Agilent SS420x
Analog to Digital Converter Board

User Guide

DOCUMENTATION
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Contents

Preface

This guide describes how to use the SS420x analog-to-digital (A/D) converter to acquire data from an analog device or to trigger external devices that the data system does not control.

Contents

- Related Documentation
- Safety and Special Notices
- Contacting Us

Related Documentation

For the SS420x A/D converter, the data system provides Help and this manual as a PDF file: *SS420x Analog to Digital Converter User Guide*.

❖ **To view product manuals**

For the Xcalibur 2.1.x data system, choose **Start > Programs > Thermo Instruments > Manuals > LC Devices > SSI > SS420x**.

❖ **To open Help**

- From the SS420x A/D converter view in the Instrument Setup window, choose **Help > SS420x A/D converter Help**.
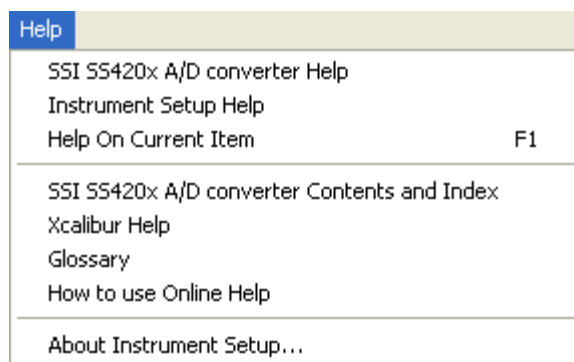
- If available for a specific window or dialog box, click **Help** or press **F1** for information about setting parameters.

Safety and Special Notices

Make sure you follow the precautionary statements presented in this guide. The safety and other special notices appear in boxes.

Safety and special notices include the following:

CAUTION Highlights hazards to humans, property, or the environment. Each CAUTION notice is accompanied by an appropriate CAUTION symbol.

IMPORTANT Highlights information necessary to prevent damage to software, loss of data, or invalid test results; or might contain information that is critical for optimal performance of the system.

Note Highlights information of general interest.

Tip Highlights helpful information that can make a task easier.

Contacting Us

There are several ways to contact Thermo Fisher Scientific for the information you need.

❖ **To contact Technical Support**

Phone	800-532-4752
Fax	561-688-8736
E-mail	us.techsupport.analyze@thermofisher.com
Knowledge base	www.thermokb.com

Find software updates and utilities to download at mssupport.thermo.com.

❖ **To contact Customer Service for ordering information**

Phone	800-532-4752
Fax	561-688-8731
E-mail	us.customer-support.analyze@thermofisher.com
Web site	www.thermo.com/ms

❖ **To copy manuals from the Internet**

Go to mssupport.thermo.com and click **Customer Manuals** in the left margin of the window.

❖ **To suggest changes to documentation or to Help**

- Fill out a reader survey online at http://www.surveymonkey.com/s.aspx?sm=R7gKOvhLXn3NTkpK2BefHQ_3d_3d.

- Send an e-mail message to the Technical Publications Editor at techpubs-lcms@thermofisher.com.

Hardware Connections

The SS420x A/D converter manufactured by Agilent Technologies Inc. offers four (20-bit resolution) analog-to-digital channels that you can use to acquire data from analog devices that Xcalibur does not support. These channels convert the analog data to a digital format that the data system can process. Additionally, contact closure control for these devices includes four inputs and eight outputs. In this chapter, contact closure refers to open collector, TTL logic, or relay closure.

The Xcalibur data system can support up to four SS420x units; however, only one unit can be used at a time.

> **IMPORTANT** If you want to use the SS420x to convert an analog signal from an unsupported analog detector, the detector must have its own control panel, or you must have an appropriate data system and a second data system computer to control the detector. For example, to download a method to the Surveyor RI Detector Plus, you must have a second data system computer with the ChromQuest data system installed.

Contents

- Connecting the SS420x to the Xcalibur Data System Computer
- Connecting the Trigger and Signal Cables
- Connecting the Relays to Control an External Device

Table 1 lists the items in the Xcalibur SS420x Interface Kit.

Table 1. Xcalibur kit used with the SS420x

Part number	Description of kit
OPTON-21721	Xcalibur SS420x Interface Kit: • SS420x serial cable • 2-wire trigger cable (for contact closure) • Power supply • Xcalibur Additional 4-Port Serial Kit

Connecting the SS420x to the Xcalibur Data System Computer

❖ **To connect the SS420x to the Xcalibur data system computer**

1. Turn off the data system computer.

2. Connect the serial communication cable as follows (see Figure 1):

    a. Connect one end of the serial communication cable (from the Xcalibur SS420x Interface Kit) to the RS-232 port on the back panel of the SS420x A/D converter.

    b. Connect the other end of the serial cable to the RS-232 port located on the back panel of the data system computer.

3. Connect the power cable from the 9 V dc power supply (included with the SS420x A/D converter) to the POWER inlet on the back panel of the SS420x A/D converter.

4. Restart the data system computer.

Figure 1. RS-232 connection between the SS420x analog-to-digital converter board and the data system computer
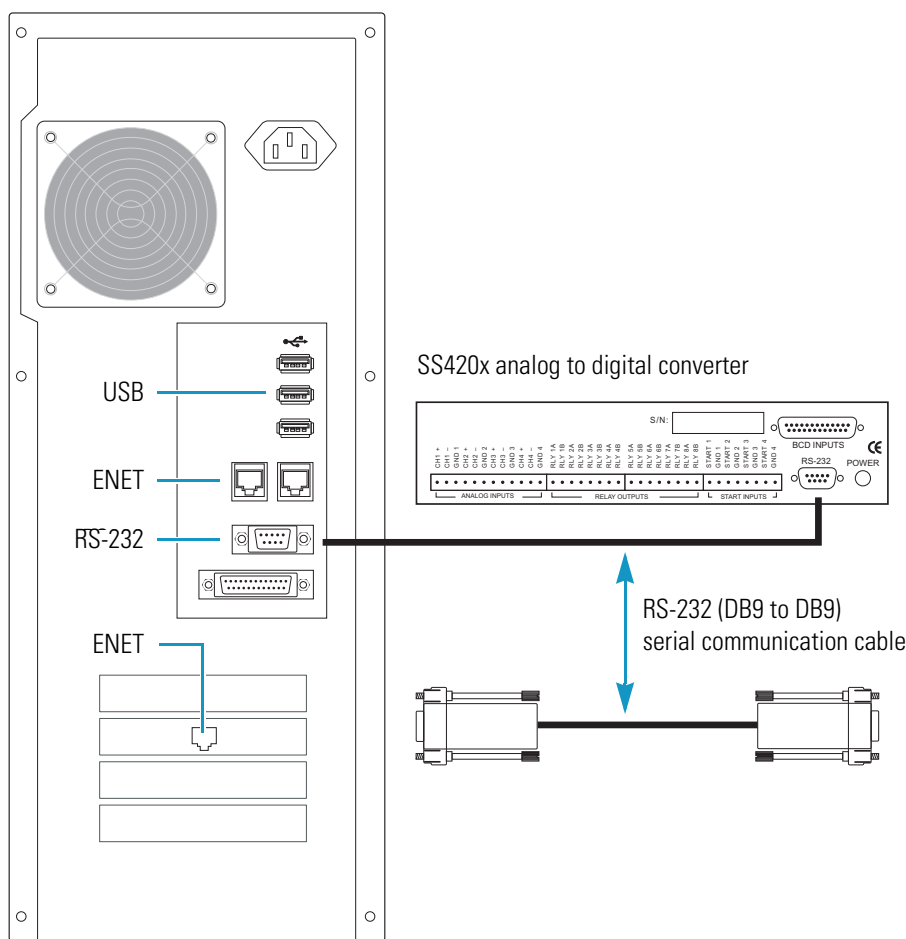
Connecting the Trigger and Signal Cables

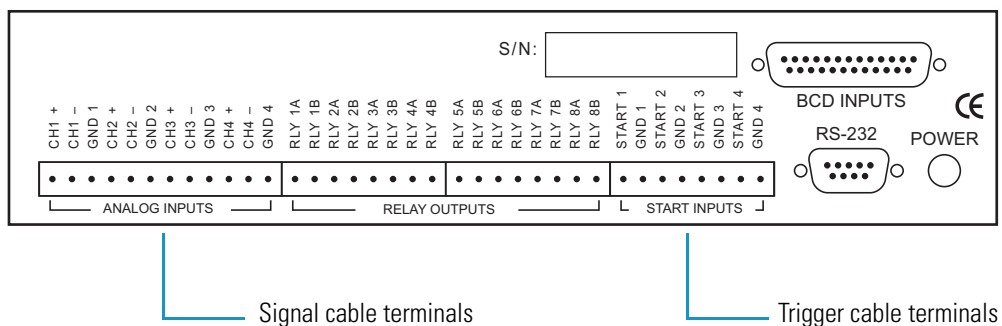The SS420x A/D converter has four analog input channels (Channel A to Channel D) and four start input terminals that you can use to acquire analog data from analog devices not controlled by the Xcalibur data system.

Figure 2 shows the analog input channels and the start inputs on the back panel of the A/D converter.

Figure 2. Back panel of the SS420x A/D converter

Signal cable terminals   Trigger cable terminals

Note The following is a general procedure for connecting up to four analog devices to the SS420x A/D converter. Your particular application might require a different procedure or a different configuration of devices.

Acquiring data from an analog device requires the following connections:

- A 2-wire signal cable from the analog device to the SS420x A/D converter

- A 2-wire trigger cable (contact closure) from one to four analog devices to the autosampler

- A 2-wire trigger cable (contact closure) from the autosampler to the SS420x A/D converter

- A 2-wire trigger cable (contact closure) from the autosampler to the MS detector

Figure 3 shows a general wiring diagram for triggering data acquisition and collecting data from an analog device, such as a detector, not supported by the Xcalibur data system.

Figure 3. Wiring diagram for triggering data acquisition and collecting data from an analog device
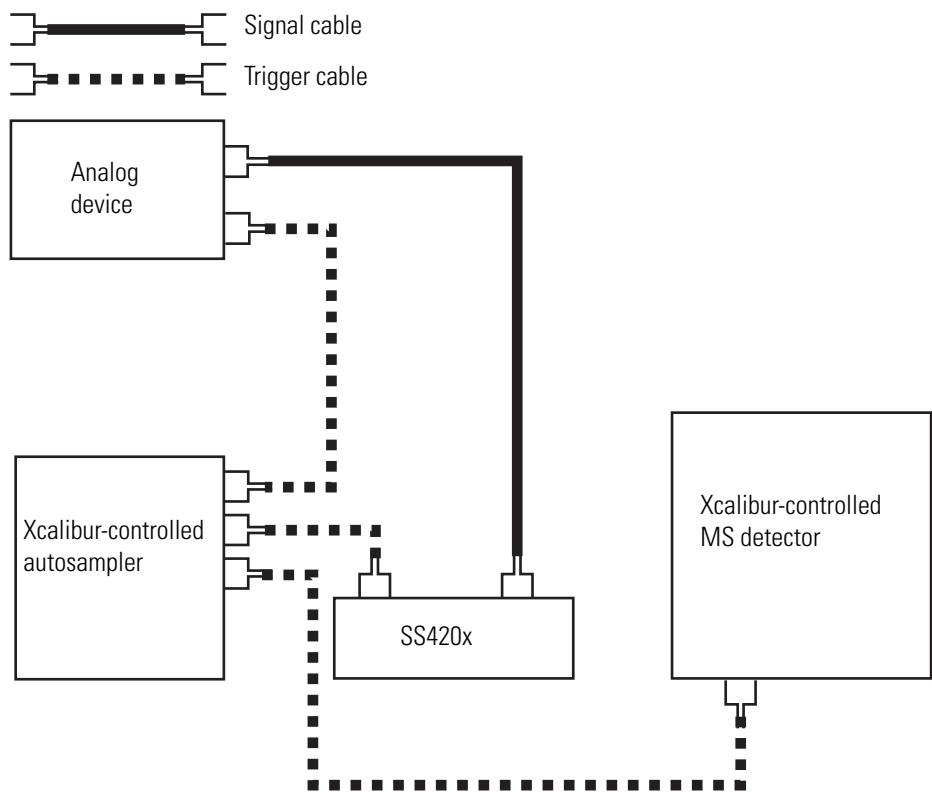
❖ **To connect the trigger and signal cables**

1. Connect a 2-wire signal cable from the SS420x A/D converter to the analog device (see Table 2). To connect more than one analog device to the SS420x A/D converter, use a separate channel (Channel A to Channel D) for each device.

Table 2. Wiring an analog device and the SS420x for A/D data acquisition

SS420x A/D converter analog inputs	Analog device (0 to 1 V or 0 to 10 V output)
CH1 +	Signal output pin
CH1 -	Ground pin

2. Connect a 2-wire trigger cable from the analog device to the autosampler (see Table 3).

Table 3. Wiring the LC autosampler and the analog device for contact closure

Analog device	Autosampler
Start in pin	Inject out pin
Ground pin	Ground pin

3. Connect a 2-wire trigger cable from the autosampler to the SS420x (see Table 4).

Table 4.   Wiring the LC autosampler and the SS420x for contact closure

Autosampler	SS420x A/D converter (START1 to START4)
Inject out pin	START1 +
Ground pin	GND1 −

4. Connect a 2-wire trigger cable from the autosampler to the MS detector (see Table 5).

Table 5.   Wiring the autosampler and the MS detector for contact closure

Autosampler	MS detector I/O
Inject out pin	START IN +
Ground pin	START IN - (ground pin)

Connecting the Relays to Control an External Device

Use the eight digital outputs (labeled RLY1 to RLY8) on the back panel of the SS420x A/D converter board to control devices, such as a fraction collector, not controlled by the Xcalibur data system.

Note   The SS40x converter board can trigger external devices through either a closed contact or open contact signal. Refer to the reference manual that is supplied with your external device to determine its trigger type.

❖   **To connect an external device to the SS420x A/D converter**

Connect a 2-wire trigger cable from the input terminals of the external device to the SS420x A/D converter. Follow the wiring scheme shown in Table 6.

Table 6.   Wiring an external device and the SS420x for contact closure

External device	SS420x A/D converter (RLY1 to RLY8)
Input pin	RLY A
Ground pin	RLY B

Instrument Configuration

The SS420x communicates with the Xcalibur data system through a serial communication link. To set up this link, you must specify the COM port on the computer where the serial communication cable is connected (see Figure 1 on page 2).

❖ **To check the data system configuration settings for the SS420x**

1. From the computer desktop, depending on the Xcalibur version, do one of the following:

   • For Xcalibur 2.0.x or lower, choose **Start > Programs > Xcalibur > Instrument Configuration**.

   The Instrument Configuration window appears.

   > **Note** The Instrument Configuration window (not shown) has the same functionality as the Thermo Foundation Instrument Configuration window.
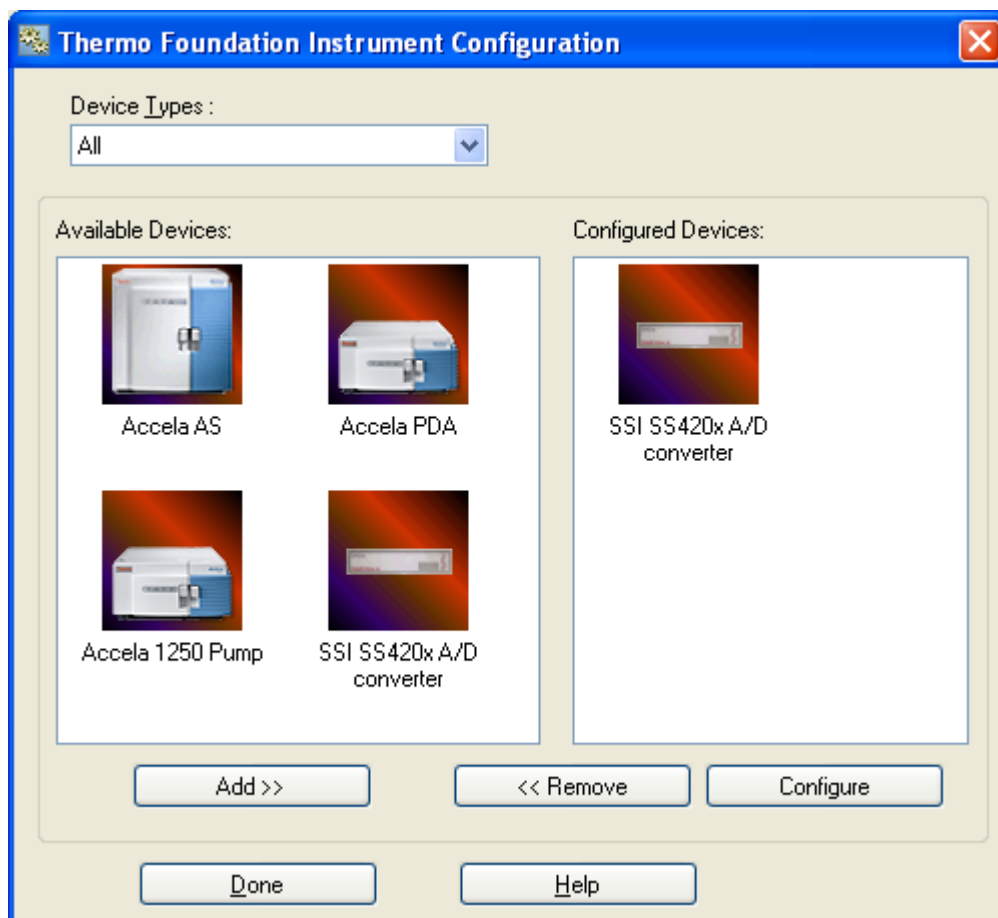
   • For Xcalibur 2.1.x or higher (with Thermo Foundation™), choose **Start > Programs >Thermo Foundation > Instrument Configuration**.

   The Thermo Foundation Instrument Configuration window appears (see Figure 4).

2. Under Available Devices, double-click the **SSI SS420x A/D converter** button.

   A copy of the SSI SS420x A/D converter button appears in the Configured Devices pane (see Figure 4).

Figure 4. Thermo Foundation Instrument Configuration window with the A/D converter added to the Configured Devices pane

3. Under Configured Devices, double-click the **SSI SS420x A/D Converter** button.

The SS420x Configuration dialog box appears (see Figure 5).

Figure 5. SS420x Configuration dialog box
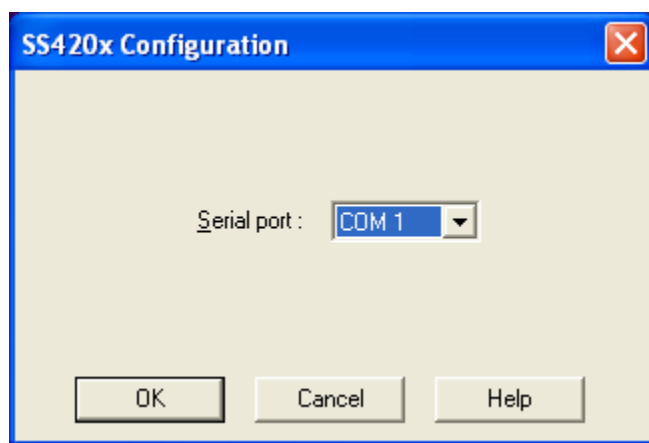
4. Select the COM port where the device is attached.

5. Click **OK** to save the changes and close the SS420x Configuration dialog box.

6. Click **Done** to close the Thermo Foundation Instrument Configuration window.

> **Note** Before you can open the Thermo Xcalibur data system, you must close the Thermo Foundation Instrument Configuration window. You cannot open the Xcalibur data system while the Foundation application is running.

Instrument Method Setup

This chapter describes how to set up an instrument method that uses the SS420x analog-to-digital board to acquire data from an analog device, such as a detector, or trigger an external device, such as a fraction collector.

See Chapter 1, "Hardware Connections," for information on connecting the SS420x to an analog device, such as a detector, or an external device, such as a fraction collector.

See Chapter 2, "Instrument Configuration," for information on adding the SS420x to your instrument configuration.

> **IMPORTANT** If you want to use the SS420x to convert an analog signal from an unsupported analog detector, the detector must have its own control panel, or you must have an appropriate data system and a second data system computer to control the detector. For example, to download a method to the Surveyor RI Detector Plus, you must have a second data system computer with the ChromQuest data system installed. The SpectraSYSTEM UV/Vis detectors have front panel controls.

Contents

- Opening the Instrument Setup View for the SS420x Board
- Specifying the Data Acquisition Settings
- Specifying the Voltage Range and Trigger Type
- Triggering an External Device with the SS420x

Opening the Instrument Setup View for the SS420x Board

❖ **To open the Instrument Setup view for the SS420x A/D converter**
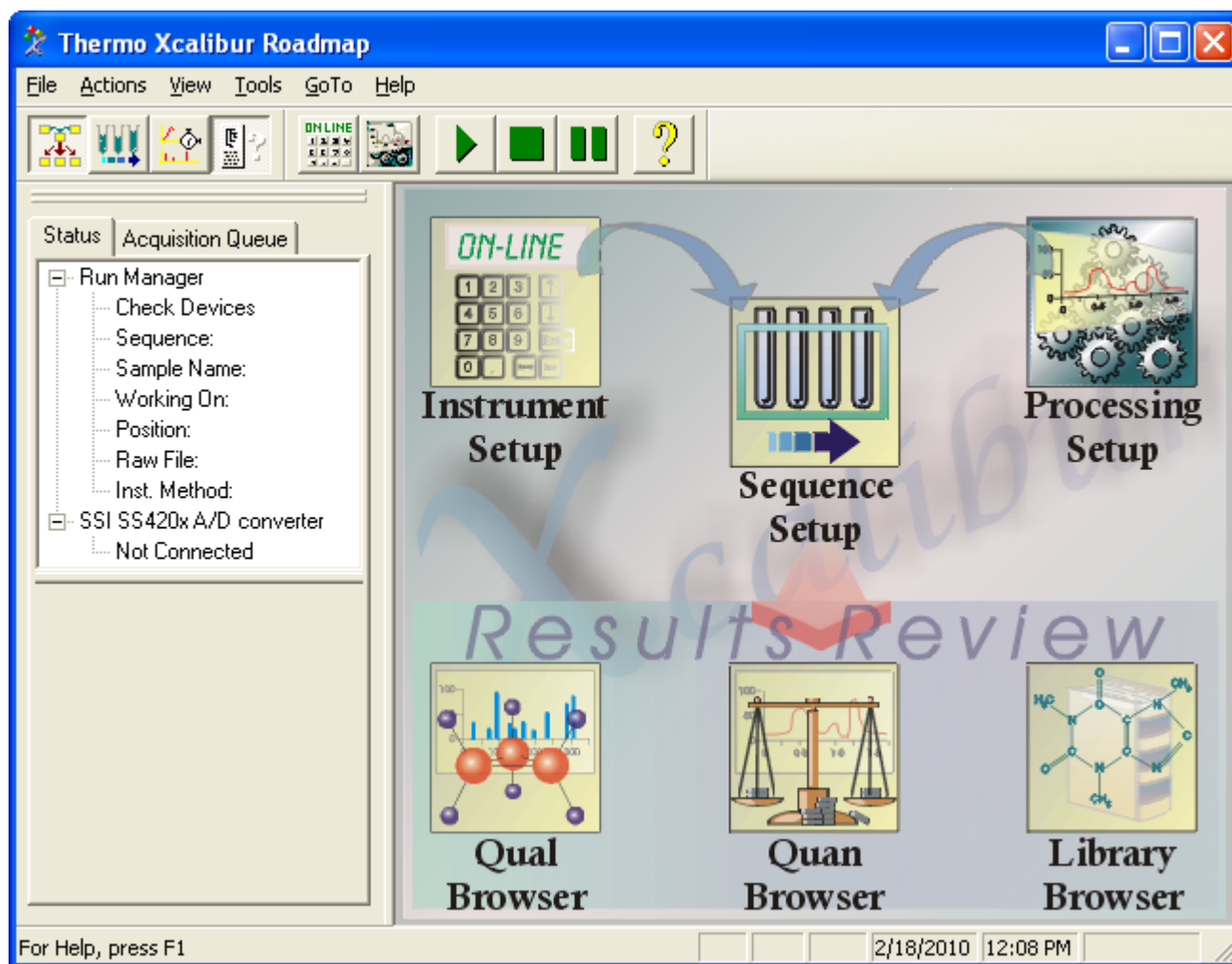
1. From the computer desktop, open the Xcalibur data system:

    - For Xcalibur 2.0.x or lower, choose **Start > Programs > Xcalibur > Xcalibur**.

      The Home Page appears.

    - For Xcalibur 2.1.x or higher (with Foundation), choose **Start > Programs > Thermo Xcalibur > Xcalibur**.

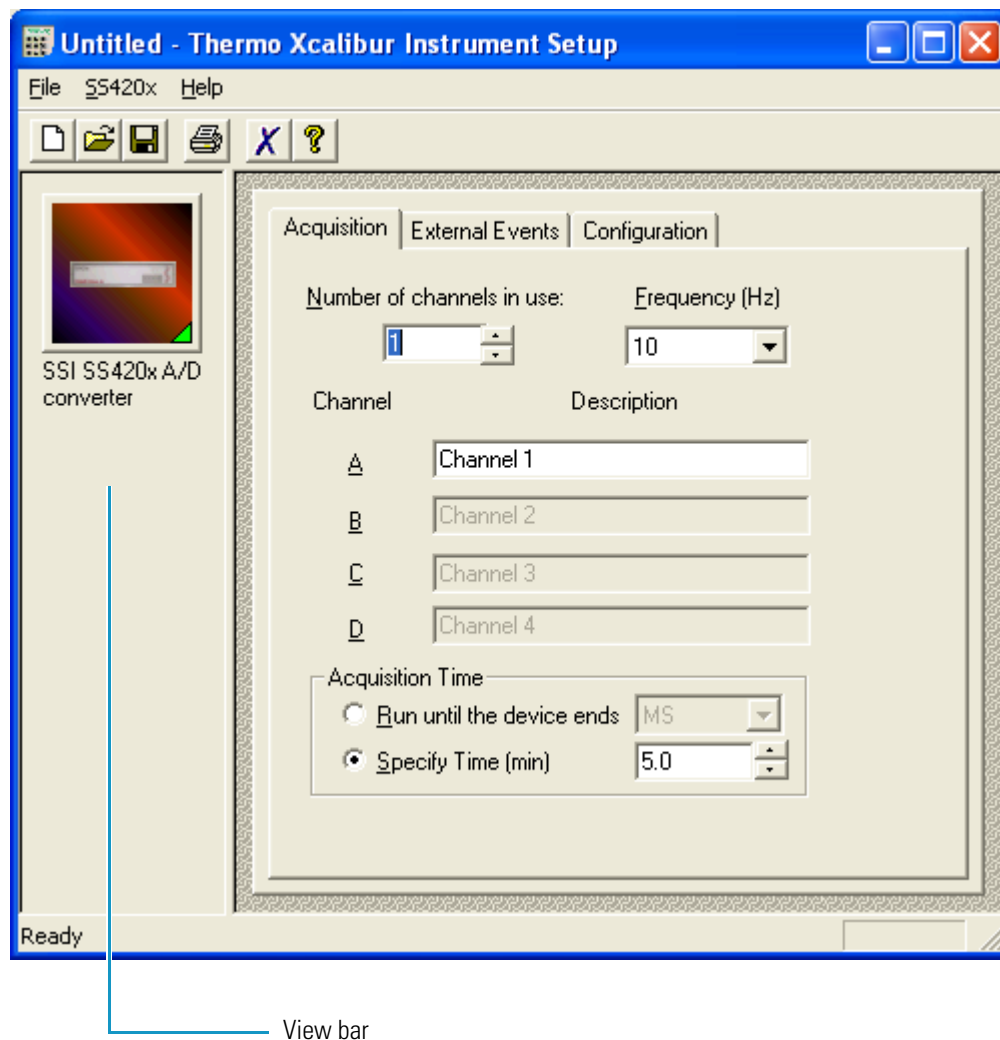The Thermo Xcalibur Roadmap window appears (see Figure 6).

Figure 6. Thermo Xcalibur Roadmap view

2. In the Roadmap view, click the **Instrument Setup** icon.

The Thermo Xcalibur Instrument Setup window appears (see Figure 7).

Figure 7. SS420x A/D converter view in the Instrument Setup window

View bar

3. In the view bar, click the **SSI SS420x A/D converter** button.

The SS420x view appears with the Acquisition page displayed (see Figure 7).

To acquire data from an analog detector, follow these procedures:

- "Specifying the Data Acquisition Settings" on page 14

- "Specifying the Voltage Range and Trigger Type" on page 16

To trigger an external device, such as a fraction collector, follow these procedures:

- "Specifying the Voltage Range and Trigger Type" on page 16

- "Triggering an External Device with the SS420x" on page 18

Specifying the Data Acquisition Settings

When you are using the SS420x A/D converter board to acquire data from an analog device, use the Acquisition page to specify the number of acquisition channels, the data rate (frequency), and the acquisition time (see Figure 8).

If the SS420x is the start instrument, data acquisition starts when all configured devices report Ready for Run. If the SS420x is not the start instrument, the channels in use are started by the input trigger line specified on the Configuration page. Data acquisition ends at a specific time or when the run time for the specified device ends.

Figure 8. Acquisition page with the default settings

❖ **To specify the data acquisition settings for the SS420x converter board**

1. In the Number of Channels in Use box, type or select the appropriate number of channels.

2. In the Frequency (Hz) list, select the data acquisition rate.

   The selections are 10, 25, 30, 50, 60, 100, and 120 Hz.

3. In each available Channel Description box, type the name of the analog device.

4. To specify the acquisition time, do one of the following in the Acquisition Time area:

- Select the **Run Until the Device Ends** option to use a device to stop data acquisition. Then select the device that controls the acquisition time.

  The selections are Any (any device), AS (autosampler), Detector, GC (gas chromatograph), LC (liquid chromatograph), MS (mass spectrometer), or Other device.

  –or–

- Select the **Specify Time (min)** option to stop data acquisition after a specified time. Then type or select the time in the associated box.

  The range is 0.1 to 100 000.0 minutes.

To specify the voltage range and trigger type for the analog device, go to "Specifying the Voltage Range and Trigger Type" on page 16.

Acquisition Page Parameter Descriptions

Table 7 describes the instrument method parameters on the Acquisition page.

Table 7. Acquisition page parameters (Sheet 1 of 2)

Parameter	Description
General Controls	
Number of Channels in Use	Specifies the number of analog input channels to be monitored.
	Selections: 1, 2, 3, or 4.
	The data system activates the number of channels (A, B, C, and D) that correspond to the number selected. For example, if you select 3 channels, the data system activates channels A, B, and C.
Frequency (Hz)	Specifies the data acquisition rate in Hz (data points per second).
	Default: 10 Hz Selections: 10, 25, 30, 50, 60, 100, and 120 Hz
Channel Description	Specifies a name for each active channel.
	Default: 1, 2, 3, and 4
	The user-specified name can consist of up to 76 alpha-numeric characters.
Acquisition Time	
Specifies how long analog data is to be acquired by the data system.	

Table 7. Acquisition page parameters (Sheet 2 of 2)

Parameter	Description
Run Until the Device Ends	Specifies that the SS420x A/D converter board acquires data from the specified device until the device is turned off.
	Selections: Any (any device), AS (autosampler), Detector, GC (gas chromatograph), LC (liquid chromatograph), MS (mass spectrometer), or Other device
Specify Time (min)	Specifies that the SS420x A/D converter board acquires data for the specified time.
	Default: 5.0 minutes Range: 0.1 to 100 000.0 minutes

Specifying the Voltage Range and Trigger Type

Use the Configuration page (see Figure 9) to specify the voltage range and trigger type for your analog device.

Figure 9. Configuration page with the default settings

❖ **To specify the voltage range of the analog channels and the trigger type for each channel**

1. In the SS420 x A/D converter view, click the **Configuration** tab.

   The Configuration page appears (see Figure 9).

2. In the Channels area, select the voltage range for the channel you are using to acquire data:

   • Select **0 - 1 V** if the output signal from the analog device is between –1 and +1 V.

   • Select **0 - 10 V** if the output signal from the analog device is between –10 and +10 V.

3. In the Trigger Input list, select the appropriate trigger.

   The selections are Trig 1, Trig 2, Trig 3, and Trig 4.

   If you want to use a device other than the autosampler to start data acquisition, select the trigger that is connected to the device.

4. In the Trigger on Contact list, select **Closed Contact,** or refer to the analog device reference manual to determine the trigger type setting.

   > **Note** To determine whether the device is triggered by a contact closure signal or an open contact signal, refer to its reference manual.

Configuration Page Parameter Descriptions

Table 8 describes the instrument method parameters on the Configuration page.

Table 8. Configuration page parameters (Sheet 1 of 2)

Parameter	Description
Channels	
Range	Specifies the range of voltages that are expected from the specified channel. The range can either be 0 to 1 VDC or 0 to 10 VDC.
Trigger	
Trigger Input	Specifies the terminal on the back panel of the SS420x used to initiate acquisition.
	Selections: Trig 1, Trig 2, Trig 3, and Trig 4
	For information on connecting the trigger terminal to the analog device, see "Connecting the Trigger and Signal Cables" on page 3.
Trigger on Contact	Specifies the trigger type used to initiate acquisition.
	Selections: Closed and Opened.

Table 8. Configuration page parameters (Sheet 2 of 2)

Parameter	Description
Calibration	
Calibration	Displays the values set during the factory calibration of this device.
Base Frequency (Hz)	Displays the base frequency in Hz of the SS420x A/D Converter.
	This value corresponds to the selection in the Frequency list on the Acquisition page.
Version	This readback displays the version number of the SS420x A/D Converter.

Triggering an External Device with the SS420x

Use the External Events page (see Figure 10) to set up the SS420x to control external devices that require a contact closure (such as gas sampling or column switching valves).

Figure 10. External Events page with the default settings

You can connect an external device to one of the eight relay outputs on the back panel of the SS420x A/D converter. You can program up to 50 events during a run. The events can occur at a delay time from 0.0 to 1 000 000 seconds into the run.

❖ **To trigger an external device at a specified time**

1. Click the **External Events** tab

   The External Events page appears (see Figure 10).

2. In the Events Description area, do the following:

   a. In the Number of Events box, type or select the number of events you want to control.

      You can control up to 50 events.

   b. In the Description box, type a description of the multi-event procedure you want to run.

      The description can consist of up to 83 alpha-numeric characters.

3. In the Event Setup area, set up an event as follows:

   a. In the Descriptions column, type a description of the event in the Descriptions box.

   b. In the Delay Time column, type a delay time for the event.

      The delay time determines when an event occurs. The delay time equals zero when the SS420x starts acquisition or the MS detector sends a contact closure signal.

   c. In the Digital Output in Use column, select the digital output terminal that you want to trigger.

      For a Trigger Type—Closed Contact device, the following occurs:

      • When the Digital Output In Use check box is selected, the external device receives a closed contact signal at the specified delay time.

      • When the Digital Output In Use check box is not selected, the external device receives an open contact signal at the specified delay time.

      For a Trigger Type—Open Contact device, the following occurs:

      • When the Digital Output In Use check box is selected, the external device receives an open contact signal at the specified delay time.

      • When the Digital Output In Use check box is not selected, the external device receives a closed contact signal at the specified delay time.

   d. Repeat steps step 3a through step 3c for each event.

External Events Page Parameter Descriptions

Table 9 describes the instrument method parameters on the External Events page.

Table 9. External Events page parameters (Sheet 1 of 2)

Parameter	Description
Events Description	
Number of Events	Specifies the number of external digital events that you want to occur. Default: 0 Range: 0 to 50 The data system activates the number of events (numbered event rows) that correspond to the number selected. For example, if you select 3 events, the data system activates Event 1, Event 2, and Event 3 so that you can enter an event description and an event delay time, and program the 8 digital outputs for each event.
Description	Describes the events list. Default: Description The user-specified description can consist of up to 83 alpha-numeric characters.

Event Setup

Specifies the description, delay time, and the 8 digital outputs for each activated event. The following figure and description show an example of how to use this table:

1. When the acquisition is started, the base time is set to zero.

2. Valve A and B are set to open at 5 seconds and 30 seconds, respectively.

   Valve A and B are connected to the relay output connectors 1 and 2 so that the SS420x A/D converter can control them during the run.

3. The two valves are turned off after 600 seconds.

Event	Displays the event number. When the number of events exceeds 5, you can use the vertical scroll bar to display the hidden events. You can specify from 0 to 50 external events.

Table 9. External Events page parameters (Sheet 2 of 2)

Parameter	Description
Descriptions	Describes a given event.
Delay Time(s)	Specifies the time in seconds after the start of acquisition that an event is to occur.
Digital Output in Use	Use these check boxes to program the eight external digital outputs.
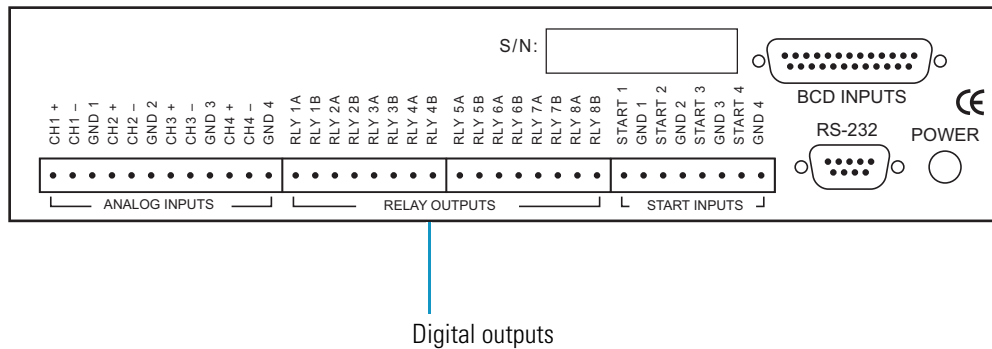
Digital outputs

The meaning of the check box depends on the Trigger Type you specified for a Trigger Line on the Configuration page (Closed Contact or Open Contact).

Trigger Type—Closed Contact

- When the Digital Output in Use check box is selected, the external device receives a Closed Contact signal at the specified delay time.

- When the Digital Output in Use check box is not selected, the external device receives an Open Contact signal at the specified delay time.

Trigger Type—Open Contact

- When the Digital Output in Use check box is not selected, the external device receives an Open Contact signal at the specified delay time.

- When the Digital Output in Use check box is selected, the external device receives a Closed Contact signal at the specified delay time.

Index