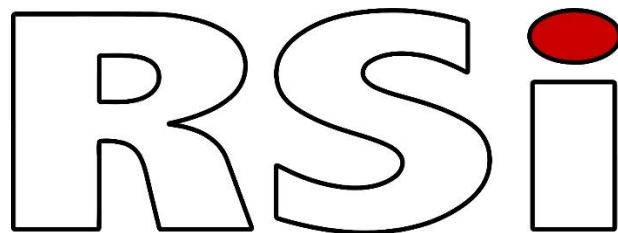


Aries Windows Software

TETRA Network Performance Measurement Tool

User Guide and Reference Manual



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Disclaimer

Whilst every care has been taken in the preparation and publication of this document, errors in content, typographical or otherwise, may occur. If you have queries regarding its accuracy please contact RSI at the address shown on the title page.

With a policy of continual improvement RSI reserves the right to alter specification without notice.

1 Overview

1.1 What is Aries?

The Aries system is a TETRA network survey tool that provides network performance statistics. It comes in the following configuration options:

1) Aries Windows Software standalone



2) Aries Windows Software for logging with web browser access to Aries Server for analysis



3) Aries Probe for autonomous logging with web browser access to Aries Server for analysis, 'Aries probe Controller' Android App for probe control and indoor positioning



4) Voice Quality and SDS testing using a 2nd fixed transponder probe



Figure 1: Aries Configurations Options

This document covers options 1 and 2 above using the Aries Windows Software.

1.2 Aries Windows Software

Aries Windows Software offers a Windows software based alternative to the Aries probe providing much of the same functionality as the probes (with the exception of VQ & SDS testing). The following table summarises the main functionality differences:

	1) Aries Windows Software standalone	2) Aries Windows Software with Aries server	3) Aries Probe with server	4) Aries Probe with server & transponder probe	Motorola SCOUT Software (now obsolete)
Log TETRA data from Motorola terminal in PEI mode	✓	✓	✓	✓	
Log TETRA data from Motorola terminal in Airtracer mode	✓	✓	✓	✓	✓
Log TETRA data from Sepura terminal	✓	✓	✓	✓	
Log TETRA data from Teltronic terminal	✓	✓	✓	✓	
Log DMR Tier 3 data from Tait terminal			✓	✓	
Unattended autonomous logging of data			✓	✓	
Android App for indoor survey positioning			✓	✓	
Suitable for limited survey of small area	✓	✓	✓	✓	✓
Suitable for large scale survey of complete network		✓	✓	✓	
Suitable for contractual network performance testing		✓	✓	✓	
Decoding key Layer 2/3 parameters (Motorola only)	✓	✓	✓	✓	✓
Layer 2/3 PDU decode	✓	✓			✓
View data in table	✓	✓	✓	✓	✓
View data on graph	✓	✓	✓	✓	✓
Save & replay data in local files	✓	✓			✓
Single database for all data from multiple probes		✓	✓	✓	
Display results on maps	✓	✓	✓	✓	✓
Square km analysis with management level reporting		✓	✓	✓	
KPI analysis		✓	✓	✓	
Neighbour Analysis		✓	✓	✓	
Voice Quality testing				✓	
SDS testing				✓	
Export results to kmz file	✓	✓	✓	✓	✓
Group Call Generator	✓	✓	✓	✓	✓
Advanced analysis by date/probe/area/base site/custom filter		✓	✓	✓	

Real-time monitoring of large operational networks		✓	✓	✓	
Email/SMS warnings for exception conditions		✓	✓	✓	
Packet Data Testing			✓	✓	
Indoor location floor plans	✓	✓	✓	✓	✓

Aries Windows software can be used in standalone mode or with the Aries server for more advanced analysis and mapping functionality.

1.3 Installation and Licensing

The latest version of the Aries software can be downloaded from this page:
<http://www.rsi-uk.com/aries-windows-software/>

Once installed, Aries Windows checks for a new version each time it is started and gives the user the option to download and install the new version. We recommend always downloading and installing to ensure you are running the latest version.

This software requires a USB License Dongle to work – contact RSI to purchase one.

A GPS receiver such as BU-353s4 providing NMEA messages at 4800 baud is required for surveys.

A suitable RS232 cable to connect to the TETRA radio terminal is required for surveys:

TETRA Terminal	Cable
Motorola MTM 700/800/800e	GMKN1022A
Motorola MTP 800 Series/CEP400	PMKN4025A
Motorola MTP 810Ex/MTP 850Ex	PMLN5237A
Motorola MTP35xx, MTP66xx, MXP600	PMKN4127 (RS232)
Motorola MTP85xx	PMKN4159 (RS232)
Motorola MTM5xxx, MTM8xxx	PMKN4104 (RS232)
Sepura SRG	300-00437 (USB) , 300-00065 (RS232)
Teltronic MDT-400	D02605

Note that when using an RS232 cable, an RS232 to USB adapter will be required as well. It is recommended to use adapters that use the FTDI chipset – some older adapters that use the Prolific chipset can have problems on Windows 11.

2.0 User Interface

Aries Windows uses a multi window user interface as shown below:

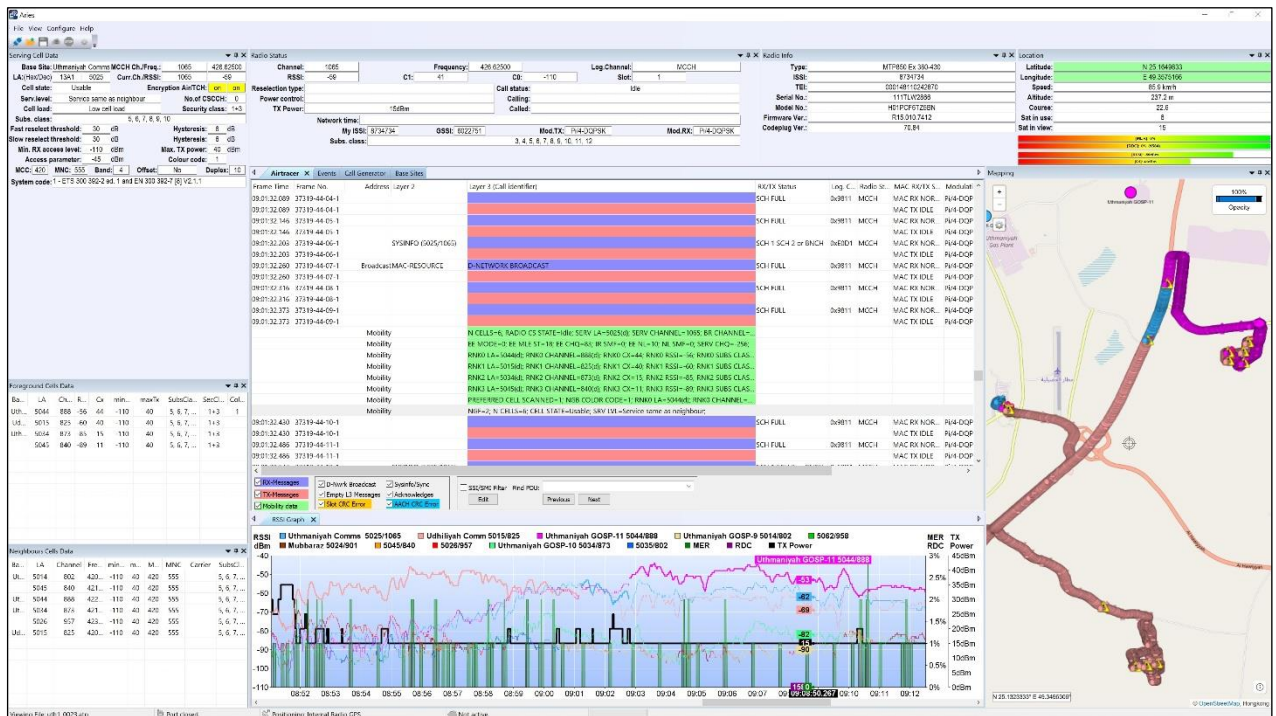


Figure 2: Aries Windows main screen view

Individual windows may be enabled or disabled from the 'View' menu. Click the 'x' in the top right of a window to close it.

Windows can either be docked or floating. Click the '▼' in the top right of a window to select whether the window is Floating, Docked or a Tabbed Document.

To move a window, click and hold the title bar while moving it to another window. To dock the window next to the second window, move the first window, while still holding the mouse down, onto one of the square direction indicators as shown:




This determines whether the first window appears to the top, bottom, left or right or as a tab to the second window.

2.1 Operating Modes


Aries Windows operates in one of the following modes:

IDLE:	GPS & Radio ports closed, no file selected, no data in memory
VIEW FILE:	GPS & Radio ports closed, file(s) selected and held in memory to be viewed
MONITOR:	GPS & Radio ports open & communicating, viewing last 60 mins of real-time data
LOG TO FILE:	GPS & Radio ports open & communicating, saving real-time data to file(s)
LOG TO SERVER:	GPS & Radio ports open & communicating, sending real-time data to server

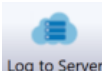
Aries Windows starts up in IDLE mode.

If this is the first time running Aries Windows, click the  Settings button and specify the GPS and Radio Com Ports on the Settings form.

To VIEW an existing File or files, click the  Open File button or menu option

To enter MONITOR mode, click the  Connect button or menu option. To return to IDLE mode, click the button again.

To LOG TO FILE real-time data, click the  Log to File button while in MONITOR mode

To LOG TO SERVER real-time data, click the  Log to Server button while in MONITOR mode

To stop the logging to file or server, click the  Stop button and return to MONITOR mode

2.2 Configuration

2.2.1 Radio and GPS

Before starting a survey the com ports must be specified for the TETRA radio terminal and GPS device if used.

The options for the TETRA radio are: Motorola, Sepura or Teltronic. If using a Motorola radio terminal then it may be used with the radio either in PEI mode giving basic information, or in Airtracer mode giving full Layer 2/3 information. This is set from the radio terminal front panel.

The options for GPS are: External device such as BU-353s4 that connects to the PC USB socket usually at 4800 Baud, Internal GPS in the TETRA radio terminal – this normally needs to be enabled from the radio terminal front panel, or Manual Positioning which is usually used for indoor or underground surveys where GPS signals are not available. The Manual Positioning option allows the user to click on a floor plan or map to indicate the current position during the survey.

The Interpolation option is available for all types of positioning and enables the generation of coordinates when GPS is temporarily lost. The algorithm takes the last known valid coordinate and the first valid coordinate after GPS loss and spreads any samples taken equally along a straight line between the two coordinates. The algorithm works best when the GPS is lost for only short periods, e.g. when going through a tunnel.

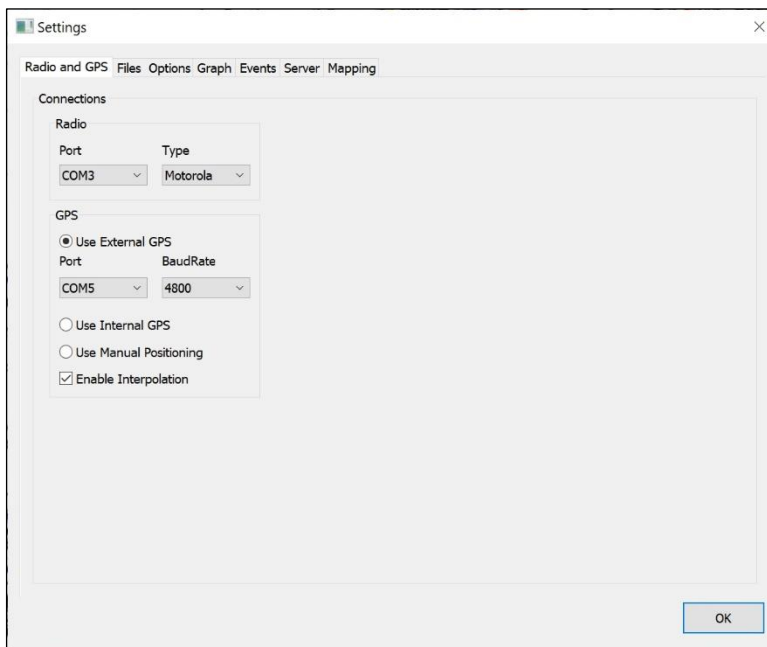


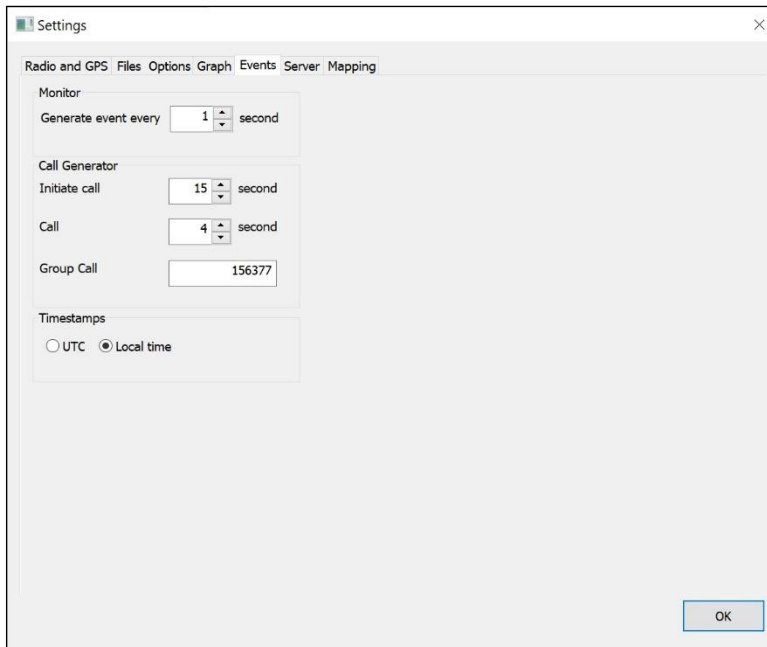
Figure 3: Configuration Form – Radio and GPS

2.2.2 Events

This form is used to specify the rate that log events are generated in Aries. The fastest rate is every 1 sec.

See section 2.9 for an explanation of the Call Generator settings.

The Timestamps options specifies whether timestamps are in UTC or the PC local time.



The screenshot shows the 'Settings' dialog box with the 'Events' tab selected. The dialog has a title bar with a close button (X) and a menu bar with 'Radio and GPS', 'Files', 'Options', 'Graph', 'Events', 'Server', and 'Mapping'. The 'Events' section contains the following settings:

- Monitor:** 'Generate event every' is set to 1 second.
- Call Generator:** 'Initiate call' is set to 15 seconds, 'Call' is set to 4 seconds, and 'Group Call' is set to 156377.
- Timestamps:** Radio buttons for 'UTC' and 'Local time', with 'Local time' selected.

An 'OK' button is located at the bottom right of the dialog.

Figure 4: Configuration Form – Events

2.3 Open File

Selecting an .atp file (Airtracer logged from Motorola terminal in Airtracer mode) or .log file (Aries Events logged from all other terminals) shall load all data into memory and display the data on the Data Logs table and graph as well as the Call Generator form if calls were made during the logging.

If an atp file is selected then the Aries Events are created and displayed on the form when the file is loaded. Monitor events are created at the rate specified on the Events tab of the Settings form.

Multiple files may be selected from the File Selection form using the standard shift/ctrl + click method.

Data is displayed in the Data Log window in separate lists as Airtracer events and Aries events. Airtracer events are only display if an atp file has been selected. If a .log file has been selected then only Aries events are displayed.

Frame Time	Frame No.	Address	Layer 2	Layer 3 (Call Identifier)	RX/TX Status	Log_Chan...	Radio State	Modulation	AACH	GPS (Lat/Lon)
08:26:59.104	40109-20-07-1				SCH 1 SCH 2 or BNCH	0xE0D1	MCCH	Pi/4-DQPSK	0208	
08:26:59.133	40109-20-07-1									
08:26:59.161	40109-20-08-1				SCH FULL	0x9811	MCCH	Pi/4-DQPSK	0609	
08:26:59.189	40109-20-08-1									
08:26:59.218	40109-20-09-1				SCH FULL	0x9811	MCCH	Pi/4-DQPSK	0208	
08:26:59.246	40109-20-09-1									
08:26:59.274	40109-20-10-1				SCH FULL	0x9811	MCCH	Pi/4-DQPSK	0609	
08:26:59.303	40109-20-10-1									
08:26:59.331	40109-20-11-1		Broadcast	MAC-RESOURCE	SCH FULL	0x9811	MCCH	Pi/4-DQPSK	0208	
08:26:59.359	40109-20-11-1									
08:26:59.388	40109-20-12-1				SCH FULL	0x9811	MCCH	Pi/4-DQPSK	0609	
08:26:59.416	40109-20-12-1									
08:26:59.444	40109-20-13-1				SCH 1 SCH 2 or BNCH	0xE0D1	MCCH	Pi/4-DQPSK	0208	
08:26:59.473	40109-20-13-1									
08:26:59.501	40109-20-14-1				SCH FULL	0x9811	MCCH	Pi/4-DQPSK	0609	
08:26:59.529	40109-20-14-1									
08:26:59.558	40109-20-15-1				SCH FULL	0x9811	MCCH	Pi/4-DQPSK	0208	
08:26:59.586	40109-20-15-1									
08:26:59.614	40109-20-16-1	7602121	MAC-RESOURCE		SCH FULL	0x9811	MCCH	Pi/4-DQPSK	0609	
08:26:59.643	40109-20-16-1									
08:26:59.671	40109-20-17-1		Broadcast	MAC-RESOURCE	SCH FULL	0x9811	MCCH	Pi/4-DQPSK	0208	
08:26:59.699	40109-20-17-1									
08:26:59.728	40109-20-18-1	7602121	MAC-RESOURCE		SCH 1 SCH 2 or BNCH	0xE0D1	MCCH	Pi/4-DQPSK	0609	
08:26:59.756	40109-20-18-1									
08:26:59.784	40109-21-01-1	11638806	MAC-RESOURCE		SCH FULL	0x9811	MCCH	Pi/4-DQPSK	0208	
08:26:59.812	40109-21-01-1									
08:26:59.841	40109-21-02-1				SCH FULL	0x9811	MCCH	Pi/4-DQPSK	0609	
08:26:59.869	40109-21-02-1									
08:26:59.898	40109-21-03-1				SCH FULL	0x9811	MCCH	Pi/4-DQPSK	0208	
08:26:59.926	40109-21-03-1									
08:26:59.954	40109-21-04-1				SCH FULL	0x9811	MCCH	Pi/4-DQPSK	0609	
08:26:59.983	40109-21-04-1									
08:27:00.011	40109-21-05-1		Broadcast	MAC-RESOURCE	SCH FULL	0x9811	MCCH	Pi/4-DQPSK	0208	

Figure 5: Airtracer Layer 2/3 data

Date/Time	Lat	Lon	Altitude	Speed	Event Type	Base Site LAC	Frequency	RCSI	C1	BN Base Site LAC	Frequency	RSSI	C2	CS / HO / DL...	MER	RDL	Slot number	Logical Channel	Rx / Tx Status	Modulation
2020-03-05 08:09:55	25.7078816	49.5093283	146	21	Monitor	5031	420.17500	-75	25	5036	421.50000	-93	7	0	1584	1	MCCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:10:00	25.7081633	49.5089516	147	38	Monitor	5031	420.17500	-76	24	5036	421.50000	-91	9	0	1584	1	MCCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:10:02	25.7082283	49.5089716	147	28	Call Setup Success	5031	420.17500	-75	25	5036	421.50000	-95	5	86	0	1584	1	MCCH	SCH FULL	Pi/4-DQPSK
2020-03-05 08:10:05	25.7082016	49.5085683	147	26	Monitor	5031	420.17500	-76	24	5041	423.00000	-94	6	0	1584	2	TCH	TCH FULL	Pi/4-DQPSK	
2020-03-05 08:10:10	25.7080016	49.5081933	148	32	Monitor	5031	420.17500	-73	27	5041	423.00000	-93	7	0	1584	2	FACCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:10:15	25.7076250	49.5079300	148	38	Monitor	5031	420.17500	-70	30	5041	423.00000	-95	5	0	1584	2	FACCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:10:15	25.7076250	49.5079300	148	38	Call Completed Successfully	5031	420.17500	-72	28	5036	421.50000	-91	9	0	1584	2	FACCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:10:20	25.7071233	49.5077850	148	40	Monitor	5031	420.17500	-69	31	5041	423.00000	-95	5	0	1584	1	MCCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:10:25	25.7066283	49.5075700	148	41	Monitor	5031	420.17500	-74	26	5037	420.30000	-94	6	0	1584	1	MCCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:10:30	25.7062816	49.5073550	149	31	Monitor	5031	420.17500	-72	28	5024	422.52500	-95	5	0	1584	1	MCCH	SCH 1 SCH 2 or BNCH	Pi/4-DQPSK	
2020-03-05 08:10:32	25.7060366	49.5071833	150	39	Call Setup Success	5031	420.17500	-71	29	5024	422.52500	-94	6	86	0	1584	1	MCCH	SCH FULL	Pi/4-DQPSK
2020-03-05 08:10:35	25.7058783	49.5070316	151	41	Monitor	5031	420.17500	-72	28	5024	422.52500	-95	5	0	1584	2	TCH	TCH FULL	Pi/4-DQPSK	
2020-03-05 08:10:40	25.7033950	49.5066200	151	51	Monitor	5031	420.17500	-72	28	5036	421.50000	-91	9	0	1584	2	FACCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:10:45	25.7048450	49.5061666	152	52	Monitor	5031	420.17500	-72	28	5036	421.50000	-91	9	0	1584	2	FACCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:10:45	25.7048450	49.5061666	152	52	Call Completed Successfully	5031	420.17500	-72	28	5036	421.50000	-91	9	0	1584	2	FACCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:10:50	25.7042816	49.5057316	153	56	Monitor	5031	420.17500	-72	28	5036	421.50000	-92	8	0	1584	1	MCCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:10:55	25.7037316	49.5053166	153	51	Monitor	5031	420.17500	-72	28	5036	421.50000	-93	7	0	1584	1	MCCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:11:00	25.7032933	49.5049983	154	37	Monitor	5031	420.17500	-71	29	5036	421.50000	-94	6	0	1584	1	MCCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:11:02	25.7031416	49.5048683	154	23	Call Setup Success	5031	420.17500	-71	29	5024	422.52500	-94	6	0	1584	1	MCCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:11:05	25.7031333	49.5048016	154	13	Monitor	5031	420.17500	-72	28	5036	421.50000	-92	8	86	0	1584	2	TCH	TCH FULL	Pi/4-DQPSK
2020-03-05 08:11:10	25.7033683	49.5046716	152	28	Monitor	5031	420.17500	-71	29	5036	421.50000	-88	12	0	1584	2	FACCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:11:15	25.7039383	49.5044316	150	53	Monitor	5031	420.17500	-70	30	5036	421.50000	-86	14	0	1584	2	FACCH	SCH 1 SCH 2 or BNCH	Pi/4-DQPSK	
2020-03-05 08:11:15	25.7040733	49.5043733	150	55	Call Completed Successfully	5031	420.17500	-70	30	5036	421.50000	-86	14	0	1584	2	FACCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:11:20	25.7046716	49.5041233	150	64	Monitor	5031	420.17500	-68	32	5036	421.50000	-88	12	0	1584	1	MCCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:11:25	25.7035650	49.5037616	150	72	Monitor	5031	420.17500	-65	35	5036	421.50000	-87	13	0	1584	1	MCCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:11:30	25.7064216	49.5033733	150	78	Monitor	5031	420.17500	-66	34	5036	421.50000	-91	9	0	1584	1	MCCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:11:32	25.7069716	49.5031416	151	75	Call Setup Success	5031	420.17500	-64	36	5036	421.50000	-93	7	86	0	1584	1	MCCH	SCH FULL	Pi/4-DQPSK
2020-03-05 08:11:35	25.7073283	49.5029866	151	75	Monitor	5031	420.17500	-64	36	5036	421.50000	-93	7	0	1584	4	TCH	TCH FULL	Pi/4-DQPSK	
2020-03-05 08:11:40	25.7082416	49.5025983	152	78	Monitor	5031	420.17500	-74	26	5036	421.50000	-93	7	0	1584	4	FACCH	SCH 1 SCH 2 or BNCH	Pi/4-DQPSK	
2020-03-05 08:11:45	25.7091899	49.5021849	153	81	Monitor	5031	420.17500	-84	16	5036	421.50000	-92	8	5	1584	4	FACCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:11:45	25.7093849	49.5021016	154	82	Call Completed Successfully	5031	420.17500	-84	16	5036	421.50000	-92	8	6	1584	4	FACCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:11:50	25.7101749	49.5017666	154	84	Monitor	5031	420.17500	-83	17	5036	421.50000	-90	10	4	1584	1	MCCH	SCH FULL	Pi/4-DQPSK	
2020-03-05 08:11:55	25.7111416	49.5013516	155	82	Monitor	5031	420.17500	-79	21	5036	421.50000	-89	11	0	1584	1	MCCH	SCH 1 SCH 2 or BNCH	Pi/4-DQPSK	

Figure 6: Aries Events

The Airtracer and Aries events lists plus the Graph and Call Generator list are synchronised so clicking on an event in one list highlights the corresponding event in the other list as well as moving the cursor on the graph to the corresponding point.

CS/HS/DL values in the Aries events list show the time in milliseconds for the Call Setup Time or Handover time or Download time depending on the event type.

To delete events from the Aries Events list, select one or more events and then right-click to bring up the menu. Select 'Delete Events'. The selected events will then disappear from the list and will also not appear in any exported files. Note that the events are not deleted from the file and will reappear the next time the file is read and viewed.

2.4 Log to File

While in Monitor mode, clicking the 'Log to File' button will start logging the received data to the specified filename. To avoid recording massive files that can be hard to view and analyse, the logging process limits the maximum file size based on either time per file or messages per file as specified on the 'Files Options' tab on the Settings form.

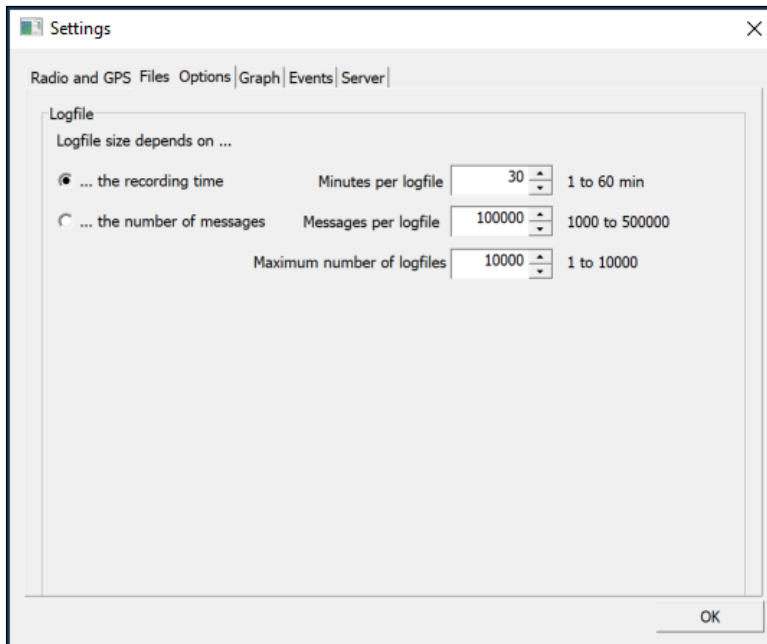


Figure 8: Aries Windows Log to File settings

Multiple log files are named in the format: filename_000x.atp with x incrementing for each additional file. All files are saved into the same folder.

To stop logging to file, click the 'Stop' button

If the radio terminal is in Airtracer mode then data may be saved either as an .atp file containing all of the Layer 2/3 details or as a .log file containing Aries Events.

If the radio terminal is in PEI mode then the data may only be saved as a .log file.

2.5 Log to Server

While in Monitor mode, clicking the 'Log to Server' button will start logging the received data to the specified Aries server.

An Aries Probe must have already been setup and configured on the Aries server with the same IMEI as specified on the Server tab of the Settings form. Normally the IMEI is used to uniquely identify an Aries probe and cannot be changed – however when using Aries Windows software any random number may be used as the IMEI as long as it matches the IMEI on the server.

The server URL must be specified, e.g. <https://rsi-aries.com>

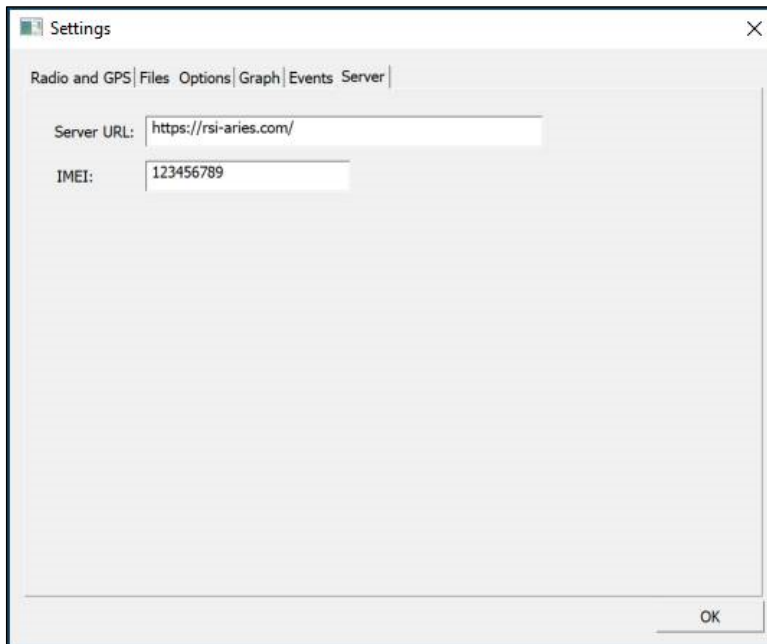


Figure 9: Aries Windows Log to Server settings

Events are logged to the Aries server in real-time as they are produced by the radio terminal. In the event that the Internet connection is lost during logging, the accumulated data shall be held in memory and periodically saved to a temporary file.

To stop logging to server, click the 'Stop' button

2.6 Graph

The signal level received from each base site is shown as a separate line on the graph. The current serving cell is displayed with a thicker line, the neighbour cells are in thinner lines. In addition the MER, RDC and Tx Power values are shown as a % using the right-hand Y-axis scale.



Figure 10: Graph window

The signal level values for each line are displayed on the cursor line. Clicking on the graph synchronises all other windows to the same point in the data. Left and Right buttons can be used to step through the data. The X-Axis scale may be zoomed in and out using the mouse wheel.

Right-clicking on the graph displays a pop-up menu with configuration options plus an option to save the graph as an image. The image format is selectable on the 'save as' dialog form from PNG, JPG, GIF, BMP, SVG and PDF.

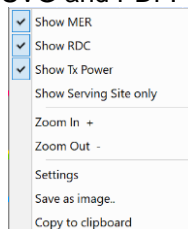


Figure 11: Graph right-click pop-up menu

The graph configuration settings form can be selected from the right-click menu or the main menu:

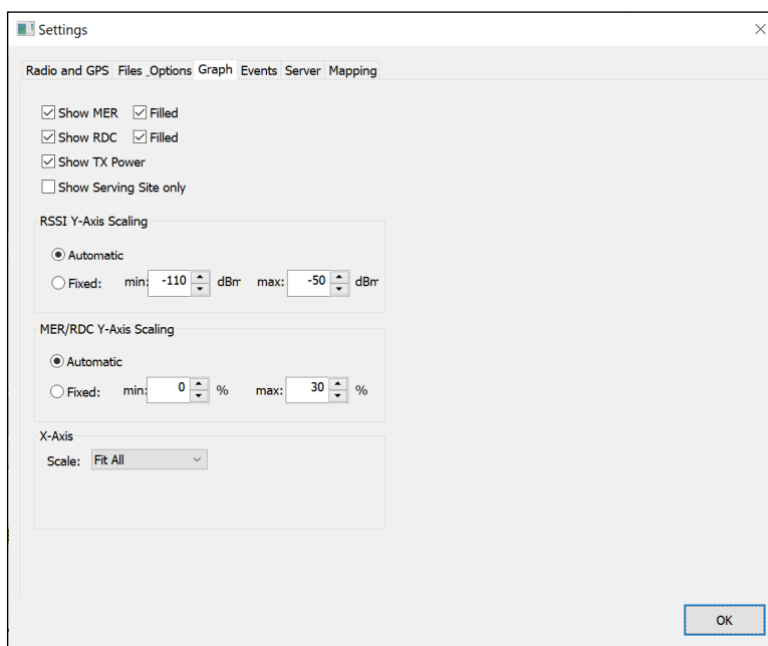


Figure 12: Graph settings

2.7 Maps

2.7.1 OpenStreetMap

Survey data may be displayed as maps in the Aries map window using map images from OpenStreetMap as the background when the PC is connected to the Internet. The map images may still be available even if the PC is disconnected from the Internet if they have previously been viewed and remain in the cache.

The 'OpenStreetMap' layer must be ticked in the 'Mapping' tab on the Settings form for map images to be visible.

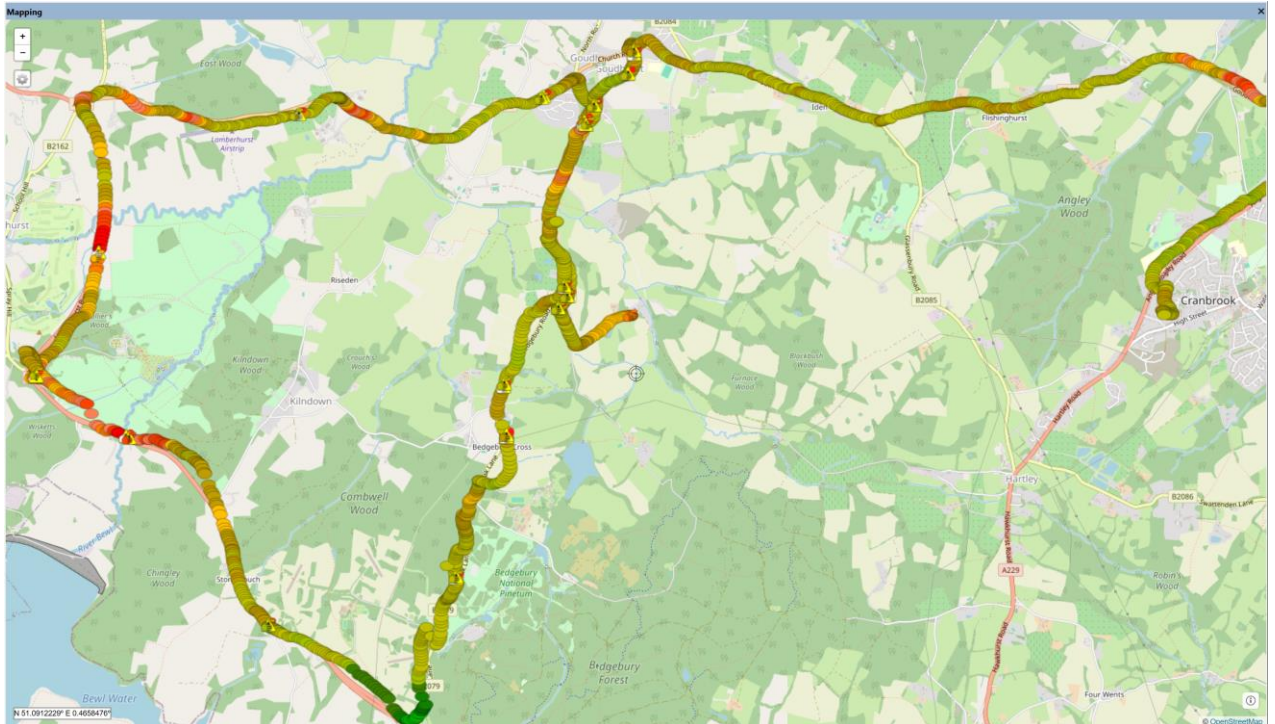


Figure 13: Map window

Click the '+' and '-' buttons to zoom in and out, or click the right-click menu, or use the mouse scroll wheel. To Pan the map, click on a point and drag the mouse across the map. The map image may be saved to a file or copied to clipboard from the right-click menu.

The map is synchronised with the graph, and Airtracer and Event windows so that clicking on an icon on the map will cause these other windows to highlight the same selected data point. On the map the selected data icon pans to the central cross-hairs on the map window.

To configure the icon colour thresholds, select the Settings button, or select 'Settings' from the right-click menu. Click the 'Colour Thresholds' button on the Mapping tab.

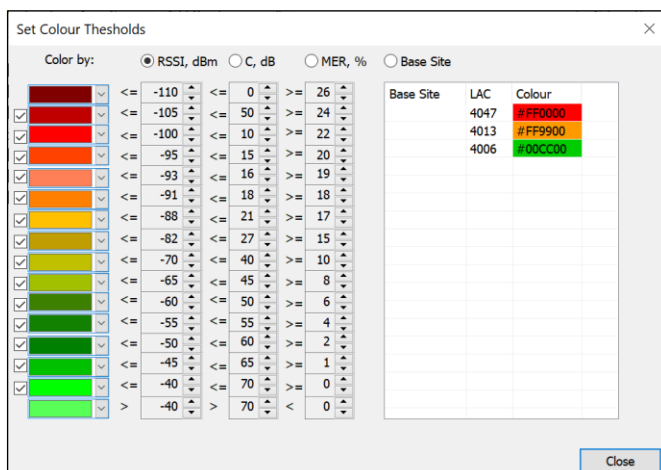


Figure 14: Set Colour Threshold for the map

Select the appropriate option for colouring the icons: RSSI [dBm], C [dB], MER [%] or Base Site and tick the colour bands that are required. If Base Sites are selected then the colours will come from the Base Site Database if the site is already listed, or will just be a random colour if it is not in the database.

2.7.2 Map Overlays

Aries can display overlay map images on top of the OpenStreetMap images. These can be wide area maps or building floor plans for indoor surveys. The software allows the user to import and geo-reference these images so that they are positioned correctly on the map and are aligned to the correct coordinates. It is possible to import map images from the Aries server which have already been geo-referenced, or to import images directly into the Aries Windows Software and to carry out the geo-referencing in the software. This is all configured from the Mapping tab on the Settings form as shown below:

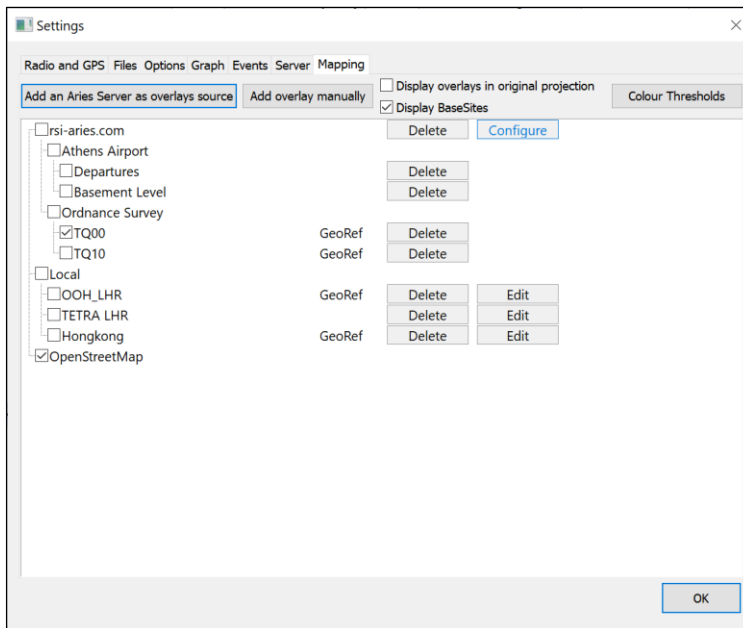


Figure 15: Map Overlay list

This form lists all of the available overlay images. One or more overlays may be selected for viewing on the map by selecting the tickbox for that overlay. Clicking on an overlay in the list will pan the map window to that overlay. If the 'Display overlays in original projection' option is selected then the overlay is displayed without the OpenStreetMap background and in the original image orientation, however the coordinates it produces are still correct. This option may be useful for indoor surveys using floor plans where it is not important to have the image aligned to the North.

Overlay images may be imported directly into the Aries Windows Software by clicking the 'Add Overlay Manually' button. This displays the form below:

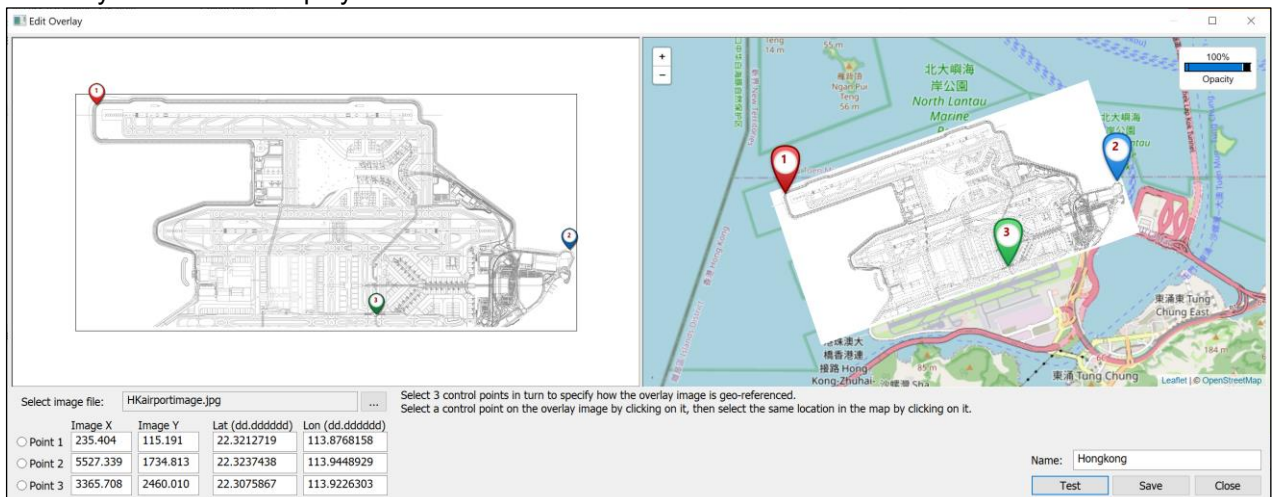


Figure 16: Geo-reference an image

Follow these steps to import and geo-reference an image:

- 1) Click the '...' button to Select an image file. The file format may be png, .jpg, .bmp, .svg .
- 2) Click the 'Point 1' option select and click on a control point on the imported image (left side of the form). Either enter the Latitude and Longitude coordinates for this control point if you already know them, or click on the corresponding point on the OpenStreetMap (right side of the form), zooming and panning as necessary.
- 3) Repeat the previous point for Point 2 and Point 3. Selecting reference points that are widely spread over the overlay image, rather than bunched together, will greatly improve the accuracy of the geo-referencing.
- 4) When you have 3 reference points correctly selected then click the 'Test' button to display the geo-referenced image on top of the OpenStreetMap image on the right side. If you are happy that the overlay is correctly geo-referenced then enter a name for it and click the 'Save' button.
- 5) The geo-referenced overlay will now appear in the list of overlays on the Settings form under the 'Local' heading and can be selected using the tick box to be displayed on the main map.

Overlay images may also be imported from the Aries server if you have access to one by clicking the 'Add an Aries Server as overlays source'. This displays the form below:

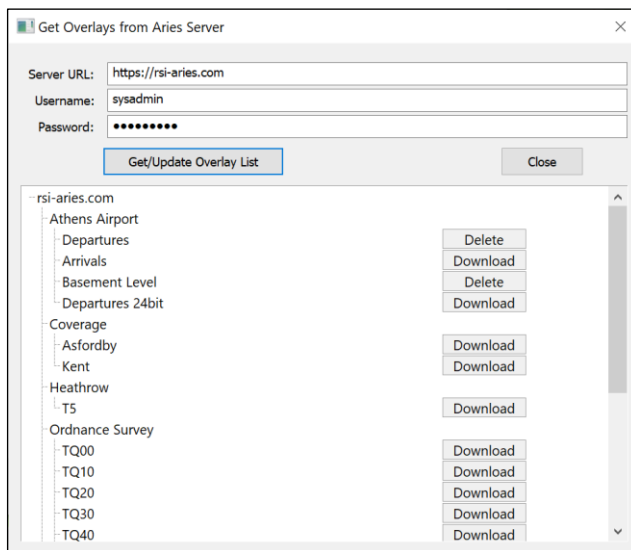


Figure 17: Get Overlays from Aries Server

Enter the URL, username and password for the Aries server and click the 'Get/Update Overlay List' – it may take a few seconds to get the list from the Aries server.

Click 'Download' for each overlay that you will need to use on the PC – this overlay will then appear on the main list on the Settings | Mapping tab under the server name heading and can be selected as before to be displayed on the map.

Exported kmz files may be viewed in Google Earth or other software as shown below. Clicking on events displays a pop-up box with details of the event.

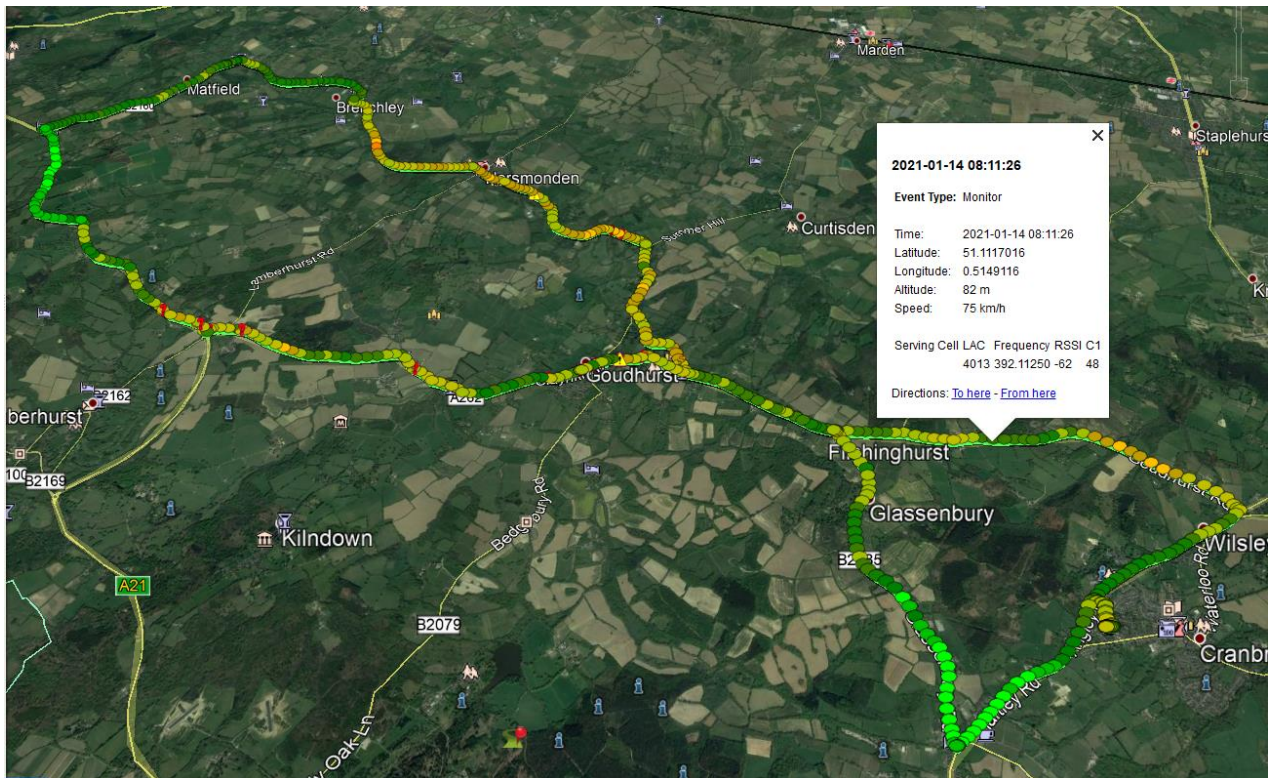


Figure 19: Aries kmz file with events coloured by RSSI

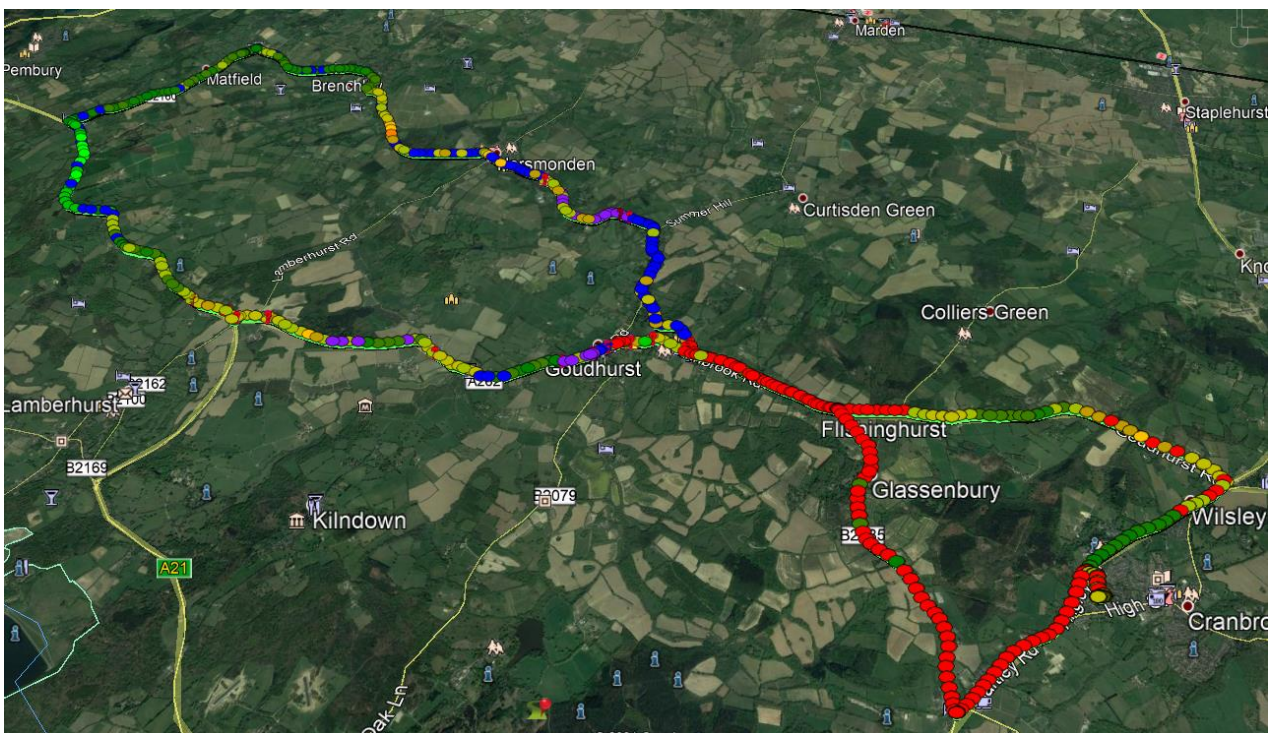


Figure 20: Aries kmz file with events coloured by TETRA Serving Base Site (LAC)

2.8.2 Export to Server

This Option is selected from the File menu. Data must first be open and visible in Aries, either by opening an .atp or .log file or from logging live data while in Monitor Mode or Logging Mode.

Data may be exported to the Aries server specified in the Settings form using the form shown below:

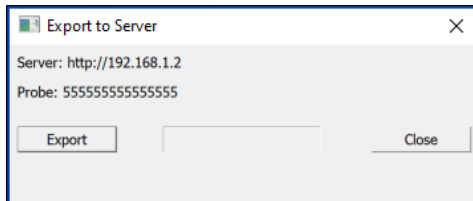


Figure 21: Aries Windows Export to Server

2.9 Call Generator

In Monitor Mode, Log to File or Log to Server Modes, it is possible to use the Call Generator form to produce regular test calls on the current selected Talk Group. The Call Generator is initiated and stopped by clicking the Start/Stop button.

Call Generator							
Calls							
Total	Successful	Not Successful	No Service	Start			
736	716	13	6				
	98%	1%					
Call No.	Start time	Setup time, ms	End time	Duration, ms	Call status	Site / Channel	
461	08:51:35.761	142	08:51:48.143	12382	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
462	08:52:05.964	142	08:52:18.325	12382	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
463	08:52:36.147	142	08:52:48.528	12382	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
464	08:53:06.350	142	08:53:18.675	12326	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
465	08:53:36.553	142	08:53:48.935	12382	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
466	08:54:06.757	142	08:54:19.138	12382	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
467	08:54:36.791		00:00:00.000		Call could not be started / No Service		
468	08:54:37.296	142	08:54:49.451	12155	Call Successful / D-RELEASE detected	Site#0/0	
469	08:55:07.228		08:55:20.715	11163	Call Dropped / Unexpected end of call	EW 1108 P1 (1108)/881	
470	08:55:37.336	142	08:55:52.423	-2147483648	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
471	08:56:10.746	142	08:56:23.128	12382	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
472	08:56:41.063	142	08:56:53.501	12439	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
473	08:57:11.380	142	08:57:53.340	12382	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
474	08:58:11.161	142	08:58:23.543	12382	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
475	08:58:41.365	142	08:58:53.690	12326	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
476	08:59:11.568	142	08:59:23.950	12382	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
477	08:59:41.828	142	08:59:54.153	12325	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
478	09:00:12.031	142	09:00:24.413	12382	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
479	09:00:42.235	142	09:00:54.616	12382	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
480	09:01:12.495	199	09:01:24.820	12326	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
481	09:01:42.641	142	09:01:55.023	12382	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
482	09:02:12.901	142	09:02:25.232	12269	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
483	09:02:43.167	142	09:02:55.492	12326	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
484	09:03:13.370	142	09:03:25.695	12326	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
485	09:03:43.517	199	09:03:55.898	12382	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
486	09:04:13.720	142	09:04:26.102	12382	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
487	09:04:43.923	142	09:04:56.362	12439	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
488	09:05:14.240	142	09:05:26.565	12326	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
489	09:05:44.443	142	09:05:56.768	12326	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
490	09:06:14.590	142	09:06:26.972	12382	Call Successful / D-RELEASE detected	EW 1136 V (1136)/886	
491	09:07:15.259	142	09:07:57.580	12382	Call Successful / D-RELEASE detected	EW 1108 P1 (1108)/881	
492	09:08:15.572	142	09:08:27.727	12155	Call Successful / D-RELEASE detected	EW 1108 P1 (1108)/881	
493	09:08:45.662	142	09:08:58.044	12382	Call Successful / D-RELEASE detected	EW 1108 P1 (1108)/881	
494	09:09:15.865	142	09:09:28.190	12326	Call Successful / D-RELEASE detected	EW 1108 P1 (1108)/881	

Figure 22: Call Generator

The form shows totals for Successful, Failed and No Service call events. The Call generator results may be exported to a text file for further analysis from the 'Export Data' form.

The test call duration and interval are set from the 'Events' tab on the Settings form – see section 2.2.2:



'Initiate Call' is the time in secs between successive test calls

'Call' is the time in secs that the call is held before it is disconnected

'Group Call' is the GSSI of the Group to be used for the test call. This should always be a Group that is not in use by other users.

2.10 Indoor Positioning

Carrying out an indoor or underground survey will usually mean that GPS will not work so it will not be possible to track the survey location. Aries allows the user to set location manually by clicking on the current location during a survey – this works best for walking surveys with hand-held equipment where the speed is just a few km/h.

- 1) Select Configure | Settings | Radio and GPs tab | Use Manual Positioning
- 2) Click the 'Connect' button to start communications with the TETRA radio terminal
- 2) Move the map so that the central cross-hairs  are on the start position, and click the cross-hairs so that the location is marked with a green circle 
- 3) Click the 'Log To File' or 'Log to Server' buttons as appropriate to start the survey
- 4) Start moving in the survey area and as a known location is reached, move the map again so that the new location is under the cross-hairs, and then click the cross-hairs to fix that location.
- 5) Keep moving at a steady speed, setting new locations around every 10secs or so. The best technique is to move in straight lines and click whenever changing direction. As new locations are fixed, a straight red line is drawn between each point indicating the route taken. When the next sample is logged, the samples logged since the previous location fix are then displayed equally spaced along the red line.
- 6) At the end of the survey, click on the final location and then click the 'Stop' button.

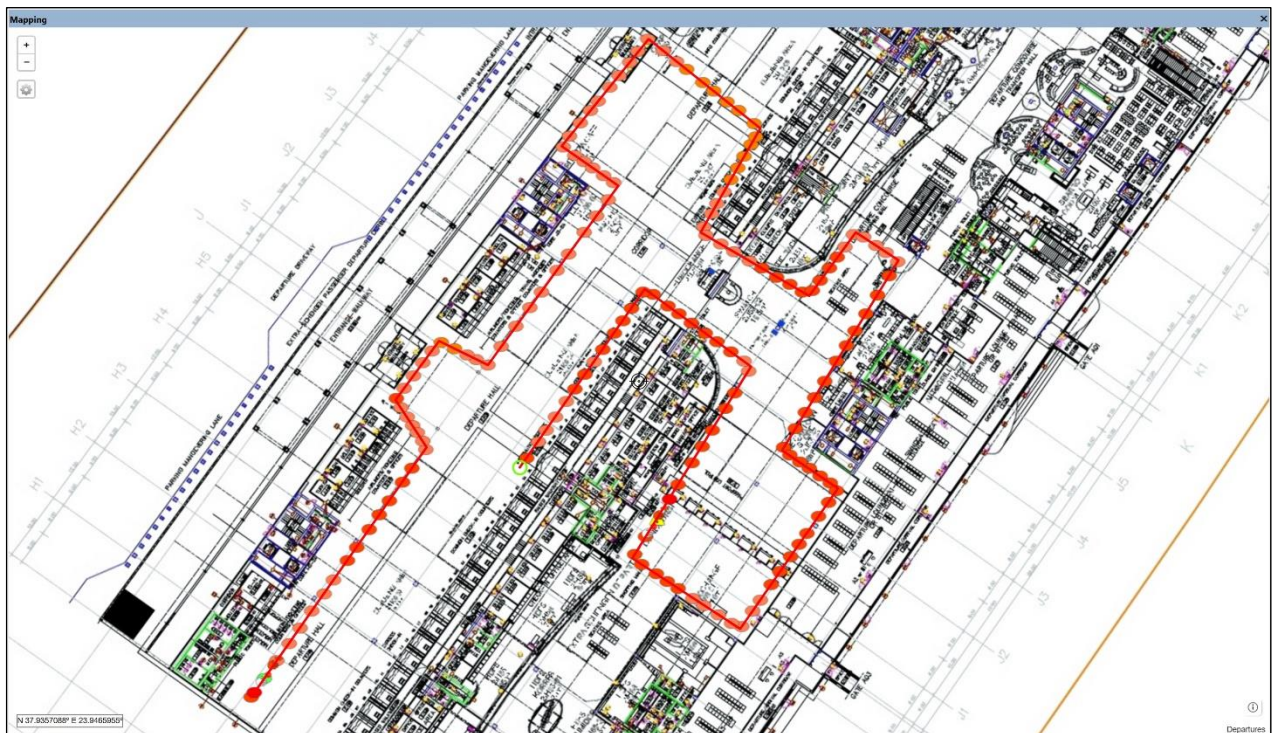


Figure 23: Indoor Positioning

2.11 Base Site Database

Aries includes a base sites database. This helps with analysis by associating a name with a LAC and also includes coordinates for displaying an icon on the map.

Name	LAC	Lat	Lon	Reference	Details	Colour	Beamwi...	Direction	Planned...	Used Fr...	Planned...	Neighb...	FRT	SRT	FRH	SRH	Min Rx	Max Tx	Acc
Abqaiq Alt	5037	25.9448900	49.6767700			#FF4141	360	0		420.30000		5011:426...-1	-1	-1	-1	-1	-1	-1	-1
Test	5022	26.5000000	49.5000000			#FFFF00													
Abqaiq GOSP-5	5041	25.8964000	49.6548000	Abaiq G5		#A87EA6	360	0		423.00000		5011:426...30	30	6	6	-110	40	-45	
Ain Dar GOSP-2	5032	25.9701000	49.2361110			#17DEFD	360	0		425.42500		5011:426...30	30	6	6	-110	40	-45	
Aindar GOSP-3	5023	25.7652000	49.2502000	Aindar G3		#E65CA1	360	0		422.37500		5011:426...-1	-1	-1	-1	-1	-1	-1	
EW 1108 P1	1108	25.6082400	48.8822600			#DDE42B	360	0		422.02500		1037:420...-1	-1	-1	-1	-1	-1	-1	
EW 1136 V	1136	25.6244300	49.1674900			#DE7129	360	0		422.15000		1037:420...-1	-1	-1	-1	-1	-1	-1	
Farzan GOSP-1	5013	26.1878440	49.1825000			#99B3D4	360	0		425.42500		5011:426...-1	-1	-1	-1	-1	-1	-1	
Marjan GOSP1	6074	28.4623300	49.6950300			#481DF0	360	0	425.10000	425.10000		6035:421...-1	-1	-1	-1	-1	-1	-1	
Marjan GOSP3	6063	28.3093300	49.5231100			#FC9AD8	360	0	422.52500	422.52500		6035:421...-1	-1	-1	-1	-1	-1	-1	
Mubbaraz	5024	25.4005000	49.5198000	SGTK		#5A3409	360	0		422.52500		5012:420...30	30	6	6	-110	40	-45	
Shedgum Comms	5016	25.6623450	49.3845350			#FFE76C	360	0		421.00000		5012:420...-1	-1	-1	-1	-1	-1	-1	
Shedgum GOSP-1	5012	25.7293000	49.4272000	SHD1		#F95656	360	0		420.42500		5011:426...30	30	6	6	-110	40	-45	
Shedgum GOSP-3	5042	25.6119000	49.3860000	SHD3		#C54AFA	360	0		421.00000		5012:420...-1	-1	-1	-1	-1	-1	-1	
Shedgum GOSP-4	5036	25.7762390	49.4639460			#5EA4E1	360	0		420.42500		5011:426...-1	-1	-1	-1	-1	-1	-1	
Shedgum IBPS	5031	25.6939600	49.5895510	SHD IBPS		#3845FD	360	0		420.17500		5011:426...30	30	6	6	-110	40	-45	
Udhiliyah Comm	5015	25.1328000	49.2937000	Udhiliyah...		#FCA1A1	360	0		420.00000		5014:420...30	30	6	6	-110	40	-45	
Uthmaniyah Comms	5025	25.1936000	49.3068000	UTH Co...		#3BB7FF	360	0		425.10000		5014:420...30	30	6	6	-110	40	-45	
Uthmaniyah GOSP-1	5043	25.3580000	49.2327770	UTH G1		#4AFFEE	360	0		425.15000		5013:426...30	30	6	6	-110	40	-45	
Uthmaniyah GOSP... 5034	5034	25.2645600	49.2478710	UTH G10		#36FF87	360	0		420.52500		5014:420...30	30	6	6	-110	40	-45	
Uthmaniyah GOSP... 5044	5044	25.2000000	49.3500000	UTH G11		#FF00FF	360	0		420.62500		5012:420...30	30	6	6	-110	40	-45	
Uthmaniyah GOSP... 5007	5007	25.0064000	49.1652000	UTH G13		#50D20F	360	0				-1	-1	-1	-1	-1	-1		
Uthmaniyah GOSP-4 5008	5008	25.0405000	49.2774000	UTH G4		#CDDF86	360	0				-1	-1	-1	-1	-1	-1		
Uthmaniyah GOSP-7 5033	5033	25.4473000	49.3561000	UTH G7		#D2D20C	360	0		423.92500		1037:420...30	30	6	6	-110	40	-45	
Uthmaniyah GOSP-9 5014	5014	25.3129000	49.3448000	UTH G9		#ECD8F	360	0		420.05000		5012:420...30	30	6	6	-110	40	-45	
Zuluf GOSP4	6083	28.3976944	49.1731944			#B71CDE	360	0	426.57500	426.57500		6035:421...-1	-1	-1	-1	-1	-1		
FM415BS01	2550	69.6581840	30.2087780																

Figure 24: Base Sites Database

Right-clicking on the form displays the following pop-up menu:

- Edit Base Site
- Add Base Site
- Find Base Site
- Delete Selected Base Sites
- Clear Base Sites Database
- Import Base Sites (CSV)
- Export Base Sites (CSV)
- Copy Ctrl + C
- Select All Ctrl + A

Figure 25: Base Sites Database right-click pop-up menu

Selecting 'Edit Base Site' or 'Add Base Site' displays the following form allowing the base site details to be entered for a single site.

Base Site

LAC: Colour:

Name: Reference:

Latitude: Longitude:

Details:

Beamwidth: Direction:

Planned:

Used:

Planned Neighbour Cell List:

Neighbour Cell List:

FRT: SRT:

FRH: SRH:

Min: Max Tx:

Acc Par: Col:

Sub: Sec:

MCC: MNC:

Enc: BS:

Additional:

Figure 26: Add / Edit Base Site details

Selecting 'Import Base Sites (csv)' or 'Export Base Sites (csv)' allows the user to import or export the base sites data to a csv file in the following format: Single Header line followed by 1 line per base site with all fields separated by a comma ',' as shown below:

Header:

Name,LAC,Lat,Lon,Reference,Details,Colour,Beamwidth,Direction,Planned Frequencies,Used Frequencies,Planned Neighbour Cell List,Neighbour Cell List,FRT,SRT,FRH,SRH,Min Rx,Max Tx,Acc Par,Col,Sub,Sec,MCC,MNC,Enc,BS,Additional Information

Example data:

Abqaiq Alt,5037,25.94489,49.67677,,,#FF4141,360,0,,420.30000,,5011:426.62500 5013:426.57500
5021:423.77500 5022:422.20000 5031:420.17500 5032:425.42500 5041:423.00000,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,0,D67,BS service Registration: 1 De-registration: 1 Priority Cell: 0 Minimum mode: 1
Migration: 0 System Wide Service: 1 TETRA Voice Service: 1 Circuit mode data Service: 0
SNDCP Service: 1 AI Encryption Service: 1 Advanced Link Supported: 1 Security Information
Current cell is operating in Security Class 3 (DCK/CCK) SDS-TL addressing Never use SDS-TL
Service centre addressing

The number of fields that are included is optional but the minimum required fields are: Name, LAC and Colour. Lat, Lon, Reference and Details may be left blank but must have the separating commas. Fields after Colour may be included as required and the number of fields in the Header must match the number of fields in the Data lines.

The format of the Planned Frequencies and Used Frequencies fields is to specify multiple frequencies using a space separator e.g.

421.00000 422.37500 423.77500 423.95000

The format of the Planned Neighbour Cell List and Neighbour Cell List fields is to specify multiple neighbour sites using the format <LAC1>:<Frequency1> <LAC2>:<Frequency2> e.g.

5012:420.42500 5013:426.57500 5014:420.05000 5016:421.00000