

Renovation of level conversion boards: Replacement of current 3U repeaters

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Outline

- Introduction to timing transmission standards
- Current level-converter kit
- Requirements
- Status of new generation level-converter-HW at CO-HT
- Proposed new HW development

Current transmission standards

	Short range (<10m)	Middle range (<1km)	Long range
DC level	TTL	-	-
Pulse signal	TTL	RS422/RS485/Blocking	Optical
Data	TTL	RS422/RS485	Optical

Current level-conversion kit (1)

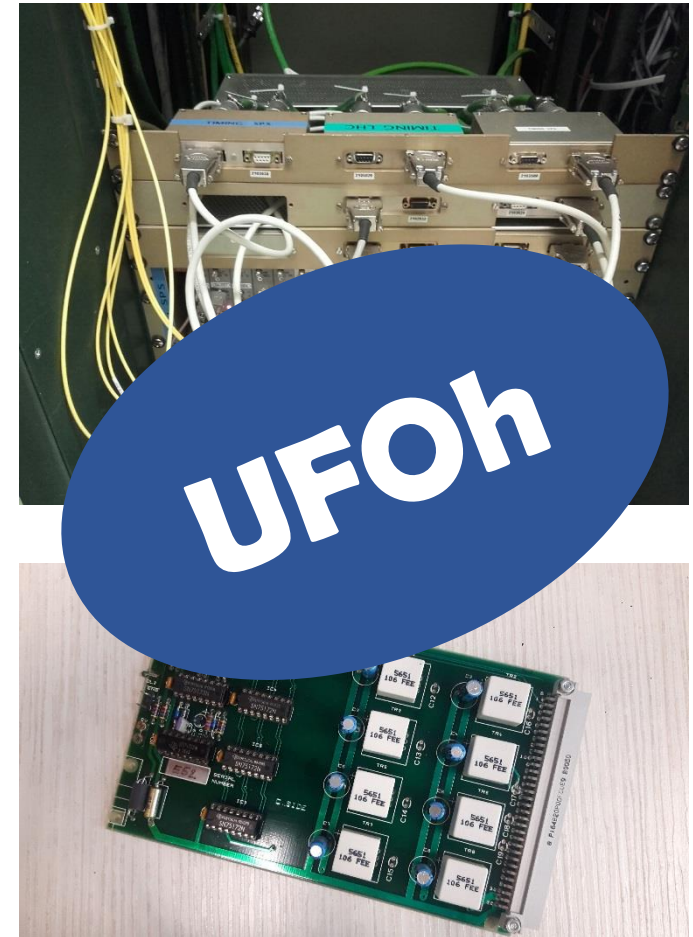
- 1st generation repeaters and patch boxes.

AKA:

Undocumented Fully-Operational hardware

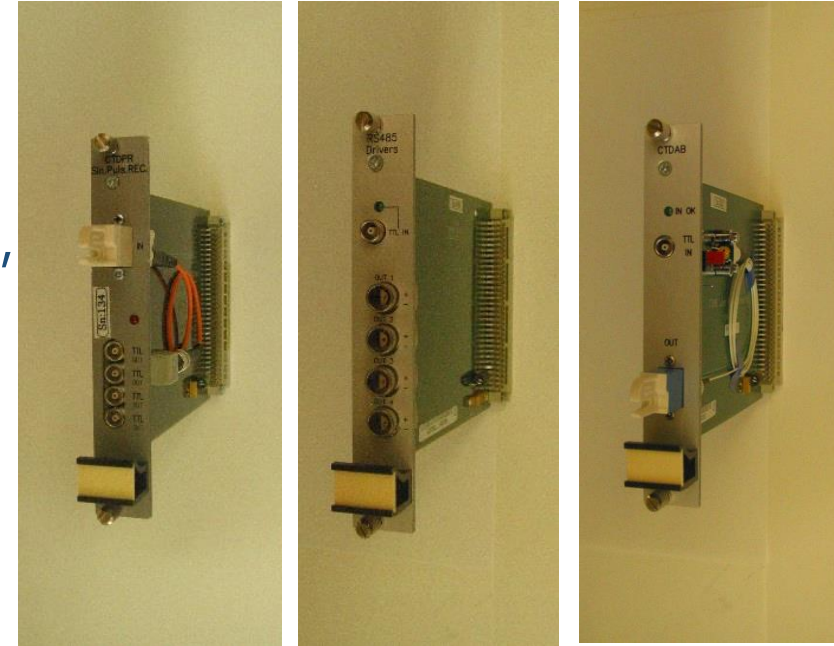
i.e. No name, No schematics, No documentation,

It just works!



Current level-conversion kit (2)

- 2nd generation repeaters are 3U format using different custom crates.
- Supposed to fully replace 1st generation repeaters, but this hasn't happened.
- NOW: 1st generation and 2nd generation both in operation, but both obsolete (or soon will be)
- **New repeater design should be rolled out to replace ALL previous hardware during LS2**



3U board portfolio

		INPUT INTERFACE			
		TTL - LEMO	RS485/ RS422 - LEMO	RS485 - DB9	Optic E2000 - SMF
OUTPUT INTERFACE	TTL - LEMO	<ul style="list-style-type: none"> CTDAG 	-	<ul style="list-style-type: none"> CTDCR 	<ul style="list-style-type: none"> CTDAR CTDPR
	RS485/RS422 - LEMO	<ul style="list-style-type: none"> CTDAD CTDLT 		<ul style="list-style-type: none"> CTDCR 	<ul style="list-style-type: none"> CTDAR
	RS485 - DB9	<ul style="list-style-type: none"> CTDCR 		1 i/p to 16 o/p DB9	<ul style="list-style-type: none"> CTDAR + (CTDCD x 4)
	Optic E2000 - SMF	<ul style="list-style-type: none"> CTDAB CTDLT CTDET 		<ul style="list-style-type: none"> CTDCR + (CTDAB x 4) 	

OBSOLETE
 Insufficient #DB9
 outputs

Inco.
 output of MTT board

OBSOLETE

UFOh

In stock, but cannot be
 produced
 +
 lacks invertible fail-safe
 outputs



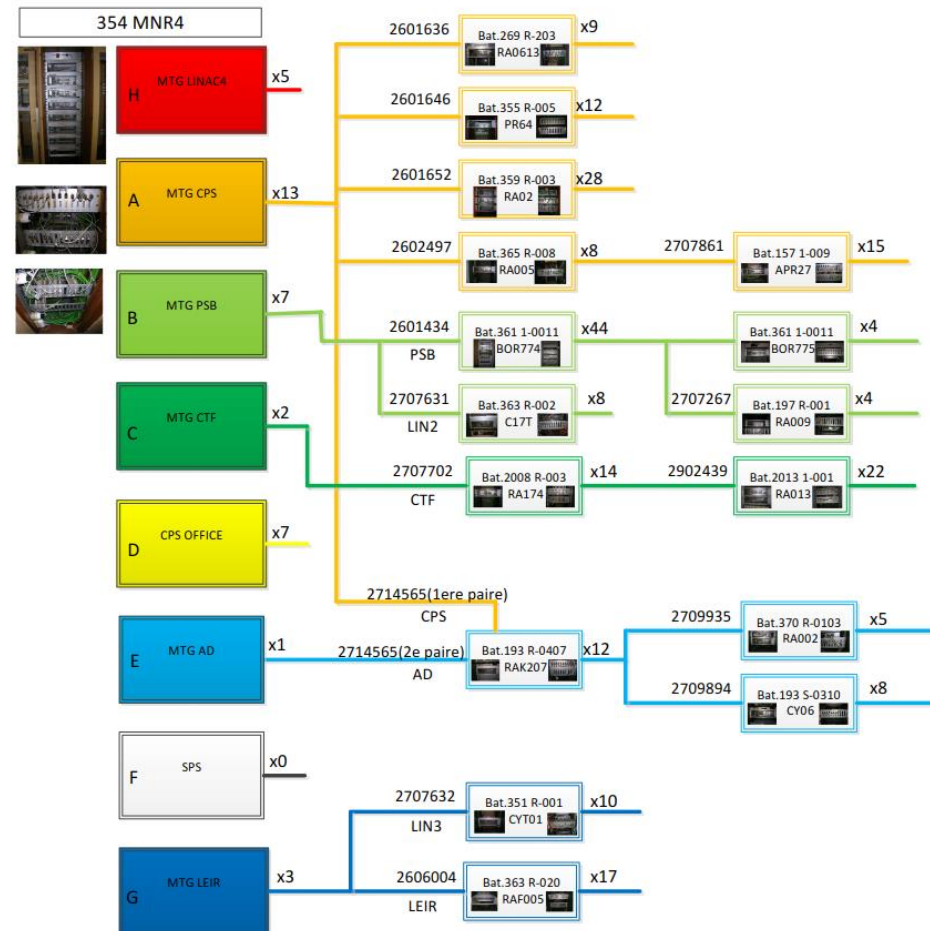
Requirements (1)

- Optical transceivers are required for both GMT timing and pulse signal repetition

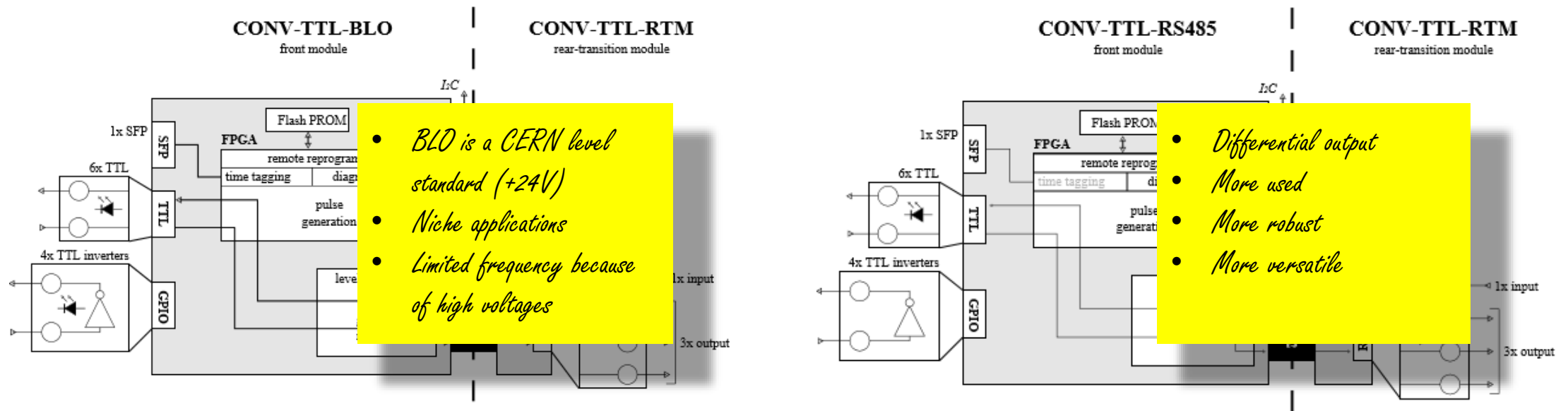
		GMT timing	Pulsed signals
Optical Receivers	CTDAR	YES	NO
	CTDPR	NO	YES
Optical Transmitters	CTDAB	YES	YES
	CTDET	NO	YES
	CTDLT	YES	NO

Requirements (2)

- Signal distribution requires “fanout” functionality
 - 1 input to multiple outputs
- Multi-channel capability is less attractive.
 - A lot of daisy chains used



Architecture of new HW kit



- *BLO is a CERN level standard (+24V)*
- *Niche applications*
- *Limited frequency because of high voltages*

- *Differential output*
- *More used*
- *More robust*
- *More versatile*

6 channels with ORed inputs:

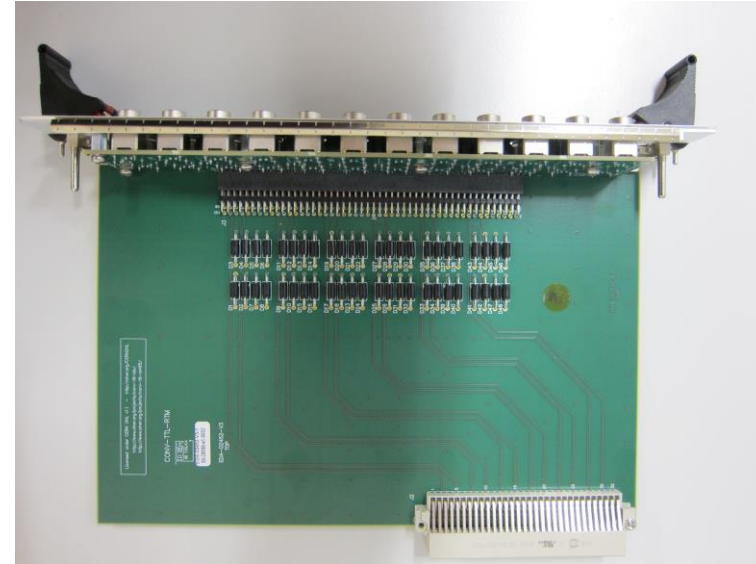
- 1 TTL in -> 1 TTL out
- 1 BLO in -> 3 BLO out

6 channels with ORed inputs:

- 1 TTL in -> 1 TTL out
- 1 RS485 in -> 3 RS485 out (in 2-pin LEMO)

Additional development required

- Following the current template, develop passive VME RTMs with desired connectivity:
 - ✓ 1 RTM for for DB9 interface
 - ✓ 1 RTM for optical interface
 - ✓ Fit as many connectors on the rear panel as possible



Roadmap for RS485/Optical repeaters replacements

		INPUT INTERFACE			
		TTL -LEMO	RS485/ RS422 - LEMO	RS485 -DB9	Optic E2000 - SMF
OUTPUT INTERFACE	TTL - LEMO	<ul style="list-style-type: none"> • CTDAG <p>CONV-TTL-RS485</p> <p>+</p>	-	<ul style="list-style-type: none"> • CTDCR 	<ul style="list-style-type: none"> • CTDAR • CTDPR
	RS485/RS422 - LEMO	<p>LEMO IN/LEMO OUT RTM</p> <ul style="list-style-type: none"> • CTDLT 		<ul style="list-style-type: none"> • CTDCR <p>DB9 IN/ DB9 OUT RTM</p>	<ul style="list-style-type: none"> • CTDAR
	RS485 - DB9	<ul style="list-style-type: none"> • CTDCD 	-	1 i/p to 16 o/p DB9 crate	<ul style="list-style-type: none"> • CTDAR +(CTDCD x 4)
	Optic E2000 - SMF	<ul style="list-style-type: none"> • CTDAB • CTDLT • CTDET 	-	<ul style="list-style-type: none"> • CTDCR +(CTDAB x 4) 	OPTIC IN/ OPTIC OUT RTM

Current 3U board portfolio

		INPUT INTERFACE			
		TTL - LEMO	RS485/ RS422 - LEMO	RS485 -DB9	Optic E2000 - SMF
OUTPUT INTERFACE	TTL - LEMO	CONV-TTL-RS485 		CONV-TTL-RS485 RTM DB9 → DB9	CONV-TTL-RS485 RTM OPTICAL → OPTICAL
	RS485/RS422 - LEMO		CONV-TTL-RS485 RTM LEMO → LEMO	CONV-TTL-RS485 RTM DB9 → DB9 CONV-TTL-RS485 RTM LEMO → LEMO	CONV-TTL-RS485 RTM OPTICAL → OPTICAL CONV-TTL-RS485 RTM LEMO → LEMO
	RS485 - DB9	CONV-TTL-RS485 RTM DB9 → DB9	CONV-TTL-RS485 RTM LEMO → LEMO CONV-TTL-RS485 RTM DB9 → DB9	CONV-TTL-RS485 RTM DB9 → DB9	CONV-TTL-RS485 RTM OPTICAL → OPTICAL CONV-TTL-RS485 RTM DB9 → DB9
	Optic E2000 - SMF	CONV-TTL-RS485 RTM OPTICAL → OPTICAL	CONV-TTL-RS485 RTM LEMO → LEMO CONV-TTL-RS485 RTM OPTICAL → OPTICAL	CONV-TTL-RS485 RTM DB9 → DB9 CONV-TTL-RS485 RTM OPTICAL → OPTICAL	CONV-TTL-RS485 RTM OPTICAL → OPTICAL

Bonus features

- One electrical→optical repeater for both GMT signal and pulse repetition
- Improve the “daisy-chaining” process:
 - Configurable transceiver
 - OR Use on-board switch
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- *Based on CONV-TTL-xxx designs,*
- *Make new motherboard with differential output on P2 connector.*
- *Move all interface-specific circuits to RTM*

... (input/output)

Conclusion

Simple hardware development

PASSIVE RTM!

A little More hardware development

Add HW support for
daisy-chains
And solve compatibility issues

Substantial hardware development

Make new motherboard with more
Active RTMs

?