MEINBERG

Technical Information

Operating Instructions

Line **I**nterface **U**nit

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Features

The board LIU (**L**ine **I**nterface **U**nit) was designed to convert the GPS-locked standard frequency of a preconnected Meinberg satellite controlled clock GPS167 or GPS167SV into several timing signals that can be used for various synchronization or measurement tasks. Typical applications are:

- o **Measurement and test of synchronization quality of Telecom networks**
- o **Calibration and synchronization of laboratory equipment**
- o **Test of synchronization of radio transmitters / base stations (GSM / CDMA / UMTS / DAB / DVB)**

There are two seperate signal paths on the board LIU. One is for providing the standard frequencies, the second path is for generation of the 'telecom-signals'. All output signals have high accuracy and stability because they are derived from GPS-disciplined standard frequencies generated by the preconnected GPS-clock. Depending on the oscillator option of the preconnected clock, the following accuracies can be achieved:

oscillator option of clock	short term stability GPS-synchronised
OCXO MQ	$\pm 2 \cdot 10^{-10}$
OCXO HQ	$\pm 5 \cdot 10^{-12}$
Rubidium	$\pm 2 \cdot 10^{-12}$

Block diagram

The following block diagram illustrates the functional principle of the board LIU:
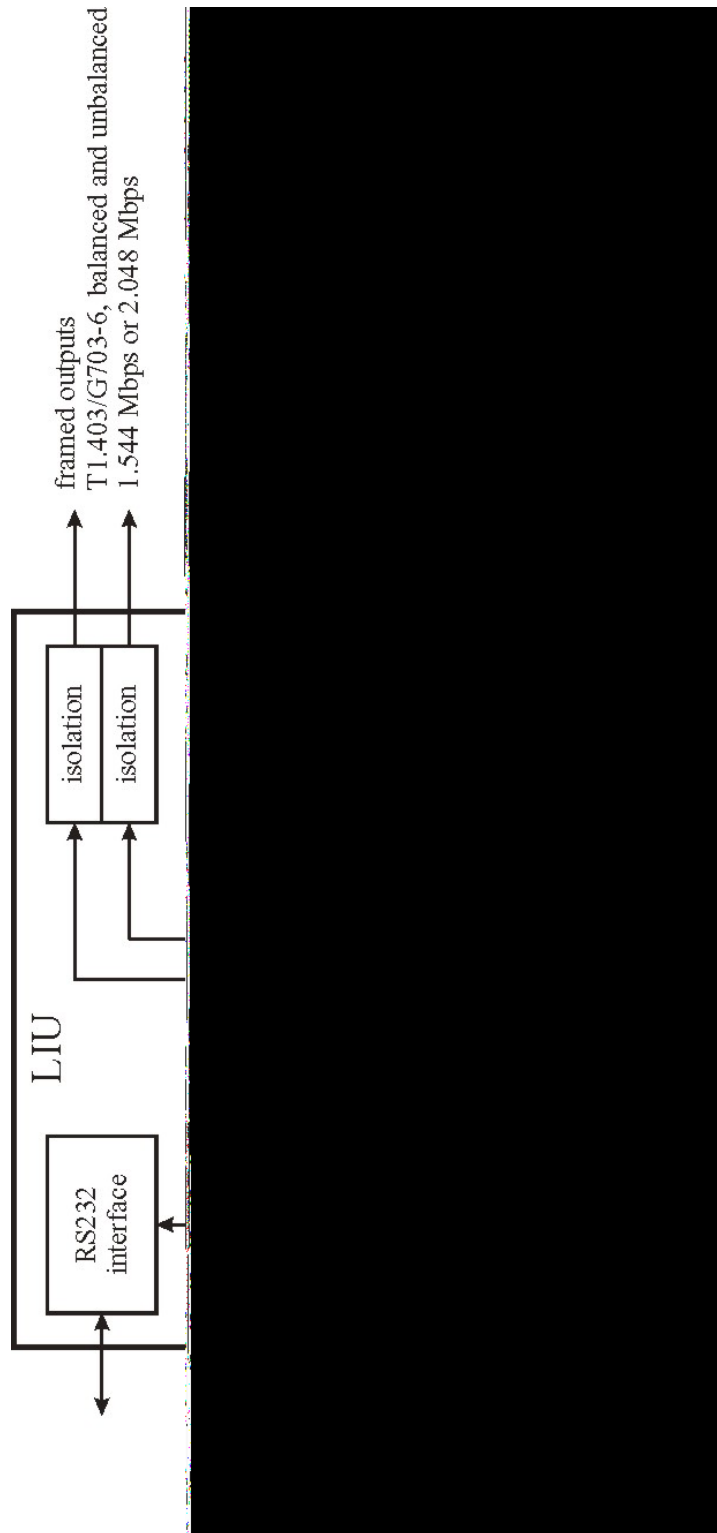
Standard frequencies

The 5 MHz and 10 MHz standard frequencies are derived directly from the master oscillator of the preconnected GPS-clock. This oscillator is phase locked to the precise PPS-signal (pulse per second generated from GPS-receiver), thus the standard frequencies are locked to the PPS also. After passing an additional filter and an amplifier circuit, the standard frequencies are fed to the BNC-connectors.

Telecom signals

These signals can be devided into two groups:

the 'unframed' and the 'framed' outputs, that are provided by a framer and line interface device on the board LIU. All clock signals needed for generation of the 'telecom outputs' are phase locked to a 4.096 MHz reference clock, which is generated by a frequency synthesizer on the preconnected GPS-clock. This synthesizer is phase locked to the PPS-signal and frequency locked to the master oscillator of the clock.

The module LIU is able to generate signals for the American T1- or the European E1-system. The mode of operation depends on the position of a DIP-switch or the state of a control input in the following way:

DIP-switch 1 „ON" or control input „low":   E1-mode
DIP-switch 1 „OFF" or control input „high":   T1-mode

The 'unframed' outputs are standard frequencies of either 1544 kHz (T1) or 2048 kHz (E1). Two unbalanced and two balenced outputs according to ITU-T G703-10 (CCITT recommendation 'Physical/electrical characteristics of hierarchical digital interfaces) are available via BNC- and BNC-Twinax-connectors.

The 'framed' outputs are consisting of data signals known from digital telephony, which are distributed by using a special frame structure. As a synchronization unit, LIU only generates a 'framed all ones' signal (data byte 0xFF hex) with a transmission speed of either 1.544 Mbps (T1) or 2.048 Mbps (E1). An unbalanced and a balanced output according to ANSI T.403 (T1-mode) or ITU-T G703-6 (E1-mode) are available via BNC- and BNC-Twinax-connectors. Two different line codes used for error correction are known for the transmission of framed signals. The board LIU however generates B8ZS- (T1-mode) or HDB3-coded (E1-mode) output signals only.
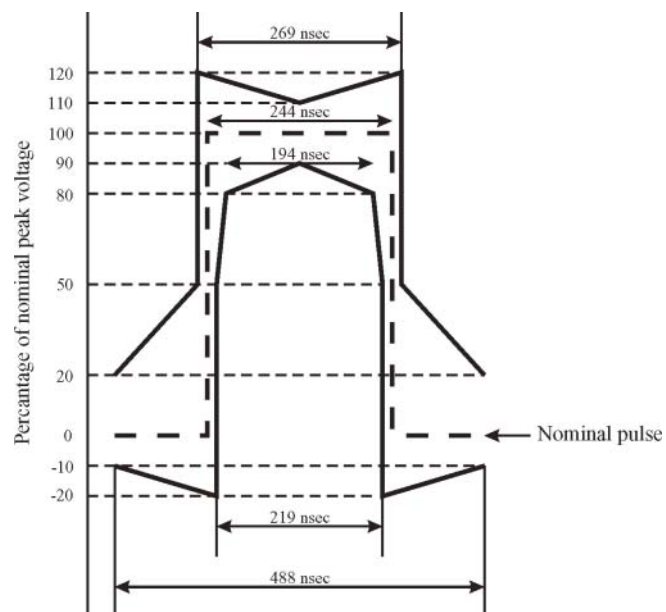
Pulse templates

The following pulse templates are required by ANSI (T1-mode) and CCITT (E1-mode) for output signals in telecom applications. The board LIU meets these recommendations.

T1 (T.403):
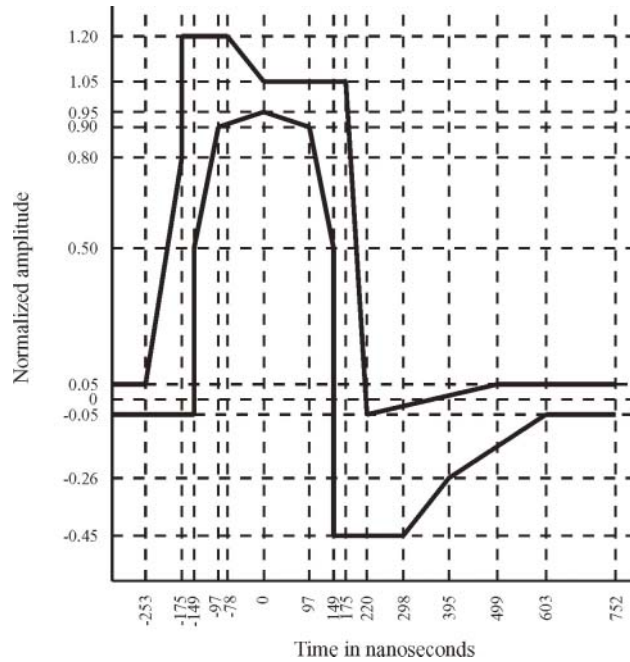
E1 (G.703):

Technical specification LIU

INPUT SIGNALS: 10 MHz and 4.096 MHz reference clocks, TTL level

FREQUENCY
OUTPUTS: 10 MHz and 5 MHz sinewave, 0.6 Vrms into 50 Ω

UNFRAMED
OUTPUTS: 1544 kHz or 2048 kHz
according to G703-10
2 outputs 75 Ω unbalanced , BNC
2 outputs 120 Ω balanced , BNC-Twinax

FRAMED
OUTPUTS: 1.544 Mbps or 2.048 Mbps
1 output 75 Ω unbalanced , BNC
1 output 120 Ω balanced , BNC-Twinax
B8ZS or HDB3 line coding
Framer and line interface meets following recommendations:
T1-mode: ITU I.431
AT&T PUB43801
TR-62411
ANSI T1.102, T.403, T.408
E1-mode: ITU-T G.703, G.704, G.706, G.775, G.796,
G.732, G.823
I.431

SHORT TERM
STABILTTY: depends on oscillator option of GPS-clock

ACCURACY: depends on oscillator option of GPS-clock

POWER
REQUIREMENTS: 5 V $\pm$ 5%, @470 mA

DIMENSIONS: Eurocard, 100mm x 160mm, 1.5mm Epoxy

FRONT PANEL: 3U / 14HP (128 mm high x 71.1 mm wide), Aluminium

CONNECTORS: according to DIN 41612, type C 64, rows a+c (male)
BNC- and BNC-Twinax-connectors (male)

AMBIENT
TEMPERATURE: 0 ... 50 °C

HUMIDITY: 85% max.

Signals at the VG-connector

Name of signal	contact	description
GND	32a+c	reference potential
VCC in (+5V)	1a+c	+5V power supply
/BSL	4a	control input for firmware updates TTL level, active low
/Reset in/out	9c	reset signal, TTL level, active low
10MHz in	12a	reference frequency 10 MHz, TTL level
CLK 4.096MHz in	21c	reference frequency 4.096 MHz, TTL level
COM0 TxD out	26c	COM0 RS-232 output
COM0 RxD in	30c	COM0 RS-232 input
COM1 TxD out	24c	COM1 RS-232 output
COM1 RxD in	29c	COM1 RS-232 input
SW1 in	16c	input for mode control, TTL level low: E1-mode high: T1-mode
SW2 in	15c	control input reserved for expansion, TTL level
SW3 in	14c	control input reserved for expansion, TTL level

Rear connector pin assignments

	a	c
1	VCC in (+5V)	VCC in (+5V)
2		
3		
4	/BSL	
5		
6		
7		
8		
9		/Reset in/out
10		
11		
12	10MHz in	
13		
14		SW3 in
15		SW2 in
16		SW1 in
17		
18		
19		
20		
21		CLK 4,096MHz in
22		
23		
24		COM1 TxD out
25		
26		COM0 TxD out
27		
28		
29		COM1 RxD in
30		COM0 RxD in
31		
32	GND	GND