

# RssiLog4v8

## User Manual



**4 Receiver**  
**100 Khz to 1300 Mhz**  
**Radio Frequency**  
**Level Analyzer**  
**Recorder**

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INNOVATIVE ELECTRONIC TECHNOLOGIES

<b>Contents</b>
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<b>Detail</b>	<b>Page</b>	<b>Detail</b>	<b>Page</b>
Audit File	3	Odometer	12
Calibration Functions	14	Overlay Recorder	27
Calibration Method	19	Patch Panel Functions	8
Common X Axis	3	Quit Button	11
Data File Name	3	RadPlotIET	24
Data Record	3	RadPolate8	6
Data Tag	5	RadPolate8	22
Event Mode.	5	RadSafe GPS	12
Event Recording	17	Receiver Config.	25
F5 Key	10	Receiver Display	16
General Config.	5	Receiver Functions	15
General Layout	7	Receiver Inputs	3
GPS Data Display	9	Receiver Stats	23
Graphic Sweep rate	18	Reserved Dat Tag	5
GUI Loaded	9	RF Patch Panel	5
GUI Monitoring	10	RssiLog4v8 Audit	3
GUI Recording	11	RssiLog4v8 Data	3
Halt Button	9	RssiLog4v8 Details	2
Install RadSafe GPS	20	Save Button	3
Install RssiLog4v8	20	Setup Functions	13
Integral PC Use	28	Start Button	9
Loading Errors	21	System Details	4
Low Level Capture	18	Virtual Receiver.	5
Map Calibration	26		
Monitor Volume	4		



## RssiLog4v8

### Rssilog systems

### General Information

RssiLog systems are **high resolution**, PC interfaced systems designed to provide accurate **Radio Signal Strength** measurement to professionals involved in the planning of new radio based systems, as well as a very effective tool for professionals required to diagnose the causes of apparent **anomalous performance** of existing systems.

**Position data** is generated and supplied to the systems by a separate DDE GPS interface application running concurrently with the RssiLog4v8 application.

RssiLog systems continuously measure, display and record **instantaneous** RF level values in dBm; **No averaging** or smoothing of the recorded data is performed so the observed and recorded levels are a **true indication** of levels extant. Experience has shown that systems that perform any **averaging or smoothing** of the recorded levels, can significantly **distort RF level** conditions, particularly in areas subject to deep, short duration **fading**.

**Multireceiver** RssiLog systems provide for accurate and easy display and examination of signal level, and transmission events, from up to 8 repeaters/sites/systems/frequencies simultaneously.

### Receivers.

The receivers each operate independently and their Rssi outputs are sampled by a suitable **USB interfaced, analogue to digital** converter.

The receivers used in my systems are commercially available, high quality, receivers which I have modified significantly to achieve my requirement for **linear Rssi DC output** over the required **RF input level** and **frequency ranges**. Each receiver is tested after **modification** to confirm that its actual performance meets system requirements. These receivers are configured to be controlled serially, directly from a PC.

**RssiLog4v8** is a stand-alone system built into a very rugged Storm Case and incorporating an integral PC. It is a 4 receiver system that can be used in the following configurations and controlled by either the integral Windows 7 ultimate PC or an external PC (with the RssiLog4v8 software installed) as required by the operator.

1. High sample rate of RF level from 4 discrete receivers set to up to 4 separate frequencies. The maximum sample rate possible is largely determined by the speed at which the PC can read the Rssi DC levels from the A to D module. This configuration is suited to RF level surveys from up to 4 separate sources simultaneously while travelling at normal speeds (100Km/Hr.) or for the diagnosis of system performance anomalies where loss of adequate RF coverage from any of 4 sites may be suspected as a contributing factor.
2. Low/medium sample rate at up to 8 separate frequencies. The maximum sample rate is determined by the speed at which the PC can read the Rssi DC levels from the A to D module as well as the time taken for the PC to change the frequency of each receiver in sequence using serial communications plus a programmed delay to ensure that each receiver output is stabilised before reading it's Rssi Level after changing its frequency. This function is intended to be used to measure the RF level from up to 8 sites simultaneously at a location.



### Antenna Cpnnections

RssiLog4v8 incorporates two separate antenna inputs, each with separate wideband RF amplifiers and 2 separate 4 channel RF splitters.

The **receiver inputs** can be configured in any combination of discrete antennae direct to a receiver or with receivers connected to the **antenna distribution circuits**. Any unused divider outputs are **terminated** with **50 Ohm coaxial terminations**.

The ability to use **combinations of receivers and antennae**, means that signal levels from different antennae, sites, frequency bands etc can be monitored, recorded, analysed and **plotted thematically** using a **common “X” axis** (time, GPS position, odometer etc.). *This facility means that in locomotive applications, the RF level from two antennae can be measured and recorded simultaneously.*

### RssiLog4v8 GUI

The **graphical user interface** is designed to provide a clear, unambiguous display of the values being recorded as the system runs as well as the means to easily **control** the system **receivers**. All values displayed graphically are refreshed as a **cursor** traverses left to right across the screen. The user can easily monitor these values in real-time and tag the appropriate data records as desired for later particular examination and analysis.

#### RssiLog4v8 Data.

RssiLog systems produce **data files in “Csv” format** incorporating all relevant data, event, Tag and position values.

An **“Audit” file** incorporating all system settings pertinent to a recording is generated automatically when a recording is commenced or a setting changed. Audit files are saved in an “Audit” subfolder.

The number of **discrete records constituting a data file** can be set to any value between 1000 and 100,000 records by the system user as deemed appropriate. A new data file is written automatically when the number of records increments by the selected number since the last save. A data file can be written manually at any time during recording by pressing the **“Save” button**. *20,000 records per file is generally the most appropriate setting.*

An appropriate **file name** is entered by the user and a numbered suffix, incrementing from 001, is attached to each data file as it is saved.

Each **data record** produced by the system incorporates the following **fields**.

- (A) Record Number, (B) RX1 Rssi; (C) RX1 dBm; (D) RX@ Rssi; (E) RX2 dBm; (F) RX3 Rssi; (G) RX3 dBm; (H) RX4 Rssi; (I) RX4 dBm; (J) RX5 Rssi; (K) RX5 dBm; (L) RX6 Rssi; (M) RX6 dBm; (N) RX7 Rssi; (O) RX7dBm; (P) RX8 Rssi; (Q) RX8 dBm; (R) Event 1; (S) Event 2; (T) Event 3; (U) Event 4; (V) Data Tag; (W) Latitude; (X) Longitude; (Y) Odometer; (Z) Speed; (AA) Time; (AB) RX1 Gain; (AC) RX2 Gain; (AD) RX3 Gain; (AE) RX4 Gain; (AF) RX5 Gain; (AG) RX6 Gain; (AH) RX7 Gain; (AI) RX8 Gain; (AJ) GPS Status; (AK) GPS Altitude.



Each **“Audit”** file records the following **fields**.

(A) RX1 Freq. (B) RX2 Freq. (C) RX3 Freq. (D) RX4 Freq. (E) RX5 Freq. (F) RX6 Freq. (G) RX7 Freq. (H) RX8 Freq. (I) RX1 B/W. (J) RX2 B/W. (K) RX3 B/W. (L) RX4 B/W. (M) RX5 B/W. (N) RX6 B/W. (O) RX7 B/W. (P) RX8 B/W. (Q) RX1 Calibration. (R) RX2 Calibration. (S) RX3 Calibration. (T) RX4 Calibration. (U) RX5 Calibration. (V) RX6 Calibration. (W) RX7 Calibration. (X) RX8 Calibration. (Y) RssiLog Serial Number.

The purpose of the “Audit” file data is to facilitate the **validation** of recorded level values should that be deemed desirable, post recording.

### **General System Details.**

RssiLog systems & receivers conform to these specifications.

**Receiver Bandwidth (FM)** Carrier Frequency + - 5 KHz .

**Receiver Bandwidth (WFM)** Carrier Frequency + - 200 KHz .

**Frequency Range** 100 KHz to 1300 Mhz. Continuous.

**Level Range (FM)** -120 dBm to -65 dBm. (+- 0.75 dBm)

**Level Range (WFM)** -108 dBm to -65 dBm. (+- 1.5 dBm)

**Calibration** ; stored calibration files (User generated & selected to suit).

**Receiver input impedance** 50 Ohms.

**Splitter** input impedance 50 ohms.

**Splitter output impedance.** 50 Ohms each output.

**Tracking response** @ max sample rate <> 10 Ms Max dBm. to Min dBm.

**DC input** Nominal 12 Volts DC @ 2.0 Amps. Maximum.

**GPS position format** WGS84 or GDA94 in Deg: Decimal Deg. to 6 decimal places.

**PC connectivity** USB type “B” socket.

**USB Expansion ports.** 2 on front panel., 2 on integral PC.

**Audio output;** Line level RCA sockets.

**Audio monitoring;** 1 loudspeaker per receiver.

**Monitor volume;** Controlled from GUI: variable and preset levels.



## General Configuration.

**PC operating systems.** Windows XP™ Windows 7™ Windows 8.1™

**Sample Rate** user selectable between 1 sample per second to maximum limited by PC performance. (Test PC 1.3 Ghz P3 XP produces maximum 92 records per second, level only. Test PC produces 65 records per second using 4 receivers and 4 Event inputs concurrently.) **4 RX Mode.**

**Physical Receivers;** 4 receivers set to any frequency between 100 Khz and 1300 Mhz. **4 RX Mode.**

**Virtual receivers;** 4 Physical receivers, each switched sequentially between 2 frequencies as RssiLog4v8 runs in **8 RX Mode.**

**Event Inputs.** 4 discrete inputs.

**Event Mode.** Event level 1 = Event ON.

**Event ON.**= Event Input connected to ground (Contact Closure)

**Data Tag.** Alpha/Numeric tag included in data record field from keyboard to identify record/s.

### RF patch Panel.

**External antenna connections** are via “N” type sockets connected to SMA sockets on the patch panel. The RF amplifiers input and output circuits and the input and output circuits of the two 4 channel splitters are terminated in SMA sockets on the RF patch panel.

Receiver Inputs (1 to 4) are terminated in SMA sockets on the RF patch panel.

Any combination of antenna, amplification, splitter connection and receiver input can be achieved using RF jumpers and RF patch panel.

### Data Tag.

Where it is desirable to delineate or identify a data record or group of data records, a Data Tag can be added as a discrete field in a data record by pressing the appropriate alpha numeric key on a PC keyboard or the “On Screen” keyboard on the integral PC.

The data tag is then added to the data records until the Esc. Key is pressed.

Pressing another key will cause the data tag to change to that Key.

**Reserved Data Tag.** The “S” when used as a data tag is reserved and is added ( Keyboard stroke “S”) between a location, immediately before a point where loss of effective satellite coverage can be expected and ceased (“Esc” Key) where coverage is known to restore, such as when traversing a tunnel or other significant infrastructure during which traverse the user would expect GPS satellite coverage degradation to cause inaccurate GPS position fixes.



**RadPolate8 GPS interpolation application** processes the “S” tagged records into a linear GPS & Km progression between the locations where the “S” tags start and finish. This permits a straight line thematic plot between the location where accurate satellite coverage can be expected to cease and the location where it is restored.

When a Data Tag is being added, it is displayed immediately to the left of the “Data file name” label.

The Data Tag function is inhibited when the RX Functions panel is displayed.



## RssiLog4v8 General Layout



### Dimensions Closed

Width.....360 MM

Height..... 290 MM

Depth..... 185 MM

Weight..... 5.5 Kg.



Receiver  
ON/OFF

Monitor  
Speakers

## Line Audio Outputs

Receiver  
Inputs.

Splitter A & B  
Outputs.

Splitter A & B  
Inputs.

Amplifier A & B  
outputs.

Amplifier A & B  
Inputs.

Antenna A & B  
Jumper Sockets

## USB “A” Sockets

## Event Inputs & TTL. RJ45

## Antenna Input Connectors

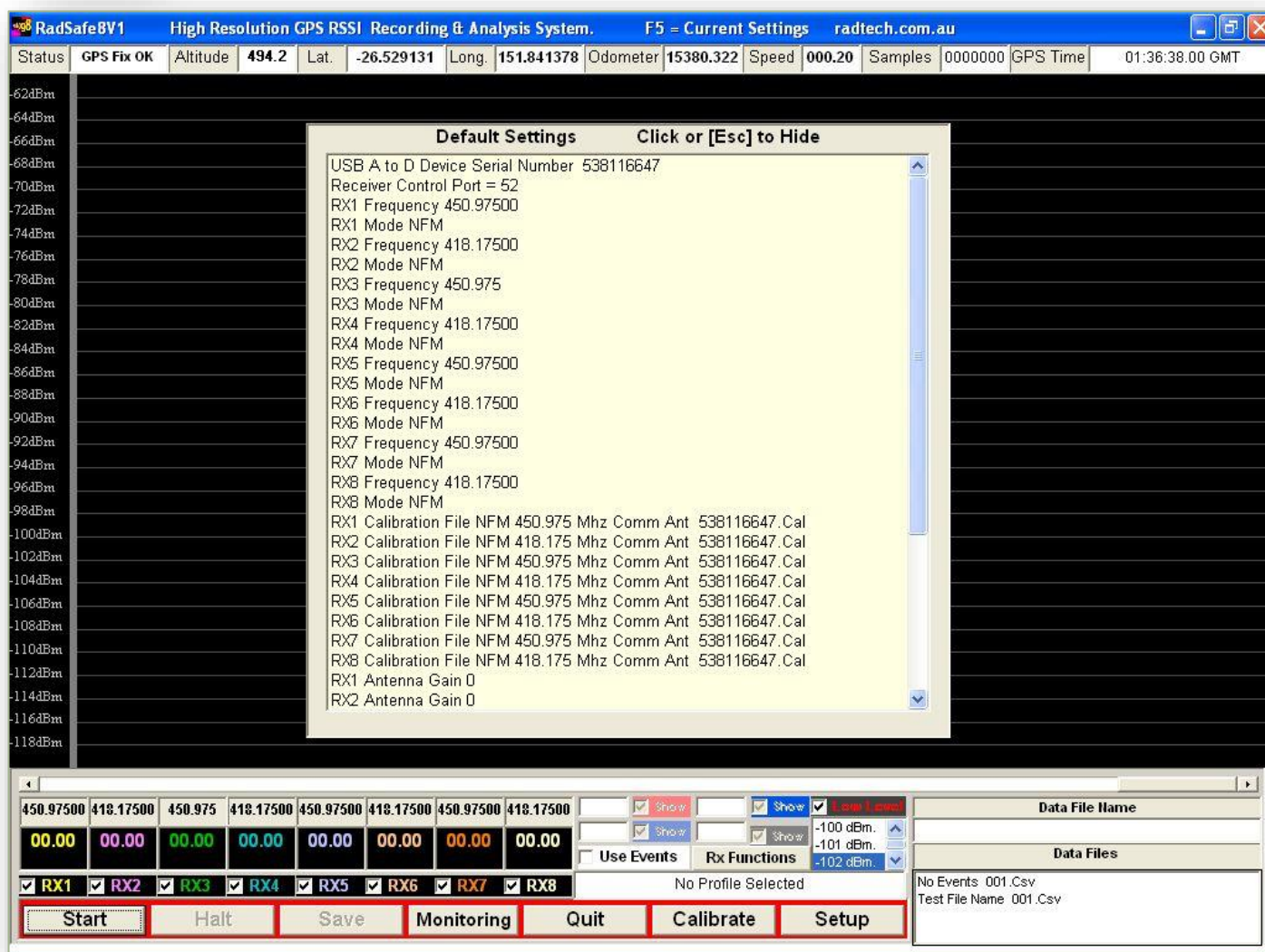
Nominal 12 Volt  
DC Input.  
Negative ground.  
2.0 Amps. Max.

System USB “B”  
type socket.





## RssiLog4v8 GUI Loaded



When RssiLog4v8 application is **loaded**, the **default settings are displayed** on the screen and the **default values** are applied to the RssiLog4v8 receivers. The default values shown and loaded are the same ones set as the **default** when the application was last closed down.

A list of the current data files recorded is displayed in the **“Data Files” list box**. These files are recorded in the **“RssiLog4v8\Data”** folder.

**GPS position, time and odometer values** are **displayed** at the top of the graphic display.

RssiLog4v8 is started initially by clicking on the **“Start” button**, this will cause the **courser to sweep left to right** across the screen and for values to be displayed graphically and numerically.

The **“Halt” button** will be enabled and is used to halt RssiLog4v8 while any **setting changes** and **Receiver configuration changes** are made.



## RssiLog4v8 GUI Monitoring



When RssiLog4v8 is running in **“Monitoring” mode** the **control button background** is shown as red, the **“Quit”** and **“Halt”** buttons are enabled with all other control buttons disabled.

In the above graphic, the signal levels displayed on screen are levels from Rx1, Rx3, Rx5 Rx7 simultaneously with no signal present on the other receivers at that time.

No data records or files are generated or recorded in **“Monitoring” mode**.

Pressing the **F5 key** will cause the **current settings** to be displayed unless Rx functions are shown..

In **“Monitoring” mode**, pressing the **“Quit” button** will cause the application to **close immediately** and all current **default settings to be saved** and loaded as the default settings when next RssiLog4v8 is loaded.





## RssiLog4v8 GUI Recording



When running in **“Recording”** mode, the control button background is green and RssiLog4v8 generates data records and saves data files as the application runs. The **data files** are saved using the **“Data File Name”** entered by the user with an **incrementing number appended** to the file name each time a file is saved. The number of discrete **records constituting a data file** is set by the user as a default value; 20000 records is a convenient amount in **4 RX** mode.

**Data files** are added to the **“Data Files”** list as recording progresses.

The data files are saved in **“Comma Separated Values”** format (**Csv**) and are compatible with most **spreadsheet** and **GIS** applications.

The fact that the data files are **Csv** format, **precludes the use of commas** in file names etc. and the application will **reject** any attempt to use **commas**.

When any **unsaved data records** are **present** as RssiLog4v8 runs, the **“Save”** button is enabled. Pressing this button will cause any unsaved records to be **immediately saved** in a new data file.

Pressing the **“Quit”** button will cause the user to be prompted to save any unsaved records. After using this option the application will then quit immediately. All **default settings** are **saved** and **loaded** as the default settings next time RssiLog4v8 is loaded.



## RadSafeGPS GPS DDE interface

GPS Time	GPS Status	Comm. Port	
00:15:53.00 GMT	GPS Fix OK	53	9600
Latitude	Longitude	Speed:	Altitude
-26.529158	151.841298	000.60	491
<input checked="" type="radio"/> + Odometer - <input type="radio"/>		Odo. Zero	Start Quit
0.267		Odo. Set	

A critical function of RssiLog08 is to provide an accurate record of the location where a data record is generated. My systems are designed to interface with RadSafeGPS application which provides real-time GPS based data to RssiLog08 and other appropriately configured & coded applications. **RadSafeGPS** must be **loaded** before RssiLog4v8.

### The data fields available are.

1. **GPS Time**.. This is parsed from the appropriate GPS NMEA sentence.
2. **GPS Status**.. Current status of the validity of GPS data based on NMEA sentence.
3. **Latitude** ... WGS84/GDA94 latitude parsed from NMEA sentence.
4. **Longitude** .. WGS84/GDA94 Longitude parsed from NMEA sentence.
5. **Speed** ... KM/Hr Parsed from NNMEA sentence.
6. **Altitude** .. Metres Parsed from NMEA sentence.
7. **Odometer**.. Km accumulating calculated value from sequential GPS fixes.

### Controls.

8. **Comm. Port** ... Sets the default communications port number and baud rate. 9600/4800
9. **Odometer +**.. Default which causes the odometer to increment from a set value.
10. **Odometer -** .. User selected which causes the odometer to decrement from a set value.
11. **Odo. Zero** ... Causes the odometer value to be set to 0 Km. at next GPS update..
12. **Odo. Set** ... Prompts user to enter a starting Km other than 0 for the odometer.
13. **Start** .. Causes RadSafeGPS to commence running.
14. **Quit** .. Causes RadSafe GPS to close immediately.

**NB.** The **odometer Km values** are generated by accumulating the calculated distance between consecutive GPS position fixes. The distance between fixes is calculated by a **trigonometric algorithm** based on the mean value of the **Earths radius**. Normal GPS position errors, particularly around curves at slow speed, cause slight errors in the distance calculated between fixes. GPS odometer **errors** are cumulative and can degrade the odometer accuracy over **long routes** but still provide a useful reference for determining record or anomaly location.

**NB.** The Odometer value is limited to 5000 Km. If the GPS has not acquired a valid GPS fix before being started, it will produce an Odometer position calculated from 0.000000 to the position of the first fix, producing a highly inaccurate starting Odometer value. The user is prompted to enter an appropriate odometer starting value.



### Setup Functions.

The Setup functions are accessed by pressing the “**Setup**” button when it is enabled.

**A. Close List.**

Closes the setup menu immediately.

**B. Set Sample rate**

Displays a list of available sample rates. Closes the setup menu when rate selected.

**C. Set Records per data file**

Displays a list of numbers of data records to constitute a data file. Closes the setup menu when number selected.

**D. Set default time source**

Selects either PC system time or GPS time for inclusion in data records. Defaults to PC if GPS time is not available.

**E. Set Default Control port**

User is prompted to enter a valid control port number to be used by RssiLog4v8 to control the system receivers. The appropriate communications port number can be identified using “Device Manager” and is identified as “USB to Serial Comm Port”.

**F. Show Time in Graph**

Causes the default time to be displayed in the level graphic display as RssiLog4v8 runs.

**G. Show Odometer in Graph**

Odometer values are displayed instead of time in the level graphic display as RssiLog4v8 runs.

**H. Add Odometer to Filename**

Causes the Odometer value extant when a data file is saved to be appended to the File name. Is useful for identifying track location where data was recorded.

**I. Save Current Profile**

User is prompted to enter a name for the current settings profile. All relevant receiver settings currently in use are then saved to a list of “Saved Profiles” under the file name supplied by the user. It is a good idea for this file name to accurately reflect the purpose of the saved profile. The **Freq4** or **Freq8** selection is **NOT saved** as a default value.

**J. Load Saved Profile**

Displays a list of the currently saved profiles available. Double clicking on a saved profile name causes the settings for all receivers to be changed to those saved in the selected profile. The changed settings are displayed in the graphic display and the user is prompted to have the new settings set as the default values for use when next RssiLog4v8 is loaded. Opting not to applies the new profile settings to all the system receivers but does not set these values as the default values applied when next RssiLog4v8 is loaded.

The name of the **selected profile is displayed** in the GUI.

**K. Use Local GPS.**

Derives GPS Data from a GPS receiver connected directly to RssiLog4v8.

**L. Use Remote GPS.**

Derives GPS Data from a GPS receiver connected to a remote GPS receiver, usually located at a Mobile RF source.





## Calibration Functions.

RssiLog4v8 uses an algorithm to convert receiver Rssi DC values to dBm values as the system runs. The values required by the algorithm to perform the conversion are contained in “Calibration Files” pertinent to a frequency and receiver configuration.

**Calibration data files** are generated by the operator and saved for use when required.

The Calibration functions are accessed by pressing the “**Calibrate**” button when it is enabled.

### Calibration Functions available.

#### A. Close Calibration Functions

Closes the calibration menu immediately.

#### B. Select Rx\* Calibration File to use

Selecting the appropriate receiver causes an alphabetically sorted list of the calibration files available for that receiver to be displayed.

The appropriate calibration file to be used is selected by clicking on the appropriate file name.

When the calibration file is selected, RssiLog4v8 uses values stored in the file with an algorithm which converts Rssi voltage to dBm.

The selected calibration file is set as the default until another calibration file is selected either directly or via the “**Load Saved profile**” setup function.

#### C. Generate New RX\* Calibration File

This function enables the user to generate a new calibration file when desired. A functional signal generator operating at the desired receiver frequency is necessary to generate a calibration file. Calibration is carried out at -104 dBm and -75 dBm.

The user is prompted to input a name for the calibration file to be generated (Commas NOT allowed). The process is then accomplished by following the screen prompts displayed during the calibration process.

#### D. Set RX\* Antenna Gain or Loss

This function allows the user to input a dbm value indicating the total gain or loss of the antenna circuit. Applying this value allows the signal level at the antenna to be displayed and recorded rather than the level at the RssiLog4v8 antenna input. A loss is entered by prefixing the value with a – (Minus) sign; gain is assumed as positive. The antenna gain/loss for each receiver is saved as a default value. It is **NOT** changed by the selection of a saved profile. In instances where it is desirable to measure the level available to a system receiver using the system antenna circuit, the antenna loss would be entered as the loss of the cable connecting RssiLog4v8 to the system antenna connector.

#### E. VSWR

This is an ancillary function which allows the user to calculate the value of Voltage Standing Wave Ratio (VSWR) when desired using the values of measured forward and reflected power.



## Receiver Functions.



Control of the RssiLog4v8 system receivers is obtained by pressing the **Rx Functions** button when it is enabled. This displays the receiver controls as shown above and hides the data file name and file list.

### Select Receiver

This displays a list of the receiver numbers available. A receiver number **MUST** be selected before any changes to receiver settings can occur. The selected receiver number is highlighted as shown above. Any changes made to any receiver setting are only applied to the receiver which number is selected and highlighted.

### Hide RX

Pressing this button causes the Receiver Functions to be hidden and the data file name and data file list to be displayed and enables the **Data Tag** function.

### Frequency

The desired frequency ( in Mhz. eg. 418.175) for the selected receiver is typed here. Entering an invalid frequency, i.e. outside the range of the receiver, may produce no (or unpredictable) changes to the receiver frequency.

### Set

Pressing this button applies the entered frequency to the selected receiver immediately then displays the option to select a calibration file appropriate to the receiver and frequency.

### Mute

Mutes the selected receiver. This function should only be used when monitoring as when a signal is not present the receiver audio mutes and Rssi output is pulsed and can produce irrelevant levels in the record.

### UnMute

Unmutes the selected receiver immediately.

### Volume control.

Sets the volume on the selected receiver to any level between min and maximum.

### Vol Min

Sets the Receiver audio level on the selected receiver to a barely audible level.

**4 RX** Switches the recorder to 4 Frequency Mode ( Max. Sample rate available.)

**8 RX** Switches the recorder to 8 Frequency mode. ( Min. Sample rate available.)



## Receiver Functions

### FM

Selects the mode and bandwidth of the selected receiver to carrier  $\pm 5$  KHz.

### WFM

Selects receiver mode and bandwidth to carrier  $\pm 200$  KHz.

### AM

Enables the use of the selected receiver in AM (Amplitude Modulation) mode. This facilitates the reception of amplitude modulated signals.

### Set

Pressing this button causes the selected receiver to operate in the selected mode. If the mode is changed care should be taken to ensure that the appropriate calibration file is used.

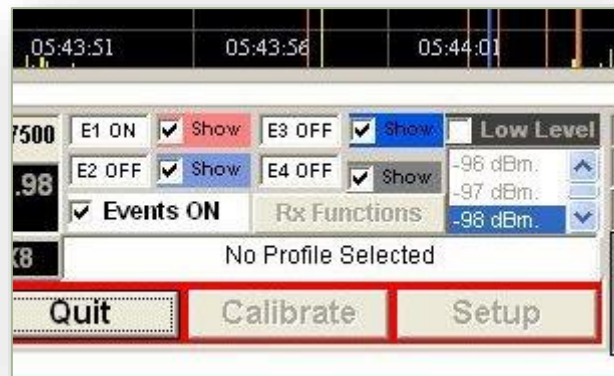


**Selecting receivers to be displayed** in the graphic display is achieved by clicking on the appropriate Check Box. In **4 RX Mode** Deselecting a receiver has NO effect other than removing its level display from the graphic display; level values continue to be sampled and recorded with the values shown in the appropriate dBm level box. Deselected receiver values are shown in grey, selected receiver values are shown in the default graphic colour for that receiver.

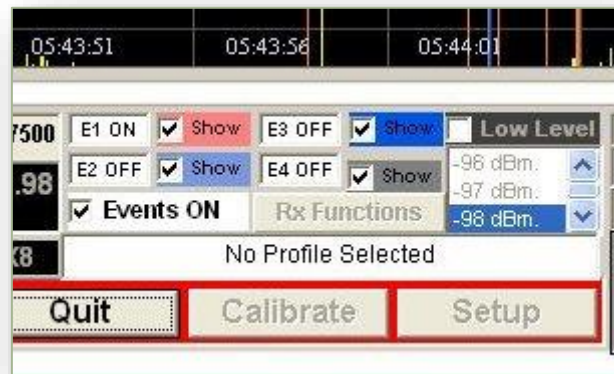
In **8 RX Mode** selecting a receiver to be displayed causes that receiver to be sampled. Deselecting a receiver causes its output to NOT be sampled and it is assigned a default value. The more receivers selected to be displayed, the more swicthing is required and the sample rate decreases. **8 RX mode** is only intended to be used in situations where a comparison between up to 8 RF levels of different frequencies is required and sample rate is not a significant consideration.



### Event Detection and Recording



- A. **Events are defined** as a closure of an event input to ground. Event detection is enabled by clicking on the “Events ON” check box. Individual Event inputs to use are selected using the E1 to E4 Show Check Boxes. With the Event OFF, the appropriate Event Level box shows E\* OFF. In the above graphic, all event inputs are OFF. I.e. No events occurring.



In the graphic above, Event 1 is ON and Events 2, 3, 4 are OFF.

- B. **Events can be used** to correlate system generated events with received radio signal level in radio based systems. **Events** can be electronically **interfaced** to systems under test or generated manually by observation of system conditions and manually closing the appropriate event contact to ground.

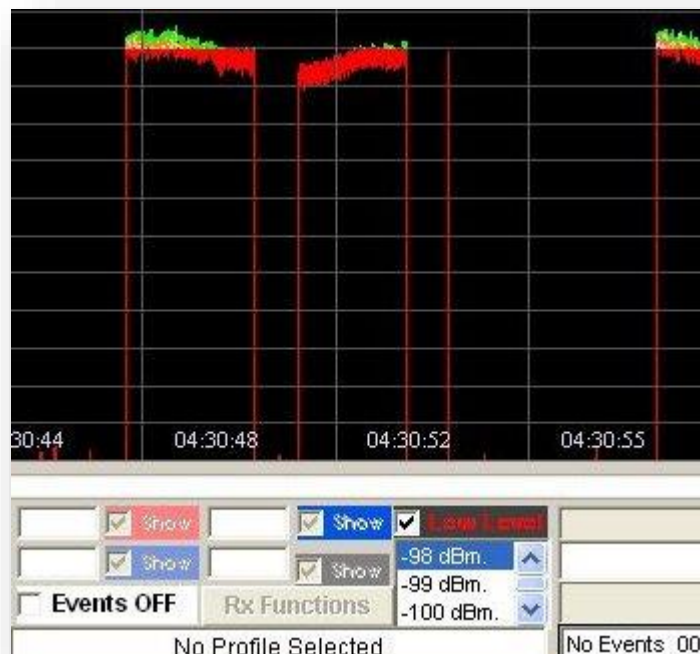


### Graphic Sweep rate



- A. **Sweep Rate** of the graphic display can be set using the slider control immediately below the graphic display. Changing the sweep rate has no effect on sample rate. Sweep rate is at maximum with the slider fully to the right (as shown above) and at minimum with the slider fully to the left.

### Capture Low Levels



- B. **Low Level signals** can be highlighted and captured by ticking the “**Low Level**” check box. The Level at which a signal is deemed to be “Low” is set by selecting the desired level in the **Low Level value list**. The level from any receiver which is at or below the selected low level is displayed as RED in the graphic display.
- C. **Recorded data files containing levels** at or below that set as Low Level have the suffix “**Low Sig**” appended to the file name if the Low Level check box is ticked.



## RssiLog4v8 Calibration Method

RssiLog4v8 uses an **algorithm** that accurately converts DC Rssi voltage from the receiver to dBm. The **calibration algorithm** uses values stored in calibration files for each receiver in a system. The calibration process reads the Rssi value at known RF input levels and uses those Rssi levels to generate the value constants used by the calibration algorithm to convert Rssi to dBm as the application runs.

Pressing the **“Calibrate” button** when enabled causes the **calibration function menu** to be visible.

### Generate New Calibration File.

- A. Connect **signal generator** set to the desired frequency to the desired RssiLog4v8 antenna input.
- B. Set **signal generator** to -104dBm (unmodulated)
- C. Click on **“Generate new Calibration File”**
- D. Follow **On-Screen prompts**.
- E. Enter the **name for the new calibration file**. An **appropriate format** is Bandwidth, frequency (Mhz.), antenna configuration (A or B), Amplifier (A or B if used), Splitter output (If Used). The application adds the serial number of the A/D device and appends the extension “.Cal” to the filename. The application then checks to see if a file of that name already exists and offers the user the choice to overwrite or abort. **NB, Commas will NOT be accepted in a file name.**
- F. The user is then prompted to **apply -104 dbm** to the antenna input being used.
- G. Press Enter
- H. The user is then prompted to **apply -75 dBm** to the same antenna input.
- I. Press Enter.

The system then generates the calibration file values and writes it in a file to the folder for the receiver being used and assigns that calibration file as the **default calibration** for that receiver.

- J. Press the **“Run” button** and confirm that the dBm value and the GUI graphic both indicate -75 dBm (+ - 1 dBm).
- K. Change the input level to -100 dBm and **confirm that value** being read and displayed in the GUI.

Repeat this process for as many receivers and frequencies as required. NB it is not generally necessary to generate a discrete file for each frequency if one is available within 5 Mhz. but it is good practice to do so for each frequency and configuration.

Should **absurd values** be read and displayed when testing the file just generated, check :-

- L. The signal generator is set to the **correct frequency**
- M. The Receiver is set to the **correct frequency**
- N. The receiver is set to the **appropriate bandwidth**
- O. The signal generator is connected to the receiver via the **appropriate antenna connector**





- P. The signal generator is working
- Q. There are no strong **interfering or extraneous RF signals** present

### Selecting Calibration File

The calibration files generated can be applied as required from the “**Select Calibration File to Use**” function menu or by selecting to load a **saved profile** from the “**Setup**” menu function.

### Installing RssiLog4v8

RssiLog4v8 is designed to be installed and run as a normal Windows™ application. When installed normally RssiLog4v8 will resize automatically to suit the user’s PC screen resolution and size.

- A. Copy the **RssiLog4v8 folder** (complete with all subfolders) into the **ROOT DIRECTORY** of the drive on which RssiLog4v8 is to be installed.
- B. Install the **USB A to D drivers** appropriate to the operating system you are using. Windows XP or Windows 7 or Windows 8.1 This is done by running the appropriate **installation file**.
- C. Install the **Serial converter driver** appropriate to the operating system you are using. This is done by double clicking on the appropriate installation file.
- D. Install RssiLog4v8. This is achieved by double clicking on the “**Setup.exe file**” in the “Setup Files” subfolder and following the prompts & Installing the application in the RssiLog4V8 Directory.
- E. Connect the RssiLog4v8 system to the PC using the USB connector.
- F. Connect the 12 Volt supply to RssiLog4v8 and switch ON.
- G. The “**Found New Hardware**” wizard will start; follow the prompts to install the iUSB driver.
- H. The “Found New Hardware” wizard will start; follow the prompts to install the PL2303 driver.
- I. Switch RssiLog4v8 OFF.

### Installing RadSafe GPS

RadSafe GPS is designed to run directly from the RadSafeGPS.EXE file.

- J. Copy the RadSafe GPS folder (complete with all subfolders) into the **ROOT DIRECTORY** of the drive on which RadSafe GPS is to be installed.
- K. Install the driver software by double clicking on the “**ublox\_USB\_driver**” application file.
- L. Plug the GPS into a RssiLog4v8 USB Socket or directly into a PC USB Socket as required..
- M. Switch RssiLog4v8 12 volt supply ON.
- N. The “**Found New Hardware**” wizard will start; follow the prompts to install the **ublox GPS driver**.
- O. Using “**Device Manager**” find the **port Numbers** for ublox GPS and PL2303 ports. NB these port numbers may change if different USB ports are used from those initially used. Port numbers are loaded at switch ON and the default port numbers must be set if a port error occurs at switch ON.
- P. Load RadSafe GPS.
- Q. Select the correct Port Number for **ublox GPS from the list**.
- R. Click “**Start button**”
- S. Ensure that GPS output is available in the GUI fields. (Valid data may take some time to appear.)



### RssiLog4v8 loading errors.

If the **correct control port** number has not been set an **error** will occur on loading RssiLog4v8. Click on **“Setup”** and set the **default “Control Port”** to the correct value.

The correct values for GPS and control ports can be ascertained using the “Device manager” incorporated in the “Control Panel” function in Windows™.

**Quit** the application then **reload RssiLog4v8**.

After successful reload, press the “Start” button in RsiLog4v8 GUI and confirm correct system function.

The “Halt” button can then be pressed to access calibration, setup functions, receiver settings etc.

If the default values border is **Red** after loading RssiLog4v8, and the system serial number is not displayed in the top line of defaults, the system has not recognised the Hytek iUSB analog to digital module. This recognition can be achieved by either switching the system OFF then ON or unplugging the system USB connector.

If the A to D module is still not recognised, re-install the driver using the appropriate application.

All the defaults shown in the default list are applied to the receivers and system when the RssiLog4v8 application is loaded and become the system defaults until changed.

### Start RssiLog4v8

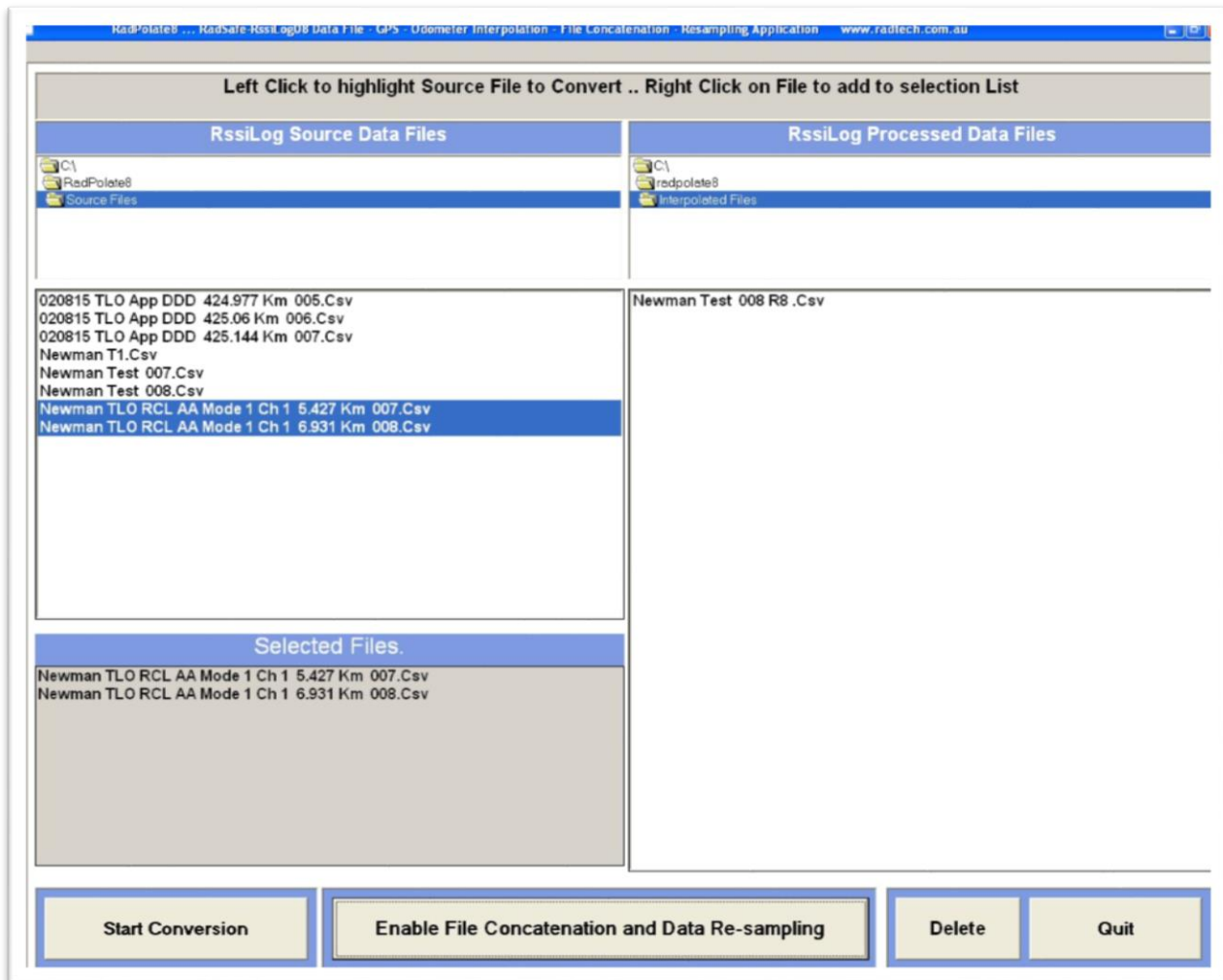
Load RssiLog4v8 then start application by clicking on the “Start” button in the RssiLog4v8 GUI.

The courser in the GUI should start moving from left to right and changing receive level values should be visible in the appropriate receiver displays.



## RssiLog Data processing software

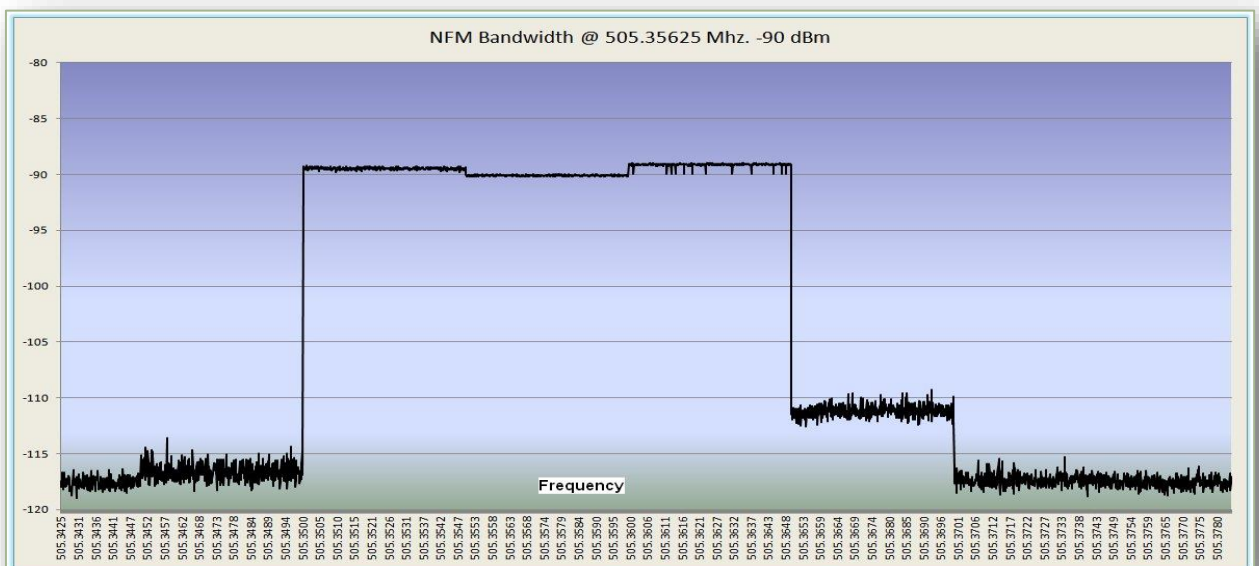
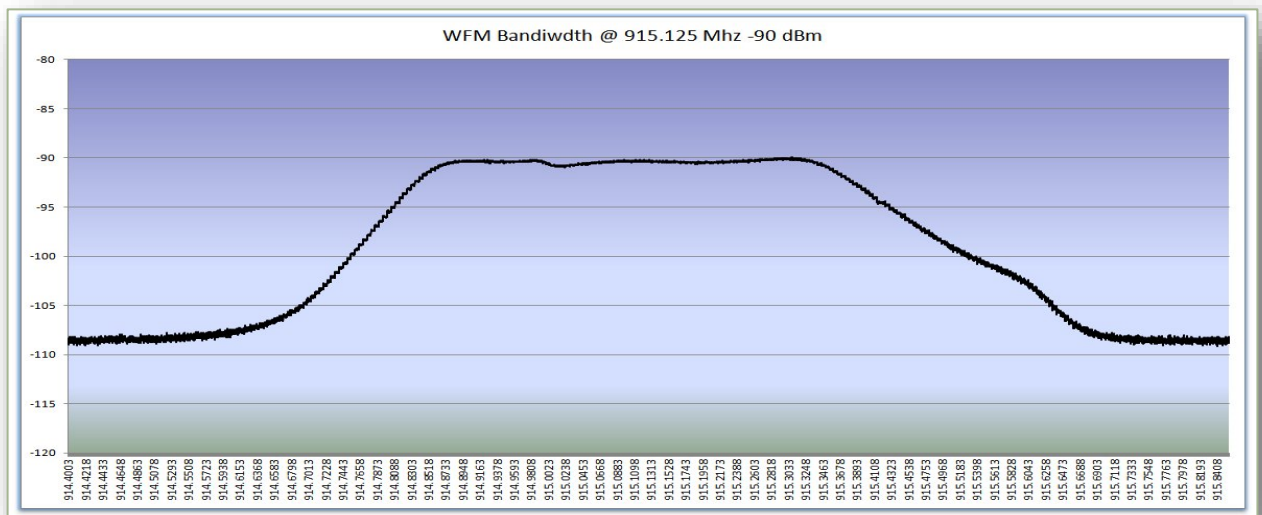
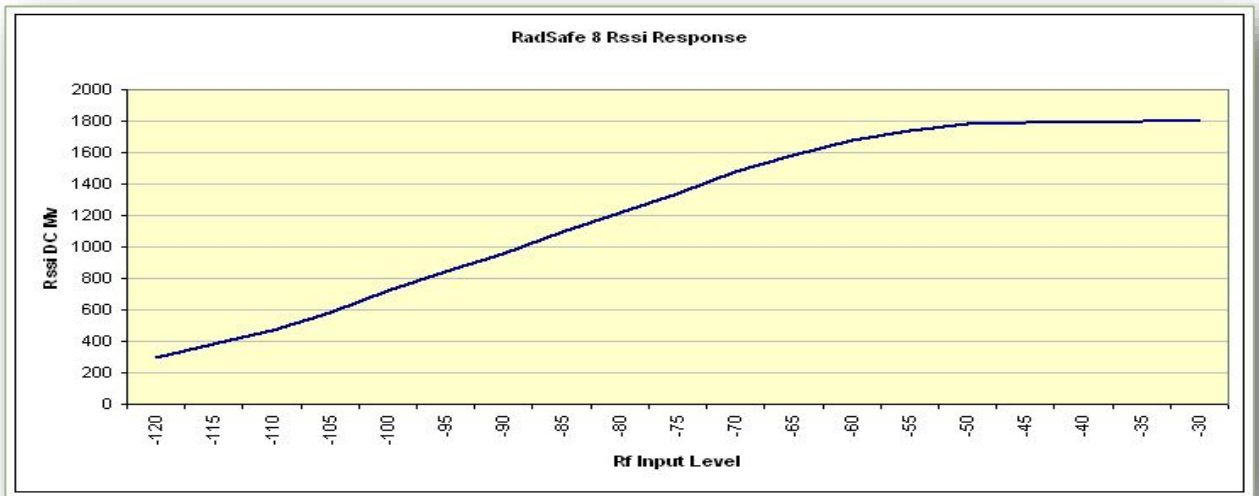
### RadPolate8.



This application is used to interpolate data GPS positions between GPS fixes.

As GPS position data and odometer Km are updated once per second and RssiLog4v8 can generate data at up to around 100 samples per second, it is necessary to assign each data record its own discrete position to achieve a meaningful high resolution display of actual Rssi levels over a route or area. RadPolate8 achieves this by reading data files, calculating the position of each data record then writing a new file using the calculated and assigned positions. This application also has the facility to concatenate a number of data files and to re-sample the recorded data if required. The original data files are preserved as well. RssiLog systems do NOT perform any averaging etc of the recorded levels as experience has shown that this significantly degrades the accuracy of the recorded levels; generally causing the level to be recorded at a higher level than actually exists.

**Reserved Data Tag.** The “S” when used as a data tag is reserved and is added between a location where loss of satellite coverage can be expected and where coverage is known to restore. RadPolate8 processes the “S” tagged records into a linear GPS & Km progression between the locations where the “S” tags start and finish. This permits a straight line thematic plot between the location where accurate satellite coverage can be expected to cease and the location where it is restored.

**RadPlotIET Thematic level plotting application.**

**RadPlotIET Thematic Data Plot****Default Functions.**

**Select Receiver**.....Select a single receiver RF Level to display.

**Composite Best** ...Select a group of receiver levels to display; plots best level from any selected receiver.

**Composite Low**....This Function Deleted.

**Select Events** .....Select a single event to plot; can be overlaid by RF level plot.

**Overlay** ..... When using an overlay instead of a graphic as a plot base, this sets the colour of the base.

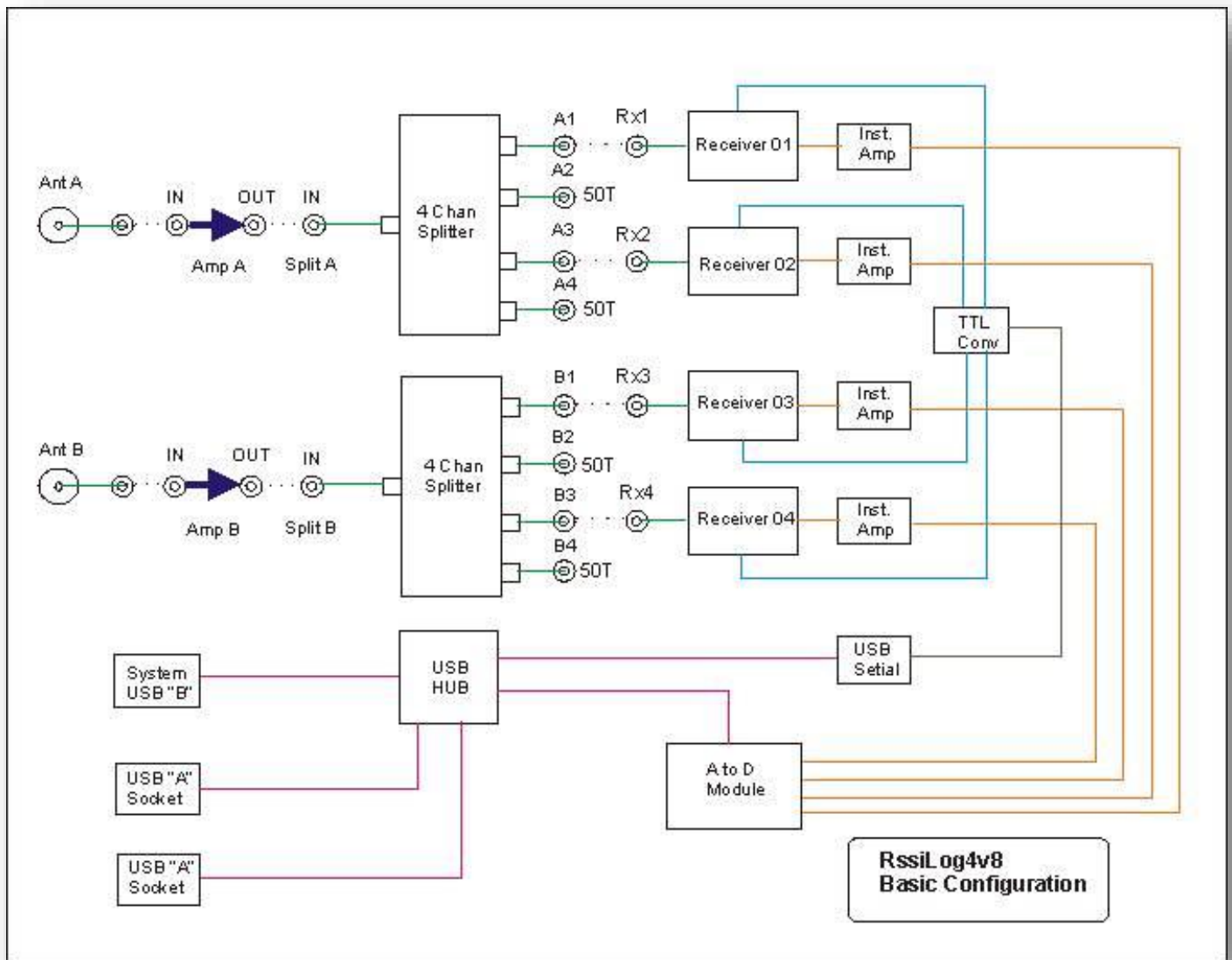
**Odometer** .... Adds odometer values and points to the plotted data.

**Show Data File Name** ..... Adds the name of the data file used for the plot at the end of each data plot; is useful for identifying which file was used for which part of the thematic plot when graphic analysis is req.

**Select Data Tag** .... Plots the alpha numeric tag beside RF level except for **Reserved Data Tag "S"**.

**RF Overlap** .... Plots locations where the RF level from multiple sites on the same frequency are present at levels higher than the preselected level.

## Receiver Configuration.



The above diagram shows the configuration with Antenna input "A" Connected to Splitter "A" via Amplifier "A". Receiver 01 is connected to splitter "A" output "A1", Receiver 02 is connected to splitter "A" output "A3". Splitter "A" outputs "A2" and "A4" are terminated.

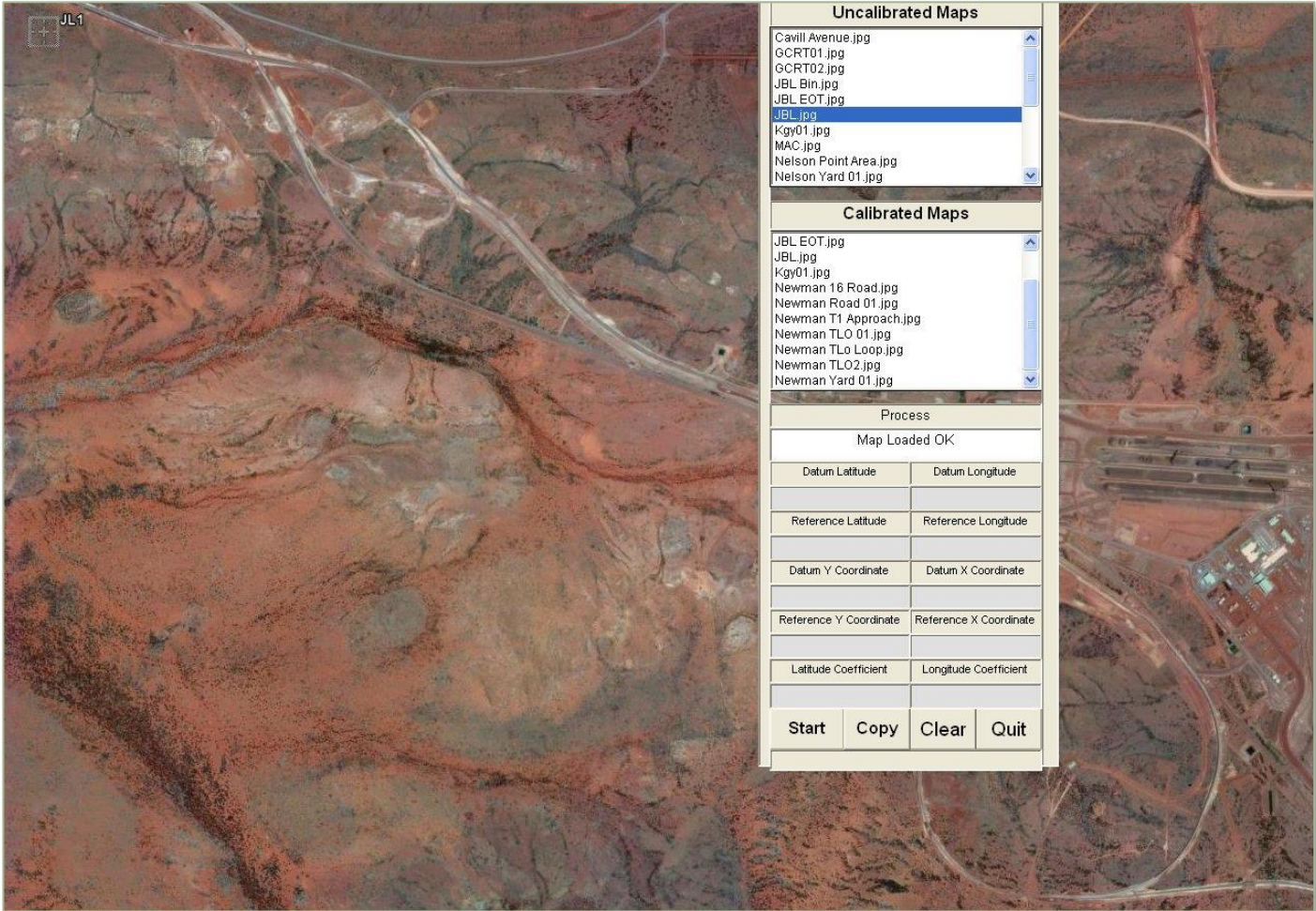
Antenna input "B" is connected to splitter "B" input via Amplifier "B". Receiver 03 is connected to splitter "B" output "B1", Receiver 04 is connected to splitter "B" output "B3". Splitter "B" outputs "B2" and "B4" are terminated.

The SMA patch panel connections allow for any combination of receiver, amplifier, splitter and antenna to be configured to suit the operator's requirement.





**RssiLog Map Calibration Application**



To accurately plot signal levels thematically onto a graphic, such as a satellite picture, it is necessary to accurately establish the mathematical relationship between the pixels which constitute the graphic and the latitude and longitude positions which also constitute the graphic.

To facilitate this I have developed an application that calculates this relationship, writes the result into a file attached to the graphic file. The application then copies the file and its calibration data to my RadPlotIET application for use by that system to plot signal level and overlays as required.

**RssiLog OverLay Recorder Application**

When recording RF signal level, it is very useful to be able to correlate the position, particularly in railroad applications, at which the recording occurred relative to pertinent infrastructure. (Signals, Switches, cuttings etc.) When examining a recording graphically, it is often useful to have the infrastructure displayed in the “X” axis with RF levels in the “Y” axis.

When plotting levels thematically, it is also very useful to show the positions of pertinent infrastructure relative to position and, particularly when using satellite pictures, the infrastructure is not clearly shown.

A recorded overlay can be used by itself as the base for a thematic plot; the overlay is zoom-able when used as the base for a plot but not when overlaid onto a graphic base.

To enable infrastructure to be clearly shown, I have developed a position recording application that easily and accurately captures required position data which is directly compatible with my plotting application, either as the basis of the plot or as an overlay onto a graphic (Satellite picture etc.)

This application can run concurrently with RssiLog4v8 to facilitate the capture of the GPS position of pertinent infrastructure while actually recording RF levels.

GPS Status		Odometer
GPS Fix OK		0.19

Latitude	Longitude	Altitude
-26.529097	151.841356	484.3

Locations File Name

Hesta to Yandi Junction North.Csv

Location to Record

Recorded Files

- Chichester Deviation..Csv
- Goldsworthy Line.Csv
- Hesta to Yandi Junction North.Csv
- Jimblebar.Csv
- Kingaroy Area.Csv
- Kingaroy Gympie.Csv
- Newman Hub.Csv
- Test File.Csv
- Test File.Csv.Csv
- Test Kgy.CSV

Recorded Locations

- 258 Km HBD,-22.424568,119.009108,N/A,258.458,4/03/2011 10:01:58 AM,□
- 260 WMN Signal,-22.444683,119.022250,N/A,261.099,4/03/2011 10:06:53 AM,□
- CAS4 Signal,-22.395988,118.997425,N/A,255.062,4/03/2011 9:57:03 AM,□
- Cowra Hill,-22.364457,119.002593,N/A,251.23,4/03/2011 1:43:10 PM,□
- Cowra North,-22.353483,119.007050,N/A,249.889,4/03/2011 1:40:30 PM,□
- Cowra South,-22.393668,118.996500,N/A,254.786,4/03/2011 9:54:46 AM,□
- Cutting End,-22.314973,119.017728,N/A,245.466,4/03/2011 1:30:17 PM,□
- Cutting Start,-22.311188,119.018798,N/A,245.031,4/03/2011 1:28:59 PM,□
- Gidgee North,-22.480870,119.061705,N/A,266.854,4/03/2011 10:16:22 AM,□
- Gidgee South,-22.500402,119.101545,N/A,271.489,4/03/2011 10:28:48 AM,□
- GIN3 Signal,-22.480108,119.060110,N/A,266.669,4/03/2011 10:15:13 AM,□
- Hesta South,-22.220315,119.025803,N/A,234.282,4/03/2011 1:12:32 PM,□
- Repeater 6,-22.567097,119.235612,N/A,287.34,4/03/2011 10:55:25 AM,□

Save Location

Quit

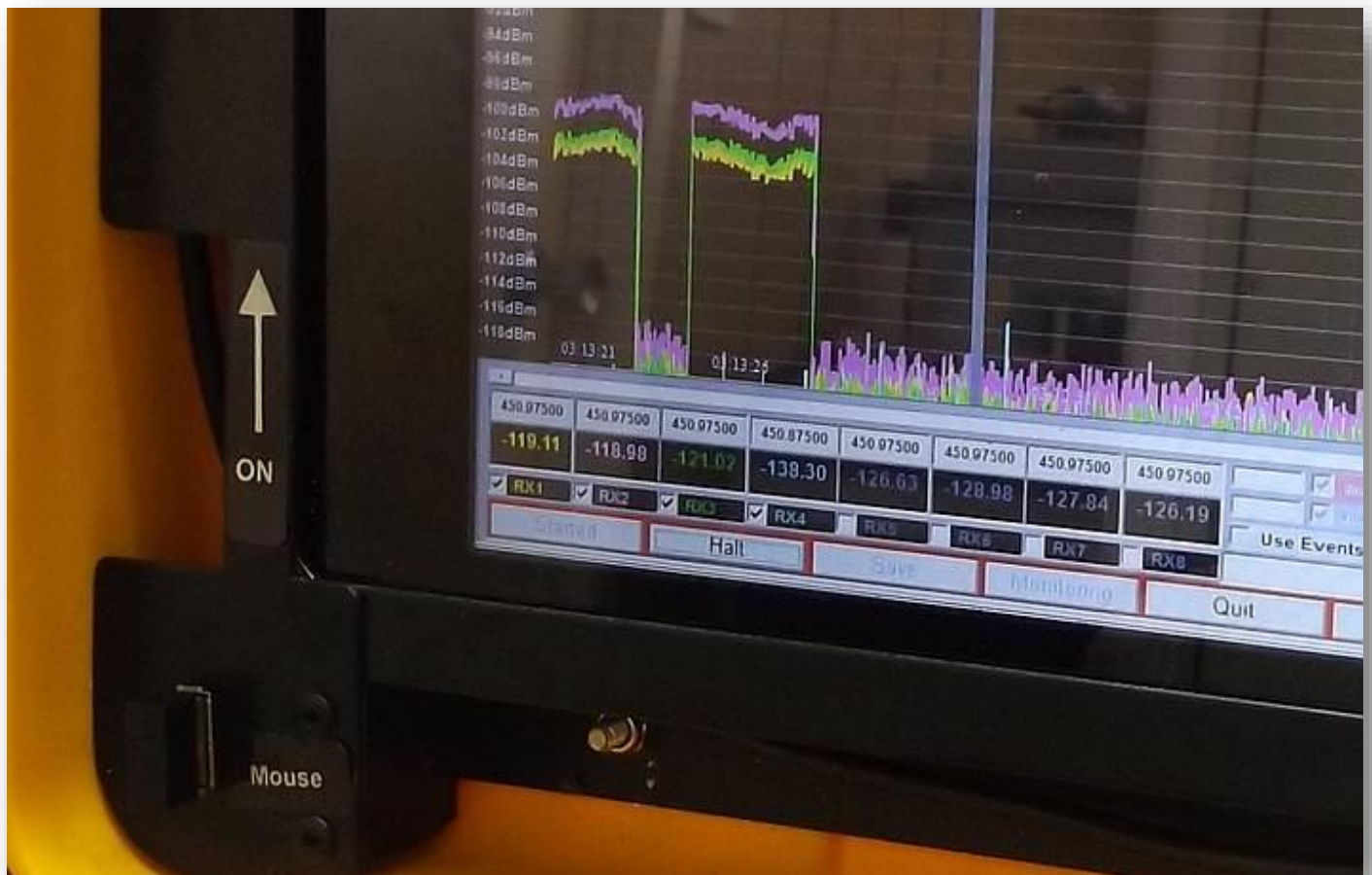


**Power Supply.****Using Integral PC in RssiLog4v8**

The integral Tablet PC is intended to operate from a 240 Volt AC mains supply via the attached power supply.

**Power Switch.**

The Power switch is located inside a recess at the bottom left of the tablet mounting hardware. Power is switched ON by sliding the slide switch in the direction shown.

**Touch Screen.**

The tablet incorporates a touch screen which is operated by fingertip as required.

**Mouse.**

The RssiLog4v8 system is supplied with a wireless mouse, the PC end of which is connected to the PC via a dongle inserted into the "Mouse" USB "A" socket as shown. The mouse is loaded at switch ON and enabled by Clicking and releasing the L.H. mouse button as required.

**Soft Keyboard.**

The keyboard is loaded at switch ON and when minimized is located in the task bar. It is used to input alpha numeric data as required. (Data File Name, Data Tag etc.) and can be dragged as convenient.