TTL Converter to 30V pulsed output Backplane

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Acknowledgements This document agregates the functional and technical specifications of the TTL to 30V pulsed output for the substitution of both 8 and 16 channel repeaters. It has been carried out thanks to the help of Emmanuel Said.

System Description and Purpose The channel repeater is a device able to translate TTL and non-TTL signals into 30V output pulses and regenerate 30V pulses. There are two kinds of repetitors: 8 channel and 16 channel. The difference between them relies in the number of channels as well as the rear connectors used in each of the repeaters. The aim of this document is setting the specifications needed for the renovation of these devices due to the difficulties faced when it comes to maintenance and repairing.

Contents

1 Functional Specifications

As the circuit to be redone has shown proven reliability among its lifetime and ease of use for the operator, the functional specifications gear towards these two ideas.

Main functionality
: The circuit must convert TTL pulses and negative TTL to a 30V pulsed output. 30V input pulses must be regenerated. The flat-top time of the pulse will be set to 1.2 μs. A more detailed information about pulse characteristics will be explained in the *Technical Specification* section.

PCB Form Factor
: The expected PCB Form Factor for each of the blocking oscillator should be a one or two-layered board with dimensions around 2 inches by 1 inch. Later fitting will be carried out for improving PCB panel explotation, according to IPC-2221A standard.

Working temperature range
: Currently, the blocking oscillator installed feedbacks temperature to the blocking oscillator via a PTC. Moreover, it is desirable adding temperature monitoring into the prospective *Self-Monitorization Module.*

Expected working lifetime
: Depending on the expected working lifetime, several components would be carefully selected so as to comply in a long-term basis with technical specifications — i.e. 30V pulse lenght.

Cost
: To be determined.

Rack Form Factor
: The rack form factor will be 19" U1 for the 8 channel repeater and 19" U2 for the 16 channel repeater. A possible improvement could be modifying the 16 channel repeater to U1 –whether it is possible to fit the blocking oscillators PCB in a different fashion or not.

Front Rack Panel Interface
: It will consist of a LED indicator for each channel letting the operator quickly know if pulses are crossing the repeater by, as the previous version does. The control of this LED indicator should come from the *Self-Monitorization Module.*

Rear Rack Panel Interface
: It will consist of two galvanic-isolated 50 Ω terminated outputs and two inputs both for each channel, as the previous version does. It is

recommended to move from LEMO 00 to another connector with more suppliers such as SMA or SMC.

Coaxial Cable compilancy

Currently, the interconnection among blocking repeaters is done thanks to a 50 Ω Coaxial Cable. The CERN Code SCEM reference is 04.61.11.225.6. Its technical specification for transmission line analysys will be taken into account in the *Technical Specification* section.

Self-Monitorization Module

A monitorizing board can be added to the set of the 8 or 16 blocking oscillators channels so as to provide increased realibility over the previous design. Thus, additional testing points should be added to the blocking oscillator circuit to carry out this improvement.
Subsequently, an operator could read a log of events with detailed information of the pulses.

2 Technical Specificiations

A Pulse Generator waveform

The way of testing the Pulse Generator waveform was done as follows:

1. **Pulse Generator configuration**
   The pulse generator was configured in auto mode. The selected output was 30V and the frecuency of the pulse was set to 2K - 20K pps. The LEMO output was used as a source for the oscilloscope. A LEMO both-sided-ended cable of 10 ns was employed.

2. **Oscilloscope configuration**
   The oscilloscope corresponds to the Tektronics TPS 2024. For avoiding the attenuation of the high frequencies in an eventual pulse overdamping, a 10X probe configuration was set.

3. **Waveform measurements**

t_{rise} 10% - 90%	32 ns
Flat-top voltage	30V
Overdamping time over 10% of flat-top voltage	9V 46.80 ns
Time on high	1.29 ns
Tilt –includes overdamping	3V
t_{fall} 90% - 10%	550 ns