

DETAILED USER'S GUIDE

THALES 25 PORTABLE RADIO (PRC6894)



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The information contained in this manual is current as of the date above. This manual is subject to change without notice as additional features are provided in future versions.

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APPENDICES

APPENDIX A – OPTIONAL FEATURES – ENCRYPTION (DES and AES) and OTAR

Appendix A provides an overview on Encryption. Details about encryption are also repeated as appropriate in the remainder of the manual. CVSD DES and P25 OFB DES were available since the radio initially shipped. AES was available beginning with version 8.0. OTAR was available beginning with version 5.15

APPENDIX B – OPTIONAL FEATURES – FIRE FEATURES

Appendix B provides details about the optional Fire Features. Fire Features include functions such as partial cloning, tone and other picklists, and zone password protection. Fire Features were available beginning with version 6.0.

Appendix C – OPTIONAL FEATURES - GPS REPORTING

Appendix C covers the radio operation of GPS reporting. It also provides a brief overview of some applications that it is used for. GPS reporting was available beginning in version 7.0.

FORWARD

This manual was prepared to be released concurrent with the **Thales 25 portable radio version 8.0** release.

The Thales 25 radio was developed using the Project 25 EIA / TIA-102 specifications. It is compatible with any radio that is Project 25 compliant, as well as any conventional FM radio operating in the 136 – 174 MHz band.

THE DEFAULT PASSWORD IS “000000”.

Organization of Manual

The Thales 25 portable has many features to make it usable to a wide variety of radio users. Not all features will be used by everyone. This manual attempts to break itself down into sections to make it easy to find information needed. The breakdown is as follows:

CHAPTER 1 – INTRODUCTION

Chapter 1 covers all the basics of the radio. It describes what all the switches are and also how to navigate the keypad. A brief description of all the possible programmable buttons is also provided here.

CHAPTER 2 – COMMONLY USED FEATURES

Chapter 2 covers the features that are currently being used by almost all current radio operators. At the time, these are scanning, and programming channels via the keypad, including keypad programming of a channel. Once more Project 25 systems come online, a few of the features in Chapter 3 (such as shadow channels) may be moved here.

CHAPTER 3 – ADDITIONAL FEATURES

Chapter 3 covers all remaining features currently implemented in the radio. Most of these are used by select customers. They are listed in alphabetical order to make them easy to find.

CHAPTER 4 – ACCESSORIES

Chapter 4 provides a brief overview on the operation of the available accessories. In some cases, the operation is so obvious, they are just mentioned.

CHAPTER 1.0 INTRODUCTION

RADIO CONFIGURATION

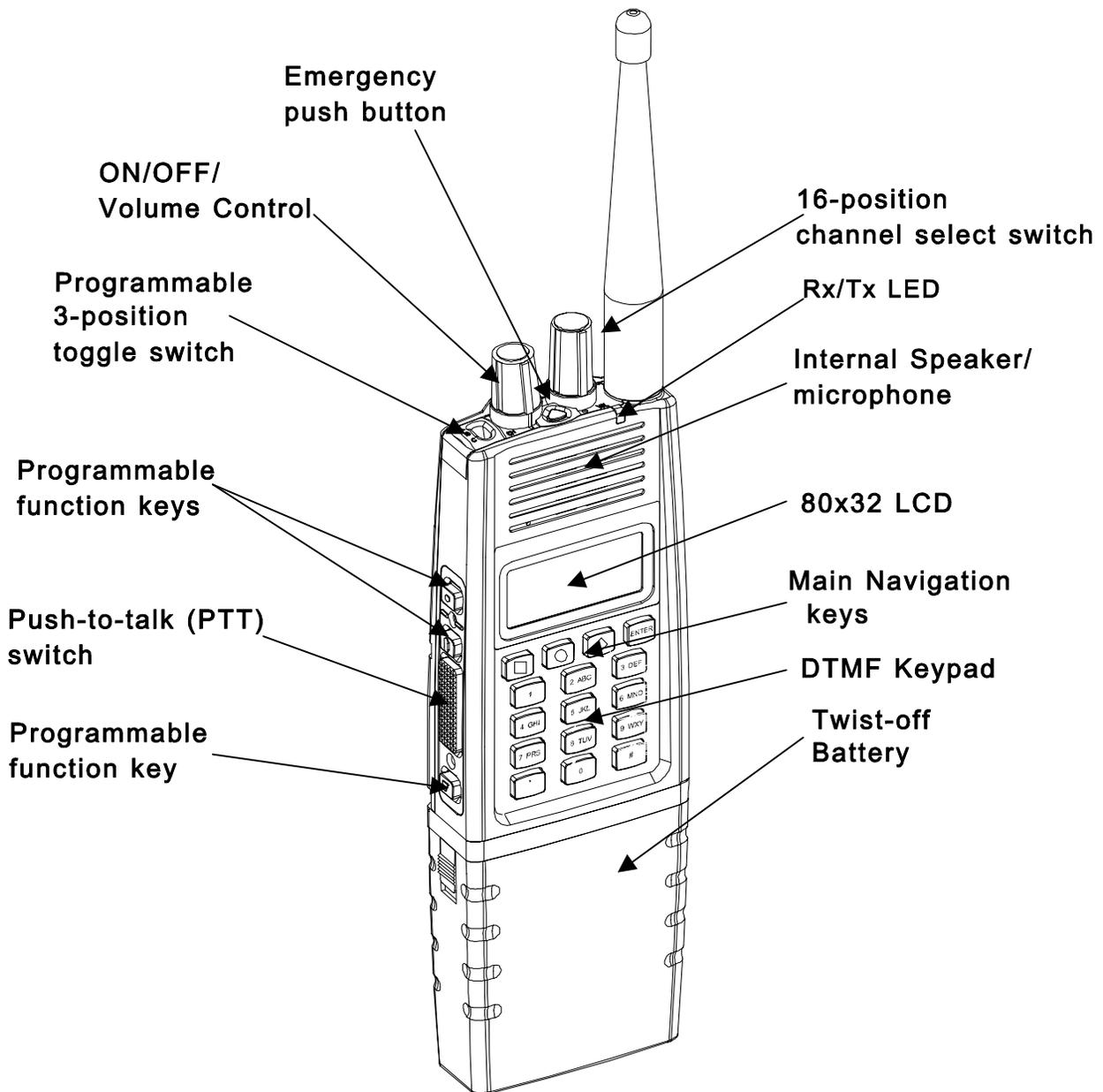
Channels contain all the information required to transmit and receive. The standard radio has a total of 256 programmable channels. Radios equipped with the Fire Features option adds an additional capacity of 48 channels in the event bank. Each channel may be programmed for receive and transmit frequencies, squelch, modulation, encryption, and transmit power using the MA6941C PC Programmer or via the radio keypad. With the exception of the special purpose channels, a channel **must** be assigned to a zone prior to use.

Zones are to provide a means to rapidly switch groups of channels. Each zone can contain up to 16 channels. If the toggle switch is set to "Zone Select", the radio provides easy access to 48 channels using the toggle switch, and the channel select knob. In addition, up to sixteen zones can be accessed from the radio keyboard and display in the standard radio. The Fire Features radio adds an additional three (3) zones. Channels can be mapped to the channel switch positions within each zone using the MA6941C PC Programmer. A zone **must** be assigned to a bank prior to use.

Banks are to provide a means of easily switching a set of zones (which contain channels) with a few key presses. This would be particularly useful when frequently traveling. For example, the Banks can be programmed with different geographic frequency plans. Up to 4 banks (with a maximum of sixteen zones each) can be programmed into the standard Thales 25 radio. Each bank contains a collection of zones, as well as defining priority channels, a home channel, and an emergency channel. The Fire Features radio adds the additional Event Bank.

PORTABLE RADIO

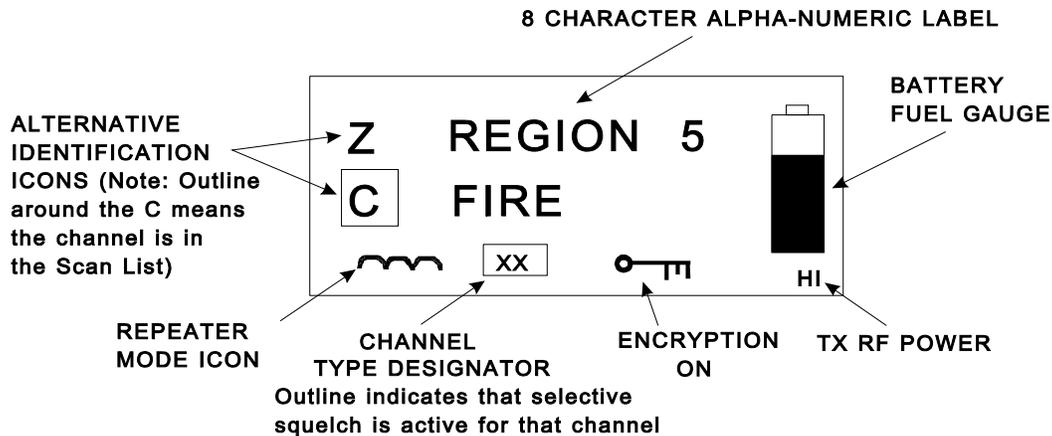
The figure below shows the various parts of the radio. Detailed of each function follows on the next pages



The Thales 25 Portable Radio

Default Display Screen

On initial power-up, the radio momentarily displays the radio title and the software version numbers. After a few seconds, this display is replaced by the default Display screen shown below. The display includes a battery "fuel gauge" indicator, a transmit power indicator, an encryption mode icon, a channel type designator, a repeater / talk-around mode icon, a zone label (top line), and a channel label (middle line).



Default Display Screen

Available Channel Type Designators are:

- Aw - Analog wide channel spacing (25 kHz)
- An - Analog narrow channel spacing (12.5 kHz)
- DG - Digital

If the Channel type Designator is outlined, some form of selective squelch is active for the channel (i.e. NAC, CTCSS, or DCS).

Channel indicators identify the type of channel, and in scan mode the designated transmit and receive channel (determined by Scan Revert mode). They are:

- C - Normal Channel
- H - Home Channel
- P - Priority Channel
- Rx - Receive Channel in scan mode
- S - Shadow Channel
- Tx - Transmit Channel in scan mode
- U - Unit ID Call Mode

Scanlist Channels

If the channel indicator “C” or alternative channel indicator from above list has a box around it, that channel is in the scanlist.

Scanlist Zones

If the zone indicator “Z” has a box around it, that zone is in the zone scanlist.

Repeater / Talkaround Icon.

If the repeater / talkaround icon is “TA”, the channel is a Talkaround (also known as TAC, direct, etc) channel. If it is a “∩∩”, the channel is a repeater channel.

Encryption Icon

The encryption icon will be blank if receiving an unencrypted signal or if set up to transmit an unencrypted signal. A key will be displayed if receiving an encrypted signal or set up to transmit an encrypted signal. The key will be normal video (dark icon on light background) if it is a DES key. It will be displayed in inverse video if it is an AES key conforming to FIPS 140-2.

Battery Gauge

The battery gauge is extremely accurate when using Lilon rechargeable batteries.

When using AA clamshell batteries, the battery gauge will read almost full continuously when idle. To get a better indication, watch the battery gauge while transmitting. It is normal for it to drop, but it should stabilize. If the battery gauge becomes depleted while transmitting, the AA batteries should be replaced.

Project 25 Unit ID display

The channel tag line may be programmed to display the received Project 25 Unit ID on digital channels. If a name in the UnitID picklist matches the alpha tag, that name will be displayed instead (if programmed). If this option is not utilized, the channel alpha tag will be displayed. The channel alpha tag will be displayed on analog channels.

CONTROLS AND INDICATORS

NOTE: Refer to The Thales 25 Portable Radio figure for this section.

Push-to-Talk (PTT)

The Thales 25 radio is normally in a ready to RX mode. (PTT is NOT depressed). To transmit, press PTT and speak into the radio in a normal voice. Distance from the radio is not critical, but 2-6 inches from the radio is optimal. To return to receive mode, release PTT.

LED

The LED indicates several conditions of the radio as follows:

- **RED** – radio is transmitting
- **Solid GREEN** – Radio has detected RF traffic on the channel
- **Flashing GREEN** – Radio has detected an encrypted signal on the channel
- **Orange** – Radio is indicating an Alarm condition. These can be low battery, failed Power-On-Self-Test (POST), Transmit timeout has occurred, etc. The LED will also be orange immediately after a flash update if the keypad firmware is being updated.
- **Flashing Orange** – Indicates database error. If the radio appears to be otherwise operating, the standard features of the radio will be functional, but all optional modes will not be (Encryption, OTAR, Fire Features, etc). The radio will need to be returned to the factory to resolve this error.

Internal Speaker and Microphone

The internal speaker is active whenever external audio accessories are not being used. The internal microphone (located behind the white dot near the speaker) is active whenever the portable's PTT is pressed.

Volume Control

The volume knob is a 16-position rotary switch. The volume increases as it is turned clockwise. Fully counterclockwise is OFF. **Position 1 (1 past OFF) provides a special mode where the radio is ON, but the speaker is OFF.** This will be indicated by "MUTE" in the repeater icon space. This feature was in response to customer requests, since the remaining 14 volume positions provided adequate volume range.

Channel Selection

The channel switch is a 16-position rotary switch. The current channel is displayed on the LCD screen.

When the radio is programmed with 2 or 3 zones, the 3-position toggle switch is usually programmed as a zone select switch. Each zone is a grouping of up to 16 channels. By selecting one of the 3 zones, and one of the available channels, this provides the user quick and easy access to 48 channels. The additional channels can be selected via the keypad, which will be described in more detail in section on keypad navigation.

Keypad

The keypad is not required for basic operation of the radio. All channel information, and switch definitions can be programmed by the PC Programmer. The keypad may be used to either select options within the radio, or to re-program almost any parameter. It is used for DTMF signaling, keypad programming, feature selection, amongst other things.

Programmable Side Buttons

Three programmable side keys are located on the left side of the radio, two above and one below the PTT switch. These keys can be programmed using the PC Programmer (Global parameters screen). There are no restrictions on order of programming, or duplication of functions. The following is a list of the available functions and a brief description of them. See your radio programmer to inquire about the side button programming.

NOTE: The three most commonly used programmable side button functions are:

- **Hi / Lo Power** – especially useful when trying to conserve battery life.
- **Monitor** – Extremely valuable when using analog FM channels (also includes squelch control)
- **Scan** – when in non-scan mode, a quick press enables scan. Pressing and holding (for about 1 second) enters scan and priority scan mode. A quick press from any scanning mode exits scan.

Backlight – Toggles the radio's backlight from OFF to (BRIGHT+RX) to (DIM + RX) to BRIGHT to DIM with each side key press. The backlight timer is not affected. Globally affects radio. The (BRIGHT+RX) and (DIM+RX) are new options that turn the Backlite ON when a signal is received. The BRIGHT and DIM options turn the backlite ON only when keys are pressed.

Disabled – Ignores any attempted use, and provides an error warning tone. Globally affects radio.

Encryption – Toggles TX encryption from OFF to ON on channels programmed with encryption enabled ONLY (will not affect channels without encryption enabled). RX encryption is unaffected. Globally affects radio.

NOTE - : Channels that are encrypted may be locked by the PC Programmer to ignore this switch. The encryption button has no effect on these channels (they stay encrypted).

Hi/Lo Power – Toggles the radio power setting from HI to LO. HI and LO power settings are as programmed into each individual channel and may be the same power level. Globally affects radio.

Home Channel - Toggles the active channel from the Home Channel to the current channel selector switch channel. Normal operation resumes on channel, zone, or bank change. This function can also be accessed via the front keypad by pressing <ENTER> until the main menu screen appears, selecting home, then pressing <ENTER>.

Keypad Disable – Toggles the keypad through the settings listed below. NOTE THAT THIS KEY MUST BE HELD FOR APPROXIMATELY 1 SECOND TO ACTIVATE IT. Globally affects radio. This function can also be accessed from the keypad by pressing AND HOLDING the SQUARE key, and then pressing and holding <ENTER>.

Everything enabled:

KEYS ENABLED
SIDE ENABLED

Keypad only disabled (side keys and toggle switch still enabled):

KEYS DISABLED
SIDE ENABLED

Keypad, side keys (except PTT), and toggle switch disabled:

KEYS DISABLED
SIDE DISABLED

Monitor (includes squelch adjust) – Provides monitor and carrier squelch adjust functions. Globally affects radio. The function is described below:

- **Momentary press** – momentarily opens squelch (any mode).
- **Press and hold for 2 seconds** – locks radio into squelch open condition. To return to normal mode, momentarily press the monitor button.
- **Press and hold for 4 seconds** – activates carrier squelch adjust (on carrier squelch adjust channels only). To return to normal mode, momentarily press the monitor button.

Next Zone – Cycles the radio through all zones of the current bank programmed into the radio. This zone selection is stored in battery-backed RAM and will be retained as long as the battery is kept on the radio. If the battery is removed for an extended period of time (>10 minutes), eventually the ZONE will revert to the first zone of the default bank programmed into the radio.

Priority Scan – Toggles the priority scan mode from OFF to ON. Note that this does not affect regular SCAN, which works independently. Globally affects radio.

Scan – when in non-scan mode, a quick press enables scan. Pressing and holding (for about 1 second) enters scan and priority scan mode. A quick press from any scanning mode exits scan. Globally affects radio.

Scan List add/delete – Toggles the channel's scan list flag from ON to OFF. Affects current channel only. Note that this function is readily available from the keypad (middle two keys on top row), so this feature is recommended only when extra side keys are available.

Talkaround – Toggles channels enabled for talkaround from talkaround mode to repeater mode. Talkaround allows radio users to bypass a repeater and talk direct (DIRECT, CAR-CAR, TAC, etc) on a repeater channel). NOTE that the channels MUST have Talkaround enabled from the PC Programmer for this to have any affect. Globally affects radio.

3-position Toggle Switch

The three-position toggle switch, located on top of the radio can be programmed using the PC Programmer for the following. See your radio programmer to inquire about its programming.

NOTE: The most commonly used toggle switch function is:

- Radios with more than 16 channels: **ZONE SELECT**
- Radios with 16 channels or less: **MONITOR or SCAN**

Disabled – ignores any attempted use, and provides an error warning tone. Globally affects radio.

Encryption – Toggles TX encryption from OFF to ON on channels programmed with encryption enabled ONLY (will not affect channels without encryption enabled). RX encryption is unaffected. Globally affects radio.

The toggle positions have the following effect:

Position A: TX encryption enabled
Position B: TX encryption disabled
Position C: TX encryption disabled

NOTE -: Channels that are encrypted may be locked by the PC Programmer to ignore this switch. The encryption button has no effect on these channels (they stay encrypted).

Hi/Lo Power – Toggles the radio power setting from HI to LO. HI and LO power settings are as programmed into each individual channel, and may be the same power level. Globally affects radio.

The toggle positions have the following effect:

Position A: RF Power HI
Position B: RF Power LO
Position C: RF Power LO

Monitor (includes squelch adjust) – Provides monitor and carrier squelch adjust functions. The switch settings provide the setting described below:

The toggle positions have the following effect:

Position A: Squelch adjust mode (carrier squelch only)
Position B: Monitor ON
Position C: Programmed squelch mode (monitor OFF)

Scan on/ priority/off – Sets scan mode to ON, Priority (scan ON), or OFF. Scan mode will be as chosen via the keypad (Scan, Zone, or Search). Globally affects radio.

- All scan modes OFF
- Scan ON, Priority Scan ON
- Scan OFF, Priority Scan ON
- Scan ON, Priority Scan OFF

The toggle positions have the following effect:

- Position A: Radio shop defined option (usually SCAN = ON)
Position B: Radio shop defined option (usually SCAN and PRIORITY SCAN = ON)
Position C: All scan modes OFF

Talkaround – Toggles channels enabled for talkaround from talkaround mode to repeater mode. **NOTE that the channels MUST have Talkaround enabled from the PC Programmer for this to have any affect.** Globally affects radio.

The toggle positions have the following effect:

- Position A: Talkaround enabled
Position B: Talkaround disabled (repeater mode)
Position C: Talkaround disabled (repeater mode)

Zone Select – Selects Zone A, B, or C as programmed via the PC Programmer. **NOTE** that if a current zone has been replaced, such as via the “Next Zone” side key function, it will no longer match the PC Programmer zone assignments.

The toggle positions have the following effect:

- Position A: First zone (A) assigned in current bank via PC Programmer
Position B: Second zone (B) assigned in current bank via PC Programmer
Position C: Third zone (C) assigned in current bank via PC Programmer

Emergency button (Red button)

The emergency button on the top of the radio is typically used for the Project 25 Emergency operation but can be programmed by the PC Programmer for any of the following functions. See your radio programmer to ask how the buttons were programmed.

Disabled – ignores any attempted use and provides an error warning tone. Globally affects radio.

Emergency Mode – Pressing and holding for about ½ second will put the radio in emergency mode. The emergency message will be a duration on a repeat interval programmable by the PC Programmer. The emergency channel is programmed by the PC Programmer or the radio keypad. In the event that it is left blank, the current channel will serve as the emergency channel. In Project 25 mode the emergency bit is set. Since analog modes had no similar function, the radio performs an open-mic function for the duration and interval programmed by the PC Programmer. The emergency mode will continue until the radio's power is turned off or the emergency button is pressed and held for about ½ second again.

Two types of operation are available for the emergency mode – Alert and Silent. The preferred mode is selected in the PC Programmer GLOBAL screen.

In Alert Emergency mode, each time the radio transmits or receives emergency signals, the LED flashes ORANGE, an audible alarm is sounded and the LCD display indicates EMERGENCY.

In Silent Emergency mode, the LCD still indicates EMERGENCY, but the flashing lights and sounds are disabled.

Zeroize – Will erase all encryption keys in the radio.

KEYPAD NAVIGATION

This section is to describe the basics of Thales 25 keypad navigation. Only basic maneuvering is covered. An example and a keypad navigation tree is also provided. The PC Programmer will overwrite any information changed via keypad programming.

Top Row of Keys

The top row of keys change with the menu that is on the screen. Here are some basic rules:

Left Key – almost always ESC – goes back one level

Middle keys – wide variety of functions. When Arrow keys are present, it usually means to pick a value from a list. If they are blank, it usually means to directly enter a number

Right Key – Always ENTER. Selects or accepts a value

MAIN MENU Navigation

Press <ENTER> key on the keypad top row to access the Main Menu. The following screen will be displayed: (**NOTE:** If OTAR is enabled in the radio, the <ENTER> key will need to be pressed twice)

SCAN	PROGRM
SELECT	ALERTS
HOME	KMGR
ESC	▼
▲	ENT

To select one of the main menu items

Use the UP / DOWN arrow keys until the desired menu item is highlighted, then press <ENTER>. This will put the radio in the sub-menu mode.

NOTE: If programmed, passwords (Default password is “000000”) will be required for the PROGRM menu item:

Once a password has been entered, it will not be required again until the radio's power is cycled.

SUB MENU Navigation

Once a main menu item had been selected, its Sub Menu will appear. With the following exceptions, all Sub Menus follow the navigation described below:

Exceptions:

HOME has no submenu. It is a direct access to the HOME channel.

PROGRM will access an interim menu similar to the Main Menu prior to the applicable Sub Menus.

A representative sub menu screen of the SELECT menu item is:

ZONE =	Zone1		
BANK =	Bank1		
PHON =	-EMPTY-		
ESC	▼	▲	ENT

As an example, to enter the mode to change a bank, for example, scroll down to BANK until it is **highlighted**, then press the <ENTER> key on the keypad top row. This action will put the radio in a mode where only the Bank can be changed. At this point, since the arrow keys are visible, use them to select the desired bank and press <ENT> to accept, or press <ESC> to reject all changes and return to the previous menu. The arrow in the bottom left indicates that there are more bank selections available. All changes or selections are made in this manner.

BNK	01BANK1		
	02BANK2		
	03BANK3	▼	
ESC	▼	▲	ENT

Another way of understanding keypad navigation is to notice that the left side of the sub-menus are the variables that you want to change (Bank, Zone, etc.) and the right side of the sub-menus are where the variable data (Bank1, Bank2, Bank3) list appears to select from.

Keypad Navigation Tree

Default values, where applicable are in **BOLD**

Main Operating Screen

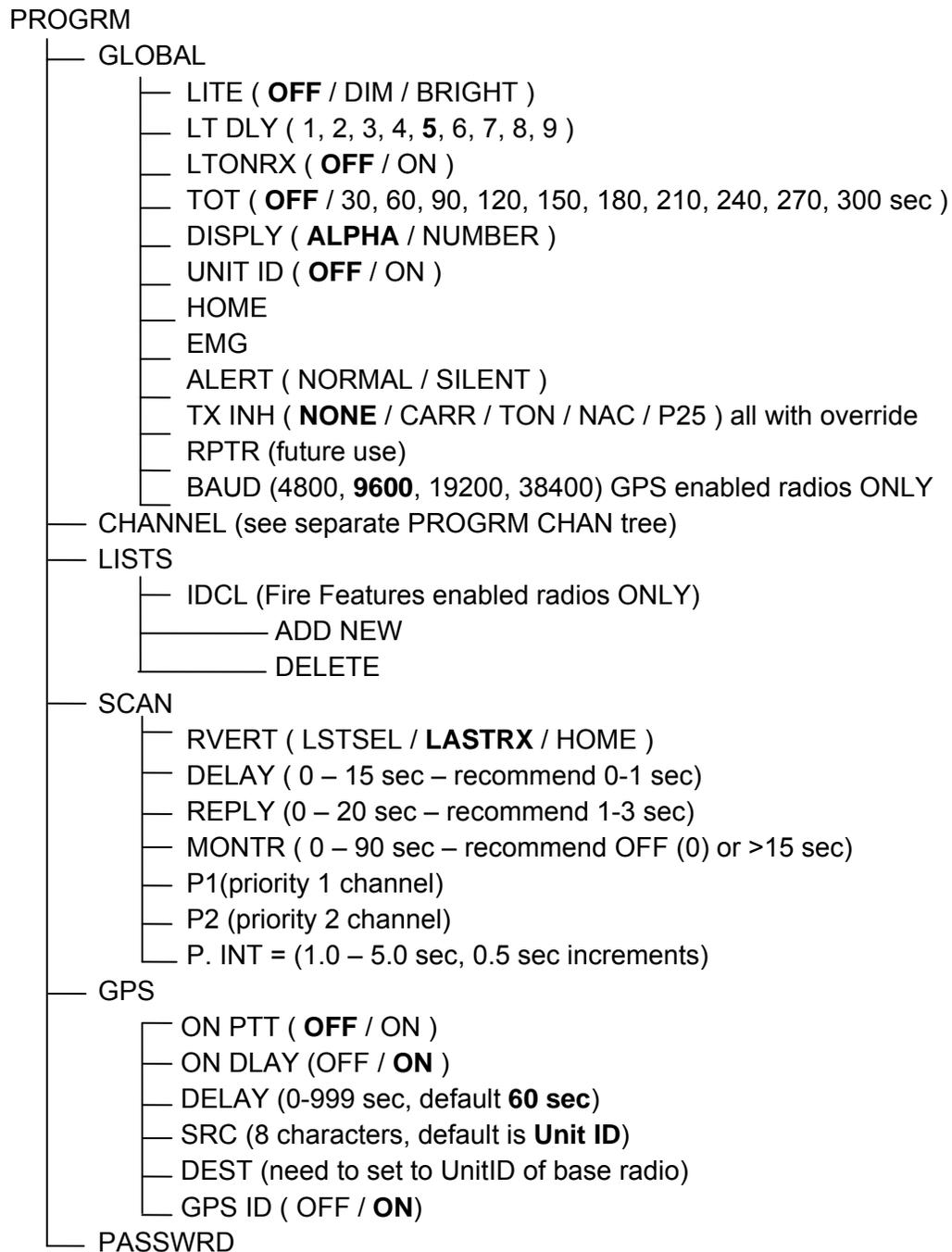
- OTAR screen (OTAR enabled radios only)
 - ROPTIONS (jumps to MAIN MENU screen)
 - OTAR (OTAR enabled radios ONLY)
 - REKEY
 - DREG (OFF / **ON**)
 - P25 UnitID # (status only , not keypad programmable)

Main Menu

- SCAN
 - SCAN (**OFF** / ON)
 - PRSCAN (**OFF** / ON)
 - SCMODE (**SCAN** / ZONE / SRCH)
 - PRMODE (**PR1** / PR2)
- SELECT
 - ZONE
 - BANK
 - LTLOCK (**OFF** / ON)
 - IDCL (**OFF** / ON) or (UnitID picklist on Fire radios)
 - DEST P25 UnitID
 - TONE (reserved for future use)
 - TKGP (Fire radios only – Talkgroup picklist)
 - TKRD (**OFF** / ON)
- HOME
- PROGRM (see separate programming trees – may require password)
- ALERTS
 - LITE (**ON** / OFF)
 - SPEAKR (reserved for future use)
 - KBEEPS (**ON** / OFF)
 - ALARMS (**ON** / OFF)
 - LED (**ON** / OFF)
 - DFAULT (reserved for future use)
- KMGR
 - KEYSSEL
 - DES
 - AES
 - ZEROZE
 - ZERO ALL
 - ZERO DES
 - ZERO AES

PROGRAM Keypad Navigation Tree

Default values, where applicable are in **BOLD**



PROGRAM CHANNEL Keypad Navigation Tree

Default values, where applicable are in **BOLD**

PROGRAM

CHANNEL (Analog)

- ID (Internal radio use)
- TAG (8 character alphanumeric channel name)
- MODE (Analog for Analog Channel)
- B/W (25.0 / 12.5)
- ENCRYPT (**DISABD** / DES / SLN) * Key/SLN appears below
- RX (Receive Frequency)
- RXSQMD (NOISE / DCS / CTCSS / NONE)
- RX SQ Value (list appropriate for mode)
- TX (Transmit Frequency)
- TXSQMD (None / DCS / CTCSS)
- TX SQ Value (list appropriate for mode)
- LO PWR (0.1 / 0.5 / 1.0 / 2.0 / 5.0)
- HI PWR (0.1 / 0.5 / 1.0 / 2.0 / 5.0)

CHANNEL (Digital)

- ID (Internal radio use)
- TAG (8 character alphanumeric)
- MODE (Digital for Project 25 Channel)
- ENCRYPT (**DISABD** / AES / DES / SLN) * Key/SLN appears below
- RX (Receive Frequency)
- RXNAC (001 to FFF Hex)
- RXSQMD (P25 MON / P25 NOR / P25SEL)
- Talkgroup (RX - If RXSQMD = P25SEL)
- TX (Transmit Frequency)
- TXNAC
- TXSQMD (P25SEL – not programmable)
- Talkgroup (TX)
- LO PWR (0.1 / 0.5 / 1.0 / 2.0 / 5.0)
- HI PWR (0.1 / 0.5 / 1.0 / 2.0 / 5.0)
- GPS (**DISABLED** / ENABLED) – GPS enabled radios ONLY

CHAPTER 2.0 COMMONLY USED FEATURES

SCANNING

Scanning is available on the Thales 25 portable at a rate of about 8 channels / sec. Various types of scanning exist for flexibility. The radio can be programmed to talkback on the received channel or on the switch-selected channel.

NOTE: To maximize the reception of desired channels, use the following guidelines:

- Keep the number of channels in a scanlist to the minimum required. Since the radio scans at about 8 per second, each channel will be scanned faster if there are fewer channels to scan.
- If scanning channels with noise squelch settings, higher carrier squelch values will provide faster results (improvements above values of 8 are minimal), but keep in mind that higher squelch values will reduce effective range.
- If scanning multiple channels with the same frequency (regardless of squelch values), use shadow channels where possible. A primary channel with all its shadows still scans at the rate of about 8 per second.

Instructions for setting up scanning, and all definitions of Thales 25 scanning terms follow on the next pages.

Priority scanning is covered in detail later in this chapter – here are a few highlights:

Priority scanning operates independently from regular scanning. It is not necessary to be scanning if it is desired to monitor a priority channel.

A new variable has been created for priority scan – Priority Interval (P.INT) is a programmable priority sample rate from 1.0 to 5.0 seconds. Based on early field testing, a default value of 1.5 seconds is recommended.

STEPS FOR SCANNING (Non-Priority)

These are the steps to scan. Details and definitions of the terms follow:

1. Set-up scanlist - Select channels and / or zones to be included in Scanlist
2. Select Scan Mode (SCAN, ZONE, or SRCH)
3. Turn Scan ON or OFF. You can confirm that you are scanning when the top row of the display indicates one of the following:

SCAN****

ZONE****

SRCH****

Scanlist Set-up

Selecting channels to be included in the scanlist

To add a channel to be included in the scanlist, set the radio to that channel, then briefly press and release the <diamond> key. A square will appear around the “C” indicating that the channel is in the scanlist.

To remove a channel from the scanlist, set the radio to that channel, then briefly press and release the <circle> key. The square will disappear from around the “C” indicating that the channel is no longer in the scanlist.

Selecting zones to be scanned

To add a zone to be included in the zone scanlist, set the radio to that zone, then press and hold the <diamond> key until the square appears around the “Z”. This indicates that the zone is in the scanlist.

To remove a zone from the scanlist, set the radio to that zone, then press and hold the <circle> key until the square disappears from around the “Z”. This indicates that the zone is no longer in the scanlist.

Scan Mode Selection

Keypad navigate to the Scan Mode area

- Press <ENTER>
- With SCAN highlighted, press <ENTER> again.
- Use the Arrow keys to scroll down to “MODE”
- With MODE highlighted, press <ENTER>.
- Use the arrow keys to select the desired SCAN MODE (Scan, Mode, or Search – see scanning definitions if needed), then press <ENTER>

At this point the radio's scan mode has been selected and will be retained until the battery is removed for an extended time or, until the scan mode is changed.

Turn SCAN ON or OFF

Scanning can be toggled ON or OFF by one of the following methods:

- Keypad navigation
- Pre-programmed side button
- Pre-programmed toggle switch.

Scanning will be evident by the display indicating the mode, with several asterisks walking across the screen. The examples are:

```
SCAN****  
ZONE****  
SRCH****
```

Nuisance Delete

While scanning, if an undesired channel is received, pressing the “circle” button will temporarily remove that channel from the scanlist. If scanning is stopped and restarted, that channel will be back in the scan list. If it is no longer wanted, it will be necessary to remove it from the scan list while not scanning.

NOTE: To discontinue scanning on a particular reception, pressing the “square” button will stop reception on that channel and continue the scan sequence. It will still be in the scanlist, so if a signal is still present after the scan sequence has been completed, it will receive that channel again.

SCANNING DEFINITIONS

Priority Scan

A type of scanning, completely independent of normal scanning that allows a radio user to sample a priority channel while listening to another conversation. Up to 2 priority channels may be selected.

Priority Scan Interval

A programmable parameter that allows the radio to sample the priority channel at various rates. At lower priority intervals (1.0 sec), the priority channel is received faster, but the audio intelligibility during normal conversation is reduced. At higher priority intervals (5.0 sec), the audio intelligibility increases, but priority transmissions may not be heard for up to 5 seconds. The recommended starting point is 1.5 sec.

Scan Modes

The active scan list or list of frequencies to be scanned during each scan sequence is built based on the radio programming. The following scan modes can be chosen:

Normal Scan Mode - The active scan list is comprised of the currently selected channel and all channels within the current zone designated as scanned channels (box around the channel icon).

Zone Scan Mode - The active scan list is comprised of the currently selected channel, all channels within the current zone designated as scanned channels (box around the channel icon), and all scan channels in Zones designated as scanned zones (box around the zone icon). Since this mode typically includes more channels, the number of hits on each channel will be reduced accordingly.

Search Scan Mode - The active scan list is comprised of all channels programmed into the radio, regardless of their scan list flag or assignments.

NOTE: If any channels exist with a squelch value of "NONE", or signals that are always present (Weather), the radio will always stop while in SEARCH Scan mode. Pressing the <SQUARE> key on the keypad top row will terminate the reception and continue the scan sequence.

EXAMPLE - SCAN MODES:

The following table provides an example of what channels would be received with the various scan modes:

In the example, assume:

- The radio is on Zone 1, Channel 1
- Scanlist channels are indicated by an "X" in the cell
- Zone 3 is the only zone that is in a scanlist
 - **SCAN MODE – SCAN detects**
 - *ZONE 1, Chans 1,4,7*
 - **SCAN MODE - ZONE detects**
 - *ZONE 1, Chans 1,4,7*
 - *ZONE 3, Chans 4,8,12*
 - **SCAN MODE – SEARCH**
 - *detects all channels*

ZONE	1	2	3 - SL
CHAN 1	current	X	
CHAN 2			
CHAN 3		X	
CHAN 4	X		X
CHAN 5		X	
CHAN 6			
CHAN 7	X		
CHAN 8			X
CHAN 9		X	
CHAN 10			
CHAN 11		X	
CHAN 12			X
CHAN 13			
CHAN 14			
CHAN 15		X	
CHAN 16			

Scan Revert Mode

Scan Revert mode refers to the channel that the radio will transmit on for the Scan Reply timer period. The possible modes are:

- Last Selected - The channel selected by the channel selector switch.
- Last Received - The channel on which the message was received.
- Home - The designated Home channel. If Home channel is undefined, revert mode will be set to "Last Selected."

In all scan revert mode cases, at the expiration of the scan reply timer period, the radio will revert back to its original operation of transmitting on the channel selected by the channel selector switch.

Scan Timers

All Scan timers can be programmed by either the PC Programmer or the radio keypad.

Scan Delay Timer

Scan delay allows a user to monitor a channel that was picked up while scanning prior to re-entering the scan sequence. This is required to hear both sides of a conversation for example.

The scan delay timer can be programmed for 0 to 15 seconds. If the scan delay timer is set to zero seconds, the receiver will start scanning as soon as the detected reception ends. It is recommended to set the scan delay timer to 1 or 2 seconds as a starting point, then adjusted to the specific application.

Scan Reply Timer

The scan reply timer assures time for a reply if the PTT interrupts the scan delay timer. The radio's transmit channel will remain on the last received channel for the duration of the scan reply timer period. This is the time in seconds that begins with the end of reception or the release of the PTT until the end of the programmed time period. If the PTT is pressed or the receiver activated, the timer is reset

The scan reply timer can be programmed for 0 to 20 seconds. If the Scan Reply timer is set to zero seconds, the receiver will start scanning as soon as the PTT is released. . It is recommended to set the scan reply timer to 1 or 2 seconds as a starting point, then adjusted to the specific application.

Monitor Timer

Monitor timer is the amount of time the radio will sample a channel picked up during a scan before the radio returns to scan operation. **At the end of the monitor period, the radio will break reception and continue with the scan sequence.**

The monitor timer can be programmed for 1 to 90 seconds. If a value of 0 seconds is selected, this will override this feature (reception will remain for as long as a signal is present).

PRIORITY SCANNING

The radio can provide scanning with none, one (P1), or two (P1 and P2) priority channels. Priority channels are selected in the BANK programming screen in the PC Programmer, or via keypad programming in the PROG → SCAN Menu.

In addition to interleaving the priority channel into the scan sequence, priority scan now breaks into actively received signals at the priority interval rate (programmable).

The following is an example of the interleaving if scan and priority scan are both turned ON. In this example of 5 channels, C1 through C5, and 2 priority channels, P1 and P2, the scan sequence would be:

Non-priority scan	C1, C2, C3, C4, C5, C1, C2, C3, ...
Priority 1 Scan	P1, C1, P1, C2, P1, C3, P1, C4, P1, C5, P1,...
Priority 2 Scan	P1, P2, C1, P1, P2, C2, P1, P2, C3, P1, P2, C4, P1, P2, C5, P1,...

STEPS FOR PRIORITY SCANNING

These are the steps to priority scan.

1. Choose priority channels (up to 2). It is recommended to only use one priority channel, unless having 2 priority channels are absolutely necessary.
2. Select Priority Scan Mode (PR1 (default) or PR1 + PR2)
3. Turn Priority Scan ON or OFF. You will know that you are scanning when the top row of the display contains one of the following:

SCANP1**

SCANP1P2

display toggling between selected and priority channel

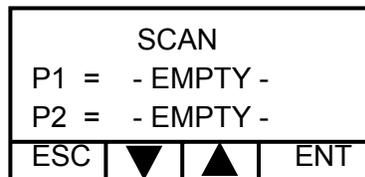
Priority Channel Selection

Selecting channels to be included in the scanlist

Priority channels may be selected ahead of time by the PC Programmer. To select priority channels by the keypad, follow the following steps:

Enter Scan Programming Mode (password may be required)

- Press <ENTER> to get to Main Menu screen.
- Select PROGRM → SCAN.
- Scroll down to Priority selection screen.



At this screen, to select a Priority 1 channel,

- Highlight P1 and press Enter.
- Move the channel selector knob to the desired Priority 1 channel.
- Press <ENTER> to accept selection.

Repeat for Priority 2 if desired.

Selecting Priority Scan Mode (PR1 or PR1 + PR2)

This is programmable from the PC Programmer. It is highly recommended to leave this at its default value (PR1), unless it is absolutely required to scan two priority channels.

If it is desired to change this mode via the keypad, follow the following steps:

- Press <ENTER> to get to the Main Menu screen
- Select SCAN and press ENTER
- Scroll down to PRMODE (may be on next screen), and press <ENTER>
- Select desired Priority Mode (PR1 or PR1 + PR2) using the arrow keys and press <ENTER>
- Return to the MAIN operating screen by pressing ESC several times.

Turning Priority Scan ON or OFF

Several options exist for turning the Priority Scan ON or OFF. Remember that priority scan is independent from regular scan. The alternatives are:

Keypad menu

- <ENTER> → SCAN → PRSCAN → ON / OFF. Note that this has no effect on the non-priority scanning

Side button (if programmed)

- If the side button is programmed for Priority Scan, pressing it will toggle Priority Scan ON and OFF. Note that this has no effect on the non-priority scanning.
- If the side button is programmed for Scan, pressing and holding it will turn Priority Scan and Regular Scan ON. To turn it back OFF, a quick press will stop scanning and priority scanning. (A quick press of the button while not scanning will enter SCAN only)

Toggle button (if programmed)

- The toggle function may be programmed by the radio shop for scanning or priority scanning. If this is the case, refer to your radio shop programmer .

KEYPAD PROGRAMMING

NOTE: It is assumed that channel parameters will be provided to the radio operator. For a more detailed description of how the channel parameters (frequencies, tones, etc) are defined, refer to the PC Programming manual.

The Thales 25 portable radio has far more capabilities than what existed in infrastructures prior to Project 25 or Analog narrowband. As a result, there are many more variables to choose from when entering a channel.

To simplify programming, assume the following defaults unless told otherwise by the person assigning the channel parameters:

- RX Frequency will always need to be specified
- TX Frequency will always need to be specified (unless RX Only)
- TAG is any 8 character alphanumeric value
- ID is internal radio information and cannot be changed
- If using a repeater, a Transmit CTCSS, DCS, or NAC code will also usually need to be assigned

Analog Channel Defaults

- MODE = Analog
- B/W = 12.5 kHz for federal frequencies, 25 kHz for all others
- ENCRYPT = DISABD (optional feature)
- RXSQMD = NOISE
- SQ (level) = 2 (bar all the way to the left, then to the right 1)
- TXSQMD = None for CAR-CAR, probably CTCSS for repeaters
- (value = specified)
- LO POWER = 2W
- HI POWER = 5W

Digital Channel Defaults

- MODE = Digital
- ENCRYPT = DISABD (optional feature)
- RXNAC = 293
- RXSQMD = P25MON for CAR-CAR, P25NOR for repeaters
- TXNAC = 293 (will need to be specified for repeaters)
- TXSQMD = P25SEL
- TALKGP (TX) = 00001
- LO POWER = 2W
- HI POWER = 5W

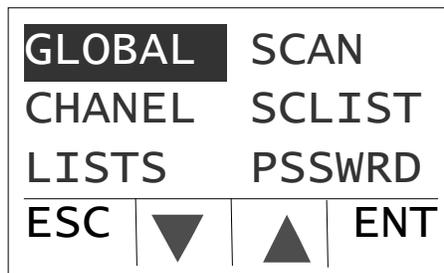
Example - Keypad Programming

The following is an example of programming a new analog wideband channel into an empty slot. This same process can be used to modify existing channels. For simplicity, the radio programmer may have provided a few channels meant to be programmed over, but this is not necessary.

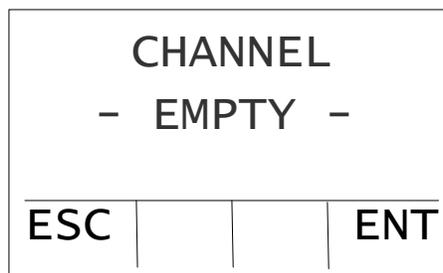
NOTE: The new channel will be assigned to whatever channel position the radio was selected to at the time of initial programming.

BEGIN

- Enter Password, then press <ENTER>
- *NOTE: If the Radio is OTAR enabled, the OTAR screen will appear → Press <ENTER>again to get to this screen*



- Use Arrow buttons to highlight "CHANEL", then press <ENTER>



The radio is now in programming mode.

- Press <ENTER>

CHANNEL			
ID = 005			
TAG= _ _ _ _ _ ▼			
ESC	▼	▲	ENT

- Press <ENTER>, enter channel name at the “TAG = “ prompt (use cell phone techniques), then press <ENTER>. Each key press advances letter. (i.e. – To select a “K”, press the “5” key twice). Press <ENTER> to complete.

CHANNEL			
ID = 005			
TAG= NEW ▼			
ESC	▼	▲	ENT

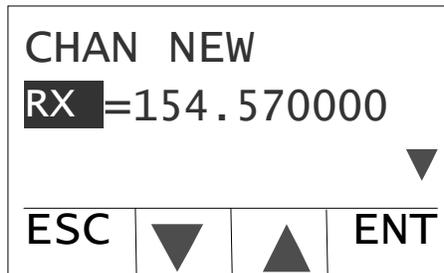
- Use arrow keys to scroll down to next screen. Use same technique to change mode to “ANALOG”

CHAN NEW			
MODE=ANALOG			
B/W = 25 kHz ▼			
ESC	▼	▲	ENT

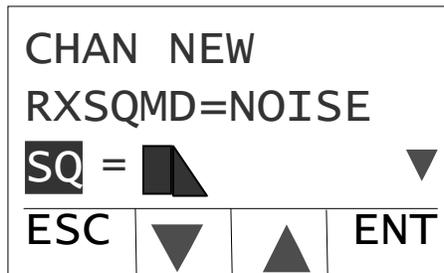
- *The following screen will appear on encrypted radios only. It is how to assign encryption keys to channels. If it appears, leave encryption disabled for the purpose of this exercise.*



- *Use arrow keys to scroll down to Receive Frequency screen, and set RX to 154.570000 MHz*



- *Use arrow keys to scroll down to next screen. Leave RXSQMD at "NOISE" and verify SQ = value 2 (bar is all the way to the left, then up one)*



- Use arrow keys to scroll down to Transmit Frequency screen, and set TX to 154.570000 MHz

CHAN NEW			
TX =154.570000 ▼			
ESC	▼	▲	ENT

- Use arrow keys to scroll down to next screen. Set TXSQMD to “CTCSS” and TON to “71.9 XA”

CHAN NEW			
TXSQMD=CTCSS			
TON = 71.9 XA ▼			
ESC	▼	▲	ENT

- Use arrow keys to scroll down to RF Power screen, and set LO PWR to “0.5W” and HI PWR to “1.0W”

CHAN NEW			
LO PWR =0.5 W			
HI PWR =1.0 W ▼			
ESC	▼	▲	ENT

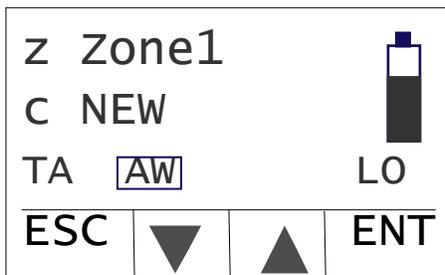
NOTE: The following screen will appear only on GPS enabled radios on digital channels. It is how to turn GPS ON or OFF on individual channels.



- Use arrow keys to scroll down to next screen. Press <ENTER> to accept channel parameters.



- Press the <ESC> key several times to get back to operating screen. The new channel is ready to use!



SHADOW CHANNEL KEYPAD PROGRAMMING

Shadow channel programming is done the same way as primary channels.

To edit an existing shadow channel, enter Programming Mode and select the desired shadow channel, in either order.

To add a shadow channel to a primary channel, perform the steps in the following sequence:

- Determine the next available shadow channel (press *1, *2, etc until an error tone is heard).
- Enter Programming mode on the desired PRIMARY channel
- Press *x to get to the desired new shadow channel
- Use the techniques for adding a primary channel

CHAPTER 3.0 ADDITIONAL FEATURES

ALERTS FUNCTIONS

Programming / Activation:

- Keypad Navigation (default OFF for all functions)

The radio's covert mode is programmed through the Alerts (ALERTS) menu. The Alerts operations screens allow the user to select operational parameters that can be disabled for covert operation. Covert operation controls override all other programming. The Alerts parameters are:

- **LITE** Backlight - Enable/disable display backlight
- **SPEAKR** Speaker - reserved for future use
- **KBEEPS** Audible Tones and DTMF Keypad Beeps - Enable/disable all audible tones, including beeps when keys are pressed
- **ALARMS** Audible Alarms - Enable/disable audio alarms
- **LED** LED Operation -Enable/disable the LED
- **DFAULT** Default - reserved for future use

To activate ALERTS selections:

Use the keypad to select from ALERTS main menu. All are programmed to ON or OFF. The default for all parameters is ON.

BACKLITE

Programming / Activation:

- Keypad Navigation (default OFF)
- Side Button (toggles through settings)

The LCD is equipped with a backlite for low light environments. The Backlite can be set to OFF, Dim or Bright, with a programmable hold time (Backlite Delay) from 0 to 9 seconds. In addition, the backlite can be programmed to illuminate when a signal is received ((DIM+RX) or (BRIGHT+RX)). From the keypad, the backlite and backlite on Receive are independent functions. When using the side button, these are combined to allow the radio user to toggle through the possible combinations. There will be a slight reduction in battery life if using the backlite, but not significant. The power drain difference between DIM and BRIGHT is negligible.

The backlite can also be set to permanently stay on. This mode is meant for temporary use while keypad programming at night, or other situations where it is desired to have the backlite remain on for longer than the delay period. It will significantly reduce battery life if allowed to remain ON.

To lock the backlite on, enter the following on the keypad:

<ENTER> → SELECT → LTLOCK → ON

The backlite will stay on until using the procedure above to turn it back OFF, or the radio is turned OFF than back ON.

BANK SELECTION

A **BANK** is a group of up to 16 zones. All radios may have up to four (4) banks. In addition, radios with Fire Features enabled have a fifth bank.

Programming / Activation:

- Keypad Navigation (Banks must be pre-programmed via PC Programmer)

The 4-bank organization allows the operators to have 4 entirely different radios in one (subject to the maximum number of 256 channels). To access effectively changed radios, select one of the other banks programmed in the radio. **Bank selection reverts to the default Bank if the battery is removed for an extended time.**

To select a different bank:

Select a different bank via the keypad SELECT main menu.

LEGACY FULL RADIO CLONING (RADIO TO RADIO)

NOTE: The cloning described in this section is for radios without Fire Features. Radios that are equipped with the Fire Features option have more flexibility in the cloning options. Cloning with Fire Features enabled radios is covered in Appendix B – Fire Features.

An alternative programming option that the Thales 25 offers is radio-radio cloning. The cloning function enables the transfer of channel parameters from one radio into another radio.

Information that is cloned

- All channel parameters (frequencies, squelch parameters, scanlist designations, power levels, etc.)
- Channel assignment to zones
- Zone assignments to banks
- Special function channels and assignments

Information that is not cloned

- Encryption keys
- Passwords
- Project 25 Unit ID
- Side button function definitions
- Toggle switch definitions
- Emergency switch definitions
- Other global parameters (revert modes, transmit inhibit, etc)

To clone radios:

NOTE: Do not turn radios off or disconnect cable during cloning process. In the event that the cloning process is interrupted, repeat the procedure.

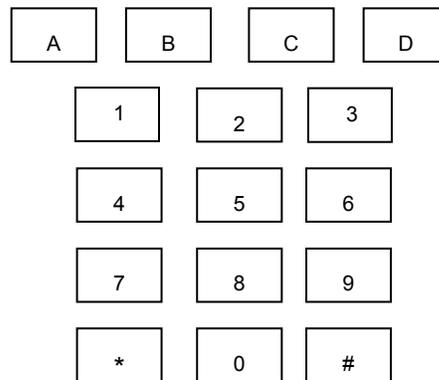
- Turn both radios on
- Connect the “SOURCE” end of the cloning cable to the side connector of the Source radio (the radio with the information to be cloned)
- Connect the “TARGET” end of the cloning cable to the side connector of the Target radio (the radio to receive the information)
- After the source radio's LCD screen indicates cloning mode, press PTT on the Source radio.
- The radio screens will indicate when cloning is complete. The Source radio can then be used to clone another radio if desired.

DTMF DIALING –

To access: While in any analog mode, press the PTT button, and press the desired key.

Description: Transmits (including sidetone) the DTMF tone corresponding to the key pressed. DTMF tones A, B, C, and D are accessed by pressing the keys across the top row of the keypad. DTMF tones are typically used for access into remote weather stations, but other applications exist.

DTMF Keypad Layout



EMERGENCY MODE

Programming / Activation:

- Keypad Navigation (programs emergency channel and alert modes)
- Emergency Button

NOTE: To access the emergency mode, the emergency button must be programmed as “EMERGENCY”.

The emergency mode transmits an emergency message that will be a duration on a repeat interval programmable by the PC Programmer. The emergency channel is programmed by the PC Programmer, or the keypad. In the event that it is left blank, the current channel will serve as the emergency channel. In Project 25 mode, the emergency bit is set. Since analog modes had no similar function, the radio performs an open-mic function for the duration and interval programmed by the PC Programmer.

Two types of operation are available for the emergency mode – Alert and Silent. The preferred mode is selected in the PC Programmer GLOBAL screen.

In Alert Emergency mode, each time the radio transmits or receives emergency signals, the LED flashes ORANGE, an audible alarm is sounded, and the LCD display indicates EMERGENCY.

In Silent Emergency mode, the LCD still indicates EMERGENCY, but the flashing lights and sounds are disabled.

To activate Emergency mode:

Press and hold the Emergency button (must be programmed as “EMERGENCY”) for about ½ second. The emergency mode will remain active indefinitely until de-activated.

To de-activate Emergency mode:

- (1) Press and hold emergency button for about ½ second again, or
- (2) Turn the radio OFF then ON.

ENCRYPTION

Encryption is an option in the radio. Most radios sold in the United States contain CVSD DES encryption as a free option. Project 25 OFB DES encryption and/or Project 25 AES encryption is an option purchased separately.

Encryption types currently available are:

CVSD DES (for Analog 25 kHz channel encryption)

Project 25 OFB DES (for Digital channels)

Project 25 AES Encryption

See the Appendix A – Encryption and OTAR for more details.

FIRE FEATURES

Fire Features is an option, which may be purchased separately. Additional features provided by Fire Features are:

- Extra Event Bank containing 3 zones of 16 channels each
- Partial Cloning (including single zones)
- Protected Zones
- Tone picklists
- Talkgroup picklists
- Project 25 Unit ID picklists

See Appendix B – Fire Features for complete details.

HOME CHANNEL

Programming / Activation:

- Keypad Navigation (toggles between HOME and selected channel, can also program the home channel from a list of channels in the current zone)
- Side Button (toggles between HOME and selected channel)

The Home channel is a convenience that allows a commonly used channel to be accessed with a limited number of keystrokes. It can be programmed via the PC Programmer (bank screen), or via the Global (GLOBAL) sub-menu of the Program (PROGRM) menu.

If the HOME channel is accessed, any channel change operation will revert back to the normal channel selection.

To access the HOME channel, perform one of the following:

- (1) Use the keypad to activate from HOME main menu.
- (2) Any of the side buttons may be programmed for HOME channel use.

To return to the SELECTED channel, perform one of the following:

- (1) If any side buttons are programmed for HOME, press that side button again.
- (2) Change the channel selector to another channel then back again.

KEYPAD SHORTCUT FUNCTIONS

The following sets of functions have been developed as limited keystroke keypad shortcuts:

Keypad Disable / Enable –

To access: Press and hold the <SQUARE> key on the keypad top row, then press and hold the <ENTER> key on the top row the desired keypad / side keys lockout is displayed.

Description:

This sequence will in turn generate the following locked conditions, assuming the radio's keypad is initially enabled:

KEYS DISABLED
SIDE ENABLED

KEYS DISABLED
SIDE ENABLED

KEYS ENABLED
SIDE ENABLED

KEYPAD DISABLED completely disables the keypad with the exception of repeating the procedure to re-enable the keypad.

SIDES DISABLED completely disables all three side buttons and the toggle switch.

An error tone will be generated by any attempt to access a disabled function.

Resume Scan sequence –

To access: While stopped on a channel during scan, press the <SQUARE> key on the keypad top row.

Description: Terminates the current scan function and resumes the normal scan sequence. Used to terminate an unwanted reception.

Scanlist (Channel) add / delete -

To access: First, select the channel to modify its scanlist.

To remove a channel from the scanlist: - Press the <CIRCLE> key on the keypad top row to remove a channel's scanlist flag. The square around the channel indicator icon will disappear.

To add a channel from the scanlist - Press the <DIAMOND> key to activate a channel's scanlist flag, adding it to the scanlist. The square around the channel indicator icon will appear.

Description: Used to modify a channel's scanlist flag.

Scanlist (Zone) add / delete –

To access: First, select the zone to modify its scanlist.

To remove a zone from the scanlist: - Press **AND HOLD for 2 seconds** the <CIRCLE> key on the keypad top row to remove a zone's scanlist flag. The square around the zone indicator icon will disappear.

To add a zone from the scanlist - Press the **AND HOLD for 2 seconds** the <DIAMOND> key to activate a zone's scanlist flag, adding it to the scanlist. The square around the zone indicator icon will appear.

Description: Used to modify a channel's scanlist flag.

Shadow Channel selection –

To access: Shadow channels must be programmed into the radio to access them.

Description: Press the * key and the desired shadow channel (0 through 7). To return to the primary channel, press **, or *0, or press the <SQUARE> key.

<u>TO ACCESS</u>	<u>PRESS KEYS</u>
Primary channel	** or
(Shadow 0)	*0 or
	<SQUARE> key
Shadow 1	*1
Shadow 2	*2
Shadow 3	*3
Shadow 4	*4
Shadow 5	*5
Shadow 6	*6
Shadow 7	*7

PROJECT 25 INDIVIDUAL CALLS

NOTE: In addition to the description below, a P25 Unit ID picklist can be entered for Fire Features enabled radios. See the Appendix B – Fire Features for complete details.

Project 25 radios include a mode that allows an individual radio to be targeted to transmit to. This is accomplished by the unique UnitID that all radios can be programmed with that is transmitted in the P25 CAI waveform. This UnitID can have a value of 1 to 9,999,999 (decimal).

NOTE: If secure communications is desired, use encryption keys. Do not rely on P25 Individual Call alone.

To initiate a P25 Individual Call:

- Select desired Project 25 channel
- Press and hold the # key until ENTER # appears.
- Press <ENTER>.
- Enter the desired UnitID to call. Use leading zeros if necessary.
- Press <ENTER>.
- The display will return to the normal operating screen. The destination UnitID will be in the space where the channel name normally is.
- Press PTT – A special tone will indicate that an Individual Call is being placed

NOTE: If UnitID call is initiated, the radio will stay in that mode until UnitID mode is terminated as described below.

To terminate P25 Individual Call mode:

- Press the <SQUARE> button on the keypad front panel - individual call mode will be exited and the normal operating screen will be displayed
- Change the channel selector knob, then back again.

When a P25 Individual Call is received:

- The radio will generate a special tone indicating that an individual call is being received.
- The RX radio will respond to the calling radio in Individual Call mode if transmitted within 10 seconds.
- To exit to normal operation prior to the 10 second timeout, press the <SQUARE> button on the keypad front panel - individual call mode will be exited, and the normal operating screen will be displayed.

SHADOW CHANNEL (MIXED MODE) OPERATION

Programming / Activation:

- Keypad Selection (selects TX shadow channel, RX is automatic)
- Keypad Navigation (Ability to program / modify shadow channels)
- PC Programmer

The Thales 25 can be programmed to detect any type of analog FM signals and any combination of Project 25 digital signals, up to a set of 8 sets of analog / digital parameters. This is done with the use of shadow channels, which are described in more detail in the Thales 25 Advanced Operations chapter. Once received, the radio is programmable to transmit either in kind or strapped to its channel selector.

This is a powerful mode of operation that has enabled digital systems to be seamlessly integrated into older analog systems without disruption. The preferred signaling mode can be set up to be a Project 25 digital signal, with all the benefits **AND** be able to receive any analog signal **AND** respond back to the operator on the analog radio.

Shadow Channels

In addition to the primary channels, the radio may be programmed with up to an additional seven (7) shadow channels. Shadow channels are used to enable mixed-mode operations on the radio.

Parameters that may be changed are:

- Channel type: (Analog / Digital)
- Bandwidth: (Analog ONLY, 12.5 kHz or 25 kHz)
- Key assignment
- Squelch Parameters (CTCSS, DCS, P25 NAC, P25 Talkgroup)

All other parameters must remain unchanged (transmit and receive frequencies, options (scan list, talk around, locked, and receive only), and transmit power levels as the primary channel). Each shadow channel counts toward the maximum 256 channels that can be programmed into one radio.

Shadow Channel applications –

Some applications that are available by using shadow channels are:

- Simultaneous analog and digital operation
- CTCSS (or DCS) picklists used to choose repeaters
- Project 25 NAC picklists used to choose repeaters
- Multiple encryption use
- Supervisory talkgroups

Transmit Revert Modes -

Shadow channels can be programmed to transmit back on the mode just received or the mode selected by the channel selector switch. This is valid only for the Shadow Channel delay period. The delay period can be overridden which would allow transmissions on the primary channel at any time by pressing the keypad <SQUARE> key on the top row. Allowable values are:

Revert Mode	Last Received (transmits in kind to signal just received)
	Last Selected (transmits on channel selector switch)
Delay	0 to 15 seconds (increments of 1 second)

Keypad Selection (for transmitting on a shadow channel)–

Shadow channels may be selected by the front keypad by pressing * then the appropriate shadow channel number (i.e. – Pressing *3 selects shadow channel 3). The primary channel can be returned to by pressing **, *0, or the keypad <SQUARE> on the top row.

NOTE: While receiving a signal, whether a channel is a primary or shadow channel is irrelevant.

TALKAROUND

Talkaround is a convenient mode of bypassing repeaters and performing local communications. A channel must have its "TA" flag set to allow Talkaround.

To access Talkaround (default is OFF):

- (1) Use the keypad to SELECT from the SEL main menu.
- (2) Any of the side buttons may be programmed for TA use.

Advantages of using Talkaround are to gain additional effective channels in a zone by bypassing the repeater when out of range.

Disadvantages of allowing Talkaround is the possibility that someone may accidentally be in TA mode, when they expect to be hitting the repeater.

While in Talkaround Mode, the Display will show "TA" (also displayed on direct channels). While in Repeater Mode, this symbol changes to the repeater symbol "∩∩∩".

TRANSMIT INHIBIT

Programming / Activation:

- Keypad Navigation (programs parameters in Global screen)

Transmit Inhibit is a feature that locks the PTT switch to keep users from talking over other radio conversations. Each transmit inhibit mode offers an override option (i.e. NAC+O). The override option allows the operator to transmit over the signal anyway if the PTT switch is pressed twice within approximately ½ second. Transmit inhibit options are:

CARR	Prevents transmissions on a busy channel (if any RF is detected – any modulation)
CARR+O	Carrier Transmit Inhibit with override
TONE	Prevents transmissions on a busy channel with analog squelch values (CTCSS or DCS) other than programmed for RX
TONE+O	Tone Transmit Inhibit with override
NAC	Prevents transmissions on a busy P25 channel with a different NAC than programmed for RX
NAC+O	NAC Transmit Inhibit with override
P25	Prevents transmission if P25 status bits indicate busy
P25+O	P25 Inhibit with Override

TONE (transmit inhibit on busy channel with wrong squelch code) prevents transmission on an active channel with a squelch code other than your own. NAC+O, CARR +O, and TONE+O add a quick-override feature, which allows the user to override the transmit inhibit state by quick-keying the radio (i.e., two PTT presses within a short time frame - default value is 0.5 second). If the user tries to transmit on an active channel, an alert tone will be generated and transmission will be inhibited.

Transmit Inhibit can be enabled either through the Global Parameters screen of the PC Programmer or through the Global (GLOBAL) sub-menu of the Program (PROGRM) menu.

TRANSMIT TIMEOUT

Programming / Activation:

- Keypad Navigation (programs transmit timeout (TOT) parameter via Global screen.

Transmit Timeout allows the radio to have a preset time that shuts the transmitter down after a pre-determined time. This is especially useful to prevent accidental long transmissions due to the PTT button being accidentally pressed. Transmit timeout is defaulted to OFF, but can be programmed from 0 minutes (OFF) to 5 minutes in 30 second increments.

ZONE SELECTION

A ZONE is a group of up to 16 channels. All radios may have up to sixteen (16) zones. Channels within the zone are selected by the channel selector knob.

Programming / Activation:

- Keypad Navigation (zone selection from pre-programmed zones)
- Side Button (Next zone scrolls through all zones)
- Toggle switch (Select between 3 PC Programmed selected zones)

Zones, or channel groups, can contain a maximum of 16 channels, one per position. Channels may be duplicated in zones (same channel on multiple positions) for convenience, or left blank.

To select a different zone:

- (1) Select a different zone via the keypad SELECT main menu. If a zone is selected by this method, it will replace the current zone, until another is selected.
- (2) If the 3-position toggle switch is programmed to "ZONE SELECT", it allows quick selection of 3 zones.
- (3) Any side button may be programmed to "NEXT ZONE". If a zone is selected by this method, it will replace the current zone, until another is selected.

NOTE: If the toggle switch is set to Zone Select, and a zone is selected via the keypad navigation method that zone will permanently be in the toggle switch setting. The original zone will be available for selection through keypad navigation.

CHAPTER 4.0 THALES 25 ACCESSORIES

BATTERIES

Lithium Ion (Lilon) Rechargeable Battery

The Lithium Ion Battery contains an Internal Fuel Gauge that enables the radio to accurately display the current charge state. It is 12.6 VDC when fully charged, and will power the radio down to 8.0 VDC. The current capacity of the Lilon Battery is 1800 mA/H. It should supply 1000 recharge cycles.

Additionally, Lithium Ion Batteries do not have the memory problems of NiCAD batteries and may be charged when fully depleted or topped off at any time.

They charge to 95% in 1.3 hours, and provide over 11 hours of 5W radio operation at a 5-5-90 duty cycle.

IMPORTANT NOTE: Be sure to periodically charge batteries if in storage. If they are left uncharged for an extended period of time, permanent damage may result. For the standard battery, charging at least every 12 weeks is recommended.



AA Alkaline Clamshell Battery

The AA Alkaline Clamshell Battery uses 10 AA Alkaline cells to power the radio. It contains a regulator to more efficiently use the cells. With a fresh set of batteries, it supplies 16 VDC to the regulator, which presents about 12.3 VDC to the battery. The raw voltage can be measured on the side of the battery.

Since the AA clamshell does not have a fuel gauge, the best way to use the radio's fuel gauge is to check it while transmitting.

The AA clamshell provides 8 hours of 2 Watt radio operation at the 10-10-80 duty cycle.



Hybrid Battery (Lilon / AA)

The Hybrid battery combines the high current capability of Lithium Ion batteries with the ready availability of AA Alkaline batteries to enable the radio to transmit at a full 5W. The radio is powered by the Lithium Ion cells. The Lilon cells are charged by eight (8) AA alkaline batteries. This also provides the benefit of being able to change AA batteries while still operating the radio. When 115 VAC or 12 VDC (vehicle power) is available, one of the cables from the charger system (MA6996) may be used to charge the hybrid battery. The hybrid battery takes 12-14 hours to fully charge, but can be charged while operating the radio. At a 10-10-80 (TX/RX/STBY) duty cycle, it provides 14-16 hours use at 5W operation, and over 24 hours use at 2W operation

The hybrid battery has a status LED on it which provides the following meanings:

LED off

The hybrid battery is not currently being charged. This may either be due to the LiIon batteries being fully charged, indicated by the battery gauge on the radio reading full; AA batteries not being inserted or being inserted incorrectly and not being charged externally, or the AA batteries being depleted (indicated by the radio's battery gauge reading less than full.

Blinking Yellow:

The hybrid battery is being charged. If being charged by AA's it indicates the AA's are getting weak.

Blinking Green:

The hybrid battery is being charged. If being charged by AA's, it indicated the AA's have plenty of capacity left.

IMPORTANT NOTE: Be sure to periodically charge batteries if in storage. If they are left uncharged for an extended period of time, permanent damage may result. For the standard battery, charging at least every 12 weeks is recommended.



BATTERY CHARGERS

Desktop / Automobile DC Lithium Ion Battery Charger Kit

(6-unit chargers also available)

This charger is the replacement to the original Lilon charger offered by Thales Communications. While the old charger will still charge batteries, this charger was improved to include the following features:

- RS232 Upgrade port to easily field install firmware upgrades (uses commercially available 9-pin RS232 extension cable)
- Separate AC power cord to allow traditional desktop charging
- DC cigarette lighter cord to allow vehicular charging
- Improved battery management (verifies and corrects battery data)



The battery charger charges the Thales 25 Lilon batteries to about 95% capacity in about 1.3 hours. It then slows to a trickle charge to complete the charge in about an hour.

If a battery is completely dead, it enters a wake-up charge for 30 seconds. Sometimes it may be necessary to repeat this procedure a second time by removing and re-inserting the battery.

Batteries may be charged separately or with a radio attached (radio ON or OFF).

The normal process to charge a battery is as follows:

- Place the battery in the charger. IT IS NOT necessary to engage the blue latch unless mechanical support is required (vehicle charging). The charger LED will flash GREEN and ORANGE while it is attempting to communicate.
- The LED will then turn solid ORANGE to indicate that it is charging.
- When the charging is complete (or if the battery was already charged), the LED will turn GREEN.
- If the battery was locked down using the blue latch be sure to unlatch it prior to removal. Failure to do so may cause the rubber inserts to eventually fall out.

If the charger's LED changes to a color other than ORANGE or GREEN, it indicates a problem. RED / GREEN may be able to be cleared by removing and re-inserting the battery. A complete LED color chart is included on the bottom of each charger. It is provided here for reference:

Charger LED Indications

Red Light = High Temp Exceeded
Red Flash = Over Discharged Battery
Orange Flash = Low Temp Exceeded (0°C)
Orange Light = Charging
Green Light = Charging Complete
Orange / Green Flash = Attempting Communications
Red / Green Flash = Battery Charging Error
Orange / Red Flash = Charger Error

The new 6-unit chargers operate in the same manner as the single-unit chargers and have all the same features, including RS232 upgrade ports. (Upgrade ports on the 6-way chargers are located inside the unit near the front. There are 6 upgrade ports – one for each battery slot.)

In addition to the charger kit, the charger unit and cables are available individually as replacement items.

PROGRAMMING EQUIPMENT

To set up channel programs for the radio, the PC Programmer is used. There is a kit, which included the software (minimum Windows 2000 required) and a PC Programming cable.

The software is extremely easy to use and is covered separately in the PC Programmer manual.

The cable used requires NO additional power sources or special adapter units. It can also be used for several other applications such as remote control (for testing) or firmware upgrades.



CABLES

NOTE: All connectors shown are the old style connector. The new screw-down connector is currently shipping. Upgrade kits are available.

PC Programming Cable

The PC Programming Cable is available separately and may be used for additional tasks such as firmware upgrades.



Cloning Cable

The cloning cable enables a radio to be cloned to another radio.



AUDIO AND SURVEILLANCE EQUIPMENT

Speaker / Microphone

The speaker / microphone attaches to the side connector of the radio and provides louder audio.

The audio flows through from the radio's volume setting. A HI / LO switch on the speaker / mic allows a quick change between 2 audio levels. An earphone jack exists to plug in an optional earphone (speaker is muted when earphone is in use).



Surveillance Equipment

If a surveillance application is desired, the minimum equipment required will be a surveillance kit (2-wire or 3-wire) and an audio adapter. Optional wireless earpieces and neck loops are available that adapt to either surveillance kit.

The 3-wire surveillance kit has separate wires for the earpiece, the lapel microphone, and the PTT. The 2-wire surveillance kit integrates the microphone and PTT into 1 wire.

Surveillance kits are available in either tan or black.



CASES

A wide variety of cases are available. A few are pictured. If ordering, be sure to get the proper case that fits a battery. Chest Packs are also available from various 3rd party vendors.

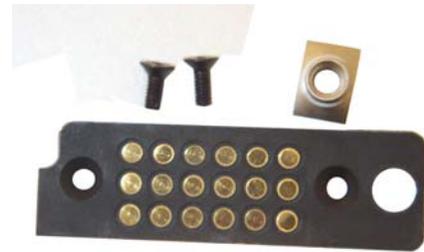


SIDE CONNECTOR UPGRADE KITS

Original radios were shipped with a latching mechanism to hold audio and programming accessories to the radio's side connector, and are no longer available. The radios and accessories currently being shipped have a screw-down mechanism which is not compatible with the older latching style. Conversion kits are available to convert the older style to the newer style and are described below.

Radio Side Connector

The new radio side connector is easily installed. The only tool required is a #0 Philips screwdriver. The installation typically takes less than one minute per radio.



Accessory Connector Kit

The accessory connector kit includes all necessary parts to modify existing speaker / mics, cloning cables, and PC Programmer cables. Soldering skills are required to perform the modification. The speaker / mic has 7 wires to change. The cloning cable and PC Programmer cable has three wires (each end) to change.

CHAPTER 5.0 UPGRADES

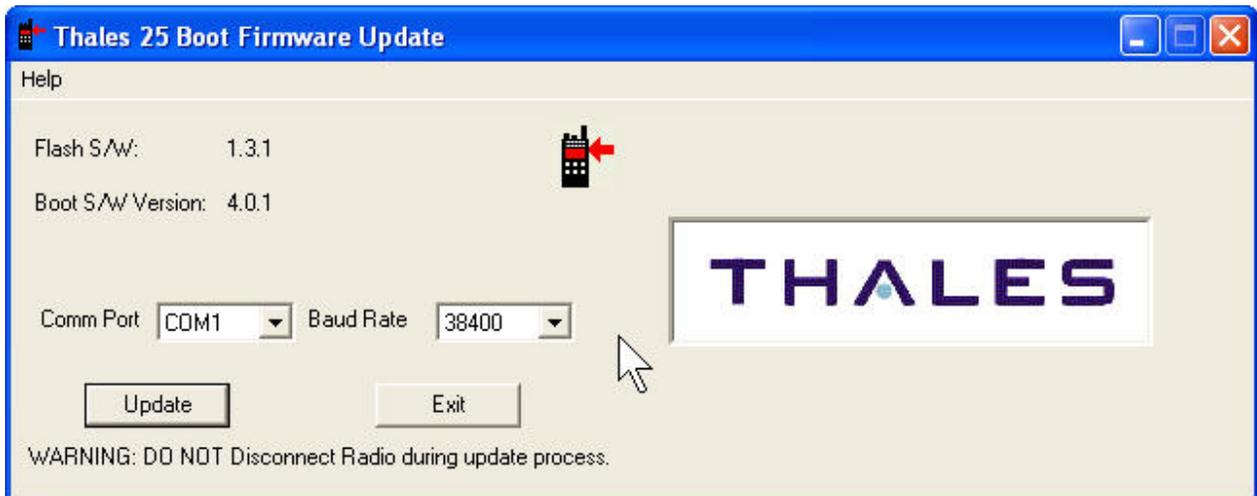
All Thales 25 upgrades are available at www.thalescomminc.com (registration is required). Follow these links to get there: Customer Care → Customer Center → Technical Resources → Public Safety. Upgrades are also available on CD by request. Contact Customer Support at 1-800-914-0303 for details.

Upgrades are available for the Boot Code (for FIPS-140-2 AES only), the radio firmware, the PC Programmer, and the charger.

BOOT CODE UPDATE

FIPS 140-2 secure download requirements

WARNING: This update is intended for radios that will have AES (FIPS 140-2) loaded. While it will still work with all other radios, it is not required. If this BOOT update is executed on a radio, that radio will not be able to return to versions prior to version 8.0



The process for this upgrade is identical to the radio firmware update (next section), so it is not repeated here. The process takes about 2 minutes and is only required once per radio.

RADIO FIRMWARE UPGRADES

Firmware upgrades on the Thales 25 are extremely easy.

The following is required:

- The upgrade file
- Desktop or laptop PC running Windows2000 or higher
- A PC Programming cable
- Portable radio to be upgraded including battery

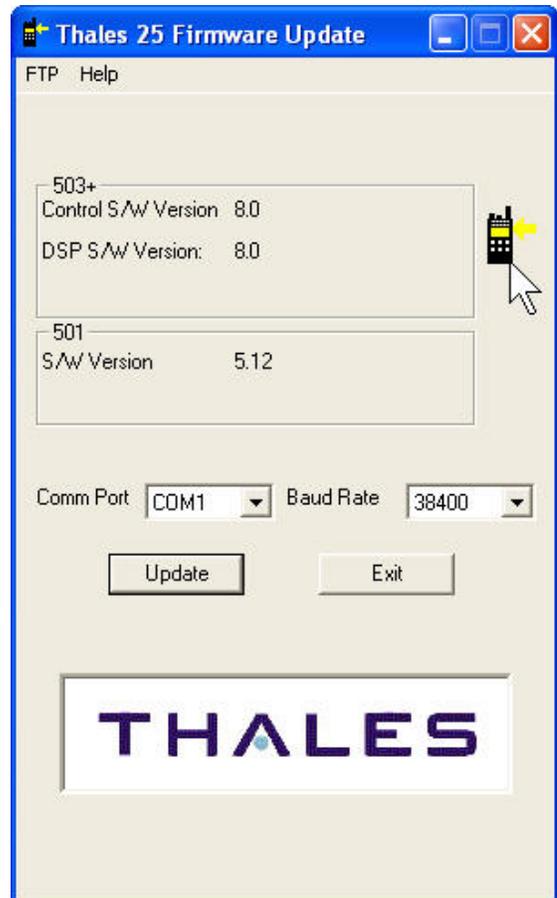
Double-click the Update file and follow the instructions. The entire update takes approximately 15 minutes at 38,400 BAUD (default)

Errors can be caused by :

- Radio is not turned ON
- Radio battery is low
- Laptop battery runs too low to operate RS232 port
- PC Programmer cable is not properly connected
- Another program is running on the PC tying up the COM port (such as PDA sync software)
- Connection is interrupted during upload

If the connection is interrupted during the update, the radio will not have the sufficient firmware to operate as a radio. Recovery may be possible by the following method. In some instances, basic radio communications only will be available. If it is necessary to restore paid options (Fire Features, Encryption, etc) or the electronic serial number, the radio will need to be returned to the factory.

- Turn the radio OFF
- Short pins 17 and 18 on the radio (tweezers work well. Pins 17, 18 are the two pins on the bottom on the back of the side connector)
- With the pins still shorted, turn the radio ON – a beep may be heard
- Restart the firmware update program



OPTIONS UPGRADE PROCEDURE

The version update utility has been enhanced to allow radios to be updated with paid options in the field. These options include features such as encryption, OTAR, and Fire Features. To access this, ensure that the update utility is run on a computer with an internet connection. The update utility will enter the Thales site to download the files needed to perform the option updates. This file will be retained in the computer for further updates after the internet connection is broken.

If an internet connection is unavailable, contact customer support at 1-800-914-0303 to have a floppy disk with the required files shipped or emailed.

Option availability:

The versions that the various options were initially available are shown below:

- CVSD Encryption – Version 1.0
- P25 DES Encryption – Version 1.0
- KVL Interface – Version 1.0
- Over the Air Rekeying – Version 5.15
- Fire Features – Version 6.0
- GPS – Version 7.0
- AES – Version 8.0

When ordering any of these options, the radio's serial numbers to be upgraded will be required.

Please contact customer assistance at 1-800-914-0303 if additional help is required.

PC PROGRAMMER UPGRADE

The PC Programmer update file is available on the website. When upgrading this file, it will be necessary to install the program from the website (usually done using "Run" or "Open" command). DO NOT select "Save" at the website popup window. (It will only save the "Setup.exe" file. Other required files will not be downloaded).

CHARGER UPGRADE

The Thale 25 charger (MA6996) has a RS-232 upgrade port to keep its firmware up to date. It is located on the back of the unit covered by a rubber gasket. Upgrades on the charger typically occur less than once per year.

The following is required:

- The upgrade file
- Desktop or laptop PC running Windows2000 or higher
- A serial extension (straight-thru) cable
- Charger to be upgraded, power ON

Double-click the Update file and follow the instructions. The entire update takes approximately 20-30 seconds

Errors can be caused by :

- Charger is not ON
- Laptop battery runs too low to operate RS232 port
- Serial extension cable is not properly connected
- Another program is running on the PC tying up the COM port (such as PDA sync software)
- Connection is interrupted during upload

6-way charger updates:

The 6-way chargers are updated using the same technique as the single chargers. To access the upgrade ports:

- Unplug the 6-way charger
- Remove the screws located at the top of the charger bays (1 per bay)
- Slide the bays out and rest them on the charger unit. Be careful not to short the case to the board.
- Upgrade using the utility to each of the 6 battery bays.



APPENDIX A - (OPTION) ENCRYPTION AND OTAR

(NOTE: CVSD DES and P25 DES have been available since the Thales 25 was first shipped. P25 AES has been available since version 8.0)

SECURITY PROCEDURES

This section provides guidance on proper secure communications use with the Thales 25 portable radio. Many agencies have established their own security policies and procedures, which exceed the guidance provided within this section.

WARNING: When using the Thales 25 for secure communications, it is important to physically control the radio. Its location and access should be controlled at all times. It should be locked up when not in use. Use by an unauthorized person could compromise all other authorized users safety and security. Sensitive information could also be inappropriately divulged.

The supported encryption algorithms are :

- CVSD DES (for interoperability with Analog 25 kHz channels)
- P25 DES
- P25 AES

The P25 AES is the only FIPS 140-2 approved algorithm in the Thales 25 radio. The practices outlined within this appendix should be practiced for all modes of encryption,.

Encryption Key Transfer From Radio

Once an encryption key has been loaded into a radio, it may not be extracted. This applies to uploading data from radio to the PC Programmer, serial interface queries, cloning from radio-to-radio, and all other methods. Key structures may be maintained, but the actual cryptographic key material is not transferred. To remove a key from the radio, it must be written over, or erased (zeroized).

Security Roles / Authentication Methods

The Thales 25 radio supports the following security roles. Individuals within an organization may perform one, two, or all three roles. Role assignment is to be determined by the agency.

User

Users use the portable to communicate via radio with other users. They have all configuration data and encryption data loaded by the maintainer or crypto officer (unless they are also roles). Access to users of security functions are controlled by the following authentication methods:

- Programming Password
- Zone Password
- Encryption Lock
- OTAR RSI / uKEK
- Feature License (CVSD DES, P25 DES, P25 AES, KVL)
- Authorization onto KMF network
- KVL Possession
- Cryptographic Key Knowledge

Maintainer

The Administrator loads configuration data (channels, button assignments, etc.) into the radio. Note that a pure Administrator role does not have access to cryptographic material, but the same individual may perform the role of Crypto Officer, which has access.

- Zone Password
- Feature License (CVSD DES, P25 DES, P25 AES, KVL)
- Authorization onto KMF network
- KVL Possession
- Cryptographic Key Knowledge

Crypto Officer

Loads keys into the radio.

- Zone Password
- KVL possession
- Feature License (CVSD DES, P25 DES, P25 AES, KVL)
- Authorization onto KMF network
- Cryptographic Key Knowledge

Authentication Methods

Possession of a Thales 25 radio enables secure communications ***when authorized***. Authentication methods describe how access to secure communications is denied to each of the roles (user, maintainer, and crypto officer) unless authorized.

Physical Radio Possession

The first layer of protection in the T25 portable is physical access to the radio. The portable radio includes several functions that require no authentication. For example until a configuration is loaded in the portable with a zone password (see description below) anyone with the applicable PC Programmer software, cable, and access to the radio can program the portable. However these are all proprietary items and even a modest, common sense access control policy for the portables and accessories will secure T25 operation.

Programming Password

The Administrator may configure the T25 portable with a programming password. This is a 6 digit PIN stored internally to the portable. The password protects modification of all channel programming data, including frequencies and other channel parameters.

The programming password does allow encryption to be enabled/disabled on a channel, and allows the channel encryption key to be changed – either manually through the keypad, or through an OTAR re-key request if the portable is licensed and configured for OTAR operation.

Once a programming password is entered it is valid until power is cycled on the portable. Be sure to turn the portable OFF whenever it will be out of use to force the next user to have to enter the programming password again.

The Administrator can overwrite the programming password from the PC Programmer, without having to know the existing programming password. This password is intended to restrict operator access and is not intended to authenticate an Administrator or Crypto officer.

Zone Password

The zone password allows more complete protection of specific zones in the portable. Each zone (collection of up to 16 channels assigned to the channel selection knob) can be configured as a "Protected Zone". Multiple zones can be password protected with the same zone password. The Zone Password provides similar access protection as the programming password with the following exceptions:

- Only applies to protected zones. Unprotected zones can be modified without requiring entry of the Zone Password.
- If ANY zone in the portable is protected the Administrator cannot reprogram the radio without first entering the Zone Password. This allows the Zone Password to provide the User with protection against others, including Administrators from modifying his configuration.

The zone password can be used for Administrator authentication. Like the programming password, the Zone Password once entered remains in effect until power is cycled on the portable.

Encryption Lock

Each channel in the portable can be programmed by the Administrator, using the PC Programmer for "Encryption Lock". When this parameter is enabled a User cannot disable encryption on a channel that is configured for encrypted operation. This ensures that the User cannot transmit on the secure channel without using encryption. This parameter can only be changed by using the PC Programmer and can be protected by a Zone Password.

Feature License (OTAR, CVSD DES, P25 DES, P25 AES)

The Thales 25 offers several features at an additional cost. T25 portable feature licenses are maintained in an encrypted form on TCI's software upgrade server. All security features that are feature license enabled require further effort and authentication for use. For example OTAR has strong authentication procedures as defined in the TIA specifications. As a matter of security policy however systems should not be configured with security features that are not expected to be used as part of the system's normal security policy and operation. An exception to this would be to configure the radio with the Fire Features option, as it is the option which includes Zone Password Protection.

The features which relate to Security functions described are:

- Over The Air Re-keying (OTAR) – DES (non-FIPS)
- CVSD DES, non-FIPS (for interoperability with Analog 25 kHz channels)
- P25 DES, non-FIPS (for legacy interoperability with P25 DES)
- P25 AES (FIPS 140-2, Level 1)
- KVL Interface (for loading keys via Motorola KVL 3000, KVL 3000+)
- Fire Features (for applying Zone Passwords)

OTAR RSI and other parameters

OTAR operation requires several identification and authentication items to be programmed in the radio. These parameters are mentioned here, but refer to the listed user documentation and the TIA specifications for details. All of these parameters can be set only from the PC Programmer and can be protected from unauthorized modification by a Zone Password. These parameters are specific to the OTAR Key Management Facility and should only be available on a need to know basis. The uKEK can be loaded from the PCP or from a KVL just like other encryption keys.

- KMF RSI
- Group RSI
- Individual RSI
- Unique Key Encryption Key (uKEK)

The Individual RSI is displayed by the Portable (cannot modify) , but the User does not have access to the other parameters.

Motorola KVL Possession

A Motorola KVL is a cryptographic piece of equipment that is not readily available. A KVL with a system's encryption keys is a critical part of a system's security and must be handled in an appropriate manner (beyond the scope of this security policy). Restricted physical access to the key loading device is the primary authentication method for KVL key loading, and the transfer of keys from the device is neither encrypted nor authenticated further. It also has many other authentication methods. Refer to its documentation for more details.

Authorization onto (Key Management Facility) KMF network

A radio may have all necessary Individual RSI, uKEK, and other OTAR parameters properly configured. The KMF adds an additional layer of protection that requires a KMF operator to authorize individual radios access onto the KMF network. Without this authorization, attempted OTAR rekeys will fail.

Cryptographic Key Knowledge

Radios that have passed all forms of authentication still need to know the actual cryptographic key algorithm and values to decrypt secure communications.

TYPES OF ENCRYPTION SUPPORTED BY THALES 25 PORTABLE

The radio is capable of secure communications by means of software-based encryption and is fully compatible with any radio using the following encryption algorithms:

- Project 25 Advanced Encryption Standard (AES), FIPS 140-2
- Project 25 Digital Encryption Standard (DES) encryption
- CVSD DES Encryption for conventional Analog 25 kHz channels

When the radio is operating in the secure mode, the transmission of all tone squelch signals is disabled. The radio's LCD displays a key icon indicating that encryption is active. When the radio is accessing FIPS 140-2 keys, the key icon will be displayed with inverted video. Encryption keys are assigned on a channel by channel basis (or all channels) via PC Programmer or Keypad.

Conventional CVSD DES Encryption (non-FIPS)

CVSD DES encryption is available as an option. The received Key encryption data must match that of the transmitting radio to be unsquelched and properly decoded. Due to the technology it was developed with, there are a few undesired effects:

- Reduced range (about 60%)
- Reduced audio intelligibility

If the key data of the receive radio does not match the key data of the receive radio, a constant noise rush will be heard.

Project 25 AES Encryption (FIPS 140-2 Level 1)

NIST has proposed that users who use Type 3 encryption use AES. It is more secure than DES. There is no reduction in range and the audio intelligibility is identical to the Project 25 unencrypted signal. The KeyID and Key Data must match to open squelch on the received signal.

Project 25 OFB DES Encryption (non-FIPS)

Project 25 DES solved many of the operational issues that the CVSD DES presented. There is no reduction in range and the audio intelligibility is identical to the Project 25 unencrypted signal. NIST has proposed the termination of DES encryption for Type 3 applications. It will still be provided for legacy interoperability, but it is recommended that all new encryption activities employ AES encryption. The KeyID and Key Data must match to open squelch on the received signal.

LOADING KEYS INTO RADIO AND CHANNEL ASSIGNMENT

PC Programmer Key-Fill

Key-fill may be accomplished through the radio side connector using the Thales 25 PC Programmer. The radio is connected to the PC Programmer using the PC Programmer cable (Thales # 85302). For more details, refer to the Thales 25 PC programmer manual.

KVL Key-Fill

Key-fill may be accomplished through the radio side connector using the Motorola ® KVL3000 or KVL3000+ device. The radio is connected to the KVL device by a Motorola keyfill cable (Mot # TK8531B), and a Thales audio adapter (Thales # 85305). For more details, refer to the Motorola KVL manual. Once keys are loaded into the radio, any channels assigned to that key will use that key.

OTAR

Keys may be loaded into the radio via OTAR.

Key Assignment to Channels

Encryption keys can be assigned to channels through one of the following methods:

PC Programmer Channel parameters screen (see PC Programmer manual)

- Keypad channel programming
 - ENTER → PROG → CHANEL → ENCRPT → Enable
 - KEY → select key (AES or DES) or SLN
- Keypad KMGR screen
 - ENTER → KMGR → KEYSEL → (AES or DES) → Select desired key

ENCRYPTION KEY RETENTION

Encryption keys are erased in the radio only under the conditions listed below. Otherwise, they remain in the radio.

- OTAR procedure over an existing key
- KVL keyload over an existing key
- Zeroize procedure
- Downloading channel configuration to the radio via PC Programmer

TRANSMITTING CLEAR ON AN ENCRYPTED CHANNEL

The ability to transmit CLEAR signals on encrypted channels has been provided for interoperability with radio users that do not have encrypted radios.

A side button or the toggle switch may be programmed for "ENCRYPTION", which will enable / disable TX encryption. When a channel has a key assigned to it, it will always receive either CLEAR signals or signals encrypted with the assigned key. The encryption key icon will disappear indicating that a clear call is being received. The radio may be programmed to lock encryption ON on a channel by channel basis. The encryption lock function is programmable via the PC programmer only.

MULTI-KEY RECEIVE

The radio has the option of decoding only the channel's assigned key, or any key contained in the radio. The default is to receive on only the channel's assigned key (effective in version 8.0). The radio will always transmit on the channel's assigned key.

Keypad channel programming is used to change this to receive on any key within the radio;

- ENTER → PROGRM → CHANEL → KEYLK → DISABLE

KEY ZEROIZE

The radio has several methods of zeroizing keys. Keys can be zeroized either one at a time, all DES keys, all AES keys, or all encryption keys in the radio.

Red button

The red button on the top of the radio, often used as an emergency button can have its function reassigned as an encryption key zeroize button (as programmed by the PC programmer). If the red button has been programmed as a zeroize button, pushing and holding the red button for about ½ second will zeroize all encryption keys in the radio

Keypad Zeroize (via KMGR)

Keys may also be completely zeroized, or selectively zeroized in the Key Manager (KMGR) menu. TO access this, press:

ENTER → KMGR → ZEROZE →

- Selecting ZERO ALL will zeroize all encryption keys in the radio.
- Selecting ZERO DES will access a submenu that allows either all DES keys to be zeroized, or selected DES keys to be zeroized.
- Selecting ZERO AES will access a submenu that allows either all AES keys to be zeroized, or selected AES keys to be zeroized.

PROJECT 25 OVER-THE-AIR-REKEYING (OTAR)

(NOTE: OTAR was first available in version 5.15). It is an option available for purchase in addition to DES Encryption and AES Encryption

Programming / Activation:

- Keypad Navigation (sends OTAR Rekey request)

Over-The-Air-Rekeying is an optional feature in the Project 25 feature set. It provides a mechanism for the radio to receive encryption keys without having to bring the radio to the radio shop. The Thales 25 is capable of being OTAR'ed with any Key Management Facility (KMF) that is compliant with the Project 25 standards.

From a radio user's perspective, the only possible action is to request a Rekey. Refer to the PC Programmer manual for other setup information. Refer to your KMF manufacturer's manual for details about setting up the KMF and/or data registration.

Automatic Rekey Operation

If the radio registers on a KMF that detects obsolete keys, the Rekeying operation will commence automatically. Data registration is automatic as soon as the channel selector is moved to an OTAR-designated channel.

To request a Manual Rekey

- Go to a channel that has been designated an OTAR channel
- Press <ENTER> on the keypad
- Use the Arrow keys to Scroll down to select OTAR
- With OTAR highlighted, press <ENTER>
- With REKEY highlighted, press <ENTER>

At this point, the radio will be displaying one of the two following screens:

REKEYING (walking across the screen)

- If this appears, the radio is registered on the network and is currently being re-keyed.
- When complete, the radio display will change briefly to "REKEY PASSED", then return to the normal operating screen.
- If REKEY FAILED appeared after several seconds, either the radio or the KMF may have timed out prior to receiving all encryption keys. Repeat the OTAR process until all encryption keys have been received (REKEY PASSED).

REKEY FAILED (immediately)

If this appears, data registration was not successful. Data registration may be attempted again by changing channels to another channel then back to the desired OTAR channel.

Possible error causes:

- Channel was not enabled for OTAR in PC Programming
- KMF is not operational
- Radio was rejected by KMF as being unauthorized
- Radio is out of range of repeater
- Other radio interference

DATA REGISTRATION

Data registration is a mode that was developed specifically to operate on Motorola ® based KMF systems. If trying to operate on another brand system that does not support /require data registration, it may be turned OFF. To enable or disable data registration, the radio and channel must be OTAR enabled.

To access the menu, press <ENTER>. At the next screen, select OTAR, then DREG, then select ON / OFF as desired.

The Default is DREG = ON

APPENDIX B - (OPTION) FIRE FEATURES

(NOTE: Fire Features was first available in version 6.0)

The Fire Features upgrade option provides many features that pertain primarily to the Wildland Fire Fighters. These include:

- Single Zone cloning
- Tone (CTCSS / DCS, NAC) picklists
- Talkgroup picklists
- UnitID picklists
- Zone password protection

Some of these may be useful to other users as well. All are described in this Appendix.

Complete details of the Fire Features are provided on the following pages.

EVENT BANK

A special Event Bank has been added to simplify incident command radio programming. It adds an additional three (3) zones of 48 channels each and is the bank that single zones are cloned into. The event bank has some special characteristics which are described below:

- The event bank adds 3 additional zones of 16 channels each for an additional 48 possible channels. This brings the total number of user channels up to 352 (48 primary channels plus 48 shadow channels). An additional four channels are reserved for the priority, home, and emergency channels.
- Unlike the main bank, each channel is independent – changes to an event bank channel do NOT affect other channels of the same name in the radio.
- Each event bank channel can have a maximum of one (1) shadow channel. If additional shadow channels are cloned into the event bank, only the first shadow channel will be cloned (per channel).
- The event bank is predefined as Bank 5.
- The event zones are pre-defined as Zones 17, 18, and 19. Their zone names may be changed but their zone ID' will always remain constant. If the toggle switch is defined as ZONE SELECT, the following assignments apply:
 - Switch Position A → Zone 17
 - Switch Position B → Zone 18
 - Switch Position C → Zone 19
- Zone 17, 18, 19 corresponds to Zone A, B, C respectively, of the toggle switch is used as Zone Select. Alternatively, the NEXT ZONE side button may be used to toggle through Zones 17, 18, and 19.
- Event channels can be password protected, but not locked.
- Event Zones cannot be protected. (A new feature has been added to prevent zones from being overwritten (protected zones). Reference **Protected Zones** section later in this chapter for more details.
- The “Z” icon on the LCD screen is inverted to provide a visual indication that the radio is in the Event Bank.

ENHANCED CLONING CAPABILITY (INCLUDING EXTRA EVENT BANK)

Prior to Thales 25 firmware 6.0, the only cloning option was to clone all channels, zones, and banks of channels. Now, in addition, an event bank has been created to provide the ability of cloning a single zone at a time. The capability of cloning globals and picklists has also been added.

To summarize, the following cloning options now exist for fire features radios. They may be performed in any combination.

- Legacy full channel, zone, bank cloning
- Global only cloning
- Individual zone (up to 3 zones) cloning into the event bank
- Tone (A/D TX squelch mode) picklist cloning
- Talkgroup picklist cloning

Cloning from non-Fire Features radios to/from Fire Features radios is still fully compatible, but only the legacy full channel, zone, channel (no event bank) option is possible.

To initiate the clone, connect the "SOURCE" end of the radio that contains the data to be cloned. A Fire Features must determine the compatibility of the target radios. The following screen will appear:



**CONNECT
TARGET
RADIO**

If a non-Fire Features target radio is attached, the screen will change to the following and once PTT is pressed, Banks 1-4, with all of their zones and channels will be sent to the target radio.

<p>CLONING FULL CLONE PTT TO SEND</p>

If a Fire Features radio is attached, the following screens appear. The √ is a toggle function which indicates if a particular element will be cloned or not, to toggle the √ being set or cleared, press the ◇ key.

√GLOBAL DATA			
√ALL ZONES			
▼ EVENT CLONE			
	▼	√	ENT

FULL EVBANK			
TX SQL LIST			
▼ TALKGP LIST			
	▼	√	ENT

The data for the selected parameters that is cloned (to a fire features radio) is described below:

GLOBAL DATA

All Global data, which includes side button settings, toggle switch settings, transmit timeout settings, transmit inhibit settings, scan settings, and priority scan settings. The following data is not cloned:

- Keypad lock
- Keypad disable
- Scan Mode
- Priority Scan Mode
- Passwords
- Unit ID and other Unit Identifiers

ALL ZONES

This is an extension of the legacy cloning. In this mode, all banks, all zones, and all channels are cloned. This includes data from the Event Bank as well as the legacy banks.

EVENT CLONE

This cloning mode is what allows a single zone (or 2-3 zones) to be cloned into the radio's event bank without affecting the remaining zones of the radio. When cloning is complete in this mode, the target radio will automatically switch to the Event Bank. When this mode is selected, an interim screen will appear. The two options are "SELECT ZONES" and "START CLONING". The "SELECT ZONES" option must be selected to choose a zone (or zones) to clone into the Event Bank. Once they are setup, returning to this screen (press ESC) allows the "START CLONING" screen to be accessed.

If SELECT ZONES is selected, the following screen appear on the radios.

SOURCE RADIO

A=17=			
B=18=			
C=19=			
ESC	▼	DEL	ENT

TARGET RADIO

A=17=Zone17
B=18=Zone18
C=19=Zone19

On the source radio, use the arrow screen to scroll to the desired zone position, and then press ENTER. A zone list will appear containing all zones in the current bank. Scroll with the arrow buttons to select the desired zone, and then press ENTER. This process may be repeated for the remaining two zones if desired.

On the target radio, the screen is provided for convenience to view what is currently in the target radio's event bank.

When this process is complete, return to the previous screen and select START CLONING.

The settings will remain in place on the Source Radio to simplify cloning additional target radios.

FULL EVBANK

Clones all zones, channels, and special channels (priority, home, emergency channels) in the Event Bank. This data is first erased in the target radio.

TX SQL LIST

This option clones the entire A/D Transmit Squelch (Tone) picklist from the Source Radio to the Target radio. This includes the tagnames and tones. Tones can be CTCSS, DCS, or None for Conventional Analog Channels, and NAC's for Project 25 Digital channels.

TALKGP LIST

This option clones the entire Talkgroup list from the Source Radio to the Target Radio. Talkgroups are applicable only for Digital channels.

PROTECTED ZONES

The ability to protect zones on an individual basis has been added. A password is needed to alter, clone over, or PC Program over these zones. For simplicity, if a source cloning radio and target cloning radio has matching zone passwords, the password criteria will be met.

Zones may be protected by the PC Programmer only.

If a protected zone is cloned to another radio (Main or Event Bank), the target radio's zone will NOT be a password protected zone.

ANALOG / DIGITAL TRANSMIT SQUELCH TONE PICK LIST

The ability to program up to 32 transmit tones (CTCSS, DCS, on NONE) has been added. They are input to the radio through the PC Programmer or by cloning only. If one of these tones is selected, the programmed tagname replaces the existing channel name. The use of a tone picklist provides a permanent change to the channel.

To access these tones, the following options exist. In all of these, only press the # key for a short duration (press and release).

(tone should be replaced by the desired number)

- Press # tone (will timeout to the selected tone if single digit, immediate response if 2 digits)
- Press # 0 tone (if single digit)
- Press # tone <ENTER>

A special case of pressing # 00 is reserved for removing the CTCSS or DCS tone on analog channels. "NO TXSQ" will be displayed on the channel name.

NOTE: If a channel is altered with the tone picklist that had a receive CTCSS or DCS tone programmed to it, that channel will be automatically set to receive carrier squelch.

NWCG PICKLIST (FOR REFERENCE ONLY)

The NWCG has been using the following picklist, and has proposed it as a standard implementation. The radio has the flexibility to assign any tone to any position (up to 32 positions). This list is provided for those wishing to program their radios with the NWCG picklist. Verify that it is still current prior to use:

Tone	Analog type	Analog tone	P25 NAC (hex)
1	CTCSS	110.9 Hz	455
2	CTCSS	123.0 Hz	4CE
3	CTCSS	131.8 Hz	526
4	CTCSS	136.5 Hz	555
5	CTCSS	146.2 Hz	5B6
6	CTCSS	156.7 Hz	61F
7	CTCSS	167.9 Hz	68F
8	CTCSS	103.5 Hz	40B
9	CTCSS	100.0 Hz	3E8
10	CTCSS	107.2 Hz	430
11	CTCSS	114.8 Hz	47C
12	CTCSS	127.3 HZ	4F9
13	CTCSS	141.3 Hz	585
14	CTCSS	151.4 Hz	5EA
15	CTCSS	162.2 Hz	656
16	CTCSS	192.8 Hz	788

TALKGROUP PICKLIST

The talkgroup list applies only to digital channels. It may be programmed by the PC Programmer or by cloning only. It is not keypad programmable. To access it, press and hold the * key until the talkgroup list appears on the LCD screen. If no list exists, the LCD display will indicate EMPTY. Select the desired talkgroup, and press <ENTER>. The talkgroup tag will replace the channel tag. The use of a talkgroup list provides a permanent change to the channel.

PROJECT 25 UNIT ID CALL PICKLIST

A Project 25 Unit ID Picklist has been added to make it more user friendly. If a call is received with a matching UnitID in the lookup table, the name will be displayed. Otherwise, the actual UnitID will be displayed. It may be programmed by the PC Programmer or by the keypad. Cloning the UnitID picklist is not available.

To access an existing P25 UnitID picklist, press and hold the # key. The list will appear on the LCD screen. The first entry (ENTER #) is a shortcut to make a UnitID call for someone who is not programmed into the radio. The remaining entries represent programmed UnitID entries. Select the desired entry and press <ENTER>. The name or UnitID number will replace the channel name while in this mode.

To return to normal operation, press the ESC key.

To edit the P25 UnitID picklist via the keypad, press

- <ENTER> to get to the Main Menu screen
- PROGRM (a password may be required)
- LISTS
- IDCL

The following choices appear:

- ADD NEW
- DELETE

Select the desired operation and follow the menus on the radio.

To exit the Project 25 UnitID mode, press <ESC> to return to the normal operation screen.

APPENDIX C - (OPTION) GPS REPORTING

(NOTE: GPS Reporting was first available in version 7.0)

NOTE: If this is the first time setting up GPS in the Thales 25, read this entire appendix before proceeding.

With the addition of data capabilities, the Thales 25 now offers GPS reporting on a Project 25 channel. This is accomplished by receiving GPS data from any GPS receiver (real-time RS232 output GPS data required) into the radio, then transmitting via Project 25 to another Thales 25 radio.

The GPS data flows through any repeater than has Project 25 data implemented. For details on repeaters that have been tested, contact Thales Customer Support at 1-800-914-0303

GPS APPLICATIONS

The Thales 25 GPS solution offers the advantage real-time GPS, and a central depository for collecting GPS data from several sources. Some current applications are:

- Resource (personnel) tracking
- Target Mapping
- Search and rescue (also being tried on dogs)
- Grid searches

To set up discussions or assistance in your specific application, contact Customer Service at 1-800-914-0303, who will direct you to the correct Thales personnel.

DESCRIPTION

The Thales 25 GPS implementation system consists of one or more GPS field radio units reporting to a GPS receiving radio (base unit). Each field unit consists of a Thales 25 radio with the GPS option, a GPS adapter cable, and a customer supplied GPS unit of choice. The base unit consists of a Thales 25 radio with GPS option, a PC Programmer cable, and a customer supplied laptop running GIS by ESRI ArcMap software. This system with standard ESRI will display the radios on the map (unlabelled). Software packages other than ESRI ArcMap will also work if they support standard NMEA \$GGA strings and can receive the \$GGA data from a serial port. The ESRI ArcMap application is the only one that has been tested by Thales.

Additionally, an ESRI plug-in is available at www.thalescomminc.com that labels the incoming radio positions. This allows multiple identified radios to be tracked and/or labeled. Some customers have written their own plug-ins specific to their application. Details on the string delivered to the computer are provided in this appendix for anyone who wishes to write their own GPS (or other data) application. If sent over encrypted channels, the GPS data will be encrypted up to the radio – PC interface.



PARAMETERS USED BY THALES 25 GPS

Currently, all values used by the Thales 25 GPS system must be set using the radio keypad. They are described below.

GLOBAL Settings

BAUD

The default BAUD rate is 9600. It may be changed to 4800, 9600, or 19200. Many GPS devices operate at a default BAUD Rate of 4800, but offer various other options. The Thales 25 radio may be changed to any of these BAUD rates to operate with the GPS unit, but must be changed back to BAUD 9600 to communicate with the PC Programmer.

The full RS232 setup for the Thales 25 radio is as follows:

- BAUD 4800, 9600, or 19200 (default 9600)
- Data Bits 8
- Parity None
- Stop Bits 1
- Flow Control None

To change the BAUD Rate, type

<ENTER> → PROGRAM → GLOBAL → BAUD → select BAUD Rate

Transmit Inhibit (TX INH)

When sending data messages automatically, it is especially important to use Transmit Inhibit. The standard TX INH = Carrier may be used, but there is an additional option designed especially for use with Project 25. The TX INH = P25 option monitors the Project 25 status bits and denies Transmit access if it detects that a Project 25 signal is being received (busy). If this is not used, received signals will constantly drop out while the radio transmits its GPS data. The P25 +O option allows the user to press the PTT button twice rapidly in succession to allow the radio to override the Transmit Inhibit.

To change the TX INH settings, type

- <ENTER> → PROGRAM → GLOBAL → TX INH → select setting (recommend P25+O)

CHANNEL Settings

Project 25 (digital) channels MUST be used to transmit GPS data over the Thales 25 radios. A channel-by-channel option is provided to determine which channels will be allowed to send data. Since the radios automatically transmit data, it is operationally important to only turn GPS to “Enabled” on channels that are intended to be used for GPS tracking.

To change the Channel Enable, type

<ENTER> → PROGRAM → CHANNEL → GPS → Enabled or Disabled

NOTE: This menu item is not available on analog channels

GPS Settings

All parameters in this section are Global GPS parameters. They are applied only when the selected channel is a designated GPS channel. To access the GPS setting menu, type:

<ENTER> → PROGRAM → GPS → <menu is displayed>

Follow standard Thales 25 keypad navigation techniques to change the GPS parameters. Their functions are described below:

ON PTT

This function when turned ON will transmit GPS data on the currently selected channel at the release of any PTT. This includes automated transmissions such as Emergency transmissions, Data registration, and OTAR functions. Since the GPS data is sent at the end of a transmission, the voice and/or data initiated proceeds with priority.

ON DLY

This function when turned ON will automatically send out a GPS transmission at the DELAY period specified below. It is especially important to turn the transmit inhibit to "P25 + O" if this function is set to ON.

DELAY

This function defines the time (in seconds) that the "ON DLY" timer transmits the GPS data on the selected channel. The range of values is 3 – 999 seconds. A value of 3 seconds is acceptable for tracking a single radio (users). When tracking multiple radios, the delay time increment should be increased to at a value approximately equally to 5 seconds multiplied time the number of radios (i.e. – if 5 radios are being tracked, set this to a minimum 25 seconds).

SRC

The value defined in this parameter is sent with each transmission when GPS ID is turned ON. By default, it is the P25 Unit ID of the radio. It may be changed to any 8 alphanumeric name. This particular value can also be valuable for transmitting **waypoints**. To transmit a waypoint, temporarily turn "ON DLY" to OFF, "ON PTT" to ON, change the "SRC" value as desired, and press the PTT button. Return the settings as desired when complete.

DEST

This value **MUST** be set to equal the P25 UnitID of the radio being used to receive and decode the GPS information (base unit).

GPS ID

This field allows the user the option of sending the GPS ID or not. It is set to "ON" by default. When GPS ID is set to OFF, only the GPS NMEA "GPGGA string is sent.

INITIAL GPS SETUP AND TESTING

This section is meant primarily for new Thales 25 GPS users. Experienced users can skip over this, section. Using GIS by ESRI is beyond the scope of this manual. ESRI offers classes to become familiar with it if required.

Thales provides a plug-in to use with ESRI. It is available to all registered users at www.thalescomminc.com. It is a basic application that allows multiple users to be tracked on the screen. Some customers have written their own application. Information about the data string transmitted with this application is provided later in this appendix.

Equipment to get started:

- Laptop / Desktop with the following installed:
 - Mapping program (ESRI ®), application optional
 - Communications program (Hyperterminal is standard with MS Windows ® packages)
 - Thales 25 PC Programmer
- Three (3) Thales 25 radios, batteries, and antennas
 - Radio 1 will simulate GPS field radio
 - Radio 2 will be the GPS receiving radio (base unit)
 - Radio 3 will be set to receive analog (monitor - any FM radio may be substituted)
- One (1) Thales 25 PC Programmer cable
- One (1) GPS unit with real-time RS232 output, preferably with a simulate mode
- One (1) GPS interface cable

Program the radios from the PC Programmer

NOTE: The BAUD RATE of the radios is required to be at 9600 for PC programming.

Radio 1 and Radio 2: For the purpose of this exercise, a configuration consisting of a single digital channel will suffice. An existing channel configuration may be used, provided it has at least one digital channel. The P25 UnitID will need to be set. This is done via the PC Programmer at download. Once the download button is clicked, a pop-up box appears, allowing the user to enter the P25 UnitID. For the purpose of this exercise, the default value of "1" can be used, or assigned P25 Unit IDs can be used.

Radio 3: The analog radio should be programmed such that its analog channel has a frequency identical to the GPS digital channel on Radios 1 & 2. Set its squelch to carrier squelch. It will be used to monitor the data bursts from the digital radio.

Set the GPS parameters in radios 1 and 2 radio via the keypad.

For the purpose of this test, set the parameters as shown. In actual use, adjust as required.

- GPS Channel = Enabled
 - (PROG → CHANEL → GPS = ENABLED)
- BAUD (Radio 1) = (matching BAUD from GPS unit)
 - (PROG → GLOBAL → BAUD = matching BAUD)
- BAUD (Radio 2) = 9600
 - (PROG → GLOBAL → BAUD = matching BAUD)
- ON PTT = ON
 - (PROG → GPS → ON PTT = ON)
- ON DLAY = ON
 - (PROG → GPS → ON DLAY = ON)
- DELAY = 3
 - (PROG → GPS → DELAY = 3)
- SRC = (can leave for now)
 - (PROG → GPS → SRC = desired 8 character alphanumeric value)
- DEST = (set to same as P25 Unit ID of GPS receiving radio)
 - (PROG → GPS → DEST = 1 (or other assigned P25 UnitID)
- GPS ID = ON
 - (PROG → GPS → GPSID = ON)

Start computer communications program (Hyperterminal program used in example)

From Windows, Click START → Programs → Accessories → Communications → Hyperterminal
(NOTE – If Hyperterminal is not there, it may be necessary to add the feature using the MS Windows disk ®.)

Name the file Thales9600, and select "Direct to COM1" (assuming radio is connected to COM1)

Set the communications parameters:

- BAUD 9600
- Data Bits 8
- Parity None
- Stop Bits 1
- Flow Control None

Connecting equipment

- Connect the GPS unit to the GPS field radio (Radio 1) using GPS interface cable
- Connect the GPS receiving unit to the PC using a PC Programmer cable.
- Turn all equipment on.
- Set the field GPS radio (Radio 1) and the GPS receiving radio (Radio 2) to the GPS enabled digital channel
- Set the monitor radio to the channel with the same frequency as the GPS field radio (analog)

Initializing GPS

Turn the GPS unit ON. If it has a simulate mode, put the GPS in simulate. If simulate mode is not available, follow the GPS units procedures for getting a GPS fix. This may take several minutes.

Does it work ???

At this point, the following should be observed:

- Noise bursts should be heard from the monitor radio once every three seconds. Note that the TX LED could have been used for this, but the RED flash is only 180 ms, and is hard to see.
- Hypterminal should be displaying the new data string once every three seconds)

If both of these are being observed, the setup is correct and functioning properly. At this point, hyperterminal can be disconnected and the mapping software launched. A separate set of instructions is available on the website that explaining the plug-in available from Thales.

Troubleshooting

Symptom:

- The monitor radio does not provide a noise burst.

Possible solutions:

- Verify all channels are programmed correctly
- The radio will not transmit data until GPS data is received from the GPS unit. Some things to check are (a) matching BAUD rates (b) proper connections (c) does the GPS have a satellite fix, or is in simulate mode

Symptom:

- The monitor radio is providing noise bursts, but the GPS receiving radio is not generating data.

Possible Solutions:

- The communications program is not configured properly
- The "DEST" of the GPS field unit is not set to the P25 UnitID of the GPS receiving unit.
- Verify all channels are programmed correctly

GPS transmitted string

The following table provides the GPS data string format:

Radio ID Enabled	Input (from GPS/DTE)	Transmitted (to Central Node HHR)
NO	\$GPGAA,...*7B<CRLF>	\$GPGAA,...*7B<CRLF>
YES	\$GPGAA,...*7B<CRLF>	\$GPGAA,...*7B<CRLF>,UID<CRLF>
NO	\$GPGAA,...*7B<CRLF>,u...u<CRLF>	\$GPGAA,...*7B<CRLF>,u...u<CRLF>
YES	\$GPGAA,...*7B<CRLF>,u...u<CRLF>	\$GPGAA,...*7B<CRLF>,UID,u...u<CRLF>

An example is provided on the next page.

Example GGA Sentence (Fix data) as delivered to Thales P25 radios from GPS Module

\$GPGGA,010002.00,4839.351,N,12325.085,W,2,09,0.9,24.1,M,-18.2,M,0,0001*7B<CRLF>

OR, with optional user data appended

**\$GPGGA,010002.00,4839.351,N,12325.085,W,2,09,0.9,24.1,M,-18.2,M,0,0001*7B<CRLF>
,1234567,this is optional user data<CRLF>**

<u>Field</u>	<u>Example</u>	<u>Comments</u>
Sentence ID	\$GPGGA	Global positioning system fixed data Identifier
UTC Time	010002.00	hhmmss.ss
Latitude	4839.351	ddmm.mmmm
N/S Indicator	N	N = North, S = South
Longitude	12325.085	dddmm.mmmm
E/W Indicator	W	E = East, W = West
GPS Quality Ind.	2	0 = Invalid, 1 = Valid SPS, 2 = Valid DGPS, 3 = Valid PPS
Satellites Used	09	Satellites being used (0-12)
HDOP	.09	Horizontal dilution of precision
Altitude	24.1	Altitude in meters according to WGS-84 ellipsoid
Altitude Units	M	M = Meters
Geoid separation	-18.2	Geoid separation in meters according to WGS-84 ellipsoid
separation Units	M	M = Meters
DGPS Age	0	Age of DGPS data in seconds
DGPS Station ID	0001	0000 - 1023
Checksum	*7B	All GGA sentences are ended by the "*" character followed by a 2 Hex digit checksum and a "<CRLF>" terminator.
<CRLF>		Carriage Return Line Feed

Optional User Data ,1234567,this is optional user data *User defined data, max 40 bytes*
If present, appended after NMEA CR/LF Terminator, delimited by a comma
Not part of standard GGA sentence, nor included in checksum

UID identifier	01234567	8-character alphanumeric unit identifier
User data	this is optional user data	
<CRLF>		Carriage Return Line Feed

84326, Rev. G

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