TECHNICAL & OPERATIONS MANUAL

For

BC460R and BC460T

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

Unit 2, the Quadrant, Howarth Road, Maidenhead, Berkshire, SL6 1AP United Kingdom
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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

CE	EN60950	Safety
	EN55103-1: 1996	Emission
	EN55103-2: 1996	Immunity

Bluebell Opticom Ltd Tested To Comply With FCC Standards FOR HOME OR OFFICE USE	This device complies with part 15 of the FCC Rules Operation is subject to the following two condition: (1) This device may cause harmful interference, and (2) This device must accept any interference received, including, Interference that may cause undesired operation

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.

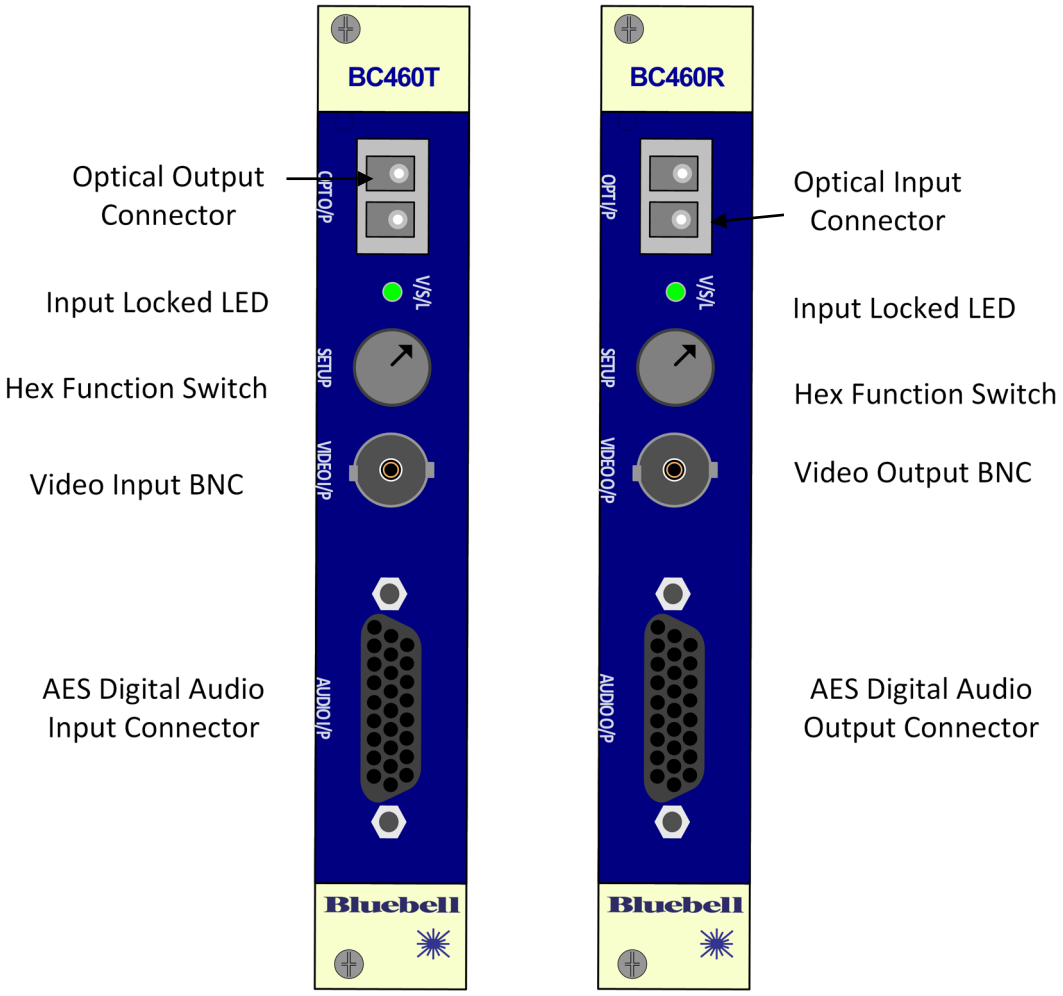
Digital audio connection between the BC440 and the BC460R is via intercard connectors
The digital audio outputs are on a 26 way high density D type connector.

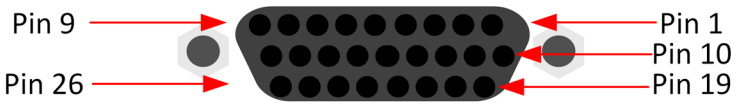
BC460T

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.


BC460T
BC460R
Optical Output Connector
Input Locked LED
Hex Function Switch
Video Input BNC
AES Digital Audio Input Connector
Optical Input Connector
Input Locked LED
Hex Function Switch
Video Output BNC
AES Digital Audio Output Connector
OPTO/P
OPTI/P
V/S/L
SETUP
VIDEOI/P
VIDEOO/P
AUDIOI/P
AUDIOO/P
Bluebell


Pin 9
Pin 26
Pin 1
Pin 10
Pin 19

Specification BC460R and BC450T

BC460R

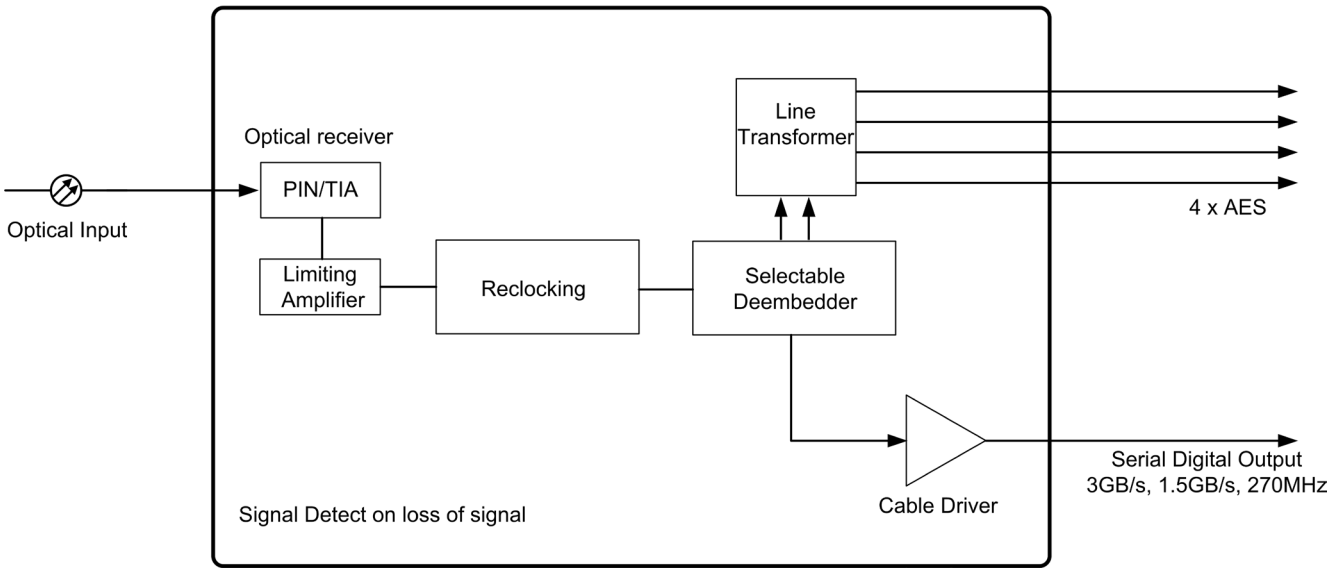
Depth	60mm
Width	20mm
Height	100mm
Weight	120g
Power Supply	6V DC
Power consumption	2.5W
Current consumption	400mA
Optical input	SFP module
Digital audio output	4 AES
Audio connector	26 way female High density “D” type
Video output	BNC

BC460T

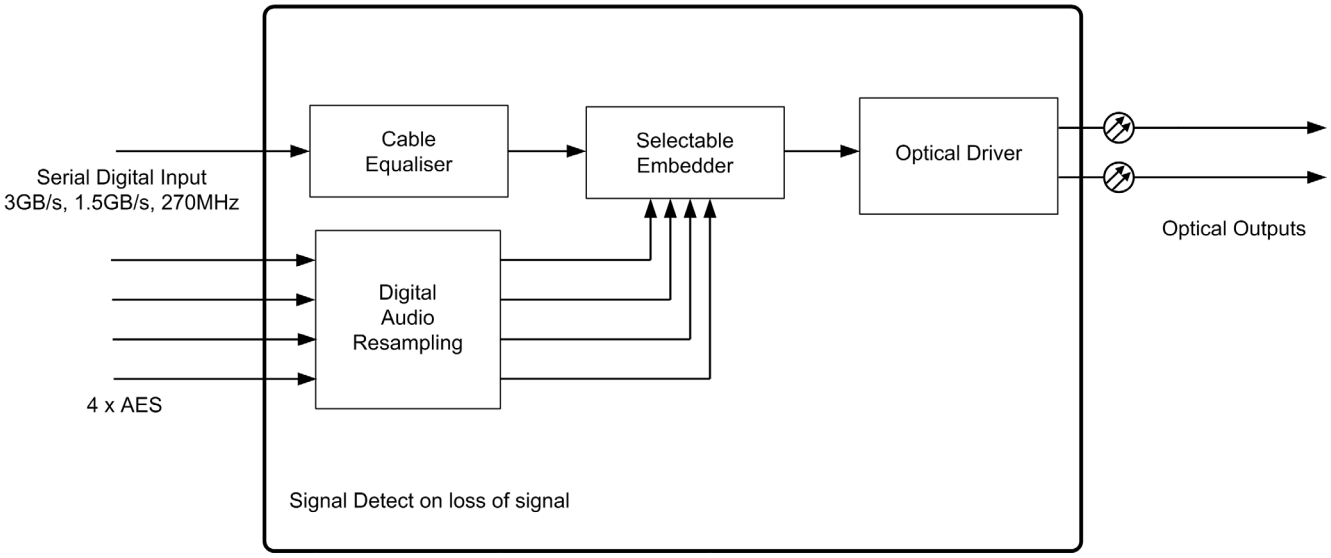
Depth	60mm
Width	20mm
Height	100mm
Weight	120g
Power Supply	6V DC
Power consumption	3 W
Current consumption	500mA
Optical input	SFP module
Audio	
Digital audio output	4 AES
Audio connector	26 way female High density “D” type
Video output	BNC

Block Diagram

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			

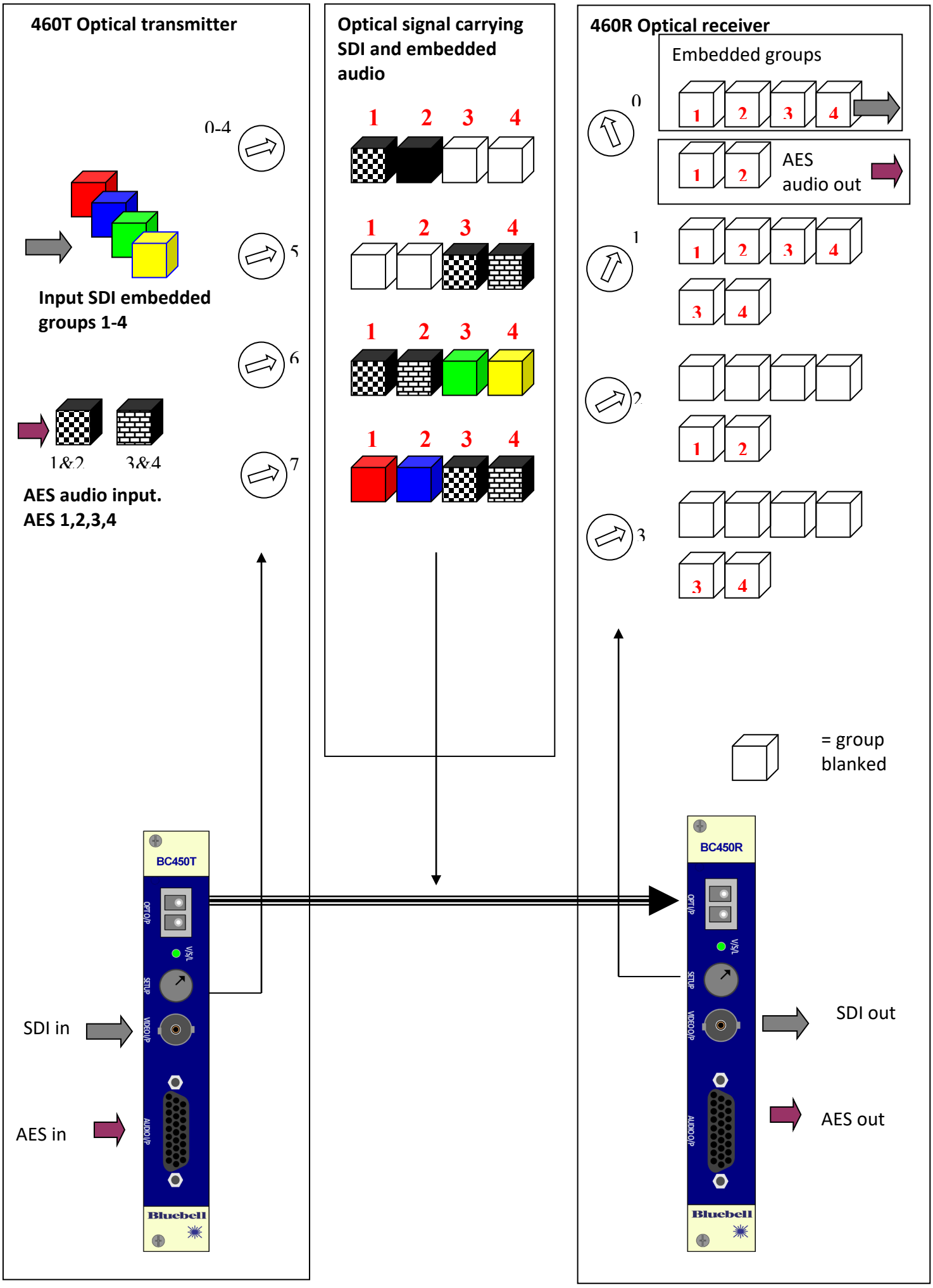
BC450R Optical receiver

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

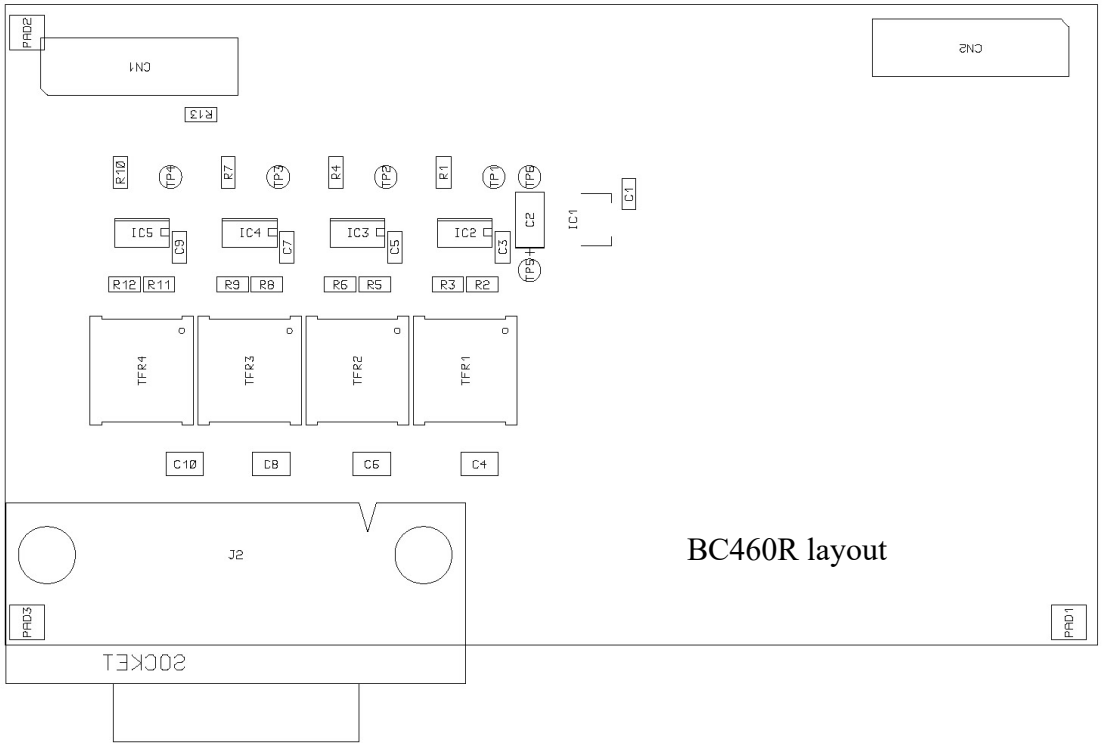
Output is SDI with embedded audio on BNC and AES audio on the D type connector

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

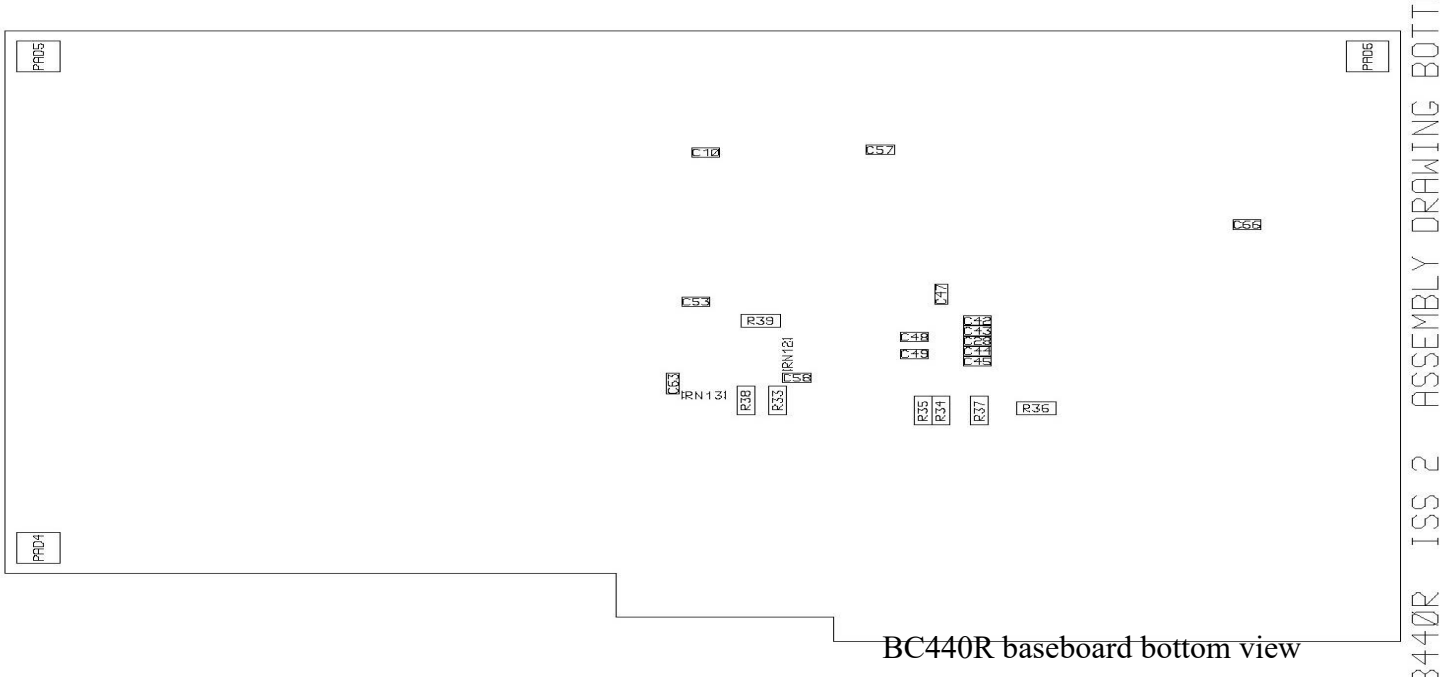
3	Blanked	Blanked	Blanked	Blanked	i/p group 3	i/p group 3	i/p group 4	i/p group 4
4	Not used							
5	Not used							
6	Not used							
7	Not used							
8	Not used							
9	Not used							
A	Not used							
B	Not used							
C	Not used							
D	Not used							
E	Not used							
F	Not used							


460T Optical transmitter
0-4
5
6
7
Input SDI embedded groups 1-4
1&2
3&4
AES audio input.
AES 1,2,3,4
Optical signal carrying SDI and embedded audio
1 2 3 4
460R Optical receiver
Embedded groups
AES audio out
= group blanked
BC450T
BC450R
SDI in
AES in
SDI out
AES out
Bluebell

Component layouts

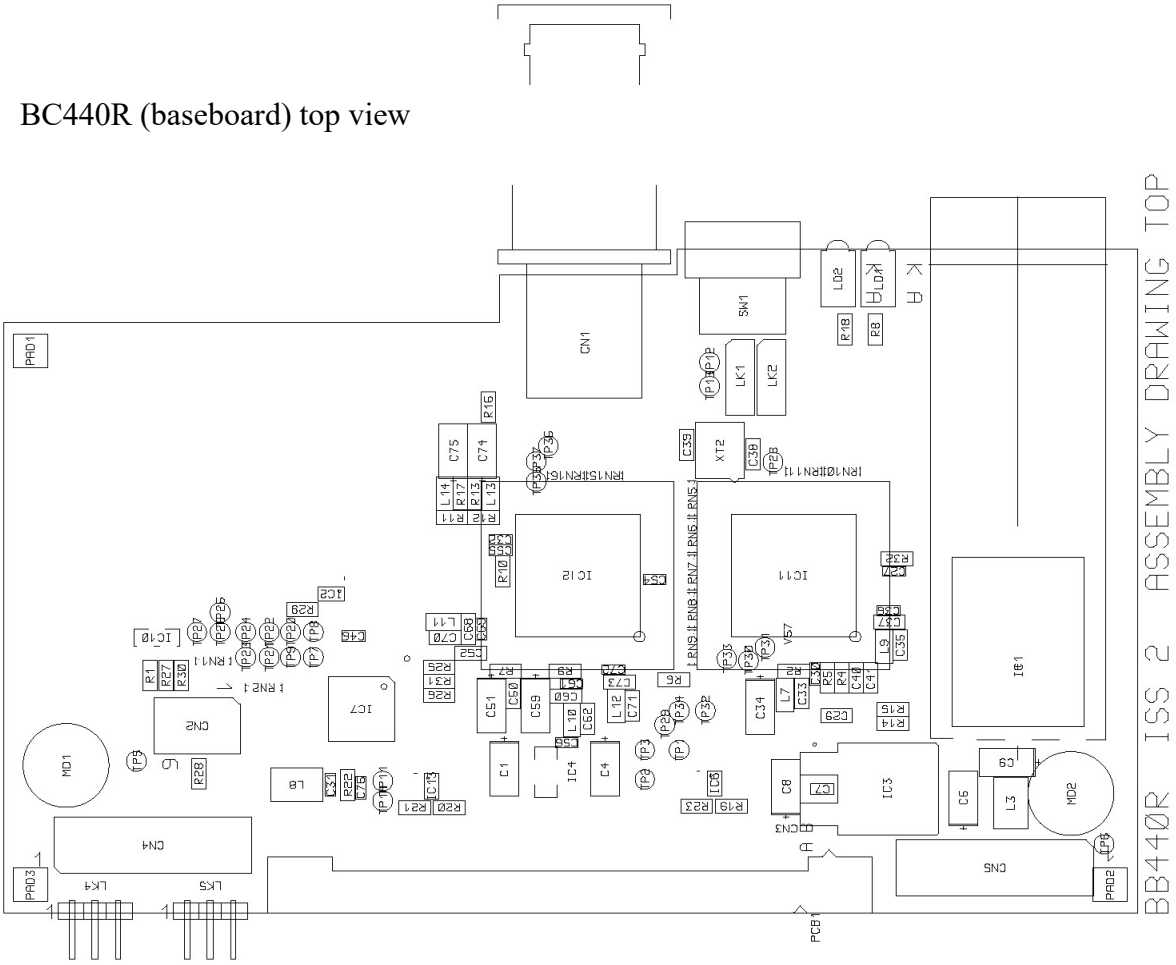


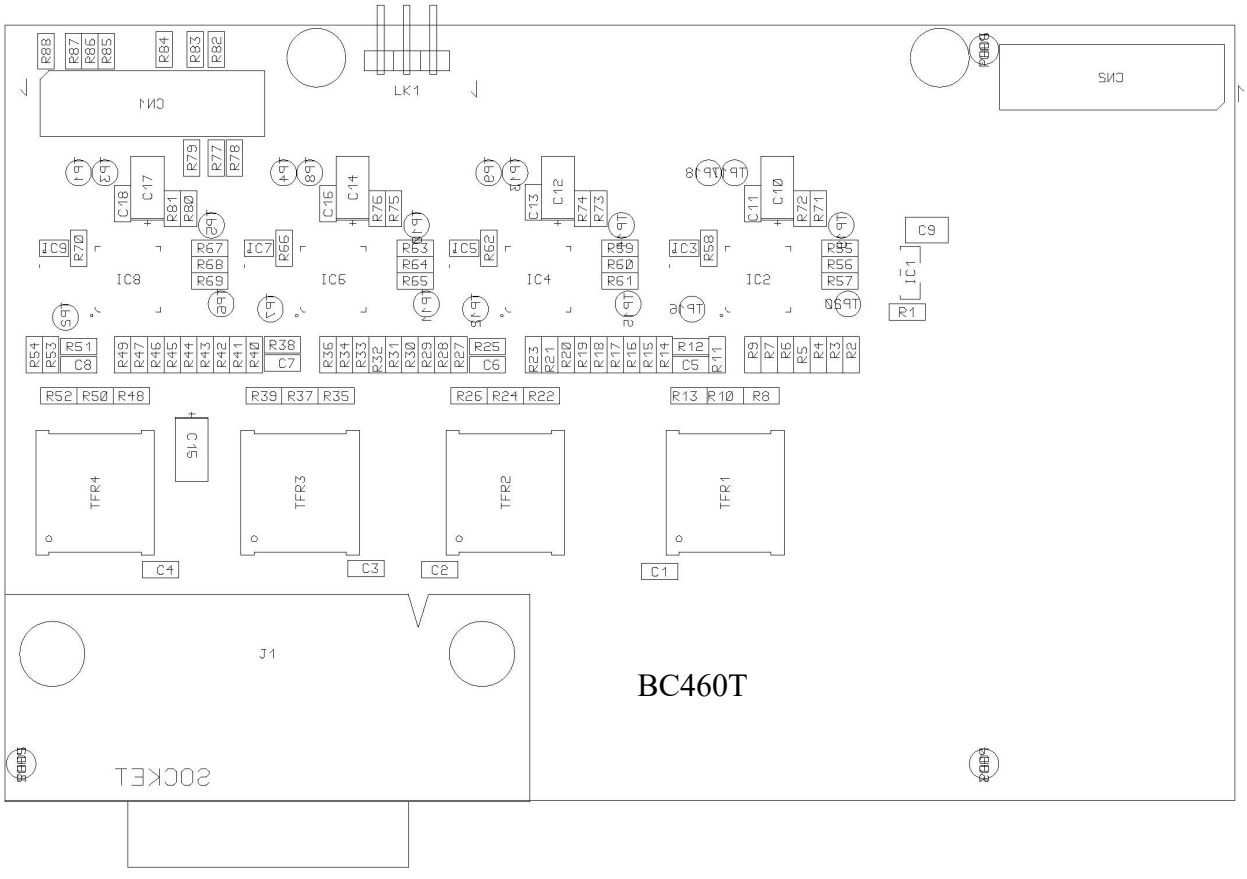
BC460R layout



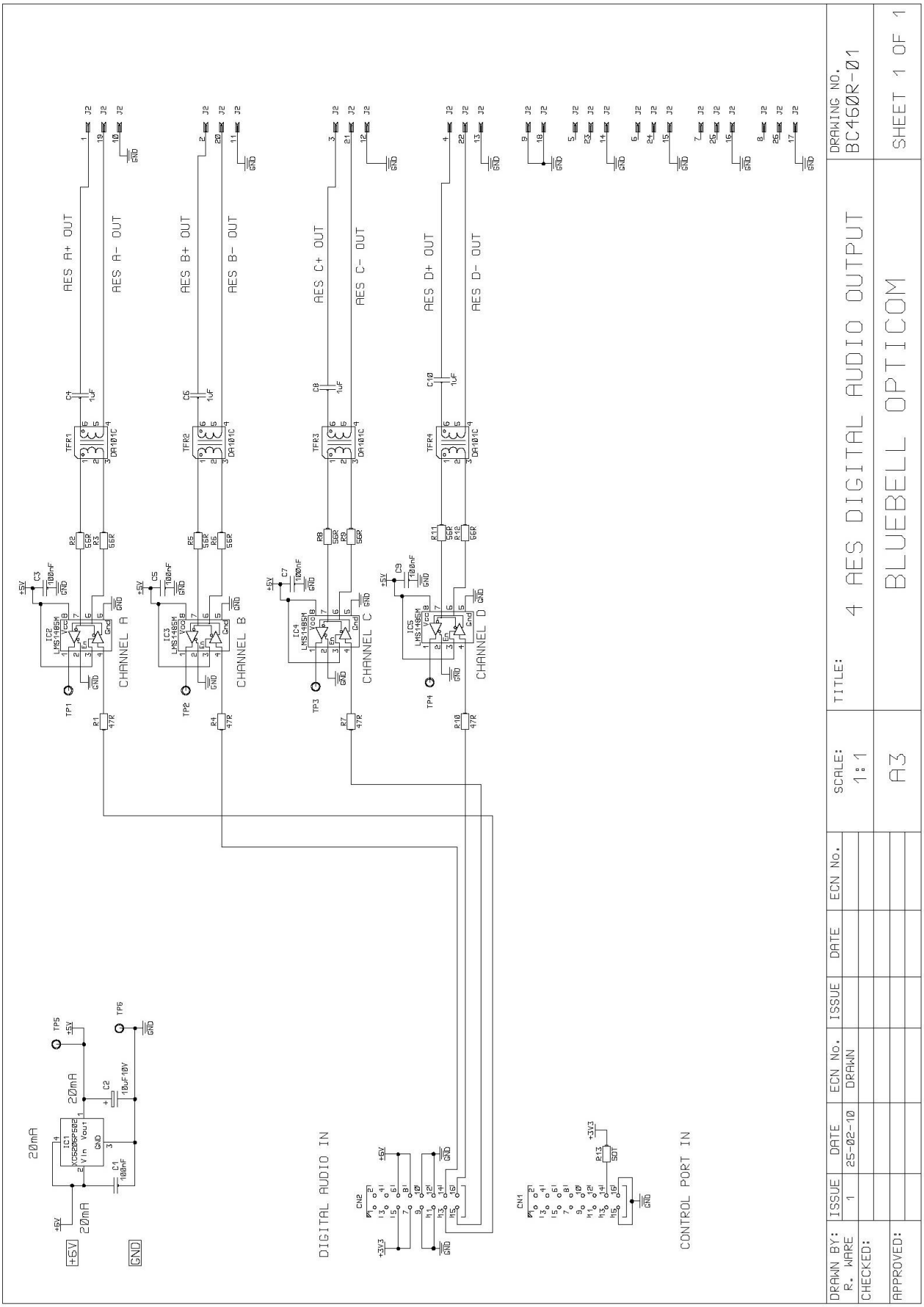
BC440R baseboard bottom view

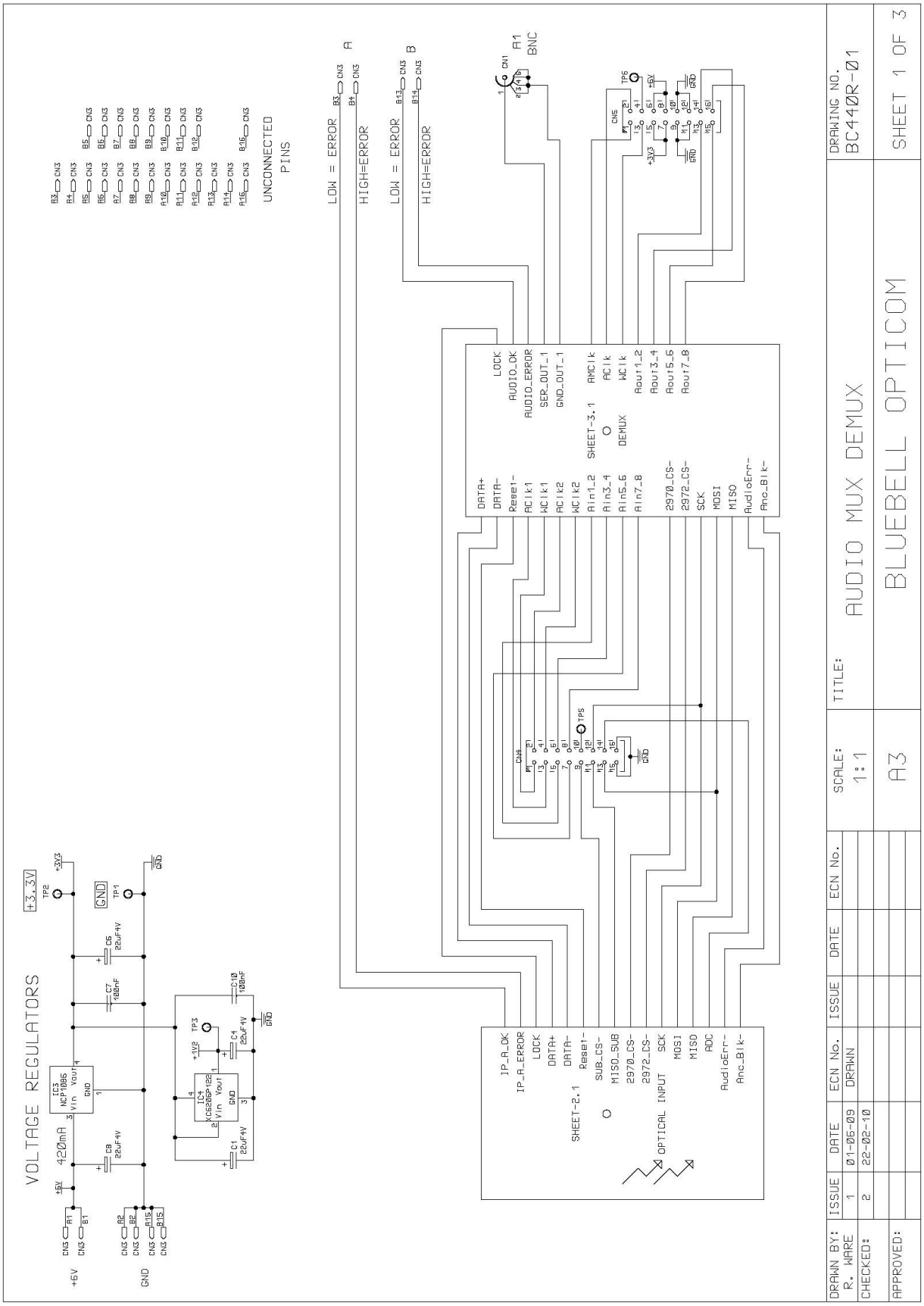
BC440R (baseboard) top view

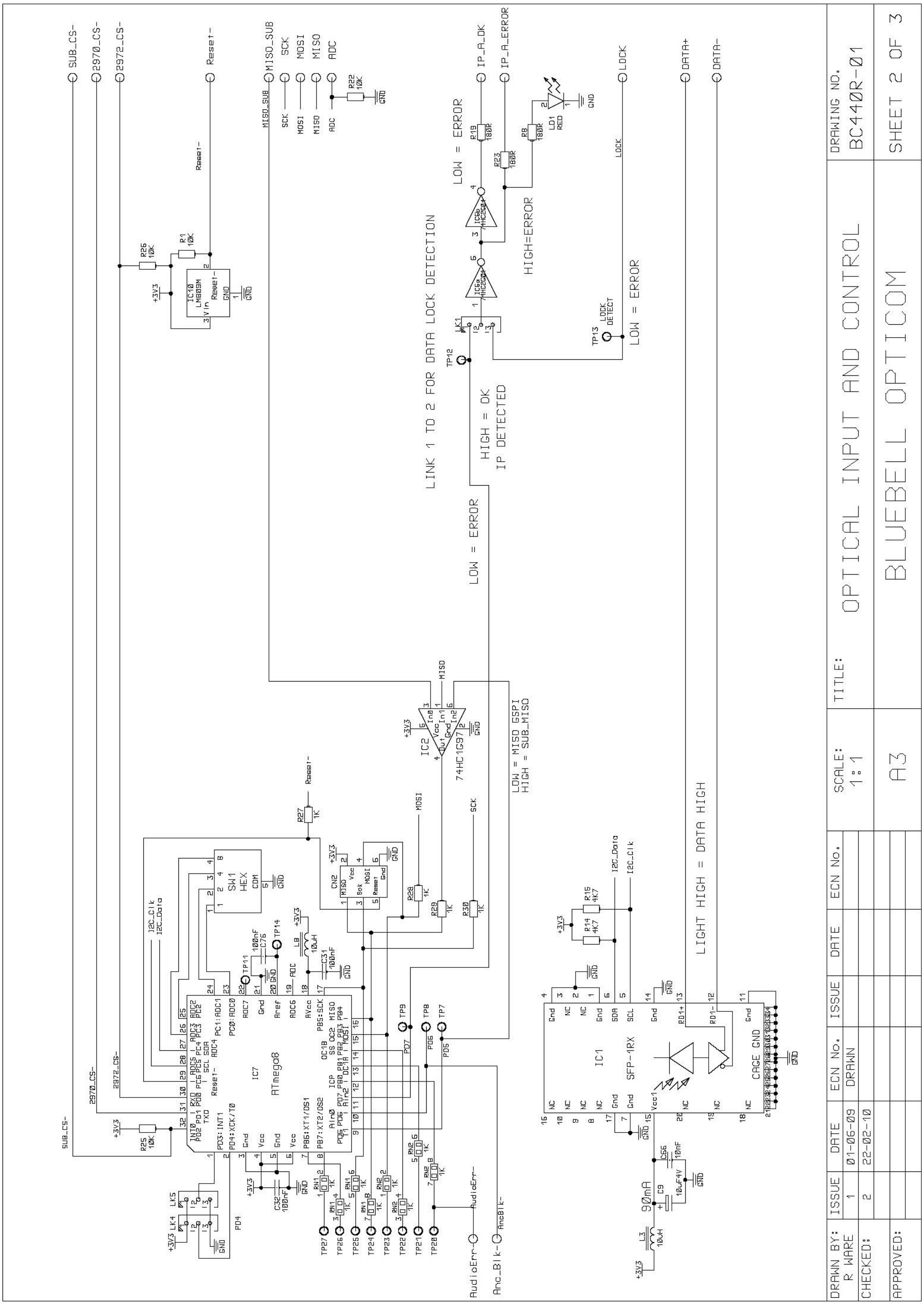


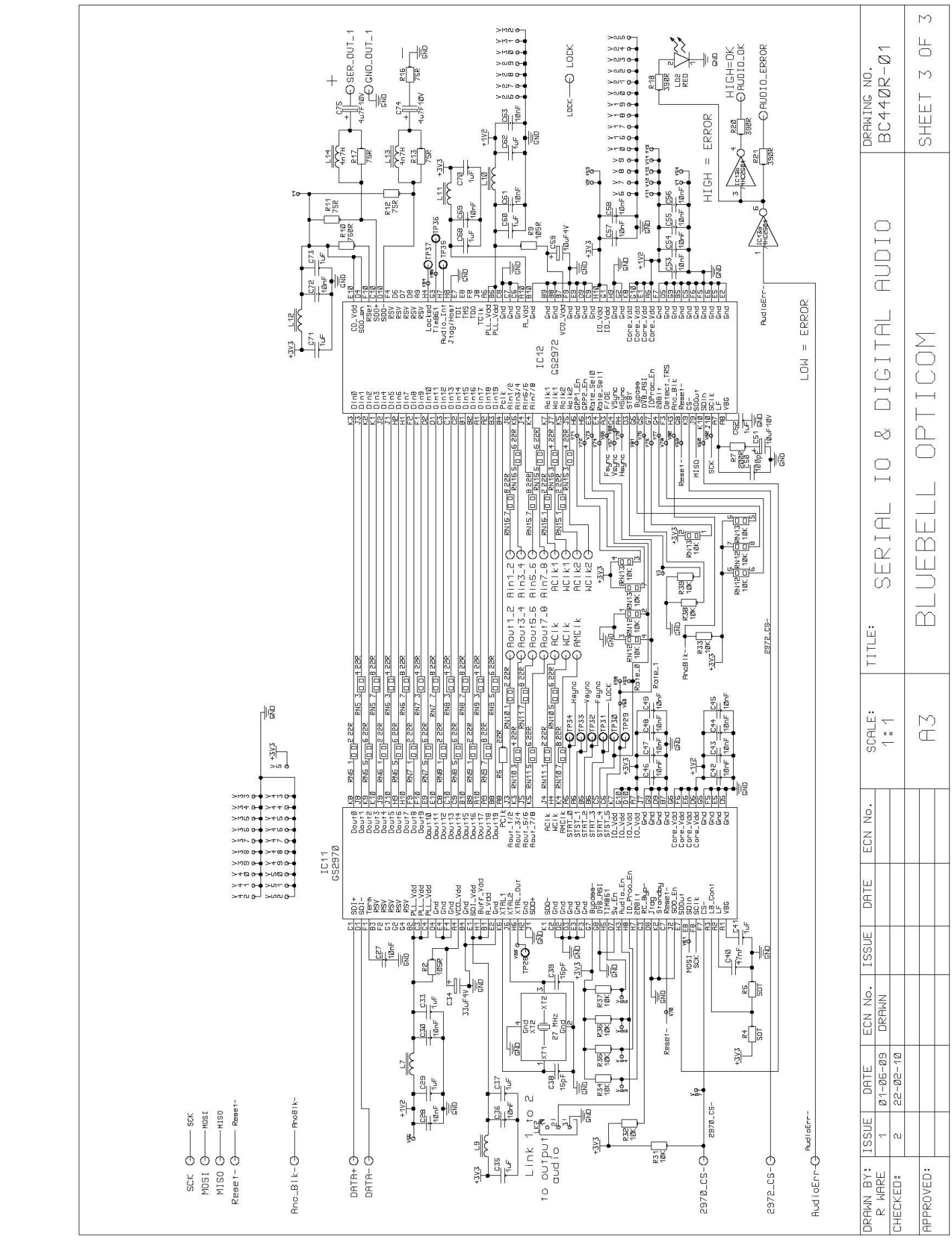


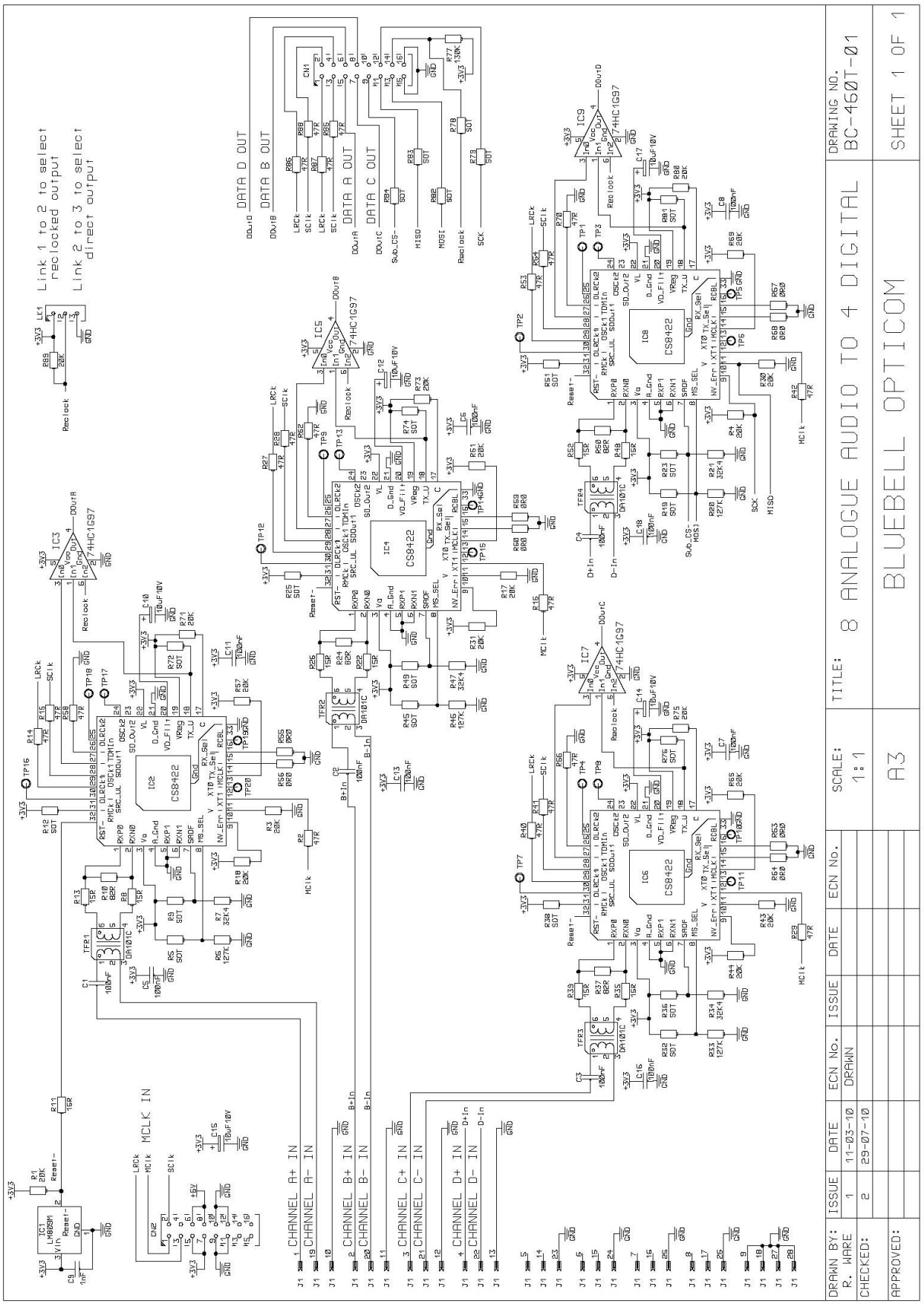
BC460T

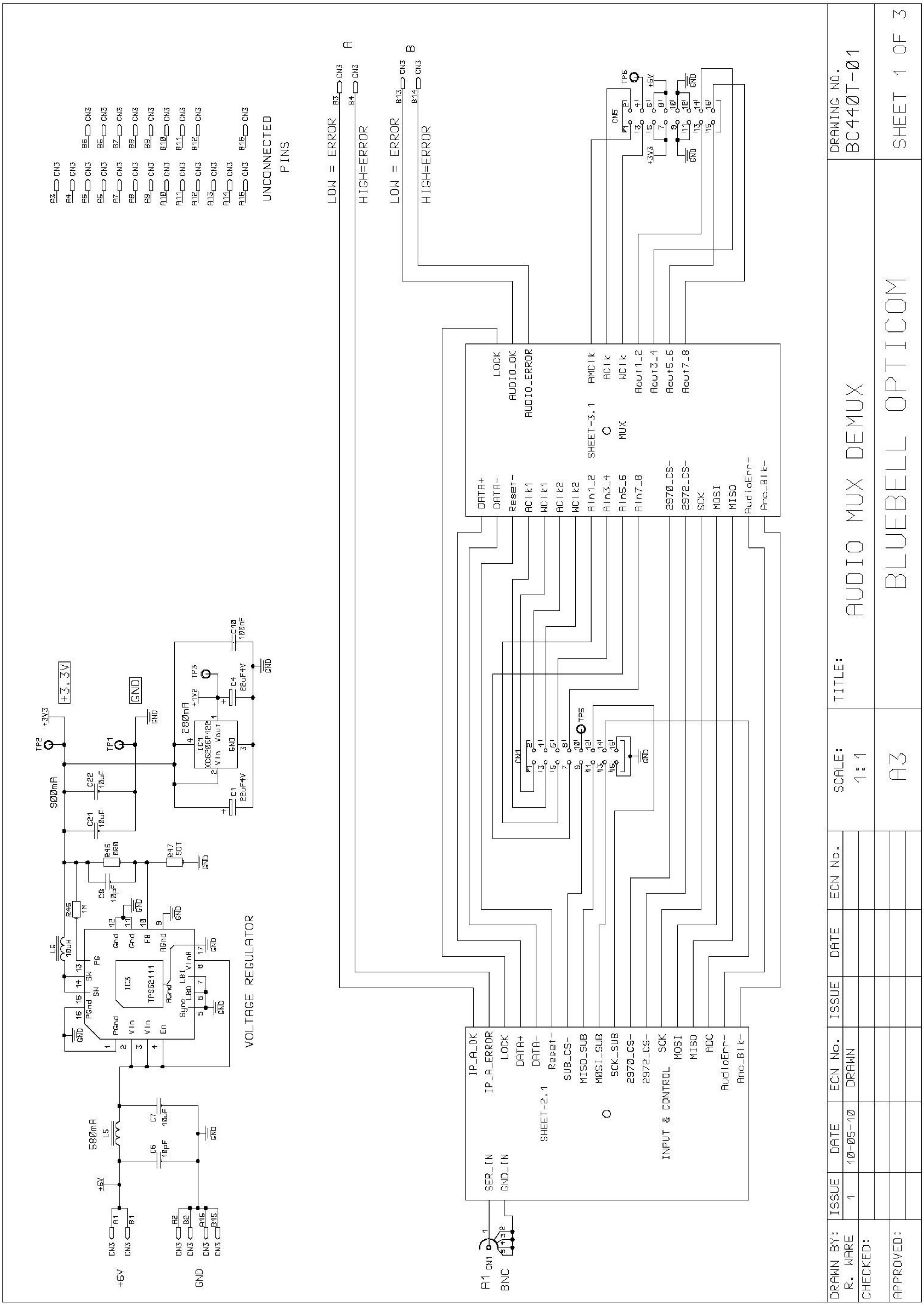

AES A+ OUT
AES A- OUT
AES B+ OUT
AES B- OUT
AES C+ OUT
AES C- OUT
AES D+ OUT
AES D- OUT
CHANNEL A
CHANNEL B
CHANNEL C
CHANNEL D
DIGITAL AUDIO IN
CONTROL PORT IN
+5V
+3V3
GND
20mA
TITLE: 4 AES DIGITAL AUDIO OUTPUT
BLUEBELL OPTICOM
DRAWING NO. BC460R-01
SCALE: 1:1
A3
SHEET 1 OF 1
DRAWN BY: R. WARE
CHECKED:
APPROVED:
ISSUE 1 DATE 25-02-10 ECN No. DRAWN

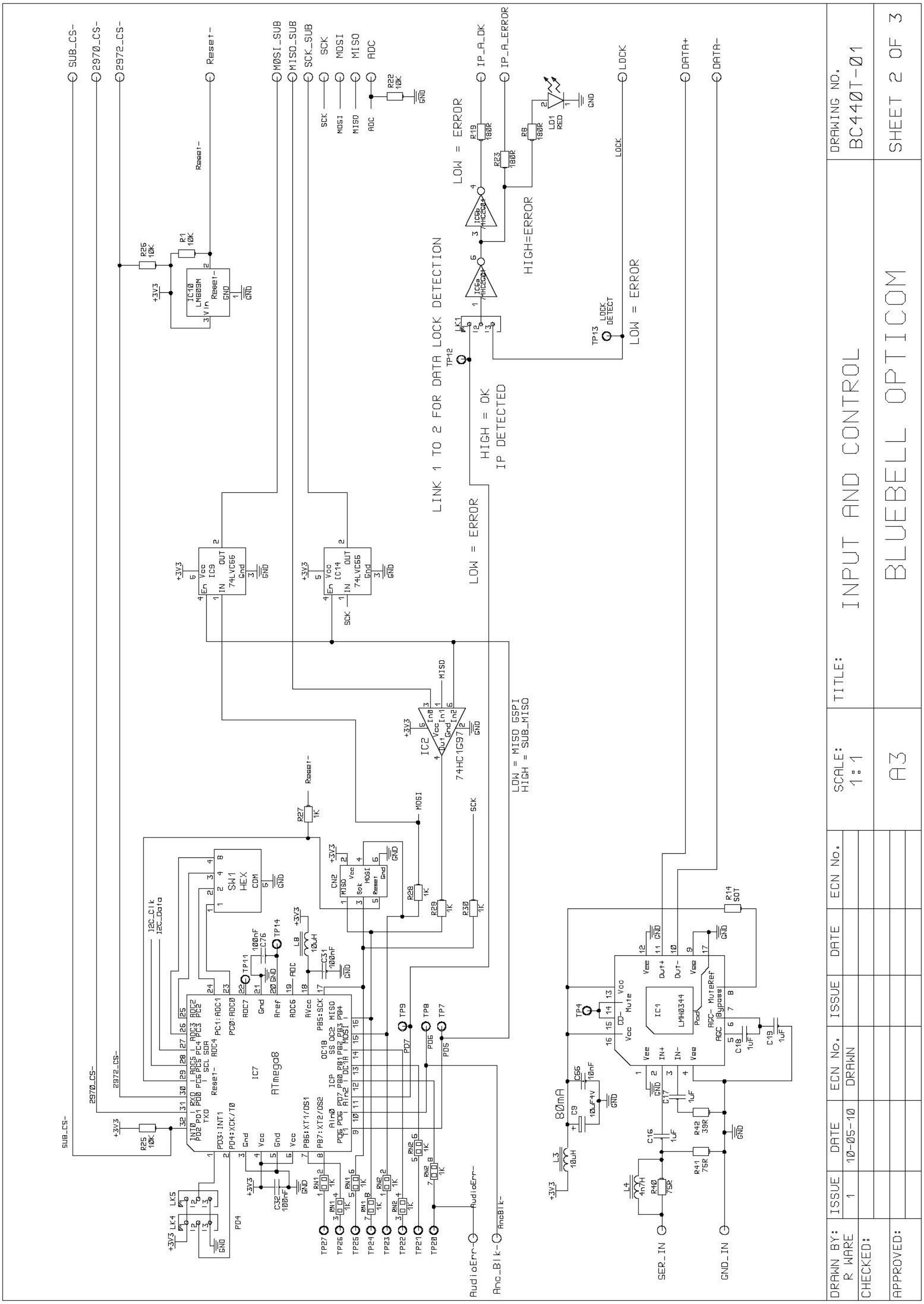

VOLTAGE REGULATORS
+3.3V
420mA
IC3 NCP1086
IC4 XC6206P182
C1 22uF4V
C4 22uF4V
C5 22uF4V
C7 100nF
C8 22uF4V
C10 100nF
TP1
TP2
TP3
GND
+5V
+3V3
+1V8
LOW = ERROR
HIGH=ERROR
UNCONNECTED PINS
AUDIO MUX DEMUX
BLUEBELL OPTICOM
SHEET 1 OF 3
DRAWING NO. BC440R-Ø1
TITLE:
SCALE: 1:1
A3
DRAWN BY: R. WARE
CHECKED:
APPROVED:
ISSUE 1 DATE Ø1-Ø5-Ø9 ECN No. DRAWN
ISSUE 2 DATE 22-Ø2-1Ø ECN No.

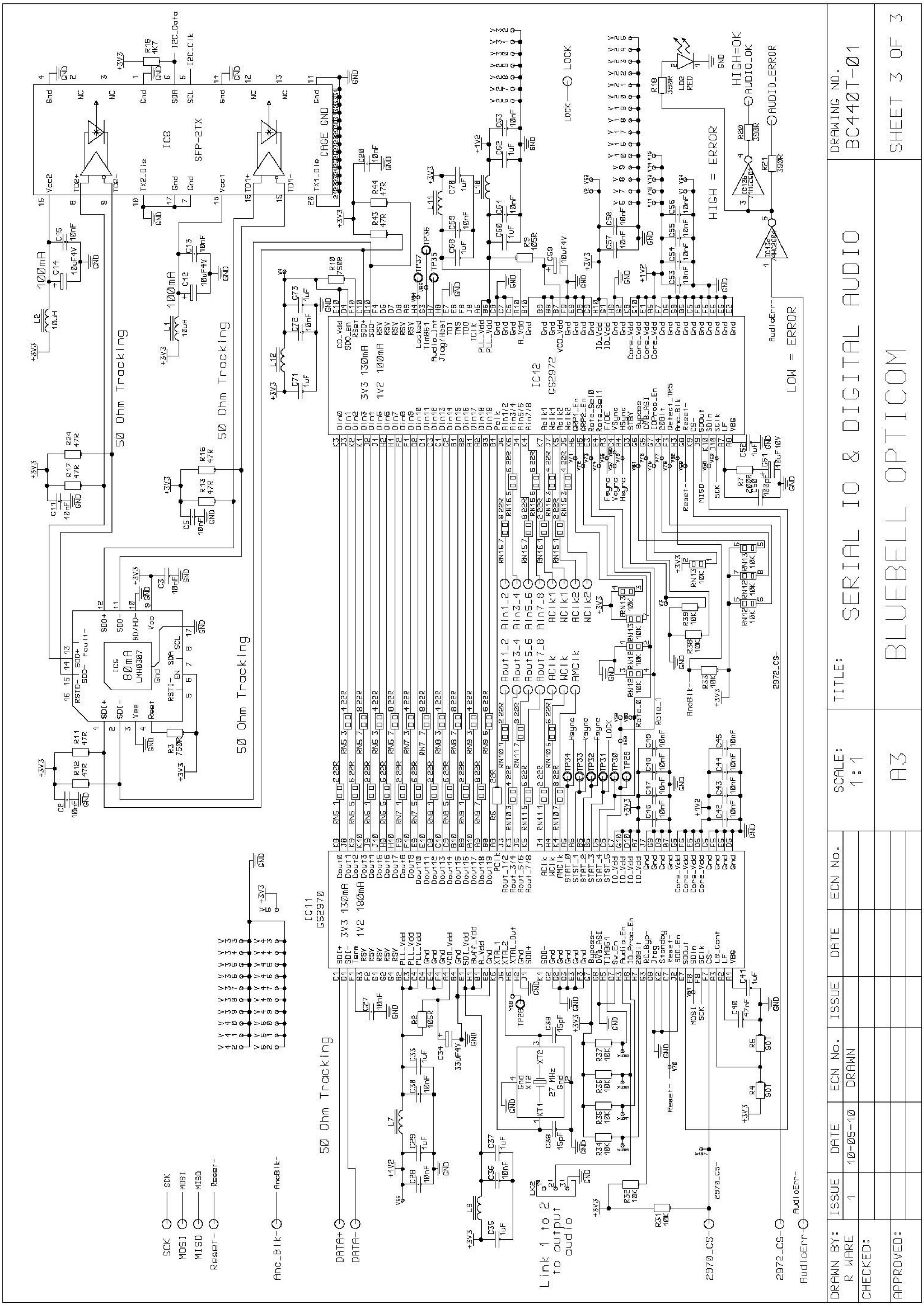

OPTICAL INPUT AND CONTROL
BLUEBELL OPTICOM
DRAWING NO.
BC440R-01
SHEET 2 OF 3
TITLE:
SCALE:
1:1
A3
DRAWN BY:
R WARE
CHECKED:
APPROVED:
ISSUE
DATE
ECN No.
1
01-06-09
DRAWN
2
22-02-10
LINK 1 TO 2 FOR DATA LOCK DETECTION
LOW = ERROR
HIGH = OK
IP DETECTED
HIGH=ERROR
LOW = MISO G5PI
HIGH = SUB_MISO
LIGHT HIGH = DATA HIGH
IC7
ATmega8
IC1
SFP-1RX
IC2
74HC1G97
SUB_CS-
2970_CS-
2972_CS-
Reset-
MISO_SUB
SCK
MOSI
MISO
ADC
IP_A_OK
IP_A_ERROR
LOCK
DATA+
DATA-
AudioErr-
Anc_Blk-


SERIAL IO & DIGITAL AUDIO
BLUEBELL OPTICOM
BC440R-01
SHEET 3 OF 3
A3
SCALE: 1:1
DRAWN BY: R WARE
DATE: 01-05-09
CHECKED:
APPROVED:
ISSUE 1
ECN No.
DRAWN
22-02-10
IC11 GS2970
IC12 GS2972
Link 1 to 2 to output audio
HIGH = ERROR
LOW = ERROR
HIGH=OK
AUDIO_OK
AUDIO_ERROR
LOCK
SER_OUT_1
GND_OUT_1
DATA+
DATA-
SCK
MOSI
MISO
Reset-
Anc_Blk-
AudioErr-
2970_CS-
2972_CS-


DATA D OUT
DATA B OUT
DATA A OUT
DATA C OUT
Link 1 to 2 to select reclocked output
Link 2 to 3 to select direct output
CHANNEL A+ IN
CHANNEL A- IN
CHANNEL B+ IN
CHANNEL B- IN
CHANNEL C+ IN
CHANNEL C- IN
CHANNEL D+ IN
CHANNEL D- IN
MCLK IN
8 ANALOGUE AUDIO TO 4 DIGITAL
BLUEBELL OPTICOM
BC-460T-01
A3
SHEET 1 OF 1
DRAWN BY: R. WARE
CHECKED:
APPROVED:
ISSUE 1 DATE 11-03-10 ECN No. DRAWN
ISSUE 2 DATE 29-07-10 ECN No.


AUDIO MUX DEMUX
BLUEBELL OPTICOM
DRAWING NO. BC440T-01
SHEET 1 OF 3
TITLE:
SCALE: 1:1
A3
DRAWN BY: R. WARE
ISSUE 1
DATE 10-05-10
ECN No.
DRAWN
CHECKED:
APPROVED:
VOLTAGE REGULATOR
UNCONNECTED PINS
LOW = ERROR
HIGH=ERROR
SHEET-3.1
MUX
SHEET-2.1
INPUT & CONTROL
+6V
GND
+3.3V
BNC


INPUT AND CONTROL
BLUEBELL OPTICOM
DRAWING NO.
BC440T-01
SHEET 2 OF 3
TITLE:
SCALE:
1:1
A3
DRAWN BY:
R WARE
CHECKED:
APPROVED:
ISSUE
1
DATE
10-05-10
ECN No.
DRAWN
LINK 1 TO 2 FOR DATA LOCK DETECTION
LOW = ERROR
HIGH = OK
IP DETECTED
HIGH=ERROR
LOW = MISO GSPI
HIGH = SUB_MISO


SERIAL IO & DIGITAL AUDIO
BLUEBELL OPTICOM
DRAWING NO. BC440T-01
SHEET 3 OF 3
SCALE: 1:1
A3
DRAWN BY: R WARE
DATE 10-05-10
ISSUE 1
CHECKED:
APPROVED:

Parts list	BC460R

CAP-0603-X7R-10% 0603 100nF	Total 5	C1 C3 C5 C7 C9
CAP-0805-X7R-10% 0805 1uF	Total 4	C4 C6 C8 C10
CAP-TANT-TAJ-A		
TAJ-A 10uF10V TAJA106K010	Total 1	C2
DTYPE-26HD-SOCKE DTYPE-26R-HD-SKT	Total 1	J2
LMS1485 SOIC-8 LMS1485M	Total 4	IC2 IC3 IC4 IC5
PCB PCB BC460R-ISSUE-1	Total 1	PCB1
RES-0603-1%-0.1W 0603 47R	Total 4	R1 R4 R7 R10
RES-0603-1%-0.1W 0603 56R	Total 8	R2 R3 R5 R6 R8 R9 R11 R12
RES-0603-1%-0.1W 0603 SOT	Total 1	R13
SOCKET-8x2-2mm SOCKET-8X2-2MM	Total 2	CN1 CN2
TFR-DA101C DA101MC DA101MC	Total 4	TFR1 TFR2 TFR3 TFR4
XC6206P502PR SOT89 XC6206P502PR	Total 1	IC1

Parts list	Baseboard BC440R

74LVC1G97 SC70-6 SN74LVC1G97DCKR	Total 1 IC2
74LVC2G04 SC70-6 SN74LVC2G04DCK	Total 2 IC6 IC13
ATmega8 TQFP-32 ATmega8	Total 1 IC7
BNC-VBM511-75-RA VBM511-75	Total 1 CN1
CAGE-SFP CAGE-SFP20 AKX-CG	Total 1 SK2
CAP-0402-X7R-10% 0402 100nF	Total 5 C7 C10 C31 C32 C76
CAP-0402-X7R-10% 0402 10nF	Total 23 C27 C28 C30 C36 C42 C43 C44 C45 C46 C47 C48 C49 C53 C54 C55 C56 C57 C58 C61 C63 C66 C69 C72
CAP-0603-X7R-10% 0603 1uF	Total 12 C29 C33 C35 C37 C41 C52 C60 C62 C68 C70 C71 C73
CAP-0603-COG-10% 0603 100pF	Total 1 C50
CAP-0603-COG-10% 0603 15pF	Total 2 C38 C39
CAP-0603-X7R-10% 0603 47nF	Total 1 C40
CAP-TANT-TAJ-A TAJ-A 10uF10V	Total 3 C9 C59 C51
CAP-TANT-TAJ-A TAJ-A 22uF10V	Total 4 C1 C4 C6 C8
CAP-TANT-TAJ-A TAJ-A 33uF10V	Total 1 C34
CAP-TANT-TAJ-A TAJ-A 4u7F10V	Total 2 C74 C75
CHOKE-0603 0603-IND 4n7H L1608-FS10K	Total 2 L13 L14
CHOKE-1210-10uH 1210-IND 10uH LC322522T-100K	Total 2 L3 L8
CHOKE-BLM18 0603-IND BLM18PG121SN1D	Total 5 L7 L9 L10 L11 L12
CONN-DIN41612-32 DIN41612M32-RA	Total 1 CN3
DTYPE-26HD-SOCKET DTYPE-26R-HD-SKT	Total 1 J1
GS2970 LBGA-100 GS2970-IBE3	Total 1 IC11
GS2972 LBGA-100 GS2972-IBE3	Total 1 IC12
HEADER-3x1-2mm HDR-1X3-2MM-RA M22-2030305	Total 2 LK4 LK5
HEADER-3x1-2mm HEADER-1X3-2MM	Total 2 LK1 LK2
HEADER-8x2-2mm HEADER-8X2-2MM Fischer SLY2-139-16	Total 2 CN4 CN5
HEADER-ISP HEADER-3X2	Total 1 CN2
LED-T1-RED LED-T1-RA RED	Total 2 LD1 LD2
LM809 SOT23-3 LM809M3-3.00	Total 1 IC10
NCP1086 TO-252 NCP1086D2T-33	Total 1 IC3
PCB PCB BB440R Issue 2	Total 1 PCB1
RES-0603-1%-0.1W 0603 105R	Total 2 R2 R9
RES-0603-1%-0.1W 0603 10K	Total 12 R1 R25 R26 R31 R32 R33 R34 R35 R36 R37 R38 R39
RES-0603-1%-0.1W 0603 180R	Total 3 R8 R19 R23
RES-0603-1%-0.1W 0603 1K	Total 4 R27 R28 R29 R30
RES-0603-1%-0.1W 0603 200R	Total 1 R7
RES-0603-1%-0.1W 0603 22R	Total 1 R6

RES-0603-1%-0.1W 0603 390R		Total 3 R18 R20 R21
RES-0603-1%-0.1W 0603 4K7		Total 2 R14 R15
RES-0603-1%-0.1W 0603 750R		Total 1 R10
RES-0603-1%-0.1W 0603 75R		Total 5 R11 R12 R13 R16 R17
RES-0603-1%-0.1W 0603 SOT		Total 3 R4 R5 R22
RESPACK-4-ISO-MN MNR14 10K		Total 2 RN12 RN13
RESPACK-4-ISO-MN MNR14 1K		Total 2 RN1 RN2
RESPACK-4-ISO-MN MNR14 22R		Total 9 RN5 RN6 RN7 RN8 RN9 RN10 RN11 RN15 RN16
SFP-1RX AKX-CGP-SFP SFP-1RX	GO2916	Total 1 IC1
SOCKET-SFP20 SOCKET-SFP20 AKX-20LFY		Total 1 SK1
SWITCH-HEX-RT-AN SW-BCD-RT-ANGLE HEX		Total 1 SW1
XP6206P122PR SOT89 XC6206P112PR		Total 1 IC4
XTAL-27MHz-ACT32 1210-4X 27 MHz ACT320SMX-4		Total 1 XT2

Parts list	BC460T

74LVC1G97 SC70-6 sn74LVC1G97dckr	Total 4	IC3 IC5 IC7 IC9
CAP-0603-X7R-10% 0603 100nF	Total 12	C1 C2 C3 C4 C5 C6 C7 C8 C11 C13 C16 C18
CAP-0805-COG-1nF 0805 1nF	Total 1	C9
CAP-TANT-TAJ-A TAJ-A 10uF10V	Total 5	C10 C12 C14 C15 C17
CS8422 QFN-32 CS8422CNZ	Total 4	IC2 IC4 IC6 IC8
DTYPE-26HD-SOCKET		
DTYPE-26R-HD-SKT DTYPE-26R-HD	Total 1	J1
HEADER-3x1-2mm HDR-1X3-2MM-RA	Total 1	LK1
LM809 SOT23-3 LM809M3-3.0	Total 1	IC1
PCB PCB BB460T_ISSUE-1	Total 1	PCB1
RES-0603-1%-0.1W 0603 127K	Total 4	R6 R20 R33 R46
RES-0603-1%-0.1W 0603 15R	Total 9	R8 R11 R13 R22 R26 R35 R39 R48 R52
RES-0603-1%-0.1W 0603 20K	Total 33	R1 R3 R4 R12 R17 R18 R25 R30 R31 R38 R43 R44 R51 R55 R56 R57 R59 R60 R61 R63 R64 R65 R67 R68 R69 R71 R72 R73 R74 R75 R76 R80 R81
RES-0603-1%-0.1W 0603 32K4	Total 4	R7 R21 R34 R47
RES-0603-1%-0.1W 0603 47R	Total 20	R2 R14 R15 R16 R27 R28 R29 R40 R41 R42 R53 R54 R58 R62 R66 R70 R85 R86 R87 R88
RES-0603-1%-0.1W 0603 82R	Total 4	R10 R24 R37 R50
RES-0603-1%-0.1W 0603 SOT	Total 14	R5 R9 R19 R23 R32 R36 R45 R49 R77 R78 R79 R82 R83 R84
SOCKET-8x2-2mm SOCKET-8X2-2MM	Total 2	CN1 CN2
TFR-DA101C DA101MC DA101MC	Total 4	TFR1 TFR2 TFR3 TFR4

Part list	Baseboard BC440T

74LVC1G66 SOT23-5 SN74LVC1G66DBV	Total 2 IC9 IC14
74LVC1G97 SC70-6 sn74LVC1G97dckr	Total 1 IC2
74LVC2G04 SC70-6 SN74LVC2G04DCK	Total 2 IC6 IC13
ATmega8 TQFP-32 ATmega8	Total 1
BNC-VBM511-75-RA VBM511-75	Total 1 CN1
CAGE-SFP CAGE-SFP20 20PIN-CAGE-SFP AKX-CG	Total 1 SK2
CAP-0402-X7R-10% 0402 100nF	Total 4 C10 C31 C32 C76
CAP-0402-X7R-10% 0402 10nF	Total 30 C2 C3 C5 C11 C13 C15 C20 C27 C28 C30 C36 C42 C43 C44 C45 C46 C47 C48 C49 C53 C54 C55 C56 C57 C58 C61 C63 C66 C69 C72
CAP-0603-1UF-X5R 0603 1uF	Total 16 C16 C17 C18 C19 C29 C33 C35 C37 C41 C52 C60 C62 C68 C70 C71 C73
CAP-0603-COG-10% 0603 100pF	Total 1 C50
CAP-0603-COG-10% 0603 10pF	Total 2 C6 C8
CAP-0603-COG-10% 0603 15pF	Total 2 C38 C39
CAP-0603-X7R-10% 0603 47nF	Total 1 C40
CAP-1210-X7R-20% 1210 10uF	Total 3 C7 C21 C22
CAP-TANT-TAJ-A TAJ-A 10uF10V	Total 5 C9 C12 C14 C51 C59
CAP-TANT-TAJ-A TAJ-A 22uF4V	Total 2 C1 C4
CAP-TANT-TAJ-A TAJ-A 33uF4V	Total 1 C34
CHOKE-0603 0603-IND 4n7H L1608-FS10K	Total 1 L4
CHOKE-1210-10uH 1210-IND 10uH NLC322522T-100K	Total 4 L1 L2 L3 L8
CHOKE-2525-10uH IND-B82462 10uH ELL6UH100M	Total 1 L6
CHOKE-BLM18 0603-IND BLM18PG121SN1D	Total 5 L7 L9 L10 L11 L12
CHOKE-BLM21 0805 BLM21PG331SN1D	Total 1 L5
CONN-DIN41612-32 DIN41612M32-RA CLASS-1	Total 1 CN3
GS2970 LBGA-100 GS2970-IBE3	Total 1 IC11
GS2972 LBGA-100 GS2972-IBE3	Total 1 IC12
HEADER-3x1-2mm HDR-1X3-2MM-RA M22-2030305	Total 2 LK4 LK5
HEADER-3x1-2mm HEADER-1X3-2MM TSM-103-01-S-SV	Total 2 LK1 LK2
HEADER-8x2-2mm HEADER-8X2-2MM Fischer SLY2-139-16-G	Total 2 CN4 CN5
HEADER-ISP HEADER-3X2	Total 1 CN2
LED-T1-RED LED-T1-RA RED	Total 2 LD1 LD2
LM809 SOT23-3 LM809M3-3.00	Total 1 IC10
LMH0307 LLP-16 LMH0307SQ	Total 1 IC5
LMH0344 LLP-16P LMH0344SQ	Total 1 IC1
PCB PCB BB440T ISSUE-1	Total 1 PCB1

RES-0603-1%-0.1W 0603 0R0	Total 1 R46
RES-0603-1%-0.1W 0603 105R	Total 2 R2 R9
RES-0603-1%-0.1W 0603 10K	Total 14 R1 R15 R22 R25 R26 R31 R32 R33 R34 R35 R36 R37 R38 R39
RES-0603-1%-0.1W 0603 180R	Total 3 R8 R19 R23
RES-0603-1%-0.1W 0603 1K	Total 4 R27 R28 R29 R30
RES-0603-1%-0.1W 0603 1M	Total 1 R45
RES-0603-1%-0.1W 0603 200R	Total 1 R7
RES-0603-1%-0.1W 0603 22R	Total 1 R6
RES-0603-1%-0.1W 0603 390R	Total 3 R18 R20 R21
RES-0603-1%-0.1W 0603 39R	Total 1 R42
RES-0603-1%-0.1W 0603 47R	Total 8 R11 R12 R13 R16 R17 R24 R43 R44
RES-0603-1%-0.1W 0603 750R	Total 2 R3 R10
RES-0603-1%-0.1W 0603 75R	Total 2 R40 R41
RES-0603-1%-0.1W 0603 SOT	Total 4 R4 R5 R14 R47
RESPACK-4-ISO-MN MNR14 10K	Total 2 RN12 RN13
RESPACK-4-ISO-MN MNR14 1K	Total 2 RN1 RN2
RESPACK-4-ISO-MN MNR14 22R	Total 9 RN5 RN6 RN7 RN8 RN9 RN10 RN11 RN15 RN16
SFP-2TX AKX-CGP-SFP SFP-2TX GO2922-3131CM	Total 1 IC8
SOCKET-SFP20 SOCKET-SFP20 20PIN-SFP AKX-20LFY	Total 1 SK1
SWITCH-HEX-RT-AN SW-BCD-RT-ANGLE FAR-108-2480	Total 1 SW1
TPS62111 LLP-16 TPS62111RSA	Total 1 IC3
XP6206P122PR SOT89 XC6206P112PR	Total 1 IC4
XTAL-27MHz-ACT32 1210-4X27 MHz ACT320SMX-4	Total 1 XT2