TECHNICAL & OPERATIONS MANUAL

For

BC460R and BC460T

Dig audio embed<>SDI/HD/3G Optical

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Contents

BC460R

The BC460R (Optical receiver) card receives a fibre optic input carrying SDI/HD/3G video with embedded audio and processes the audio to produce digital audio outputs.

The BC460R card assembly comprises a BC460R audio processor card coupled to a BC440R receiver base board.
The BC440R baseboard receives the optical signal and de-embeds the audio for processing by the attached BC460R board.
On the BC460R four channels of I2S digital audio from the BC440R are converted to eight channels of digital audio.

Digital audio connection between the BC440 and the BC460R is via intercard connectors
The digital audio outputs are on a 26 way high density D type connector.

BC460T

The BC460T (Optical transmitter) card accepts SDI/HD/3G video and digital audio inputs (AES) and after processing outputs SDI/HD/3G video with embedded audio onto optical fibre.

The BC460T card assembly comprises a BC460T audio processor card coupled to a BC440T transmitter card.
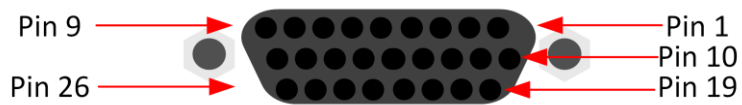The BC440T receives and processes the received video and also embeds audio from the attached BC460T board.
On the BC460T eight channels of digital audio are converted to eight channels of I2S digital audio.

Digital audio input to the BC440T is via intercard connectors between the BC440T and the BC460T.
The digital audio inputs are via a 26 way high density D type connector.

Optical Output Connector	Optical Input Connector
Input Locked LED	Input Locked LED
Hex Function Switch	Hex Function Switch
Video Input BNC	Video Output BNC
AES Digital Audio Input Connector	AES Digital Audio Output Connector

Pin 9 → ← Pin 1

← Pin 10

Pin 26 → ← Pin 19
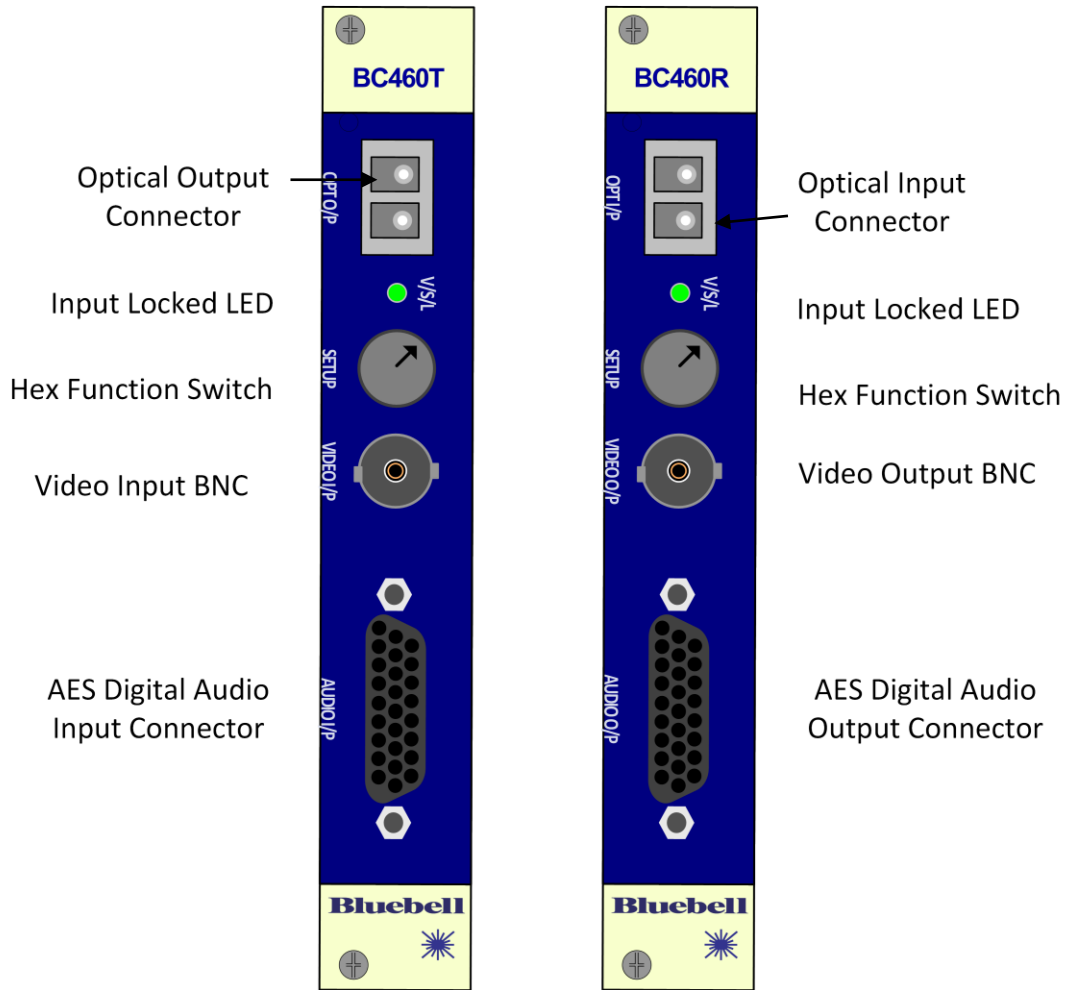
BC460R

Depth	60mm
Width	20mm
Height	100mm
Weight	120g
Power Supply	6V DC
Power consumption	2.5W
Current consumption	400mA
Optical input	SFP module
Digital audio output	4 AES
Audio connector	26 way female High density "D" type
Video output	BNC

BC460T

Depth	60mm
Width	20mm
Height	100mm
Weight	120g
Power Supply	6V DC
Power consumption	3 W
Current consumption	500mA
Optical input	SFP module

Audio

Digital audio output	4 AES
Audio connector	26 way female High density "D" type
Video output	BNC
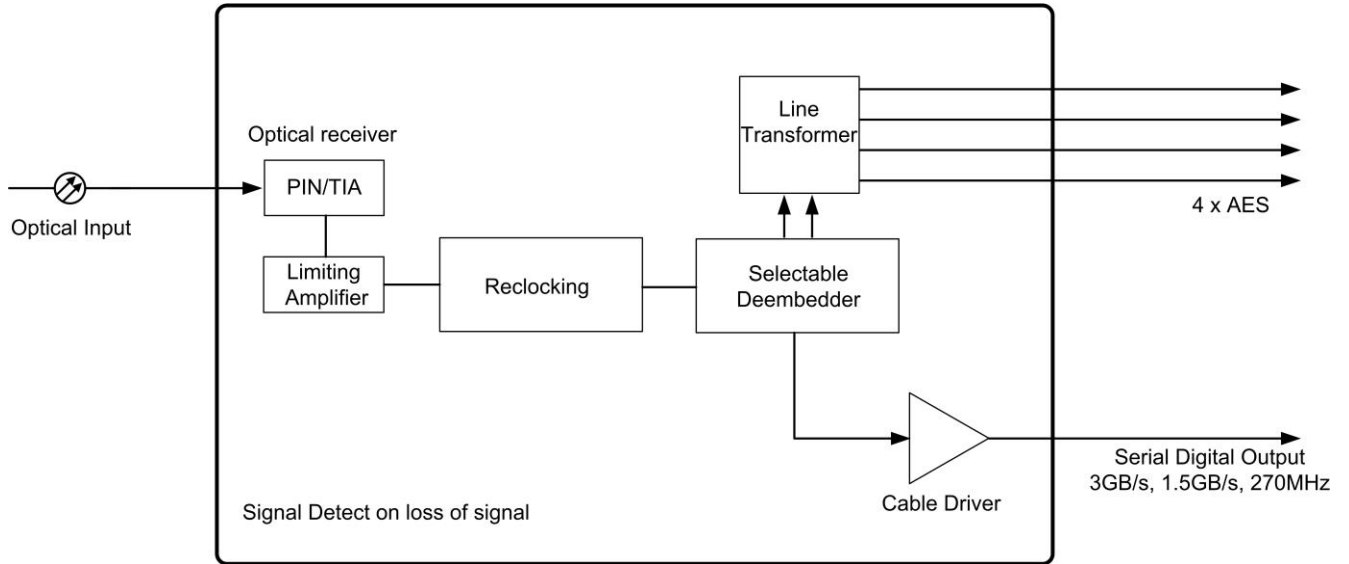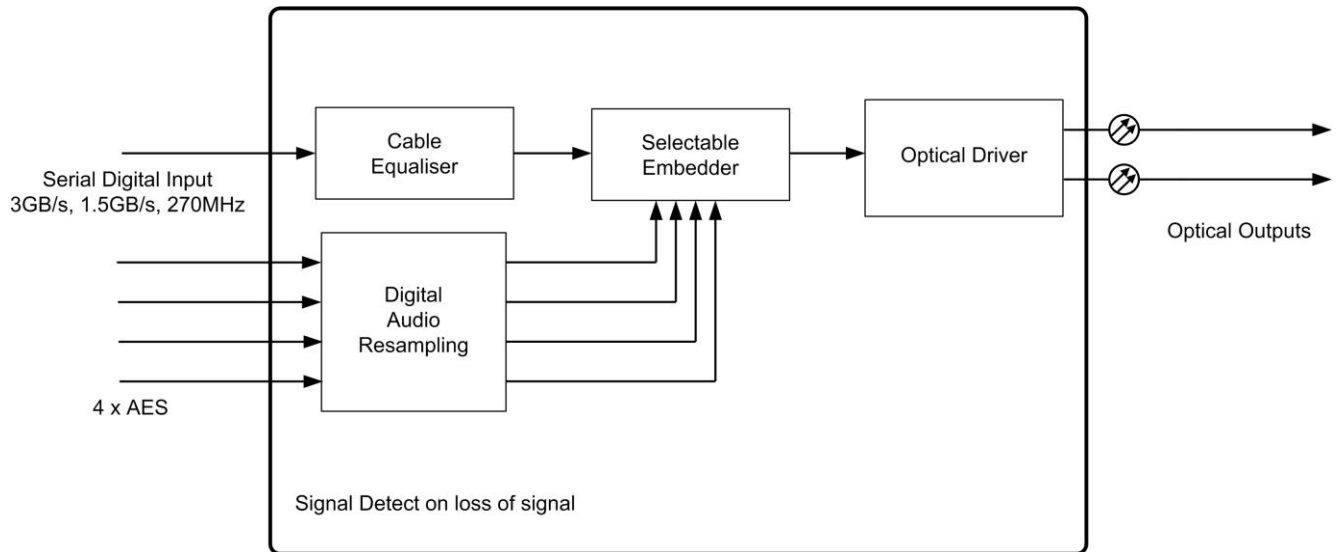
BC460R

BC460T

BC460R

The + 6 Volts DC input is decoupled by C1 and regulated to 5V by IC1. Power test points are, TP5 (+5V) and TP6 (Gnd).

The AES data inputs from the BC440 are on CN2 pins 13, 14, 15 and 16 and are buffered by IC2, IC3, IC4 and IC5 for differential output at the 26 way high density D type connector J2.

The + 6 Volts DC input is decoupled by C1 and regulated to 5V by IC1. Power test points are, TP5 (+5V) and TP6 (Gnd).

BC440R

The BC440R is an audio de-embedder with a fibre optic input and BNC output. It is used with the BC450R audio sub card and will de-embed eight channels of audio from the optical video data stream.

The digital video fibre optic input is via an LC type connector.

The audio outputs are via a 26 way HD D type connector on the sub board.

The digital video output is on a BNC connector.

Power input: 6V DC at 0.47A via a DIN 41612 1/2 AB RA format 32 way connector.

The + 6 Volts DC input is filtered by C8 and fed to regulator IC3 Pin 3. The regulated +3.3V output is on IC3 pin 4 C6 and C7 decouple this to ground.

The +3.3V DC goes to pin 2 of IC4 the +1.2V regulator and C4 decouples this to ground Power supply test points are, TP2 (+3.3V), TP1 (Gnd) and TP3 (+1.2V).

The optical data output from the SFP module IC1 is fed to IC11, IC11 reclocks the serial data stream and provides indication of correct data rate lock via TP31 and local LED indicator LD1 (if LK 1-2 fitted) to indicate lock, IC3 buffers the lock status output to drive the system status lines.

The reclocked serial digital video signal is deserialised by IC11 which provides the data and reference clock signal to IC12. IC11 allows the removal of the embedded audio data from the digital video data stream and generates audio clock signals which are locked to digital video. The BC450 sub board is fitted on CN4 and CN5 to extract audio from the data stream. IC7 is a single chip microcontroller which is used to access the functions and operation modes on the registers in IC11 and IC12, Or on sub boards, it can be reprogramed via CN2. SW1 allows operation mode setting according to the table in the adjustment section. The digital audio data from groups 1 and 2 (AES 1, 2, 3 and 4) or the audio data from groups 3 and 4 (AES 5, 6, 7 and 8) of the video data stream can be extracted.

The parallel video data output from IC11 goes to IC12 to be converted to a serial data stream. This serial data is fed to outputs CN1, the BNC connector. Digital audio to be embedded is fed from a sub board via CN4 to IC12 which can insert the audio data into groups 1 and 2 (AES 1, 2, 3 and 4) or into groups 3 and 4 (AES 5, 6, 7 and 8) of the video data stream. In overwrite mode any existing audio already in the data stream will be

overwritten and in cascade mode new data to be inserted is appended to any existing data.

BC460T
Circuit Description:-

The + 3.3 Volts DC input is decoupled by C15 and feeds all on board IC's.

The AES data inputs from J1 are coupled by TFR1, TFR2, TFR3, and TFR4 to IC2, IC5, IC6 and IC8 for output to the BC440 at interboard connector CN1. IC2, IC5, IC6 and IC8 resample and retime the digital audio signals to the clock signals generated from the digital video which are input from the BC440 at CN2. The reclocking function can be bypassed by connecting link LK1 pins 2 to 3 to output only the equalised AES input signals. Note that when used with a BC440 to embed digital audio there must be a valid signal on channel A for the channel B signal to be embedded in HD or 3G video, the same applies to channel C for the channel D signal.

BC440T
The + 6 Volts DC input is filtered by C6, L5 and C7 and fed to regulator IC3 Pin 3. The regulated +3.3V output is on L6, C21 and C22 decouple this to ground.
The +3.3V DC goes to pin 2 of IC4 the +1.2V regulator C4 decouples this to ground
Power supply test points are, TP2 (+3.3V), TP1 (Gnd) and TP3 (+1.2V).

The serial data input from the BNC CN1 is fed to IC1, IC1 equalises the serial data cable input which is then fed to IC11 IC11 provides indication of correct data rate lock via TP31, local LED indicator LD1 indicates lock and IC6 buffers the lock status output to drive the system status lines.

The reclocked serial digital video signal is deserialised by IC11 which also provides the data and reference clock signal to IC12. IC11 allows the extraction of the embedded audio data and audio clocks from the digital video data stream. The BC450T sub board should be fitted on CN4 and CN5 to insert audio from the data stream. IC7 is a single chip microcontroller which is used to access the functions and operation modes on the registers in IC11 and IC12 and on a sub board. It can be reprogramed via CN2. SW1 allows operation mode setting. The digital audio data from groups 1 and 2 (AES 1,2,3 and 4) or the audio data from groups 3 and 4 (AES 5,6,7 and 8) of the video data stream can be extracted or embedded. Hex Switch SW1 should be set according to the operation mode required.

The parallel video data output from IC11 goes to IC12 to be converted to a serial data stream. This serial data is fed to the dual driver IC5. IC5 outputs to IC8, the SFP fibre output module. Digital audio to be embedded is fed from a sub board via CN4 to IC12 which can insert the audio data into groups 1 and 2 (AES 1, 2, 3 and 4) or groups 3 and 4 (AES 5, 6, 7 and 8) of the video data stream according to the table below. In overwrite mode any existing audio already in the data stream will be overwritten and in cascade mode new data to be inserted is appended to any existing data.

BC460R (Optical receiver - SDI and digital audio AES out)

Output connections:
The 26 way high density D type electrical connections are as follows:-

Digital Audio outputs

1	AES audio channel A +	10	Audio channel A Screen/Ground	19	AES audio channel A -
2	AES audio channel B +	11	Audio channel B Screen/Ground	20	AES audio channel B -
3	AES audio channel C +	12	Audio channel C Screen/Ground	21	AES audio channel C -
4	AES adio channel D +	13	Audio channel D Screen/Ground	22	AES audio channel D-
5	No connection	14	Ground	23	No connection
6	No connection	15	Ground	24	No connection
7	No connection	16	Ground	25	No connection
8	No connection	17	Ground	26	No connection
9	Ground	18	Ground		

Links / adjustments

Links located on 440R (issue 3) base board			
LK4			Factory use only
LK5			Factory use only

Hex switch position	Function
0	De-embed without blanking original audio on groups 1,2,3,4 on BNC o/p
1	De-embed without blanking original audio groups 5,6,7.8 on BNC o/p
2	De-embed and blank audio original on groups 1,2,3,4 on BNC o/p
3	De-embed and blank audio original on groups 5,6,7,8 on BNC o/p
4 - 7, A -F	Not applicable to BC450R

Indicator	Function	
LED LD1		

BC460T (Optical transmitter, SDI and AES inputs)

Input connections:
The 26 way high density D type electrical connections are as follows:-
Audio outputs

1	Digital audio channel A +	10	Audio channel A Screen/Ground	19	Audio channel A -
2	Digital audio channel B +	11	Audio channel B Screen/Ground	20	Audio channel B -
3	Digital audio channel C +	12	Audio channel C Screen/Ground	21	Audio channel C -
4	Digital audio channel D +	13	Audio channel D Screen/Ground	22	Audio channel D -
5	No connection	14	Ground	23	No connection
6	No connection	15	Ground	24	No connection
7	No connection	16	Ground	25	No connection
8	No connection	17	Ground	26	No connection
9	Ground	18	Ground		

Indicator	Function	
LED	Indicates lock to incoming SDI signal	

Links located on 440T baseboard			
LK1			Factory use only.
LK4			Not used
LK5			Not used
Links located on 460T sub board			
LK1	Pin 1	Pin2	Reclocking
	Pin 2	Pin 3	Non-reclocking (Audio must be synchronous with video)

Hex switch position	Function
0 - 4	Embed new audio and blank existing audio on groups 1,2,3,4.
5	Embed new audio and blank existing audio on groups 5,6,7,8.
6	Embed without blanking existing audio on groups 1,2,3,4.
7	Embed without blanking existing audio on groups 5,6,7,8.

See table below for further details of Hex switch operation

BC450T Optical transmitter

Input is SDI			
i/p group 1 L1/R1 & L2/R2	i/p group 2 L1/R1 & L2/R2	i/p group 3 L1/R1 & L2/R2	i/p group 4 L1/R1 & L2/R2

And

AES audio input				
	AES 1	AES 2	AES 3	AES 4

Hex switch	Fibre output is SDI with embedded audio.			
	Group 1	**Group 2**	**Group 3**	**Group4**
0 - 4	AES 1 & 2	AES 3 & 4	Blanked	Blanked
5	Blanked	Blanked	AES 1 & 2	AES 3 & 4
6	AES 1 & 2	AES 3 & 4	Input group 3 L1/R1 & L2/R2	Input group 2 L1/R1 & L2/R2
7	Input group 1 L1/R1 & L2/R2	Input group 2 L1/R1 & L2/R2	AES 1 & 2	AES 3 & 4
8	Not used			
9	Not used			
A	Not used			
B	Not used			
C	Not used			
D	Not used			
E	Not used			

BC450R Optical receiver

Input is fibre carrying SDI with embedded (Note; the i/p groups referred to below are the groups as embedded into the fibre SDI signal by the BC460T.			
i/p group 1 L1/R1 & L2/R2	i/p group 2 L1/R1 & L2/R2	i/p group 3 L1/R1 & L2/R2	i/p group 4 L1/R1 & L2/R2

**Output is SDI with embedded audio on BNC and AES audio on the D type connector**

Hex switch	SDI output				AES audio output			
0	i/p group 1	i/p group 2	i/p group 3	i/p group 4	i/p group 1	i/p group 1	i/p group 2	i/p group 2
1	i/p group 1	i/p group 2	i/p group 3	i/p group 4	i/p group 3	i/p group 3	i/p group 4	i/p group 4
2	Blanked	Blanked	Blanked	Blanked	i/p group 1	i/p group 1	i/p group2	i/p group 2

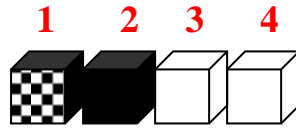| 3	Blanked	Blanked	Blanked	Blanked	i/p group 3	i/p group 3	i/p group 4	i/p group 4
4	Not used
5	Not used
6	Not used
7	Not used
8	Not used
9	Not used
A	Not used
B	Not used
C	Not used
D	Not used
E	Not used
F	Not used

460T Optical transmitter

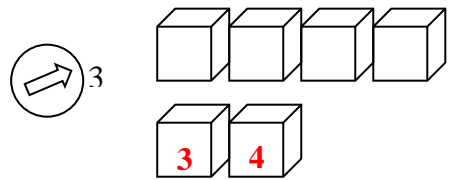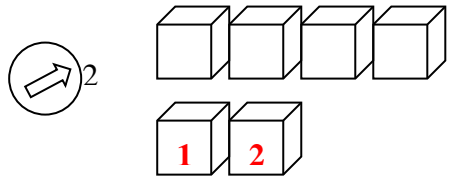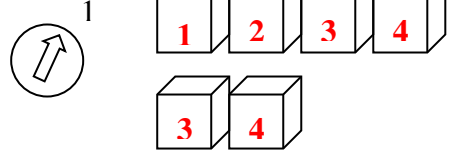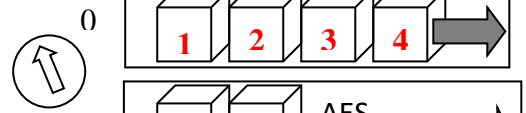0-4
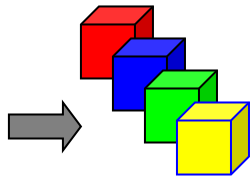
Input SDI embedded groups 1-4

5

6

7
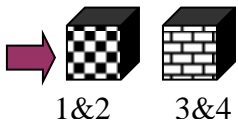
AES audio input.
AES 1,2,3,4

1&2   3&4
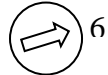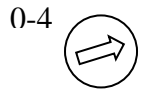
Optical signal carrying SDI and embedded audio

1   2   3   4
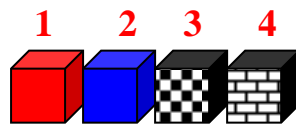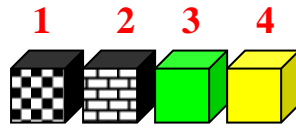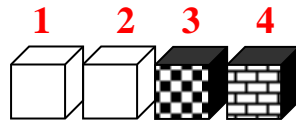
460R Optical receiver

Embedded groups

1   2   3   4

1   2   AES audio out

0

1

2

3

1   2   3   4

3   4

1   2

3   4

= group blanked

BC450T

OPT O/P

V/S/L

SETUP

VIDEO I/P

AUDIO I/P

Bluebell

SDI in

AES in

BC450R

OPT I/P

V/S/L

SETUP

VIDEO O/P

AUDIO O/P

Bluebell

SDI out

AES out