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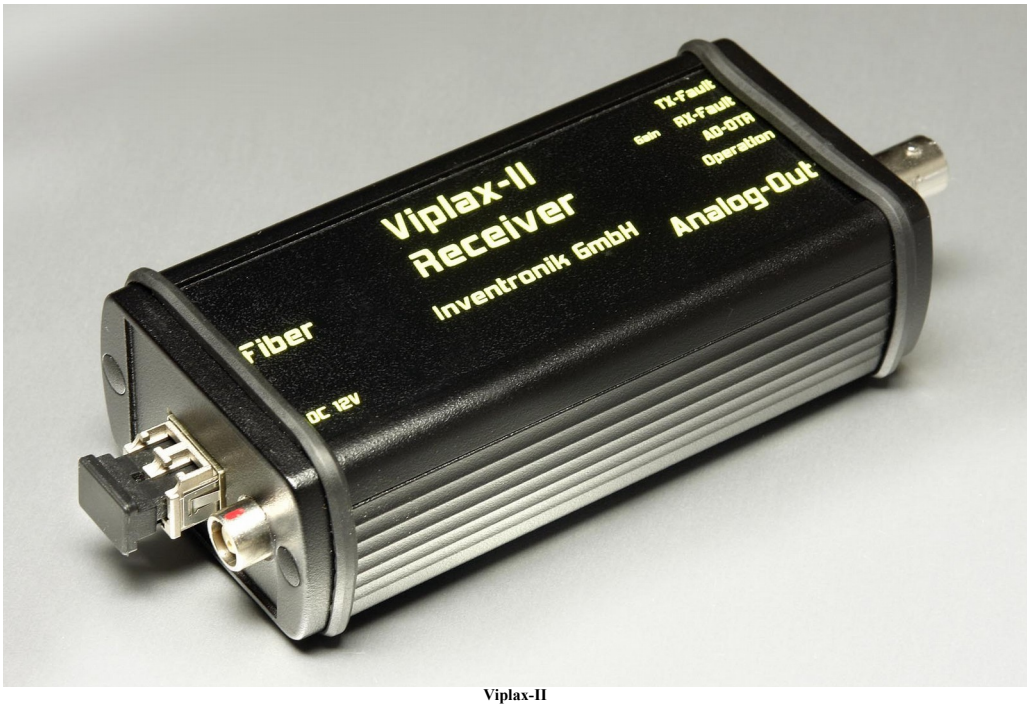
Viplax-IIA



Viplax-II

User Documentation and Technical Specification of the Viplax-IIA 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.
08	20190723	WF	Changes concerning the migration from Viplax-II to Viplax-IIA

References

[1]

Monday, July 23, 2019

Subject to change without notice

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General Description of the Viplax-IIA Transmission System

Introduction

Viplax-IIA 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-IIA is available in compact handheld housings (see 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-IIA 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-IIA 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-IIA

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-IIA

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-IIA transmission system consists of a transmitter unit, a receiver unit, two power supplies or (optionally) rechargeable batteries and a fiber-optic cable. Once connected to the power supplies and the fiber-optic installed, the system is ready to use after link synchronization (which may take several seconds). 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 user selectable. 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-IIA 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-IIA transmitter unit and the receiver unit are each equiped with four LEDs as shown in 2. These LEDs have different functions. The respective LED markings of the transmitter and receiver unit are labeled on the to sides of the handheld covers and at the front side of the rack mount devices.

The Transmitter LEDs:

During startup and after the link is established, the four LEDs indicate for about four seconds the firmware version of the transmitter in the format wx.yz where w is upper left, x is upper right, y is lower left and z is lower right. After this, the indication is as follows:

FLT: The Fault signal appears, when the supply voltage drops below 10.6 V, the minimum allowable voltage when operated from a lead battery.

G2: Indicates the status of the second gain selector switch.

G1: Indicates the status of the first gain selector switch.

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

Figure 2: Status LEDs of a Viplax-IIA Handheld Unit

The Receiver LEDs:

the receiver LEDs show more variations than the transmitter LEDs. This is owned by the fact, that the receiver can be concidered as master unit which establishes the link synchronization. So we have three different states: Link synchronization – receiver firmware – normal operation.

Right after powering the receiver unit or connecting the fiber optic cable to an already powered receiver, the system is in the link synchronization phase. All LEDs indicate at the same time, that the link synchronization is in progress. This process may take several seconds. Once the link to the transmitter is stable the system switches to indicate the version of the receiver unit:

the four LEDs indicate for about four seconds the firmware version of the receiver in the format wx.yz where w is upper left, x is upper right, y is lower left and z is lower right. After this normal operation proceeds.

Normal operation:

TFLT: If the TFLT LED is indicating steady state then the supply voltage drops below 10.6V, the minimum allowable voltage when operated from a lead battery.

If the TFLT LED signals short flashes, then it reflects the receivers gain setting of G1.

RFLT: If the RFLT LED is indicating steady state then it reflects the status of the Fault signal on the transmitter.

If the RFLT LED signals short flashes, then it reflects the receivers gain setting of G2.

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

PWR: This signal indicates a correctly working receiver unit.

Gain Selection of the analog Transmitters

As mentioned above, the Viplax-IIA 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 TXFLT and RXFLT reflect the status of the G1 and G2 settings as follows:

TFLT = G1	RFLT = G2	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 PWR LED will begin flashing 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, zero 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 Specification

Input Amplifier:

Input voltage range:	±1V; ±2V; ±5V; ±10V
Voltage Gain:	20dB; 14dB; 6dB; 0dB
The input range is selected from the receiver unit.	
3dB Frequency:	> 10 MHz

***A/D Converter**:*

Digital Resolution:	14 bit
Sampling Rate:	65 Msps
Signal to Noise Ratio:	> 73 dB
Integral Linearity Error:	±2.5 LSB
Differential Nonlinearity:	±1 LSB
Further information:	see the Analog Devices AD9244 data sheet.

Overall Analog Section and AntiAliasingFilter:

No internal aliasing filter, the desired behaviour is selected using external filters.

3dB Frequency:	> 10 MHz depending on the filter accuracy
Nyquist frequency:	32.5 MHz

***Digital Signal Processing**:*

Signal Latency:	< 0.08 µs
System Bandwidth (3dB):	typ. 10MHz, (up to the Nyquist frequency)
System Status Bits:	A/D Overflow, Battery Load Condition Link Fault, Gain selection

Fiber Optics:

Maximum Bit Stream Frequency:	1.3 Gbps
Optical Wave Lenght	850 nm
Fiber Type:	50/125 µm core, multimode
Connector:	LC Type (duplex)
Maximum Length:	300m / 10.000m (with repeater)

D/A converter:

Resolution:	14 bit
Sampling Rate:	65 Msps.
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:	± 10.0 V
Output Impedance:	50 Ohm.
3dB Frequency:	> 10 MHz

Voltage Supply:

*Receiver/*Transmitter:	12 VDC / 1.2 A.
Current consumption Transmitter:	aprox. 0,25A.
Current consumption Receiver:	aprox. 0,17A.