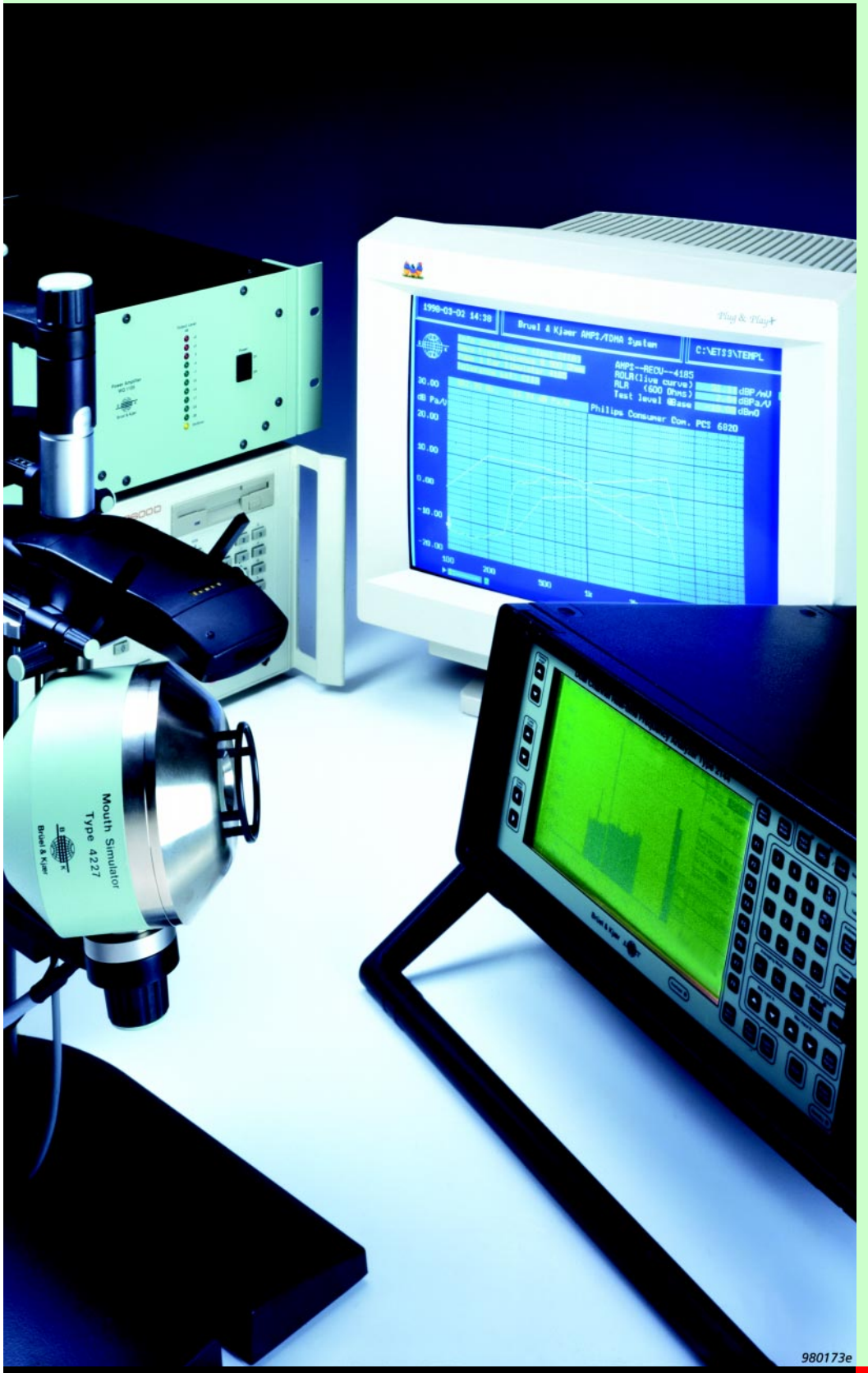
# PRODUCT DATA

## Conformance Test System — Type 6713
## For Dual Mode AMPS/TDMA Cellular Subscriber Units




Type 6713 is a specially engineered system for testing the voice transmission performance of equipment designed for Dual Mode AMPS/TDMA telephony.

As well as offering built-in conformance tests based on TIA IS-55 and the CTIA Test Plan for 800 MHz AMPS/TDMA Dual Mode Cellular Subscriber Stations, a supplementary group including tests suitable for research and development is included. Software flexibility also allows the user to define custom tests.

As the conditions under which the system is to be used may differ in individual cases, Type 6713 is available on individually agreed terms only. Please refer to Ordering Information.

**6713**

Brüel & Kjær

## Uses and Features

*Uses*

- ❍ Conformance testing of Dual Mode AMPS/TDMA phones
- ❍ Research and development with special focus on testing using advanced test signals
- ❍ General acoustic design, verification, and troubleshooting
- ❍ Quality Assurance and incoming/outgoing inspection
- ❍ Production test facilities (including automated test execution and production of statistics)

*Features*

- ❍ Pre-programmed tests run individually or as a complete sequence with minimum operator interaction
- ❍ Advanced noise excitation test methods including artificial speech signal ITU-T P.50
- ❍ Digital equalization of Mouth Simulator
- ❍ Statistics and automated test execution for production test facilities
- ❍ Real-time filters (IEC 225) and sound level measurements (IEC 651) for noise and speech signal analyses
- ❍ Automatic test report generation
- ❍ Flexible user interface enabling high level users to design own test cases
- ❍ Adjustable excitation level and tolerance curve/values

## Introduction

Conformance Test System for Dual Mode AMPS/TDMA Cellular Subscriber Units Type 6713 is a complete system for testing the speech transmission performance of Dual Mode AMPS/TDMA telephones.

Type 6713 is based on measuring instruments which can be software controlled, allowing measurements to be made consistently and with a minimum of operator intervention. The system software handles instrument control, calibration, operator interface, postprocessing calculations and display.

Two groups of test cases are delivered with the system (see also Specifications):

- ❍ A conformance group includes tests based on TIA IS-55 and the CTIA Test Plan for 800 MHz AMPS/TDMA Dual Mode Cellular Subscriber Stations, as well as a few related tests.
- ❍ A supplementary group includes tests suitable for research and development.

The program structure allows the execution of individual tests, user-defined groups of individual tests, or a complete suite of tests. Higher level users may, however, use the instruments interactively to develop their own tests for research and development, quality assurance and production test.

# System Configuration

Type 6713 consists of two main parts – software and hardware.

BZ 5247 Dual Mode CTIA Test Software running on a PC under DOS is the core of the software. BZ 5247 is an integrated environment which executes the Dual Mode AMPS/TDMA test procedures, and controls system instruments via the IEEE-488 interface.

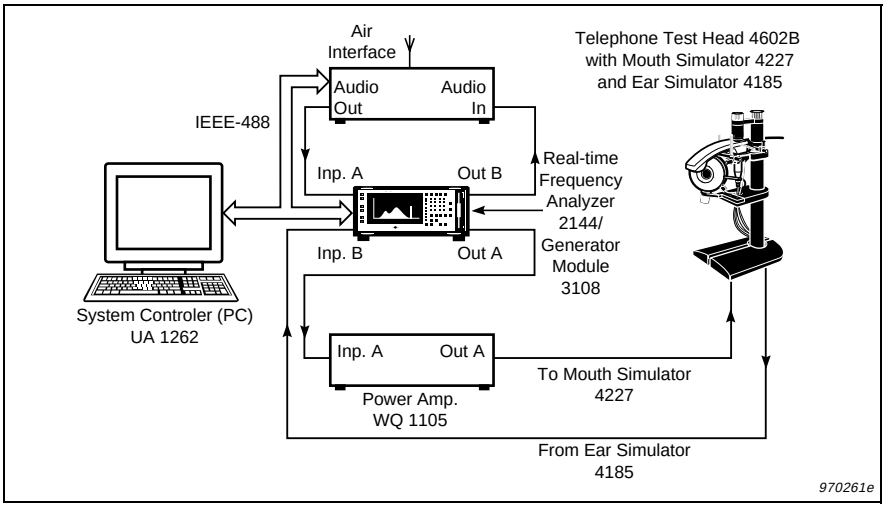



*Fig. 1 Type 6713 main system components and their interconnection. All instruments are controlled by a PC via the IEEE–488 Interface bus. Measurement data from the analyzer is also downloaded to the PC over the bus for further processing. The Air Interface performs all necessary call processing functions and acts as a reference base station.*

The hardware instrumentation includes the Dual Channel Real Time Analyzer Type 2144 for signal analysis, Generator Module Type 3108 for pink noise, pulsed pink noise, and P.50 Artificial Speech test signals, and Type 4602B Telephone Test Head to place the phone in a reference test position. Standard test transducers, Mouth Simulator Type 4227 and Ear Simulator Type 4185 are mounted on the test head.

The RF link and audio signals to and from the Dual Mode phone is established by the Wavetek 3600D Air Interface (not included in the system).

Optional test transducers can be added for measurement results that are more subjectively relevant. Head And Torso Simulator Type 4128C closely represents the human mouth and ear, including pinna and placement effects. Wideband Ear Simulator Type 4195 enables highly repeatable measurements which include the effect of a realistic and well defined acoustic leak.

# Calibration

A central part of any conformance test system is the calibration of the test instruments to ensure that they themselves conform. With Type 6713 calibration procedures are made extremely easy due to the software controlled autocalibration sequences. Using Microphone Calibrator Type 4231 as an absolute reference, a chosen microphone is calibrated acoustically. The electrical equivalent of this acoustic calibration level is then used by the system to auto-calibrate the send and receive chains, including any dynamic equalisation required for Mouth Simulator Type 4227.

## Telephone Test Head

Telephone Test Head Type 4602B is an integrated part of the Dual Mode AMPS/TDMA Test System Type 6713. This test head is especially suitable for correct placement of mobile handsets since it accommodates small handsets, handsets with antenna as well as non-symmetrical handsets.

## Air Interface

The Air Interface is the link between the Frequency Analyzer/Generator and the antenna of the mobile telephone. The Air Interface types which can be selected, are intended for flat voice frequency characteristics. To extend the frequency range in which measurements can be done, digital equalization is carried out in the test system. Hereby an 'ideal' codec characteristic is obtained. The Air Interface and the mobile telephone are linked together either with an antenna cable, or a wireless connection between an antenna on the Air Interface and the antenna on the mobile telephone.

The Air Interface/mobile telephone link can be established either by calling from the mobile telephone or calling from the Air Interface (selectable from the User Interface). A software controlled connect check is carried out both before and after each test case is run.

Please see Ordering Information for further information about optional air interfaces. The Air Interface is not included in Type 6713, but must be ordered separately.

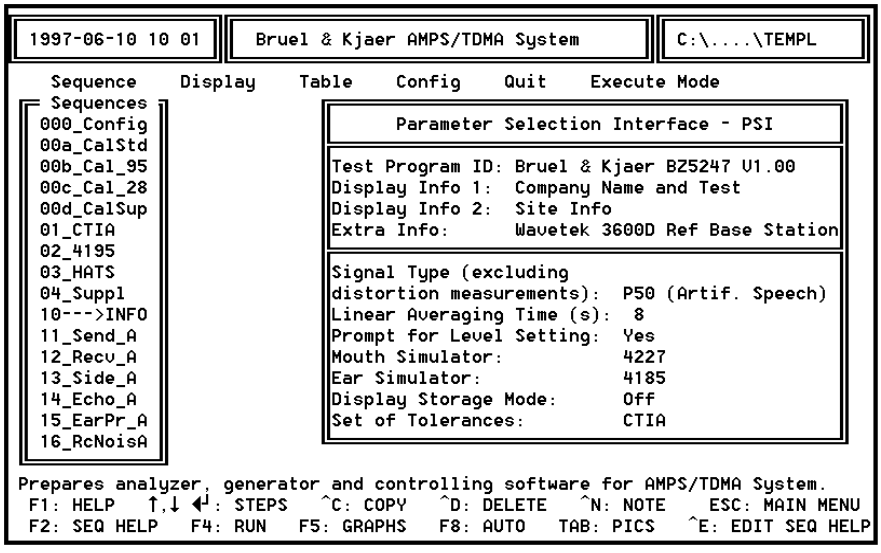



*Fig. 2 The Parameter Selection Interface (PSI) showing a number of fields in which you specify global information for use during the test and when generating test reports.*
*The left hand side shows a list of sequences. The sequences are pre-defined within the BZ5247 software. A full list of conformance sequences and additional sequences are given in the specifications section.*
*Sequences starting with 00x are used for system configuration and calibration. Sequence groups (01x to 04x) run a predefined selection of conformance/additional sequences. A sequence group is a collection of individual sequences which are run sequentially when the group measurement is started.*

## User Interface

The 6713 application can be started from either MS-DOS 5.x or above or MS-Windows 3.1, 3.11 or Win95.

During normal use only the Parameter Selection Interface (PSI) and the Sequence menus are used (see Fig. 2). In the PSI, information about the

mobile telephone can be entered, together with test- and telephone parameters. All information in the PSI is automatically transferred to the test report.

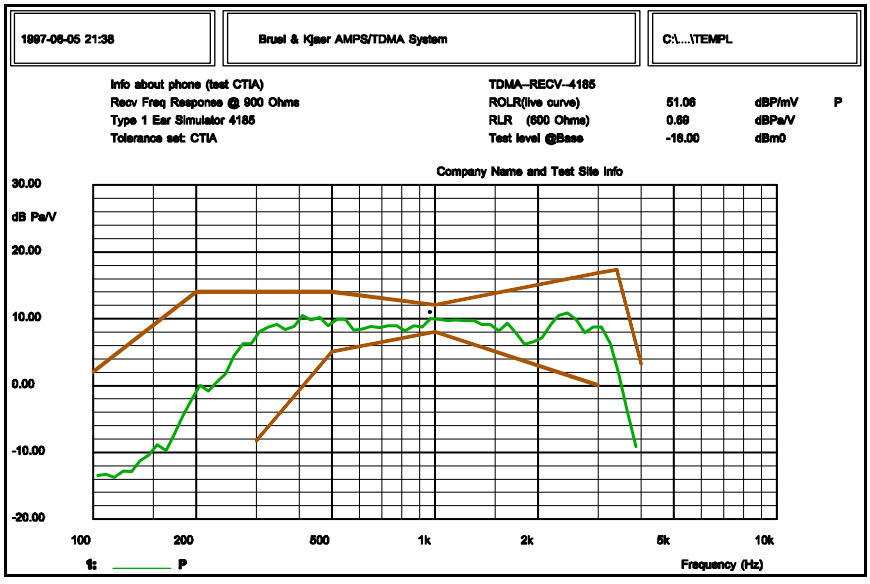
In the Sequence menu the automated test sequences, all controlled by the PC, are shown. The instrument selections/configurations, for example selection of air interface type, are done in the 'Configuration' sequence. The calibration of microphones and the artificial mouth is done in the 'Calibration' sequence.

By running the 'fulltest' sequence, all test are done. Alternatively, each test can be run separately. In the tools menu miscellaneous functions can be run as separate sequences. This gives the possibility of measuring the background noise, monitoring IEEE-488 command and to perform separate Air Interface connect, connect-check and connect-release.

On screen help is available for both the Type 6713 application and the User Interface in general.

During a test case run, the measurement graph and calculated result are displayed on the screen together with the tolerance limits set by CTIA (see Fig. 3). A failed indication is shown if the limits are exceeded.

*Fig. 3 Sample result screen*




## Test Report and Results

When a telephone test has been completed, the results can be documented in pre-defined report formats.

A test report is provided which includes all the measurement results from the CTIA Group. Test reports in WordPerfect format are generated during execution of the test report sequence, or a master sequence which includes the test report sequence.

You can print the report directly from WordPerfect. Saving the report from WordPerfect will save the report text and format, but the not actual results since these are referenced files in *.hgl file (HPGL) format produced by the system software. Apart from measurement graphs, the report includes a description of the test conditions and information entered in the Parameter Selection Interface (PSI) of the user interface (see Fig. 2).

The user manual delivered with the system explains how to install and set-up the hardware and software for a Type 6713 test system. There is a section on how to operate the user interface and a full description of each test case and how they reference to the standards.

A section also describes how batch testing can be done with Type 6713. Batch testing allows you to sequentially test a number of similar instruments, for example as they are manufactured, providing a set of results files on which statistical functions can be applied. Type 6713 software includes a number of statistical functions.

# Test Case Specifications Type 6713

| Test Plan Rev 1.0 ref. | Test Case | Test Title | Description |
|---|---|---|---|
| P.3.3.1.2.5, P.3.3.1.2.6. | 11_Send_A | Send, AMPS mode | Measures the frequency response in the transmit direction and calculates TOLR and SLR. Tolerance checking is performed on response curve and LRs. |
| P.2.2.2.6, P.2.2.2.7 | 12_Recv_A | Receive, AMPS mode | Measures the frequency response in receive direction and calculates ROLR and TOLR. Tolerance checking is performed on response curve and LRs. |
| | 13_Side_A | Sidetone, AMPS mode | Measures the frequency response in sidetone direction and calculates RSOLR and STMR. Tolerance checking is performed on LRs. |
| P.3.5, Single Talk | 14_Echo_A | Acoustic Echo Path, AMPS mode | Measures the echo response and calculates the AEPL. Tolerance checking is performed on AEPL. |
| P.7.3 | 15_EarPr_A | Ear Protection, AMPS mode | The max SPL is measured at the ERP when a sine sweep is applied to the Wavetek Air Interface. |
| P.3.3.2.2.2, P.3.3.2.2.3 | 21_Send_D | Send, TDMA mode | Measures the frequency response in the transmit direction and calculates TOLR and SLR. Tolerance checking is performed on response curve and LRs. |
| P.2.2.4.2, P.2.2.4.3 | 22_Recv_D | Receive, TDMA mode | Measures the frequency response in receive direction and calculates ROLR and TOLR. Tolerance checking is performed on response curve and LRs. |
| | 23_Side_D | Sidetone, TDMA mode | Measures the frequency response in sidetone direction and calculates SOLR and STMR. Tolerance checking is performed on LRs (ref TIA-470B). |
| P.3.5, Single Talk | 24_Echo_D | Acoustic Echo Path, TDMA mode | Measures the echo response and calculates the AEPL. Tolerance checking is performed on AEPL. |
| P.7.3 | 25_EarPr_D | Ear Protection, TDMA mode | The max SPL is measured at the ERP when a sine sweep is applied to the Wavetek Air Interface. |
| P.3.3.3 | 31_LdContr | Loudness Contrast | The difference between the ROLR and TOLR respectively in AMPS and TDMA mode is calculated, with tolerance checking. |
| | 32_EarPr_Al | Ear Protection from Alerting Signal | The telephone is called up and the SPL at the ERP is measured during ringing. Tolerance on max. SPL. |
| P. Alerting | 33_Alert | Alerting Loudness | The telephone is called up and the SPL at 75 cm distance is measured. Tolerance on min. SPL. |

# Additional Test Case Specifications Type 6713

| Test Case | Test Title | Description |
|---|---|---|
| 51_TOLRLvA | Send Loudness Rating vs Level, AMPS mode | Measures send response and calculates TOLR as function of excitation level. |
| 52_SDstLvA | Send Distortion vs Level, AMPS mode | Measures the Signal-to-total-Distortion in send direction as a function of excitation level. |
| 53_SDstFrA | Send Distortion vs Frequency, AMPS mode | Measures the 3rd harmonic distortion in send direction as a function of Frequency. |
| 54_ROLRLvA | Receive Loudness Rating vs Level, AMPS mode | Measures receive response and calculates ROLR as function of excitation level. |
| 55_RDstLvA | Receive Distortion vs Level, AMPS mode | Measures the Signal-to-total-Distortion in receive direction as a function of excitation level. |
| 56_RDstFrA | Receive Distortion vs Frequency, AMPS mode | Measures the 3rd harmonic distortion in receive direction as a function of Frequency. |
| 57_RcNoisA | Receive Noise, AMPS mode | Measures the Receive Noise and calculates the A-Weighted noise level. |
| 61_TOLRLvD | Send Loudness Rating vs Level, TDMA mode | Measures send response and calculates TOLR as function of excitation level. |
| 62_SDstLvD | Send Distortion vs Level, TDMA mode | Measures the Signal-to-total-Distortion in send direction as a function of excitation level. |
| 63_SDstFrD | Send Distortion vs Frequency, TDMA mode | Measures the 3rd harmonic distortion in send direction as a function of Frequency. |
| 64_ROLRLvD | Receive Loudness Rating vs Level, TDMA mode | Measures receive response and calculates ROLR as function of excitation level. |
| 65_RDstLvD | Receive Distortion vs Level, TDMA mode | Measures the Signal-to-total-Distortion in receive direction as a function of excitation level. |
| 66_RDstFrD | Receive Distortion vs Frequency, TDMA mode | Measures the 3rd harmonic distortion in receive direction as a function of Frequency. |
| 67_RcNoisD | Receive Noise, TDMA mode | Measures the Receive Noise and calculates the A-Weighted noise level. |
| 71_Sn4128A | Send, using 4128, AMPS mode | Measures the frequency response in the transmit direction and calculates TOLR and SLR. Tolerance checking is performed on response curve and LRs. |
| 72_Rc4128A | Receive, using 4128, AMPS mode | Measures the frequency response in receive direction and calculates ROLR and TOLR. Tolerance checking is performed on response curve and LRs. |
| 73_Si4128A | Sidetone, using 4128, AMPS mode | Measures the frequency response in sidetone direction and calculates SOLR and STMR. Tolerance checking is performed on LRs. |
| 74_Rc4195A | Receive, using 4195, AMPS mode | Measures the frequency response in receive direction and calculates ROLR and TOLR. Tolerance checking is performed on response curve and LRs. |
| 75_Si4128A | Sidetone, using 4195, AMPS mode | Measures the frequency response in sidetone direction and calculates SOLR and STMR. Tolerance checking is performed on LRs. |
| 81_Sn4128D | Send, using 4128, TDMA mode | Measures the frequency response in the transmit direction and calculates TOLR and SLR. Tolerance checking is performed on response curve and LRs. |
| 82_Rc4128D | Receive, using 4128, TDMA mode | Measures the frequency response in receive direction and calculates ROLR and TOLR. Tolerance checking is performed on response curve and LRs. |
| 83_Si4128D | Sidetone, using 4128, TDMA mode | Measures the frequency response in sidetone direction and calculates SOLR and STMR. Tolerance checking is performed on LRs. |
| 84_Rc4195D | Receive, using 4195, TDMA mode | Measures the frequency response in receive direction and calculates ROLR and TOLR. Tolerance checking is performed on response curve and LRs. |
| 85_Si4128D | Sidetone, using 4195, TDMA mode | Measures the frequency response in sidetone direction and calculates SOLR and STMR. Tolerance checking is performed on LRs. |
| 34_LdCtr28 | Loudness Contrast, using 4128 | The difference between the ROLR and TOLR respectively in AMPS and TDMA mode is calculated, with tolerance checking. |
| 35_LdCtr95 | Loudness Contrast, using 4195 | The difference between the ROLR and TOLR respectively in AMPS and TDMA mode is calculated, with tolerance checking. |

# Ordering Information

Type 6713: Conformance Test System for Dual Mode AMPS/ TDMA Cellular Subscriber Units

**includes the following components:**
Type 2144: Real Time Frequency Analyzer
Type 3108: Generator Module for Analyzer Type 2144
Type 4185: Ear Simulator for Telephonometry
Type 4227: Mouth Simulator
Type 4231: Microphone Calibrator
Type 4602B: Telephone Test Head
BZ 5247: Dual Mode CTIA Test Software for Type 6713
WQ 1105: Audio Power Amplifier
WQ 0625: IEEE–488 Interface for PC-AT
WT 9383: Word Perfect for DOS
UA 1262: System Controller

**For ringer test:**
Type 4191: $^1/_2$" Free-Field Microphone
Type 2669L: Microphone Preamplifier
AO 0414: 3 m Microphone Extension Cable

UA 0801: Lightweight Tripod
UA 1317: Microphone Preamp Holder
**Note:** An air interface must be available to run the system. It is not included with the system and should therefore be ordered directly from a Wavetek agent:
**Wavetek 3600D:** AMPS/TDMA Air Interface with TDMA, IS-136 Basic or Custom, and IEEE Interface Options

## Optional Accessories

**For receive testing with leak simulation:**
**Type 4195:** Wideband Ear Simulator

**For send and receive testing with Head and Torso simulator:**
**Type 4128C:** Head And Torso Simulator
**Type 4135:** $^1/_4$" Free-Field Microphone
**Type 2670:** $^1/_4$" Microphone Preamplifier
**AO 0414:** 3 m Microphone Extension Cable
**DP 0887:** Calibration Adaptor for Type 4128

Brüel & Kjær reserves the right to change specifications and accessories without notice

# Compliance with Standards

| | |
|---|---|
| CE | All Brüel & Kjær components of the Dual Mode AMPS/TDMA Voice Testing System are individually CE marked and comply with standards as detailed in their respective product data sheets. |

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Philips Digital PCS Wireless Telephone 6820 courtesy of Philips Communications

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