

# MICROCORR<sup>®</sup> DIGITAL

## Digital Leak Noise Correlator



Leak noise correlation is the most effective method of pinpointing leaks in buried pipelines. Once leakage has been localised to a particular area of the network, the correlator enables leakage staff to identify precisely where the leak is located along the pipe. In most cases the leak can then be confirmed audibly prior to excavation and repair.

MicroCorr<sup>®</sup>DIGITAL is the latest model of the world's leading correlator brand (over 4,000 MicroCorr<sup>®</sup> units in use worldwide) but is the first fully digital system. This enables it to achieve performance levels well in excess of previous analogue-based systems, with important benefits to the user.

- Totally digital system
- Superior leak detection performance on all pipe materials and sizes
- Quicker and easier to use, especially for less experienced operators
- Automatic parametric filtering (APF)
- Self-calibrating
- Ergonomically designed – lightweight, compact system
- 1/4 VGA colour display
- Remote diagnostics via modem
- Software upgrades via Internet web site
- Optional third outstation for velocity measurement and rapid survey
- Select dedicated or PC-based models



## Fully Digital Correlation

### Digital sensor

- New sensor with improved sensitivity to low frequency noise (for plastic and large diameter pipes and low pressure situations) - down to 0.1Hz
- Wider dynamic range than any previous sensor - can distinguish leak noises 10 times quieter than previous sensors
- True 16 bit  $\Sigma\Delta$  ADC with 10kHz sampling
- Immediate digitisation of received signal
- Independent of sensor orientation (vertical/horizontal)
- Low noise electronics with digital

protocol eliminates interference

- Longer sensor cables possible



New digital sensor with enhanced low frequency sensitivity

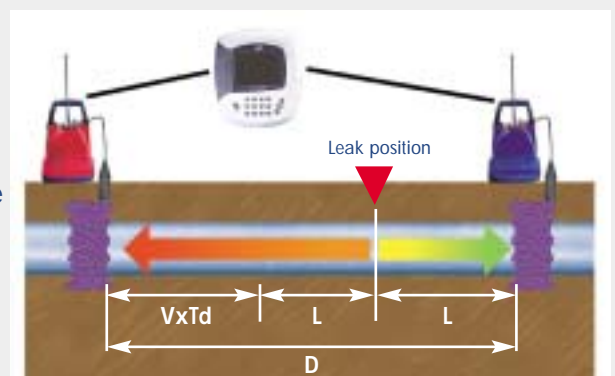
### Digital radio outstation

- Two-way communication with control unit using transceiver technology
- No data loss, interference or distortion of the transmitted signal
- Single UHF radio frequency for all outstations
- Improved dynamic range over analogue radios
- High speed data transmission using transform coding techniques
- No "line of sight" or directional restrictions

## Principle of Correlation

In the "classic" correlation process, two sensors are deployed on pipe fittings ("dry" connection) or connected to hydrants ("wet" connection). The sensors are positioned either side of the suspected leak position. Noise is created by the leak as it escapes from the pipe under pressure. This noise is conducted in both directions away from the leak through the pipe wall (as minute vibrations) and through the water column (as a pressure wave). The leak noise travels at a constant

velocity ( $V$ ), which depends on the material and diameter of the pipe, and arrives first at the sensor nearer the leak. The arrival time at each sensor is registered. The difference ( $T_d$ ) between the two arrival times, combined with knowledge of the pipe type and length, enables the leak position to be calculated by the correlator.



Principle of correlation:  $L = \frac{1}{2} (D - (V \times T_d))$

Depending on the environmental conditions, accuracy of leak pinpointing can be to within centimetres.

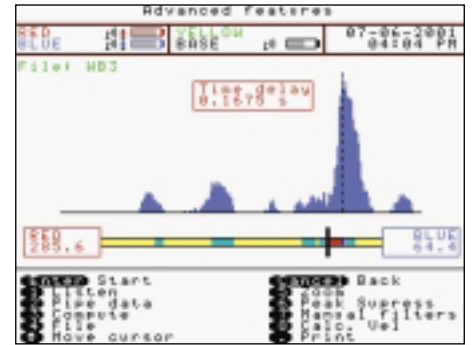
## Digital Leak Noise Correlator



Outstation design incorporates sensor storage and cable wrap

### Digital data processing & analysis

- Benefits of real-time and FFT correlation without the limitations of either
- Automatic parametric filtering
- Context-specific intelligent filter selection
- Full data replay facility
- Optional third sensor operation for automatic velocity measurement



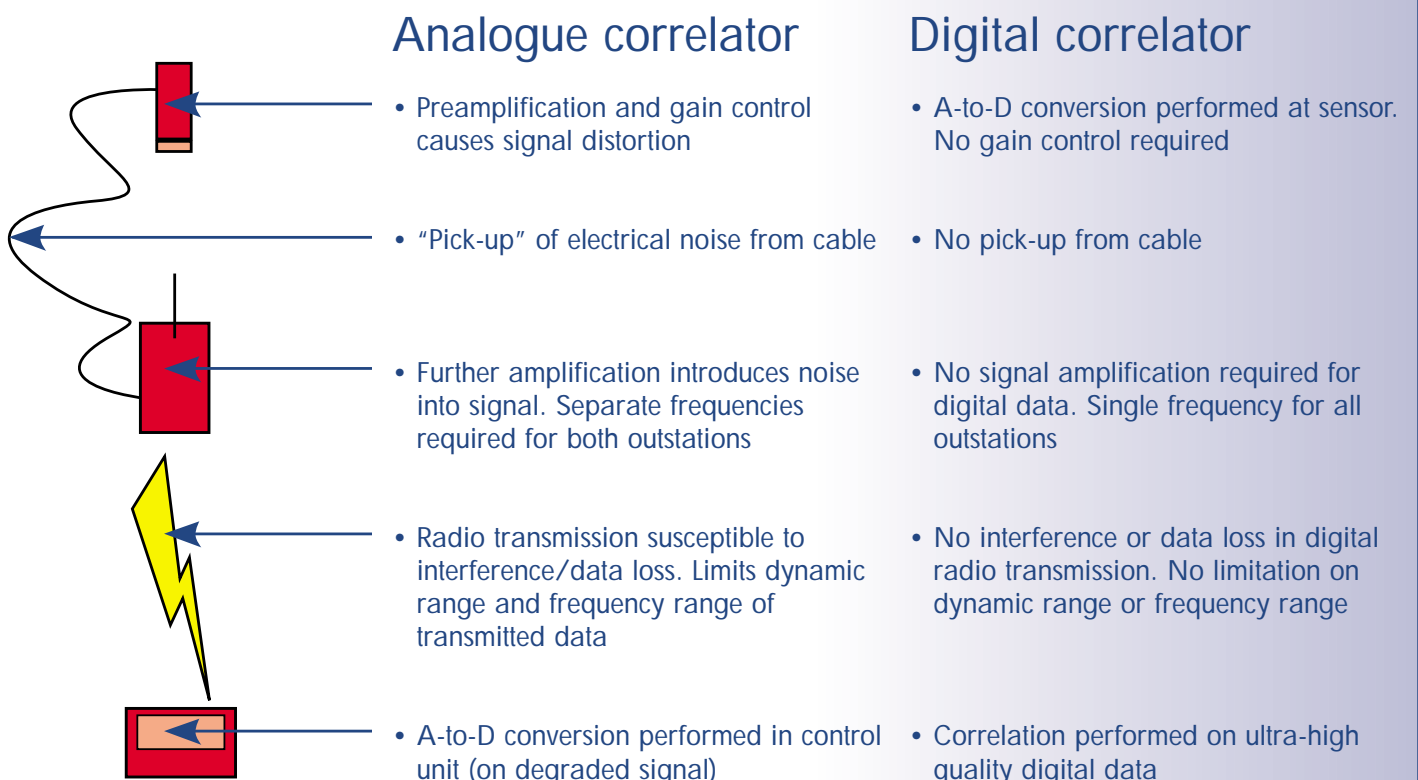
Advanced digital correlation

## Digital Technology – Superior Performance

MicroCorr®DIGITAL is the first fully digital correlator (patent pending). It represents a major step forward in correlation, deriving elements of its technology from high-tech military

sonar and space communications applications. In a conventional analogue system, leak noise quality is subject to degradation as the analogue signal is processed through

sensors, cables and radios. The truly digital system converts noise to the digital format at the sensor, preserving its quality and integrity.



## Innovation in Action



### New Features

- Transceiver communication enables all system functions to be controlled centrally, enabling quicker deployment
- Expert system leak detection algorithms eliminate transient, non-leak effects
- Noise logging – sensors can be programmed to act as noise loggers to localise leak in difficult situations (e.g. low pressure)
- Tricorrelation (optional third outstation/sensor) automatically calculates site-specific velocity
- Remote diagnostics via modem for world-wide field support
- Data replay function allows immediate post-processing or off-line correlation
- Software upgrades downloaded directly from [www.palmer.co.uk](http://www.palmer.co.uk)
- Results transferable into Windows PC for post-processing or export

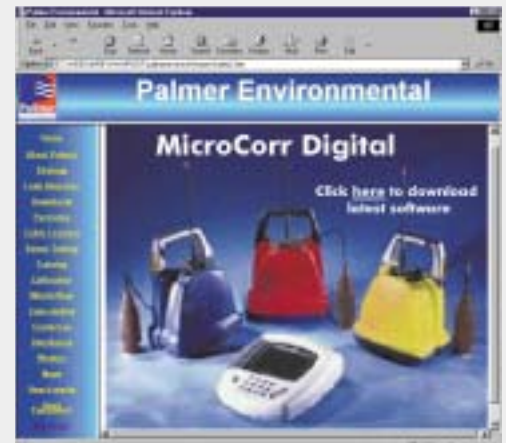
## Digital Leak Noise Correlator

### The first e-Correlator

MicroCorr®DIGITAL is the first correlator that enables software upgrades and system diagnostics to be carried out on-line:

- The Palmer web site [www.palmer.co.uk](http://www.palmer.co.uk) can be accessed to download the latest version of the operating software. New features and functions will be available to all users.

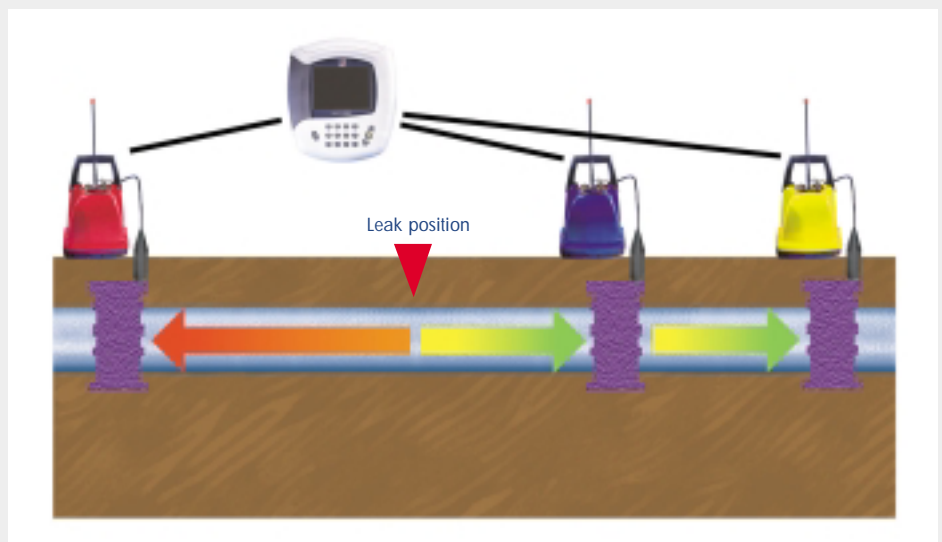
- Palmer Service On-Line can connect to MicroCorr®DIGITAL via a modem to carry out system check functions. In the event of an electronic fault being diagnosed, the correct part can be sent directly to the user or an authorised Palmer service centre.



### Tricorrelation



Tricorrelation (optional yellow outstation and third sensor) enables the velocity of leak noise to be measured automatically, eliminating the most common cause of error in leak pinpointing. Using the correct velocity of leak noise in



correlation can often mean the difference between accurate and inaccurate pinpointing – a key factor in avoiding “dry” holes and enabling difficult leaks to be located precisely.

Tricorrelation enables correlation to be carried out between any pair of outstations, so that the operator can compare the results gained from three correlations. This enables lengths of main to be surveyed more rapidly.

## In Practice – the Best

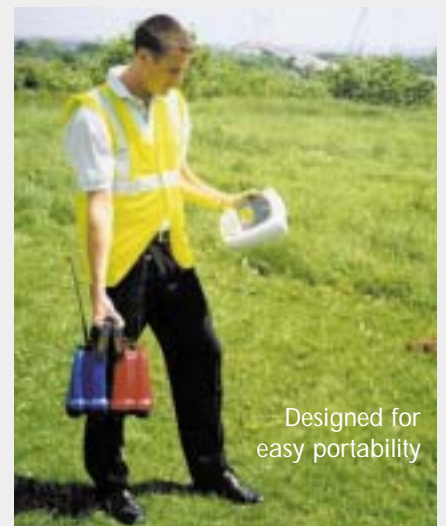
Leak detection staff require a high performance correlator in order to maximise their productivity (number of leaks found per hour) and minimise the incidence of “dry” holes, when excavation reveals no leak to be present. However, because it is used constantly in the field, the correlator must also be robustly designed.

The Control Unit and Outstation are injection-moulded housings, providing maximum strength and durability. They are designed to survive total immersion (IP68) and a 1 metre drop. Both units incorporate internal antennae for short-range correlation, with external antennae used for longer distances and magmount antenna if the Control Unit is vehicle-based. All connectors are military-

specification and cables are fitted with strain relief to protect against fatigue damage. The complete system, comprising control unit with two outstations and sensors, weighs only 7kg and is easily carried by one person. The outstations have been designed to be visible over typical correlation distances and allow back-to-back portability.

## Operational Benefits

- Pinpoints a higher percentage of leaks...
- ...and a significantly higher percentage of “difficult” leaks (plastic pipes, trunk mains, low pressure situations)
- Fewer “dry” holes reduces excavation costs
- Improved productivity - more leaks found per hour
- Easier to use – less training required
- Improved reliability with less downtime
- Lighter yet more robust
- Easily integrates into Company-specific reporting
- New software versions available from [www.palmer.co.uk](http://www.palmer.co.uk)
- Ground microphone “foot” option to improve versatility



Designed for easy portability

### Fully automatic

- Immediate correlation – switch on and go (enter pipe details later)
- Automatic parametric filtering (APF)
- Velocity measurement using (optional) third outstation/sensor
- Self-calibrating

### Easier to Use

- Colour graphical user interface
- Intuitive display and operation
- Quick correlation
- Batteries field-changeable

### Reliability to inspire confidence

- All functions self-calibrated

automatically on power-up

- Remote diagnostics – system can be checked by Palmer Service On-Line
- In-built power management
- Quick charge function
- Increased battery life - batteries rechargeable and field replaceable with no data loss

# Digital Leak Noise Correlator

## Digital System Configuration & Options

	System configuration	Options & accessories
Dedicated correlator	<ul style="list-style-type: none"> <li>Control Unit</li> <li>Two outstations (red &amp; blue)</li> <li>Two digital accelerometer sensors</li> <li>Headphones</li> <li>Windows PC software</li> <li>Internet software upgrade package</li> <li>Transit case</li> </ul>	<ul style="list-style-type: none"> <li>Third outstation (yellow) for automatic velocity check or tricorrelation</li> <li>Digital hydrophones for long-distance correlation</li> <li>Magnetic vehicle-mounting antenna</li> </ul>
PC-based correlator	<ul style="list-style-type: none"> <li>PC (if required)</li> <li>Windows operating software</li> <li>PC interface module</li> <li>Two outstations (red &amp; blue)</li> <li>Two digital accelerometer sensors</li> <li>Headphones</li> </ul>	<ul style="list-style-type: none"> <li>Digital microphone "foot" attachment for acoustic sounding</li> <li>Memory upgrade for &gt;200 correlation files</li> </ul>

## PC-based Correlator

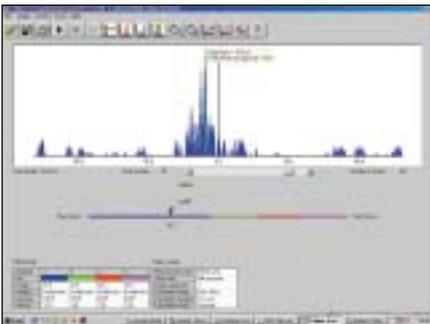
The PC is now the flexible workstation of choice for many companies. The PC version of MicroCorr<sup>®</sup>DIGITAL requires a dedicated PC interface module and the PC operating software, together with the red/blue and optional yellow outstations and sensors. The PC-based system combines all the advantages of fully digital correlation with PC graphics

and versatility of operation to deal with even the most difficult leak detection situations.

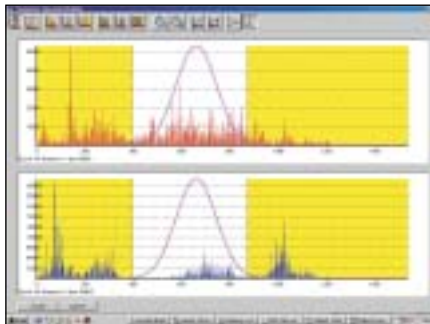
Additional benefits include:

- Full VGA/SVGA/XVGA graphics
- Identification of transient effects
- Multiple peak suppression
- Post-processing of digital correlation data

- Disk storage and archiving in standard report formats
- Combine with other leakage applications (e.g. Permalog<sup>®</sup>)
- Lightweight and portable
- Dedicated vehicle mounting options.



Powerful PC software for automatic leak calculation



Filters are calculated automatically



## Technical Specification

### Control Unit

**Process**

Full digital correlation

**Frequency response**

0.1 to 5000Hz

**Filter selection**

Automatic Parametric Filtering

Manual setting if required

**Resolution**

± 0.1m

**Display**

Backlit colour 1/4 VGA

**Antennae**

Integral antenna for short-range

External antenna/magmount

**Mixed material**

6 sections

**Correlation files**

Up to 10 files stored

Plug-in memory upgrade for >200 files

**Battery level indication**

For all system units

**Battery type**

Rechargeable Lithium ion batteries, field replaceable

**Battery life**

>24 hours continuous use without backlight

14 hours continuous use with backlight

**Key functions**

Combined correlation/survey mode

Listen (acoustic survey)

Frequency analysis

Peak suppression

Compute

Data replay for post-processing

Velocity measurement (tricorrelation option)

User definable pipe types & velocities

**Language**

Selectable via menu

**Operating software**

User upgradable from [www.palmer.co.uk](http://www.palmer.co.uk)

**Printer output**

RS232 to parallel printer

**PC download**

Via PC software, Windows-compatible

**Dimensions**

220mm x 250mm x 100mm

**Weight**

1.8kg

**Operating temperature**

-15°C to +50°C

**Shock protection**

Drop tested to 1 metre

**Environmental**

IP68

**Enclosure**

Fully injection-moulded ABS

**Connectors**

Military specification Amphenol

**Diagnostics**

Self-test and auto-calibration on power-on

Remote diagnostics via modem

### Outstation

**Radio communication**

Single frequency digital transceiver

**Radio frequency**

UHF (local regulations apply)

**Controls**

ON/OFF (all functions remotely controlled and monitored from Control Unit) with LED status light

**Connections**

Headphones

External antenna (if required)

**Battery type**

Rechargeable Lithium ion batteries, field replaceable

**Battery life**

>18 hours

**Hazard indication**

Flashing lights (2)

**Antenna**

Integral pivoted antenna for short-range

External antenna

**Portability**

Integral sensor stowage

Integral cable wrap

**Dimensions**

210mm x 145mm x 305mm

**Weight**

1.6kg

**Environmental**

IP68



MicroCorr®DIGITAL – patent pending

**Housing**

Fully injection-moulded ABS

**Connectors**

Military specification Amphenol

**Shock protection**

Drop tested to 1m

### Sensor

**Type**

Digital sensor with integral high strength magnet

**Frequency range**

0.1 to 5000Hz

**Dynamic range**

>90dB

**Dimensions**

180mm x 50mm diameter

**Weight**

1kg

**Environmental**

IP68, rubber shroud for shock protection

**Connection to Outstation**

2m cable with strain relief

Military spec connector

**Palmer Environmental is the world leader in the field of leakage control equipment.**

Our product range includes:

- Data loggers for flow, pressure and other parameters
- Leak noise logging, correlation and acoustic systems
- Permalog® – telemetry-based installed leak detection system
- Pressure management systems for controlling PRV operation
- GSM, radio telemetry, land-line and other communications systems
- Integrated network management software

For details of our full product range, or for information on a specific product, please contact Inlec, 01642 718900 or visit [www.inlec.com](http://www.inlec.com).

