

21 Networking Consoles

21.1 Networking Consoles

There are a number of ways for the console to communicate with lighting fixtures beyond the traditional DMX sockets, and these are described in this chapter.

If the console has multiple network ports, DMX will be output on all ports. You can set this from the **DMX module properties** (Section 19.6.1) in the DMX Settings window, each port is listed with a switch to enable or disable it.

You can also connect to **networked processing nodes** (Section 18.1), which allow you to control up to 64 universes of DMX.

The console may also be networked with other Titan consoles for multi-user control, and for backup.

At the end of the chapter is a section which aims to cover **the basics of IP addressing** (Section 21.6), which is essential for various features on the console such as Art-Net.

Lighting networks need to transfer of large amounts of data. For best reliability you should use network wiring which is dedicated to the lighting system and physically isolated from other networks, and uses simple hubs rather than intelligent switches.

Connecting to an existing network with other network traffic is possible but can lead to problems both with the lighting equipment and with other IT equipment on the network. Managed Ethernet switches may drop or block lighting data. If you need to do this please read about the IP addresses you should use in **the IP addressing guide** (Section 21.6).

21.2 Connecting the Diamond 9 or Arena to a network

The Diamond 9 and Arena consoles are different to the other Titan consoles because they have a built-in network switch and an optical network connection. **This section applies only to the Diamond 9 and Arena consoles.**

21.2.1 Optical Connections

The optical network connector is a Neutrik opticalCON which uses multimode fibre. On the Arena the connector is a Duo, a single connector is fitted as standard, but a second can be fitted on request. On the Diamond 9 the connector is a Quad with one of the two pairs populated as standard - if the optional 10GbE Ethernet is fitted then the second pair is populated with a 10GbE fibre.

The stage end of the connection normally plugs into the Avolites TitanNet Switch (TNS) rack unit which provides standard wired Ethernet connections. If you want to connect to a different optical switch you should contact Avolites for advice.

21.2.2 Wired Ethernet Outputs

The Diamond 9 console has an in-built 1Gb Luminex network switch; the Arena console has an in-built 1Gb TitanNet switch (TNS). These are directly connected to the console Main board on network connection 1. The network switch has 4 ports available on the back of the console.

The mainboard Network Connection 2 is available on a separate etherCON connector at the back of the console and marked as “secondary Ethernet” on the back. We recommend that this should only be used if you need to connect to two different networks, for example the show network and an office network for documentation.

The Diamond 9 can be fitted with a 10GbE port as an optional extra.

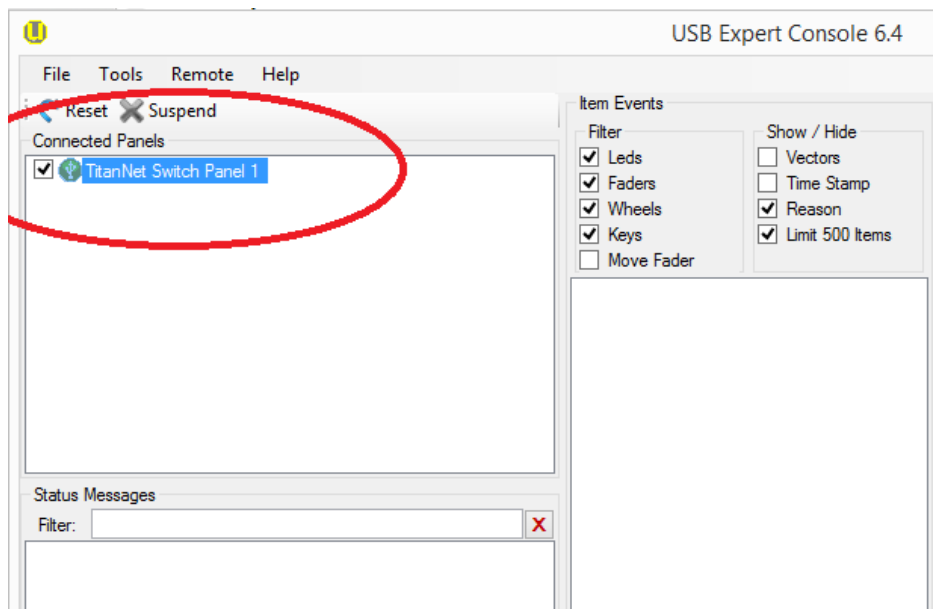
The network switch and the controller for the switch both use an IP address. When the controller IP address is set, the network switch will use the next one (for example controller 10 . 19 . 0 . 50, network switch becomes 10 . 19 . 0 . 51)

21.2.3 Changing the IP address of the Titan Network Switch (TNS)

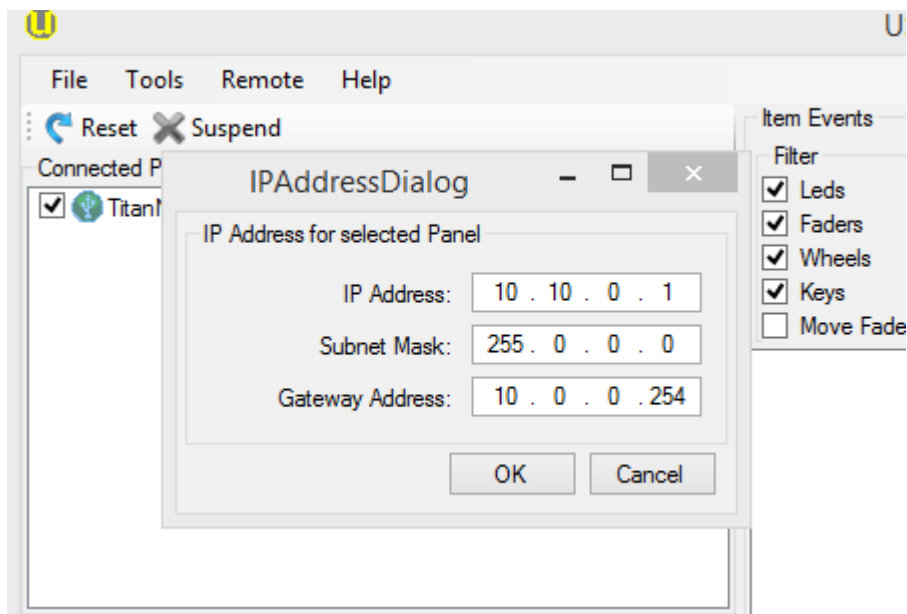
The controller and network switch IP address do not need to be changed unless they overlap other devices on the network. The factory default is 10 . 19 . aa . bb where aa . bb is the serial number of the console (e.g. 10 . 19 . 01 . 124 is serial number **379** or **255+124**).

To change the IP address of the TNS in the console:

1. Open **USB Expert Console** from the **Tools** menu.
2. Select the TNS panel



3. In the **IP Address Dialog**, set the new IP address.



21.2.4 Power and UPS behaviour

The network switch in the console runs from the same UPS as the console itself, so if power fails the switch will continue working.

When you power down the console, the UPS will continue to power the internal switch for about 5 minutes, or until mains power is removed. This is to allow you to restart the console without interrupting the network (for example if you have connected a backup console via the inbuilt switch).

21.3 Controlling Fixtures over a Network

Before the console can talk to another device over the network, it has to be given a unique network address. This is called its “IP address”.

21.3.1 Setting the console’s IP address

We recommend that you use the console’s automatic IP setting function. However, if you need to you can also set a manual IP address. See [Setting your IP address](#) for details of how IP addressing works.

1. Go to the **System** menu (press <Avo> + <Disk>) and press [Network Settings]
2. Press [Local Area Connection] (some consoles have more than one network connection, so you may have different connections to choose from)
3. Check [Subnet Mask] is set to 255 . 255 . 255 . 0
4. Press [Set IP 2 . * . * . *]
5. Press [Save settings]
6. Press <Exit> to leave the system menu.

- Some Art-Net equipment may operate on a fixed IP address range of 2 . * . * . * or 10 . * . * . *, in which case you will need to also set the console within the same range, but most equipment can be set to any address.
- If you need an address range other than 2 . * . * . * or 10 . * . * . * you can press [IP Address = ...] and enter the address with the numeric keypad.

21.3.2 Setting up DMX outputs

Titan can control 64 DMX universes (see **DMX Output Mapping (Section 19.6)** for details), except when used with T1 / T2 / T3 hardware when it is limited to one, two, and sixteen universes respectively. The Titan Go software (with AvoKey) will output one universe over Art-Net or sACN. The Titan Simulator software (with AvoKey) will output all universes over Art-Net or sACN, but periodically random DMX values will be sent down all DMX outputs as a “spoiler”.

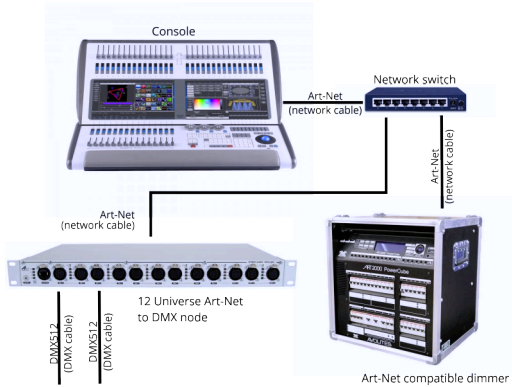
Within the console, you patch fixtures to one of 64 output lines. You connect console output lines to network universes using the **DMX Settings menu (Section 19.6.1)**. Often you will simply allocate console line 1 to network universe 1, line 2 to universe 2 and so on, but there are times (for example if using a house rig with a touring show) when you might need to allocate the lines differently.

21.3.3 Example of a simple Art-Net system

There are two main systems for sending lighting control information over a network, Art-Net and sACN. Titan supports both; in this section we will describe how to set up a system using Art-Net.

Art-Net is not specific to one range of products, and is recognised and implemented by a growing number of manufacturers. Many products (such as Dimmers and Moving lights) can accept the Art-Net signal directly, so there is no need to convert the signal to DMX. Most people will, however, need to output DMX to their equipment and this can be done using an Art-Net to DMX converter (often called a **Node**).

In the following diagram, an Art-Net compliant Console (such as a Titan console) is connected via a network switch to an Art-Net compatible dimmer and a rackmount DMX conversion node.



Once the system is connected together, the devices can be configured.

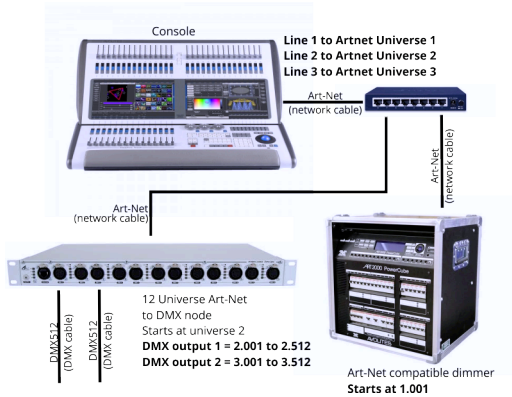
- On the Dimmer, set the start address of 1.001 (Address 001 on universe 1)
- On the DMX node, set start at universe 2 so it will convert universes 2-13 to DMX512 on its 12 outputs

The **DMX Settings menu** (Section 19.6.1) on the console is used to set which DMX line on the console is output to each Art-Net universe (1-256). Each console line may be output to multiple universes (including the physical connectors on the console) depending on how your devices are connected.

If everything is connected right, you should see each universe of the Dimmer and the DMX node show up as connectable devices on the left hand side of the DMX Settings window. The devices will tell the console what universe they are set to receive.

So we do the following:

- Click on the first universe of the dimmer on the left of the window, then click Line 1 on the right to connect it.
- Click on the first universe of the DMX node on the left of the window, then click Line 2 on the right to connect it.
- Click on the second universe of the DMX node on the left of the window, then click Line 3 on the right to connect it.



Now on the console when you patch, you will patch the dimmer channels on addresses 1.001 - 1.024, the fixtures on the first output of the 12-way DMX node will be on addresses 2.001 - 2.512 and the fixtures on the second output will be on addresses 3.001 - 3.512.

- Press the small {Cog} button on the Art-Net device to show a properties window. See [Art-Net settings \(Section 19.6.2.3\)](#) for an explanation of the settings.

“Unpolled” and “unknown” devices may appear as Art-Net nodes.

- An unpolled device is a ‘rolling extra’ which allows more than 4 connections to be made to a particular Art-Net device. The Art-Net specification only allows each device to advertise a max of 4 universes so if you need to add more the console has to invent the 5th, 6th, etc universes.
- An unknown device is one which doesn’t format an Art-Net poll reply properly so the console doesn’t know if it is an input or output device.

21.3.4 Additional Art-Net Resources

To find out more information about Art-Net please refer to the Art-Net Standard published by [Artistic Licence](#).

21.4 Using Active Fixtures with CITP

CITP is a standard system allowing lighting devices to communicate and share information. This is often used with media servers to allow the console to get media thumbnail images and layer information from the server. The thumbnail images can then be used on the console to select media clips.

This section does not apply to Ai media servers which use the Synergy system to communicate with Titan consoles.

21.4.1 Example C1TP setup

This example shows how to set up a Hippotizer with Titan.

1. Connect the console and Hippotizer to the network. (You can connect the Hippotizer directly to the console, if no other devices are being connected, using a crossover patch cable).
 2. Set up the IP addresses and subnet masks of the console and Hippo so that they are on the same address range, for example 192 . 168 . 0 . 1 and 192 . 168 . 0 . 2.
 3. If you are using Titan PC Suite (Titan Go or Titan Simulator) ensure the firewall on your PC is disabled. Also ensure the Hippo machine is not running a firewall.
 4. Run the Hippo system. Make sure the C1TP component is running.
 5. Go to the **System** menu (<Avo> + <Disk>) and select [DMX Settings].
 6. On the left hand side under Art-Net you should see the Hippo with its IP address. Click on it and then on the right hand side click on the DMX line you want to use it with.
 7. On the assigned Hippo node on the right hand side, click the {Cog} button and set the Universe number to match the universe setting on the Hippo.
 8. Press <Exit> to go back to the default menu.
 9. Restart the console software using the option on the Tools menu (for Titan PC Suite (Titan Go or Simulator) just close and restart the Titan software).
 10. Go into Patch mode and select [Active Fixtures]. You should see the Hippo with its IP address as a softkey option.
 11. Select the Hippo, then set the DMX line to match the line you set in Step 6.
 12. Press an empty fixture handle to patch. The console will automatically patch the required layers and master layer as a series of fixture buttons.
 13. Now if you select a fixture and open the Attribute Editor window you should see the media thumbnails.

The next time you start the system, ensure the Hippo is powered up before you start the console.

If you decide to re-patch to a different DMX address you will need to re-start the Hippotizer software. You will also need to reset the Art-Net nodes if you are moving across DMX lines.

21.5 Network Ports used by Titan

Titan uses the following ports over the network. If your network includes firewalls you might need to know these so you can set up rules for them.

Protocol	Port	Address	Notes
TitanNet	TCP 808	All available adapters	Titan Remote, TNPs, multi-user and backup.
HTTP	TCP 4430	All available adapters	WebApi

Protocol	Port	Address	Notes
SLP	UDP 427	Multicast 239.255.255.253	Used to discover TitanNet devices on the network.
Ping	ICMP echo	Any adapters that are in use	Monitors connection to TitanNet devices.
Art-Net	UDP 6454	By default all wired adapters	
sACN	UDP 5568	Multicast 239.255.0.0-239.255.249.255	
CITP	UDP 4809/TCP	Multicast 224.0.0.180	Used for communication with Capture Visualiser and media servers. Discovery done by multicast UDP then negotiates TCP connection
RDMNet	UDP 5569		
ProDJ Tap	UDP 60000-60002, 65023-65535		Protocol for getting data from Pioneer DJ equipment by software now known as TC-Supply
LiveDMX	UDP 5584	Multicast 239.184.0.0-239.184.249.255	Used for internal Visualiser DMX data
NTP	UDP 1234	Between TitanNet hosts	Non-standard NTP port
NDI	UDP 5353	Multicast between NDI sources and Panel	mDNS for NDI source discovery
NDI	UDP 49152-65535	Between NDI sources and the Panel	NDI video streams

21.6 A quick guide to IP addressing

Every device on a network must have a unique IP address. IP addresses have the format $w . x . y . z$ where w , x , y and z are numbers between 0 and 255, for example $192 . 168 . 0 . 1$. The address can be set manually (this is called a **Static** IP address) or can be automatically allocated by the network (using a system called

DHCP). In lighting networks static addressing is normally used, it takes a bit more time to set up but you then know for sure what the address is for each device.

For devices to be able to “see” each other on the network, they must be in the same **Subnet** - this is the first part of the IP address. Each device has a **Subnet Mask** which sets the parts of the IP address which must match for the devices to be able to see each other, and which parts must be different.

Subnet Masks are often set to 255 . 255 . 255 . 0 which means that the w x and y numbers must match but the z number must be different. So if the console was set at 192 . 168 . 1 . 1 then the subnet would be 192 . 168 . 1 . z and all the other devices would be 192 . 168 . 1 . 2, 192 . 168 . 1 . 3 and so on.

If your IP address is allocated by DHCP then the Subnet Mask is set automatically. Subnet masks are sometimes referred to as /24 or /8, this is the number of bits set to 1 in the mask. Each number in the mask is 8 bits so 255 . 255 . 255 . 0 can also be called /24, or 255 . 0 . 0 . 0 . would be /8.

21.6.1 Choosing an IP address and Subnet Mask

This is the hardest part of setting up a network as a suitable IP address totally depends on what you are using on the network and what IP addresses you can and cannot change. Some older Art-Net equipment is fixed to the address range 2 . x . y . z or 10 . x . y . z which means everything else has to use that range as well. But if none of your equipment is fixed, the address range 192 . 168 . 1 . x is often used.

Below are a number of example scenarios for standard lighting networks using a Titan console and what IP addresses should be set. *These aren't guaranteed to work but try them if the scenario matches your network.*

Titan and TNP with all output operating as standard DMX

Device	IP Address	Subnet Mask
Titan Console	192 . 168 . 1 . 30	255 . 255 . 255 . 0
TNP	192 . 168 . 1 . 31	255 . 255 . 255 . 0

Titan outputting over Art-Net Fixtures (and DMX)

Device	IP Address	Subnet Mask
Titan Console	10 . 100 . 100 . 100	255 . 0 . 0 . 0
Art-Net Fixtures	10 . x . y . z *	255 . 0 . 0 . 0

(the 2 . x . y . z range can also be used for Art-Net if required but see section on Private Address ranges

below).

* Where a combination of x , y and z are unique for these fixtures.

Titan and TNP outputting over Art-Net (and DMX)

Device	IP Address	Subnet Mask
Titan Console	2.100.100.100	255.0.0.0
TNP	2.100.100.101	255.0.0.0
Art-Net Fixtures	2.x.y.z *	255.0.0.0

Alternatively:

Device	IP Address	Subnet Mask
Titan Console	10.100.100.100	255.0.0.0
TNP	10.100.100.101	255.0.0.0
Art-Net Fixtures	10.x.y.z *	255.0.0.0

* Where a combination of x , y and z are unique for these fixtures.

It's best to avoid using 255 in the IP address because if the unmasked part of an IP address is set to 255, this acts as a broadcast address (for example 192.168.1.255 would be a broadcast address if the mask is 255.255.255.0, or 10.255.255.255 would be broadcast if the mask is 255.0.0.0).

21.6.2 If your network is connected to the internet

If at all possible you should use a dedicated network for lighting with no external connections. However if your network has to be connected to the internet it is important to use one of the following ranges of **private** IP addresses. These are special IP addresses that will not be routed onto the internet. They are:

Start Address	Final Address	Subnet Mask
10.0.0.0	10.255.255.255	255.0.0.0 (/8)
172.16.0.0	172.31.255.255	255.240.0.0 (/12)
192.168.0.0	192.168.255.255	255.255.0.0 (/16)

For Art-Net, the 10.x.y.z range may need to be used if you have devices which are fixed to this address range.