

User Guide

Barrett ALE 2G and 3G

P/N BCM40524/06

s/w v1.9.0 and above

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INTRODUCTION 1

This chapter contains the following sections:

- Overview
- Terms and Abbreviations

Overview

Automatic Link Establishment (ALE) automatically determines the best channel to connect to another transceiver using Link Quality Assessment (LQA) information obtained from previous transmissions.

Using this LQA information allows the transceiver to automatically choose the best channel during constantly changing HF ionosphere propagation, reception interference and shared spectrum use of busy or congested HF channels.

ALE 2G

ALE 2G establishes a link between two or more stations and performs a handshake to establish a link. For best performance, all transceivers should be in scan mode.

The LQA is a key feature of ALE 2G as it allows the calling station to choose the “best” possible channel on which to attempt a link. If the link attempt fails on this channel, then the next best channel will be tried and so on until all channels in the preset map have been tried. As HF channel conditions change throughout the day due to factors such as ionospheric propagation, reception interference, and time of day the “best” channel may also change. ALE 2G allows for this by using soundings which are sent out at intervals programmed by the operator or radio network administrator. Soundings are broadcast either on all channels in the currently selected preset map or only on channels in the currently selected preset map which have soundings enabled on them. On reception of a sounding the LQA information gets stored in the transceivers LQA table. The time the LQA data remains usable can be set via the LQA Decay Rate setting.

ALE 3G

ALE 3G provides a more robust waveform and quicker linking times (Synchronous Mode) in comparison to ALE 2G.

Quicker linking times (Synchronous Mode) are achieved through the connection of a GPS receiver. The GPS receiver allows the station to obtain UTC (Universal Time Coordinated) TOD (Time of Day) and therefore network scanning synchronization.

For a time exchange to succeed (TOD Sync/TOD Req), all stations need to be configured to within seven minutes of the network master’s date and time settings. This is a limitation imposed by the ALE 3G specifications (STANAG 4538).

Barrett Communications recommends GPS receivers be fitted to all stations in a network (minimum master station) to ensure faster linking capabilities.

ALE 3G has 2 modes of operation: Synchronous and Asynchronous

Synchronous mode synchronizes scanning across all stations in the network. This requires TOD synchronization from either the Master station (if slave station doesn't have a GPS connected) or a GPS receiver to be fitted to the slave station.

Asynchronous mode is used when TOD synchronization is not available. IE No GPS receiver is fitted to any station in the ALE 3G network. Linking times will be increased (similar to ALE 2G) however ALE 3G waveforms are still used.

ALE 3G allows for the scheduled sending of Sounding calls hourly. When enabled it will speed up the LQA information being recorded by all stations on the ALE 3G network and therefore promote correct channel selection when communicating between stations. If not enabled, an ALE3G network builds its LQA information from listening to all stations transmitting on the network. Even if the call is not for the station it will still automatically carry out an LQA of the transmitted signals being sent between the other stations on the network and add this to its LQA memory.

Tuners

When using ALE 2G and 3G with an antenna tuner, tune and wait times are incorporated into the calling system. Tune times lengthen the time needed to create a link and this delay occurs after the call has been placed but before a transmission begins. They are associated with the transceiver addresses and any change to a tuner times needs to be incorporated across the network. Not programming a tune or wait time across an entire network may prevent linking with that transceiver.

As there are many types of antenna tuners, tune times vary. 2G tune and wait times are programmed in milliseconds. 3G tune times are entered in seconds.

This guide refers to the following products available from Barrett Communications:

Barrett 4050 HF SDR Transceiver (P/N BCM40500)

Barrett 4000 Series HF Programming Software (P/N BCA40001)

2G Automatic Link Establishment (P/N BCO40501 and 4090-01-03)

3G Automatic Link Establishment (P/N BCO40502 and 4090-01-04)

GPS Receiver (P/N BCA40009)

WiFi Adaptor (P/N BCO40508)

Terms and Abbreviations

Term	Definition
ALE	Automatic Link Establishment
AMD	Automatic Message Display
BER	Bit Error Rate
LQA	Link Quality Assessment
LSU	Link Set-up mode
Pack	The collection of settings and channels in a transceiver. Can be modified using the Programming Software.
SINAD	Signal to Noise and Distortion Ratio
SNR	Signal to Noise ratio

ALE 2G 2

This chapter contains the following sections:

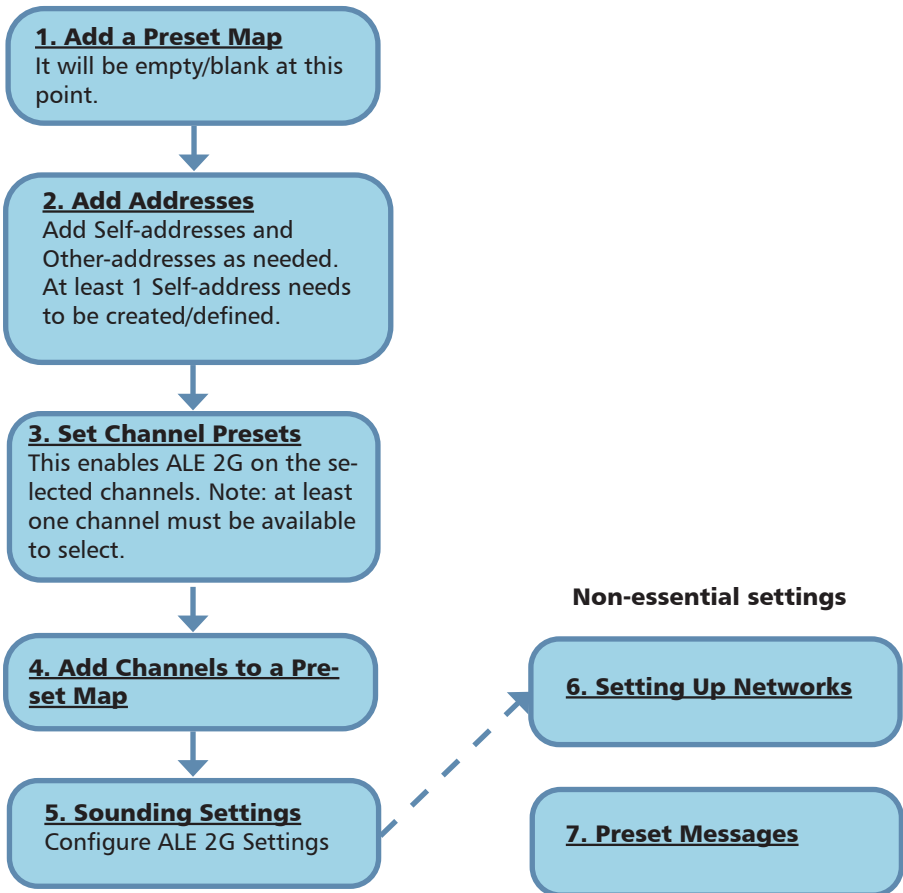
- Programming Software
- Operation
- Advanced Operation

Programming Software

The Barrett 4000 Series HF Programming Software (P/N BCA40001) is a tool used for configuring and managing the settings of a Barrett 4000 series transceiver.

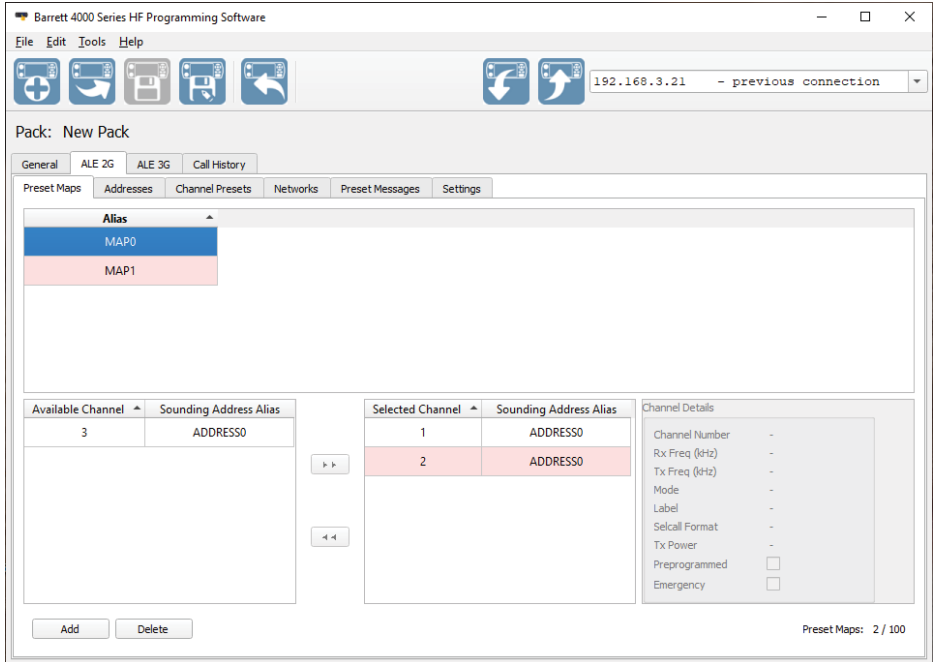
ALE 2G Set Up Procedure

ALE channels are mapped to the standard channels that the transceiver has been configured with. This mapping is configured by accessing the Channel Presets tab. The following work flow is recommended for setting up ALE 2G in both the Barrett 4000 Series HF Programming Software and from the transceiver front panel:(see [page 23](#)):



1. Add a Preset Map

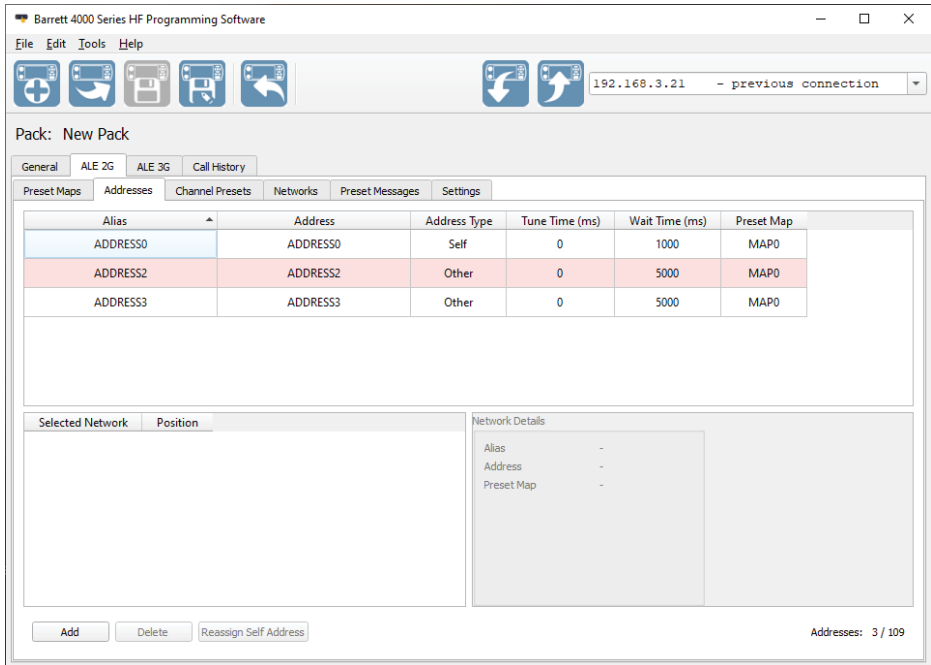
A preset map is a group of channels that the transceiver can cycle through. It functions in the same manner as a scan table. To create a new preset map, click “Add” in the bottom left-hand corner of the programming window.




2. Add Addresses

ALE addresses function as call signs. Self-addresses are the call sign of the local transceiver. Other-addresses denotes all other transceivers in the network. At least 1 Self address must be programmed.

It is also possible to have multiple self-addresses. In this case, the transceiver is capable of “listening” for transmissions for more than one address simultaneously.



To add an address, click  to add a row to the Address table. Each of the fields can be modified by double-clicking the appropriate field:

Alias: a user friendly name for the address.

Address: the address designated to a specific ALE enabled transceiver. It is 3-15 Alpha-numeric characters.

Address Type: The type of address:

- Self: This implies an address for the local transceiver.

– Other: This implies the address of a remote transceiver.

Tune Time: the amount of time allowed for antenna tuning

Wait Time: The amount of time spent listening for a transmission from a remote transceiver.

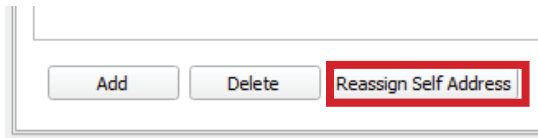
Preset Map: designates the Preset Map this address is a part of.

To delete an address, simply select it and press the Delete button in the bottom left hand corner of the window.

Reassigning Self-Addresses

To swap the self-address of a radio from one ALE address to another:

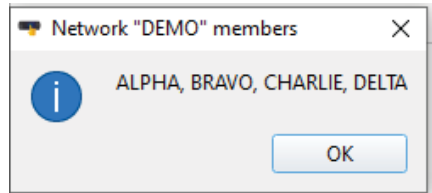
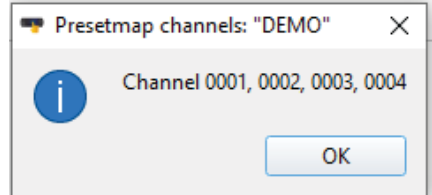
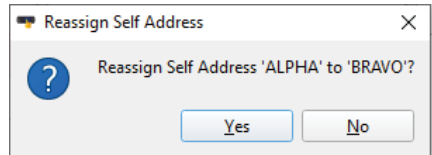
Select the self-address and click the “Reassign Self Address” button located at the bottom of the screen.



This will bring up the following pop-up:

Reassign Self Address		
Reassign Self Address "ALPHA" to:	Presetmap	Network
Address Alias	PresetMap Alias	Network Alias
BRAVO	DEMO	DEMO
CHARLIE		
DELTA		
Close		

- Selecting an address from the list will allow the self address to be changed to the one selected.
- Selecting a Preset Map will confirm which channels are in the selected preset map.
- Selecting a Network will confirm which addresses are in the selected Network.
- Pressing “close” will cancel the operation.



3. Establish Channel Presets

Channels in the transceiver are not automatically 2G or 3G enabled. The channels must first be brought into the Channel Presets. If any channels are already ALE enabled, they will appear in this window.

Pack: New Pack

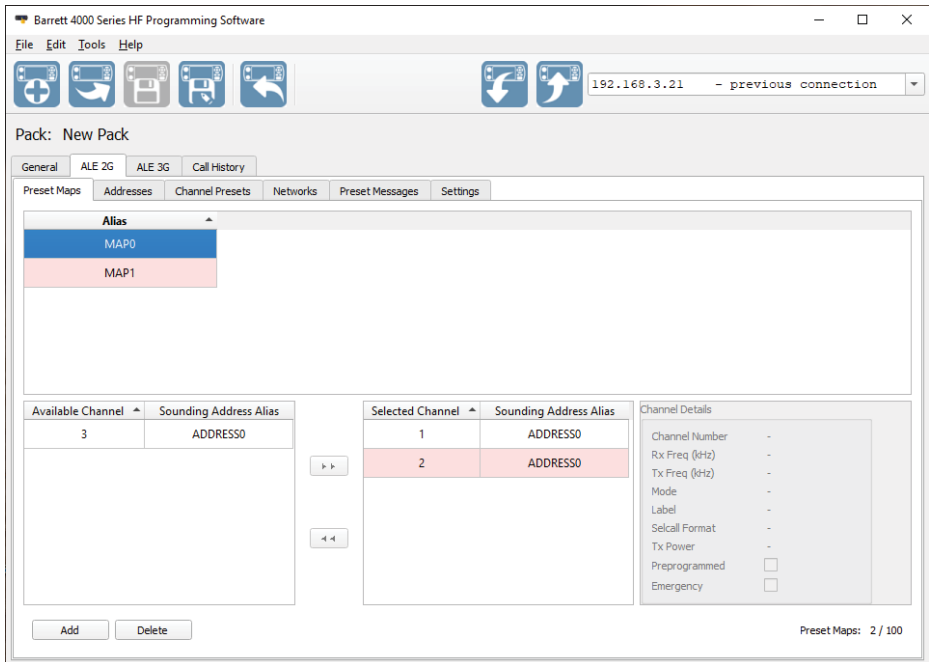
Pack: New Pack						
General	ALE 2G	ALE 3G	Call History			
Preset Maps	Addresses	Channel Presets	Networks	Preset Messages	Settings	
Channel Number	Sounding	Sounding Address Alias	Sounding Interval (hh:mm)	Sounding Offset (hh:mm)	Response Blocked	Rx Freq (kHz)
1	<input type="checkbox"/>	ADDRESS0	01:00	00:00	<input type="checkbox"/>	8,000.000
2	<input type="checkbox"/>	ADDRESS0	01:00	00:00	<input type="checkbox"/>	8,000.000
3	<input type="checkbox"/>	ADDRESS0	01:00	00:00	<input type="checkbox"/>	8,000.000



To add a channel to this list, click the “Add” button until the desired channel number is added. Clicking a channel and clicking “delete” will remove a channel from this list and any ALE capabilities from the channel. Double-clicking on a modifiable field will allow a user to customise the Channel Preset Settings

4. Add Channels to a Preset Map

An Alias is the name given by the user to the preset map. The default alias is MAP1.

Antenna 1 is the default Antenna selected by the programming software. The 4050 only has one antenna port, unless connected to a Barrett Dual Port Antenna Switch (P/N BCA40506) in which case, a second antenna can be connected to the 4050, and Antenna 2 can be selected.



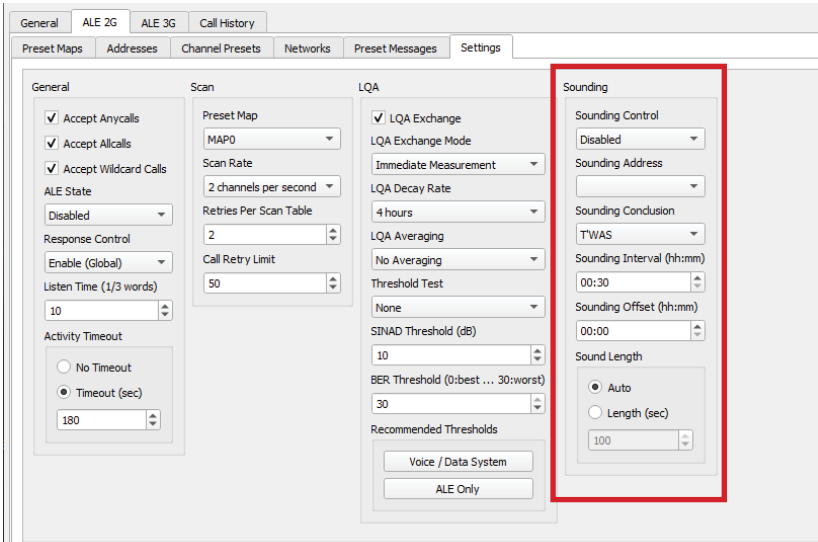
To add channels into a map, select them from the lower left panel. Select and click  to add them to the map. The channel will then move to the right hand panel. Select and click  to remove a channel from the Selected Channels list.

5. Sounding Settings

Sounding is the testing of selected channels in a Preset Map for quality by providing a brief identifying transmission that may be used by other transceivers to evaluate connectivity, availability and to identify known working channels for immediate or later use for communications or calling. This allows for greater efficiency in channel selection and communication.

Sounding times are taken from midnight UTC time.

The Sounding Settings can be found on the right hand side within the Settings tab.



Sounding Control

- The default setting for Sounding Control is “Disabled” and the Sounding call will not be available under the ALE 2G section of the Call key.
- Changing this to “Individual Preset” will send Soundings only to channels with Sounding boxes ticked under the Channel Presets section of the Programming Software.
- Selecting “Enable (Global)” will enable Soundings on all channels regardless of the Soundings box being selected.

Sounding Address

This is the Self-Address programmed in the Addresses tab. If there are multiple Self-Addresses, more than one option will appear in this drop down menu.

Sounding Conclusion

There are only two possible selections for this setting: T'WAS or T'IS.

If T'WAS is selected, the sounding will be sent to a channel and a link will not be made. The transceiver will proceed to the next channel in the preset map and repeat the process.

If T'IS is selected however, the sounding will be sent and a link will be made. The transceiver will not move to the next channel.

Sounding Interval

This is the interval between Soundings. For instance, in the image opposite, the Sounding Interval is 30 minutes. This means that every 30 minutes a Sounding will be sent after the initial Sounding.

Sounding Offset

This delays the first sounding from midnight UTC and the first Sounding call will be made at this time. For instance, in the image opposite, there is no Sounding Offset, therefore the first Sounding will occur at 00:00 UTC.

Sound Length

This denotes the length of the Sounding in seconds. The default is set to 100. Selecting 100 will automatically calculate the required sounding length based on the ALE 2G configuration (e.g. the number of channels in the preset map, amongst other settings). Auto is the recommended setting.

Other Settings

Under the Settings tab, General Settings, Scan Settings and LQA Settings may also need to be established.

A description of these settings can be found below:

General Settings

Accept Anycalls

Select this check-box to enable the transceiver to accept anycall calls ('@@?' or '@@A') from remote transceivers.

Accept Allcalls

Select this check-box to enable the transceiver to accept allcall calls ('@?@' or '@A?') from remote transceivers.

Accept Wildcard Calls

Select this check-box to enable the transceiver to accept wildcard based calls (using the '?' and '@' characters) from remote transceivers.

Autofill

Select this check-box to enable Autofill.

When a call is received from an address not stored in the Transceiver's address book, the receiving address is logged as Autofill. This allows the address to be contactable. Up to 10 autofill addresses can be stored simultaneously, with the oldest being removed when a new address is recorded.

ALE State

Select from the drop-down menu: ALE 2G.

This setting will decide the default value when the transceiver starts up. For example, if ALE 2G is selected, the transceiver will be already set for 2G. If Disabled is selected, the transceiver will need to be manually set.

Response Control

Determines whether this transceiver should respond to calls or not.

From the drop-down menu select either:

- Disabled (no response permitted),
- Enable Global (always respond), or
- Individual Preset (response is determined by the channel presets).

Listen Time 1/3 words

The time the transceiver listens on a channel before transmitting. Used for channel occupancy detection. Each value is based on the length of an ALE word which is 130.66milli seconds. A setting of 10 would be a delay of 1.3066 seconds

Setting this value to 0 will disable occupancy detection.

Enter a value between 0 and 99. The default is 10.

Activity Timeout

If there is no activity on an established link for a specified time, the Activity Timeout will terminate the link. Activity is denoted by PTT and ALE calls. Select either:

- No Timeout (will never timeout), or
- Specify Timeout (a given timeout in seconds). Enter a value between 1 and 600 seconds. The default is 120 seconds.

Scan Settings

Preset Map

Select a default Preset map from the drop-down menu.

Scan Rate

The rate at which scanning occurs on a preset map.

From the drop-down menu select either 2 or 5 channels per second

Retries per Scan Table

When attempting to establish a link this indicates the number of times a complete cycle of the scan table should be accomplished before failing a link attempt.

Select from 0 to 99. The default is set to 2.

Call Retry Limit

The maximum number of calls to attempt before failing a link attempt.

Select from 0 to 99. The default is set to 50.

LQA Settings

LQA Exchange

Select this check-box to allow LQA information to be swapped between self and other addresses. LQA information maintains signal strength measurements for determining best channel for making calls.

LQA Exchange Mode

The mode of the exchange. Select either:

Immediate Measurement (will immediately measure quality and use this information for exchange), or

Value from LQA Memory (will use a pre-measured value for exchange).

LQA Decay Rate

The rate in hours for which an LQA measurement is no longer current.

This sets the artificial decay rate for the link quality information stored in the LQA tables of the 4050 transceiver.

Switching the sounding off and setting a decay rate of two hours would result in the recording of a perfect channel (100% channel quality) decaying to an unusable channel (0% channel quality) over a period of two hours.

From the drop-down menu select either: Disabled, or 1, 2, 4, 8, 24, or 48 hours.

LQA Averaging

The method used for calculating the current LQA measurement. It is a ratio between the old measurement (as determined by the decay rate) and the newly acquired one.

This option sets the method used to update an existing link quality value stored in transceiver when the new link quality value is lower than the stored value.

It can be set to either replace the old values with the new values or different weighted averages of the old values and new readings.

Averaging reduces the effect that one bad reading might otherwise have on a good channel. If a new reading is better than an old value, the old value is replaced by the reading. There are four different averaging formulas available

From the drop-down menu select either: No Averaging, $(old + new)/2$, $((3*old) + new)/4$, or $((7*old) + new)/8$

Threshold Test

Used to select the type of threshold test used to determine acceptable channel quality for ALE communication.

From the drop-down menu select either: None, BER, SINAD or Both (BER + SINAD)

Sinad Threshold

Signal-to-noise and distortion ratio (SINAD) is a measure of the quality of a signal from a communications device. This option sets the SINAD threshold (in dB) at which an ALE channel is considered usable.

Select from 0 to 30.

BER Threshold (0:Best ... 30:worst)

The Bit Error Rate (BER) is the number of bit errors per unit time. This option selects the BER threshold at which an ALE channel is considered usable. If the required BER is not reached in the reply from the remote station, the link establishment process is rejected. Depending on the retry setting, the link establishment would continue on another link.

Select from 0 to 30 with 0 indicating 0 bits of error per unit time (higher likelihood of link rejection) and 30 indicating 30 bits of error per unit time (less likelihood of link rejection).

Recommended Threshold Settings

Click the **Voice/Data System** button to set the Threshold Test to SINAD, the SINAD threshold to 15 and the BER threshold to 0.

Click the **ALE Only** button to set the Threshold Test to None, the SINAD threshold to 6 and the BER threshold to 30.

6. Setting Up Networks

ALE Networks function as a group of Addresses or transceiver IDs specified as a particular network. This is often used for closed groups and limiting the listening patterns of the transceiver to a few specific “other” transceivers. The main purpose of a network is to rapidly and efficiently establish links with multiple transceivers that share the network address. It is possible to have 20 networks at once with up to 15 addresses each.

Pack: New Pack

General ALE 2G ALE 3G Call History

Preset Maps Addresses Channel Presets **Networks** Preset Messages Settings

Alias	Address	Padding (131.5ms steps)	Preset Map
NET0	NET0	0	MAP0

Available Address

ADDRESS3

Position Selected Address

1	ADDRESS0
2	ADDRESS2

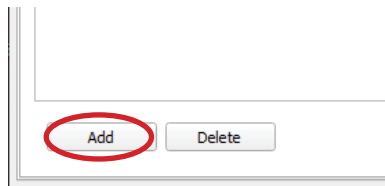
Address Details



Alias	ADDRESS3
Address	ADDRESS3
Address Type	Other
Tune Time (ms)	0
Wait Time (ms)	5000
Preset Map	MAP0

Add Delete

Networks: 1 / 20

To create a new network, click “add” in the bottom left-hand corner of the programming window.

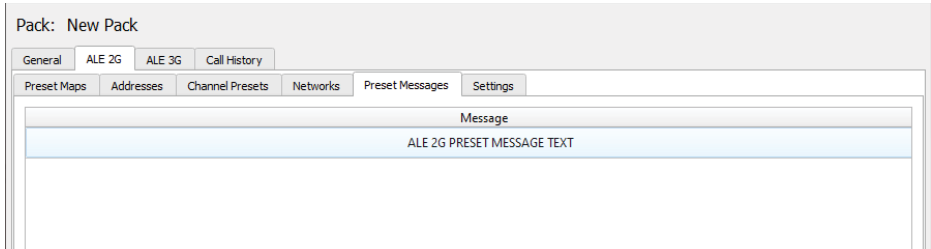


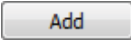
Addresses can be added to Networks the same way that channels were added to Preset Maps. The available addresses appear in the lower left box and can be added to the selected network by clicking the  button. Likewise, selecting a channel from the lower right hand box and clicking  will remove an address from the selected network.

To delete a network entirely, select it and click the “Delete” button, found next to the “Add” button.


7. Preset Messages

Preset Messages are optional and do not affect the transceiver's ability to send an ALE 2G Message in any way. Pre-programming messages can be an efficient use of time if there is a message that is sent regularly as typing the message out every time can become repetitive.



To add a preset message, click  to add a row to the Preset Message table.

Double-clicking this new message allows it to be edited and the old message over-typed with the new one.

To delete a selected Preset Message, select a Preset Message and click .

ALE Settings in the 4050 Transceiver

Some ALE settings can be changed directly in the 4050 transceiver. The majority of these allow toggling on or off certain attributes programmed with the Programming Software.

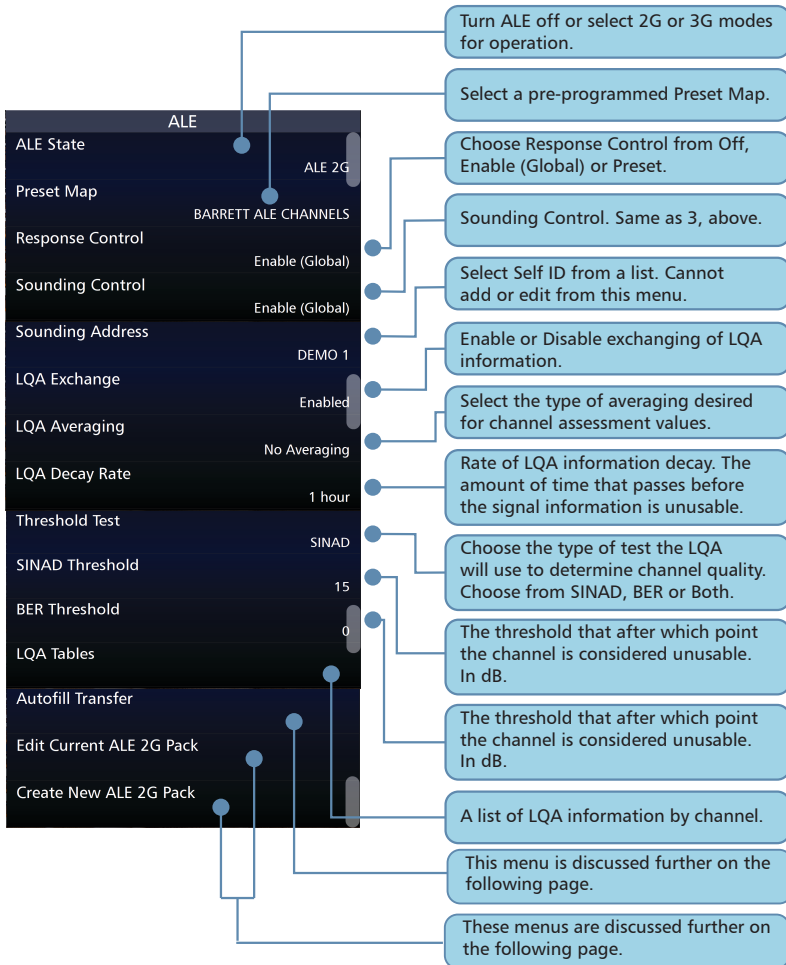
To access these settings **select Settings**, then **ALE**.



Settings



ALE



Autofill Transfer

When a call is received from an address not stored in the Transceiver's address book, the receiving address is logged as Autofill. This is stored temporarily in the transceiver memory. It appears as orange (as shown opposite) in the Edit/Delete ALE Address menu.

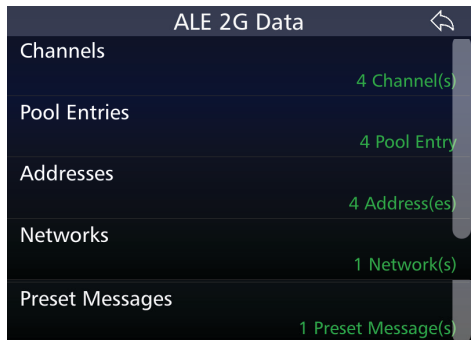


Tapping an orange autofill address changes it to blue/grey, saving it permanently to the pack. The address is now added to the address list and additional contact information can be added via the Contacts menu.



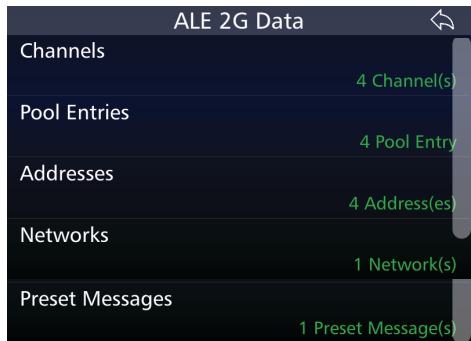
Edit Current ALE 2G pack

This menu allows the operator to modify the existing ALE 2G pack settings.



Create New ALE 2G pack

This menu allows the operator to create a new ALE 2G pack while overwriting the existing ALE 2G pack settings.



Operation

ALE 2G calls can be made from the call menu and can be selected by pressing the call button on the transceiver's front panel. The types of ALE 2G call are as below:

Call Type	Description
ALE Call	Voice call that uses ALE linking protocols
NetCall	Calls a specific network
Phone Call	Calls a telephone via a station with a 2060 HF telephone interconnect
Group Call	An ALE call that links with more than one transceiver
Sounding	Broadcasts a signal and assesses transmit signal quality over preset map channels
Messages	Sends a preset or manual message of up to 90 characters
LQA	Assesses both the transmit and receive signals between two stations over preset map channels
GPS	Sends or receives GPS information

Making an ALE Call

Use the **CALL** key to access the Call Selection screen.

From this menu, Selcalls, Contacts and Favourites can be accessed.





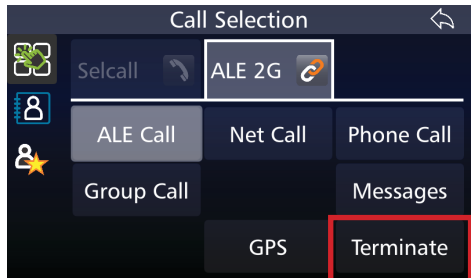
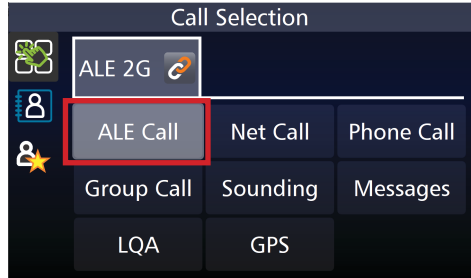
- 1 Call Type Selection Menu
- 2 Contacts
- 3 Contacts - Favourites
- 4 Call Sub-types
- 5 Call Key
- 6 Call Type

ALE Call

This is a call that links two or more transceivers using ALE protocols.

A reverberative tone will be heard as the transceivers communicate and exchange information and establish communication protocols.

1. Press **CALL** and, if necessary, press the  icon to show the Call Selection screen.
2. Select ALE Call
3. From the list of addresses that appear, select the desired address. If more than 1 self-address is available a list of self-addresses will be shown to select from.
4. The transceiver will emit a series of tones. The transceivers will display the "ALE Linked" line and the SNR values will appear beside the ALE 2G label.
5. To make the voice call, simply use the PTT button on the side of the handset.
6. Disconnect from the call by pressing **CALL** and, if necessary, the  icon, and select Terminate or the Terminate icon from the front screen. This ends the link between the transceivers. The link will also terminate after a set period of time (Activity Time-out, see [page 18](#))




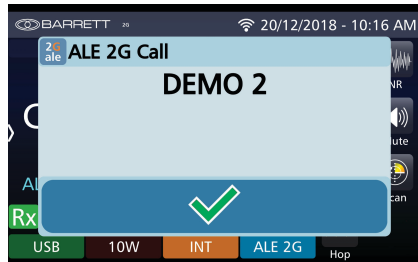
If you have trouble connecting, first check that the antenna is tuned and power source is connected properly, that ALE 2G is enabled on the channel you are transmitting on (not 3G), the address is correct, and that the preset map is set up correctly in both transceivers.

Receiving an ALE Call

When an ALE call is received, a tone will be received followed by the transceiver transmitting the same tone in response.

When a link has been established, the alarm will sound.






Press  to stop the alarm.

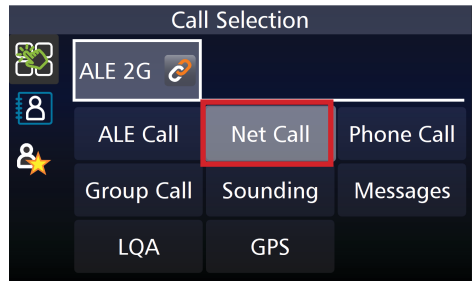


NetCall

Selecting NetCall initiates a network wide call where the transceiver attempts to create a link with every transceiver in the network. It may not actually connect to every transceiver as some may be out of range or switched off.

These networks are generated from the Networks Tab of the programming software or via the transceiver front panel.

1. Press  and, if necessary, press the  icon to show the Call Selection screen.
2. Select NetCall.
3. The transceiver will emit a series of tones. The transceiver will display the "ALE Linked" line with the  and the SNR values will appear beside the ALE 2G label.
4. To make the voice call, use the PTT button on the side of the handset.
5. Disconnect from the call by pressing the Terminate icon or  and, if necessary, press the  icon, and select Terminate. This ends the link between the transceivers. The link will also terminate after a set period of time (Activity Timeout, see page 18)




Network Alias

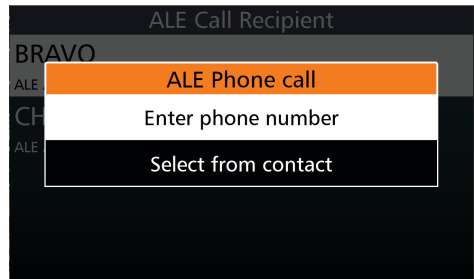
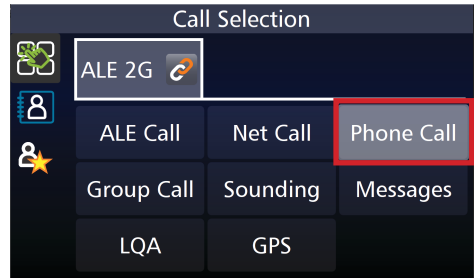
Note: all transceivers must be programmed with the same network for this call to connect.

Receiving a Netcall is the same as receiving an ALE call above.

Phone Call

This allows the transceiver to connect with a telephone via a Barrett 2060 Interconnect.




1. Press **CALL** and, if necessary, press the  icon to show the Call Selection screen.
2. Select Phone Call
3. Either:
 - Select "Enter Phone Number", enter the phone number manually, press Enter, select the ALE recipient (Usually this station has a 2060 interconnect connected to it), If more than 1 self-address is available a list of self-addresses will be shown to select from. or
 - Select "Select from Contact". Choose contact and then select the ALE recipient (Usually this station has a 2060 interconnect connected to it).
4. The call begins automatically.

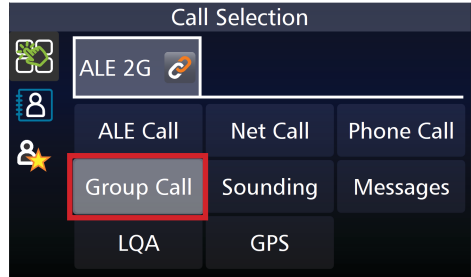




Note: If an interconnect is not present at the contacted station, the receiving station will receive a message displaying the sent phone number instead of making a call.

Group Call

Group Calls are used to link more than one station in an Ad Hoc manner, meaning the operator can select any available Other-addresses with the same preset map assigned. This differs from Network Calls as the group does not have to be predefined before making the call.

1. Press  and, if necessary, press the  icon to show the Call Selection screen.
2. Select Group Call
3. Select the recipients of the call. There can be more than one recipient selected.
4. Press  or enter to initiate the call.



To terminate the link before the Activity Timeout activates, press  and, if necessary, the  icon, and select Terminate or select the Terminate button from the front screen. This ends the link between the transceivers.

Receiving a Group Call

When a Group Call is received, a tone will be received followed by the transceiver transmitting the same tone in response.



When a link has been established the alarm will sound.

Press  to stop the alarm.

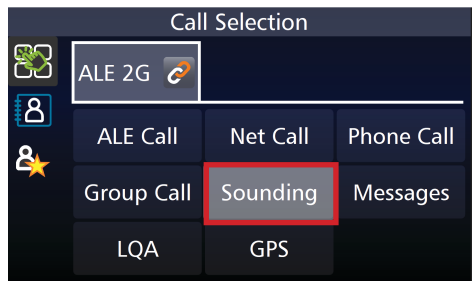
Sounding

A Sounding call will broadcast an identifying ALE call over the air on each channel in the currently selected preset map (if the transceiver is not scanning then the sounding will only be done on the current channel) allowing any receiving stations in the network to update LQA information on the calling station. This call is a “one-way” call and only the receiving stations will update LQA data, the calling station does not update LQA information.

It is recommended that both transmitting and receiving transceivers be in scan mode when performing this call. If the transceiver is not set to scan, the sounding will only be sent on the channel the transceiver is set to, regardless of other settings. When in scan, the transceiver follows the T'WAS and T'IS protocols explained below and on [page 17](#).

1. Press  and, if necessary, press the  icon to show the Call Selection screen.
2. Select Sounding
3. Sounding will begin automatically.

Note: Depending on the programmed settings, the transceiver will either cycle through all of the channels in the preset table, sending a sounding on each (T'WAS, see [page 17](#)) or stop once a sounding has been successful and establish a link (T'IS, see [page 17](#)).





Receiving a sounding

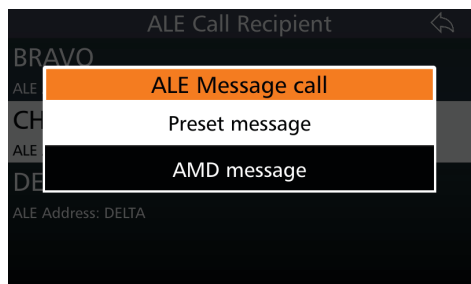
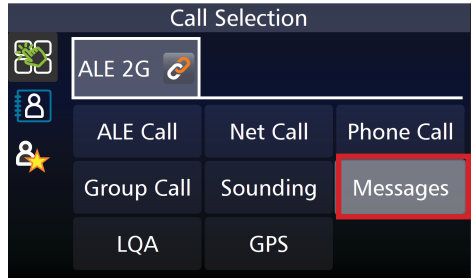
A tone will sound and “SoundingRx:” followed by the station name will appear in place of the channel label on the display. No action needs to be taken.

Soundings broadcast across a channel and assess only signal travelling in one direction (out). This signal may be clear for the transmitter but there is no guarantee that the channel is as clear for the receiver. LQA can assess signal quality in both directions (in and out) between the self and one other station. This is address specific. For more information on LQA, see [page 33](#). Both LQA and Soundings assess the signal quality on all channels in a selected preset map.

Messages

Messages allow a text message to be sent from one transceiver to another, or many other, transceiver. These can be up to 90 characters long and can be either preset in the programming software or input manually when making the call.


1. Press  and, if necessary, press the  icon to show the Call Selection screen.
2. Select Messages
3. Either:
 - Select "Preset message", select a recipient and select a pre-programmed message (see [page 22](#) to program a message) or
 - Select "AMD message", select recipient, manually type a message and press enter.




The call will be sent automatically.

Receiving a Messages Call

The transceiver will receive and transmit a series of tones before the sent message displays accompanied by an alarm.



Press  to stop the alarm but keep the message displayed.

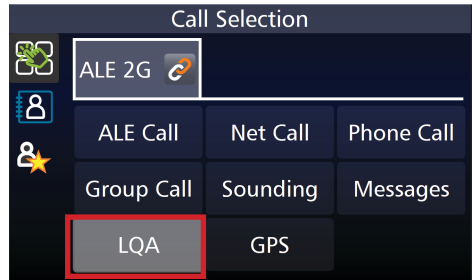
Press  to close the message display.

LQA

LQA calls will broadcast a two-way handshake call to the selected receiving station which allows the transfer of LQA information between the calling and receiving station. This call differs from Sounding calls as both stations in the call receive LQA information, also Sounding calls can be set up to happen automatically whereas LQA calls are manually done.

Note: It is recommended that both transmitting and receiving transceivers be in scan mode when performing this call. If not in Scan mode, the LQA will only be made for the specific channel the transceiver is on. It will not continue to cycle through channels and make further assessments.

1. Press  and, if necessary, press the  icon to show the Call Selection screen.
2. Select LQA
3. Select recipient



If in Scan mode, the two transceivers will begin cycling through the preset map, exchanging data for each channel.

LQA assesses the signal quality in both directions (“incoming” and “outgoing”) compared to sounding which is one way only (“incoming”). For more information on Soundings, see [page 31](#). LQA data is collected in tables assigned to known (configured) ALE addresses and assists in selecting the best channel when calling a certain address.

This image depicts an example LQA table. Each channel of the current preset map is shown in the table with corresponding SINAD values. The left SINAD value is reported by the remote station during an LQA call (up arrow, "outgoing"), the right value is from the local station (down arrow, "incoming"). Not measured SINAD values are shown as "--". Soundings will also update LQA values, but either the incoming SINAD value (when sent from the local station) or outgoing value (when sent from a remote station) only.

ALE LQA Table	
Channel:0004	6850.000kHz
↑ SINAD=4dB	↓ SINAD=7dB
Channel:0005	8099.500kHz
↑ SINAD=10dB	↓ SINAD=4dB
Channel:0006	10301.000kHz
↑ SINAD=10dB	↓ SINAD=13dB
Channel:0007	14750.000kHz
↑ SINAD=-1dB	↓ SINAD=6dB



GPS

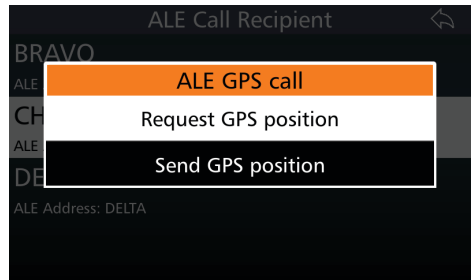
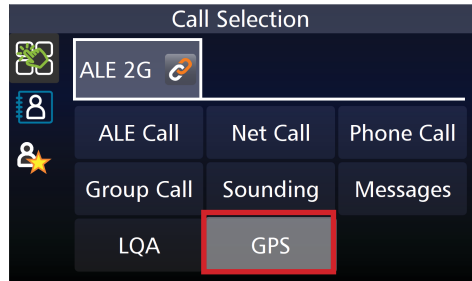
This call requests and sends GPS information. This can be useful when marking a mobile transceiver's progress or locating a transceiver after a distress signal.

A GPS Request call is a request from a station for another's GPS data.



A GPS Position call sends your position to another transceiver.

Note: A GPS Receiver (P/N BCA40009) must be equipped for the GPS position call to function.

1. Press  and, if necessary, press the  icon to show the Call Selection screen.
2. Select GPS
3. Select either "Request GPS position" or "Send GPS position". If a GPS receiver is not fitted then only the "Request GPS position" option will be available.
4. Select recipient





The call will start automatically.
When a GPS position is received, an alarm will sound and the GPS data will display on screen.

5. Press  to stop the alarm but keep the dialogue box open or press  to stop the alarm and close the dialogue box entirely.

Receiving a GPS Call

When receiving a request GPS Position Call, no operator input is required. The transceiver will play the tones to indicate transmission and receive of data.

When receiving a Send GPS Position call, the tones will play and the alarm will sound when the GPS data is received.

- Press  to stop the alarm but keep the dialogue box open, or press  to close the dialogue box.

Advanced Operation

Collective Call types

Collective calls are not accessed directly from the call button as they can be used in conjunction with multiple ALE2G call types. These call types function as address types and are entered as addresses when setting up the 2G network.

AllCall

Call Format - @?@

To call to anyone within range and whose radios will alarm but do not send a response to sender of Allcall

AnyCall

Call Format - @@@? Or @@A

Call to anyone whose address ends in the last character shown, or in the case of a '?' end character, all addresses

An Anycall destination address must be exactly 3 characters long but may match an address of any length.

For example, the anycall address "@@A" will match "BBA", "BBBBBA" and any other address ending in "A" regardless of length or other letters.

Anycalls are responded to by recipients to Anycall sender

Wildcard Call

Call Format - ?A? or ??A or A??

Call to any 3 character address with same character as shown in corresponding position with all other characters irrelevant

In-link

Call Format: ?@?

Allows the members of a group link to send broadcasts to each other.

Adding Members to a Link

Once a link has been established by an ALE call, it is possible to create additional ALE links by performing additional ALE calls. For example: If Station A is linked and in conversation with Station B, they can then call Station C and include them in the conversation. As the original link was not addressed to station C, they would continue scanning through the preset map channels (assuming scan mode is active) until an ALE call is addressed directly to them. In the case of A and B who are already linked, making an additional ALE linking call to C would bring them into the link, stopping scan.

Terminating this link can be made on an individual basis or all links can be terminated at once.

ALE 3G 3

This chapter contains the following sections:


- Programming Software
- Operation
- Advanced Operation

Programming Software

Introduction

The Barrett 4050 HF SDR Programming Software (P/N BCA40001) is a tool used for configuring and managing the settings of the Barrett 4050 HF SDR Transceiver.

Addresses

To add an address, click  to add a row to the Address table. Each of the fields can be modified as below:

Ensure that Address numbers match between packs.

Pack: New Pack

Pack: New Pack						
General		ALE 2G	ALE 3G	Call History		
Addresses	Pool Entries	Networks	Preset Messages	Settings		
Alias	Address	Scan Group	Self Address	Master Address	Tune Time (sec)	
ADDRESS0	0	0	Self	Master	0	
ADDRESS1	1	0	-	-	0	
ADDRESS2	2	0	-	-	0	
ADDRESS3	3	0	-	-	0	

Alias: A user given name used to identify the address to the user.


Address: In ALE 3G, addresses are automatically generated and generally don't need to be modified. However, it can be changed to a value between 0 and 1022. Address numbers must match between packs for correct ALE 3G operation.

Scan Group: refers to the network the address is a part of.

Self Address: Designates which address refers to the current transceiver.

Master Address: One of the addresses must be designated as Master for the network. This transceiver controls the others in a master/slave relationship.

Tune Time: Time allowed for tuning that particular station.

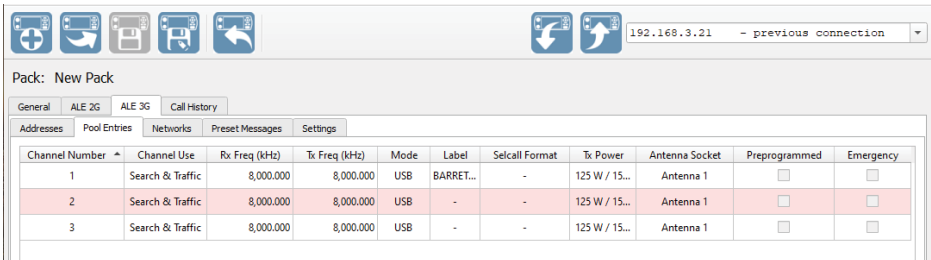
To delete an address, click on it and then press .

Pool Entries

Pool entries are the equivalent of scan tables or preset maps for ALE 3G.


To add a channel to a pool entry, click  to add another row to the Pool Entry table.

Only the channel number can be changed here. All pool entry channels will be set to Search and Traffic.



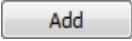
The screenshot shows the software interface for ALE 3G. At the top, there are several icons for navigation and a status bar displaying the IP address 192.168.3.21 and the text '- previous connection'. Below this, the 'Pack: New Pack' is selected. The main interface has tabs for 'General', 'ALE 2G', 'ALE 3G', and 'Call History'. Under the 'ALE 3G' tab, there are sub-tabs for 'Addresses', 'Pool Entries', 'Networks', 'Preset Messages', and 'Settings'. The 'Pool Entries' sub-tab is active, showing a table with the following data:

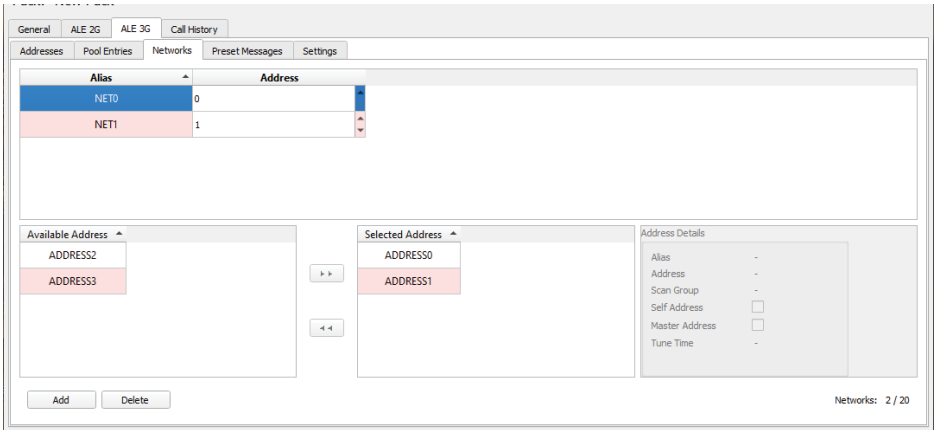
Channel Number	Channel Use	Rx Freq (kHz)	Tx Freq (kHz)	Mode	Label	Selcall Format	Tx Power	Antenna Socket	Preprogrammed	Emergency
1	Search & Traffic	8,000,000	8,000,000	USB	BARRET...	-	125 W / 15...	Antenna 1	<input type="checkbox"/>	<input type="checkbox"/>
2	Search & Traffic	8,000,000	8,000,000	USB	-	-	125 W / 15...	Antenna 1	<input type="checkbox"/>	<input type="checkbox"/>
3	Search & Traffic	8,000,000	8,000,000	USB	-	-	125 W / 15...	Antenna 1	<input type="checkbox"/>	<input type="checkbox"/>


To delete a Pool Entry channel, select a row and click .


Networks

Networks can be configured using this tab. A network is a sub address that a group of addresses belong to. The main purpose of a network is to rapidly and efficiently establish links with multiple transceivers that share the network address.

To add a network, click  to add another row to the Network table.

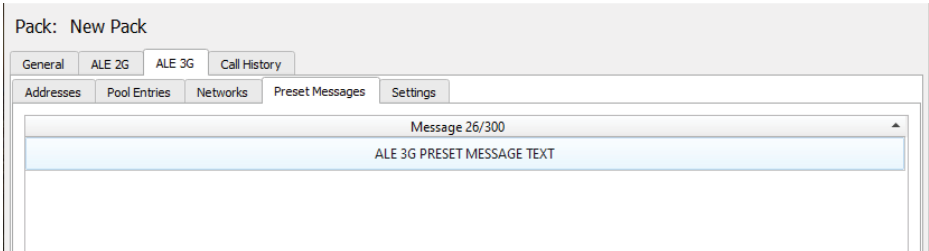



The available addresses appear in the lower left box and can be added to the selected network by clicking the  button. (Use the Ctrl key to select multiple networks) The Address details for a particular address are displayed on the right hand side.

Selecting a channel from the lower right hand box and clicking  will remove an address from the selected network.


Preset Messages

Preset Messages are optional and do not affect the transceiver's ability to send an ALE 3G Message. Pre-programming messages can be an efficient use of time if there is a message that is sent regularly as typing the message out each time can become repetitive.



To add a preset message, click  to add a row to the Preset Message table.

Double-clicking this new message allows it to be edited and the old message over-typed with the new one.

To delete a selected Preset Message, select a Preset Message and click .

Settings

General Settings

ALE State

From the drop-down menu select either: ALE 3G.

This setting will decide the default value when the transceiver starts up. For example, if ALE 3G is selected, the transceiver will be already set for 3G. If Disabled is selected, the transceiver will need to be manually set.

LSU Mode

3G ALE may operate in one of two distinct modes; Asynchronous and Synchronous.

Synchronous

In synchronous mode the 4050 SDR will change channels according to an algorithm generated from the current time. It assumes that all the other radios in the network are doing the same thing. The result is that all the radios that are not linked are listening to the same channel at the same time.

Asynchronous.

In Asynchronous mode the 4050 SDR scans channels according to an algorithm generated from the current time. It assumes that all the other radios on the network are using a different time reference. The result is that any call to another station needs to be long enough to ensure that the called station scans to that channel during the call.

Link Retry Count

The link retry count is a representation of how many attempts will be made to contact a remote station. The chosen value will determine number of subsequent retries (call attempts) The default value is 2. Select a value between 0 and 254.

The screenshot shows a software interface for ALE 3G settings. At the top, there are tabs for 'General', 'ALE 2G', 'ALE 3G', and 'Call History'. Below these are sub-tabs for 'Addresses', 'Pool Entries', 'Networks', and 'Preset Messages'. The main content area is divided into two columns: 'General' and 'Low Quality Links'.
 In the 'General' column, the following settings are visible:
 - ALE State: Disabled (dropdown menu)
 - LQA Averaging: No Averaging (dropdown menu)
 - LSU Mode: Synchronous (dropdown menu)
 - GPS Leap Seconds: 18 (spin box)
 - Link Retry Count: 2 (spin box)
 - Voice Link Timeout (sec): 60 (spin box)
 - Data Link Timeout (sec): 60 (spin box)
 - Network Key: 0 (spin box)
 In the 'Low Quality Links' column, the following settings are visible:
 - Master SNR Threshold: Disabled (dropdown menu)
 - SNR Threshold (dB): 10 (spin box)
 - Slave SNR Threshold: Disabled (dropdown menu)
 - SNR Threshold (dB): 10 (spin box)
 Below these is a 'Sounding' section with:
 - An unchecked checkbox for 'Enable Sounding'.
 - A 'Sounding Offset (minutes)' spin box set to 5.

If for example, the link is unsuccessful the first time an attempt is made to initiate a call and the chosen value is 2, the calling station will then make 2 more attempts to contact the remote station, first calling on the channel with the best recorded LQA result. If it is not successful, it will then re-attempt on the channel with the next best recorded LQA result.

Data Link Timeout

After the data call link has been established, this setting determines how long the link will remain open without any data transmission between the stations.

Select a value between 1 and 3600 seconds.

Voice Link Timeout

After the voice call link has been established, this setting determines how long the link will remain open without any voice transmission.

Select a value between 1 and 3600 seconds.

Network Key

A network key can negotiate between recipients and other transceivers that may have the same channel and / or address. The caller and intended recipient must have the same network key to communicate.

Select a value between 0 and 8191.

Low Quality Links

Master SNR Threshold

3G has the ability to reject links. If the Signal-to-Noise (SNR) ratio reaches a particular low level, voice will be undecipherable. As the SNR will be different for both ends of the link, the Master SNR and Slave SNR will need to be set.

From the drop-down menu select either: Disabled, Automatic, or Specified

SNR Threshold (dB)

If the Master SNR Threshold has been set to Specified, enter a value for the Master SNR Threshold in dB (between -10 and +54)

Slave SNR Threshold

Refer to the description for Master SNR Threshold, above.

From the drop-down menu select either: Disabled, Automatic, or Specified.

SNR Threshold (dB)

If the Slave SNR Threshold has been set to Specified, enter a value for the Slave SNR Threshold in dB (between -10 and +54).

Sounding

Enable Sounding

Check the box to enable soundings. When ALE 3G sounding is enabled, a sounding signal will be sent on a fixed interval defined by the sounding Offset

Sounding Offset (minutes)

The Sounding offset determines when the sounding signal will be sent. It is defined as minutes from the hour i.e. Setting the offset to 15 will result in soundings being sent at 15 minutes past the hour, every hour.

ALE Settings in the 4050 Transceiver

Some ALE settings can be changed directly in the 4050 transceiver. The majority of these allow toggling on or off certain attributes programmed with the Programming Software.

These Settings can be accessed directly from the **Swipe Menu** by selecting **ALE** or by selecting **Settings**, then **ALE**.

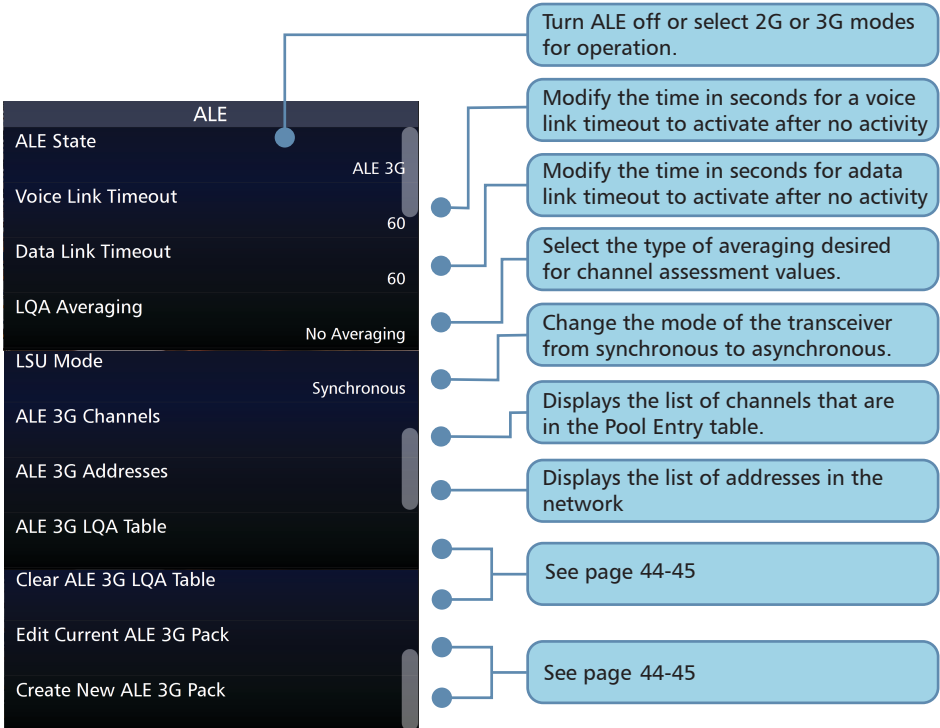


OR



Settings

ALE



ALE 3G LQA Table

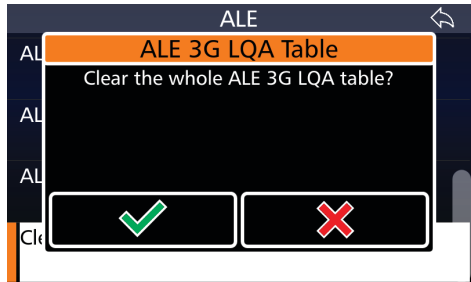
ALE 3G LQA table presents a visual representation of the transmitted and received LQA results gathered from 3G LQA data. LQA data is displayed by Alias and channel frequency with a signal strength level (in dB) and a coloured indication representing the strength of signal sent and received per hour. This is detailed in the below table.

Default theme	Dark Green theme	Green theme	Red theme	dB Range	Notes
				-4dB and below	for 3G data messages only
				-4 to 0 dB	for 600/700bps digital voice, data, messaging and small email
				0 to 3 dB	for 1200 digital voice, data messaging and file transfer
				3 to 8 dB	for 2400 digital voice, data messaging and large email/ file transfer
				8dB and above	for very good performance



Clear ALE 3G LQA Table

This menu item clears the stored LQA table results for all aliases and frequencies.



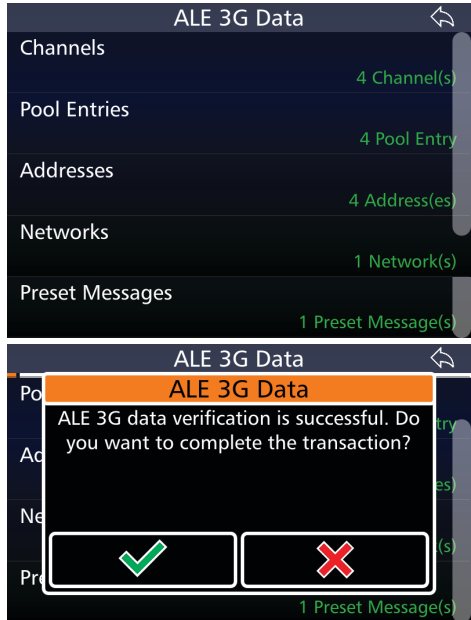
Edit Current ALE 3G Pack

This menu option allows the editing of the current ALE 3G settings within the transceiver.

Green text indicates valid pack settings whilst red text indicates invalid settings.

This menu follows the same procedure as editing 3G settings via the 4000 series programming software. i.e. a channel must be added to the Pool Entries before it can be used as an ALE channel.

Saving the pack will overwrite the transceiver's ALE 3G settings.



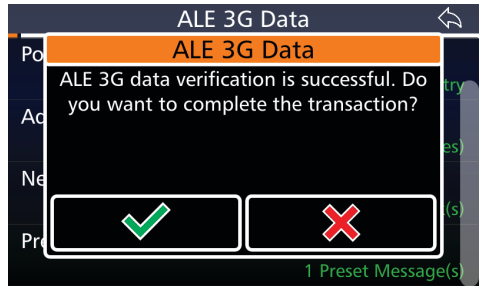
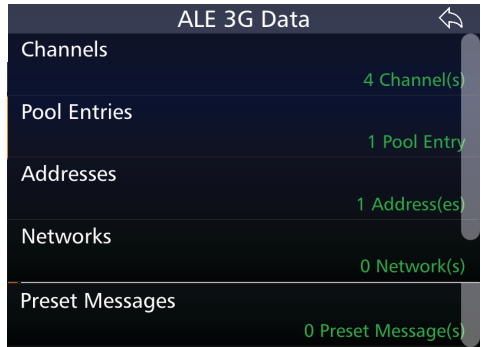
Create New ALE 3G Pack

This menu option allows the creation of a new ALE 3G pack within the transceiver.

Green text indicates valid pack settings whilst red text indicates invalid settings.

This menu follows the same procedure as editing 3G settings via the 4000 series programming software. i.e. a channel must be added to the Pool Entries before it can be used as an ALE channel.

Saving the pack will overwrite the transceiver's ALE 3G settings.



Operation



Call Type	Description
ALE Call	Voice call that uses ALE linking protocols
NetCall	Calls a specific network
Sounding	Broadcasts a signal and assesses transmit signal quality over preset map channels
Messages	Sends a preset or manual message of up to 300 characters
LQA	Assesses both the transmit and receive signals between two stations over pool entry channels
GPS	Sends or receives GPS information
TOD Sync/ TOD Req	The master station synchronises the scanning of all slave stations / the slave station requests to be synchronised with the master station.

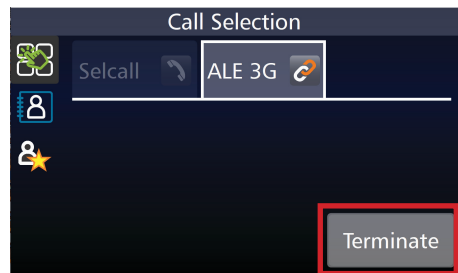
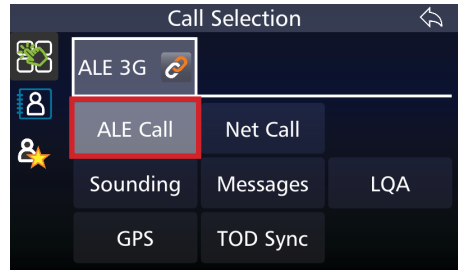
Making an ALE 3G Call



3G calls have a quicker and more robust signal so they are able to link faster than their 2G equivalents.

3G stations can only link to others in their network i.e. slaves or master.

ALE Call

1. Press  and, if necessary, press the  icon to show the Call Selection screen.
2. Select ALE Call
3. From the list of addresses that appear, select the desired address. The transceiver will emit a series of tones. The transceivers will display the "ALE Linked" line and the SNR values will appear beside the ALE 3G label.
4. To make the voice call, simply use the PTT button on the side of the handset.



5. Disconnect from the call by pressing  and, if necessary, press the , and select Terminate. This ends the link between the transceivers. The link will also terminate after a set period of time (Voice Link Timeout, see [page 43](#)).

Receiving an ALE Call

When an ALE call is received, a tone will be received followed by the transceiver transmitting the same tone in response.




When a link has been established the alarm will sound.

Press the  to stop the alarm.

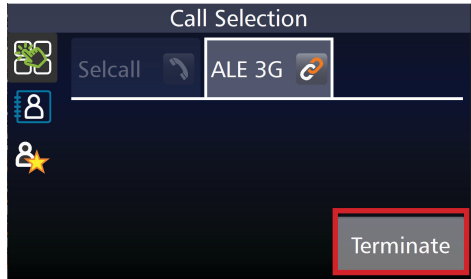
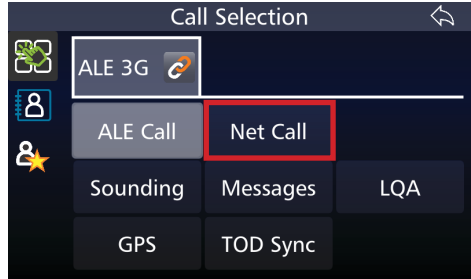


NetCall

Selecting NetCall initiates a network wide call where the transceiver attempts to create a link with every transceiver in the network. It may not actually connect to every transceiver as some may be out of range or switched off.

1. Press **CALL** and, if necessary, press the  icon to show the Call Selection screen.
2. Select NetCall.
3. The transceiver will emit a series of tones. The transceiver will display the "ALE Linked" line with the  and the SNR values will appear beside the ALE 3G label.
4. To make the voice call, use the PTT button on the side of the handset.
5. Disconnect from the call by pressing **CALL** and, if necessary, press the  icon, and select Terminate. This ends the link between the transceivers. The link will also terminate after a set period of time (Voice Link Timeout, see [page 43](#))



Receiving a NetCall is the same as receiving an ALE call.

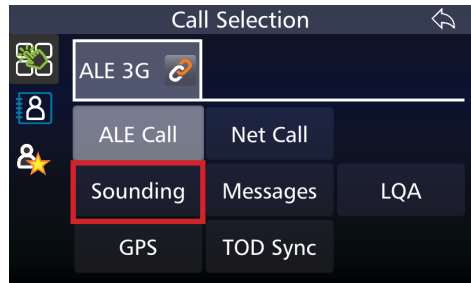


Sounding

Sounding is the testing of selected channels in the Pool Entries table for quality by providing a brief identifying transmission that may be used by other transceivers to evaluate connectivity, availability and to identify known working channels for immediate or later use for communications or calling. This allows for greater efficiency in channel selection and communication.



Note: It is recommended that both transmitting and receiving transceivers be in scan mode when performing this call. If not in scan, the Sounding will only occur on the channel selected and there is no guarantee that all transceivers heard it.

1. Press  and, if necessary, press the  icon to show the Call Selection screen.
2. Select Sounding
3. Sounding will begin automatically.

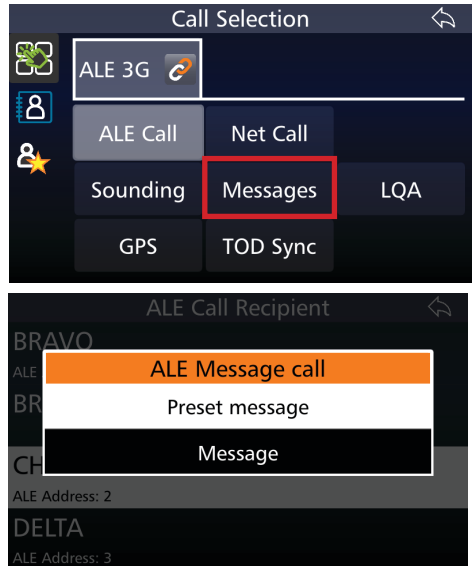


Messages

Messages allow a text message to be sent from one transceiver to another, or many other, transceiver. These can be up to 300 characters long and can be either preset in the programming software or input manually when making the call.


1. Press  and, if necessary, press the  icon to show the Call Selection screen.
2. Select Messages
3. Either:
 - Select "Preset message", select a recipient and select a pre-programmed message (see [page 22](#) to program a message) or
 - Select "Message", select recipient, manually type a message and press enter.


The call will be sent automatically.



Receiving a Messages Call

The transceiver will receive and transmit a series of tones before the sent message displays accompanied by an alarm.



Press  to stop the alarm but keep the message displayed.

Press  to close the message display.

LQA

LQA information maintains signal strength measurements for determining best channel for making calls. Its settings can be altered in the Programming software (see [page 19](#)).

Note: It is recommended that both transmitting and receiving transceivers be in scan mode when performing this call. If not in Scan mode, the LQA will only be made for the specific channel the transceiver is on. It will not continue to cycle through channels and make further assessments.

1. Press  and, if necessary, press the  icon to show the Call Selection screen.
2. Select LQA
3. Select recipient





If in Scan mode, the two transceivers will begin cycling through the preset map, exchanging data for each channel.

LQA assesses the signal quality in both directions (“incoming” and “outgoing”) compared to sounding which is one way only (“incoming”). For more information on Soundings, see [page 52](#). LQA data is collected in tables assigned to known (configured) ALE addresses and assists in selecting the best channel when calling a certain address.

GPS

This call requests and sends GPS information. This can be useful when marking a mobile transceiver's progress or locating a transceiver after a distress signal.



Note: A GPS receiver must be equipped for this call to function.

1. Press  and, if necessary, press the  icon to show the Call Selection screen.
2. Select GPS
3. Select either "Request GPS position" or "Send GPS position".
4. Select recipient



The call will start automatically.



When a GPS position is received, an alarm will sound and the GPS data will display on screen.

5. Press  to stop the alarm but keep the dialogue box open or press  to stop the alarm and close the dialogue box entirely.

Receiving a GPS Call

When receiving a request GPS Position Call, no operator input is required. The transceiver will play the tones to indicate transmission and receive of data.



When receiving a Send GPS Position call, the tones will play and the alarm will sound when the GPS data is received.

- Press  to stop the alarm but keep the dialogue box open, or press  to close the dialogue box.

TOD Sync/ TOD Req

An unsynchronised slave station will have access to the TOD Req call. This call requests data from the master station so that the remote synchronise its scanning with the network. The call will disappear from the call menu once the station has become synchronous.

Only the master station will display the TOD Sync and this synchronises all the stations in the network that can hear the signal. This allows them to scan in step, allowing the stations to link faster than in 2G.

1. Press  and, if necessary, press the  icon to show the Call Selection screen.
2. Select TOD Sync/Req

The call will begin automatically.

Note: if a GPS is not attached, the transceiver will transmit a TOD req before continuing the call.



Master



Remote

Quiet Call

This call requires the Digital Voice encryption option to be activated before making a call. With Digital Voice active, the noise between transmission is removed and the call is encrypted.

If a station makes a call with these settings, it will force the receiving station into Digital Voice mode in order to receive the call and establish the link.

If Call Mute is also switched on, no linking audio will be received. Voice communication will operate as normal.

Warranty Statement

Barrett Communications (hereafter referred to as 'Seller') provides a three (3) year warranty on all Barrett products from the date of shipment from the Seller. A one (1) year warranty from the date of shipment from the Seller is provided for all batteries.

Each warranty guarantees acceptable performance of the product under normal recommended conditions for the duration of the warranty period. In cases of accident, abuse, incorrect installation or maintenance by a non-Seller representative, subjection to abnormal environmental conditions, negligence or use other than those in accordance with instructions issued by the Seller, the warranty shall be voided. In addition, this warranty shall not cover low performance – specifically the distance or quality of transmission and reception - due to unfavourable environmental or locational conditions. Nor shall this warranty cover the quality of transmission and reception of transceivers mounted in vehicles or vessels that have not been sufficiently electrically suppressed.

Should any fault due to bad design, workmanship or materials be proven at any time within the warranty period, the Seller will rectify such fault free of charge provided that the equipment is returned, freight paid, to Barrett Communications Pty Ltd head office or to an authorised service centre. The repaired or replaced product will remain covered under and throughout the term of the original warranty period up to its expiration. No repair or replacement will extend the warranty term past the original thirty-six (36) month anniversary of the original date of shipment from the Seller.

Firmware and software (pre-installed, stand-alone or provided as an update), hereafter referred to as 'Software', is guaranteed to perform acceptably within the specifications provided by the Seller, provided that the Software is within the warranty period.

Should Software not perform acceptably, the Seller will use all commercially reasonable efforts to correct such nonconformity as reported to the Seller directly or via a support representative. The Seller is not obliged to update Software under warranty if the nonconformity is caused by a) the use or operation of the Software in an environment other than intended or recommended by the Seller in relevant documentation, or b) modifications made to the Software not authorised or undertaken by the Seller or a representative of said Seller.

Subject to the matters set out in this warranty, no liability, expressed or implied is accepted for any consequential loss, damage or injury arising as a result of a fault in the equipment and, all expressed or implied warranties as to quality or fitness for any purpose are hereby excluded.

This warranty does not extend to products supplied by the Seller which are not designed or manufactured by it. The Seller will however make every

endeavour to ensure that the purchaser receives full benefit on any warranty given by the original equipment manufacturer.

This warranty is restricted to the original purchaser except where the original purchaser is a reseller authorised by the Seller who has purchased for the purpose of resale, warranty shall be extended to the reseller's customer.

Contact Details

Our customer / dealer technical support department can be contacted via land mail, email, telephone or via support ticket on the technical support web page.

<https://www.barrettcommunications.com.au/support/>

Barrett Communications Pty Ltd Head Office:

PO Box 1214, Bibra Lake WA 6965 AUSTRALIA

Toll Free Tel: 1800 999 580 (Within Australia)

Tel: +618 9434 1700

Fax: +618 9418 6757

email: support@barrettcommunications.com.au

Telephone support from the Australian office is available from 7:30 am to 4:00 pm local time Monday to Friday.

Barrett Communications – Europe:

Unit 9, Fulcrum 2 Victory Park, Solent Way,
Whiteley Hampshire PO15 7FN United Kingdom

Tel: +44 (0) 1489 880 332

Fax: +44 (0) 1489 565 422

email: support@barrettcommunications.co.uk

Telephone support from the UK office is available from 8:30 am to 5:00 pm local time Monday to Friday.

Barrett Communications Corporation USA:

190 Office Parkway

Pittsford, N.Y. 14534

Tel: +1 585 582 6134

E-Mail: support@barrettusa.com

Telephone support from the USA support office is available from 8:30 am to 5:00 pm local time Monday to Friday.

AUSTRALIA

(Head office and Manufacturing)

Barrett Communications Pty Ltd

47 Discovery Drive, Bibra Lake, WA 6163 Australia

Tel: +61 8 9434 1700

Email: info@barrettcomms.com

UK

(European office)

Barrett Communications - Europe

Unit 9, Fulcrum 2, Solent Way, Whiteley, Hampshire, PO15 7FN United Kingdom

Tel: +44 (0) 1489 880 332

Email: uksales@barrettcommunications.co.uk

USA

(US office and Manufacturing)

Barrett Communications USA Corp

190 Office Parkway, Pittsford, NY 14534 United States of America

Tel: +1 585 582 6134

Email: sales@barrettusa.com