COBHAM

NetLink Front End Unit Users' Manual

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1 Table of Contents

2 About this Manual

This manual describes the operation of the domo NetLink Front End unit. The manual is divided into three main sections.

- **Getting started and basic operation**

  This section describes to users how to deploy and use a **domo** NetLink Front End unit.

- **Advanced operation**

  This section describes the operation of the system in more detail, concentrating particularly on how to change advanced parameters.

- **Technical reference**

  This section provides technical specification and control protocol data and will be of interest to those integrating the product into larger systems.

3 Introduction

The NetLink product allows domo equipment to be connected to IP networks. In its basic form the NetLink can be connected to the output of any standard domo transmitter or receiver, and translates the signal into a streaming video service. NetLink can be set to stream at rates suitable for either private or public networks.

In private network mode it will stream full frame rate, full resolution video for maximum quality. When connected to public networks where the data rates are limited, it will produce a reduced frame rate and resolution stream at a data rate appropriate for the network.

NetLink uses AES128 or AES256 encryption to ensure the security of the transmission. These transmissions can then be decoded in software using the NETEPLAY application or in hardware using the domo NETIPHW IP Hardware decoder. The NetLink also has an RS232 output suitable for control of any PTZ camera that might be connected to it. NetLink is fitted with a USB interface for external devices.

NetLink complements the domo SOLO4 and SOLO2 product range, which enable the user to build wireless digital microwave video systems. The standard domo SOLO4 and SOLO2 Encoder/Transmitter and Receiver/Decoder products have been designed to provide rugged point-to-point links for high quality full frame rate video, and audio, even in non line of sight and urban environments.

4 Warranty and Support

4.1 Warranty Cover

domo offers a 12 month standard product warranty. During this period, should the customer encounter a fault with the equipment we recommend the following course of action:

- Check the support section of the website for information on that product and any software/firmware upgrades. If fault persists;
- Call our support line and report the fault. If fault persists and you are informed to return the product please obtain an RMA number from the domo support department, and ship the equipment with the RMA number displayed and a description of the fault. Please email the support section the airway bill/consignment number for tracking purposes.
- If you have extended warranty provisions then domo will send an immediate advance replacement to you. Under most circumstances this must be returned once the fault item is repaired.

Depending on the nature of the fault domo endeavour to repair the equipment and return it to the customer within 14 days of the item arriving at our workshops.

Obviously it is impossible to cater for all types of faults and to manage 100% replacement part availability, and delays are sometimes inevitable. This is why domo recommend that its customers take out an extended warranty (which includes advanced replacement of faulty items), and/or hold a basic level of spare parts, which can be held by domo on the customer's behalf.

Please contact domo for details of packages that can be tailored to meet your individual needs, whether they are service availability, technical training, local geographic support or dedicated spares holdings.

5 Safety, Compliance and Approvals

5.1 Safe Operating Procedures

- Ensure that the power supply arrangements are adequate to meet the stated requirements of each SOLO4 or SOLO2 product.
- Operate within the environmental limits specified for the product.
- Do not subject the indoor equipment to splashing or dripping liquids.
- Only authorized, trained personnel should open the product. There are no functions that required the User to gain access to the interior of the product.

6 Getting Started and Basic Operation

6.1 Which Model Do I Have

NetLink units are marked with labels similar to the one shown below. The product code is at the top of the label, and the serial number is below the bar code.

The **domo** product code can be referenced in the table below.

Product Code	Product	Accompanying items
NETLINK	Private/public network streamer.	Power supply unit **Cables:** Combined Chaining + control for SOLO4 products A/V Out RS232 Control
NETLINK-AV	As above, plus composite video and stereo audio inputs.	As above, plus A/V input cable
NETLINK-DVRI	As above, plus store and forward capabilities and triggers	As above, plus internal 250GB hard disk and backup battery.

6.2 Controls

There are no physical controls on the NetLink Front End unit, as the unit is controlled through the network connection.

If the IP address of the Ethernet port is not known, first follow the procedure described in the section 'Initial IP Set-up'.

6.3 Indicators

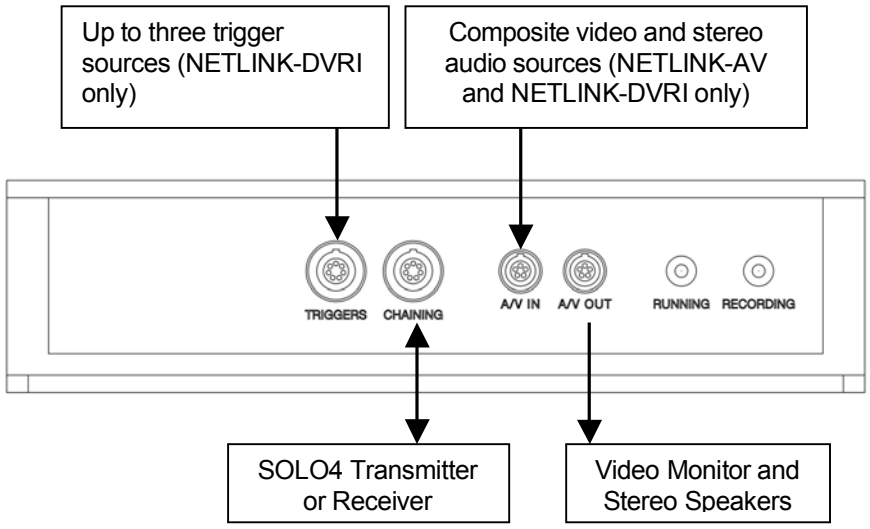
There are 2 LED's on the NetLink unit; their meaning is explained in the table below.

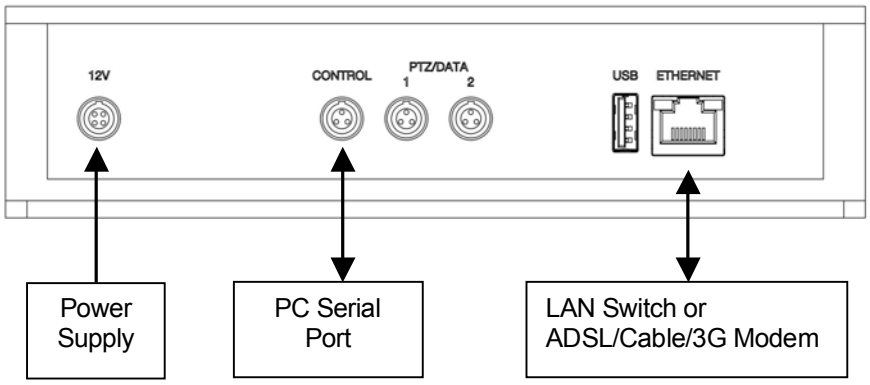
LED Label	Colour	Meaning / Use
RUNNING	Green	Will light 40 seconds after applying power. Indicates power is on and unit is fully operational. NETLINK-DVRI only: flashes when unit is powering down.
RECORDING	Green	Recording to hard disk (NETLINK-DVRI only)

6.4 NetLink Unit Connections

This section describes how to connect the domo NetLink product.

The drawings below show the Front End Unit's front and rear panels. Each connection is described in detail in the following section.





Ethernet Connection

Connect this port to a compatible 100Base-TX switch or modem. Use of 10Base-T networks for full rate video streaming is not recommended, as the network may not be capable of supporting the data rates, especially when high bit-rate video is streamed.

Connector	Signal
RJ45 socket	10Base-T / 100Base-TX, single or full-duplex, auto-negotiation, auto MDI/MDIX feature for automatic cross-over of Ethernet cables

Some poorly designed network appliances sold as 100Base-TX compatible are incompatible with multicast streams, and may cause the streaming to fail. Disconnect any such devices from your private network if you are experiencing streaming problems.

A/V In Connection (NETLINK-AV and NETLINK_DVRI only)

Connect the supplied A/V input cable to this port. The other end of the cable has a BNC for connecting the chosen video source, and two RCA connectors for audio sources.

Connector	Signal
Video BNC	75 ohm composite video input, PAL or NTSC
Audio RCA	Analogue stereo audio inputs, line level

Typically the video source will be a high quality surveillance camera.

A/V Out Connection

Connect the supplied A/V breakout cable to this port. The other end of the cable has a BNC for connecting to the chosen video display device, and two RCA audio connectors for audio monitoring.

Connector	Signal
Video BNC	75 ohm composite video output, PAL or NTSC, depending on incoming video stream
Audio RCA	Analogue stereo audio output, line level

Typically the video display device will be a high quality monitor.

Triggers (NETLINK-DVRI only)

The NetLink unit can be set up to only record when one or more of the trigger inputs are active. Triggers can be set up to active high or active low, or can be disabled.

Connector	Signal
Triggers	3 standard LVTTL level inputs, 5V compatible. Must be pulled high via a 4k7 resistor or low via a 1k resistor, depending on application. 1 LVTTL output

Control Connection

This port is used to discover the unit's network settings or to give the unit a temporary IP address. See Initial IP Setup section.

Connector	Signal
RS232 socket	Standard RS232 signal levels, RX, TX and ground only.

DC Power

The NetLink unit is powered from a nominal 12V DC supply.

As standard domo supply an AC to DC converter, terminated with a LEMO connector on the DC power output. Push the LEMO plug into the socket labelled '12V', taking care to align the connectors. Connect the AC adapter block to your local mains electricity supply, noting the mains supply requirements detailed on the adapter.

The 12V DC input has the following characteristics.

- Input Voltage Range – 10V to 18V, reverse voltage protected.
- Current Draw – 1.0A at 12V (varies depending on number of options fitted)

domo can supply optional bare DC power leads, for connection or hardwiring to other DC sources. The domo part number is **CABDC3**

6.5 Installation Notes

The domo NetLink unit is a professional digital video streamer designed to multicast audio/video streams over private networks or to send thumbnail streams over public networks like the Internet. Live multicast streams can be played back by using a domo NetLink Player (NETEPLAY), Software Decoder (NETSWDR), or Hardware IP Decoder (NETIPHW).

The NetLink unit is self-cooling; however it should be mounted in a ventilated environment. Forced air cooling is not required. Adequate clearance on either side the receiver (5cm) should be allowed for ventilation.

6.6 Network Requirements

The NetLink unit should be connected to an Ethernet network or modem with the following characteristics.

Capacity

For live streaming the network should have sufficient capacity to support the required bit rate, plus some spare capacity.

Live multicast streaming will only work on private networks, as internet service providers block any multicasts, unless specific arrangements for bandwidth and scope are made in advance.

Each domo video service occupies between 600kb/s and 4.8MB/s depending on mode. Typical occupation is 2.4Mb/s. Therefore the network must have sufficient capacity to support these services and also any other data on the network. Contact domo technical support for more details on this subject.

To use NetLink on public networks, a cable, ADSL or 3G modem with an Ethernet port is required. This can be connected directly to the Ethernet port on the NetLink unit.

Protocols

For live multicast streaming the network should support multicast UDP streaming protocols.

For thumbnail streaming on public networks, the external modem should act as a DHCP server to give the appropriate IP address to the NetLink unit. If the modem acts a router, appropriate routes must be set up to allow NetLink traffic though.

6.7 Powering on the System

All external connection to the NetLink unit should be made, as described in the previous sections, before proceeding to power on the system.

On powering the NetLink unit, the system will boot in approx. 45 seconds, although audio and video outputs may start working within a few seconds of applying power. When the boot process is complete, the **RUNNING** LED on the front panel will turn on.

6.8 Understanding NetLink Modes

The NetLink Front End unit operates in three different modes:

1) **Private Network Mode**
2) **Public Network Server Mode**
3) **Public Network Client Mode**.

Private Network Mode

In this mode, the NetLink unit behaves like a domo NetStream unit: It multicasts a full quality, full frame rate audio/video/data stream onto a private network. The multicast can be received and played back on a PC using the domo software decoder, or it can be output as composite/ S-Video, using the domo IP Hardware Decoder.

Public Network Server Mode

In this mode, NetLink can be used over a public contended network, like the internet. The unit will stream reduced resolution thumbnails, using the available bandwidth. If the DVRI option is purchased, NetLink will locally record both the thumbnails and full quality video, along with any triggers applied to its trigger inputs. These can then be downloaded in non-real time. See the NetLink Windows application manual for more details.

In this mode the NetLink unit acts as a server, therefore users can connect directly to it without having a server in between. This mode is recommended when using ADSL or cable modems. Dynamic DNS is supported, therefore the unit can always be located on the internet, regardless of its current IP address. This mode can also be used when a 3G connection with a fixed IP address is available.

Public Network Client Mode

This mode is similar to Public Network Server Mode, but the NetLink unit acts as a client rather than a server. This mode is needed when using standard 3G data cards, as service providers do not allow inbound connection on standard data services. In this mode, an in-between server is required. The server is designed to run as a command-line executable on a windows PC, and is supplied by domo either as software only, or as a fully set up PC. The server must have a fixed IP address and it must visible on the internet. **When a NetLink unit is set up in client mode, the server's fixed IP address must be entered in the NetLink unit.** When NetLink is set up in this mode, both the NetLink unit and the Windows application connect to the server.

6.9 Controlling the NetLink Unit

The unit behaves and is controlled differently depending on which mode it is in. The RS232 CONTROL port described in the next section works in all modes, but for higher levels of control an internet browser or the NetLink Player is needed.

- If the unit is in private network mode, it behaves like a **domo** NetStream unit, and must be accessed via a web browser.
- If the unit is in public network mode (either client or server), it must be accessed via the domo NetLink Player (NETEPLAY).

To discover which mode a unit is in, see the next section.

6.10 IP Setup via RS232 Control Port

The RS232 port marked **CONTROL** can be used to setup the NetLink unit in situations where a PC with a web browser is not available, or when the IP address of the unit is not known. Only a subset of the setup options is available via the serial port. Once an IP address and a suitable operating mode has been set, the rest of the options can be set up via the Ethernet port, as described later.

To set up the unit via the serial port:

1) Connect the Ethernet port to the same network as the PC used as controller. Alternatively, connect the PC directly to the port. The Ethernet port features MDI/MDIX automatic cable cross-over, supported by most modern PC's. This makes it unnecessary to use a crossover Ethernet cable in most cases.

2) Connect a domo serial port control cable to the RS232 port marked CONTROL. Connect the other end to the control PC.

3) On the PC, start a terminal program such as TeraTerm or Hyper Terminal. Set the serial port parameters as follows:

Baud Rate:	9600
Data:	8 bit
Parity:	None
Stop bit:	1
Flow Control:	None

4) Power on the system. If the terminal is setup correctly, boot messages will be printed on the terminal window. Wait until the boot procedure is complete, and messages are no longer printed.

DVRI units: If no video signal is present at the AV input, some error messages may be printed at this stage. These messages can be ignored, and will stop when the unit switches to the state described at 5) below.

5) About one minute after the unit has booted, it will print the following: "**INIT: no more processes left in this runlevel**"

6) At this point press the Enter button on the PC keyboard, and the unit's IP parameters and current mode will be printed, followed by the message "**Change local IP address? [type Yes]**".

The menu runs as a continuous loop. To go into the current option, type "Yes" and press the Enter key. To skip the current option, just press the Enter key.

If the IP parameters are correct, the unit can be accessed using either a web browser or the NetLink application, depending on the current mode (see the previous sections).

The Menu Loop: IP Parameters

If the IP parameters need to be changed, type Yes, ensuring that the 'Y' is uppercase, and 'es' are lowercase. Press Enter.

The following message will be printed: “**Use DHCP? [type Yes]**”. If DHCP is needed type Yes and press Enter. The message “**DHCP has been enabled**” will be printed, and the menu loop will reset. Press enter to change more parameters.

If a fixed IP address is required press Enter, and the message “**Please enter new IP address**” will be printed. Enter a valid IP address and press enter. The menu loop will reset, and pressing Enter will re-print the IP parameters and unit mode.

If the address is accepted, the message “**New IP address has been set**” will be printed. Otherwise an error message will be printed. The netmask is automatically set to 255.255.255.0.

The unit can now be accessed using either a web browser or the NetLink application, depending on the current mode.

The Menu Loop: Unit Mode

To enter this menu option, type “Yes” at the question **“Change unit mode? [type Yes]”** and press Enter.

The message **“Enter new mode [1, 2 or 3]”** will be printed, followed by a brief description of each mode. Type the number corresponding to the required mode and press enter.

If mode 3 is selected, an valid IP address for the remote server must be entered. Enter the IP address press Enter.

The unit will reboot into the requested mode.

6.11 Using the Browser Controller (Private Network Mode Only)

When the unit is in private network mode, it is controlled from a standard web browser running on the user's PC or laptop. In order to access the unit's browser interface, the first step is to make sure the PC or laptop is on the same subnet as the IP Decoder.

In the browser window, type the unit's address in the URL bar. The controller's main page should appear as shown below.

This indicates that the system is running, and if the network parameters have already been set up, the unit will be streaming live video on the network.

6.12 Login Details

All NetLink units are shipped with the following default login:

Username: admin

Password: vegemite

7 Advanced Operation

7.1 Setting up Network Interfaces

These settings are valid in both private and public network mode. For security reasons it is not possible to change IP parameters in public network mode, so it must be done while the unit is in private network mode.

IMPORTANT: Most web browsers keep copies of pages cached in memory. These pages may be out of date and show the wrong information. To ensure the page being displayed on a browser screen is a current page, click **CTRL+F5** on the PC keyboard to force a page reload. The refresh button on the browser does NOT force a reload.

To access the Network Setup page, click on the "Set up Network Parameters" link in the main browser page. The following page will appear:

Back to main menu

Network Setup

Ethernet Port Settings

DHCP Control	Off On
IP Address	192.168.2.25
Address Mask	255.255.255.0
Default Gateway	192.168.2.254
DNS Server 1	
DNS Server 2	

Dynamic DNS Client

Enable	No Yes
User name	
Password	
Domain name	

Multicast Settings

Multicast Address	239.16.33.253
SAP Address	224.2.127.254
Port Number	10507
TTL Value	2
Service Name	NetLink
Information	LiveStream
Description	NLStream
Bit Rate (kb/s)	usr

Apply values

Back to main menu

7.2 Ethernet Port Settings

If the LAN switch or modem has a DHCP server, turn on the DHCP Control feature. The unit will automatically acquire an IP address.

After selecting the DHCP On radio button and clicking on “Apply values”, the unit’s IP parameters will probably change. Therefore the web browser will lose its connection to the unit and the page will not be reloaded. To discover the unit’s new IP parameters, see the **Initial IP Setup** section.

If a DHCP server is not in use, give the Ethernet port a suitable IP address, netmask and default gateway.

If Dynamic DNS is to be used in the absence of a DHCP server, enter the IP address of at least one DNS server.

7.3 Dynamic DNS Client

Dynamic DNS is only needed when the unit is in public network mode, but can be left enabled in both modes.

This feature allows the unit to be accessed via a fixed URL, rather than via its IP address. This is vital if the unit is to be left unattended for long periods whilst connected to a modem. Modems (and NetLink units connected to them) can have their IP address changed by internet service providers at any time. If the unit is not physically accessible, it will not be possible to discover the unit’s new IP address. However, the dynamic DNS service will ensure that the unit always responds to a fixed URL (domain name) across the internet.

Before setting up dynamic DNS on the unit, it is necessary to go to www.dyndns.com and open an account with them. A new host service can then be set up. Follow the instruction on the DynDNS web site to open a new account and set up a host service.

DynDNS offer both free and paid for services. It is up to the customer to select the most suitable option.

The DynDNS account’s user name and password should be entered in the relevant fields in the browser controller page.

The domain name field should contain the URL the unit should respond to. If multiple units are in use simultaneously, they should all have different URLs (domain names), otherwise conflicts will occur.

The same account can be used for multiple domain names used by different units, although the user name and password will be in common.

7.4 Multicast Settings

Multicast Address

This control allows the user to change the multicast address used by the unit. The default value is 239.16.33.254.

Port Number

This control allows the user to change the multicast port used by the unit. The default value is 10000.

TTL

This control allows the user to change the value of the IP TTL (Time to Live) set by the unit.

SAP Address

This control allows the user to change the SAP/ SDP multicast address used by the unit. The default value is 224.2.127.254 and the port used is 10000. These are standard multicast values for such parameters, and it is recommended they are not changed unless specifically required due to routing restrictions.

SAP / SDP Data

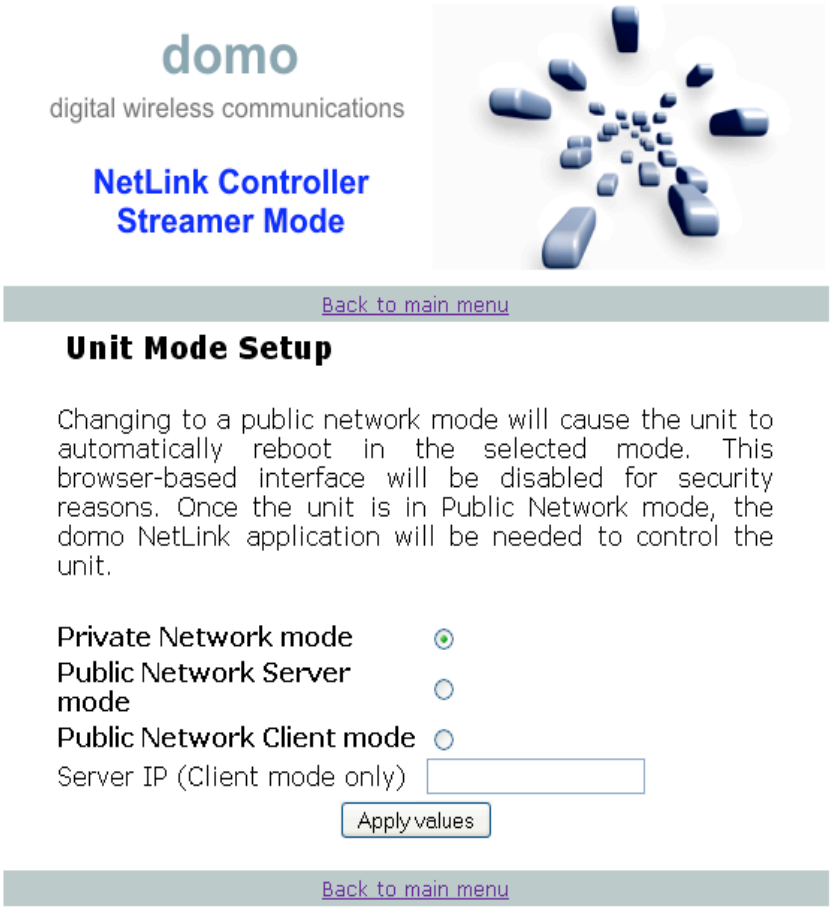
Note – SAP is Session Announcement Protocol and SDP is Session Description Protocol as defined in RFC2327 and RFC2974.

The parameters described below are useful to distinguish between multicasts. Although standards indicate what type of information they are meant to contain, they can be used in any way the user sees fit.

- Service Name – textual information naming the multicast stream as delivered in the SAP/SDP packets from the unit.
- Info – further textual information about the multicast stream as delivered in the SAP/SDP packets from the unit.
- Description - Optional URI (Universal Resource Identifier) pointing to a web page on the network containing additional information about the multicast.
- Bitrate - Textual information indicating the bitrate in kbits/s of the stream.

7.5 Changing the Network Mode

To access the Unit Mode Setup page, click on the Set Unit Mode link in the main page. The page shown below will load.



Select the required mode and click on “Apply values”.

The unit will automatically restart in Public Network mode.

If Public Network Client mode is selected, a valid IP address for the remote server must be entered.

7.6 Accessing the System page

To access the System page, click on the System link in the main page. A page similar to the one shown below will load.

This page is used to verify software versions and to add new features to a unit by purchasing additional licenses.

8 Technical Reference

8.7 Connector pin-outs

Power - 4-pin 0B LEMO Socket

Pin No	Function
1	12 V
2	12 V
3	GND
4	GND

RS232 Control / PTZ / Data - 3-pin 0B LEMO Socket

Pin No	Function
1	TX
2	RX
3	GND

Triggers - 6-pin 1B LEMO Socket

Pin No	Function
1	Input 1
2	Input 2
3	GND
4	Input 3
5	Output
6	GND

Chaining (Input slot 1) - 6-pin 1B LEMO Socket

Pin No	Function
1	Chaining Clock Input
2	Chaining Data Input
3	GND
4	RS232 TX
5	RS232 RX
6	GND

A/V In (Input slot 2) - 5-pin 0B LEMO Socket – 2 key

Pin No	Function
1	Audio Right Input
2	Audio Left Input
3	GND
4	Composite Input
5	GND

A/V Out (Monitoring output) - 5-pin 0B LEMO Socket – 1 key

Pin No	Function
1	Audio Right Output
2	Audio Left Output
3	GND
4	Composite Output
5	GND

9 Triggers Cable

The triggers cable contains specially colour coded wiring which matches the resistor colour code.

Pin 1 = Brown

Pin 2 = Red

Pin 3 = Orange

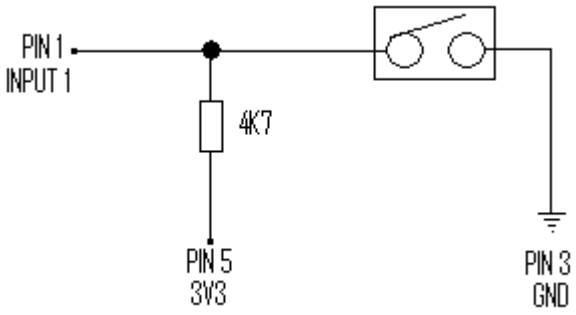
Pin 4 = Yellow

Pin 5 = Green

Pin 6 = Blue

The pins bear direct correlation to the pin outs shown in the previous section. The trigger activation for triggered recordings are made by the use of a switch (or relay within a sensor) using a Pull Up Resistor (4K7 recommended) which grounds the output 3V3 supply in the event of an activated trigger on one or more of the four input pins.

The switch/relay in the diagram below can be part of a PIR or other sensor. The circuit shown corresponds to one of the trigger inputs, in this case shown on Pin 1, though any of the three inputs can be used, for example on multiple PIRs.



In the event that the Trigger function is enabled in the NetLink Player application but the Trigger Cable is not connected, the behaviour of the NetLink unit will be unpredictable as the inputs will 'float' causing the recording state to be random.

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