



HW Setup and Operating Guide

AnaPico APCON4

Sampling System

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1. Introduction

This document will give a quick reference to the APCON4 hardware setup including

- hardware overview
- required RF signals and connections
- required control connections
- main specifications.

The control software is described in a separate document.

2. Hardware overview

Figure 1 shows a picture of a four-channel APCON4 downsampling system. In the two-channel system, channels C and D are not present. The system is built in a standard 19"-compatible case.



Fig. 1: Typical four-channel sampling system APCON4

The system consists of several printed circuit boards providing the different functions, shown schematically in Figure 2. The figure also shows the location of the external RF and control connections.

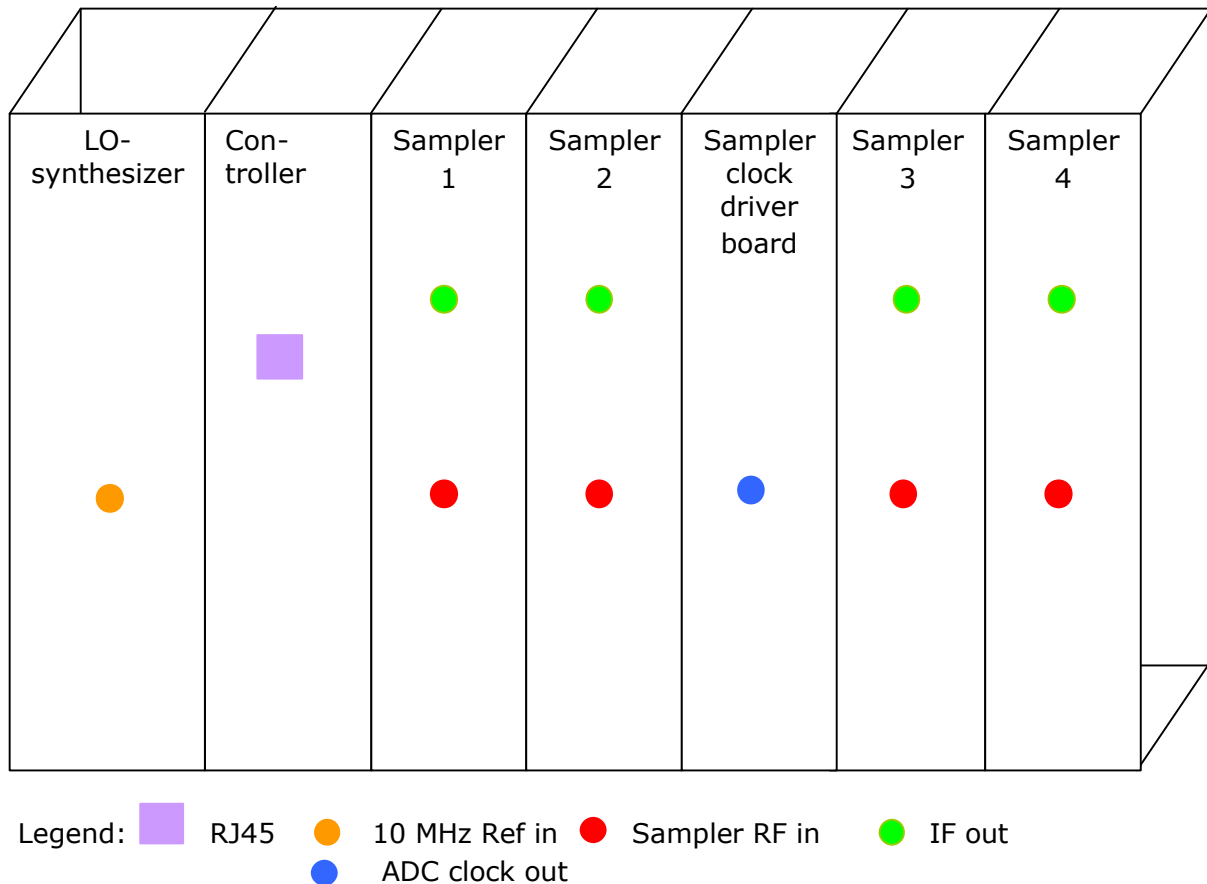


Fig. 2: Schematic view of sampling system (power supply not shown)

The main components of the sampling systems are:

- A) LO-synthesizer providing a programmable sampling clock frequency locked to the external reference signal
- B) Clock driver providing up to four sampling clocks with defined level and rise/fall time
- C) Sampler cards, consisting of a carrier PCB providing DC and sampler biases to the sampler modules mounted on these cards
- D) Controller and DC-conditioning board controlling all internal hardware, providing the external Ethernet interface and supplying power to all boards

The block diagram (Fig. 3) shows how these main function blocks are interconnected.

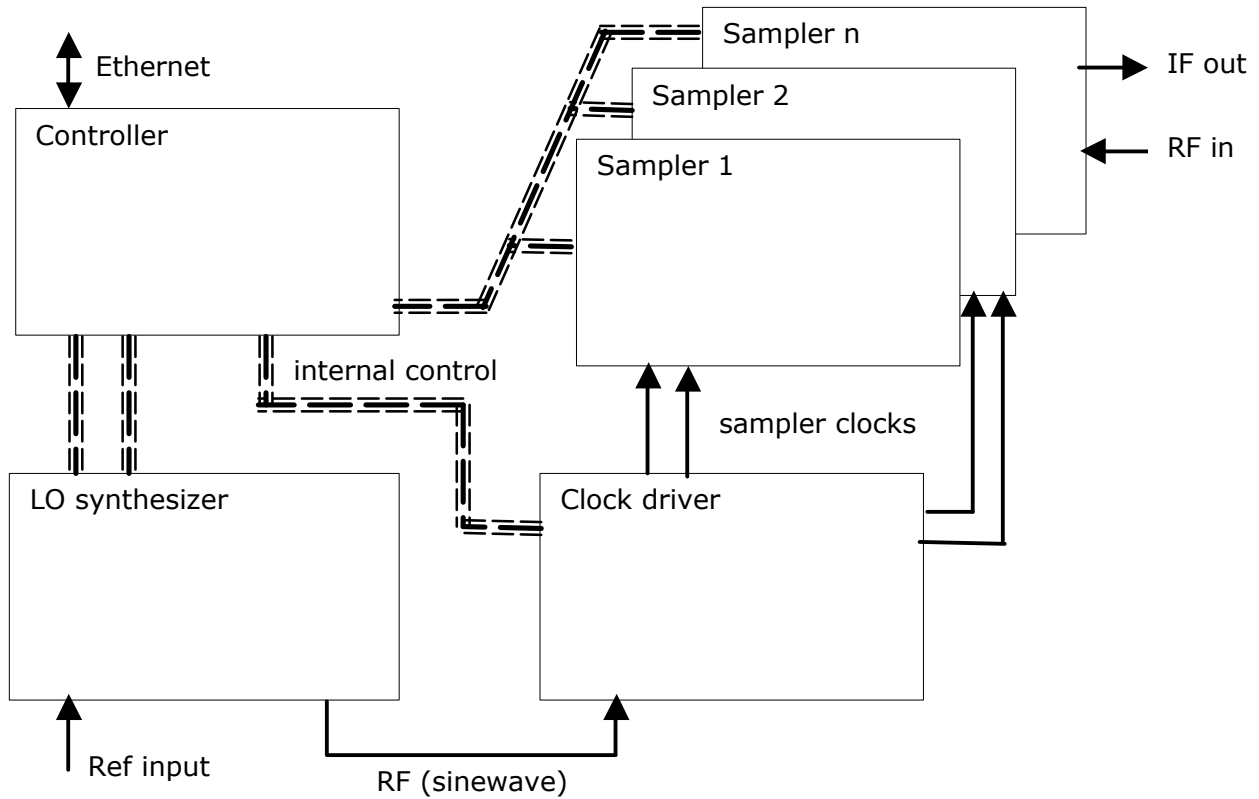


Fig. 3: Block diagram of APCON4 sampling system

All internal RF connections are made with 50 Ω coaxial cables, internal DC and control signals are distributed by ribbon cables.



3. RF signal connections and general setup

The location of the sampler RF input and IF output connectors, the reference input and ADC clock output, and the RJ-45 connectors given in Fig. 2.

When making these connections, please follow the hints below:

- All RF connectors are SMA female.
- All RF inputs and outputs are sensitive to ESD, so please use standard precautions.
- The system does not have an internal reference, therefore the user must provide an external reference. The reference signal must be a very stable signal with sufficient amplitude, see the specifications.
- The sampler RF inputs and IF outputs are DC coupled. **CAUTION:** The internal loads of the samplers will be damaged by static electricity or when applying more than +/-1.5 V DC or AC(rms).
- The DC offset at the sampler IF output is dependant on the sampling rate. Offset compensation may be necessary when going to an ADC.
- In two-channel systems, the ADC clock output is taken from the third sampling channel C, to enable it, set the channel C = ON in the control SW.
- The hardware must be powered-up before the SW can establish a connection, the power-up takes a few seconds. After initial power up, the samplers and their clock signals are switched to the OFF state.
- Avoid powering up and down in short intervals (<10 sec) as this may put the system in an undefined state.



4. Specifications

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
sampling frequency range	f_s	13		1000	MHz	
sampling freq. step size	f_{step}		1		Hz	1
reference input frequency		10		100	MHz	
reference input impedance			50		Ohm	
Reference input level		3		13	dBm	
Reference input slew rate		200			V/ μ s	
RF input signal bandwidth			12	18	GHz	2
IF output signal bandwidth			$f_s/30$		MHz	
Input voltage range		-1.5 -1		1.5 1	V	3a 3b
Output offset		-1	tbd	+2	V	4
RF Input impedance			50		Ohm	
Input return loss	S11			-10		5
IF output impedance			50		Ohm	
Conversion gain		-6	-3	0	dB	6
Spurious free dynamic range			60		dB	
Aperture jitter			150		f_{sRMS}	7
Output noise level			0.5		mV_{RMS}	8
Latency			6		ns	
Controller interface			10		Mbps	9
Mains power supply		100		240	V AC	10
Power consumption			50		W	

Notes:

1. varies with output frequency but minimum 1 Hz always met
2. with SMA connectors
3. a) <10% error b) for $\leq \pm 2\%$ linearity error
4. depending on sampler bias setting
5. connector dependent, with SMA up to 15 GHz
6. at 100 MS/s and 0 V sampler bias, depending on sampling rate
7. integrated from 10 kHz to half of sampling frequency
8. noise integrated up to sampling rate
9. standard RJ-45 Ethernet connector
10. universal with automatic switching, 50 ... 60 Hz



5. Absolute maximum ratings

Parameter	Symbol	Min.	Max.	Units	Note
RF input signal voltage range	V_{RF}	-2	+2	V	1
Continuous Input Current at RF input	I_{RF}	-25	+25	mA	1
Reference input power			+13	dBm	
IF signal voltage	V_{IF}	-5	+5	V	
Continuous output current at IF output	I_{IF}	-80	80	mA	
Mains power voltage		100	240	V AC	
Operating temperature range	T_{amb}	10	45	°C	2
Storage Temperature	T	-20	80	°C	

Notes:

1. DC + AC peak
2. adequate air flow is required when mounted in a rack enclosure

6. Known issues

- tbd

7. Document History

Version/Status	Date	Author		Notes
V11	29/10/07	ul		