

# Pile Integrity Tester (PIT)



**Assesses the structural integrity of augered cast-in-place, continuous flight auger, drilled displacement and bored piles, drilled shafts, driven concrete or timber piles and concrete filled pipes.**

The Pile Integrity Tester performs Low Strain Impact Integrity Testing by the Pulse (or Sonic) Echo or Transient Response Methods. These methods are also collectively known as Pile Integrity Testing or Low Strain Dynamic Testing. The interpretation of PIT data may reveal potentially dangerous defects such as major cracks, necking, soil inclusions or voids and, in some situations, may determine unknown lengths of piles that support existing structures such as bridges or towers.

## The Test:

The PIT test consists of placing one or two accelerometers on the foundation to be tested, (generally at least one on the exposed top), and hitting it with a small hand held hammer (instrumented or not). The impact of the hammer generates a stress wave that propagates down the foundation and reflects back up. The accelerometer collects data that reveals the pattern of wave propagation and reflection. Piles with flawless shafts typically show a reflection from the pile toe at the expected time, which corresponds to the pile length. If a defect is present along the shaft, its size and location affect the propagation and reflection of the wave. PIT tests may also help estimate the depth of the pile toe (the pile length) in intact piles with embedments less than 30 diameters. PIT data is evaluated in the field and later transferred to a personal computer for further analysis by the PIT-W software.



*PIT-X; PIT-XFV has a similar look*



*PIT-FV; PIT-V has a similar look*



## Models for Various Applications:

The Pile Integrity Tester is available in two sizes and various configurations as shown on the table below. All models read data from at least one accelerometer and output a graph of velocity (integrated from the acceleration signal) versus time (translated to distance) as shown on the screen of the PIT-X above.

Models of PIT with 2 channels of data acquisition may output a second curve on the same graph, either the force of the impact of an instrumented hammer or a second velocity integrated from an accelerometer placed further down along the shaft (usually side mounted). A second velocity is useful to test piles under existing structures, or of unknown length. The force signal is useful to investigate potential damage near the top of the foundation, to test large diameter shafts or short foundation elements, and to assess integrity by the Transient Response Method.

All Pile Integrity Tester models are operated by one person, have an easy-to-use touch screen, and run an entire day on an internal rechargeable battery. All conform with ASTM D5882 and other codes, specifications and norms.

Model	Screen Size	Wireless	Traditional (cabled)	Velocity only	Force & Velocity	2 Velocities
PIT-X	9.4 cm	✓	✓	✓		
PIT-XFV	9.4 cm	✓	✓	✓	✓	✓ (traditional only)
PIT-V	21.3 cm		✓	✓		
PIT-FV	21.3 cm		✓	✓	✓	✓

**Quality Assurance for Deep Foundations**

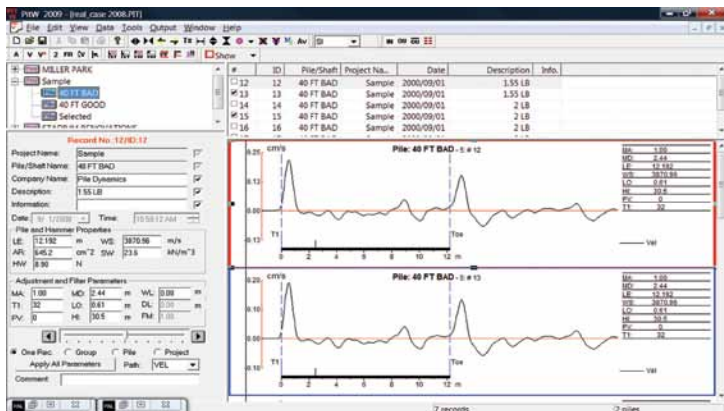
# Data Processing Software

## PIT-W Standard Version

A license of PIT-W Standard is supplied with all models of PIT. PIT-W Standard allows data to be filtered and magnified with an exponential amplification as a function of time, facilitating analysis, which this version performs in time domain. In most situations the analysis in the time domain is sufficient to help locate the depth of a potential defect. If an instrumented hammer is used, PIT-W Standard may output a force-velocity plot and perform Surface Wave Analysis, recommended for piles of large diameters. PIT-W Standard Version outputs user customized tables and reports.

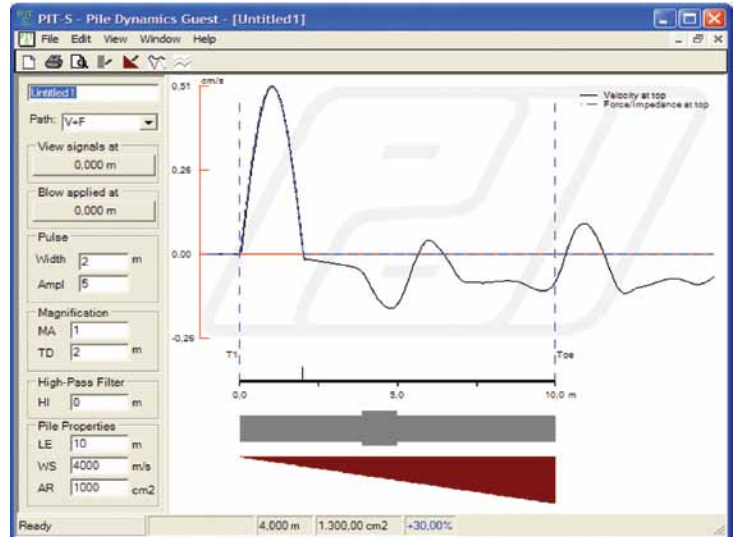
## PIT-W Professional Version

PIT-W Professional Version has all the features of the Standard Version plus advanced tools to estimate the impedance (and shape) of the pile and quantify the severity of defects. In addition, it analyses records from two accelerometers (calculates wave speed, separates the upward from the downward travelling wave to help assess unknown length) or from an instrumented hammer (Frequency Domain Analysis). Frequency Domain Analysis, through study of the dominant frequencies of the PIT signals, may aid in the detection of anomalies and in the estimate of their locations; it may also reveal the unknown length of an existing foundation. Another useful feature of PIT-W Professional Version is the Multiple Column Plot, which helps compare various records.



## PIT-S

The PIT-S software simulates the performance of low strain integrity testing with the PIT. It allows the user to enter a pile shape, realistic soil layer properties and characteristics of a hammer impact. It then displays the signals that would result from a test performed in those circumstances. Curves simulated by PIT-S may be overlaid over measured curves for a simple signal matching process that helps investigate the cause of observed reflections. A demonstration license of the PIT-S software is supplied with all models of PIT and is also available as a free download from [www.pile.com/pit](http://www.pile.com/pit).



## Fast Fourier Transform Feature

All Pile Integrity Tester models are offered with a Fast Fourier Transform (FFT) feature. FFT is a computational algorithm that calculates the various frequency components of the PIT signal. The FFT feature performs these calculations in the field, and then computes the distances that correspond to the various frequency components. This may help in defect location and in determining the length of short foundation elements (up to 1.5 m). A more comprehensive frequency analysis of PIT signals is performed with the PIT-W Professional software described above.

PIT accessories include hand held hammers, instrumented or not, in a gamut of weights to suit various testing situations. Instrumented hammers may be traditional (cabled) or wireless. PIT accelerometers are available for top or side mounting, and may also be wireless or traditional (wireless model for top mount only).

- 1 traditional instrumented 3"/4 kg\* hammer;
- 2 non-instrumented 2"/1.5 kg hammer (also in 1.5"/0.5 kg and 3"/4 kg);
- 3 side mounted traditional accelerometer;
- 4 traditional top mount accelerometer;
- 5 traditional instrumented 1.5"/0.5 kg hammer (also available in 2"/1.5 kg size);
- 6 wireless accelerometer;
- 7 wireless instrumented hammer.

\* all weights are approximate

Please visit [www.pile.com/pit](http://www.pile.com/pit) for complete technical specifications of each model and accessories.



  
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