



QAM Snare Navigator User Manual

QS-NAV-2.1.1

6/2/12

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

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Keyboard description

The Navigator's keyboard has three several types of buttons designed for simple navigation.

The ON/OFF/Standby button (1)

Keep pressed for two seconds to turn the unit ON

Press shortly to display OFF/Standby menu on the screen, and then highlight required action with Navigation buttons (3) to turn the unit off or put into Standby power saving / quick start mode.



Hot keys (2) are the four buttons located just below the display. Their function is attached to menu selection items as indicated on the display. Navigation buttons (3) are used to highlight required menu items as well as for moving markers and cursors around the screen. In certain screens the numerical keypad can be used for directly highlighting the desired menu item.

Exit button (4) can be used to return to the previous menu, in some screens a hot key described as **Back** takes you one step back in the menu.

Numerical keypad (5) is used for direct input of numbers and accessing selected menu items. There are two non-number buttons in this group.

The **Space** button makes simply a space in entered text.

The **Clear** button deletes one character before cursor.

Inputs and outputs

The Navigator requires connection of several antennas. It has one mini USB port and a power adaptor input for charging the battery.

Antenna connectors

The Navigator's front panel has the following connectors:



(1) ISM antenna SMA connector input used for transmitting signals to the QAM Snare Isolator

(2) GPS antenna SMA connector

(3) GSM antenna SMA connector marked as **3G** on the panel

(4) ANT input – F connector port for connecting leakage detection antenna, requires use a barrel type adaptor

(5) The threaded hole in the housing is not used.

USB and power input ports


The bottom of the Navigator contains the mini USB connector and the battery charger input.

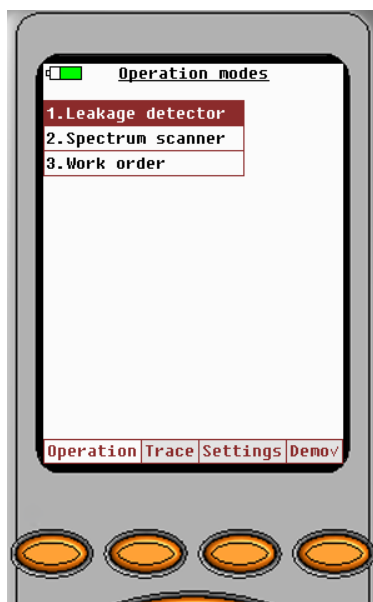
The USB is used for transferring saved screenshots into the PC computer using the Q-Browser software. Please refer to the Q-browser manual for further instructions.

The battery charger input uses a 5.5mm/2.5mm power connector and can accept a wide range of input voltage levels, from 6 to 24 volts.

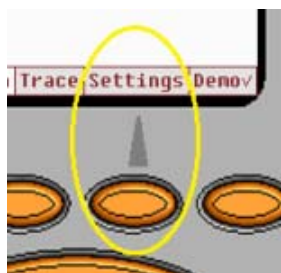


Adjusting system settings

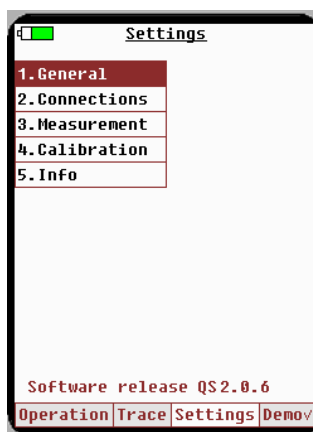
Turn on the Navigator by pressing and holding the  power button.



After initialization, the Operation mode screen is displayed. Select Settings menu by pressing the hot key marked **Settings**.



The page to the right will open



General settings

In the General Settings screen the user can select various audio alarm thresholds that establish how this device alerts the user to the presence of detected leaks. Additionally, the name and ID of the user is input for automatic reporting up through the headend leak management database.

Adjusting audible signals



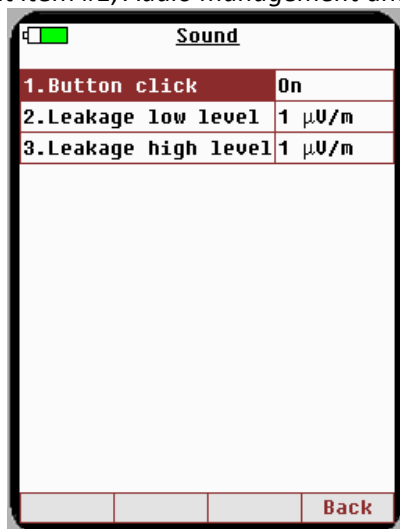
Highlight item #1 **General** and press Enter key to open the following menu:

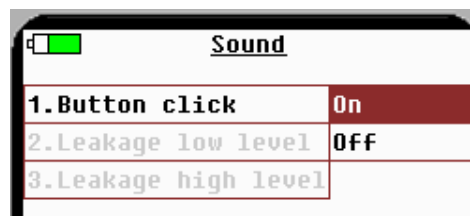
Audio feedback when pressing a button on the handheld's keypad can be turned *ON* and *OFF* via *Audio management* submenu.

While the vehicle is traveling, the leakage signals are detected and recorded as a 'trace' in the database located at the Headend Signal Processor. The user in the field is informed about the field strength of detected leakages with two pitches of audio generated by the Navigator's built in buzzer. The lower pitch audio is associated with leakage field strength reaching the threshold level *low* and a higher pitch is indicated when the leakage level reaches the *high* threshold. These thresholds are independent from any configuration and leak level setting done at the headend.

Button click sound activation/deactivation

Highlight item #1, *Audio management* and press Enter to open submenu:





Open *Button click* submenu by highlighting it and pressing Enter, then select *ON* or *OFF* and confirm selection by pressing Enter again.

Leakage detection audible alarms



In the following submenu the user can define the leakage field strength values associated with the low and high level audio alarms.

Sound	
1.Button click	On
2.Leakage low level	20 µV/m
3.Leakage high level	100 µV/m

-->

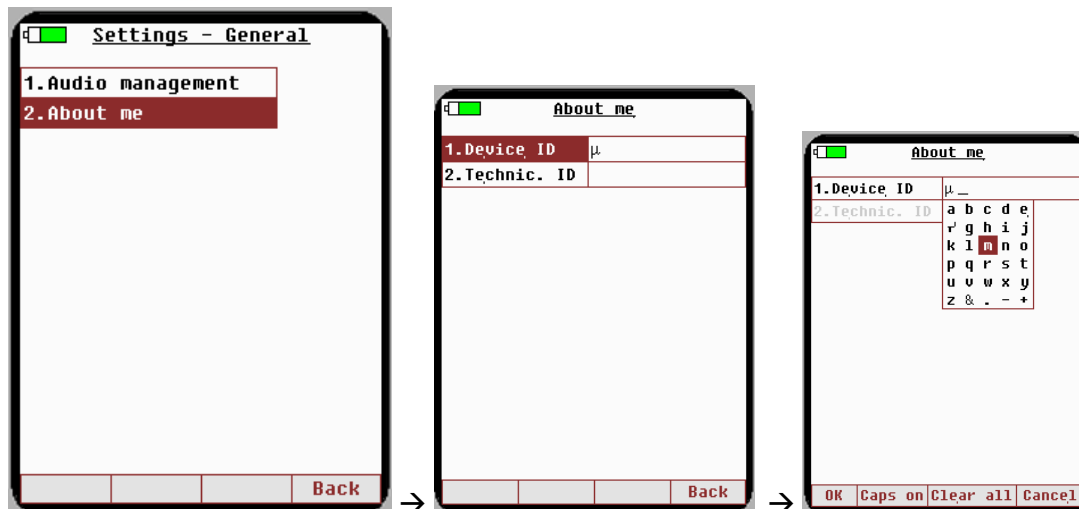
Sound	
1.Button click	1 µV/m
2.Leakage low level	2 µV/m
3.Leakage high level	5 µV/m
	10 µV/m
	20 µV/m
	50 µV/m
	100 µV/m
	200 µV/m
	500 µV/m
	1000 µV/m
	off

Press enter to open submenu and select the field strength threshold above which will be indicated with the *high* and *low* level audio alarms. Note: the value associated with High must be higher than that associated with Low.

User identity settings – About me

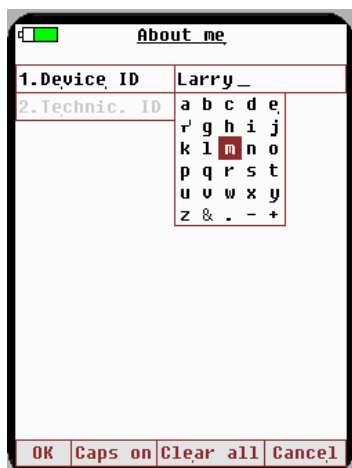
The *About me* item is very important, here the name and ID of the user must be entered, and the Navigator will later automatically register the listed user on the QAM Snare Signal Processor server. Certain data along with the user ID is saved at the server and later used for automated work order generation and statistics.

Opening *About me* menu:



Entering user name

To enter the user name open the *About me* menu. Highlight *My name* submenu using the navigation buttons and press enter to open. In the pop-up screen write the desired name by selecting letter by letter using navigation buttons. Each letter is selected after pressing *Enter* button creating the user name:



The letters must be highlighted one by one using navigation buttons. Each highlighted letter must be confirmed by pressing **Enter** key. You can toggle between capital and lower case letter by pressing hot key **Caps On/Off**. Digits can be entered directly from the numerical keypad. If a mistake is made use the **Clear** button on the numerical keypad to delete the single character before cursor or clear all previous input by hitting **Clear all** hot key.

Once the text is complete, press the **OK** hot key.

Editing user name

To edit My name press **Clear all** hot key to remove the text and re-enter new name using above explained method.

Editing user ID



The **My ID** part should be completed same way as **My name** part. Use numerical keypad for entering digits.

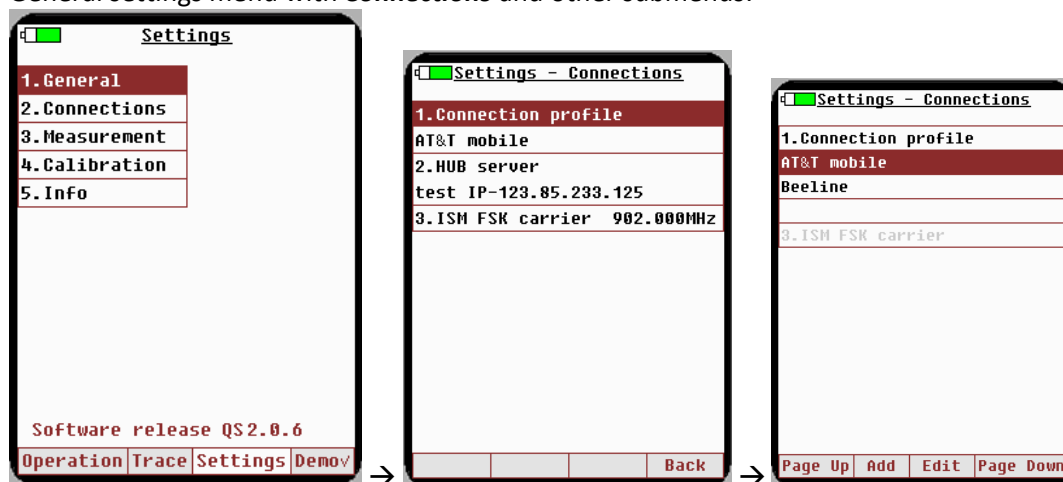
Connections settings

In this menu section the user must select the appropriate GSM network, hub ID/name and the IP address of the Headend Signal Processor server.

Connection profile selection

Some connection profiles might be preinstalled in the unit. If they are preinstalled, simply select your G3 cell network provider from the available on the list. For the USA market proper settings for item #1 **Connection profile** is AT&T Mobile.

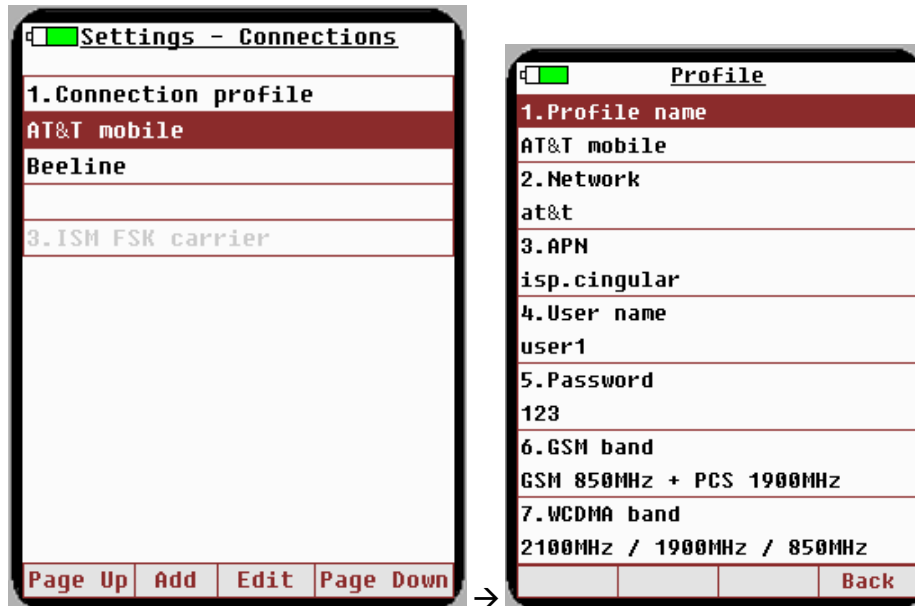
General settings menu with **Connections** and other submenus:




Editing Connection profile

The connection profile can be adjusted if necessary. It is recommended to not change the preset profiles without consulting on parameter specifics with the cell network provider!

To edit Connection profile open menu **Connections**, open **Connection profile** and highlight required profile name then press hot key **Edit**. The following screen will open:



Each Profile item can be opened by highlighting the required item. Editing is possible by clearing the cell text and reentering new by selecting each single letter of the required text. A

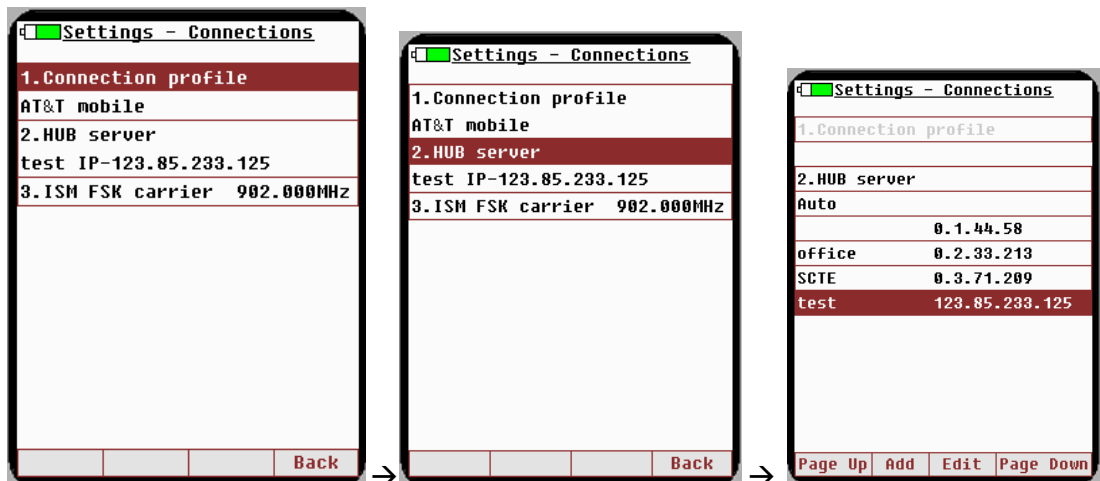
single digit just before the cursor can be deleted with **Clear**  key on the numerical keypad. Before editing it is recommended to write down the original existing profile parameters since editing one field might require clearing it first.

Selecting Hub server name and IP

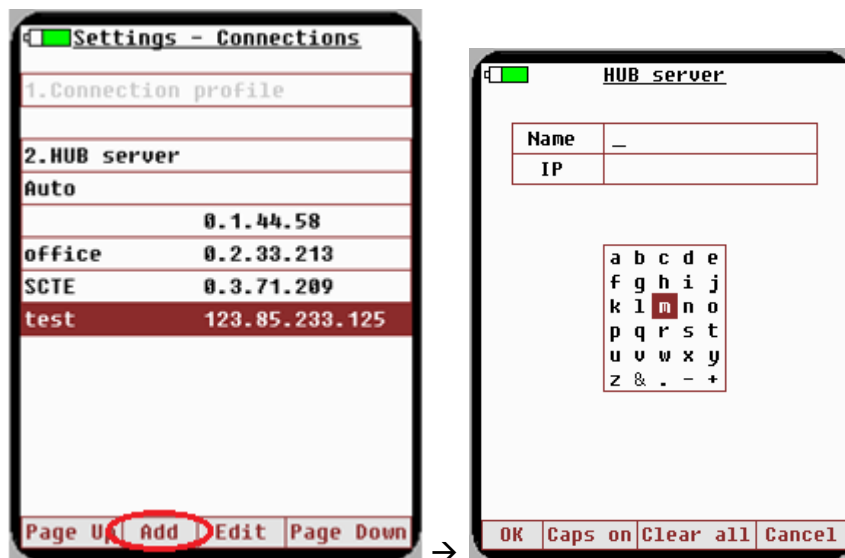
The handheld device is processing signals in close cooperation with the headend Signal Processor. In order to exchange information the TCPIP protocol is used. For connecting to the proper hub, the hub IP address needs to be entered into the Navigator. The Navigator can work with one manually selected hub and if the headend signal processor is properly provisioned can automatically receive data from multiple hubs, dependant upon the current GPS location of the Navigator.

Selecting the hub name and IP address

Access the Hub server item by highlighting *HUB server* in the *Settings-Connections* screen, then press *Enter* to open it:



There may already be some preset hub names and IP addresses listed. If your hub is preset, simply select required one on the list by highlighting it then press the Enter button to confirm selection. If the hub needs to be created, then the Signal Processor server IP address must be set. To set up a new name and IP address for the hub open the following menu by using the *Add* hot key:



First, create the hub name text. The letters must be highlighted one by one using navigation buttons. Each highlighted letter must be confirmed by pressing **Enter** key. You can toggle between capital and lower case letters by pressing hot key **Caps On/Off**. Digits can be entered directly from the numerical keypad. If a mistake is made the character just before the cursor can be deleted with the **Clear** key on the numerical keypad. You can clear all text window content by hitting the **Clear all** hot key.



When the text is complete, hit **OK** hot key to confirm selection and proceed to entering the IP address. Do not use *Enter* button for this purpose here. The cursor is not blinking but will move automatically to the IP field.

The IP numbers are entered using the numerical keypad, no need to try to highlight it. **Remember to ALWAYS enter three digits for each number between the dots.** If you are to enter 20 (twenty) always enter it as 020 (zero-two-zero).

Editing the hub name and IP address

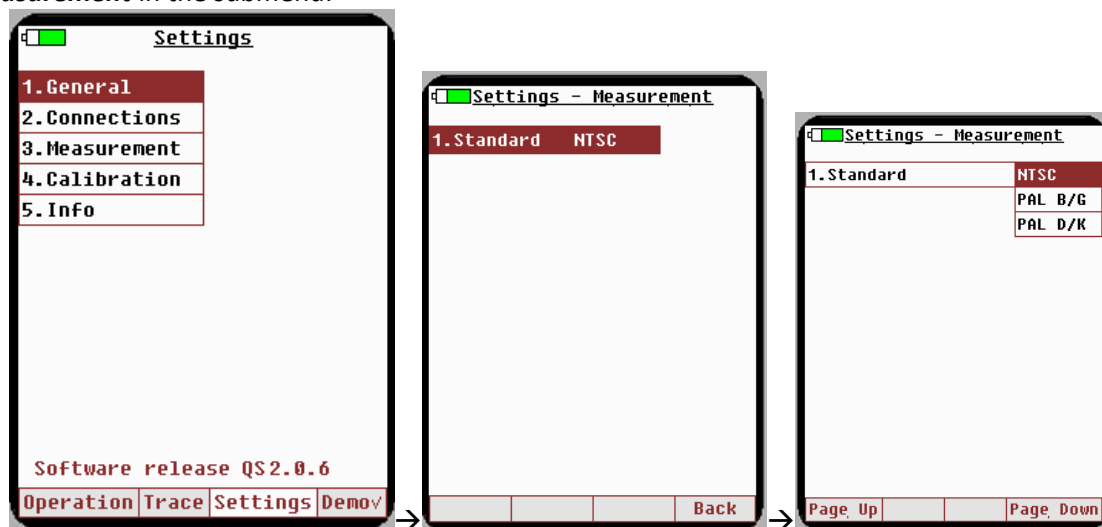
Editing entered data is possible only by clearing the fields with **Clear all** hot key and entering new text and numbers.

Measurement settings menu item

The **Measurement** settings item allows the user to adjust the television standard.

Television standard setting

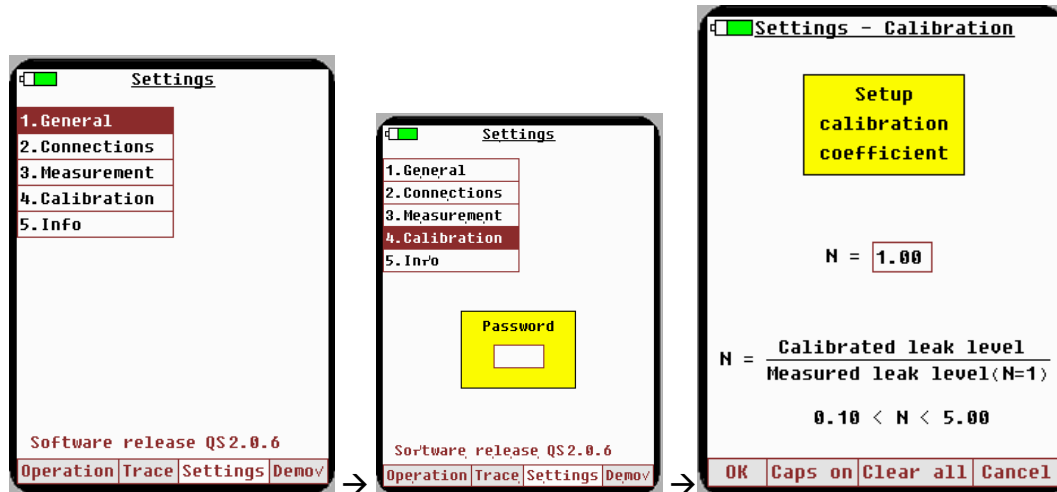
To select required TV standard, open the **Settings** first and then select item #3 **Measurement** in the submenu:



Menu item#1 sets TV system, to change value, hit **Enter** button, highlight required standard using navigation buttons and confirm selection by pressing the **Enter** button again.

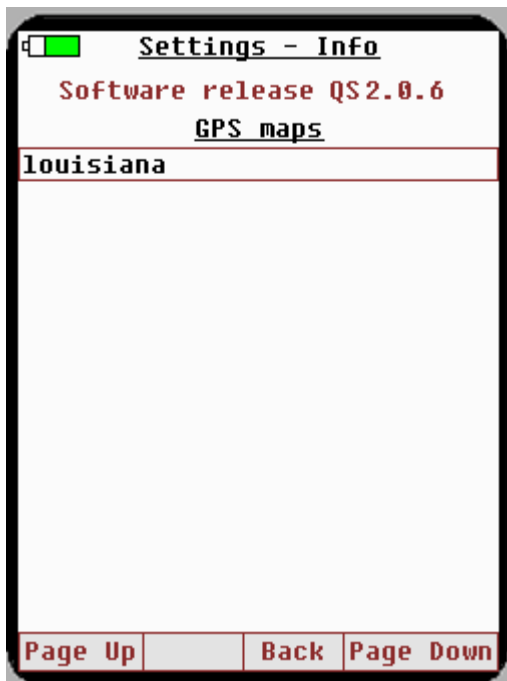
Calibration

The Menu item **Calibration** is dedicated for aligning meter indications to a known signal strength source. This procedure requires a password and knowledge as to the proper technique.



Info.

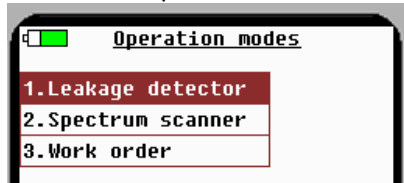
Provides information as to software release and maps installed in unit.



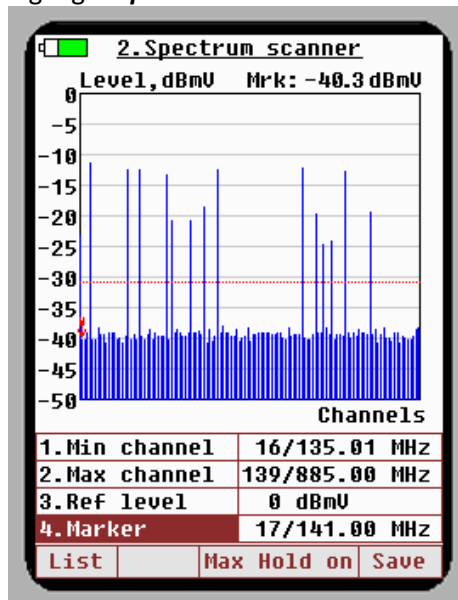
Operation mode – Spectrum scanner

In order to operate the unit successfully, a proper QAM channel must be selected first. Proper channels are those which are broadcast across the entire hub (not narrowcast), and

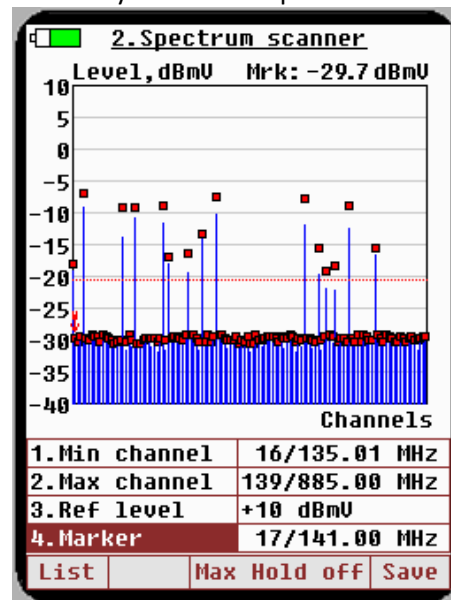
additionally are not distorted by terrestrial signals or interferences. To checking for terrestrial interferences the Spectrum Scanner can be used. From the Operation modes menu item,



Highlight **Spectrum scanner** item and hit **Enter** key to activate spectrum mode.



Max hold off



Max hold on

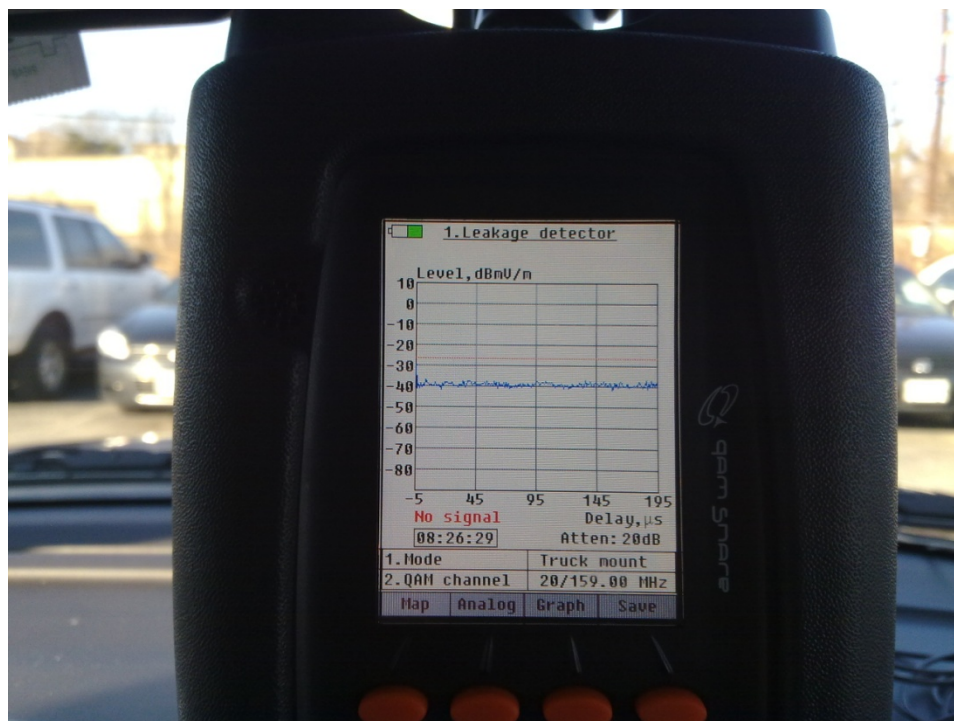
Highlight the **Marker** menu item and select the desired channel to inspect for interfering signals. The signal data corresponding to the indicated marker is displayed in the upper part of the screen. Turning on Max Hold can help in identifying those signal levels that change dynamically. The best conditions are when the selected channel has no interferences on itself and there is nothing disturbing on the adjacent channels. The horizontal dotted red line defines the max allowed power level of distortions. It is a threshold indicating if the channel is suitable for use, and the selected detection channel must not be reach nor go above this line. To get a better signal definition the span of the view can be adjusted by selecting Min and Max channels in the menu items #1 and #2. This is recommended to use reference level "**Ref Level**" of 0dBmV if the strongest signals do not reach that level. The soft key **List** shows spectrum scanning result in a form of text data:

Channel	Level
16/135.01 MHz	-22.8 dBmV
17/141.00 MHz	-38.8 dBmV
18/147.00 MHz	-41.0 dBmV
19/153.00 MHz	-38.8 dBmV
20/159.00 MHz	-11.2 dBmV
21/165.00 MHz	-39.9 dBmV
22/171.00 MHz	-39.8 dBmV
7/177.00 MHz	-38.3 dBmV
8/183.00 MHz	-39.6 dBmV
9/189.00 MHz	-38.5 dBmV
10/195.00 MHz	-39.4 dBmV
11/201.00 MHz	-38.8 dBmV
12/207.00 MHz	-39.1 dBmV
13/213.00 MHz	-39.0 dBmV
23/219.00 MHz	-40.6 dBmV
24/225.00 MHz	-41.0 dBmV
25/231.01 MHz	-39.6 dBmV

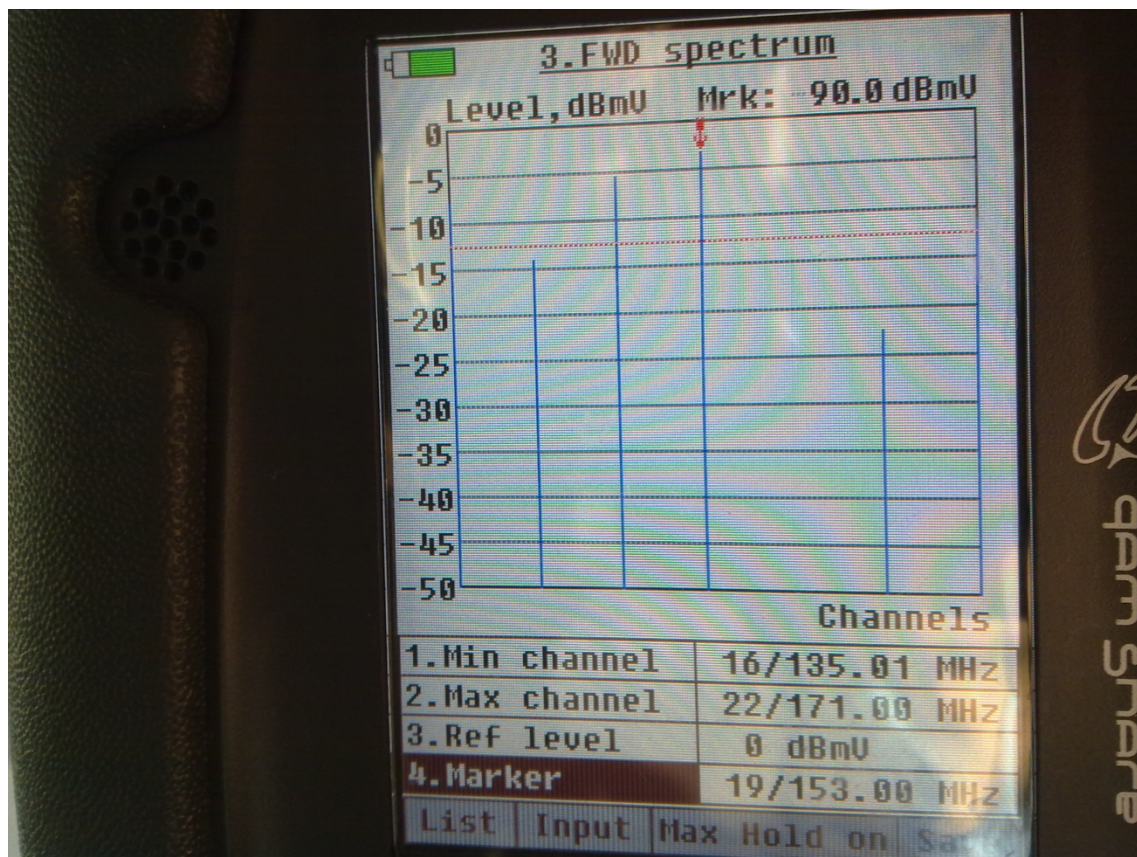
Spectr Page Up Page Down Save

Those channels whose level is indicated with red letters are not to be used, green can be considered usable.

If the selected channel is significantly distorted, then QAM leakage readings might be not stable or the noise floor of the correlator will be increased as on the picture below:



This particular case was a result of using channel #20, which spectrum screenshot in the Scanner mode indicated interferences in the adjacent channel #19:



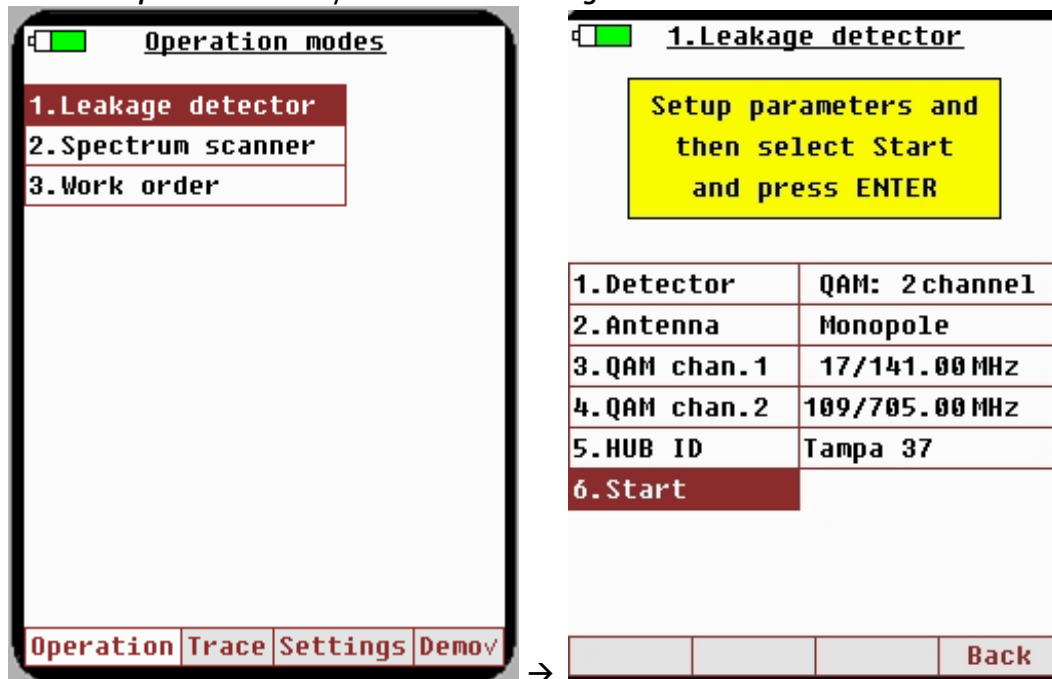
The Spectrum as well as the **List screen** content can be saved into the internal memory and later retrieved over the USB port in a form of JPEG file via Q-Browser program.

Once the channel is tested, the unit is ready for activating leakage detection.
Hit **Exit** button on the keyboard to exit this mode.

Note: sometimes a disturbing signal might be present only in isolated places of the areas covered by a hub site.

Operation mode – Leakage detector

Press the **Operation** soft key to access the **Leakage detector** mode:



The item #1 of the menu should be highlighted, then hit **Enter** to activate leakage detector submenu. The submenu appears with the **Start** menu item highlighted such that a simple next click of the **Enter** button will activate the leakage detector according to the last used settings. The Start button will be associated with number 5 or 6, dependant upon the working mode (two QAM channel operation has more line items).

Selecting working mode

The detector can work in three user selectable detection modes. It can process one QAM channel, simultaneously process two QAM Channels, or it can function as an analog detector. The QAM modes are the main function, where data on detected leaks is automatically saved in the Headend Signal Processor database. If the analog mode is selected no data is stored.

1 QAM, 2 QAM or Analog detection mode

To select the desired detection mode, highlight the item #1, 2, or 3 from the **Detector** menu item. Then confirm by pressing **Enter**.

1. Leakage detector

Setup parameters and then select Start and press ENTER

1. Detector	QAM: 1 channel
2. Antenna	QAM: 2 channel
3. QAM channel	Analog
4. HUB ID	
5. Start	

Page Up

Page Down

Antenna type

To select what antenna type will be used with the meter highlight **Antenna** menu item then choose between dipole and monopole:

1. Leakage detector

Setup parameters and then select Start and press ENTER

1. Detector	
2. Antenna	Monopole
3. QAM channel	Dipole
4. HUB ID	
5. Start	

Page Up

Page Down

Then press **Enter** to confirm selection.

Selecting the QAM channel



The Headend Signal Processor can process two QAM channels simultaneously.

1. Leakage detector

Setup parameters and then select Start and press ENTER

1. Detector	QAM
2. Antenna	Monopole
3. QAM channel	17/141.00 MHz
4. HUB ID	Tampa 37
5. Start	

Back

→

1. Leakage detector

Setup parameters and then select Start and press ENTER

1. Detector	55/411.00 MHz
2. Antenna	56/417.00 MHz
3. QAM channel	57/423.00 MHz
4. HUB ID	58/429.00 MHz
5. Start	59/435.00 MHz
	60/441.00 MHz
	61/447.00 MHz
	62/453.00 MHz
	63/459.00 MHz
	64/465.00 MHz

Page Up Page Down

In order to change the QAM channel, highlight the menu item **QAM channel** and press **Enter** to display the channel list. In the appearing channel list highlight the desired frequency and press **Enter** to confirm selection. The channel list is quite long, in order to move faster between different frequencies the soft keys **Page Up** and **Page Down** can be used.

QAM Channel not available error message

The QAM Snare Admin Program has the ability to set default channels to avoid contention issues of multiple Field devices attempting to simultaneously tune to more than two channels. If the Admin is not configured this way, the two channels are available on a first come first served basis. When two channel are already selected and the Navigator attempts to tune to a third channel, the following error message is generated. The user must therefore select one of the two listed channels.

Channel is not installed

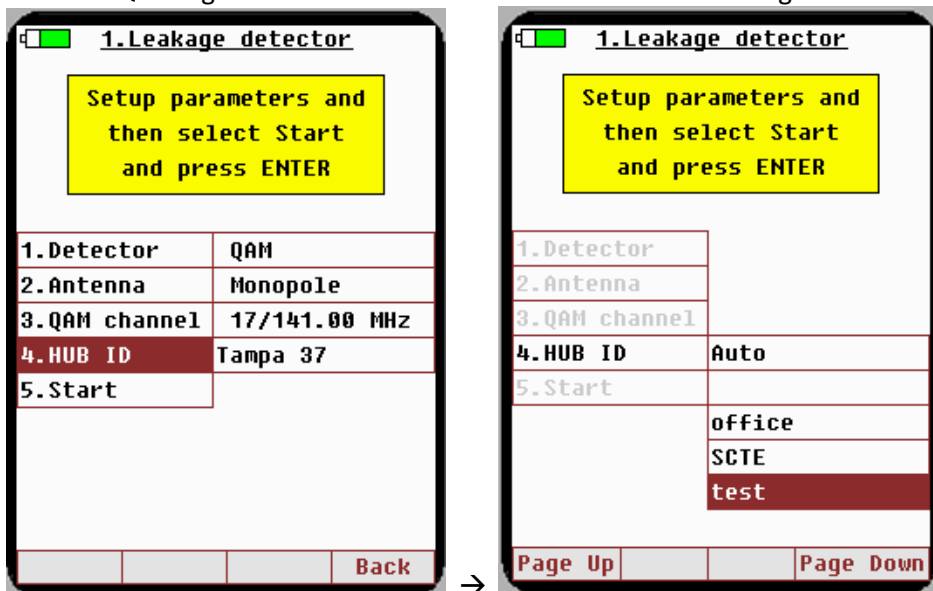
Available channels

82/573.00 MHz

94/645.00 MHz

Hub ID setting

The QAM Snare Navigator needs to know which Hub site Headend Signal Processor is transmitting its reference QAM signals. The Hub ID can be selected in the following menu:



1. Leakage detector

Setup parameters and then select Start and press ENTER

1. Detector	QAM
2. Antenna	Monopole
3. QAM channel	17/141.00 MHz
4. HUB ID	Tampa 37
5. Start	

Back

→

1. Detector	
2. Antenna	
3. QAM channel	
4. HUB ID	Auto
5. Start	

office
SCTE
test

Page Up Page Down

The hub ID can be selected from a pull down list of installed hubs. **In a multiple hub environment one hub is designated as the master hub, and all communication from the other hubs goes through the master. In such a scenario, ensure that the master hub is selected.** The other hubs communicate with the master hub and transmit the corresponding data. This way the Navigator only has to connect with the one master hub. Because of the GPS coordinates within the unit, the Navigator will know which hub it needs to get data from and will do so automatically without any user involvement and without the necessity to close the connection and reconnect to a different hub.

Using QAM Snare Navigator in the Field

Startup

In order to work with the QAM Snare Navigator in the field, the user must connect with the hub where the Headend Signal Processor is installed. Once all setup parameters are configured, highlight menu item #5 **Start** to activated Leakage detecting mode. The unit will connect to the hub over G3 connection and display the following screen which shows proper connection.



As indicated, the GPS status is OK and the GSM signal is strong. **Initial activation of the unit may require longer wait time for synchronizing with GPS – having this startup take several minutes is entirely normal.** When there is no GPS signal properly received, the message on the screen says 'No GPS'.

Another important indication of proper data exchange is a running second hand on the onscreen clock at the lower left portion of the screen . This clock is generated from the time in the Headend Signal Processor computer-it is generated locally at the device.

Once the leakage source is detected, depending upon the selected audio configuration, the unit will alarm. After a short period of time, when the location calculations at the Headend Signal Processor are completed, a flag will show up on the Navigator screen indicating the leakage source location.

The map can be navigated using left, right and up and down navigation buttons of the meter. It can be zoomed in and out using the + and - soft keys.

The actual signal trace can be viewed instead of the map. To switch between the views hit the **Signal** soft key.

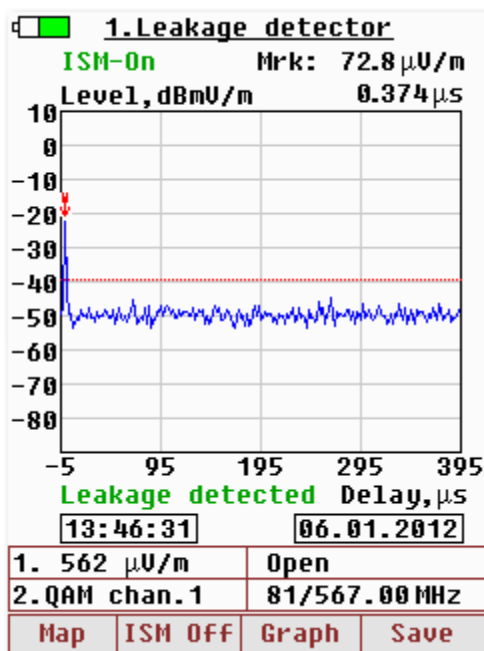
Map dot color indications

The table below shows the meaning of the travel route dots indicated on the maps. Reds indicate leak detected at that data point, green indicates nothing detected, and grey indicates insufficient data received from the headend.

- No leak detected
- Leak detected
- No data from headend

Signal mode

The signal screen of the leakage detector is shown below:



The marker is automatically placed at the peak of the strongest leakage signal. Parameters of the measured signal (at the detection point) are displayed in the upper part of the screen. In the example above, the detected leak value is 72.8 microvolts per meter – with a time delay of .374 micro second.

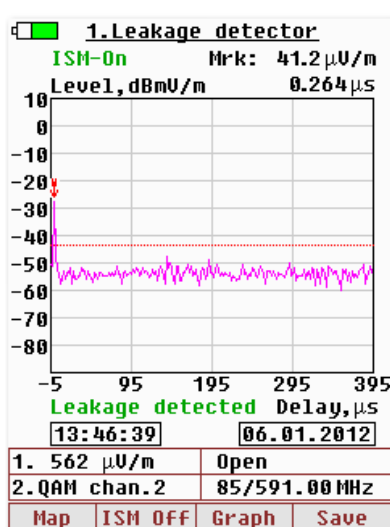
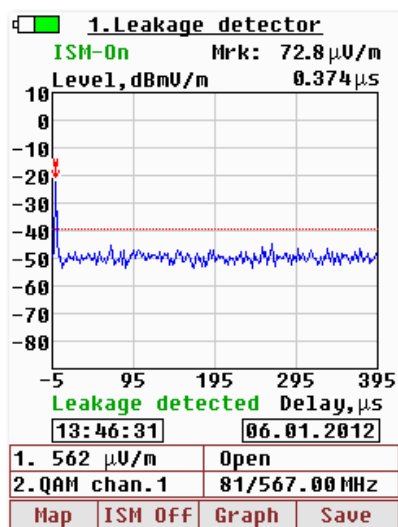
At the bottom of the screen there is information on the QAM channel being used for detection – in this case channel 81, centered at 567 MHz, as well as the previously mentioned Headend clock and date. Additionally, next to the #1 is information about the last leak that was detected. But in this box, instead of showing the magnitude of the detected leak, it indicates the value of the leak scaled to 10 ft – in this case 2 μV/m. The word Open next to the scaled value showed the leak work order status – in this case the leak is open.



At the very bottom of the screen are hot key options that let the user switch between different views. Map reverts back to the map view. Save allows the screen shot to be captured (using the Q-Browser program this screen capture can be ported to a PC via USB connection).

Toggling display between the two QAM channels

In the case dual QAM channel operation, the display can be changed to show the other channel by pressing the number button 2, as shown below.



In dual channel QAM mode, audio leak alarm but not leak on screen

In the dual QAM mode, audio alarms are for either of the two QAM channel, not just the one displayed on the screen. In cases where the leak existed at one frequency and not another this could result in a condition when the unit is alarming, but nothing is displayed on the screen. Simply press the button #2 to toggle to the other frequency.

Data buffering, rapidly moving clock displayed

Brief lapses in cellular coverage will be buffered for up to sixty seconds with no loss of data or lapses in coverage. When this occurs, the clock will speed up rapidly as time catches up with the current system. This operation is completely normal. All the buffered data point are recorded and if appropriate used for leakage detection purposes. Should the data gap exceed 60 seconds, the data collected during that time interval will be lost and the unit will automatically attempt to reconnect to the Headend Signal processor.

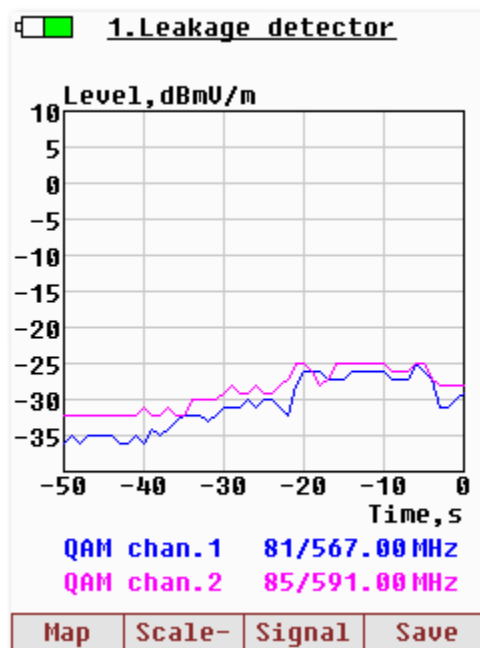
ISM on/off

The menu item **ISM On** activates communication over the 900MHz ISM band with the QAM Snare *Isolator*. The Isolator is used for the process of close in identification of the offending device. Consult with the QAM Snare Isolator manual for more details on this.

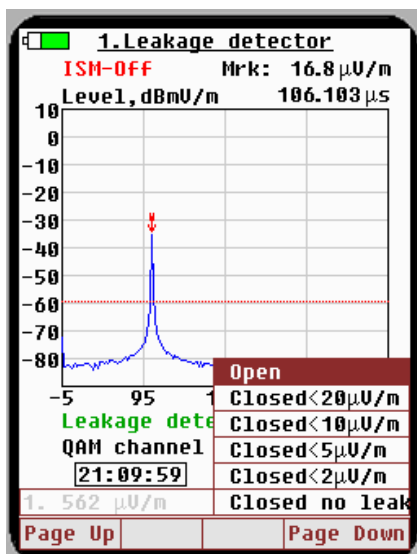
Graph mode

Lastly, the **Graph mode** as shown below – allow the user to see the history of the signal level for either one or two QAM channels depending upon the selected mode, continuously rolling over the past 50 seconds.

The graph function is quite valuable in the process of final leak location identification. The blue line shows changes in the detected signal level over previous scans. The x-axis indicates time in seconds, readings are done one per second. The screen can be saved by using **Save** soft key. The scale + soft key provides a different scale to make changes in level easier to see.



Closing a leak without generating a work order

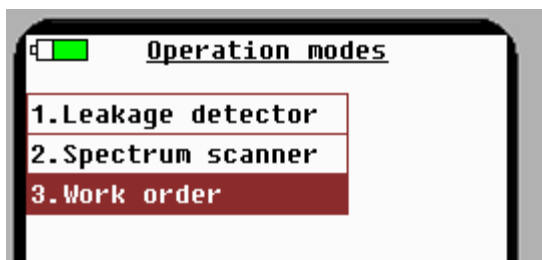


The last detected leak may be closed out directly from the Navigator, where the status is updated in the QAM Snare Headend Signal processor Database. Since the leak is identified as 1. as described above, press the 1 key on the numeric keypad and then enter, and the options as shown to the left appear. Scroll down to the desired selection, click enter – and the leak will be closed with the corresponding leak level comment updated in the database.

Operation–Work order

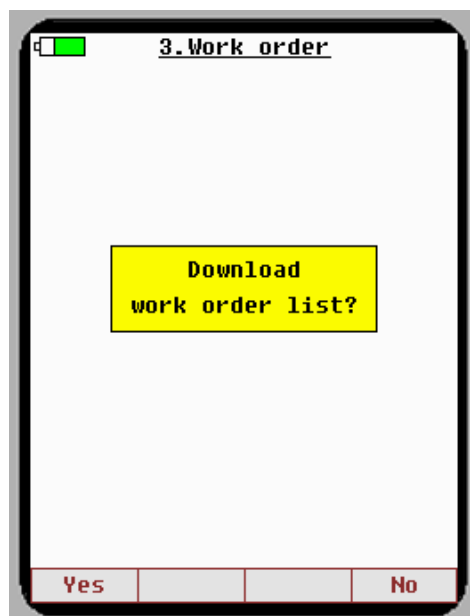
The Navigator can download work orders that are automatically assigned to the user through the QAM Snare Admin program. The work orders can be configured to be automatically assigned to a particular user in a specified quantity each day. New work orders are not assigned unless older work orders are cleared out.

Downloading work order list



To download the work orders assigned to your device, open Operation mode.

Then highlight menu item#3 **Work order** and hit **Enter** key. The following screen will open:

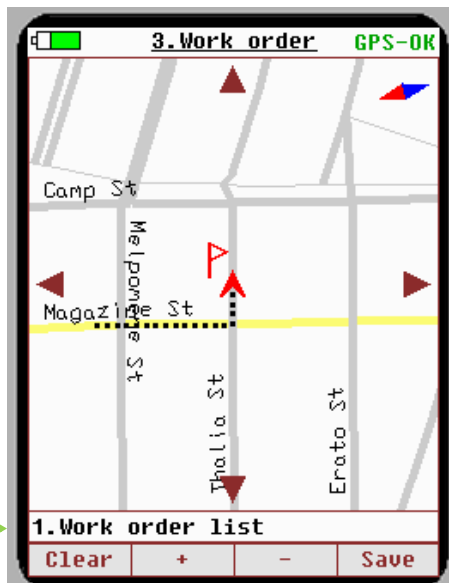


To download the work order, press the **Yes** soft key at the bottom of the window.


If the next screen displays the message: **No work order** like as in the example below, that indicates that automated work orders were not assigned to this device through the QAM Snare Admin program



Opening the work order list



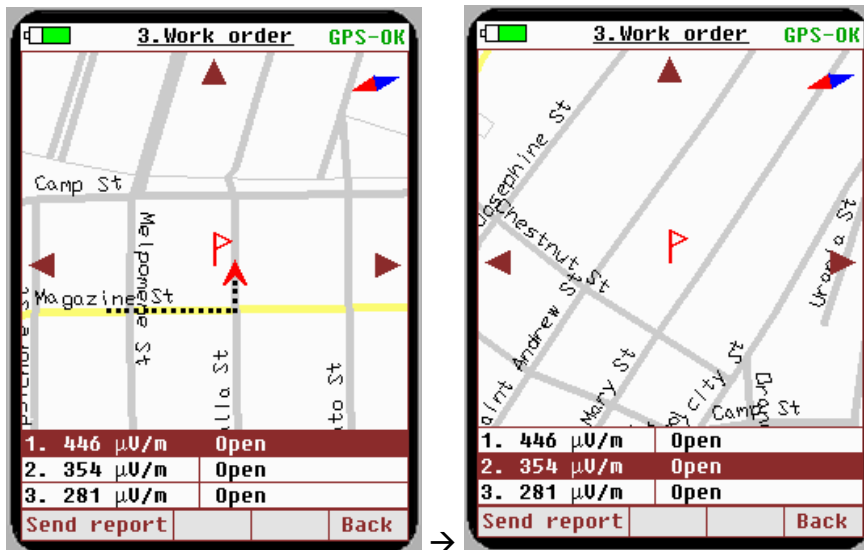
As indicated on the screen, to open the list of actual work orders, press digit 1 on the numerical keypad.

The screen with the work order listing will be displayed. It shows the map with flagged first leakage source centered on the screen. If you want to select a leak different from the first, simply highlight it and press enter. As you drive to the leak, your route will be highlighted with black dotted line which helps in navigating to the source. The screen can be zoomed in and out by soft keys  and navigated with navigation buttons located



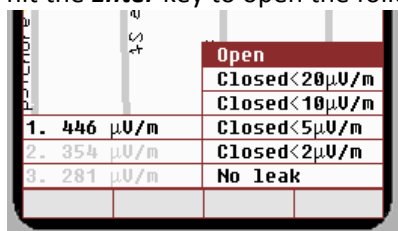
around the **Enter** key:

The soft key **Clear** deletes the black dotted trace line.



Closing work orders

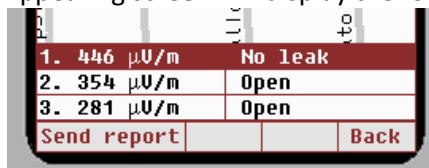
When the leak is repaired, select required leak from the menu on the screen shown above and hit the **Enter** key to open the following sub-menu:



In the submenu highlight appropriate current level information about the leak that was repaired. If there was no detectable leak level after repair highlight **No leak** and hit the **Enter** key.

If there was some leak residue left after the repair, select from the list the leak level residue and press **Enter**.

Appearing screen will display the following options at the bottom:

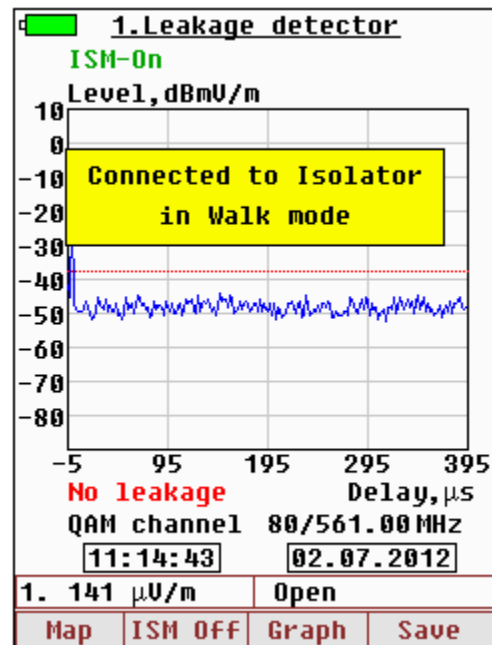


To send information about already repaired leaks hit **Send report** **Send report** soft key to close the work order for the leak that was actually repaired. This action will change the color of the flag for that leak on the map to blue and the data will be saved on the server.

Error and Informational Messages

Connected to Isolator in Walk mode

This informational message is displayed when an Isolator is connected to the Navigator in Walk mode over the ISM frequency band. When Isolator connects in this mode, the Navigator turns into a data bridge and relays samples from the Headend Signal Processor to the Isolator. Leaks detected by the Isolator are NOT updated to the QAM Snare database.



Sim Card error

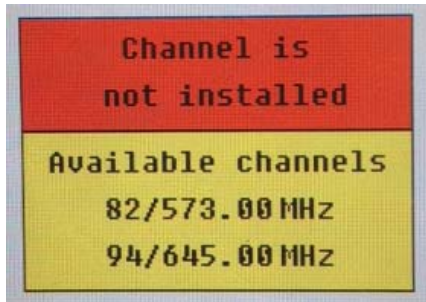
Sim Card error indicates an internal software issue. The unit must be completely powered down and restarted.

Connecting to Wireless Network

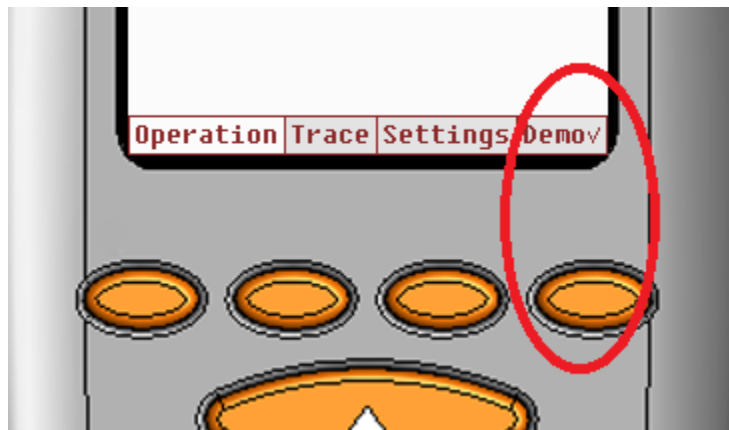
This message is displayed whenever the unit is reconnecting to the wireless network. This occurs automatically in conditions where there are lapses in cell coverage sufficient to transmit the complete data packet. In conditions such as this the unit will buffer data for 60 seconds then attempt to reconnect. It will continue to do this until connection is re-established. This condition could also occur if an Administrator changes one of the global QAM channels being used by Navigator.

Channel is not available

This informational message is displayed when the Navigator attempts to connect to a channel beyond the two currently assigned for use or in use by other users. Select one of the two channels displayed in the message.



Demo mode



Please, note that when handling the Navigator the **Demo mode** can be turned on accidentally. When demo mode is activated a check mark is indicated next to the Demo indicator. In the demo mode the unit will cycle through a demo sequence so it should be easy to tell that the unit is in demo mode. Press demo to exit this mode.



Navigator and Antenna Installation and Connections

Navigator Installation

An Arcom RAM Holder (Part# RAM-HOL-ARC1U) should be mounted at a solid location under the dash or on transmission hump where they will not interfere with vehicle controls or passenger movement. Great care should be taken not to mount any equipment, wires, or accessories that will interfere in the deployment path of a Supplemental Inflatable Restraint or "Air Bag". Once the antenna cables are connected the Navigator will slide into the RAM holder to remain secure. The Navigator can be removed from the holder for battery charging and file exchange.

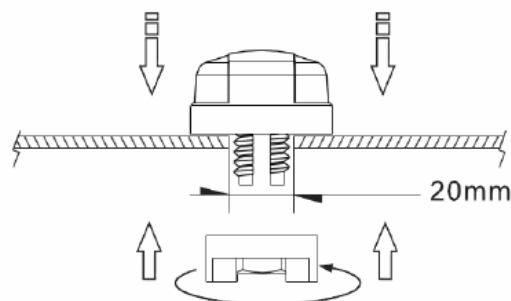
Antenna Installation

Two antenna fixtures are required for use with the QAM Snare Navigator: A combined GSM or Cellular antenna with a GPS receiving antenna (Taoglass Part # MA.104.C.A301111.B301111) and an ISM transmitter antenna (Taoglass part # IS.05.B.301111). For proper operation both antenna fixtures must be mounted at least 25cm (10in) apart.

Select the antenna locations on an upward facing flat exterior surface – preferably near the center of the vehicle. It is important that all antennas have an unobstructed view of the sky.

Drill two 20mm (13/16in) holes 25cm (10in) apart. Remove the seal insulation, feed the cable connections through the holes and secure the antenna underneath with the nut supplied.

Route the antenna cables from the antennas to the QAM Snare Navigator. Use a rubber grommet to insulate any time cables travel through a metal barrier.



Recommended torque for mounting is 95Nm or 70ftlbs
Maximum torque for mounting is 135.6Nm or 100ft lbs





FCC and IC Compliance

FCC Compliance Statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

Information to Users (FCC 15.21 & 15.105)

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Warning to Users (FCC 15.21 & 15.105)

Changes of modifications not expressly approved by Arcom Digital, Ltd. could void the users authority to operate this equipment.

Industry Canada Compliance Statement (IC RSS-Gen 7.1.3)

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference, and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Information to Users (IC RSS-Gen 7.1.2)

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter, QSnare-60, has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device. The approved antenna is a Taoglass part # IS.05.B.301111, 902-928 MHz, 3.14 dBi, 50 Ohms impedance.