PULSE Reflex Telephone Test Type 8770

PULSE Reflex™ Telephone Test Type 8770 software provides a standardized approach to voice testing of telephones in a fast, reliable and efficient way. By using a proper network simulator the full receive and transmit signal paths are measured, giving realistic measurements of the telephone performance.

Type 8770 supports various PULSE™ hardware system configurations including the PULSE configuration applied by the Voice Testing System for Telephones Type 6712.

Type 8770 is an easy to use application that enables testing of telephones. Accurate results are quickly obtained by following the intuitive, yet flexible workflow that guides you efficiently through setup, measurement, analysis and reporting.

Type 8770 is a powerful tool in the development and production process of telephones. Besides being a solid foundation for telephone test applications, the PULSE Reflex platform also provides a wide range of post-analysis capabilities for the verification of the acoustic design during development, and is a versatile platform for objective as well as subjective evaluation of specific components, such as noise suppressors, echo cancellers, etc.

Uses and Features

Uses
- Voice testing of telephones according to international and national standards
- Measurement of the full transmit and receive signal path using a proper network simulator
- Research and development of telephones with focus on voice testing using advanced test signals
- Quality assurance and sample testing of telephones
- Inspection and validation of telephones

Features
- Pre-programmed test suites according to international standards
- Minimum interaction required when running complete test suites, or individual test cases
- Supports the use of Type 1, Type 3.2 and Type 3.3 (HATS) ear simulators

Brüel & Kjær

Introduction

In combination with Voice Testing System for Telephones Type 6712, Type 8770 comprises a comprehensive system for testing the acoustical transmission performance of telephones according to different standards. Furthermore, the system is designed to accommodate the needs for quality assurance testing, sample testing, incoming inspection and validation of telephones.

Type 6712 is based on software-controlled instruments that allow measurements to be made consistently and with a minimum of interaction by you. Test suites delivered with the system allow tests to be run individually, or as a sequence made up of the various standards.

Advanced users can use the PULSE platform software interactively to develop their own tests and measurements to determine audio parameters and in this way expand the testing and measuring capabilities beyond the standard test cases. This makes it easy to perform tests for research and development purposes.

All the control, measurement and report functions of Type 6712 are software based. The software is optimized to run on Windows®, its familiar interface making the system intuitive and efficient for inexperienced and experienced operators alike.

Type 8770, with its task-oriented user interface, supports the natural workflow in the testing of telephones – covering setup, measurement, analysis and reporting. Extensive on-line help is available to provide guidance if a question arises during test execution.

Setting Up and Preparing Measurements

Before making measurements, the test system must be configured for a specific test suite. This involves setting up specific testing parameters of the telephone, configuration of the network simulator, and acoustical interfaces, for example, ear and mouth simulator, as well as other parameters. See the example in Fig. 1.

Fig. 1
Test system configuration, including measurement setup, transducer setup and network simulator settings
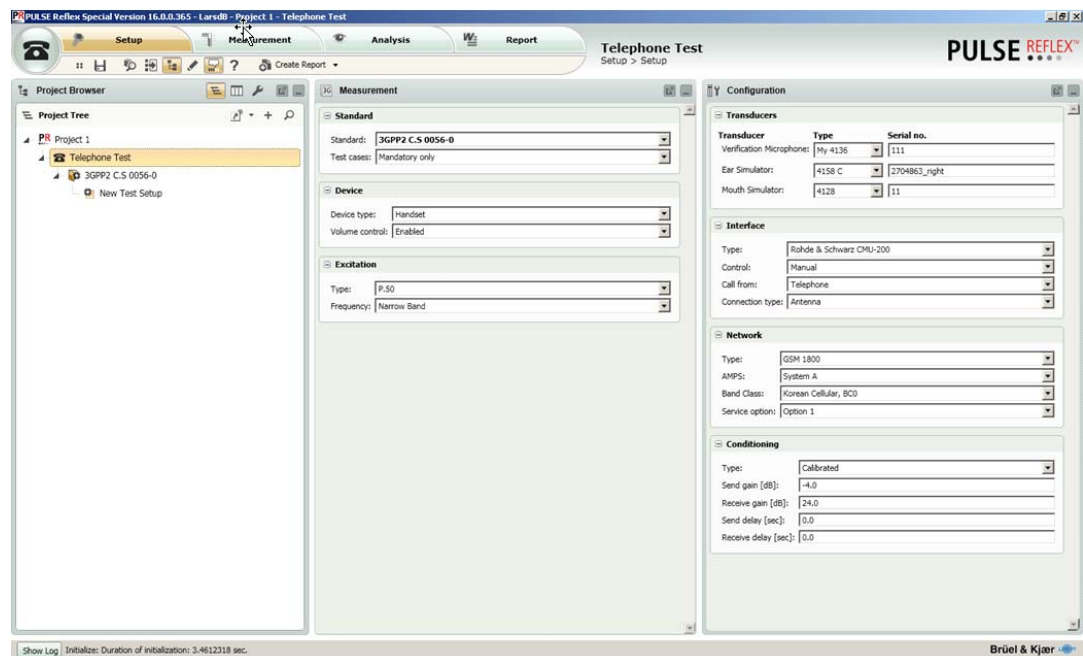
To ensure optimal performance and security the system incorporates a comprehensive and automated calibration procedure. This includes verification of the ear simulator, the mouth simulator and the electrical signal paths, therefore ensuring that any deviation can be digitally compensated for during measurement.

If you are using an air interface as the network simulator, the various parameters relating to the radio link between the air interface and the mobile phone can be set up manually.

A manual mode allows you to enter send and receive gains of 1 kHz. This mode also allows the use of air interfaces not supported by the control software, as well as new telephone technologies currently unsupported by Type 6712.

Performing Measurements

To control the measurements, the Test Manager (see Fig. 2) is used to start, pause and stop the testing.
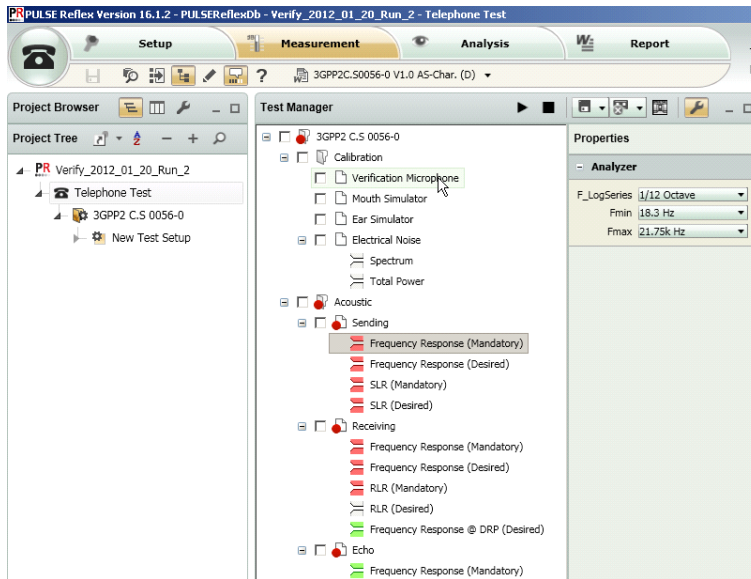
Fig. 2
Test Manager is used to control the execution of calibration procedures and test cases.
The Measurement Viewer displays the measurement results in graphical or tabular format
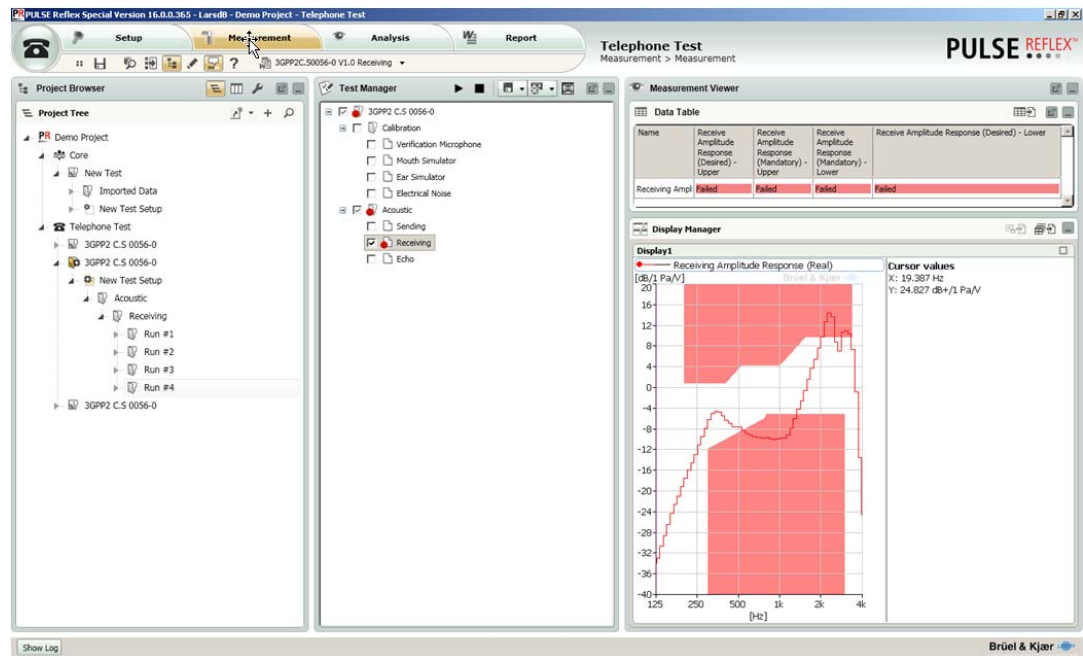
Testing is performed in accordance with the selected session profile corresponding to a specific test suite or standard. When a session has been selected, you are presented with a hierarchical tree showing all the tests included in the session. By selecting the root of the tree, all tests are performed consecutively. It is also possible to select individual branches of the tree to do a limited range of tests, for example only sending characteristics. Test results are clearly indicated on the screen, making pass/fail judgements immediately obvious. Each test within a session can be performed according to the standard set down by the issuing authority.

You can view the settings of the different parameters and tolerances (within the range of the hardware and software), using the Test Manager Properties page (see Fig. 3).

Fig. 3
The Test Manager properties page allows you to view all the relevant test case parameters and requirements


As each test is performed the current state and the event history can be examined via a log. Using the Measurement Viewer, you can also see the results of tests graphically during or after a test (see Fig. 2).

Viewing, Storing and Retrieving Measurements

Combined, the Measurement Viewer and the Test Manager constitute a tool for instantly displaying the results of the current test, or for viewing the previous tests. Using the Windows® copy-and-paste facility, results can be copied to word-processing packages or spreadsheets.

Using the Project Browser (see Fig. 4), you can access the different sessions that hold the measurements.

Fig. 4
The Project Browser supports the storing and retrieving of measurements
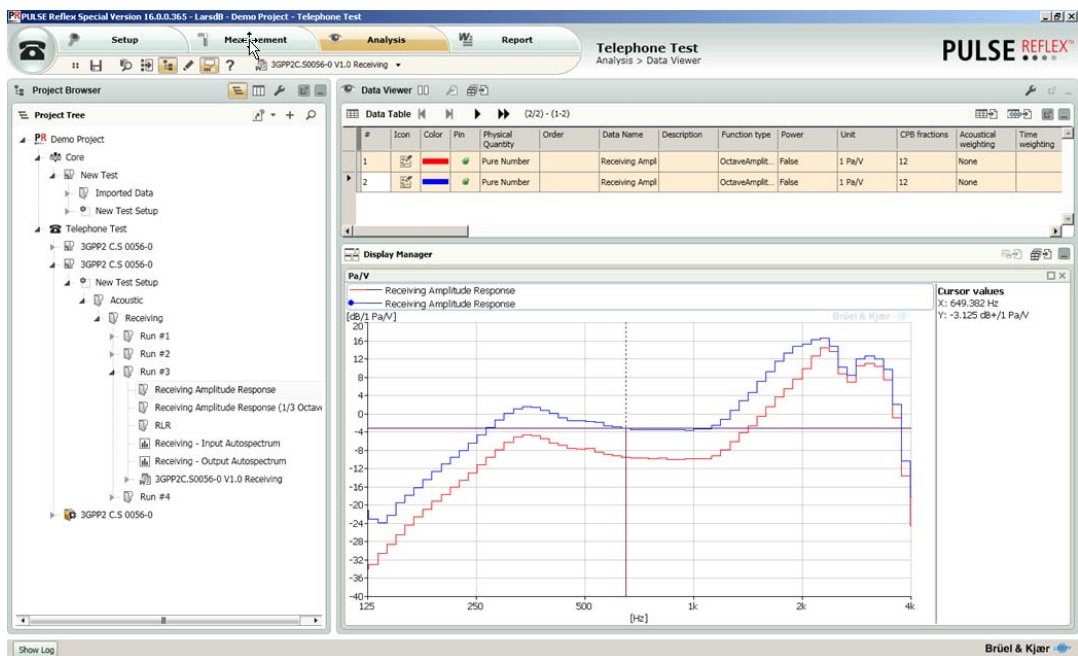
A session is a set of tests conducted on a telephone according to a specific standard and related measurement data produced during the test of the telephone. The Project Browser provides facilities to quickly find previous sessions and simple procedures to create new sessions. Commonly used sessions containing recurrent information, for example, the name of the test house or telephone manufacturer, are easily copied into new sessions, considerably reducing the time needed for testing of similar telephones.

Measurement results of stored sessions can be examined using the Analysis Task (see Fig. 4) and reports of stored sessions are easily produced within the Report task.

Documenting the Measurements

The Report Generator takes measurement data files individually, or collectively, and converts the stored results into pre-formatted Microsoft® Word, Excel® or PowerPoint® documents (see Fig. 5). Each test can be presented in short form, showing only a graph and a table of the most important results, or in standard form, where parameters, tolerances and detailed measurement data are given. Once in Microsoft® Word format (for example) the report can be printed, or the page layout modified to suit individual corporate standards.

For customized documentation of measurements, the measurement data, etc., can be exported in different file formats. This powerful export facility takes the measurement data and formats them into files that can be imported into a wide variety of standard data-processing programs (see Fig. 6). Measurement data can even be dynamically linked to enable automatic referencing and updating.

Fig. 5
*The Report Generator showing predefined report templates and user-defined reports*
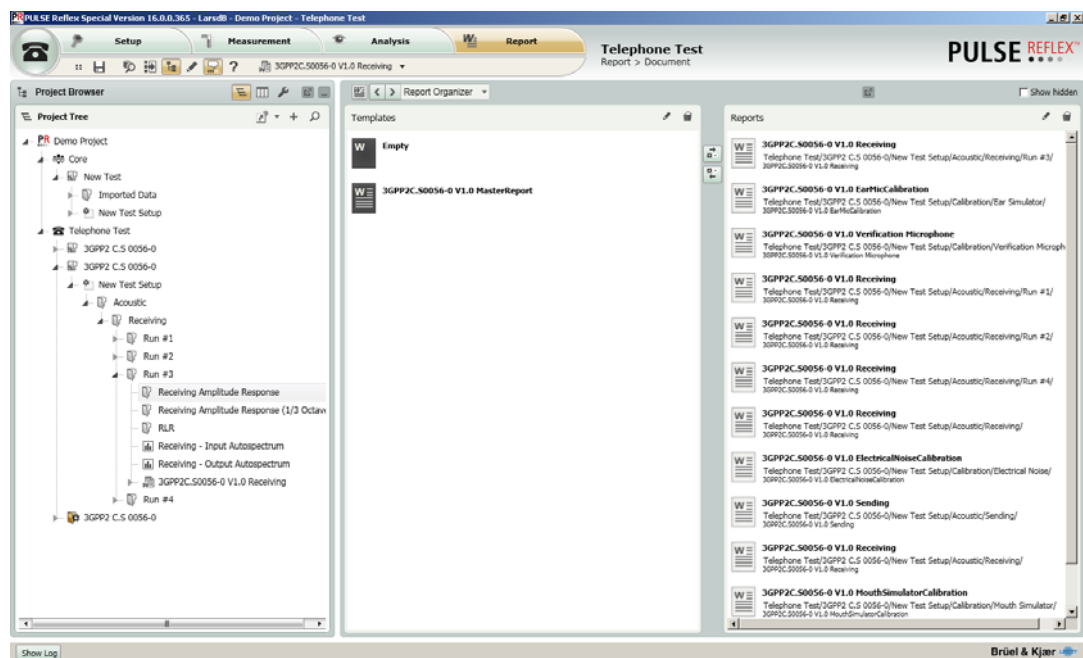
Fig. 6

The Data Export tool for export of measurement results to Microsoft® Excel®
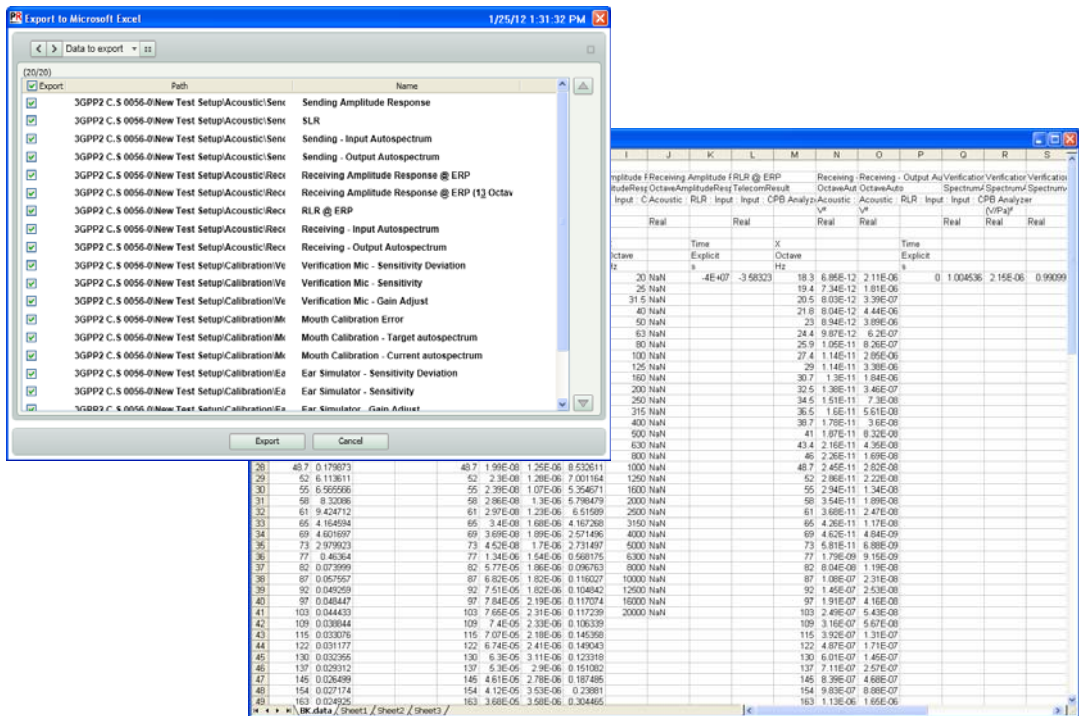
Optimizing the Audio Performance of a Mobile Phone

In the process of optimizing the audio performance of a mobile phone, an important task is to determine a proper input filter for the microphone in the mobile phone, as well as an output filter for the receiver in the mobile phone. The export feature of Type 8770 makes it very easy to utilize the measurement results in Microsoft® Excel® where further calculations and transformations are easily performed (Fig. 7). The final result can then be exported from Excel® to a format that is required by programs used for designing digital filters in mobile phones.

Fig. 7

Optimizing performance using Excel®
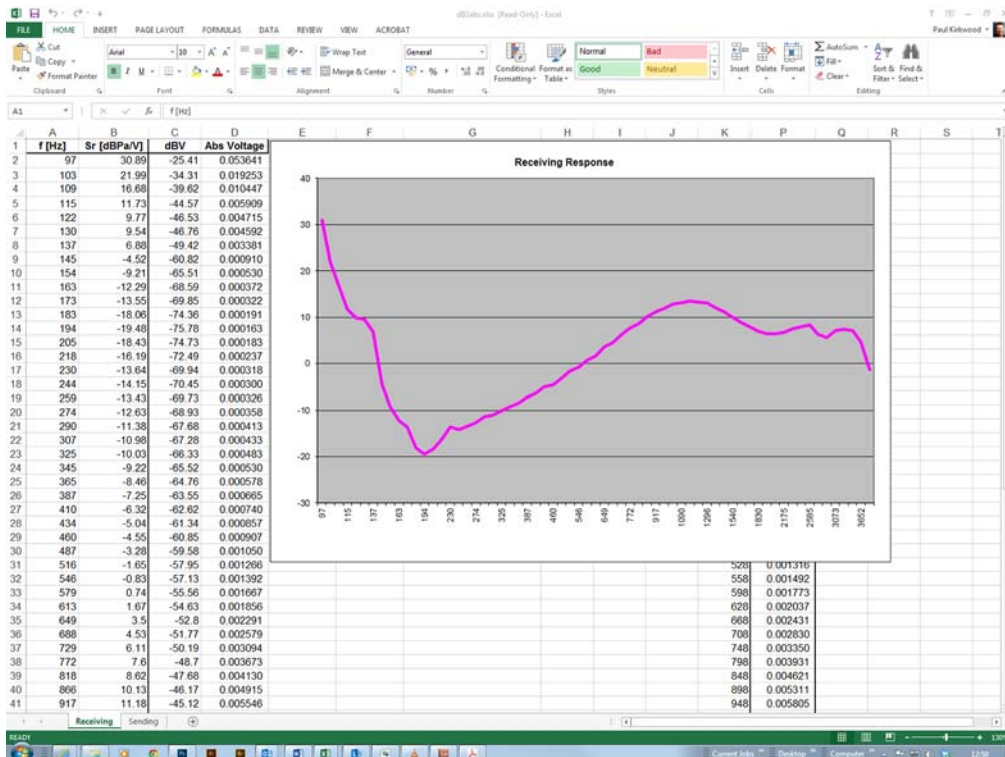
System Configurations

Voice Testing System Type 6712 is a modular system with an overall structure that is very simple and straightforward. The system consists of an acoustic interface, an acquisition and analysis system, one or more software licenses and optional accessories.
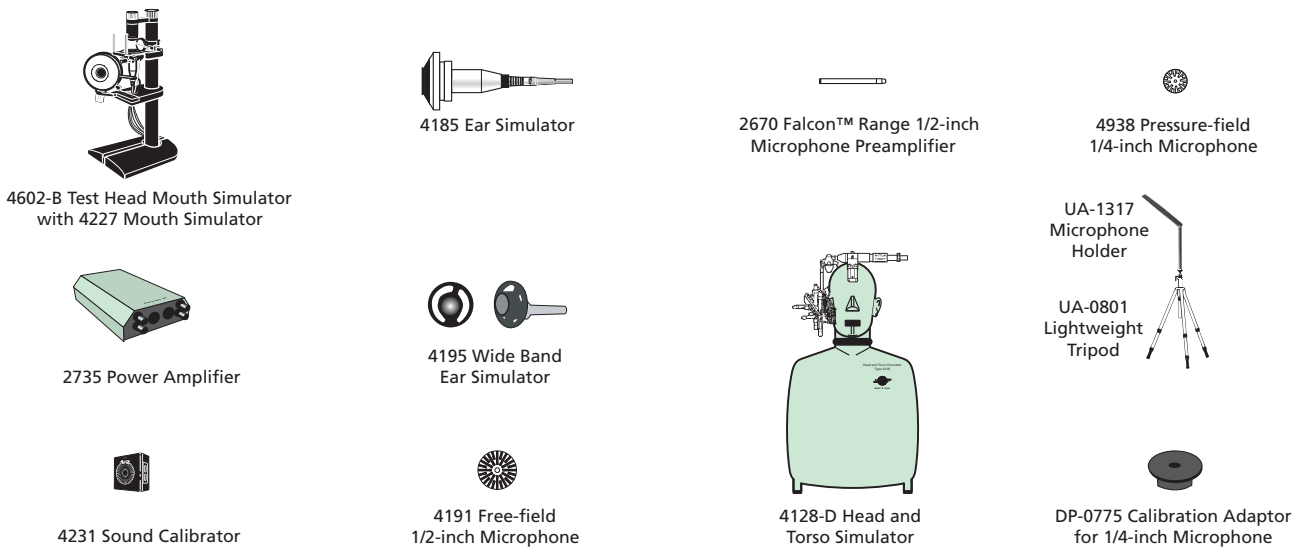
Acoustic Interface

To establish a standardized and suitable acoustical coupling between the telephone and the acquisition and analysis system, Telephone Test Head Type 4602-B or Head and Torso Simulator (HATS) Type 4128-D should be used (see Fig. 8). Both Type 4602-B and Type 4128-D are especially suitable for the correct placement of handsets, since both accommodate small handsets, handsets with antennae and non-symmetrical handsets. Type 4602-B incorporates Mouth Simulator Type 4227 and Ear Simulator Type 4185 (or Wideband Ear Simulator Type 4195) allowing tests to be performed in a standardized position according to ITU-T recommendations. Type 4128-D, which includes Handset Positioner Type 4606, is a very realistic test setup for handset testing, using either standardized positions according to ITU-T recommendations, or user-defined positions.

Acquisition and Analysis System

PULSE LAN-XI front-end Type 3160-A-042 is the heart of Type 6712. Type 3160-A-042 generates the excitation signal such as the real speech, P.50 male and female artificial speech signal, as well as pink noise. Furthermore, the system can support CPB (constant percentage bandwidth), FFT (fast Fourier transform) or SSR (steady state response analyzer) signal analysis. CPB and FFT are used for all response measurements that require a broadband excitation signal such as artificial speech signal or pink noise signal. SSR is used for all response measurements that require a sinusoidal excitation signal and is used for determining the frequency response. The SSR analyzer incorporates an adaptive sweep algorithm to ensure highly accurate results, even in noisy environments.

Fig. 8 *Items available for system configurations*

4602-B Test Head Mouth Simulator with 4227 Mouth Simulator

4185 Ear Simulator

2670 Falcon™ Range 1/2-inch Microphone Preamplifier

4938 Pressure-field 1/4-inch Microphone

2735 Power Amplifier

4195 Wide Band Ear Simulator

UA-1317 Microphone Holder

UA-0801 Lightweight Tripod

4231 Sound Calibrator

4191 Free-field 1/2-inch Microphone

4128-D Head and Torso Simulator

DP-0775 Calibration Adaptor for 1/4-inch Microphone

020230/7

Software Licenses

Software licenses that can be used in conjunction with PULSE Reflex Telephone Test Type 8770 fall into two groups:

• Those that support testing of telephones according to specific standards. These are all described in separate product data sheets
• Those that add analysis capability and features to the PULSE Reflex Telephone Test environment. These optional packs are described in the following sections

PULSE Reflex Telephone Test Type 8770-X
PULSE Reflex Telephone Test is the platform for all telephone test applications. It supports calibration of relevant ear and mouth simulators, as well as execution of individual test cases.

PULSE Reflex Telephone Test Pack Type 8770-A-XS
The Telephone Test Pack combines all the software and licenses necessary for performing a standard telephone test. It consists of:
• PULSE Reflex Telephone Test Type 8770-X
• PULSE FFT & CPB Analysis Type 7700-N2
• PULSE Time Capture Type 7705
• PULSE Sequencer BZ-5600

PULSE Reflex Telephone Test for ITU-T P.862 PESQ Type 8771-X01[*]
PULSE Reflex Telephone Test, ITU-T P.862 PESQ supports speech quality evaluation based on the PESQ (perceptual evaluation of speech quality) algorithm.

PULSE Reflex Telephone Test for ITU-T P.863 POLQA Type 8771-X02[*]
PULSE Reflex Telephone Test, ITU-T P.863 POLQA supports speech quality evaluation based on the PESQ (perceptual objective listening quality assessment) algorithm.

PULSE Reflex Telephone Test, Standard Test Suites
Each standard test suite includes a comprehensive set of test cases relevant for testing a specific type of telephone (handset, headset or hands-free) according to a specific standard. For more information please see the separate product data.

PULSE Reflex Telephone Test, Bundles of Standard Test Suites
Each bundle includes a complete set of test cases relevant for testing according to a specific standard. For more information please see the separate product data.

Optional Accessories
Accessories are available for use with software licenses that support testing of telephones according to specific standards. These include accessories for remote control of the Network Simulator via IEEE-488 and accessories for measurements on the alerting module (ringer test). For easy configuration of a complete system, a number of standard system configurations are available from Brüel & Kjær. The standard configurations have all been put together by selecting them from the full configuration overview shown in Fig. 8. For specific information regarding standard system configurations, please see the ordering information.

## Using PULSE as a General Research and Development Tool

PULSE provides analyzers, post-processing functions and display facilities for many applications within the area of electroacoustic testing. Using the FFT analyzer, CPB (1/nth octave) analyzer, overall level analyzer and signal generators included with Type 6712, PULSE can be set up to accommodate the vast amount of measurements typically required for R&D of new electroacoustic devices. The PULSE LabShop environment of Type 6712 contains a user interface (Fig. 9) that allows the steps involved in the complete measurement process to be implemented as individual tasks that can be performed one after another.

---

* Requires Type 8770-X.

Fig. 9
*PULSE LabShop software showing task-oriented user interface*
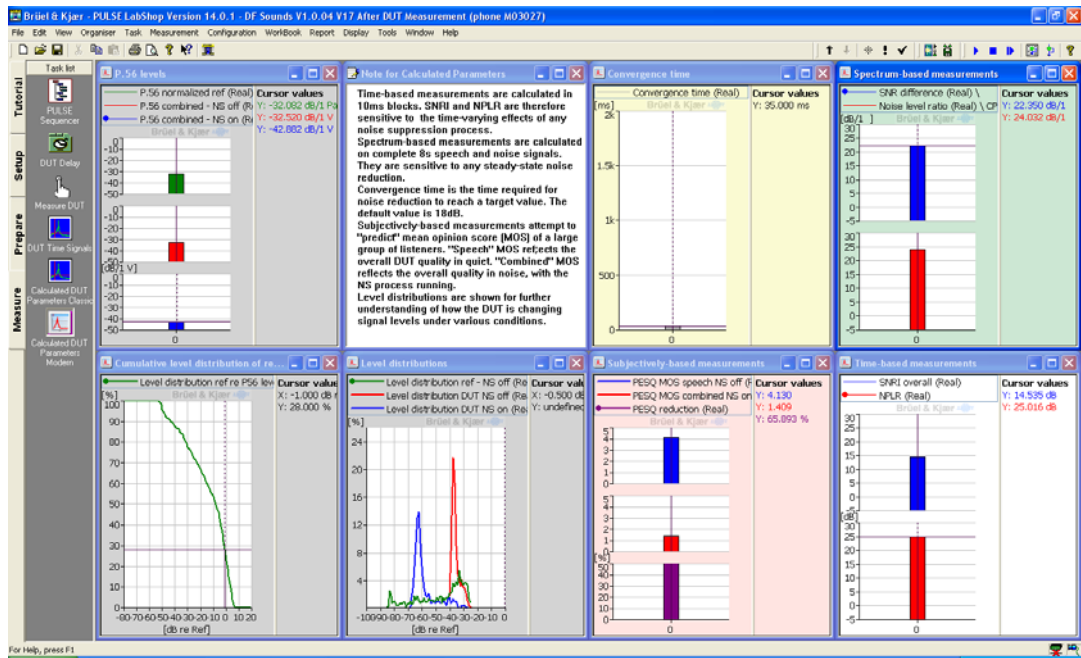
This could typically include many different types of analysis that can easily be managed and documented. All the tasks can be stored together with the actual measurements, and reports can be stored as a PULSE project that can be restored in PULSE LabShop at a later stage. For displaying the measurements, PULSE LabShop has a large variety of different functions such as 3D waterfall display and contour display.

For documenting the measurements, PULSE LabShop supports the use of either dynamic or static links to Word or Excel® displays. Additional software that enhances the analysis capability of PULSE LabShop and could be useful during the development of new electroacoustic devices is:
• PULSE Data Recorder Type 7701
• PULSE Time Capture Type 7705
• PULSE Sound Quality Software Type 7698
• PULSE Sound Quality Zwicker Loudness BZ-5265
• PULSE Sound Quality Psychoacoustic Test Bench BZ-5301

PULSE Time Data Recorder Type 7708 or PULSE Time Capture Type 7705 can be used for recording acoustical or electrical signals – recordings that can be exported from PULSE Labshop as wave files and then loaded into PULSE Reflex Core and replayed, see Fig. 10. For more information on PULSE software and hardware please refer to system data BU 0229 (PULSE software) and product data BP 2215 (LAN-XI hardware).

Fig. 10
*Post-analysis with
PULSE Reflex*
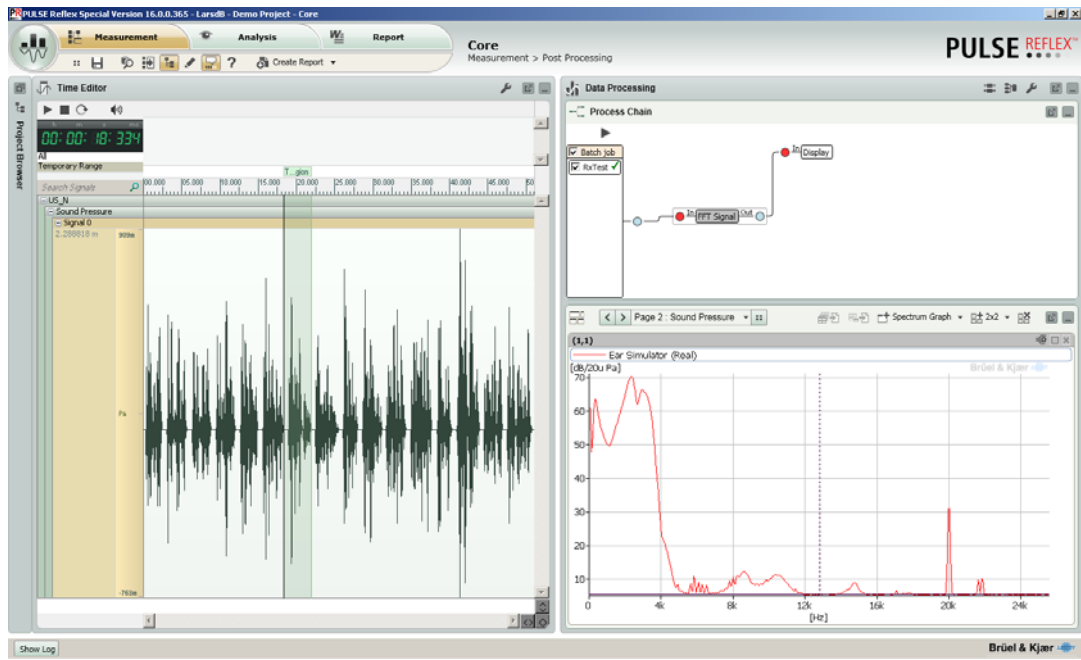
Using Sound Quality for Product Sound Evaluation

Using the Brüel & Kjær Sound Quality solution during the development of specific electroacoustic components enables useful sound quality parameters such as loudness, sharpness, fluctuation strength, roughness and related parameters to be determined. The main features of the sound quality software allow recording, editing and replay of sounds using binaural techniques. It also supports subjective listening tests or jury testing such as semantic differential and paired comparison. The way in which the tests are set up and presented to the person listening can be designed using the sound quality software.

Besides subjective testing, the sound quality software also supports a wide range of objective measurements. Objective measurements using Zwicker loudness analysis allows the calculation of metrics for both stationary and non-stationary sounds revealing:
• Total loudness vs. time
• Specific loudness
• Instantaneous loudness vs. time
• Statistical instantaneous loudness
• Sharpness vs. time
• Specific roughness
• Specific fluctuation strength

The following sound quality software is available :
• PULSE Sound Quality Software Type 7698
• PULSE Sound Quality Zwicker Loudness BZ-5265
• PULSE Sound Quality Psychoacoustic Test Bench BZ-5301

For more information on PULSE sound quality software and hardware please refer to the product data for PULSE Sound Quality (BP 1589).

Ordering Information

PULSE REFLEX TELEPHONE TEST
Type 8770-X*   PULSE Reflex Telephone Test
Type 8770-A-XS*   PULSE Reflex Telephone Test Pack

Type 8770-A-XS* includes the following:
- Type 8770-X*: PULSE Reflex Telephone Test
- Type 7700-N2: PULSE FFT & CPB Analysis, 2-channel node-locked license
- Type 7705: PULSE Time Capture
- BZ-5600-X*: PULSE Sequencer

OPTIONAL SOFTWARE PACKAGES
Type 8771-X01*†   PULSE Reflex Telephone Test, ITU-T P.862 PESQ
Type 8771-X02*†   PULSE Reflex Telephone Test, ITU-T P.863 POLQA

STANDARD SYSTEM CONFIGURATIONS USING TEST HEAD
Type 6712-A-S01 Telephone Testing using Test Head

The following items are included in the configuration:
- Type 3160-A-042: Generator, 4/2-ch. Input/Output Module LAN-XI 51.2 kHz (Mic, CCLD, V)
- Type 7700-N2: PULSE FFT & CPB Analysis, 2-channel node-locked license
- M1-7700: Maintenance and Upgrade Agreement for Type 7700
- Type 7705: PULSE Time Capture
- M1-7705: Maintenance and Upgrade Agreement for Type 7705
- BZ-5600-X*: PULSE Sequencer
- M1-5600: Maintenance and Upgrade Agreement for BZ-5600
- Type 2735: Power Amplifier
- Type 4231: Sound Calibrator
- AO-0389: BNC-BNC cable 0.13 m (0.43 ft)
- Type 4602-B: Telephone Test Head
- Type 4227: Mouth Simulator

STANDARD SYSTEM CONFIGURATIONS USING HATS
Type 6712-A-S02   Telephone Testing using HATS (mono)

The following items are included in the configuration:
- Type 3160-A-042: Generator, 4/2-ch. Input/Output Module LAN-XI 51.2 kHz (Mic, CCLD, V)
- Type 7700-N2: PULSE FFT & CPB Analysis, 2-channel node-locked license
- M1-7700: Maintenance and Upgrade Agreement for Type 7700
- Type 7705-X*: PULSE Time Capture
- M1-7705: Maintenance and Upgrade Agreement for Type 7705
- BZ-5600-X*: PULSE Sequencer
- M1-5600: Maintenance and Upgrade Agreement for BZ-5600

* X = license model either N for node-locked or F for floating
† Requires Type 8770-X

- Type 2735: Power Amplifier
- Type 4231: Sound Calibrator
- AO-0389: BNC-BNC cable 0.1 m (0.33 ft)
- Type 4128-D‡: Head and Torso Simulator (HATS)
- Type 4938-A-011: ¼″ Pressure-field Microphone including Preamplifier Type 2670 with TEDS
- DP-0775: Adaptor for calibration of ¼″ microphones, on Pistonphone Type 4228 or Sound Calibrator Type 4231

REQUIRED ACCESSORIES FOR STANDARD CONFIGURATION USING TEST HEAD
Selection of Type 1 Ear Simulator or Type 3.2 Ear Simulator is required for standard system configuration 6712-A-S01:
Type 4185   Ear Simulator for Telephonometry
or
Type 4195   Wideband Ear Simulator
Type 4191   ½″ Free-field Microphone

OPTIONAL ACCESSORIES FOR STANDARD CONFIGURATIONS
WB-3598   OptiPlex™ 7010 with Windows® XP and Microsoft® Office 2003

ACCESSORIES FOR REMOTE CONTROL OF NETWORK SIMULATOR
WQ-2464   NI® GPIB Universal Serial Bus (USB) Controller
WL-1368   Antenna Cable, BNC to open-end
WL-3162   Air Interface Cable, for R&S CMU-200 Codec (GSM)
WL-3162-A   Air Interface Cable, for R&S CMU-200 Codec (CDMA)
2 × AO-0087   Air Interface Cable, for HP-8922 codec
Accessories for the remote control of the air interface are available for all standard system configurations. Please note that Type 6712 supports remote control of Air Interface HP-8922, CMD-55 and CMU-200

ACCESSORIES FOR ALERTING MODULE OR RINGER MEASUREMENTS
UA-0801   Lightweight Tripod
UA-1317   Microphone Preamplifier Holder
Type 4191-L-001 ½″ Free-field Microphone including Preamplifier Type 2669-L with TEDS

OPTIONAL PULSE LICENSES THAT ADD ANALYSIS CAPABILITY TO PULSE*
Type 7797-X   PULSE Basic Electroacoustics
Type 7708-X**   PULSE Time Data Recorder
Type 7705-X   PULSE Time Capture
Type 7698-X   PULSE Sound Quality Software
BZ-5265-X   PULSE Sound Quality Zwicker Loudness
BZ-5301-X   PULSE Sound Quality Psychoacoustic Test Bench

‡ Type 4128-D-001 includes Right Ear Simulator and Handset Positioner, Type 4128-D-002 includes Right and Left Ear Simulators and Handset Positioner
**Includes Type 7701 PULSE Data Recorder

Service and Support Products

2735-TCF	Conformance test of Type 2735-C with certificate
3160-CAF	Type 3160 accredited calibration
3160-CAI	Type 3160 accredited initial calibration
3160-EW1	Type 3160 extended warranty, one year extension
3160-TCF	Type 3160 conformance test with certificate and measured values
4128-CFF	Factory standard calibration of Head and Torso Simulator Type 4128-C
4185-CAI	Accredited Initial calibration for Type 4185
4191-CAI	Initial open circuit sensitivity calibration (DANAK) plus factory calibration of Type 4191
4195-CFF	Factory standard calibration of Type 4195
4227-CAI	Accredited Initial calibration for Type 4227
4231-CAI	Accredited Initial calibration of Type 4231
4602-CVN	Conformance test with measurements report of Type 4602
4938-CAI	Accredited Initial Calibration of Type 4938

SOFTWARE MAINTENANCE AND SUPPORT AGREEMENTS

M1-8770-X[*]	Software Maintenance and Support Agreement for PULSE Reflex Telephone Test
M1-8771-X01[*]	Software Maintenance and Support Agreement for PULSE Reflex Telephone Test, ITU-T P.862 PESQ
M1-8771-X02[*]	Software Maintenance and Support Agreement for PULSE Reflex Telephone Test, ITU-T P.863 POLQ

* X = license model either N for node-locked or F for floating

BP 2428 – 12   2014-10

Brüel & Kjær