Keithley DAS-800 Series

Using DriverLINX with Your Hardware

KEITHLEY

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Keithley DAS-800 Series: Using DriverLINX with Your Hardware

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Preface

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About DriverLINX

Welcome to DriverLINX® for Microsoft® Windows™, the high-performance real-time data-acquisition device drivers for Windows application development.

DriverLINX is a language- and hardware-independent application programming interface designed to support hardware manufacturers' high-speed analog, digital, and counter/timer data-acquisition boards in Windows. DriverLINX is a multi-user and multitasking data-acquisition resource manager providing more than 100 services for foreground and background data acquisition tasks.

Included with your DriverLINX package are the following items:

- The DriverLINX API DLLs and drivers supporting your data-acquisition hardware
- Analog I/O Panel, a DriverLINX program that verifies the installation and configuration of DriverLINX for your analog input/output board and demonstrates several virtual bench-top instruments
- Learn DriverLINX, an interactive learning and demonstration program for DriverLINX that includes a Digital Storage Oscilloscope
- Source code for the sample programs
- The DriverLINX Application Programming Interface files for your compiler
- DriverLINX On-line Help System
- *DriverLINX 4.0 Installation and Configuration Guide*
- *DriverLINX Analog I/O Programming Guide*
- *DriverLINX Technical Reference Manual*
- Supplemental Documentation on DriverLINX and your data acquisition hardware

About This User's Guide

The purpose of this manual is to help you quickly learn how to configure and use the hardware features of Keithley's DAS-800 Series boards with DriverLINX.

- For help installing and configuring your hardware and DriverLINX, please see the manual that accompanied your hardware and the *DriverLINX 4.0 Installation and Configuration Guide* for your version of Windows.
- For more information on the DriverLINX API, please see the *DriverLINX Technical Reference Manual.*
- For additional help programming your board, please examine the source code examples on the Distribution Disks.

This manual contains the following chapters:

Configuring the DAS-800 Series

Shows how to configure the DAS-800 Series using the *Configure DriverLINX Device* dialog box.

Using the DAS-800 Series with DriverLINX

Shows how to set up DriverLINX with the *Edit Service Request* dialog box to use DAS-800 Series hardware features.

Conventions Used in This Manual

The following notational conventions are used in this manual:

- Itemized lists are identified by a round bullet (•).
- Numbered lists indicate a step-by-step procedure.
- DriverLINX Application Programming Interface and Windows macro and function names are set in bold when mentioned in the text.
- **DriverLINX** indicates the exported function name of the device driver DLL while DriverLINX indicates the product as a whole.
- DriverLINX Application Programming Interface identifiers, menu items, and Dialog Box names are italicized when mentioned in the text.
- *Italics* are used for emphasis.
- Source code and data structure examples are displayed in Courier typeface and bounded by a box with a single line.

```
Code
```

- Tables of information are bounded by a box with a double line.

Tables

Concept

- Important concepts and notes are printed in the left margin.

Configuring the DAS-800 Series

Introduction

The installation program provides general instructions for installing and configuring DriverLINX. This manual explains the steps and special features that apply to Keithley's DAS-800 Series boards.

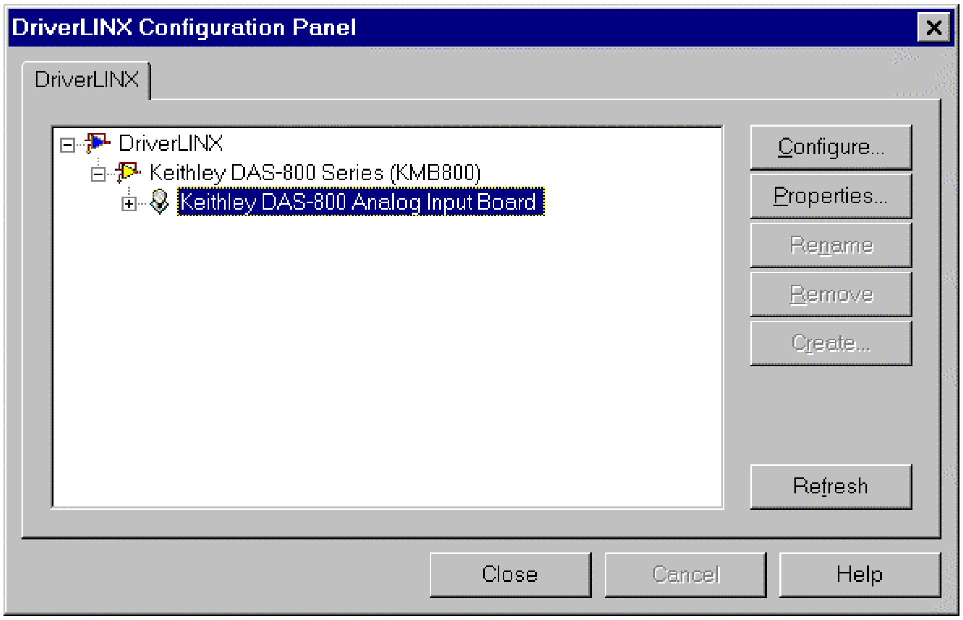
Installing and configuring DriverLINX for the Keithley DAS-800 Series boards requires three steps:

1. **Install DriverLINX.** Follow the instructions given by the installation program. The *Read Me First* instructions explain the components and drivers you can install.
2. **Configure DriverLINX.** See "Configure DriverLINX Device Dialog" on page 11 for configuration options specific to a Keithley DAS-800 Series model.
3. **Install your DAS-800 hardware**, read and follow the instructions in your hardware manual.

Configure DriverLINX Device Dialog

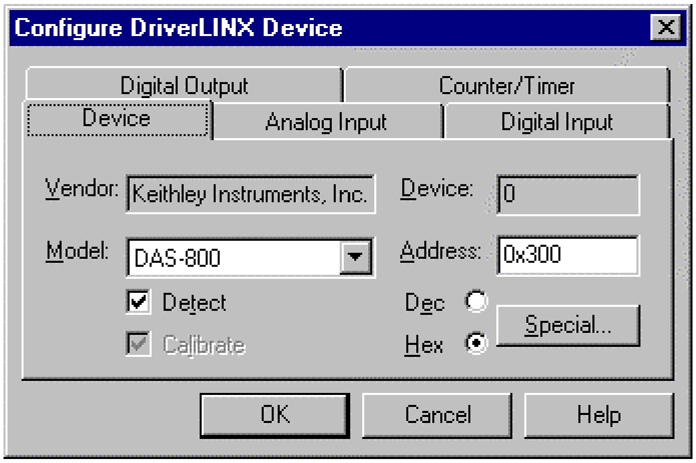
DriverLINX uses a standardized configuration protocol for all data-acquisition hardware. Configuration assigns a port address, interrupt resources and a DriverLINX Logical Device number to a specific DAS-800 Series board in your computer.

The installation program automatically starts the *DriverLINX Configuration Panel*. To start it again later, use the shortcut on the Windows Start Menu or click here.


DriverLINX Configuration Panel
DriverLINX
DriverLINX
Keithley DAS-800 Series (KMB800)
Keithley DAS-800 Analog Input Board
Configure...
Properties...
Rename
Remove
Create...
Refresh
Close
Cancel
Help

When you click the *Configure…* button on the *DriverLINX Configuration Panel*, DriverLINX displays the *Configure DriverLINX Device* dialog. The dialog has a page for each subsystem on a Keithley DAS-800 Series model. The following sections describe your choices in configuring DriverLINX to work with your board.

Device Subsystem Page



Vendor: Keithley Instruments, Inc.

Device: 0

Model: DAS-800

Address: 0x300

☑ Detect

☑ Calibrate

Dec ○

Hex ●

Use the Device subsystem page to tell DriverLINX the model name, address and, optionally, the expansion accessories connected to your DAS-800 Series board.

Vendor

The *Vendor* property displays “Keithley Instruments, Inc.” It is a read-only property.

Device

The *Device* property designates the Logical Device you are configuring. It is a read-only property. To change it, first save (**OK**) or quit (**Cancel**) the current configuration. Then select or create a new Logical Device using the *DriverLINX Configuration Panel.*

Model

The *Model* property selects or indicates the hardware model of the board you’re configuring.

Windows NT

Select one of the following models:

DAS-800

DAS-801

DAS-802

Windows 95/98

Under Windows 95/98, DriverLINX displays the model you chose during installation. To install a different model, cancel the configuration and run *Add New Hardware* from the Windows Control Panel.

Address

Windows NT

The *Address* property records the I/O port address for the board. The default address used by DriverLINX is 768 decimal or 0x300 hex. If you have another peripheral board at the same address, select a different base address. Note: you need a block of eight free addresses.

Windows 95/98

Under Windows 95/98, *Add New Hardware* automatically selects an appropriate address. To change the address, see “Using the Windows 95/98 Device Manager” on page 15.

Detect

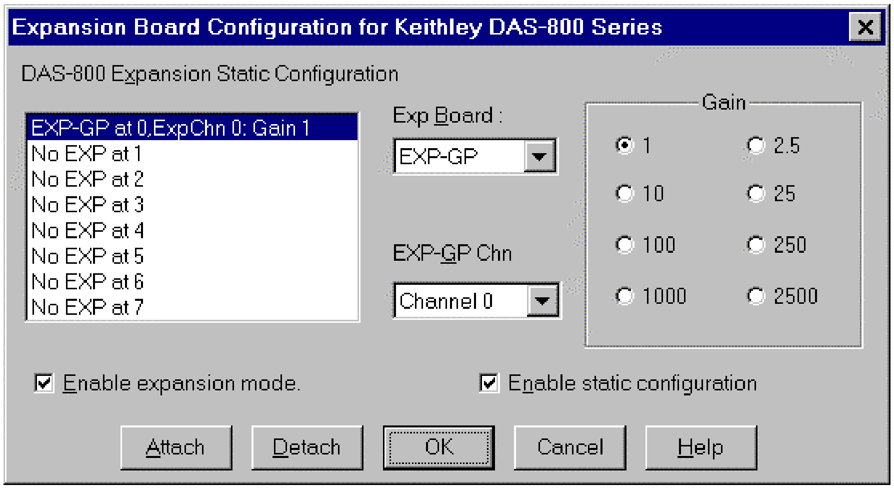
The *Detect* property enables and disables DriverLINX’s hardware detection and testing algorithms. For maximum system reliability, always leave this check-box marked.

Calibrate

The *Calibrate* property enables and disables hardware auto-calibration. This option is grayed-out for the DAS-800 Series because it does not support autocalibration.

Special…

The *Special…* button displays the following dialog box of DAS-800 Series-specific configuration options:



DAS-800 Expansion Static Configuration

EXP-GP at 0,ExpChn 0: Gain 1
No EXP at 1
No EXP at 2
No EXP at 3
No EXP at 4
No EXP at 5
No EXP at 6
No EXP at 7

Exp Board : EXP-GP

EXP-GP Chn: Channel 0

Gain

● 1	○ 2.5
○ 10	○ 25
○ 100	○ 250
○ 1000	○ 2500

☑ Enable expansion mode.

☑ Enable static configuration

The *Expansion Board Configuration for Keithley DAS-800 Series* dialog allows you to enable analog input expansion channels. By enabling analog input expansion channels, you can run tasks that sample Analog Input Expansion Channels from an add-on multiplexer. (See *Enable expansion mode*.)

The *Expansion Board Configuration for Keithley DAS-800 Series* dialog also allows you to record the gain selections for each multiplexer attached to an analog input channel. (See *Enable static configuration*.)

Note: On models DAS-801 and 802, using a multiplexer requires setting the associated base channel’s switch to single-ended.

- **Enable expansion mode**

Checking *Enable expansion mode* allows you to run tasks with Analog Input Expansion Channels in the task's Channel/Gain list.

- **Enable static configuration**

Checking *Enable static configuration* allows you to record the gain selections for each multiplexer attached to the analog input channels. DriverLINX uses this information to correctly convert A/D codes to volts. Checking *Enable static configuration* enables the following controls, which you will use to record information about your multiplexers.

- **DAS-800 Expansion Static Configuration**

Select the analog input channel that you want to configure. DriverLINX records gain selections for an expansion accessory attached to each base channel. To record your *Exp Board* and *Gain* setting for the selected channel, click *Attach*. To clear previous settings for the selected channel, click *Detach*.

- **Exp Board**

Select an expansion accessory type in the list. DriverLINX supports the following expansion accessory types:

EXP-800
EXP-16/16A
EXP-GP

- **EXP-GP Chn**

If you selected the EXP-GP from the *Exp Board* list, select each EXP-GP channel and record its gain setting. **Note:** The gains for all channels on an EXP-GP must be from one of two sets of gains: (1, 10, 100, 1000) or (2.5, 25, 250, 2500).

- **Gain**

Select the gain that matches the settings of your multiplexer's gain switches. The gains listed change with your *Exp Board* selection.

Note: With static configuration disabled, you must perform gain correction in your application.

Note: You can disable expansion mode and/or static configuration without losing existing gain settings.

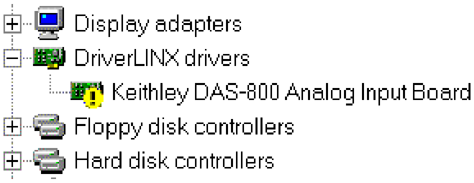
Using the Windows 95/98 Device Manager

Under Windows 95/98, DriverLINX uses the address and interrupt settings maintained by the Windows Device Manager.

To view or change the settings for your board using the Device Manager:

1. Start the Device Manger by right-clicking on My Computer and selecting *Properties* or click here ↖.
2. Click the *Device Manger* tab.
3. Click the ⊞ next to DriverLINX drivers, if necessary to expand the list.

4. Under *DriverLINX drivers*, select the entry for your board. (It may or may not have ❗ next to it.)



⊞ Display adapters
⊟ DriverLINX drivers
  Keithley DAS-800 Analog Input Board
⊞ Floppy disk controllers
⊞ Hard disk controllers

5. Click the *Properties* button.

6. On the board’s property page, click the *Resources* tab.

7. To configure the board with an interrupt, use *Setting based on* “Basic configuration 0.” Or, to configure the board without an interrupt, use *Setting based on* “Basic configuration 1.”

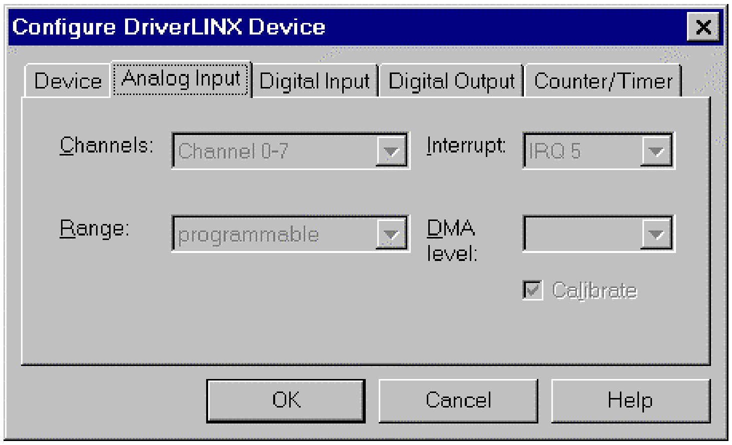
8. To change a setting, select it under *Resource Type* and click the *Change Setting* button. Windows will guide you in selecting an appropriate value.

9. When you are done, click *OK* to close the board’s property page.

10. The board’s address switches must match the address setting you select. If necessary shut down your computer and reposition them as described in your hardware manual.

11. Restart Windows to load the Logical Device for your board using the new settings.

Analog Input Subsystem Page



Channels: Channel 0-7

Interrupt: IRQ 5

Range: programmable

DMA level:

☑ Calibrate

Use the Analog Input subsystem page to set or view your board’s interrupt request level.

Channels

All DAS-800 Series boards have 8 analog input channels. On DAS-801 and 802 models, you can switch each channel to differential or single-ended. The switch setting affects only the connections for the channel.

DriverLINX grays out this property in the configuration dialog.

Range

The analog input ranges for the DAS-800 Series are fully software programmable. DriverLINX grays out this property in the configuration dialog.

Interrupt

Windows NT

For Windows NT, select a free interrupt request level to support interrupt mode transfers. Valid IRQ levels are: 2, 3, 4, 5, 6, 7 and None.

Windows 95/98

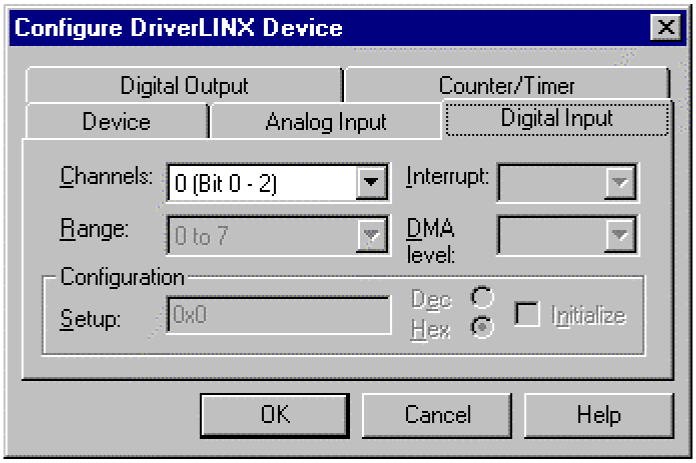
Under Windows 95/98, *Add New Hardware* automatically selects an appropriate interrupt. To change the address, see “Using the Windows 95/98 Device Manager” on page 15.

DMA level

The DAS-800 Series does not use system DMA channels. DriverLINX disables this property.

Digital Input Subsystem Page

For the DAS-800 Series, there are no configurable options on the Digital Input subsystem page.



Channels: 0 (Bit 0 - 2)
Interrupt:
Range: 0 to 7
DMA level:
Configuration
Setup: 0x0
Dec ○
Hex ●
□ Initialize

Channels

The *Channels* property allows you to select a Logical Channel for configuration or viewing the channel's range. The DAS-800 Series digital input channels have fixed configurations.

DriverLINX defines the following Logical Channels for the DAS-800 Series digital inputs:

Logical Channel	DriverLINX Function	DAS-800 Series External Connector
0	Standard Digital Input	IP1 … IP3
1	External Trigger	IP1/TRIG
2	External Clock	INT_IN/XCLK

Range

The *Range* property specifies the supported digital input range for the selected Logical Channel. This is a read-only property.

Interrupt

The DAS-800 Series uses the same interrupt for digital input as for analog input. Go to the Analog Input page to set it. DriverLINX grays out this property and displays it as blank.

DMA level

The DAS-800 Series does not use system DMA channels. DriverLINX disables this property and displays it as blank.

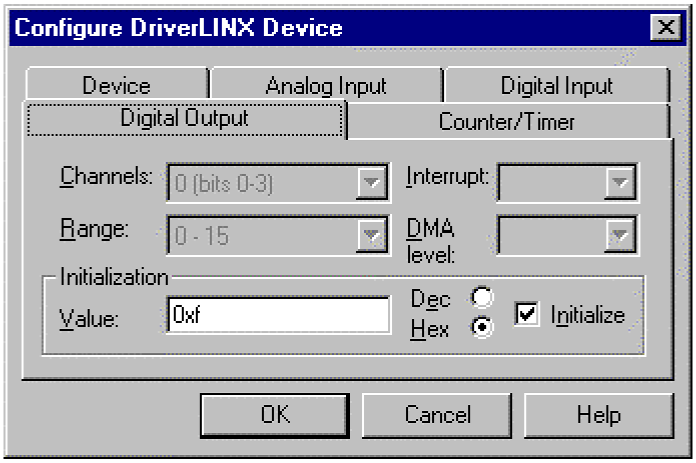
Configuration Setup

The *Configuration Setup* property specifies the hardware configuration of the digital I/O ports. The DAS-800 Series has a fixed digital I/O configuration. Therefore, DriverLINX disables this field.

Initialize

Checking the *Initialize* check box instructs DriverLINX to use the *Configuration Setup* property to configure the digital I/O ports. The DAS-800 Series has a fixed digital I/O configuration. Therefore, DriverLINX disables this field.

Digital Output Subsystem Page



Channels: 0 (bits 0-3)

Range: 0 - 15

Value: 0xf

○ Dec ● Hex

☑ Initialize

Use the Digital Output subsystem page to change the default digital output port initialization values.

Channels

The *Channels* property allows you to select a Logical Channel for initialization or viewing the channel's range. DAS-800 Series boards only have a single digital output channel.

Range

The *Range* property specifies the supported digital output range for the selected Logical Channel. This is a read-only property.

Interrupt

The DAS-800 Series uses the same interrupt for digital output as for analog input. Go to the Analog Input page to set it. DriverLINX grays out this property and displays it as blank.

DMA level

The DAS-800 Series does not use system DMA channels. DriverLINX disables this property and displays it as blank.

Initialization Value

The *Initialization Value* property specifies the digital output value DriverLINX will write to the selected Logical Channel on hardware initialization. DriverLINX only writes this value if you enable the *Initialize* check box. By default, DriverLINX uses the hardware-defined initialization values if the *Initialize* check box is not checked. For the DAS-800 Series, the default digital output value is zero.

Initialize

Checking the *Initialize* check box instructs DriverLINX to use the *Initialization Value* property, rather than the default value, for digital output port initialization.

Dec

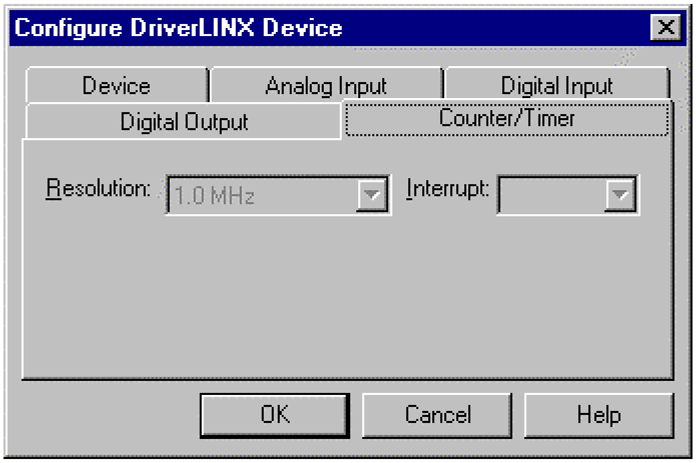
This check box converts the *Initialization Value* property to decimal.

Hex

This check box converts the *Initialization Value* property to hexadecimal.

Counter/Timer Subsystem Page

For the DAS-800 Series, there are no configurable options on the Counter/Timer subsystem page.



Resolution: 1.0 MHz

Interrupt:

Resolution

The *Resolution* property specifies the clock frequency of the master oscillator. All models have a 1.0 MHz clock source for pacing I/O and count/timer operations.

Interrupt

The DAS-800 Series does not support interrupts from counter/timers. DriverLINX disables this property and displays it as blank.

Using the DAS-800 Series with DriverLINX

Introduction

This chapter shows you how to set up and use DAS-800 Series hardware features with DriverLINX. See the *Analog I/O Programming Guide* for an overview of DriverLINX programming.

The descriptions here use the *Edit Service Request* dialogs for language and API independence. For the correct syntax with the language you're using, please see the *DriverLINX Technical Reference Manuals.* For DriverLINX examples in your programming language, please see the source code examples in the subdirectories of your DriverLINX installation directory or on the original distribution media.

DriverLINX Hardware Model for DAS-800 Series

DriverLINX provides a portable, hardware-independent API for data-acquisition boards while still allowing applications to access unique or proprietary hardware features of specific products. To achieve this goal, DriverLINX maps a hardware-independent, or abstract, data-acquisition model onto DAS-800 Series hardware capabilities.

The following sections describe how DriverLINX implements DAS-800 Series hardware features as Subsystems, Modes, Operations, Events, Logical Channels, Buffers, and Messages.

DriverLINX Subsystems

The DAS-800 Series supports five of the six of DriverLINX's subsystems:

1. **Device**—refers to a DAS-800 model as a whole.
2. **Analog Input**—refers to the analog input channels, clocks, and control signals.
3. **Analog Output**—refers to the analog output channels, clocks, and control signals. *The DAS-800 Series does not support Analog Output.*

4. **Digital Input**—refers to the 4-bit digital input port as well as 1-bit digital input (TTL) control signals, such as INT_IN/XCLK, etc.
5. **Digital Output**—refers to the 4-bit digital output port.
6. **Counter/Timer**—refers to the input/output subsystem-specific internal clock channels as well as independent counter/timers.

DriverLINX Modes

Applications use modes in Service Requests to advise DriverLINX on their preferred hardware data transfer technique. The DriverLINX modes fall into two general classes:

- **Foreground or synchronous modes.** The calling application doesn't regain control until DriverLINX completes the Service Request. DriverLINX supports this mode for simple, single value I/O operations or software housekeeping functions that DriverLINX can complete without a significant delay.
- **Background or asynchronous modes.** The calling application regains control as soon as DriverLINX initiates the task. The calling application must synchronize with the data-acquisition task using status polling or DriverLINX's messages (preferred). DriverLINX supports this mode for buffered data transfers or for commands that require a significant time to complete.

DriverLINX supports three modes with the DAS-800 Series for its commands (Service Requests).

- **Polled Mode**—This is a foreground or synchronous operation. DriverLINX supports this mode for simple, single-value I/O operations that the data-acquisition board can complete without significant delay.
- **Interrupt Mode**—This is a background or asynchronous operation. DriverLINX transfers data between the computer's memory and the data-acquisition board using hardware interrupts and programmed I/O transfers.
- **Other Mode**—This is a foreground or synchronous operation. DriverLINX supports this mode for initialization, configuration, calibration, data conversion, and timebase operations.

The following table summarizes the data acquisition modes that DriverLINX supports for each subsystem with the Keithley DAS-800 Series.

Subsystem	Polled	Interrupt	DMA	Other
Analog Input	√	√		√
Analog Output				
Digital Input	√	√		√
Digital Output	√	√		√
Counter/Timer	√			√
Device				√

DAS-800 Series Supported DriverLINX Modes.

DriverLINX Operations and Events

Applications construct DriverLINX data-acquisition tasks by combining a small number of DriverLINX operations and events in many possible ways. The following table summarizes the operations and events that DriverLINX supports for the Keithley DAS-800 Series. Later sections for each DriverLINX subsystem will describe the operations and events in more detail.

Note: All subsystems allow the *MESSAGE* operation and the Analog Input subsystem allows the *CONVERT* operation, which are not shown in the table. DriverLINX allows any Mode setting for these operations.

Subsystem	**Operation**	**Events**		
Mode		Timing	Start	Stop
Analog Input				
Polled	Start	null	null, cmd	null, TC
Interrupt	Start, Stop, Status	rate, dig	cmd, dig, ana	cmd, TC
Other	Initialize			
Digital Input				
Polled	Start	null	null, cmd	null, cmd, TC
Interrupt	Start, Stop, Status	rate, dig	cmd	cmd, TC
Other	Initialize			
Digital Output				
Polled	Start	null	null, cmd	null, cmd, TC
Interrupt	Start, Stop, Status	rate, dig	cmd	cmd, TC
Other	Initialize			
Counter/Timer				
Polled	Start, Stop, Status	null, rate	null, cmd	null, cmd, TC
Other	Initialize, Configure	CT Setup		
Device				
Other	Initialize, Configure, Capabilities			

Allowed Operations and Events for DAS-800 Series Subsystems and Modes.

The following list explains the Event abbreviations in the preceding table:

- **null**—Null or None Event when a Service Request doesn’t require an event
- **cmd**—Command Event when DriverLINX starts or stops a task on software command

- **TC**—Terminal Count Event when DriverLINX processes all data buffers once
- **rate**—Rate Event specifies how DriverLINX paces or clocks data transfer
- **dig**—Digital Event specifies a trigger, clock, or other control signal to pace, start, or stop a task
- **ana**—Analog Event specifies an analog input signal to pace, start, or stop a task

Logical Channels

DriverLINX designates the individually addressable hardware channels for each subsystem as “Logical Channels.” Generally, the zero-based Logical Channel numbering sequence closely follows the hardware manufacturer’s channel numbering scheme.

In some cases, however, DriverLINX assigns Logical Channel numbers to hardware features that users don’t commonly think of as “channels.” For instance, DriverLINX commonly models external hardware clock input lines, external hardware trigger input lines, and external interrupt inputs as 1-bit digital Logical Channels. In other cases, DriverLINX models subsystem-specific features, such as internal pacer clocks, as members of a more general purpose set of counter/timer channels.

For a list of DriverLINX assigned Logical Channel numbers, see the notes on each supported subsystem.

Buffers

Applications usually use data buffers to exchange data between the application and the data-acquisition hardware. When using data buffers, please note the following points about DriverLINX’s data buffers:

- DriverLINX supports data-acquisition tasks with 1 to 255 data buffers per task.
- DriverLINX imposes no size limits on a single buffer, although the operating system or some hardware products may have size restrictions.
- User applications must allow DriverLINX to allocate all data buffers to guarantee application portability to different hardware and operating systems and to insure that the hardware can physically access the buffer memory.
- User applications usually don’t have concurrent or immediate access to the in-use data buffer while DriverLINX is executing a data-acquisition task.

Connecting Signals to the DAS-800 Series

The Keithley hardware manual describes the data and control signals for the DAS-800 Series and the connector pinouts for these signals. This section summarizes how DriverLINX numbers the I/O data signals and how DriverLINX uses several of these control connections for external clock, trigger, and gating inputs.

Analog Input Subsystem Signals

The Analog Input subsystem has 8 analog input single-ended or differential signal connections depending on the model of your DAS-800 board. DriverLINX maps these signals to Logical Channels as shown in the following table:

A/D Channels	Connector Name	Logical Channels
Channel 0-7 DAS-800	IN0 – IN7/LLCOM	0–7
Channel 0-7 DAS-801/802	IN0+/IN0- – IN7+/IN7-	0–7

How DriverLINX maps analog input hardware channels to Logical Channels.

Analog Input Pacing, Triggering and Gating Signals

Analog input tasks can use the internal pacer clock, which DriverLINX designates as Counter/Timer Logical Channels 2 (single) or 3 (cascaded). Analog input tasks can also use an external pacer clock, which DriverLINX designates as Counter/Timer Logical Channel 5.

The Analog Input subsystem uses two control signals that DriverLINX defines as external clocks, gates, and triggers as shown in the following table:

Connector Name	DriverLINX Usage
INP1/TRIG	External trigger/External Gate
INT_IN/XCLK	External pacer clock

How DriverLINX uses analog input control signals.

Digital Input Subsystem Signals

The Digital Input subsystem has one 3-bit digital input port and two control inputs which DriverLINX models as 1-bit logical digital input ports. DriverLINX maps these signals to Logical Channels as shown in the following table:

Port	Connector Name	Logical Channels
3-bit digital input	INP0 … INP2	0
External trigger alias	INP1/TRIG	1
External clock alias	INT_IN/XCLK	2

How DriverLINX maps digital input hardware channels to Logical Channels.

Digital Input Pacing Signals

Digital input tasks can use the internal pacer clock, which DriverLINX designates as Counter/Timer Logical Channels 2 (single) or 3 (cascaded). Digital input tasks can also use an external pacer clock, which DriverLINX designates as Counter/Timer Logical Channel 5.

Digital Output Subsystem Signals

The Digital Output subsystem has one 4-bit digital output port. DriverLINX maps these signals to Logical Channels as shown in the following table:

Port	Connector Name	Logical Channels
4-bit digital output	OP0 … OP3	0

How DriverLINX maps digital output hardware channels to Logical Channels.

Digital Output Pacing Signals

Digital output tasks can use the internal pacer clock, which DriverLINX designates as Counter/Timer Logical Channels 2 (single) or 3 (cascaded). Digital output tasks can also use an external pacer clock, which DriverLINX designates as Counter/Timer Logical Channel 5.

Counter/Timer Subsystem Signals

The Counter/Timer subsystem has several internal and external hardware timers. The DAS-800 Series boards have three sixteen-bit timers and an external clock input. The three timers can operate independently or in combination. DriverLINX maps these internal and external timers to Logical Channels as shown in the following table:

Timer	Connector Name	Logical Channels
C/T 0	CLK 0, GATE 0, OUT 0	0
C/T 1	CLK 1, GATE 1, OUT 1	1
C/T 2	GATE 2*, IP1/TRIG*, OUT 2	2
C/T 1 & C/T 2	GATE 2*, IP1/TRIG*, OUT 1	3
C/T 0 & C/T 2**	GATE 2, OUT 0	4
External Clock	INT_IN/XCLK, IP1/TRIG	5

How DriverLINX maps counter/timer hardware channels to Logical Channels.

* The DAS-800 Series uses the IP1/TRIG signal to gate input/output tasks and the GATE 2 signal to gate counter/timer tasks on Logical Channels 2 and 3.

** To use C/T 0 & C/T 2 together, make an external connection between OUT 2 and CLK 0.

Device Subsystem

The following sections describe how DriverLINX implements Device Subsystem features for the DAS-800 Series.

Device Modes

The Device Subsystem only supports DriverLINX's *Other* mode for all operations.

Device Operations

The DAS-800 Series Device Subsystem supports the following DriverLINX operations:

If another application is using the same data-acquisition board, DriverLINX will prevent Device Initialization from interfering with another application's data-acquisition tasks.

- **Initialize**—DriverLINX aborts all data-acquisition tasks for every subsystem controlled by the current application. DriverLINX then performs an initialization for each supported subsystem.
- **Configure**—DriverLINX displays the *Configure DriverLINX Device* dialog for the current Logical Device. Please use the *DriverLINX Configuration Panel* rather than this operation to configure DriverLINX.
- **Capabilities—**DriverLINX provides hardware-specific and configuration information in the form of a Logical Device Descriptor database.

Analog Input Subsystem

The following sections describe how DriverLINX implements Analog Input Subsystem features for the DAS-800 Series.

Analog Input Modes

The Analog Input Subsystem supports the following modes:

- **Polled**—For single value analog input samples.
- **Interrupt**—For buffered transfers using programmed I/O.
- **Other—**For subsystem initialization and data conversion.

Analog Input Operations

The DAS-800 Series Analog Input Subsystem supports the following DriverLINX operations:

- **Initialize**—aborts all active analog input data-acquisition tasks. However, DriverLINX prevents one application from interfering with another application’s data-acquisition tasks.
- **Start**—initiates a data-acquisition task using the Mode, Timing, Start, and Stop Events, the Logical Channels, and the Buffers the application specified in the Service Request.
- **Status**—reports the buffer position of the next sample that DriverLINX will write into a buffer.
- **Stop**—terminates an analog input data-acquisition task.
- **Message—**DriverLINX displays a pop-up dialog box for the user containing the text for the current DriverLINX error message.

Analog Input Timing Events

Timing Events specify how the hardware paces or clocks the acquisition of analog input samples. DriverLINX uses the Timing Event to program when the DAS-800 Series acquires the next analog input sample.

The DAS-800 Series supports the following Timing Events:

- **None**—Sampling requires no pacing as DriverLINX is acquiring only a single value.
- **Rate—**The DAS-800 Series supports fixed rate sampling using internal and external clocks.
- **Digital**—DriverLINX uses an external digital input signal to pace the acquisition of the next sample.

None or Null Event

The Null Event specifies that the task does not need a clock to determine when to acquire the next sample.

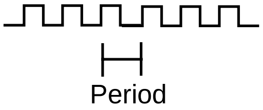
Rate Event

The DAS-800 Series supports a single Rate Event for analog input:

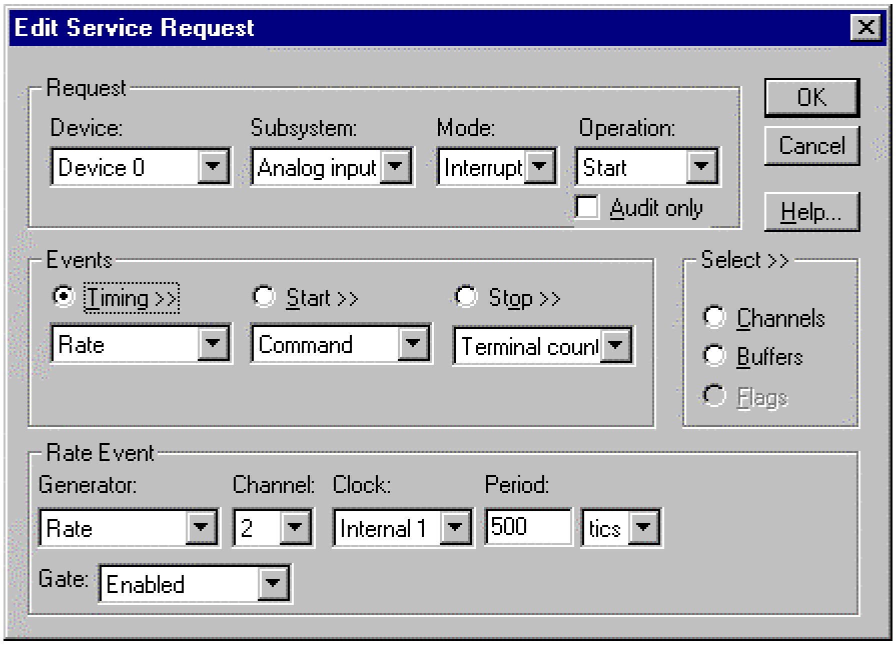
- **Rate Generator**—Generates a fixed rate clock with equal time intervals between tics.

Rate Generator: Internal Clocking

An internally clocked Rate Generator produces a fixed rate clock with equal time intervals between tics.



Use an internally clocked rate generator when you want to acquire all analog input samples at equally spaced time intervals.



Request
Device: Device 0
Subsystem: Analog input
Mode: Interrupt
Operation: Start
☐ Audit only

Events
● Timing >> ○ Start >> ○ Stop >>
Rate Command Terminal count

Select >>
○ Channels
○ Buffers
○ Flags

Rate Event
Generator: Rate
Channel: 2
Clock: Internal 1
Period: 500 tics
Gate: Enabled

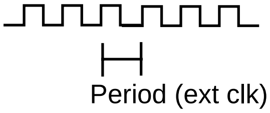
How to set up the DAS-800 Series for fixed rate sampling using an internal clock.

For hardware independence, specify the clock channel using the symbolic constant, DEFAULTTIMER, which always maps to the default Logical Channel for analog input timing.

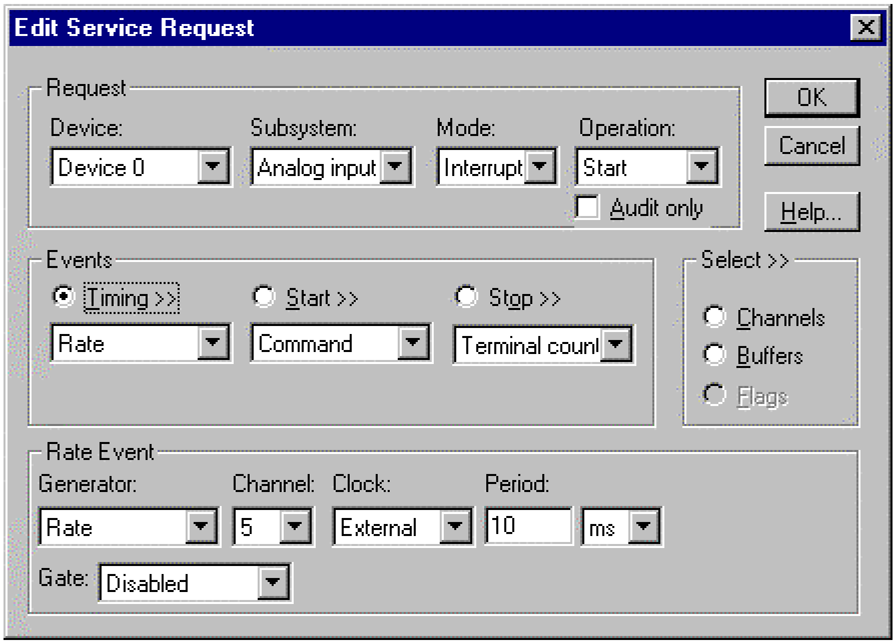
- Specify internal clocking using a **Rate** *Generator* on *Channel* **2** or **3** with the **Internal 1** *Clock* source. See “Counter/Timer Subsystem” on page 63 for a description of clock sources.
- The *Period* property specifies the time interval between samples in tics, where an **Internal 1** tic is 1 µs, or 1 MHz. The minimum period is 25 tics, or 40 kHz. The maximum period is 4294967295 tics ($2^{32} - 1$), or 0.000233 Hz.

Rate Generator: External Clocking

An externally clocked Rate Generator produces a rate clock with unknown time intervals between tics.



Use an externally clocked rate generator when you want to synchronize analog input samples with a recurrent external signal. In this mode you will need a separate external clock tic for each analog sample you want to acquire.


Edit Service Request

Request
Device: Device 0
Subsystem: Analog input
Mode: Interrupt
Operation: Start
□ Audit only

Events
● Timing >> ○ Start >> ○ Stop >>
Rate | Command | Terminal count

Select >>
○ Channels
○ Buffers
○ Flags

Rate Event
Generator: Rate
Channel: 5
Clock: External
Period: 10 ms
Gate: Disabled

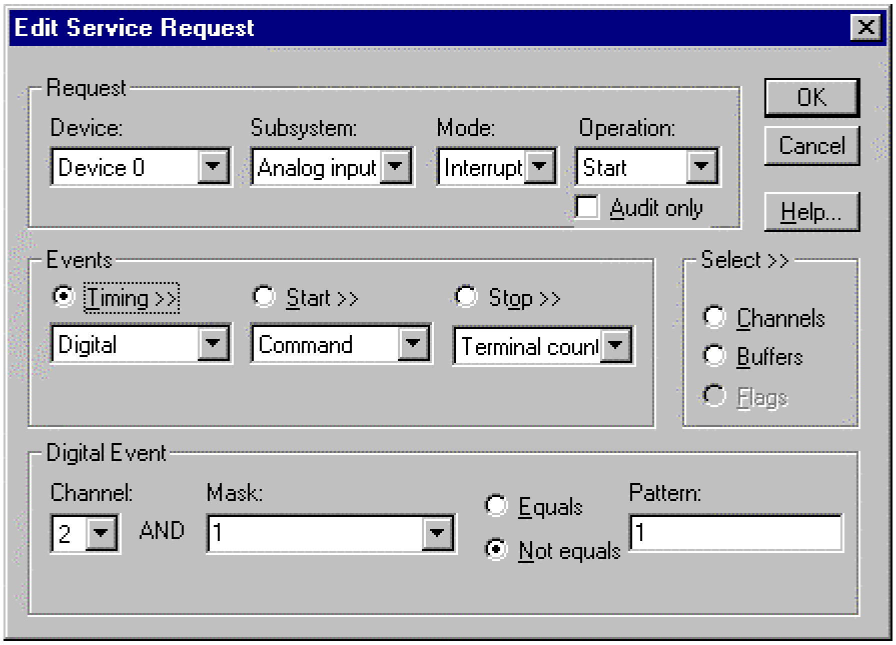
How to set up the DAS-800 Series for fixed rate sampling using an external clock.

***BE SURE** that the external clock source is TTL compatible, 0 V minimum to +5 V maximum!*

- Specify external clocking using a **Rate** *Generator* on *Channel* **5** with an **External**, or **External-** *Clock* source. See “Counter/Timer Subsystem” on page 63 for a description of clock sources.
- Users should connect the external clock signal to the INT_IN/XCLK line.
- The *Period* may be any value ≥ 50 tics, or 10 µs. The period value doesn’t affect the external clock frequency, but DriverLINX requires a valid hardware value in case the application requests a timebase operation and to optimize data transfer between the driver and the application.
- The frequency of the external clock must not exceed 40 kHz.

Digital Event

DriverLINX supports Digital Events as aliases for externally clocked Rate Generators. Use this technique for compatibility with data-acquisition products that only support external clock sources.



Edit Service Request

Request

Device: Device 0

Subsystem: Analog input

Mode: Interrupt

Operation: Start

□ Audit only

Events

● Timing >> Digital

○ Start >> Command

○ Stop >> Terminal count

Select >>

○ Channels

○ Buffers

○ Flags

Digital Event

Channel: 2 AND Mask: 1

○ Equals

● Not equals

Pattern: 1

How to set up the DAS-800 Series for external rate sampling using a digital event.

- Specify external clocking using *Channel* **2.** For hardware-independence, you can specify the hardware external trigger channel by the symbolic constant, *DI_EXTCLK*.
- Users should connect the external clock signal to the INT_IN/XCLK line.
- Specify the *Mask* property as **1,** or **Bit 0**, to indicate that DriverLINX should only compare a 1-bit digital input value against the *Pattern* property.
- Specify the *Match* property as **Not equals**.
- Specify the *Pattern* property as **1** for a falling, or negative, edge clock (≠1).

Analog Input Start Events

Start Events specify when the DAS-800 hardware starts acquiring analog input data.

The DAS-800 Series supports the following Start Events:

- **None**—Use this event when the DriverLINX operation does not require a Start Event.
- **Command**—DriverLINX starts the task on software command, i.e., as soon as DriverLINX finishes programming the DAS-800 hardware for the task.

- **Digital**—The DAS-800 starts acquiring analog input samples when the hardware detects the digital Logical Channel input satisfies the condition specified in the Start Event.
- **Analog**—The DAS-800 starts acquiring analog input samples when the hardware detects the analog Logical Channel input satisfies the condition specified in the Start Event.

None or Null Event

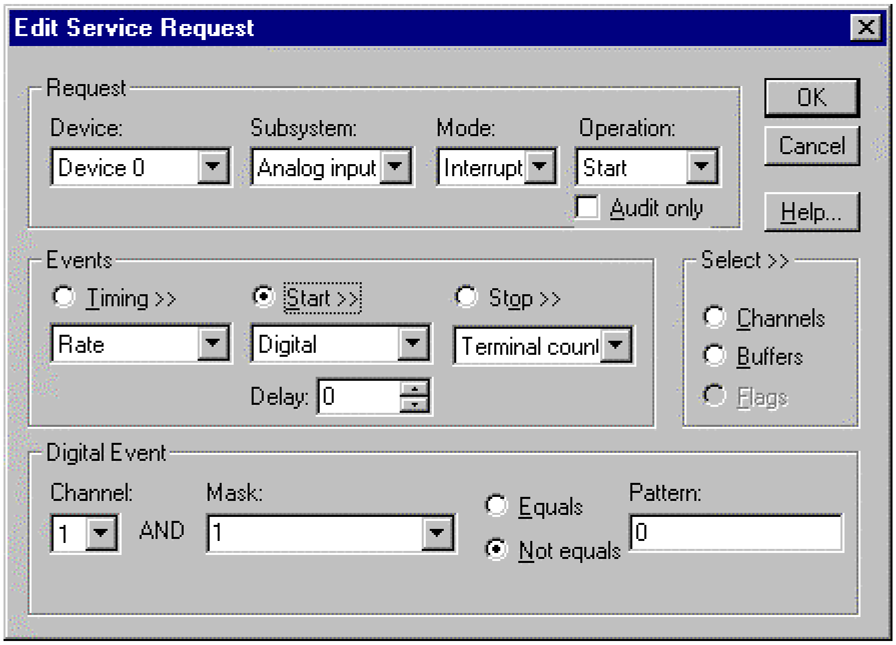
The Null Event specifies that the task does not need a Start Event to begin the task.

Command Event

The Command Event starts data acquisition as soon as DriverLINX has completed programming the data-acquisition hardware with the task parameters.

Digital Event or Post Triggering

The DAS-800 can acquire analog input samples ***after*** the hardware detects a digital trigger condition. Use post-triggering when you want to synchronize the start of data acquisition with an external signal.



Edit Service Request

Request

Device: Device 0

Subsystem: Analog input

Mode: Interrupt

Operation: Start

□ Audit only

Events

○ Timing >> ● Start >> ○ Stop >>

Rate

Digital

Terminal count

Delay: 0

Select >>

○ Channels

○ Buffers

○ Flags

Digital Event

Channel: 1 AND Mask: 1

○ Equals

● Not equals

Pattern: 0

How to set up the DAS-800 Series for post-triggered analog input.

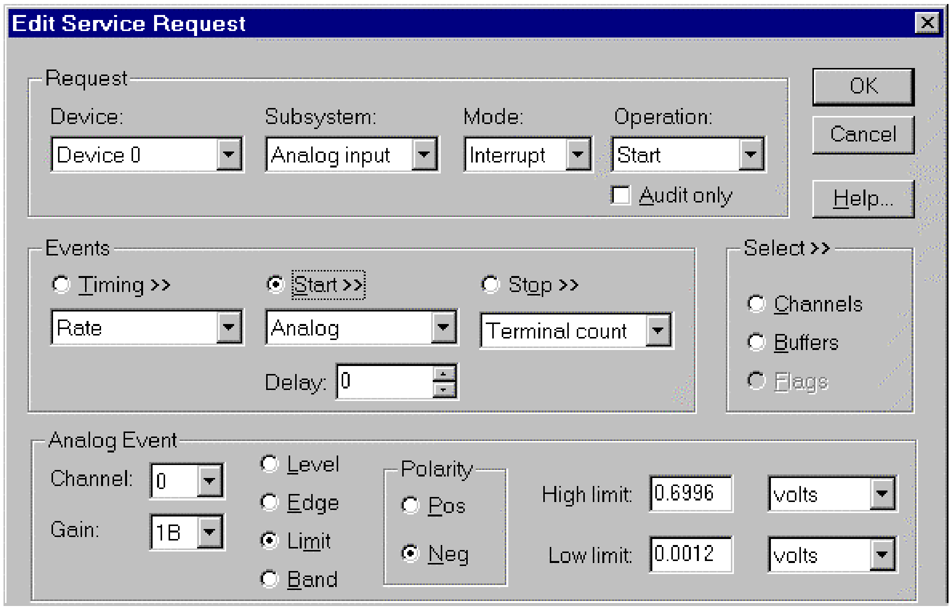
Digital Start Events contain *mask*, *pattern*, and *match* fields. The mask is logically ANDed with the digital input data on the Logical Channel and then compared with the *pattern* for a match/mismatch.

- Specify the *Channel* as **1**. For hardware-independence, you can specify the hardware external trigger channel by the symbolic constant, *DI_EXTTRG*.
- Users should connect the external trigger signal to the INP1/TRIG line.

- Specify the *Mask* property as **1**, or **Bit 0**, to indicate that DriverLINX should only compare a 1-bit digital input value against the *Pattern* property.
- Specify the *Match* property as **Not equals**.
- Specify the *Pattern* property as **0** for a rising, or positive, edge trigger (≠0).
- Specify the *Delay* property as any integer from 0 to $2^{32} - 1$. DriverLINX discards this number of samples after the trigger.

Analog Event or Post-Triggering

The DAS-800 can acquire analog input samples ***after*** the hardware detects an analog trigger condition. Use post-triggering when you want to synchronize the start of data acquisition with an external signal.



Edit Service Request

Request

Device: Device 0

Subsystem: Analog input

Mode: Interrupt

Operation: Start

□ Audit only

Events

○ Timing >> Rate

● Start >> Analog

○ Stop >> Terminal count

Delay: 0

Select >>

○ Channels

○ Buffers

○ Flags

Analog Event

Channel: 0

Gain: 1B

○ Level

○ Edge

● Limit

○ Band

Polarity

○ Pos

● Neg

High limit: 0.6996 volts

Low limit: 0.0012 volts

How to set up the DAS-800 Series for post-triggered analog input.

Analog Start Events contain *Channel*, *Gain*, *Polarity* and *Limit* fields. The limits determine the type of analog event (Level, Edge, Limit, Band). DriverLINX samples data from the Logical Channel and compares it against the *High* and *Low Limits*. The trigger occurs when a sequence of samples is in the relationship specified by *Polarity* and *Limits*.

- Specify the *Channel* from the analog input subsystem. For the DAS-800 Series, the analog event channel must be a channel in scan list.
- Specify the *Gain* property for the analog event channel.
- Specify the *Polarity* (or Slope) property as **Pos** or **Neg**. For a Level event, **Pos** means the trigger occurs when a sample is above the (high) threshold. For a Limit event, Pos means the occurs when a sample is between the limits.
- Specify the *Limit* properties in hardware A/D codes as follows:

Type	High Limit	Low Limit
Level, above	Maximum AI code	Threshold
Level, below	Threshold	Minimum AI code
Limits, inside or outside	Upper Threshold	Lower Threshold
Edge, positive or negative crossing	Threshold	Threshold
Band, positive or negative crossing	Upper Threshold	Lower Threshold

Use the DriverLINX *Volts2Code* method to easily convert volts to hardware A/D codes for the threshold properties.

- Specify the *Delay* property as any integer from 0 to $2^{32} - 1$. DriverLINX discards this number of samples after the trigger.

Analog Input Stop Events

Stop Events specify when the hardware stops acquiring analog input data.

The DAS-800 Series supports the following Stop Events:

- **None—**Use this event when the DriverLINX operation doesn't require a Stop Event.
- **Command**—DriverLINX stops the task on software command, i.e., when the application issues a Service Request with a *Stop* operation.
- **Terminal count**—DriverLINX stops the task after the data-acquisition hardware has filled all the data buffers once.

None or Null Event

The Null Event specifies that the task does not need a Stop Event to end the task.

Command Event

The Command Event stops data acquisition when the user application changes the *Operation* property in the Service Request to *Stop* and resubmits the Service Request to DriverLINX.

In Stop-on-Command mode, DriverLINX continuously cycles through all the data buffers filling them with analog input data from the data-acquisition hardware.

Terminal Count Event

The Terminal Count Event stops data acquisition after DriverLINX has filled all the data buffers ***once*** with analog input data. Use Terminal Count when you want to acquire a single scan or fixed amount of data.

Analog Input Channels

The DriverLINX allows applications to specify analog input channels using three techniques:

- **Start Channel**—Acquire data from a single channel.
- **Start/Stop Channel Range**—Acquire data from a consecutive range of channels.
- **Channel List**—Acquire data from a list of channels.

The DAS-800 Series models support a variety of channel gains. The DAS-800 has a fixed bipolar range (-5 to +5 V). The DAS-801 and 802 have five programmable bipolar gains and four programmable unipolar gains.

The following tables show the correspondence between DriverLINX gains, the maximum input signal range, and the hardware gain code for each input range. Note: DriverLINX uses a negative (-) gain value to signify a bipolar (±) range.

DAS-800

Gain	Range (volts)	Hardware Gain Code
-1	±5	0

Gains, Ranges, and DriverLINX Gain Codes for Model DAS-800.

DAS-801

Gain	Range (volts)	Hardware Gain Code
-1	±5	0
-0.5	±10	1
1	0 … 10	2
-10	±0.5	3
10	0 … 1	4
-100	±0.05	5
100	0 … 0.1	6
-500	±0.01	7
500	0 … 0.02	8

Gains, Ranges, and DriverLINX Gain Codes for Model DAS-801.

DAS-802

Gain	Range (volts)	Hardware Gain Code
-1	±5	0
-0.5	±10	1
1	0 … 10	2
-2	±2.5	3
2	0 … 5	4
-4	±1.25	5
4	0 … 2.5	6
-8	±0.00625	7
8	0 … 1.25	8

Gains, Ranges, and Gain Codes for Model DAS-802.

Use the DriverLINX **Gain2Code** method to easily convert between the gains in the above tables and hardware Gain Codes.

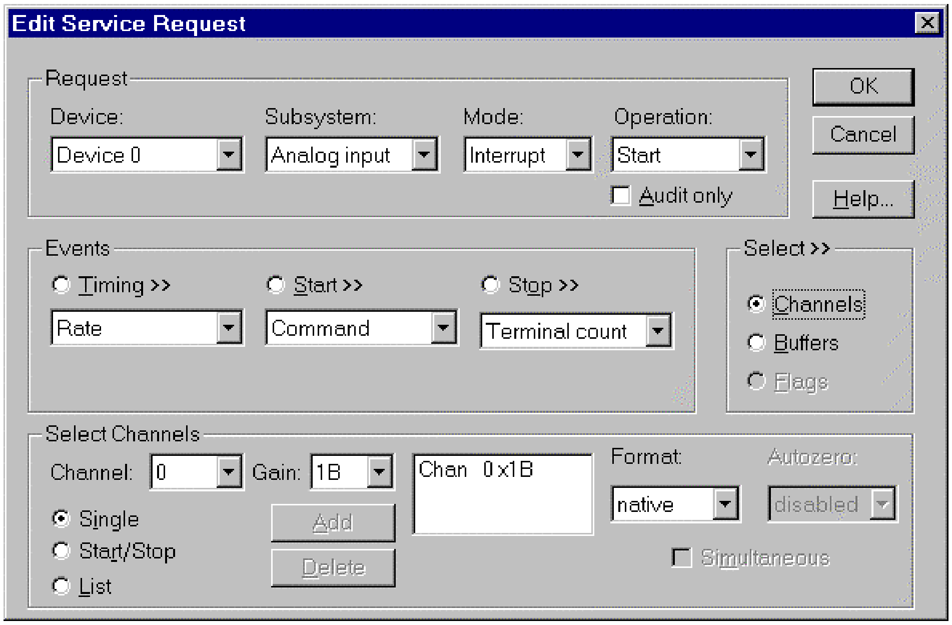
The available gains for an expansion channel are the products of the expansion board’s gain, set by jumpers, and the programmable gains of the DAS board.

For example, the gains available for a channel on an EXP-16, jumpered for a gain of 10 and attached to a DAS-802, are: -10, -5, 10, -20, 20, -40, 40, 80 and -80.

See “Special…” on page 14 for information on configuring expansion accessories or "Analog Input Expansion Channels" on page 42 for information on selecting expansion channels.

Single Channel Analog Input

In single channel mode, the DAS-800 Series acquires all data from one channel at the specified gain.



Edit Service Request

Request

Device: Device 0

Subsystem: Analog input

Mode: Interrupt

Operation: Start

□ Audit only

Events

○ Timing >> Rate

○ Start >> Command

○ Stop >> Terminal count

Select >>

● Channels

○ Buffers

○ Flags

Select Channels

Channel: 0

Gain: 1B

Chan 0x1B

Format: native

Autozero: disabled

● Single

○ Start/Stop

○ List

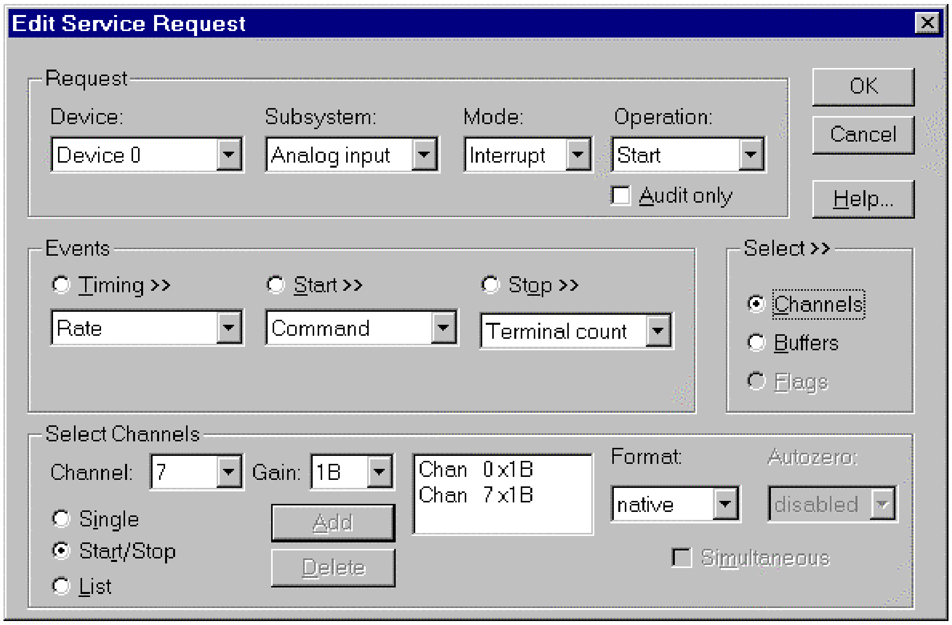
□ Simultaneous

How to set up the DAS-800 Series for sampling on a single channel.

Multi-channel Analog Input Range

In multi-channel range mode, the DAS-800 Series acquires data from a consecutive range of analog channels.

- The Start Channel and Stop Channel gains must be the same as the DAS-800 Series does not support changing gains while acquiring a channel range.
- If the Start Channel is greater than the Stop Channel, the channel sequence is [Start Channel, …, 7, 0, …, Stop Channel].



Edit Service Request

Request

Device: Device 0

Subsystem: Analog input

Mode: Interrupt

Operation: Start

☐ Audit only

Events

○ Timing >> Rate

○ Start >> Command

○ Stop >> Terminal count

Select >>

● Channels

○ Buffers

○ Flags

Select Channels

Channel: 7

Gain: 1B

Chan 0 x1B
Chan 7 x1B

○ Single

● Start/Stop

○ List

Format: native

Autozero: disabled

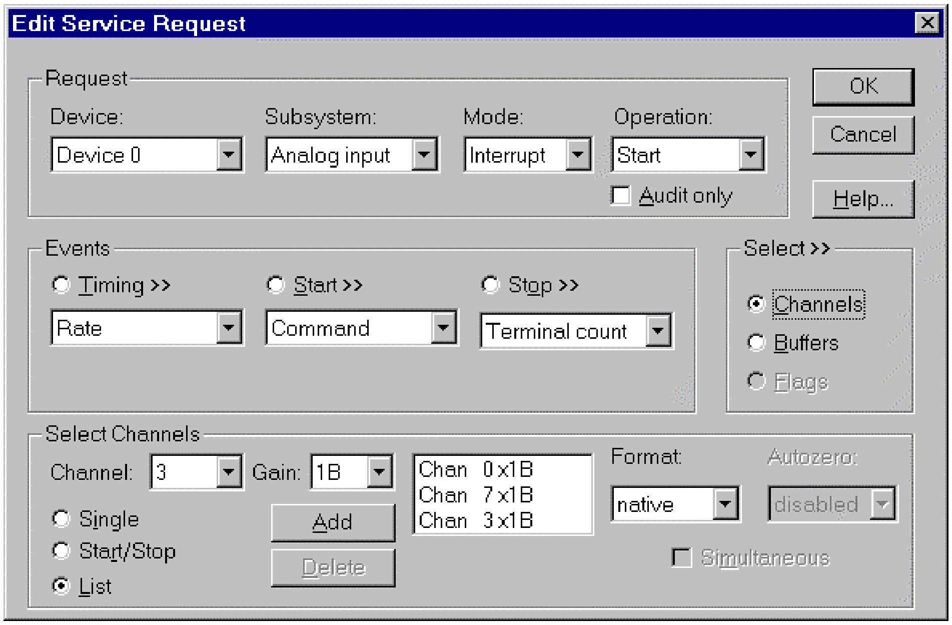
☐ Simultaneous

How to set up the DAS-800 Series for sampling on a consecutive range of channels.

Multi-channel Analog Input List

In multi-channel list mode, the DAS-800 Series acquires data from a random list of analog channels.

- The channel-gain list may contain up to 256 channels in any order and with any supported gain. The list may repeat a channel with the same or different gains. See “Using a Channel/Gain List on the DAS-800 Series” below for special considerations when using a channel-gain list.



Request

Device: Device 0

Subsystem: Analog input

Mode: Interrupt

Operation: Start

□ Audit only

Events

○ Timing >> Rate

○ Start >> Command

○ Stop >> Terminal count

Select >>

● Channels

○ Buffers

○ Flags

Select Channels

Channel: 3

Gain: 1B

Chan 0 x1B
Chan 7 x1B
Chan 3 x1B

Format: native

Autozero: disabled

□ Simultaneous

○ Single

○ Start/Stop

● List

How to set up the DAS-800 Series to sample on a random list of channels.

Using a Channel/Gain List on the DAS-800 Series

The DAS-800 hardware supports sampling only a single channel or a consecutive range of channels at constant gain. DriverLINX simulates a hardware channel/gain list for the DAS-800 in software by changing the board’s channel, gain, and expansion multiplexer settings during an interrupt service routine.

When DriverLINX reprograms the DAS-800 with the next entry in the channel-gain list, the hardware needs a minimum settling time for the multiplexers and programmable gain amplifiers to acquire the signal on the new channel and/or at the new gain. Due to the wide statistical distribution of interrupt latencies in a non-real time operating system, software reprogramming of the DAS-800 hardware may occur too late to satisfy the hardware’s minimum settling time before the start of the next A/D conversion cycle.

DriverLINX’s software channel-gain list reprogramming algorithm can insure the DAS-800 hardware’s minimum settling time requirements are satisfied *only* if the data-acquisition task satisfies two requirements.

1. The task must use an internal clock. When an application uses an external clock, DriverLINX cannot measure the time interval to the next clock pulse which starts A/D conversion to insure minimum settling time.

2. The channel-gain list gain entries do not contain a gain of 500. At a gain of 500, the DAS-800 settling and conversion times increase. See below for a technique to compensate for the longer settling time at a gain of 500.

If the task satisfies the above restrictions, DriverLINX will detect when the operating system called the interrupt service routine too late to meet the minimum settling time specification. In this situation, DriverLINX will report a “data lost” message to the application and terminate the task. The maximum sustainable data-acquisition rate will depend on the speed of the host computer and the peak CPU utilization caused by *all* processes and threads running on the host computer.

If the task does not satisfy the above restrictions, sampling using a channel-gain list may have the following effects:

- The hardware acquires a sample from the wrong channel due to insufficient settling time of a channel or expansion multiplexer.
- The hardware acquires an inaccurate sample value due to insufficient settling time of a programmable gain amplifier.

You can significantly reduce, but not eliminate, the probability of incorrect channels or inaccurate values by using the following techniques:

- Acquire data at slower sampling rates. Slower rates allow more time for the software to reprogram the hardware for the next channel. Use an internal clock to empirically determine the maximum sustainable sampling rate on your computer and limit sampling rates accordingly.
- Run your application in the foreground and do not start other applications. This reduces the probability of an occasional occurrence of an unusually long interrupt latency.
- Avoid high gain settings. The DAS-800 Series’ programmable gain amplifier settles faster at lower gains. If the channel-gain list uses a gain of 500 with an internal clock, sample the channel with a gain of 500 twice and ignore the first value. Repeat this double-sampling technique with the entry in the channel-gain list that follows a channel with a gain of 500.
- Minimize interrupts from other devices during data-acquisition.

For maximum data throughput when sampling multiple channels, scan consecutive channels at constant gain rather than using a random, variable-gain channel list.

Analog Input Expansion Channels

Multiplexers can expand the number of analog input channels from the 8 base channels up to 128 differential analog input channels. The DAS-800 Series hardware automatically switches the multiplexer channels, allowing you to specify expansion channels along with base channels in a channel list.

To enable DriverLINX to use multiplexers, enable expansion mode in the *Expansion Board Configuration for Keithley DAS-800 Series* dialog (see “Special…” on page 14). With expansion mode enabled, DriverLINX considers the board to have the original 8 base channels followed by 128 expansion channels.

DriverLINX uses a static numbering scheme for attaching multiplexers. Attaching or removing a mux from a base channel doesn’t change the Logical Channel number of any other channel. DriverLINX reserves a fixed number of expansion channels for each potential mux, whether it is attached or not.

To determine the DriverLINX Logical Channel number for a multiplexer channel, use the following formula or refer to the table that follows it. Note that DriverLINX uses 0-based numbering for all channels.

<logical chan#> = <num base chan> + <base chan#> × <num mux chan> + <mux chan#>

Term	**Description**
<logical chan#>	Logical Channel number to use in channel lists.
<num base chan>	Number of base channels on the DAS-800 board. All DAS-800 models have 8 base channels.
<base chan#>	Base channel on the DAS-800 board where you attached the mux.
<num mux chan>	Number of expansion channels DriverLINX reserves for the mux. (16 for DAS-800 expansion accessories).
<mux chan#>	Channel on the expansion board where you attached the signal. Mux channels are numbered from 0 to 15.

For example, the Logical Channel address for channel 4 on a mux attached to base channel 3 is

$$8 + 3 \times 16 + 4 = 60.$$

To specify multiplexer input channels 0, 1, and 2 on an expansion board connected to base channel 0, add 8, 9, and 10 to the channel/gain list.

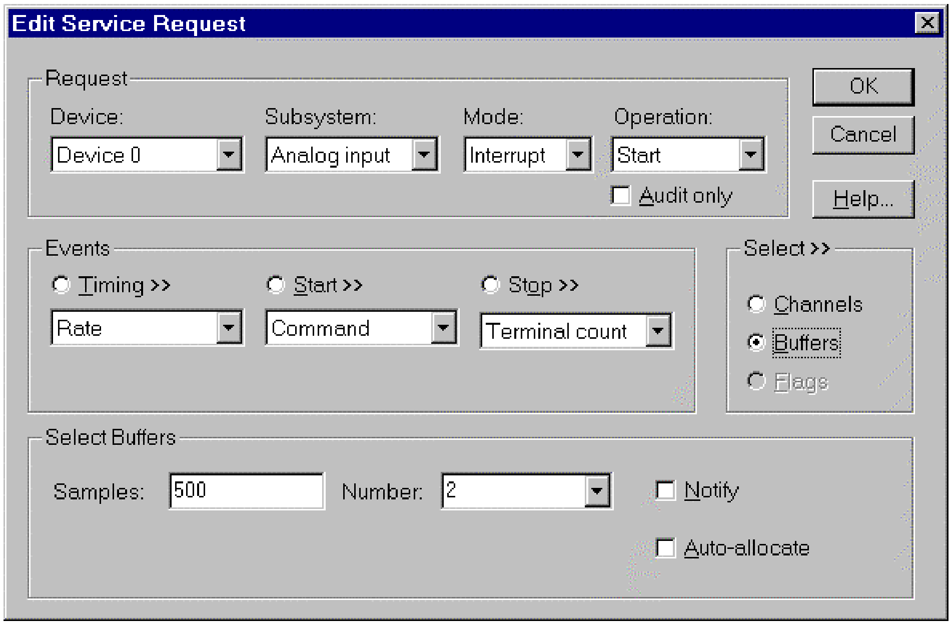
Mux	Base Chan #							
Input Chan #	0	1	2	3	4	5	6	7
0	8	24	40	56	72	88	104	120
1	9	25	41	57	73	89	105	121
2	10	26	42	58	74	90	106	122
3	11	27	43	59	75	91	107	123
4	12	28	44	60	76	92	108	124
5	13	29	45	61	77	93	109	125
6	14	30	46	62	78	94	110	126
7	15	31	47	63	79	95	111	127
8	16	32	48	64	80	96	112	128
9	17	33	49	65	81	97	113	129
10	18	34	50	66	82	98	114	130
11	19	35	51	67	83	99	115	131
12	20	36	52	68	84	100	116	132
13	21	37	53	69	85	101	117	133
14	22	38	54	70	86	102	118	134
15	23	39	55	71	87	103	119	135

Table of logical channel numbers for DAS-800 expansion boards.

Analog Input Buffers

DriverLINX supports both single-value analog input and buffered analog input.

- **For single-value input**, specify the *Number* of buffers as **0** and the number of *Samples* as **1**.
- **For buffered input**, specify the *Number* of buffers from **1** to **256** and the number of *Samples* as desired.



Request

Device: Device 0

Subsystem: Analog input

Mode: Interrupt

Operation: Start

□ Audit only

Events

○ Timing >> Rate

○ Start >> Command

○ Stop >> Terminal count

Select >>

○ Channels

● Buffers

○ Flags

Select Buffers

Samples: 500

Number: 2

□ Notify

□ Auto-allocate

How to set up the DAS-800 Series to store samples in buffers.

For example, 500 samples/2 channels = 250 is ok, but 500 samples/3 channels = 166.67 is incorrect.

An individual DriverLINX buffer may have any size as long as the buffer length holds an integral number of channel scans (i.e., a multiple of the number of analog input channels you're acquiring). This restriction enforces the requirement that all acquired channels have the same number of samples.

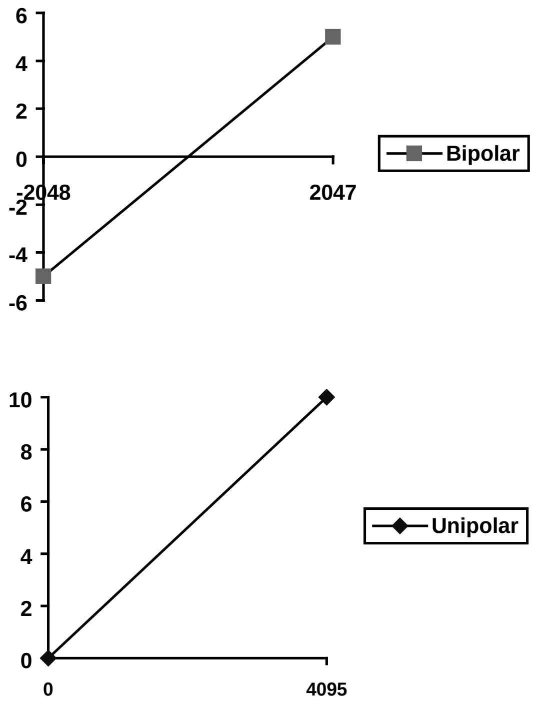
Analog Input Data Coding

DAS-800 Series models return A/D hardware codes using binary integers for unipolar ranges and offset binary for bipolar ranges. DriverLINX refers to this coding scheme as the "native" format.

For any programmable gain, the DAS-800 models return hardware codes with the ranges in the following table:

A/D Resolution	Polarity	A/D Hardware Code
12 bits	Unipolar	0 to 4095
12 bits	Bipolar	-2048 to 2047

Native A/D hardware codes for each DAS-800 Series polarity.



DAS-800 Series native A/D Codes versus Voltage Range

DriverLINX refers to the default hardware analog coding scheme as the “native” format. For computer arithmetic in a higher level language, the integer, or two’s complement, format is generally easier to use. For unipolar data, native and integer formats are identical.

For bipolar data, DriverLINX automatically converts A/D codes to integer format, if you specify **integer** for the *Format* property. Or, applications can use DriverLINX’s data conversion operations to transform an entire data buffer from native format to many common integer and floating-point formats.

Analog Input Messages

For analog input operations, DriverLINX can report the following messages to the application:

DriverLINX Message	Explanation
Service Start	DriverLINX has started the acquisition task.
Service Done	DriverLINX has completed the acquisition task.
Buffer Filled	DriverLINX has filled an analog input buffer.
Start Event	DriverLINX has processed the interrupt for a hardware start event.
Data Lost	DriverLINX has detected an analog input data overrun condition.
Critical Error	DriverLINX has encountered an unexpected hardware or software condition.

DriverLINX Event messages for analog input.

Digital Input Subsystem

The following sections describe how DriverLINX implements Digital Input Subsystem features for the DAS-800 Series.

Digital Input Modes

The Digital Input Subsystem supports the following modes:

- **Polled**—For single value digital input samples.
- **Interrupt**—For buffered transfers using programmed I/O.
- **Other**—For subsystem initialization and data conversion.

Digital Input Operations

The DAS-800 Series Digital Input Subsystem supports the following DriverLINX operations:

- **Initialize**—aborts any active interrupt data-acquisition tasks and stops the clock. DriverLINX prevents one application from interfering with another application's data-acquisition tasks.
- **Start**—initiates a data-acquisition task using the Mode, Timing, Start, and Stop Events, the Logical Channels, and the Buffers the application specified in the Service Request.
- **Status**—reports the buffer position of the next sample that DriverLINX will read into a buffer.
- **Stop**—terminates a digital input data-acquisition task.
- **Message**—DriverLINX displays a pop-up dialog box for the user containing the text for the current DriverLINX error message.

Digital Port Configuration

The DAS-800 Series has separate, dedicated digital input and output ports and doesn't require the application to configure its digital I/O ports.

Digital Input Timing Events

Timing Events specify how the hardware paces or clocks the reading of Digital Input samples. DriverLINX uses the Timing Event to program when the DAS-800 Series reads the next digital input sample from the port.

The DAS-800 Series supports the following Timing Events:

- **None**—Input requires no pacing as DriverLINX is reading only a single value.
- **Rate**—The DAS-800 Series supports only fixed rate digital input using an internal hardware clock.
- **Digital**—DriverLINX uses an external digital input signal to pace the acquisition of the next sample.

None or Null Event

The Null Event specifies that the task does not need a clock to determine when to read the next sample.

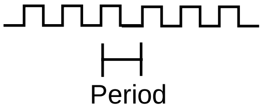
Rate Event

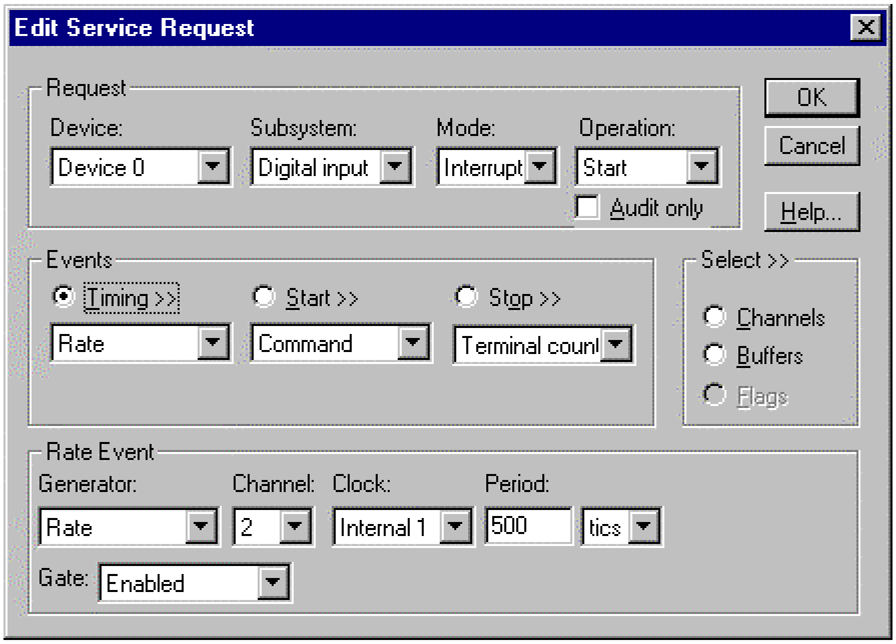
The DAS-800 Series supports one type of Rate Event for digital input:

- **Rate Generator**—Generates a fixed rate clock with equal time intervals between tics.

Rate Generator: Internal Clocking

An internally clocked Rate Generator produces a fixed rate clock with equal time intervals between tics.





Request
Device: Device 0
Subsystem: Digital input
Mode: Interrupt
Operation: Start
□ Audit only

Events
● Timing >> Rate
○ Start >> Command
○ Stop >> Terminal count

Rate Event
Generator: Rate
Channel: 2
Clock: Internal 1
Period: 500 tics
Gate: Enabled

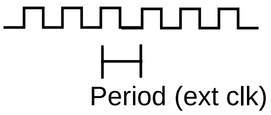
How to set up the DAS-800 Series for fixed rate sampling using an internal clock.

For hardware independence, specify the clock channel using the symbolic constant, DEFAULTTIMER, which always maps to the default Logical Channel for digital input timing.

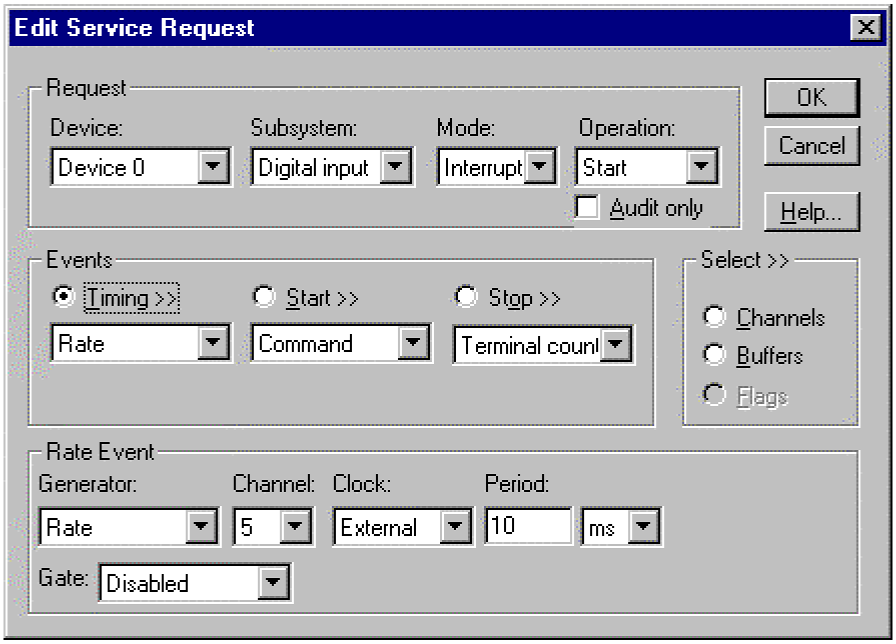
- Specify internal clocking using a **Rate** *Generator* on *Channel* **2** or **3** with the **Internal 1** *Clock* source. See “Counter/Timer Subsystem” on page 63 for a description of clock sources.
- The *Period* property specifies the time interval between samples in tics, where an **Internal 1** tic is 1 µs, or 1 MHz. The minimum period is 25 tics, or 40 kHz. The maximum period is 4294967295 tics ($2^{32} - 1$), or 0.000233 Hz.

Rate Generator: External Clocking

An externally clocked Rate Generator produces a rate clock with unknown time intervals between tics.



Use an externally clocked rate generator when you want to synchronize digital input samples with a recurrent external signal. In this mode, you will need a separate external clock tic for each digital sample you want to acquire.


Edit Service Request

Request

Device: Device 0

Subsystem: Digital input

Mode: Interrupt

Operation: Start

□ Audit only

Events

● Timing >> Rate

○ Start >> Command

○ Stop >> Terminal count

Select >>

○ Channels

○ Buffers

○ Flags

Rate Event

Generator: Rate

Channel: 5

Clock: External

Period: 10 ms

Gate: Disabled

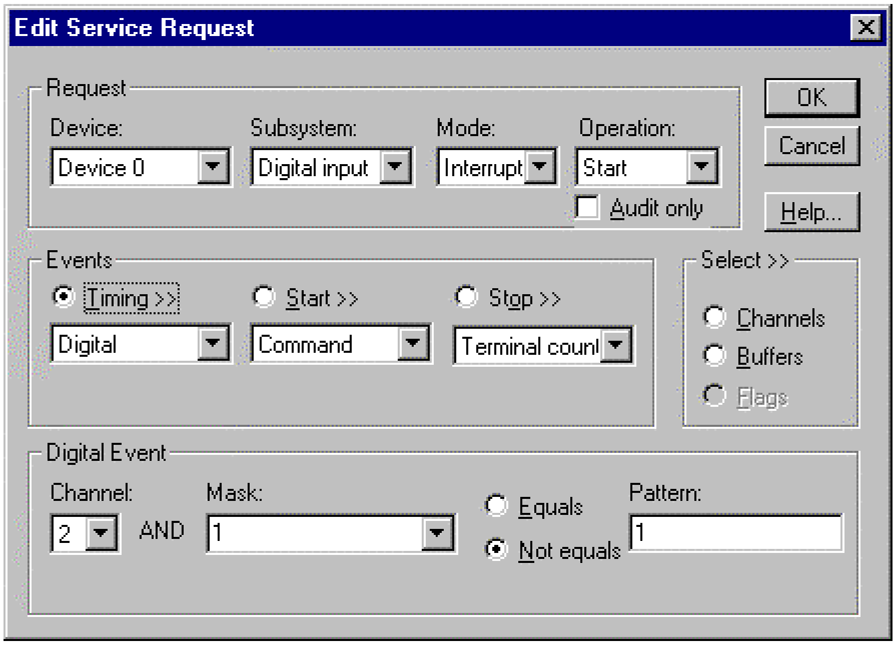
How to set up the DAS-800 Series for fixed rate sampling using an external clock.

***BE SURE** that the external clock source is TTL compatible, 0 V minimum to +5 V maximum!*

- Specify external clocking using a **Rate** *Generator* on *Channel* **5** with an **External**, or **External-** *Clock* source. See “Counter/Timer Subsystem” on page 63 for a description of clock sources.
- Users should connect the external clock signal to the INT_IN/XCLK line.
- The *Period* may be any value ≥ 50 tics, or 10 µs. The period value doesn’t affect the external clock frequency, but DriverLINX requires a valid hardware value in case the application requests a timebase operation and to optimize data transfer between the driver and the application.

Digital Event

DriverLINX supports Digital Events as aliases for externally clocked Rate Generators. Use this technique for compatibility with data-acquisition products that only support external clock sources.



Edit Service Request

Request

Device: Device 0

Subsystem: Digital input

Mode: Interrupt

Operation: Start

□ Audit only

Events

● Timing >> Digital

○ Start >> Command

○ Stop >> Terminal count

Select >>

○ Channels

○ Buffers

○ Flags

Digital Event

Channel: 2 AND Mask: 1

○ Equals

● Not equals

Pattern: 1

How to set up the DAS-800 Series for external rate sampling using a digital event.

- Specify external clocking using *Channel* **2.** For hardware-independence, you can specify the hardware external trigger channel by the symbolic constant, *DI_EXTCLK*.
- Users should connect the external clock signal to the INT_IN/XCLK line.
- Specify the *Mask* property as **1**, or **Bit 0**, to indicate that DriverLINX should only compare a 1-bit digital input value against the *Pattern* property.
- Specify the *Match* property as **Not equals**.
- Specify the *Pattern* property as **1** for a falling, or negative, edge clock (≠1).

Digital Input Start Events

Start Events specify when the DAS-800 Series hardware starts reading digital input data.

The DAS-800 Series supports the following Start Events for digital input:

- **None**—Use this event when the DriverLINX operation doesn't require a Start Event.
- **Command**—DriverLINX starts the task on software command, i.e., as soon as DriverLINX finishes programming the DAS-800 hardware for the task.

None or Null Event

The Null Event specifies that the task does not need a Start Event to begin the task.

Command Event

The Command Event starts data acquisition as soon as DriverLINX has completed programming the DAS-800 Series hardware with the task parameters.

Digital Input Stop Events

Stop Events specify when the DAS-800 Series hardware stops reading digital input data.

The DAS-800 Series supports the following Stop Events for digital input:

- **None**—Use this event when the DriverLINX operation doesn't require a Stop Event.
- **Command**—DriverLINX stops the task on software command, i.e., when the application issues a Service Request with a *Stop* operation.
- **Terminal count**—DriverLINX stops the task after the DAS-800 Series hardware has filled all the data buffers once.

None or Null Event

The Null Event specifies that the task does not need a Stop Event to end the task.

Command Event

The Command Event stops data acquisition when the user application changes the *Operation* property in the Service Request to *Stop* and resubmits the Service Request to DriverLINX.

In Stop-on-Command mode, DriverLINX continuously cycles through all the data buffers, reading from the digital port on the DAS-800 Series.

Terminal Count Event

The Terminal Count Event stops data acquisition after DriverLINX has read the digital input data into all the data buffers ***once***. Use terminal count when you want to read a fixed amount of data.

Digital Input Channels

The DAS-800 Series allows applications to specify the digital channels using three techniques:

- **Start Channel**—Acquire data from a single channel.
- **Start/Stop Channel Range**—Acquire data from a consecutive range of channels.
- **Channel List**—Acquire data from a list of channels.

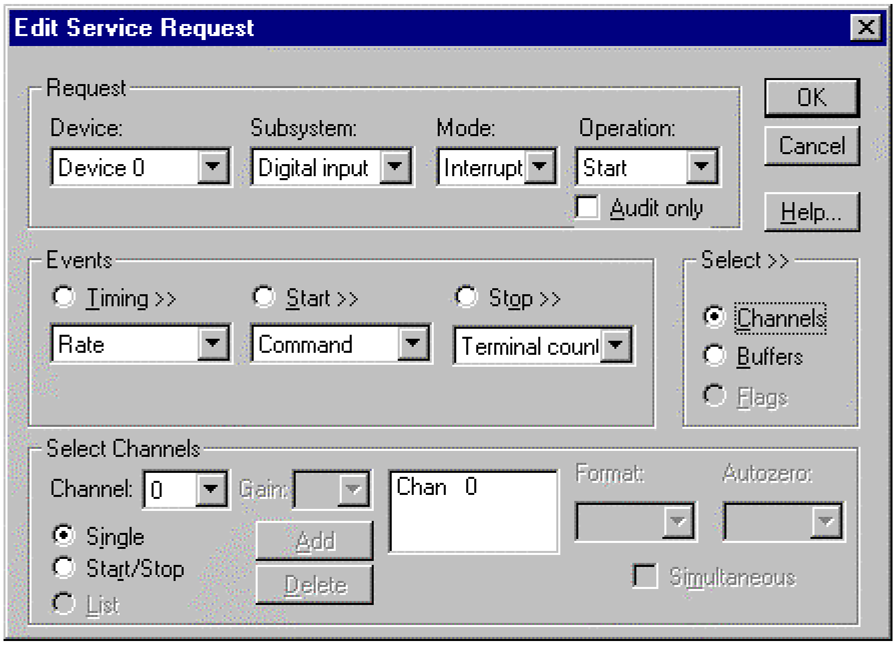
Digital Input Logical Channels

The DAS-800 Series has a single digital input port that DriverLINX designates as Logical Channel 0. DriverLINX defines two additional Logical Channels for the external clock and trigger signals but applications cannot directly read their values.

Logical Channel	DriverLINX Function	DAS-800 Series External Connector
0	Standard Digital Input	IP1 … IP3
1	External Trigger	IP1/TRIG
2	External Clock	INT_IN/XCLK

Single Channel Digital Input

In single channel mode, the DAS-800 Series acquires all data from one channel.



Edit Service Request

Request

Device: Device 0 | Subsystem: Digital input | Mode: Interrupt | Operation: Start

□ Audit only

Events

○ Timing >> Rate | ○ Start >> Command | ○ Stop >> Terminal count

Select >>

● Channels
○ Buffers
○ Flags

Select Channels

Channel: 0 | Gain: | Chan 0 | Format: | Autozero:

● Single
○ Start/Stop
○ List

□ Simultaneous

How to set up the DAS-800 Series to read from a single channel.

Multi-channel Digital Input Range

Even though the DAS-800 Series has only one digital input channel, DriverLINX supports specifying a channel range for compatibility with applications that use this method.

In multi-channel range mode, the DAS-800 Series acquires all data from a consecutive range of digital channels.

- The Start and Stop Channel must specify channel 0.

Multi-channel Digital Input List

Even though the DAS-800 Series has only one digital input channel, DriverLINX supports specifying a channel range for compatibility with applications that use this method

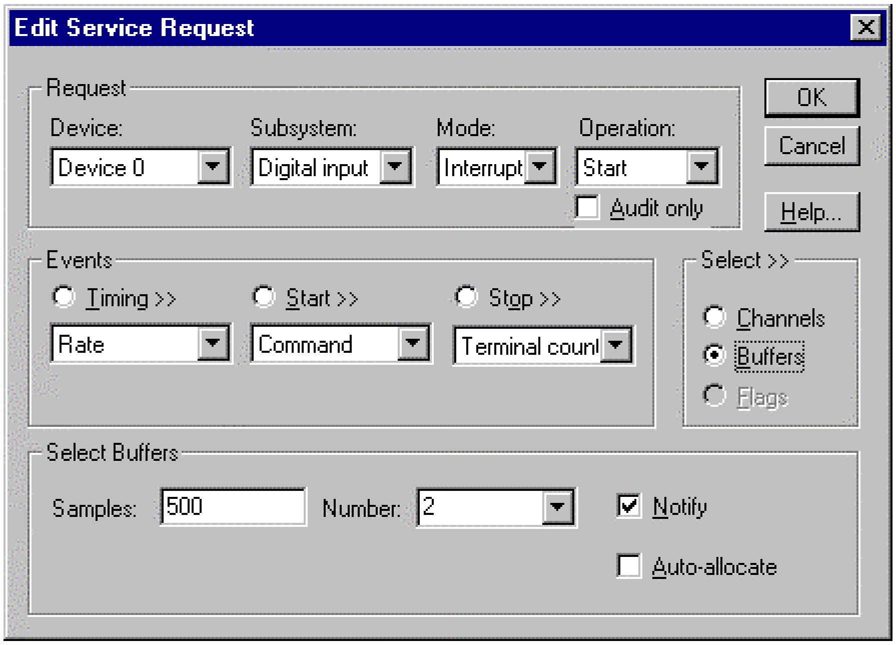
In multi-channel list mode, the DAS-800 Series acquires all data from a random list of digital channels.

- The channel list may contain only one channel.
- As the DAS-800 Series only has a single digital input channel available for reading, this technique is equivalent to Single Channel Digital Input.

Digital Input Buffers

DriverLINX supports both single-value digital input and buffered digital input.

- **For single-value input**, specify the *Number* of buffers as **0** and the number of *Samples* as **1**.
- **For buffered input**, specify the *Number* of buffers from **1** to **256** and the number of *Samples* as desired.



Edit Service Request

Request

Device: Device 0

Subsystem: Digital input

Mode: Interrupt

Operation: Start

□ Audit only

Events

○ Timing >> Rate

○ Start >> Command

○ Stop >> Terminal count

Select >>

○ Channels

● Buffers

○ Flags

Select Buffers

Samples: 500

Number: 2

☑ Notify

□ Auto-allocate

How to set up the DAS-800 Series to read digital samples using data buffers.

An individual DriverLINX buffer may have any size as long as the buffer length holds an integral number of channel scans (i.e., a multiple of the number of digital input channels you’re acquiring). This restriction enforces the requirement that all input channels have the same number of samples.

Digital Input Messages

For digital input operations, DriverLINX can report the following messages to the application:

DriverLINX Message	Explanation
Service Start	DriverLINX has started the acquisition task.
Service Done	DriverLINX has completed the acquisition task.
Buffer Filled	DriverLINX has filled a data buffer with digital input
Data Lost	DriverLINX has detected a digital input data overrun condition.
Critical Error	DriverLINX has encountered an unexpected hardware or software condition.

DriverLINX Event message for digital input

Digital Output Subsystem

The following sections describe how DriverLINX implements Digital Output Subsystem features for the DAS-800 Series.

Digital Output Modes

The Digital Output Subsystem supports the following modes:

- **Polled**—For single value digital output samples.
- **Interrupt**—For buffered transfers using programmed I/O.
- **Other**—For subsystem initialization and data conversion.

Digital Output Operations

The DAS-800 Series Digital Output Subsystem supports the following DriverLINX operations:

- **Initialize**—aborts any active interrupt data-acquisition tasks and stops the clock. DriverLINX prevents one application from interfering with another application's data-acquisition tasks.
- **Start**—initiates a data-acquisition task using the Mode, Timing, Start, and Stop Events, the Logical Channels, and the Buffers the application specified in the Service Request.
- **Status**—reports the buffer position of the next sample that DriverLINX will write from a buffer.
- **Stop**—terminates a digital output data-acquisition task.
- **Message—**DriverLINX displays a pop-up dialog box for the user containing the text for the current DriverLINX error message.

Digital Output Initialization

By default, the Digital Output subsystem writes zero into the digital output port. You can specify a different initial output value using the *Configure DriverLINX Device* dialog. See "Digital Output Subsystem Page" on page 20.

Digital Output Timing Events

Timing Events specify how the hardware paces or clocks writing Digital Output samples. DriverLINX uses the Timing Event to program when the DAS-800 Series writes the next digital output sample from the port.

The DAS-800 Series supports the following Timing Events:

- **None**—Output requires no pacing as DriverLINX is writing only a single value.
- **Rate—**The DAS-800 Series supports only fixed rate digital output using an internal hardware clock.
- **Digital**—DriverLINX uses an external digital input signal to pace the acquisition of the next sample.

None or Null Event

The Null Event specifies that the task does not need a clock to determine when to write the next sample.

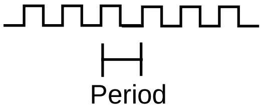
Rate Event

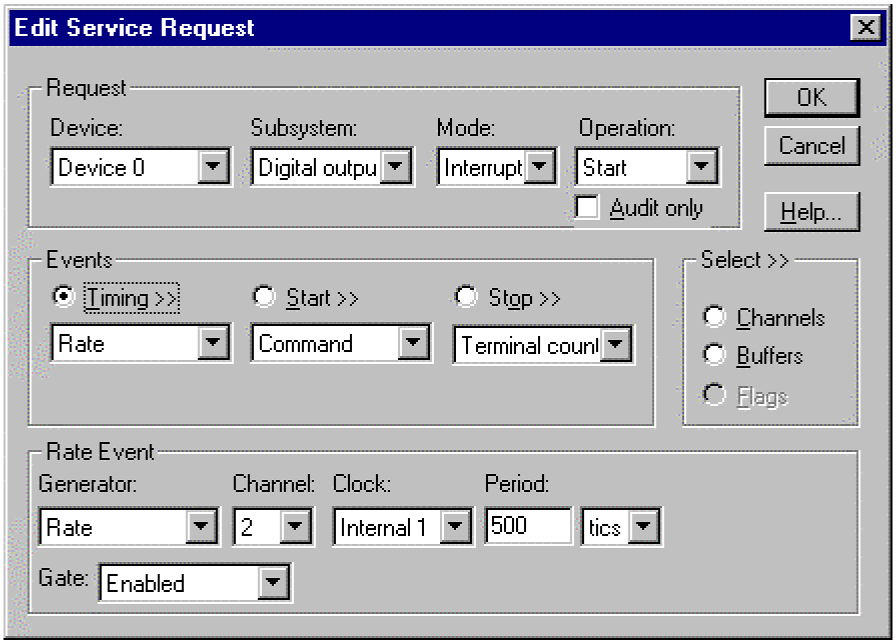
The DAS-800 Series supports one type of Rate Event for digital output:

- **Rate Generator**—Generates a fixed rate clock with equal time intervals between tics.

Rate Generator: Internal Clocking

An internally clocked Rate Generator produces a fixed rate clock with equal time intervals between tics.





Request

Device: Device 0

Subsystem: Digital outpu

Mode: Interrupt

Operation: Start

□ Audit only

Events

● Timing >> Rate

○ Start >> Command

○ Stop >> Terminal count

Select >>

○ Channels

○ Buffers

○ Flags

Rate Event

Generator: Rate

Channel: 2

Clock: Internal 1

Period: 500 tics

Gate: Enabled

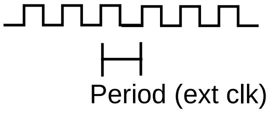
How to set up the DAS-800 Series for fixed rate sampling using an internal clock.

- Specify internal clocking using a **Rate** *Generator* on *Channel* **2** with an **Internal 1** *Clock* source.
- The *Period* property specifies the time interval between samples in tics, where a system timer tic is 1 µs, or 1 MHz. The minimum period is 100 tics, or 10 kHz. The maximum period is 4,294,967,295 tics ($2^{32} - 1$), or 0.0002 Hz.

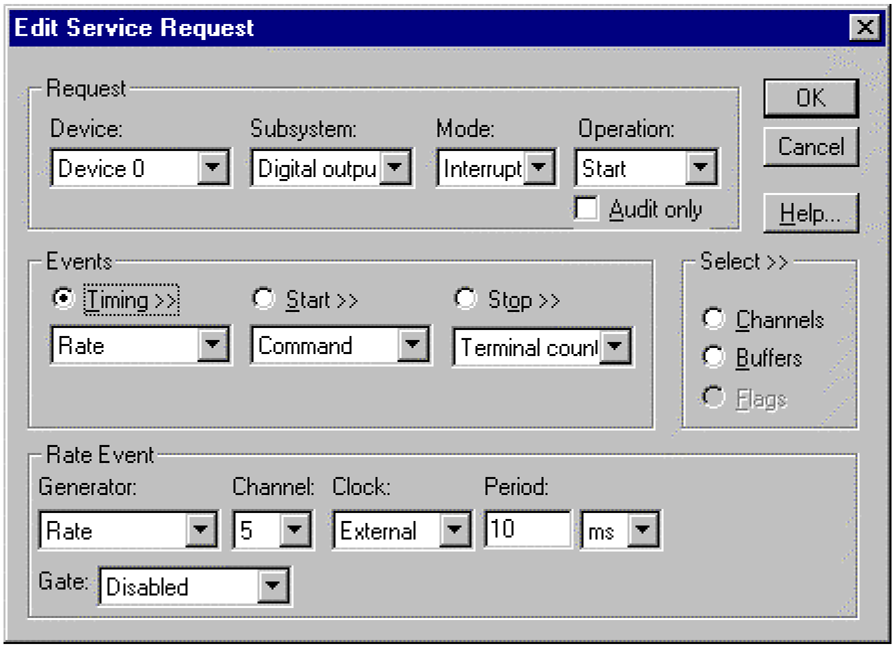
For hardware independence, specify the clock channel using the symbolic constant, DEFAULTTIMER, which always maps to the default Logical Channel for digital output timing.

Rate Generator: External Clocking

An externally clocked Rate Generator produces a rate clock with unknown time intervals between tics.



Use an externally clocked rate generator when you want to synchronize digital output samples with a recurrent external signal. In this mode you'll need a separate external clock tic for each digital sample you want to write.



Edit Service Request

Request

Device: Device 0

Subsystem: Digital outpu

Mode: Interrupt

Operation: Start

□ Audit only

Events

● Timing >> Rate

○ Start >> Command

○ Stop >> Terminal count

Select >>

○ Channels

○ Buffers

○ Flags

Rate Event

Generator: Rate

Channel: 5

Clock: External

Period: 10 ms

Gate: Disabled

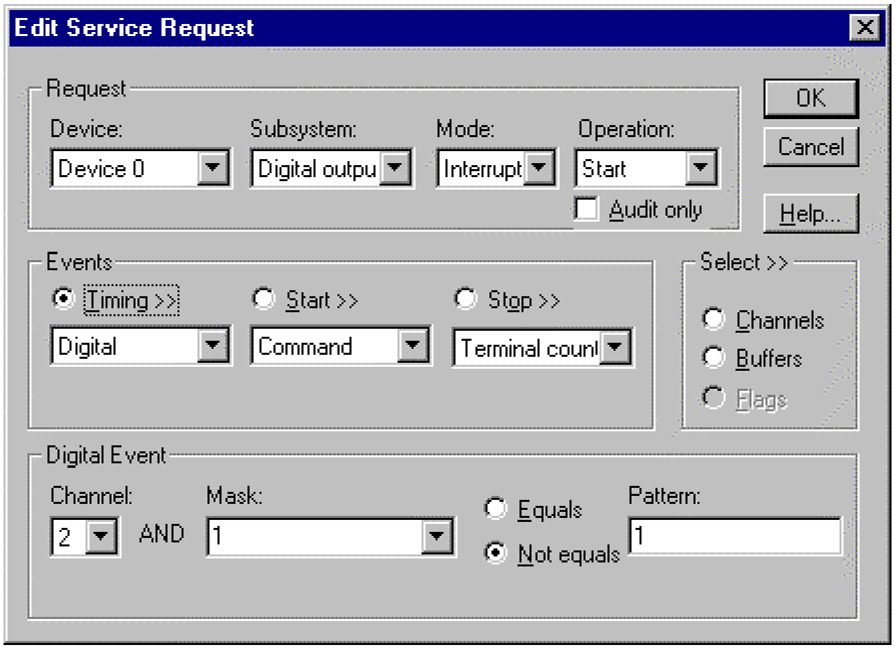
How to set up the DAS-800 Series for fixed rate sampling using an external clock.

***BE SURE** that the external clock source is TTL compatible, 0 V minimum to +5 V maximum!*

- Specify external clocking using a **Rate** *Generator* on *Channel* **5** with an **External**, or **External-** *Clock* source. See "Counter/Timer Subsystem" on page 63 for a description of clock sources.
- Users should connect the external clock signal to the INT_IN/XCLK line.
- The *Period* may be any value as long as it is ≥ 50 tics, or 10 µs. The period value doesn't affect the external clock frequency, but DriverLINX requires a valid hardware value in case the application requests a timebase operation and to optimize data transfer between the driver and the application.

Digital Event

DriverLINX supports Digital Events as aliases for externally clocked Rate Generators. Use this technique for compatibility with data-acquisition products that only support external clock sources.



Edit Service Request

Request

Device: Device 0

Subsystem: Digital outpu

Mode: Interrupt

Operation: Start

□ Audit only

Events

● Timing >> ○ Start >> ○ Stop >>

Digital | Command | Terminal count

Select >>

○ Channels

○ Buffers

○ Flags

Digital Event

Channel: 2 AND Mask: 1

○ Equals

● Not equals

Pattern: 1

How to set up the DAS-800 Series for external rate sampling using a digital event.

- Specify external clocking using *Channel* **2.** For hardware-independence, you can specify the hardware external trigger channel by the symbolic constant, *DI_EXTCLK*.
- Users should connect the external clock signal to the INT_IN/XCLK line.
- Specify the *Mask* property as **1**, or **Bit 0**, to indicate that DriverLINX should only compare a 1-bit digital input value against the *Pattern* property.
- Specify the *Match* property as **Not equals**.
- Specify the *Pattern* property as **1** for a falling, or negative, edge clock (≠1).

Digital Output Start Events

Start Events specify when the DAS-800 Series hardware starts writing digital output data.

The DAS-800 Series supports the following Start Events for digital output:

- **None**—Use this event when the DriverLINX operation doesn’t require a Start Event.
- **Command**—DriverLINX starts the task on software command, i.e., as soon as DriverLINX finishes programming the DAS-800 hardware for the task.

None or Null Event

The Null Event specifies that the task does not need a Start Event to begin the task.

Command Event

The Command Event starts data acquisition as soon as DriverLINX has completed programming the DAS-800 hardware with the task parameters.

Digital Output Stop Events

Stop Events specify when the DAS-800 Series hardware stops writing digital output data.

The DAS-800 Series supports the following Stop Events for digital output:

- **None**—Use this event when the DriverLINX operation doesn't require a Stop Event.
- **Command**—DriverLINX stops the task on software command, i.e., when the application issues a Service Request with a *Stop* operation.
- **Terminal count**—DriverLINX stops the task after the DAS-800 Series hardware has written all the data buffers once.

None or Null Event

The Null Event specifies that the task does not need a Stop Event to end the task.

Command Event

The Command Event stops data acquisition when the user application changes the *Operation* property in the Service Request to *Stop* and resubmits the Service Request to DriverLINX.

In Stop-on-Command mode, DriverLINX continuously cycles through all the data buffers, writing to the digital port on the DAS-800 Series.

Terminal Count Event

The Terminal Count Event stops data acquisition after DriverLINX has written the digital output data from all the data buffers ***once***. Use terminal count when you want to write a fixed amount of data.

Digital Output Channels

The DAS-800 Series allows applications to specify the digital channels using three techniques:

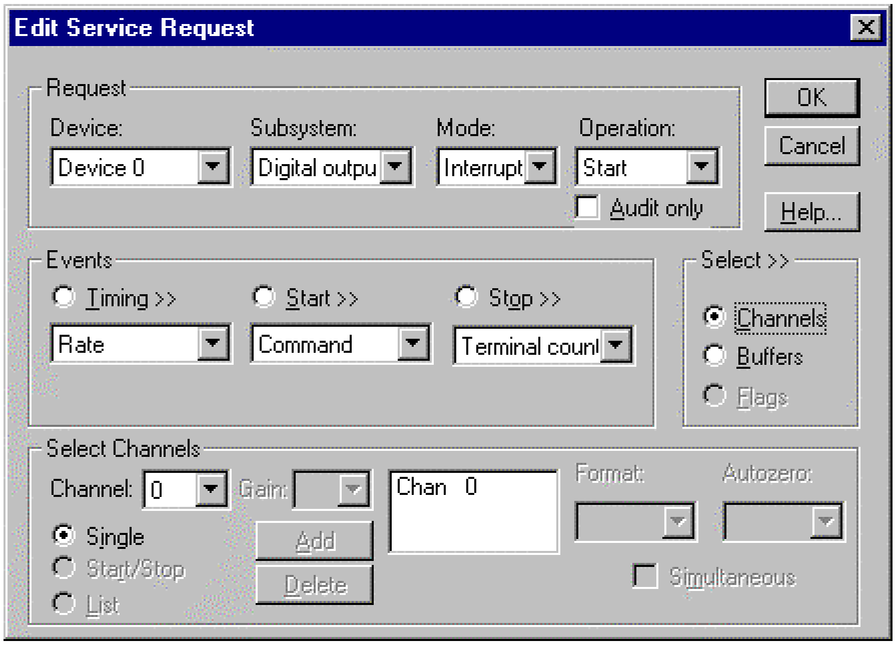
- **Start Channel**—Acquire data from a single channel.
- **Start/Stop Channel Range**—Acquire data from a consecutive range of channels.
- **Channel List**—Acquire data from a list of channels.

Digital Output Logical Channels

The DAS-800 Series has a single digital output port that DriverLINX designates as channel 0.

Single Channel Digital Output

In single channel mode, the DAS-800 Series writes all data from one channel.


Edit Service Request

Request

Device: Device 0

Subsystem: Digital outpu

Mode: Interrupt

Operation: Start

□ Audit only

Events

○ Timing >> Rate

○ Start >> Command

○ Stop >> Terminal count

Select >>

● Channels

○ Buffers

○ Flags

Select Channels

Channel: 0

Gain:

Chan 0

● Single

○ Start/Stop

○ List

Format:

Autozero:

□ Simultaneous

How to set up the DAS-800 Series to write a single digital output channel.

Multi-channel Digital Output Range

Even though the DAS-800 Series has only one digital output channel, DriverLINX supports specifying a channel range for compatibility with applications that use this method.

In multi-channel range mode, the DAS-800 Series acquires all data from a consecutive range of digital channels.

- The Start and Stop Channel must specify channel 0.

Multi-channel Digital Output List

Even though the DAS-800 Series has only one digital output channel, DriverLINX supports specifying a channel range for compatibility with applications that use this method

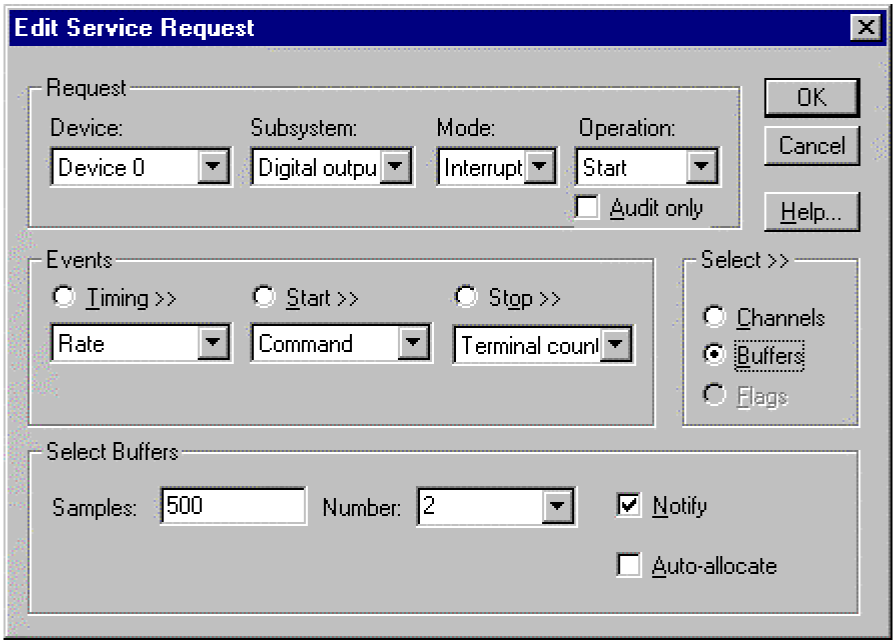
In multi-channel list mode, the DAS-800 Series acquires all data from a random list of digital channels.

- The channel list may contain only one channel.
- As the DAS-800 Series only has a single digital output channel available for writing, this technique is equivalent to Single Channel Digital Output.

Digital Output Buffers

DriverLINX supports both single-value digital output and buffered digital output.

- **For single-value output**, specify the *Number* of buffers as **0** and the number or *Samples* as **1**.
- **For buffered output**, specify the *Number* of buffers from **1** to **256** and number of *Samples* as desired.



Request

Device: Device 0

Subsystem: Digital outpu

Mode: Interrupt

Operation: Start

☐ Audit only

Events

○ Timing >> Rate

○ Start >> Command

○ Stop >> Terminal count

Select >>

○ Channels

● Buffers

○ Flags

Select Buffers

Samples: 500

Number: 2

☑ Notify

☐ Auto-allocate

How to set up the DAS-800 Series to write digital output using data buffers.

An individual DriverLINX buffer may have any size as long as the buffer length holds an integral number of channel scans (i.e., a multiple of the number of digital output channels you’re acquiring). This restriction enforces the requirement that all output channels have the same number of samples.

Digital Output Messages

For digital output operations, DriverLINX can report the following messages to the application:

DriverLINX Message	Explanation
Service Start	DriverLINX has started the acquisition task.
Service Done	DriverLINX has completed the acquisition task.
Buffer Filled	DriverLINX has written all data in the buffer.
Data Lost	DriverLINX has detected a digital output data overrun condition.
Critical Error	DriverLINX has encountered an unexpected hardware or software condition.

DriverLINX Event messages for digital output.

Counter/Timer Subsystem

The DAS-800 Series has counter/timers for both input/output pacing and independent counter/timer tasks. All models have an Intel 8254 Programmable Counter/Timer chip. This chip has three 16-bit counter/timers. On the DAS-800, two of these counter/timers have programmable interconnections to create a 32-bit clock to pace input/output tasks. In addition, each counter/timer has external connectors that permit external jumpers to create many complex counter/timer tasks. See “Counter/Timer Subsystem Signals” on page 29 for connection details.

The following table lists the Counter/Timer Subsystem’s Logical Channels and shows their allowable clock sources, modes and gates. See the *DriverLINX Counter/Timer User’s Guide* for detailed information on programming the Intel 8254 chip.

Logical Channels	Clocks		Modes	Gates
	Source	Tic Period		
0—C/T 0	External External-		Rate Gen Square Wave Divider Freq Measurement Count	Enabled No Connect High Level
			One-Shot Retrig One-Shot	Enabled No Connect Low Edge High Level
1—C/T 1	External External-		Rate Gen Square Wave Divider Freq Measurement Count	Enabled No Connect Hi Level
			One-Shot Retrig One-Shot	Enabled No Connect Low Edge Hi Level
2 — C/T 2	Internal 1	1 µs (1 MHz)	Rate Gen (pacer)	Enabled Disabled No Connect Hi Level
			Rate Gen (counter/timer) Square Wave Divider	Enabled No Connect High Level
			One-Shot Retrig One-Shot	Enabled No Connect High Level Low Edge
3 — C/T 1 & 2	Internal 1	1 µs (1 MHz)	Rate Gen (pacer)	Enabled Disabled No Connect Hi Level
			Rate Gen (counter/timer) Square Wave VDC Gen Divider	Enabled No Connect High Level
4 — C/T 0 & 2	Internal 1	1 µs (1 MHz)	Rate Gen Square Wave VDC Gen Divider	Enabled No Connect High Level
5 — INT_IN / XCLK	External External-		Rate Gen	Enabled Disabled No Connect High Level

Counter/Timer Subsystem Logical Channels and Allowed Clocks, Modes and Gates.

Uninstalling DriverLINX

How do I uninstall DriverLINX?

DriverLINX consists of three separate component installations:

- DriverLINX for the Keithley DAS-800 Series
- DriverLINX Programming Interfaces
- DriverLINX Documentation

You can uninstall the last two installations at any time without interfering with compiled applications that require DriverLINX drivers. To uninstall the latter components, run the “Add/Remove Programs” tool in the Windows Control Panel.

To uninstall DriverLINX drivers for the Keithley DAS-800 Series, you must

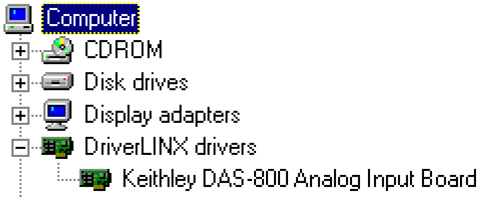
- Disable the DriverLINX driver.
- Shut down your computer to remove the hardware.
- Reboot your computer to unload the driver.
- Run the DriverLINX uninstall program.

How to Disable a DriverLINX Driver in Windows NT

1. From the Windows Start menu, select “Settings”, then “Control Panel”. Left click on the DriverLINX Configuration icon in the Control Panel.
2. Select the DAS-800 devices you want to disable.
3. Right click on each device and select “Disabled” on the popup menu.
4. Repeat steps 2-3 for each DAS-800 card that you are uninstalling.
5. Close the DriverLINX Configuration Panel.
6. When finished, shut down your computer and physically remove any installed DAS-800 hardware.
7. Reboot Windows.
8. To finish uninstalling, see “How to Remove DriverLINX for the Keithley DAS-800 Series” on page 66.

How to Disable a DriverLINX Driver in Windows 95/98

1. From the Windows Start menu, select "Settings", then "Control Panel". Left click on the System icon in the Control Panel. Select the "Device Manager" tab in the System Properties dialog.
2. Left click the "+" icon next to "DriverLINX drivers" to display the installed Keithley DAS-800 devices.



3. Select the DAS-800 device you want to disable.
4. Click the "Remove" button.
5. In the "Confirm Device Removal" dialog, select "OK".
6. Repeat steps 3-5 for each DAS-800 card or driver that you uninstalling.
7. When finished, click "Close", shut down your computer, and physically remove any installed DAS-800 hardware.
8. Reboot Windows.
9. To finish uninstalling, see "How to Remove DriverLINX for the Keithley DAS-800 Series" on page 66.

How to Remove DriverLINX for the Keithley DAS-800 Series

1. From the Windows Start menu, select "Settings", then "Control Panel". Left click on the Add/Remove Programs icon in the Control Panel.
2. Select "DriverLINX for Keithley DAS-800" in the Add/Remove Programs Properties dialog.
3. Click the "Add/Remove…" button.
4. Answer "Yes" to "Are you sure you want to remove 'DriverLINX for Keithley DAS-800 Series' and all of its components?" in the Confirm File Deletion dialog.
5. The DriverLINX uninstall program will proceed.

The uninstall program will not remove the folder, "\DrvLINX4\System". This folder contains copies of any \Windows\System or \Windows\System32 files that the original DriverLINX installation updated.

Troubleshooting

Solving Problems

Correct operation of your DAS-800 hardware requires successful completion of four steps.

1. Windows finds free resources for the DAS-800 board.
2. The DAS-800 address switches are set to the assigned address resource.
3. You configure the DAS-800 drivers using the DriverLINX Configuration Panel.
4. Windows loads the DAS-800 drivers into memory.

If you are having a problem installing or configuring your DAS-800 product, review the following notes. If these notes do not solve your problem, or your problem is not described, then contact technical support and fully describe your problem.

Solving Problems Installing Drivers

The DriverLINX installation program runs a wizard that assists you in installing, registering and configuring the DriverLINX driver for your board. If you would like to repeat any steps with the wizard, click here ↖.

Solving Problems Configuring the Drivers

Windows 95/98 assigns hardware resources for the DAS-800, but you must still configure the DAS-800 drivers before using them. The DriverLINX configuration requires that you select the hardware model of your DAS-800 board.

On Windows NT, you must, also, manually enter the address and interrupt resource assignments. See “Configuring the DAS-800 Series” on page 11 for more information.

Solving Problems Loading Drivers

Before the DAS-800 drivers can load, you must

1. Install the DriverLINX software.
2. Install the DAS-800 hardware into your computer.
3. Configure DriverLINX.
4. Reboot your computer.

If you have not completed the above steps, please do so before proceeding.

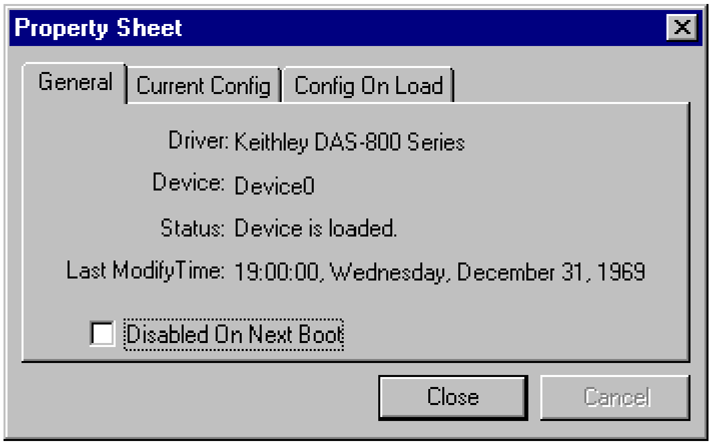
On Windows NT you must determine free hardware resources for the DAS-800 using Windows NT Diagnostics . On Windows 95/98, the operating system will automatically assign hardware resources to the DAS-800 cards. Automatic resource assignment can fail sometimes on

- Older PCI computers.
- Computers with ISA cards installed.
- Computers with no free hardware resources.

Sorting through all possibilities can be a challenge due to the sheer number of combinations of hardware designs, PC plug-in boards, and versions of Windows. The following sections will help you gather information about why a driver may have failed to load. This information is essential for you or technical support to solve your problem.

Did the DriverLINX Driver Load?

1. Run “DriverLINX Configuration” from Windows Control Panel.
2. Select the “DriverLINX” tab.
3. Click the “+” icon next to DriverLINX to expand the list of drivers, if necessary.
4. Select “Keithley DAS-800”. Click “+”, if necessary, to expand the list.
5. Select the line with the number of the Logical Device you configured. If the number does not exist, you did not configure the driver. See “Configuring the DAS-800 Series” on page 11.
6. Click the “Properties…” button and then select the “General” tab.
7. Do you see “Status: Device is loaded”? If not, did you reboot the computer after configuring? If not, reboot now and repeat the above steps.



Driver: Keithley DAS-800 Series

Device: Device0

Status: Device is loaded.

Last ModifyTime: 19:00:00, Wednesday, December 31, 1969

□ Disabled On Next Boot

8. If you rebooted the computer after configuring and Windows did not load your device, see “Checking for Device Errors” on page 69.

Checking for Device Errors

When a DriverLINX kernel driver cannot load, it writes an explanation into the system event log. You can view this log under Windows 95/98 or Windows NT using the DriverLINX Event Viewer.

Windows 95/98 maintains additional driver information in the Device Manager. Also see “Getting More Driver Information on Windows 95/98” on page 69.

1. Run “DriverLINX Event Viewer” from the DriverLINX folder.
2. Click on the “+” icon next to “DriverLINX” in the left panel.
3. Select the abbreviation for your driver.
4. Does the first line in the right panel show a current error?
5. Double click on the error line to see more detail and an explanatory message.
6. If you cannot resolve the problem yourself, please provide this error information when contacting technical support.

Getting More Driver Information on Windows 95/98

Windows 95/98 reports additional information about device status using the Device Manager. To access this utility,

1. Right click on “My Computer” and then select “Properties”.
2. Select “Device Manager” and “View devices by type”.
3. Does “DriverLINX drivers” appear in the list? If not, see “Solving Problems Installing Drivers” on page 67.
4. Click the “+” next to “DriverLINX drivers”.
5. Does your DAS-800 product appear in the list? If not, see “Solving Problems Installing Drivers” on page 67.
6. Does the icon next to your DAS-800 product display an exclamation point (!)? If no, Windows has loaded your DAS-800 driver.
7. Select the line with the “!” and then click “Properties”.

8. The General tab will show the reason why the driver did not load.

9. The Resources tab will show if Windows detected an unresolvable hardware conflict.

Getting More Driver Information on Windows NT

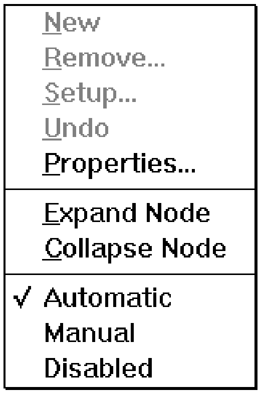
On Windows NT, the only reasons that a driver does not load are

- You did not install the driver software.
- You did not correctly configure the driver.
- You changed the driver startup parameters.

An incorrectly configured driver will report the reasons that it failed to load into the Windows Event Log. See “Checking for Device Errors” on page 69 for more information.

On Windows NT, DriverLINX drivers load automatically during system boot. An administrator can change the startup command for any NT driver to either “manual” or “disabled”.

1. Run “DriverLINX Configuration” from Windows Control Panel.
2. Select the “DriverLINX” tab.
3. Click the “+” icon next to DriverLINX to expand the list of drivers, if necessary.
4. Select “Keithley DAS-800”. Click “+”, if necessary, to expand the list.
5. Select the line with the number of the Logical Device that did not load.
6. Right click the mouse to see a popup menu.



7. Select “Automatic” to instruct Windows to load the driver the next time you reboot.

Generating a DriverLINX Configuration Report

Your DriverLINX installation includes a troubleshooting tool that generates a report of your DriverLINX configuration. If you call Technical Support, after reading “Solving Problems” on page 67, they may ask you to generate and e-mail this report to help you solve installation and configuration problems.

What is in the Report?

The troubleshooting tool analyzes your computer to obtain information about DriverLINX and operating system software that would assist Technical Support in troubleshooting a problem you are having. It includes information on DriverLINX files, environment variables, registry entries, hardware and the operating system.

How do I Generate the Report?

You can easily generate the report by clicking this shortcut . Once the troubleshooting tool generates the report, you will have the opportunity to review it and make deletions, if desired, before e-mailing it to Technical Support. If you do not have direct access to e-mail, you can save the report to a disk file and send a copy later. A Technical Support engineer will guide you through these steps when you are asked to send a report.

Glossary of Terms

A/D

Abbreviation for Analog-to-Digital, a process that converts a continuous analog signal into a discrete digital approximation of the analog signal.

ADC

Abbreviation for Analog-to-Digital Converter, the hardware that performs the A/D conversion.

API

Abbreviation for Application Programming Interface. An API defines the syntax of the data structures and functions of software services.

Buffer

A block of memory used to receive data from a data-acquisition device or to write data to a data-acquisition device.

Clocking

A periodic pulse or signal that data-acquisition hardware uses to read or write the next sample or block of samples. Also referred to as “pacing”.

D/A

Abbreviation for digital-to-analog, a process that converts a discrete digital value into a continuous analog voltage representing that value.

DAC

Abbreviation for digital-to-analog converter, the hardware that performs the D/A conversion process.

DMA

Abbreviation for Direct Memory Access, a technique where the system board can transfer data between a device and memory without using the CPU. In the PC, a standard chip on the system board controls the transfer.

Event

For DriverLINX, an event is the occurrence of a signal that clocks, starts, or stops a data-acquisition task.

Gating

A signal that enables and disables another signal or data-acquisition task depending on the value of the gate signal.

IRQ

Abbreviation for interrupt request. Peripheral hardware signals the CPU that it is ready to transfer data.

ISA

Abbreviation for Industry Standard Architecture. A standard for the original IBM AT bus specification that defines the bus structure, CPU and support chip architecture, and the clock frequency of the ISA bus.

ISR

Abbreviation for interrupt service routine, the software function inside a device driver that handles interrupt requests.

Logical Device

DriverLINX's designation for a specific data-acquisition board inside your computer.

Messages

In Windows and DriverLINX, a message notifies the application about the state of a process.

Modes

DriverLINX data-acquisition techniques.

Operations

Allowed DriverLINX data-acquisition commands.

Pacing

A periodic pulse or signal that data-acquisition hardware uses to read or write the next sample or block of samples. Also referred to as “clocking”.

Process

Refers to the collection of data and code segments and hardware resources that the operating system assigns to one application.

Service Request

A DriverLINX object or data structure that completely defines a data-acquisition task.

Subsystem

DriverLINX subdivides a general purpose data-acquisition device into six subsystems—Device, Analog Input, Analog Output, Digital Input, Digital Output, and Counter/Timer.

Triggering

The technique of using a pulse or signal to start or stop a data-acquisition task.

TTL

Abbreviation for transistor-transistor logic, a family of digital logic elements.