Installation and Operation Manual

Document Number 013-RD000-000-02-201510

For Products: JAZ, JAZ-INDY, JAZ-PX
Document: 013-RD000-000-02-201510

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About This Manual

Document Purpose and Intended Audience

This document provides the users of Jaz with instructions for setting up, calibrating and performing experiments with their Jaz unit.

What's New in this Document

This version of the *Jaz Installation and Operation Manual* updates information for the Jaz Battery Pack.

Document Summary

Chapter	Description
Chapter 1: *Introduction*	Contains descriptive information about Jaz and how sampling works. It also provides a list of system requirements, interface options, and shipment components.
Chapter 2: *Installing Jaz*	Provides installation instructions.
Chapter 3: *Operating Jaz*	Provides instructions for using Jaz without OceanView software. For information on using Jaz with OceanView, see the OceanView manual (see *Product-Related* Documentation below).
Chapter 4: *Operating the JAZ-PX Module*	Contains instructions for using the JAZ-PX module. Includes menus and setup information.
Chapter 5: *Operating the JAZ-INDY Module*	Provides instructions for the JAZ-INDY module.
Chapter 6: *Maintenance*	Contains recommended steps to isolate and correct common problems. Also contains instructions for obtaining software updates and replacing an LED in the JAZ-INTLED module.
Appendix A: *Calibrating the Wavelength of Jaz*	Provides instructions for calibrating the Jaz spectrometer module.
Appendix B: *Appendix B Specifications*	Contains technical specifications for the Jaz stack and its individual modules.

Product-Related Documentation

You can access documentation for Ocean Optics products by visiting our website at **http://www.oceanoptics.com**. Select Support →Technical Documents, then choose the appropriate document from the available drop-down lists.

- ***Jaz Absolute Irradiance Installation and Operation Manual***
- ***JAZ-ADP-GPIO Adapter and JAZ-CBL-DB15 Accessory Cable Instructions***
- ***Jaz-ALP Adjustable Laser Pointer Operation Manual***
- ***Jaz Battery Pack (JAZ-EXT-BP) Instructions***
- ***Jaz Ethernet Ferrite Installation***
- ***JAZ-PX Lamp Module Engineering Note***
- ***Jaz Data Sheet***
- ***NeoFox and NeoFox Sport Installation and Operation Manual***
- Detailed instructions for OceanView Spectrometer Operating Software are located at: **http://oceanoptics.com///wp-content/uploads/OceanViewIO.pdf**.

Ocean Optics offers a Glossary of spectroscopy terms to help you further understand your state-of-the-art products and how they function, located at: **http://oceanoptics.com/glossary/**.

Upgrades

Occasionally, you may find that you need Ocean Optics to make a change or an upgrade to your system. To facilitate these changes, you must first contact Customer Support and obtain a Return Merchandise Authorization (RMA) number. Please contact Ocean Optics for specific instructions when returning a product.

Warranty

Our 3-Year Warranty covers Ocean Optics miniature fiber optic spectrometers, light sources and sampling accessories – regardless of the application – from manufacturing defects. It also covers fibers and probes for a full 12 months: **http://oceanoptics.com/services/exclusive-3-year-warranty/.**

This comprehensive warranty ensures you of the highest level of craftsmanship and reliability for years to come. No other manufacturer offers such a solid guarantee of quality and reliability.

The Ocean Optics 3-Year Warranty applies to Ocean Optics equipment (excluding OEM configurations) purchased on or after July 1, 2010. The warranty covers parts and labor needed to repair manufacturing defects that occur during the warranty period. We also will cover the costs of shipping warranty-related repairs from our customers to Ocean Optics and from us to our customers.

WARNING

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC COMPLIANCE

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which the user will be required to correct the interference at his on expense.

WARNING: The authority to operate this equipment is conditioned by the requirement that no modifications will be made to the equipment unless the changes or modifications are expressly approved by the manufacturer.

Chapter 1

Introduction

Product Overview

Jaz is a community of stackable, modular and autonomous component modules that combine to create a community of smart sensing instruments that is unfettered by the limits of traditional optical sensing instrumentation: a powerful microprocessor and onboard display eliminate the need for a PC; stackable, autonomous instrument modules allow users to customize the system to their changing application needs; and Ethernet connectivity plus SD card data storage capability facilitate remote operation.

Jaz is built on a platform that expands to include a light source, rechargeable lithium-ion battery and up to 8 spectrometer modules to make Jaz the first analytical instrument easily adaptable for the field, lab or process environment. Jaz can also connect to a computer via the USB port. When connected through a USB 2.0 or 1.1, the spectrometer draws power from the host computer. Jaz, like all USB devices, can be controlled by our OceanView software.

Jaz is extremely adaptable. It can be powered via battery, USB connection, over the Ethernet, or from a power outlet. The Jaz display can be rotated 180 degrees in either direction, and the faceplate itself can be specified for either orientation. You can order the specific modules needed for your particular application to be built in the Jaz stack, making Jaz a uniquely customizable scientific instrument and eliminating the cost of unnecessary components.

Stack of Jaz Modules

Jaz Modules

Jaz consist of a stack of individual spectroscopic instruments specified by the user to suit their unique application. Modules available for the Jaz stack include the following:

Module	Description
JAZ-S	Spectrometer and grating (up to 8 can be configured in a stack)
JAZ-DPU	Processor (CPU), OLED display and keypad
JAZ-E	Ethernet and memory module. Includes one slot for an SD card (up to 2 GB).
JAZ-B	Battery (lithium-ion) and memory module. Includes two slots for an SD card (up to 2 GB each). A Jaz 50-Watt battery extender (JAZ-EXT-BP-50WH) is also available.
JAZ-INDY	Industrial module enables communication with RS-232 and RS-485 data standards. Offers both analog and digital inputs and outputs.
JAZ-PX	Pulsed xenon light source
JAZ-UV-VIS	Deuterium-tungsten halogen light source
JAZ-VIS-NIR	Tungsten-halogen light source
JAZ-INTLED	LED module that allows you to replace the following LED assmblies: - JAZ-L640: 640 nm red LED - JAZ-L590: 590 nm yellow LED - JAZ-L450: 470 nm blue LED - JAZ-L365: 365 nm UV LED - JAZ-LWHITE: White LED
JAZ-NEOFOX	Jaz NeoFox Sport oxygen sensing module for measuring percentage of oxygen.

A Jaz Combo consists of a combination of up to three JAZ-S spectrometer modules and a JAZ-DPU module.

Features

- Sony ILX511B 2048-element linear silicon CCD array detector
- 14 grating options, UV through shortwave NIR
- Responsive from 200 to 1100 nm
- Maximum Wavelength range 650 nm
- Sensitivity of up to 75 photons/count at 400 nm; 41 photons/count at 600 nm
- An optical resolution of ~0.3 to 10.0 nm (FWHM)
- Integration times from 870 µ to 65 seconds
- EEPROM storage for
  - Wavelength Calibration Coefficients

  - Linearity Correction Coefficients
  - Absolute Irradiance Calibration (optional)
- SD card data storage
- Low power consumption of ~ 2.5 W
- 16 bit, 3MHz A/D Converter
- 20-pin connector for interfacing to external products
- 8-hour rechargable lithium-ion battery
- Up to 3 spectrometer channels in a stack for simultaneous multipoint measurement
- CE Certification
- RoHS compliant
- Ethernet IEEE 802.3 compliant 10/100

System Requirements

You can use the Jaz USB connectivity with any computer that meets the following requirements:

- Microsoft Windows – Windows 2000/XP/7; 32-bit and 64-bit and Windows Vista (32-bit only)
- Apple Macintosh – version 10.5 Intel or later
- Linux – Any version released for an x86 or amd64 platform since 2010
- Ocean Optics' spectrometer operating software application installed and configured for use.

EEPROM Utilization

An EEPROM memory chip in each JAZ-S spectrometer module contains wavelength calibration coefficients, linearity coefficients, and a serial number unique to each individual spectrometer module. The OceanView software application reads these values directly from the spectrometer, enabling the ability to "hot-swap" spectrometers between computers without entering the spectrometer coefficients manually on each computer.

About OceanView Software

Although Jaz is unique in that it can perform a number of spectroscopy measurements and display results right on its display screen, OceanView spectrometer operating software is also available to enhance Jaz's functionality. OceanView is the latest generation of operating software for all Ocean Optics spectrometers. It is a Java-based spectroscopy software platform that operates on Windows, Macintosh and Linux operating systems. The software can control any Ocean Optics USB spectrometer and device.

OceanView is a user-customizable, advanced acquisition and display program that provides a real-time interface to a variety of signal-processing functions. With OceanView, you have the ability to perform spectroscopic measurements (such as absorbance, reflectance, and emission), control all system parameters, collect and display data in real time, and perform reference monitoring and time acquisition experiments. Consult the OceanView manual for hardware requirements when using OceanView (see *Product-Related Documentation*).

Sampling System Overview

How Sampling Works

Ocean Optics components function in a sampling system as follows:

1. The user stores reference and dark measurements to correct for instrument response variables.
2. The light from the light source transmits through an optical fiber to the sample.
3. The light interacts with the sample.
4. Another optical fiber collects and transmits the result of the interaction to the spectrometer.
5. The spectrometer measures the amount of light and transforms the data collected by the spectrometer into digital information.
6. The spectrometer passes the sample information to OceanView.
7. OceanView compares the sample to the reference measurement and displays processed spectral information.

Interface Options

Jaz is field-portable and can collect data as a free-standing unit from the battery embedded in the stack. The Jaz stack also has both USB and Ethernet port connectors, enabling you to connect the spectrometer to a computer via a USB port or to the network via a connection from the Ethernet port to a Power Over Ethernet (POE) bridge or a switch to the network (e.g., a network hub). Your Jaz stack receives power from either connection, and both connections enable Jaz to be recognized by OceanView software.

Shipment Components

Jaz is a scalable system, allowing you to design the instrument most appropriate for your application. However, a typical Jaz system could consist of the following components:

- **Packing List**

  The packing list is inside a plastic bag attached to the outside of the shipment box (the invoice arrives separately). It lists all items in the order, including customized components in the spectrometer (such as the grating, detector collection lens, and slit). The packing list also includes the shipping and billing addresses, as well as any items on back order.

- **Jaz Stack**

  Usually consists of up to eight spectrometer modules (JAZ-S), a CPU module (JAZ-DPU), a battery/memory module (JAZ-B), and an Ethernet/SD module (JAZ-E).

- **Mini USB Cable (USB-CBL-MINI)**

  Use this cable to connect your Jaz spectrometer module to a computer running on a Windows, Mac or Linux operating system.

- **Ethernet Cable** (if an Ethernet module is included)

  A 14-foot cable to connect the JAZ-E module to a bridge or switch to access the network.

- **Power Supply (USB-CBL-PS)**

  A 5 V power supply to provide an extra power source in addition to the battery, USB power and POE (Power Over Ethernet).

- **Wavelength Calibration Data Sheet**

  Each spectrometer is shipped with a Wavelength Calibration Data Sheet that contains information unique to your spectrometer. OceanView Operating Software reads this calibration data from your spectrometer when it interfaces to a computer via the USB port.

Note

Please save the Wavelength Calibration Data Sheet for future reference.

Additional Equipment Available

In addition to the *Jaz Modules*, the following software and accessories are available for use with Jaz. Visit us at **www.OceanOptics.com** for a complete list of products available for all of your spectroscopy needs.

- **JAZ-MNT-DIN3** rail-mounting kit
- **JAZ-MNT-WALL** wall-mounting kit for mounting Jaz stacks with 3 or fewer modules (excluding the DPU and end module) onto a wall.
- **JAZ-MOUNT** Jaz side-mounting kit for 3 different orientations.
- **JAZ-CBL-DB15** accessory cable.
- **JAZ-ADP-GPIO** adapter for DPUs manufactured on January 1, 2008.
- **JAZ-PACK** soft-sided Jaz carrying pack with adjustable shoulder strap (-S) or waist belt (-W).
- **JAZ-CASE-1450** black Jaz Pelican 1450 case.
- **JAZ-SOLAR** solar battery supply with charger for an additional 4 hours of battery life.
- **JAZ-ULM-200** Jaz light measurement system for spectroradiometric analysis.
- **JAZ-PX** Jaz PX pulsed xenon light source. See Chapter 4: *Operating the JAZ-PX Module*.
- **JAZ-EXT-BP** battery pack (38 Watt-hour)
- **Accessory** Lithium-ion external 5V power supply.

- **INTLED-KIT** tool kit for changing LEDs in the JAZ-INTLED module. See *Replacing an LED Assembly in the JAZ-INTLED Module*.
- **Jaz Light Meter** convenient light-sensing tool containing the following:
  - Jaz Spectrometer containing reverse-orientation keypad, Grating 2 (200-850 nm), 2000-series detector with 200-850 nm order-sorting filter and UV upgrade, L2 detector collection lens, 10µm slit
  - JAZ-MOUNT side-mount module for hands-free operation
  - Battery module
  - Ethernet module with SD card
  - Direct-attach cosine corrector
  - JAZ-A-IRRAD software for irradiance measurements
  - Spectroradiometric calibration service (350-1000 nm)
  - JAZ-PACK-S carrying case with shoulder strap
  - JAZ-CASE-1450 Jaz Pelican case
- **Jaz EL 350** for VIS-NIR applications includes the following:
  - Jaz Spectrometer
  - Grating #2 (350-1000 nm)
  - Detector 350-1000 nm
  - INTSMA-25 (25mm slit)
  - L2 light collection lens
  - Battery module
  - OceanView software
- **Jaz EL 200** for UV-VIS applications
  - Jaz Spectrometer
  - Grating #1 (200-850 nm)
  - Detector 200-850 nm
  - INTSMA-25 (25mm slit)
  - L2 light collection lens
  - Battery module
  - OceanView software
- **Jaz EL 200-XR1** for both VIS/NIR and UV/VIS applications
  - Jaz Spectrometer
  - Grating #31 (200-1025 nm)
  - Detector 200-1050 nm
  - INTSMA-25 (25mm slit)
  - L2 light collection lens
  - Battery module
  - OceanView software
- **Jaz-FL-365** for fluorescence applications
  - JAZ-COMBO
  - JAZ-L365 (365 mm LED module)

- JAZ-B battery module
- JAZ-E Ethernet module
- Grating #2 (250-800 nm)
- Detector 250-800 nm
- INTSMA-200 (200mm slit)
- L2 light collection lens
- OceanView software

- **Jaz-FL-450** for fluorescence applications
  - JAZ-COMBO
  - JAZ-L450 (450 mm LED module)
  - JAZ-B battery module
  - JAZ-E Ethernet module
  - Grating #3 (350-1000 nm)
  - Detector 350-1000 nm
  - INTSMA-200 (200mm slit)
  - L2 light collection lens
- **OceanView Operating Software**. See *About OceanView* for more information.
- **OmniDriver** software driver package for Windows, Mac OSX and Linux operating systems.
- **JAZ-A-IRRAD** absolute irradiance application.

  Available on an SD card for onboard absolute irradiance measurements.
- **Jaz Scripting Language**. Allows you to write scripts for your Jaz system to perform simple data acquisition, processing and exporting of results to an SD card.
- **Jaz Application Programming Interface** (API) enables 3rd party development for Jaz.
- **NeoFox Sport**

  Available as an additional module (JAZ-NEOFOX), when coupled with a probe, light source module and spectrometer module, the NeoFox Sport offers a turnkey Oxygen and pH sensing instrument, along with spectrometer functionality in a convenient handheld, portable device.
- **Fibers**
- **Light Sources**
- **Integrated Sampling Systems**
- **Cuvettes**
- **Filter Holders**

Chapter 2

Installing Jaz

Overview

Your Jaz unit is field-portable and can collect data as a free-standing unit from the battery embedded in the stack. You also have two options for connecting Jaz to a computer to process the data you have collected:

- A USB connection directly to a computer running OceanView.
- An Ethernet connection to a computer network.

Note

Your Jaz unit receives power from either connection.

If you have purchased OceanView software, you must install it prior to connecting Jaz Spectrometer to a computer. The OceanView software installation installs the drivers required for Jaz. If you do not install OceanView first, the computer will not properly recognize Jaz. Follow the prompts in the OceanView installer wizard.

If you have already connected Jaz to a computer running on a Windows platform prior to installing OceanView, consult *Jaz Connected to Computer Prior to OceanView Installation* for information on correcting a corrupt Jaz installation.

Caution

Connect all cables before powering-on your Jaz unit. Install Jaz in the following order:

1. **Connect the external power supply (if used).**
2. **Open OceanView.**
3. **Connect the USB cable between Jaz and your computer (if used).**
4. **Press F5 to display Jaz in OceanView.**

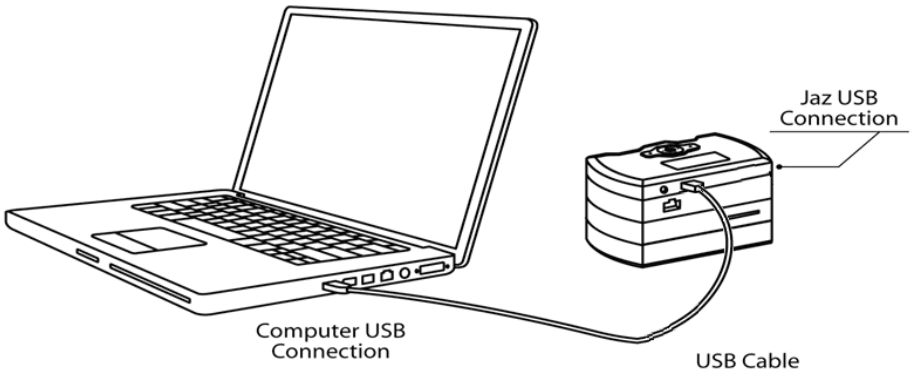
Installing the Jaz Unit

This section contains instructions for connecting Jaz directly to a computer through the USB port or to the network through the Ethernet port.

Connecting Jaz to a Computer via USB

► *Procedure*

1. Connect the USB (B) cable that you received with your Jaz unit from the JAZ-DPU module to your computer.



2. When first connecting Jaz to your computer, you must run the Hardware Wizard for your PC to recognize the new hardware. For Mac users, this step is not necessary.
3. In OceanView, use the Device Manager for your Jaz unit to be recognized in the OceanView software.

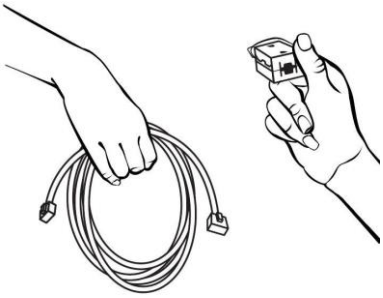
Ethernet Connection

You can connect Jaz to the network via the Ethernet port on the JAZ-E module. A ferrite is provided with your JAZ-E Ethernet module to be used in the event that you experience interference with any electronic devices.

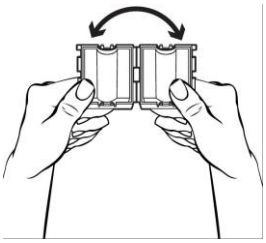
► *Procedure*

Follow the steps below to connect the port on the Jaz Ethernet & Memory module to a Power Over Ethernet (POE) bridge or a switch to the network (e.g., an 8-port network hub):

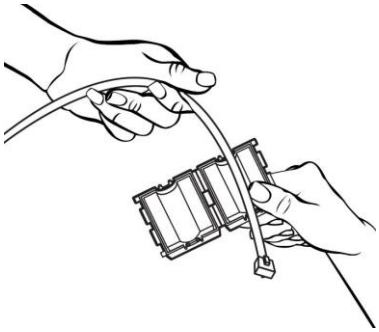
1. Find the Ethernet cable and the ferrite that you received in your Jaz package.



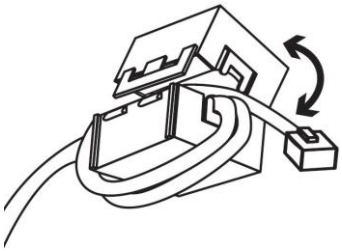
2. Open the ferrite.



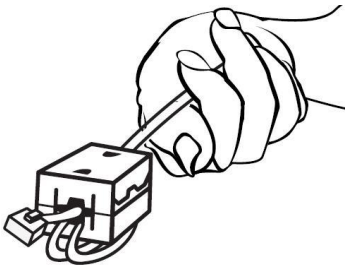
3. Place the ferrite on the Ethernet cable as close to the connector for the computer as possible.



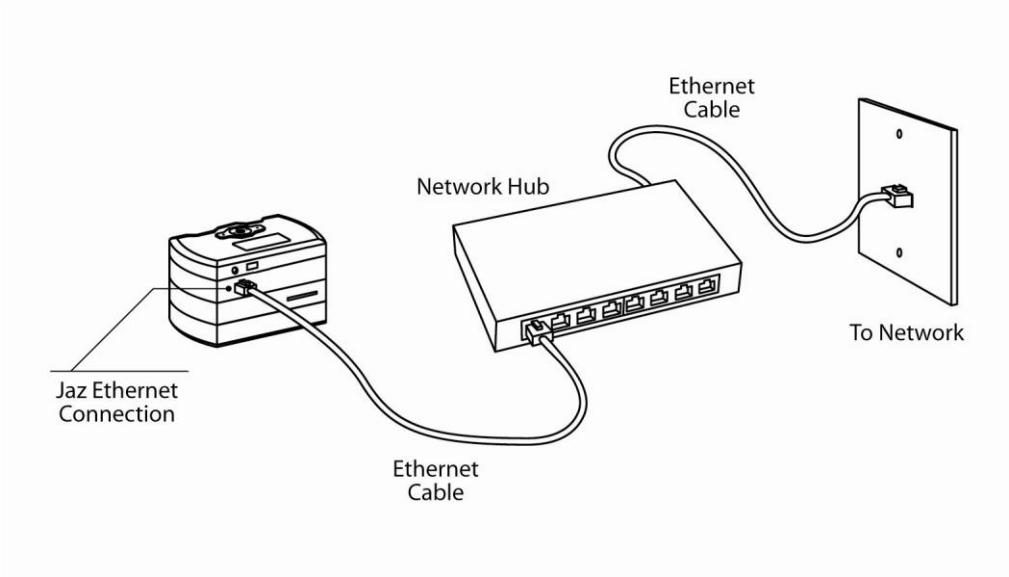
4. Loop the Ethernet cable through the ferrite twice.



5. Snap the ferrite closed to lock it in place.



6. Plug the Ethernet cable into the Ethernet connector on the JAZ-E module, and then to a Power Over Ethernet (POE) bridge or switch to the network (e.g., an 8-port network hub).



7. In OceanView, click to Display the Device Manager, then click **Rescan**. Your Jaz unit should be recognized in OceanView.

Chapter 3

Operating Jaz

Overview

Jaz is designed to perform a wide number of functions as a standalone instrument, untethered to a computer. These functions include the following:

- Power on/off the Jaz stack
- Perform absorbance, reflectance and irradiance experiments and read the results on the Jaz display screen
- View and edit network settings
- View battery charge
- Set display backlight intensity
- Update the flash memory and system information
- Rotate the display screen 180 degrees
- Set date and time
- Control light source modules in the stack

The Jaz faceplate providing you with your interface to the modules in your Jaz stack is shown below:

Powering Your Jaz Unit

The Jaz unit can be powered from the USB connection as well as from the Ethernet connection. You can also power Jaz using the 5 VDC power supply cable and transformer that came with your unit.

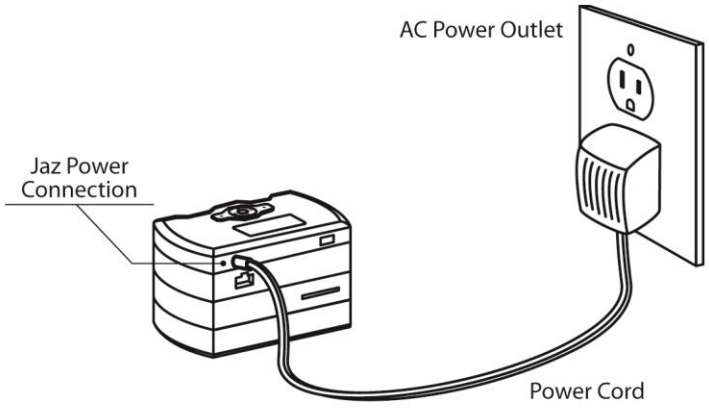
Note

You can plug the power supply into your Jaz unit concurrently with the USB or Ethernet connection without harming the equipment. This may even be necessary if the USB connection does not supply sufficient power to drive the Jaz stack, or your Ethernet connection is not over a POE-enabled switch/hub.

The Jaz stack contains a battery module that should allow for several hours of field operation before the unit must be recharged. A power save feature dims the screen to 50% intensity, then darkens the screen totally after 3 minutes of inactivity.

► *Procedure*

1. Connect the power supply cable that you received with your Jaz unit from the unit's power connector on the JAZ-DPU module to a wall outlet.



2. Press the Power button ( ) in the center of the Jaz unit to power up the Jaz stack.

   It can take the Jaz stack 2 – 3 seconds to power up.

Jaz Menus

Main Menu

Your Jaz unit is unique from other spectrometers in that it offers you an interactive menu screen to perform various functions without the need of spectroscopy operating software. The menu order may differ from the order shown on the following menus. Also, the functions available differ depending on when the DPU in your Jaz stack was manufactured.

Jaz menu functions available for DPUs manufactured on January 1, 2008 include the following:

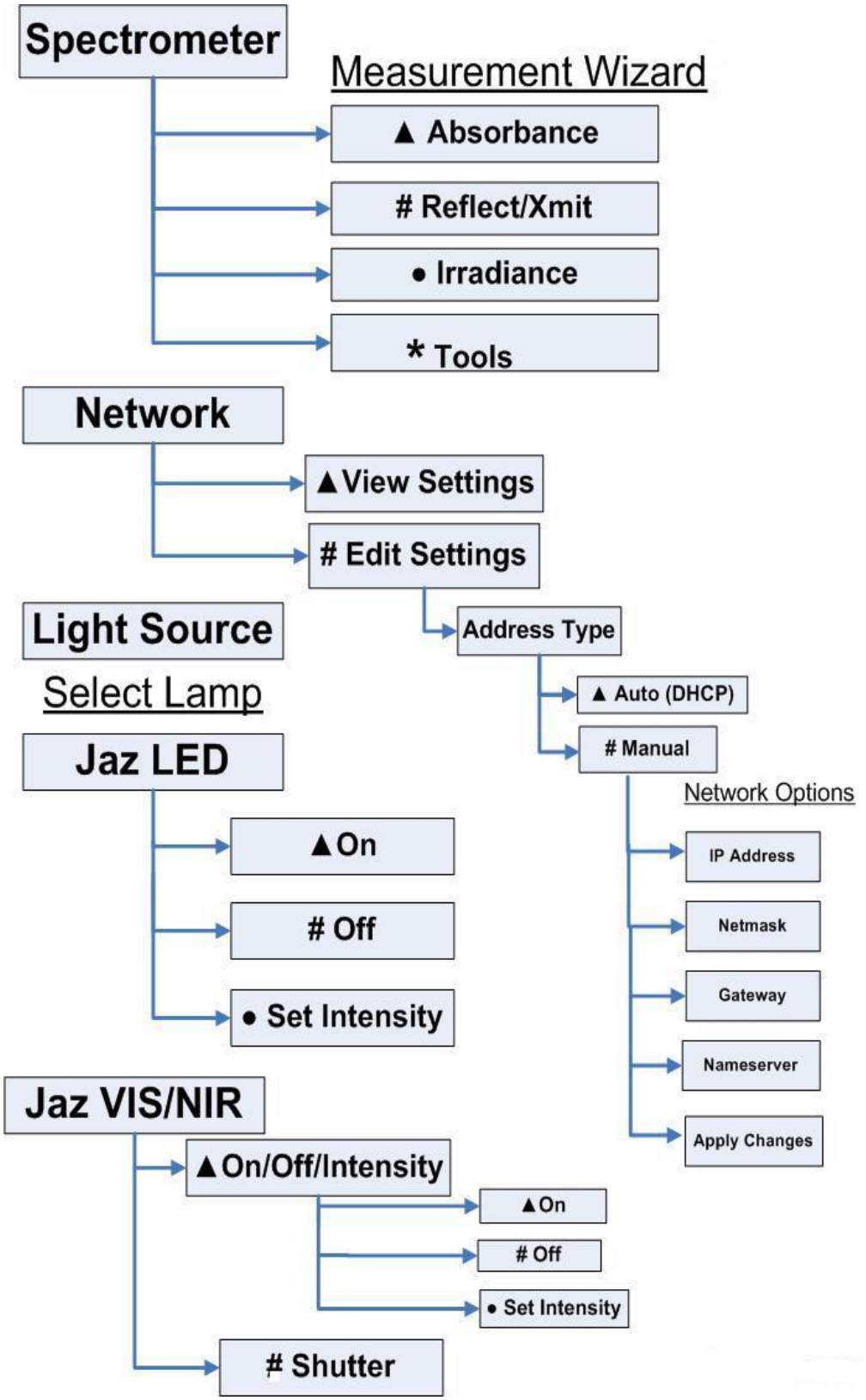
- **Spectrometer**: Displays the Measurement Wizard. See *Measurement Wizards* for more information.
- **Network**: View and set the Jaz IP address, net mask gateway, and Name Server address.
- **Light Source**: Provides control over the light source module, if included in the stack.
- **System Tools**:
  - Downloads an update to the Jaz flash memory.
  - Rotates the screen orientation. **Rotate-Save** turns the screen display 180 degrees and saves the screen orientation as the default. **Rotate** turns the screen display until Jaz is rebooted.
  - Adjusts the brightness of the OLED screen.
  - Displays the charge percentage of the battery module in the stack (if included).

Jaz menu function available for DPUs manufactured on January 1, 2008 include the following:

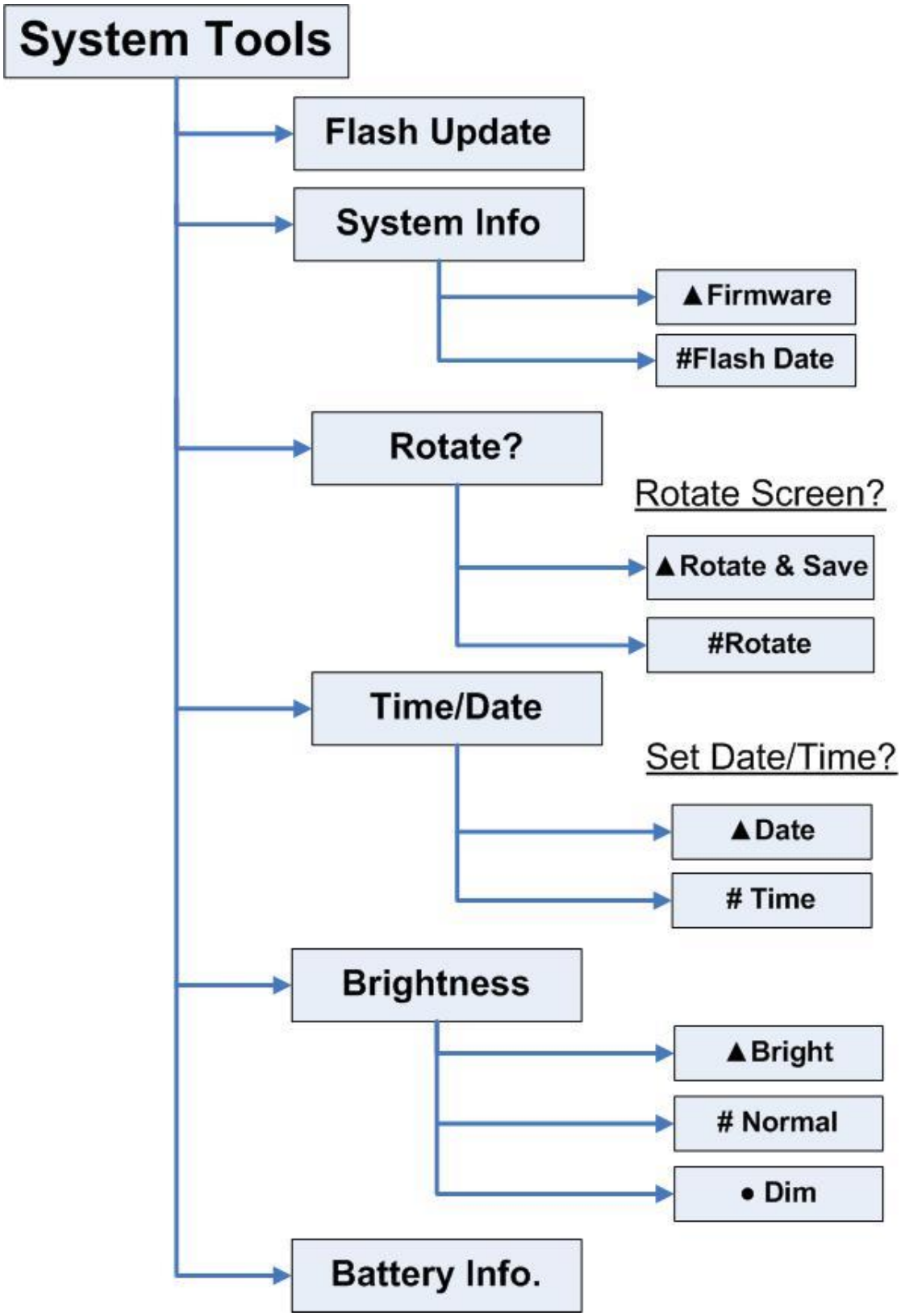
- **Serial Bus**: Lets you select the specifics related to the serial bus(es) in your Jaz stack. For Jaz stacks that contain a JAZ-INDY module, the Indy RS232 and Indy RS585 bus choices are available in addition to the DPU RS232 serial bus.
- **File System**: Allows you to manage SD cards in your Jaz stack.
- **Spectroscopy**: Displays the Measurement Wizard. See *Measurement Wizards* for more information.
  Network: View and set the Jaz IP address, net mask gateway, and Name Server address
- **System Tools**:
  - Downloads an update to the Jaz flash memory.
  - Rotates the display screen orientation. **Rotate-Save** rotates the screen display 180 degrees and saves the screen orientation as the default. **Rotate** rotates the screen display until Jaz is rebooted.
  - Adjusts the brightness of the OLED screen.
  - Displays the charge percentage of the battery module in the stack (if included).
- **Light Source**: Provides control over the light source module, if included in the stack.

Note

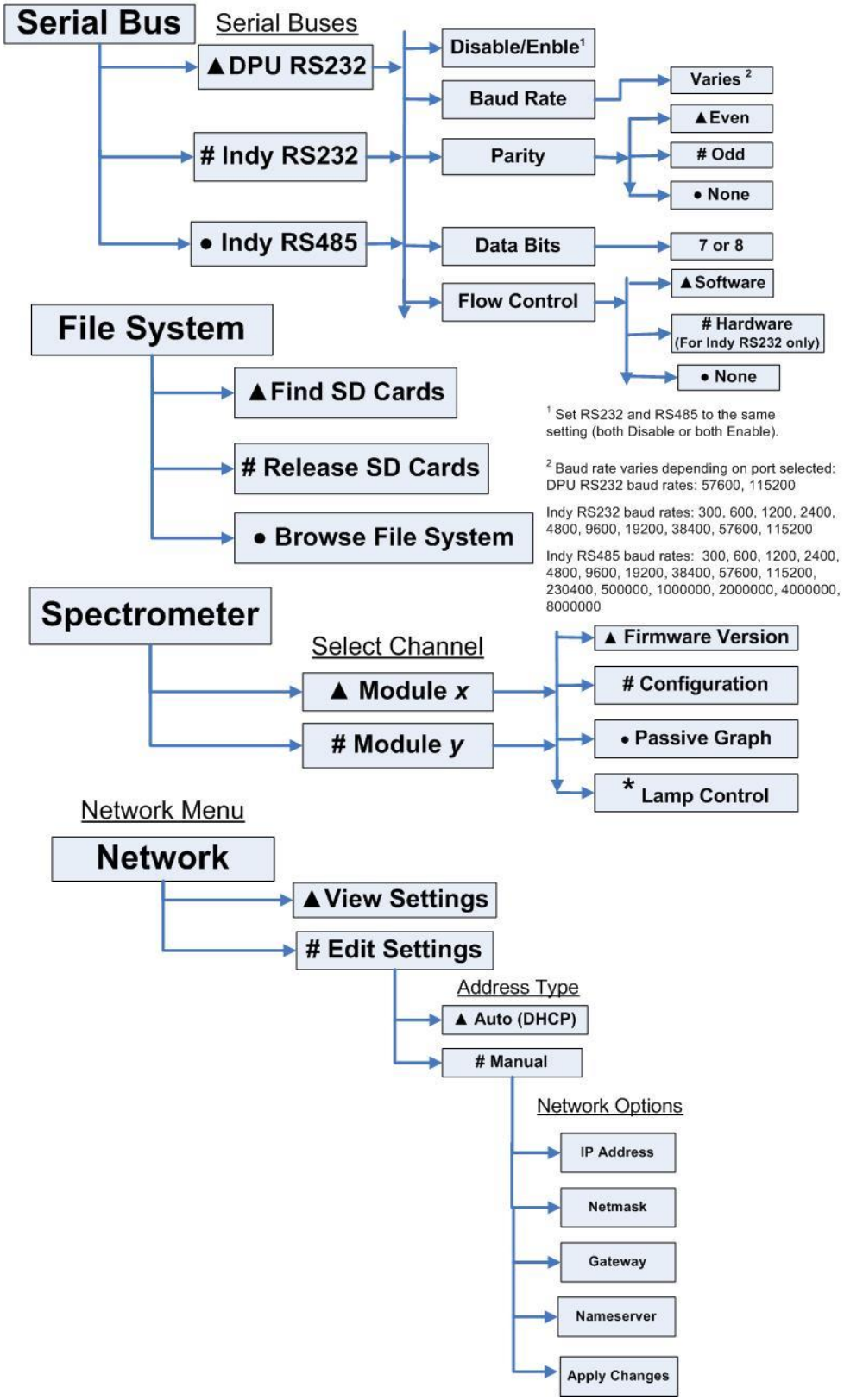
Jaz has a screen saver that blanks the display screen after a few minutes of inactivity. Press any button other than Save ( ) on the faceplate to redisplay the screen without performing that button's function. The Save button actually performs a save before redisplaying the screen.



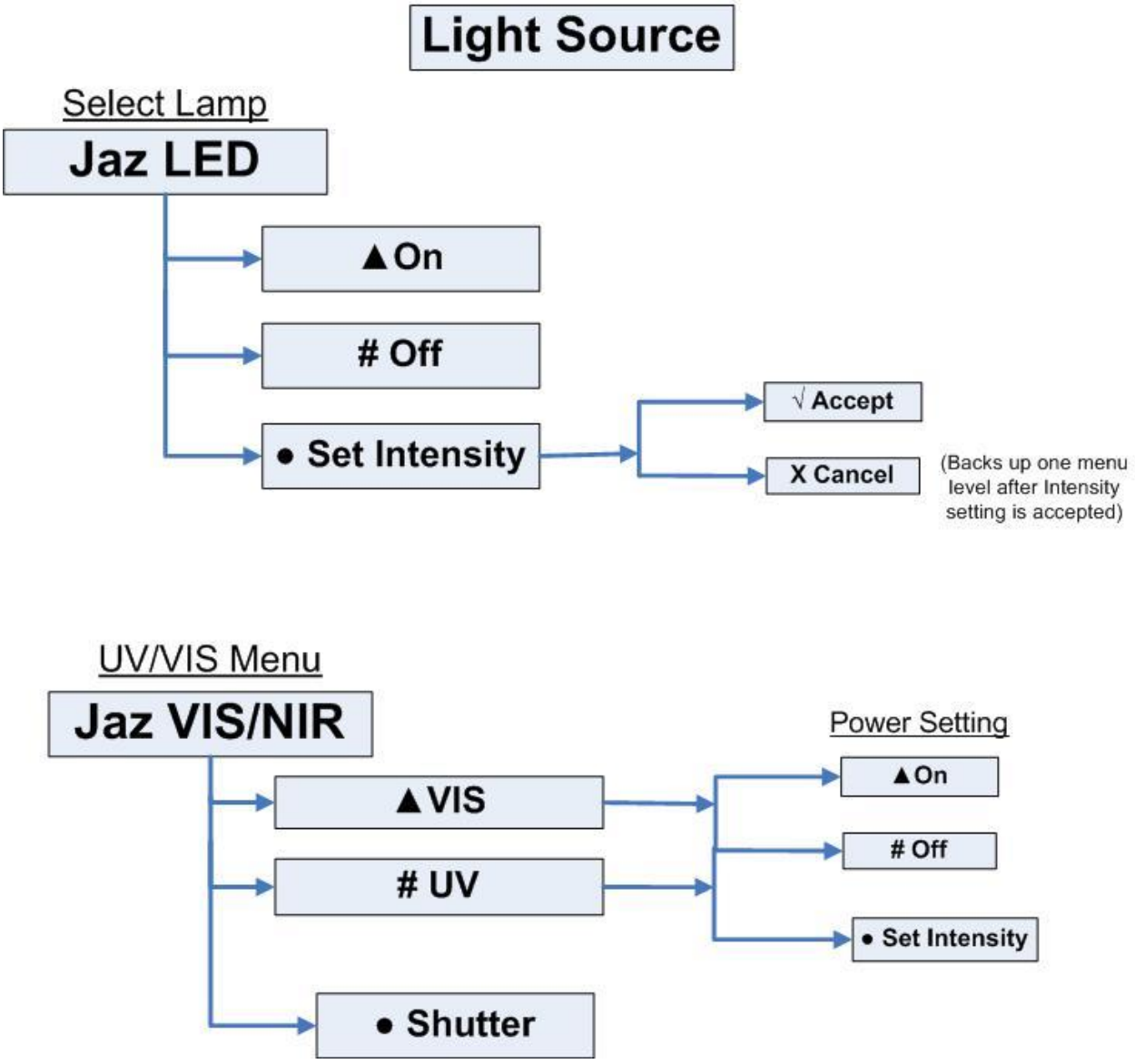
Jaz Main Menu (for DPUs dated January 1, 2008)



Jaz Main Menu (for DPUs dated January 1, 2008) (Continued)



Jaz Main Menu (for DPUs dated <u>after</u> January 1, 2008)



Jaz Main Menu (for DPUs dated <u>after</u> January 1, 2008)

Measurement Wizards

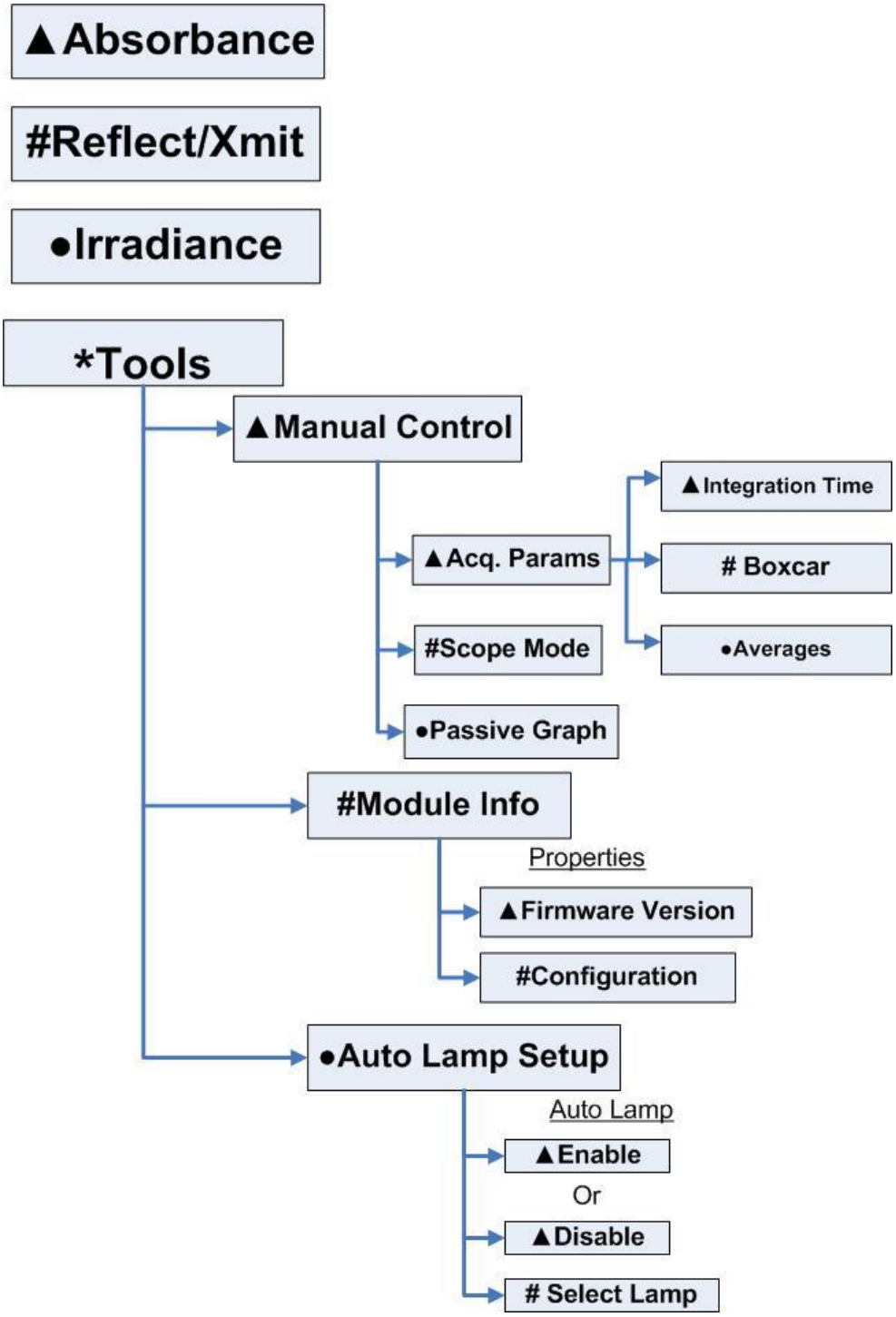
Jaz features shortcut wizards that are accessible via the Jaz keypad (icons on the navigation keys) for the following measurements:

- **▲ Absorbance**
- **# Reflection/Transmittance**
- **• Irradiance**

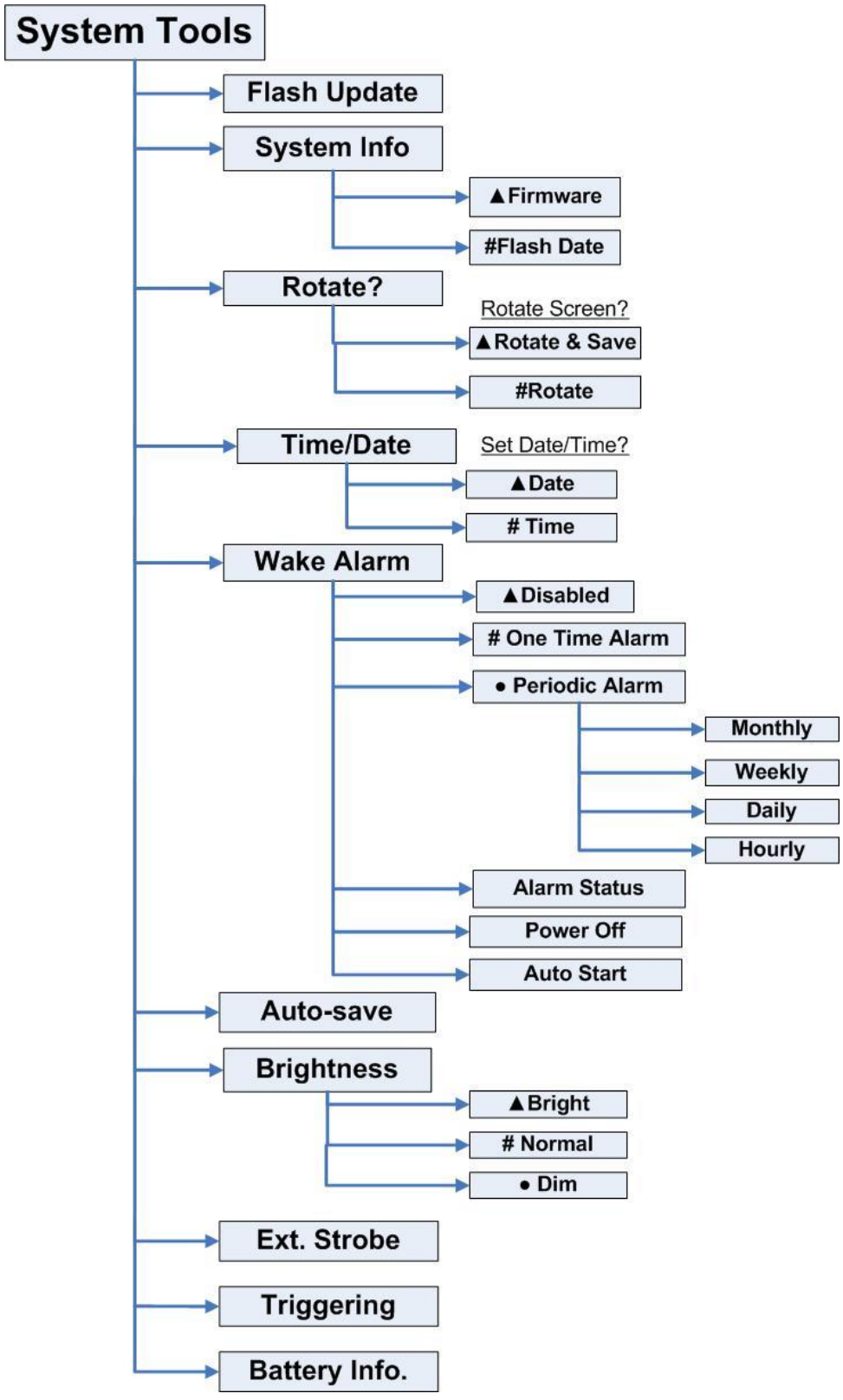
Press the button on the keypad that corresponds to the icon for the desired measurement (▲, #, or •).

* Tools

The Tools menu item provides additional functionality for manual setting of acquisition parameters, retrieving information about the spectrometer module properties, and lamp set-up (if applicable).



(for DPUs dated January 1, 2008)



(for DPUs <u>after</u> January 1, 2008)

JAZ-PX Menu

The menu for the PX light source module allows you to control the strobe and triggering functions (JAZ-PX can operate in both free running and triggered modes), and set various parameters such as intensity and number of flashes. This menu only appears if you have the JAZ-PX module installed in your Jaz stack. See Chapter 4: *Operating the JAZ-PX Module* for the JAZ-PX menu and more in-depth information on operating the JAZ-PX module.

JAZ-INDY Menu

The menu for the JAZ-INDY module allows you to configure GPIO, Analog V out, and 4-20mA excitation and Tx control. It also lets monitor Analog and Digital inputs and calibrate voltage inputs/outputs, and the 4-20mA transmitter/receiver. This menu only appears if you have the JAZ-INDY module installed in your Jaz stack. See Chapter 5: *Operating the JAZ-INDY Module* for the JAZ-INDY menu and more in-depth information on operating the JAZ-INDY module.

Storing Data on an SD Card

The JAZ-B and JAZ-E modules provide slots for up to 2 GB of storage on an SD card. The following are procedures to ensure proper data storage on an SD card.

Note

For best results, we recommend SanDisk, Transcend and Kingston SD cards.

► *Procedure*

To store data on an SD card,

1. From the Jaz main menu, select **File System | Find SD Cards**. The Jaz screen then displays, **SD Card Search Finished**.
2. Take your measurements. This data is continuously streamed to the SD card found in Step 1.

► *Procedure*

To release an SD card,

1. From the Jaz main menu, select **File System | Release SD Cards**. Jaz then informs you when it is safe to remove your SD card from the slot.
2. Remove your SD card from the Jaz module to access the stored data from your computer.

Chapter 4

Operating the JAZ-PX Module

JAZ- PX Module Overview

The Jaz PX lamp is a pulsed, short arc xenon lamp for UV-VIS applications such as absorbance, bioreflectance, fluorescence and phosphorescence. The lamp has a specified pulse frequency of 200 Hz (maximum 500 Hz) and spectral response from 190 – 1100 nm.

WARNING

The PX-2 produces ultraviolet radiation. Direct eye contact can cause permanent eye damage. Always wear safety eyewear, and never look directly into the light source.

The JAZ-PX module operates in both free running and triggered modes, allowing its pulses to coordinate with other devices in the stack. The module contains an SMA connector to couple to other Ocean Optics accessories such as optical fibers, cuvette holders, probes, etc. (see *Additional Equipment Available*).

The JAZ-PX is ideal for field applications such as bioreflectance that require a high-intensity, low-power light source. In fact, no external power supply is required to operate the JAZ-PX module. When used in battery power mode, the lamp will operate for approximately 3 hours. An additional external power supply is avialable through an optional 38 Watt-hour jaz battery extender (see *Additional Equipment Available*).

For JAZ-PX module specifications, refer to Appendix B: Specifications.

Caution

The spectrometer module is especially sensitive to heating, so you should be aware of the effects of heating on spectrometer modules when setting up an experiment, particularly when using the JAZ-PX module. Since the JAZ-PX does not include a fan and the Jaz metal housing has high thermal conductivity, heat generated by the JAZ-PX will be conducted to other modules in the stack.

These effects are most prevalent in applications with long term, continuous operation of the JAZ-PX at moderate to high flash rates. For short-duration experiments, these thermal effects are not as prominent. Most significantly, heating a spectrometer module will cause that spectrometer's baseline (the measured intensity when it is not exposed to light) to drift downwards.

The *JAZ-PX Lamp Module Engineering Note* contains more information on thermal considerations and how to mitigate the effects of heating. See *Product-Related Documentation*.

JAZ-PX Module Features

The JAZ-PX module is very versatile and easy to operate. It features a configurable timing generator that that can generate a high-precision lamp trigger and the capability of operating on battery power or with an external power source.

The PX part of the PX Lamp menu on your Jaz stack provides you with the following features:

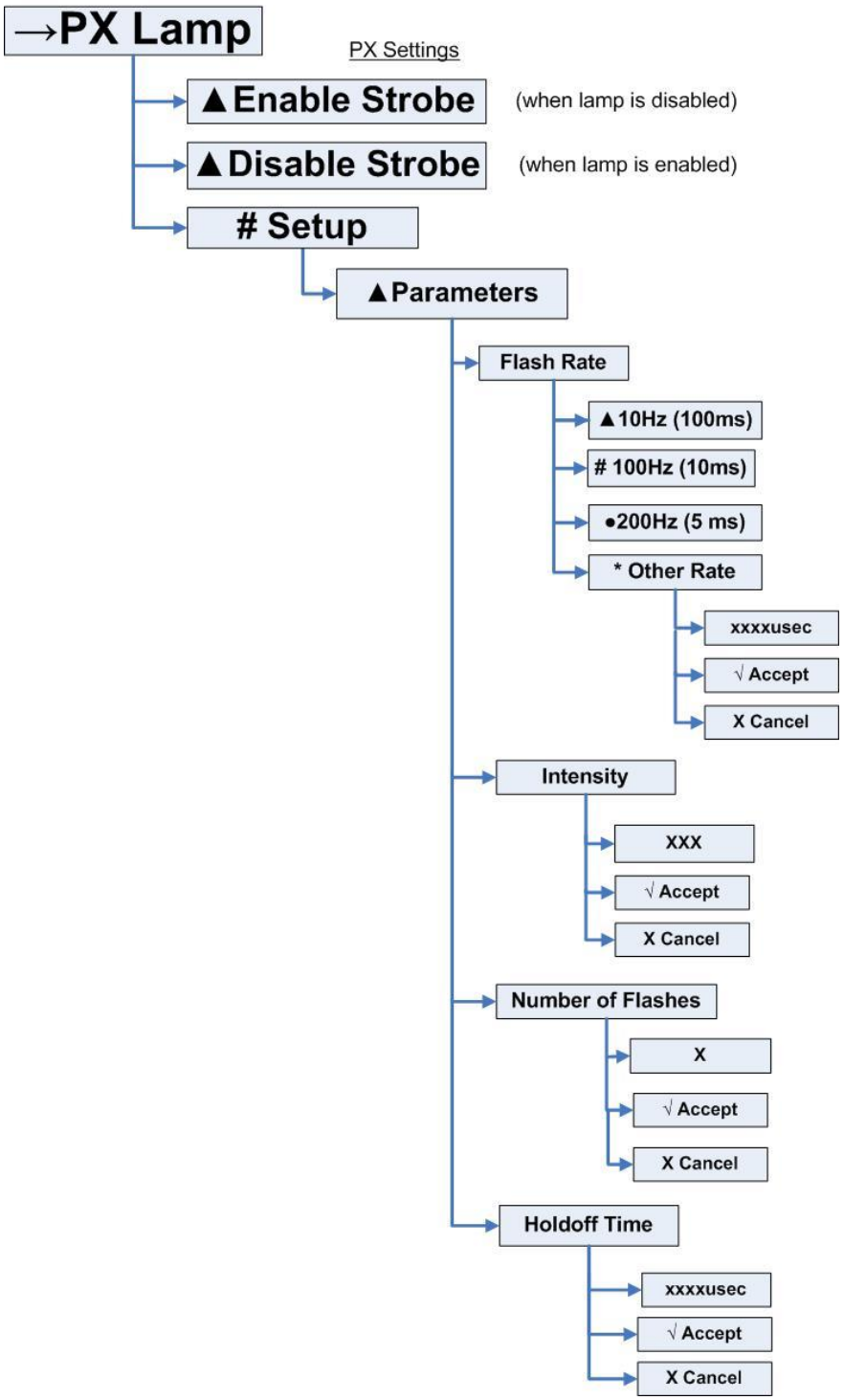
- Strobe enable/disable
- Lamp setup parameters
  - Flash rate
  - Lamp intensity
  - Number of flashes
  - Holdoff time
- Flash timing controls
  - Forced trigger
  - Timing reset
  - Free Running mode
  - Run Forever mode (continuous trigger)
  - Flash output enable/disable
  - Trigger enable
- Advanced settings
  - Read/write from/to the JAZ-PX module control registers
  - Power source (battery or external wall power)

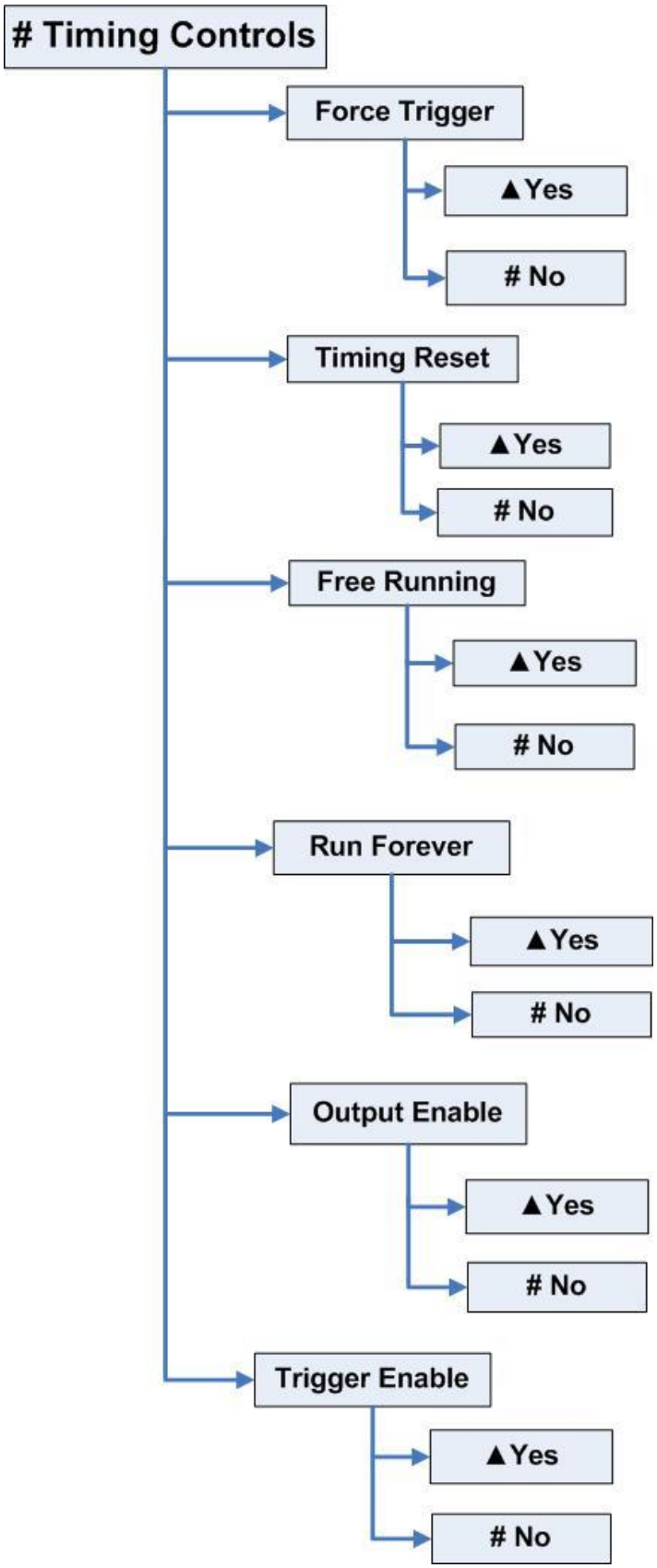
In addition, the trigger source (internal or external) can be selected from the Jaz System Tools menu (see *Jaz Menus*).

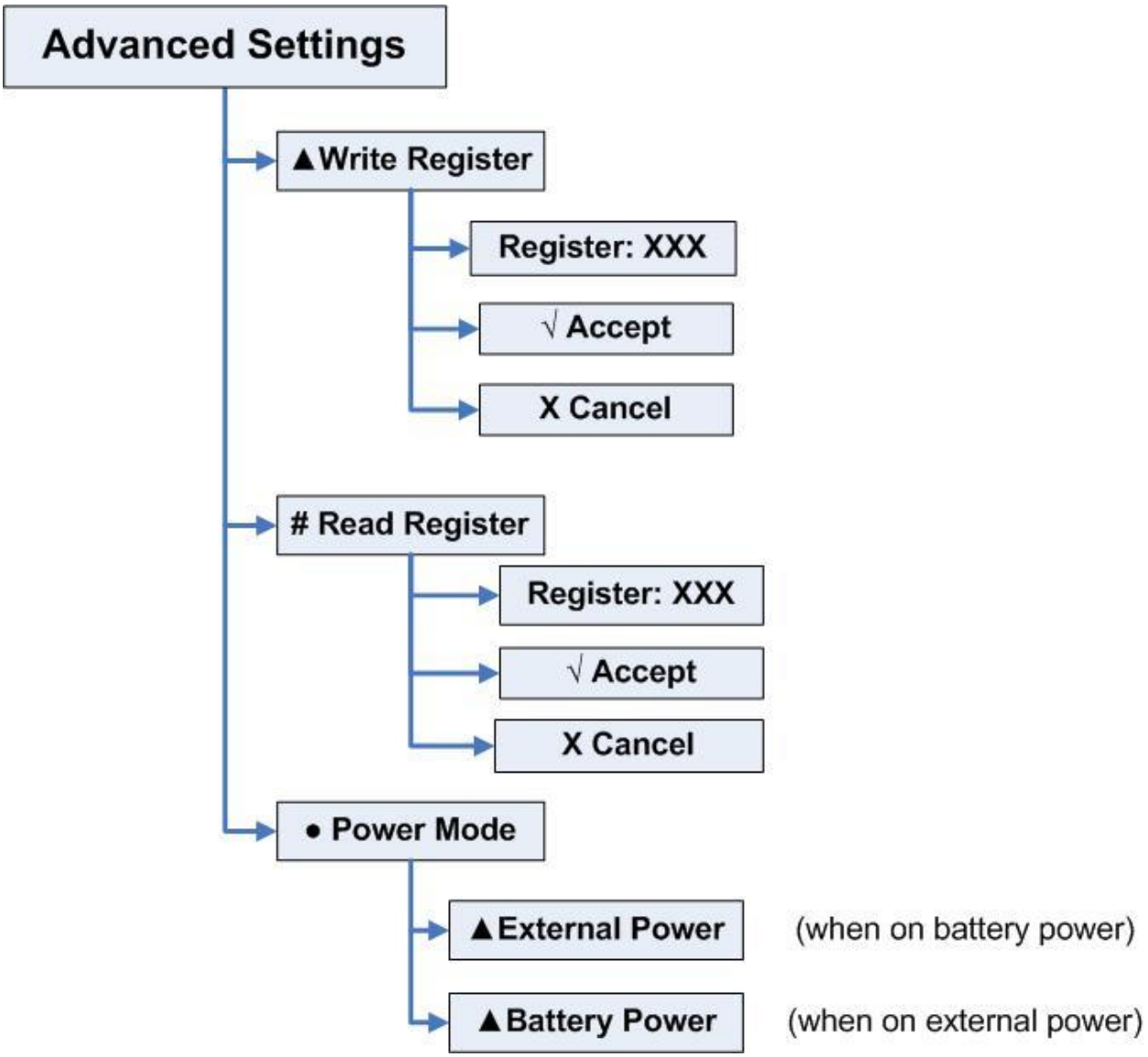
Additional information for the JAZ-PX module is located on our website at *Technical → Engineering Docs*. This information includes more in-depth descriptions of the various modes selectable from the menu and a lamp stability graph.

JAZ-PX Menu

JAZ-PX Menu Tree




Timing Controls
Force Trigger
▲Yes
No
Timing Reset
▲Yes
No
Free Running
▲Yes
No
Run Forever
▲Yes
No
Output Enable
▲Yes
No
Trigger Enable
▲Yes
No



Menu Tree Description

Menu Item	Description
Strobe Enable / Disable	Provides a quick way to prevent or allow the lamp to flash.
Setup	Enables you to manually configure the options for the device.
Parameters	Contains the various numeric parameters that can be set for the JAZ-PX.
Flash Rate	Sets the flash frequency (in microseconds) of the internal timing controller.

Menu Item	Description
Intensity	Controls the discharge voltage (and thus the flash intensity) of the lamp. Select 400-600V. On battery power, the intensity is restricted to 400V.
Number of Flashes	Sets the number of times that the lamp should flash after detecting a trigger event.
Holdoff Time	Specifies how long the timing generator should wait after detecting a trigger event before beginning to flash at the rate specified by the Flash Rate parameter.
Timing Controls	Controls used to set the timing behavior of the JAZ-PX module.
Force Trigger	An emulated trigger signal that can be used to force trigger events on the JAZ-PX module at any time. Forcing a trigger causes a trigger event with the same behavior as if the device detected a stack trigger. Force Trigger will not have any effect when the device is in Free Running mode, but it is not masked by turning Trigger Enable off.
Timing Reset	Does not reset the timing parameters themselves. Instead, it resets the state of the counters keeping track of timing in the hardware. This can be useful to “escape” from long flash periods or large values set in the Number of Flashes parameter.
Free Running	Puts the device into Free Running mode. In this mode, the timing generator simply flashes the lamp at the rate that is specified by the Flash Rate parameter and ignores trigger events.
Run Forever	When enabled, the timing generator will enter Run Forever mode. In this mode, it will ignore the Number of Flashes parameter setting and continue flashing forever once it has received a trigger event. It will re-sync to any trigger events that are detected during that time.
Output Enable	When disabled, the lamp will not flash. When set to 1, the lamp will flash as normal.
Trigger Enable	When enabled, the timing generator will not detect trigger events that are generated by the stack trigger. It *will* still detect timing events that are generated by the forced trigger.
Advanced Settings	Provides the advanced capability to set parameters and controls directly on the device, bypassing the Jaz menus. It also contains the power management menu.
Write Register	Allows you to write values directly to the control registers of the JAZ-PX module.
Read Register	Allows you to write values directly to the control registers of the JAZ-PX module.
Power Mode	Sets the power mode of the JAZ-PX module to either battery power or external power. You must manually set the power mode to external power to access intensities greater than 0 (400V) and flash rates higher than 200 Hz (5 msec). Using the JAZ-PX module on Jaz battery power at flash rates greater than 200 Hz can result in unexpected behavior.

PX Menu Default Values

When you first power-on the Jaz stack, the JAZ-PX module defaults to the following settings:

Setting	Default Value
Parameters Menu	
Flash Rate	200Hz (5 ms)
Intensity	400V
Number of Flashes	1
Holdoff Time	1 ms
Timing Controls Menu	
Force Trigger	No (N/A)
Timing Reset	No (N/A)
Free Running	Disabled
Run Forever	Disabled
Output Enable	Disabled
Trigger Enable	Enabled
Advanced Settings Menu	
Power Mode	Battery Power

Getting Started with the JAZ-PX Module

You can control your JAZ-PX module from the Jaz PX menu (see *JAZ-PX Menu*) or from OceanView spectrometer operating software (if you have purchased OceanView and have your Jaz unit attached to a computer) (see *Operating JAZ-PX from OceanView*).

For most applications, the JAZ-PX module can be quickly configured for either Continuous Strobe mode or triggered mode as described below. Also, see *PX Menu Default Values* for a list of JAZ-PX menu defaults.

More in-depth information concerning triggering is located in the JAZ-PX Lamp Module Engineering note. See *Product-Related Documentation*.

Setting JAZ-PX for Free Running Mode

In Free Running mode, the lamp simply flashes at a given rate and is not synchronized with any other elements of the system. This mode is only suitable when the integration time is much longer than the flash rate.

► *Procedure*

1. To place the JAZ-PX module into Free Running mode, set **PX Lamp | Setup | Timing Controls | Free Running** to **Enable**.
2. Select the desired flash rate using **PX Lamp | Setup | Parameters | Flash Rate**. The default rate is 200 Hz (5 msec).
3. Enable the strobe using **PX Lamp | Enable Strobe**.

Setting JAZ-PX for Triggered Mode

Some applications may require you to synchronize the various elements in the system to a system-wide trigger signal. This mode would be comparable to the legacy "single strobe" mode in that the PX lamp flashes can be synchronized to the spectrometer integration periods. However, the procedure below will result in multiple synchronized flashes per integration period rather than just a single flash per integration period.

► *Procedure*

1. Set the JAZ-PX module to turn Strobe Enable on using **PX Lamp | Enable Strobe**. The lamp will not begin to strobe until after you have set the internal trigger.
2. Set the Jaz DPU's stack trigger using **System Tools | Triggering | Internal | Set Rate**. This selects the DPU's internal timer as the source for the stack's trigger and sets an appropriate flash rate for the JAZ-PX lamp. The lamp will begin to flash at this rate when you click . The 10 msec setting is recommended as a starting point.

Caution

Unpredictable behavior may occur at rates above 200 Hz (5 msec) on battery power.

---

3. Select the spectrometer module in the Jaz stack to associate with the JAZ-PX module using **Spectrometer | Module *x* | Lamp Control | Choose Lamp | PX | Module *x*.** (The selected spectrometer's module number will appear in parentheses next to the PX.) This lamp will be disabled for dark measurements on the associated spectrometer module in the Jaz Spectroscopy menu.
4. Set the selected spectrometer module to begin its integration period whenever it detects a stack trigger (and is not currently in an integration period) using **Spectroscopy | Module *x* | Tools | Synchronization | Trigger | Mode | Hardware.**
4. Use the Jaz Spectroscopy menu to run your experiment.

Operating JAZ-PX from OceanView

Although the JAZ-PX module's internal timing cannot be set directly from OceanView, this software can still easily control the PX flash by selecting the appropriate triggering options. To control the JAZ-PX via OceanView, the JAZ-PX module should operate in Triggered mode (not Free Running mode) and use the Jaz internal trigger to control its flash timing. Ideally, the Jaz internal trigger should also be used to synchronize the lamp flashes to the integration periods of any spectrometers in the system. Additionally, the output of the JAZ-PX can be quickly enabled or disabled via the **Strobe/Lamp Enable** check box above the graph.

Getting Started using JAZ-PX with OceanView

► ***Procedure***

1. In OceanView, click on to display the **Acquisition Controls**.
2. Select the **Add/Remove Controls** tab.
3. Check the **Trigger Select** box to add it to the Main Controls.

Caution

Unpredictable behavior may occur at rates above 5 msec on battery power.

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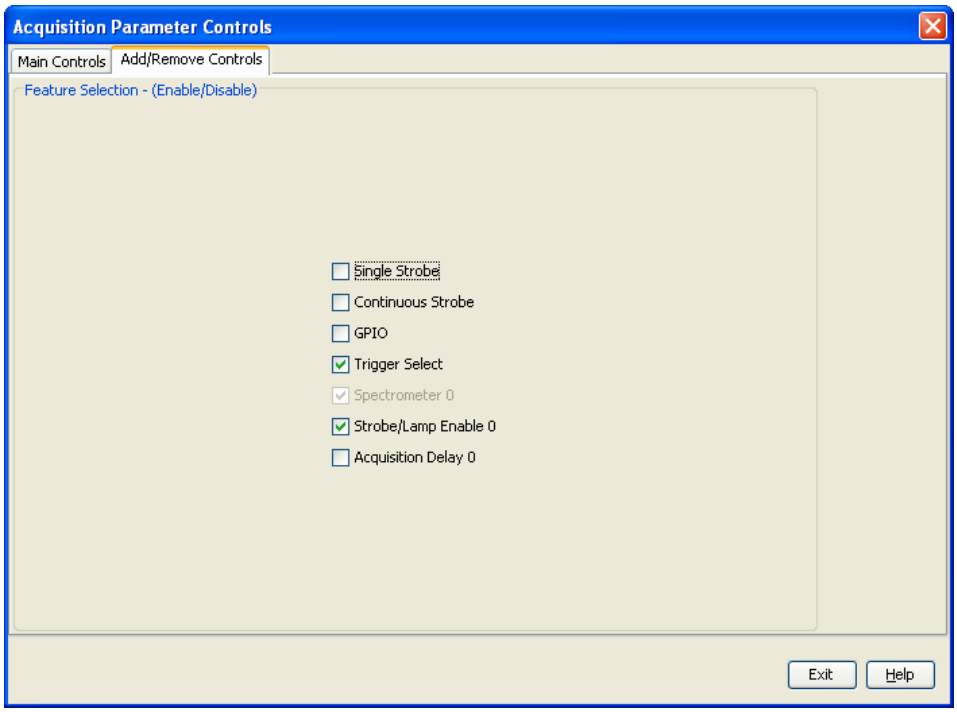
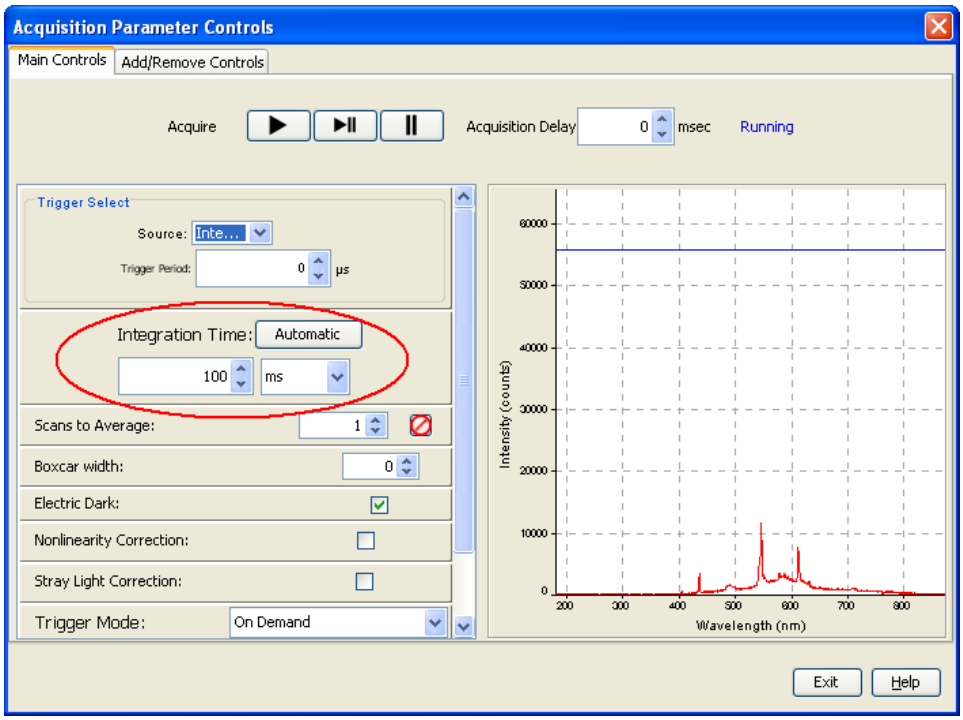
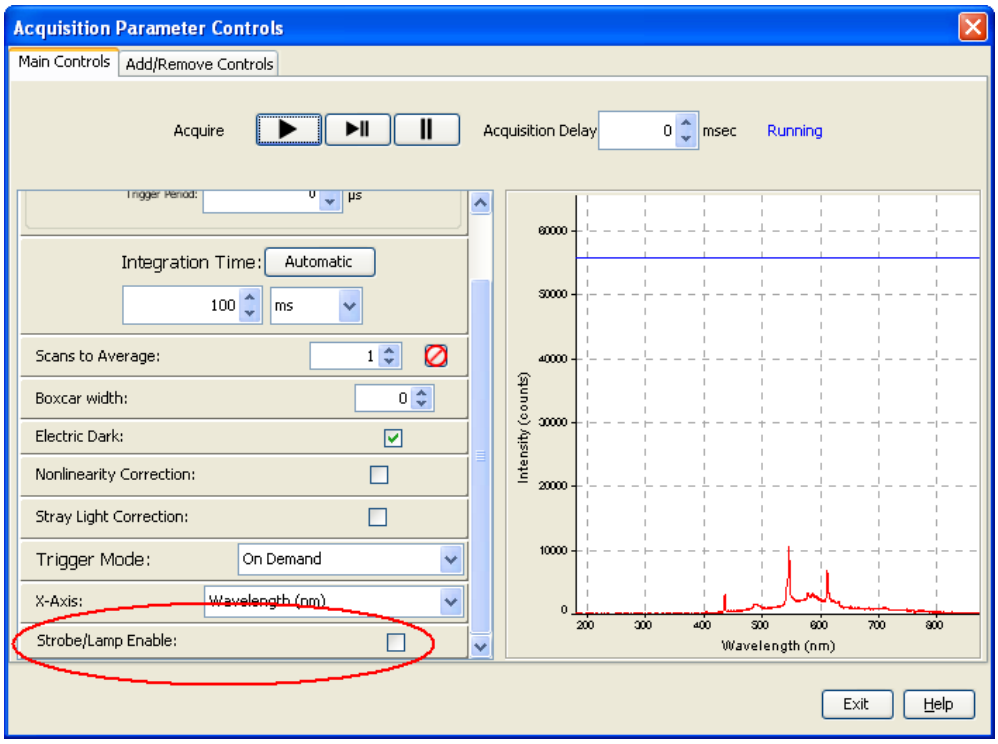
4. Check the **Strobe/Lamp Enable** box to add it to the Main Controls.



5. Select the **Main Controls** tab.
6. Change the **Trigger Select Source** to Internal and set your **Trigger Period** (in µs).



7. Scroll down to **Strobe/Lamp Enable** and check the box to turn the lamp on.



Synchronizing a Spectrometer Module to a JAZ-PX Module (recommended)

► *Procedure*

1. See *Getting Started using JAZ-PX with OceanView* to add Trigger Select and Strobe/Lamp Enable to the Main Controls if they are not already there.
2. Change the **Trigger Select Source** to **Internal** and set your **Trigger Period** to **10,000** µs as a starting point. The lamp will now be controlled by OceanView software (via the Strobe/Lamp Enable control).
3. Scroll down to **Strobe/Lamp Enable** and check the box to turn the lamp on.
4. Adjust the integration time in increments of 10 ms (Internal Trigger Period) to ensure that the signal does not vary with each acquisition. It is also helpful to set the Scans to Average to **1** so that the signal appears stable. After stability is set, then increase Scans to Average as desired.

Note

It is important to synchronize the lamp's flash rate (internal trigger period) with the integration time. For instance, if the trigger period is 10 ms and the integration time is 60 ms, there would be 6 full flashes for each acquisition (consistent light each measurement). Results will be inconsistent if the amount of light per acquisition varies (if the times are out of sync).

Chapter 5

Operating the JAZ-INDY Module

JAZ- INDY Module Overview

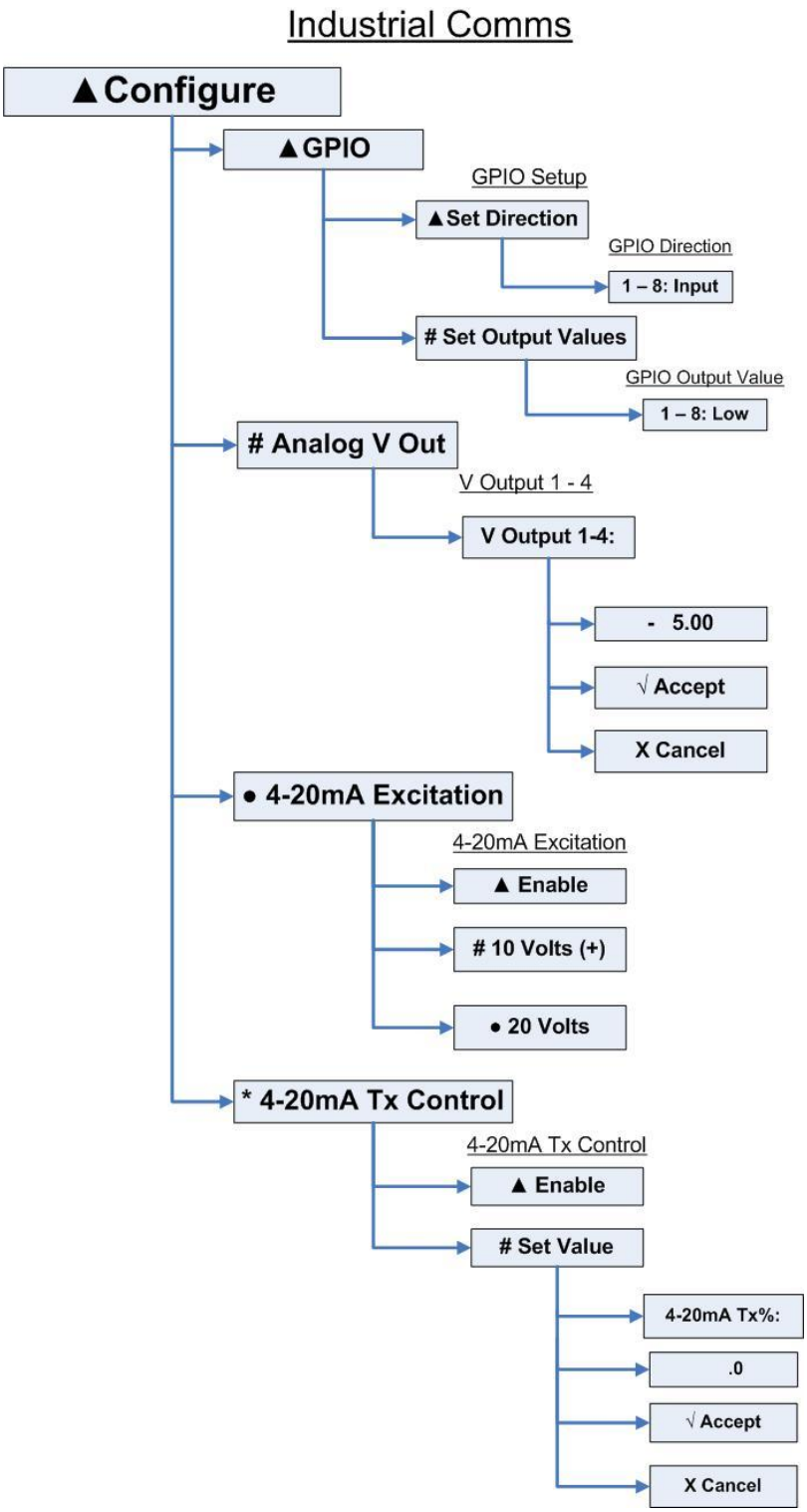
The Jaz Indy is a multifunction module that allows the Jaz system to communicate with data standards common to industrial applications – in particular, RS-232 and RS-485 – and provides both analog and digital inputs/outputs. When combined with the Jaz triggering capabilities and multichannel capacity, the Indy module makes Jaz an attractive optical-sensing option for multipoint sampling, reference monitoring and other applications in process and lab environments.

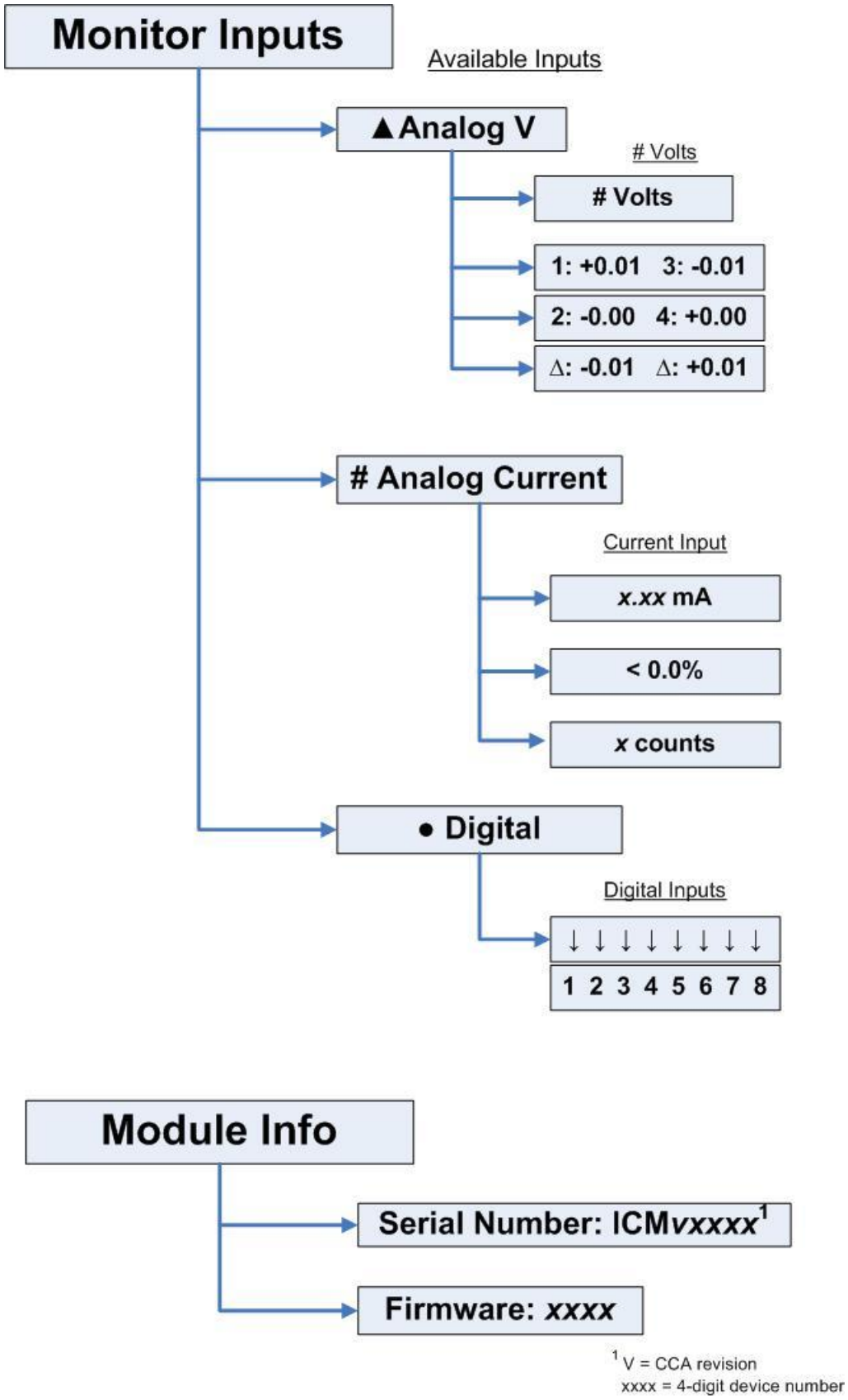
The Jaz Indy Module is installed in the vertical Jaz stack and operates as part of the fully integrated spectrometer system. The module has 4 analog I/Os software-configurable to -5 to +5 volts and 8 digital I/Os. Data for analog inputs and outputs can be processed in values such as volts or counts. The module complies with RoHS, CE and FCC Part 15, Class A requirements.

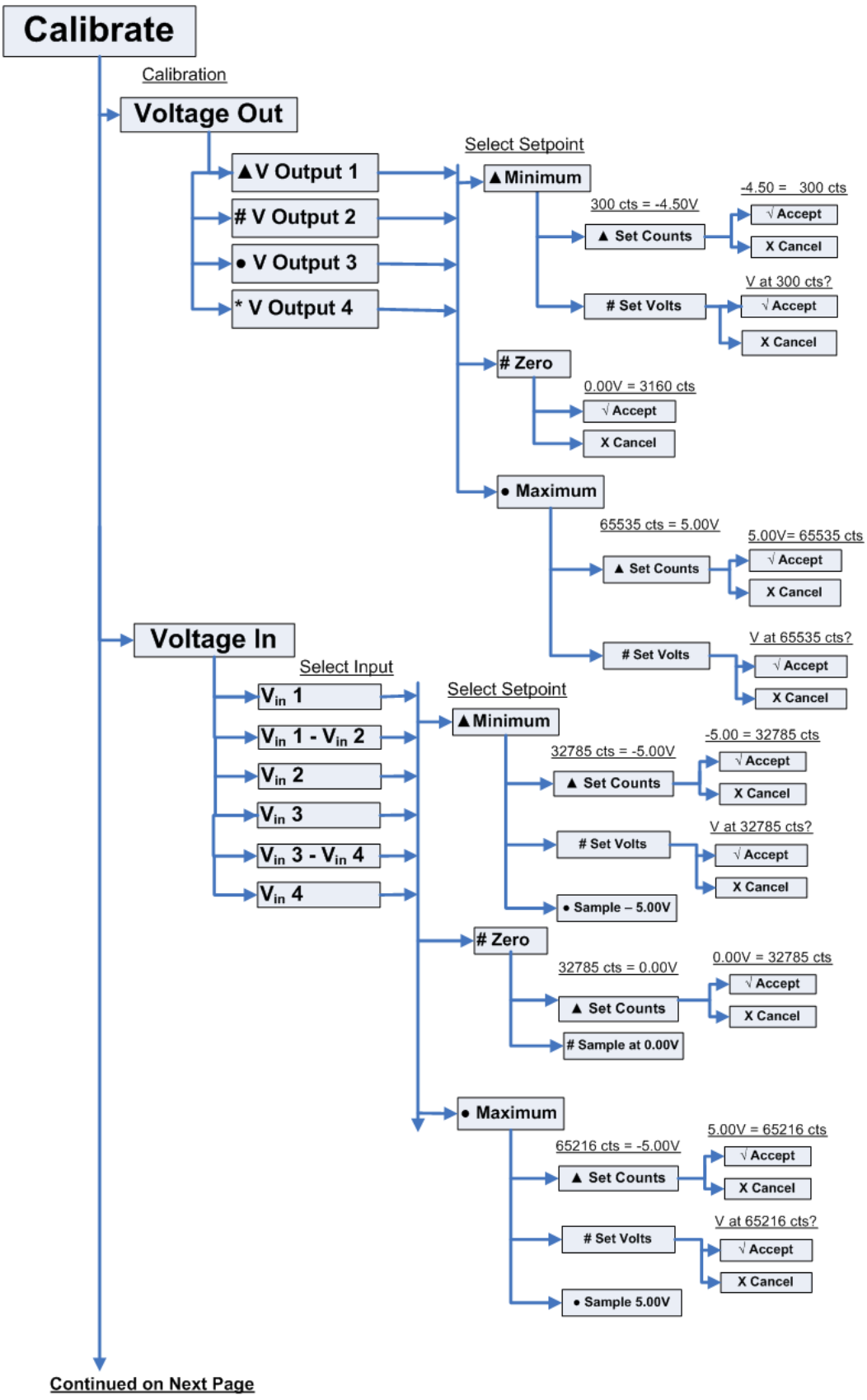
JAZ-INDY Module Features

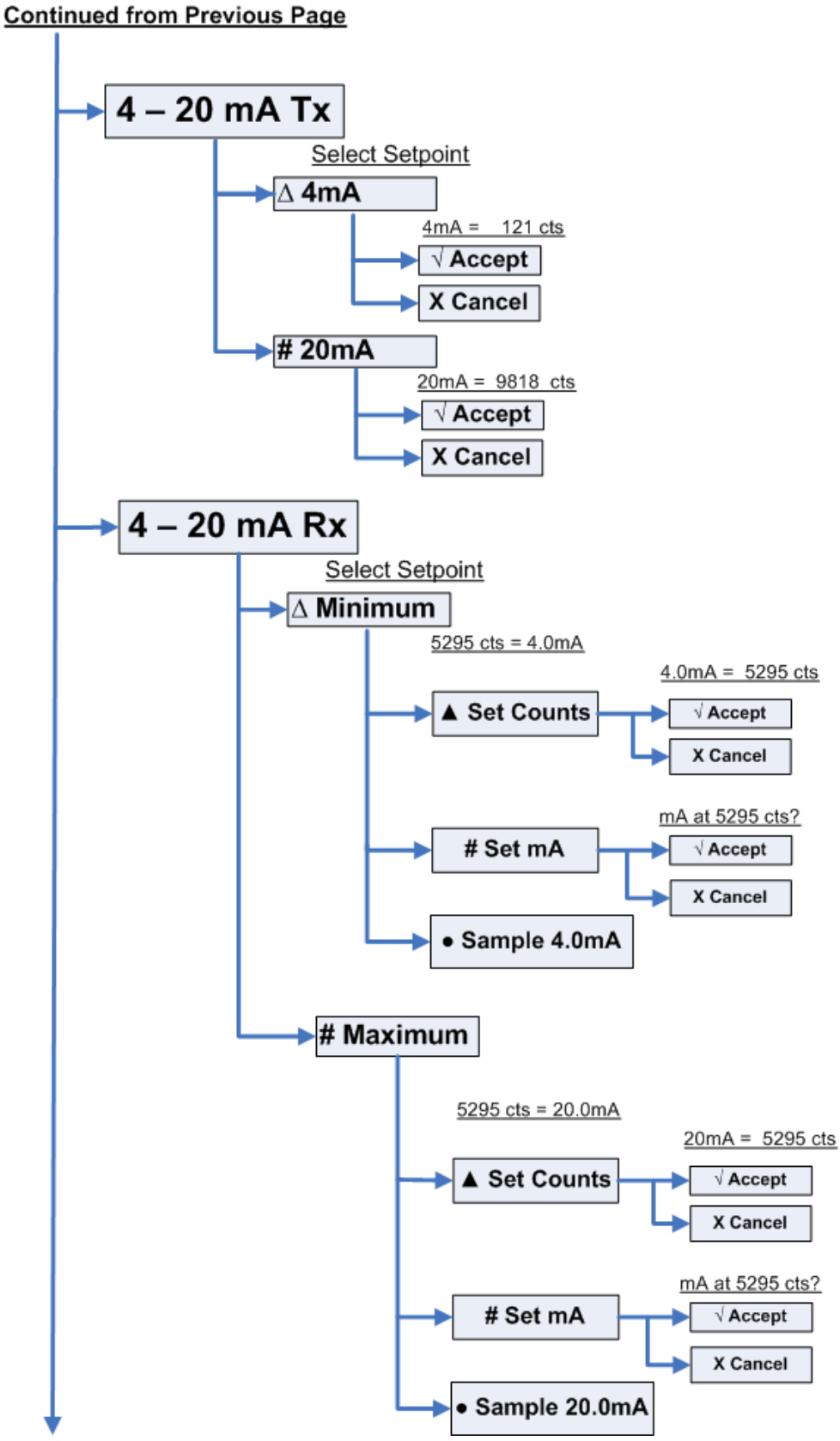
- Experiments connect directly to Indy module for analog and digital I/O
- Enables Jaz to communicate with other devices via RS-232/RS-485 standards
- Provides measurement and control for portable, laboratory and "light-industrial" setups
- Installs in Jaz stack and can be mounted to DIN rail or a wall (with special accessories) or anywhere with universal ¼-20 threaded mount

JAZ-INDY Menu




Monitor Inputs
Available Inputs
▲Analog V
Volts
Volts
1: +0.01 3: -0.01
2: -0.00 4: +0.00
Δ: -0.01 Δ: +0.01
Analog Current
Current Input
x.xx mA
< 0.0%
x counts
• Digital
Digital Inputs
↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
1 2 3 4 5 6 7 8
Module Info
Serial Number: ICMvxxxx[1]
Firmware: xxxx
[1] V = CCA revision
xxxx = 4-digit device number


Calibrate
Calibration
Voltage Out
▲V Output 1
V Output 2
• V Output 3
* V Output 4
Select Setpoint
▲Minimum
300 cts = -4.50V
▲ Set Counts
√ Accept
X Cancel
-4.50 = 300 cts
Set Volts
V at 300 cts?
√ Accept
X Cancel
# Zero
0.00V = 3160 cts
√ Accept
X Cancel
• Maximum
65535 cts = 5.00V
▲ Set Counts
√ Accept
X Cancel
5.00V= 65535 cts
# Set Volts
V at 65535 cts?
√ Accept
X Cancel
Voltage In
Select Input
Vin 1
Vin 1 - Vin 2
Vin 2
Vin 3
Vin 3 - Vin 4
Vin 4
Select Setpoint
▲Minimum
32785 cts = -5.00V
▲ Set Counts
√ Accept
X Cancel
-5.00 = 32785 cts
Set Volts
V at 32785 cts?
√ Accept
X Cancel
• Sample – 5.00V
Zero
32785 cts = 0.00V
▲ Set Counts
√ Accept
X Cancel
0.00V = 32785 cts
# Sample at 0.00V
• Maximum
65216 cts = -5.00V
▲ Set Counts
√ Accept
X Cancel
5.00V = 65216 cts
# Set Volts
V at 65216 cts?
√ Accept
X Cancel
• Sample 5.00V
Continued on Next Page


Continued from Previous Page
4 – 20 mA Tx
Select Setpoint
Δ 4mA
4mA = 121 cts
√ Accept
X Cancel
# 20mA
20mA = 9818 cts
√ Accept
X Cancel
4 – 20 mA Rx
Select Setpoint
Δ Minimum
5295 cts = 4.0mA
4.0mA = 5295 cts
▲ Set Counts
√ Accept
X Cancel
mA at 5295 cts?
Set mA
√ Accept
X Cancel
• Sample 4.0mA
Maximum
5295 cts = 20.0mA
20mA = 5295 cts
▲ Set Counts
√ Accept
X Cancel
mA at 5295 cts?
Set mA
√ Accept
X Cancel
• Sample 20.0mA

Menu Tree Description

Menu Item	Description
Configure	Enables you to manually set options for the device.
GPIO	Contains parameters for the 8 GPIO lines.
Set Direction	Sets the operational direction for each of the GPIO lines to input or output.
Set Output Values	If any GPIO lines are set to output, this menu item appears to allow you to set the output value for each output GPIO to 0 (low) or 1.
Analog V Out	Allows you to change each of the 4 voltage output settings from -5Vdc to +5Vdc. Change the voltage value using the * (left)/ # (right) buttons. Change the -/+ sign using the ▲ (Up)/ ● (Down) buttons, then press √ to accept your selection.
4-20mA Excitation	This selection affects the output of the 4-20mA current loop receiver. Select Enable for the receiver to provide a voltage source for an external 4-20mA current loop. You can choose to provide a 10Vdc or 20Vdc voltage.
4-20mA Tx Control	Provides control of the 4-20mA current loop transmitter to source 4 – 20 mA into the current loop. Control the value by adjusting the percentage of current flowing into the current loop using the 4-20mA Tx% setting (0 – 100%). Use the ▲ (Up)/ ● (Down) buttons to select the desired value, then press √ to accept your selection. NOTE: This menu option will display only if an excitation voltage is connected to the 4-20mA current loop transmitter.
Monitor Inputs	Enables you to monitor the status of the Analog V, Analog Current and Digital inputs.
Analog V	Select Analog V to monitor the four Analog-to-Digital input voltages (for channels 1, 2, 3 and 4), including the two differential readings. The two differential readings are taken by subtracting Channel 1 from Channel 2, and Channel 3 from Channel 4.
Analog Current	Displays the amount of current in the JAZ-Indy module's 4-20mA receiver circuit. The values shown are: • Current in mA, • Percentage of 4-20mA value (0 –100%), with 0% = 4mA and 100% = 20mA. If current dips below 4mA, < appears next to the value. If current rises above 20mA, > appears. The percentage value will never display for input current below 4 mA or above 20 mA. • Count is the digital value collected at the current-sense input of the Analog-to-Digital converter (Channel 7).
Digital	When enabled, the Digital Inputs sub menu shows the state of the GPIO lines configured as inputs: • ↑ indicates a TTL high input (Logic 1) • ↓ indicates a TTL low input (Logic 0) NOTE: Arrows are not shown for bits assigned as outputs.

Menu Item	Description
Module Info	Allows you to display the Indy module serial number where: *v* = the CCA revision *xxxx* = the 4-digit number of the device
Calibrate	Select to measure the following: • voltage out: in counts or volts • voltage in: in counts or volts • 4 – 20 mA Transmit • 4 – 20 mA Receive See *Calibrating the JAZ-INDY Module* for the calibration procedures.

JAZ-INDY Menu Defaults

When you first power-on the Jaz stack, the JAZ-INDY module defaults to the following settings:

Setting	Default Value
GPIO Menu	
Set Direction	1-8: Input Set Output Values does not appear until one of the 1 bits is changed to Output
Analog V Out	
V Output	- 5.00
4-20mA Excitation	
4-20mA Excitation	10 Volts (+)
4-20mA Tx Control	
Set Value	.0

Calibrating the JAZ-INDY Module

Your JAZ-INDY module is calibrated at the factory, but you can use the procedures in this section to recalibrate the module so that it matches your equipment.

- You can calibrate the following on the JAZ-INDY module:
- Four voltage outputs

- Four single-ended voltage inputs and the two differential inputs
- 4-20mA transmitter
- 4-20mA receiver

Calibrating the Voltage Outputs

The JAZ-INDY module provides four analog voltage outputs on its 26-pin connector (outputs 14 are mapped to pins 5, 14, 23, and 4 respectively, where pins 2, 12, or 15 can be used as analog ground).

► *Procedure*

1. Connect an external, calibrated voltmeter (providing at least 5 total digits resolution) to each output pin to calibrate it. No load should be connected to the output pin; it should be connected to a voltmeter and nothing else.
2. Set the output voltage (in counts) until the voltmeter reads as close as possible to -4.5V. Record this value to be used later.
3. Set the output voltage (in counts) until the voltmeter reads as close as possible to 0.0V. Record this value to be used later.
4. Set the output voltage (in counts) until the voltmeter reads as close as possible to 4.5V. Record this value to be used later.
5. Using the Jaz menu or OceanView software, select the voltage output to be calibrated:
   a. Select Minimum, then change the voltage to -4.5 and set the counts to the value you measured in Step 2.
   b. Select Zero and enter the counts measured in Step 3.
   c. Select Maximum, then change the voltage to 4.5 and set the counts to the value you measured in Step 4.
6. Repeat this procedure for each of the output channels.

Calibrating the Voltage Inputs

Once the voltage outputs are calibrated, they can be used to calibrate the voltage inputs. These can be found on pins 3, 13, 22, and 21. Note that the output voltage may sag slightly when connected to the voltage inputs, so it is necessary to keep the voltmeter connected to the joined input and output pins to compensate.

► *Procedure*

1. Set the output voltage (in counts) until the voltmeter reads as close as possible to -4.5V.
2. Using the Jaz menu or OceanView software (see *Calibrating the 4-20mA Transmitter*), select the voltage input to be calibrated:
   a. Select Minimum, and change the voltage to -4.5V. Then select Sample at -4.50V. This will update the counts automatically.

b. Set the output voltage (in counts) until the voltmeter reads 0.0V. Then select **Calibrate | Voltage In | #Zero | #Sample at 0.00V** from the Jaz menu.

c. Set the output voltage (in counts) until the voltmeter reads 4.5V. Then select **Calibrate | Voltage In | ●Maximum, set the voltage to 4.5V and select ●Sample at 4.5V**.

8. Repeat this procedure for each of the input channels.

Note

There are two special channels (Vin 1 – Vin 2 and Vin 3 – Vin 4) that are differential (the hardware finds the difference between the corresponding input pins). To calibrate these, You must use two voltage inputs at once and set them to opposite values (e.g., set one to +4.5V, the other to -4.5V, to calibrate the differential input at +9V). The process is the same as described above, except that the differential inputs should be calibrated at -9V, 0.0V, and 9V.

For the 0.0V measurement, set both of the voltage outputs being driven in to zero. For the non-zero measurements, both voltage input/output pairs should be confirmed on the external voltmeter prior to finishing the calibration.

Calibrating the 4-20mA Transmitter

The JAZ-INDY module provides a 4-20mA current controller that must be calibrated. There are only two setpoints for this controller: 4mA and 20mA. The controller can be calibrated by passing the current directly through a digital multimeter (ensure first that the meter is rated to withstand at least 30mA to prevent damage). JAZ-INDY provides an excitation source that can be used to power the current transmitter (pin 19). If you use this internal source, set it to 20V (this can be done in OceanView) and ground the output of the current loop (after passing through the multimeter) back to the JAZ-INDY module (using any of the ground pins).

Calibrating the 4-20mA Receiver

Once the 4-20mA transmitter has been calibrated, it can be used to calibrate the receiver.

► *Procedure*

1. Move the ground connection from the current loop used in calibrating the 4-20mA transmitter so that it is instead connected to pin 11 (4-20 Sense).
2. Vary the current output of the 4-20mA transmitter until 4mA is reached.
3. In the Jaz menu, select **Calibrate | 4-20 mA Rx | Minimum**. Set the mA value, if needed, to 4.0 and then select **Sample 4.0mA**.
4. Select **Calibrate | 4-20 mA Rx | Maximum**, then repeat this process for the 20mA setpoint.

Chapter 6

Maintenance

Overview

This chapter contains Jaz software updates, maintenance and troubleshooting issues.

Software Updates

Ocean Optics is constantly striving for excellence and innovation in our products. Updates for both OceanView and Jaz software are available to ensure that you always have the most recent software.

OceanView

OceanView is updated frequently. You can download the latest version from the Ocean Optics website **www.oceanoptics.com** or use the Update Center in OceanView (**Help | Check for Updates**).

Jaz

Select System **Tools | Flash Update** from the Jaz menu to download Jaz updates.

Jaz Troubleshooting

The following sections contain information on troubleshooting issues you may encounter when using Jaz.

Jaz Connected to Computer Prior to OceanView Installation

Windows Operating Systems

If you connected Jaz to a computer prior to installing OceanView on a Windows platform, you may encounter installation issues that you must correct before your Ocean Optics device will operate properly.

Follow the applicable steps below to remove the incorrectly installed device, device driver, and installation files.

Note

If these procedures do not correct your device driver problem, you must obtain the *Correcting Device Driver Issues* document from the Ocean Optics website: **http://oceanoptics.com///wp-content/uploads/Correcting-Device-Driver-Issues.pdf.**

Remove the Unknown Device from Windows Device Manager

► *Procedure*

1. Open Windows Device Manager. Consult the Windows operating instructions for your computer for directions, if needed.
2. Locate the **Other Devices** option and expand the **Other Devices** selection by clicking on the "+" sign to the immediate left.

Note

Improperly installed USB devices can also appear under the Universal Serial Bus Controller option. Be sure to check this location if you cannot locate the unknown device.

3. Locate the unknown device (marked with a large question mark). Right-click on the **Unknown Device** listing and select the **Uninstall** or **Remove** option.
4. Click the **OK** button to continue. A warning box appears confirming the removal of the Unknown Device. Click the **OK** button to confirm the device removal.
5. Disconnect Jaz from your computer.
6. Locate the section in this chapter that is appropriate to your operating system and perform the steps in the following *Remove Improperly Installed Files* section.

Remove Improperly Installed Files

► *Procedure*

1. Open Windows Explorer.
5. Navigate to the **Windows | INF** directory.

Note

If the INF directory is not visible, you must disable the Hide System Files and Folders and Hide File Extensions for Known File Types options in Windows Folder Options. Access Windows Folder Options from Windows Explorer, under the **Tools | Folder Options** menu selection.

6. Delete the **OOI_USB.INF** in the INF directory. If your computer is running either the Windows 2000 or XP operating system, you must also delete the **OOI_USB.PNF** file in the INF directory.
7. Navigate to the **Windows | System32 | Drivers** directory.
8. Delete the **EZUSB.SYS** file.
9. Reinstall your Ocean Optics application and reboot the system when prompted.
10. Plug in the USB device.

The system is now able to locate and install the correct drivers for the USB device.

Mac Operating Systems

Since there are no device files for Jaz in a Mac operating system, you should not encounter any problems if you installed the spectrometer before the OceanView software.

Linux Operating Systems

For Linux operating systems, all you need to do is install the OceanView software, then unplug and replug in the spectrometer. Technically, the driver files for Linux simply give nonprivileged users permission to use newly connected hardware. There isn't any long-term harm to plugging in the device before installing the software.

Jaz Troubleshooting Tips

The following table provides additional information for troubleshooting Jaz issues. If these suggested solutions do not solve the problem, please contact us for Technical Support.

Problem	Possible Cause(s)	Suggested Solution(s)
Jaz does not initialize correctly.	Unit was powered on too quickly after being powered off.	Wait 10-15 seconds before powering on Jaz.
USB Jaz turns on and then powers down before it completes initialization	Only the Jaz-DPU (CPU module) + Jaz-S (spectrometer module) can be powered over USB (unless the unit also includes a battery). While a JAZ-DPU + JAZ-E (Ethernet) + JAZ-S might sometimes power over USB, the available USB power may not always successfully power the Jaz stack.	Use the accessory +5V power supply.
Jaz power LED doesn't turn on (PoE, USB operation or +5V power, no battery).	Jaz needs to power its internal electronics before it can fully power up.	Wait 10 seconds after plugging in Jaz before pressing the power button
Jaz display blanks out	Jaz has an automatic screensaver	While any key press will bring back

Problem	Possible Cause(s)	Suggested Solution(s)
	that turns on 3 minutes after the last key press.	the display, pressing the SAVE key (floppy disk) is recommended since other keys might cause an unwanted command to be executed. A future release of the firmware will ignore the first key press when restoring the display from screen-saver operation.
I plugged in the Ethernet connection after the Jaz powered up, and now see a "Network Unplugged" message when "View Settings" is selected.		If you select #Edit Settings and select Auto (DHCP), the Jaz will try again to acquire a network address.
Jaz does not communicate with OceanView via USB.	Jaz needs to boot completely before initiating USB communication.	Restart Jaz and wait until it displays the menu screen before starting (or re-scanning devices) in OceanView.
Jaz can get an IP address and can be pinged over Ethernet, but won't otherwise communicate.	The battery is nearly empty, causing Jaz to lose the connection.	Plug Jaz into the wall power receptacle or use the Power over Ethernet capability.

Replacing an LED Assembly in the JAZ-INTLED Module

The JAZ-INTLED module allows you to replace the LED assembly instead of replacing the entire module when you want to switch out LEDs. The following LED assemblies are available for the JAZ-INTLED module:

- JAZ-L640: 640 nm red LED
- JAZ-L590: 590 nm yellow LED
- JAZ-L450: 470 nm blue LED
- JAZ-L365: 365 nm UV LED
- JAZ-LWHITE: White LED

You can also order all five of these LED assemblies together (plus the JAZ-405 LED assembly) in the INTLED-KIT.

Parts Needed

- JAZ-INTLED module in your Jaz stack

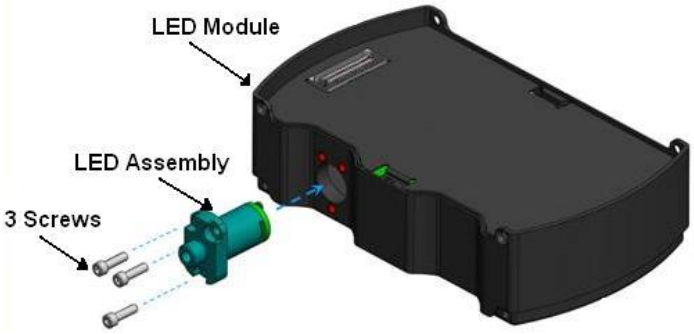
- Jaz LED assembly
- Allen wrench (5/64")
- Three 2-56 screws (comes with LED assembly)

LED Assembly Replacement Procedure

► *Procedure*

To replace an LED assembly,

1. Disconnect power from the Jaz stack.
2. Power-down the Jaz stack by pressing the Power button ( ).
3. Lightly hold pressure on the LED assembly to hold it into the LED module while loosening the three 2-56 screws with the Allen wrench. You will feel some slight pressure from the springs once the screws are loosened as they try to push the assembly out of the module.



4. Completely remove the screws and set them aside for use in the new LED assembly.
5. Pull the LED assembly straight out of the module.
6. Align the holes of the new LED assembly with the three holes on the LED module and gently push the LED assembly straight in to the module. Do **not** force the LED assembly into the module.
7. Re-insert the three 2-56 screws into the holes and tighten them finger-tight in succession to hold the LED assembly in place. Do **not** over-tighten the screws.
8. Power-up your Jaz stack.

Caution

Always remove and insert the LED by gently pushing it straight into and pulling it straight out of the module. Twisting the LED can result in breakage.

Appendix A

Calibrating the Wavelength of Jaz

Overview

This appendix describes how to calibrate the wavelength of your spectrometer. Though each spectrometer is calibrated before it leaves Ocean Optics, the wavelength for all spectrometers will drift slightly as a function of time and environmental conditions. Ocean Optics recommends periodically recalibrating the Jaz spectrometer.

About Wavelength Calibration

You are going to be solving the following equation, which shows that the relationship between pixel number and wavelength is a third-order polynomial:

$$\lambda_p = I + C_1 p + C_2 p^2 + C_3 p^3$$

Where:

λ = the wavelength of pixel p

I = the wavelength of pixel 0

C_1 = the first coefficient (nm/pixel)

C_2 = the second coefficient (nm/pixel^2)

C_3 = the third coefficient (nm/pixel^3)

You will be calculating the value for I and the three Cs.

Calibrating the Spectrometer

Preparing for Calibration

To recalibrate the wavelength of your spectrometer, you need the following components:

- A light source capable of producing spectral lines

Note

Ocean Optics' HG-1 Mercury-Argon lamp is ideal for recalibration. If you do not have an HG-1, you need a light source that produces several (at least 4-6) spectral lines in the wavelength region of your spectrometer.

- A Jaz spectrometer module
- An optical fiber (for spectrometers without a built-in slit, a 50-μm fiber works best)
- A spreadsheet program (Excel or Quattro Pro, for example) or a calculator that performs third-order linear regressions

---

Note

If you are using Microsoft Excel, choose **Tools | Add-Ins** and check **AnalysisToolPak** and **AnalysisTookPak-VBA**.

Calibrating the Wavelength of the Spectrometer

► *Procedure*

Perform the steps below to calibrate the wavelength of the spectrometer:

1. Place the spectrometer operating software into Quick View (Scope) mode and take a spectrum of your light source. Adjust the integration time (or the A/D conversion frequency) until there are several peaks on the screen that are not off-scale.
2. Move the cursor to one of the peaks and position the cursor so that it is at the point of maximum intensity.
3. Record the pixel number that is displayed in the status bar or legend (located beneath the graph). Repeat this step for all of the peaks in your spectrum.
4. Use the spreadsheet program or calculator to create a table like the one shown in the following figure. In the first column, place the exact or true wavelength of the spectral lines that you used.

   In the second column of this worksheet, place the observed pixel number. In the third column, calculate the pixel number squared, and in the fourth column, calculate the pixel number cubed.

Independent Variable

Dependent Variables

Values Computed from the Regression Output

True Wavelength (nm)	Pixel #	Pixel # ^{2}	Pixel # ^{3}	Predicted Wavelength	Difference
253.65	175	30625	5359375	253.56	0.09
296.73	296	87616	25934336	296.72	0.01
302.15	312	97344	30371328	302.40	-0.25
313.16	342	116964	40001688	313.02	0.13
334.15	402	161604	64964808	334.19	-0.05
365.02	490	240100	117649000	365.05	-0.04
404.66	604	364816	220348864	404.67	-0.01
407.78	613	375769	230346397	407.78	0.00
435.84	694	481636	334255384	435.65	0.19
546.07	1022	1044484	1067462648	546.13	-0.06
576.96	1116	1245456	1389928896	577.05	-0.09
579.07	1122	1258884	1412467848	579.01	0.06
696.54	1491	2223081	3314613771	696.70	-0.15
706.72	1523	2319529	3532642667	706.62	0.10
727.29	1590	2528100	4019679000	727.24	0.06
738.40	1627	2647129	4306878883	738.53	-0.13
751.47	1669	2785561	4649101309	751.27	0.19

5. Use the spreadsheet or calculator to calculate the wavelength calibration coefficients. In the spreadsheet program, find the functions to perform linear regressions.
   - If using Quattro Pro, look under **Tools | Advanced Math**
   - If using Excel, look under **Analysis ToolPak**
6. Select the true wavelength as the dependent variable (Y). Select the pixel number, pixel number squared, and the pixel number cubed as the independent variables (X). After executing the regression, you will obtain an output similar to the one shown below. Numbers of importance are noted.

Regression Statistics

Multiple R	0.999999831
R Square	0.999999663
Adjusted R Square	0.999999607
Standard Error	0.125540214
Observations	22

R Squared

Intercept

	Coefficients	Standard Error
Intercept	190.473993	0.369047536
X Variable 1	0.36263983	0.001684745
X Variable 2	-1.174416E-05	8.35279E-07
X Variable 3	-2.523787E-09	2.656608E-10

First coefficient

Second coefficient

Third coefficient

7. Record the Intercept, as well as the First, Second, and Third Coefficients. Additionally, look at the value for R squared. It should be very close to 1. If not, you have most likely assigned one of your wavelengths incorrectly.

   Keep these values at hand.

Saving the New Calibration Coefficients: USB Mode

Ocean Optics programs wavelength calibration coefficients unique to each Jaz spectrometer module onto an EEPROM memory chip in Jaz.

You can overwrite old calibration coefficients on the EEPROM if you are using Jaz via the USB port.

► *Procedure*

To save wavelength calibration coefficients using the USB mode, perform the following steps:

1. Ensure that Jaz is connected to the computer and that you have closed all other applications.
2. Point your browser to **http://www.oceanoptics.com/technical/softwaredownloads.asp** and scroll down to **Microcode**. Select **USB EEPROM Programmer**.
3. Save the setup file to your computer.
4. Run the **Setup.exe** file to install the software. The **Welcome** screen appears.
5. Click the **Next** button. The **Destination Location** screen appears.
6. Accept the default installation location, or click the **Browse** button to specify a directory. Then, click the **Next** button. The **Program Manager Group** screen appears.
7. Click the **Next** button. The **Start Installation** screen appears.
8. Click the **Next** button to begin the installation. Once the installation finishes, the **Installation Complete** screen appears.
9. Click the **Finish** button and reboot the computer when prompted.
10. Navigate to the **USB EEPROM Programmer** from the Start menu and run the software.
11. Click on the desired Jaz device displayed in the left pane of the **USB Programmer** screen.
12. Double-click on each of the calibration coefficients displayed in the right pane of the USB Programmer screen and enter the new values acquired in Steps 5 and 6 of the *Calibrating the Wavelength of the Spectrometer* section in this appendix.
13. Repeat Step 12 for all of the new values.
14. Click on the **Save All Values** button to save the information, and then **Exit** the USB Programmer software.

The new wavelength calibration coefficients are now loaded onto the EEPROM memory chip on the Jaz spectrometer module

Appendix B

Specifications

Overview

This appendix contains specification information for the Jaz stack and its individual modules.

Specification	Value
Power Consumption	250 mA @ 5 VDC
Computer interface	USB in JAZ-DPU module Ethernet in JAZ-E module
Computer requirements	IBM-compatible PC with Pentium or better microprocessor 32 MB RAM (16 MB) Windows 98/Me/2000/XP, Mac OS X and Linux when using the USB interface on desktop or notebook PCs.
Operating software	OceanView (for an additional $199)
Fiber optic connector	SMA 905 to single-strand optical fiber
Spectrometer Module (JAZ-S)	
Grating Options	14 different gratings, UV through Shortwave NIR
Detector	2048-element linear silicon CCD array; L2 Collection Lens
Wavelength range	200-1100 nm; maximum 650 nm
Entrance aperture	5, 10, 25, 50, 100 or 200 µm wide slits or fiber (no slit)
AgPlus Mirrors	Provide reflectivity >95% over the visible and NIR wavelength range and over a wide range of angles of incidence
Signal-to-noise ratio	250:1
Integration time	870 µs to 65 seconds
Data transfer rate	USB: 60 scans per second Ethernet: 20 scans per second

Specification	Value
Optical resolution	~0.3-10.0 nm FWHM
Dark noise	50 RMS counts
Dynamic range	1300:1
OLED Display Module (JAZ-DPU)	
OLED Display	128 x 64 OLED
Keypad	Pushbutton functions; functionality can be rotated 180º
Onboard computer	Embedded processor with data processing and storage capability
Ethernet & Memory Module (JAZ-E)	
Ethernet	100 Mbps; IEEE 802.3-compliant 10/100
Data Storage	Via SD card
Battery & Memory Module (JAZ-B)	
Type	Rechargable lithium-ion
Life	8 hours before recharging
L450 Blue LED Light Source (JAZ-L450)	
Type	LS-450 LED
VIS-NIR Light Source Module (JAZ-VIS-NIR)	
Type	Tungsten-halogen
Bulb life (estimated)	1100 hours
UV-VIS Light Source Module (JAZ-UV-VIS)	
Type	Deuterium-tungsten-halogen
Pulsed Xenon Lamp Module (JAZ-PX) (tested at 200 Hz flash rate, 400V intensity, in Triggered mode at 1 flash per period)	
Operation time	2.5 hours (typical) on internal battery
Flash rate	200 Hz maximum
Optical stability	1% (stability will decrease at frequencies above 200 Hz)

Specification	Value
Lamp life	Minimum: 10^8 flash (Number of flashes before intensity is reduced to 50%. Lamp behavior is not characterized beyond lamp life Typical: $5x10^9$
Power	Average : 2.5W ; Peak : 3W
Spectral range	190 – 1100 nm
Industrial Communications Module (JAZ-INDY)	
Standards	RS-232 and RS-435

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