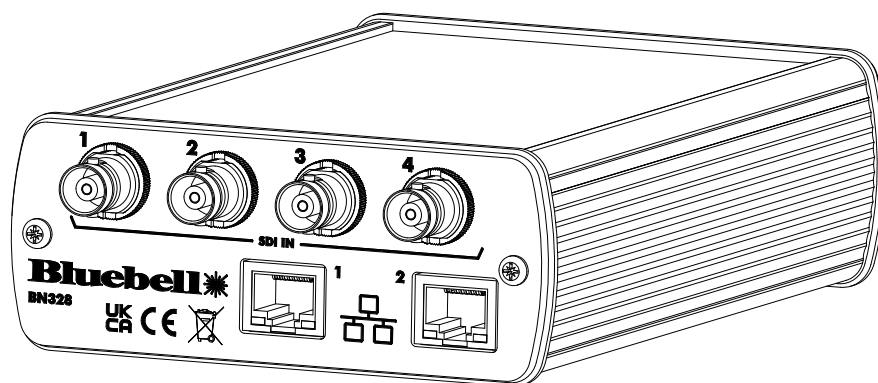


## BN328 Series Quad 12G Fibre Interfaces



Thank you for purchasing this Bluebell Opticom professional broadcast video product. BN328 interfaces are very simple to install and this Quick Start Guide should provide sufficient information to get you up and running in the vast majority of cases.

## Quick Start Guide

## Overview:

The BN328 Series is a range of compact, stand-alone fibre interfaces intended for remote video applications of up to 8K format. They allow four independent SDI video signals meeting SD, HD, 3G, 6G or 12G standards, plus one or two gigabit Ethernet data streams to be transported over a single fibre-optic cable for distances of up to 20 km\*. They are ideal for use with remote 8K cameras employing quad 12G outputs and Ethernet control, but can be used for any other application requiring transport of multiple SDI signals and control data over long distances.

An optical “expansion” port allows a BN328 to be cascaded with a second, similar unit - or any other optical source - operating on a different range of wavelengths to double the capacity of the single fibre link.

The “copper” connections are four BNC connectors for video and one or two RJ45 ports for Ethernet; the optical port is a standard dual LC optical connector.

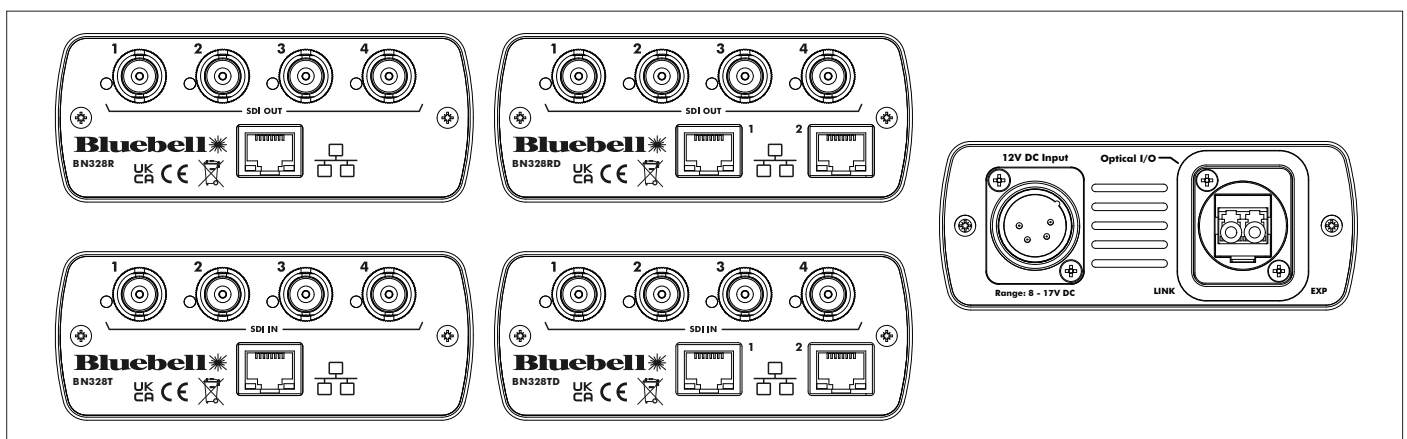
This Quick Start Guide covers the whole BN328 range, which comprises four models, each of which exists in two variants. The first four variants listed below operate using “High Band” optical wavelengths in the range 1470 to 1610 nm:

- BN328T transmitter – quad SDI inputs plus Ethernet to an LC fibre output
- BN328R receiver – LC fibre input to quad SDI outputs plus Ethernet
- BN328TD transmitter – quad SDI inputs plus dual Ethernet to an LC fibre output
- BN328RD receiver – LC fibre input to quad SDI outputs plus dual Ethernet

The four additional variants below are functionally identical to those above, but use “Low Band” optical wavelengths in the range 1270 to 1410 nm. A High Band unit and a Low Band unit can be cascaded using the optical expansion port to double the signal capacity on the single fibre length.

- BN328T-L transmitter – quad SDI inputs plus Ethernet to an LC fibre output
- BN328R-L receiver – LC fibre input to quad SDI outputs plus Ethernet
- BN328TD-L transmitter – quad SDI inputs plus dual Ethernet to an LC fibre output
- BN328RD-L receiver – LC fibre input to quad SDI outputs plus dual Ethernet

All variants are of identical construction, and in outward appearance differ only in the silk-screened labelling:



In the following descriptions of usage, it can be assumed that the High Band and Low Band variant of the same model are functionally identical, unless stated otherwise.

\*Typical figure. Operational distance achievable in practice is dependent on fibre type and number of intermediate connections

## Power supply:

All BN328 variants require an external power supply voltage between 5 and 17 V DC. A Bluebell Model PS12 PSU (12 V) will be packed with the interface if one was ordered. The power supply connector is a Neutrik® XLR4M, and a locking mating connector is pre-fitted to the PS12 DC cable.

Pin	
1	0 V
2	n/c
3	n/c
4	+V DC

If using an alternative PSU, wire the connector as above.

Model	Power
BN328T BN328T-L	7.5 W
BN328R BN328R-L	
BN328TD BN328TD-L	9 W
BN328RD BN328RD-L	

BN328 range: typical power consumption (measured with 4 x 12G SDI signals).

## Inputs and outputs:

### SDI Video:

BN328 interfaces can be used with serial digital video signals having data rates up to 12 Gb/s. Standards supported are:

- SD-SDI: SMPTE ST259M compliant
- HD-SDI: SMPTE ST292M compliant
- 3G-SDI: SMPTE ST424M compliant
- 6G-SDI: SMPTE ST2081 compliant
- 12G-SDI: SMPTE ST2082 compliant

The interfaces are also compliant with SMPTE ST297, covering optical transmission of SDI video. DVB-ASI baseband streams are also compatible.

Video inputs and outputs are on 75 ohm BNC sockets. All models have four connectors: inputs on the BN328T/TD and outputs on the BN328R/RD. Each SDI connector has a bi-colour LED to confirm signal lock.

### Ethernet:

All BN328 models handle bidirectional Ethernet data via RJ45 connector(s) employing standard Cat 5/Cat 6 network UTP cabling. Models with the suffix 'D' to their Part Number have a second RJ45 connector, and can cater for two independent Ethernet data streams.

The Ethernet ports are compatible with 10Base-T, 100Base-T and 1000Base-T data rates. Auto negotiation is employed to select the correct data format, and full- or half-duplex operation without the need for any manual configuration. The port is also compliant with MDI-X, allowing either "straight" or "crossed" cables to be used, configuration being automatic.

**Optical:**

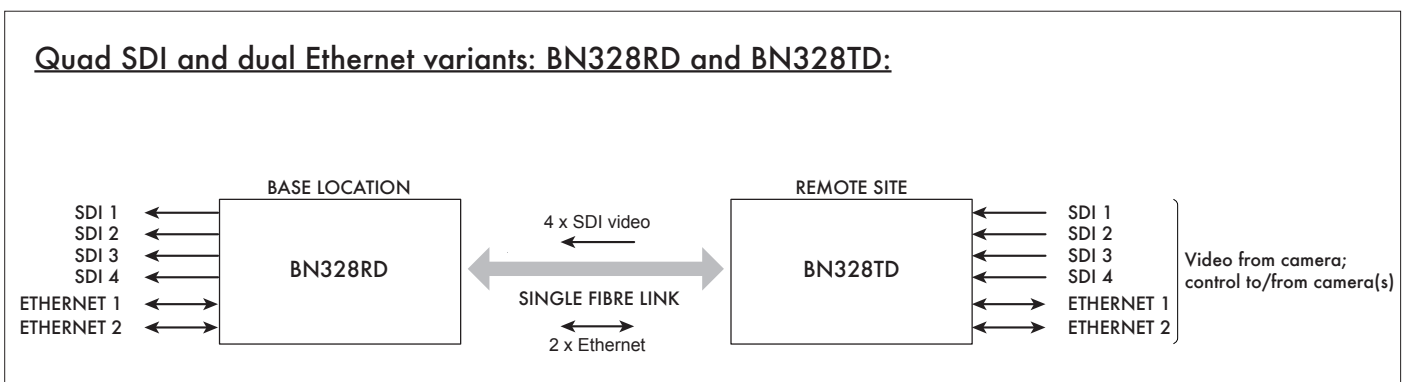
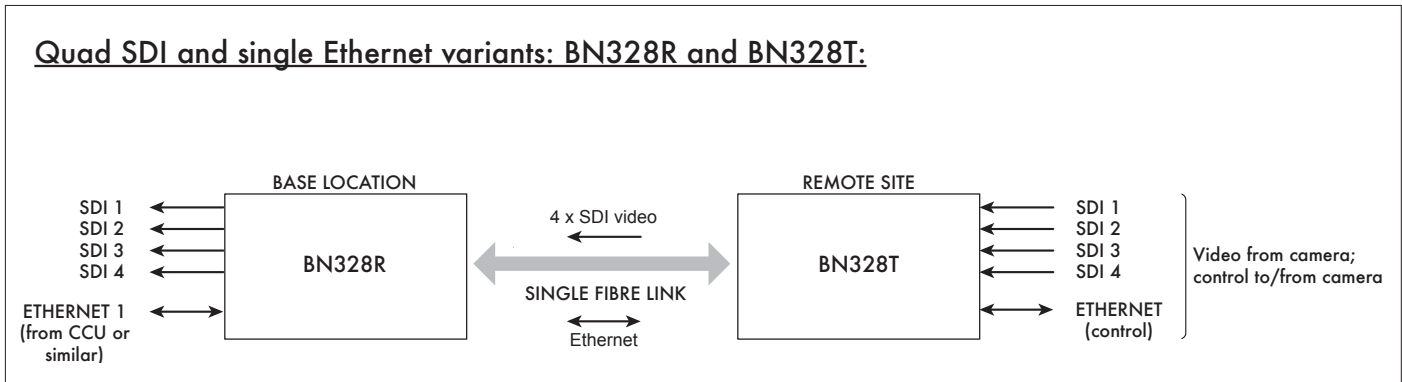
All BN328 models are fitted with a dual LC optical connector. The two ports are marked **LINK**, and **EXP**: **LINK** is the primary optical input or output, while the **EXP** port may be used for system expansion purposes. (See Guide section "Using the BN328" for details.)

Optical operation is single-mode. Models BN328T use six wavelengths, Models BN328TD use eight, as listed below:

Signal	BN328T	BN328TD	BN328T-L	BN328TD-L
Ethernet 2		1470 nm		1270 nm
Ethernet 2		1490 nm		1290 nm
Ethernet 1	1510 nm	1510 nm	1310 nm	1310 nm
Ethernet 1	1530 nm	1530 nm	1330 nm	1330 nm
SDI 1	1550 nm	1550 nm	1350 nm	1350 nm
SDI 2	1570 nm	1570 nm	1370 nm	1370 nm
SDI 3	1590 nm	1590 nm	1390 nm	1390 nm
SDI 4	1610 nm	1610 nm	1410 nm	1410 nm

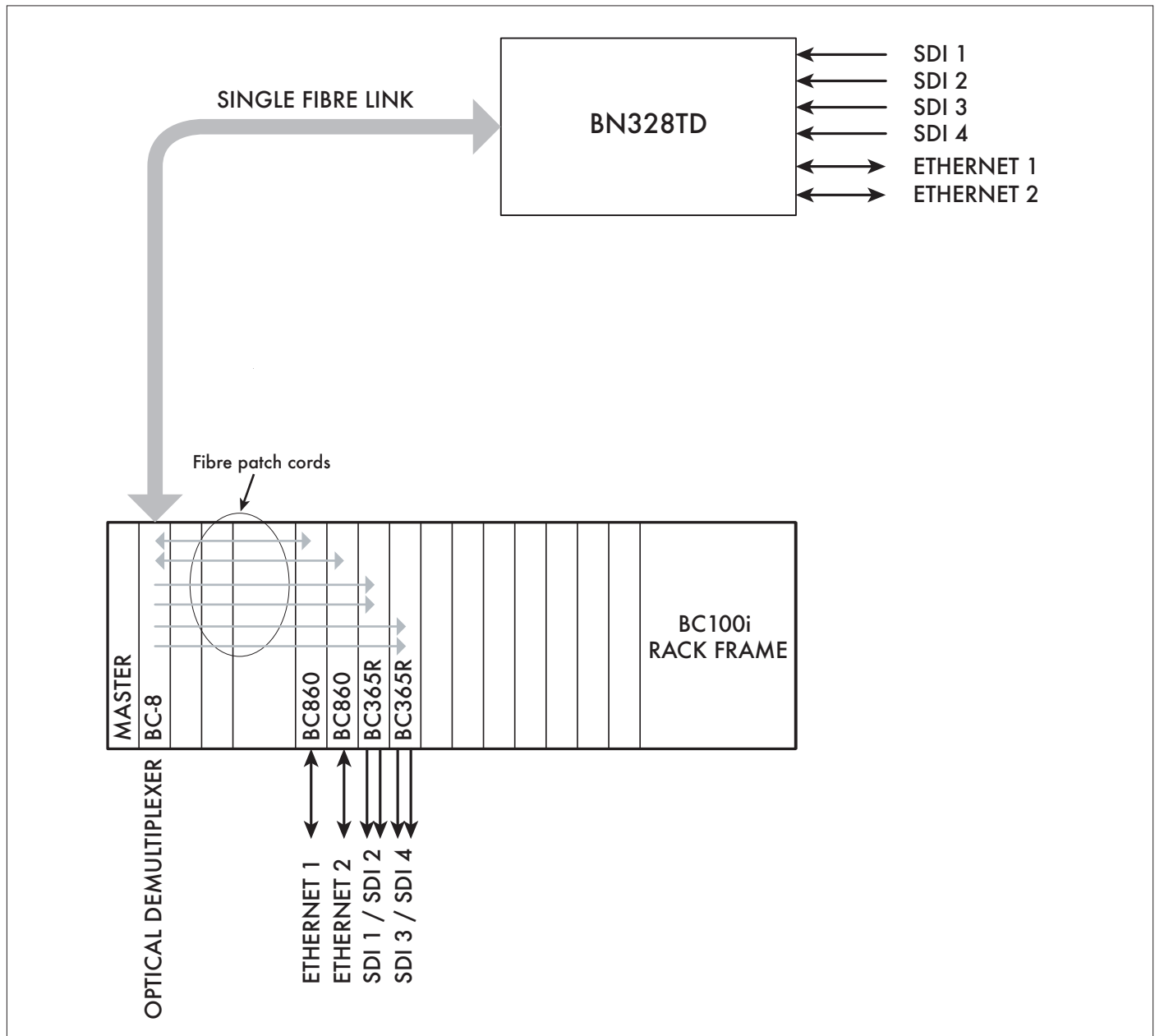
**Using the BN328:**

Typically, BN328 units will be used in pairs, either with a BN328T/BN328R pair or a BN328TD/BN328RD pair at the two ends of the fibre run. For remote camera use, the transmitter interfaces ('T' models) will be installed adjacent to the camera(s), and the receiver interfaces ('R' models) at the OB truck, MCR or other base station.



The interfaces in the previous diagrams could be either High Band or Low Band versions, provided the same Band version is used at each end of the fibre link.

In large OB situations where many remote cameras are employed, an alternative configuration might be to replace the BN328R units at the base station with Bluebell BC Series modular interface cards in a BC100i rack frame. This would be a tidier solution and would remove the multiplicity of “throw-down” units, each with their SDI, Ethernet, fibre-optic cables and PSUs.



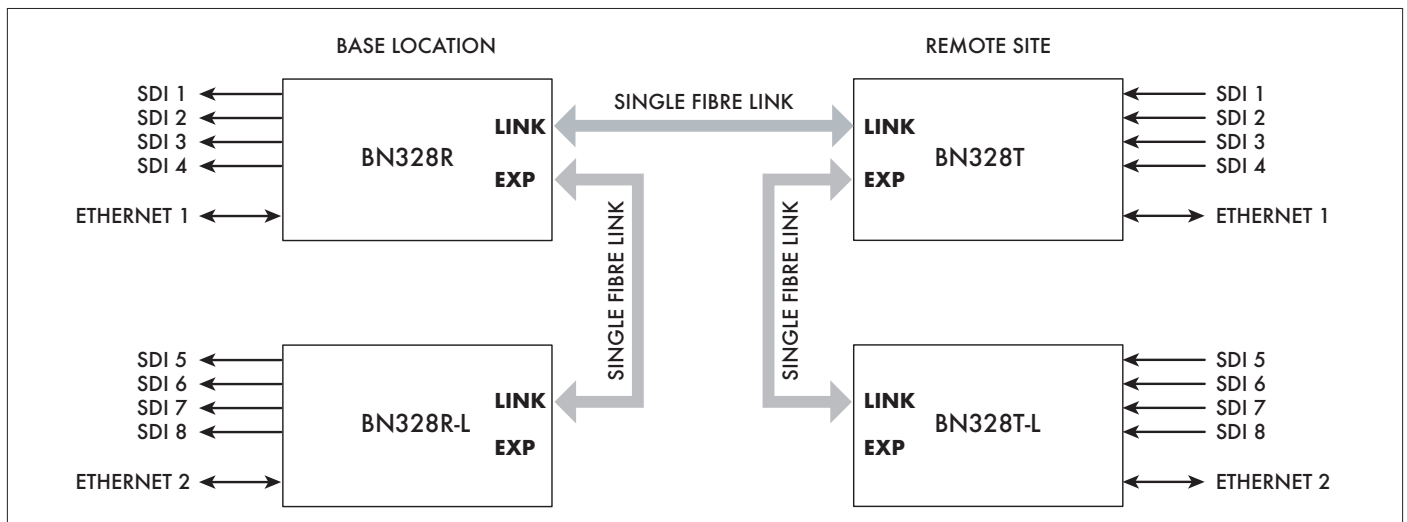
The example above illustrates a remotely-located BN328D connected to BC Series cards in a BC100i rack frame in an MCR, OB truck or other base station via a single fibre link. The optical data would be routed via a BC-8 optical demultiplexer, which separates the signals using different wavelengths for onward processing. The wavelengths carrying the SDI signals would be routed to two BC365R dual receiver cards for recovery of the video; two BC860 cards would similarly recover the bidirectional Ethernet data.

## Using the Expansion Port

The **EXP** port of the dual LC optical connector can be used to double the amount of data that can be transmitted over a single fibre link. The **EXP** port is wideband in the range which is not that of the interface’s standard wavelengths. This means that on a High Band variant, the **EXP** port is transparent to Low Band wavelengths, and vice versa.

Two BN328s, one High Band, the other Low Band, can thus be interconnected, allowing up to eight 12G-SDI video signals and up to four Gigabit Ethernet data streams to be passed over the single fibre. Two similar BN328 pairs will be required at each end of the fibre link in this configuration.

The interconnection is made with a single LC fibre patch cable between the EXP port of the primary interface (that providing the long-distance fibre link) and the LINK port of the secondary interface.



The example shows a pair of BN328s at each end of the single fibre link. At the remote site, the BN328T-L encodes four SDI signals and Ethernet data onto Low Band wavelengths, which are then passed by a fibre patch into the BN328T. As this optical signal uses different wavelengths to the BN328T, it can be multiplexed with the High Band wavelengths of the BN328T, enabling eight SDI signals and two separate Ethernet streams to be encoded onto the single fibre link.

At the base location, the same configuration of two R units decodes all signals. If one or two ‘D’ units were to be used at each end, the number of independent Ethernet streams could be increased to either 3 or 4.

## LEDs:

On all BN328 variants, bi-colour LEDs are fitted adjacent to each of the BNC connectors. These illuminate **green** to confirm a valid input signal (SD/HD/3G/6G/12G SDI), or **red** to indicate either no signal or a signal which is in some way invalid. On a BN328T, the LEDs monitor the incoming SDI video signal, on a BN328R, they confirm the receipt of a valid optical signal.

There are also two LEDs integral with each Ethernet connector (one on BN328T/R, two on BN328TD/RD):

- **TP LINK/ACT** – green LED indicating connectivity and data activity at the RJ45 connector:
  - LED off – no valid connection
  - LED on (steady) – valid connection, no data
  - LED blinking – data transfer in progress
  
- **FX LINK/ACT** – amber LED indicating connectivity and data activity at the optical port :
  - LED off – no valid connection
  - LED on (steady) – valid connection, no data
  - LED blinking – data transfer in progress

**NOTE:** For any technical issues not covered in this Quick Start Guide, please contact Bluebell Opticom.

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