Transient Recording with a uDIMM

EPICS Collaboration Meeting: Embedded Controllers

Argonne, June 15. 2006

Matthias Clausen on behalf of
Erwin Gadwinkel and Albert Kagarmanov
DESY Cryogenic Controls

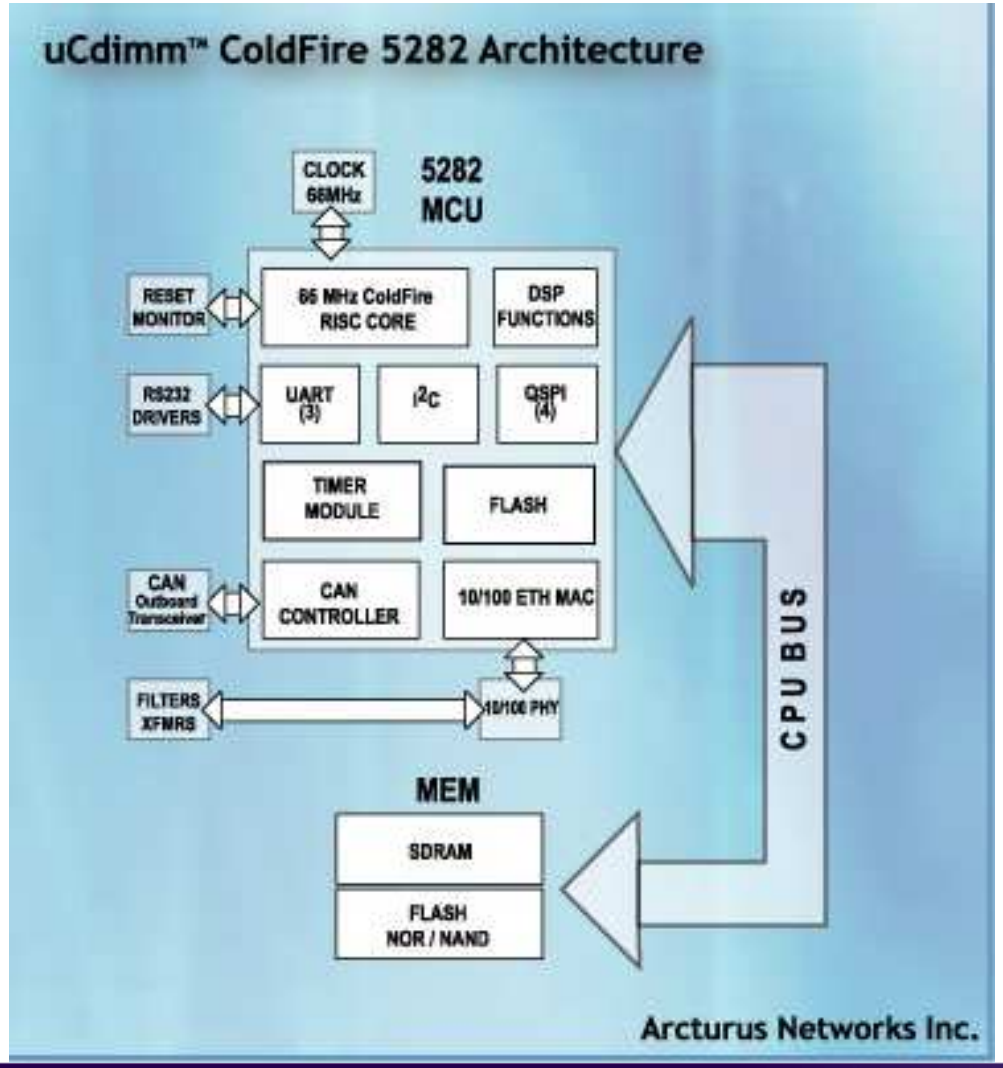
Realizing a Transient Recorder by the use of the µCDIMM with MCF 5282 from Arcturus Networks

The µCDIMM

40 mm

68 mm

From the Web-Site: http://www.arcturusnetworks.com/coldfire5282.shtml

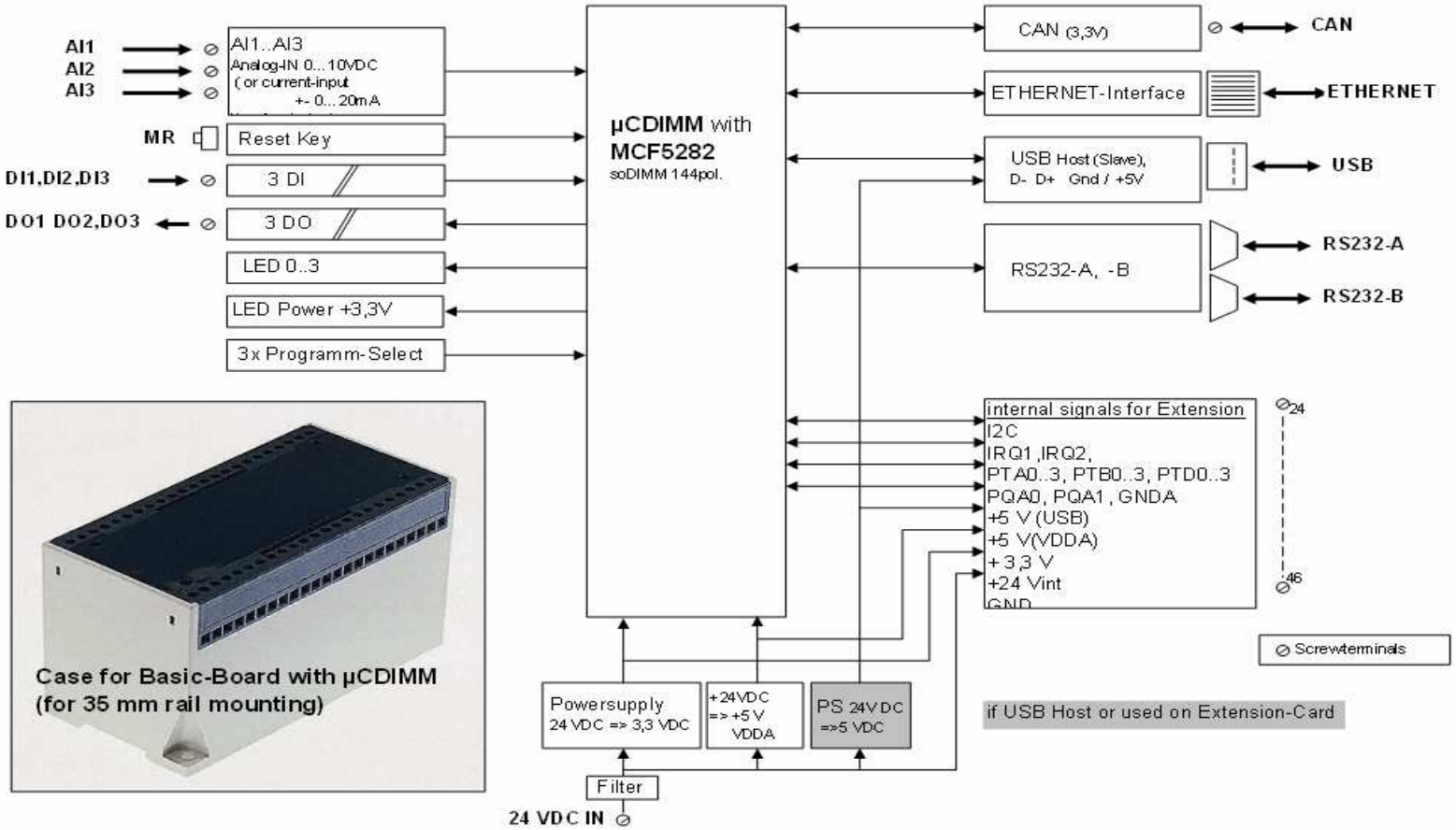


Hardware Support

- 8/16 MB RAM
- 4/8/16 MB NOR Flash
- NAND Flash Version Available
- 66 MHz ColdFire RISC Core
- 32 Bit wide SDRAM addressing
- 512KB on-chip flash
- 64 Kbytes of static RAM
- eMAC DSP functionality
- 10/100 Ethernet MAC
- Ethernet PHY
- CAN 2.0 Bus interface
- Two RS232 serial UARTs
- QSPI with four chip selects
- QADC A-to-D converter
- Four 32-bit timers
- Eight 16-bit timer channels
- Four periodic interrupt timers
- I2C bus controller
- 16 dedicated GPI/O
- BDM for debug
- Operation from -40C to +85C

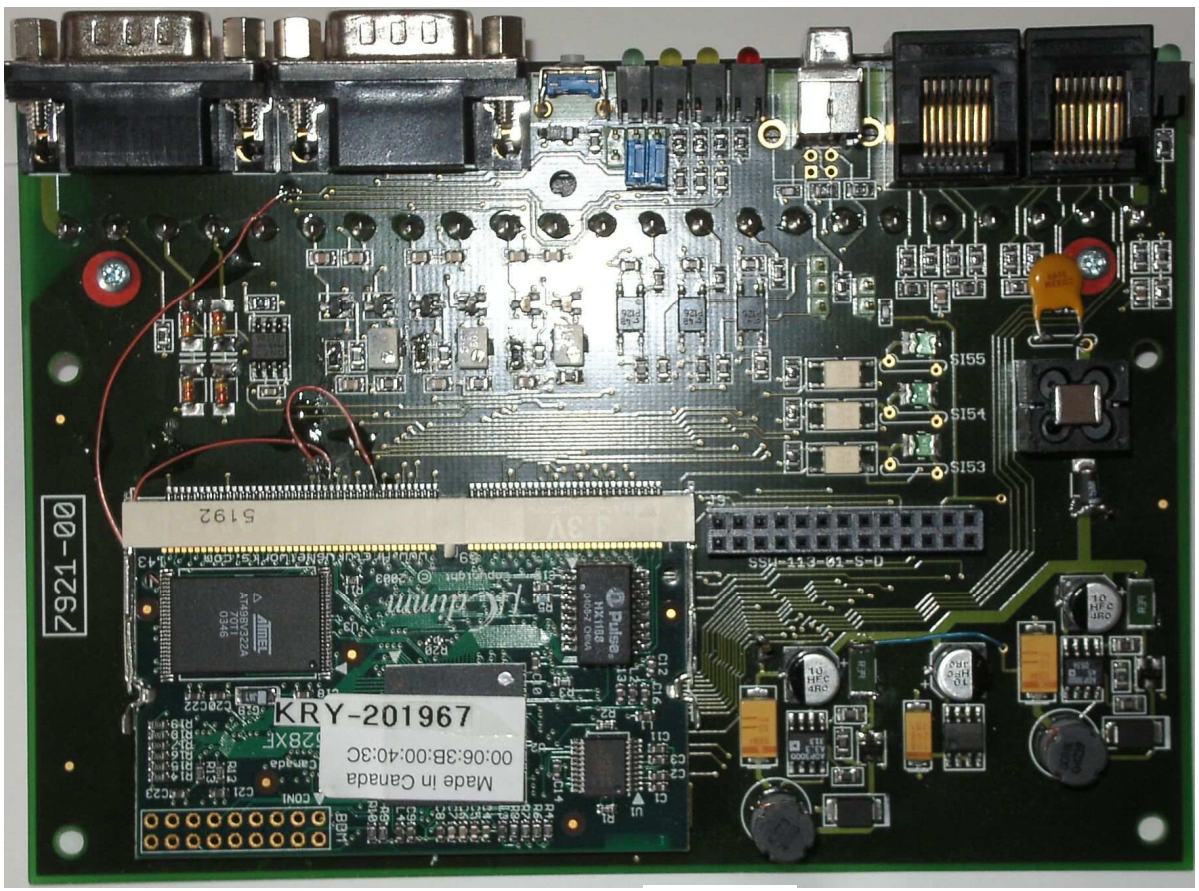
Realizing a Transient Recorder by the use of the µCDIMM with MCF 5282 from Arcturus Networks

Developed Basic-Board with µCDIMM (MCF 5282) / realized I/O-System



Realizing a Transient Recorder by the use of the µCDIMM with MCF 5282 from Arcturus Networks

Basic-Board with µCDIMM (MCF 5282) / Component placement

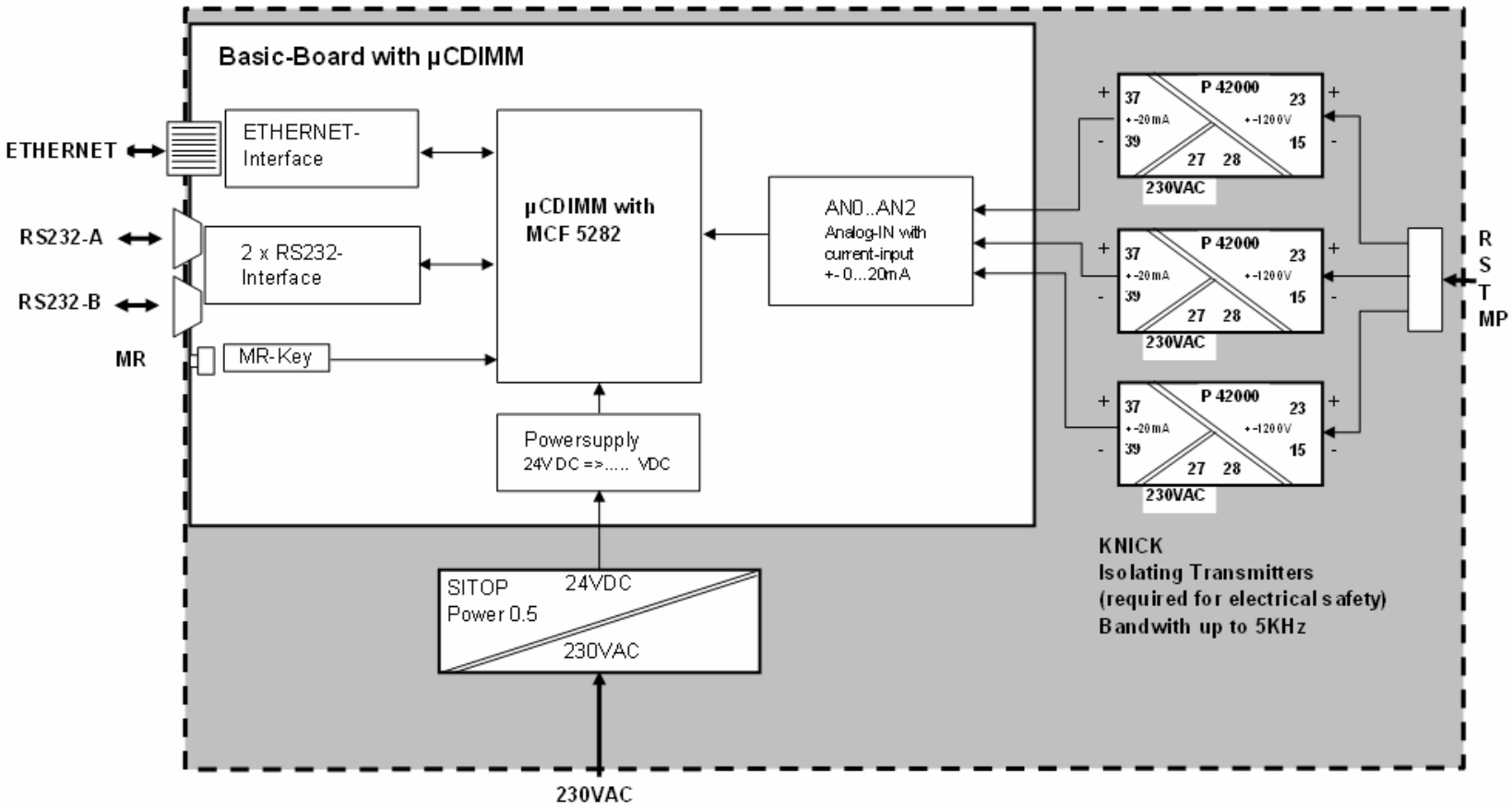


99 mm

143 mm

Realizing a Transient Recorder by the use of the µCDIMM with MCF 5282 from Arcturus Networks

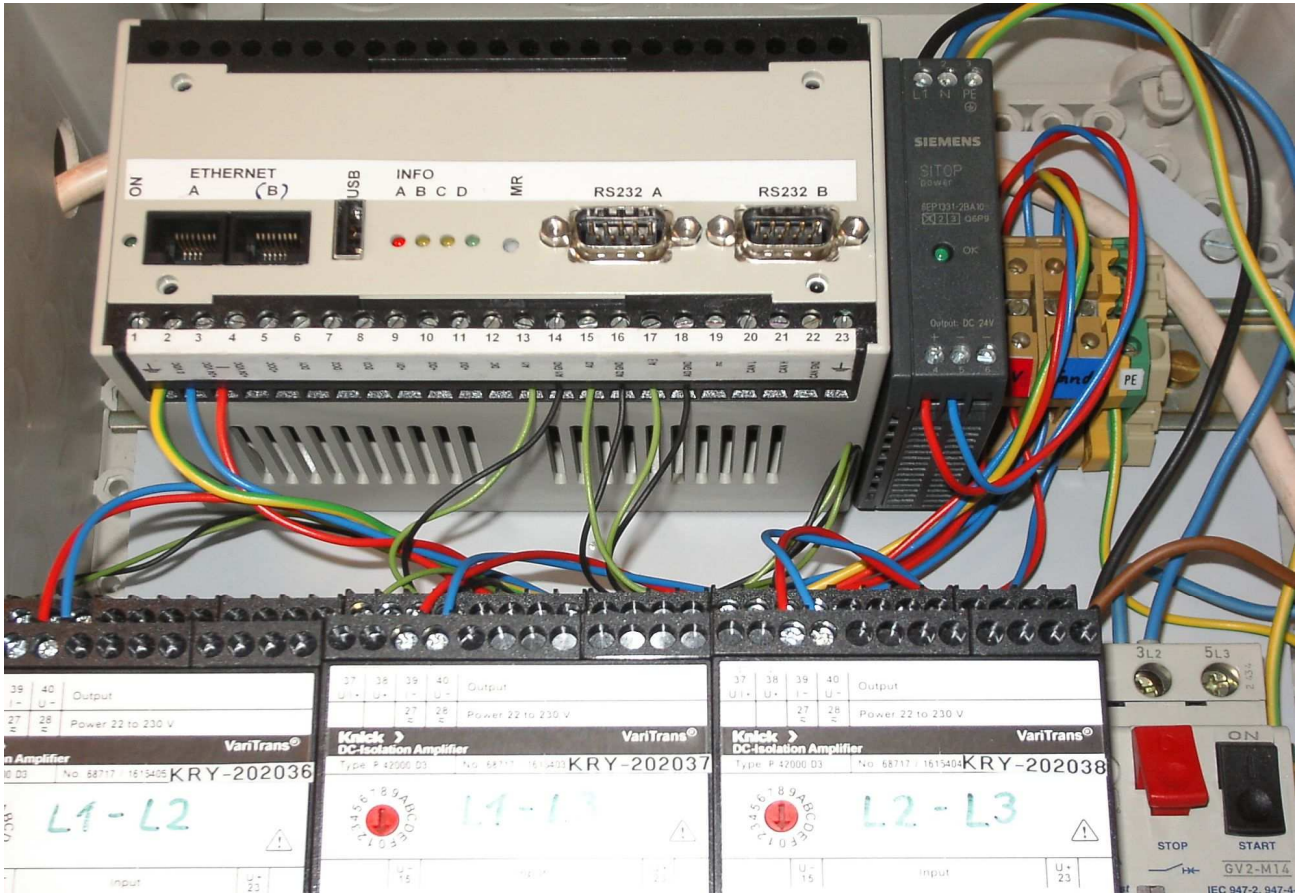
Using the Basic-Board with µCDIMM (MCF 5282) as a Transient Recorder to monitor the 3 Phases (R S T) of a 400 VAC Power System



Matthias Clausen, Erwin Gadwinkel, Albert Kagarmanov DESY

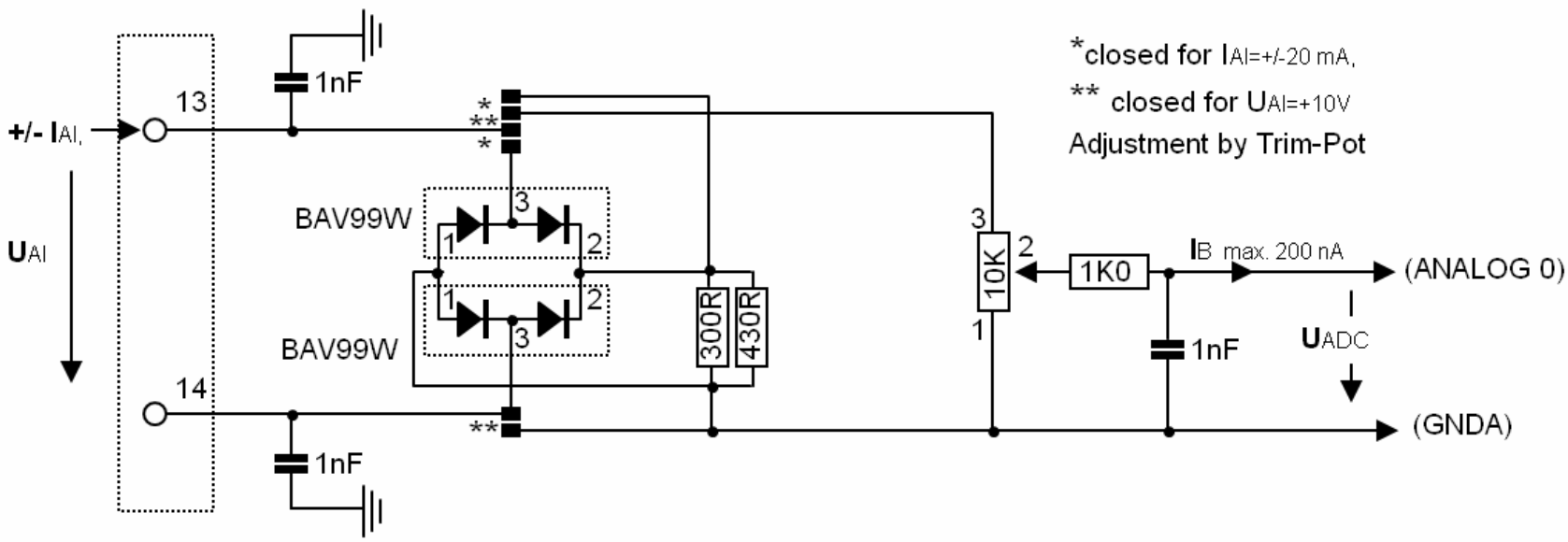
Realizing a Transient Recorder by the use of the µCDIMM with MCF 5282 from Arcturus Networks

Using the Basic-Board with µCDIMM (MCF 5282) as a Transient Recorder to monitor the 3 Phases (R S T) of a 400 VAC Power System



Realizing a Transient Recorder by the use of the µCDIMM with MCF 5282 from Arcturus Networks

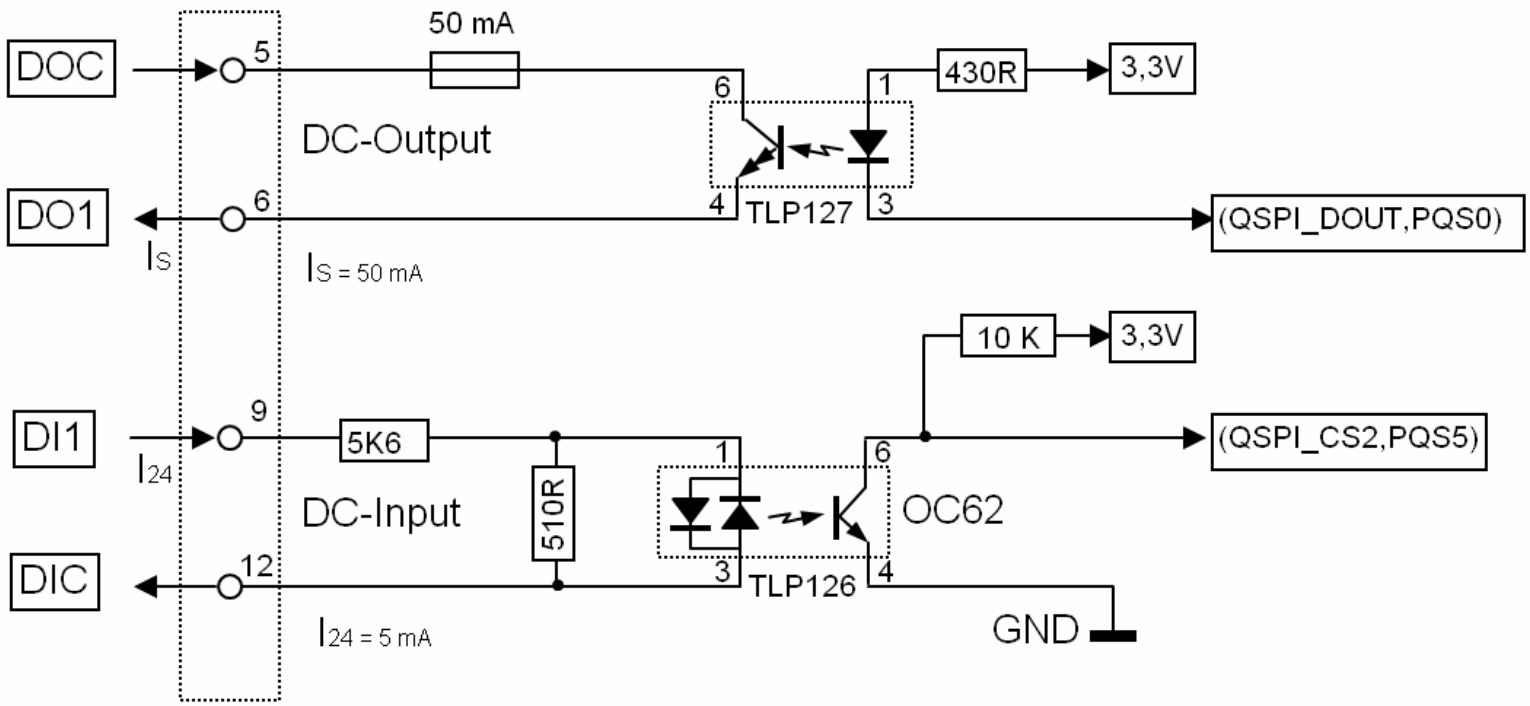
µCDIMM Basic-Board Analog-Input-Configurations (for each Channel, Resolution 10 Bit)



With this input circuit it is possible to measure currents in the range of 0….+/-20 mA or voltages in the range of 0….3.3 V up to 20 V

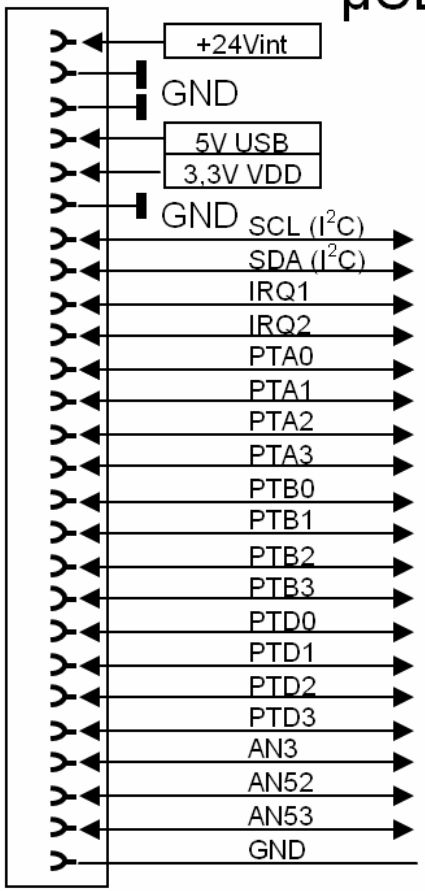
Realizing a Transient Recorder by the use of the µCDIMM with MCF 5282 from Arcturus Networks

µCDIMM Basic-Board Digital-Input-Output-Circuits



Realizing a Transient Recorder by the use of the µCDIMM with MCF 5282 from Arcturus Networks

µCDIMM Basic-Board Extension-Connector



The used housing allows a second board of the same size as the Basic-Board. This second board can be connected to the Extension-Connector and can carry a variety of special circuits.

Example: Circuit with 24 opto isolated digital inputs to fast monitor 24 digital signals in a control system in case of fault finding

(Hardware) Outlook

With the developed Hardware around the µCDIMM it will be possible to use the unit in many Applications.

The possibility to add an Extension-Board to the Basic-Board in the same Case opens even more Application Areas.

Note:
All the Applications need hardware and software !

Software Support

Using the uDimm for a transient reorder was triggered by a presentation from Eric Norum about one year ago.

- uDimm provides all he necessary functionality for a transient recorder on the chip
- Rtems support for the uDimm allows to run EPICS natively

After having made the decision to use the uDimm we've got a lot of support from Eric

- Getting Rtems running
- Support for Generic Transient Recorder (GTR)
- powerMonitor record support
- Driver for the ADC on the uDimm

EPICS Database

Generic Transient Recorder records:

- **http://www.aps.anl.gov/epics/modules/analog/qtr/R1-2/qtr.html**
- **http://www-csr.bessy.de/control/Epics02/THU-AM/pdf/transientRecorders.pdf**

Additional records

- **Beside raw value waveforms -> EGU based waveforms**
- **Utility records**

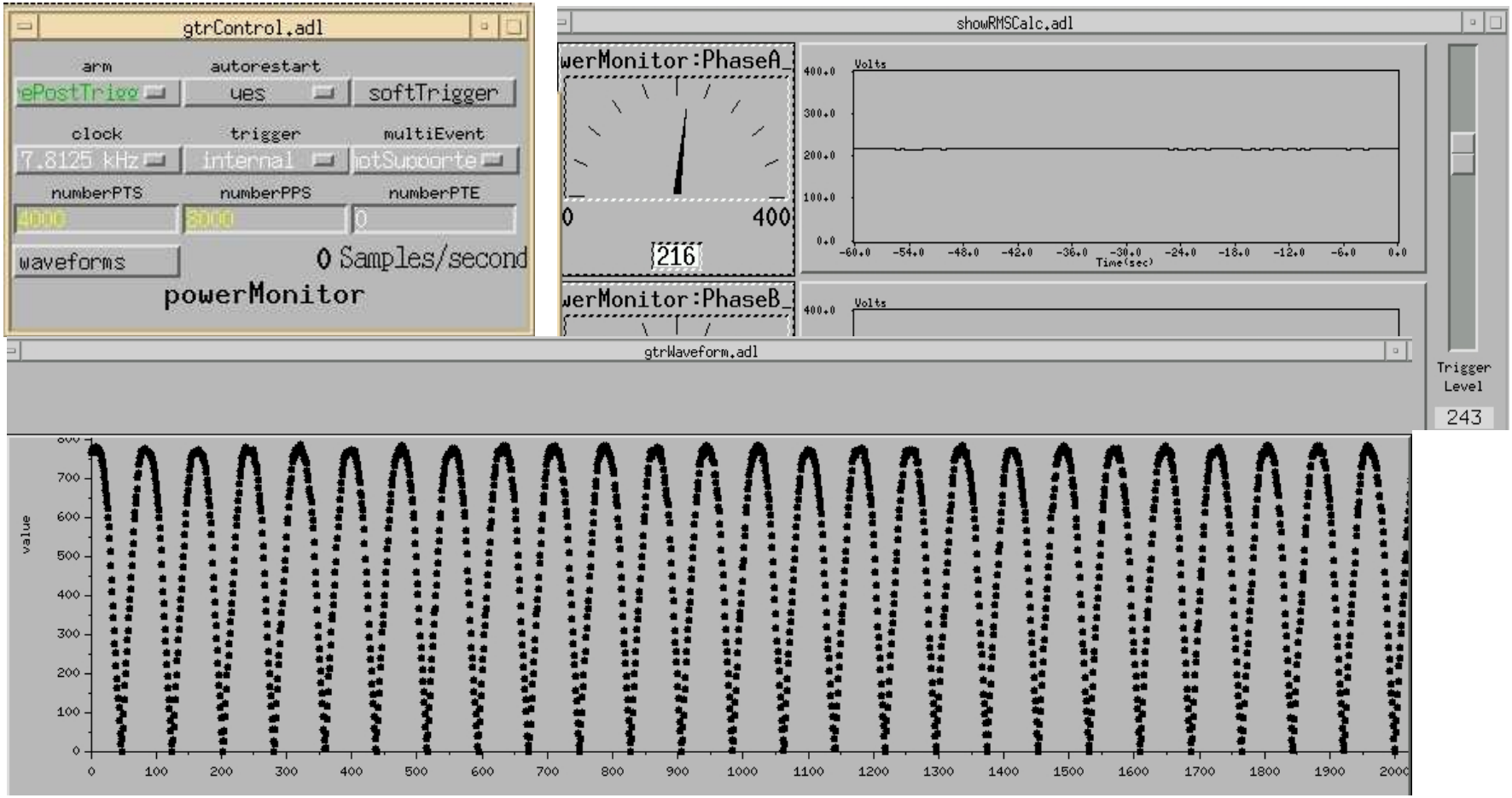
Some Information on Software

- Epics R3.14.8.2 RTEMS on uDimm ColdFire 5282
- Freq=50Hz, RMS_SAMPLE_COUNT = 156
- Currently default number of points
  - numberPTS (number of post trigger samples to take)=8000
  - numberPPS (number of prePost samples)=4000

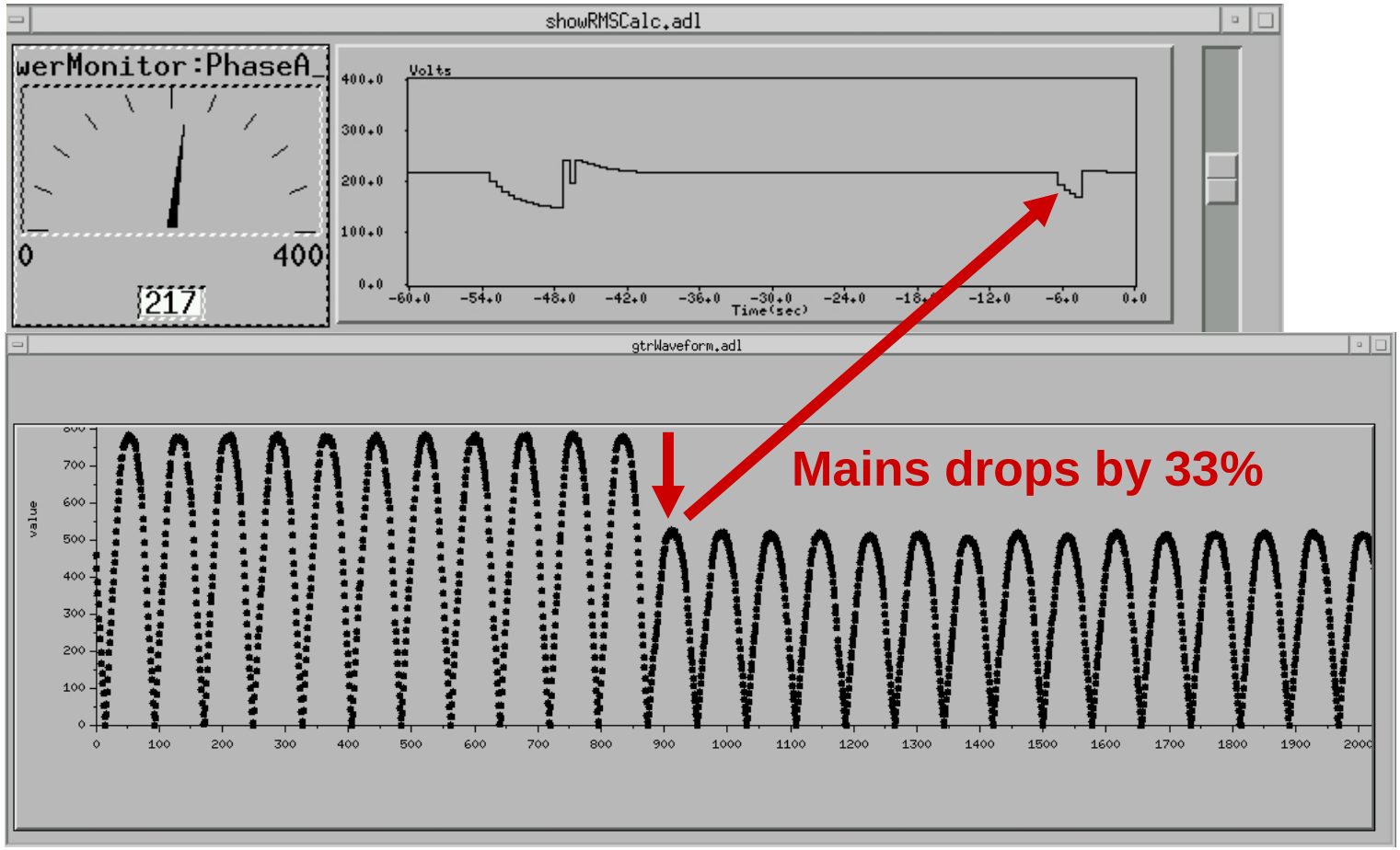
- Add new records
  - powerMonitor:uniPolarInput (biPolar current if 0, otherwise unipolar)
  - powerMonitor:RawA_ai (ai-raw value, not so useful, mostly for testing) for simplify count2Volts understanding we're adding
  - powerMonitor:PhaseA_calc - RMS in volts
  - powerMonitor:HIGH_ao - default level in volts i.e. 220 380 etc
  - powerMonitor:RawVeff_ao
  - max Veff for triggering in volts i.e 240, 390 etc

Screendumps from a ‚sign wave‘

(flipped by harware to gain resolution)



Screendumps: Power-Failure Simulaion



Outlook

About 20 units will be installed at DESY

Additional Applications possible

- Transient recorder for digital values
- Adding 16bit ADC to extension port

Thanks to Eric for his help!!