Programming software

KPG-20D

INSTRUCTION MANUAL

KENWOOD CORPORATION

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Introduction

The PROGSYS programming software package allows the dealer to configure and program the TK-709/809 and TK-249/349 radios with conventional signalling.

The TK-709/809 and TK-249/349 of conventional signalling radios offer an exceptionally high degree of flexibility, enabling operation in systems ranging from simple non-selective calling systems to advanced combined selective calling, CTCSS/DCS and DTMF systems.

Programming a radio unit takes place in two stages. The first stage is to set up all parameters for the radio to be configured. This can be done without the radio unit being connected. All parameters can be edited and saved to a file, allowing almost all of the work to be done in advance. The second stage is to store the programming data in the radio. During this procedure, the radio must be connected to the PC via a serial cable. If necessary, the radio unit(s) can be reprogrammed, since all data can be stored on disk for later retrieval.

The contents of this manual are based on version 1.02 of the PROGSYS software. Chapter 2 explains how the program has to be installed. Chapter 3 gives a full overview of available facilities. This list is useful for evaluating and deciding about required facilities for a given application.

Chapter 4 deals with the editing of the configuration data. This chapter describes items such as entering and leaving the program and moving through the various windows. Chapter 5 explains how the radio has to be programmed and how file maintenance is organized. In chapter 6 follows a reference guide, in which the parameters in each of the windows are described in detail. Chapter 7 deals with possible error messages.

In addition, there are a number of appendices and a glossary. Appendix A describes the available tonesets. Appendix B contains a table of the available CTCSS tones. Appendix C shows the DTMF combinations. Appendix D gives an overview of alert tones, and appendix E contains programming examples of decode and encode formats and macros. The glossary lists the abbreviations that are used in this manual.

Text that has to be typed in and function keys that have to be pressed are printed in bold. Keys that have to be pressed in combination are separated by a hyphen, for example **Alt-F1**. Bold is also used for short messages given by the program. Longer messages are set off from the main text by an extra line and are centred. Possible selections are printed in italics and bold. (DOS) Commands and file names are capitalized.

2 Installation of PROGSYS

The programming software for the TK-709/809 and TK-249/349 conventional radios runs on IBM-PC, AT or compatible systems. The minimum hardware requirements are the following:

- Monochrome (Hercules), CGA, EGA, VGA or XGA screen adapter
- One serial port (COM1 or COM2)
- 512 KByte of RAM
- Disk drive

A hard disk is not required, although recommended for faster operation.
The programming software is delivered on two floppy disks, one for 5.25 inch drives and one for 3.5 inch drives, both low-density formatted (360 K and 720 K). The disks contain the following files:

PROGSYS.EXE	Executable file
PROGSYS.MSG	Message file
PROGSYS.CFG	Configuration file

Other files included are default files for the several models of TK-705/805 and TK240/340 radios and example files.

2.1 Making a backup copy

Before installing the program, you must make a backup copy of the original disks. This can be done using the DISKCOPY command, which can be found on any DOS program disk.

If you have a two-drive system, follow these steps:

1. Insert the original disk in drive A: and a new disk in drive B:.
2. Type **DISKCOPY A: B:** and press **Enter**.

If you have a single-drive PC, follow these steps:

1. Insert the original disk in drive A:.
2. Type **DISKCOPY A: A:** and press **Enter**.
3. Follow the instructions on the screen.

For more information about the DISKCOPY command, see the DOS user manual.

2.2 Installation on hard disk

For faster operation the programming software can be installed on a hard disk or network drive.

To install the software on a hard disk, follow these steps:

1. Select the directory in which you want to store the programming software with the DOS command CD *directory name*.
   To store the software in a new directory, you must first create this directory with the DOS command MKDIR *directory name*. For example, to create and use directory C:\PROGSYS, type the following commands and press Enter after each command:
   ```
   C:
   CD \
   MKDIR PROGSYS
   CD PROGSYS
   ```
2. Insert the disk in drive A:.
3. Type **COPY A:*.*** and press **Enter**.

After copying, the programming software is installed on your system, and you are able to use it from the hard disk.

Operation from a networked drive is similar to that of a hard disk.

2.3 Using files and directories

The programming software itself is very compact and straightforward in the use of files and directories. It is possible to create separate directories for data files (for example, to store the configuration file of a programmed mobile or handportable). To run PROGSYS from another directory, make sure that a path is set up, in the AUTOEXEC.BAT file, to the directory where PROGSYS is installed or to a directory where PROGSYS is called from a batch file.

For example, if PATH is currently set to C:\DOS within the AUTOEXEC.BAT file and the program is stored in C:\PROGSYS, replace the line:

```
SET PATH=C:\DOS
```

by

```
SET PATH=C:\DOS;C:\PROGSYS.
```

On networked drives, make sure that the program, help and configuration files are flagged as read-only, sharable files.

3 TK-709/809 and TK-249/349 Product Specifications

The TK-709/809 and TK-249/349 conventional radios are very versatile in operation and configuration. The product allows simultaneous use of CTCSS/DCS, selective calling and DTMF, which are all available as standard functions. Because of its flexibility, the product is suitable for use in complex systems using (combined) selective calling and CTCSS/DCS, and as replacement radios providing full compatibility with other brands of mobile and hand-portable radios. This chapter presents an overview of the facilities that are available for the product, enabling you to make a selection for the most suitable configuration for a given application.

3.1 User controls

The following options are available:

- The mobile offers 5 programmable function buttons, which can be used in the standard configuration (monitor open/close, squelch defeat, transmit call, digit x1 and digit x10), but can also be customized for special applications.
- A keypad/microphone can be connected to the mobile for numerical entry of the selcall address, channel number, DTMF tones and scan group entry. In addition, the keypad/microphone buttons * and # can be used to operate selcall-related functions such as open/close and transmit call.
- The portable offers 6 programmable function buttons, which can be used in the standard configuration (monitor open/close, squelch defeat, transmit call, digit x1 and digit x10, lamp), but can also be customized for special applications.
- A keypad can be attached to the portable for numerical entry of the selcall address, channel number, DTMF tones and scan group entry. In addition, the keypad buttons * and # can be used to operate selcall-related functions like open/close and transmit call.
- All buttons and keys can be configured to access up to three functions by assignment of the key press or release, key hold and key shift user actions.
- An extensive set of 60 functions is available for assignment to each of the button and key actions.
- A PTT button is provided to operate the transmitter, with programmable PTT press and release functions.
- The default operation of the numerical keys of the keypad can be set to 'selcall' or 'channel' to speed up selection.
- The LCD shows the selected channel number and/or selected selcall address. The LCD readout is also used to show the scan group number, number of queue entries, and the entered number in the DTMF/selcall dial mode. A number of symbols is available to show the current operating modes.
- A red LED on the portable shows the transmit mode and indicates a transmit lockout condition.
- Programmable transmit time-out, transmit time-out warning and transmit lockout parameters are available to limit speech transmission time.

3.2 Channel selection and scanning

The following options are available for channel selection and scanning:

- The channel readout string is programmable per channel. In the numerical mode this 3-digit string can contain digits, characters A to C, - and space. Parts of the channel number can be preset by an overlay string, which can be entered as alphanumeric characters for all channels combined. In the alphanumeric mode, all five digits can be entered as alphanumeric characters.

- Channel numbers entered by keypad are compared with the defined channel number read-out strings.
- No-, one-, two- or three-digit channel numbers are allowed to be entered by keypad.
- The selected channel at radio turn-on can be either a predefined channel or the channel that was selected before switching off.
- Ten scan groups are available, of which each can contain a number of channels and one priority channel. The number of channels per scan group can vary from one to the number of programmed channels.
- Each of the configured scan groups can be made 'user programmable', allowing the user to include or exclude scan channels and to change the priority channel.
- The scan speed, scan wait, scan dwell time and scan configuration are programmable per system. This allows selection of those parameter values best suited for a particular application.
- Scanning can be activated automatically at radio turn-on. When pressing the PTT button while scanning, scanning can continue (PTT press is ignored), stop entirely or stop temporarily (resumed after the PTT button is released), depending on the configuration. The radio can be configured to transmit on the current scan channel, a preference channel or the channel selected before scanning was activated.
- A scan background facility is provided to allow entry of a selcall address or dialling information during scanning.

3.3 Selective calling

The following options are available for selective calling:

- Available tonesets are: ZVEI, CCIR, DZVEI, PZVEI, PCCIR, PDZVEI, EEA, CCIR2, EIA, Natel, AP 369 and Kenwood.
- Tonesets for receiving selective calls are configured per system group, thus allowing separate tonesets per group.
- Toneset selection for transmission of selective calls is included in encode formats. In this way, separate tonesets can be used for each application the radio is configured for.
- Selectable selective call decode reset period, configured per system group.
- Number of selectable digits for normal calls can be configured as none, one, two, three, four or five. This number is configured per system group.
- Number of selectable status digits can be configured as none, one, two, three, four and five. They are configured per system group.
- A selcall sequence can consist of a maximum of 30 to 50 tones, depending on the complexity of the encode format. Selcall sequences can also be interrupted by pauses to create formats like 2*5-tone and 3*5-tone.
- The transmitted tones can be fixed, extracted from the channel selcall digits, variable digits selectable on the keypad, or digits from the queue entry.
- There are four five-tone addresses available per channel, which are normally used to configure the transmit address and the primary, secondary and third receive address. These five-tone sequences can also be used for other purposes, for example, to specify a PTT-ident call.

- The tone length per selcall tone can be selected from 1 ms to 7000 ms in 1 ms steps. The tone length can be changed within the tone sequence at any place and as much as required.
- A silence period (pause) can be inserted at any position within the tone sequence, and also before and after transmission of the call. The pause duration can be selected from 1 ms to 7000 ms in 1 ms steps.
- For transfer of dialling information, specific encode format instructions are available to transmit up to 28 digits plus a checksum and length indicator.
- Matching and/or decoding an incoming selective call is possible for up to 16 digits. It is possible to match either fixed or group digits.
- Both the A-digit and 0-digit can be used as group digits for decoding selective call messages, combined or separately.
- Single as well as multiple decode identities can be configured per system group, which can be distinguished for the user by separate alert beep sequences. Incoming group calls can be indicated with distinctive alert tones if necessary.
- A queue for up to nine incoming calls is available to store the identity of the calling party, enabling the user to call back later. The number of queue entries is dependent on the number of digits stored and whether or not the channel number is stored too.
- Incoming call digits can be stored in the queue using the FIFO (First In First Out) or FILO (First In Last Out) order, duplicates of the same call can be stored or avoided, and the queue entry can contain the channel number or not. For all combinations of these functions eight queue instructions are available.
- After queueing an incoming call, the identity can be shown on the display immediately or retrieved after pressing a key.
- Variable digits, anywhere and in any order within a decoded sequence, can be transferred to the queue for identity readout or callback.
- A separate decoding format can be configured for activating remote stun and revive, and remote kill (destroying EEPROM contents).
- The decode format can contain instructions to remotely close the radio.
- In the mobile, an external alarm can be activated after receiving a call. The rhythm can be configured to make the alarm, for example a horn, easily recognizable.
- The radio can be configured in such a way that it closes automatically on receiving a call directed to another radio; matching with two, three or four digits is possible.
- Operation of the automatic close facility can be disabled for a certain period of time, for example, when expecting a response from another radio or base station.
- Transmission of a single tone is possible using a frequency between 300 and 3000 Hz, and a duration from 1 ms to 7000 ms in 1 ms steps.
- An encode format can be repeated for a number of times, selectable from 1 to 255. A decode format can be configured to stop a repeating encode format, for example, when a valid selcall sequence is received.
- A timed decode sequence can be triggered after decoding as a series of tones, allowing decoding of multiple sequences, for example, to decode 2*5-tone and 3*5-tone formats.
- A timed decode sequence can be triggered from an encode format, allowing decoding or matching of a response from another radio or base station. This facility can be used to automatically repeat a call if necessary, or to show if a call has been transmitted successfully.
- Decode formats can be linked to allow decoding of very complicated sequences.

3.4 CTCSS/DCS

The following options are available for SAT (CTCSS/DCS):

- SAT (CTCSS/DCS) transmit and receive frequencies are configured separately per channel. Both the transmit and receive SAT can be set to any of the 38 available CTCSS frequencies, 83 DCS codes or switched off.
- Transmit lockout for CTCSS/DCS restricts transmission when the radio receives a CTCSS/DCS tone or code with the wrong frequency, or when it only receives a carrier.
- CTCSS/DCS can be enabled and disabled in an encode format, thus allowing suppression of noise when the PTT button is released.
- A squelch noise tail suppression feature is available for both CTCSS (delay after transmission without CTCSS) or DCS (transmitting a specific tone).
- For DCS decoding, the number of bits that may be corrected, can be selected.

3.5 DTMF

The following options are available for DTMF:

- Transmission is possible of each of the 16 available DTMF tones.
- The duration per DTMF tone can be selected from 1 ms to 7000 ms in 1 ms steps.
- The encode format facility can be used to buffer entered digits, thus enabling transmission of digits each time a key is pressed while the PTT button is pressed (overdialling).
- Transmission of a fixed and variable sequence of DTMF tones is possible similar to transmission of selective call digits.
- For overdialling, the transmitted DTMF tone can be configured for a fixed duration, or it can be transmitted as long as a key is pressed.

3.6 Miscellaneous

The following miscellaneous functions are available:

- Startup power selection can be set to low or high.
- Power selection can be fixed to low or high per system group, or made user selectable if required.
- The Return-to-Standby facility allows more 'closed' operation of the radio network by restricting open channel speech communications. Several parameters are provided to configure the Return-to-Standby facility; these are the RtS listen and active period, and the RtS mode.
- Transmission of speech can be triggered from an encode format, thus allowing transmission of surrounding noise in an emergency state without the PTT button being pressed. This function can be combined with transmission of a selective call to identify the radio on a base station controller readout.
- Multiple lockout modes to prevent transmission, for example, when scanning is activated or the selcall monitor is muted.
- A text message with fixed characters can be shown after receiving a call or shortly after switching on the radio.

4 Getting started

4.1 Starting up

The program can be started up from any directory if the directory where the program is located is included in the path (see 2.3). It is recommended to use a separate directory for storing the data files.

To start the program, type **PROGSYS** and press **Enter**.

The program starts up with the main menu. The top line displays the current date and time. The date and time are retrieved from the system clock and cannot be changed from PROGSYS. The top line also shows the version number.

4.2 Moving through the program

The program uses text-based windows. These windows are organized in a stacked manner, enabling you to see the level at which you are currently working. Most editing windows are directly accessible from the main menu. Only less frequently used functions of the program have to be accessed from a submenu. The structure of the menus is explained later.

To select an item from a menu, move to the item by using the cursor command keys (↑ / ↓) and **PgUp** / **PgDn**), and activate the menu item by pressing **Enter**. An editing window or submenu will appear. From submenus, other menu selections are possible. To return to a higher level, press **Esc**.

Within an editing window, you can move to another parameter with the cursor command keys (↑ / ↓). You can also use the Enter key to move to the next item. Some editing windows are presented as a table with rows and columns (for example, the channel list and scan group windows). Within these windows, the cursor command keys serve to move within the current column (vertically), while the Enter key serves to move to the next column (horizontally). In the key definition window, a special function key is used to move to the next column.

4.3 Moving within a selection window

At some locations in the program, you can select an item from a special selection window, which can be displayed with the function **F3** (select). This function is used, for example, to select already defined system groups (System parameters window) or encode / decode definitions (Encode / Decode format editor). In a selection window, the following keys can be used:

↑ ↓	moves to the next item in the direction indicated by the arrow
Home	moves to the very first item
End	moves to the very last item
PgUp	moves to the first item in the current window; if you press it again, it moves to the first item in the previous window
PgDn	moves to the last item in the left column of the current window; if you press it again, it moves to the last item (left column) of the next window
Enter	selects the currently highlighted item and leaves the selection window
Esc	leaves the selection window without making a selection

4.4 Leaving the program

Leaving the program is only possible from the main menu. To leave the program, press Esc or select the option Exit program from the menu. Press **Y** when asked for confirmation, or press **N** or **Esc** to return to the main menu. Immediate quitting without a request for confirmation is possible by pressing **Alt-X**.

4.5 Changing parameter values

The default values of parameters are normally the lowest values possible for these parameters. Changing parameter values takes place in one of the following ways:

- Values of parameters with a range of predefined values are displayed on a bar (in reverse video). To change such values, press the space-bar. The next value is then displayed. Forward and backward scrolling is also possible with the cursor left / right keys (← , →). Press **Ins** to pick an item directly from a selection window (see also section 4.3). Press **Enter** or cursor up / down (↑ , ↓) to accept the selected value.

- To enter numeric values, type in the value directly or change the current value by using the Backspace key to delete the value and then type in the correct digit(s). If the entered value is out of range, it is automatically set to the nearest valid value. After entry of some of the parameter values, the entered value is immediately checked for validity. If the value is invalid, the program generates an error message and enables you to enter another value.

- Editing text is similar to entering numeric values. Changing entries is possible by retyping the relevant string or by editing the current string first by using the Backspace key. Press **Enter** to fix the selection and move to the next parameter.

.6 On-line help

Each parameter window has help information attached to it. To display this help information, press **F1**. The on-line help gives information on the purpose of the parameter and lists value ranges that are generally valid. Some ranges are dependent on the selected values of other parameters, such as the frequency range, and are not shown in the help window.

4.7 Use of function keys

The bottom line of each screen lists the available keys and their functions. The function keys may have different meanings in different windows, except for **F1** (help) and **Esc** (exit). Therefore, the available key functions are described per window in chapter 5.

Sometimes, the bottom line is used to show valid responses to a message.

If the available function keys cannot be shown on one line, the next line can be selected by pressing **Tab**.

Many of the editing windows can be accessed directly by means of short-cut keys. The following key combinations are available:

Alt-C	Channel parameters
Alt-D	Decode formats
Alt-E	Encode formats
Alt-G	General parameters
Alt-I	Statistics
Alt-K	Key definitions, front panel buttons
Alt-M	Key definitions, keypad/microphone
Alt-P	Program radio
Alt-R	Load file
Alt-S	System parameters
Alt-V	Printout of data
Alt-W	Save file

In addition, the following key combinations are available:

Alt-X	Exit PROGSYS without a check on saving (available from Main menu)

5 Program structure

This chapter contains information on the menus and editing windows. Each menu and editing window has its own set of function keys, which are also explained here. For a detailed description of each of the parameters, see chapter 6.

5.1 Main menu

The options of the Main menu give direct access to the most frequently used editing windows. Only two of the options display a submenu.

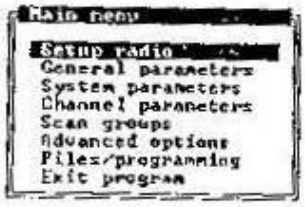


Figure 1: Main menu

All possible selections from this main menu are described in the subsequent sections in this chapter.

5.2 Setup radio

The setup radio option enables the selection of some general parameters of the radio to be programmed. Parameter ranges in the other windows are dependent on the parameter values entered in this setup window. This means that the parameters in this window must *always* be set first.

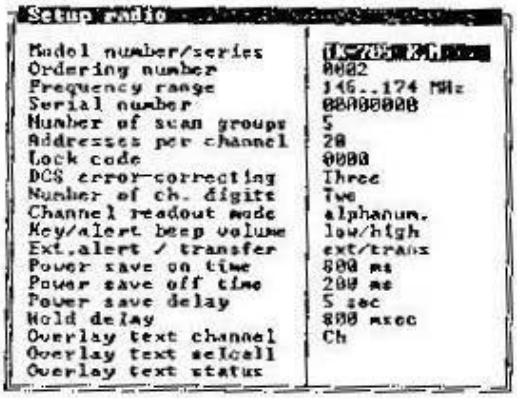


Figure 2: Setup portable window

The setup radio editing window includes selection of the model number and overall configuration of the radio.

Selection of the model is possible by three methods. These methods are fully interactive to simplify selection. The methods are:

- Model number / series: enables the radio to be selected by specifying its commercial name and number.
- Ordering number: enables the radio to be selected by choosing the right ordering number.
- Frequency range: on entry of the frequency range, the model and ordering number are automatically adapted.

Furthermore, the setup window contains information on, for example, the serial number of the radio, the number of scan groups, addresses per channel and the lock code.

No submenus are available from this menu. Press Esc to return to the Main menu.

5.3 General parameters

The parameters in the general parameter editing window are valid for all configured channels and system groups. These parameters are related to power-up conditions, user interface keypad operation, display format and time-outs. General parameters are system-independent. The short-cut key for this window is Alt-G.

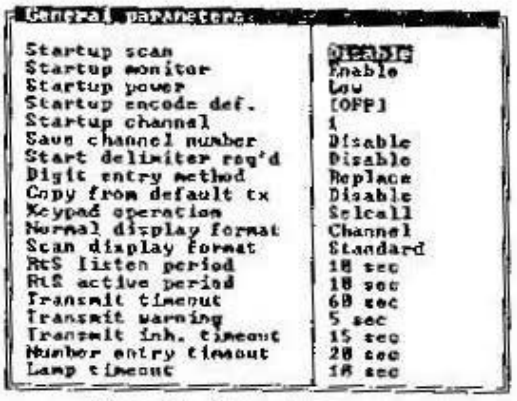


Figure 3: General parameters

5.4 System parameters

A radio can be programmed for use in different system groups (or blocks). The parameters in the system parameters window are valid for one particular system group. The top line of the window indicates which system group is currently being edited. Press **F7** (add) to create a new system block. The program automatically names the system blocks by numbering them from #0 upwards. Use **F6** (rename) to change the name of the system block.

Figure 4: System parameters

When there is more than one system block available already, you can select the next / previous system block that is listed by pressing **F4** (next) or **F5** (previous). Selection of another system block is also possible from the selection list that is displayed when you press **F3** (select).

Figure 5: Selecting a system

You can program a number of formats per system group. Select **F2** (formats) to display the window System formats, in which you can select a format for each function. The number and the contents of the available formats are dependent on the way in which the formats have been programmed (see 5.7.2 and 5.7.3).

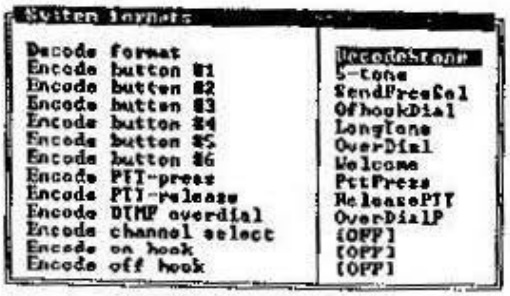


Figure 6: Selecting formats

Press **F8** (delete) to delete the system block that is currently displayed. The next system block will then be displayed.

Press Esc to return to the Main menu. The short-cut key for the System parameters window is Alt-S.

5.5 Channel parameters

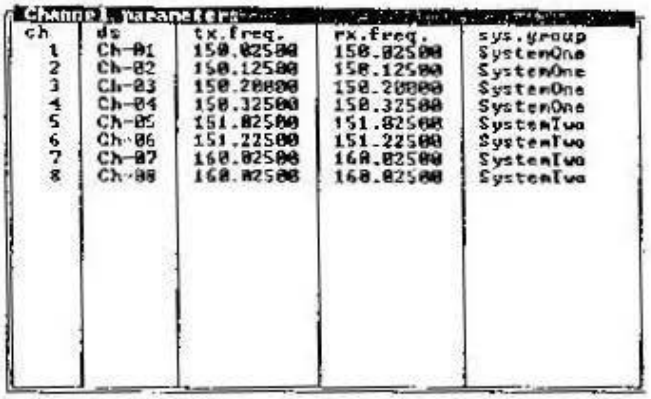


Figure 7: Channel parameters

The parameters in the window Channel parameters enables you to edit the most frequently used channel-related parameters. The Channel parameter window can be selected from the main menu or accessed directly by using short-cut key **Alt-C**.

In the main Channel parameters window, the following functions are available:

- Adding one channel at a time with **F4** (add). The channel is inserted after the one that is currently selected.
- Inserting a channel with **F5** (insert). The channel is inserted at the current position.

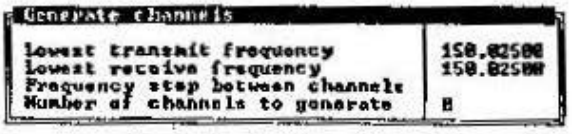


Figure 8: Generate channels

- Adding a number of channels within a specified frequency range and frequency step between channels. Activate this function with **F2** (generate). The program displays the window Generate channels, enabling you to enter the required values. Press **F2** (start generate), after which the program calculates the frequencies for each channel and displays them in the Channel parameter window.

- Deleting the currently selected channel with **F6** (delete). The values entered for this channel are deleted and replaced with the values of the next channel.

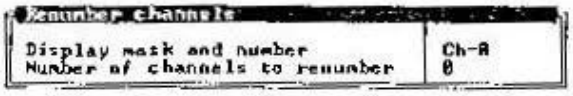


Figure 9: Renumber channels

- Renumbering the channels with **F3** (renumber). The program displays the window Renumber channels, enabling you to enter the number of channels you wish to renumber and the lowest display number of these channels. Enter the display number (readout string) in the format you want to see displayed (see 6.4). Press **F2** (start renumber), after which the list in the Channel parameter window is updated.

The parameters in the Channel parameters window can also be edited in the Channel edit window. This window also contains a number of additional parameters, such as the tx and rx addresses per channel.

Press **F7** (edit) to display this edit window. Use **F2** (next channel) and **F3** (previous channel) to edit a number of channels in a row. The top line of the Channel edit window displays the number of the channel that is currently being edited.

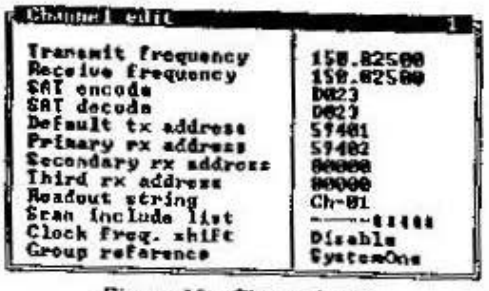


Figure 10: Channel edit

5.6 Scan groups

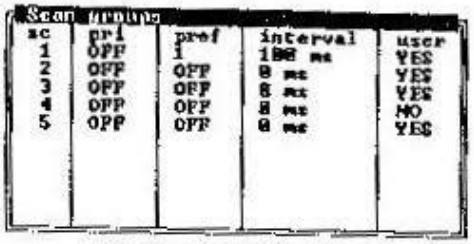


Figure 11: Scan groups

The Scan groups window serves to edit the parameters that are valid for a particular scan group. The range for the priority channel and the preference channel are dependent on the channels that are included in the scan group in the edit window of the Channel parameters window. If there are no scan groups available (no scan groups programmed in the Setup radio window), the program will display an error message.

5.7 Advanced options

The Advanced options window is a submenu of the Main menu and contains less-frequently used options, like the key definitions and the decode and encode formats. After you have defined the radio keys and the decode and encode formats, you can use them elsewhere in the program. For example, the System parameters window contains the parameter for selecting the decode format to be used for a particular system group.

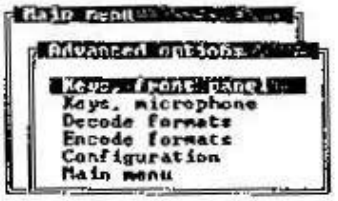


Figure 12: Advanced options

Refer to the following sections for more information on each of the available options.

5.7.1 Key definitions

All available keys of the radio are programmable. This is especially useful if you want to program radios for a specific application.

There are two windows available, one for the keys of the keypad/microphone (mobile) or add-on keypad (portable), and one for the buttons on the radio itself.

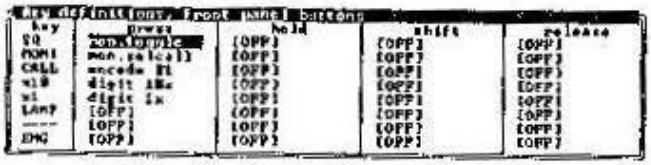


Figure 13: Key definitions, front panel

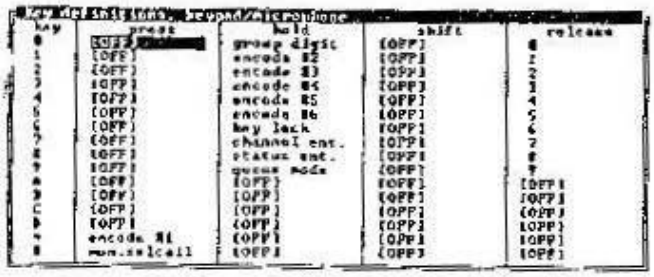


Figure 14: Key definitions, keypad / microphone

Keys may have more than one function. The functions can be accessed in the following ways:

Press The programmed key function is executed as soon as the key is pressed. The press function is normally used for the primary key functions, such as entering digit 1 with key 1.

Hold The programmed key function is executed if the key is held down for 500 ms. The hold function is useful for activating secondary key functions, such as selecting the channel entry mode.

Shift The programmed key function is executed after the shift functions have been activated with a special Shift key. The shift function is useful for activating secondary key functions, such as selecting the channel entry mode.

Release The programmed function is executed when the key is released. In this way, the primary function of a key can be distinguished from the hold function. So, if you want to assign a hold function to a particular key, do *not* use the press function for the key's primary function, but use the release function instead.

Note:

- If you use shift functions, make sure that the Shift activation function (shift) is assigned to a key as a primary function.
- It is possible to program the same value for a hold function and a shift function. In this way, the user can choose whether he wants to activate the function by holding down the relevant key for 500 ms or by pressing the Shift activation key first.
- As a rule, do not program a function under Key release if you have already programmed a function under Key press, or the other way around. A possible exception is the monitor function. To allow brief monitoring of a channel, you could use the press function of a key to activate monitoring and use the release function of the same key to deactivate it. In this way, monitoring lasts as long as the relevant key is held down.
- Besides the standard 500 ms hold delay, a different hold delay can be set using the hold delay parameter. This different hold delay will be used when **hold delay** has been assigned to the key press function.

The available key functions are already defined in the program and can be selected with the cursor command keys. See section 6.6 for an overview of the available key functions. Press **F2** or **PgDn** to move to the next column, and press **PgUp** to move to the previous column. Press **Esc** to return to the Advanced options menu. The short-cut keys for the Key definitions windows are **Alt-K** and **Alt- M** respectively.

5.7.2 Decode formats

The option Decode formats of the Advanced options menu enables you to define the formats for the decoding sequences for incoming selective call messages. You can use **Alt-D** as a short-cut.

Decode formats are series of instructions describing the contents of selective call messages to be received, and the actions to be executed if the incoming message matches the defined sequences. Once these formats have been defined in the current window, they can be referred to by name elsewhere in the program (e.g. in the System parameters window). The program allows up to 63 format definitions.

Figure 15: Format editor (DEC)

Defining and editing the decode formats takes place in the Format editor window. The top line displays the number or name of the format that is currently being defined or edited.

To define a decode format, follow these steps:

1. Use the overview given in section 6.7 to determine which commands and strings must be included. See also appendix F for programming examples of decode formats.
2. Enter the required commands and strings.
3. Press **F2** to compile the current format.

If the program detects any errors, the cursor will be positioned near the statement that is incorrect.

4. Correct the statement and press **F2** again.

To correct entries, you can either use the Backspace and Delete keys or switch to the Typeover mode by pressing the Insert key. In the Insert mode, the top line of the window shows INS.

Formats cannot be stored until they are fully debugged and compiled.

Note: Make sure that the programmed formats are stored to a file, before you program the radio. This is necessary, because unused formats will be deleted when the radio unit is programmed in order to save memory space.

In addition to the help, exit and compile functions, the following functions are available in the Format editor window:

- Selecting the next/previous format with **F4/F5**.
- Selecting an existing format from a selection list with **F3** (select). Use the arrow keys to move to the format to be selected, and press **Enter** (see 4.3 for details).
- Renaming the currently displayed format with **F6** (rename). In this way, you can replace the number that is assigned by default by an appropriate name.
- Adding a new format with **F7** (add).
- Deleting the currently displayed format with **F8** (delete).

5.7.3 Encode formats

Defining and editing encode formats is similar to defining and editing decode formats (see previous section). Valid commands and strings for encode formats are listed in section 6.8. See also appendix F for examples of encode formats. The short-cut key is **Alt-E**.

Figure 16: Format editor (ENC)

5.7.4 Configuration

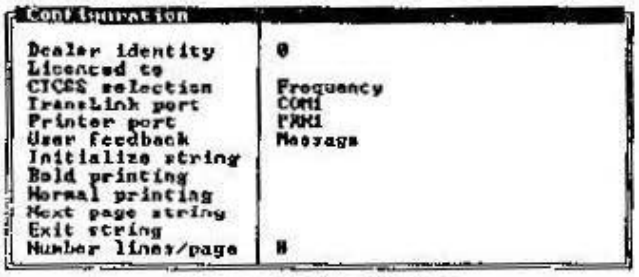


Figure 17: Configuration

The Configuration window contains parameters on program-related options such as the dealer identity (user of the software), and system and printer settings for programming and printing the program data. See 6.9 for details on the parameters.

8 Files / programming

The Files / programming window contains options for programming the radio unit and file management.

Figure 18: Files / programming

5.8.1 Load file

This Load file command enables you to load a file with radio unit information, so that you can edit the programmed data or program the radio unit with the data. To retrieve a file, follow these steps:

1. Select the Load file option from the Advanced options menu, or press **Alt-R** as a short-cut.

The program displays a small window, enabling you to enter the relevant file name.

2. Select **F2** to display a selection list or enter the relevant file name.

If you press **F2**, the program only searches for files with the extension .DAT in the default directory and lists them in a selection window.

If the file name has a different extension or is located in a different directory, you need to specify the full name or path. DOS wildcards such as ? and * are also valid. For example, if you know that the relevant file is in the current directory, but you do not remember the exact name, you can type ***.*** and press **Enter** to display all the files that are in the current directory. See the DOS manual for more information.

3. To select a file from the selection list, use the arrow keys to move to the relevant file name and press **Enter** (see 4.3 for details).

5.8.2 Save file

The programmed data are not automatically saved to file. However, it is strongly recommended to store the data on disk, before you program the radio unit, in case you need to reprogram the radio unit. Not all programmed data will be stored in the radio unit. All unused formats are deleted when the radio unit is programmed, in order to save memory space.

To save the edited parameters of the current radio unit to a file, follow these steps:

1. Select the Save file option from the Files / programming menu, or press **Alt-W** as a short-cut.

The program displays a small window, enabling you to enter the file name.

2. Type in the file name and press **Enter**.

If you want to overwrite an existing file (for example, if you have edited the file) you can also select the file name from a list that is displayed with F2 (select).

There are several ways in which you can specify the file name. If you only enter a file name of up to eight characters, the program will automatically store the file with the extension .DAT. If you enter a file name, followed by the extension mark (.) or with a full extension (of up to three characters), the file is stored under the name you assigned to it. See 5.8.1 for details on how to retrieve such files.

It is also possible to specify the directory where you want to store the files by entering a full path name. See the DOS manual for details.

5.8.3 Retrieve from radio

If necessary, the data that are stored in the radio unit can be retrieved with the Retrieve from radio option. Note that this retrieve function is only meant as a last resort to retrieve the programmed data. It is always better to have the information stored in a file. The retrieved data are never identical to the data that were programmed.

The differences between the data on file and the data in the radio unit are the following:

- When the radio unit is programmed, unused decode and encode formats are deleted to save memory space.
- The labels you have assigned to formats and system groups are never programmed into the radio unit. On retrieval, they are renumbered from #0 upwards.

If you want to retrieve the data from the radio, the radio must be connected to the PC in the way described in 5.8.4.

5.8.4 Program radio

Before you program the radio, make sure you have edited the parameters carefully and stored them on file. If you program irreconcilable data into the radio, it is possible that the radio will not operate properly.

To program the radio with the edited data, follow these steps:

1. Connect the programming cable to the Trans-Link port of the radio. Usually, this is the external microphone jack.
2. Connect the other end of the cable to the RS232 communications port (COM1 or COM2) of the computer.
3. Turn on the radio unit.
4. Load the relevant file, if necessary (see 5.8.1).
5. Select Program radio from the Files / programming menu, or press **Alt-P** as a short-cut.

The program checks if the cable is connected properly and starts programming the radio. The screen displays the percentage of data that has already been processed. After successful programming, the radio is automatically reset and displays the initial channel number.

5.8.5 Printout of data

This option displays the window Printout selection, enabling the printout of programming data, namely the general parameters, all system groups and channels, key definitions and decode / encode formats.

If you want to print all data, select **F2** (print all). If you want to print only some of the listed items, select the relevant items by entering the value YES, and then select **F3** (print selection).

5.9 Statistics

The Statistics window shows the current usage of the EEPROM. By checking this data, the user is able to optimize the size and number of memory blocks. When the total amount of memory blocks exceeds the capacity of the EEPROM, optimization is necessary. The short-cut key for this window is **Alt-I**.

6 Reference Section PROGSYS

6.1 Setup radio

The Setup radio window enables the selection of the radio model to be configured, the serial number and other information related to the radio. After starting up PROGSYS, the parameters in the window must be edited first. The Setup radio window can be selected from the main menu.

Below follows a description of the parameters of the Setup radio window. If no ranges are given, you have to select the relevant value by means of the space-bar or the cursor command keys.

Model number / series
This field displays the selected model number and series.

Ordering number
The relevant radio model can also be selected from this field. The ordering number is shown in the Kenwood format.

Frequency range
If no model number or ordering number is known, selection is possible by choosing the right frequency range and channel spacing. The frequency range of the radio to be configured is selected here.

Serial number
Range: 00000000 .. 99999999

Enter the serial number of the radio to be configured. The serial number can consist of up to eight digits.

Number of scan groups
Range: 0 .. 10

Determines the required number of scan groups. Select the minimum number of scan groups to save memory space. Enter 0 when scanning is not required.

Addresses per channel
Range: 0 .. 20

Determines the number of address digits per channel. Enter the minimum number of address digits possible to save memory space. Enter 0 if selcall is not required or if the selcall addresses that are used are defined as fixed values within the encode and decode formats.

Lock code
Range: 0000 .. 9999

Determines the code with which the user can lock and unlock the radio unit. In the locked state, all normal radio functions are disabled, thus preventing unauthorized use of the radio.

DCS error correcting
Range: None, One, Two, Three

Determines the number of bits the error-correcting algorithm is allowed to correct. The DCS decode capability for low signal strengths will improve if this parameter is set to a high value. However, this will also increase the false decoding probability.

Number of channel digits
Range: None, One, Two, Three

This parameter determines the number of digits the user is allowed to enter for channel selection. The radio can be configured to accept the entry of one channel digit (0 to 9), two channel digits (00 to 99) or three channel digits (000 to 250). If required, channel selection can be disabled by programming None.

Channel readout mode
Range: Numerical, Alphanum.

This parameter determines the type of channel readout. If you select Numerical, a three-digit number will be shown overlayed on the channel overlay text. The Alphanum. mode enables the entry of a full five-character string per channel to identify the channel.

Note that the alphanumeric mode requires four extra bytes per channel, thus limiting the maximum number of channels.

Key/alert beep volume
Range: off/low, off/high, low/low, low/high, high/low, high/high

The key/alert beep parameter determines the volume of the key beep and the alert beep.

Ext.alert / transfer
Range: None, Ext.alert, Transfer, Ext/trans

This parameter determines if the user can activate either the external alert or transfer or both. None means that the user can activate neither.

Power save on time
Range: 0 .. 2550 ms

This parameter specifies the period of time after which the radio switches to the power save state. This parameter is relevant when the radio is in the standby mode. The suggested value is 400 ms.

Power save off time
Range: 0 .. 2550 ms

This parameter specifies the period of time the radio is allowed to switch back to the power on state, to check for channel activity while in standby mode. The suggested value is 100 ms.

Power save delay
Range: 0 .. 255 s

This parameter specifies the period of time the radio waits after a channel busy condition, before switching to the power save state. The suggested value is 5 s.

Hold delay
Range: 0, 10 .. 2550 ms

This parameter specifies the period of time the emergency switch or button has to be pressed to activate the emergency procedure. The suggested value is 1 s. Enter the value 0 if a delay is not required.

Overlay text channel
Range: five-character string

This parameter defines the overlay text for the numerical channel readout mode. The five-character string will be displayed in a seven-segment format so as to approach the layout of the programmed string as much as possible.

Overlay text selcall
Range: five-character string

This parameter defines the overlay text for selcall address selection. The five-character string will be displayed in a seven-segment format so as to approach the layout of the programmed string as much as possible.

Overlay text status
Range: five-character string

This parameter defines the overlay text for status number selection. The five-character string will be displayed in a seven-segment format so as to approach the layout of the programmed string as much as possible.

6.2 General parameters menu

The General parameters menu enables the selection of options, such as the radio's startup conditions and user interface (except key definitions). The General parameters are valid for all programmed channels.

Startup scan
Range: Disable, Enable

The startup scan parameter determines whether scanning is activated at radio switch-on (Enable) or not (Disable).

Startup monitor
Range: Disable, Enable

If startup monitor is set to Enable, selcall mute will be open at radio switch-on. If set to Disable, selcall mute will be closed initially.

Startup power
Range: Low, High

This parameter determines the initial power selection. If set to Low, the radio will transmit initially with low power. If set to High, the radio will use high power. Note that this parameter selection is not in effect when the power selection programmed per group is fixed to low or high (see 6.3). Not available in the mobile.

Startup encode definition
Range: [OFF], <defined encode formats>

This parameter enables the selection of a transmit encode definition to be executed immediately after the radio is switched on. This facility can be used, for example, to register a radio within a system. Selection of a startup encode definition is only possible if the definition has already been entered with the encode format editor.

Startup channel
Range: 1 .. 250

This parameter determines which channel is selected at radio switch-on. The channel number refers to the physical channel number in the channel parameter menu, not the displayed number. The startup channel number is not in effect when the parameter Save channel number is set to Enable (see below).

Save channel number
Range: Disable, Enable

This parameter determines whether or not the last channel number selected before the radio is turned off is automatically selected again at radio turn-on. If set to Disable, the programmed startup channel will be used instead (see above).

Start delimiter required
Range: Disable, Enable

This parameter determines whether a decoded sequence with a matching decode definition is accepted with leading digits (Disable) or is only accepted if preceded by a no-tone period of silence (Enable).

Digit entry method
Range: Replace, Overwrite

If the digit entry method is set to overwrite, the selected selcall address overwrites the previously selected address from right to left. If set to replace, the previously selected selcall address is first replaced by the default transmit address for the selected channel and then overwritten from right to left.

Copy from default tx
Range: Disable, Enable

This parameter determines whether the keypad-selectable selcall address is overwritten by the default tx address each time the user changes the channel number through selection or during scanning (Enable) or remains the same (Disable).

Keypad operation
Range: Channel, Selcall, Status, Standard

The keypad operation parameter determines the primary use of the numeric keypad field. If this parameter is set to channel, the radio switches to the channel entry mode as soon as a digit is pressed. If set to selcall, the selcall entry mode is activated instead. If set to status, the status entry mode is activated. If keypad operation is set to standard, the user has to activate the required entry mode before entering a number. If the user presses a numeric key when no entry mode has been selected, the radio generates an error beep.

Normal display format
Range: Selcall, Channel, Both, Combined

Determines the way in which the selcall and channel information is displayed. If the display format is set to Selcall, the radio will show the selected selcall address in its default state. If set to Channel, the channel number will be shown instead. If set to Both, the radio will show the channel number as well as the selected selcall address. If set to Combined, the channel number and the selected selcall address will be displayed on the large digit field in a 2+2 format.

Scan display format
Range: Normal, Scan text, Background

Determines the way in which the scan channel and scan group information is displayed when the radio is in the scan mode. If the scan display format is set to Normal, the radio will show the channel number during the entire scanning procedure. If set to Scan text, the channel number will be replaced by the text Scan whenever the radio has not stopped on a channel. If set to Background, the user can select another entry mode while the radio is scanning.

Return-to-Standby listen period
Range: 0 .. 255 s

The Return-to-Standby listen period determines the period of time the user can monitor a channel to initiate a call, before the radio automatically closes again. This facility is used together with selcall encode / decode facilities to prevent unnecessary operation of the equipment. An additional PTT lockout condition is available when the radio is in the listening mode. The suggested value for RtS listen is 10 seconds.

Return-to-Standby active period
Range: 0 .. 255 s

The Return-to-Standby active period determines the period of time in the active state (conversation mode) after which the radio is closed automatically if no PTT is pressed and no carrier is received. The suggested value for RtS active is 30 seconds.

Transmit time-out
Range: 0, 1 .. 255 s

The transmit time-out parameter determines the maximum duration of continued transmitting while the PTT button is pressed. After this transmit time-out period has expired, the radio will sound an error beep, and stop transmitting. Suggested value: 60 seconds. Enter value 0 to disable the transmit time-out facility.

Transmit warning
Range: 0, 1 .. 255 s

This parameter determines the period of time an alert beep is sounded before the transmit time-out period expires. If you enter a value that is higher than the transmit time-out value, no transmit warning will be generated. Suggested value: 10 seconds.

Transmit inhibit time-out
Range: 0 .. 255 s

The transmit inhibit time-out defines the period of time after the transmit time-out has fully expired, and during which transmitting is not possible. This function is required sometimes by operators of repeater systems. Suggested value: 10 seconds.

Number entry time-out
Range: 0, 1 .. 255 s

The number entry time-out determines the period of time the radio stays in the selected entry mode (for example, entry of selcall address or free-dialling telephone number), before switching back to the default operating mode. Suggested value: 30 seconds.

Lamp time-out
Range: 0, 1 .. 255 s

This parameter determines the period of time the LCD backlight remains on after having been activated manually. Suggested value: 10 seconds. Enter value 0 if no time-out is required. This function is available only in the portable.

6.3 System parameters menu

The System parameters menu serves to configure system-dependent parameters. By creating multiple system blocks, you are able to configure the portable radio for operation in different systems. The method of creating extra system blocks is explained in section 5.4. The current section describes all parameters of the System parameters menu.

Selcall standard
Range: ZVEI, CCIR, DZVEI, EEA, ZVEI2, PZVEI, PCCIR, PDZVEI, EIA, Natel, AP-369, Kenwood

This parameter determines which selcall toneset standard is used for decoding selective call messages. Note that the selcall standard that is used for encoding is defined within the encode formats. The Philips EEA derivative can be configured by selecting PCCIR and choosing a 40 ms duration per tone for encoding.

Receive gap period
Range: 5 .. 638 ms

The reset gap period defines the period of time the selcall decode algorithm requires a 'no-tone' condition after the last valid tone has been received. The recommended value for the receive gap period is 1.5 times the duration per tone, for example, 150 ms for CCIR 100 ms.

Selectable selcall digits
Range: None, One, Two, Three, Four, Five

The parameter Selectable selcall digits is used to define the number of digits of the keypad/button selectable address that may be changed by the user. These keypad selectable digits are normally included in the transmit selective call formats.

Selectable status digits
Range: None, One, Two, Three, Four, Five

The parameter Selectable status digits is used to define the number of digits of the keypad/button selectable address that may be changed by the user. These keypad selectable digits are normally included in the transmit selective call formats.

Busy symbol function
Range: Carrier, SAT-busy

This parameter determines the use of the busy symbol on the display. For CTCSS/DCS-driven repeater operation, the value SAT-busy should be selected. For all other applications, Carrier is preferred.

Return-to-Standby mode
Range: Disable, Tx-only, Rx/Tx

The Return-to-Standby mode is activated if this parameter is set to Tx-only or Rx/Tx. If this parameter is set to Tx-only, the RtS timer is retriggered only during transmission. If set to Rx/Tx, the RtS timer is retriggered both when transmitting and receiving. The RtS facility prevents users of radios to use the equipment unnecessary.

Automatic close
Range: None, Two, Three, Four

The automatic close parameter determines the number of digits that have to match the primary receive address in order to close the radio. If None is selected, the automatic close facility is disabled. It is recommended to enter the highest number of digits possible for operation of automatic close, for example, Three for a 5-tone decode format with the first three digits fixed and two variable digits.

Power selectable
Range: Disable, Enable

The power selectable parameter defines whether or not the user may change the RF output power for the current system group. If set to Enable, the power is selectable. If set to Disable, the fixed power selection state is used (see below). To enable user selection of RF output power, a key must be assigned to execute this function (see 6.6). This function is available only in the portable.

Fixed power selection
Range: Low, High

This parameter determines whether the RF output power is high or low. This parameter only has effect if the power selectable parameter is set to Disable (see above). This function is available only in the portable.

Monitor function
Range: Selcall, SAT, Both, Reset, Off

This parameter determines the function of the monitor button. If set to Selcall, the monitor button operates as selcall open / close. If set to SAT, the monitor button operates as SAT monitor. If set to Both, the monitor button operates as combined selcall and SAT monitor. If set to Reset, the monitor button resets the selcall mute. If set to Off, the monitor button has no function.

Scan speed
Range: 10 .. 2550 ms

The scan speed parameter specifies the period during which the radio checks for activity on a channel while scanning. If no activity is detected during this period of time, the radio continues scanning. This parameter is normally configured for fastest scanning possible for the selected scanning operating mode. Recommended values are 100 ms for carrier scanning, 80 ms for selcall scanning, and 300 ms for SAT and combined selcall / SAT scanning.

Scan wait
Range: 10 .. 25500 ms

The scan wait parameter specifies the period of time after which scanning is resumed if no activity is detected any more. Normally, this parameter is set to a value around 1 second.

Scan dwell time
Range: 0, 1 .. 255 s

The scan dwell time specifies the period of time after which scanning is resumed while continuously detecting activity on the channel. If set to 0, the scan dwell facility is disabled.

Scan configuration
Range: Carrier, SAT, Selcall, Both, Selcall-st, Both-st, No carrier

The scan configuration parameter determines the operating mode of scanning defined for the current system group. If set to Carrier, the radio stops on a channel when it receives a carrier. If set to SAT, the radio stops on receiving a valid SAT tone (defined per channel as SAT receive). If set to Selcall, the radio stops on receiving a tone that matches the first tone of the Primary rx address defined for that channel. If set to Both, the radio stops on receiving a valid SAT and first tone simultaneously. Operation of Selcall-st and Both-st is similar to Selcall and Both, but the radio remains on the channel until the radio is operated. The No-carrier selection allows scanning for a channel which is not used (opposite of carrier scanning).

Carrier detect ignore
Range: 0 .. 2550 ms

The carrier detect ignore parameter determines the minimum duration of a carrier detect condition before the Return-to-Standby timer is retriggered. This parameter is only relevant if the Return-to-Standby mode parameter has been set to Rx/Tx.

Group digit selectable
Range: Disable, Enable

This parameter determines whether or not group digit selection is possible by means of the Digit 1x, Digit 10x and Digit Up keys.

6.4 Channel parameters

The Channel parameters window enables the selection of channel-related parameters. In this window only the most frequently used parameters can be edited. An additional window can be opened to select other channel-related parameters. See section 5.5 for instructions on how to switch between these windows.

Transmit frequency (tx.freq.)
Range: depending on selected model

The transmit frequency in MHz for the selected channel must be entered here. This parameter can be edited in the channel parameters window as well as in the Channel edit window. Entered frequencies are only accepted if they are valid for the selected radio model and are rounded off to the nearest frequency that is available.

Receive frequency (rx.freq.)
Range: depending on selected model

The receive frequency in MHz for the selected channel must be entered here. This parameter can be edited in the Channel parameters window as well as in the Channel Edit window. Entered frequencies are only accepted if valid for the selected radio model and are rounded off to the nearest frequency that is available.

SAT encode
Range: 50.0 .. 250.3 Hz, CTCSS call signs, valid DCS codes, inverted DCS codes

The SAT encode parameter specifies the CTCSS tone or DCS code that is used when the radio is transmitting on the selected channel. Editing this parameter is only possible in the channel-edit window. Refer to appendix B for an overview of valid CTCSS tone frequencies and to appendix C for an an overview of valid DCS codes.

SAT decode
Range: 50.0 .. 250.3 Hz, CTCSS call signs, valid DCS codes, inverted DCS codes

The SAT decode parameter determines the CTCSS tone or DCS code that is used to detect if the right subtone is received on the selected channel. Editing this parameter is only possible in the Channel Edit window. Refer to appendix B for an overview of valid CTCSS tone frequencies and to appendix C for an overview of valid DCS codes.

Default tx address
Range: 00000 .. 99999

The default tx address defines the selectable part of the transmit selcall address. This address is used at radio turn-on, when the channel is selected while the parameter Copy from default tx is set to Enable, or when the contents of the keypad buffer is replaced on entry of another selcall address. This parameter is normally used to define the most frequently called 5-tone identity, but it can also be used for other purposes. To enable selection of this parameter, the parameter Addresses per channel in the Setup radio window must be set to at least 5.

Primary rx address
Range: 00000 .. 99999

The primary rx address defines the primary own identity of the radio. In most applications, this parameter is used to define the unit's own 5-tone address. To enable selection of this parameter, the parameter Addresses per channel in the Setup radio window must be set to at least 10.

Secondary rx address
Range: 00000 .. 99999

The secondary rx address defines the secondary own identity of the radio. In most applications, this parameter is used to define the unit's own second 5-tone address. To enable selection of this parameter, the parameter Addresses per channel in the Setup radio window must be set to at least 15.

Third rx address
Range: 00000 .. 99999

The Third rx address defines a third own identity of the radio. In most applications, this parameter is used to define the unit's own third 5-tone address. To enable selection of this parameter, the parameter Addresses per channel in the Setup radio window must be set to 20.

Readout string (ds)
Range: numerical mode: 0 .. 9, A, B, C, -, <space> and # for overlay text
alphanumeric mode: all characters

The Readout string (or display string) parameter determines how the channel number will be displayed to the user. If the numerical mode has been selected, the readout string consists of three characters (all within the specified range). If the alphanumeric mode has been selected, the readout string consists of five characters.

Scan include list
Range: set of 0 .. 9

The Scan include list parameter defines the scan groups to which the channel belongs. If a digit is shown, the channel is included in that particular scan group. If the channel does not belong to a defined scan group, a dash symbol will be shown at that position. Unused scan groups are shown as squares. Editing this parameter is possible by entering the scan group numbers in one string. For example, enter 156 to include the current channel into scan groups 1, 5 and 6. Of course, this entry (156) is only possible if you have defined at least 6 scan groups in the Setup radio window.

Clock frequency shift
Range: Disable, Enable

The clock frequency shift facility slightly moves the crystal clock frequency, which may be useful to prevent interference on some radio channels. Set this parameter to Enable for channels on which this interference has been noticed during operation.

Group reference
Range: <available system groups>

The group reference parameter links the currently selected channel to one of the defined system groups. Refer to sections 5.4 and 6.3 for details on System group parameters.

6.5 Scan groups

A separate scan group can be defined for each scan application. Each scan group can contain a number of channels, ranging from 2 to all channels defined. The scan include list in the Channel edit window is used to link channels to scan groups. The following parameters are available for each scan group:

Priority channel (pri)
Range: 1 .. 200, OFF

This parameter determines which channel functions as priority channel. The entered channel number must be listed in the 'ch' column in the Channel-list window. Enter OFF if a priority channel is not required.

Preference channel (pref)
Range: 1 .. 200, OFF

This parameter determines which channel functions as preference channel. The preference channel can be used for various purposes related to scan operation, but is mainly used to force the radio to transmit on this channel when the PTT button is pressed while the radio is in scanning mode. See also section 6.8 for usage of this parameter. Enter **OFF** if a preference channel is not required.

Priority scan interval (interval)
Range: 0 .. 2550

The Priority scan interval parameter determines the period of time during which the priority channel is checked for activity. If no activity is detected on the priority channel, the priority scan interval timer is restarted. Enter 0 if this parameter is not relevant.

User programming (user)
Range: NO, YES

The user programming parameter determines whether the user is allowed to program the scan list and the priority channel for the current scan group (YES) or not (NO).

6.6 Key definitions

The Key definitions window allows assignment of key functions to each of the key actions. The key actions are divided into columns and have the following meanings:

Press	Function executed immediately after pressing the key
Hold	Function executed after holding down the key
Shift	Function executed when the key is pressed after activation of the shift function
Release	Function executed immediately after releasing a key

These key actions are available for each of the front panel buttons (0 .. 9, A .. D, * and #), scan, pri, lamp and lock buttons, as well as for the keypad/microphone keys.

The following key functions are available for each of the key actions:

[OFF]	not assigned
0	enter digit 0
1	enter digit 1
2	enter digit 2
3	enter digit 3
4	enter digit 4
5	enter digit 5
6	enter digit 6
7	enter digit 7
8	enter digit 8
9	enter digit 9
group digit	enter digit A
clear digit	erase one digit
mon.selcall	selcall open / close
mon.SAT	SAT monitor on / off
mon.both	selcall / SAT monitor on / off
selcall res.	mute selcall (close)
shift	activate shift mode
unshift	deactivate shift mode
digit 1x	5th digit up
digit 10x	4th digit up
digit up	selected digit up
digit shift	select next digit
mode select	toggle between channel and selcall entry
mode reset	reset to default entry mode
scan on / off	toggle between scan on / off
pri on / off	toggle between priority scan on / off
scan + pri	toggle between scan + priority on / off
scan on	start scanning
pri on	start priority scanning
scan + pri on	start both scan and priority scan
lamp on / off	switch LCD backlight on / off
lamp on	switch LCD backlight on
key lock	lock front keypad
code lock	lock operation of radio by means of 4-digit code
power select	select power low / high
channel ent.	select channel entry mode
selcall ent.	select selcall entry mode
status ent.	select status entry mode
queue mode	select queue mode
queue next	select next queue entry
queue select	select next queue entry / default operation mode
encode #1	execute call format #1 (normal call)
encode #2	execute call format #2 (free-dialling using selcall)
encode #3	execute call format #3 (free-dialling using DTMF)
encode #4	execute call format #4 (long tone call)
encode #5	execute call format #5 (status call)
encode #6	execute call format #6 (emergency call)
mon.unmute	squelch unmute
mon.mute	squelch mute

mon.toggle	squelch mute / unmute
clear dial	clear full dial buffer
scan prog	go to scan programming mode
extTransfer	switch on/off external alert and/or transfer function
hold delay	change hold delay
beep volume	select key beep volume
alert volume	select alert beep volume

6.7 Decode formats

Decode formats are series of instructions describing the contents of selective call messages to be received, and the actions to be executed if the incoming message matches the defined sequences.

The sequences of instructions can be entered, edited and compiled within PROGSYS. A suitable name can be assigned to every defined decode format to enable reference to these formats per system group and to other decode formats and / or encode formats. It is possible to define up to 63 decode formats.

Refer to section 5.7.2 for details on operating the window-based editor and compiler. The current section describes the available instructions and their purpose.

In the overview below, the instructions are grouped according to their function. In the explanatory part that follows, these instructions are presented in alphabetical order for quicker reference.

Mnemonic	Description
CMP *seq*	Compare to sequence; immediate or indirect
STO *index*	Store digits for queueing
GRPN	No group digit decode
GRPA	Decode A-tone as group digit
GRP0	Decode 0-tone as group digit
GRP0A	Decode both A-tone and 0-tone as group digits
MONO	Monitor open
MONF	Monitor open, flash symbol
MONC	Monitor close
RSTUN	Remote stun
RVIVE	Remote revive
RKILL	Remote kill
EMGOF	Emergency mode off
REPOF	Repeat sequence off
QUEUE	Queue contents of temporary buffer
QUE1	Queue buffer, with channel, duplicate allowed, FILO
QUE2	Queue buffer, without channel, duplicate allowed, FILO
QUE3	Queue buffer, with channel, no duplicate allowed, FILO
QUE4	Queue buffer, without channel, no duplicate allowed, FILO
QUE5	Queue buffer, with channel, duplicate allowed, FIFO
QUE6	Queue buffer, without channel, duplicate allowed, FIFO
QUE7	Queue buffer, with channel, no duplicate allowed, FIFO
QUE8	Queue buffer, without channel, no duplicate allowed, FIFO
DISPQ	Select queue mode and show first entry on display
BEEP *num*	Sound alert for individual and group calls
BEEPI *num*	Sound alert for individual calls only
BEEPG *num*	Sound alert for group calls only
EXTAL *alertseq*	Control external alert output
XPASS	Exit if individual or group call match
ERASE *time*	Erase contents of temporary buffer after the specified time
ACK	Show ACK sign (*)
ENCA *enc*	Execute encode format if individual or group call
ENCI *enc*	Execute encode format if individual call
ENCG *enc*	Execute encode format if group call
DECA *dec*	Execute decode format if individual or group call
DECI *dec*	Execute decode format if individual call

DECG *dec*	Execute decode format if group call
DECF *dec*	Execute decode format if call fail
DECAT *time dec*	Trigger decode format for time ms if individual or group call
DECIT *time dec*	Trigger decode format for time ms if individual call
DECGT *time dec*	Trigger decode format for time ms if group call

The parameters mentioned are:

seq	Sequence of immediate and / or indirect digits:
	#dig immediate digit
	^Dptr default transmit address
	^Pptr primary receive address
	^Sptr secondary receive address
	^Tptr third receive address
	^Qptr temporary queue entry
	^Uptr selectable status address
	^Mptr miscellaneous digits
	^Kptr selectable selcall digits
dig	Digit: 0 .. 9 and A .. F
ptr	Pointer: 1 .. 5
index	Index: 1 .. 5
num	Alert number: 0 .. 31
enc	Encode format
dec	Decode format
time	Time-out value: 0 .. 2550 ms in 10 ms steps
alertseq	External alert sequence: 00000000 .. 11111111

ACK

On a matching sequence, executing the ACK instruction causes a dot on the display to be shown. Applications for this ACK instruction in combination with encode formats are described in section 6.8.

BEEP *num*

On a matching sequence, BEEP alerts the user for an incoming call. Both individual and group calls are accepted. The valid range of *num* is 0 to 31. See appendix E for an overview of available alert tones.

BEEPG *num*

On a matching sequence, BEEPG alerts the user for an incoming call with group digits. The valid range of *num* is 0 to 31. See appendix E for an overview of available alert tones.

BEEPI *num*

On a matching sequence, BEEPI alerts the user for an individually-addressed incoming call. The valid range of *num* is 0 to 31. See appendix E for an overview of available alert tones.

CMP *seq*

The CMP instruction enables the comparison of decoded digits and defined digits. Defined digits can be immediate digits, which are fixed in the decode format, or indirect digits, which are stored as channel parameters, entered address or status digits. Immediate digits are entered as a hash-sign (#) plus one or more digits. Indirect digits are entered as ^-sign plus pointer character and one or more indexes. In one sequence, up to fifteen digits can be defined, so this allows decoding of sequences up to fifteen digits. CMP and STO instructions can be alternated to define queue formats.

To explain the purpose of these immediate and indirect digits, four examples are given below with the result for a channel-defined primary receive address of '73492' and keypad entered address of '39281':

CMP #59402: Compares with fixed 5-tone sequence '59402'. Matches the incoming sequence '59402'.

CMP ^P12345: Compares with channel-defined primary receive address; '12345' defines 1st, 2nd, 3rd, 4th and 5th digit of the primary receive address. Matches the incoming sequence '73942'.

CMP #594^P45: Compares first three digits with '594' and next two digits with last two digits of the channel-defined primary receive address. Matches the incoming sequence '59492'.

CMP #59^P45^K5: Compares first two digits with '59', next two digits with last two digits of the channel-defined primary receive address, and the last digit with the last digit of the keypad-entered address. Matches the incoming sequence '59921'.

DECA *dec*
On a matching sequence, for both individual and group calls, DECA starts another decode format. The DEC range of instructions enables the linkage of decode sequences when the size of one decode format is insufficient, or when further decoding is required of parts of the received sequence. String *dec* must be replaced by the name of a previously created decode format.

DECAT *time dec*
On a matching sequence, either with or without group digits, DECAT activates another decode format, but only if another sequence of digits is received within the number of ms specified by *time*. The timed DEC instructions are used to process multiple selcall sequences, such as two-by-five tone and three-by-five tone.

DECF *dec*
If no matching sequence is found, DECF starts execution of another decode format. DECF is normally used when the size of a decode format is insufficient. String *dec* must be replaced by the name of a previously created decode format.

DECG *dec*
On a matching sequence with one or more group digits, DECG starts the execution of another decode format, which is indicated by *dec*. String *dec* must be replaced by the name of a valid decode format.

DECGT *time dec*
Similar to DECAT, but activated only if the received sequence contains one or more group digits.

DECI *dec*
On a matching sequence without group digits, DECI starts the execution of another decode format, which is indicated by *dec*. String *dec* must be replaced by the name of a valid decode format.

DECIT *time dec*
Similar to DECAT, but activated only if the received sequence does not contain group digits.

DISPQ
On a matching sequence, DISPQ automatically selects the queue mode and displays the queue contents. DISPQ will be ignored if there are no queue entries.

EMGOF
On a matching sequence, EMGOF switches off the emergency state. The emergency state can be activated by an encode format (see also section 6.8).

ENCA *enc*
On a matching sequence for both individual and group calls, ENCA starts the execution of a specific encode format. The ENC range of instructions is most frequently used to assign a 'transpond' transmission, as acknowledgement of a successfully received call. String *enc* must be replaced by a valid encode format name.

ENCG *enc*
On a matching sequence with one or more group digits, ENCG starts the execution of a specific encode format. String *enc* must be replaced by the name of a previously created encode format.

ENCI *enc*
On a matching sequence without group digits, ENCI starts the execution of a specific encode format. For transpond applications, the ENCI instruction is more suitable than ENCA and ENCG, because it only responds to individual calls. String *enc* must be replaced by the name of a previously created encode format.

ERASE *time*

On a matching sequence, the contents of the temporary buffer (filled by STO instructions) will be erased after the specified period of time. This instruction can be used to decode two-by-five tone format with transmitting order [own-ID] [selected-ID].

EXTAL *alertseq*

On a matching sequence, provided the external alert facility is enabled by the user, the externally connected relay controlling the horn or lights will be activated according to the specified sequence. The sequence *alertseq* consists of a series of eight 0s and 1s specifying the on/off slots of 500 ms each. For example, the *alertseq* 11011011 activates the external alert output three times with a 1 second duration, with a pause of 0.5 seconds in between.

GRP0

During execution of the CMP instructions that follow, the 0-tone will be recognized as a group digit (standard in some Motorola systems).

GRP0A

During execution of the CMP instructions that follow, both the 0-tone and the A-tone will be recognized as group digits (international as well as Motorola-specific group tone decoding standard).

GRPA

During execution of the CMP instructions that follow, the A-tone will be recognized as a group digit (international standard for group tone decoding).

GRPN

During execution of the CMP instructions that follow, no group tones will be recognized.

MONC

On a matching sequence, MONC causes the selcall monitor function to close.

MONF

The MONF instruction is similar to MONO, but also causes the selcall monitor sign to blink; this gives a visible call alert.

MONO

If the incoming selcall sequence matches the preceding CMP / STO definition, the MONO instruction causes the radio to open selcall monitor. The user can then hear the conversation on the channel.

QUEUE

On a matching sequence, QUEUE stores digits prepared by previously executed STO instructions and the currently selected channel to the queue.

QUE1

On a matching sequence, QUE1 (same as QUEUE) stores digits prepared by previously executed STO instructions to the queue. The currently selected channel is also stored. Duplicated entries are allowed. The entry is stored in FILO order (First In, Last Out).

QUE2

On a matching sequence, QUE2 stores digits prepared by previously executed STO instructions to the queue. The currently selected channel is not stored. Duplicated entries are allowed. The entry is stored in FILO order (First In, Last Out).

QUE3

On a matching sequence, QUE3 stores digits prepared by previously executed STO instructions to the queue. The currently selected channel is also stored. Duplicated entries are not allowed. The entry is stored in FILO order (First In, Last Out).

QUE4

On a matching sequence, QUE4 stores digits prepared by previously executed STO instructions to the queue. The currently selected channel is not stored. Duplicated entries are not allowed. The entry is stored in FILO order (First In, Last Out).

QUE5
On a matching sequence, QUE5 stores digits prepared by previously executed STO instructions to the queue. The currently selected channel is also stored. Duplicated entries are allowed. The entry is stored in FIFO order (First In, First Out).

QUE6
On a matching sequence, QUE6 stores digits prepared by previously executed STO instructions to the queue. The currently selected channel is not stored. Duplicated entries are allowed. The entry is stored in FIFO order (First In, First Out).

QUE7
On a matching sequence, QUE7 stores digits prepared by previously executed STO instructions to the queue. The currently selected channel is also stored. Duplicated entries are not allowed. The entry is stored in FIFO order (First In, First Out).

QUE8
On a matching sequence, QUE8 stores digits prepared by previously executed STO instructions to the queue. The currently selected channel is not stored. Duplicated entries are not allowed. The entry is stored in FIFO order (First In, First Out).

REPOF
On a matching sequence, REPOF stops repeating encode formats when activated from an encode format (see section 6.8). Applications of the REPOF instructions can be found in decode formats linked to encode formats when an acknowledge message is necessary, for example, for an emergency call.

RKILL
On a matching sequence, RKILL destroys the contents of the EEPROM, so that the radio must be returned to the dealer for reprogramming. This facility is normally used for security reasons when the radio has been stolen or is missing.

RSTUN
On a matching sequence, RSTUN causes the radio to lock operation of PTT, mute the receiver, and show 'Loc2' on the display. This remote stun facility can be used to take a radio out of service for commercial or security reasons (for example, for not paying an invoice or in case the radio has been stolen or is missing).

RVIVE
On a matching sequence, RVIVE revives a radio previously taken out of service with the remote stun feature.

STO *index*
STO instructions copy received digits to a temporary buffer for further processing or queueing. Any digit value is accepted, except no-tone (F). The index pointer points to a position within the internal 5-digit buffer. This 5-digit buffer can be copied to the queue with the QUEUE command STO and CMP instructions can be alternated in any order to allow single digits to be used for further processing and queueing.

To explain the purpose of the STO instruction, consider the following examples with the results mentioned when '59409' is received.

CMP #594 STO 45
Only matches sequences starting with '594' followed by two digits each ranging from 0 to E. When '59409' is received, digit 0 will be stored on position 4 and digit 9 will be stored on position 5.

CMP #5 STO 41 CMP #09
Only matches sequences starting with '5' followed by two digits each ranging from 0 to E, followed by '09'. When '59409' is received, digit 9 will be stored on position 4 and digit 4 on position 1.

6.8 Encode formats

Encode formats are series of instructions which describe the actions and selective call tones and DTMF tones to be transmitted in a sequence. The concept is very similar to that of decode formats, described in the previous section.

Like the decode formats, the sequences of instructions of the encode formats can be entered, edited and compiled within PROGSYS. Every sequence has a name attached to it, and the maximum number of encode formats is 63.

In the following overview, all encode format instructions are described briefly. Here, they are grouped according to their function. Following the overview, these instructions are explained in more detail.

In this explanatory part, the instructions are listed in alphabetical order for quicker reference.

Mnemonic	Description
SEND *seq*	Send sequence of digits, immediate or indirect
SLEN *ofs*	Send length indicator plus offset
SCHK	Send checksum digit
SDIAL	Send free-dialled string of digits
TXS	Switch to transmit, selcall path
TXD	Switch to transmit, DTMF path
TXM	Switch to transmit, microphone path
RX	Switch to receive mode
TXP	Switch to transmit using programmed frequency
TXF *rf-freq*	Switch to transmit using in-line frequency
RXP	Switch to receive using programmed frequency
RXF *rf-freq*	Switch to receive using in-line frequency
SCTP	SAT transmit using programmed frequency
SCT *st-freq*	SAT transmit using in-line frequency
SCRP	SAT receive using programmed frequency
SCR *st-freq*	SAT receive using in-line frequency
SCOFF	SAT transmit off
SCPH0	CTCSS phase 180 degrees (1) (Reserved)
SCPH1	CTCSS phase 120 degrees (2) (Reserved)
TSET *toneset*	Select toneset
TONE *af-freq*	Send single tone
LEN *xtime*	Select duration per tone
DEL *xtime*	Execute delay
RIGN *stime*	Receive ignore for period of time
RACK *stime dec*	Trigger acknowledge receive for period of time
RSMS *stime*	Resume after short period of time (10 .. 2550 ms)
RSML *ltime*	Resume after long period of time (1 .. 255 s)
EMGON	Activate emergency mode
DIFIX	Fix display
TEXT '*text*'	Output text to display
TXTOF	Restore normal display operation
WAITR	Wait for key release
TPE	Transparency enable
TPD	Transparency disable
ERRX0	Error alert on exit off
ERRX1	Error alert on exit on
REP *rep*	Repeat sequence for *rep* times
SELT	Select tone mode
SELD	Select free-dialling mode
SELS	Select status entry mode
RTSL	Reload RtS with listen or active time-out
RTSA	Reload RtS with active time-out
RTSO	Reload RtS only in active mode
STOPS	Stop scanning
STOPP	Stop priority scan
OPEN	Select selcall mute open
CLOSE	Select selcall mute close
PREFA	Select preference channel when in scan mode
PREFS	Select preference channel when in scan mode and scanning
SPREV	Select previously selected channel when in scan mode
XCLOS	Exit if selcall mute closed

XOPEN	Exit if selcall mute open
XSCAN	Exit if in scan mode
XPRI	Exit if in priority scan mode
XCARR	Exit if carrier detected
XCTCN	Exit if no or wrong CTCSS detected
XCTCW	Exit if no carrier, no or wrong CTCSS detected
XSENS	Exit if scanning, but not stopped on channel
XIDLE	Exit if Return-to-Standby idle mode
XLIST	Exit if Return-to-Standby idle or listen mode
XNOT	Exit if not in transfer mode

The parameters mentioned are:

seq	Sequence of immediate and / or indirect digits
	#dig immediate digit
	^D*ptr* default transmit address
	^P*ptr* primary receive address
	^S*ptr* secondary receive address
	^T*ptr* third receive address
	^Q*ptr* temporary queue entry
	^U*ptr* selectable status address
	^M*ptr* miscellaneous digits
	^K*ptr* selectable selcall address
dig	Digit: 0 .. 9 and A .. F
ptr	Pointer: 1 .. 5
ofs	Offset: 0 .. 9
dec	Decode format
time	Time-out value: 0 .. 2550 ms in 10 ms steps
rf-freq	Radio frequency: dependent on selected range
af-freq	Audio frequency: 300 .. 3000 Hz
st-freq	Subtone frequency: 0 .. 63, see appendix B
tmeset	7VEI, CCIR, EEA, DZVEI, PZVEI, PCCIR, PDZVEI, EIA, Natel, AP-369, Kenwood
xtime	Extended time: 1 .. 7000 ms in 1 ms units
stime	Standard time: 10 .. 2550 ms in 10 ms units
ltime	Long time: 1 .. 255 seconds in 1 second units
rep	Repeat factor
text	String of characters

CLOSE

The CLOSE instruction forces the selcall mute to the closed state. Note that the related XCLOS and XOPEN instructions will test the selcall mute state at the time the encode format was started, not at the time the XCLOS or XOPEN instruction is executed.

DEL *xtime*

Execution of instruction DEL causes the execution of the encode sequence to be suspended for a period of time, defined by parameter *xtime*. The range of *xtime* is 1 to 7000 ms in 1 ms steps, thus allowing a precise pause duration of up to 7 seconds. The DEL instruction can be used to insert an LET (Link Establishment Time) or intersequence gap for e.g. two-by-five tone formats.

DIFIX

Instruction DIFIX activates the emergency mode with the display contents freezed. In the emergency mode, selcall encoding and decoding continues, but the display and LED will show no activity, and the speaker will be muted. Deactivation of the emergency mode is possible only by switching off the equipment, or by execution of EMGOF from a decode format.

EMGON

Instruction EMGON activates the emergency mode. In the emergency mode, selcall encoding and decoding continue, but no activity can be seen on the display and LEDs, and the speaker will be muted. Deactivation of the emergency mode is possible only by switching off the equipment, or by execution of EMGOF from a decode format.

ERRX0

After execution of instruction ERRX0, exiting an encode instruction due to one of the exit conditions (for example, instruction XOPEN) prevents the radio from sounding an error alert.

RTSL
Instruction RTSL causes the Return-to-Standby timer to be set to the listen or active period of time, depending on the current Return-to-Standby state.

RTSO
Instruction RTSO causes the Return-to-Standby timer to be set to the active period of time, if already in the active state. If not, the timer will not be set.

RX
Switches to receive mode, after which all mute functions apply.

RXF *rf-freq*
Switches to receive mode, using the in-line specified RF frequency. The specified frequency must be within the selected RF band. For example, in a VHF radio, the instruction RXF 149.0500 will cause the radio to receive on 149.0500 MHz.

RXP
Switches to receive mode, using the programmed frequency for the selected channel.

SCHK
Instruction SCHK sends a checksum digit, the value of which is calculated as the sum of all previous digits MOD 10. The SCHK instruction can also be used to build a data-packet for transmitting dialling information.

SCOFF
Instruction SCOFF switches off SAT transmission. In a PIT release encode format, a useful application for SCOFF is to switch CTCSS off about 300 ms before transmission is ended (sequence 'SCOFF DEL 300 RX'); this will prevent the trailing noise to be heard on the receiving equipment if CTCSS decoding is used as well.

SCPH0
The SCPH0 instruction causes the CTCSS sine wave to skip 180 degrees out of phase. This will mute the receiving equipment of the other party quicker than switching off CTCSS only.

Note: the SCPH0 instruction is not available yet.

SCPH1
The SCPH1 instruction causes the CTCSS sine wave to skip 120 degrees out of phase. This will mute the receiving equipment of the other party quicker than switching off CTCSS only.

Note: the SCPH1 instruction is not available yet.

SCR *st-freq*
Activates SAT receive, using the in-line specified SAT receive frequency or code. This frequency or code must be entered as a number from 0 to 255 (see appendix B and C).

SCRP
Activates SAT receive using the programmed SAT receive frequency or code for the selected channel.

SCT *st-freq*
Activates SAT transmit, using the in-line specified SAT transmit frequency or code. The SAT frequency or code must be entered as a number in the range of 0 to 255 (see appendix B and C).

SCTP
Activates SAT transmit, using the programmed SAT transmit frequency or code for the selected channel.

SDIAL
Instruction SDIAL sends all the digits that are entered as a dialling string. The dialling string can contain up to 28 digits. The SDIAL instruction is used to transmit this dialling information. It is recommended to use SLEN and SCHK in addition to SDIAL, to minimize the occurrence of errors due to bad signalling conditions.

SELD

Instruction SELD selects the dialling string entry mode. After execution of SELD, the display will be cleared and a number of up to 28 digits can be entered from the keypad. Execution of the encode format is resumed after the * key is pressed. The contents of the dial buffer can be transmitted later using the SDIAL instruction.

SELS

Instruction SELS selects the status digit entry mode. After execution of SELS, the display will show 'St _', allowing entry of one digit in the range of 0 .. 9. If necessary, this digit can be overwritten or erased by pressing button C. After selection, pressing button * continues execution of the current encode format.

SELT

Instruction SELT causes the text 'tONE' to be shown on the display. The instruction can be used to ask for a confirmation of single-tone transmission using the * key.

SEND *seq*

The SEND range of instructions is used to transmit selective call digits and DTMF tones. The digit or tone values can be fixed in the encode format, the so-called immediate digits, or they can be retrieved from the internal tables, the indirect digits. Immediate digits are entered in a format consisting of a hash-sign (#) followed by one or multiple digits. Indirect digits are entered as ^-sign plus pointer character and one or more indexes. One sequence can contain up to 63 instructions, thus allowing approximately 50 tones to be sent in a sequence. Examples of immediate and indirect reference of digits can be found in section 6.7, under the CMP command.

SLEN *ofs*

Instruction SLEN causes a digit to be sent as selcall or DTMF, the value of which is determined from the length of the dialled number string. The digit value is calculated as (Length + Offset) MOD 10, and thus has a value ranging from 0 to 9.

The SLEN instruction can be used to build a data-packet to transmit dialling information from the radio to an infrastructure connected to the PSTN.

SPREV

Instruction SPREV can be used to choose the channel that had been selected before scanning was activated. This instruction can be used to switch off scanning fully from an encode format, just as if switching off scanning manually.

STOPP

Instruction STOPP switches off priority scanning. Note that the related XPRI instruction will test the priority scan state at the time when the encode format was started, not at the time when the XPRI instruction is executed.

STOPS

Instruction STOPS switches off scanning. Note that the related XSCAN instruction will test the scanning state at the time when the encode format was started, not at the time when the XSCAN instruction is executed.

TEXT *'text'*

Instruction TEXT outputs text to the display. All characters can be entered, yet some characters will be more difficult to read because of the limited displaying capability of characters in the 7-segment format. Characters are shown on the large 5-digit display section and are shifted from right to left. The speed of shifting characters on the display can be set using the LEN command.

TONE *af-freq*

Instruction TONE allows transmission of any tone between 300 and 3000 Hz. The length of the tone can be defined using the LEN instruction, which must be inserted before the TONE instruction. For example, encode sequence 'LEN 1200 TONE 1550' sends a tone of 1550 Hz during 1.2 seconds. Single-tone transmission is frequently used for repeater operation, group calls, or all-close in certain selective call systems.

ERRX1

After execution of instruction ERRX1, exiting an encode instruction due to one of the exit conditions (for example, instruction XOPEN) causes the radio to sound an error alert.

LEN *xtime*

Instruction LEN defines the duration per tone for TONE, SEND, SLEN, SCHK and SDIAL instructions. The range of *xtime* is 1 to 7000 ms in 1 ms steps, thus allowing a precise tone duration of up to 7 seconds.

OPEN

Instruction OPEN forces selcall mute to the open state. Note that the related XCLOS instruction will test the selcall mute state at the time when the encode format was started, not at the time when the XCLOS instruction is executed.

PREFA

Instruction PREFA causes the radio to select the preference channel when scanning is activated. The PREFA instruction can be used to choose a predefined channel to transmit on when the PTT button is pressed while in scanning mode, regardless of whether scanning has stopped temporarily or not.

PREFS

Instruction PREFS causes the radio to select the preference channel when checking channels in the scanning mode. The PREFS instruction can be used to choose a predefined channel to transmit on when the PTT button is pressed while the radio is in scanning mode but is not stopping on a channel.

RACK *stime dec*

Instruction RACK is used to trigger a decode format when a full selective call sequence is received within a specified period of time. This period is defined by *stime*, which ranges from 10 to 2550 ms in 10 ms steps. String *dec* determines which decode format will be triggered.

The RACK instruction can be used to ch whether a transpond call is returned from called unit, or to check whether a call is ackn ledged before retrying (see also REP instructi If no ACK instruction is triggered by a lis decode format, the minus sign will be shown the display after the time-out period has elaps

REP *rep*

Instruction REP can be used to repeat an enc format for a specific number of times. Param *rep* defines how often the current encode for will be repeated. Use RSMS or RSML to res a sequence after the defined period of time. T the decode format instruction REPOF to bi off the repetition of encode sequences before end of the programmed period.

RIGN *stime*

Instruction RIGN causes the auto-close featur be disabled during a period of time. The rang *stime* is 10 to 2550 ms in 10 ms steps. This struction can be used in combination with 'automatic close' feature to prevent the unit fr closing automatically when expecting a tra pond call (acknowledge call from another when calling that unit).

RSML *ltime*

After passing instruction RSML, execution of encode sequence is suspended and restarted fr the beginning after a period of time. This pe is defined by *ltime*, which ranges from 1 to 2 seconds in 10 second steps.

RSMS *stime*

After passing instruction RSMS, execution of encode sequence is suspended, and resta from the beginning after a period of time. T period is defined by *stime*, which ranges from to 2550 ms in 10 ms steps.

RTSA

Instruction RTSA causes the Return-to-Stan state to be set to active, and resets the Return-Standby timer to the active period of time.

TPD

Deactivates the transparency mode that has been activated with TPE.

TPE

Enables the transfer of a large packet of data using selective call tones, without causing other units to be called because of matching sequences. When the transparency mode has been activated by TPE, a D-digit will be inserted after every fourth digit that is transmitted, which will prevent other units from being called. The TPE instruction is normally used in combination with the SDIAL instruction for transferring a dialling string.

TSET ***toneset***

Instruction TSET selects the toneset for transmission of selective call messages. The available tonesets are: ZVEI, CCIR, EEA, PZVEI, DZVEI, PCCIR, PDZVEI, ZVEI2, EIA, Natel, AP-369 and Kenwood. Note that the length per tone is not defined in the TSET instruction, but must be set separately using the LEN instruction.

TXD

Switches to transmit mode, prepared for DTMF digit transmission. For each following SEND and related instructions, DTMF digits will be sent.

TXF ***rf-freq***

Switches to transmit mode, using the in-line specified RF frequency. The specified RF frequency must be within the selected RF band. For example, in a VHF radio, the instruction TXF 149.0500 will cause the radio to transmit on 149.0500 MHz. The transmit path selection will not change.

TXM

Switches to transmit mode, prepared for speech (microphone) transmission.

TXP

Switches to transmit mode, using the programmed frequency for the selected channel. The transmit path selection (selcall, DTMF, microphone) will not change.

TXS

Switches to transmit mode, prepared for selcall digit transmission. For each following SEND and related instructions, selective call digits will be sent.

TXTOF

The TXTOF instruction restores the normal operation mode of the display, after the display has been used for text output with the TEXT command.

WAITR

Waits until the key has been released. This instruction can be used to prolong DTMF tones that are sent when keys are pressed in the DTMF overdialling mode.

XCARR

The XCARR instruction will abort execution of the current encode format if an RF carrier is detected by the receiver. XCARR can be used to create a carrier lockout condition to prevent speech transmission and / or calls while the channel is occupied.

XCLOS

The XCLOS instruction will abort execution of the current encode format if the selcall mute state was 'closed' when the current encode format was started. The following example describes a possible application: to prevent the transmission of an immediate call while the radio is in a 'closed' state, encode sequence 'OPEN XCLOS' to cause the radio to open first and test the selcall mute state before executing OPEN. Execution of this sequence will be aborted if the radio was previously in a closed state.

XCTCN

The XCTCN instruction will abort execution of the current encode format if an RF carrier is detected by the receiver without SAT or with a wrong SAT tone received simultaneously. This instruction can be used to lock out usage of a repeater station when the repeater is used by another user group.

XCTCW
The ON instruction will abort execution of the current encode format if no carrier is detected, or if no SAT or a wrong SAT tone is received. This instruction can be used to allow transmission only if a valid SAT tone or code has already been received.

XIDLE
The XIDLE instruction will abort execution of the current encode format if the Return-to-Standby mode is set to idle.

Execution proceeds when the Return-to-Standby mode is set to listen (monitor) or active.

XLIST
The XLIST instruction will abort execution of the current encode format if the current Return-to-Standby is not set to active. This instruction can be used to prevent speech transmission in the Return-to-Standby idle or listen (monitor) state.

XNOT
The XNOT instruction will abort execution of the current encode format if the transfer function is disabled. This instruction can be used to transmit a transfer call or pager call when the radio receives an incoming call or to prevent transmission of such a call if this function has been disabled by the user of the radio.

XOPEN
The XOPEN instruction will abort execution of the current encode format if the selcall mute state was 'open' when the current encode format was started. This instruction can be used to prevent calls while the unit is opened (for example in dispatch-oriented systems).

XPRI
The XPRI instruction will abort execution of the current encode format if priority scanning was activated at the start of the current encode format. See XCLOS example for combining XPRI with STOPP.

XSCAN
The XSCAN instruction will abort execution of the current encode format if scanning was activated at the start of the current encode format. See XCLOS example for combining XSCAN with STOPS.

XSENS
The XSENS instruction will abort execution of the current encode format if the radio is scanning and has not temporarily stopped because of activity on a channel. Thus, XSENS can be used to allow transmission if scanning is not active or if scanning has temporarily stopped on a channel.

6.9 Configuration

The Configuration parameters determine the settings of the ports to be used for programming the radio unit and printing the programmed (administrated) data. Some of these parameters may have been programmed already by the manufacturer.

Dealer identity
Range: 0 .. 30000

Gives the code to identify the supplier of the radio. Enter the relevant code. This parameter may also be programmed by the manufacturer, if necessary, in which case it cannot be changed.

Licenced to
Range: up to 40 characters

Enables the entry of the name and address of the licensed user. This parameter may also be programmed by the manufacturer, if necessary, in which case it cannot be changed.

CTCSS selection
Range: Frequency, CTCSS code

Determines whether the programmed CTCSS transmit and receive codes in the channel menu are shown as CTCSS frequencies in Hz (Frequency) or as call signs (CTCSS code).

TransLink port
Range: COM1, COM2

The TransLink port must be a serial port on the PC with 9 or 25 pin male connector (COM1 or COM2). It is the port that is used to connect the programming cable and program the radio unit.

Printer port
Range: PRN1, PRN2, PRN3, LST

Denotes the printer port of the current computer system that is used to send the printing data to the printer. PRN1 and PRN2 are the first and secondary, parallel, ports, while PRN3 is usually available on a video adapter. LST can be used to select the standard printer output, which can be redirected to, for example, a network printer.

User feedback
Range: None, Beep, Message, Beep+Msg

This parameter determines how the user feedback is realized during file loading and saving procedures and during compilation of encode and decode functions. Select None to disable this function.

Initialize string
The initialize string serves to activate the default configuration of the printer that is used for printing the programming data. Refer to the user manual of your printer for more information.

Bold printing
To print out the programming data in a way similar to the presentation on the screen (with part of the text printed bold), you need to enter the relevant lead-in string to activate this mode on the printer. This lead-in string may be entered as ASCII codes (format: \nnn, e.g. the function Esc can be activated with ASCII code \027). Refer to the user manual of your printer for more information. Usually, the printer manual also contains a list of ASCII codes. If not, refer to your DOS manual for these codes.

Normal printing
Enter the string for reactivating the normal printing mode on your printer, after bold printing has been active (see above).

Next page string
Enter the string to be sent to the printer at the end of each page. Refer to the user manual of your printer for the correct string value.

Exit string
The exit string serves to reset the printer after the programming data have been printed, to restore the initial printer state (see initialize string above). Refer to the user manual of your printer for the correct string value.

Number lines/page
Range: 0, 1 .. 255

This parameter defines the number of lines per page. The maximum number of lines the page can hold depends on the printer configuration and on the paper size. Enter 0 for a continuous print-out.

7 Troubleshooting

This chapter gives an overview of error messages that may be generated by the program and need additional explanation.

Message Channel number does not exist
Problem The entered channel number is not valid.
Action Enter a correct number or program the channel first, in the Channel parameters window.

Message Error writing to configuration file
Problem The file cannot be saved: the file may be read-only or you may not have rights in the current directory.
Action Make sure you have writing rights in the current directory and the standard configuration file is not flagged as read-only.

Message Failure writing file
Problem The file cannot be saved: the disk may be full or corrupt.
Action If the disk is full, either delete some files or replace the (floppy) disk. If the disk is corrupt, reformat the disk.

Message ERROR: entered CTCSS frequency or code does not exist
Problem You have entered an invalid frequency or code.
Action Refer to appendix B for valid entries.

Message Device error while accessing EEPROM
Problem EEPROM cannot be programmed due to hardware failure.
Action Return the radio to a qualified service engineer for repair.

Message TransLink communications failure
Problem There is no radio connected or it is not connected properly.
Action Make sure the radio is connected properly in the way described in section 5.8.4.

Message TransLink access failure
Problem The radio cannot be programmed, either because another, non-Kenwood product with TransLink is connected, or because the connected radio has been programmed incorrectly (that is, with incompatible data).
Action You can attempt reprogramming in the following way:

1. Make sure the correct file has been loaded and the data have been entered correctly.
2. Select the **Files / programming** menu and move the cursor to the **Program radio** option. Do *not* press **Enter** yet.
3. Make sure the programming cable is connected properly (see 5.9.4).
4. Make sure the radio is turned off.
5. Press **PTT** and hold it down.
6. Turn on the radio, while still holding down **PTT**.
7. Press **Enter** to activate the **Program radio** option. Do not release the PTT button until the programming is over.

The radio should now be programmed successfully. When all data have been programmed (100 %), the radio generates the alert tone and displays the initial channel number.

Message No formats defined
Problem You cannot select a format because there have been no formats defined yet.
Action Define the decode and encode formats first. Refer to sections 5.7.2 and 5.7.3 for details.

Message No systems defined
Problem You cannot select another system (block), because no other system blocks have been defined.
Action Program another system block first. Refer to section 5.4 for details.

Message Information changed since last update; are you sure you want to discard it [Y/N] ?
Problem You want to quit a menu without compiling and storing the information first.
Action Compile and store the data before quitting.

Message No files found matching <entered filename>
Problem No files were found matching the entered file specification.
Action Enter the correct file specification.

Message Key macro facility is not enabled; select size and number of macros within the setup-menu.
Problem This facility is not available due to restrictions in functionality.
Action None: the facility cannot be activated.

Message Error: size of entered macro is too large
Problem You have exceeded the maximum size of a macro, which is 63 bytes. This is roughly equivalent to 63 key strokes.
Action Simplify the current macro.

Message Error: entered macro string is not correct
Problem You have entered incorrect key label or control characters.
Action See 6.6 for an overview of valid key labels and control characters.

Message No scan groups available; select number of scan groups within the setup menu
Problem You need to define the maximum number of scan groups before you can define the channels for each scan group.
Action Enter the maximum number of scan groups in the Setup portable window (see 6.1).

Compilation errors:

Message Error: format definition not compiled; continue [Y / N]:
<encode/decode formats>

Problem You have not yet compiled the current encode/decode format. If you continue (Y), the data cannot be saved.

Action
1. If you want to save the format, press N to go back to the format editing window.
2. Press **F2** to compile the current format. For details, see 5.8.2 and 5.8.3.

If you do not want to save the current format, press Y to continue.

Message Error: instruction not found

Problem The entered instruction is not valid.

Action Check the appropriate section in the manual for valid instructions, and correct the entry.

Message Error: too many instructions

Problem The encode or decode format is too large to fit in the 47 byte buffer.

Action Simplify the encode or decode format, or create a linked encode or decode format.

File errors:

Message File not found

Problem The file does not exist or is not located in the current directory.

Action Check if the file name is entered correctly or if the file is located in the current directory. If it is in a different directory, specify the path.

Message Path not found

Problem The path you have specified is not correct and cannot be accessed from the current location.

Action Check the current directory and specify the correct path.

Message Error while writing to file

Problem The disk may be corrupt, or another unexpected problem has occurred while writing.

Action Check the floppy disk or the operation of the hard disk before retrying.

Message Too many open files

Problem The operating system has no buffers available to access more files on disk.

Action Increase the number of files (FILES =) in the CONFIG.SYS file. See DOS user manual for details.

Message File access denied

Problem The file is read- and / or write-protected.

Action Flag the relevant file as read / write.

Message Invalid drive

Problem Drive not available.

Action Select the correct drive.

Message Read beyond end of file

Problem The file that has been accessed is corrupt.

Action Restore the file from a backup copy, or re-create the file.

Message Disk full

Problem The files cannot be saved, because the disk is full.

Action Save the file to another (floppy) disk.

Appendix A
Selcall Toneset Standards

Tone	ZVEI	CCIR	EEA	PZVEI	DZVEI	PCCIR	PDZVEI	ZVEI2	EIA	Natel	AP-369	Kenwood
0	2400	1981	1981	2400	2200	1981	2200	2400	600	1633	980	815
1	1060	1124	1124	1060	970	1124	970	1060	741	631	1190	882
2	1160	1197	1197	1160	1060	1197	1060	1160	882	697	1380	954
3	1270	1275	1275	1270	1160	1275	1160	1270	1023	770	1600	1032
4	1400	1358	1358	1400	1270	1358	1270	1400	1164	852	1800	1117
5	1530	1446	1446	1530	1400	1446	1400	1530	1305	941	2010	1209
6	1670	1540	1540	1670	1530	1540	1530	1670	1446	1040	2220	1308
7	1830	1640	1640	1830	1670	1640	1670	1830	1587	1209	2410	1415
8	2000	1747	1747	2000	1830	1747	1830	2000	1728	1336	2590	1531
9	2200	1860	1860	2200	2000	1860	2000	2200	1869	1477	2820	1657
A	2800	2400	1055	970	2600	1050	825	885	2151	1633	770	1939
B	810	930	930	810	886	930	886	N.T.	2433	600	N.T.	2270
C	970	2247	2247	2800	586	2400	2600	740	2010	1995	N.T.	2098
D	886	991	991	886	810	991	856	N.T.	2292	2205	N.T.	2457
E	2600	2110	2110	2600	2400	2110	2400	970	459	1805	2960	1792

All frequencies are in Hz

Tone length (ms)

70	100	40	70	70	100	70	70	33	100	100	70

Definitions:

A	Group tone
C	Default remote close
E	Repeat tone
N.T.	No tone specified

Appendix B
CTCSS Frequencies

#	Call sign	Frequency (Hz)
1	XZ	67.0
2	XA	71.9
3	WA	74.4
4	XB	77.0
5	WB	79.7
6	YZ	82.5
7	YA	85.4
8	YB	88.5
9	ZZ	91.5
10	ZA	94.8
11	ZB	97.4
12	1Z	100.0
13	1A	103.5
14	1B	107.2
15	2Z	110.9
16	2A	114.8
17	2B	118.8
18	3Z	123.0
19	3A	127.3
20	3B	131.8
21	4Z	136.5
22	4A	141.3
23	4B	146.2
24	5Z	151.4
25	5A	156.7
26	5B	162.2
27	6Z	167.9
28	6A	173.8
29	6B	179.9
30	7Z	186.2
31	7A	192.8
32	M1	203.5
33	M2	210.7
34	M3	218.1
35	M4	225.7
36	M5	233.6
37	M6	241.8
38	M7	250.3

Appendix C
DCS codes

DCS employs a fixed octal digit (4) as the first digit, followed by three octal digits, which are shown in the table below. Codewords are 23-bit strings: 12 bits of octal code (9 bits address, 3 bits synchronization code), followed by 11 bits of CRC. Each bit is 7.5 ms, which means just over 170 ms per word.

Low series	100 series	200 series	300 series	400 series	500 series	600 series	700 series
023	114	205	306	411	503	606	703
025	115	223	311	412	506	612	712
026	116	226	315	413	516	624	723
031	125	243	331	423	532	627	731
032	131	244	343	431	546	631	732
043	132	245	346	432	565	632	734
047	134	251	351	445		654	743
051	143	261	364	464		662	754
054	152	263	365	465		664	
065	155	265	371	466			
071	156	271					
072	162						
073	165						
074	172						
	174						

The turn-off code is 200 ms of 134 Hz.

Appendix D
DTMF Frequencies

Digit	F_{HIGH}	F_{LOW}
1	697	1209
2	697	1336
3	697	1477
4	770	1209
5	770	1336
6	770	1477
7	852	1209
8	852	1336
9	852	1477
0	941	1336
*	941	1209
#	941	1477
A	697	1633
B	770	1633
C	852	1633
D	941	1633

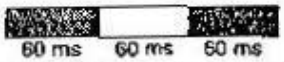
Appendix E
Alert Tones

This appendix lists the available tone sequences.

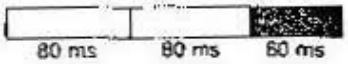
Beep numbers 26 to 31 are not available yet.

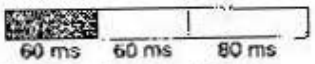
0 

Default for key beep.

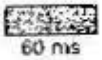
1 

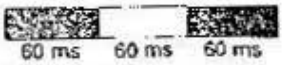
Default for double beep (used for activation of hold function).

2 

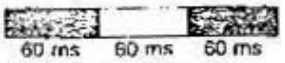
3 

Default for error beep.

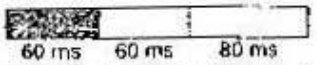
4 

5 

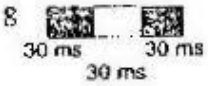
Default for power-up beep.

6 

Default for PTT time-out warning beep.

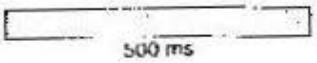
7 

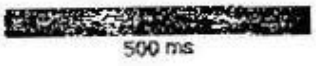
Default for PTT time-out beep.

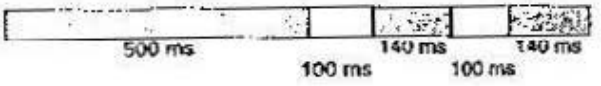
8 

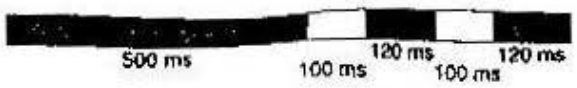
Default for macro error beep.

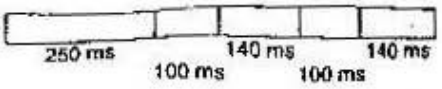
9 

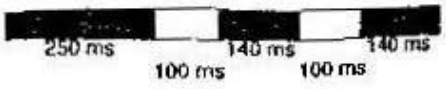
10 

11 

12 

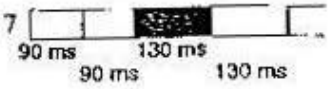
13 

14 

15 

16 

This sequence is repeated four times.

17 

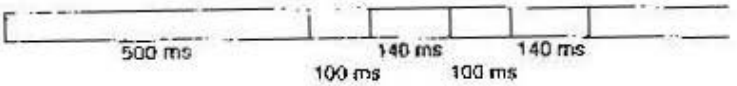
This sequence is repeated four times.

18 

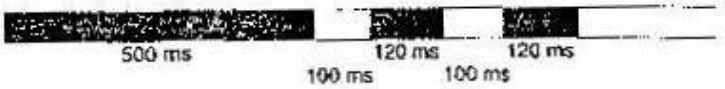
This sequence is repeated every 15 seconds, 254 times in all.

19 

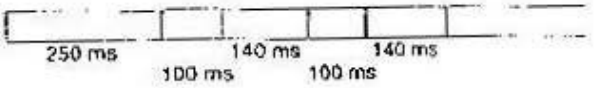
This sequence is repeated every 15 seconds, 254 times in all.

20 

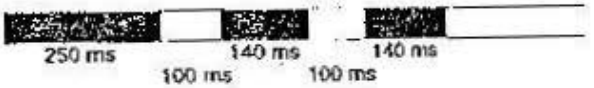
This sequence is repeated every 15 seconds, 254 times in all.

21 

This sequence is repeated every 15 seconds, 254 times in all.

22 

This sequence is repeated every 15 seconds, 254 times in all.

23 

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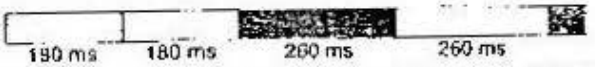
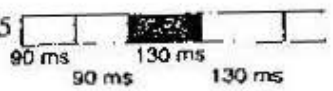
24 

This sequence is repeated every 15 seconds, 254 times in all.

25 

This sequence is repeated every 15 seconds, 254 times in all.

Appendix F
Programming examples

Below follows a number of examples to illustrate the use of decode / encode formats and macros and the way in which these can be programmed.

1. Encode format for 5-tone selcall using 70 ms ZVEI tones, with tones taken from the default tx address, using two variable digits in the fourth and fifth positions, a lead-in delay of 200 ms and lead-out delay of 10 ms:

   TXS DEL 200 TSET ZVEI LEN 70 SEND ^D123^K45 DEL 10 RX

2. Encode format for 5-tone selcall using 100 ms CCIR tones, prolonged first tone of 1200 ms, with the first two tones taken from the default tx address and the next three tones fixed as '837', a lead-in delay of 150 ms and a lead-out delay of 5 ms:

   TXS DEL 150 TSET CCIR LEN 1200 SEND ^D1 LEN 100 SEND ^D2#837 DEL 5 RX

3. Encode format for 2*5-tone format using 100 ms CCIR tones, with the first five tones taken from the keypad selectable buffer and the next five tones from the primary receive address, a lead-in delay of 200 ms, an inter-sequence gap of 300 ms and a lead-out delay of 10 ms:

   TXS DEL 200 TSET CCIR LEN 100 SEND ^K12345 DEL 300 SEND ^P12345 DEL 10 RX

4. Encode format for sending an ident message when the PTT button is pressed, consisting of a 5-tone selcall message of 40 ms CCIR tones, in which the tones are taken from the secondary receive address, with a lead-in delay of 80 ms and a delay of 20 ms from selcall to microphone activation:

   TXS DEL 80 TSET CCIR LEN 40 SEND ^S12345 DEL 20 TXM

5. Encode format for sending a single tone of 1200 Hz with a duration of 1500 ms, preceded by a lead-in delay of 100 ms and followed by a lead-out delay of 10 ms:

   TXS DEL 100 LEN 1500 TONE 1200 DEL 10 RX

6. Encode format, to be linked to PTT-press (system format), which starts CTCSS transmission as programmed for the selected channel with a lead-in delay of 50 ms:

   SCTP TXS DEL 50 TXM

7. Encode format, to be linked to PTT-release (system format), which causes the radio to continue transmitting for 250 ms after releasing the PTT-button without CTCSS, to mute the other party's receiver without a trailing noise burst:

   TXS SCOFF DEL 250 RX

8. Encode format for transmitting an emergency call consisting of a selective call taken from the primary receive address, using 5-tone 70 ms ZVEI with 200 ms lead-in and 50 ms lead-out, the microphone activated for 10 seconds (2*5 s), and a receiving period of 5 seconds, repeated for 15 times or until the radio is turned off; the user indications are switched off during this state:

   TXS EMGON DEL 200 TSET ZVEI LEN 70 SEND ^P12345 DEL 50 TXM DEL 5000 DEL 5000 REP 15 RX RSML 5

9. Encode format for transmitting a 5-tone selcall message copied from the default transmit address, using 70 ms, and trigger decode format 'Check_ACK' for 1500 ms to check if the call has been received successfully by the called party:

   TXS DEL 150 TSET ZVEI LEN 70 SEND ^D12345 DEL 20 RACK 1500 Check_ACK RX

Decode format 'Check_ACK' is entered as follows:

CMP ^D12345F ACK

10. Encode format for transferring free-dialling information, using a specific selcall format, a lead-in delay of 200 ms, a lead-out delay of 40 ms and the ZVEI toneset with 70 ms tones. The format consists of a fixed 59492 sequence, a length indicator (length MOD 10), the dialled digits, and a checksum (sum of digits MOD 10):

    SELD TXS DEL 200 TSET ZVEI LEN 70 SEND #59492 SLEN 7 SDIAL SCHK DEL 40 RX

11. Encode format for PTT-press to stop scanning temporarily when the PTT button is pressed and to transmit speech on the current channel if not scanning or if scanning has temporarily halted on an active channel, or else use the preference channel. An error beep is sounded when the radio has not been opened previously:

    ERR1 XCLOS PREFS TXM

12. Encode format for PTT-press to open selcall mute if closed and sound an error beep, or to transmit speech immediately if selcall mute is already open:

    ERR1 OPEN XCLOS TXM

13. Encode format, to be linked to DTMF single-tone (system format), which transmits a DTMF tone of a length of 200 ms preceeded and followed by a pause of 50 ms. This encode format is triggered by pressing a key while holding down the PTT button.

    TXD DEL 50 LEN 200 SEND ^M2 DEL 50 TXM

14. Encode format for a 6-tone status call using 70 ms ZVEI tones, with the first 5 tones taken from the default rx address and a 6th status digit, a lead-in delay of 200 ms and a lead-out delay of 20 ms. After activating this encode format, the radio requests entry of the status digit; to confirm the call, press the * button.

    SELS TXS TSET ZVEI LEN 70 DEL 200 SEND ^P12345^M1 DEL 20 RX

15. Decode format to check for a single 5-tone sequence, using the programmed 5-tone primary rx address. When receiving a valid individual or group call, an alert tone will be sounded and the radio opens.

    CMP ^P12345 MONO BEEP 12

16. Decode format to check for a single 5-tone sequence, using the programmed 5-tone primary rx address. Depending on whether decoding a valid individual or group call, a different alert tone will be sounded. The radio will open and the mode LED will flash.

    CMP ^P12345 BEEP1 12 BEEPG 14 MONF

17. Using a general 5-tone format, this decode format provides several functions to demonstrate remote open (MONO), remote close (MONC), remote stun (RSTUN), remote revive (RVIVE) and remote kill (RKILL). The fixed sequences attached to these functions are 59402, 59403, 59410, 59411 and 59412 in the order mentioned above.

    CMP #59402 MONO CMP #59403 MONC CMP #59410 RSTUN CMP #59411 RVIVE CMP #59412 RKILL

18. Decode format for standard 5-tone decoding and 6-tone Philips remote close. For decoding, the primary address is used:

    CMP ^P12345#F MONO BEEP 12 CMP ^P12345#C MONC

19. Decode format for standard 5-tone decoding. A transpond call will be returned when an individual call is received by triggering encode format 'Transpond'.

    CMP ^P12345 MONO BEEP 12 ENCI Transpond

    Encode format 'Transpond' is entered as follows (standard 5-tone ZVEI with 150 ms lead-in and 20 ms lead-out):

    TXS TSET ZVEI LEN 70 DEL 150 SEND ^P12345 DEL 20 RX

20. Decode format for 7-tone messages, of which the first five tones must match the primary rx address, and the next two tones are stored in the queue for call-back:

    CMP ^P12345 STO 45 CMP #F OPEN BEEP 12 QUEUE

21. Linked decode formats for decoding and queueing two-by-five tone messages; first 5-tone must match primary rx address, next 5-tone address is stored in the queue for call-back; time between end of first and end of second 5-tone sequence may not exceed 1000 ms.

    Decode format '2x5-decode':

    CMP ^P12345#F DECAT 1000 2x5-queue

    Decode format '2x5-queue':

    STO 12345 CMP #F QUEUE OPEN BEEP 12

Glossary

ASCII: American Standard Code for Information Interchange.

CCIR: Sequential tone signalling system recommended by the Comité Consultatif International de Radio.

CTCSS: Continuous Tone Controlled Squelch System, also called Tone Lock or Tone Squelch. A continuous (sub-audible) tone is modulated onto the carrier in addition to other signalling or voice traffic. By using one particular tone for a number of receivers, it is possible to send messages to selected receivers only.

DCS: Digital Coded Squelch. Also called DPL or Digital Private Line.

DPL: Digital Private Line. Motorola equivalent for DCS.

DTMF: Dual Tone Multiple Frequencies. Also called touchtone.

DZVEI: Depressed ZVEI, a modified form of ZVEI, with lower signalling frequencies.

EEA: Sequential tone signalling system recommended by the Electronic Engineering Association.

Group call: A transmission addressed to a group of radio receivers. In this way, a single message can be sent to many mobiles simultaneously.

ICM: Integrated Controller Module. Concept for integrated control of channel switching, channel scanning, selective calling, CTCSS, DCS and DTMF.

Identity: The name given to each tone sequence which is used in sequential tone signalling. They can be either encode identities, tone sequences which are transmitted when a particular condition occurs (e.g. PTT-press), or decode identities, tone sequences with which incoming tone sequences are compared.

LCD: Liquid Crystal Display.

LED: Light-Emitting Diode.

LET: Link Establishment Time. The time for which the carrier is transmitted before any signalling tones or audio are transmitted. This allows the base station receiver some time to detect the carrier and ready itself to receive the message.

Lockout: A facility which combines receiver lockout (user only allowed to enable the loudspeaker when called) and transmit inhibit facilities (user not allowed to transmit on busy channels, except for an emergency call).

PCCIR: A modified form of CCIR, used in PYE systems.

PSTN: Public Switched Telephone Network.

PDZVEI: A modified form of DZVEI, used in PYE systems.

PZVEI: A modified form of ZVEI, used in PYE systems.

RtS: Return-to-Standby. Facility offered by ICM, causing the radio to close after a period of inactivity on a channel.

SAT: Sub-Audible Tone. Includes CTCSS and DCS, because they both use the sub-audible frequency range from 0 to 250 Hz.

Scanning: A facility for continuously monitoring a selected group of channels, switching between the relevant channels in cyclic sequence.

Squelch: A system used to suppress weak, unintelligible signals and random noise.

Transpond: A facility for automatically transmitting a predefined encode sequence in response to the user being called.

ZVEI: Sequential tone signalling system recommended by the Zentral-Verband der Electrotechnische Industrie.

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