GETTING STARTED
WITH

A1560 SONIC

OEM ULTRASONIC PULSER/
RECEIVER FRONT-END UNIT

APPLICABLE FOR A1560 SONIC-LF, A1560 SONIC-HF, A1560 SONIC-AIR

A1560 SONIC-HF

POWER   IN   OUT

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INTRODUCTION

The A1560 SONIC (hereinafter "A1560") is a product line of ultrasonic flaw detectors that allows ultrasonic data acquisition for different material applications. The instrument can be operated in manual (internal triggering) as well as in automatic (external triggering) mode with up to 2000 measurements per second.

The main purpose of the A1560 SONIC is system integration and customizing a wide range of measurement and inspection tasks. The user is provided with a software development kit (SDK) for writing their own software applications. The included Mathilda A1560 GUI is a simple software application that allows users to get familiar with the instrument's settings and demonstrates the programming routines.

The A1560 series is available in the following configurations:

TABLE 1. AVAILABLE PRODUCTS

Instrument version	Frequency Range	Transducers
A1560 SONIC-LF	10 kHz – 500 kHz	To be operated with DPC and regular low-frequency piezo-transducers.
A1560 SONIC-HF	400 kHz – 15 MHz	Piezo-electric transducers with contact and immersion coupling.
A1560 SONIC-AIR	10 kHz – 750 kHz	Air-coupled piezo-electric transducers. Modifications for different transducers are available.

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This document demonstrates the first steps of working with the A1560. It is highly recommended to familiarize yourself with the following A1560 documents:

- **A1560 User Manual**
- **A1560 Programming Manual**
- **A1560 Advanced Configuration**

SAFETY SYMBOLS USED IN THIS MANUAL:

| Symbol	Description
⚠WARNING	Indicates a potential threat. Failure to avoid it can result in death or serious injury.
⚠CAUTION	Indicates a potential threat. Failure to avoid it may result in minor injury.
NOTICE	Indicates a potentially harmful situation. If it is not avoided, the device or something in its vicinity may be damaged.

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A1560 MAIN COMPONENTS
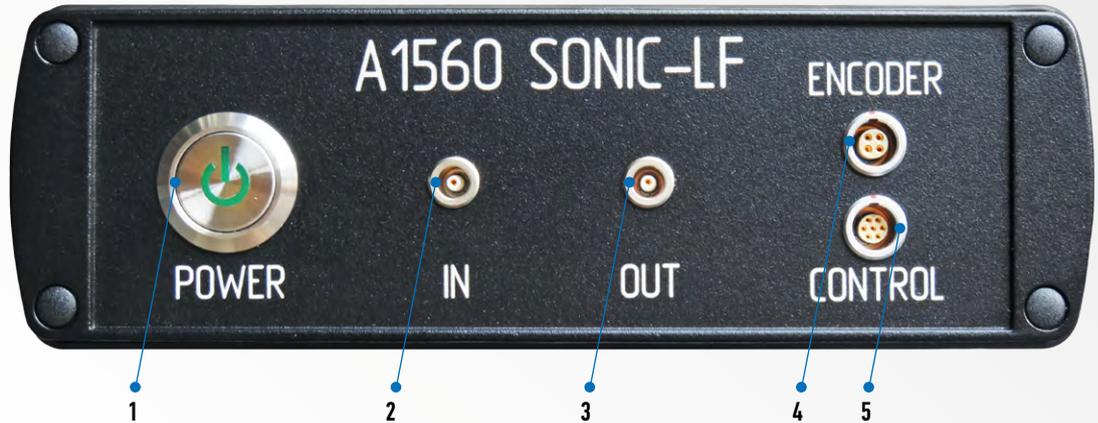
FIGURE 1. A1560 FRONT PANEL

1. Power button with built-in state indicator, **POWER**
2. Input connector for a receiving transducer or receiving element of a double-crystal transducer, input-output connector of a single-crystal transducer, **IN**
3. Output connector of a transmitting transducer or transmitting element of a double-crystal transducer, **OUT**
4. Encoder connector, **ENCODER**
5. Control connector (reserved), **CONTROL**

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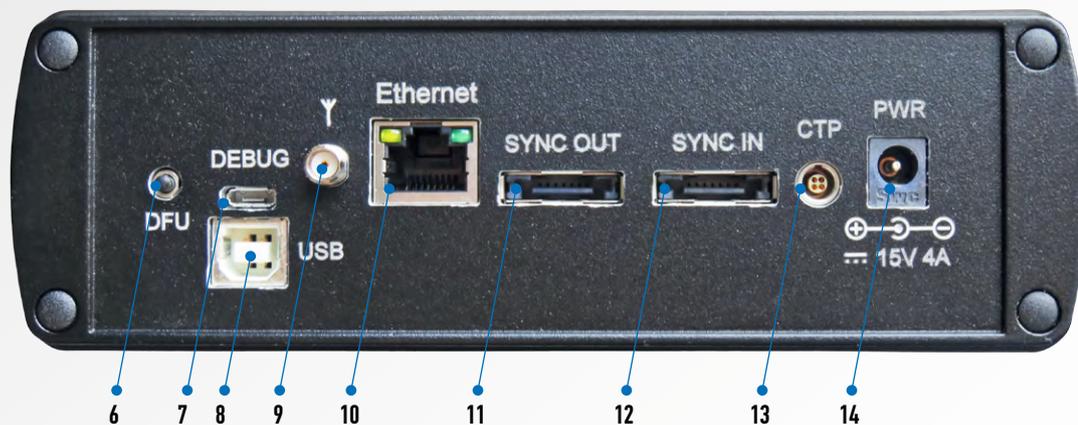
FIGURE 2. A1560 REAR PANEL

6. Device firmware upgrade button, **DFU**
7. Service debug connector, **DEBUG**
8. Firmware upgrade USB connector, **USB**
9. Wi-Fi antenna connector
10. Ethernet network connector, **ETHERNET**
11. Connector for the next A1560 unit in a synchronized unit chain, **SYNC OUT**
12. Connector for the previous A1560 unit in a synchronized unit chain, **SYNC IN**
13. Connector for an external triggering device, **CTP**
14. Connector for power supply, **PWR**

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BEFORE THE FIRST USE

CONNECT WI-FI ANTENNA

Your A1560 unit is delivered with a Wi-Fi antenna unscrewed. Attach the antenna by positioning its connector coaxially with the connector of the unit and screwing it clockwise.

NOTICE Use only the included antenna or an antenna approved by ACS. Common "router" antennas won't provide a stable connection despite their connector visibly matching the A1560 connector.

CHARGE THE DEVICE

Connect the power supply unit delivered with the A1560 instrument to the **PWR** connector, plug the power supply unit into an AC power outlet and charge the A1560 for at least 2.5 hours before using it.

The A1560 is equipped with a battery, which allows it to be used when a power connection is unavailable or impossible.

NOTICE You can use the instrument while it is connected to the external power source. Run the device on battery only when you have to. The device has a four-to-eight-hour battery life, depending on the usage mode. When the battery level is critically low, the **POWER** state indicator will start blinking. If that happens, connect the A1560 to a power source as soon as possible. Deep discharge can dramatically affect the battery's lifespan.

⚠CAUTION Power supply unit parts are subjected to dangerous voltages. They can store energy even when the power supply unit is disconnected from the AC power. Therefore, DO NOT disassemble the adaptor or touch any metal parts of it, including cable plug and connectors, even when it is disconnected. Neglecting this may result in personal injury.

⚠WARNING Use only the included power supply unit or a compatible unit approved by ACS. Poor-quality power supply units may introduce noise to the acquired data. Mismatched voltages can cause the built-in battery to explode or can damage the instrument.

CONNECTING UT TRANSDUCER(S)

If you are using double-crystal transducers, connect the receiving element to the A1560's **IN** connector, and the transmitting element to the **OUT** connector. In case of a single crystal transducer, connect it to A1560 **IN** connector and leave the **OUT** connector unconnected.

Connect the LEMO cable of the transducer to the A1560 by inserting the plug of the cable into the socket.

If you need to disconnect the cable, carefully grasp the LEMO plug by the knurled sleeve and pull it straight backwards.

⚠ **CAUTION**   Do not touch the IN and OUT connectors or, plug/unplug the transducers when the A1560 is switched on. Neglecting this may result in personal injury, as well as damage of the instrument and transducers. When the A1560 is switched on, a 400V pulse voltage may be present at the central pin of the IN and OUT connectors.

NOTICE   We recommend using transducers approved by ACS.
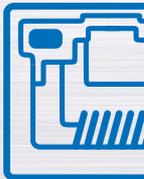
USING THE A1560 INSTRUMENT

SWITCHING THE POWER

To power the instrument on, press the POWER button for half a second. The state indicator inside the button should light up immediately.

To power the instrument off, press the POWER button for half a second again. Due to the deinitialization process, it takes ~3s before the state indicator goes off.

CONNECTING TO THE A1560 VIA A NETWORK

The A1560 is equipped with an 802.11n Wi-Fi module as well as an Ethernet connector.

The default IP address for the A1560 is 192.168.1.2 in both cases.

NOTICE By default, the A1560 network subsystem is left unprotected to simplify getting it into operation. The A1560, when connected to an organization's local area network without adequate security measures, can and will be used as an entry point for a network intrusion. Use the A1560 in an isolated network segment. Otherwise, consider at the very least setting Wi-Fi and configuration passwords.

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WIRELESS CONNECTION VIA WI-FI

The A1560 is delivered with the wireless module pre-set as a Wireless Access Point with A1560_XXXXXXX SSID, where XXXXXXX is the serial number of the unit. To connect to the A1560 wirelessly:

1. Power the A1560 on.

2. Wait 20 to 30 seconds for the A1560 networking stack initialization.

3. Find an open Wi-Fi network with A1560_XXXXXXX SSID in an available network list and connect to it (Figure 3)

4. Once the Wi-Fi connection is established, your A1560 unit should be accessible to data acquisition software.
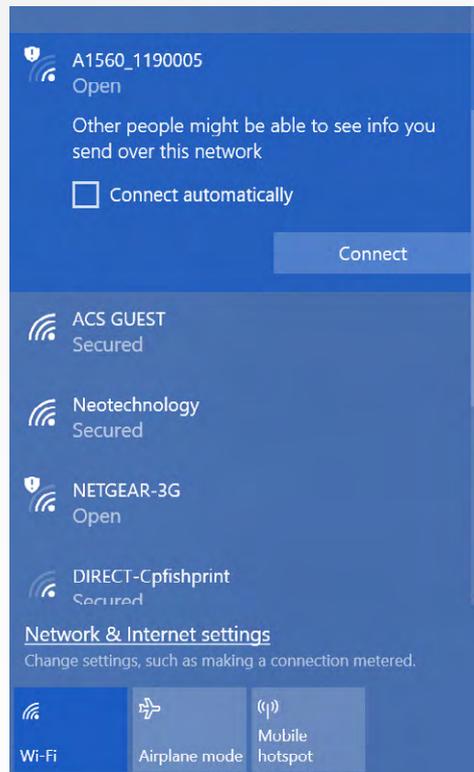
FIGURE 3 A1560 IN THE LIST OF AVAILABLE WI-FI NETWORKS (WINDOWS 10)

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WIRED CONNECTION VIA ETHERNET

Your instrument is delivered with the DHCP server enabled at the Ethernet port. Therefore, it is generally advised to refrain from connecting the A1560 to a company's local area network without changing the default network settings of the A1560. To connect to the A1560 via Ethernet:

1. Connect the Ethernet port of your A1560 directly to an Ethernet port of your PC with a standard Ethernet cable.
2. Power the device on.
3. In 20 to 30 seconds, your A1560 unit should be accessible to data acquisition software.

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CONTROLLING THE DEVICE FROM A PC AND ULTRA-SONIC DATA ACQUISITION

Start working with A1560 using Mathilda demo program

Mathilda A1560 GUI is a simple software application that allows data acquisition parameters to be changed, performs the data acquisition and observes the acquired data.

Installation and running the Mathilda demo program

The program can be downloaded from the ACS website. To install it, unpack the installation archive and run setup.exe. Once the program is installed, you can find it in the Windows start menu as "Mathilda" app.

Using the Mathilda demo program

The application has only one window with the following set of controls:

1. Connection status text, editable IP address and reconnection button. The label at this line may read **Connected** or **Disconnected,** reflecting the current connection state. If the connection was not established automatically on startup, make sure the IP address is correct (192.168.1.2 is a factory setting of A1560) and click Reconnect.

In any of the inputs, information is validated and applied when a user either presses the Enter key or proceeds to edit any other parameter. If validation fails, the previous value will be automatically restored in the input field.

2. Input the signal sampling rate value.

3. Acquired data acquisition length (A-Scan / vector) value can be changed in the range of 1024 to 131072.

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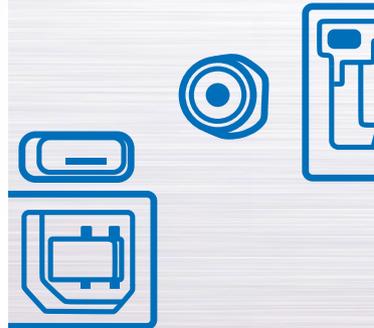
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4. Input signal high-pass filter cut-off frequency value. The set of the available values depends on the version of the instrument.

5. Signal attenuation/gain value. Value can be changed in the range of -20dB to +80dB.

6. Pulse duration dial. The value can be selected in the range of one half-cycle to five full cycles. For example, when **Number of periods=1**, the pulse duration is one full cycle (negative and positive half-waves), or 1μS for **Transducer Frequency=1000kHz**

7. Pulse period value. Enter the suitable pulse period for the used transducer. The acceptable values are different for different instrument versions.

8. Pulse frequency value. Enter the suitable frequency for the used transducer. The acceptable values are different for different instrument versions.

9. Transducer type selector. Select **Double** if a dual crystal transducer or two transducers are connected to the **IN** and **OUT** connectors of the A1560. Select **Single** if you have a signle-crystal transducer is connected to the **IN** connector.

10. Pulse amplitude selector. An amplitude from 20 to 200Vpp can be selected, depending on the instrument configuration.

11. Acquisition start trigger selector:

-when **single** shot is selected, a single pulse-acquisition sequence will take place every time a user clicks DAQ.

-once **continuous(internal)** is selected, the A1560 will repeat the pulse-acquisition sequence periodically with a period entered by the user in the input to the right of the radio button.

- once **continuous(external)** is selected, the A1560 will perform the pulse-acquisition when it receives a new CTP message from external triggering device.

12. The data rate and acquisition rate bars allow you to estimate how many megabits of data or acquisitions were received in the last second.

13. The A-Scan meta data display shows the packet number (assigned by A1560) and CTP ID (generated by external CTP or internal timer) of the A-Scan, currently displayed in the plot area.

14. The plot area displays the last acquired data vector (A-Scan) as soon as it is acquired. The X-axis changes its resolution automatically according to the length of the displayed A-Scan. A part of the plot may be zoomed in or out with a mouse.

NOTICE The Safe-C threshold of 3000 pulse cycles per second should not be exceeded. **It is calculated, e.g., in timed mode, as Number of Periods*10^6/Continuous(internal) μS.**
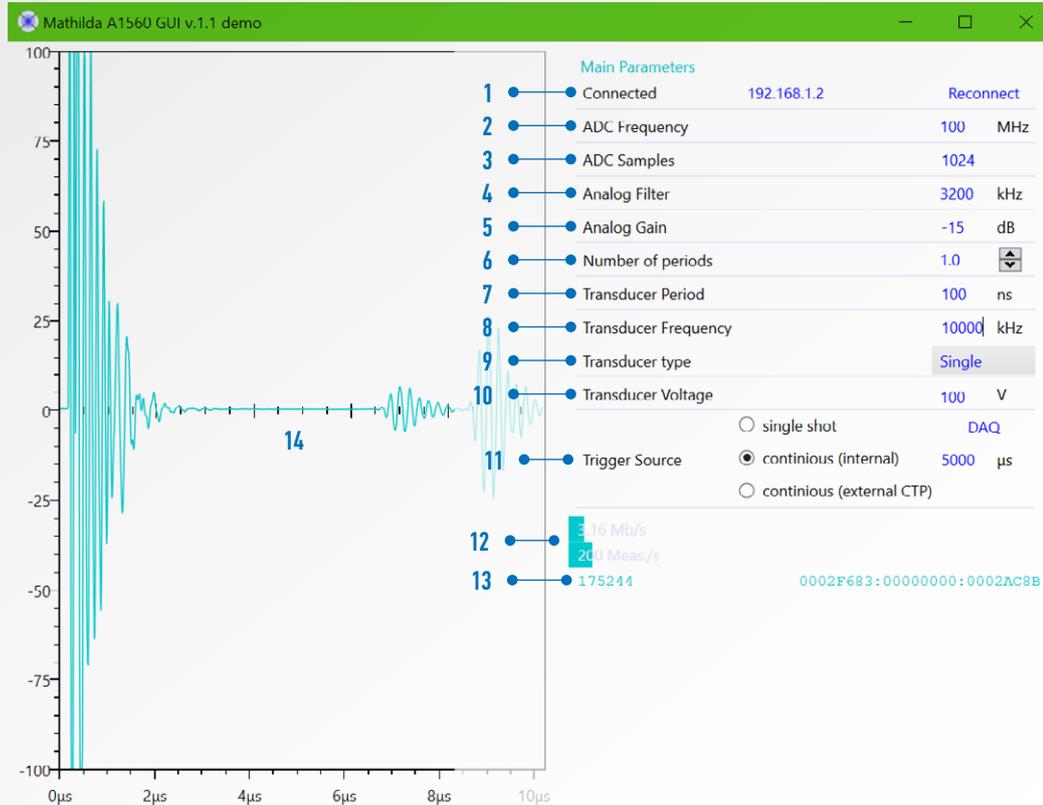
FIGURE 4 MATHILDA DEMO PROGRAM CONTROLS
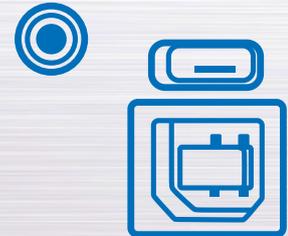
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CONTROLLING THE A1560 PROGRAMMATICALLY

The purpose of the **Mathilda** demo software is only to demonstrate the capabilities of the A1560.

The A1560 can be integrated into a user-specific data acquisition application and controlled by a user software via the A1560 API Library, which provides an easy-to-use set of commands and parameters.

Please refer to the A1560 **Programming Manual** document as well as the **A1560ApiTestCsharpApp** sample project provided by ACS to guide the development of your software for using the A1560.

The A1560 SDK containing the A1560 API Library, program sample and documentation can be downloaded from the ACS website.

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TROUBLESHOOTING

Problem	Possible Reason(s)	Action
The A1560 won't turn on (state indicator is off)	The device is discharged.	Connect the device to the mains power with the supplied power adaptor and charge for at least two hours.
Can't connect to the A1560, state indicator is blinking	The device is starting in firmware upgrade mode by mistake.	Switch the device off. Make sure nothing keeps the **DFU** button on the rear panel in the pressed state. Switch the device on again.
State indicator started blinking while the device is operating normally	The battery is discharged.	Connect the device to the mains power with the supplied power adaptor.
Can't connect to the A1560 via Ethernet, state indicator is on	Wrong network adapter configuration on the user's PC.	Make sure the Ethernet network adapter has DHCP enabled in its TCP/IPv4 settings. You can also set the address manually, provided it belongs to the same network as the A1560 (192.168.1.2 is a factory preset device address)
Can't connect to the A1560 via Wi-Fi, state indicator is on	PC is connected to the wrong Wi-Fi access point.	Make sure your PC is associated with the A1560_XXXXXXX SSID Wi-Fi network
Can't connect to the A1560 via Wi-Fi, state indicator is on	Wrong network adapter configuration on the user's PC.	Make sure the Wi-Fi network adapter has DHCP enabled in its TCP/IPv4 settings. You can also set the address manually, provided it belongs to the same network as the A1560 (192.168.1.2 is a factory preset device address).

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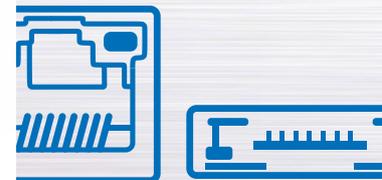
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NOTES

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