



**Wuxi Sicomm Communication Technologies, Inc**

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# **SCT2400 Test Guide and CPS Instructions**

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# Revision History

| <b>Version</b> | <b>Date</b> | <b>Description</b>  |
|----------------|-------------|---|
| 1.0            | 2018-4-12   | Initial version   |
| 2.0            | 2018-11-16  | Additional content added  |
| 2.1            | 2019-03-20  | Figure 8.5 updated  |
| 2.2            | 2019-05-13  | Section 3.4 – Default EVM settings added<br>Section 8 – new screen images |

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# 1 Brief Description

The SCT2400 EVM is a compact evaluation board that allows the user to investigate all aspects of the SCT2400 integrated circuit, a high performance 2.4GHz transceiver and baseband processor. The evaluation board also includes additional circuits that can be used to evaluate the system performance of the SCT2400 in a typical radio implementation. These circuits include a 2.4GHz FEM, audio codec and audio power amplifier. The SCT2400 EVM can work independently and also can be controlled via a PC using a USB port.

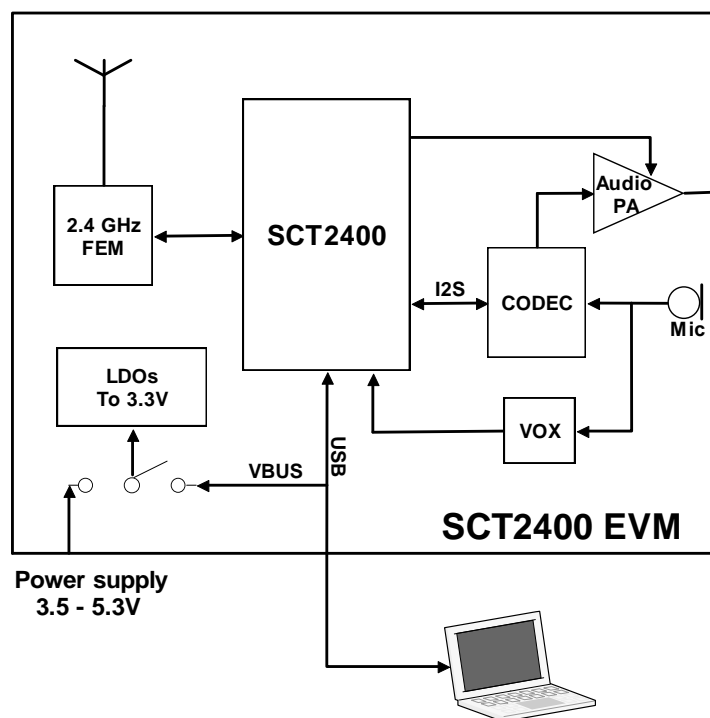


Figure 1.1 SCT2400 EVM Block Diagram

The board has the facility to be powered either from an external power supply or the USB interface (as the EVM power consumption is lower than the 500mA limit of USB2 interfaces).

## 2 Hardware Description

Schematics for the SCT2400 EVM are given in Appendix.1.

Figure.2 shows the top view of the SCT2400 EVM silk screen which identifies the major components and connectors.

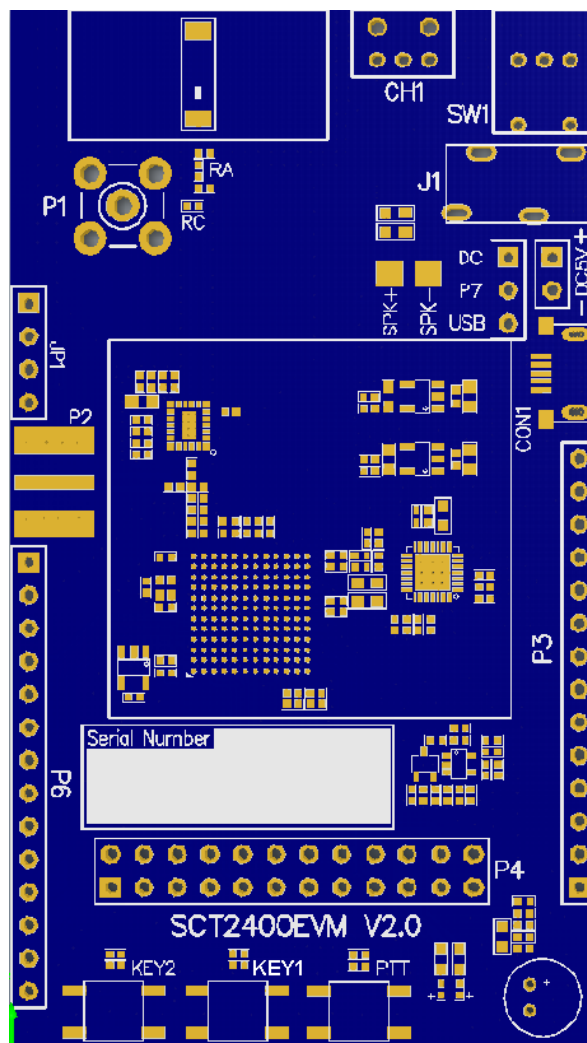


Figure 2.1 SCT2400 EVM

|         |                                    |
|---------|------------------------------------|
| CH1:    | Channel switch                     |
| SW1:    | Power switch and volume control    |
| SPK+/-: | External speaker (8 $\Omega$ , 1W) |

- J1: 3.5mm earphone socket. The external speaker output will be disconnected when the earphone is plugged in
- DC5V: Power supply
- CON1: Micro USB port. This USB interface can work not only as the port for the connection between SCT2400 EVM and PC to enable radio programming, but also act as the EVM power supply
- P3/P4/P6: SCT2400 GPIO. For pin definition, please refer to silk print on the reverse of the board.
- P2: SMA RF test connector. This connector is for evaluation of the RF performance of SCT2400 transceiver directly.
- P1: SMA test connector. This connector is for evaluate the RF performance of SCT2400 transceiver together with 2.4GHz FEM together.
- P7: Switch the power supply between DC5V and CON1 USB
- R\_LED: TX status Red LED, it will be lit if the PTT is pressed
- G\_LED: RX status Green LED, it will be lit if the radio receives a call
- RA: LTCC connection, connected by default
- RC: FEM RF performance test, disconnected by default

## 3 Quick Start

Quick start provides a quick way for users to test SCT2400 EVM. The default frequency is 2400MHz.

### 3.1 Hardware Connection

Connect an external speaker ( $8\ \Omega$ , 1W) to the SPK+/- pads or plug an earphone into socket J1. The external speaker output will be disconnected if the earphone is plugged in. **Caution** : When using the earphone ensure that the volume control is set to minimum before the earphone is plugged in, then adjust the volume to a comfortable level. Excessive volume when using the earphone can cause hearing damage.

## 3.2 Power Supply

The power supply input voltage to the EVM PCB is nominally 3.7V (3.5V to 5.3V is acceptable). On-board voltage regulators are provided to generate all voltage rails used on PCB (3.3V rails are used). The 3.7V supply should be rated at 500 mA. Power supply for this board can be switched between an external supply provided on DC5V and the VBUS pin on CON1 micro USB port by using JP7.

## 3.3 Operation

Rotate the SW1 clockwise to turn on the EVM board and set the speaker volume. The red and green LED will flicker for a few seconds and a beep sound should be heard in the earphone or external speaker at the same time.

After this has occurred the EVM board is operational and the radio is now in standby mode and is ready to receive a call from another radio.

Pressing the PTT key puts the SCT2400 into TX mode (red LED on the board will illuminate). Other compatible SCT2400 EVM boards set to the same channel can receive the call, when the green LED lights

## 3.4 Functionality supported when first used

Default EVM settings:

16 channels have been defined starting at 2.4GHz with a step size of 1.2MHz

Channels 1-8 are assigned to Zone 1. Channels 9-16 are unassigned.

Channels 1-4 are set to call G\_1 and receive from group G\_1 only.

Channels 5-16 are set to call ALL\_CALL and have no receive group restrictions.

Contacts Group G\_1 is assigned. An example contacts Group, G\_2 has been defined with call ID2 but is not assigned.

Group ALL\_CALL has been defined to call all contacts.

No scan list has been defined.

Users may further modify the functionality using the Sicomm CPS software (section.5).

## 4 EVM Test Guide

The SCT2400 EVM features PCB routing options to make networking testing more convenient.

### 4.1 Small-scale Networking Test

In order to perform small-scale networking testing, the EVM transmit power should be reduced (output 0dBm). The transmit output of the SCT2400 can be disconnected from the PA (remove C102) and connected to the SMA interface (At ① shown in the Figure 4.1). This operation can also test the receiving indicator of the SCT2400. However, removing the external LNA will result in a deterioration of sensitivity.

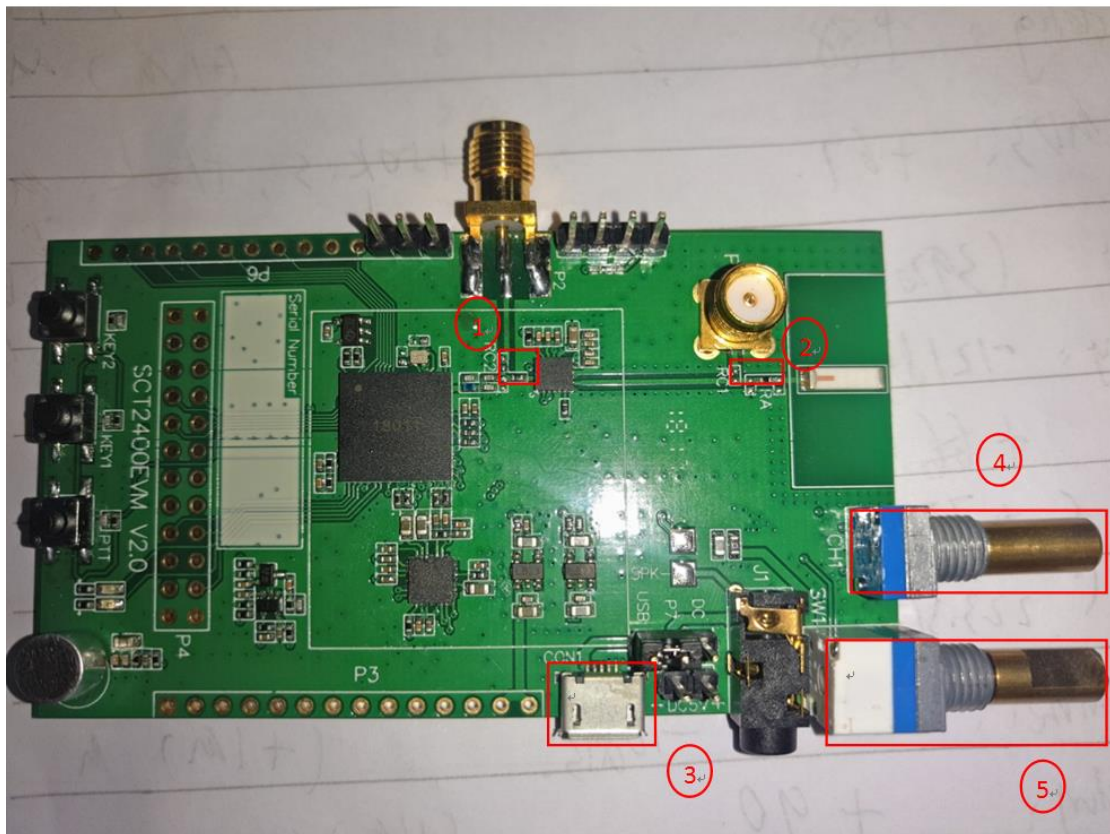


Figure 4.1 SCT2400 EVM



## 4.2 Antenna Replacement

The SCT2400 EVM is fitted with an standard LTCC 2.4GHz antenna. To test the transmit power (20dBm) or replace the antenna, disconnect the PA (remove inductor RA) from the LTCC antenna and connect the PA to the SMA interface (At ② shown in the Figure 4.1) by fitting a zero ohm resistor RC.

## 4.3 Channel Switching Notes

The SCT2400 EVM is configured to support 16 radio channels.

The channel select switch CH1 is a rotary encoder, rotating the switch in the clockwise direction increases the channel number, whilst rotating anticlockwise decreases the channel number.

A voice announcement of the selected channel number is given. An alarm sound will be heard if channel switching exceeds the maximum configured channels (At ④ shown in the Figure 4.1).

## 5 CPS Instructions

Sicomm provides the CPS to enable users to access and configure SCT2400 functionality. The CPS program is provided as a compressed file which needs to be extracted to a convenient folder before use.

### Mapping of keys between radio and CPS

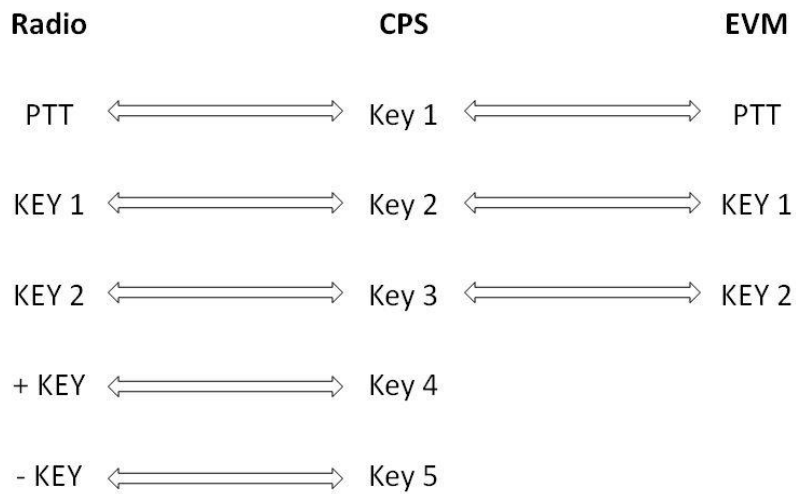


Figure 5.1 SCT2400 Radio

## 5.1 CPS Files Path

If the CPS executable is moved to a different folder, a shortcut will need to be created to open it, otherwise some functions of CPS will not work. The modification steps are as follows.

**Step 1:** Right-click SicommCps.exe ->Create shortcut:

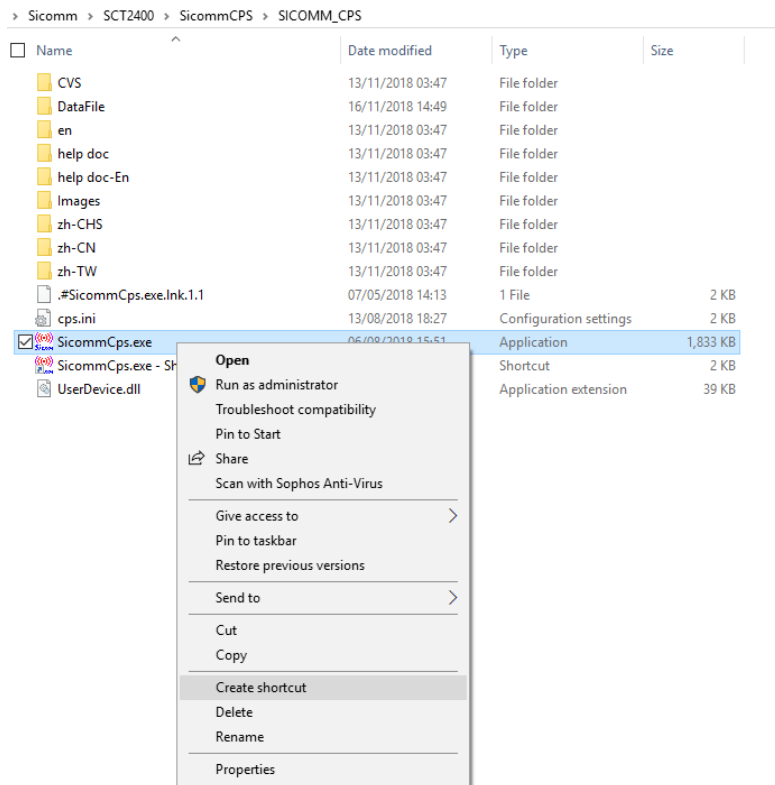


Figure 5.2 Sicomm CPS Icon

**Step 2:** Right click on this shortcut -> Properties -> Target:

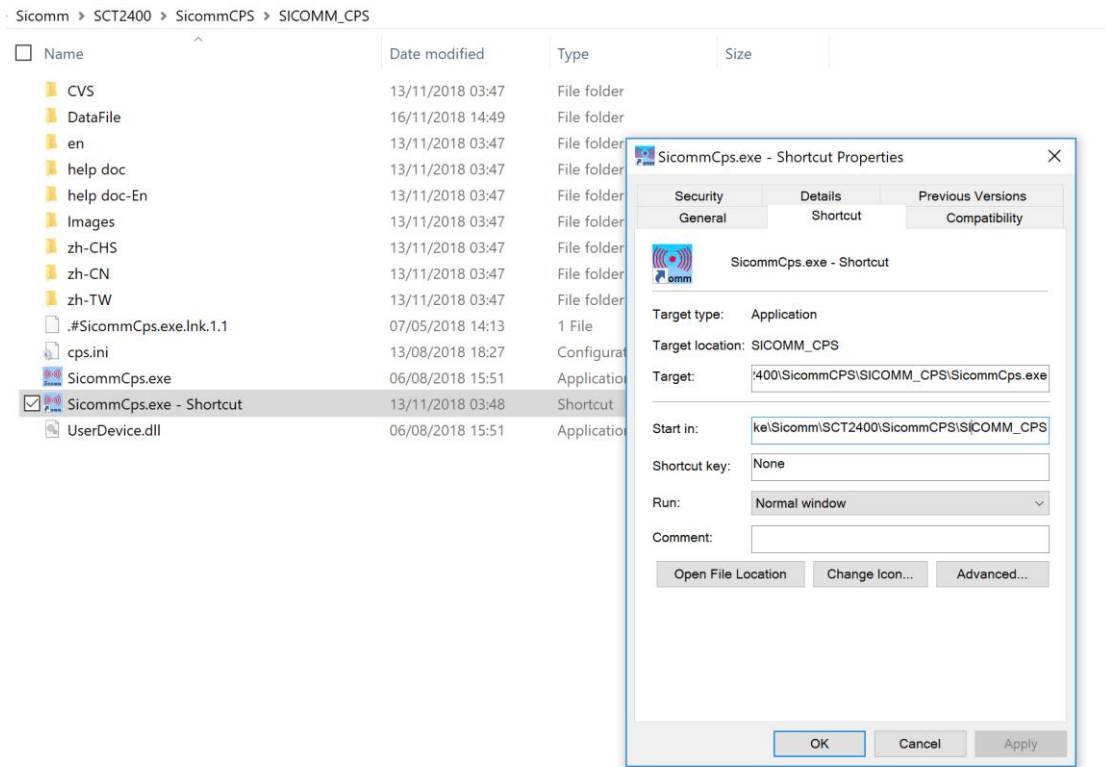


Figure 5.3 Sicomm CPS Shortcut

**Step 3:** Add a space + "internal" at the end of the target path (space and quotation marks are English characters):

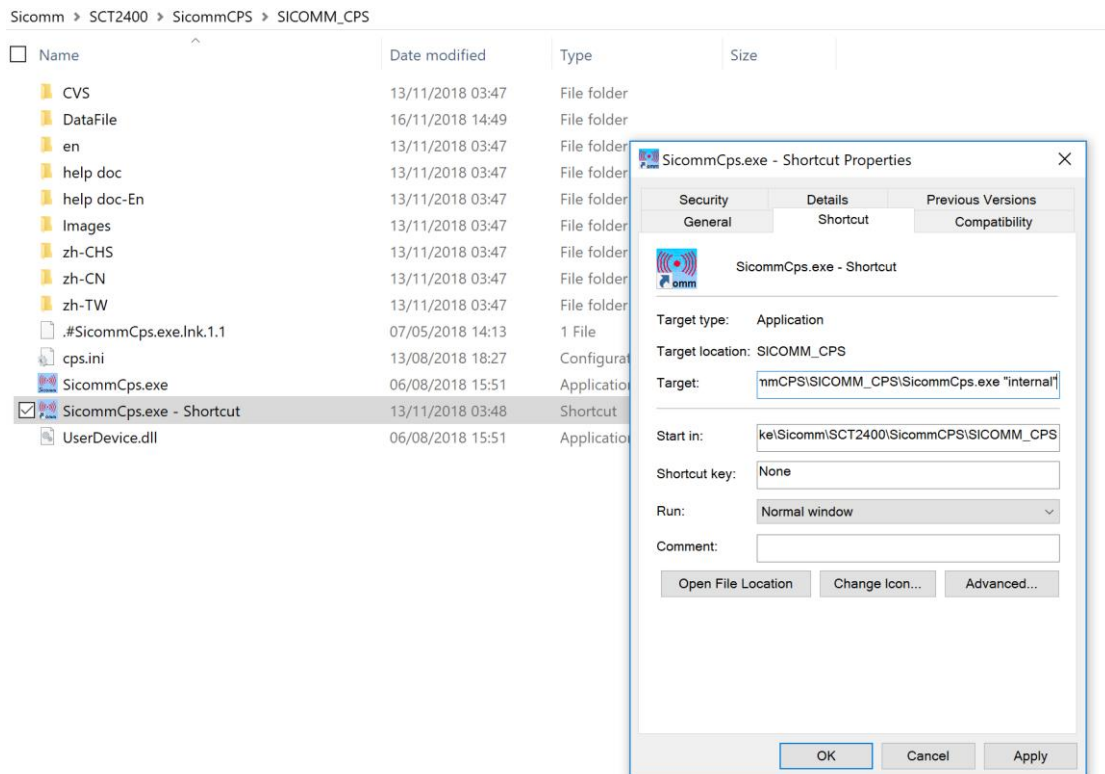


Figure 5.4 Modify Path

## 5.2 EVM Connected With the Host Computer

**Step 1:** Double-click the shortcut to open CPS.

**Step 2:** Click the Language tab and select the desired language setting (default is Chinese)

**Step 3:** Connect the SCT2400 EVM to the computer via a universal USB cable (At ③ shown in Figure 4.1), then turn on the EVM power switch (At ⑤ shown in Figure 4.1) and confirm the USB identification in Device Manager (Shown in Figure 5.5).

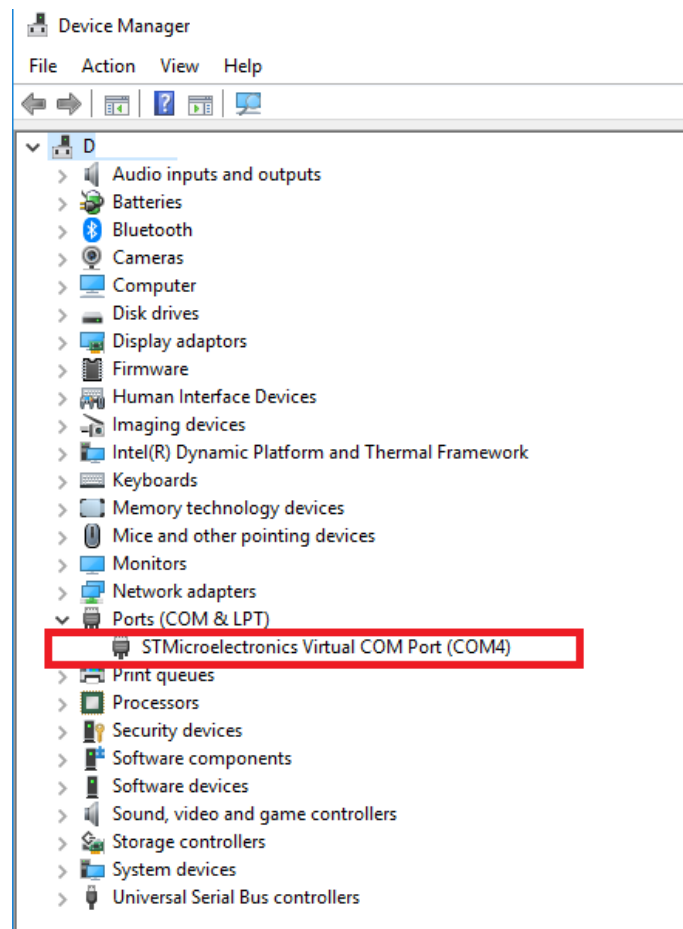


Figure 5.5 USB Identification

## 5.3 CPS Screen Layout

The CPS screen is divided into 5 main sections. At the top is the toolbar, with shortcut buttons beneath. In the left pane is a directory tree allowing various functions to be called and in response the right pane displays settings and programming options. The bottom pane shows context related information.

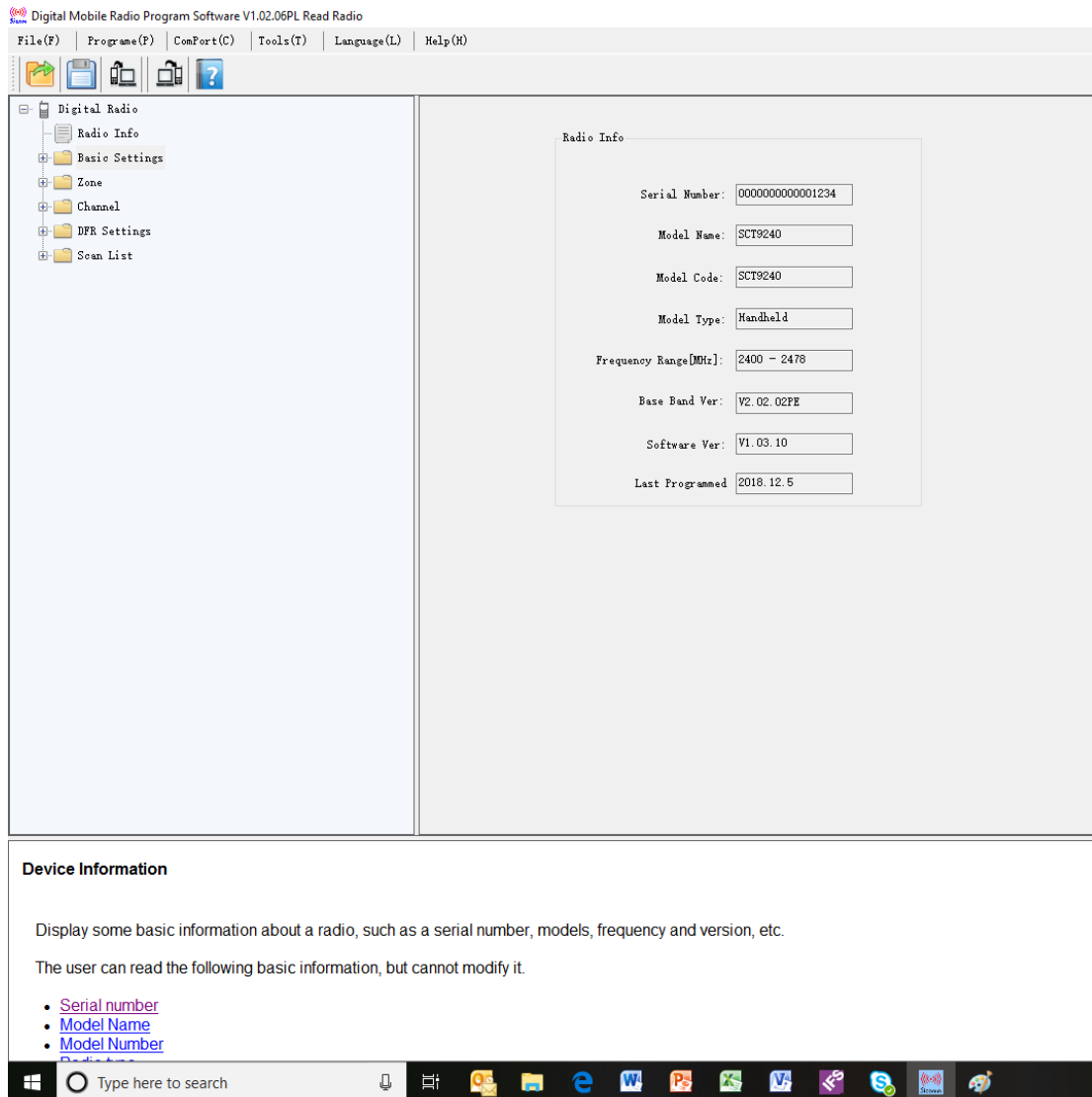


Figure 5.6 CPS Screen

Settings can be changed using either radio buttons or drop down boxes, whilst titles for channel names, zones, etc. can be directly overwritten.

Not all features are currently supported, unsupported features will not respond to selection.

## 5.4 Initial Functionality

When CPS is first loaded and the EVM is configured, the initial configuration supports the following functionality:

| <b>Feature</b>     | <b>Description</b>                      |
|--------------------|---|
| Number of channels | 16                                      |
| Call types         | Individual, Group, Broadcast (All call) |
| Group list         | G_1                                     |
| Scan list          | Not set up                              |

## 5.5 Reading Frequency

First, run the CPS software, and connect the EVM to the computer, turn on the EVM power switch (At ⑤ shown in Figure 4.1). Click "ComPort" and select the appropriate COM port which should show in the drop down list (Shown in Figure 5.7). Click "Program" and find the "Read" icon to implement the reading operation (See Figure 5.8).

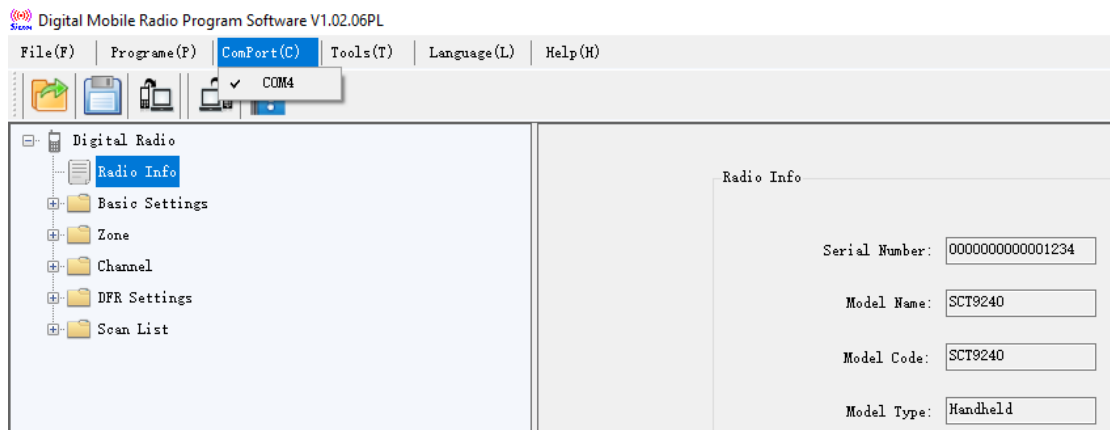


Figure 5.7 COM Port

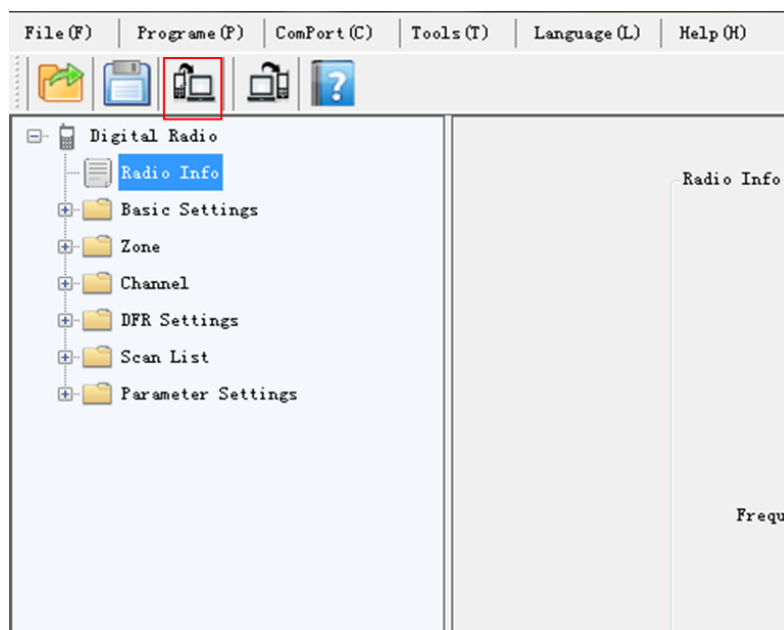


Figure 5.8 Reading Frequency

A confirmation box will open (Figure.5.9), select OK to proceed.



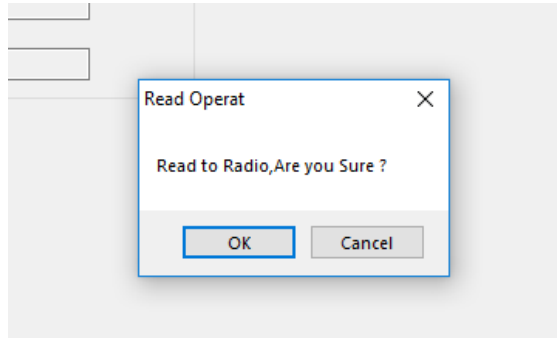


Figure 5.9 Read operation

A progress dialog box then appears

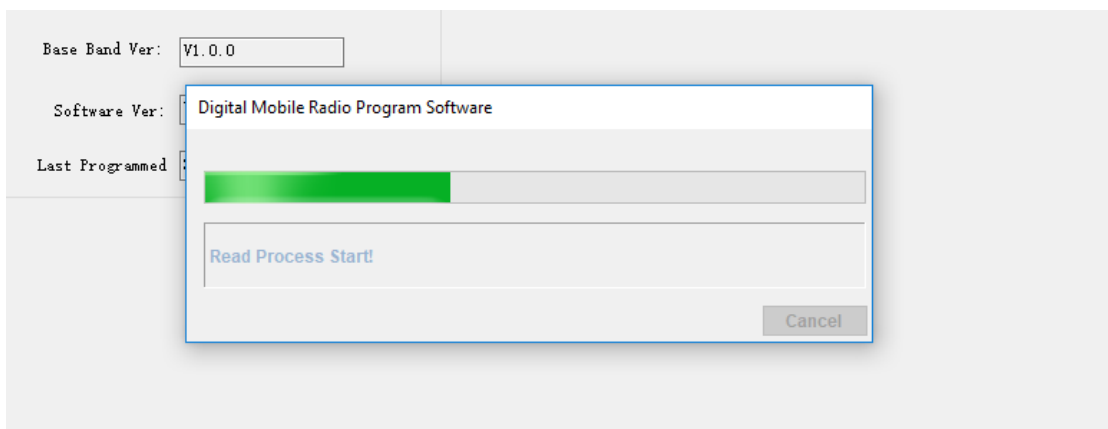


Figure 5.10 Progress Dialog

followed by a confirmation of successful operation

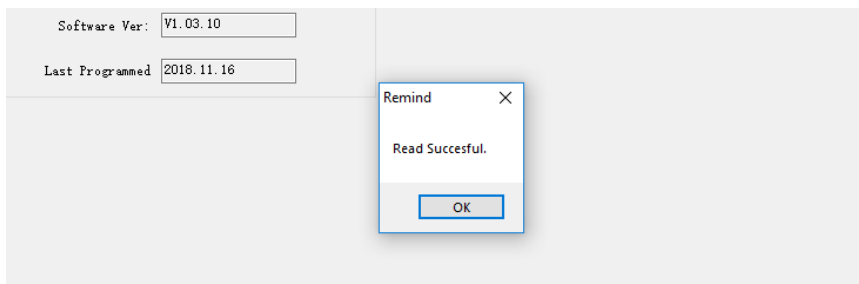


Figure 5.11 Read Successful

If the read operation is unsuccessful an alternative dialog box is shown.

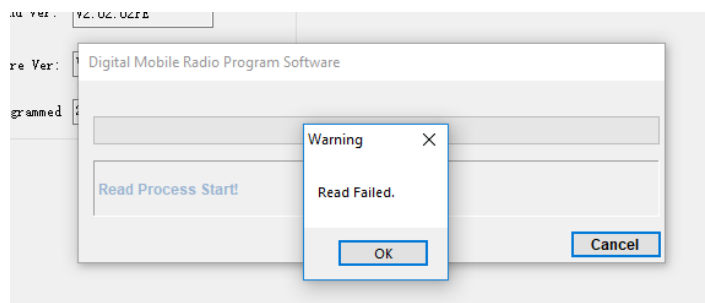


Figure 5.12 Read Failed

## 5.6 Writing Frequency

There are two methods of writing operating frequencies to the EVM. Firstly after successful frequency reading, the parameters can then be reconfigured (See section 6 as an example), then Click Save icon to save it.

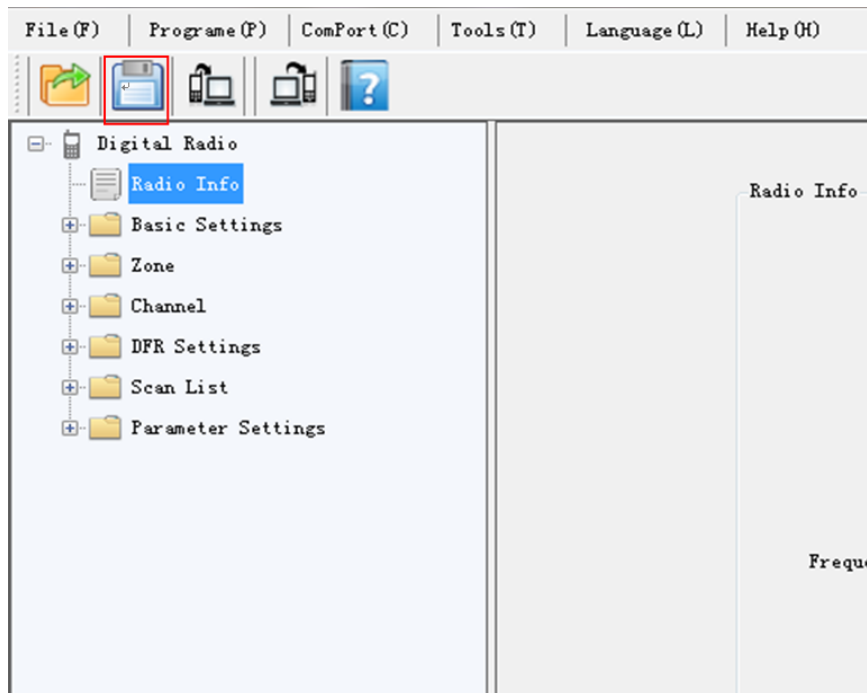


Figure 5.13 Save the Configuration

This action opens a directory screen where the saving location may be selected.

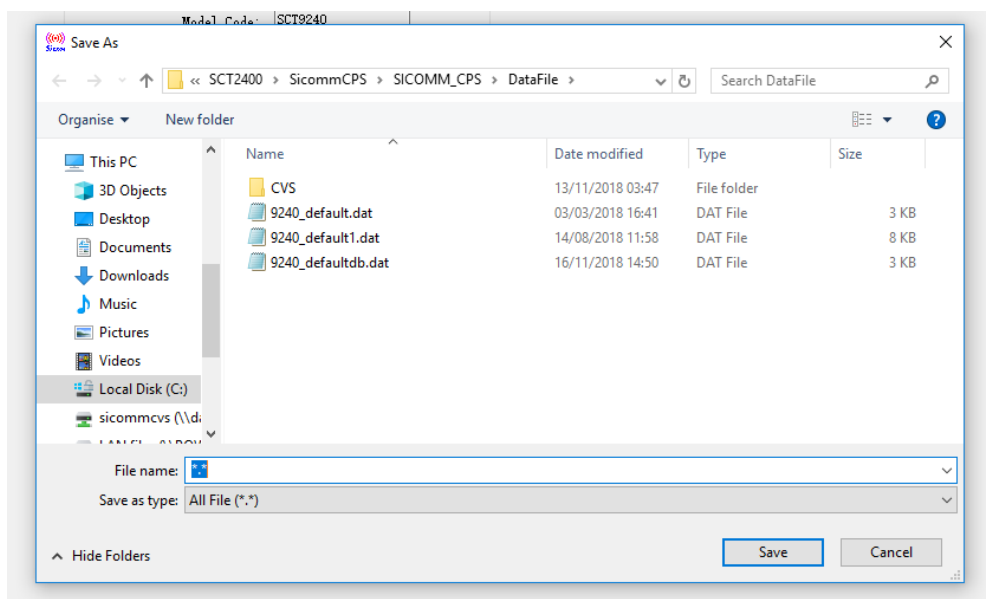


Figure 5.14 Saving location

The second method is to directly open the .dat configuration file (Shown in Figure 5.15 and 5.16), and then write the frequency.

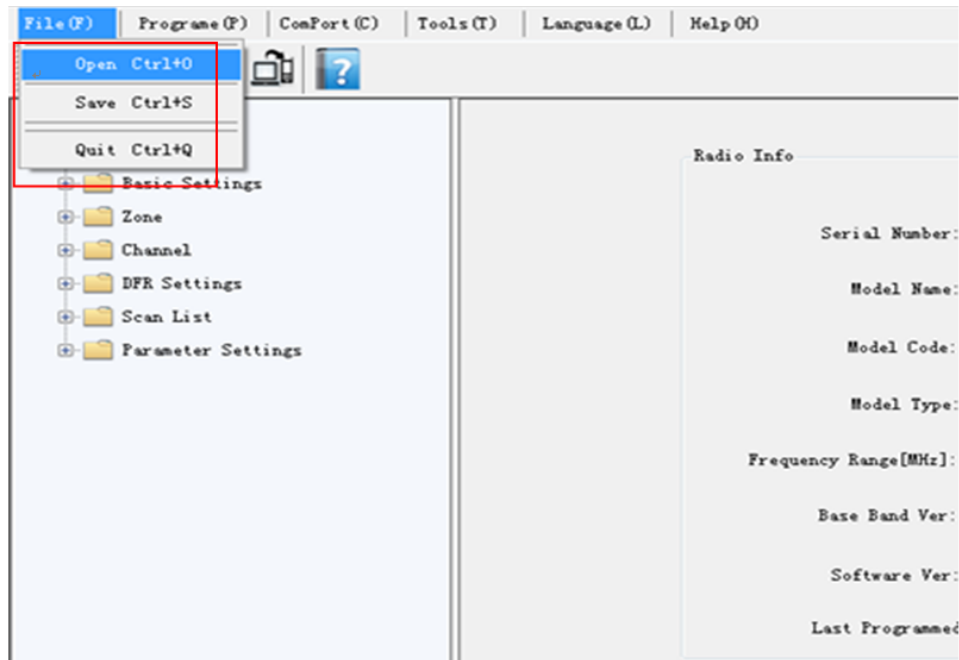


Figure 5.15 Open Configured File

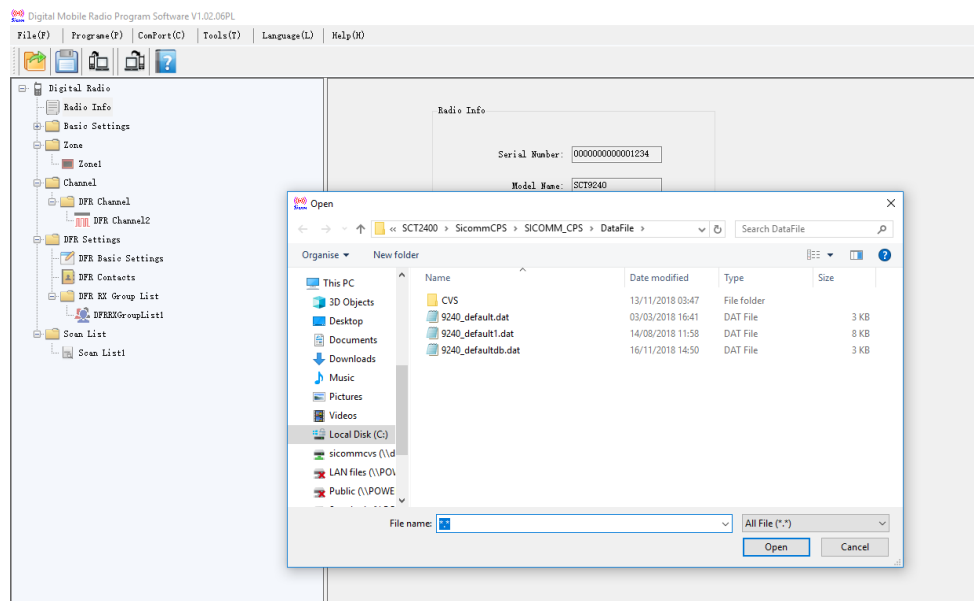


Figure 5.16 Choose and Open .dat File

EVM parameters can then be reconfigured (See section 6). Click the “Write Frequency” icon (Shown in Figure 5.17) to send the configuration to the EVM.

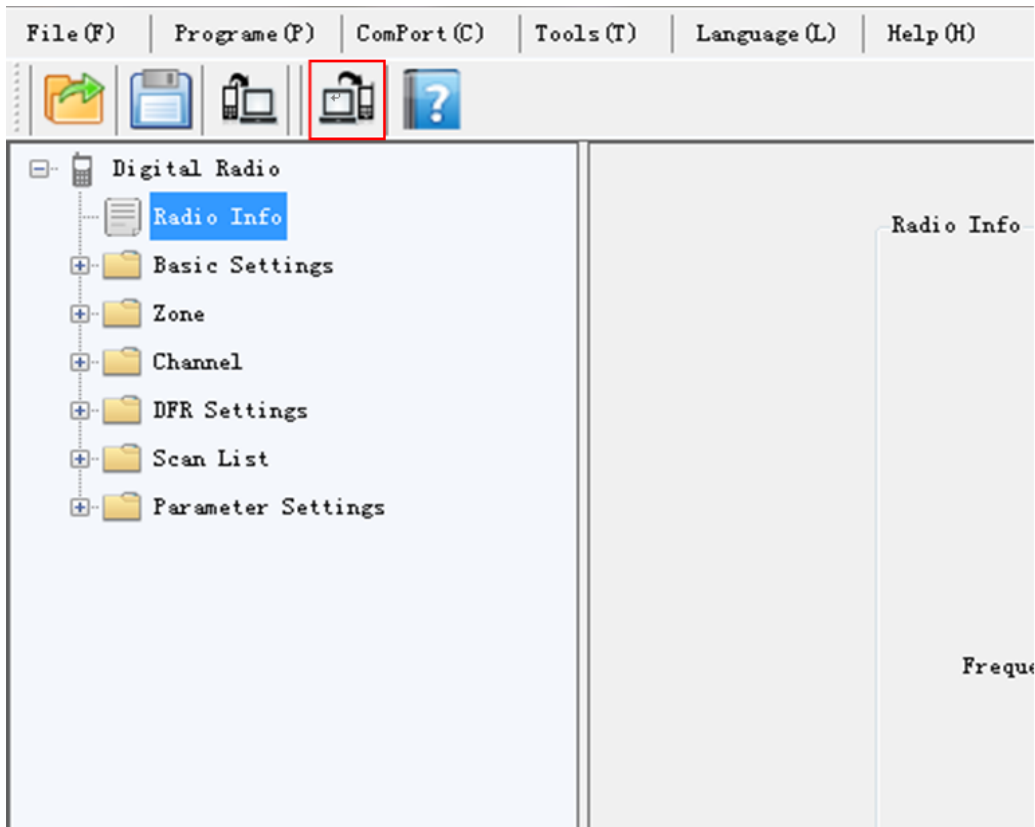


Figure 5.17 Writing Frequency

A dialog box opens asking for confirmation

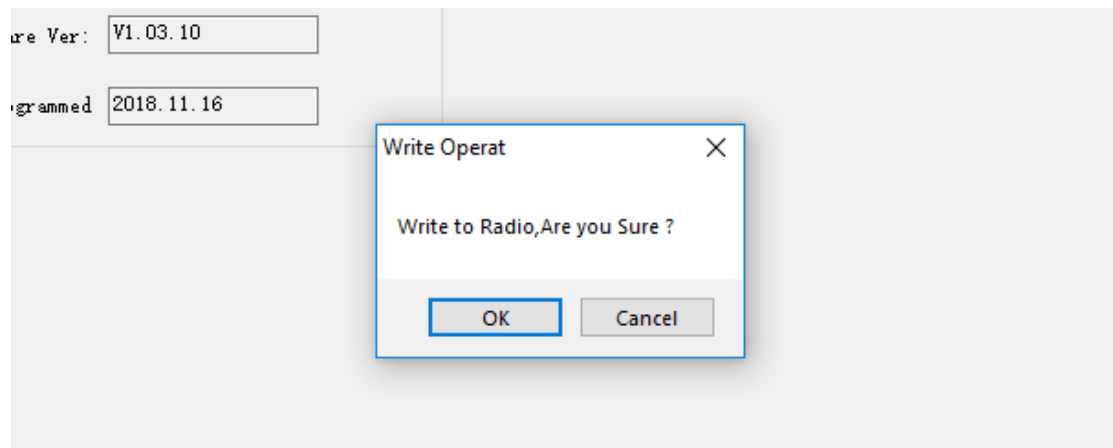


Figure 5.18 Write confirmation

## 6 SCT2400 Firmware Upgrading

### Step 1:

Press PTT button and turn on the power knob at the same time.

### Step 2:

If led is twinkling between red and green, which means it goes into the ISP Upgrade mode.

### Step 3:

Go to Tools -> Upgrade ISP-> select the .bin file and upgrade it in CPS

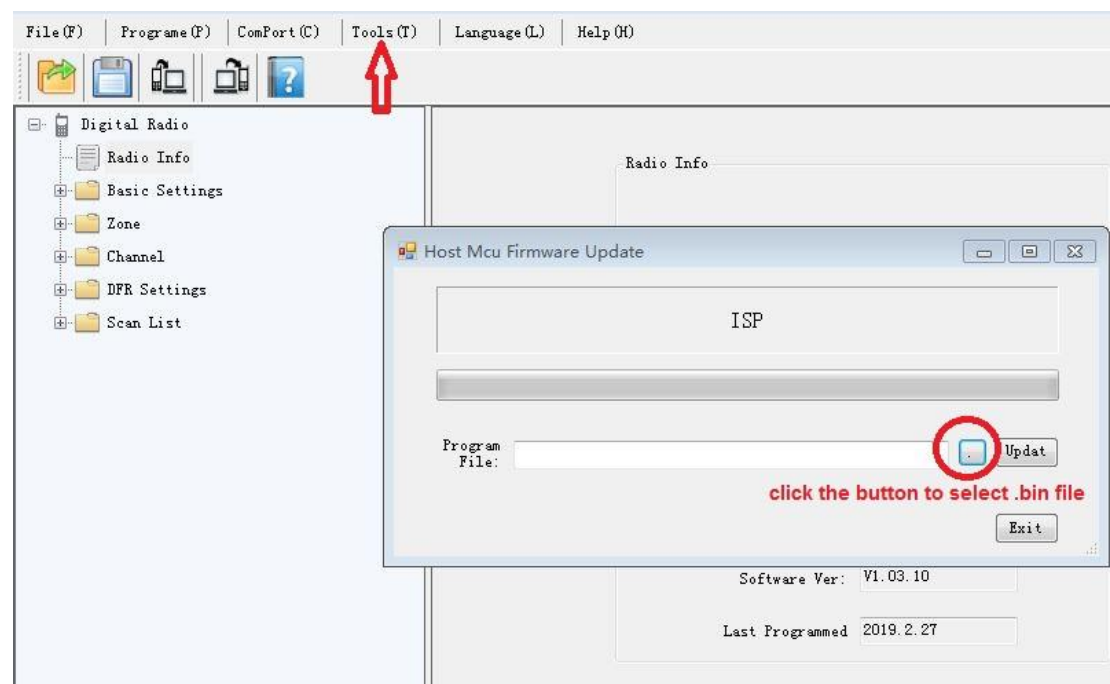


Figure 6.1 ISP Upgrade

## 7 Frequency Modification

After successful frequency reading (Or open local configured .dat file of this EVM), click "Zone" -> "Zone 1". And you will find that there are already four channels (Shown in Figure 7.1), which can be added, removed, or adjusted its order on this window.

Click "Channel" -> "DFR Channel" to see the four channel frequencies (Shown in Figure 7.2) that have been configured. Modifying the frequency point is to change the "TX Frequency", and then click "Copy"(Shown in Figure 7.3) to confirm the same frequency of TX and RX (Note that the

frequency range is 2400MHz ~ 2478MHz).

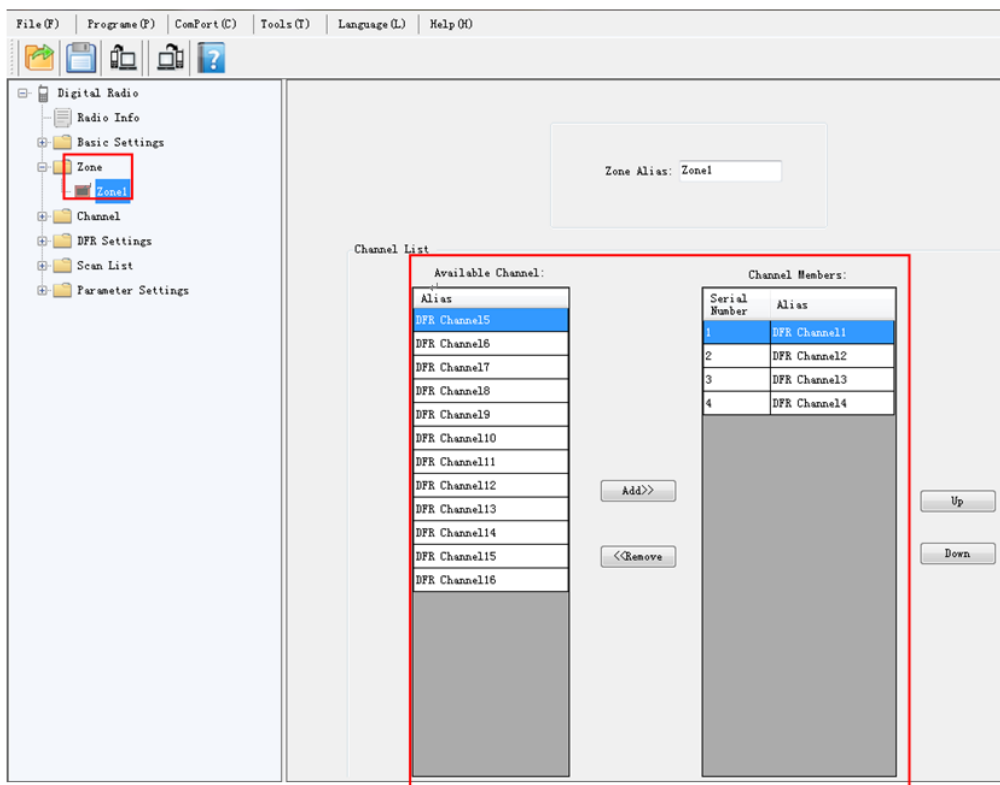


Figure 7.1 Channel Zone

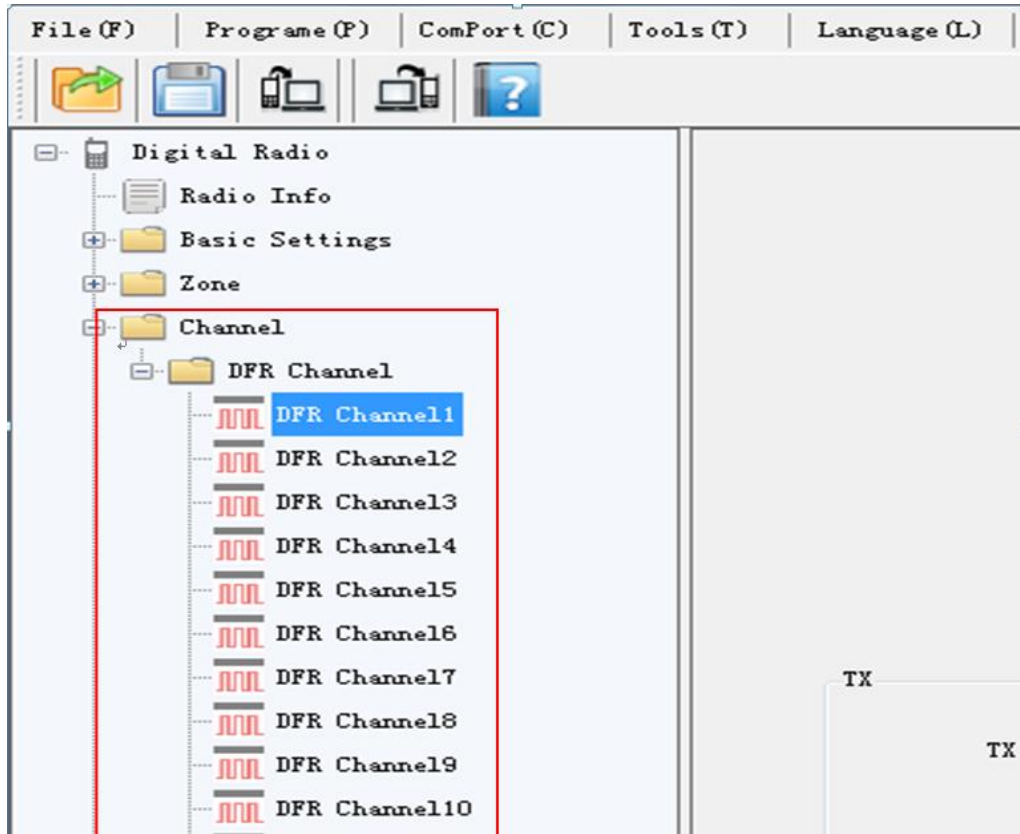


Figure 7.2 Channel Parameters

The screenshot displays the configuration interface for the SCT2400 radio. It is divided into several sections:

- DFR Channel:**
  - DMR Digital Channel Alias: DFR Channell
  - Vocoder: iFengyu
  - Scan List: None
  - Enable Auto Scan:
  - RX Only:
- TX (Transmit):**
  - TX Frequency [MHz]: 2400.000000
  - TX Contacts: G\_1
  - TX Power Level: High
  - TX Admit: TX Allow
  - Time-out Forbidden Time [s]: No Limitation
  - Time-out Recovery Time [s]: 0
- Frequency Offset [MHz]:**
  - 0.000000
  - Copy >> button
- RX (Receive):**
  - RX Frequency [MHz]: 2400.000000
  - RX Group List: DFREXGroupList1
- Encryption:**
  - Encryption:
  - Encrypt Key: 1

Figure 7.3 Channel Frequency Setting

## 8 Other Settings

### 8.1 Basic Settings

The user can configure some basic settings of the radio, these configurations are generally available globally.

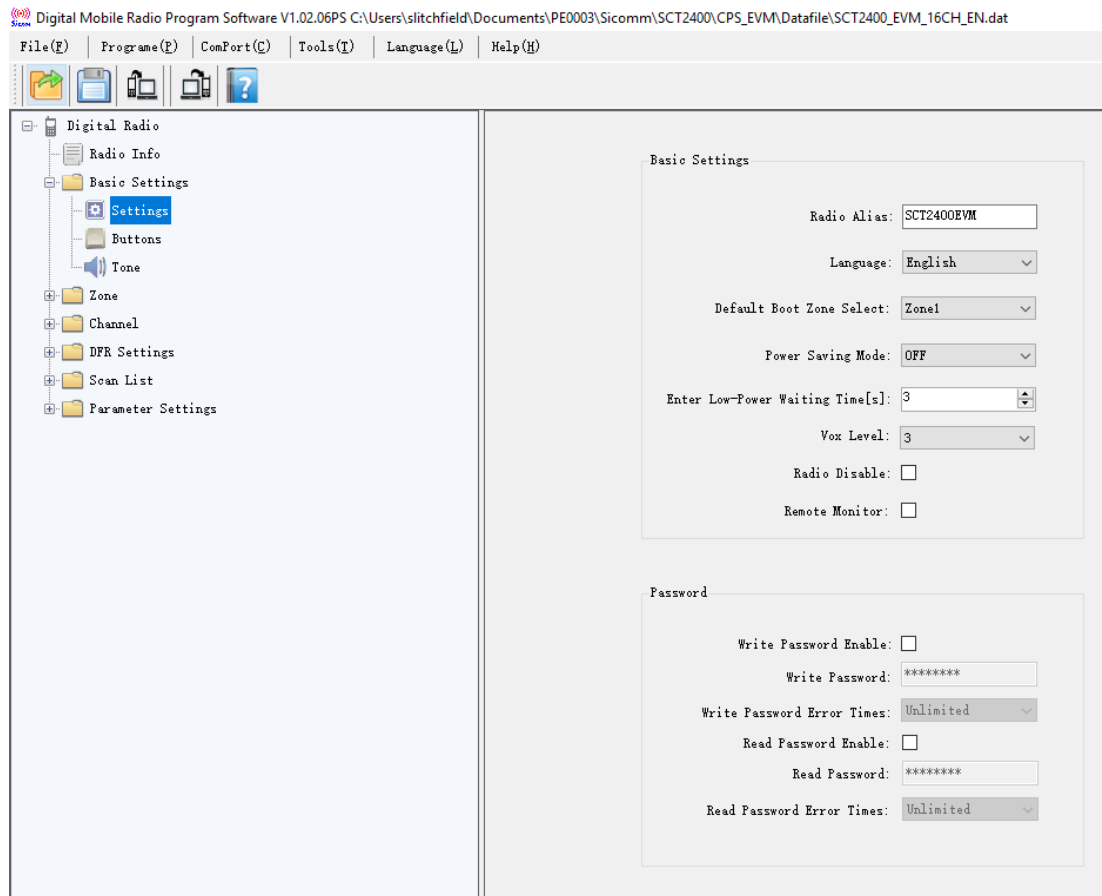


Figure 8.1 Basic radio settings

## 8.2 Buttons

The user can program the programmable keys for some optional functions.



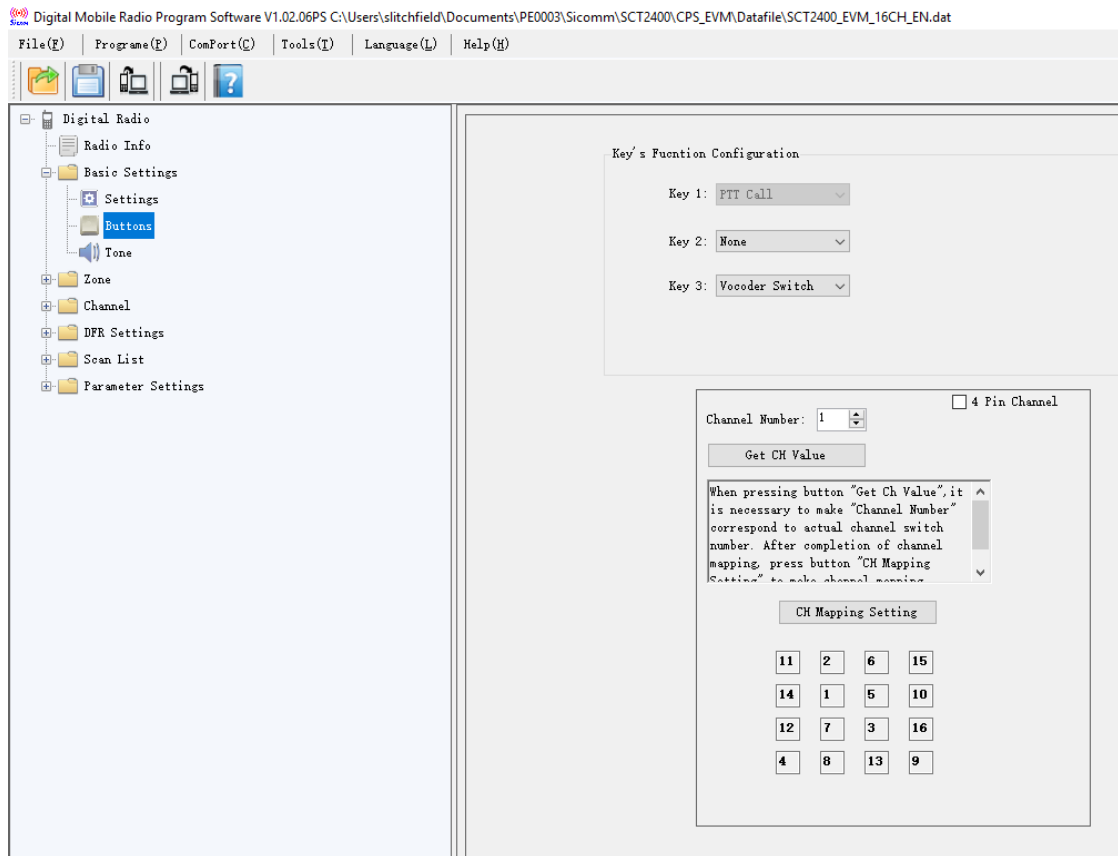


Figure 8.2 Configuring Button Functionality

Note: The channel mapping box is not used. The Channel Switch, CH1, is defined in the SCT2400 and cannot be changed. The selector lines are directly connected to PE14 and PE15 of the SCT2400.

## 8.3 Tone

On this window, users can set the Tones and LED/Backlight

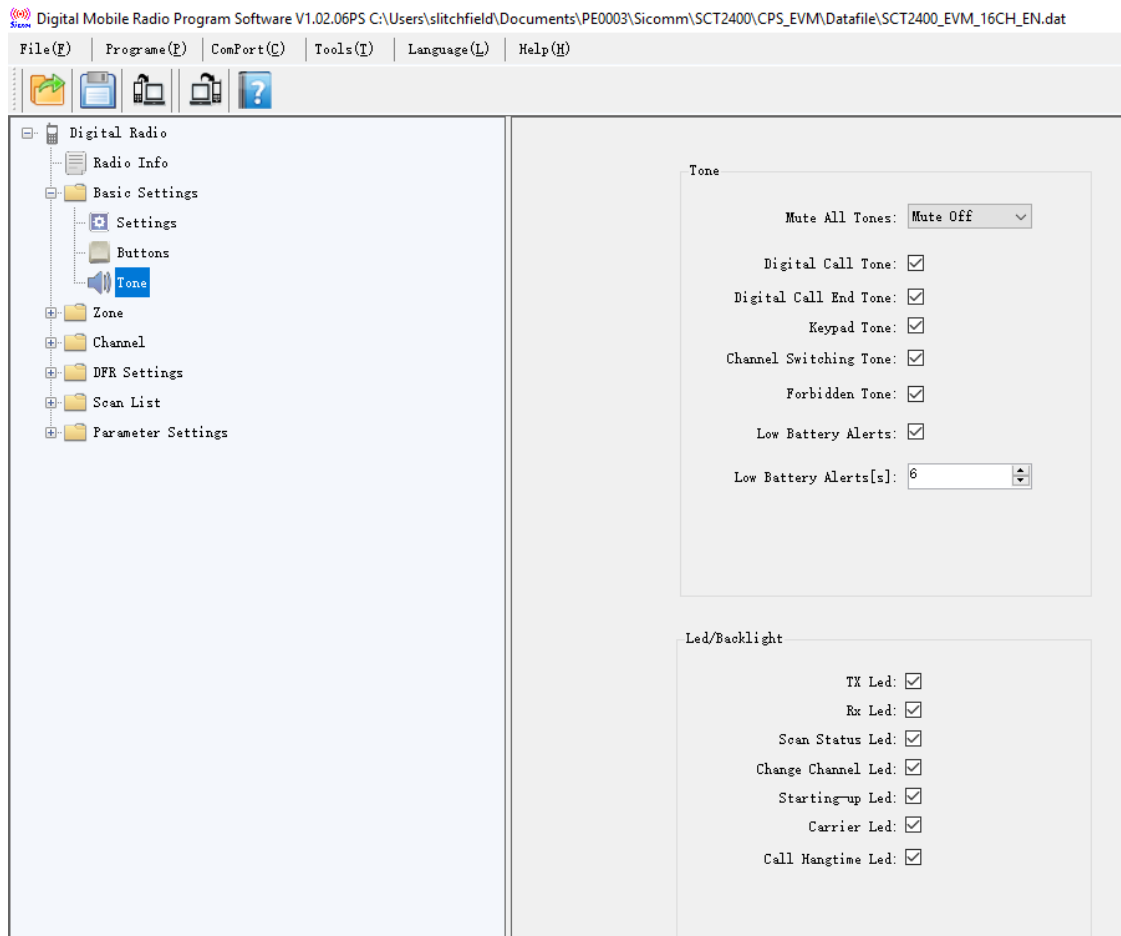


Figure 8.3 Configuring Tone Functionality

## 8.4 Zone

A zone is a group of channels, which could help user to manage radio channels easily. If users add several zones, they could switch zone through Menu>Zone or the programmable function key associated with zone switching function.

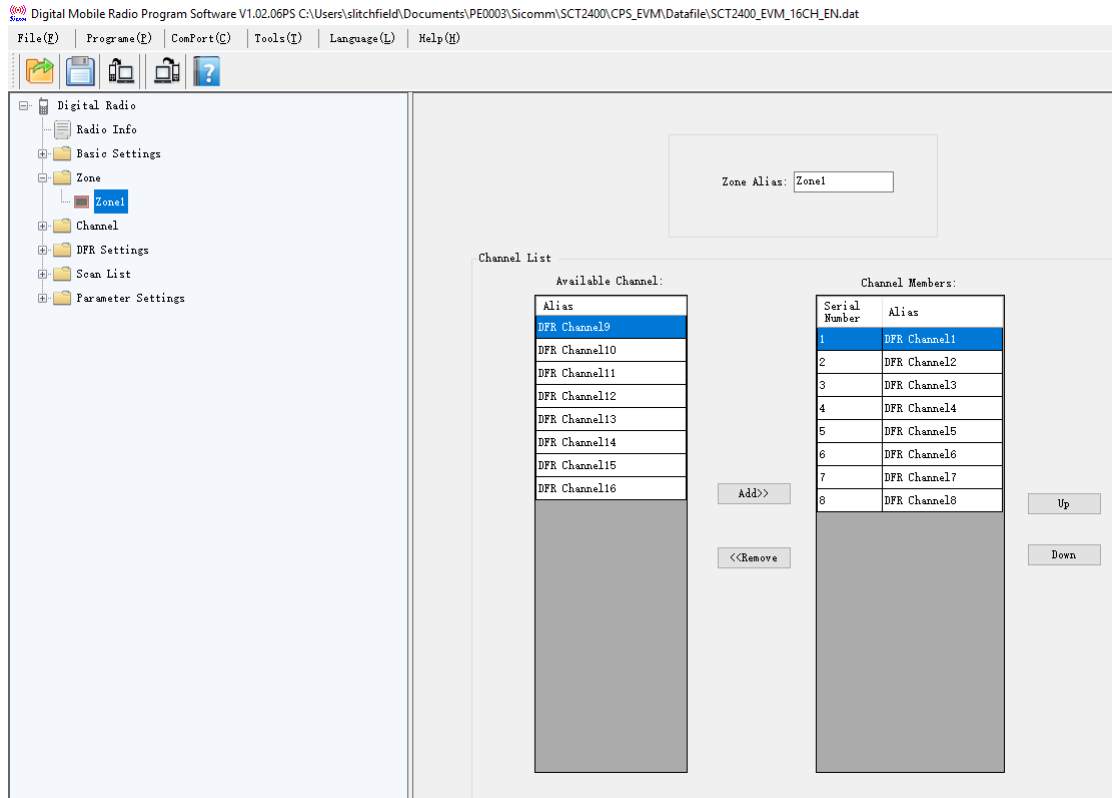


Figure 8.4 Setting Radio Zones

## 8.5 Radio Channel

The user can add or delete a channel. And configure the specific parameters for each channel.

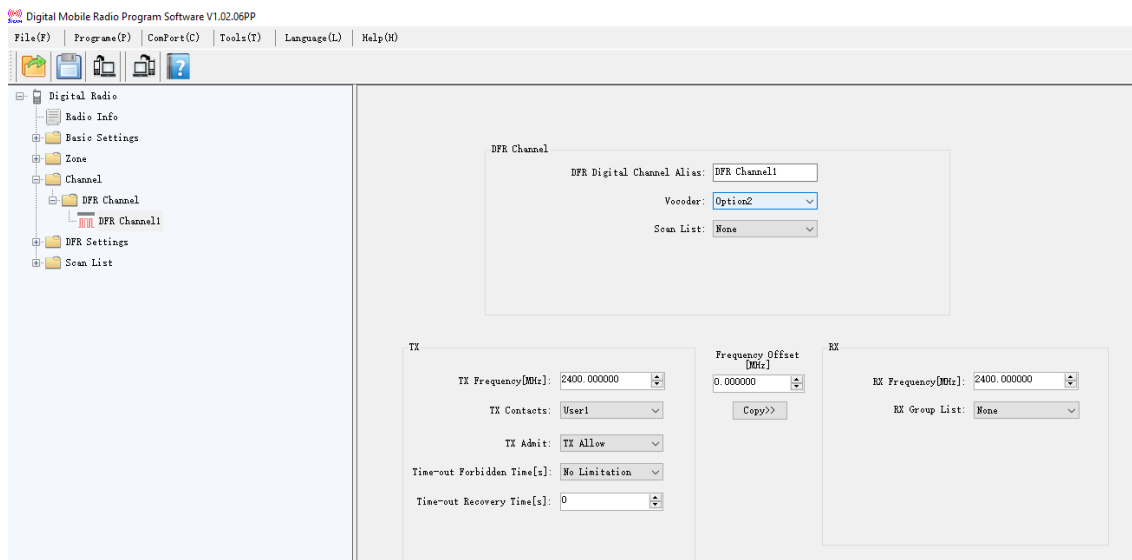


Figure 8.5 Radio Channel Configurations

## 8.6 DFR Basic Settings

The user can set the following DFR basic settings based on DFR specification;

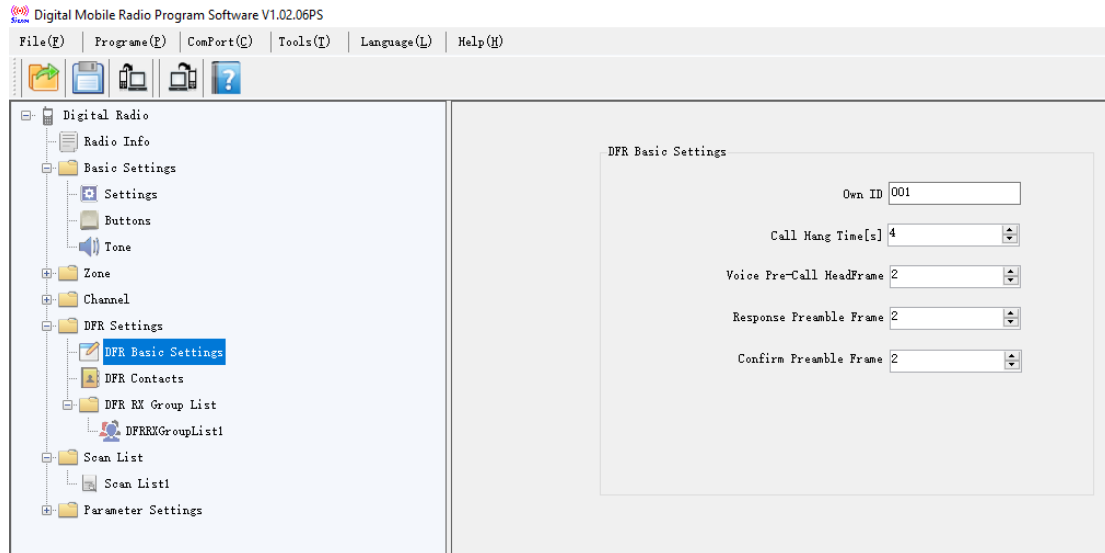


Figure 8.6 DFR Basic Settings

## 8.7 DFR Contacts

Contacts provide "address-book" capabilities of the radio and set a list of call ID for a digital call member. Each entry corresponds to a call alias or call ID that you can use to initiate a call and associates with one of 3 call types (Group Call, Private Call, All Call). The meaning of the call type is explained as follows:

- 1) Group Call - This is the ID of the Group that the user wishes to subscribe to.
- 2) Private Call - This is the Radio ID of the target radio.
- 3) All Call - This has a fixed ID of 255 (value is not editable).

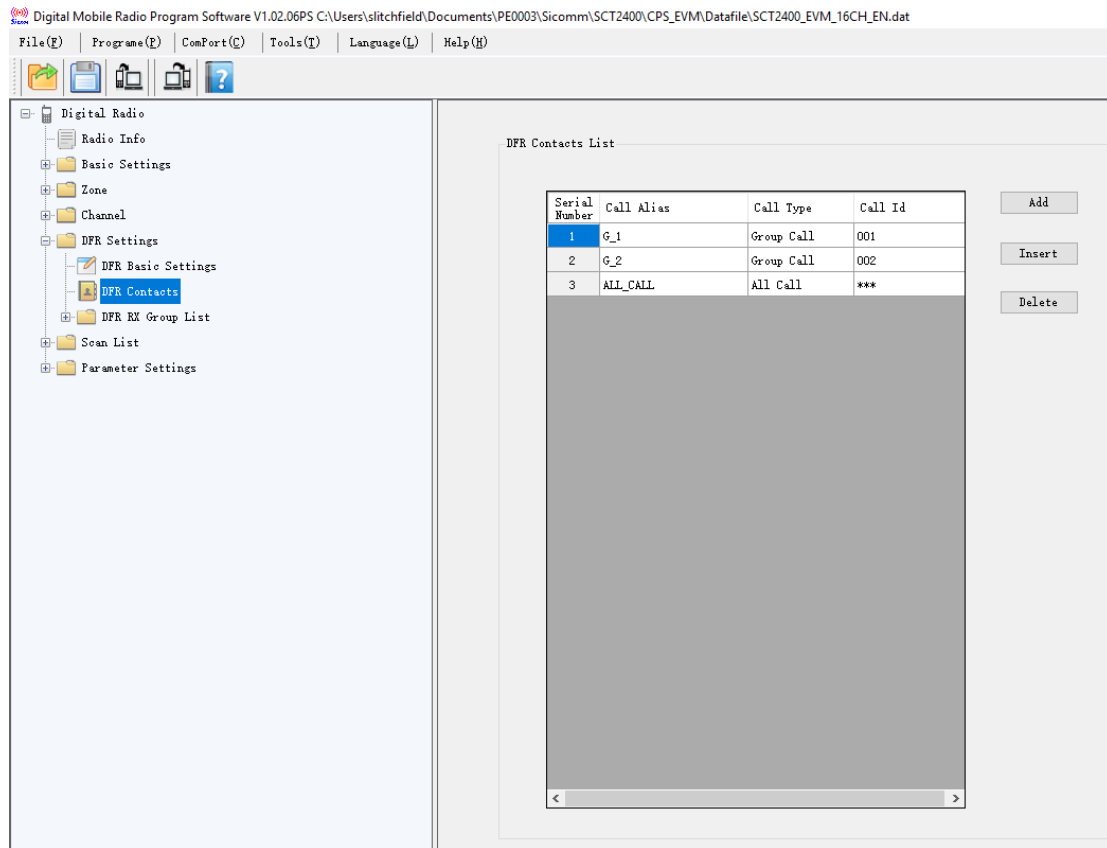


Figure 8.7 Setting Up Contact Lists

## 8.8 DFR Rx Group List

List all DFR Group IDs, which is a member of (or subscribed to) the channels.

When this list is attached to a digital channel, the radio can receive a group call that is addressed to anyone of its subscribed groups, and will talk back within the Group Call hang time.

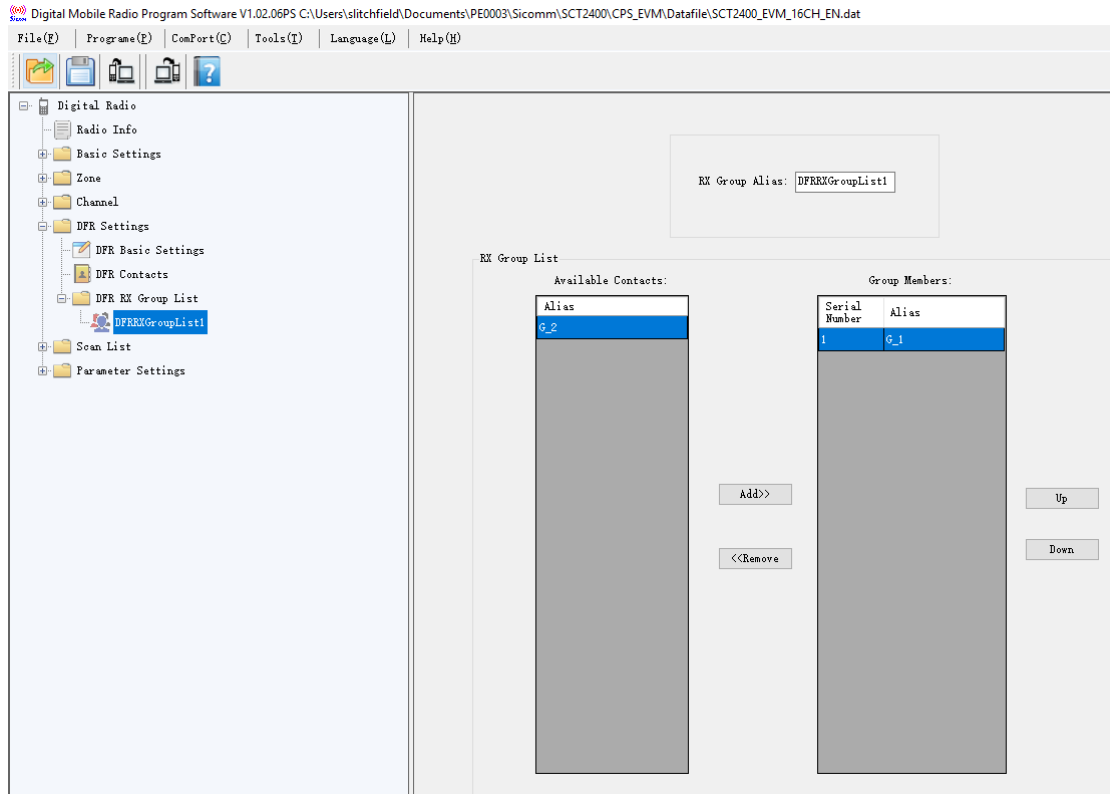


Figure 8.8 Setting up Call Groups

## 8.9 Scan List

Scanning allows the radio to search the scan list that is attached to the current channel for an eligible channel to receive. All the members on this scan list will be scanned during a scanning operation. Each Scan list should keep at least one channel.

## SCT2400 Test Guide and CPS Instructions

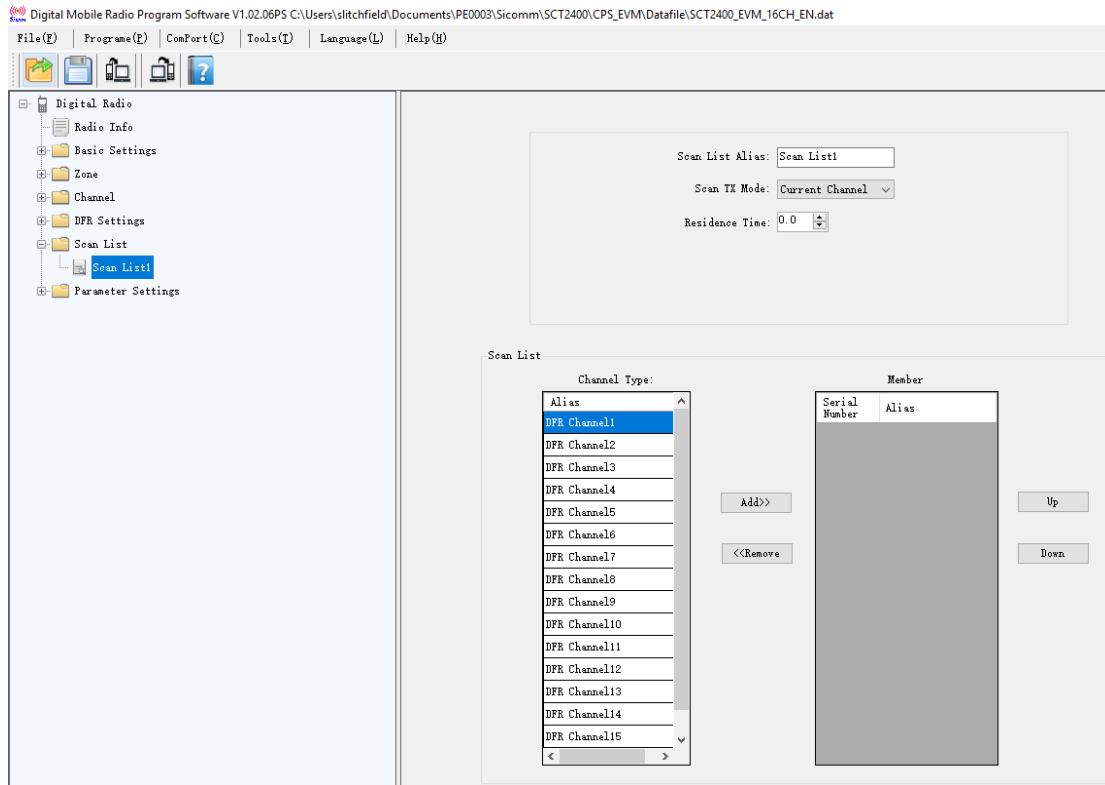
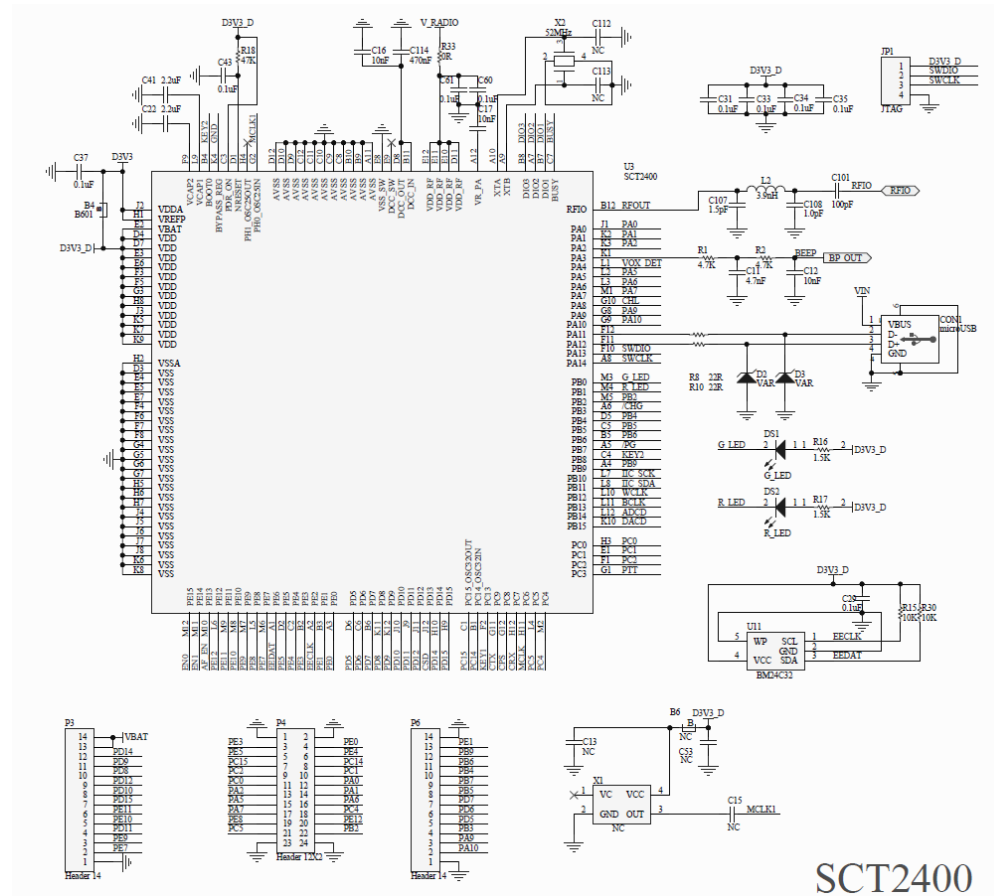
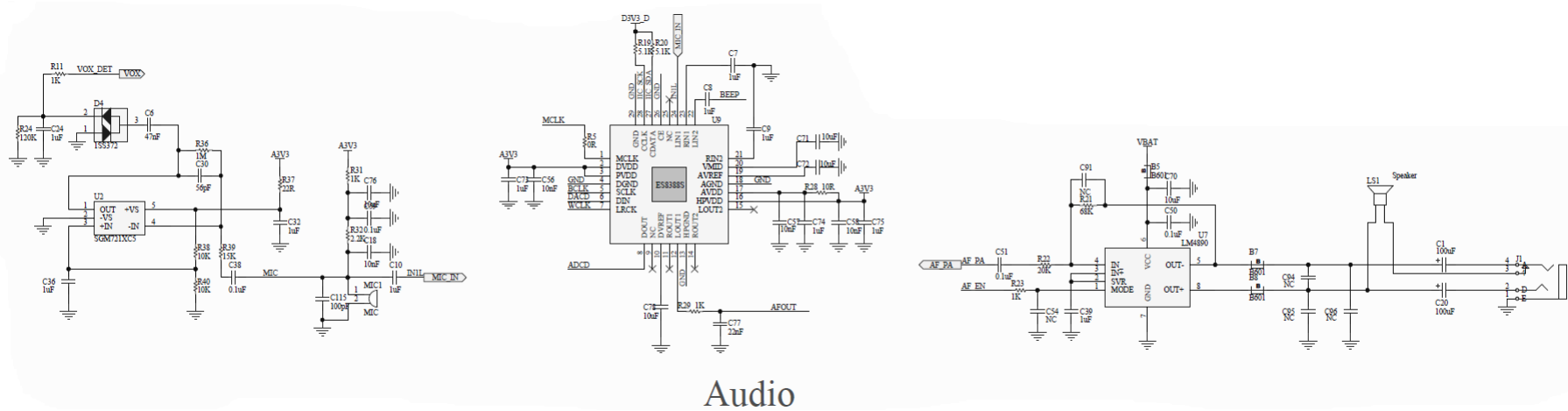


Figure 8.9 Setting Up Scanning

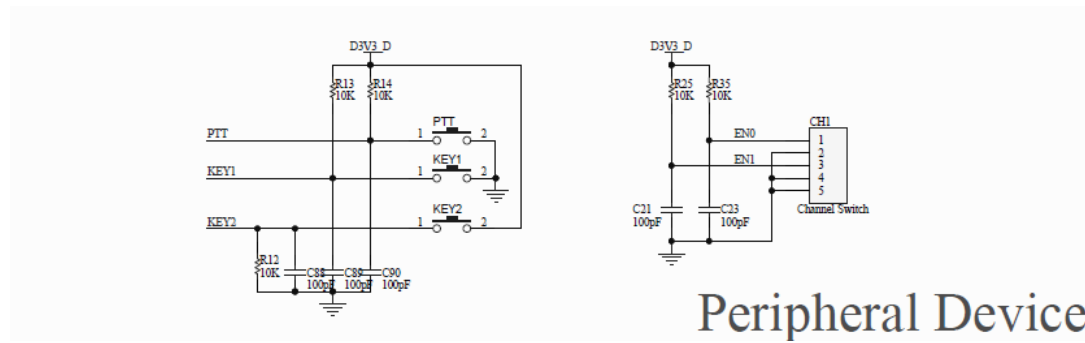
# 9 Appendix.1 SCT2400 EVM Circuit Schematics



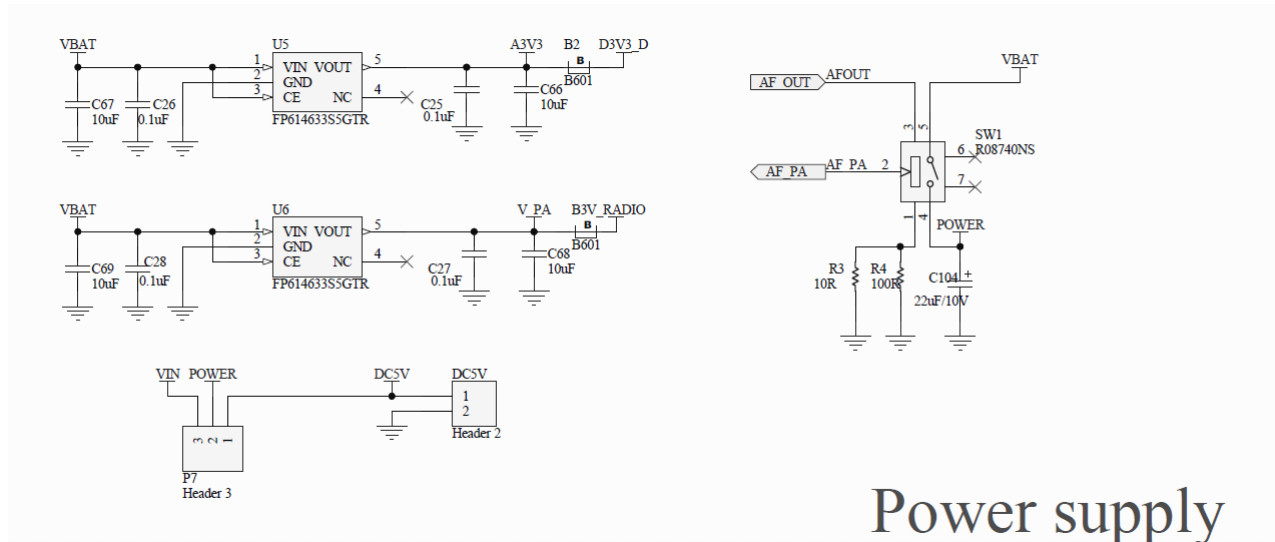




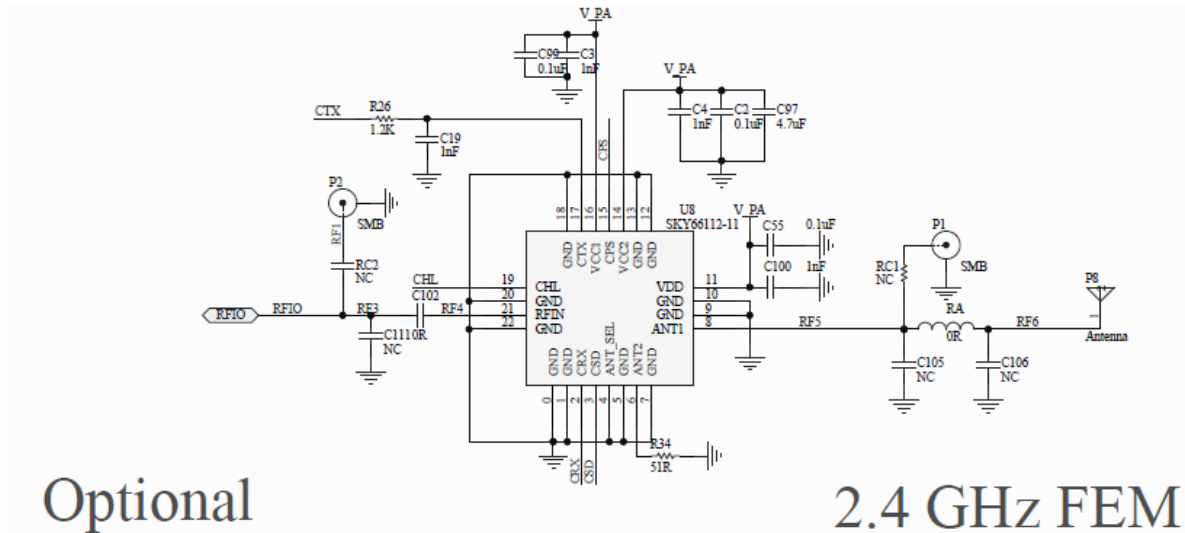
Audio



Peripheral Device



Power supply



Optional

2.4 GHz FEM

*Note: The value of RC1 and RC2 is same, 0 ohm.*

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

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[SCT2400EVM](#)