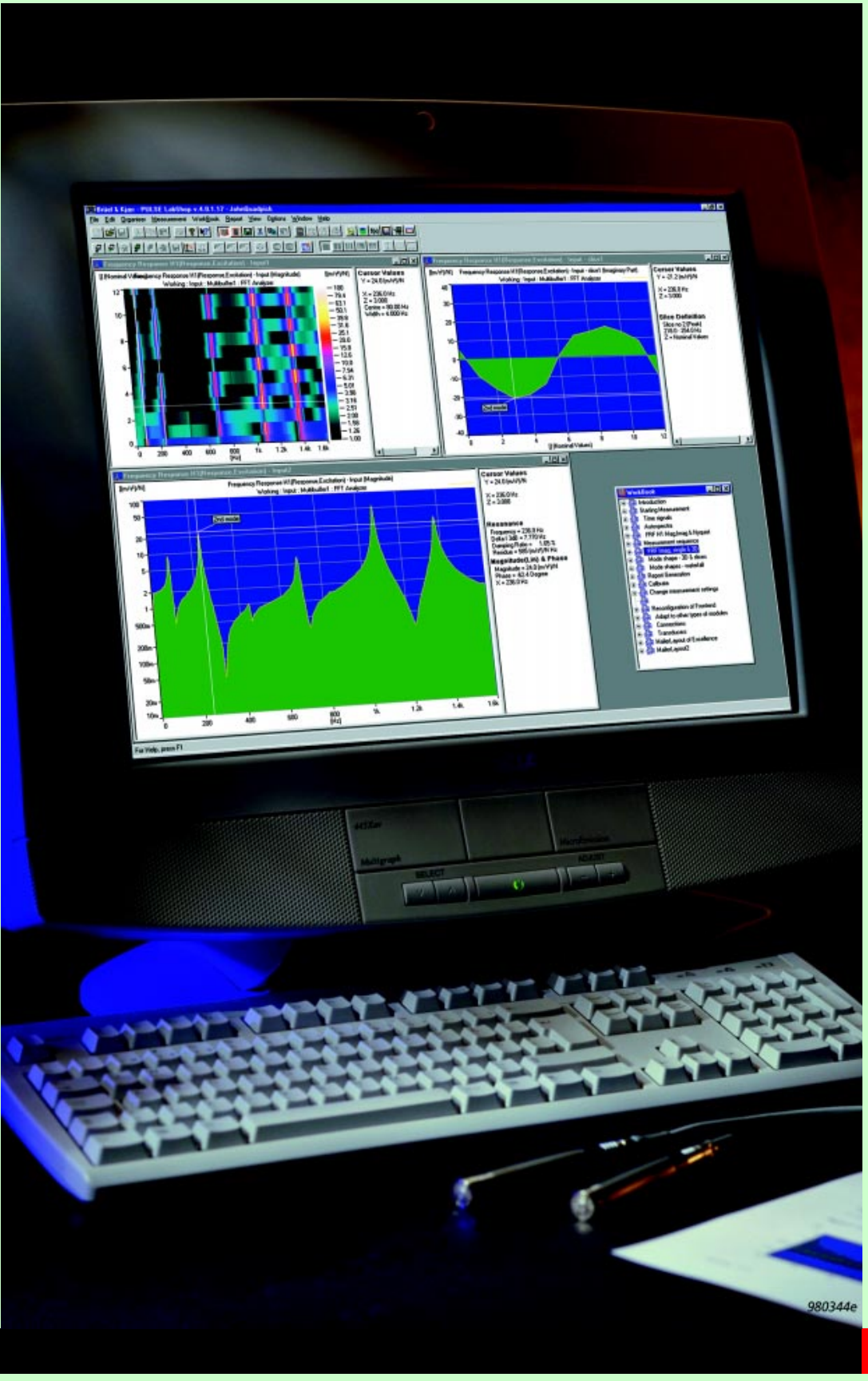
PRODUCT DATA

Noise and Vibration Analysis — Type 7700
Base Software for PULSE, the Multi-analyzer System



Noise and Vibration Analysis Type 7700 is the base PULSE™ software. It allows the definition of configuration and measurement setups, calibration, post-processing, and display and documentation of results. The software contains a number of generic tools that let you customise your system to suit the requirements of your measurement task.

PULSE provides access to analyzers, post-processing functions and display facilities for your noise and vibration applications. The analyzers and other facilities available depend upon the software installed. For PULSE's base software, Noise and Vibration Analysis Type 7700, the following are available:

- FFT Analyzer
- CPB (1/nth Octave) Analyzer
- Overall Level Analyzer
- Signal Generator

7700

Brüel & Kjær

Uses and Features

USES

- ❍ General noise and vibration testing using real-time multichannel analysis
- ❍ General R&D noise and vibration analysis using simultaneous FFT and 1/nth octave measurements
- ❍ Overall analysis with simultaneous measurement of exponential, linear, impulse and peak levels
- ❍ Customised measurement solutions
- ❍ Data acquisition, calibration, measurement, analysis, post-processing and documentation

FEATURES

- ❍ Runs under Microsoft® Windows NT® with task-oriented user interface
- ❍ Project templates allow rapid setup of new projects with built-in measurement guidance
- ❍ Multi-analysis allows multiple analyses of the same input data, reduces test and reporting times, and ensures consistency, e.g.:
  – Simultaneous FFT and 1/3-octave analysis of the same data
  – Simultaneous analysis using several FFT analyzers
- ❍ Configurations from 2 to 32 channels with scalable real-time performance
- ❍ Automatic detection of front-end hardware
- ❍ Tabular entry of channel parameters including transducer type and sensitivity for multichannel measurements
- ❍ Automatic calibration sequencing
- ❍ Advanced graphical display and cursor facilities
- ❍ Data export in a variety of formats for use with external applications
- ❍ Fast, automatic report generation using MS® Word
- ❍ Integrated with MS Office allowing, e.g., post-processing using Excel
- ❍ Supports customisation, external control and data export (OLE automation and ActiveX™ control)

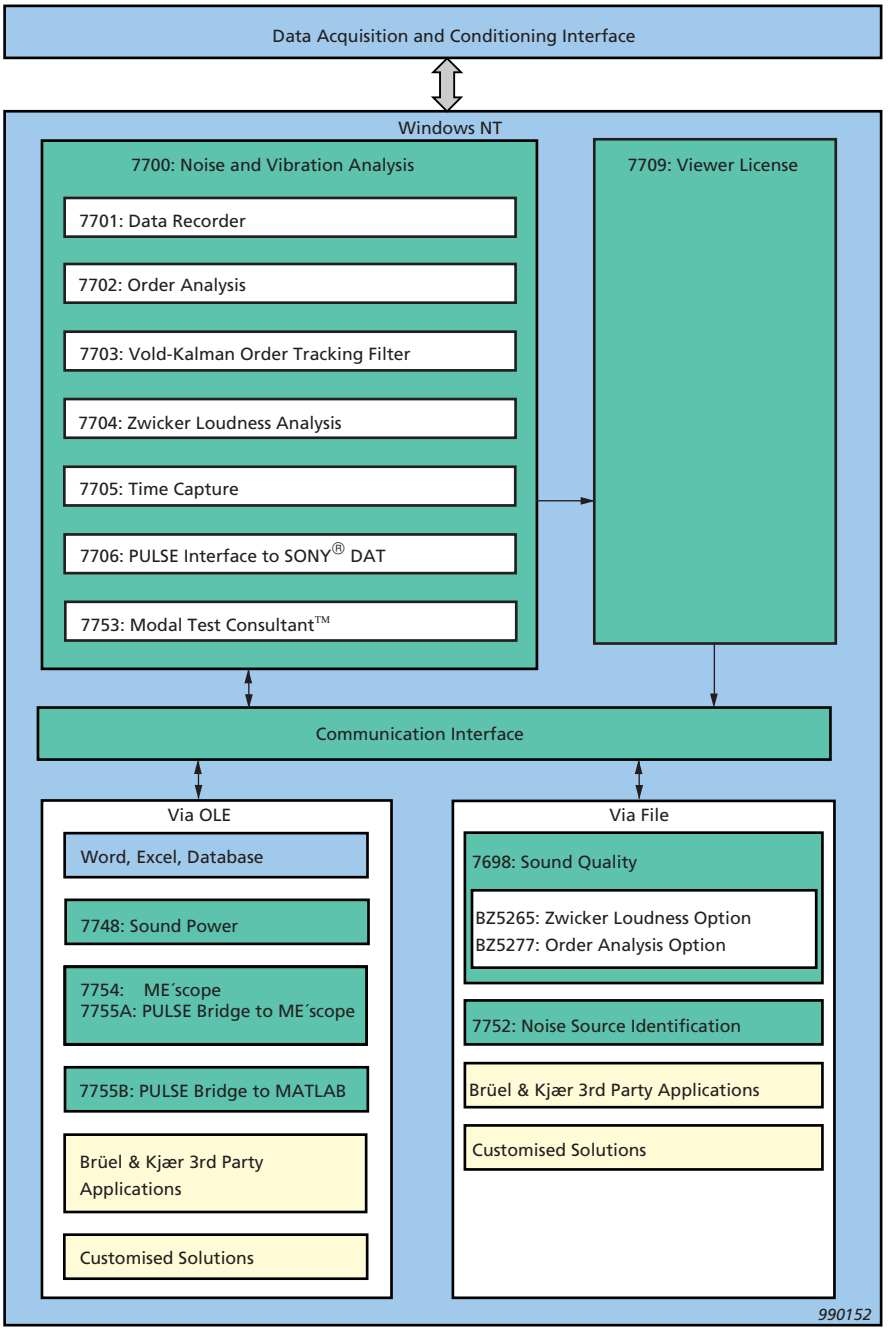
PULSE Software

The PULSE software Noise and Vibration Analysis Type 7700 is the base software for all Type 3560 PULSE systems. As well as Noise and Vibration Analysis Type 7700, a range of application software packages is available for use in a PULSE system (see Fig. 1).

License codes determine the software accessible in PULSE and the measurement instruments, post-processing function types and display facilities that can be used for analyses. The software available includes:

- ❍ Data Recorder Type 7701 (see Product Data BP 1633)
- ❍ Order Analysis Type 7702 (see Product Data BP 1634)
- ❍ Vold-Kalman Order Tracking Analyzer Type 7703 (see Product Data BP 1760)
- ❍ Zwicker Loudness Analyzer Type 7704 (see Product Data BP 1761)
- ❍ Time Capture Type 7705 (see Product Data BP 1762)
- ❍ PULSE Interface to SONY® DAT Type 7706 (see Product Data BP 1764)
- ❍ PULSE Viewer License Type 7709 (see Product Data BP 1855)

Fig. 1 The software and applications available for PULSE



Each of these products comes with a number of predefined applications in the form of PULSE Application Projects for common measurement tasks. For example, one of the predefined PULSE Projects supplied with Noise and Vibration Analysis Type 7700 is for “mobility using a hammer”. Years of Brüel & Kjær experience have been built into these application projects. They can be adapted to specific requirements or totally new projects can be created.

PULSE Projects and Templates

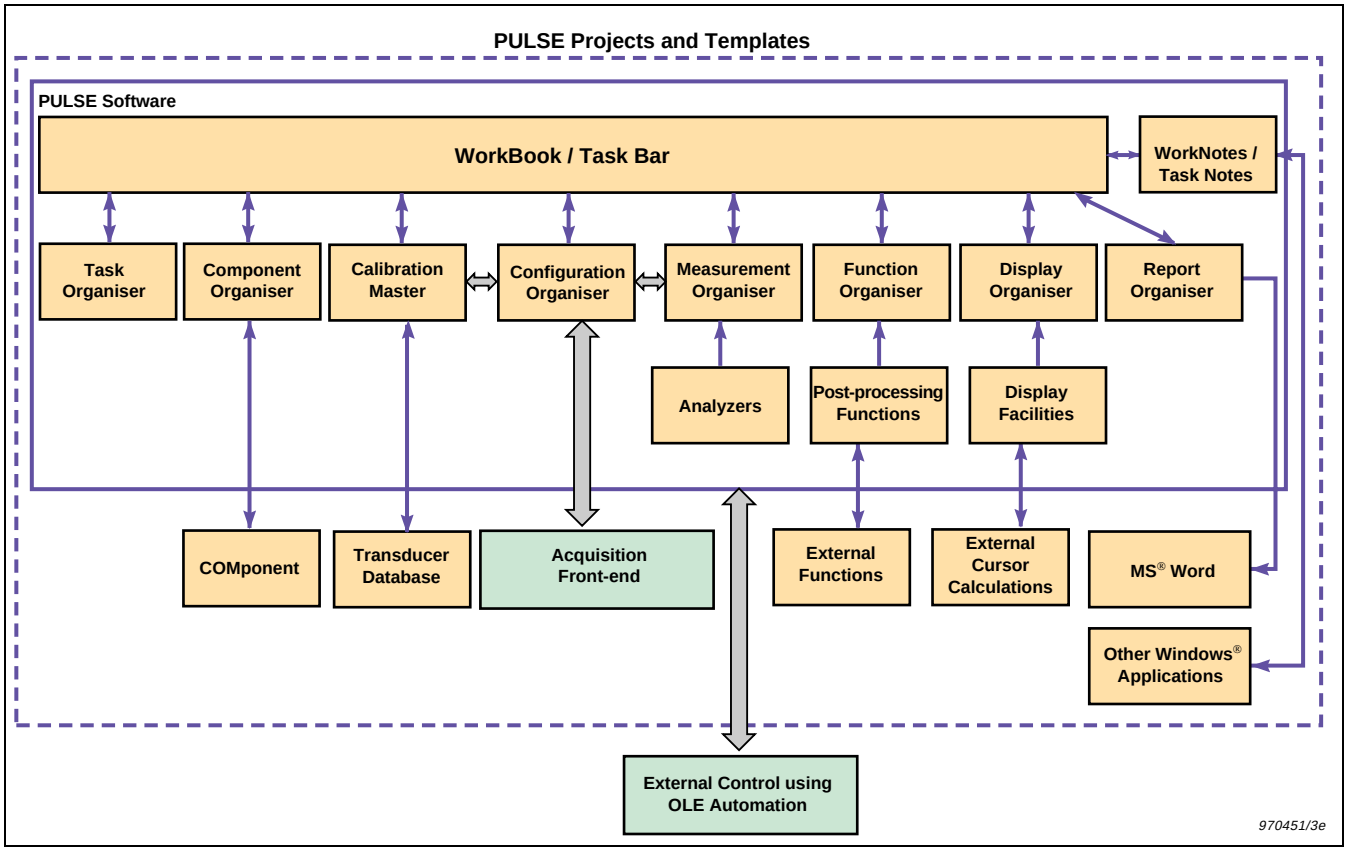
A PULSE project covers the complete measurement process and can involve many different tasks and analyses. Projects are set up, managed and documented using Organisers, the WorkBook and WorkNotes, or Task Bar and TaskNotes.

A project is essentially a complete definition of the instrument and measurement setup with measurement results and documentation. When you re-open a saved project, all settings and windows are restored to the same state as when the project was last saved.

Once you have set up a project, you can save it as a PULSE template. This ensures that you can make series of measurements with identical setup and start point. You can also select one of your templates as default, so that whenever you create a new project, PULSE automatically uses that template.

Type 7700 projects contain Organisers that you can use to define or modify the configuration, measurement, post-processing function, display and report setups, to arrange specific tasks in groups in the task bar, and to add COM components to your projects. See the software architecture block diagram in Fig. 2.

Fig. 2 Block diagram showing software architecture and interface to front-end hardware



Task-oriented User Interface

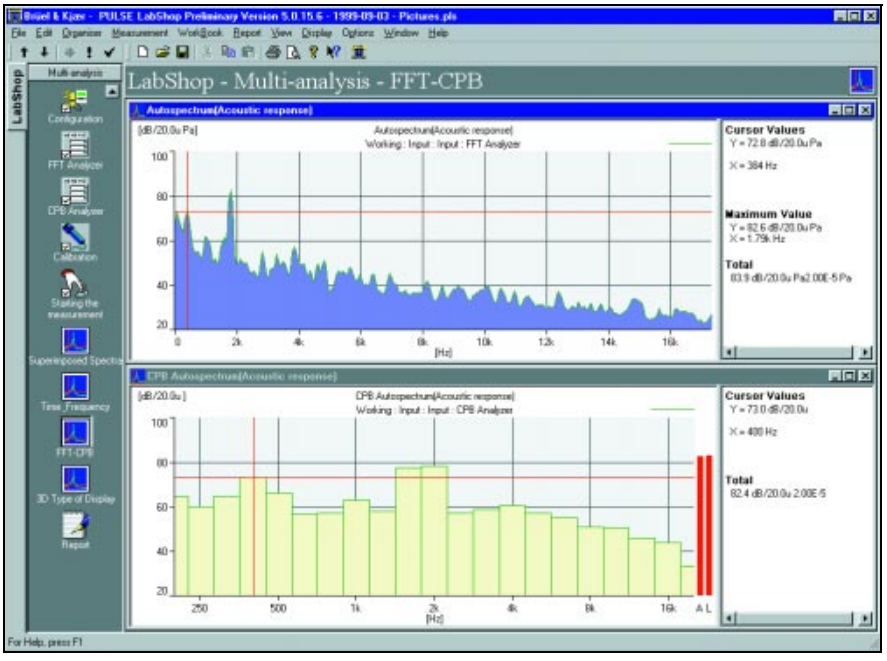
PULSE has a task-oriented user interface. The Task Bar has a number of advantages over the user interface in earlier versions of PULSE as it is easier to see the flow in a project and to maintain an overview of which measurement tasks have been completed.

In the task-oriented user interface, tabs (application groups) and stacked menus (task groups) in the left-hand column can be set up to guide you through the measurement process. Each task group has a series of tasks associated with it that are activated from icons in the group. The icons can be rearranged, or removed, allowing you to customise measurement sequences and remove unnecessary activities when, for example, repeated measurements are being made on the same item.

These features make the measurement process linear and intuitive. By simply working your way through the menus and the associated tasks, you automatically do all the necessary set up and measurement activities.

For each task that you define, you can set up the screen layout and specify the toolbars that you wish to use with the task. This simplifies the display and ensures that no “irrelevant” tools are available. An extra tool bar is also available so that, as you proceed through the tasks in the group you have defined, you can indicate the task status in the task bar. For example, you can tick tasks off when they are complete.

Fig. 3 PULSE software with task-oriented user interface



A TaskNote is available for every saved layout. You can add text containing hints and guidance, graphics, a video sequence or another Windows application such as Excel or Word to any TaskNote.

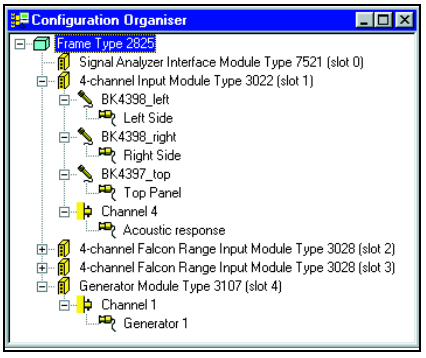
Configuration Organiser

The Configuration Organiser automatically detects the front-end hardware. If you are using IEEE P1451.4 capable transducers with standardised TEDS, these are detected and automatically attached to the correct channel of the input module. Non-TEDS or non-standard TEDS transducers have to be set up manually.

Depending on the types of module in use, configurations of up to 32 channels are possible using a Type 2816 frame. The maximum number of measurement channels is dictated by the software license, which can be for 2, 4, 8, 12, 16, 24 or 32 channels.

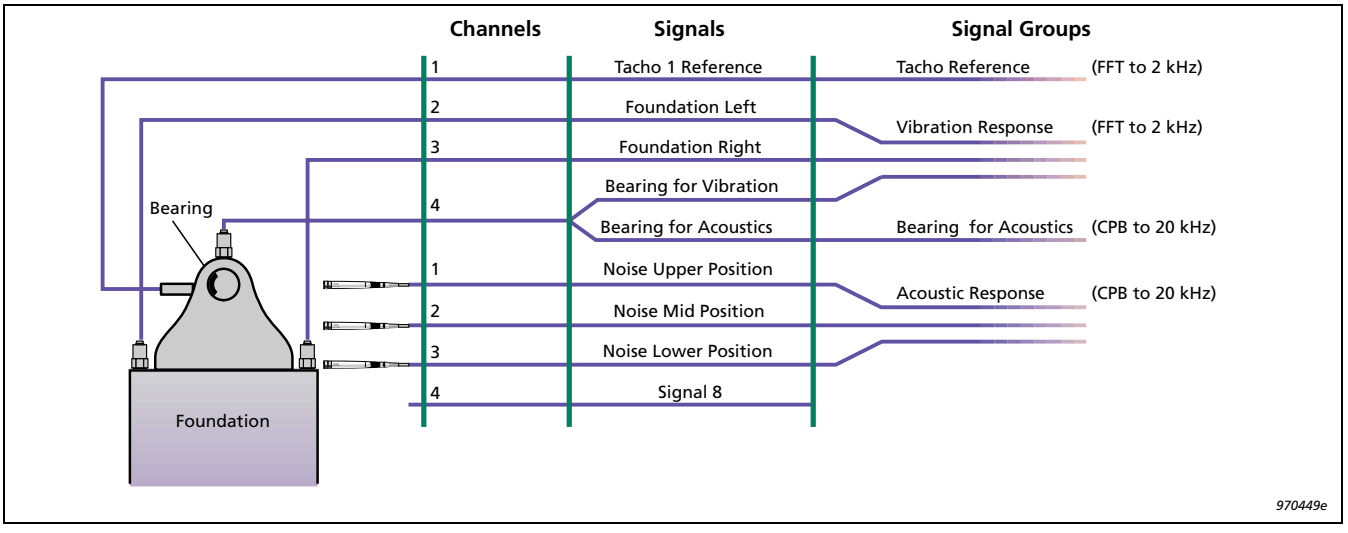
You need to define one or more signals for each physical input from a channel that you want to measure. When defining signals, you can give them descriptive names that are used throughout the system for easy identification. The same physical input can yield multiple duplicate signals for analysis in different ways, for example, with different weighting functions applied. You can use a tabular display to enter all channel parameters, including transducer type and sensitivity, giving you a complete overview of multichannel configurations at a glance.

Fig. 4 Configuration Organiser showing the frame, modules, transducers and signals in a front-end configuration for a measurement task



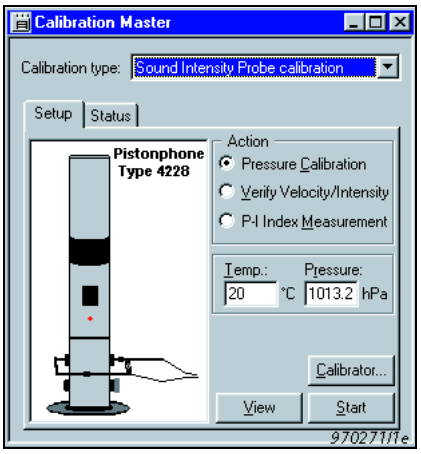
Signals can be collected in groups and handled as a single entity, which is beneficial for multichannel analyses, as it allows the same measurement criteria and/or post-processing to be applied to all members of a group. This makes direct comparison of signals straightforward. A signal can be a member of more than one group. For example, a number of groups can contain the same input signal, but different output signals. The only constraint on signal groups is the number of signals that an analyzer can measure to the desired frequency bandwidth. Fig. 5 illustrates one way of defining signals and signal groups for the measurement channel inputs for a motor test. In this example, to simplify management of the measurement task, channel 4 has been used to yield duplicate signals for use in different groups. The duplicate signal of the measurement on the bearing called “Bearing for Vibration” can be used for vibration analysis and “Bearing for Acoustics” can be used for correlation with the acoustic responses.

Fig. 5 Front-end configuration for a project showing the physical input channels, signals for analysis and signal groups



Calibration Master

Fig. 6 Calibration Master showing the setup for calibrating a sound intensity probe



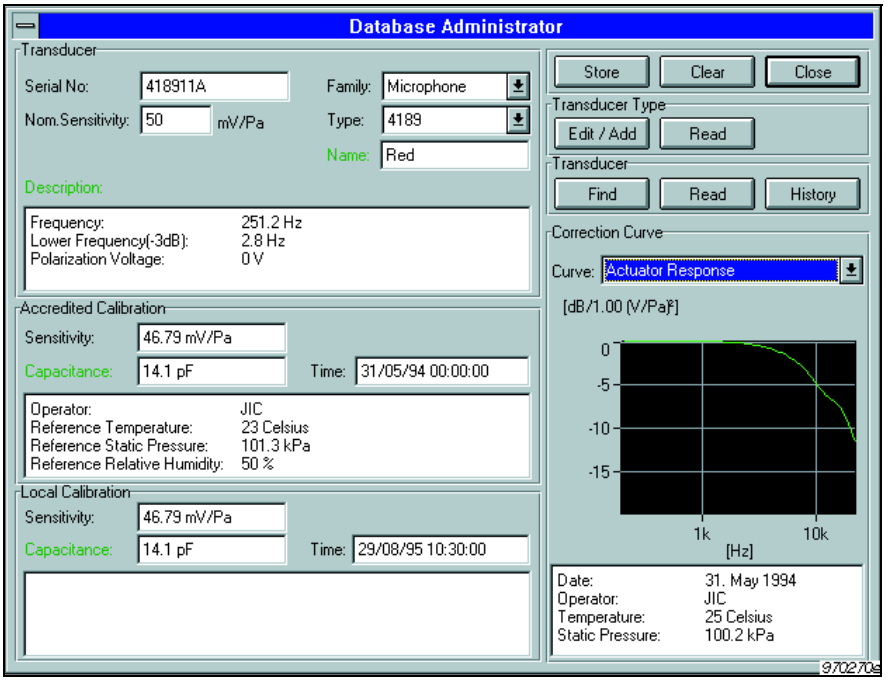
The Calibration Master is available for calibrating the front-end hardware connected to a measurement template.

Calibration of a measurement chain is a straightforward procedure and can be performed before or after measurement. The Calibration Master is aware of the hardware configuration and uses automatic detection for where and when to calibrate. The use of this auto-detection facility allows you to fit a specified calibrator to any transducer, turn it on, and the system will detect it and execute the correct calibration procedure for that channel. Thus, it is possible to calibrate the transducer channels in any order. If a suspect reading is obtained during measurement, it is possible to go back and re-calibrate a channel, or all channels.

The calibration results for the transducer channels in a front-end are automatically stored in the measurement template.

Transducer Database

Fig. 7 The Database Administrator dialog box which is used for entering transducer information and for reading in and viewing calibration data. If you have multiple PULSE systems, you can move the database to a net drive, making the same database available to all PULSE users



The transducer database is used to store transducer information that is automatically retrieved when a transducer is added to a channel (Fig. 7). If an IEEE P1451.4 capable transducer with standardised TEDS is connected to the front-end and the transducer is not already in the

database, its data – type, serial number, nominal sensitivity, accredited calibration, microphone capacitance, etc. – are automatically stored in the database.

Measurement Organiser

The Measurement Organiser is used for setting up and making measurements. This includes specifying the measurement instruments and the signals, or signal groups, to measure.

The analyzer types available for use in system analyses depend on the software accessible. Type 7700 includes:

- FFT analyzer
- Real-time 1/nth octave digital filter analyzer (CPB analyzer)
- Overall Level analyzer
- Signal generator

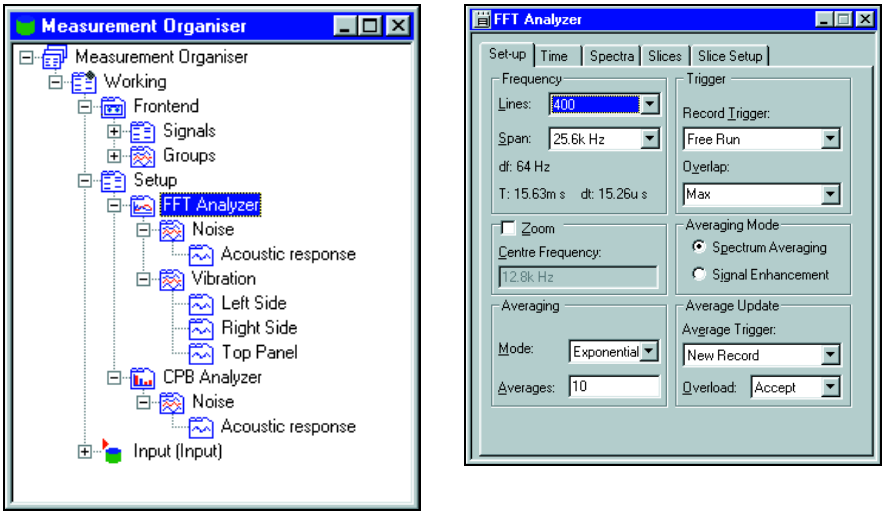


Fig. 8 Left: The Measurement Organiser with a defined measurement template. Right: Measurement Organiser properties, illustrated for an FFT analyzer

The fact that PULSE can simultaneously analyse the same signal in a number of different ways, for example, simultaneous FFT and octave analyses, greatly reduces the overall test time and ensures consistency between analyses. It is possible to analyse the same or different signals in different analyzers using different frequency spans and/or bandwidths, for example, having one FFT analyzer analysing to 25 kHz with 800 lines and another FFT analyzer analysing the same or different signals to 1.6 kHz with 6400 lines.

The tab pages of the analyzer properties window allow you to specify how you want to treat the incoming measurement data. For the various measurement types, such as autospectrum and cross-spectrum, you can select:

- Measurement according to the trigger conditions where only the most recent data is kept
- Measurement according to the trigger conditions where each set of measurement data (e.g., each autospectrum) is stored in a multi-buffer. If Throughput-to Disk Option UL 0112 is installed, two of these multi-buffers can be on the dedicated hard disk

Alternatively, you can reduce the amount of data recorded and obtain faster processing by selecting calculation of slices in the analyzer. This allows you to extract data at a number of specified frequency bands and discard the data that does not interest you. Not only does this reduce the amount of RAM required for the measurement, but it also

reduces the test time as the quantity of data requiring processing is greatly reduced.

Any measurement template can be saved for re-use, so it is easy to repeat measurements. Saved measurements can be recalled at any time and, if required, the measurement resumed or selected parts measured again.

Function Organiser

The Function Organiser is for setting up the post-processing applied to measured signals. A wide range of function types are supplied (see the Post-processing specifications for CPB and FFT analyzers).

Functions (Fourier spectrum, Cepstrum, Coherence, Frequency Response Function, etc.) are inserted in user-defined groups for ease of management and to allow a number of functions to be shown in the same display graph. The data for the functions in a group can come from any measurement template within the current project – data from different projects can be compared by saving and importing measurement templates.

Function groups can be saved in a variety of formats for re-use. This allows different sets of measurement data to have the same post-processing functions applied to them.

The post-processing functionality of a PULSE system can be extended by installing additional function types on the fly.

Display Organiser

The Display Organiser is for setting up the display of results. Calculated functions can be viewed in a wide range of graph types, including:
– Waterfall
– Colour contour
– Curve
– Bar
– Line
– Overlay
– Multi-value

A number of functions can be superimposed and displayed using the same axes in curve graphs. Interpolation can be used with contour plots. Slices (see, e.g., Fig. 10) can be created from contour or waterfall plots. The X-, Y- and Z-axis can be set as linear or logarithmic, and a dB scale can also be selected for the Y-axis. A graph can be shown using any combination of these axis types and autoscaling can be selected. You can display the magnitude, phase, real part or imaginary part of a function. Nyquist and Orbit plots are also available. The spectral scaling units for graphs include:

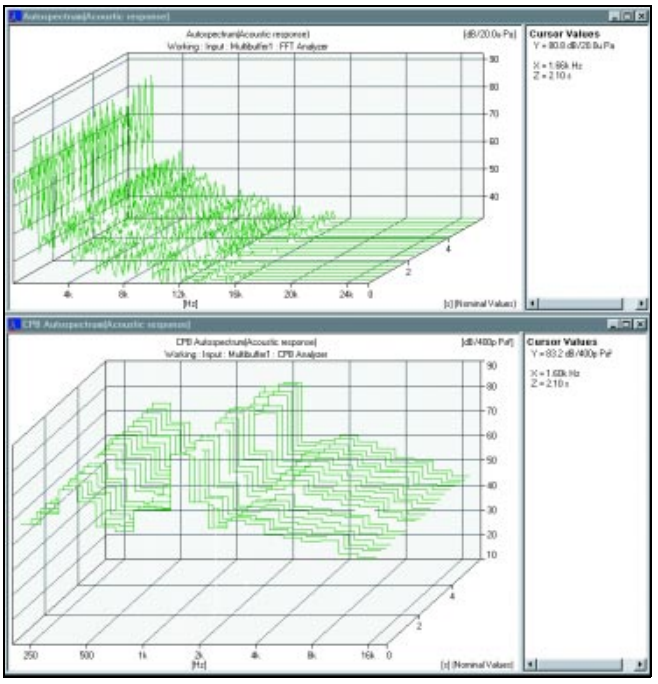
- Root mean square (RMS)
- Power (PWR)
- Power spectral density (PSD)
- Root mean square spectral density (RMSSD)
- Energy spectral density (ESD)

A wide range of cursor types are available including:

- Main
- Delta
- Reference
- Harmonic
- Sideband

Cursors can be aligned to allow the changes made in one display to be reflected in other displays showing the same function, or similar displays showing different functions. This is extremely useful for making comparisons and obtaining a cursor read-out for various functions at the same axis value in a different display.

Fig. 9 Waterfalls showing simultaneously measured FFT and 1/3-octave acoustic response for a signal from a multi-analysis using an FFT and a Real-time Digital Filter (CPB) analyzer

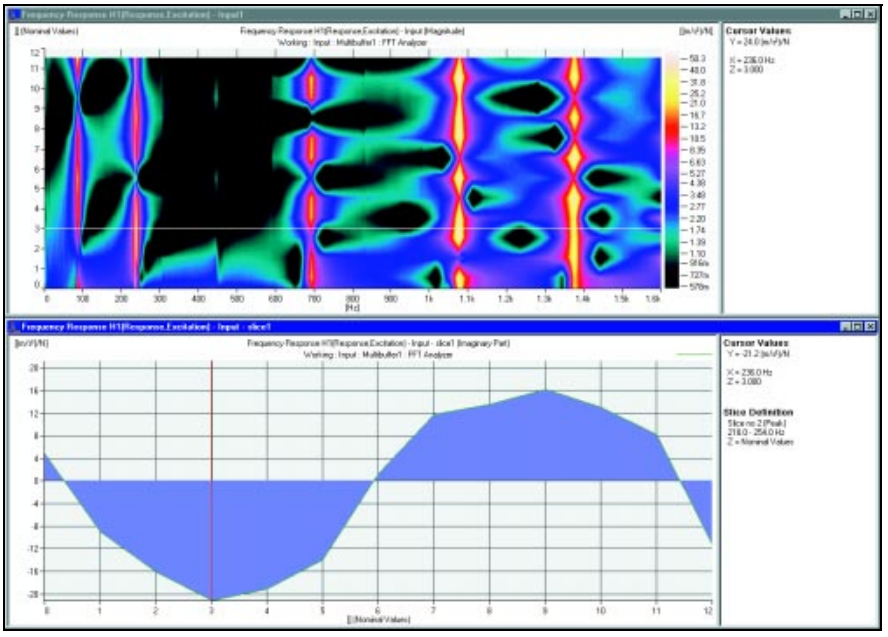


A wide range of cursor readings can be selected and read out from displays. Additional types of cursor readings can be installed on the fly at run-time to fulfil special needs.

Display setups can be saved for re-use. This allows sets of measurement data to be displayed in the same manner.

The colour, line width and line style used for each function in a graph can be set up individually.

Fig. 10 An interpolated contour plot of a run-up measurement made using an FFT analyzer and a slice view which has been extracted from it



Report Organiser

The Report Organiser is where report setups are defined and stored. PULSE's built-in report generator allows fast and automatic generation of reports in MS Word

Reporting in PULSE is very easy – simply drag a task from the Task Bar, drop in the Report Organiser, and have the report made in Word automatically. A report can be generated automatically when you make a measurement. When you generate a report, the report setup is automatically loaded into a Word template. This template can be edited and the final report document worked with in the same way as any other document in the word-processing package. You can also select the re-

port template to use with a report setup. This enables the development of a catalogue of report templates for different purposes that include, for example, company information and logos.

Data Export

PULSE allows you to select the format in which you want to export data. A number of formats are available including:

- PULSE ASCII – for exporting data in ASCII format for use in spreadsheets, etc.
- PULSE Binary – for saving functions for import into other PULSE projects
- Universal File Format (UFF) – for data export with degree-of-freedom information to, for example, structural analysis packages
- Binary UFF – for reduced file size and improved performance, and for the export of extra function types
- SDF – a Hewlett-Packard® file format used in many applications
- WAV – for use, for example, with Sound Quality Program Type 7698[1]
- STAR Binary – for data export to Modal Analysis Type 7750

If you have PULSE Bridge to MATLAB Type 7755 B installed, PULSE also allows you to export groups of data from the Function Organiser for further processing using MATLAB®.

On-line Help and Literature

The installation manual, hardware manual and all related Product Data are available using Acrobat™ Reader which is provided with PULSE. Comprehensive help is available in the form of an on-line user manual incorporating context-sensitive help. Printed installation and “Getting Started” manuals are provided.

Custom Control Programs

Custom control programs can be developed for the automation of measurement procedures using OLE Automation and Visual Basic® or Visual C++®. With such programs, PULSE becomes the server and allows easy and automated gathering of data or complete analyses including report generation to be performed at the click of a mouse button. An extra help file, type library and a range of programming examples are included with PULSE.

With the introduction of the Component Organiser, standard and custom components can easily be integrated.

1. This option requires installation of a license for Time Capture Type 7705

Specifications – Noise and Vibration Analysis Type 7700

PULSE Software

The Windows-based analysis software is delivered on CD-ROM and with a software protection key
The software can be ordered with a license for measurement on 2, 4, 8, 12, 16, 24 or 32 channels
As many signal groups as desired can be created from the measured signals

ACQUISITION PERFORMANCE
Data Transfer rate via TAXI Interface:
Channel × Bandwidth 400 kHz corresponding to 2 MB/s or 1 Msample/s or, for example, 32 channels to 12.8 kHz

ANALYSIS PERFORMANCE
Guidelines for the computing power of each DSP Board ZD 0812 expressed as real-time channel × bandwidth product (see also FFT and CPB specifications below):

	1 DSP: Channel × Bandwidth	
	Max.	**Typical**
Real-time FFT	400	200
Real-time CPB	200[a]	100

a.For example, 8 channels to 20 kHz centre frequency in upper band

Upper Freq. in Zoom × Channel: 100 kHz

Hardware Configuration

The software automatically detects the front-end hardware connected and configures the system

Calibration

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 %, $66^2/_3$ %, 75 % and max. or can be set from 0 to 99 %

TRIGGER TYPES
- Signal
- External
- 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 651 type 1)

ANALYSIS
A number of instruments of the same or different types can be used simultaneously. The possible instrument types include:
- FFT analyzer
- CPB analyzer (1/nth octave)
- Overall Level analyzer
- Signal Generator (requires Generator Module Type 3107)

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: 4
Maximum capacity of each: 100 k values, e.g., 250 spectra × 400 lines
Two of the multi-buffers can be specified as being on the DSP hard disk (if a Throughput-to-Disk Option UL 0112–00x is installed). Depending on the disk size, this will increase the maximum capacity of each multi-buffer

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)

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

jω WEIGHTING
- $1/j\omega^2$
- $1/j\omega$
- 1
- $j\omega$
- $j\omega^2$

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
- Maximum and minimum values
- Nearest harmonic
- Nearest sideband
- Reference
- Resonance
- Reverberation
- Slice definition
- Status
- Total

Other cursor readings can be added

Programmable

Supports OLE Automation, allowing the development of customised control programs

Export

Export of data to a file in ASCII format or to spreadsheet packages such as MS Excel 7.0, or later. Also PULSE File Binary, Universal File ASCII/Binary, SDF, WAV (7705 license required) and STAR Binary
With PULSE Bridge to MATLAB Type 7755 B installed, export of groups of data for further processing using MATLAB

Reporting

Integrated reporting utilising MS Word for Windows version 7.0, or later

Specifications – FFT Analyzer

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–102.4 kHz
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, $1/j\omega$, $1/j\omega^2$

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
- Frequency response function (H1, H2, H3)
- 1/Frequency response function (1/H1, 1/H2, 1/H3)
- 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 Synthesize
- Orbit

Input Module Type	Frequency Span (kHz)	Minimum Number of DSP Boards (60 MHz) and Analyzers Required to Measure 800 line FFT Autospectrum Using Maximum Overlap (No Cross-spectrum Measured) [DSP Boards: ZD 0812 – all channels, ZD 0828 – 1 and 2 channels]				
		Number of Channels				
		1	2	4	6	8
3016	102.4	1 (1)		1 (1)		
	51.2				1 (1)	1 (1)
	25.6				1 (2)	2 (2)
	12.8			1 (2)		2 (3)
	6.4				2 (3)	2 (4)
	3.2					

() values in parenthesis are the minimum number of virtual analyzers required

Input Module Type	Frequency Span (kHz)	Minimum Number of DSP Boards (60 MHz) and Analyzers Required to Measure 800 line FFT Autospectrum Using Maximum Overlap (No Cross-spectrum Measured) [DSP Boards: ZD 0812 – all channels, ZD 0828 – 1 and 2 channels]				
		Number of Channels				
		1	2	4	6	8
3015	25.6	1 (1)				
	12.8					
	6.4					
	3.2					

() values in parenthesis are the minimum number of virtual analyzers required

Input Module Type	Frequency Span (kHz)	Minimum Number of DSP Boards (60 MHz) and Analyzers Required to Measure 800 line FFT Autospectrum Using Maximum Overlap (No Cross-spectrum Measured) [DSP Boards: ZD 0812 – all channels, ZD 0828 – 1 and 2 channels]								
		Number of Channels								
		1	2	4	6	8	12	16	24	32
3022 & 3028	25.6	1 (1)								
	12.8								1 (2)	
	6.4									
	3.2									

() values in parenthesis are the minimum number of virtual analyzers required

Specifications – CPB Analyzer (Real-time 1/nth octave)

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

Measurement

Maximum frequency: 100 kHz per channel

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: $-3 \le n \le 16$. 20 filters with centre frequencies from 125 mHz to 63 kHz
Doubling the number of channels halves the upper frequency

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: $-10 \le n \le 49$. 60 filters with centre frequencies from 100 mHz to 80 kHz
Doubling the number of channels halves the upper frequency
Minimum Mean Time Interval between Spectra[1]**:** 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
Doubling the number of channels halves the upper frequency
Minimum Mean Time Interval between Spectra[1]**:** 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
Doubling the number of channels halves the upper frequency
Minimum Mean Time Interval between Spectra[1]**:** 10 ms

DETECTORS
- Linear averaging
- Exponential averaging

[1] Dependent on PC configuration, number of DSP cards and number of channels

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

Note that intensity measurement is for intensity probes with 2 microphones

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

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

Input Module Type	Centre Frequency Span (Hz)	Minimum Number of DSP Boards (60 MHz) and Analyzers Required to Measure Autospectrum using Standardised Real-time 1/3-octave Digital Filtering (No Cross-spectrum Measured), No A & L measurement [DSP Boards: ZD 0812 – all channels, ZD 0828 – 1 and 2 channels]				
		Number of Channels				
		1	2	4	6	8
3016	20–80 k	1 (1)*	1 (2)	3 (4)		
	20–50 k			2 (4)		
	20–25 k		1 (1)*	1 (1)	2 (2)	2 (3)
	20–12.5 k					2 (2)
	20–6.3 k				1 (2)	2 (3)
	20–3.15 k					2 (2)

() values in parenthesis are the minimum number of virtual analyzers required * For DSP Board ZD 0828, only valid to 25 k for 1 channel and 10 k for 2 channels

Input Module Type	Centre Frequency Span (Hz)	Minimum Number of DSP Boards (60 MHz) and Analyzers Required to Measure Autospectrum using Standardised Real-time 1/3-octave Digital Filtering (No Cross-spectrum Measured, No A & L measurement) [DSP Boards: ZD 0812 – all channels, ZD 0828 – 1 and 2 channels]				
		Number of Channels				
		1	2	4	6	8
3015	20–20 k	1 (1)			1 (2)	2 (1)
	20–10 k				1 (1)	1 (1)
	20–6.3 k					
	20–3.15 k					1 (1)

() values in parenthesis are the minimum number of virtual analyzers required

Input Module Type	Centre Frequency Span (Hz)	Minimum Number of DSP Boards (60 MHz) and Analyzers Required to Measure Autospectrum using Standardised Real-time 1/3-octave Digital Filtering (No Cross-spectrum Measured), No A & L measurement [DSP Boards: ZD 0812 – all channels, ZD 0828 – 1 and 2 channels]								
		Number of Channels								
		1	2	4	6	8	12	16	24	32
3022 & 3028	20–20 k	1 (1)				1 (2)	2 (2)	3 (2)		
	20–10 k					1 (1)	1 (2)	2 (2)	2 (3)	3 (4)
	20–6.3 k						1 (1)	1 (2)		
	20–3.15 k							1 (1)	1 (3)	1 (4)

() values in parenthesis are the minimum number of virtual analyzers required

Specifications – Overall Level Analyzer

A number of variants of the Overall Level analyzer can be used simultaneously

Measurement

Any signal can be measured using an Overall Level analyzer. Complies with the requirements for a Class 1 instrument in IEC 651, 1979, Sound Level Meters

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
Maximum averaging time when running continuously on 1 channel with an Input Module Type 3022:
Overload Accept Mode:
– Linear: 17 s
– Peak: 18 s
Overload Reject Mode:
– Linear: 34 s
– Peak: 27 s

FREQUENCY SPAN
Maximum: 102.4 kHz

MEASUREMENT MODES
• Exponential (including fast and slow)
• Exponential + impulse
• Exponential + maximum hold
• Exponential + minimum hold
• Linear
• Linear + impulse
• Peak
All modes can be measured simultaneously

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

CYCLIC BUFFER
A cyclic buffer is available for making continuous linear and peak measurements

Specifications – Signal Generator

Provides signals for performing a system analysis. Each signal requires the use of a Type 3107 Generator Module. Type 2825 or 2816 can hold up to four Type 3107 modules

WAVEFORMS
• Sine – fixed or swept (burst or continuous)
• Dual sine – fixed, swept or combination
• Multisine
• Random (burst or continuous)
• Pseudo-random
• Periodic Random
• Pulse
See Type 3560 System Data (BU 0216) for further specifications

Ordering Information

Type 7700 Noise and Vibration Analysis
for use with PULSE, the Multi-analyzer System Type 3560

SOFTWARE

	Protection Key
Type 7700G:	Noise and Vibration Analysis, 2 ch. license
Type 7700A:	Noise and Vibration Analysis, 4 ch. license
Type 7700B:	Noise and Vibration Analysis, 8 ch. license
Type 7700E:	Noise and Vibration Analysis, 12 ch. license
Type 7700C:	Noise and Vibration Analysis, 16 ch. license
Type 7700F:	Noise and Vibration Analysis, 24 ch. license
Type 7700D:	Noise and Vibration Analysis, 32 ch. license

SERVICES

7700G – MS1:	Software Maintenance and Upgrade Agreement, 2 ch. license
7700A – MS1:	Software Maintenance and Upgrade Agreement, 4 ch. license
7700B – MS1:	Software Maintenance and Upgrade Agreement, 8 ch. license
7700E – MS1:	Software Maintenance and Upgrade Agreement, 12 ch. license
7700C – MS1:	Software Maintenance and Upgrade Agreement, 16 ch. license
7700F – MS1:	Software Maintenance and Upgrade Agreement, 24 ch. license
7700D – MS1:	Software Maintenance and Upgrade Agreement, 32 ch. license

See the Software Maintenance and Upgrade Product Data (BP 1800) for further details

99/11

BP 1795 – 14

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