9300 ALE controller
User guide

Australia

Head Office
Codan Pty Ltd
ACN 007 590 605
81 Graves Street
Newton
South Australia 5074
Telephone (08) 305 0311
International +61 8 305 0311
Facsimile (08) 305 0411

State Office (WA)
Codan Pty Ltd
37 Collingwood Street
Osborne Park
Western Australia 6017
Telephone (09) 445 3422
Facsimile (09) 446 9500

International Marketing Offices

Pacific and South East Asia
Codan Pty Ltd
818 Pittwater Road
Dee Why
NSW 2099
Australia
Telephone (02) 971 2233
International +61 2 971 2233
Facsimile (02) 982 1117

Africa, Europe and The Middle East
Codan (UK) Ltd
Gostrey House, Union Road
Farnham, Surrey GU9 7PT
United Kingdom
Telephone (01252) 717 272
International +44 1252 717 272
Facsimile (01252) 717 337
Telex 858355

North and South America
Codan Pty Ltd
782 NW Le Jeune Road
Suite 1 – Ground Floor
Miami, Fla 33126
USA
Telephone (305) 448 6210
International +1 305 448 6210
Facsimile (305) 447 8361

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1. About this guide

This is a user guide for the Codan 9300 ALE (Automatic Link Establishment) controller.

This user guide explains:

- what the 9300 ALE controller does
- how to set it up
- how to use it
- how it works.

Who should use it

This guide is written for users of the 9300 ALE controller.

How to use it

The 9300 ALE controller is called the 9300 in this guide.

This guide contains seven chapters and two appendices. Read chapters 2, and 3 before you use the 9300.

Chapter 2 provides an overview of the 9300 and how it works.

Chapter 3 describes how to set up the 9300 in an ALE station.

Chapter 4 describes how to make and receive calls from an ALE station.

Chapter 5 describes how an ALE station automatically monitors channel quality within a network of ALE stations.

Chapter 6 describes 9300 settings that control ALE functions in the 9300.

Chapter 7 tells you what to do if something goes wrong.

Appendix A describes the connectors on the rear panel of the 9300 which allow the unit to be connected to other equipment.

Appendix B lists the specification of the 9300.

Standards and icons

In this guide words in *italics* are messages that are displayed on the transceiver screen.

This icon…	Means…
☞	a reference to other sections within the user guide or related documentation.
	a note or reminder.
⚠	a warning. If you do not observe the warning, you may damage yourself or the equipment.
❑	the end of a section.

Other documentation

For more information, refer to the:

- Operators handbook for your transceiver

- 9001 HF fax & data interface User guide
  (Codan Part No. 15-04038)

- 9002 HF data modem User guide
  (Codan Part No. 15-04041)

- 9102 Fax & data controller software User guide
  (Codan Part No. 15-03015).

Glossary

ALE	Automatic Link Establishment
BER	Bit Error Rate
HF	High Frequency
PCB	Printed Circuit Board
PTT	Press To Talk
SSB	Single Side Band

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This chapter provides an overview of the Codan 9300 ALE (Automatic Link Establishment) controller. It covers:

- what the 9300 ALE controller does
- other Codan equipment used with the 9300 ALE controller
- how an ALE station works.

What the 9300 ALE controller does

The 9300 ALE controller (called the 9300 in this guide) simplifies making calls using Codan HF SSB transceivers.

Using the 9300 removes the need to make selective beacon calls on different channels to find out which channel is the best for communication. The 9300 automatically selects the channel which it has identified as the best operating channel available. It then establishes an ALE link with the station you want to call.

In an ALE call, you specify the address of the other station but not the channel.

The table below shows how using the 9300 simplifies making a call.

Without using the 9300	Using the 9300
1. Make a number of selective beacon calls using different channels.	1. Make an ALE call.
2. Listen to the revertive signals to decide which channel is the best.	
3. Make a selective call using the best channel.	

Once an ALE link is established, you continue and end the call as you would normally.

The ALE station

Connecting a 9300 converts your station to an ALE station.

Normally, your ALE station will belong to a group of ALE stations called an ALE network.

An ALE network can include non-ALE stations. You can make and receive selective calls as well as ALE calls from your ALE station.

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Codan equipment used with the 9300

You can convert voice, data and fax stations to ALE operation by adding a 9300.

The 9300 can be used with the following Codan equipment:

- the 8528 HF SSB transceiver with option RS fitted
- the 9001 HF fax & data interface
- the 9002 HF data modem
- the 8570 Remote control console
- the 8571 Remote control interface.

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How an ALE station works

Establishing the ALE link

When you make an ALE call, the ALE station selects a channel from a pre-set list of channels and tries to establish an ALE link. It selects the channel which the 9300 recognises as currently the best channel for communicating with the station you are calling.

If the ALE station fails to establish a link using this channel, it selects the next best channel and tries again. It repeats this process until an ALE link is established. If no link has been established after trying all channels, the ALE station indicates call failure.

The set of channels is called the scan group. This is the same set of channels which your ALE station scans for incoming calls. You can set up to 15 channels in the scan group.

Monitoring channel quality

ALE stations monitor changes in channel quality for all channels used in the ALE network.

ALE stations send and receive ALE sounding signals. These are special ALE signals for testing channel conditions. ALE stations analyse incoming ALE sounding signals to rank channels from best to worst for each station in the ALE network.

Automatic ALE scanning

Like non-ALE stations, ALE stations support automatic scan mode.

In automatic scan mode, the ALE link is automatically cancelled if there has been no PTT activity for two minutes. The transceiver immediately starts scanning for incoming calls.

Automatic ALE scanning is disabled while the ALE station is sending or receiving data or fax information in an ALE call.

Emergency channel

Pressing the PTT button while the transceiver is scanning causes scanning to stop. The first channel programmed in the scan group is automatically selected ready for you to speak.

This feature is useful for selecting a preset channel in an emergency situation.

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3. Getting started

This chapter describes how to:

- set up your ALE station
- switch on your ALE station
- control the 9300
- use ALE preambles.

Setting up your ALE station

What you need

To convert your station to an ALE station, you need:

- a 9300 ALE controller
- a 9300 cable (Codan Part No. 08-05014-001 supplied with the 9300) for connecting the 9300 to the transceiver
- an earth cable (Codan Part No. 08-04515-001 supplied with the 9300) for earthing the 9300 to the transceiver.

A typical ALE station

A typical ALE voice station consists of:

- a 9300 ALE controller
- an HF SSB transceiver
- an AC power supply
- an antenna system.

Connecting the units of your ALE station

The transceiver supplies power and all necessary control signals to the 9300 by means of one cable connected to the 'Transceiver' 15-pin D-type connector on the 9300 rear panel.

⚠ Never connect or disconnect the 9300 while the transceiver is switched on.
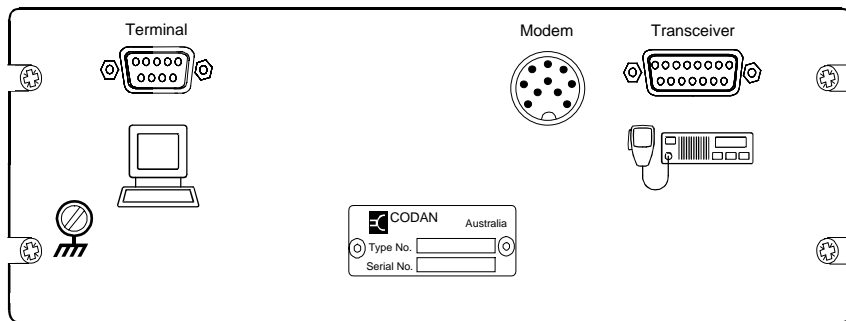
The 9300 rear panel

To connect the units of your ALE station:

1. Make sure that the transceiver is switched off.

2. Connect the transceiver and power supply.

☞ To do this, follow the instructions in the Operators handbook for your transceiver.

3. Place the 9300 on top of the equipment stack.

4. Use the 9300 cable to connect the 'Transceiver' 15-pin D-type connector on the 9300 rear panel to the unlabelled 10-pin round connector on the transceiver rear panel.

5. Use the earth cable to connect the earth screw on the 9300 rear panel to the earth screw on the transceiver rear panel.

6. If you are also using a modem or fax interface, connect the modem or fax interface to the 9300 instead of to the transceiver.

    Use the transceiver cable (Codan Part No. 08-05014-001) supplied with the modem or fax interface. This connects the 'Transceiver' 15-pin D-type connector on the modem or fax interface rear panel to the 'Modem' 10-pin round connector on the 9300 rear panel.

☞   For other details, refer to the User guide for your modem or fax interface.

7. Fit the side brackets that hold the units together if required.

☞   The 'Terminal' 9-pin D-type connector on the 9300 rear panel is used for specialist applications. For details, see 'Using a computer' on page 6-2.

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Switching on your ALE station

Power on

1. Switch on the power supply and the transceiver.

2. Wait for the system to start up. This may take up to a minute.

    The transceiver automatically enters ALE mode and displays *ALE*.

    If *ALE* is not displayed, switch off the transceiver, check connections and return to step 1.

Setting up your station address and scan group

If you are switching on the station for the first time, you need to set:

- your station address (self ID)

- the group of channels for scanning (the scan group).

You need to do this whether or not you are going to use ALE functions.

☞ For details on setting your station address and scan group, refer to the Operators handbook for your transceiver.

The scan group should contain all the channels used by the stations in your ALE network. As far as possible, set channels in the scan group that have proved to be good channels in the past. Channels do not have to be enabled for selective calling.

You can specify the same channel more than once if you want it to be scanned more than once in each scan cycle of the scan group.

Scan group size

The more channels in the scan group, the better the chance of finding a good channel for establishing an ALE link.

There are two disadvantages of having a large scan group:

- recognising incoming calls takes longer since the transceiver has to scan more channels before finding the right one

- sending ALE sounding signals takes longer.

For best performance of the ALE network, all stations in the ALE network should scan the same number of channels.

Channel order in the scan group

When scanning for incoming calls, an ALE station scans channels in the same order that they were specified in the scan group.

When making an ALE call, this order is unimportant. An ALE station tries to establish a link with another station by using channels in order of decreasing channel quality for that station.

For convenience, you may prefer to set channels in the scan group in order of frequency. This makes it easier for you to monitor the scanning sequence for incoming calls as each channel is displayed on the transceiver screen.

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Controlling the 9300

The 9300 has no operator controls. You control the 9300 from the transceiver.

Indicators

The 9300 has two indicator lights on the front panel:

- the power on/off light
- the link status light.

The unlabelled power on/off light is at the top left of the panel. It is red when the 9300 is switched on.

The link status light at the bottom left of the panel is labelled 'HF Link Status'. This light indicates the operating status of the 9300.

Link status light	Meaning
Off	ALE mode is on. Your station is running as an ALE station. It is scanning for selective and ALE calls.
Flashing yellow	ALE mode is on but scanning has stopped. Your station can only receive ALE calls on the current channel.
Yellow	ALE mode is off. Your station is running as a normal station without ALE capability.
Flashing red	Your station is calling another station and is trying to establish an ALE link.
Red	Your station has successfully called another station and established an ALE link.
Green	Another station has successfully called your station and established an ALE link.

ALE mode

When you switch on the transceiver, the transceiver recognises that the 9300 is connected and automatically starts up in ALE mode.

You can turn ALE mode on and off at the transceiver. Turning ALE mode off has the same effect as disconnecting the 9300 from the transceiver. Your station reverts to being a normal station without ALE capability.

☞ For details on turning ALE mode on and off, refer to the Operators handbook for your transceiver.

In ALE mode your station can make and receive selective calls as well as ALE calls.

When scanning for incoming calls in ALE mode, the transceiver screen displays *ALE*. The ALE station scans each channel in the scan group for 0.75 seconds. This allows sufficient time to detect any incoming selective or ALE calls on the current channel.

The maximum delay in seconds before your station finds the right channel and responds to an incoming call is 0.75 seconds multiplied by the number of channels in the scan group.

Pressing the Selective Call Mute button on the transceiver in ALE mode does not change the scanning time.

☞ For full details on how ALE mode changes transceiver operation, refer to the Operators handbook for your transceiver.

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ALE preambles

Optimising ALE performance

The preamble transmitted by a station making a call gives a receiving station sufficient time to find out what channel is being used for transmission.

If the preamble is too short, a receiving station may not have time to scan the right channel before the sending station gives up the call. If the preamble is too long, the process of establishing an ALE link is unnecessarily slow.

An ALE network runs most efficiently when preamble times match the time taken for transceivers to scan all the channels in their scan groups once.

☞   For full details on setting preambles, refer to the Operators handbook for your transceiver.

Preamble times

An ALE station automatically calculates the preamble time based on the number of channels in the scan group. Using different scan group sizes in the ALE network means that preamble times will vary between stations.

Mismatching of preamble times can:
- cause calls to fail
- increase the time needed to establish an ALE link.

For example, the preamble of an ALE station with six channels in its scan group will be too short when this station calls an ALE station scanning 10 channels. The call might fail once or twice before succeeding.

Setting the preamble type

A transceiver in an ALE station allows you to set one of three preamble types:

- Short preamble
- Long preamble
- ALE preamble.

The Short and Long preambles are the same two preamble settings that non-ALE stations use for selective calls.

☞   For full details, refer to the Operators handbook for your transceiver.

If all the stations in your ALE network have a similar number of channels in their scan groups, select the Short or Long preamble type.

When you make an ALE call with the Short or Long preamble setting, the 9300 automatically sets the preamble time to match the size of the scan group. Because all stations in the ALE network scan a similar numbers of channels, this preamble time is optimal for all stations scanning for your call.

If your station scans fewer channels than other stations in the ALE network, select the ALE preamble type.

When you make an ALE call with the ALE preamble setting, the 9300 uses a preamble time optimal for a station scanning 15 channels. This is the maximum number of channels that an ALE station can scan.

The ALE preamble setting makes sure that the preamble time is sufficiently long for all stations in the ALE network. If you call a station scanning less than 15 channels, your call will succeed but it may take longer than necessary to establish an ALE link.

The table below shows the relationship between preamble type settings and preamble times when making selective and ALE calls.

Preamble type setting	Preamble time on selective call	Preamble time on ALE call
Short	2 seconds	Automatically set to suit number of channels in scan group
Long	6 seconds	Automatically set to suit number of channels in scan group
ALE	12 seconds	Set to suit 15 channels

Non-ALE stations in the ALE network

If you want to scan for selective calls as well as ALE calls because there are non-ALE stations in your ALE network, do not set more than eight channels in your scan group. This ensures that your selective call preamble will not exceed the six second limit for selective call preambles of non-ALE stations.

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4. Using the ALE station

This chapter describes how to:

- make calls from an ALE station
- receive calls at an ALE station
- send data and fax information in ALE calls.

Making calls from an ALE station

Making an ALE call

You can only make ALE calls to ALE stations.

You do not need to turn off scanning before making an ALE voice call.

To make an ALE call:

1. Follow the ALE link establishment procedure in the Operators handbook for your transceiver.

   The ALE station tries to establish an ALE link using the best channel from the scan group. If this fails, it tries the next best channel. The current channel number and transmit frequency are displayed on the transceiver screen.

2. Wait until your transceiver indicates that an ALE link has been established.

   Selective call mute is automatically cancelled ready for you to speak.

An ALE station continues trying to establish an ALE link until:

- an ALE link is successfully established
- you press the PTT button to manually interrupt the process
- the number of tries controlled by the Call Retry Limit is reached.

☞   For details, see 'Call Retry Limit' on page 6-13.

An ALE call ends when:

- you turn off ALE mode or resume scanning to end the call (voice call only)
- the other station ends the call and notifies your station that the call has finished
- either station has been inactive (no PTT activity) for two minutes.

Making a selective call

Non-ALE stations cannot recognise incoming ALE calls. To call a non-ALE station, you must make a selective call.

Before making a selective call, you need to turn off scanning. You do not have to turn off ALE mode.

☞   To make a selective call, refer to the Operators handbook for your transceiver.

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Receiving calls at an ALE station

Detecting an incoming call

In ALE mode, an ALE station automatically detects incoming selective and ALE calls.

To detect an incoming call in ALE mode, an ALE station:

1. Scans for incoming selective and ALE call signals.

2. Stops scanning to listen when a signal is detected.

3. Resumes scanning if the signal is not a selective or ALE call.

4. Resumes scanning if the selective or ALE call is not for this station.

5. Starts to establish a link with the other station.

Receiving an ALE call

To establish an ALE link with the calling station, an ALE station:

1. Tunes the antenna to maximise transmitter power if necessary.

    Antenna tuning is necessary when the channel used by the incoming call does not match the channel frequency currently set for the antenna.

2. Sends an ALE response to tell the calling station that it has recognised the ALE call.

3. Swaps channel quality information with the other station.

    ☞ See 'Swapping channel quality information' on page 5-3.

4. Automatically cancels Selective Call Mute.

5. Indicates that the ALE link is now established.

6. Displays the current channel number and receive frequency on the transceiver screen for the duration of the call.

> The ALE station ignores any other incoming call during the process of establishing the ALE link.

An ALE call ends when:

- you turn off ALE mode or resume scanning to end the call (voice call only)

- the other station ends the call and notifies your station that the call has finished

- either station has been inactive (no PTT activity) for two minutes.

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Sending data and fax information in ALE calls

An ALE station can include a 9002 HF data modem attached to a computer, or a 9001 HF fax & data interface attached to a fax machine. These units allow you to make and receive ALE data calls.

In an ALE data call, data or fax information is sent using the ALE link.

As in a selective call, you can switch between voice and data transfer during the call.

Selecting ALE data calls

Although you control the sending of data from the computer or faxes from the fax machine, you control the choice of making an ALE call or selective call from the transceiver.

To make an ALE data call, turn on ALE mode at the transceiver and make sure the transceiver is scanning before you start the call from the computer. If you need to make a data call to a non-ALE station, turn off ALE mode before you start the call.

Making an ALE data call

To make an ALE data call, you can:

- make the call directly from the computer or fax machine
- establish a voice link at the transceiver then continue the call from the computer or fax machine.

If a link is already established and you want to send data or a fax to a different station, end the current link at the transceiver before making the call. When you make the ALE data call from the computer or fax machine, there will be a short delay as your station establishes an ALE link with the new station.

Ending an ALE data call

If you made the data call directly from the computer or fax machine, the call ends automatically.

If you established a voice link at the transceiver then continued the call from the computer or fax machine:

1.   Wait for data transmission to end.

2.   End the ALE link from the transceiver.

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5. Monitoring channel quality

This chapter tells you how the 9300 automatically monitors channel quality. It describes:

- channel quality information
- ALE sounding signal transmission.

How the 9300 monitors channel quality

The 9300 determines channel quality by analysing signal characteristics such as signal strength and noise level.

By continually analysing channel performance, the 9300 recognises how channel quality improves or worsens as signal conditions change.

An ALE station builds up a record of channel quality for each ALE station in the ALE network by:

- exchanging channel quality information at the start of an ALE call with another ALE station
- analysing ALE sounding signals received from other ALE stations
- sending ALE sounding signals for other ALE stations in the ALE network to analyse.

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Channel quality information

Channel quality information is the result of analysing channel performance. The 9300 uses channel quality information to sort the channels from the scan group in order of channel quality. This is done for each ALE station in the ALE network.

The list of ordered channels for each ALE station is called the channel quality table. This table is stored in 9300 memory.

The channel quality table

Information about each ALE station in the ALE network is stored in the channel quality table under its station address. The channel quality table can store up to 15 ordered channels for 100 stations.

For example, if there are five stations in the ALE network and the scan group used by each station contains three channels, the channel quality table for station 2 might be as follows:

Other station addresses	1st channel (best)	2nd channel	3rd channel (worst)
Station 1	channel 3	channel 2	channel 1
Station 3	channel 2	channel 3	channel 1
Station 4	channel 3	channel 2	channel 1
Station 5	channel 2	channel 1	channel 3

If station 2 makes an ALE call to station 5, it will try to establish an ALE link on channel 2. If this fails, it will try channel 1 and then channel 3.

Building up the channel quality table

If the channel quality table has no record of the address of an ALE station, no channel quality information is stored for this station.

You can still make an ALE call to this station but your station will not be able to identify the best channel to use. Your station will establish an ALE link using the channels from the scan group in an unspecified order.

A station address gets added to the channel quality table when the ALE station calls or is called by the other station. This is made possible because ALE transmissions to establish ALE links include the addresses of the sending and receiving stations.

If the limit of 100 stations in the channel quality table is exceeded, the 9300 overwrites records of old station addresses with new station addresses. Old station addresses are overwritten in the order of when they were last created starting with the oldest first.

Swapping channel quality information

ALE stations swap channel quality information at the start of every ALE call. By obtaining channel quality information from other stations, an ALE station can find out the channel quality of its sending paths and achieve a more accurate assessment of the channel quality between stations.

The channel quality of the receiving path between two stations is not necessarily the same as the channel quality of the sending path. For example, local signal conditions may differ for the two stations because of strong interfering signals close to one station.

An ALE station determines the channel quality of receiving paths by directly analysing transmissions from the other ALE stations in the ALE network. It uses this information to estimate the channel quality of its sending paths. When channel quality information is swapped in a call, the ALE station improves its estimate of the channel quality for the sending path to the other station.

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ALE sounding signal transmission

ALE stations use sounding signals as one way of determining channel quality.

Controlling sounding signal transmission

An ALE station sends sounding signals when all the following conditions are met:

- the transceiver is in ALE mode

- the transceiver is scanning for incoming calls

- sounding is turned on.

☞ To turn sounding on and off, see 'Sounding On/Off ' on page 6-9.

Effect of sounding signal transmissions

ALE sounding signal transmissions affect the user in two ways:

- an ALE station cannot receive calls while the transceiver is sending sounding signals

- sounding signals may be audible on voice links.

When an ALE station sends sounding signals, the transceiver temporarily stops scanning. The station is not able to detect incoming calls until scanning resumes after the sounding signal transmission.

Sounding does not affect outgoing calls. If you start making a call while your station is sending sounding signals, sounding transmission automatically stops.

In ALE mode, Selective Call Mute is only cancelled when an ALE link is established. While your station is scanning, you do not hear any ALE preamble or sounding signals.

Although your ALE station stops sending sounding signals when an ALE link is established, other ALE stations may be sending sounding signals on the same channel. This can cause noise interference on voice links. Data links are unaffected.

Where possible, sounding should be left on all the time to ensure efficient ALE operation.

The sounding interval

ALE stations send sounding signals at regular intervals. The time between sending sounding signals is called the sounding interval.

You may need to change the sounding interval if sounding activity is too infrequent or excessive for your ALE network.

☞　　　For details, see 'Changing the sounding interval' on page 6-3.

The default setting for the sounding interval is 30 minutes.

Judging the level of sounding activity

Codan transceivers used in ALE stations allow you to hear the level of sounding activity in your ALE network.

By setting an option you can make the transceiver emit a beep every time it receives a sounding signal. You can then judge the level of sounding activity by listening to how often the transceiver emits beeps.

☞　　　For details on enabling this option, refer to the Operators handbook for your transceiver. To enable this option for the 8528 transceiver, fit link 4 on the microprocessor PCB.

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6. 9300 settings

This chapter tells you how to change 9300 settings. It describes:

- the sounding interval
- 9300 system settings
- 9300 memory reset options.

How to change 9300 settings

9300 settings control how the ALE functions work. These settings are stored in 9300 memory. You can change 9300 settings from the control panel of the transceiver.

You can:

- change the sounding interval
- change 9300 system settings
- use 9300 memory reset options to reset 9300 system settings and erase 9300 memory.

☞ For details on the procedures, refer to the Operators handbook for your transceiver.

The 9300 is factory set to run efficiently. In normal situations, you should not need to change settings.

You should not change settings unless:

- ALE performance is poor
- advised by a Codan agent
- troubleshooting suggests changes are necessary.

Before changing settings

Before changing any 9300 setting:

1. Enter ALE setup mode.

☞ To do this, follow the procedure described in the Operators handbook for your transceiver.

2. Identify the setting to be changed.

3. Note the current setting displayed on the transceiver screen.

   This will allow you to change back to the old setting if you find that ALE performance is worse after the change.

You can use this procedure to check the current values of 9300 settings without changing them.

Using a computer

You can use a computer to change 9300 settings for specialist applications. The computer connects to the 'Terminal' 9-pin D-type connector on the rear panel of the 9300. This connector is the interface for ALE control and monitoring.

Using a computer instead of a transceiver allows you to change a wider range of factory settings. For normal applications, use of a computer is not recommended.

☞ For details, contact your Codan agent.

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Changing the sounding interval

Changing the sounding interval used by each ALE station may be necessary to decrease or increase the level of sounding activity in your ALE network. Optimising the level of sounding activity can improve ALE performance throughout the ALE network.

☞ For the procedures to change the sounding interval and turn sounding on and off for your ALE station, refer to the Operators handbook for your transceiver.

The greater the level of sounding activity, the more time each ALE station in the ALE network spends processing incoming sounding signals. This time increases as:

- the sounding intervals set for each station decrease (since each station sends sounding signals more often)

- the number of stations in the ALE network increases (since more stations are sending sounding signals)

- the number of channels in each scan group increases (since each sounding transmission lasts longer).

Too much sounding activity

ALE stations in your ALE network should consider reducing sounding activity by increasing the sounding interval used at each station if:

- sounding signal noise is a problem on voice links

- stations are missing incoming calls or are taking longer to establish links because they are busy processing incoming sounding signals.

These problems happen when sounding activity is excessive for the size of your ALE network.

Too little sounding activity

ALE stations in your ALE network should consider increasing sounding activity by decreasing the sounding interval used at each station if:

- stations are failing to identify the best channels to use

- stations are taking longer to establish links because they have to try more channels before they can find a channel good enough for establishing a link.

These problems happen when sounding activity is too infrequent for the size of your ALE network. Channel quality information is not updated fast enough to keep track of changing channel conditions. Channels stored in the channel quality table are not able to be maintained in order of decreasing channel quality.

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9300 system settings

The 9300 has 17 system settings numbered from 00 to 16.

There are nine system settings that you can change. The other eight are reserved system settings.

Do not try to change the factory set values of reserved system settings.

Types of system settings

9300 system settings control:

- ALE mode operation
- how an ALE station establishes an ALE link
- the channel quality table.

The system setting ALE Silent Mode (option 11) controls how the ALE station sends and receives ALE calls.

Four system settings control how the ALE station decides whether the quality of the current channel is good enough for establishing an ALE link:

- BER (Bit Error Rate) Threshold (option 05)
- Golay Threshold (option 06)
- Error Threshold (option 07)
- Call Retry Limit (option 13).

If the ALE station fails to establish an ALE link after testing the quality of the current channel based on these settings, it considers the next best channel in the channel quality table and repeats the testing.

Four system settings control how information builds up in the channel quality table:

- Sounding On/Off (option 00)
- Channel Quality Decay Time (option 02)
- Sounding Signal Length (option 03)
- Channel Quality Averaging (option 14).

Changing these settings allows you to influence how ALE stations monitor channel quality.

Default 9300 system settings

The table below lists all 9300 system settings giving their range of values and default settings.

No.	Name	Purpose	Settings	Default
00	Sounding On/Off	Turns sounding on and off.	00: Off 01: On 02: Reserved	01
01	Reserved			01
02	Channel Quality Decay Time	Sets the time for channel quality values to decay completely.	00: 1 hour 01: 2 hours 03: 4 hours 03: 8 hours 04: No decay	03

No.	Name	Purpose	Settings	Default
03	Sounding Signal Length	Sets the sounding length.	00: Minimum 01: 5 seconds 02: 10 seconds 03: 20 seconds 04: 30 seconds 05: 40 seconds 06: 50 seconds 07: 60 seconds 08: 80 seconds 09: 100 seconds	00
04	Reserved			01
05	BER Threshold	Selects the BER Threshold of allowed errors for received ALE words.	00–48	48
06	Golay Threshold	Selects the Golay Threshold of allowed errors for received ALE words after they have been Golay decoded.	00–04	03
07	Error Threshold	Sets the maximum number of sequentially received bad ALE words which are allowed.	00–04	03
08	Reserved			00

No.	Name	Purpose	Settings	Default
09	Reserved			00
10	Reserved			00
11	ALE Silent Mode	Turns transmission silent mode on and off.	00: Off (all transmission allowed) 01: On (no automatic transmission)	00
12	Reserved			00
13	Call Retry Limit	Controls the number of times the station tries to establish an ALE link using each channel (the Call Retry Limit plus one if odd or two if even).	00–98 99 (no retry limit)	00
14	Channel Quality Averaging	Sets the method used to update an existing channel quality value stored in the 9300 (Old) when the new reading (New) indicates a drop in channel quality.	00: New 01: (Old+New)/2 02: (3xOld+New)/4 03: (7xOld+New)/8	02
15	Reserved			09
16	Reserved			01

Sounding On/Off (option 00)

This option turns sounding on and off.

When sounding is turned off, your station no longer sends or receives ALE sounding signals. For correct ALE operation, sounding should be left on all the time.

If ALE Silent Mode (option 11) is turned on, the Sounding On/Off option setting is ignored and your station does not send or receive ALE sounding signals.

Channel Quality Decay Time (option 02)

This option sets the artificial decay time for the record of channel quality stored in the channel quality table in 9300 memory.

You can turn decay off or set the decay time in the range 1–8 hours.

For example, turning sounding off and setting a decay time of four hours would result in the record of a perfect channel (100% channel quality) decaying to a unusable channel (0% channel quality) over a period of four hours.

Making the record of channel quality artificially decay ensures that channels only remain recognised as good channels by active means. It avoids the risk of channels remaining incorrectly recorded as a good channels after unnoticed channel deterioration in the field.

The channel quality table may not accurately reflect real conditions if:

- sounding transmissions in the ALE network are too infrequent
- channel quality information is rarely swapped between stations because few ALE calls are made.

The effect of sounding and swapping channel quality information is to work continually against this artificial decay and maintain an accurate picture of channel quality that does not overestimate actual conditions.

Sounding Signal Length (option 03)

This option sets the length in seconds of the sounding transmission for each channel in the scan group.

When an ALE station sends sounding signals, a separate signal is transmitted for each channel in the scan group. The ALE station sends these signals sequentially. The total length of the sounding transmission is the product of the sounding signal length and the number of channels.

For example, if the sounding signal length is set to 10 seconds and the scan group contains seven channels, the ALE station takes 10x7 or 70 seconds to complete sounding transmission.

The default sounding signal length is the minimum setting (under five seconds). The maximum setting is 100 seconds.

BER Threshold (option 05)

This option sets the value of the BER Threshold used in BER testing.

You can set a value in the range 0–48.

BER testing is a method of error detection for ALE word transmission. ALE stations send and receive ALE link controlling information in blocks of data called ALE words. An ALE word consists of a 3-bit preamble and a 21-bit data field.

The result of BER error testing is used in helping to decide whether the ALE link can be established using the current channel.

The higher the BER value of a transmitted ALE word, the greater the error. A BER value of 0 indicates perfect reception of an ALE word. The maximum BER value of 48 indicates that all bits of the ALE word were bad.

If a received ALE word contains more errors than the BER Threshold, the 9300 rejects the word. The lower you set the BER Threshold, the tougher the test for rejecting transmission errors.

Golay Threshold (option 06)

This option sets the value of the Golay Threshold used in Golay testing.

You can set a value in the range 0–4.

Golay testing is an additional method of error detection for ALE word transmission. The result of Golay error testing is used in helping to decide whether the ALE link can be established using the current channel.

The higher the Golay value calculated for a received ALE word, the greater the error.

If a received ALE word contains more errors than the Golay Threshold, the 9300 rejects the word. The lower you set the Golay Threshold, the tougher the test for rejecting transmission errors.

Golay coding is used for forward error correction. Additional error correction bits are added to each ALE word before the word is sent. This tends to increase the transmission time but it allows the 9300 receiving the ALE word to correct some transmission errors.

Excessive transmission errors can sometimes lead to false corrections. The more errors that the Golay method detects and corrects, the greater the chance that the corrections are wrong.

Error Threshold (option 07)

This option sets the maximum number of sequentially received bad ALE words which are allowed before the 9300 decides that the quality of the current channel is too poor to establish an ALE link. A bad word is a word that has exceeded either the BER or Golay Threshold.

You can set a value in the range 0–4.

If the test fails during the process of establishing the ALE link, the call aborts and the transceiver returns to scanning.

ALE Silent Mode (option 11)

This option turns ALE silent mode on and off.

When ALE silent mode is turned off, the station runs as a normal ALE station.

When ALE silent mode is turned on, the station no longer:

- recognises any incoming ALE calls
- sends or receives sounding signals even if Sounding On/Off (option 01) is turned on.

You can still make ALE calls in ALE silent mode.

Call Retry Limit (option 13)

This option controls the number of times the ALE station tries to establish an ALE link using each channel in turn from the scan group.

You can set 'no limit' or a value in the range 0–98.

The maximum number of attempts made is the number set for the Call Retry Limit, plus one if the Call Retry Limit is odd or plus two if the Call Retry Limit is even. If the ALE station has not succeeded in establishing an ALE link after reaching this maximum, it tries again with the next best channel from the scan group.

For example, if the Call Retry Limit is three and there are five channels in the scan group, the ALE station tries to establish an ALE link (3+1)x5 or 20 times. Since each attempt takes 0.75 seconds, the ALE station may take up to 15 seconds in trying to establish an ALE link.

Channel Quality Averaging (option 14)

This option sets the method used to update an existing channel quality value stored in 9300 memory when the new channel quality reading is worse than the stored value.

You can select to:

- replace old values with new readings
- replace old values with different weighted averages of the old values and new readings.

Averaging reduces the effect that one bad reading might otherwise have on a perfect channel. If a new reading is better than an old value, the old value is replaced by the reading.

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9300 memory reset options

The 9300 has eight memory reset options numbered from 00 to 07. These options reset 9300 system settings and erase different areas of memory in the 9300.

There are three memory reset options that you can use. The other five are reserved memory reset options.

Do not use reserved memory reset options.

After you have used 9300 memory reset options, you must switch the transceiver off and then on again to make the changes current.

No.	Option name	Action
00	Quick Reset	Partially re-initialises the 9300 and erases channel quality information from the channel quality table.
01	Full Reset	Fully re-initialises the 9300, resets all 9300 system settings to their default values and erases all the channel quality table.
02	Reserved	
03	Clear Station Addresses	Erases station addresses from the channel quality table.
04–07	Reserved	

Quick Reset (option 00)

This option performs a partial reset of the 9300.

Using this option:

- partially re-initialises the 9300
- erases channel quality information (but not station addresses) from the channel quality table
- restarts the sounding timer.

A Quick Reset takes about five seconds to complete.

Full Reset (option 01)

This option performs a full reset of the 9300.

Using this option:

- fully re-initialises the 9300
- resets the sounding interval to 30 minutes
- resets all 9300 system settings to their default values
- erases all information from the channel quality table
- restarts the sounding timer.

A Full Reset takes about 30 seconds to complete.

Clear Station Addresses (option 03)

This option erases station addresses from the channel quality table but not channel quality information.

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9300 settings

This chapter tells you what to do if you have problems while using the 9300.

Problem	Cause	Action
ALE is not displayed on the transceiver screen after switching on the ALE station.	The 9300 is not connected correctly.	Switch off the transceiver, check that the 9300 is connected correctly then switch it on again.
The 9300 is connected correctly but it is not working efficiently.	9300 system settings may be incorrect.	Switch off the transceiver for five seconds then switch it on again. If the problem remains, reset the 9300 (see 'Full Reset' on page 6-15). If this does not solve the problem, contact your Codan agent.
Transceiver displays *No ALE chan*.	No channels have been set in the scan group.	Set channels in the scan group (refer to the Operators handbook for your transceiver).

Problem	Cause	Action
You have to call an ALE station several times before succeeding in establishing an ALE link.	Signal conditions are poor and the Call Retry Limit is set too low.	Increase the Call Retry Limit system setting (see 'Call Retry Limit' on page 6-13).
	Your preamble time is too short because your station is set to scan fewer channels than the station you are calling.	Either increase the number of channels in your scan group to match the number set for the other station or select the 'ALE preamble' for your transceiver (see 'Setting the preamble type' on page 3-9).
Your station misses some incoming calls and is slow to establish links.	Your station is often busy processing incoming sounding signals. It is unable to detect incoming calls during these periods.	Increase the sounding intervals used by the ALE stations in your ALE network. In severe cases get these station to turn sounding off (see 'Changing the sounding interval' on page 6-3 and 'Sounding On/Off ' on page 6-9).
Your station fails to find the best channel to use and is slow to establish links.	Sounding is turned off or too infrequent for the number of ALE stations in the ALE network to build up an accurate record of channel quality.	Turn sounding on or decrease the sounding intervals used by the ALE stations in the ALE network (see 'Sounding On/Off ' on page 6-9 and 'Changing the sounding interval' on page 6-3).

| Problem	Cause	Action
Sounding signals are too noisy and too frequent.	Either there are many ALE stations in the ALE network, or the sounding intervals set for these stations are too short.	Increase the sounding intervals used by the ALE stations in your ALE network. In severe cases get these station to turn sounding off (see 'Changing the sounding interval' on page 6-3 and 'Sounding On/Off ' on page 6-9).
The ALE link was lost during a quiet period in an ALE voice call.	The 9300 breaks the link automatically if there has not been any PTT activity for two minutes.	During an ALE voice call, avoid periods of inactivity longer than two minutes.
The transceiver indicates an ALE error.	The connection between the 9300 and transceiver is faulty or the 9300 has a hardware problem.	Switch off the transceiver, check that the 9300 is connected correctly then switch it on again. If this does not solve the problem, contact your Codan agent.
You have used 9300 memory reset options but transceiver memory still holds old settings.	You must switch off the transceiver after using 9300 memory reset options.	Switch off the transceiver for five seconds then switch it on again.

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Troubleshooting

Appendix A—Connectors

This appendix lists the external interface specification of the 9300.

External interface specification

The 9300 has three external interfaces:

- the 'Terminal' interface for ALE control and monitoring
- the 'Modem' interface for connecting a modem or fax interface
- the 'Transceiver' interface for connecting a transceiver (includes the DC supply).

Connectors for the three interfaces are provided on the rear panel of the 9300.
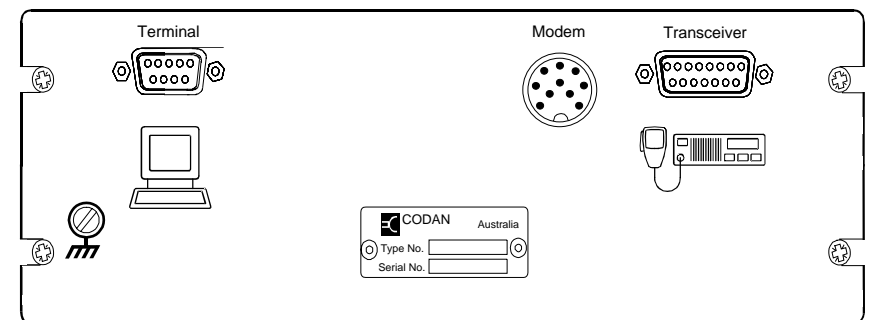
The 9300 rear panel

The 'Terminal' interface

The 9300 interfaces to data terminal equipment by means of the 'Terminal' 9-pin D-type connector which has male contacts and a female shell. The terminal is used for ALE control and monitoring.

Pin No.	Signal Description
1	Not connected
2	Serial data input to the 9300
3	Serial data output from the 9300
4	Not connected
5	Signal ground connected to case
6	Modem reset input
7	Not connected
8	Not connected
9	Not connected

The 'Modem' interface

The 9300 interfaces to the modem or fax interface by means of the 'Modem' 10-pin round socket. This socket is used to replace the unlabelled socket on the transceiver used by the 9300.

Pin No.	Signal Description
1	Ground
2	Audio output (nominal 1.5Vpp)
3	Audio input (3Vpp into 100 KΩ)
4	Quiet line output (+10V: on, Float: off)
5	Alarm tones input (3Vpp into 100 KΩ)
6	PTT input (ground to PTT)
7	Scan output (+10V output in scan)
8	+12V power supply output
9	RS232 input to the transceiver
10	RS232 output from the transceiver

The 'Transceiver' interface

The 9300 interfaces to the transceiver by means of the 'Transceiver' 15-pin D-type connector which has male contacts and a female shell. This connector also supplies switched DC power from the transceiver.

Pin No.	Signal Description
1	+12V power supply input
2	+12V power supply input
3	Serial control data output (TTL)
4	Not connected
5	Control output, +12V when in data mode
6	Spare output (OC)
7	PTT out (OC)
8	Audio output (3Vpp max)
9	Ground
10	Ground
11	Scan input
12	Spare input
13	Spare input
14	Serial control data input (TTL)
15	Audio input (4Vpp max)

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This appendix lists:

- general specification of the 9300

- accessory codes used with the 9300.

General specification

Item	Specification
Compatibility	FED-STD-1045 ALE
Audio bandwidth	500 to 2,750 Hz ±1 dB
Tone frequencies	750 Hz, 1,000 Hz, 1,250 Hz, 1,500 Hz, 1,750 Hz, 2,000 Hz, 2,250 Hz, 2,500 Hz
Primary power	12V DC nominal (300 mA) normally supplied from the transceiver
Audio signals	Input: -10 to 0 dBm (nominal 10 KΩ) Output: -10 to 0 dBm
Channel scan time	0.75 seconds/channel
Computer interface	RS232: 9,600 baud
Temperature	0 to 55°C
Size	250 mm W x 215 mm D x 78 mm H
Weight	1.5 kg

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Accessory codes

Code	Accessory
164	Rack mounting frame (483 mm for type 9300)
–	Vehicle mounting cradle—front entry (Part No. 08-05120-001)
4046	User guide for type 9300

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