ADDER®

AdderLink Infinity 100T

User Guide

Experts in Connectivity Solutions

ADDER®

KVM Extension Solutions

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Introduction

WELCOME

Thank you for choosing the AdderLink Infinity (aka ALIF) family of high capacity digital extenders/switches. By encoding high quality DVI video, digital audio and USB data into Internet Protocol (IP) messages, ALIF units offer flexible ways to link peripherals and systems via standard networks.

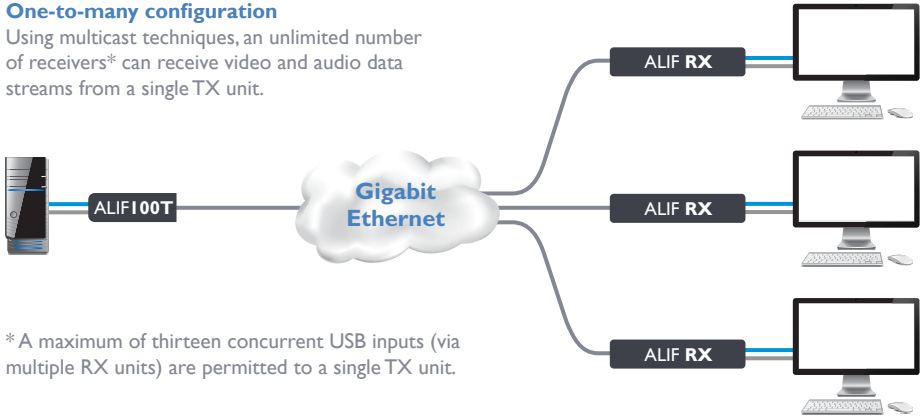
This guide covers the ALIF100T unit, a highly compact dongle which can be attached to its host computer and transfer single link DVI video and USB signals across your network.

One-to-one configuration

The simplest configuration links one RX unit to a single TX unit, either by a direct link or over much greater distances via a high speed network.

One-to-many configuration

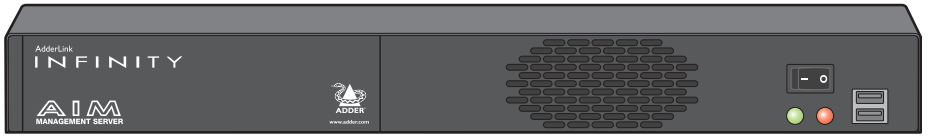
Using multicast techniques, an unlimited number of receivers* can receive video and audio data streams from a single TX unit.



* A maximum of thirteen concurrent USB inputs (via multiple RX units) are permitted to a single TX unit.

ALIF and A.I.M.

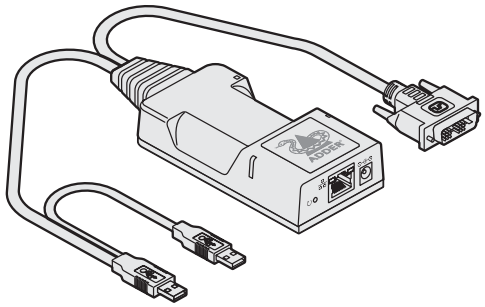
Where multiple ALIF units are used on a network, we have developed the AdderLink Infinity Management (A.I.M.) server to allow comprehensive and secure central control of all transmitters, receivers and users.



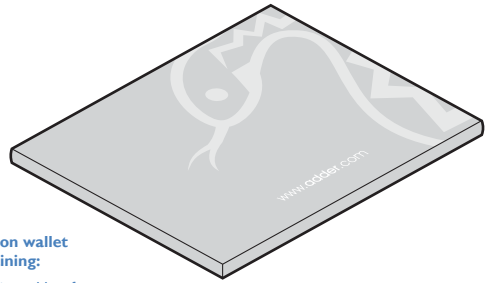
When using an A.I.M. server to configure ALIF units, it is vital that all ALIF units that you wish to locate and control are set to their factory default settings. Otherwise they will not be located by the A.I.M. server. If necessary, perform a factory reset on each ALIF unit.

Please also see Appendix C - Tips for success when networking ALIF units

SUPPLIED ITEMS



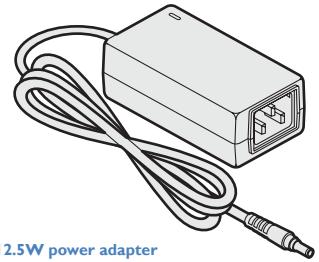
ALIF100T unit



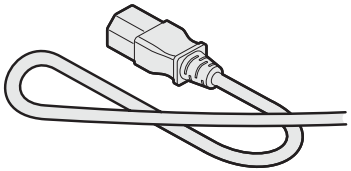
Information wallet containing:

Four self-adhesive rubber feet
Quick start guide
Safety document

OPTIONAL EXTRAS



12.5W power adapter
Part number: PSU-IEC-5VDC-2.5A



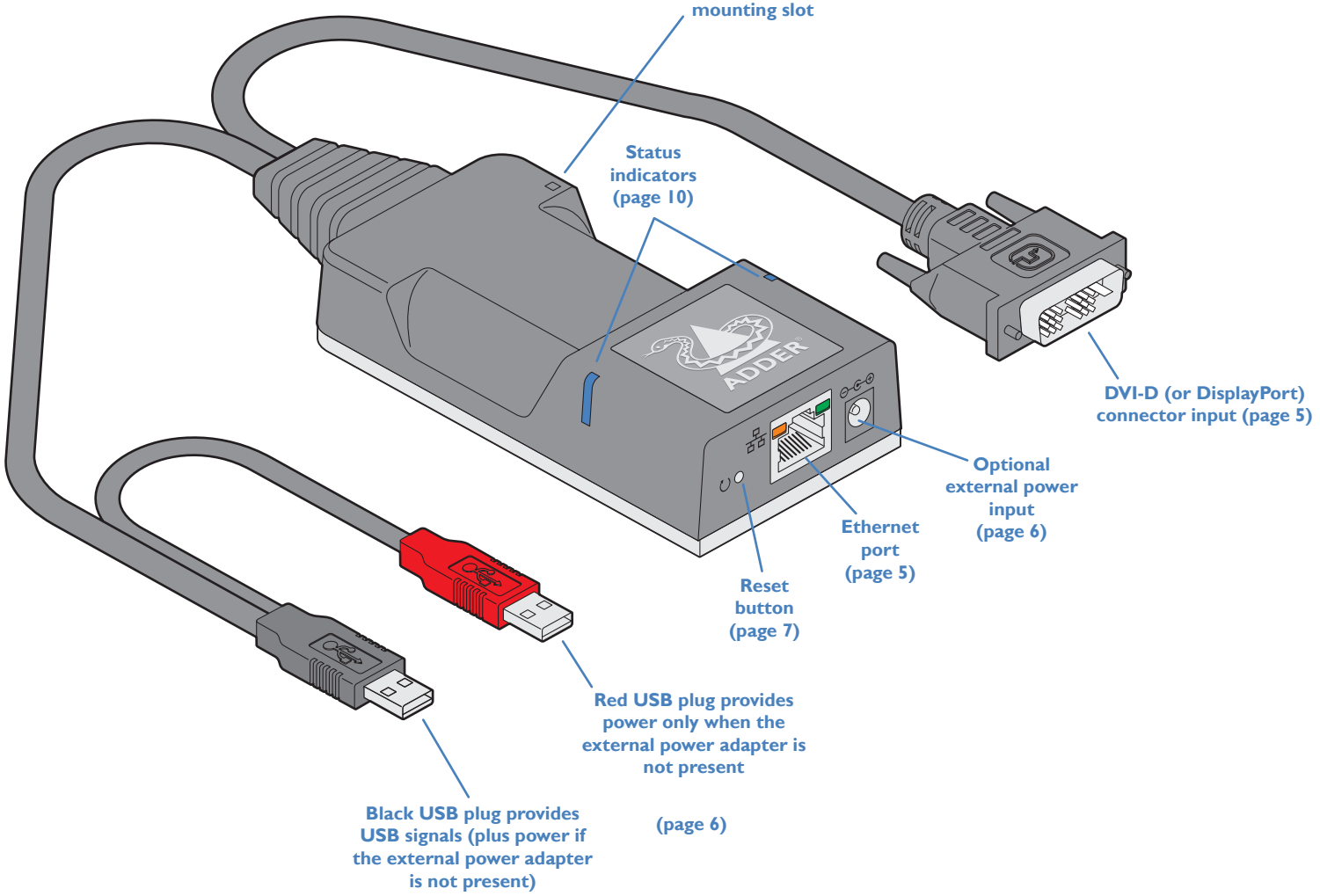
Country-specific power cords

CAB-IEC-AUS	*(Australia)*
CAB-IEC-EURO	*(Europe)*
CAB-IEC-UK	*(United Kingdom)*
CAB-IEC-USA	*(United States)*

Installation

CONNECTIONS

Installation involves linking the ALIF100T unit to various ports on the host computer, while the ALIF RX unit is attached to your peripherals:



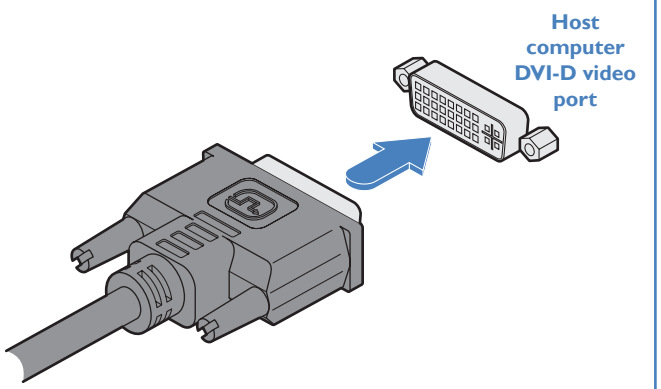
Video link

Each ALIF100T unit is supplied with either a DVI-D (single link) or a DisplayPort™ video connector. Video signals at pixel clocks up to 165MHz (equivalent to a maximum resolution of 1920 x 1200 at 60Hz) are permissible.

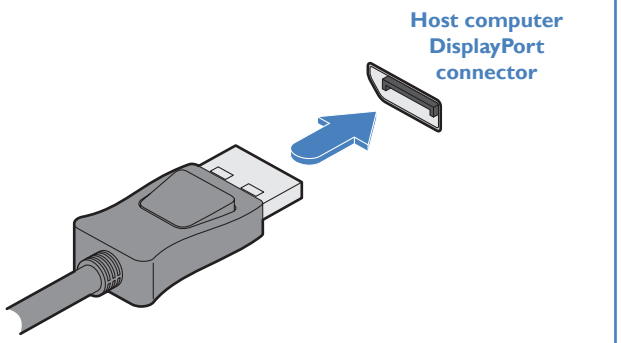
To make a video link

1 Connect the ALIF100T video connector to the DVI-D or DisplayPort™ socket of the host computer:

ALIF100T DVI-D model



ALIF100T DP model



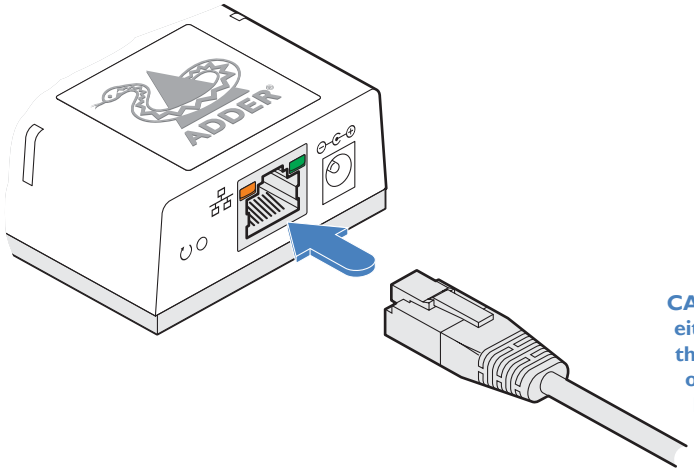
Network link

ALIF transmitters and receivers can either be connected directly to each other or via a high speed network.

A single Gigabit Ethernet port is located on the front panel. For direct links via Ethernet cable, the length of cable should not exceed 100 metres (328 feet). Network cables used for connections may be category 5, 5e, 6 or 7 twisted-pair cable. The ALIF100T unit has an autosensing capability on its network interfaces, so for direct point-to-point connections, no 'crossover' Ethernet cable is required.

To link the ALIF100T unit

1 Connect a CAT 5, 5e, 6, or 7 cable to the Gigabit Ethernet socket on the front panel of the ALIF100T unit.



2 Connect the other end of the cable either directly to an ALIF receiver or to a Gigabit Ethernet switch, as appropriate.

3 [For connections via a network] repeat steps 1 and 2 for the other ALIF unit(s).

Please see Appendix C for important tips about networking ALIF units.

USB and power connections

The ALIF100T unit is designed to be as flexible as possible. It can either operate using an optional external power adapter (see page 3) or derive all of its power from its two USB plugs. The main advantage offered by using an external power adapter is that it allows the ALIF100T unit to be active before the host computer; thus allowing a remote user to access the host's initial boot up and access the BIOS menu, when required.

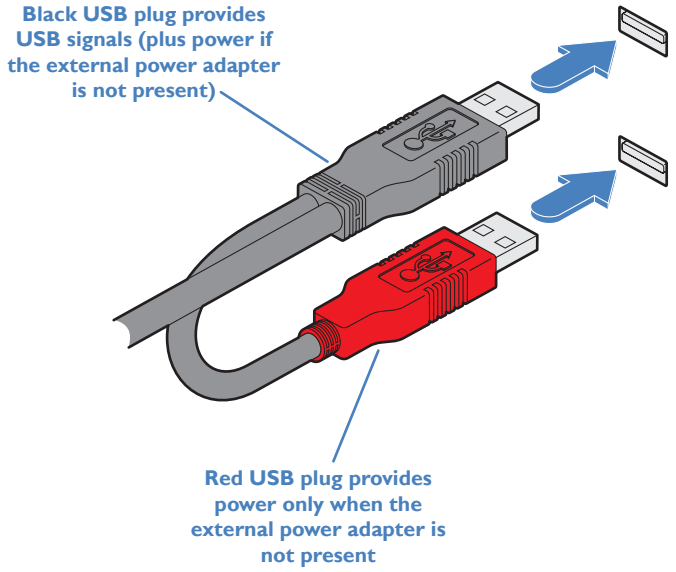
If powered by USB only, then both the black and red USB plugs need to be connected.

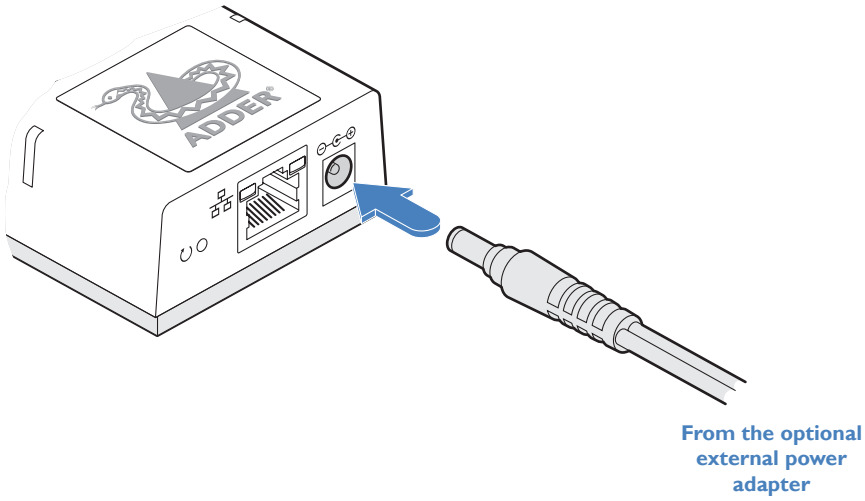
If powered by external power adapter, only the black USB plug needs to be connected, for signal purposes. Whenever, the external power adapter is attached and operating, then power will be taken from it rather than the USB plugs. There is no problem if the red USB plug remains connected while the power adapter is used.

This is summarized as follows:

Power adapter	Black USB	Red USB	Power sourcing behavior
✗	✓	✓	*Power taken from both USB plugs.*
✓	✓	✗	*Power taken from power adapter only.*
✓	✓	✓	*Power taken from power adapter only, unless it becomes unavailable, in which case power will be taken from both USB plugs after a short interruption.*

Note: The USB plugs do not operate as a seamless failover for the external power adapter; there will be a short interruption as operation switches from one power source to the other.





Configuration

INITIAL CONFIGURATION

ALIF units are designed to be as flexible as possible and this principle extends also to their configuration.

Direct linking

Where ALIF transmitters and receivers are directly linked to each other, very little configuration action is required, provided that they have their factory default settings in place. If the standard settings have been changed in a previous installation, you merely need to perform a factory reset on each unit.

Networked linking

Where ALIF units are connected via networked links, you can either configure them individually, or configure them collectively using an A.I.M. server:

- **Configuring networked ALIF units individually** - You need to specify the network addresses of the ALIF units so that they can locate each other. This is done by running the AdderLink Infinity browser-based configuration utility on a computer system linked to the same network as the ALIF units.
- **Configuring ALIF units collectively** - The AdderLink Infinity Management (A.I.M.) server allows you to configure, control and coordinate any number of ALIF transmitters and receivers from a single application.

IMPORTANT: When using A.I.M. to configure ALIF units, it is vital that all units that you wish to locate and control are set to their factory default settings. Otherwise they will not be located by the A.I.M. server. If necessary, perform a factory reset on each ALIF unit.

Please also see Appendix C - Tips for success when networking ALIF units

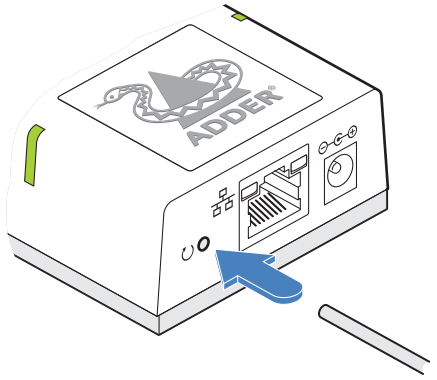
Manual factory reset

A factory reset returns ALIF100T unit to its default configuration. You can perform factory resets using the AdderLink Infinity browser-based configuration utility or by using this direct manual method.

To perform a manual factory reset

1 Power on the ALIF100T unit.

2 Use a narrow implement (e.g. a straightened-out paper clip) to press-and-hold the recessed reset button on the front panel for roughly fifteen seconds, until the indicators turn **blue** *(Note: alternating red/green indications will occur during the fifteen second period while the button is still pressed).*



Use a straightened-out paper clip to press the reset button for roughly 5 seconds

3 Release the reset switch.

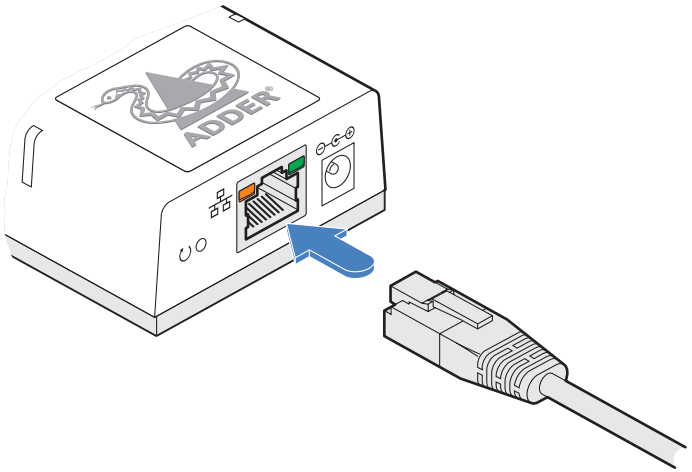
The indicators will remain **blue** for a short while (less than ten seconds) while ALIF100T unit configures itself and should then change to **green** if all connections are correct; or **orange** if one or more of the video, USB and/or network links are missing.

AdderLink Infinity browser-based configuration utility

The browser-based configuration utility within all TX and RX units requires a network connection between the ALIF100T unit and a computer on the same network. The configuration utility allows you to perform many important functions. Please see Appendix A.

To connect a computer to access the configuration utility

1 Connect a CAT 5, 5e, 6, or 7 link cable to the network port on the front panel. The port automatically configures itself, so no cross-over cable is required (but is supported if you do use one).



Temporary link from your computer to the ALIF100T network port

2 Connect the other end of the link cable directly to the network port of your computer.

To access the browser-based configuration utility

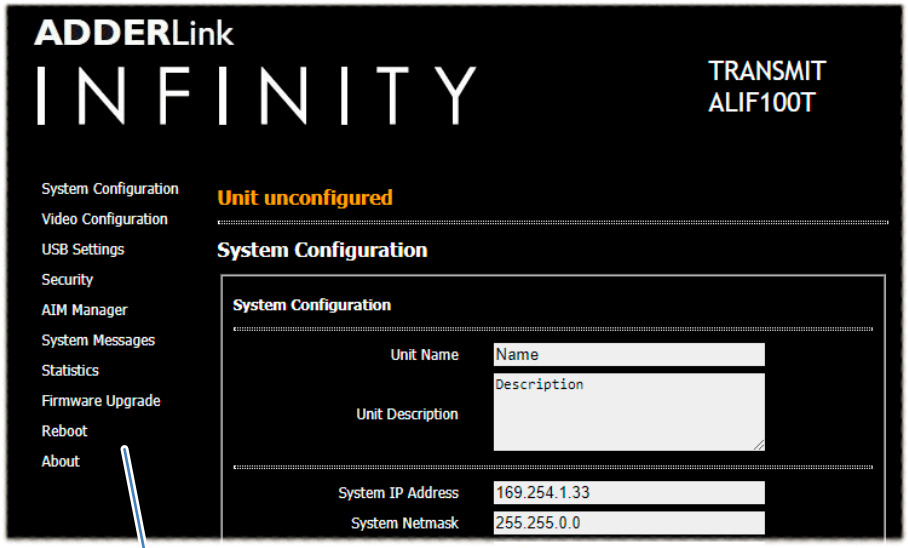
1 Temporarily connect the ALIF100T unit and your computer, as discussed left.

2 Run a web browser on your computer and enter the IP address of the ALIF100T unit:

169.254.1.33

Note: If the IP address of ALIF100T unit has been changed and is not known, providing it is appropriate to do so, perform a manual factory reset to restore the default address.

The opening page of the ALIF configuration utility should be displayed:



Use the menu options to choose the required configuration page

You can find further information about the configuration pages later in this guide:

- Appendix A - Configuration pages

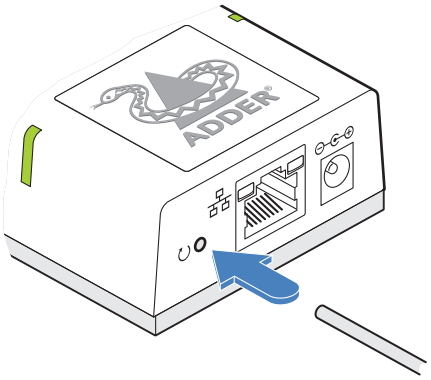
RESTORING A BACKUP FIRMWARE IMAGE

The ALIF100T unit retains a backup image of the previous firmware version in order to provide a fallback in case of any issues with the primary image. The backup image has no video or USB functionality; once invoked, you will need to load an upgrade file using the web interface or via an AdderLink Infinity Manager (A.I.M.) to load a new primary image - see Performing an upgrade (shown right).

To restore the backup firmware image

1 Power on the ALIF100T unit.

2 Use a narrow implement (e.g. a straightened-out paper clip) to press-and-hold the recessed reset button for roughly ten seconds until the indicators flash **green**/**red**.



Use a straightened-out paper clip to press the reset button for roughly 10 seconds

3 Release the reset switch.

The ALIF100T unit will switch to the backup firmware image. Once complete, ALIF100T unit will then continually flash **green**/**red**.

4 Perform an upgrade to reinstate a fresh primary firmware image - see right.

PERFORMING AN UPGRADE

ALIF100T units are flash upgradeable using the method outlined here. However, for larger installations we recommend that you use the AdderLink Infinity Manager (A.I.M.) to upgrade multiple ALIF units. When using the method below, the ALIF100T unit will be upgraded in sequence.

IMPORTANT: Upgrades must be performed equally on transmitters and receivers at the same time. Mixed firmware operation is not supported.

WARNING: During the upgrade process, ensure that power is not interrupted as this may leave ALIF100T unit in an inoperable state.

If the upgrade process is interrupted and fails, it may be necessary to switch to the backup firmware image in order to regain operation. See left for details.

To upgrade a single ALIF100T unit via the network link

1 Download the latest upgrade file from the Adder Technology website.
Note: There are separate upgrade files for ALIF TX and RX units.

2 Temporarily connect the ALIF100T unit and a computer via a network (see AdderLink Infinity browser-based configuration utility section for details).

3 Run a web browser on your computer and enter the IP address of the ALIF100T unit to be upgraded.

4 Click the Firmware Upgrade link. Within the Firmware Upgrade page, click the Choose File button. In the subsequent file dialog, locate the downloaded upgrade file - check that the file is correct for ALIF100T unit being upgraded. The file contains main and backup images, you can choose to upgrade either the Main or the Backup.

5 Click the Upgrade Now button. A progress bar will be displayed (however, if your screen is connected to ALIF100T unit being upgraded then video may be interrupted) and the status indicators on ALIF100T unit will flash while the upgrade is in progress.

6 The indicators should stop flashing in less than one minute, after which ALIF100T unit will automatically reboot itself. The upgrade process is complete.

Finding the latest upgrade files

Firmware files for the ALIF100T units are available from the *Technical Support > Updates* section of the Adder Technology website (www.adder.com).

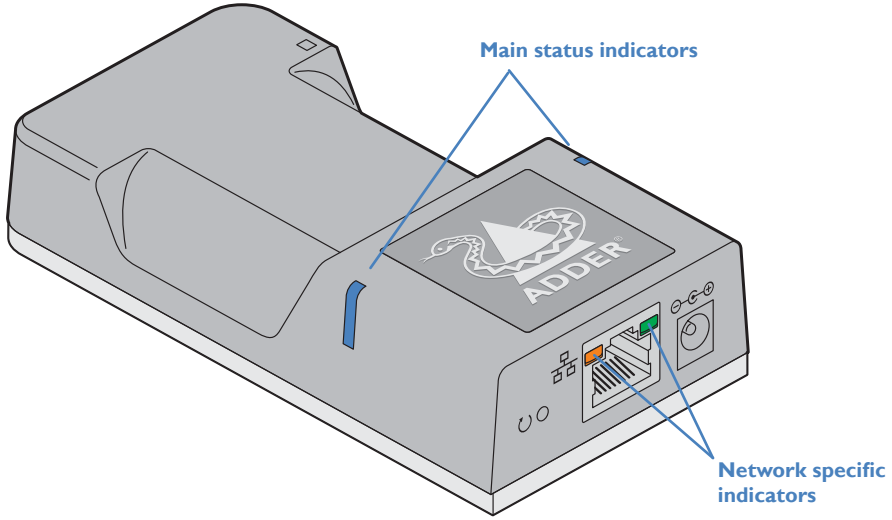
Note: It is possible to downgrade the AdderLink Infinity firmware. After installing the older firmware, perform a factory reset on each AdderLink Infinity in order to clear the configuration file.

Operation

In operation, many ALIF installations require no intervention once configured. The TX and RX units take care of all connection control behind the scenes so that you can continue to work unhindered.

STATUS INDICATORS

The two top panel indicators on the ALIF100T unit provide a useful guide to operation:



Main status indicators

- Off — No power
- Green — Operating - Video, USB and network link all present
- Orange — Operating - But video, USB and/or network link missing.
- Red — (momentarily) Unit is booting up, or (consistently) Unit has failed, try rebooting.
- Red/green flashing — Unit is in backup mode.
- Blue — Factory reset has been activated.
- Red/blue flashing — Unit is in upgrade mode.
- Fast green flash — Unit is in identify mode (see page 13).

Network specific indicators

- Orange — Off: No link — On: Link established
- Green — Off: No link — Flashing: Network activity — On: Quiescent link

RESETTING

The recessed reset button provides a way to take control of the ALIF100T if normal operation is affected. You will need a thin implement, such as a straightened out paper clip to press and hold the button. Depending on when you release the button, one of three functions will occur:

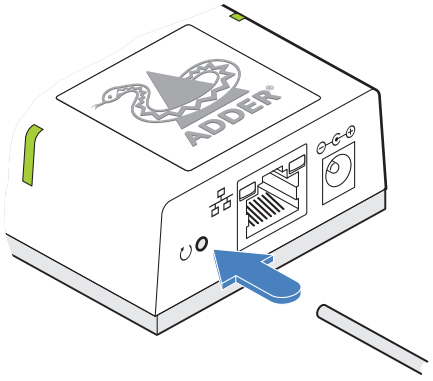
Required function	Release time	Indicators
To reboot to the primary firmware version	less than 10s	**red**
To boot to the backup firmware version*	10 to 14s	**green**/**red** flash
To restore factory settings and reboot	more than 15s	**blue**

* *The backup firmware version has no video or USB functionality. Once invoked, you will need to load an upgrade file to restore normal operation - see page 9.*

To reset the ALIF100T

1 Power on the ALIF100T unit.

2 Use a narrow implement (e.g. a straightened-out paper clip) to press-and-hold the recessed reset button. The status indicators will immediately turn **red**:



3 Release the reset switch at the appropriate time (see the table above).

Further information

This chapter contains a variety of information, including the following:

- Getting assistance - see right
- Appendix A - Transmitter (TX) unit configuration pages
- Appendix B - Dimensions
- Appendix C - Tips for success when networking ALIF units
- Appendix D - Troubleshooting
- Appendix E - Glossary
- Appendix F - Open source licenses
- Waste Electrical and Electronic Equipment (WEEE)
- Safety information
- Warranty
- Radio frequency energy statements

GETTING ASSISTANCE

If you are still experiencing problems after checking the information contained within this guide, then we provide a number of other solutions:

- **Online solutions and updates** – www.adder.com/support

  Check the Support section of the adder.com website for the latest solutions and firmware updates.

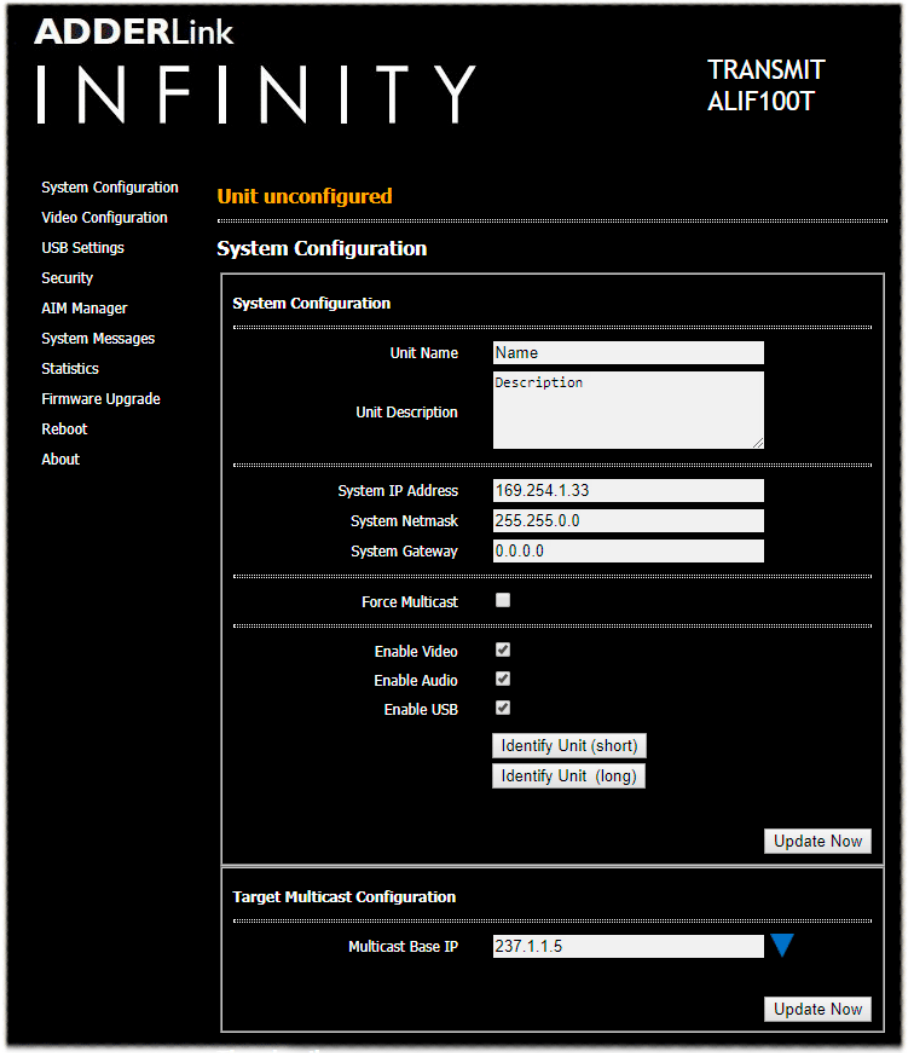
- **Technical support** – www.adder.com/contact-support-form

  For technical support, use the contact form in the Support section of the adder.com website - your regional office will then get in contact with you.

APPENDIX A - Configuration pages

This section covers the browser-based configuration utility for the ALIF100T unit. There are ten pages, titled as follows:

- System Configuration
- Video Configuration
- USB Settings
- Security
- AIM Manager
- System Messages
- Statistics
- Firmware Upgrade
- Reboot
- About



Unit Name
Name details that you can alter to distinguish this unit from all others. The name entered here will be read by A.I.M. units (if used) for administration purposes.

Unit Description
Allows you to optionally add a description of ALIF100T unit, such as its location. Useful when many ALIF units are being used.

System port
This section determines the IP Address, Netmask and Gateway details for the Gigabit Ethernet port located on the front panel. The default IP address is 169.254.1.33 which is the zero config IP address that allows ALIF100T unit to work immediately in point-to-point mode. You are recommended to change this to an appropriate address in the private IP range 192.168.xxx.xxx
The default netmask is 255.255.0.0. If you change the IP address to the private range, you are recommended to change this to 255.255.255.0 The default gateway address is 0.0.0.0

Force Multicast
By default, the ALIF100T unit will use unicast transmission when only a single RX is connected. This would then be upgraded to multicast when one or more other RX units are added. By ticking this option, the ALIF100T unit will always use multicast. This option should be ticked for most installations as it provides the most efficient way to deliver video and audio to multiple destinations.

Enable options
These checkboxes allow you to determine which peripheral options will be used: Video, audio and USB.

Identify unit
When clicked, these buttons cause the top indicators to flash to assist with identifying the ALIF100T unit within a rack.

- The Identify Unit (short) button flashes the indicators for five seconds.
- The Identify Unit (long) button flashes the indicators for one hour but can be overridden by clicking the Identify Unit (short) button.

Target Multicast Configuration
This option allows you to configure an IP address to which this transmitter can send multicast data, and from which multiple receivers can tap into it.

*Note: The multicast addresses for each service endpoint **must** be unique across the whole ALIF installation.*

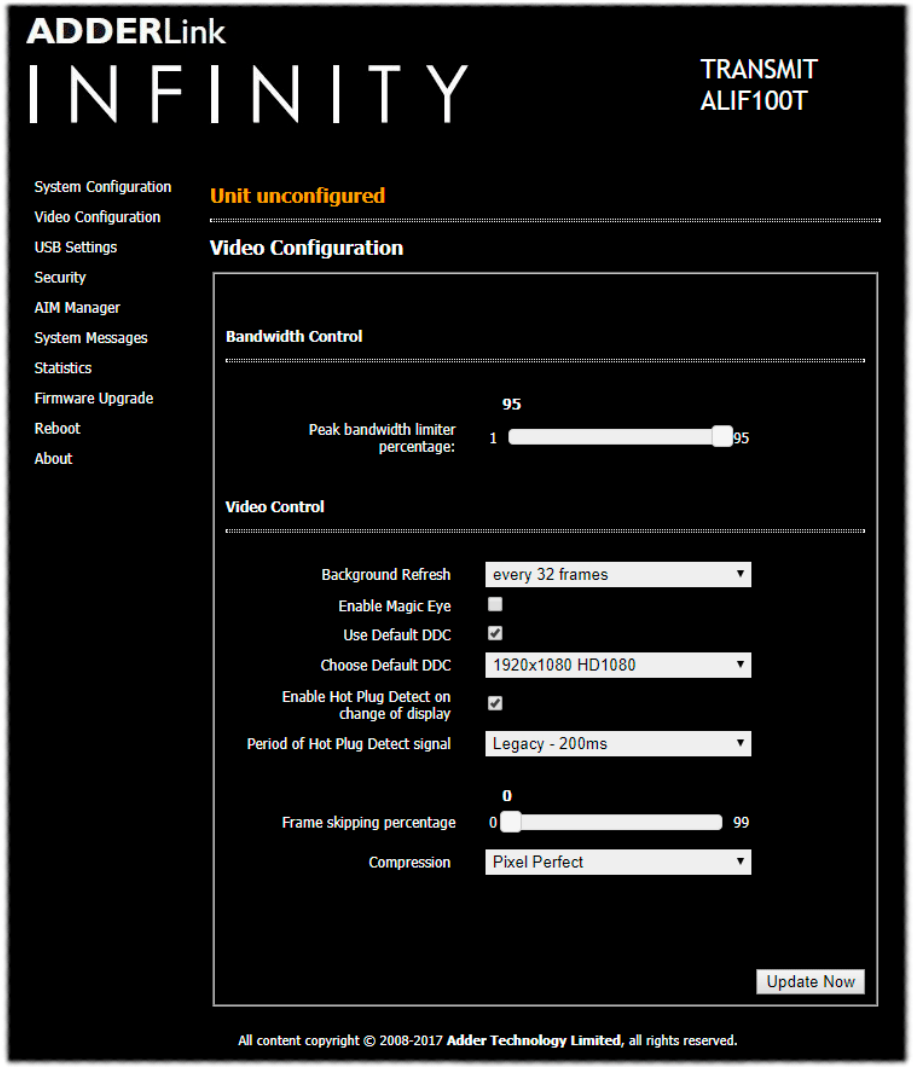
To get here

1 Connect your computer to the network port on the front panel.

2 Run a web browser and enter the IP address of the unit: **http://169.254.1.33**
If the address is unknown, perform a manual factory reset.

3 If necessary, click the **System Configuration** link.

Video Configuration



To get here

1 Connect your computer to the network port on the front panel.

2 Run a web browser and enter the IP address of the unit: **http://169.254.1.33**
If the address is unknown, perform a manual factory reset.

3 Click the **Video Configuration** link.

Peak bandwidth limiter percentage

The ALIF100T unit will employ a 'best effort' strategy in sending video and other data over the IP network. This means it will use as much of the available network bandwidth as necessary to achieve optimal data quality, although typically the ALIF100T unit will use considerably less than the maximum available. In order to prevent the ALIF100T unit from 'hogging' too much of the network capacity, you can reduce this setting to place a tighter limit on the maximum bandwidth permissible to the ALIF100T unit. Range: 0 to 95%.

Note: All of the following controls are available separately for each video port:

Background Refresh

The ALIF100T unit sends portions of the video image only when they change. In order to give the best user experience, the ALIF100T unit also sends the whole video image, at a lower frame rate, in the background. The Background Refresh parameter controls the rate at which this background image is sent. The default value is 'every 32 frames', meaning that a full frame is sent in the background every 32 frames. Reducing this to 'every 64 frames' or more will reduce the amount of bandwidth that the ALIF100T unit consumes. On a high-traffic network this parameter should be reduced in this way to improve overall system performance. Options: every 32 frames, every 64 frames, every 128 frames, every 256 frames or disabled.

Enable Magic Eye

This feature, enabled as standard, aims to reduce the effect of dithering - a technique used by some graphics cards to improve the perceived quality and color depth of images by diffusing or altering the colour of pixels between video frames. The Magic Eye feature increases the frame rate and eliminates unnecessary network traffic by ignoring the color dithering where it occurs. If the video source is not noisy or dithered then you can switch off Magic Eye to enable full colour accuracy.

Use Default DDC and Choose Default DDC

When the *Use Default DDC* option is unticked, AdderLink Infinity will use the EDID that is reported by the monitor connected to the receiver unit. However, if you tick the *Use Default DDC* option, you can then select from a range of preset video resolutions from the *Choose Default DDC* drop down box. Once selected, ALIF100T unit will report itself capable of only supporting this one video resolution. Please note that all of the listed video resolutions are single link DVI with a maximum pixel clock of 165MHz and a 60Hz refresh rate.

Enable Hot Plug Detect...

When this option is ticked, every time the monitor is changed at the receiver unit, a hot plug detect message will be sent to the graphics card of the PC attached to the ALIF100T unit.

Period of Hot Plug Detect signal

This is the length of time that a hot-plug detect signal is applied. The default of 100mS is sufficient for the majority of graphics cards, however, a small minority may need to be given a longer a period.

Frame skipping percentage

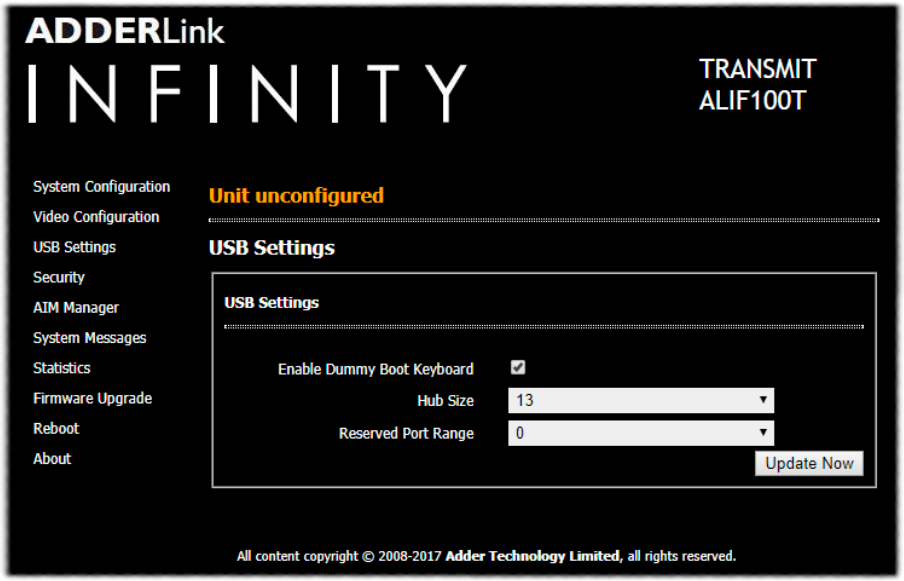
Frame Skipping involves 'missing out' video frames between those captured by the ALIF100T unit. For video sources that update only infrequently or for those that update very frequently but where high fidelity is not required, frame skipping is a good strategy for reducing the overall bandwidth consumed by the system. Range: 0 to 100%.

Compression

Determines the (AFZ and AFZ+) compression method used for video transmission. Choices are:

- '*Pixel perfect*' - only uses pixel perfect AFZ,
- '*Adaptive*' - guarantees frame rate, builds to pixel perfect,
- '*Smoothest video*' - forces the maximum compression, or
- '*Advanced*' - allows you to choose a fixed compression mode:
  - '*AFZ only (pixel perfect)*,
  - '*AFZ+ Minimum compression*',
  - '*AFZ+ Middle compression*', or
  - '*AFZ+ Maximum compression*'.

USB Settings



Enable Dummy Boot Keyboard

When ticked, ALIF100T unit will report a virtual dummy boot keyboard to the attached PC to ensure that a keyboard is always reported when the PC boots up. The dummy boot keyboard uses one of the 13 USB endpoints, therefore if all 13 endpoints are required elsewhere for USB devices (or a KVM switch only supports two HID devices) then it can be disabled by deselecting this option. See also *Reserved Port Range* below.

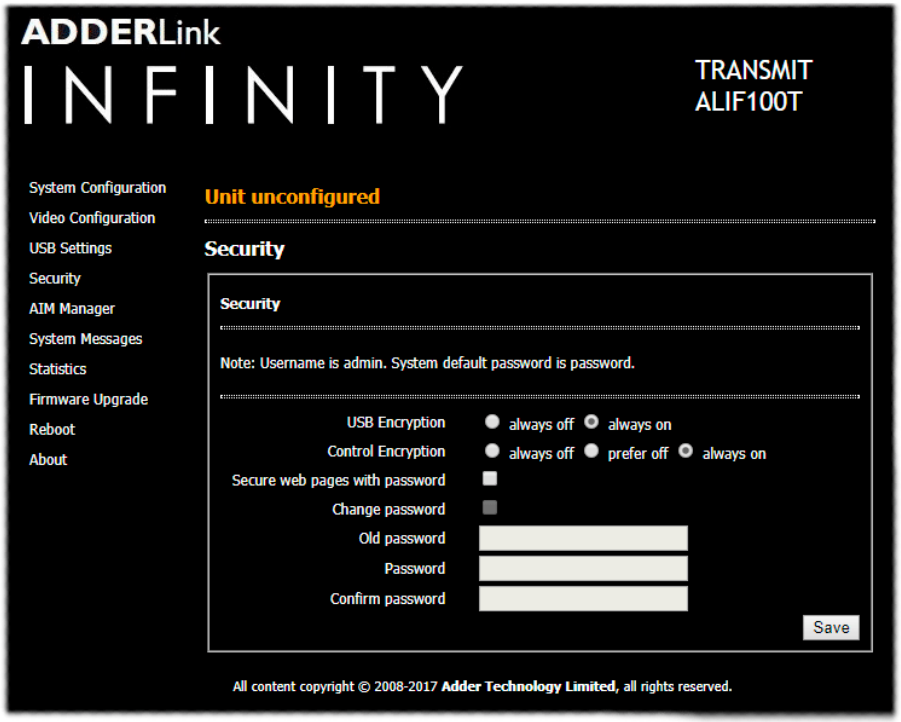
Hub Size

Using this option you can select whether ALIF100T unit should report itself as a 13 or a 7 port USB hub. Some USB hosts are only able to support 7 port USB hubs. If this option is set to 7, then only 7 USB devices are supported by the PC.

Reserved Port Range

For some devices, e.g. touch screens, you may wish to ensure that they are always reported to the same USB port number so that the USB driver will always find the device. This option allows you reserve up to 8 ports for certain devices. At the RX unit, the devices are assigned to the reserved ports. If a port reservation is to be applied, then the dummy boot keyboard should be disabled. The default value for this option is '0', i.e. *disabled*.

Security



USB Encryption

This setting determines whether encryption should be applied to the USB data passed across the link. Note that video data is never encrypted.

Control Encryption

This setting determines whether encryption should be applied to the control data passed across the link. The "Prefer off" setting means that control encryption is enabled if the receiver at the other end of the link has "always on" selected, otherwise it is disabled. *Note: video data is never encrypted.*

Secure Web pages with password

When ticked, this option enables https security so that the configuration pages are only accessible to the admin user with a password.

Change/confirm password

These options allow you to change the admin password for the system.

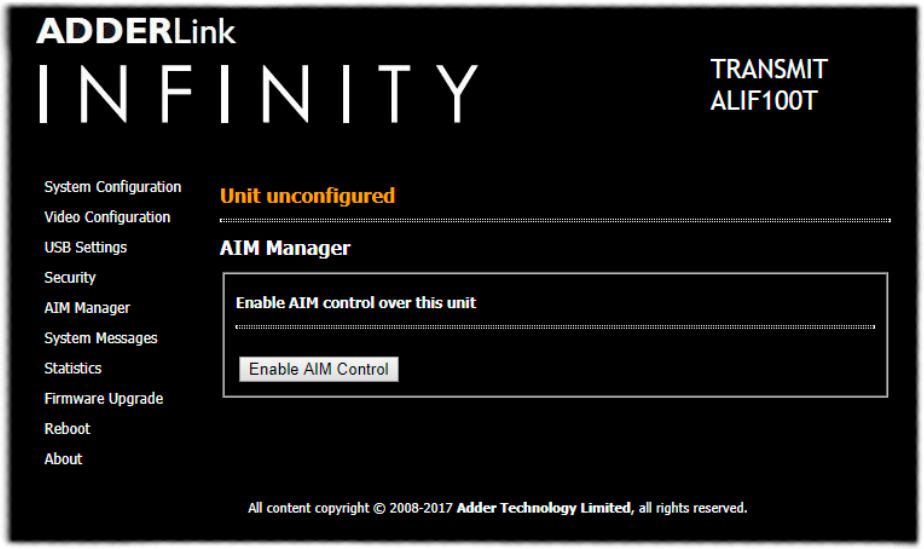
To get here

1 Connect your computer to the network port on the front panel.

2 Run a web browser and enter the IP address of the unit: **http://169.254.1.33**
If the address is unknown, perform a manual factory reset.

3 Click either the **USB Settings** or **Security** links, as appropriate.

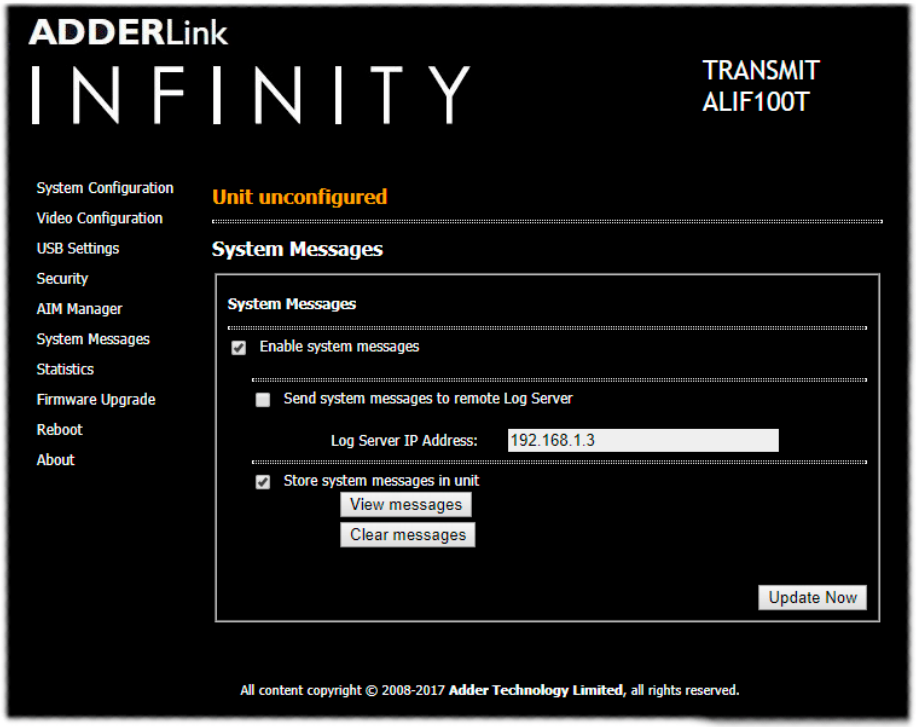
AIM Manager



Enable AIM Control

Click this button to allow an A.I.M. (Adder Infinity Manager) box to take control of this TX. When the button is clicked, the ALIF100T unit will be rebooted to allow the A.I.M. box to discover and control it.

System Messages



Enable system messages

Tick to allow the creation of status and error messages by ALIF100T unit.

Send system messages to remote Log Server

Choose this option to send the system messages to a remote server via the network. Provide the IP address of a suitable server here also.

AdderLink Infinity servers use the User Datagram Protocol (UDP) for all Syslog traffic.

Store system messages in unit

When ticked, this option will store system messages within the memory of ALIF100T unit. Click the *View messages* button to view the list or the *Clear messages* button to delete the list.

Update Now

Click to save and implement any changes that you make.

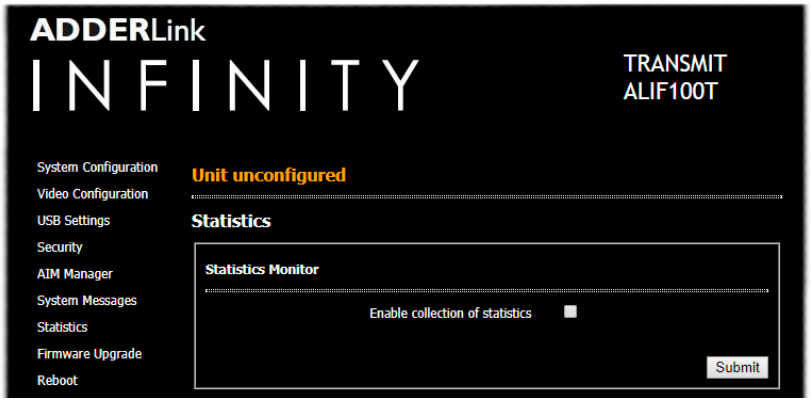
To get here

1 Connect your computer to the network port on the front panel.

2 Run a web browser and enter the IP address of the unit: **http://169.254.1.33**
If the address is unknown, perform a manual factory reset.

3 Click either the **AIM Manager** or **System Messages** links, as appropriate.

Statistics



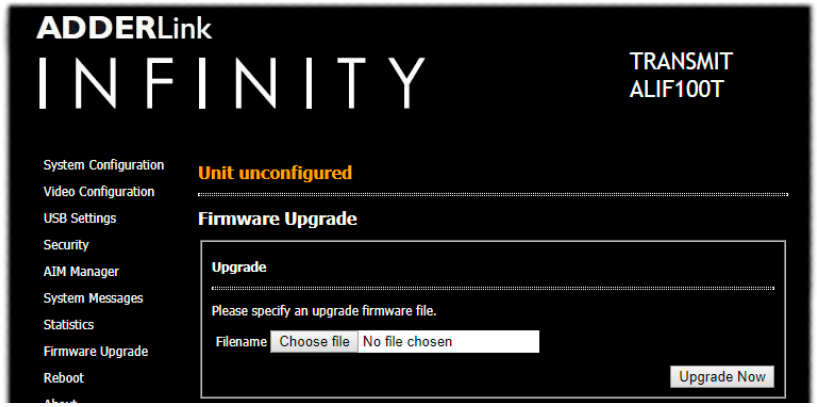
Enable collection of bandwidth statistics

ALIF units can record data transfer statistics from the System port and plot them on a graph for troubleshooting and optimization purposes. When you enable this option, you will first be presented with a pop up from which you can choose which aspects you would like to graph: Data throughput, various packet rates and/or frame rates.

Submit

Click this button after ticking the above checkbox to plot the chosen statistics on a pop up graph.

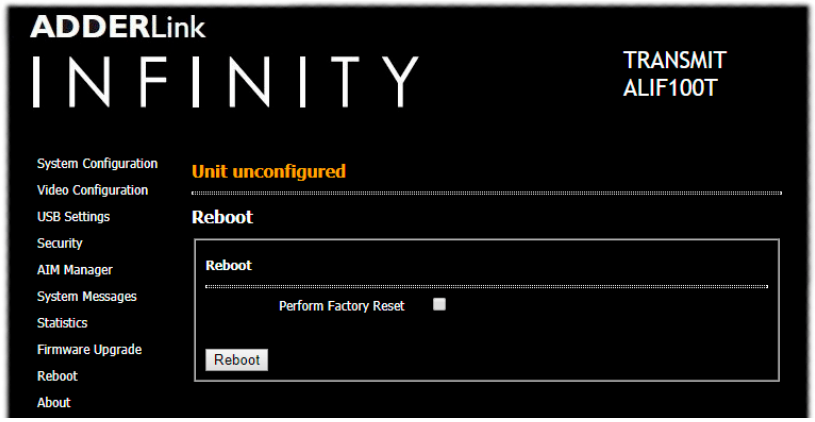
Firmware Upgrade



Upgrade

Use this page to upgrade the main or backup firmware image on ALIF100T unit. Please see the section Performing an upgrade for details.

Reboot



Reboot

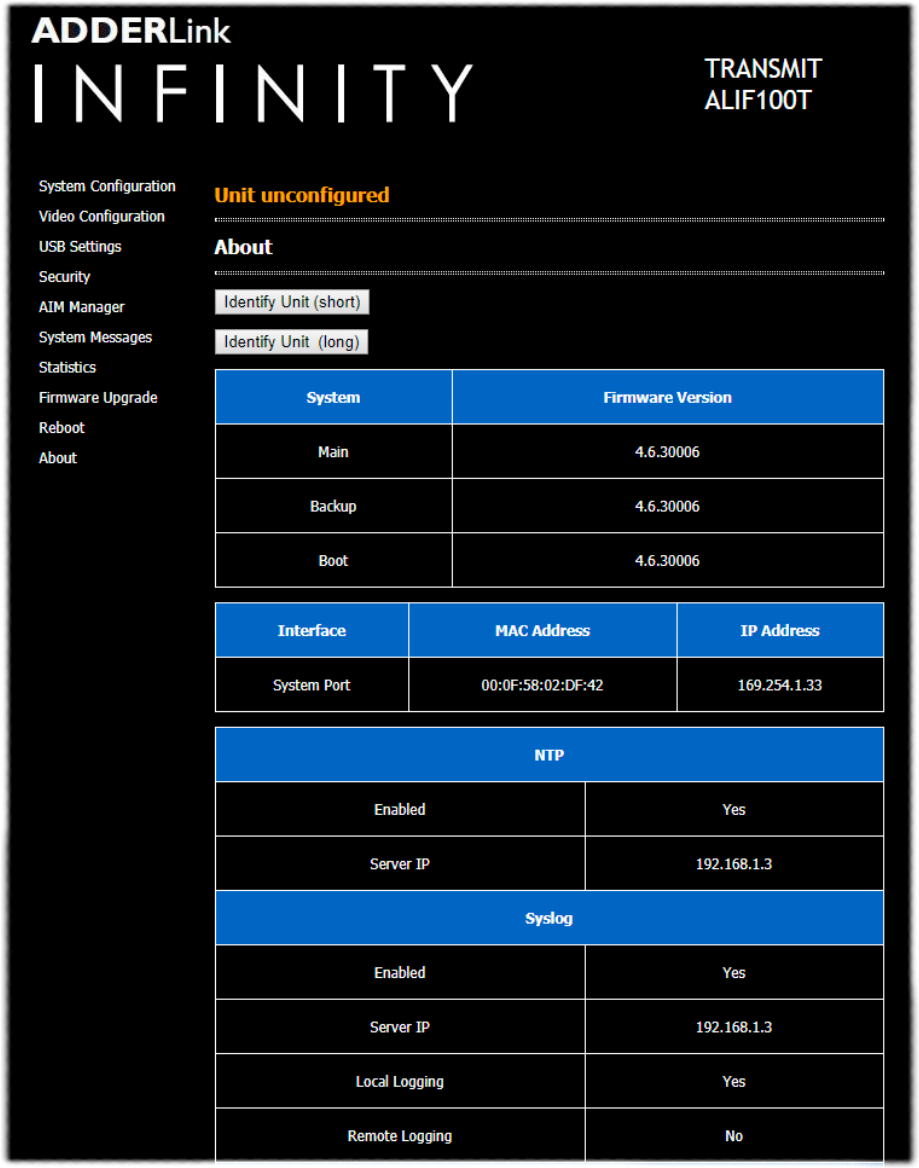
Use this page to perform a reboot or a factory reset. Please see the section Manual factory reset for details.

To get here

1 Connect your computer to the network port on the front panel.

2 Run a web browser and enter the IP address of the unit: **http://169.254.1.33**
If the address is unknown, perform a manual factory reset.

3 Click either the **Statistics** , **Firmware Upgrade** or **Reboot** links, as appropriate.



About

This page displays key information about the ALIF100T unit that may be requested by Adder Technical Support.

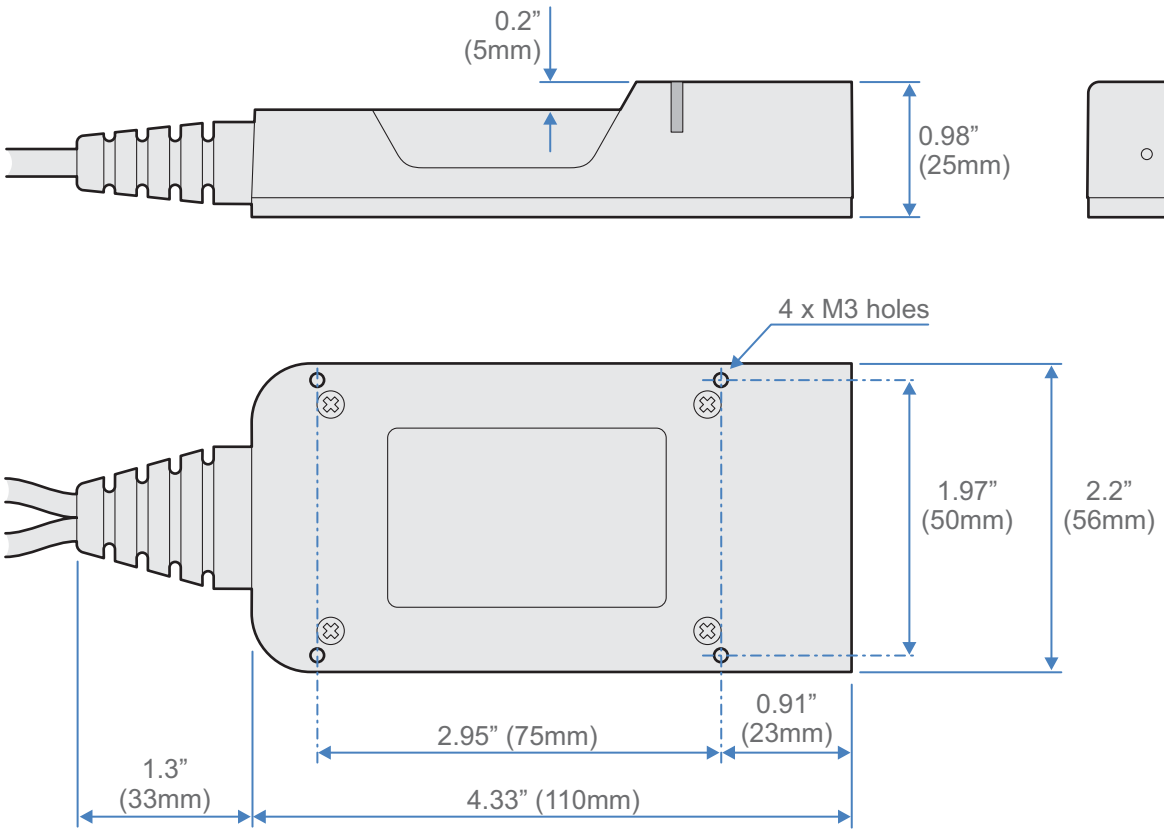
To get here

1 Connect your computer to the network port on the front panel.

2 Run a web browser and enter the IP address of the unit: **http://169.254.1.33**
If the address is unknown, perform a manual factory reset.

3 Click the **About** link.

APPENDIX B - Dimensions



APPENDIX C - Tips for success when networking ALIF units

ALIF units use multiple strategies to minimize the amount of data that they send across networks. However, data overheads can be quite high, particularly when very high resolution video is being transferred, so it is important to take steps to maximize network efficiency and help minimize data output. The tips given in this section have been proven to produce very beneficial results.

Summary of steps

- Choose the right kind of switch.
- Create an efficient network layout.
- Configure the switches and devices correctly.

Choosing the right switch

Layer 2 switches are what bind all of the hosts together in the subnet. However, they are all not created equally, so choose carefully. In particular look for the following:

- Gigabit (1000Mbps) or faster Ethernet ports,
- Support for IGMP v2 (or v3) snooping,
- Support for Jumbo frames up to 9216-byte size,
- High bandwidth connections between switches, preferably Fiber Channel.
- Look for switches that perform their most onerous tasks (e.g. IGMP snooping) using multiple dedicated processors (ASICS).
- Ensure the maximum number of concurrent 'snoopable groups' the switch can handle meets or exceeds the number of ALIF transmitters that will be used to create multicast groups.
- Check the throughput of the switch: Full duplex, 1Gbps up- and down- stream speeds per port.
- Use the same switch make and model throughout a single subnet.
- You also need a Layer 3 switch. Ensure that it can operate efficiently as an IGMP Querier.

For the latest list of switches known to work with ALIF, please download the latest white paper 'Successful AdderLink Infinity Implementation' from www.adder.com/white-papers

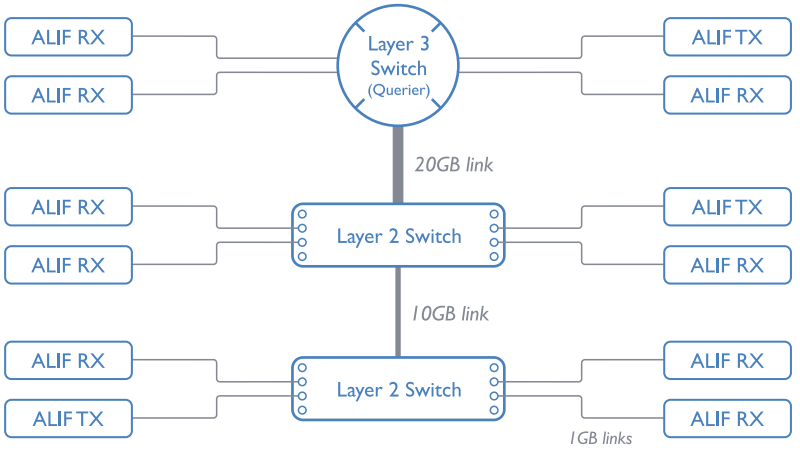
Creating an efficient network layout

Network layout is vital. The use of IGMP snooping also introduces certain constraints, so take heed:

- Keep it flat. Use a basic line-cascade structure rather than a pyramid or tree arrangement.
- Keep the distances between the switches as short as possible.
- Ensure sufficient bandwidth between switches to eliminate bottlenecks.
- Where the A.I.M. server is used to administer multiple ALIF transceivers, ensure the A.I.M. server and all ALIF units reside in the same subnet.
- Do not use VGA to DVI converters, instead replace VGA video cards in older systems with suitable DVI replacements. Converters cause ALIF TX units to massively increase data output.
- Wherever possible, create a private network.

The recommended layout

The layout shown below has been found to provide the most efficient network layout for rapid throughput when using IGMP snooping:



Note: From firmware version 3.1, tree and hierarchical structures of network switches are also supported. The Transmitter now joins its own multicast group so there is always a route from the querier to the transmitter which was previously missing in earlier firmware versions.

- Use no more than two cascade levels.
- Ensure high bandwidth between the two L2 switches and very high bandwidth between the top L2 and the L3. Typically 10GB and 20GB, respectively for 48 port L2 switches.

continued

Configuring the switches and devices

The layout is vital but so too is the configuration:

- Enable IGMP Snooping on all L2 switches.
- Ensure that IGMP Fast-Leave is enabled on all switches with ALIF units connected directly to them.
- Enable the L3 switch as an IGMP Querier.
- Enable Spanning Tree Protocol (STP) on all switches and importantly also enable portfast (only) on all switch ports that have ALIF units connected.
- If any hosts will use any video resolutions using 2048 horizontal pixels (e.g. 2048 x 1152), ensure that Jumbo Frames are enabled on all switches.
- Choose an appropriate forwarding mode on all switches. Use Cut-through if available, otherwise Store and forward.
- Optimize the settings on the ALIF transmitters:
  - If moving video images are being shown frequently, then leave Frame Skipping at a low percentage and instead reduce the Peak bandwidth limiter.
  - Where screens are quite static, try increasing the Background Refresh interval and/or increasing the Frame skipping percentage setting.

  Make changes to the ALIF transmitters one at a time, in small steps, and view typical video images so that you can attribute positive or negative results to the appropriate control.
- Ensure that all ALIF units are fully updated to the latest firmware version (at least v2.1).

APPENDIX D - Troubleshooting

Problem: The video image of the ALIF receiver shows horizontal lines across the screen.

This issue is known as *Blinding* because the resulting video image looks as though you're viewing it through a venetian blind.

When video is transmitted by ALIF units, the various lines of each screen are divided up and transmitted as separate data packets. If the reception of those packets is disturbed, then blinding is caused. The lines are displayed in place of the missing video data packets.

There are several possible causes for the loss of data packets:

- Incorrect switch configuration. The problem could be caused by multicast flooding, which causes unnecessary network traffic. This is what IGMP snooping is designed to combat, however, there can be numerous causes of the flooding.
- Speed/memory bandwidth issues within one or more switches. The speed and capabilities of different switch models varies greatly. If a switch cannot maintain pace with the quantity of data being sent through it, then it will inevitably start dropping packets.
- One or more ALIF units may be outputting Jumbo frames due to the video resolution (2048 horizontal pixels) being used. If jumbo frames are output by an ALIF unit, but the network switches have not been configured to use jumbo frames, the switches will attempt to break the large packets down into standard packets. This process introduces a certain latency and could be a cause for dropped packets.
- One or more ALIF units may be using an old firmware version. Firmware versions prior to v2.1 exhibited an issue with the timing of IGMP join and leave commands that caused multicast flooding in certain configurations.

Remedies:

- Ensure that IGMP snooping is enabled on all switches within the subnet.
- Where each ALIF unit is connected as the sole device on a port connection to a switch, enable IGMP Fast-Leave (aka Immediate Leave) to reduce unnecessary processing on each switch.
- Check the video resolution(s) being fed into the ALIF transmitters. If resolutions using 2048 horizontal pixels are unavoidable then ensure that Jumbo frames are enabled on all switches.
- Check the forwarding mode on the switches. If *Store and forward* is being used, try selecting *Cut-through* as this mode causes reduced latency on lesser switch designs.
- Ensure that one device within the subnet is correctly configured as an IGMP Querier, usually a layer 3 switch or multicast router.
- Ensure that the firmware in every ALIF unit is version 2.1 or greater.
- Try adjusting the transmitter settings on each ALIF to make the output data stream as efficient as possible. See ALIF transmitter video settings for details.

continued

Problem: The mouse pointer of the ALIF receiver is slow or sluggish when moved across the screen.

This issue is often related to either using dithering on the video output of one or more transmitting computers or using VGA-to-DVI video converters.

Dithering is used to improve the perceived quality and color depth of images by diffusing or altering the color of pixels between video frames. This practice is commonly used on Apple Mac computers using ATI or Nvidia graphics cards. VGA-to-DVI converters unwittingly produce a similar issue by creating high levels of pixel background noise.

ALIF units attempt to considerably reduce network traffic by transmitting only the pixels that change between successive video frames. When dithering is enabled and/or VGA-to-DVI converters are used, this can have the effect of changing almost every pixel between each frame, thus forcing the ALIF transmitter to send the whole of every frame: resulting in greatly increased network traffic and what's perceived as sluggish performance.

Remedies:

- Linux PCs

  Check the video settings on the PC. If the Dither video box option is enabled, disable it.
- Apple Mac with Nvidia graphics

  Use the Adder utility for Mac's – Contact technical support.
- Apple Mac with ATI graphics

  Enable the Magic Eye dither removal feature.
- Windows PCs

  If you suspect these issues with PC's, contact technical support for assistance.
- Replace old VGA adapters on host computers with DVI video cards.

Problem: My monitor is displaying a pink screen

It is possible that the source computer and ALIF transmitter are sending a high resolution Dual Link signal in response to a request from your Dual Link monitor. However, your ALIF receiver is unable to correctly process the signal, causing the pink screen issue (DVI resolutions above 1920 x 1200 are generally Dual Link).

ALIF2002T and 2112T transmitters are able to send Dual Link video when requested, however, an ALIF2000R receiver is required to process the higher resolution signal fully at the other end. Other receivers, such as the ALIF1000R, 1002R and 2020R units cannot process Dual Link DVI as they are Single Link devices.

Ensure that the ALIF transmitter is set to supply a Single Link EDID to the graphics card. When the video source is changed to a Single Link video resolution, the pink screen should disappear and the video should be displayed normally. Alternatively, change the monitor to a Single Link DVI monitor.

It is important not to mix Dual Link Transmitters with Single Link Receivers.

On an A.I.M. controlled system, ensure that the Video compatibility check is enabled as this ensures that the correct video mode is displayed for the monitor being used.

Problem: The audio output of the ALIF receiver sounds like a scratched record.

This issue is called Audio crackle and is a symptom of the same problem that produces blinding (see previous page). The issue is related to missing data packets.

Remedies:

As per blinding discussed previously.

Problem: A.I.M. cannot locate working ALIF units.

There are a few possible causes:

- The ALIF units must be reset back to their zero config IP addresses for A.I.M. discovery. If you have a working network of ALIF's without A.I.M. and then add A.I.M. to the network A.I.M. will not discover the ALIFs until they are reset to the zero config IP addresses.
- This could be caused by Layer 2 Cisco switches that have Spanning Tree Protocol (STP) enabled but do not also have *portfast* enabled on the ports to which ALIF units are connected. Without portfast enabled, ALIF units will all be assigned the same zero config IP address at reboot and A.I.M. will only acquire them one at a time on a random basis.

  You can easily tell whether portfast is enabled on a switch that is running STP: When you plug the link cable from a working ALIF unit into the switch port, check how long it takes for the port indicator to change from orange to green. If it takes roughly one second, portfast is on; if it takes roughly thirty seconds then portfast is disabled.

Remedies:

- Ensure that the ALIF units and the A.I.M. server are located within the same subnet because A.I.M. cannot cross subnet boundaries.
- Manually reset the ALIF units to their zero config IP addresses.
- Enable portfast on all switch ports that have ALIF units attached to them or try temporarily disabling STP on the switches while A.I.M. is attempting to locate ALIF units.

APPENDIX E - Glossary

Internet Group Management Protocol

Where an ALIF transmitter is required to stream video to two or more receivers, multicasting is the method used.

Multicasting involves the delivery of identical data to multiple receivers simultaneously without the need to maintain individual links. When multicast data packets enter a subnet, the natural reaction of the switches that bind all the hosts together within the subnet, is to spread the multicast data to all of their ports. This is referred to as Multicast flooding and means that the hosts (or at least their network interfaces) are required to process plenty of data that they didn't request. IGMP offers a partial solution.

The Internet Group Management Protocol (IGMP) is designed to prevent multicast flooding by allowing Layer 3 switches to check whether host computers within their care are interested in receiving particular multicast transmissions. They can then direct multicast data only to those points that require it and can shut off a multicast stream if the subnet has no recipients.

There are currently three IGMP versions: 1, 2 and 3, with each version building upon the capabilities of the previous one:

- IGMPv1 allows host computers to opt into a multicast transmission using a Join Group message, it is then incumbent on the router to discover when they no longer wish to receive; this is achieved by polling them (see IGMP Querier below) until they no longer respond.
- IGMPv2 includes the means for hosts to opt out as well as in, using a Leave Group message.
- IGMPv3 encompasses the abilities of versions 1 and 2 but also adds the ability for hosts to specify particular sources of multicast data.

AdderLink Infinity units make use of IGMPv2 when performing multicasts to ensure that no unnecessary congestion is caused.

IGMP Snooping

The IGMP messages are effective but only operate at layer 2 - intended for routers to determine whether multicast data should enter a subnet. A relatively recent development has taken place within the switches that glue together all of the hosts within each subnet: IGMP Snooping. IGMP snooping means these layer 2 devices now have the ability to take a peek at the IGMP messages. As a result, the switches can then determine exactly which of their own hosts have requested to receive a multicast – and only pass on multicast data to those hosts.

IGMP Querier

When IGMP is used, each subnet requires one Layer 3 switch to act as a Querier. In this lead role, the switch periodically sends out IGMP Query messages and in response all hosts report which multicast streams they wish to receive. The Querier device and all snooping Layer 2 switches, then update their lists accordingly (the lists are also updated when Join Group and Leave Group (IGMPv2) messages are received).

IGMP Fast-Leave (aka Immediate Leave)

When a device/host no longer wishes to receive a multicast transmission, it can issue an IGMP Leave Group message as mentioned above. This causes the switch to issue an IGMP Group-Specific Query message on the port (that the Leave Group was received on) to check no other receivers exist on that connection that wish to remain a part of the multicast. This process has a cost in terms of switch processor activity and time.

Where ALIF units are connected directly to the switch (with no other devices on the same port) then enabling IGMP Fast-Leave mode means that switches can immediately remove receivers without going through a full checking procedure. Where multiple units are regularly joining and leaving multicasts, this can speed up performance considerably.

Jumbo frames (Jumbo packets)

Since its commercial introduction in 1980, the Ethernet standard has been successfully extended and adapted to keep pace with the ever improving capabilities of computer systems. The achievable data rates, for instance, have risen in ten-fold leaps from the original 10Mbit/s to a current maximum of 100Gbit/s.

While data speeds have increased massively, the standard defining the number of bytes (known as the Payload) placed into each data packet has remained resolutely stuck at its original level of 1500 bytes. This standard was set during the original speed era (10Mbits/s) and offered the best compromise at that speed between the time taken to process each packet and the time required to resend faulty packets due to transmission errors.

But now networks are much faster and files/data streams are much larger; so time for a change? Unfortunately, a wholesale change to the packet size is not straightforward as it is a fundamental standard and changing it would mean a loss of backward compatibility with older systems.

Larger payload options have been around for a while, however, they have often been vendor specific and at present they remain outside the official standard. There is, however, increased consensus on an optional 'Jumbo' payload size of 9000 bytes and this is fully supported by the AdderLink Infinity (ALIF) units.

Jumbo frames (or Jumbo packets) offer advantages for ALIF units when transmitting certain high resolution video signals across a network. This is because the increased data in each packet reduces the number of packets that need to be transferred and dealt with - thus reducing latency times.

The main problem is that for jumbo frames to be possible on a network, all of the devices on the network must support them.

Spanning Tree Protocol (STP)

In order to build a robust network, it is necessary to include certain levels of redundancy within the interconnections between switches. This will help to ensure that a failure of one link does not lead to a complete failure of the whole network.

The danger of multiple links is that data packets, especially multicast packets, become involved in continual loops as neighbouring switches use the duplicated links to send and resend them to each other.

To prevent such bridging loops from occurring, the Spanning Tree Protocol (STP), operating at layer 2, is used within each switch. STP encourages all switches to communicate and learn about each other. It prevents bridging loops by blocking newly discovered links until it can discover the nature of the link: is it a new host or a new switch?

The problem with this is that the discovery process can take up to 50 seconds before the block is lifted, causing problematic timeouts.

The answer to this issue is to enable the portfast variable for all host links on a switch. This will cause any new connection to go immediately into forwarding mode. However, take particular care not to enable portfast on any switch to switch connections as this will result in bridging loops.

Forwarding modes

In essence, the job of a layer 2 switch is to transfer as fast as possible, data packets arriving at one port out to another port as determined by the destination address. This is known as data forwarding and most switches offer a choice of methods to achieve this. Choosing the most appropriate forwarding method can often have a sizeable impact on the overall speed of switching:

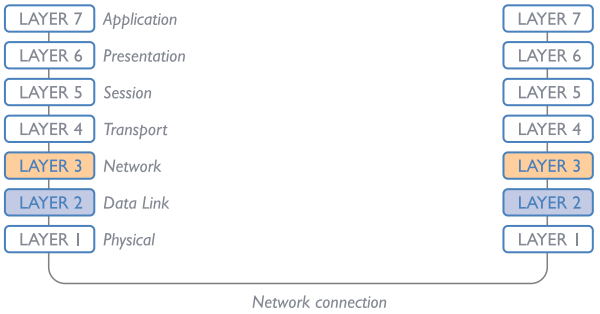
- **Store and forward** is the original method and requires the switch to save each entire data packet to buffer memory, run an error check and then forward if no error is found (or otherwise discard it).
- **Cut-through** was developed to address the latency issues suffered by some store and forward switches. The switch begins interpreting each data packet as it arrives. Once the initial addressing information has been read, the switch immediately begins forwarding the data packet while the remainder is still arriving. Once all of the packet has been received, an error check is performed and, if necessary, the packet is tagged as being in error. This checking 'on-the-fly' means that cut-through switches cannot discard faulty packets themselves. However, on receipt of the marked packet, a host will carry out the discard process.
- **Fragment-free** is a hybrid of the above two methods. It waits until the first 64 bits have been received before beginning to forward each data packet. This way the switch is more likely to locate and discard faulty packets that are fragmented due to collisions with other data packets.
- **Adaptive** switches automatically choose between the above methods. Usually they start out as a cut-through switches and change to store and forward or fragment-free methods if large number of errors or collisions are detected.

So which one to choose? The *Cut-through* method has the least latency so is usually the best to use with AdderLink Infinity units. However, if the network components and/or cabling generate a lot of errors, the *Store and forward* method should probably be used. On higher end store and forward switches, latency is rarely an issue.

Layer 2 and Layer 3: The OSI model

When discussing network switches, the terms Layer 2 and Layer 3 are very often used. These refer to parts of the Open System Interconnection (OSI) model, a standardized way to categorize the necessary functions of any standard network.

There are seven layers in the OSI model and these define the steps needed to get the data created by you (imagine that you are Layer 8) reliably down onto the transmission medium (the cable, optical fiber, radio wave, etc.) that carries the data to another user; to complete the picture, consider the transmission medium is Layer 0. In general, think of the functions carried out by the layers at the top as being complex, becoming less complex as you go lower down.



As your data travel down from you towards the transmission medium (the cable), they are successively encapsulated at each layer within a new wrapper (along with a few instructions), ready for transport. Once transmission has been made to the intended destination, the reverse occurs: Each wrapper is stripped away and the instructions examined until finally only the original data are left.

So why are Layer 2 and Layer 3 of particular importance when discussing AdderLink Infinity? Because the successful transmission of data relies upon fast and reliable passage through network switches – and most of these operate at either Layer 2 or Layer 3.

The job of any network switch is to receive each incoming network packet, strip away only the first few wrappers to discover the intended destination then rewrap the packet and send it in the correct direction.

continued

In simplified terms, the wrapper that is added at Layer 2 (by the sending system) includes the physical address of the intended recipient system, i.e. the unique MAC address (for example, 09:f8:33:d7:66:12) that is assigned to every networking device at manufacture. Deciphering recipients at this level is more straightforward than at Layer 3, where the address of the recipient is represented by a logical IP address (e.g. 192.168.0.10) and requires greater knowledge of the surrounding network structure. Due to their more complex circuitry, Layer 3 switches are more expensive than Layer 2 switches of a similar build quality and are used more sparingly within installations.

APPENDIX F - Open source licenses

This product includes binaries that are derived from the open source community. The modules listed below are licenced under the GNU General Public License v2 and must be provided, in source form, on request:

dtc
u-boot-xlnx
linux-xlnx
busybox
util-linux
udev
termcap
mtd-utils
libpbe
haserl

The software included in this product contains copyrighted software that is licensed under the GPL. You may obtain the complete Corresponding Source code from Adder for a period of three years after the last shipment of this product, which will be no earlier than 2028, by contacting support@adder.com or writing to :

Attn: ACD/Open Source Request,
Adder Technology Ltd,
Saxon Way, Bar Hill, Cambridge, CB23 8SL, United Kingdom

Please write "Source for product XXXXXXXX " in the subject line (where XXXXXX is the model and version number). This offer is valid to anyone in receipt of this information.

This product includes binaries that are derived from the open source community. The modules listed below are licenced under the GNU Lesser General Public License v2.1 and must be provided, in source form, on request:

kmod
libdaemon
avahi
libgpg-error
nettle
libgcrypt
gnutls
libmicrohttpd

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18. [19]Dennis Ferguson <dennis@mrbill.canet.ca> foundation code for NTP Version 2 as specified in RFC-1119
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27. [29]Poul-Henning Kamp <phk@FreeBSD.ORG> Oncore driver (Original author)
28. [30]Frank Kardel [31]<kardel (at) ntp (dot) org> PARSE <GENERIC> (driver 14 reference clocks), STREAMS modules for PARSE, support scripts, syslog cleanup, dynamic interface handling
29. [32]Johannes Maximilian Kuehn <kuehn@ntp.org> Rewrote sntp to comply with NTPv4 specification, ntpq saveconfig
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38. [41]Wolfgang Moeller <moeller@gwdgv1.dnet.gwdg.de> VMS port
39. [42]Jeffrey Mogul <mogul@pa.dec.com> ntptrace utility
40. [43]Tom Moore <tmoore@fievel.daytonoh.ncr.com> i386 svr4 port
41. [44]Kamal A Mostafa <kamal@whence.com> SCO OpenServer port
42. [45]Derek Mulcahy <derek@toybox.demon.co.uk> and [46]Damon Hart-Davis <d@hd.org> ARCRON MSF clock driver
43. [47]Rob Neal <neal@ntp.org> Bancomm refclock and config/parse code maintenance
44. [48]Rainer Pruy <Rainer.Pruy@informatik.uni-erlangen.de> monitoring/trap scripts, statistics file handling
45. [49]Dirce Richards <dirce@zk3.dec.com> Digital UNIX V4.0 port
46. [50]Wilfredo Sánchez <wsanchez@apple.com> added support for NetInfo
47. [51]Nick Sayer <mrapple@quack.kfu.com> SunOS streams modules
48. [52]Jack Sasportas <jack@innovativeinternet.com> Saved a Lot of space on the stuff in the html/pic/ subdirectory
49. [53]Ray Schnitzler <schnitz@unipress.com> Unixware1 port
50. [54]Michael Shields <shields@tembel.org> USNO clock driver
51. [55]Jeff Steinman <jss@pebbles.jpl.nasa.gov> Datum PTS clock driver
52. [56]Harlan Stenn <harlan@pfcs.com> GNU automake/autoconfigure makeover, various other bits (see the ChangeLog)
53. [57]Kenneth Stone <ken@sdd.hp.com> HP-UX port
54. [58]Ajit Thyagarajan <ajit@ee.udel.edu>IP multicast/anycast support
55. [59]Tomoaki TSURUOKA <tsuruoka@nc.fukuoka-u.ac.jp>TRAK clock driver
56. [60]Brian Utterback <brian.utterback@oracle.com> General codebase, Solaris issues
57. [61]Loganaden Velvindron <loganaden@gmail.com> Sandboxing (libseccomp) support
58. [62]Paul A Vixie <vixie@vix.com> TrueTime GPS driver, generic TrueTime clock driver
59. [63]Ulrich Windl <Ulrich.Windl@rz.uni-regensburg.de> corrected and validated HTML documents according to the HTML DTD

SAFETY INFORMATION

- For use in dry, oil free indoor environments only.
- Warning - live parts contained within power adapter.
- No user serviceable parts within power adapter - do not dismantle.
- Plug the power adapter into a socket outlet close to the module that it is powering.
- Replace a defective power adapter with a manufacturer approved type only.
- Do not use the power adapter if the power adapter case becomes damaged, cracked or broken or if you suspect that it is not operating properly.
- Do not attempt to service the units yourself.
- Not suitable for use in hazardous or explosive environments or next to highly flammable materials.
- If you use a power extension cord with the units, make sure the total ampere rating of the devices plugged into the extension cord does not exceed the cord's ampere rating. Also, make sure that the total ampere rating of all the devices plugged into the wall outlet does not exceed the wall outlet's ampere rating.
- The unit and its power adapter can get warm in operation - do not situate these items in an enclosed space without any ventilation.

Waste Electrical and Electronic Equipment (WEEE)

- At the end of its useful life, your product is considered to be WEEE. As such, it is important to note that: WEEE is not to be disposed of as unsorted municipal waste. It is to be collected separately such that it can be disassembled so its components and materials can be recycled, re-used, and recovered (burned for energy content in the production of electricity).
- Public collection points have been set up by municipalities for the collection of WEEE, free of charge to you.
- Please return your WEEE to the collection facility nearest your home or office.
- If you have difficulty locating a collection facility, the retailer that sold you the product should accept your WEEE.
- If you are no longer in contact with your retailer, please contact Adder Technology Ltd for assistance with this matter.
- Recycling of WEEE is geared toward protecting the environment, protecting human health, preserving raw materials, improving sustainable development, and ensuring a better supply of commodities in the European Union. This will be achieved by retrieving valuable secondary raw materials and reducing the disposal of waste. You can contribute to the success of these goals by returning your WEEE to a collection facility.
- Your product is marked with the WEEE symbol (wheelie bin with an X through it). This symbol is to inform you that the WEEE is not to be disposed of as unsorted municipal waste.
- For B2B WEEE collection and reprocessing requirements refer to Adder Technology's Terms and Conditions of Purchase.

WARRANTY

Adder Technology Ltd warrants that this product shall be free from defects in workmanship and materials for a period of two years from the date of original purchase. If the product should fail to operate correctly in normal use during the warranty period, Adder will replace or repair it free of charge. No liability can be accepted for damage due to misuse or circumstances outside Adder's control. Also Adder will not be responsible for any loss, damage or injury arising directly or indirectly from the use of this product. Adder's total liability under the terms of this warranty shall in all circumstances be limited to the replacement value of this product.

If any difficulty is experienced in the installation or use of this product that you are unable to resolve, please contact your supplier.

Warranty (in Australia)

Adder Technology warrants its products and their parts against defects in materials and workmanship under normal use for a period of 24 months from the original date of purchase (please retain proof of purchase). During this period we will repair or replace a defective product or part subject to the following warranty conditions:

The warranty applies only to defects in materials and workmanship under normal use and does not extend to damage to the Product or parts which result from:-

- Alteration, repair, modification or service carried out by anyone other than an authorised Adder Technology service provider.
- Accident, neglect, abuse or misuse owing to failure to comply with the normal operating procedures for a product of this type.

Nothing in this warranty shall have the effect of excluding the liability of Adder Technology in respect of death and personal injury caused by the negligence of Adder Technology. This Warranty is offered (subject to these terms and conditions) in addition to, and does not affect your rights and remedies under the Australian Consumer Law and other laws.

Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and for compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

For any questions relating to your warranty, please contact your local service agent.

RADIO FREQUENCY ENERGY

A Category 5e (or better) twisted pair cable must be used to connect the units in order to maintain compliance with radio frequency energy emission regulations and ensure a suitably high level of immunity to electromagnetic disturbances.

All cables used with this equipment must be shielded in order to maintain compliance with radio frequency energy emission regulations and ensure a suitably high level of immunity to electromagnetic disturbances.

European EMC directive 2014/108/EC

This equipment has been tested and found to comply with the limits for a class A computing device in accordance with the specifications in the European standard EN55032. In a residential environment, this equipment may cause radio interference.

FCC Compliance Statement (United States)

This equipment generates, uses and can radiate radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a class A computing device in accordance with the specifications part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area may cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference. Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Canadian Department of Communications RFI statement

This equipment does not exceed the class A limits for radio noise emissions from digital apparatus set out in the radio interference regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le règlement sur le brouillage radioélectriques publié par le ministère des Communications du Canada.

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