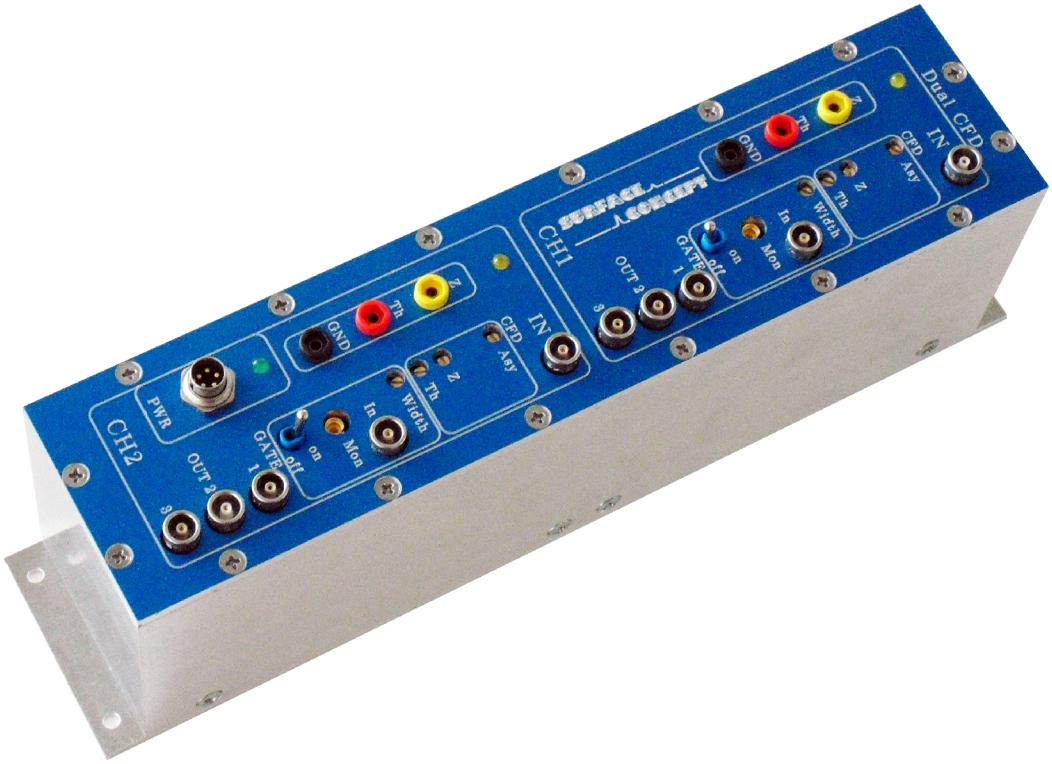
Stand-alone Dual Channel CFD Module with Gating

(Release 6)



Manual

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User manual for the Dual Channel CFD (Release 6).

Version 1.0 dated at 25 July 2014.

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1 Table of Contents

2 Introduction

2.1 General Information and Safety Instructions

This manual is intended to assist users in the operation of the Stand-alone Dual Channel CFD Release 6. It is divided into 4 chapters.

Surface Concept strongly recommends reading this manual carefully before operating the Stand-alone Dual Channel 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 Stand-alone Dual Channel CFD is a 2 channel CONSTANT FRACTION DISCRIMINATOR mounted in a stand-alone 200.7 x 33 x 65mm housing.
The module accepts 2 negative inputs and produces 4 NIM and 2 LVTTL outputs (2 NIM and 1 LVTTL outputs per input) on 6 front panel LEMO 00 connectors. Both channels can be operated with or without gating. In gated operation the CFD only accepts input pulses within a time slot that can be adjusted by the user.

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.

4 Technical Specification

4.1 Layout of Front and Back Panels of the Dual Channel CFD

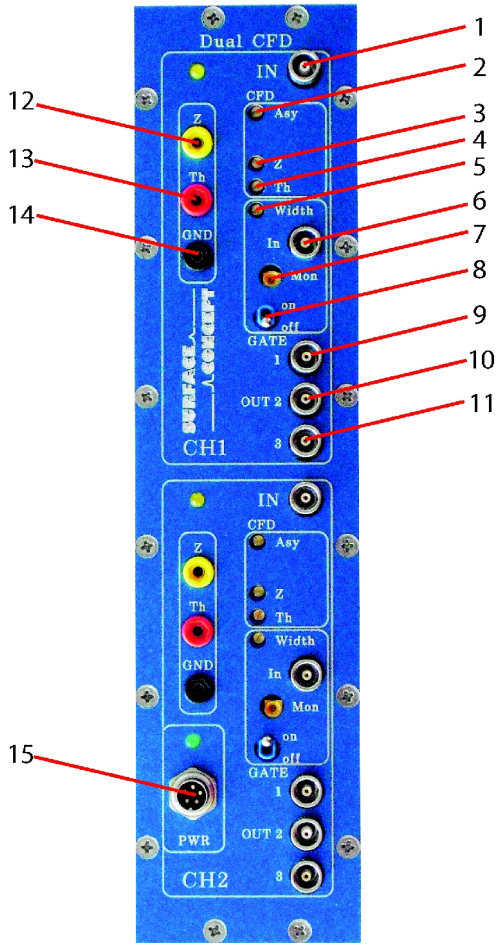


Figure 1: Front Panel of Dual Channel CFD

1 CFD Input on LEMO 00 type connector

2 Regulator for the Asymmetry (Asy)

3 Regulator for the Zero Offset (Z)

4 CFD Threshold (Th) Regulator

5 Regulator for the Gate Width [Width]

6 Gate Input on LEMO 00 type connector (Input signal: NIM)

7 Gate Monitor Output on MMCX type connector

8 ON / OFF switch Gating

9 CFD Output 1 on LEMO 00 type connector (Output signal: NIM)

10 CFD Output 2 on LEMO 00 type connector (Output signal: NIM)

11 CFD Output 3 on LEMO 00 type connector (Output signal: LVTTL)

12 Monitor Output for the Zero Offset [Z]

13 Monitor Output for the Threshold [Th]

14 Monitor Output for Ground [GND]

(and identical for Channel 2)

15 Power Connector

4.2 Input/ Output Features

4.2.1 INPUT features

No. of CFD inputs:	2 (one for each channel)
Impedance:	50 Ohm
CFD Input level:	- 50 mV to – 1.5 V

4.2.2 OUTPUT features

No. of CFD outputs:	6 (three for each channel)
CFD output level:	2x Standard NIM, 1x LVTTL (per channel)

4.2.3 Measurement Parameters

CFD working frequency:	200 MHz (without gating, in gated operation 75 MHz)
CFD jitter (max.):	20 ps
CFD walk (typ.):	< 30 ps (for 20 db amplitude range and while ambient temperature varies less then 5 K)
CFD propagation delay (typ.):	1.2 ns

4.3 CFD Adjustment

4.3.1 Adjustment of CFD Threshold

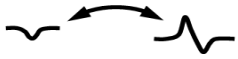
The CFD Threshold can be adjusted manually by turning the corresponding potentiometer (marked “Th” on the front panel). The threshold is getting less sensitive when turning the potentiometer clockwise. It can be monitored on the front panel (see Fig. 1).

4.3.2 Adjustment of the 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 front panel (see Fig. 1).

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:

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

In the delivery status the time walk is minimized for an input amplitude range of -200 mV to -600 mV.

4.4 Gating

The CFDs can be operated in a continuous mode or with gating. Switching between these two modes is possible on the front panel of the module. In gated operation the CFDs only accept input signals within a time slot that can be adjusted by the user using the gate width potentiometer on the front panel. The Gate Input accepts NIM type pulses. The gate width can be increased by turning the width potentiometer clockwise. The width can be adjusted between 5 ns and 220 ns. It can be monitored at the MMCX type connector on the front panel (see Fig. 1).

Note: If the Gating is turned on it is necessary to provide a valid NIM type Gating Input signal on the front panel (see Fig. 1).

4.5 Power Requirements

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

EC Declaration of Conformity

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CE

Product Dual Channel 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……. Legal signature……
(Date) (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.