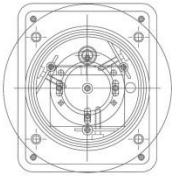


SPECTRA-1 Duct Monitor User Manual





About This Manual

Document Purpose and Intended Audience

This document provides the user of **Spectra-1** Duct Monitor gas analyzer with instructions for setting up and performing real-time measurements of select gases.

Document Summary

Chapter	Description
Chapter 1: User Information/Warranty	Contains descriptive information about Spectra-1 Duct Monitor laser based gas detection instrument. Warranty description.
Chapter 2: Set-up and operation	Provides set-up and installation instructions. System configuration and user settings overview.
Chapter 3: Troubleshooting	Contains recommended steps to isolate and correct common problems.
Chapter 4: Specifications	Contains technical specifications.



Chapter 1

User Information

Caution – use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Class 1 Laser Product

Spectra-1 contains no user serviceable components. All service work to be performed by PKL Technologies Inc. personnel only. Return **Spectra-1** to PKL Technologies Inc. for any service or repair work. **Spectra-1** is not to be opened or modified in any way – broken seal will void warranty.

Do not operate Spectra-1 if the unit is not complete.

No scheduled maintenance required for continued Class 1 compliance.

Please refer to Chapter 2 for proper instrument set up and operation – failure to do so may cause instrument damage or inaccurate data reported.

This Laser Product is designated as Class 1 during all procedures of operation.

Spectra-1 Serial Number:

Wavelength: nm

Laser Power for classification: <10 mW

Beam Diameter: <20mm at aperture

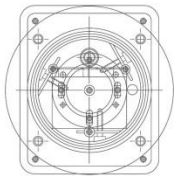
Divergence: >1.5 mrad

Transverse Beam Mode: TEM00

Emissions: Continuous Wave

Tested By:

Test date:



Warranty

PKL Technologies Inc. hereby represents and warrants all Products manufactured by PKL Technologies Inc. to be free from defects in workmanship or material during a period of twelve (12) months from the date of delivery. If any Product proves however to be defective in workmanship or material within the period herein provided PKL Technologies Inc. undertakes to the exclusion of any other remedy to repair or at its own option replace the defective Product or part thereof free of charge and otherwise on the same conditions as for the original Product or part without extension to original warranty time. Defective parts replaced in accordance with this clause shall be placed at the disposal of PKL Technologies Inc.

PKL Technologies Inc. also warrants the quality of all repair and service works performed by its employees to products sold by it. In case the repair or service works should appear inadequate or faulty and should this cause malfunction or non-function of the product to which the service was performed PKL Technologies Inc. shall at its free option either repair or have repaired or replace the product in question. The working hours used by employees of PKL Technologies Inc. for such repair or replacement shall be free of charge to the client. This service warranty shall be valid for a period of six (6) months from the date the service measures were completed.

The warranty is however subject to the following conditions:

a) A substantiated written claim as to any alleged defects shall have been received by PKL Technologies Inc. within thirty (30) days after the defect or fault became known.

This warranty does not however apply when the defect has been caused through:

a) Normal wear and tear or accident.

b) Misuse or other unsuitable or unauthorized use of the Product or negligence or error in storing, maintaining or in handling the Product or any equipment thereof.

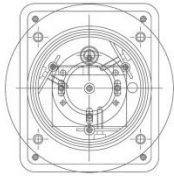
c) Wrong installation or assembly or failure to service the Product or otherwise follow PKL Technologies Inc. service instructions including any repairs or installation or assembly or service made by unauthorized personnel not approved by PKL Technologies Inc. or replacements with parts not manufactured or supplied by PKL Technologies Inc.

d) Modifications or changes of the Product as well as adding to it without PKL Technologies Inc. prior authorization.

e) Other factors depending on the Customer or a third party.

Notwithstanding the aforesaid PKL Technologies Inc. liability under this clause shall not apply to any defects arising out of materials, designs or instructions provided by the Customer.

This warranty is expressly in lieu of and excludes all other conditions, warranties and liabilities, express or implied, whether under law, statute or otherwise.



Set-up and Operation

Selecting Location

Spectra-1 is an open-path gas sensing instrument. A clear line of sight between the Spectra-1 remote transmitter and the remote photodiode receiver is required. Typical stack/duct applications provide for openings on opposite sides of the stack/duct. Where flanges are used ensure parallelism of opposing flange faces. The Spectra-1 remote transmitter is mounted on one side of the stack/duct, and the remote photodiode receiver is mounted on the opposite side of the stack/duct. Purge gas connections may be required – Nitrogen is typically used. Purge gas pressure should be set just above stack/duct pressure.

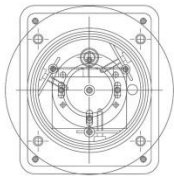
Remote Transmitter and Receiver Positioning

Spectra-1 remote transceivers are placed on an adapter flange with an adjustable mount. The adjustable mount is used to aim the Spectra-1 remote transceiver through the stack/duct onto the retro-reflector on the opposing side of the stack/duct. Adjustments will be required to adjust the remote transceiver to provide the desired signal level. This will be done after Spectra-1 is powered up.

An infrared sensor card is very useful for initial alignment through stack/duct.

A fiber coupled single mode visible laser source is also useful for alignment through the stack/duct.

The Spectra-1 remote transceivers are preconfigured for specified stack diameters and dust loading for optimal signal level.



Spectra-1 Control Unit



2 X 20 character LCD display:

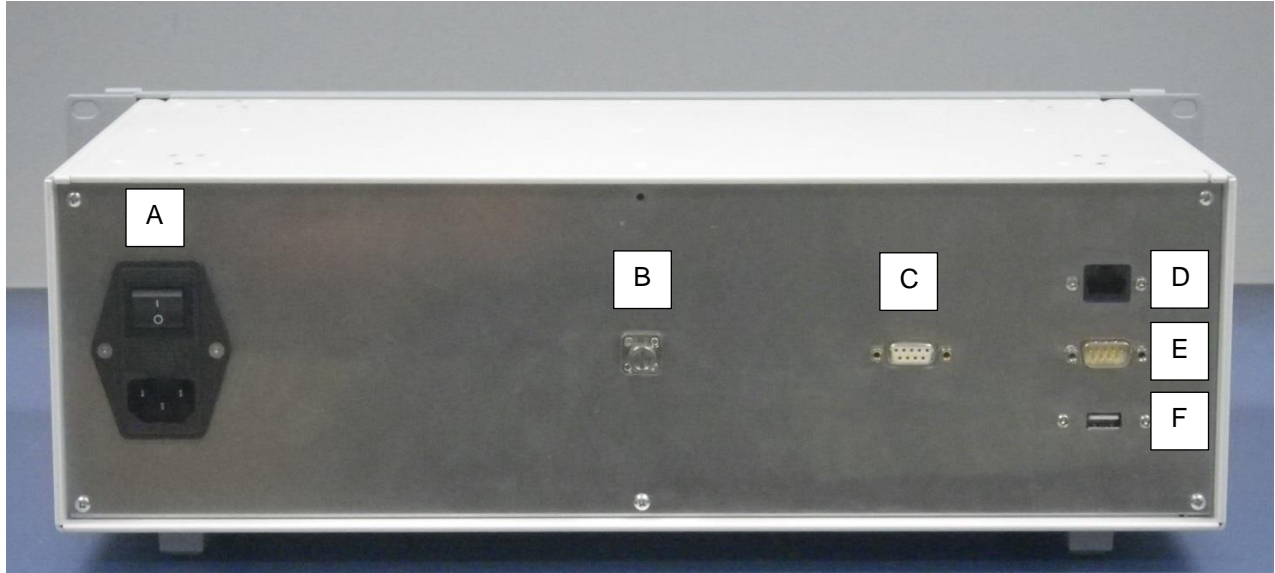
- gas concentration
- ppm or ppm-m
- distance (optical path length)
- signal level bar graph
- signal level % reading
- configuration/menu display

Keypad for system configuration:

- distance (stack or duct diameter – optical path length)
- gas concentration - ppm or ppm-m
- averaging time .5 to 60 seconds
- maximum signal level set (i.e. 95%)
- minimum signal level set (i.e. 2%)
- RS232 com port setting (baud rate)
- calibration settings (Factory Set)
- Spectra-1 settings output
- display IP address



Spectra-1 Control Unit – rear panel



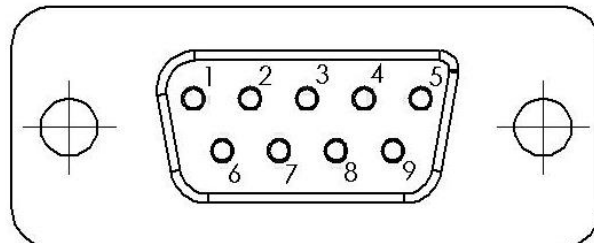
- A. ON/OFF Switch & 100-240VAC 50/60Hz input (Fuse 5mm X 20mm, 1A 250V)
- B. FC/APC single mode fiber optic output to remote transceiver
- C. Female DB9 power out / signal return to/from remote transceiver (see pin-out)
- D. RJ45 Ethernet socket
- E. Male DB9 RS232 serial data output (see pin-out) (Null modem cable required)
- F. USB

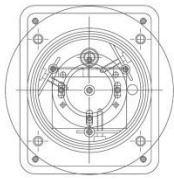
RS232 Serial Output Pin-out:

[Rear panel E]

DB-9 Male

- Pin 1: NC
- Pin 2: Rx
- Pin 3: Tx
- Pin 4: NC
- Pin 5: Gnd
- Pin 6: NC
- Pin 7: NC
- Pin 8: NC
- Pin 9: NC

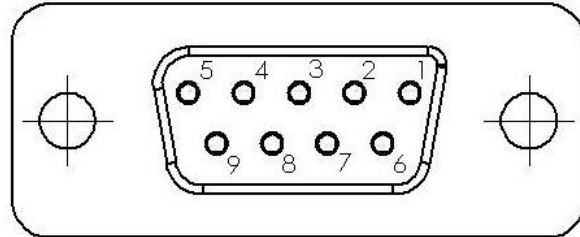




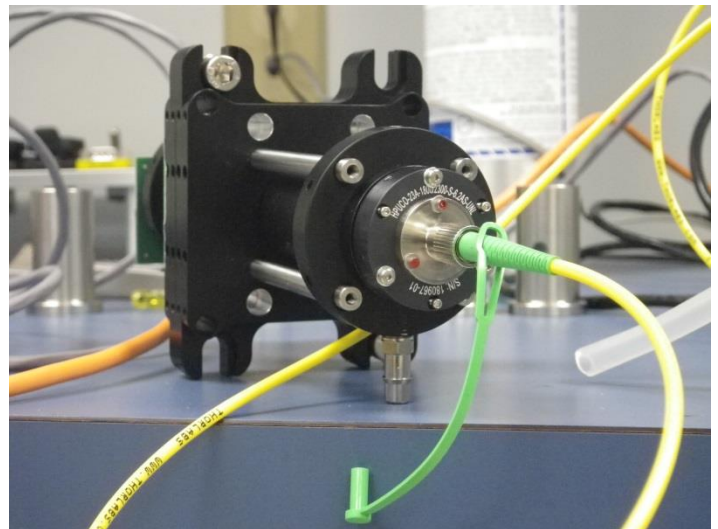
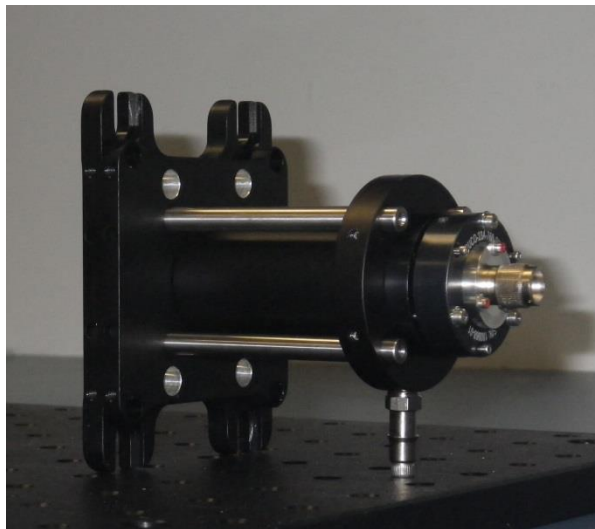
Remote Receiver Power & Signal Return Pin-out: [Rear Panel C]

DB-9 Female

- Pin 1: Signal Return – (Alpha 6460 Blue)
- Pin 2: Signal Return + (Alpha 6460 Orange)
- Pin 3: NC
- Pin 4: -12 VDC (White)
- Pin 5: +12 VDC (Green)
- Pin 6: Cable Shield (Alpha 6460)
- Pin 7: NC
- Pin 8: NC
- Pin 9: DC Ground (Black)



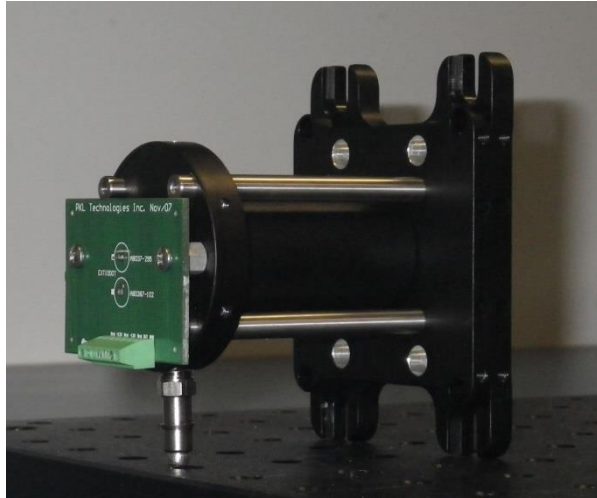
Spectra-1 Remote Transmitter



Adjustable FC/APC fiber optic connector for Single Mode fiber cable. Adjustments are used to aim outgoing laser beam onto opposite mounted remote photodiode receiver.



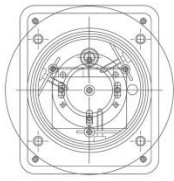
Remote Photodiode Receiver



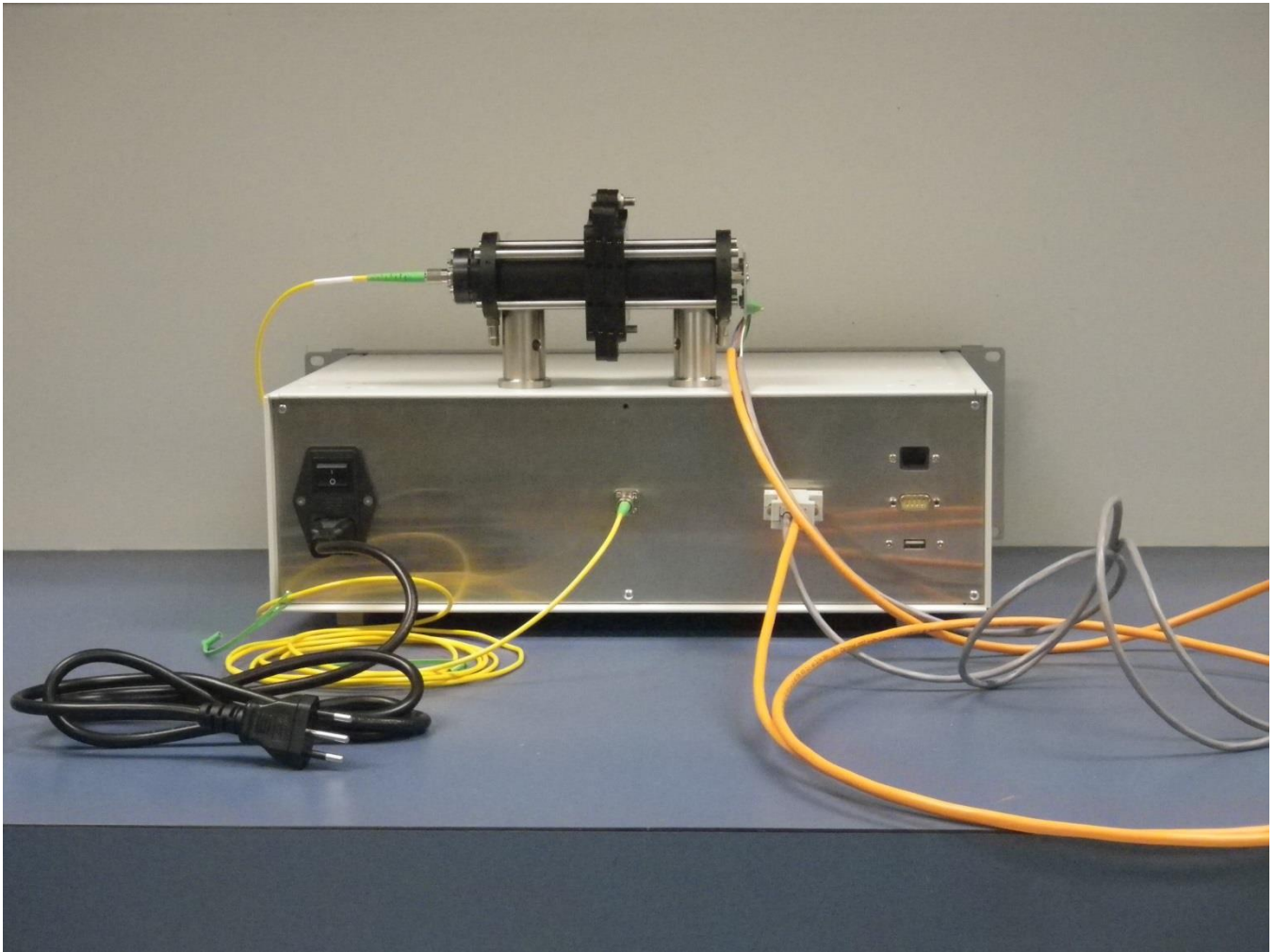
Remote Photodiode Wiring:

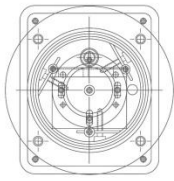
Labeled on photodiode PCB.

1. - 12 VDC (White) Shielded 18 AWG Cable
2. DC GND (Black) Shielded 18 AWG Cable
3. + 12 VDC (Green) Shielded 18 AWG Cable
4. Out Gnd Return Signal - (Blue) ALPHA 6460 Cable
5. Out Return Signal + (Orange) ALPHA 6460 Cable



Rack Mount Controller with Remote Transmitter and Photodiode Receiver:





Spectra-1 Start-up



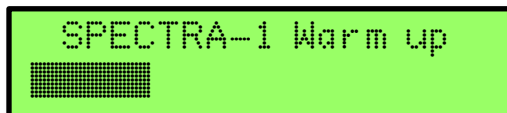
Power switch is turned on. Spectra-1 will display:

PKL TECHNOLOGIES INC
SPECTRA-1 BOOTING

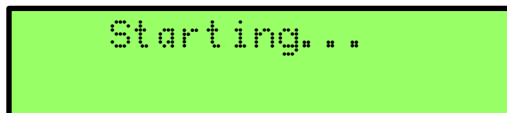
This will be displayed during internal computer boot-up – approximately 2 minutes.



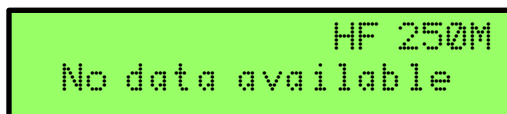
After Spectra-1 booting period display reads:



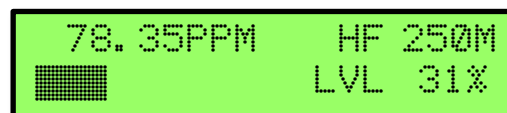
After warm up period display reads:
This takes as long as the data averaging period setting. (1 second +)



After warm up, display will read no data available, if not in optical alignment.



Proper optical alignment with the photodiode receiver will produce the following normal operational display output.



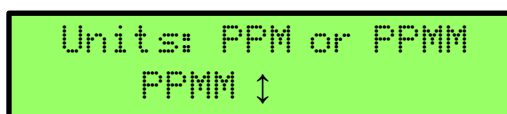
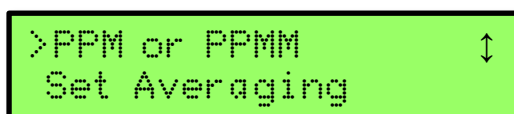
Signal Level (LVL) should fall between 30% and 80% for best operation.

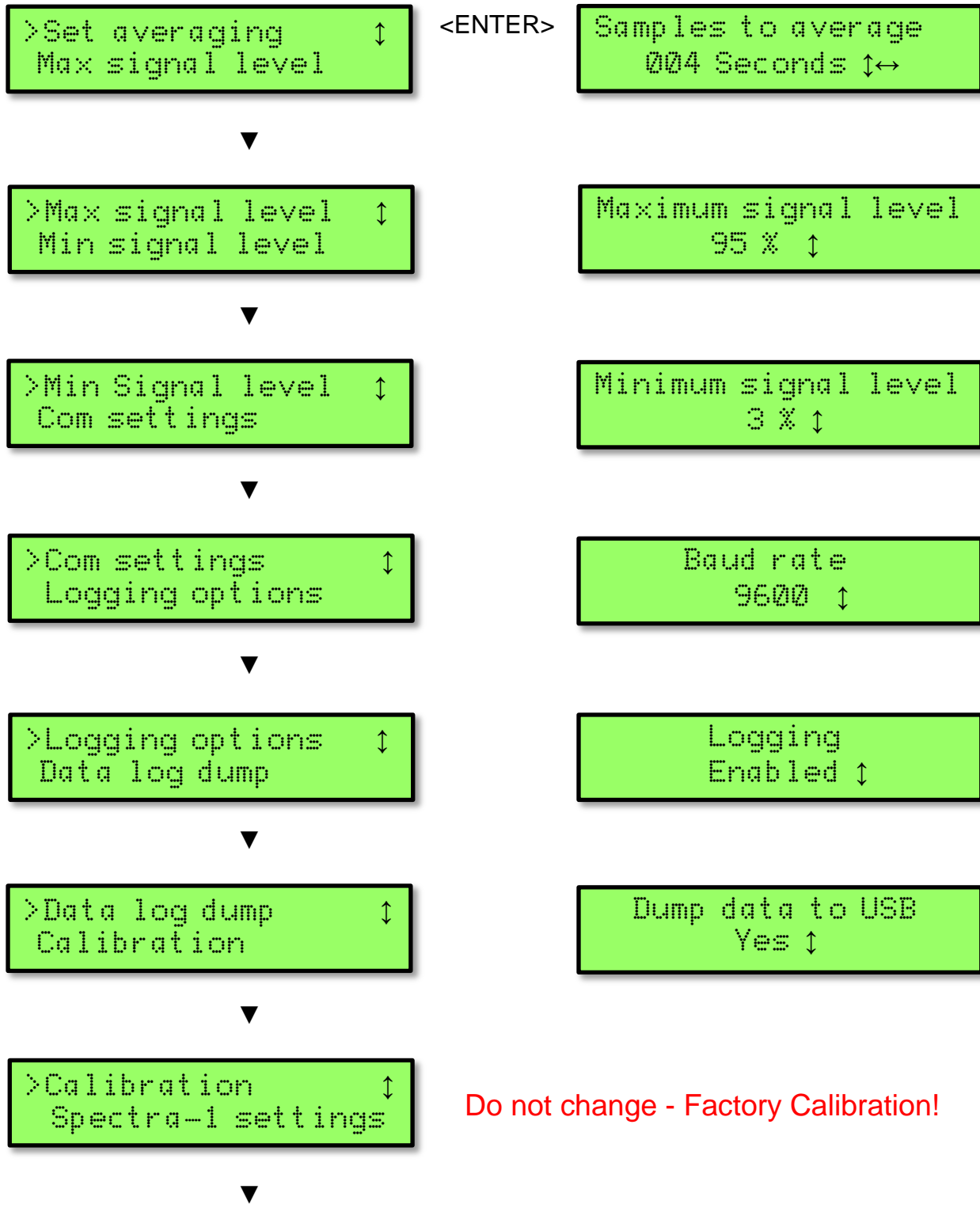
Configuration Menu – Spectra-1 Options

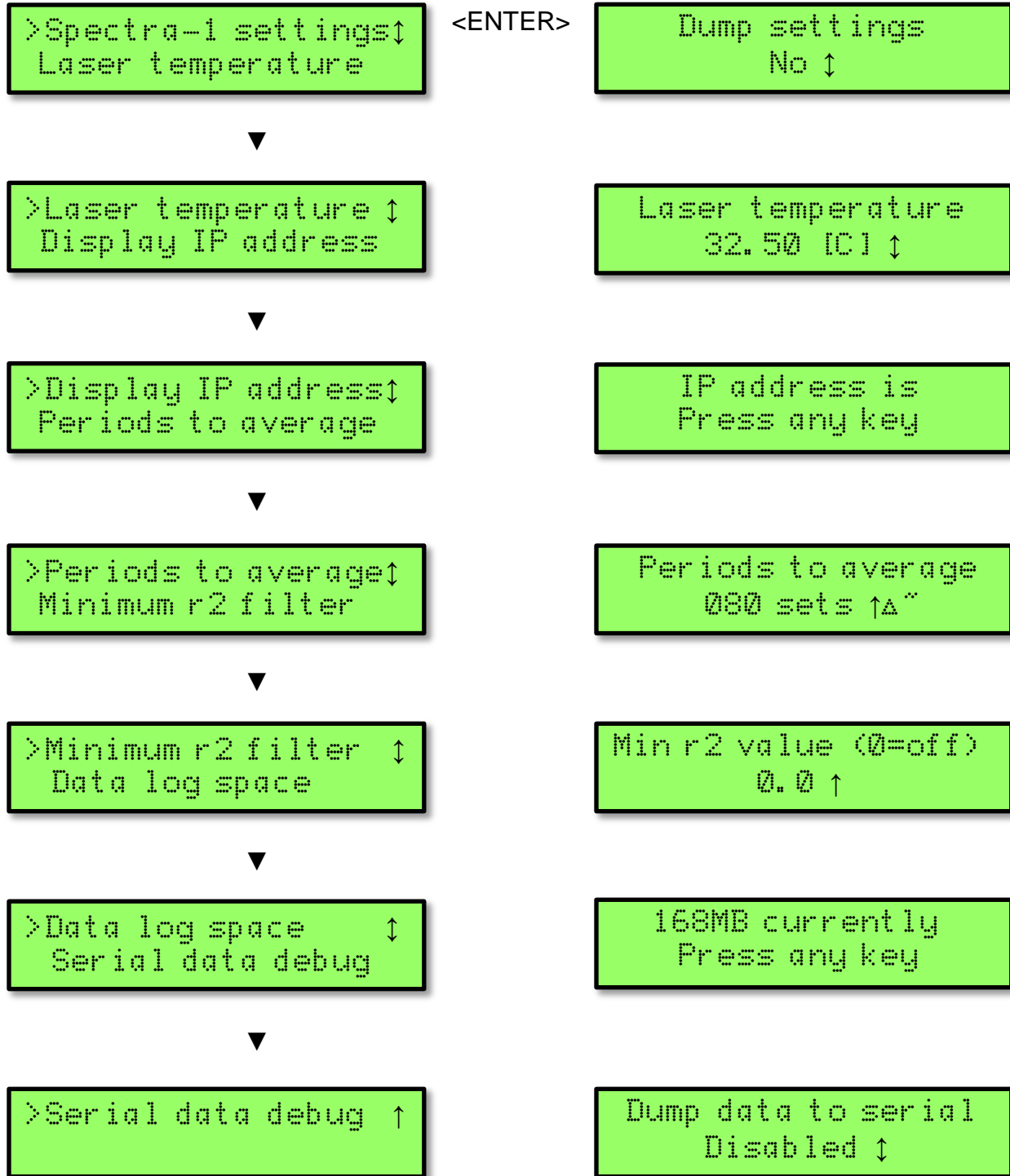
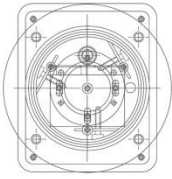
Press CONFIG/MENU key to enter Spectra-1 options.
Use the arrow keys ▲ ▼ to select the menu item you wish to change. (Scrolling menu)
Press the ENTER/SELECT key to make change. After making a change press the ENTER/SELECT key. Press the RUN key to return to normal Spectra-1 operation.



<ENTER>









CONFIG/MENU Items Description:

Distance to refl.	- Distance between Spectra-1 and the retro-reflector (or duct optical path length)
PPM or PPMM	- Change from PPM mode to PPM-M mode
Set averaging	- Set Spectra-1 averaging from .5 to 60 seconds
Max signal level	- Maximum signal level setting for data analysis
Min signal level	- Minimum signal level setting for data analysis
Com settings	- Baud rates: 2400, 9600, 19200, 38400, 57600, 115200, 230400
Logging options	- Enable or disable internal data logging (168MB allocated)
Data log dump	- Internally logged data transfer to USB memory stick (Optional)
Calibration	- Do not change factory settings!
Spectra-1 settings	- Serial output of internal settings of Spectra-1
Laser Temperature	- Set laser diode temperature set point (future development)
Display IP address	- Display IP address when connected to Ethernet
Periods to average	- Internal sampling rate – Do not adjust!
Minimum r2 filter	- Filter to display data with a minimum r2 value
Data log space	- Internal data logging memory remaining
Serial data debug	- Serial data debug data string output via serial port(leave disabled)

Serial Data Output/Logging Format:

```
2007-03-12 11:37:14 MDT,0x00000001,NH3,0.46,0.00,ppmm,21%,5.0,11,0,0,0
2007-03-12 11:37:18 MDT,0x00000001,NH3,0.38,0.00,ppmm,21%,5.0,12,0,0,0
2007-03-12 11:37:22 MDT,0x00000001,NH3,0.41,0.00,ppmm,21%,5.0,11,0,0,0
2007-03-12 11:37:26 MDT,0x00000001,NH3,0.31,0.00,ppmm,21%,5.0,12,0,0,0
2007-03-12 11:37:30 MDT,0x00000001,NH3,0.35,0.00,ppmm,21%,5.0,11,0,0,0
```

Format is : t,s,g,r,p,w,P,T,d,c,e,l,h

t = time with time zone, 24 hour clock

s = status code – see below

g = gas species

r = averaged r-squared value

p = averaged gas concentration

w = ppm-m or ppm units

P = signal level %

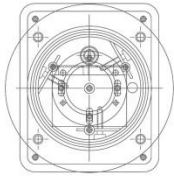
d = distance to retro-reflector (meters)

c = number of samples in averaging period

e = number of times we tried to get a sample set but did not

l = number of low signal level samples (also included in e)

h = number of high signal level samples (also included in e)



Status codes:

0x00000001 Normal Signal Present

0x00000002 No Signal Present

0x00000004 Low Signal Level

0x00000008 High Signal Level

0x00000010 Unstable Signal Level (Both High and Low Signal Levels)

0x00000020 Log File Full (Less than 10MB Free Space)



Serial Port Connection:

Connect serial port cable (DB-9 female-female) from RS232 output on Spectra-1 to com port on laptop or desktop computer.

A null modem cable is required.

In the case that there is no DB-9 serial port available, a USB serial adapter may be used. Plugable USB Serial Converter works well.

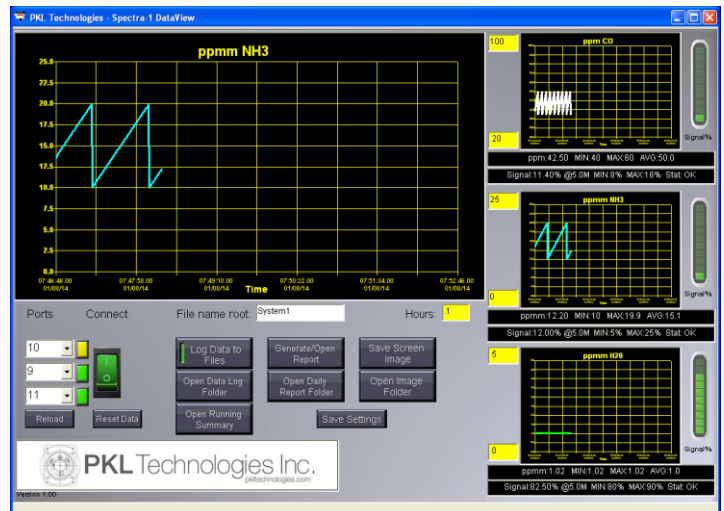
The serial port connection speed is set in the CONFIG/MENU set-up of Spectra-1. This is outlined in the Configuration Menu section.

Once connection is established Spectra-1 DataView or HyperTerminal may be used.

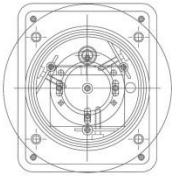
Data bits: 8
Parity: none
Stop bits: 1
Flow control: none



Plugable USB serial adapter



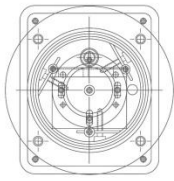
Spectra-1 DataView Program for Data display and logging



Troubleshooting

Common Problems:

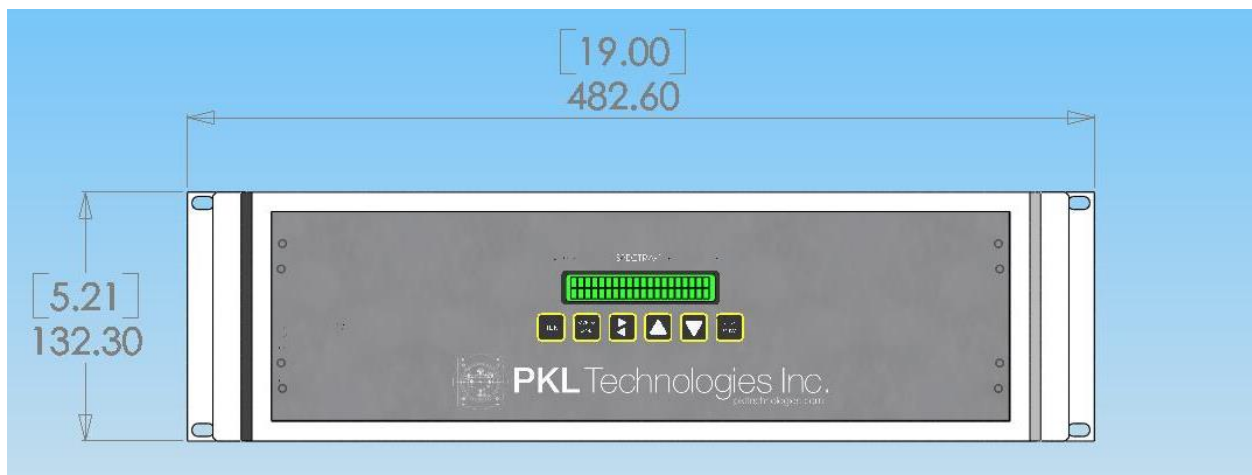
- Mains Power Connection
- Transceiver Pin-out verification and testing for +12VDC and -12VDC
- Fiber output power level (using fiber power meter)
- Serial Port Communication
Check baud rate setting, and correct DB-9 cable connection.
Check com port settings on laptop or desktop computer.
- Low Signal Level
Check for alignment
Ensure Spectra-1 transmitter and photodiode optical surfaces are clean.
Check for clear obstruction free optical path.
- High Signal Level
Re-check transmitter alignment.
- Stable Spectra-1 Transmitter and Receiver Mounting
Ensure Spectra-1 transmitter and photodiode receivers are suitably mounted to eliminate alignment problems.
- Please consult with factory for any problems encountered. Your help will provide for a more extensive and detailed troubleshooting guide.



Specifications

Spectra-1 Dimensions:

Rack Mount Controller:



Power Input: 100-240VAC 50/60Hz input on rear panel