RedWave Labs

Operating manual

## Universal platform for spectroscopic instruments

Contents

Introduction

Universal platform for spectroscopic instruments will cover all electronics requirements for power, data processing, signal acquisition and control, data storage and external communications.

All necessary power rails are provided by backplane with integrated charging capabilities.

Linux based Kontron CPU (COM Express) with additional high end FPGAs and MCUs allows to process all signals in real time and increase overall system refresh rate.

All (or optional) plug-ins can be installed depending on the end user application. This allows additional cost and power saving.

All boards can have conformal coating for humidity protection.
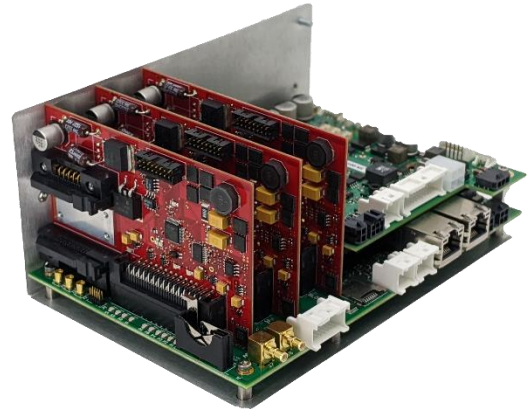
Full system description

Full system has following parts:

1. Open Express CPU. Currently Kontron Apollo series.
2. S350 backplane with following capabilities
   a. 4 USB 2.0 ports available directly including keybord and mouse, one USB 2.0 on LVDS connector, one USB 2.0 mPCI express card, one to S370 isolation board.
   b. 2 Ethernet ports, MODBUS over TCP/IP
   c. HDMI port and LVDS interface.
   d. SATA connector
   e. Memory card / micro/ for data storage
   f. Analog input Slow 16 SE (or 8DI) 24 bit 1kS/s
   g. Analog output 8 SE 16 bit 1kS/s Analog output,
   h. Digital IO x 8 bidirectional DIO at 1 kHz,
   i. 2 SE 18 bit 2 MS/s Analog input,
   j. 3 SE 16 bit Analog output with settling time 800 ns,
   k. 4 fast bidirectional DIO connected directly to plug-in cards. They are DO by default
   l. On board buffer of 8kS for fast signal sampling / shared between channels/
   m. Open Express connector / type 6/
   n. Digital PWM control for Valve and proportional valve with dedicated MCU
   o. I2C and SMB connector for external devices / via S360 board/
   p. Dedicated DO lines for gain*bandwidth control on the detector
   q. EEPROM for serial number and system description storage

3. S360 is the power supplies and battery charger for entire system. S360 also has connector for external signals as S350 has limited area for external connectors. S360 has following capabilities
   a. +12.0V 3.0A
   b. +12.0 V 1.5A clean / to drive laser cards/
   c. +12.0V 1.0 A separate power rail for Kontron CPU

    d. +5.0 V 5 A

    e. +3.3V 5.0 A

    f. -12 V 0.5 A

    g. Battery charge 3or 4 cell and 4.1A4.2V per cell voltage options 4A max current.

    h. Internal EEPROM for calibration storage

    i. Internal ADC for rail check

4. C155 NEL (C156 EagleYard) Laser driver with same functionalities as standard C150 driver. All TEC control will be done with build-in digital PID. Each card will have flash memory to store serial number and base test results.

    a. Laser current control 0-200 mA,3 V compliance voltage, 200 kHz bandwidth, 4 nA/sqrt(Hz) noise.

    b. Laser TEC control +/-1.0A, 3V compliance voltage with digital PID

    c. Current monitor

    d. Laser photodiode monitor

5. RedWave Labs provides drivers/firmware, BSP for S350 and S360, full communication compiled libraries and drivers for S350 and all plug-in cards, including laser drivers. Extensive example code will be provided for all relevant APIs.

S350 Backplane

Parameter		Value
CPU	Processor	Kontron Apollo
	Memory	Up to 4 GB on Apollo
	Storage OS	Up to16 GB on Apollo
	Storage Data	Up to 32 GB Micro Sd card. EEPROM for calibration
	Connectivity	Ethernet x 2, 2 x USB 2.0, 1 x USB 2.0, Modbus over TCP
	Externa Bus	mPCIe, full length
	Video	HDMI, LVDS + USB 2.0
	Control	Keyboard, mouse (2 x USB 2.0)
Plug-In Slots	3 slots able to accommodate C155 with connector	
DAQ	Slow AI	24 bit x 16 SE (8 DI) channels, 1 kS/s, PGA (1-128), -10$\rightarrow$+10V
	Slow AO	16 bit x 4 SE channels, 1 kS/s, -10$\rightarrow$+10V
	Fast AI	18 bit x 2 SE channels, 2 MS/s, -10$\rightarrow$+10V
	Fast AO	16 bit x 3 SE channels, 800 ns settling time, -10$\rightarrow$+10V
	Buffer	8 kS
	DIO	8 slow (10 μs) bidirectional, 4 out fast integrated (20 ns)
Dimensions (WxHxD)	4 x 6 x 1 inch	
Weight	<600 g	
Operating Temp	-40-85 C	
Restrictions	EAR99	

S360 Power

Parameter		Value
Power	Input	10 – 30 V
	Power rails	+12 V / 3 A; +12 V / 1.5 A, +12 V / 1.0 A (dedicated to CPU), 5 V / 5 A, 3.3 V / 5 A, -12 V / 0.5 A
	Ripple	Less than 0.5 % at 20 MHz measurement bandwidth
Charge	Input	10 - 30 V
	Current	Up to 4 A
	Battery type	4.1/4.2 V per cell, 3 or 4 cells
Storage and communication	Internal EEPROM store calibration data and ADC to monitor voltage rails. API libraries and driver for S350 (Linux)	
Dimensions (WxHxD)	4 x 10 x 1 inch	
Weight	100 g	
Operating Temp	-40-85 C	
Restrictions	EAR99	

PC201D Pressure controller (integrated into S360)

Parameter		Value
Pressure	Sensor	external
	Set point	0-10 V
	Current	1 A max
	Polarity	Unipolar, upstream and downstream controller
	Control	Digital PID
	PWM frequency	5-200 kHz, 20 kHz default
Communication		API libraries and driver for S350 (Linux)
Dimensions (WxHxD)		Integrated in S350
Weight		Integrated in S350
Operating Temp		-40-85 C

C155 Laser controller (C155 is for NEL and C156 for EagleYard)

Parameter		Value
Laser driver	Current	0-250 mA, transfer function 20 mA/V
	Bandwidth	DC-250 kHz
	Noise	Less 3 nV/sqrt(Hz) at 10 kHz, less 2 μA integrated
	Drift	50 ppm/C
	Connectivity	Azimuth connector, and connector for the external laser mount if necessary similar to C150
	Digital modulation	TTL, rise/fall time 250 ns
TEC	Current	Bidirectional 1.5 A
	Compliance voltage	>8 V
	Sensor	Thermistor 2KOhm to 100KOhm
	PID	Digital
	Stability	1 mK/h for small loads
Communication	API libraries and driver for C155 (Linux)	
Dimensions (WxHxD)	4 x 2 x 1 inch	
Weight	100 g	
Operating Temp	-40-85 C	
Restrictions	EAR99	

Certification

RedWave Labs Ltd certifies that: i) the parts and/or materials were produced in conformance with all contractually applicable Government and/or Buyer's specification as referenced in, or furnished with, the above purchase order and ii) all processes required in the production of these parts and/or materials are listed and were performed by a facility or by personnel specifically approved or certified by the seller's cognizant government quality control agency when such approval or certification is required by an applicable specification. RedWave Labs products are not authorized for use in safety-critical applications (such as life support) where a failure of the product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use of the products.

Warranty and returns

C190 Laser Controllers are warranted against defects in materials and workmanship for a period of 180 days from date of shipment. During the warranty period RedWave Labs Ltd will replace or repair products which prove to be defective or damaged. Our warranty shall not apply to defects or damages resulting from: i) misuse of the product or ii) operation beyond specifications detailed in the current manual.

Return procedure

Customer must obtain a valid RMA number by contacting RedWave Labs prior to the return. In all cases the customer is responsible for duty fees incurred on all received shipments and on all international returns for both warranty and non-warranty items; the customer is responsible for any duties, brokers fees or freight charges deemed chargeable to RedWave Labs Ltd.

Revisions

Revision 1