

# Osprey™ Universal Digital MCA Tube Base

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User's Manual



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# Preface

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The Osprey™ Universal Digital MCA Tube Base is a fully integrated 2K channel signal analyzer offering advanced signal processing filters and digital stabilization.

- All-in-one HVPS, preamplifier, and digital MCA
- Compatible with all standard 14-pin scintillation detectors, including NaI(Tl) and LaBr<sub>3</sub>(Ce)
- Optional temperature-stabilized locking NaI detector
- USB 2.0 connection for PC plug-and-play
- Ethernet 10/100T (PoE) connection for network applications
- PHA, MCS, SCA, AUX Counter, MSS, List, and Time-stamped List modes of acquisition
- PHA and MCS modes are fully supported by Genie™ 2000 Software. SCA, AUX Counter, MSS, List and Time-Stamped List modes are supported by programming libraries.
- Includes programming libraries with examples. The programming libraries expose methods to client applications for accessing the Osprey's full complement of parameters and controls for acquisition, external start/stop, coincidence gating, and counters.
- Compatible with Canberra Model 727 shield.
- Support for scintillation detectors used in gamma and x-ray spectroscopy with up to 2K channels of spectral memory.
- User interfaces:
  - Full featured acquisition/analysis capability through Canberra's Genie™ 2000 spectroscopy software.
  - Live system status and firmware updates using an Internet browser.
- Signal shaping filters with appropriate shaping times to support the various detectors over a wide range of count rates.
- Multiple counting modes from traditional Pulse Height Analysis (PHA) and Multichannel Scaling (MCS) analysis modes to LIST and Multispectral Scaling (MSS) modes. The latter two are of interest when continuous counting intervals are needed for position or time-based analyses. SCA counters and a single Auxiliary Counter are also supported.

- Multiple computer interfaces with routable TCP/IP and DHCP network support:
  - 10/100 Base-TX Ethernet for fast network connections over any distance up to 100 meters
  - USB for fast, convenient local connections over any distance up to 5 meters.
- Base Line Restoration and Digital Spectrum Stabilization.
- Adjustable digital signal delay for Coincidence timing applications (0–160  $\mu$ s in 0.1  $\mu$ s steps).
- Three general purpose input/output interfaces (MCX connection) for external control. Some interfaces include: MCS In, PHA and MCS Start/Stop, MCS Channel and Sweep Advance, Coincidence/Anticoincidence Gating, plus general-purpose I/O connectors. Refer to the appendix *External GPIO Configuration Matrix* on page 97 for a complete GPIO configuration selection chart and descriptions.



# Important Safety Considerations Read Carefully



Indicates warning of mains or high voltage present at output labeled HV.  
Risk of electrical shock if covers are removed.



Caution – risk of danger. Refer to documentation for detailed explanation of caution symbol wherever marked.



Product complies with appropriate current EU directives.



Example of "Cue" mark. Product complies with appropriate current FCC (UL)/CSA 61010-1 directives.

# Note

# 1. Introduction

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The Osprey™ is a high-performance, fully-integrated multi-channel analyzer (MCA) tube base that contains everything needed to support scintillation spectrometry. Designed for both laboratory and field use, this one compact unit contains a high-voltage power supply (HVPS), preamplifier and a full-featured digital MCA. Osprey can be controlled through either USB or Ethernet with no need to purchase two separate units – an industry first. USB or Ethernet, there is only one cable connecting the Osprey to the control and data acquisition system.

For desk-top applications, power and all communications are handled by a USB 2.0 port. In situations where networking and/or remote access are desired, the Ethernet 10/100T port can be used which provides power and communications via power-over-Ethernet (PoE). An example of using Osprey's networking capabilities is setting up a radiation monitoring system with multiple unattended detectors in remote locations. (Ethernet can also be used in desk-top applications instead of USB if desired.) Coupled with the powerful Genie 2000 software suite, the Osprey takes scintillation spectrometry to a new level. Just connect the detector and Osprey, connect the Osprey to an available USB or Ethernet port, start the Genie 2000 software, and you are ready to acquire the spectrum, making this a true “plug-and-play” solution.

The Genie 2000 software suite is a comprehensive environment for MCA control, data acquisition, display, and analysis. It provides independent support for multiple detectors, extensive networking capabilities, advanced data analysis, and comprehensive batch procedure capabilities. With the Genie 2000 programming libraries, the advanced user can develop custom applications using all available Genie 2000 features and user interfaces. An OS independent software development kit (SDK) with examples is included with every Osprey and can be used without Genie 2000. The SDK is similar to the comprehensive set of programming tools distributed with CANBERRA's Lynx® MCA. It allows expert users to develop platform independent applications for instrument control and data acquisition.

In addition, a diagnostic web graphical user interface (GUI) application is supplied with the Osprey, providing MCA and detector status information, network setup, and firmware upgrade functionalities.

The Osprey features support for all commonly used spectrometry modes – PHA, MCS, SCA, Aux Counter, MSS, List, and Time-stamped List – unmatched by any other tube-base MCA on the market. The Osprey provides a level of performance superior to many available desk-top MCAs.

The Osprey will accommodate standard 14-pin scintillation detectors. It also supports a temperature-stabilized NaI detector designed specifically for the Osprey. The CANBERRA NAIS-2x2 temperature-stabilized detector uses a *patented*<sup>1</sup> LED stabilization technique and features a robust locking mechanism for increased

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<sup>1</sup> US Patents 7,005,646 B1 and 7,049,598 B1

reliability. In all configurations, the Osprey is compatible with Canberra Model 727 laboratory lead shield.

This manual describes the capabilities of the Osprey MCA. Setup and interaction with the Genie 2000 software is reviewed, as it relates to the Osprey MCA. System setup details for the Osprey system are provided, and User instructions for data acquisitions are also described.

## About this Manual

This manual is a reference to the capabilities and operation of the Osprey MCA. Each of its chapters covers specific functions.

The Chapters are divided into the following arrangement:

### Chapters

Chapter 1, **Introduction**, is an introduction to the manual's contents and an overview of the Osprey's features.

Chapter 2, **Controls and Connectors**, includes a brief description of each LED indicator and each panel connector.

Chapter 3, **System Configuration**, includes instructions for setting up a typical system. This chapter also reviews the interaction with the Genie 2000 Basic Spectroscopy software, which is required for spectral analysis.

Chapter 4, **Web-Based Status**, describes how to use a web browser to view device status, set IP address, update firmware and FPGA files and change user passwords of the Osprey.

### Appendices

The appendices offer useful information not usually needed in day-to-day operation.

## Abbreviations and Acronyms

The following abbreviations and acronyms used throughout the manual are listed below:

AUX:	Auxiliary
DHCP:	Dynamic Host Configuration Protocols
FPGA:	Field Programmable Gate Array
GPIO:	General Purpose Input/Output Connectors
ICR:	Incoming Count Rate
MCA:	MultiChannel Analyzer
MCS:	Multichannel Scaling
MID:	MCA Input Definition
MSS:	Multi-spectral Scaling
PHA:	Pulse Height Analysis
PoE:	Power over Ethernet
SCA:	Single Channel Analyzer
USB:	Universal Serial Bus
UPnP:	Universal Plug and Play

## Acquisition Units

The Osprey contains four acquisition units:

### PHA Acquisition Unit

The PHA acquisition unit converts energy signals from a radiation detector into a digital value. The digitized value could be accumulated by the device to form a histogram, or stored with a time-stamp and supplied to a client application for analysis.

### MCS Acquisition Unit

The MCS acquisition unit sequentially accumulates data pulses into each of the configured channels for the specified dwell time. When the dwell time of the last

configured channel expires the acquisition will end if the sweep count has been reached or restart with the first channel if the sweep count has not been reached.

Pulses could be internally supplied by the PHA Acquisition Unit, or from an external source via the external GPIO connectors.

## **AUX Acquisition Unit**

The AUX acquisition unit consists of a single programmable counter that counts externally supplied TTL pulses. The counter may be programmed for manual or automatic operation, or externally synchronized to other acquisition units.

## **SCA Acquisition Unit**

The SCA acquisition unit consists of six synchronized programmable counters, each with independent energy windows that count events processed by the PHA Acquisition Unit. The counters may be programmed for manual or automatic operation, or externally synchronized to other acquisition units.

## **Acquisition Modes**

The Osprey supports the following acquisition modes.

### **PHA Mode**

The PHA (Pulse Height Analysis) mode acquires energy-correlated data from a radiation detector to produce a histogram of 256, 512, 1024, or 2048 channels. Each channel, defined as an energy window, is incremented by one for each event that falls within the window, producing a spectrum which correlates the number of energy events as a function of their amplitude.

### **MCS Preset Mode**

The MCS (Multichannel Scaling) mode acquires time-correlated data where events are counted into each of the configured channels of a histogram for the specified DWELL time period before advancing to the next channel, to eventually produce a full SWEEP. Each sweep incorporates a programmed number of channels (256, 512, 1024, or 2048). Events are counted for the duration of a programmed number of sweeps.

## MSS Mode

The MSS (Multispectral Scaling) mode, also called "ping-pong" mode, alternately collects PHA data in two separate memory groups for a pre-programmed condition that can be based on time, counts, or an external event. The Osprey can collect spectra quickly with practically no latency (50ns) between acquisitions. The spectra can be temporarily held in the device until a client application requests them, or can be streamed over the network to waiting client applications.

## List Modes

In *Standard List* mode, each PHA energy event is converted to a channel value then is either stored sequentially in an internal buffer until requested by a client application, or streamed over the network connection to waiting client applications.

In *Time-Stamped List* mode, each PHA energy event is converted to a channel value, time-stamped, then either stored sequentially in an internal buffer, or streamed over the network connection to waiting client applications. The time base can be configured for 100 ns or 1  $\mu$ s resolution.

Client applications can be developed using methods from the supplied Software Development Kit to extract List data from the Osprey. Once extracted both the energy and time components become available to the client application where real-time analysis can be performed, energy/time-correlated spectrums can be produced, etc.

## Auxiliary Counters

A single Auxiliary Counter is supported by the Osprey to count externally supplied TTL pulses. The counter's acquisition can be set for *manual*, *automatic*, or *dependent* on the PHA acquisition unit or synchronized to an external event.

## Single Channel Analyzer (SCA)

The Osprey supports up to six programmable SCA's each with its own independent window setting within the PHA spectrum. In addition to providing a numeric value, each counter can also be programmed to provide a TTL output pulse to one or more GPIO connectors to drive external counters. The SCA's acquisition can be set for manual, automatic, dependent on the PHA acquisition unit or synchronized to an external event.

## 2. Controls and Connectors

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Osprey has several functional indicators and a number of connectors on its front panel. This chapter includes a brief description of each one.

With the exception of a recessed reset button, there are no other user controls on the unit itself. The indicators show status and some indications that may be used to verify a setup; however there are no 'user' indicators that require the Osprey be visible to the user. Refer to the *Factory Reset Control* on page 18 section for description of the reset button.

### Panel Indicators

The LED indicators are summarized in *LED Status* on page 7. Figure 1 shows the Osprey's front panel LED indicators, communication connectors, and general purpose I/O connectors.

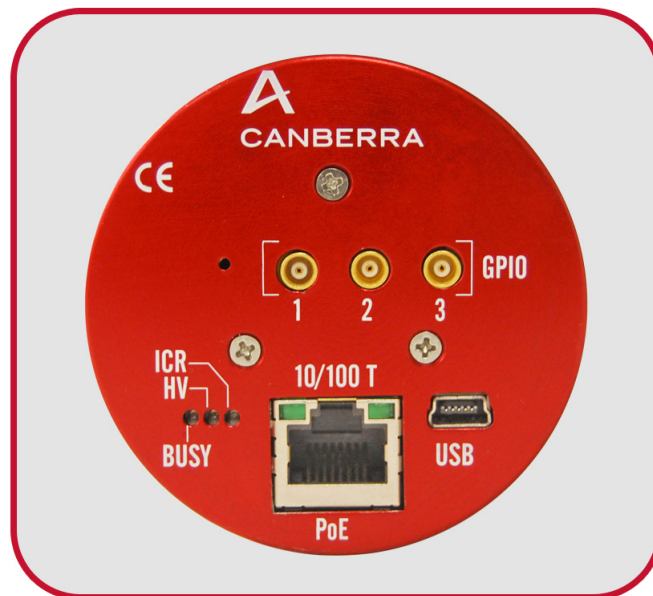


Figure 1 Front Panel of Osprey

It is not absolutely necessary to be able to observe the LED indicators during operation, as the real-time results are displayed in the Osprey's user interface.

For more information, refer to the appendix *Specifications* on page 73.



## LED Status

The Osprey has three LED indicators labeled BUSY, HV, and ICR. After applying power, under normal operation, the Osprey will initialize in approximately 10 to 20 seconds. During the initialization both the BUSY and HV indicators will blink green. The status of the ICR indicator will be undefined until the device completes its initialization. When the device completes the initialization the BUSY indicator should be steady green, the HV should be off, and the ICR will depend on the input signal.

### BUSY

A multicolor LED showing instrument status and presence of system power. The different LED states may be observed during or after the power-up self test.

- **Blinking Green** – Instrument is powered on and in the process of initialization. (This state occurs when power is first applied.)
- **Blinking Green** - Instrument is acquiring data.
- **Steady Green** – Instrument is powered on and ready for data acquisition.
- **Steady Red** – Signals a self-diagnostic error occurred during initialization and the Osprey is not ready for data acquisition.
- **Blinking Red** – Signals a factory-default operation in process.

**LED is Off** – Instrument is not receiving power.

### HV/Stabilized Probe

A multicolor LED indicating the state of the high voltage power supply or NAIS 2X2 LED stabilized detector if such detector is connected to the Osprey.

- **Off** – High voltage supply is *Off*.
- **Blinking Green** – High voltage supply is *On* and ramping up to its programmed voltage. When an NAIS 2X2 LED Stabilized Detector is connected, indicates the detector is performing its internal calibration and therefore not ready to acquire data.
- **Steady On Green** – High voltage supply is *On* and has reached its programmed voltage. When an NAIS 2X2 LED stabilized Probe is connected, indicates that the detector is operating properly.
- **Steady On Red** - An error, such as a HVPS fault has occurred or a fault condition exists within an NAIS 2X2 LED stabilized detector.

## ICR

A *green* LED for Incoming Count Rate. Illuminates each time the instrument processes an incoming signal through the PHA acquisition unit. The intensity of the LED is proportional to the incoming count rate.

## GPIO Connectors

Three user-configurable General Purpose Input/Output connectors labeled GPIO-1, GPIO-2, and GPIO-3, provide access to the device's internal acquisition status, counters, and start/stop control. The basic functionalities for the GPIO connectors are summarized here. For the connector's technical data, refer to the appendix *Specifications* on page 73. For detailed description of each GPIO functionality and any restriction(s) that may apply, refer to the appendix *External GPIO Configuration Matrix* on page 97.

## Input Assignments for GPIO Connectors

This section describes the input assignment for the GPIO connectors.

### COINC/ANTI-COINC

This mode is restricted to a single GPIO connector. Input signal is TTL-compatible with minimum pulse duration of 100 nanoseconds. Polarity is software-selectable for positive or negative logic.

The COINC/ANTI-COINC mode is typically used for coincidence or anti-coincidence gating of the energy input signal to the PHA acquisition input. The **Coincidence Anticoincidence** signal input, polarity, and gate delay are software selectable.

The gate input can be used as a qualifier for the storage of individual energy events. The external gate input signal must occur *after* the energy signal from the detector crosses its noise threshold but *before* the energy signal is processed. The normal processing time for the energy event is the sum of the shaper's rise time and flat top settings. The gating signal can occur after this time if the gate delay feature is used. The Gate Delay feature will delay the decisions regarding the storage of individual energy events by the programmed amount of time.

The Gate Delay feature allows for the coincidence /anticoincidence qualification to be made later if the gate qualifying signal is provided by a mechanism slower than the processing time in the Osprey. Energy events that have passed the Coincidence Anticoincidence qualifications must still meet the conditions of additional qualifiers such as LLD, ULD etc. before they can be processed by the PHA acquisition unit.

## MCS IN

This mode is restricted to a single GPIO connector. Input signal is TTL-compatible with minimum pulse duration of 100 nanoseconds. Polarity is fixed at positive logic.

The **MCS IN** mode is used to supply external TTL pulses to the MCS Acquisition Unit. When configured for TTL input, the MCS Acquisition Unit counts the number of pulses present on the designated GPIO connector for the duration of the dwell timer and accumulates the count value into the current channel of the histogram.

## MCS EXT START/STOP IN

This mode is restricted to a single GPIO connector. Minimum pulse duration of 100 nanoseconds. Polarity is software-selectable for positive or negative logic.

The MCS START/STOP IN mode can be used to enable an external user-supplied signal to start and/or stop data acquisition of the MCS Acquisition Unit. Once the acquisition unit has been configured for external start/stop control, it can further be configured to accept pulses to Start, Stop, Start & Stop, or DC level to Suspend & Resume acquisition.

Software selectable modes are as follows:

**Start** – Once the MCS Acquisition Unit is enabled through a software Start command, a pulse on this input begins the acquisition and storage of MCS events. Acquisition continues until the end of a sweep and the preset sweep counter is reached. After receiving the first Start pulse, subsequent pulses have no effect.

**Stop** – While MCS acquisition is in progress a pulse on this input will immediately abort the acquisition and storage of MCS events prior to reaching the end of the current sweep. If no stop pulse occurs, acquisition and storage will continue until either a Stop command is received, or the end of a sweep and the preset sweep counter has been reached. After receiving the first Stop pulse, subsequent pulses have no effect.

**Start/Stop** – Once the MCS Acquisition Unit is enabled through a software Start command, a pulse on this input begins the acquisition and storage of MCS events. A second pulse on this input will immediately abort the acquisition and storage of MCS events prior to reaching the end of the current sweep. If no second pulse occurs, acquisition and storage will continue until the end of a sweep and the preset sweep counter has been reached. After receiving the second pulse, subsequent pulses have no effect.

**Suspend/Resume** – Once acquisition is enabled through a software Start command, the Suspend/Resume input can be used to suspend or resume storage of MCS events through a TTL compatible DC level.

For Start, Stop, and Start/Stop modes, acquisition and storage of MCS events is synchronized to the leading edge of the incoming pulse.

For Suspend/Resume mode, with positive logic polarity selected, a TTL-high signal allows storage and a TTL-low inhibits storage. Negative logic polarity reverses the logic.

### **MCS EXT CHN ADV**

This mode is restricted to a single GPIO connector. Minimum pulse duration of 100 nanoseconds. Polarity is software-selectable for positive or negative logic.

The MCS EXT CHN ADV mode can be used to enable an external user-supplied pulse to control the dwell time of the MCS Acquisition Unit.

When operating in MCS mode and configured for external channel advance this input will advance counting from the current to the next dwell channel.

Minimum dwell time must be 1 microsecond or greater.

### **MCS EXT SWP ADV**

This mode is restricted to a single GPIO connector. Minimum pulse duration of 100 nanoseconds. Polarity is software-selectable for positive or negative logic.

The MCS EXT SWP ADV mode can be used to enable an external user-supplied pulse to start a new acquisition sweep in the MCS Acquisition Unit.

When operating in **MCS** mode and configured for external sweep advance this input will advance counting from the current to the next MCS sweep. This allows for either partial or full sweeps to be acquired. Note that if the internal sweep completes before the EXT SWP ADV signal occurs then the accumulation of events stops until the EXT SWP ADV signal occurs.

### **PHA EXT START/STOP IN**

This mode is restricted to a single GPIO connector. Minimum pulse duration of 100 nanoseconds. Polarity is software-selectable for positive or negative logic.

The PHA EXT START/STOP IN mode can be used to enable an external user-supplied signal to start or stop data acquisition of the PHA Acquisition Unit.

Once the acquisition unit has been configured for external start/stop control, it can further be configured to accept pulses to Start, Stop, or Start & Stop, or DC level to Suspend & Resume acquisition.

**Start** – Once the PHA Acquisition Unit is enabled through a software Start command, a pulse on this input begins the acquisition and storage of PHA events. Acquisition continues until either a Stop command is received, or a PHA preset

condition (time or counts) has been reached. After receiving the first Start pulse, subsequent pulses have no effect.

**Stop** – While PHA acquisition is in progress a pulse on this input will stop acquisition and storage of PHA events prior to reaching the PHA preset condition. If no stop pulse occurs, acquisition and storage will continue until either a Stop command is received, or a PHA preset condition is reached. After receiving the first Stop pulse, subsequent pulses have no effect.

**Start/Stop** – Once the PHA Acquisition Unit is enabled through a software Start command, a pulse on this input begins the acquisition and storage of PHA events. A second pulse on this input will stop acquisition and storage of PHA events prior to reaching the PHA preset condition. If no second pulse occurs, acquisition and storage will continue until either a Stop command is received, or a PHA preset condition is reached. After receiving the second pulse, subsequent pulses have no effect.

**Suspend/Resume** – Once acquisition is enabled through a software Start command, the Suspend/Resume input can be used to suspend or resume storage of PHA events through a TTL compatible DC level.

For Start, Stop, and Start/Stop modes, acquisition and storage of PHA events is synchronized to the leading edge of the incoming pulse.

For Suspend/Resume mode, with positive logic polarity selected, a TTL-high signal allows storage and a TTL-low inhibits storage. Negative logic polarity reverses the logic.

## AUX CNTR IN

This mode is restricted to a single GPIO connector. Minimum pulse duration of 100 nanoseconds. Polarity is fixed at positive logic

The AUX CNTR IN mode enables external user-supplied pulses to be counted in the AUX Acquisition Unit.

## EXT SYNC IN

This mode is restricted to a single GPIO connector. Minimum pulse duration of 100 nanoseconds. Polarity is software-selectable for positive or negative logic.

The EXT SYNC IN mode enables an external user-supplied signal to synchronize the Osprey's MSS, AUX, SCA, and List/TList Acquisition Units. The external signal can be from a second Osprey MCA or from other electronic equipment. The Osprey's acquisition units make use of the external sync signal as follows:

**PHA** – does not make use of the external sync signal.

**MSS** – The external sync signal synchronizes individual MSS acquisitions. An external sync pulse on this signal will initiate the next MSS cycle if the PHA preset condition has already been reached. If the pulse occurs prior to the preset then the Osprey will terminate the current cycle and begin the next MSS cycle.

**AUX** – The external sync signal synchronizes the operation of the auxiliary counter.

**SCA** – The external sync signal synchronizes the operation of the SCA counter operation with an external signal.

**Time Stamped List** – The external sync signal synchronizes the internal timer stamp of the Osprey with an external device such as another Osprey. This mode can be used to acquire data which can later be utilized for coincidence and/or multiparameter experiments.

**List** – The external sync signal synchronizes the processing of PHA events with an external device such as another Osprey.

## INPUT LEVEL SENSE

The INPUT LEVEL SENSE mode can be used to detect the logic level on the designated GPIO connector. The logic level is reported through the GPIO1\_Input, GPIO2\_Input, or GPIO3\_Input parameter.

Any of the GPIO connectors can be configured for the INPUT LEVEL SENSE mode.

## Output Assignments for GPIO Connectors

This section describes the output assignment for the GPIO connectors.

### ICR

The **Incoming Count Rate** pulse duration is 200 nanoseconds. Polarity is fixed at positive logic. Any combination of GPIO connectors can be configured for this mode.

Provides a positive output pulse to the designated GPIO connector(s) for each incoming event above the instrument's noise threshold setting. The pulse width is 200 nanoseconds. The noise threshold is selectable as automatic (determined by the Osprey) or manual (set to a value selected by the user).

### SCA (1-6)

The **Single Channel Analyzer** pulse duration is 200 nanoseconds. Polarity is fixed at positive logic.

The SCA1-SCA6 modes direct output pulses generated from energy events that fall within the respective SCA's energy window to the selected GPIO connector(s).

Pulses occur if the events have energy between the SCA's upper and lower level discriminator (ULD and LLD) setting.

Any combination of GPIO connectors can be configured for the SCA1-SCA6 modes mode. Only three of the six total SCA counters within the Osprey can drive outputs signals due to the limited number (3) of available output connectors. Only ONE SCA can be selected per output connector.

## PHA ACQ OUT

The **PHA ACQ OUT** output signal is TTL-compatible. Polarity is fixed at positive logic. Any combination of GPIO connectors can be configured for this mode.

The PHA ACQ OUT mode drives the designated GPIO connector(s) with the status of the PHA acquisition. The output will be driven to logic-high when PHA acquisition starts and logic-low when PHA acquisition stops. The output level is TTL-compatible and may be used to drive circuitry for acquisition indicators. Latency time of the output signal to reflect a change in acquisition status is typically less than 12.5 ns.

## PHA EXT START/STOP OUT

The **PHA EXT START STOP OUT** output signal is TTL-compatible. Polarity is fixed at positive logic. Any combination of GPIO connectors can be configured for this mode. When in pulse mode, the width is 200 ns.

In this mode, the device drives the designated GPIO connector(s) with either a pulse or a level when the status of the PHA acquisition changes state. The output may be used to synchronize the start/stop data acquisition of another device. The PHA EXT START/STOP OUT mode can be configured for Pulsed mode or Level mode. Pulsed mode may be used to Start, Stop, and Start & Stop the PHA Acquisition unit. Level mode may be used to Suspend/Resume the PHA Acquisition unit. Latency time of the output signal to reflect a change in acquisition status is typically less than 12.5 ns.

## EXT SYNC OUT

The **EXT SYNC OUT** output signal is TTL-compatible. Polarity is fixed at positive logic. Any combination of GPIO connectors can be configured for this mode.

The EXT SYNC OUT mode can provide an external signal to synchronize the Osprey's MSS, AUX, SCA, and List/TList Acquisition Units to another device.

See **EXT SYNC IN** description for more information on synchronization operation for the different Osprey acquisition modes.

## **MCS EXT START/STOP OUT**

The **MCS EXT START STOP OUT** output signal is TTL-compatible. Polarity is fixed at positive logic. Any combination of GPIO connectors can be configured for this mode. When in pulse mode, the width is 200 ns.

In this mode, the device drives the designated GPIO connector(s) with either a pulse or a level when the status of the MCS acquisition changes state. The output may be used to synchronize the start/stop data acquisition of another device. The MCS EXT START/STOP OUT mode can be configured for Pulsed mode or Level mode. Pulsed mode may be used to Start, Stop, and Start & Stop the MCS Acquisition unit. Level mode may be used to Suspend/Resume the MCS Acquisition unit. Latency time of the output signal to reflect a change in acquisition status is typically less than 12.5 ns.

## **Multifunction Assignments for GPIO Connectors**

To maximize the use of a single GPIO connector, the Osprey provides several multifunction assignments in its GPIO configuration. Multifunction assignments combine the functionality of two independently configurable functions into a single GPIO connector. Multifunction assignments are limited to a single GPIO connector; additionally, for input-type functions, neither of the combined function can be selected separately on a different GPIO connector. The multifunction assignment is not supported using Genie 2000 software.

### **AUX CNTR IN and MCS IN**

This mode combines the AUX CNTR IN and MCS IN into a single GPIO connector; the device internally connects the GPIO connector to the input of the AUX Acquisition Unit and MCS Acquisition Unit to provide a common signal to both acquisition units.

Refer to the individual functions for more details and any restrictions to may apply. This function is limited to a single GPIO connector; additionally, neither function can be selected again on any other GPIO connector.

### **MCS EXT SWP ADV and EXT SYNC IN**

This mode combines the MCS EXT SWP ADV and EXT SYNC IN into a single GPIO connector; the device internally connects the GPIO connector to the input of the SYNC Module and to the external sweep advance logic of the MCS Acquisition Unit.

Refer to the individual functions for more details and any restrictions that may apply. This function is limited to a single GPIO connector; additionally, neither function can be selected again on any other GPIO connector.



### **PHA EXT START/STOP IN and MCS EXT START/STOP IN**

This mode combines the PHA EXT START/STOP IN and MCS EXT START/STOP IN into a single GPIO connector to provide a common signal that can be used to synchronize the Start, Stop, Start & Stop, and Suspend/Resume capabilities of the PHA and MCS Acquisition units.

Refer to the individual functions for more details and any restrictions that may apply. This function is limited to a single GPIO connector; additionally, neither function can be selected again on any other GPIO connector.

### **PHA EXT START/STOP OUT and MCS EXT START/STOP IN**

This mode combines the PHA EXT START/STOP OUT and MCS EXT START/STOP IN functionality into a single GPIO connector to provide a synchronization signal from the PHA Acquisition Unit into the external start/stop logic of the MCS Acquisition Unit.

When this mode is selected, the signal at the designated GPIO connector can further be used to drive other logic such as the counter logic or external start/stop logic of other Osprey devices.

Refer to the individual functions for more details and any restrictions that may apply. This function is limited to a single GPIO connector; additionally, the MCS EXT START/STOP IN cannot be selected again on any other GPIO connector.

### **PHA EXT START/STOP IN and MCS EXT START/STOP OUT**

This mode combines the PHA EXT START/STOP IN and MCS EXT START/STOP OUT functionality into a single GPIO connector to provide a synchronization signal from the MCS Acquisition Unit into the external start/stop logic of the PHA Acquisition Unit.

When this mode is selected, the signal at the designated GPIO connector can further be used to drive other logic such as the counter logic or external start/stop logic of other Osprey devices.

Refer to the individual functions for more details and any restrictions that may apply. This function is limited to a single GPIO connector; additionally, the PHA EXT START/STOP IN cannot be selected again on any other GPIO connector.

### **MCA PROBE I/O**

This mode provides a special feature used during factory testing and should never be selected by client applications.

## PHA TEST IN

This mode provides a special feature used during factory testing and should never be selected by client applications.

## Tube Socket

The Osprey detector socket is compatible with all standard 14-pin scintillation detectors (including NaI(Tl) and LaBr3(Ce)) and a CANBERRA proprietary LED temperature-stabilized 8-pin locking NaI detector.

Please refer to *Basic Detector Setup* on page 53 for instructions on how to connect each detector type.

## Osprey System Power

Each Osprey unit receives power through either the USB connection or the Ethernet connection from a PoE IEEE 802.3af compliant device. To apply power to the device, please refer to *Applying Power* on page 17.

Note: Do not apply power to the Osprey until you are ready to set it up.

## Communication Ports

The Osprey system is accessed through communication with a computer. Several communications formats are supported; the connectors are listed below. Communication port setup commands and options are described in the appendix *Communication Setup* on page 81. Connect the appropriate communication port to host computer. The unused communication port should be left unconnected.

### 10/100 T

This port connects the Osprey to an Ethernet (IP) network or directly to a host computer; uses the industry-standard RJ45-type network jack and pin layout for a networked device.

Note: The 'factory default' communication is using a static IP network connection to the 10/100 T connector. See the Quick IP Setup Summary in appendix *Communication Setup* on page 81 for details.

LED indicators: There are two LED indicators on the Ethernet connector.

- LINK (Left) – Will be *on* to indicate Link is good and *blink* to indicate activity is present on either transmit or receive activity. Link will be *Off* when no LINK is present.
- SPEED (Right) – Indicates 10 or 100 Mb/s data rate of the port. Will be *On* for 100 Mb/s data rate or USB connection and *Off* for 10 Mb/s data rate.

## USB D

Full speed USB 2.0 compatible device connection between the Osprey and host PC. The connector is a 5-pin mini USB B-type receptacle. Use a standard USB A-to- Mini B cable to connect Osprey to your PC. This cable is provided with the Osprey unit.



**CAUTION:** The Osprey requires the USB connection to be to a USB compliant device or damage can occur.

## Controls for the Osprey System

This section describes the various controls for the Osprey system.

### Applying Power

To power the Osprey, plug the device into either a USB connection or an Ethernet connection from a PoE IEEE 802.3af compliant device.

### Power-On Self Test

When power is first applied to the Osprey, the Busy LED will *blink green* until the instrument has gone through its internal configuration and power on self test (POST) diagnostics. Once this process is complete the Busy LED will change to *steady green* for a 'successful' power up test. The POST takes about 15 seconds.

### Fault Indications

If a fault condition is detected within the Osprey, the Busy LED will change from *blinking green* to *steady red* after POST. If the fault condition is serious, the Osprey power LED may continue to *blink green* beyond the normal power on time duration.

## Correcting a Fault

If the Osprey signals a fault condition, contact your local Canberra Technical Service Center for service before operating the product.

## Factory Reset Control

The factory reset button is located behind a small hole in the Osprey's panel to the left of the GPIO 1 connector.



**CAUTION:** Operating this control will interrupt an acquisition in process.

To reset the instrument to a factory default condition, with power applied to the Osprey, press and hold the button with a small screwdriver as noted below:

- Press and hold for greater than *1 second* and release before *7 seconds* to reset the instrument to the factory default condition and settings.
- Press and hold for *7 seconds* to perform a reboot of the instrument and restart in boot loader mode. This mode is used for updating the firmware. Please note the device will need to be communicating via USB to load firmware. This mode is for diagnostic purposes and not for normal operation.
- Press while applying power to enter boot loader mode. This mode is used for updating the firmware. Please note the device will need to be communicating with USB to load firmware. This mode is for diagnostic purposes and not for normal operation.
- If the device requires a hard reset and then to start up in normal operating mode, disconnect and reconnect the USB or Ethernet connector (whichever connector is supplying power).

## 3. System Setup

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This chapter serves as an overview of setting up a basic Osprey system. Those user-based commands that are related to a one-time-only setup function, such as network connections and other system-affecting concerns are also introduced in this section. Specific Osprey setup parameters, settings, and details are provided in the Web-Based Status.

Spectral analysis is performed using the Genie 2000 system. Acquiring input data using the Osprey can be controlled from the Genie 2000 or from your PC using the programming libraries.

### The Osprey Digital MCA Tube Base

The Osprey is a low-power, solid-state device that does not employ a fan, so it operates silently. Its location is likely dictated by the placement of other detection equipment. The Osprey unit is controlled by another device using one of several communication methods or options.

In addition to the Osprey Digital Tube Base you'll receive:

- Single port PoE injector.

This provides power to device when operating over Ethernet.

- This user's manual.
- Ethernet and USB communications cables.
- MCX to BNC cables for GPIO use.

### Genie 2000 Analysis Software

The Osprey requires Genie 2000 Basic Spectroscopy Software version 3.2.1 or later, for analyzing spectra. Refer to the *Genie 2000 Operations Manual* for operating information.

#### Installing Genie 2000 on Your PC

To install the optional Genie 2000 software on your PC, refer to the documentation provided with the Genie 2000 software. Genie 2000 software installation is covered in the appendix “Software Installation” of the *Genie 2000 Operations Manual*.

Note: Osprey MCA can be used with the no-key Genie S504 InSpector Basic Spectroscopy software, but only a single Osprey MCA definition can be loaded at a time.

### Configuring Spectrum Refresh Rate

Genie software uses the same registry parameter for configuring the default spectrum refresh interval for both Lynx and Osprey MCAs. The default rate is 1 second. The value of this parameter must be specified in milliseconds (e.g. for a 1.5 seconds update rate enter 1500). This property is located in Windows Registry under the following path:

```
HKEY_LOCAL_MACHINE\SOFTWARE\Canberra Industries, Inc.\Genie-2000  
Environment\Lynx\SpectrumCacheTime
```



**CAUTION:** Making changes to the Windows Registry is a dangerous procedure. If you modify the registry incorrectly your Genie and even Windows may become unusable. Only experienced users should be making these changes.

## Osprey and MID Files

Your Osprey's MCA information can be saved as a file or files that you can save and exchange with Genie 2000. This 'file' is referred to as a MID file. Genie 2000 includes tools to create and modify MID files - specifically, the MID Wizard and the MID Editor. These tools and MID files are discussed in depth in the Genie 2000 manuals, and are covered in the following sections as they relate to the Osprey including:

- Using the MID Editor to Set Up your Osprey MCA
- Using the MID Wizard
- Using the Acquisition and Analysis Window

## MCA Input Definition (MID) Editor

The following sections explain how to use the MCA Input Definition (MID) Editor.

The MID Editor is used to set the parameters of your MCA as desired and then save those settings as a MID file. In addition to using the MID Editor to create a new input definition, it may be used to edit an existing MID file. You may choose to use the MID Editor to change the default settings for any of the Osprey's programmable Features. Two examples are shown below:

**DSP Gain**

FDisc Mode (Default = Auto)

Coarse Gain (Default = x8)

**DSP Filter**

BLR Mode (Default = Auto)

Rise Time (Default = 1.0  $\mu$ S)

**Basic Concepts**

We'll review some basic concepts that are important to understand before actually getting into the details of how you define your system's MCAs.

**Multiple MCA Configurations**

Since MCA definitions are saved in individual files called MID files, you can have as many definitions as you like. For example, you might have one MCA defined as a *1K Sodium Iodide Spectroscopy MCA* in one file and another as a *2K Sodium Iodide Spectroscopy MCA* in another file.

Before you start an experiment you simply pick the configuration you want to use by selecting the appropriate MID file and loading it.

Because an MCA definition file can include any or all of the MCAs that are available to your system, you can use more than one MCA at a time. However, each MCA can be included only once in a given definition file and each MCA in that file must have a unique name and/or IP address.

**Building an MCA Definition**

Building an MCA Definition means:

- Selecting the MCA to be used for each input through the Device Menu. To do so, you ADD the MCA to the MID Editor.
- Defining the operating characteristics and modes for each MCA through the Settings Menu.
- After your desired settings for this MCA Definition have been achieved, Saving the MCA Input Definition as a MID file.

We'll discuss how to add (and delete) the MID editor's MCA entries and will explain what the definition entry consists of, and how to build an MCA Definition list.

### Using the MCA Definition Files

To use an MCA Definition, first load that MID file into the VDM's internal MCA Runtime Configuration Database. From that point on, all MCA operations will use the configuration information that was stored in the Definition File. To change to a new configuration, all you have to do is replace the database's contents with a new file.

### Starting the MID Editor

You will use the MID Editor to work with at least one definition file for your device.



Start the MID Editor by double clicking on its icon (MCA Input Definition Editor) in the Genie-2000 Program Group (or by selecting the desktop icon, if provided) or from the Start menu select **Programs | GENIE-2000 | MCA Input Definition Editor**.

The result will be the application window shown in Figure 2.

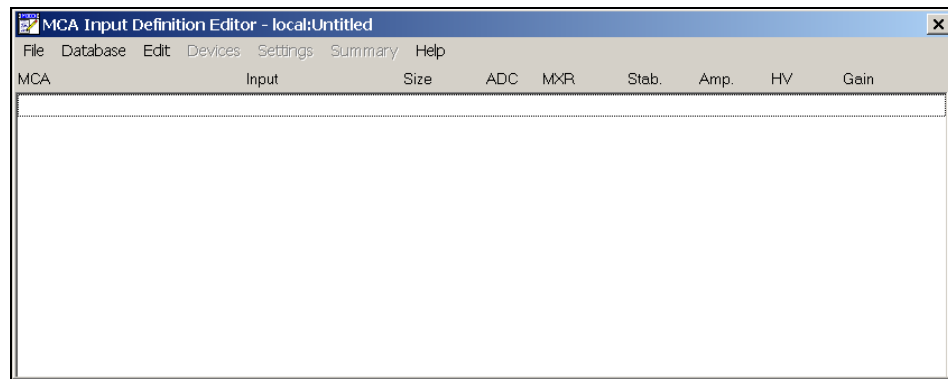


Figure 2 The MID Editor Window

To use the MID Editor, you build the MCA Definition list and you may then add to or delete the desired MID files from the list.

Note: The phrase "local:Untitled" in the title bar, means that the MID Editor is connected to the local VDM and that no file is currently open; this is the default condition in a non-networked environment.

### Adding an MCA

The **Edit** menu, at the top of the MCA Input Definition Editor's main window, is used to add MCA hardware to or delete MCA hardware from an MCA Input Definition.

To add an MCA:



1. From the **Edit** menu, select **Add MCA**.
2. The “Add MCAs to Definition Table” dialog box opens. This dialog contains all available MCAs.
3. Select **Osprey MCA** from the list of available MCAs by clicking on the ‘+’ symbol next to Network MCAs (Figure 3). Use this selection for both Ethernet and USB connections.

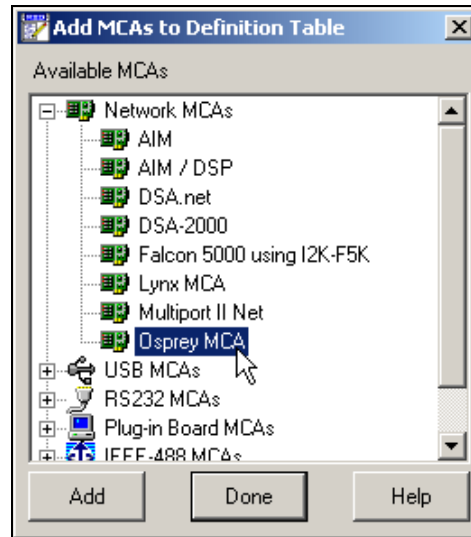


Figure 3 Adding an Osprey MCA

4. Click on **Add** to add an Osprey MCA to the MCA Input Definition Editor list.

You can add as many MCAs to the definition as are necessary for your system, highlight each MCA and then click the Add button to add them to the MCA Input Definition Editor list.

5. When you’ve finished adding MCAs, click on the **Done** button.

## Deleting an MCA

If you want to remove an MCA that you have added to the definition, you can do it easily by:

1. Selecting the table entry you want to delete.
2. Select **Edit | Delete MCA** to open the Delete MCA dialog box (Figure 4). Click on OK or click twice on the entry in the table to remove the entry.

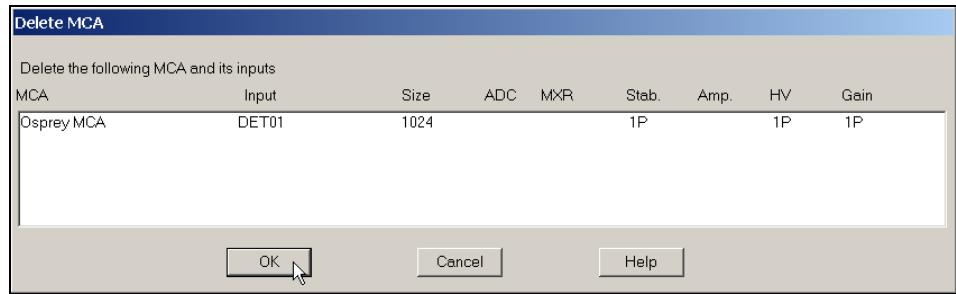


Figure 4 The Delete MCA Dialog

## Defining an MCA

This section discusses setting up an Osprey MCA, which has a fully programmable front end. That is, its DSP Gain, DSP Filter, Digital Stabilizer, MCS and High Voltage Power Supply are all controlled from the host computer.

To begin, click on the Osprey MCA entry in the Definition Table (Figure 5) that you want to set up.

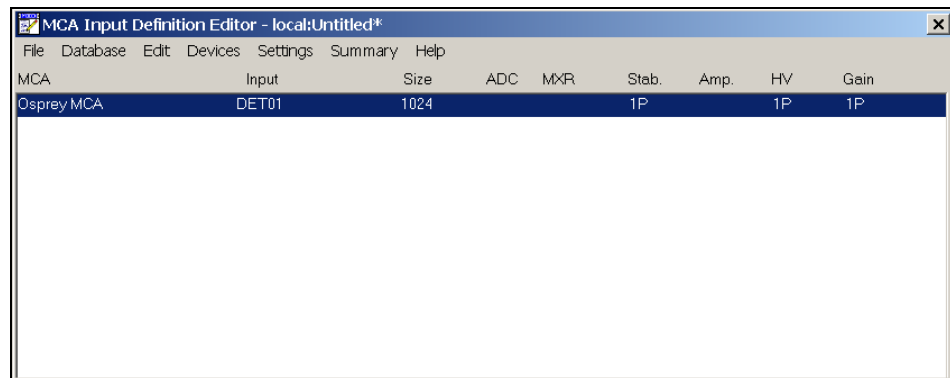


Figure 5 Selecting the MCA to Set Up

## Interpreting the Definition Entry

As you can see in Figure 5, adding the entry put more than just the name of the MCA in the definition table. We'll take a brief look at the other items in the entry now. As we get further into the definition process we'll cover them in greater detail. Note the letter following the unit number in each Definition Table item available: an M indicates a manually controlled unit and a P indicates a programmable unit.

**MCA**

This is the type of MCA device being used for this particular entry in the table.

**Input**

This is the name that will be used to refer to this specific hardware entry in the table. The MID Editor automatically assigns these names sequentially as DET $nn$ , starting with  $nn=01$ . You can easily change these names to something you find more meaningful.

**Size**

This shows the number of data channels assigned to this input.

**Stab**

This column describes the Stabilizer associated with the Osprey.

**HV**

This column describes the High Voltage Power Supply associated with the Osprey.

**Gain**

This column describes the DSP Gain associated with the Osprey.

**Other Entries**

All of the other entries - ADC, MXR, and Amp are not configurable parameters for the Osprey.

**Device Setup**

The **Devices** menu sets the parameters for the Osprey's MCA and associated devices. Some Devices options are disabled (grayed out) because they do not have any adjustable parameters. Of the enabled Devices, only the MCA has user-selectable parameters. The remainder default to their only parameter: Internal.

Note: At this point in the setup process the Osprey is required to be connected to the network or directly to the host computer. Note the device's IP address or UPnP name as it will be required to complete the setup. Refer to the appendix *Communication Setup* on page 81, as it describes the initial setup and basic operation of each of these interfaces.

## MCA

From the **Device** menu, select the **MCA** command to display the dialog box (Figure 6). Enter the IP address or its exact UPnP Name can be entered and define the MCA's Number (1 = PHA and 2 = MCS) then click on **OK** to accept the changes.

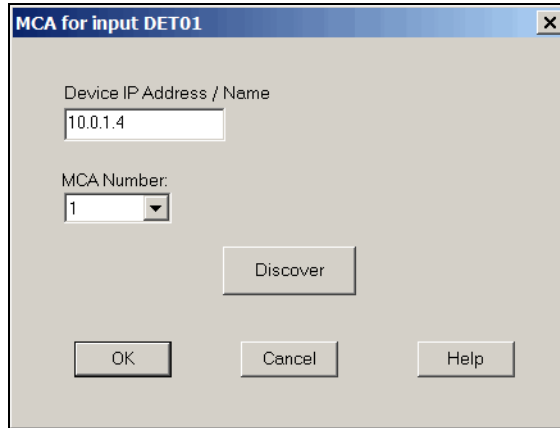


Figure 6 Identify Osprey Device by entering its IP Address

Note: Device names are restricted to 10 characters in length.

### Discovering the Osprey MCA

If the **Discover** button is selected and the Universal Plug and Play features have been activated (in Osprey and with your Windows PC), the Osprey identification information will be displayed. Select the desired Osprey and click the **OK** button to automatically fill the IP address information in the Device IP Address field.

Note: Discover will only work on networks that do not block Universal Plug and Play (UPnP) messages and the PC must have UPnP enabled.

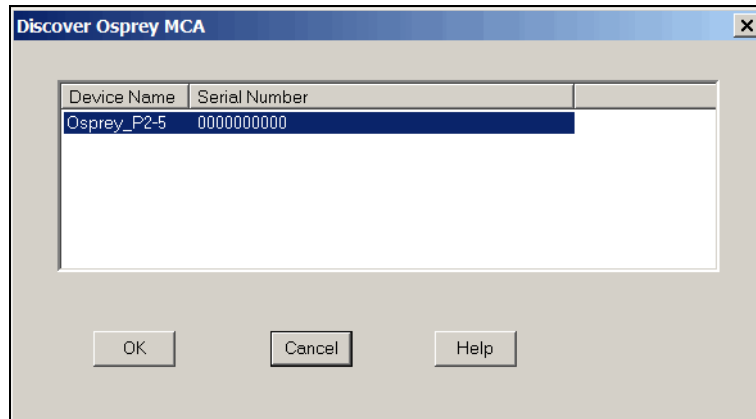


Figure 7 MID Plug and Play Discovery of Osprey

## Parameter Settings

This section discusses the specific settings for the Osprey in the MCA Definition. You can change any of them from the MID Editor via the Settings menu.

Note: MCS will be available only if the MCA Acq. Mode under Devices was previously configured for MCS, otherwise it is grayed out.

## MCA Settings

This device has no adjustable controls in MID editor.

## Stabilizer Settings

This device has no adjustable controls in MID editor.

## High Voltage Settings

The **High Voltage** command opens a screen that allows you to adjust the High Voltage Power Supply settings (Figure 8).

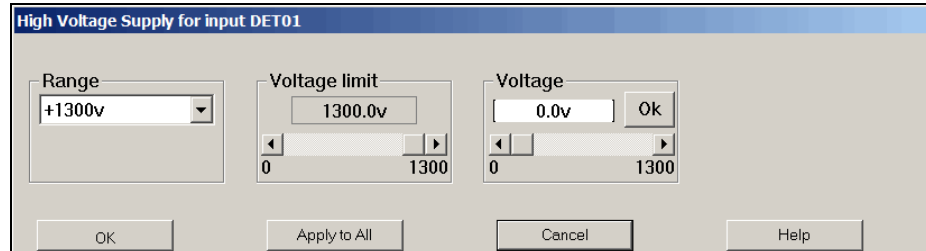


Figure 8 The High Voltage Settings

Note: This window's initial focus is on the **Cancel** button; pressing the keyboard's ENTER key after making changes in this dialog box will cancel the changes. Be sure to click on the **OK** button to accept the changes.

### Range

The Osprey supports a voltage range of 1300 volts. This setting is not adjustable.

### Voltage Limit

The **Voltage limit** control establishes the HVPS's maximum output voltage within the selected range. It must be set *before* the Voltage control is adjusted.

### Voltage

The **Voltage** scroll bar sets the output voltage of the HVPS between the Voltage Limit's minimum and maximum settings. The voltage setting can also be typed in from the keyboard, and then accepted with the **OK** button within the control.

### DSP Gain Settings

The DSP Gain settings screen (Figure 9) for the Osprey contains the following controls.

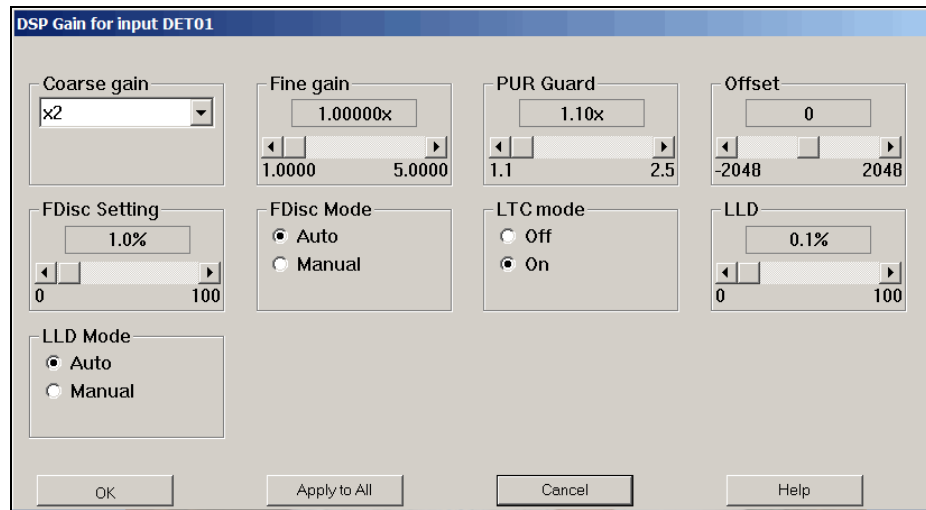


Figure 9 DSP Gain Setting Dialog

The combination of **Coarse** and **Fine Gain** sets the overall system gain to match the requirements of the detector and energy range of the application; overall gain is continuously variable from x1 to x40.

### Coarse Gain

Sets the device's coarse gain. It's best to choose the highest Fine Gain which, combined with the Coarse Gain, will produce the total desired gain. The Coarse gain allows selections of x1 through x8.

### Fine Gain

Sets the device's Fine Gain multiplier; the adjustment range is x1 to x5.

### PUR GUARD

Sets the device's Guard Time (GT) multiplier to reject trailing edge pileup in the event that detector/preamp signal anomalies occur. The PUR guard sets the pileup reject interval, which is defined by  $GT \times T_{Risetime} + T_{Flattop}$ .

## OFFSET

Sets the device's *digital offset* in channels. The digital offset shifts the memory assignment of the device's conversions either up or down depending on the sign and value of the offset. A positive offset value shifts the spectrum by the amount of the offset in upward direction. A negative offset value shifts the spectrum by the amount of the offset in downward direction.

## FDisc Setting

This adjustment sets the device's Fast Discriminator threshold level (when MANUAL Fdisc Mode is selected). The range is 0 to 100%. A setting of 100% is approximately 20% of the full energy range. The percentage value varies slightly based on the rise time of the detector signal.

## FDisc Mode

This adjustment sets the device's Fast Discriminator threshold mode. AUTO allows the fast discriminator threshold to be optimized automatically above the system noise level; MANUAL allows the threshold to be manually adjusted. The fast discriminator is used to quickly detect multiple events during the Osprey's signal processing for the determination of a pile-up condition.

## LTC Mode

Sets the amplifier's Pulse Pileup Rejector and Live Time Corrector. When PUR is *On*, the pileup rejector and live time corrector (LTC) are enabled. *Off* disables the pileup rejector and LTC.

## LLD

Active when the Manual Lower Level Discriminator Mode is selected, sets the minimum input acceptance level, range is 0 to 100%. The LLD setting is a percentage of the full-scale spectral size or range.

## ULD

The digital Upper Level Discriminator sets the maximum input acceptance level. Range is 0 to 100%. The ULD setting is a percentage of the full-scale spectral size or range.

## LLD Mode

Selects Automatic and Manual LLD modes; the digital Lower Level Discriminator selects minimum input acceptance level. With AUTO select the LLD cutoff is automatically optimized just above the spectral noise threshold. MANUAL allows the LLD cutoff to be set manually using the LLD slider bar as a percentage of the full-scale spectral size or range. The LLD slider bar does not function when AUTO is selected.

## DSP Filter Settings

The DSP Filter settings screen (Figure 10) for the Osprey contains the following controls.

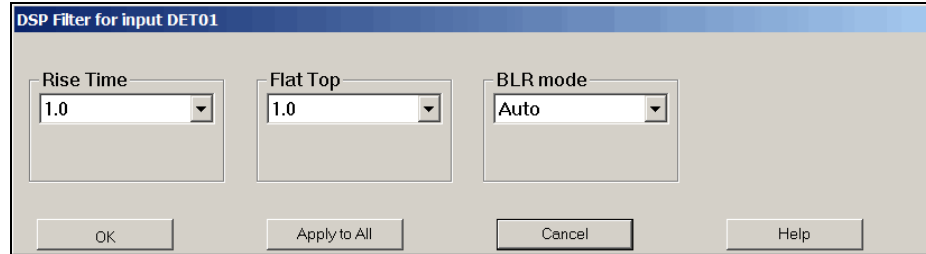


Figure 10 DSP Filter Settings

### Rise Time

Symmetrically sets the rise time and fall time of the digital filter time response. As with conventional Gaussian shaping, the degree of noise filtering is proportional to the rise time selection. The Rise Time setting range is from 0.2 to 5.0  $\mu$ s.

### Flat Top

The Flat Top allows for the charge light collection time of the particular Scintillator. Independent adjustment of the flat top allows the shaping function to be optimized for Scintillators with long light collection time, without a large increase in the overall processing time. The Flat Top setting ranges from 0.0 to 3.0  $\mu$ s.

### BLR Mode

Sets the Baseline Restorer mode. When set to AUTO, the baseline restorer is automatically optimized as a function of trapezoid shaping time and count rate. With settings, of SOFT, MEDIUM and HARD, the baseline restorer is set to fixed rates as selected.



## MCS Settings

The MCS settings screen (Figure 11) for the Osprey contains the following controls.

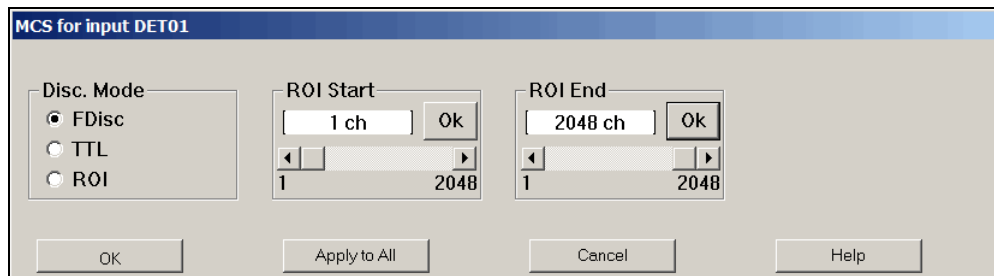


Figure 11 MCS Settings

### Disc. Mode

The Discriminator Mode control establishes the input signal to the MCS Acquisition Unit.

Selecting **FDisc** enables the MCS's “fast discriminator mode” where all incoming events above the Fast Discriminator threshold are counted.

Selecting **TTL** enables the MCS's “TTL mode” where all TTL events (as seen at the GPIO connector selected to accept the MCS IN signal) to be counted.

Selecting **ROI** enables the “ROI discrimination mode”, meaning that all incoming events processed by the DSP that fall within the selected discrimination window are counted.

If TTL mode is selected, then the External GPIO Configuration in the Acquire Setup dialog must have one GPIO connector selected for MCS IN. Refer to the appendix *External GPIO Configuration Matrix* on page 97 for GPIO configuration selection chart and descriptions.

The FDisc and ROI selections require that the PHA Acquisition Unit has been setup for the correct input size and energy range.

### ROI Start

Sets the start channel of the discrimination window used when ROI mode is enabled as the MCS input signal.

### ROI End

Sets the end channel of the discrimination window used when ROI mode is enabled as the MCS input signal.

Note: ROI Start and ROI End values are with reference to the PHA input size.

## Input Settings

The Input command is used to change the name of the Input and set up the structure of its memory via the Define Input screen (Figure 12). Some of these commands are not available in the Acquisition and Analysis application.

Note: This window's initial focus is the **Cancel** button; pressing the keyboard's ENTER key after making changes in this dialog box will cancel the changes. Be sure to click on the **OK** button to accept the changes.

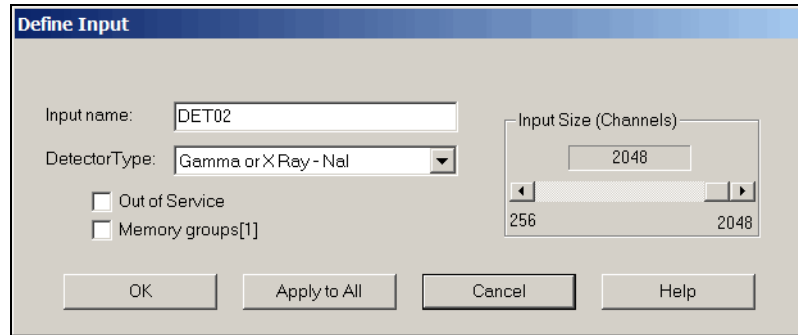


Figure 12 Define Input Dialog

### Input Name

The default DETnn name is the name displayed here, allowing you to easily change it to a more meaningful name, such as “H2OSampl”, up to a total of eight characters.

### Detector Type

Use this drop down list to select the type of detector to be used with this MCA; this also assigns appropriate default values to the spectrum display and analysis parameters. Five choices are available: Gamma or X Ray - Ge, Gamma or X Ray - NaI, Gamma or X Ray - Si, Alpha or Beta Particle - Si, or Other. For additional information please refer to the *Genie 2000 Operations Manual*.

### Input Size

This parameter defaults to 1K, the number of channels assigned during Device setup for the MCA. To use a different memory size, use this control to select the size you want to use. For instance, for NaI spectra, you wouldn't want to use more than 1024 channels.

### Out of Service

This check box allows you to place this Input temporarily “out of service”. That is, it will remain as an entry in your MCA Definition File but will not be available for data acquisition. It is meant to be used when the MCA or its front end electronics are temporarily disconnected.

## Memory Groups

This check box allows you to define up to two memory groups, each with an input size equal to the selected number of channels.

## Saving and Loading the Input Definition

Having completed a definition, the next step is to save the file using the Mid Editor's File Save as or Save command.

- **Save As** saves the definition to a user defined MID file.
- **Save** saves the settings to an existing MID file.

To remind you to save a changed definition, you'll see an asterisk (\*) next to the name of the current definition in the Title Bar.

**CAUTION:** If you change an existing Input Definition, saving it will clear the Acquisition Start time. You will be asked to retain the existing energy calibration information.

After having saved the definition, the next step is to load it into the run-time database so that it can be used by the Genie 2000 applications. To load the definition, from the **Database** menu select the **Load To** menu option.

Refer to the "MCA Input Definition" chapter of the *Genie 2000 Operations Manual* or *Genie-PC Operations Manual* for additional information regarding saving and loading definition files, as well as editing existing files.

By loading this configuration into the VDM runtime database, then exiting the MID Editor, you will be able access this detector in the MCA View and Control (MVC) window utilizing your Genie 2000 software.

## The MID Wizard

The MID Wizard helps you set up simple Input Definitions quickly and easily. It allows you to create a MID definition in a few simple steps.

If your Input Definition is more complex than the MID Wizard was designed to handle, you'll have to use the MID Editor to create your definition. It is covered in detail starting in the *MCA Input Definition (MID) Editor* on page 20.

## Using the Wizard

To use the MID Wizard, open the Genie 2000 folder and select the MID Wizard executable file (Mid Wiz.exe) or from the Start menu select **Programs | GENIE-2000 | MID Setup Wizard** to start the definition process.

Note: At any time you can click **Next** to proceed to the next screen, click **Back** to return to the previous screen or click **Cancel** to exit the wizard. You can also access the help topic for each screen by clicking on the **Help** button.

## Step 1 - Selecting the MCA

The Select MCA screen (Figure 13) lets you select the MCA you want to create a definition for. Select “Osprey MCA” from the list of available MCAs by clicking on the ‘+’ symbol next to Network MCAs, and then click the **Next** button.

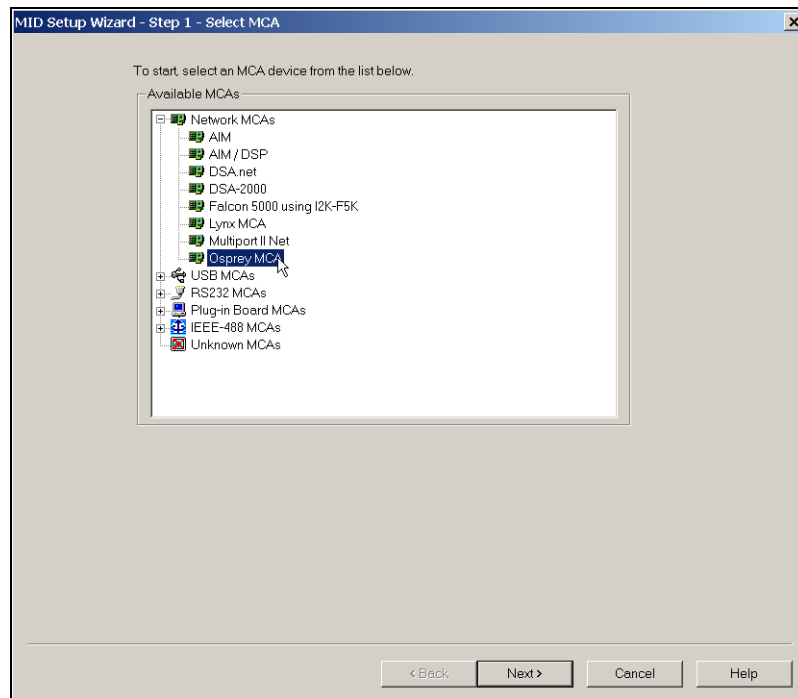


Figure 13 Selecting the MCA

## Step 2 - Configuring the MCA

Note: At this point in the setup process the Osprey is required to be connected to the network or directly to the host computer. Note the device’s IP address or UPnP name as it will be required to complete the setup. Refer to the appendix *Communication Setup* on page 81, as it describes the initial setup and basic operation of each of these interfaces.

The Configure MCA screen (Figure 14) lets you define the MCA's Number (1 = PHA and 2 = MCS) and IP address or UPnP name.

Device Name	Serial Number
OspreyP1	0000000000

Figure 14 Configuring the MCA

### Discovering the Osprey MCA

If the **Discover** button is selected and the Universal Plug and Play features have been activated (in Osprey and with your Windows PC), the Osprey identification information will be displayed. Select the desired Osprey and click the **OK** button to automatically fill the IP address information in the Device IP Address field.

Note: Discover will only work on networks that do not block Universal Plug and Play (UPnP) messages and the PC must have UPnP enabled.

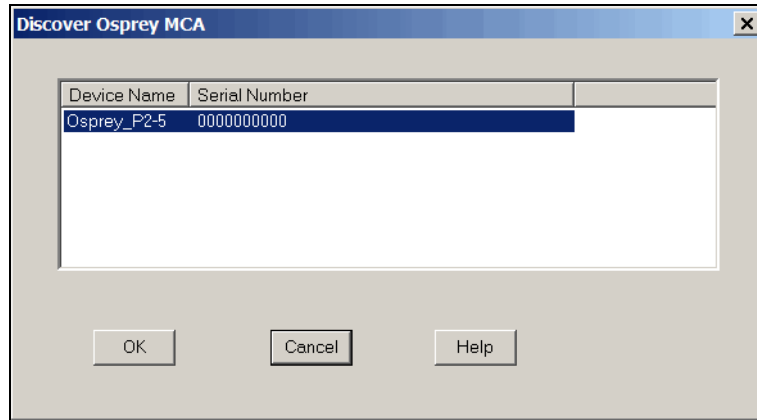


Figure 15 MID Plug and Play Discovery of Osprey

### Step 3 - Configuring the Detector

The Configure Detector screen (Figure 16) lets you enter an Input Name, Memory Groups, Number of Channels and Detector Type (this parameter is described in detail in *Input Settings* on page 32).

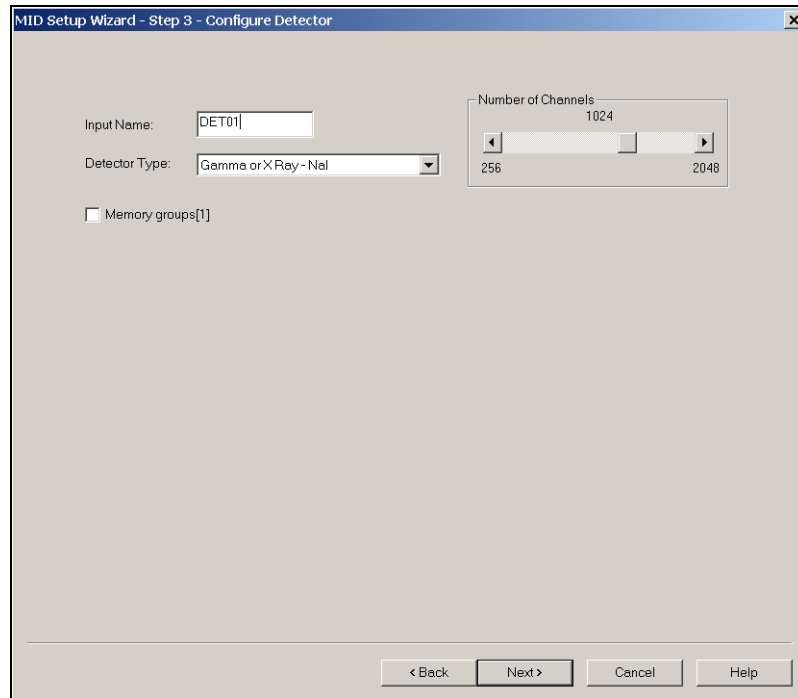


Figure 16 Assigning the Detector Type

You can change the default Input Name if you like, but if the field is empty, you won't be able to go to the next screen.

Selecting the Memory Groups box will define two memory groups, each with an input size equal to the selected number of channels.

## Steps 4, 5, and 6

You won't see the screens for Steps 4, 5, and 6; these steps are not used when setting up an Osprey.

## Step 7 - Summary

The Summary screen (Figure 17) displays a summary of the current MCA's configuration for review and lets you enter the name of the MID file that the configuration is to be saved to.

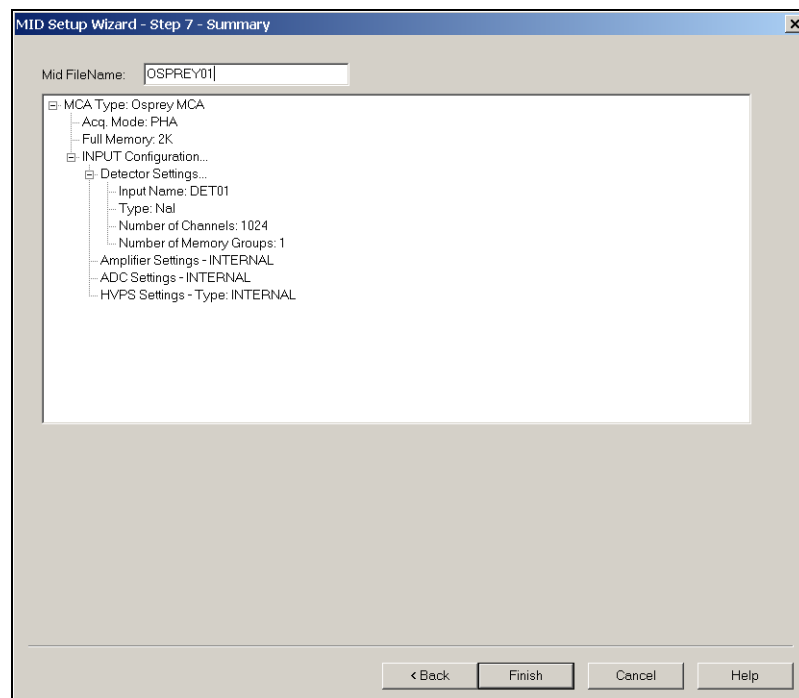


Figure 17 Summary of the Configuration

## Ending the Definition

To complete your Input Definition, select **Finish**. The input that you just defined will be stored as an MID file named `inputname.MID` and is automatically loaded into the MCA Runtime Configuration Database. When you select **Finish**, you will be asked if

you would like to define another input. Answering “Yes” will start the Wizard again and “No” will close the Wizard.

Note that if you didn’t enter an Input Name, you won’t be allowed to exit the Step 3 screen. If the name you entered is the same as the name of an existing MID file, the system informs you and goes back to Step 3 to let you enter another name.

The Step 7 Mid FileName defaults to UNTITLED, which you’ll probably want to change to something more meaningful. If the name you enter is the same as that of an existing MID file, the system will ask if you want to overwrite the existing file.

## Acquisition Window Adjust Dialogs with Genie 2000

The Adjust dialogs are found under the **MCA** menu in the Gamma Acquisition and Analysis (GAA) application. The datasource for the specific instrument must be opened. To open a datasource, select **File | Open Datasource**, then select the “Detector” option in the Source box. Next, select the datasource file and then **Open**.

In the following Adjust Screen discussion, the MCS Adjust Screen and the associated selection button are available only if MCS was selected as the Acquisition Mode when setting up the MCA controls in the **Devices | MCA** screen of the MID Editor. If MCS was not selected the selection button and adjust screen are hidden from view.

Notes: If you get a “Required Hardware Unavailable” error, likely causes are you may have selected the wrong data source for the instrument; there is a problem with the communication interface (check the cables); the instrument power is off; or, the instrument IP address was incorrectly entered when configuring the device. For this case the problem must be corrected before the data source can be opened.

If you get a “Hardware Verification Error” there is a mismatch between the MID Definition setup and the hardware configuration. Likely causes are the High Voltage Power Supply configuration or the hardware settings have been changed.

You can choose to accept or not accept the verification error in the associated dialog box. If you select NO, a RED error box will appear in the top left corner of the Acquisition and Analysis window. You can determine the source of the verification error by looking at the Status Page, which you can access by clicking **MCA | Status**. The problematic item will be marked with an asterisk (\*).

The following section describes those parameters for the Osprey that can be accessed from the acquisition windows’ Adjust dialog screen. Select the **MCA | Adjust** menu options to access these screens. Note that the Adjust screen for a given device may actually be composed of several screens, which are accessed by using the **Next/Prev** buttons.



## Stabilizer

The Stabilizer control in the Adjust dialog provides access to a set of parameters used to adjust the Spectrum Stabilizer.

Note: This control is not supported when using NAIS-2X2 detector.

The spectrum stabilizer algorithm in the Osprey Multi Channel Analyzer is based on similar implementations of spectrum stabilization in other Canberra MCA's, where two user-defined regions of interest or windows, are used to monitor the count rate and control the stabilization.

The stabilizer algorithm periodically monitors the count rate at the lower window  $C_{low}$  and the count rate at the upper window  $C_{high}$ , then calculates the ratio between the two as

$$R_{temp} = C_{high} / C_{low}$$

$R_{temp}$  is then compared against a previously-established reference ratio  $R_{ref}$  and if a significant difference is found, a correction value is applied to the signal gain to compensate for the drift.

User settings for the spectrum stabilizer algorithm include the width of the sampling windows, a centroid channel, the spacing, a reference ratio, and correction divider. The relationship between the windows, spacing, and centroid settings are shown in Figure 18.

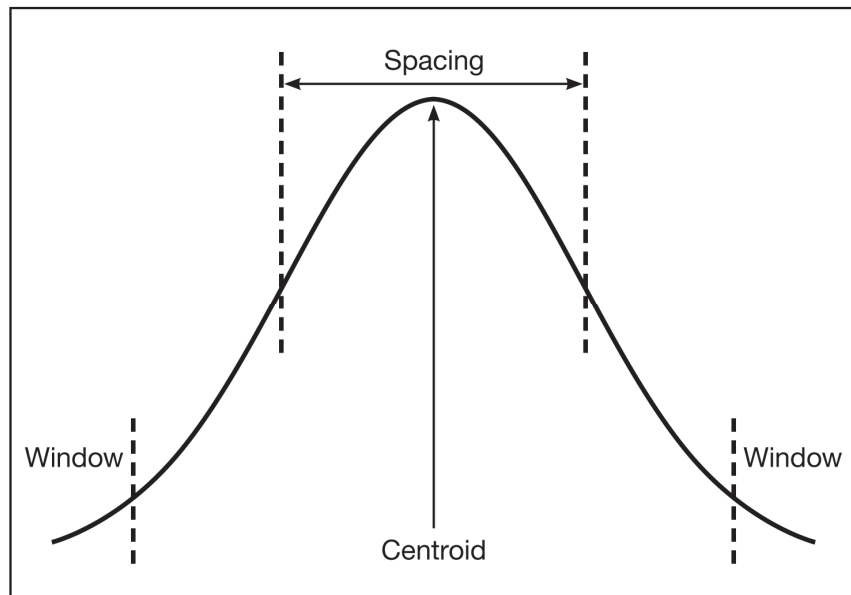


Figure 18 Relationship Between Stabilizer Functions

## Stabilizer Parameters

The Stabilizer settings screen (Figure 19) for the Osprey contains the following controls.

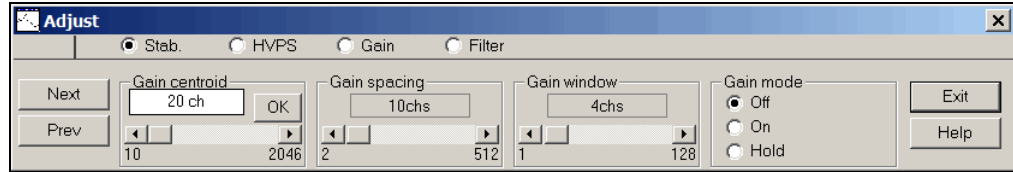


Figure 19 Adjust Screen's Stabilizer Settings

### Gain Centroid

The Centroid parameter sets the centroid (in channels) of the reference peak at the high end of the spectrum that will be used for gain stabilization. The centroid channel becomes the focus point for the stabilization algorithm.

### Gain Window

This adjustment sets the width (in channels) of the upper and lower sampling windows on either side of the gain reference peak. For best results, the windows should be placed so that a shift in the reference peak reflects a significant change in the count rate through the windows.

### Gain Spacing

This adjustment sets the spacing (in channels) between the upper and lower sampling windows. For broad peaks, the spacing should be set so that the windows' edges are not on the flat part of the peak.

### Gain Mode

This adjustment sets the Gain Stabilization mode to Off, On or Hold.

- **Off** disables the spectrum stabilization, and resets the correction to the system gain back to zero.
- **On** enables the spectrum stabilization by allowing the Stabilizer in the Osprey to continuously monitor the incoming data and compare its rate against a pre-established reference, making adjustments to the system gain as necessary to maintain a stable ratio.
- **Hold** suspends the spectrum stabilization and retains the current correction to the system gain until the Stabilizer is switched to either *Off* or *On*.

### Gain Ratio

The Gain Ratio value can be manually entered or automatically calculated by the Osprey depending on the Ratio Mode setting.

The Gain ratio value is interpreted by the stabilizer as the ratio to maintain between the two windows (ratio = upper window / lower window). For instance, a value of 1.000 would be appropriate for a pure Gaussian peak.

### Gain Rate Div

The Gain Rate Divider is a factor by which the level of correction applied to the system gain is reduced by. This value in effect determines the aggressiveness of the stabilization algorithm. The algorithm becomes less aggressive as the correction divider is increased.

### Ratio Mode

The Ratio Mode can be set for Manual or Automatic (default). In Manual mode, the reference ratio parameter must be manually entered or supplied by a client application. In Automatic mode, the reference ratio is calculated and managed automatically by the device. For normal operation, the Ratio Mode should be set to Automatic.

### Reset

During the normal course of operation, if the stabilization algorithm attempts to set a correction value that is beyond its  $\pm 10\%$  allowable range, the device will assert either an over-range or under-range fault depending on the direction of the correction value. Additionally, the device will switch the stabilizer mode from *On* to *Hold*.

Such a fault may be an indication of faulty electronics and thus requires operator intervention. The fault will remain asserted until (a) the operator acknowledges the fault by pressing the Reset, or the Stabilizer Mode is turned to *Off*.

## Typical Setup Sequence

When the stabilizer in the Osprey is turned *On*, the stabilization algorithm establishes a reference by taking a snapshot of the data relationship between the upper and lower sampling windows. Thereafter, the algorithm is designed to maintain the data relationship between two windows as close to the reference as possible by manipulating the internal high voltage control within an allowable range.

The stabilizer should be turned *On* after all other adjustments have been made. A typical sequence for setting up the spectrum stabilizer is as follows:

1. Adjust the coarse gain, fine gain, and detector's high voltage to select the desired energy range. The detector high voltage must be *On* to activate the stabilizer.

2. With the Osprey acquiring data in PHA mode, and a sample on the detector, select the energy peak to be used as a reference by the stabilizer. For best results, the peak should be located in the upper half of the spectrum.
3. Enter the reference peak's centroid channel into the stabilizer's Centroid control. If using Canberra's Genie Gamma Analysis application, the Centroid channel can be read directly from the Marker Info page provided that the left and right markers surround the reference peak. For best results the reference peak should be well defined, with sufficient count rate to provide at least 2:1 peak to background ratio.
4. The selection for the Spacing value and Window width largely determine the effectiveness of the stabilizer. The window width should provide for sufficient counting statistics but exclude interference from adjacent peaks. The spacing should provide sufficient separation between the sampling windows to strategically position the windows on the peak where a change in data rate will result in maximum effect detected by the algorithm, such as on the shoulders of the peak. Spacing values that are approximately 50% of the FWHM and window width that are approximately 80% of the FWHM are typical settings. If Using Canberra's Genie Gamma Analysis application, the FWHM can be read directly from the Marker Info page provided that the left and right markers surround the reference peak. Please note that the value reported by Genie is in energy units, and manual conversion to channels is necessary.
5. For most applications, the Ratio Mode should be set to *Auto*. The Auto mode directs the stabilization algorithm to automatically calculate the reference using the given parameters. Manual mode should be used to allow a client application to calculate the reference and pass it to the Osprey.
6. The Rate Divider in most cases can be set to 2 or 4 for a typical NaI detector. Default setting is 2, which translates to a correction step size of approximately 0.6 volts. Each step increase of the Rate Divider setting will reduce the size of the correction by half, and each step decrease will increase the size of the correction by two. Please note that if the correction step size is too small, the stabilization algorithm will not be able to correct for normal peak shifts resulting from typical variations in ambient temperature.
7. Turn the stabilizer mode to *On*.

Since the stabilization algorithm relies on spectral data to establish its reference, and changes in spectral data for its decisions on applying correction, the algorithm is active when PHA acquire is *On*, and inactive when PHA acquire is *Off*. In addition, once the stabilizer is activated, neither the fine gain nor the high voltage setting can be changed.

Turning the high voltage to *Off* while the stabilizer is active will disable the stabilizer by placing it in the *Hold* mode. In Hold mode the stabilizer will hold the current

correction level. Once the high voltage is turned back to *On*, the stabilization can be 'resumed' by turning the stabilizer mode to *On*.

Turning the stabilizer to *Off* will reset any correction currently in effect back to zero. A shift in peak centroid will take place if the correction was non-zero.

## High Voltage Parameters

The High Voltage control in the Adjust dialog (Figure 20), provides access to a set of parameters required to control the High Voltage Power Supply (HVPS) in the Osprey.

Note: The only parameter supported when using a NAIS-2X2 detector is HVPS Reset.

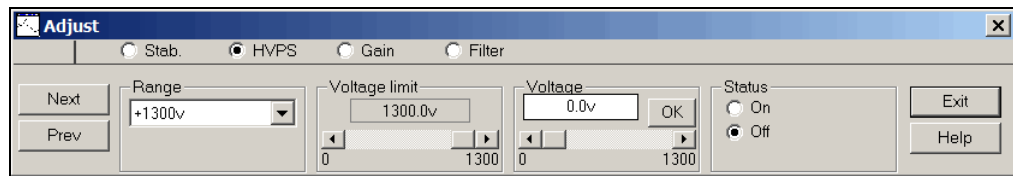


Figure 20 Adjust Screen's HVPS Settings



### Stabilized Detector:

The Osprey NAIS 2X2 LED stabilized detector has no user-adjustable HVPS parameters. Attempting to change any voltage parameters, when a stabilized detector is attached to the Osprey will generate the "Invalid Operation" error from the device. The only control on this screen that can be used with the stabilized detector is the HVPS Reset button for clearing an error state.

### Status

This control allows you to turn the HVPS On/Off. When turned *On*, the high voltage output will ramp to the current High Voltage setting, and when turned *Off* will ramp to zero. The high voltage indicator LED will turn *On* when the high voltage power supply is switched to *On*, and will turn *Off* when the high voltage power supply has been switched to *Off* and the output voltage has decayed to approximately 10% of full scale, or 130 volts.



### WARNING:

When turned Off, as the voltage output approaches zero, its decay becomes exponential. This means that a residual voltage may still be present at the detector

socket after the high voltage power supply has been switched Off. To avoid shock, use extreme care when plugging or un-plugging detectors with power applied to the Osprey.

### Range

The Osprey supports a single voltage range of 1300 volts. This setting is not adjustable.

### Voltage Limit

The Voltage limit control establishes the HVPS's maximum output voltage within the selected range. The Voltage Limit setting must be established before the Voltage control is adjusted.

### Voltage

The Voltage scroll bar sets the output voltage of the HVPS between the Voltage Limit's minimum and maximum settings. The voltage setting can also be typed in from the keyboard, and then accepted with the **OK** button within the control. Acceptable settings range from zero up to the full range of the power supply. When changed, the high voltage output ramps towards its new destination at a rate of 100 volts/second, updated approximately six times per second.

### HVPS Reset

This control resets any HVPS fault condition. The Osprey will assert a HVPS fault if the measured output voltage falls outside the expected range, or if the Osprey detects communication problems with the HVPS electronics. Once asserted, a HVPS fault must be acknowledged with the HVPS Reset control.

## DSP Gain Parameters

The DSP Gain settings screen (Figure 21) for the Osprey contains the following controls.

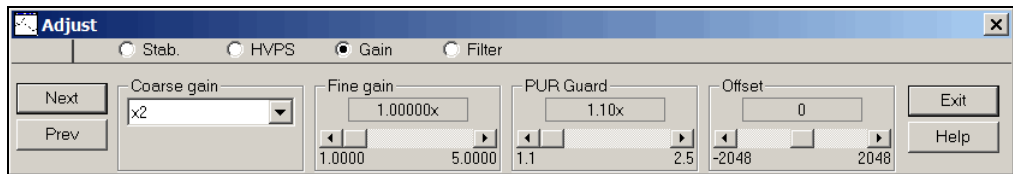


Figure 21 Adjust Screen's Gain Settings

**Coarse Gain**

This adjustment sets the device's coarse gain. It's best to choose the highest Fine Gain which, combined with the Coarse Gain will produce the total desired gain. The Coarse gain allows selections of x1 through x8. The Coarse Gain cannot be adjusted when the Spectrum Stabilizer is active.

**Fine Gain**

This adjustment sets the device's Fine Gain multiplier. The adjustment range is x1 to x5.

The combination of Coarse and Fine Gain sets the overall system gain to match the requirements of the detector and energy application; overall gain is continuously variable from x1 to x40.

The Fine Gain cannot be adjusted when the Spectrum Stabilizer is active.

**PUR Guard**

Sets the device's Guard Time (GT) multiplier to reject trailing edge pileup in the event of detector/preamp anomalies. The PUR guard sets the pileup reject interval, which is defined by  $GT \times T_{\text{Risetime}} + T_{\text{flattop}}$ .

**Offset**

The Offset adjustment sets the device's digital offset in channels. The digital offset shifts the memory assignment of the device's conversions either up or down depending on the sign and value of the offset. A positive offset value shifts the spectrum by the amount of the offset in upward direction. A negative offset value shifts the spectrum by the amount of the offset in downward direction.

The Offset cannot be adjusted when the Spectrum Stabilizer is active.

**FDisc Setting**

Sets the device's Fast Discriminator threshold level (when MANUAL Fdisc Mode is selected). The range is 0 to 100%, where 100% corresponds to approximately 20% of the full scale energy range.

**FDisc Mode**

Sets the device's Fast Discriminator threshold mode. AUTO allows the threshold to be optimized automatically above the system noise level; MANUAL allows the threshold to be manually adjusted.

**LTC Mode**

Sets the amplifier's Pulse Pileup Rejector and Live Time Corrector (LTC). When PUR is *On*, the pileup rejector and LTC are enabled. *Off* disables the pileup rejector and LTC.

### LLD

The digital Lower Level Discriminator (LLD) sets the minimum input acceptance level; active only when Manual LLD mode is selected; adjustment range is 0.0% to 100% of the spectrum full scale range.

### LLD Mode

This adjustment selects Automatic and Manual LLD modes; the digital Lower Level Discriminator selects minimum input acceptance level. With AUTO select the LLD cutoff is automatically optimized just above the spectral noise threshold. MANUAL allows the LLD cutoff to be set manually using the LLD slider bar as a percentage of the full-scale spectral size or range. The LLD slider bar does not function when AUTO is selected.

### ULD

The digital Upper Level Discriminator (ULD) sets the maximum input acceptance level. Range is 0 to 100%. The ULD setting is a percentage of the full-scale spectral size or range.

## DSP Filter Parameters

The DSP Filter settings screen (Figure 22) for the Osprey contains the following controls.

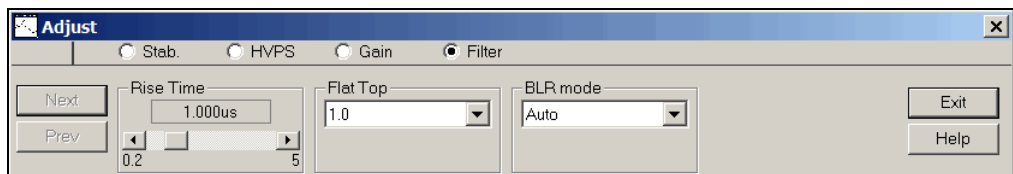


Figure 22 Adjust Screen DSP Filter Settings

### Rise Time

Symmetrically sets the rise time and fall time of the digital filter time response. As with conventional Gaussian shaping, the degree of noise filtering is proportional to the rise time selection. The Rise Time setting ranges from 0.2 to 5.0  $\mu$ s.

### Flat Top

The Flat Top allows for the charge light collection time of the particular scintillator. Independent adjustment of the flat top allows the shaping function to be optimized for scintillators with long light collection time, without a large increase in the overall processing time. The Flat Top setting ranges from 0.0 to 3.0  $\mu$ s.



### BLR mode

Sets the baseline restorer mode. With a setting of AUTO, the baseline restorer is automatically optimized as a function of trapezoid shaping time and count rate. With settings, of SOFT, MEDIUM and HARD, the baseline restorer is set to fixed rates as selected.

## MCS Parameters

The MCS settings screen (Figure 23) for the Osprey contains the following controls.

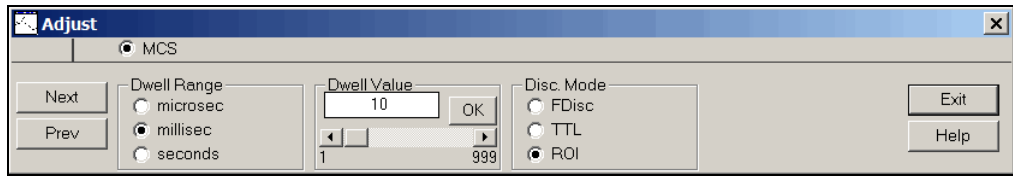


Figure 23 Adjust Screen's MCS Settings

### Dwell Range

Sets the units for the dwell time value. The unit's selection can be made for microseconds, milliseconds, or seconds.

### Dwell Value

Sets the dwell time value (in units specified by the Dwell Range control). The Osprey supports a dwell value ranging from 1 microsecond to 999 seconds in increments of 1 microsecond.

### Disc. Mode

The Discriminator Mode control establishes the input signal to the MCS Acquisition Unit.

Selecting **FDisc** enables the MCS's "fast discriminator mode" where all incoming events above the Fast Discriminator threshold are counted.

Selecting **TTL** enables the MCS's "TTL mode" where all TTL events (as seen at the GPIO connector selected to accept the MCS IN signal) to be counted.

Selecting **ROI** enables the "ROI discrimination mode", meaning that all incoming events processed by the DSP that fall within the selected discrimination window are counted.

If TTL mode is selected, then the External GPIO Configuration in the Acquire Setup dialog must have one GPIO connector selected for MCS IN. Refer to the appendix

*External GPIO Configuration Matrix* on page 97 for GPIO configuration selection chart and descriptions.

### ROI Start

Sets the start channel of the discrimination window used when ROI mode is enabled as the MCS input signal.

### ROI End

Sets the end channel of the discrimination window used when ROI mode is enabled as the MCS input signal.

Notes: ROI Start and ROI End values are with reference to the PHA input size.

Only MCS setting adjustments are available for the MCS datasource. A PHA datasource for the device must be opened if adjustments to the Stabilizer, High voltage, Gain or Filter are required.

## Acquire Setup with Genie 2000

This section includes a 'review' of options presented in the Genie 2000 documentation. Only those options that are supported with your Osprey setup will be discussed here.

The Acquire Set dialog (Figure 24) allows you to define the set of acquisition setup parameters to be used when initiating data collection on the current hardware datasource.

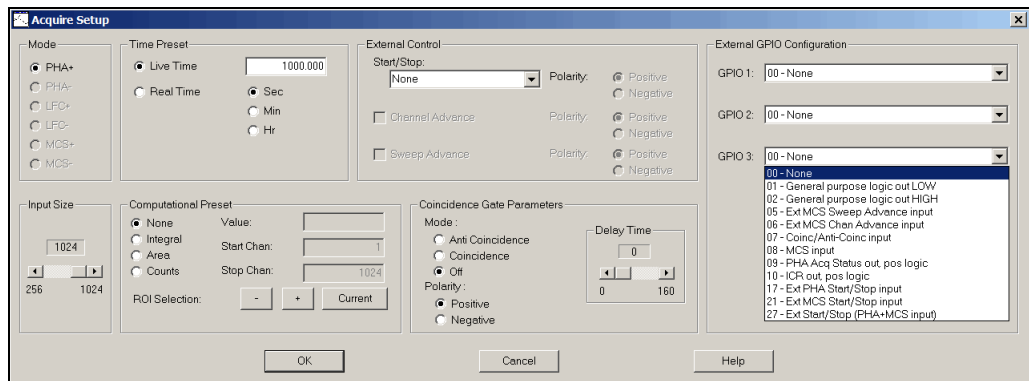


Figure 24 Acquisition Setup Controls in Genie 2000

Refer to your *Genie 2000 Operations Manual* for additional information on these Genie 2000 settings, if required.

## Counting Mode

Select the radio button for the counting mode desired.

- **PHA+** mode of Pulse Height Analysis is automatically enabled from the Acquire Setup screen.
- **MCS+** mode will be available if the MCA Acquisition Mode was previously configured for MCS (Input 2) in the MID setup.

## Time Preset

For PHA+ counting mode. **Live Time** and **Real Time** selections, enabled and set in seconds, minutes or hours.

## MCS Presets

For MCS+ counting mode. Preset Sweep Counts.

## External Control

External Start and Stop signals arriving at the GPIO connector selected to accept the signal can be used to control data acquisition. Four modes of External Start/Stop control are supported (plus None), and the polarity of the control input is selectable. A fifth option, None, is provided which disables External Start/Stop control. Initially, External Start/Stop control is disabled.

Channel Advance and Sweep Advance options for MCS counting mode only are grouped with the Start/Stop options.

Select the proper GPIO for the External Control input using the External GPIO Configuration. Refer to the appendix *External GPIO Configuration Matrix* on page 97 for GPIO configuration selection chart and descriptions.

The external controls are used as follows.

### External Start/Stop

Four active external Start/Stop control options are offered, plus 'none'. The Polarity of each of the external input signals is set using this area of the setup page.

- Start Only, Stop Only, and Start and Stop allow an external signal pulse to change the state of an acquisition once acquisition is enabled; subsequent external signal inputs are ignored.

- Suspend & Resume will toggle the state of the acquisition upon receipt of an external level.

### **Start Only**

An External Start/Stop pulse starts acquisition. Acquisition is first armed by pressing the **Acquire Start** button in Genie. Then an external pulse triggers the start of acquisition. Once acquisition is active, subsequent pulses are ignored.

### **Stop Only**

An External Start/Stop pulse stops acquisition. While Acquisition is active, an external pulse triggers the stop of acquisition. Once acquisition is stopped, subsequent pulses are ignored.

### **Start and Stop**

If acquisition is inactive but armed, an External Start/Stop pulse starts acquisition. Once acquisition is active, an External Start/Stop pulse stops acquisition. Subsequent pulses are ignored.

### **Suspend & Resume**

In this mode when the acquisition is enabled (by pressing the **Acquire Start** button in Genie) storage of events will occur when the External Start/Stop input is active (TTL-high) and acquisition storage will be suspended when the External Start/Stop input is inactive (TTL-low).

### **Polarity**

Select the External Start and Stop input signal active polarity: Positive or Negative logic can be selected.

## **Channel Advance**

An external Channel Advance signal arriving at the configured GPIO connector will advance the MCS channel ending in the current dwell. Channel Advance will be available if the MCA Acquisition Mode was previously configured for MCS in the MID setup. Otherwise this option will be disabled (grayed out).

### **Polarity**

Select the Channel Advance input signal active polarity: Positive or Negative logic can be selected.

## **Sweep Advance**

An external Sweep Advance signal arriving at the configured GPIO connector will advance the MCS Sweep. This returns the current dwell to the first channel in the group. Sweep Advance will be available if the MCA Acquisition Mode was

previously configured for MCS in the MID setup. Otherwise this option will be disabled (grayed out).

### **Polarity**

Select the Sweep Advance input signal active polarity as either Positive or Negative.

## **Input Size**

Select the Osprey's full memory size. The memory size settings range from 256 to 2048 channels.

## **Computational Preset**

Computational Presets are available only when MCA Acquisition Mode was previously configured for **PHA** mode in the MID setup. Otherwise this option will be disabled (grayed out).

These presets stop acquisition when a computed value you specify is reached. When a computational preset is defined, the chosen time preset is still active. The **Acquire Stop** command is issued by the preset that is reached first. If you want to use a computational preset alone, set the time preset to 0 which means "forever". This insures that the computational preset will be reached first.

Computational Presets are mutually exclusive with each other, but any one can be combined with either a live time or real time preset.

### **None**

Selecting **None** disables all computational presets. Only the time preset will be used in this case.

### **Integral, Area and Counts**

Each of the three computational presets: **Integral**, **Area** and **Counts**, applies to a specified ROI.

To use any computational preset, you must specify its **Value**, the ROI's **Start Channel** and its **Stop Channel**. The Start and Stop Channel values will default to the current computational preset if there is one, otherwise the Start value will be 1 and the Stop value will be the spectrum's highest channel number.

### **ROI Selection**

You can enter the Start and Stop limits manually or by using the **Current** button in ROI Selection or the + and – buttons to move to the next ROI. These functions automatically replace the limits with the current ROI's start and stop channels.

Note: ROI Start Channel and ROI Stop Channel values are with reference to the PHA input size.

## Coincidence

Coincidence is the ability to qualify the recording of incoming events. A qualifying (gate) signal must arrive within a time window which is selectable by the user.

The gate input signal at the configured GPIO connector determines which incoming events are recorded. Events which do not meet the qualification requirements are not recorded.

Select the proper GPIO for the Coincidence Gate input using the External GPIO Configuration. Refer to the appendix *External GPIO Configuration Matrix* on page 97 for GPIO configuration selection chart and descriptions.

### Mode (Gating)

Select the gating mode, Coincidence or Anti-Coincidence, or Off.

- In **Coincidence** mode, an incoming pulse of the selected polarity within the selected gate window permits recording of the event
- In **Anti-Coincidence** mode, an incoming pulse of the selected polarity within the selected gate window inhibits recording of the event.
- In **OFF** mode, the Coincidence function is disabled.

### Polarity

Selects the polarity of the gate input. **Positive** or **Negative**.

### Delay Time ( $\mu$ s)

Selects the time window (in microseconds) available for arrival of the qualifying gate pulse. Recording of the event is delayed until the qualifying signal occurs or the window time expires.

## External GPIO Configuration

Selects the functional assignments of the GPIO connectors.

Refer to the appendix *External GPIO Configuration Matrix* on page 97 for GPIO configuration selection chart and descriptions. Selects the functional assignments of GPIO connectors. Genie supports a subset of the total number of GPIO functions.

## System Connections for a Detector

This describes a basic system consisting of an Osprey, a standard NaI(Tl) or LaBr<sub>3</sub>(Ce) detector or an Osprey NAIS 2X2 LED stabilized detector, and a PC running Genie 2000 (Figure 25). Your configuration may vary.

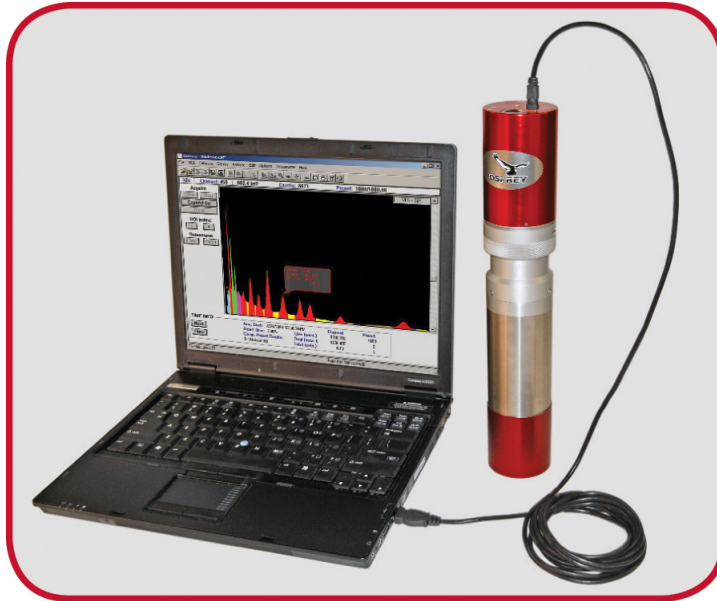


Figure 25 Typical Osprey System

### Basic Detector Setup

The Osprey can be connected to a variety of detectors. The next sections describe how to set up the probe to the Osprey.

## 14-Pin Detector

Before connecting the USB or Ethernet connector, carefully align the keyway and pins on your photomultiplier tube (PMT) with the 14-pin tube socket base on the Osprey device. To ensure correct alignment, the PMT has a key which mates with the Osprey's keyway (Figure 26). Push the two parts together in a straight motion, which should be snug but not difficult to assemble together.



Figure 26 Connecting the Osprey to an 14-Pin Probe

**CAUTION:** Do not force the connection; doing so can permanently damage either or both units. If resistance is felt, pull the two units apart, recheck the alignment of the keyway and carefully press them together again.

Refer to the specific Scintillation Detector User's Manual for the tube-base pin configuration.



### 14-Pin Tube Socket Pin-out

The 14-pin tube base socket is a standard JEDEC B14-38 socket that will accept a 10 stage PMT. The pin-out is as follows:

<b>Pin</b>	<b>Function</b>
1	Dynode 1
2	Dynode 2
3	Dynode 3
4	Dynode 4
5	Dynode 5
6	Dynode 6
7	Dynode 7
8	Dynode 8
9	Dynode 9
10	Dynode 10
11	Anode
12	N/C
13	FOCUS
14	K (Cathode)

### 8-Pin Stabilized Detector

To connect the NAIS 2X2 stabilized detector with the Osprey device refer to the photos and steps below.



Figure 27 Connecting the Osprey to an 8-Pin Stabilized Probe

**CAUTION:** Do not force the connection; doing so can permanently damage either or both units. If resistance is felt, pull the two units apart, recheck the alignment of the keyway and carefully press them together again.

1. Carefully align the keyway and pins on your detector with the 14-pin tube socket base on the Osprey device. To ensure correct alignment, the detector has a key which mates with the Osprey's keyway.
2. Push the two parts together in a straight motion, the mating parts should be snug but not difficult to assemble together. Align the locking pin on the Osprey with the slot on the locking collar of the stabilizer detector.
3. Slide the locking collar up so the locking pin meets the bottom of the slot.
4. Twist the locking collar to the right until the locking pin comes to the end of the slot.

**Note:** The stabilized detector will enter the internal calibration mode during the initial power-up and at any time when the outside temperature changes significantly. This state is indicated by the blinking Green HV LED on the Osprey's front panel. If the stabilization occurs while the device is in active acquisition mode, then the acquisition will become suspended until the detector has stabilized. If the device is opened by Genie during this time, then Genie will display "Wait" state in the datasource status area window and the acquisition elapsed time will stop advancing. The acquisition will resume and proper elapsed time adjustments will be performed after the detector is stable again.

Refer to the NAIS 2X2 NaI(Tl) LED Temperature-Stabilized Scintillation Detector User's Manual for the tube-base pin configuration.

## Communication Interfaces

To use any of Osprey's communications interfaces, connect the supplied cable between the Osprey and another device, such as a hub or the host computer. The appendix *Communication Setup* on page 81 describes the initial setup and basic operation of each of these interfaces.

### Ethernet

Osprey supports 10/100 Base-T Ethernet (auto-sensing), connecting to an Ethernet network (PoE IEEE 802.3af compliant) using an Ethernet patch cable, or directly to a host computer through a single port PoE injector.

One 3 m (10 ft) 10/100 Base-TX UTP Ethernet patch cable, and one 3 m (10 ft) 10/100 Base-TX UTP Ethernet Crossover cable (Red in color) are supplied.

## USB

USB 5-pin Mini-B is for connecting the Osprey as a Device to a USB hub or directly to a host computer. The USB Host will be required to supply 2W of power. One 3 m (10 ft) USB A-B cable is supplied.

- Before you can use the USB interface, you'll have to set up your PC for this. USB setup instructions are found in the appendix *Communication Setup* on page 81.

## GPIO Connections

Several GPIO connections may be required. Figure 28 shows a GPIO MCX cable. Refer to *GPIO Connectors* on page 8 and to the appendix *External GPIO Configuration Matrix* on page 97 for GPIO configuration selection chart and descriptions.



Figure 28 Sample GPIO MCX Cable

## 4. Web-Based Status

A web-based status page (Figure 29) is supplied with the Osprey, providing MCA and detector status information, network setup, and firmware upgrade functionalities. The status page is accessible from most web browsers. Internet Explorer version 7 and higher is supported. Version 6 has limited support. Firefox 3.0 and higher is supported.

Java script and Cookies must be enabled in the browser for proper operation. To learn how to allow Java Script and Cookies, see online help in your web browser.

It is recommended to close the web browser when all tasks are completed in the web-based status page. When using IE7 or IE8 there is a known issue of excessive memory usage when the browser is open for extended periods.

The following three Status Page sections include status indicators. The indicators are rectangular boxes with text beneath describing their function. A *white* indicator denotes the function is inactive and a *green* indicator denotes the function is active.

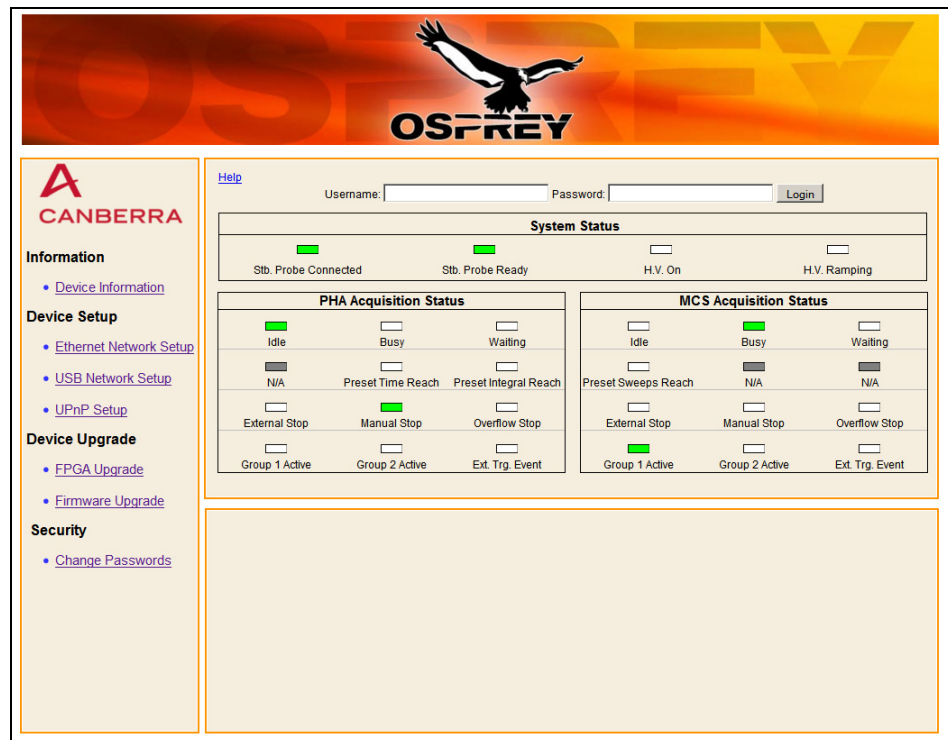


Figure 29 Osprey's Web-Based Status Page

### Username and Password

To log on to the device, you will need a user name and password. The default Osprey Username is *administrator*, and the default password is *password*. This log on provides administrative privileges and allows changes to all functions. Click on the **Login** button to begin. Refer to *Security* on page 71 for directions on changing the administrator password.

## System Status

The **System Status** indicators provide status of Osprey NAIS 2X2 LED stabilized detector, if installed, and high voltage power supply.

### Stb. Probe Connected and Stb. Probe Ready

The status indicators of the CANBERRA NAIS-2x2 temperature-stabilized detector (if installed).

- **Stb. Probe Connected** – *Green* indicates the CANBERRA NAIS 2x2 LED stabilized detector is connected to the Osprey.
- **Stb. Probe Ready** – *Green* indicates the CANBERRA NAIS 2x2 LED stabilized detector is stabilized and within its stabilization range. If the indicator is *white* when the detector is connected the detector is not within its range and acquisition will be inhibited by the Osprey.

### H.V. On and H.V. Ramping

The status indicators of the high voltage power supply.

- **H.V. On** – *Green* indicates the high voltage power supply is on.
- **H.V Ramping** – *Green* indicates the high voltage power supply is either ramping up or down to its target voltage. Once the target voltage has been reached it will change to *white*.

## PHA Acquisition Status

The following indicators provide status of the PHA acquisition of the Osprey. The descriptions below describe the active state of the indicators.

### Idle

The device is not in acquire.

**Busy**

The device is in acquire or armed and waiting to start acquire.

**Waiting**

Acquisition is armed but has not started because waiting for one of several events: External Start, External Sync, or CANBERRA NAIS 2x2 LED stabilized detector performing internal calibration.

**Preset Time Reach**

Acquisition has stopped due to preset time being reached.

**Preset Integral Reach**

Acquisition has stopped due to computational preset being reached based on Integral value only. The Manual Stop indicator will activate if Computational Preset was reached due to Area or Counts presets.

**External Stop**

An external event has stopped acquisition.

**Manual Stop**

Acquisition was stopped by pressing **Acquire Stop** in Genie 2000. The Manual Stop indicator will also activate if Computational Preset was reached due to Area or Counts presets.

**Overflow Stop**

Acquisition was stopped due to PHA channel overflow counts.

**Group 1 Active**

Device is in acquisition and group 1 is active.

**Group 2 Active**

Device is in acquisition and group 2 is active.

**Ext. Trig. Event**

An external event such as External Start/Stop or External Sync has occurred.

## MCS Acquisition Status

The following indicators provide status of the MCS acquisition of the Osprey. The descriptions below describe the active state of the indicators.

**Idle**

The device is not in acquire.

**Busy**

The device is in acquire or armed and waiting to start acquire.

**Waiting**

Acquisition is armed but has not started because waiting for one of several events: External Start, External Sync, or CANBERRA NAIS 2x2 LED stabilized detector performing internal calibration.

**Preset Sweeps Reach**

Acquisition has stopped due to preset sweeps being reached.

**External Stop**

An external event has stopped acquisition.

**Manual Stop**

Acquisition was stopped by pressing **Acquire Stop** in Genie 2000.

**Overflow Stop**

Acquisition was stopped due to MCS channel overflow counts.

**Group 1 Active**

Device is in acquisition and group 1 is active.

**Group 2 Active**

Device is in acquisition and group 2 is active.

**Ext. Trig. Event**

An external event such as External Start/Stop or External Sync has occurred.



## Information

The **Device Information** page (Figure 30) provides a summary of the device configuration that can be accessed without the need to log in to the device.

The screenshot shows the Osprey web interface. At the top is the Osprey logo with an eagle. Below it is a sidebar with the Canberra logo and navigation links: Information (Device Information), Device Setup (Ethernet Network Setup, USB Network Setup, UPhP Setup), Device Upgrade (FPGA Upgrade, Firmware Upgrade), and Security (Change Passwords). The main content area has a login form (Username, Password, Login) and several status panels: System Status (Stb. Probe Connected, Stb. Probe Ready, H.V. On, H.V. Ramping), PHA Acquisition Status (Idle, Busy, Waiting, NIA, Preset Time Reach, Preset Integral Reach, External Stop, Manual Stop, Overflow Stop, Group 1 Active, Group 2 Active, Ext. Trg. Event), and MCS Acquisition Status (Idle, Busy, Waiting, Preset Sweeps Reach, NIA, NIA, External Stop, Manual Stop, Overflow Stop, Group 1 Active, Group 2 Active, Ext. Trg. Event). At the bottom is the Device Information panel with the following data:

Device Information			
Serial Number:	Pilot2	Ethernet MAC Address:	00-00-AF-00-20-1E
Firmware Version:	0.00.0911.20.00	Ethernet IP Address:	160.84.36.71
FPGA Version:	0327	USB MAC Address:	00-00-AF-00-20-1F
Web Version:	0.00.0911.23.00	USB IP Address:	0.0.0.0

Figure 30 Summary of Device Information

### Serial Number

The serial number of the Osprey.

### Firmware Version

The version of the microcontroller firmware.

### FPGA Version

The version of the FPGA design file.

### Web Version

The version of the Web Status page.

### Ethernet MAC Address

The network card Media Access Control Address. A unique number that identifies the Ethernet hardware interface.

**Ethernet IP Address**

A unique address assigned to the device that is used to identify and communicate with devices on a network. This address can be changed on the Ethernet Network Setup page.

**USB MAC Address**

The network card Media Access Control Address. A unique number that identifies the USB hardware interface.

**USB IP Address**

A unique address assigned to the device that is used to identify and communicate with devices on a network. This address can be changed on the USB Network Setup page.

# Device Setup

The **Device Setup** menu group (Figure 31) allows the user to perform changes to device parameters when logged in with administrative privileges.

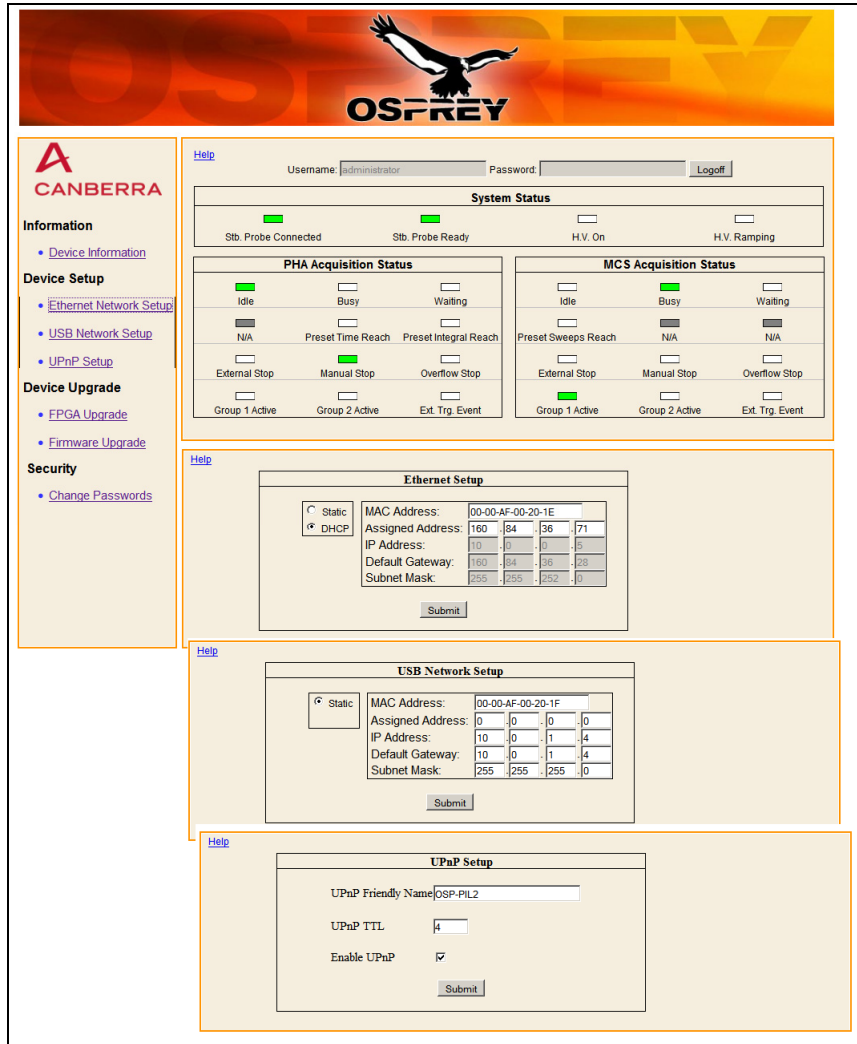


Figure 31 Device Setup Parameters

## Ethernet Network Setup

Refer to the appendix *Communication Setup* on page 81 for network setup directions for Ethernet connection.

### Static and DHCP

Static enables Static IP addressing and DHCP enables DHCP.

### MAC Address

The network card Media Access Control Address. This is a read-only field for information purposes and cannot be changed.

### Assigned Address

The current IP address of the device. This can be a static address or the address assigned by the DHCP server if DHCP is enabled. This is a read-only field for information purposes and cannot be changed.

### IP Address

Defines the static IP address of the device. When the **Static** radio button is selected the device's static IP address can be changed by typing the desired IP address in the appropriate boxes and pressing the submit button. It is required to restart the device for this change to take affect. This address must be changed to a unique address if multiple Ospreys are connected to same host PC and/or multiple devices will be controlled by same Genie 2000 session.

### Default Gateway

The default gateway to be used to route those packets not destined for a subnet that the device is directly connected to, and for which a more specific route does not exist.

### Subnet Mask

This value specifies the subnet masks to be used with the IP interfaces bound to the adapter. This value can be any set of valid IP addresses.

### Device Reset

When changes have been made to the Ethernet Network Setup press the **Submit** button. For the changes to take affect the device is required to be reset. Press the **Device Reset** button to reset the device immediately or perform additional device parameter changes and reset the device at a later time.

When the **Device Reset** button is pressed, the device will reset and the Web Status page will *refresh* in 60 seconds. During this time the links in the web page are disabled. Verify the new settings in the Device Information page.

## USB Network Setup

Refer to the appendix *Communication Setup* on page 81 for network setup directions for USB connection.

### MAC Address

The network card Media Access Control Address. This is a read-only field for information purposes and cannot be changed.

### Assigned Address

The current IP address of the device. This is a read-only field for information purposes and cannot be changed.

### IP Address

Defines the IP address of the device. The device's IP address can be changed by typing the desired IP address in the appropriate boxes and pressing the submit button. It is required to restart the device for this change to take affect. This address must be changed to a unique address if multiple Ospreys are connected to same host PC and/or multiple devices will be controlled by same Genie 2000 session.

### Default Gateway

The default gateway to be used to route those packets not destined for a subnet that the device is directly connected to, and for which a more specific route does not exist.

### Subnet Mask

This value specifies the subnet masks to be used with the IP interfaces bound to the adapter. This value can be any set of valid IP addresses.

### Device Reset

When changes have been made to the USB Network Setup press the **Submit** button. For the changes to take affect the device is required to be reset. Press the **Device Reset** button to reset the device immediately or perform additional device parameter changes and reset the device at a later time.

When the **Device Reset** button is pressed, the device will reset and the Web Status page will *refresh* in 60 seconds. During this time the links in the web page are disabled. Verify the new settings in the Device Information page.

## UPnP Setup

Refer to *Universal Plug and Play* on page 86 for UPnP setup directions.

### UPnP Friendly Name

This defines the name of the device. You can use this name to identify the device using a UPnP browser such as Windows XP My Network Places applet.

### UPnP TTL

The network Time To Live value. TTL is the number of hops an IP packet may make across the network. The default number is 4. This value can be changed from 1 to 255. It is required to restart the device for this change to take affect.

### Enable UPnP

This check box enables or disables this service. When enabled you will be able to discover this device on your network using any UPnP browser such as Windows XP My Network Places applet.

### Device Reset

When changes have been made to the UPnP Setup press the **Submit** button. For the changes to take affect the device is required to be reset. Press the **Device Reset** button to reset the device immediately or perform additional device parameter changes and reset the device at a later time.

When the **Device Reset** button is pressed, the device will reset and the Web Status page will *refresh* in 60 seconds. During this time the links in the web page are disabled. Verify the new settings in the Device Information page.

## Device Upgrade

The **Device Upgrade** menu group (Figure 32) allows the user to update the FPGA files or the firmware when logged in with administrative privileges.

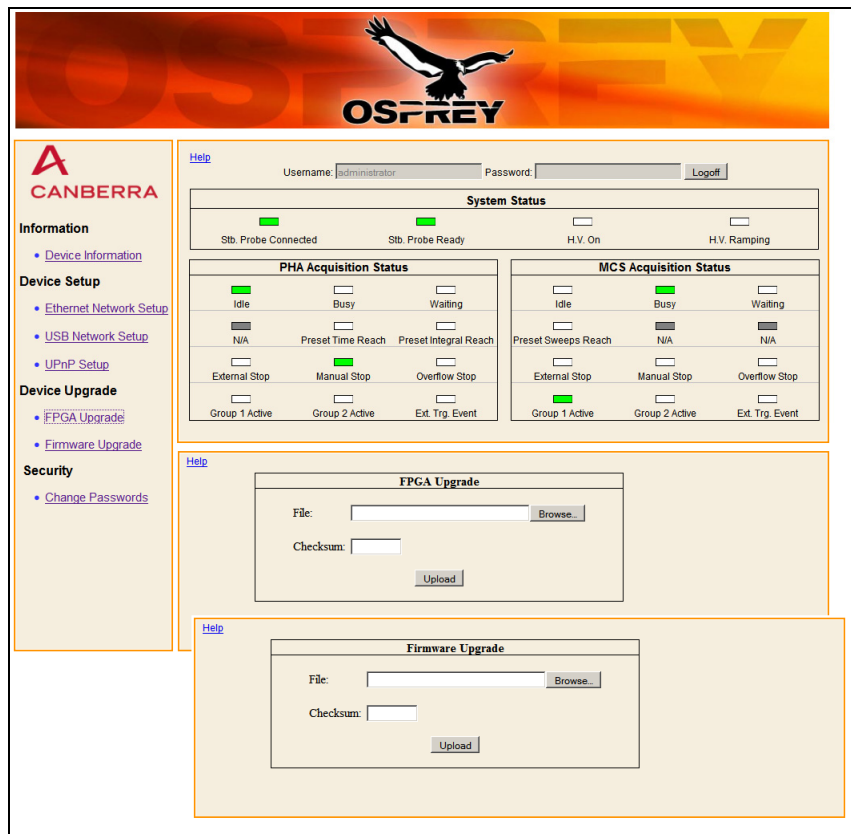


Figure 32 Device Upgrade Parameters

## Installing the Firmware and FPGA Files

Use these steps only if a new version of firmware has been recommended for your Osprey by an authorized Canberra service center. These steps are abbreviated here, as you will receive more detailed instructions with any updates from the Canberra service center product support personnel.

Note: If a datasource is open in Genie, it must be closed prior to performing any device upgrades.

**CAUTION:** Do not power off device during update process. This can make the device unusable.

### Directions for FPGA Upgrade

To install a FPGA upgrade:

1. Under **Device Upgrade**, click on the **FPGA Upgrade** link.
2. Click on the **Browse** button (or **Choose File**) and select appropriate file supplied for upgrade.
3. Type the checksum value in the checksum box.  
This value will be supplied from the factory with the FPGA file.
4. Click the **Upload** button.
5. When the checksum has been verified press the **Apply** button.
6. The installation can take 2 minutes. The Web Status page will *refresh* in 120 seconds. During the FPGA upgrade time the links in the web page are disabled.
7. Verify new version of FPGA has been installed in the Device Information window.
8. Exit web page when complete.

### Directions for Firmware Upgrade

To install a firmware upgrade:

9. Under **Device Upgrade**, click on the **Firmware Upgrade** link.
10. Click on the **Browse** button (or **Choose File**) and select appropriate file supplied for upgrade.
11. Type the checksum value in the checksum box.
12. This value will be supplied from the factory with the firmware file.
13. Click the **Upload** button.
14. When the checksum has been verified press the **Apply** button.
15. The installation can take 1 to 2 minutes. The Web Status page will *refresh* in 120 seconds. During the firmware upgrade time the links in the web page are disabled.
16. Verify new version of Firmware has been installed in the Device Information window.
17. Exit web page when complete.



## Security

The **Security** page (Figure 33) allows the Administrator to change the user's password when logged in with administrative privileges.

The screenshot shows the Osprey web interface. At the top, there is a header with the Osprey logo and a navigation menu on the left with categories: Information, Device Setup, Device Upgrade, and Security. The Security section includes a link for 'Change Passwords'. The main content area has a login form with 'Username: administrator' and a 'Logoff' button. Below the login form is the 'System Status' section with indicators for 'Stb. Probe Connected', 'Stb. Probe Ready', 'H.V. On', and 'H.V. Ramping'. There are two 'Acquisition Status' sections: 'PHA Acquisition Status' and 'MCS Acquisition Status', each with multiple status indicators. At the bottom is the 'Password Manager' section with input fields for 'User Name', 'Current Password', 'New Password', and 'Confirm New Password', and a 'Submit' button.

Figure 33 Password Manager Settings

### Change Passwords

Use the following steps in the Password Manager to change the administrator password.

1. Under **Security**, click on the **Change Password** link.
2. Type “administrator” in the Username text box.
3. Type the current password in the Current Password text box. The factory default password is “password”.
4. Type the new password in both the New Password and Confirm New Password text boxes.
5. Press the **Submit** button.

## Web Update Utility

A Web Update utility is supplied with the Osprey on the enclosed CD. This utility is used to transfer files to the device via TFTP to update the web status page and other files. The folder location of the update utility file is <Drive>:\Osprey Device Files\WebUpdate. The folder location of the website files is <Drive>:\Osprey Device Files\WebUpdate\Website.

To run this utility, open a command window. Verify the command prompt is configured for the proper directory. See above folder location for update utility. The general syntax to run the utility is: oWebUpdate ipAddress FolderPath. An example is "oWebUpdate 10.0.0.3 website\", where oWebUpdate is the update utility file name, 10.0.0.3 is the IP address of the device and website is the folder that includes all the web files to update to the device. This example is shown in Figure 34.

Cycle power to the Osprey once the web update is complete.

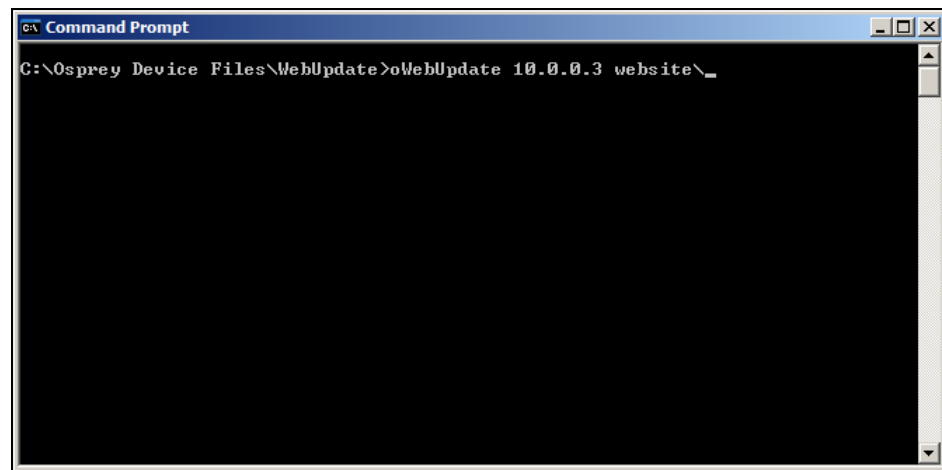


Figure 34 Folder Location for Web Update Utility

# A. Specifications

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## Inputs/Outputs

PMT – Standard 14-pin PMT socket and CANBERRA proprietary 8-pin socket.

8-Pin stabilized detector connector – Canberra proprietary 8-pin connector for NAIS 2X2 detector.

## Communication Ports

USB 2.0 – USB Mini B-type (5-pin) connector, labeled USB D (for USB Device). Full speed USB support for direct connection of Osprey to a host computer or a USB hub. The USB interface is software-configurable and must be set up before it is operational. Its factory default URL is 10.0.1.4.

Ethernet 10/100T – Female RJ45-type 8-pin modular jack for connection to an IP Ethernet network or directly to a host computer. Port settings under software control and are configurable. Factory settings cooperate with Universal Plug n Play detection by a host Windows computer, and the wired Internet interface is operational out-of-the-box using the static URL 10.0.0.3. Power over Ethernet (PoE) is 802.3af compliant.

## Device General Purpose Inputs/Outputs

Three user-configurable General Purpose Input/Output connectors labeled GPIO-1, GPIO-2, and GPIO-3, provide access to the device's internal acquisition status, counters, and start/stop control. For the connector's functional data, refer to the chapter *Controls and Connectors* on page 6. For detailed description of each GPIO functionality and any restriction(s) that may apply, refer to the appendix *External GPIO Configuration Matrix* on page 97.

GPIO – Three freely assignable MCX connectors.

- TTL compatible, minimum pulse width for inputs >50 ns, all inputs have software selectable polarity.
- Coincidence/Anti-coincidence.
- PHA External Start/Stop. Start/Stop Mode (Start Only, Stop Only, and Start and Stop) or Suspend and Resume Mode (can also be an output to control other devices).

- MCS External Start/Stop. Start/Stop Mode (Start Only, Stop Only, and Start and Stop) or Suspend and Resume Mode (can also be an output to control other devices).
- External Time Sync. (can be an input or an output to control other devices) for the following modes:
  - List – Sync. rate from external source or master to sync. time stamps of events.
  - MSS – Sync. from external source or master to advance to next spectral group.
  - Aux Counters and SCA Counters – Sync. can be used to control the start of interval timer and synchronize the interval timer at each sync event.
- Aux Counter In – Auxiliary Counter Input.
- MCS Input – External MCS input; TTL pulse.
- MCS Channel Advance - External MCS Channel Advance; TTL pulse.
- MCS Sweep Advance - External MCS Sweep Advance input; TTL pulse.
- SCA Outputs – Up to three; each of these outputs can be selected from one of the six internal SCAs.
- ICR Out – Incoming count rate output.
- Acquisition Out – Acquisition status.
- General Purpose Input/Output – output signal to drive external devices or input signal to monitor external device's status.

### Electrical Specifications

Input – TTL compatible. 10 K $\Omega$  pull-up resistor to +3.3V volts (software selectable), logic low  $\leq$  +0.8 V, logic high  $\geq$  +2.0V; Minimum pulse width >100 ns.

Output – TTL compatible. Logic low  $\leq$  +0.55 V, logic high  $\geq$  +2.4V; Output current  $\pm$ 24mA.

## Acquisition Modes

### PHA

- PHA Channels 256 to 2048 Channels. Supports two memory groups of up to 2048 channels each.
- Preset: ROI Counts (Integral), Real or Live Time timers.
- Real and Live Time Resolution 0.01 s.
- Preset Time 0 to  $>4 \times 10^7$  s.
- Control: Internal or External Start/Stop control.
- LTC accuracy 5% (3% typical) up to 50 kcps.
- LTC method proprietary.

### MCS

- Dwell range 1  $\mu$ s to 999 seconds in 1  $\mu$ s steps.
- Sweep range 1 to  $2^{32}-1$ .
- Preset Sweep Counter 0 to  $2^{32}-1$ ; 0 implies “Forever”.
- MCS input selection: PHA ROI, external TTL or Fast Discriminator.
- Dwell selection internal or external.
- MCS Channels 256 to 2048 Channels. Supports two memory groups of up to 2048 channels each.

The following advanced modes of operation are accessible through the SDK.

### SCA

- Channels 6.
- Preset Modes Live Time, Real Time.
- SCA Modes Automatic, Manual, AutomaticEx, External Sync.
- Size of Counter for each SCA Channel 32-bits.
- LLD and ULD for each SCA Channel 0% to 100% Full Scale Software Programmable.
- SCA Signal Output for selected channel 200 ns output pulse for each event can be mapped to a GPIO connector.

### MSS

- Data acquired into two memory groups, alternating between the two in a “ping-pong” fashion when a preset time parameter or preset count parameter is reached.
- Ability to use External Sync. to switch between groups.

### List/Time-Stamped List

- Latency: 100 ms (Only when streaming mode is supported).
- External time base support (Use of External Sync.).
- Time-stamp resolution 1  $\mu$ s and 100 ns.
- Maximum event rate 100 000 pulses/sec.

### AUX Counters

- TTL compatible, minimum pulse width for input >50 ns.
- AUX Counter Modes Automatic, Manual, AutomaticEx, External Sync.

## Performance

Channel Configurations – Total channels 8192; Configurable as two groups of 2048, 1024, 512 or 256 channels for PHA and MCS; Bits per channel 32.

Integral Non-linearity –  $\pm 0.025\%$  of full scale over the top 99% of the selected range.

Differential Non-linearity –  $\pm 1\%$  over the top 99% of the range including the effects from integral non-linearity.

Gain Drift –  $< 75$  ppm/ $^{\circ}$ C after 15 minutes of operation.

Zero Drift –  $< 3$  ppm/ $^{\circ}$ C after 15 minutes of operation.

Incoming Count Rate (ICR) –  $> 250$  K cps ICR if not limited by probe/detector.

## Programmable Controls

Coarse Gain – x1, x2, x4, x8 software programmable.

Fine Gain – x1 to x5 software programmable.

Total Gain – Product of Fine Gain, Coarse Gain and the ADC Reference Control, x1 to x40.

ADC – ADC 14-Bit 20 MHz Sampling.

LLD – 0% to 100% of Full Scale software programmable.

ULD – 0% to 100% of Full Scale software programmable.

Detector Voltage - HVPS – 0 to +1300 V dc: 100 V/s ramping on power up and down.

Shaping – DSP Based Trapezoidal shaping filter operating at 80 MHz.

Rise Time – 0.2  $\mu$ s to 5  $\mu$ s in 200 ns steps. Default: 1  $\mu$ s for NaI detector.

Flat Top – 0 to 3  $\mu$ s in 100 ns steps. Default: 1  $\mu$ s for NaI detector.

Digital Spectrum Stabilization –

Support for a stabilization source for non-stabilized detectors.

Support of CANBERRA NAIS-2x2 —temperature-stabilized NaI probe.

BASE LINE RESTORER – Automatic with provision for adjustable BLR.

Fast Discriminator Threshold – Automatic with provision for adjustable FDisc.

PUR GUARD – Programmable guard time 1.1 to 2.5 times shaping.

## High Voltage Power Supply

Output is current limited and short-circuit protected.

### HVPS

OUTPUT – 0–1300V at 300  $\mu$ A max.

RIPPLE – 1 mV.

ACCURACY – 3% Full Scale.

SETTING RESOLUTION – 14-bit (1/16 384).

## Indicators

Three indicators:

- BUSY
- Status – HV/Stabilized Probe
- ICR

## Detectors

- 14-pin scintillation detector.
- CANBERRA NAIS-2x2 temperature-stabilized NaI probe.

## Power

- Main power will be supplied by either the USB port or IEEE 802.3af-compliant Power over Ethernet (PoE).
- Power consumption USB < 2 Watt.
- Power consumption PoE < 3 Watt.

## Physical

SIZE – 62 x 108 mm (2.44 x 4.25 in.) (D x L).

WEIGHT – 280 g (9.9 oz).

## Environmental

Temperature – Range: - 10 to 50 °C (14 to 122 °F).

Humidity – 85% non-condensing.

Meets the environmental conditions specified by EN 61010, Installation Category I, Pollution Degree 2.



## Compliance

EMC (Emissions and Immunity):

- EN61326:2006
- EN61000-3-2:2008
- EN61000-3-3: 2008
- EN61000-4-2: 2008
- EN61000-4-3: 2008
- EN61000-4-4: 2004
- EN61000-4-5: 2005
- EN61000-4-6: 2008
- EN61000-4-11: 2004
- EN61000-4-8:2001

NRTL LISTED (Safety):

- CAN/CSA C22.2 No. 61010-1-04
- UL61010-1:2004
- IEC61010-1:2001 2nd edition
- EN61010-1:2001 2nd edition

RoHS

DIRECTIVE 2002/95/EC

## Software

Genie 2000 Spectroscopy Software.

Genie 2000 Programming Libraries.

SDK – OS independent, distributed with the device, independent of Genie 2000 programming libraries, Genie 2000 not required.

Diagnostic Web GUI – OS and browser independent, Genie 2000 not required.

## Computer Requirements

The minimum computer requirements are those specified for the current version of the Genie 2000 software. See the Genie 2000 data sheet for more details.

## Ordering Information

OSPREY – Digital tube-base MCA with 3 m (10 ft) USB cable, 3 m (10 ft) crossover Ethernet cable, 3 m (10 ft) Ethernet cable, PoE input injector (110/220), 1.2 m (4 ft) MCX-BNC cables, 3 pcs.

OSPREY-PRO – Osprey with S504C Genie 2000 InSpector™ Basic Spectroscopy Software.

OSPREY-PRO+ – Osprey with S504C Genie 2000 InSpector™ Basic Spectroscopy Software and S501C Gamma Analysis Option.

OSPREY-E03L – 3 m (10 ft) Ethernet cable with a right angle plug for use with Model 727 laboratory lead shield.

LABR-1.5x1.5 – 14-pin 1.5 x 1.5 in. non-stabilized LaBr<sub>3</sub> probe.

NAIS-2x2 – 8-pin 2 x 2 in. LED temperature-stabilized NaI probe.

Model 802 – 14-pin 2 x 2 in. or 3 x 3 in. non-stabilized NaI probe.

## B. Communication Setup

---

This appendix includes an abbreviated “Quick Start” for the Network Administrator to summarize a few network-connected environments' requirements with the Osprey.

You will need to establish communications with Osprey in order to make any setup changes. This may be a temporary setup using your existing PC to interact with the Osprey, after establishing an initial connection with Osprey, merely to make a few changes so the Osprey can then be accessed normally on your company's network.

### Communicating with the Osprey

The Osprey can be operated via Genie 2000 on the host computer. The Osprey supports Ethernet (TCP/IP) network connections and USB. The USB connection appears as a network adapter.

This appendix describes using the Osprey Web Based Status page for configuration, using a conventional IP network. You must access the Osprey via one of the default methods in order to make parameter changes within the Osprey.

### Factory Settings for the Osprey

The factory default settings for each network connection method are:

Ethernet: .....10.0.0.3

USB: .....10.0.1.4

The subnet mask value for each of the above is 255.255.255.0.

In order to access the Osprey for the first time, you must decide on which method of network communication you intend to use:

- Direct Ethernet using the *red* Crossover cable from your PC to the Osprey.
- USB Connection

### Communication Notes

If the following parameters are changed, the device needs to be restarted for changes to take effect:

1. TFTP Enable/ Disable
2. Web Server Enable / Disable
3. UPnP Enable / Disable
4. UPnP TTL

## Quick IP Setup Summary

Whether your IP network employs DHCP or provides a specific IP address, follow these steps to change the factory presets to the IP settings you require.



**CAUTION:** Due to the nature of configuring Network parameters on a Windows PC, there is no 'undo' for some steps as they will first remove your existing network settings. It is suggested that you first write your existing settings down before deleting or changing settings in your efforts to connect with the Osprey.

This direct-connection method also may be used for an Osprey application in a non-networked site, such as a 'PC-to-Osprey stand-alone system'.

### Direct Setup: Connect to Osprey with your PC

This procedure allows you to connect to and operate the Osprey using your PC, without other network equipment.

Use this if you do not yet have an IP Network connection (either a static address or DHCP) configured for your new Osprey system and you choose to set it up before that network connection is available. Later - after your network connection is available - you will make a few network settings changes to connect the Osprey to your network.

Note there is no 'Undo'. Record any existing IP address settings in your PC before you change it, in the event you must return this PC to its original settings.



Figure 35 Connecting the Osprey to a PC

## Connections

To begin, perform the following connections:

1. Place the Osprey near your PC. Connect the AC power to the single port PoE injector provided with the Osprey.
2. Disconnect your PC's network adapter from the existing connections.
3. Connect the IP crossover cable (Red cable provided with Osprey) from your desktop PC's network adapter to the IN connector on the single port PoE injector.
4. Connect the yellow Ethernet cable (IP straight through, supplied with the Osprey) from the OUT connector on the single port PoE injector to the Network jack (10/100) on the Osprey. It will take approximately 15 seconds for Osprey to boot.

## Setup on your PC

Setup your desktop's network adapter to use a Static or alternate network address:

1. Right-click on the **My Network Places** icon, then select **Properties**.
2. Right-click on the appropriate **Network Adapter** icon, then select **Properties**.

3. On the **General** tab, select **Internet Protocol (TCP/IP)** then select **Properties**.
4. Select the **General** or **Alternate Configuration** tab and then select the “Use the following IP address” option. Enter the following settings:

IP = 10.0.0.10

Subnet = 255.255.255.0

All other entries are blank.

5. Press **OK**.

Note: Use any number other than the factory-default IP address used by the Osprey unit (10 . 0 . 0 . 3 Ethernet).

You are now able to access the Osprey directly from your PC, in a 'computer to computer' network configuration.

## Access the Osprey Web Status Page

To access the Web Status Page:

1. Open your Internet browser on your PC.
2. In the URL line, enter 10 . 0 . 0 . 3 and press **Enter**. This will open the Osprey Web Status page.
3. Enter “administrator” for the Username and “password” for the Password. Click the **Login** button to connect to the Osprey. This provides administrative privileges to allow parameter changes. Make any changes using instructions provided the chapter *Web-Based Status* on page 59. Save your changes when done.
4. When finished, use the **Logoff** button at the top of the Osprey' page, or simply close your Internet browser.

## DHCP Setup Changes: Optional for IP Network Use

If the Osprey is required to operate on a DHCP network, the following must be configured in the Osprey in order for it to operate on that network type. After this change is made, disconnect the Red Crossover cable, and then connect the Osprey to the site's network or router/hub connection box using the Yellow straight through CAT5 network cable.

- You must connect with the Osprey Web Status page to make the following changes. Refer to previous section. You must change the Osprey setting from its default fixed IP address to connect using DHCP.
- The Name of the Osprey must be set as desired. Its default name is “Osprey” and if you only have one Osprey unit you may choose to leave this as is.
- If your PC supports Universal Plug and Play discovery, UPnP can help you initially connect with the Osprey. See *Universal Plug and Play* on page 86 for more information.

## Change Osprey from Static IP to DHCP

This requires the yellow IP network cable.

Make these changes after the site's DHCP Network is operational, but while still connected to your PC using the Red Crossover cable.

1. Connect to the Osprey's Web Status page as described above.
2. Under **Device Setup** click on **UPnP Setup**. Enter a new name for the Osprey (e.g., OSPREY01; up to 8 contiguous characters maximum), verify **Enable UPnP** check box is selected and press **Submit**.
3. Under **Device Setup** click on **Ethernet Network Setup**. Select the **DHCP** option then press **Submit** to save this change. Once this has been performed, log off the Osprey unit.
4. Now, change the Ethernet cable on the Osprey from the Red Cross-over CAT5 cable to the Yellow CAT5 cable to the standard IP network connection.

## Set your PC to utilize DHCP via its NIC

This requires using a standard Ethernet cable

1. On your PC, right-click the **My Network Places** icon, then select **Properties**.
2. Right-click on the **Network Adapter** icon, then select **Properties**.
3. On the **General** tab, select **Internet Protocol (TCP/IP)** then select **Properties**.
4. Select the **General Configuration** tab; select the “Obtain an IP Address Automatically” option. Press **OK** to keep this setting.

5. In My Network Places, if UPnP has been installed, you will see the Osprey unit as a peripheral (similar to a printer) connected to the network with the name Osprey or the new name if changed. Double clicking or selecting this unit or name, will start your browser and open the Osprey Web Status page.

If not, start your browser and type in the IP address of your Osprey instrument in the URL section, you should then see the Osprey Web Status page.

## Firewall Setup for Genie 2000

Genie-2000 driver for Osprey MCA reads important metadata information from the device using network TCP port 8080. If you have the stock Windows Firewall enabled or use a third-party firewall software, ensure that the port 8080 is not blocked for inbound traffic.



**CAUTION:** Genie 2000 will not be able to communicate with Osprey MCA if port 8080 is blocked on your PC.

## Universal Plug and Play

The Osprey device registers for Universal Plug and Play (UPnP) during start up. This means that once a device (in this case, the Osprey) is running and plugged into your network, other computers on the network are informed that it's present and running.

**Note:** In order to use the UPnP feature, it must first be set up and active on your Windows XP (or newer) PC operating system. Earlier versions of Windows do not support this protocol.

For a networked computer to detect the Osprey when it is connected to the network, your PC must have UPnP services installed.



## Adding Universal Plug and Play to Your PC

If not installed, you can add UPnP by following the steps below on a Windows-XP PC.

Note: Note: Adding or enabling UPnP support varies on each operating system. Refer to the operating system documentation for additional help.

1. Press the **Start** button on Windows XP. Select **Settings**, and then select the **Control Panel**.
2. Select the **Add or Remove Programs** icon. This brings up the Add or Remove Programs list, including options groups in the left border.
3. Select the **Add/Remove Windows Components** icon in the left-hand pane.

Note: Do not double-click on this icon to open it. If you double-click the icon, you'll launch two instances of the Add/Remove dialog.

4. Select the **Networking Services** item, and then select the **Details** button (Figure 36).

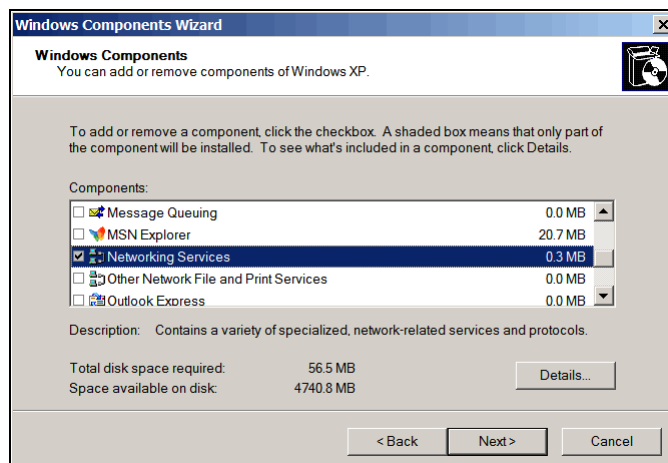


Figure 36 Windows Components Wizard

5. Select the “UPnP User Interface” check box (Figure 37).

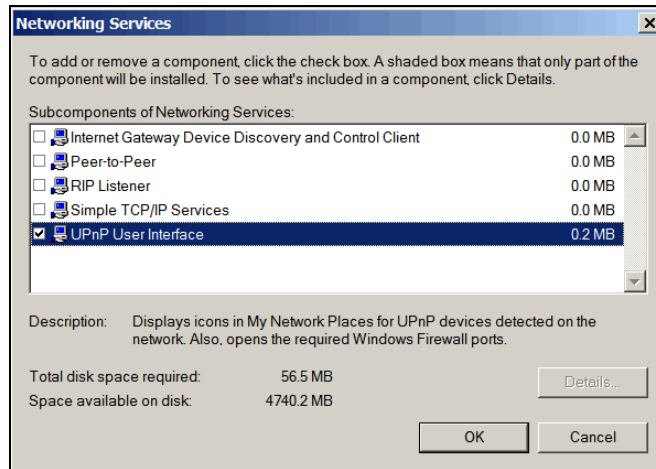


Figure 37 Selecting the Subcomponent of Network Services

6. Click **OK**.
7. Click **Next** to start the installation.
8. Click **Finish** to complete the installation.

After the UPnP feature has been installed and the Osprey's Web-based control application is started, the UPnP icon will appear in the Windows computer's system tray.

- Double click on the icon to access “My Network Places”.
- Double click on the Osprey icon to launch your browser and run the Web-based status application (as described in the chapter *Web-Based Status* on page 59).

## Setting Up a USB Connection

This section describes how to set up a USB PC-to-Osprey communications via USB connection to a Windows PC (Windows XP and Vista are supported).

### Installing the USB Driver

To install the USB drive place CD with USB drivers in drive. Next, plug the Osprey into a USB port then follow the steps below.

1. The Found New Hardware Wizard will start.
2. When asked if Windows can connect to Windows Update to search for software select, “No, not this time” and click **Next**.
3. Select “Install from a list or specific location (Advanced)” and click **Next**.
4. Select “Search for the best drivers in this location” and check the “Include this location in the search” box.
5. Browse for the proper path for the USB Drivers from the included CD <Drive>:\Bin\Osprey\OspreyUSB\X86 and click **Next**.

Note: 64-bit operating system drivers are supplied in the X64 folder. These drivers are only supported when custom programming using the SDK.

6. Click “Continue Anyway” on window stating this hardware has not passed Windows logo testing.
7. When complete click **Finish**.

Note: *Do not stop*. It is required to run the Found New Hardware Wizard a second time. Repeat the same steps above.

## Configuring Your PC for the Osprey via USB

Follow the steps below to configure your Windows-XP PC:

Note: Refer to your operating system documentation for non-Window-XP configuration steps.

1. Connect or leave connected the USB cable from your PC to the Osprey.
2. After auto-discovery is finished, it may take a brief period of time before the USB connection functions. Wait until it appears to complete this process.
3. Right-click on the **My Network Places** icon and select **Properties**. This will bring up the Network Connections window.
4. Right click on the Local Area Connection with the device name “Canberra Osprey MCA”. Click on **Properties**.

Note: Record the name of this Local Area Connection for referencing later in step 9.

5. Select **Internet Protocol (TCP/IP)** and then click on **Properties**. The Internet Protocol Properties page (Figure 38) opens. This sets up the client side (e.g., your PC's end) of the USB connection to some otherwise unused address.

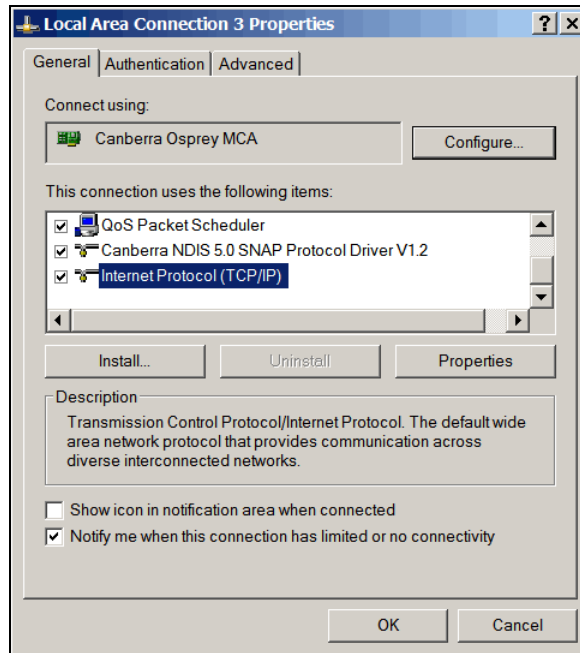


Figure 38 Set up the USB Connection

6. Select the **General** tab and then select the “Use the following IP address” option. Enter the following settings. Refer to Figure 39.

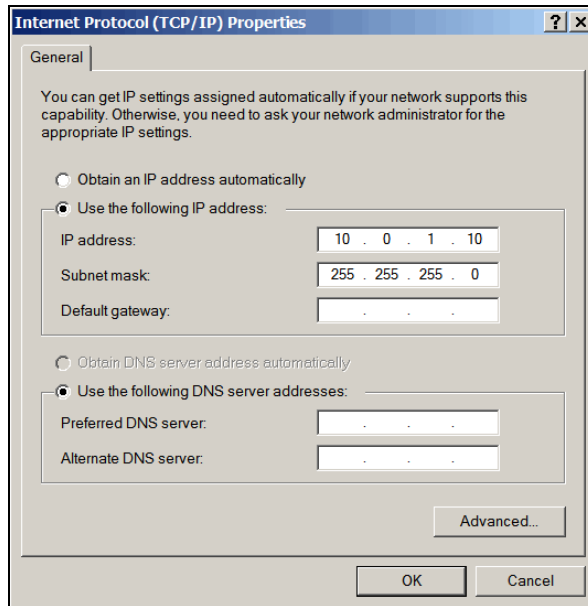


Figure 39 IP Parameters for USB Setup

IP = 10 . 0 . 1 . 10

Subnet = 255 . 255 . 255 . 0

All other entries are blank.

Note: The 10 . 0 . 1 . 10 IP address setting assumes that you don't have any other device on your network currently set to this address. If you do, choose any other valid setting within your subnet mask range (1-255) but use 11 or higher, as the lower numbers are most likely already assigned for some purpose.

For example, if 10.0.1.10 conflicts change your entry to 10.0.1.11 or 10.0.1.15, or 10.0.1.27, etc.

7. Press **OK** when done.

When the address has been assigned, you'll be able to access the Osprey using the USB connection's static address (10 . 0 . 1 . 4) from Genie 2000 or your Internet browser.

Note: The next few steps are necessary to restore the default order of the local area connections in Windows. When Osprey USB connection installs a new Local Area Connection in your system with a device name “Canberra Osprey MCA”, Windows automatically puts this connection to the front of the network adapters binding order (order in which all Windows applications will enumerate the local area connections). This may cause problems for local VDM and other network-dependent services.

8. In the Network Connections window click on the **Advanced** menu and select the **Advanced Settings** menu item. This will bring up the Advanced Settings dialog window (Figure 40).

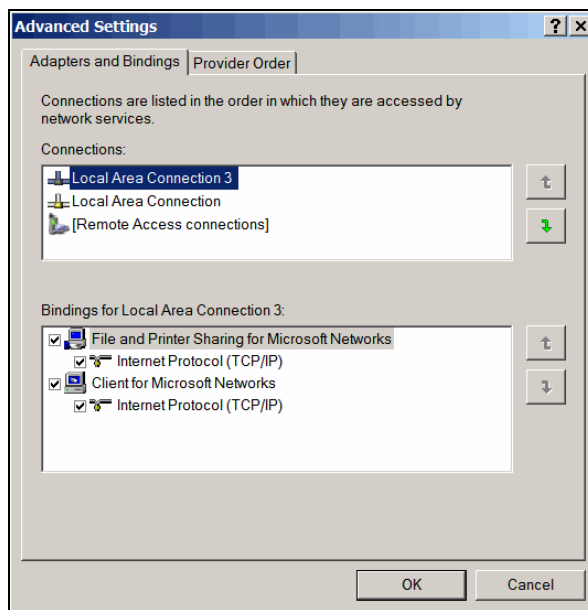


Figure 40 Advanced Settings for the Osprey

9. In the Connections list highlight the topmost Local Area Connection that was created by the Osprey USB driver (refer to the step 4 to determine the actual connection name).
10. Click on the down-pointing arrow next to the Connections list to move the Osprey USB connection below the default network connection.

You're done and may close any open windows.

## Configuring for Multiple Osprey using USB

### Setup for Multiple USB Connections

Note: When connecting two or more Osprey devices to the same host computer via USB it is recommended to use a 4-port self-powered USB hub. If it is necessary to control more than four devices with one host computer it is recommended to use the Ethernet connection.

When configuring your PC for multiple Osprey devices follow these steps:

1. Change the USB IP address of each additional Osprey.
  - a. If this is the first time a device is connected to the host PC, there will be a prompt to install the USB drivers. Follow the steps provided in *Installing the USB Driver* on page 88.
  - b. Connect to each Osprey separately at the default address 10.0.1.4 using the web based status page and login as administrator.
  - c. Select USB Network Setup link under Device Setup.
  - d. In the boxes for IP Address enter a unique IP address for the device and hit Submit. Use 10.0.X.4 where the X is a number other than 1. Each Osprey requires a different number for X. Record the IP address for use in setting up the Network adapter in the PC step below. Cycle power to the device for the change to take effect.
2. When the IP address changes have completed, connect each Osprey to the host PC through a self-powered USB hub. Connect one Osprey at a time to properly keep track of the correct IP address. After each device is connected to the host PC there will be a prompt to install the USB drivers. Follow the same steps provided in *Installing the USB Driver* on page 88.
3. Follow the same steps as in *Configuring your PC for the Osprey via USB* on page 89 with the only change being instead of using **10.0.1.10** for the IP address of the USB network adapter use **10.0.X.10** where the X is the same number used when changing the IP address in the Osprey device.

## Verify the USB Connection

To verify the USB connection and to access the Osprey system:

1. Disconnect your Ethernet cable connection, if it is connected.
2. Connect the USB cable from your PC to the Osprey.
3. Open your Internet browser on your PC.
4. In the URL line, type in 10 . 0 . 1 . 4, and press **Enter** to connect. This will open the Osprey Web Status page.



## C. Shape Adjustments

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This appendix describes how to adjust the rise time and the flat top settings.

### Optimizing Process Time

The digital filter employed in the Osprey MCA has a Triangular/Trapezoidal weighting or shaping function.

#### Shaping

Shaping is adjusted by selecting the Rise Time and Flat Top, which determine the Trapezoid pulse shape and optimizes performance for the specific Scintillator, spectral energy range and count rate.

Note: For more information on count rate performance, refer to Canberra's Application Note *Performance of Digital Signal Processors for Gamma Spectroscopy*. Please contact your sales representative to request a copy.

#### Rise Time

The Rise Time sets the noise filtering characteristics of the Digital Filter.

#### Flat Top

The Flat Top allows for the light collection time of the particular scintillator. Independent adjustment of the flat top allows the shaping function to be optimized for scintillator with long light collection time, without a large increase in the overall processing time.

#### Guard Time

The Guard Time (GT) multiplier rejects trailing edge pileup in the event of detector/preamp signal anomalies. The PUR guard sets the pileup reject interval, which is defined by  $GT \times T_{\text{Risetime}} + T_{\text{Flattop}}$ .

## Rise Time and Flat Top Settings

Table 1 lists Osprey rise time and flat top settings for common scintillators.

**Table 1 Settings for Other Common Detectors**

<b>Detector</b>	<b>Rise Time/Flat Top (<math>\mu</math>s)</b>
Scintillation [NaI(Tl)]	1.0/1.0
LaBr	1.0/1.0

Refer to the specific Scintillation Detector User's Manual for the recommended shaping time.

## D. External GPIO Configuration Matrix

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Three user-configurable General Purpose Input/Output connectors labeled GPIO-1, GPIO-2, and GPIO-3, provide access to the device's internal acquisition status, counters, and start/stop control. The detailed description of the GPIO functionality and any restriction(s) that may apply are described in this appendix. Each GPIO connector has an internal 10K ohms pull-up resistor that becomes enabled when the connector is configured for input mode. Table 2 below describes all user-configurable functions. Some functions are available through client applications such as Genie 2000, while others are only accessible through custom applications. Please refer to the *mcaSDK/Communication Software Development Kit* documentation on developing an application to access specific functions or other device parameters.

There are several cases in the GPIO configuration matrix where selecting a GPIO function alone is not sufficient to achieve the desired operation; for these cases the setup of additional parameters is required. Where applicable, the **Description** column in the matrix will identify the other parameters involved. Applications such as Genie 2000 will expose all relevant parameters through its user interface, but if developing a custom application please refer to the *mcaSDK/Communication Software Development Kit* documentation on accessing all user parameters in the device.

All GPIO signals are TTL-compatible. Refer to the *Specifications* on page 73 of this manual for actual voltage levels and other electrical characteristics of input and output signals into and out of the GPIO connectors. Unless specifically noted in the description, all signal polarities are active-high.

To maximize the use of a single GPIO connector, functions #23 through #30 actually combine multiple functions into a single selection. Refer to the individual descriptions for more specific information on combinational functions.

Appendix D External GPIO Configuration Matrix

Function	# - Name	Description
INPUT LEVEL SENSE	00 – GPIO_IN	<p>Function #00 configures the connector pin for input mode. The INPUT LEVEL SENSE function should be selected when reading the logic status at the respective MCX connector through the GPIO1_Input, GPIO2_Input, or GPIO3_Input parameters. This feature is available regardless of the function selected and will reflect the state of the GPIO pin whether it is configured as an output or input.</p> <p>Any GPIO pin can be configured for INPUT LEVEL SENSE mode</p> <p>The INPUT LEVEL SENSE function should also be selected when not using the respective MCX connector to conserve power.</p>
OUTPUT LEVEL 0	01 – GPIO_OUT_0	<p>Function #01 configures the connector pin for output mode and drives the output to logic 0.</p> <p>Any GPIO pin can be configured for OUTPUT LEVEL 0 function</p>
OUTPUT LEVEL 1	02 – GPIO_OUT_1	<p>Function #02 configures the connector pin for output mode and drives the output to logic 1.</p> <p>Any GPIO pin can be configured for OUTPUT LEVEL 1 function.</p>
AUX CNTR IN	03 – AUXCNT_IN	<p>Function #03 configures the connector pin for input mode. The AUX CNTR IN function directs the respective GPIO connector to accept an external user-supplied input pulse to the AUX counter. The Osprey supports a single AUX counter. Polarity is fixed to active high.</p> <p>The AUX CNTR IN selection is limited to a single GPIO connector.</p> <p>Minimum pulse width is 100 ns</p> <p>This function is not supported in Genie 2000.</p>
MCS EXT SWP ADV	05 – MCSEXTSWP_IN	<p>Function #05 configures the connector for input mode. The MCS EXT SWP ADV function directs the respective GPIO connector to accept an external MCS Sweep Advance Input signal for synchronizing the start of an MCS sweep. The MCS Input defaults to internal sweep advance mode, therefore must be specifically configured to accept an external sweep advance signal through the Input_McsExternalSweepAdvMode parameter. The polarity defaults to active-high, but can also be selected through the Input_McsExternalSweepAdvPolarity parameter.</p> <p>The MCS EXT SWP ADV selection is limited to a single GPIO connector</p>
MCS EXT CHN ADV	06 – MCSEXTCHN_IN	<p>Function #06 configures the connector for input mode. The MCS EXT CHN ADV function directs the respective GPIO connector to accept an external MCS Channel Advance Input signal for user-controlled dwell time during an MCS sweep. The MCS Input defaults to internal channel advance mode,</p>

Function	# - Name	Description
		<p>therefore must be specifically configured to accept an external channel advance signal through the Input_McsExternalChannelAdvMode parameter. The polarity defaults to active-high, but can also be selected through the Input_McsExternalChannelAdvPolarity parameter.</p> <p>The MCS EXT CHN ADV selection is limited to a single GPIO connector</p>
COINC / ANTI-COINC	07 – COINCANTI_IN	<p>Function #07 configures the connector for input mode. The COINC / ANTI-COINC function directs the respective GPIO connector to accept a user-supplied external coincidence or anti-coincidence signal for gating the energy input signal to the PHA channel.</p> <p>Coincidence or Anti-coincidence mode in the device must be selected through Input_CoincGateMode parameter, polarity through the Input_CoincGatePolarity, and delay through the Input_CoincGateDelay parameters.</p> <p>The COINC / ANTI-COINC function is limited to a single GPIO connector.</p>
MCS IN	08 – MCSTTL_IN	<p>Function #08 configures the connector for input mode.</p> <p>The MCS IN function directs the respective GPIO connector to accept a user-supplied external TTL signal for MCS counting.</p> <p>The MCS Channel in the device must be configured to accept external TTL signals through the Input_DiscMode parameter to enable counting of external pulses.</p> <p>Logic polarity of the MCS IN signal is fixed at Active-High. Counting takes place on the leading edge of the pulse.</p> <p>The MCS IN function is limited to a single GPIO connector</p>
PHA ACQ OUT	09 – PHAACQ_OUT	<p>Function #09 configures the connector for output mode.</p> <p>Selecting PHA ACQ OUT function directs the Osprey device to drive the GPIO connector logic output to active (high) when the device's PHA acquisition is enabled, and inactive (low) when the device's PHA acquisition is disabled.</p> <p>Logic polarity for PHA ACQ OUT is fixed at active-high</p> <p>The PHA ACQ OUT signal will remain active as the PHA acquisition becomes temporarily suspended by either of the following conditions:</p> <ol style="list-style-type: none"> <li>1. waiting for the stabilized detector to become ready if one is present, or</li> <li>2. waiting for the external suspend/resume signal to resume PHA acquisition if the external start/stop logic has been configured for level mode</li> </ol> <p>Multiple GPIO connectors can be configured for the PHA ACQ OUT function to extend the same output to multiple connectors.</p>

Appendix D External GPIO Configuration Matrix

Function	# - Name	Description
ICR	10 – ICR_OUT	<p>Function #10 configures the connector for output mode.</p> <p>Selecting ICR function directs the Osprey device to drive the GPIO connector output with its Incoming Count Rate pulses. The ICR pulses are derived from the raw PHA energy events processed by the Fast Discriminator hardware and are not affected by the LLD/ULD window settings.</p> <p>The approximate ICR count rate can also be read by client applications through the Input_CountRate parameter.</p> <p>Multiple GPIO connectors can be configured for the ICR output function to extend the same output to multiple connectors</p>
SCA1 SCA2 SCA3 SCA4 SCA5 SCA6	11 – SCA1_OUT 12 – SCA2_OUT 13 – SCA3_OUT 14 – SCA4_OUT 15 – SCA5_OUT 16 – SCA6_OUT	<p>Functions #11 through #16 configures the respective GPIO connector for output</p> <p>By selecting SCA<math>n</math> function on a GPIO connector, pulses from energy events that falls within an SCA's energy window and counted by the internal SCA counter, are also exposed external to the device through the designated GPIO connector. Selecting SCA<math>n</math> function on a GPIO connector makes the same pulses counted by the SCA counter available on that GPIO connector.</p> <p>The internal SCA counters can be read by the GetSCAbuffer command. The SCA energy windows can be set through the PutSCA definitions command and read through the GetSCA definitions command.</p> <p>Multiple GPIO connectors can be configured for other SCA<math>n</math> functions, or to the same SCA<math>n</math> function. There are no restrictions.</p> <p>These functions are not supported in Genie 2000.</p>
PHA EXT START/STOP IN	17 – PHAEXTSS_IN	<p>Function #17 configures the connector for input mode.</p> <p>The PHA EXT START/STOP IN function directs the GPIO connector to accept an external user-supplied signal to synchronize the start or stop of the Osprey's PHA acquisition. The Osprey supports both pulsed and level modes of external acquisition control.</p> <p>The PHA input's external start/stop logic must be enabled and configured for either pulsed (DSA2K) or level (Lynx) control mode through the Input_PhaExternalControlMode parameter. The pulsed mode behavior must be setup through the Input_PhaExternalControl parameter, and the polarity through the Input_PhaExternalControlPolarity parameter.</p> <p>The PHA EXT START/STOP IN function is limited to a single GPIO connector.</p>
PHA EXT START/STOP OUT	18 – PHAEXTSS_OUT	<p>Function #18 configures the connector for output mode.</p> <p>The PHA EXT START/STOP OUT function directs the Osprey device to drive the GPIO connector logic output with either a pulse or a level when the PHA Input acquisition status changes state.</p>

Function	# - Name	Description
		<p>When Function 18 is selected, the parameter Input_PhaExternalControlMode defines whether a change in acquisition produces a logic pulse or a logic level at the selected GPIO connector. For pulse mode, where the parameter is set to DSA2K, a 200 ns pulse is produced when PHA acquisition starts or stops. For level mode, where the parameter is set to Lynx, the output will be driven active (high) when the device's PHA acquisition is enabled, and inactive (low) when the device's PHA acquisition is disabled.</p> <p>When configured for level mode the output signal will remain active as the PHA acquisition becomes temporarily suspended by either of the following conditions:</p> <ol style="list-style-type: none"> <li>1. waiting for the stabilized detector to become ready if one is present, or</li> <li>2. waiting for the external suspend/resume signal to resume PHA acquisition if the external start/stop logic has been configured for level mode</li> </ol> <p>Logic polarity for PHA EXT START/STOP OUT is fixed at active-high</p> <p>Multiple GPIO connectors can be configured for the PHA EXT START/STOP OUT function to extend the same output to multiple connectors.</p> <p>This function is not supported in Genie 2000.</p>
EXT SYNC IN	19 – EXTSYNC_IN	<p>Function #19 configures the connector for input mode.</p> <p>The EXT SYNC IN function directs the respective GPIO connector to accept a user-supplied external TTL signal and route it to the Osprey's internal Sync Module for internal distribution to the various acquisition units, including MSS unit, Aux Counter unit, SCA unit, and List/TList unit. When properly configured, the Osprey will accept a user-supplied signal to synchronize the acquisition of the various acquisition units.</p> <p>To accept an external signal, the Sync Module must be configured for Slave mode through the Input_ExternalSyncMode parameter. The polarity is selected through the Input_ExternalSyncPolarity parameter.</p> <p>The EXT SYNC IN function is limited to a single GPIO connector.</p> <p>This function is not supported in Genie 2000.</p>
EXT SYNC OUT	20 – EXTSYNC_OUT	<p>Function #20 configures the connector for output mode.</p> <p>The EXT SYNC OUT function directs the Osprey device to drive the GPIO connector output from the internal Sync Module to provide a synchronization signal to other devices.</p> <p>To provide an output, the Sync Module must be enabled through the Input_ExternalSyncStatus parameter, and selected for MasterA or MasterB mode through the Input_ExternalSyncMode parameter. In MasterA mode then</p>

Appendix D External GPIO Configuration Matrix

Function	# - Name	Description
		<p>output will be a pulse whose rate is determined by the Input_ExternalSyncPulse parameter. In MasterB mode the output will be a fixed 1.0 microsecond pulse rate.</p> <p>Logic polarity of the EXT SYNC OUT signal is fixed at active-high</p> <p>Multiple GPIO connectors can be configured for the EXT SYNC OUT function to extend the same output to multiple connectors.</p> <p style="text-align: center;"><b>IMPORTANT NOTE</b></p> <p>The EXT SYNC OUT function should be selected only to distribute the Sync Module's signal to other devices externally connected to this device via the respective GPIO connector. The Sync Module's output within the device is always distributed internally to other acquisition units such as Aux Counter, SCA Counters, MSS unit, and List/TList unit whether or not the EXT SYNC OUT function has been selected. Each acquisition unit within the device has an associated parameter to enable or disable external sync operation.</p> <p>This function is not supported in Genie 2000.</p>
MCS EXT START/STOP IN	21 – MCSEXTSS_IN	<p>Function #21 configures the connector for input mode.</p> <p>The MCS EXT START/STOP IN function directs the GPIO connector to accept an external user-supplied signal to synchronize the start or stop of the Osprey's MCS acquisition. The Osprey supports both pulsed and level modes of external acquisition control.</p> <p>The MCS input's external start/stop logic must be enabled and configured for either pulsed (DSA2K) or level (Lynx) control mode through the Input_McsExternalControlMode parameter. The pulsed mode behavior must be setup through the Input_McsExternalControl parameter, and the polarity through the Input_McsExternalControlPolarity parameter.</p> <p>The MCS EXT START/STOP IN function is limited to a single GPIO connector</p>
MCS EXT START/STOP OUT	22 – MCSEXTSS_OUT	<p>Function #22 configures the connector for output mode.</p> <p>The MCS EXT START/STOP OUT function directs the Osprey device to drive the GPIO connector logic output with either a pulse or a level when the MCS Input acquisition status changes state.</p> <p>When Function 22 is selected, the parameter Input_McsExternalControlMode defines whether a change in acquisition produces a logic pulse or a logic level at the selected GPIO connector. For pulse mode, where the parameter is set to DSA2K, a 200 ns pulse is produced when MCS acquisition starts or stops. For level mode, where the parameter is set to Lynx, the output will be driven active (high) when the device's MCS acquisition is enabled, and inactive (low) when the device's PHA acquisition is disabled.</p>



Function	# - Name	Description
		<p>When configured for level mode the output signal will remain active as the MCS acquisition becomes temporarily suspended by either of the following conditions:</p> <ol style="list-style-type: none"> <li>1. waiting for the stabilized detector to become ready if one is present and the MCS input mode is set for FD or ROI mode, or</li> <li>2. waiting for the external suspend/resume signal to resume MCS acquisition if the external start/stop logic has been configured for level mode</li> </ol> <p>Logic polarity for MCS EXT START/STOP OUT is fixed at active-high</p> <p>Multiple GPIO connectors can be configured for the MCS EXT START/STOP OUT function to extend the same output to multiple connectors.</p> <p>This function is not supported in Genie 2000.</p>
<p>AUX CNTR IN (#03) and MCS IN (#08)</p>	<p>23 – AUXCNT_IN + MCSTTL_IN</p>	<p>Function #23 configures the connector for dual input mode with fixed active-high polarity for both modes.</p> <p>Selecting this function internally configures the GPIO connector for dual input mode where the same external user-supplied input signal is routed to the AUX CNTR IN (see Function #03) and MCS IN (see Function #08), effectively combining two functions into a single selection.</p> <p>The selection for this function is limited to a single GPIO connector</p> <p>Please refer to the individual function description for any additional information that may apply.</p> <p>This function is not supported in Genie 2000.</p>
<p>MCS EXT SWP ADV (#05) and EXT SYNC IN (#19)</p>	<p>25 – MCSEXTSWP_IN + EXTSYNC_IN</p>	<p>Function #25 configures the connector for dual input mode with fixed active-high polarity for both modes.</p> <p>Selecting this function internally configures the GPIO connector for dual input mode where the same external user-supplied input signal is routed to the MCS EXT SWP ADV (see Function #05) and EXT SYNC IN (see Function #19), effectively combining two functions into a single selection.</p> <p>The selection for this function is limited to a single GPIO connector.</p> <p>Please refer to the individual function description for any additional information that may apply.</p> <p>This function is not supported in Genie 2000.</p>
<p>PHA EXT START/STOP IN (#17) and MCS EXT START/STOP IN</p>	<p>27 – PHAEXTSS_IN + MCSEXTSS_IN and 28 – PHAEXTSS_IN + MCSEXTSS_IN NEG</p>	<p>Function #27 configures the connector for dual input mode with fixed active-high polarity for both modes.</p> <p>Function #28 is identical to #27 but the polarity is fixed at active-low for both modes.</p> <p>Selecting this function internally configures the GPIO connector for dual input mode where the same external user-</p>

Appendix D External GPIO Configuration Matrix

Function	# - Name	Description
(#21)		<p>supplied input signal is routed to the PHA EXT START/STOP IN (see Function #17) and MCS EXT START/STOP IN (see Function #21), effectively combining two functions into a single selection.</p> <p>The selection for this function is limited to a single GPIO connector</p> <p>Please refer to the individual function description for any additional information that may apply.</p>
PHA EXT START/STOP OUT (#18) and MCS EXT START/STOP IN (#21)	29 – PHAEXTSS_OUT + MCSEXTSS_IN	<p>Function #29 combines the functionality of the PHA EXT START/STOP OUT (see Function #18) with the functionality of the MCS EXT START/STOP IN (see Function #21), where the signal generated by the PHA's acquisition status changing state feeds the MCS start/stop input logic to synchronize the MCS acquisition activity with the PHA's.</p> <p>Polarity is fixed at active-high for both functions.</p> <p>The selection for this function is limited to a single GPIO connector.</p> <p>Please refer to the individual function description for any additional information that may apply.</p> <p>This function is not supported in Genie 2000.</p>
PHA EXT START/STOP IN (#17) and MCS EXT START/STOP OUT (#22)	30 – PHAEXTSS_IN + MCSEXTSS_OUT	<p>Function #30 combines the functionality of the PHA EXT START/STOP IN (see Function #17) with the functionality of the MCS EXT START/STOP OUT (see Function #22), where the signal generated by the MCS's acquisition status changing state feeds the PHA start/stop input logic to synchronize the PHA acquisition activity with the MCS's.</p> <p>Polarity is fixed at active-high for both functions.</p> <p>The selection for this function is limited to a single GPIO connector.</p> <p>Please refer to the individual function description for any additional information that may apply.</p> <p>This function is not supported in Genie 2000.</p>
STB PROBE I/O	31 – SPROBE_IO	<p>Function #31 on GPIO 1 is a special case function that overrides the present GPIO configuration and redefines the GPIO connectors as follows:</p> <ul style="list-style-type: none"> <li>GPIO 1: Probe RXD</li> <li>GPIO 2: Probe TXD</li> <li>GPIO 3: not used</li> </ul> <p>This function is intended for factory use and should never be configured outside of the factory.</p> <p>This function is not supported in Genie 2000.</p>

## E. Installation Consideration

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This unit complies with all applicable European Union requirements. Compliance testing was performed with application configurations commonly used for this device.

During design and assembly of the device, precautions were taken by the manufacturer to minimize the effects of EMI on the system. However, care should be taken to maintain full compliance. These considerations include:

- Single point external cable access
- Compliant grounding and safety precautions for any internal power distribution
- The use of CE compliant accessories such as cables, UPS, etc.

### Preventive Maintenance

This unit does not require any periodic cleaning maintenance.

Any maintenance should be performed by a qualified Canberra service representative.

### Operating Protection Impairment

Canberra is not liable for any operational malfunctions or personal injuries due to mishandling or unauthorized repair and maintenance not detailed in this manual.

### Cleaning/Decontamination



When needed, the unit may be cleaned. Remove power from the unit before, cleaning. Use only a soft cloth dampened with warm water and do not allow water to enter the unit. Make sure unit is fully dry before restoring power.

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