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# **HW Functional Specification of Condor/Raven Meters**

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## Document Revisions

Revision	Date	Author	Description
01	12/18/00	VK	Original Document

## 0.0 Related Documents

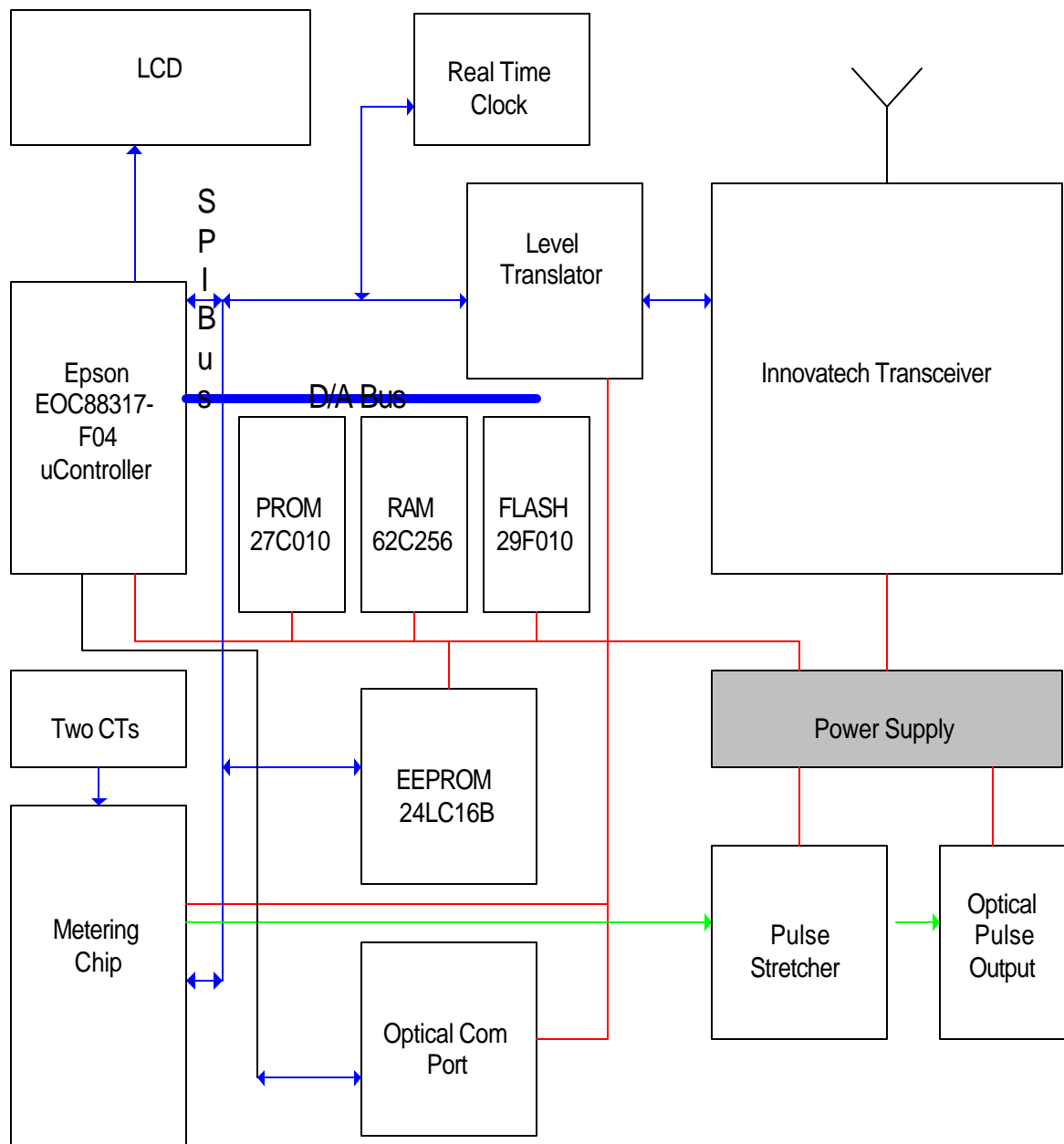
	Document	Author	File Name
1	Residential Energy Meter Requirements Rev 3.00	Fred Schleifer	Spec300.pdf
2	Network Communications Firmware Specification Ver. 0.97	Innovatec Corp.	
3	Power Supply Specification		PS_Specs.pdf

## 1.0 Introduction

This specification describes the architecture and basic functional operation of Condor/Raven Meter (Meter from here on) – the device for measurement of electrical power (energy) supplied to the consumer and for communication with the nearby Gateway Node.

## 2.0 Hardware Specification

The following diagram illustrates the architecture of the Meter.



### Fig 1. Meter Block Diagram

## **2.1 Liquid Crystal Display**

Radio Meter has an LCD with 7 digits and 7 decimal points. The LCD is configured as 8x9 matrix with the following pinout:

P#	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Name	R0	R1	R2	R3	C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	R4	R5	R6	R7

## **2.2 Epson EOC88317 MicroController**

The MicroController used in the Meter is EOC88317-F04. The main functions of the MicroController are:  
Driving the LCD,  
Receiving data from the Metering Chip,  
Storing calibration and configuration parameters in the EEPROM,  
Communicating with Innovatec Transceiver,  
Communicating with external optical devices.

## **2.3 Current transformers**

Meter has to be able to work with split phase power lines and therefore to measure current in both power lines. The Meter has two Current Transformers and the circuitry for summation of two signals. Current transformers' ratio is 1000 : 1 and maximum measurable current is 200A.

## **2.4 Metering Chip**

The CS5460 is a highly integrated Delta-Sigma Analog-to-Digital Converter (ADC), which combines two Delta-Sigma ADCs, high-speed power calculation functions, and a serial interface on a single chip. It is designed to accurately measure and calculate: Energy, Instantaneous Power, I RMS , and V RMS for single phase 2 or 3-wire power meter applications. The CS5460 interfaces to a CT to measure current, and resistive divider to measure voltage. The CS5460 features an SPI interface for communication with a MicroController and a fixed-width programmable frequency output that is proportional to power. The chip is initialized and fully functional upon power-up, and includes facilities for system-level calibration under control of the user program.

The chip has the following technical characteristics:

- Energy Data Accuracy: 0.1% of Reading in 1 Second over 300:1 Dynamic Range
- On-Chip Functions: Energy, I \*V, I RMS and V RMS , Energy to Pulse-Rate Conversion
- Complies with IEC 687/1036, JIS
- Power Consumption <12 mW
- Interface Optimized for Shunt Sensor
- Phase Compensation
- Ground-Referenced Signals with Single Supply
- System Calibration
- On-chip 2.5 V Reference (60 ppm/°C drift)
- Simple Three-wire Serial Interface
- Watch Dog Timer
- Power Supply Monitor
- Power Supply Configurations
- VA+ = +5 V; VA- = 0V; VD+ = +3 V to +5 V
- VA+ = +2.5 V; VA- = -2.5 V; VD+ = +3 V

## **2.5 Real Time Clock**

The Real Time clock is based on Dallas DS1306 chip and 32.768kHz crystal and provides accuracy of 20ppm. The chip communicates with the MicroController via SPI interface.

## **2.6 Level Translator**

The Level translator is needed to communicate with Innovatec transceiver. It is implemented on TC74AC244 chip.

## **2.7 EEPROM**

The EEPROM is 24LC16B and works down to 2.5V.

## **2.8 Optical Communication Port**

Optical Communication Port uses 38kHz carrier frequency.

## **2.9 Power Supply**

The Power Supply is a Printed Circuit Board Assembly from Artesyn. See PS\_Specs.pdf.

## **2.10 Pulse Stretcher**

The Pulse Stretcher is needed to expand the pulses from Metering chip to ~60ms.