F3400 Series: Low-Level and Limited DES Encryption

Introduction

The following procedures describe how to program 15-bit NXDN or limited DES (four keys maximum) encryption built into the F3400/F5400 Series digital radios as a standard option. While the F3400/5400 series radios offer DES (more than four keys) or AES encryption using additional accessories, this document describes how to program 15-bit or limited DES encryption only.

Note: High and Low Level encryption are for digital operation only.

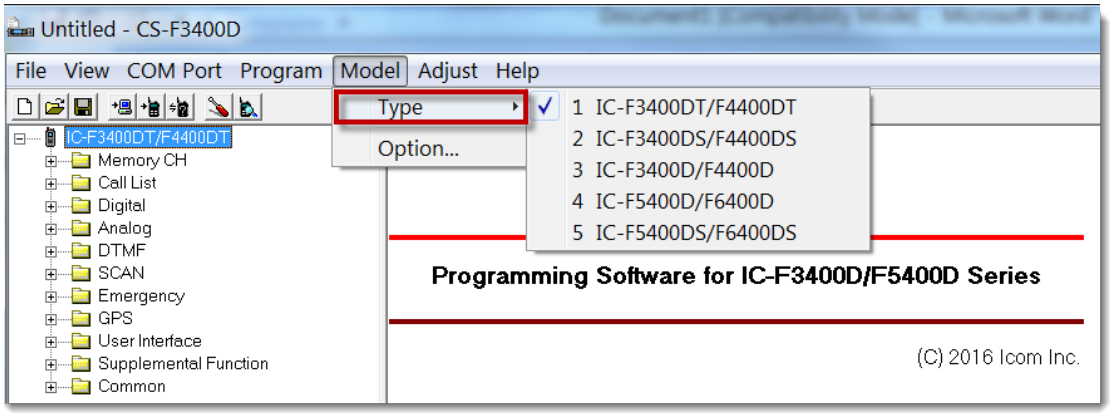
Prerequisites

- Radio connected to the computer with a cloning cable. USB A to micro B type, with matching driver or OPC-1862 (portables) or OPC- 2363 (Mobiles) with matching drivers
- For NXDN 15-bit programming:
  - All F3400/F5400 series fleets: Use CAI 1.3
  - Mixed fleets of F3400/F5400 and others: Use CAI 1.2
- Firmware and Software are updated to the latest version
- Windows® 7, 8.1, or 10 (32/64bit) operating system

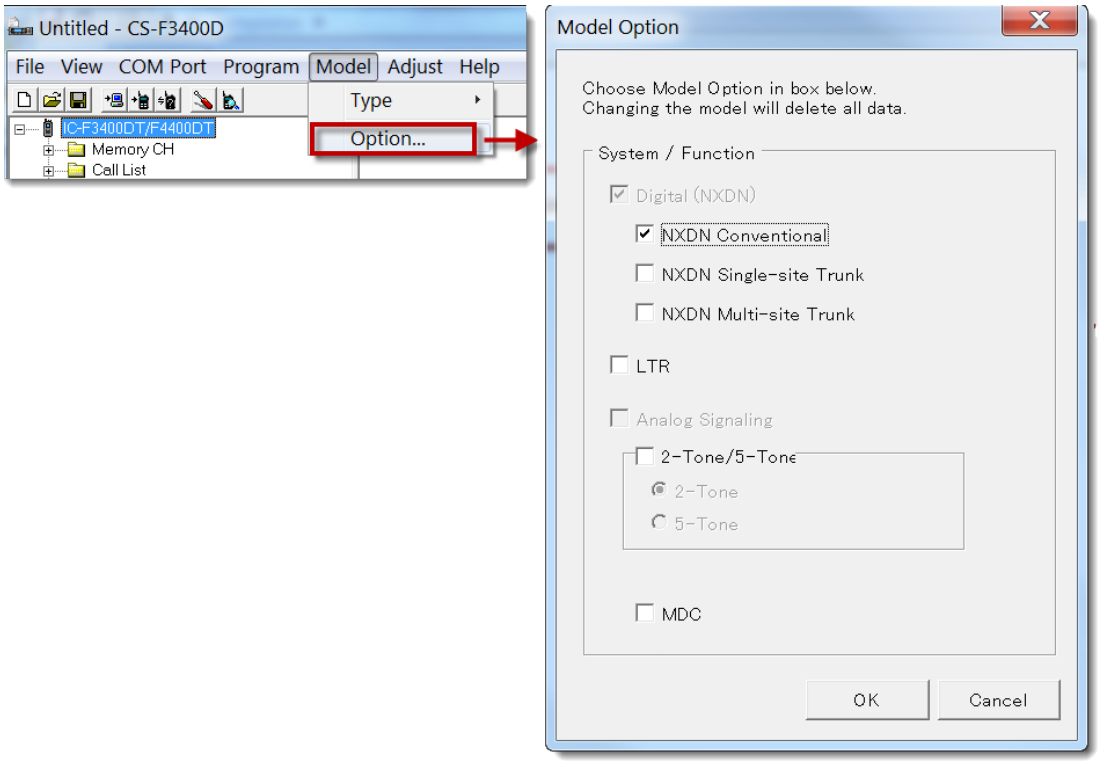
Programming

The following procedures describe programming for both low level (15-bit) and limited high level (4-key DES) encryption.

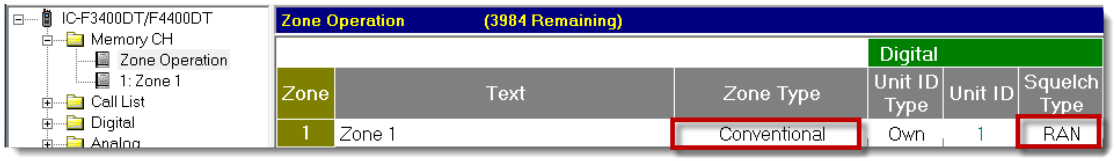
Preliminary Programming



1. Click **Model** -> **Type** and select your model radio.
2. Click **Model** -> **Option** and select your digital features in the **Model Option** window.



Zone Operation Window



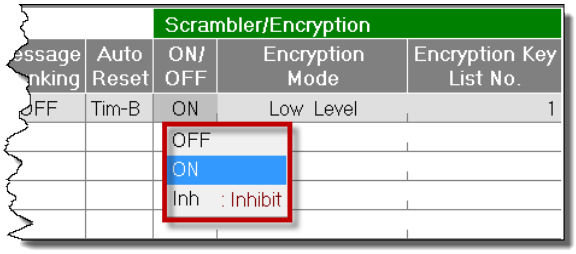
3. Select a **Zone Type** (Conventional in this example).
4. Select a **Squelch Type** of RAN or SEL as per application requirements.

Zone 1

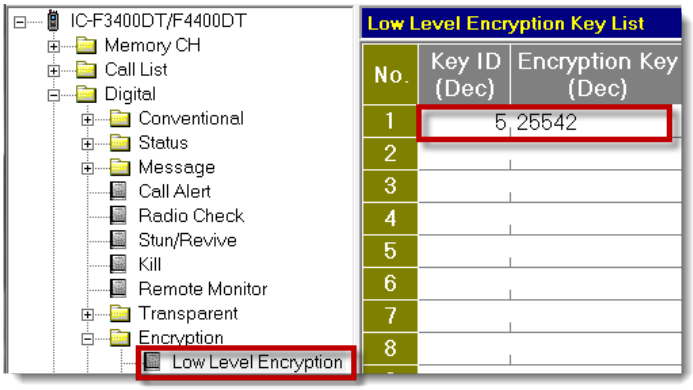
5. Go to **CH Type** and select **Digital**.
6. Enter an applicable **Frequency.**
7. Enter an applicable **RAN** number.

Low Level Encryption Programming (15-bit NXDN scrambling)

Zone 1 (continued)



1. Go to **ON/OFF** and set to **ON.** Encryption will be active by default. You can turn it off with a **Scrambler/Encryption** key. If set to **OFF**, encryption will be off by default. A **Scrambler/Encryption** key will be required to activate it on a channel by channel basis.
2. Set **Encryption Mode** to **Low Level** (NXDN 15-bit).
3. Set **Encryption Key List No.** to **1**. This number points to line No 1 in **Low Level Encryption Key List** in the following steps. Note: Ignore the yellow warning icon if present.
4. Go to **Digital** > **Encryption** > **Low Level Encryption**.



5. At **Key ID (Dec**), enter the Key ID (1-63). All radios must have the same Key ID if they are all using this encryption code on Line 1.
6. At **Encryption Key (Dec)**, enter the Encryption Key. It can be any number from 0 to 32767, as long as all radios match.
7. Write the file into your radio.

Operation

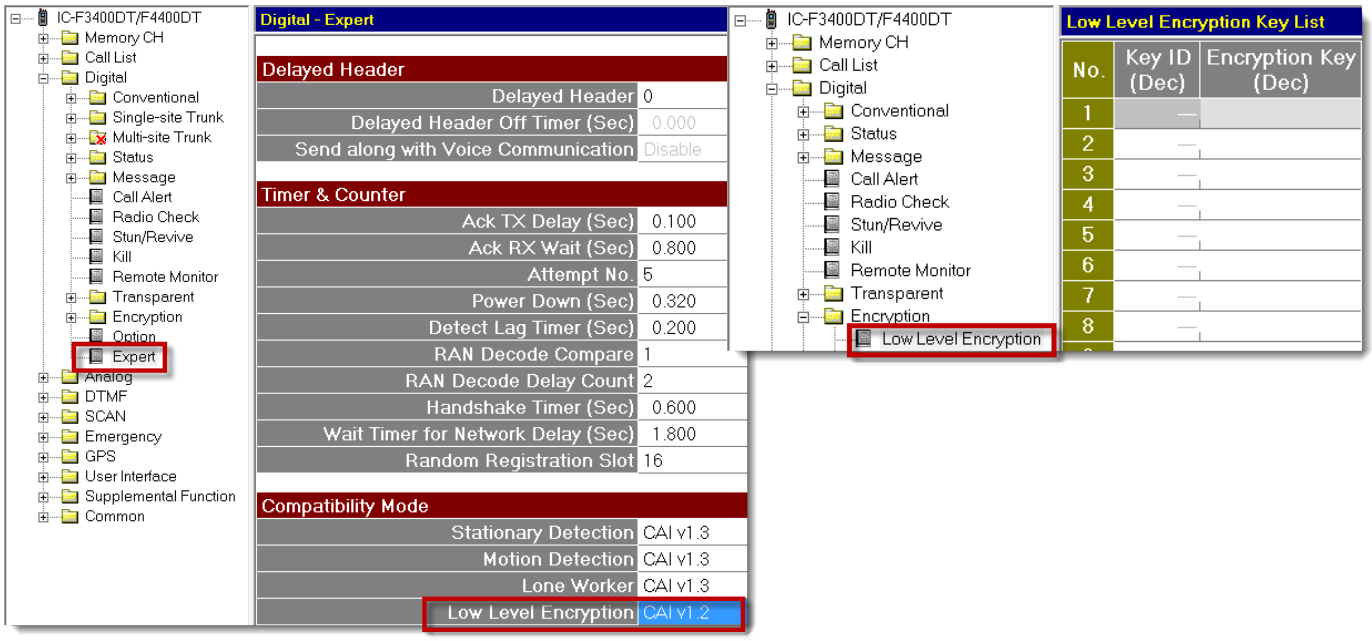
- If all radios are set to the same encryption code they will decode each other correctly.
- If you want to turn encryption on or off for each channel, a Scrambler/Encryption key needs to be programmed into the radio (**Menu** > **Channel Scan** > **Scrambler** > **Encryption**).
- If one radio is operating with encryption, other NON-encrypted radios will hear no audio when receiving that signal.

NXDN 15-Bit Encryption Compatibility with older Icom radios

The F3400/F5400 series radios use the **CAI v1.3** protocol for encryption. Older Icom radios use CAI v1.2. As a result, the F3400/F5400 Series will not be compatible with encryption when used with older series of radios such as the F4261 and F4161 unless this setting is changed to v1.2.

1. Go to **Digital** > **Expert**.

Digital/Expert Window



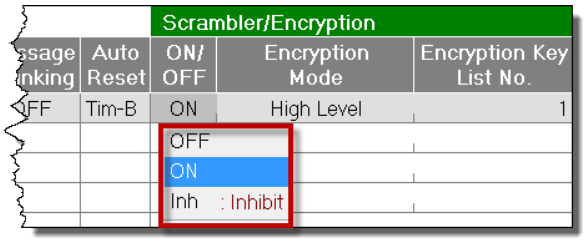
2. At **Low Level Encryption**, change the setting **to CAI v1.2**.

   Note that the key ID setting is now grayed out in the software (following window) and is not required for encryption between new and older radio models.

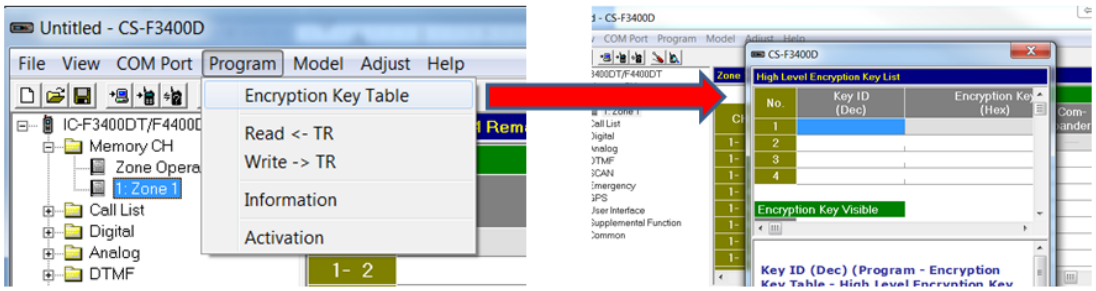
Limited DES Encryption: DES Programming (using CS-F3400 software – 4 DES Keys Only)

Note: Not available in legacy radios.

1. Go to **Zone 1** > **ON/OFF** and set to **ON** (encryption will be active by default. Can turn off with key). If set to **OFF**, encryption will be off by default. A scrambler Encryption key will be required to activate it on a channel by channel basis.



2. Set **Encryption Mode** to **High Level** for DES.
3. Set **Encryption Key List No.** to **1**. This number points to line No 1 in **High Level Encryption Key List** (found at **Program** > **Encryption Key Table.**



4. Go to **High Level Encryption Key List**.

01 02 04 07 08 0B 0D 0E 10 13 15 16 19 1A 1C 1F
20 23 25 26 29 2A 2C 2F 31 32 34 37 38 3B 3D 3E
40 43 45 46 49 4A 4C 4F 51 52 54 57 58 5B 5D 5E
61 62 64 67 68 6B 6D 6E 70 73 75 76 79 7A 7C 7F
80 83 85 86 89 8A 8C 8F 91 92 94 97 97 9B 9D 9E
A1 A2 A4 A7 A8 AB AD AE B0 B3 B5 B6 B9 BA BC BF
C1 C2 C4 C7 C8 CB CD CE D0 D3 D5 D6 D9 DA DC DF
E0 E3 E5 E6 E9 EA EC EF F1 F2 F4 F7 F8 FB FD FE

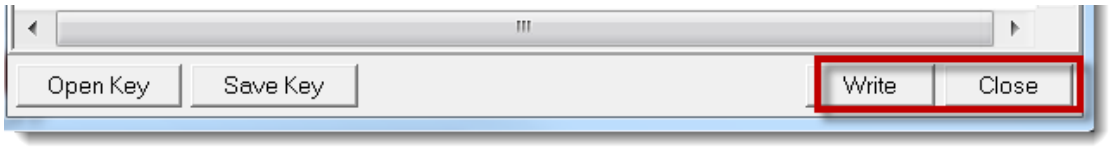
5. At **Key ID (Dec)**, enter a key ID (1-63).

6. **At Encryption Key (Hex)**, enter an encryption key. The key must 8 ASCII or 16 hexadecimal characters (useable characters listed in the preceding table). An alternative method for creating a key is to select the **Encryption Key** field, right-click, and select **Auto Create**. This will create a random DES key.

Other Settings:

- To make the encryption key visible, set **Visible** to **Enable**. This makes the key visible in the software.
- To save a Key or a list of keys to your PC, click **Save Key**.
- To open a key that was saved previously, click **Open Key**.

7. Once the key has been entered, click **Write** then **Close**.



8. Write the file into your radio.

Operation

- If all radios are set to the same encryption code they will decode each other correctly.
- If it is desired to turn on or off encryption on each channel, a Scrambler/Encryption key needs to be programmed into the radio (Menu -> Channel Scan -> Scrambler -> Encryption).
- If one radio is operating with encryption, other NON-encrypted radios will hear no audio when receiving that signal.