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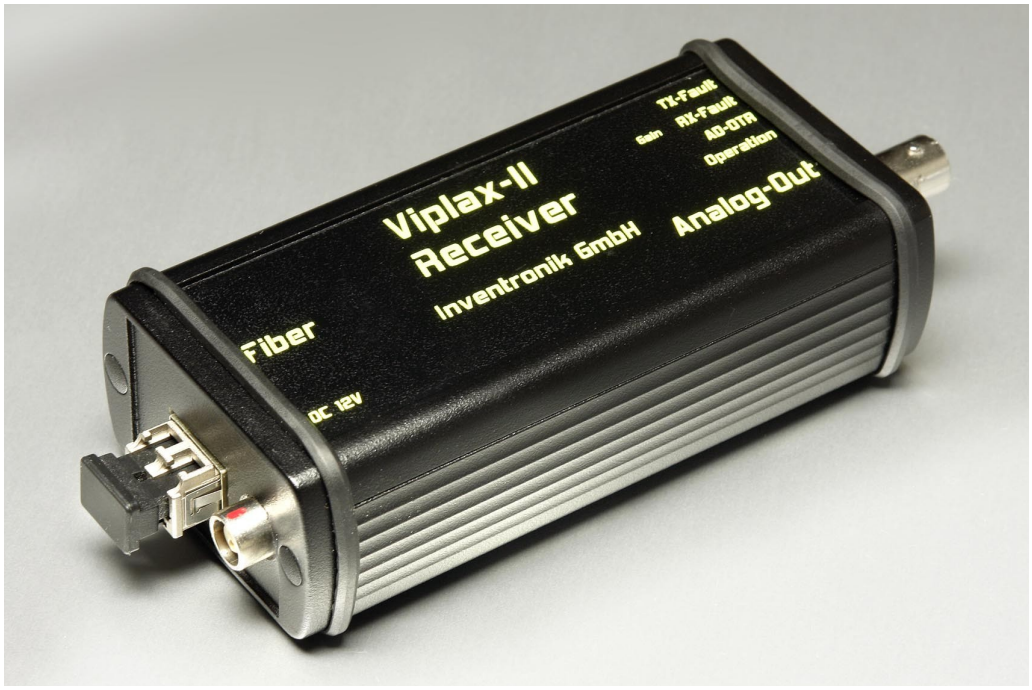
Viplax-II



User Documentation and Technical Specification of the Viplax-II Transmitter- / Receiver Units

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History

Issue	*Date*		*Reason For Changes*
01	20090323	WF	Initial issue.
02	20090901	WF	Added the 'User Documentation' part.
03	20100222	WF	Several additions.
04	20100421	WF	First official Version.
05	20110804	WF	Minor Changes.
06	20120312	WF	Additions concerning the LED visualization, more images.
07	20130805	WF	Several minor corrections of the specifications.

References

[1]

Monday, August 5, 2013

Subject to change without notice

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General Description of the Viplax-II Transmission System

Introduction

Viplax-II is a family of electronic units designed for transmitting analog or digital signals with little regard to the difference in electrical potential. Electrical isolation is accomplished by using a fiber-optic cable between the transmitter and receiver. The operation does not require any adjustment nor maintenance, it is plug and play. Typical applications are high voltage measurement, power electronics, scientific equipment, industrial control systems and noise sensitive measurements. To meet the requirements of the different applications, there are several form factors available. On the one hand, analog Viplax-II is available in compact handheld housings (see Figure 1) and on the other hand in 19” rack mount housing. Digital transceivers are available in 19” rack mount housings. The system features 14 bit digital resolution, very low transmission delay of about 400ns, selectable user gain settings long measure cycles in battery operation mode, easy useability and very easy installation.

The Viplax-II handheld transmitters and receivers is one of the industry's most compact and easy to use solution of a high speed high accuracy fiber optic transmission system.

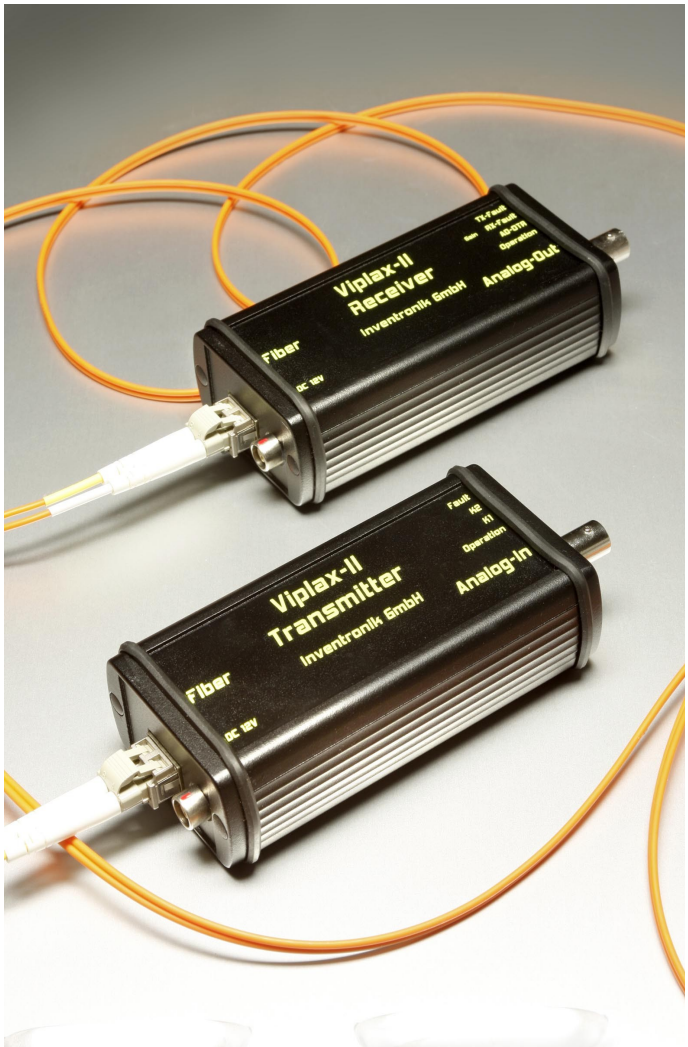

Figure 1: Analog transmission system in the handheld form factor

Besides the details already mentioned, there are additional features distinguishing Viplax-II from

other commercial systems as well as from Viplax-I. First of all, the system is a bidirectional link which allows for example selecting the input amplifier gain via the fiber-optic line. The system has a sophisticated fault detection and error correction mechanism to provide proper and safe operation.

The analog Viplax-II

In case of the analog transmission, the input signal connected to the transmitter is converted to a digital signal, serialized and sent via a high speed fiber-optic link to the receiver unit.

The receiver unit reverses the process, converting the serial data with a minimal delay and extreme accuracy back into the analog signal measured by the transmitter.

A high-quality, low-impedance output-driver delivers the recovered analogue signal to loads with small impedance e.g. correctly terminated coaxial cables at 50 or 75 Ohm. The digital resolution of the system is 14 bit.

The components coming in handheld cases features battery operation. There is a battery pack available which is intended to operate the transmitters or the receivers for several hours. The transmitter unit, e.g. the system which typically is used in conjunction with a battery, features a power down mode to save energy.

The digital Viplax-II

The digital system shall provide an easy to use transmission system for up to 16 digital signals per unit in each direction. For this purpose, there are besides the transmitter and the receiver backplanes for 19” racks available featuring voltage protection, fast switching and easy installation for several transmitters or receivers.

Operation Preparations

The analog System

The basic version of an analog Viplax-II transmission system consists of a transmitter unit, a receiver unit, two power supplies or rechargeable batteries and a fiber-optic cable. Once connected to the power supplies and the fiber-optic installed, the system is ready to use. The fiber-optic cable may be connected or disconnected at any time. The receiver and transmitter resynchronizes automatically. In case of a disconnected cable, the output of the receiver is locked to zero voltage and the transmitter unit switches to the power down mode. The input voltage of the analog transmitter unit may not exceed a level of 10V. The output of the analog receiver is adjusted to a full scale voltage of +/-10V. The gain settings of the transmitter unit's amplifier are selectable gain settings. Refer to paragraph Gain Selection. If the receiver unit is switched off, the power supplies for the analog circuitry in the transmitter are also switched off. This feature helps to save energy during the operation of the transmitter unit from a rechargeable battery.

The digital System

The basic version of a digital Viplax-II transmission system consists of a transmitter unit, a receiver unit, two power supplies, two backplanes and a fiber-optic cable. Once connected to the power supplies and the fiber-optic installed, the system is ready to use. The fiber-optic cable may be connected or disconnected at any time. The receiver and transmitter resynchronizes automatically. In case of a disconnected cable, the digital outputs of the receiver are driving low signal. The input voltage of the digital transmitter unit is protected by the backplane and spans a wide range from 5VDC to 42VDC. The output of the digital receiver drives a voltage which is dependant of the backplane. There are floating contacts driven by MOS relays TTL outputs as also 24VDC drivers.

Operation Signals

The analog System

The Viplax-II transmitter unit and the receiver unit are each equiped with four LEDs as shown in Figure 2. These LEDs have different functions.

The transmitter LEDs:

During startup (for the first 4s, the LEDs) indicate the firmware version in binary format. After this, the indication is as follows:

Fault: The Fault signal appears, when the fiber-optic link is not locked correctly in the transmitter unit or if the supply voltage drops below 10.6 V, the minimum allowable voltage when operated from a lead battery.

K2: Indicates the status of the second gain selector switch.

K1: Indicates the status of the first gain selector switch.

Operation: This signal indicates a correct link to the receiver unit.

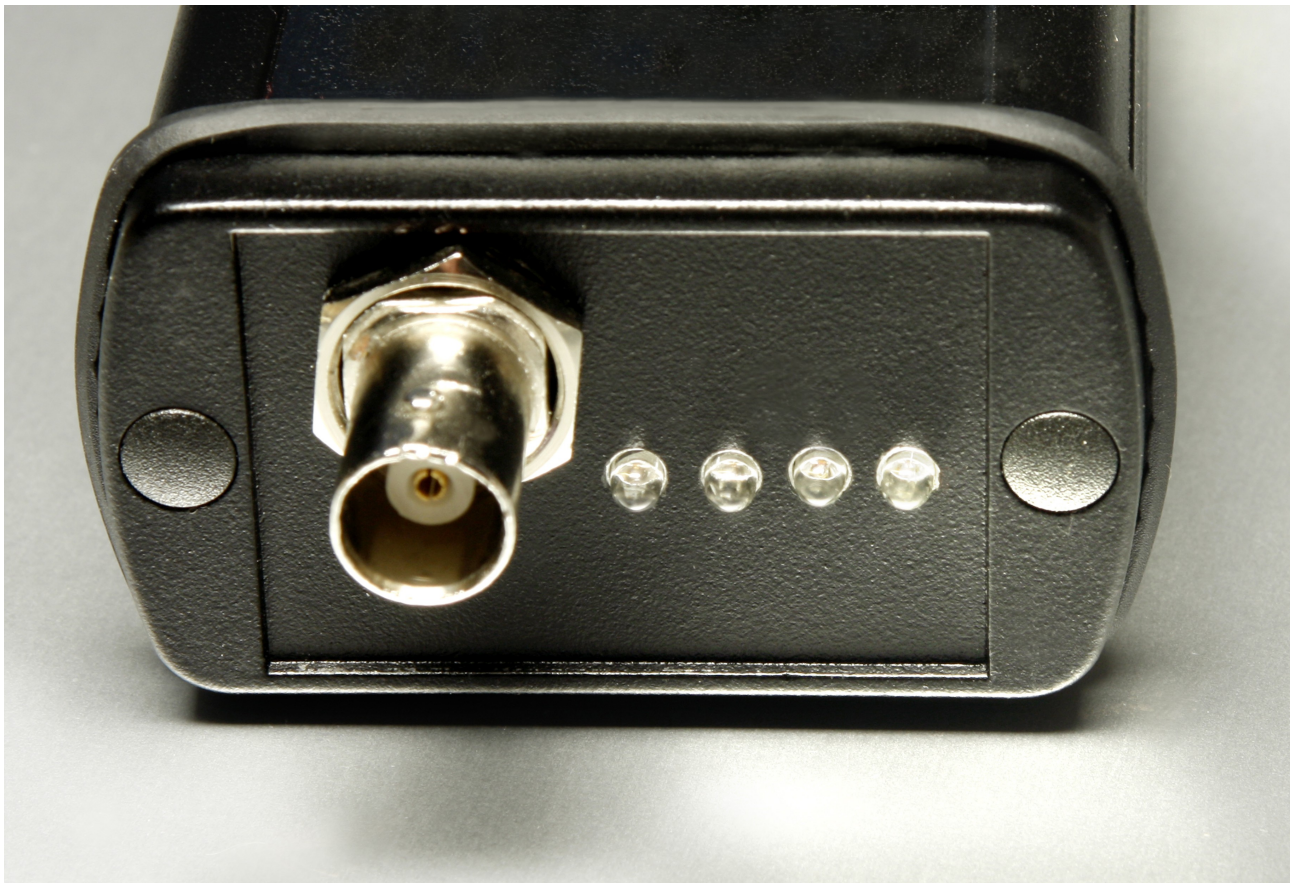

Figure 2: Status LEDs of the Transmitter Unit (Handheld Version)

The receiver LEDs:

During startup (for the first 4s, the LEDs) indicate the firmware version in binary format. For the next few seconds, when the Viplax-II receiver is powered on the RX-Fault LED and the AD-OTR LED indicate the status of the gain selector switches K1 and K2 of the transmitter unit. If the setting is “11”, “10” or “01”, the respective LEDs flash with a frequency of about 2Hz. The RX-Fault reflects the K2 setting and the AD-OTR reflects the K1 setting. When using the gain selector push button these two LEDs reflect the status of K1 and K2 as long as the push button is held active.

After this, the indication is as follows:

TX-Fault: The Fault signal appears, when the fiber-optic link is not locked correctly in the receiver unit or if the supply voltage drops below 10.6V, the minimum allowable voltage when operated from a lead battery.

RX-Fault: This signal reflects the status of the Fault signal on the transmitter.

AD-OTR: This signal indicates that the AD-converter on the transmitter unit is operating out of range.

Operation: This signal indicates a correctly functioning receiver unit.

Gain Selection of the analog transmitters

As mentioned above, the Viplax-II transmitter has four selectable gain settings of 1.0, 2.0, 5.0 and 10.0 respective to the 10V output voltage. The selection of these settings is done via the gain selector push button on the receiver unit. The push button selects the gain sequentially with each activation. When the button is held active, the LEDs RX-Fault and AD-OTR reflect the status of the K1 and K2 settings as follows:

RX-Fault = K2	AD_OTR = K1	Gain
1	1	10.0
1	0	5.0
0	1	2.0
0	0	1.0

Three seconds after the push button is released, the actual gain setting is stored and will be used when the Viplax system is powered off and on again. **Be aware, that the gain settings and the storage of the actual value only works if the fiber-optic link is already established.**

Receiver Calibration Test

The receiver can easily be verified for correct calibration. To do this the calibration mode must be entered by pressing the pushbutton for about 4 seconds. The Operation LED will begin blinking once the calibration mode is entered. In this mode, with the gain selector pushbutton one can select zero maximum, minimum or triangular patterns for the DA converter sequentially. The respective values for the analog outputs of the minimum or maximum should be -10V, zero and +10V. To switch back to normal operation, press the pushbutton again until the operation LED is signaling normal operation.

Technical Data

Input Amplifier:

Input voltage range:	± 1.0V; ± 2.0V; ± 5.0V; ± 10.0V.
Voltage Gain:	20dB; 14dB; 6dB; 0dB.

Gain is selected via the receiver unit.

A/D-Converter:

Resolution:	14 bit
Samplig Rate:	36Msps
Signal to Noise Ratio:	> 73 dB
Integral Linearity Error:	± 1.4 LSB
Differential Nonlinearity:	± 0.7 LSB
Effective Number of Bits	> 12.1

Further information: see the Analog Devices AD9244 data sheet

Anti-Aliasing-Filter:

No internal filter. Desired behaviour is selected using external filters

3dB Frequency: approx.	10MHz depending on the filter accuracy
Nyquist frequency:	18.0MHz

Digital Signal Processing:

Signal Latency:	< 0.5µs
System Bandwidth:	up to the Nyquist frequency
System Status Bits:	A/D-Overflow; Battery Load Condition, Link Fault, Gain selection.

Fiber-Optics:

Maximum Bit Stream Frequency:	Approximately 1.5Gb/s.
Optical Wave Length:	850nm
Fiber Type:	62.5/125µm core, multimode (duplex)
Connector:	LC Type (duplex)
Maximum Length:	300m (the maximum achievable length is dependant on the quality and condition of the fiber-optic cable).

D/A converter:

Resolution:	14 bit
Sampling Rate:	125Mbps / 36Mbps
Spurious Free Dynamic Range:	>75dB
Integral Linearity Error:	± 2.5 LSB
Differential Nonlinearity:	± 1.5 LSB (typ.)

Further information: see the Analog Devices AD9764 data sheet.

Output Amplifier:

Output Voltage Range:	± 10.0V
Load Impedance:	>= 50 Ohm

Voltage Supply:

Receiver/Transmitter:	12 VDC / 1.2A