "Dry Run All Schedules" [page 60].

#### Time/mm

This field lets you select what will control the length of each run of the schedule:



#### Note

The unit used here depends on how you initially configured the system in Section 3.1.1, "Parameters" [page 18]

#### Time

The schedule will run for exactly as long as it is configured to.

#### **ET Correct**

The schedule will accept corrections from the ET input. This could mean shorter run times if there has been a lot of rain and longer run times in extraordinary dry periods.

#### **Amount**

The schedule will run until it has irrigated a certain amount of water.

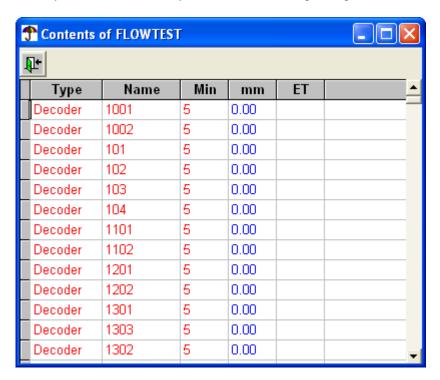


#### **Note**

If you select ET Correct or Amount, the run time is calculated based on the application rate of the valve types used. Read more about application rates in Section 3.3.1, "Types of Valves" [page 29].

#### Dec's

This field describes which decoders or sectors are included in the schedule and how they are run. When you click in this field, you'll see the following dialog:



To edit the elements, click in the fields you wish to change. Here's a description of the fields in the dialog:

#### Type

The type can only be selected when you assign a new element to a schedule. You choose between Decoder and Sector and this then determines what can be selected in the Name field above.

#### Name

The name that identifies the decoder/sector - this is a list of decoders/sectors known to the system.

Check out Section 3.3.2, "Line Decoder" [page 30] and Section 4.6, "Sectors" [page 67] for descriptions of how decoders and sectors are managed in the system, respectively.

#### Min

This is the run time in minutes.

#### Inch/mm

This is a calculated field that tells you how much water will actually be used. The number is calculated from the run time entered above and the application rate for valve types for the decoder(s) used (see Section 3.3.1, "Types of Valves" [page 29]).



#### Note

The unit used here depends on how you initially configured the system in Section 3.1.1, "Parameters" [page 18]

ET

This is the adjustment in relation to ET. Set to "1" there will be no correction.



### **Important**

When the PROCOM calculates how to run an irrigation schedule, it creates a list of all decoders included in the schedule, directly assigned or part of an included sector. If a decoder is assigned directly and also included in an included sector, the configuration for the directly assigned one will be used and the decoder ignored when running the sector.

#### Sim.Time

The time a simulation run will take. A star (\*) indicates that the schedule configuration has changed since the last simulation run.

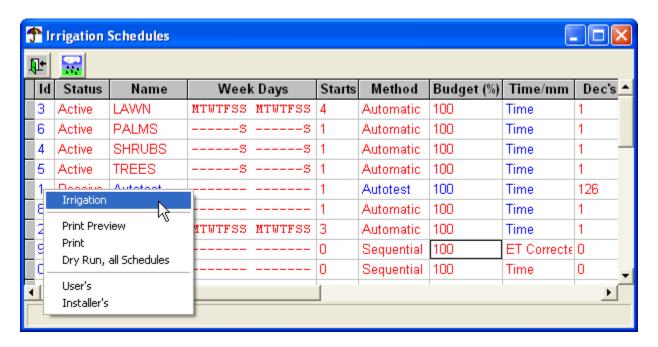
For details on simulating a run, please refer to Section 4.5.3, "Performing a Dry Run" [page 58].

#### Description

Free text area for your own description of this schedule.

3. When you are all done configuring the irrigation schedules, click the Exit button to save your settings and exit the dialog.

In addition to editing the main fields in this dialog, you can right click in the Id column to get a few more options:

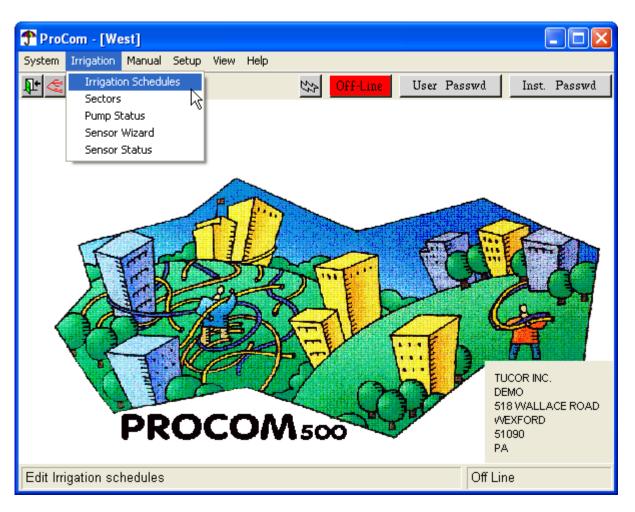


The Print Preview, Print and Dry Run, all Schedules should be self explanatory, and the two bottom options - User's and Installer's let you set the respective passwords.

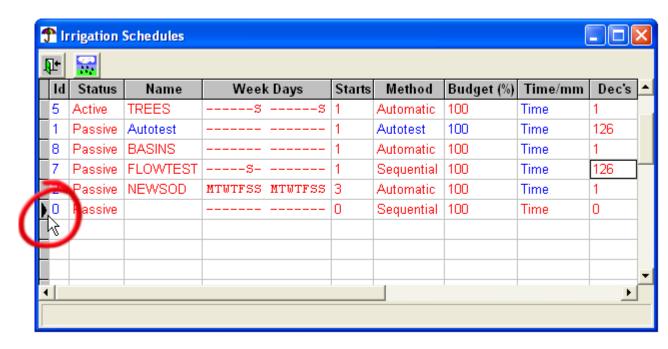
# 4.5.2. Deleting an Irrigation Schedule

To delete an irrigation schedule:

1. Open the Irrigation menu and select Irrigation schedules:



2. In the dialog that opens, left-click in the grey area next to the schedule you wish to delete:



3. Push the Delete button on your keyboard and confirm the deletion to remove the schedule:



# 4.5.3. Performing a Dry Run

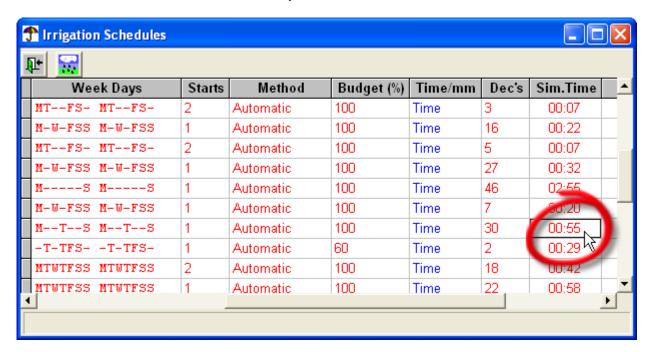
When you have configured an irrigation schedule it's a good idea to perform a "dry run". A dry run is a simulation of an irrigation that will tell you a lot of things about the schedule:

- Do the pipes have enough capacity to run the decoders in your schedule in the order and duration you want?
- · Will any pump settings interfere with your schedule?
- How is the pipe capacity used when running your schedule? (More on this in Section 4.5.5, "Checking Pipe Utilization" [page 61].)

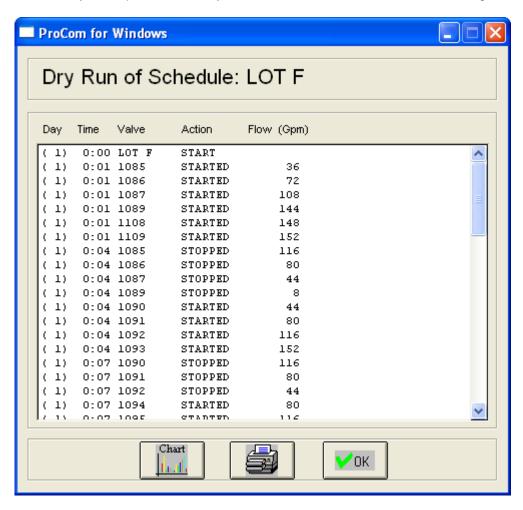
All in all, doing a dry run before you deploy a new schedule is a good idea - in fact, the dry run is a useful tool for designing your schedules in the most economical way.

Here's how you perform a dry run on one of your irrigation schedules:

- 1. Open the list of irrigation schedules as described in Section 4.5.1, "Managing Irrigation Schedules" [page 49].
- 2. Click in the Sim. Time column of the schedule you wish to test:

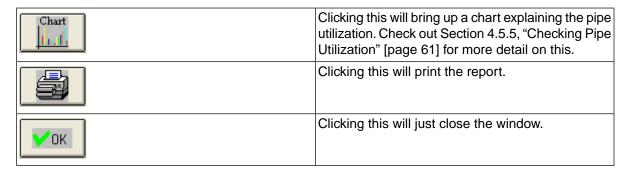


3. Now the dry run is performed and you'll see a list of results that looks something like this:



This window tells you everything you need to know about each step in the schedule. If you've made mistakes like the ones listed earlier (exceeded pipe capacity, overlapped start/stop times etc.) it will be listed in this window and you can go back and re-configure the schedule.

Here's what the buttons in the lower part of the window mean:

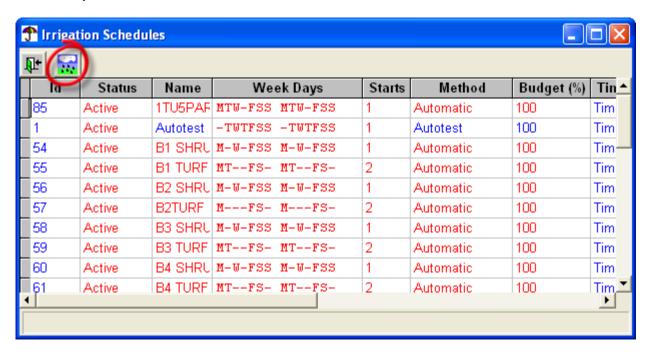


# 4.5.4. Dry Run All Schedules

The "dry run all" is probably one of the features you'll be using the most in your daily work with irrigation schedules. It works exactly the same way as a regular dry run, only it includes all schedules which is extremely useful for making sure that you don't have overlaps or resource shortnesses in your system. Since the PROCOM will only run one schedule at a time, optimizing is an important part of the schedule design job and the "dry run all" is the main tool.

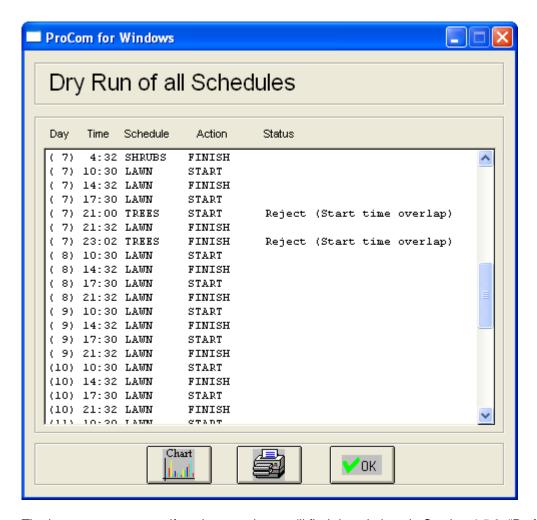
To perform a dry run of all schedules:

- Open the list of irrigation schedules as described in Section 4.5.1, "Managing Irrigation Schedules" [page 49].
- 2. Click the dry run all button:



Now you'll get a report that will point out any conflicts - here's an example that includes overlapping start times:

60



The buttons are pretty self-explanatory but you'll find descriptions in Section 4.5.3, "Performing a Dry Run" [page 58].



### **Important**

When you do a dry run to check for overlaps in your schedules, you should consider that in real life your ET device might alter the run time for your schedules, creating conflicts that don't show when you perform the dry run. This happens because the dry run uses the default ET settings, so if you want to be absolutely sure that not even ET corrected schedules can conflict, you should set the default ET to the maximum before performing the dry run.

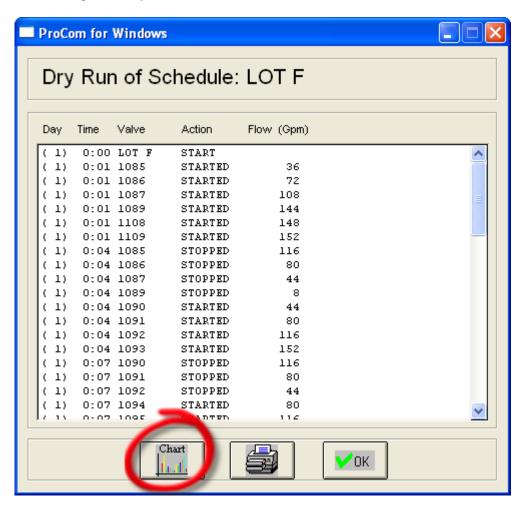
Check out Section 4.13.2, "ET default value" [page 103] for instructions on how to change the ET default.

# 4.5.5. Checking Pipe Utilization

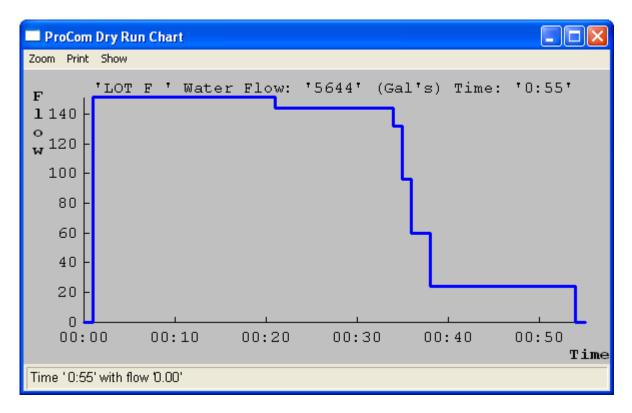
One of the challenges of creating a good irrigation setup is to utilize the pipe usage to its fullest. In the ideal setup, water flow in the pipes is constant while all parts of your turf are being watered sufficiently.

The PROCOM will show you exactly how the network of pipes is being utilized for each irrigation schedule in your system and even show it to you in a graphical manner. To check out the pipe utilization, follow this procedure:

- 1. Select the irrigation schedule you wish to check and perform a dry run of it as described in Section 4.5.3, "Performing a Dry Run" [page 58].
- 2. In the dialog of the dry run, click the Chart button:



Now a graphical representation of the dry run will appear:

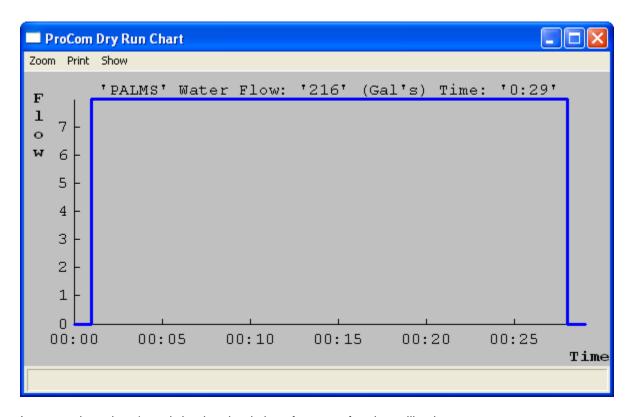


The example here has poor pipe utilization in the last third of the schedule or so. For more information on how to read the utilization chart, check out the following section.

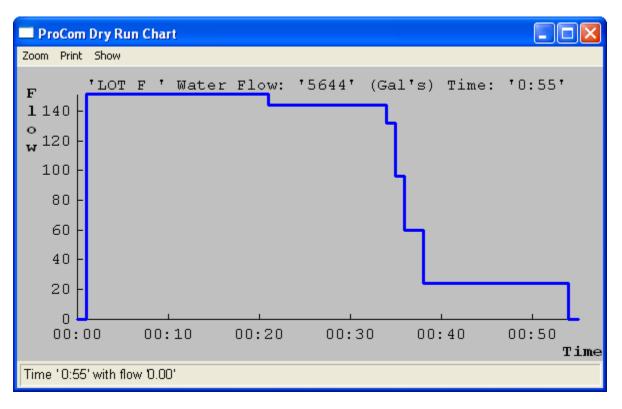
### 4.5.5.1. Understanding the Pipe Utilization Chart

The Pipe Utilization Chart tells you how much water is flowing in the pipes during the run of an irrigation schedule. In a perfect system the flow is constant throughout the irrigation, and during a poorly planned irrigation, the flow changes all the time - the utilization chart gives you a quick graphical understanding of how your schedule is placed in this range.

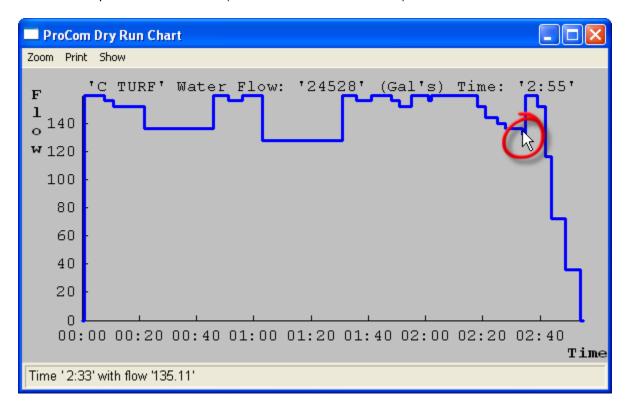
First, here's how a perfectly planned irrigation looks on a utilization chart:



In comparison, here's an irrigation that is less fortunate for pipe utilization:



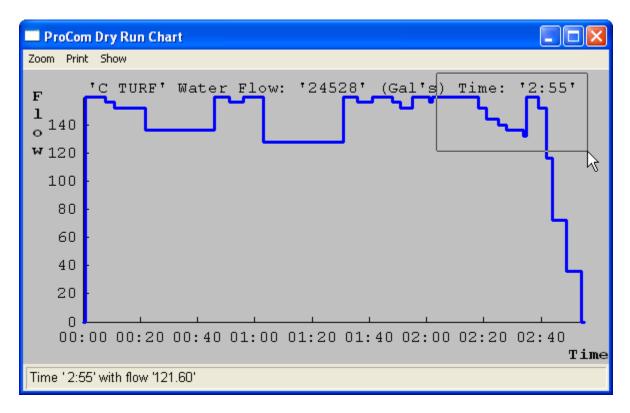
Most of your irrigation schedules will probably be something in between. The chart below shows an irrigation that isn't perfect, but very realistic. Note how placing the cursor on the graph will tell you exactly what the flow is at that point in the schedule (shown in the lower status bar):



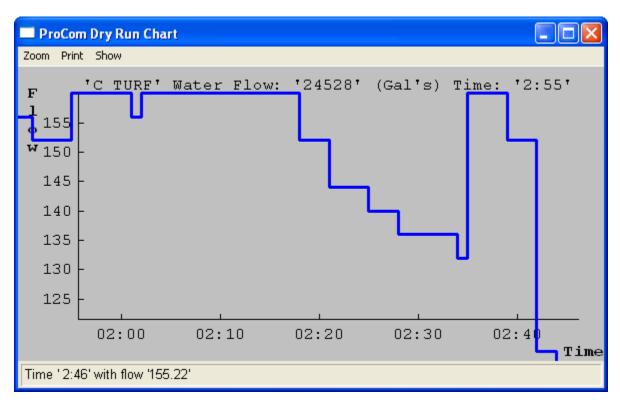


# **Tip**

If you want more detail about a certain part of a longer schedule, you can drag and draw a rectangle on the chart, and you will zoom on the selected area:



Next you'll see the rectangle enlarged:



To return to the view of the whole chart, select View all from the Zoom menu.

### 4.6. Sectors

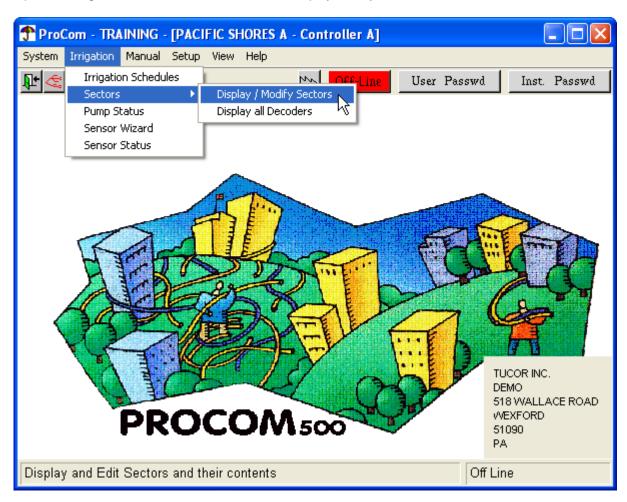
Sectors is a way of grouping a number of decoders logically, regardless of how they are connected to the grid of pipes in the ground. For example, if you're responsible for a large irrigation system, you might want to group a number of decoders that water certain areas: "north lawn", "front shrubs" etc. in order to control all decoders in different areas in a uniform way.

The advantage of using sectors is that you can use them directly in your irrigation schedules, and the PROCOM will take care of activating the right decoders when the sector is up for irrigation. See Section 4.5.1, "Managing Irrigation Schedules" [page 49] for more information on how to do this.

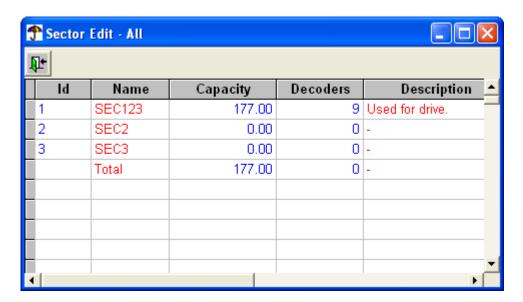
Since sectors are really just a group of decoders, the only information you need to provide to create a sector is the list of decoders included, and a name for the sector.

Here's how you create and edit sectors:

1. Open the Irrigation menu and select Sectors > Display/Modify Sectors:



This will bring up the following dialog:



#### 2. Now you can fill in or edit the fields for each sector:

ld

This field can not be edited - it's automatically assigned by the PROCOM.

#### Name

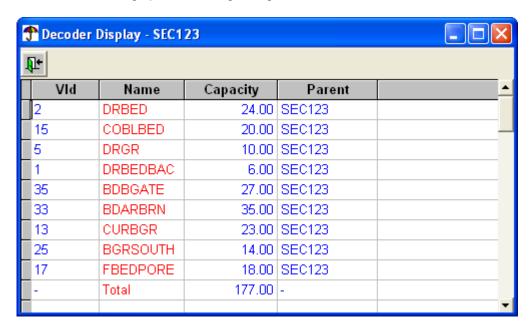
Your name for the sector - up to six characters.

#### Capacity

The capacity of the sector. This is automatically calculated based on the decoders you include in the sector.

#### **Decoders**

This field shows the number of decoders included in the sector. You edit the list by clicking in the field, which will bring up the following dialog:



# Listing Decoder to Sector Assignments

The fields in the decoder list:

#### VId

Short for Valve Id. This depends on the selected decoder, which is selected in the Name field.

#### Name

The name of the decoder. When clicking in this field you'll get a list of all available decoders as entered in Section 3.3.2, "Line Decoder" [page 30].

#### Capacity

Automatically read from the data available about the selected decoder.

#### Parent

The name of the parent sector. In this dialog, this will always be the same, since we're viewing all decoders from one specific sector.

#### Description

Your description of this sector - up to 200 characters.

3. When you're done editing the sector(s) to your liking, click the Exit button to save your configuration and close the dialog.



#### Note

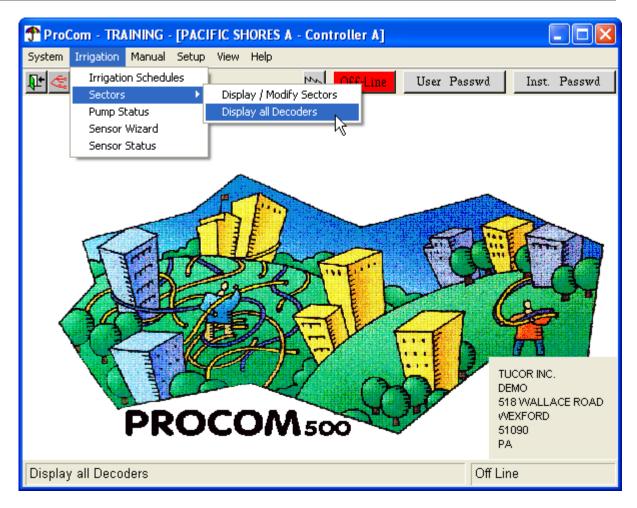
Once created, sectors can not be deleted.

To see a list of how all decoders are mapped to sectors, check out the next section, Section 4.6.1, "Listing Decoder to Sector Assignments" [page 69].

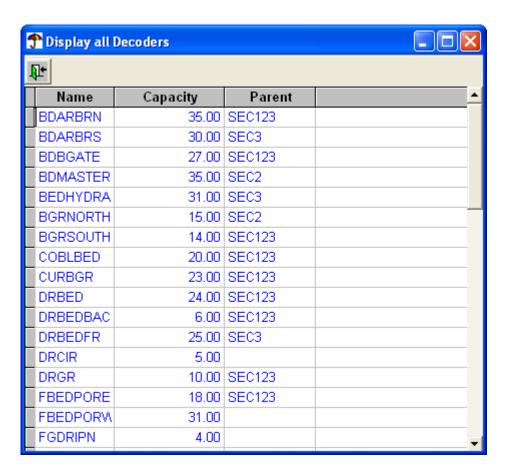
# 4.6.1. Listing Decoder to Sector Assignments

To get an overview of which decoders are assigned to which sectors, follow this procedure:

Open the Irrigation menu and select Sectors > Display all Decoders:



This will bring up the list of decoders and their "parent" sectors (empty if the decoder isn't included in any sectors):





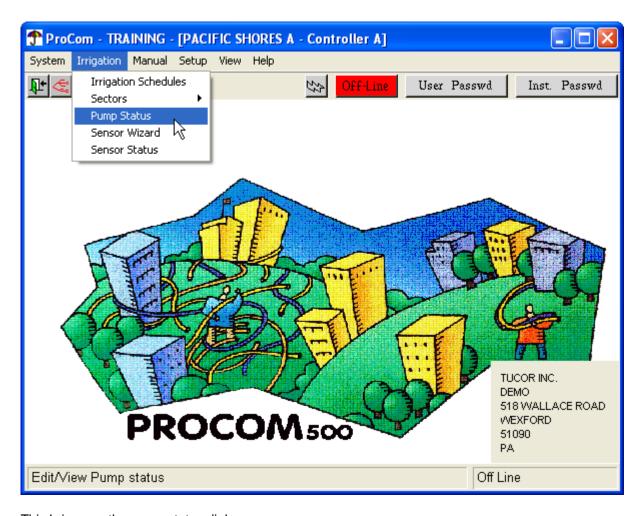
### **Note**

A decoder can only be included in one sector.

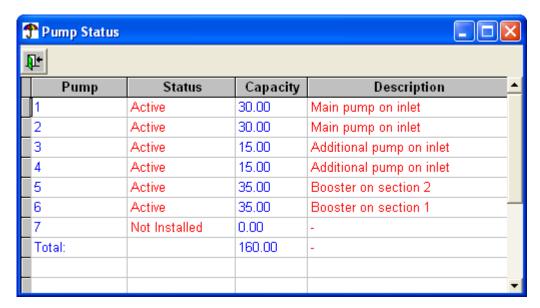
# 4.7. Pump Status

To check or edit the status of your pumps, follow this procedure:

1. Open the Irrigation menu and select Pump Status:



This brings up the pump status dialog:



2. Now you can change the status and description of the pumps registered in the system. The pumps listed are the ones that are entered when your physical system is described to the PROCOM software - check Section 3.4.1, "Pump Decoders" [page 32] for more details on how to add pumps to the list.

The fields in this dialog are:

#### Pump

ID number of the pump. This is assigned automatically by the PROCOM.

#### Status

You can change the status between Active and Passive. Setting the status to Passive doesn't mean that the controller forgets about the pump - it's just a guarantee that it will never get started. This can come in handy if you need to take out a pump for repair etc.



#### **Note**

The third option in the Status list, Not Installed can not be chosen here - that is part of the installation data and is handled in Section 3.4.1, "Pump Decoders" [page 32].

#### Capacity

The capacity entered when adding the pump to the system.

### Description

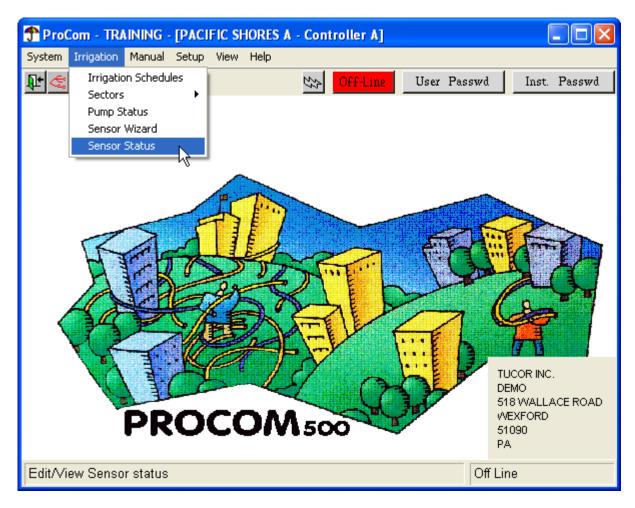
Your own logical description of the pump.

3. When you're done editing the pumps, click the Exit icon to save your settings and close the dialog.

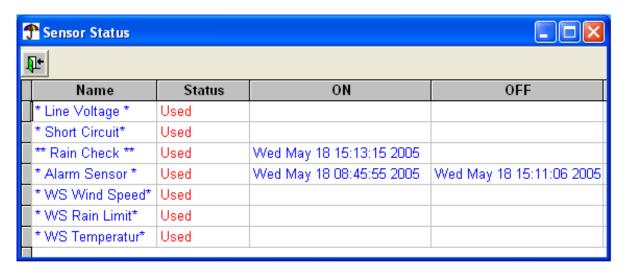
# 4.8. Sensor Status

To check or edit the status of your sensors, follow this procedure:

1. Open the Irrigation menu and select Sensor status:



This will bring up the Sensor Status dialog:





### **Important**

When a sensor triggers an alarm, the ALARM LED on the controller will turn on and stay lit until this dialog has been opened. Opening the dialog is the way you tell the PROCOM that you have registered the event and that it's safe to turn off the LED.

2. The list of sensors are the ones that are configured in Section 3.5.1, "Sensor Inputs" [page 34]. What you can edit here is the Status column that can be set to Used or Not used. There is a third option in the list, Not Installed, but this can only be activated when setting up the physical system under installation data. See Section 3.5.1, "Sensor Inputs" [page 34] for more details.



### **Note**

The Line Voltage and Short Circuit sensors are built in and can not be de-activated as these will notify you about problems with the two-wire path itself.

The ON and OFF columns show you when the sensors have last notified the PROCOM. In the example above the alarm sensor was active on May 18. between 08:45:55 and 15:11:06. The rain sensor was activated briefly after, at 15:13:15, and is still active.

What the notifications from the different sensors actually mean depends on how they are configured (again, see Section 3.5.1, "Sensor Inputs" [page 34]).

3. When you're done editing the status of the sensors, click the Exit icon to save your settings and exit.

## 4.9. Sensor Decoder Wizard

The sensor decoder wizard is a tool that helps you define a set of actions to take in response to sensor input. The wizard takes you through just four simple screens, and each screen has instructions on how to answer the questions it asks you.

The Wizard let's you define two types of rules:

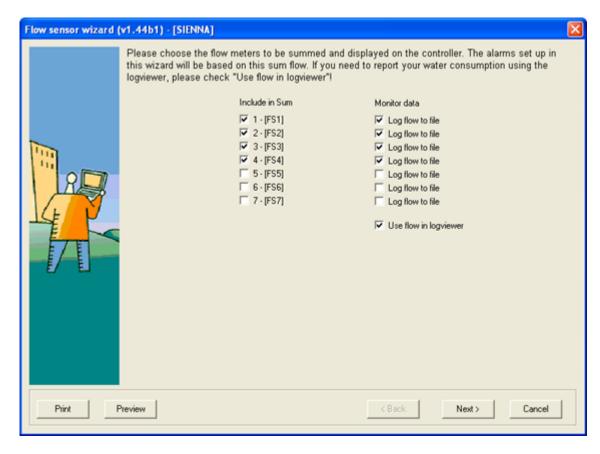
- 1. When a specific flow sensor exceeds a certain value, you can take action.
- 2. When the summed flow for a group of sensors exceeds a given value, you can take action too.

To create a rule set for how the PROCOM should react to input from your sensors, follow this procedure:

1. Open the Irrigation menu and select Sensor Wizard:



This brings up the first screen of the Sensor Decoder Wizard:



In this first step of the wizard you need to check which decoders will be included in "group" rules - you must select which sensors can add to the summed up flow.

You also need to check which sensors should log their flow, and whether you want to see the flow in the log viewer (see Section 4.12.2, "Offline Monitoring - The Log Viewer" [page 91] for more details).



#### **Note**

The wizard has Next and Back buttons that allows you to browse freely back and forth between the screens and change the settings until you're happy with your choices.

3. In the next screen you enter limits for each flow sensor that will cause the running irrigation to be aborted - irrigation will be picked up again when the next schedule kicks in. The unit is what ever was chosen when configuring the PROCOM initially (see Section 3.1.1, "Parameters" [page 18] for details).

Beneath the list of sensors you can enter the limit for the summed up flow.



### **Important**

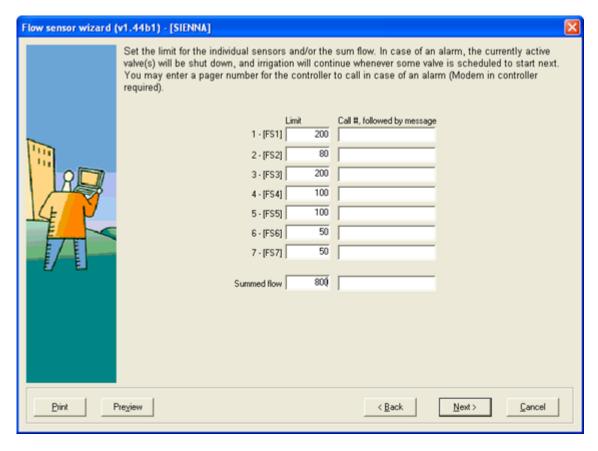
This is the sum for the sensors checked in the previous screen - not the sum for all sensors listed here.

Finally you can enter a pager number and message for each sensor and the summed flow - the pager will then be notified if the limits are exceeded.



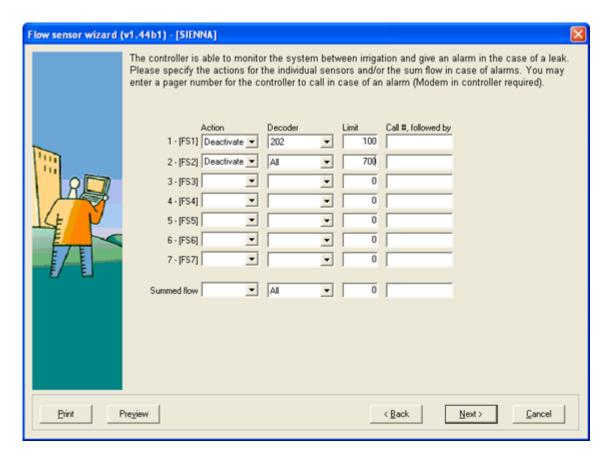
### Note

The PROCOM must have a modem connected in order for pagers to be notified.



4. Flow sensors can also monitor flow between active irrigation schedules, which is an easy way to detect leaks in your pipes. This next screen lets you define actions to take when the flow exceeds certain limits with no irrigation going on.

You define the flow limit, which action to take and on which decoders - all for each sensor and for the summed flow:



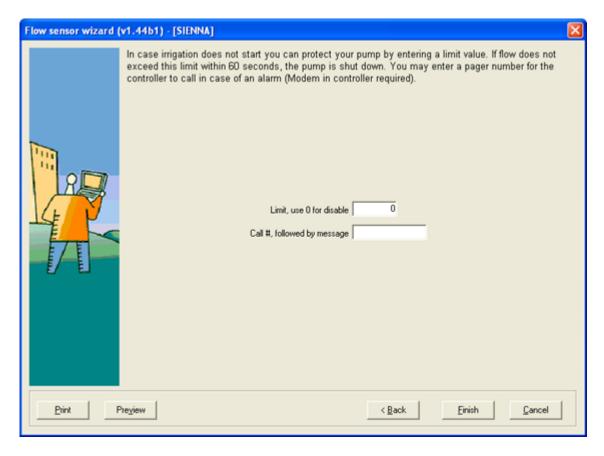


# **Important**

Regarding alarms on master valves: If your master valve is "normally open", meaning that it will shut down in the event of an alarm, you must remember to set the master valve's flow capacity to zero, or else the PROCOM will register that a valve is running and needs water, and it will start the pumps. This, of course, will lead to problems.

5. The last screen lets you take protective measures on behalf of your pump in case irrigation doesn't kick in as it was supposed to (due to errors in the equipment in the field). Here you can enter a flow limit that must be exceeded within 60 seconds from irrigation start - if this doesn't happen, the pump is shut down.

This prevents your pump from working up a critical pressure in the pipes, or melting down the pump if no water is flowing.



# 4.10. Manual Control

In addition to completely automated operation, the PROCOM lets you intervene manually if you want to run or stop a specific decoder or schedule. This section describes how you take manual control over the PROCOM system.



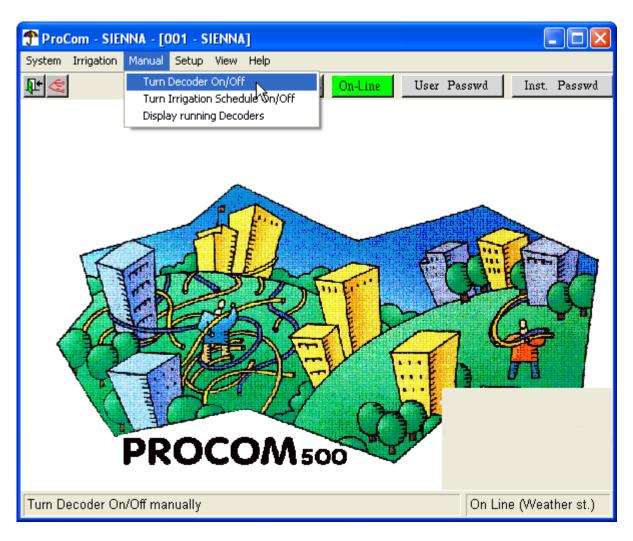
# **Important**

To work with any procedure in this section you must be connected to the controller.

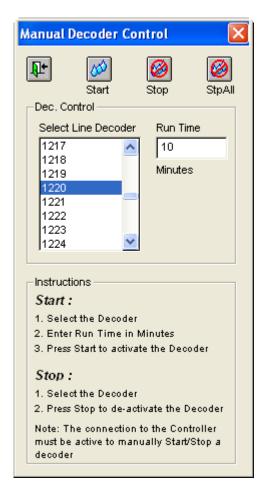
# 4.10.1. Controlling Decoders

Follow this procedure to take manual control over a single decoder:

1. Open the Manual menu and select Turn Decoder On/Off:



2. Now the Manual Decoder Control appears:



The dialog itself has the instructions for how to start or stop a decoder:

#### To start a decoder:

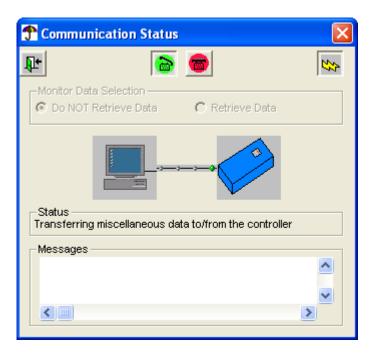
Select the decoder from the list, enter run time in minutes and push the Start button.

### To stop a decoder:

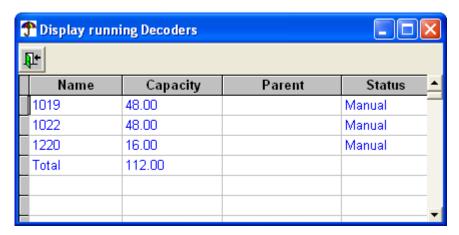
82

Select the decoder from the list and push the Stop button.

3. When you start or stop decoders manually the communication status window will state that the software is "Transferring miscellaneous data to/from the controller" as seen in this dialog:



4. Now if you list all running decoders, you'll see any decoders you started manually (1220 in our example):

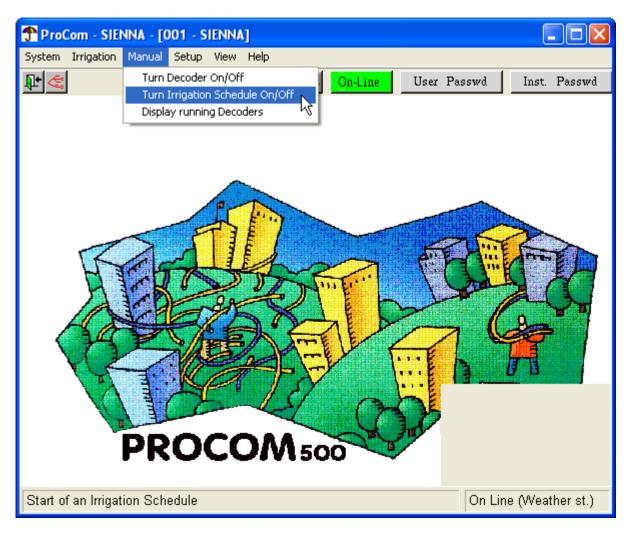


The Status column tells you whether a decoder has been started manually (Manual) or as a part of an irrigation schedule (Active).

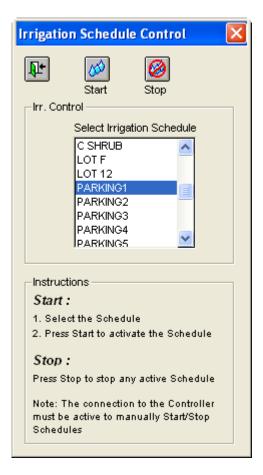
# 4.10.2. Controlling Irrigation Schedules

Follow this procedure to start or stop an irrigation schedule manually:

1. Open the Manual menu and select Turn Irrigation Schedule On/Off:

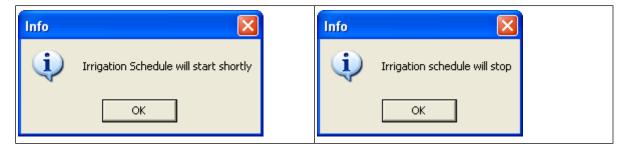


2. Now the Irrigation Schedule Control appears:



The dialog holds the instructions itself: Select a schedule from the list and push the Start or Stop button.

3. After starting/stopping a schedule you'll get a confirmation:



In addition, when starting a schedule, you'll see its running decoders in the list of running decoders.



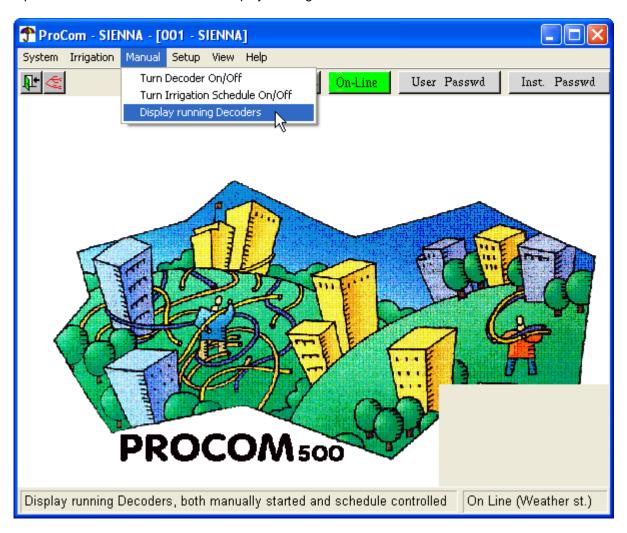
#### Note

It might be a little while before the alert pops up since the PROCOM acts only on "whole minutes".

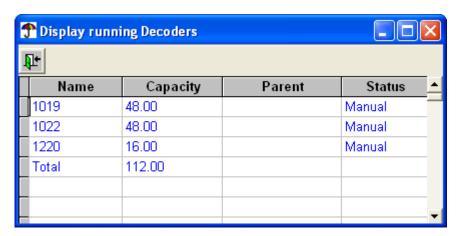
# 4.10.3. Listing all Running Decoders

In a complex system, a nice feature of the PROCOM is the possibility to check a list of all running decoders. Follow this procedure to get to the list of running decoders:

1. Open the Manual menu and select Display running Decoders:



2. Now the list of running decoders appears:



The window is all read-only, but here's the meaning of the different fields:

#### Name

The name provided for this decoder during setup (See Section 3.3.2, "Line Decoder" [page 30])

#### Capacity

The capacity is read from the type description of this particular decoder (See Section 3.3.1, "Types of Valves" [page 29])

#### Parent

If this decoder is part of a sector, the sector name will be displayed here.

#### Status

One of Manual: started manually, or Active: running as part of an irrigation schedule.

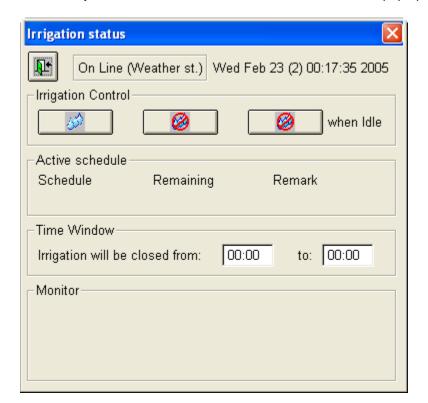


### **Note**

Decoders started automatically by an irrigation schedule will not show up when you open the dialog - only decoders started after the dialog is opened will appear.

# **4.11. Status**

Whenever you connect to a controller, the Status Window will pop up:





### Tip

You can also open the Status Window manually: Open the View menu and select Status.

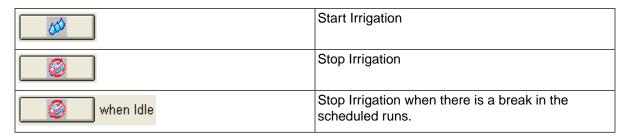
Here's a description of the four parts of the Status Window:

#### Controller Status

The box next to the date in the top shows the controller status, which can be one of the following:

Status Message	Description
Irrigation On	Normal operations: schedules will be run according to plan and the sensor decoder system is active.
Irrigation Off	No schedules will be run according to plan and sensor decoders are inactive.
Off line	PC is not connected to a controller.
Calling (Weather St.)	Performing a call to the weather station.
On line (Weather St.)	Communicating with the weather station.
Exiting Weather St.	Disconnecting from the weather station.
Weather St. Alarm	Weather station is emitting an alarm.
Closed (Time Window)	Irrigation is halted because the time of day is in the "Time Window" for irrigation shutdown.
SHORT (2-wire short)	The PROCOM has reported a short circuit on the two-wire path.
ERROR (GND fault)	The PROCOM has reported a leak on the two-wire path.
RAIN	The rain sensor is active.
ALARM (pump)	The alarm sensor is active - this is typically a pump.

#### **Irrigation Control**



#### Time Window

Here you can define a time window during which all irrigation will be blocked.

#### Monitor

This part of the Status Window will display the last monitor messages in three lines:

- 1. Line one will show the latest monitor data.
- 2. Line two will show the latest SUM flow.
- 3. Line three will show the latest alarm.

# 4.12. Monitoring

The PROCOM software lets you monitor everything the controller does. You can monitor events in real time as well as view and analyze log files for previous days of irrigation.

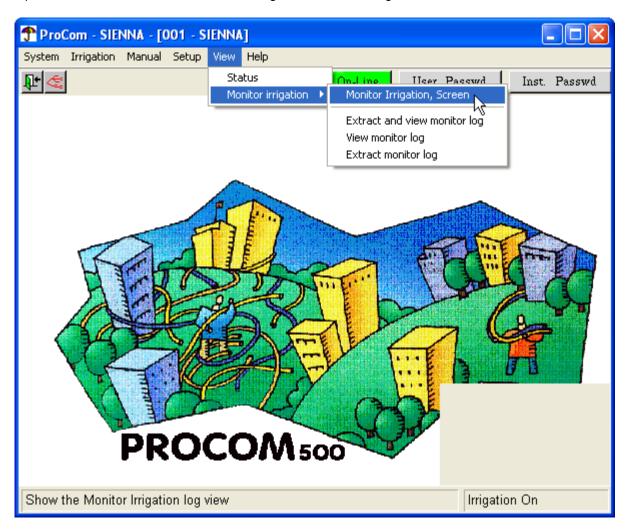
To perform any of the monitoring tasks described in this section, you must be connected to the controller.

# 4.12.1. Online Monitoring

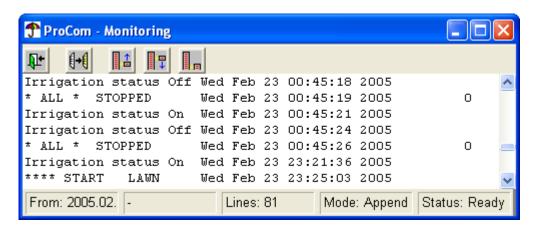
Online monitoring allows you to keep an eye on the log file as it grows - you'll see the lines being appended as the PROCOM carries out its actions.

Follow this procedure to call up the online monitor:

1. Open the View menu and select Monitor irrigation > Monitor Irrigation, Screen:



2. Now the online monitor pops up:



Each line consists of four elements. For instance:

"LAWN STARTED Wed Feb 23 16:20:00 2005 60"

This line can be broken down like this:

#### LAWN

Identifier for what the controller is working on - a pump, a decoder, or as here, an irrigation schedule.

#### **STARTED**

Action taken, like started, stopped.

Wed Feb 23 16:20:00 2005 Time for log entry

60

Expected flow for this action.

In addition to the Exit icon, the online monitor has these icons in the top row:

Icon	Description
1+1	Copies the selected content to the clipboard. Before clicking this you must use the mouse to highlight the lines you wish to copy.
	To get more complex extracts from the log, check out Section 4.12.2.5, "Extracting Log Files" [page 98].
	Selects data from the previous day relative to the one you are currently viewing.
	Selects data from the next day relative to the one you are currently viewing.
	Selects data from today in append mode, which means that you will see lines appending in the window as the PROCOM does its job.
	This is the default mode when you open the online monitor.

# 4.12.2. Offline Monitoring - The Log Viewer

The Log viewer digests all of your monitor data offline and gives you a number of useful reports on irrigation, water usage, alarms etc. The log viewer application is a complex set of macros for Microsoft Excel, which means that in order to use the Log viewer, you must have Microsoft Excel installed. The default security settings of Microsoft Excel will initially prevent you from running the log viewer - check out the following section (Section 4.12.2.1, "Getting around Microsoft Excel security warnings" [page 91]) to work around this.

## 4.12.2.1. Getting around Microsoft Excel security warnings

Depending on your security settings in Excel, you might get warning about running an "untrusted macro". If your settings are very tight (security setting: high) you'll get a warning like this:



If your settings are more relaxed (security setting: medium), you'll see a warning like this one:



It's safe to trust the macros in Logviewer.xls, so we recommend that you set your security settings to "medium" and then click the Enable Macros button whenever you use the log viewer.



### **Note**

We take no responsibility for incidents caused by other macros because of this recommendation.

### 4.12.2.2. Extracting and viewing Monitor Data

To get the latest monitor data from the PROCOM and inspect it in the Log Viewer, follow this procedure:

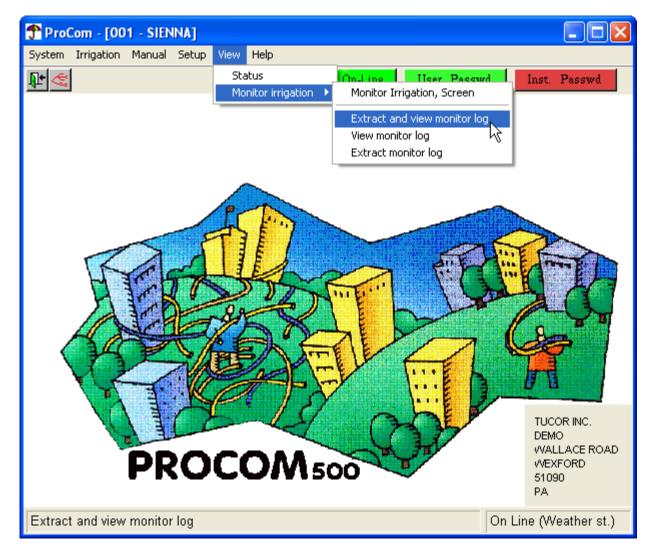
1. Connect the PROCOM software to your controller to get the latest monitor data - instructions are found in Section 4.4, "Communicating with Controllers" [page 45].



#### Note

You can have monitor data from multiple sites merged in the same PROCOM installation - they will simply show up as different sheets in the reports created by the log viewer.

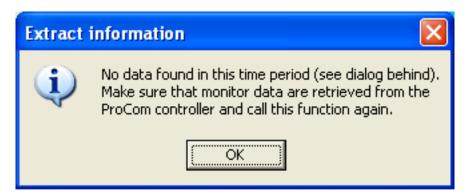
2. Open the View menu and select Monitor irrigation > Extract and view monitor log:



3. This will make the PROCOM check for new data in the pool of monitor data:



If no new data is found, you'll see a message like this:

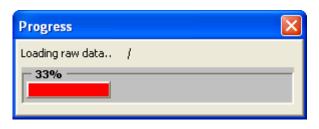


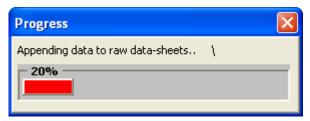


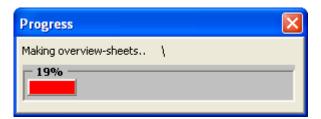
# **Important**

Make sure that you have actually transferred monitor data in step 1 - otherwise the PROCOM will keep responding that no new data is found.

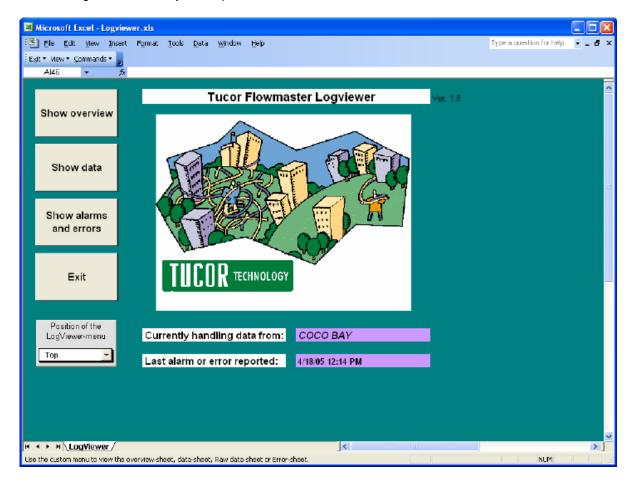
4. Now the PROCOM will start loading the data, appending it to the existing reports and creating the new reports:







5. Now the log viewer is ready for inspection:

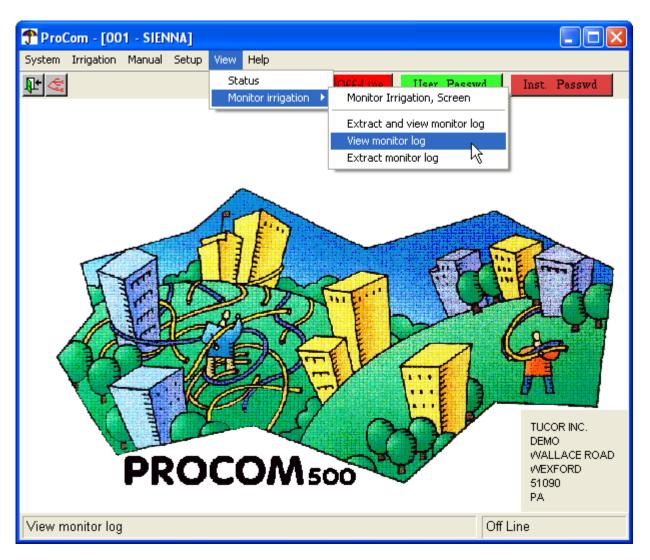


Proceed to Section 4.12.2.4, "Log Viewer Report Types" [page 96] to learn more about the different report types.

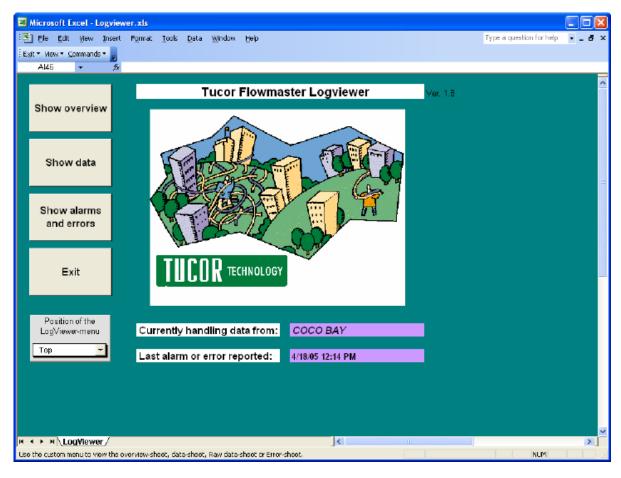
### 4.12.2.3. Viewing existing Monitor Data

To view the monitor data already on your PC, follow this procedure:

1. Open the View menu and select Monitor irrigation > View monitor log:



- 2. If this is the first time you view the monitor data on your PC, the PROCOM will start loading the data, like described in Section 4.12.2.2, "Extracting and viewing Monitor Data" [page 92].
- 3. Now the log viewer is ready for inspection:



Proceed to Section 4.12.2.4, "Log Viewer Report Types" [page 96] to learn more about the different report types.

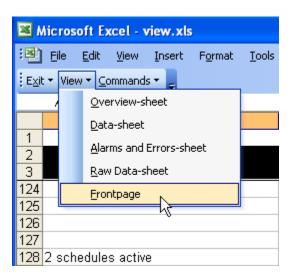
# 4.12.2.4. Log Viewer Report Types

Once you have gathered your monitor data and fed them to the log viewer as described in Section 4.12.2.3, "Viewing existing Monitor Data" [page 94] you're ready to start investigating the reports. Here's an overview of what the different fields means in the reports:



### Tip

You can navigate between the reports or return to the front page by using the view menu:



#### The Overview Report

This gives you a good idea of the overall state of irrigation in your system. Grouped by date, the following fields describe the irrigation:

Field	Description
Schedules	Name of the run schedule.
	If you see schedule names like this:  "(unknown ID = 12)", it means that the schedule has been deleted, but the monitor data still contains entries for the schedule. This is handy when
	generating historical reports.
Start	Start time of the schedule
Stop	End time of the schedule
Run Time	Total run time
Used	Water used by schedule.
Estim.	Estimated water usage.
Diff.	Difference between estimate and actual usage.

#### The Data Report

This report gives you more detail on how schedules have been executed - you'll see start and stop times for schedules, but in addition you'll see the start times for each valve in the schedule, and the report will also tell you about alarms. The report is listed chronically by date, and the data fields are:

Field	Description
Alarm	If the event is an alarm, this field will hold the name of the alarm. Examples:
	** Short sensor **

Field	Description
	** Ground sensor **
	** Rain sensor **
Schedules	If the event is a schedule starting or stopping, the schedule name will be listed here. Again, an "Unknown" schedule means that the schedule has been deleted in the PROCOM.
On	Time of the event.
Valves	Valves involved in the event. If a schedule starts five valves simultaneously, the will be listed next to the start time.

### The Alarms and Errors Report

If you want an isolated overview of all alerts emitted by the system, this report will give you that. The fields in the report are pretty self-explanatory:

Field	Description
Alarm type	Examples:
	Valve error
	Ground sensor
	Rain sensor
	Short sensor
	Data error
Site	Name of the site spawning the alert or error. Obviously useful if you manage multiple sites from the same PROCOM installation.
Description	Description of the event.

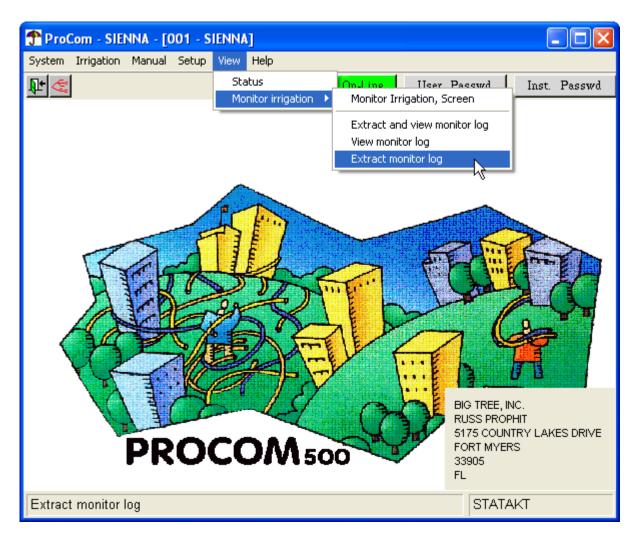
#### Raw Data

This isn't really a report, but the raw data as received from the controller(s). This data is the source for the other reports and is mainly here for debugging purposes.

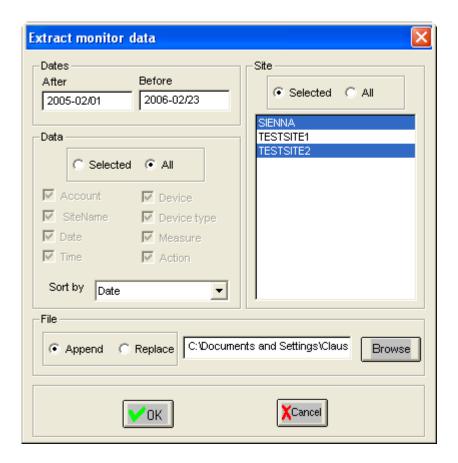
### 4.12.2.5. Extracting Log Files

If you want to export log data or maybe manipulate the data in your own application, you can extract and export a log file from a time span of choice by following this procedure:

1. Open the View menu and select Monitor irrigation > Extract monitor log:



2. Now the extract dialog pops up and prompts you for a number of things:



Here's how you fill in the various sections:

#### **Dates**

Enter the date range for which you wish to extract log data - including the dates you enter. The text boxes work by just typing on top of the defaults - you won't be able to enter a date in the wrong format.

#### Site

Choose All to include all sites or Selected to pick out the ones you wish to limit the log extract to.

### Data

Choose All to include all types of data or Selected to define what you want to appear on each line of the log extract.

#### File

Use the Browse button to decide where to save your log file and select whether to Append to it or just Replace it. If you're creating a new file, these two options give the same result.

- 3. Click the OK button to save the log data to file please note that it can take a while to extract the data.
- Now you can use a spread sheet like Microsoft Excel™ to manipulate your log data.



# Tip

If you want to view the extracted log with the log viewer, you also have the option of extracting and viewing log data in just one step. To do this, open the View menu and select Monitor irrigation > Extract and view monitor log.

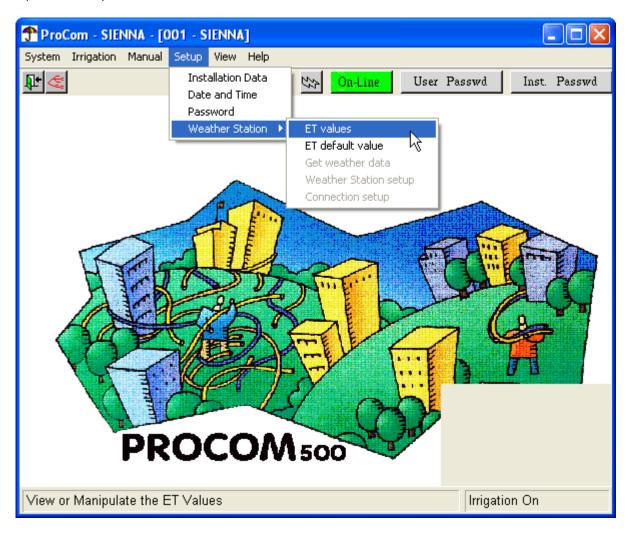
# 4.13. Weather Station

### 4.13.1. ET Values

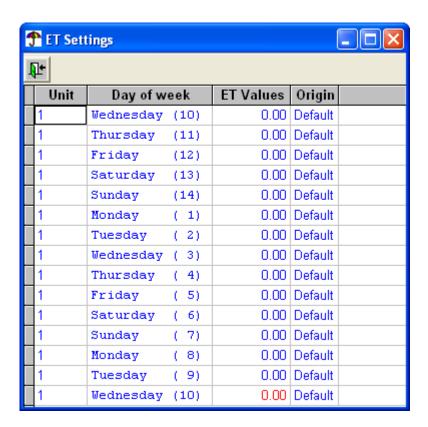
You can view ET values for the last 14 days. These values tell you how the irrigation has been corrected by a connected weather station.

To view the ET values for your system:

• Open the Setup menu and select Weather Station > ET Values:

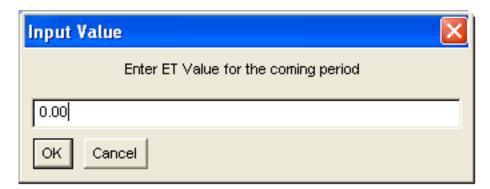


This will bring up the ET Settings dialog:



There is one entry for each day in the 14 day cycle that makes up irrigation schedules - the ET Values column tells you how much the irrigation should be corrected, and the Origin column tells you what determined the value.

The value for the next ET period is marked in red and can be entered manually.



The possible values for Origin are:

#### Default

No data received from weather station - default setting used.

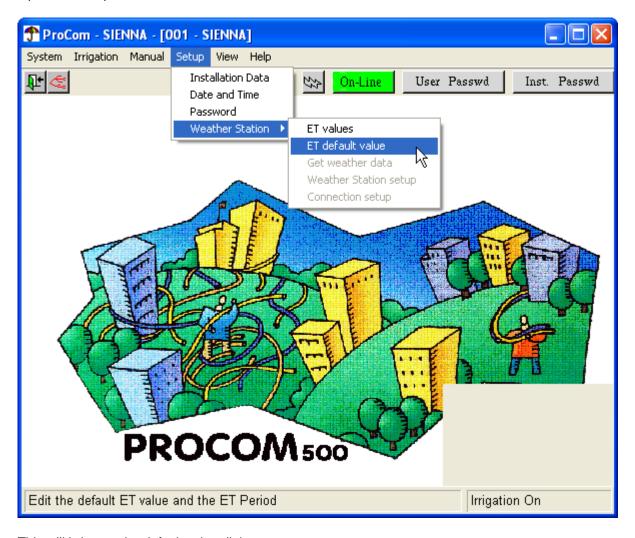
#### WS/Man

Data received from weather station or entered manually

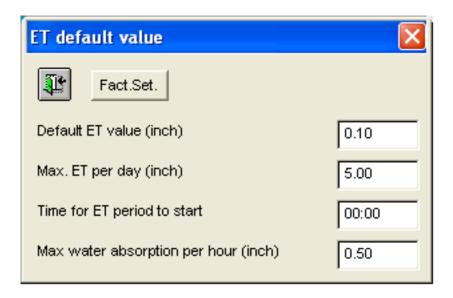
# 4.13.2. ET default value

The ET default value dialog lets you set a few settings that will affect the way ET works. To manage the settings:

• Open the Setup menu and select Weather Station > ET default value:



This will bring up the default value dialog:



#### Default ET value (inch)

This value is used if no data was obtained from the weather station.

#### Max. ET per day (inch)

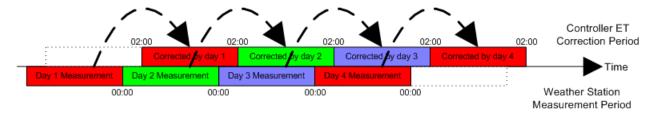
Defines a limit that the weather station can not exceed when correcting irrigation.

#### Time for ET period to start

Time of day when the ET period should start.

You should leave enough room for the controller to call the weather station and retrieve data before starting it's ET period - typically one to two hours. So, if the weather station collects data between 00:00 and 23:59, set the ET period start to 02:00. (See Section 4.13.4, "Weather Station Setup" [page 106] for instructions on how to set the weather station data collection period).

This diagram shows you how the weather station measurement periods (00:00 to 23:59) are used to correct the following days irrigation between 02:00 and 01:59 - the buffer zone between 00:00 and 02:00 makes sure that data gets transferred from the weather station to the controller:



Max water absorption per hour (inch)

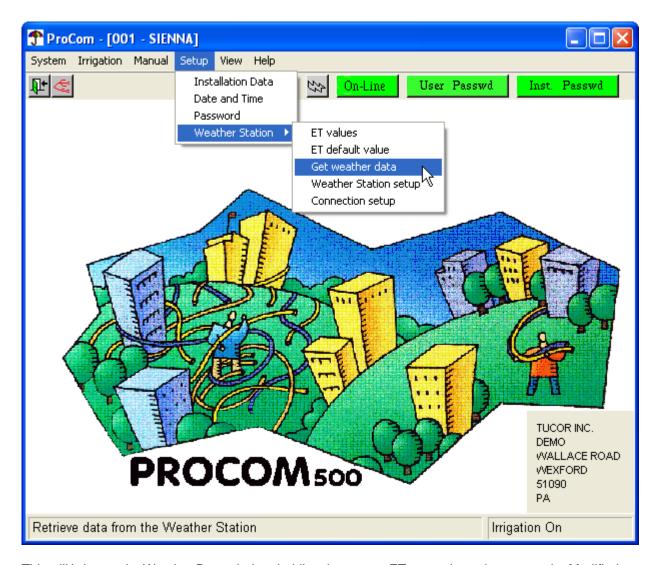
The maximum amount of water the soil can absorb - irrigation will never be corrected to exceed this.

To reset the settings to factory values, click the Fact.Set. button.

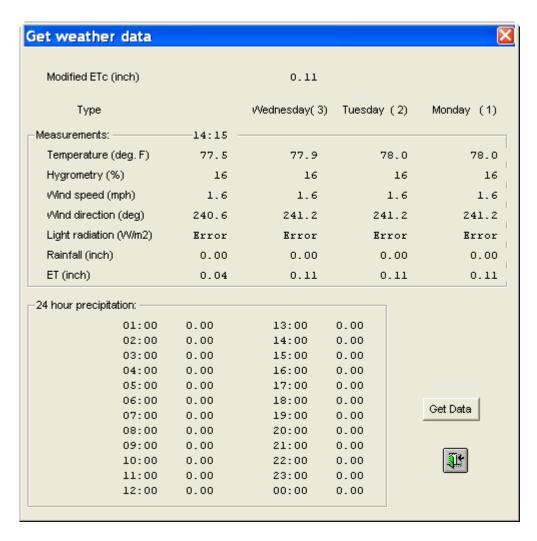
## 4.13.3. Get weather data

You can get the latest data from a connected weather station in raw format:

Open the Setup menu and select Weather Station > Get weather data:



This will bring up the Weather Data window, holding the current ET correction value next to the Modified ETc field (in this case, 0.11):



The ETc value is calculated by taking the ET value from yesterday (in this case Wednesday) and subtracting the fallen rain that day (in this case zero).

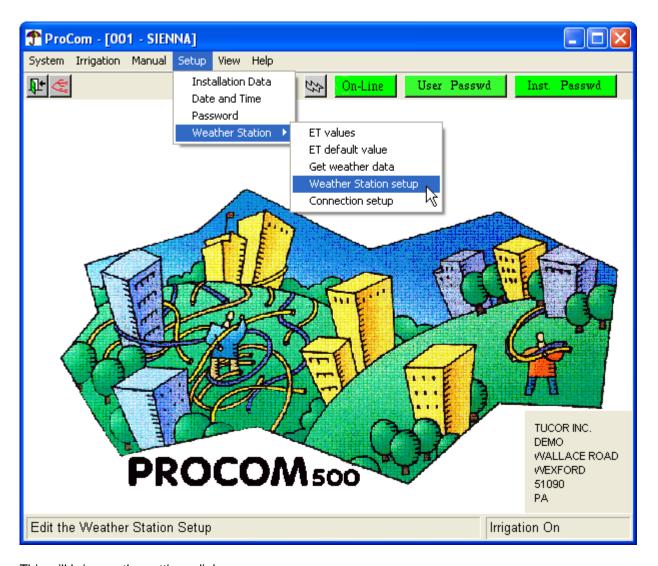
The four columns in the Measurements block represent the current data and averages for the three previous days.

You can update the current data by pushing the Get Data button.

# 4.13.4. Weather Station Setup

To manage the settings of the weather station:

• Open the Setup menu and select Weather Station > Weather Station setup:

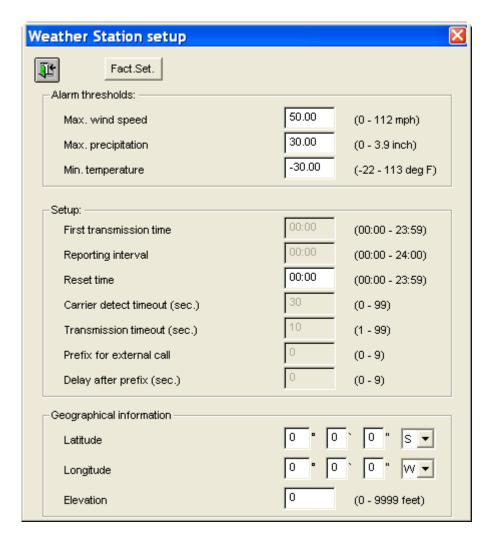


This will bring up the settings dialog:



#### **Note**

The many dimmed out fields stem from older versions of the software that supported weather stations that needed more configuration - you can just ignore these.



#### Fact.Set.

Click this button to revert to factory settings.

#### Alarm thresholds:

If any of these limits are met, irrigation will be halted. Max. precipitation must be measured for three consecutive minutes to avoid false alarms.

#### Setup:

The Reset time determines when in the data collection will be reset. This must be coordinated with the controller's ET period (Check out Section 4.13.2, "ET default value" [page 103] for details).

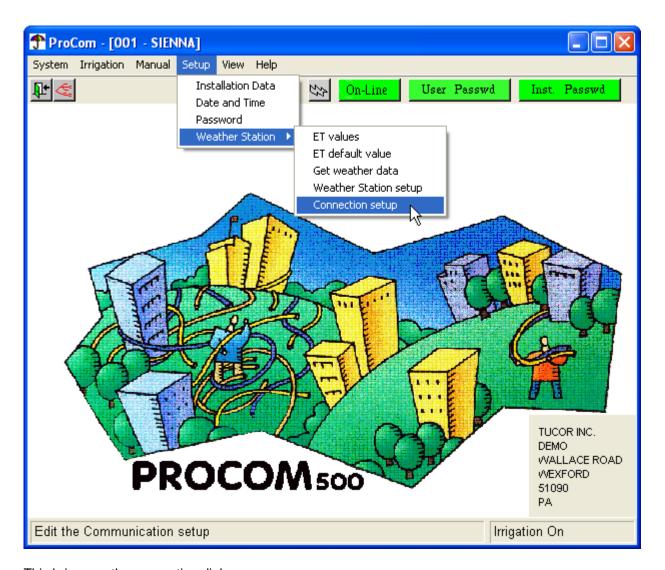
#### Geographical information

This is used to correct the ET values.

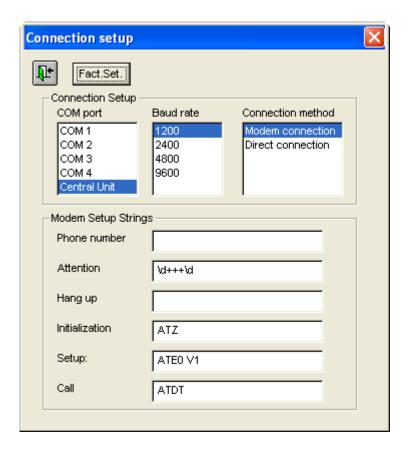
# 4.13.5. Connection Setup

To configure how the controller communicates with the weather station:

Open the Setup menu and select Connection setup:



This brings up the connection dialog:



The COM port and Baud rate fields can not be changed, but you should select between Modem connection and Direct connection. If you select Modem connection, you should fill in the Modem Setup Strings section too.

To revert to factory defaults, click the Fact.Set. button.

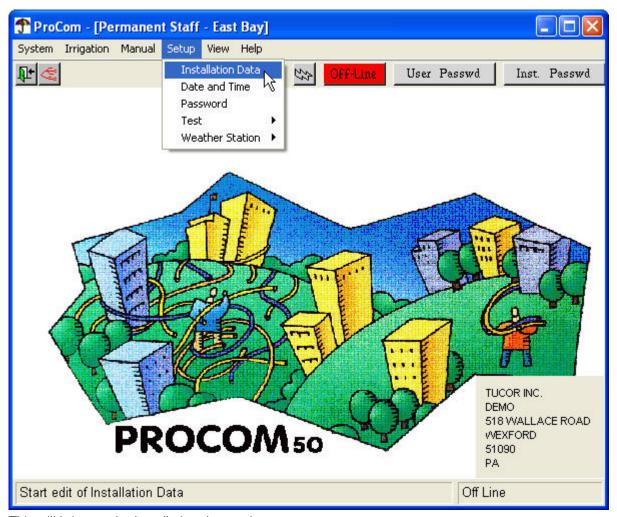
# **Chapter 5. Testing**

The test suites that ship with the PROCOM are all explained within their dialogs - this section will guide you to the tests, but read the test dialogs carefully before initiating any of them.

# 5.1. Manual Test

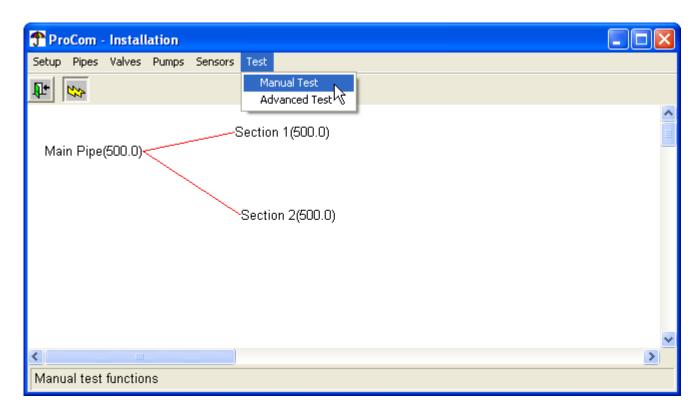
To open the manual test suite from the main window:

1. Open the Setup menu and select Installation Data:

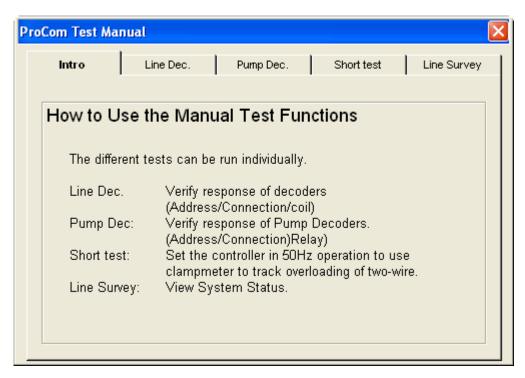


This will bring up the Installation data main menu.

2. Now open the Test menu and select Manual Test:



Now the suite of manual tests will open:



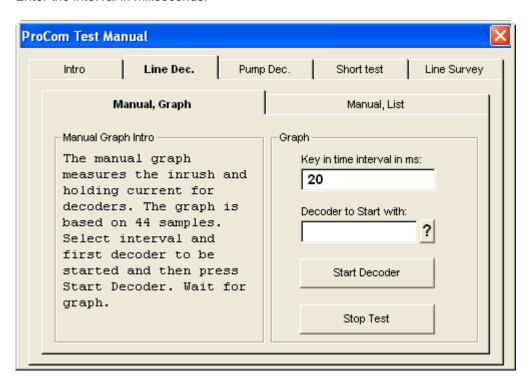
3. Read the following sections for instructions on each test.

# 5.1.1. Line Decoder

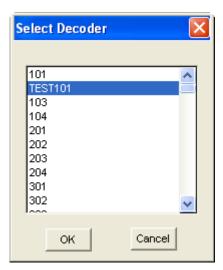
This lets you test a single line decoder in the field and view the results as either a graph or a list of measurements.

## 5.1.1.1. Graph

1. Enter the interval in miliseconds:

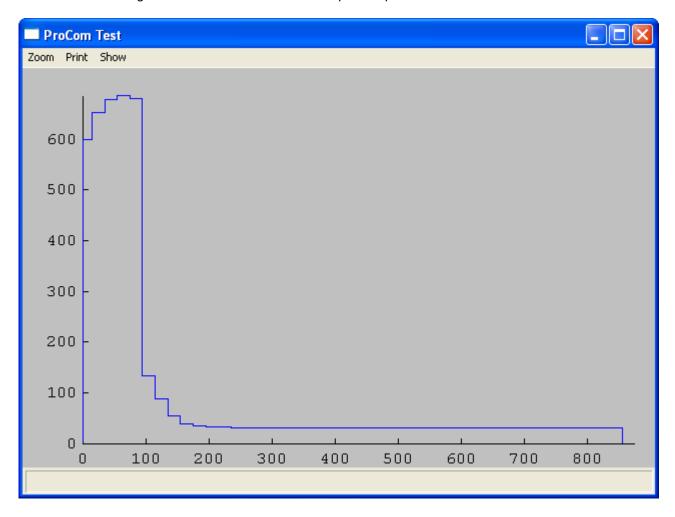


2. Select the decoder you wish to test:

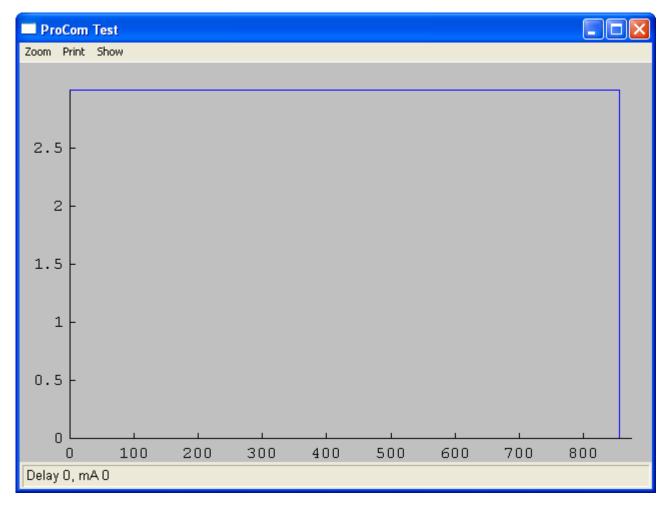


3. Wait for the graph to pop up.

A successful test should look something like this, where you see high current during inrush, and then a much lower holding current after the valve has been pulled open:



A failed test on the other hand could look something like this:



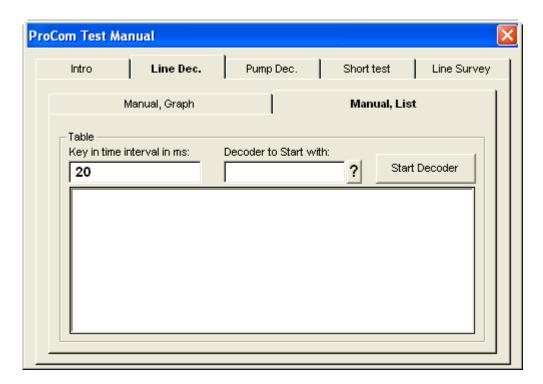
# 5.1.1.2. List



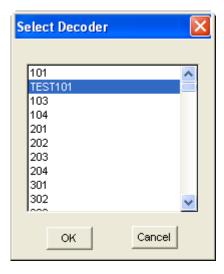
## **Note**

The results from any tests you run in this dialog are saved in a sub directory of your installation called  ${\tt TestData}$ . The results will be saved as  ${\tt decodername}$ . txt. Subsequent tests of the same decoder will be appended to the file.

1. Enter the interval in miliseconds:

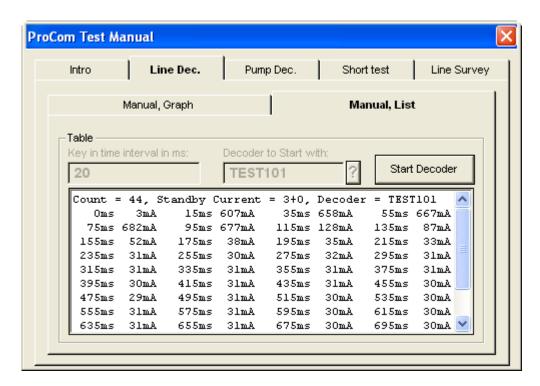


2. Select the decoder you wish to test:

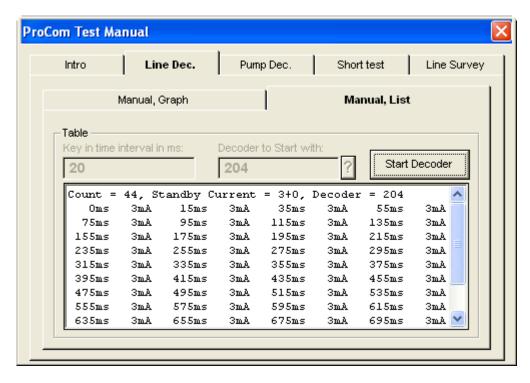


3. Wait for the test data to get listed.

A successful test will look like this, with a high inrush current and then a constant, lower holding current:



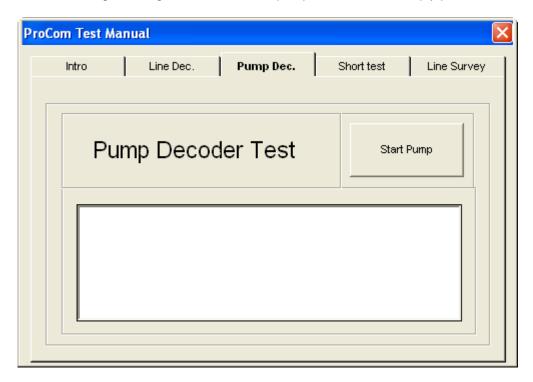
Whereas a failed test could look like this:



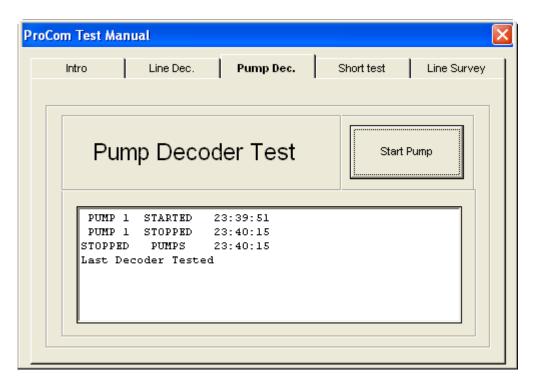
# 5.1.2. Pump Decoder

The Pump Decoder test is simply an on/off button for your pumps that can help you verify whether the controller is communicating with your pumps:

1. There's nothing to configure or select in the pump decoder test - simply push the Start Pump button.

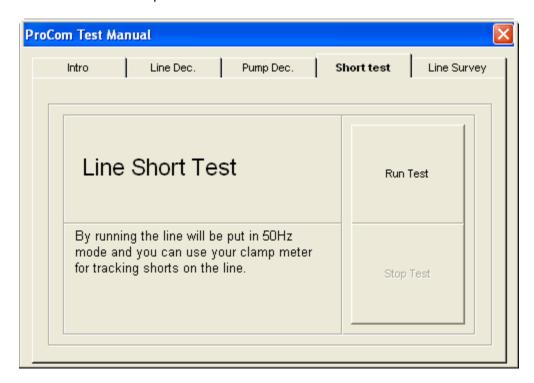


2. Now each pump decoder is turned on and off. Verify the sanity of your system by monitoring the pumps as the test runs.



# 5.1.3. Short Test

Perform the Short Test to put the system in 50Hz mode which allows you to use a clampmeter to track down shorts on the two-wire path.



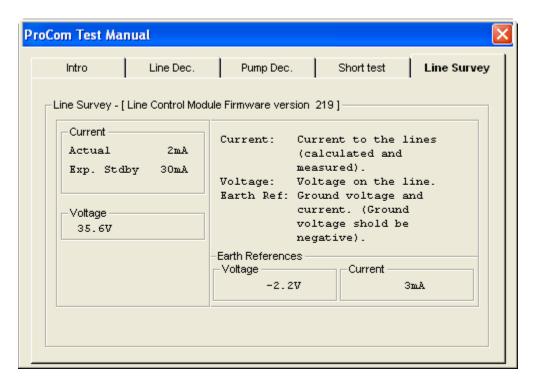
# 5.1.4. Line Survey

The Line Survey isn't really a test, but a real-time snapshot of the current and voltage on the line and to ground.



#### **Note**

The Expected Current takes into consideration the different types of line decoders attached, but not the sensor decoders.



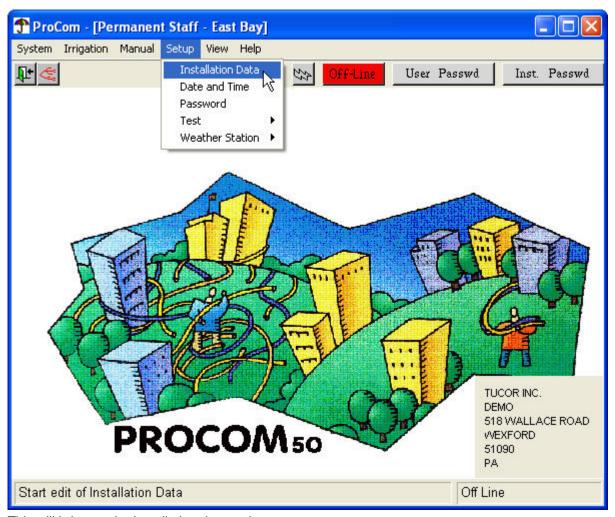
A few rules of thumb for this test dialog:

- If voltage is below 25V you should consider it a short. Typically the voltage should be over 30V.
- The Earth Reference voltage should be around -2V and the current a few mA. Currents over 70mA indicates ground leaks. Note that the controller toggles between measuring on the two sockets, so it might toggle between OK and not OK state if one wire has a leak and the other one doesn't.
- Expected current might be too low in case you have an attached decoder running fewer valves than it is capable of. For example if a decoder capable of running six valves is running only five or fewer.

# 5.2. Advanced Test

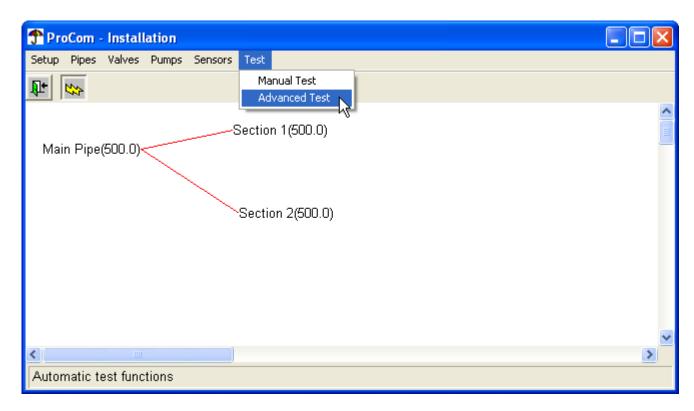
To open the advanced test suite from the main window:

1. Open the Setup menu and select Installation Data:

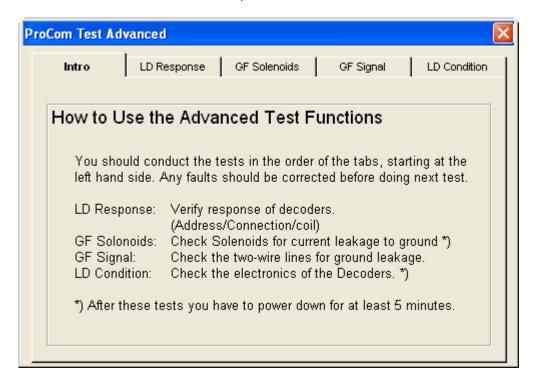


This will bring up the Installation data main menu.

2. Now open the Test menu and select Advanced Test:



Now the suite of advanced tests will open:

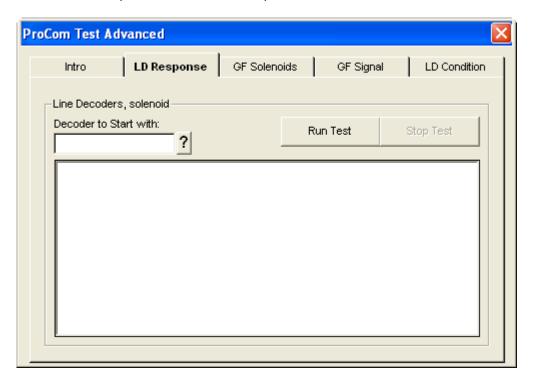


3. Read the following sections for instructions on each test.

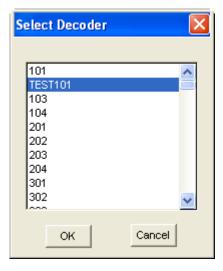
# 5.2.1. LD Response

The LD Response test will test the line decoder response for each decoder in turn. It's basically an automated, chained version of the manual line decoder test.

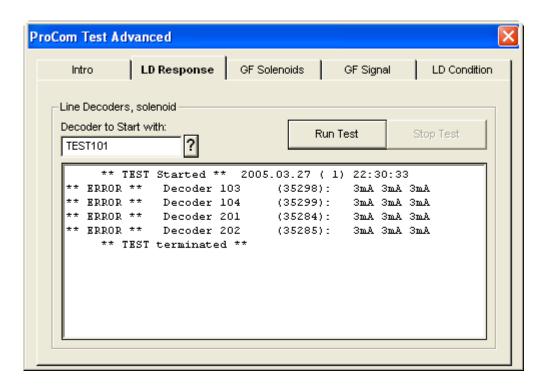
1. Go to the LD Response tab and click the question mark to select the first decoder:



2. Select the first decoder to test and click OK:



3. Now the test will try to activate each decoder in turn. Only the failures will show up in the list - the three measurement columns are standby, inrush and holding current:





#### Note

Decoder types that have resistance set to zero will be ignored in this test. Decoder type resistance is handled in the installation data - check out the details in Section 3.3.1, "Types of Valves" [page 29].

## 5.2.2. GF Solenoids

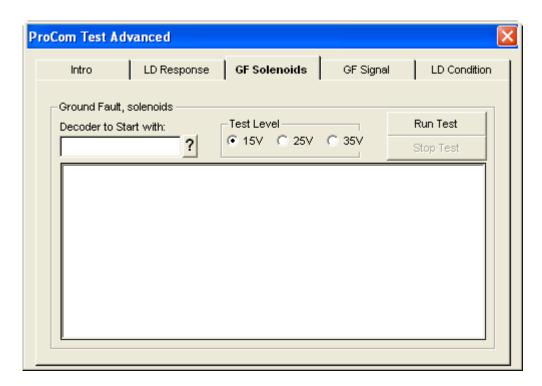
The GF Solenoids test checks for Ground Failures in the solenoids. The test will reprogram all decoders to the address zero, run the selected test voltage on both outlets for five minutes and then try to activate each decoder in turn. The ones with ground leaks will have kept the address zero and thus not activate after the five minute wait.



#### **Note**

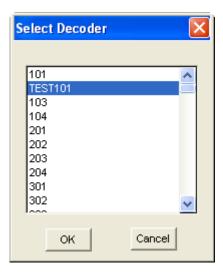
This test will take at least five minutes to complete.

1. Go to the GF Solenoids tab and click the question mark to select the decoder to test first:



The Test Level must be set according to what you are looking for: Solenoids failing the 15V test are severely damaged, whereas solenoids failing the 35V are having very small ground leaks that you may get away with ignoring.

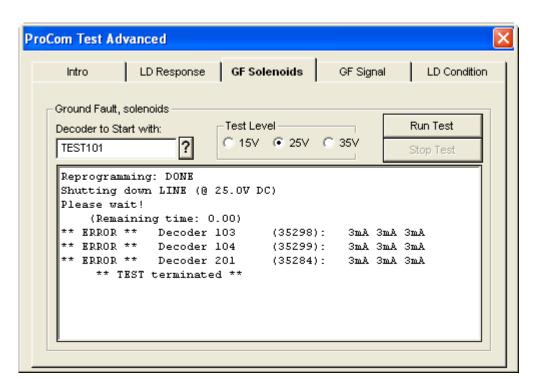
#### 2. Select the decoder to test first and click OK:



#### Click Run Test to start the test.

Now you'll see a lot of Reprogramming decoder <xxx> flashing in the window as the controller reprograms all your decoders. After that, the two-wire is shut down at the testing voltage and you'll see a count down to when the controller will start activating the decoders.

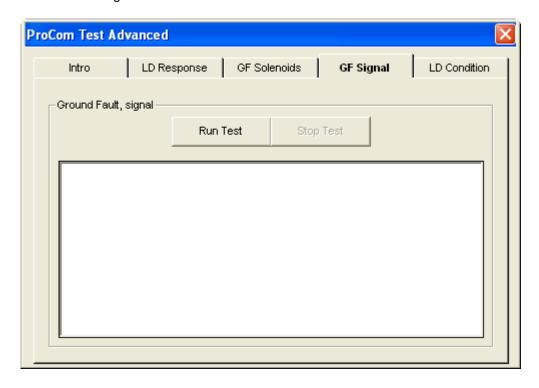
Only failed decoders will show up in the list. The three measurements are standby, inrush and holding currents:



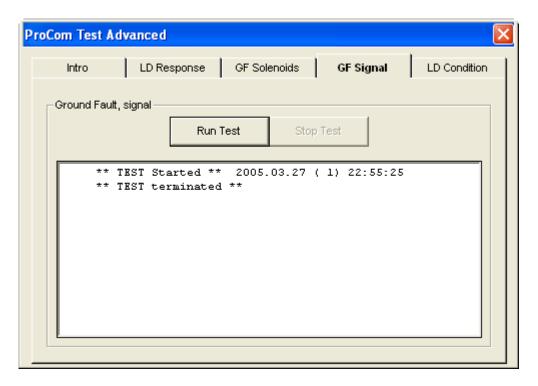
# 5.2.3. GF Signal

This test measures any ground faults on the two-wire path.

1. Go to the GF Signal tab and click Run Test:



2. The results will show up in the window below. A successful test will look like this:



Failures will be reported with expected and actual current.

## 5.2.4. LD Condition

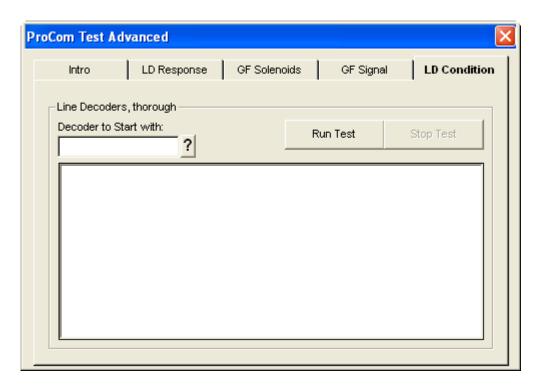
This test will check for electrical failures in the line decoders. It reprograms all decoders to a common switch code, turns off the two-wire path for a minute and then tries to activate each decoder without sending a switch code. If a decoder has an abnormal power consumption it will have lost it's switch code during the one minute power down and not react.



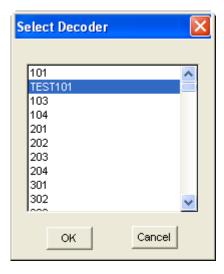
## **Important**

Decoders that fail this test should be replaced.

1. Go to the LD Condition tab and click the question mark to select the first decoder to test:



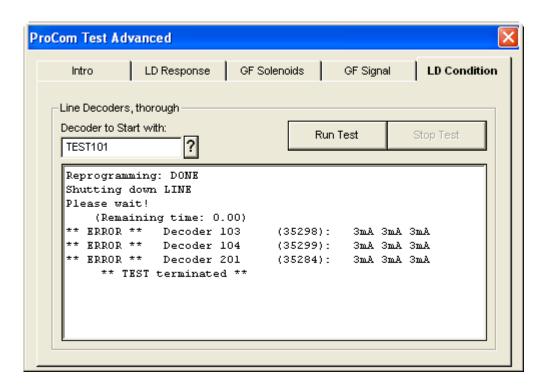
2. Select a decoder and click OK:



3. Click Run Test to start the test.

Now wait for all decoders to be reprogrammed and watch the count down before the controller tries activating each decoder in turn.

Only decoders failing the test will show up in the list.



# **Chapter 6. Miscellaneous**

# 6.1. Upgrading the Controller Firmware

Every time you upgrade the PROCOM software, you should transfer the accompanying firmware to the controller too to ensure that the two are in sync. To upgrade the firmware, follow this procedure:

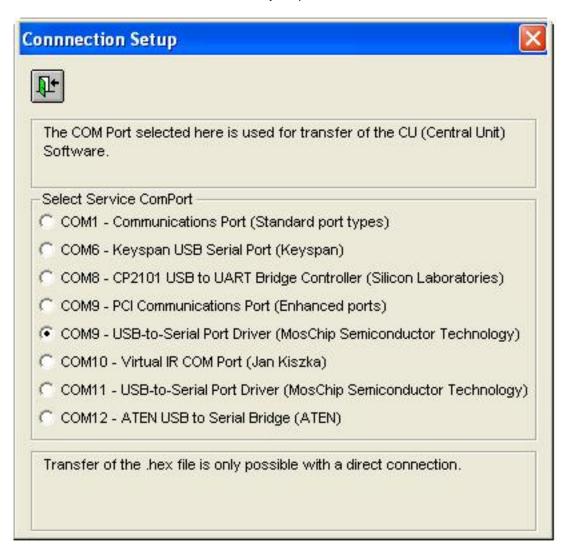
1.



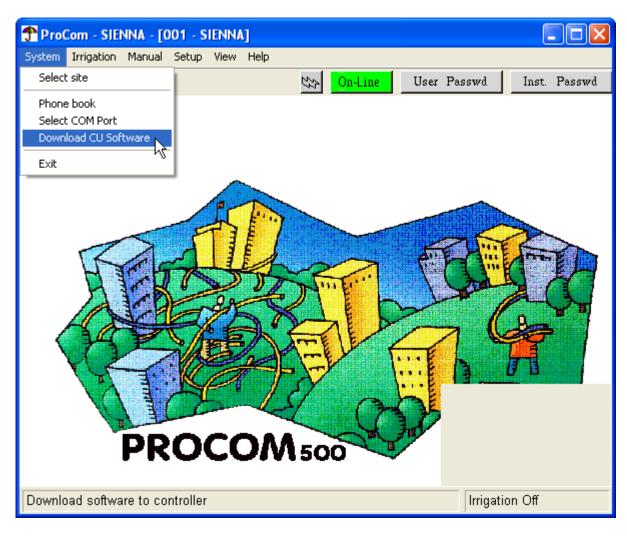
#### **Important**

You must be directly connected to the controller via one of your PC's COM ports. You can not upgrade the firmware over a modem connection.

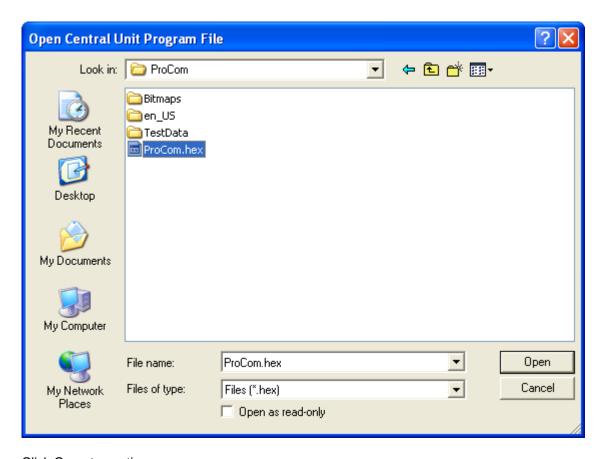
Make sure that you have chosen the right COM port for transferring the firmware: Open the System menu, select Select COM Port and choose your port of choice:



Open the System menu and select Download CU Software (CU is short for Central Unit, which is an alias for the controller):

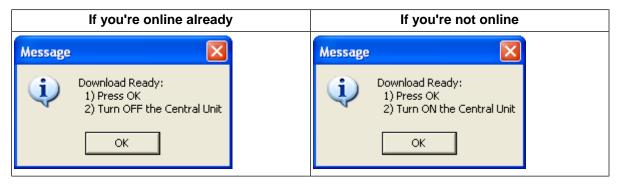


3. In the file chooser that pops up, select the firmware file - usually located in the directory in which you installed the application. The file will typically have a .hex suffix:



Click Open to continue.

4. Now the actual installation is about to begin. Depending on whether you are already online with the controller, you'll see one of these two dialogs:



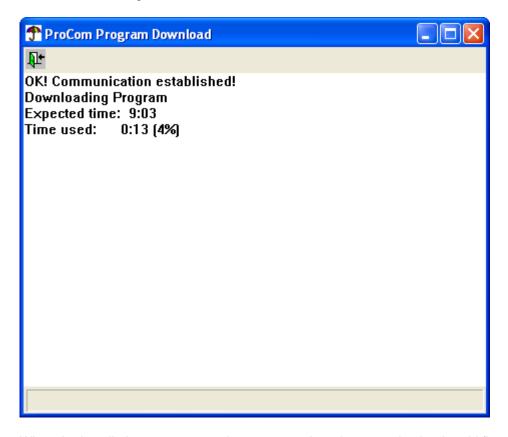


#### **Note**

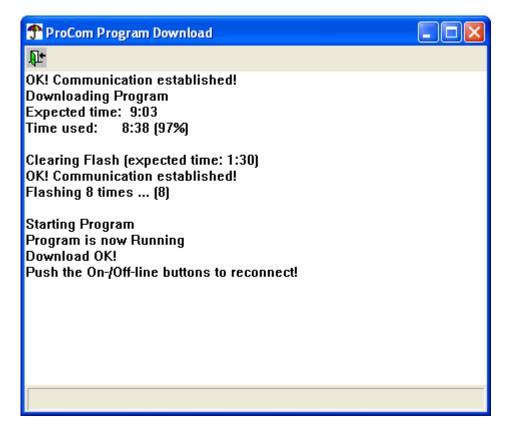
If the controller is turned on, but you are not connected to it, you must:

- 1. Turn off the controller.
- 2. Click OK on the dialog shown above.
- 3. Turn the controller back on.

5. Now the PROCOM will establish a connection to the controller via the COM port you have specified and start transferring the firmware to the controller:



6. When the installation moves on to the next step, there is no way back - the old firmware is wiped out and the new is put in place. Finally the controller will flash eight times and then you're ready to go:



If anything fails during this procedure, you should reboot your machine and try over.

# 6.2. Backing up your Installation

You should back up your data regularly in order to avoid re-entering everything if you computer crashes. To back up a PROCOM installation, simply copy these files from the installation directory to a backup disk:

- procom.ldb
- monitor.ldb
- ProcomRMS.ini

You can also use these files to set up a second PC with your PROCOM software - just do a fresh installation and dump these files into the installation directory and you're all set.

# Appendix A. Troubleshooting

# A.1. Troubleshooting the connection

A general note on the connection between the PROCOM software and a controller: the timeout is relatively high - in some contexts up to five minutes, so troubleshooting the connection requires a certain amount of patience.

The PROCOM determines whether to try to connect to a modem or via a COM port by looking at the first three characters of the number in the phone book. If these are "COM", it will try connecting via a COM port - otherwise it will try to get a dial tone and connect via modem.

Check out the following two sections for what to keep in mind in each case.

# A.1.1. When connecting via a COM port

Here's a list of things that you should consider when troubleshooting a direct connection using a COM port:

- The PROCOM supports COM ports 1-40 only.
- Make sure you're actually using the COM port you have entered in the phone book.
- The COM port you're trying to use can be occupied by another application running in the background. An often seen example of this is Palm<sup>TM</sup>'s Hot Sync application.
- If you're using a USB/COM adapter this in itself can cause problems, as such adapters don't always use
  the same COM port between reboots. The only adapter that has been tested and is known to work for
  sure is Keyspan USA-19HS.

# A.1.2. When connecting via modem

- Make sure that there is a modem in both the PC you're using and the PROCOM you're trying to reach.
- When the PROCOM boots it will try to detect a modem. If it is successful, the the power LED will start flashing if the LED stays solid red the PROCOM has not reckognized any connected modems.
- It can take up to five minutes after the PROCOM starts until you can communicate with the modem, so don't try to connect right away.
- The modem on the PROCOM can be busy listen to the dial tone.

# **Appendix B. Switch Codes**

The format of switch codes is as follows:

<Group><Control><Inrush voltage><Inrush time><Holding voltage><Holding time>.

The meaning of the different parts is:

#### Group

Determines the type of device that should react to a broadcast stop commands. Possible values are:

- 3: Non-irrigation device
- 4: Pump
- 5: Valve

#### Control

Determines the range of the holding voltage. Possible values are:

- 9: Low range
- B: High range

This is normally set to 9.

#### Inrush voltage

Determines the voltage during inrush, when devices are started. Possible values are in a range from 2-9, A-F and 0-1 as listed in the table below. 2 is the lowest and 1 is the highest value.

This is normally set to F.

#### Inrush time

Determines the duration of the inrush pulse, measured in chunks of 10 miliseconds, so 3 equals 30ms, 4 is 40ms etc. Possible values range from 3-9 and A-F, where A-F corresponds to 10-15, so A is 100ms, B is 110ms and the maximum is F, which means 150ms.



#### **Note**

If the resistance for the solenoid is between 1 and 50 ohms, the controller needs at least 100ms to measure correctly, and inrush times set lower than 100ms will be overruled by the controller.

This is normally set to 3. If your valves won't get pulled open, try increasing the value.

#### Holding voltage

Determines the holding voltage. This is the current that must be applied after the inrush. Possible values are in a range from 2-9, A-F and 0-1 as listed in the table below. 2 is the lowest and 1 is the highest value.

This is normally set to 5. If your valves keep shutting off, try increasing this.



# **Note**

Increasing the holding voltage "takes voltage from the rest of the system" and you may end up reducing the capacity of simultaneously running valves.

# Holding time

This is almost always set to 0.

The table below shows the minimum holding voltage on the decoder output at a two-wire line voltage input of 25V (normally 35V). The output will increase when the two-wire voltage increase. If voltage exceeds 27V the output voltage will be adjusted to avoid unnecessary power usage.

	Holding Voltage	
Voltage select (5th digit)	Low range (2nd digit set to 9)	High range (2nd digit set to B)
2	0,6	10,1
3	1,6	10,7
4	1,7	11,3
5	2,3	11,8
6	2,9	12,4
7	3,5	13,0
8	4,0	13,6
9	4,6	14,1
A	5,2	14,7
В	5,8	15,3
С	6,3	15,9
D	6,9	16,4
E	7,5	17,0
F	8,1	17,6
0	9,0	18,2
1	9,5	18,8

# Appendix C. AM/PM to Military time conversion

AM/PM	Military Time
12:00 Midnight	00:00
01:00 AM	01:00
02:00 AM	02:00
03:00 AM	03:00
04:00 AM	04:00
05:00 AM	05:00
06:00 AM	06:00
07:00 AM	07:00
08:00 AM	08:00
09:00 AM	09:00
10:00 AM	10:00
11:00 AM	11:00
12:00 Noon	12:00
01:00 PM	13:00
02:00 PM	14:00
03:00 PM	15:00
04:00 PM	16:00
05:00 PM	17:00
06:00 PM	18:00
07:00 PM	19:00
08:00 PM	20:00
09:00 PM	21:00
10:00 PM	22:00
11:00 PM	23:00