



# QAM Snare Snoop User Manual

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QS-Snoop-v2.0

2/21/2018

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This document details the functions and operation of the QAM Snare Snoop leakage detector



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## Overview

The QAM Snare Snoop is designed with the fulfillment technician in mind for troubleshooting within the home or at the drop. It is a multi-modulation format, multi-channel detector that is extremely flexible for the user. It will operate in QAM, Analog, Pilot/QAM, OFDM and Shielding Test detector modes. The device does not provide the ability to record drive-outs, and does not report detected leaks to the QAM Snare server database. However, when the Snoop Auto Detection profile is configured, the Snoop Time and GPS coordinates are captured at the server to log activity each time the detector is activated.

When not being used, it is stored in its cradle, where it receives power as well as the GPS from the roof antenna which attaches to the cradle. It is designed to remain powered while cradled such that it establishes GPS lock and is always ready to be used without wait time for the technician. When the technician needs to use the detector, it is pulled from the cradle and the technician can freely move to the leak source. The Snoop is a Wi-Fi device that requires Wi-Fi connectivity when used in the QAM detector mode. When used in Analog detector, Pilot/QAM detector, Shielding Test detector and OFDM detector modes it does not require Wi-Fi connectivity nor does it require GPS lock.

The Snoop Shielding Test detector mode is intended to be used in conjunction with the QAM Snare Pilot Transmitter, to quickly troubleshoot locations in the home and MDU's where poor shielding effectiveness results in forward ingress issues related to close proximity LTE transmitters. Others have referred to this testing technique as 'Pressure Testing'.

The device contains no maps and provides the user with no feedback as to the flagged leak location. If it is desired to utilize this product as a find and fix tool at leak locations previously identified by other QAM Snare devices having drive-out capability,





as a time saver it is recommended to use the QAM Snare Web Client on a mobile device to have visibility to the GPS calculated flagged leak location which provides an accurate starting point for the final search. This process is much more effective than blindly walking around, but marginally more time consuming as compared to the Navigator Plus device which contain maps integrated within the device display.

## Screen Navigation

---

Upon startup the user can either select Detector mode, where the unit will function as a leakage detector - or the user can select Settings, where various changes to the operating parameters are made.

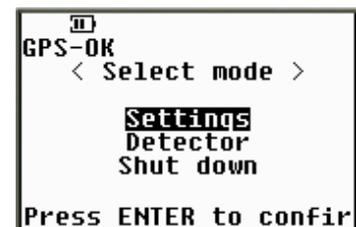
Screen navigation is performed with a simple three button scheme. The left and right arrows move the highlighted cursor to the desired item to be selected, and the middle circular enter button is used to confirm the selected menu item. The circular middle button also functions as a power button and turns the unit on by pressing and holding for two seconds.



## Settings

---

The Settings button is used to select all the various configuration options. To access this mode, use the left or right arrow to highlight the Settings mode and press enter. Settings related to the QAM Snare server and the Wi-Fi profiles that the device attaches to MUST be configured through the Q-browser software program.



## General

The General settings button provides for access to several miscellaneous configuration items which are detailed below.

```

ii) < Select setting >
    General
    Connection
    Detector
    Leak alarms
    Calibrator
    Exit
    Press ENTER to confir
  
```

## Information

The Information selection item provide the user with information on the Device ID (which by default is the MAC address) and Technician ID that was assigned to the unit through Q-browser. It provides information on the Firmware revision, the QAM Snare Server name it is configured to connect to, and the device MAC address. For security reasons, the Wi-Fi configuration is not displayed – but this information is available through the Q-browser.

```

ii) < Select >
    Information
    Sound:OFF
    Auto Start/Stop:OFF
    Auto Det. Profile: OFF
    Standard: NTSC
    Exit
    Press ENTER to confir
  
```

```

ii)
Dev. ID :001EC02B45A7
Techn ID:Arcom Snoop
Firmware :S5.20.04
QS Server:server 2
MAC:00:1E:C0:2B:45:A7
    Press ENTER to EXIT
  
```

## Sound

The Sound button allows the user to turn the audio alarm and button feedback on or off. Naviagate to Sound and press enter, then use the right or left arrow to select on or off, then press enter to confirm the selection. The threshold setting for high and low leak alarms is configured in the Leak alarms menu item, and the sound off setting configured here will override the Leak alarm setting.

```

ii) < Select >
    Information
    Sound:OFF
    Auto Start/Stop:OFF
    Auto Det. Profile: OFF
    Standard: NTSC
    Exit
    Press ENTER to confir
  
```

## Auto start

The Auto Start/Stop setting allows the unit to turn on and establish GPS lock automatically when power is applied, as when the vehicle is started. It will **NOT** automatically enter detector mode, as it is not intended to detect leaks while cradled. This setting also controls an Auto Off counter feature, which powers the device down when power is disconnected, as the vehicle is turned off.



```
ii) < Select >
Information
Sound: OFF
Auto Start/Stop: OFF
Auto Det. Profile: OFF
Standard: NTSC
Exit
Press ENTER to confir
```

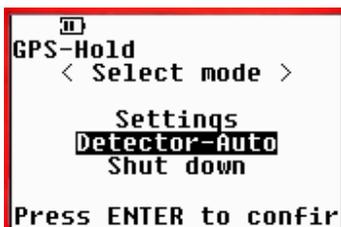
## Auto Detect Profile

The Auto Detect Profile turns on and off the ability to automatically switch between detection profile (Analog, QAM, Pilot/QAM, and OFDM) based on GPS coordinates. Different sections of the cable network can have different channel lineups and can utilize different modulation format, or can be in R-PHY node areas. Since the detection schema can be different in different areas, the Auto Detection Profile feature provides a means to for the detector to automatically switch to the correct detection profile without user involvement. The QAM Snare Server communicates with the detector and based upon its GPS location tells it which mode it should be in. Additionally, when Auto Detection Profile is ON, and Wi-Fi & QS Server credentials have been entered, the Snoop will connect to a selected server to send GPS Time and coordinates to the server. This is used to log Snoop usage activity only, and no leakage data is recorded. "GPS SYNC" is required when Auto Detect Profile is turned "ON".



```
ii) < Select >
Information
Sound: OFF
Auto Start/Stop: OFF
Auto Det. Profile: ON
Standard: NTSC
Exit
Press ENTER to confir
```

When Auto Detection Profile is ON, the main menu will indicate this by adding "AUTO" to the detector menu option.



```
ii) GPS-Hold
< Select mode >
Settings
Detector-Auto
Shut down
Press ENTER to confir
```

## Standard

This allow to change the television standard between NTSC, PAL B/G, and PAL D/K so the proper channel listing can be selected. It is a one-time setup parameter.

```

    < Select >
    Information
    Sound:OFF
    Auto Start/Stop:OFF
    Auto Det. Profile:OFF
    Standard: NTSC
    Exit
    Press ENTER to confir
  
```

## Exit

Exit returns to the higher-level menu screen. Select and press enter.

```

    < Select >
    Information
    Sound:OFF
    Auto Start/Stop:OFF
    SE indication:ON
    Standard: NTSC
    Exit
    Press ENTER to confir
  
```

## Connection

The connection menu item is used to select the QAM Snare server and Wi-Fi devices the Snoop connects to. **Specifics related to these connections must be entered using the Q-browser software program by connecting a PC to the device through the USB port on the cradle.** Multiple profiles may be entered, and the connection setting allows the user to select from previously entered profiles, but it will not allow profiles to be entered directly into the Snoop.

```

    < Select setting >
    General
    Connection
    Detector
    Leak alarms
    Calibrator
    Exit
    Press ENTER to confir
  
```

## QS Server

The QAM Snare Server which the device needs to connect to is selected here. Press enter and the profiles of servers previously configured through the Q-browser are displayed, with the server name and IP address displayed. To select a different server press next server. If the required server is not displayed it must be configured through the Q-browser. Multiple server

```

    < Select >
    QS server
    WiFi profile
    Exit
    Press ENTER to confir
  
```

```

    Select server
    Name(ID):test
    IP:100.200.255.254
    Next server
    Exit
    Press ENTER to confir
  
```

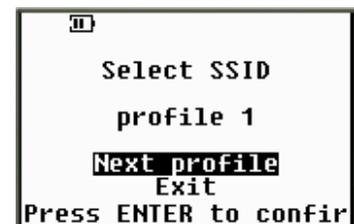


profiles would only be necessary for the technician that works in areas covering more than one server.

*For clarification, a typical QAM Snare installation will have multiple hubs connected to one server that covers a broad area. One signal processor hardware device is required in each hub, and the signal processors communicate with the QAM Snare server when in QAM Detector mode. The server monitors the GPS location of each connected field device and coordinates that each device receives signal samples appropriate for the hub the field device is currently located. This setting has nothing to do with signal processors as that is managed by the server – just multiple server addresses.*

## Wi-Fi profile

The Snoop is a Wi-Fi enabled device that requires connectivity to operate in QAM detector mode. Profiles that were previously entered into the device through the Q-browser are selected through this menu item. Multiple profiles may be stored in device, and selected when desired.



## Walk mode -vs- Truck mode

Other QAM Snare products such as the Navigator Plus utilize a Truck mode and Walk mode concept for how the device operates when it is cradled and when it is used by the technician moving around. Since the Snoop is designed to be used only while moving around outside the vehicle, it inherently operates in Walk mode, as has no Truck mode capability.

## Detector Settings

---

QAM Snare Snoop is very flexible as to how it operates. Specifics related to the desired detector settings are configured here.

```
ii)
< Select setting >
  General
  Connection
  Detector
  Leak alarms
  Calibrator
  Exit
Press ENTER to confir
```

## Signal Mode

---

Signal mode is the terminology used to describe the leakage detector operating in Analog, QAM, Pilot/QAM or OFDM modes. If it desired to use any of these modes – then Signal mode needs to be turned to On. When Signal mode is turned off, the unit will only operate in Shielding Test mode (used in conjunction with a Pilot transmitter device for in-home troubleshooting) and the unit will automatically go into Shielding Test mode when the Detector setting is selected. *If the unit will not allow you to select QAM, analog, or OFDM modes and that is what you would like to do, then the Signal mode needs to be turned on.*

```
ii)
< Select >
Signal mode:ON
  Channel
  Shielding test:ON
  Channel
  Exit
Press ENTER to confir
```

## Channel

---

This is where the leakage detector channel and channel format is selected for QAM, Analog, Pilot/QAM and OFDM modes.

Snoop can operate simultaneously at two frequencies one above and one below 650MHz. The channels below 650MHz are considered to be the low band and the channels above 650MHz is considered to be the LTE band. Low band allows selection of OFDM, QAM, Pilot/QAM, Analog, or OFF. LTE band allows selection of OFDM, QAM, or off.

To configure, the logic is to select the desired band and press enter. The arrow buttons will cycle between available modulation formats or off – press enter for the desired selection.

```
ii)
< Select >
Signal mode:ON
Channel
  Pilot mode:OFF
  Pilot frequency
  Exit
Press ENTER to confir
```



The next step is to select the desired channel or frequencies for the selected modulation format within the selected band, and then configure for the specifics and details related to the selected modulation format as described below.

After one frequency band is configured, navigate to the Next band line and press enter, then repeat the process for the second band. When Auto Detection is enabled, the QS server will control the detection channel and will over-ride any channel settings configured on the local detector.

## Channel – Analog detection

When Analog detection is selected, in addition to the channel configuration, an option to use analog tagging is available. From the Low band line, press enter, then use the arrow keys to select Analog.

*Analog detection option is not available as a selection option for the LTE band.*

```

  < Select >
  LOW band:Analog
  Channel: 16/133.26MHz
  TAG confirm : ON
  TAG frequency: 20 Hz
  Next band
  Exit
  Press ENTER to confir

```

## Analog channel

To select the channel, navigate to the Channel line, press enter, and then use the right and left arrow keys to select the desired channel.

*If the channels displayed are different from the television standard utilized in your network, go to the General settings page, select Standard, and change to the appropriate desired television standard.*

```

  < Select >
  LOW band:Analog
  Channel: 16/133.26MHz
  TAG confirm : ON
  TAG frequency: 20 Hz
  Next band
  Exit
  Press ENTER to confir

```

## Tag confirmation on/off

If utilizing an existing AM tagging system is desired, then the TAG confirm option needs to be set to ON. Navigate to the TAG confirm line, press enter, use the arrow keys to toggle ON/OFF.

```

  < Select >
  LOW band:Analog
  Channel: 16/133.26MHz
  TAG confirm : ON
  TAG frequency: 20 Hz
  Next band
  Exit
  Press ENTER to confir

```

## Tag frequency

The TAG frequency must be configured to match the frequency of the utilized tag system. Default is 20 Hz. To change to a different frequency, navigate to the TAG frequency line, press enter, and use the arrow keys to select desired modulation frequency. Selectable options range from 10 - 30 Hz.

```

  < Select >
    LOW band:Analog
  Channel: 16/133.26MHz
  TAG confirm : ON
  TAG frequency: 20 Hz
    Next band
    Exit
  Press ENTER to confir

```

## Channel - QAM detection

From either the Low band or LTE band selection line, press enter, use the arrows to select QAM, then press enter.

```

  < Select >
  LOW band: QAM
  Channel: 17/141 MHz

  Next band
  Exit
  Press ENTER to confir

```

## QAM channel

To select the QAM channel, navigate down to the Channel line, press enter, and use the arrows to select the desired frequency.

After selecting the channel, navigate down to Next band and repeat the process to configure the second channel.

*For QAM detection, it is recommended to use only channels configured as Global Channels in the QAM Snare Manager Program to avoid channel contention issues. Each server is only able to process four different channels, and all users connected to the server must operate only on those four channels.*

```

  < Select >
  LOW band: QAM
  Channel: 17/141 MHz

  Next band
  Exit
  Press ENTER to confir

```

## Channel - OFDM detection

From either the Low band or LTE band selection line, press enter, use the arrows to select OFDM, then press enter.

```

  < Select >
  LTE band: OFDM
  Channel: 120/771 MHz
  CP 1: 768.555555 MHz
  CP 2: 773.555555 MHz
  Next band
  Exit
  Press ENTER to confir

```

## OFDM channel

To select the OFDM channel, navigate down to the Channel line, press enter, and use the arrows to select the desired frequency.

```

  (M) < Select >
      LTE band: OFDM
  Channel: 120/771 MHz
  CP 1: 768.555555 MHz
  CP 2: 773.555555 MHz
      Next band
      Exit
  Press ENTER to confir
  
```

## OFDM detection continuous pilot harmonics

Two harmonics of the OFDM continuous pilots are utilized for OFDM detection. The two harmonic frequencies MUST both be within the bandwidth of the selected OFDM channel, and for optimum performance the two harmonics should be selected at the maximum spacing within the channel. The EXACT frequency of each pilot harmonic must be entered. It is recommended that the device is configured to enable the Auto Detection Profile such that exact harmonic frequencies do not need to be loaded into the detector, and the detector acquires the information from the QS Server. The method to determine the pilot harmonic frequency is beyond the scope of this document, consult with your supervisor to get the proper frequency information.

```

  (M) < Select >
      LTE band: OFDM
  Channel: 120/771 MHz
  CP 1: 768.555555 MHz
  CP 2: 773.555555 MHz
      Next band
      Exit
  Press ENTER to confir
  
```

```

  (M) < Select >
      LTE band: OFDM
  Channel: 120/771 MHz
  CP 1: 768.555555 MHz
  CP 2: 773.555555 MHz
      Next band
      Exit
  Press ENTER to confir
  
```

If it is required to add this information manually to the detector, once the frequency information is acquired, first navigate to the CP1 line item and press enter. The cursor will move to the first frequency digit. If this digit needs to be changed, press enter, then use the left and right arrow to increment or decrement the digit. Press the enter button to confirm the selection. Then use the right arrow to move to the next digit that needs to be changed and repeat the process. The right arrow can also be used to skip digits if they do not need to be changed. Once this process is finished, continue to press the right arrow to highlight MHz, and the entire line as entered will be accepted. Then for the next CP2 line, repeat the process for the second harmonic of the continuous pilot within the selected channel bandwidth – press the right arrow to move the cursor to the far right to accept changes. Frequencies can also be configured using the Q-browser, and it is recommended to do so such that the exact frequency can be

cut and pasted as a more foolproof configuration process – if Auto Detection is not being used.

### Error CP1 or CP2

---

If you receive this error message after selecting the two harmonic frequencies, it indicates that the selected frequency is outside of the bandwidth of the selected channel. Repeat the configuration step and ensure the selected frequencies are within the channel.

```

❏ < Select >
  LTE band: OFDM
  Channel: 120/771 MHz

  ERROR CP2

  Exit
  Press ENTER to confir

```

### Pilot/QAM mode

---

The Pilot/QAM option is used to detect a leakage test signal comprised of a pair of low-level CW carriers separated by 6 MHz, with one of the carriers injected at the channel boundary on the lower edge of the Single Carrier QAM (SC-QAM) signal, and the second CW carrier injected at the channel boundary on the upper edge of the same SC-QAM signal. The Pilot/QAM carriers are precisely placed at the QAM band edge,  $\pm 5$  kHz. This setting is typically utilized in Remote-PHY systems.

```

❏ < Select >
  LOW band:Pilot/QAM
  Channel: 17/141 MHz
  Code # 2
  Pilot lev, dB: -30
  Next band
  Exit
  Press ENTER to confir

```

### Leakage Detector Pilot/QAM mode Channel and Frequency Selection

---

Once Pilot/QAM mode has been selected it is necessary adjust frequency and level parameters for detection. Using the Arrows and Enter keys, select “Channel” and press Enter. Select the desired leakage detection channel using the Arrow and Enter Keys.

### Leakage Detector Pilot/QAM mode Code #

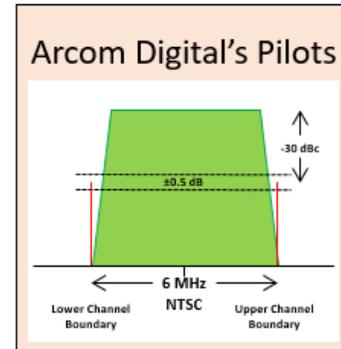
---

To simplify the setup of specific pilot frequencies the Snoop presents codes for the operator to select a desired pair of frequencies. To set the Pilot/QAM detector frequency use the Arrows and Enter keys to select “Code” and press Enter. Now continue with the Arrow keys to select the desired leakage detection code (frequencies). Press Enter again and you will see the channel you selected, Pilot Level, and Frequency code.

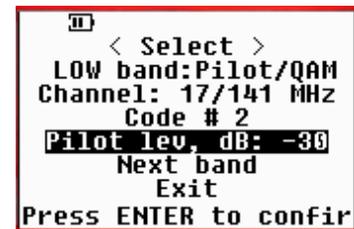
There are four possible channel codes for every detection channels used by Arcom, intended to provide flexibility in overbuild situations. Table 1 below illustrates those frequencies. To select the desired code, simply select Code# and use the Up and Down arrows to select the desired frequency code.

**Table 1: Code # vs Pilot Carrier Frequencies**

Code # (Marker)	Pilot 1 (MHz)	Pilot 2 (MHz)	Remarks
1	$F1^* + 0.005$	$F2^* + 0.005$	Any channel in the QAM SNARE Low-band
2	$F1^* - 0.005$	$F2^* - 0.005$	Any channel in the QAM SNARE Low-band
3	$F1^* + 0.005$	$F2^* - 0.005$	Any channel in the QAM SNARE Low-band
4	$F1^* - 0.005$	$F2^* + 0.005$	Any channel in the QAM SNARE Low-band
Note: F1* and F2* are central frequencies about a selected channel, located between upper and lower adjacent channels.			



As illustrated above, the Pilot Carriers are typically offset -30 dBc with respect to the channel level. However, if the pilot carriers are above or below -30 dBc then the Snoop Pilot Level requires adjustment so the detected leakage levels are accurate. To adjust the Pilot Level offset, select the "Pilot Lev, dB:" options and use the right and left arrows and the enter button to set the offset accordingly.



## Shielding Test mode

To quickly and easily troubleshoot difficult ingress problems in the home, Snoop is able to operate as a Shielding Efficiency (SE) detector. Operation in this mode requires the use of a QAM Snare Pilot transmitter device.

The transmitter is connected at the grounding block in place of the home coax feed (the home is disconnected from the cable network when the transmitter is used) or at the tap. The transmitter places a high level, easy to find signal at the frequency which is programmed into the transmitter when setting up. The process of how to configure

the transmitter is described in a later section of this manual. Shielding Test Pilots can be used in either the LOW band, LTE band, or both.

The Pilot Transmitter generates two carriers in each band at frequencies equivalent to the Pilot/QAM detection scheme described above at one selectable channel in each of the LOW and LTE bands. Two pilot carriers are utilized in both the aeronautical and LTE bands to minimize multipath effects and to make the product easier to use. When using this mode, since the transmitter is located at the grounding block – there is no visibility to leaks in the drop between the multi-tap and the grounding block. Because of this, and because of the extra time required to install and to retrieve the transmitter, it is only recommended to use this test mode when troubleshooting specific problems.

### Shielding Test ON/OFF

To turn Shielding Test mode on, navigate to the Shielding Test: On/Off line, press enter and change the setting to ON.

*If you do not plan on using this option, turn it to OFF such that it does not appear as a menu option when you enter the Detector screen.*

```
ii)
  < Select >
  Signal mode:ON
  Channel
  Shielding test:ON
  Channel
  Exit
  Press ENTER to confir
```

### Shielding Test Channels

To configure the Shielding Test channels, navigate to the “Channel” option and press enter. The LOW band of frequencies will appear first. Select the line titled “Channel” and use the right and left arrows, and the enter button to select the desired Low Band channel

```
ii)
  < Select >
  Signal mode:ON
  Channel
  Shielding test:ON
  Channel
  Exit
  Press ENTER to confir
```

```
ii)
  < Select >
  Low band: SE Test
  Channel: 15/129 MHz
  Code # 1
  Pilot lev, dBmU:+40
  Next band
  Exit
  Press ENTER to confir
```

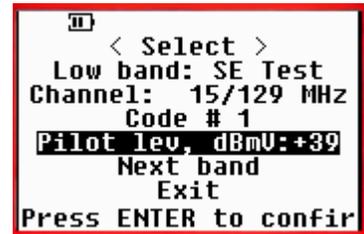
### Shielding Test Code

Select the desired Code (as described in Table I above).

## Pilot Level

---

The Transmitter RF output level is +46 dBmV, but there are many scenarios where the test pilot signal level will be lower. For example, if a splitter is connected after the grounding block, the transmitter signal will be attenuated 7 to 8 dB. So, an adjustment to the receiver will be necessary. Assuming the splitter is 3 or 4-way, the Test Pilot RF output of the splitter will be +39 dBmV. In this situation the Snoop Pilot Level setting should be set to +39 dBmV. (+46 dBmV pilot out - 7.5 dB splitter attenuation).



```

[ ] < Select >
    Low band: SE Test
    Channel: 15/129 MHz
    Code # 1
    Pilot lev, dBmV: +39
    Next band
    Exit
Press ENTER to confir

```

## Next Band

---

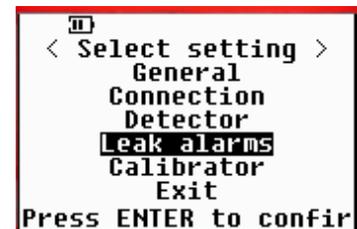
To configure the LTE pilot, select Next Band and the select the channels, code and Pilot Level as done in the Low band

*Remember that prior to using the Pilot transmitter, the transmitter needs to be connected to the cradled Snoop via USB such that the pilot settings configured in Snoop can automatically be transferred to the Pilot transmitter. After initial setup this connection process is only required when a change is made to the Snoop pilot settings.*

## Leak Alarms

---

The Snoop can be configured to provide low and high level audio alarms based upon the amplitude of the detected leak, for both bands of operation in Signal alarm mode (QAM, OFDM, or Analog) and in Shielding Test alarm mode. The alarm is based upon the leak level at the detector.



```

[ ] < Select setting >
    General
    Connection
    Detector
    Leak alarms
    Calibrator
    Exit
Press ENTER to confir

```

## Signal alarms

To change the alarm value for both the low and LTE bands, use arrow keys to navigate to the item you would like to change, press enter and then use the arrow keys to increase or decrease the number.

```

[ ]
< Select >
Signal alarms
SE tect alarms
Exit
Press ENTER to confir
  
```

```

[ ]
< Select >
LOW band: 50 µU/m
LTE band: 50 µU/m
Exit
Press ENTER to confir
  
```

## SE Test alarms

The Shielding Test alarms also display a shielding effectiveness indicator, which equates the detected signal to shielding effectiveness. From this setting, one can see that it is possible to locate very small leaks which could be the source of forward ingress from close proximity transmitters such as LTE devices.

To change the alarm value, navigate to the alarm level indicator and use the arrows to increase or decrease the alarm setting.

```

[ ]
< Select >
Signal alarms
SE tect alarms
Exit
Press ENTER to confir
  
```

```

[ ]
< Select >
LOW band:
30µU/m SE= 70dB/m
HIGH band:
40µU/m SE= 67dB/m
Exit
Press ENTER to confir
  
```

## Calibration

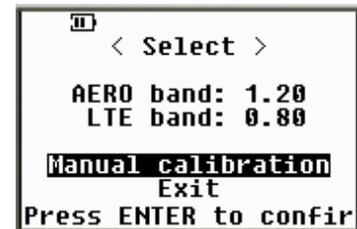
The calibration setting is used to normalize the setup to a known leak with a known level, and to compensate for antenna variations, and other internal variations. Calibration Factors” are factory set for the type of antenna supplied with each Snoop.

```

[ ]
< Select setting >
General
Connection
Detector
Leak alarms
Calibrator
Exit
Press ENTER to confir
  
```



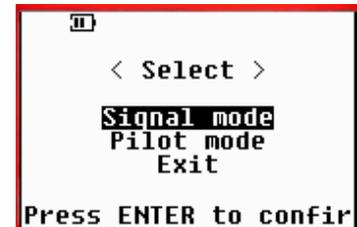
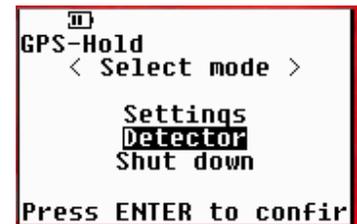
Changes to calibration are password protected, and should only be done by users familiar with the process. This process is minimally important for Snoop since leak detection results are not updated to the server.



## Detector Mode

The detector mode is used when the user wants the leak detector to locate leaks. When the device is placed in detector mode, if both Signal and Shielding Test are turned on, it will ask which mode the user would like to enter. Select the desired Signal or Shielding Test Mode.

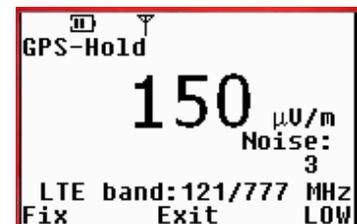
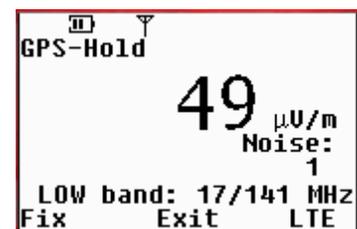
If the device is configured for only one mode, either Signal or Shielding Test – the detector will directly enter the configured mode and not ask this question.



## Detector Mode – when configured for QAM detection

QAM detector mode is only available when the device is pulled from the cradle and when GPS-Hold is indicated on the display. When the unit is placed back in the cradle it will automatically exit QAM detector mode. Typically, Snoop will be configured for single or dual frequency detection at either the LTE and/or Aeronautic band. The user needs to ensure that the correct antenna is connected to the antenna input for the selected frequency and band. When operating in one frequency band the Snoop will sample the selected channel two times per second. A screen sample showing single channel detection is shown to the right.

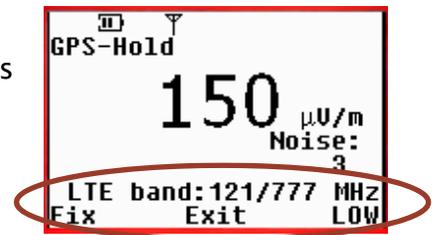
Snoop can simultaneously detect leaks at two channels, one each within the low and the LTE band. This mode should



only be used if a dual band antenna for each of the selected frequencies is being used. A screen sample showing dual channel detection is shown to the right. The sampling rate while operating in dual channel detection mode is once per second for each channel.

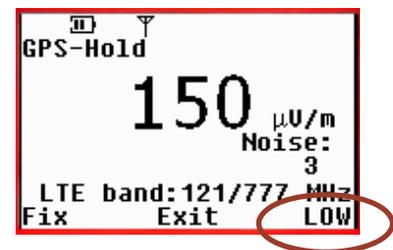
### Detection channel displayed on screen

The frequency band, channel number, and channel frequency currently being displayed on the detector screen is shown on the second line from the bottom.



### Indication of leaks detected at bands other than displayed

When in dual band detection mode, when a leak is detected at a band other than that displayed on the screen, feedback is provided through audio alarms as well as flashing at the bottom of the screen that indicates the bands in which the leaks were detected.

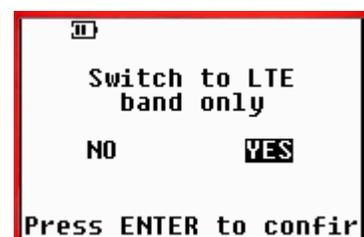
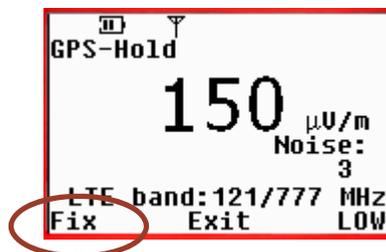


### Switch to different band

To have the display switch to the other frequency band, simply press the right arrow and the display will be changed.

### Fix detection to one frequency

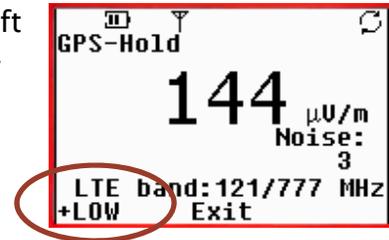
When operating in the dual channel mode, the user can “Fix” on one of the frequency bands, corresponding to that band currently being displayed. This action switches to that selected



channel being sampled two times per second. This may be desirable when performing the final step leakage source identification process. Press the left arrow button to

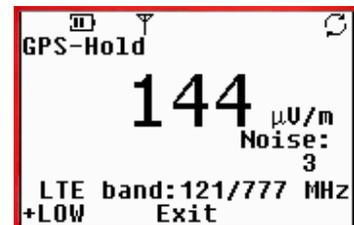
switch and fix on the one channel. You will receive a message confirming that this action is desired, press enter to confirm yes.

To return to dual frequency detection, again press the left arrow - in this case to add the Aero channel to the currently fixed LTE channel. Sampling will again revert to once per second per channel.



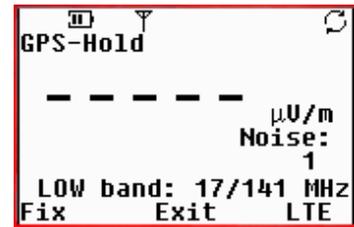
### Leakage Display Level Indicator

When configured or fixed to one channel detection, the detector performs a leakage level calculation two times per second. This sampling is too fast to change the display indicator for every calculation, therefore peak hold techniques are utilized.



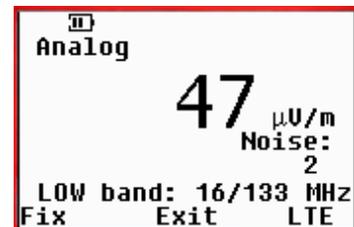
The Snoop leak display shows the peak level detected over the previous two seconds.

When no leakage has been detected within the last two seconds, a dash display is indicated.



### Detector Mode - Analog

When Analog detector mode is selected, the unit will clearly display Analog, such that the user knows which mode was selected. GPS is not required in this mode. Navigation to the second band and fixing detection to one frequency is the same as described in Detector Mode - QAM section of this manual above.



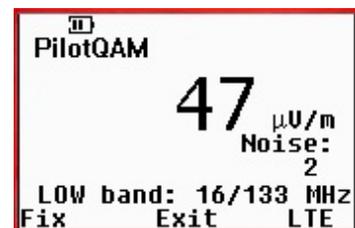
## Detector Mode – OFDM

When OFDM detector mode is selected, the unit will clearly display OFDM, such that the user knows which mode was selected. GPS is not required in this mode. Navigation to the second band and fixing detection to one frequency is the same as described in Detector Mode – QAM section of this manual above.



## Detector Mode – Pilot/QAM

When Pilot/QAM detector mode is selected, the unit will clearly display “PilotQAM”. GPS is not required in this mode. Navigation to the second band and fixing detection to one frequency is the same as described above.



## Detector Mode – Shielding Test

When the detector is put into Shielding Test mode, it detects the signals output by the companion QAM Snare Pilot Transmitter. As described in this manual, the Pilot Transmitter must be programmed by the Snoop to operate at the frequency for which the Snoop is configured. The Snoop can be configured as a pilot detector to operate at either the aeronautical band and/or the LTE band. The user must ensure that the proper antenna is used for each band. The antennas will only be the same if a combination antenna is employed. The Pilot mode requires neither Wi-Fi connectivity nor GPS connectivity. When the detector is in Pilot mode – for clarity, the words “SE Test” will continuously flash on the upper left corner of the screen.

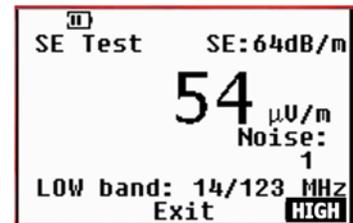
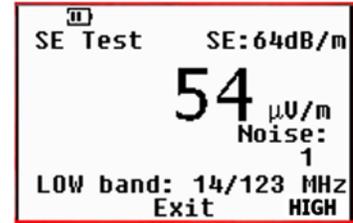


## Screen navigation in Shielding Test mode

The Snoop Shielding Test detector is configured for operation in both the LTE and AERO bands. The right arrow button is used to conveniently switch the display between the two frequencies. Remember that when switching, the antenna must also be switched – if a dual band antenna is not being utilized.

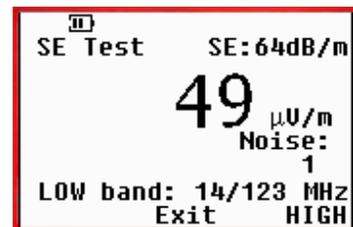
The device is capable of simultaneous detection at the two frequencies, and will provide an audio alarm if the detected level exceeds the configured threshold settings at either of the bands. If a leak is detected at the band not being currently displayed in the screen, the second band indication at the lower right portion of the screen will flash, along with the audio alarm.

To switch the display to a different band, press the right arrow button that corresponds to the highlighted second band circled in blue to the right – in this case the LTE band.



## Shielding effectiveness indication

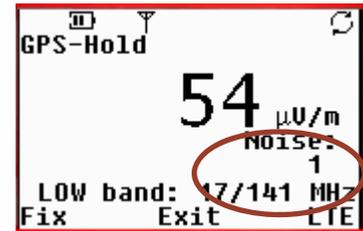
When in Shielding detector mode, along with the detected leak level – the equivalent shielding effectiveness of the leak will be displayed in the upper right corner. This indication may be used by the technician as a sort of home certification metric. The SE and indicated leak level are both normalized to remove the extra signal level from the inserted pilot carrier.



## Noise Floor Level Indication

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The Snoop contains an indicator that provides feedback as to the device noise floor. The noise floor of the instrument will vary depending upon other off-air signals it is subject to. The lower the noise floor, the lower level leak Snoop will be able to detect. To keep the display screen uncluttered, units are not shown – but they are in  $\mu\text{V}/\text{m}$ , where for example a 1 would correspond to 1  $\mu\text{V}/\text{m}$ . This number would correspond to a noise floor level of –

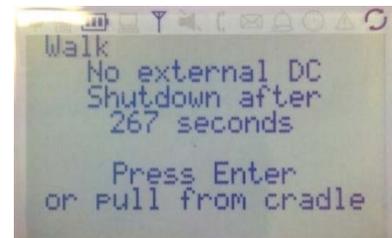


60dBmV/m using the convention employed in the Navigator Plus. The lower the indicated noise floor, the better the sensitivity of the device. If noise floors are relatively high, then a recommendation would be to change to a different frequency containing less terrestrial noise.

## Auto shutdown counter

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When Auto start is enabled – when power is removed from the device while cradled, the unit will begin a five minute countdown to shut down the device. No action is required of the user, the message is informational. To stop the countdown and use the device, press enter.



## Other battery saving features

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There are two additional battery saving features. First is that the display backlight will turn off if no buttons on the snoop have been pressed for one minute. Simply press the power button one time to turn the backlight on. Second, when the unit is cradled and unused for two hours, it will automatically power down.

## GPS status indicator

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There are four possible GPS conditions that can be indicated on the screen:

**GPS -NO** – This is the condition the unit is in when it is initially turned on and the unit is waiting for GPS lock. Leak detection in QAM detector mode is not possible



when there is no GPS lock, the device needs to wait until a signal is acquired. It may take a few minutes to get lock, which is typical for modern GPS receivers. The time to get lock may vary each time it connects.

**GPS-Sync** After GPS lock is acquired it will go into GPS Sync. GPS Sync mode will stay for 60 seconds, which provide sufficient time to ensure a good stable GPS signal so the unit can be used for extended time in walk mode. When GPS Sync is displayed, and the user attempts to pull from the cradle it will revert to GPS No and will not enter detector mode. The unit must be re-cradled and wait until the GPS-OK indication.

**GPS-OK** After the 60 seconds of GPS Sync, the indicator will change to GPS OK. In this condition Snoop is ready to pull from the cradle and enter walk mode.

Walk mode timer – we have also implemented a 100 minute counter for walk mode. This is a battery saving feature to make sure the unit is not left in the correlator mode for extended time period inadvertently. After 100 minutes the unit will exit detector mode and the GPS indicator will change to GPS No. The unit needs to be re-cradled and get to the GPS OK state before it can be used again in walk mode if QAM detection is being used.

**GPS-Hold** this indicator is displayed when the unit is pulled from the cradle when entering walk mode when in QAM detector mode. It will stay in this condition while out of the cradle. This indication will not be displayed when in Pilot, Analog, or OFDM modes – instead the unit will indicate the selected mode.

## Error Messages and Troubleshooting

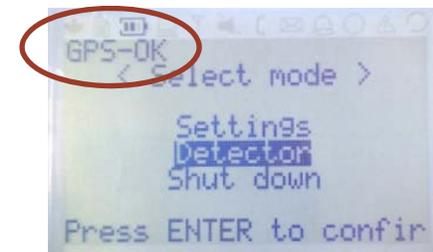
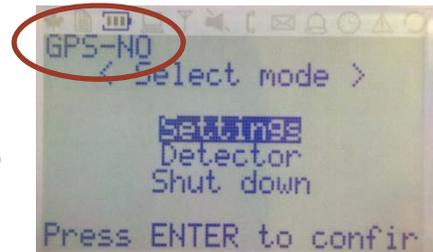
---

To assist in troubleshooting any connection or connectivity issues, Snoop will display error messages corresponding to the condition.

### No GPS lock

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GPS lock is required for proper operation of the device in QAM detector mode. When the device is turned on with clear visibility to the sky, it may take approximately two minutes for the GPS lock indication to go from GPS-NO, to GPS-OK - which indicates lock. **Before removing the device from the cradle to move outside the vehicle, the user should ensure that GPS-OK condition is indicated.** When in Walk mode, no GPS antenna is required.



### No Wi-Fi connection

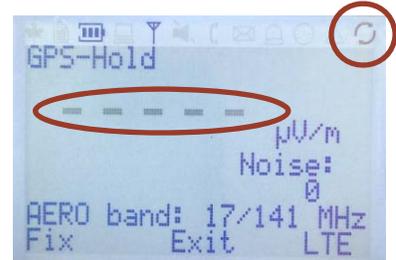
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When the device is attempting to connect to a Wi-Fi network for QAM detection, the message below is displayed. If the Wi-Fi network with the displayed SSID is not available, the device will continuously attempt to connect to it. If you would like to connect to a different Wi-Fi network, go into the settings menu item and pick the desired network.



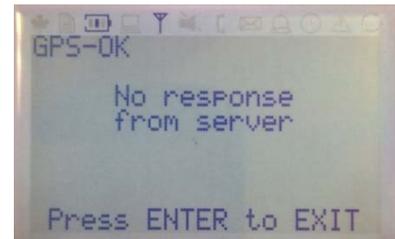
## No Data

The Snoop screen contains two elements that move to indicate that the device is operating properly and receiving data from the server when in QAM detector mode. The indicators are the circle with arrow display on the top right side of the display, and the five-dash indicator at the location where the leak value is displayed. These indicators will flash each second data is being received. When the indicators are solid the device is not communicating with the server and it will attempt to reconnect shortly if new data is not received.



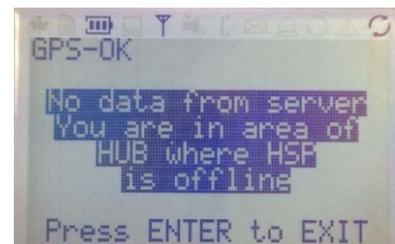
## No response from Server

The QAM Snare field device needs to communicate with the server when in QAM detector mode. When there is no connection with the server, the following message appears. When this message appears during initial setup, the user should double check the server address that was entered via Q-browser. If this is correct, then the next troubleshooting step would be to power cycle the device and attempt to connect again. The user should check that the server is on-line by connecting to it through either the QAM Snare Manager or Web client.



## Headend Signal Processor offline

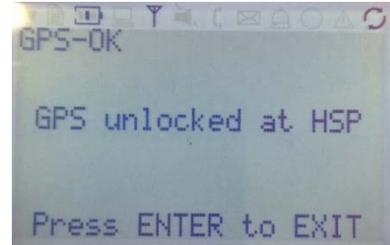
For multiple hub installations, within the QAM Snare server geographic boundaries are defined that correspond to the areas of the plant fed by different Headend Signal Processors. The Headend Signal Processor is what is used to sample the QAM channels and serves a reference signal for the leakage detection process. If a problem exists within the headend signal processor serving the area in which the field device is currently being used, the following message will appear. There could be several reasons why the HSP is not operating properly that will need troubleshooting. The device could be turned off, the communication port could be disabled blocking data from being forwarded to the server, or the device could have a hardware issue. Consult with an Arcom Digital field engineer if the obvious troubleshooting is not



effective after power cycling the unit. This message is only applicable for QAM detection mode.

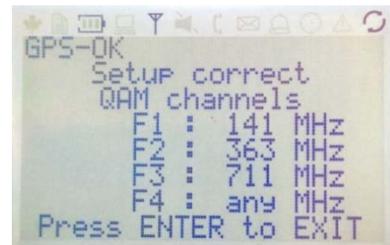
### No GPS at Headend Signal Processor

When this error message is displayed, the Headend Signal processor does not have the required GPS lock. The GPS could not be providing signal because it is blocked, disconnected, or possibly even covered with snow depending upon placement and environment – the cause needs to be investigated and rectified. This message is only applicable for QAM detection mode.



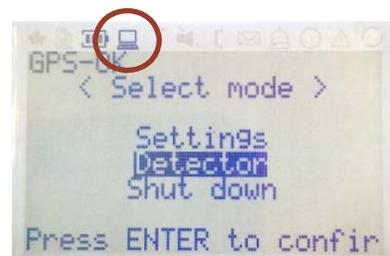
### Setup correct QAM channels

Each QAM Snare server can simultaneously process four channels. It is recommended that one channel is reserved in each band and configured as a global channel, such that they are available for any field device to use. Additionally, one additional frequency is available on a first come first served basis. This channel is released when all devices using that frequency are turned off. If when you attempt to connect to the server, the error message to the right appears, it means that your requested channels are in excess of the four currently being used. You should change detector settings such that the listed frequencies are used, and then reconnect. If only three channels are currently in use, the 4<sup>th</sup> frequency will show the word ‘any’ next to F4. If all four frequencies are currently allocated, the four frequencies will be listed. When Auto Detection is enabled, this message is not applicable because the server will automatically direct the detector as to the correct channel to use.



### Unable to connect to Q-browser

When connecting to Q-browser, the computer icon below must appear on the display. If it does not appear, try pushing down on the detector to ensure it is fully seated into the cradle.





## Changes made in Q-browser are not saved in detector

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If changes made within Q-browser and the changes are not saved at the detector, the likely cause is that the final step of removing the USB cable from the cradle did not take place, and the user attempted to continue in Settings with the USB cable still in place.

## Shut Down

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To power down Snoop either navigate to the Shutdown line item from the main menu, press enter and then confirm yes - or alternative press and hold the enter button for three seconds.

## Antennas

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QAM Snare Snoop requires a GPS antenna attached to the cradle base BNC connector, and an RF antenna that is connected to the top of the detector at the detector antenna input port. When the device is cradled, the GPS antenna is connected through the BNC connector at the bottom of the cradle, adjacent to the screw-on power jack input. When the Snoop is removed from the cradle, GPS lock is retained and the GPS antenna is no longer required. With the Snoop, no vehicle mounted RF antennas can be used, and the cradle antenna input is not enabled. A GPS antenna is only required for QAM operation, not for Analog, OFDM, or Pilot modes.

## GPS antenna

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A GPS or GPS/Glonass antenna is required for correlation time synchronization as well as to establish vehicle GPS coordinates such that the samples from the correct hub are transmitted to the device from the server. The GPS antenna can be either magnetic or permanent mount, and it needs to be located at some place on the vehicle with visibility to the sky.

## RF walk mode antenna

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A dual frequency rubber duck antenna is used by Snoop to detect leaks while the technician is searching for leaks.

One rubber duck antenna tuned to two specific frequencies, 135 MHz (Channel 16) and 750 MHz (Channel 117), comes standard with the Snoop. The bandwidth of these



antennas is such that if a different frequency is desired to be used, a corresponding different antenna must be used.

Two Rubber Duck antennas are available for the Snoop – Standard and Enhanced. An enhanced antenna will operate on channels 16 and 17 (130 MHz to 144 MHz) in the low band, and channels 108 to 125 (700 MHz to 800 MHz) in the High Band.

Consult with your Arcom Digital representative if there are question about antenna requirements.

### Wi-Fi antenna

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Snoop contains an internal Wi-Fi antenna that connects with the external Wi-Fi transmitter utilized for communication between the field device and the server when in QAM detector mode.

### Frequency Setup of QAM Snare Pilot transmitter

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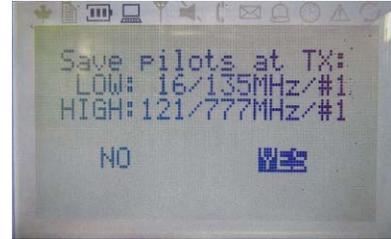
Snoop can be utilized as a pilot detector in Shielding Effectiveness Mode, when used with a companion QAM Snare Pilot Transmitter. The Pilot transmitter can be used in either or both the aeronautical or LTE band, with two CW carriers placed at each utilized frequency band.

Shielding Test signals transmitted from the Pilot Transmitter are like the Pilot/QAM detection described above. The transmitter output is comprised of a pair of high-level CW carriers separated by 6 MHz, at frequencies equivalent to the selected QAM channel upper and lower band edges.

The Pilot Transmitter is configured through a very simple process of connecting a USB cable between the Pilot transmitter and the USB connector of the Snoop cradle. Snoop is required to be in the cradle during this process. The Transmitter Output frequencies are set to the same frequencies as set up in the Shielding Test Settings menu.



While the Snoop main menu is displayed, once the Pilot transmitter is connected to the Snoop cradle via USB the message shown at the right will appear on the Snoop screen. Press the enter button to confirm yes, and the Pilot transmitter will be programmed for those frequencies. Now the USB cable can be disconnected. This Pilot transmitter setup is a one-time process, and only needs to be repeated if it is desired to change the pilot frequencies.



### Turning the Pilot transmitter on

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Simply move the lever switch on the top of the transmitter to turn the device on. LED's will illuminate

### Battery charging

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The device battery is charged through the companion cradle, directly through the vehicle battery. Optional DC cigarette lighter chargers and AC/DC power pack chargers are also available. The detector is designed to be stored and used in the cradle at all times other than when not in use in while moving about performing the final leak location. **If a battery becomes fully depleted, it will require charging of at least 30 minutes prior to being able to be used in detector mode.**

### Patents

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QAM Snare is protected under the following US Patents. Other US and Foreign Patents are pending.

