Bluebell✳

BC100i
Modular Rack Frame System

Operations Guide

Bluebell Opticom Ltd.
Unit 2, The Quadrant
Howarth Road
Maidenhead
Berkshire
SL6 1AP
United Kingdom

Tel: +44 (0) 1628 510055
Fax: +44 (0) 1628 510057
Email: support@bluebell.tv
Web: www.bluebell.tv

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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 video and/or other types of signal over fibre links, please take the time to read through this document before putting the system to use.

Introduction

The BC100i is a 19", 3RU frame for the Bluebell Opticom BC Series of modular fibre interfaces. BC Series cards are designed primarily for Outside Broadcast (OB) and studio applications, and the very extensive range includes single-channel, two-channel and four-channel fibre-optic interfaces for SDI video (all current formats), audio, Ethernet data and serial control data. The BC100i can hold 15 BC Series cards of any type: thus up to 60 separate signals can be transmitted/received over fibre optic links from the frame.

The BC100i is an evolution of the BC100 frame, and incorporates greatly enhanced monitoring functions. The front panel is fitted with a 7" colour touchscreen, which displays the status of each card in the frame, and also various global parameters. There is no menu system to navigate and most information is available within a single touch.

Physical format

The BC100i accepts up to 15 single-slot BC Series cards: any combination of card types is permitted, and there are no restrictions regarding slot allocation. A 16th slot is reserved for an optional BM102i or BM103 network monitoring card. The card slots are at the rear of the frame, so that all signal connections – fibre and copper – can be kept within the 19" rack in which the frame is fitted.

The frame includes dual modular power supplies (PSUs) mounted in the front of the frame.

The frame depth is 250 mm. To allow for cables and connectors at the rear, installers should ensure that rack depth greater than this is available.

Ventilation

The standard BC100i frame is not force cooled. It is recommended that some vertical spacing is left between adjacent rack-mounting units to allow for natural convection: this is particularly important if the rack includes equipment which generate a significant amount of heat (e.g., audio amplifiers).

The temperature of a fully-loaded frame can rise to approx. 20 ⁰C above ambient, i.e., typically 45 ⁰C. An optional internal low-speed fan assembly may be specified at the time of order; when this is fitted, the temperature rise is limited to about 10 ⁰C above ambient i.e., about 35 ⁰C.

Power requirements

The frame is supplied with two modular PS100i Power Supply Units (PSUs) rated at 100 W each. The PSUs are wired for fully redundant operation, and have independent rear panel IEC connectors. The PS100i is a "universal" type and will operate on any AC mains supply voltage from 90 to 253 V, 47 to 63 Hz.

The DC outputs are distributed internally via the motherboard to all card slots using current-sharing: there is no interruption to frame operation in the unlikely event of a PSU failing. Each PSU can power a fully-loaded rack, regardless of card type mix.

Each of the two IEC connectors has an integral fuseholder. The fuse compartment below the connector has a second holder for a spare fuse. Note that the active fuse is the one on the left. The fuse data is given in the table below: always replace a blown fuse with one of exactly the same type. If the replacement fuse blows immediately on switch-on, the PSU is faulty and should be removed for repair.

| Fuse type	T5A 250V
Fuse rating	5 A
Fuse size (l x dia.)	20 mm x 5mm

The power supply modules plug in at the front of the frame and are secured in place by two captive screws at the top of the module panel. They are hot-swappable. A green **POWER OK** LED confirms correct PSU operation.

BC100i front panel
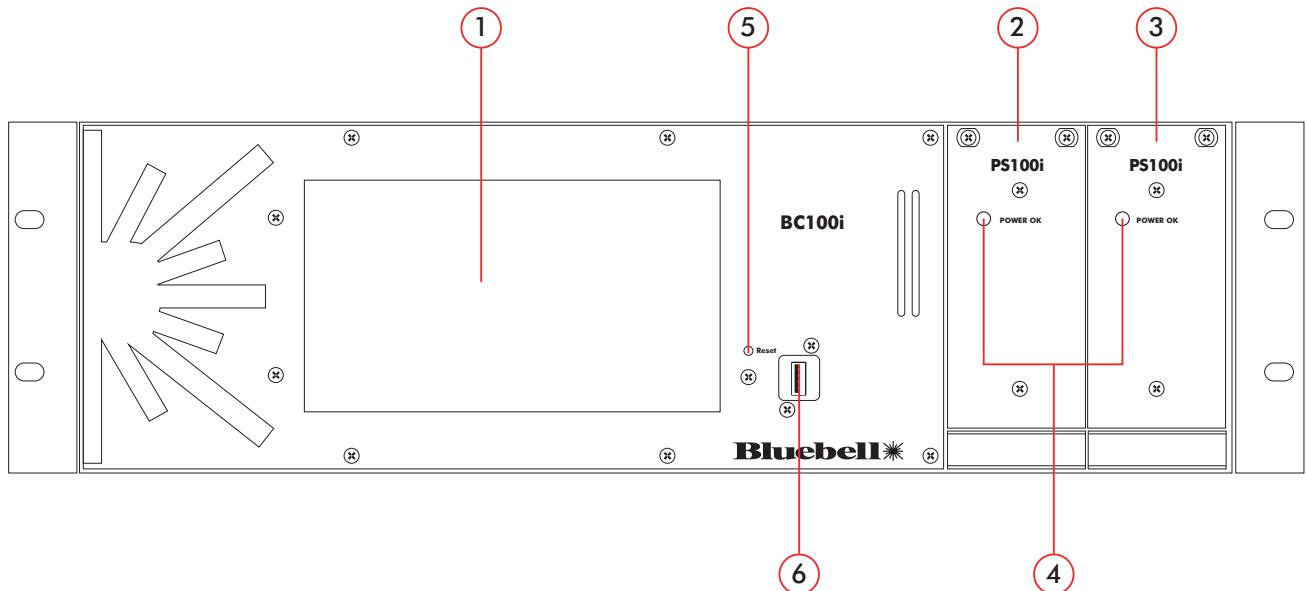
1. Display – 7" colour touch-sensitive LCD. The home page shows a status overview of all 15 card slots; further pages give further details of each card and its SFP(s), the BC100i PSU status and a network card (if fitted).

2. **PSU 1** - PS100i modular power supply.

3. **PSU 2** - PS100i modular power supply. The two PSUs form a dual redundant pair.

4. **POWER OK** – two green LEDs, illuminate when the associated PSU is operating normally.

5. Reset button – resets the BC100i's internal microprocessor controlling the frame monitoring functions and display. Pressing this button will also update the frame's firmware if a USB memory device with the new firmware is plugged into the USB port [5]. Use a small screwdriver (or similar) to press the internal tac button.

6. USB port – Type A USB connector for updating BC100i firmware.

BC100i rear panel
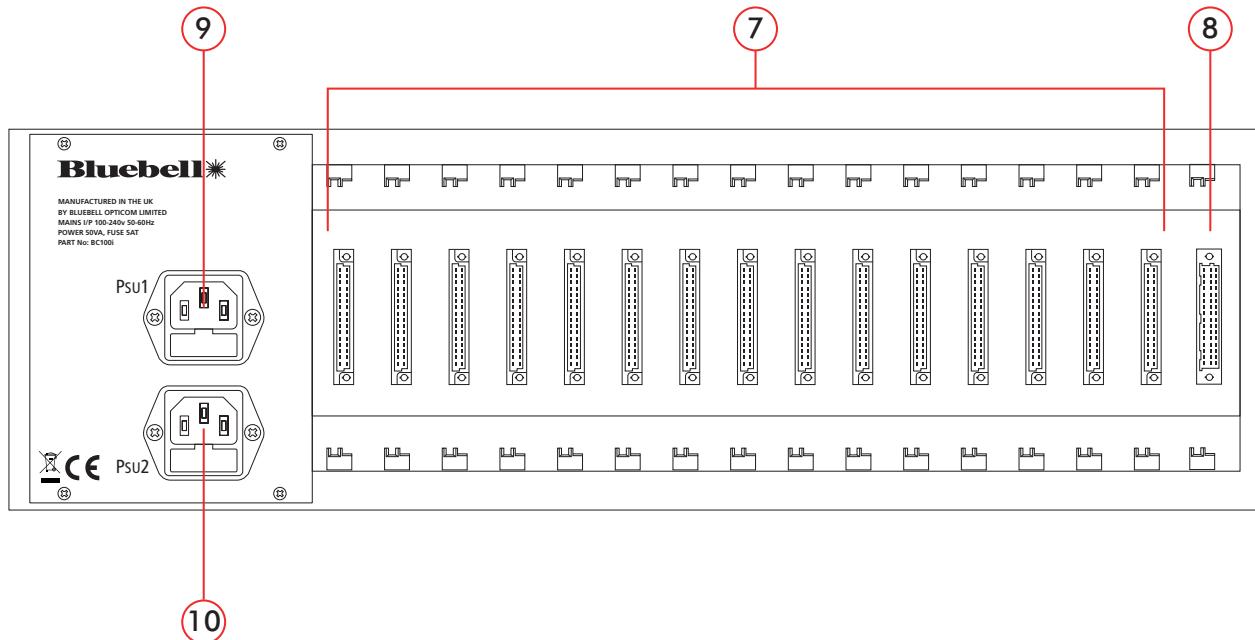
7. Card slots 1 to 15. BC Series cards may be freely fitted here. Note that the slots are numbered right-to-left: Slot 1 is the second slot from the right and Slot 15 the left-most slot.

8. Card slot 16: this is reserved for a network monitoring card, either a BM102i or BM103.

9. **PSU1** - IEC mains connector/fuseholder for PSU 1.

10. **PSU2** - IEC mains connector/fuseholder for PSU 2.

System Monitoring

The BC100i incorporates a sophisticated, microprocessor-based monitoring system. All BC Series cards are able to report information about their type and status to the frame: this data is available for display on the front panel touchscreen.

The BC100i display has eight pages:
- Home page (the default page on power-up)
- Frame page
- Frame Settings page
- PSU Information page
- Card info page
- SFP page
- Card specific parameters page
- Network Card page

Home page
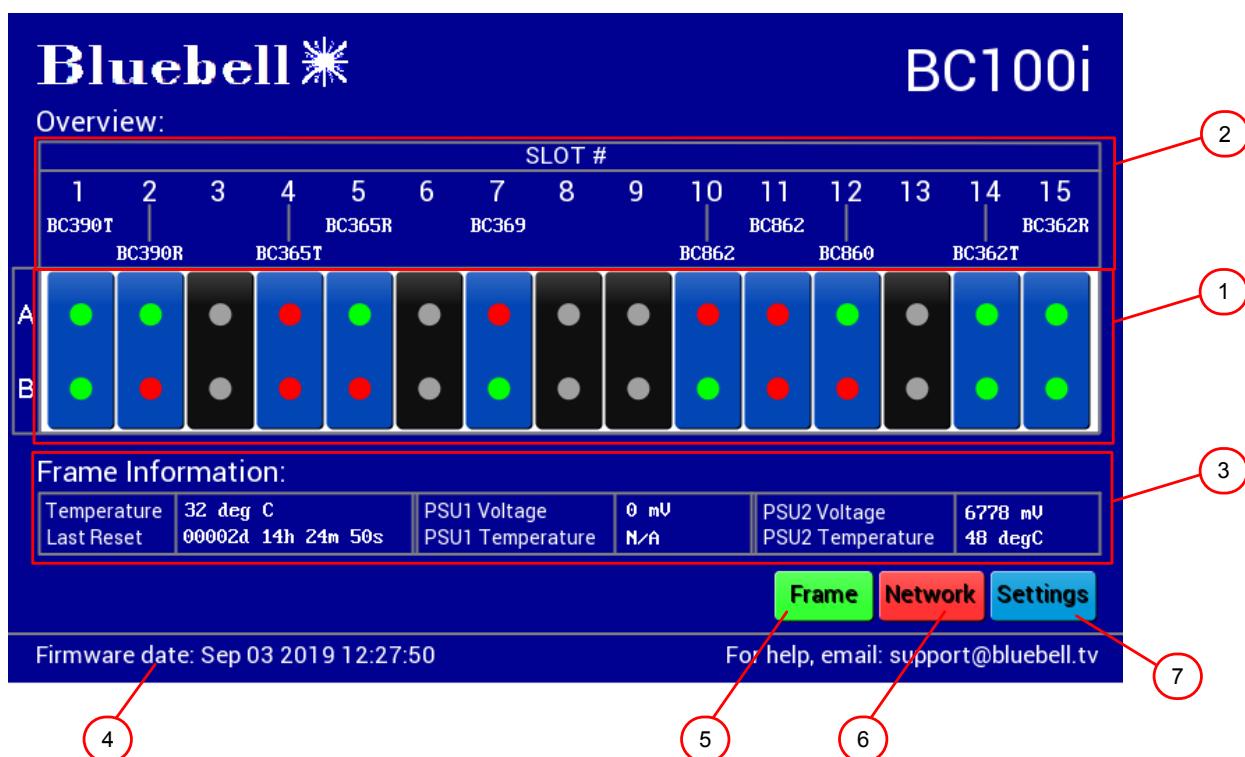
The main area of the Home page is the frame Overview, which shows the primary status of each card installed in the frame.

1. The Overview area has been designed to mimic the LED status array fitted to the front panel of the Bluebell BC100 frame. Each of the 15 card slots is represented by a coloured rectangle containing two bicolour "virtual LEDs".

In each slot:
- Blue rectangle – card present
- Black rectangle – no card detected
- Green LED – valid signal detected, or no channel present on card (applicable only to certain single-channel cards)
- Red LED – no valid signal detected

The red and green LEDs give a general "go/no-go" indication of the status of each channel (A and B) on each card, but the precise method of status monitoring determining the LED colour varies considerably from card to card. Please refer to the Operation Guide for each type of card in use for full details of how the status indication is derived.

Touch a blue rectangle to navigate to the Card Info page for the card fitted to that slot.

2. Each card installed reports its identity to the frame monitoring system: the type is displayed below the slot number. (The odd-even offset of card idents is purely for reasons of legibility.) **NOTE**: a few older types of BC Series cards do not report their identities.

3. The Home Page includes basic information about the BC100i frame's operation and status: temperature and output voltage of each PSU, temperature of the frame itself and time since the last reset or power-up (whichever was more recent). The Frame page repeats and expands on this data.

4. Unit firmware date.

5. Press the **Frame** button to navigate to the Frame page.

6. If a Network Card is fitted to Slot 16, this button will display **BM102i** or **BM103** according to card type. Press to navigate to the Network Card page. If no Network Card is fitted, the button displays **Network**.

7. Press the **Settings** button to navigate to the Settings page.

Frame page
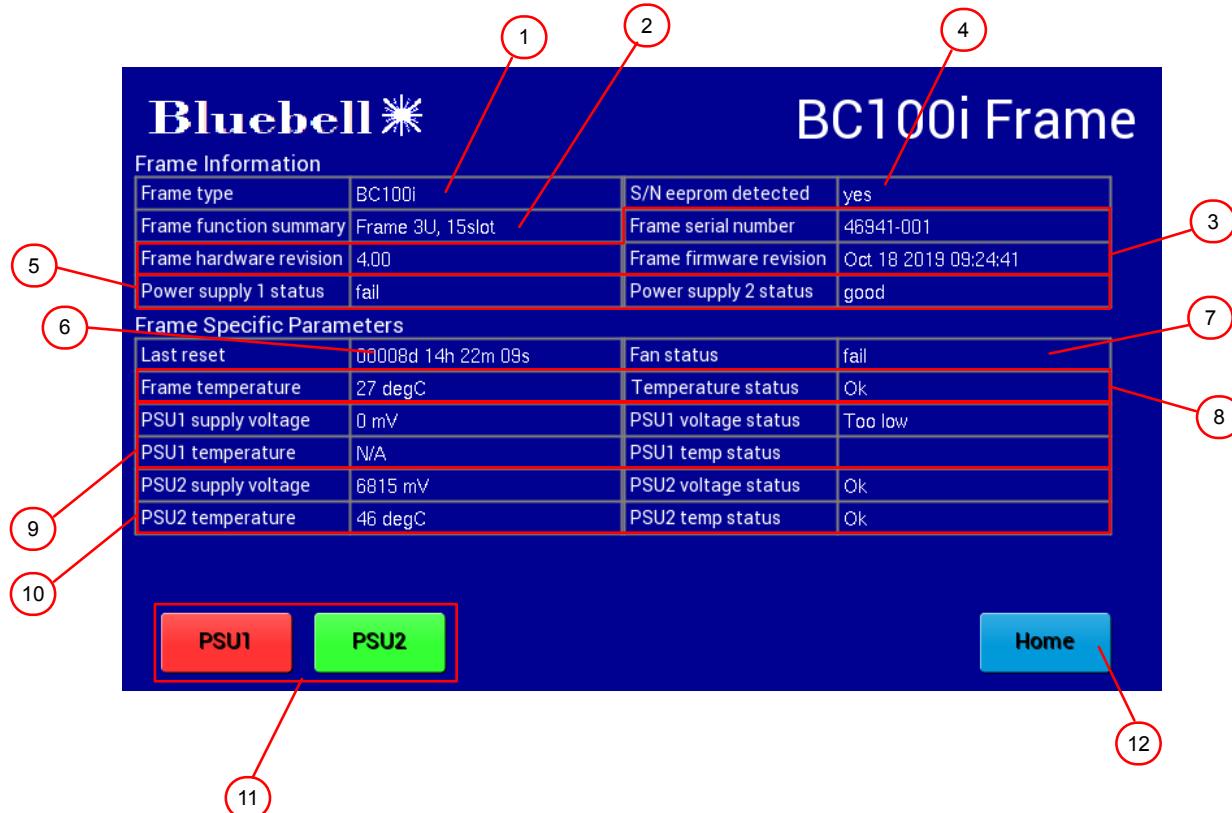
The Frame page displays more detailed information about the BC100i frame itself.

Frame Information

1. **Frame Type** – confirms frame type.

2. **Frame Function summary** – confirms the frame configuration.

3. **Frame Serial Number, Frame hardware revision** and **Frame firmware revision** – confirms serial number, hardware and firmware versions: you may need this information if you need to contact Bluebell with any technical issues that may arise with the BC100i.

4. **S/N eeprom detected** – confirms the detection of the frame's Serial Number EEPROM. (Included for assistance in fault-finding).

5. **Power Supply status** – confirms the correct operation of each of the frame's two PSUs.

Frame Specific Parameters

6. **Last reset** – displays the elapsed time since the last BC100i frame microprocessor was reset, either by the front panel Reset button or by power-cycling. The time format is in days, hours, minutes and seconds.

7. **Fan status** – if a fan assembly is fitted, this will display **ok** or **fail**, indicating its correct operation. If the BC100i frame does not have a fan assembly, this field will display **Not fitted**.

8. **Frame temperature** and **Temperature status** – display the actual internal frame temperature and a status report about the temperature relative to the frame's permitted operating range, as follows:

Temperature status	Meaning
Too low	<= 0 °C
Low	<= 5 °C
Ok	> 5 °C to 60 °C
High	> 60 °C
Too high	> =70 °C

9. PSU1 data – the PSU's DC output voltage and internal temperature are displayed, together with a status comment for each.

10. PSU data – as [9] above, for PSU2.

11. Press the **PSU1** or **PSU2** buttons to open the Power Supply Information page for each PSU. These buttons are colour-coded: green indicates the PSU is operating normally, red indicates that there is a problem

12. **Home** – press this button to return to the Home page.

Frame Settings page
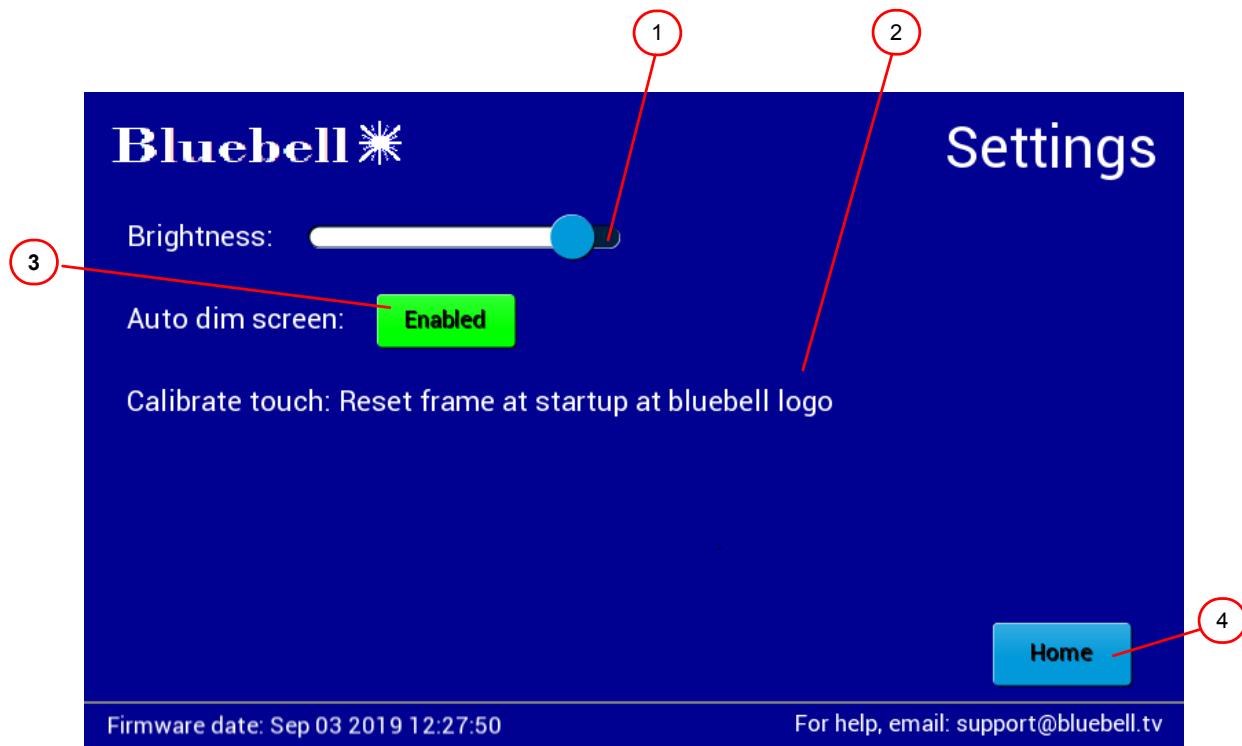
1. **Brightness** – the slider allows the brightness of the touch screen display to be adjusted. The setting is saved and reinstated on subsequent power-up.

2. Touch screen calibration – this procedure is not actually done from the Settings page: the text here is for user guidance. To recalibrate the touch screen, press the Reset button (see [5] at page 6) during the power-up sequence, while the Bluebell logo is displayed. This will launch the screen calibration routine: press the three dots displayed on the screen.

3. Auto dim - touch **Enabled** to activate the screen's Auto dim function. When enabled, the screen brightness will automatically reduce to 20% of the maximum value after 4 minutes of inactivity, and resume its previous level as soon the screen is next touched. Note that Auto dim does not operate if the screen brightness has already been set with slider [1] to 20% or less of the maximum level.

4. **Home** – press this button to return to the Home page.

PSU Information page
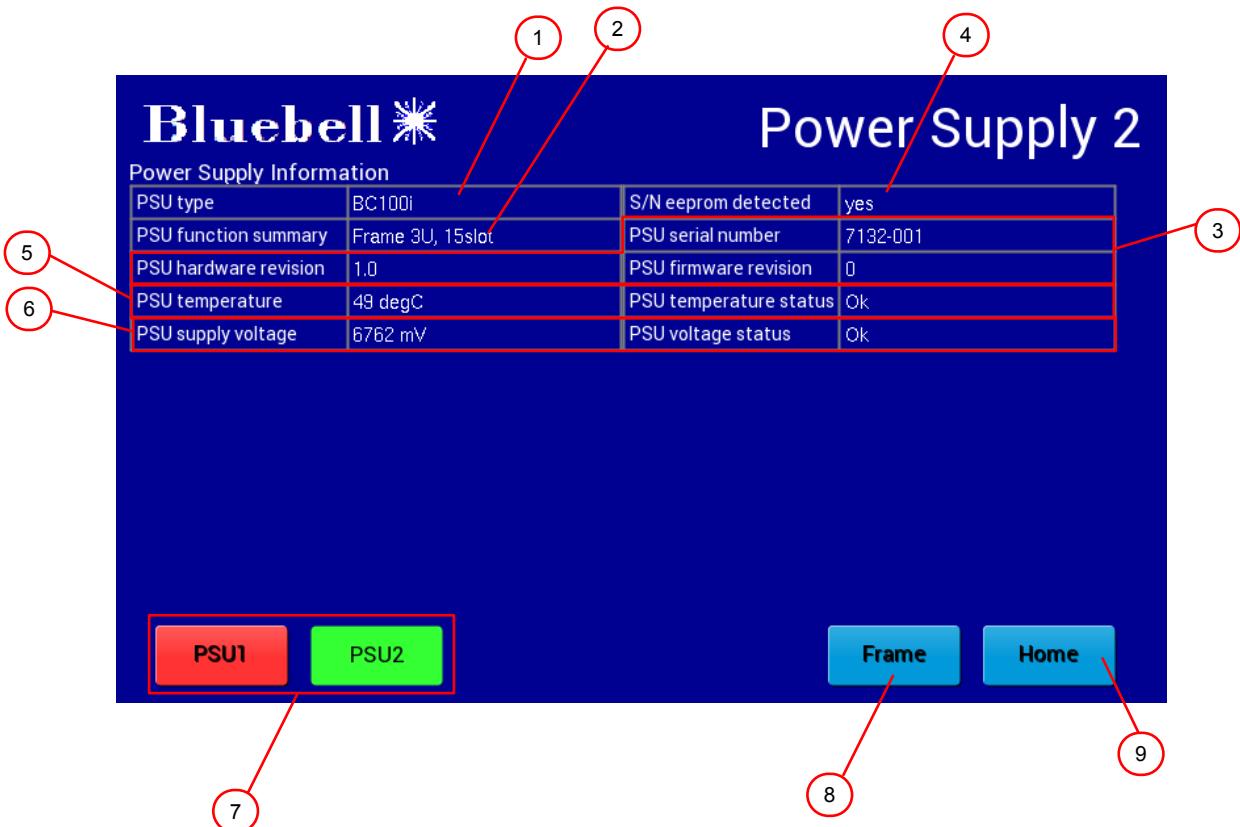
1. **PSU type** – confirms PSU type. This field will be blank if no PSU is detected.

2. **PSU Function summary** – confirms the PSU function. This field will be blank if no PSU is detected.

3. **PSU Serial Number, Hardware Revision and Firmware Revision** – confirms serial number, hardware and firmware versions: you may need this information if you need to contact Bluebell with any technical issues that may arise with the BC100i. These fields will be blank if no PSU is detected.

4. **S/N eeprom detected** – '**yes**' confirms the detection of the PSU's Serial Number EEPROM. '**no**' indicates that a PSU is not detected. (Included for assistance in fault-finding). Note that a faulty PSU may still display '**yes**'.

5. **PSU temperature** and **PSU temperature status** - each PSU has its own temperature sensor: these fields display the internal PSU temperature and a status report about the temperature relative to the PSU's permitted operating range, as follows:

Temperature status	Meaning
Too low	<= 0 °C
Low	<= 5 °C
Ok	> 5 °C to 60 °C
High	> 60 °C
Too high	> =70 °C

'N/A' or a blank field indicates that no PSU is detected. However, temperature is still monitored and reported in the event of a faulty PSU.

6. **PSU supply voltage** and **PSU voltage status** – displays the output voltage of the selected PSU and a status report about the voltage relative to the PSU's nominal output voltage, as follows:

Voltage status	Meaning
Too low	<=4,500 mV
Low	<=5,000 mV
Ok	>5,000 mV, <7500 mV
High	>7,500 mV
Too high	>=8,000 mV

These two fields will display '**0 mV**' and '**Too low**' respectively in the event of either a faulty PSU, or if a PSU is not detected.

7. The two PSU buttons are present on both PSU Information pages (PSU1 and PSU2). They are colour coded according to PSU status: green = normal PSU operation; red = a PSU problem or over-temperature.

8. **Frame** – press this button to return to the Frame page.

9. **Home** – press this button to return to the Home page.

NOTE: In the event of PSU failure, most of the fields on the PSU Information page will be blank. The **PSU supply voltage** and **PSU voltage status** will display "0 mV" and "Too low" respectively.

Card Info page
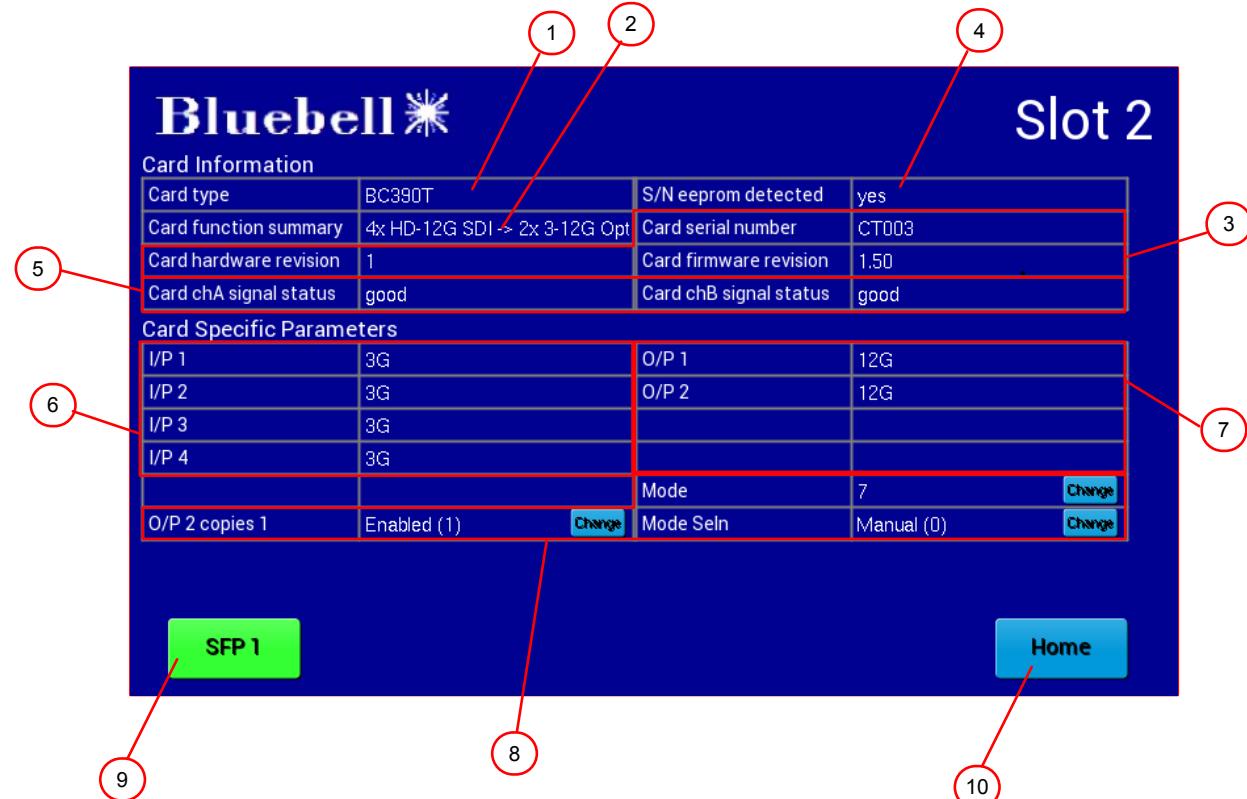
The data displayed on the Card Info page varies considerably with BC card type. The example above is for a BC390T card (a 4K SDI multiplexer with four SDI inputs and a dual transmitter SFP, designed to perform a variety of format conversions). The tabular page layout is consistent for all card types, though some fields will be empty depending on the card's function.

1. **Card Type** – confirms card type.

2. **Card Function summary** – a brief description of the card's signal architecture.

3. **Card serial number, Card hardware revision** and **Card firmware revision** – confirms serial number, PCB issue and firmware version: you may need this information if you need to contact Bluebell with any technical issues that may arise with the card.

4. **S/N eeprom detected** – confirms the detection of the card's Serial Number EEPROM. (Included for assistance in fault-finding).

5. **Ch A/B signal status** – confirms the presence of a valid signal in each channel; these fields are essentially text versions of the red/green LEDs on the Home page. Please refer to the Operation Guide for the specific card type for full details of signal status detection in each channel.

Card Specific Parameters

NOTE – this area of the page is omitted for certain card types – see example below.

6. **I/P** status – confirms the signal type detected at each of the card's inputs. (In the example, the BC390T is receiving four separate 3G signals at the BNC inputs which are then converted to a 12G optical signal at each of the two SFPs: this is further confirmed in the **Card Function Summary** field above.) If the card type permits any Card Specific Parameters, the fields concerned will show a **Change** button. In the case of the BC390T, pressing the **Change** button opens the Change CSP page, where the copy mode can be enabled or disabled.

7. **O/P** status – confirms the signal type for each of the card outputs.

8. Card specific settings – these fields will be filled if the card has user-selectable functions that can be controlled from the BC100i. In the case of the BC390T example shown, its current encoding mode (7) is displayed as **Mode**, while the Mode Selection (**Mode Seln**) is set to **Manual**. Press the **Change** button to open the Change CSP page, where these settings can be altered.

9. **SFP 1** – press this button to navigate to the SFP page for SFP 1, where full details of the cartridge fitted in the SFP 1 carrier are displayed. If the card has more than one SFP carrier, additional SFP buttons are displayed, with an SFP page available for each. The SFP buttons will be green if the carrier is fitted with a valid SFP cartridge and red if one is not fitted or if the cartridge is faulty. Note that if the card has no active SFP, a single SFP button is still displayed, but it will be coloured red and non-functional.

10. **Home** – press this button to return to the Home page.

Further examples of Card Info pages are shown below:

Example 1: Card type BC370T (Quad Electrical-to-Optical SDI converter with two SFP carriers). The Card Info page displays the status of each SDI co-ax input as a Card Specific Parameter, but no user-changeable settings are available.


Example 2: Card type BC369 (Dual Multi-format converter with four SFP carriers. This card type has no Card Specific Parameters.

SFP data page
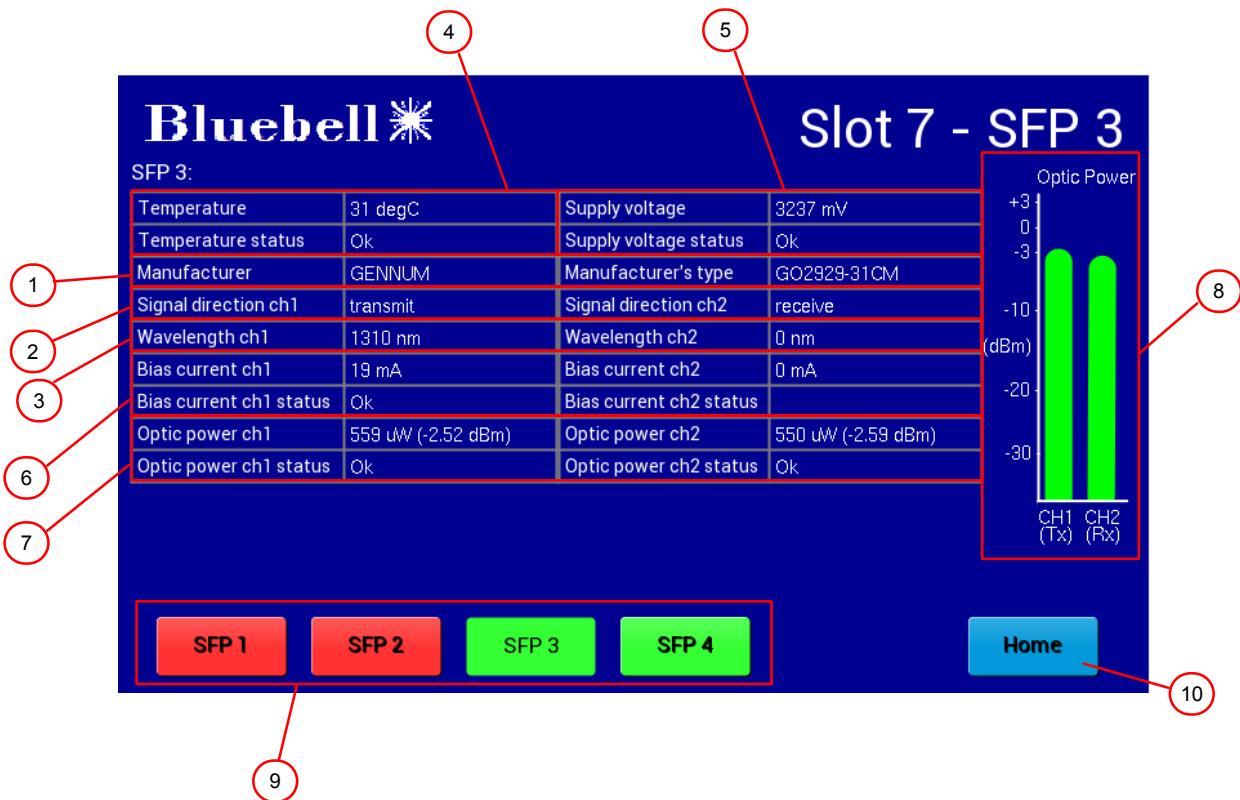
The SFP pages, accessed from the Card Info page, display more detailed information about each SFP. Note that there is a separate page for each SFP carrier fitted to the card.

> **NOTE**: This data displayed on this page is that reported by the SFP itself. Users should be aware that not all SFPs are fully compliant with SFP reporting standards, and that this may be particularly so with older or time-expired SFPs. Apparently incorrect data may therefore originate with the SFP's reporting mechanism itself, and may not necessarily indicate a dysfunctional SFP.

1. **Manufacturer** and **Manufacturer's type** – identify the cartridge model fitted in the SFP carrier.

2. **Signal direction ch1** and **ch2** – confirm the type of SFP cartridge: dual transmit, dual receive, or transmit + receive.

3. **Wavelength ch1** and **ch2** – displays the wavelength on which the optical cartridge is operating. Note that as all receivers are wideband, SFP channels configured as receivers will report '**0 nm**'.

4. **Temperature** and **Temperature status** – the SFP temperature is measured once per second and the temperature display updated accordingly. The **Temperature status** field gives an indication of the temperature relative to the SFP's permitted operating range: the possible options are **Too low**, **Low**, **OK**, **High** or **Too high**. Because of the wide range of SFP options available, it is not possible to relate these options to specific temperature ranges.

5. **Supply voltage** and **status** – display the DC operating voltage to the SFP: this is derived from the main PSU DC on each card. The **status** field gives an status report of the voltage relative to the SFP's permitted operating range: the possible options are **Too low**, **Low**, **OK**, **High** or **Too high**.

6. **Bias current data** – display the bias current of each optical transmitter and a status report of the current relative to the approved range: the possible options are **Too low**, **Low**, **OK**, **High** or **Too high**. Note that receivers always report "0 mA".

7. **Optic power ch1** and **ch2**, and **status** – the **power** fields display the optical power measured at each optical element, in both microwatts (µW) and dBm (where 0 dBm = 1 mW). The **status** fields give an status report of he figure relative to the SFP's rated power output: the possible options are **Too low**, **Low**, **OK**, **High** or **Too high**.

8. **Optic power** bargraphs – a graphical representation of the figures in the **Optic power** fields [7], calibrated in dBm (0 dBm = 1 mW). Note that the signal direction of each SFP channel (Tx/Rx) is reconfirmed below the bargraphs.

9. Press the **SFP** buttons to display the data for another SFP. The number of buttons displayed may not always the match the number of SFPs fitted to the selected card:

No. of SFPs on card	SFP buttons displayed
0	SFP 1
1	SFP 1
2	SFP 1, SFP 2
4	SFP 1, SFP 2, SFP 3, SFP 4

The buttons are colour coded: green confirms that an SFP is detected, red implies that the carrier is empty.

10. **Home** – press this button to return to the Home page.

Card-specific parameters (CSP) page
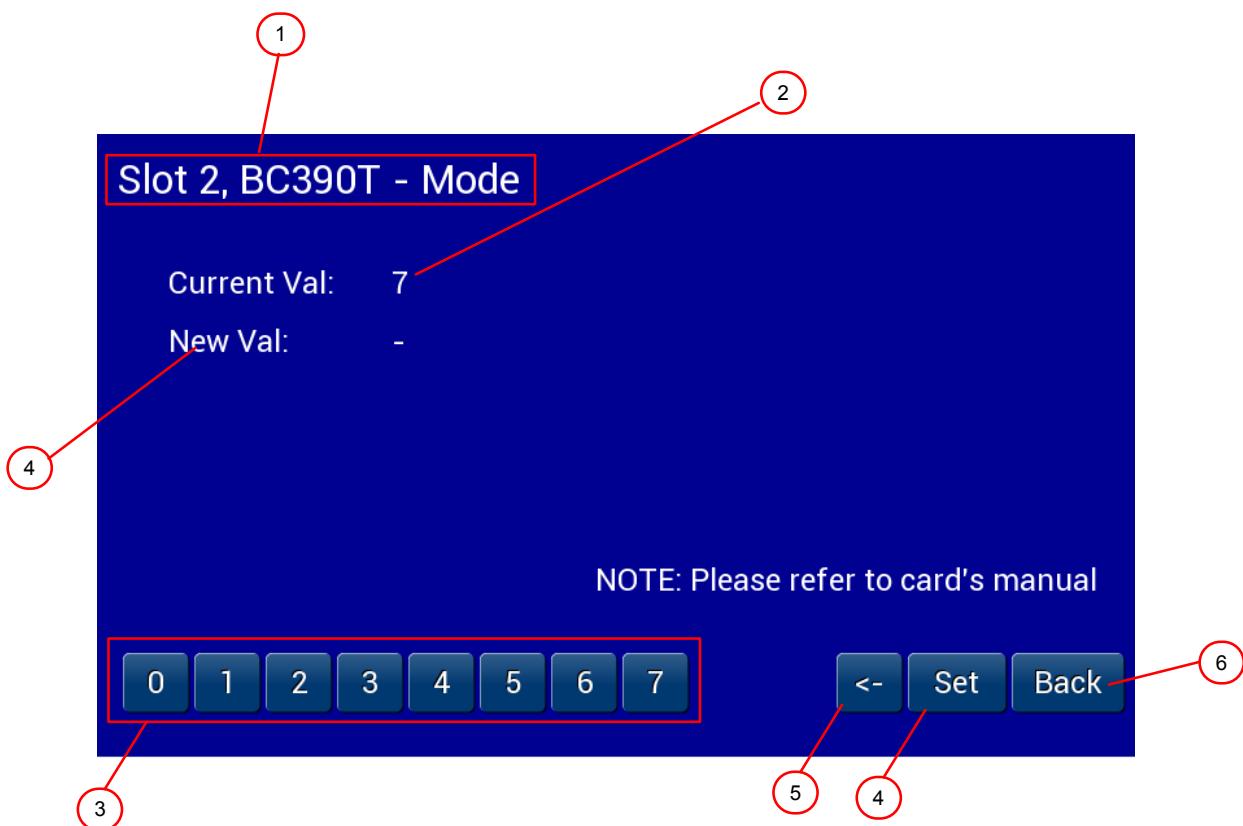
A card-specific parameters page will be available if the currently-selected card has settings which may be changed from the frame touchscreen. The example above is for the BC390T card, which has eight user-selectable encoding modes, enabling SDI signals to be converted between different formats.

Card-specific parameters pages will be displayed by pressing the **Change** button in the relevant field on the card's Card Info page. In the example above, this page would be displayed if the **Change** button in the Mode field on the BC390T's Card Info page (see page 13) is pressed. (Note that the **Change** button on the Card Info page will only be available if the card has changeable parameters).

1. Parameter details – text confirming the card type, Slot number and the card setting or parameter the page is concerned with.

2. **Current Val:** the current value of the parameter or setting.

3. Parameter value – select the required parameter or setting with one of these buttons.

> **IMPORTANT**: Users are advised to refer to the Operation Guide for the card before changing any card-specific parameters from this page.

4. Press the **Set** button to establish the new parameter or setting. This will be confirmed in the **New val:** field.

5. Press the **<-** button to delete the last digit entered.

6. Press the **Back** button to return to the Card Info page.

Network Card page

This page will be available if the BC100i frame has a BM102i or BM103 Network card fitted in Slot 16. It may be displayed by pressing the **BM102i** or **BM103** button on the Home page. (Note: if a Network card is not fitted in the frame, pressing the **Network** button the Home page will produce a reduced version of the page shown below, with the card data fields blank.)

Network cards allow external monitoring of the BC Series cards fitted in the BC100i frame from a remote location, via a standard network connection. An external computer, tablet or other suitable network device can use any compatible web browser application to display a similar series of pages to those available on the BC100i front panel. SNMP reporting is also supported. The BM103 Network card has the additional ability to connect to external devices wirelessly.
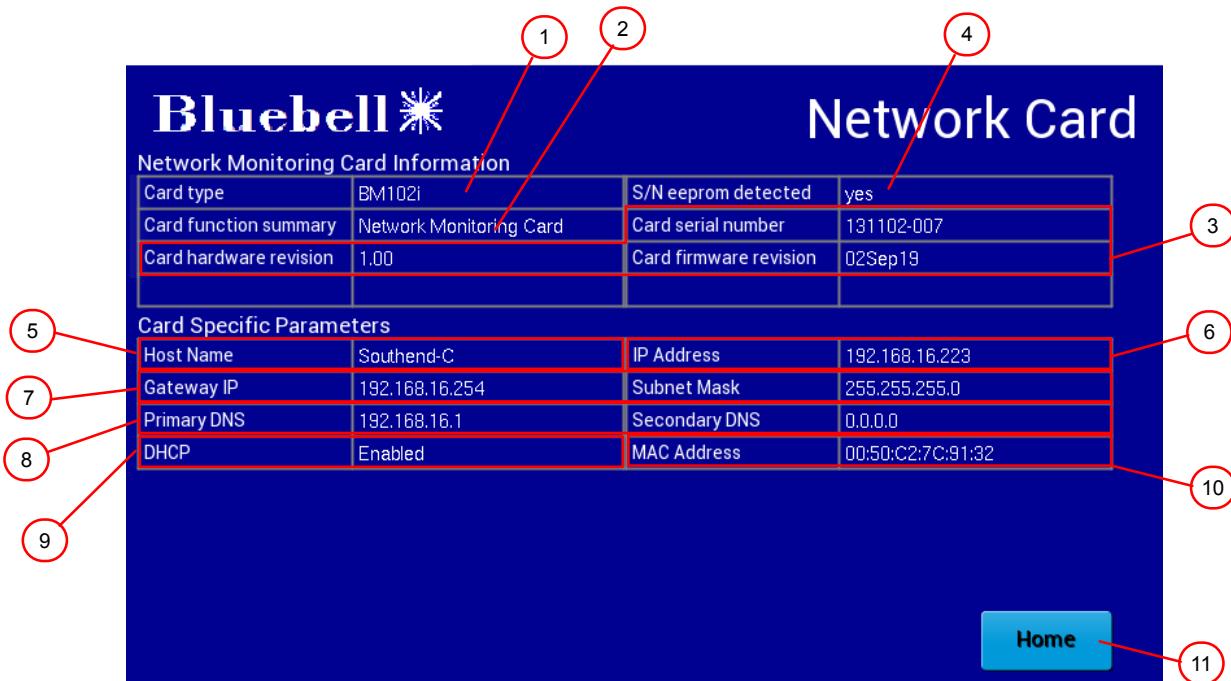
The Network Card page provides card details together with a summary of the network settings applied to the card when it was set up for network use.

Network Monitoring Card Information

1. **Card type** – confirms card type.

2. **Card function summary** – card description.

3. **Card serial number**, **Card hardware revision** and **Card firmware revision** – confirms serial number, PCB issue and firmware version: you may need this information if you need to contact Bluebell with any technical issues that may arise with the card.

4. **S/N eeprom detected** - confirms the detection of the PSU's Serial Number EEPROM. (Included for assistance in fault-finding).

Card Specific Parameters

The settings displayed in this area of the page are the standard suite of settings used for identification of all Ethernet-enabled devices. The settings should be made using the Network Card's internal web page when the Network card is first connected to the LAN (or other network): see the Network Card Operation Guide for full details.

5. **Host Name** – assigned to the card at configuration.

6. **IP Address** – this is the Network card's IP address.

7. **Gateway IP** and **Subnet Mask** – standard Ethernet settings, assigned at configuration.

8. **Primary and Secondary DNS** – Dynamic Name System addresses.

9. **DHCP** – will be Enabled or Disabled.

10. **MAC Address** – the Network card's "physical" unique identifier.

11. **Home** – press this button to return to the Home page.

Firmware updates

The USB port on the front panel allows the firmware of the BC100i's motherboard processor to be updated if necessary.

To perform an update, download the latest firmware from www.bluebell.tv/firmware onto a removable USB memory device, and then plug it into the USB port on the front panel of the of the BC100i frame. An update is then initiated by either i) pressing the reset button, or ii) power-cycling the frame.

When updating by pressing the reset button, the screen will freeze while the update is in process. The frame PSUs are still active, and all cards fitted will remain operational while this happens. The Bluebell logo will be displayed at the end of the update process, which should take no longer than 10 seconds.

When updating by power cycling, frame functions and cards will not be available during the update process and the screen will be blank, but all cards fitted will remain operational. When the update is complete, the frame will restart as normal.

Specifications

BC100i General Specifications	
Number of card slots	15 + 1 for network card option
Power supplies	2 x 100 W modular units, fully redundant
Power input	90 to 250 VAC, 47-63 Hz
Fuses	2 x T5AH 250 V, integral with AC inlets
Operating temperature range	-30 °C to +70 °C
Dimensions (w x h x d)	445 mm x 132.5 mm (3RU) x 250 mm
Weight	11 kg (fully-loaded)
Warranty	5 years
Conformities	
EMI/RFI	89/336/EEC, EN55022B, EN61000-4-2, EN61000-4-4 (Level 2), EN61000-4-4FTB, EN61000-4-5, EN61000-4-11
Electrical	EN61000-6-1, EN61000-6-2, EN61000-6-3, EN61000-6-4
RoHS	Directive 2002/95/EC

Main parts and options

Part No.	Description
BC100i	19" 3RU frame for up to 15 BCxxx Cards, with Dual Redundant Power Supplies, integrated microprocessor-based card/frame monitoring and 7" touchscreen. Monitoring card is optional and accessible via dedicated rear slot.
PS100i	90-250VAC 100 Watt Power Supply for BC100i frame. Two required per frame for redundancy.
BC140	Extender Card for BC100i 3RU frame.
Optical Flight Case	Ruggedised aluminium flight case housing a BC100i 3RU frame. Any combination of cards, including WDM & CWDM, can be fitted for complete flexibility. Dual mains inputs with forced air cooling and a rugged rear panel is fitted with BNC, XLR and optical connectors as necessary. Contact the UK Sales Office for a written quotation.
BM102i	Network Monitoring Card with Ethernet connection. Optional: 1 per frame.
BM103	Network Monitoring Card with two Ethernet ports (RJ45 and SFP). Optional: 1 per frame.

Related products:

Part No.	Description
BC101	Single Slot Enclosure for a single BCxxx card. Needs external DC Power Supply.
BC102	Double Slot Enclosure for two BCxxx cards. Needs external DC Power Supply.
PS12	10 W Plugtop PSU for the BC101/102 Enclosures. Fitted with 4 pin XLR. IEC Mains Leads not supplied
BC120	Triple Slot Enclosure for three BCxxx cards: integral Universal Mains Power Supply.
BC160i	19" 1RU Frame for up to six BCxxx cards with integrated microprocessor-based card/frame monitoring and 3.8", 480 x 116 pixel touchscreen. Optional Network Monitoring. Supplied with Dual Redundant Power Supplies.
BC160P	19" 1RU Frame for up to 6 Passive BCxxx Cards.