

User Guide: PCorr+ and Permalog+ (Using the HWM WebCorr app in Standalone mode).



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1 OVERVIEW

1.1 SYSTEM DOCUMENTATION AND SUPPORT OF PRODUCT

Read any "Safety Information" or "Safety Warnings and Approvals Information" documentation provided with the products prior to using.

This manual is a follow-on from the manual MAN-2004-0001 "Pcorr+ and Permalog+ (Using the HWM WebCorr app)", which covers the use of WebCorr in conjunction with the HWM DataGate server. Refer to the aforementioned manual for guidance also.

Please also refer to the document MAN-031-0003 "User Guide: PCorr+ and PermaLog+ - (Description and uses)". This provides a description of PCorr+ and PermaLog+ logger devices, their functions, how they should be physically handled and examples of their use (e.g. Drive-by Patrol, Lift and Shift, Investigations).

This manual covers the use of the HWM WebCorr app in "Standalone" mode (i.e. without any server) to both set up the logger devices and collect data from them.

Note: Your phone may show views not identical to the pictures in this manual.
Pictures in the manual were created from screenshots using an Android phone.
Due to the wide variety of phones available to consumers, variations will exist.
Pictures in the manual are therefore presented for guide-lines only.
HWM will release software updates from time to time. These may also cause changes to the screen presentation and the functionality of the application.

It is recommended that you enable your phone to allow automatic updates of the WebCorr app.

HWM also provides support of the product by means of a webpage:

https://www.hwmglobal.com/pcorr-support/

Should you have any questions that are not covered by a manual, or Frequently Asked Questions (FAQs) provided online, please contact the HWM Technical Support team on +44 (0) 1633 489479, or email <u>cservice@hwm-water.com</u>

1.2 System Components

A system is comprised of:

- A set of logger devices (PCorr+ or Permalog+).
- A compatible Patroller unit (e.g. Patroller 4 radio transceiver with Bluetooth).
- A mobile phone.
- The HWM WebCorr app.
- An internet connection (for the mobile phone software updates).

1.3 MOBILE PHONE – SPECIFICATION

The HWM WebCorr app is available on Android-based mobile phones and also on Apple iPhone mobile phones.

Minimum specification of phone:

Android:Android version 5 (Lollypop) minimum.Device must have Bluetooth, GPS and Internet capability.Memory (for application):80MBMemory (for data):0.2MB typical per sound file.

Apple iOS:iOS version 8.0 minimum.Device must have Bluetooth, GPS and Internet capability.Memory (for application):80MBMemory (for data):0.2MB typical per sound file.

1.4 WEBCORR APP – INSTALLATION

The app is available for Android phones, from the Google "Play Store". The app is available for the Apple iPhone, from the Apple "App Store".

- Search for and locate the HWM WebCorr app.
- Install the app.
- The installed app will have an icon, as shown, when installed.

Occasionally, updates become available at the stores. It is recommended to install these updates.

1.5 PATROLLER

The app uses a Bluetooth connection, provided by the phone, to communicate with a compatible Patroller (e.g. HWM Patroller 4). Refer to the Quick Start Guide of the Patroller device for instructions regarding its safety, installation, and use.

To work, the phone must have Bluetooth enabled and it must be connected to the Patroller (see section 4). Bluetooth radio has a short range limit. Keep the phone close to the Patroller to ensure the Bluetooth radio connection can function.

The Patroller acts a communications relay between the loggers (using a proprietary radio-link) and the mobile phone (using the Bluetooth Low-Energy compatible radio-link).

The Patroller is battery powered (unless being charged via USB). It must be turned on to use. It can only communicate to loggers that are within radio range and also have an active radio-link.



1.6 TERMINOLOGY

The terminology used for the WebCorr app is summarised here...

- **PCorr+** and **Permalog+** are **logger devices** that produce measurement **data**.
- The logger device obtains several forms of data. This will include Leak status, Noise Level, Noise Spread, Aqualogs. For Pcorr+ devices (not Permalog+), it can also include Sound Recordings.
- The data is meaningless, unless it represents a measurement actually made on the pipe network. When the logger is attached to the pipe network it is **deployed**.
- Access to the pipe network is often available through various chambers that house (and give access to) valves or hydrants. These chambers can be used as an installation **site** for a logger device.
- The logger can be put into "storage mode" where it is in a deep sleep and does not produce any data.
- A site may be one of many in an area or suburb, with the pipe network interconnecting them. Sites may therefore be collected together in a group, often referred to as a **zone** or **DMA**.
- Each of these separate entities may be represented on a **database**, such as one used by the app. Within the app database, each site can have one logger device installed (maximum, at any given time).
- Devices such as PCorr+ and Permalog+ can either be permanently installed or used as a **mobile** device.
- A mobile logger is time-shared by multiple sites and transferred from one site to another. The transfer process is known by various terms, including "Lift" and "Shift". The app also adopts these as general terms for removal of a device from a site or deploying a device to a site, respectively.

2 **RUNNING THE SOFTWARE APP**

Note: HWM revises software from time to time, so the screenshots provided in this guide may be different from what you experience when you download the app.

2.1 LAUNCHING THE APP - FIRST-TIME SETUP

Find the HWM WebCorr app on your mobile phone.

Launch the app by tapping the icon.



The first time an app is run, or after it has been upgraded to a new version, the phone makes a sequence of one-off requests.

It may ask the user for permission for the app to use the phone location services. Tap on ALLOW...

Note: The phone should be set to give "high-accuracy" location details to the app. (This is a setting within the operating-system of the phone).

The app may also request permission to have access to the files on the phone. (The app requires this permission to allow it to store data). Tap on ALLOW...

At the Login page, tap "Enter Stand Alone Mode".

You are given a chance to cancel or continue and use the app in standalone. Once past this point there is no option to return to using the DataGate server.

If you have not used the app with DataGate before, it is safe to "proceed without sync".

If you have, this is the last opportunity to update DataGate with any data for the logger devices saved on the phone, by tapping "Perform sync"; The database will be cleared before Standalone mode is enabled on the phone.

Note: Where a user uses a combination of stand-alone operation and also DataGate server the use of two separate phones is recommended.

*** The initial setup of the phone, is now complete. ***



The app will then show the main screen:

Note: Some icons do not become visible until the app connects to the Patroller4.

HWM WebCorr App

Patrol Patrol devices

Database View devices stored in local database

Lift and Shift For continuous location change

Is

A

Aq

Configure Devices Configure the devices

Correlation Correlate sound recordings

Aqualog Aqualog config for devices

App Settings Patroller/Server configurations

App Settings

Patroller/Server configurations

3 SETTING OF APP OPTIONS

From the main window, tap on "App Settings".

The app settings view is divided into several sections, examples of which are shown opposite.

Each area has a set of options.

e.g.

DataGate

Standalone Mode

Yes

On the above section, ensure the "Standalone Mode" option is set to "Yes".

÷	App Settings
Pat	roller
Dat	aGate
Dat	а
Lift a	nd Shift

The list of options is extensive.

Most options are self-explanatory.

(Refer also to the manual MAN-2004-0001).

The app options may be adjusted by tapping on the relevant line and editing the field.

Several Lift and Shift settings are discussed in manual MAN-2004-0001; only additional ones are discussed here.

"Keep logger alive while lifting" refers to keeping the radio communications link open (which could otherwise time out after a few minutes).

"Put logger to sleep after a successful lift" refers to putting the logger into a long-term storage mode, so it pauses any leak-evaluation until next used.

"Delete Aqualogs after download" instructs the logger that the Aqualog Data just read can be deleted.

← App Settings
Patroller
Not connected
Battery Level Not connected
GPS Not connected
DataGate
Standalone Mode
Data
Data management Manage loggers and DMAs
Export Data Export app data as PDF or CSV
Save correlation results
Yes
Lift and Shift
Download recording from lifted devices Yes
Download only new recordings Yes
Download only if logger is in leak state Yes
Keep logger alive while lifting recording Yes
Put logger to sleep after successful lift Yes
Aqualog
Delete Aqualogs after download
Other
Units Metric
App Information View App Info
Visit the HWM website
Privacy Policy https://www.hwmglobal.com/privacy/
Upload Log File
Clear Database
Clear all data in local database Backup Database
Copy to accessible storage

4 CONNECTING THE PATROLLER AND APP OVER BLUETOOTH

Check the Patroller is switched on prior to trying to connect the app with it.

Tap on "App Settings".

Find the "Patroller" section within the App Settings window.

This section shows the connection status.

There is a control to connect (or disconnect).

Tap the "Connect" line to start the connection process.

If required, give permission for the app to use Bluetooth.

	÷	App Settings	
_	Patroller		
•	Not conn	ected	
n process.			Cor
se Bluetooth.		Application is requesting permission to turn on Blu Allow?	etooth.
			NO

App Settings

Patroller/Server configurations

Connect

YES

The app searches for Bluetooth devices and lists them.

The Patroller will be identifiable by the Bluetooth-ID matching a part of the serial number, or some other identification on its label.

If the Patroller is not listed, gently swipe the list on the screen downwards (as shown) to re-start the search for Bluetooth devices.

When the Patroller is listed, tap the line to attempt to connect to it.

Progress of the attempt to connect will be shown, along with a confirmation message when connection is successful.

If the connection attempt is not successful, try again, until the "Connected to ..." message is displayed.

Device List

4

Bluetooth Ensure the Patroller is switched on and in range. Scan finished. 7 devices found. PAT4 E721 Available SU-080985 Available PAT4 12CE Available PAT4 12BC Available





Note: When the Patroller is powered over USB is it always on. If the Patroller is battery powered, it can switch itself off when it has not been used for some time (approx. 30 minutes); It does this to conserve battery use. It will also disconnect if the battery runs very low.

Once connected, an indication of the battery level of	
the Patroller can be obtained.	

Tap the "Battery Level" line to get the current level.

OK = More than 15% charged.

Low = Below 15% charged; Charging advised. Charging = Plugged in and charging.

The user can periodically check the battery level by returning to this screen.

The status of the "GPS time-sync" is shown (either "no time-sync" or "time-sync OK"). GPS can provide a very accurate time to the Patroller, but when not available the Patroller uses the time available from the phone.

Tapping the "GPS" line shows more details.

Patroller	
PAT4 12CE	
	Disconnect
Battery Level	
	OK
GPS	
	Enabled, no time sync
DataGate	

←	Patroller GPS
GPS	
	Enabled, time sync OK
Last G	PS time acquired
	25/03/2019 08:18:05

5 ACTIVATING THE LOGGER'S RADIO COMMUNICATIONS LINK.

During various points in operating the app with the loggers, you may have to re-activate the radio communications link of the device. This consists of swiping the logger with a magnet. Refer to MAN-031-0003.

If the logger has been set with a "patrol window" this action may not be necessary, depending on the patrol window settings and time of day.

6 REGISTERING LOGGER DEVICES FOR USE WITH THE APP

The app must be made aware of a logger before it can use it. This requires that any unknown loggers be registered with the app.

÷	App Settings
Patroll	er
PAT4-0	00166
	Disconnect
Batter	y Level
	ОК
GPS	
	Enabled, no time sync
DataG	ate
Standa	alone Mode
	Yes
Data	
Data n	nanagement
	Manage loggers and DMAs
Fynort	Data

Within the Data management area of the app, tap on "Manage loggers and DMAs"

The next screen give the option to add either loggers or DMAs

Ensure the "Loggers" tab is selected.

Tap the "+" icon to add logger devices.





You will be given the option of scanning the barcode (recommended)



(An alternative barcode format)

Alternatively, tap "Can't scan". You can then manually enter the logger serial number, which is an 8-digit number on the logger label.

e.g. 07170037 in the picture above.



Note that leading "0" characters are important as they form part of the serial number. They should be entered into the app along with other digits. Enter the serial number and tap on "Add".

Add as many loggers as required.

When you have finished, click on "Done".

All loggers that have been registered will be listed.

← Add Loggers				
Ente	r the logger serial n	umber(s) to add		
Ser	ial Number	ADD		
07	170037			
-	501	•		
	← Data man	agement 🚍	- Đ	
	LOGGERS	DMAS	;	
	Serial Numb	er		
	07170034		1	
	07170036		1	

If you tap on the Edit symbol.



... You have the option to give the logger an alternative reference name for use within the app, called an "Easy ID".

When finished, tap on "Save".

If you make a mistake with Easy-ID, you can edit this field again; it is for human use only.

If, instead, you chose to scan the logger bar-code, the app uses the phone's camera.

Align the bar-code so that it is in focus and the red line on the screen passes through the entire barcode.

Once the app can read the barcode it will load the serial number into its memory.

If the bar-code cannot be scanned, enter it manually as described earlier.





When you have finished, return to the main screen of the app, shown opposite.

7 USING THE DEVICES

7.1 LOGGER REPETITIVE FUNCTION CONFIGURATION (LEAK DETECTION)

The primary purpose of the logger is for leak detection. The operation is summarised as follows:

• The logger (PCorr+ or Permalog+) makes repetitive daily measurements of noises within the pipe it is attached to.

Pcorr+ devices can also be set to automatically record the sound of a new leak.

- The Radio link is activated during the times set as 'Patrol' windows. The device broadcasts a short radio "chirp" every few seconds whilst in the patrol window, so the Patroller can detect it.
- The Patroller will pick up the 'chirp' from the logger, when within range, and communications are established to gather data.
- If you are not in a 'Patrol' window, swipe the logger with a magnet to temporarily activate the radio communications link.
- The current settings of a logger can be read from it, to verify its current program settings. The device can also be re-programmed.

7.1.1 Reading the device settings

From the main screen, tap on "Configure Devices".

Configure Devices

Select the "Read" tab.

Tap on "Devices" to list devices that are registered within the app database and are within radio range.

Note: The radio link of the device must be active by being within its patrol window or by it recently being swiped with a magnet.



The app will list the devices by serial number with any Easy ID.

Select one or more logger devices.

Then tap on "Read".

← Device Select READ :

Devices will appear in real time. If a device does not appear, try moving closer or swiping the device.

Please select one or more devices:

07170034 034

Available

07170036 036

Available

← Device Sele	ect	READ	:		
Devices will appear in real time. If a device does not appear, try moving closer or swiping the device. Please select one or more devices:					
07170034	034				
Selected					
07170035	035				
Selected					
07170036	036				
Available					
07170037	037				
Available					

Wait for the configurations to read.

Note: If you have swiped a logger to awaken the radio comms, the available time is limited and it may need to be re-swiped if it is not responding after a few minutes. 07170034 034 Reading configuration... 07170035 035 Reading configuration... 07170036 036 Available

Once the message advises the read process is complete, tap the back-arrow button.

Then tap on a line to select the logger for which you wish to see the configuration that was read from it. **07170035** 035 Complete. Select to view.

07170034 034 Complete. Select to view.

The configuration of the logger is displayed, showing:

- IDs.
- Patrol Window (i.e. when radio link will be active).
- Patrol Days.
- Time to start leak detection.
- Confirmation delay

 (a re-check is made if there is a change from yesterday's result).
- The clock-time of the logger.
- Automatic recording setting.
 - ON = Make a recording if a new leak is detected.
 - Off = Automatic recordings are not to be made.

07170035 035

Complete. Select to view.

07170034

0

Easy ID: 034 Patrol window: 9am to 5pm Patrol days: Weekdays Log time: 02:00 Confirmation: 01:00 Logger time: 13 Apr 2020, 14:09 Automatic recording On

OK

7.1.2 Programming the device settings

From the main screen, tap on "Configure Devices".

Configure Devices



Select the "Program" tab.

The logger time is auto set to the phones time and cannot be adjusted.

All of the other settings can be adjusted by the user, but some have a limited range to preserve the life of the battery.

"Patrol Window" and "Patrol Days" controls the availability of the radio link.

"Determination Time" controls the start time of the leak evaluation.

'Confirmation Delay' is the delay to confirm the initial reading is not an error due to usage or some other event.

Use "Logging Days" to extend the battery life by evaluating only on the days that data will be collected.

Logger can be set to automatically make a sound recording when the logger detects a new leak. To enable this feature set to 'YES'.

← Configure	Devices DEVICES
PROGRAM	READ
Set logger time to:	
	13 Apr 2020 14:24:35
Patrol Times	
Patrol Window	
	Custom (9am-5pm)
Patrol Days	
	Weekdays
Logging	
Set Determination	Time
	02:00:00
Set Confirmation	Delay
	01:00:00
Set Logging Days	
	EveryDay
Automatic audio re transition to leak	ecording on a
	Yes

Select "Cancel" to cancel a change.

or

Select "Set" to accept a change; The change will be accepted and copied to the "program" tab on the "Configure Devices" screen.

The "Program" tab shows a program stored in the phone. This program can now be copied into logger devices.

Confirm each new listing is correct and tap on 'Devices'

The Device Select screen will list loggers.

If the loggers required do not appear in the list swipe them to activate the radio link for 2 minutes.

← Device Select PROGRAM

Devices will appear in real time. If a device does not appear, try moving closer or swiping the device.

Please select one or more devices:

07170034

034

036

Selected ·

07170035 035

Complete

07170036

Available

Cancel	Patrol Da	ys	Set
 Mond 	lay		
● Tueso	day		
← Co	onfigure Devi	ces	DEVICES
PROC	GRAM	RE4	AD
Set logge	r time to:		
	13 Aj	or 2020	14:37:56
Patrol Time	ès		
Patrol Wi	ndow		
	Cu	stom (9	am-5pm)
Patrol Da	ys		
		V	Veekdays
Logging			
Set Deter	mination Time	<u>}</u>	
			02:00:00
Set Confi	rmation Delay		01.00.00
0.11			01:00:00
Set Loggi	ng Days		Evendou
Automoti		ling on o	EveryDay
transition	to leak	ing on a	
			Yes
Select the loggers to be programmed			
Then tap the 'PROGRAM' button.			

Wait for the logger(s) to be programmed.

Note: If you have swiped a logger to awaken the radio comms, the available time is limited and it may need to be re-swiped if it is not responding after a few minutes.

The re-program of the repetitive operation settings of the selected loggers is now complete.

The loggers are ready to be deployed (installed).

07170034	034	2.2 8
Checking firmware	version	
07170035 Selected	035	2.2 8
07170036 Available ·	036	2.2 8

07170034	034	2.2 8
Programmed		
07170035	035	2.2 8
Programmed		
07170036	036	2.2 8
Available		

7.2 PATROLLING LOGGERS (OBTAINING LATEST LEAK-STATUS)

Patrolling loggers is the activity of driving (or walking) near the loggers in order to obtain the data from them. New data is produced daily. Only the most recent data (leak-state) is collected. The data has to be collected during the logger patrol window as the radio communications link is only operating during this time period.

From the main screen, tap on "Patrol".



The app must be connected to the Patroller 4 via the phone's Bluetooth link in order to operate.

Here it is shown as not connected. (Refer to section 4 for guidance on how to remedy this issue).

The picture opposite shows an OK connection to the Patroller 4.

Tap on "Start" to commence the Patrol process.

The Patroller 4 will then detect the chirps from the loggers and collect the data.

"State" indicates whether the logger considers a leak exists. (Y or N; Yes or No).

Level and Spread are additional numbers which can be used to derive a measure of confidence in the leak.

(i.e. a borderline or strong indication).

When you feel you have data from all the required loggers press 'Stop'. (The number of devices picked up is shown to help with this assessment).



← Patrol

```
START :
```

Connected to PAT4-00166

 Construction
 STOP

 No of devices: 2, No of chirps: 21
 No of devices: 2, No of chirps: 21

 7170034
 02:07:42 12/04/20

 State: N
 Level: 15

 7170037
 02:07:42 12/04/20

 State: N
 Level: 13

 State: N
 Spread: 11

7.3 VIEWING APP DATABASE FOR LATEST COLLECTED LEAK-STATUS

All patrolled information can be viewed in the database.

From the main screen, tap on "Database" to access.

Database

View devices stored in local database

	← Datab	ase			=
	PATROLLED	DEPL	OYED	RECO	ORDINGS
	Date / Id	State	Level	Spread	Туре
	09 Apr 2020	Ν	14	25	PC+
	28 Mar 2020	N	4	6	PC+
	07170036				
	13 Apr 2020	Ν	14	9	PC+
	12 Apr 2020	Ν	5	3	PC+
	11 Apr 2020	Ν	11	7	PC+
	09 Apr 2020	Ν	11	7	PC+
	28 Mar 2020	Ν	8	12	PC+
	07170034				
-	13 Apr 2020	N	12	4	PC+
	12 Apr 2020	Ν	15	8	PC+
	11 Apr 2020	Ν	8	7	PC+
	09 Apr 2020	Ν	10	30	PC+
	28 Mar 2020	Ν	9	6	PC+
	07170037				
	13 Apr 2020	Ν	11	6	PC+
	12 Apr 2020	Ν	13	11	PC+
	11 Apr 2020	Ν	13	6	PC+
	09 Apr 2020	Ν	12	25	PC+
	28 Mar 2020	Ν	8	6	PC+

Loggers are listed along with date of data collection and results.

The "Type" field indicates whether the logger is a PCorr+ type or a Permalog+ type.

The sub-menu icon gives access to other display ordering options for the screen.



7.4 MAKING SCHEDULED SOUND RECORDINGS

Sound recordings are useful to confirm a possible leak by an experienced person.

Sound recordings are also useful for correlation purposes to get an approximate location of a leak between 2 measurement points. Two synchronised recordings are needed for this.

When used for obtaining sound recordings, the operation is summarised as follows:

- The logger (PCorr+ only) makes a scheduled sound recording of noises within the pipe it is attached to.
- The Radio link is activated during any set 'Patrol' windows (so set this first). The device broadcasts a short radio "chirp" every few seconds whilst in the patrol window, so the Patroller can detect it.
- The Patroller will pick up the 'chirp' from the logger within range and 2-way communications are established to gather data; this may take some time but is usually less than 40 seconds.
- If you are not in a 'Patrol' window, simply swipe the logger with a magnet to temporarily activate the radio link. However, if you require the sound files for correlation purposes you must only upload them in an open patrol window, without swiping the device.

7.4.1 Programming the device	Sound Recording Program and download sound recordings
from the main screen, tap on sound kecording .	
Select the "Program" tab.	← Sound Recording DEVICES
	PROGRAM DOWNLOAD SCHEDULE
The recording may be either set to occur on the next available timeslot, or at some future time.	Recording type
	Schedule Next (10:30 recording available am)
	Recording Day
Set the date of the scheduled recording.	21/04/2020
	Recording Time
Set the time of the scheduled recording.	10:35
The recording may be either 10 or 20 seconds in duration.	Recording Duration
	10 seconds
25	



```
... OR ...
```



Confirm the options are correct for your scheduled recording and that there is sufficient time to position the loggers.

Then tap on 'Devices'. ← Sound Recording DEVICES PROGRAM DOWNLOAD SCHEDULE \leftarrow **Device Select** PROGRAM The Device Select screen will list loggers. Devices will appear in real time. If a device does not appear, try moving closer or swiping the device. If the loggers required do not appear in the Please select one or more devices: list swipe them with a magnet to activate 2.2 the radio link for 2 minutes. 034 07170034 8 Available - Aqualog 2.2 035 07170035 Q Available - Aqualog 2.2 036 07170036 8 ← **Device Select** : PROGRAM Available - Aqualog 2.2 037 07170037 Devices will appear in real time. If a device does not appear, try moving closer or swiping Available - Aqualog the device. Please select one or more devices: 2.2 034 07170034 8 Available - Aqualog 2.2 035 07170035 8 Available - Aqualog 2.2 036 07170036 Select the loggers to be programmed 8 Selected - Aqualog Then tap the 'PROGRAM' button. 2.2 037 07170037

8

Selected - Aqualog

Wait for the logger(s) to	be	0717	0036	036	5	2.2 8 7
programmed.		Synchro	nising A	qualog		
		0717	0037	037	7	2.2 8 7
		Initialisi	ng Aqua	log		
						ſ
Once programmed, the control appears; Tap it.	back-arrow	÷	Device S	elect	PROGR	AM :
		Devices does no	will appear t appear, try	[,] in real y movin	time. If a d g closer or	evice swiping
Select the "Schedule" ta	b.	← :	Sound Re	cordi	ng	÷
		PROGR	AM DO	WNLO.	AD SC	HEDULE
You will be able to follo scheduled recording. (N ← Sound Recording PROGRAM DOWNLOAD SC	w the expected p lote: The display i HEDULE	progress of ed times ar	the loggers e only appr	with a posimate	orogramme e).	d
036	00:09.33	ooording				
07170037 0	00:09.41		:			
037	AM D	OWNLOAD	SCHEDULE			
	036		Recording		-	
	07170037		0 00:00.05	Sound	Recording	:
	037		071	RAM	DOWNLOAD	SCHEDULE
			036	/0036	Reco	ording complete
			071 037	70037	Reco	ording complete
		28				

7.5 DOWNLOADING SCHEDULED RECORDINGS

Once the recordings are complete, they can be downloaded.



	← s	ound	Recordi	ng	DEVICES
	PROGRA	M	DOWNLO	AD	SCHEDULE
b.					
evices within stored sound					
	No devices in the top ri	selec ght to r	ted. Tap or select the ecordings	n the ' devic from!	Devices' button es to download

Select the Download tab.

Then Tap on "Devices".

The app searches for devices within radio range that have stored sound recordings.

Select the devices that you wish to download the sound file from.

Tap "Download".



Then wait for the files to download.

Device Select

ABORT

Devices will appear in real time. If a device does not appear, try moving closer or swiping the device.

Please select one or more devices:

07170034	034	2.2 8
Available - Aqualog		
07170035	035	2.2 8
Available - Aqualog		
07170036	036	2.2 8
Downloading: 50% - A	Aqualog	
07170037	037	2.2 8
Preparing to downloa	ad Aqualog	•

07170036	036	2.2 8
Download finished	- Aqualog	
07170037	037	2.2 8
Download finished	- Aqualog	

When download of the selected devices is finished, tap on the back arrow.

The recordings will be listed.

You have the option to play them now, or at a later time (from the Database "recordings" tab).

← Sound	d Recording	DEVICES :
PROGRAM	DOWNLOAD	SCHEDULE
0717003 28 Mar 2020 1	4 034 7:40	(Tap to play) [10s]
0717003 28 Mar 2020 1	5 035 7:40	(Tap to play) [10s]
0717003	5 035	(Playing)
Zo War ZUZU	17.40	[105]

Tap on a line to play the sound file through the phone speaker or headset.

Tap again to stop.

Note: The same download process can also be used to collect sound recordings that were automatically made by the logger as part of its leak-detection program.

7.6 VIEWING AND PLAYBACK OF SOUND RECORDINGS

Recordings can be viewed and selected for playback from the Database.

From the main screen, tap on the "Database" line.

Database View devices stored in local database



Select the "Recordings" tab.

Sound files (automatic recordings and scheduled recordings) will be listed. The date and time of the recording is also available.

Tap the line of the recording you want to listen to.

Tap on the media controls at the top of the screen to begin or stop playback.



The file can be deleted if you choose by tapping on the bin icon.

You can use the phone's speaker, but headphones give a better experience.



Recording length: 10

7.7 USING PCORR FOR LEAK LOCATION (SOUND CORRELATION)

7.7.1 Introduction to theory of operation

To obtain a good correlation place the sensors **either side** of the suspected leak, make **synchronised** sound recordings, and let the app correlation facility do its job. The noise of the leak must be heard at each sensor. (Refer to section 7.4 for how to make the recordings).



The process calculates the time difference (Td) between two recordings made simultaneously at different locations. The location (L) of the leak along the pipe network can then be calculated from various parameters, including the sound velocity (V).



The two loggers that correlation recording will be performed with need to either -

- Both be on firmware version 2.28 or less. OR
- Both be on firmware version 2.30 or greater.

7.7.2 Operating the app to obtain a correlation

From the main screen, tap on "Correlation".

The Correlation screen is shown, which lists recordings grouped by date time.

(Correlations make a mathematical comparison of the sounds for similarity. They therefore require synchronised sound recordings from devices that were near the leak, for a fair comparison. Only choose recordings that have the same date and time and that are from devices that were located near to each other).

Correlation Correlate sound red	cordings
← Correlation	
RECORDINGS	CORRELATIONS
28 Mar 2020 17:40	
07170034	
07170035	

Select the two recordings for correlation.

Then tap on "Correlate".

The "Properties" screen, requires information about the parameters of the pipe network between the measurement points.

RECORDINGS	CORRELATIONS	
28 Mar 2020 17:4	0	
07170034	 Properties 	CORRELATE
07170035	071700 34>	071700 35
	Segment 1 A	
	Material	Ductile iron
	Diameter	14" (350mm)
	Segment length (metres)	750
	Velocity (mtrs/sec)	1180
	34	





e.g. Two segments will be needed for the following example:

When the parameters are correct, tap on "Correlate".

A message should be displayed with an option to show the correlation result graph.

Correlation

Correlation successful. Show graph?

NO YES

Tap on "Yes".

← Properties	CORRELATE
071700 34>	071700 35
Segment 1 A	
Material	Ductile iron
Diameter	14" (350mm)
Segment length (metres)	750
Velocity (mtrs/sec)	1180
Recommended Band Filter	100 - 2000 Hz



	Data
	Data management
	Manage loggers and DMAs
	Export Data
Within the Ann Settings page there is	Export app data as PDF or CSV
an option to save any correlation	Save correlation results
results.	Yes

If the option to save correlations is active, correlations are automatically saved.

Saved correlations appear when the "Correlations" tab is selected.

	← Correlation
CORRELATIONS	RECORDINGS
	17 Apr 2020 15:15
150m Cast iror	->
78.9m	07170036 -> 07170037
	09 Apr 2020 15:55
100m Cast iror	->
39.8m	07170035 -> 07170034
100m Cast iror	->
60.1m	07170034 -> 07170035
	28 Mar 2020 17:40
150m Cast iror	->
63.2m	07170034 -> 07170035

Note: Not all sound files are able to be used for Correlation purposes. The scheduled recording setup-process sets the time more accurately than the general logger setup process. The app is able to determine which sound files are acceptable and only lists these for selection. (The database recordings tab lists all available files, including unsuitable ones). For best results, setup of recordings should not be more than a few hours in the future to minimise any time-drift occurring between loggers.





Clicking on "More details" gives the opportunity to view more information about a correlation.

Band pass filters (Hz) - 100 -	2000 Hz Reset	
MORE DETAILS	DONE	
← Correlation I	Details	
From:	07170034	
То:	07170035	
Date & time: 28 Mar 2020 17:40		
Leak position: 3	8.9m	
Confidence: 67.1%		
Low band pass filter frequency: Aut o		
High band pass filt	er frequency: Aut o	
Segment 1		
Length:	100m	
Material:	Ductile iron	
Diameter:	14" (350mm)	
Velocity:	1180	

7.8 Use for obtaining Aqualogs

7.8.1 Introduction to Aqualogs

An "Aqualog" is the name given to a set of data produced when a HWM logger analyses the sound coming from a water pipe. The logger analyses the power-level of the sound at various intervals. The power-level of each sample is then used to increment one of a set of counters, one counter being for each possible power-level. The over-all picture of the sound levels coming from the pipe can then be displayed graphically in the form of a histogram. (More persistent power levels have a higher count).

Absence of a leak usually appears as a wide spread of sound power levels; this indicates no persistent noise (just random water noises).

Presence of a leak usually appears as a narrow spread of sound power levels; this indicates a persistent noise (the leak sound is super-imposed on random water noises). These are shown respectively in the two diagrams below.





The loggers are limited in the number of Aqualogs that can be produced, thus there is a trade-off between number of days and samples per day; they can affect each other if

the overall limit is not to be exceeded. A battery warning message may be displayed if many Aqualogs are being set. Choose whether to continue or re-program.

To set loggers with the program:

- Tap on the "Devices" line,
- Wait for loggers to be listed,
- Select the ones you want to program from the list,
- Tap on Program.
- Wait for the devices to be programmed.

(These steps are similar to that described at the end of section 7.4.1).

Depending on what is entered into the Aqualog program, the Aqualogs could take some time to produce.

Return to the loggers at a suitable time, when the programmed Aqualogs will have finished.

The Aqualogs may be downloaded by the following method:

From the main screen, tap on "Aqualog".

Aqualog

	Aqualog config for devices		vices
Tap on "Downloads".			DEVICES
Tap on "Devices"	← Davia	Device Select	DOWNLOAD
	does i the de Please	es will appear, try movin evice. e select one or more	devices:
Select one or more devices from the list of the loggers in radio range.	037 Select	071 ted - Aqualog	170037 ^{2.2} 8
The tap on "Download".			

Aqualag

Note: If a device has an Aqualog stored, the app will indicate this in the "Device Select" screen.

The Aqualog data (a set of one or more Aqualogs) is downloaded.

When finished, tap the back-arrow.

The Downloads tab lists all available (stored by the app) Aqualogs.

Tap on a "Samples downloaded" line.

Each set of Aqualog data is listed.

as a histogram.

This screen allows you to select a single or

multiple Aqualogs for display in a graphical form

(Aqualogs are not saved in the app database, but only kept temporarily in the phones memory).

← Device Select DOWNLOAD :

Devices will appear in real time. If a device does not appear, try moving closer or swiping the device.

Please select one or more devices:

Complete(5/5) - Aqualog

← Aqualog		DOWNLO	٩D	
CONFIGURATION		ON	DOWNLOADS	
071	70037	037		-
Samples downloaded:		5 of 5		

← Histog	grams	:
07170037	037	-
0	20 April 2020	0 13:58
1	20 April 2020	0 13:52
2	20 April 2020	0 13:46
3	20 April 2020	0 13:41
4	20 April 2020	0 13:35

← Histog	grams	:
07170037	037	-
0	20 April 2020	0 13:58
1	20 April 2020	0 13:52
2	20 April 2020	0 13:46
3	20 April 2020	0 13:41
4	20 April 2020	0 13:35

Select the ones you wish to see.

The tap "Show Histogram".

SHOW HISTOGRAM

The selected data is displayed on a single graph.

If a logger was on a leaking pipe it should show a strong peak, particularly for Aqualogs made at periods of low water use (e.g. night).

It should also look similar for each of the plots on the graph, with the peak at around the same power level (dB).

← 07170036

21 April - 22 April

Average level = 44 Average spread = 38





If a logger was on a non-leaking pipe it will not show a strong peak.

The histogram is more chaotic and will show random pipe noise only.

It is best to set the logger to produce Aqualogs during low water use periods (e.g. at night).

7.9 Use of devices for temporary leak surveillance (lift and shift)

7.9.1 Programming the device for Lift and Shift operation

"Lift and Shift" has three specific meanings, depending on the context.

- It refers to the process of deploying a logger to a site (managing its location details within the app database).
 - "Shift" is the deployment stage where a logger is installed at a site.
 - \circ "Lift is removal from the site and back into temporary storage.
- It refers to the use of the loggers as mobile devices that make an over-night survey for leaks and are moved each day to a new location.
- It refers to the setting of a logger's patrol window for maximum battery life; effectively there is no patrol window and the logger communication has to be temporarily activated by a magnet swipe.
- Note: It is not mandatory to set the patrol window to be inactive in order to manage the logger's location change. However, having many loggers broadcasting whilst being transported in a vehicle can cause interference and the Patroller may not be able to easily pick up transmissions from some loggers. It is therefore recommended that the patrol window be made inactive (i.e. by selecting the "lift and shift" option, as described here) when the loggers are continuously changing their location.

Configure Devices



From the main screen, tap on "Configure Devices".

Set the program for devices in a similar manner described in section 7.1.2, but set the Patrol Window to be "Lift and Shift".

Then select and program the logger devices.

Once a device is programmed, the radio link will be deactivated.

Presets	
Day (8am-4pm)	
Night (8pm-4am)	
Morning (6am-12pm)	
Afternoon (12pm-6pm))
Lift & Shift	
Custom	
	CANCEL

← Co	nfigure Do	evices	DEVICES
PROG	RAM		READ
Device Time			
Set logger	time to:		
	02	May 20	20 14:06:01
Patrol Times	ò		
Patrol Win	dow		
			Lift & Shift
Patrol Day	S		
			Lift & Shift
Logging			
Set Detern	nination Ti	ime	
			02:00:00
Set Confiri	mation De	lay	
			01:00:00
Set Loggir	ig Days		
			EveryDay
Automatic transition	audio rec to leak	ording o	na

7.9.2 Operating Lift and Shift:

From the main screen, tap on "Lift and Shift".

Lift and Shift For continuous location change

IS,

Select the "Shift" tab.

(Shift is the deployment stage).

Then tap on the "Device serial number" line.

The app will list all loggers in radio range.

Select the one you want to deploy.

Note: Since the loggers were earlier set to have no patrol window, swipe the logger with a magnet to temporarily activate the RF comms.

← Lift & Shift	
LIFT	SHIFT
Select the device seria	I number to deploy.
Device Serial Num	ber
	0.000
RESET	SYNC LOGGER

Tap on a line with a logger serial number to select it in the app.

÷	Select device	:
071 035	70035	
071 036	70036	

The logger details will load into the screen.

ap off the discool and the	Тар	on	the	"GPS	coordinates	" line.
----------------------------	-----	----	-----	------	-------------	---------

← Lift & Shift	
LIFT	SHIFT
Select the device seria	l number to deploy.
Device Serial Numb	ber
	07170035
Easy ID	
	035
GPS Coordinates	

A map will appear.

The map will either show existing sites which could be re-used (tap on the geolocation pin to select) or a new site may need to be created (as in this example).

Position the "X" on the map so it is correctly showing the location of the new site. (The map can be panned and zoomed to do this using usual phone finger control; the X remains in the middle of the screen).



Then tap on the "Create new site at this location" line.

CREATE NEW SITE AT THIS LOCATION

The app will get GPS coordinates and an approximate address for the site.

The address details can be modified if required.

Tap on the "Site ID" line and enter an ID for the site.

The app requires a Zone or DMA to be entered. Tap on the line and select a preexisting one or create a new one.

(A Zone or DMA is a way of grouping sites into an area, possibly a "District Metered Area", or however you wish to group the sites).

When finished, tap on "Sync Logger Time".

Swipe the logger if required to temporarily activate its RF comms once more, which will allow the app to proceed.

Once the logger time sync is completed, the option to "Deploy" appears.

Tap on "Deploy".

This tap must be done as soon as the time is synced, and before the logger communications link times out.

The app manages two logger lists for tracking deployment status, the "deployed" list, and the "non-deployed" list. The above actions (a shift) have deployed the logger, which is now moved to the "deployed" list, waiting to be lifted from the site.

Repeat the deployment process for all sites that require a logger for the area survey.

← Lift & Shi	ift			
LIFT	SHIFT			
Select the device serial number to deploy.				
Device Serial N	umber			
	07170035			
Easy ID				
	035			
GPS Coordinate	es			
	53.485613, -1.221932			
Address				
The Castle	e Mill, Minneymoor Hi			
Site ID	High St 2			
Zone/DMA	Flight St 2			
Zone, Divia	Conisbrough			
0 ¹ N 1				
RESET	SYNC LOGGER			
Clock was set on				
RESET	DEPLOY			

Following the overnight survey, return to each site to collect the loggers and data.

Connect to the Patroller 4 and re-open Lift and Shift.

Select the "Lift" tab.

Tap on "Selected Zone / DMA" and make your selection.

e.g.

	-	Colort Tons /DMA	_
		Select zone/DMA	
	Cas May 2	tle 20	
	Wat Estat	erside e	
Tl tł	he DMA nat are	is accepted and a list of all dev deployed in the area is shown.	vices
Ta Ic	ap on "S oggers t	Start"; the app is now looking fo hat are listed.	or

Go to each location, one at a time.

Collect the logger.

Swipe the logger with a magnet to activate the RF communications.

← Lift & Shift	
LIFT	SHIFT
Selected Zone/D	MA:
Number of devices	Devices remaining
Serial number	Easy ID
← Lift & Shift	
LIFT	SHIFT
Selected Zone/DI	MA:
Number of devices	Castle Devices remaining
Number of devices	Castle Devices remaining 4
Number of devices 4 Serial number	Castle Devices remaining 4 Easy ID
Number of devices 4 Serial number 07170034	Castle Devices remaining 4 Easy ID 34
Number of devices 4 Serial number 07170034 07170035	Castle Devices remaining 4 Easy ID 34 035
Number of devices 4 Serial number 07170034 07170035 07170036	Castle Devices remaining 4 Easy ID 34 035 036
Number of devices 4 Serial number 07170034 07170035 07170036 07170037	Castle Devices remaining 4 Easy ID 34 035 036 37
Number of devices 4 Serial number 07170034 07170035 07170036 07170037	Castle Devices remaining 4 Easy ID 34 035 036 37
Number of devices 4 Serial number 07170034 07170035 07170036 07170037	Castle Devices remaining 4 Easy ID 34 035 036 37
Number of devices 4 Serial number 07170034 07170035 07170036 07170037	Castle Devices remaining 4 Easy ID 34 035 036 37

START



"Sleep mode" is also known as "storage mode" as it de-activates the device from making any leak-noise evaluations (there is no point to this whilst the device is being stored).

The app produces a Logger summary report. It advises of the leak-state detected by the logger. It also advises which actions were taken. 07170035 Logger 07170035 lift report: - Leak: No - Lifted: Yes - Completed: Yes - Sleep: Yes

The above actions (a lift) have removed the logger from deployment, which is now moved to the "non-deployed" list, available to be deployed to another site.

Continue collecting loggers until there are none left on the list, which implies you have all of your loggers returned.

7.9.3 Viewing the results

After collecting all loggers, the data can be viewed in the "Database" screen.

You can view data grouped by patrolled date.

You can view data grouped by deployment status (sorted by DMA).

Tap on any line(s) to select a site (or sites), then tap "show on map".

<	Database				
Date / Id	State	Level	Sprea d	Туре	
02 May 2020					
07170037	Ν	20	8	PC+	
07170036	Ν	17	14	PC+	
07170035	Ν	12	13	PC+	
07170034	Ν	17	16	PC+	
Castle 1					

07170034 034 os Cottage Castle Cottage, Castle St,...

07170035 035 opp Dale Conisbrough Castle, Coni...

07170036 036 opp Car Park Conisbrough Castle, Co...

07170037 *037* junc Low Rd Conisbrough Castle, Con...

Show on map



The sites containing the selected devices will be shown.

8 MANAGING GEOGRAPHICAL LOCATION OF LOGGERS

Note: The same procedure as described in section 7.9.2 can also be used for the app to manage the geographical locations of permanently installed loggers.

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MAN-2004-0002-A June 2020