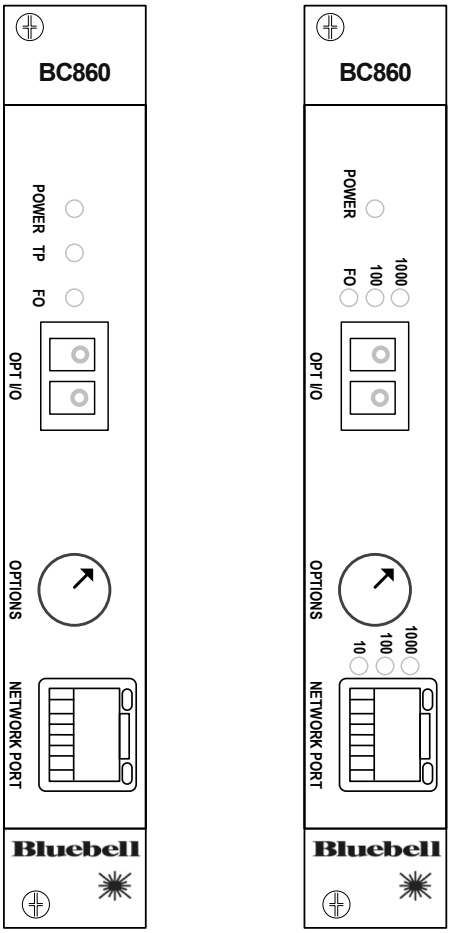
Bluebell

BC860
Fibre Ethernet Interface



Issue 1 Issue 2

Operation Guide

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Declaration of Conformities

The components of the Bluebell Opticom BC860 Fibre-optic Transmission System complies with the essential requirements of the following EU directives, where appropriate:

EMI/RFI: complies with:
89/336/EEC, EN55022B
EN61000-4-2, EN61000-4-4 (Level 2), EN61000-4-4FTB
EN61000-4-5, EN61000-4-11

Electrical: complies with:
EN61000-6-1, EN61000-6-2, EN61000-6-3, EN61000-6-4

Laser Safety: dependent on SFP fitted.
Complies with Class 1 laser product

RoSH and WEEE declaration

Bluebell Opticom Ltd. complies with EU RoSH Directive 2002/95/EC, which restricts the use of substances hazardous to humans and their environment in the manufacture of electrical and electronic equipment.

The “crossed out wheelie bin” symbol on the enclosures and represented above is there to remind users of the obligation of selective collection of waste. This label is applied to various products to indicate that the product is not to be thrown away as unsorted municipal waste. At the end of life, dispose of this product by returning it to the point of sale or to your local municipal collection point for recycling of electric and electronic devices. Customer participation is important to minimize the potential effects on the environment and human health that can result from hazardous substances that may be contained in this product. Please dispose of this product and its packaging in accordance with local and national disposal regulations, including those governing the recovery and recycling of waste electrical and electronic equipment. Contact your local waste administration, waste collection company or dealer.

Table of Contents

Overview

Thank you for purchasing this Bluebell Opticom professional broadcast video product. If you are new to Bluebell products, or to the subject of transmitting signals and/or data over fibre links, please take the time to read through this document before putting the BC860 to use.

Introduction

The BC860 plug-in card belongs to the range of the Bluebell Opticom BC Series modular fibre interfaces, designed primarily for Outside Broadcast (OB) and studio applications. It performs the function of a copper-to-fibre converter, allowing full duplex transport of Ethernet data between two locations remote from each other over a single or dual fibre-optic link.

BC860 cards will normally be used in pairs, though individual cards can also be used in conjunction with certain other Bluebell interfaces (see “Compatibility with other cards” on page 12), or third-party products fitted with compatible SFPs. Standard RJ45 sockets are provided for the electrical (copper) Ethernet connection, while the optical ports are LC fibre couplers on an SFP cartridge. Several variants of the BC860 are available; these differ only in the type of SFP cartridge fitted. Singlemode dual fibre versions exist for both standard fixed (1310 nm) and CWDM ITU Grid wavelengths. In addition, the range includes a matched pair of cards with integrated dual-wavelength singlemode WDM optics within the cartridge, thus allowing a single fibre link. A multimode fibre version is also available. The optical option must be specified at the time of order.

10base-T, 100base-T and 1000base-T (‘Gigabit’) Ethernet standards are supported by the copper (RJ45) side. Data rates are auto-negotiated. The optical side supports data speeds of 100base-FX or 1000base-X, selected by a faceplate switch.

BC860 versions - PCB revisions

BC860 PCBs were updated from Issue 1 to Issue 2 in Q4 2015: cards fitted with Issue 1 PCBs were shipped before this date, and Issue 2 PCBs were fitted to cards until Q4 2016, when they were in turn superseded by Issue 3 PCBs.

All BC860 versions have identical functionality. Apart from the faceplate changes, cards with Issue 2 and 3 PCBs have enhanced status reporting capabilities. These detail differences are indicated in the following sections of the Guide.

Issue 2 and 3 versions are identical in all visual and operational respects. They can be clearly distinguished from Issue 1 versions by the additional faceplate LEDs – see “BC860 connections” on page 6.

This Operations Guide covers all BC860 versions.
All references to Issue 2 apply equally to Issue 3.

Physical formats

BC860 cards fit the Bluebell BC100 or BC160 19” modular frames. The frames can house six (BC160) or fifteen (BC100) BC Series cards, and are fitted with dual internal AC power supplies.

Alternatively, cards may be fitted into smaller aluminium chassis; the BC101 and BC102 hold one and two cards respectively and require an external DC power source, while the BC120 holds three cards and has an integral mains PSU.

Power requirements

Power supply requirements are dictated by the enclosure type used.

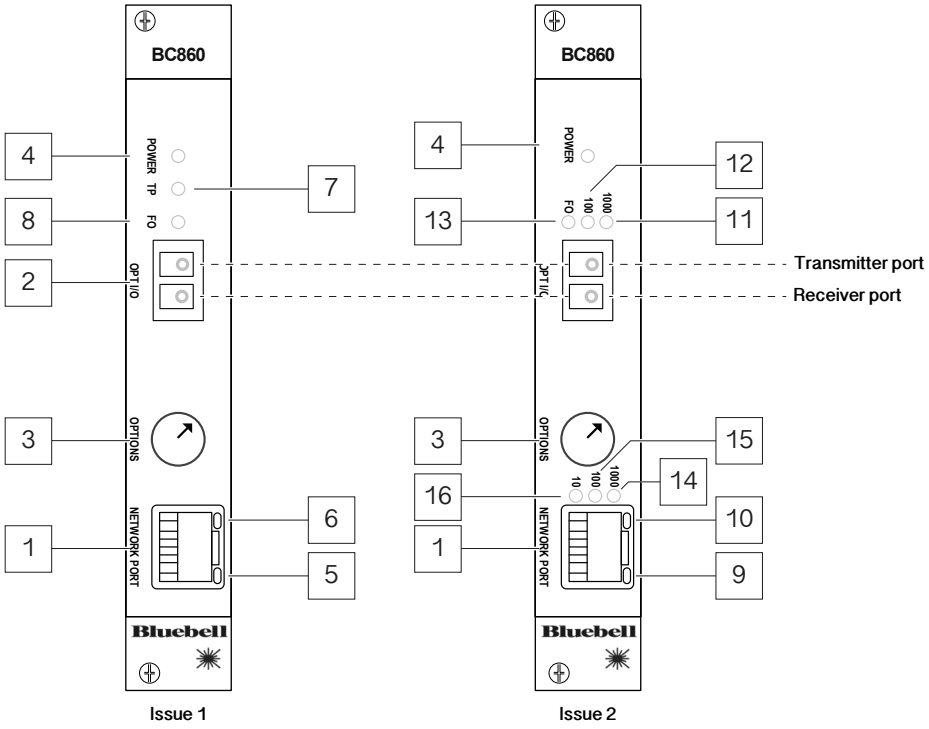
BC100 modular frames:
These may be fitted with either one or two AC mains PSU modules (number specified at time of order). Each module has sufficient capacity to power a fully-loaded frame. The AC connection is via standard IEC cables, DC power distribution inside the frame is via the motherboard. See the Operation Guide supplied with the frames for more details.

BC160 modular frames:
These are fitted as standard with dual internal AC mains power supplies, each of sufficient capacity to power a fully-loaded frame. The AC connection is via standard IEC cables, DC power distribution inside the frame is via the motherboard. See the Operation Guide supplied with the frames for more details.

BC101 and BC102 single- and dual-slot chassis:
These are supplied with an external Universal AC adaptor which connects to the chassis via a flying lead terminated in a 4-pin locking XLR connector. Mains is supplied via an IEC connector.

BC120 triple-slot chassis:
This housing for three plug-in cards is fitted with an internal AC mains supply; mains connection is via a rear IEC connector.

BC860 connections



1. **NETWORK PORT** – standard RJ45 receptacle for connection to an Ethernet network.
2. **OPT I/O** – SFP dual fibre connector. The connector is mounted on a removable cartridge. The standard cartridge uses singlemode dual fibres, transmitting at a wavelength of 1310 nm, or at any of the standard CWDM grid wavelengths if specified at the time of order. Singlemode, single fibre cartridges, and multimode fibre cartridges are also available. The optical receiver element in all versions is wideband. Where a dual fibre SFP transceiver is fitted, the transmitting port is the upper port (in vertical orientation).
3. **OPTIONS** – hexadecimal switch setting the data speed of the optical interface:
   - 0 = 100Base-FX (100 Mbps)
   - 1 = 1000Base-X (1 Gbps)

   All other switch positions are unused. When a pair of BC860 cards are used to form a fibre link, the **OPTIONS** switch on each must be set to the same position.
4. **POWER** – green LED, illuminates when DC power is applied to the card.

Issue 1 cards only:

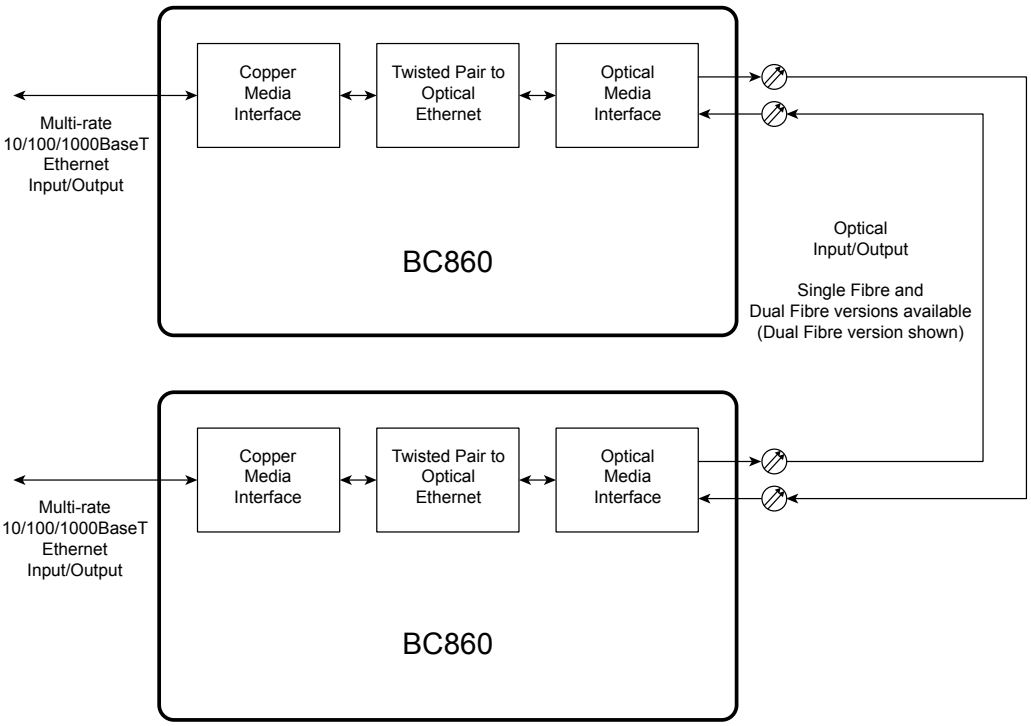
5. Data speed LED – the green LED illuminates when data at 100base-T rate is detected.
6. Port activity – the green LED will blink in normal operation to indicate network activity.
7. **TP** ("Twisted Pair") – green LED, illuminates to confirm a Gigabit signal is detected.
8. **FO** ("Fibre Optic") – green LED, illuminates to confirm that Gigabit data speed is selected. The LED flickers with 1 Gbps data activity.

Issue 2 cards only:

9. Port activity – the green LED will blink in normal operation to indicate network activity.
10. Link LED – the green LED illuminates when a valid data link is detected.
11. **1000** – green LED, illuminates to confirm selection of 1 Gbps data rate at the optical interface.
12. **100** – green LED, illuminates to confirm selection of 100 Mbps data rate at the optical interface.
13. **FO** – green LED, illuminates when optical fibre link is active.
14. **1000** – green LED, illuminates to confirm detection of 1 Gbps signal at the copper (RJ45) interface.
15. **100** – green LED, illuminates to confirm detection of 100 Mbps signal at the copper (RJ45) interface.
16. **10** - green LED, illuminates to confirm detection of 10 Mbps signal at the copper (RJ45) interface.

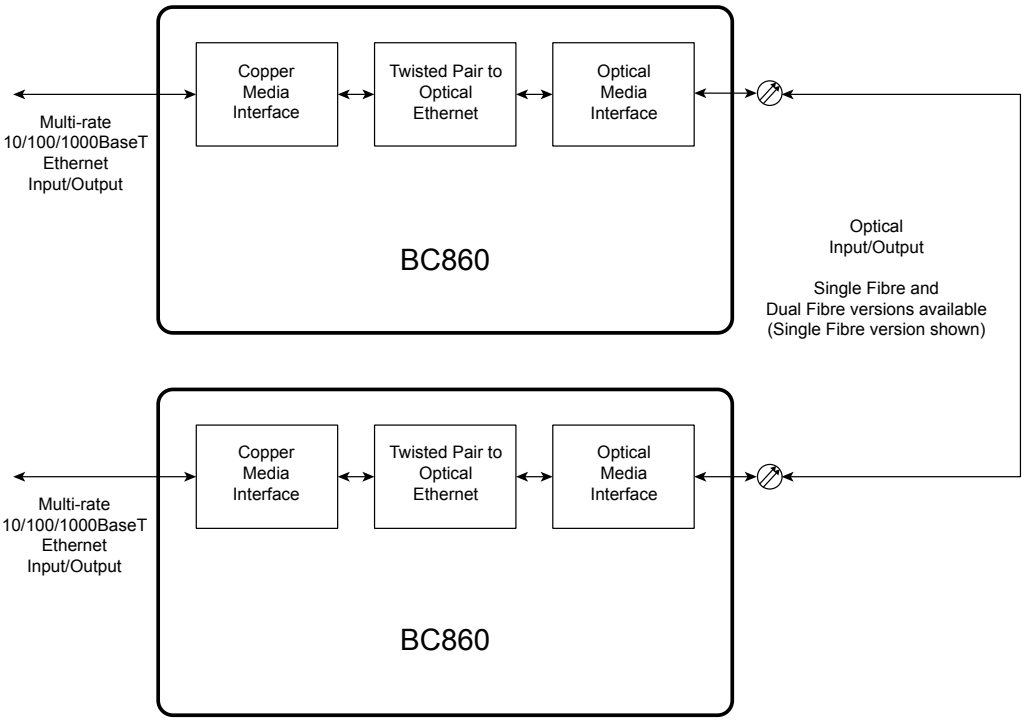
System block diagrams

BC860 cards fitted with dual fibre interfaces transmit and receive on separate fibres. The standard singlemode fibre SFP cartridge transmits at 1310 nm; the receivers are wideband.



Alternative dual fibre variants are available with different transmission wavelengths corresponding to the CWDM grid; a multimode dual fibre variant is also available.

A single fibre may be used when cartridges with integral optical WDMs are fitted. One card transmits at 1310 nm, the other at 1550 nm. The optical multiplexer combines the transmitted signal with the received signal at each end. Because the received signal will always be at the "other" wavelength, a single fibre can be used between the cards.



External monitoring

All cards in the Bluebell modular range can report their status to the frame in which they are housed. The frame's LEDs - two per card - will confirm correct operation (or otherwise), and if the optional BM101/102 SNMP/Ethernet interface card is fitted, remote monitoring of cards is also available. Note that BC860 cards with Issue 1 PCBs have restricted remote monitoring capability. Contact Bluebell for the relevant .mib file.

BC 100/160 Frame Panel LEDs:

Issue 1 cards only:

BC860 cards fitted with Issue 1 PCBs report to the frame LEDs as follows:

LED	State	BC100/160 frames
LED A	Green	1 Gbps data rate detected at the RJ45 input
	Off	10/100 Mbps detected or no connection
LED B	Green	1000base-X selected for fibre
	Off	100base-FX selected for fibre

Issue 2 cards only:

BC860 cards fitted with Issue 2 PCBs report to the frame LEDs as follows:

LED	State	BC100/160 frames
LED A	Green	Link detected at RJ45 input
	Red	No link detected at RJ45 input
LED B	Green	Signal detected at SFP input
	Red	No signal detected at SFP input

Monitoring via webpages:

"Overview" webpage:

LED	State	Status - Issue 1 cards	Status - Issue 2 cards
Ch A LED	Green	Issue 1 cards always show green	Link detected at RJ45 input
	Red		No link detected at RJ45 input
Ch B LED	Green	Issue 1 cards always show green	Signal detected at SFP input
	Red		No signal detected at SFP input

“Frame Information” webpage:

Signal status	State	Status - Issue 1 cards	Status - Issue 2 cards
Ch A	“good”	Issue 1 cards always report “good”	Link detected at RJ45 input
	“fail”		No link detected at RJ45 input
	“unknown”	Card not detected in this slot	
Ch B	“good”	Issue 1 cards always report “good”	Signal detected at SFP input
	“fail”		No signal detected at SFP input
	“unknown”	Card not detected in this slot	

Parameters specific to BC860 (Issue 2 cards only):

Parameter	Value	Meaning
TP1	10baseT	10 Mbps Ethernet signal detected at RJ45 input
	100baseT	100 Mbps Ethernet signal detected at RJ45 input
	1000baseT	1 Gbps Ethernet signal detected at RJ45 input
	No Link	No valid Ethernet signal detected at RJ45 input
Fibre	100baseFX	100 Mbps fibre data rate selected by **OPTIONS** switch
	1000baseF*	1 Gbps fibre data rate selected by **OPTIONS** switch
	No Link	No valid Ethernet signal detected at SFP input

*In this manual, “1000baseF” encompasses the standards 1000base-SX, 1000base-LX and 1000base-ZX.

Remote monitoring via SNMP:

OID	Value	Meaning - Issue 1 cards	Meaning - Issue 2 cards
cardsigChA	“good”	Issue 1 cards always report “good”	Link detected at RJ45 input
	“fail”		No link detected at RJ45 input
	“unknown”	Card not detected in this slot	
cardsigChB	“good”	Issue 1 cards always report “good”	Signal detected at SFP input
	“fail”		No signal detected at SFP input
	“unknown”	Card not detected in this slot	

Parameters specific to BC860 (Issue 2 cards only):

OID	Value	Meaning
Parameter 1: Speed of Twisted Pair link (RJ45)		
cspDesc1	TP1	Speed/status of Twisted Pair link (RJ45)
cspValue1	10baseT	10 Mbps Ethernet signal detected at RJ45 input
	100baseT	100 Mbps Ethernet signal detected at RJ45 input
	1000baseT	1 Gbps Ethernet signal detected at RJ45 input
	No Link	No valid Ethernet signal detected at RJ45 input
Parameter 2: Speed of Fibre link (SFP)		
cspDesc2	Fibre	Speed/status of Fibre link (SFP)
cspValue2	100baseFX	100 Mbps fibre data rate selected by **OPTIONS** switch
	1000baseF*	1 Gbps fibre data rate selected by **OPTIONS** switch
	No Link	No valid Ethernet signal detected at SFP input

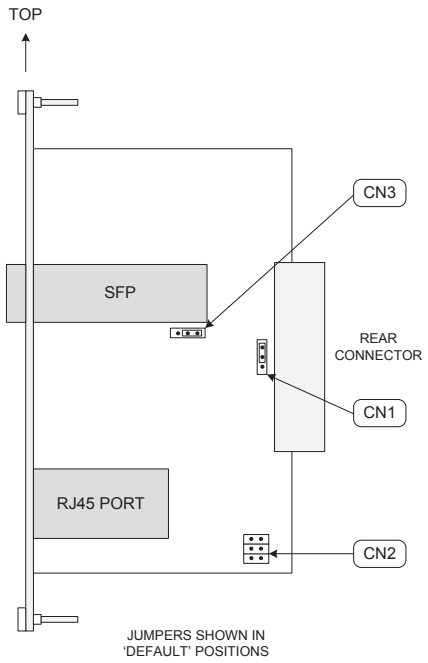
*In this manual, “1000baseF” encompasses the standards 1000base-SX, 1000base-LX and 1000base-ZX.

Configuration and setup options

The BC860 card has no internal user adjustments. Both Issue 1 and Issue 2 PCBs have three internal connectors:

- CN1 – I^2C EEPROM write enable. For factory use only. Do not alter.
  Default setting – no link fitted, or link Pins 1 & 2 ('storage' position).
- CN2 – 6-pin Programming connector. For factory use only. Do not fit any links!
- CN3 – Selection of SFP pinout type (MSA or non-MSA).
  Factory default: link Pins 1 & 2 for MSA pinout (I^2C data on SFP pin 4)
  Alternative SFP: link Pins 2 & 3 for non-MSA pinout (I^2C data on SFP pin 6)

The diagram below shows the location of the PCB connectors. Note that in all cases, Pin 1 is identified by a square solder pad.



Compatibility with other cards

The BC860 may form one end of a fibre link using other (older) cards of the BC800 Series at the other end as follows:

- BC800 – set hex switch on BC860 to '0' (100base-FX)
- BC850 – set hex switch on BC860 to '1' (1000base-X)

Note that the BC860 card may also form one end of a fibre link using certain other manufacturers' products, provided the SFPs are fully compatible.

Appendix

Specifications - BC860

Ethernet Network Port	
Connector	RJ45
Format	10/100/1000base-T half/full duplex auto-negotiation
Standard	IEEE 802.3 (10base-T) IEEE 802.3u (100base-T) IEEE 802.3ab (1000base-T)
Optical Output & Input	
Physical	SFP Module
Connector	Dual LC/PC (dual fibre version) Single LC/PC (single fibre versions)
Format	Full duplex 100base-FX/1000base-X data transmission
Wavelength	Tx - 1310 nm singlemode or 850 nm multimode. User-specified CWDM wavelengths are also available Rx – wideband, 1260 nm to 1610 nm
Optical Power	-6 dBm @ 1310/1510 nm singlemode (typical)
Sensitivity	SFP dependent; typically -3 dBm to -28 dBm
Max. input power	SFP dependent; typically > -1 dBm
Conformities	
EMI/RFI	Complies with 89/336/EEC and EN55022B
EMC	Complies with EN61000-4-2, EN61000-4-4 (Level 2), EN61000-4-4FTB, EN61000-4-5 and EN61000-4-11
Electrical Immunity	Complies with EN 61000-6-1, EN61000-6-2, EN61000-6-3 and EN61000-6-4
Laser Safety	Class 1 Laser Safety compliant; for additional conformities see datasheets for SFP cartridges fitted
RoHS	Complies with Directive 2002/95/EC
Physical	
Depth	87 mm (inc. connectors)
Width	20 mm (4HP)
Height	129 mm (3RU)
Weight	100 g
Operating Temp	-30°C to +70°C
Power	2.4 W

SFP Options

The functionality of the BC860 is partly dependent on which type SFP cartridge is fitted to the carrier. Your card will be supplied with the cartridge that was specified at the time of ordering already factory-fitted; if no cartridge was specified, the carrier will be empty for users to fit a cartridge of their choice.

The application to which the card may be put can be changed at any time by fitting a different cartridge in the carrier.

In general, if the guidance below is followed, the BC860 will operate within its design criteria. Please contact the Bluebell Sales Department with any specific requirements.

SFP cartridge selection

SFPs fitted to these cards must have the following characteristics:

- SFPs can be either MSA or non-MSA pinout as long as the card's jumper links are set accordingly (see "Configuration and setup options" on page 12)
- It must be a transceiver
- It must be able to handle data rates of up to 1 Gbps

A list of suitable SFPs with the required characteristics can be found at:
http://bluebellcomms.co.uk/sfps/

Customers choosing their own SFPs do so at their own risk.