Codan part number 15-04080 Issue 2, April 1997

Contents

4 Using the ALE station

5 Monitoring channel quality

6 9600 settings

1 About this guide

This user guide describes how you use the ALE (Automatic Link Establishment) Controller 9600. It covers:

- what the 9600 does
- how the 9600 works
- how you set up an ALE station
- how you send and receive ALE calls.

Who should use it

This guide is written for users of the 9600.

How to use it

This guide contains nine chapters. Read Chapters 2 and 3 before you use the 9600.

Chapter 2 provides an overview of the 9600 and how it works.

Chapter 3 describes how to set up the 9600 in an ALE station.

Chapter 4 describes how you use an ALE station to send and receive calls.

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

Chapter 6 describes 9600 settings that control ALE functions in the 9600.

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

Chapter 8 describes the connectors on the rear panel of the 9600 that allow the unit to be connected to other equipment.

Chapter 9 lists the specifications of the 9600.

Standards and icons

In this guide Arial typeface in bold is used for the names of buttons, knobs and connectors. For example:

Plug in the fax interface at the **Terminal** connector.

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:

- user guide and reference manual for your transceiver
- HF Fax & Data Interface 9001 User Guide (Codan Part No. 15-04038)
- HF Data Modem 9002 User Guide (Codan Part No. 15-04041)
- Fax & Data Controller Software 9102 User Guide (Codan Part No. 15-03015).

Glossary

This term...	Means...
AC	Alternating Current
ALE	Automatic Link Establishment
ALE scanning	Scanning using an ALE scan table
ALE station	Station with a 9600
baud	Binary transfer rate
BER	Bit Error Rate
bit	binary digit
DC	Direct Current
Golay	An error control coding method
HF	High Frequency
network	Group of stations
PCB	Printed Circuit Board
PTT	Press To Talk
scan table	List of channels used when scanning for incoming calls
SSB	Single Sideband transmission format
station	Your equipment for making and receiving calls including transceiver, power supply and antenna
TTL	Transistor Transistor Logic

This term...	Means...
Vdc	Volt direct current
Vpp	Volt peak to peak

Units

°C	degree Celsius
A	Ampere
dB	Decibel
dBm	Decibel referenced to 1 milliwatt
g	gram
Hz	Hertz
m	metre
V	Volt
Ω	Ohm

Unit multipliers

M	mega	one million	10^{6}
k	kilo	one thousand	10^{3}
d	deci	one tenth	10^{-1}
m	milli	one thousandth	10^{-3}

2 Overview

This chapter provides an overview of the 9600. It covers:

- what the 9600 does
- other Codan equipment used with the 9600
- how an ALE station works.

What the 9600 does

The 9600 simplifies sending calls for compatible Codan HF SSB transceivers.

The 9600 automatically selects the channel that it has identified as the best operating channel.

The ALE station

Connecting a 9600 to your transceiver 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 send and receive selcalls as well as ALE calls from your ALE station.

Codan equipment used with the 9600

You can convert voice, data and fax stations to ALE operation by adding a 9600.

The 9600 can be used with the following Codan equipment:

- HF SSB Transceiver 9323
- HF SSB Transceiver 9360
- Marine Transceiver 9390
- HF Fax & Data Interface 9001
- HF Data Modem 9002
- Remote Control Console 8570
- Remote Control Interface 8571.

How an ALE station works

Sending an ALE call

When you send an ALE call, the 9600 tries to find the best channel for communication between your station and the station you are calling. The call proceeds once the 9600 has found the best available channel.

The 9600 uses the list of channels from the transceiver's scan table. These channels are ranked from best to worst based on previous testing of channel quality. The 9600 starts at the top of the list and keeps trying channels until one works. If none work, your call fails. If the system is operating efficiently, calls should succeed on the first or second channel tried.

In between calls, the 9600 continuously monitors channel quality to keep the channel ranking up to date.

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.

Emergency channel

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

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

3 Getting started

This chapter describes how you:

- set up your ALE station
- switch on your ALE station
- control the 9600
- use ALE preambles.

Setting up your ALE station

What you need

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

- an ALE Controller 9600
- a 9600 cable (Codan Part No. 08-05014-001 supplied with the 9600) for connecting the 9600 to the transceiver
- an earth cable (Codan Part No. 08-04515-001 supplied with the 9600) for earthing the 9600 to the transceiver.

A typical ALE station

A typical ALE voice station consists of:

- an ALE Controller 9600
- 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 9600 by means of a cable connected to the **Transceiver** connector on the 9600 rear panel.

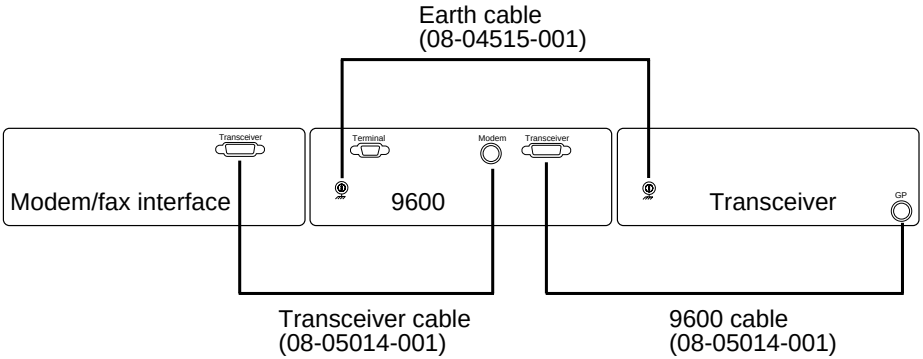
Never connect or disconnect the 9600 while the transceiver is switched on.

To connect the units of your ALE station:

1. Make sure that the transceiver and power supply are switched off.
2. Connect the transceiver and power supply.

To do this, follow the instructions in the user guide for your transceiver.

3. Place the 9600 on top of the equipment stack.



Schematic cable connection

4. Use the 9600 cable to connect the **Transceiver** connector on the 9600 rear panel to the **GP** connector on the transceiver rear panel.
5. Use the earth cable to connect the earth screw on the 9600 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 9600 instead of to the transceiver.

Use the transceiver cable (Codan Part No. 08-05014-001 supplied with the modem or fax interface) to connect the **Transceiver** connector on the modem or fax interface rear panel to the **Modem** connector on the 9600 rear panel.

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

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

The **Terminal** connector on the 9600 rear panel is used for specialist applications. For details, see *Using a computer* on page 6-3.

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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 60 seconds.

   If the transceiver does not indicate that it is loading ALE information during start up, switch off the transceiver, check connections and return to step 1.

Setting up your station address and scan table

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

- your station address
- the group of channels for scanning (the scan table).

You must do this even if you are not going to use ALE functions.

For details on setting your station address and scan table, refer to the user guide for your transceiver.

The scan table should contain all the channels used by the stations in your ALE network. As far as possible, set channels in the scan table that have proved to be good channels in the past.

Scan table size

The more channels in the scan table, the better the chance of the 9600 finding a good channel.

There are two disadvantages of having a large scan table:

- 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 table

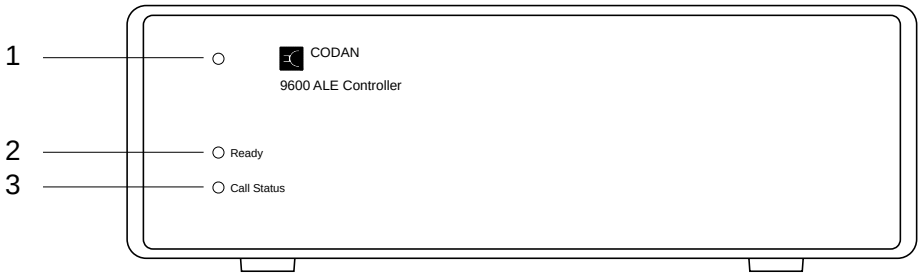
When scanning for calls, an ALE station scans channels in the same order that they were specified in the scan table.

When sending an ALE call, this order is unimportant. An ALE station tries to communicate 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 table in order of frequency. This makes it easier for you to monitor the scanning sequence for calls as each channel is displayed on the transceiver screen.

Controlling the 9600

The 9600 has no operator controls. You control the 9600 from the transceiver.



The 9600 front panel

Indicators

The 9600 has three indicator lights on the left of the front panel:

1 The power on/off indicator—red when the 9600 is switched on.

2 The **Ready** indicator—shows whether or not the 9600 is ready to send or receive ALE calls (see table below).

3 The **Call Status** indicator—shows the operating status of the 9600 during an ALE call (see table below).

Ready indicator	Meaning
Off	Your station cannot send or receive ALE calls. It is running as a normal station without ALE capability.
Flashing green	Starting up or configuring. The ALE station is not yet ready for use.
Green	Your station is running as an ALE station. It is monitoring for selective and ALE calls.
Red	A system fault has occurred. See *Troubleshooting* on page 7-1.

Call Status indicator	Meaning
Off	You are not in an ALE call.
Flashing green	Another station is trying to ALE call your station.
Green	You are in an ALE call started from the other station.
Flashing red	Your station is trying to ALE call another station.
Red	You are in an ALE call started from your station.

ALE preambles

Optimising ALE performance

A preamble is a signal transmitted at the start of a call. It allows stations scanning channels to hear the incoming call. Preambles must be long enough to cover the scanning cycle of the receiving station.

If the preamble is too short, the 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 communication 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 tables once.

For full details on setting preambles, refer to the user guide for your transceiver.

Preamble times

An ALE station automatically calculates the preamble time based on the number of channels in its scan table. Using different scan table 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 communication.

For example, the preamble of an ALE station with six channels in its scan table will be too short when this station calls an ALE station scanning 10 channels. Since preamble transmission may end before the right channel is scanned, calls are likely to fail once or twice before succeeding.

Setting the preamble type

A transceiver in an ALE station allows you to set:

- the selcall preamble
- the ALE preamble.

For full details, refer to the user guide for your transceiver.

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

Preamble type setting	Preamble time on selcall	Preamble time on ALE call
Selcall	6 seconds	Automatically set to suit number of channels in scan table
ALE	12 seconds	Set to suit scan table containing maximum number of channels

When you send an ALE call with the selcall preamble setting, the 9600 automatically sets the preamble time to match the size of the scan table. This preamble time is optimal for all stations scanning for your call when stations in the ALE network scan a similar numbers of channels.

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

When you send an ALE call with the ALE preamble setting, the 9600 uses a preamble time optimal for a station using a scan table containing the maximum number of channels.

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 fewer channels, your call will succeed but it may take longer than necessary to establish communication.

4 Using the ALE station

This chapter describes how you:

- send ALE calls from an ALE station
- receive calls at an ALE station
- send data and faxes from an ALE station
- send calls to non-ALE stations.

Sending ALE calls from an ALE station

You can only send ALE calls to ALE stations. You do not need to turn off scanning before sending the call.

To send an ALE call:

1. Follow the procedure for sending an ALE call in the user guide for your transceiver.

   The ALE station tries using the best channel from the scan table for the call. If this fails, it tries the next best channel. The current channel number and transmit frequency being tried are displayed on the transceiver screen.

2. Wait until your transceiver indicates that the call is successful.

   Selcall mute is automatically cancelled ready for you to speak.

An ALE station continues trying different channels until:

- a call succeeds
- 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 6-9.

An ALE call ends when:

- you resume scanning to end the call
- the other station resumes scanning causing your station to resume scanning too
- either station has been inactive (no PTT activity) for the transceiver automatic scanning timeout period.

Receiving calls at an ALE station

Detecting calls

When ALE scanning, an ALE station automatically detects selective and ALE calls.

To detect a call, an ALE station:

1. Scans for selective and ALE call signals.
2. Stops scanning to listen when a signal is detected.

   If the signal is not a selective or ALE call, the station resumes scanning.

   If the selective or ALE call is not for this station, the station resumes scanning.
3. Starts to establish communication with the other station since the signal is for this station.

Receiving an ALE call

To establish communication with a 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 5-4.

4. Automatically cancels selcall mute.
5. Indicates that communication is now established.
6. Displays the current channel number and receive frequency on the transceiver screen for the duration of the call.

An ALE call ends when:

- you resume scanning to end the call
- the other station resumes scanning causing your station to resume scanning too
- either station has been inactive (no PTT activity) for the transceiver automatic scanning timeout period.

The ALE station ignores any other incoming call until the ALE call has ended.

❑

Sending data and faxes from an ALE station

If your station includes an HF Data Modem 9002 (attached to a computer) or an HF Fax & Data Interface 9001 (attached to a fax machine), you control data and fax communication directly from these units. Make sure that the transceiver is ALE scanning before you start the call.

If you are using another type of data modem or fax interface, you will need to send an ALE call from the transceiver (see *Sending ALE calls from an ALE station* on page 4-2). You start sending the data or fax once the transceiver indicates that the call is successful. You end the ALE call by resuming ALE scanning.

Sending calls to non-ALE stations

Non-ALE stations cannot recognise ALE calls. To call a non-ALE station, you must use another type of call (for example, a selcall). You must turn off scanning before sending the call.

5 Monitoring channel quality

This chapter describes:

- channel quality monitoring
- channel quality information
- ALE sounding signal transmission.

How the 9600 monitors channel quality

The 9600 determines channel quality by analysing signal characteristics such as signal strength and noise level.

By continually analysing channel performance, the 9600 recognises how channel quality improves or deteriorates as signal conditions change.

An ALE station builds up a record of channel quality between itself and 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.

Channel quality information

Channel quality information is the result of analysing channel performance. The 9600 uses channel quality information to sort the channels from the scan table 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 9600 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 100 ordered channels for 100 stations.

For example, if there are five stations in the ALE network and the scan table 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 sends an ALE call to station 5, it will first try to establish communication 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 send an ALE call to this station but your station will not be able to identify the best channel to use. Your station will establish communication using the channels from the scan table in an unspecified order.

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

If the limit of 100 stations in the channel quality table is exceeded, the 9600 overwrites records of old station addresses with new station addresses. The stations that have been least recently used are the first to be replaced.

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.

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 both the following conditions are met:

- the transceiver is ALE scanning for calls
- sounding is turned on.

To turn sounding on and off, see *Sounding On/Off* on page 6-11.

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 calls.

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

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

Selcall mute is only cancelled when communication 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 communication is established, other ALE stations may be sending sounding signals on the same channel. This can cause noise interference on voice calls. Data calls 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 insufficient or excessive for your ALE network.

☞ For details, see *Changing the sounding interval* on page 6-4.

The default setting for the sounding interval is 30 minutes.

❑

6 9600 settings

This chapter tells you how to change 9600 settings to improve system performance. It covers:

- the sounding interval
- 9600 system settings.

How to change 9600 settings

9600 settings control how the ALE functions work. These settings are stored in 9600 memory. You can change 9600 settings from the control panel of the transceiver.

You can:

- change the sounding interval
- change 9600 system settings
- reset 9600 system settings.

☞ For details on the procedures, refer to the user guide for your transceiver.

The 9600 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 representative
- troubleshooting suggests changes are necessary.

Before changing settings

Before changing any 9600 setting:

1. Enter ALE setup mode.

   ☞ To do this, follow the procedure described in the user guide 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 9600 settings without changing them.

Using a computer

You can use a computer to change 9600 settings for specialist applications. The computer connects to the **Terminal** connector on the rear panel of the 9600. This connector is 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 representative.

❑

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 user guide 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 table 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 calls
- stations are missing calls or are taking longer to establish communication because they are busy processing incoming sounding signals.

These problems occur 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 communication because they have to try more channels before they can find one that works.

These problems occur when sounding activity is insufficient 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.

9600 system settings

9600 system settings control:

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

The system setting ALE Silent Mode controls how the ALE station sends and receives ALE calls.

Four system settings control how the ALE station determines if the quality of the current channel is good enough for establishing communication:

- Call Retry Limit
- BER (Bit Error Rate) Threshold
- Golay Threshold
- Error Threshold.

If the ALE station fails to establish communication 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
- Sounding Signal Length
- Channel Quality Averaging
- Channel Quality Decay Time.

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

The table below lists all 9600 system settings giving their range of values.

Name	Purpose	Settings
ALE Silent Mode	Turns transmission silent mode on and off.	0: Off (all transmission allowed) 1: On (no automatic transmission)
Call Retry Limit	Controls the number of times the station tries to establish communication using each channel (the Call Retry Limit plus one).	0–98 99 (no retry limit)
BER Threshold	Selects the BER Threshold of allowed errors for received ALE words.	0–48
Golay Threshold	Selects the Golay Threshold of allowed errors for received ALE words after they have been Golay decoded.	0–4
Error Threshold	Sets the maximum number of sequentially received bad ALE words that are allowed.	0–3
Sounding On/Off	Turns sounding on and off.	0: Off 1: On 2: Reserved

Name	Purpose	Settings
Sounding Signal Length	Sets the sounding length.	0: Minimum 1: 5 seconds 2: 10 seconds 3: 20 seconds 4: 30 seconds 5: 40 seconds 6: 50 seconds 7: 60 seconds 8: 80 seconds 9: 100 seconds
Channel Quality Averaging	Sets the method used to update an existing channel quality (Old) value stored in the 9600 when the new reading (New) indicates a drop in channel quality.	0: New 1: (Old+New)/2 2: (3xOld+New)/4 3: (7xOld+New)/8
Channel Quality Decay Time	Sets the time for channel quality values to decay completely.	0: 1 hour 1: 2 hours 3: 4 hours 3: 8 hours 4: No decay

ALE Silent Mode

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 incoming ALE calls
- sends or receives sounding signals even if Sounding On/Off is turned on.

You can still send ALE calls in ALE Silent Mode.

Call Retry Limit

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

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 ALE station has not established communication after reaching this maximum, it tries again with the next best channel from the scan table.

For example, if the Call Retry Limit is three and there are five channels in the scan table, the ALE station tries to establish communication (3 + 1) x 5 = 20 times. Since the 9600 takes 0.75 seconds for each attempt, the ALE station may take up to 15 seconds in trying to establish communication.

BER Threshold

This option sets the value of the Bit Error Rate (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 control information in blocks of data called ALE words.

The result of BER error testing is used in the process of determining whether or not communication can be established using the selected 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 9600 rejects the word. The lower you set the BER Threshold, the greater the likelihood of rejecting words with errors.

Golay Threshold

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

You can set a value in the range 0–3.

Golay testing is an additional method of error detection and correction for ALE word transmission. The result of Golay error testing is used in the process of determining whether or not communication can be established using the selected channel.

If a received ALE word contains more errors than the Golay Threshold, the 9600 rejects the word. The lower you set the Golay Threshold, the greater the likelihood of rejecting words with 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 9600 receiving the ALE word to correct some transmission errors.

The higher the Golay Threshold on noisy channels, the more the 9600 will attempt to correct reception errors but the greater the possibility that calls may fail on good channels.

Error Threshold

This option sets the maximum number of sequentially received bad ALE words that are allowed before the 9600 decides that the quality of the current channel is too poor to establish communication. 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 communication, the call aborts and the transceiver returns to scanning.

Sounding On/Off

This option turns sounding on and off.

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

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

Sounding Signal Length

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

When an ALE station sends sounding signals, a separate signal is transmitted for each channel in the scan table. The ALE station sends these signals sequentially. After sending each signal, the 9600 monitors all channels for incoming calls.

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 table contains seven channels, the ALE station takes a total of 10 x 7 = 70 seconds to complete sounding transmission.

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

Channel Quality Averaging

This option sets the method used to update an existing channel quality value stored in 9600 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.

Channel Quality Decay Time

This option sets the artificial decay time for the record of channel quality stored in the channel quality table in 9600 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.

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

- there are insufficient sounding transmissions in the ALE network
- 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.

7 Troubleshooting

This chapter tells you what to do if you have problems while using the 9600.

Problem	Cause	Action
You have to call an ALE station several times before the call succeeds.	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 6-9).
	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 table to match the number set for the other station or select the ALE preamble for your transceiver (see *Setting the preamble type* on page 3-10).
Your station misses some calls and is slow to establish communication.	Your station is often busy processing incoming sounding signals. It is unable to detect 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 6-4 and *Sounding On/Off* on page 6-11).
Your station fails to find the best channel to use and is slow to establish communication.	Your station is unable to build up an accurate record of channel quality because sounding is turned off or there is insufficient sounding activity in the ALE network.	Turn sounding on or decrease the sounding intervals used by the ALE stations in the ALE network (see *Sounding On/Off* on page 6-11 and *Changing the sounding interval* on page 6-4).

Problem	Cause	Action
Sounding signals are too noisy and too frequent.	Either there is a large number of 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 stations to turn sounding off (see *Changing the sounding interval* on page 6-4 and *Sounding On/Off* on page 6-11.
Communication was lost during a quiet period in an ALE voice call.	The 9600 ends the call automatically if there has not been any PTT activity for the transceiver automatic scanning timeout period.	During an ALE voice call, avoid periods of inactivity longer than this period.
The transceiver indicates an ALE error.	The connection between the 9600 and transceiver is faulty or the 9600 has a hardware problem.	Switch off the transceiver, check that the 9600 is connected correctly including the earth cable, then switch it on again. If this does not solve the problem, contact your Codan representative.
The 9600 seems to be working inefficiently although it is connected correctly and there are no specific problems.	9600 system settings may be incorrect.	Switch off the transceiver for five seconds then switch it on again. If the problem remains, reset the 9600 (refer to the reference manual for your transceiver). If this does not solve the problem, contact your Codan representative.

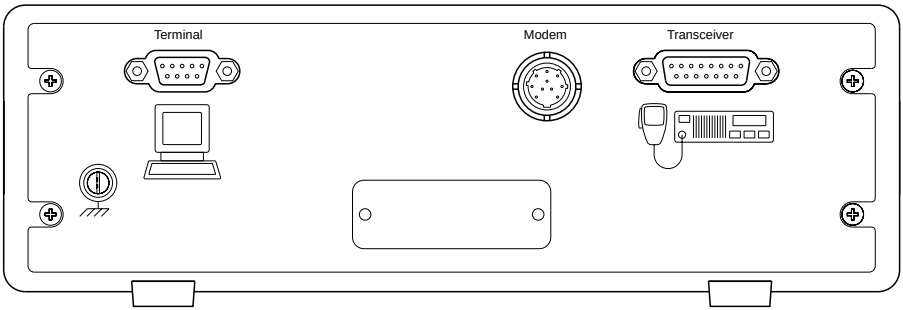
Problem	Cause	Action
The **Ready** indicator is red.	Hardware or configuration fault.	Switch off the transceiver for five seconds then switch it on again. If the problem remains, reset the 9600 (refer to the reference manual for your transceiver). If this does not solve the problem, contact your Codan representative.

❑

8 Connectors

This chapter describes the three connectors on the rear panel of the 9600:

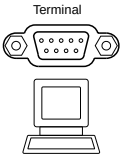
- the **Terminal** connector for ALE control and monitoring
- the **Modem** connector for a modem or fax interface
- the **Transceiver** connector for the transceiver.



The 9600 rear panel

The Terminal connector

The **Terminal** connector is used by data terminal equipment for ALE control and monitoring. It is a 9-pin D-type connector with male contacts and a female shell.



The Terminal connector

Pin No.	Signal Description
1	Not connected
2	Serial data input to the 9600
3	Serial data output from the 9600
4	Not connected
5	Signal ground connected to case
6	Reset input (for details, contact your Codan representative)
7	Not connected
8	Not connected
9	Not connected

The Modem connector

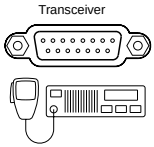
The **Modem** connector is used for plugging in a modem or fax interface. It is a 10-pin round connector.

The Modem connector

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

The Transceiver connector

The **Transceiver** connector is used for plugging in the transceiver. It is a 15-pin D-type connector with male contacts and a female shell. It also supplies switched DC power from the transceiver.



The Transceiver connector

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

9 Specifications and accessories

This chapter lists:

- specifications of the 9600
- accessories used with the 9600.

Specifications

Item	Specification
Compatibility	FED-STD-1045 ALE
Audio bandwidth	500 to 2750 Hz ±1 dB
Tone frequencies	750 Hz, 1000 Hz, 1250 Hz, 1500 Hz, 1750 Hz, 2000 Hz, 2250 Hz, 2500 Hz
Primary power	12 Vdc nominal (500 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: 9600 baud
Temperature	0 to 55°C
Size	250 mm width x 215 mm depth x 78 mm height
Weight	1.5 kg

Accessories used with the 9600

Code	Accessory
164	19 inch rack mounting frame
15-04080	ALE Controller 9600 User Guide (this book)

Index

—M—

—N—

—O—

—P—

—R—

—S—

—T—

—U—