DAS-4300 Series

USER'S GUIDE

DAS-4300 Series User's Guide

New Contact Information

Keithley Instruments, Inc.
28775 Aurora Road
Cleveland, OH 44139

Technical Support: 1-888-KEITHLEY
Monday – Friday 8:00 a.m. to 5:00 p.m (EST)
Fax: (440) 248-6168

Visit our website at http://www.keithley.com

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Preface

The *DAS-4300 Series User's Guide* provides the information needed to install and use the DAS-4301/8K high-speed analog input board.

The manual is intended for data acquisition system designers, engineers, technicians, scientists, and other users responsible for setting up and installing DAS-4301/8K boards. It is assumed that users are familiar with data acquisition principles, with their computer, and with their particular application.

The *DAS-4300 Series User's Guide* is organized as follows:

- Chapter 1 provides an overview of the features of the DAS-4301/8K board, including a description of supported software and accessories.

- Chapter 2 provides a technical description of the features of the DAS-4301/8K board.

- Chapter 3 describes how to unpack, set up, and install a DAS-4301/8K board.

- Chapter 4 describes how to use the scope and test program to test the functions of the DAS-4301/8K board.

- Chapter 5 provides troubleshooting information.

- Appendix A lists the specifications for DAS-4301/8K boards.

- Appendix B describes the Keithley Memory Manager.

- Appendix C presents bandwidth charts for the supported input ranges.

An index completes this manual.

> **Note:** Not all features of the DAS-4301/8K board are currently supported by all software packages. Refer to the documentation provided with your software package to determine which features are supported.

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1

Overview

The DAS-4300 Series consists of the DAS-4301/8K board. The DAS-4301/8K is an 8-bit data acquisition board available for IBM® PC AT® or compatible computers, with a conversion rate of up to 1 Gsamples/s. This chapter describes the features of the DAS-4301/8K board, the software that supports it, and available accessories.

Note: Not all features of the DAS-4301/8K board are currently supported by all software packages. Refer to the documentation provided with your software package to determine which features are supported.

Features

The major features of the DAS-4301/8K board are as follows:

- Supports high-speed data acquisition on one of two analog input channels accessed through standard BNC connectors.

- Provides an analog bandwidth at −3 dB of 250 MHz combined with a true 1 Gsamples/s conversion rate.

- Provides a flash converter with a resolution of 8 bits.

- Provides 16 software-selectable input voltage ranges from ±0.025 V to ±1 V.

- Provides onboard autocalibration to ensure accurate digitization.

- Stores digitized data in an onboard 8K byte memory buffer.

- Provides zero wait-state operations to transfer data off the board at up to 5M byte/s via the ISA bus.

- Supports jumper-selectable AC or DC signal coupling.

- Provides jumper-selectable 50 Ω or 1 MΩ input impedance.

- Provides a wide variety of trigger options, including internal and external triggering and post-trigger delay, which you can use to tailor the operation of the board to the specific requirements of your application.

- Supports Equivalent Time Sampling (ETS) and Random Interleaved Sampling (RIS) for repetitive waveforms; ETS and RIS provide conversion rates of up to 20 Gsamples/s.

- Provides a Synchro-Link digital signal processing (DSP) port to transfer data from onboard memory at up to 25 Msamples/s.

Supporting Software

The following software is available for operating the DAS-4301/8K board:

- **DAS-4300 Series standard software package** - This package, which comes with the board, is provided on 3.5-inch high-density disks. The package includes utility programs that allow you to configure, test, and calibrate the DAS-4301/8K board.

- **ASO-4300 software package** - The optional Advanced Software Option for DAS-4301/8K boards is provided on 3.5-inch high-density disks. The package includes function libraries for writing application programs using Microsoft C/C++, Borland® C/C++, or Microsoft Visual Basic® for Windows. The package also includes support files, utility programs, and language-specific example programs. Refer to the *DAS-4300 Series Function Call Driver User's Guide* for more information.

- **DAS-4300 Series configuration utility** - The configuration utility (CFG4300.EXE), provided as part of both the DAS-4300 Series standard software package and the ASO-4300 software package, runs under DOS and allows you to create or modify a configuration file. The configuration file provides information about the board; this information is used by the DAS-4300 Series Function Call Driver and other software packages to perform the board's operations. Refer to page 3-8 for more information.

- **DAS-4300 Series scope and test program** - The scope and test program (D4300.EXE) allows you to test the hardware features of a DAS-4301/8K board, calibrate the analog input circuitry of the board, and perform basic oscilloscope functions on the board. This program runs under DOS and is provided as part of both the DAS-4300 Series standard software package and the ASO-4300 software package. Refer to Chapter 4 for more information.

- **Visual Test Extensions™ (VTX™)** - These optional custom controls for Visual Basic for Windows help you write application programs for the DAS-4301/8K board. Refer to the *Visual Test Extensions™ User's Guide* and the VTX online help for more information.

- **VisualSCOPE** - This optional software package runs under Windows and emulates a stand-alone oscilloscope on your host computer. Refer to the VisualSCOPE documentation for more information.

Accessories

The SDC-5600 DSP board is an accessory for the DAS-4301/8K board. The SDC-5600 uses the optional DSP port on the DAS-4301/8K board to transfer data at 25M byte/s for digital signal processing applications. This accessory is available from Sonix Inc., 8700 Morrissette Drive, Springfield, VA 22152 (703-440-0222).

2

Functional Description

This chapter describes the features of the DAS-4301/8K board from a functional point of view. The intent of these descriptions is to familiarize you with the operating options and to enable you to make the best use of your board. Figure 2-1 shows a block diagram of the DAS-4301/8K board.
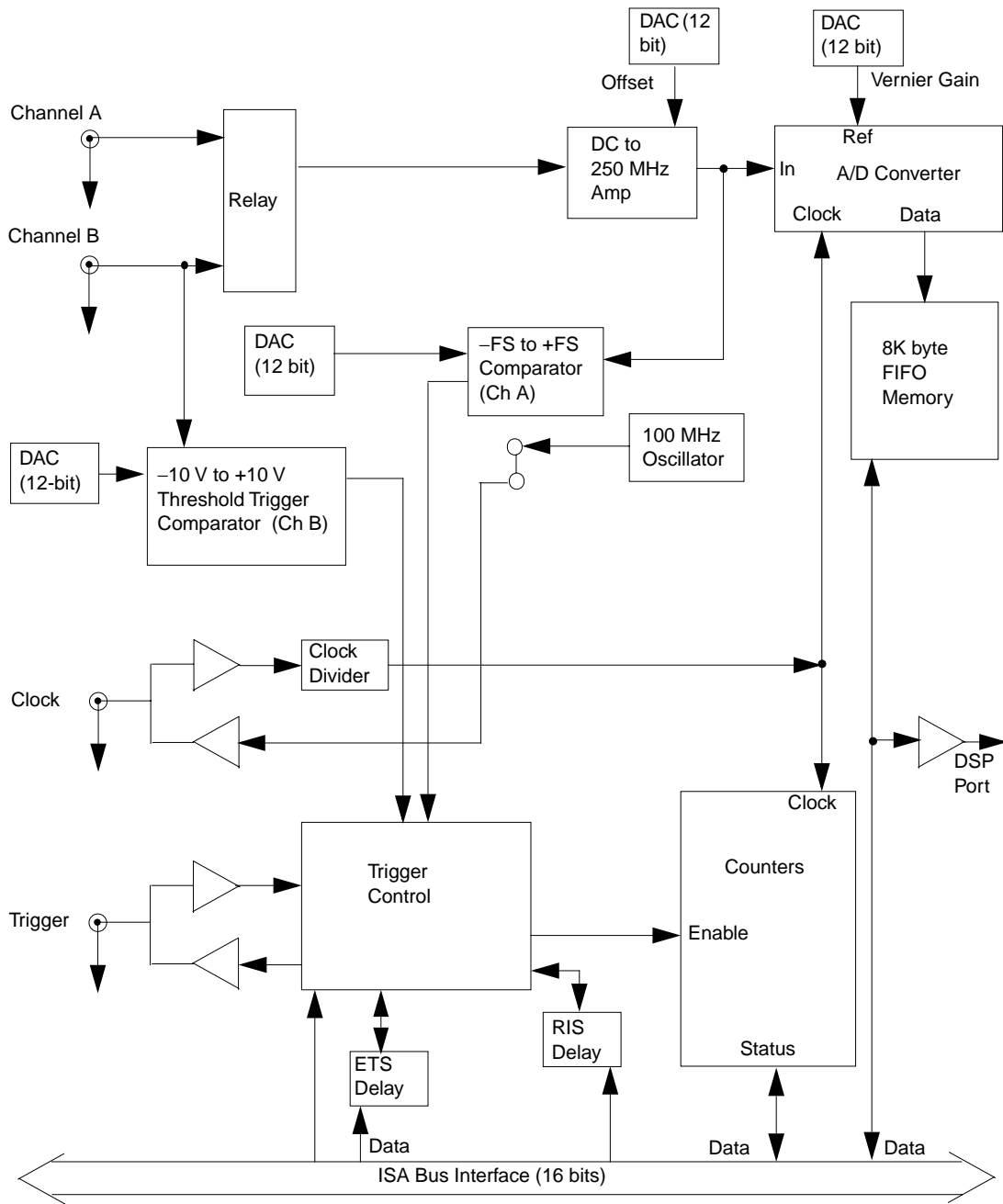
Figure 2-1. Block Diagram of the DAS-4301/8K

Functional Description

Channels

The DAS-4301/8K board can acquire data from one of two analog input channels at a time: Channel A, accessed from the Ch A connector, or Channel B, accessed from the Trg/Ch B connector.

You use software to specify Channel A. To specify Channel B, leave a jumper installed in positions 1 and 2 of jumper block J103 (the factory-default configuration), and use software to select Channel B.

Channel A is terminated with a 50 Ω impedance. Using a jumper, you can select an input impedance of 50 Ω or 1 MΩ. Refer to page 3-17 for more information.

The Trg/Ch B connector is also used for triggering; refer to page 2-10 for more information on triggering using this connector and selecting the input impedance for the signal attached to this connector.

Input Ranges

DAS-4301/8K boards support 16 bipolar, factory-calibrated analog input ranges. Through software, you specify the input range of the analog input channel.

Table 2-1 lists the analog input ranges supported by DAS-4301/8K boards and their corresponding gain codes. The gain code is used in software to determine the input voltage range. The choice of gain code affects the bandwidth on the DAS-4301/8K board; Appendix C shows the effect of the input ranges and gain code choices on the bandwidth of the DAS-4301/8K board.

Table 2-1. Analog Input Ranges

Analog Input Range	Gain Code	Analog Input Range	Gain Code
±25 mV	12	±200 mV	0
±31.25 mV	13	±250 mV	1, 10
±62.5 mV	14	±312.5 mV	6
±100 mV	8	±0.5 V	2, 11
±125 mV	4, 9, 15	±0.625 V	7
±156.25 mV	5	±1.0 V	3

The DAS-4301/8K board uses a 4096-step DC signal offset voltage and a 4096-step fine gain control to calibrate the voltage input ranges.

The scope and test program supports binary, twos complement, and absolute value data coding of the digitized analog input values. The DAS-4300 Series Function Call Driver and VTX use twos complement data coding only.

Memory

This section describes memory on the DAS-4301/8K board and on the host computer.

Onboard Memory

The DAS-4301/8K board contains an 8K byte (8,192 samples) memory buffer for storing digitized data as well as a nonvolatile EEPROM memory location for storing calibration values.

Whenever a DAS-4301/8K board is idle, the host computer can access the data in the onboard memory buffer, download it into its own main memory, and process it.

Host Computer Memory

DAS-4301/8K boards require part of both the host computer I/O address space and the host computer memory address space.

I/O Address Space

The DAS-4301/8K board uses a block of 16 bytes (ports) in the I/O address space of the host computer to set up the board's parameters. These ports can be located anywhere below 400h, provided that they are not used by your host computer. The default I/O address space for these ports is 250h to 25Fh.

You select the base address for the I/O address space by setting jumpers on the board; refer to page 3-12 for information.

Memory Address Space

The memory address space of the host computer is used for reading the acquired data from the DAS-4301/8K onboard memory buffer. The host computer accesses the onboard memory using the decoding logic on the DAS-4301/8K.

The onboard 8,192 byte buffer memory is mapped into a 16K byte window within the 1M byte address space in the host computer's upper memory (above the 640K byte user memory area). You select the base address for the memory address space by setting jumpers on the board; refer to page 3-14 for information. Figure 2-2 illustrates the memory address space of a host computer.

Note: The memory map must fall on a 16K byte boundary; this memory area must not be in use by other boards or devices.
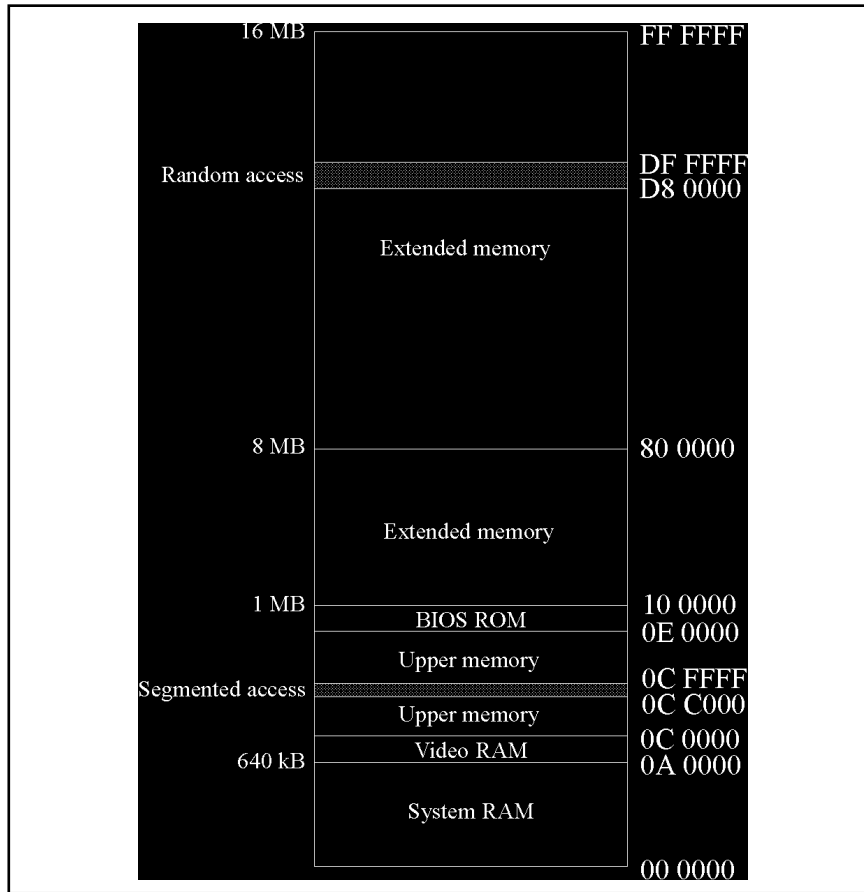
Figure 2-2. Host Computer Memory Address Space

Functional Description

Bus Interface

The ISA bus interface provides 16-bit data transfers and allows the host computer to initialize all onboard parameters, read from and write to onboard memory, and trigger the board.

As mentioned in the previous section, the bus interface uses two distinct address spaces of the host computer: a 16 byte consecutive segment in the I/O address space for control information and a 16K byte segment in the memory address space for data exchange. Both the I/O base address and memory address are jumper selectable; refer to page 3-12 and page 3-14 for more information.

The bus also provides a zero wait state, which allows data to be transferred off the board at a rate of 5M byte/s. You enable or disable the zero wait-state option through the configuration file; refer to page 3-8 for more information.

An interrupt can be generated to signal the host computer at the end of a data acquisition. You select the interrupt by setting jumpers on the board. Refer to page 3-15 for more information.

Pacer Clock

Through software, you select either an internal or external pacer clock to determine when each A/D conversion is initiated.

Internal Pacer Clock

The internal pacer clock circuit is composed of the onboard 100 MHz crystal oscillator, a 2000 Ω pull-up resistor to +5 V, and a PLL (phased locked loop) circuit to generate an effective conversion rate of 1 Gsamples/s. The clock signal is fed through a driver circuit to the Clk IO connector.

The available conversion rates and sample periods using the internal pacer clock are shown in Table 2-2.

Table 2-2. Available Conversion Rates Using Internal Clock

Conversion Rate	Sample Period	Conversion Rate	Sample Period
1 Gsamples/s	1 ns	12.5 Msamples/s	80 ns
500 Msamples/s	2 ns	6.25 Msamples/s	160 ns
250 Msamples/s	4 ns	3.125 Msamples/s	320 ns
100 Msamples/s	10 ns	1.5625 Msamples/s	640 ns
50 Msamples/s	20 ns	0.78250 Msamples/s	1280 ns
25 Msamples/s	40 ns		

You can also use the Clk IO connector as an output. When the board is configured for an internal pacer clock source, a TTL-level output signal is provided on the Clk IO connector that has the same frequency as the crystal oscillator.

External Pacer Clock

An external pacer clock is an externally generated TTL-level clock signal of at least 100 MHz, with a duty cycle of 50/50 ±20%, applied to the Clk IO connector. When you start an analog input operation, the board is armed. At the next rising edge (and at every subsequent rising edge of the external pacer clock), a conversion is initiated.

A 20 Ω series protection resistor is provided on the clock input signal. The 20 Ω resistor combined with the output resistance of the driver IC (a 74ABT series TTL input with a 2 kΩ pull-up resistor) makes the output appear as approximately 50 Ω.

You can use a jumper-selectable 50 Ω termination resistor on the clock input signal; this resistor is particularly useful when working with a signal driving a long line or a line that is driving many devices (where the DAS-4301/8K is at the end of the line). Refer to page 3-18 for more information on this jumper.

> **Notes:** A diode on the input limits signal excursions to +5.7 V and
> –0.7 V.
>
> Due to excessive loading of the signal, do not use the jumper-selectable
> 50 Ω termination resistor when using the clock output signal.

Triggers

A trigger is an event that determines when a DAS-4301/8K board
responds to either an internal or an external pacer clock. Depending on
the type of acquisition and setup parameters, the trigger event can occur
before, during, or after the actual sampling of data. The trigger signal can
originate from a variety of sources.

This section describes trigger sources, types of trigger acquisition, and
trigger synchronization on DAS-4301/8K boards.

Trigger Sources

The DAS-4301/8K board supports internal triggers, external analog
triggers, and external digital triggers.

Internal Trigger

An internal trigger (or software trigger) event occurs when a particular
instruction is executed by the host computer. When the trigger event
occurs, a signal is output on the Trg IO connector. At the end of data
acquisition, the signal on the Trg IO connector returns to its inactive state.

Using the test and scope program, you can program the edge polarity of
the trigger output signal. Using the DAS-4300 Series Function Call
Driver or VTX, you cannot program the trigger polarity; it is always
positive.

External Analog Trigger

An external analog trigger (or threshold trigger) event occurs when one of the following conditions is met by an analog input signal:

● The analog input signal rises above a programmable threshold (positive-edge trigger).

● The analog input signal falls below a programmable threshold (negative-edge trigger).

A TTL-level signal is output on the Trg IO connector when the trigger event occurs. At the end of data acquisition, the signal on the Trg IO connector returns to its inactive state.

Using the test and scope program, you can program the polarity of the trigger output signal. Using the DAS-4300 Series Function Call Driver or VTX, you cannot program the polarity of the trigger output signal; it is always positive.

You can use an external analog trigger in the following ways:

● You can trigger the DAS-4301/8K board using the analog input signal from the Ch A connector or from the Trg/Ch B connector on the board. When using the analog input signal as the trigger source, the trigger channel and the data acquisition channel must be the same. For example, if you are using the signal from the Ch A connector as the trigger source, you must use Channel A as the data acquisition channel. You specify the trigger channel and the data acquisition channel in software.

Using the test and scope program, you can program the trigger threshold in 4096 steps. Using the DAS-4300 Series Function Call Driver or VTX, you can program the trigger threshold in 256 steps.

● You can trigger the DAS-4301/8K board using the ±10 V analog input trigger signal from the Trg/Ch B connector. When using the ±10 V trigger signal, you can acquire data from either Channel A or Channel B. You specify the trigger channel and data acquisition channel using software.

Using the test and scope program, you can program the threshold in 4096 steps from −10 V to +9.995 V; the resolution is 12 bits. Using the DAS-4300 Series Function Call Driver or VTX, you can program the threshold in 256 steps from −10 V to +9.922 V; the resolution is 8 bits.

Using a jumper, you can select the input impedance (50 Ω or 5600 Ω) of the ±10 V trigger signal from the Trg/Ch B connector. Refer to page 3-18 for more information.

External Digital Trigger

A digital trigger event occurs when an externally generated TTL-level signal of programmable polarity (positive edge or negative edge) is detected as an input on the Trg IO connector.

A 20 Ω series protection resistor is provided on the trigger input signal of the Trg IO connector. The 20 Ω resistor combined with the output resistance of the driver IC (a 74ABT series TTL input with a 2 kΩ pull-up resistor) makes the output appear as approximately 50 Ω. You can use a jumper-selectable 50 Ω termination resistor on the trigger input signal; this resistor is particularly useful when working with a signal driving a long line or a line that is driving many devices (where the DAS-4301/8K is at the end of the line). Refer to page 3-19 for more information on this jumper.

Notes: A diode on the input limits signal excursions to +5.7 V and −0.7 V.

When you are not using the Trg IO connector for external digital triggering, you can use the Trg IO connector to output a TTL-level signal. If you use the trigger output signal, however, do not use the jumper-selectable 50 Ω termination resistor due to the excessive loading of the signal.

Trigger Acquisition

Depending on your application, you can sample data before and/or after a trigger event occurs. If you want to collect data after a specific trigger event, use post-trigger acquisition. If you want to collect data before or before and after a specific trigger event, use about-trigger acquisition.

The maximum number of samples you can collect for each trigger event is 8,192. The minimum number of samples you can collect for each trigger event depends on the conversion rate as follows:

- **Conversion rate of 100 Msamples/s and slower**: minimum of 1 sample in increments of 1 sample.

- **Conversion rate of 250 Msamples/s and faster**: minimum of 10 samples in increments of 10 samples.

Post-Trigger Acquisition

Use post-trigger acquisition to store data samples after a trigger event occurs. You can also use a programmable post-trigger delay. The delay is the number of samples after the trigger and before data acquisition starts. At a conversion rate of 100 Msamples/s or slower, the post-trigger delay can range from 0 to 65,536 samples (in increments of 1); at a conversion rate of 250 Msamples/s or faster, the post-trigger delay can range from 0 to 655,360 samples (in increments of 10).

Note: VTX does not support post-trigger delay.

To start a post-trigger acquisition, perform the following steps:

1. Set up all board parameters, such as the data acquisition channel, voltage input range, conversion rate, trigger source, trigger polarity, the number of samples to acquire after the trigger event, and the post-trigger delay, as appropriate. You need to set up these parameters only once unless your application requires a change.

2. Using software, arm the board to accept the next valid trigger event. Arming the board requires about 10 μs.

Once the board is armed, the next valid trigger event starts the acquisition. When the trigger event occurs, the post-trigger length, which includes the post-trigger delay and the number of samples to acquire (defined by the buffer length), is decremented until it reaches zero, at which point acquisition stops. Using software, you can poll a status bit or use an interrupt to determine if the acquisition is finished.

For example, assume the conversion rate is 50 Msample/s, the post-trigger delay is 10 samples and the buffer length is 190 samples. When a valid trigger event occurs, the first 10 samples are ignored, the remaining 190 post-trigger samples are collected, then the acquisition operation stops.

About-Trigger Acquisition

Use about-trigger acquisition to store data samples before a trigger event occurs or before and after a trigger event occurs.

To start an about-trigger acquisition, perform the following steps:

1. Set up all board parameters, such as the data acquisition channel, voltage input range, conversion rate, trigger source, trigger polarity, and the number of samples to acquire after the trigger occurs. You need to set up these parameters only once unless your application requires a change.

2. Using software, arm the board to accept the next valid trigger event. Arming the board requires about 10 μs.

Once armed, the board continuously acquires data and stores it in the onboard 8K byte memory buffer. The memory buffer must fill up with data at least once before the board can accept a trigger event. When a valid trigger event occurs, the specified number of post-trigger samples (defined by the buffer length) is collected.

For example, suppose you set the buffer length to 4,160 and start the about-trigger operation. Pre-trigger data is collected and begins to fill the 8K byte buffer. Once the buffer is filled, the board can accept a trigger; pre-trigger data continues to be collected and overwrites the data in the buffer until the trigger event occurs. When a valid trigger event occurs, the board collects 4,160 post-trigger samples then stops the acquisition. The number of pre-trigger samples in the buffer is 8,192 minus 4,160 or 4,032.

The minimum number of pre-trigger samples is 1; the maximum number of pre-trigger samples is 8,192.

Notes: The term pre-trigger acquisition is often used for an about-trigger acquisition when only the samples before the trigger event are significant. The DAS-4300 Series Function Call Driver differentiates between pre-trigger acquisition (where the number of post-trigger samples is zero) and about-trigger acquisition (where you specify the number of post-trigger samples); refer to the *DAS-4300 Series Function Call Driver User's Guide* for information. The DAS-4300 scope and test program uses the term pre-trigger mode for both pre-trigger acquisition and about-trigger acquisition.

You cannot specify a post-trigger delay for an about-trigger acquisition.

VTX does not support about-trigger acquisition.

Equivalent Time Sampling (ETS)

Equivalent time sampling (ETS) is an advanced feature that allows you to digitize high-frequency analog input signals and achieve faster conversion rates than 1 Gsamples/s. The advantage of ETS is that the total number of acquisitions needed to collect a waveform is deterministic; therefore, ETS is ideal for scanning repetitive waveforms quickly.

On the DAS-4301/8K board, ETS is implemented through a patented circuit (U.S. Patent No. 4,595,908). The analog signal to be digitized must be repetitive and coherent with a TTL-level trigger out signal on the Trg IO connector of the DAS-4301/8K board.

Using ETS, the board samples a repetitive signal several times with the pacer clock shifted relative to the input signal by a fraction of the sample period. With N acquisitions and a pacer clock shifted by the fraction of the sample period $1/(N * f_{clock})$ between the acquisitions, the effective conversion rate is $N * f_{clock}$. N is called the ETS factor. The maximum ETS factor is 20, corresponding to an effective conversion rate of 20 Gsamples/second. Other supported ETS factors are as follows: 2, 4, 5,

and 10 for effective conversion rates of 2, 4, 5, and 10 Gsamples/s, respectively. Figure 2-3 illustrates an ETS factor of 2.
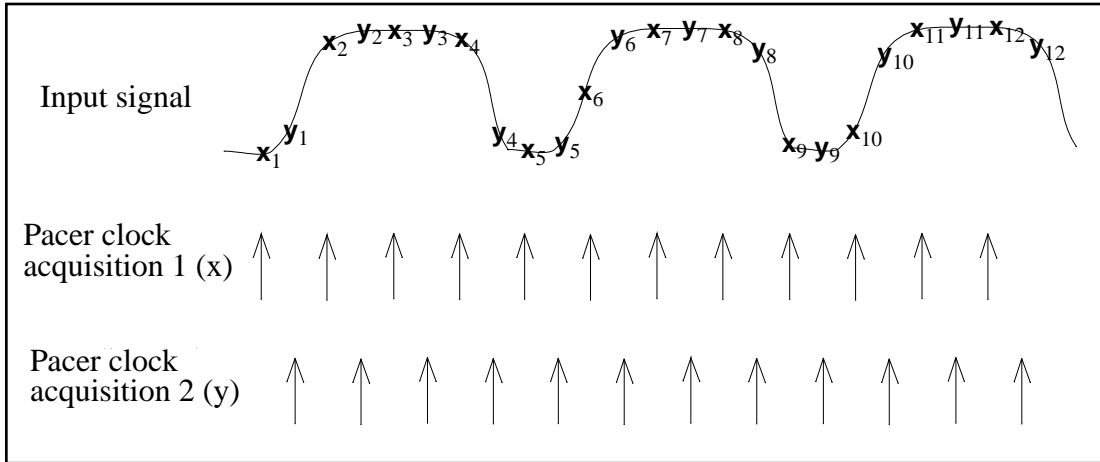
Figure 2-3. Equivalent Time Sampling (ETS)

On the DAS-4301/8K board, individual samples are stored in standard sequential format. Continuing with the previous example, the data is stored as follows:

x_1 x_2 x_3 x_4 ... x_n y_1 y_2 y_3 y_4 ... y_n

To reconstruct the correct sequence of samples, the host computer deinterleaves the data of the individual waveforms when transferring the data off the board. For the two waveforms (x and y) described previously, the data is transferred as follows:

x_1 y_1 x_2 y_2 x_3 y_3 x_4 y_4 ... x_n y_n

The ETS process is started by an internal (software) trigger that is generated by the DAS-4301/8K board. Note that when using ETS, the DAS-4301/8K board waits for an internal trigger only; external analog triggers and digital triggers cannot be used. When the trigger event occurs, an internal trigger signal is generated synchronously to the internal pacer clock, which performs an A/D conversion. The synchronous trigger signal is then delayed by a programmable fraction of

the pacer clock and output on the Trg I/O connector; this delay is called the ETS delay. The trigger output signal then generates the input signal, and the entire process repeats.

The effect of ETS is that samples are digitized at progressively increasing time intervals until the entire waveform is characterized. Since the ADC only digitizes one sample when a trigger is received, acquisition is not limited by the conversion rate of the ADC, but eventually by the total analog input circuitry of the board.

Figure 2-4 illustrates how ETS works. In this example, the delayed start of the input signal causes the DAS-4301/8K board to sample the signal at different points in the two acquisitions described previously. During acquisition 1 with a larger ETS delay shift, the pacer clock occurs earlier with respect to the input signal; therefore, the data from this acquisition is sorted into the even-numbered samples of the combined data set: 0, 2, 4, and so on. The data from acquisition 2 is sorted into the odd-numbered samples: 1, 3, 5, and so on.
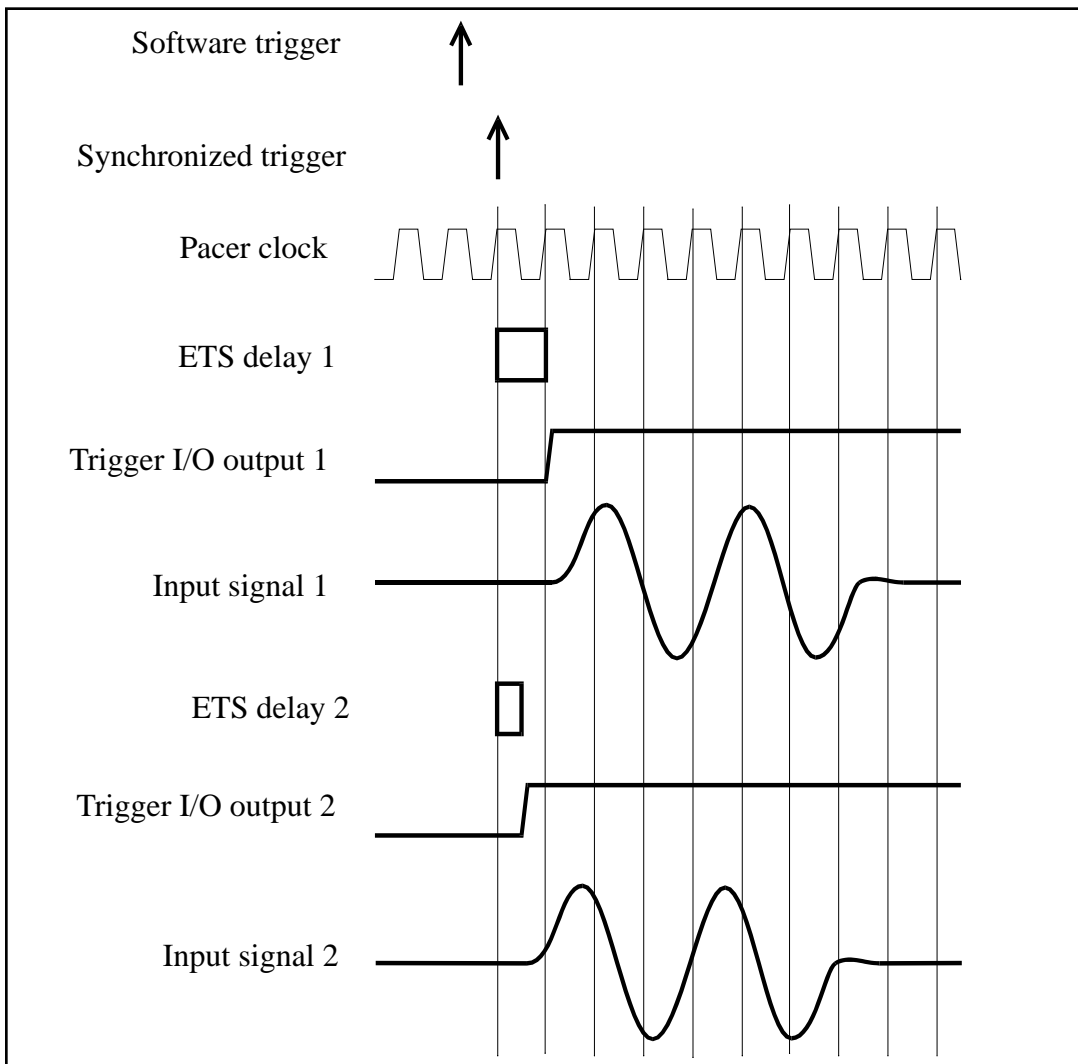
Figure 2-4. ETS Delay

Note: The DAS-4300 Series Function Call Driver and VTX do not support ETS.

Random Interleave Sampling (RIS)

In addition to ETS, the DAS-4301/8K board provides Random Interleave Sampling (RIS). Like ETS, RIS allows the DAS-4301/8K board to sample a repetitive signal at rates above 1 Gsamples/s. Unlike ETS, however, the signal does not have to be coherent with the pacer clock. This feature is particularly convenient in scope-type applications where you may not be overly concerned about the time it takes to complete the acquisition but you want to watch the screen filling with data.

One advantage of RIS over ETS is the ability to acquire and display pre-trigger data at sampling rates of up to 20 Gsamples/s. RIS also offers more trigger source options than ETS. The trigger for the signal can be derived from the signal (external software analog trigger), external hardware analog trigger, or external digital trigger. If the trigger source is external analog or digital, the trigger needs to be synchronized with the signal.

RIS offers the same sampling rates as ETS: 2, 4, 5, 10, and 20 Gsamples/s. During each acquisition, an entire waveform is collected. Ideally, at 20 Gsamples/s, 20 waveforms sampled at 1 Gsamples/s are required to reconstruct a waveform equivalently sampled at 20 Gsamples/s. However, because the waveforms fall randomly, many waveforms are usually required. The DAS-4300 scope and test program updates the waveform as each is acquired.

Figure 2-5 illustrates how RIS works.
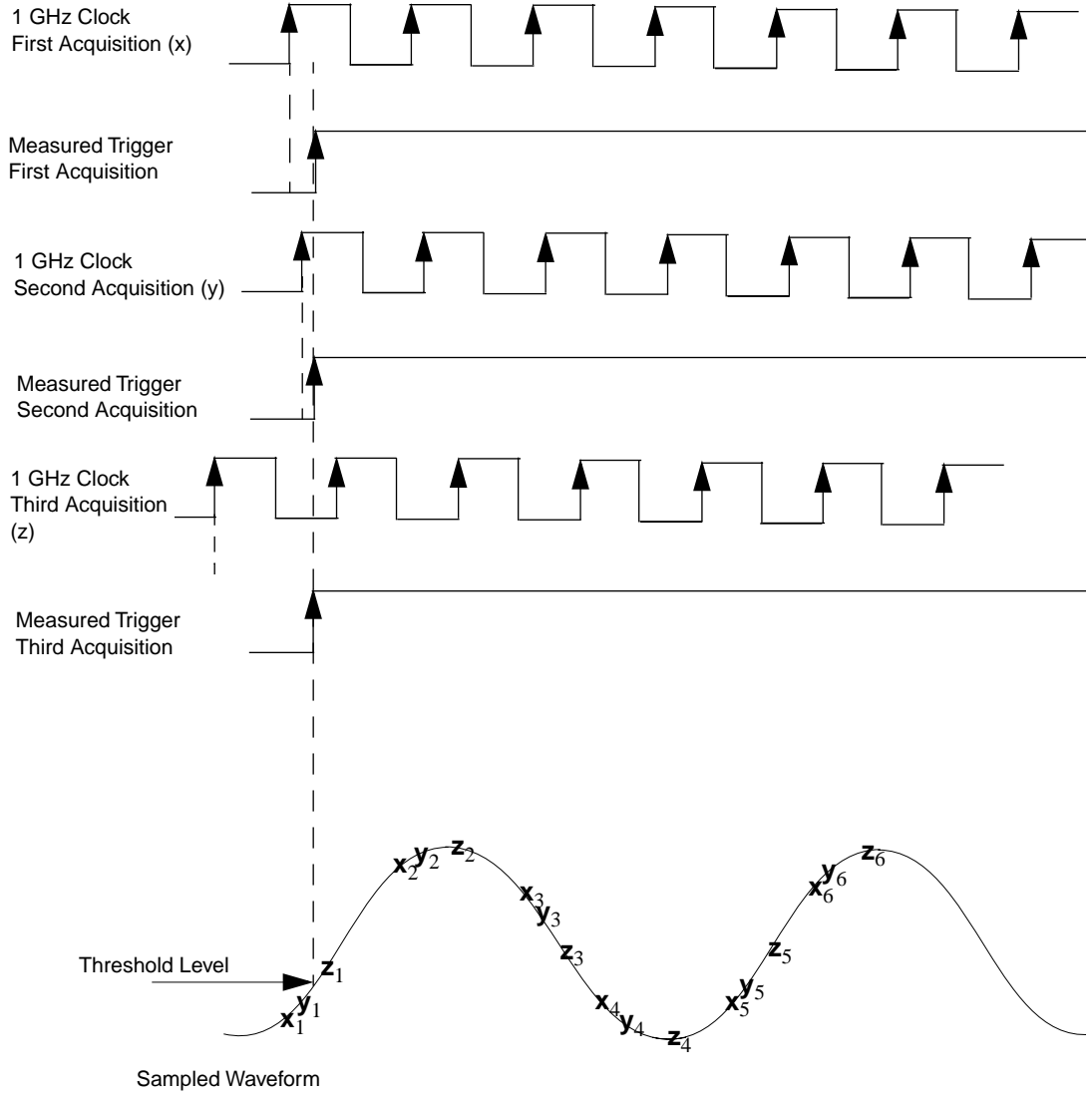
Figure 2-5. Random Interleave Sampling

Note: The DAS-4300 Series Function Call Driver and VTX do not
support RIS.

3

Setup and Installation

This chapter contains the information you need to set up and install your DAS-4301/8K board.

Unpacking the Board

Caution: A discharge of static electricity from your hands can seriously damage certain electrical components on any circuit board. It is recommended that you use wrist strap grounds when handling a board. If wrist strap grounds are not available, make sure that you discharge static electricity from yourself by touching a grounded conductor such as your computer chassis (your computer must be turned OFF).

Whenever you handle a board, hold it by the edges and avoid touching any board components. Avoid touching the gold edge connector as this may leave fingerprints that can degrade the electrical connections.

To prevent any damage to your DAS-4301/8K board, perform the following steps when unpacking the board:

1. Remove the wrapped DAS-4301/8K board from its outer shipping carton.

2. Carefully remove the board from its antistatic wrapping material. (You may wish to store the wrapping material for future use.)

Note: Do not remove the pink foam pad. Leave the board on the pink foam pad until you are ready to install the board in the computer.

3. Inspect the board for signs of damage. If any damage is apparent, arrange to return the board to the factory; refer to page 5-4 for more information.

4. Check the remaining contents of your package against the packing list to ensure that your order is complete. Report any missing items immediately.

5. Once you have determined that the board is acceptable, install the software and configure the board. Refer to the following sections for information.

Installing the Software

This section describes how to install the DAS-4300 Series standard software package and how to install the ASO-4300 software package from both DOS and Windows. To install other software packages, refer to the documentation supplied with the software package.

Installing the DAS-4300 Series Standard Software Package

To install the DAS-4300 Series standard software package, perform the following steps:

1. Make a backup copy of the supplied disks. Use the copies as your working disks and store the originals as backup disks.

2. Insert disk #1 into the disk drive.

3. Assuming that you are using disk drive A, enter the following at the DOS prompt:

```
A:install
```

The installation program prompts you for your installation preferences, including the drive and directory you want to copy the software to. It also prompts you to insert additional disks, as necessary.

4. Continue to insert disks and respond to prompts, as appropriate.

When the installation program prompts you for a drive designation, enter a designation of your choosing or accept the default drive C.

When the installation program prompts you for a directory name, enter a name of your choosing or accept the default name.

The installation program creates a directory on the specified drive and copies all files, expanding any compressed files.

5. When the installation program notifies you that the installation is complete, review the following files:

   – FILES.TXT lists and describes all the files copied to the hard disk by the installation program.

   – README.TXT contains information that was not available when this manual was printed.

Installing the ASO-4300 Software Package

The ASO-4300 software package contains software for both the DOS and Windows environments. This section describes how to install both the DOS version and the Windows version of the ASO-4300 software package.

DOS Installation

To install the DOS version of the ASO-4300 software package, perform the following steps:

1. Make a backup copy of the supplied disks. Use the copies as your working disks and store the originals as backup disks.

2. Insert disk #1 into the disk drive.

3. Assuming that you are using disk drive A, enter the following at the DOS prompt:

   ```
   A:install
   ```

   The installation program prompts you for your installation preferences, including the drive and directory you want to copy the software to. It also prompts you to insert additional disks, as necessary.

4. Continue to insert disks and respond to prompts, as appropriate.

   When the installation program prompts you for a drive designation, enter a designation of your choosing or accept the default drive C.

When the installation program prompts you for a directory name, enter a name of your choosing or accept the default name.

The installation program creates a directory on the specified drive and copies all files, expanding any compressed files.

5. When the installation program notifies you that the installation is complete, review the following files:

   – FILES.TXT lists and describes all the files copied to the hard disk by the installation program.

   – README.TXT contains information that was not available when this manual was printed.

Windows Installation

To install the Windows version of the ASO-4300 software package, perform the following steps:

1. Make a backup copy of the ASO-Windows disk. Use the copy as your working disk and store the original as a back up.

2. Insert the ASO-Windows disk into the disk drive.

3. Start Windows.

4. From the Program Manager menu, select File and then select Run.

5. Assuming that you are using disk drive A, type the following at the command line in the Run dialog box, and then choose OK:

   ```
   A:SETUP
   ```

   The installation program prompts you for your installation preferences, including the drive and directory you want to copy the software to. It also prompts you to insert additional disks, as necessary.

6. Continue to insert disks and respond to prompts, as appropriate.

   When the installation program prompts you for a drive designation, enter a designation of your choosing or accept the default drive C. When the installation program prompts you for a directory name, enter a name of your choosing or accept the default name.

   The installation program creates a directory on the specified drive and copies all files, expanding any compressed files.

The installation program also creates a DAS-4300 family group; this group includes example Windows programs and help files.

7. When the installation program notifies you that the installation is complete, review the following files:

   – FILES.TXT lists and describes all the files copied to the hard disk by the installation program.

   – README.TXT contains information that was not available when this manual was printed.

Configuring the Board

You configure the following items for DAS-4300 Series boards by setting jumpers on the board and/or by specifying the configuration in a configuration file:

- Base I/O address

- Memory address

- Interrupt

- Zero wait-state option

- AC/DC couplings

- Acquire data from Channel B or calibrate input ranges

- Input impedance for signal into Ch A connector

- 50 Ω termination resistor for clock input signal

- 50 Ω termination resistor for trigger input signal

- 100 Ω pull-up resistor to +5 V for trigger input signal

- Ground connections

Table 3-1 lists the items that are configurable for DAS-4301/8K boards, the available options, the default settings in the configuration file, and the default jumper settings.

Table 3-1. Configuring DAS-4301/8K Boards

Attribute	Options	Where Option is Set		Default	Default Jumper Settings[1]
		File	Board		
Base I/O address[2]	&H200 to &H3FF	✔	✔	&H250	J400 1: OUT 2: IN 3: IN 4: OUT 5: IN 6: OUT
Memory address[1]	C 000 to D C00	✔	✔	C C00	J401 1: OUT 2: IN 3: IN
Interrupt[1]	2, 5, 7, 10, 11, 12, 15	✔	✔	None	J402 1 to 7: OUT
AC/DC coupling	AC, DC		✔	DC	J106 IN
Zero wait state[3]	Enabled, Disabled	✔		Enabled	Not applicable
Channel B/ Calibration	Acquire data from Channel B or calibrate input ranges		✔	Acquire data from Channel B	J103 1-2: IN 3-4: OUT
Input impedance for Ch A signal	50 Ω or 1 MΩ		✔	50 Ω	J105: IN
Input impedance for analog trigger signal from Trg/Ch B	50 Ω or 5600 Ω		✔	50 Ω	J901: IN
Clock input 50 Ω termination	Terminated or not terminated		✔	Not terminated	J500: OUT
Trigger input 50 Ω termination	Terminated or not terminated		✔	Not terminated	J502: OUT

Table 3-1. Configuring DAS-4301/8K Boards (cont.)

| Attribute | Options | Where Option is Set | | Default | Default Jumper Settings[1] |
		File	Board		
Trigger input 100 Ω pull-up to +5 V	Pulled up or not pulled up		✔	Not pulled-up	J501: OUT
Analog-to-digital ground to A/D	Grounded or not grounded		✔	Grounded	J102: IN
Analog-to-digital ground to DC converter	Grounded or not grounded		✔	Grounded	J202: IN
Bracket-to-analog ground	Grounded or not grounded		✔	Grounded	J104: IN
DSP ground[4]	J302, location 19 grounded or not grounded		✔	Grounded	J301: 2-3: IN
DSP connector[4]	DSP connector or no connector		✔	DSP connector	J302: None
DSP I/O[4]	None or Spare I/O		✔	Spare I/O	J300: None

Notes

[1] OUT indicates that a jumper is not inserted in the specified jumper position and IN indicates that a jumper is inserted in the specified jumper position.

[2] The setting in the configuration file must match the settings of the jumpers on the board.

[3] The default setting is appropriate for most computers. If you are using an older computer, you may want to try changing the setting.

[4] These jumper settings are provided for completeness; unless you are using the SDC-5600 DSP board, you do not need to change these jumper settings.

Refer to page 3-10 for information on setting the jumpers. Refer to the next section for information on creating a configuration file.

Creating a Configuration File

A configuration file is required by the DAS-4300 Series Function Call Driver and other software packages to perform operations on the DAS-4301/8K board. A default configuration file called DAS4300.CFG is provided in both the DAS-4300 Series standard software package and the AS0-4300 software package. The factory-default settings in DAS4300.CFG are shown in Table 3-1.

If the default settings in the configuration file are appropriate for your application, refer to the following section to ensure that the jumper settings on the board match the settings in the configuration file.

If the default settings are not appropriate for your application, you must create a new configuration file or modify an existing configuration file to specify the correct configuration options. The CFG4300.EXE configuration utility, shipped with both the DAS-4300 Series standard software package and the ASO-4300 software package, is provided for this purpose.

To create a new configuration file or modify an existing configuration file, perform the following steps:

1. Invoke the configuration utility from DOS or Windows, as follows:

   – *If you are running under DOS*, from the directory containing the CFG4300.EXE configuration utility, enter the following at the DOS prompt:

       CFG4300 *filename*

   where *filename* is the name of the configuration file you wish to create or modify.

   – *If you are running under Windows*, select Run from the Program Manager File menu, enter the following in the box, and choose OK:

       CFG4300 *filename*

   where *filename* is the name of the configuration file you wish to create or modify. Make sure that you enter the correct path to CFG4300.EXE, or use the Browse button to find this file.

If the utility finds a configuration file named *filename*, it displays the opening menu screen with *filename* shown; this file contains the configuration options found in *filename*. If the utility does not find a configuration file named *filename*, it displays the opening menu screen with *filename* shown; this file contains the default configuration options. If you do not enter a file name, the utility displays the opening menu screen of the default configuration file DAS4300.CFG.

Note: The example programs, provided with the ASO-4300 software package, use the default configuration file DAS4300.CFG. If you intend to use the example programs, make sure that DAS4300.CFG exists and that the settings in DAS4300.CFG match the jumper settings of your board.

---

2. On the opening menu screen, enter the number of DAS-4301/8K boards you plan to configure (1 or 2).

   The utility displays the configuration options for the first board (board 0). The number of the board is shown in the upper-left corner of the top menu box.

3. To modify any of the configuration options, use the arrow keys to highlight the option you want to change, press **Enter** to display a list of available settings, use the arrow keys to highlight the appropriate setting, and press **Enter**. These instructions are summarized in the Commands/Status box at the bottom of the screen.

   When the configuration options for this board are correct, press **N** to display the configuration options for the next board.

4. After you modify the appropriate configuration options for all boards, press **Esc**. The utility asks if you want to save the new settings to the specified configuration file.

5. Press **Y** to save the new settings and exit. Press **N** to exit without saving the new settings.

When you finish creating or modifying the configuration file, refer to the following section to ensure that the jumper settings on the board match the settings in the configuration file.

Setting Jumpers on the Board

The locations of the jumpers required for configuring DAS-4300 Series boards are shown in Figure 3-1.
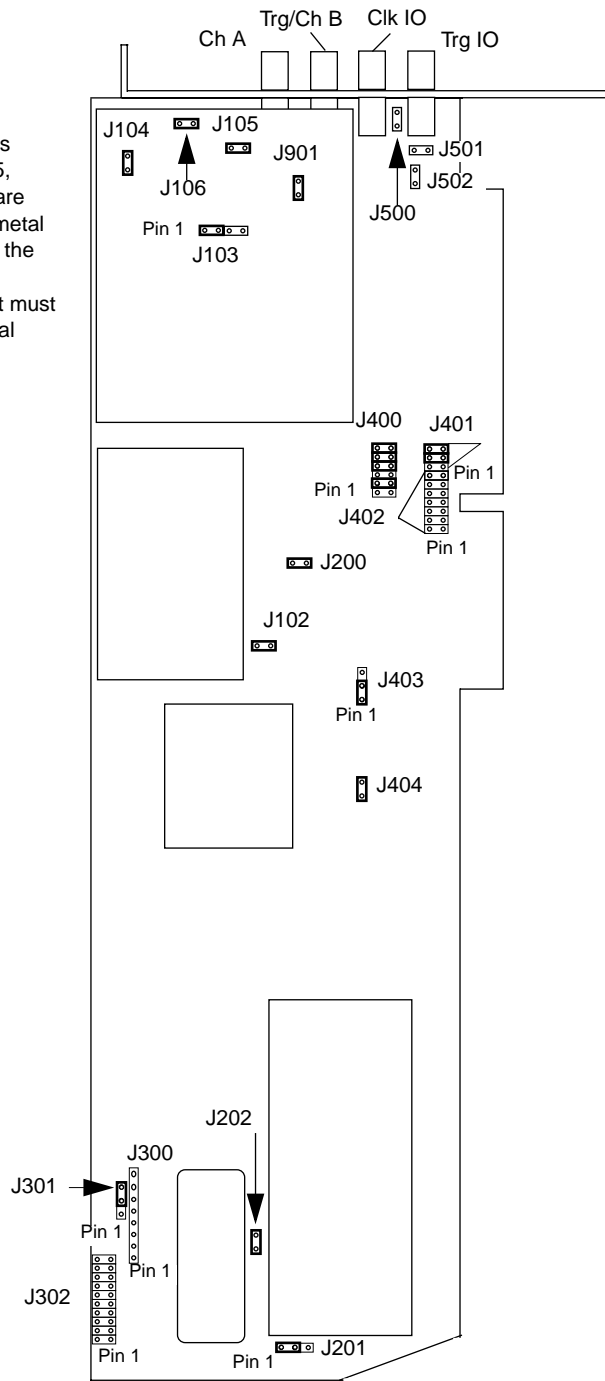
Figure 3-1. Jumper Placement on DAS-4301/8K Board

Setting the Base I/O Address

The DAS-4301/8K board requires 16 consecutive bytes in the I/O address space of the host computer. The board is shipped with a base I/O address of 250h. If your application requires a different setting, use jumper block J400 to set the base I/O address. Each board must have a unique base I/O address.

Note: If you change the default base I/O address of the board and you plan on using the DAS-4300 scope and test program, you must change the base I/O address setting in the D4300.ADC file. See Chapter 4 for more information.

Table 3-2 lists the settings of J400 for base I/O addresses in the range of 200h to 3FFh.

Table 3-2. Base I/O Address

Base I/O Address	Jumper J400					
	Position 1	Position 2	Position 3	Position 4	Position 5	Position 6
200 to 20F	OUT	IN	IN	IN	IN	IN
210 to 21F	OUT	IN	IN	IN	IN	OUT
220 to 22F	OUT	IN	IN	IN	OUT	IN
230 to 23F	OUT	IN	IN	IN	OUT	OUT
240 to 24F	OUT	IN	IN	OUT	IN	IN
250 to 25F[1]	OUT	IN	IN	OUT	IN	OUT
260 to 26F	OUT	IN	IN	OUT	OUT	IN
270 to 27F	OUT	IN	IN	OUT	OUT	OUT
280 to 28F	OUT	IN	OUT	IN	IN	IN
290 to 29F	OUT	IN	OUT	IN	IN	OUT
2A0 to 2AF	OUT	IN	OUT	IN	OUT	IN
2B0 to 2BF	OUT	IN	OUT	IN	OUT	OUT

Table 3-2. Base I/O Address (cont.)

Base I/O Address	Jumper J400					
	Position 1	**Position 2**	**Position 3**	**Position 4**	**Position 5**	**Position 6**
2C0 to 2CF	OUT	IN	OUT	OUT	IN	IN
2D0 to 2DF	OUT	IN	OUT	OUT	IN	OUT
2E0 to 2EF	OUT	IN	OUT	OUT	OUT	IN
2F0 to 2FF	OUT	IN	OUT	OUT	OUT	OUT
300 to 30F	OUT	OUT	IN	IN	IN	IN
310 to 31F	OUT	OUT	IN	IN	IN	OUT
320 to 32F	OUT	OUT	IN	IN	OUT	IN
330 to 33F	OUT	OUT	IN	IN	OUT	OUT
340 to 34F	OUT	OUT	IN	OUT	IN	IN
350 to 35F	OUT	OUT	IN	OUT	IN	OUT
360 to 36F	OUT	OUT	IN	OUT	OUT	IN
370 to 37F	OUT	OUT	IN	OUT	OUT	OUT
380 to 38F	OUT	OUT	OUT	IN	IN	IN
390 to 39F	OUT	OUT	OUT	IN	IN	OUT
3A0 to 3AF	OUT	OUT	OUT	IN	OUT	IN
3B0 to 3BF	OUT	OUT	OUT	IN	OUT	OUT
3C0 to 3CF	OUT	OUT	OUT	OUT	IN	IN
3D0 to 3DF	OUT	OUT	OUT	OUT	IN	OUT
3E0 to 3EF	OUT	OUT	OUT	OUT	OUT	IN
3F0 to 3FF	OUT	OUT	OUT	OUT	OUT	OUT

Notes
[1] Default base I/O address.

Setting the Memory Address

The onboard 8K byte memory on the DAS-4301/8K board is mapped into a 16K byte window in upper memory (above 640K bytes). The DAS-4301/8K board is shipped with a memory address of CC00:0000. If your application requires a different setting, use jumper block J401 to set the memory address, as shown in Table 3-3.

Note: Note that no other boards or devices can share the selected memory address. If you change the default memory address of the board and you plan on using the DAS-4300 scope and test program, you must change the memory address setting in the D4300.ADC file. See Chapter 4 for more information.

Table 3-3. Memory Address

Memory Address	Jumper J401		
	Position 1	**Position 2**	**Position 3**
C 0000	OUT	OUT	OUT
C 4000	OUT	OUT	IN
C 8000	OUT	IN	OUT
C C000[1]	OUT	IN	IN
D 0000	IN	OUT	OUT
D 4000	IN	OUT	IN
D 8000	IN	IN	OUT
D C000	IN	IN	IN

Notes
[1] Default factory setting.

The host computer must leave room for the onboard memory of the DAS-4301/8K board in its memory address map. To ensure that the host computer is configured to leave room in its memory address map, you must exclude the memory area of 16K bytes (CC00:0000 to CFFF:000F or your memory address setting) from the memory available for the EMS manager of your system (for example, QEMM or EMM386).

For QEMM, your C:\CONFIG.SYS file should contain a line similar to the following:

```
DEVICE = C:\QEMM\QEMM386.EXE X=CC00-CFFF
```

For EMM386, your C:\CONFIG.SYS file should contain a line similar to the following:

```
DEVICE = C:\DOS\EMM386.EXE X=CC00-CFFF
```

Note that the examples assume a certain directory structure on the disk; you may have to modify these commands.

Setting the Interrupt

If enabled in software, the DAS-4301/8K board can generate an interrupt at the end of a data acquisition operation to notify the host computer that the operation is completed. Selecting an interrupt connects the interrupt line to a tristate driver on the board; this feature allows the interrupt to remain selected while allowing other devices to use the interrupt line.

The DAS-4301/8K board is shipped with no interrupt selected. If your application requires a different setting, select the interrupt by inserting the jumper into one of the positions of jumper block J402. Make sure that you insert a jumper into only one of the positions of J402; refer to Table 3-4.

Table 3-4. Interrupt Selection

Interrupt	Jumper J402						
	Position 1	Position 2	Position 3	Position 4	Position 5	Position 6	Position 7
None[1]	OUT	OUT	OUT	OUT	OUT	OUT	OUT
2	IN	OUT	OUT	OUT	OUT	OUT	OUT
5	OUT	IN	OUT	OUT	OUT	OUT	OUT
7	OUT	OUT	IN	OUT	OUT	OUT	OUT
10	OUT	OUT	OUT	IN	OUT	OUT	OUT
11	OUT	OUT	OUT	OUT	IN	OUT	OUT
12	OUT	OUT	OUT	OUT	OUT	IN	OUT
15	OUT	OUT	OUT	OUT	OUT	OUT	IN

Notes
[1] Default setting.

Acquiring Data from Channel B or Calibrating the Board

If you want to acquire analog input data from Channel B, you must specify Channel B in software and leave the default jumper setting of jumper J103 in its factory-default configuration (jumper installed in positions 1 and 2).

Positions 3 and 4 of jumper block J103 are provided for calibrating the board. However, it is strongly recommended that you return the board to Keithley Metrabyte if calibration is required; refer to page 5-4 for more information on returning a board.

Jumper block J103 is underneath the metal cover on the top right of the board. To change the jumper setting, you first must unscrew this metal cover.

Figure 3-2 illustrates the analog input circuitry.
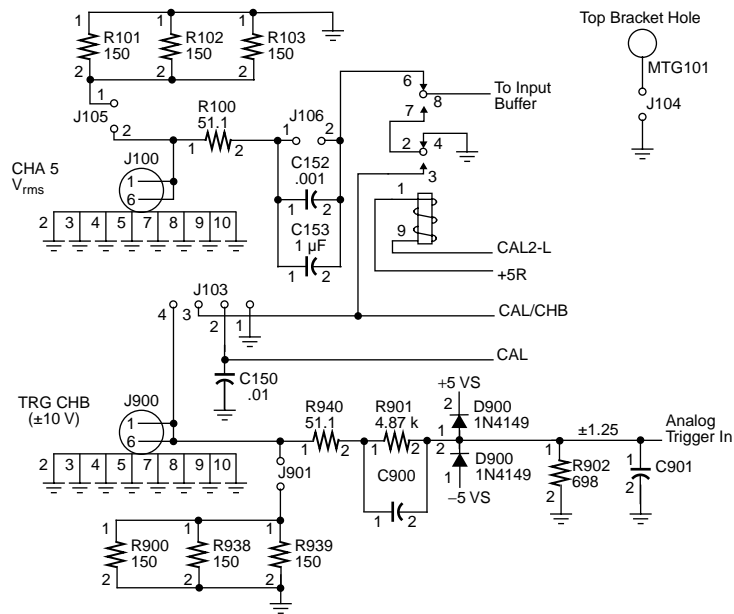
Figure 3-2. Analog Input Circuitry

Selecting AC or DC Coupling

AC or DC coupling is determined by jumper block J106. If a jumper is installed in jumper block J106 (the default condition), DC coupling is selected. Removing the jumper from jumper block J106 selects AC coupling.

Jumper block J106 is underneath the metal cover on the top right of the board. To change the jumper setting, you first must unscrew this metal cover.

Setting the Input Impedance of Ch A Signal

The input impedance of the signal coming into the Ch A connector is determined by jumper block J105. If a jumper is installed in jumper block J105 (the default condition), the input impedance is 50 Ω. Removing the jumper from jumper block J105, selects an input impedance of approximately 1 MΩ.

Jumper block J105 is underneath the metal cover on the top right of the board. To change the jumper setting, you first must unscrew this metal cover.

Setting the Input Impedance of the Analog Trigger Input Signal

The input impedance of the trigger input signal from the Trg/Ch B connector is determined by jumper block J901. If a jumper is installed in jumper block J901 (the default condition), the input impedance is 50 Ω. If you remove the jumper from jumper block J901, the input impedance is approximately 5600 Ω.

Jumper block J901 is underneath the metal cover on the top right of the board. To change the jumper setting, you first must unscrew this metal cover.

Setting the 50 Ω Termination Resistor for the Clock Input Signal

The clock input signal of the Clk IO connector has a jumper-selectable 50 Ω termination to ground for signals driving long lines or lines that are driving many devices. Insert a jumper into jumper block J500 to provide the 50 Ω termination resistor. The 50 Ω resistor is provided in the solderless component jack, R503. By default, the jumper is removed.

Note: To prevent excessive loading of the signal, do not use the 50 Ω termination resistor when the board is providing the clock output signal on the Clk IO connector.

Figure 3-3 illustrates the clock I/O and trigger I/O circuitry.
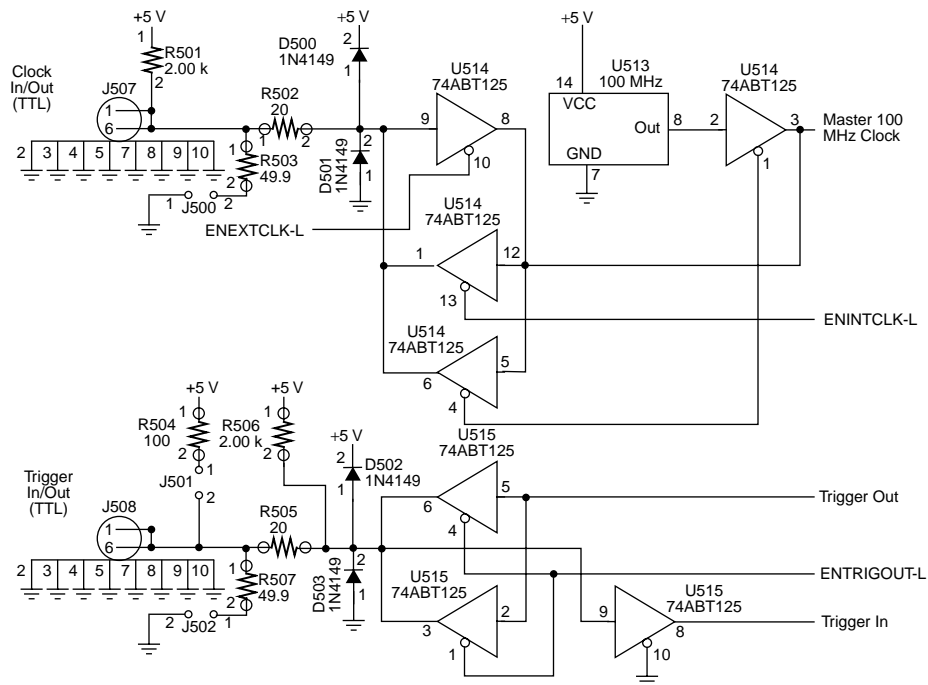
Figure 3-3. Clock I/O and Trigger I/O Circuitry

Setting the 50 Ω Termination Resistor for the Trigger Input Signal

The trigger input signal of the Trg IO connector has a jumper-selectable 50 Ω termination to ground for signals driving long lines or lines that are driving many devices. Insert a jumper into jumper block J502 to provide the 50 Ω termination resistor. The 50 Ω resistor is provided in the solderless component jack, R507. By default, the jumper is removed.

Note: To prevent excessive loading of the signal, do not use the 50 Ω termination resistor when the board is providing the trigger output signal on the Trg IO connector.

Setting the 100 Ω Pull-Up to +5 V for the Trigger Input Signal

The trigger input signal of the Trg IO connector has a jumper-selectable 100 Ω pull-up to +5 V to float the tristate output high. Insert a jumper into jumper block J501 to provide the 100 Ω pull-up to +5 V. The 100 Ω pull-up to +5 V is provided in the solderless component jack, R504. By default, the jumper is removed.

Setting Grounds

The DAS-4301/8K board provides several jumper-selectable grounds. By default, each of these grounds is selected (a jumper is inserted in the appropriate jumper block). Table 3-5 lists the grounds that are jumper-selectable on the DAS-4301/8K board and their default configurations. If you want to remove the grounds, remove the jumpers from their respective locations.

Table 3-5. Grounds on the DAS-4301/8K Board

Ground Type	Jumper Used	Default Setting
Analog-to-digital ground to A/D	J102	IN
Analog-to-digital ground to DC converter	J202	IN
Bracket-to-analog ground	J104	IN

Jumper block J104 is underneath the metal cover on the top right of the board. To change the jumper setting, you first must unscrew this metal cover.

Installing the Board

You can avoid many problems by providing the proper operating environment for the DAS-4301/8K board.

The following suggestions will help ensure an optimal environment that includes adequate space, cooling, and power:

- Place the DAS-4301/8K board next to a half-length or half-height Circuit Card Assembly (CCA), if possible.

- Do not place another CCA next to the component side of the DAS-4301/8K board, if possible.

- Ensure that your computer has adequate cooling air flow in the card-nest.

- Make sure that the power supply fan filter is clean.

- Make sure that ribbon cables are not impeding the air flow.

- Make sure that the rear cutouts of all unused expansion slots are sealed with a cover plate.

- Ensure that your computer has an adequate power supply rating. The DAS-4301/8K board requires the following power from the computer's power supply:

  - +5 volt; 11.5 Watts

  - +12 volt; 0.9 Watts

  - −12 volt; 2.2 Watts

To install the DAS-4301/8K board in your host computer, perform the following steps:

1. TURN OFF SYSTEM POWER AND UNPLUG THE AC POWER CORD.

2. Remove the cover from the computer and locate a free expansion slot.

3. Remove the cover plate from the slot by removing its mounting screw and lifting the cover plate from its location. Save the mounting screws and cover plate for later use.

4. Insert the BNC connector side first, pushing the BNCs through the slot at the back of the computer. Bring the opposite side down into the card edge guide. The lower left side of the board has a slight bevel to facilitate insertion.

5. Push the board's connector strip into the expansion slot. Make sure that the board is firmly placed into the bus.

6. Secure the board to the computer at the board's back bracket with the cover plate screw. Some computer chassis and motherboards are made with very loose dimension tolerances. Make sure when you tighten the screw, the left side of the gold edge connector on the DAS-4301/8K does not pull up and out of the expansion slot.

7. Once the board is firmly in place, attach the signal and trigger connections to the BNC connectors at the back of the board.

Initializing the Board

To initialize the DAS-4301/8K board, locate the AUTO4300.EXE file on the disk. AUTO4300 should be included in the AUTOEXEC.BAT file of the root directory if the board is plugged into the bus.

AUTO4300.EXE initializes the DAS-4301/8K during power-up since the board's setup parameters are random when the computer is powered on. In some cases, the random analog offset and gain values could cause an undesirable current drain in the analog section. AUTO4300.EXE prevents this drain from occurring.

If you are using the default base I/O address setting of 250h, no parameters are required. Include the following command line in the AUTOEXEC.BAT file:

```
AUTO4300
```

If you are using some other base I/O address, include the base I/O address (in hexadecimal notation) on the command line. For example, if you are using a base I/O address of 258h, include the following command in the AUTOEXEC.BAT file:

```
AUTO4300 258
```

If you are using multiple boards, you must initialize each board separately because each board must use a different base I/O address.

4

Scope and Test Program

The DAS-4300 Series scope and test program (D4300.EXE) is a utility program that allows you to test the hardware features available on the DAS-4301/8K board, to recalibrate the analog input section of the board, and to perform basic oscilloscope functions, such as saving and recalling waveforms to disk.

D4300 is a menu-based, keyboard-controlled DOS program that requires a VGA compatible display. It has one support file, D4300.ADC, which is shipped with both the DAS-4300 Series standard software package and the ASO-4300 software package.

To run the scope and test program, enter the following at the DOS prompt:

```
D4300
```

Use the control keys, described in the following section, to use the scope and test program.

Control Keys for D4300.EXE

Table 4-1 lists the keys that control the D4300.EXE scope and test program. In addition, several function group menus are listed at the top of the oscilloscope screen; press the first letter in the title of a menu to change to the menu. Note that D4300.EXE is case-insensitive.

Table 4-1. Control Keys

Key	Description
A	Selects the A/D menu as the currently displayed menu at the bottom of the screen. From the A/D menu, you can modify most of the hardware features of the board.
C	Selects the Configure/EEPROM menu as the currently displayed menu at the bottom of the screen. The Configure/EEPROM menu allows you to display and overwrite the calibration values in EEPROM.
D	Selects the Display menu as the currently displayed menu at the bottom of the screen. The Display menu controls operations such as waveform accumulation and averaging.
E	Allows direct entry of a number. This is not valid for all parameters. See Table 4-2 for a list of suffixes you can use with some entries.
H	Displays a help screen, which lists these control keys.
L	Loads a parameter file. Refer to page 4-10 for more information about parameter files.
M	Toggles measurement cursors on or off. If the measurement cursors are currently on, they are turned off. Otherwise, you are prompted to select measurement of voltage or time. The measurement readouts are displayed above the main scope display; the currently selected cursor values are displayed in white above the screen. The two measurement cursors are identical. See also the descriptions of the 1, 2, 3, <, and > keys.
O	Selects the Options menu as the currently displayed menu at the bottom of the screen. The Options menu controls the printer type and allows you to create a file with the current setup.
P	Prints the currently displayed screen. The printer type is controlled through the Options menu.
Q	Quits the program, unless a waveform recall is currently active. If recalling a waveform, **Q** returns D4300 to normal real-time acquisition.
R	Redraws the screen. This is useful for clearing the scope display after accumulating waveforms.

Table 4-1. Control Keys (cont.)

Key	Description
S	Saves a parameter file. Refer to page 4-10 for more information about parameter files.
T	Takes a single shot. This key is valid only if the single-shot switch on the A/D menu is turned on.
W	Displays a prompt asking whether to save or recall waveforms. If saving, you are prompted for the number of waveforms to save and a file name to save them in. Only 64K bytes of waveform data can be saved. If recalling, you are prompted for a D4300-generated waveform file. You can scroll through the waveforms saved in this file with the **Pg Up** and **Pg Down** keys (see the Display menu). Pressing **Q** exits waveform recall mode and returns to normal operation.
Arrows	Moves the highlight within the current menu.
SPACE	Toggles between setting and not setting the move factor. The move factor controls the rate at which the + and - keys increment the current selection.
ESC	Toggles the highlight cursor to or from the Command menu at the top of the screen. Commands are selected using **Pg Up** and **Pg Down**, and then pressing the **Enter** key.
Pg Up	Displays next waveform.
Pg Down	Displays previous waveform.
+	Increments the current selection to the next value.
−	Decrements the current selection to its previous value.
>	Moves the current measure cursor to the right (for time cursors) or up (for voltage cursors).
<	Moves the current measure cursor left (for time cursors) or down (for voltage cursors).
1	Selects the first measure cursor. The < and > keys change the position of the first cursor.
2	Selects the second measure cursor. The < and > keys change the position of the second cursor.
3	Selects both measure cursors simultaneously. The < and > keys move both cursors in tandem.

Table 4-2 lists the suffixes that you can use on entered numbers. Note that not all suffixes are allowed on all entries.

Table 4-2. Suffixes

Suffix	Description
h	Hexadecimal
n	Nanoseconds
u	Microseconds
m	Milliseconds
s	Seconds
v	Voltage

Scope and Test Program Menus

The following sections describe the parameters on the scope and test program menus.

A/D Menu

Table 4-3 lists the parameters on the A/D menu. You can access the A/D menu at any time by pressing the **A** key.

Table 4-3. A/D Menu

Parameter	Description
Sampling Rate	Changes the conversion rate for the board. The conversion rate can range from 0.78125 Msamples/second to 20 Gsamples/second. Conversion rates above 1 Gsamples/s are achieved through ETS or RIS.
ETS Wait	Not implemented at this time.

Table 4-3. A/D Menu (cont.)

Parameter	Description
Single shot	Turns single-shot mode on or off. If single-shot mode is off, the waveforms are updated in real time. If single-shot mode is on, waveform collection is suspended until the **T** key is pressed; this causes one waveform to be taken.
Post-trigger delay	Specifies the number of samples to wait after the trigger event occurs before starting to collect data. You cannot change this parameter if about-trigger mode (pre-trigger mode) is on; it is automatically set to zero. For conversion rates of 100 Msamples/s or slower, the post-trigger delay ranges from 0 to 65,536 minus the buffer length; for conversion rates of more than 250 Msamples/s, the post-trigger delay ranges from 0 to 655,360 minus the buffer length. You can use the h, n, u, m, and s suffixes with this entry.
Buffer length	Specifies the amount of data that is saved after the trigger pulse is accepted. The post-trigger delay setting does not affect the buffer length. This number ranges from 0 to 8,190 and is independent of the conversion rate. The buffer length is limited to a multiple of 10 for conversion rates of 250 Msamples/s and faster. You can use the h, n, u, m, and s suffixes with this entry.
Clock	Switches between an internal and an external pacer clock. An internal pacer clock is the onboard 100 MHz clock. The external pacer clock is an externally generated clock signal of any frequency up to 100 MHz applied to the Clk IO connector.
Voltage level	Sets the voltage input level of the board. This can range from ±50 mV to ±2.0 V.
Voltage offset	Sets the offset voltage. This parameter is calibrated in the factory, but may require minor adjustments, depending on the input signal. The zero point of the waveform should be centered on the oscilloscope display. You can use the h suffix with this entry.

Table 4-3. A/D Menu (cont.)

Parameter	Description
Vernier gain	Sets the vernier gain. This parameter is calibrated in the factory, but may require minor adjustments, depending on the input signal. The signal should stretch over the full height of the scope You can use the h suffix with this entry.
Pre-trigger	Turns pre-trigger mode (about-trigger mode) on or off. If the display start parameter on the Display menu is negative, you can view the pre-trigger data.
Trigger type	Selects the trigger source. The supported options are software, analog, and digital. Refer to Chapter 2 for information on triggers.
Trigger logic	Not used in this version of the program.
Trigger Phase In	For an external analog or digital trigger, specifies whether a rising or falling edge triggers the board.
Trigger Phase Out	If +, specifies that the trigger output signal on the Trg IO connector will be low during normal operations and go high while the board is digitizing; otherwise, specifies that the trigger output signal on the Trg IO connector will be high during normal operation and and go low while the board is digitizing.
Interrupts	Not implemented at this time.
Channel threshold	Specifies the threshold level at which the trigger will occur for an external analog trigger. You can use the h suffix with this entry.
Analog threshold	Specifies the threshold level at which the trigger will occur for an external analog trigger. You can use the h suffix with this entry.
A/D base port	Specifies the base address of the DAS-4301/8K board being used. You can also use this parameter to switch between multiple DAS-4301/8K boards. When a new board is selected, all current parameters are set on the board.

Display Menu

Table 4-4 lists the parameters on the Display menu. You can access this menu at any time by pressing the **D** key.

Table 4-4. Display Menu

Parameter	Description
Disp start	Displays the collected data, except in single-shot mode. If about-trigger mode (pre-trigger mode) is on, the display start is relative to the trigger point (a display start of 0 starts the waveform display at the trigger point); you can enter a negative number for the display start to display pre-trigger data. Scrolling past the end of the collected data is not possible. You can use the h, n, u, m, and s suffixes with this entry.
Time / points	Specifies whether the time-based entries (post-trigger delay, buffer length, and display start) are displayed in raw data points or in terms of microseconds calculated from the current conversion rate.
Oscope width	Specifies the number of data points displayed across the scope. This can range from 31 points to 8000 points, changing by powers of two. A one-to-one pixel-to-point ratio is achieved with a scope width of 500. If the scope width is less than 500, pixels are interpolated between the true data points. If the scope width is greater than 500 points, only the maximum value within a group is displayed.
Accumulate	Turns waveform accumulation on or off. To clear the display of accumulated waveforms, press the **R** key.
Number to average	Specifies the number of waveforms to average before displaying the final averaged waveform. This may also be applied in ETS and RIS waveform sampling; in these cases, the final interleaved waveforms are averaged.
Tolerance	Not implemented at this time.

Table 4-4. Display Menu (cont.)

Parameter	Description
Data type	Specifies the data format of the display as either twos complement, binary, or absolute value.
Zero wait	Turns the synchronous ready bus signal on or off. If synchronous ready is on and the DAS-4301/8K board and the host computer motherboard are synchronized correctly, data transfer takes place at high speed. However, if synchronous ready is on and the DAS-4301/8K board and the motherboard are not synchronized correctly, errors will appear in the waveform.

Options Menu

Table 4-6 lists the miscellaneous parameters of the Options menu. You can access the Options menu at any time by pressing the **O** key.

Table 4-5. Options Menu

Parameter	Description
Make D4300.ADC	When Yes, creates a special parameter file called D4300.ADC with the current settings in the program. At program startup, D4300.EXE automatically loads D4300.ADC with the initial values for all the menu entries. The program displays No if the file has already been created.
Printer type/ resolution/port	Specifies the type of printer that is used if the **P** key is pressed.
Show debug	Not currently implemented.
DSP	Transfers the currently visible portion of the displayed waveform over the Synchro-Link bus. On-screen waveform updates cease but triggers remain active.

EEPROM Menus

The C-EEPRM menu provides configuration information on how the base drivers work. However, most of the entries in this menu are not functional; they are provided for informational purposes only. Table 4-6 lists the parameters on the C-EEPRM menu. You can access this menu at any time by pressing **C**. The G-EEPRM menu is provided for restoring EEPROM values. You can access this menu at any time by pressing **G**.

Caution: Reprogramming the EEPROM is not covered under warranty.

Table 4-6. Configure EEPROM Menu

Parameter	Description
Write EEPROM	Permanently changes the calibration values stored in the board's EEPROM. Two sets of calibration values are provided: one is for the voltage calibration, the other is for stabilizing the trigger point at high conversion rates with an external trigger. Make sure both sets of calibration values are correct before overwriting the EEPROM values. A double confirmation is required. The first is yes / no; the second asks for a password, which is hardcoded as Keithley (case insensitive).
Serial number	Displays the board's serial number. This parameter cannot be changed.
5.00 V true	Displays the +5 VDC reference voltage measured during factory calibration. This parameter cannot be changed.
2.50 V true	Displays the +2.5 VDC reference voltage measured during factory calibration. This parameter cannot be changed.
Load calib.	Not implemented at this time.

Table 4-6. Configure EEPROM Menu

Parameter	Description
DSP works	Indicates the availability of a functional Synchro-Link port.
Calib. offsets	Not implemented at this time.

DAS-4301/8K Board Calibration

DAS-4301/8K boards are calibrated at the factory prior to shipment; however, over time, the analog section of the board can drift, slightly distorting the calibration. Unless jitter larger than ±1 point is experienced, the board does not require calibration.

If calibration is required, it is recommended that you return the board to Keithley Metrabyte; refer to page 5-4 for more information.

Parameter Files

The D4300 program creates a parameter file called PROG_END.PAR when the program is exited. PROG_END.PAR allows you to automatically restore the D4300 program to its operating state just before program termination. This file contains both the current calibration data and the current settings of all the menu entries. You can examine a parameter file using any text editor.

To load the parameter file, enter **L** and specify the file name (wildcards are permitted); if you enter a wildcard, the program displays a file selection menu containing all directory entries accessible from the current directory; any extensions are ignored. Press **Enter** when the correct file is highlighted.

To save the parameter file, enter **S**; the program prompts you for a file name. The extension of the file name is forced to .PAR; this cannot be changed. Do not use the filename PROG_END.PAR or the original file will be overwritten.

Waveform Data File Format

Waveform data is saved in a binary file with a .WAV extension. The format of the data file is described in Table 4-7.

Table 4-7. Waveform Data File Format

Byte Position	Description
0 to 3	"4300"
4 to 5	Integer saying how many waveforms exist in total
6 to 7	Integer saying how many bytes are in each waveform
8 to 11	Data type that waveform was saved as: 0: twos complement 1: binary 2: absolute value
12 to 15	Conversion rate at which waveforms were saved: 0: 0.78250 Msamples/s 1: 1.5625 Msamples/s 2: 3.125 Msamples/s 3: 6.25 Msamples/s 4: 12.5 Msamples/s 5: 25 Msamples/s 6: 50 Msamples/s 7: 100 Msamples/s 8: 250 Msamples/s 9: 500 Msamples/s 10: 1 Gsamples/s 11: 2 Gsamples/s 12: 4 Gsamples/s 13: 5 Gsamples/s 14: 10 Gsamples/s 15: 20 Gsamples/s
16 to 19	Post-trigger delay of saved waveforms

Table 4-7. Waveform Data File Format

Byte Position	Description
20 to 23	Display start of saved waveforms (how far into collected data the first saved point is)
24 to 27	Pre-trigger (about-trigger) on or off: 0: Pre-trigger off 1: Pre-trigger on
28 to 31	Number of points being displayed in D4300 when waveforms were saved: 5: 31 6: 62 7: 125 8: 250 9: 500 10: 1000 11: 2000 12: 4000 13: 8000
32 to EOF	Actual waveform data with no separators between the waveforms

Scope and Test Program

5

Troubleshooting

If your DAS-4301/8K board is not operating properly, use the information in this chapter to isolate the problem. If the problem appears serious enough to warrant technical support, refer to page 5-4 for information on how to contact an applications engineer.

Identifying Symptoms and Possible Causes

Table 5-1 lists general symptoms and possible solutions for problems with DAS-4301/8K boards.

Table 5-1. Troubleshooting Information

Symptom	Possible Cause	Possible Solution
Board does not respond	Base I/O address is unacceptable.	Make sure that no other system resource is using the base I/O address specified by the I/O address jumper. Reconfigure the base I/O address, if necessary. Refer to page 3-12 for instructions.
	Memory address is unacceptable.	Make sure that no other system resource is using the memory address specified by the memory address jumper. Reconfigure the memory address, if necessary. Refer to page 3-14 for instructions.

Table 5-1. Troubleshooting Information (cont.)

Symptom	Possible Cause	Possible Solution
Board does not respond (cont.)	Interrupt is unacceptable.	Make sure that no other system resource is using the interrupt specified by the interrupt jumper. Reconfigure the interrupt, if necessary. Refer to page 3-15 for instructions.
	The board configuration is unacceptable.	Check the settings in the configuration file. Make sure that they match the settings of the jumpers on the board, where appropriate.
	The board is incorrectly aligned in the accessory slot.	Check installation.
	The board is damaged.	Contact the Keithley MetraByte Applications Engineering Department; refer to page 5-4.
	The I/O bus speed is in excess of 8 MHz.	Reduce I/O bus speed to a maximum of 8 MHz. To change the I/O bus speed, run BIOS setup; refer to your computer documentation for instructions on running BIOS setup.
Intermittent operation	Vibrations or loose connections exist.	Cushion source of vibration and tighten connections.
	The board is overheating.	Check environmental and ambient temperature.
	Electrical noise exists.	Provide better shielding or reroute wiring.
	The I/O bus speed is in excess of 8 MHz.	Reduce I/O bus speed to a maximum of 8 MHz. To change the I/O bus speed, run BIOS setup; refer to your computer documentation for instructions on running BIOS setup.
System lockup	A timing error occurred.	Press **Ctrl** + **Break**.

If you cannot identify the problem using the information in Table 5-1, refer to the next section to determine whether the problem is in the host computer or in the DAS-4301/8K board.

Testing Board and Host Computer

To determine whether the problem is in the host computer or in the DAS-4301/8K board, perform the following steps:

1. Remove power connections to the host computer.

2. Unplug any cables from the DAS-4301/8K board.

3. Remove the DAS-4301/8K board from the computer and visually check for damage. If a board is obviously damaged, refer to page 5-4 for information on returning the board.

4. With the DAS-4301/8K board out of the computer, check the computer for proper operation. Power up the computer and perform any necessary diagnostics.

If you have another DAS-4301/8K board that you know is functional, refer to the next section to determine whether the problem is in the accessory slot or in the I/O connections. If you do not have another board, refer to page 5-4 for information on how to contact an applications engineer.

Testing Accessory Slot and I/O Connections

To determine whether the problem is in the accessory slot or in the I/O connections, perform the following steps:

1. When you are sure that the computer is operating properly, remove computer power again, and install a DAS-4301/8K board that you know is functional. Do not make any I/O connections.

2. Apply computer power and check operation with the functional DAS-4301/8K board in place. This test checks the computer accessory slot. If you are using more than one DAS-4301/8K board, check the other slots you are using.

3. If the accessory slots are functional, check the I/O connections. Connect any devices, one at a time, and check operation.

4. If operation is normal, the problem is in the DAS-4301/8K board originally in the computer. Try the DAS-4301/8K boards one at a time in the computer to determine which is faulty.

5. If you cannot isolate the problem, refer to the next section for instructions on getting technical support.

Technical Support

Before returning any equipment for repair, call the Keithley MetraByte Applications Engineering Department at:

(508) 880-3000
Monday - Friday, 8:00 A.M. - 6:00 P.M., Eastern Time

An applications engineer will help you diagnose and resolve your problem over the telephone.

Please make sure that you have the following information available before you call:

DAS-4301/8K board	Serial #	_____
	Revision code	_____
	Base I/O address	_____
	Memory address	_____
	Interrupt	_____
Computer	Manufacturer	_____
	CPU type	286 386 486 Pentium
	Clock speed (MHz)	20 25 33 66 100 ____
	Math coprocessor	Yes No
	Amount of RAM	_____
	Video system	VGA SVGA
	BIOS type	_____
	Memory manager	_____
Operating system	DOS version	_____
	Windows version	3.0 3.1 _____
	Windows mode	Standard Enhanced
Software package	Name	_____
	Serial #	_____
	Version	_____
	Invoice/order #	_____
Compiler (if applicable)	Language	_____
	Manufacturer	_____
	Version	_____

If a telephone resolution is not possible, the applications engineer will issue you a Return Material Authorization (RMA) number and ask you to return the equipment. Include the RMA number with any documentation regarding the equipment.

When returning equipment for repair, include the following information:

● Your name, address, and telephone number.

● The invoice or order number and date of equipment purchase.

● A description of the problem or its symptoms.

● The RMA number on the outside of the package.

Repackage the equipment, using the original antistatic wrapping, if possible, and handling it with ground protection. Ship the equipment to:

ATTN: RMA #_____
Repair Department
Keithley MetraByte
440 Myles Standish Boulevard
Taunton, Massachusetts 02780

Telephone (508) 880-3000
Telex 503989
FAX 508/880-0179

Note: If you are submitting your equipment for repair under warranty, you must include the invoice number and date of purchase.

A

Specifications

Table A-1 lists the analog input specifications for DAS-4301/8K board.

Table A-1. DAS-4301/8K Specifications

Feature	Attribute	Specifications
Channels	Number	Two (single channel and calibration voltages, or dual channel relay selectable between signal connector and trigger connector)
	Bandwidth	DC to −3 dB of 250 MHz
	Channel-to-channel switching time	1 ms with both channels set for DC coupling and identical level 15 ms with both channels set at opposite extremes for worst-case switching
	Input coupling	AC or DC, jumper selectable
	Input impedance	50 Ω or 1 MΩ, jumper selectable
	Input ranges	16 full-scale ranges from ±0.025 V to ±1 V[1]
ADC	Type	Flash
	Resolution	8-bit
	Output coding[2]	Binary Twos complement Absolute
Onboard memory buffer	Size	8,192 bytes

Table A-1. DAS-4301/8K Specifications (cont.)

Feature	Attribute	Specifications
Pacer clock	Internal	Internal 100 MHz oscillator
	External	TTL-level signal of at least 100 MHz Duty cycle: 50/50 ±20%
	Sampling rate for internal clock	**Sampling rate (MHz)** **Sampling period (ns)** 1000 1 500 2 250 4 100 10 50 20 25 40 12.5 80 6.25 160 3.125 320 1.5625 640 0.78250 1280
Trigger	Sources	Internal software External software analog; positive or negative threshold crossing; 4096 levels External hardware analog on Trg/Ch B connector: positive or negative threshold crossing; −10 V to +9.995 V, 4096 levels (12-bit resolution)[3] External digital: positive or negative TTL input signal on Trg IO connector
	Number of samples per trigger (length)	Minimum: 1 @ 100 MHz and slower (increment of 1) 10 @ 250 MHz and faster (increment of 10) Maximum: 8,192
	Post-trigger delay	Minimum: 0 Maximum: 65,536 @ 100 MHz and slower (increment = 1) 655,360 @ 250 MHz and faster (increment = 10)
	Pre-trigger data	Minimum: 1 sample Maximum: 8,192 samples

Table A-1. DAS-4301/8K Specifications (cont.)

Feature	Attribute	Specifications
Trigger (cont.)	Trigger output signal	Programmable phase on Trg IO connector, except when used as external digital trigger source[4]
Equivalent time sampling (ETS) and Random Interleave Sampling (RIS)	Maximum rate	20 Gsamples/second
	Sampling period	2000 Msamples/s = 500 ps 4000 Msamples/s = 250 ps 5000 Msamples/s = 200 ps 10000 Msamples/s = 100 ps 20000 Msamples/s = 50 ps
Synchro-Link DSP Bus	Transfer speed	Conversion rate / 4 (25 Msamples/second)
Bus interface	Bus type	PC ISA bus (8.0 or 8.33 MHz)
	I/O map address size	16 consecutive bytes
	I/O data transfer size	16 bits
	Memory map address size	16K bytes in upper memory
	Zero wait-state	Programmable (transfer rate up to 5M byte/s)
General	Size	Full-size AT extension board
	Power consumption	2.3 A at +5.0 V, typical; tolerance = ±5% 0.75 mA at +12.0 V, typical; tolerance = ±5% 0.185 mA at −12.0 V, typical; tolerance = ±5%
	Operating temperature	0 to + 50°C (ambient)
	Storage temperature	−20 to +70°C

Notes

[1] Calibration voltages provided by a digital-to-analog converter for software autocalibration of all voltage ranges.

[2] The DAS-4300 Function Call Driver and VTX support twos complement data coding only.

[3] The DAS-4300 Function Call Driver and VTX support up to 256 steps from −10 V to +9.922 V, with a resolution of 8 bits.

[4] The DAS-4300 Function Call Driver and VTX use positive edge polarity for the trigger output signal.

B

Keithley Memory Manager

The process that Windows uses to allocate memory can limit the amount of memory available to Keithley DAS products operating in Windows Enhanced mode. To reserve a memory heap that is adequate for the needs of your product, you can use the Keithley Memory Manager (KMM), included in the ASO software package.

The reserved memory heap is part of the total physical memory available in your system. When you start up Windows, the KMM reserves the memory heap. Then, whenever your application program requests memory, the memory buffer is allocated from the reserved memory heap instead of from the Windows global heap. The KMM is DAS product independent and can be used by multiple Keithley DAS Windows application programs simultaneously.

Note: The memory allocated with the KMM can be used by a DMA controller, if applicable.

The following are supplied with the KMM:

- **VDMAD.386** - Customized version of Microsoft's Virtual DMA Driver. This file consists of a copy of Microsoft's Virtual DMA Driver and a group of functions that is added to perform the KMM functions. When you use the KMM to reserve a memory heap, Microsoft's Virtual DMA Driver is replaced by the VDMAD.386 file.

Note: If you have multiple versions of VDMAD.386, it is recommended that you install the latest version; to determine which version is the latest version, refer to the time stamp of the file.

- **KMMSETUP.EXE** - Windows program that helps you set up the VDMAD.386 parameters and then modifies your SYSTEM.INI file accordingly.

Installing and Setting Up the KMM

To install and set up the KMM whenever you start up Windows, you must modify the SYSTEM.INI file. You can modify the SYSTEM.INI file using either the KMMSETUP.EXE program or a text editor.

Using KMMSETUP.EXE

Using the KMMSETUP.EXE program, you can modify your Windows SYSTEM.INI file as follows:

1. Invoke KMMSETUP.EXE in one of the following ways:

   – From the Program Manager menu, choose File and then Run, and then type the complete path and program name for KMMSETUP.

   – Select the KMMSETUP icon, if installed.

2. In the New VDMAD.386 box, enter the path and name of the VDMAD.386 file, as follows:

   ```
   C:\WINDOWS\VDMAD.386
   ```

   The string you enter replaces `*vdmad` in the `device=*vdmad` line in your SYSTEM.INI file.

   Note: Normally, the VDMAD.386 file is stored in the WINDOWS directory. If it is stored elsewhere, enter the correct path and name or use the Browse button to find the file.

   ---

3. Notice the Current Setting box. The value specified reflects the current size of the reserved memory heap in Kbytes.

4. In the Desired Setting box, enter the desired size of the reserved memory heap in Kbytes.

   The value you enter replaces the `KEIDMAHEAPSIZE=` line in the [386Enh] section of your SYSTEM.INI file.

Notes: The memory size you specify is no longer available to Windows. For example, if your computer has 8M bytes of memory installed and you specify `KEIDMAHEAPSIZE=1000` (1M byte), Windows can only see and use 7M bytes.

If you specify a value less than 128, a 128K byte minimum heap size is assumed. The maximum heap size is limited only by the physical memory installed in your system and by Windows itself.

---

5. Select the Update button to update the SYSTEM.INI file with the changes you have made.

6. Restart Windows to ensure that the system changes take effect.

Using a Text Editor

Using a text editor, you can modify your Windows SYSTEM.INI file in the [386Enh] section, as follows:

1. Replace the line `device=*vdmad` with the following:

        device=c:\windows\vdmad.386

Note: Normally, the VDMAD.386 file is stored in the WINDOWS directory. If it is stored elsewhere, enter the correct path and name.

---

2. Add the following line:

        KEIDMAHEAPSIZE=<size>

where *size* indicates the desired size of the reserved memory heap in Kbytes.

Notes: The memory size you specify is no longer available to Windows. For example, if your computer has 8M bytes of memory installed and you specify `KEIDMAHEAPSIZE=1000` (1M byte), Windows can only see and use 7M bytes.

If you do not add the `KEIDMAHEAPSIZE` keyword or if the size you specify is less than 128, a 128K byte minimum heap size is assumed. The maximum heap size is limited only by the physical memory installed in your system and by Windows itself.

3. Restart Windows to ensure that the system changes take effect.

Removing the KMM

If you make changes to the SYSTEM.INI file, you can always remove the updated information from the SYSTEM.INI file and return all previously reserved memory to Windows.

If you are using KMMSETUP.EXE, select the Remove button to remove the updated information. If you are using a text editor, modify and/or delete the appropriate lines in SYSTEM.INI. In both cases, make sure that you restart Windows to ensure that the system changes take effect.

C

Bandwidth Charts for Input Voltage Ranges

The following figures show the effect of input voltage ranges on the bandwidth of the DAS-4301/8K board. These figures are useful in determining the best input voltage range for a particular application. Note that the number in parentheses indicates the gain code used.

±0.2 V Input Range (Gain Code 0)
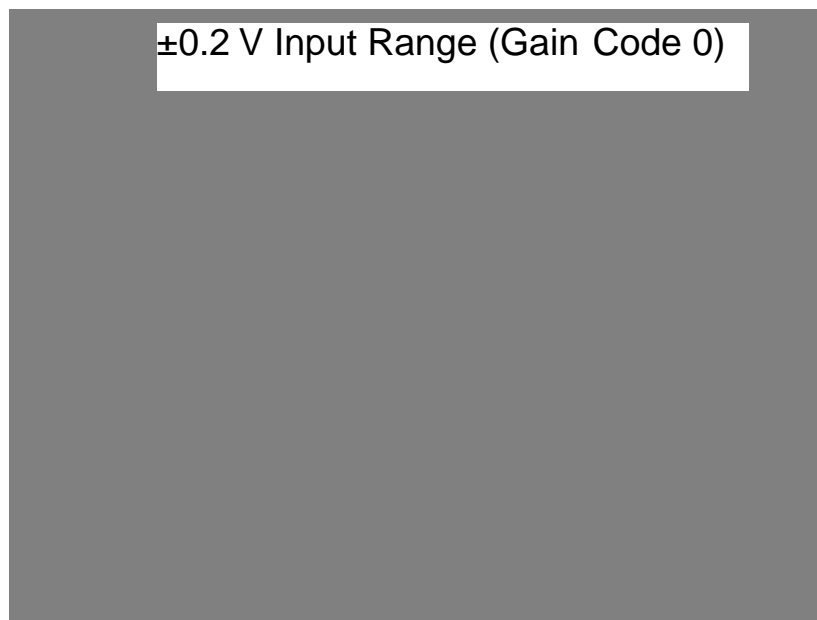
Figure C-1. ±0.2 V Input Range (Gain Code 0)
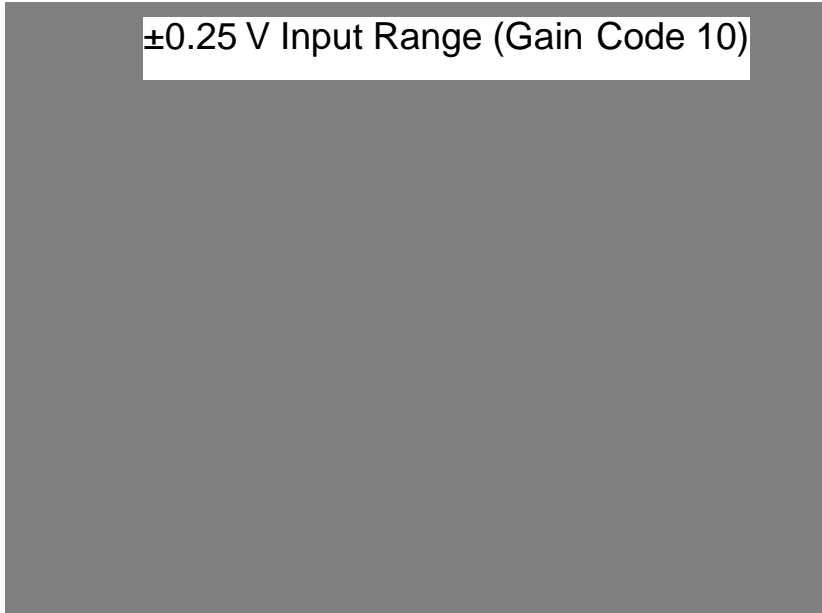
±0.25 V Input Range (Gain Code 1)
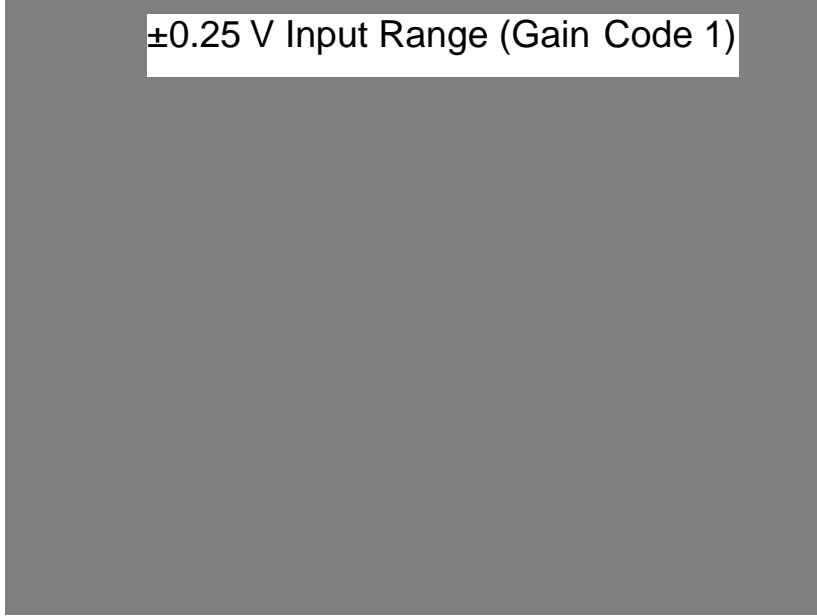
Figure C-2. ±0.25 V Input Range (Gain Code 1)

±0.5 V Input Range (Gain Code 2)
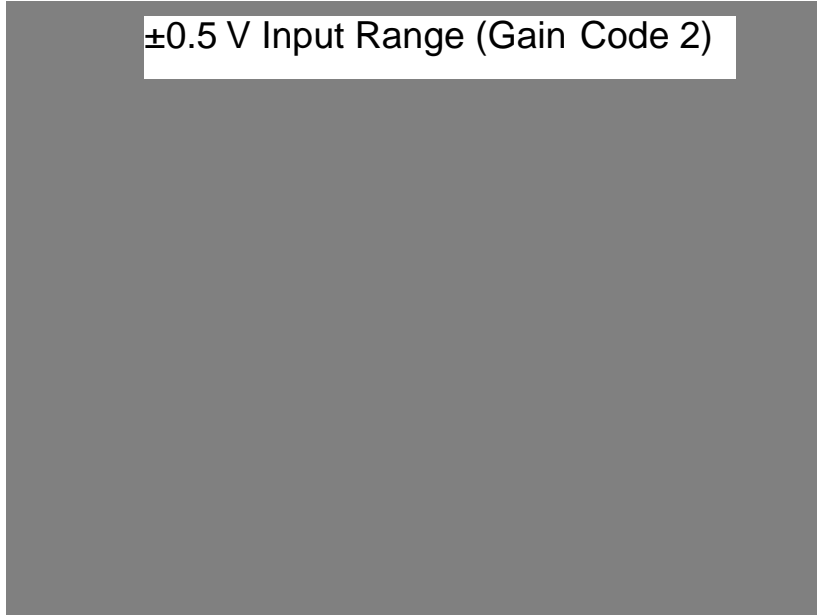
Figure C-3. ±0.5 V Input Range (Gain Code 2)

Bandwidth Charts for Input Voltage Ranges

±1 V Input Range (Gain Code 3)

Figure C-4. ±1 V Input Range (Gain Code 3)

±0.125 V Input Range (Gain Code 4)

Figure C-5. ±0.125 V Input Range (Gain Code 4)

±0.15625 V Input Range (Gain Code 5)
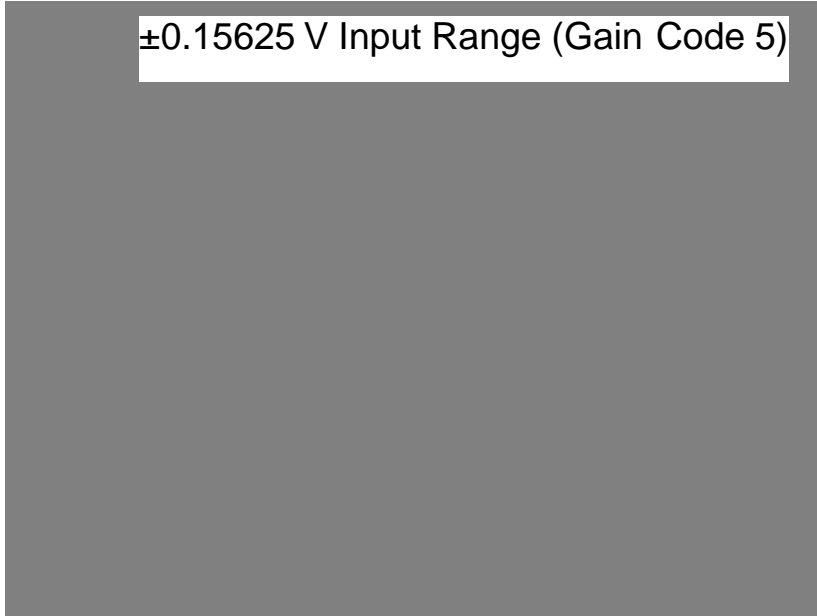
Figure C-6. ±0.15625 V Input Range (Gain Code 5)

±0.3125 V Input Range (Gain Code 6)

Figure C-7. ±0.3125 V Input Range (Gain Code 6)

Bandwidth Charts for Input Voltage Ranges

±0.625 V Input Range (Gain Code 7)

Figure C-8. ±0.625 V Input Range (Gain Code 7)

±0.1 V Input Range (Gain Code 8)

Figure C-9. ±0.1 V Input Range (Gain Code 8)

±0.125 V Input Range (Gain Code 9)

Figure C-10. ±0.125 V Input Range (Gain Code 9)

±0.25 V Input Range (Gain Code 10)

Figure C-11. ±0.25 V Input Range (Gain Code 10)

Bandwidth Charts for Input Voltage Ranges

±0.5 V Input Range (Gain Code 11)

Figure C-12. ±0.5 V Input Range (Gain Code 11)

±0.025 V Input Range (Gain Code 12)

Figure C-13. ±0.025 V Input Range (Gain Code 12)

±0.03125 V Input Range (Gain Code 13)

Figure C-14. ±0.03125 V Input Range (Gain Code 13)

±0.0625 V Input Range (Gain Code 14)

Figure C-15. ±0.0625 V Input Range (Gain Code 14)

Bandwidth Charts for Input Voltage Ranges

±0.125 V Input Range (Gain Code 15)

Figure C-16. ±0.125 V Input Range (Gain Code 15)

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