Report of issues in CONV-TTL-BLO v1.0 EDA-02446-V1-0

Carlos Gil Soriano
BE-CO-HT
carlos.gil.soriano@cern.ch

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Abstract

CONV-TTL-BLO V1-0, internally named as **EDA-02446-V1-0**, has several **bugs to be fixed in V2**. The present report covers them all.

Revision history		
HDL version	**Module**	**Date**
1.0	Initial report	October 2, 2012

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1 Power supply 24 volts

Some resistors and capacitors should be changed to achieved better stability in the 24 volts power supply rail.

OHWR issues 452, 455, 458	http://www.ohwr.org/issues/458
After carefully checking the design (against the calculations provided by TI in its datasheet and SwitcherPro Desktop for checking the gain and phase margin) some modifications are submitted for an improved control of the 24V rail.	

DESIGN VALUES

- Switching Frecuency: 475Khz

- Crossover Frecuency: 23.75KHz

- Vin : 12V

- Vout : 24V

- Feedback network: R_{high} 50K, R_{low} 1K51

- Compensation network: R_{comp} 13K35, C_{comp} 4.7μF, C_{pole} 68μF (upto 100μF)

- RC network: R_{RC} 335K, C_{RC} 100pF

Table 1: Issue 458: 24 volts power supply

CHANGES OF COMPONENTS

$\mathbf{R}_{high}$	
Resistor	**Value**
R231	not changed (10K)
R232	not changed (10K)
R233	not changed (10K)
R235	not changed (10K)
R234	4K7 changed to 10K

$\mathbf{R}_{low}$	
Resistor	**Value**
R229	100 changed to 510R
R230	4K7 changed to 1K

$\mathbf{R}_{comp}$	
Resistor	**Value**
R254	10K changed to 4K7
R255	10K changed to 4K7
R256	10K changed to 1K
R257	10K changed to 100R
R258	not changed (10K)

$\mathbf{C}_{comp}$	
Capacitor	**Value**
C45	not changed (4.7 μF)

$\mathbf{C}_{pole}$	
Capacitor	**Value**
C190	100pF removed
C191	100pF changed to 68pF (100pF can be used, as well)

$\mathbf{R}_{RC}$	
Resistor	**Value**
R261	470K changed to 100K
R262	not changed (470K)
R263	not changed (470K)

$\mathbf{C}_{RC}$	
Capacitor	**Value**
C196	not changed (100pF)

$\mathbf{R}_{isns}$	
Resistor	**Value**
R259	100R changed to 1K

Output ceramic capacitors	
Capacitor	**Value**
C192	Not mounted
C193	Not mounted
C189	Not mounted

2 Power line filter to be added

In CONV-TLL-BLO v1 no power supply filters are mounted.
Due to the logic families used in the design, noise in the vicinity of 60MHz to 150MHz was expected. Spectral measurements in the power rails and FFT null-magnetic tests checked the presence of this noise. Thus, a filter schema for this band is needed. The following simple solution consisting of a one-stage pi filter with the following values:

- Capacitor to external power rails: 22μF ceramic

- Capacitor to board input power rails: 150μF OSCON

- Inductor: Murata BLM41PG181SN1L

This filter stage is mounted in CONV-TTL-RS485, as well.

Table 2: Issue 517: Power line filter

3 Optoisolator resistor

Blocking input should change the value of one resistor to reduce degradations of diode in the optoisolator.
Taking EDA schematics document as reference and going to page 10. R222 resistor, which is 100R must be replaced for 1K. Thus, a maximum value of 22 mA is driven into the LED of the optoisolator.
Do the same for R227,R219, R217, R215 and R226.

Table 3: Issue 520: Optoisolator resistor

CHANGES OF COMPONENTS

Resistor	Value
R215	100R changed to 1K
R217	100R changed to 1K
R219	100R changed to 1K
R222	100R changed to 1K
R226	100R changed to 1K
R227	100R changed to 1K

4 Bad VME64x connections

It represents a problem when other boards try to use the bus granted pins or interrupt acknowledge lines.

OHWR issue 502	http://www.ohwr.org/issues/502
Some VME64 lines are misconnected. Daisy-chain *BGxIN_N*, *BGxOUT_N* and *IACKIN_N*, *IACKOUT_N*.	

Table 4: Issue 502: VME64x misconnections

5 Blocking driver stage

5.1 Misconnection of output enable pin

OHWR issue 463	http://www.ohwr.org/issues/463
In IC3, there's a bad net name yielding into an unwanted floating pin (pin 13). The net name in the corresponding schematic page must be changed.	

Table 5: Issue 463: bad net name in IC3

CHANGES IN SCHEMATICS

IC3	
Pin number	**Value**
13	OE_N_ANTIGLITCH changed to ANTIGLITCH_OE_N

In addition, power supply must be changed. It is explained in the next section.

6 Blocking module changes

OHWR issue 462	http://www.ohwr.org/issues/462
The blocking modules must face some profiling. The changes address three points: • Being less temperature resistance. • Improve operating point of the MOSFET (be fully conducting). • Improve RC constant after pulse is outputed.	

Table 6: Issue 462: Blocking module changes

6.1 Eliminate temperature issues

Due to kT relationship, the gate diode must be removed.
CHANGES OF COMPONENTS

Diode	Value
D69	Remove
D45	Remove
D21	Remove
D65	Remove
D41	Remove
D17	Remove
D61	Remove
D37	Remove
D13	Remove
D67	Remove
D43	Remove
D19	Remove
D63	Remove
D39	Remove
D15	Remove
D59	Remove
D35	Remove
D11	Remove

6.2 Increase power supply of driver stage

Driver stage must be powered at recommended 5 volts. It permits MOS-FETs to be fully conducting.

The change affects to all BCT25244 (IC2 and IC3).

CHANGES OF CONNECTIONS

BCT25244	
IC	**Value**
IC1	Power pin to 5V
IC2	Power pin to 5V
IC3	Power pin to 5V

6.3 Output resistors: change and add

To better balancing the deal between fast draining and steady on-current, the 100R output resistors must be changed to 1K.

CHANGES OF COMPONENTS

Resistor	Value
R196	100R change to 1K
R152	100R change to 1K
R118	100R change to 1K
R192	100R change to 1K
R148	100R change to 1K
R114	100R change to 1K
R188	100R change to 1K
R144	100R change to 1K
R110	100R change to 1K
R194	100R change to 1K
R150	100R change to 1K
R116	100R change to 1K
R190	100R change to 1K
R146	100R change to 1K
R112	100R change to 1K
R186	100R change to 1K
R142	100R change to 1K
R108	100R change to 1K

In addition, an external 1K after the protection diode must be added to place a small load at the output when no external load is connected.

CHANGES OF COMPONENTS

Resistor	Value
R[x]	Add 1K after the output protection diode

7 Square LED array

OHWR issue 570	http://www.ohwr.org/issues/570
The front panel three LED array will be changed by a Dialight 568 model. This model is a bicolour (red-green) 4-LEDs array, which will be driven by a VME buffer to reduce BOM. Already done in CONV-TTL-RS485.	

Table 7: Issue 570: square LED array

8   Other issues

8.1   Change of logic family for Schmitt triggers

As done in CONV-TTL-RS485, ACT family is changed for LVT family for
all the Schmitt triggers.

OHWR issue 603	http://www.ohwr.org/issues/603
To allow better compatibility between different modules, LVT family will subsitute ACT one because of its wider use as logic level translator.	

Table 8: Issue 603: Change of logic family for Schmitt triggers

8.2   Separate control lines for DACs

As done in CONV-TTL-RS485, separate control of the DACs has been in-
cluded.

OHWR issue 604	http://www.ohwr.org/issues/604
According to Javier's recommendation, now the control lines are independent for every DAC.	

Table 9: Issue 604: Separate control lines for DACs

8.3   Board Test Points

OHWR issue 449	http://www.ohwr.org/issues/449
Test points should not be mounted in production boards.	

Table 10: Issue 449: Test points

8.4 White Rabbit connector in front panel

It has been detected in different boards (such as WR repetitors) that the WR hole in the front pannel was not properly designed.

It seems that the current size and spacing of the WR connector is OK in V1, however the issue is reported below:

OHWR issue 450	http://www.ohwr.org/issues/450
WR connector socket should be rechecked for better plugging quality.	

Table 11: Issue 450: WR connector in front panel

8.5 Components not to be mounted

OHWR issue 501	http://www.ohwr.org/issues/501
Resistor R98 should not be mounted. Resistor R137 should not be mounted.	

Table 12: Issue 501: not to be mounted resistors

8.6 Protection for misconnections of the inputs

A double control mechanism must be added in the FPGA to avoid damage in the Blocking output stage.

OHWR issue 503	http://www.ohwr.org/issues/503
If the all the input channels of the board are connected to a high level and the RTM outputs are all parallel terminated to 50 Ohms the 24V power supply will blow up. To avoid this, some control must be added in the FPGA, first to detect and then to report via I2C. A protection fuse is currently not installed in the 12V rail. It's needed.	

Table 13: Issue 503: Protection for misconnections of the inputs

The proposal is to trigger event upon edge detection, and measure the level of the inputs to report problems back through the I2C connection.

8.7 12 volts fuse to be added

It was considered time ago. To be discussed in the meeting.

OHWR issue 504	http://www.ohwr.org/issues/504
After writing down a list of test to be performed, it was found that some configurations can harm the board. If all the inputs are connected to '1', the FPGA is programmed to generated a periodic signal of 3us with 50% duty cycle. If all the outputs are terminated with 50 Ohms, irreversible damage will be caused to the 24V Power Supply. The power supply is able to provide 2.5 A (and up to 3.5A) in 24V. A fuse targeted to solve that problem must be placed in the 12V rail.	

Table 14: Issue 504: 12 volts fuse to be added

8.8 Add silkscreen for fuses

OHWR issue 505	http://www.ohwr.org/issues/505
It should be added an easy to read silkscreen for every fuse in next V2 board.	

Table 15: Issue 505: add silkcreen for fuses