

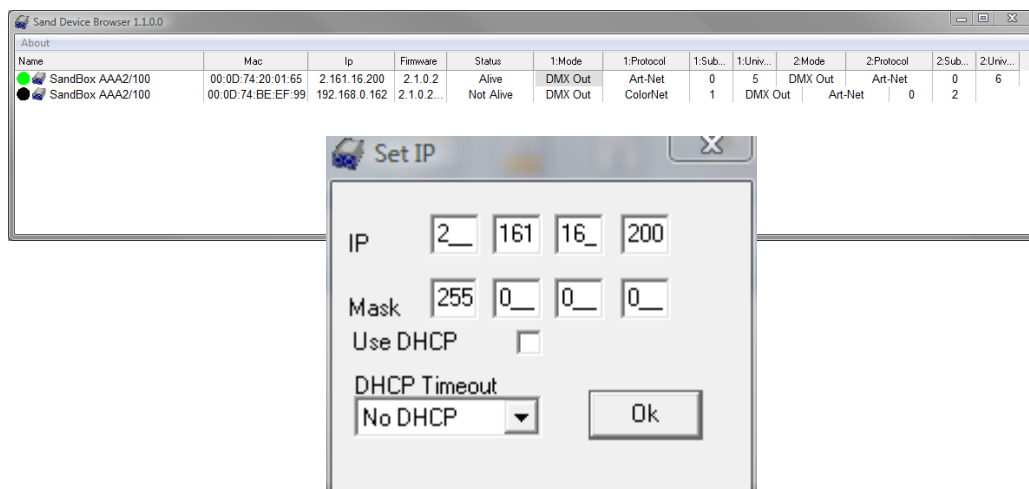
# Sand Device Browser

## SandBox AAA2/100™

### SandPort

## AAA2/100™

# User Guide



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# General

## Scope

This user guide covers discovery, configuration, and firmware upload for SandNet compatible Ethernet devices, specifically the SandBox AAA2/100 and SandPort AAA2/100 models, using the Sand Device Browser software and the EXMUploader utility. The above mentioned devices are hereinafter referred to as SandNet devices.

## Compatibility

This user guide is compatible with the following software and hardware:

- Sand Device Browser version 1.1.0.0 and higher.
- EMXUploader version 1.1.0.0 and higher.
- SandBox AAA2/100 and SandPort AAA2/100 FW version 2.0.0.0 and higher.
- 

Note that older SandNet devices and devices other than listed above might lack support for some of the features described in this user guide or have an implementation of these features different from the description in this user guide.

## User Prerequisites

This user guide assumes that the user have basic understanding of PC operation, computer networks, and IP addressing.

## Operating System and Hardware Requirements

The Sand Device Browser requires one of the following Microsoft™ operating systems to function correctly:

- Windows XP™
- Windows Vista™
- Windows 7™

Any PC hardware that runs the above operating systems can be used to run the Sand Device Browser.

Any Apple™ Mac™ with an Intel processor running the above operating systems under Boot Camp™ or Parallels™ can also be used to run the Sand Device Browser.

## Network

It is assumed that the computer running the Sand Device Browser and the SandNet devices are connected via a working Ethernet local area network (LAN). The setup and configuration of such networks are beyond the scope of this user manual and should be facilitated by personnel with the necessary skills.

The simplest network configuration is an Ethernet cable between the computer running Sand Device Browser and the SandNet device. Newer SandNet devices, including the AAA2/100 models, support auto MDI/MDI-X which allows use a straight or cross-over Ethernet cable for this purpose.

The Sand Device Browser will discover and communicate with devices connected to the same local area network independent of their IP address setting, but note that a router, i.e. a device intended to facilitate communication between two different local area networks, will not pass this communication unless specifically configured to do so.

**WARNING:** A typical PC running MS Windows or Vista will take some time to configure its network settings when connected to a network and during that period the computer's network interface is disabled by the operating system resulting in the SandNet devices not being visible in the Sand Device Browser. This is typical if you connect the SandNet device directly to a PC and the PC is set to utilize DHCP. The PC will often take as much as 2-3 minutes to realize that it will not get a DHCP address and then configure a APIPA/AutoIP address and finally enable the network interface again at which point the SandNet devices will pop up in the Sand Device Browser.

## **Installation**

The latest version of the Sand Device Browser is always available to download from:

<http://www.sandsys.com>

The Sand Device Browser does not require an installation process. Just copy the file to any convenient location on your PC and double click on it to start the program. The size of the program is about 5 Mb. If you got the Sand Device Browser on a CD or USB stick you can even run it directly from those devices.

You can close the Sand Device Browser application when you have finished the configuration of the SandNet devices.

## **SandNet Software**

SandNet is a full featured software application that goes beyond the basic setup and configuration features provided by the Sand Device Browser. It allows for extensive monitoring and testing and is an excellent tool for more advanced network setups.

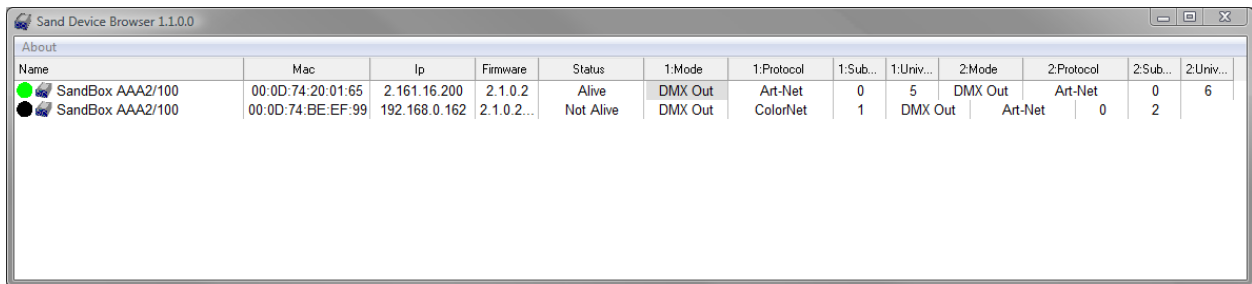
SandNet is available for free for SandNet device setup and configuration. SandNet also comes in paid versions that allow for Ethernet protocol conversion and other network operations. You can download The SandNet software from:

<http://www.sandsys.com>

# Configuration

## Sand Device Browser Window

The Sand Device Browser will discover and display in a table format all SandNet compatible devices that are connected to the network. Devices that are connected, but later disconnected from the network will remain in the browser until the browser is restarted.



The screenshot shows a window titled "Sand Device Browser 1.1.0.0" with a table of discovered devices. The table has columns for Name, Mac, Ip, Firmware, Status, 1:Mode, 1:Protocol, 1:Sub..., 1:Univ..., 2:Mode, 2:Protocol, 2:Sub..., and 2:Univ... The first row shows a device named "SandBox AAA2/100" with a green status icon, Mac address "00:0D:74:20:01:65", IP "2.161.16.200", and status "Alive". The second row shows a device with a black status icon, Mac address "00:0D:74:BE:EF:99", IP "192.168.0.162", and status "Not Alive".

Name	Mac	Ip	Firmware	Status	1:Mode	1:Protocol	1:Sub...	1:Univ...	2:Mode	2:Protocol	2:Sub...	2:Univ...
SandBox AAA2/100	00:0D:74:20:01:65	2.161.16.200	2.1.0.2	Alive	DMX Out	Art-Net	0	5	DMX Out	Art-Net	0	6
SandBox AAA2/100	00:0D:74:BE:EF:99	192.168.0.162	2.1.0.2...	Not Alive	DMX Out	ColorNet	1	DMX Out	Art-Net	0	2	

## Editing

All device properties that are user configurable can be edited directly in the table as long as the devices are connected to the network.

The Status field will change from “Alive” to “Save Changes” and the whole device line will change color to red if you change a setting. Double clicking the Status field “Save Changes” will commit the changes and the field will display “Rebooting” for a few seconds while the device assumes its new settings.

## Header

The header will change to display the field names appropriate for the selected device. To activate the correct header for a specific device; click anywhere on the line for the desired device.

Port specific fields will display the port number in front of the field name as in “1:Mode” which denotes the Mode field for port 1.

You can resize the width of the fields for the selected device by dragging the header field divider lines.

## Identify

All SandNet devices have an Identify function that will facilitate visual identification of a particular device. The Identify function is available in the device local menu; select a device and right click to bring up the local menu then click “Identify”. SandNet devices will blink all its LEDs for a few seconds as the visual indication in response to an identify request.

## Name

The Name field displays the device name. Factory default is the product name e.g. “SandBox AAA2/100”. You can edit this field and put in any name you want e.g. “FOH Left Balcony”. The name is limited to 32 alphanumeric characters.

The name field also includes a visual status indicator in the form of a colored circle.

- Green indicates that the device is connected and operational.
- Black indicates that the device is unavailable or is rebooting.

## MAC

The MAC field will display the device MAC (Media Access Control) address. This is a unique identifier that is assigned to the device at the factory and cannot be changed. This number is also used as the device serial number and can typically be found printed on the device itself. The

MAC address is sometimes referred to as IEEE Address, Ethernet Hardware Address (EHA), hardware address, adapter address, or physical address.

## IP

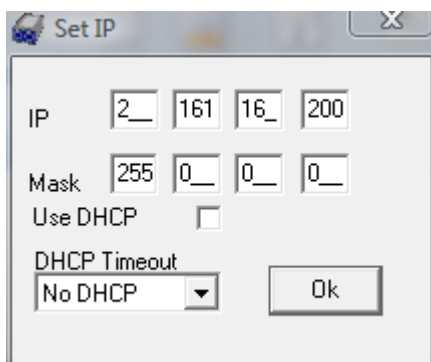
The IP field displays the active IP (Internet Protocol) address of the device. The IP address is a logical identifier that can be changed by the user to accommodate the required settings for the network and protocol in question.

You will find more specific information about suitable IP settings in the sections for each individual network protocol.

## Set IP

Double clicking the IP field will bring up the Set IP window. The window displays the IP address, the sub net Mask, the Use DHCP (Dynamic Host Configuration Protocol) option, and the DHCP timeout setting.

Note that new settings will not take effect until you click the “OK” button.



With DHCP disabled, as displayed above, the device will use the IP and Mask displayed as a fixed IP address.

Enable DHCP by clicking on the “Use DHCP” tick mark box and a tick mark will appear. The device will try to obtain an IP address from a DHCP server on the network after clicking OK. If it fails to obtain an IP address and subnet Mask from a DHCP server it will use the IP and subnet Mask displayed as its IP address, then typically referred to as the “Fall-back IP Address”.

The DHCP Timeout is used to control the time the device will spend trying to obtain an IP address from a DHCP server before it uses the fallback IP setting. The default DHCP Timeout is 6 seconds; it might be necessary to adjust the timeout in larger networks to allow more time for the DHCP process to complete.

SandNet devices themselves and the Sand Device browser do not provide DHCP server functionality; a DHCP server has to be provided by other software or hardware connected to the network.

SandNet devices will only search for a DHCP server on power up or reset. A device that has DHCP enabled and that is powered up, but not connected to the network with the DHCP server at that time, will retain its fall-back IP address even if it is later connected to the network with the DHCP server. You can force a new DHCP process by resetting the box via the Set IP window or by cycling power to the device.

## **Firmware**

The Firmware field displays the firmware version of the device. This will change only when a new version of firmware is uploaded to the device.

## **Status**

The Status field denotes the current operational status of the device and cannot be edited by the user, but it is used to initiate a commitment of changes done in the Sand Device Browser as explained below.

- “Alive” denotes that the device is connected and operational with the parameters displayed.
- “Not Alive” denotes that the Sand Network Browser has lost contact with the device. This occurs as part of normal operation if the device is removed from the network. It can also indicate that the device has lost power, is malfunctioning, or that a network problem prevents it from communication with the Sand Network Browser.
- “Save Changes” denotes that a change has been made to the device configuration in the Sand Network Browser, but that the changes have not been committed to the device.

## **Mode**

Every port on the device will have a Mode field that displays the operational mode of the DMX port. Most SandNet devices have bi-directional ports i.e. they can be used as a DMX input or

and output independent of the gender of the XLR connector on the port. Double clicking on the Mode field will display a list of the available settings.

- “Disabled” will cease all DMX operations on the port and set the port in a high-impedance state.
- “DMX Out” will configure the port as a DMX output.
- “DMX In” will configure the port as a DMX input.
- “Pipe other port” will take the DMX input or output from the other port and use it as the source for protocol conversion. Only one port may use this option. The DMX port is disabled in this mode.

Note that a change of Mode might require changes to device IP settings. See the sections for each individual network protocol for more information.

## Protocol

With the port Mode set to “DMX Out” this field will display the Ethernet protocol which the port will use as its source for the DMX.

With the port Mode set to “DMX In” this field will display the protocol which the incoming DMX from the port will be distributed as on the Ethernet.

Double clicking on the field will display a list of available protocols. Note that a protocol may not be supported for both input and output.

Note that a change of Protocol might require changes to device IP settings. See the sections for each individual network protocol for more information.

A device can have different protocols for each port i.e. one port can utilize Art-Net as its Ethernet source protocol while the other utilize Streaming ACN as its Ethernet source protocol. Note however that there might be IP issues involved with this type of setup and this is only recommended for users with sufficient understanding of these issues.

## Timeout

The timeout parameter allows the user to specify how many seconds the DMX port will continue to output the last known levels upon loss of its source. It may be set from 1 to 255.

When Timeout is set to 0 the timeout period is disabled and the port will continue to output the last known levels until the source returns. The timeout parameter has no effect when the port is configured as an input.

**WARNING:** Note that when the DMX data is static, some protocols may only send a new data packet over the Ethernet every few seconds. If the timeout is set below this refresh rate, the port will think the source is lost and disable the output. This will result in the output flashing on and off. For these protocols, you must set the timeout value higher than the protocol’s refresh rate.

## **Protocol Specific Fields**

The various Ethernet protocols have specific notations for the DMX channel and universe selection criteria. This will automatically be displayed in the header when a specific Ethernet protocol is selected.

You will find more detailed information about the protocol specific field settings in the sections for each individual network protocol.

# Protocols

## Thru from other port

“Thru from other port” is not really a protocol; it simply duplicates the DMX data that is present on the other port, making it a “thru” port. This option is only available when the port mode is set to DMX Out and the other port is set to DMX In. The universe field and other associated protocol fields have no meaning for the port that is set to “Thru from other port”.

If you would like both ports to output identical DMX data from one Ethernet source, set the ports to the same protocol and protocol settings.

## Art-Net

The Art-Net protocol was placed in the public domain by Artistic Licence(UK) Ltd. and is currently in its 2<sup>nd</sup> major iteration as Art-Net II. SandNet devices support both Art-Net I and Art-Net II. Many manufacturers have implemented the Art-Net protocol, but to varying degree of compliance with the full specification.

### Art-Net IP Addresses

The Art-Net protocol specifies its primary and default IP address range to be 2.X.X.X and its secondary IP address range to be 10.X.X.X. both with a subnet mask of 255.0.0.0.

#### **WARNING!**

**2.X.X.X is a routable IP address range i.e. it can proliferate through routers and go out on the Internet.**

**It is therefore important not to connect any device using this address range to a network that has contact with the internet.**

10.X.X.X is a private , non-routable IP address range i.e. traffic in this address range will be contained within the local network and will not go out and disturb the Internet.

SandNet devices support Art-Net’s default method automatic allocation of IP addresses based on an algorithm using the MAC address and the Art-Net OEM code.

You can allocate an IP address in the 2.X.X.X or 10.X.X.X address ranges using this method by entering 2.0.0.0 or 10.0.0.0 respectively in the IP field of the Set IP window and click OK. This will produce an IP address based on this algorithm and also set the subnet mask to 255.0.0.0.

Art-Net also allows what the Art-Net II document t refers to as “Custom IP addresses”; which means anything but the 2.X.X.X and 10.X.X.X address ranges.

Art-Net’s ArtDmx packets are transmitted by IP broadcast as default, but unicast is also allowed. Unicast is a recent addition to Art-Net to remedy the problems that broadcast create in busy networks and is mostly employed in networks carrying a large number of universes.

The Art-Net II document states: Use of unicast only is mandatory for systems using greater than 30 universes.

SandNet devices will receive Art-Net both as broadcast and unicast, but transmit as broadcast only.

SandNet devices will use a transmit broadcast address based on the IP and subnet Mask settings.

A SandNet device transmitting Art-net and set to IP in the 2.X.X.X address range with a subnet mask of 255.0.0.0 will use the broadcast address 2.255.255.255.

A “Custom IP Address” of 192.168.0.100 and a subnet Mask of 255.255.0.0 will result in a local broadcast address of 192.168.255.255.

SandNet devices transmitting Art-Net will do a global broadcast on address 255.255.255.255 if the subnet mask for the device is set to 0.0.0.0.

**WARNING: Note that some Ethernet switches have broadcast storm protection i.e. they will not pass the type of broadcasts that Art-Net represents. Some managed switches can disable the broadcast storm prevention function. Another solution to this problem is to use unicast if the Art-Net source is capable that.**

### **Art-Net Sub-Net and Universes**

Art-Net’s maximum of 255 DMX universes is organized in 16 Art-Net Sub-Nets, not to be confused with an IP subnet mask, and 16 Art-Net Universes for each the Art-Net Sub-Nets.

The SandBox and SandPort use a decimal notation of 0 to 15 for the subnet and universe numbers.

Both the Art-Net Sub-Nets and Art-Net Universes have unfortunately been subject to different notation by various manufacturers. Older SandBoxes used a 1 – 16 notation for the universes. Some equipment may use hexadecimal notation. A conversion table is below.

0-15	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0-F	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
1-16	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

### **E1.31 “Streaming ACN”**

Streaming ACN’s official name is “ANSI E1.31-2009 Entertainment Technology – Lightweight streaming protocol for transport of DMX 512 using ACN”.

If you use SandNet devices to “tunnel” DMX from SandNet device(s) to SandNet device(s) over an Ethernet network we recommend using this protocol as it is by far the most efficient and network friendly protocol available for “DMX over Ethernet” applications.

The SandNet devices support the released version as well as a draft version identified by “Draft r.20 10/4/2006”. This draft version was implemented in several manufacture’s products before the standard became official. When configuring a port as a DMX input, you must select the specific version to output onto the network.

When a port is configured as a DMX output, it can respond to both formats. If you want a port to listen to both the draft and standard versions of Streaming ACN, select “E1.31-Draft sACN”. However, if you only want to listen to the standard version, select “E1.31-2009 sACN” as the protocol.

### **Streaming ACN IP addresses**

IP address allocation for Streaming ACN devices are specified in “ANSI E1.30-7-2009 EPI 29 Allocation of Internet Protocol Version 4 Addresses to ACN Hosts”. This standard document is available to download free of charge from the technical standards section of The Entertainment Services & Technology Association’s (ESTA) website:

[www.esta.org](http://www.esta.org).

SandNet devices support two of the address methods allowed by E1.30-10-2009; DHCP and manually set static IP addresses.

Using DHCP requires that there is a DHCP server on the network; the SandNet devices do not themselves provide a DHCP server.

Streaming ACN uses multicast for its communication and it is necessary that network hardware supports IGMP 2 or 3 (Internet Group Management Protocol).

Streaming ACN uses multicast for its communication and it is necessary that network hardware supports IGMP 2 or 3 (Internet Group Management Protocol).

Notable typical exceptions are many industrial type Frequency Hopping Spread Spectrum (FHSS) wireless Ethernet systems; as opposed to the Direct Sequencing Spread Spectrum that is used in 802.11 / WiFi equipment.

### **Streaming ACN Universes**

Streaming ACN use universe numbers from 1 through 63999. Universe 0 and universes above 63999 are reserved for special purposes.

### **Hydra-Net**

Hydra-Net is a protocol used by LT-light consoles from Ben-Ri Electronica S.A. in Spain and the 8700 Series and Piccolo consoles from Leviton in the US.

Note that these consoles typically include an internal setup utility that allows discovery and configuration of SandNet devices directly from the consoles.

### **Hydra-Net IP addresses**

This protocol does not use IP addresses for its communication; it uses an IPX protocol that communicates between MAC addresses. It is however good practice to assign valid IP addresses to all devices in a LT-light network to allow firmware up-loads etc.

### **Hydra-Net Net# and Universes**

Hydra-Net is organized in Hydra Net #, a logical grouping ranging from 0 to 9, each with 8 possible universes numbered 1 through 8.

### **Pathport**

The Pathport protocol is supported using the 128 “Standard Universe” patches or the “Quick Patch” mode.

Sourcing custom patches is not supported.

When a SandBox/SandPort is configured to use the Pathport protocol, it will appear in Pathway’s PathportManager configuration tool, where many of the device’s settings will be displayed. However, the SandNet devices do not respond to configuration commands from PathportManager. All configuration must be done via the Sand Device Browser.

### **Color-Net II**

Color-Net II is a protocol used by a variety of Leviton control consoles, dimmers, and Network Protocol Converters.

### **Color-Net II IP addresses**

Color-Net II specifies DHCP as its primary address allocation method and secondarily, in absence of a DHCP server, an IP address in the 100.X.X.X address range derived from the device MAC address with a mask of 255.0.0.0. Color-Net II devices also allow use of static IP addresses outside the 100.0.0.0 range.

**WARNING! 100.X.X.X is a routable IP address range i.e. it can proliferate through routers and go out on the Internet. It is therefore important not to connect any device using this address range to a network that has contact with the internet.**

The SandNet devices will allocate an address and mask according to the above secondary method if the IP address is set to 100.0.0.0 in the set IP window and confirmed with a click on the OK button. Typical setup for Color-Net II includes enabling DHCP and setting the fall-back IP to 100.0.0.0 as described above.

### **Color-Net II Universes**

Color-Net II uses universe numbers from 1 to 255.

# Firmware Up-Load

## Preparation

All SandNet devices support up-load of new application firmware over the network connection. The up-load utility and the latest firmware can be found in the download section of our website:

[www.sandsys.com](http://www.sandsys.com)

The up-load utility file for the AAA2/100 model devices is EMXUpload.exe. It requires no installation process and will run under Windows XP, Windows Vista, or Windows 7.

The firmware file name for AAA2/100 type devices will be in the format “sandbox\_X\_X\_X\_X.dli” or “sandport\_X\_X\_X\_X.dli”, X\_X\_X\_X being the version number e.g. 2\_0\_1\_2.

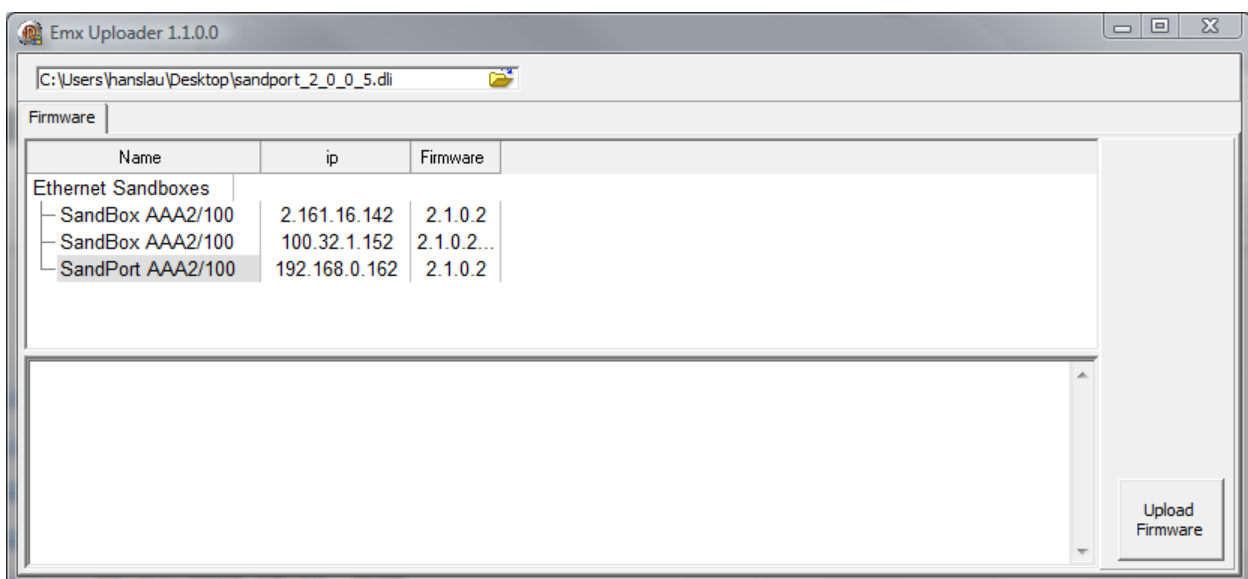
Make sure that the firmware you want to upload is correct for your device and readily available on the PC that you use to run the up-load utility.

The PC running the EMXUpload.exe application and the SandNet devices have to be on the same local network and be in the same IP address range.

It is advisable to perform the firmware upload process with minimal other network traffic.

## Operation

Running the up-load utility will bring up a window with a file select field at the top and below that a list of all SandNet devices on the network. The list will include the device user name, the IP address, the MAC address, and the current firmware version for each device.



Click on the file icon in the file select field to bring up the open file dialog. Browse and select the desired firmware file and then click the OK button. This should bring the selected file name and path into the file select field.

Click on the Sandnet device you want to up-load new firmware to so that the background of one of its fields is dark gray; then click the “Upload Firmware” button.

The lower window of the up-load utility will display in detail the ongoing process until it has finished.

# Default Configuration

## Default Configuration Button

All SandNet AAA2/100 devices have a “Default Config” button. This button will allow various operations related to loading of factory default user settings and other programming functionality.

### **Warning!**

The Default Config button has special functionality, including erasing the device firmware, at power up and for up to about 10 seconds after power-up while the Heartbeat/Status LED is on solid. This functionality is beyond normal user operations and should only be performed by trained personnel or as instructed by factory tech support; see “Firmware Erase” and “Factory Only” below.

## Load Factory Default User Settings

You can load the factory default user settings by pressing the “Default Config” button (about 5 seconds) until the Heartbeat / Status LED starts to blink as a fast rate and then release the button.

### **Warning:**

The device has to be powered for at least 10 seconds and the Heartbeat/Status indicator blinking at normal rate before you perform this operation; pressing the ”Default Config” button before 10 seconds after power-up will take the device into other configuration settings.

The following settings will revert to factory defaults:

- Device Name: Device Model Name e.g. “SandBox AAA2/100”  
IP: 192.168.0.162  
Mask: 255.255.255.0  
DHCP: Disabled  
Port 1 & 2 Mode: Disabled  
Port 1 & 2 Protocol: Streaming ACN  
Port 1 Universe: 1  
Port 2 Universe: 2  
LED: Enabled

## Firmware Erase

### **Warning!**

This should only be performed by trained personnel or as instructed by factory tech support.

You can erase the device application firmware and force the SandNet device to load the Firmware Up-loader by momentarily pressing the Default Config button within 3 seconds after power up and while the Heartbeat/Status LED is on solid. The LEDs on the device will start a chase pattern to indicate that you are in this state. You can only recover from this state by up-loading new firmware to the device.

## **Factory Only**

### **Warning!**

This should only be performed by trained personnel or as instructed by factory tech support.

Pressing and holding the Default Config button on power-up will set the device in a state for factory programming. All LEDs will be off. You can recover from this by cycling power to the device.