
Ngara

User Manual



Revision History

Revision	Date	Author(s)	Description
7cd7566	2019-02-18	Juan Aguero	Add Noise Cloud flowchart
d0547e7	2018-12-05	Juan Aguero	Update for V12.2 operation
f071bc2	2018-09-14	Juan Aguero	Add missing section label
d4141bf	2018-09-14	Juan Aguero	Add new warning screens
c9a308b	2018-09-12	Juan Aguero	As released for V12.1 firmware
8d68c33	2018-09-07	Juan Aguero	Update reference specifications
f0185aa	2018-09-07	Juan Aguero	Update remote host operation
301deda	2018-09-06	Juan Aguero	Add Noise Cloud and Email sections
1b99182	2018-09-05	Juan Aguero	Move specifications to end of manual
d73e30a	2018-09-04	Juan Aguero	Update Noise Cloud image
296b171	2018-09-04	Juan Aguero	Update for V12.1 firmware
834b25f	2018-04-18	Juan Aguero	Move images to images folder
d3798ae	2018-03-05	Juan Aguero	Add application history
15aafc7	2018-03-05	Juan Aguero	Merge branch 'master' of git.lab:ngara/logger.wiki
2117605	2018-03-05	Juan Aguero	Update to format and spelling
4cb3b86	2018-03-05	Juan Aguero	Add header information
fbfc9db	2018-03-05	Juan Aguero	Update Manual
1530610	2018-03-05	lucky jaiswal	Update Manual Issue 35
e8089b5	2017-12-12	Juan Aguero	Add temperature calibration information
25bc0c9	2017-12-11	Aaron Skeates-Udy	Update manual factory default time weighting fast.
10aa48c	2017-12-11	Aaron Skeates-Udy	Update manual factory default options.
5e93bd0	2017-11-07	Juan Aguero	Move to general root directory structure
9cebcfa	2017-06-20	Juan Aguero	added local operation page
c71de3a	2017-06-20	Juan Aguero	added general description page
6efa461	2017-06-20	Juan Aguero	adding user manual to wiki

Table of Contents

1	Introduction	8
1.1	Overview	8
2	General Description	9
2.1	Weather Proof Case	9
2.2	12V DC Battery	9
2.3	Ngara	9
2.3.1	Enclosure Back	10
2.3.2	Enclosure Front	10
2.3.3	Enclosure Top	11
2.4	Microphone	11
2.4.1	Mounting Options	11
3	Functions	13
3.1	Standalone Logger	13
3.1.1	Storage Handling	13
3.1.2	Storage Power	13
3.1.3	Session Directory	14
3.1.4	Data Usage	16
3.2	Noise Cloud	17
3.2.1	Communication	17
3.2.2	Modem Power	17
3.2.3	Operation Settings	18
3.2.4	Data Usage	18
3.2.5	Troubleshooting	18
3.3	Email	20
3.3.1	Communication	20
3.3.2	Power Saving	20
3.3.3	Format	20
3.4	Industrial Noise Monitor	21
3.4.1	Additional Data	21
3.4.2	Data Usage	22

4	Local Operation	23
4.1	Available User Interface	23
4.2	Powering the Unit	23
4.3	Menu Structure	23
4.4	Configuration Menu Item (Menu 1)	23
4.4.1	Idle Timeout	24
4.4.2	Ancillaries Timeout	24
4.4.3	Network	24
4.4.4	Time and Date	27
4.4.5	System Calibration	27
4.4.6	Temperature Calibration	28
4.4.7	USB Power	28
4.4.8	Keep Alive	29
4.4.9	Factory Default	29
4.4.10	Exit	30
4.5	Logging Menu Item (Menu 2)	30
4.5.1	Start Session	30
4.5.2	Stop Session	31
4.5.3	Take Ref	31
4.5.4	Change Disk	32
4.5.5	WAV Setup	32
4.5.6	Time Weighting Setup	32
4.5.7	Trigger Setup	33
4.5.8	Band Pass Setup	33
4.5.9	Flush Logs	34
4.5.10	Exit	34
4.6	Status Menu Item (Menu 3)	34
4.6.1	Show Status	35
4.6.2	Live SPL	35
4.6.3	Max SPL	35
4.6.4	Short L_{eq}	35
4.6.5	Long L_{eq}	36

4.6.6	RMS Detection	36
4.6.7	Filtered SPL	36
4.6.8	Exit	36
4.7	Disk Menu Item (Menu 4)	37
4.7.1	Disk Status	37
4.7.2	List Sessions	37
4.7.3	Disk Size	37
4.7.4	Disk Free	37
4.7.5	Format Disk	38
4.7.6	Exit	38
4.8	Noise Cloud Menu Item (Menu 5)	38
4.8.1	Start	38
4.8.2	Stop	38
4.8.3	Percentiles	39
4.8.4	Upload Period	39
4.8.5	Exit	40
4.9	Status and Idle Screen	40
5	Remote Operation	42
5.1	Installation of Host Software	42
5.2	Main Screen	43
5.3	Linking to a logger	43
5.3.1	The Result Group	44
5.3.2	The Status Group	44
5.3.3	The General Information Group	44
5.4	Changing Logger Configuration	45
5.4.1	General Logger Configuration Tab	45
5.4.2	Wave File Configuration Tab	46
5.4.3	Trigger Configuration Tab	46
5.4.4	Alarm Clock Tab	54
5.4.5	AUX Output Tab	54
5.4.6	UDP Output Tab	55
5.4.7	Advanced Configuration Options	56

5.4.8	Noise Cloud Configuration	57
5.4.9	Email Tab	57
5.5	Logger Time	58
5.6	System Calibration	59
5.7	Logger Reboot	60
5.8	Logger Shutdown	60
5.9	Logger Control	61
5.9.1	Starting Session	61
5.9.2	Stopping a Session	62
5.9.3	Taking a Reference Level	62
5.9.4	Changing Disk	63
5.10	Disk Operations	64
5.10.1	Detail Storage Media View	64
5.10.2	Downloading session Data	65
5.10.3	Remotely Formatting a USB Drive	66
5.10.4	Performing Statistical Analysis	66
5.10.5	Re-constitution of wave file data	67
5.10.6	Reformatting a USB Device	68
6	Network Configuration Options	69
6.1	Communication	69
6.2	Connection to PC	69
6.3	Connection to a Network	70
6.4	Connection to 3G/4G	70
7	Reference Specifications	72
7.1	Applicable Standards	72
7.2	Acoustic Reference Conditions	72
7.3	Environmental Reference Conditions	72
7.4	Adjustments to Indicated Levels	72
7.5	Extreme Inputs	73
7.6	Nominal A-Weighted Sound Levels	73
7.7	Microphone	73

7.7.1	Frequency Response	73
7.7.2	Directional Response	74
7.7.3	Thermal Characteristics	74
7.7.4	Humidity Characteristics	75
7.7.5	Reduction of Wind Noise by Windscreen	75
7.7.6	Specifications	76
7.8	Filter Responses	76
8	Application Change Log	80

1 Introduction

This document provides a description of the functions provided by the Ngara logger platform. All displays, user tools, facilities and capabilities are described herein.

1.1 Overview

The Ngara Sound Acquisition System offers full measurement flexibility, simultaneously producing the following acoustic measurements –

- Fast or Slow SPL-A
- Fast or Slow SPL-C
- L_{eq} -A
- L_{eq} -C

In addition to the above measurements the Ngara platform is able to store raw audio data to a USB storage device, capable of post processing the majority of your acoustic needs. All of this is achieved in a low power 12-volt environment.

Simple control and configuration of Ngara can be accomplished through the on-board Liquid Crystal display (LCD) and push-button interface. More advanced control functions are made available through the remote host software. This may include:

- Alarm Control
- Triggering Configuration
- Auxiliary Output Configuration
- Email Alerts
- Noise Cloud Interface

The logged data is saved as a formatted list of Sound Pressure Level measurements in a *Comma Separated Variable* (CSV) file. Samples are stored at $100ms$ intervals. The data gathered is capable of being post processed to produce any required statistical representation of the data obtained.

Both CSV file data and audio data are split into 1-hour long files. A new file is created every hour, on the hour, with each logging session stored into separate directories.

2 General Description

Ngara is a Class 1 instrument (IEC 61672.3:2006), consisting of the following components –

- Weather proof case
- 12V DC Battery
- Ngara Instrument
- Microphone & Pre-Amplifier

2.1 Weather Proof Case

Ngara is housed in a rugged weatherproof case. To open the case, unclip the two latches at the front of the case. When closing the weatherproof case, ensure the microphone lead is carefully guided through the cut out provided.

To attach the microphone post, simply screw the base of the post into the mounting found on the lid. On the outside of each latch, a reinforced hole is provided to allow for security measures such as padlocks and chains.



Failure to carefully guide the cable through the cut out provided will cause irreparable internal damage to the microphone cable.

2.2 12V DC Battery

Ngara can be configured to operate using two different sized batteries. The configurable battery sizes include –

- 24Ahr – Allows for up to a maximum of 2 weeks of continual CSV data only logging, and up to 1 week worth of CSV and WAV file data recording.
- 12Ahr – Allows for up to a maximum of 1 week of continual CSV data only logging

The above figures are a guide only and assume -

- The use of a fully charged battery
- There is enough available disk space

Current battery status can be viewed using the LCD or the Remote Host application.



Battery discharge rate is not linear. Battery voltage will drop faster as the stored capacity decreases.

2.3 Ngara

The electronics can be housed within either a Silver (V1) or Black (V2) aluminium enclosure. The unit is classified as per Group X for susceptibility to radio frequency fields and has been tested to AS/NZS CISPR 22, and is approved for connection to any network.

There are no user serviceable parts inside the enclosure.



The electronic circuitry contains many calibration settings that are essential for Ngara to operate correctly. Opening the enclosure will void the unit's calibration and warranty.

2.3.1 Enclosure Back

The back of the enclosure contains the following connections –

- Aux connector (4-pin)
- Ethernet communications port (RJ-45)
This port can be used to connect to a Local Area Network (LAN) to provide a communications link to Ngara
- USB ports (2x USB ports)
The USB ports allow the connection of a single storage device
- 12V Output Connector
Provided as standard on Ngara Black systems



Data will be lost if the storage device is removed during a logging session.
Please refer to Section 4.5.4 for details on ensuring there is no data loss.

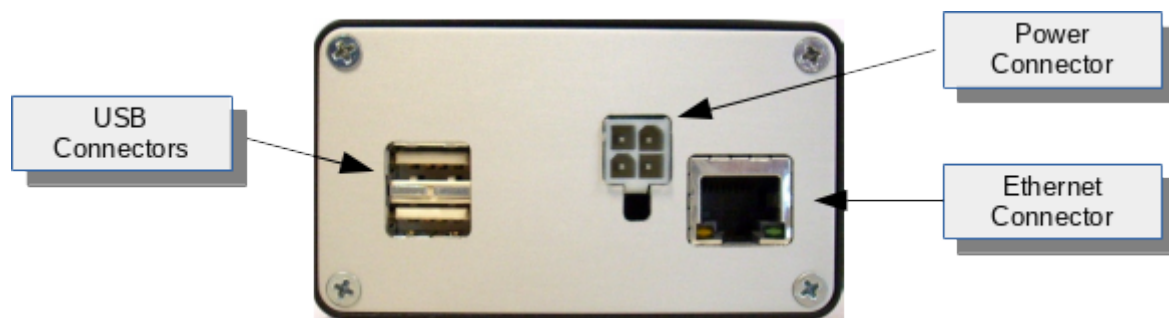


Figure 1: Back Enclosure

2.3.2 Enclosure Front

The front of the enclosure is provided with the following connector –

- Microphone Connector
Inserting the plug and screwing it in until firm connects the microphone lead to Ngara

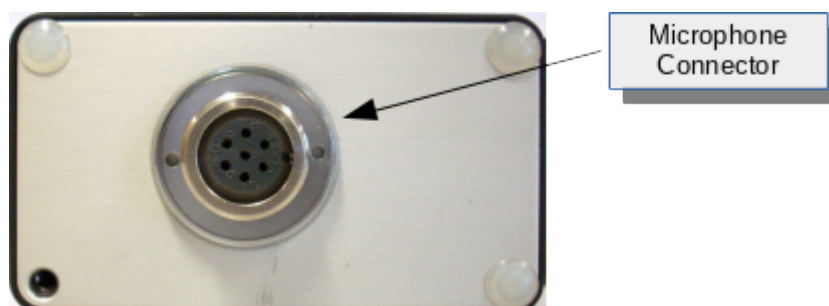


Figure 2: Front Enclosure



Over tightening can lead to internal board damage

2.3.3 Enclosure Top

The top of the enclosure houses the local user interface. The local user interface consist of the following items –

- A Liquid Crystal Display (LCD)
- A WAKE-UP push-button
Used to control the power to peripheral devices
- A SELECT push-button
Used to scroll through menu items
- An ENTER push-button
Used to select menu items

Refer to Section 4 for details on the local interface provided.

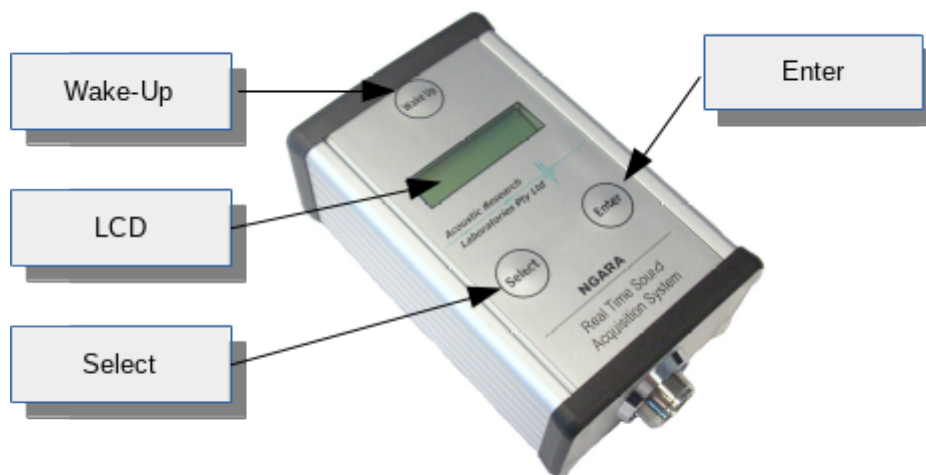


Figure 3: Top Enclosure

2.4 Microphone

Ngara uses a UC-53A Rion microphone attached to a NH-17 with 5 metre cable, preamplifier.

These components comply with the specifications of AS 1259 and IEC 61672 and as such are highly sensitive. Whilst they have some resistance to environmental effects, care should be taken when the microphone is to be exposed to rain and other extremes in weather. Wind and rain shields are available as an option for Ngara.

Detailed microphone specifications can be found on Section 7.7.

2.4.1 Mounting Options

To achieve compliance with the stated standards the supplied UC-53A microphone and NH-17 preamplifier must be mounted to the end of the supplied microphone post.

To make these posts easy to set up and pull apart, we recommend dipping the post screws in a lubricant, such as Vaseline. This makes the posts easier to screw into each other and it also stops them from becoming stuck after being left in the field for a few days.

3 Functions

The following sections describe the general operating functions of a Ngara real time sound acquisition system.

3.1 Standalone Logger

When operating as a standalone logger, Ngara will store all logging data to an external USB storage device.

To start a USB session, simply select start session using the on-board interface (Section 4.5.1) or the Remote Host application (Section 5.9.1).

During the course of the recording session, any number of reference levels can be recorded. Simply follow the instruction for the on-board interface (Section 4.5.3) or the Remote Host application (Section 5.9.3).

Once completed, the USB session may be stopped through the on-board interface (Section 4.5.2) or the Remote Host application (Section 5.9.2). This will cause the data within the internal buffer to be moved to the USB storage device (described as *flushing*). The session is only complete once this final write has completed, do **not** remove power to the unit before hand.

3.1.1 Storage Handling

All USB storage devices must be formatted by Ngara. This ensures both, a small format information file is written at the root of the drive as well as circumventing the Windows imposed FAT32 file system allocation size limit of 32GB.

The internal format information file (*fmtinfo.rec*) is a small record of sessions found and drive speed parameters. The stored session record is required to ensure fragmentation of the file system does not occur. To increase disk performance, Ngara will not allow the use of a disk which has had sessions deleted.

It is recommended **not** to delete sessions from drives, but rather format the drive using Ngara or the Remote Host software. Details on how to format a USB drive using the on-board interface can be found in Section 4.7.5, and using the Remote Host interface can be found in Section 5.10.3.

There is no longer the need to *download* session data using special software. The USB device can be read directly by a desktop computer. This is the fastest and easiest method for session data transfers. The **same** session data can then be processed to any number of statistical configurations (See Section 5.10.4).

If remote access to Ngara is required, data can still be downloaded via its Ethernet port. The Remote Host application can be used to download statistics directly from the Ngara in order to reduce the required cellular bandwidth (See Section 5.10.2).



USB 3.0 devices are not compatible with the Ngara USB interface.
Not all USB devices are compatible with Ngara.
Please only use the USB devices supplied with the unit.

3.1.2 Storage Power

During a standalone logging session (USB Session), Ngara can be configured to control the power to it's USB ports. Power will be provided when the units internal buffer is full. This mode of operation can be toggled using the on board interface. See Section 4.4.7 for more details.



Constant Power mode operation is recommended for newer solid-state USB devices

Table 2 describes each possible USB state.

Table 2: Allowable Disk States

State	Description
Unknown	Current disk is invalid
Powering Up	New disk is currently being mounted
Removed	No valid disk found
Format Required	Disk with invalid file table or sessions deleted
Present	Valid disk found



It may still be possible to format an Unknown disk.
However, if the disk remains Unknown after a format, then it could be a USB 3.0 device

3.1.3 Session Directory

Each newly created session is stored as a separate directory within the USB disk. Each session directory contains the following:

- Session log file
Used to record errors and events which occurred during the logging session.
- Session information file
Used to store logger configuration during the logging session.
- Data directories
Directories in which logging data is stored into.

3.1.3.1 Session Log File

Session information messages, along with any session errors are displayed within the log file.

Ngara maintains a copy of this log file in its internal memory. This allows correct error logging, even when access to the USB is not possible.

If no disk errors are encountered during a session, the internal log file is always flushed to the USB disk. However, if there were errors found, the log file must be manually flushed at the end of the session.

3.1.3.2 Session Information File

Session settings are also stored to the session directory.

Table 3: Session Detail File

Tag	Description
SERIAL	Logger serial number
VERSION	Logger software version
CALIBRATION	Logger calibration (absolute)
RANGE MULTIPLIER	Logger range multiplier calibration (absolute)
SESSION NAME	Session Name
SESSION START	Session start time
SESSION END	Session end time
TWEIGHT	Time Weighting (125ms or 1s)
WAVE REC	Wave file recording (ON or OFF)

Tag	Description
WAVE FREQ	Wave file sampling frequency (48kHz or 12kHz)
WAVE DEPTH	Wave file number of bits (16bit or 8bit)
WAVE RANGING	Wave file auto ranging (ON or OFF)
TRIG SETTING	Triggering setting (ON or OFF)
TRIG TYPE	Current trigger type
TRIG LEVEL	Required trigger level. In the units set in TRIG TYPE entry
TRIG ON	Required ON time for level trigger, in seconds
TRIG OFF	Required OFF time for level trigger, in seconds
TRIG PERCENTILE	Percentile used for statistical trigger
TRIG STAT PERIOD	Statistics triggering period length, in minutes
TRIG PRE REC LENGTH	Number of seconds to record before trigger event
TRIG POST REC LENGTH	Number of seconds to record after trigger event
TRIG TMR START	Start time for timer trigger
TRIG TMR END	End time for timer trigger
TRIG TMR RPT	Repeat mode for timer trigger (Hourly/Weekly)

3.1.3.3 Data Directories

A new data directory is created once the number of files within the current data directory reaches a high water mark. This is currently set to 900. This is required in order to avoid the current Operating System limitation of 999 files per directory.



It may possible to reach this limitation during a triggered recording session

3.1.3.3.1 CSV Data

Logged data is stored to Comma-Separated-Variable (CSV) files. These files are rotated every hour on top of the hour, with filenames corresponding to the time and date. The following is an example header, which is stored at the beginning of each each hourly file.

```
Session Name      20090524_194427
Logger Serial Number  878001
Date              24/05/2009
Hour              19
Temperature       28
```

```
Time  SPL-A  SPL-C  LEQ-A  LEQ-C  Signal Condition  Battery
```

Data is then stored into each CSV file every 100ms. Each new line entry is a *snap-shot* in time of the logger data, with the description of each column shown in Table 4.

Table 4: CSV Line Description

Name	Description	Units	Format
Time	Time stamp for result		mm:ss:msec
SPL-A	Snapshot of Exponentially Averaged Result	dB(A)	xxx.x
SPL-C	Snapshot of Exponentially Averaged Result	dB(C)	xxx.x
LEQ-A	100ms Time Averaged Result	dB(A)	xxx.x
LEQ-C	100ms Time Averaged Result	dB(C)	xxx.x
Signal Condition	Overload or Range state		1, 2 or 3
Battery	Battery Voltage	Volts	xx.x

3.1.3.3.2 PCM Data

Ngara is capable of storing raw audio samples. The raw files can be used in conjunction with FireFly to obtain octave spectrum analysis of the data. More information on FireFly can be found [here](#).

PCM samples are stored as single channel data and are taken directly from the microphone output voltage. These samples are used internally during SPL calculations and are sampled by the Analog-to-Digital-Converter (ADC) at a constant rate of $48kHz$.

Ngara uses internal range switching to obtain a greater dynamic range. This is reflected within the Signal Condition field within the CSV file entry, with the switching occurring every $100ms$ as required. If the signal is in the high range (value of 2) the data needs to be multiplied by the logger's saved multiplication factor.

Allowable raw audio configurations are shown in Table 5.

Table 5: PCM Configuration Options

Option	F_s	bit-depth	Auto-ranged
OFF			
48kHz	$48kHz$	16-bit	Yes
12kHz	$12kHz$	16-bit	Yes
12k/8	$12kHz$	8-bit	No
NCam	$48kHz$	16-bit	No



PCM data must be recorded at $48kHz$ if post processing is to include octave analysis of the data

Continuous

Continuously recorded Pulse-Coded-Modulation (PCM) data will be stored to the USB storage device if selected by the user.

Files are rotated every hour on top of the hour, with filenames corresponding to time and date.

Triggered

Triggered Pulse-Coded-Modulation (PCM) data will be stored to the USB storage device if selected by the user.

Files are rotated in the event that a triggered wave files exceeds two hours duration.

3.1.4 Data Usage

Table 6 describes the expected data usage requirements for various logger configurations.

Table 6: Standalone Logger Data Usage

CSV Data	PCM Data	PCM F_s (kHz)	PCM bit-depth	Usage (GB)
Y	N			0.04
Y	Y	48	16	8.00
Y	Y	12	16	2.00
Y	Y	12	8	1.00



CSV data is always recorded and cannot be disabled

3.2 Noise Cloud

When operating as a Noise Cloud logger, Ngara will store all logging data to the Noise Cloud server.

To start a Noise Cloud session, simply select start using the on-board interface (Section 4.8.1). If a valid USB drive is provided to Ngara, a log file containing status messages will be written.

Once completed, the Noise Cloud session may be stopped through the on-board interface (Section 4.8.2). This will cause the data within the internal buffer to be moved to the Noise Cloud server (described as *flushing*). The session is only complete once this final write has completed, do **not** remove power to the unit before hand.

During the final flushing stage, a count down of the number of records still left to be uploaded will be shown. Only once all records are uploaded can the Noise Cloud session be considered as completed. This requires a valid internet connection.



A Noise Cloud session can run independently of a USB logging session



Ngara currently requires a writeKey to be entered by the user.

This is generated through the Noise Cloud interface and is to be provided to Ngara as part of the Noise Cloud configuration in the Remote Host.

See Section 5.4.8.

3.2.1 Communication

The Ethernet interface on the Ngara is used for all communications to the Noise Cloud server. This can be interfaced through a modem for a completely remote installation, or to a local area network as available. The connection type can be updated using the on-board interface (Section 4.4.3.6).

When configured to use a modem for connection, Ngara will interrogate the modem for the items shown on Table 10. The result of interrogation can be viewed using the on-board interface via the status screen, for details see Section 4.9. If the modem has failed to register to the wireless network, a Bad Modem indication will be shown.

Table 7: Modem Status

Item	Description
status	Current SIM status
signal	Radio signal strength
technology	Radio technology in use
registration	Wireless network registration status



If Ngara is configured to use a modem for connectivity, it will wait for valid network registration before trying to contact the Noise Cloud server.

When configured to use a modem, but instead is incorrectly connected to a local area network, this registration will never be found and all communications will appear to stop.

All values are recorded to the log file as they change.

3.2.2 Modem Power

During a Noise Cloud session (NC Session), Ngara is automatically configured to control the power to a modem via it's AUX output. Power will be provided to the modem when the upload period is reached. Setting the upload period can be carried out using the on-board interface, see Section 4.8.4.

The modem power will be turned off after a successful initial upload, and re-powered on subsequent minute boundary markers. Table 8 shows the minute markers used during each upload period setting.

Table 8: Upload Period Markers

Setting	Marker	Description
60min	Minute MOD 0	Marker occurs when minute is 0
30min	Minute MOD 30	Marker occurs when minute is 0 or 30
15min	Minute MOD 15	Marker occurs when minute is 0, 15, 30 or 45
Always ON	Minute MOD 1	Marker occurs every minute



Constant Power operation is recommended for LAN configurations only

3.2.3 Operation Settings

When configured to access Noise Cloud servers, Ngara will automatically update internal configuration settings to those shown on Table 9.

Table 9: Noise Cloud Operation Settings

Item	Description	Setting
Ancillary Timeout	Allow to turn off Ethernet devices	Enabled
Alarm Clock	Set to Keep Alive. Ensures Ngara is still on at 7am each day.	Enabled
AUX Output	Set to Follow Ethernet. Ensures the AUX Output toggles at the same rate as the Ethernet device. This allows Ngara to conserve maximum power from the battery in use.	Enabled



These options are restored once the Noise Cloud session is complete

3.2.4 Data Usage

All data that is uploaded by Ngara is consumed by the Noise Cloud server, this occurs at an hourly rate of 77.1kB¹.

Future Noise Cloud development may involve two way communication with Ngara which may increase this base figure.

3.2.5 Troubleshooting

The steps shown in Figure 4 may help identify any communication problems with the Noise Cloud server. As each configuration is different, please contact Acoustic Research Labs if communication with the Noise Cloud server is still problematic.

¹ 1 kB being equal to 1024 Bytes

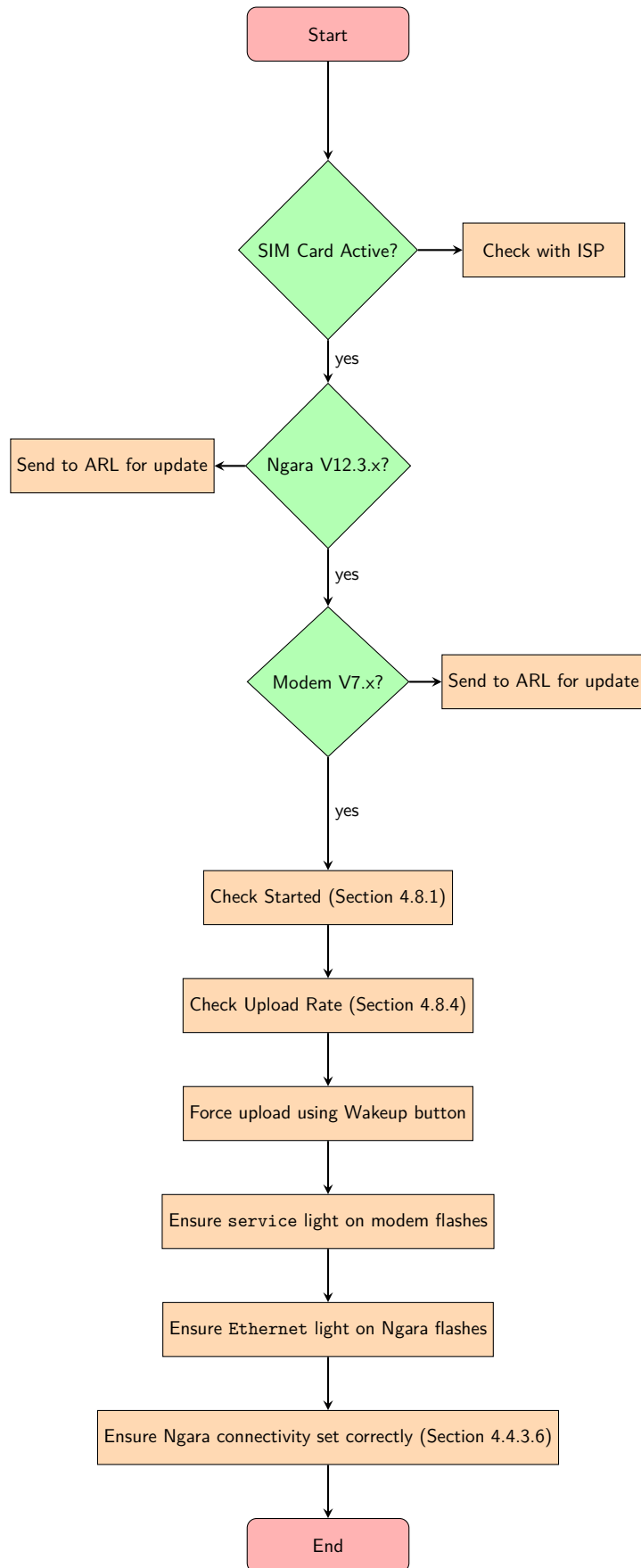


Figure 4: Noise Cloud Troubleshooting

3.3 Email

Ngara can be configured to generate email alerts when specified noise limits are exceeded.

The email server which is used to route the required alert emails is provided by Acoustic Research Labs, free of charge. The server address can be changed if required by submitting a request to Acoustic Research Labs.



Email alerts run independently of any type of logging session

3.3.1 Communication

The Ethernet interface on the Ngara is used for all communications to the email server. This can be interfaced through a modem for a completely remote installation, or to a local area network as available. The connection type can be updated using the on-board interface (Section 4.4.3.6).

When configured to use a modem for connection, Ngara will interrogate the modem for the items shown on Table 10.

Table 10: Modem Status

Item	Description
status	Current SIM status
signal	Radio signal strength
technology	Radio technology in use
registration	Wireless network registration status



If Ngara is configured to use a modem for connectivity, it will wait for valid network registration before trying to contact the email server. When configured to use a modem, but instead is incorrectly connected to a local area network, this registration will never be found and all communications will appear to stop.

3.3.2 Power Saving

When configured for email alerts, and Ngara is configured to control the power to the modem, power will be provided to the modem when there is a need to send an email. Otherwise, the modem will remain off to conserve battery power.

The modem power will be turned off after the email is sent.



If using a modem connection, power on times for the modem will vary between 1 to 5 minutes. Expect this amount of delay for email delivery.

3.3.3 Format

The email alert provided by Ngara is a simple text email which is appended with each new email alert. This allows for internal buffering of alerts in the event that no communication could be established with the mail server. The general format of each alert email entry is shown below, with details of all values described in Table 11.

```
YYYY-MM-DD HH:MM Lx (len band) -- xxx.x dB(fweight) [level dB(fweight)]
```

Table 11: Email Body Descriptors

Item	Description	Sample
YYY-MM-DD HH:MM	Time and Date for interval that caused the alert	2018-08-20 23:45
Lx	Configured alert percentile (or L_{eq})	L90
len	Length of interval	15min
band	Displayed for band limited results only	10Hz to 1kHz
xxx.x	Actual value	56.4
fweight	Frequency weighting	A
level	Configured alert level	50



Due to internal buffering, a single email may contain alerts for multiple time periods, and/or multiple statistics configurations.
This ensures that alerts are not discarded due to bad network status.

3.4 Industrial Noise Monitor

When Ngara is configured for Industrial Noise Monitor operation, it provides an additional processing channel. This channel consists of a configurable band pass filter, with the band edges being those defined for 1/3 octave bands and range from 10Hz to 20kHz. See Section 4.5.8 for details on updating the band edges using the on-board interface.

3.4.1 Additional Data

Band filtered logger data is stored to Comma-Separated-Variable (CSV) files. These files are rotated every hour on top of the hour, with filenames corresponding to the time and date. The filenames are distinguished from the all pass result files with a bpv file extension. When found in session data directories, these files are automatically added to statistics conversions providing a full secondary output file solely for the purpose of band filtered statistics.

Following is the header information stored at the beginning of each each file.

```
Session Name      20090524_194427
Logger Serial Number 878001
Date              24/05/2009
Hour              19
Temperature       28
```

```
Time  SPL-A  SPL-C  LEQ-A  LEQ-C  Signal Condition  Battery
```

Data is then stored into each CSV file every 100ms. Each new line entry is a *snapshot* in time of the band filtered logger data, with the description of each column shown in Table 12.

Table 12: Band Filtered CSV Line Description

Name	Description	Units	Format
Time	Time stamp for result		mm:ss:msec
SPL-A	Snapshot of Exponentially Averaged Result	dB(A)	xxx.x
SPL-C	Snapshot of Exponentially Averaged Result	dB(C)	xxx.x
LEQ-A	100ms Time Averaged Result	dB(A)	xxx.x
LEQ-C	100ms Time Averaged Result	dB(C)	xxx.x
Signal Condition	Overload or Range state		1, 2 or 3
Battery	Battery Voltage	Volts	xx.x

3.4.2 Data Usage

Table 13 describes the expected **additional** data usage when operating in Industrial Noise Monitor mode. These are in addition to those listed in Section 3.1.4.

Table 13: Industrial Noise Monitor Additional Data Usage

CSV Data	PCM Data	PCM F_s (kHz)	PCM bit-depth	Usage (GB)
Y	N/A	N/A	N/A	0.04



CSV data is the only addition when in Industrial Noise Monitor Mode

4 Local Operation

The Ngara noise logger provides local interfacing capabilities allowing the user to –

- Configure logging parameters
- Start/Stop logging sessions
- Display current configuration information
- Display current logger status and results information
- Carry out disk operations

4.1 Available User Interface

The local interface provided by Ngara consists of the following:

- A Liquid Crystal Display (LCD)
Used for display feedback
- A WAKE-UP push-button
Used to control the power to peripheral devices
- A SELECT push-button
Used to scroll through menu items
- An ENTER push-button
Used to select menu items

4.2 Powering the Unit

To turn Ngara on, press and hold the wake-up button until NGARA or a firmware version identifier is displayed on the LCD.



If the power cable has been unplugged or the Ngara has been turned off, please wait 1 to 2 minutes before trying to turn the Ngara back on.

4.3 Menu Structure

The menu provided follows a *tree* structure.

Cycling through each menu item is achieved through the SELECT push button, whilst selecting a menu item is achieved through the ENTER push-button.

4.4 Configuration Menu Item (Menu 1)

Items available through the configuration menu give the ability to update settings which will affect **common** logger operations.

4.4.1 Idle Timeout

The idle timeout menu item allows toggling of the idle time out setting to either Enabled or Disabled. The timeout length setting is preset to 2 minutes. If this timeout is reached Ngara will power off, if not in recording mode.

To change the current timeout settings, the following steps must be carried out –

1. Activate menu item by pressing ENTER
2. Ngara will display current setting
3. Toggle setting using SELECT
4. Confirm selection by pressing ENTER

4.4.2 Ancillaries Timeout

The ancillary timeout menu item allows toggling of the ancillary time out setting to either Enabled or Disabled. The timeout length setting is preset to 2 minutes. If this timeout is reached, Ngara will power down all ancillary devices (Ethernet and modem) whilst recording and not actively in use.

To change the current timeout settings, the following steps must be carried out –

1. Activate menu item by pressing ENTER
2. Ngara will display current setting
3. Toggle setting using SELECT
4. Confirm selection by pressing ENTER

4.4.3 Network

The Network Configuration menu allows updating the Ethernet interface settings.

To enter Net Config menu item press ENTER

4.4.3.1 Network Password

The network password menu item allows the configuration of the 6-digit password to use when connecting to the Ngara using the Remote Host software.

To change the current network password, the following steps must be carried out –

1. Activate menu item by pressing ENTER
2. Ngara will display current setting
3. Toggle selected digit using SELECT
4. Confirm selected digit using ENTER
5. Continue until all 6 digits are confirmed

4.4.3.2 IP Mode

The IP mode menu item configures how Ngara will try to obtain a network address. There are three allowable settings, each described in Table 14.

Table 14: IP Modes

Setting	Description
DHCP	Ngara will obtain all configuration using a DHCP server
Auto	Ngara will set a Windows Auto-IP compatible address
Manual	Ngara is configured with a Static IP address, along with a gateway and a net mask.



Consult with your network administrator to determine the most appropriate network settings for your Ngara.
Generally, DHCP is preferred.

To change the IP mode of operation, the following steps must be carried out -

1. Activate menu item by pressing ENTER
2. Ngara will display current setting
3. Toggle setting using SELECT
4. Confirm selection by pressing ENTER

4.4.3.3 IP Address

The IP address menu item allows the configuration, or display of the IP address currently configured for the Ngara.

To view currently assigned IP address, the following steps must be carried out -

1. Activate menu item by pressing ENTER
2. Ngara will display current setting

If the Ethernet device was configured to operate in Manual mode, then the menu item will also allow updating of the stored IP Address.

To update the Manual IP address, each digit is edited with the following -

3. Each digit must be entered separately - selected digit is shown by cursor
 - Pressing SELECT will increase selected digit by one.
 - Pressing ENTER will confirm current digit and move to next digit
4. Once the final digit is reached, pressing ENTER will confirm entered address

4.4.3.4 Net mask

The IP Net mask menu item allows the configuration of the network Net mask to use.

To set current Net mask, the following steps must be carried out -

1. Activate menu item by pressing ENTER

2. Ngara will display current Net mask
3. Each digit must be entered separately - selected digit is shown by cursor
 - Pressing SELECT will increase selected digit by one.
 - Pressing ENTER will confirm current digit and move to next digit
4. Once the final digit is reached, pressing ENTER will confirm entered Net mask



Available in Manual IP mode only.

4.4.3.5 Gateway

The IP Gateway menu item allows the configuration of the network Gateway to use.

To set current Gateway, the following steps must be carried out -

1. Activate menu item by pressing ENTER
2. Ngara will display current Gateway
3. Each digit must be entered separately - selected digit is shown by cursor
 - Pressing SELECT will increase selected digit by one.
 - Pressing ENTER will confirm current digit and move to next digit
4. Once the final digit is reached, pressing ENTER will confirm entered gateway



Available in Manual IP mode only.

4.4.3.6 Connectivity

The Connectivity menu item allows the configuration of internet communication method. Available communication methods are described in Table 15.

Table 15: Connectivity Options

Setting	Description
WR11 Modem	Ngara is connected to WR11 modem
Direct LAN	Ngara is connected to an Local Area Network LAN

To change the IP mode of operation, the following steps must be carried out -

1. Activate menu item by pressing ENTER
2. Ngara will display current setting

3. Toggle setting using SELECT
4. Confirm selection by pressing ENTER

Configuring to use the WR11 modem will allow Ngara to interrogate the modem to determine if valid internet access is provided.

Direct LAN setting should be used when the Ethernet interface is always on, and no modem is in use.



Configuring Ngara to use a WR11 Modem, and it is instead connected in Direct LAN mode will cause Ngara to constantly fail trying to reach the internet and all external communications WILL fail.

4.4.4 Time and Date

Allows the date and time stored in Ngara to be updated.

To set current date and time, the following steps must be carried out -

1. Activate menu item by pressing ENTER
2. Ngara will display a snapshot of the date and time when the ENTER button was pressed
3. The Date must be entered first, followed by the time. Time is entered as a 24hr value.
4. Each allowable number must be entered separately - selected number is shown by cursor
 - Pressing SELECT will increase selected number by one.
 - Pressing ENTER will confirm current number and move to next number
5. Once the final number (seconds) is reached, pressing ENTER will confirm entered date and time



It is possible to enter invalid date configurations (i.e. 31 day, 02 month) In this instance an error message will appear stating Invalid Parameter



This menu item is not accessible when in recording mode.

4.4.5 System Calibration

Allows Ngara to calibrate to a known source.



This menu item will alter all internal calibration factors, to simply record a reference level, refer to Section 4.5.3.

To calibrate, the following steps must be carried out -

1. Apply reference tone
2. Activate calibration mode by pressing ENTER
3. Ngara will wait until the expected level is entered using SELECT and ENTER

- Pressing SELECT increases the value of each selected digit by 1
 - Pressing ENTER selects the next digit.
4. Once the expected level is entered, the user is given the chance to confirm or cancel calibration. “Y” confirms entered value, “N” cancels calibration.
- Pressing SELECT toggles between “Y” and “N”
 - Pressing ENTER accepts value.



This menu item is not accessible when in recording mode.

4.4.6 Temperature Calibration

Allows Ngara to calibrate its internal temperature sensor. The internal temperature sensor is used to monitor the performance of the electronics within the weatherproof enclosure and it is not intended to replace weather station data.

To calibrate, the following steps must be carried out -

2. Activate calibration mode by pressing ENTER
 3. Ngara will wait until the expected level is entered using SELECT and ENTER
- Pressing SELECT increases the value of each selected digit by 1
 - Pressing ENTER selects the next digit.
4. Once the expected level is entered, the user is given the chance to confirm or cancel calibration. “Y” confirms entered value, “N” cancels calibration.
- Pressing SELECT toggles between “Y” and “N”
 - Pressing ENTER accepts value.



This menu item is not accessible when in recording mode.

4.4.7 USB Power

The USB power menu item allows the toggling of the USB power setting to either Constant or Toggle.

To change the current timeout settings, the following steps must be carried out –

1. Activate menu item by pressing ENTER
2. Ngara will display current setting
3. Toggle setting using SELECT

4. Confirm selection by pressing ENTER

Toggle will cycle power to the USB device, whilst Constant will maintain the USB drive powered on.



The Toggle option was designed to be used in conjunction with large mechanical drives, when using solid state flash drives it is recommended to use Constant power mode.



This menu item is not accessible when in recording mode.

4.4.8 Keep Alive

The keep alive menu item allows the setting of the internal Real-Time-Clock (RTC) daily alarm. It can be set to either On or Off.

When set to On, the RTC alarm is configured to generate a wake-up signal at 7am each day. This ensures Ngara powers up in the event it lost power.

To change the current timeout settings, the following steps must be carried out –

1. Activate menu item by pressing ENTER
2. Ngara will display current setting
3. Toggle setting using SELECT
4. Confirm selection by pressing ENTER



This menu item is not accessible when in recording mode.

4.4.9 Factory Default

Sets the Ngara unit back to a standard Factory configuration. Note that there is no option to alter a standard *Factory Default* configuration.

1. Activate menu item by pressing ENTER
2. Once the menu item is selected, the user is given the chance to confirm or cancel the configuration update. "Y" confirms the update, "N" cancels the update.
 - Pressing SELECT toggles between "Y" and "N"
 - Pressing ENTER accepts value.

Activating factory default will set the settings to those shown in Table 16

Table 16: Factory Settings

Description	Setting
Idle timeout	Enabled
Ancillary timeout	Enabled

Description	Setting
IP mode	DHCP
Network password	000000
PPTP	Disabled
SNTP	Disabled
FTP	Disabled
UDP	Disabled
USB Power	Constant
Wav Recording	48kHz
Time Weight	Fast
Band Pass Low	10 Hz
Band Pass High	1 kHz
Logger state	Standby
Triggers	Disabled
Auxiliary Output	Disabled
Alarms	Disabled
Emails	Disabled
Noise Cloud	Disabled



This menu item is not accessible when in recording mode.

4.4.10 Exit

This menu item returns to the top-level menu structure.

To return to the top level menu structure, the following steps must be carried out -

1. Activate menu item by pressing ENTER

4.5 Logging Menu Item (Menu 2)

Items available through the logging menu give the ability to update settings which will affect **USB** recording operations.

4.5.1 Start Session

This menu item starts a logging session.

As this session is started through the local interface instead of a remote PC, the session name cannot be entered, thus Ngara creates a name based on current date and time.

A session will not be able to be started if any of the following conditions are met:

- There is no valid disk found, or
- Logger time has not been set by the RTC due to an internal battery fault

Upon selection of this menu item, the result of trying to start the USB recording session will be displayed to the user.

Previous session settings (Trigger settings, timers, etc) are stored in internal memory and are remembered each time the unit is turned on.

To start a session using the LCD, the following steps must be carried out -

1. Activate menu item by pressing ENTER
2. Ngara will create a session name based on date and time
3. Once the session has started a **Session Running** message will appear on the LCD.



This menu item is not accessible when a USB session is running.

4.5.2 Stop Session

This menu item stops a logging session.

Upon selection of this menu item, a **Session Flushing** message will appear on the display to indicate final flushing of data to disk is taking place. Upon completion of the data flushing, Ngara will return to the top-level menu structure.

To stop a session using the LCD, the following steps must be carried out -

1. Activate menu item by pressing ENTER
2. Ngara will indicate the internal memory is being flushed to the USB storage device
3. Once the internal memory has been cleared, the LCD will return to the top level menu item.



This menu item is only accessible when a USB session is running.

4.5.3 Take Ref

This menu item allows the recording of a reference level. The user is not prompted to record reference tones at any stage during a logging session. The user is able to take an unlimited number of reference tones throughout the logging session.

If wave file recording is enabled, a one second recording of the reference tone is stored as a wave file which can be played back to obtain reference levels on measuring equipment.

To take a reference tone using the LCD, the following steps must be carried out -

1. Activate menu item by pressing ENTER
2. Ngara will indicate the current measured levels (both A and C) which will be recorded to the log file.
 - Pressing SELECT will re-take the reference levels
 - Pressing ENTER will store the reference tone



This menu item is only accessible when a USB session is running.

4.5.4 Change Disk

This menu item allows the flushing of the current logging session, without stopping the session. This allows the change over of storage devices without any loss of data.

Upon selection of this menu item, a *Session Flushing* message will appear on the display to indicate flushing of data to disk is taking place. Once this is completed, the user will be prompted to *Swap Disk*.

To swap a USB storage device using the LCD, the following steps must be carried out -

1. Activate menu item by pressing ENTER
2. Ngara will indicate the internal buffers are being flushed to disk by displaying “Session Flushing”
3. A *Swap Disk* message appears once the internal buffers have all been written to disk.
 - The user then has 10 seconds to swap the USB storage device.
4. Ngara then checks the new USB storage device to determine if it is useable.
 - A session error will be displayed on the LCD if the USB storage device is not useable.



This menu item is only accessible when a USB session is running.

4.5.5 WAV Setup

This menu item toggles the recording and format of raw PCM data. Allowable options are listed in Section 3.1.3.3.2.

To change the wav file recording setup, the following steps must be carried out -

1. Activate menu item by pressing ENTER
2. Ngara will display current setting
3. Toggle setting using SELECT
4. Confirm selection by pressing ENTER



All results are derived using 48kHz setting



This menu item is not accessible when a USB session is running.

4.5.6 Time Weighting Setup

This menu item toggles the time weighting used during the exponential averaging. Allowable options are listed on Table 17.

Table 17: Time Weighting Configuration Options

Option	Decay
FAST	125ms
SLOW	1000ms

To change the wav file recording setup, the following steps must be carried out -

1. Activate menu item by pressing ENTER
2. Ngara will display current setting
3. Toggle setting using SELECT
4. Confirm selection by pressing ENTER



This menu item is not accessible when a USB session is running.

4.5.7 Trigger Setup

This menu item toggles the stored trigger settings ON or OFF only. Actual trigger settings can only be altered using the remote host software (See Section 5.4.3). This menu item simply provides the option to Enable or Disable triggering without the need for a valid IP connection.

To enable or disable triggering, the following steps must be carried out –

1. Activate menu item by pressing ENTER
2. Ngara will display current setting
3. Toggle setting using SELECT
4. Confirm selection by pressing ENTER



This menu item is not accessible when a USB session is running.

4.5.8 Band Pass Setup

This menu item allows the setting of lower and upper band edges to use for band-pass filtered results. The band edges are those defined in IEC 61260 for 1/3 fractional octave bands, ranging from 10Hz to 20kHz.

To change selected bands, the following steps must be carried out –

1. Activate menu item by pressing ENTER
2. Ngara will display current Low Band setting
3. Toggle setting using SELECT
4. Confirm selection by pressing ENTER

5. Ngara will display current High Band setting
6. Toggle setting using SELECT
7. Confirm selection by pressing ENTER



Industrial Noise Monitor option must be enabled. Please contact ARL for more details.



This menu item is not accessible when a USB session is running.

4.5.9 Flush Logs

This menu item appears only once erroneous log files have been found within internal storage memory. This menu item allows the user to flush the internal log files to an attached USB device.

The log files stored internally do not contain any header information found within the USB log files, however they are stored using session names to enable quick identification (in the same manner the USB log files are stored)

The internal log files will be moved to a directory named *Incomplete Log Files* within the USB drive, the directory will be created if it does not exist.

To flush internal log files, the following steps must be carried out –

1. Activate menu item by pressing ENTER
2. Ngara will display an error message if an error was encountered



A valid drive must be inserted into Ngara's USB port in order to successfully flush internal log files



This menu item is not accessible when a USB session is running, or if no internal log files are found.

4.5.10 Exit

Return to top menu structure.

To return to the top level menu structure, the following steps must be carried out -

1. Activate menu item by pressing ENTER

4.6 Status Menu Item (Menu 3)

Items available through the status menu give the ability to view current Ngara state.

4.6.1 Show Status

This menu item scrolls through current logger operation, configuration and errors (if any). Refer to Section 4.9 for details of all possible screens.

Within this menu screen -

- Pressing SELECT will scroll through each item.
- Pressing ENTER will exit from the status screen.

4.6.2 Live SPL

Displays the current SPL. Both A and C weighted. An overload condition is indicated with an '⌢'.

Within this menu screen:

- Pressing SELECT has no effect
- Pressing ENTER will exit.

This display is updated once a second.

4.6.3 Max SPL

Displays maximum SPL for both A and C weighted level. An overload condition is indicated with an '⌢'.

Within this menu screen -

- Pressing SELECT will reset the display
- Pressing ENTER will exit.

This display is updated once a second.

4.6.4 Short L_{eq}

Displays current short (100ms time averaged) L_{eq} . Both A and C weighted. An overload condition is indicated with an '⌢'.

Within this menu screen -

- Pressing SELECT has no effect
- Pressing ENTER will exit

This display is updated once a second.

4.6.5 Long L_{eq}

Displays current Time Averaged L_{eq} . Both A and C weighted.

Averaging starts once menu item is entered. An overload condition is indicated with an '^'.

Within this menu screen:

- Pressing SELECT will re-start the averaging time and reset any overload condition
- Pressing ENTER will exit

This display is updated once a second.

4.6.6 RMS Detection

Displays current and peak RMS algorithm results. An overload condition is indicated with an '^'.

Within this menu screen:

- Pressing SELECT will reset the display
- Pressing ENTER will exit

This display is updated once a second.



This menu item is not accessible when operating in Industrial Noise Monitor mode

4.6.7 Filtered SPL

Displays the current band filtered SPL. Both A and C weighted. An overload condition is indicated with an '^'.

Within this menu screen:

- Pressing SELECT has no effect
- Pressing ENTER will exit.

This display is updated once a second.



This menu item is only accessible when operating in Industrial Noise Monitor mode

4.6.8 Exit

Return to top menu structure. To return to the top level menu structure, the following steps must be carried out -

1. Activate menu item by pressing ENTER

4.7 Disk Menu Item (Menu 4)

Items available through the disk menu give the ability to update and configure USB devices.

4.7.1 Disk Status

This menu item displays the current USB disk state. Allowable states are listed on Table 18.

Table 18: Allowable Disk States

State	Description
Unknown	USB was unable to be mounted. Possible USB 3.0 device.
Powering Up	Recently provided power or waiting for USB to respond
Removed	No Disk found
Present	Useable disk found
Format Required	Unusable disk found

Within this menu screen -

- Pressing SELECT has no effect
- Pressing ENTER exits the menu item

4.7.2 List Sessions

Displays current saved sessions found on disk.

Within this menu screen -

- Pressing SELECT scrolls through the found session names
- Pressing ENTER exits the menu item

4.7.3 Disk Size

Displays current disk total size in days.

Within this menu screen -

- Pressing SELECT has no effect
- Pressing ENTER exits the menu item

4.7.4 Disk Free

Displays current disk free space in days.

Within this menu screen -

- Pressing SELECT has no effect
- Pressing ENTER exits the menu item

4.7.5 Format Disk

Format currently inserted disk. A confirmation option is presented before formatting proceeds.

Within this menu screen -

- The SELECT push-button is used to toggle between Y and N during confirmation
- The ENTER push-button is used to confirm the selection



This menu item is not accessible when a USB session is running.

4.7.6 Exit

Return to top menu structure.

To return to the top level menu structure, the following steps must be carried out -

1. Activate menu item by pressing ENTER

4.8 Noise Cloud Menu Item (Menu 5)

Items available through the Noise Cloud menu give the ability to update and configure logging to the Noise Cloud service.

4.8.1 Start

This menu item starts a Noise Cloud logging session.

To start a Noise Cloud session using the LCD, the following steps must be carried out -

1. Activate menu item by pressing ENTER
2. Once the session has started a Session Running message will appear on the LCD.



This menu item is not accessible when a Noise Cloud session is running.

4.8.2 Stop

This menu item stops a Noise Cloud logging session.

Upon selection of this menu item, a NC: Flushing message will appear on the display to indicate final flushing of data to Noise Cloud is taking place. Upon successful connection to the server, a countdown showing the number of records remaining appears. After completion of the data flushing, Ngara will return to the top-level menu structure.

To stop a Noise Cloud session using the LCD, the following steps must be carried out -

1. Activate menu item by pressing ENTER
2. Ngara will indicate the internal memory is being flushed to the Noise Cloud server
3. Once the internal memory has been cleared, the LCD will return to the top level menu item.



This menu item is only accessible when a Noise Cloud session is running.

4.8.3 Percentiles

This menu item configures the statistical percentiles that are to be uploaded to the Noise Cloud server. These can be updated at any stage, however the updated percentiles are only applied to new results.

To edit the percentiles, the following steps must be carried out -

1. Activate menu item by pressing ENTER
2. Ngara will display current setting
3. Increase selected percentile value using SELECT
4. Confirm value using ENTER
5. Continue until all 5 percentiles are confirmed



L_{eq} , L_{min} and L_{max} are calculated by default.

4.8.4 Upload Period

This menu item configures the period at which data is pushed to the Noise Cloud server. This can be updated at any stage. Allowable values are shown in Table 19.

Table 19: Noise Cloud Upload Periods

Setting	Description
15min	Data is pushed every 15 minutes
30min	Data is pushed every 30 minutes
60min	Data is pushed every 60 minutes
Always On	Data is pushed every minute

To edit the upload period, the following steps must be carried out -

1. Activate menu item by pressing ENTER
2. Ngara will display current setting
3. Toggle setting using SELECT
4. Confirm selection by pressing ENTER



The Ethernet interface will be powered off in between upload periods

4.8.5 Exit

Return to top menu structure.

To return to the top level menu structure, the following steps must be carried out -

1. Activate menu item by pressing ENTER

4.9 Status and Idle Screen

The idle screen is displayed when the following occurs:

- Through the Show Status menu item, or
- Ngara is idle for more than 120 seconds, or
- A connection to the Remote PC application is found

The screen circulates through current logger information and displays any warnings or errors that may be present.

It is possible to speed up circulation by using the SELECT push-button. It is also possible to exit the idle screen by pressing the ENTER push-button, unless a remote PC connection is found. In this case the HCI Connection screen is displayed.

Not all screens may appear as some screens are skipped if no valid information is present. Details of each screen are shown in Table 20.

Table 20: Status Screens

Name	Description	Example
Version	Current firmware version	Ver: Vxx.x.x
Serial	Unit serial number	Serial: 878xxx
Time and Date	Current time and date	DD/MM hh:mm:ss
Logger State	Current logger state	Standby
USB Session	Current USB Session state	Logging -> USB
Noise Cloud Session	Current NC Session state	Logging -> NC
Session Errors	Current USB Session error	Disk Full
Disk State	Current disk state	Disk Present
Main Battery Status	Current 12V Battery indicator	Main Bat: x.x.x
RTC Battery Status	Current Internal Battery indicator	RTC Bat: OK
Temperature	Current internal temperature	Temp: xx.x C
PCM Mode	Current PCM recording setting	Wav Rec:48kHz
Time Weighting	Current Time Weighting setting	TWeight: FAST
Trigger Status	Trigger configuration	Trigger Enabled
Alarm Status	RTC Alarm configuration	Alarm Clk Enabled
Noise Cloud Status	Last Noise Cloud upload status	NC: OK
Noise Cloud Interval	Next interval time to be uploaded	NC: DD/MM hh:mm
Noise Cloud State	Current Noise Cloud state	NC: Buffering
Noise Cloud Upload	Current Noise Cloud upload period	NC: 15min Cycle

In addition to general status screens, Ngara will also display details of any warning event that may have occurred. Details of these warning screens are shown in Table 21.

Table 21: Ngara Warnings

Name	Description	Example
RTC Battery	Internal battery fault	WARN: RTC Bat
RTC Time	Ngara lost time whilst powered down	WARN: RTC Time
Internal Configuration	Internal configuration failure	WARN: Config
Watchdog Reset	An unrecoverable error occurred and Ngara reset itself	WARN: WD Reset
Slow Drive Found	During a logging session, the time it took for the drive to spin up was longer than that found in the format record file	WARN: Slow Drive
Log Files	Log files were found within the internal memory. Insert valid USB drive and select Flush Logs (Section 4.5.9)	WARN: Log Files
Noise Cloud Buffer	Internal Noise Cloud buffers were found within the internal memory. Provide a valid network connection to initiate push to the server.	NC: Buffer

5 Remote Operation

The Ngara noise logger provides remote interfacing capabilities through the use of specialised software allowing the user to -

- Configure logging parameters
- Configure triggering and alarm parameters
- Start/Stop logging sessions
- Display current configuration information
- Display current logger status and results information
- Carry out disk operation
- Calibrate logger



Loggers running software version 5.00 and above must use host software version 2.1 and above.

5.1 Installation of Host Software

The Remote Host Application can be downloaded from the Acoustic Research Labs website. Simply run the executable installer, clicking **Next** to progress through each configuration option.

An option to **Install** will be provided once all options are set.

The installation should not take any longer than 1 minute.

5.2 Main Screen

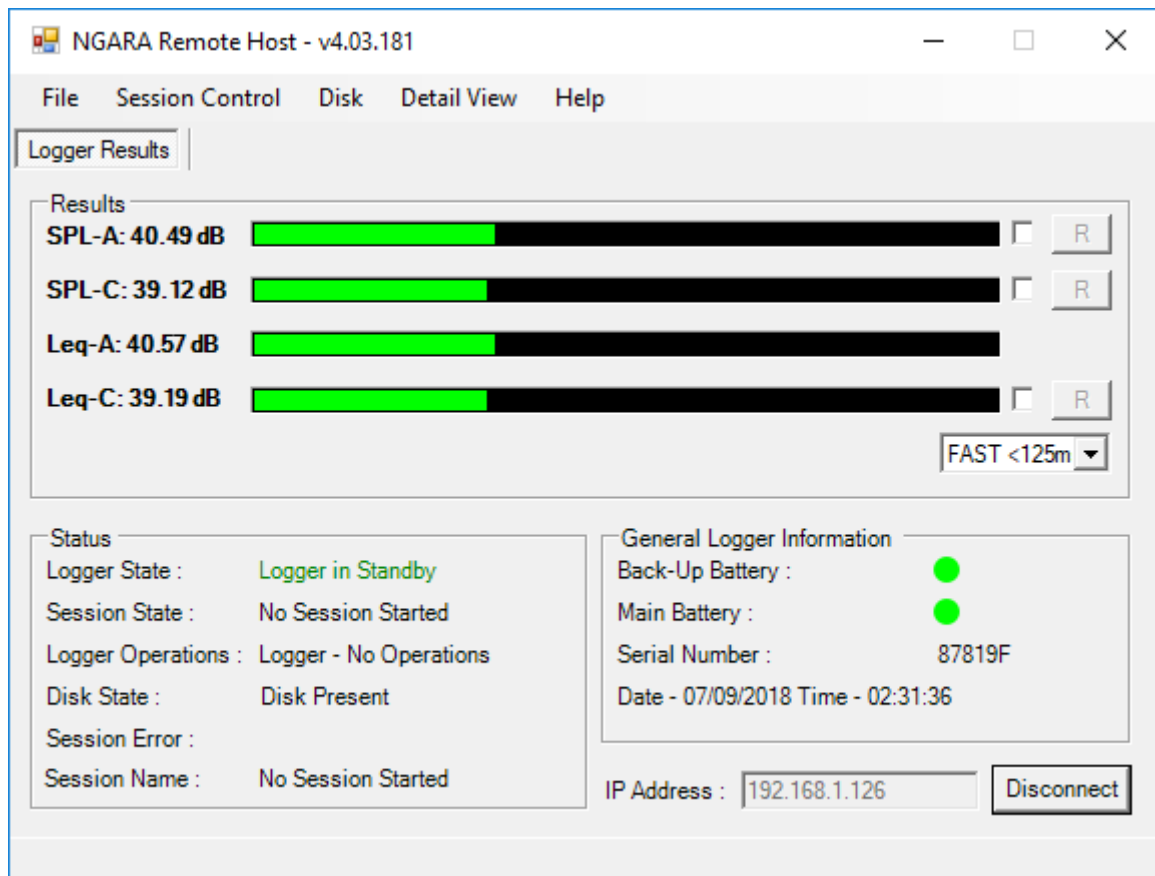


Figure 5: Main Program Window

The main window of the application displays the data Ngara has processed. It also displays any current logger warnings along the bottom status bar.



These warnings cannot be reset.
Please contact Acoustic Research Labs if any warning messages appear.

5.3 Linking to a logger

The software is used to connect to any Ngara that is capable of communication over the Ethernet port. The way this is achieved is highly dependant on the network configuration settings set on the Ngara, see Section 4.4.3.

If the Ngara can be accessed within a local network, and is set to DHCP mode (See Section 4.4.3.2), Ngara may also be accessed using the following address name `ngara-XXXXXX`. Where `XXXXXX` is the unit's serial number. This name is then resolved to an IP address by the DHCP server, thus saving the need to remember IP address numbers.



As there are numerous network configuration options please consult with your local network administrator for proper configuration

This section will assume that a correct network topology has been implemented, and a valid IP address has been assigned.

To link to a Ngara -

1. Enter the loggers IP Address in the IP Address box
2. Press the Link Button
3. A password prompt will appear
4. Enter loggers remote password as previously set in Section 4.4.3.1
5. Connection will be established

To disconnect from a remote logger -

1. Press the Disconnect button, or simply lose the application

5.3.1 The Result Group

Through the results group it is possible to view all of the current results simultaneously.

Through the results group it is also possible to-

- Change current time weighting whilst in standby mode
- Enable maximum hold markers through the tick boxes provided
- Reset the maximum hold markers through the push button provided



The display is updated every 100ms

5.3.2 The Status Group

General logger status messages can be viewed through the status group box.

The status group shows the following information-

- Current Logger State
- Current Session State
- Current Logger Operations
- Current Disk State
- Current Session Error
- Session Name

5.3.3 The General Information Group

The general information group displays current battery states along with date and time of logger, and current logger's serial number.

5.4 Changing Logger Configuration

Logger configuration can be updated by navigating to the following menu item

File -> Logger Configuration -> Change Configuration

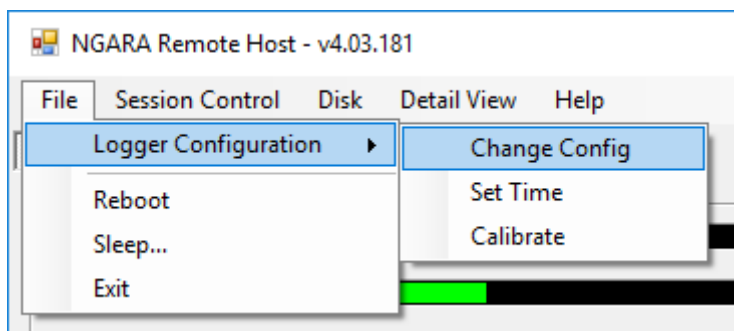


Figure 6: Logger Configuration Menu

5.4.1 General Logger Configuration Tab

Ngara configuration tab allows general configuration changes to be made. Details of each configuration option is listed on Table 22.

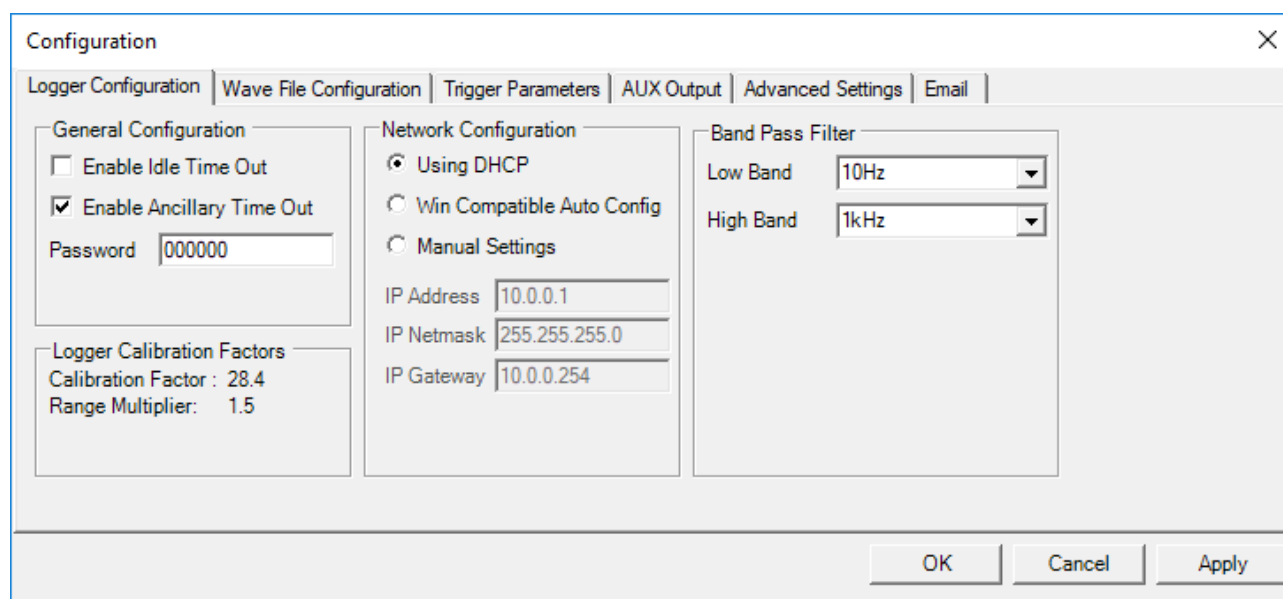


Figure 7: Main Logger Configuration

Table 22: General Logger Configuration

Item	Description
Idle Timeout	Enable or Disable the unit idle timeout setting
Ancillary Timeout	Enable or Disable the unit ancillary timeout setting
Network Configuration	Update all aspects of network configuration options
Band Pass Filter	Update the band edges for the provided band pass filter. This option is only provided when configured for Industrial Noise Monitor mode.

5.4.2 Wave File Configuration Tab

The wave file configuration tab allows the updating of PCM storage. Details of each configuration option is listed in Section 3.1.3.3.2.

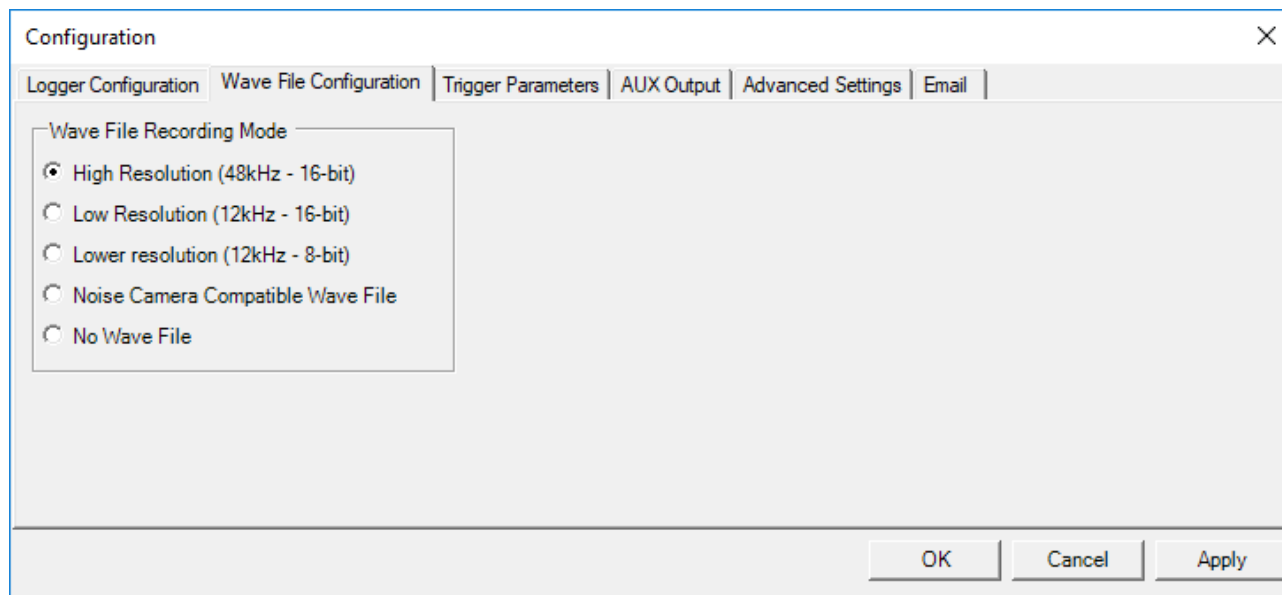


Figure 8: Logger Configuration Menu

5.4.3 Trigger Configuration Tab

PCM data triggering modes can be adjusted through the Trigger Parameters tab.

Triggering can be set as one of the following –

1. At a predetermined SPL or L_{eq} Level
2. Once a predetermined percentile reaches a required level
3. At a predetermined RMS Level (Engine brake analysis)
4. Timer based
5. Remote Push Button

5.4.3.1 Setting an SPL or L_{eq} Level Trigger

The following example illustrates the parameters required to enable a level trigger.

Configuration

Logger Configuration | Wave File Configuration | **Trigger Parameters** | AUX Output | Advanced Settings | Email

☒ Triggering Enabled

Type

☒ SPL-A Duration ☐ LEQ-A Duration ☐ SPL-A Percentile ☐ LEQ-A Percentile

☐ SPL-C Duration ☐ LEQ-C Duration ☐ SPL-C Percentile ☐ LEQ-C Percentile

☐ RMS Detection ☐ Timer ☐ Remote Switch

Parameters

Level (SPL) : Record Pre-Trigger (s) :

ON Period (s) : Record Post-Trigger (s) :

OFF Period (s) :

OK Cancel Apply

Figure 9: Level trigger example

In the above example a level of 60dB-A must be reached for 5 seconds before triggering is asserted. When trigger is set, 30 seconds of internal buffered data is recorded.

The trigger is reset when the level falls below 60dB-A for more than 5 seconds. Once reset Ngara records a further 20 seconds of raw data.

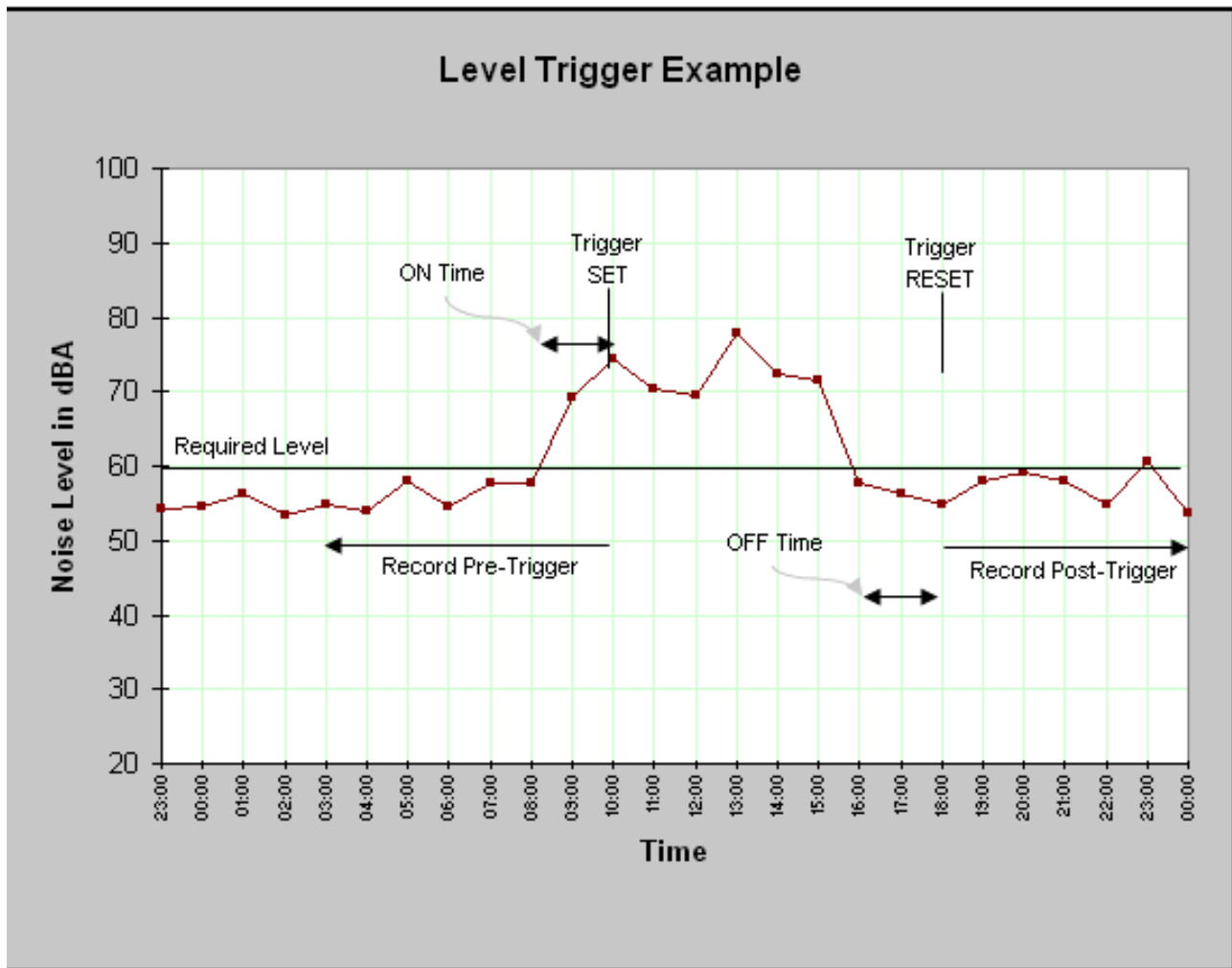


Figure 10: Level trigger example

5.4.3.2 Setting an SPL or L_{eq} Percentile Trigger

Ngara can be set to continually monitor the current percentile levels over a given time period.

Configuration

Logger Configuration | Wave File Configuration | Trigger Parameters | AUX Output | Advanced Settings | Email

☒ Triggering Enabled

Type

☐ SPL-A Duration ☐ LEQ-A Duration ☒ SPL-A Percentile ☐ LEQ-A Percentile

☐ SPL-C Duration ☐ LEQ-C Duration ☐ SPL-C Percentile ☐ LEQ-C Percentile

☐ RMS Detection ☐ Timer ☐ Remote Switch

Parameters

Level (SPL) : 60 Record Pre-Trigger (s) : 30

Req Ln (%) : 95 Record Post-Trigger (s) : 20

Stats Duration (min) : 5

OK Cancel Apply

Figure 11: Percentile Trigger Example

In the above example a level of 60dB-A must be reached within L_{95} . This percentile is calculated over a 5 minute period. This period can only be set to a **maximum** of 5 minute blocks.

When trigger is set, 30 seconds of internal buffered data is recorded. This buffer can be set to a maximum of 480seconds (8 minutes)

Once the L_{95} falls below 60dB-A, Ngara records a further 20 seconds of raw data.

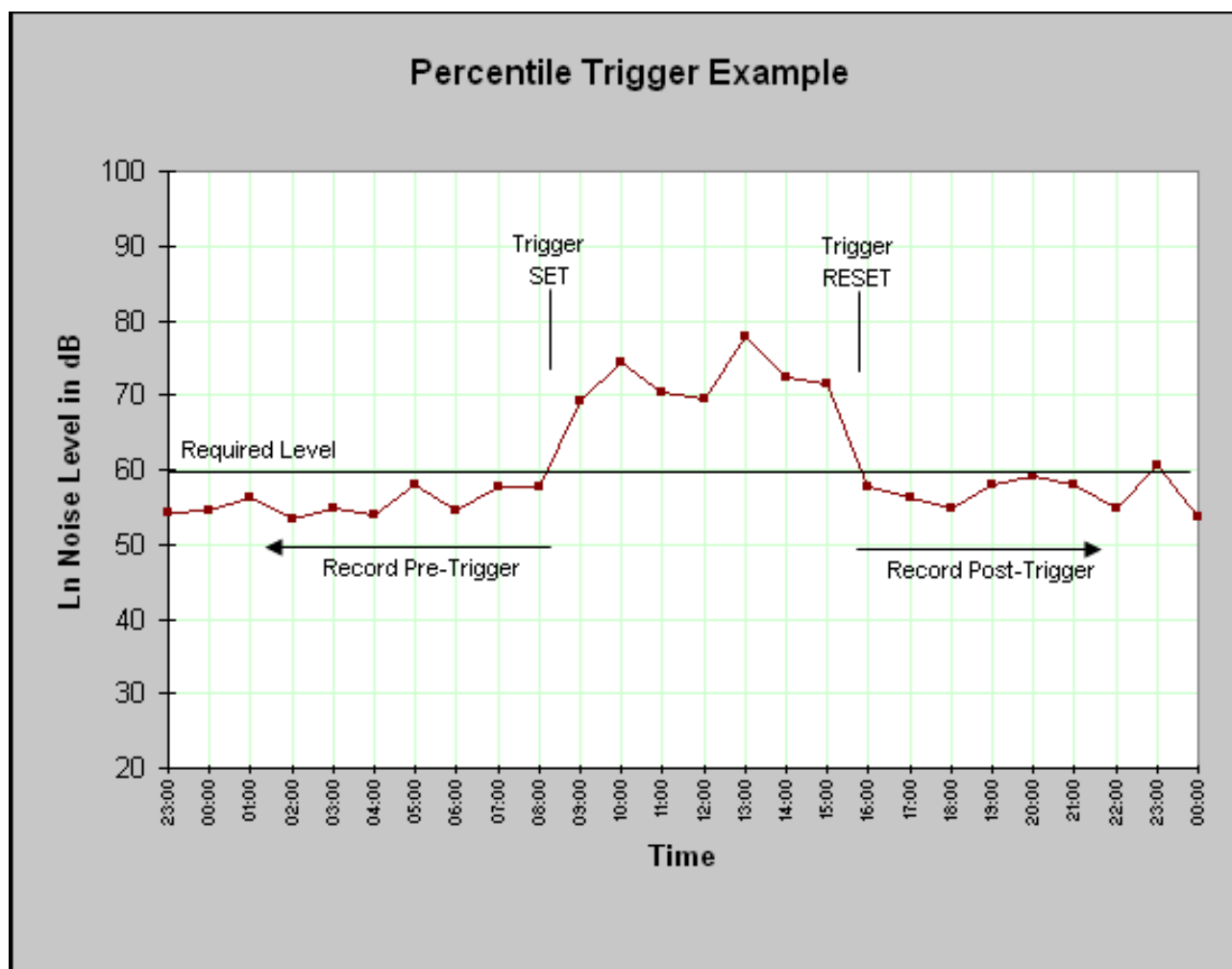


Figure 12: Percentile Trigger Example

5.4.3.3 Setting an RMS Trigger (For Engine Brake Analysis)

The following example illustrates to set an engine brake trigger.

Configuration

Logger Configuration | Wave File Configuration | **Trigger Parameters** | AUX Output | Advanced Settings | Email

☒ Triggering Enabled

Type

☐ SPL-A Duration ☐ LEQ-A Duration ☐ SPL-A Percentile ☐ LEQ-A Percentile
☐ SPL-C Duration ☐ LEQ-C Duration ☐ SPL-C Percentile ☐ LEQ-C Percentile
☒ RMS Detection ☐ Timer ☐ Remote Switch

Parameters

RMS Level : Record Pre-Trigger (s) :
 Record Post-Trigger (s) :

OK Cancel Apply

Figure 13: RMS Trigger Example

In this example, Ngara will set a trigger event as soon as the RMS is greater than 3.12. It will then record 7 seconds of internal buffered data, followed by 8 seconds of raw data after the trigger event.

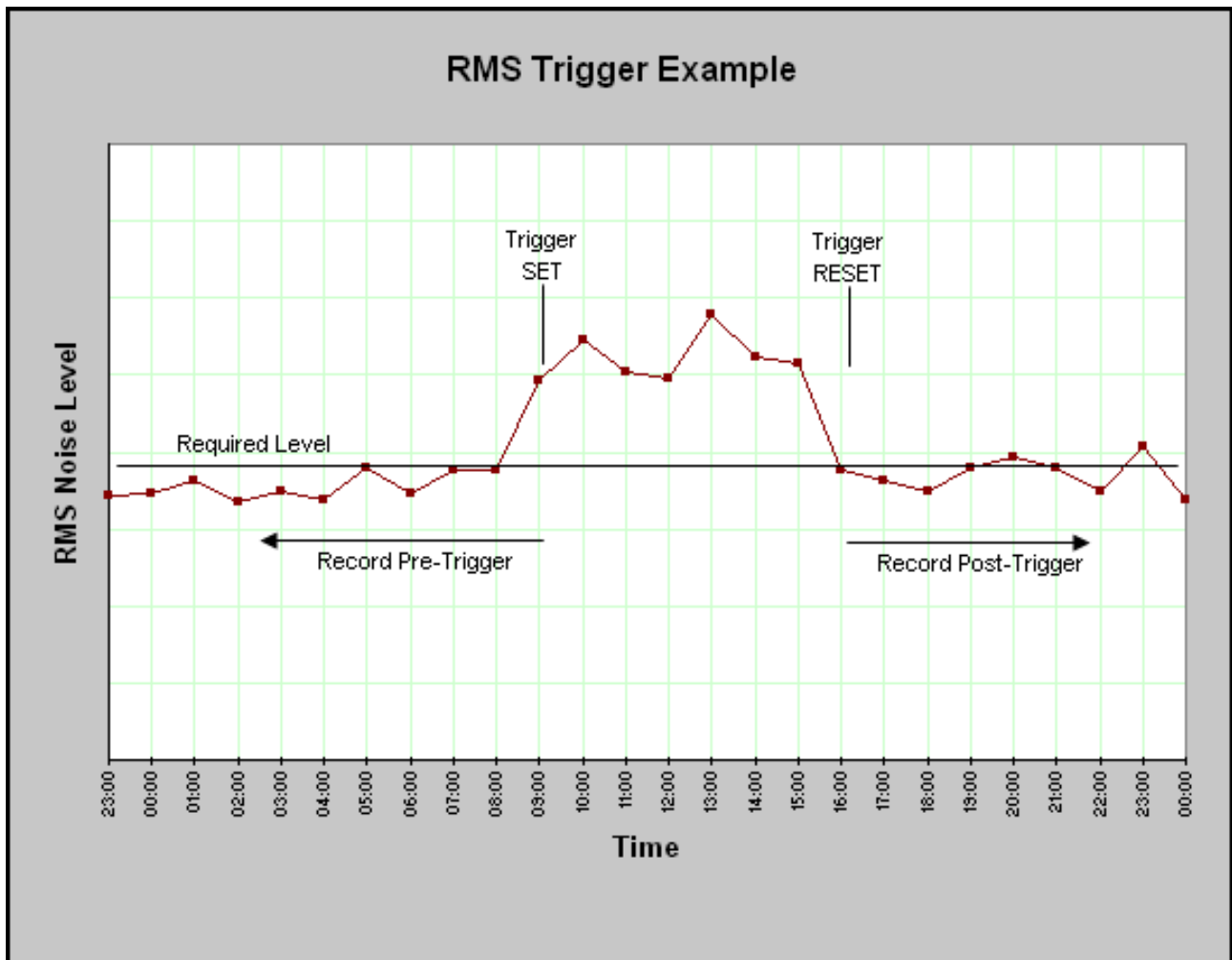


Figure 14: RMS Trigger Example

5.4.3.4 Setting a Time Based Trigger

The following example illustrates how to set time based wave file recording.

The screenshot shows the 'Configuration' dialog box with the 'Trigger Parameters' tab selected. The 'Triggering Enabled' checkbox is checked. Under the 'Type' section, the 'Timer' radio button is selected. The 'Parameters' section shows 'Recurrence' set to 'Hourly', 'Start Time' set to 05:00, and 'End Time' set to 08:00. The 'OK', 'Cancel', and 'Apply' buttons are at the bottom right.

Figure 15: Timer Based Trigger Example

The timer module can be set to repeat on an hourly or daily basis.

Ngara will trigger and record a wave file for the configured time period.

5.4.3.5 Setting a Remote Push Button Trigger

The following example illustrates how to set a remote push button trigger wave file recording.

The screenshot shows the 'Configuration' dialog box with the 'Trigger Parameters' tab selected. The 'Triggering Enabled' checkbox is checked. Under the 'Type' section, the 'Remote Switch' radio button is selected. The 'Parameters' section shows 'Record Pre-Trigger (s)' set to 7 and 'Record Post-Trigger (s)' set to 8. The 'OK', 'Cancel', and 'Apply' buttons are at the bottom right.

Figure 16: Push Button Trigger Example

Ngara will trigger and record a wave file for the pre and post time periods once it detects a push button trigger event.



This requires an internal modification for Silver (V1) Ngara and cannot be used at the same time as the AUX output

5.4.4 Alarm Clock Tab

Ngara is capable of setting an alarm clock that may be implemented to conserve battery power.

It can be set up to power itself on, log for a certain time period, and turn itself off. The settings for the logging session may be set up using any of the previous tabs.

It can also be set up to control the power to its Ethernet port to conserve battery whilst logging (Power Ethernet).

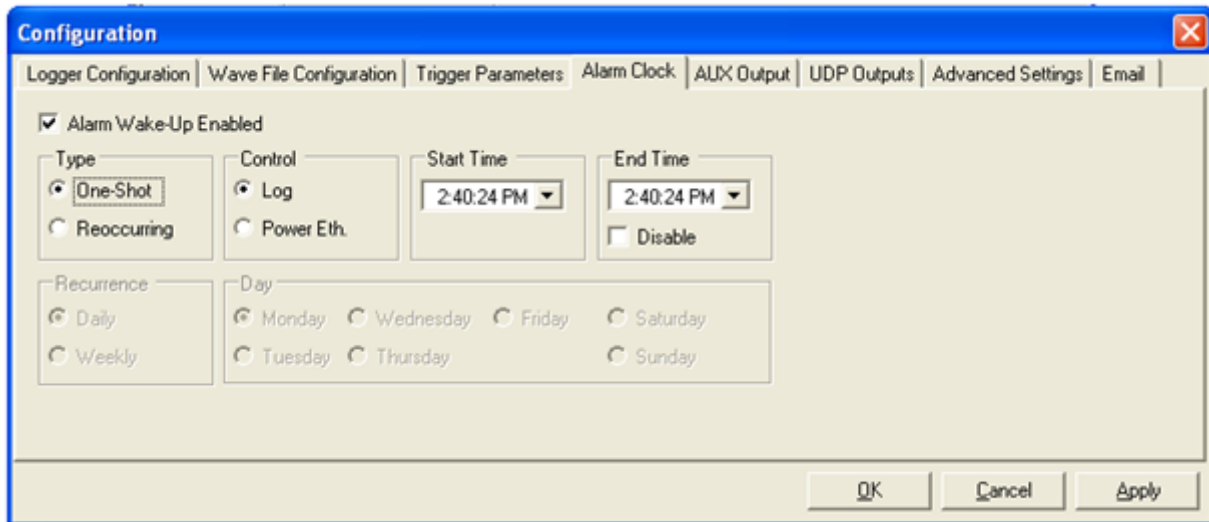


Figure 17: Alarm Clock Trigger Example

As an example:

The Ethernet interface would normally be off whilst logging to conserve battery, but it would turn on daily at 4:00pm for one hour to allow for remote interrogation.



This feature is not available when operating in Industrial Noise Monitor mode as it will default to the Keep Alive configuration

5.4.5 AUX Output Tab

Ngara is capable of supplying 12V DC @ 1A to power external devices.

The output can be set up in a very similar fashion to the wave file triggers (Section 5.4.3)

It can also be set up to follow the alarm clock, when the alarm clock is used to control power to the Ethernet port. This allows the 12V DC output to be used to control power to an external 3G modem.

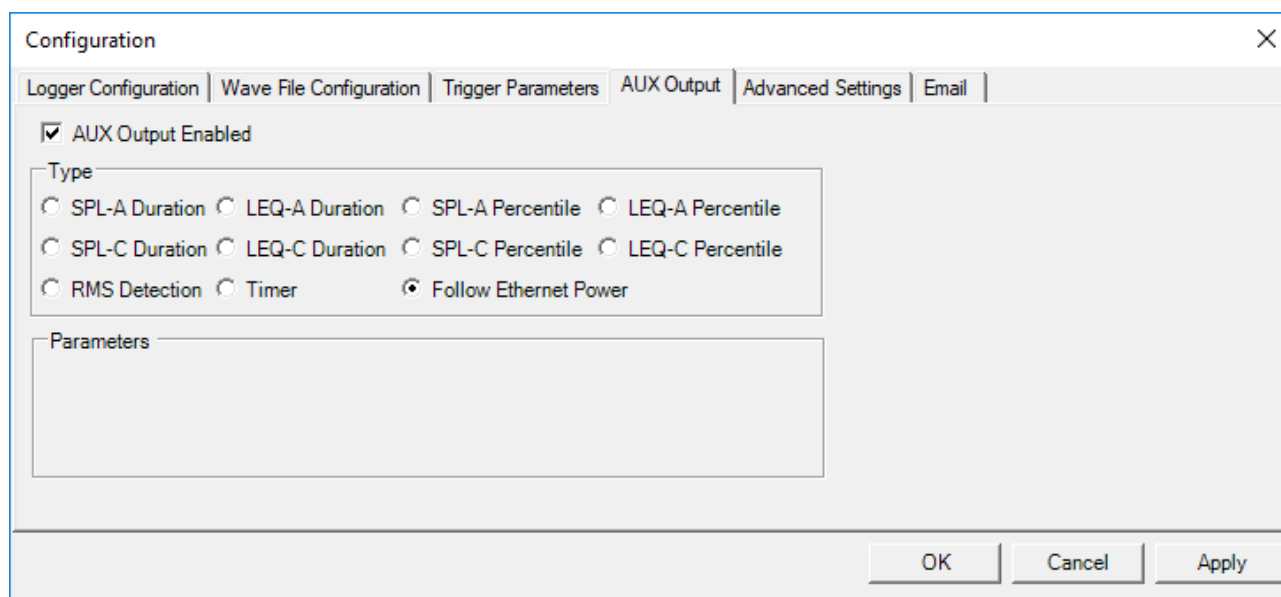


Figure 18: Power Output Trigger Example

As an example:

The Ethernet interface would normally be off whilst logging to conserve battery, but it would turn on daily at 4:00pm for one hour via the alarm clock interface. When the Ethernet interface is turned on, 12V DC is also supplied to the 3G modem via the AUX output.



This setting is locked to Follow Ethernet Power when Logging to Noise Cloud

5.4.6 UDP Output Tab

Ngara is capable of sending results information to listeners via User Datagram Protocol(UDP).

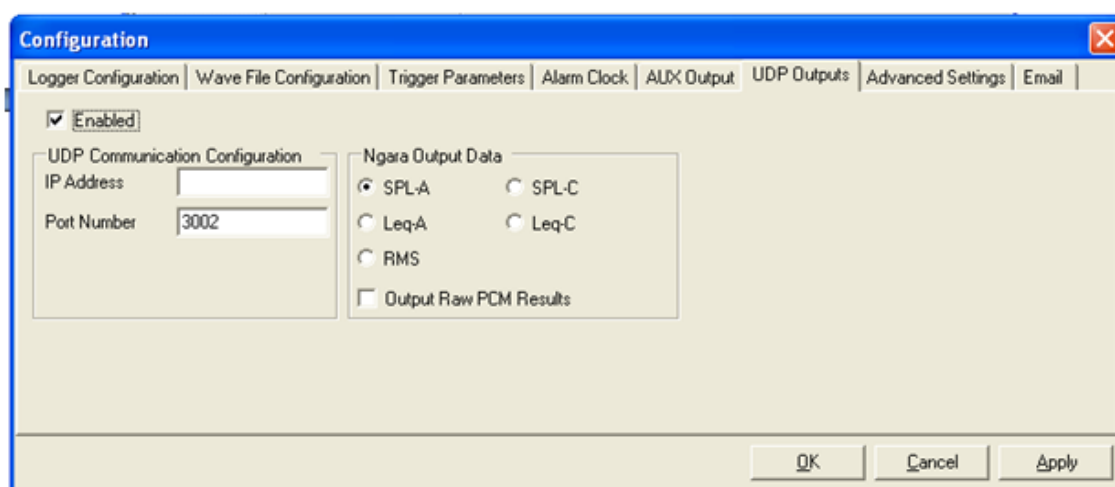


Figure 19: UDP Output Configuration

The IP address and port number is the “SEND TO” address that the Ngara unit will channel the information into.



Using IP address “255.255.255.255” will cause Ngara to send broadcast messages to all network devices

The output data can only be set to only **one** of the 5 results that Ngara calculates, along with the optional raw data sample values.

The raw data sample values sent will match the configuration set in the wave file configuration tab (Section 5.4.2), thus may not always be 48 kHz.



Whilst the output of raw data is enabled, a session cannot be started as Ngara will not have enough processing power to write the raw sample values to both USB and Ethernet.

Please contact Acoustic Research Labs for UDP message structures.



This feature is not available when operating in Industrial Noise Monitor mode

5.4.7 Advanced Configuration Options



Some of these configuration options are DEPRECATED and may be removed in future firmware releases

Advanced configuration options include-

- Simple Network Time Protocol (SNTP)² – **DEPRECATED**

When Ngara is connected to the internet, it can synchronise its clock with an external time server. This option must be used with extreme care as very large time changes during a logging session may result in some loss of data. ARL recommend using this setting only when Ngara is configured in a non-logging configuration, for example, when Ngara is used solely to relay results via UDP.

Secondary server address may be left blank if not required.



v7.06 onwards, Ngara supports variable SNTP refresh rates. These are set to pre determined values using a provided sliding bar.

- Remote Server Logon³ – **DEPRECATED**

Address of remote virtual private network server and authentication credentials.

- File Transfer Protocol Setup (FTP)

Ngara can share the contents of the USB drive operating as a FTP server. The server is only operational whilst in standby mode as this ensures the drive remains ON and disk access is restricted to only FTP operations.

Restrictions-

- Usernames and passwords may only contain numbers and letters
- The FTP server was written to be compatible with the freely available “FileZilla” client



These configuration options are not available when operating in Industrial Noise Monitor mode

²System time updates during a continuous logging session to Noise Cloud may prove problematic.

³Noise Cloud preferred over VPN connection.

5.4.8 Noise Cloud Configuration

Figure 20: Noise Cloud Configuration Options

Noise Cloud configuration consists of setting the following -

Item	Description
Location	This is the name the data will be tagged with on Noise Cloud
Write Key	This is the API access into the Noise Cloud server
Frequency Weighting	Frequency weighting of results to use
Percentiles	All L_N that will be pushed to Noise Cloud

5.4.9 Email Tab

Ngara email tab allows users to set L_{eq} and L_N levels which will trigger an event email., The email will detail the time at which the given level was reached and at what level. Up to 5 email addresses can be listed.

The screenshot shows the 'Configuration' window with the 'Email' tab selected. The 'Enable' checkbox is checked. Under 'Alarm Settings', 'Frequency Weight' is set to 'A', 'Bandwidth' has 'AP' and 'BP' checked, 'Interval' is 5 min, and 'Ln' levels are set to 90% (Level 60), 10% (Level 50), and 'Leq' is checked (Level 65). 'Server Settings' include 'SMTP Server' (mail.acousticresearch.com), 'From Email' (ngara@noisecloud.com.au), and five 'To Email' fields. 'Descriptive Text' has 'Enable' checked and the text 'INM Mode - BP and AP' and 'Email alerts from Ngara'.

Figure 21: Email Alert Configuration

From firmware V12.1 Ngara now has access to email servers hosted by Acoustic Research Labs, as such, server and from fields are not accessible.

5.5 Logger Time

Logger time can be updated by navigating to the following menu item.

File -> Logger Configuration -> Set Time

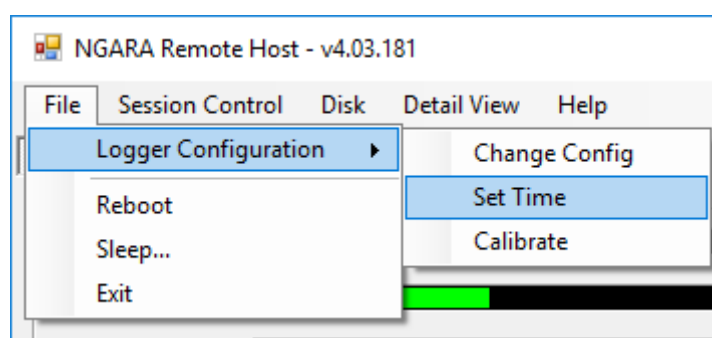


Figure 22: Set Time Menu

All settings are stored in internal memory and are remembered during power cycles.

Logger date and time, along with current logger GMT time zone information can be updated.

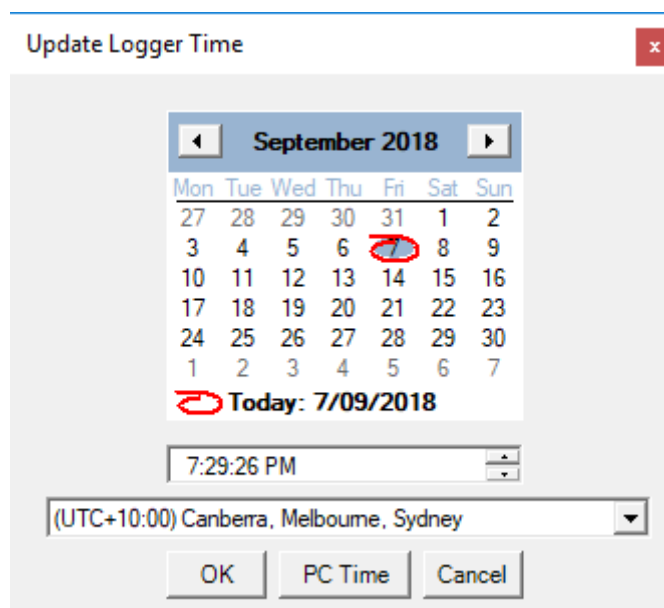


Figure 23: Set Time Configuration

The date, time and timezone information can be entered manually, alternatively, the PC Time button provided can be used. This will set the current date, time and timezone information to match that of the controlling PC.

5.6 System Calibration

Internal calibration factors can be updated by navigating to the following menu item

File -> Logger Configuration -> Calibrate

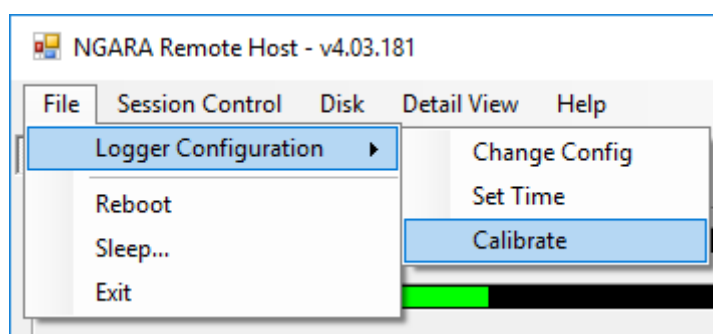


Figure 24: System Calibration Menu

All settings are stored in internal memory and are applied during power cycles.

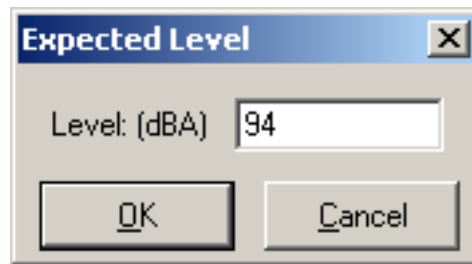


Figure 25: System Calibration Option

After applying a $1kHz$ reference level, enter in the expected reading (in dB) and the logger will perform a system calibration.



A steady signal must first be detected before the OK button is enabled

5.7 Logger Reboot

For logger versions $V7.06$ and later, it is possible to remotely reboot the Ngara by navigating to the following menu item

File -> Reboot...

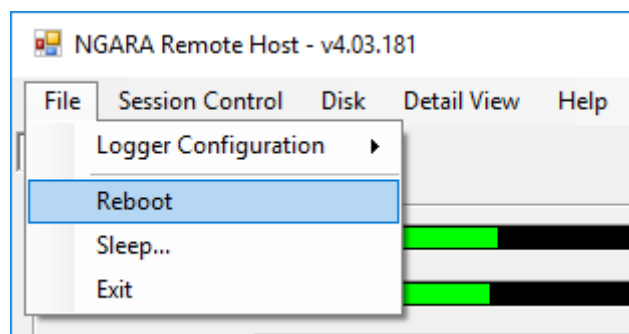


Figure 26: Logger Reboot



Ngara waits for any running USB and Noise Cloud operations to stop before rebooting

5.8 Logger Shutdown

The logger can be forced to power down by navigating to the following menu item.

File -> Sleep...

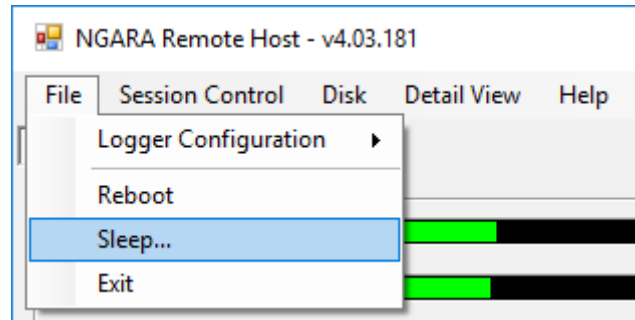


Figure 27: Logger Sleep



Ngara waits for any running USB and Noise Cloud operations to stop before shutting down

5.9 Logger Control

Main logger control is achieved through the Session Control menu item.

Through this menu item it is possible to do any one of the following

- Start a logging session
- Stop a logging session
- Record reference levels
- Flush current internal buffers to disk

5.9.1 Starting Session

The logger can be set to start a session by navigating to the following menu item

Session Control -> Start

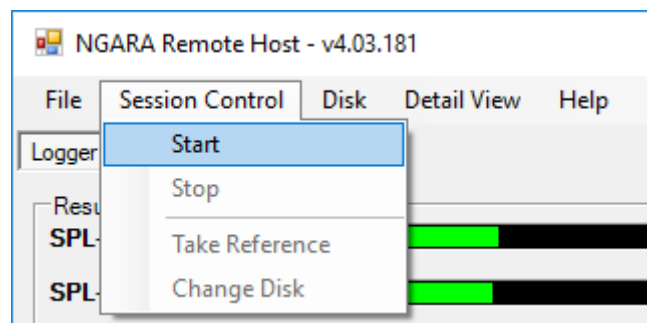


Figure 28: Starting a Session

A new window will pop up, allowing the new session to be named. Current logger configuration can be viewed and/or changed by clicking on the Update Configuration button.

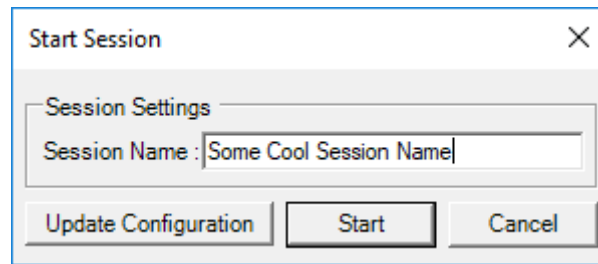


Figure 29: Session Configuration

Indication of the start session command can be viewed through the logger's status information group described in Section 5.3.2.

5.9.2 Stopping a Session

The logger can be set to stop a session by navigating to the following menu item.

Session Control -> Stop

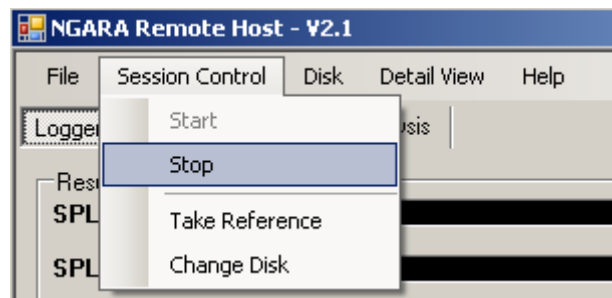


Figure 30: Stopping a Session

Indication of the stop session command can be viewed through the logger's status information group described in Section 5.3.2.



The internal buffers must be flushed before Ngara returns back to the standby state

5.9.3 Taking a Reference Level

Reference levels can be recorded to the log file by navigating to the following menu item

Session Control -> Take Reference

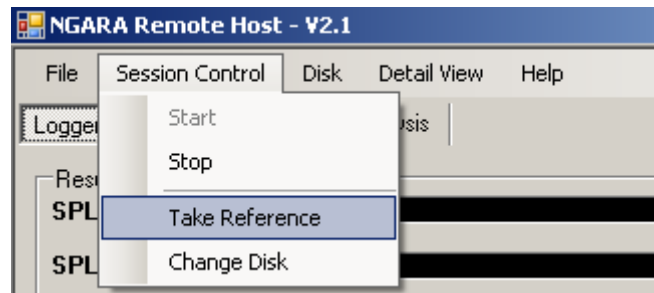


Figure 31: Reference Level

A secondary window will pop up giving the user a chance to confirm or re-take the reference level.

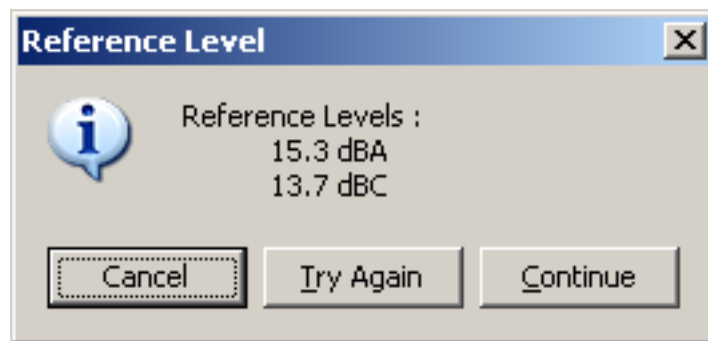


Figure 32: Reference Level Confirmation



Ngara does not prompt the user to take a reference level at any stage of the logging session. Ngara is capable of storing many reference levels throughout the course of a running session.

5.9.4 Changing Disk

Internal buffers can be flushed ready for a disk swap over by navigating to the following menu item.

Session Control -> Change Disk

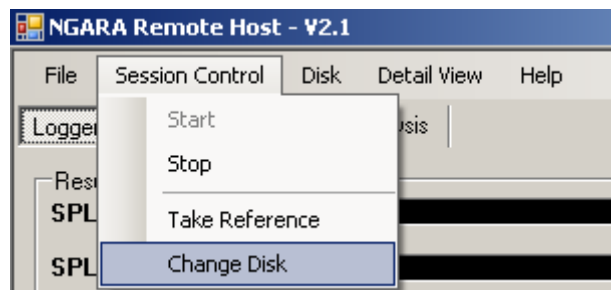


Figure 33: Disk Swap

A window will pop up giving the user an indication when the disk is ready to be swapped.

5.10 Disk Operations

Main data storage functions can be found under the disk menu item.

Through this menu item it is possible to do any one of the following

- Get current storage media detailed information—capacities shown in days
- Download session data
- Format current disk
- Perform statistical analysis on 100ms session date
- Re-constitute Wave Files
- Re-Format Ngara Drive

5.10.1 Detail Storage Media View

A detailed view of the current USB storage device can be seen by navigating to the following menu item

Disk -> Get Detail Info

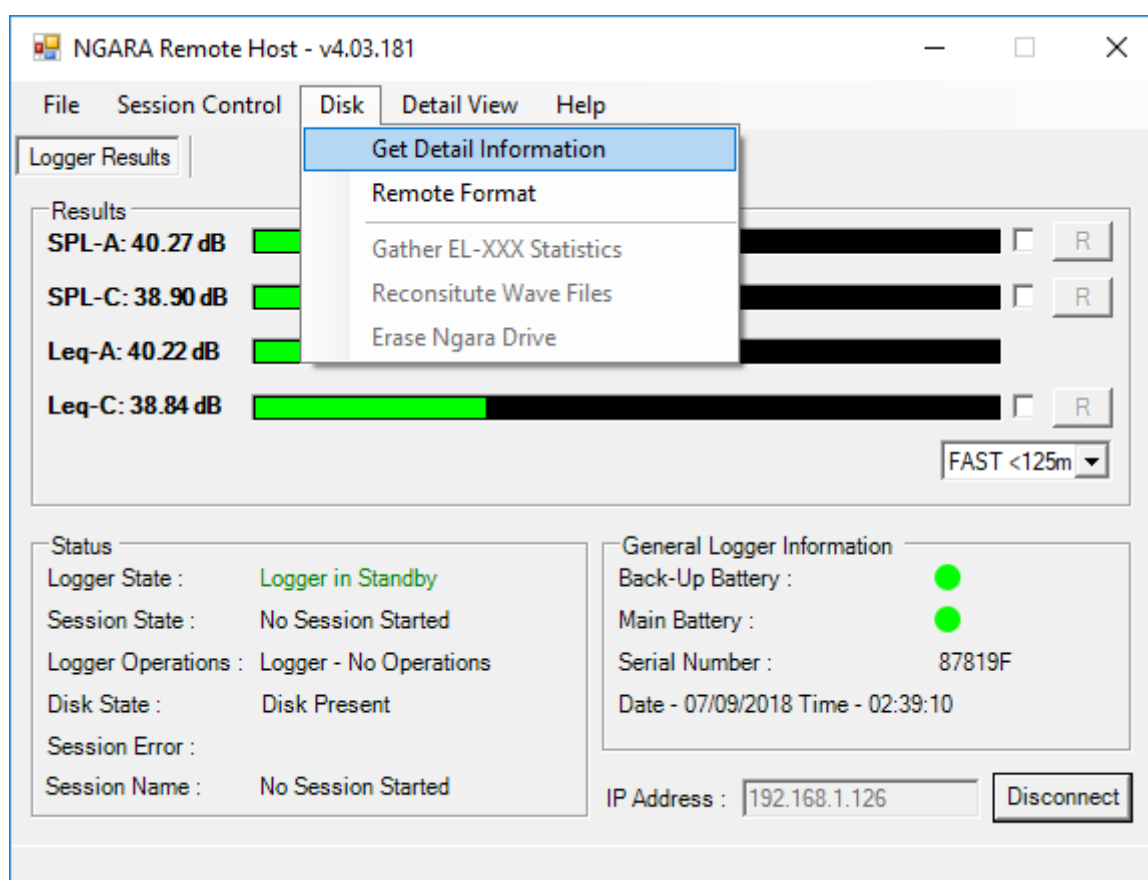


Figure 34: Disk Detail

A detail window will pop up with details on current inserted USB device.

5.10.2 Downloading session Data

Session data can be downloaded via the Ethernet interface by navigating to the following menu item

Disk -> Download Session Stats

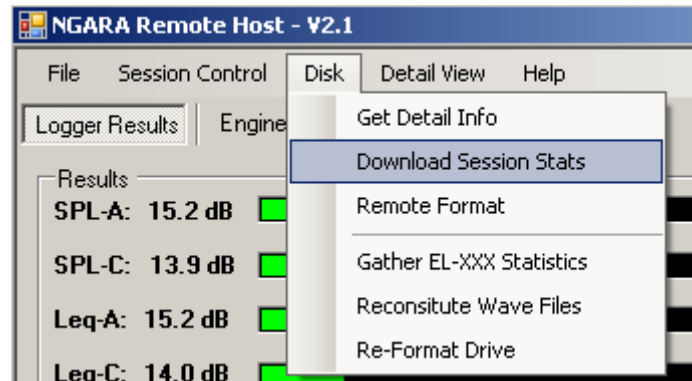


Figure 35: Download Statistics

Only the CSV files can be downloaded using the remote user interface, as the downloading of raw audio files would create excessive network traffic.



This feature is not available when operating in Industrial Noise Monitor mode

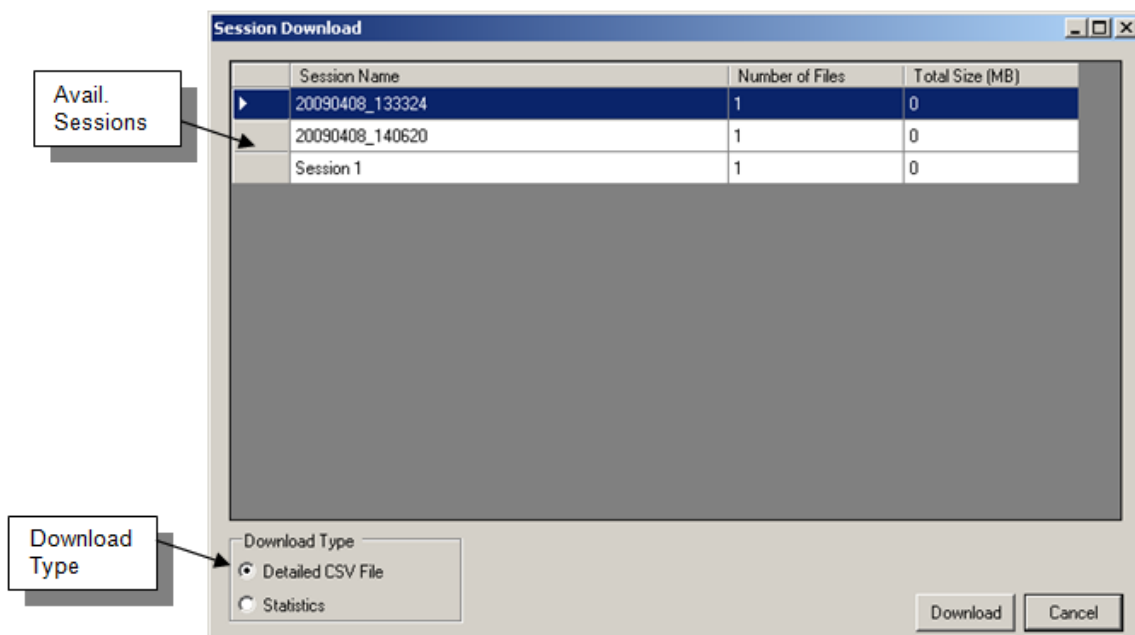


Figure 36: Statistics Configuration

The data can be downloaded in two formats

1. A detailed CSV file

This includes 100ms SPL and L_{eq} samples for both A and C weighting and is a mirror download of what is found on the USB storage device.

2. Direct Statistics

The Ngara logger works out required statistics before sending data through network (greatly reduces network traffic)



Due to the large amount of data stored, it is highly recommended to directly browse the stored sessions on the USB storage device by using a spare USB port on your PC

5.10.3 Remotely Formatting a USB Drive

A USB device which is attached to Ngara may be formatted by navigating to the following menu item

Disk -> Remote Format

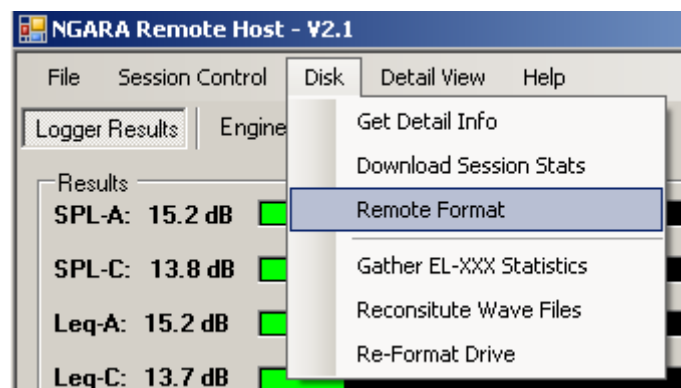


Figure 37: Remote Disk Format

5.10.4 Performing Statistical Analysis

A Ngara session directory (100ms CSV files) can be converted to a statistical representation of the data by navigating to the following menu item

Disk -> Gather EL-XXX Statistics

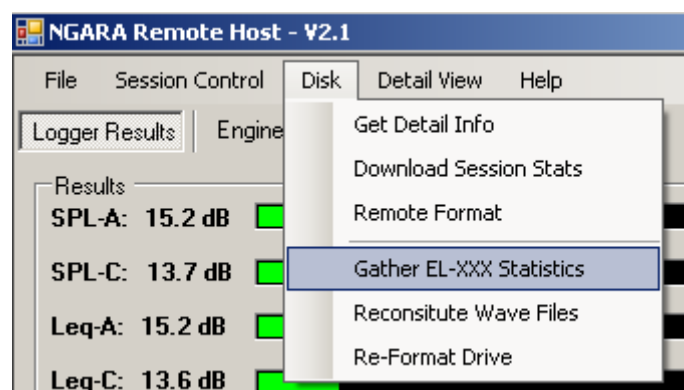


Figure 38: USB Statistics

Statistical analysis is performed on an entire logging session that can be found locally on the host computer. This can be either after a detailed download, or by browsing the contents of the USB disk used to record the session.

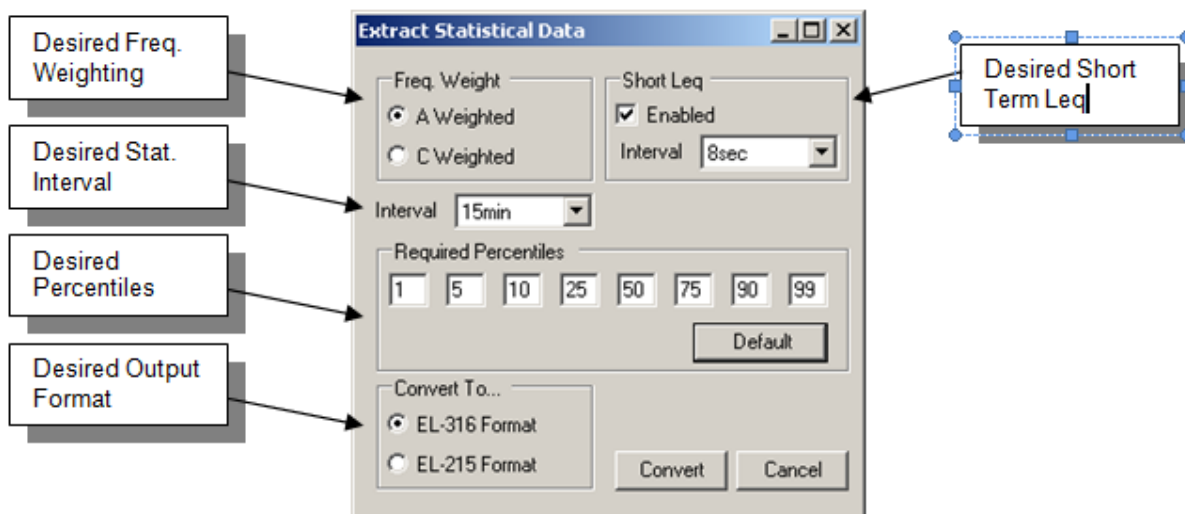


Figure 39: Statistics Configuration

5.10.5 Re-constitution of wave file data

A Ngara session directory containing both CSV and PCM data can be scanned, with all range switching removed from PCM files.

Disk -> Reconstitute Wave Files

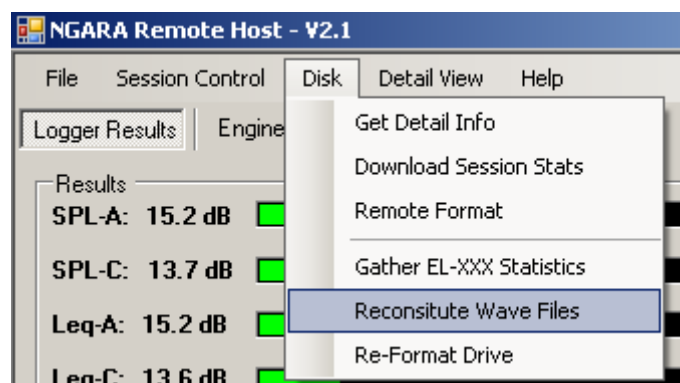


Figure 40: PCM Reconstitution

The recorded 48kHz wave files are linear from the noise floor of the instrument to approximately 97dB @ 1kHz . From 97dB to 120dB the gain has been reduced to allow 100dB of dynamic range within 16-bits.

In order to see the full dynamic range within the wave file, the user is required to reconstitute each wave file. This involves the conversion of each sample into 32 bit values.

Calibration factors are used from the stored data to reconstitute the 48kHz file to 32-bits, allowing for a linear 100dB dynamic range.

WinAmp is recommended for playback of the 32-bit wave files, as this is the only player that can handle 32-bit floating point samples that are greater than ± 1.0 .



The entire session folder must be provided as the software will look for calibration factors during range removal



There is currently no way to normalise samples to the required ± 1.0 levels when samples span multiple files, whilst still maintaining calibration

5.10.6 Reformatting a USB Device

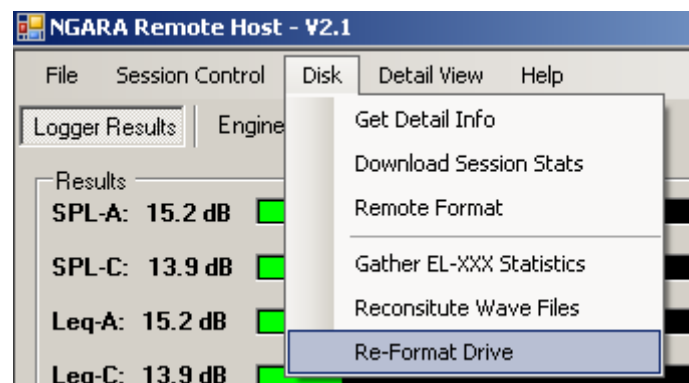


Figure 41: USB Reformat

A drive which has been previously formatted by a Ngara can be re-formatted using a PC.

This clears all data on the drive and updates the drive format information file.



A drive must always be first formatted using Ngara.
Ngara determines specific drive spin up times which cannot be determined from a PC.

6 Network Configuration Options

Remote connection to Ngara is achieved through the device's Ethernet port. Care must be taken to ensure Ngara has not disabled the network connection interface before attempting to connect to the device. This can be easily checked by visually inspecting the lights provided on the Ethernet connector once a physical connection to a network has been established.

In the event the Ethernet interface is disabled, it can be re-enabled by disabling the ancillary timeout delay (Refer to Section 4.4.2) or by pushing the wake-up button.

The following sections cover only some of the allowable configurations. Due to the vast number of different network configurations possible, not all possibilities have been covered.



Consult with your network administrator for details on any existing network, and the options available for adding an additional device to the network.

6.1 Communication

Ngara uses the port(s) shown on Table 24 for communication.

Table 24: Network Port Usage

Port	Description	IN	OUT
25	Email communication	No	Yes
21	FTP Server	Yes	On Established
80	Noise Cloud	No	Yes
3000	Remote Host	Yes	On Established
3001	Remote Host Download	Yes	On Established

6.2 Connection to PC

Ngara can be connected directly to a free Ethernet port on a modern desktop PC.

When using this method of connectivity, the suggested configuration options are shown in Table 25.

Table 25: Direct Connection Settings

System	IP Setting
Ngara	Set to Auto IP mode. See Section 4.4.3.2.
Desktop PC	Set to auto configure.

Linking to Ngara is then achieved by entering the IP address allocated to the unit. The address allocated by Ngara can be viewed through the LCD, refer to Section 4.4.3.3. See Section 5.3 for details on using the Remote Host application to link to a Ngara.



Contact your network administrator to ensure the Windows Auto-IP configuration utility is enabled.

6.3 Connection to a Network

Ngara can be connected directly to a free Ethernet port on a Local Area Network (LAN). This is the preferred connection method.

Special care must be taken in setting up the network settings on Ngara to ensure there are no conflicts with other devices on the network. The simplest way to achieve this is to set Ngara to DHCP IP mode. See Section 4.4.3.2.

When using this method of connectivity, the suggested configuration options are show in Table 26.

Table 26: Direct Connection Settings

System	IP Setting
Ngara	Set to DHCP mode. See Section 4.4.3.2.
Desktop PC	No configuration changes required

Linking to Ngara is then achieved by entering the IP address allocated to the unit. The address allocated by Ngara can be viewed through the LCD, refer to Section 4.4.3.3. See Section 5.3 for details on using the Remote Host application to link to a Ngara.

6.4 Connection to 3G/4G

Ngara can be connected to a modem, providing communication over 3G or 4G.

Special care must be taken in setting up the network settings on Ngara to ensure there are no conflicts with other devices on the network. The simplest way to achieve this is to set Ngara to DHCP IP mode. See Section 4.4.3.2.

When powered from a battery source, the 3G modem will be required to use the Ngara AUX output connector. This will ensure the modem can be powered **off** in the event that the battery voltage drops to critical levels.

When using this method of connectivity, the suggested configuration options are show in Table 27.

Table 27: Direct Connection Settings

System	IP Setting
Ngara Modem	Set to DHCP mode. See Section 4.4.3.2. DHCP Enabled, address assigned by MAC, interrogation allowable via telnet to a preconfigured ngara user, and port forwarding configured as per details in Section 6.1.

Linking to Ngara is then achieved by entering the IP address allocated to the modem.

There are a number of different ways to determine this IP address, either through a third party dynamic name resolution service, or by using a static IP address. In both instances it is imperative that the SIM card provided is capable of obtaining a **public** IP address⁴. If connection to Ngara is **not** required, in the case of Noise Cloud only, there is no requirement to obtain a **public** IP address⁵.

The local IP address provided to Ngara by the modem must also remain constant to ensure the configured port forwarding rules remain valid.

Additional settings must also be provided to the modem to ensure that each Ngara is capable of interrogating current status over a standard telnet session.

⁴When using Telstra SIM cards, access to their extranet network must be granted.

⁵Ngara will not be accessible using the Remote Host in this configuration.



As there are many configuration options to consider, Acoustic Research Labs can provide modems with options set using tried and tested stable modem configuration files. These will ensure all configuration requirements are met.

It is also a requirement that all remote 3G/4G Ngara systems be fully operation **before** they are provided to you.

This ensures all systems, including SIM cards, are tested using both the Acoustic Research Labs network and your network.

7 Reference Specifications

7.1 Applicable Standards

- IEC 61672:2006 (Class 1)
- AS / NZS CISPR 22:2006 (Class A)

7.2 Acoustic Reference Conditions

Reference acoustic values are given in Table 28.

Table 28: Acoustic Reference

Description	Value
Level	94dB
Frequency	1kHz
Direction	Along centre axis of microphone/preamplifier
Linear Operating Range	25 to 120dB(A/C)
Acoustic Noise Floor	20dB(A) typically
Electrical Noise Floor	20dB(A) typically

Note that the **94dB** Sound Pressure Level is also to be used as the starting level for all linearity tests.

7.3 Environmental Reference Conditions

Reference environmental conditions are given in Table 29.

Table 29: Reference Environmental Conditions

Description	Value
Air Temperature	23°C
Static Pressure	101.325 kPa
Relative Humidity	50%
Settling Time	10 seconds



A minimum of 5 minutes should be provided for stabilisation after changes to environmental conditions

7.4 Adjustments to Indicated Levels

Calibration is performed using the Remote Host software (Section 5.6) or via the on-board push button interface (Section 4.4.5).

Recommended calibration components –

- Acoustic Calibrator – NC-74

Using the above calibrator a reference tone at 94dB (A) is equal to 94.00dB (A) as seen by Ngara.

7.5 Extreme Inputs

Table 30: Maximum Allowable Input Values

Description	Value
Maximum Acoustic Input	125dB
Maximum Electrical Input	$\sim 11V_{pp}$
Minimum Supply Voltage	10.8V
Maximum Supply Voltage	14V

7.6 Nominal A-Weighted Sound Levels

Table 31: Nominal A Weighted Response

Frequency (Hz)	Ideal (dB)	Ngara (dB)	Difference (dB)	Tolerance (dB)
31.5	-39.4	-39.7	-0.3	± 2.0
1 000	0.0	0.0	0.0	± 1.1
4 000	+1.0	+1.1	+0.1	± 1.6
8 000	-1.1	-0.9	-0.2	+2.1 to -3.1
12 500	-4.3	-6.4	-2.1	+3.0 to -6.0

7.7 Microphone

7.7.1 Frequency Response

The frequency response of a sound field microphone is expressed as the frequency response in the reference direction of incidence (0°). Figure 42 shows an example for the frequency response of a UC-53A microphone.

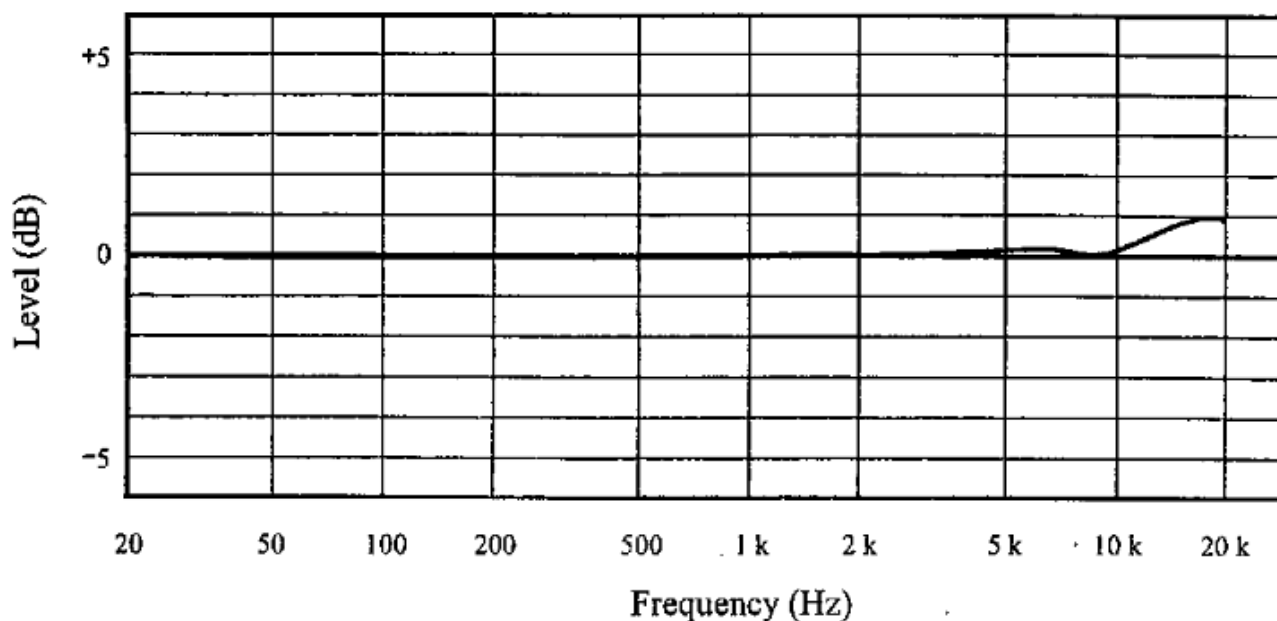


Figure 42: UC-53A Frequency Response

7.7.2 Directional Response

The directional characteristic of a microphone is a measure of its differing sensitivity for sound waves arriving from various angles. Since the pre-polarised condenser microphone used in Ngara is a pressure sensitive type, it should be equal in all directions. However, refraction and cavity effects cause a certain microphone directional response at high frequencies.

Figure 43 shows the directional response for the UC-53A microphone.

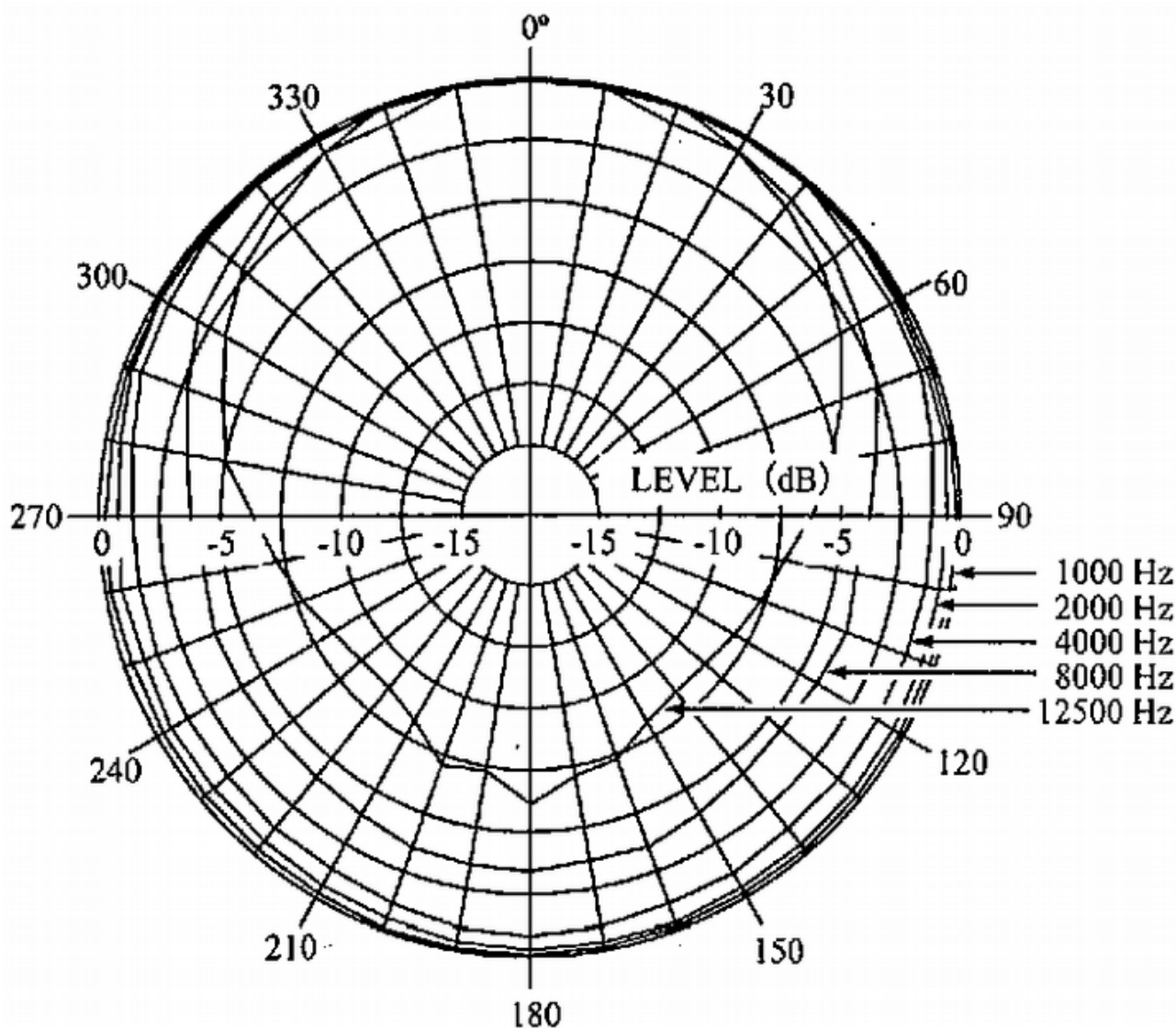


Figure 43: UC-53A Directional Response

7.7.3 Thermal Characteristics

The thermal characteristics of a microphone include indicate how sensitivity changes at various temperatures. This is influenced by the choice of materials and the design of microphone. Normally materials with a linear expansion coefficient are used.

Figure 44 shows the thermal characteristics of a UC-53A microphone at 250Hz.

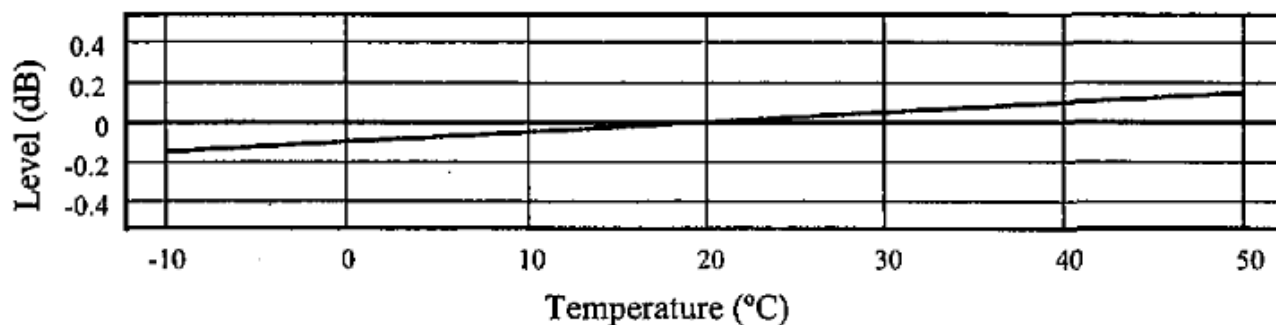


Figure 44: UC-53A Thermal Response

7.7.4 Humidity Characteristics

The humidity characteristics of a microphone indicate how sensitivity changes at various humidity levels.

Figure 45 shows the humidity characteristics for a UC-53A microphone at 250Hz.

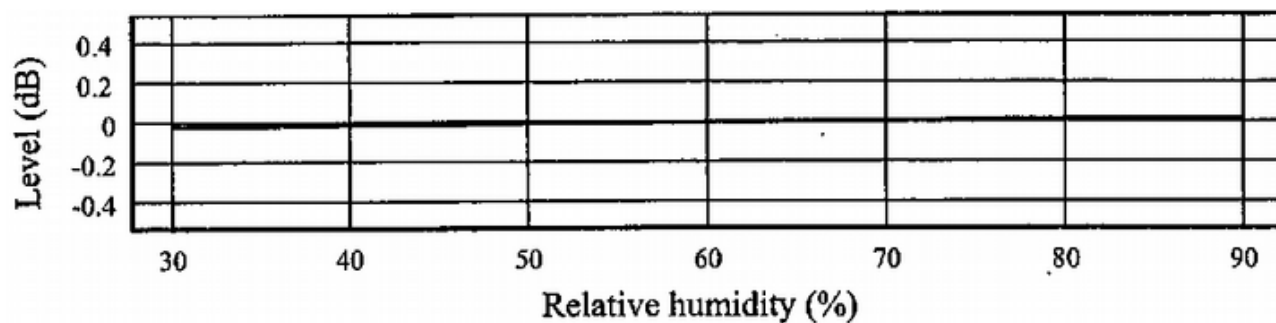


Figure 45: UC-53A Humidity Response

7.7.5 Reduction of Wind Noise by Windscreen

During outdoor measurements wind noise can falsify measurement results. To counter such problems, the recommended windscreen WS-10 should be mounted on the microphone. The characteristics of the WS-10 windscreen are shown below. The attenuation of wind noise produced by the windscreen is about 25dB with frequency weighting A and 15dB with frequency weighting C.

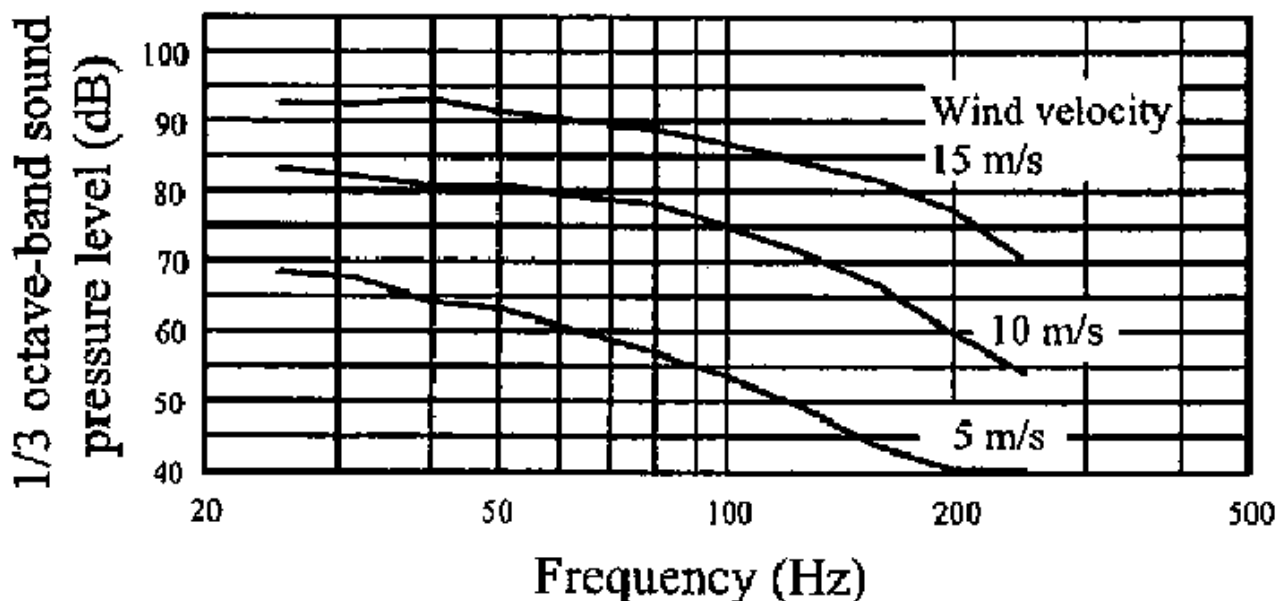


Figure 46: Windscreen Noise Reduction

Figure 46 shows the influence of windscreens WS-10 on acoustical properties of microphone (referred to microphone response without windscreens). The influence of the windscreens WS-10 on the acoustic performance of the microphone is within ± 1.0 dB up to 12.5 kHz.

7.7.6 Specifications

Table 32: UC-53A Quick Specifications

Description	Value
Model	UC-53A
Nominal Diameter	½ inch
Sensitivity	-28dB (0dB = 1V / Pa)
Frequency Response	10 to 20 000 Hz
Capacitance	12pF
Diaphragm Type	Titanium alloy foil
Temperature Coefficient	+0.005 dB/°C (at 250Hz)
Humidity-dependant Sensitivity Change	0.1dB or less (at 250Hz, RH below 95%, no condensation)
Dimensions	13.2 diameter x 12mm

7.8 Filter Responses

The following images show typical frequency response characteristics for the provided band pass filters.

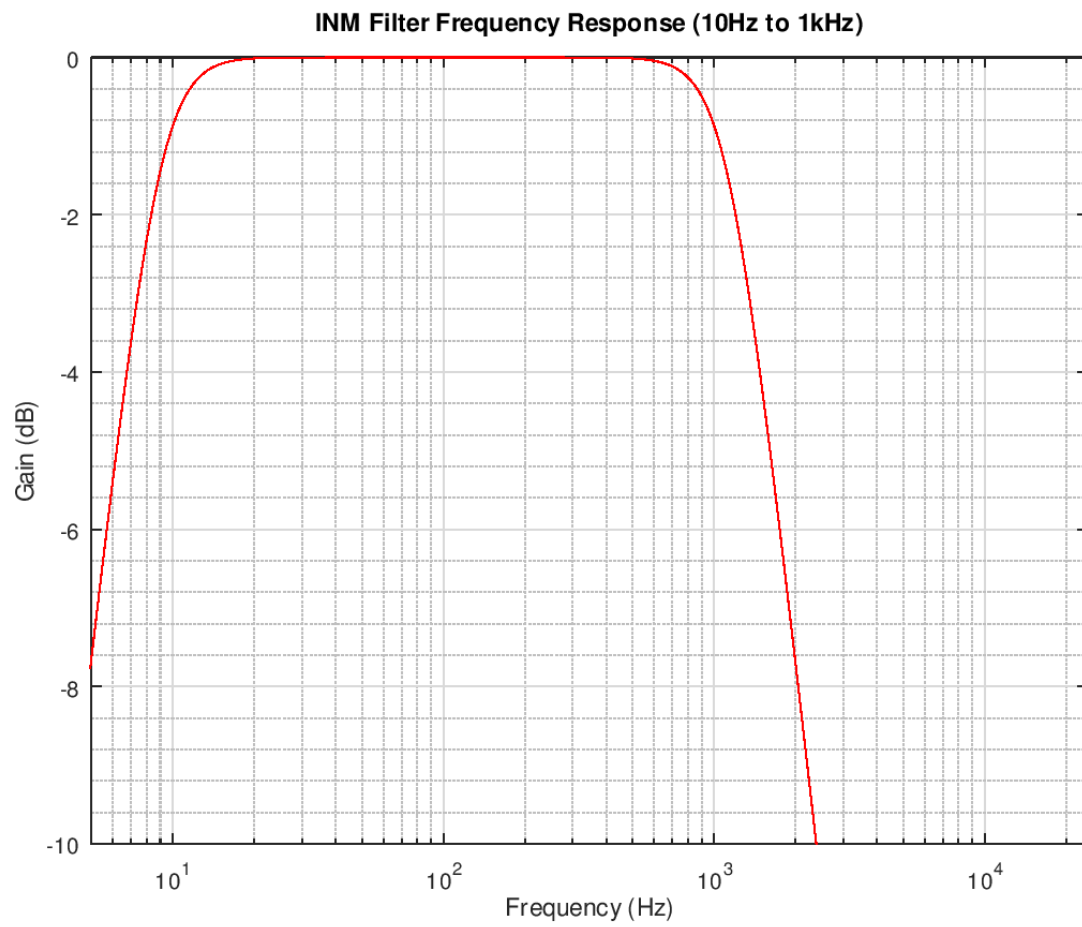


Figure 47: 10Hz to 1kHz

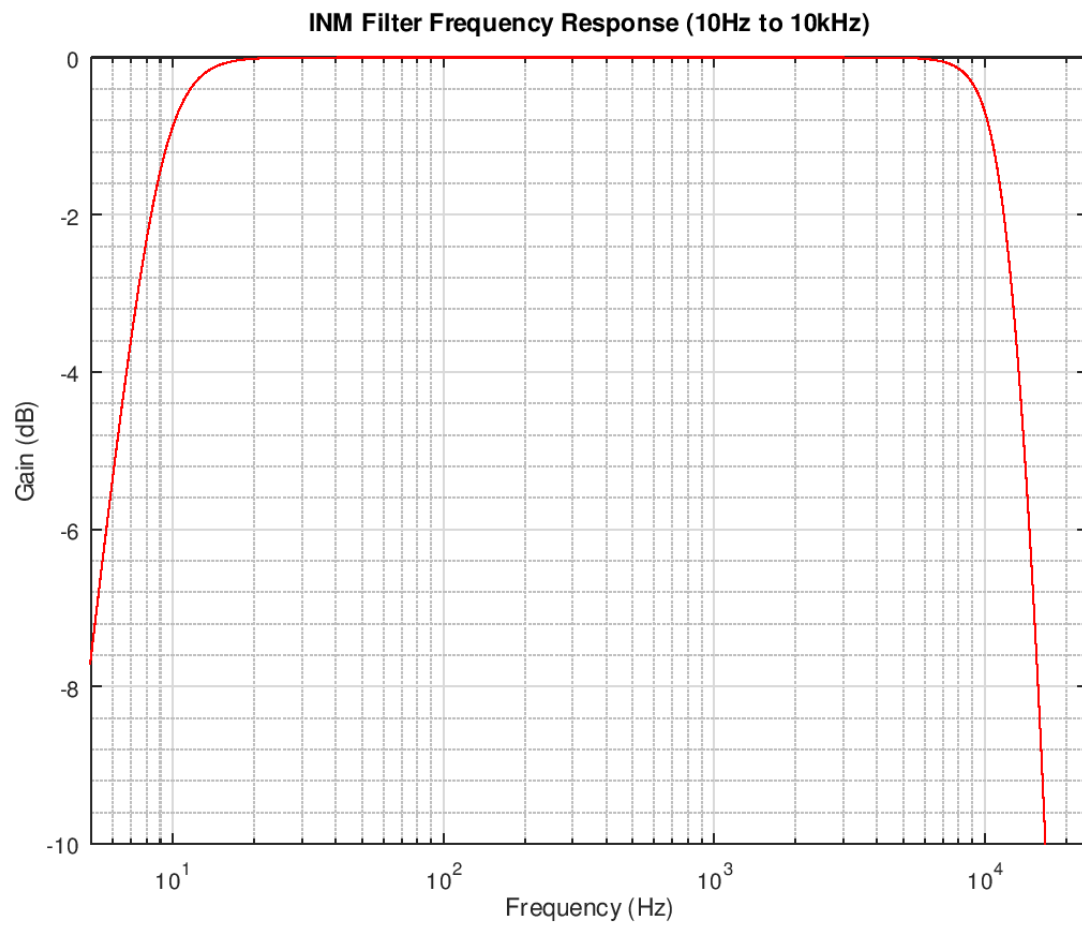


Figure 48: 10Hz to 10kHz

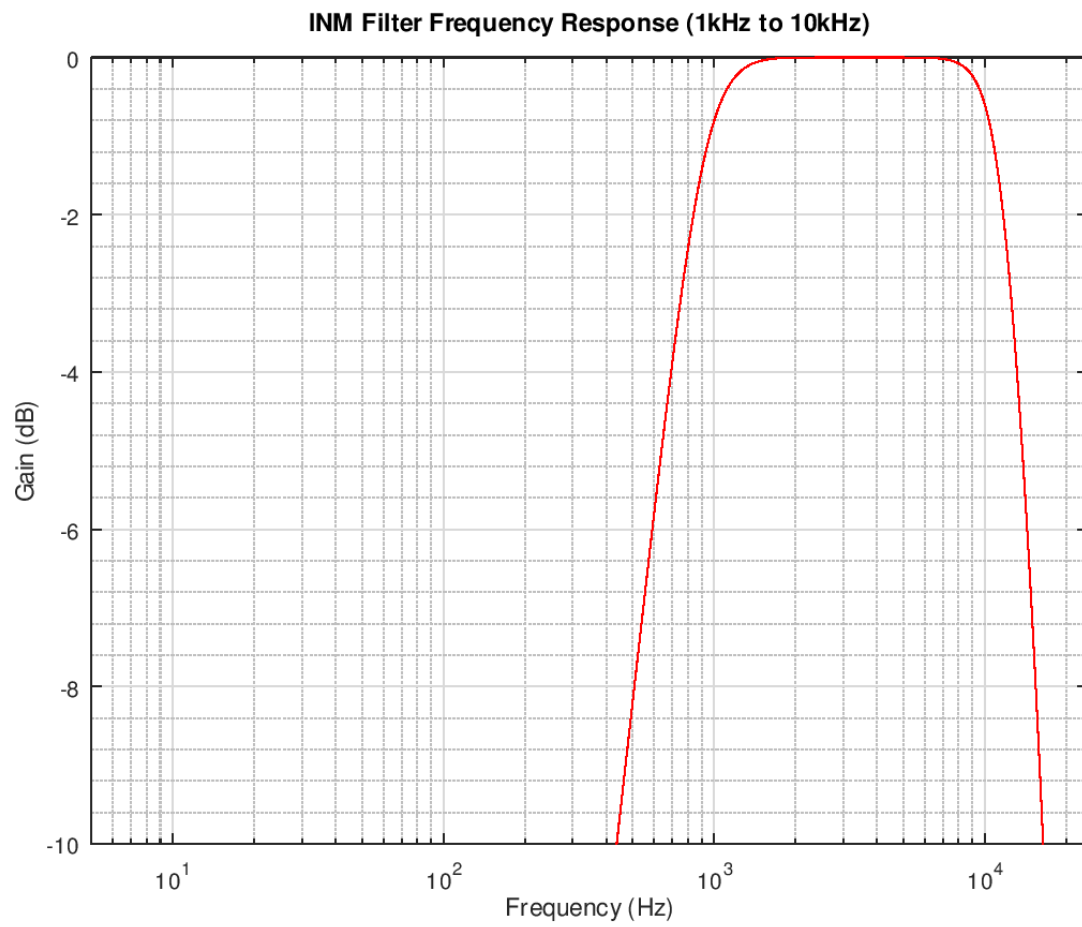


Figure 49: 1kHz to 10kHz

8 Application Change Log

Revision History

Revision	Date	Author(s)	Description
v9.4.2	2014-07-16	Juan Agüero	update to flash filesystem value checks and ip address quad handling
v10.0	2015-05-04	Juan Agüero	As released with V2 boards.
v10.0.1	2015-05-05	Juan Agüero	hotfix for bad invalid remote host calibration
v10.0.2	2015-05-06	Juan Agüero	added internal log limit
v10.1	2015-05-18	Juan Agüero	updated to fix calibration problem
v10.2	2015-06-02	Juan Agüero	factory reset and menu item shuffle
v10.3	2015-07-20	Juan Agüero	GPIO and I2C bug fixes.
v11.0-rc1	2015-11-24	Juan Agüero	fixed triggering, statistics and RTC power
v11.0.rc1	2015-11-24	Juan Agüero	fixed triggering, statistics and RTC power
v11.0-rc1	2015-11-24	Juan Agüero	fixed triggering, statistics and RTC power
v11.0	2015-11-24	Juan Agüero	released after testing
v11.1	2016-03-15	Juan Agüero	updated noisecloud server location
v11.2	2016-08-01	Juan Agüero	Log to cloud in standby and location stored with config
v11.3	2016-11-21	Juan Agüero	Updated to use new GPIO driver
v12.0-rc1	2016-11-29	Juan Agüero	Initial release with MineMonitor option
v12.1-rc1	2018-07-27	Juan Agüero	Test release with Noise Cloud bulk uploads
v12.1-rc2	2018-08-09	Juan Agüero	Test build for Ethernet control issues
v12.1.rc2.1	2018-08-17	Juan Agüero	As released for testing noise cloud uploading
v12.1-rc3	2018-08-20	Juan Agüero	Cleanup modem messages and API version control
v12.1-rc4	2018-08-21	Juan Agüero	Fix up small menu bug and remote host connection
v12.1-rc5	2018-08-21	Juan Agüero	Add next interval window
v12.1-rc6	2018-08-22	Juan Agüero	Fix Mine Monitor email issue
v12.1-rc7	2018-08-30	Juan Agüero	Add for email server authentication
v12.1-rc8	2018-08-31	Juan Agüero	Update handling of email address display
v12.1	2018-09-03	Juan Agüero	Update Noise Cloud interface and use private email server
v12.2-rc1	2018-11-30	Juan Agüero	Initial release for internal testing
v12.2-rc2	2018-12-03	Juan Agüero	Add Noise Cloud Log file. See I22
v12.3-rc3	2018-12-04	Juan Agüero	Add noise events to log file
v12.2-rc4	2018-12-06	Juan Agüero	Update to factory settings and automatic flash formatting
v12.2-rc3	2019-01-09		Add noise events to log file
v12.2	2019-01-09	Juan Agüero	Update WR11 handling and Noise Cloud log file
v12.3-rc1	2019-02-06	Juan Agüero	Fix format flash operation
v12.3	2019-02-12	Juan Agüero	Minor Noise CCloud updates and corrected power handling
v12.4-rc1	2019-05-20	Juan Agüero	RTC Testing
v12.4	2020-03-10	Juan Agüero	Noise Cloud and modem handling updates
v12.5	2020-05-05	Juan Agüero	Fix various Noise Cloud issues