1-Channel & 4-Channel Preamplifier-CFD

Manual

SURFACE CONCEPT

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User Manual for the
1-Channel Preamplifier-CFD R007
& 4-Channel Preamplifier-CFD R011
Manual Version 2.3
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1 Table of Contents


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2 General Information

2.1 General Information & Safety Instructions

This manual is intended to assist users in the operation of the 1-Channel Preamplifier-CFD R007 and 4-Channel Preamplifier-CFD R011. It is divided into 4 chapters.

Surface Concept strongly recommends reading this manual carefully before operating the Preamplifier-CFD. Surface Concept declines all responsibility for damages or injuries caused by an improper use of the Module due to negligence on behalf of the User.

2.2 General Overview of the System

The Surface Concept Preamplifier-CFD devices are a combination of a preamplifier with variable gain (typ. 13dB to 30dB) and a constant fraction discriminator (CFD) housed in a RF-shielded stand-alone (R007) or 19" (R011) housing. The device accepts 1 analog negative or positive input (BNC connector) and produces 1 LVTTL output (BNC connector) and 1 NIM output (LEMO connector) per channel. It is equipped with an additional monitor output (BNC) for the amplified analog signal.


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3 CFD - Principle of Operation

3.1 CFD - Principle of Operation

The technique of the constant fraction discriminator (CFD) is based on summing the original input signal to an inverted signal. The original input signal is delayed but of full height, while the inverted signal is attenuated.
The resulting signal is fed into a zero-crossing comparator. This allows obtaining precise timing information that eliminates any walk error, which is induced by constant rise time and varying signal amplitudes.


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4 Technical Specification

4.1 Layout of Front Panel

Figure 1: Front Panel of 1-Channel Preamplifier-CFD

Figure 2: Front Panel of 4-Channel Preamplifier-CFD

Figure 3: Back Panel of 4-Channel Preamplifier-CFD

1. BNC Input for Negative Analogue Signal
2. Regulator for Variable Gain of Preamplifier
3. Switch for Pulse Input Polarity (neg. or pos.)
4. BNC Monitor Output for Amplified Analogue Signal
   (Recommendation: use AC-coupled measurement mode when observing the signal with an oscilloscope)
5. Regulator for the Asymmetry (Asy)
6. Regulator for the Zero Offset (Z)
7. CFD Threshold (Th) Regulator
8. 5 PIN Power Connector
9. Lemo Output for CFD NIM Signal
10. BNC Output for CFD LVTTL Signal
11. CFD Operation Monitor LED
12. Monitor Output for the Zero Offset [Z]
13. Monitor Output for the Threshold [Th]
14. Monitor Output for Ground [GND]
15. Power Switch to turn the device ON/OFF. Lighted, when set to ON.
16. Device Ground Connection
17. Power Socket

4.2 Input/Output Features

4.2.1 Input Features

Preamplifier Input Signal:	2mV - 1V (BNC) (depending on gain setting)
Polarity of Input Signal:	negative or positive (switchable)
Impedance:	50Ohm

4.2.2 Output Features

CFD Output Signal per Channel:	1 LVTTL (BNC), 1 NIM (LEMO)
Pulse Width of Output Signal (typ.):	2.4 (LVTTL), 3ns (NIM)
Monitor Output:	1 analogue (BNC)

4.2.3 Measurement Parameters

Input Signal Frequency (max.):	40MHz
CFD Jitter (max.):	20ps
CFD Walk (typ.):	< 40ps (for 20dB amplitude range and while ambient temperature varies less then 5K)
Device propagation delay (typ.):	6.5ns

4.3 CFD Adjustment

4.3.1 Adjustment of CFD Threshold

The CFD Threshold can be adjusted manually by turning the corresponding potentiometer (marked "Th" on the front panel). The threshold is getting more sensitive when turning the potentiometer clockwise. It can be monitored on the corresponding sockets (no. 13 & 14) on the front panel (see Figure 1 & 2).

4.3.2 Adjustment of Zero Offset

The Zero Offset can be adjusted by turning the corresponding potentiometer (marked "Z" on the front panel). The Zero Offset is getting more positive when turning the potentiometer clockwise. It can be monitored on the corresponding sockets (no. 12 & 14) on the front panel (see Figure 1 & 2).

4.3.3 Adjustment of the Asymmetry

The Asymmetry between the inverted input signal and the original input signal can be adjusted by turning the corresponding potentiometer (marked "Asy" on the front panel). The fraction of the positive pulse is getting larger, when turning the potentiometer counterclockwise.

4.3.4 Procedure for Walk Minimization

The following description gives a procedure of how to minimize the walk for a given amplitude range:

1. Select the amplitude range of pulses, which should be measured (e.g. -60mV to -600mV).
2. Apply pulses of max. Amplitude (within the amplitude range) to the Input of the CFD (e.g. -600mV).
3. Observe the CFD output signal with an oscilloscope and trigger on the falling edge of the output signal.
4. Check the CFD walk by changing the amplitude of the input signal by around 50% (e.g. changing between -300 and -600mV) and minimize the CFD walk by adjusting the asymmetry.
5. Decrease the amplitude of the input signal by at least 50% (e.g. down to -300mV) and check the CFD walk for small pulse amplitudes by changing the amplitude of the input signal again (e.g. changing between -50 and -300mV).
6. Minimize the CFD walk for small pulses by adjusting the zero offset.

4.4 Power Requirements

The 1-Channel Preamplifier-CFD is supplied by a wall power supply (input: 100 – 240V, 50 – 60Hz, 1.0A max) with a maximum output of 15W (+5V, 3A).

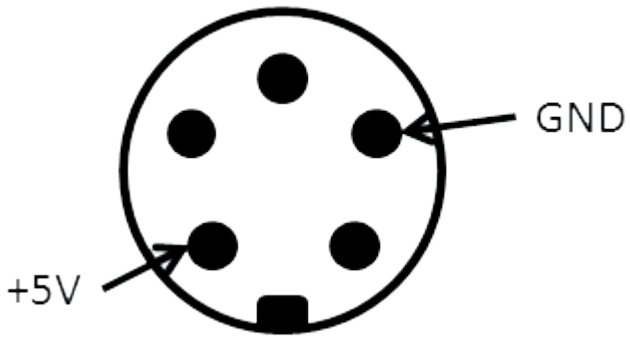

Figure 4: View of 5 Pin housing connector of 1-Channel Preamplifier-CFD from outside.

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EC Declaration of Conformity

Manufacturer

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CE

Product

1-Channel Preamplifier-CFD
4-Channel Preamplifier-CFD

The above named products comply with the following European directive:

89/336/EEC	Electromagnetic Compability Directive, amended by 91/263/ EEC and 92/31/ EEC and 93/68/EEC
73/23/EEC	Low Voltage Equipment Directive, amended by 93/68/EEC

The compliance of the above named product to which this declaration relates is in conformity with the following standards or other normative documents where relevant:

EN 61000-6-2:2005+AC:2005	Electromagnetic compatibility (EMC): Generic standards - Immunity for industrial environments
EN 61000-6-4:2007+A1:2011	Electromagnetic compatibility (EMC): Generic standards - Emission standard for industrial environments
EN 61010-1: 2010	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use

For and on behalf of Surface Concept GmbH

Mainz,……01.04.2013…….
(Date)

Legal Signature……
(Dr. Andreas Oelsner)

This declaration does not represent a commitment to features or capabilities of the instrument. The safety notes and regulations given in the product related documentation must be observed at all times.