7074

Quad Analog-to-Digital Converter

Technical Documentation

Grünwalder Weg 28a, D-82041 Oberhaching
Germany

Version 2.2, February 25, 2005

Table of Contents

1. Introduction

The model 7074 contains four independent 16k (14bit) conversion range pulse height analyzing Wilkinson-type analog-to-digital converters with 100MHz clock rate each.

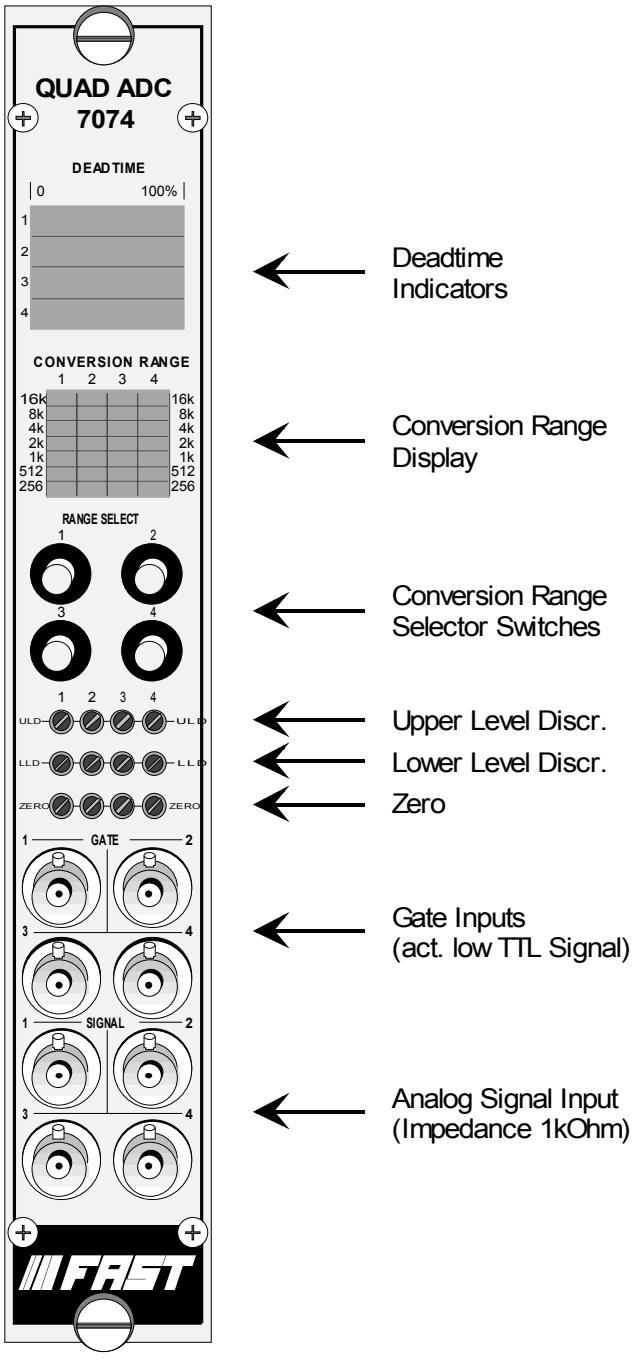
The 7074 is ideally suited for applications in multiparameter spectrometry. In Alpha spectroscopy the 7074 replaces analog mixers and routers. The upper- and lower-level discriminators of each ADC have an output on the rear connector. These outputs can be used as single channel analyzer (SCA) in such applications as Mössbauer Spectroscopy. The 7074 is an ideal replacement of analog mixers and routers that typically degrade the resolution of the connected detectors and significantly limit the count rate capabilities of such systems.

The 7074 Quad ADC can be used in any NIM-BIN that supplies +6V and +/-24V with 500mA each.

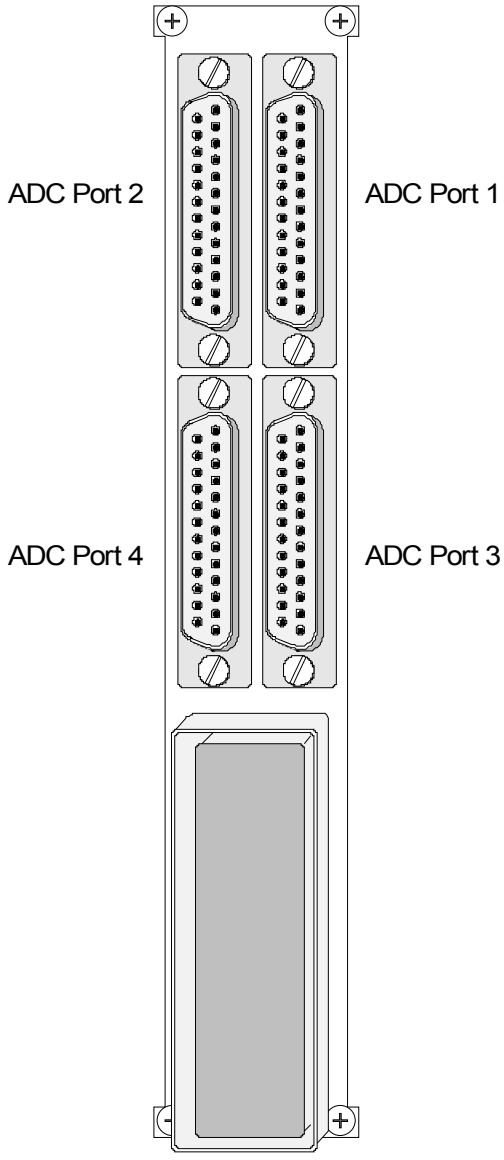
IMPORTANT NOTE:

Ample airflow must be provided for sufficient cooling. Do not cover the top or bottom of the NIM-BIN.

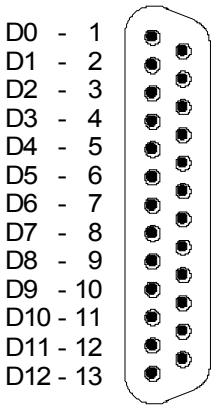
2. Frontpanel



3. Rearpanel



4. ADC Port Connectors



Legend:

D0...D13	= Data Bit 0...13 (output; act. low)
DRDY	= Data Ready (output; act. low)
DACC	= Data Accepted (input; act. low)
ENC	= Enable Converter (input; act. high)
DEAD TIME	= ADC Dead Time Signal (output; act. high)
DENB	= Data Enable (input; act. low)
SCA	= Single Channel Analyzer (output; open drain; 10kOhms pullup; act. low)
GND	= Ground
N.C.	= No Connection

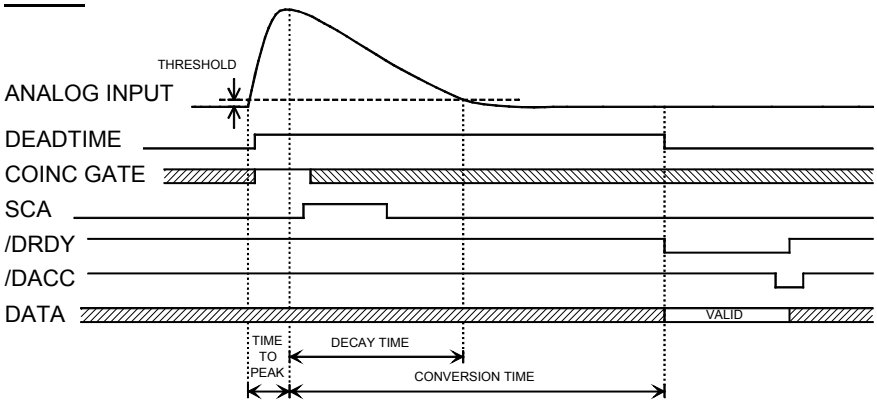
female 25 pin D-SUB connector

D0...D13:	Data bits 0...13 (outputs, active low)
DRDY:	Data Ready (output, active low) DRDY = *low* initiates the data transfer. It is held low until DACC goes *low*.
DACC:	Data Accepted (input, active low) DACC = *low* signals that the data is transfered and resets DRDY to *high*. Must be held *low* until DRDY goes *high*.
ENC:	Enable Converter (input, active high)
Dead Time:	ADC Dead Time signal (output, active high)
DENB:	Data Enable - activates data output drivers (input, active low)
SCA:	Single Channel Analyzer signal (output, open drain, 10k pullup, active low)
N.C.:	Not connected
GND:	Digital Ground

4.1. Signal Timing

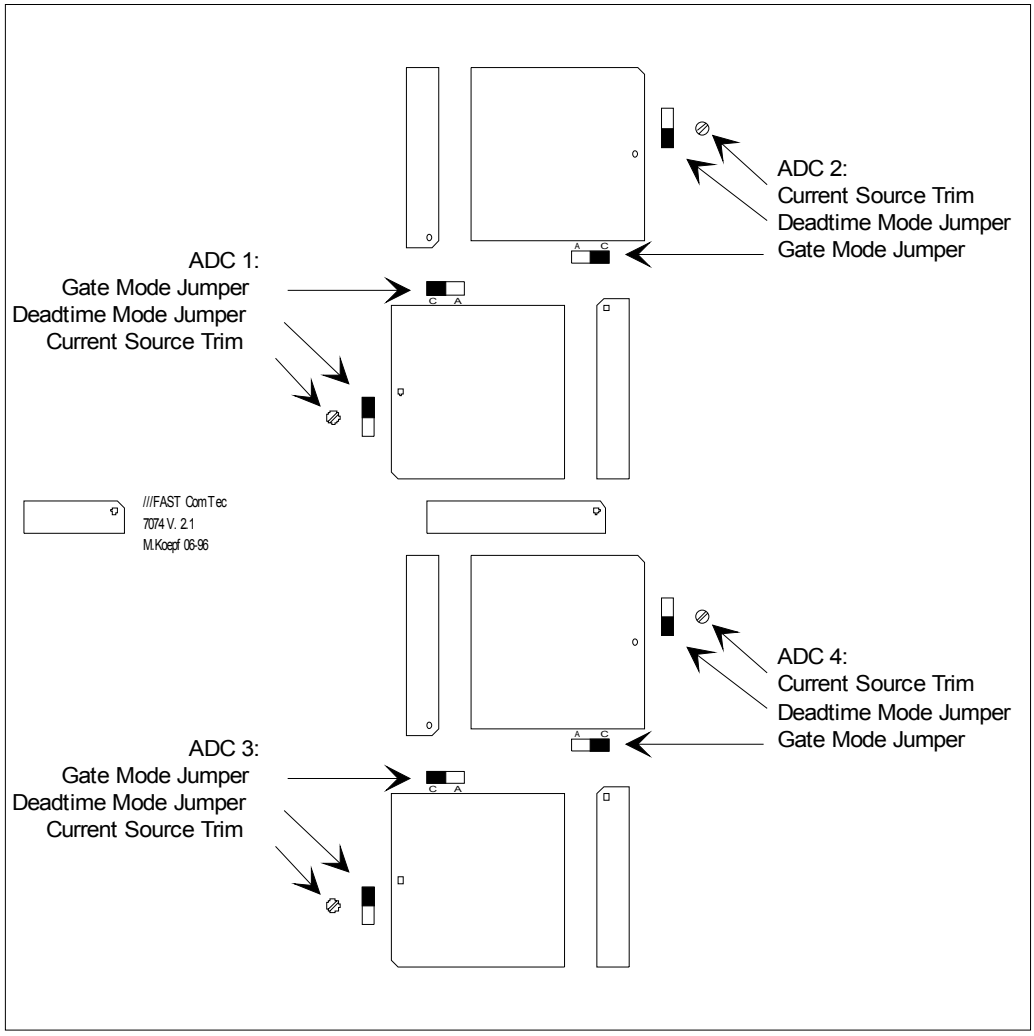
General ADC Signal Timing

7074:



DEADTIME = Time-to-peak + MAX(DecayTime; ConversionTime)

5. Jumper Settings



Gate Mode: C = Coincidence
A = Anticoincidence

Deadtime Mode: C = ADC conversion time
C+P = ADC conversion + (logic OR) pulse decay time

Current Source: adjusts the conversion gain

6. Specifications

6.1. Connectors

Signal 1...4:	4 frontpanel BNC connectors. Accept positive or bipolar pulses (positive portion leading). Input voltage range 25mV to 8V, 1kOhm input impedance, DC coupled, risetime 100ns to 100us, flat top, width 0.5us minimum, falltime 200ns to 100us.
Gate 1...4:	4 frontpanel BNC connectors. Accept TTL input signal (active low). Width >1us, 10kOhm input impedance. Internal pullup resistors for anti-coincidence and pulldown resistors for coincidence mode provide for proper operation when no GATE input signal is connected. The mode of the gate input is jumper selectable on the main board. The GATE signal must be valid before the analog input pulse starts rising and must be held valid at least 1us after the beginning of the pulse decay or some 100mV voltage decay from the pulses top level whichever is last.
ADC port 1...4:	4 backplane 25 pin female D-SUB connetors. Standard adc data port with DataReady/DataAccepted handshake. Provides 14bit data output and command I/O lines.
Power supply:	+24V / 450mA max. +6V / 550mA max. -24V / 500mA max.

6.2. Frontpanel controls

SELECT 1...4:	Conversion range selection switches. Cycles the conversion range of each of the 4 adc´s through 16k - 8k - 4k - 2k - 1k - 512 - 256 - 16k - etc.
ULD 1...4:	Screwdriver adjustable precision potentiometer to set the lower level discriminator, continously adjustable from +25mV to +10V.
LLD 1...4:	Screwdriver adjustable precision potentiometer to set the upper level discriminator, continously adjustable from +10V to +25mV.
ZERO 1...4:	Screwdriver adjustable precision potentiometer to set the analog zero level, range +/-200mV.

6.3. Mainboard controls

Gate mode 1...4:	Jumper to select Coincidence (default) or Anticoincidence mode. For coincidence or anticoincidence mode of operation a TTL input signal must be present during the linear gate time (≈1us).
Deadtime mode 1...4:	Jumper to select if the deadtime signal and display take care of the input signal pulse form. If the falltime of the input signal is longer than the conversion time of the adc a new input pulse will only be accepted after the input had reached zero again. When the DeadtimeMode jumper is in „C+P“ (default) position this will be taken in account, in „C“ position only the conversion time is used for deadtime.
Current source 1...4:	Screwdriver adjustable precision potentiometer to set the analog input range.

6.4. Indicators

DEADTIME 1...4: 10 LEDs bar graph display of the deadtime (0 to 100%).

CONV. RANGE 1...4: Displays the actual selected conversion range of each adc.

6.5. Performance

ConversionTime: ConversionTime = (1.0 + 0.01 x N) µs

where N is the channel address generated by the 7074 adc.

ADC deadtime: Deadtime = Time-to-peak + 1µs +ConversionTime

Each of the 4 adc´s has a 1 word output buffer register that normally will eliminate the transfertime to the multichannel analyzer.

Typical adc deadtime using a Gamma-spectrum containing I-131, Ru-103, Cs-137 and Cs-134g measured with a Germanium detector:

Conversion Gain	Average deadtime
1024	3.7 µs
2048	7.1 µs
4096	13.9 µs
8192	27.4 µs

Integral non-linearity: less than +/-0.05% of full scale over top 99% of selected range.

Differential non-linearity: less than +/-0.75% of full scale over top 99% of selected range.

Gain stability: better than 50 ppm/°C

Baseline stability: 50 µV/°C

Temperature range: 0 °C to +50 °C

Power Requirements: +24V, 450 mA, -24V, 500 mA +6V, 550 mA

6.6. Physical

Size: single width NIM module (1.35 x 871 inches; 3.43 x 22.13 cm) as per TID - 20893 (rev.)

Shipping weight: 1.2 kg (net 0.8 kg)