

PRODUCT DATA

PULSE Vehicle Pass-by Test System

Including PULSE In-vehicle Box — Type 3643, Pass-by Ground Station — Type 3645, Pass-by In-vehicle Unit — Type 3646, and PULSE Vehicle Pass-by Test Software — Types 7788-B, -C

PULSE™ Vehicle Pass-by Test System is a scalable, PULSE-based system for measuring operational exterior vehicle noise. The system consists of PULSE Vehicle Pass-by Test Software Type 7788 together with PULSE hardware and a selection of dedicated pass-by accessories. The system covers all common pass-by standard measurements, such as ISO 362 (including the latest revisions), SAE J1470 and ISO 13325 (tyre noise), as well as stationary measurements, such as ISO 5130 (exhaust noise).

The system is highly flexible – you can use PULSE's real-time analyzers (FFT, 1/n-octave, Order, Overall levels, etc.) for measurement and analysis, and at the same time record time data for post-analysis.

In-vehicle parameters, such as RPM, throttle position and CAN bus parameters, can be measured along with in-vehicle noise and/or vibration. Single-person operation is also supported.



USES AND FEATURES

USES

- Vehicle pass-by noise testing according to a variety of international standards, such as ISO 362 (including latest revisions)
- Vehicle pass-by noise testing to regional standards and internal corporate procedures
- Measurement of operational exterior vehicle noise (cars, trucks, buses and motorcycles)

FEATURES

- Turnkey system for pass-by measurements including other exterior noise measurements such as tyre and exhaust noise
- Single-person operation
- Scalable solution

- Complete data collection in one pass-by measurement: noise and vibration spectra, orders, position, velocity, RPM and throttle (gas pedal) position along with other parameters, incl. CAN data
- Built-in data management for organising, comparing and reporting results
- Export of results in common data formats
- Advanced graphical displays with live cursor functionality when embedded in Microsoft® Office applications
- Flexible design ensuring openness for custom procedures and future revisions of international standards
- Doppler-corrected Order plots
- Dedicated Driver's Aid display

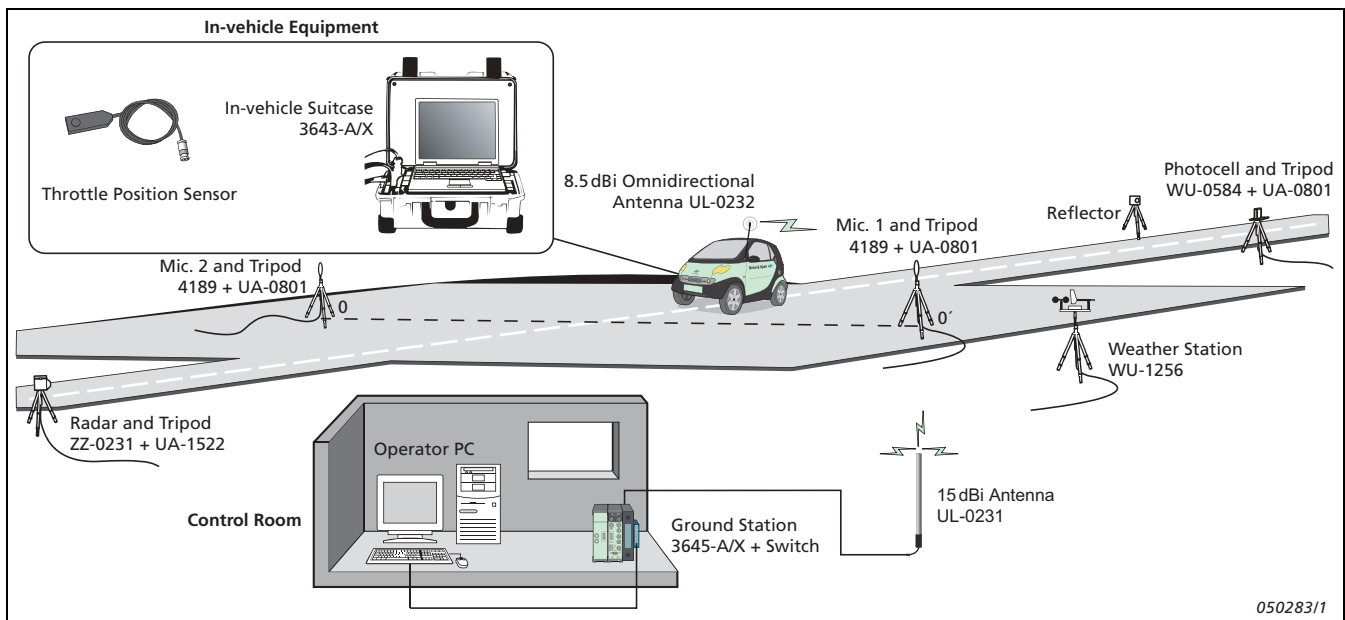
Introduction

Community noise regulations put increasingly stringent requirements on road vehicle exterior noise emission. Regulations apply not only to cars, but also to trucks, buses, motorcycles and scooters. Manufacturers have to certify that their vehicles comply with the local noise emission standards. The only way to certify a vehicle is to measure according to procedures defined by international or local standards.

PULSE Vehicle Pass-by Test System is a turnkey solution covering all aspects of measurement, documentation and presentation of results. The system forms part of an exterior vehicle noise test suite that also includes Indoor Pass-by and Beamforming (phased array measurements).

The complete system includes pass-by related accessories such as photocells giving absolute position reference, speed sensor (radar, GPS or other devices) providing continuous speed and position information, and a weather station providing environmental parameters.

Fig. 1 System overview



Software

The system is operated via Type 7788-B or 7788-C pass-by software using dedicated pass-by templates. You can modify the templates to reflect your workflow. The software provides guidance, calculation and bookkeeping features. Additional features include speed signal and telemetry drop-out compensation, and doppler correction of order plots. Tests can be made both in a single direction and bi-directionally.

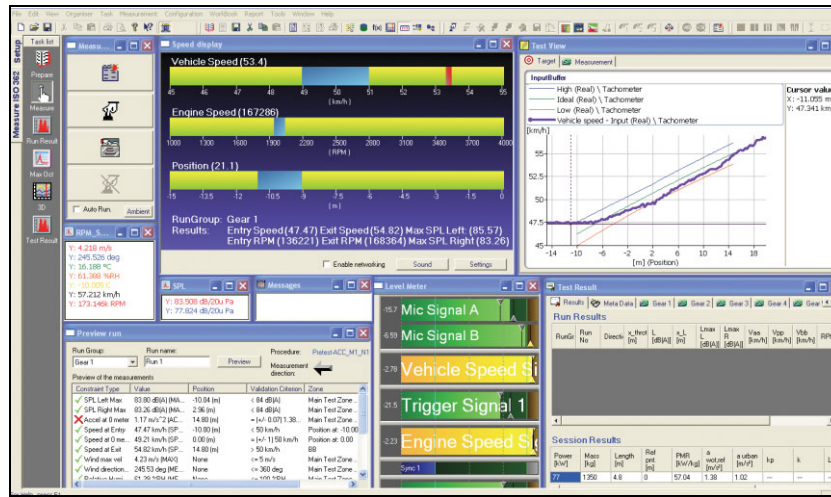
Additional analyses and time history recording can be done in real time in parallel with the pass-by measurements. This includes all PULSE LabShop's real-time analyzers. The analysis can be done on in-vehicle channels as well as the ground channels or even across ground and vehicle channels to investigate component contributions. CAN data can also be measured during the pass-by test and used as an rpm reference for order analysis.

A flexible "Validation engine" lets you assign target values for any measured parameter. At the end of each run, a summary status of the validation criteria is given in tabular form, and the results are saved together with the measurement data. This means that you can check every aspect of the test to see whether it was performed correctly: an example of this could be the

maximum wind speed occurring during the test or the engine oil temperature from the CAN bus to check whether the vehicle was up to operating temperature.

In addition to the standard test procedures, you can create your own: decide what values to measure, the gears to use, the runs to make in each gear and how to calculate the “intermediate” value. This makes the system extremely flexible.

Fig. 2
Graphical user interface showing the constraints summary (bottom left) after a run and a target display to assist in selecting the correct gear and entry speed for ISO 362: 2007 tests

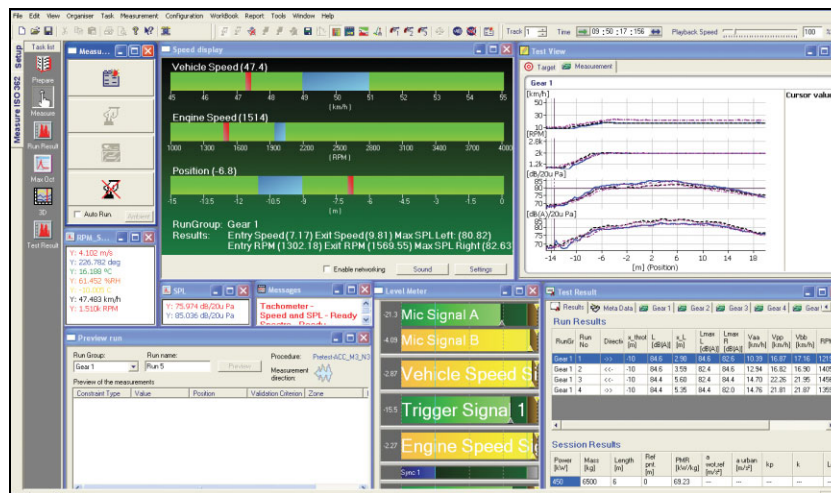


As part of its full support of the ISO 362: 2007 standard, the software includes intelligent tools to help you choose the correct entry speed and the correct gear(s) for testing, and automatically calculates the result as the test progresses.

Driver's Aid

A special Driver's Aid display provides real-time vehicle and engine speed information along with the vehicle's position on the test track. Information is shown both graphically (as bars) and numerically. The Driver's Aid supports targets for engine and vehicle speeds and position, which can be set manually or automatically according to the selected test procedure. The display's background colours indicate the state of the system, such as activated, triggered, or measurement finished.

Fig. 3
Graphical user interface showing previous runs overlaid with the results tabularised below



Key test results are summarised in the Driver's Aid immediately after each run. The Driver's Aid can be used stand-alone (without the pass-by software) on a remote PC inside the test vehicle, presenting the driver with information in real time.

The Test Results table and the graphical displays can be copied and pasted directly from the screen into Microsoft® Office products for reporting on the fly.

Data Management

PULSE Data Manager Type 7767 is integrated with the system to store results and documentation, and provide advanced reporting tools. Type 7767 is based around a Microsoft® SQL-type database with export and backup facilities. Stand-alone browsing licenses allow other users to work with the saved results over a local area network. A built-in report generator allows you to define any report layout, with logos, in Microsoft® Word or Excel® and store it as a reporting template for repeated use.

Standard Solutions

Two standard solutions are available – the ground solution, and the ground and in-vehicle solution. These solutions can be modified or scaled according to need.

Ground Solution

Based on PULSE Standard Configuration Type 3560-B-T41, Vehicle Pass-by Test (Ground Channels), the ground solution provides vehicle external noise measurements simultaneously on both sides of the test track. Vehicle speed and position are obtained using a combination of radar and photocells. A weather station can be added to the system in order to measure environmental parameters in real time. The Type 3645 hardware is a fully integrated unit that contains a PULSE front-end and Pass-by Connection Unit Type 7451 for connecting and powering the photocells, radar and weather station. Everything can be powered from 12 V DC if required.

The solution can be upgraded by the addition of a simple, single-channel telemetry system, WQ-2850, for acquiring engine rpm during the test.

Ground and In-vehicle Solution

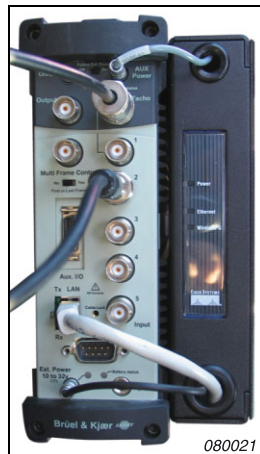
Fig. 4
Type 3645 Ground Station (left) and Type 3643 PULSE In-Vehicle Box (right)



Based on PULSE Standard Configuration Type 3560-B-T42, Vehicle Pass-by Test (Ground and In-vehicle Channels), the ground and in-vehicle solution builds on the Ground Solution by adding an in-vehicle front-end. Parameters such as speed (engine and vehicle), sound, vibration and CAN data can be sample-synchronously measured on the vehicle, with the ground channels. The system uses a wireless LAN-based telemetry

system with built-in synchronisation to maintain sample-synchronous alignment between ground and in-vehicle data.

Fig. 5
In-vehicle Unit Type 3646





There are two standard options for the in-vehicle hardware: In-Vehicle Box Type 3643 and In-Vehicle Unit Type 3646. You can also use other PULSE front-ends to provide more channels within the channel-bandwidth limits of the wireless connection.

PULSE In-vehicle Box Type 3643 provides a robust case with an integrated PULSE front-end, a wireless LAN unit and an optional tach sensor. A normal PC or a tablet PC can be housed and operated from the case, providing a robust and easily transportable solution for in-vehicle measurements. The in-vehicle PC can be used for the Driver's Aid or to run the whole system from within the vehicle. The system has been optimised for this mode, requiring only minimum driver-system interaction during the test.

Compliance with Standards

(For environmental specifications and compliance with standards for PCs, see the specifications given by their respective manufacturers)
TYPES 3643, 3645 AND 3646

 	CE-mark indicates compliance with: EMC Directive and Low Voltage Directive. C-Tick mark indicates compliance with the EMC requirements of Australia and New Zealand.
Safety	EN/IEC 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use. UL 61010-1: Standard for Safety – Electrical measuring and test equipment.
EMC Emission	EN/IEC 61000-6-3: Generic emission standard for residential, commercial and light industrial environments ^a . EN/IEC 61000-6-4: Generic emission standard for industrial environments. CISPR 22: Radio disturbance characteristics of information technology equipment. Class A Limits. FCC Rules, Part 15: Complies with the limits for a Class A digital device.
EMC Immunity	EN/IEC 61000-6-1: Generic standards – Immunity for residential, commercial and light industrial environments. EN/IEC 61000-6-2: Generic standards – Immunity for industrial environments. EN/IEC 61326: Electrical equipment for measurement, control and laboratory use – EMC requirements. Note: The above is only guaranteed using accessories listed in this Product Data sheet.
Temperature	IEC 60068-2-1 & IEC 60068-2-2: Environmental Testing. Cold and Dry Heat. Operating Temperature: -10 to +50°C (+14 to +122°F) Storage Temperature: -25 to +70°C (-13 to +158°F)
Humidity	IEC 60068-2-78: Damp Heat: 80% RH (non-condensing at 40°C (104°F))
Mechanical	Non-operating: IEC 60068-2-26: Vibration: 0.3 mm, 20 m/s ² , 10–500 Hz IEC 60068-2-27: Shock: 500m/s ² IEC 60068-2-29: Bump: 1000 bumps at 250 m/s ²
Enclosure	IEC 60529: Protection provided by enclosures: 3643: Closed IP 64, Open IP 40; 3645: IP 40D; 3646: IP 40D

a. Excluding Type 3643

Specifications – Pass-by In-vehicle Box Type 3643

Pass-by In-vehicle Box Type 3643 consists of:
 Type 3560-B built into a ruggedized, splashproof case with a WLAN unit. A PC can be housed in the case along with a cigarette lighter tachometer

POWER REQUIREMENTS

Fulfills the requirements of ISO 7637-1 and 7637-2 with batteries

Voltage: 10 – 32 VDC

Power Consumption:

Nominal: 20 W

Max.: 32 W (while charging battery)

Ext. Power Connector: XLR

BATTERIES

Optional Accessories: 2 × DR35 NiMH or NI 1030, 10.8 V (nominal)

Working Time (continuous): 3.5 hours

Charging Time: 5 hours/battery

ACOUSTIC NOISE EMISSION (at 1 m)

Silent operation to 25°C (77°F) when not charging batteries. When charging batteries, fan operation may start at a lower ambient temperature

DC OUTPUT

+12 V nominal, dependent on supply voltage

Connector: Cigarette lighter

DIMENSIONS (closed)

Height: 188 mm (7.4")

Width: 460 mm (18.1")

Depth: 350 mm (13.8")

Weight: 10.5 kg (23.1 lb.) with batteries

Specifications – Pass-by Ground Station Type 3645

Pass-by Ground Station Type 3645 consists of:
 ZN-0693 WLAN Unit for PULSE
 Type 7451 Pass-by Connection Box – Powers and supports any photocell device going high (8.4 – 12 V) when the beam is broken. Up to six photocells can be connected
 Type 3560-B

POWER REQUIREMENTS

Fulfills the requirements of ISO 7637-1 and 7637-2 with batteries

Voltage: 12 VDC, 230 VAC @ 50 Hz

Power Consumption:

Nominal: 20 W

With Radar and two Photocells attached: 25 W

Max.: 37 W (while charging battery)

Ext. Power Connector: LEMO coax., FFA.00.113, ground on shield

BATTERIES

Optional Accessories: 2 × DR35 NiMH or NI 1030, 10.8 V (nominal)

Working Time (Continuous): 2.8 hours

Charging Time: 5 hours/battery

ACOUSTIC NOISE EMISSION (at 1 m)

Silent operation to 35°C (95°F) when not charging batteries. When charging batteries, fan operation may start at a lower ambient temperature

DIMENSIONS

Height: 182 mm (7.2")

Width: 170 mm (6.7")

Depth: 270 mm (10.6")

Weight: 5.5 kg (12.1 lb.) without batteries

Specifications – Wireless LAN

Performance dependent on hardware
Throughput (typical): 600 kHz channel × bandwidth product

Range: > 1 km dependent on test conditions and antenna used

Specifications – Pass-by In-vehicle Unit Type 3646

Pass-by In-vehicle Unit Type 3646 consists of:
ZN-0693 WLAN unit for PULSE
Type 3560-B

POWER REQUIREMENTS

Fulfills the requirements of ISO 7637–1 and 7637–2 with batteries

Voltage: 10 – 32VDC

Power Consumption:

Nominal: 20W

Max.: 32W (while charging battery)

Ext. Power Connector: LEMO coax., FFA.00.113, ground on shield

BATTERIES

Optional Accessories: 2 × DR35 NiMH or NI 1030, 10.8V (nominal)

Working Time (Continuous): 3.5 hours

Charging Time: 5 hours/battery

ACOUSTIC NOISE EMISSION (at 1 m)

Silent operation to 35°C (95°F) when not charging batteries. When charging batteries, fan operation may start at a lower ambient temperature

DIMENSIONS

Height: 182 mm (7.2")

Width: 104 mm (4.1")

Depth: 270 mm (10.6")

Weight: 3 kg (6.6 lb.) without batteries

Specifications – PULSE Vehicle Pass-by Software Type 7788

Type 7788 is Vehicle Pass-by software working with PULSE Multi-analyzer System Type 3560

REQUIREMENTS

PC Requirements: Pentium® III 1.4 GHz or better with 1024 MB RAM

Operating System Requirements: Windows® 2000 or XP

Software Requirements: Microsoft® Office 2000 or XP; PULSE FFT & CPB Analysis Type 7700

MEASUREMENT

Vehicle speed and position measured relative to a reference (photocell), noise measured via two microphones (left and right), and additional parameters

PULSE Vehicle Pass-by Test Software, Ground Channels, Node Locked License Type 7788-B-N

- Vehicle speed using radar
- Noise: Overall, FFT, and CPB slices as functions of distance, speed or time, CPB and FFT contours as functions of speed and time
- Auxiliary parameters: air temperature, relative humidity, wind speed, wind direction and user-defined parameters, instantaneous, averaged and max. values available as tags on Waterfall data (up to 12 channels)

PULSE Vehicle Pass-by Test Software, Ground and Vehicle Channels, Node Locked License Type 7788-C-N

Same as Type 7788-B-N with the addition of:

- Vehicle engine speed, vehicle throttle position, user-definable (dependent on hardware and software license) order analysis with doppler correction
- Auxiliary parameters: in-car, user-definable, 12 channels
- CAN data

CALIBRATION

Calibration of dynamic channels using the PULSE Calibration Master. Calibration histories available from the Global Calibration Database

USER INTERFACE

- Standard Windows® GUI
- Four-button operation (Activate, Run, Accept and Cancel)
- Automatic display of summarised measurement results including validation criteria with non-compliance notification
- User-configurable test-documentation input window

AVAILABLE DISPLAYS

- Level vs. Position
- Spectra vs. Position
- Doppler-corrected Spectra vs. Position
- Slice vs. Position
- 2D Graphics – Real time
- 3D Graphics – Waterfalls/Contours – Real time
- Auxiliary data (2D and readout)

REPORTS

- User-definable reports with default template supplied
- Displays of all measured data available in Word with live cursors in displays
- Display of meta-data (test documentation) in tabular form

DATA MANAGEMENT

- Microsoft® Windows® SQL Database upgradable to Microsoft® SQL 2005 database
- User-configurable data labels and fields
- Automatic storage of all measurement data and validation criteria along with user-selectable items such as pictures or data recordings
- Browsing of stored data using tree structure, keywords, or SQL statements
- Drag and drop of retrieved data into displays for viewing or comparison
- Easy editing or deletion of stored data
- Exportable as xml or ASCII
- Direct export to Excel®

Ordering Information

Type 7788-B-N	PULSE Vehicle Pass-by Test Software, Ground Channels, Node-locked License
Type 7788-C-N	PULSE Vehicle Pass-by Test Software, Ground and In-Vehicle Channels, Node-locked License

MAINTENANCE AND UPGRADE AGREEMENTS	
M1-7788-B	PULSE Vehicle Pass-by Test Software, Ground Channels Software Maintenance and Support Agreement
M1-7788-C	PULSE Vehicle Pass-by Test Software, Ground and Vehicle Channels Software Maintenance and Support Agreement

Standard Solutions

Ground Solution

Based on PULSE Standard Configuration
Type 3560-B-T41 Vehicle Pass-by Test (Ground Channels), which includes:

- Type 3645-A: Pass-by Ground Station
- Type 7700-N4: PULSE FFT & CPB Analysis, 4-channel, Node-locked license
- M1-7700-N4: Annual Software Maintenance and Support Agreement for Type 7700-N4
- Type 7788-B-N: PULSE Vehicle Pass-by Test software, Ground Channels, Node-locked license
- M1-7788-B-N: Annual Software Maintenance and Support Agreement for Type 7788-B-N

Recommended Accessories

2 × Type 4189-A-021	Prepolarized Microphone
AO-0087-D-012	Screened Connection Cable, BNC to BNC connector, 1.2 m
2 × UA-0237	Windscreen
2 × UA-0588	Microphone Holder
ZZ-0231	Radar Unit
AO-0413	Radar Cable
UA-1522	Tripod
DB-2164	Tripod Adaptor for Tripod UA-1522
WU-0584 ¹	Photocell
AO-04751	Cable for Photocell WU-0584
SB-1537	Light Reflector
4 × UA-0801	Lightweight Tripod used with Type 4189-A-021, SB-1537 and WU-0584
Type 7201-D-xx ²	Dell™ Latitude® High-End Notebook

WEATHER STATION

WQ-1256	Weather Station, Wind Speed/Direction, Temperature, Humidity
WL-1340	Cable for Weather Station, 40 m
WQ-1185	Cable Drum
UA-1522	Tripod for Weather Station

Optional Accessories

WQ-2850	Tel 1-40k TTL 1-ch Telemetry
WL-1391-D-200	Cable Drum with double-screened BNC Cable, 20 m
WL-1195	Cable Roller for Radar Unit, 60 m
WL-1194	Cable Roller for Photocell, 60 m

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1. × 2 (along with accessories) to support bi-directional mode measurements (photocells required at entry and exit of track)
2. xx specifies country: GB, DE, FR, ES, IT, SE

Ground and In-vehicle Solution

Based on PULSE Standard Configuration
Type 3560-B-T42 Vehicle Pass-by Test (Ground and In-vehicle Channels), which includes:

- Type 3645-A: Pass-by Ground Station
- Type 3646-A/X: Pass-by In-vehicle Unit
or
Type 3643-A/X: PULSE In-vehicle Box (for use with in-vehicle PC)
- 2 × ZH-0683: PULSE Wireless Sync Unit
- Type 7700-N8: PULSE FFT & CPB Analysis, 8-channel, Node-locked license
- M1-7700-N8: Annual Software Maintenance and Support Agreement for Type 7700-N8
- Type 7788-C-N: PULSE Vehicle Pass-by Test Software, Ground and In-vehicle Channels, Node-locked license
- M1-7788-C-N: Annual Software Maintenance and Support Agreement for Type 7788-C-N

Recommended Accessories

All the components of the ground solution plus the following components:

UL-0232	8.5 dBi Omnidirectional Magnet-based Car Antenna for Wireless LAN
2 × UL-0234	Antenna Cable, RPSMA to N-Type Female
2 × UL-0233	Antenna Cable, N-type Male to N-Type Male, 3 m
WQ-2575	Lightning Protector for Antenna Cable, N-female to N-female
UL-0231	15 dBi Omnidirectional Antenna for Wireless LAN
WA-1587	Fixture for 15 dBi Omnidirectional Antenna
UA-1522	Tripod for UL-0231
WQ-2659	4.5 m Tripod for UL-0231

Optional Accessories

WQ-2350	Cigarette Lighter Tacho Sensor
MM-0097	Throttle Position Sensor
WQ-2410	Power Splitter (1 to 2) for cigarette lighter socket
WB-3471 ³	Power Distributor (1 to 4 splitter for cigarette lighter socket)
2 × QB-0048	Front-end Battery

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3. WB-3471 replaces WQ-2410 when more than two cigarette lighter sockets are required

PULSE DATA MANAGER

Both Type 7788-B-N and Type 7788-C-N licenses include:

- PULSE Data Manager Type 7767-A license
- A demo database with a predefined structure specifically designed for the pass-by application
- Predefined report templates working with the demo database

Type 7767-B-N is required when one or more of the following requirements has to be fulfilled:

- For larger installations with multiple browsing stations accessing the PDM database
- Database located on a separate PC (server)
- Data storage capability larger than 2 GB
- User-configurable meta/header data for database
- User-definable reporting

In such cases, the following items are required:

Type 7767-B-N	PULSE Data Manager, five-user, node-locked license
M1-7767-B-N	Annual Software Maintenance and Support Agreement for Type 7767-B-N
BZ-5445	Microsoft® SQL Server 2005 Standard Edition, five users
BK-0058	System Installation, per day

A BZ-5444 PULSE Data Manager browsing license must also be added for each additional office station browsing the database

To provide ASAM ODS connectivity the following license is required:

Type 8605	ASAM ODS Connectivity
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INSTALLATION AND TRAINING

BK-0058	System Installation, per day
BK-0060	On-site Training, per day

TRADEMARKS

Dell is a trademark and Latitude is a registered trademark of Dell Computer Corporation

Microsoft, Windows and Excel are registered trademarks of Microsoft Corporation in the United States and/or other countries

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