

USER MANUAL



# A1560 SONIC

**OEM ULTRASONIC PULSER/  
RECEIVER FRONT-END UNIT**

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



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Saarbrücken, Germany 2019



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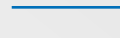
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The A1560 SONIC (hereinafter “A1560”) is a product line of ultrasonic flaw detectors designed for stand-alone and integrated use in laboratory and industrial measurement and testing applications, facilitating ultrasonic data acquisition for different materials. The instrument possesses an integrated battery and wireless data communication for long-term, stand-alone operation with a high on-off time ratio. The A1560 can be operated in manual single-shot mode as well as in automatic mode with internal or external triggering to allow up to 2500 ultrasonic data acquisitions per second.

The main purpose of the A1560 is system integration and customization for 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 the user to become familiar with the instrument settings and demonstrates the programming routines.

The A1560 series is available in the following configurations:

**TABLE 1. AVAILABLE PRODUCTS**

<b>Instrument version</b>	<b>Frequency Range</b>	<b>Transducers</b>
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.





This document covers the A1560's specifications and usage. It is highly recommended to familiarize yourself with the following A1560 documents:

- **A1560 Getting Started**
- **A1560 Programming Manual**
- **A1560 Advanced Configuration**

**Read this manual carefully before using the device to ensure safe and proper use.**

#### SAFETY SYMBOLS USED IN THIS MANUAL:

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



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## DEVICE CAPABILITIES

The A1560 has the following main features and capabilities:

o Transducer interface

- Different transducers can be connected to A1560 via industry-standard connectors.
- Single-crystal and double-crystal transducers can be used.

o Pulse generation

- Adjustable pulse period (frequency).
- Adjustable pulse duration.
- Adjustable pulse voltage.

o Input signal conditioning:

- Four switchable high-pass FIR filters.
- Adjustable attenuation.
- Adjustable gain.

o Digital data acquisition

- Adjustable acquired data vector length.
- Adjustable sampling rate.

o Digital signal processing

- Averaging of several acquired data vectors into a single vector for higher SNR.
- Adjustable averaging factor.
- Adjustable duration of a pause between acquisitions to be averaged, with an optional randomization.
- Internal time gain compensation with a user-defined curve.





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- o Flexible data acquisition control with several modes:
  - Manual single-pulse acquisition sequence.
  - Automatic periodic acquisition controlled by internal timer.
  - Automatic, variable-dependent acquisition controlled by external triggering device.
  - Automatic, position-dependent acquisition controlled by an external encoder or an external distance sensor.
  - Synchronous acquisition by several A1560 units linked in a chain.
- o Communication interfaces:
  - 100BASE-TX Ethernet interface.
  - Wi-Fi interface with Access Point and Host modes (Access Point by default).
  - Both interfaces have DHCP server capability enabled by default.
- o Power supply options:
  - AC power via an included power supply;
  - Autonomous power from an internal battery.
- o Device firmware upgrade via USB





The main characteristics of the above-mentioned three-instruments A1560 are specified in Tables 2-4.

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**TABLE 2: SPECIFICATIONS OF A1560 SONIC-LF**

<b>TRANSMITTER</b>		
Transmitter output voltage	20, 100, 200	V
Excitation sequence	Meander, 0.5 - 5.0	periods
Pulse repetition rate	1 - 1.000	Hz
<b>RECEIVER</b>		
Length of the data acquisition vector	1024 - 131072	samples
Sampling rate	1, 2, 5, 10, 25, 50, 100	MHz
High-pass filter (FIR) frequencies	10, 20, 40, 100	kHz
Low-pass filter (FIR) frequency	350	kHz
Receiving bandwidth	10 - 350	kHz
Amplifier dynamic range	0 - 80	dB
Attenuator dynamic range	-20 - 0	dB
Gain setup range	from 0 to 100 dB, step 1 dB	
DAC function programmable points count	128k	
Dynamic range of DAC function	40	dB
Averaging factor	1 - 256	

## SPECIFICATIONS

▼ TABLE 2: SPECIFICATIONS OF A1560 SONIC-LF

<b>POWER SUPPLY</b>		
Embedded power source	Built-in battery	
Operation time of the battery	5	hours
Battery charging time	2.5	hours
External power supply	DC 15 V, 4A \ AC 110-250 V	
<b>DIMENSIONS &amp; WEIGHT</b>		
Dimensions of the electronic block	260 x 156 x 43	mm
Weight of the electronic block	800	g
Operating temperature range	-20 - +45	°C
<b>DATA INTERFACES</b>		
Wireless Ethernet 54 Mbit	IEEE802.11n	
Ethernet 100 Mbit	100BASE-TX	
External trigger input	TTL	



TABLE 3: SPECIFICATION OF A1560 SONIC-HF

<b>TRANSMITTER</b>		
Transmitter output voltage	20, 100, 200	V
Excitation sequence	Meander, 0.5 - 5.0	periods
Pulse repetition rate	1 - 2.500	Hz
<b>RECEIVER</b>		
Length of the data acquisition vector	1024 - 131072	samples
Sampling rate	1, 2, 5, 10, 25, 50, 100	MHz
High-pass filter (FIR) frequencies	0.4, 0.8, 1.6, 3.2	MHz
Low-pass filter (FIR) frequency	15	MHz
Receiving bandwidth	0.4 - 15	MHz
Amplifier dynamic range	0 - 80	dB
Attenuator dynamic range	-20 - 0	dB
Gain setup range	from 0 to 100 dB, step 1 dB	
DAC function programmable points count	128k	
Dynamic range of DAC function	40	dB
Averaging factor	1 - 256	





▼ **TABLE 3: SPECIFICATION OF A1560 SONIC-HF**

<b>POWER SUPPLY</b>		
Embedded power source	Built-in battery	
Operation time of the battery	5	hours
Battery charging time	2.5	hours
External power supply	DC 15 V, 4A \ AC 110-250 V	
<b>DIMENSIONS &amp; WEIGHT</b>		
Dimensions of the electronic block	260 x 156 x 43	mm
Weight of the electronic block	800	g
Operating temperature range	-20 - +45	°C
<b>DATA INTERFACES</b>		
Wireless Ethernet 54 Mbit	IEEE802.11n	
Ethernet 100 Mbit	100BASE-TX	
External trigger input	TTL	

TABLE 4: SPECIFICATION OF A1560 SONIC-AIR

<b>TRANSMITTER</b>		
Transmitter output voltage for adjustable transmitter frequency	20, 100, 200	V
Transmitter output voltage for fixed transmitter frequency (special versions)	800	V
Excitation sequence	Meander, 0.5 - 5.0	periods
Pulse repetition rate	1 - 1.000	Hz
<b>RECEIVER</b>		
Length of the data acquisition vector	1024 - 131072	samples
Sampling rate	1, 2, 5, 10, 25, 50, 100	MHz
High-pass filter (FIR) frequencies	10, 20, 40, 100	kHz
Low-pass filter (FIR) frequency	750	kHz
Receiving bandwidth	10 - 750	kHz
Amplifier dynamic range	0 - 80	dB
Attenuator dynamic range	-20 - 0	dB
Gain setup range	from 0 to 100 dB, step 1 dB	
DAC function programmable points count	128k	
Dynamic range of DAC function	40	dB
Averaging factor	1 - 256	



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▼ TABLE 4: SPECIFICATION OF A1560 SONIC-AIR

<b>POWER SUPPLY</b>		
Embedded power source	Built-in battery	
Operation time of the battery	5	hours
Battery charging time	2.5	hours
External power supply	DC 15 V, 4A \ AC 110-250 V	
<b>DIMENSIONS &amp; WEIGHT</b>		
Dimensions of the electronic block	260 x 156 x 43	mm
Weight of the electronic block	800	g
Operating temperature range	-20 - +45	°C
<b>DATA INTERFACES</b>		
Wireless Ethernet 54 Mbit	IEEE802.11n	
Ethernet 100 Mbit	100BASE-TX	
External trigger input	TTL	



# 4

The delivery kit for the A1560 contains:

- A1560 unit
- Power supply unit
- Ethernet cable
- Wi-Fi antenna
- User manual
- Transportation and storage case

The A1560's software development kit (SDK) and the Mathilda evaluation application are available at <http://www.acs-international.com>

**DELIVERY KIT  
OF THE A1560**

User manual



The A1560 unit contains the following connectors and controls:

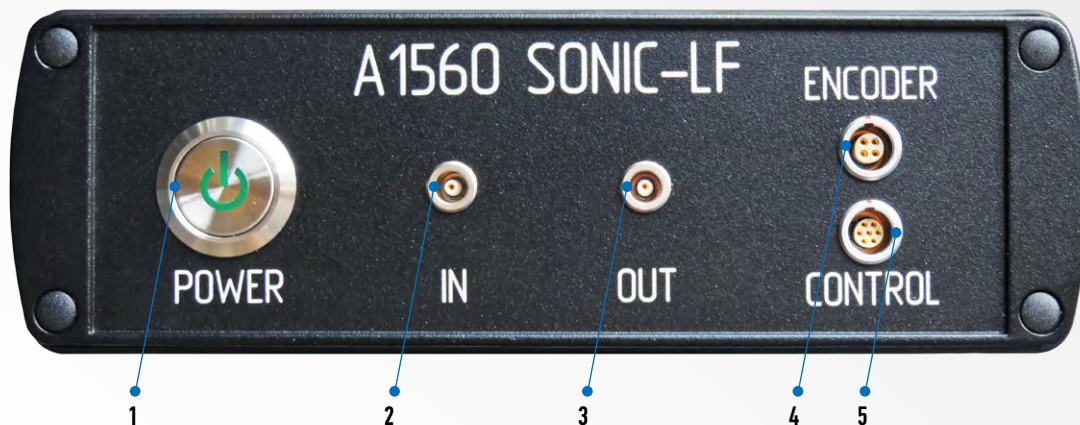


FIGURE 1. A1560 FRONT PANEL

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

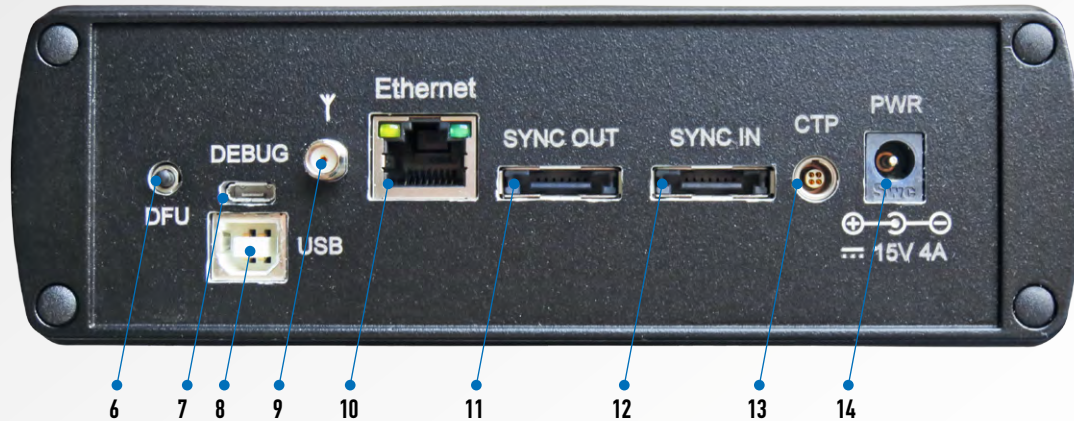


FIGURE 2. A1560 REAR PANEL

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 synchronized unit chain, **SYNC OUT**
12. Connector for the previous A1560 unit in synchronized unit chain, **SYNC IN**
13. Connector for an external triggering device, **CTP**
14. Connector for power supply, **PWR**



## 5.1 POWER BUTTON WITH BUILT-IN STATE INDICATOR

To power the instrument on, press the **POWER** button (Fig.1 Pos.1) for a half-second. The state indicator inside the button lights up immediately.

To power the instrument off, press the **POWER** button for a half-second again. Due to the deinitialization process, it takes about three seconds before the state indicator goes off.

In normal mode, the indicator has the following indication modes:

**TABLE 5 POWER LED INDICATION IN NORMAL MODE**

LED Indication	Device state
Constantly On	A1560 is on.
Constantly Off	A1560 is off.
Blinking	A1560 is on, battery is discharged.

In device firmware upgrade (DFU) mode, the meaning of the indication is different. Please refer to the **A1560 Advanced Configuration** document for further information.

## 5.2 CONNECTOR FOR A SINGLE-CRYSTAL TRANSDUCER OR THE RECEIVING ELEMENT OF A DOUBLE-CRYSTAL TRANSDUCER

The receiving element of a double-crystal transducer or a single-crystal transducer equipped with a LEMO 00 series plug can be connected to the IN socket (Fig.1 Pos.2) of the A1560. Connect the transducer cable to the A1560 by inserting the plug of the cable into the socket. If you need to disconnect the cable, carefully grasp the plug by the knurled metal outer shell and pull it straight backwards.

## 5.3 CONNECTOR FOR THE TRANSMITTING ELEMENT OF A DOUBLE-CRYSTAL TRANSDUCER

The transmitting transducer or transmitting element of a double-crystal transducer equipped with a LEMO 00 series plug can be connected to the **OUT** socket (Fig.1 Pos.3) of the A1560. Connect the transducer cable to the A1560 by inserting the plug of the cable into the socket. If you need to disconnect the cable, carefully grasp the plug by the knurled metal outer shell and pull it straight backwards.

**CAUTION** Do not touch the **IN** and **OUT** connectors or plug/unplug transducers when the A1560 is switched on. Neglecting this may result in personal injury or damage to the instrument and transducers. When the A1560 is switched on, up to 800V pulse voltage may be present at the central pin of the **IN** and **OUT** connectors.

**NOTICE** We recommend using transducers approved by ACS.

**NOTICE** It is not recommended to attach long (>30mm) conversion adapters, such as the LEMO ABF, ASF, ASG, APF series, directly to the **IN** and **OUT** sockets of the A1560, since the strain they impose may damage the sockets.

## 5.4 ENCODER OR PATH SENSOR CONNECTOR

When enabled in the A1560 configuration, a scanning path sensor or an encoder attached to the **ENCODER** (Fig.1 Pos.4) socket can initiate a pulse-acquisition sequence on position/angle change. To connect the plug of an encoder cable to the A1560, first make sure the plug has its red positioning mark pointing upward and matching with the positioning mark on the socket, then gently insert the plug of the cable into the socket. If you need to disconnect the cable, carefully grasp the plug by the knurled metal outer shell and pull it straight backwards.

**NOTICE** Use only encoders/sensors supplied by ACS. Please refer to an ACS representative for information about available devices.





## 5.5 CONTROL CONNECTOR

**CONTROL** connector (Fig.1 Pos.5) is used in user-specific device variants that are out of the scope of the products described in this manual.

**NOTICE** Please do not connect any devices to the **CONTROL** connector until advised by an ACS representative.

## 5.6 INSTRUMENT FIRMWARE UPGRADE BUTTON

The A1560 can be switched to device firmware upgrade (DFU) mode with the **DFU** (Fig.2 Pos.6) key. Please refer to the A1560 Advanced Configuration document for further information.

## 5.7 SERVICE DEBUG CONNECTOR

The **DEBUG** connector (Fig.2 Pos.7) is used by service personnel for A1560 setup and diagnostics.

**NOTICE** Please do not connect any devices to the **DEBUG** connector until advised by an ACS representative.

## 5.8 INSTRUMENT FIRMWARE UPGRADE USB CONNECTOR

In device firmware upgrade (DFU) mode, the **USB** connector (Fig.2 Pos.8) is used to upgrade and set up the A1560's firmware. Please refer to the A1560 Advanced Configuration document for further information.

## 5.9 WI-FI ANTENNA CONNECTOR

The A1560 can communicate with an external device, such as a PC, wirelessly via a Wi-Fi network. In order to establish a Wi-Fi connection to the A1560 in its default factory configuration:





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1. Attach the Wi-Fi antenna to the A1560 by positioning the antenna's connector coaxially with the connector of the unit (Fig. 2, Pos. 9) and screwing it clockwise.
2. Power the A1560 on
3. Wait 20 to 30 seconds for the A1560 networking stack initialization
4. Find an open Wi-Fi network with A1560\_XXXXXX SSID in the available networks list (Fig.3) and connect to it
5. Once the Wi-Fi connection is established, your A1560 unit should be accessible for data acquisition software at **the default IP address 192.168.1.2**

**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.

The A1560 can be re-configured in wireless client mode. Additionally, the IP address/Access Point name can be altered if needed. Please refer to the A1560 Advanced Configuration document for further information.

**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 with the A1560 connector.

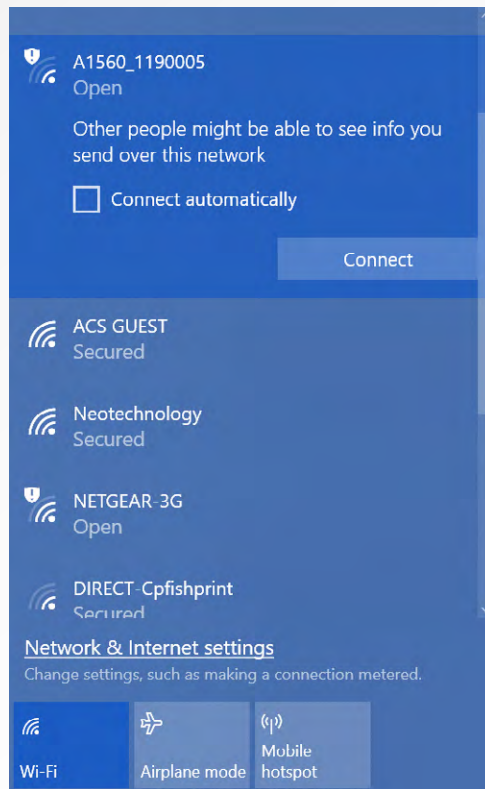
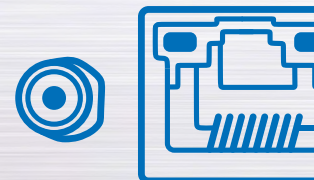


FIGURE 3 A1560 IN THE LIST OF AVAILABLE WI-FI NETWORKS (WINDOWS 10)



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## 5.10 ETHERNET NETWORK CONNECTOR

Wired communication via the **ETHERNET** port (Fig. 2, Pos. 10) usually provides higher communication speed than Wi-Fi communication. To connect to the A1560 in its default factory configuration via Ethernet:

1. Connect the Ethernet port of your A1560 directly to the **Ethernet port of your PC** with a standard Ethernet cable.
2. Power the A1560 on.
3. In 20 to 30 seconds, your A1560 unit should be accessible for data acquisition software at **the default IP address 192.168.1.2**

The A1560 is delivered with the DHCP server enabled at the Ethernet port. Therefore, it is generally advised to refrain from connecting the A1560 to an organization's local area network (LAN) without changing the default network settings of the A1560, as it may disturb LAN services.

**NOTICE** The A1560 can be reconfigured to disable DHCP and its IP address can be altered if needed. Please refer to the **A1560 Advanced Configuration** document for further information.

## 5.11 CONNECTOR FOR THE NEXT A1560 UNIT IN A SYNCHRONIZED UNIT CHAIN

Several A1560 units can perform simultaneous acquisitions when linked into the synchronized chain (Fig.4).

When linking units into the synchronized chain, the **SYNC OUT** output (Fig.2 Pos.11) of each unit except the last one should be connected to the **SYNC IN** input of the following unit.

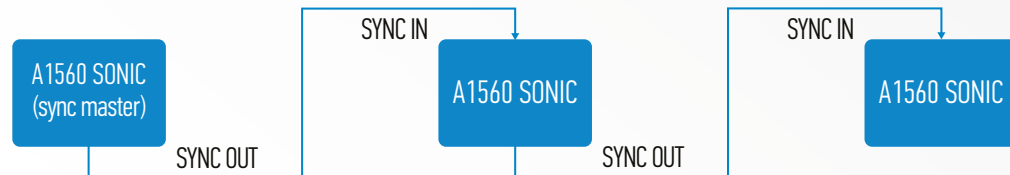


FIGURE 4 SYNCHRONIZING A1560 UNITS



## 5.12 CONNECTOR FOR THE PREVIOUS A1560 UNIT IN A SYNCHRONIZED UNIT CHAIN

When linking units into the synchronized chain, the **SYNC IN** input (Fig.2 Pos.12) of each unit except the first “master” unit should be connected to the **SYNC OUT** output of the previous unit. Every unit except the first “master” unit should be explicitly configured as the device chain “slave”.

**NOTICE** Use only high-quality SATA cables for chaining units.

## 5.13 EXTERNAL TRIGGERING DEVICE CONNECTOR

When enabled in configuration, the pulse-acquisition sequence of the A1560 can be initiated by any process variable, including a six-coordinate placement (position plus orientation) information. The initiation message, which contains information about a triggering event (process variable, position, time, etc.), is sent by an external triggering device connected to the **CTP** socket (Fig.2 Pos.13). The triggering event information is attached to the acquired data the A1560 sends to data acquisition software.

**NOTICE** Use only triggering devices supplied by ACS. Please refer to an ACS representative for information about available devices and/or the triggering device protocol.

## 5.14 POWER SUPPLY CONNECTOR

The power supply unit is connected to the **PWR** connector (Fig.2 Pos.14) of the A1560. You can use the instrument while it is connected to the external power source.

**CAUTION** The power supply unit parts are subject to dangerous voltages. They can store energy even while the power supply unit is disconnected from the AC power. Therefore, DO NOT disassemble the adaptor or touch any metal parts of it, including the 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 compatible unit approved by ACS. Poor-quality power supply units may introduce noise to the acquired data, cause the built-in battery to explode or damage the instrument.

**The power supply unit does not have an on/off switch. You need to disconnect the charger from the power socket when not in use to prevent wasting energy.**

## 5.15 BUILT-IN BATTERY

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

**NOTICE** Tips and precautions for using the built-in battery:

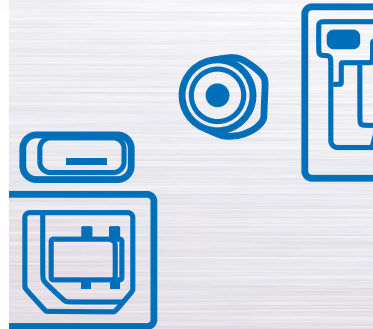
- Before first use, the battery must be fully charged. Connect the power supply unit delivered with the A1560 instrument to the PWR connector, plug the power supply unit into an electrical outlet and charge the A1560 for at least 2.5 hours before using it.
- You can use the instrument while it is connected to the external power source. Only run the A1560 on the battery when you have to.
- A low battery charge is indicated by the blinking of the indicator inside the POWER button (Fig.1 Pos.1). When this happens, connect the A1560 to AC power via the included power supply unit as soon as possible to prevent deep discharge. Deep discharge can dramatically affect the battery's lifespan.
- In normal mode, the instrument switches OFF as soon as the battery level drops beyond a certain safety limit. It is recommended that you DO NOT restart the instrument before the charging procedure is complete to avoid damage.
- When the battery is discharged, the instrument will not turn on immediately after it has been connected to the power supply. Charge the battery for a few minutes before turning the instrument back on.
- A moderate increase in temperature during the charging procedure is not critical. In the case of a drastic temperature rise, on the other hand, the power supply must be disconnected immediately.
- It is advisable to install the power supply unit close to the AC power connection and to keep the surroundings free, so that easy access is possible anytime.



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**NOTICE** If the A1560 is not used for an extended period, make sure that the battery is completely charged once every two months to prevent total discharge. In case of total discharge, the battery may be destroyed and must be replaced.

**⚠ WARNING** The battery is permanently installed inside the instrument and is not intended to be replaced by the operator. For safety reasons, do not attempt to remove the battery. Incorrect removal of the battery may result in damage to the battery and the instrument, personal injury, and/or equipment damage, including impairment of safety. ACS is not liable for any damage or loss (whether contractually or unauthorized, including negligence) caused by neglecting this warning.



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## 6.1 ULTRASONIC TRANSMITTER

The ultrasonic transmitter of the A1560 is capable of generating pulses of adjustable amplitude, period and duration. The resulting pulse is available on either the **OUT** or **IN** connector, depending on current instrument configuration (**Transducer Type parameter**).

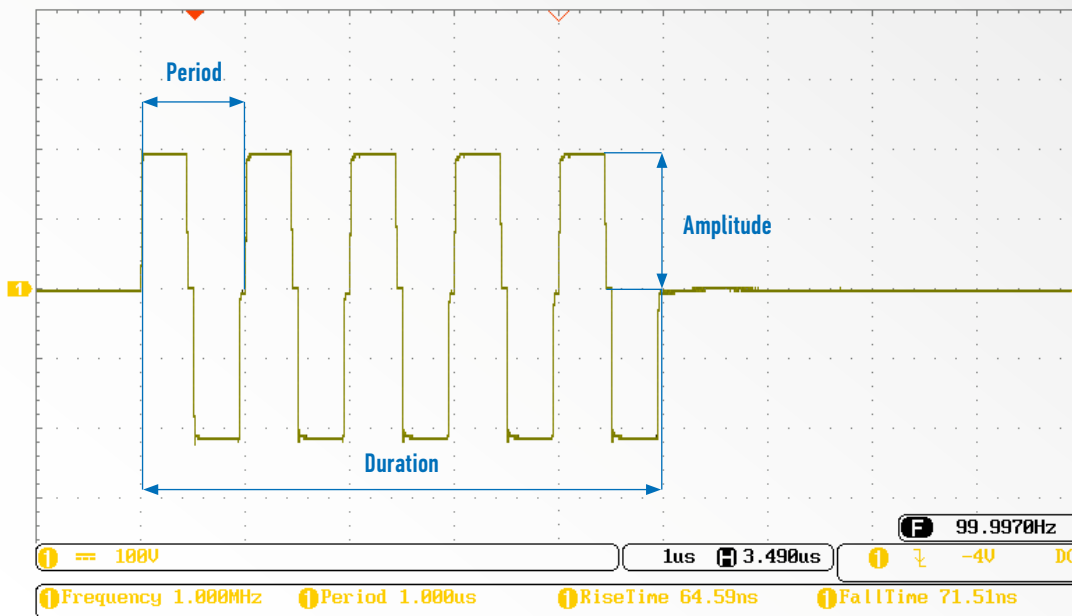


FIGURE 5 A1560 PULSE PARAMETERS

In a double-crystal or double-transducer configuration (**Double Transducer Type**) the pulse is present at the **OUT** connector, whereas in a single-crystal configuration (**Single Transducer Type**), the pulse is generated at the **IN** connector.

A transmitter pulse generated by the A1560 is shown in Fig.5. The shown pulse has an amplitude of 200V and a period of  $1\mu\text{s}$  or Transducer Frequency of  $1\mu\text{s}^{-1} = 1\text{MHz}$ . The duration (Number of periods) of the pulse is 5 periods, or 5  $\mu\text{s}$ .

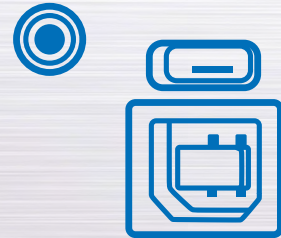
Please note that the A1560 accepts only pulse period values that are the multiples of 20nS.

## 6.2 RECEIVED SIGNAL CONDITIONING

The signal from a transducer connected to the **IN** connector first enters the instrument's analog front-end, where it is amplified or attenuated. Its frequency band is limited before the signal is sampled by the instrument's ADC. The attenuation/amplification of the analog front-end can be set in a range from -20dB to +80dB with 1dB precision. The upper frequency band limit is fixed and depends on an instrument's version. The lower frequency band limit can be selected from the four cut-off frequency presets, which are individual to each version of the instrument.

## 6.3 DIGITAL DATA ACQUISITION

The A1560 digitalizes ultrasonic signals with the sampling rate (ADC Frequency) from 1 to 100MHz and puts samples to data vectors from 1024 to 131072 samples long, allowing the capture of up to 130 milliseconds of a pulse-echo sequence at 1MHz ADC frequency, or achieving a temporal resolution of 10nS at a 100Mhz ADC frequency.



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Figure 6 shows a 2048 sample-long data vector acquired at ADC Frequency = 100MHz and contains information about the first 20.48 microseconds of a pulse-echo sequence. In this case, a SINGLE Crystal Transducer was selected, causing the initial pulse to occur at the same IN input where the acquisition took place. As a result, the acquired vector contains not only the surface echo, but also the initial pulse.

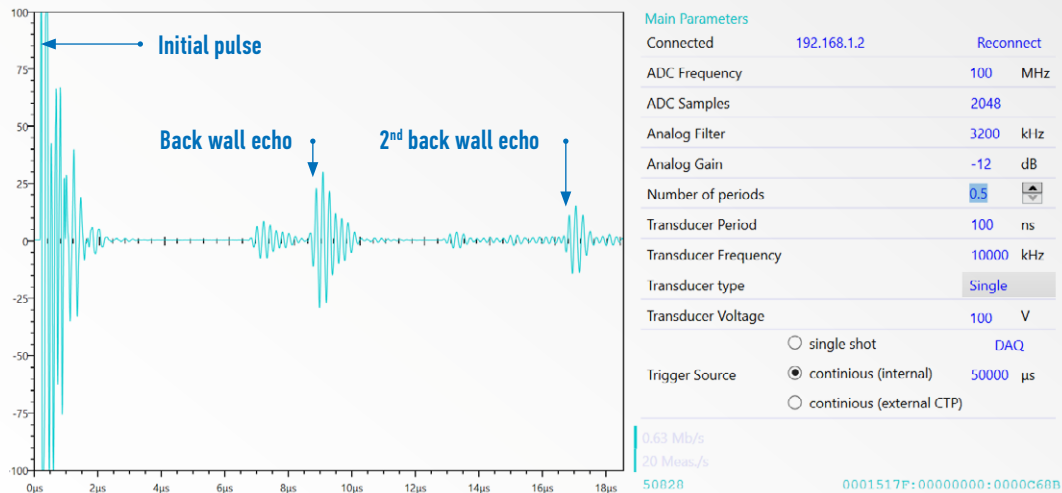


FIGURE 6 A1560 ACQUIRED DATA VECTOR PLOT

## 6.4 TIME OR POSITION RELATED PULSE GENERATION AND DIGITAL DATA ACQUISITION

A series of acquisitions can be performed by the A1560, with each acquisition initiated by some condition (time, position, etc.).

Figure 7 shows three pulses initiated by the A1560's internal timer with a  $\sim 400\mu\text{s}$  interval. Simultaneous with each pulse, an acquisition was started, and one digital data vector was sent to data acquisition software for each corresponding pulse/acquisition sequence.

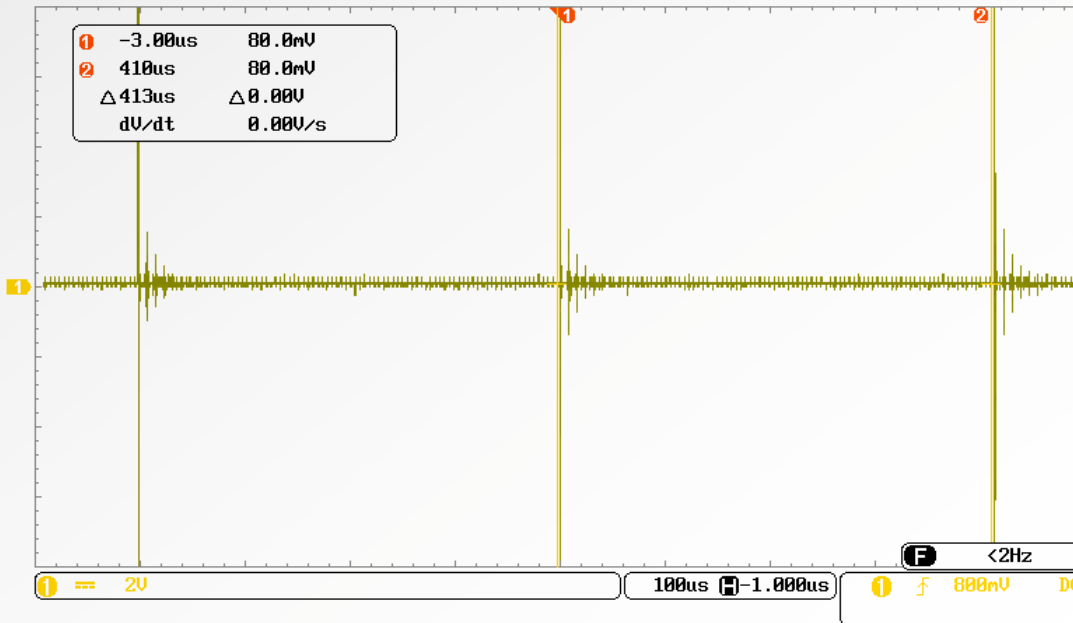


FIGURE 7 A SERIES OF PULSES GENERATED BY A1560 IN INTERNAL TIMER TRIGGERING MODE.





**NOTICE** A safe pulse repetition rate (PRR) of 3000 pulses per second should not be exceeded. It is calculated as [Pulse duration in periods] \* [Pulses per second] \* [Averaging Factor].  
 If the PRR is exceeded in user-defined parameters, it might be limited internally without any user notification.

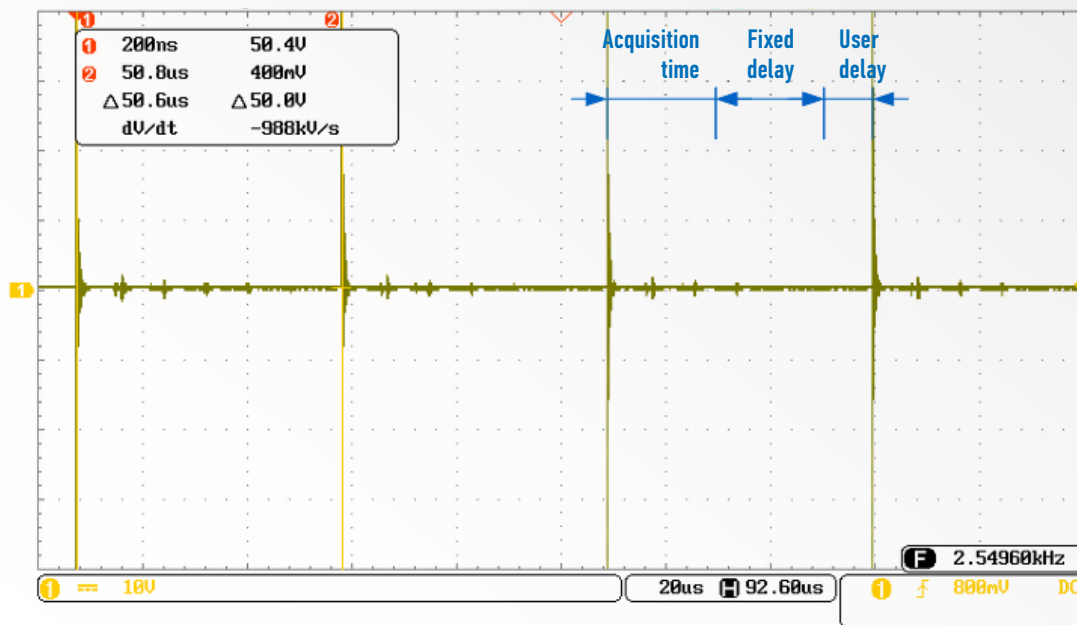


FIGURE 8 A SEQUENCE OF FOUR PULSES AND ACQUISITIONS FOR THE FOLLOWING AVERAGING



## 6.5 SIGNAL AVERAGING

In order to increase SNR, the A1560 can perform several pulse/acquisition sequences over a short period of time to calculate a single averaged data vector and send it to the data acquisition software.

The period between pulses shown on Fig.8 is only 50.5 microseconds. It consists of 20.48 $\mu$ S, which is necessary to acquire 2048 samples of data at a 10MHz rate, 22 $\mu$ S of fixed internal delay and 8 $\mu$ S of user-defined delay. The four acquired data vectors are then averaged internally by the A1560, and only one resulting vector is sent to the data acquisition software. User delay can vary from 0 to 65 microseconds with a 10-nanosecond step. User delay can be made random within these limits.



# 6



# 7

## TROUBLE-SHOOTING

Problem	Possible Reason(s)	Action
A1560 won't turn on (state indicator is off)	The device is discharged.	Connect the device to the mains power with supplied power adaptor and charge for at least 2 hours.
Can't connect to the A1560, state indicator is blinking	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).



# 8

A networking subsystem of the A1560 runs the OpenWrt system, which contains third-party applications and modules available under various open-source licenses including but not limited to GNU General Public License Version 2:

**<https://www.gnu.org/licenses/old-licenses/gpl-2.0.en.html>.**

The sources for those packages can be found at

**<https://sources.openwrt.org/>.**

Please refer to these source packages to find out which license applies to them.

## OPEN-SOURCE CODE





**A1560** SONIC

**OEM ULTRASONIC PULSER/RECEIVER FRONT-END UNIT**



**USER MANUAL**

Acoustic Control Systems – ACS Group  
Saarbrücken, Germany 2019