



OPERATIONS MANUAL

for

BC551

3G/SD/HD ↔ Fibre

With reverse Audio link

© 2010 - 2014 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: sales@bluebell.tv Website: www.bluebell.tv

Please note that all documentation herein is of a confidential nature and may not be reproduced without written confirmation from Bluebell Opticom Ltd. The technical descriptions and schematics are to aid service and repair only. Dissemination to a third party or parties will constitute breach of copyright. Information in this document is subject to change without notice and does not represent a commitment on the part of Bluebell Opticom Ltd.

**© 2010-2014 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: sales@bluebell.tv
Website: www.bluebell.tv**

Safety Warning – Important Precautions

To reduce the risk of fire or electric shock, do not expose this equipment to rain, moisture, or wet conditions.

General Safety Guidelines

- Always **disconnect the entire system from the AC mains** before cleaning or servicing.
- The following product frames – **BC100, BC100i, BC101, BC102, BC120, BC160i** – must be connected using a **three-conductor AC mains power cord with an earth ground**. All three conductors must be used at all times to prevent electric shock.
- Do **not** bypass or disable any fuse.
- Only replace fuses with those of the **specified type and rating**.
- Do **not** use flammable or combustible chemicals for cleaning.
- Do **not** pour or spill liquids directly onto the unit.
- Do **not** allow any liquid to enter the unit or wet the internal components.
- Do **not** operate the unit with any cover or panel removed.
- Do **not** obstruct the ventilation slots—**adequate airflow must be maintained**.
- Do **not** operate the unit in environments with **extreme temperatures**.
- Do **not** use or store the unit in **explosive atmospheres**.
- Do **not** attempt to repair the unit yourself. If servicing is required, please contact your local **Bluebell Opticom** distributor.
-  **Product Warranty**
- **Bluebell Opticom Ltd** provides warranty coverage as detailed in our general terms and conditions.
Please note that warranty support is only valid **if product serial numbers remain intact and legible**. Tampering with or removing serial numbers may void your warranty.

Contents	BC551T/BC551R	4
Description	BC551T/BC551R	5
Block Diagrams	BC551T/BC551R	6
Specification	BC551T	7
Connections	BC551T	8
Settings/Indicators	BC551T	9
Circuit Description	BC551TX	10
Component layout	BC551TX	11
Parts list	BC551TX	12
Specification	BC551R	13
Connections	BC551R	14
Settings/Indicators	BC551R	15
Circuit Description	BC551RX	16
Component layout	BC551RX	17
Parts list	BC551RX	18

Description	BC551T/BC551R
-------------	---------------

The BC551T transmitter and BC551R receiver modules enable the transport of a 3G-SDI, HD-SDI, SD-SDI or DVB-ASI signal over fibre optical cable. A reverse path for a stereo audio signal is carried on a second fibre making the BC551 perfect for adding cost effective fibre I/O to compact remote camera systems.

The BC551 modules can be housed in any BC compatible enclosure such as the BC100 (3U) or BC160 (1U) racks

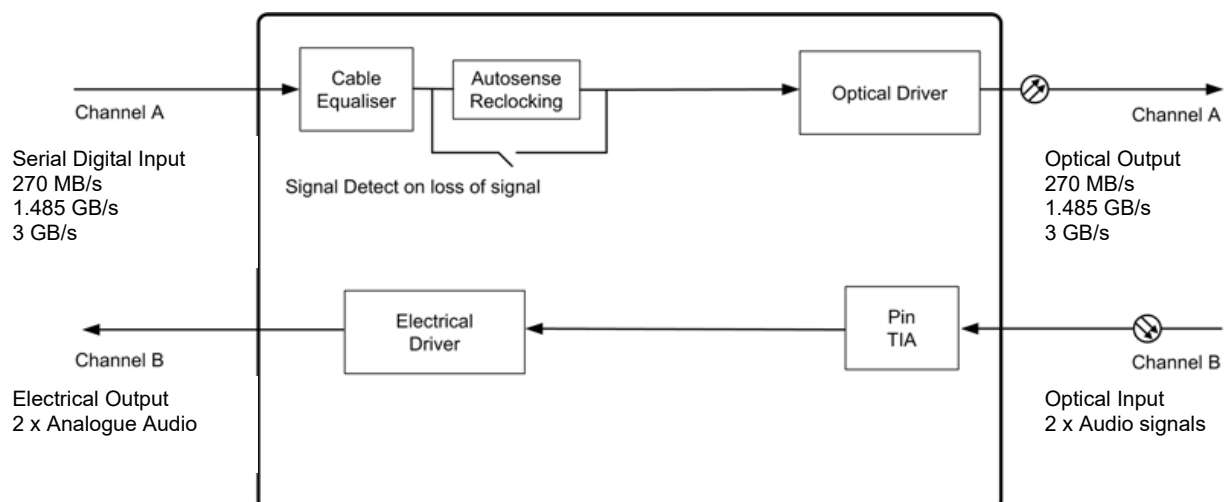
The BC551 units are compact fibre optic converters that are perfectly suited to provide interference free transmission and for extending the range of electrical signals, particularly HD-SDI and 3G-SDI signals.

In the BC551T transmitter, the incoming digital video signal is auto-sensed and then equalised and re-clocked prior to conversion and transmission down a single optical fibre. In the BC551R receiver the incoming optical signal is fed to a trans-impedance and limiting amplifier before being electrically re-clocked on the output.

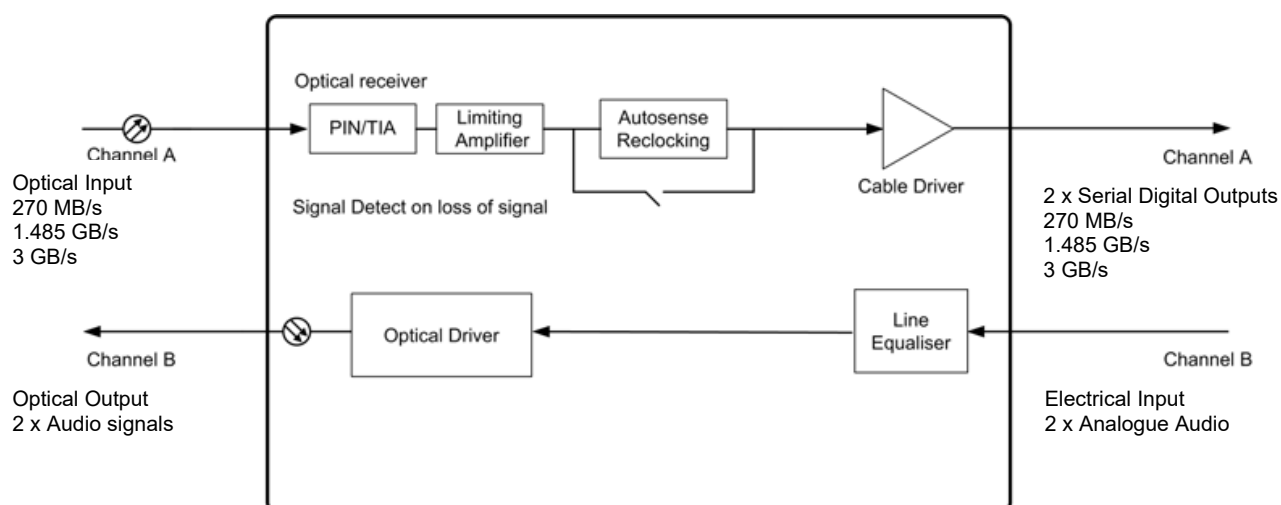
The video channel can also operate in non-re-clocking mode and handle data rates from 50 Mb/s to 3 Gb/s.

The BC551T and BC551R are available in single-mode, WDM, and CWDM variants to suit any fibre application, achieved via interchangeable SFP transceiver modules. The optical input sensitivity and output power and wavelength are dependent on the SFP module fitted. Contact sales office for details.

BC551T



BC551R



General module specifications

Depth	87mm (inc connectors)
Width	20mm (4HP)
Height	129mm (3RU)
Weight	100g
Operating Temperature	-30°C to +70°C
Power supply voltage	6V DC Nominal (accepts 4.5 to 17V DC)
Power consumption	2.0W

Electrical Input

Connector	1 x 75 Ohm BNC (per IEC 60169-8 Amendment 2)
Format	Re-clocked (bypass allows data rates down to 50 Mb/s) (Unless specified, factory default is re-clocking mode. Non-re-clocking mode is accessed via pcb link.)
Standards	SMPTE 424M, SMPTE 292M, SMPTE 259M, SMPTE 297M, DVB-ASI Auto-Sensing for SD-SDI, ASI, HD-SDI, 3G-SDI
Equalisation	Automatic to 100 m @ 3 Gb/s Automatic to 200 m @ 1.485 Gb/s Automatic to 300 m @ 270 Mb/s
Return Loss	> 15 dB @ 1.485 Gb/s

Electrical Output - Video

Connector	1 x 75 Ohm BNC (per IEC 60169-8 Amendment 2)
Format	Active, driven, optionally re-clocked, copy of video input.

Electrical Output - Audio

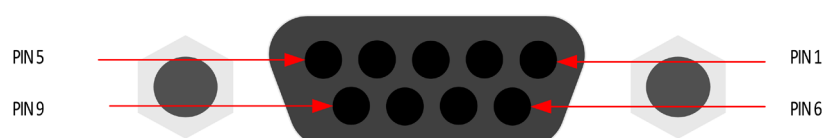
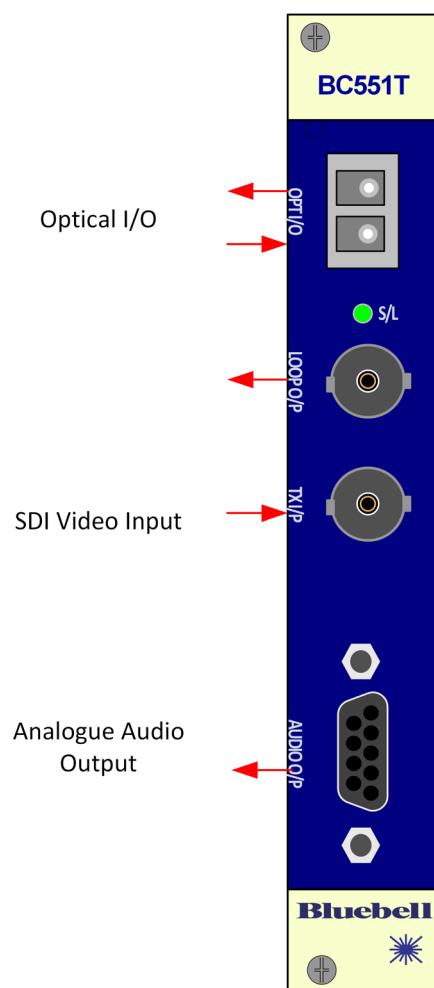
Connector	9 pin D type
Format	2 x analogue audio, balanced pair, signals

Optical Input/Output

Connector	SFP transceiver with LC connectors
Wavelength	1310 nm, 1550 nm (see Ordering Information for variants)
Optical Performance	Dependent on SFP module fitted

Conformance

EMI/RFI	Complies with 89/336/EEC
Electrical	Complies with EN 61000-6-1, EN61000-6-2
Laser Safety	Complies with Class 1 laser: 24 CFR 1040.10 & 1040.11
RoHS	Complies with Directive 2002/95/EC
Warranty	5 years



Analogue Audio Output
9-pin D-socket (female pins)

pin 1	LEFT+
pin 2	LEFT-
pin 3	Ground
pin 4	RIGHT+
pin 5	RIGHT-
pin 6	LEFT Ground
pin 7	
pin 8	
pin 9	RIGHT Ground

Settings/Indicators	BC551T
----------------------------	---------------

Internal Link Settings on BC551TX board

	Link	To Link	
Digital input video clocking			
LK101	Pin 1	Pin 2	disable SDI digital input re-clocking
LK101	Pin 2	Pin 3	enable SDI digital input re-clocking (Default)

Indicator LEDs

Indicator	Function
"S/L" LED LD1 (below SFP module)	green = SDI/HD/3G input signal detected on BNC red = no signal detected on BNC

The BC551T is a SDI-HD digital video fibre optic transmitter and audio receiver. The fibre optic transmitter is intended for operation with ANSI/SMPTE 259/292 digital video at data rates from 143 to 2970 Mb/s. The fibre optic receiver will receive digitised audio.

The digital video transmitter input is via BNC connector BNC101.

A repeated and re-clocked digital video output is available on BNC1

The digital video transmitter output is via the SFP module (LC connector) to fibre.

The audio receiver input is via the SFP module (LC connector) from fibre.

The balanced analogue audio outputs (Left and Right) are on 9-pin D connector.

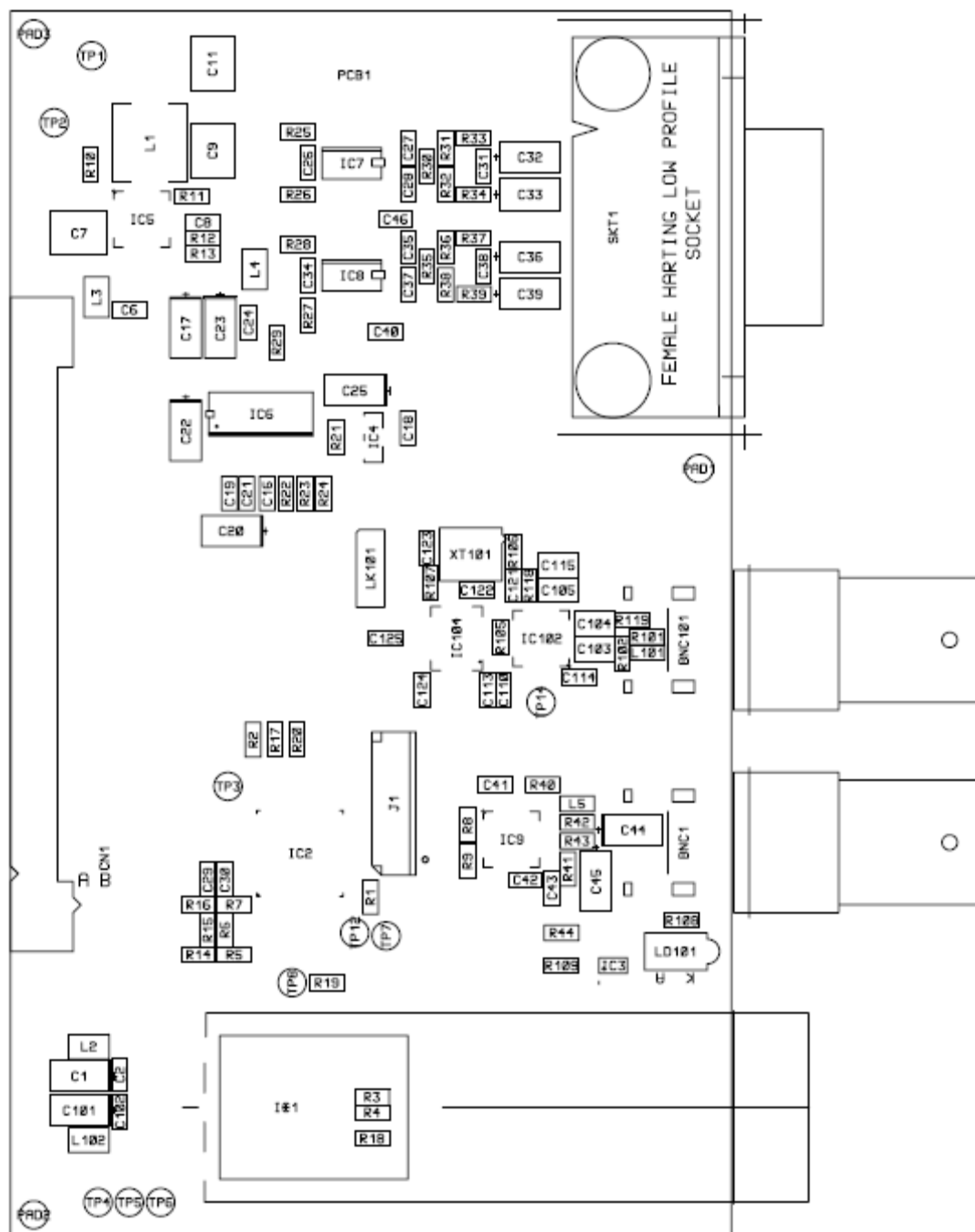
The power input can be from 4.5V to 16.0V DC and is supplied on the 32-pin DIN41612 connector, CN1. Power requirement is approximately 2.0W, and so will take approx 170mA at 12V DC input or 340mA at 6V DC input.

The DC input is filtered by C6, C7 and L3 and is fed to regulator IC5 (+3.3V). C9 and C11 decouple its +3.3V output to ground. Filtered +3.3V outputs are fed to the SFP fibre module via L2 and L102. Power supply test points are: TP2 (Gnd) and TP1 (+3.3V).

The digital video input from BNC connector BNC101 is fed to equaliser IC102 which provides compensation for frequency dependent cable losses. The data output from IC102 is then fed to IC104 which can re-clock the serial data stream. LK101 can be used to configure IC104 to re-clock (the default, link pins 2 to 3) or to bypass re-clocking (link pins 1 to 2). IC104's output signal is fed to the SFP fibre optic output module.

The data re-clocker IC104 also provides indication of correct data rate lock via IC3 to the system status (channel A error) and local LED indicator LD101 (visible on the front panel just below the SFP module).

The digital data input from the SFP module is fed to de-serialiser IC2. Data lock indication from IC2 is available on TP12. The de-serialised data and clocks are then fed to audio DAC IC6. Analogue differential audio then goes to filters and buffers IC8 and IC7 and is output on 9-pin D socket SKT1. IC4 generates the reset for IC6.



Parts list	BC551TX
-------------------	----------------

Part number	Qty	Part locations
IC-SN74LVC2G04DCK-SC70-6	1	IC3
BNC-CAM-C-SX-069	2	BNC1 BNC101
CAGE-SFP	1	SK2
CAP-10pF-0603-COG-10%	2	C6 C8
CAP-2n2-0603-COG-10%	2	C26 C34
CAP-390pF-0603-COG-10%	4	C27 C28 C35 C37
CAP-39pF-0603-COG-10%	2	C122 C123
CAP-100nF-0603-X7R-10%	14	C3 C5 C12 C14 C16 C18 C19 C21 C24 C29 C30 C40 C46 C114
CAP-10nF-0603-X7R-10%	15	C2 C4 C10 C13 C15 C31 C38 C41 C42 C43 C102 C110 C121 C124 C125
CAP-56nF-0603-X7R-10%	1	C113
CAP-1uF-0805-X7R-10%	3	C103 C104 C105
CAP-SOT-0805-X7R-10%	1	C115
CAP-10uF-1210-X7R-20%	3	C7 C9 C11
CAP-10uF/16V-TANT-TAJ-A	13	C1 C17 C20 C22 C23 C25 C32 C33 C36 C39 C44 C45 C101
CHOKe-2n2H-0603	2	L5 L101
CHOKe-10uH-2525-10uH	1	L1
CHOKe-BLM21PG331SN1D	4	L2 L3 L4 L102
CONN-DIN41612-32	1	CN1
IC-CS4350-CZZ-TSSOP24	1	IC6
IC-DS99R106SQ-LLP48	1	IC2
DTYPE-9WAY-SOCKET	1	SKT1
HEADER-1.2mm-5-8WAY	1	J1
HEADER-3x1-2mm	1	LK101
LED-T1-RED\GREEN	1	LD101
IC-LM8093-3.00SOT23-3	1	IC4
IC-LME49721-SOIC8	2	IC7 IC8
IC-LMH0302SQE	1	IC9
IC-LMH0344SQE	1	IC102
IC-LMH0346SQE	1	IC104
PCB-BC551TX-ISS1	1	PCB1
RES-100R-0603-1%-0.1W	2	R8 R105
RES-10R-0603-1%-0.1W	10	R1 R2 R12 R17 R20 R22R23 R24 R29 R107
RES-1M-0603-1%-0.1W	1	R11
RES-27K-0603-1%-0.1W	2	R30 R35
RES-2K2-0603-1%-0.1W	4	R31 R32 R36 R38
RES-300R-0603-1%-0.1W	4	R25 R26 R27 R28
RES-36R-0603-1%-0.1W	1	R119
RES-390R-0603-1%-0.1W	3	R44 R108 R109
RES-47R-0603-1%-0.1W	6	R7 R16 R33 R34 R37 R39
RES-4K7-0603-1%-0.1W	5	R3 R4 R18 R19 R21
RES-750R-0603-1%-0.1W	1	R9
RES-75R-0603-1%-0.1W	6	R40 R41 R42 R43 R101 R102
RES-82R-0603-1%-0.1W	4	R5 R6 R14 R15
RES-SOT-0603-1%-0.1W	4	R10 R13 R106 R118
SFP-TXRX-GO2925	1	IC1
SOCKET-SFP20	1	SK1
IC-TPS62111	1	IC5
XTAL-27MHz-ACT32	1	XT101

General module specifications

Depth	87mm (inc connectors)
Width	20mm (4HP)
Height	129mm (3RU)
Weight	100g
Operating Temperature	-30°C to +70°C
Power supply voltage	6V DC Nominal (accepts 4.5 to 17V DC)
Power consumption	1.8W

Optical Input/Output

Connector	SFP transceiver with LC connectors
Wavelength	1310 nm, 1550 nm (see Ordering Information for variants)
Optical Performance	Dependent on SFP module fitted

Electrical Input - Audio

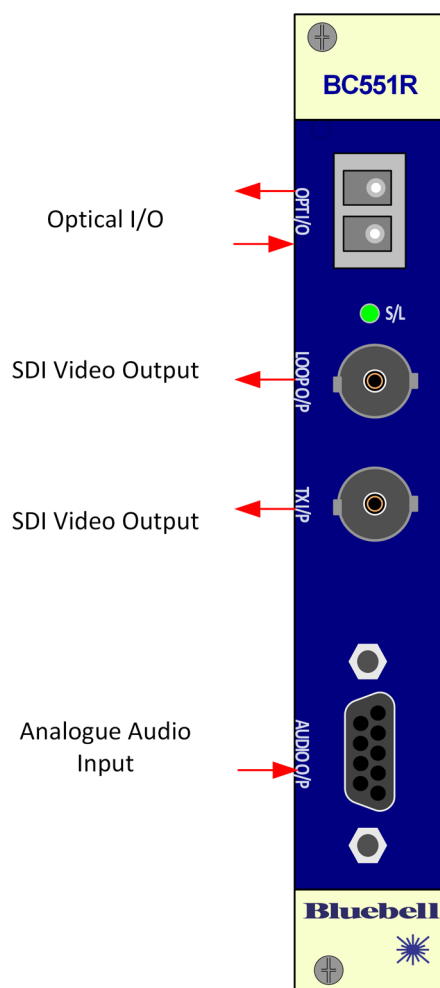
Connector	9 pin D type
Format	2 x analogue audio, balanced pair, signals

Electrical Output - Video

Connector	2 x 75 Ohm BNC (per IEC 60169-8 Amendment 2)
Format	Re-clocked (bypass allows data rates down to 50 Mb/s) (Unless specified, factory default is re-clocking mode. Non-re-clocking mode is accessed via pcb link.)
Standards	SMPTE 424M, SMPTE 292M, SMPTE 259M, SMPTE297M, DVB-ASI Automatic rate selection for SD-SDI, HD-SDI and 3G-SDI
Return Loss	> 15 dB @ 1.485 Gb/s
Signal Level	800mV $\pm$ 10%
DC Offset	0 $\pm$ 0.5 V
Jitter	<0.15 UI line equalised

Conformance

EMI/RFI	Complies with 89/336/EEC
Electrical	Complies with EN 61000-6-1, EN61000-6-2
Laser Safety	Complies with Class 1 laser: 24 CFR 1040.10 & 1040.11
RoHS	Complies with Directive 2002/95/EC
Warranty	5 years



Analogue Audio Input
9-pin D-socket (female pins)

pin 1	LEFT+
pin 2	LEFT-
pin 3	Ground
pin 4	RIGHT+
pin 5	RIGHT-
pin 6	LEFT Ground
pin 7	
pin 8	
pin 9	RIGHT Ground

Internal Link Settings on BC551RX board

	Link	To Link	
Digital video receiver clocking			
LK1	Pin 1	Pin 2	disable received video signal re-clocking
LK1	Pin 2	Pin 3	enable received video signal re-clocking (Default)

Indicator LED

Indicator	Function
"S/L" LED LD1 (below SFP module)	green = locked to input signal on optic fibre red = Not locked to input signal on optic fibre

The BC551RX is an SDI-HD digital video fibre optic receiver and audio transmitter. The fibre optic receiver is intended for operation with ANSI/SMPTE 259/292 digital video at data rates from 143 to 2970 Mb/s. and the fibre optic transmitter will digitise analogue audio and transmit it on fibre.

The digital video receiver input is from fibre via LC connector on SFP module.

The digital video receiver output is via BNC connectors BNC1 and BNC2.

The analogue audio input is 2 balanced signals on a 9-pin D connector.

The audio transmitter output is via LC connector on SFP module to fibre.

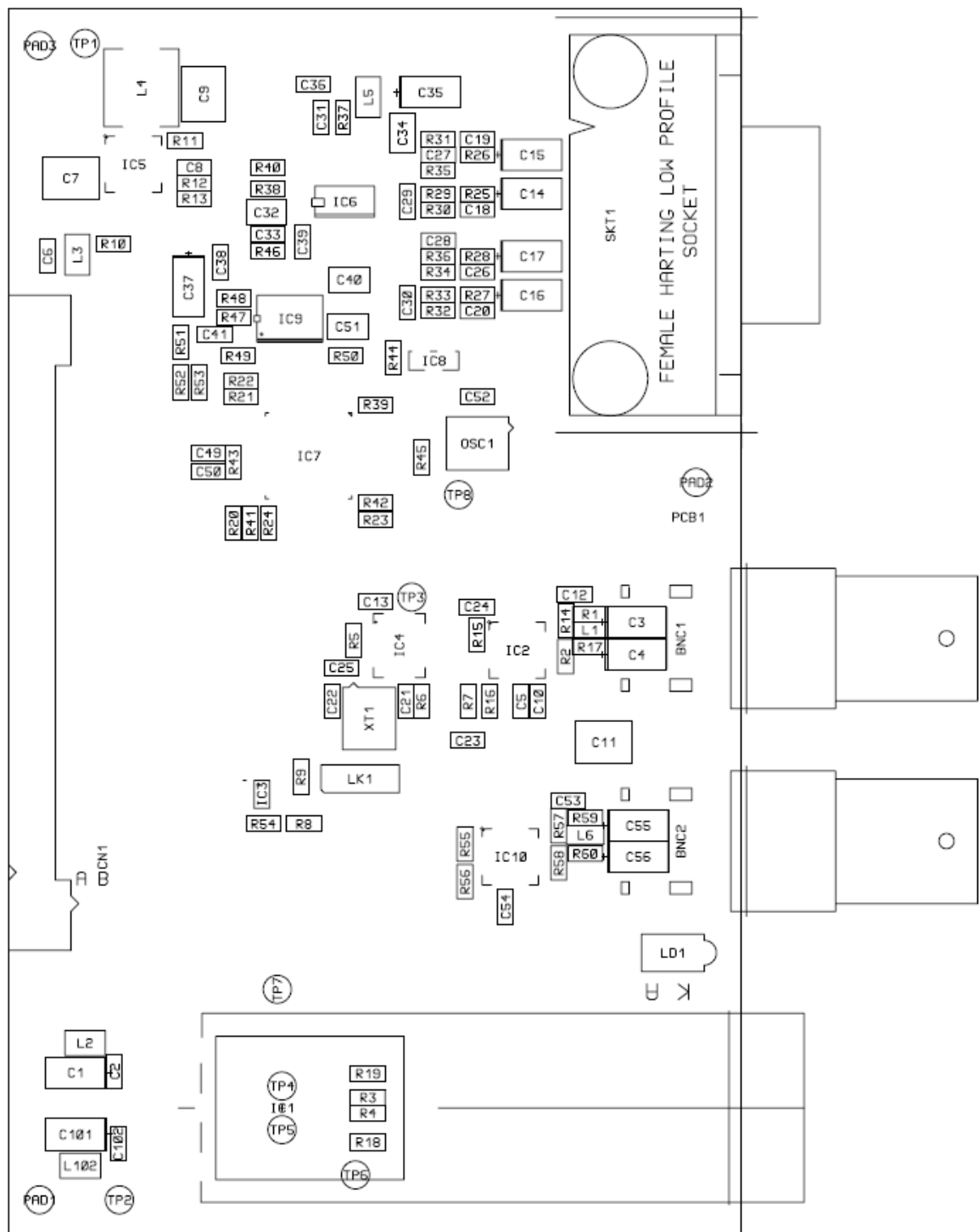
The power input can be from 4.5V to 16.0V DC and is supplied on the 32-pin DIN41612 connector, CN1. Power requirement is approximately 1.8W, and so will take approx 150mA at 12V DC input or 300mA at 6V DC input.

The DC input is filtered by C6, C7, and L3 and is fed to switched mode psu IC5. C9 and C11 decouple its 3.3V output to ground. Filtered +3.3V outputs are fed to the fibre sub module via L2 and L102. Power supply test points are: TP2 (GND) and TP1 (+3.3V).

The digital video input from SFP fibre optic module is fed to IC4 which can re-clock the serial data stream. LK1 can be used to configure IC4 to re-clock (the default, link pins 2 to 3) or bypass re-clocking (link pins 1 to 2). Cable drivers IC2 and IC10 provide 75 Ohm digital video outputs on BNC1 and BNC2.

The data re-clocker IC4 also provides indication of correct data rate lock via IC3 to the system status (channel A error) and local LED indicator LD1 (visible on the front panel just below the SFP module).

The two channels of balanced analogue audio from the 9-pin D connector are filtered and buffered in amplifiers IC6a, IC6b and then go to audio ADC IC9 which creates an I2S digital data stream plus sample clocks. These signals are sent to IC7 which generates a serial data stream suitable for transport on the SFP transmitter IC1. OSC1 provides the master clock for IC9 and IC7. IC8 generates the reset for IC9.



Parts list	BC551RX
-------------------	----------------

Part number	Qty	Part locations
ICSN74LVC2G04DCK-SC70-6	1	IC3
BNC-CAM-C-SX-069	2	BNC1 BNC
CAGE-SFP	1	SK2
CAP-10pF-0603-COG-10%	2	C6 C8
CAP-1nF-0603-COG-10%	4	C18 C19 C20 C26
CAP-220pF-0603-COG-10%	4	C27 C28 C29 C30
CAP-39pF-0603-COG-10%	2	C22 C23
CAP-100nF-0603-X7R-10%	12	C31 C33 C36 C38 C39 C41 C42 C45 C47 C49 C50 C52
CAP-10nF-0603-X7R-10%	14	C2 C5 C10 C12 C21 C24 C25 C43 C44 C46 C48 C53 C54 C10
CAP-56nF-0603-X7R-10%	1	C13
CAP-1uF-0805-X7R-10%	4	C32 C34 C40 C51
CAP-10uF-1210-X7R-20%	3	C7 C9 C11
CAP-10uF/16V-TANT-TAJ-A	10	C1 C3 C4 C14 C15 C16 C17 C55 C56 C101
CAP-22uF/16V-TANT-TAJ-A	2	C35 C37
IND-2n2H-CHOKE-0603	2	L1 L6
IND-10uH-CHOKE-2525-10uH	1	L4
IND-CHOKE-BLM21PG331SN1D-0805	4	L2 L3 L5 L102
CONN-DIN41612-32	1	CN1
IC-CS5341CZZ-TSSOP16	1	IC9
IC-DS99R105SQ-LLP-48	1	IC7
DTYPE-9WAY-SOCKET	1	SKT1
HEADER-3x1-2mm-TSM-103-01-S-SV	1	LK1
LED-T1-RED\GREEN	1	LD1
IC-LM809M3-3.0	1	IC8
IC-LME49721MA-SOIC8	1	IC6
IC-LMH0307SQE-LLP16	2	IC2 IC10
IC-LMH0346SQE-LLP24	1	IC4
OCS-ACT9325-24.576MHz	1	OSC1
PCB	1	PCB1
RES-100R-0603-1%-0.1W	4	R5 R15 R43 R55
RES-10K-0603-1%-0.1W	9	R21 R23 R24 R39 R42 R44 R48 R49 R51
RES-10R-0603-1%-0.1W	9	R7 R12 R20 R37 R45 R46 R50 R52 R53
RES-13K-0603-1%-0.1W	4	R29 R32 R35 R36
RES-1M-0603-1%-0.1W	1	R11
RES-3K3-0603-1%-0.1W	4	R30 R31 R33 R34
RES-43K-0603-1%-0.1W	4	R25 R26 R27 R28
RES-470R-0603-1%-0.1W	5	R8 R9 R38 R40 R54
RES-4K7-0603-1%-0.1W	4	R3 R4 R18 R19
RES-750R-0603-1%-0.1W	2	R16 R56
RES-75R-0603-1%-0.1W	8	R1 R2 R14 R17 R57 R58 R59 R60
RES-SOT-0603-1%-0.1W	5	R6 R10 R13 R22 R41 R47
SFP-TXRX	1	IC1
SOCKET-SFP20	1	SK1
IC-TPS62111RSA-LLP16	1	IC5
XTAL-27MHz-ACT32	1	XT1