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Keithley CTM Series

# Using DriverLINX with Your Hardware

**KEITHLEY**

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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
- CTM Pulse Generator, a DriverLINX program that verifies the installation and configuration of DriverLINX for your counter/timer board
- 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 Counter/Timer Programming Guide*
- *DriverLINX Technical Reference Manual*
- Supplemental Documentation on DriverLINX and your data acquisition hardware

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## 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 CTM 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 CTM Series**

Shows how to configure the CTM Series using the *Configure DriverLINX Device* dialog box.

### **Using the CTM Series with DriverLINX**

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



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## Conventions Used in This Manual

The following notational conventions are used in this manual:

- A round bullet (●) identifies itemized lists.
- 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

- A box with a double line bounds tables of information.

Tables

*Concept*

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



# Configuring the CTM Series

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## 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 CTM Series boards.


Installing and configuring DriverLINX for the Keithley CTM Series boards requires three steps:

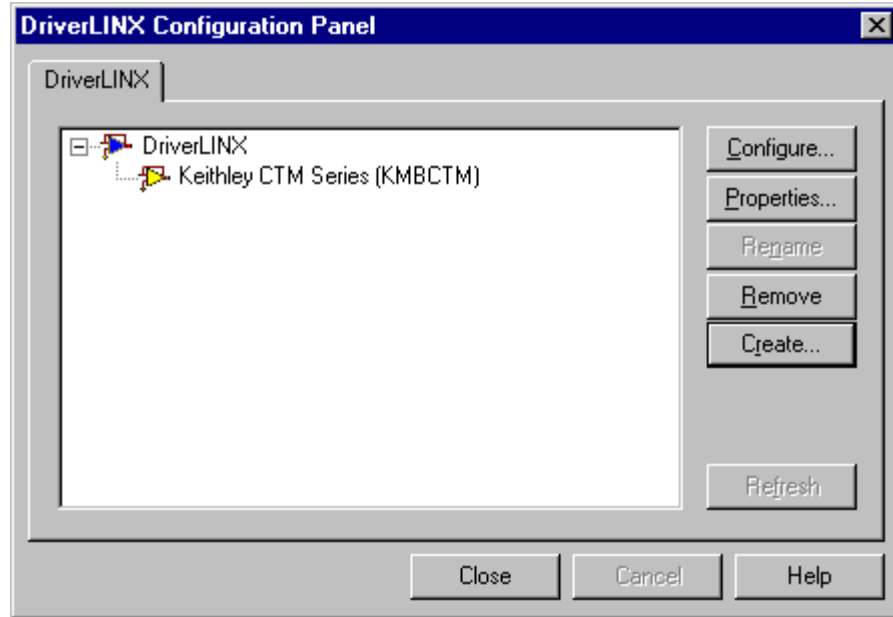
1. **Install DriverLINX.** Follow the instructions given by the installation program. The *Read Me First* instructions explain the components and drivers you can install.
2. **Configure DriverLINX.** See “Configure DriverLINX Device Dialog” on page 11 for configuration options specific to a Keithley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

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## Configure DriverLINX Device Dialog

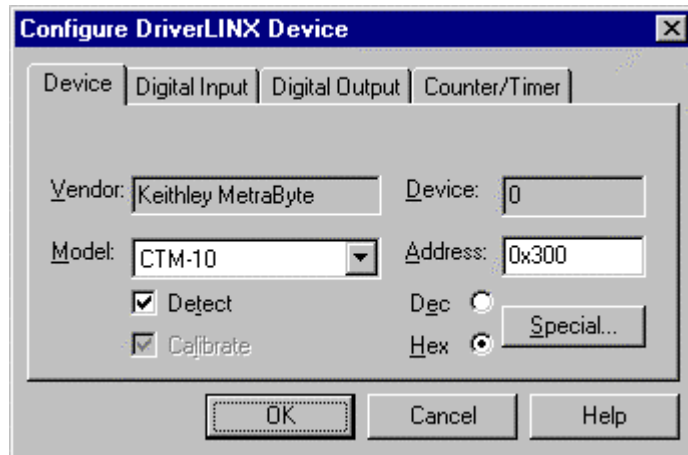
DriverLINX uses a standardized configuration protocol for all data-acquisition hardware. Configuration assigns a port address, interrupt resources and a DriverLINX Logical Device number to a specific CTM Series board in your computer.

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 .



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

## Device Subsystem Page



Use the Device subsystem page to tell DriverLINX the model name, address and, optionally, to disable detection and testing of your CTM Series board.

### ***Vendor***

The *Vendor* property displays “Keithley MetraByte, 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:

- CTM-5
- CTM-5A
- CTM-10

#### ***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 that address, select a different base address. Note: consult your hardware manual for the number of consecutive free addresses you need.

## 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.

### **Dec**

This radio button converts the *Address* property to decimal.

### **Hex**

This radio button converts the *Address* property to hexadecimal.

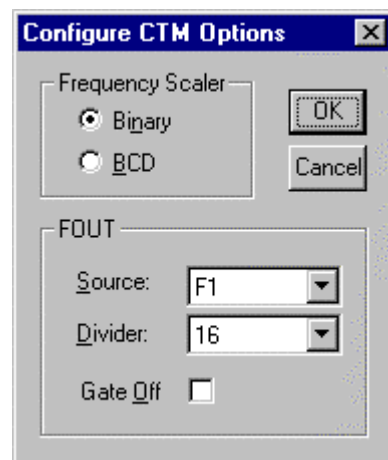
### **Detect**

The *Detect* property enables and disables DriverLINX’s hardware detection and testing algorithms. For maximum system reliability, leave this check-box marked. You may need to disable detection if your hardware has malfunctioning I/O ports that you’re not using or if the hardware testing algorithms interfere with permanently attached equipment.

### **Calibrate**

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

### **Special...**



The *Special...* button allows configuration of hardware-specific options.

For Am9513-based devices, you can select the follow options:





- **Frequency Scaler**—this switches the frequency divider for the master oscillator prescaler between binary and binary coded decimal (BCD) counting modes.
- **FOUT**—this specifies the clock source, prescaler value, and output (gate) option for the Am9513’s FOUT line.

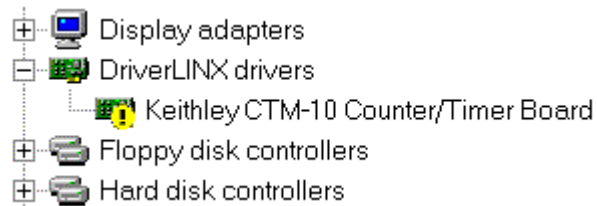
DriverLINX uses the same values for all Am9513 chips on the counter/timer. To set different characteristics for each Am9513 on the CTM-10 board, configure the hardware as two individual CTM-5A Logical Devices.

## Using the Windows 95/98 Device Manager

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

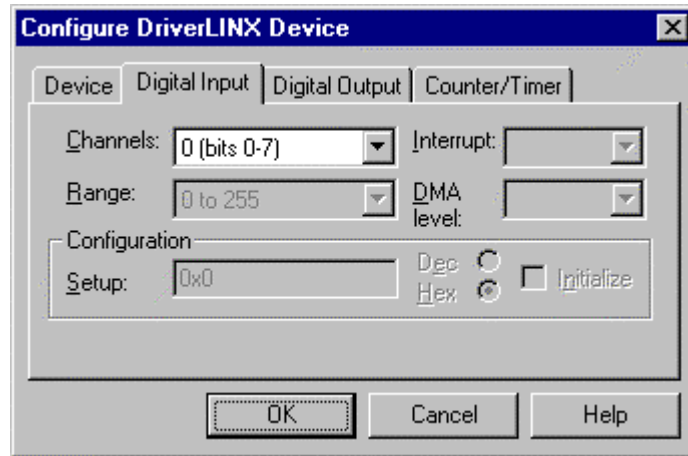
To view or change the settings for your board using the Device Manager:

1. Start the Device Manager by right-clicking on My Computer and selecting *Properties* or click here .
2. Click the *Device Manager* 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.)



5. Click the *Properties* button.
6. On the board's property page, click the *Resources* tab.
7. To change a setting, select it under *Resource Type* and click the *Change Setting* button. Windows will guide you in selecting an appropriate value.
8. When you are done, click *OK* to close the board's property page.
9. 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.
10. Restart Windows to load the Logical Device for your board using the new settings.

## Digital Input Subsystem Page



For the Keithley CTM Series, there are no configuration settings on the Digital Input Subsystem page. You can view the list of Logical Channels and their ranges.

### **Channels**

The *Channels* property allows you to select a Logical Channel for viewing the channel's range.

DriverLINX defines Logical Channels starting with zero. Each model has a different number of channels. See “Mapping Logical Channels to Digital Hardware Channels” in the *Counter/Timer Programming Guide* for more details.

### **Range**

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

### **Interrupt**

The Keithley CTM Series does not use interrupts for digital input. DriverLINX disables this property and displays it as blank.

### **DMA level**

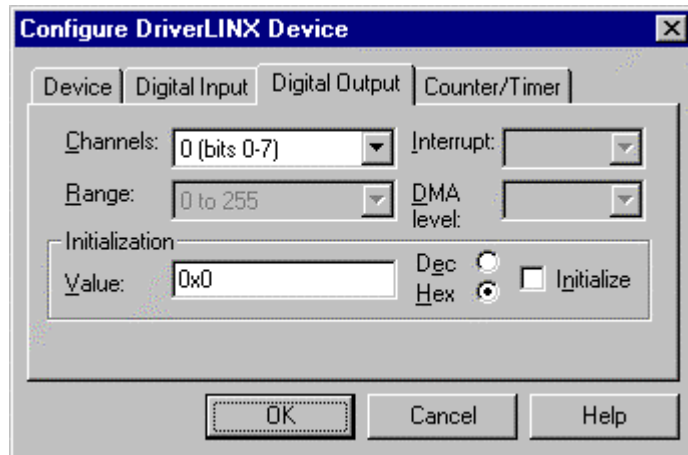
The CTM Series does not use system DMA channels. DriverLINX disables this property and displays it as blank.

### **Configuration Setup**

The *Configuration Setup* property specifies the input/output configuration of programmable digital I/O channels. The digital input and digital output channels on the Keithley CTM Series have fixed configuration. DriverLINX disables the property.



## Digital Output Subsystem Page



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

### **Channels**

The *Channels* property allows you to select a Logical Channel for initialization or viewing the channel's range.

### **Range**

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

### **Interrupt**

The CTM Series does not use interrupts for digital output. DriverLINX disables this property and displays it as blank.

### **DMA level**

The CTM 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 CTM Series, the default digital output value is zero.

### **Dec**

This radio button converts the *Initialization Value* property to decimal.

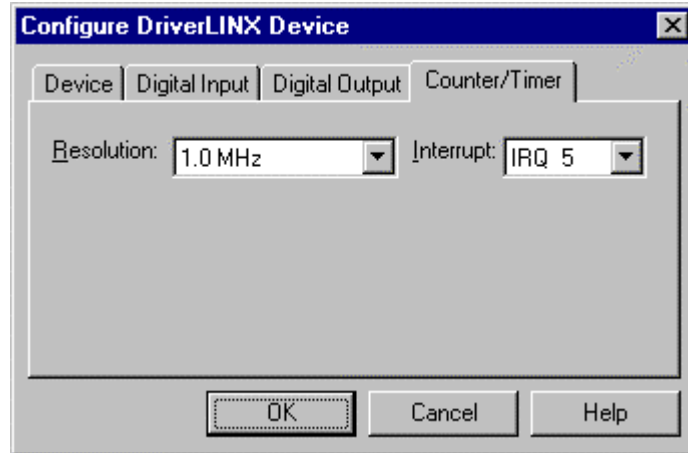
### **Hex**

This radio button converts the *Initialization Value* property to hexadecimal.

## Initialize

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

## Counter/Timer Subsystem Page



Use the Counter/Timer subsystem page to select the internal master clock frequency that the hardware inputs to the prescaler for the counter/timer channels and to define the interrupt channel, if any, for the counter/timers. Enter selections for the following fields:

### Resolution

The *Resolution* property specifies the internal master clock frequency that the counter/timers use.

### Interrupt

The *Interrupt* property selects an interrupt level for your board. Only a few models support hardware interrupts.

For the CTM-10, DriverLINX programs both Am9513 chips to use the same interrupt channel. If you want each chip to use a different interrupt, configure the CTM-10 as two, separate CTM-5A devices.

### Windows NT

Select an interrupt level for your board.

### Windows 95/98

Under Windows 95/98, *Add New Hardware* automatically selects an appropriate interrupt level. See "Using the Windows 95/98 Device Manager" on page 15.

# Using the CTM Series with DriverLINX

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## References

Please see the following references for information on programming your Keithley CTM Series board with DriverLINX:

- ***Counter/Timer Programming Guide***  
Shows you how to set up and use CTM Series hardware features with DriverLINX.
- ***DriverLINX Technical Reference Manual***  
Describes the DriverLINX Application Program Interface (API) for the DLL interface using C++.
- ***DriverLINX/VB Technical Reference Manual***  
Describes the API for the ActiveX (OCX) interface using VB or Delphi.
- **DriverLINX examples for your programming language**  
They are in the subfolders of your DriverLINX installation folder or on the original distribution media.

# Glossary of Terms

## **API**

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

## **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.

## **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.

## **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.

## **TTL**

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