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Keys and macros

This section contains the following topics:

- [Overview of the keypad and macros on page 246](#)
- [Keypad on page 247](#)
- [Macros on page 249](#)
- [Entries for a macro on page 250](#)
- [Working with macros on page 252](#)

Overview of the keypad and macros

Each control point for the Envoy™ Transceiver has a set of keys that are used to set up and operate the transceiver. The 2220 Handset and 2230 Desk Console have the Power and Emergency keys, and a full set of navigation and alphanumeric keys. The 2230 also has three dedicated function keys.

The 2221 Handset has the Power and Emergency keys, and the navigation keys. These are used for operation in conjunction with extra menu options in the user interface.

Figure 48: Power and Emergency keys



Figure 49: Navigation keys



Figure 50: Alphanumeric keys



Figure 51: Function keys (desk console only)



Each key may have more than one function. This function depends on your current location in the user interface of the control point, the length of time that you press it, and whether or not you press it in conjunction with another key. Some keys have a specific function (macro) assigned to them. This function is written in blue text on the key. A key with a macro assigned to it is called a hot key. The dedicated function keys on the desk console may be used at any location within the user interface.

You can press a key briefly to perform the direct function, or you can *hold* a key for two seconds.

Related links:

[Keypad on page 247](#)

[Macros on page 249](#)

Keypad

Standard macros are programmed in the transceiver in the factory. You can also create a macro and assign it to a hot key.

Table 9: Keys and their function














| Key | Function |
|---|---|
|  | Switches on the transceiver. Switches off the transceiver (<i>hold</i> for 2 sec). Performs a hot-key sequence with another key (<i>hold</i> + key): <ul style="list-style-type: none"> •  + 0 jumps to the Brightness screen •  + 2 toggles advanced view •  + 3 jumps to the Select Language screen (admin level) •  + SEC performs secure erase |
|  | Starts a chain call of all calls for the selected emergency contact (<i>hold</i> for 2 sec). |
| PTT | Press-to-talk. Cancels out of editing and calls before they are connected. |
|  | Performs the function shown directly above the key in the menu bar of the screen. |
|  | Scrolls left in a list of values. Moves the cursor/highlight to the left. Reduces the volume when the  indicator is shown in the menu bar of the screen. |
|  | Scrolls right in a list of values. Moves the cursor/highlight to the right. Increases the volume when the  indicator is shown in the menu bar of the screen. |
|  | Scrolls up in a list of entries. Moves the highlight up a row. |
|  | Scrolls down in a list of entries. Moves the highlight down a row. |
| OK | Enters the submenu or list of entries represented by the selected icon. Toggles the selection of a check box. Enters the virtual keypad in the user interface of a 2221 Handset. |
| CALL | Starts the calling process by jumping to the call screen (default behaviour). Jumps to Contacts/Call History/Emergency Contacts/Last Heard Log (<i>hold</i> for 2 sec). |

Table 9: Keys and their function (cont.)

| Key | Function |
|-------------------|--|
| SCAN ← | Toggles scanning on and off. Ends a call. Deletes the character to the left of the cursor. Deletes all characters (<i>hold</i> for 2 sec). |
| 1 TUNE | Enters 1 in character-entry mode. Tunes the antenna. |
| 2 FUNC | Enters 2, a, b, c, A, B, C in character-entry mode. Access the clarifier for the currently selected channel. |
| 3 MODE | Enters 3, d, e, f, D, E, F in character-entry mode. Selects the next allowed mode for the current channel. |
| 4 FREE Rx | Enters 4, g, h, i, G, H, I in character-entry mode. Accesses the free-tune receive function. |
| 5 | Enters 5, j, k, l, J, K, L in character-entry mode. Toggles the operating mode of a crosspatch, if connected. Shows the firmware version of a crosspatch, if connected (<i>hold</i> for 2 sec). |
| 6 | Enters 6, m, n, o, M, N, O in character-entry mode. |
| 7 V/S | Enters 7, p, q, r, s, P, Q, R, S in character-entry mode. Toggles the type of mute selected. |
| 8 SEC | Enters 8, t, u, v, T, U, V in character-entry mode. Toggles secure mode on and off. Enables you to enter a PIN for a secure session, or access secure information (<i>hold</i> for 2 sec). |
| 9 | Enters 9, w, x, y, W, X, Y in character-entry mode. |
| 0 VIEW | Enters 0 or a space in character-entry mode. Toggles between the channel screen and Contacts/Call History. |
| * EASITALK | Enters a special character (repeated press, or <i>hold</i> for 2 sec). Toggles <i>Easitalk</i> ™ on or off. |
| # | Toggles character-entry mode. Enables you to select the input language (<i>hold</i> for 2 sec). |

Related links:

[Macros on page 249](#)



[Free tune on page 265](#)

[Selecting the mute type on page 64](#)

Macros

If you want to automate some of the tasks you perform with the transceiver you can create hot keys on the handset and desk console to perform the tasks for you. Each task is stored in a macro as a series of steps, and the macro is assigned to a hot key. Performing the tasks is then as simple as pressing or *holding* the hot key.

The transceiver is supplied with a set of standard hot keys. These functions are labelled on the corresponding hot key in **BLUE** text. The descriptions of these standard hot keys are included in Table 9. The hot keys to which these macros are assigned cannot be moved at user level. The user can create hot keys when in advanced view.

A macro can be assigned to the alphanumeric or  keys. When the user interface is in character-entry mode, macros assigned to an alphanumeric key cannot be used, as the key is used to enter characters. If you want to be able to use a macro at any time, you should assign the macro to the  key.

Related links:

[Keypad on page 247](#)

[Advanced view on page 31](#)

[Switching between basic and advanced views on page 32](#)

Entries for a macro

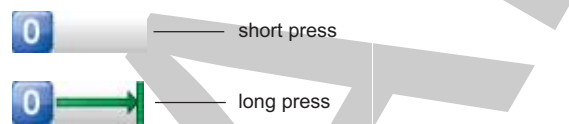
Macro name

A macro is a set of actions that are grouped together and stored under a single name. The name of the macro should identify the general action, and must be unique.

Key

The key is the physical key on the keypad of the handset or desk console to which you want to assign the macro, thus making the key a hot key. There are three function keys that are only available on the desk console. A macro can be invoked by either a short or a long key press of the hot key.

Figure 52: Length of key press for hot key



Steps

The steps are the individual actions that you put together to make up the complete action of the macro. For example, you may want to add a macro named 'Message Bob', where Bob is one of your contacts. The steps of this macro are: go to Contacts, go to Bob, select the call item that sends a Message call to Bob, then send the call.

A step consists of an activity, the location of the activity or the factory macro for the activity, and the delay before the activity is started.

The activity of the macro step can be:

- to show a screen
- to select a peripheral
- to perform an action
- to view or edit a setting

When you select the activity to be:

- **Show screen**, the **Screen** entry requires you to navigate to that screen
- **Select peripheral**, the **Peripheral** entry requires you to navigate to that peripheral
- **Perform action**, the **Action** entry requires you to select from a list of available actions (see [Table 10](#))
- **View/Edit setting**, the **Setting** entry requires you to navigate to the setting, and the **Operation** entry sets the activity on the setting

NOTE: You can navigate to screens and settings that are available in the access level into which you are logged, and the view that you are showing.

The **Delay** entry is the length of time that lapses between macro steps (in msec).

Table 10: Available actions for a macro step

| Activity | Available actions | | |
|----------------|--|---|---|
| Perform action | Toggle Advanced Toggle Clarifier Toggle Easitalk Toggle Free Tune Toggle Internal Speaker Toggle Manual Tune Toggle Mute Toggle Scan Toggle Secure | Mute Type Set Mute Off Set Mute On | Show Call Log Show Channel Screen Show Contacts |
| | Call Call Contact Emergency Call | Next Crosspatch State Next Mode Next Tx Power | Clear LQA |
| | Abandon Mode Erase Secure Keys Power Down | Discovery Screen | |

NOTE: If you select the action Call Contact, you are able to select the contact and the type of call that you want to make from the existing list of call information for the contact.

Related links:

[Moving a macro step on page 258](#)

Working with macros

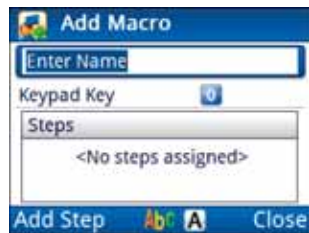
Adding a macro




A

A macro is one or more steps that combine to make up an action that happens at the press of the associated hot key. You should plan the steps of your macro and enter them in a logical sequence, however, you can move the macro steps later, if required.


To add a macro:

- From the main menu, select  (**User Data**), then  (**Macros**).
- Press  (**Options**), scroll to **Add**, then press  (**Select**) to add a macro.



- Enter the name that you want to use for the macro.
- Press  to move to the **Keypad Key|Console Only** entry.
- Press  or  to select the hot key and the type of press (short or long) that you want to use to invoke the macro.

NOTE: You can also press or *hold* the key that you want to set as the hot key on the control point.

- Press  (**Add Step**).
- Do *one* of the following:
 - To show a screen, continue from [Adding a step that shows a screen on page 253](#).
 - To select a peripheral, continue from [Adding a step that selects a peripheral on page 254](#).
 - To perform an action, continue from [Adding a step that performs an action on page 254](#).
 - To view or edit a setting, continue from [Adding a step that views or edits a setting on page 255](#).

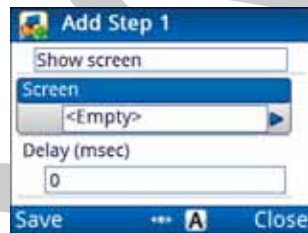
Related links:

- [Moving a macro on page 257](#)
- [Navigating the menu structure on page 30](#)
- [Entering text in a field on page 40](#)
- [Entering text in the 2221 Handset on page 43](#)
- [Selecting a value from a list on page 44](#)
- [Selecting/deselecting a check box on page 45](#)
- [Saving your changes on page 48](#)
- [Overview of basic and advanced views on page 31](#)
- [Overview of user and admin levels on page 33](#)

Adding a step that shows a screen

To show a screen:

- Press ◀ or ▶ to select the **Show screen** value.
- Press ▼ to move to the **Screen** entry.



- Press ▶.
- The macro icon (📁) flashes at the top right of the screen.

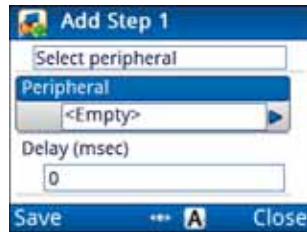


- Navigate to the screen that you want to show, then press **Select**.
- Press ▼ to move to the **Delay** entry.
- Enter the delay (in msec) that you want between the macro steps.
- Press **Save** to save the information.
- Continue from [Completing the macro on page 256](#).

Adding a step that selects a peripheral

To select a peripheral:

- Press ◀ or ▶ to select the **Select peripheral** value.
- Press ▼ to move to the **Peripheral** entry.



- Press ▶.
- The macro icon (📁) flashes at the top right of the screen.

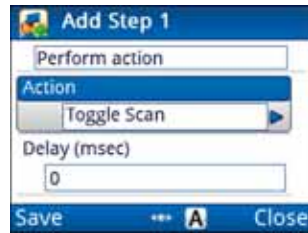


- Navigate to the peripheral that you want to select, then press **OK**.
- Press ▼ to move to the **Delay** entry.
- Enter the delay (in msec) that you want between the macro steps.
- Press ⏪ (**Save**) to save the information.
- Continue from [Completing the macro on page 256](#).

Adding a step that performs an action

To perform an action:

- Press ◀ or ▶ to select the **Perform action** value.
- Press ▼ to move to the **Action** entry.

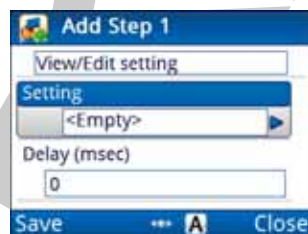


- Press ► to view the list of available actions (see [Table 10](#)).
- Press ▲ or ▼ to scroll to the action that you want to use, press **OK**, then press ⏎ (**Save**).
- Press ▼ to move to the **Delay** entry.
- Enter the delay (in msec) that you want between the macro steps.
- Press ⏎ (**Save**) to save the information.
- Continue from [Completing the macro on page 256](#).

Adding a step that views or edits a setting

To view or edit a setting:

- Press ◀ or ▶ to select the **View/Edit setting** value.
- Press ▼ to move to the **Setting** entry.



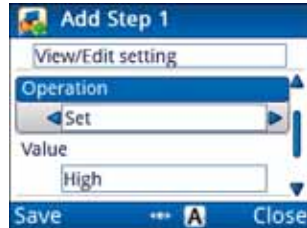
- Press ►.

The macro icon (📁) flashes at the top right of the screen.



- Navigate to the setting that you want to view or edit, then press ⏎ (**Select**).

- Press ▼ to move to the **Operation** entry.
- Press ◀ or ▶ to scroll through the following values:
 - To access the entry for editing at the time of the macro, select **Open**.
 - To set a value in the entry at the time of the macro, select **Set**.
 - To toggle the state of the entry at the time of the macro, select **Toggle**.



- If you selected **Set** for the operation, do the following:
 - Press ▼ to move to the **Value** entry.
 - Select the value that you want to use.
- Press ▼ to move to the **Delay** entry.
- Enter the delay (in msec) that you want between the macro steps.
- Press ⏏ (**Save**) to save the information.
- Continue from [Completing the macro on page 256](#).

Completing the macro

To complete the macro:

- If you want to add another macro step, press ⏏ (**Options**), scroll to **Add Step**, then press ⏏ (**Select**) to add a step.

NOTE: When more than one macro step exists for the macro, you can move the steps to the order in which you want them performed.

- Press ⏏ (**Options**), scroll to **Save**, then press ⏏ (**Select**).

Editing a macro



Editing a macro is similar to adding a macro. If a macro is added at user level, it may be edited at user level and admin level.

To edit a macro:

- From the main menu, select (**User Data**), then (**Macros**).
- Press ▲ or ▼ to scroll to the macro that you want to edit, then press **OK**.
- Continue with the process for adding a macro.

Related links:

[Adding a macro on page 252](#)

Moving a macro



When you move a macro, you change the hot key to which it is assigned. As you change this hot key and the short/long press for the hot key, the macro gradually moves through the list.

NOTE: The factory-programmed macros cannot be moved at user level.

To move a macro:

- From the main menu, select (**User Data**), then (**Macros**).
- Press ▲ or ▼ to scroll to the user macro that you want to move.
- Press (**Options**), scroll to **Move**, then press (**Select**) to move a macro.



- Press ▲ or ▼ to scroll to the hot key and type of key press that you want to use for this macro.

This is shown to the left of the macro name.



- Press  (**Place**).













Moving a macro step

A

If you add a macro but discover that the macro steps that you have added are not in the correct order, you can rearrange the order of the steps.

NOTE: There must be at least two macro steps in the macro before you can move a macro step.

To move a macro step:





- From the main menu, select  (**User Data**), then  (**Macros**).
- Press  or  to scroll to the macro in which you want to move the macro steps, then press **OK**.
- Press  to move to the **Steps** entry.
- Press  or  to scroll to the macro step that you want to move.
- Press  (**Options**), scroll to **Move Step**, then press  (**Select**).
- Press  or  to scroll to the location to which you want to move the macro step, then press  (**Place**).

Deleting a macro



If a macro is added at user level, it may be deleted at user level and admin level.

To delete a macro:

- From the main menu, select  (**User Data**), then  (**Macros**).
- Press ▲ or ▼ to scroll to the macro that you want to delete, press  (**Options**), scroll to **Delete**, then press  (**Select**) to delete the macro.
- Confirm that you want to delete the macro.

Examples of macro

Related links:

[Creating a macro to toggle a setting on page 260](#)

Creating a macro to toggle a setting



To create a macro to toggle the CES-128 Mode:

- From the main menu, select (**User Data**), then (**Macros**).
- Press (**Options**), scroll to **Add**, then press (**Select**).
- Enter the name that you want to use, for example **Toggle CES-128 Mode**.
- Press to move to the **Keypad Key** entry.
- Do *one* of the following:
 - Press or to select the key and key press duration that you want to use for this macro.
 - Press or hold the key that you want to use for this macro.
- Press (**Add Step**).
- Press or to select the **View/Edit setting** value.
- Press to move to the **Setting** entry.
- Press .
- Navigate to , then press **OK**.
- Press or to scroll to the **CES-128 Mode** entry, then press **OK**.
- Press to move to the **Operation** entry.
- Press or to select the **Toggle** value.
- Press to move to the **Delay** entry.
- Enter the delay that you want to use.
- Press (**Save**) to save the information.
- Press (**Options**), scroll to **Save**, then press (**Select**).

Related links:

[Entering text in a field on page 40](#)

[Entering text in the 2221 Handset on page 43](#)

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Modes

This section contains the following topics:

- [Overview of modes on page 262](#)
- [Available modes on page 263](#)

DRAFT

Overview of modes

Information about the modes available in the transceiver is stored in **User Data > Modes**. A mode specifies a combination of a sideband (for example, USB or LSB) and IF filter values (that is, bandwidth and centre frequency).

Each channel must have at least one mode. You may want to select several modes for each channel depending on the modes available to you.

Related links:

[Overview of channels on page 112](#)

DRAFT

Available modes

The transceiver comes with a set of standard modes, and other modes may be added with software options. [Table 11](#) lists the modes that may be available within your transceiver. The modes that appear for selection with a channel are the allowed modes.

Table 11: Modes

| Name of mode | Sideband | Rx/Tx | IF centre (Hz) | IF width (Hz) | Standard/Option |
|--------------|----------|-------|----------------|---------------|-----------------------|
| USB | USB | Rx/Tx | 1500 | 2400 | Standard |
| LSB | LSB | Rx/Tx | 1500 | 2400 | Standard |
| AM | AM | Rx | 0 | 6000 | Standard |
| AM | AM | Tx | 1500 | 2400 | AM filter option |
| USBW | USB | Rx/Tx | 1675 | 2750 | 2750 Hz filter option |
| LSBW | LSB | Rx/Tx | 1675 | 2750 | 2750 Hz filter option |
| USBXW | USB | Rx/Tx | 1800 | 3000 | 3000 Hz filter option |
| LSBXW | LSB | Rx/Tx | 1800 | 3000 | 3000 Hz filter option |
| UMCW | USB | Rx/Tx | 900 | 500 | 500 Hz filter option |
| LMCW | LSB | Rx/Tx | 900 | 500 | 500 Hz filter option |
| CW | USB | Rx/Tx | 0 | 500 | 500 Hz filter option |

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DRAFT

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Free tune

This section contains the following topics:

- [Overview of free tune on page 266](#)
- [Selecting a free-tune frequency on page 267](#)
- [Adding a channel in free tune on page 269](#)

DRAFT

Overview of free tune

The transceiver can be used as a free-tune receiver. This enables you to tune to any frequency within the transceiver's operating range of 250 kHz to 30 MHz. In some circumstances, the options installed on your transceiver may enable you to transmit while free tuning, for example, the Amateur Mode option enables you to transmit during free tune when tuned to amateur band frequencies.

Table 12: Amateur Band frequencies

| Frequency (MHz) |
|-----------------|
| 1.8 to 2.0 |
| 3.5 to 4.0 |
| 7.0 to 7.3 |
| 10.1 to 10.15 |
| 14.0 to 14.35 |
| 18.0 to 18.2 |
| 21.0 to 21.45 |
| 24.8 to 25.0 |
| 28.0 to 29.7 |

Selecting a free-tune frequency

The free-tune function in the transceiver provides the ability to scroll up and down through the frequency range to tune to the frequency that you want, or enter the exact frequency on which you want to tune.

To select a free-tune frequency:

- Go to the channel screen.
- If the transceiver is scanning, press **SCAN** to switch off scanning.
- If you are using a 2220 Handset or 2230 Desk Console, press **FREE Rx**.
- If you are using a 2221 Handset:
 - From the main menu, select **Functions**.
 - Press **▲** or **▼** to scroll to the **Free Tune Screen** function.
 - Press **OK**.
- If you want to listen for traffic on the frequency, ensure that mute is switched off.
- Do *one* of the following:
 - If you want to scroll to a free-tune frequency that is accurate to a fraction of a kilohertz (up to 3 decimal points), use **◀**, **▶**, **▲** or **▼** to scroll to the frequency.



NOTE: You cannot change the volume of the signal that you are receiving.

- If you want to enter a free-tune frequency, press **↵** (**Select**) until the existing frequency is highlighted, then use the numeric keys to enter the frequency that you want to use, up to 2 decimal places.



- If you want to scroll to a free-tune frequency, and be able to adjust the volume as required, press **↵** (**Select**) until the navigation indicator appears next to the frequency, then use **▲** or **▼** to scroll to the frequency.



NOTE: You cannot scroll to a frequency that is a fraction of a kilohertz.

- If you are using a 2220 Handset or 2230 Desk Console, press **FREE Rx** to exit free tune.
- If you are using a 2221 Handset, press **↵** (**Options**), scroll to **Channels**, then press **↵** (**Select**).

Related links:

[Switching mute on or off on page 63](#)

[Adding a channel in free tune on page 269](#)

[Entering text in the 2221 Handset on page 43](#)

Adding a channel in free tune

If you want to be able to return to a frequency to which you have free tuned quickly, you may add the frequency as a channel.

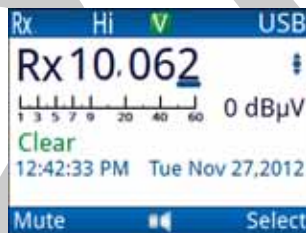
NOTE: If you are operating the transceiver in a country that has stringent licensing regulations, you may not be permitted to add channels with transmit frequencies.

NOTE: If the TxD option is installed in the transceiver, there are restrictions on the frequencies that you can enter.

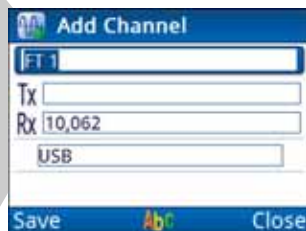
NOTE: If the TxP option is installed in the transceiver, you cannot add channels.

To add a channel in free tune:


- If you are using a 2220 Handset or 2230 Desk Console, press **FREE Rx**.
- If you are using a 2221 Handset:
 - From the main menu, select **(Functions)**.
 - Press **▲** or **▼** to scroll to the **Free Tune Screen** function.
 - Press **(OK)**.
- Tune to the frequency that you want to use.



- *Hold OK.*



- Enter the name that you want to use for the channel.
- Press **▼** to move to the **Rx** entry.

- Enter the receive frequency (in kHz) that you want to use for this channel.
- Press  (**Save**) to save the information.

Related links:

[Selecting a free-tune frequency on page 267](#)

[Entering text in the 2221 Handset on page 43](#)

DRAFT

20

Encryption

This section contains the following topics:

- [Overview of encryption on page 272](#)
- [Using encryption on page 101](#)
- [Setting up encryption on page 283](#)
- [CIVS voice scrambler on page 289](#)
- [CES-128 voice encryption on page 292](#)
- [AES-256 encryption on page 303](#)

Overview of encryption

NOTE: You must have the CES or AES hardware option fitted and the option enabled in the transceiver to use these methods of encryption.

In order to communicate securely between two stations, both stations must use the same channel frequency and secure key or code. The CES and AES encryptors may be programmed with multiple secure keys, any one of which may be selected. For secure communications within your organisation you must set up secure keys that are common to all transceivers in your organisation. CIVS uses standard codes that provide a basic level of voice encryption. You can select a different code for the encryption, but you cannot change the codes to make them unique to your organisation.

NOTE: Codan's KMS may be used to generate secure keys and to fill the CES and AES encryptors.

You can pre-set:

- the available encryptors
- the tasks that an operator may perform at user level
- the status of encryption at power up and when scanning is switched off
- the secure key prefixes
- whether or not encryption can be switched off

The encryptors have some common features and some encryptor-specific features.

Table 13: Features available with CIVS, CES and AES encryption

| Feature | CIVS Voice | CES-128 Voice | AES-256 Digital Voice | AES-256 Digital Data |
|--|------------|------------------|-----------------------|----------------------|
| Secure mode | N/A | Global/Corporate | N/A | N/A |
| Base key | N/A | Yes | N/A | N/A |
| PIN for secure session | N/A | Optional | N/A | N/A |
| Standby mode (including clear Tx) | N/A | Yes | N/A | N/A |
| Setting secure status at power up and scan off | Yes | Yes | Yes | Yes |
| Selecting secure key/code | Yes | Yes | Yes | Yes |
| Editing secure key | N/A | Yes | Yes | Yes |

Table 13: Features available with CIVS, CES and AES encryption (cont.)

| Feature | CIVS Voice | CES-128 Voice | AES-256 Digital Voice | AES-256 Digital Data |
|---|------------|-------------------------|-----------------------|----------------------|
| Erasing secure key | N/A | Yes (individual or all) | Yes (all) | Yes (all) |
| Setting/Locking digital voice data rate | N/A | N/A | Yes | N/A |
| Setting/Locking digital voice mute | N/A | N/A | Yes | N/A |
| Setting digital mute status at power up | N/A | N/A | Yes | N/A |

Secure key

A secure key is a sequence of characters that is used by a CES-128 encryption algorithm to encrypt voice, or an AES-256 encryption algorithm to encrypt voice or data. The secure key is contained in an index. The index provides a means of identifying the key, for example **Corp-01** or **TEK0001**. Typically, each station is programmed with the same key set so that when a particular index is selected at any station, the key stored within is the same. Stations need to use the same key to provide end-to-end secure communication.

The format of a secure key depends upon the encryptor with which it is used.

Table 14: Properties of a secure key in CES-128 and AES-256 encryption

| Properties | CES-128 Voice Encryption | AES-256 Digital Voice/Data Encryption |
|---------------|---|---------------------------------------|
| Length of key | Index 1: 8 digits Index 2 to 98: 16 digits | 64 characters |
| Characters | Numeric | Hexadecimal |

NOTE: Codan's KMS may be used to generate secure keys and to fill the CES and AES encryptors.

Secure keys may also be entered via the user interface of the control point, if permitted. You can also replace a secure key with a new string of characters. You cannot read existing secure keys.

CAUTION: If you edit a key, you must make the same change to the same key in all other transceivers that want to communicate securely with this station.

Related links:

[*Adding a secure key on page 278*](#)

[*Selecting a secure key on page 103*](#)

[*Editing a secure key on page 280*](#)

[*Setting the CES key prefix on page 294*](#)

[*Setting the digital key prefix on page 303*](#)

DRAFT

Using encryption

Related links:

[Encryption on page 271](#)

Switching the encryptor on or off

The 2220 Handset and 2230 Desk Console have hot keys that access the secure feature directly. With the 2221 Handset, you access the secure feature via **Functions**.

If you want secure to remain on at all times, you set this in **Settings > Security > Secure Start State**.

To switch the encryptor on or off:

- If you are using a 2220 Handset or 2230 Desk Console, press **SEC**.
- If you are using a 2221 Handset:
 - Press **Options**.
 - Press **▲** or **▼** to scroll to the **Secure On|Secure Off** option.
 - Press **Select**.

Secure is toggled on or off across all available encryptors.

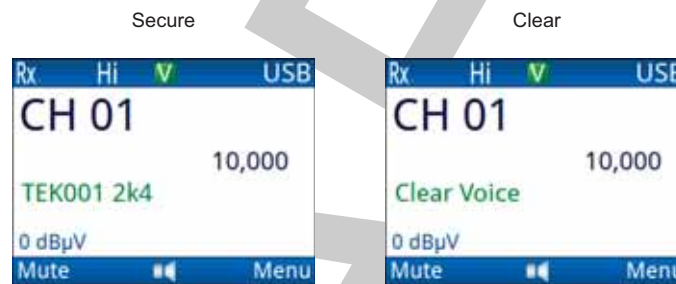
For CIVS voice scrambling you will see:



For CES-128 voice encryption you will see:



For AES-256 digital voice encryption you will see:







For AES-256 digital data encryption you will see:



- Change to the encryptor type that you want to use, if permitted.
- If you are using CES-128 voice encryption with a 2220 Handset or 2230 Desk Console, press * to go to secure standby mode, if enabled and required.



- If you are using CES-128 voice encryption with a 2221 Handset, do the following to go to secure standby mode:
 - Press  (**Options**).
 - Press  or  to scroll to the **Standby On** option.
 - Press  (**Select**).

Related links:







- [Selecting an encryptor on page 277](#)
- [CIVS voice scrambler on page 289](#)
- [CES-128 voice encryption on page 292](#)
- [AES-256 digital voice encryption on page 303](#)
- [AES-256 digital data encryption on page 309](#)
- [Secure Start State on page 238](#)
- [Setting the secure state of all encryptors at power up on page 288](#)
- [Standby mode on page 297](#)
- [Entering a PIN for a secure session on page 296](#)

Selecting an encryptor

You can select the type of encryptor or scrambler that you want to use, if permitted.

NOTE: The ability to select an encryptor or scrambler at user level is set in **Settings > Security > General Options > Allow user to select encryptor type**. The available encryptors and scramblers from which the user can select is set in **Settings > Security > Encryptor Type**.

To select an encryptor:

- If you are using a 2220 Handset or 2230 Desk Console, do *one* of the following:
 - From the main menu, select  (**General**), then  (**Secure**).
 - *Hold* **SEC**.
- If you are using a 2221 Handset:
 - From the main menu, select  (**Functions**).
 - Press  or  to scroll to the **Secure Info** function.
 - Press  (**OK**).



- Press ▲ to move from the list of entries to select the tab.
- Press ◀ or ▶ to select the encryptor tab that you want to use.



- Press ⏎ (**Activate**).

Related links:

[Enabling encryptor selection on page 285](#)

Adding a secure key

If you are permitted to add a secure key for a CES-128 or AES-256 encryptor, the transceiver automatically selects the next empty secure index into which you can enter a secure key. You cannot select the secure key index.

To add a secure key:



- If you are using a 2220 Handset or 2230 Desk Console, do *one* of the following:
 - From the main menu, select 🏠 (**General**), then 🔒 (**Secure**).
 - Hold **SEC**.
- If you are using a 2221 Handset:
 - From the main menu, select 📁 (**Functions**).
 - Press ▲ or ▼ to scroll to the **Secure Info** function.
 - Press ⏎ (**OK**).
- Press ▲ or ▼ to scroll to the **Edit Keys** entry.
- Press ▶.



- Press ⏎ (**Options**), scroll to **Add**, then press ⏎ (**Select**).

NOTE: If all secure key indexes contain a key, **Add** is not shown as an option.



- Enter the characters that you want to use for the secure key.
- Press  (**Save**) to save the information.
- Press  (**Close**).

Related links:

[Setting user access to encryptor features on page 284](#)

[Editing a secure key on page 280](#)









[Entering text in a field on page 40](#)

[Entering text in the 2221 Handset on page 43](#)


Selecting a secure key

If an encryptor contains two or more keys, you have the option of selecting a different key for encryption, if permitted. When AES-256 digital voice and data encryptors are used together, the selected key is common to both.

To select a secure key:

- If you are using a 2220 Handset or 2230 Desk Console, do *one* of the following:
 - From the main menu, select  (**General**), then  (**Secure**).
 - Hold **SEC**.
- If you are using a 2221 Handset:
 - From the main menu, select  (**Functions**).
 - Press  or  to scroll to the **Secure Info** function.
 - Press  (**OK**).
- Press  or  to scroll to the **Select Key Index** entry.



- Press ◀ or ▶ to select the secure key index that you want to use.
Hold the key to scroll rapidly through the secure key indexes.
- Press  (OK).
The transceiver goes secure on the selected key.





Related links:

[Setting user access to encryptor features on page 284](#)

Editing a secure key

If permitted, you can replace the content of a secure key index with a new key.

To edit a secure key:

- If you are using a 2220 Handset or 2230 Desk Console, do *one* of the following:
 - From the main menu, select  (**General**), then  (**Secure**).
 - *Hold* **SEC**.
- If you are using a 2221 Handset:
 - From the main menu, select  (**Functions**).
 - Press ▲ or ▼ to scroll to the **Secure Info** function.
 - Press  (OK).
- Press ▲ or ▼ to scroll to the **Edit Keys** entry or **Edit First Key** entry.
- Press ▶.



- If you can edit more than the first key:
 - Press ▲ or ▼ to scroll to the secure key index that you want to edit.
Hold the key to scroll rapidly through the secure key indexes.
 - Press ⏏ (Options), scroll to **Edit**, then press ⏏ (Select).



- Enter the characters that you want to use for the secure key.
- Press ⏏ (Save) to save the information.
- Press ⏏ (Close).

Related links:

[Setting user access to encryptor features on page 284](#)

[Secure key on page 273](#)

[Entering text in a field on page 40](#)

[Entering text in the 2221 Handset on page 43](#)

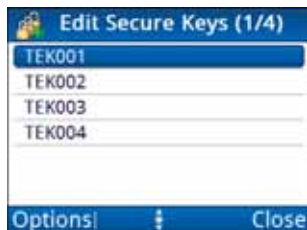
Deleting a secure key




Depending on the encryptor, you can delete a single secure key, or all of the secure keys.

NOTE: If permitted, you can delete all of the secure keys using the ⏏ + SEC hot-key sequence.

To delete a secure key:

- If you are using a 2220 Handset or 2230 Desk Console, do *one* of the following:
 - From the main menu, select 🗑 (General), then 🔒 (Secure).
 - *Hold* SEC.
- If you are using a 2221 Handset:
 - From the main menu, select ⚡ (Functions).
 - Press ▲ or ▼ to scroll to the **Secure Info** function.
 - Press ⏏ (OK).
- Press ▲ or ▼ to scroll to the **Edit Keys** entry.
- Press ▶.



- If you are able to delete a single secure key:
 - Press ▲ or ▼ to scroll to the secure key index that you want to delete.
 - Press  (**Options**), scroll to **Delete**, then press  (**Select**).
- If you are able to delete all the secure keys, press  (**Delete All**).
- Confirm that you want to delete the secure key(s).

Related links:

[Setting user access to encryptor features on page 284](#)

[Enabling a hot-key sequence for erasing secure keys on page 286](#)

Setting up encryption

Setting the available encryptor types

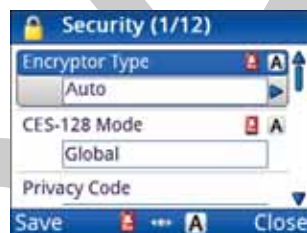


The transceiver is able to operate with a range of Codan and third-party encryptors. You can set the types of encryptors from which the user may select for use in your system from the following:

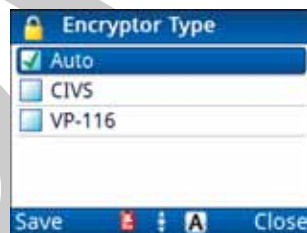
- If you use any of the Codan-protocol encryptors, select **Auto**.
- If you use an encryptor that uses one of the nominated third-party protocols, select the specific encryptor from the list, as required.

To set the available encryptor types:

- From the main menu, select (**Settings**), then (**Security**).
- Press or to scroll to the **Encryptor Type** entry.



- Press .
- Press or to scroll to the value that you want to set, then press **OK** to select the check box.



When the check box is selected, the item is enabled. When the check box is clear, the item is disabled.

You can select multiple values.

- Press (**Save**) to save the information.
- Press (**Close**).

Related links:

[Selecting an encryptor on page 277](#)

[Encryptor Type on page 236](#)

Setting user access to encryptor features



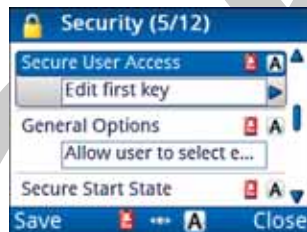
You can select the features that you want to allow the user to perform, or you can prevent access to these features.

The user access values control whether or not the user can:

- select a secure index that contains a key, or a select a code
- edit just the first key, or any of the keys in the secure indexes
- erase one or all of the secure keys and indexes

To select the features that you want the user to be able to perform:

- From the main menu, select (**Settings**), then (**Security**).
- Press or to scroll to the **Secure User Access** entry.





- Press .
- Press or to scroll to the value that you want to set, then press **OK** to select the check box.



When the check box is selected, the item is enabled. When the check box is clear, the item is disabled.

You can select multiple values.

- Press  (**Save**) to save the information.
- Press  (**Close**).

Related links:

[Secure User Access on page 237](#)

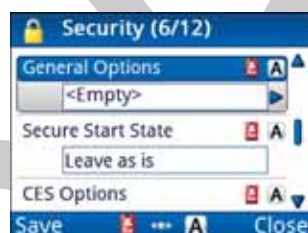
Enabling encryptor selection



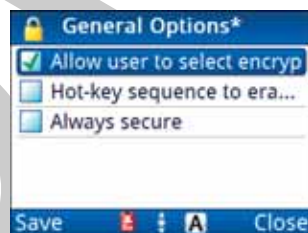
If you want the user to be able to select the type of encryptor at the time of use, enable this feature. When enabled, the user will be able to select the encryptor by *holding SEC*, or via **Functions** > **Secure Info** (2221 only).

To enable encryptor selection:



- From the main menu, select  (**Settings**), then  (**Security**).
- Press  or  to scroll to the **General Options** entry.



- Press .
- Press  or  to scroll to the **Allow user to select encryptor type** value, then press **OK** to select the check box.



When the check box is selected, the item is enabled. When the check box is clear, the item is disabled.

- Press  (**Save**) to save the information.
- Press  (**Close**).

Related links:

[Selecting an encryptor on page 277](#)

[General Options on page 238](#)

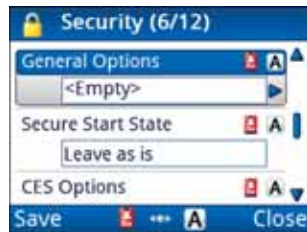
Enabling a hot-key sequence for erasing secure keys



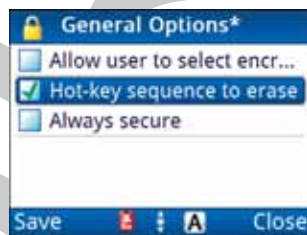
If you want the user to be able to erase all secure keys quickly, enable the **⏻ + SEC** hot-key sequence.

To enable the hot-key sequence:

- From the main menu, select **⚙️ (Settings)**, then **🔒 (Security)**.
- Press **▲** or **▼** to scroll to the **General Options** entry.



- Press **▶**.
- Press **▲** or **▼** to scroll to the **Hot-key sequence to erase keys** value, then press **OK** to select the check box.



When the check box is selected, the item is enabled. When the check box is clear, the item is disabled.

- Press **↵ (Save)** to save the information.
- Press **⏻ (Close)**.

Related links:

[Deleting a secure key on page 281](#)

[General Options on page 238](#)

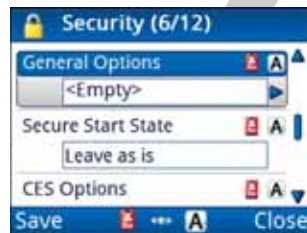
Setting the encryptor to be secure at all times



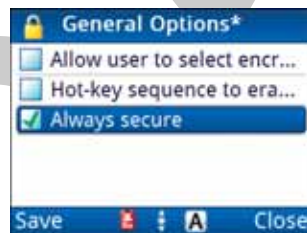
If you want the encryptor to be in secure mode at all times, enable this feature.

To set the encryptor to constant secure mode:



- From the main menu, select  (**Settings**), then  (**Security**).
- Press  or  to scroll to the **General Options** entry.



- Press .
- Press  or  to scroll to the **Always secure** value, then press **OK** to select the check box.



When the check box is selected, the item is enabled. When the check box is clear, the item is disabled.

- Press  (**Save**) to save the information.
- Press  (**Close**).

Related links:

[General Options on page 238](#)

Setting the secure state of all encryptors at power up







You can set the state of the available encryptors when the transceiver is powered up.

To set the secure state of the encryptors at power up:

- From the main menu, select  (**Settings**), then  (**Security**).
- Press  or  to scroll to the **Secure Start State** entry.



- Press  or  to select the value that you want to use from the following:
 - To return to the secure state that the encryptor was in prior to the transceiver being switched off, select **Leave as is**.
 - To always enter secure mode at power up, select **Secure on**.
 - To remain clear at power up, select **Secure off**.
- Press  (**Save**) to save the information.
- Press  (**Close**).

Related links:

[Secure Start State on page 238](#)

CIVS voice scrambler

NOTE: CIVS may be used in conjunction with all other types of encryption.

CIVS provides cost-effective, software-enabled voice scrambler. It is simple to use, and provides a basic level of voice security. You can select from one of 64 fixed codes that offer different levels of security. Lower CIVS code levels are more secure than higher CIVS code levels.

Figure 53: Channel screen showing secure/clear status for CIVS voice scrambler

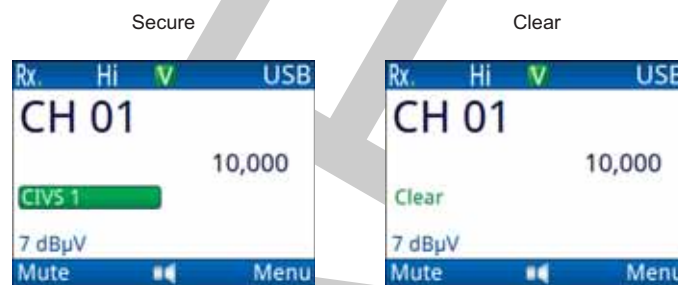


Figure 54: Channel screen showing transmit/receive status for CIVS voice scrambler



Related links:

[Switching the encryptor on or off on page 101](#)

Setting the privacy code for CIVS



The privacy code is used when CIVS is activated. This can be changed while CIVS is active.

To set the privacy code:

- From the main menu, select (**Settings**), then (**Security**).
- Press or to scroll to the **Privacy Code** entry.



- Press or to select the code that you want to use for the CIVS scrambler.
- Press (**Save**) to save the information.
- Press (**Close**).

Related links:

[Privacy Code on page 237](#)

Changing the privacy code


The CIVS scrambler operates on one of 64 codes. You can change the current privacy code, if permitted.

To select a privacy code:

- If you are using a 2220 Handset or 2230 Desk Console, do *one* of the following:
 - From the main menu, select (**General**), then (**Secure**).
 - *Hold* **SEC**.
- If you are using a 2221 Handset:
 - From the main menu, select (**Functions**).
 - Press or to scroll to the **Secure Info** function.
 - Press (**OK**).

- Press ▲ or ▼ to scroll to the **Privacy Code** entry.



- Press ◀ or ▶ to select the code that you want to use.
Hold the key to scroll rapidly through the codes.
- Press  (OK).
The transceiver goes secure on the selected code.

Related links:

[CIVS voice scrambler on page 289](#)

[Setting the privacy code for CIVS on page 290](#)

[Setting user access to encryptor features on page 284](#)

CES-128 voice encryption

NOTE: CES-128 voice encryption may be used in conjunction with AES-256 digital data encryption, and the CIVS scrambler.

CES-128 voice encryption is an optional feature that provides high-grade security for voice communications. This feature uses CES-128 secure keys, secure modes, and PINs to provide various levels of secure communications. The CES-128 voice encryptor may be programmed with multiple secure keys, any one of which may be selected. In addition to the secure keys, the CES-128 voice encryptor provides a PIN facility.

The CES-128 voice encryptor remembers the last-used state if the transceiver is switched off then on again.

Figure 55: Channel screen showing secure/standby/clear status for CES-128 voice encryption



Figure 56: Channel screen showing transmit/receive status for CES-128 voice encryption



Related links:

- [Secure mode on page 293](#)
- [PIN for secure session on page 295](#)
- [Standby mode on page 297](#)
- [Base key on page 301](#)
- [Enabling the use of a PIN for a secure session on page 295](#)
- [Enabling access to secure standby on page 298](#)
- [Enabling clear transmissions during secure standby on page 299](#)
- [Switching the encryptor on or off on page 101](#)
- [CES Options on page 238](#)

Secure mode

CES-128 encryption may operate in one of two modes: Corporate or Global. You can set the secure mode in **Settings > Security > CES-128 Mode**.

For secure communications within your organisation you must set up secure keys in the Corporate secure indexes. These must be common to all transceivers in your organisation. Corporate secure mode refers to a secure session that uses a key stored in one of the Corporate secure indexes, and the Base key, as the seed for the encryption algorithm. The CES-128 voice encryptor can store a secure key in up to 98 Corporate secure indexes. Each key may contain up to 16 digits, except the first key, which accepts only 8 digits.

If you need to have secure communications with other organisations operating the same type of equipment as yours, you can use the fixed Global secure key that is common to all CES-128 voice encryptors shipped from Codan. The Global secure key provides secure communications, however, the security is less than that provided by a secure key in a Corporate secure index. The PIN facility may also be used with the Global secure key to increase the level of security.

NOTE: The Global secure key does not use the Base secure key in its encryption algorithm.

Related links:

- [Setting the CES-128 mode on page 294](#)
- [CES Key Prefix on page 238](#)
- [Base key on page 301](#)

Setting the CES-128 mode

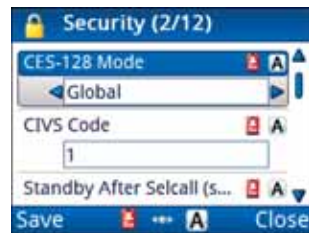


CES-128 voice encryption operates in one of two modes: Corporate or Global. The default CES-128 mode is used when encryption is activated.

NOTE: If it is standard operating procedure for users to switch between Global and Corporate modes on-the-fly, set up a macro to toggle the **CES-128 Mode** entry.

To set the default CES-128 mode:

- From the main menu, select (**Settings**), then (**Security**).
- Press or to scroll to the **CES-128 Mode** entry.



- Press or to select the secure mode that you want to use by default for the CES-128 encryptor.
- Press (**Save**) to save the information.
- Press (**Close**).

Related links:

[Secure mode on page 293](#)

[Creating a macro to toggle a setting on page 260](#)

[CES-128 Mode on page 236](#)

Setting the CES key prefix





A secure key is contained within a secure index. This index has a name that is used to identify it. The name comprises a prefix followed by a sequential number. The CES key prefix applies to all key indexes used by the CES-128 encryptor in the transceiver.

To set the CES key prefix:

- From the main menu, select (**Settings**), then (**Security**).
- Press or to scroll to the **CES Key Prefix** entry.



- Enter the prefix that you want to use.
You may enter up to 4 alphanumeric characters.
- Press  (**Save**) to save the information.
- Press  (**Close**).

Related links:

[CES Key Prefix on page 238](#)

PIN for secure session

A PIN temporarily varies the level of privacy for a secure session. The PIN may be up to 4 digits long, and is only valid for the current secure session. The same, or a different PIN, may be used at the next secure session. Every party to the secure session must use the same PIN for successful secure communication. The PIN may be entered at the time of going secure, or it may be entered during a secure session to enable a more private conversation within the Corporate or Global secure mode. Parties must know what PIN they intend to use without mentioning it over the air.

Related links:

[Enabling the use of a PIN for a secure session on page 295](#)

[Entering a PIN for a secure session on page 296](#)





[CES Options on page 238](#)

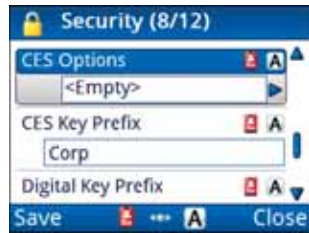
Enabling the use of a PIN for a secure session



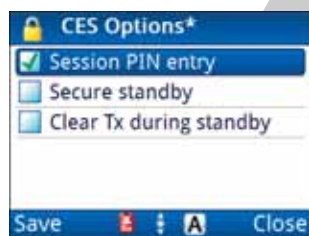
If you want the user to be able enter a PIN so that they may add a privacy to their conversation, enable this feature.

To enable the use of a session PIN:

- From the main menu, select  (**Settings**), then  (**Security**).
- Press  or  to scroll to the **CES Options** entry.



- Press **▶**.
- Press **▲** or **▼** to scroll to the **Session PIN entry** value, then press **OK** to select the check box.



When the check box is selected, the item is enabled. When the check box is clear, the item is disabled.

- Press **↵** (**Save**) to save the information.
- Press **↵** (**Close**).


Entering a PIN for a secure session

If you have CES-128 voice encryption, you can enter a PIN for a secure session to provide additional privacy. The PIN may be entered as you go secure, or while in a secure session.

To enter a PIN for a secure session:

- If you are using a 2220 Handset or 2230 Desk Console, do *one* of the following:
 - From the main menu, select **General**, then **Secure**.
 - *Hold SEC*.
- If you are using a 2221 Handset:
 - From the main menu, select **Functions**.
 - Press **▲** or **▼** to scroll to the **Secure Info** entry.
 - Press **↵** (**OK**).



- Enter up to 4 digits.
 - Press  (**Activate**).
- The transceiver goes secure on the selected key.

Related links:

[CES Options on page 238](#)

Standby mode

CES-128 voice encryption provides a standby mode in which the transceiver receives signals in clear, and automatically switches to secure mode if it detects a secure transmission. When the encryptor is in standby mode, any transmissions that you make will be in secure mode, by default. If you want transmissions to be in clear mode while the encryptor is in standby mode, you can set this in **Settings > Security > CES Options**.

A brief standby period may be set following a call made in an HF network using a Selcall call system. This period enables you to hear the revertives that are sent from the called station. The encryptor goes to secure mode after the standby period. The standby period is set in **Settings > Security > Standby After Selcall**.

The encryptor allows secure operation to remain on during scanning. Secure standby mode is permitted and remains on until * is pressed again.

Related links:

[Using secure standby on page 300](#)

[Enabling access to secure standby on page 298](#)

[Enabling clear transmissions during secure standby on page 299](#)

[Setting the duration of secure standby for a Selcall HF network on page 300](#)

[Standby After Selcall on page 237](#)

[CES Options on page 238](#)

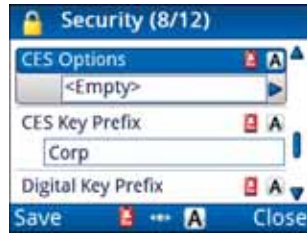
Enabling access to secure standby



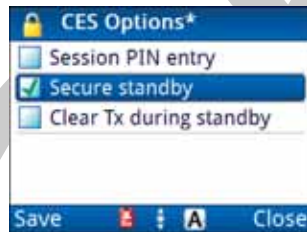
Secure standby mode is available for CES-128 voice encryption only.

To enable access to secure standby mode:



- From the main menu, select  (**Settings**), then  (**Security**).
- Press  or  to scroll to the **CES Options** entry.



- Press .
- Press  or  to scroll to the **Secure standby** value, then press **OK** to select the check box.



When the check box is selected, the item is enabled. When the check box is clear, the item is disabled.

- Press  (**Save**) to save the information.
- Press  (**Close**).

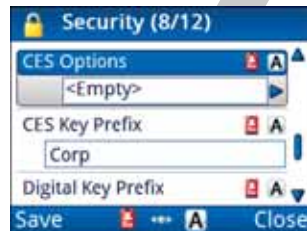
Enabling clear transmissions during secure standby



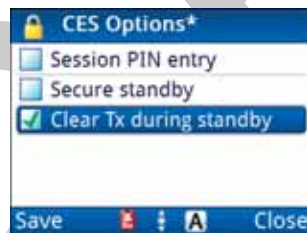
If you want the user to be able to make transmissions that are not secure while the transceiver is in standby mode, enable this feature.

To enable clear transmissions in standby mode:

- From the main menu, select (**Settings**), then (**Security**).
- Press or to scroll to the **CES Options** entry.



- Press .
- Press or to scroll to the **Clear Tx during standby** value, then press **OK** to select the check box.







When the check box is selected, the item is enabled. When the check box is clear, the item is disabled.

- Press (**Save**) to save the information.
- Press (**Close**).





Using secure standby

Secure standby mode available with the CES-128 voice encryptor only. It is accessed via secure mode.

To use secure standby mode:

- Switch on secure mode.
- If you are using a 2220 Handset or 2230 Desk Console, press * to go to secure standby mode.
- If you are using a 2221 Handset, do the following to go to secure standby mode:
 - Press  (**Options**).
 - Press  or  to scroll to the **Standby On** option.
 - Press  (**Select**).



- If you are using a 2220 Handset or 2230 Desk Console, press * to go to exit secure standby mode and return to secure mode.
- If you are using a 2221 Handset, do the following to go to exit secure standby mode and return to secure mode:
 - Press  (**Options**).
 - Press  or  to scroll to the **Standby Off** option.
 - Press  (**Select**).

Related links:

[Switching the encryptor on or off on page 101](#)

Setting the duration of secure standby for a Selcall HF network



If your HF communication network operates with the Codan Selcall call system, you will not hear revertives from the called station when secure mode is active. You can set a brief period following a call made in a Codan Selcall HF network during which the transceiver enters secure standby, listens for revertives, then returns to secure mode.

The transceiver returns to secure mode after any one of the following:





- the end of the period is reached
- you press PTT to begin transmission
- you receive encrypted audio from another station

The time required depends on the length of time the called station takes to tune the antenna, typically 12 to 15 seconds.

To set the duration of secure standby:

- From the main menu, select  (**Settings**), then  (**Security**).
- Press  or  to scroll to the **Standby After Selcall** entry.



- Press  or  to select the value that you want to set, or enter the number directly.
- Press  (**Save**) to save the information.
- Press  (**Close**).

Related links:

[Standby After Selcall on page 237](#)

Base key

The CES-128 voice encryptor uses a Base secure key in secure index 0. This key, along with the selected secure key in a Corporate secure index, is used as the seed for the encryption algorithm. The Base secure key may be changed using a CICS command (`secure key #0 key`) or via the control point. Changing the Base secure key changes the seed for the encryption algorithm. Transceivers must use the same Base secure key and secure key in a Corporate secure index for successful secure communication.

NOTE: Only the Base secure key is combined with a secure key in a Corporate secure index for use in the encryption algorithm.

Changing the base key



To change the base key:

- If you are using a 2220 Handset or 2230 Desk Console, do *one* of the following:
 - From the main menu, select (**General**), then (**Secure**).
 - Hold **SEC**.
- If you are using a 2221 Handset:
 - From the main menu, select (**Functions**).
 - Press or to scroll to the **Secure Info** entry.
 - Press (**OK**).
- Press or to scroll to the **Base Key** entry.



- Press .



- Enter the characters that you want to use for the base key.
- Press (**Save**) to save the information.
- Press (**Close**).

AES-256 encryption

Related links:

[AES-256 digital voice encryption on page 303](#)

[AES-256 digital data encryption on page 309](#)

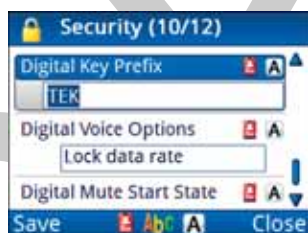
Setting the digital key prefix



A secure key is contained within a secure index. This index has a name that is used to identify it. The name comprises a prefix followed by a sequential number. The digital key prefix applies to all digital voice and data encryptors used with the transceiver.

To set the digital key prefix:

- From the main menu, select (**Settings**), then (**Security**).
- Press or to scroll to the **Digital Key Prefix** entry.



- Enter the prefix that you want to use.
You may enter up to 4 alphanumeric characters.
- Press (**Save**) to save the information.
- Press (**Close**).

AES-256 digital voice encryption

NOTE: AES-256 digital voice encryption may be used in conjunction with AES-256 digital data encryption.

AES-256 digital voice encryption is an optional feature that provides high-grade security for voice communications. This feature uses secure keys to provide secure communications. The digital encryption may be processed at 1200 or 2400 bit/s. The display on the handset clearly indicates whether the transceiver is secure or clear.

NOTE: You can change the prefix for the AES secure keys in **Settings > Security > Digital Key Prefix**, using KMS, or via CICS.

Figure 57: Channel screen showing secure/clear status for AES-256 digital voice encryption



Figure 58: Channel screen showing transmit/receive status for AES-256 digital voice encryption



The AES-256 digital voice encryptor can use a key in secure index 0. This key may be programmed at any time, by any user. This key cannot be programmed by KMS. If all of the secure keys have been erased, the user can enter a new key into secure index 0 for immediate secure communications.

NOTE: This key must be the same across all transceivers that communicate securely.

Related links:

[Digital Key Prefix on page 239](#)

[Switching the encryptor on or off on page 101](#)

Data rate

The data rate affects the speed with which digitally encrypted transmissions are sent. The data rate is shown as either 1k2 (1200 bit/s) or 2k4 (2400 bit/s) in the centre of the screen. Select 1k2 as the data rate in the first instance, then if good HF propagation conditions exist, the 2k4 rate may be selected.







Figure 59: Channel screen showing AES-256 secure key and data rate






Selecting the data rate

The data rate affects the speed with which digitally encrypted transmissions are sent.

To select a different data rate:

- If you are using a 2220 Handset or 2230 Desk Console, do *one* of the following:
 - From the main menu, select  (**General**), then  (**Secure**).
 - *Hold* **SEC**.
- If you are using a 2221 Handset:
 - From the main menu, select  (**Functions**).
 - Press  or  to scroll to the **Secure Info** function.
 - Press  (**OK**).







- Press  or  to select the data rate that you want to use.
- Press  (**OK**).

Locking the data rate





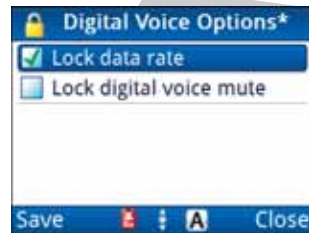
The data rate for AES-256 digital voice encryption can be locked so that the user cannot change it. You must select the rate that you want to use before locking it.

To lock the data rate:



- Select the data rate that you want to use.
- From the main menu, select  (**Settings**), then  (**Security**).
- Press  or  to scroll to the **Digital Voice Options** entry.



- Press .
- Ensure that the **Lock data rate** value is highlighted.
- Press  (**OK**) to select the check box.



When the check box is selected, the item is enabled. When the check box is clear, the item is disabled.

- Press  (**Save**) to save the information.
- Press  (**Close**).

Related links:

[Selecting the data rate on page 305](#)

Digital Voice mute

When the AES-256 digital voice encryptor is switched on, you have the option of selecting Voice mute (**V**), Selcall mute (**S**), or Digital Voice mute (**D**). Digital Voice mute enables only digitally encrypted voice to be processed through to the user. Voice mute enables all clear and encrypted voice detected at your station to be processed, and Selcall mute enables clear and encrypted voice that is directed to your station to be processed.

Figure 60: Digital Voice mute indicator



Selecting digital voice mute

NOTE: Digital voice mute is available when AES-256 digital voice encryptor is active.

To select digital voice mute:

- If you are using a 2220 Handset or 2230 Desk Console, press **SEC**, then press **V/S** until **D** is shown in the centre of the title bar on the channel screen.
- If you are using a 2221 Handset:
 - From the main menu, select **(Functions)**.
 - Press **▲** or **▼** to scroll to the **Secure** function.
 - Press **(OK)**.
 - Press **(Options)**.
 - Scroll to **V/S/D**.
 - Press **(Select)**.
 - Repeat these steps until **D** is shown in the centre of the title bar on the channel screen.



Related links:

[Switching the encryptor on or off on page 101](#)

Locking the state of digital voice mute

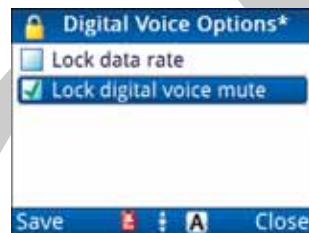


To lock the state of digital voice mute:

- Select the digital voice mute state that you want to use.
- From the main menu, select (**Settings**), then (**Security**).
- Press or to scroll to the **Digital Voice Options** entry.



- Press .
- Press or to scroll to the **Lock digital voice mute** value.
- Press (**OK**) to select the check box.



When the check box is selected, the item is enabled. When the check box is clear, the item is disabled.

- Press (**Save**) to save the information.
- Press (**Close**).

Setting the start state of digital voice mute





You can set the initial state that digital voice mute uses when you go secure with AES-256 digital voice encryption.

To set the start state of digital voice mute:

- From the main menu, select (**Settings**), then (**Security**).
- Press or to scroll to the **Digital Mute Start State** entry.



- Press ◀ or ▶ to select the value that you want to use from the following:
 - If you want digital mute to be on when you enter secure mode, select **Mute on**.
 - If you want digital mute to be off when you enter secure mode, select **Mute off**.
 - If you want digital mute to be in the same state as when secure mode was last used, select **Leave as is**.
- Press  (**Save**) to save the information.
- Press  (**Close**).

AES-256 digital data encryption

NOTE: To use AES-256 digital data encryption, you must have an RM50e HF Data Modem installed in your transceiver system and selected as a peripheral device.

NOTE: AES-256 digital data encryption may be used in conjunction with AES-256 digital voice encryption, or CES-128 voice encryption.

NOTE: Codan's KMS must be used to generate secure keys and to fill the AES-256 digital data encryptor.

The external RM50e HF Data Modem is an optional feature that provides data communications with high-grade AES-256 digital encryption. It must be used in conjunction with the RC50-C HF Email software. The data modem is capable of high-speed data transfer at speeds of up to 9600 bit/s using STANAG 4539 waveforms. The data modem also supports MIL-STD-188-110A/B (including Appendix F), STANAG 4285, STANAG 4529, and STANAG 4415 waveforms.

For more information on setting up and using RC50-C with your email application, see the documentation provided on the RC50-C HF Email software CD.

For information on connecting the transceiver, data modem and computer, see the *RM50e HF Data Modem Operator Guide*. The data modem detects whether or not a computer is connected.

The data modem switches to power-save mode if:

- a computer is not detected
- the cable between the computer and data modem is disconnected
- the RC50-C HF Email software is shut down

The AES-256 digital data encryptor uses secure keys to provide secure communications. The display on the handset clearly indicates whether the transceiver is secure (**TEKindex**) or clear (**Clear Data**).

NOTE: You can change the prefix for the AES secure keys in **Settings > Security > Digital Key Prefix**, using KMS, or via CICS.

Figure 61: Channel screen showing secure/clear status for AES-256 digital data



Figure 62: Channel screen showing transmit/receive status for AES-256 digital data



The AES-256 digital data encryptor can use a key in secure index 0. This key may be programmed at any time, by any user. This key cannot be programmed by KMS. If all of the secure keys have been erased, the user can enter a new key into index 0 for immediate secure communications.

Related links:

[Selecting a peripheral on page 183](#)

[Switching the encryptor on or off on page 101](#)

Installing the driver for the cable

The cable requires a specific driver to be installed on the computer. A driver is available on the RC50-C Installation CD or from www.ftdichip.com/Drivers/VCP.htm. Select the latest Windows®-certified driver that is suitable for your computer.

To install the driver for the cable:

- Insert the RC50-C Installation CD into the CD drive of the computer to which the cable is connected.
- Click on **Install RC50-C**.

The driver comes packaged with the software. It remains present even if RC50-C is uninstalled.

- If the driver provided on the RC50-C Installation CD is not suitable for your computer, do the following:
 - Download a suitable Windows®-certified driver from www.ftdichip.com/Drivers/VCP.htm.
 - Double-click on the self-extracting .exe file.

NOTE: Some older drivers are delivered as a zip file. Extract the files (using folder names) from the zip file. Right-click on the **ftdibus.inf** file, then select **Install**.

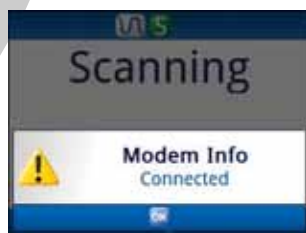
Using AES-256 digital data encryption

The RM50e stores the secure keys and provides the secure encryption and decryption. The transceiver provides the interface to the RM50e and control of key selection and secure status. An email message is sent via your email client to the RC50-C HF email software, which passes it to the RM50e for encryption. The RM50e passes the message to the transceiver, which transmits it over the air.

To use AES-256 digital data encryption:

- Launch the RC50-C HF Email software, then click **Go Online** to activate the RM50e HF Data Modem.

The transceiver responds with a beep.



- If you are using a 2220 Handset or 2230 Desk Console, press **SEC**.

- If you are using a 2221 Handset:
 - From the main menu, select **(Functions)**.
 - Press **▲** or **▼** to scroll to the **Secure** function.
 - Press **↵** (**OK**).
- Compose your email message in your email client software, for example Microsoft® Outlook®, then send it to the recipient.

When a digitally encrypted signal is transferred between the data modems across the link established by the transceivers, the index is highlighted. The current transmit or receive data rate is indicated on the right-hand side of the secure index.

While the message is being sent between the transceivers, activity is reported on the screen of the control point.

Figure 63: Transmit and receive screens during an AES-256 digital data call



If the email station is not in secure mode when a signal is transferred between the data modems, **TEKindex** is replaced by **Clear Data**.

Related links:

[Switching the encryptor on or off on page 101](#)

21

Data options

This section contains the following topics:

- [Internal data modem \(2400 bit/s\) on page 314](#)
- [RM50e HF Data Modem on page 320](#)

DRAFT

Internal data modem (2400 bit/s)

NOTE: The Internal Data Modem option must be enabled in your Envoy™ Transceiver (X2 only).

The internal data modem provides an extremely robust, field-proven HF waveform that is interoperable with Codan's proprietary 3012 protocol. It is particularly useful for long-range communications in remote areas where existing communications are poor or non-existent. It incorporates data compression to boost effective throughput and is easily integrated with Codan voice and signalling networks.

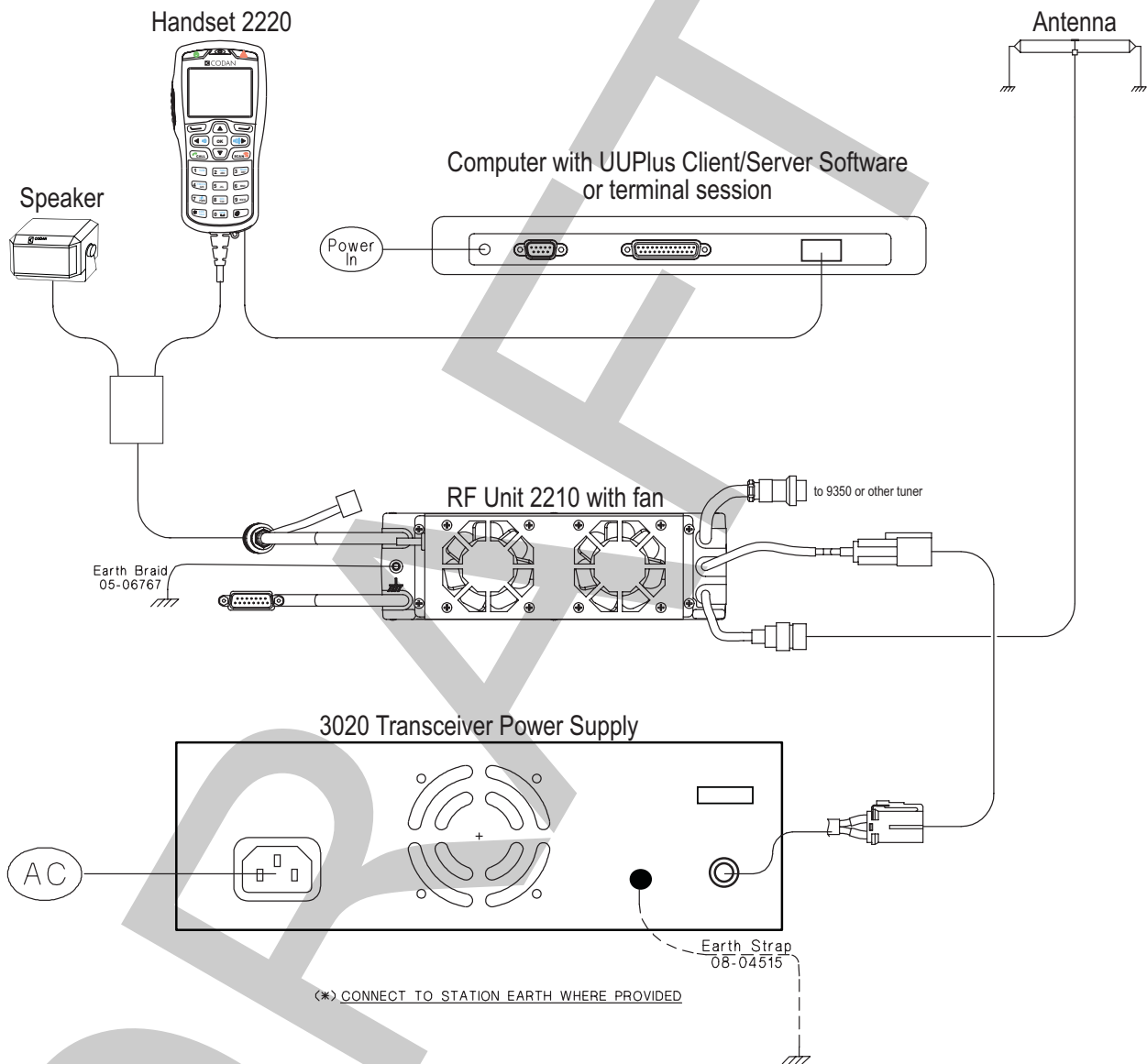
This modem can be used with ALE and Selcall call systems. Voice links may be established first, then an in-link data exchange may be performed.

A typical internal data modem station comprises:

- an Envoy™ X2 Transceiver with the Internal Data Modem (2400 bit/s) option enabled (Codan part number 15-10559)
- a suitable 12 V DC power supply
- an antenna system
- a PC running UUPlus or suitable terminal program

NOTE: Software that operates on standard telephone modems should operate over HF via the AT commands.

Figure 64: Envoy™ X2 Transceiver with internal modem connected to computer



The modem is controlled by the connected PC using the UUPlus HF Email Client. Email is sent and received via your chosen email client, for example Microsoft® Office Outlook®. For information on using UUPlus, please see the documentation provided with the product.

Pinging the modem from the computer

To ping the modem:

- Connect the computer to the control point and ensure that the transceiver is switched on.
- Start a Command Prompt session on the computer.
- Type **ping** followed by the IP address of the connected control point.

For example, type **ping 192.168.234.1**

If the ping is OK, the modem is ready for use.

If the ping times out:

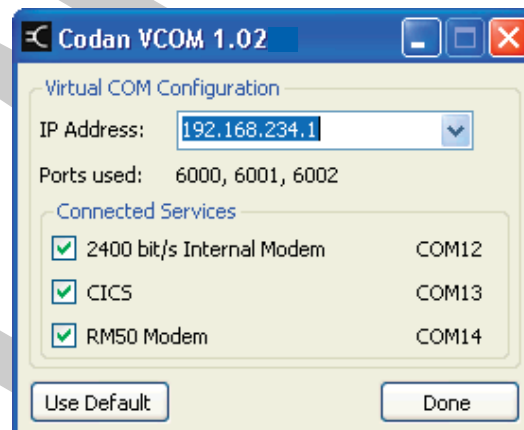
- check the cable between the computer and the control point
 - check the IP address of the USB interface on the control point
- Check the communication between the computer and modem at each station in the data network.

Viewing COM port setting in VCOM

When VCOM launches, it assigns a virtual COM port for use by internal devices in the Envoy™ Transceiver. This port number must be set up in other programs used for communication over HF.

To view the virtual COM port setting:

- Launch the Virtual COM PC Application from **Start > All Programs > Codan**.



- Record the value of the COM port used for the **2400 bit/s Internal Modem** in the **Connected Services** frame.
- Exit the Virtual COM PC Application.

Setting the COM port in UUPlus

The COM port used by UUPlus to communicate with the modem must be the same as the COM port set in the Virtual COM PC Application.

To set up the COM port in UUPlus:

- Launch UUPlus Server/Client.
- Click **Setup**, then select the **Modem Settings** tab.
- Click on the drop arrow in the **Com Port** field, then select the COM port used by VCOM.

Related links:

[Viewing COM port setting in VCOM on page 316](#)

Making a data call

Data calls are made in the background when you send an email via UUPlus (or similar), or when transferring a file between terminal sessions.

NOTE: For information on sending an email via UUPlus see the documentation provided with the software.

To make a data call:

- Compose your email in UUPlus (or similar).
- Do *one* of the following:
 - If you want to make the call using a Selcall HF network, switch off scanning on the transceiver's control point, then scroll to the channel that you want to use for the call.
 - If you want to make the call using an ALE/CALM HF network, switch on scanning on the transceiver's control point.

NOTE: If a channel is common to both HF networks, the type of HF network used for the call is determined by the scanning status when the call is made.

- In UUPlus, press **Send**.

Viewing the performance of the modem

You can set one of the status areas to show the link status and throughput of the internal data modem.

To view the performance of the modem:

- Go to the channel screen.
- Use the information in [Table 15](#) to determine the status of the internal data modem.

Table 15: Status of internal data modem






| Colour of LED | State | Description |
|---------------|----------|--|
| Green | Solid | The internal modem is enabled and a computer is communicating with it via VCOM.  |
| | Flashing | The station is establishing a link, or in a link, with another station. This station is the receiver of the link.  |
| Red | Flashing | The station is establishing a link, or in a link, with another station. This station is the initiator of the link.  |

Table 15: Status of internal data modem (cont.)

| Colour of LED | State | Description |
|---------------|-----------------|--|
| Red | Variable length | Red bar is indicative of the data throughput rate for the link.  |
| Grey | Solid | The internal modem is enabled, but a computer is not communicating with it.  Check that VCOM is running as a background task. |

Related links:

[Selecting information to be shown in a status area on page 57](#)

RM50e HF Data Modem

The RM50e HF Data Modem provides data communications. It may also be used to provide high-grade AES-256 digital encryption. It may be used with any data-capable Codan HF transceiver. It must be used in conjunction with the RC50-C HF Email software. The data modem is capable of high-speed data transfer at speeds of up to 9600 bit/s using STANAG 4539 waveforms. The data modem also supports MIL-STD-188-110A/B (including Appendix F), STANAG 4285, STANAG 4529, and STANAG 4415 waveforms.

Related links:

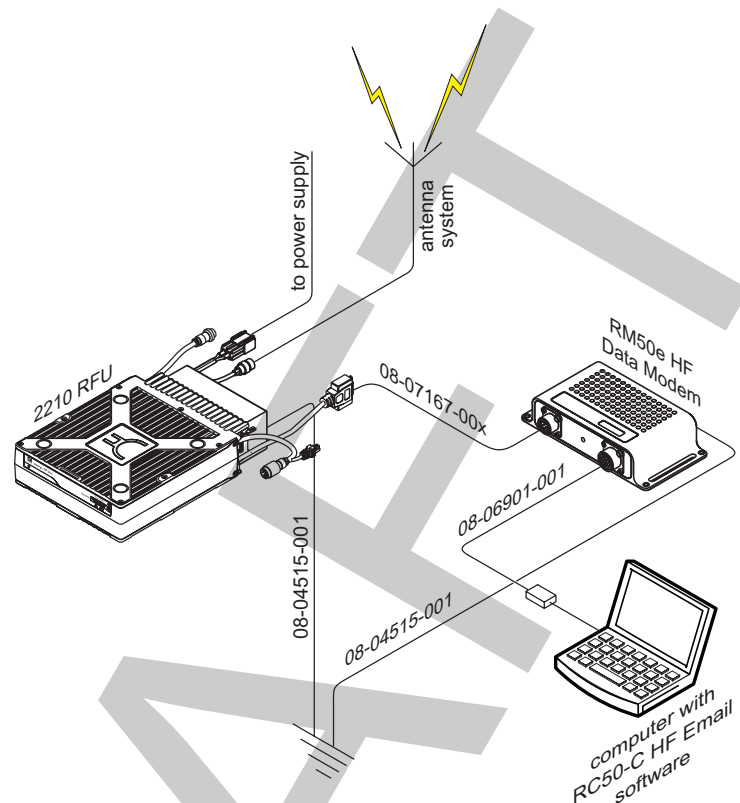
[AES-256 digital data encryption on page 309](#)

Typical data station

A typical RM50e email station comprises:

- any data-capable Codan HF transceiver
- an antenna system
- an appropriate 12VDC power supply
- an RM50e HF Data Modem
- a computer with RC50-C HF Email software

Figure 65: RM50e with an 2210 RFU



NOTE: For more information on setting up and using an RM50e email station, see the documentation provided with the modem and the RC50-C on-line help.

Using the RM50e for sending email

An email message is sent via your email client to the RC50-C HF email software, which passes it to the RM50e. The RM50e passes the message to the transceiver, which transmits it over the air.

To use the data modem:

- Launch the RC50-C HF Email software, then click **Go Online** to activate the RM50e HF Data Modem.

The transceiver responds with a beep.



- Compose your email message in your email client software, for example Microsoft® Outlook®, then send it to the recipient.

When a signal is transferred between the data modems across the link established by the transceivers, the current transmit or receive data rate is indicated on the right-hand side of the **Clear Data** indicator.

While the message is being sent between the transceivers, activity is reported on the screen of the control point.

Figure 66: Transmit and receive screens during a data call



22

Connectors

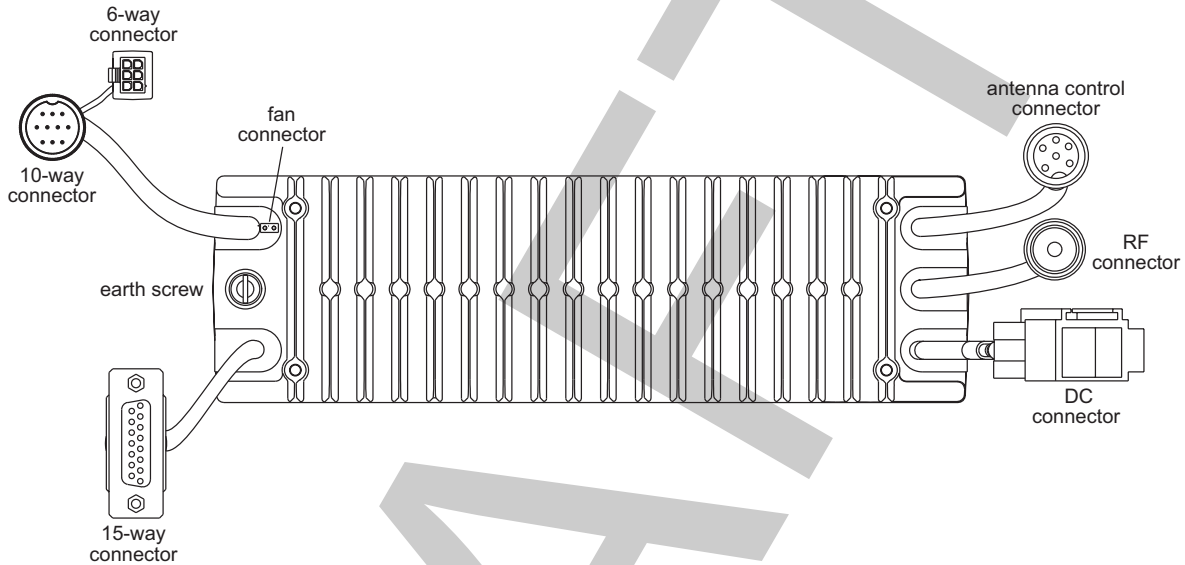
This section contains the following topics:

- [Connectors on the RFU on page 324](#)
- [Connectors on the desk console on page 334](#)

DRAFT

Connectors on the RFU

Figure 67: Back panel of the 2210 RFU



NOTE: The 6-way connector is attached to the rear of the 10-way connector.

Related links:

- [Antenna control connector on page 324](#)
- [DC supply connector on page 325](#)
- [RF connector on page 326](#)
- [Fan connector on page 326](#)
- [10-way connector on page 327](#)
- [6-way serial data connector on page 328](#)
- [Handset and speaker connector on page 329](#)
- [15-way GPIO connector on page 330](#)

Antenna control connector

The antenna control connector is on a flying lead located on the right side of the back panel. The antenna control connector connects to automatic tuning antennas and broadband antennas (no automatic tuning required). It supplies power to the antenna and transmits control signals to and from the antenna.

Figure 68: Front view of the antenna control connector

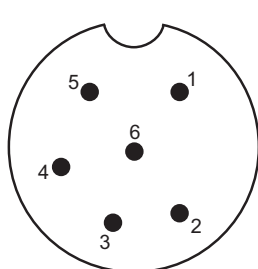


Table 16: Pinouts of the antenna control connector

| Pin no. | Function | Input/output | Signal level |
|---------|--------------------------------|--------------|-----------------------|
| 1 | Tune in/out (Data) | Input/output | 5 V logic, active low |
| 2 | Scan (Detect) | Output | 5 V logic, active low |
| 3 | Tuned in (Data) | Input | 5 V logic |
| 4 | A rail protected (2 A maximum) | Output | +13.6 V nominal |
| 5 | External ALC input | Input | Control at 3.4 V |
| 6 | Ground | | 0 V |

DC supply connector

The DC supply connector is on a flying lead located on the right side of the back panel. The DC supply connector supplies power to the transceiver system and ancillary products.

Table 17: Pinouts of the DC supply connector

| Pin | Function |
|-----|-----------------------------------|
| + | +13.6 V nominal (10.8 to 16 V DC) |
| - | Ground (0 V) |

RF connector

The RF connector is on a flying lead located on the right side of the back panel. It is used to connect to an antenna.

Fan connector

The fan connector is on a flying lead located at the top left of the back panel. The fan connector is used when additional cooling is required for the heatsink, for example, for continuous data communication.

Figure 69: Front view of the fan connector



Table 18: Pinouts of the fan connector

| Pin | Function |
|-----|---|
| - | 0 V |
| + | +13.6 V nominal (when fan is activated) |

10-way connector

The 10-way connector is on a flying lead located on the top left side of the back panel. It connects to either the handset and speaker cable (Codan part number 08-06022-001), or to the 2230 Desk Console via cable 08-07205-xxx or 08-07215-001.

Figure 70: Front view of the 10-way connector

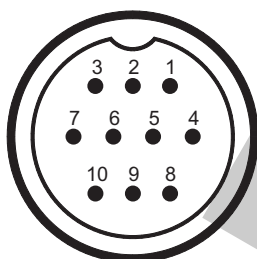


Table 19: Pinouts of the 10-way connector

| Pin no. | Function | Input/output | Signal level |
|---------|----------------------------------|--------------|--|
| 1 | Speaker audio + | Output | Approx. 12 V p-p at onset of clipping |
| 2 | Speaker audio - | Output | 0 V |
| 3 | Ethernet data | Input | 3.3 V logic |
| 4 | Ethernet data | Input | 3.3 V logic |
| 5 | Ethernet data | Output | 3.3 V logic |
| 6 | Ethernet data | Output | 3.3 V logic |
| 7 | N/C | | |
| 8 | Standby/power/PWR ON for handset | Output | +4.8 V standby power, or +12 V handset power Momentary 120 Ω to 0 V = PWR ON |
| 9 | A rail protected (2 A nominal) | Output | +13.6 V nominal |
| 10 | Ground | | 0 V |

Related links:

[Setting the location of the desk console on page 71](#)

6-way serial data connector

The 6-way connector is on a flying lead from the back of the 10-way connector. The serial data (RS232) connector can be used for connecting a GPS unit to the transceiver.

Figure 71: Front view of the 6-way connector

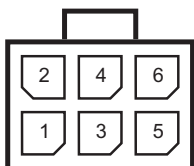


Table 20: Pinouts of the 6-way connector

| Pin no. | Function | Input/output | Signal level |
|---------|-------------------------------|--------------|-----------------|
| 1 | A rail protected (2 A) | Output | +13.6 V nominal |
| 2 | Ground | | 0 V |
| 3 | RS232 Tx data A | Output | RS232 |
| 4 | RS232 Rx data A | Input | RS232 |
| 5 | RS232 Tx data B | Output | RS232 |
| 6 | RS232 Rx data B | Input | RS232 |

Handset and speaker connector

The handset and speaker connector is part of the control cable (Codan part number 08-06022-001) that connects to the 10-way connector on the RFU. This cable is not used with 2230 Desk Console.

Figure 72: Front view of the handset and speaker connector

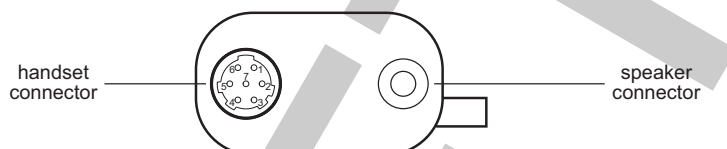


Table 21: Pinouts of the handset connector

| Pin no. | Function | Input/output | Signal level |
|---------|----------------------------------|--------------|--|
| 1 | Standby/power/PWR ON for handset | Input | +4.8 V standby power, or +12 V handset power Momentary 120 Ω to 0 V = PWR ON |
| 2 | Ethernet data | Input | 3.3 V logic |
| 3 | Ethernet data | Input | 3.3 V logic |
| 4 | Ground | | 0 V |
| 5 | Ethernet data | Output | 3.3 V logic |
| 6 | Ethernet data | Output | 3.3 V logic |
| 7 | N/C | | |

The speaker should be 4 Ω with a power rating of 5 W.

Table 22: Pinouts of the speaker connector

| Connection | Function |
|------------|----------------------|
| Tip | Speaker audio output |
| Sleeve | Ground |

15-way GPIO connector

The GPIO connector is on a flying lead located on the left side of the back panel. It is used to interface to a variety of third-party products such as morse keys, GPS units etc.

Figure 73: Front view of the 15-way connector

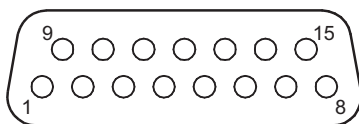


Table 23: Pinouts of the 15-way connector

| Pin no. | Function | Input/output | Signal level |
|---------|--|--------------|---|
| 1 | RTS (Audio 2 out) | Output | RS232 |
| 2 | RS232 Rx data | Input | RS232 |
| 3 | RS232 Tx data | Output | RS232 |
| 4 | Ground | | 0 V |
| 5 | Tx audio (10 k Ω balanced) | Input | 300 mV p-p ALC threshold |
| 6 | External alarm relay contact (Audio 2 out) (NO or NC depending on jumper P402) | | Contacts rated 50 V, 1 A |
| 7 | External alarm relay common, or 600 Ω balanced audio | Output | Contacts rated 50 V, 1 A, or 600 Ω audio |
| 8 | A rail protected (2 A maximum) | Output | +13.6 V nominal |
| 9 | CTS (Audio 2 In) | Input | RS232 |
| 10 | PTT | Input | 5 V TTL logic active low |
| 11 | Morse | Input | 5 V TTL logic active low |
| 12 | Busy (Mute out) | Output | 5 V logic |

Table 23: Pinouts of the 15-way connector (cont.)

| Pin no. | Function | Input/output | Signal level |
|---------|---|--------------|---|
| 13 | Quiet (Q) line (Audio 2 In) | Input | 5 V TTL logic active high when Data selected 5 V TTL logic active low when all other devices selected |
| 14 | System audio unbalanced, or 600 Ω balanced audio | Output | 600 Ω audio 1 V p-p, or 600 Ω balanced audio |
| 15 | Tx audio (10 k Ω balanced) | Input | 300 mV p-p ALC threshold |

NOTE: External alarm relay is an internal link that may select normally open or normally closed. It can be configured to switch to ground or the **A** rail.

NOTE: The 600 Ω output option is selected by internal links.

NOTE: The second audio function requires an additional audio PCB to be fitted.

Related links:

[Morse input on page 331](#)

[PTT on page 331](#)

[Q line on page 332](#)

[Relay contact on page 332](#)

[Serial data on page 332](#)

[System power \(A rail protected\) on page 333](#)

[Tx audio input on page 333](#)

[System audio output on page 333](#)

Morse input

When a ground is detected on the morse input, the transceiver generates a morse tone on air. This functionality is typically provided with a morse key.

PTT

This function puts the transceiver into transmit mode and enables the audio transmit path via the 15-way connector (pins 5 and 15).

Q line

The Q line switches the transceiver between data and voice modes, and stops the transceiver from scanning. When a modem is connected, settings are chosen that are suitable for data transmission.

Related links:

[Serial data on page 332](#)

Relay contact

The relay can be wired by a user to ring a bell or to sound a car horn. If a voice call is received, the bell or horn sounds for 2 minutes. If it is an emergency call, it toggles on and off three times per second, continuing for 5 minutes.

The contact can be configured via internal links to do one of the following in the case of an alarm:

- join pins 6 and 7 together (normal, not available when 600 Ω balanced audio output is used), or
- switch pin 6 to ground, or
- switch pin 6 to battery volts (**A** rail)

NOTE: The external alarm is not activated under certain values of the **Alert Tones** entry in **Settings > Calling**.

Related links:

[Alert Tones on page 216](#)

Serial data

The serial data (RS232) connector can be used for controlling and monitoring the transceiver, programming the transceiver settings, and sending and receiving message calls.

The serial data connector may be used for a number of products:

| | |
|------|--|
| None | to be used when no external RS232 device is connected to the transceiver |
| GPS | to receive information from a connected GPS receiver |
| CICS | to control and monitor the transceiver via the connected computer |

The operating parameters can be set to the following:

| | |
|-----------|--|
| Data rate | 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 bit/s |
| Data bits | 8 |
| Stop bits | 1 |
| Parity | None |

System power (A rail protected)

System power is switched off when the transceiver is switched off.

WARNING: The total load connected to the **A** rail protected supply must not exceed 2 A.

Tx audio input

Audio input from external equipment, for example, data modems, is connected between pins 5 and 15 and is a balanced floating input. The input signal should be nominally 1 V p-p and not exceed 3 V p-p.

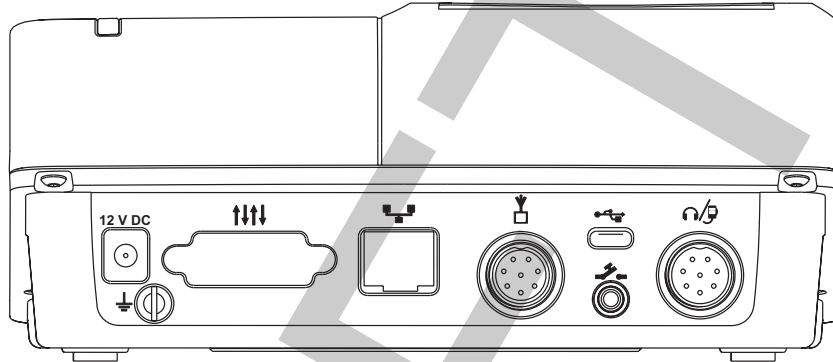
System audio output

This supplies Rx audio at a default level of -13 dBm. This can be varied from -31 to 0.5 dBm using the **RFU Rx Out Audio Level** entry in **User Data > Peripherals**. There are other entries that enable other parameters like *Easitalk*TM and mute.

System audio output is normally unbalanced and connected to pin 14. The transceiver can also be internally reconfigured to provide balanced 600 Ω audio output from pins 14 and 7. In this mode, the relay contacts can only be used by switching pin 6 to either ground or the battery volts.

Connectors on the desk console

Figure 74: Back panel of the 2230 Desk Console



Related links:

[DC supply connector on page 334](#)

[15-way GPIO connector on page 335](#)

[Ethernet connector on page 336](#)

[Transceiver connector on page 336](#)

[USB connector on page 337](#)

[Foot-switched PTT connector on page 337](#)

[8-way connector on page 338](#)

[Headphone connector on page 339](#)

DC supply connector

12 V DC

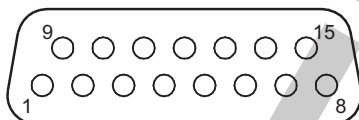
The DC supply connector is on the back panel of the desk console. It is used with a 12 V DC power supply to provide power to the desk console when it is connected via Ethernet to the RFU.

15-way GPIO connector



The 15-way connector is on the back panel of the desk console. It is used to interface to a variety of third-party products.

Figure 75: Front view of the 15-way GPIO connector



| Pin no. | Function | Input/output | Signal level |
|---------|--|--------------|--------------------------|
| 1 | Not implemented | | |
| 2 | Not implemented | | |
| 3 | Not implemented | | |
| 4 | Ground | | 0 V |
| 5 | Not implemented | | |
| 6 | Not implemented | | |
| 7 | Not implemented | | |
| 8 | A rail protected (2 A maximum) | Output | +13.6 V nominal |
| 9 | Not implemented | | |
| 10 | Not implemented | | |
| 11 | Morse | Input | 5 V TTL logic active low |
| 12 | Not implemented | | |
| 13 | Not implemented | | |
| 14 | Not implemented | | |
| 15 | Not implemented | | |

Ethernet connector



The Ethernet connector is on the back panel of the desk console. It is a standard RJ45 socket.

Transceiver connector



The Transceiver connector is on the back panel of the desk console. It is an 8-way PLT168-RF-R connector (female). It transfers control signals between the RFU and the console, and provides power from the RFU to the console.

Figure 76: Front view of the Transceiver connector

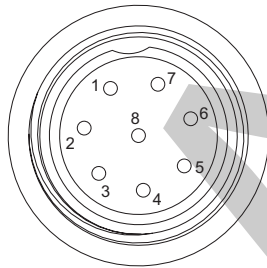


Table 24: Pinouts of the Transceiver connector

| Pin no. | Function | Input/output | Signal level |
|---------|--------------------------------------|--------------|-----------------------------|
| 1 | Ground | Output | 0 V |
| 2 | Ethernet Rx- | Input | 10Base-T/100Base-Tx |
| 3 | Ethernet Rx+ | Input | 10Base-T/100Base-Tx |
| 4 | Shield | | |
| 5 | Ethernet Tx- | Output | 10Base-T/100Base-Tx |
| 6 | Ethernet Tx+ | Output | 10Base-T/100Base-Tx |
| 7 | Power supply for console | Input | 5 V/12 V nom (10.8 to 16 V) |
| 8 | A rail protected (future use) | Output | +12 V nom (10.8 to 16 V) |

USB connector



The USB connector is on the back panel of the desk console. It is a standard micro-USB connector.

Foot-switched PTT connector



The foot-switched PTT jack is on the back panel of the desk console. It is a 3.5 mm (1/8 in) jack.

Table 25: Pinouts of the Foot-switched PTT connector

| Connection | Function |
|------------|----------|
| Ring | Audio |
| Tip | Audio |
| Sleeve | Ground |

8-way connector



The 8-way connector is on the back panel of the desk console. It is a male Nisshin NS1508 or equivalent. It is used to interface to an external foot-switched PTT, headset, microphone or morse key.

Figure 77: Front view of the 8-way connector

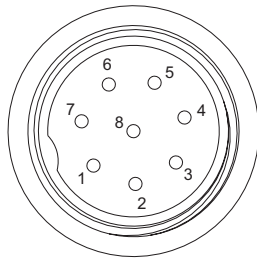


Table 26: Pinouts of the 8-way connector

| Pin no. | Function | Input/output | Signal level |
|---------|---------------------|--------------|------------------------------|
| 1 | Ground | | 0 V |
| 2 | External microphone | Input | To suit electret microphone |
| 3 | Bias for Electret | Output | +5 V via 3k2 resistor |
| 4 | PTT | Input | Active low, pull-up to 3.3 V |
| 5 | External earpiece | Output | 20 mW max into 16 Ω |
| 6 | Ground | | 0 V |
| 7 | +5 V supply | Output | +5 V, 100 mA max |
| 8 | External morse key | Input | Active low, pull-up to 3.3 V |

Headphone connector



The headphone jack is on the right-hand side of the desk console. It is a 3.5 mm (1/8 in) stereo jack.

Table 27: Pinouts for the headphone connector

| Connection | Function | Signal level |
|------------|---------------|----------------------------|
| Ring | Audio (right) | 10 mW max into 32 Ω |
| Tip | Audio (left) | 10 mW max into 32 Ω |
| Sleeve | Ground | 0 V |

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Specifications

This section contains the following topics:

- [General specifications on page 342](#)
- [Transmit specifications on page 344](#)
- [Receive specifications on page 346](#)
- [Environmental specifications on page 348](#)
- [Mechanical specifications on page 349](#)

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General specifications

The figures listed for specifications are normally exceeded by production equipment. Where relevant, typical values are given in brackets []. All measurements are made at 13.6 V DC, with 50 Ω source and load resistances at 25°C ambient temperature, unless otherwise specified.

Table 28: General specifications

| Item | Specification |
|---|--|
| Frequency range | Transmit: 1.6 to 30 MHz Receive: 0.25 to 30 MHz |
| Channel capacity (single or two-frequency simplex channels) | X1: 100 (International) 400 (Australia) X2: 1000 |
| Frequency generation | All frequencies generated by synthesiser and DDS with 1 Hz resolution |
| Operating modes | Single sideband (J3E) USB and LSB or switched USB/LSB, AM (A3E Rx, H3E Tx), CW (J1A, A1A) |
| Frequency stability | ± 0.5 [± 0.3] ppm -30 to $+60^\circ\text{C}$ (-22 to 140°F) |
| Programming | Frequencies and options are programmed via the USB connector on the handset using TPS programming software and a computer Channels may be entered from the handset by qualified personnel or (where authorised) by the user |
| Transmit/Receive switching | 15 ms via 15-way port on RFU |
| RF input/output impedance | 50 Ω nominal |
| Supply voltage | 13.8 V DC nominal, negative earth Nominal operating range: 10.8 to 15 V Functional range: 9 to 16 V (not specified) Reverse polarity protected |
| Overvoltage protection | Shut down at 16 V DC nominal for duration of overvoltage |

Table 28: General specifications (cont.)

| Item | Specification |
|----------------|--|
| Supply current | Transmit: see Table 29 Receive: no signal < 0.6 A |
| Finish colour | Black |

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Transmit specifications

Table 29: Transmit specifications

| Item | Specification |
|---------------------------------|--|
| Power output for AUST & FCC | 100 W PEP ± 0.5 dB, 27 MHz CB 10 W PEP (Aust only) |
| Power output | 125 W PEP reducing with frequency to 100 W PEP at 30 MHz ± 1 dB CW or single tone: approximately 60% of PEP with average PEP control (average control disabled on handset PTT) |
| Duty cycle | 100%: normal speech over full temperature range 100%: ARQ up to 30°C (86°F) 25%: 16-tone continuous data mode (5 minutes on maximum) at ambient temperature up to 30°C (86°F) 100%: all modes up to maximum ambient temperature of 45°C (113°F) with Option F |
| Supply current | Output power: 100 W or 125 W Two-tone or CW: 9 to 14 A Average speech: 8 A for battery life calculations |
| Protection | Safe under all load conditions by limiting reflected power to 10 W PEP and limiting PA FET drain voltage swing Thermal protection against excessive heatsink temperature |
| A/F response | Overall response of microphone and transmitter rises approximately 6 dB/octave 300 to 2700 Hz |
| Spurious and harmonic emissions | Better than 60 [65] dB below PEP |
| Carrier suppression | 60 [65] dB below PEP |
| Unwanted sideband | 65 [70] dB below PEP |
| Intermodulation (Two-tone test) | 100 W: 26 [30] dB below each tone 32 [36] dB below PEP 125 W: 26 [27] dB below each tone 32 [33] dB below PEP |

Table 29: Transmit specifications (cont.)

| Item | Specification |
|------------|--|
| ALC | <p>A 10 dB increase in signal input above compression threshold produces less than 0.5 dB increase in power output</p> <p>Maximum ALC range greater than 30 dB</p> <p>ALC attack time approximately 1 ms</p> |
| Microphone | Electret Condenser type |

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Receive specifications

Table 30: Receive specifications

| Item | Specification |
|--------------------|--|
| Type | Superheterodyne/IF sampling DSP |
| IF frequencies | 45 MHz |
| Sensitivity | <p>Frequency: RF amp off: 0.25 to 30 MHz 0.5 [0.4] μV PD -113 [-115] dBm</p> <p>Frequency: RF amp on: 1.6 to 30 MHz 0.2 [0.12] μV PD -121 [-125] dBm</p> <p>For 10 dB SINAD with greater than 50 mW audio output</p> |
| Input protection | Will withstand 50 V p-p RF from a 50 Ω source |
| Selectivity | <p>Greater than 65 [70] dB at -1 kHz and +4 kHz reference SCF USB</p> <p>2400 Hz filter: -6 [-4] dB 300 to 2700 Hz</p> <p>2750 Hz filter: -3 [-2] dB 300 to 3050 Hz</p> <p>3000 Hz filter: -3 [-2] dB 300 to 3300 Hz</p> |
| Desensitisation | <p>10 dB SINAD reduced to 7 dB SINAD (2400 Hz filter)</p> <p>-1 and +4 kHz 60 [65] dB (ref SCF)</p> <p>\pm10 kHz 75 [80] dB</p> <p>\pm50 kHz 95 [100] dB</p> |
| Blocking | <p>As for Desensitisation</p> <p>For frequencies > \pm50 kHz > 95 dB</p> |
| Image rejection | Better than 80 [100] dB |
| Spurious responses | <p>Better than 80 [85] dB</p> <p>Self-generated signals > 0.15 μV PD: 20 MHz</p> |

Table 30: Receive specifications (cont.)

| Item | Specification |
|---------------------------------|--|
| Intermodulation | <p>To produce a third-order intermodulation product equivalent to a wanted signal producing 10 dB SINAD, two unwanted signals greater than 30 kHz removed from the wanted signal must have a level greater than 94 [100] dB above the wanted signal (RF amp on)</p> <p>Third-order intercept (unaffected by AGC): +33 [+40] dBm with RF amp off +17 [+25] dBm with RF amp on</p> |
| AGC | <p>Less than 3 dB variation in output for input variation between 1.0 [0.5] μV and 100 mV PD (RF amp on)</p> <p>Fast attack, slow release (selectable release time)</p> |
| A/F response @ loudspeaker | <p>Typical: -6 dB 300 to 2500 Hz</p> |
| A/F power and A/F distortion | <p>2.4 W into 8 Ω, 5% THD 4 W into 4 Ω, 5% THD 4 W into 2 Ω, 5% THD</p> |
| Clarifier | <p>\pm10 ppm (nominal) \pm50 Hz below 5 MHz, increasing to \pm300 Hz at 30 MHz</p> <p>Clarifier is automatically reset to mid-frequency with channel change</p> |
| Inband IMD | <p>Better than 25 dB IMD with two 100 mV EMF RF inputs</p> |
| Signal to noise vs input signal | <p>An increase of input level of 40 dB above the sensitivity level increases the signal to noise ratio to at least 40 dB</p> |

Environmental specifications

Table 31: Environmental specifications

| Item | Specification |
|-------------|---|
| Environment | Ambient temperature: –30 to +60°C (–22 to 140°F) Relative humidity: 95% Derate upper ambient temperature by 1°C (33.8°F) per 330 m (360 yd) above sea level |
| Cooling | Convection or fan (Option F) |

Mechanical specifications

Table 32: Mechanical specifications

| Item | Specification | |
|---------|--------------------------------|--|
| Size | 2210 RFU: | 210 mm W × 270 mm D × 65 mm H (8.4 in W × 10.8 in D × 2.6 in H) |
| | 2220/2221 Handset: | 74 mm W × 32 mm D × 150 mm H (2.9 in W × 1.3 in D × 5.9 in H) |
| | 2230 Desk Console: | 190 mm W × 233 mm D × 81 mm H (7.5 in W × 9.2 in D × 3.2 in H) |
| | Handset and speaker connector: | 42 mm W × 55 mm D × 22 mm H (1.7 in W × 2.2 in D × 0.9 in H) |
| Weight | 2210 RFU: | 2.8 kg (6.2 lb) |
| | 2220/2221 Handset: | 0.3 kg (0.7 lb) |
| | 2230 Desk Console: | 1 kg (2.2 lb) |
| | Handset and speaker connector: | 0.4 kg (0.9 lb) |
| Sealing | All units: | IP41 |

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Installation

This section contains the following topics:

- [Mobile stations on page 352](#)
- [Fixed stations on page 368](#)

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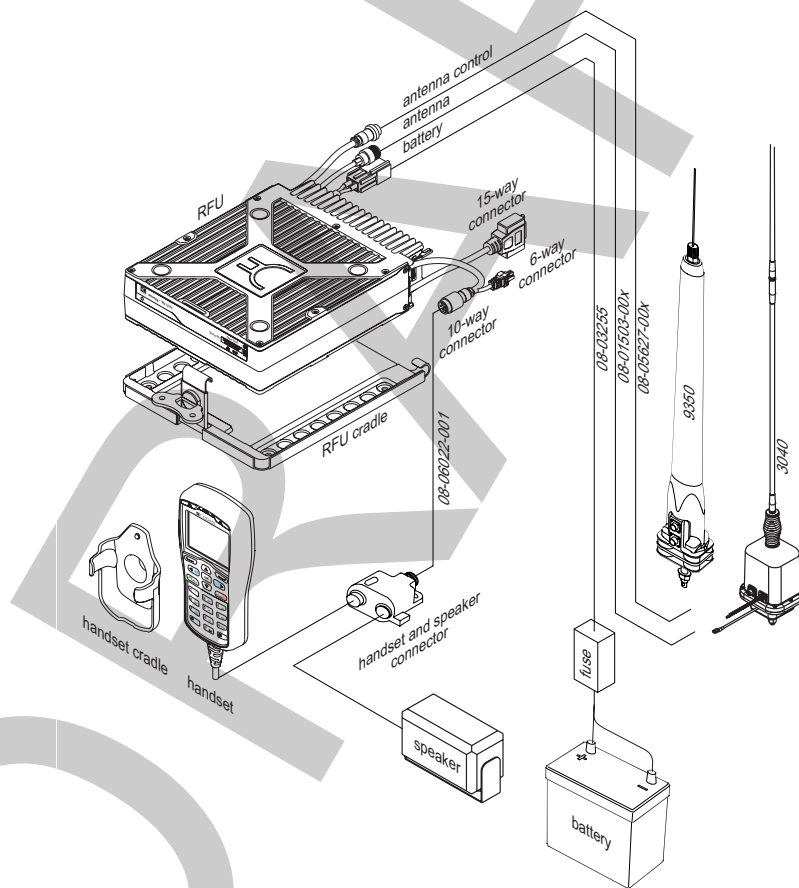
Mobile stations

Overview of mobile stations

A mobile station typically consists of a transceiver, a 12 V DC power supply (battery), an antenna, control and accessory devices, ancillary equipment, and appropriate connecting cables. The antenna is connected to the transceiver by coaxial cable. An automatic tuning antenna also requires a control cable connected to the transceiver.

When space is limited in a mobile situation, the transceiver may be located in the boot or behind/under a seat.

Figure 78: Typical mobile station



NOTE: A range of ancillary equipment may be connected to the Envoy™ Transceiver using the 6-way and 15-way connectors at the rear of the RFU.

Related links:

[Types of mobile antennas on page 394](#)

Installing the transceiver in a mobile station

NOTE: All antennas are supplied completely assembled and ready for installation.

On receiving your Envoy™ Transceiver, check the contents against the packing list. Make sure that all equipment itemised on the packing list is present and that there is no damage to the equipment before you start installing the system.

If anything is missing or damaged, please contact your nearest Codan office immediately to obtain the correct warranty service procedures. This ensures prompt assistance, minimal turnaround time, and avoids any freight issues.

We recommend that the equipment is installed by qualified and experienced personnel, to the relevant standards and approvals. For detailed instructions on connecting particular items of equipment, see the relevant document on the CD provided with the Envoy™ Transceiver Getting Started Guide.

WARNING: While the following information is intended to assist with installation in a vehicle, it is the purchaser's responsibility to ensure that the mounting cradle is installed with due regard to vehicle-occupant safety, particularly in the event of a vehicle accident. Codan accepts no responsibility or liability in the event of injury to vehicle occupants or any other damage due to insecure or otherwise unsafe or inappropriate installation of the mounting cradle.

NOTE: Unused connectors on the RFU must be covered with the protective caps supplied to prevent electrostatic discharge passing through your transceiver.

Positioning the transceiver

When choosing a location for the components of the transceiver, you should be aware of the environmental ratings of each item of equipment as set out in the specifications. They must be mounted in a suitable position that:

- provides physical protection to the transceiver and its cables, for example, avoid floor mounting where the transceiver and cables may be subjected to accidental contact
- provides easy access to the controls
- provides a free flow of air through the rear cooling fins to dissipate the heat generated by the transceiver
- does not expose the unit to direct sunlight
- does not expose the unit to water ingress
- will not cause injury to motor-vehicle occupants if an accident occurs, for example, *do not* mount the transceiver overhead
- minimises vibration and shock

- ensures correct connection and operation
- provides easy access for maintenance

WARNING: The units of the mobile station should only be mounted on structural components of the vehicle body and not to dress panels. The areas used for mounting may require reinforcement.

Mounting positions that are recommended in a mobile installation include:

- the transmission hump
- in place of the glove box
- behind the seat
- under the dashboard (if safe)

WARNING: Do not mount the transceiver on a cargo barrier as this may void the vehicle manufacturer's warranty.

The mounting position must ensure sufficient cable length is provided to enable the removal of the equipment from the cradle with the various cables connected.

Related links:

[Specifications on page 341](#)

Positioning the control points

The control points and speaker must be in a position that:

- suits the operator
- is near the operating position
- is clear of other controls
- is not dangerous to the driver or passengers
- considers cable routing

Installing the cables

WARNING: Do not cut the control, coaxial or speaker cable. If the cables are too long, gather the excess neatly and secure it out of the way.

CAUTION: Large magnetic fields can be generated along the power cable during transmission and these fields may be coupled into the control cabling. Failure to keep these cables separated causes distortion of the transmitted signal.

The cabling must be in a position that:

- is away from operator's feet
- is secured and concealed as much as possible
- ensures the control cables are separated from the DC power cable by at least 200 mm (8 in), except over short distances where they may pass through the same hole in a bulkhead
- is secured behind protective metalwork (only if the cables run under the vehicle)

Keep cables in the engine compartment away from:

- heat, for example, exhaust, air-conditioning systems, and water pipes
- oils and corrosive liquids, for example, engine oil, battery fluid, and brake fluid

Power supply

WARNING: All installations should be checked by a qualified technician before power is applied to the transceiver.

Power must be provided by a 12 V DC battery for mobile stations.

Battery power supply

Batteries need to be well-charged and in good condition to ensure effective operation. Poor condition of the battery usually leads to poor performance of your transceiver. This includes reduced power output and signal distortion during transmission.

If a mobile transceiver causes a heavy drain on the vehicle battery, a two-battery system can be used. Generally the vehicle alternator and charge system copes with the extra battery, however, an isolation circuit should be provided between the batteries.

Checking a battery

It is important to maintain the condition of the battery to ensure that it is in suitable working order.

Table 33: Battery maintenance

| Check for... | Comment |
|--------------------------|---|
| Correct charge | Use a multimeter or a hydrometer to check the charge condition of the battery. |
| Water level in cells | The plates should be sufficiently covered with electrolyte. Add clean distilled water if the electrolyte is below the top of the plates. Never overfill cells as this causes corrosion. |
| Corrosion-free terminals | Where there is corrosion on the terminal posts, the whole area should be neutralised and cleaned. This can be achieved using a wire brush, paint scraper, and a solution of water and baking soda. WARNING: Any cleaning of the terminals should be done in a well-ventilated area using the appropriate personal protective equipment. |

Table 33: Battery maintenance (cont.)

| Check for... | Comment |
|------------------------------|--|
| Tight electrical connections | Check for defective cables, loose connections, corrosion, cracked cases or covers, loose hold-down clamps, and deformed or loose terminal posts. |

Power supply factors

Voltage drop

The most common causes of voltage drop along a cable are:

- the diameter of the wire is too thin
- the length of the cable is too long

The average current consumption of a transceiver is low except during transmission of voice and data peaks, where high current is needed for short intervals. The power supply cable needs to be sufficiently heavy to supply these current peaks without excessive voltage drop.

Incorrect wiring techniques, including poor choice of connection points and incorrect use of terminal lugs, can also cause a voltage drop.

Related links:

[Power and control cabling on page 357](#)

Fuse protection

An external fuse must be fitted in the active wire as close as possible to the battery to ensure there is no risk of fire if the cable is damaged. The fuse must be of a type that has a low voltage drop at peak currents.

NOTE: A 32 A cartridge fuse (Codan part number 15-00711) is recommended.

Related links:

[Protecting the cables on page 358](#)

Noise interference

The transceiver has noise-rejection circuitry and, provided correct connection and routing of the power cable are established, noise interference via the power cable should be kept to a minimum.

For situations where noise and interference from the vehicle is excessive, Codan recommends that you use the Vehicle Interference Suppression Kit (Codan part number 15-00704).

Related links:

[Connecting the battery supply on page 357](#)

Wiring techniques

Correct wiring techniques can reduce voltage drop. These include choosing good connection points and using terminal lugs correctly.

Connecting the power supply

Power and control cabling

The connection from the transceiver is made directly to the battery/power source via a twin core cable.

The cable should:

- be of adequate electrical capacity
- be fused in the positive leg at or near the battery terminal
- not be used to provide power connections to any other equipment

The cable from the battery must be able to carry the full supply current, so it must be of correct size. As the distance between the transceiver and the battery increases, the cross-sectional area of the cable must increase proportionally to minimise the voltage drop. For example, a 100 W transceiver positioned 2 m (2 yd) away from the battery requires a cable with a cross-sectional area of approximately 4 mm² (11 AWG), whereas a transceiver 5 m (5 yd) away from the battery requires a cable with a cross-sectional area of approximately 10 mm² (7 AWG).

A heavy-duty power cable is supplied with the vehicle-mounting cradle for mobile stations. This cable minimises the voltage drop between the battery and transceiver during transmission.

CAUTION: If you use a thinner cable, signal quality may be affected.

Related links:

[Voltage drop on page 356](#)

Connecting the battery supply

A battery supply may be used as a direct source of power in a mobile installation, or as a back-up source of power in a fixed installation.

To connect the battery supply:

- Connect the red positive and black negative wires from the power cable of the transceiver to the positive and negative terminals of the battery, respectively.
- Fit a suitable fuse as near as practicable to the positive side of the battery connection.

A 32 A cartridge fuse (Codan part number 15-00711) is recommended.

CAUTION: Do not connect the power supply to the ignition switch or the body next to the transceiver due to voltage drop and noise interference.

- Route the power cable away from other vehicle wiring, including high-voltage ignition wiring between the spark plugs, distributor and coil.

CAUTION: Ensure the power cable does not run together with, or parallel to, the control cables for any long distance.

Where wiring passes through any bulkhead, provide appropriate grommets to prevent insulation being cut.

- Terminate the transceiver power cable with connector lugs.
- Secure the power cable using cable ties.
- Test that the power supply and transceiver work correctly.

Using a terminal block

A terminal block can be fitted where heavy cables are used for long cable runs, or where the tools or materials may not be available to re-terminate the transceiver supply connector. The terminal block is fitted next to the transceiver to connect the cable from the battery to the transceiver power cable. The length of the cable between the terminal block and the transceiver should not exceed 500 mm (20 in) so that voltage drop is minimised.

To connect a terminal block:

- Cut the connector from the end of the battery cable.
- Strip 10 mm (½ in) of the insulation from the cable.
- Insert the cable into the terminal block, ensuring the screws of the terminal block are completely undone before inserting the wires.

Observe correct polarity.

- Turn the screws into place.
- Ensure there are no stray wires.

Protecting the cables

Physical protection

Protect all the cables from sharp edges and mechanical abrasions. Cables that pass through panels or walls must be protected by grommets. Such holes need only be large enough to allow the end of the cable with the smaller connector to pass through. Removing a connector should be a last resort. Externally, the cable and connectors need to be weatherproofed using self-amalgamating rubber tape.

CAUTION: Removal of factory-fitted connectors may cause cable or connector faults.

CAUTION: Crimp-style coaxial connectors for vehicle installations should be avoided because they are susceptible to mechanical damage and are not weatherproofed.

NOTE: Any cabling under carpet or floor mats should be clear of foot traffic.

Electrical protection

The transceiver is provided with adequate internal protection. The transceiver supply is also fitted with adequate protection.

If a battery is used, Codan recommends that a suitable cartridge fuse (32 A, Codan part number 15-00711) is fitted in the positive wire, close to the battery. This protects the power cable from risk of fire if damaged insulation should touch surrounding metalwork.

As the fuse is not included to protect the transceiver circuits, it should be of large physical and electrical size to eliminate the possibility of voltage drops across the fuse.

WARNING: Do not use normal glass in-line automotive fuses.

Earthing the transceiver in a mobile station

A good RF earth is essential for efficient operation of the mobile station. The transceiver chassis should be connected to earth via the earth screw on the rear panel of the transceiver. Use a copper braid of at least 12 mm (½ in) width to connect the transceiver to the earthing point.

NOTE: Keep the earth braid as short as possible.

All individual units in a mobile station should be earthed to prevent RF interference corrupting the data and audio circuits. Equipment that requires earthing has an earth screw fitted. To achieve good earthing, connect separate earth braids to the earth screws on each piece of equipment and connect them back to the same earthing point.

NOTE: Ideally, all earth braids should connect directly back to a single point to prevent earth loops.

An adequate earthing system is necessary for:

- static drain
- noise reduction

Related links:

[Static drain on page 359](#)

[Noise reduction on page 360](#)

Static drain

In some cases, wind-driven particles, such as dry sand, may charge the transceiver and ancillaries to very high voltages above earth. Usually the low-impedance protective earth connection prevents high voltages from building up. In the event that the protective earth is disconnected or does not exist, as for a solar-powered fixed installation, these high voltages may occur.

If the voltage of the electrostatic charge becomes sufficiently high, a flashover could occur between the charged parts and earth. The energy released at flashover depends upon the voltage of the charged parts to earth. This energy generates a steep wave front, which may cause failure in the front end of the transceiver or result in damage elsewhere.

Noise reduction

In some cases, noise can be reduced by connecting the case of the transceiver directly to earth. If an improvement is noticed, the existing functional RF earth may be inadequate and need improvement.

Where the antenna and transceiver must be installed in close proximity, directly earthing the transceiver may be necessary to eliminate RF feedback.

Troubleshooting the mobile installation

Common problems caused by incorrect installation are listed in [Table 34](#).

Table 34: Possible faults in the installation

| Symptom | Possible cause | Action |
|---|--|--|
| No power | The internal fuse of the transceiver has blown | Replace the fuse. |
| | Poor connections | Check that the battery is connected correctly to the transceiver. |
| | Power not switched on | Check that the AC mains supply and the transceiver supply are both switched on. |
| | Battery not supplying the correct voltage, or is in poor condition | Check battery supply. |
| Tuning fails | Inadequate earthing | Antenna mounting bracket should be welded or bolted directly to the chassis. All paint should be cleaned from mating surfaces. The earth braid provided should be connected to an independent earthing point going to the bodywork of the vehicle, or to the battery negative if possible. |
| Distortion of the transmit audio signal | Inadequate earthing of the transceiver to the vehicle chassis | Improve the earth of the transceiver by connecting an earth strap (braid or copper strip) from the earth screw of the transceiver to the vehicle chassis, keeping the strap as short as possible. |
| Transceiver is not responding to instructions | The transceiver may not be connected correctly | Check that the cables and connectors between all items of equipment are securely connected and not damaged. |
| | Faulty cables and/or connectors | Check that the cables and connectors between all items of equipment are securely connected and not damaged. |

Table 34: Possible faults in the installation (cont.)

| Symptom | Possible cause | Action |
|---|---------------------------|---|
| Voltage drop in the fuse, the control leads, or the battery | Voltage less than 12 V DC | Check the voltage; it must be greater than 12 V DC on transmit. |

Related links:

[Radiation safety \(non-EU installations\) on page 439](#)

[Radiation safety \(EU installations only\) on page 437](#)

[Earthing the antenna on page 361](#)

[Standing wave ratio on page 366](#)

[Earthing the transceiver in a mobile station on page 359](#)

[Checking a battery on page 355](#)

Installing the antenna

WARNING: The antenna should be installed by a suitably qualified technician, to the relevant standards and approvals.

NOTE: Correct installation of the antenna provides efficient operation over the frequency range of the transceiver. It ensures the antenna provides maximum output power during transmission and clear reception of weak signals.

Positioning the antenna

For information on positioning a mobile antenna, see the documentation provided with the antenna.

Connecting the antenna to the transceiver

A vehicle antenna is a tuned antenna, and therefore, must be connected to the transceiver using 50 Ω coaxial cable. Type RG58 cable is normally used. The cable should be as far as possible from other vehicle wiring, especially high-voltage ignition wiring.

In addition to an RF coaxial cable connection, an automatic tuning whip antenna also requires a control cable to be connected to the transceiver.

The cables are supplied in standard lengths with the appropriate connectors fitted at either end.

Earthing the antenna

For information on earthing a mobile antenna, see the documentation provided with the antenna.

Tuning a mobile antenna

A mobile antenna uses an automatic tuner to make the physically small whip appear larger to the transceiver.

To tune a mobile antenna:

- Scroll to the channel on which you want to transmit, then press PTT to tune.

Troubleshooting the mobile antenna

Common problems caused by incorrect installation are listed in [Table 35](#).

WARNING: Before using the antenna system see the safety information provided.

WARNING: Poor installation can damage the antenna beyond repair.

Table 35: Possible faults in the mobile antenna installation

| Symptom | Possible cause | Action |
|--|---|--|
| Antenna tunes when stationary, but fails when mobile | Incorrect positioning of the antenna on the vehicle | Ensure correct installation and tuning procedures are followed. With an SWR meter in place, alter the position of the antenna to achieve best forward-radiated power. Carry out all testing in the open, away from trees and buildings etc. Leaning the antenna away from the bodywork sometimes assists in tuning. Check that the problem does not move to other channels. |
| Antenna fails to tune certain channels | The antenna and/or tuner may not be earthed correctly | Improve the earth connection. Ensure a good earth connection to the vehicle body is provided by an earth braid or copper strap, keeping it as short as possible. Check the vehicle earth on metal areas close to the antenna and rectify if necessary, for example, the bonnet of the vehicle may be isolated from the main vehicle earth. If the problem persists, shorten or lengthen the coaxial cable between the antenna and the transceiver by approximately 1 m (1 yd). Check that the problem does not move to other channels. |
| | The antenna may have been tuned without the whip in place | Ensure the whip is in place before tuning. |

Table 35: Possible faults in the mobile antenna installation (cont.)

| Symptom | Possible cause | Action |
|---|---|--|
| Poor radiation efficiency | Poor installation | Improve the earth connection. |
| | Incorrect positioning of the antenna | Check the position of the antenna, ensuring that the vehicle body is not acting as a shield. With an SWR meter in place, alter the position of the antenna to achieve best forward-radiated power. Check that the problem does not move to other channels. |
| | The antenna and/or tuner may not be earthed correctly | Improve the earth connection. |
| SWR is bad | The SWR measurement may have been performed at the RFU rather than at the antenna | Ensure the SWR meter is connected to the coaxial line at the base of the antenna to achieve an accurate reading. |
| | The antenna may not be positioned correctly | Check the position of the antenna, ensuring that the vehicle body is not acting as a shield. With an SWR meter in place, alter the position of the antenna to achieve best forward-radiated power. |
| | Faulty coaxial cable or control cable | Replace faulty cables. |
| | The antenna and/or tuner may not be earthed correctly | Improve the earth connection. |
| Voltage drop in the fuse, the control leads, or the battery | Voltage less than 12 V DC | Check the voltage; it must be greater than 12 V DC on transmit. |

Related links:

[Earthing the antenna on page 361](#)

[Earthing the transceiver in a mobile station on page 359](#)

Radio frequency interference (mobile stations only)

Types of noise

Engine noise and electrical accessories often cause RF interference.

Noise interference can be:

- induced into and carried along the cables to the transceiver
- radiated from the noise source and picked up at the antenna

Table 36: Noise source and type

| System | Noise source | Noise type |
|------------------|-----------------------|-----------------------------|
| Ignition | Ignition | Spark plug leads |
| Battery charging | Alternators | Diode switching and brushes |
| Other | Brakes and bearings | Static discharge |
| | Oil pressure sender | Contact arcing |
| | Tachometer | Impulse |
| | Winches | Motor brushes |
| | Wipers and fan motors | Motor brushes |

Noise from the battery-charging system

Alternator/generator-to-battery wiring

A low-pass filter, such as a Marine Technology type MAR-60A (up to 60 A), should be fitted to the main battery lead at the alternator to minimise noise. The filter must be rated for the maximum current available from the charging system. The earth lug of the filter should attach to the alternator body or the engine block.

Noise suppression

Noise interference is suppressed by:

- shielding/screening, for example, the addition of a physical metallic shield between a noise source and the transceiver
- decoupling to earth, for example, a filter capacitor on the alternator
- providing RF filtering
- maintaining all electrical equipment and connections
- re-routing wiring, for example, separating the antenna feed wire from the battery cable

Most commercial and passenger vehicles are not easily suppressed for noise at radio frequencies. Since shielding of existing cables and devices such as spark plugs is neither practical nor viable for general vehicle installations, RF filtering is the preferred option.

RF filtering involves:

- preventing the noise from being generated
- minimising the noise radiated by the wiring connected to the noise source

An interference suppression kit is available from Codan (Codan part number 15-00704). It contains filters, suppressing capacitors, earth straps and fitting instructions.

The process of eliminating signal interference is by:

- identifying the noise source(s) by noting the difference in the noise levels in the receiver with the motor and accessories switched off then on
- working on each source individually until an acceptable level of suppression is achieved

Alternatively, disconnect all possible sources of noise then replace and suppress them in turn.

Most suppression is carried out using some type of RF filtering. All suppressor devices must be fitted at the source of the interference in order to be effective.

Testing the installation

Following correct installation, the station should be tested for correct operation prior to use in the HF communication network.

Testing involves:

- measuring the SWR
- carrying out station-to-station on-air testing

Standing wave ratio

WARNING: Before using the antenna system see the safety information provided.

An SWR meter measures the forward and reflected powers between a transceiver and its antenna load, and represents these in a ratio called the SWR. To ensure correct installation, the power and SWR assessment should be performed with the transceiver working in its normal antenna system. Press **TUNE** to see the SWR, then press PTT to manually tune the antenna.

If the impedance of the antenna is equal to 50 Ω , no power is reflected. This is the ideal situation, which gives an SWR reading of 1:1. An SWR equal to or lower than 1.8:1 is acceptable. If the SWR is greater than 1.8:1, the ALC circuitry in the transceiver reduces the output power. With some combinations of frequencies and antenna design, it may not be possible to achieve the desired figure on all channels.

CAUTION: The SWR should never rise above 2:1.

Related links:

[Radiation safety \(non-EU installations\) on page 439](#)

[Radiation safety \(EU installations only\) on page 437](#)

Using SWR to test the installation

To test the installation using SWR:

- Select the highest operating frequency of the transceiver.
- Press PTT to tune the antenna.

If the antenna installation parameters are within the satisfactory operating range, tuning will be successful and the SWR reading will be less than 2:1.

- Select the lowest operating frequency of the transceiver, then repeat the test.
- If a particular channel frequency does not tune, check the:
 - length of the antenna (for long wire antennas)
 - conductivity of the earthing system
 - orientation of the antenna
- Alter these slightly in an attempt to achieve better tuning.

On-air testing

On-air testing gives a better indication of antenna operation, particularly if the operator is familiar with the signal strengths normally received within an HF communication network. Certain types of test calls can be used to test the installation.

With on-air testing, the difference in equipment between stations must be taken into account when determining the quality of the transmission. For example, a 100 W mobile station may be in contact with a base station using a full-size antenna and high-power transceiver.

Any testing on an automatic tuning antenna should be made on all frequencies of operation. A failure to tune on a particular frequency indicates the antenna base impedance at this frequency has pushed the VSWR outside the acceptable tuning range.

This may be corrected by:

- improving or extending the existing earth system
- altering the length of the coaxial feeder cable (only if the VSWR measurements were made at the transceiver rather than the base of the antenna)

NOTE: It is recommended that the VSWR measurements are made at the base of the antenna. In this case, altering the feeder length has little effect.

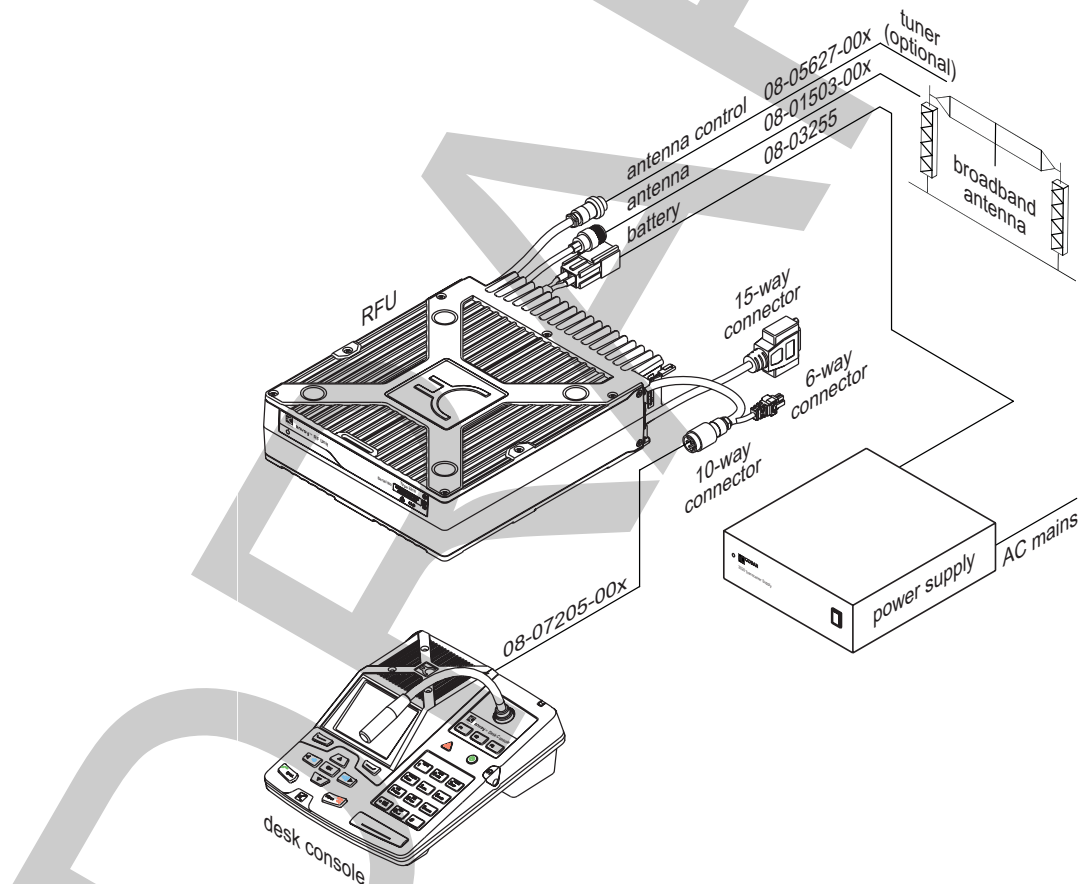
Fixed stations

Overview of fixed stations

A fixed station typically consists of a transceiver, an AC transceiver supply connected directly to the mains, an antenna, control and accessory devices, ancillary equipment, and appropriate connecting cables. The transceiver is connected to the DC output lead of the transceiver supply. The antenna is connected to the transceiver by coaxial cable.

NOTE: A fixed station may also be powered via a battery system or solar power system.

Figure 79: Typical fixed station



NOTE: A range of ancillary equipment may be connected to the Envoy™ Transceiver using the 6-way and 15-way connectors at the rear of the RFU.

Antenna tuners in a fixed station

The purpose of an antenna tuner is to adjust the wavelength of the antenna according to the selected frequency. This ensures an optimum load to the transceiver so that it achieves maximum efficiency. A tuner is usually installed when a single antenna is operating on a range of frequencies, for example, the long wire and vertical whip antennas, and when there is limited space available to install additional antennas.

The radiating portion of the antenna connects directly to the tuner through a high-voltage insulator. The antenna length must be compatible with the tuner installed, and be suitable for the working frequency range.

CAUTION: It is essential that the correct antenna type, site location, and earthing technique be chosen so that the system operates effectively.

Related links:

[Types of fixed antennas on page 395](#)

Automatic tuners

These tuners automatically tune to the selected frequency, and can recall frequency settings for future use. Automatic tuners operate with almost any end-fed antenna with a length of 6 m (7 yd) or more, provided an effective earth system is used.

Antenna supports in a fixed station

Supports are used to position the antenna to face the desired direction of communication. The supports suspend the antenna in the air and provide it with adequate rigidity. The supports must be able to withstand extreme environmental conditions.

CAUTION: The antenna may not tune or remain tuned if it sways or sags excessively.

Existing supports can be used, such as trees or windmill towers, if they are suitably positioned according to the desired direction of communication. Support systems also include freestanding or guyed masts.

NOTE: If the supports are unstable, additional support, such as guy anchors, should be provided.

The antenna is tied to various supports by wire or nylon rope guys to ensure the antenna is insulated from its supports. If wire guys are used, two ceramic insulators *must* be provided at each end of the antenna. If metallic supports are used, position the insulators so that the antenna is at least 2 m (2 yd) from the mast. Ceramic insulators ensure the signal is not connected directly to the earth via the metallic supports.

Installing the transceiver in a fixed station

On receiving your Envoy™ Transceiver, check the contents against the packing list. Make sure that all equipment itemised on the packing list is present and that there is no damage to the equipment before you start installing the system.

If anything is missing or damaged, please contact your nearest Codan office immediately to obtain the correct warranty service procedures. This ensures prompt assistance, minimal turnaround time, and avoids any freight issues.

We recommend that the equipment is installed by qualified and experienced personnel, to the relevant standards and approvals. For detailed instructions on connecting particular items of equipment, see the relevant document on the CD provided with the Envoy™ Transceiver Getting Started Guide.

NOTE: Unused connectors on the RFU must be covered with the protective caps supplied to prevent electrostatic discharge passing through your transceiver.

Positioning the transceiver

When choosing a location for the components of the transceiver, you should be aware of the environmental ratings of each item of equipment as set out in the specifications. They must be mounted in a suitable position that:

- provides a free flow of air through the rear cooling fins to dissipate the heat generated by the transceiver
- provides easy access to the controls
- does not expose the unit to direct sunlight
- does not expose the unit to water ingress
- ensures correct connection and operation
- provides easy access for maintenance

Related links:

[Specifications on page 341](#)

Installing the cables

WARNING: *Do not cut the control, coaxial or speaker cable. If the cables are too long, gather the excess neatly and secure it out of the way.*

CAUTION: *Large magnetic fields can be generated along the power cable during transmission and these fields may be coupled into the control cabling. Failure to keep these cables separated causes distortion of the transmitted signal.*

Power supply

WARNING: All installations should be checked by a qualified technician before power is applied to the transceiver.

Power can be provided by either:

- a suitable transceiver supply connected directly to the AC mains
- a 12 V DC lead acid battery

CAUTION: Ensure that the power supply to operate your station is 12 V DC.

AC mains power supply

Codan provides a 3020 Transceiver Supply, which can be used with transceivers operating on speech and data communications.

CAUTION: If the distance between the transceiver supply and the transceiver requires the cable to be extended, the cable size may need to be increased to minimise voltage drop.

Related links:

[Connecting the AC mains supply on page 373](#)

Battery power supply

Standby batteries are usually used to supply power to the transceiver in case of a mains failure. Sometimes, batteries are used with solar panels to supply the power to fixed stations.

Batteries need to be well-charged and in good condition to ensure effective operation. Poor condition of the battery usually leads to poor performance of your transceiver. This includes reduced power output and signal distortion during transmission.

Checking a battery

It is important to maintain the condition of the battery to ensure that it is in suitable working order.

Table 37: Battery maintenance

| Check for... | Comment |
|--------------------------|---|
| Correct charge | Use a multimeter or a hydrometer to check the charge condition of the battery. |
| Water level in cells | The plates should be sufficiently covered with electrolyte. Add clean distilled water if the electrolyte is below the top of the plates. Never overfill cells as this causes corrosion. |
| Corrosion-free terminals | Where there is corrosion on the terminal posts, the whole area should be neutralised and cleaned. This can be achieved using a wire brush, paint scraper, and a solution of water and baking soda. WARNING: Any cleaning of the terminals should be done in a well-ventilated area using the appropriate personal protective equipment. |

Table 37: Battery maintenance (cont.)

| Check for... | Comment |
|------------------------------|--|
| Tight electrical connections | Check for defective cables, loose connections, corrosion, cracked cases or covers, loose hold-down clamps, and deformed or loose terminal posts. |

Power supply factors

Voltage drop

The most common causes of voltage drop along a cable are:

- the diameter of the wire is too thin
- the length of the cable is too long

The average current consumption of a transceiver is low except during transmission of voice and data peaks, where high current is needed for short intervals. The power supply cable needs to be sufficiently heavy to supply these current peaks without excessive voltage drop.

Incorrect wiring techniques, including poor choice of connection points and incorrect use of terminal lugs, can also cause a voltage drop.

Related links:

[Power and control cabling on page 357](#)

Fuse protection

An external fuse must be fitted in the active wire as close as possible to the battery to ensure there is no risk of fire if the cable is damaged. The fuse must be of a type that has a low voltage drop at peak currents.

NOTE: A 32 A cartridge fuse (Codan part number 15-00711) is recommended.

Related links:

[Protecting the cables on page 358](#)

Noise interference

The transceiver has noise-rejection circuitry and, provided correct connection and routing of the power cable are established, noise interference via the power cable should be kept to a minimum.

For situations where noise and interference from the vehicle is excessive, Codan recommends that you use the Vehicle Interference Suppression Kit (Codan part number 15-00704).

Related links:

[Connecting the battery supply on page 357](#)

Wiring techniques

Correct wiring techniques can reduce voltage drop. These include choosing good connection points and using terminal lugs correctly.

WARNING: It is essential for every mains-energised installation to have an effective connection to the protective earth of the power distribution system in case the basic insulation fails.

WARNING: Without protective earthing, dangerous voltages may be applied to accessible metal parts.

A 3-wire mains cord has an earth wire that provides an effective earth, and is therefore electrically safe. A 2-wire mains cord lacks a protective earth wire, so one must be established by bonding the transceiver supply to an earth stake driven into the ground, or to some other low-impedance earth connection.

Related links:

[Connecting the AC mains supply on page 373](#)

Connecting the power supply

Connecting the AC mains supply

An AC mains or a generator-based supply may be used as a direct source of power to a transceiver power supply in a fixed station.

To connect an AC mains supply:

- Fit the plug from the transceiver supply into the AC mains socket.
The transceiver supply converts the AC power supply to DC.
- Connect the transceiver supply to the transceiver via the DC power leads.
- Ensure the transceiver is earthed correctly.

Most Codan power supplies can use an external battery as an alternative power supply in the event of an AC mains failure. Codan recommends the use of the Standby Battery Cable Kit (Codan part number 15-00702) for easy and correct installation of the standby battery. The cable from this battery must be able to carry the full supply current, so it must be of correct size.

Related links:

[Earthing the transceiver in a fixed station on page 374](#)

[Power and control cabling on page 357](#)

Protecting the cables

Physical protection

Protect all the cables from sharp edges and mechanical abrasions. Cables that pass through panels or walls must be protected by grommets. Such holes need only be large enough to allow the end of the cable with the smaller connector to pass through. Removing a connector should be a last resort. Externally, the cable and connectors need to be weatherproofed using self-amalgamating rubber tape.

CAUTION: Removal of factory-fitted connectors may cause cable or connector faults.

CAUTION: Crimp-style coaxial connectors for vehicle installations should be avoided because they are susceptible to mechanical damage and are not weatherproofed.

NOTE: Any cabling under carpet or floor mats should be clear of foot traffic.

Electrical protection

The transceiver is provided with adequate internal protection. The transceiver supply is also fitted with adequate protection.

If a battery is used, Codan recommends that a suitable cartridge fuse (32 A, Codan part number 15-00711) is fitted in the positive wire, close to the battery. This protects the power cable from risk of fire if damaged insulation should touch surrounding metalwork.

As the fuse is not included to protect the transceiver circuits, it should be of large physical and electrical size to eliminate the possibility of voltage drops across the fuse.

WARNING: Do not use normal glass in-line automotive fuses.

Earthing the transceiver in a fixed station

A good RF earth is essential for efficient operation of the fixed station. The transceiver chassis should be connected to earth via the earth screw on the rear panel of the transceiver. Use a copper braid of at least 12 mm (½ in) width to connect the transceiver to the earthing point.

NOTE: Keep the earth braid as short as possible.

All individual units in a fixed station should be earthed to prevent RF interference corrupting the data and audio circuits. Equipment that requires earthing has an earth screw fitted. To achieve good earthing, connect separate earth braids to the earth screws on each piece of equipment and connect them back to the same earthing point.

NOTE: Ideally, all earth braids should connect directly back to a single point to prevent earth loops.

An adequate earthing system is necessary for:

- electrical safety
- static drain
- noise reduction

Related links:

[Electrical safety on page 375](#)

[Static drain on page 375](#)

[Noise reduction on page 360](#)

Electrical safety

You must use correct wiring techniques to provide electrical safety for the fixed station.

Related links:

[Wiring techniques on page 373](#)

Static drain

In some cases, wind-driven particles, such as dry sand, may charge the transceiver and ancillaries to very high voltages above earth. Usually the low-impedance protective earth connection prevents high voltages from building up. In the event that the protective earth is disconnected or does not exist, as for a solar-powered fixed installation, these high voltages may occur.

If the voltage of the electrostatic charge becomes sufficiently high, a flashover could occur between the charged parts and earth. The energy released at flashover depends upon the voltage of the charged parts to earth. This energy generates a steep wave front, which may cause failure in the front end of the transceiver or result in damage elsewhere.

WARNING: A flashover may result in the failure of the basic insulation of a mains-energised transceiver supply, causing an extreme safety hazard. To avoid a flashover, ensure that the transceiver is correctly earthed.

Noise reduction

In some cases, noise can be reduced by connecting the case of the transceiver directly to earth. If an improvement is noticed, the existing functional RF earth may be inadequate and need improvement.

Where the antenna and transceiver must be installed in close proximity, directly earthing the transceiver may be necessary to eliminate RF feedback.

Troubleshooting the fixed installation

Common problems caused by incorrect installation are listed in [Table 38](#).

Table 38: Possible faults in the installation

| Symptom | Possible cause | Action |
|---|--|---|
| Tuning fails | Inadequate earthing | Improve the earth of the transceiver by connecting an earth strap (braid or copper strip) from the earth screw of the transceiver to the earth point, keeping the strap as short as possible. |
| Noise interference | Noise interference by other equipment | Identify the source of interference by switching off other equipment. If possible, move the transceiver and/or antenna away from the noise source. |
| | Inadequate earthing of the transceiver | Improve the earth of the transceiver by connecting an earth strap (braid or copper strip) from the earth screw of the transceiver to the earth point, keeping the strap as short as possible. |
| No power | The internal fuse of the transceiver has blown | Replace the fuse. |
| | Power not switched on | Check that the AC mains supply and the transceiver supply are both switched on. |
| | Incorrect cable connections | Check that the AC mains outlet, the transceiver supply, and the transceiver are connected correctly. |
| | Faulty cables and/or connectors | Check that the cables and connectors between all items of equipment are securely connected and not damaged. If the cables or connectors are faulty, contact your Codan representative. |
| | Battery not supplying the correct voltage, or is in poor condition | Check battery supply. |
| Transceiver is not responding to instructions | The transceiver may not be connected correctly | Check that the cables and connectors between all items of equipment are securely connected and not damaged. |
| | Faulty cables and/or connectors | Check that the cables and connectors between all items of equipment are securely connected and not damaged. |

Related links:

[Antenna supports in a fixed station on page 369](#)

[Earthing the antenna on page 378](#)

[Earthing the tuner on page 379](#)

[Standing wave ratio on page 366](#)

[Earthing the transceiver in a fixed station on page 374](#)

[Checking a battery on page 355](#)

Installing the antenna

WARNING: The antenna should be installed by a suitably qualified technician, to the relevant standards and approvals.

NOTE: Correct installation of the antenna provides efficient operation over the frequency range of the transceiver. It ensures the antenna provides maximum output power during transmission and clear reception of weak signals.

Positioning the antenna

Position the fixed antenna:

- next to the antenna feed point
- free from obstructions such as buildings, trees and vegetation
- at right angles to the desired direction of communication
- away from any other antenna system

NOTE: The transceiver and antenna do not have to be positioned close to each other if connected by coaxial cable. The transceiver and the feed point of the antenna can be up to 20 m (22 yd) apart before heavier low-loss coaxial cable, such as RG213, is necessary.

Horizontal wire antennas, including the dipole, broadband and long wire antennas, have maximum radiation along their length. Radiation is lowest at the ends of the antenna. Therefore, position these antennas at right angles to the desired direction of communication.

Vertical antennas, such as the vertical whip antenna, have an omnidirectional radiation pattern. Therefore, the direction that vertical antennas face is not important as the radiation pattern is generally equal in all directions.

Earthing the antenna

For a fixed antenna, requirements of the earth plane depend upon the type of antenna selected and the location of the antenna, that is, on open ground or on a roof-top.

When installing an antenna on open ground, earth conductivity is often insufficient to provide adequate earthing, especially on well-drained sandy, rocky or loamy soils. An earth plane should be used to provide adequate earthing of the antenna. For a vertical antenna, an efficient earth plane is provided by a counterpoise consisting of at least four radials extending from the base of the antenna. The radials should be buried approximately 10 cm (4 in) below the surface. An earth mat for an antenna mounted on open ground can be supplied by Codan (Codan part number 15-00158).

When installing an antenna on roof-tops where there is no existing earth plane, an earth plane should be installed. The earth plane should be a conducting surface extending several wavelengths in all directions around the antenna. This can be provided by placing a screen of wire mesh or similar material over the roof of the building. Usually, a counterpoise system is used to provide an efficient earth plane. For example, the counterpoise system for a vertical antenna should consist of at least 8 to 10 radials bonded together at the base of the antenna. A radial earth plane for an antenna mounted on the roof-top of a building can be supplied by Codan (Codan part number 15-00159).

If an earth plane, such as a counterpoise, cannot be provided for the antenna, an earth wire connected to a suitable earth stake can be used, but with reduced efficiency.

NOTE: As the earth wire forms part of the antenna system, any resistance in the earthing network reduces the efficiency of the antenna.

CAUTION: The earth connections are subject to corrosion and oxidation. All joints must be clean, and the hardware adequately tightened. The joints can be protected by the application of silicone grease. In severe conditions, joints should be covered with self-amalgamating tape followed by a layer of good quality UV-stable PVC tape.

CAUTION: RF earthing should not be relied upon to provide protective earthing. It can fail upon the removal of one of the interconnecting links. A separate wire should always be connected to the item that you want to protect.

Related links:

[Types of fixed antennas on page 395](#)

Positioning the tuner

Due to high voltages on the antenna, position the tuner so that the antenna-to-tuner connection is isolated from accidental contact with conducting surfaces.

WARNING: It is essential that the antenna be positioned at least 50 mm (2 in) from a conducting surface.

CAUTION: Avoid kinks in the lead-in wire of the antenna.

Connecting the antenna to the tuner

When routing the antenna wire to the tuner:

- keep the length of the antenna wire inside the building to a minimum and away from metal objects
- a minimum hole diameter of 100 mm (4 in) is necessary for wiring that passes through a wall or roof, and the wiring should pass through the centre of this hole using a grommet or other suitable insulator
- wiring must not come into contact with guttering, eaves etc, upon entering or leaving a building

Earthing the tuner

The earth system is a key part of the overall antenna system. An inefficient earth system is a primary cause of poor performance and difficulty in adjusting the tuner.

The earth system should be connected to the earth stud on the tuner by a heavy copper wire or braid. The connection from the tuner to the earth must be a small percentage of the total length of the antenna, that is, the earth braid must be kept as short as possible.

CAUTION: Do not use an earth strap that exceeds 1.5 m (5 ft).

In areas of good earth conductivity, an effective earth can be established with an earth spike. The spike should be approximately 3 m (10 ft) in length and should be installed as close as possible to the tuner. It may be necessary to use several earth spikes bonded together to improve the earth contact.

Copper or steel water pipes can be suitable earths, provided that:

- the water pipe is close to the tuner
- the water pipe enters the ground very close to the tuner earthing point
- there are no joints or couplings in the pipe that may increase the resistance path to earth
- the water pipe makes good contact to soil that has good conductivity
- a low resistance connection is made to the water pipe

Troubleshooting the fixed antenna

Common problems caused by incorrect installation are listed in [Table 39](#).

WARNING: Before using the antenna system see the safety information provided.

WARNING: Poor installation can damage the antenna beyond repair.

Table 39: Possible faults in the fixed antenna installation

| Symptom | Possible cause | Action |
|--|---|--|
| Antenna fails to tune certain channels | The antenna and/or tuner may not be earthed correctly | Improve the earth connection. |
| | Incorrect positioning of the antenna | Check that the position of the antenna corresponds to the desired direction of communication. The antenna must also be positioned away from trees, buildings etc, which provide a shielding effect and diminish the efficiency of the antenna. With an SWR meter in place, alter the position of the antenna to achieve best forward-radiated power. |
| | Inadequate support of the antenna | Ensure the antenna has adequate support so that it does not sway or sag. If required, use antenna supports such as guyed masts. |
| Poor radiation efficiency | Poor installation | Improve the earth connection. |
| | Incorrect positioning of the antenna | Check that the position of the antenna corresponds to the desired direction of communication. The antenna must also be positioned away from trees, buildings etc, which provide a shielding effect and diminish the efficiency of the antenna. With an SWR meter in place, alter the position of the antenna to achieve best forward-radiated power. If the problem persists, check the antenna length (for long wire antennas), the length of the antenna feed wire, and the conductivity of the earthing system. Alter these slightly in an attempt to achieve better tuning. Check that the problem does not move to other channels. |
| | The antenna and/or tuner may not be earthed correctly | Improve the earth connection. |

Table 39: Possible faults in the fixed antenna installation (cont.)

| Symptom | Possible cause | Action |
|-----------------|---|---|
| SWR is bad | The SWR measurement may have been performed at the RFU rather than at the antenna | Ensure the SWR meter is connected to the coaxial line at the base of the antenna to achieve an accurate reading. |
| | The antenna may not be positioned correctly | Check that the position of the antenna corresponds to the desired direction of communication. The antenna must also be positioned away from trees, buildings etc, which provide a shielding effect and diminish the efficiency of the antenna. With an SWR meter in place, alter the position of the antenna to achieve best forward-radiated power. |
| | Faulty coaxial cable or control cable | Replace faulty cables. |
| | The antenna and/or tuner may not be earthed correctly | Improve the earth connection. |
| Antenna detunes | Inadequate support of the antenna | Ensure the antenna has adequate support so that it does not sway or sag. If required, use antenna supports such as guyed masts. |

Related links:

[Earthing the antenna on page 378](#)

[Earthing the tuner on page 379](#)

[Earthing the transceiver in a fixed station on page 374](#)

Testing the installation

Following correct installation, the station should be tested for correct operation prior to use in the HF communication network.

Testing involves:

- measuring the SWR
- carrying out station-to-station on-air testing

Standing wave ratio

WARNING: Before using the antenna system see the safety information provided.

An SWR meter measures the forward and reflected powers between a transceiver and its antenna load, and represents these in a ratio called the SWR. To ensure correct installation, the power and SWR assessment should be performed with the transceiver working in its normal antenna system. Press **TUNE** to see the SWR, then press PTT to manually tune the antenna.

If the impedance of the antenna is equal to 50 Ω , no power is reflected. This is the ideal situation, which gives an SWR reading of 1:1. An SWR equal to or lower than 1.8:1 is acceptable. If the SWR is greater than 1.8:1, the ALC circuitry in the transceiver reduces the output power. With some combinations of frequencies and antenna design, it may not be possible to achieve the desired figure on all channels.

CAUTION: The SWR should never rise above 2:1.

Related links:

[Radiation safety \(non-EU installations\) on page 439](#)

[Radiation safety \(EU installations only\) on page 437](#)

Using SWR to test the installation

To test the installation using SWR:

- Select the highest operating frequency of the transceiver.
- Press PTT to tune the antenna.

If the antenna installation parameters are within the satisfactory operating range, tuning will be successful and the SWR reading will be less than 2:1.

- Select the lowest operating frequency of the transceiver, then repeat the test.
- If a particular channel frequency does not tune, check the:
 - length of the antenna (for long wire antennas)
 - conductivity of the earthing system
 - orientation of the antenna
- Alter these slightly in an attempt to achieve better tuning.

On-air testing

On-air testing gives a better indication of antenna operation, particularly if the operator is familiar with the signal strengths normally received within an HF communication network. Certain types of test calls can be used to test the installation.

With on-air testing, the difference in equipment between stations must be taken into account when determining the quality of the transmission. For example, a 100 W fixed station may be in contact with another fixed station using a full-size antenna and high-power transceiver. Fixed stations sometimes use split sites, where the receivers are located in a noise-free area, therefore, signal quality is improved because noise interference is minimised.

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B

HF radio transmission

This section contains the following topics:

- *HF radio transmission on page 386*
- *Frequency, distance and time of day on page 388*
- *Channels, HF networks and scanning on page 389*
- *Etiquette for the use of HF radio on page 390*

HF radio transmission

The HF band is the range of frequencies between 3 and 30 MHz. HF transceivers usually cover a frequency range of 1.6 to 30 MHz.

Codan HF transceivers transmit on single sidebands. This reduces the power required to send HF signals, and increases the number of channels available within the HF spectrum.

HF transceivers are primarily used for long-range communication where distances of 3000 km (1800 mi) and more are possible. Obstructions such as buildings and mountains have little effect on long-range communication. HF radio can cover such large distances because of the way the transmitted radio signal propagates.

HF radio waves propagate in three ways simultaneously:

- ground wave
- direct wave
- sky wave

Related links:

[Ground wave on page 386](#)

[Direct wave on page 386](#)

[Sky wave on page 387](#)

Ground wave

The ground wave travels near the ground for short distances, typically up to 100 km (60 mi) over land and 300 km (190 mi) over sea. The distance covered depends upon the operating frequency, transmission power and type of terrain.

Direct wave

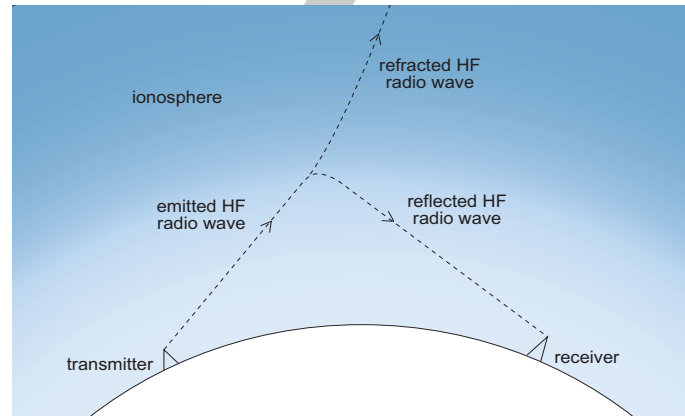
The direct wave travels in a direct line-of-sight from the transmitter to the receiver.

Sky wave

The sky wave is the most important form of HF propagation. The HF radio wave is transmitted toward the sky and is reflected by the ionosphere to a distant receiver on earth.

The reflective properties of the ionosphere change throughout the day, from season to season, and yearly.

Figure 80: The reflective properties of the ionosphere



Frequency, distance and time of day

The extent to which an HF radio wave is reflected depends on the frequency that is used. If the frequency is too low, the signal is absorbed by the ionosphere. If the frequency is too high, the signal passes straight through the ionosphere. Within the HF band, low frequencies are generally considered to be in the range of 2 to 10 MHz. High frequencies are above 10 MHz.

A frequency chosen for day-time transmission may not necessarily be suitable for night-time use. During the day, the layers of the ionosphere are thick. The layers absorb lower frequencies and reflect higher frequencies. At night, the ionosphere becomes very thin. The low frequencies that were absorbed during the day are reflected, and the high frequencies that were reflected during the day pass straight through.

Summer HF radio communications usually operate on higher frequencies than those used in winter over the same distance.

Solar activity varies over an 11-year cycle. Higher frequencies need to be used during periods of peak activity.

It is important to remember that you may need to change the frequency you are using to achieve the best communication. The general rules of thumb for effective HF radio communication are:

- the higher the sun, the higher the required frequency
- the further the distance, the higher the required frequency

Channels, HF networks and scanning

For transmission and reception to occur over HF, the transceivers must be able to tune to the same frequency. This may be defined in a channel, or the transceiver may be free-tuned to this frequency.

A transceiver that has a range of frequencies on which it can receive a call should have scanning switched on so that all of these frequencies are monitored for calling activity.

Transceivers must also have the same call systems available to be able to detect the call. For example, a call made using an ALE/CALM HF network will send a particular type of preamble before the call. This can only be detected by other transceivers with ALE/CALM HF networks programmed.

Related links:

[Overview of channels on page 112](#)

[Overview of HF networks on page 130](#)

[Overview of scan tables on page 120](#)

Etiquette for the use of HF radio

There is a standard procedure for communicating over HF radio. Before you begin transmitting, switch off scanning, select a channel, then press PTT to initiate tuning of the antenna. Listen to the channel that you are going to use and ensure that there is no voice or data communication taking place. You may need to wait until the channel is clear, or select another channel.

NOTE: If you have **LBT Mode** set to **Enabled** or **Override allowed**, the transceiver checks that a channel is not being used; you do not need to check any channels first.

When you first establish communication with another station it is customary to state their call sign and then your own, using the phonetic alphabet (see [Table 40](#)).

For example: ‘Alpha Bravo One, this is Alpha Bravo Two. Do you receive me? Over.’

In this example your call sign is AB2 and you are calling a station with the call sign AB1. A call sign is a group of letters and numbers issued by a government authority to identify a station. The phonetic alphabet is used to ensure that your call sign is understood.

The word ‘over’ is used to signify the end of your transmission. The transceiver may be set up to transmit a short beep when you release the PTT button on the handset. When your conversation with the other party is finished, the party that speaks last should say ‘out’.

Swearing or foul language should not be used—heavy penalties can apply.

Keep communication as short as possible.

Table 40: The phonetic alphabet

| Letter | Phonetic word | Letter | Phonetic word |
|--------|---------------|--------|---------------|
| A | Alpha | N | November |
| B | Bravo | O | Oscar |
| C | Charlie | P | Papa |
| D | Delta | Q | Quebec |
| E | Echo | R | Romeo |
| F | Foxtrot | S | Sierra |
| G | Golf | T | Tango |
| H | Hotel | U | Uniform |
| I | India | V | Victor |
| J | Juliet | W | Whiskey |
| K | Kilo | X | X-ray |
| L | Lima | Y | Yankee |
| M | Mike | Z | Zulu |

Related links:

[LBT Mode on page 217](#)

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C

Antennas

This section contains the following topics:

- [Types of mobile antennas on page 394](#)
- [Types of fixed antennas on page 395](#)

DRAFT

Types of mobile antennas

Automatic tuning whip antenna

Description

The automatic tuning whip antenna is a multi-frequency antenna. A microcontrolled stepper motor in the base of the automatic antenna adjusts an inductor until the antenna is tuned to the selected frequency.

Advantages and limitations

Table 41: Advantages and limitations of the automatic tuning whip antenna

| Advantages | Limitations |
|---|---|
| Wide range of operating frequencies. Easier to operate than a tapped whip antenna. | Large physical size that requires a substantial mounting bracket. A control cable is required. |

For information on installing the antenna see the documentation provided with the product.

Types of fixed antennas

Vertical whip antenna

Description

The vertical whip antenna is omnidirectional in performance, therefore it provides radiation efficiency equally in all directions depending on its mounting position. When receiving, this omnidirectional performance may mean more unwanted signals are picked up, which contributes to high levels of background noise or interference.

Where used

The vertical whip antenna is designed for installation on buildings or open ground. The antenna is suitable for most transceivers operating with an antenna tuner.

Installation

The vertical whip antenna is designed for permanent or temporary installation. The antenna is easy to install.

For efficient operation of the vertical whip antenna, a good earth system is necessary. When the antenna is erected on open ground, especially in dry ground conditions, an earth mat consisting of at least four wire radials extending as far as possible from the base is desirable.

For roof-mounted installations, metal roofing or a radial earth plane is recommended.

Advantages and limitations

Table 42: Advantages and limitations of the vertical whip antenna

| Advantages | Limitations |
|--|---|
| <p>Suitable for long-distance communication.</p> <p>Omnidirectional antenna, therefore it can pick up signals equally in all directions.</p> <p>Suitable where space is limited.</p> | <p>Unsuitable for communication distances under 100 km (60 mi).</p> <p>This antenna is more susceptible to noise pickup such as that produced by welders, electric motors, power lines etc. If installed in a noisy environment, the received signal is degraded.</p> <p>Due to its relatively small size, it may require an antenna tuner for optimum performance.</p> |

Related links:

[Earthing the antenna on page 378](#)

[Noise suppression on page 365](#)

End-fed broadband antenna

Description

The end-fed broadband antenna is a multi-frequency antenna.

Where used

The end-fed broadband antenna is designed for rural outposts, not built-up areas.

Installation

The end-fed broadband antenna is easily and permanently installed. It requires masts and sufficient space for installation. No installation or operational adjustments are required.

Advantages and limitations

Table 43: Advantages and limitations of the end-fed broadband antenna

| Advantages | Limitations |
|--|--|
| Wide range of operating frequencies. Suitable for point-to-point and base-to-mobile applications. | Must be positioned at right angles to the desired direction of communication. Due to its large size, it requires a large area for installation. Due to its broadband properties, it has a low immunity to noise. |

Broadband dipole antenna

Description

The broadband dipole antenna is designed for large-scale professional fixed station systems. The antenna is suitable for high or low-power, multi-frequency operation.

Where used

The broadband dipole antenna is designed for installation on buildings or open ground.

Installation

The broadband dipole antenna is generally erected on masts and requires sufficient space for installation.

Advantages and limitations

Table 44: Advantages and limitations of the broadband dipole antenna

| Advantages | Limitations |
|--|--|
| <p>Wide range of operating frequencies. Generally, more efficient than the end-fed broadband antenna. Suitable for point-to-point and base-to-mobile applications.</p> | <p>Must be positioned at right angles to the desired direction of communication. Due to its large size, it requires a large area for installation.</p> |

Long wire antenna

Description

The long wire antenna is suitable for multi-frequency operation using an antenna tuner in most transceiver systems. It is approximately 20 m (22 yd) in length.

Where used

The long wire antenna is used on buildings or open ground. It is ideal for field crews who require an antenna that can be quickly and easily installed at temporary sites. It may also be used in permanent installations where space is limited.

Installation

The long wire antenna is designed for permanent or temporary fixed station installations. It requires at least one mast and sufficient space for installation.

Advantages and limitations

Table 45: Advantages and limitations of the long wire antenna

| Advantages | Limitations |
|---|---|
| Wide range of operating frequencies. Large in size, therefore, is more efficient. | Must be positioned at right angles to the desired direction of communication. Due to its large size, it requires a large area for installation. The length of the wire may be too long for some operating frequencies and tuners. Under these conditions, the length of the wire must be reduced according to the recommendations provided in the handbook for the tuner. If you require further assistance, contact your Codan representative. |

D

Call types and features

This section contains the following topics:

- [Call types on page 400](#)
- [ALE address syntax on page 409](#)
- [Group calls in a Codan Selcall HF network on page 419](#)
- [Sending AMD information with a call on page 420](#)
- [Sending recognised keywords with a call on page 421](#)

Call types

The type of call that you may send depends upon your operational scenario. You can call another station by entering the address for that station and selecting the type of call that you want to make. For example, if you want to speak to an operator, make a Selective or Emergency call. If you want the stations to automatically exchange information without the need for an operator to answer a call, make a Message, Send Position, Get Position or Get Status call.

If you have the MIL-STD-188-141B ALE option installed, you can make a call from one station to many stations by using a special ALE address syntax.

Table 46: Icons for call types















| Call type | Icon | See... |
|----------------|---|--|
| Channel Test |  | <i>Channel Test call on page 401</i> |
| Emergency |  | <i>Emergency call on page 402</i> |
| Get Position |  | <i>Get Position call on page 402</i> |
| Get Status |  | <i>Get Status call on page 403</i> |
| Message |  | <i>Message call on page 405</i> |
| Phone |  | <i>Phone call on page 406</i> |
| RFDS Emergency |  | <i>RFDS Emergency call on page 406</i> |
| Selective |  | <i>Selective call on page 407</i> |
| Send Position |  | <i>Send Position call on page 407</i> |

Table 47: Icons for ALE address syntax calls (MIL-STD-188-141B ALE)

| ALE address syntax | Icon | See... |
|--------------------|---|--|
| ALL |  | ALL call on page 409 |
| ANY |  | ANY call on page 410 |
| Group Selective |  | Group Selective call on page 411 |
| NET |  | NET call on page 412 |
| Wildcard |  | Wildcard call on page 413 |

Channel Test call



If you want to test the suitability of a channel/mode before you use it to transmit voice or data, make a Channel Test call to a specific station.

In an ALE/CALM HF network, a Channel Test call may be sent to an ALE address using a Group Selective or NET address syntax (if you have the MIL-STD-188-141B ALE option installed). Information from this call updates the information stored in the LQA database for the called address using the same HF network for the current time slot. The calling station automatically sends a beacon on each channel/mode combination in the ALE/CALM HF network, recording local and remote BER and SINAD information, and calculating an LQA score. The LQA screen is visible during the Channel Test call, and at the end of the call, displays the best channel on which to make the call.

A Channel Test call made in an ALE/CALM HF network that uses the text **SOUNDING** as the call address may be used to initiate a sounding operation. Transceivers that detect this sounding update the relevant information stored in their LQA database.

In a Codan Selcall HF network, a Channel Test call sends a request to the station that you want to call on the channel/mode you have selected. The called station automatically returns an audible test signal (revertive). The volume and clarity of this signal indicates the quality of the channel/mode.

NOTE: If you set up one of the status areas to show the Rx level, you can view the strength of the revertive signal.

You can also test channels once you have started a call.

Related links:

[Making a Channel Test call on page 75](#)

[MIL-STD-188-141B ALE on page 133](#)

[Selecting information to be shown in a status area on page 57](#)

Emergency call



If you want to trigger an emergency alert tone at a particular station and speak with an operator, make an Emergency call. If the GPS Call option is installed in the transceiver and you have a GPS receiver connected and selected as a peripheral device, or you have valid information in the My Position setting, your GPS position is automatically sent with the call. Emergency calls can be sent to several stations at once.

If you have the FED-STD-1045 ALE/CALM option installed, you can use the global ALL address syntax (@?@) with the Emergency call type to send a call to all stations using the ALE/CALM HF network and common channels. If you have the MIL-STD-188-141B ALE option installed, you can use the ALL, ANY, Group Selective, NET, or Wildcard address syntax with the Emergency call type to send a call to a group of stations using an ALE/CALM HF network.

Related links:

[Making an Emergency call on page 86](#)

[Group calls in a Codan Selcall HF network on page 419](#)

[ALE address syntax on page 409](#)

Get Position call



NOTE: You can make a Get Position call if the GPS Call option is installed.

NOTE: The success of your Get Position call depends upon the value selected in the **Respond GPS** entry in the transceiver that you are polling and the privacy mode of the HF network that you are using for the call.

NOTE: If you send a Get Position call in an Open Selcall HF network, the transceiver you are polling must have the **Respond GPS** entry set to **Always respond**.

If you want to obtain the GPS position of a specific station that has the GPS Call option installed and has valid GPS information, make a Get Position call to that station. Get Position calls are automatically answered by the called station so an operator is not required to process the return call.

NOTE: The transceiver uses GPS information from either a connected GPS receiver (selected as a peripheral device), or from valid content in **Settings > GPS > My Position**.

The information you receive from a Get Position call is displayed on the screen as it is received, if permitted, and is stored in the Call History.

Related links:

[Making a Get Position call on page 83](#)

[Respond GPS on page 218](#)

Get Status call



NOTE: The success of your Get Status call depends upon the value selected in the **Respond OTA** entry in the transceiver you are polling and the privacy mode of the HF network that you are using for the call.

NOTE: If you send a Get Status call in an Open Selcall HF network, the transceiver you are polling must have the **Respond OTA** entry set to **Always respond**.

If you want to obtain information on the status of a transceiver at a specific station, such as the power output of the transmitter or the firmware versions installed, make a Get Status call to that station. Get Status calls are automatically answered by the called station so an operator is not required to process the return call.

The information you receive from a Get Status call is displayed on the screen as it is received, if permitted, and is stored in the Call History.

When you make a Get Status call you must specify the type of information you require: Diagnostic, Configuration, or Other message. When the **ALE Site Manager** entry is set to **Auto**, **Manual** or **Restricted**, you have the option of broadcasting your site information to other stations, or requesting site information from other stations.

If you want to:

- request diagnostic information from the station that you are calling, select **1: Diagnostic** (see [Table 48](#), [Table 49](#), [Table 50](#))
- request configuration information from the station that you are calling, select **2: Configuration** (see [Table 51](#))
- broadcast your self address to the station that you are calling, select **3: Broadcast Site** (see [Table 6](#))
- request site information from the station that you are calling, select **4: Request Site** (see [Table 6](#))
- send a message, such as an OTA command, select **?: Other**

NOTE: For information on OTA commands, contact your Codan representative.

Table 48: Information retrieved in a Codan Diagnostic Get Status call made to a Codan HF transceiver

| Information received | Description |
|----------------------|--|
| TXnn.n | Battery voltage in transmit |
| TXnn.n | Battery voltage in transmit |
| S1=nnn | Signal strength of received call (dB μ V) |
| S2=nnn | Signal strength 2 sec after call was received (dB μ V) |
| SWRn.n | SWR of the antenna |
| Pnnn | Power output of the transmitter (W) |
| Tnn | Temperature ($^{\circ}$ C) |

Table 49: Information retrieved in a Codan Diagnostic Get Status call made to a Codan 9323 or 9360 transceiver

| Information received | Description |
|----------------------|--|
| RX=nn.nV | Battery voltage in receive |
| TX=nn.nV | Battery voltage in transmit |
| S1=nnn μ V | Signal strength of received call (dB μ V) |
| S2=nnn μ V | Signal strength 2 sec after call was received (dB μ V) |
| GAIN=nnn | RF gain on or off |
| SWR=n.n | SWR of the antenna |
| PWR=nnnW | Power output of the transmitter (W) |

Table 50: Information retrieved in an open Diagnostic Get Status call

| Information received | Description |
|----------------------|----------------------------------|
| RXnn.n | Battery voltage in receive |
| TXnn.n | Battery voltage in transmit |
| S1=nn | Signal strength of received call |
| SWR=n.n | SWR of the antenna |

Table 50: Information retrieved in an open Diagnostic Get Status call (cont.)

| Information received | Description |
|----------------------|--------------------------|
| Vn.nn | Transceiver power |
| Base Mobile | Transceiver antenna type |
| FwrPower=nn | Forward power |
| RevPower=nn | Reflected power |
| Tcvt930 2000 | Transceiver type |
| Vn.nn | Firmware version |
| T=nn | Temperature (°C) |
| ID=nnnnnn | Last Called ID |

Table 51: Information retrieved in a Codan Configuration Get Status call made to a Codan HF transceiver

| Information received | Description |
|---|--|
| Codan transceiver type | Product type |
| RF:n.nn JB:n.nn NRI:n.nn 2110:n.nn | Product name, followed by the firmware version number for the device |

Related links:

[Making a Get Status call on page 84](#)

[Respond OTA on page 219](#)

[ALE Site Manager on page 222](#)

Message call



If you want to send a text message to another station, make a Message call. You can enter a message at the time you make a call, store up to 10 messages in **User Data > Messages**, and store messages in the call information for a contact.

You may insert keywords into the message that are recognised and expanded by the transceiver when the call is sent. Message calls can be sent to several stations at once.

If you have the FED-STD-1045 ALE/CALM option installed, you can use the global ALL address syntax (@?@) with the Message call type to send a call to a group of stations using an ALE/CALM HF network. If you have the MIL-STD-188-141B ALE option installed, you can use the ALL, ANY, Group Selective, NET, or Wildcard address syntax with the Message call type to send a call to a group of stations using an ALE/CALM HF network.

Message calls are automatically answered by a called station so an operator is not required to take any action. If you make a Message call type using an ALE/CALM HF network, the link terminates immediately after the message is sent. Messages you receive are displayed on the screen, if permitted, and stored in the Call History.

Related links:

[Making a Message call on page 78](#)

[Sending recognised keywords with a call on page 421](#)

[ALE address syntax on page 409](#)

Phone call



If you want to call a telephone number from the transceiver, make a Phone call. Before you make a Phone call you must know the address of an HF telephone station through which your call can be routed to the public telephone network. A telephone station has a radio/telephone interconnect connected to the transceiver system.

If you have the FED-STD-1045 ALE/CALM option installed, you can use the global ALL address syntax (@?@) with the Phone call type to send a call to a group of HF telephone stations using an ALE/CALM HF network. If you have the MIL-STD-188-141B ALE option installed, you can use the ALL, ANY, Group Selective, NET, or Wildcard address syntax with the Phone call type to send a call to a group of telephone stations using an ALE/CALM HF network.

Related links:

[Making a Phone call on page 80](#)

[ALE address syntax on page 409](#)

RFDS Emergency call



If you want to trigger an emergency alert tone at an RFDS station, make an RFDS Emergency call. RFDS Emergency calls are made on channels reserved for RFDS use in specific RFDS HF networks.

Related links:

[Making an RFDS Emergency call on page 87](#)

Selective call



If you want to speak with an operator at a particular station, make a Selective call. When the station receives the call, the transceiver sounds an alert tone similar to a telephone to notify the operator. Selective calls can be heard by any station tuned to or scanning your current channel with their mute switched off. Only the transceiver at the station to which the call is addressed will sound an alert tone.

Selective calls can be made to several stations at once.

If you have the FED-STD-1045 ALE/CALM option installed, you can use the global ALL address syntax (@?@) with the Selective call type to make a voice call to a group of stations using an ALE/CALM HF network. If you have the MIL-STD-188-141B ALE option installed, you can use the ALL, ANY, Group Selective, NET, or Wildcard address syntax with the Selective call type to send a call to a group of stations using an ALE/CALM HF network. The transceiver automatically determines the call icon from the address syntax that you enter in the address.

If you have the MIL-STD-188-141B ALE option installed and the **ALE Selective Message** entry set to **Enabled**, you are able to send a message with the call. You are prompted to attach a message when you send the call. You must use an ALE/CALM HF network to make the call.

Related links:

[Making a Selective call on page 74](#)

[Group calls in a Codan Selcall HF network on page 419](#)

[ALE address syntax on page 409](#)

Send Position call



NOTE: You can make a Send Position call if the GPS Call option is installed, and your GPS information is valid.

If you want to send your GPS information to another station, make a Send Position call.

NOTE: The transceiver sends GPS information from either a connected GPS receiver (selected as a peripheral device), or from valid content in **Settings > GPS > My Position**.

Send Position calls can be made to several stations at once. If you have the FED-STD-1045 ALE/CALM option installed, you can use the global ALL address syntax (@?@) with the Send Position call type to send a position to a group of stations using an ALE/CALM HF network. If you have the MIL-STD-188-141B ALE option installed, you can use the ALL, ANY, Group Selective, NET, or Wildcard address syntax with the Send Position call type to send a position to a group of stations using an ALE/CALM HF network.

Send Position calls are automatically answered by any called stations so an operator is not required to take any action. If you make a Send Position call, the link terminates immediately after the GPS position is sent. GPS positions you send are stored in the Call History.

Related links:

[Making a Send Position call on page 81](#)

[Group calls in a Codan Selcall HF network on page 419](#)

[ALE address syntax on page 409](#)

DRAFT

ALE address syntax

Related links:

[ALL call on page 409](#)

[ANY call on page 410](#)

[Group Selective call on page 411](#)

[NET call on page 412](#)

[Wildcard call on page 413](#)

[Summary of special ALE address syntaxes on page 414](#)

ALL call



NOTE: The global ALL address syntax may be used if the FED-STD-1045 ALE/CALM option or MIL-STD-188-141B ALE option is installed.

If you want to send an ALE call to all stations that are tuned to the same frequency in an ALE/CALM HF network or scanning the channels in the scan table(s) associated with the HF network, make a call through the Emergency, Message, Phone, Selective, or Send Position call type using the global ALL address syntax.

The ALL call does not specifically call any stations, and does not request any automatic responses from stations that enter the link. Stations can be configured to accept or to ignore ALL calls.

NOTE: When you use an ALL address syntax through the Selective call type, the call icon changes to the ALL call icon (🔔) when the call is started.

The global ALL address syntax is **@?@**. All stations detecting the call enter an ALE link with the calling station, if enabled to do so. The group of linking stations can be narrowed by using a selective ALL address syntax (MIL-STD-188-141B ALE option). In this address, the **?** is replaced by an upper-case letter or number, for example, **@A@**. All stations detecting the call that have this letter or number as the last character in their self address for the ALE/CALM HF network enter the link.

If you send a selective ALL call to a group of stations, you can send another selective ALL call to bring more stations into the link. For example, if you initially call **@A@**, all stations tuned to the same frequency in an ALE/CALM HF network or scanning the HF network with an **A** as the last character of their self address enter the link. If you follow this with a call to **@B@**, then a further group of stations with **B** as the last character of their self address also enter the link. If the called stations are already in a link, this link is closed and a new link created with the new call.

Alternatively, you can send multiple ALL addresses together to make a call to a range of stations, for example, **@A@,@B@**.

Related links:

[ALE address syntax on page 409](#)

[Emergency call on page 402](#)

[Message call on page 405](#)

[Phone call on page 406](#)

[Selective call on page 407](#)

[Send Position call on page 407](#)

ANY call



NOTE: This address syntax may be used if the MIL-STD-188-141B ALE option is installed.

CAUTION: If a station detects an ANY call to its matching self address, it sends a response over the air.

If you want to send an ALE call to and receive a response from all stations that are tuned to the same frequency in an ALE/CALM HF network or scanning the channels in the scan table(s) associated with the HF network, make a call through the Emergency, Message, Phone, Selective, or Send Position call type using the ANY address syntax.

The ANY call does not specifically call any stations, but it does request an automatic response from stations that detect the call. These responses are returned in any slot position (collisions may occur). The operator at the calling station can use these responses to gather information on the status of the stations using the HF network. The calling station then completes the link establishment with an acknowledgement sent to all stations from which it received a response. Stations can be configured to respond to or to ignore ANY calls.

NOTE: When you use an ANY address syntax through the Selective call type, the call icon changes to the ANY call icon (🗣️) when the call is started.

The global ANY address syntax is @@?. All stations detecting the call send a response to the calling station. The group of stations detecting the call can be narrowed by using a selective ANY address syntax. In this address, the ? is replaced by an upper-case letter or number, for example, @@A. All stations detecting the call that have this letter or number as the last character in their self address for the ALE/CALM HF network send a response, then enter a link with the calling station when the acknowledgement is received.

You can send multiple ANY addresses together to make a call to a range of stations, for example, @@A,@@B.

The allowable length of the address at the called station is dependent on the length of the self address used for the call by the calling station.

If the length of the self address of the calling station is...

1 to 3 characters

4 to 6 characters

The length of the address at the called station can be...

3 to 9 characters

3 characters

Related links:

[ALE address syntax on page 409](#)

[Emergency call on page 402](#)

[Message call on page 405](#)

[Phone call on page 406](#)

[Selective call on page 407](#)

[Send Position call on page 407](#)

Group Selective call




NOTE: This address syntax may be used if the MIL-STD-188-141B ALE option is installed.

CAUTION: If a station detects a Group Selective call to its matching self address, it sends a response over the air.

If you want to send an ALE call to specific stations that are named in the call but are not members of a pre-determined group, make a call through the Emergency, Message, Phone, Selective, or Send Position call type using the Group Selective address syntax.

The Group Selective call requests an automatic response from stations that detect the call and whose self addresses match one of those in the call. These responses are sent in reverse order from that provided in the call. The calling station then completes the link establishment with an acknowledgement sent to all stations from which it received a response.

NOTE: When you use a Group Selective address syntax through the Selective call type, the call icon changes to the Group Selective call icon () when the call is started.

With Group Selective addresses, the length of the combined address can have up to 12 ALE words, excluding commas. An ALE word has 3 characters. There can be up to five different first ALE words in the combined address.

For example, an address of **BOB1,BOB2,BOB3,BOB4,TIM,JOHN,MIK,SUE** has five different first ALE words, that is, BOB, TIM, JOH, MIK and SUE. However, this address will be rejected because it has a total of 13 ALE words, that is, BOB, 1, BOB, 2, BOB, 3, BOB, 4, TIM, JOH, N, MIK and SUE.

Related links:

[ALE address syntax on page 409](#)

[Emergency call on page 402](#)

[Message call on page 405](#)

[Phone call on page 406](#)

[Selective call on page 407](#)

[Send Position call on page 407](#)

NET call



If you want to send an ALE call from one station to other stations that are members of the NET or have the NET programmed, make a NET call using the NET address through the Emergency, Message, NET, Phone, Selective, or Send Position call type.

These stations have a common NET address. The member stations send an automatic response to the calling station in a pre-determined response slot. The calling station then completes the link establishment with all member stations. If a member station is set up to not respond during its allocated response slot, it still enters the link.

NOTE: When you use a NET address syntax through the Selective call type, the call icon changes to the NET call icon () when the call is started.

The NET address syntax can be any combination of upper-case letters and numbers up to 15 characters, however, for efficiency of NET calls, it is preferable that the address be limited to 3 characters. To make a call using a NET, the NET must be programmed in the transceiver and configured correctly.

Related links:

[ALE address syntax on page 409](#)

[Emergency call on page 402](#)

[Message call on page 405](#)

[Phone call on page 406](#)

[Selective call on page 407](#)

[Send Position call on page 407](#)

[NETs on page 165](#)

Wildcard call




NOTE: This address syntax may be used if the MIL-STD-188-141B ALE option is installed.

CAUTION: If a station detects a Wildcard call to its matching self address, it sends a response over the air.

If you want to send an ALE call to all stations that are tuned to the same frequency in an ALE/CALM HF network or scanning the channels in the scan table(s) associated with the HF network, and receive a response, make a call through the Emergency, Message, Phone, Selective, or Send Position call type using the Wildcard address syntax.

The Wildcard address syntax, which ALE stations recognise, uses the wildcard character **?** as a placeholder for characters within a self address of a called station. Stations that detect the call and whose self address matches the pattern in the wildcard address send a response to the calling station. These responses are returned in any slot position (collisions may occur). For example, a call sent to **EM?** may be responded to by stations in the communication network with a self address in the ranges EMA to EMZ and EM0 to EM9. The calling station then completes the link establishment with an acknowledgement sent to all stations from which it received a response.

NOTE: When you use a Wildcard address syntax through the Selective call type, the call icon changes to the Wildcard call icon () when the call is started.

NOTE: The wildcard question marks can be in any position within the address. The stations that respond have an address that is the same length as the wildcard address sent from the calling station.

You can send multiple Wildcard addresses together to make a call to a range of stations, for example, **?A,B??**.

The allowable length of the address at the called station is dependent on the length of the self address used for the call by the calling station.

If the length of the self address of the calling station is...

1 to 3 characters

4 to 6 characters

The length of the address at the called station can be...

3 to 9 characters

3 characters

Related links:

- [ALE address syntax on page 409](#)
- [Emergency call on page 402](#)
- [Message call on page 405](#)
- [Phone call on page 406](#)
- [Selective call on page 407](#)
- [Send Position call on page 407](#)

Summary of special ALE address syntaxes

You can use a special ALE address syntax to call a group of stations. The types of ALE address syntaxes you can use depend on the options installed in the transceiver.

NOTE: You can use any of the characters in the basic 38 ASCII subset (A to Z, 0 to 9, @ and ?) for the address.

Table 52: Summary of ALE address syntaxes for MIL-STD-188-141B ALE

| ALE address syntax | Call sent |
|--|--|
| @?@ | A global ALL call to all listening stations |
| @A@ | A selective ALL call to listening stations that have an A as the last character of their self address (A may be any specified upper-case letter or number), for example, TNAA, EANBA, 1NCA, 23A |
| @@? | A global ANY call to all listening stations |
| @@A | A selective ANY call to listening stations that have an A as the last character of their self address (A may be any specified upper-case letter or number), for example, TNAA, EANBA, 1NCA, 23A |
| @AB | A double selective ANY call to listening stations that have AB as the last two characters of their self address (A and B may be any specified upper-case letter or number), for example, BAAB, 14BAB, Q2CAB, 1AB |
| @A? | A double selective wildcard ANY call to listening stations that have an A as the second to last character of their self address (A may be any specified upper-case letter or number) and any upper-case letter or number as the last character, for example, USAM, 19MA0, ENA9, 3DAZ |
| ABC,JK3MN,PQR (example only) | A Group Selective call to the stations specifically addressed |
| NET address | A NET call to all stations with that NET programmed in NETs |
| ??? | A Wildcard call to listening stations that have a self address matching the length of the sent address and with any upper-case letter or number as each of the characters, for example, SAM, NAA, 234, 3AZ |

Table 52: Summary of ALE address syntaxes for MIL-STD-188-141B ALE (cont.)

| ALE address syntax | Call sent |
|-------------------------------|---|
| A?B? (example only) | A selective Wildcard call to listening stations that have a self address matching the length of the sent address with A and B as the first and third characters respectively (A and B may be any specified upper-case letter or number), and with any upper-case letter or number in the second and last characters (in this case), for example, A2BM , ADB1 , AZBE , A3B8 |

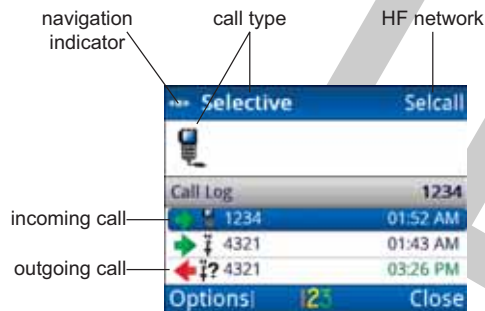
Related links:

[ALL call on page 409](#)[ANY call on page 410](#)[Group Selective call on page 411](#)[NET call on page 412](#)[Wildcard call on page 413](#)

Call Log

The Call Log contains filtered records of the latest call sent to or received from a station. You can scroll through the list of calls in the log and use each record as the basis for a new call. The Call Log is accessed by pressing **CALL** (default behaviour of the **CALL** key).

Figure 81: Call Log



Each item in the Call Log provides information on whether the call was incoming or outgoing, the type of call, the address of the station, and the time of the call. When you have selected an item in the Call Log, the name of the HF network used for the call is shown in the top right of the screen.

When you highlight an item in the Call Log, you can press ◀ or ▶ to scroll to another call type, if required, then press **CALL** to start the calling process.

Related links:

[Adding a contact from the Call Log, Call History, or Last Heard Log on page 158](#)

[Calling on page 73](#)

[Call Key Options on page 194](#)

[Call History on page 417](#)

Call History


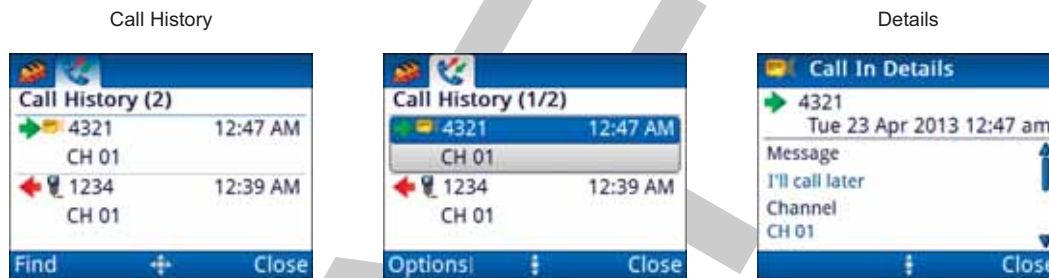


The Call History contains detailed information on all of the calls sent from and received by your transceiver. You can scroll through the list of calls in the history and use each record as a basis for a new call. The Call History is accessed by *holding CALL* (default behaviour of the **CALL** key), then pressing ► to select  (**Call History**).

Figure 82: Call History and details



Each item in the Call History provides information on whether the call was incoming (➔) or outgoing (➔), the type of call, the station address, the channel used, and the time of the call.

From the top level of the tab, you can search the Call History by pressing  (**Find**), then entering the characters on which you want to search. Once an item is selected in the Call History, you can press  (**Options**) to select from a number of activities.

You can:

- **Save** the details as a contact
- **Clear** the entire Call History
- **Delete** the selected item only
- view the **Details** of the selected item

Related links:

[Adding a contact from the Call Log, Call History, or Last Heard Log on page 158](#)

[Making a call from the Call History on page 89](#)

[Finding a word or value on page 36](#)

[Call Key Options on page 194](#)

[Call Log on page 416](#)

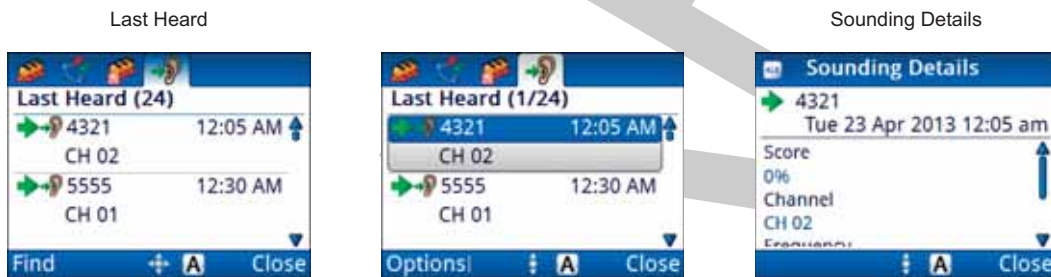
Last Heard Log

NOTE: The Last Heard Log is available if the MIL-STD-188-141B ALE option is installed.

NOTE: You must be in advanced view to see the Last Heard Log.

The Last Heard Log contains detailed information on all of the sounding calls sent from and received by your transceiver. You can scroll through the list of calls in the log and use each record as a basis for a new call. The Last Heard Log is accessed in advanced view by *holding* **CALL** (default behaviour of the **CALL** key), then pressing **▶** to select **🔊 (Last Heard)**.

Figure 83: Last Heard Log



Each item in the Last Heard Log provides information on whether the sounding was incoming (➔) or outgoing (➠), the station address, the channel used, and the time of the call.

From the top level of the tab, you can search the Last Heard Log by pressing **🔍 (Find)**, then entering the characters on which you want to search. Once an item is selected in the Last Heard Log, you can press **⌨ (Options)** to select from a number of activities.

You can:

- **Save** the details as a contact
- **Clear** the entire Last Heard Log
- **Delete** the selected item only
- view the **Details** of the selected item

Related links:

[Switching between basic and advanced views on page 32](#)

Group calls in a Codan Selcall HF network

Emergency, Message and Selective calls can be made to a group of stations simultaneously by using a Codan Selcall HF network and a group address.

A group selcall address is an address that ends in two or more zeros. For example, to call all stations with addresses that range from 1201 to 1299, you would enter **1200** as the address. To call all stations with addresses that range from 150001 to 159999, you would enter **150000** as the address.

DRAFT

Sending AMD information with a call

NOTE: GPS information is only sent if the GPS Call option is installed.

For interoperability with other transceivers, the Envoy™ Transceiver recognises special AMD messaging syntax included at the beginning of an AMD message sent in an HF network with a privacy mode set to **Plain**. The transceiver accepts and processes the syntax shown in [Table 53](#). You can also manually enter any of this text into an AMD message. The syntax shown must be followed by a space, then the required information.

Table 53: Special AMD syntax

| Syntax | Processed as... |
|------------------------------|--|
| #EMERGENCY | An Emergency call. The transceiver sounds an emergency alert tone. |
| #GPS <i>position</i> | A Send Position call. The GPS position data is sent followed by position information. For example, enter: #GPS 34.6S 118.34E +98M 152311 |
| #HELP | An Emergency call. The transceiver sounds an emergency alert tone. |
| #MAYDAY | An Emergency call. The transceiver sounds an emergency alert tone. |
| #PANPAN | An Emergency call. The transceiver sounds an emergency alert tone. |
| #SOS | An Emergency call. The transceiver sounds an emergency alert tone. |
| #TEL <i>telephone number</i> | A Phone call. The call is transferred to the attached radio/telephone interconnect unit, which dials the telephone number. For example, enter: #TEL 0883050311 |
| #TEL! | A hangup for a Phone call. The call at the radio/telephone interconnect is hung up. |

NOTE: When you send an Emergency call from an Envoy™ Transceiver using a Plain network, the text **#HELP** appears in the AMD message of the receiving vendor transceiver.

NOTE: Calls sent from a Codan HF transceiver to a non-Codan HF transceiver show the various calls using the AMD alert feature of that transceiver.

Sending recognised keywords with a call

The keywords listed in [Table 54](#) may be added in a Message call or an AMD message sent with a call. These keywords are recognised by the firmware in the Envoy™ Transceiver. The firmware expands the keyword by inserting the current information associated with the keyword into the message.

NOTE: \$GPS and \$GPS+ keywords require the GPS Call option to be installed. \$GPS+ and \$TZ require the MIL-STD-188-141B ALE option to be installed.

Table 54: Recognised keywords and their associated information

| Keyword | Function when used in a message |
|---------|---|
| \$DATE | Inserts the current date in the following format: <i>name of day month day year</i> For example, Wed Jan 09 2013. |
| \$GPS | Inserts the current valid GPS position in the following format: <i>latitude longitude</i> For example, 3452.823S 13841.256E. NOTE: Latitude and longitude are expressed in degrees, minutes, and fraction of minutes, with a direction of N/S or E/W. NOTE: If you enter text before \$GPS, this is sent as a header for the GPS information stored in the Call History. |
| \$GPS+ | Inserts the current valid GPS position in the following format: <i>latitude longitude altitude UTC (type of reading)</i> For example, 3452.823S 13841.256E +113.4M 053657 (A). NOTE: Latitude and longitude are expressed in degrees, minutes, and fraction of minutes, with a direction of N/S or E/W. NOTE: If you enter text before \$GPS+, this is sent as a header for the GPS information stored in the Call History. |
| \$TIME | Inserts the local time of the transceiver in the following format: <i>hh:mm:ss</i> For example, 05:50:49. |
| \$TZ | Inserts the time zone offset stored in the transceiver in the following format: <i>time zone offset</i> For example, +0:00 GMT. |
| \$VER | Inserts the current version of the RFU firmware in the following format: <i>version number</i> For example, v1.02. |

If you have the MIL-STD-188-141B ALE option installed and the **ALE Selective Message** entry set to **Enabled**, you are able to send a message with a call. If you enter the following message...

\$GPS+

...the called station displays the current GPS information for the calling station. For example:

8958.041 N 13841.234 E +0.0M 101622 (A)

NOTE: The transceiver checks the length of the expanded message before transmission. If you receive an error stating that the message is too long, review the message and shorten the message as required.

Related links:

[ALE Selective Message on page 230](#)

E

Definitions

This section contains the following topics:

- [Acronyms and abbreviations on page 424](#)
- [Glossary on page 427](#)
- [Units on page 432](#)
- [Unit multipliers on page 433](#)
- [About this issue on page 434](#)

Acronyms and abbreviations

| This term... | Means... |
|---------------------|--|
| 4WD | four-wheel drive |
| AES | advanced encryption standard |
| AGC | automatic gain control |
| ALC | automatic level control |
| ALE | automatic link establishment |
| AM | amplitude modulation |
| AMD | automatic message display |
| ASCII | American standard code for information interchange |
| BER | bit error rate |
| CALM | Codan automated link management |
| CB | citizen band |
| CCW | continuous carrier wave |
| CICS | computer interface command set |
| CR | carriage return |
| CTS | clear to send |
| DC | direct current |
| DSP | digital signal processor |
| DTE | data terminal equipment |
| DTR | data terminal ready |
| EMC | electromagnetic compatibility |
| ESN | electronic serial number |
| ETSI | European Telecommunications Standards Institute |
| FCC | Federal Communications Commission |
| GP | general purpose |

| This term... | Means... |
|---------------------|---|
| GPIO | general purpose input/output |
| GPS | global positioning system |
| HF | high frequency |
| ICNIRP | International Commission on Non-Ionizing Radiation Protection |
| ID | identification |
| IF | intermediate frequency |
| ISB | independent sideband |
| ISO | internal sales order |
| LBT | listen before transmit |
| LCD | liquid crystal display |
| LED | light-emitting diode |
| LF | line feed |
| LMCW | lower morse carrier wave |
| LQA | link quality analysis |
| LSB | lower sideband |
| LSBW | lower sideband (wide filter) |
| LSBXW | lower sideband (extra wide filter) |
| NC | normally closed |
| NO | normally open |
| OTA | over-the-air |
| p-p | peak-to-peak |
| PA | power amplifier |
| PEP | peak envelope power |
| PSU | power supply unit |
| PTT | press-to-talk |
| R&TTE | radio and telecommunications terminal equipment |

| This term... | Means... |
|---------------------|---|
| RF | radio frequency |
| RFU | RF unit |
| RTS | request to send |
| Rx | receive, received |
| SB | sideband |
| SINAD | (signal + noise + distortion)-to-(noise + distortion) ratio |
| SWR | standing wave ratio |
| tcvr | transceiver |
| TIS | ALE keyword 'this is' |
| TPE | transmit program enable |
| TPS | transceiver programming software |
| TWAS | ALE keyword 'this was' |
| Tx | transmit |
| TxD | transmit disabled |
| TxE | transmit enabled |
| TxP | transmit prohibited |
| UMCW | upper morse carrier wave |
| USB | upper sideband, universal serial bus |
| USBW | upper sideband (wide filter) |
| USBXW | upper sideband (extra wide filter) |
| UTC | universal time coordinated |
| UV | ultraviolet |
| V | firmware/software version |

Glossary

This term...

Means...

ALL call

An ALE address syntax used to broadcast to any station that is tuned to the same frequency in an ALE/CALM HF network, or scanning the channels in the scan table(s) associated with the HF network. The ALL call uses a special address syntax @?@ that ALE stations recognise.

A selective ALL call addresses a subset of stations. A multiple selective ALL call addresses these subsets within the one call.

The global ALL address syntax may be used in Emergency, Message, Phone, Selective, and Send Position calls if the FED-STD-1045 ALE/CALM option is installed. Selective ALL calls may be made in these call types if the MIL-STD-188-141B ALE option is installed.

ANY call

An ALE address syntax used to broadcast to any station that is tuned to the same frequency in an ALE/CALM HF network, or scanning the channels in the scan table(s) associated with the HF network. The ANY call uses a special address syntax @@? that ALE stations recognise.

A selective ANY call addresses a subset of stations. A multiple selective ANY call addresses these subsets within the one call.

The ANY address syntax may be used in Emergency, Message, Phone, Selective, and Send Position calls if the MIL-STD-188-141B ALE option is installed.

automatic gain control
(AGC)

A process that automatically adjusts the gain with respect to the input signal to provide a constant output level.

automatic level control
(ALC)

A process that automatically provides a constant output level as the input level varies.

automatic tuning antenna

An antenna designed for use with multi-channel transceivers. It uses a microcontrolled stepper motor to give continuous tuning over the operating frequency range of the antenna.

calling station

The station that starts the call.

called station

The station that receives the call. You enter the address of this station, or an appropriate syntax to match the address, when you make a call to this station.

channel

A frequency and sideband programmed in the transceiver that is used to transmit and receive signals on air.

channel dwell time

The length of time during scanning that the transceiver pauses on each channel in order to detect an incoming call. It is the inverse of the scan rate.

| This term... | Means... |
|----------------------|--|
| Channel Test call | A call that enables you to test the quality of a channel in a Codan Selcall HF network. It is sometimes referred to as a Beacon call. If you have the MIL-STD-188-141B ALE option installed, a Channel Test call may be made in an ALE/CALM HF network to replace information in the LQA database, and to perform a manual sounding operation. |
| control cable | A cable connecting two items of equipment that passes control information between items of equipment. |
| counterpoise | A radial array or a grid network of metallic wires arranged horizontally around the base of an antenna to provide an effective earth plane. |
| decoupling | The removal of unwanted noise and signal from electronic circuitry by transferring it to ground. |
| desk console | A control point for the transceiver. It features a microphone, a PTT button, a keypad, built-in speaker, headphone socket and various connectors. |
| email station | A point of communication consisting of a transceiver, a data modem, a computer with HF email software and an email client, a power source, an antenna, ancillary equipment, and appropriate connecting cables. |
| Emergency call | A call that enables you to trigger an emergency alert tone at a specific station then speak to an operator there. |
| fixed base station | A station that is permanently installed and cannot be moved without significant effort. It consists of a transceiver, a transceiver supply, an antenna, control and accessory devices, ancillary equipment, and appropriate connecting cables. |
| frequency | The number of cycles per second of a radio wave, usually expressed in kilohertz. |
| Get Position call | A call that gets the GPS position of a specific station. You can make a Get Position call if the GPS Call option is installed. |
| Get Status call | A call that gets diagnostic information about the transceiver at a specific station. |
| Group Selective call | An ALE call that is sent to stations specifically addressed in the call that are tuned to the same frequency in an ALE/CALM HF network, or scanning the channels in the scan table(s) associated with the HF network. The Group Selective call may be used in Emergency, Message, Phone, Selective, and Send Position calls if the MIL-STD-188-141B ALE option is installed. |
| handset | A hand-held device that is used to control the functions of a transceiver. It consists of a microphone, PTT button, display and keypad. |

| This term... | Means... |
|------------------------------|---|
| HF network | Two or more stations that use the same channels and call system to communicate. |
| hot key | A key on the handset or desk console that is pre-programmed with a macro that enables you to perform a task quickly. |
| address | The HF transceiver equivalent of a telephone number. Your station self address is used by other stations to call you, and it is sent when you make calls to identify you as the caller. It is sometimes referred to as a station ID, or a self ID. |
| Last Heard log | A log of the last 100 on-air transmissions detected by the current station. The information gathered from each transmission includes the address of the heard station, the time/date of the transmission, and the channel/mode used for the transmission. The Last Heard Log is available if the MIL-STD-188-141B ALE option is installed. |
| link | A link is established following a 3-way handshake process. Scanning is off and a timeout, set using the In Call Timeout entry in Settings > Calling > General , is active. With ALL calls and NET calls that are set to link immediately, the link establishment process is 1-way. |
| listen before transmit (LBT) | The automatic process that the transceiver uses to detect whether or not there is traffic on a channel and, when necessary, select another channel or inform the user that the channel is busy. |
| LQA beacon | A Channel Test call that is made in an ALE/CALM HF network using a Group Selective or NET address syntax. The LQA beacon tests all channels in the scan table(s) associated with the HF network to determine the best channel according to local and remote BER and SINAD measurements. On completion of the beacon, the information collected replaces the information for the channel stored in the LQA database. It is sometimes referred to as an ALE beacon. The LQA beacon is available if the MIL-STD-188-141B ALE option is installed. |
| macro | A short set of instructions to automate a task you perform with the transceiver. When a macro is assigned to a key, the key becomes a hot key. |
| manual sounding | A Channel Test call that is made in an ALE/CALM HF network using the text SOUNDING as the call address. The station performs a sounding operation, which other stations use to update the information in their LQA database. Manual sounding is available if the MIL-STD-188-141B ALE option is installed. |
| Message call | A call that enables you to send a message to a specific station. |

| This term... | Means... |
|----------------------|--|
| MIL-STD-188-141B ALE | An option that enables you to make ALE ALL, ANY, Group Selective, NET and Wildcard calls, and perform LQA reporting and AMD messaging. |
| mobile station | A station that is usually mounted in a vehicle or easily transportable. It consists of a transceiver, a power supply, an antenna, control and accessory devices, ancillary equipment, and appropriate connecting cables. |
| mode | A type of reception or transmission you can use with a channel, comprising a sideband and an IF filter. |
| NET call | <p>An ALE address syntax that is used to send a call from one station to other stations that have the NET programmed in NETs. If these stations have their self address in the NET Members entry they are members of this NET.</p> <p>The NET address syntax may be used in Emergency, Message, Phone, Selective, and Send Position calls if the MIL-STD-188-141B ALE option is installed.</p> |
| Phone call | A call that enables you to connect to a public telephone network. |
| PTT button | Press-to-talk button, located on the left side of the handset or bottom right of the desk console. This button enables you to communicate during voice calls, switch mute off temporarily, cancel voice calls prior to the point where voice can be transmitted, cancel calls where data is being transmitted, and exit out of editable screens without saving changes. |
| receive frequency | A frequency that carries modulated information that is received from a remote transceiver. |
| revertive | A signal sent by a station in response to a call. |
| RF filtering | A device fitted to prevent noise from being generated and to minimise the noise radiated by the wiring connected to the noise source. These devices include filters, suppressing capacitors, and earth straps. |
| RFU | The unit in a transceiver that modulates audio signals onto radio frequencies that can be transmitted on air, and that demodulates the radio frequencies it receives into audio signals. |
| scan rate | See channel dwell time. |
| Selective call | A call that enables you to contact a specific station then speak to an operator. |
| Send Position call | <p>A call that sends your GPS position to a specific station.</p> <p>You can make a Send Position call if the GPS Call option is installed, and your transceiver has a GPS position registered.</p> |

| This term... | Means... |
|---------------------------|--|
| shielding | A metallic barrier that is positioned between a noise source and the transceiver to minimise noise interference. |
| sideband | A band of frequencies that is above or below a modulated carrier frequency. |
| standing wave ratio (SWR) | The ratio of forward and reflected powers between a transmitter and its antenna load, which can be measured by an SWR meter. |
| station | A point of communication consisting of a transceiver, a power supply, an antenna, control and accessory devices, ancillary equipment, and appropriate connecting cables. |
| transceiver | An RFU, handset, speaker, and appropriate connecting cables. |
| transmit frequency | A frequency that carries modulated information to a remote transceiver. |
| Wildcard call | <p>An ALE address syntax used to broadcast to any station that is tuned to the same frequency in an ALE/CALM HF network, or scanning the channels in the scan table(s) associated with the HF network. The Wildcard address syntax, which ALE stations recognise, uses the wildcard character ? as a placeholder for characters within an address of a called station. A multiple Wildcard call uses multiple wildcard addresses in the one call. Stations with matching addresses respond to the call.</p> <p>The Wildcard address syntax may be used in Emergency, Message, Phone, Selective, and Send Position calls if the MIL-STD-188-141B ALE option is installed.</p> |

Units

NOTE: Imperial dimensions are in United States Customary Units.

| Measurement | Unit | Abbreviation |
|-------------|---------------------------------|--|
| Area | American wire gauge | AWG |
| Capacitance | farad | F |
| Current | amp | A |
| Frequency | hertz | Hz |
| Impedance | ohm | Ω |
| Length | metre (inch/feet/yard/mile) | m (in/ft/yd/mi) |
| Power | watt | W |
| Power ratio | decibel | dB |
| Temperature | degrees Celsius (Fahrenheit) | $^{\circ}\text{C}$ ($^{\circ}\text{F}$) |
| Time | second | s |
| | hour | h |
| Voltage | volt | V |
| Weight | gram (pound) | g (lb) |

Unit multipliers

NOTE: Units are expressed in accordance with ISO 1000:1992 'SI units and recommendations for the use of their multiples and of certain other units'.

| Unit | Name | Multiplier |
|------|-------|---------------|
| M | mega | 1 000 000 |
| k | kilo | 1 000 |
| m | milli | 0.001 |
| μ | micro | 0.000 001 |
| n | nano | 0.000 000 001 |

About this issue

This is the third issue of the Envoy™ Transceiver Reference Manual. It relates to firmware V1.06, or later.

DRAFT

F

Compliance

This section contains the following topics:

- [Overview on page 436](#)
- [European R&TTE Directive on page 437](#)
- [EMC and safety notices on page 439](#)
- [FCC compliance on page 442](#)
- [IC certification on page 443](#)
- [RCM approval on page 444](#)

Overview

This section describes how to ensure the Envoy™ Transceiver complies with the European R&TTE Directive 1999/5/EC.

This section also contains the requirements for RCM.

DRAFT

European R&TTE Directive

The Envoy™ Transceiver has been tested and complies with the following standards and requirements (articles of the R&TTE Directive):

- Article 3.1b: ETSI EN 301 489-1 V1.8.1
- Article 3.1b: ETSI EN 301 489-15 V1.2.1
- Article 3.2: Australian type approval according to AS/NZS 4770:2000 + transmitter RSE tests to the limits specified in Annex 6, section 6.1.2 of CEPT/ERC/Recommendation 74-01E
- Article 3.1a: assessed against ICNIRP and FCC requirements
- Article 3.1a: (LVD) EN 60950-1:2006/AC:2011
- Article 3.1a: (MPE) EN 62311:2008

Product marking and labelling

Any equipment supplied by Codan that satisfies these requirements is identified by the **CE 0889** Ⓢ markings displayed on the product.

Radiation safety (EU installations only)

To ensure optimal transceiver performance and to avoid exposure to excessive electromagnetic fields, the antenna system must be installed according to the instructions provided.

WARNING: High voltages exist on the antenna during transmission and tuning. Do not touch the antenna during these activities. RF burns may result.

WARNING: Install the grounding system or counterpoise as directed to prevent RF burns from any metal part of the transceiver.

WARNING: You should not transmit from your transceiver or tune the antenna unless people are beyond the safe working distance for the installation.

The following safe working distances apply:

- anywhere within the vehicle cabin with externally mounted mobile antenna
- 3 m unobstructed, of any part of a mobile antenna
- 2 m of any part of a fixed antenna

Safe working distance is based on continuous exposure to CW-type transmissions, as set out in the Human Exposure Restrictions standard EN 62311:2008.

Declaration of Conformity and Notified Body Letter of Opinion

The CE Declaration of Conformity and Notified Body Letter of Opinion for this product are available upon request to Codan or a Codan-authorized supplier.

Protection of the radio spectrum

CAUTION: Most countries restrict the use of HF radio communications equipment to certain frequencies and bandwidths and/or require such equipment to be licensed. It is the user's responsibility to check the specific requirements with the appropriate communications authorities. Some options may vary the stated compliance. If necessary, contact Codan for more information.

The receive and transmit frequencies may be any frequencies within the HF range, however, the transmit frequencies can only be those allocated to you by the relevant government authority in your country.

Spectral regulations may require the TxD option to be installed in the transceiver. In this case, you cannot add channels with new transmit frequencies. You can, however, add receive-only channels, and channels with the same transmit frequency as an existing channel. If the TxP option is installed in the transceiver, you cannot add channels.

EMC and safety notices

Radiation safety (non-EU installations)

To ensure optimal transceiver performance and to avoid exposure to excessive electromagnetic fields, the antenna system must be installed according to the instructions provided.

WARNING: High voltages exist on the antenna during transmission and tuning. Do not touch the antenna during these activities. RF burns may result.

WARNING: Install the grounding system or counterpoise as directed to prevent RF burns from any metal part of the transceiver.

WARNING: You should not transmit from your transceiver or tune the antenna unless people are beyond the safe working distance for the installation.

The following safe working distances apply:

- anywhere within the vehicle cabin with an externally mounted mobile antenna
- 1.8 m (6 ft) unobstructed, of any part of a mobile antenna
- 2 m (7 ft) of any part of a fixed antenna in a data installation of up to 125 W output
- 5 m (17 ft) of any part of a fixed antenna in a data installation of up to 1 kW output

Safe working distance is based on continuous exposure to CW-type transmissions, as set out in the ICNIRP Exposure Guidelines (1998) for occupational exposure. Safe working distance can be reduced with normal voice communication.

Sécurité des radiations (installations non-EU)

Pour assurer la performance optimale de l'émetteur-récepteur et pour éviter une exposition excessive aux champs électromagnétiques, le système d'antenne doit être déployé selon les instructions fournies.

ATTENTION: De hautes tensions RF sont présentes au cours de la transmission et de la syntonisation. Ne touchez pas l'antenne pendant ces activités, au risque de vous brûler.

ATTENTION: Installez le système de prise de terre ou le contrepois comme prescrit pour éviter toute brûlure RF au contact des pièces métalliques de l'émetteur-récepteur.

ATTENTION: Evitez d'émettre à partir de votre émetteur-récepteur onde syntoniser l'antenne si quelqu'un se trouve à moins de la distance de sécurité.

Les distances de sécurité suivantes sont applicables :

- à l'intérieur de la cabine d'un véhicule sur lequel une antenne mobile est déployée
- 1.8 m sans obstruction, de n'importe quelle partie de l'antenne mobile
- 2 m de n'importe quelle partie de l'antenne fixe dans une installation de données dont la sortie peut atteindre 125 W
- 5 m de n'importe quelle partie de l'antenne fixe dans une installation de données dont la sortie peut atteindre 1 kW

La distance de sécurité du travail se base sur une exposition continue aux transmissions de type onde entretenue, telle qu'établie dans les Lignes directives d'exposition de l'ICNIRP (1998) pour l'exposition au travail. La distance de sécurité du travail peut être réduite dans le cas de communications vocales normales.

EMC

CAUTION: If it is necessary to remove the covers at any stage, they must be refitted correctly before using the equipment.

To ensure that compliance with the EMC Directive is maintained.

- Use standard shielded cables supplied from Codan (where applicable).
- Ensure the covers for the equipment are fitted correctly.
- Cover unused connectors on the RFU with the protective caps supplied to prevent electrostatic discharge passing through your transceiver.

Electrical safety

To ensure compliance with the European Low Voltage Directive is maintained, you must install and use the Envoy™ Transceiver in accordance with the instructions in the Envoy™ Transceiver Getting Started Guide and the Envoy™ Transceiver Reference Manual.

When using equipment that is connected directly to the AC mains these precautions must be followed and checked before applying an AC mains supply to the unit.

To ensure electrical safety:

- Use the standard AC mains cable supplied.
- Ensure the covers for the equipment are fitted correctly.

CAUTION: If it is necessary for a qualified electronics technician to remove the covers during servicing, they must be refitted correctly before using the equipment.

WARNING: A protective earth connection must be included in the mains wiring to the 3020 Transceiver Supply.

WARNING: The protective cover must always be fitted when the 3020 Transceiver Supply is connected to the AC mains.



Related links:

[Earth symbols on page 441](#)

Earth symbols

Chassis earth connection points are provided on the Envoy™ Transceiver and 3020 Transceiver Supply. A protective earth is provided in the AC mains wiring of the 3020 Transceiver Supply. This protective earth must be connected at the AC mains supply outlet. The symbols shown below are used to identify the earths on the equipment.

Table 55: Earth symbols

| Symbol | Meaning |
|---|------------------|
|  | Chassis earth |
|  | Protective earth |

FCC compliance

FCC Part 90 certification

The Envoy™ Transceiver has been tested and certified to FCC Part 90 (FCC identifier code DYY2210).

FCC Part 15 compliance

Any modifications made to the Envoy™ Transceiver and 3020 Transceiver Supply that are not approved by the party responsible for compliance may void your equipment's compliance under Part 15 of the FCC rules.

The Envoy™ Transceiver and 3020 Transceiver Supply have been tested and found to comply with the limits for a Class B device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by switching the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- reorient or relocate the receiving antenna
- increase the separation between the equipment and receiver
- connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- consult the dealer or an experienced radio/TV technician for help

IC certification

Product markings and labelling

The Envoy™ Transceiver is certified to IC standards (IC identifier 1029A-1).

L'émetteur-récepteur Envoy™ est certifié conforme aux normes IC (Code d'identification IC : 1029A-1).

DRAFT

RCM approval

The Envoy™ Transceiver meets the requirements of the Australian Communications and Media Authority: Radiocommunications (MF and HF equipment—Land Mobile Service) Standard 2003 (AS/NZS 4770) and Radiocommunications (HF CB and Handphone Equipment) Standard 2008 (AS/NZ 4355).

DRAFT

G

Licence information

This section contains the following topics:

- *alsa-lib* on page 446
- *alsa-utils* on page 446
- *base_libs* on page 446
- *busy-box* on page 446
- *dosfstools* on page 446
- *Droid Font Family* on page 447
- *iproute* on page 447
- *iptables* on page 447
- *libtermcap* on page 447
- *libusb* on page 447
- *libXML2* on page 448
- *lzo* on page 449
- *Linux Kernel* on page 449
- *mtd-utils* on page 449
- *ncurses* on page 449
- *Qt Everywhere* on page 450
- *skell* on page 450
- *sysconfig* on page 450
- *u-boot* on page 450
- *Freescale Semiconductor Embedded Linux 2.6.28* on page 451
- *GNU Lesser General Public License* on page 455
- *GNU General Public License Version 2* on page 463

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base_libs

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dosfstools

dosfstools consists of two components – dosfsck and mkdosfs.

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Droid Font Family

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libXML2

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Linus Torvalds

mtd-utils

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ncurses

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Contact: Nokia Corporation (qt-info@nokia.com)

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sysconfig

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u-boot

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Wolfgang Denk, DENX Software Engineering, wd@denx.de.

#

See file CREDITS for list of people who contributed to this project.

#

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Freescale Semiconductor Embedded Linux 2.6.28

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DRAFT

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