Standard Blocking Output Signal Definition for CTDAH board

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Abstract

The aim of this document is defining the Standard Blocking Output Signal of the Pulse Converter Unit. This shape is compatible with previous versions, depending upon its use.

History of changes

This document version has been checked by:

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Date	Pages	Changes
September 19, 2011	All	Initial submission
September 21, 2011	All	Scope reduced to Standard Blocking Output Signal definition

Contents

1 Boards and compatibility

1.1 Repetitors and Blocking Generators

Five Pulse Conversion boards outputting the so-called "Blocking" pulse are known to be working at CERN. Three of them were reported and studied by W. Heinze [1]:

- **Level Converter -LA boards-**
  Due to the VAC transformer ZKB 407/115, the output level is 35 V or 18 V depending on the applied voltage to the A30 pin in the 96 pin DIN connector –either 24 V for the 35 V output or 12 V for the 18 V one. The length of the pulse is 1 μs.

- **LAPF-TTL-BLO**
  This board was used to provide 4 μs pulses to SAC and LAF boards. For these boards, a longer pulse width is required due to the input low pass filter applied in SAC and LAF boards to avoid LINAC noisy environment. It uses the same transformer as Level Converter and the output level is reported to be the same.

- **LASB-TTL-BLO**
  It uses a VAC 409/27 transformer. It outputs a pulse with a high level of either 23V or 11V depending upon the voltage supplied to the A30 pin in the 96 pin DIN connector –24 V or 12 V, respectivelly.

Apart from these three boards, two more are actually running in CERN facilities: an 8 Channel Repeater and a 16 channel one. Both Channel Repeater boards use the same subcircuit in every channel to output the signal. The main differences between them lie in the power supply they use and the daisy-chain connector included in the 8 channel version. Thanks to the daisy-channel two boards can copy the same input by means of a short interconnecting cable.
The output level is 24V for the 8 Channel Repeater and 30V for the 16 channel version. This is due to the use of different power supplies because of different stocks when they were made. The length of the pulses ranges from 1.2 μs to 1.4 μs.

The table below summarizes the information of the repetitors systems:

Board	Input Level	Output Signal	
		Level	Pulse width
8 Channel Repeater	TTL inverted-TTL 10V to 30V	24V	[1.2 μs, 1.4 μs]
16 Channel Repeater	TTL inverted-TTL 10V to 30V	30V	[1.2 μs, 1.4 μs]
LASB -TTL-BLO	TTL inverted-TTL	11V or 23V	1.5 μs
LAPF-TTL-BLO	TTL inverted-TTL	18V or 35V	4 μs
Level Adapter	TTL inverted-TTL	18V or 35V	1μs

None of the boards specify the design value of the rise time. Only the trailing edge is reported for LAPF when the circuit is unloaded [2]: 0.3 ms. Measurements on both 8 and 16 Channel Repeater show a worst-case rise time of 100 μs and a fall time of 400 μs when the outputs are loaded with 50 Ω.

1.2 Receivers

Three boards are reported to be Blocking pulse receivers in CERN facilities:

- **LA-BLO-TTL, LAF-BLO-TTL, CTDAC**
  By reading the schematics [3] [4], an input threshold detection around 4.5 V can be inferred from the input net consisting of the 10 $K\Omega$, 1.5 $K\Omega$ and the 2N2222A NPN switching transistor $-V_{BE}$ should be around 0.6 V by [5].
  It is not documented the reason why this input value threshold is set.

1.3 Uses of boards

The boards are used as:

- **Repetitors** The 8 and 16 Channel Repeaters, LASB and Level Adapter are used as repetitors.
- **Control signal** LAPF is intended to interface VME SAC/LAF boards.

2 Standard Blocking Output Signal Definition

As it was shown in the previous section, a wide variety of output shapes are running together. One common type of output shape will be defined to set a reference for the design of the new CTDAH board.

2.1 Criteria

The criteria employed to define the output shape is as follows:

A board designed for a specific use should be backwards compatible with existing boards so as to avoid interoperability failure.

2.2 Target use

Standard Blocking signals are intended to be used in repetitors.

NOTE: Due to the fact that just a few boards -5 or less- need a LAPF-TTL-BLO-like shaped pulse, the Standard Blocking signal is not compatible with wide pulses from LAPF-TTL-BLO boards.

2.2.1 Repetitor Boards

To comply with previous designs, the definition for this kind of boards, **loaded with 50** Ω, is as follows:

Parameter	**Name**	**Value**
$v_{i,H}$	High level	24V $\pm$ 1V
$t_{P_{min}}$	*Minimum pulse width*	1 μs
t_P	*Typical pulse width*	1.2 μs
$t_{P_{max}}$	*Maximum pulse width*	2 μs
t_r	*Rise time*	150 ns $\pm$ 75 ns
t_f	*Fall time*	150 ns $\pm$ 75 ns

References

[1] W. Heinze. Adapting TTL to Blocking Level with 3U Cards. CERN, PS-CO, Note 94-83, November 1994. https://edms.cern.ch/file/817779/1/TTL_BLO_cards.pdf.

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[3] C. Dehavay. Distributeur de Timing en Chasis Europe Notice Descriptive. CERN, PS-CO-WP, Note 87-028, February 1987.

[4] P. Nouchi. CTDAC schematics. CERN, TS-DEM, May 2007. https://edms.cern.ch/file/842138/1/EDA-01632-V1-0_sch.pdf.

[5] Fairchild Semiconductors. 2222A Fairchild Semiconductors Datasheet, August 2010. www.fairchildsemi.com/ds/PN/PN2222A.pdf.