

## PULSE Beamforming System with 18-channel Sector Wheel Array

Based on Beamforming Type 8608

*Beamforming is one of a suite of systems developed for noise source identification.*

*Based on one simple measurement, the system provides an acoustical map of noise sources by using an array of microphones to detect the direction of arrival of sound from the sources to the array.*



### Uses, Features and Benefits

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#### Uses

- Basic system for beamforming measurements which can be expanded with holography
- Noise source identification
- Troubleshooting investigations
- Squeak and rattle testing
- Industrial plant noise measurement

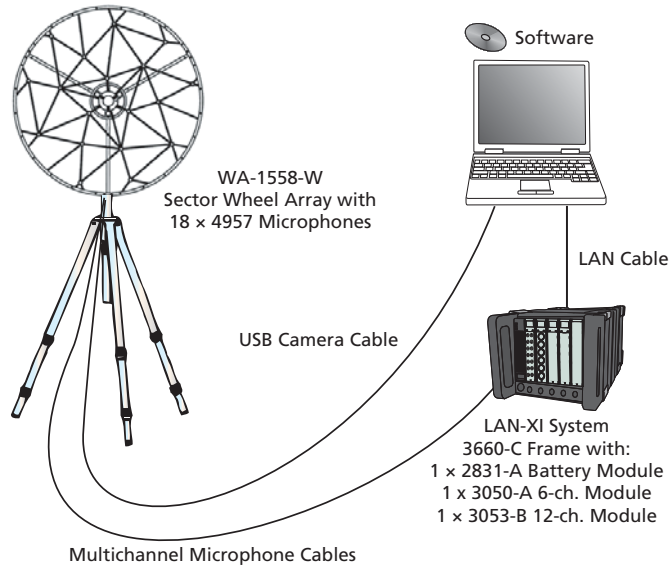
#### Features

- Quick snapshot measurement
- Built-in high-resolution camera
- Wide frequency range of use
- Frequency range can be extended to 20 kHz by using high frequency microphones

#### Benefits

- Rapid evaluation of noise problems saves time
- Independent operation for up to 7 hours using internal battery
- Robust array suitable for on-site use
- Provides fully operative 18-channel FFT analyzer for other sound and vibration applications

**Fig. 1**  
18-channel sector wheel array system



**Fig. 2**  
18-channel sector wheel array positioned on a tripod close to source under test

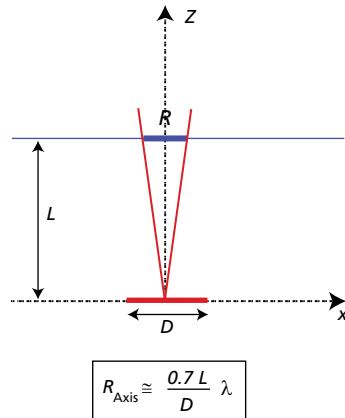


The measurement is performed using a planar, sector wheel array of 18 microphones (see Fig. 2).

The microphone positions have been numerically optimized to maximize the dynamic depth of the map, that is, to minimize the levels of the ghost images produced by side lobes.

In use, the array is usually pointed at the source under test at a distance of 0.7 times the array's diameter,  $D$ , in order to obtain optimal spatial resolution.

The relationship between distance to the source,  $L$ , the spatial resolution,  $R$ , and the wavelength of interest,  $\lambda$ , is given by:



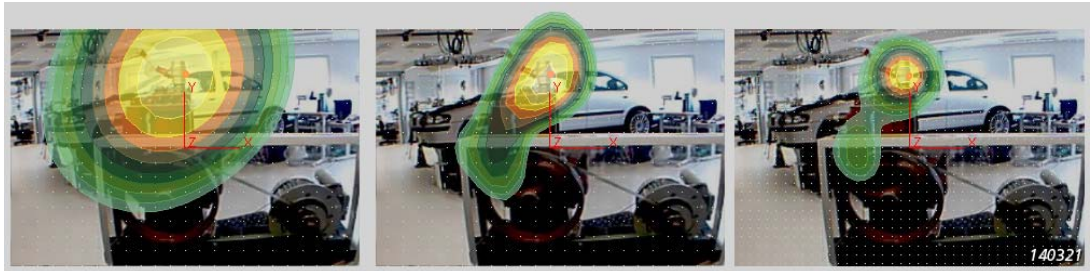
The frequency range provided by the 18-channel system depends on the algorithms installed.

In the basic entry level system, which includes delay and sum (DAS) beamforming, the useful frequency range is typically from 1 kHz to 10 kHz.

With the Refined Beamforming option, the range is typically 500 Hz to 10 kHz and with the Wideband Holography option, it is typically 100 Hz to 10 kHz.

Note that with the Wideband Holography option and the classical Acoustic Holography option, there are restrictions on the positioning of the array relative to the source in order to produce optimal results.

**Fig. 3**  
Results from measurements on a pump at 1 kHz third-octave band: **Left:** basic DAS; **Centre:** Refined Beamforming; **Right:** Wideband Holography. The colour scale in the contour plots is in steps of 1 dB



## Specifications – PULSE Beamforming System with 18-channel Sector Wheel Array

### Configuration

#### OPERATING SYSTEM REQUIREMENTS

Microsoft® Windows® 10 Pro or Enterprise (x64), Windows® 8.1 Pro or Enterprise (x64), Windows® 7 Pro, Enterprise or Ultimate (SP1) (x64)

#### OTHER SOFTWARE REQUIREMENTS

Microsoft® Office 2007 SP2 (x32), Office 2010 SP2 (x32), Office 2013 (x32), or Office 2016 SP2 (x32) and (x64)

Microsoft® SQL Server® 2008, SQL Server 2008 R2, SQL Server 2012, SQL Server 2012 R2, SQL Server 2014 or SQL Server 2014 Express (SP1) (included in PULSE installation)

#### COMPUTER CONFIGURATION/DATA ACQUISITION FRONT-ENDS

As for PULSE software, see System Data [BU 0229](#)

## Typical System

### PULSE HARDWARE

Type 3660-C-100	5-module LAN-XI Front-end Frame with GPS
Type 3050-A-060	6-ch. Input Module LAN-XI 51.2 kHz (Mic, CCLD, V)
Type 3053-B-120	12-ch. LAN-XI Module (CCLD, V)
UA-2112-060	LAN-XI Front Panel, detachable, 6-ch. Mic Arrays, 1 × 7-pin (F) connector
UA-2112-120	LAN-XI Front Panel, detachable, 12-ch. Mic Arrays, 2 × 7-pin (F) connectors
2 × UA-2203	Blank Module for LAN-XI Front-end Frame

### BATTERY

Type 2831-A	Battery Module for LAN-XI, including Mains Charger ZG-0469 and Adaptor ZH-0686
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### PULSE SOFTWARE

Type 8608-N	PULSE Array Acoustics Beamforming, node-locked licence
Type 7770-N	PULSE FFT Analysis, node-locked licence
Type 7761-N	PULSE Acoustic Test Consultant, node-locked licence
Type 3099-A-N1	PULSE LAN-XI Single Module Front-end Driver, node-locked licence

### SOFTWARE MAINTENANCE AND SUPPORT

M1-8608-N	Annual Software Maintenance and Support Agreement for PULSE Array Acoustics Beamforming, node-locked licence
M1-7770-N	Annual Software Maintenance and Support Agreement for PULSE FFT Analysis, node-locked licence
M1-7761-N	Annual Software Maintenance and Support Agreement for PULSE Acoustic Test Consultant, node-locked licence
M1-3099-A-N1	Annual Software Maintenance and Support Agreement for PULSE LAN-XI Single Module Front-end Driver, node-locked licence

See the PULSE Software Maintenance and Support Agreement Product Data (BP 1800) for further details

### INCLUDED ARRAY

WA-1558-W-021	18-ch. Sector Wheel Array (for Beamforming and SONAH), size: 0.35 m (1.15 ft)
18 × Type 4957	10 kHz Array Microphone
WL-1297-W-004	Bundle of 3 × WL-1297-D-050 cables, 5 m (16.40 ft)
WQ-2691	Tripod

## Optional Accessories

### SOFTWARE

BZ-5635-X*	PULSE Array Acoustics Quasi-stationary Calculations
BZ-5636-X*	PULSE Array Acoustics Transient Calculations
BZ-5639-X*	PULSE Array Acoustics Refined Beamforming Calculations
BZ-5644-X*	PULSE Array Acoustics Wideband Holography
Type 8607	PULSE Array Acoustics Acoustic Holography

### TRANSDUCERS

Type 4958	20 kHz Miniature TEDS Microphone, 11.2 mV/Pa, 10 Hz to 20 kHz, pre-polarized
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\* X = Licence model either N for node-locked or F for floating

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