

# PRODUCT DATA

Evaluator — Type 7820  
Evaluator Light — Type 7821

*Evaluator™ Type 7820 and Evaluator Light Type 7821 are Windows®-based software packages for environmental noise evaluation. They provide versatile tools for analysing measured data from the family of Brüel & Kjær Sound Level Meters, and is a complete solution for the determination of Rating Levels according to various national standards.*

*A Rating Level is a single value for evaluating the potential nuisance factor of noise. It takes into account time of day, nature of the noise (impulsive and pure tones present) as well as the overall level of noise.*

*Evaluator boasts many advanced features, including recording and replaying sound, tonal assessment using FFT spectra and the option of remote downloading data from Brüel & Kjær Sound Level Meters through a modem connection.*



## USES AND FEATURES

### USES

- Calculation of Rating Levels according to national and international standards; examples include Austria, Belgium, Canada, Denmark, France, Germany, Holland, Italy, Portugal, Switzerland, United Kingdom and the USA
- Noise Profile measurement:
- Industrial noise
- Residential noise
- Road and rail traffic noise
- Evaluation of noise in the environment against noise limits according to national and international standards

### FEATURES

- Direct import of data<sup>a</sup> from Sound Level Meter Types 2231 and 2236, 2237 Controller, 2238 Mediator™,

a. Sound Level Meter Type 2231 (running BZ-7112 software), 2250, 2260 Investigator and 2260 Observer are not supported by Evaluator Light Type 7821

Sound Level Meter (SLM) Type 2239, 2260 Investigator™ and 2260 Observer™

- Import of data from Hand-held Analyzer Type 2250 using BZ-5503
- Dial-up modem data transfer and remote instrument control<sup>a</sup> of 2238 Mediator, 2260 Investigator and 2260 Observer
- Storage and view of broadband, spectra and FFT measurement data on a PC
- Automatic markers for loudest periods, impulse content, constant tones (derived from 1/3-octave spectra) and level excursions
- Tonal Assessment to JNM2–1999, DIN 45 681–1992 and ISO/CD 1996–2–2001–05 using FFT spectra
- Profile knitting to produce an overall Rating Level from different time-based contributions
- Sound recording (controlled by 2238 Mediator or Type 2260<sup>b</sup>)

b. Type 2260 refers to 2260 Investigator and 2260 Observer, unless otherwise stated

## Introduction

A hand-held Brüel & Kjær sound level meter/analyzer together with dedicated post-measurement software Evaluator Type 7820 is a powerful combination for analysing, evaluating and reporting on the fluctuations of ambient noise in any community.

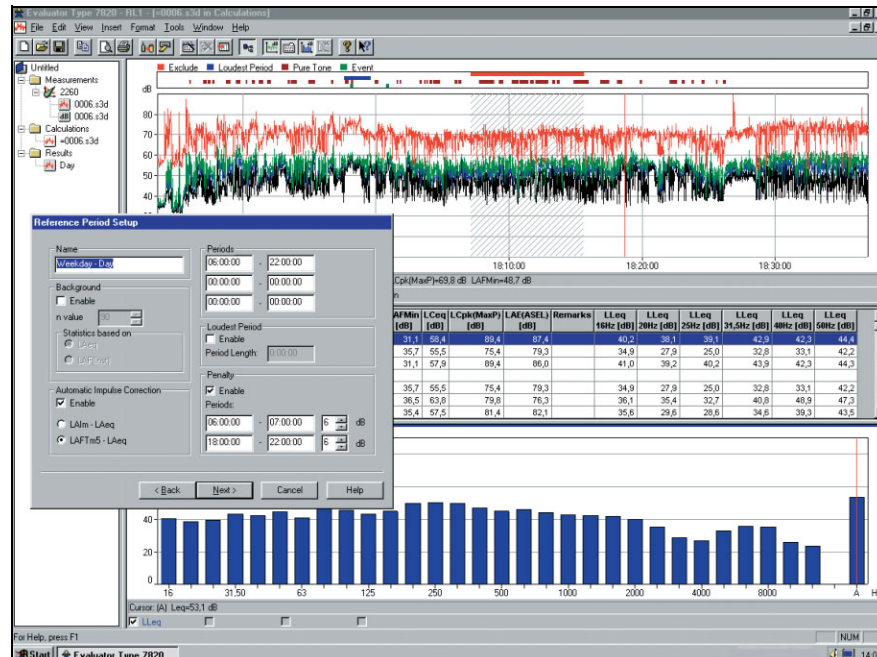
Evaluator<sup>a</sup> allows you to edit and combine measurement data from Brüel & Kjær Sound Level Meters and from other Brüel & Kjær software packages in order to calculate a Rating Level for the noise source in question.

The Rating Level is based on a graphical profile you create from selected measurement contributions. Results are presented according to a framework of parameters that you define, and can include time of day/week, and penalties for impulse and constant tone. To make things easier, a large set of national standard parameters are available for you to choose from.

Evaluator Light Type 7821 is functionally similar to Evaluator Type 7820, but supports a reduced set of instruments.

Evaluator is an extremely powerful and versatile piece of software specially designed to make calculation of Rating Levels easy, fast and repeatable. With Evaluator running on your PC, you have a graphically based set of tools allowing you to build up rating level scenarios from measured data. Evaluator also offers comprehensive calculation, file storage and reporting facilities. Evaluator interfaces directly with a number of Brüel & Kjær sound level meters and allows direct import of data files from these instruments or other Brüel & Kjær programs concerned with environmental noise.

**Fig. 1**  
The Evaluator screen provides you with the tools for visually combining measurement data to produce contributions for calculating a Rating Level



In a practical approach to measuring environmental and community noise (Rating Levels), a four-step process is normally used:

1. Field measurements using a hand-held sound level meter/analyzer
2. Transfer of measurement files to a PC
3. Production of contributions for calculating a Rating Level
4. Reporting the results

a. Evaluator refers to Evaluator Type 7820 and Evaluator Light Type 7821, unless otherwise stated

Step 1 uses one of the many hand-held solutions offered by Brüel & Kjær. Steps 2<sup>a</sup> to 4 are all managed by Evaluator. Typical instruments and accessories you might use are SLM Type 2236, Type 2237 Controller, 2238 Mediator, SLM Type 2239, Type 2250, Type 2260, Outdoor Gear Type 3592, and so on. See the respective Product Data sheets.

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## Sound Recording

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To help with documentation of a sound occurrence, and to be sure of what had caused a marked event, you can record sound directly onto your PC's hard drive.

With Evaluator installed on your PC, you can use 2238 Mediator or Type 2260 to control sound recording on the hard disk while making measurements. The only limit to duration is the size of the hard disk.

Sound recording can be tagged to one or more markers. There is a 60 s sound buffer in the PC to permit editing of markers up to 1 minute after the occurrence has taken place. Recordings are time-stamped and stored as .wav files. After transferring the measurement data from 2238 Mediator or Type 2260 to Evaluator, the data is automatically merged with the sound recordings. The sound recordings are then marked in the profile display and can be replayed. You use the cursor position in the profile display to decide which part of the recording you want to hear.

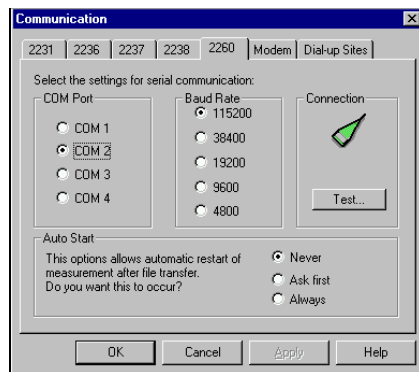
Sound recordings made with 2250 Logging or Enhanced Logging Software are fully integrated in Evaluator.

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## Transfer Field Measurements to a PC

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**Fig. 2**  
*Tab pages in Evaluator*



Data can be downloaded into Evaluator either via a PC-card or via an RS-232 serial link. Data files are stored in Evaluator projects, which are groupings of files containing all raw data, calculations, and results for a particular set of measurements.

Evaluator Type 7820 has a modem dial-up facility allowing you to remotely log-on to a Type 2260 or 2238 Mediator and download measurement files. This frees disk space on the sound level meter for more results, and saves you a site visit. The modem interface is standard RS-232, so you can connect either a land-line modem or a mobile phone with a digital interface<sup>b</sup>.

Use BZ-5503 to transfer data from Type 2250 to an archive on a PC, then export data from the archive to Evaluator.

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a. BZ-5503 is used to transfer data from Type 2250 to PC

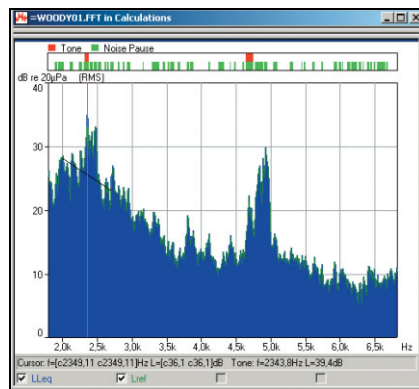
b. See Application Note BO 0458 for details on modem transfer

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## Viewing Measurement Data Graphically

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**Fig. 3**  
An FFT spectrum with the cursor at a pure tone of 2343.8 Hz



To help you visualise your measured data graphically, Evaluator can present measured parameters in the following ways: as a noise profile display (level versus time), as a spectrum display of 1/1-octave and 1/3-octave filters, as an FFT spectra (level versus frequency), or as a statistical display of cumulative or level distributions (percentage versus level).

All displays have a movable main cursor that allows you to read the x and y values at the cursor position, and a zoom function to allow closer inspection. When viewing FFT spectra, the following measurement cursors are also available: reference cursor, delta cursor, harmonic cursor and tone cursor.

Another feature of the FFT spectral display is the ability to select one particular spectrum and overlay it on top of another, to allow a comparison to be made. Profiles of spectra, can also be compared this way. This feature is useful for machine diagnostics, for example.

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## Tone Assessment using FFT Measurements

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**Fig. 4**  
A Tone Text Table showing the results of a tone assessment

	Name	Tone Frequency [Hz]	Tone Penalty [dB]	Tone Audibility [dB]	Critical Bandwidth [Hz]	CB Start [Hz]	Status Codes
1	Prominent	398,4	4,0	8,0	111,1	342,8	t, p
2							
3	Tone 1	398,4	4,0	8,0	111,1	342,8	t
4	Tone 2	495,1	2,0	3,8	116,8	436,5	t
5	Tone 3	641,8	2,0	2,1	127,7	577,1	t
6	Tone 4	782,2	2,0	2,8	139,9	711,9	t, p
7	Tone 5	1034,2	2,0	2,1	166,0	952,1	t
8	Tone 6	1072,3	1,0	1,6	170,4	987,3	t

Tone assessment using FFT measurements is an objective method to rate the annoyance of tones and produce a tonal penalty for rating level calculation. The aim is to achieve equivalent results to those obtained from the average subjective listener. Three standards are currently implemented in Evaluator Type 7820:

- Joint Nordic Method – Version 2 – 1999
- DIN 45681 – 1992
- ISO/CD 1996-2 – 2001 – 05

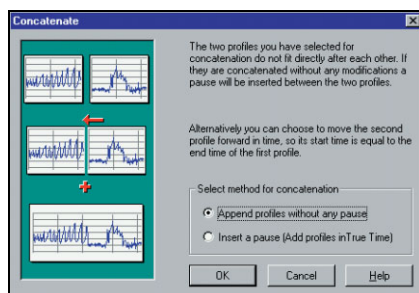
FFT spectra created by 2260 Investigator running BZ-7208 software are imported into Evaluator and moved to the Calculations branch, from where the Tonal Assessment algorithm is accessed. The FFT spectra are parsed according to rules defined in the standards and the results presented in a tone text table that shows any prominent tones and their penalty level. Calculated penalties are easily transferred to the Results branch for incorporation in a rating level calculation.

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## Editing and Combining Measurement Data

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**Fig. 5**  
“Knitting Wizard” in Evaluator



Data imported into Evaluator is in read-only form, preserving the integrity of your field measurements. Data is usually appended to the Measurements branch of a project. From here you just have to drag-and-drop selected measurement data into the Calculations branch.

Data in the Calculations branch can be transformed by a number of powerful algorithms built into Evaluator. You can take one measurement file made on-site that contains samples of different noise environments and

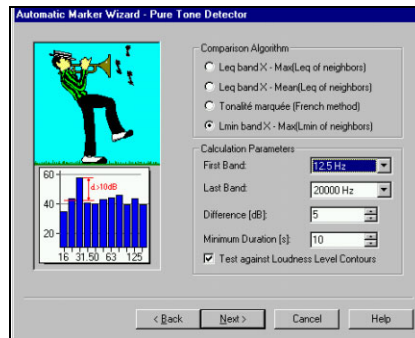


use the cut and paste functions to build up rating level profiles for each measurement. It is also possible to take different profile samples and knit them together into one long profile.

## Marker Function

**Fig. 6**

Pure tone detection based on logged 1/3-octave spectra using one of the automatic Marker Wizards



The Marker function allows your data to be segmented into its component parts, for example, impulses, constant tones, and data to be excluded.

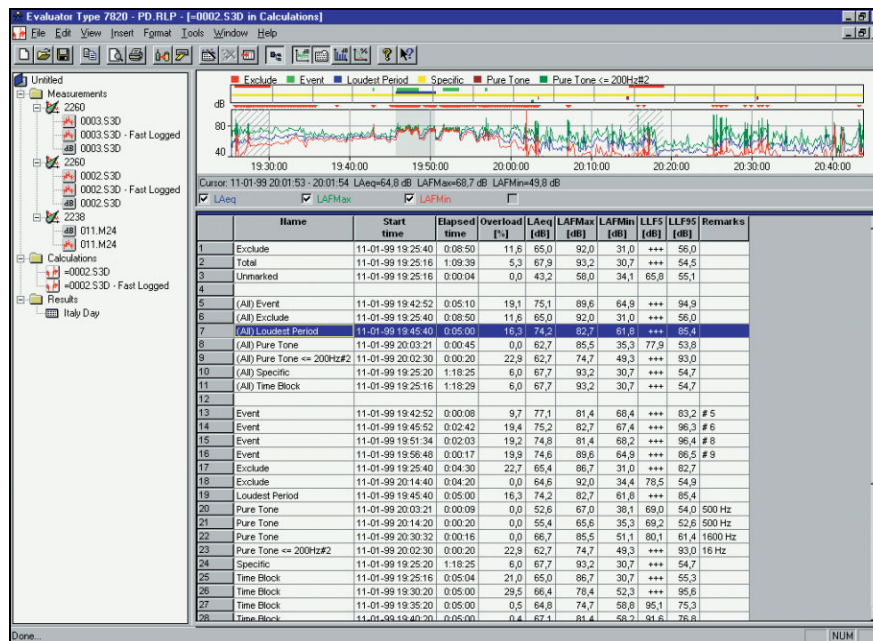
With the Automatic Marker function tool you can, for example, ask Evaluator to find the loudest period in the data over a specified time. You can search for constant tones based on 1/3-octave measurements, or you can search for and mark impulse noise, or set up a level trigger that will mark all data above a certain level for a specified period of time. This can be used, for example, to locate aircraft fly-over or auto pass-by events.

You can also subdivide your total measurement time into smaller intervals of your choice, called Time Blocks. For example, if you have been logging at 1 s intervals for 1 hour, time blocks can be made of 10 s or 1 minute duration.

For all marked intervals, or time blocks, you can see the the level for each unit as well as the total, and can sort them in a table according to level, duration or time.

**Fig. 7**

Table of Markers in the Calculations program, in alphabetical order, highlighting the Loudest Period in both the table and the graphic

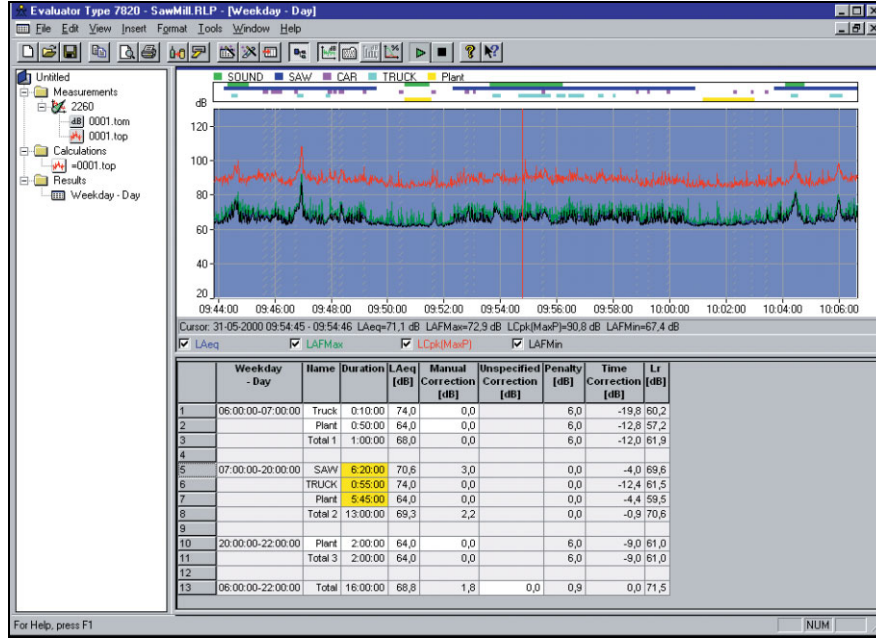


In some Brüel & Kjær Sound Level Meters, markers can be set during the measurement to identify measurement events, objects or conditions. Marker information is transferred with the data into Evaluator, for display.

## Rating Level Calculation

Once you have selected the data you want and handled it in the Calculations branch, you add the data to the Results branch. The Results branch contains a spreadsheet that you set up to suit the standards you are measuring to. Different times of day can be specified, impulse corrections can be added, constant tone penalties accounted for – in fact all the different aspects of Rating Level calculations that you find in the most common international standards.

**Fig. 8**  
 Table with results of  
 the Rating Level  
 calculation



## Specifications – Evaluator Type 7820, Evaluator Light Type 7821 (ver. 4.9)

### Standards

Conforms to the following:

- ISO 1996 (Part1–1982; Part2–(Amendment 1–1998)1987; Part3–1987) Acoustics – Description and measurement of environmental noise
- DIN 45 645, Teil 1 Ermittlung von Beurteilungspegeln aus Messungen – Geräuschimmissionen in der Nachbarschaft, Entwurf 1994)
- VDI 2058, Blatt1 Beurteilung von Arbeitslärm in der Nachbarschaft
- TA – Lärm Technische Anleitung zum Schutz gegen Lärm 1998
- NF S 31–010 Acoustique – Caractérisation et mesure du bruit de l’environnement – méthodes particulières de mesure, 1996
- BS 4142 Rating industrial noise affecting mixed residential and industrial areas, 1997
- Joint Nordic Method – Version 2 – 1999
- DIN 45681 – 1992
- ISO/CD 1996–2 – 2001–05

### Measurement Data

The data type depends upon the instrument producing the data, but will always fall into the following categories:

**Total Profile:** Up to four selected parameters shown simultaneously. Cursor read-out for all parameters. Zoom and scroll facilities provided. Marker annotations from field measurements shown. The cursor read-out is also shown as a spectrum (CPB or FFT) and in statistical form, where appropriate.

**Periodic Reports:** Up to four selected parameters shown simultaneously. Cursor read-out for all parameters, statistical distributions and Ln values (percentile levels). Zoom and scroll facilities provided

**Total Measurement:** All measured parameters are listed. Level and cumulative-level distributions together with seven Ln values (percentile levels)

**FFT Spectra:** Cursors: Main, delta, reference, harmonic and tone. Scaling and annotations in dB or Engineering Unit (SI or US/UK). Vibration data displayed as acceleration, velocity or displacement

**Human Vibration:** Accelerations in  $m/s^2$  where appropriate

### Calculations

The calculations branch allows numerical operations based on data in the measurements branch to be incorporated into a calculation or sent to the results branch.

**Profile View:** Shows data and markers. Start/Stop times of profiles can be modified, data can be repeated

**Text View:** Shows table of marker content

**Tone Text View:** Shows tonal assessments based on FFT spectra, including Tone Penalty, Tone Frequency, Corrected Frequency, Tone Audibility and Tone Penalty

**Spectrum View:** Marked data

**Distribution View:** Marked data

### Results

**Rating Level calculations:** Made according to reference times and specified parameters. Predefined templates for Austria, Belgium, Canada, Denmark, France, Germany, Holland, Italy, Portugal, Switzerland, United Kingdom and USA

**Profile View:** Data and markers

**Spectrum and Distribution View:** Based on result.

**Text View:** Table with rating level result and rows for all contributions to the rating level. New rows can be inserted into the results table with manually specified values for Name, LAeq, Duration, Manual corrections, and Impulse correction

**Parameters:** The following parameters for each marker/contribution and result are available (where applicable):

Name	Time correction
LAeq	LAeq, residual <sup>a</sup>
Start time	Residual correction <sup>a</sup>
End time	LN <sup>a</sup>
Duration <sup>a</sup>	Lr
Manual correction <sup>b</sup>	Lr-LN
Manual correction #2 <sup>b</sup>	LAFMax
Impulse correction <sup>b</sup>	LDN
Result correction <sup>b</sup>	Unspecified correction <sup>a</sup>
Result correction #2 <sup>a</sup>	Unspecified correction #2 <sup>a</sup>
Emergence	Unspecified correction #3 <sup>a</sup>
Automatic impulse correction	Penalty (up to 3 periods)

a. user definable

b. specified by marker

### Markers

Up to 10 markers are available, some of which may originate from the measuring instrument and some which are automatically inserted by the Automatic Marker function

### Automatic Marker Function

This function, available in the Calculations and Results branches, allows you to automatically set markers in a profile. The markers can show:

- The loudest period for a specified time
- Events
- Periods with a constant tone (by spectral analysis)
- Periods with impulse noise over a set value
- Time blocks
- Perceived Noise Levels (PNL, PNLT and EPNL)

### Sound Recording

#### USING TYPES 2238 AND 2260

**Input:** Audio

**Control:** From 2238 Mediator, Type 2260 or directly from Evaluator

**Output Format:** .wav

**Display:** As marker

**Replay:** Controlled by profile cursor

**Recording Quality:** High (86 kbyte/s/ch.), Medium (43 kbyte/s/ch.), Low (21.5 kbyte/s/ch.)

**Input Selector Left:** Line, Microphone, or None

**Input Selector Right:** Line, Microphone, or None

#### USING TYPE 2250

Sound recordings made with 2250 Logging or Enhanced Logging Software are integrated in profile

### Input

**RS–232 Interface:** 1200 bps to 115200 bps

**PC-card:** Files stored on S-RAM or ATA Flash cards by Type 2260

**Import:** From files generated by software Types 7694, 7696 and 7815 Noise Explorer

### Output

**Windows® Clipboard:** As either a metafile for graphical data or text for tabular data

**Printer:** To any Windows®-compatible device

**Export:** To Excel spreadsheet file in .xls format or to tab-separated ASCII file

### Modem Interface

Dial-up modem interface controlled from Evaluator using the PC's serial interface. (Not supported in Evaluator Light Type 7821)

**PC Modem:** Hayes compatible with error correction

**SLM modem on Landline:** "Dumb" modem with error correction  
**SLM Modem on a GSM Link:** Specifications similar to a Siemens GSM Module M1 phone/modem and a non-transparent pathway offered by the GSM service provider  
**SLM Remote Control:** Download of Type 2236 and 2238 Mediator logged results and some/all stored files for Type 2260. Measurement is suspended during download. Measurement restart after download, with or without deleting files (as dictated by SLM Type)

### Language Versions

The software interface is available in English, French, German, Italian, Slovenian and Spanish

### Help

On-line context-sensitive help plus comprehensive tutorial

### Platform

32-bit software written for Windows® 2000/XP

### Supported Instruments

	Type 7820	Type 7821
Type 2236 (all variants)	●	●
Type 2237 (A and B variants)	●	●
Type 2238 (All variants)	●	●
Type 2239 (A and B variants)	●	●
Type 2231 with BZ-7112	●	
Type 2260 Observer with BZ-7219	●	
Type 2260 Investigator with BZ-7201/02/03/06/08/10	●	
Type 2250 with BZ-7222/23/24/25/26	●	

### Recommended Computer

Pentium® III (or equivalent) PC, 256 MB RAM, SVGA graphics display/adaptor, sound card, CD ROM drive, mouse, USB and Windows® XP

**Note:** A PC-card slot is necessary to make PC-card data transfers

### Ordering Information

Type 7820 Evaluator software  
 Type 7821 Evaluator Light software  
 Type 7820-X-100 Upgrade from Type 7696 to Type 7820  
 Type 7820-X-200 Upgrade from Type 7821 to Type 7820

AO-0585 Cable from 2238 to Audio input on a PC, 3 m (10 ft.)  
 ZE-0770 PCI Soundcard (for desktop PCs)  
 ZE-0770-A PCM-CIA Soundcard (for laptop PCs)  
 AO-1440 RS-232 cable for Siemens M1  
 ZH-0547 Power supply connection box for Siemens M1

### Optional Accessories

Type 3592 2260 Investigator Outdoor Gear  
 AO-1442-Y-XXX<sup>a</sup> RS-232 cable for Types 2236, 2237, 2238, 2239 and 2260  
 AO-0586-Y-XXX<sup>a</sup> Cable from 2260 to Audio input on a PC

a. Cables are available in different lengths, specified by Y-XXX, where:  
 Y = D (decimetres) or M (metres)  
 XXX is the length in the given units  
 Please specify

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