MicroCorr® Digital+
Users Guide

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MicroCorr® Digital+ Users Guide

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Introduction and Features

MicroCorr® DIGITAL+ is the latest model of the world's leading correlator brand (over 4,000 MicroCorr® 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
- Quick and easy to use, especially for less experienced operators
- Automatic parametric filtering (APF)
- Ergonomically designed – lightweight, compact system
- 1/4 VGA colour display
- *Software upgrades via Internet web site*
- *Optional third Out Station for velocity measurement and rapid survey and tricorrelation*
- *Select dedicated or PC-based models*

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
- *Tricorrelation (optional third Out Station/sensor) automatically calculates site-specific velocity*
- Data replay function allows immediate post-processing or off-line correlation
- *Software upgrades downloaded directly from www.palmer.co.uk*
- *Results transferable into Windows PC for post-processing or export*

Best in the field

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 Out Station are injection-moulded housings, providing maximum strength and durability. They are designed to IP65 protection and the Control Unit incorporates an external antenna and a magmount antenna (optional extra) may be connected for longer correlation distances if the Control Unit is vehicle-based. External antennae are used with the Out Stations.

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 Out Stations and sensors, is easily carried by one person. The Out Stations 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

• Lightweight and robust

• Easily integrates into Company-specific reporting

• New software versions available from www.palmer.co.uk

• Ground microphone “foot” option to improve versatility

• Permalog “Patroller link” 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 Out Station/sensor

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

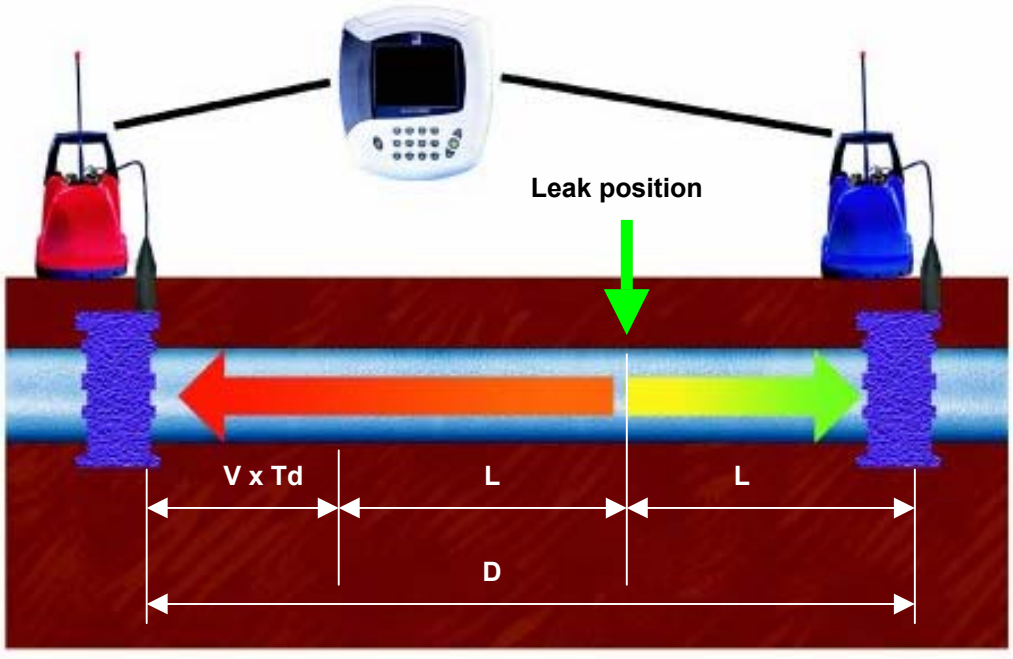
• In-built power management

• Increased battery life – batteries rechargeable and field replaceable

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 (Td) between the two arrival times, combined with knowledge of the pipe type and length, enables the leak position to be calculated by the correlator. Depending on the environmental conditions, accuracy of leak pinpointing can be to within centimetres.

Principle of correlation: L = ½ (D-(VxTd))



System Overview

Standard system configuration

The standard MicroCorr Digital+ system comprises the following equipment:-

1. Control Unit (C.U.)
2. External Antenna for C.U.
3. Carry strap for C.U.
4. Red Out Station (O/S)
5. Blue Out Station
6. 2 x External Antennae for O/S
7. 2 x Digital Sensors with cables
8. Headphones (for use with C.U. or O/S)
9. MicroCorr Digital+ PC communications cable
10. Mains power supply/charger for 2 Out Stations
11. Mains power supply/charger for Control Unit
12. 12V DC power/charge lead for C.U. or O/S
13. Operating manual

Optional accessories

1. PC software (for upgrades, diagnostics, PC interface)
2. Spare battery pack with charge lead
3. Vehicle magmount antenna with cable
4. Digital hydrophones with cables (set of 2)
5. Leak noise CD
6. Microphone foot
7. Tripod or ground plate for accelerometer (magnetically attached)
8. Printer cable to standard Epson/HP printer
9. Rechargeable colour printer with batteries
10. “Tricorrelation” 3rd (yellow) Out Station and digital sensor, with antenna and charge lead
11. Measuring Wheel
12. Soft carry bags for control unit and Out Station(s)
13. Hard transit case for all system components.
14. Permalog Patroller radio unit

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 1.0Hz

• Wider dynamic range than any previous sensor - can distinguish leak noises much quieter than previous sensors

• True 16 bit ΣΔ ADC with 10kHz sampling

• Immediate digitisation of received signal

• Low noise electronics with digital protocol eliminates interference

• Longer sensor cables possible

Digital radio Out Station

• Two-way communication with control unit using transceiver technology

• Virtually no data loss, interference or distortion of the transmitted signal

• Single radio frequency for all Out Stations

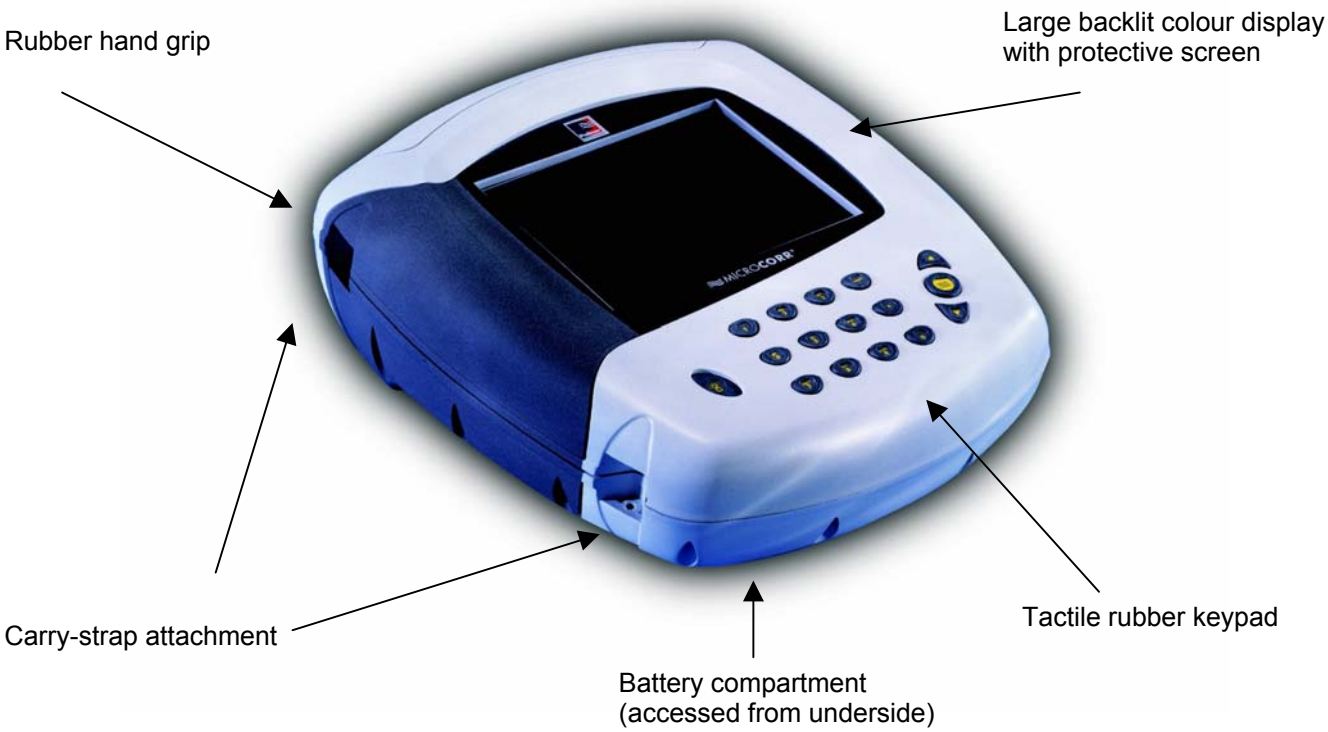
• Improved dynamic range over analogue radios

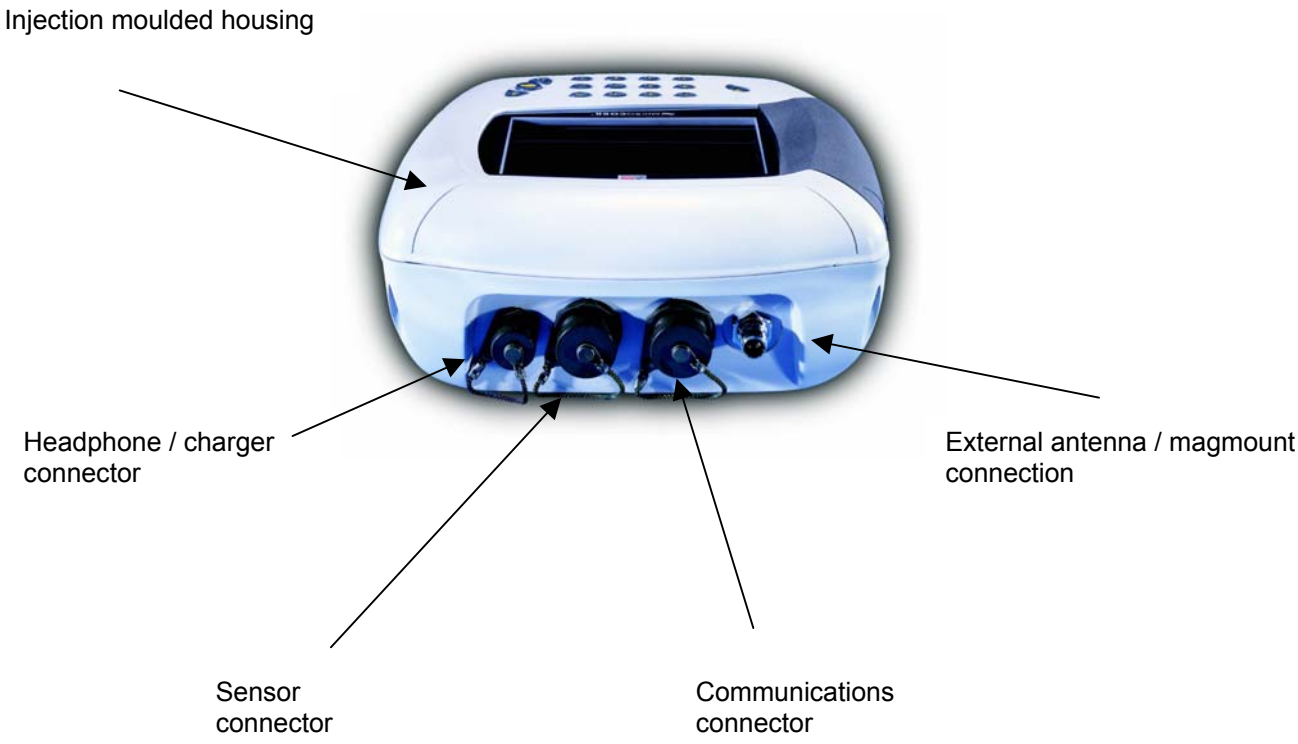
• High speed data transmission using transform coding techniques

• No directional restrictions

New digital sensor with enhanced low frequency sensitivity

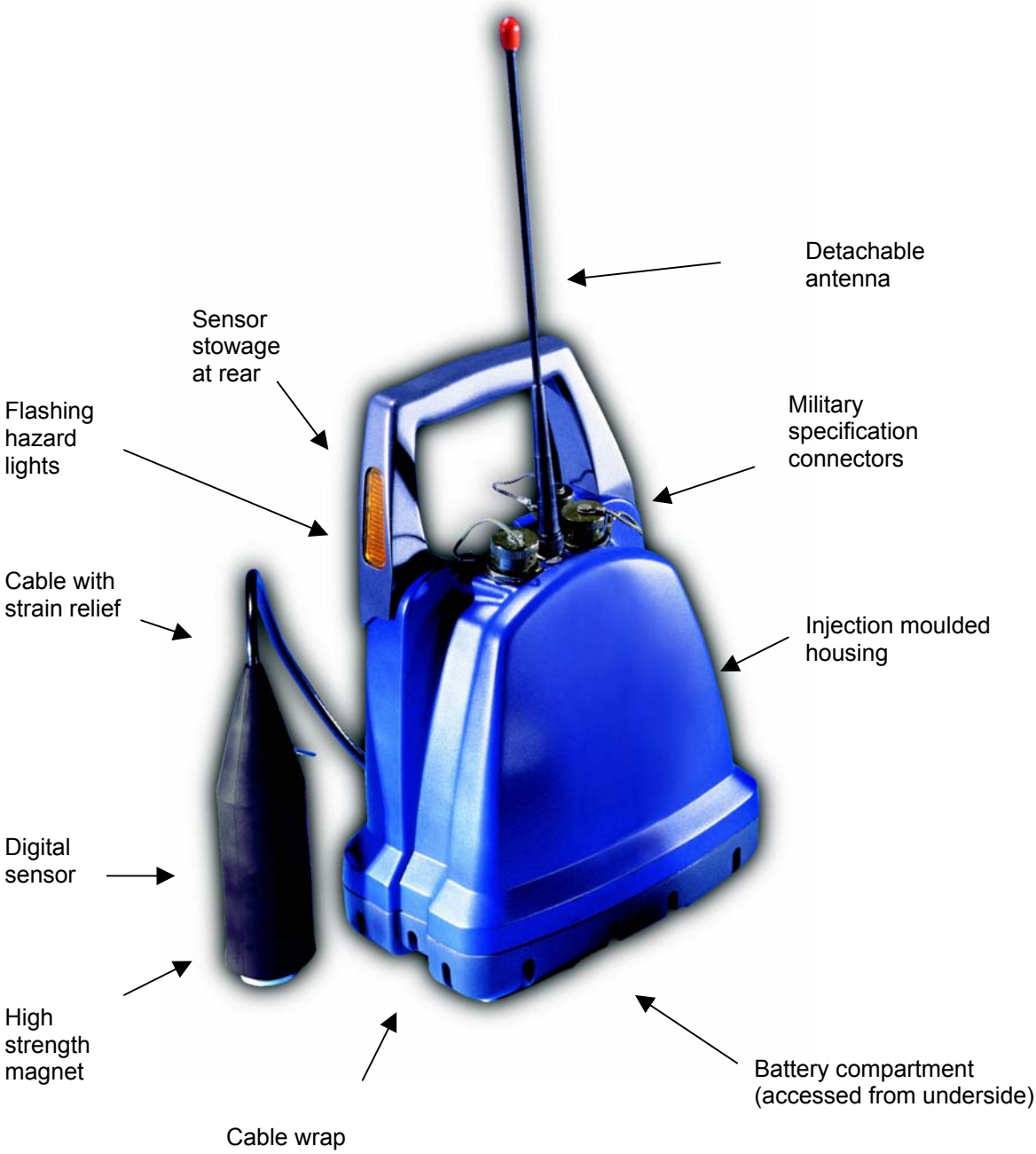
Features of the correlator unit



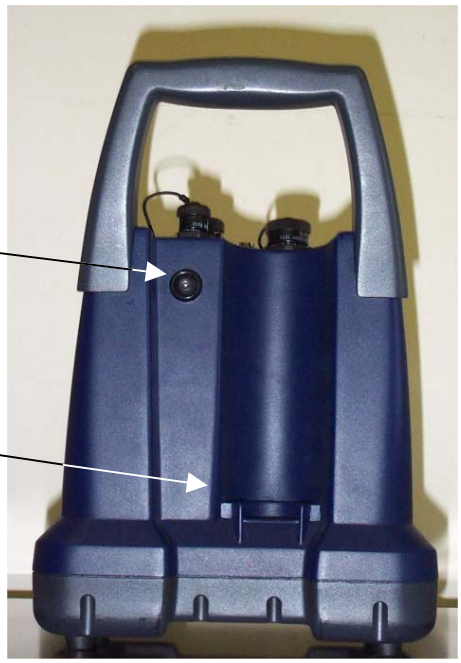


Features of the Out Stations

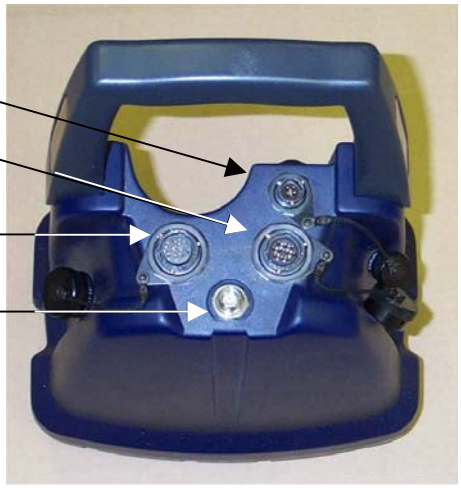
The Out Station consists of a transmitter unit (red, blue – or optionally yellow) and a digital sensor unit complete with cable to connect to the transmitter. Its design incorporates sensor stowage and cable wrap.



Rear of transmitter



Top view of transmitter – connector covers removed

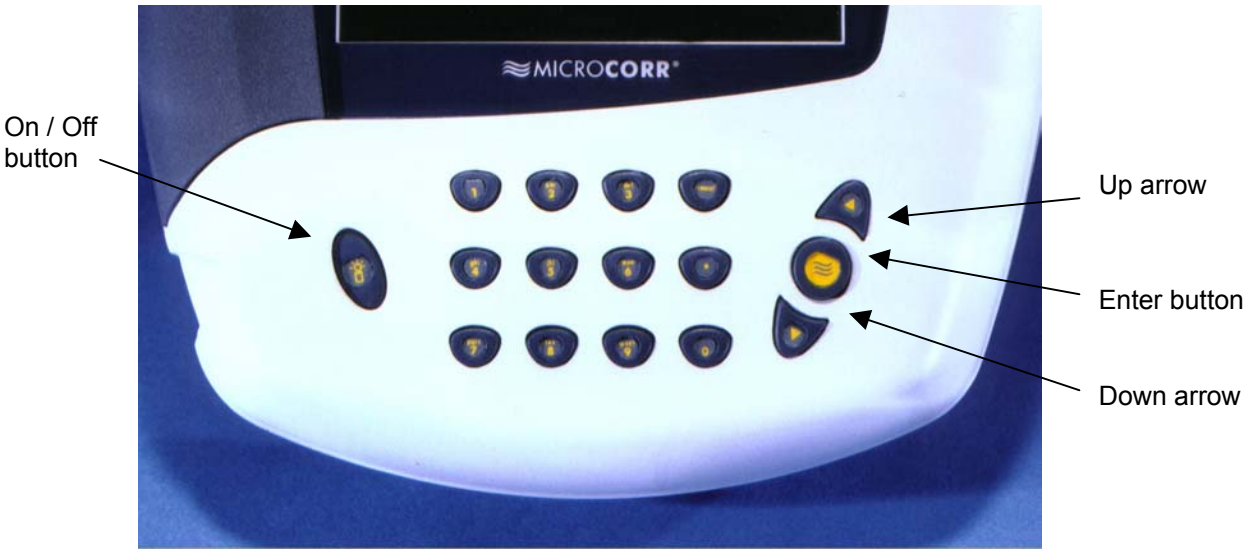


Top view of transmitter – connector covers fitted

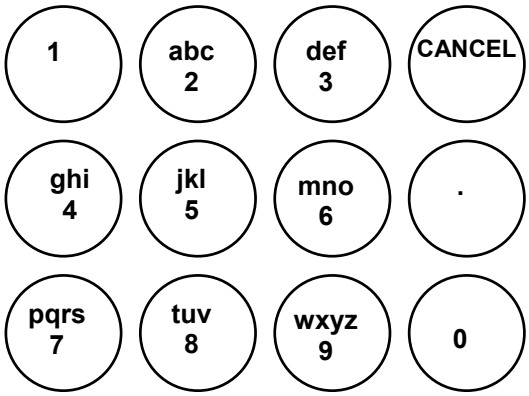
MicroCorr® DIGITAL+ correlator unit operational features

The unit performs accurate leak noise correlations for leak positioning and velocity measurement. It has listening and surveying facilities and its stored information can be downloaded to a computer or printer.

Key functions



Keypad functions



MicroCorr Digital+ has an alpha-numeric keypad, similar to that of a mobile phone including a full stop, cancel, enter and up/down arrows. Navigation through the menus uses combinations of these keys.

- UP/DOWN arrows will select items from within a list
- Numeric to select menu item
- Enter to accept input
- Cancel to move back a menu level.

Using the MicroCorr® Digital+ Correlator

BATTERY WARNING

All three batteries supplied are rechargeable lithium ion. Do not short circuit these batteries. Any misuse of these batteries may result in explosion or fire. They must not be used in any other application or used with any other equipment. Only batteries/battery-packs supplied by Palmer Environmental must be used.

The Palmer sealed battery packs contain circuitry to prevent overcharging and overdischarging.

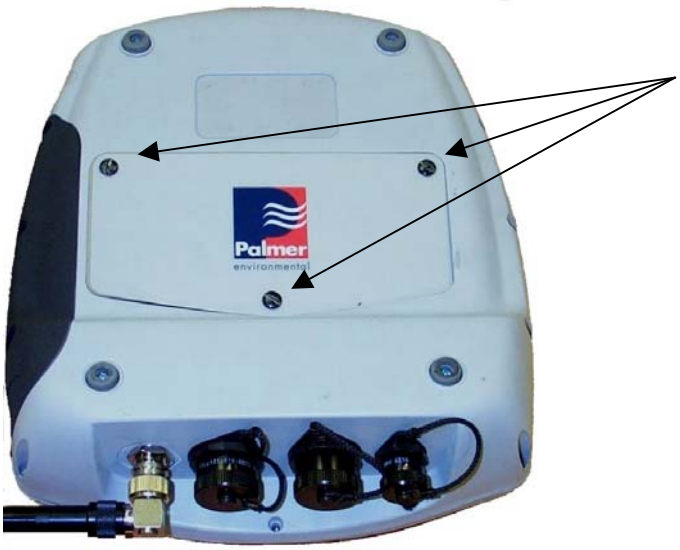
Step 1: Charging and installing batteries

The battery packs for the correlator and the Out Stations are supplied as separate items and will need to be fully charged although they are supplied quarter charged.

Two different battery chargers are supplied: one for the correlator and one for both Out Stations to be charged simultaneously. All three batteries are identical and are interchangeable. Charging for all batteries takes up to 4 hours from flat.

Charging the Correlator

1. To charge the correlator battery, the battery must first be fitted inside the correlator.



Unscrew these 3 quick-release screws to remove battery compartment panel.

2. To insert the battery pack into the correlator unscrew the three screws underneath the unit, remove the cover and packing foam and connect the battery pack, place in the battery compartment, refit the packing foam, and then replace the cover with the three screws.

3. Connect the charge lead from the correlator charger to the headphone / battery charge connector on the back of the correlator. Plug the charger unit into the mains supply and switch on. The correlator will turn itself on and display the battery indicator as charging on the correlation screen.

4. To charge the Out Station batteries they must first be installed. To do this remove the screws from the battery compartment on the bottom of each Out Station, connect the battery lead to the connector and insert the battery. Refit the screws and attach the battery charge lead to the headphone / charge connector on the top of the transmitter. The Out Stations will turn themselves on to charge.

Unscrew these 2 quick-release screws to remove battery compartment panel.

Remember to turn control unit and Out Stations off after disconnecting charger cables.

Although the batteries are rechargeable, they may eventually need to be replaced. Only batteries configured to the correct specification and type must be used. These are available from Palmer Environmental.

TWO OUT STATIONS CONNECTED VIA CHARGER TO MAINS

Step 2: Set up and deployment of Out Stations

1. Once the batteries have been charged and installed in the correlator and the Out Stations, connect the antennae, connect a sensor cable and sensor to each Out Station. Switch on each transmitter by pressing the On / Off button on the back.

2. Transmitter switch functions

To switch the transmitter on, press the switch on the rear of the transmitter once momentarily. The beacons will flash once.

To switch the flashing beacons on, press the switch momentarily again.

To switch the flashing beacons off, press the switch momentarily once more.

To switch the transmitter off, press the switch and hold it in for at least 2 seconds. The beacons will flash three times before the Out Station turns off.

3. **Green LED functions**

The switch incorporates a green LED, which provides the following functions:-

When lit constantly the transmitter is charging.

When flashing rapidly, the transmitter battery is almost fully charged.

When flashing steadily, the transmitter is switched on and performing normally.

When there is a long flash this indicates the battery is discharged and requires charging.

Deploy each sensor on a water pipe fitting either side of the suspected leak position. The sensor has a strong magnet that will enable it to remain in position on steel / iron fittings.

Always try to make a debris free contact between sensor and fitting for the best possible results.

To check sensors are working correctly, connect sensors as normal to Out Station. Connect headphones to the Out Station and listen while running your finger over sensor magnet. A clear crisp noise should be heard.

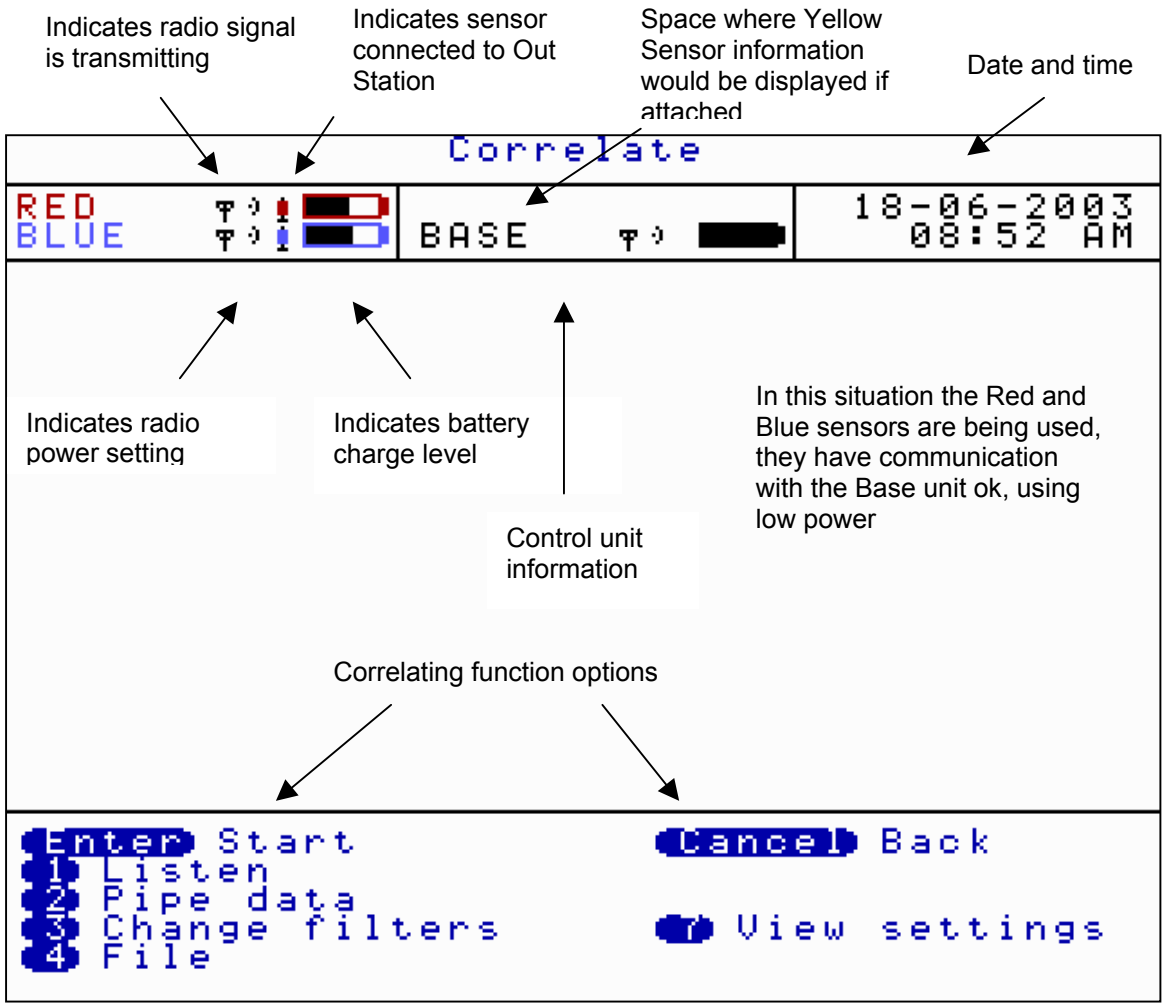
Step 3: Switching on the Correlator

Switch the correlator on by pressing the On/Off switch momentarily. A number of system tests are carried out on power up to ensure the correlator is fully functional. After a few seconds the main correlation screen will appear on the display as shown below. Note, this is the default screen on start-up to enable the operator to start correlating immediately. The Main Menu screen is accessed by pressing Cancel.

To switch the correlator off, press the On/Off button and select 2, to switch off

To turn off the display only, press the On/Off button and select 1, to put into standby. (If the correlator is not then used for 2 hours it will switch off). To reactivate the screen, press the On/Off button again.

The top menu bar on the correlate screen shows information for each sensor by displaying in the relevant colour (except Yellow appears black)

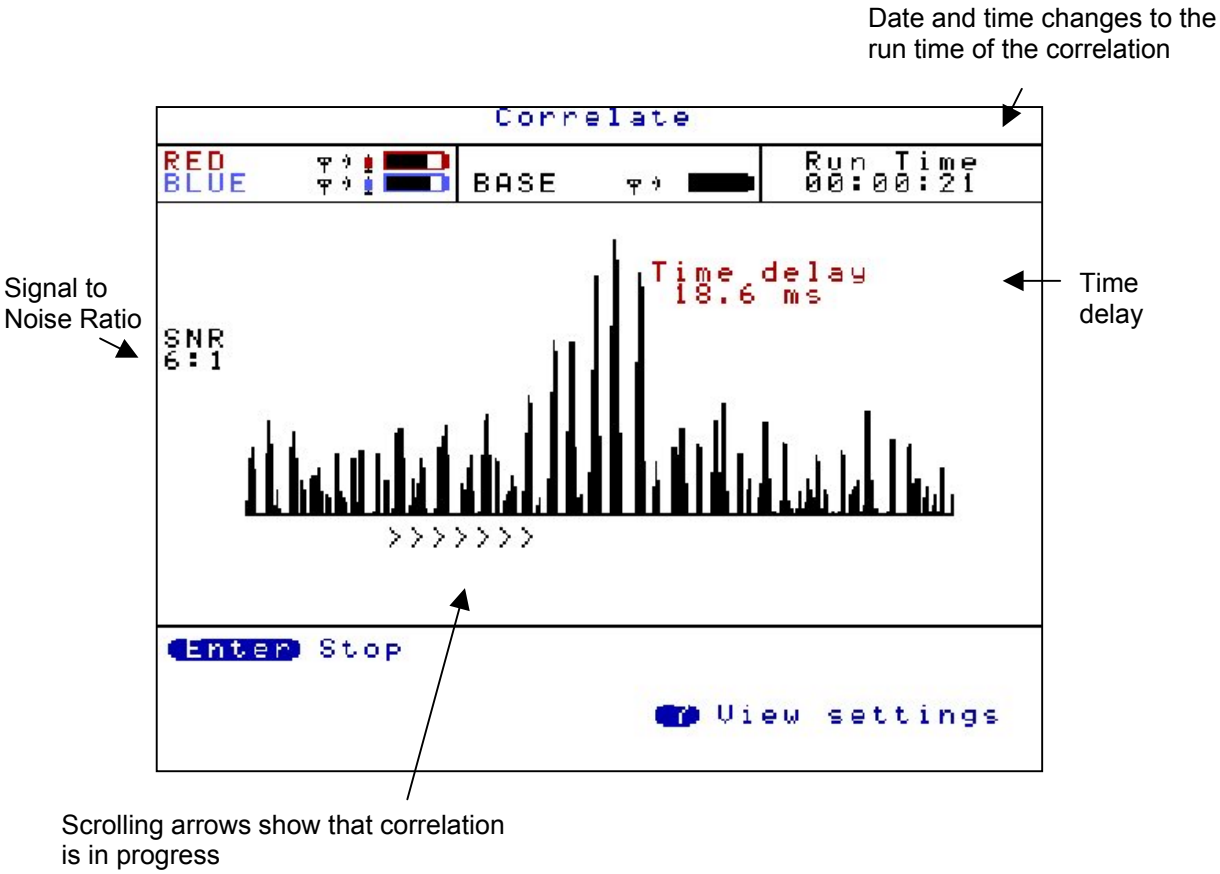


Correlating

The screen shown above is the first screen that appears on the control unit when it is switched on. Once the ENTER key is pressed the system will begin to correlate. Correlation can be stopped by pressing the ENTER key again.

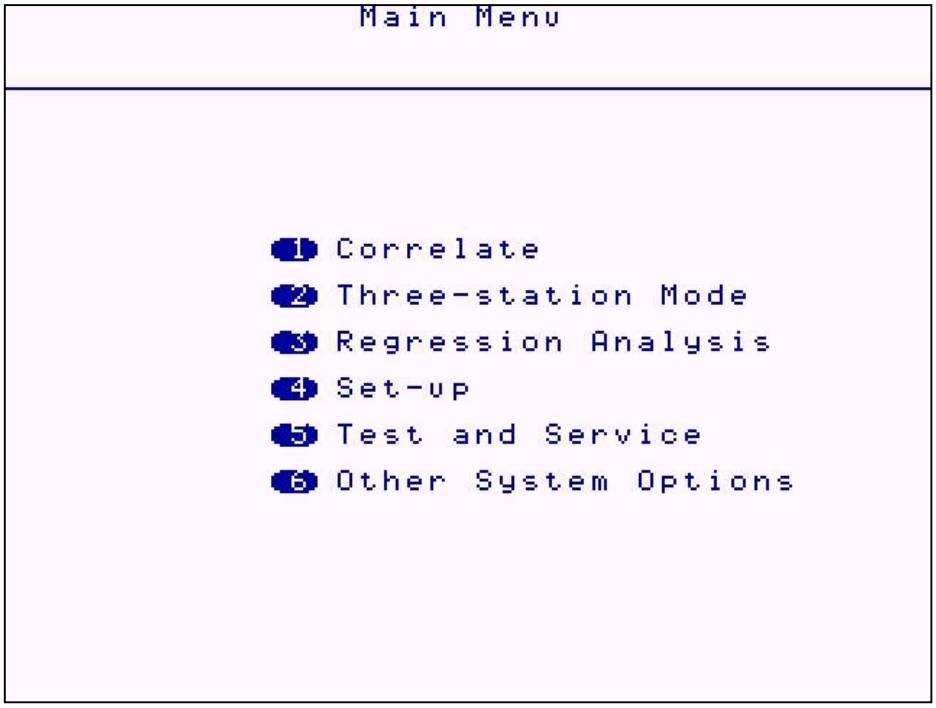
This can be used for quick surveys without having to input any pipe data.

If the Enter key is pressed the control unit will start to correlate as shown below.
Press ENTER to stop correlation, to return to correlator function options



There is an option to select either the Correlate screen or the Main Menu screen as the first screen to appear after turning on. This can be selected by using the Set-up screen (option 4) from the Main Menu.

Main Menu

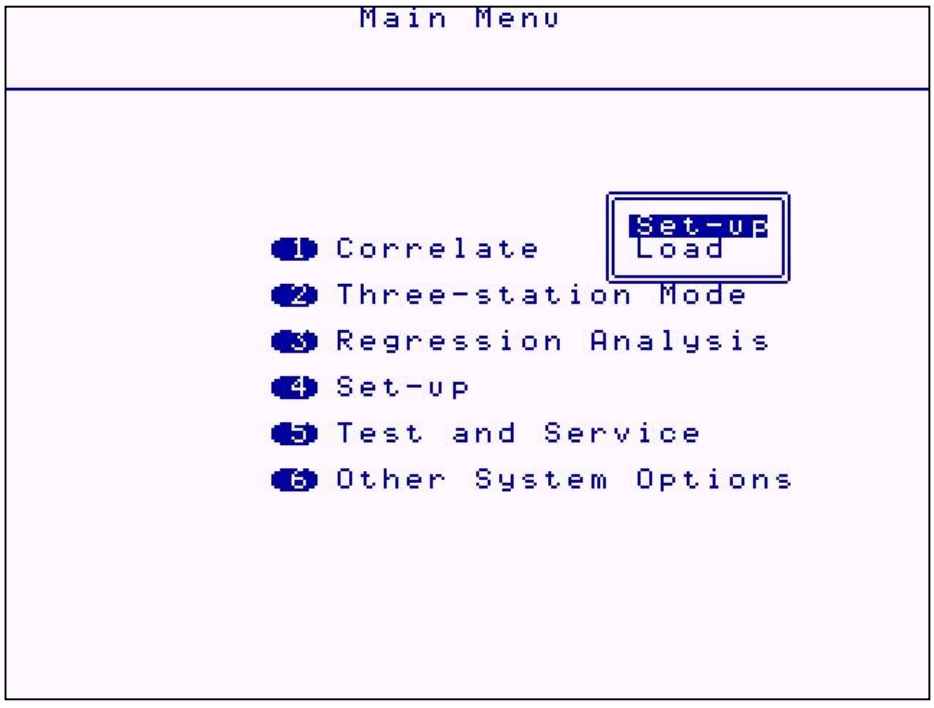


Correlate

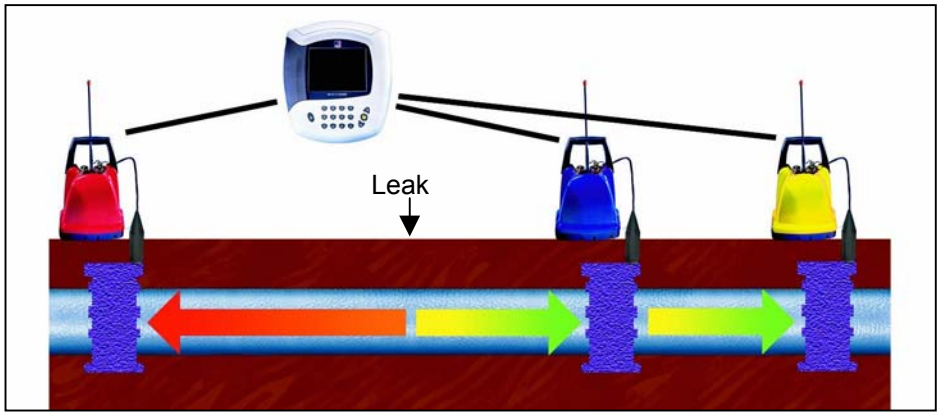
See previous page for quick correlation instructions or Correlation Screen section for more in depth instructions.

Tri-correlation (Three station mode)

Press 2 for Tri-correlation (Three station) mode and select Set-up



Tri-Correlation



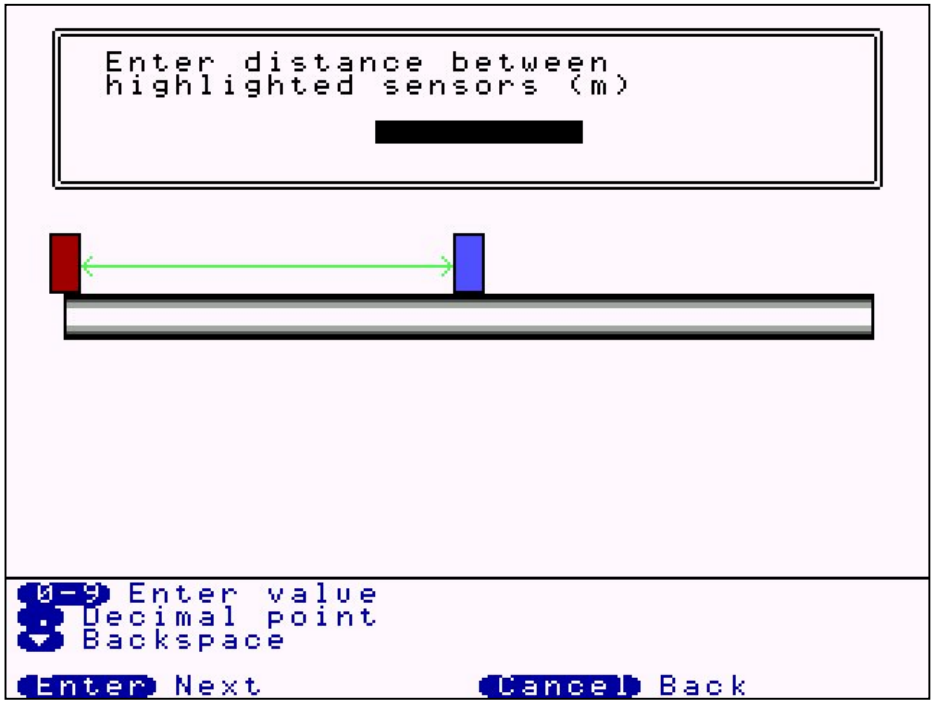
Red outstation (left) **Blue Outstation (in between)** **Yellow outstation (right)**

Tri-correlation Set up

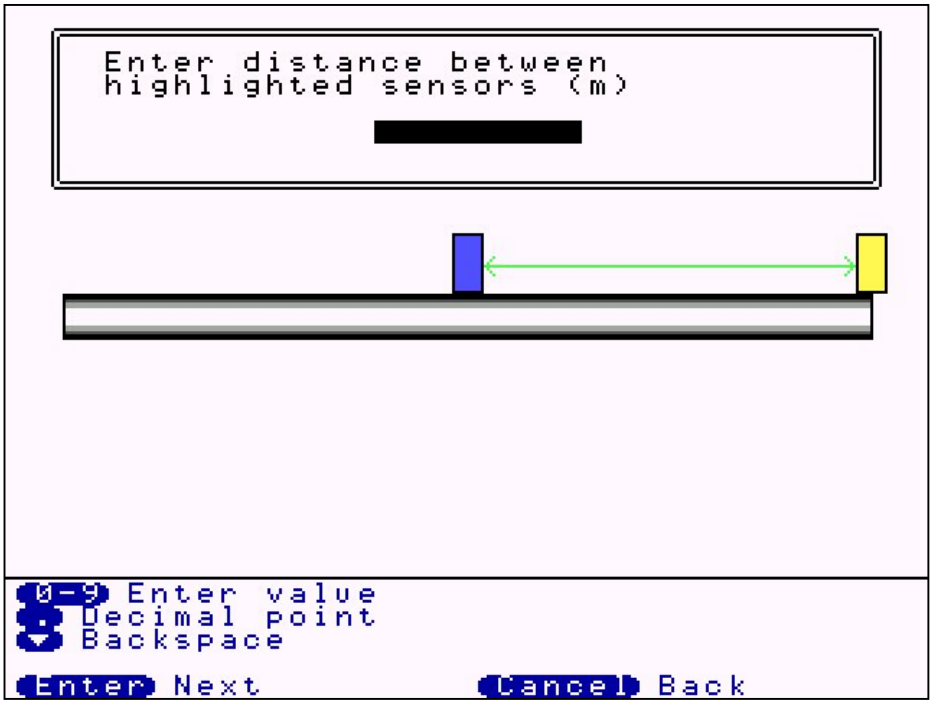
To set up the correlator for three-station correlation, each of the outstations must be positioned relative to each other as shown above.

The sensors must always be placed in the same order on the pipe being surveyed.
i.e. left-to-right - red, then blue, then yellow, as shown above.

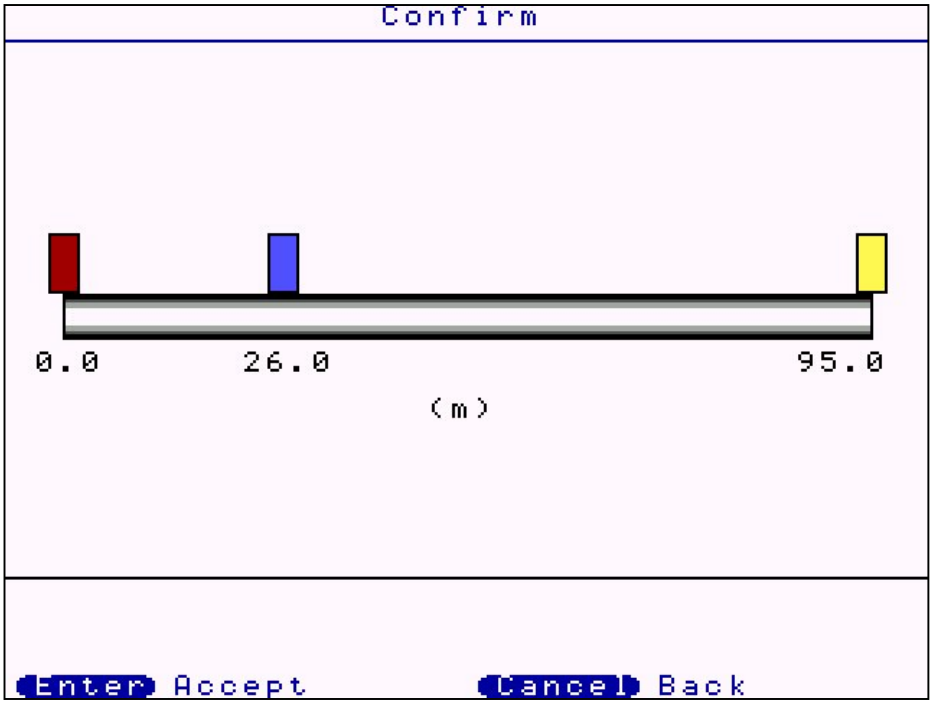
1. Enter the distance between the red and blue sensors



2. Enter the distance between the blue and yellow sensors. The distance between the red and yellow sensors (used for the third correlation) can be deduced for the distances already entered.

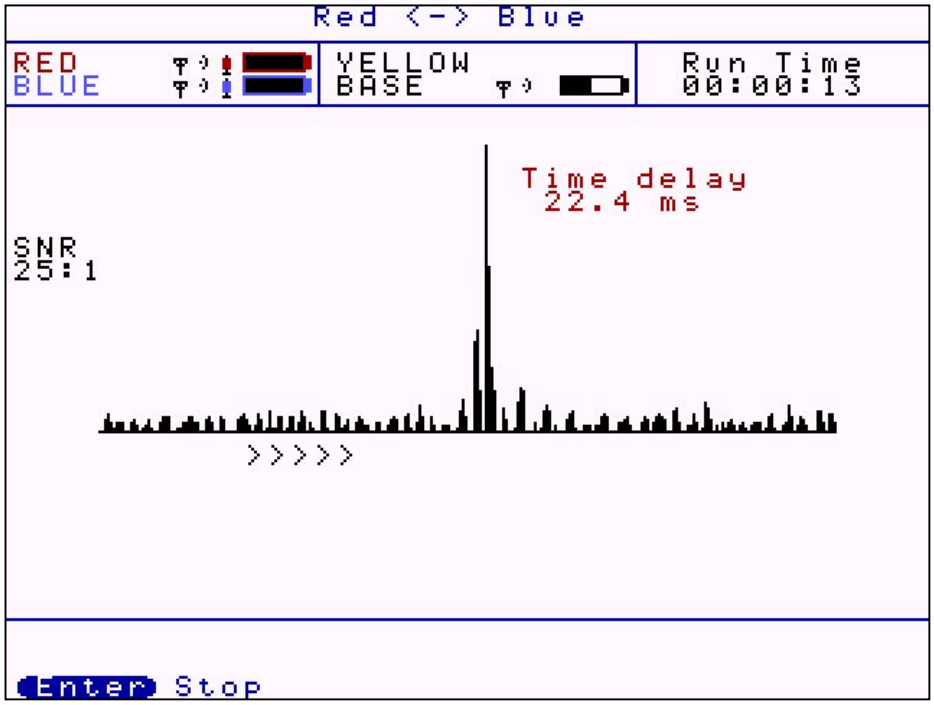


3. Confirm the entered data.

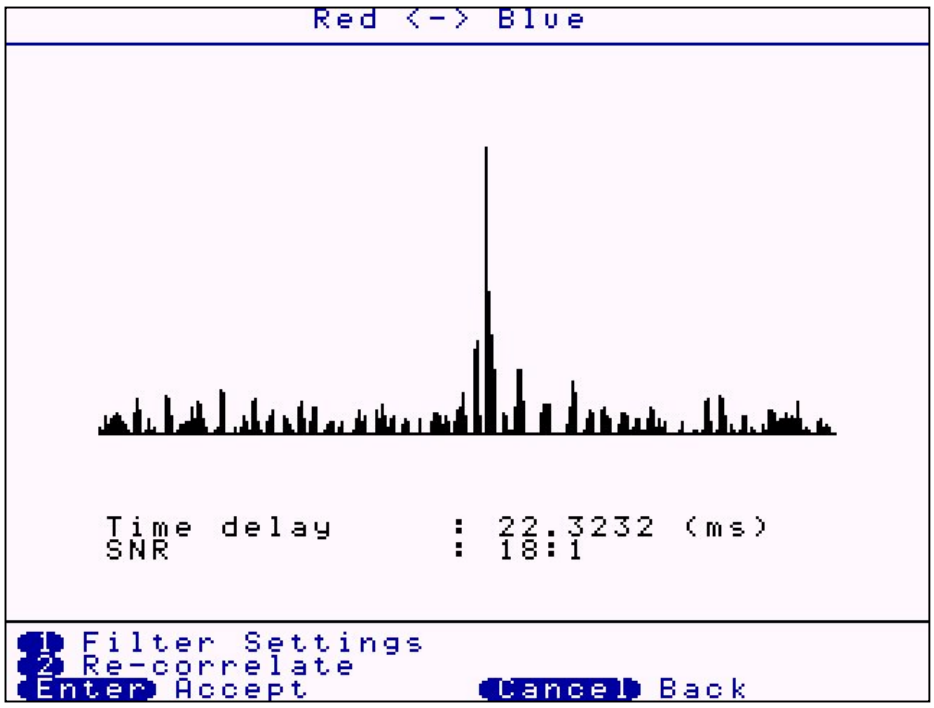


4. Select the filters based upon suspected pipe material. The material chosen here is also used to decide upon the survey range i.e. 0.8s, 2.5s or 4.2s.

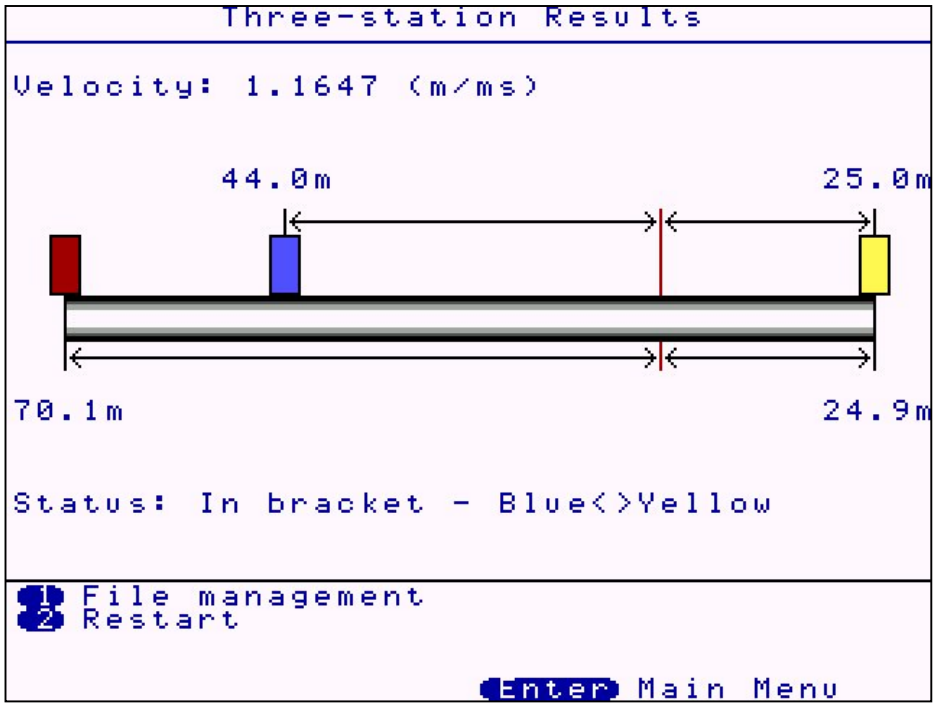
5. Correlate on the first, second and third outstation pairs.



The next screen allows the user to accept the correlation result, modify the filters or to re-correlate. Steps 5 and 6 are repeated for each of the three correlations.



The results of the three-station correlation are displayed with options to save results, reload a previous result, to restart, or to exit the three-station feature.



Regression Analysis

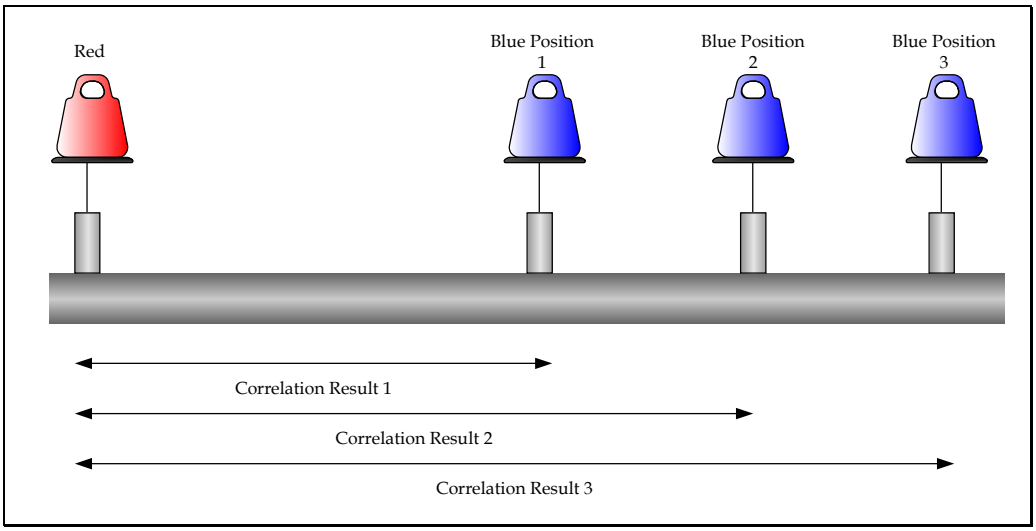
Regression Analysis provides an additional way of pinpointing leak positions by using a set of correlation results, rather than an individual correlation result. This also provides a way of measuring an accurate velocity.

The time delay / distance relationship of the correlation is linear, as the distance between a sensor and the leak noise increases, the time taken for the sound to reach the sensor increases proportionally with the distance. For example, if you move the sensor twice as far away, the sound will take twice as long to reach it. It is this linear relationship that makes it possible to predict values for varying time delays / distances when using a set of correlation results.

Before the regression analysis feature can be used, correlation's must have been saved on the control unit. For an accurate result it is recommended to save three correlation's, but obeying the following two rules :-

- One of the sensors must remain static during the collection of data. Which of the sensors does not matter.

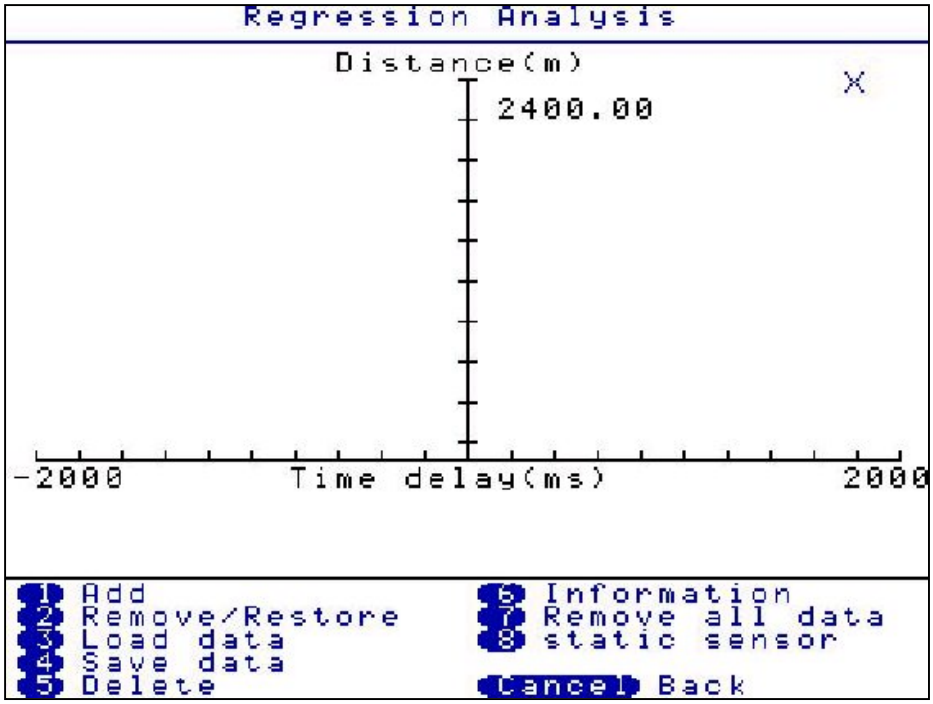
- The pipe material and diameter must be constant for each of the correlation results. This is validated by the control unit.



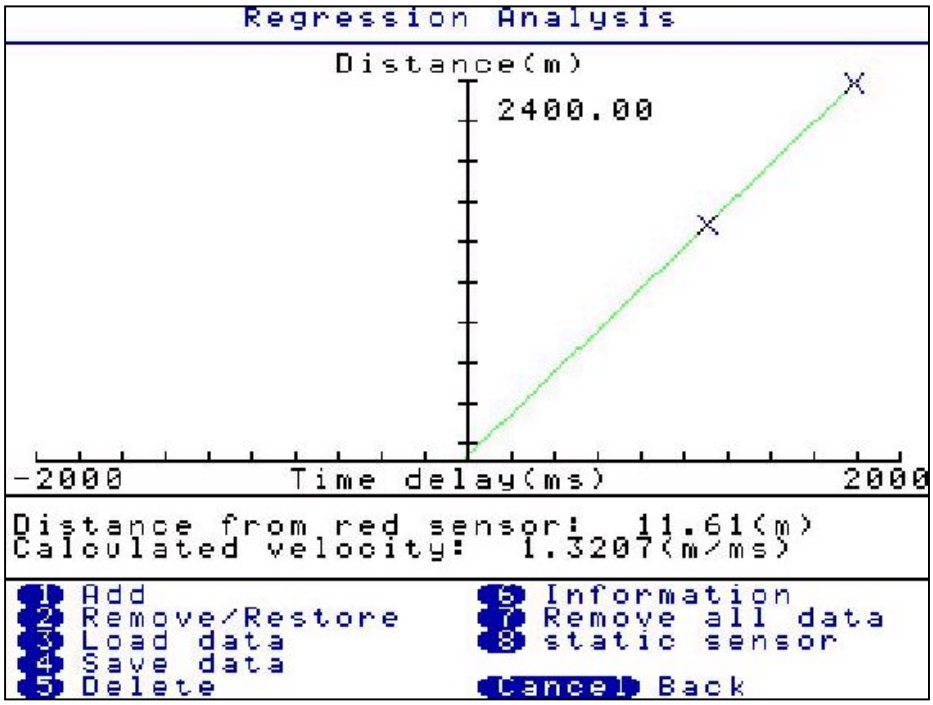
Press 3 (Regression Analysis) After correlation results have been saved. Press 1 to Add a result, the file screen will appear, select the first correlation result saved.

The control unit will then ask for the "Static Out Station" colour. The control unit will store the material and diameter of the first correlation result and compare with the next results to be added, this ensures these details remain constant.

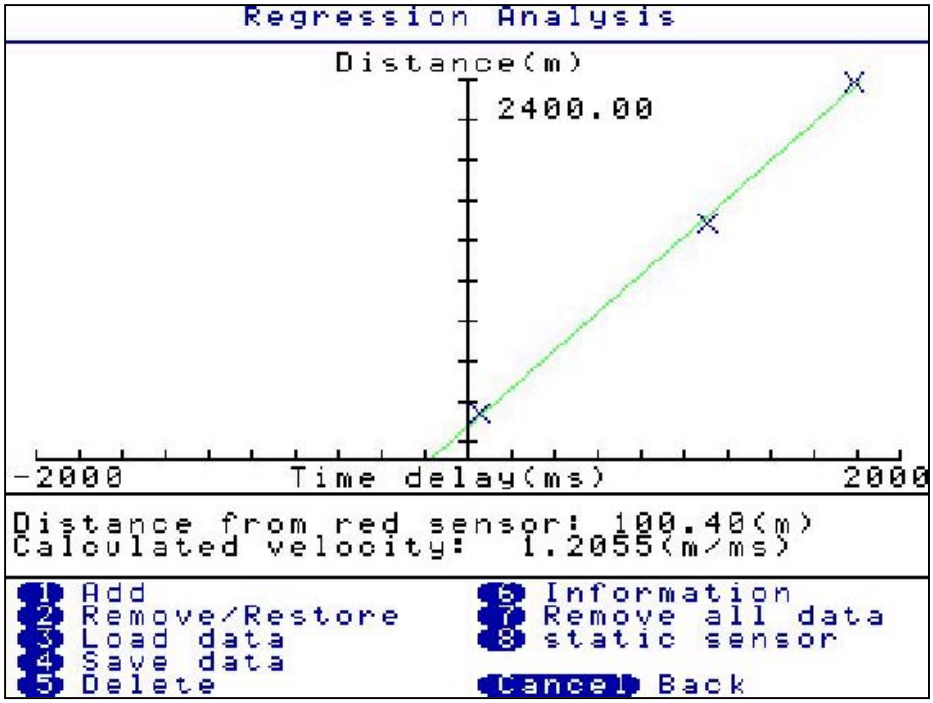
A regression analysis graph will appear showing time delay and distance. A cross will appear on the graph plotting the first correlation result.



Then press 1 to add the second correlation result. A second cross will appear and a line will pass through both. A result will be given on the leak position and velocity, but we recommend the user add a third result for a more confident result.



Then press 1 to add the third correlation result. A third cross will appear and a best fit line will pass through or near the three crosses. The result of the leak position and velocity will be displayed under the graph.



Press 2 (Remove / Restore) Allows you to select a suspicious correlation for removal. After pressing 2, use the arrow keys to select the cross on the regression graph for removal (a box appears around the selected cross) then press ENTER.

Press 3 (Load data) Retrieves previously stored regression analysis graph results.

Press 4 (Save data) Saves the current regression analysis graph results.

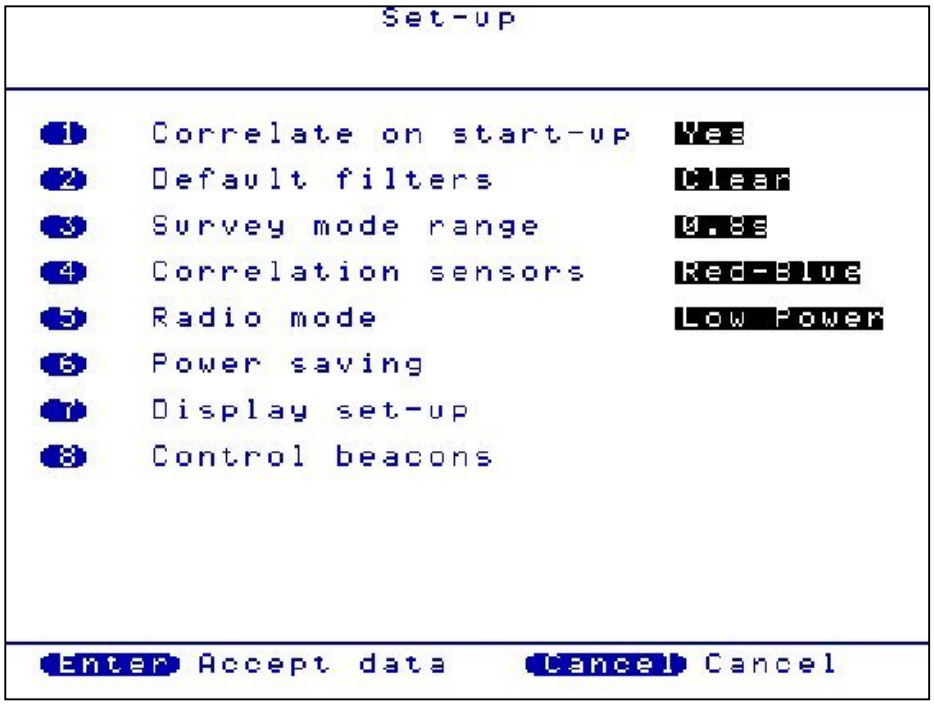
Press 5 (Delete) Enables the deletion of saved regression analysis files.

Press 6 (Information) Displays correlation information. After pressing 6, use the arrow keys to select the cross on the regression graph for information to be displayed (a box appears around the selected cross) then press ENTER

Press 7 (Remove all data) Removes all data currently being used on the regression graph, you will be prompted to verify your selection.

Press 8 (Static sensor) Allows you to change the colour of the static sensor.

Set-up



Press 1(Correlate on start-up) Toggles between YES and NO. If set to YES, the control unit will go straight to the correlate screen after turning on. If set to NO, the control unit will go straight to the Main Menu after turning on.

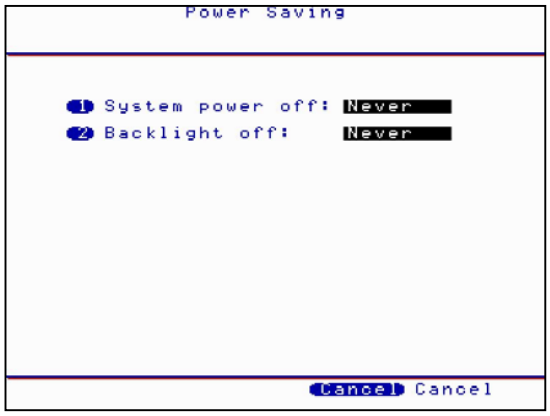
Press 2(Default filters) Toggles between CLEAR and RETAIN. If set to CLEAR, in survey mode, the filters will clear each time a new correlation is processed. If set to RETAIN, in survey mode, the filters will retain a set filter setting (set by the user) for every correlation processed.

Press 3(Survey mode range) Toggles between 0.8, 2.4 and 4.0 seconds. Each of these values provides the time delay range over which the correlator will correlate, where the times in seconds shows twice the range. For example, over longer distances the 4.0 second range should be used to give +2 seconds to –2 seconds. If entering pipe data, the survey mode range automatically defaults to the appropriate setting.

Press 4(Correlation sensors) Toggles between the pairs of sensors to be used. Red-Blue, Red-Yellow, Blue-Yellow, Base-Red, Base-Blue and Base-Yellow.

Press 5(Radio Mode) Toggles between HIGH power and LOW power. LOW power can be used over shorter distances and HIGH power over longer distances or areas where a signal can be interrupted by the environment. The correlator will always default to LOW power when turning on.

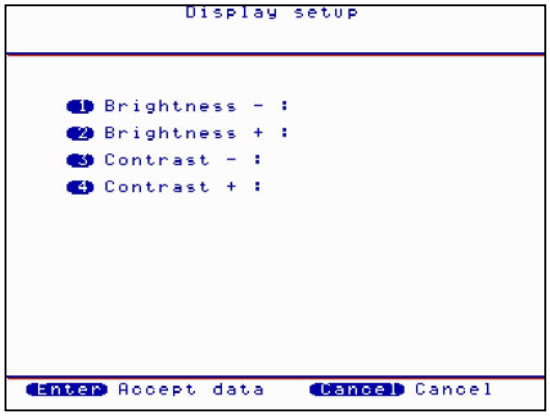
Press 6(Power Saving)



Press 1 to toggle the System power off between NEVER and 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55 and 60 minutes duration.

Press 2 to toggle the Backlight off between NEVER and 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55 and 60 minutes duration.

Press 7(Display set-up)



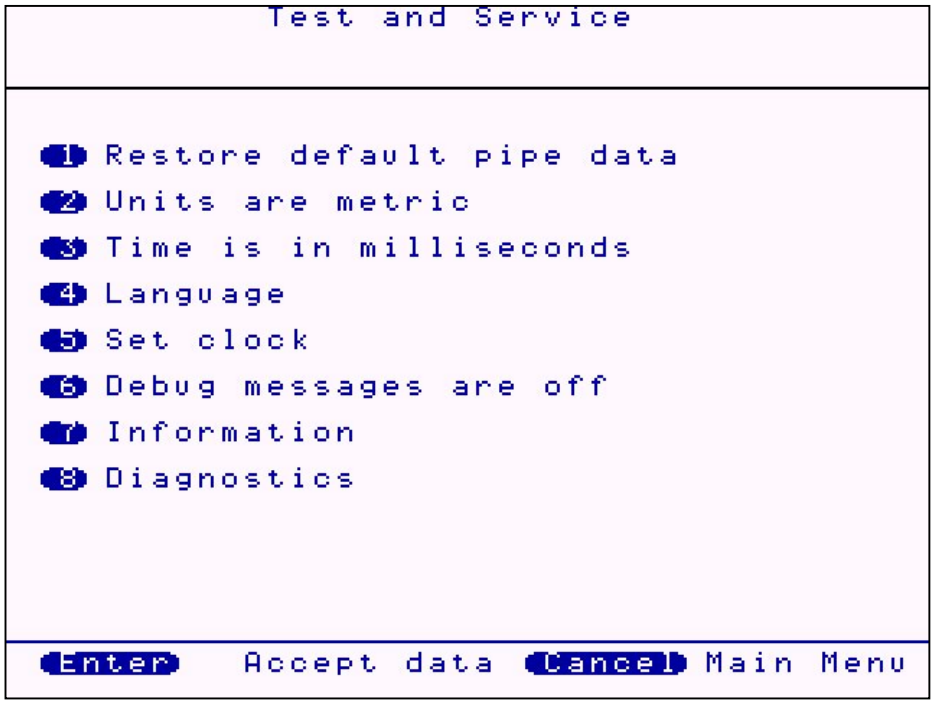
Press 1 to incrementally decrease the screen brightness.
Press 2 to incrementally increase the screen brightness.
Press 3 to incrementally decrease the screen contrast.
Press 4 to incrementally increase the screen contrast.

Press 8(Control beacons)

Note. The beacons should be checked when switched on from the control unit as they will only switch on if they are within range to pick up the signal.

Press 1 to switch On the flashing beacons on the transmitters.
Press 2 to switch Off the flashing beacons on the transmitters.

Test and Service

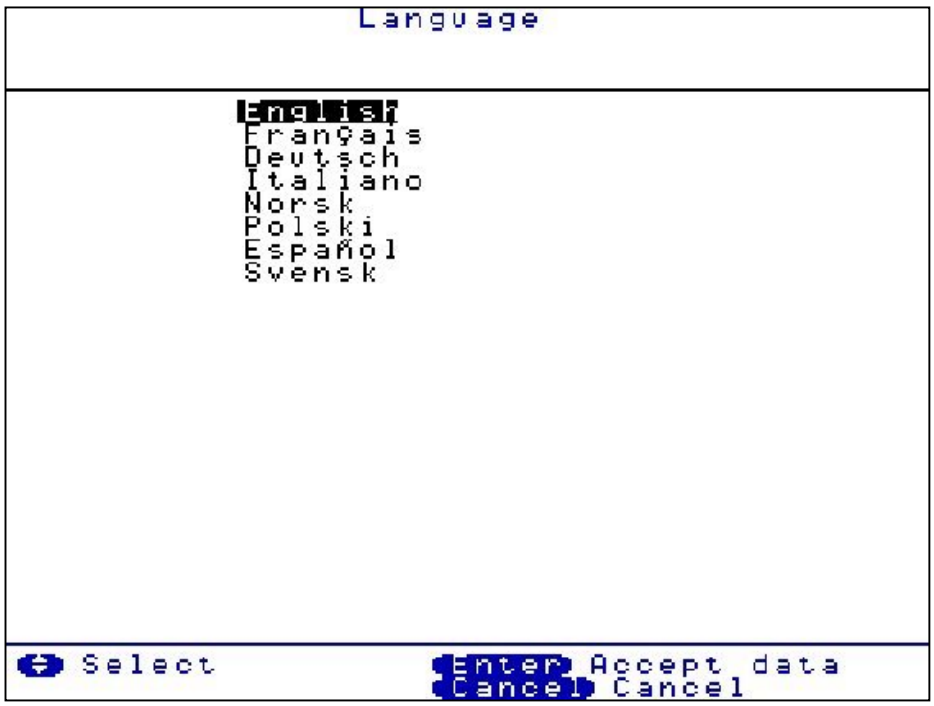


Press 1 (Restore default pipe data) Wait a few seconds and the default pipe data will be restored to the control unit.

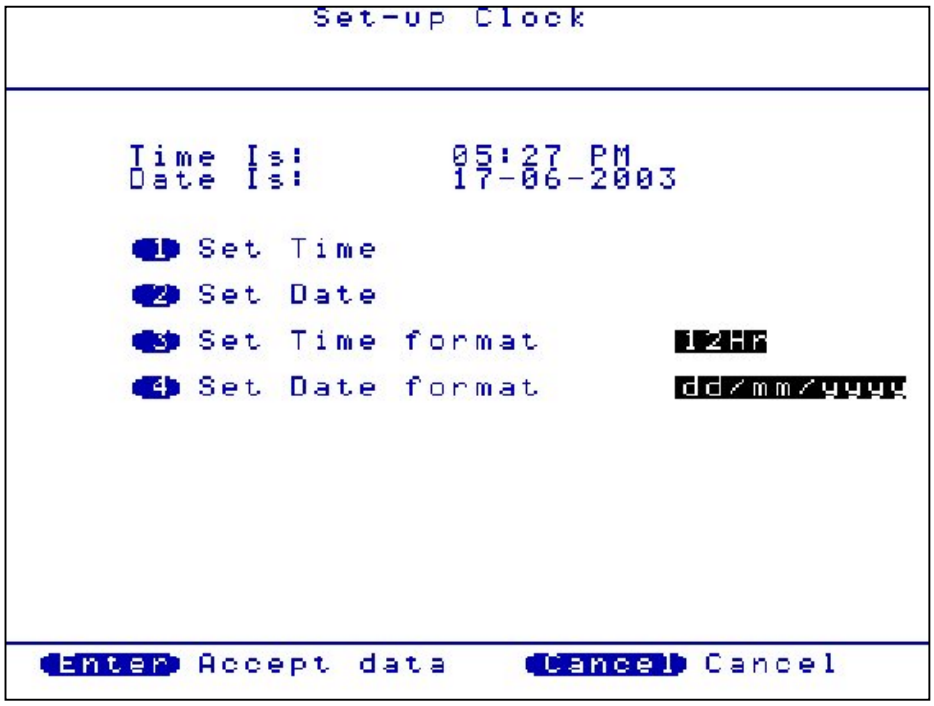
Press 2 (Units are Metric) Toggle between METRIC and IMPERIAL measurement units.

Press 3 (Time is in milliseconds) Toggles between MILLISECONDS and SECONDS

Press 4 (Language) Select the required language by using the arrow buttons.

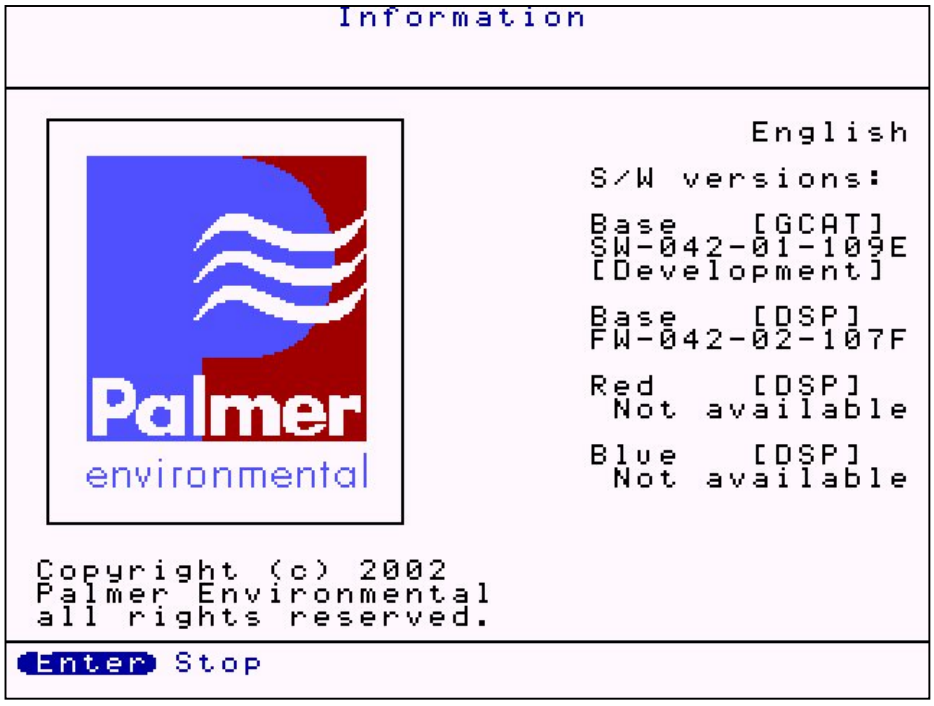


Press 5 (Set clock) Set the clock according to the user preferred format.

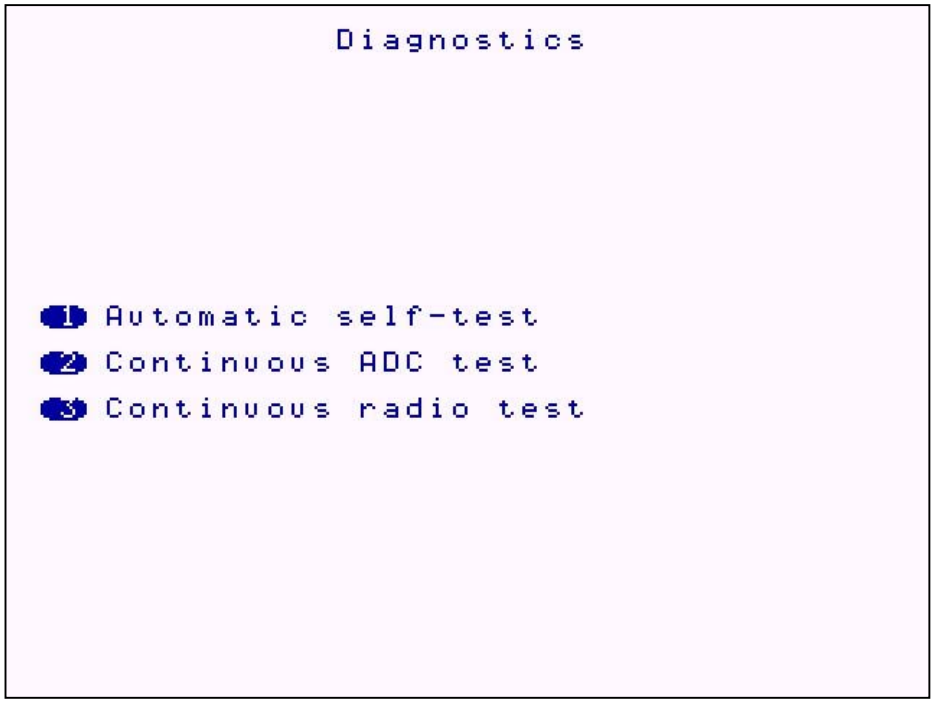


Press 6 (Debug Messages are Off) Toggles between ON and OFF. This should normally be set to OFF and is normally only used during fault diagnosis.

Press 7 (Information) Connect sensors to Out Stations and turn on before pressing 8. This displays the current firmware and software version currently installed on the MC Digital.



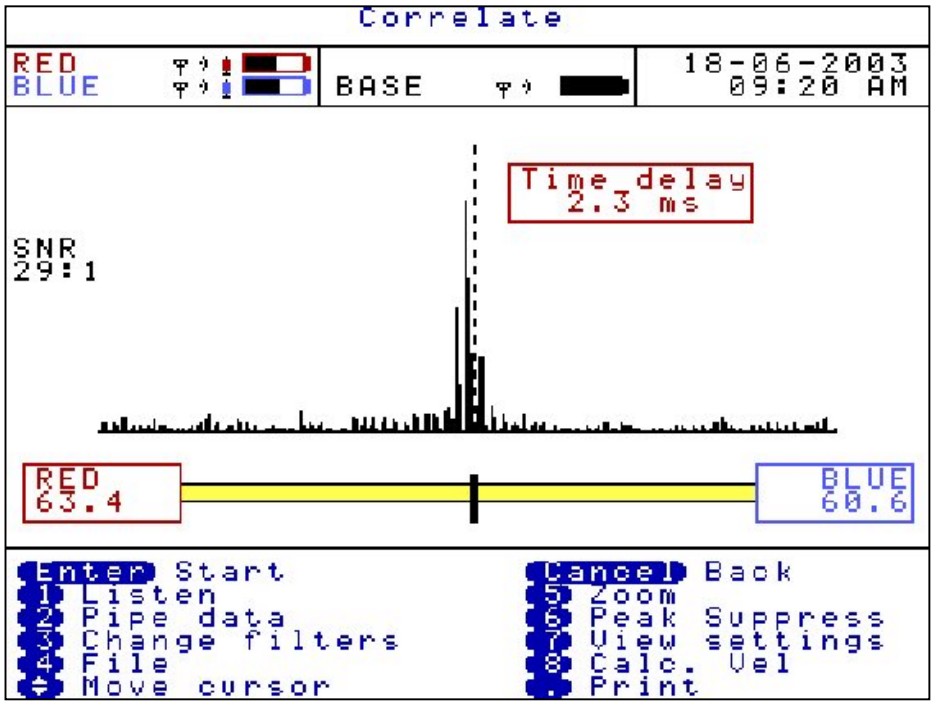
Press 8 (Diagnostics) Displays a series of numbers. This is only used during fault diagnosis



Other System Options

The MC Digital is designed for versatility. Pressing 1 will activate the Permalog Patroller Link, changing the MC Digital into a Permalog Patroller. (This is only possible if the Patroller Link radio has been purchased, not fitted as standard)

Correlation Screen



A dashed cursor line shows the position of the largest peak (best result). The dashed cursor line can be moved once the correlation has been stopped, by using the arrow keys. Moving the dashed cursor line alters the correlation distance.

This screen shows the result of a correlation where the position of the leak is. In this example 63.4 metres from the Red Out Station and 60.6 metres from the Blue Out Station.

The time delay is calculated at 2.3 milliseconds.

The correlation shown has a SNR of 29:1. Signal to Noise Ratio (SNR) means the largest correlation peak is 29x larger than any other displayed peak shown on the correlation graph. Hence the larger the SNR the more pronounced the peak will be.

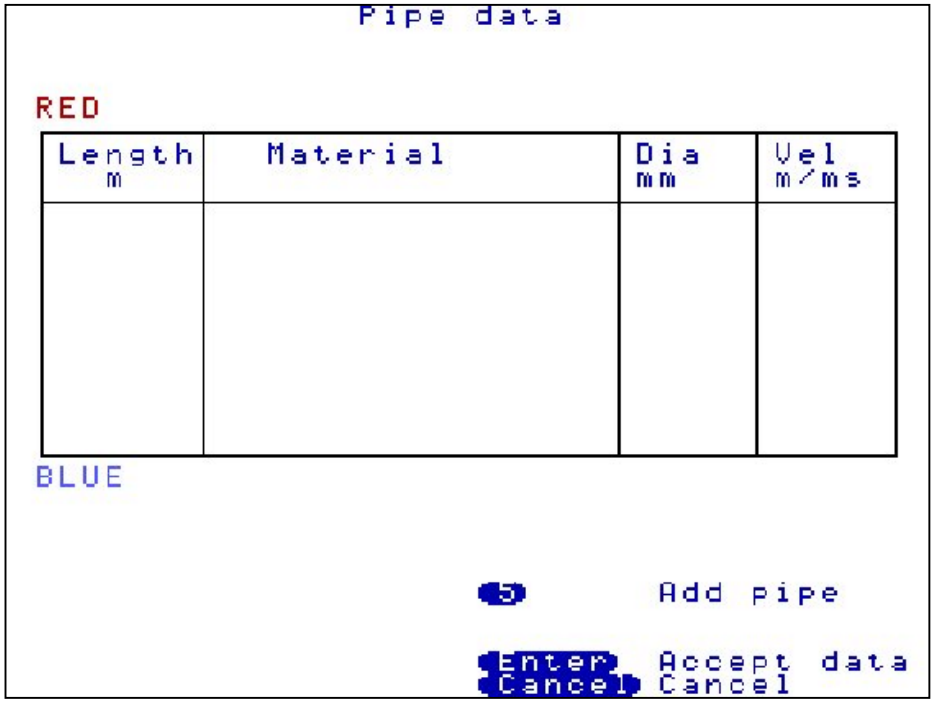
Press 1(Listen)

Attach the headphones to the control unit before pressing 1. Use the arrow keys to select the sensor required to listen to; BASE, RED, BLUE or YELLOW. The sound will transmit in blocks of approx 20 seconds. To stop listening press ENTER, but note the sound will continue until the 20 seconds elapses.

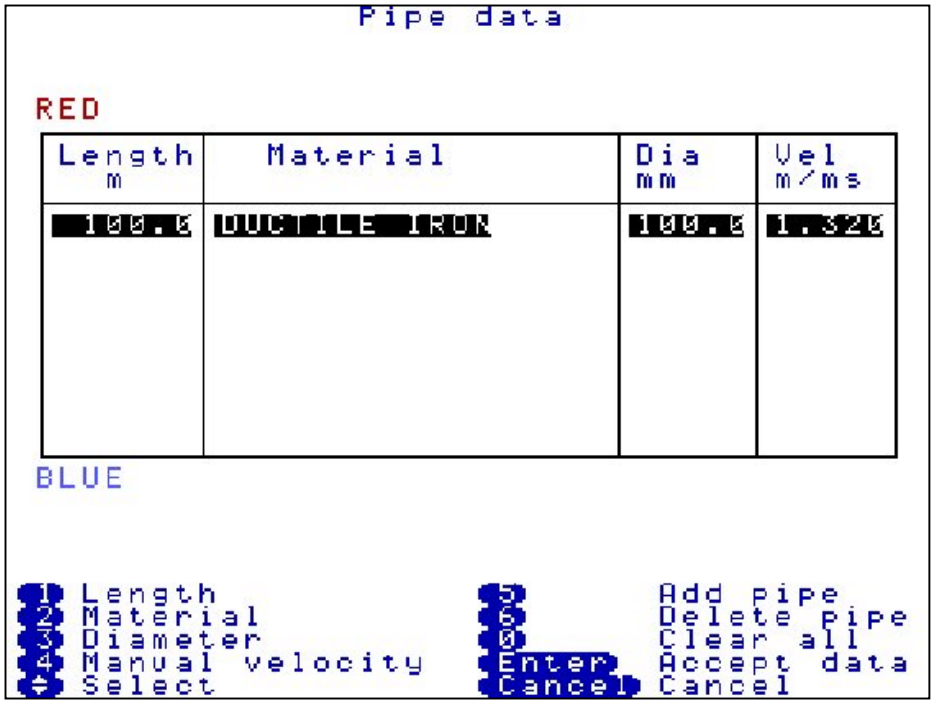
Pipe data

Press 2 (Pipe data)

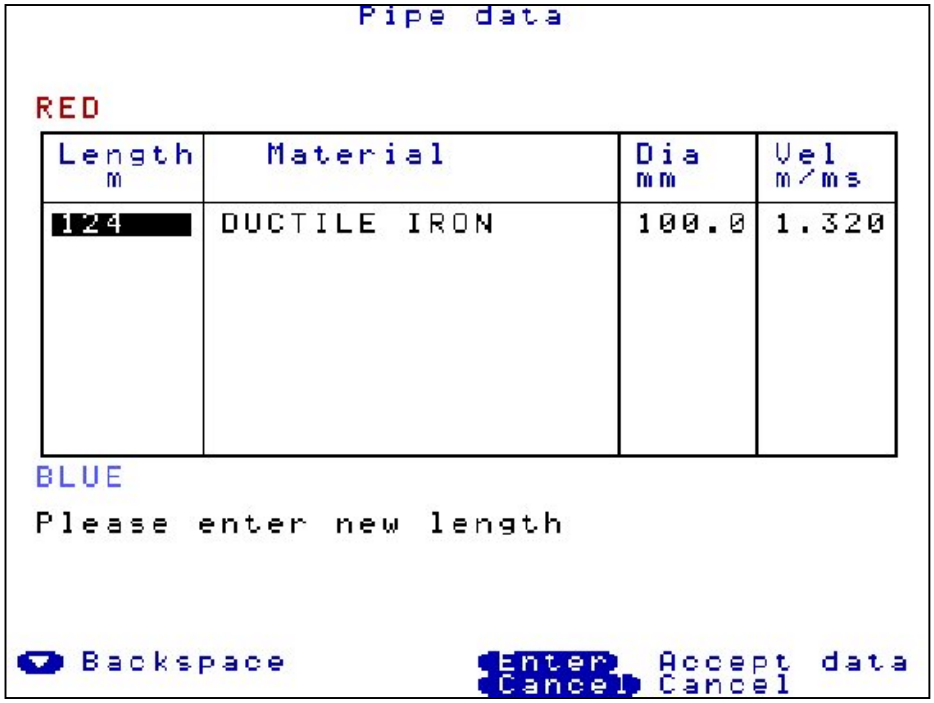
To accurately locate a leak position the user must enter the correct information with respect to the physical properties of the pipe. Each section must be entered to be accepted by the system.
Press 5 to Add new pipe data.



A default setting appears.

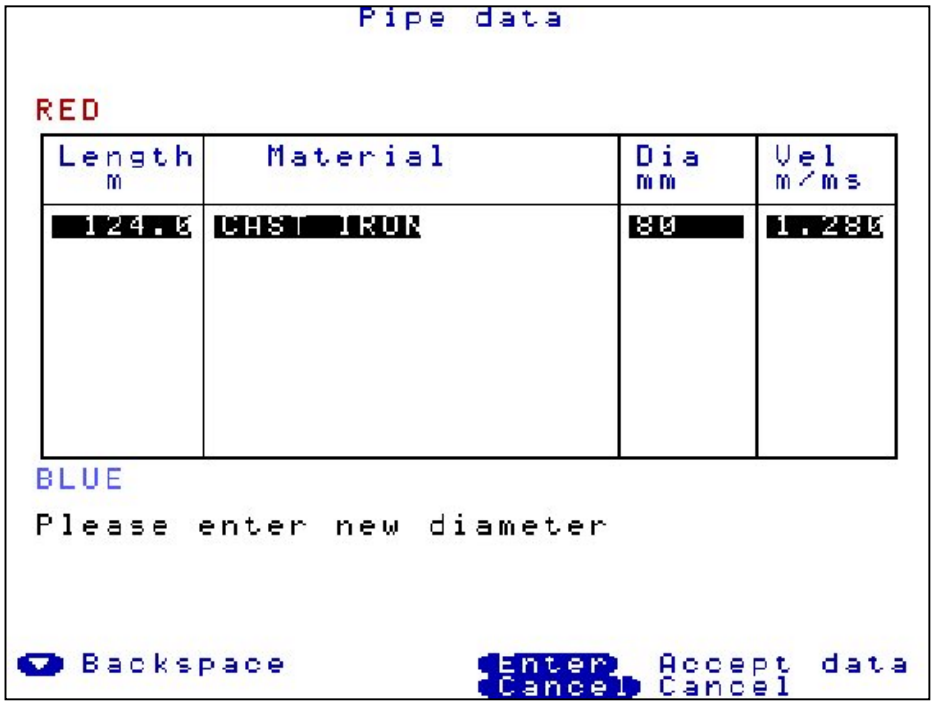


Press 1 to enter Length, the distance between the sensors. In this example 124m.

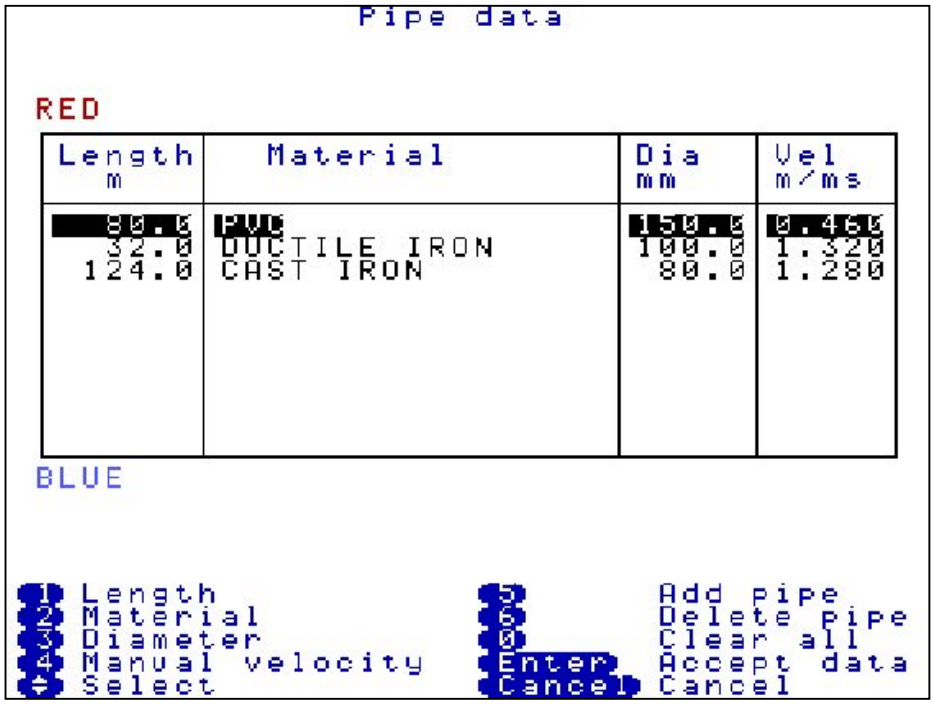


Press 2 to enter material type, use the arrow keys to select the required pipe material and press ENTER. In this example cast iron is selected.

Press 3 to enter the diameter of the pipe. In this example 80mm. The velocity column will then automatically be updated. In this example 1.280 m/ms.



To add another pipe length for mixed material situations, press 5 to add another pipe. If working on mixed materials, work from the sensor colour displayed at the bottom of the pipe data screen, back to the sensor colour at the top of the screen. Up to 6 mixed materials can be used in one correlation. In this example, from the blue sensor the cast iron pipe was entered first, the ductile iron pipe was second and the PVC pipe was third.

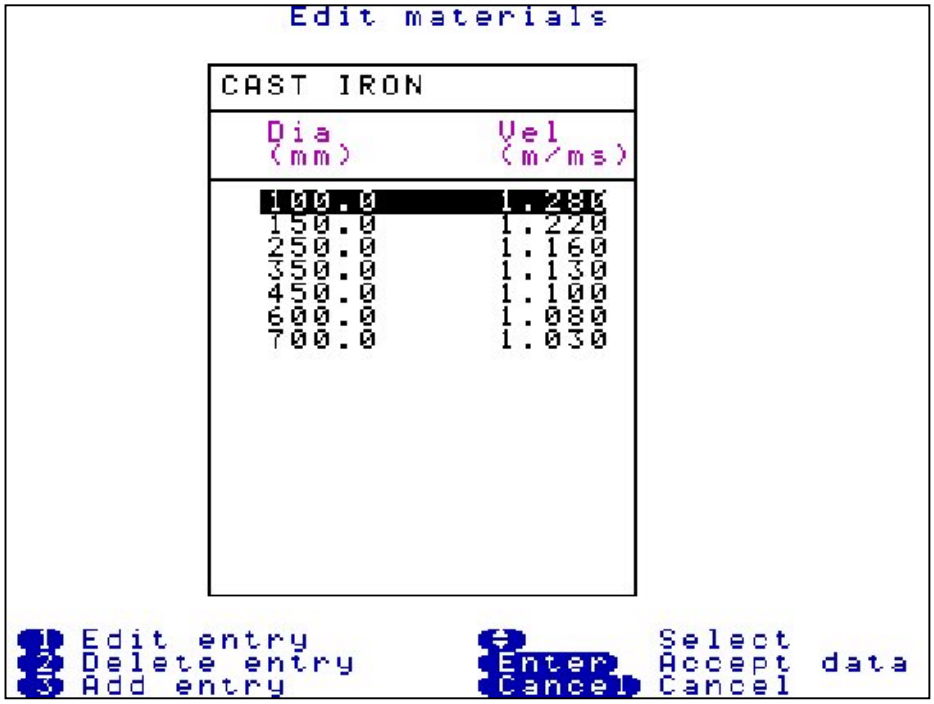


To delete a pipe, use the arrow keys to highlight the relevant pipe to remove and press 6.

To delete all pipe data press 0.

To use a manual velocity the user has calculated, press 4 and type in the new velocity value, this will automatically update the default value for the current correlation only.

To enter and store extra user defined velocity's and diameters, press 2 Materials, then press 1 Edit materials, then press 1 Edit table, then press 3 Add entry. To restore to factory set values see Test and Service menu.



Filters

If correlating with pipe data entered, the default filter settings will be used depending on the properties of the pipe. Some times this may not be accurate enough to filter out unwanted frequencies, so the user may wish to alter the filer settings to remove certain frequencies that are influencing the current correlation.

Press 3 (Change Filters) Displays a pop up box with four options :-

Quick set-metallic
Quick set-non metallic
Clear all
Manual settings

By using the arrow keys highlight the required option and press ENTER

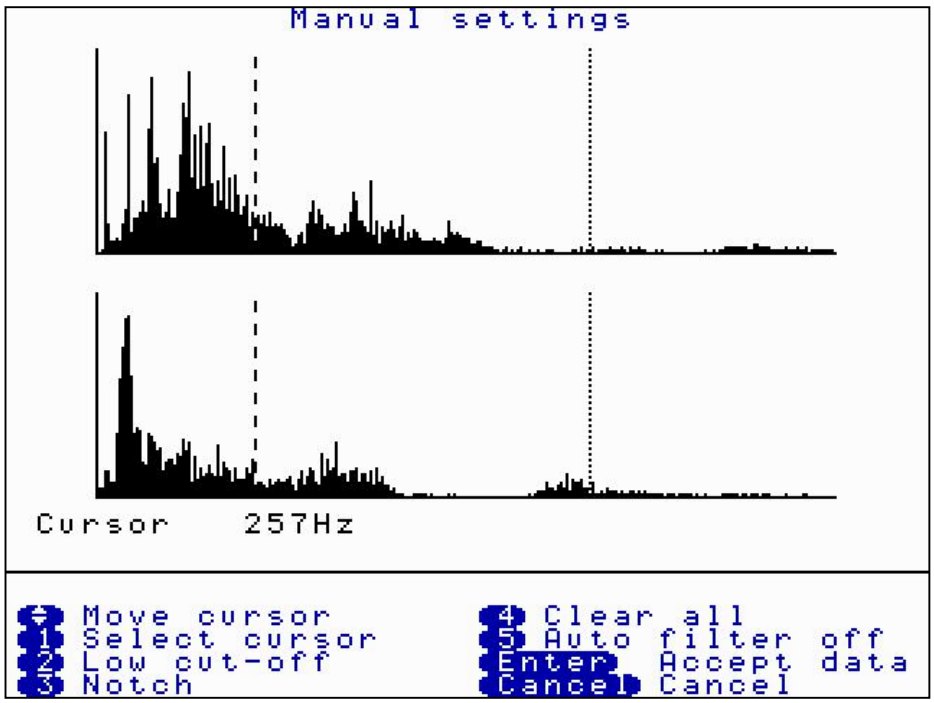
Quick set-metallic removes all frequencies from 0Hz to 405Hz. So the sensors will only listen to frequencies of 406Hz and above.

Quick set-non metallic removes all frequencies from 696Hz and above. So the sensors will only listen to frequencies of 695Hz and below.

Clear all removes any filter settings set and will listen to all frequencies.

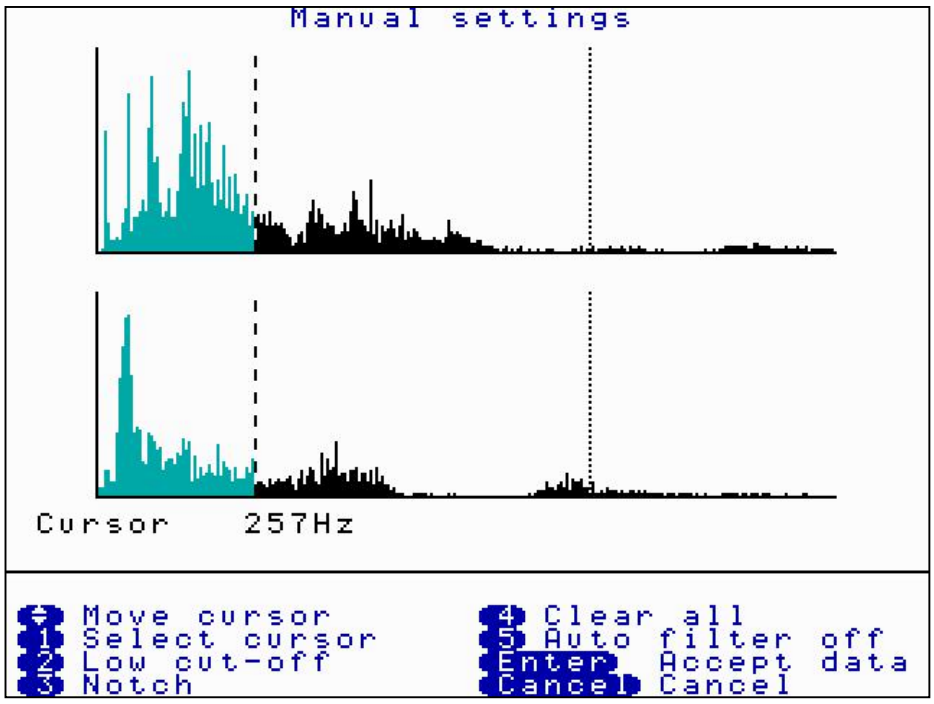
Manual settings allow the user to view the frequencies and set to the user preference.

The filter screen displays the frequencies heard at the two sensors in use. The bottom axis of each graph displays the frequency level starting at 0Hz to the left. Two cursor lines are displayed on each graph and are move by using the arrow keys. The longer dashed cursor line is the current line selected to move. The lines on each graph will not cross. The position of the current cursor line is displayed under the second graph, in this example 275Hz.

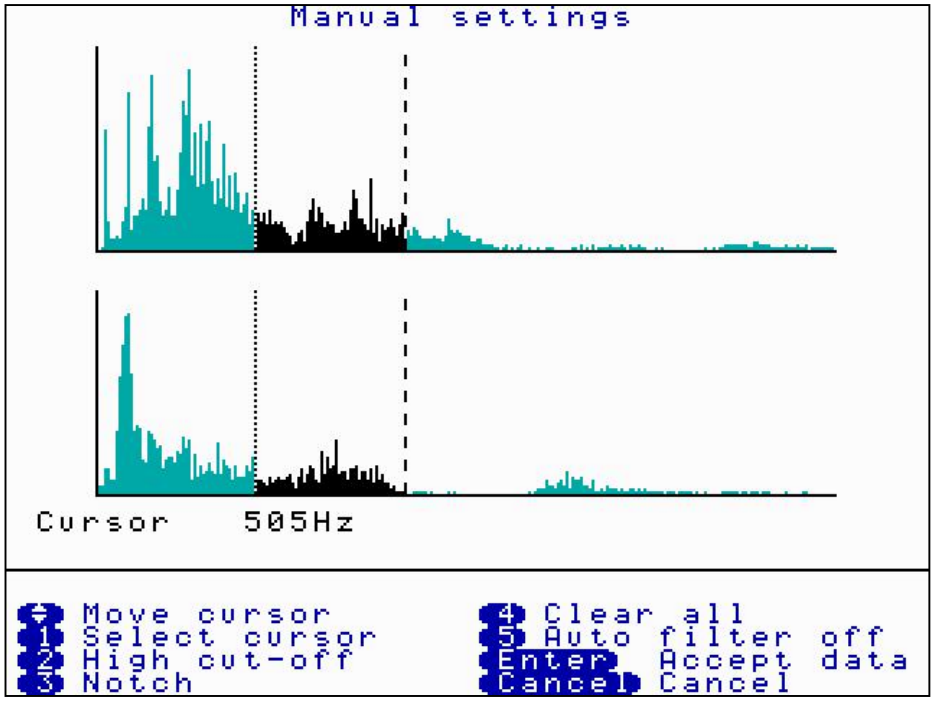


Press 1 (Select cursor) This toggles between the two cursor lines. Only the longer dashed cursor line can be moved.

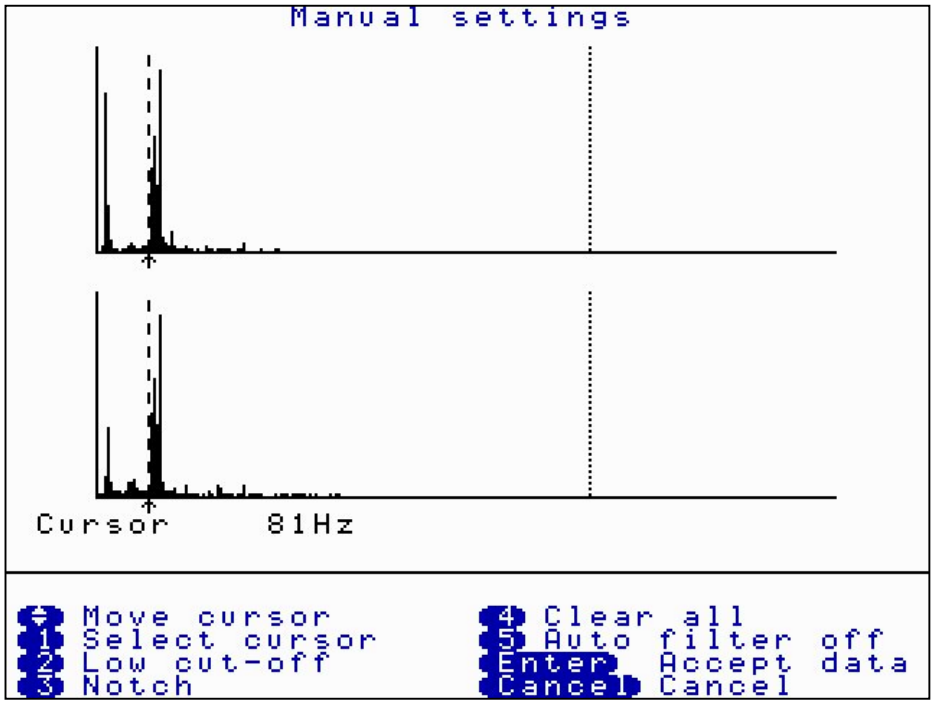
Press 2 (Low cut-off) When the left cursor line has be selected the low cut off option is displayed. Move the left cursor to the required position and press 2. This will remove all frequencies to the left of the cursor line. Removed frequencies are displayed in a cyan colour. In this example the cursor was moved to 257Hz and a low cut off was selected, so all frequencies from 0Hz to 257Hz will be removed.



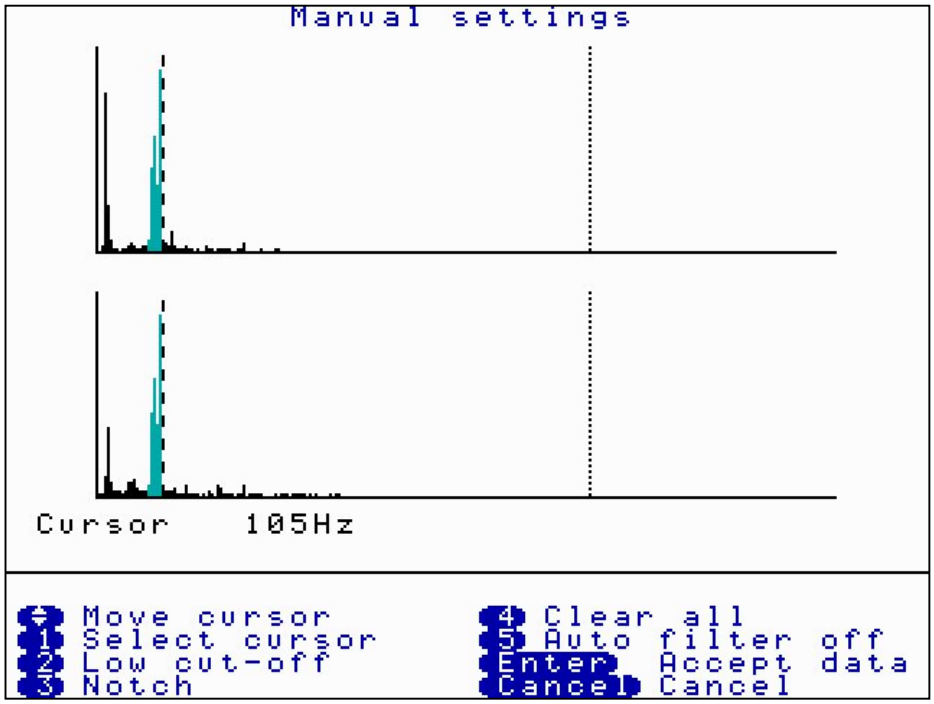
Press 2 (High cut-off) When the right cursor line is selected the high cut off option is displayed. Move the right cursor to the required position and press 2. This will remove all frequencies to the right of the cursor line. Removed frequencies are displayed in a cyan colour. In this example the cursor was moved to 505Hz and high cut off was selected, so all frequencies from 505Hz and above will be removed. By pressing ENTER to accept the data would mean frequencies between 258Hz and 504Hz only are being used to process the current correlation.



Press 3 (Notch) This options allows a “notch” of frequencys to be filtered out. Move the selected cursor to the left of the area of frequency to be removed and press 3. A small arrow appears under the graph. In this example 81Hz is selected.



Move the same cursor to the right of the area to be removed and press 3 again. In this example 105Hz. The notch area of filtered out frequencys will change colour to cyan. The current correlation will now ignore frequencys from 81Hz to 105Hz but will use all other frequencys.

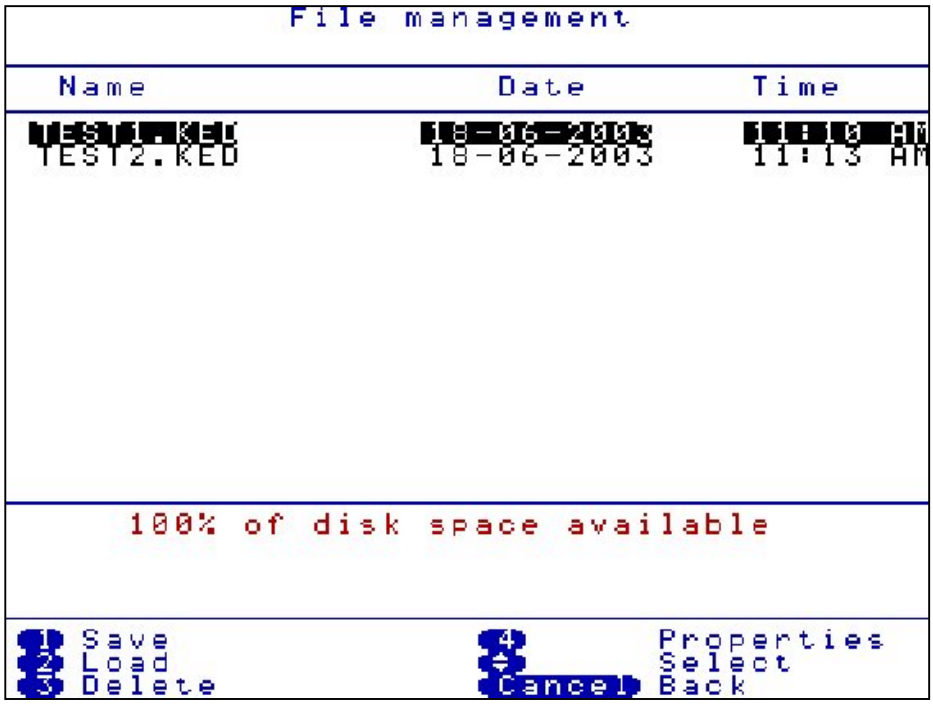


Press 4 (Clear all) This clears all filter settings currently set.

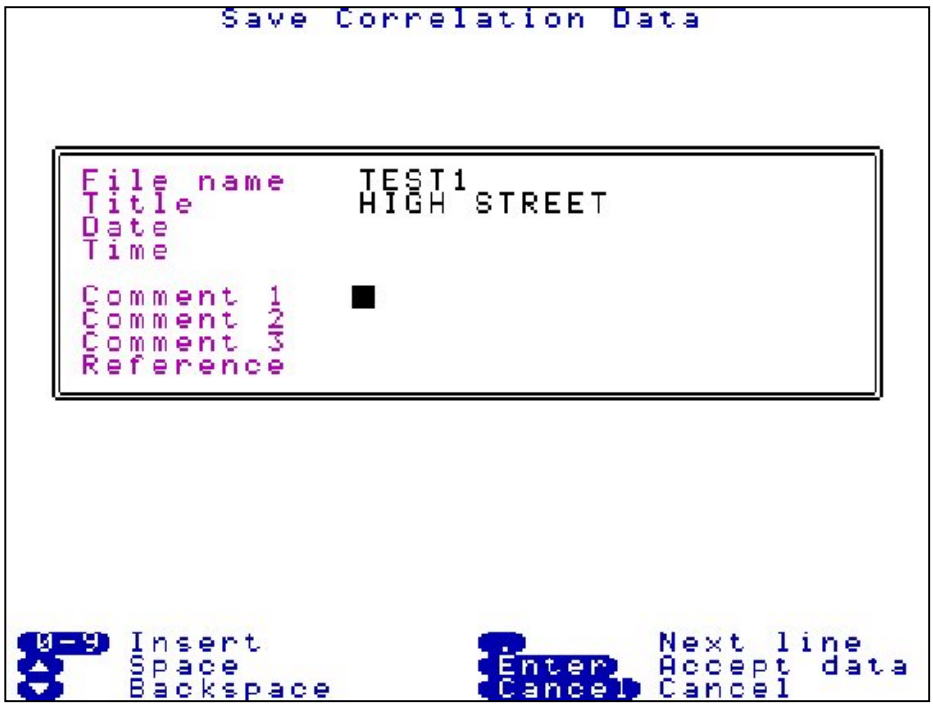
Press 5 (Auto Filter off) This will toggle between Auto Filter OFF and Auto Filter ON. At present this option is under development and will be released on a future upgrade.

File

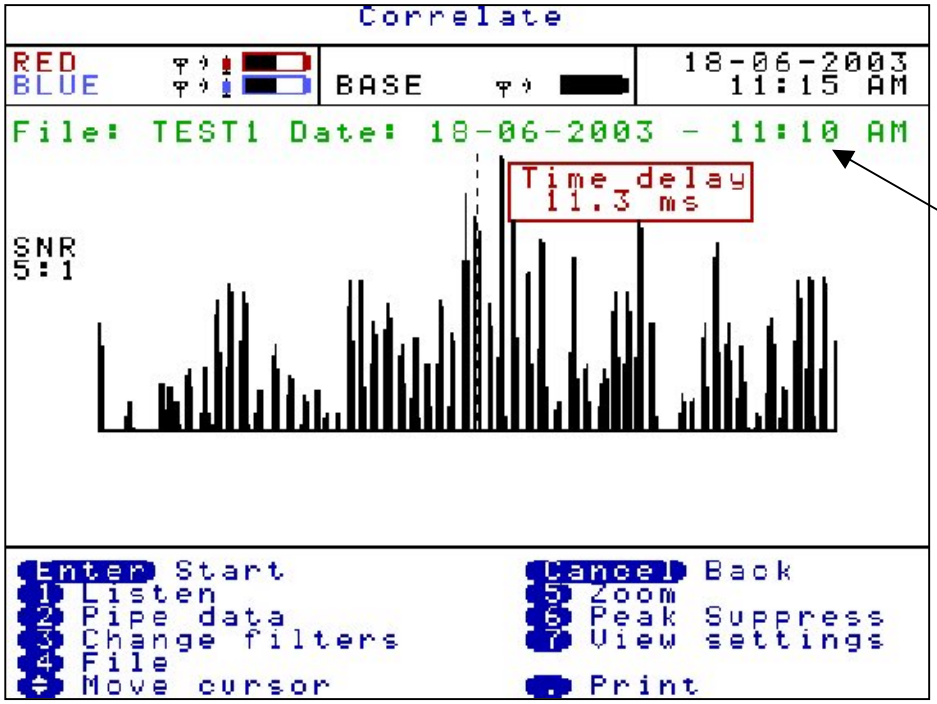
Press 4 (File) This enables the user to load previously saved files or save a current correlation. The control unit can store approximately 30 files.



Press 1 (Save) The following screen is displayed. The current correlation information details can be typed and saved.



Press 2 (Load) The saved correlation will be displayed. Arrow over the required saved file and press 2.



Loaded file name is displayed in green

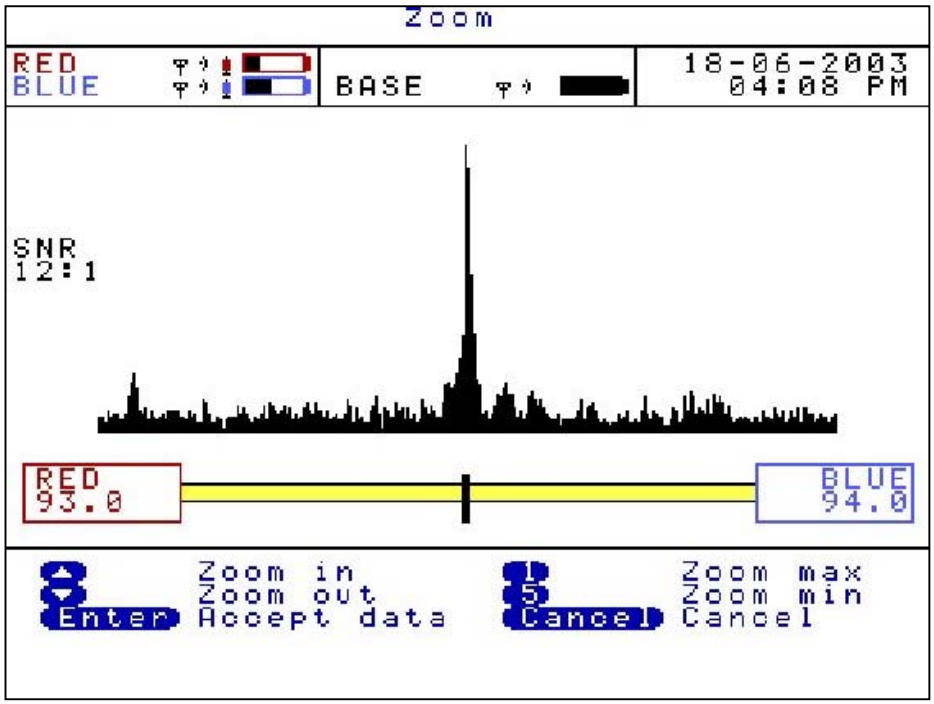
From a loaded file the control unit can undertake post correlation. Correlating functions such as pipe data, filters and peak suppression can be changed on the loaded data without having to return to site to re-correlate. Using new information may correlate a different result.

Press 3 (Delete) Deletes a previously saved file. Use the arrow keys to highlight the file for deletion and press 3.

Press 4 (Properties) Displays file information and comments, when the file was saved. Use the arrow keys to highlight the file to view and press 4.

Zoom

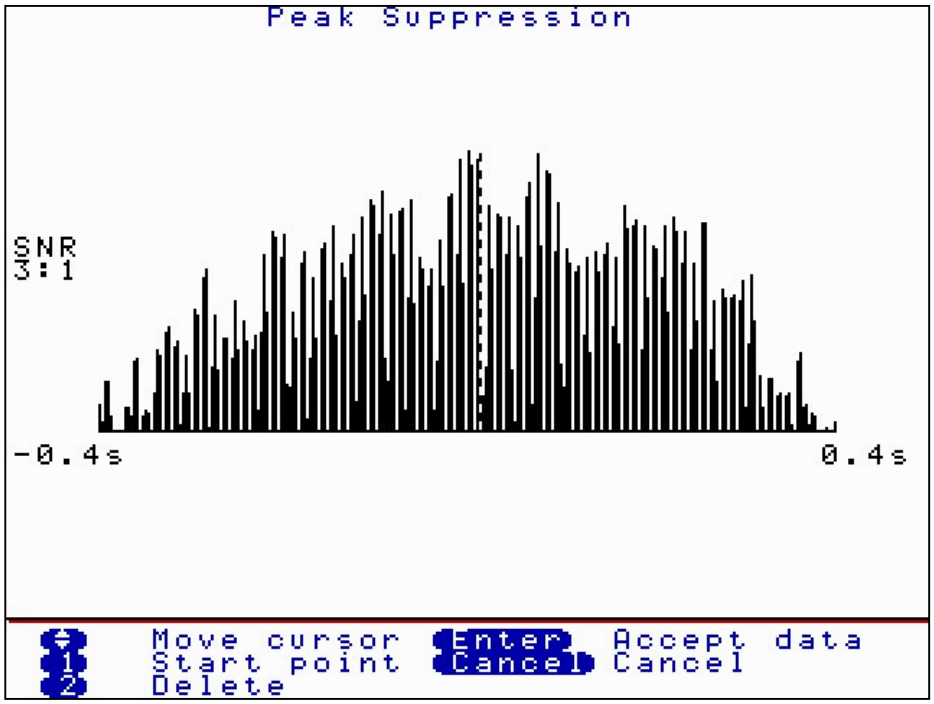
Press 5 (Zoom) To see a more enhanced view of the leak centred around the dashed cursor line. Moving the dashed cursor line along the graph to the required point then press 5.



Use the arrow keys to zoom in or out stage by stage.

For a quicker zoom press 1 to zoom to maximum view or press 5 to zoom to a minimum view.

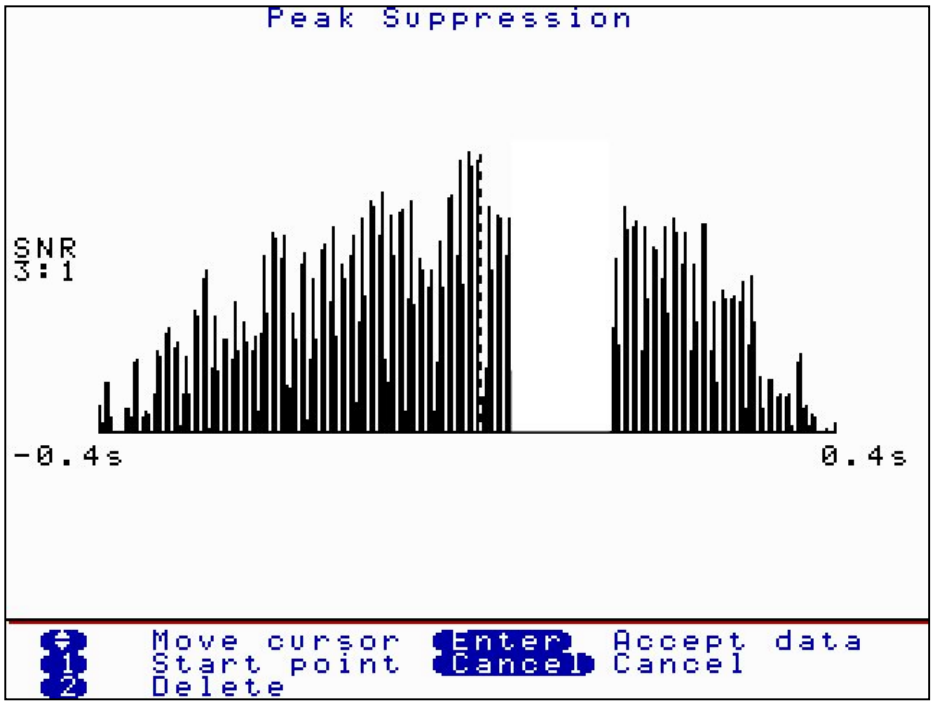
Peak Suppression Screen



Press 6(Peak Suppression) To suppress a section of the time delay range from the current correlation. This may be used to remove known leaks or demand usage that may be hiding unknown leaks.

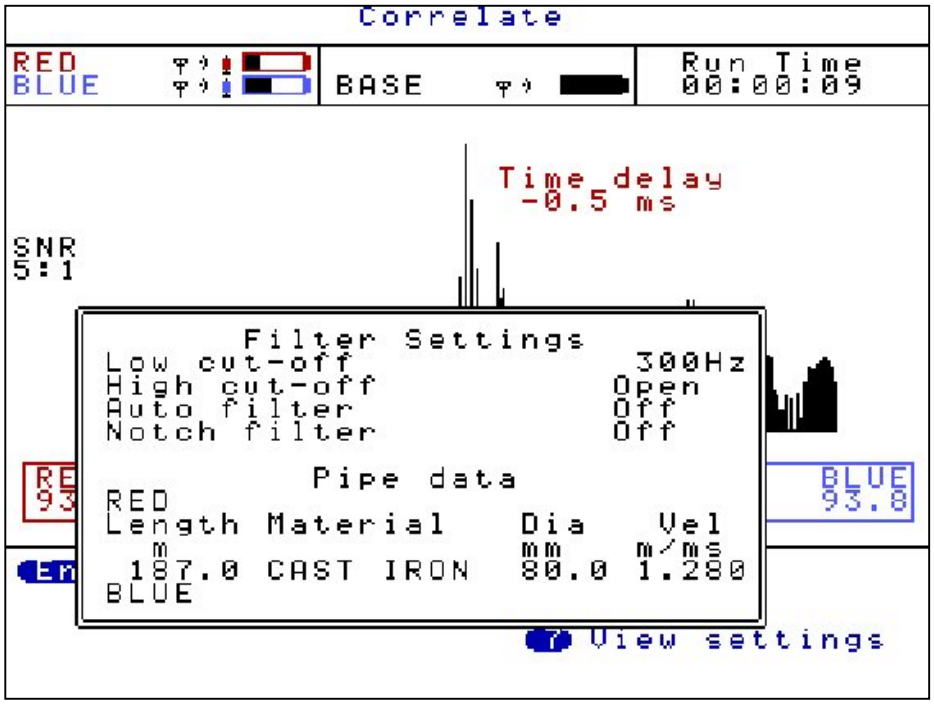
Move the dashed cursor line to the start point of the data to be removed and press 1 to select a start point. A small arrow will appear below the correlation graph. Move the dashed cursor line along the data to select the stop point. Press 1 again and the section of the data to be suppressed will disappear from the correlation graph as shown below.

Press Enter to accept the data and a new correlation can be carried out without the suppressed data. To replace the removed data press 2 delete.



View Settings

Press 7 (View Settings) During correlation or after stopping a correlation press 7 to view all pipe data and filter settings currently in use. A pop up box appears to display the information. Press Cancel to remove the display.

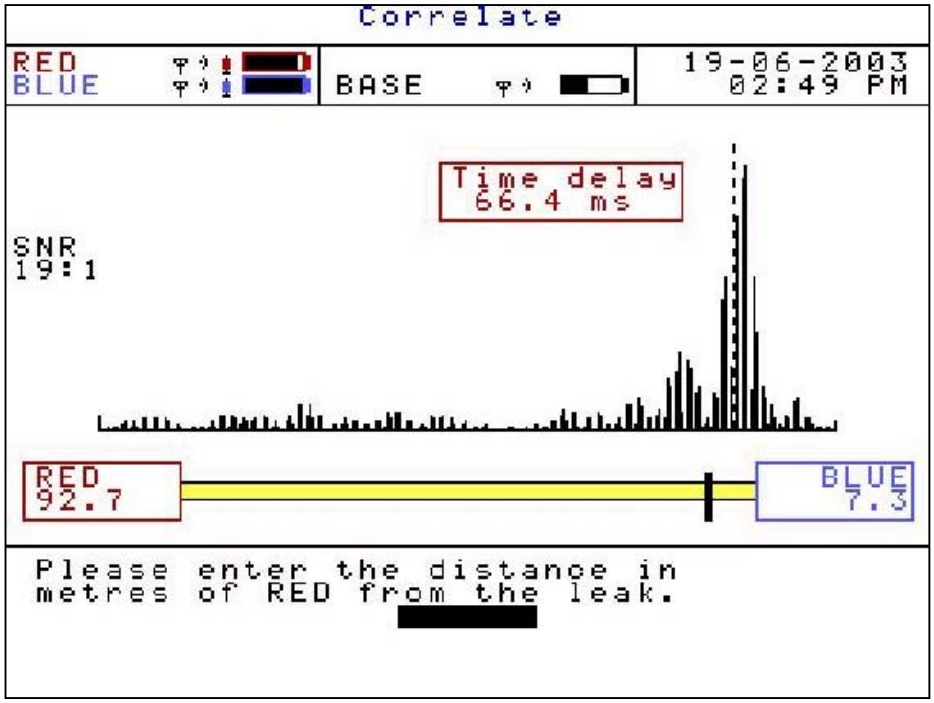


Calculate Velocity

Press 8 (Calc Vel) After stopping correlating the option to calculate velocity appears. A velocity check gives a more accurate velocity of the pipe to be correlated instead of using the default velocity value.

To calculate velocity a leak must be present, either real or induced. The leak can either be between the sensors called an “In Bracket” check or outside of the sensors called an “Out of Bracket” check. Unlike correlation, where the more central the leak is positioned between the sensors, the more accurate the result. A velocity check requires the leak to be positioned closer to one of the sensors to create a larger time delay.

The procedure for a velocity check is to position your sensors as described above. Induce your leak or use the real leak. Correlate as normal entering the correct pipe data. After a good correlation peak, stop correlating and press 8(Calc vel). The screen below will be displayed.



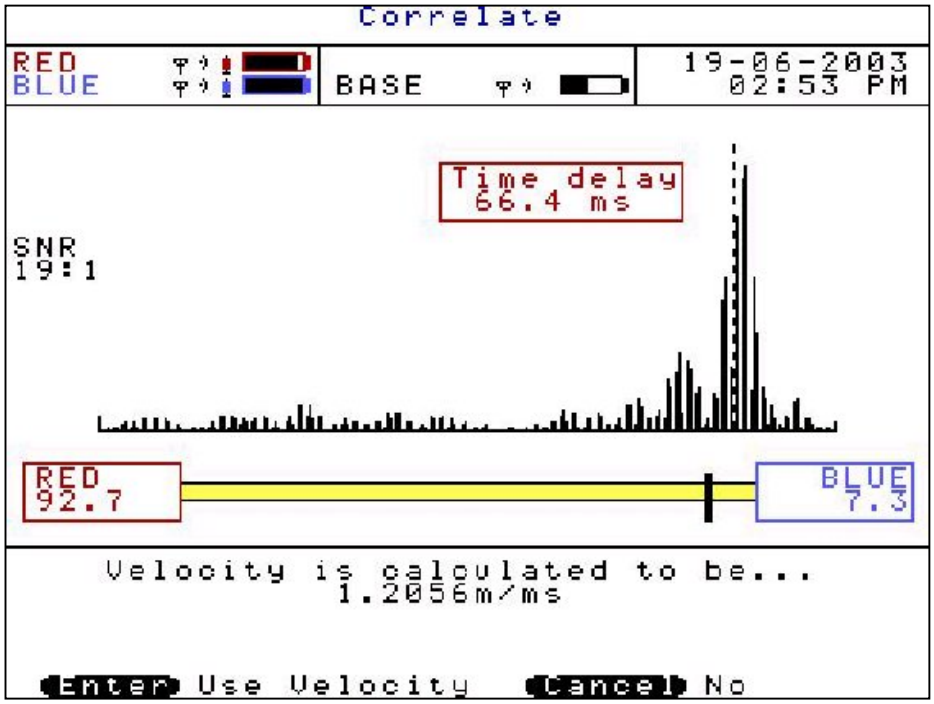
Enter the position of the leak from the RED Out Station.

If the leak is “In Bracket” between the sensors, then enter the distance from the leak to the RED sensor. (In this example 92.7m)

If the leak is “Out of Bracket” to the left of the RED sensor, then enter the distance 0

If the leak is “Out of Bracket” to the right of the second sensor, then enter the distance between the RED sensor and second sensor.

A new velocity will be displayed under the correlation graph



The control unit then gives you the option to either use the calculated velocity by pressing ENTER or CANCEL to ignore it.

By accepting the calculated velocity value, the default velocity value under Pipe Data will be replaced with the new calculated velocity value. A new correlation position may now be displayed using the more accurate velocity value.

Program upgrade (Software and Firmware)

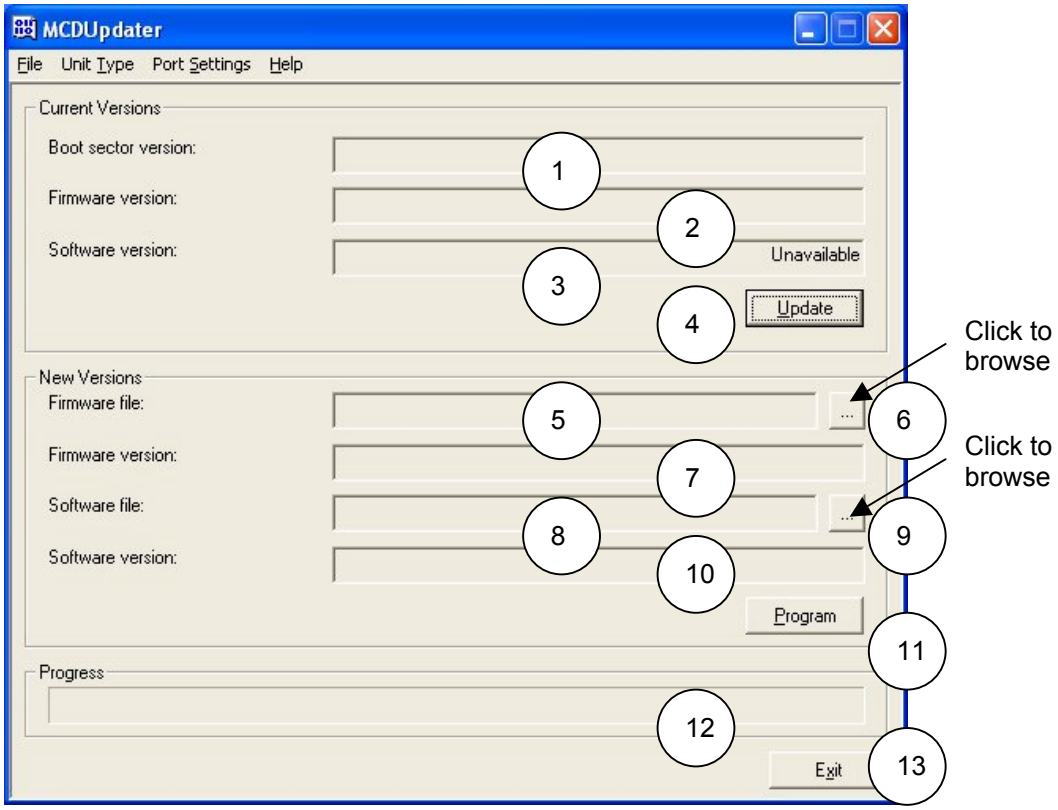
The MicroCorr Digital correlator and Out Stations have been designed so that their programs can be upgraded as the latest developments take place.

The MicroCorr Digital Software is defined as the user interface within the base station, and the Firmware describes the program that communicates between the correlator base station and the Out Stations.

To upgrade the Software and/or Firmware a program must be installed on the PC. This is the MCD Updater Application. The base unit requires both software and firmware to operate, where as the Out Stations only require firmware to operate.

The application, the latest software and the latest firmware are all available as downloads from the Palmer website www.palmer.co.uk/microcorr.htm

Once all the files have been downloaded to the PC start the MCD Updater Application and follow the instructions as described below.



Screen description

The fields of the MCD Updater screen are described by number below.

Current System Information

1. This field gives the boot sector version within a base/out station and cannot be changed by the user. It can only be used by Palmer engineers for system diagnostics.

2. This field gives the current firmware version within a base/out station.

3. This field gives the software version within a base station only, but will currently state “Unavailable” before and after upgrading as the field is currently under development. Note, this information can also be seen on the MicroCorr Digital information screen.

4. The ‘Update’ button is used to refresh the data in fields 1, 2 and 3.

Upgrade Information

5. This field gives the name and location of a *firmware* update file. These files have the extension .mdf and contain the required information to upgrade a system's firmware.

6. This button is used to 'browse' for a firmware update file on a local/network file system.

7. When a firmware file has been selected, this field displays version information about the file. This allows the user to check that a newer version of firmware is being installed onto the system.

8. This field gives the name and location of a *software* update file. These files have the extension .mds and contain the required information to upgrade a system's software.

9. This button is used to 'browse' for a software update file on a local/network file system.

10. This field displays version information about the file.

11. If there is a firmware and/or a software file selected clicking this button performs the upgrade on the connected system.

12. This is a progress bar that indicates the progress of any running operation.

13. This button exits the application.

The File Menu

There is only one option in the file menu, which is 'Exit'. Selecting this menu option closes the MCD Updater application.

The Unit Type Menu

This menu allows the user to select the type of unit that is being programmed. The user can either select 'Base Station' or 'Out Station'.

The Port Settings Menu

This menu allows the user to select the communications port used by the MCDUpdater application. In this menu there are 4 predefined options COM1 through COM4, and a user defined port which allows the user to specify the port to use.

Important Notes for upgrading a MicroCorr Digital correlator (August 2003)

When using the upgrade program for the MCD the following points should be noted:

<u>All of the correlation (.ked) files stored on the MicroCorr Digital will be deleted during the upgrade operation.</u> Therefore the user must save any required correlation files to a PC before upgrading the software.

Once the upgrade procedure starts the power to the PC and the MCD should not be interrupted, if it is the MCD will be rendered unusable.

1. Reboot your PC before starting, and ensure the Palmer Upgrade program is the only application running, this ensures no other application can cause a break in the upgrade procedure.

2. Ensure the MCD is connected to a charger that is switched on. This ensures a low battery does not cause a shutdown.

3. Never try to interrupt the upgrade procedure once it is initiated.

Upgrading a Base Station

The following steps should be followed to upgrade the software/firmware within a base station:

1. Connect the PC to the base station via the supplied serial cable.

2. Connect external power to the system. This ensures that the system does not power down while the upgrade is in progress. Then back up all correlation files to the PC.

3. Start the MCDUpdater application and ensure that the 'port' is set correctly and 'unit type' is set to base.

4. Click on the 'Update' button to retrieve the current versions from the system.

5. Click on the 'Browse Firmware' and 'Browse Software' buttons and locate the firmware and software update files. If only the software or the firmware is to be upgraded then only select the required upgrade file.
6. Ensure that the update files are newer than those currently installed on the system. (The latest version should always be used unless told specifically by your Palmer representative that an older version should be used).

7. Click on the 'Program' button and wait for the operation to complete.

8. Remove the power and reset the system. Wait for the system to fully restart, then click on the 'Update' button and verify that the software/firmware has updated successfully.

9. Switch the unit off completely and then switch back on again.

Upgrading an Out Station

The following steps should be followed to upgrade the firmware within an out station:

1. Connect the PC to the out station via the supplied serial cable.

2. Connect external power to the system. This ensures that the system does not power down while the upgrade is in progress.

3. Start the MCD Updater application and ensure that the 'port' is set correctly and 'unit type' is set to Out Station.

4. Click on the 'Update' button to retrieve the current versions from the system.

5. Click on the 'Browse Firmware' button and locate the firmware update file.

6. Ensure that the update file is newer than that currently installed on the system. (The latest version should always be used unless told specifically by your Palmer representative that an older version should be used).

7. Click on the 'Program' button and wait for the operation to complete.

8. Remove the power and reset the system. Wait for the system to fully restart, then click on the 'Update' button and verify that the firmware has updated successfully.

9. Remember to upgrade both red and blue Out Stations and, if purchased, the optional yellow Out Station.

Upgrade verification

To verify the latest versions of software have been successfully installed, go to the main menu on the correlator and select "5 Test and Service". Then select "8 Information". This shows the Information screen, which lists the software and firmware versions.

Technical Specification

Base station

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 ¼ VGA
Antennae	External antenna/magmount
Mixed material	6 sections
Correlation files	Up to 30 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 and velocities
Language	Selectable via menu
Operating software	User upgradable from www.palmer.co.uk
Printer output	RS232 to parallel printer
PC download	Via PC software, Windows compatible
Dimensions	220mm x 250 x 100mm
Weight	1.8Kg
Operating temperature	-15°C to +50°C
Environmental	IP65
Enclosure	Fully injection-moulded ABS
Connectors	Military specification Amphenol
Diagnostics	Self-test and auto-calibration on power-on

Out Station

Radio communication	Single frequency digital transceiver
Radio frequency	UHF (local regulations apply)
Controls	ON/OFF (all functions remotely controlled and monitored from Base station) 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	External antenna
Portability	Integral sensor stowage Integral cable wrap
Dimensions	210 x 145 x 305mm
Weight	1.6kg
Environmental	IP68
Housing	Fully injection-mouled ABS
Connectors	Military specification Amphenol

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 Out Station	2m cable with strain relief Military specification connector

Warranty

All equipment is warranted by Palmer Environmental Ltd to be free from defects in materials and workmanship for a period of one year (unless otherwise stated) from the date of shipment to the original customer. This warranty is only valid if the equipment has been installed and used in the correct manner as described in this manual.

Repair or replacement (at Palmer Environmental's option) will be made without charge provided the above conditions have been met.

If any problems occur, notify Palmer Environmental Ltd or its authorised representative giving full details of the problem, and the model and serial number of the equipment. You will receive technical advice and/or shipping instructions depending upon the nature of the problem.

Patents

Patents for the MicroCorr Digital are pending. MicroCorr® is a registered trade-mark.

Note

Palmer Environmental reserves the right to change products, services or specifications without notice.

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