Unity Float Controller
Set Up and Networking Guide

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I. Unity Controller

1. Component Identification

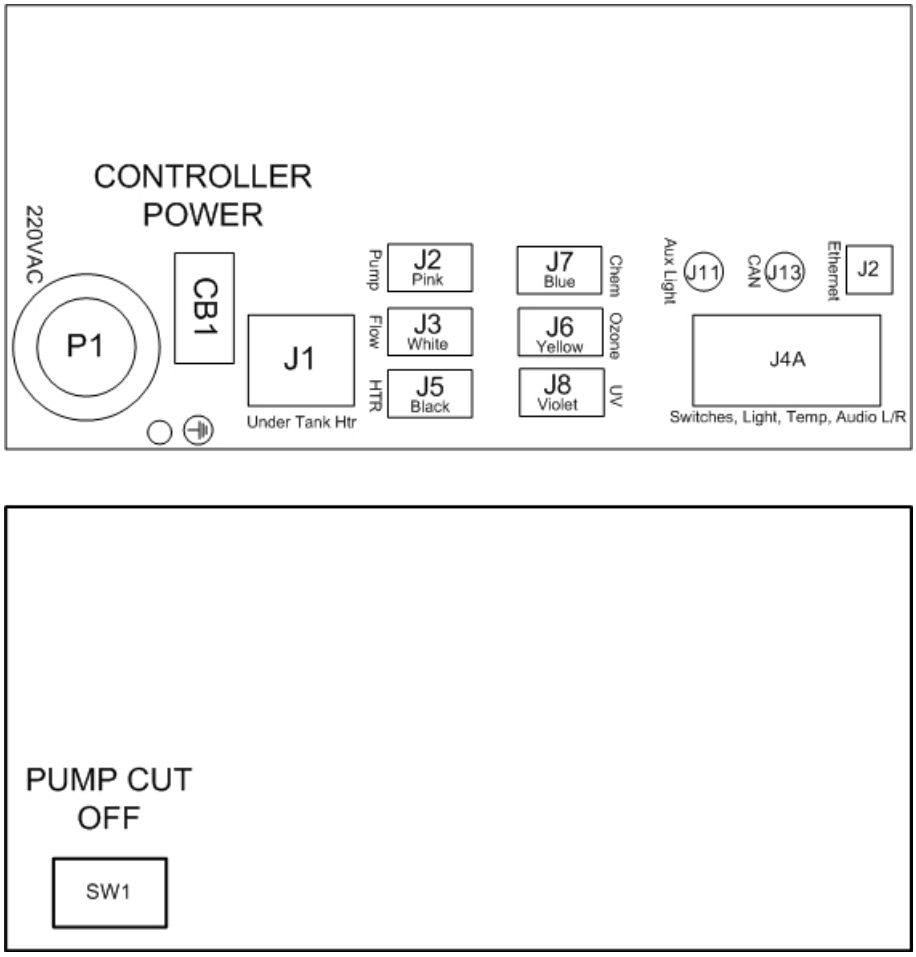

Figure 1

2. Power Requirement

Model # BBG SPACTL-100		
Input Voltage	**Frequency**	**Power**
220-240VAC	50/60 Hz	120W
Combined Max Short Circuit Current 19.5A		

For a functional diagram see drawing number DW-5097 Appendix D

III. Recommended Network Configuration

The network configuration shown in Figure 2 is the most robust and flexible network topology for interfacing with the Unity Float controller. The network switch allows passing of UDP messaging critical to the operation of the Unity float controller. The switch allows users with legacy routers that do not support multicasting to obtain a dynamic IP address and still communicate with the Unity controllers.

1. Units come preconfigured from the factory with DHCP enabled. A DHCP router must be connected to the network to assign the appropriate IP address

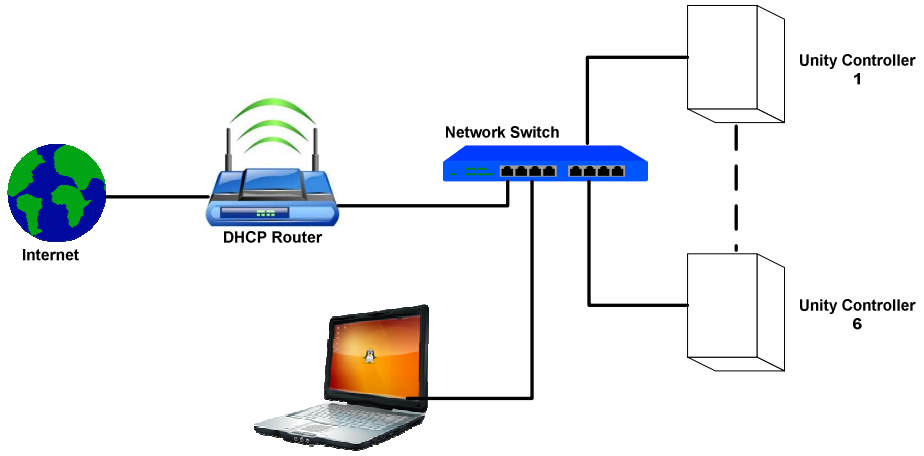

Figure 2

IV. Alternate Network Configuration

The network configuration shown in Figure 3 is not as robust and flexible as the network topology presented in Figure 1 but is an acceptable topology. The router used in this topology must meet the following criteria:

1. The router must be a DHCP router. The Unity Float controller comes preconfigured from the factory with DHCP enabled and must be connected to the network to assign the appropriate IP address.
2. The router must be able to support IGMP or multicasting for UDP messaging.
3. The router should support IPv6 protocol.

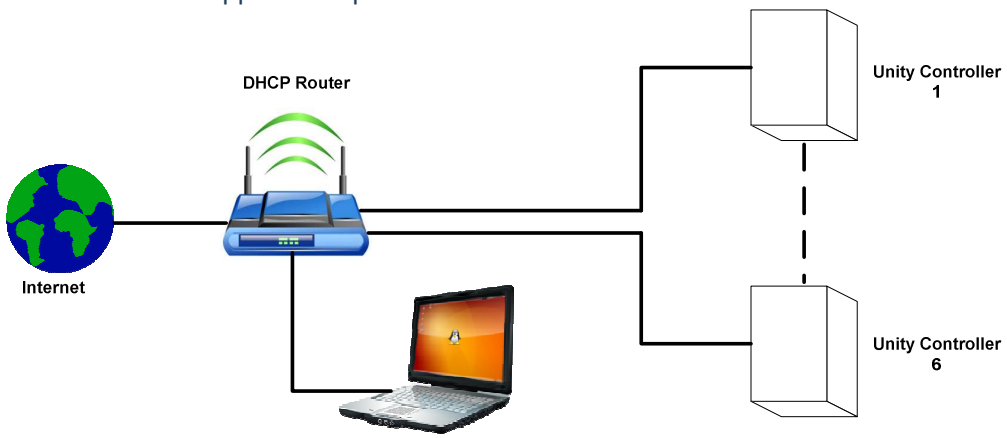

Figure 3

V. Connecting the Unity Control Module Directly to a PC without a Network Router.

A PC can be connected directly to the Unity Float Controller; however, the Unity Controllers are pre-configured at the factory as DHCP and **must be re-configured to a static IP address**. To reconfigure the Static/DHCP IP address the user has 2 options:

1. **Establish a connection with the controller though a DHCP** enabled router and change the network settings using the Unity Control software V2.4 or later. Appendix A

OR

2. **Open the Controller and modify the network configuration file located on the SD card.** Appendix B

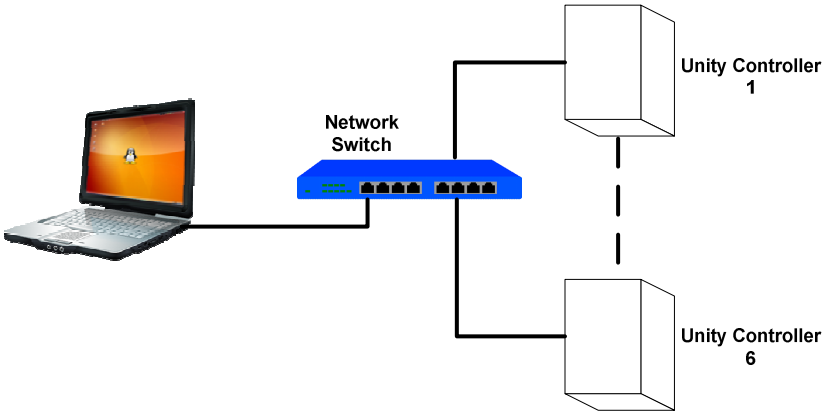

Figure 4

VI. Configuring the PC for a Static IP Address

1. **Set the PC IP Address** to a static IP
   a. Open Windows Control panel
   b. Navigate to Network Sharing Center →Within Network Sharing Center select "Change Adapter Settings"
   c. Highlight Local Area Connection Right click and select "Properties"
   d. Highlight "Internet Protocol Version 4 (TCP/IPv4)"
   e. Select "Properties"
   f. Select "Use the Following IP address"
   g. Chose an IP within the subnet of the Unity controller IP. (For Example 192.168.1.XX. Note: do not select an IP that may conflict with any other devices that may eventually reside on the same subnet)
   h. The Net Mask should default to 255.255.255.0
   i. The Default Gateway can stay blank. (If you chose to enter a default gateway enter 192.168.1.1)
   j. Select "Ok"
   k. Close out of the Network Sharing Center and Control Panel

l. Verify the IP address has changed
    i. From the Windows Command Prompt (Start→ Search→"CMD") type: "IP config"
    ii. Verify the IP address matches the IP address entered in Step g.

2. **Verify the Network Connection**: Ping the Unity controller IP address.
    a. From the Windows Command Prompt type : "ping 192.168.1.XX" (Substitute XX for the controller IP address)
    b. You should receive multiple replies from the IP address 192.168.1.XX with reply times less than 100mS.
    c. If you get no reply check your cables and connection points. The link should be solid green and the orange data should be flashing.

VII. Installing The Unity Software

1. **Install the Unity Software:** Select Unity.exe and follow the install instructions.
2. **Open the Unity Software:** Once you have established a known good Ethernet connection with the engine controller open the Unity software:
    a. From Windows Explorer select the file location of the Unity Software:
    b. Open the folder "Unity Float Controller"
    c. Select Unity.exe
    d. The Unity Software will perform the install. **Important:** If prompted by the Windows Firewall to allow network access. Select Yes to Public and Private networks.

3. **Set the IP in the Unity Software:** From the Unity.exe Software set the IP address for the tank
    a. Select Sys. Config.
    b. From the pull down (1), select the IP for the Controller. It can take up to 15 seconds after power up for the IP to appear in the pull down. If the IP never appears in the pull down check your network setup, also see the troubleshooting guide. If the IP is known it can be manually typed into the IP address field to the left of the pull down.
    c. Set the Tank enable to ON
    d. Select Return

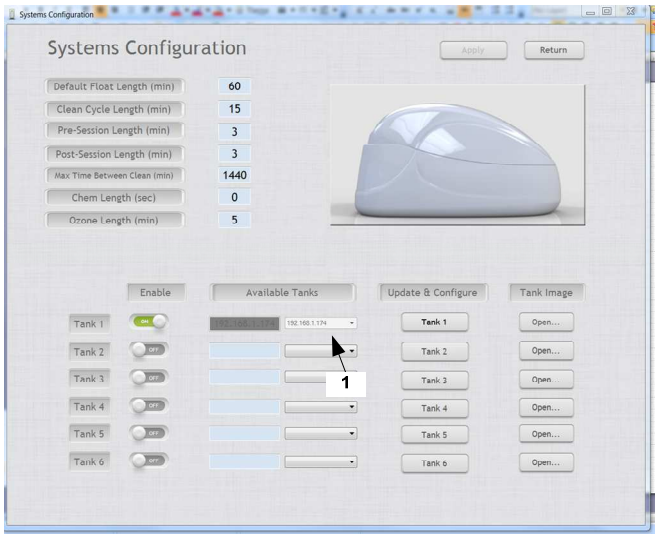

Figure 5

4. **Verify the Unity Software Connection with the Controller**: From the Unity main page verify the state: Idle
    a. It may take up to 3 minutes for the controller to connect.
    b. If the State reads "Connection Lost" after 3-5 minutes, cycle power on the Engine Controller (Black Switch on the connector side of the controller module)

5. **Set the Unity Software Defaults**
    a. Global Defaults
        i. Select Sys. Config button at the top of the Unity Software main page
        ii. Set the appropriate default values
    b. Individual Tank Defaults
        i. Select the tank by clicking on the Pod image
        ii. Verify the Idle and Float Temperature set points are set to your preference
        iii. Verify the Audio volume is appropriate
            a. Note: Audio leveling may be necessary to achieve desired levels
        iv. Verify the light color
        v. For any changes to take affect be sure to click **APPLY**

VIII. Firmware Updates

1. Users with following serial numbers will need to follow the detailed upgrade procedure in Appendix C. This procedure installs a bootloader and brings them up-to-date to allow for remote updates through the HMI software. The procedure in Apendix C will only need to be followed once to bring the controller up-to-date. Future Firmware updates can then be performed through the Unity HMI software.

FLT15H001 through FLT15H015
15K001 through 15K015
15M001 through 15M002

Table 1

2. User with S/Ns greater than 15M002 can upgrade the firmware remotely through the Unity HMI software.

a. When a firmware update is available, the user will be provided 2 files with the following file extensions : ".bin" and ".info"
b. Save both files to the same local directory and record the location.
c. From the Unity Software open the Sys Config Menu
    i. Select Update and Configure for the tank to be upgraded
    ii. Select Open from the Firmware menu
    iii. Navigate to the location of the files saved previously. Select the new firmware file with the ".bin" extension. (The system will automatically pull the ".info" file.)
    iv. **IMPROTANT:** You must cycle power on the controller for the Firmware update to take effect.

Figure 6

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IX. Troubleshooting the System

Tips

1. Always make connections using known good Cat5 or better cable.
2. Always troubleshoot with only 1 Unity Controller active and connected to the network.
3. Disconnect other extraneous devices such as, PCs, printers and other network drops from the router while troubleshooting a network issue. Add them back into the system one at a time verifying each new drop until the conflict has been identified.
4. Devices with same IP address on the same network will not connect or cause poor/intermittent performance.
5. When selecting a network router for the system look for the following:
    a. Supports DHCP
    b. Supports IPv6
    c. Supports Multicasting or IGMP Internet Group Management Protocol
6. Avoid intermingling Unity controllers configured as DHCP and Static IP

Troubleshooting Guide

IP does not display in Unity SW pull-down	1. Ensure Unity Controller is powered up for at least 3 minutes. 2. Ensure Window Firewall or Antivirus software is not blocking the Unity network connection. 3. Verify all cables and connections. Ensure point to point connections do not exceed 75ft. 4. Cycle power to the entire network, repowering in the listed order. Power down the PC, network router, network switch and all Unity Controllers Repower each component as follows: a. Network Router b. Network Switch c. Only 1 Unity Controller d. PC e. Open Unity SW f. Select the pull down and wait for up to 30 seconds for the IP address to display 7. Verify a DHCP router is connected to the network and DHCP is enabled on the router
Changes to the Unity SW network settings do not take.	Changes to the network settings do not take effect until the power has been cycled on the Unity controller. Power down the Unity Controller and wait 10 seconds before powering up.
The Unity SW is connecting to the controller but the Pump is not cutting on	Check the pump switch and ensure it is on. It will be the blue switch on the top left hand side of the box a. Check your temperature settings in the Unity SW Tank Information Page b. Verify the physical connection

The SW reports a connection (such as an Idle state) but the user cannot change the state or start a session:	1. Ensure the tanks are on the same subnet as the router. The controller sends status messages via UDP and reports on all subnets. The user will see a status from the tank but commands sent from the software will be ignored. 2. If the IP has been changed through the Sys Config menu, the controller power must be cycled for the changes to take effect.
Direct connection issues - Static IP	Verify the PC supports automatic crossover. Not all PCs handle automatic crossover. a. Ensure there are no other devices connected to the subnet with the same IP address as the controller. b. Verify the PC is set to static IP c. Ensure the PC and Unity Controller resides on the same subnet
The Unity SW is connecting but the Music Manager is slow or never loads	Poor Network connections are difficult to diagnose. As long as occasional messages get through the system will keep trying to communicate over the network, resulting in slow loading of the Music Manager. Verify the network connection. a. Perform a trace route of the network connection to the controller. From the DOS CMD prompt type " **TraceRt XXX.XXX.XXX.XXX** " (XXX is the tank IP address) 1. A response time of >30ms is an indicator of a possible network connectivity issue to the controller. b. Perform a trace route of the PC. From the DOS CMD prompt type " **TraceRt 127.0.0.1** " 1. A response time of >30ms is an indicator of a possible network connectivity issue to the PC. C. Perform a trace route of the Gateway. From the DOS CMD prompt type " **IPCONFIG/all** " Identify the IP address for the gateway of the network. From the DOS CMD prompt type " **TraceRt XXX.XXX.XXX.XXX** " (where XXX is the IP address of the gatway) 1. A response time of >30ms is an indicator of a possible network connectivity issue to the PC. Alternatively: Users can decrease the Network Time Out to 1000mS. Users will then receive a Network Error message sooner when there is a network issue. See Sys Config Menu→Update Under Network and Configure → Set the Timeout

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X. Appendix A: Changing the Controller Network Settings to Static Via DHCP

1. Establish a connection with the controller though a DHCP enabled router and change the network settings using the Unity Control software V2.4 or above. Appendex A
    a. The IP configuration is found in the Sys Config Menu → Update & Configure Menu
    b. From the Pull Down under Available Tanks, the DHCP router will assign an address to the Unity Controller.
    c. Select the IP address (1) and enable the Unity Controller (2)
    d. Select the Tank under Update and Configure (3)
    e. Within the Network Configuration Menu
        i. Set the Static IP (4)
        ii. For Advanced users. Set the value to the desired sub-net. This should not change unless the user knows the specific subnet for which the controllers are to reside.
        iii. For Advanced Users. Set the value to the desired netmask. This should not change unless the user knows the specific range for which the controllers are to reside.
        iv. Upload (5) the new network configuration.
        v. The Unity Controller must be power cycled for the changes to take effect. Turn the Unity controller off for 10 seconds then power up.

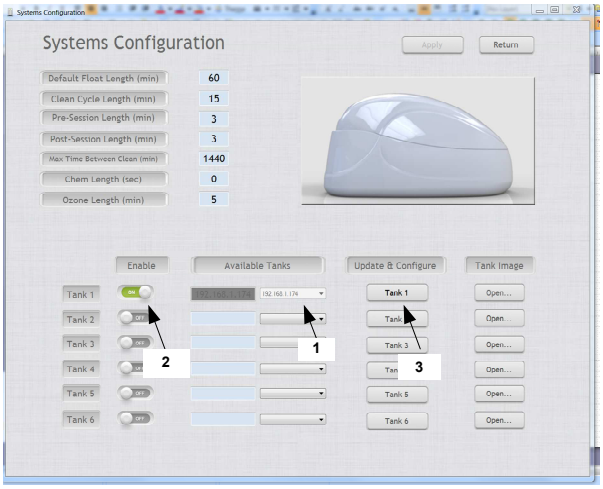

Figure 5

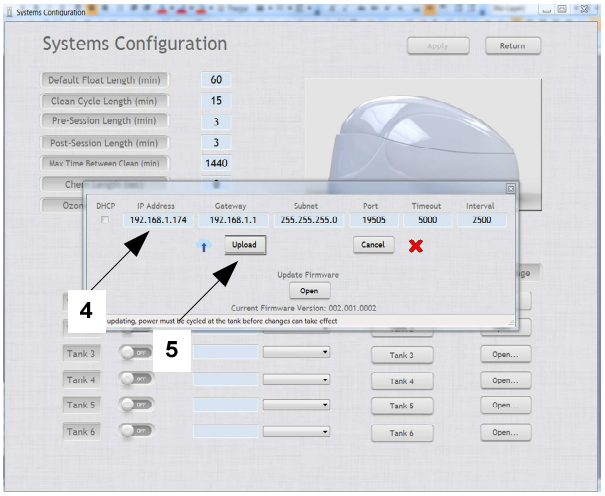

Figure 6

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XI. Appendix B: Changing the Controller Network Settings Via the SD card

1. **Open the Controller, remove the Micro SD card and modify the network configuration file.**

Warning: Lethal voltages of 240VAC a present inside the frame when connected to AC mains! Never power up or operate the unit unless the front cover is installed!

a. Disconnect power from the Controller
b. Remove the front cover and remove the Micro SD card
    i. Using one finger, gently slide the SD card toward the center of the circuit card. The card will move approximately 1/16 to 1/8" forward. Release your finger and the SD card will gently pop up, allowing you to remove the card. Observe the orientation for replacement later.

Figure 7

c. Connect the SD card to a PC, you will likely need a micro-SD to SD card adapter. Check inside the frame for a plastic sleeve, the adapters are now provided with each unit inside this sleeve
d. Save a copy of the existing "enet.config" file for later reference.
e. Using a text editor program, open the "enet.cfg" file located in the root directory. (Ex. Windows Notepad)
f. Edit the file as follows:
    i. **2** 192.168.1.150 192.168.1.1 255.255.255.0 19505 5000 2003
        1. Set the value to **1** for Static IP
    ii. 1 192.168.1.150 192.168.1.1 255.255.255.0 19505 5000 2003
        1. Set the value to the desired Static IP
    iii. 1 192.168.1.150 192.168.1.1 255.255.255.0 19505 5000 2003
        1. Set the value to the desired sub-net. For Advanced users. This should not change unless the user knows the specific subnet for which the controllers are to reside.
    iv. 1 192.168.1.150 192.168.1.1 255.255.255.0 19505 5000 2003

1. Set the value to the desired netmask. For Advanced users. This should not change unless the user knows the specific range for which the controllers are to reside.

v. Save the changes under the same file name “enet.cfg”

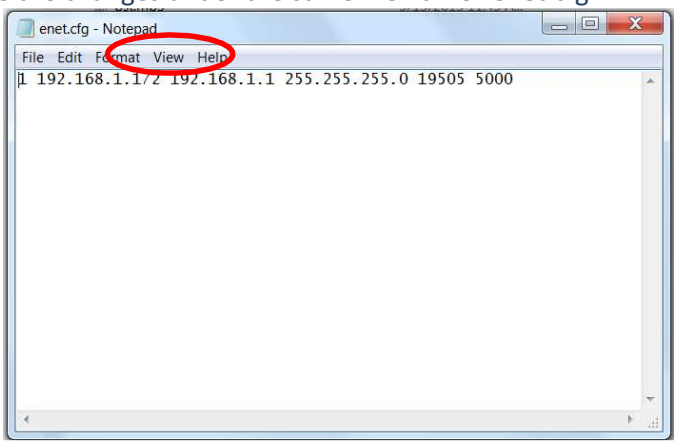

Figure 8

g. Eject the SD card from the PC by selecting “Safely Eject Media”

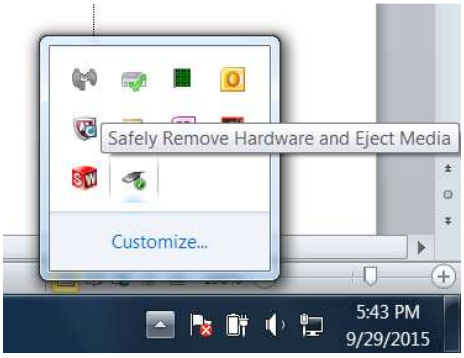

Figure 9

h. Replace the SD card on the Unity Float controller

i. Orient the card with the SD card slot

ii. Place the front of the card into the SD card slot (contacts first)

iii. With one finger, gently press down on the center of the card and slide the card back towards the circuit card edge. The card will slide 1/16”-1/8” underneath the SD card slot retainer. The card will now be flat with the connector

Figure 10

i. **Close the Unit**

i. Replace the cover

ii. Secure the cover with the 12#6 3/8 SS screws.

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XII. Appendix C: Installing the Bootloader for Remote Updates

CAUTION: Do not perform this procedure unless directed by Float Controller provider

Tools Needed

- # 2 Philips Head Screw driver •PC capable of running Atmel SAM-BA in circuit programming software •PC with SD Card Reader •Micro USB cable (short housing <3/4" deep)

1. Power Down and Open the Unit

1.1. Switch the Unity Float controller breaker off

1.2. Disconnect the power cord from the unit

Caution : Lethal voltages of 240VAC are present inside the frame when connected to AC mains. Never open the frame unless power is disconnected and the unit is allowed to sit for 5 minutes to discharge.

1.3. Remove the front cover retaining screws and retain for later

Note: The follwing procedure will be performed with the Unity Control system turned OFF. The necessary power will be provided via the USB cable.

2. Install Atmel SAMBA In-System programming software

2.1. **Download SAM-BA** In-System programmer V2.15 software from http://www.atmel.com/tools/atmelsam-bain-systemprogrammer.aspx

2.2. Run the Installer and follow the install prompts.

WARNING: The following step will disable all functions of the controller until the entire procedure has been completed. Only perform this procedure one unit at a time only when there is adequate time to complete the procedure in its entirety.

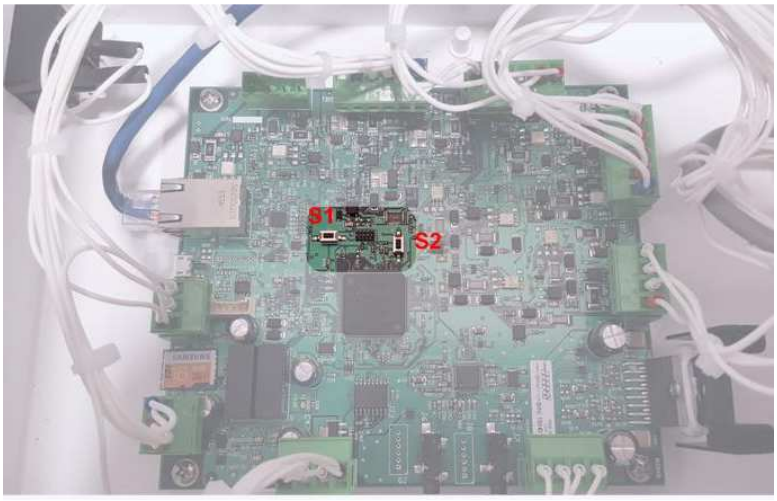
3. Install the Driver

3.1. Connect the Micro USB to the Unity Controller Circuit Card J2. Connecto the other end of the USB to a PC. Note there will be several LEDs illuminated to indicate power is present from the USB connection.

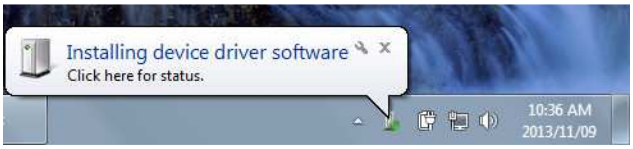
CAUTION: The USB connector is delicate and the PCB can be damaged if the cable connection is stressed. Do not pull on the cable or cause any rotational forces on the cable connection.

3.2. Reset Microprocessor

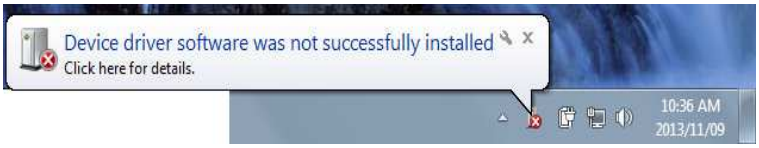
3.2.1. With the unit powered via the USB, press and hold S2 then press and release S1. Now release S2.



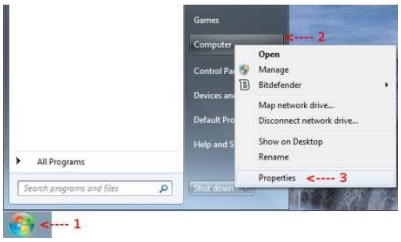
3.2.2. After plugging in the microcontroller, Windows will try to install a driver.



3.2.3. Automatic driver installation should fail.



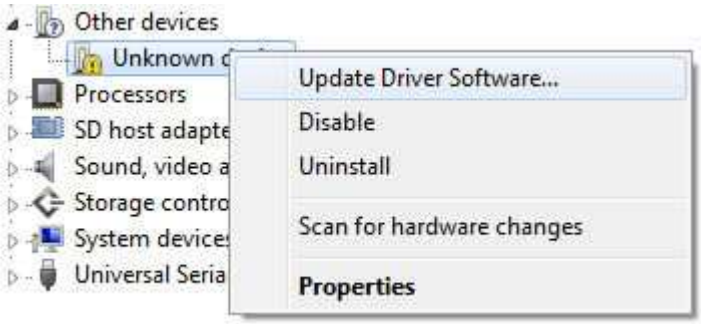
3.2.4. Open Device Manager: Click the Windows **Start** button and then right-click **Computer**. Click **Properties** on the menu that pops up.



3.2.5. In the window that opens, click "Device Manager".

3.2.6. The Atmel microcontroller running SAM-BA will be displayed as an "unknown device".

3.3. Update the Driver: Right-click the unknown device in the device manager and then click **Update Driver Software...** on the menu that pops up.



3.3.1. In the dialog box that pops up, click **Browse my computer for driver software**.

3.3.2. Click the **Browse...** button.

3.3.3. Use the dialog box to navigate to the folder containing the driver.

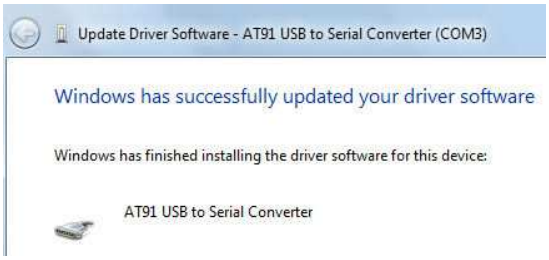
3.3.4. The correct path will now appear in the dialog box. Click the **Next** button at the bottom of the dialog box.

3.3.5. In the dialog box that pops up, click **Install this driver software anyway**.

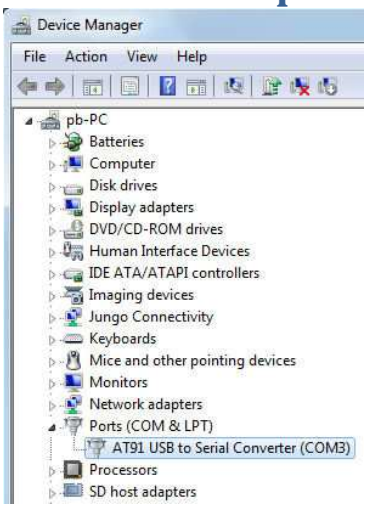
3.3.6. The driver may **take a while** to install.

If the aforementioned screen does not appear

3.3.7. You will be notified when installation is complete.



3.3.8. Back in the Device Manager window, the new device and COM port number assigned to it can be seen.



3.3.9. Reboot the computer

4. Download the New Firmware.

4.1. Open an internet browser and navigate to the download location of the new firmware file. A separate e-mail has been sent detailing the location and instructions for accessing the files

4.1.1. Navigate to the Firmware Folder.

4.1.2. Download the file: **Bootloader_Float_v1_0_1**

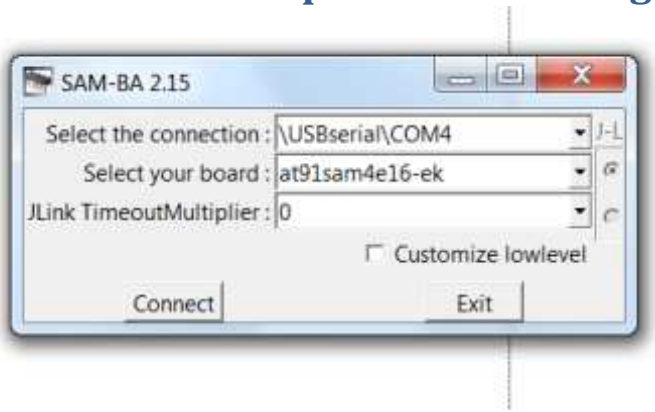
4.1.3. Move the file to a location that can be easily found.

5. Program Firmware

5.1. Open the SAM-BA In circuit programming software. Note, if this PC is using a user account and not Administrator then Right Click on the program Icon and select " Run as Administrator"

5.2. The SAM-BA software should automatically populate the serial connection with \USBSerial\COMx (COMx is the serial port assigned when the driver was installed)

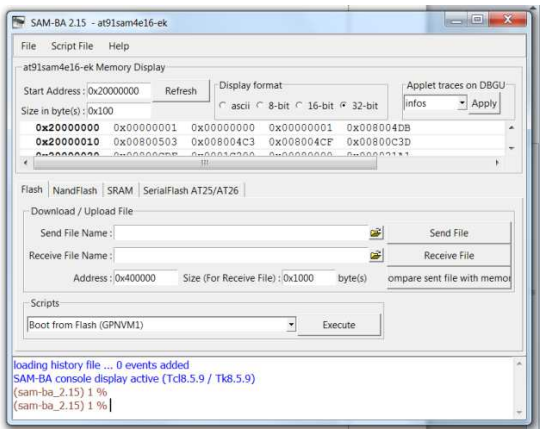
5.3. Select the appropriate device for "Select Your Board" The device is **at91sam4e16-ek.** Note, if the device is not properly selected the microcontroller will not program



5.4. All other settings should remain as the default.

5.5. Select Connect

5.6. If properly connected the following screen will appear.

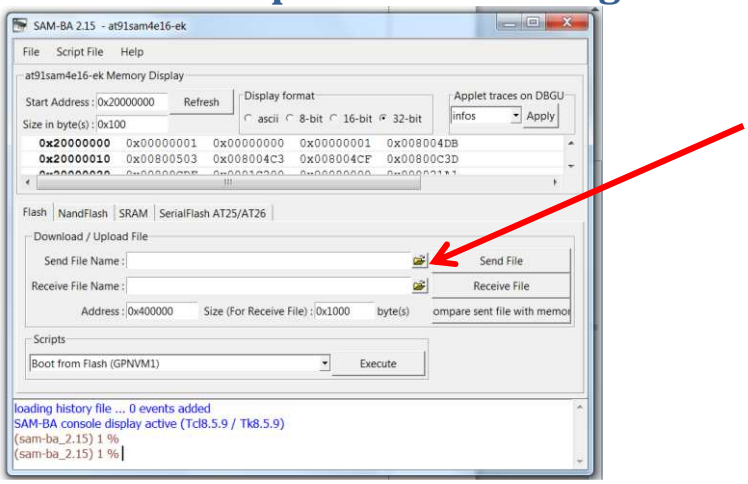


5.6.1. If the aforementioned screen does not appear.

5.6.1.1. If nothing happens, there may have been a problem with the set-up. Repeat the Program Firmware instructions from the beginning.

5.6.1.2. Reset the microprocessor once again as outlined in step 3.2.Resetting the Microprocessor then with the USB cable connected between the microcontroller board and the PC, reboot the PC and begin the Program Firmware instructions again.

5.7. Load the Firmware file downloaded from the FTP. Select the file folder icon and navigate to the file location of the file **Bootloader_Float_v1_0_1**. Select the file and select Open.

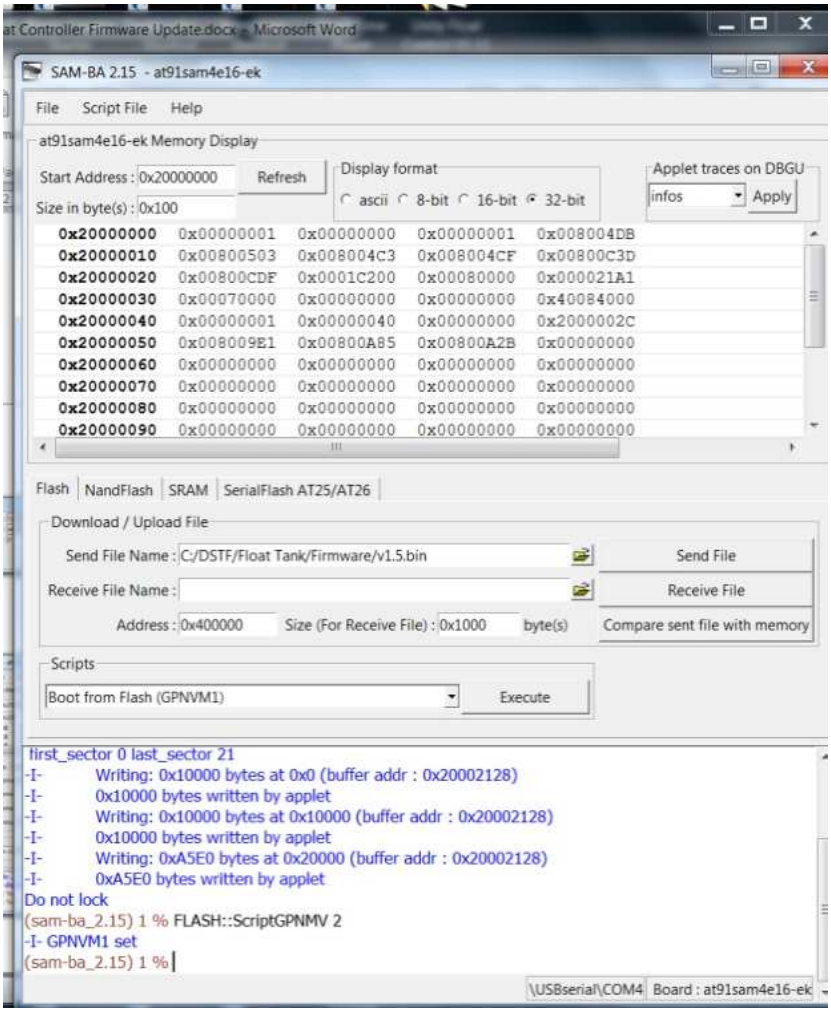


5.7.1. Select Send File. You will be prompted to" Lock Regions". Select **No**

5.7.2. Ensure the Scripts pull down menu is set to "**Boot from Flash (GPNVM1)"**

5.7.2.1. Select Execute

5.7.2.2. The status window should indicate "GPNVM1 Set". If it does not set then select execute again



5.7.2.3. Once the microprocessor is programmed **CAREFULLY** disconnect the USB cable from the frame

6. Update the SD Card

6.1. Disconnect the Micro SD card

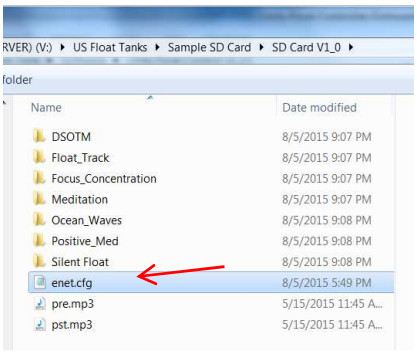
6.1.1. Using one finger, gently slide the SD card toward the center of the circuit card. The card will move approximately 1/16 to 1/8" forward. Release your finger and the SD card will gently pop up, allowing you to remove the card. Observe the orientation for replacement later.

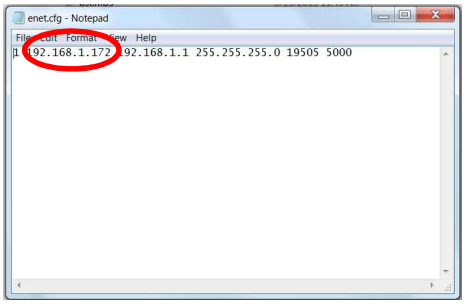
6.2. Connect the SD card to a PC, you will likely need a micro-SD to SD card adapter. Check inside the frame for a plastic sleeve, the adapters are now provided with each unit inside this sleeve

6.2.1. A sample SD Card V2.0 is available on the FTP site. Users can elect to download the entire folder or only add/update the necessary files. A separate e-mail has been sent detailing the location and instructions for accessing the FTP

6.2.2. Save a copy of the existing enet.config file for later reference.

6.2.3. Open the file. Record the IP address and Tank number for this IP address.





6.2.4. Open an internet browser and navigate to the download location of the new SD Card files.

6.2.5. Option A: Replace All

6.2.5.1. Save a copy of the existing files for later reference.

6.2.5.2. Decide if DHCP is acceptable: DHCP may require existing users to reconfigure the tank IPs

6.2.5.2.1. If DHCP is acceptable: Delete all files from the SD card. Replace with all files downloaded from the FTP

6.2.5.2.2. If DHCP is not acceptable: Delete all files with the exception of the enet.cfg file. Replace with all files downloaded from the FTP. Omit the new enet.cfg file from the FTP.

6.2.6. Option B: Add and modify the necessary files

6.2.6.1. Add the folder “FIRMWARE” and the file contents to the SD card root.

6.2.6.2. In the root directory of the SD card also add the following files

6.2.6.2.1. Float_Ctrl_v2_0_99.bin

6.2.6.2.2. Float_Ctrl_v2_0_99.info

6.2.6.3. Decide if DHCP is acceptable: DHCP may require existing users to reconfigure the tank IPs

6.2.6.3.1. If DHCP is acceptable: Delete the enet.cfg file from the SD card. Replace with the file downloaded from the FTP

6.2.6.3.2. If DHCP is not acceptable: Add and Modify the enet.cfg file downloaded from the FTP as follows:

6.2.6.3.2.1. Open the existing enet.cfg file and record the IP address. Make note of the IP and Tank number.

6.2.6.3.2.2. Delete the existing file from the SD card

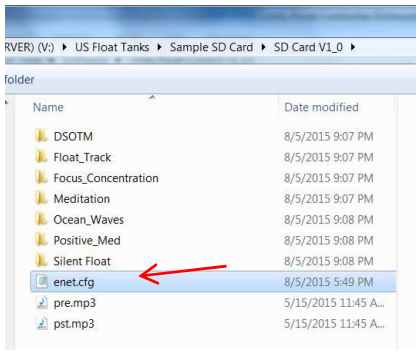
6.2.6.3.2.3. Move the new enet.cfg file downloaded from the FTP to the SD card

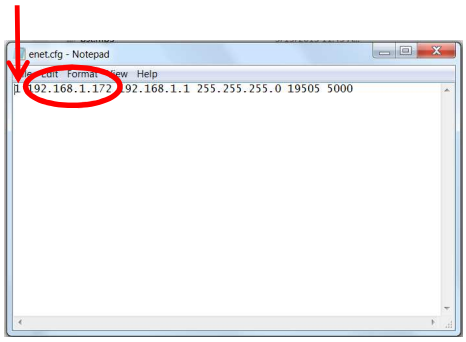
6.2.6.3.2.4. Open the enet.cfg file using a text editor.

6.2.6.3.2.5. Set the first digit to **1.** This establishes a static IP

6.2.6.3.2.6. Change the IP to the existing IP recorded in the step earlier

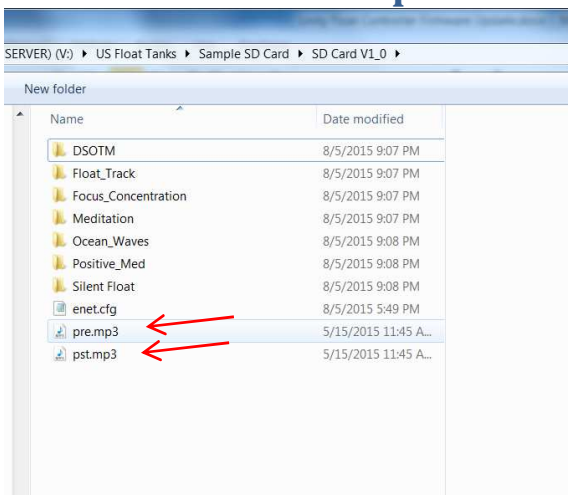
6.2.6.3.2.7. Save the file



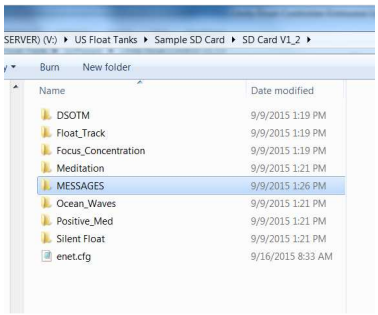


6.2.7. For older versions of the firmware the following may also be necessary:

6.2.7.1. Remove Pre.mp3 and Pst.mp3 files from the root directory



6.2.7.2. Add the MESSAGES folder from the FTP site listed above.



6.3. Eject the SD card from the PC by selecting “Safely Eject Media”

6.4. Replace the SD card on the Unity Float controller

6.4.1. Orient the card with the SD card slot

6.4.2. Place the front of the card into the SD card slot (contacts first)

6.4.3. With one finger, gently press down on the center of the card and slide the card back towards the circuit card edge. The card will slide 1/16”-1/8” underneath the SD card slot retainer. The card will now be flat with the connector

6.5. **Close the Unit**

6.5.1. Replace the cover
6.5.2. Secure the cover with the 12#6 3/8 SS screws.
6.5.3. Reconnect power to the unit

Caution : Lethal voltages of 240VAC a present inside the frame when connected to AC mains! Never operate the unit unless the front cover is installed!

6.6. **Download the new HMI software**

6.6.1. Open an internet browser and navigate to Download location provided in a separate e-mail
6.6.2. Open an internet browser and navigate to the download location of the new software and firmware files. A separate e-mail has been sent detailing the location and instructions for accessing the files
6.6.3. Once logged into the FTP site navigate to the Software folder
6.6.4. Select the folder Unity Float Control V2.4
6.6.5. Download the file Unity Float Control V2.4.exe
6.6.6. Delete any old versions of the software from the directory where the Unity Float Control software will reside
6.6.7. Install the Unity Float Control V2.4 software in the desired directory
6.6.8. Select the Sys Config button
6.6.8.1. Set the IP address for the appropriate Tank number.
6.6.9. Set the defaults accordingly and begin using the tank.

XIII. Appendix D Functional Diagram