PRODUCT DATA

Software for PULSE™ 15
incl. Types 7700, 7705, 7707, 7709, 7764, 7770, 7771, 7773, 7789 and 7797

PULSE is Brüel & Kjær's platform for noise and vibration analysis and builds on over 60 years of measurement experience and innovation.

The PULSE hardware/software family is your solid foundation upon which to build a system to suit your present needs, and which can also be extended as your requirements change. This expandability, and the continuing development of new PULSE applications and hardware, ensures the safety of your investment now and in the future.

PULSE's flexibility, combined with industry-specific solutions, has made PULSE Brüel & Kjær's best-selling analyzer platform. The PULSE system is a leader in a wide range of industries, including:

- *Automotive*
- *Electroacoustics and Telecommunications*
- *Aerospace and Defence*
- *Consumer Products*

PULSE Software and Literature Overview

The base measurement software for a PULSE system is PULSE FFT & CPB Analysis Type 7700. Separate FFT and CPB licenses are also available as FFT Analysis Type 7770 and CPB Analysis Type 7771. On this base, you can install PULSE application software such as Multichannel Data Recorder Type 7708. Table 1 illustrates the range of application software available for use with PULSE systems.

With a PULSE Software Maintenance and Support Agreement (M1) you can ensure that your PULSE installation is kept updated to the latest security updates from Microsoft® as well as having access to a global network of specialists, with experience from more than 10000 PULSE systems in a multitude of application and test configurations. Details of the PULSE Software Maintenance and Support Agreement are given in BP 1800.

We strongly recommend that you update your PULSE installation to the latest major release to ensure that the latest security updates from Microsoft® are supported by your installation.

Details on PULSE Reflex™, the post-processing suite from Brüel & Kjær that brings together a wide range of generic post-processing tools for off-line analysis and processing of time data and spectra, can be found in application-specific Product Data such as PULSE Reflex Core, which contains PULSE™ LabShop compatible FFT, CPB (1/n-octave) and Order Analysis (BP 2258); PULSE Reflex Building Acoustics (BP 2190) and PULSE Reflex Modal Analysis (BP 2257).

Details of the LAN-based hardware available for use with PULSE are given in the LAN-XI Data Acquisition Hardware Product Data (BP 2215) and the IDA^e Hardware Configurations for PULSE System Data (BU 0228).

Table 1 *Overview of PULSE application software specifying support of either FFT & CPB Analysis Type 7700, FFT Analysis Type 7770 and/or CPB Analysis Type 7771. References to Brüel & Kjær source literature are also specified*

	Type/Part Number	FFT and CPB Analysis Type 7700	FFT Analysis Type 7770	CPB Analysis Type 7771	Further Information	Specifications
Platform Enhancements						
PULSE Time Capture	7705	●	●	●	page 9	page 16
PULSE Analysis Engine Upgrade	7707	●	●	●	page 7	page 16
PULSE Time Data Recorder	7708	●	●	●	BP 2110	BP 2110
PULSE Viewer	7709	●	●	●	page 8	–
IDA[e] Driver for I-deas	BZ-5231	●	●	●	–	–
PULSE Reflex Base	8700				BP 2258	BP 2258
PULSE Reflex Basic Post-processing	8702	●	●		BP 2258	BP 2258
PULSE Reflex Standardised CPB Option	8706	●		●	BP 2258	BP 2258
LAN-XI Notar	BZ-7848-A	●	●	●	BP 2215	BP 2215
Acoustic Applications						
PULSE Sound Quality	7698	●	●	●	BP 1589	BP 1589
PULSE Noise Source Identification	7752	●	●	●	BP 1908	BP 1908
PULSE Material Testing	7758	●	●		BP 1870	BP 1870
PULSE Advanced Intensity Analysis	7759	●	●	●	BP 1890	BP 1890
PULSE Acoustic Test Consultant	7761	●	●	●	BP 1908	BP 1908
PULSE Pass-by Conformance Test System	7788-A	●			BP 2256	BP 2256
PULSE Vehicle Pass-by	7788-B, -C	●			BP 2011	BP 2011
PULSE Indoor Pass-by	7793	●			BP 2015	BP 2015
PULSE Sound Power	7799	●			BP 2093	BP 2093
PULSE Spherical Beamforming	8606	●	●	●	BP 2144	BP 2144
PULSE Acoustic Holography	8607	●	●	●	BP 2144	BP 2144
PULSE Beamforming	8608	●	●	●	BP 2144	BP 2144
PULSE Sound Quality Zwicker Loudness	BZ-5265	●	●	●	BP 1589	BP 1589
PULSE Sound Quality Order Analysis	BZ-5277	●	●	●	BP 1589	BP 1589
PULSE Pyschoacoustic Test Bench	BZ-5301	●	●	●	BP 1589	BP 1589
Robot Option for ATC	BZ-5370	●	●	●	BP 1908	BP 1908
PULSE Position Detection Option	BZ-5611	●	●	●	BP 1908	BP 1908
PULSE Quasi-stationary Calculations	BZ-5635	●	●	●	BP 2144	BP 2144
PULSE Transient Calculations	BZ-5636	●	●	●	BP 2144	BP 2144
PULSE Conformal Calculations	BZ-5637	●	●	●	BP 2144	BP 2144
Electroacoustics						
PULSE Basic Electroacoustics	7797	●	●		page 12	page 17
PULSE Electroacoustics	7907	●	●	●	BP 2085	BP 2085
PULSE Voice Testing for Hands-free Equipment	7909-S 1	●	●		BP 2116	BP 2116
Telephone Test on PULSE	BZ-5137	●			BP 1684	BP 1684
PULSE SSR Analysis – Harmonic Distortion	BZ-5548	●	●		BP 2085	BP 2085
PULSE SSR Analysis – Intermodulation Distortion	BZ-5549	●	●		BP 2085	BP 2085
PULSE SSR Analysis – Difference Frequency Distortion	BZ-5550	●	●		BP 2085	BP 2085
PULSE Directivity and Polar Plot	BZ-5551	●	●		BP 2085	BP 2085
PULSE Sequencer	BZ-5600	●	●		BP 2085	BP 2085
PDM for Electroacoustics	BZ-5601	●	●		BP 2085	BP 2085
PULSE Receiver Test Applications	BZ-5602	●	●		BP 2085	BP 2085
PULSE Loudspeaker Test Applications	BZ-5603	●	●		BP 2085	BP 2085
PULSE Thiele Small Parameter Calculation	BZ-5604	●	●		BP 2085	BP 2085
PULSE TSR Analysis – Harmonic Distortion	BZ-5742	●	●		BP 2085	BP 2085
PULSE Microphone Test Application	BZ-5743	●	●		BP 2085	BP 2085
PULSE Headset Test Application	BZ-5744	●	●		BP 2085	BP 2085
Machine Diagnostics						
PULSE Order Analysis	7702	●	●		BP 1634	BP 1634
PULSE Vold-Kalman Order Tracking Filter	7703	●	●		BP 1760	BP 1760
PULSE Envelope Analysis	7773	●	●		page 11	page 17
PULSE Two-plane and Multi-plane Balancing Consultants	7790-A/B	●	●		BP 2010	BP 2010
PULSE Vibration Check for Aircraft Engines	7795	●	●		BP 2059	BP 2059
PULSE Vibration Analysis for Aircraft Engines	7906-S 1	●	●		BP 2059	BP 2059
Orbit and Polar Plots for PULSE	WT-9695	●	●		–	–
PULSE Reflex Basic Order Analysis	8704	●	●		BP 2258	BP 2258

	Type/Part Number	FFT and CPB Analysis Type 7700	FFT Analysis Type 7770	CPB Analysis Type 7771	Further Information	Specifications
Structural Dynamics						
PULSE Structural Dynamic Test Consultants	7753/7765	●	●		BP 1850	BP 1850
ME'scopeVES™ Modal and Structural Analysis, incl. PULSE Bridge to ME'scopeVES	7754/7755-A	●	●		BP 1843	BP 1843
PULSE Operational Modal Analysis	7760	●	●		BP 1889	BP 1889
PULSE Multiple-Input Multiple-Output Analysis	7764	●	●		page 10	page 17
PULSE Run-up/down ODS Option	BZ-5612	●	●		BP 1850	BP 1850
PULSE Animation Option	BZ-5613	●	●		BP 1850	BP 1850
PULSE Reflex Geometry	8719	●	●		BP 2257	BP 2257
PULSE Reflex Basic Modal Analysis	8720	●	●		BP 2257	BP 2257
PULSE Reflex Advanced Modal Analysis	8720	●	●		BP 2257	BP 2257
PULSE Reflex Shock Response Analysis	8730	●	●		BP 2339	BP 2339
Vibroacoustics						
PULSE Source Path Contribution	7798	●	●		BP 2086	BP 2086
PULSE DTS Software for NVH Simulator	8601	●	●		BP 2109	BP 2109
Test and Data Management						
PULSE Data Manager	7767	●	●	●	BP 1961	BP 1961
PULSE Time	7789	●	●	●	page 8	page 17
PULSE Automotive Test Manager	7796	●	●	●	BP 2061	BP 2061
PULSE ASAM ODS Connectivity	8605	●	●	●	BP 2187	BP 2187
PULSE CAN Bus Option	BZ-5610	●	●	●	BP 2150	BP 2150
Environmental Noise & Vibration						
PULSE Reflex Building Acoustics	8780				BP 2190	BP 2190

Pre-configured PULSE bundles (measurement software and hardware) are available for many common noise and vibration measurements. See the PULSE Analyzers and Solutions catalogue BF 0209 for a complete description of available PULSE bundles.

FFT & CPB Analysis – Type 7700

Type 7700 is PULSE's base software for FFT, CPB (1/n-octave) and Overall Level analysis with simultaneous measurement of exponential, linear, impulse and peak levels. Type 7700 provides general noise and vibration testing using real-time, multichannel analysis as well as general R&D, noise and vibration analysis using several analyzers and multiple frequency spans simultaneously.

With user-definable measurement solutions, all basic requirements, including data acquisition, calibration, measurement, analysis, post-processing and reporting are convenient and manageable.

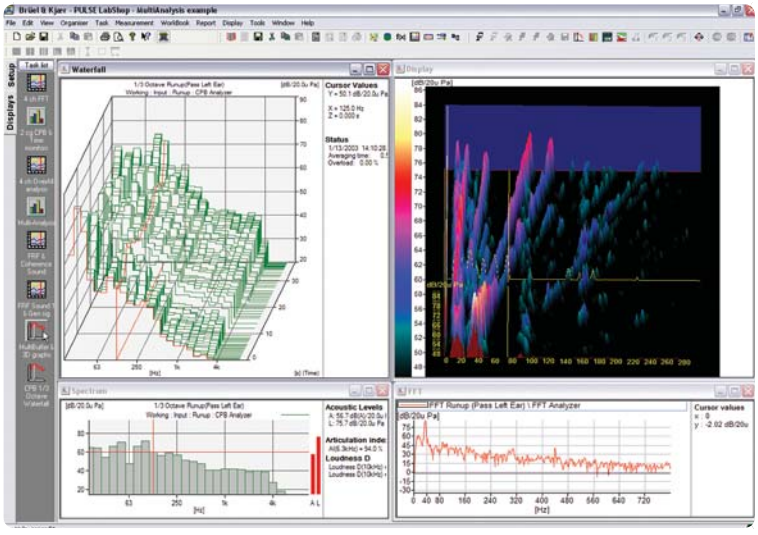


Fig. 1
PULSE software showing task-oriented user interface

Powerful Analysis Capabilities

- Real-time measurements on over 200 channels (recordings and post-analysis on over 300)
- Multi-analysis allows multiple analyses of the same input data, reduces test and reporting time, and ensures consistency of data, for example:
  – Simultaneous FFT and 1/n-octave analysis of the same data

  - Simultaneous analysis using several FFT analyzers with different properties such as frequency span, zoom, etc.
- Real-time signal analysis using the PC's CPU. The standard package includes 75 PULSE beats, enough real-time DSP resources to perform:
  - FFT analysis on 16 channels to 25.6 kHz bandwidth (0% overlap, 6400 lines)
  - 1/3-octave analysis on 6 channels to 25.6 kHz bandwidth

This performance, which requires a Pentium III 1 GHz computer or faster, is sufficient for many noise and vibration applications. For more demanding applications, use Analysis Engine Type 7707 for real-time DSP resources limited only by the speed of the computer's CPU

- Powerful signal generator, providing a host of sine, random and user-definable waveforms (requires hardware module with generator support, see BP 2215 or BU 0228)
- Tonality and prominence ratio calculations according to ECMA 74 and ISO 7779
- Reverberation time calculation

FFT, CPB and Overall Level Analyzers

The FFT analyzer allows real-time, multichannel FFT spectrum analyses whether you want to perform mobility measurements, vibration diagnostics or narrow-band analysis of acoustic signals.

- Supplied in Types 7700/7770

PULSE's Constant Percentage Bandwidth analyzer provides real-time standardised digital filter-based analysis using 1/1, 1/3, 1/12 and 1/24 octaves. This 1/n-octave analysis is often preferable to FFT analysis when analysing noise. The real-time CPB analyzer can be used, among other things, for the determination of sound power levels and intensity measurements. CPB filters fulfil the requirements of IEC 1260–1995 Class 1, DIN 45651 and ANSI S1.11–1986.

- Supplied in Types 7700/7771

For characterising your noise or vibration signals, there is an Overall Level analyzer, which performs a broadband analysis. When measuring sound, this analyzer is equivalent to a sound level meter and fulfils selected, relevant requirements of IEC 651, IEC 61672 and IEC 60804 for a class 1 instrument.

- Supplied in Types 7700/7770/7771

Smart Start

Now it is easier than ever to start and operate PULSE. With Smart Start, PULSE configuration and project setup is performed in just a few steps.

- Quick 3-step start-up for new projects: Select the default New Project template, click Start and start measuring

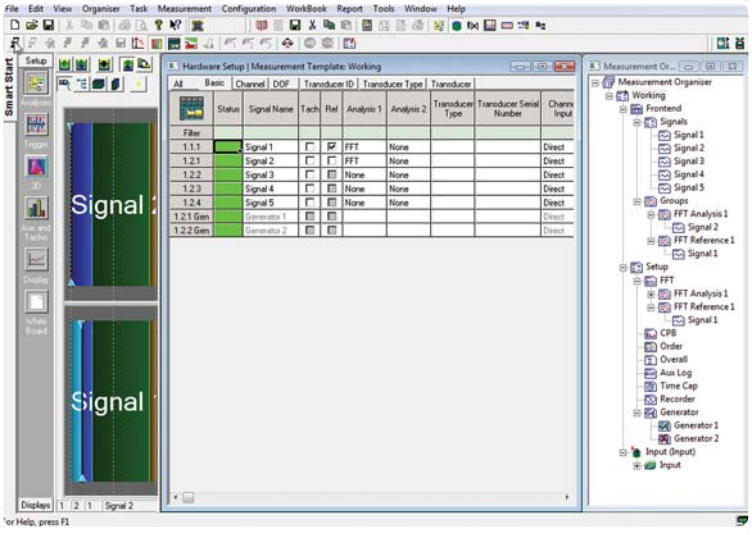
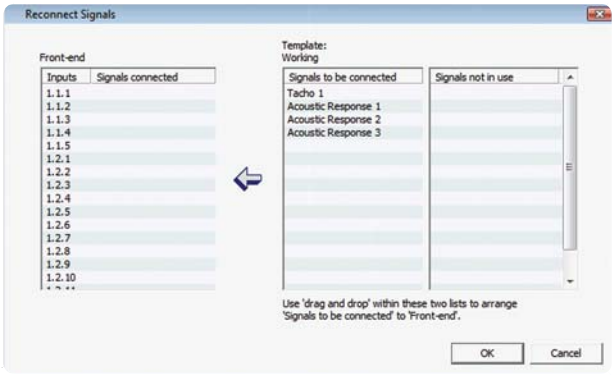


Fig. 2
Smart Start uses the Hardware Setup table to automatically detect current hardware connections – simply click Start to begin measurements

If a more advanced setup is required, the user interface's various organiser windows provide access to all analyses and function properties available in PULSE.

- Find and connect any front-end available on the LAN using the Front-end Browser. Management of front-ends and IP addresses done without the use of an RS–232 cable
- Easy and automatic update of signal names and functions when loading a PULSE project on a new front-end, or when opening time recordings into PULSE projects where signal names do not match

Fig. 3
Reconnect Editor facilitates easy connection of signals to match current hardware setup

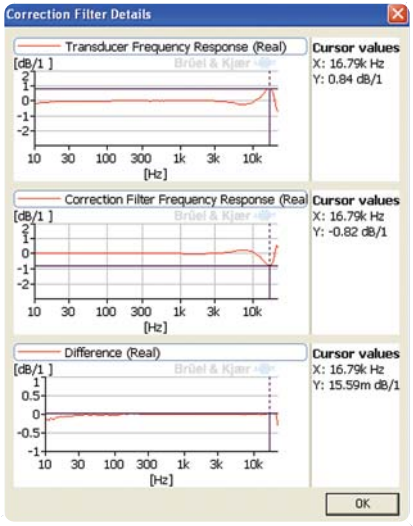


Response Equalisation

Response Equalisation eXtreme (REq-X) allows you, in real-time, to effectively equalise the frequency response of a transducer to a flat response. This applies to both accelerometers and microphones. REq-X is performed by filtering the time signal of a transducer by the inverse of the frequency response. When applicable, the equalisation can be performed in both phase and magnitude.

- Expands the high accuracy frequency range for transducers
- Extends the usability of existing transducers
- Use of the same microphone in different sound fields (free field, pressure field and random) and with various accessories can be compensated
- Microphone correction using the frequency response functions found in the Transducer Database
- Increase frequency range for accelerometers by up to 50%
- Automatic detection of the accelerometer frequency response via TEDS

Fig. 4
The upper curve shows a typical microphone frequency response without correction. The middle curve shows the correction filter. The lower curve shows the resulting frequency response after equalisation



Data Acquisition Hardware

- Automatic detection of front-end hardware and attached transducers – supports IEEE 1451.4 transducers with TEDS (Transducer Electronic Data Sheets)
- Automatic calibration sequencing and registration of calibration history
- Level meter for monitoring of conditioned signals for optimal data quality
- Hardware setup table provides easy management of multiple channels

Easy-to-use Software

- Running on Microsoft® Windows® 7, Windows® XP or Windows Vista® operating systems, Types 7700/ 7770/7771 are the basis for an ever-increasing number of sound and vibration applications
- Task-oriented user interface that guides you through the measurement process step by step. Task views are easy to set up and customise for specific needs. They are the best way to switch easily between multiple display and settings windows
- Advanced graphical display and cursor facilities
- Data export in a variety of formats for use with external applications
- Linked with Microsoft® Word and Excel® allowing fast, automatic report generation and post-processing
- Supports external control and data export (OLE automation and ActiveX® control)
- Built-in VBA (Visual Basic® for Applications) allowing easy customisation of PULSE
- A comprehensive library of sample projects and technical literature

- IRIG-B time/data synchronization – ensures timestamp alignment between different types of IRIG-B enabled instrumentation using an encoded analogue channel

Data Transfer and Post-processing

Transfer measurement data from PULSE LabShop to PULSE Reflex, MATLAB®, Excel®, etc., for post-processing and calculations with:

- Fast and flexible viewing, editing and selection of time data for post-processing
- Graphical display of measurement data
- Mathematical calculation procedures for experimental data
- Data comparison from experiment to numerical calculation
- Easy-to-use data transfer, including x-, y- and z-axis annotation, using PULSE's Function Organiser

Auxiliary Parameter Logging

Measurement of auxiliary, pseudo-DC parameters with 12 channels of low-frequency (10 Hz sample rate) input channels that can be recorded along with the dynamic channels and used as logging or multi-buffer tags (available via LAN controller modules, see BU 0228)

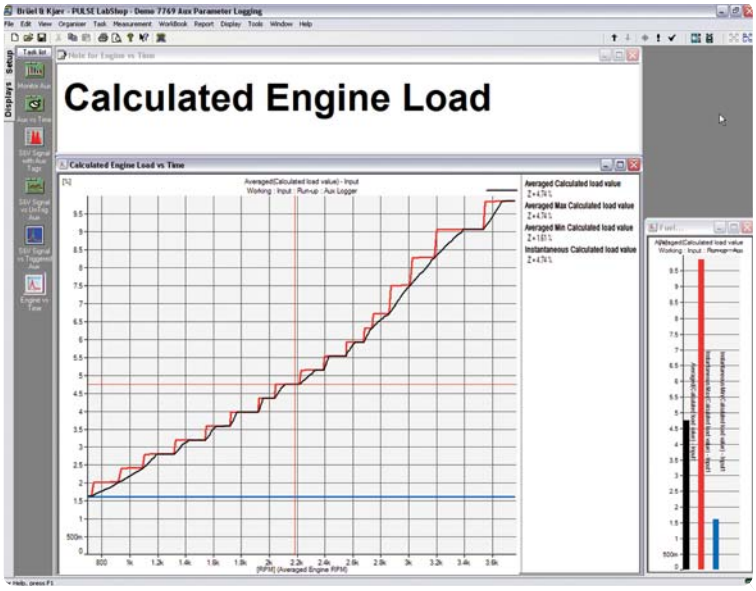


Fig. 5
A typical Auxiliary Parameter Logging display in PULSE

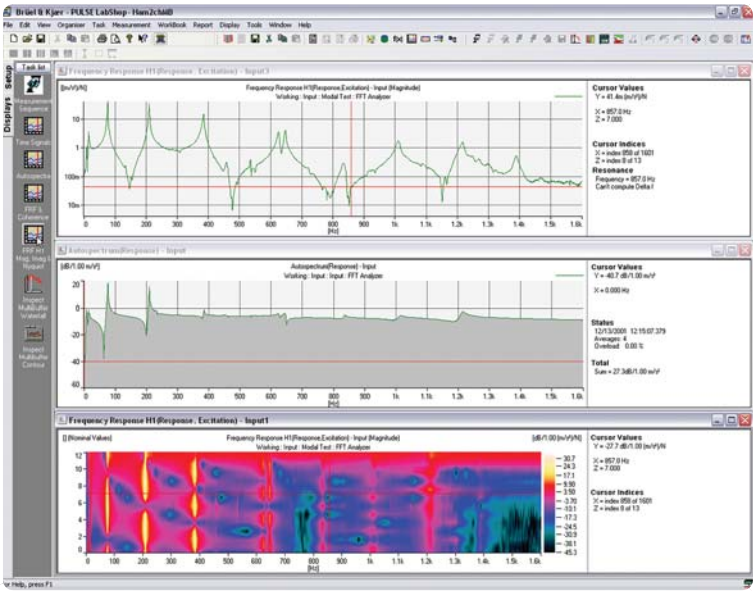
Typical applications include:

- Automotive – intake pressure, thermocouples, throttle position, vehicle acceleration/braking, CAN Bus parameters, strain gauges
- Industrial – process parameters (temperature, pressure, control position, etc.)
- Production Line Testing – PLC control parameters, environmental conditions (temperature, barometric pressure)
- Pass-by Testing – environmental parameters
- Auxiliary data like temperature and wind speed available as time data or as z-axis tags
- Integration of auxiliary parameters with dynamic data such as FFT, Order and CPB spectra
- Data available as: instantaneous, instantaneous maximum, instantaneous minimum, linear average, averaged maximum, and averaged minimum
- Individual channels can be logged with multiple average settings (that is, average over 10 seconds and 24 hours)
- Access to auxiliary channels settings and data through OLE
- Requires cables AO-1472 and AO-0594 to connect to LAN modules

FFT Analysis – Type 7770

FFT Analysis Type 7770 is intended for users who only require FFT and Overall analysis. With the exception of CPB analysis, it includes all the configuration, calibration, measurement, post-processing display and reporting features, including multi-analysis, described above for FFT & CPB Analysis Type 7700.

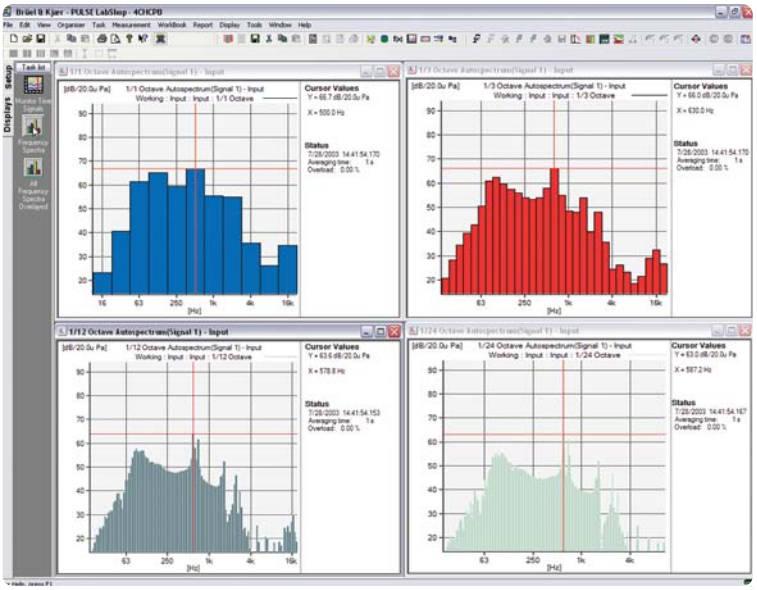
Fig. 6
Autospectrum, Frequency Response Function (FRF) and Contour plot of FRF for an Impact Hammer test



CPB Analysis – Type 7771

CPB Analysis Type 7771 is intended for users who only require 1/n-octave and Overall analysis. With the exception of FFT analysis, it includes all the configuration, calibration, measurement, post-processing, display and reporting features, including multi-analysis, described above for FFT & CPB Analysis Type 7700.

Fig. 7
1/1-, 1/3-, 1/12- and 1/24-octave measurements of acoustic response from multiple, simultaneous, Constant Percentage Band (CPB) analyzers



Analysis Engine – Type 7707

With Analysis Engine Type 7707, you can increase the real-time channel × bandwidth analysis power of your PULSE system without having to add dedicated DSP hardware. The limit is determined only by your PC's capacity.

For further information on the real-time channel × bandwidth product for measurement with the FFT, CPB, Overall Level and Order Analyzers, and the performance rating of different PC types, see the specifications for Type 7707.

PULSE Viewer – Type 7709

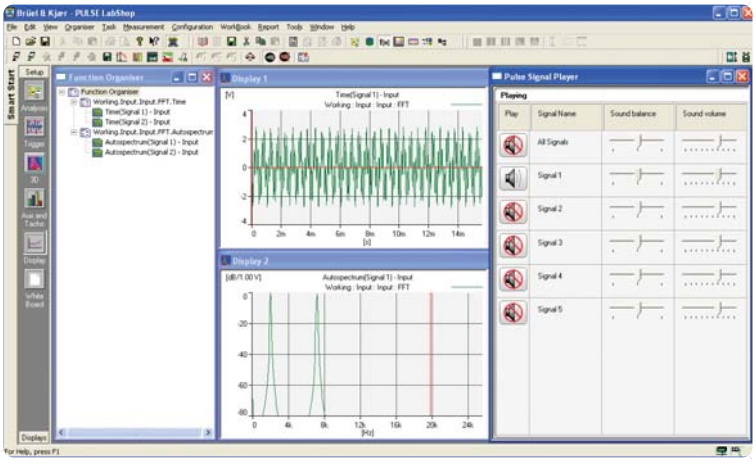
PULSE Viewer Type 7709 provides remote measurement viewing and report generation separate from the PC connected to the PULSE front-end.

- Frees up your front-end for more measurements and more efficient use
- Import multiple sets of measurement data
- Store data on a network drive for processing at any number of licensed workstations with only a single front-end
- Handles data measured using Types 214x, FFT and CPB Analysis Type 7700, Order Analysis Type 7702 and Time Capture Type 7705

PULSE Signal Player – WT-9804

PULSE Signal Player WT-9804 allows you to listen to any of the active analogue channels using the PC's built-in sound card and headphone output.

Fig. 8
PULSE Player



Uses

- Enables you to listen to any of the analogue channels during measurement or recording

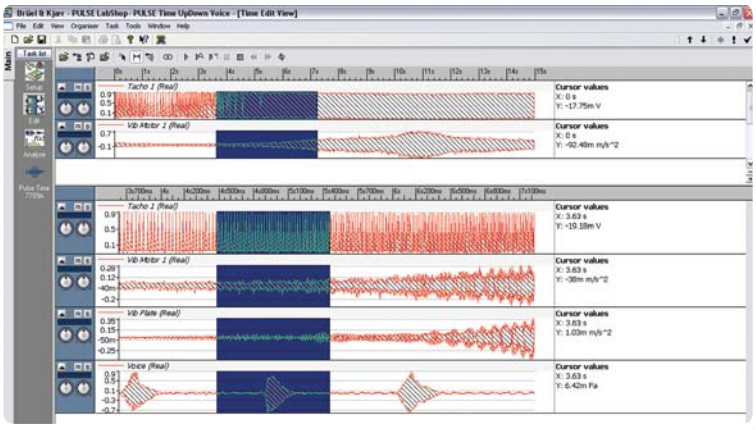
Features

- Allows you to select between channels during measurement or recording
- Allows you to listen to the channel using the computer's built-in sound-card
- Allows you to individually control balance and volume per monitored channel
- Allows you to mix the sound from many (all) channels

PULSE Time – Type 7789

PULSE Time Type 7789 allows you to listen to time data recordings or to select portions of the recorded signals for post-analysis. Import, edit and inspect the recordings prior to analysis as well as export them. PULSE lets you analyse an edited recording by opening PULSE Time in a running project.

Fig. 9
Using PULSE Time to select portions of recorded signals for post-analysis



Uses

- Allows the import, export, inspection and editing of PULSE time-data recordings (*.dat, *.pti), Universal File Format (*.uff), Time Data Format (*.tdf), Wave (*.wav), TEAC (*.hdr), MATLAB (*.mat), Head Acoustics (*.hdf) and I-deas Time (*.ati) files
- Enables you to listen to any part of the time-data recording
- Enables you to focus post-analysis on a particular part of a time-data recording

Features

- Accesses data from disk, handling very large files without exhausting computer memory
- Allows you to inspect multiple signals, in both overview and edit panes
- Allows you to listen to the full signal, or selected tracks and ranges
- Allows you to select/crop a time range and select individual signals for further analysis with any PULSE measurement project

Time Capture – Type 7705

Time Capture Type 7705 is designed for the capture of long time signals in PC memory and for their subsequent retrieval for post-processing or for data export. If a data recorder is installed, the input can also be played back from disk. Type 7705 allows you to extract any part of the recorded time signal for analysis. If Vold-Kalman Order Tracking Filter Type 7703 is installed, you can perform Vold-Kalman order analysis.

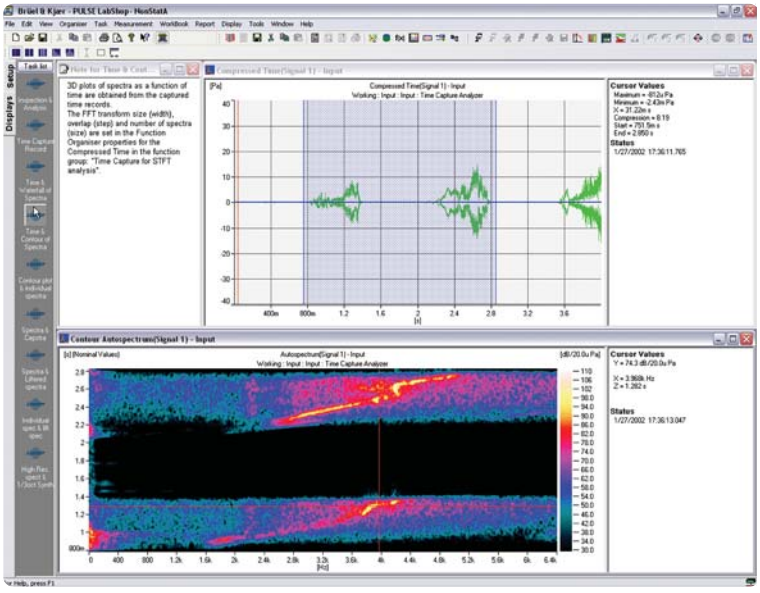


Fig. 10
Using Time Capture and Short Time Fourier Transform (STFT) to analyse speech signals

Uses

- Capture, retrieval and export of time-data sequences
- Capture of long time records for Vold-Kalman Order Analysis using Type 7703
- Post-processing and time inspection of long time records
- Data export including waveform files (*.wav) at selectable sampling rate

Features

- FFT, STFT and Synthesis to other frequency resolutions while listening to time signals
- Pre-processing of input data
- All analysis done as post-processing
- Extraction of any selectable part of a recorded signal

Multiple-Input Multiple-Output Analysis – Type 7764

MIMO Analysis Type 7764 allows Multiple-Input Multiple-Output (MIMO) analysis on large, complex and/or symmetrical structures.

Fig. 11
Application of PULSE Multiple-Input Multiple-Output (MIMO) analysis using multiple shakers and accelerometers

On large structures such as aircraft, it may not be possible to drive the entire structure from a single excitation point. The solution is to distribute the excitation over the structure using several smaller shakers. This also reduces the risk of non-linear structural behaviour.

Complex structures exhibit local modes that require multiple excitation points in order to extract all of them.

On symmetrical structures, repeated roots are found (that is, multiple modes at the same frequency). The solution here is to decompose the repeated roots using MIMO analysis and polyreference curve-fitting.

In addition, measuring simultaneously multiple output optimises data consistency.

Uses

- Analysis of large structures requiring high excitation energy
- Analysis of complex structures with local modes
- Analysis of symmetrical structures with repeated roots

Features

- Determination of MIMO Frequency Response Function H_1 and H_v, ordinary coherence and multiple coherence
- Number of inputs limited only by your PC's processing power
- Automatic parameter setup when used with Modal Test Consultant Type 7753

Envelope Analysis – Type 7773

Envelope Analysis Type 7773 is implemented as one of three ‘modes’ in PULSE’s FFT Analyzer (Baseband, Zoom, Envelope). It can be used for diagnostics/investigation of machinery where faults have an amplitude modulating effect on the characteristic frequencies of the machinery.

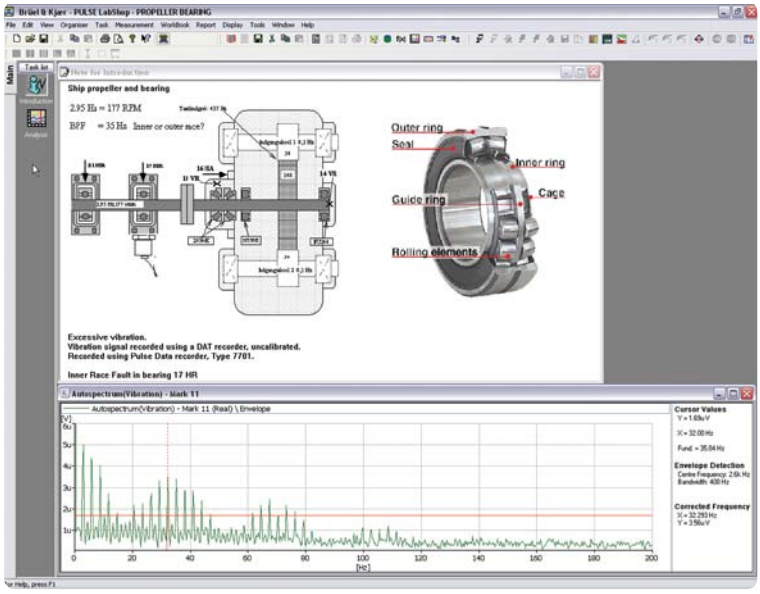


Fig. 12
Application of Envelope Analysis to detect and identify faults in roller-bearings

Uses

- Amplitude demodulation, that is, detection of the spectral and temporal representation of the modulating signal
- Spectral (what frequency) and temporal (where in a cycle) identification of the occurrences of impulsive events in rotating machinery
- Common applications:
  - Roller-bearing elements: identification of cracks in inner race, outer race or roller defects
  - Gear boxes: identification of cracked or broken teeth from impulsive modulation of the tooth-meshing frequency
  - Turbine blades: identification of broken or distorted blades from modulation of the blade-passing frequency
  - Induction motors: identification of broken or cracked rotor bars, or bad soldering from modulation of slot harmonics by twice the slip frequency
  - Reciprocating machinery: determination of precise point (in time) in the cycle of impulsive events like valve openings/closings or combustion

Basic Electroacoustics – Type 7797

PULSE Basic Electroacoustics uses stepped or swept sine excitation to measure responses of electroacoustic systems. Reliable and efficient testing is made possible with PULSE platform's user-definable measurement and analysis setup – allowing you to characterise electroacoustic equipment using traditional performance specifications such as: frequency response, linearity, directivity, delay, impedance, etc., with a wide range of acoustical and vibration measurements.

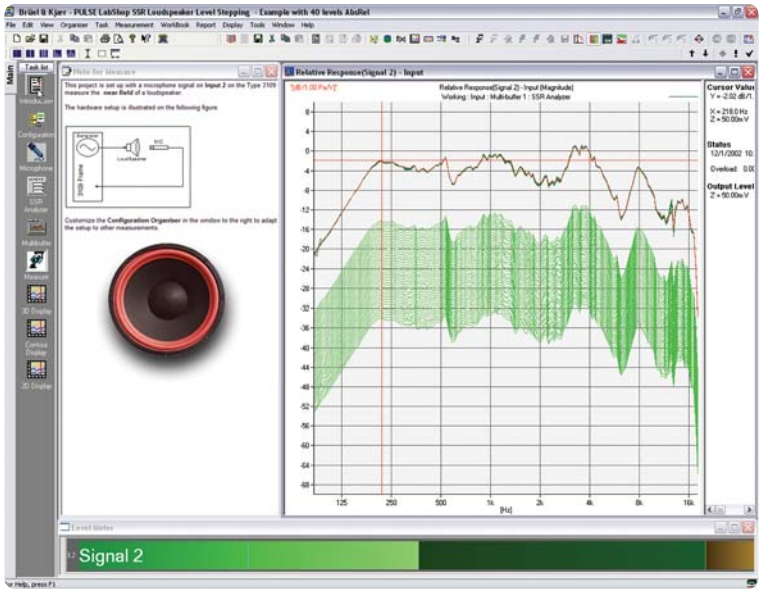


Fig. 13
Application of basic electroacoustics on a speaker using level stepping

Uses

- Development and quality control testing of electroacoustic and vibration transducers: loudspeakers, telephones, headphones, microphones, hearing-aids, hydrophones, accelerometers
- Linear and non-linear system analysis
- Acoustical measurements in rooms and vehicles

Features

- Frequency Response measurements using the Steady State Response method
- Excellent noise suppression using the Steady State Response method
- Fast measurements using Time Selective Response method

Electronic License Protection System

To accommodate a modern working environment, PULSE uses a flexible electronic license protection system (**FLEX**NET™). There are two main license models, N and F:

- Node-locked license (N) – license locked to a specific PC's hardware or hardware key
- Floating license (F) – a network server lends out licenses in a larger work environment allowing, for example, 20 users to share 8 licenses

PULSE will, as standard, be supplied with a node-locked licence applicable to a single PC. Licenses can be issued/fulfilled directly through a Web interface and hardware keys can be purchased if required.

One of the benefits of this system is that you can combine licenses from different license models. For example, two separate Type 7700 licenses, a 4-channel and a 6-channel, can be combined to give a 10-channel system. In this way, it is possible to 'stack' licenses.

PULSE Software

We strongly recommend that you update your PULSE installation to the latest major release to ensure that the latest security updates from Microsoft® are supported by your installation
The Windows®-based analysis software is delivered on a DVD. The software can be ordered with a license for measurement on specified number of channels (see Ordering Information). As many signal groups as desired can be created from the measured signals.
The license is either node-locked to a PC host ID or hardware key, or floating – locked to a network server

ANALYSIS PERFORMANCE
The table shows guidelines for the computing power of the 75-beat analysis engine included in Type 7700, 7770, 7771 expressed as real-time channel × bandwidth product. Analysis engine capacity can be upgraded with Type 7707

	Channel × Bandwidth	
Real-time FFT	450 kHz, 0% overlap	Type 7700 and 7770
Real-time CPB	150 kHz[a]	Type 7700 and 7771

[a] For example, 6 channels to 25 kHz or 12 channels to 12.5 kHz

See also FFT and CPB specifications below

Recommended PC

- 2.5 GHz Intel® Core™ Duo processor, or better
- 4 GB of memory
- 160 GB Solid State Drive (SSD) with 20 GB free space
- DVD-RW drive
- 1 Gbit Ethernet network
- Integrated COM port or USB adaptor to COM (except with LAN-XI modules, which use a network connection)
- Microsoft® Windows® 7 (all editions), Windows® XP Professional (SP 3), Windows Vista® Ultimate (SP 2) or Windows Vista® Business (SP 2)
- Microsoft® Office 2003 (SP 3) or Office 2007 (SP 2)
- Adobe® Reader® 9.1 (US version included with PULSE DVD)
- Microsoft® SQL Server® 2008 Express Edition (SP 1) (included with PULSE DVD)

Hardware Configuration

The software automatically detects the front-end hardware connected and configures the system. If IEEE 1451.4 capable transducers (with standardised TEDS) are being used, these are also detected and attached automatically to the correct channel of the input module

Calibration and System Validation

Calibration can be performed before or after measurement. The program uses automatic calibration sequencing

Measurement Control

AVERAGING
Averaging types available for the measured signals are:
- Linear
- Exponential
- Max. hold
- Min. hold
- +Peak
- –Peak
- Overlaps – fixed values of 0 %, 50 %, 66.67%, 75 % and max. (95%)

TRIGGER TYPES
- Signal
- Manual
- Free-run
- Time
- Generator
- Internal level (CPB and Overall Level analyzers)

A channel or a trigger delay can be applied

PRE-PROCESSING
Pre A-, B-, C- and D-weighting (IEC 61672/IEC 651/IEC 60804 type 1)

MULTI-ANALYSIS
A number of instruments of the same or different types can be used simultaneously. The instrument types in Type 7700 are:
- FFT analyzer
- CPB analyzer (1/n-octave) (IEC 1260–1995 Class 1, DIN 45651 and ANSI S1.11–1986)
- Overall Level analyzer (IEC 61672/IEC 651/IEC 60804 type 1)
- Signal Generator

Measurement

ANALYZERS
For the FFT, CPB and Overall Level analyzer specifications see the relevant analyzer specifications at the end of this section

MULTI-BUFFERS
No. of Multi-buffers: 8
Maximum Capacity: Dependent on RAM in PC

Display

Maximum Display Cycle Rate: 25 times per second, per display, depending on PC hardware

GRAPH TYPES
Display of functions in a range of graph types including:
- Waterfall
- Waterfall (step)
- Colour contour
- Bar
- Line
- Curve
- Curve (step)
- Overlay
- Overlay (all)
- Multi-value

Superimposed Graphs: A number of functions can be superimposed on the same curve graph

DERIVED DISPLAYS
Harmonic and individual slices can be cut and extracted from contour, waterfall and overlay plots

AXES
X-axis Scale: linear, logarithmic and CPB
Y-axis Scale: linear, logarithmic and dB
Z-axis Scale: linear and logarithmic

COORDINATES
- Real
- Imaginary
- Magnitude
- Phase
- Nyquist

SPECTRAL UNITS
- Root mean square (RMS)
- Power (PWR)
- Power spectral density (PSD)
- Root mean square spectral density (RMSSD)
- Energy spectral density (ESD)
- Peak (Peak)
- Peak-to-Peak (PkPk)

ACOUSTIC POST-WEIGHTING
- A-, B-, C-, D-, L-weighting

jω WEIGHTING
- $1/j\omega^2$, $1/j\omega$, 1, $j\omega$, $j\omega^2$ (single and double integration and differentiation)

Cursors

CURSOR TYPES
Depending on the display type, the following are available:
- Main
- Delta
- Reference
- Harmonic
- Sideband

Alignment: Cursors in different displays can be synchronised to allow the changes to one display to be reflected in other displays showing the same or different functions

CURSOR READINGS
The cursor values that can be read out include:
- Acoustic levels
- Corrected frequency
- Cursor indices and values
- Delta
- Delta/total
- Max. and min. values
- Nearest harmonic
- Nearest sideband
- Reference
- Resonance
- Reverberation
- Slice definition
- Status
- Total

Other cursor readings can be added

AUXILIARY PARAMETER LOGGING
Provided by IDA^e LAN modules Type 7533, 7536, 7537/37-A, 7538/38-A, 7539/39-A, 7540/40-A, and 3560-B-XXX for the integration of auxiliary parameters (temperature, wind, speed, etc.) with dynamic data
Sampling Rate: 10 samples per second on each channel
Detectors: Instantaneous and Linear
Averaging: The following averaging modes are available:
- Average over a period
- Continuous running averaging

Average Over a Period of Time:
- Max. Linear Averaging Time: 86 400 s (24 hrs.)
- Min. Linear Averaging Time: 0.1 s
- Averaging can be reset by measurement start and/or a user selected trigger

Continuous Running Averaging: Via cyclic buffer
Averaging can be reset by measurement start and/or a user-selected trigger
Measurement Modes:
- Instantaneous
- Instantaneous Maximum
- Instantaneous Minimum
- Averaged
- Averaged Maximum
- Averaged Minimum

All modes can be measured simultaneously. An auxiliary channel can have multiple signals with multiple averaging settings. Only auxiliary signals can be measured using an Auxiliary Parameter Logger
Integration With PULSE Platform:
- Data available as multi-buffer tags
- Auxiliary parameter as a function of time
- Auxiliary channels can be recorded and played back with Time Data Recorder Type 7708 or Data Recorder Type 7701
- Access to auxiliary channel settings and data through OLE interface
- Connection to Hardware: use 37-pin D-sub to Aux I/O cable AO-1472 and 16 BNC Female to 37-pin D-sub AO-0594

Programmable

Visual Basic® for Applications is embedded in PULSE software and also supports OLE Automation/ActiveX® controls, allowing the development of customised control programs. A wide range of functions that are not directly available in PULSE are supported using PULSE Programming Language, written in a text editor and compiled

Export

Export of data to a file in ASCII format or to spreadsheet packages such as Microsoft® Excel® 2003, or later. Also PULSE File Binary, Universal File ASCII/Binary, SDF, WAV (Time Data Recorder Type 7708, Data Recorder Type 7701 or Time Capture Type 7705 license required) and STAR Binary
Export of groups of data for further processing using PULSE Bridge to MATLAB®

Reporting

Integrated reporting with Microsoft® Word 2003, or later

FFT Analyzer (Types 7700 and 7770)

A number of variants of the FFT analyzer can be used simultaneously

Measurement

FREQUENCY RANGE
Baseband and Zoom: 50∠6400 lines
Frequency Span: 1.56 Hz∠204.8 kHz in 1, 2, 5, … or 2^n (1, 2, 4, 8, …) sequence
Centre Frequency Resolution: 1 mHz

TIME WEIGHTING
The following are available:
- Uniform
- Hanning
- Flat-top
- Kaiser-Bessel
- Transient
- Exponential

FREQUENCY WEIGHTING
- A, B, C, D
- $j\omega^2$, $j\omega$, 1, $1/j\omega$, $1/j\omega^2$

Performance

	Channel × Bandwidth Product	
	0% Overlap	66.7% Overlap
Real-time FFT	450 kHz	300 kHz[a]

[a] For example, 16 channels to 25.6 kHz

The above table shows guidelines for the computing power of the 75-beat analysis engine included in Type 7700, 7770 expressed as real-time channel × bandwidth product for measurement of FFT, 400 lines, autospectra, no cross-spectra. Values are scalable with the addition of the Analysis Engine Type 7707

Pre-processing

The following pre-processing can be selected for an analyzer
- Time
- Autospectrum
- Cross-spectrum

Post-processing

The following post-processing functions can be applied to measured data:
- Complex time (Hilbert transform)
- Monitor time
- Fourier spectrum
- Phase-assigned autospectrum (PAS)
- Ratio-based PAS
- Frequency response function (H1, H2, H3)
- 1/Frequency response function (1/H 1, 1/H 2, 1/H 3)
- Coherence
- Signal-to-noise ratio
- Coherent/non-coherent power
- Auto-correlation
- Cross-correlation
- Impulse response (h1, h2, h3)
- Calculated intensity
- Calculated complex intensity
- Calculated mean pressure spectrum
- Calculated velocity spectrum
- p–I index
- Cepstrum
- Liftered Spectrum
- CPB (1/n^{th} Octave) Synthesize
- Orbit

CPB Analyzer (Real-time 1/n-octave) (Types 7700 and 7771)

A number of variants of the CPB analyzer (Real-time 1/n-octave Digital Filter analyzer) can be used simultaneously. The analyzer uses real-time standardised fractional octave digital filters

Measurement

1/1-OCTAVE FILTERS
14-pole filters with centre frequencies given by $10^{3\,n/10}$. Fulfils IEC 1260–1995 Class 1, DIN 45651 and ANSI S1.11–1986, Order 7 Type 1–D, optional range
Single Channel: $-3 \le n \le 14$. 18 filters with centre frequencies from 125 mHz to 16 kHz (25.6 kHz module) or 125 kHz (204.8 kHz module, Type 3110)

1/3-OCTAVE FILTERS
6-pole filters with centre frequencies given by $10^{n/10}$. Fulfils IEC 1260–1995 Class 1, DIN 45651 and ANSI S1.11–1986, Order 3 Type 1–D
Single Channel: $-10 \le n \le 43$. 54 filters with centre frequencies from 100 mHz to 20 kHz (25.6 kHz modules) or 160 kHz (204.8 kHz module, Type 3110)
Minimum Mean Time Interval between Spectra: 5 ms

1/12-OCTAVE FILTERS
6-pole filters with centre frequencies given by $10^{(n + 0.5)/40}$.
Single Channel: $-30 \le n \le 173$. 204 filters with centre frequencies from 183 mHz to 21.8 kHz
Minimum Mean Time Interval between Spectra: 5 ms

1/24-OCTAVE FILTERS
6-pole filters with centre frequencies given by $10^{(n + 0.5)/80}$
Single Channel: $-84 \le n \le 323$. 408 filters with centre frequencies from 90.4 mHz to 11.1 kHz
Minimum Mean Time Interval between Spectra: 10 ms

DETECTORS
- Linear averaging
- Exponential averaging
- Exponential Confidence averaging
- Exponential Confidence Limit averaging

With Exponential Confidence, the averaging time is administered so that the estimates for all octaves are within the same confidence level. Exponential Confidence Limit is the same as Exponential Confidence, but a minimum averaging time can be set

PROCESSING
The following can be measured:
- Autospectrum
- Cross-spectrum
- Mean pressure spectrum
- Velocity spectrum
- Intensity spectrum
- Complex intensity spectrum

Note: Intensity measurement is for intensity probes with 2 microphones

MAX./MIN. SPECTRUM HOLD
Max./min. hold of spectrum for exponential averaging mode

Performance

The following table shows guidelines for the computing power of the 75-beat analysis engine included in Type 7700, 7771 expressed as real-time channel × bandwidth product for measurement of CPB autospectra without A & L bands. Values are scalable with the addition of Analysis Engine Type 7707

	Channel × Bandwidth Product			
	1/1-octave	**1/3-octave**	**1/12-octave**	**1/24-octave**
Real-time CPB	225 kHz	150 kHz	60 kHz	30 kHz

Post-processing

The following post-processing can be applied to a CPB measurement
- Phase-assigned autospectrum
- Frequency response function (H 1, H 2, H 3)
- 1/Frequency response function (1/H 1, 1/H 2, 1/H 3)
- Coherence
- Signal-to-noise ratio
- Coherent/non-coherent power
- Calculated intensity/complex intensity
- p–I index
- Loudness (ISO 532 B)
- Articulation Index (ANSI 53.5–1969)

Overall Level Analyzer (Types 7700, 7770 and 7771)

A number of variants of the Overall Level analyzer can be used simultaneously. Any signal can be measured using an Overall Level analyzer. Complies with the requirements for a type 1 instrument in IEC 61672/IEC 651/IEC 60804

DETECTORS
- Exponential, Linear, Impulse, Peak

AVERAGING
The following averaging modes are available:
- Average over a period
- Continuous running averaging

Average Over a Period of Time:
- Max. Linear Averaging Time: 86400 s (24 hrs.)
- Max. Exponential Averaging Time: 1024 s
- Max. Peak Detection Time: 36000 s (10 hrs.)

Continuous Running Averaging:
Via cyclic buffer

FREQUENCY SPAN
Maximum: Determined by maximum analysis bandwidth of hardware used

MEASUREMENT MODES
- Exponential (including fast and slow)
- Exponential + impulse
- Exponential + maximum hold
- Exponential + minimum hold
- Exponential + statistics (L_N percentile level, N = 1, 2, …, 99)
- Linear
- Linear + impulse
- Peak

All modes can be measured simultaneously

ACOUSTIC WEIGHTING
- Linear, A, B, C, D

Performance

The following table shows guidelines for the computing power of the 75-beat analysis engine included in Type 7700, 7770, 7771 expressed as real-time channel × bandwidth product for measurement of overall levels with and without peak. Values are scalable with an additional Analysis Engine Type 7707

	Channel × Bandwidth Product	
	Without peak	With peak
Real-time overall analysis	450 kHz	180 kHz

Signal Generator (Types 7700, 7770 and 7771)

Provides signals for performing a system analysis. Requires the use of modules with generator outputs. See Type 3560 B/C/D/E System Data, BU 0228, or LAN-XI Data Acquisition Hardware Product Data, BP 2215, for further specifications

WAVEFORMS
- Sine – fixed or swept (burst or continuous)
- Dual sine – fixed, swept or combination
- Random (burst or continuous)
- Pseudo-random
- Periodic Random
- User-defined waveform (import from WAV file)

Specifications – Analysis Engine Type 7707

The following table shows the possible performances of PULSE with and without Analysis Engine Type 7707 on various PCs. Actual performances may vary

PC Configuration	**Analysis Engine (Beats)**	**PULSE Performance, Real-time Channel × Bandwidth Product (kHz)**		
		FFT[a] (400 lines 0%)	**CPB[1/3-oct]**	**Order Tracking[b,c]**
Pentium®II 600 MHz (minimum)	50[d]	300	100	40
Pentium®II 1000 MHz	75[e]	450	150	60
Pentium®4 2.7 GHz or Dual Pentium®III 1.8 GHz without Type 7707	75††	450	150	60
Pentium®4 2.7 GHz or Dual Pentium®III 1.8 GHz with Type 7707	150	900	300	120
Dell Latitude™ D 630 2.0 GHz with Intel® Centrino™ and Type 7707	250	1500	500	200
Dual Pentium® 4 3 GHz with Type 7707	250	1500	500	200

[a] 1, 2, 5 FFT sequence uses more resources than 2^n
[b] Bandwidth = (Max. no. of orders) × (Max. fundamental), e.g., 2-ch. 6000 RPM, 100 Orders 0% overlap = 20 kHz
[c] Order Tracking requires Type 7700 or 7770 **and** Type 7702
[d] Restricted by PC performance
[e] 75 beats is the maximum available with Types 7700, 7770 and 7771 without using Type 7707

Specifications – Time Capture Type 7705

Requirements

Type 7700, 7770 or 7771

Recording

Frequency Span: 1.56 Hz∠204.8 kHz in 1, 2, 5, … or 2^n (1, 2, 4, 8, …) sequence
Record Length: 1 ms to 24 hrs. with indication of equivalent record size in samples

TRIGGER
Start: Any virtual trigger or free-run
Stop: Any virtual trigger or Stop at End

Specifications – Multiple-Input Multiple-Output Analysis Type 7764

Requirements

Type 7700 or 7770

MIMO Analysis

- Provides calculations of MIMO H_1 and H_v, multiple coherence
- Automatic parameter setup when used with Modal Test Consultant Type 7753

Specifications – Envelope Analysis Type 7773

Requirements

Type 7700 or 7770

Envelope Analysis

Uses FFT analyzer in Envelope Mode
Detection Range: Set by the Centre Frequency and 2 × selected Frequency Span
For other specifications, see FFT Analyzer (Types 7700 and 7770) on page 14

Specifications – PULSE Time Type 7789

Requirements

- Types 7700, 7770 or 7771
- Type 7708 – if data are to be analysed in PULSE LabShop
- PC should be equipped with a soundcard that is compatible with Windows® in order to play back signals
- A PC optimised for CPU and hard disk intensive operations is recommended

Data Import/Export

- PULSE Data Recorder (.dat and .pti)[1]
- Universal File Format (.uff), ASCII and Binary
- Time Data Format (.tdf)
- Wave file (.wav)
- TEAC (.hdr)
- MATLAB (.mat)
- Head Acoustics (.hdr)
- I-deas Time (.ati)

[1] Maximum .pti file size is 2 G samples per channel

Specifications – PULSE Basic Electroacoustics Type 7797

Requirements

Type 7700, 7770 or 7771

Steady State Response Analysis

RESPONSE
Relative response (transfer function) or absolute response (response signal only) can be measured

FREQUENCY SWEEP
A frequency sweep is set up by defining a start and a stop frequency and a number of steps that can be distributed on a logarithmic or linear scale or at user-defined frequencies

- **Frequency Span:** Type 3109 up to 25.6 kHz; Type 3110 up to 102.4 kHz; Type 3160 up to 51.2 kHz; Type 3560-B up to 25.6 kHz
- **User Defined:** Frequency sweep inserted by the user, as desired
- **Direction:** Up, Down
- **Log:** 1/3-, 1/6-, 1/12-, 1/24-, 1/48- and 1/96-octave steps
- **Log ISO:** Series R10, R20, R40 and R80
- **Log CPB:** 1/3-, 1/6-, 1/12-, 1/24-, 1/48- and 1/96-octave steps according to CPB frequencies
- **Lin:** 1 to 1600 steps

LEVEL SWEEP
A level sweep is set up by defining the excitation frequency, the output level range to be swept and the step size
Output Level: Range and step size for an Output Level sweep can be selected from 0.1 dB to 80 dB

DETECTOR
For optimal estimation of the frequency response, the Steady State Response Detector or Adaptive Scan Algorithm are used. The detector requires that a detector averaging method, a detector accuracy, a detector delay as well as a detector max. time are defined

- **Detector Averaging:** Complex Adaptive, Power Adaptive, Complex Linear and Power Linear averaging can be selected. When Adaptive averaging is selected, the response is estimated to a user-defined accuracy in the minimum possible time. When Linear averaging is selected, all data within a specified period of time are averaged. Complex indicates that phase information is included in the response, whereas Power indicates no phase information
- **Detector Accuracy:** 0.01, 0.02, 0.03, 0.04, 0.05, 0.06, 0.08, 0.1, 0.15, 0.2, 0.3, 0.4, 0.5, 0.6, 0.8, 1.0, 1.5, 2, 3 and 6 dB. The value specifies the required accuracy of the measurement (67% confidence level) when Complex Adaptive or Power Adaptive is selected
- **Detector Delay:** 0 ms, 10 ms, 20 ms, 50 ms, 100 ms, …, 10 s. The value specifies the delay before the detector is activated for each excitation frequency
- **Detector Max. Time:** 0 ms, 100 ms, 200 ms, 400 ms, 800 ms, 1.6 s, 3.2 s, 6.4 s, 12.5 s, …, 13 ks. For complex averaging, the value specifies the maximum measuring time after the detector algorithm has been activated. For linear averaging, the value specifies the averaging time

Time Selective Response Analysis

RESPONSE
Relative response (transfer function) or absolute response (response signal only) can be measured

FREQUENCY SWEEP
Fundamental: Start and Stop Frequency can be selected from 1 Hz to 25 kHz/50 kHz/100 kHz

Minimum Frequency Range: 39 Hz
Harmonic Distortion: Up to 20th order harmonic distortion can be selected. For the nth order harmonic distortion Start and Stop Frequency can be selected from 20 Hz to (40/n) kHz

TIME WINDOW
50 / (N × F), 100 / (N × F), 200 / (N × F), 400 / (N × F) and 800 / (N × F)
N = harmonic, F = frequency range

DELAY
0.0 s to 100.0 s (max 5 decimals, rounded off to nearest 10 μs value)

SWEEP TIME
0.5, 1, 2, 4, 8, 16, 32, 64, 128, 256, 512 s

AVERAGES
1 to 4096

PAUSE:
0.0 s to 100.0 s

CONDITIONING TONE
0.0 s to 10.0 s (max. 3 decimals, rounded off to nearest 10 ms value)

Ordering Information

SOFTWARE[1]

Type 7700-Xy	PULSE FFT & CPB Analysis
Type 7770-Xy	PULSE FFT Analysis
Type 7771-Xy	PULSE CPB Analysis
Type 7707-X	PULSE Analysis Engine Upgrade

PULSE VIEWER LICENSE[1]

Type 7709-X	PULSE Viewer

PULSE APPLICATIONS[1]

Type 7698-X	PULSE Sound Quality
Type 7702-X	PULSE Order Analysis
Type 7703-X	Vold-Kalman Order Tracking Filter for PULSE
Type 7705-X	PULSE Time Capture
Type 7708-X	PULSE Time Data Recorder
Type 7752-X	PULSE Noise Source Identification
Type 7753-X	PULSE Modal Test Consultant™
Type 7753-A-X	PULSE Modal Test Consultant with FRF Animation
Type 7754-X	PULSE ME'ScopeVES™ Modal and Structural Analysis
Type 7755-A-X	PULSE Bridge to ME'ScopeVES™
Type 7758-X	PULSE Material Testing
Type 7759-X	PULSE Advanced Intensity Analysis
Type 7760-X	PULSE Operational Modal Analysis
Type 7761-X	PULSE Acoustic Test Consultant
Type 7764-X	PULSE Multiple-Input Multiple-Output Analysis
Type 7765-X	PULSE Operating Deflection Shapes Test Consultant™
Type 7765-A-X	PULSE Operating Deflection Shapes
Type 7765-B-X	PULSE Run-up/Down Operating Deflection Shapes
Type 7767-A-X	PULSE Data Manager, single user
Type 7767-B-X	PULSE Data Manager, up to 5 users
Type 7767-C-X	PULSE Data Manager, up to 10 users
Type 7773-X	PULSE Envelope Analysis
Type 7788-A-X	PULSE Pass-by Conformance Test Software
Type 7788-B-X	PULSE Vehicle Pass-by Test Software, Ground Channels
Type 7788-C-X	PULSE Vehicle Pass-by Test Software, Ground and In-vehicle Channels
Type 7789-X	PULSE Time
Type 7790 A-X	PULSE Two-plane Balancing Consultant
Type 7790-B-X	PULSE Multi-plane Balancing Consultant
Type 7793-X	PULSE Indoor Pass-by Noise Measurement
Type 7795-X	PULSE Vibration Check for Aircraft Engines
Type 7796-X	PULSE Automotive Test Manager
Type 7797-X	PULSE Basic Electroacoustics
Type 7798-X	PULSE Source Path Contribution
Type 7799-X	PULSE Sound Power
Type 7906-S 1-X	PULSE Vibration Analysis for Aircraft Engines
Type 7907-X	PULSE Electroacoustics
Type 7909-S 1-X	PULSE Voice Testing for Hands-Free Equipment
Type 8601-X	PULSE DTS Software for NVH Simulator
Type 8604-A-001	PULSE Static Droop for Makila 1A2
Type 8605-X	PULSE ASAM ODS Connectivity
Type 8606-X	PULSE Spherical Beamforming
Type 8607-X	PULSE Acoustic Holography
Type 8608-X	PULSE Beamforming
BZ-5137-X	Telephone Test on PULSE
BZ-5231-X	IDA[e] Driver for Test for I-deas
BZ-5265-X	PULSE Sound Quality Zwicker Loudness
BZ-5277-X	PULSE Sound Quality Order Analysis
BZ-5301-X	PULSE Sound Quality Psychoacoustic Test Bench
BZ- 5370-X	Robot Option for ATC
BZ-5548-X	PULSE SSR Analysis – Harmonic Distortion
BZ-5549-X	PULSE SSR Analysis – Intermodulation Distortion
BZ-5550-X	PULSE SSR Analysis – Difference Frequency Distortion
BZ-5551-X	PULSE Directivity and Polar Plot
BZ-5600-X	PULSE Sequencer
BZ-5601-X	PULSE Data Manager for Electroacoustics
BZ-5602-X	PULSE Receiver Test Applications
BZ-5603-X	PULSE Loudspeaker Test Applications
BZ-5604-X	PULSE Thiele Small Parameter Calculation
BZ-5610-X	PULSE CAN Bus Option
BZ-5611-X	PULSE Position Detection Option for ATC
BZ-5612-X	PULSE Run-up/down ODS Option
BZ-5613-X	PULSE Animation Option
BZ-5635-X	PULSE Quasi-stationary Calculations
BZ-5636-X	PULSE Transient Calculations
BZ-5637-X	PULSE Conformal Calculations
BZ-5696-X	PULSE Moving Source Option for Beamforming
BZ-5742-X	PULSE TSR Analysis – Harmonic Distortion
BZ-5743-X	PULSE Microphone Test Application
BZ-5744-X	PULSE Headset Test Application
BZ-7848-A	LAN-XI Notar™
WT-9695-X	Orbit and Polar Plots for PULSE

SERVICES

3560−SI 1	Installation and Configuration (at Brüel & Kjær)
M 1-ZZZZ-Xy[2]	PULSE Software Maintenance & Support Agreement

See the Software Maintenance and Support Agreement Product Data (BP 1800) for further details of M 1 Agreements

[1] 'X' indicates the license model, either N: Node locked or F: Floating.
'y' is the number of channels supported by the license, between 2 and 16 (e.g., 7700-N7 denotes a node locked, 7-channel license). A 16-channel license supports an unlimited number of channels

[2] 'Z' indicates the product type number, 'X' indicates the license model and 'y' indicates the number of channels

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