BirdDog | OG4

WORLD'S FIRST NDI® OPENGEAR CARD.

USER GUIDE

NDI.

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Important Information

Legal Notice

To ensure account security, please change the password after your first login. You are recommended to set a strong password (no less than eight characters). The contents of this document are subject to change without prior notice. Updates will be added to the new version of this manual. We will readily improve or update the products or procedures described in the manual. Best effort has been made to verify the integrity and correctness of the contents in this document, but no statement, information, or recommendation in this manual shall constitute formal guarantee of any kind, expressed or implied. We shall not be held responsible for any technical or typographical errors in this manual. The product appearance shown in this manual is for reference only and may be different from the actual appearance of your device. Due to uncertainties such as physical environment, discrepancy may exist between the actual values and reference values provided in this manual. Use of this document and the subsequent results shall be entirely on the user's own responsibility.

Regulatory Compliance

FCC Part 15

This equipment has been tested and found to comply with the limits for digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
This product complies with Part 15 of the FCC Rules. Operation is subject to the following two coNDI® tions:

- This device may not cause harmful interference.

- This device must accept any interference received, including interference that may cause undesired operation.

LVD/EMC Directive

This product complies with the European Low Voltage Directive 2006/95/EC and EMC Directive 2004/108/EC.

Welcome to BirdDog

Thank you for purchasing your OG4 converter card. If you have any questions regarding the card, please contact your authorized dealer.

Using This Manual

Your new OG4 converter card is a sophisticated and powerful device, therefore before operating the unit, please read this manual thoroughly and retain for future reference.

Tip

When viewing the diagrams in this manual, use the zoom controls in your browser or PDF reader to reveal more detail.

We're Invested In Your Success

We pride ourselves on being approachable and easily contactable. We'd love to hear from you.

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Co–Founder and CEO	Co–Founder and CMO
dan@bird–dog.tv	eamon@bird–dog.tv

Welcome to the Future

What is NDI®?

Your new OG4 converter card has been designed from the ground up to support the cutting edge NDI® video transmission standard.

NDI® (Network Device Interface) is a free, high-quality, low-latency, frame-accurate standard that enables compatible devices to communicate, deliver, and receive high definition video over your existing Gigabit Ethernet network.

Operating bi-directionally, NDI® devices can be auto-detected, powered and controlled over the same Ethernet cable used to send the video and audio. If you have a Gigabit network, you have a now have the potential for a streamlined, interconnected, video production environment.

With the introduction of NDI® 5, you can now securely share network sources between remote sites anywhere in the world – on a single network port. Even a smartphone can be a NDI® source.

Transitioning to NDI® can also occur gradually. Existing SDI signals can easily be converted to an NDI® stream and piped where required on your network and converted back only at the neccessary SDI endpoints.

BirdDog has been on the NDI® journey since the very beginning and your OG4 converter card is just one of our products designed to take advantage of the features and potential of NDI®.

For more information on NDI®, please refer to this page on our website.
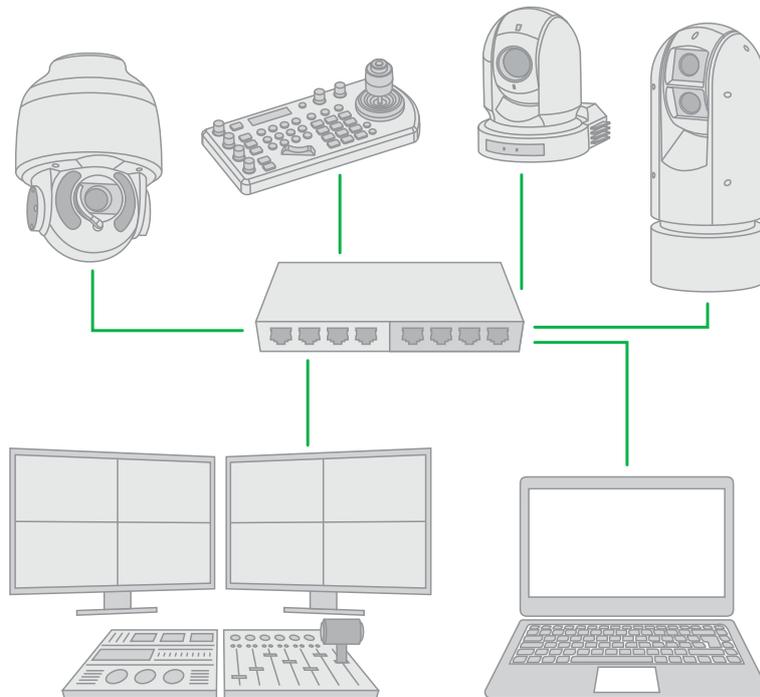
Key Features

BirdDog OG4 openGear card, is the World's First NDI® card and features four independently configurable 12G SDI inputs and outputs.

- Supports up to four channels of UHD 4Kp60/1080p60 encode. Two channels of UHD 4Kp60 decode, four channels of 1080p60 decode.

- Network streaming transport support:

    · Full NDI® I-frame compression

- Full bandwidth I-frame compression.

- 4 x 12G-SDI selectable inputs/outputs.

- Next Level NDI® Tools.

- System management and control: On-device WebUI, Published RESTful API, Q-Sys plugin, Crestron, Zoom and openGear Dashboard control system.

Encode and Decode up to 4Kp60
Encode or Decode Full NDI® for all resolutions up to 4Kp60, including all HD resolutions and embedded 2 channel 48kHz audio.

4x 12G SDI bi-directional ports
Each port supports independent resolutions/frame rates.

Selectable Network Connectivity
Easily toggle between SFP+ or the openGear 1GbE Network connection. The Industry standard SFP+ connection allows for short, medium, and long range connections over fiber and supports 10GbE Ethernet protocols.

Professional Cooling and Power.
openGear frames include integrated cooling fans to provide maximum cooling for all cards and can be configured with dual, redundant power supplies for maximum reliability and uptime.

Getting To Know Your BirdDog OG4 Converter Card

Thanks for purchasing the BirdDog OG4 converter card. This card is designed for the openGear oGx modular frame. This AV industry rack standard makes it easy to securely install and integrate many types of processing cards from a large variety of openGear partners.

Please take some time to read this guide and familiarize yourself with the features of your new converter.
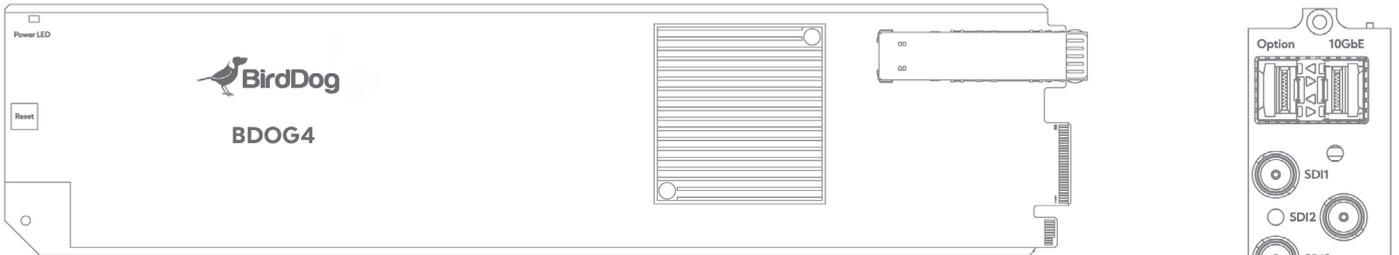
The OG4 converter card consists of the main processing card, which is mounted inside the openGear frame, and the rear module plate which houses the connectors for the converter.

The card is automatically powered by the frame and you can easily access the settings of the converter using either the BirdDog WebUI, or the Ross Video Dashboard, via the frame Ethernet port. The front end of the card also features a Reset button which clears all user configuration.

Video I/O Connectivity

The rear module plate features: Four 12G SDI connectors.

Network Connectivity

Press the **Reset** button at the front of the card for 30 seconds to toggle between:

- The openGear 1GbE Network Port (integrated into chassis backplane).

or

- The 10Gbps SFP+ Network Port (Optical or Copper 10GbE). (The Option SFP+ Network Port is set aside for future use).
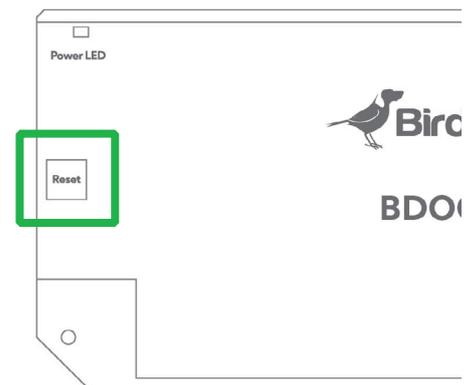
System Requirements

- openGear oGx or BBG–1300–FR 1RU modular frame.
- For 1Gb Ethernet operation, the frame requires either a OG3–N or OG3–NS controller card installed. The 8322–S controller card does not provide external 1 Gb Ethernet connectivity.
- Both the Ross Dashboard and BirdDog WebUI interfaces must run on a computer that has a physical wired Ethernet connection. Wireless connections do not allow device discovery.

Card Installation

ESD (Electrostatic Discharge) Precautions

- Always wear a grounded anti-static wrist strap when handling cards.
- Always hold card by the corners and avoid direct contact with any of the components.
- Never let the card come in contact with clothing. Clothing can generate high levels of electrostatic energy.
- The warranty may be void if equipment is damaged by ESD.

NOTE openGear cards are *hot swappable,* which means that cards can be installed or removed without powering down the frame.

Installation of the module connector plate

1. From the rear of the openGear frame, locate the card slot into which you wish to install your OG4 converter card.
2. Using a No. 1 Phillips screwdriver, unscrew the top screw from the desired blank module plate and remove the plate. Retain the plate for possible future use.
3. Locate the bottom of the module into the seating slot at the base of the frame backplane.
4. Using the Phillips screwdriver, secure the module in position with the screw. Do not tighten fully at this point.

Installation of the main card

1. From the front of the frame, slide the side door catches towards the center of the door, releasing the door from the frame.
2. Using both hands, pull the door towards you. The door extender arms will prevent the door from falling.
3. Locate the card slot in which you installed the module connector plate.
4. Insert the card into the guides and push the card into the frame until the card is seated into the module connector plate at the rear of the frame. The white plastic card ejection tab at the front of the card will stand fully vertical when the card is fully seated.
5. Close the frame door, ensuring that the door catches engage into the frame.
6. Use the Phillips screwdriver to fully secure the rear module plate in position but do not overtighten.

NOTE The SFP+ module is part of the card and NOT attached to the module connector plate. Therefore, when plugging into the module, ensure that the card is not pushed out of it's slot.

Operating your OG4 Converter Card

Operation of the OG4 Converter Card is simple and very similar to the BirdDog QUAD Converter.

Setup of your card is accomplished via the BirdDog WebUI. Once set up, you can choose to adjust the settings of your card via the BirdDog WebUI or the Ross Dashboard.

However, firmware updates, as well as configuration of network settings such as DHCP can only be done via the BirdDog WebUI.

Your card is supplied with a sample Ross Dashboard interface. You can custom design your own Ross Dashboard to display whatever features you wish. Both interfaces must run on a computer that has a physical wired Ethernet connection. Wireless connections do not allow device discovery.

Web Configuration Panel

The BirdDog web configuration panel (WebUI) allows you to interact with your converter and offfers complete control of A/V settings and video frame rates, including restarting the video processing engine, changing networking parameters and applying firmware updates.

Access via web browser (URL)

Your converter is configured to automatically receive a network IP address from the computer network via DHCP (Dynamic Host Configuration Protocol). Most corporate, education and home networks have a DHCP server on the network to allow this to occur. Usually your Internet Router provides this.

If your device receives an IP address automatically from this server (DHCP) the IP address can be discovered in several ways, including the free BirdDog Central Lite software.

Your computer will need to have 'Bonjour' services loaded in order to access the unit via it's user defined name. Apple devices come pre-installed with Bonjour, while Windows devices need a plugin available from here.

Access without a network DHCP server

Some standalone or private networks may not have a DHCP server. After 30 seconds of waiting for an automatically assigned IP address the device will fall back to a default address which is: 192.168.100.100.

In order to access the web configuration panel on a network which is configured to a different subnet, change your computers IP address to match the BirdDog unit's IP address range. Once you gain access to the BirdDog web configuration panel (WebUI), choose your IP address to match the rest of the devices on your network.

For instructions on setting your computers IP address please consult your computer operating system manual or IT support resources.

Password Management

Once you direct your web browser to the BirdUI you will need to log in to change any settings.

Default password

The web configuration panel is secured by a user-selectable password.

The default password is: **birddog** (one word, lower case).

To change the password simply login using the default password, navigate to the network tab in the web interface, and select change password.

It is recommended to change this password in a network environment where your device is shared with other users (e.g., not private). By entering this password, the user is granted full access to the configuration settings and could interrupt a live program.

BirdUI Layout

The BirdUI is organized into the following panels:

1. **Dashboard**

   Overall view of important information such as the network connection type and video stream format and resolution.

2. **Network**

   General network settings such as DHCP IP Address details, DHCP timeout, DHCP Fall-back IP Address, Network Name, designation of group access and NDI® specific net-work settings

3. **System**

   System Admin functions such as updates and password change.

4. **AV Setup**

   Operational mode (Encode or Decode) and associated settings.

5. **Login/Logout**

   BirdUI login/logout.
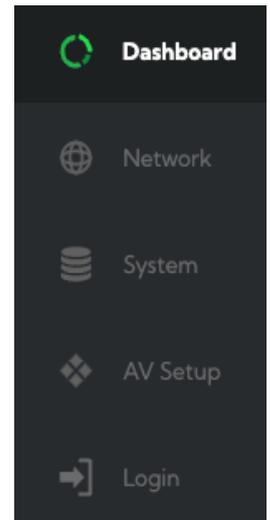
Dashboard
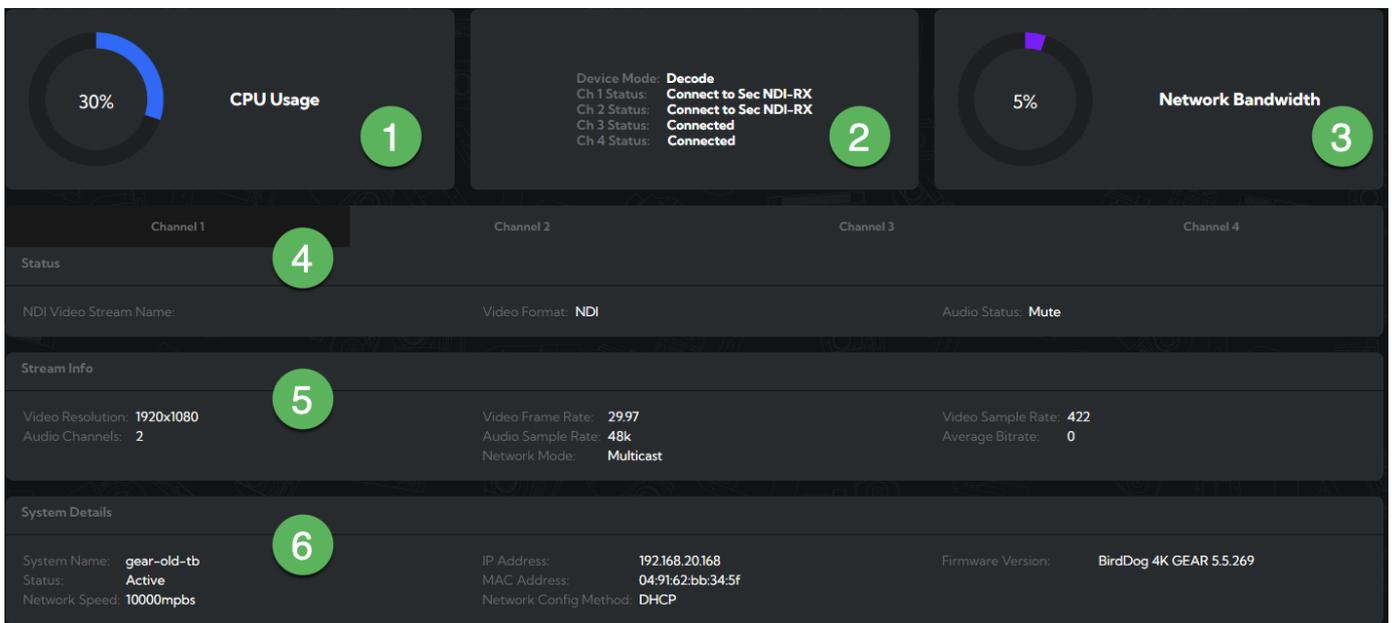
The Dashboard summarizes the important settings for the OG4 converter card in one convenient location. You can also reboot the device or restart the video processing engine. The card also has a Reset button located at the front end of the card which can be used to clear all user configuration. Open the frame front door, press and hold the Reset button for approximately 5 sec.

1. **CPU Usage**

    Current computer system CPU utilization.

2. **Device mode and Source Status**

    Indicates whether the device is operating in Encode or Decode mode and shows the status of the connected sources.

3. **Network Bandwidth**

    Network bandwidth consumption of the current NDI® stream(s).

4. **Status (per channel)**

    a. NDI® video stream name

    b. Selected video format.

    c. NDI® audio status.

5. **Stream Info**

    a. Video resolution, frame rate and sample rate.

    b. Number of audio channels of the stream. The audio output sample rate and average NDI® bitrate of the stream.

    c. Network transmit method.

6. **System Details**

    a. System Name, Status, IP Address, MAC Address, Network Configuration Method, Firmware Version and Network Speed.

Network

Network Details

NIC Medium Select

Select the desired network connection. Note that SFP+ is the default selection.

Configuration Method

You can configure the device to operate on the network with a dynamic (DHCP) IP Address or a fixed Address. For smaller networks DHCP networking is generally suitable, however larger networks with managed operations will often determine each device needs to have a dedicated and static IP Address.

DHCP IP address

DHCP is set as the network configuration by default.

Static IP address

To enable a static IP address, change configuration method to static and fill in the details required in Address, Mask and Gateway. Particular attention should be paid to the **Address** and **Mask** fields as incorrect information entered will result in the device not being visible on the network.

DHCP Timeout, Fallback IP Address, Fallback Subnet Mask

You can set the timeout period during which the converter will look for a DHCP IP Address. After this period, the camera will default to the designated fallback IP Address.

This can be useful if you use your camera in other network environments. For example, if a DHCP server is available in your normal office or studio application, the converter will use the DHCP supplied IP Address. If you then use the camera in another application without a DHCP server, your device will always default to the known fallback IP Address. Note: Do not set the fallback IP Address the same as the device IP Address. It is recommended that you keep the default.

IP Address Recovery

In the event that the device is not visible on the network, the network has changed, or the static IP Address details have been lost, reset the BirdDog back to its default settings by following the factory reset procedure.

BirdDog Name

You can name each converter with a memorable name that makes sense for each production. This name will appear on any NDI® receiver when it looks for video over the network. The name must not include any special or uppercase characters but can be any combination of 'a–z, 0–9, and –'.

NDI Network Settings

The OG4 operates with the latest NDI® Libraries. There are several options to configure its behaviour in an NDI® network. Each configuration has its benefits, however it is recommended to utilise the default TCP transmit method unless you have reason to change.

Transmit / Receive Preferred Method

TCP

TCP is the default transmission method for NDI®. It operates well in local networks with predictable latency and limited jitter. BirdDog recommends that TCP be used for typical applications, and using alternative transports only for specific reasons.

UDP

UDP is recommended for networks where there is extended latency. The nature of UDP allows dropped packets and doesn't establish handshaking dialogues to confirm each received packet – which can improve performance. UDP can have some consequences if there are other issues on the network, such as jitter or packet loss, as lost packets will not be resent.

R-UDP (Reliable UDP)

This protocol bridges the performance of TCP and UDP. Compared to TCP, R-UDP reduces overall network load (allowing more NDI® streams) by not requiring every packet to be 'acknowledged' by every receiver. Built-in error correction adds smoothness and reliability.

NDI Discovery

By default, NDI® utilizes mDNS (multicast Domain Name System) to create a zero configuration environment for network discovery. The primary benefits of using mDNS is that it requires little or no administration to set up. Unless the network is specifically configured to not allow mDNS, NDI® sources will be discovered.

The NDI® Discovery Service is designed to allow you to replace the automatic discovery with a server that operates as an efficient centralized registry of NDI® sources resulting in much less bandwidth use. NDI® discovery server also helps with location of devices that reside on different subnets. The NDI® Discovery Server is available as part of the free NDI Tools in NDI version 5.5 (C:\Program Files\NDI\NDI 5 Tools\Discovery\NDI Discovery Service.exe).

1. If you are using a NDI® Discovery Server, click the ON button.

2. Enter the IP Address of your NDI® Discovery Server.

3. Click the **APPLY** button to save your changes.

Access Manager Configuration
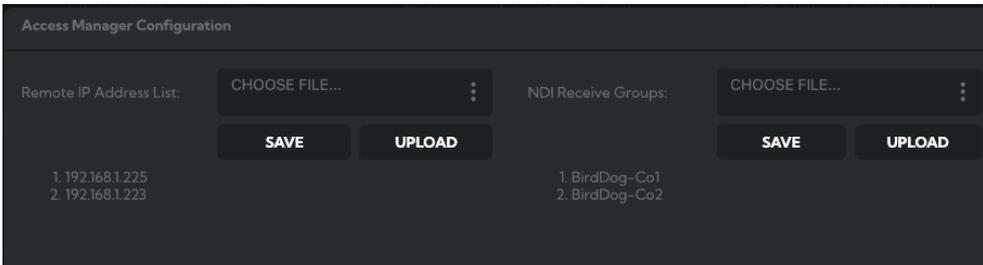
Remote IP Address List

By default, NDI® devices are visible to each other only when they're on the same VLAN. If you want visibility or control of a device on a different VLAN, you need to add it's address manually as a Remote IP.

1. Click the **CHOOSE FILE** button to load your **Remote IP Address List** in UTF-8 encoded string format.

2. Click the **UPDATE** button. Do not upload a blank list.
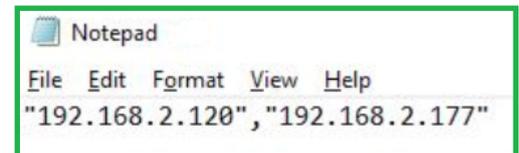
NDI Receive Groups

Set the NDI Receive Group. NDI® Groups allow you to restrict communication to only devices that belong to the same NDI® Group. NDI® Groups can be very useful in larger environments to control visibility and access amongst various groups.

1. Click the **CHOOSE FILE** button to load your **NDI Receive Group List** in UTF-8 encoded string format.

2. Click the **UPDATE** button. Do not upload a blank list.
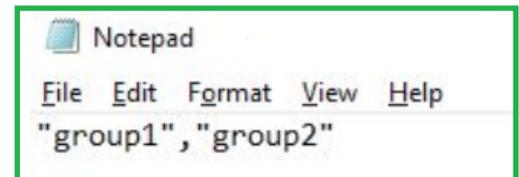
Encode Groups
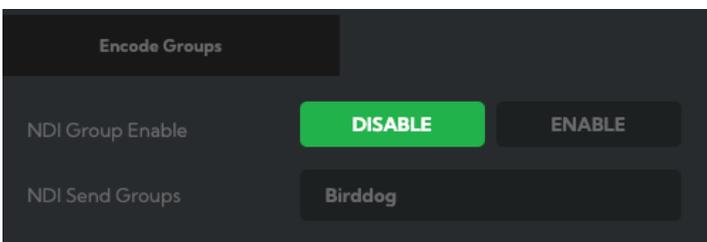
Enable and set the Encode NDI Group for each channel. NDI® groups allow you to restrict communication to only devices that belong to the same NDI® group. NDI® Groups can be very useful in larger environments to control visibility and access amongst various groups.

System

Password Settings

The WebUI is secured by a user password. The default password is **birddog** (one word, lower case). It is recommended to change this password to retain administration rights to prevent unauthorized changes since the WebUI grants full access to the configuration settings.

1. Enter the current password.
2. Enter the new password. Confirm the new password and click the Apply button.

System Update

The converter is able to be updated via the BirdDog WebUI. Please check our <u>Downloads</u> page regularly to ensure you have the latest firmware available for your device. Having the latest firmware ensures you have all the latest features and performance updates to get the most out of your OG4 converter card.

After downloading the latest firmware release, navigate to the **System Update** tab on the BirdUI and click the **CHOOSE FILE**... button, select the firmware update file and click the **UPDATE** button.

System Reboot

Click this button to reboot the unit after changing key network settings or the BirdDog name.

A/V

Device Settings
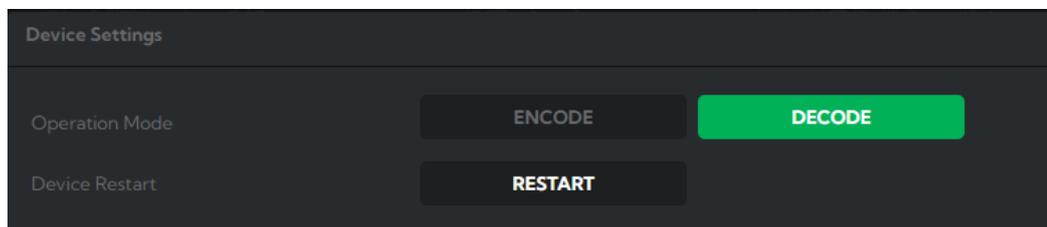
Operation Mode

Choose whether the converter is operating in Encode or Decode mode. You may need to click on the Operation Mode label to display this option.

Device Restart

Click the **RESTART** button to ensure the video engine initialises with any new settings.

Encode Settings

Four tabs display the settings for each channel.
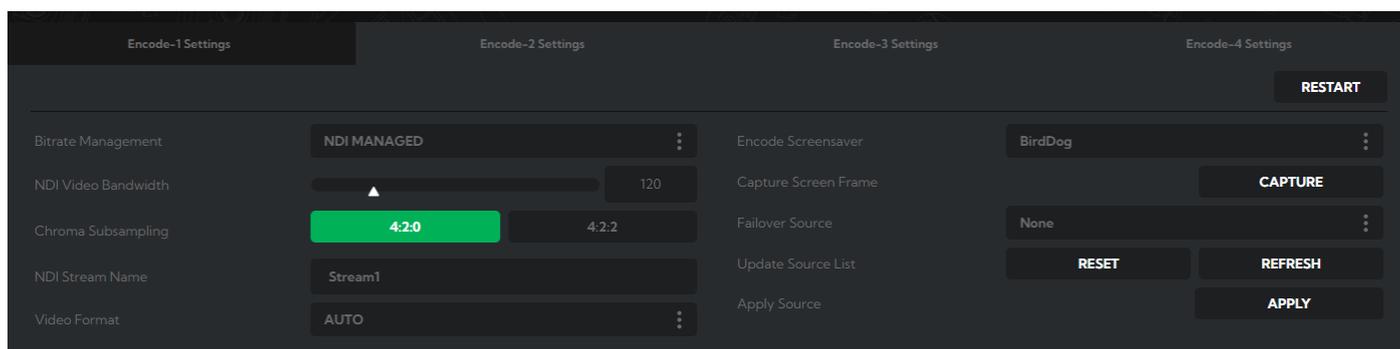
Bitrate Management

BirdDog devices allow you to set your target NDI®output bitrate. This allows you to select a compression ratio that is more efficient (uses lower bandwidth) on your networking infrastructure or higher image quality for critical footage. By setting **Bitrate Management** to NDI MANAGED, the BirdDog device will manage the target bitrate in accordance with the NDI® standard. By selecting MANUAL you are able to manually select a target bitrate.

NDI Video Bandwidth

If you have selected a manual bitrate management, you may set your target NDI® output bitrate here. This allows you to select a higher bitrate stream for a higher quality video if your network capacity allows. Select from 60 – 360 Mbps. Use the manual setting with caution, as higher bitrates may cause issues such as frame tearing with video sources of high temporal complexity.

Chroma Subsampling

Set the desired level of chroma subsampling. To maintain performance when encoding 4K resolutions on multiple channels, it is recommended to use the Chroma Subsampling option of 4:2:0.

NDI Stream Name

When your BirdDog converter generates an NDI® stream, it can be identified via it's name on any NDI®–capable receiver. You are able to nominate the NDI® stream name here to give you a more descriptive name of the source you are connecting to. This can be particularly useful in multi–channel devices or on networks where there are a large amount of NDI® streams.

Video Format

This converter is capable of accepting many different video formats to encode to NDI®. For the most part it is recommended to leave **Video Format** set to AUTO, you can manually override this setting and choose whatever resolution your source device is set to. This can be useful if there is an issue in synchronising video input resolutions.

NDI Group Enable

This allows you to limit the visibility of the device to other devices that belong to the same NDI® Group. By default this setting is DISABLED. When enabled the receiver device needs to also be set to the same identical group name. Commonly this is done using the **NDI Access Manager** application provided by NewTek free of charge. NDI® Groups can be very useful in larger environments to control visibility and access amongst various groups.

Encoder Screensaver

Assign a captured frame, black frame, or the BirdDog logo as a screensaver.

Capture Screensaver Frame

Click the **CAPTURE** button to capture the current frame for use as a screensaver.

Failover Source

If the generated NDI® stream is interrupted for any reason the receiver can automatically switch to a nominated alternative NDI® stream. This is particularly useful for live 'on air' productions where there can be no risk of still frames or black being broadcast should any source no longer be available. Pressing the **REFRESH** button will add new sources to the list, whereas pressing the **RESET** button will populate the list with only active NDI® sources.

Apply Source

Click the **APPLY** button to apply changes of source.

Restart button

Click the Restart button to ensure the stream starts with the new settings.

v

Decode Settings

Four tabs display the settings for each channel.

NDI Audio

Choose to enable or mute the NDI® audio.

Decode Screensaver

Assign a captured frame, black frame, or the BirdDog logo as a screensaver.

Capture Screen Frame

Click the **CAPTURE** button to capture the current frame for use as a screensaver. The video frame must be progressive. Interlaced frames cannot be captured.

Interlaced Field Order

Select the desired field order to match your playback hardware.

NDI Decode Source

To select an NDI® decode source, click the dropdown and select a source. The source will be displayed in the **NDI Decode Source** field. Click the link icon to navigate to a webpage if applicable.

The **RESET** button will delete the currrent list and display only current NDI® sources. The **REFRESH** button will add newly discovered sources to the list but not remove older, currently non–active sources.

Failover Source

If the generated NDI® stream is interrupted for any reason the receiver can automatically switch to a nominated alternative NDI® stream. This is particularly useful for live 'on air' productions where there can be no risk of still frames or black being broadcast should any source no longer be available. Pressing the **REFRESH** button will add new sources to the list, whereas pressing the **RESET** button will populate the list with only active NDI® sources.

Apply Source Change

Click the **APPLY** button to apply changes of source.

Restart button

Click the Restart button to ensure the stream starts with the new settings.

Ross DashBoard

Displayed below are images of the supplied Ross DashBoard for the OG4 Converter Card. Note that network set up and firmware updates need to be done via the BirdDog WebUI. The available settings in the Ross DashBoard are similar to those available in the BirdDog WebUI.

To open the Ross DashBoard.

1. Download the BirdDogPanel.grid file from here.
2. Double click on the downloaded file.

Configuration

1. Select the Config tab.
2. Add the IP Address of the installed BirdDog OG4 card.

Device Settings

1. Click the RELOAD button to view the current settings on the card.
2. Click the APPLY to action any changes you have made.

Encode

1. Click the RELOAD button to view the current settings on the card.
2. Click the APPLY to action any changes you have made.

Decode

1. Click the RELOAD button to view the current settings on the card.
2. Click the APPLY to action any changes you have made.

Receiving NDI® Streams

There are many applications that support receiving the NDI® signal that the unit produces. Each application will vary slightly on how you choose your source.

NewTek Studio Monitor

NDI® Tools is a free suite of applications designed to introduce you to the world of IP video and is available here.

The included Studio Monitor application allows you to monitor many NDI® sources on a standard Windows computer. Once Studio Monitor is launched on your computer, simply right click anywhere in the interface and select OG4 from the dropdown list.

Once connected to your converter, a Configuration gear icon is displayed on the bottom right-hand side of the video display that provides shortcut access to the OG4 WebUI.

NewTek TriCaster Series

NewTek TriCaster series devices allow several NDI® sources to be received simultaneously – the amount of simultaneous connections varies by what model TriCaster you have. Consult your TriCaster user manual to determine how many connections are available on your device.

To select OG4 as a source on your TriCaster, click on the Configuration gear icon below your desired source location. This will display the **Input Setting** dialog, from which you can select your converter source from the dropdown list.

Once connected to your converter, a Configuration gear icon displays next to the Source dropdown window that provides shortcut access the OG4 converter card WebUI.

Glossary

Domain

A domain contains a group of computers that can be accessed and administered with a common set of rules. Domain can also refer to the IP address of a website on the Internet.

DNS

DNS (Domain Name System) is a system used by the Internet and private networks to translate domain names into IP addresses.

mDNS

mDNS (Multicast DNS) refers to the use of IP multicast with DNS to translate domain names into IP addresses and provide service discovery in a network that does not have access to a DNS server.

Ethernet

Ethernet, standardized as IEEE 802.3, refers to a series of technologies used to connect computers and other devices to a LAN (Local Area Network) or wide area network (WAN).

Firmware

Firmware is a class of software held in non-volatile memory that provides the low-level control for a device's hardware.

Gigabit Ethernet (GigE)

An Ethernet capable of transmitting frames at a rate of a gigabit per second. A Gigabit capable Ethernet network is recommended for NDI® production workflows.

IP

IP (Internet Protocol) is the communications protocol for the Internet, many wide area networks (WANs), and most local area networks (LANs) that defines the rules, formats, and address scheme for exchanging datagrams or packets between a source computer or device and a destination computer or device.

LAN

LAN (Local Area Network) is a network that connects computers and devices in a room, building, or group of buildings. A system of LANs can also be connected to form a WAN (Wide Area Network).

Mbps

Mbps (Megabits per second) is a unit of measurement for data transfer speed, with one megabit equal to one million bits. Network transmissions are commonly measured in Mbps.

NDI®

NDI® (Network Device Interface) is a standard allowing for transmission of video using standard LAN networking. NDI® comes in two flavours, NDI® and NDI® |HX. NDI® is a variable bit rate, I-Frame codec that reaches rates of around 140Mbps at 1080p60 and is visually lossless. NDI®|HX is a compressed, long-GOP, H.264 variant that achieves rates around 12Mbps at 1080p60.

Packet (Frame)

A packet s a unit of data transmitted over a packet-switched network, such as a LAN, WAN, or the Internet.

PoE

Power over Ethernet

Port

A port is a communications channel for data transmission to and from a computer on a network. Each port is identified by a 16-bit number between 0 and 65535, with each process, application, or service using a specific port (or multiple ports) for data transmission. Port can also refer to a hardware socket used to physically connect a device or device cable to your computer or network.

PTZ

Pan, tilt and zoom.

RJ45

A form of standard interface commonly used to connect computers onto Ethernet-based local area networks (LAN).

RS422, RS485, RS232

Physical layer, serial communication protocols.

Subnet

Subnet or subnetwork is a segmented piece of a larger network.

Tally

A system that indicates the on-air status of video signals usually by the use of a red illuminated lamp.

TCP

TCP (Transmission Control Protocol) is a network communications protocol.

UDP

UDP (User Datagram Protocol) is an alternative protocol to TCP that is used when reliable delivery of data packets in not required.

WAN

WAN (Wide Area Network) is a network that spans a relatively broad geographical area, such as a state, region, or nation.

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