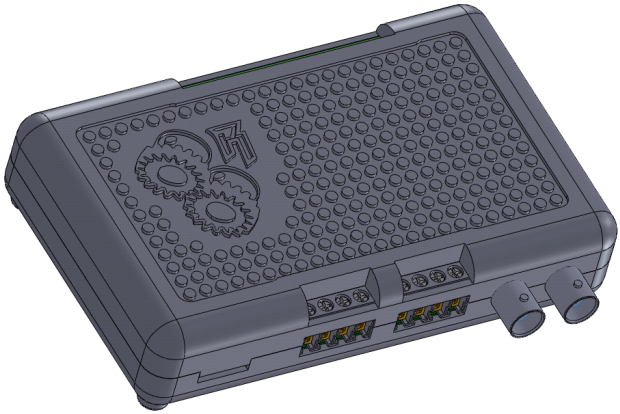

ED201

ETHERDOSE DUO

v1.0 User Manual

ROBOMATIC LLC.
DIX HILLS, NEW YORK

Engineers:
Edward Kim
Greg Wille
Colin Diesh
Mike Ceyko

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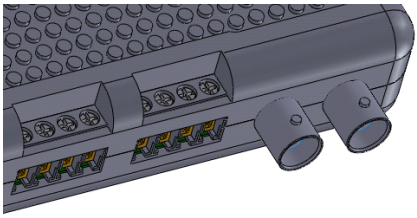
Section 1

Introduction



1.1 Features

1.1.1 Hardware

+ Dual Channel EC, PH and Temperature Sensors
+ EC Range 0 to 20,000 uS
+ EC Accuracy ±50 uS
+ PH Accuracy ±0.02 pH
+ Thermometer Accuracy ±1°C
+ Firmware Temperature Compensation
+ MicroSD card with SDHC, FAT16, FAT32, ≤4GB
+ Battery backed Calendar and Clock
+ 10/100 Mbps Ethernet with Web Interface
+ Control up to Six Actuators each 1 AMP 24VDC MAX
+ Sensor Datalogging and Date Based Scheduling
+ Very Small Form Factor 5" by 3.1"
+ High Quality Reinforced Enclosure
+ High Quality Probe Connectors
+ Wide Input Supply 2.5 AMP 6VDC to 24VDC
+ Firmware Upgrade Capability

1.1.2 Software

+ PC/MAC Client
+ IP Address Auto Detection

1.1.3 Applications

+ Hydroponics
+ Fertigation
+ Aquariums
+ Enivronmental Datalogging

1.2 Warnings

Please take the time to learn these warnings before attempting to operate an **ETHERDOSE DUO** controller:

1. The **ETHERDOSE DUO** controller was not designed for unprotected outdoor use. Damage caused by water, rain or the elements will damage the unit and void your warranty. Careful measures have been taken to design a process to "weatherproof" **ETHERDOSE DUO** controllers as much as possible, but precision instruments will always be prone to damage from the elements. Careful precautions must be considered for all applications.

2. Use only center **positive**, **negative** shield 3.5 mm barrel connector to supply power to the controller. Use only a 6VDC to 24VDC 2 AMP power supply. *Be careful when working with electrical equipment near open containers of liquid. Always use GFCI protected equipment.*

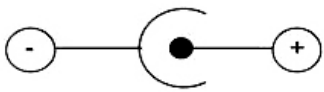


Figure 1.1: Positive center, negative shield connector.

3. Only connect 6VDC to 24VDC actuators to the outputs, positive (RED) lead to left terminal, negative (BLACK) lead to right terminal. Input power supply voltage must match the required voltage for outputs. Typical actuators include peristaltic pumps, solenoid valves and power relays. *Be sure that your actuators never source more than* 1 AMP. Damage due to improper use will void your warranty.

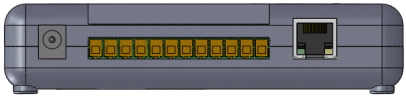


Figure 1.2: Left to Right: DC Power Connector, six output pairs (left positive, right negative), Ethernet connector.

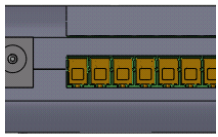


Figure 1.3: Left positive output 1, right negative output 1, left positive output 2, right negative output 2, etc.

4. *Be very cautious when inserting a memory card into the controller's microSD card slot. Take care not to slip the memory card above the slot, falling into the enclosure.* Carefully push the memory card downward into the microSD card slot until you hear a clicking sound. If the memory card is sliding into the enclosure freely, stop immediately and pull the memory card out. When the memory card clicks in, this signals that the card has been locked in place. To remove the card, press the card slightly in until you hear a clicking sound, this signals the card has been unlocked from its dock, and allows the card to eject. *Remove and insert memory cards only when the controller is powered off.*

Figure 1.4: Insert microSD card in microSD card slot, use a flathead screwdriver for assistance. DO NOT let the microSD card slide above the slot and fall into the enclosure.

5. Always shutdown the controller prior to disconnecting its power supply. *While unlikely, sudden power failures and failure to shutdown properly may cause files in the loaded microSD card to corrupt.* If this occurs, reformat the memory card and recopy the necessary configuration and schedule files.

6. Only use authorized EC and temperature combination probes and PH probes. The EC and PH probes should be stored in a storage container filled with deionized water when not in use. When probes are installed in a hydroponic or fertigation system. Take care to install them in a sample pot, a container connected to a circulating pump actively sampling the reservoir. Install probes in systems with consideration to accuracy in application. Do not allow the probes to go dry. Fragile probes become damaged easily, especially when dry, and will void your warranty.

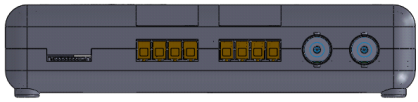


Figure 1.5: Connectors from left to right: microSD card slot, EC1, EC2, PH1, PH2.

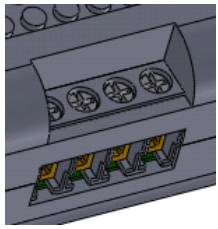


Figure 1.6: Four conductor EC connector, left two conductors (RED) are for a temperature probe, and the right two (BLUE) are for a conductivity probe with k=1.01 constant. Do not use probes with common ground for these two components. Your kit should include a combination temperature and conductivity probe. Carefully squeeze the two sets of pins until the connector fits into the four position screw terminal.

7. Do not allow peristaltic pumps to activate while not drawing fluid. *Running peristaltic pumps dry will damage them over time and void your warranty.*

1.3 MicroSD Card Files

The **ETHERDOSE DUO** controller requires a configuration profile minimally to operate. If a configuration profile is not availible in the root folder of the attached microSD card, the controller will proceed to start in `Passive / Sensors Only Mode` with default settings. *The controller's LED indicators above the Ethernet connector will light to indicate the controller's successful start up. An Ethernet connection and a microSD card must be attached. You can verify its operation by accessing the controller's HTTP control page by browsing to* ***`http://serverip`*** *or* ***`http://hostname`****, the IP or HOSTNAME is assigned using the controller's associated configuration profile.* If a configuration profile is not provided, the controller can be accessed with this URL: `http://etherdoseduo` or using the **NodeCall** feature in the desktop client software. The controller also uses the microSD card to access schedule files and log files, as well as to flash itself with a firmware update.

1.4 Restricted Filenames

The files specific to **ETHERDOSE DUO** operation must be located in the root directory of the attached microSD card, those filenames are restricted for use only by the **ETHERDOSE DUO** controller:

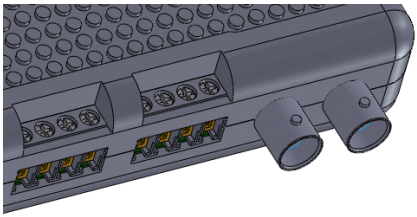
1. ED-CFG.EDC - Required Configuration Profile
2. ED-SCH1.EDS - Optional Schedule File for Channel 1
3. ED-SCH2.EDS - Optional Schedule File for Channel 2
4. ED-LOG1.EDL - Ouput Log File for Channel 1
5. ED-LOG2.EDL - Ouput Log File for Channel 2
6. ED_CALD.CAL - Calibration and Sleep Mode Data [1]
7. FIRMWARE.BIN - Firmware Image for Upgrading
8. BOOTCOM.BIN - Boot Command File for Upgrading [2]

[1] This important file is automatically created by the controller to store calibration data and the current Sleep Mode to be recalled later when the controller repowers up.

[2] A valid Firmware Image must accompany this file, refer to the Firmware Update section.

Section 2

Theory of Operation



An **ETHERDOSE DUO SYSTEM** is a network of Ethernet linked **ETHERDOSE DUO** controllers. It was designed for ease of use and flexibility. Each controller unit acts as an independent distributed node in a network comprised of controllers. An **ETHERDOSE DUO SYSTEM** may have hundreds of controllers, operating simultaneously, providing real time sampling of its probes, and control of its actuators for adjustments. Each controller unit runs a **Dosing Program** constantly monitoring readings from each of the controller's probes, maintaining programmed levels by turning on and off the controller's outputs.

2.1 Dosing Program

Initially, the **Dosing Program** is in a `NOT STABILIZED` state. The probes are sampled every second. When a number of continuous samples **Stabilization Delay** are measured that are within a tolerance, **EC Tolerance** or **PH Tolerance**, the **Dosing Program** will switch to the `STABILIZED` state. At this point, if the current probe readings are maintained outside the bounds of **EC Target** $\pm$ **EC Tolerance** or **PH Target** $\pm$ **PH Tolerance**, the **Dosing Program** will enter the `DOSING` state, activating a sequence of outputs determined by the **Dosage Ratios** and **Dosage Increment**.

2.2 Sequenced Dosing

The **ETHERDOSE DUO** controller adjusts EC and PH by activating a sequence of actuators connected to the outputs of the controller. Each output is rated at 1 AMP 24VDC MAX. The input DC voltage must match the output's. For instance, if you plan on connecting 12 VDC peristaltic pumps then ensure that you provide a similar 12 VDC input into the

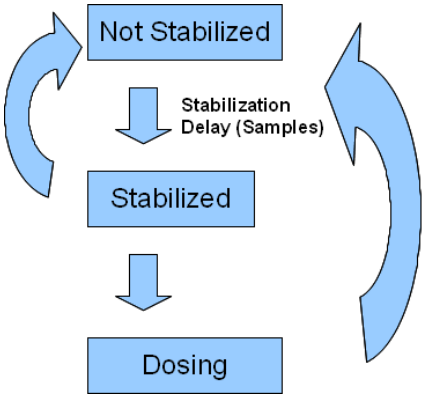


Figure 2.1: Delays used in **Dosing Program**.

controller, of at least 2 AMPs. The **Dosage Increment** is the amount of liquid to dispense by all actuators given a `EC UP`, `PH UP` or `PH DOWN` event. This total amount of liquid is dispensed with parts of each actuator given by the **Dosage Ratio** for that event. For instance, if the **EC Dosage Increment** is set to 200 mL, and the **EC Dosage Ratio** is set to 1, 2, 1, 0, 0, 0 then in the case of a triggered `EC UP` event, the controller will attempt to dispense 50 mL of actuator 1, 100 mL of actuator 2, and 50 mL of actuator 3. Each output will be activated and deactivated in a sequence, as to prevent more than one actuator being activated at once. *While this sequence is executed, the controller will continue to sample probe readings but will cease attempting to stabilize a reading.* This behavior can be observed by viewing your controller's CORE and DATARAM page using your web browser.

2.3 Operation Modes

There are four different modes each **ETHERDOSE DUO** controller can be configured for depending on your application:

1. `Passive / Sensors Only Mode`
2. `Single Channel / Single Environment Mode`
3. `Dual Channel / Single Environment Mode`
4. `Dual Channel / Dual Environment Mode`

In a simple one channel reservoir application where only one channel of EC and PH readings require monitoring and adjustment the `Single Channel / Single Environment Mode` should be selected. In this mode, both channels can be read in the web interface, but only CHANNEL 1 will be adjusted, while ignoring CHANNEL 2. The `Dual Channel / Single Environment Mode` is a special mode designed to use one sensor channel as a redundant check on the other. This provides a capability to monitor probe failure at the cost of requiring the use of two pairs of probes for a single environment, use CHANNEL 1 for programming and configuration, ignore CHANNEL 2. The `Dual Channel / Dual Environment Mode` configures your controller to monitor and adjust both channels independently, make sure both channels one and two are configured properly. This mode controls each channel as if its operating its own independent environment.

2.4 Calibration

The **ETHERDOSE DUO** controller is a precision instrument. Its sensors require reference points in order to compute an accurate model for that probe. Both EC and PH sensors require two reference points as well as corresponding temperature readings to properly calibrate its readings. While the PH probe does not have a temperature probe integrated like the EC probe, it will use its channel's EC probe to obtain its temperature readings. The PH channels require two reference

solutions, one at 4.0 pH and another at 7.0 pH. The EC channels require two reference solutions as well, one at 0 uS and another at 2930 uS. The 0 uS reference can come from deionized water or air. All reference solutions are availible from General Hydroponics.

2.5 Scheduling

While scheduling of EC and PH dosing is optional, this allows users to get the most out of the **ETHERDOSE DUO** system's programming capabilities. Upon entering the `DOSING` state, the controller will attempt to open ED-SCH1.EDS for channel 1 or ED-SCH2.EDS for channel 2 in the root directory of the microSD card. Reading these files, the controller will attempt to search for an entry corresponding to the current date, if an entry is found, the set **Target EC** or **Target PH** will be overridden with the one in the entry, as well as its corresponding **Dosage Ratio**. *If one of these files are not present or a corresponding entry is not present, the set EC or PH level and* ***Dosage Ratio*** *set in the configuration file will be used.* This functionality provides an infinite degree of programming options for users to use and develop.

2.6 Data Logging

A log file is generated or appended depending on the EC or PH channel that becomes stablized. Once stabilization of readings has been established, a log file will be appended, ED-LOG1.EDL or ED-LOG2.EDL for the channel that has just become stabilized.

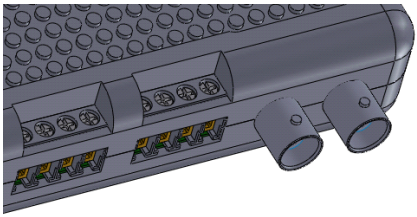
2.7 Sleep Mode and Shutdown

The **Dosing Program** has a capability to enter a `SLEEP MODE` state. This shuts off all data logging and actuator controlled adjustments. It ignores all dosing events until the Sleep Mode is switched to an `AWAKE MODE` state. In the `LOGONLY MODE`, data is logged, but never enters a dosing state. The Sleep Mode can be changed in the core page of the **ETHERDOSE DUO** web interface. This is useful when first setting up a new controller and where adjustments are necessary. The `RESET MODE` will reset the controller.

It is important to enter the `KILL MODE` Sleep Mode to shut off the controller. This prevents files from being corrupted on the microSD card. Check that the controller is indeed in a shutdown state before powering it down, by failing to attempt to access the HTTP pages on the controller.

Section 3

Quick Start



In a few minutes your system will have real time water quality monitoring and automated adjustment capabilities. Please read this entire manual carefully and proceed to integrate the controller into the system with care. The **ETHERDOSE DUO** was designed to be used in either a fertigation or hydroponic system, careful consideration is required to determine efficient use of the controller in system design. This manual will not cover how a fertigation or hydroponic system would be constructed to efficiently use the **ETHERDOSE DUO** but instead will guide you to setting the controller up and programming it for simple automated tasks.

3.1 Predeployment

Each **ETHERDOSE DUO** controller is addressed by its IP address, each having a HTTP server on port 80. Keep address spaces in mind when designing networks of controllers. The IP address is configured manually using the configuration profile or is provided for using a DHCP service to automatically request a new address from your DHCP server, typically your router. We will go through the procedure of manually setting this up as a guide to setting up a new controller.

3.2 What are my Router's Settings?

It is important to know your Router's Default Gateway, Subnet Mask, DNS Server, and which IP address you want to assign to your new **ETHERDOSE DUO** controller. You can easily obtain this information on Windows machines by accessing your command prompt. Start by clicking the START menu on your Windows Desktop, then clicking the RUN... button. In the OPEN: field, enter `command` or `command.com` and press the enter key.

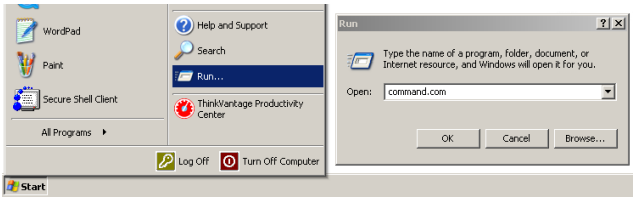


Figure 3.1: Click the START menu, then click RUN.

You should now see the Windows command prompt. Type `ipconfig /all` and hit the enter key.

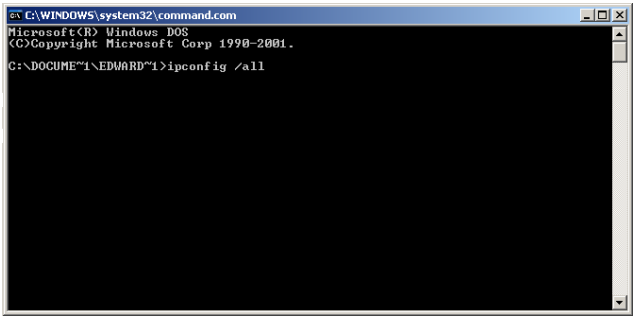


Figure 3.2: Type `ipconfig /all` and hit the enter key.

You should now see a listing of network settings.

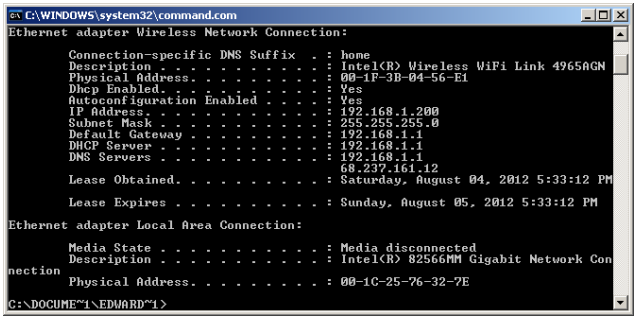


Figure 3.3: A listing of local network settings.

Your IP address is the PC you are using's IP address. You should assign your new **ETHERDOSE DUO** controller's IP address something similar to this, but not exactly the same. Make sure this IP address is free to use and not used by another device. For instance if your PC's IP address is listed as `192.168.1.200`, you should assign your controller's IP address as `192.168.1.215` or `192.168.1.216`. Record your Default Gateway, Subnet Mask and DNS Server. You will use these in the next section, setting up the network configuration of your new controller. The Default Gateway is generally the IP address of your router, but not always.

3.3 Windows Client Installation

Install the windows client software. Insert CD-ROM in drive. Run `SETUP.EXE` or `ED201-WINSETUP.EXE` located in the root folder of the installation CD. Follow directions for installation.

If a CD-ROM was not included in your kit, you can access the same files in the included microSD card or you can download the files off HTTP://WWW.ROBOMATIC.COM.

For proper operation of the **ETHERDOSE DUO**, a microSD card loaded with a configuration profile generated by the **ETHERDOSE DUO** client software is required, if no configuration file is present, the controller will reset to default settings (refer to the Quick Deployment using Default Settings section). This file must be located in the microSD card's root folder. Use only a memory card with no more than 4 GB of space, that is preformatted properly using a FAT16/FAT32 file allocation table format.

Run the **ETHERDOSE DUO** client software, upon starting, the application will create a new configuration profile.

3.4 Network Configuration

Fill in the last nine entries configuring the HTTP server configuration: the HOSTNAME, IP, SUBNET, GATEWAY or select the DHCP option to enable your router to setup these settings automatically. We recommend users to avoid using DHCP for long term deployments, setting addresses permanently. Use DHCP for easy IP address assignment. Users can use the HOSTNAME to access the controller using a web browser by using the URL `http://hostname` or the **Node-**

Call feature in the client software to search for controllers on your network when IP address is not known.

Double click on the username and password entries also and fill them in.

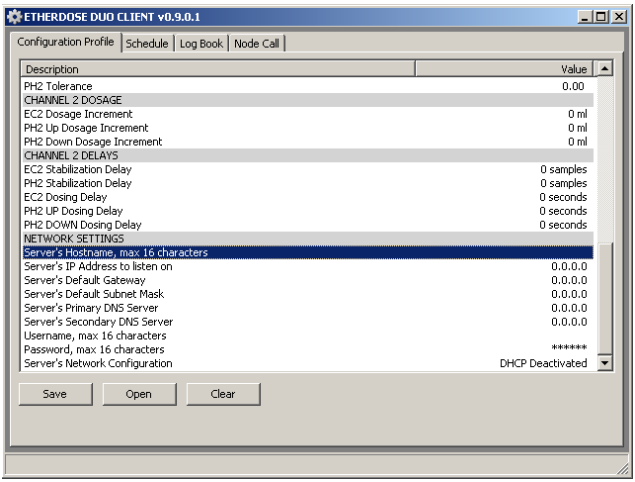


Figure 3.4: Double click on these rows to modify HTTP server settings.

3.5 Application Settings

There are four modes of operation for the **ETHERDOSE DUO**:

1. `Passive / Sensors Only Mode`
2. `Single Channel / Single Environment Mode`
3. `Dual Channel / Single Environment Mode`
4. `Dual Channel / Dual Environment Mode`

For the single environment modes, set your configuration for CHANNEL 1, CHANNEL 2 will be omitted. Refer to the **Theory of Operation** section for more information on the different operation modes.

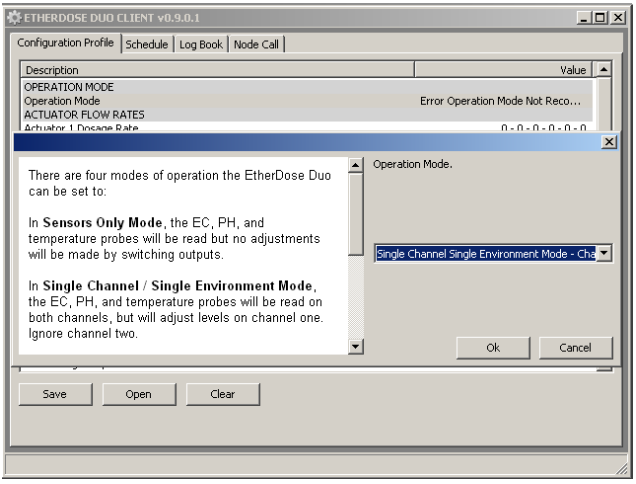


Figure 3.5: Double click on the Operation Mode row to modify this setting.

Below is a demonstration on how to setup EC CHANNEL 1 for dosing, setting the EC target level to `800 uS`. Using peristaltic pumps connected to actuator channels one and two. The pumps have a flow rate of `31 ml/min`. When the EC level for CHANNEL 1 drops below the target level set, actuator one will pump out two parts, while actuator two will pump out one part of a `50 ml` total liquid dose. Use the guide below to set EC or PH for either channel.

Firstly, set the actuator flow rates:

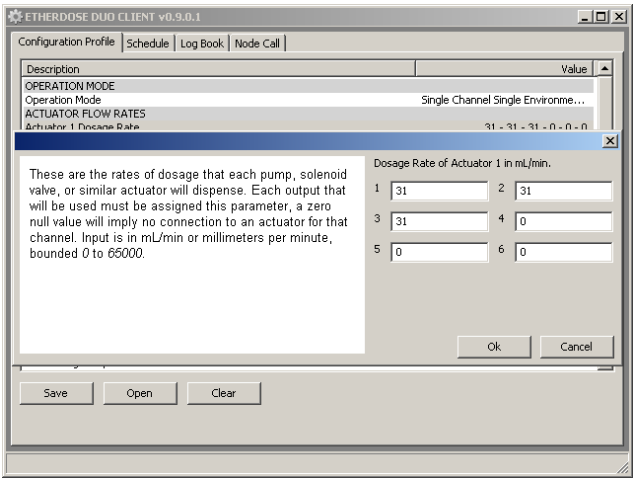


Figure 3.6: Enter actuator flow rates in ml/min.

Next enter the two parts to one part dosage ratio:

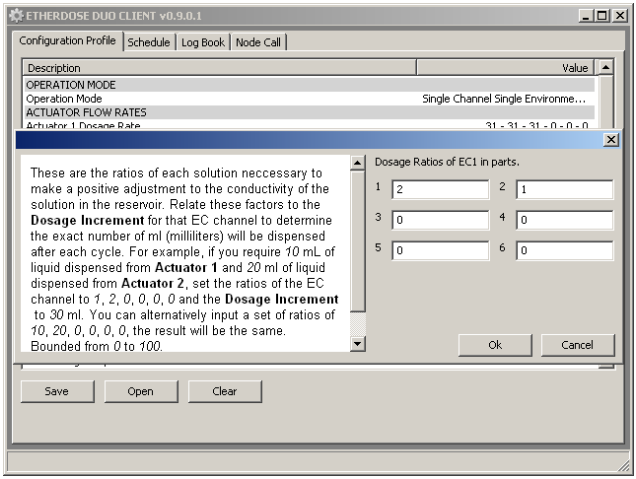


Figure 3.7: Enter how many fractional parts each actuator channel will deposit from a single dose.

Set the target EC level:

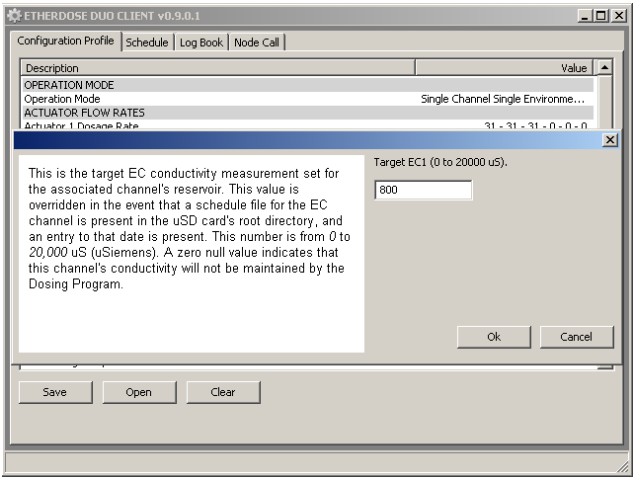


Figure 3.8: Enter the target EC level in uS (microsiemens).

Set the tolerance for the EC of CHANNEL 1. This is the amount of deviation the doser will allow to vary from the EC target level. This value also dictates how much deviation the machine will allow before a stabilized state is reached.

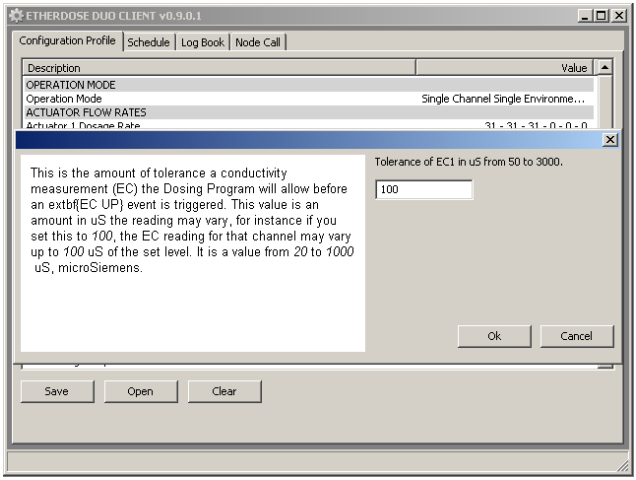


Figure 3.9: Enter the EC tolerance in uS.

Set the EC dosage increment. This is the total amount of liquid in mililiters, ml, the doser will deposit using the actuators in the event the actual EC is below the target EC level.

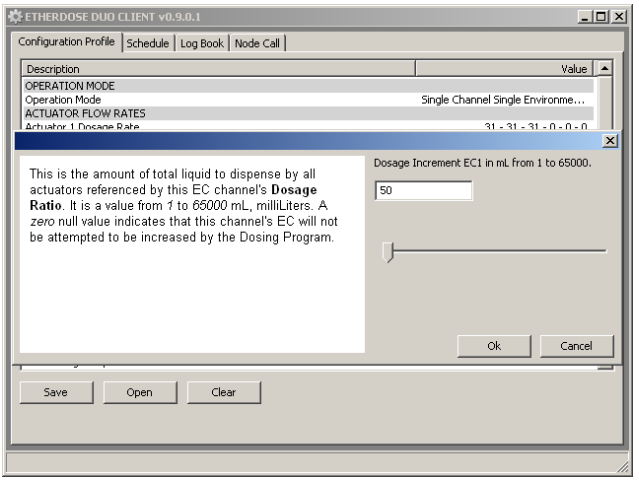


Figure 3.10: Enter the dosage increment for EC CHANNEL 1 in ml.

Set the EC stabilization delay. This is the amount of samples the doser will read and compare before reaching a stabilized state, readying the device for dosing.

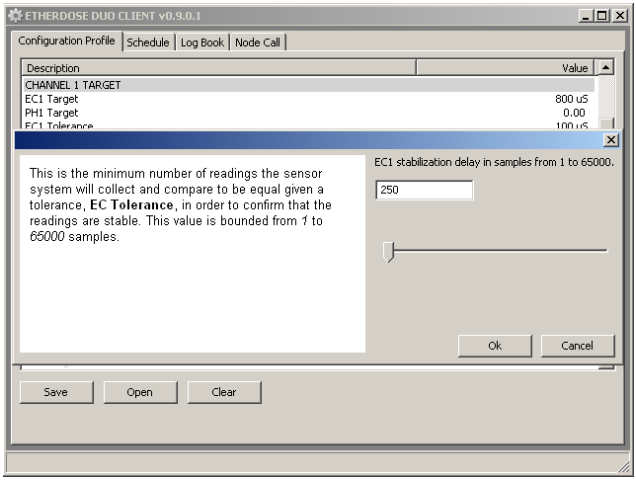


Figure 3.11: Enter the stabilization delay in number of samples.

Repeat these instructions to configure EC CHANNEL 2 or PH channels 1 or 2. Click SAVE. Browse to MY COMPUTER, and then to REMOVEABLE DRIVE. Save the new configuration profile onto your microSD card in the root folder. Save the file as `ED-CFG.EDC`.

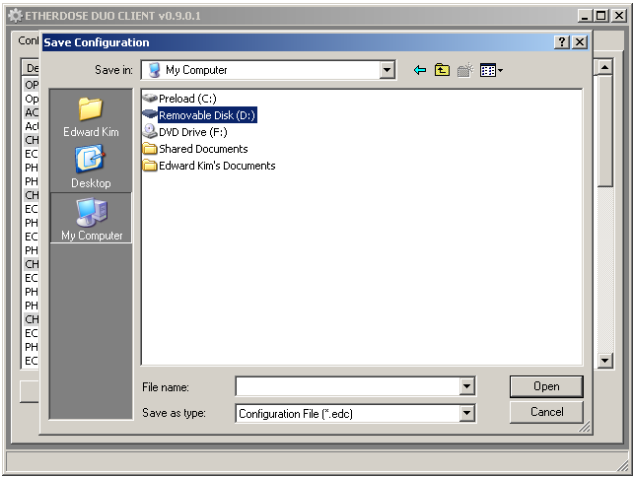


Figure 3.12: Click Save in Configuration Profile. Then browse to microSD card.

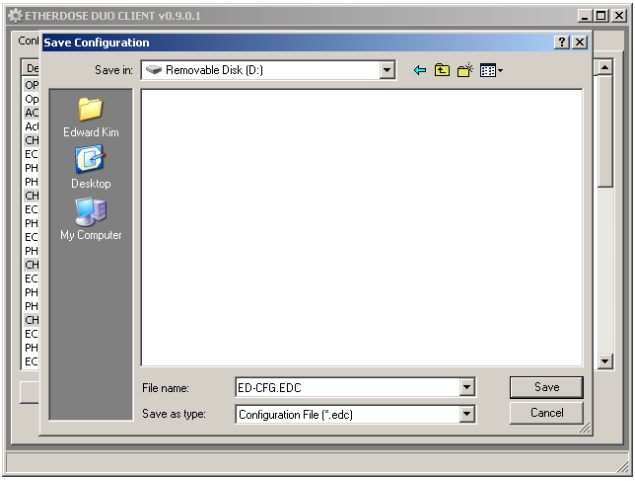


Figure 3.13: Save the file as `ED-CFG.EDC`.

Safely eject the microSD card from your PC by double clicking on My Computer and right clicking on the Removable Drive that indicates your microSD card mounted to your PC. Then click Eject.

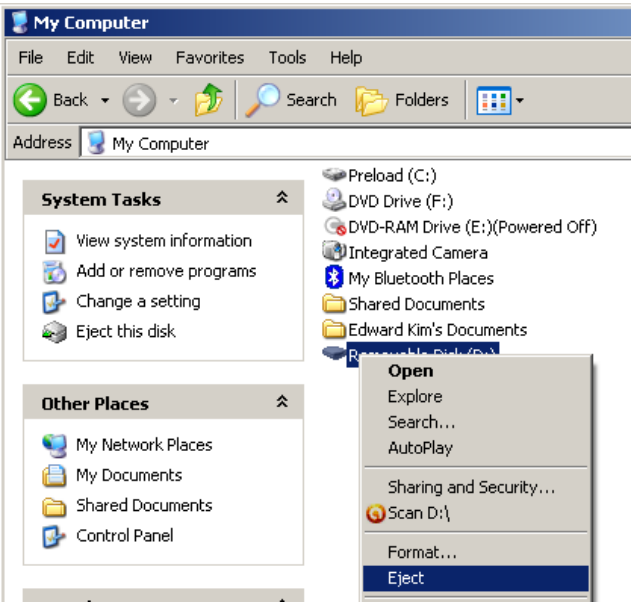


Figure 3.14: Eject the mounted microSD card on your PC.

3.6 Hookup Guide

Connect your **ETHERDOSE DUO** to an open port in your network's router or switch.

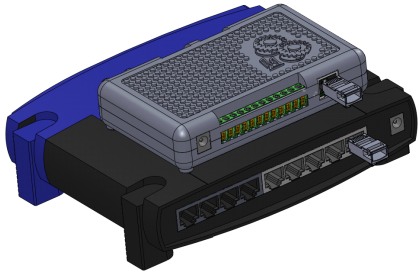


Figure 3.15: Connect the RJ-45 connector using a CAT5e cable to an open numbered port on your router/switch.

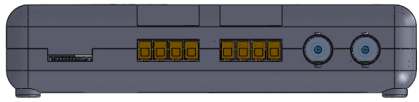


Figure 3.16: Connectors from left to right: microSD card slot, EC1, EC2, PH1, PH2.

Connect a set of PH and a set of EC probes into the left channel connectors or both depending on your **Operation Mode**.

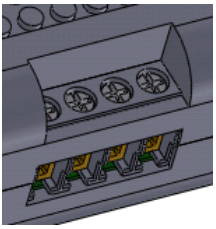
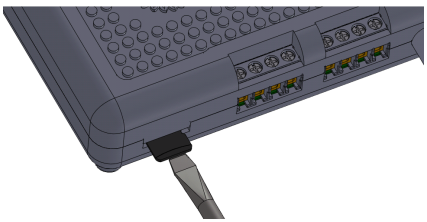


Figure 3.17: Four conductor EC connector, left two conductors (RED) are for the temperature probe, and the right two (BLUE) are for a conductivity probe with k=1.01 constant. Do not use probes with common ground for these two components. Your kit should include a combination temperature and conductivity probe. Carefully squeeze the two sets of pins until the connector fits into the four position screw terminal.

Be very cautious when inserting a memory card into the controller's microSD card slot. Take care not to slip the memory card above the slot, falling into the enclosure. Carefully push the memory card downward into the microSD card slot until you hear a clicking sound. If the memory card is sliding into the enclosure freely, stop immediately and pull the memory card out. When the memory card clicks in, this signals that the card has been locked in place. To remove the card, press the card slightly in until you hear a clicking sound, this signals the card has been unlocked from its dock, and allows the card to eject. *Remove and insert memory cards only when the controller is powered off.*



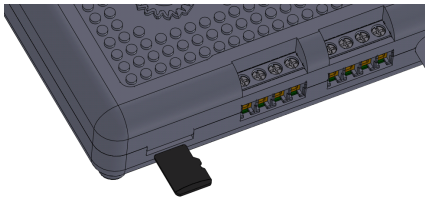


Figure 3.18: Insert microSD card in microSD card slot, use a flathead screwdriver for assistance. DO NOT let the microSD card slide above the slot and fall into the enclosure.

Power on your **ETHERDOSE DUO** controller by plugging in your power supply to the controller's power barrel connector. The yellow LED indicator on the Ethernet connector shows that the controller is powered on, while the green LED indicator shows that the controller has successfully established a connection to your Ethernet network and has sucessfully been assigned an IP address.

3.7 Access the Web Interface

Verify that the controller is working properly by accessing its control panel via a web browser. For example if your controller's IP was set to `192.168.1.215` you would type:

`http://192.168.1.215` or `http://192.168.1.215:80`

in the address bar of your favorite web browser. You may also type in the hostname of your controller instead. For example if you set your hostname to `etherdoseduo` earlier, you can access:

`http://etherdoseduo`

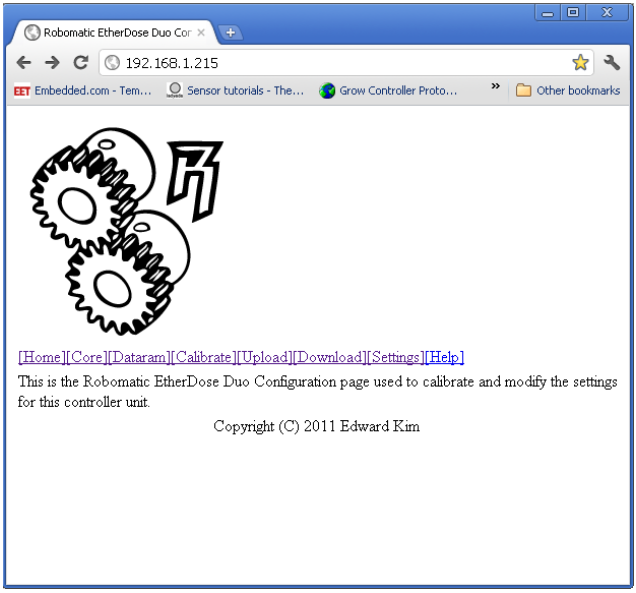


Figure 3.19: Enter your controller's IP set during the configuration process: `http://serverip` or `http://serverip:80`. If you don't know your controller's IP address, you can also use `http://HOSTNAME` or the **NodeCall** feature in the desktop software.

If you are unsure of the IP address of your **ETHERDOSE DUO** controller or if you set the DHCP option earlier to automatically assign network settings, you can also type in the HOSTNAME of your device in your browser `http://HOSTNAME` or you may use the **NodeCall** feature in the Windows client to discover all controller's in your local network/subnet. Run the Windows client. Click the **NodeCall** tab and click the *Search* button. Wait a minute to allow the list of controllers availible to populate. Double click on the controller to launch your browser and access its web interface. Record all IP addresses for future use.

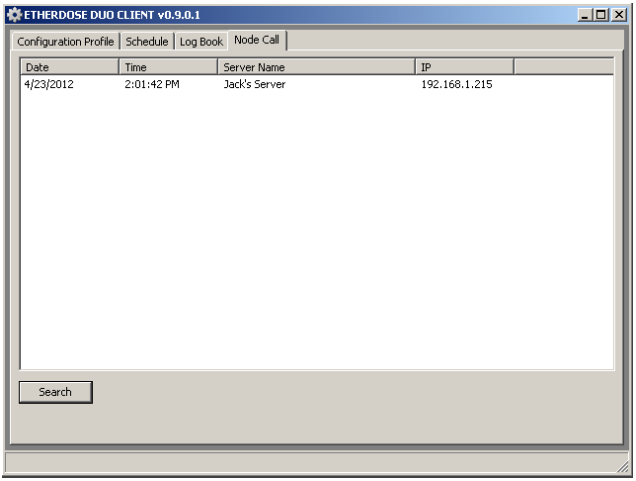


Figure 3.20: Search for all **ETHERDOSE DUO** controllers across an entire network.

This feature works on most routers. Some older models may not allow broadcast UDP, in which case this feature may not function.

3.8 Calibrate and Verify

Access to the web client control panel is restricted by username and password authentication. Use the username and password set earlier during the configuration process.

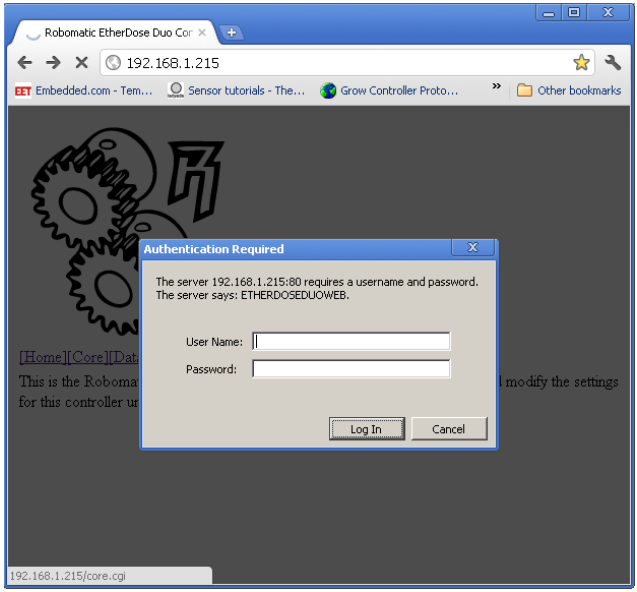


Figure 3.21: Enter your username and password.

Access the CORE section to see what the controller is doing or to check EC, PH or temperature levels.

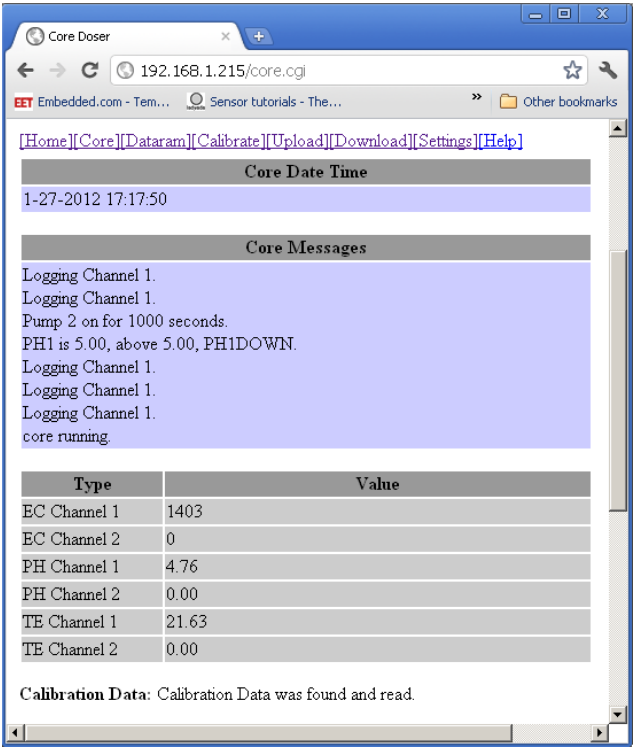


Figure 3.22: Check recent changes and EC, PH or temperature levels in the CORE section.

You can also change the Sleep Mode in the CORE section. Change the Sleep Mode to `SLEEP MODE`.

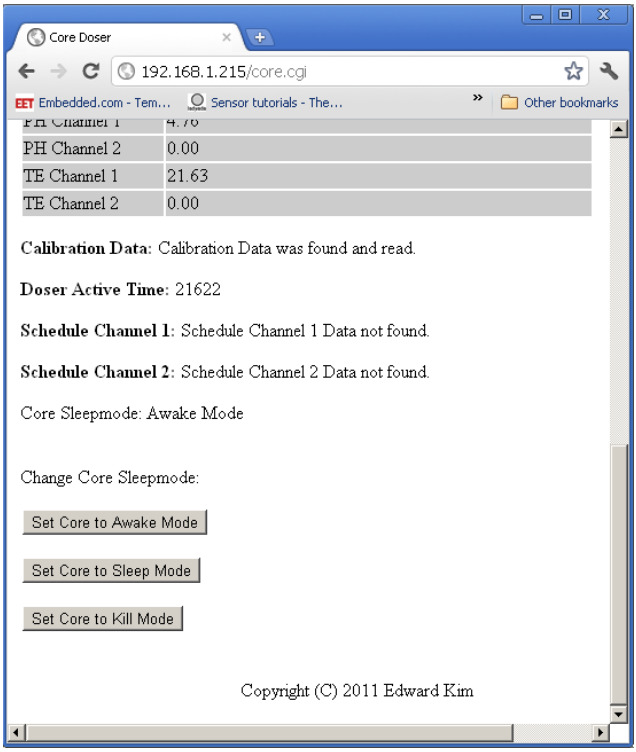


Figure 3.23: Change Sleep Modes in the CORE section.

For each channel, each EC or PH probe must be calibrated properly to obtain accurate results. To calibrate an EC channel, submerge that channel's EC probe into either 0 uS (by leaving it in open air or deionized water) or 2930 uS calibration solution, wait about a minute to stabilize, and click the appropriate EC calibration button located on the *Calibrate* page hosted on your controller's web interface. To calibrate a PH channel, submerge that channel's PH probe into either 4.0 or 7.0 pH reference solution, wait about a minute to stabilize, and click the appropriate PH calibration button located on the *Calibrate* page hosted on your controller's web interface. Ensure all reference solutions including the 0 uS reference are about the same temperature.

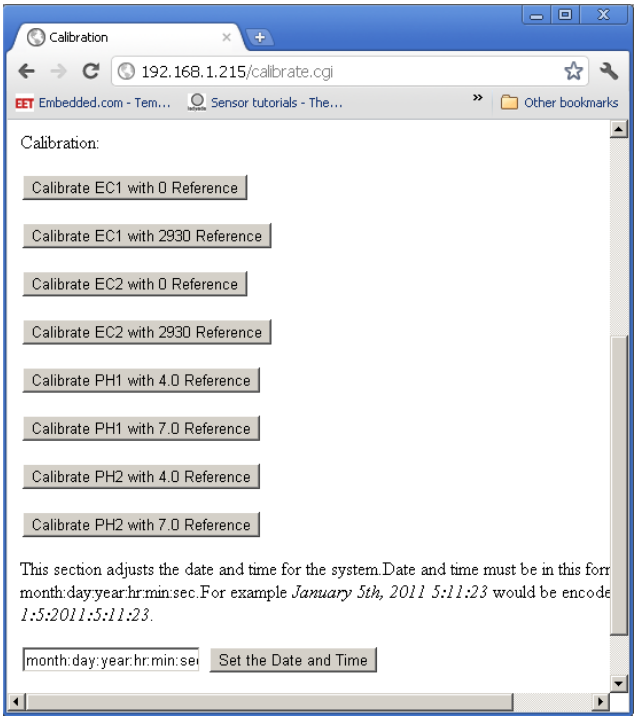


Figure 3.24: Calibrate each probe for accurate results.

Check current status of the controller in the DATARAM section, ensure the EC, PH and temperature are at reasonable levels.

At this point, ensure the sensor readings are accurate by checking them against the reference solutions. Recalibrate if necessary, waiting a longer duration before clicking the calibration buttons to ensure proper stabilization. Recheck your sensor readings and repeat if necessary. Your controller is now calibrated and ready. To test dosing functionality, proceed to change the Sleep Mode to `AWAKE MODE`.

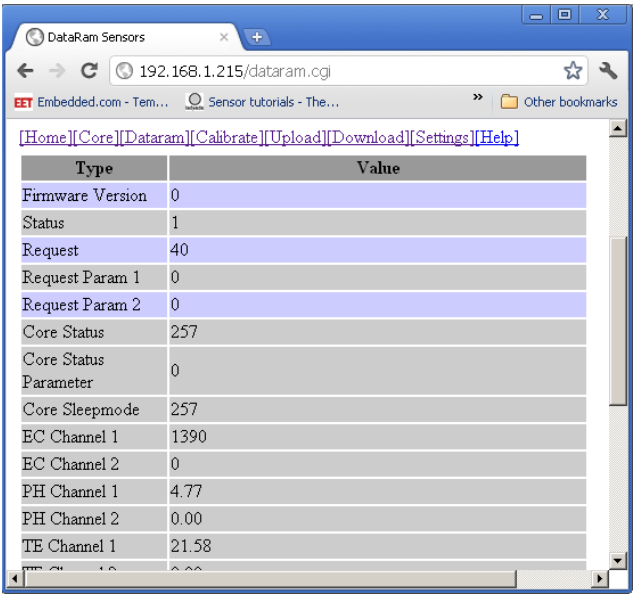


Figure 3.25: Check current levels and states of the controller in the DATARAM section.

Confirm that the pumps activate and the dosing procedure commences. Change the Sleep Mode back to `SLEEP MODE`. Your **ETHERDOSE DUO** controller is now properly setup.

Do not allow peristaltic pumps to activate while not drawing fluid. Running peristaltic pumps dry will damage them over time and void your warranty.

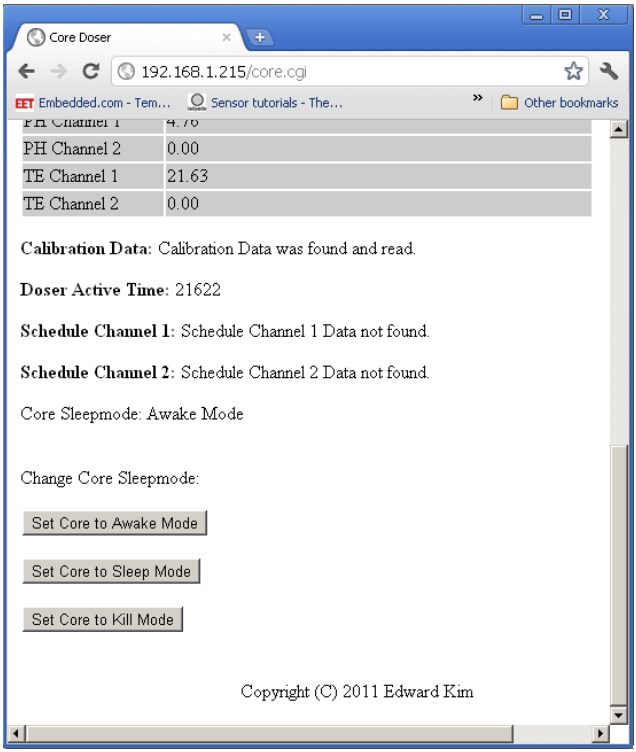


Figure 3.26: Change Sleep Modes in the CORE section.

3.9 Quick Depoloyment using Default Settings

Setting up a controller for dosing requires all the previously mentioned steps to configure properly. The controller can also be deployed using default settings appropriate for a `Passive / Sensors Only Mode` in the event that no configuration profile is present in the root folder of the attached microSD card. In this case, the following settings will be applied automatically:

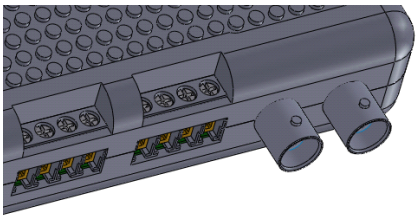
DHCP: Activated

Hostname: etherdoseduo
Username: admin
Password: password
Operation Mode: `Passive / Sensors Only Mode`
EC1 Tolerance: 50
EC2 Tolerance: 50
PH1 Tolerance: 0.2
PH2 Tolerance: 0.2
EC1 Stabilization Delay: 30 samples
EC2 Stabilization Delay: 30 samples
PH1 Stabilization Delay: 30 samples
PH2 Stabilization Delay: 30 samples

This allows users that require only metering functionality to simply connect all sensors needed, connect a valid Ethernet connection and an empty microSD card to the controller for easy set up. Turn the controller on and access the controller's web interface by typing in the address `http://etherdoseduo` to your web browser or by simply searching for all devices using the **NodeCall** feature in your desktop client. This provides plug and play functionality for metering applications.

Section 4

Software Client



In order to generate configuration profiles, create schedule files, read log files, you will need an **ETHERDOSE DUO** software client for your operating system. We will demonstrate installation and some basic functions using the provided Microsoft Windows client.

4.1 Windows Client Installation

Install the windows client software. Insert CD-ROM in drive. Run `SETUP.EXE` or `ED201-WINSETUP.EXE` located in the root folder of the installation CD. Follow directions for installation.

If a CD-ROM was not included in your kit, you can access the same files in the included microSD card or you can download the files off HTTP://WWW.ROBOMATIC.COM.

For proper operation of the **ETHERDOSE DUO**, a microSD card loaded with a configuration profile generated by the **ETHERDOSE DUO** client software is required, if no configuration file is present, the controller will reset to default settings (refer to the Quick Deployment using Default Settings section). This file must be located in the microSD card's root folder. Use only a memory card with no more than 4 GB of space, that is preformatted properly using a FAT16/FAT32 file allocation table format.

Run the **ETHERDOSE DUO** client software, upon starting, the application will create a new configuration profile.

4.2 Configuration Profile

The configuration profile consists of a number of parameters that define the behavior of the controller. The following lists these parameters and their effect on the **Dosing Program**:

Operation Mode
Dosage Rate of Actuators in mL/min from 0 to 65000
Dosage Ratios for each EC channel / Actuator from 0 to 100
Dosage Ratios for each PH channel / Actuator from 0 to 100
EC1 Target in uS from 0 to 20000
EC2 Target in uS from 0 to 20000
PH1 Target from 0.00 to 14.00
PH2 Target from 0.00 to 14.00
EC1 Tolerance in uS from 50 to 3000
EC2 Tolerance in uS from 50 to 3000
PH1 Tolerance 0.01 to 2.00
PH2 Tolerance 0.01 to 2.00
EC1 Dosage Increment in mL from 1 to 65000
EC2 Dosage Increment in mL from 1 to 65000
PH1 UP Dosage increment in mL from 1 to 65000
PH2 UP Dosage increment in mL from 1 to 65000
PH1 DOWN Dosage increment in mL from 1 to 65000
PH2 DOWN Dosage increment in mL from 1 to 65000
EC1 Stabilization Delay in samples 1 to 65000
EC2 Stabilization Delay in samples 1 to 65000
PH1 Stabilization Delay in samples 1 to 65000
PH2 Stabilization Delay in samples 1 to 65000

4.2.1 Operation Mode

There are four modes of operation the **ETHERDOSE DUO** can be set to:

1. Passive / Sensors Only Mode
2. Single Channel / Single Environment Mode
3. Dual Channel / Single Environment Mode
4. Dual Channel / Dual Environment Mode

In **Passive / Sensors Only Mode**, the EC, PH, and temperature probes will be read but no adjustments will be made by switching outputs.
In **Single Channel / Single Environment Mode**, the EC, PH, and temperature probes will be read on both channels, but will adjust levels on CHANNEL 1. Ignore CHANNEL 2.
In **Dual Channel / Single Environment Mode**, the EC, PH, and temperature probes will be read on both channels, using one channel as a backup for the other, the controller will adjust levels on CHANNEL 1. Ignore CHANNEL 2.
In **Dual Channel / Dual Environment Mode**, the EC, PH, and temperature probes will be read on both channels, and will be adjusted on both channels independently.

4.2.2 Dosage Rates of Actuators

These are the rates of dosage that each pump, solenoid valve, or similar actuator will dispense. Each output that will be used must be assigned this parameter, a zero null value will imply no connection to an actuator for that channel. Input is in mL/min or millimeters per minute, bounded 0 to 65000.

4.2.3 Dosage Ratios for each EC channel

These are the ratios of each solution neccessary to make a positive adjustment to the conductivity of the solution in the reservoir. Relate these factors to the **Dosage Increment** for that EC channel to determine the exact number of ml (milliliters) will be dispensed after each cycle. For example, if you require 10 mL of liquid dispensed from **Actuator 1** and 20 ml of liquid dispensed from **Actuator 2**, set the ratios of the EC channel to 1, 2, 0, 0, 0, 0 and the **Dosage Increment** to 30 ml. You can alternatively input a set of ratios of 10, 20, 0, 0, 0, 0, the result will be the same. Bounded from 0 to 100.

4.2.4 Dosage Ratios for each PH channel and direction

There are four sets of ratios that may be required for your application. Two pairs of sets of ratios for each of two PH channels, a **PH UP** and a **PH DOWN** set. These sets of ratios tell the **Dosing Program** how much to dispense of each liquid when a positive PH adjustment is needed **PH UP** and when a negative adjustment is needed **PH DOWN**. For example if you require the reservoir related to CHANNEL 2 to be adjusted with 5 ml dosings of Actuator 1 and 10 ml of Actuator 2 for a **PH UP** event, and just 5 mL of Actuator 3 for a **PH DOWN** event, set the **Dosage Ratio for PH UP** to 1, 2, 0, 0, 0, 0 and the **PH UP DOSAGE** for that channel to 15 ml, as well as setting the **Dosage Ratio for PH DOWN** to 1, 2, 0, 0, 0, 0 and the **PH DOWN DOSAGE** to 5 ml. Bounded from 0 to 100.

4.2.5 EC Target

This is the target EC conductivity measurement set for the associated channel's reservoir. This value is overridden in the event that a schedule file for the EC channel is present in the uSD card's root directory, and an entry to that date is present. This number is from 0 to 20,000 uS (uSiemens). A zero null value indicates that this channel's conductivity will not be maintained by the **Dosing Program**.

4.2.6 PH Target

This is the target PH measurement set for the associated channel's reservoir. This value is overridden in the event that a schedule file for the PH channel is present in the uSD card's root directory, and an entry to that date is present. This number is from 0.00 to 14.00. A zero null value indicates that this channel's acidity will not be maintained by the **Dosing Program**.

4.2.7 EC Tolerance

This is the amount of tolerance a conductivity measurement (EC) the **Dosing Program** will allow before an **EC UP** event is triggered. This value is an amount in uS the reading may vary, for instance if you set this to 100, the EC reading for that channel may vary up to 100 uS of the set level. It is a value from 20 to 1000 uS, microSiemens.

4.2.8 PH Tolerance

This is the amount of tolerance an acidity measurement (pH) the **Dosing Program** will allow before a **PH UP** or **PH**

DOWN event is triggered. This value is the amount the reading may vary, for instance if you set this to 20, the pH reading for that channel may vary up to 0.20 of the set level. It is a value from 0.01 to 2.00.

4.2.9 EC UP Dosage Increment

This is the amount of total liquid to dispense by all actuators referenced by this EC channel's **Dosage Ratio**. It is a value from 1 to 65000 mL, milliLiters. A zero null value indicates that this channel's EC will not be attempted to be increased by the **Dosing Program**.

4.2.10 PH UP Dosage Increment

This is the amount of total liquid to dispense by all actuators referenced by this pH channel's **Dosage Ratio** for a **PH UP** event. It is a value from 1 to 65000 mL, milliLiters.

4.2.11 PH DOWN Dosage Increment

This is the amount of total liquid to dispense by all actuators referenced by this pH channel's **Dosage Ratio** for a **PH DOWN** event. It is a value from 1 to 65000 mL, milliLiters.

4.2.12 EC Stabilization Delay

This is the minimum number of readings the sensor system will collect and compare to be equal given a tolerance, **EC Tolerance**, in order to confirm that the readings are stable. This value is bounded from 1 to 65000 samples.

4.2.13 PH Stabilization Delay

This is the minimum number of readings the sensor system will collect and compare to be equal given a tolerance, **PH Tolerance**, in order to confirm that the readings are stable. This value is bounded from 1 to 65000 samples.

4.3 Scheduling Profile

Scheduling EC and PH levels and their associated dosage ratios provides overwhelming flexibility in programming **ETHERDOSE DUO** controllers to adjust levels more dynamically as a grow progresses through various stages. Open the **ETHERDOSE DUO** software client and click on the Schedule tab to create a new schedule profile. Click ADD to add a new entry.

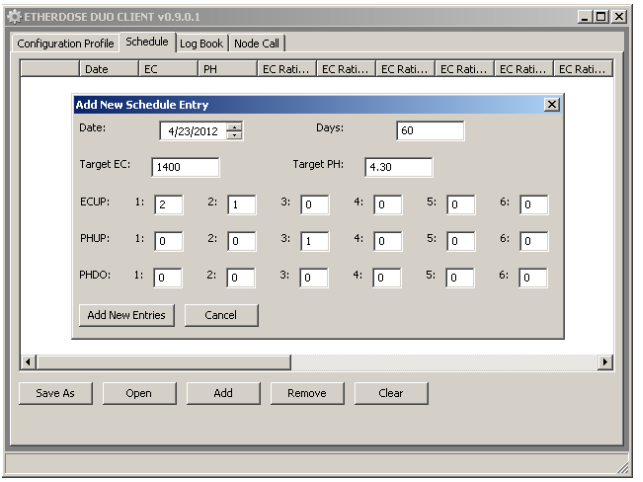


Figure 4.1: Enter in a new schedule entry by inputing overide EC and PH set levels as well as their associated dosage ratios.

Enter new target EC and PH levels and associated dosage rates to overide the configuration profile in the event that the current date correlates with an entry in the schedule profile.

Repeat the insertion of entries until each important date is accounted for. Here we show a simple schedule with multiple entries:

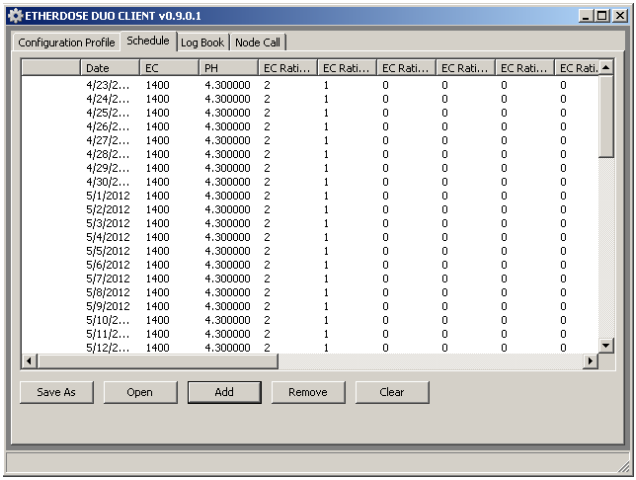


Figure 4.2: Repeat adding entries until a detailed scheduling profile is created.

Save the schedule files as either `ED-SCH1.EDS` for CHANNEL 1 or `ED-SCH2.EDS` for CHANNEL 2. Schedule files are completely optional. Store these files on the microSD card inserted into the **ETHERDOSE DUO** controller.

4.4 Log Files

Log files allow user interpretation of EC and PH levels during particular events during a grow. Download the log files for either CHANNEL 1 or CHANNEL 2 off the microSD card from your **ETHERDOSE DUO** controller. For CHANNEL 1, download `ED-LOG1.EDL` or for CHANNEL 2, download `ED-LOG2.EDL`. Run the **ETHERDOSE DUO** software client to interpret these files. Click the Log Book tab.

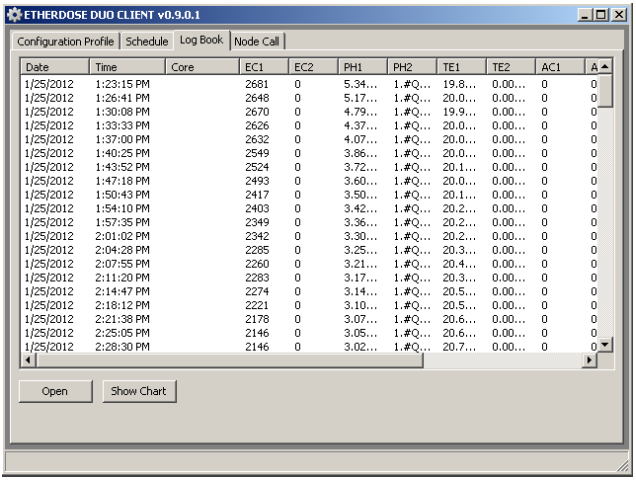


Figure 4.3: View a log file using the software client.

4.5 NodeCall Auto IP Detection

When using either the DHCP method of aquiring an IP address or manually assigning it using a configuration profile, we can detect all controllers across a network and get its hostname and IP. Make sure your router is configured properly to use this feature. In many cases, it may be easier to use a new factory configured router or wireless access point in order to save time. Run the **ETHERDOSE DUO** software client and click the **NodeCall** tab.

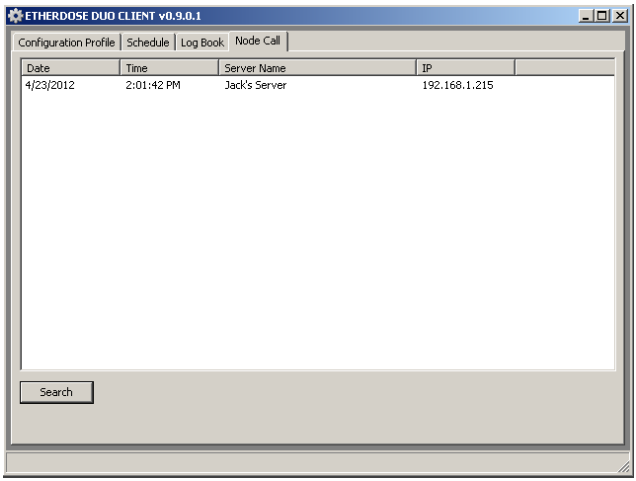
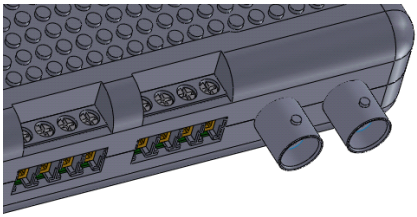


Figure 4.4: Search for all **ETHERDOSE DUO** controllers across an entire network.

Click on the Search button to begin the detection process. Wait a minute to see the list populate. If you are having trouble getting this feature to work, try enabling DHCP in the Network Configuration section of the Configuration Profile editor. Double click on the controller to launch your browser and access its web interface. Record all IP addresses for future use.

Section 5

Firmware Update



Firmware updates should be performed with care and only if the fixes and added features are important for your applications. Check the **ETHERDOSE DUO** website regularly for information on firmware updates.

You will need the serial number located underneath your **ETHERDOSE DUO** controller. This number is important since each firmware update is tailored for each controller. *WARNING: You cannot use the firmware update files for one controller to update another.*

You may damage your controller if the firmware is not updated properly. *Damage due to improper firmware update will void your warranty.*

5.1 Perform Firmware Update

Goto our website `http://www.robomatic.com` to download the two files you need to update your firmware. The two files are `BOOTCOM.BIN` and `FIRMWARE.BIN`. These two tailored files must be located in the root folder of your microSD card. Insert the microSD card into your **ETHERDOSE DUO** controller while the device is powered off. Power the unit on and wait up to 15 minutes. Shut the device off by unplugging it. Delete the two files you downloaded earlier from your microSD card using a personal computer. Reinsert the microSD card with a valid configuration profile back into the **ETHERDOSE DUO** controller. Congratulations your firmware should have been updated.