

This manual refer to the latest version of the program for STORNO CQM6xxx radio, written by StrayCat.

The program has two arrays of channels, 100 channels each. Switching between channel arrays is performed by clicking the button "Mode selector" then "A" ("Alarm"). Originally both arrays are written in ROM. At offset 4000h - the first channels array and at offset 4800h - second channels array. Recording format of the channels array is simple and straightforward. So you can manually enter the desired frequency into the array before blowing the ROM, maintaining exactly the used records format. To avoid confusion, it is recommended not to change the channels numbers in records.

Each channel array in the ROM have the projection corresponding in size to the RAM (initially empty). Changed frequencies is stored into the RAM, in the corresponding channel projection. Program detects the presence of the channel in memory and will use them in the first place. If the channel entry in RAM corrupted or damaged, you need to clean this area of RAM. (see below)

At the very first time, as rule, the program automatically makes a complete cleaning of the most areas of the memory, and performs the initial installation of some parameters - the initial volume level, initial and final channel scan numbers (00 - 99) and several others. At the very first time the radio is turned on, click at the basic function keys and make sure that the program respond to them correctly. Make the necessary settings, turn off the radio, turn on again and make sure that the necessary settings are saved in the memory when you turn off.

The main modes of operation of the program:

Mode 0 - receive/transmit on split frequency, channel scanning at the reception. This is the basic mode of operation of the program, the program enters into it at startup.

Mode 1 - Set the channel number. The program goes into this intermittent operation by pressing the "CH" and at the end return to mode 0.

Mode 2 - set of frequencies of reception/transmission channel. The program goes into this intermittent operation by pressing the "Queue" and at the end return to mode 0.

Mode 3 - receive/transmit at the current frequency, the frequency scanning in the interval. The program goes into this mode by pressing "*" and at the end return to mode 0.

Mode 4 - Set current frequency of receive-transmit. This mode is a peculiar submode of the third mode of operation of the program. The program goes into this intermittent operation submode from mode 3 by pressing the "Queue" and at the end return to mode 3.

Switching to mode 3:

To enter this mode, press "*". The indicator will show the current channel number, the receive frequency (transmission frequency) and two digits to the right of the display - the current frequency step. Frequency step selected only in this mode by clicking the "Mode selector". Possible choices - 12, 25, 50 KHz (12 = 12,5 KHz). Frequency step is stored in the memory. To exit from mode 3 press the "*". When you exit from mode 3, current channel will be rewrite in the appropriate area of the RAM, even if nothing has changed!

The scan submode: (work in mode 0 and 3)

The scan submode is entered/removed by pressing the "S" button and is working in modes 0 and 3.

The scan submode has its own indicator - LED "Scanning indicator".

In the scan submode, the keys "Volume up" and "Volume down" are used to increase/decrease the number of the current channel (mode 0) or frequency (mode 3).

In the scan submode, the key "A" (ALARM) starts/stops the automatic channel scan (mode 0) or scan in the frequency interval (mode 3). The Scan indicator will flash, pointing to the automatic scanning.

Before starting the automatic scan, be sure that you are set properly the starting and ending channels or the starting and ending frequency. If the starting and ending channels have been set before, set it again there is no need - when you turn off the radio starting and ending channels stored in memory.

Each array of the channels has the ability to set their own the starting and ending channel for scan.

Upon detection the work in the channel, during the automatic channel scan, the program will be suspended for a 10 seconds (maximum), giving the opportunity to make decision about the channel. When scanning the frequency, the delay is set to 5 seconds. If the frequency scan will be interrupted, the current frequency will be taken for a new beginning or the new ending of the scan (if the current frequency will be more of the ending frequency after setting).

The Selective Call mode: (work in mode 0)

The main purpose of the Selective Call is to open squelch only when receiving the correct ID number. When this will occur, will be open the "Car horn" key (for 1 second) and sound channel. The channel will be closed at the end of the carrier.

Selective Call mode is switched on/off by pressing the "Bell" ("External alarm on/off") and have its own indicator - LED "Bell" ("External alarm"). This option work fine on radio with old type of control board with main DIP chips and bad on the radio with new type of control board with main SMD chips. Probably the new DSP firmware OKI M77C20A are

slightly different from the old one.

To configure this mode, you must to do the following:

1. When Selective Call mode is OFF, click the "Mode selector" then press button "Bell". (this state is set on 5 second without pressing any key) You will see the next string, for example: "12345 CCIR", where:

"12345" - is the Selective Call ID number of your radio. You can change it by typing a new number from the keyboard.

"CCIR" - is codec name. Type of the codec is selected by successive pressing of the "Bell" button.

Keys, used in this mode:

"0-9" - for typing the ID number.

"Bell" - to select the codec.

"Queue" - to exit from this mode.

"CL" - to backspace in editing.

2. When Selective Call mode, click the "Mode selector" then press the button "Bell". (this state is set on 5 second without pressing any key) You will see the next string, for example: "* 1 12345 +12ABC", where:

"*" - is the tone-coded squelch flag. When it is ON - "*" is set, your sound channel will be open only after getting right ID number! This flag is switched by pressing "Call Transmitter" button - tone key and work only in Selective Call mode.

"1" - is a number of string with your abonent.

"12345" - is a string with ID number of your radio abonent.

The abonent string is selected by successive pressing on the "Bell". In total there are 9 rows of abonents, and you can change his ID numbers by typing a new ID number from the keyboard.

"+" - is the flag. Its purpose - add or no the following after him message to the sending ID number.

"12ABC" - is a message, what can be sent to your abonent. The message can consist from signs: 0-9,A,B,C,D. Size of all numbers and messages are 5 signs.

Keys, used in this mode:

"0-9" - for typing the number and "0-9,A,B,C,D" - for typing the message.

"Bell" - to select the abonent string.

"A" - to switch on/off the "+" flag.

"tone" - to switch on/off the "*" flag.

"#" - the PTT analog key to send the Selective Call direct from that mode.

"*" - to switch between abonent numbers and message editing.

"Queue" - to exit from this mode.

"CL" - to backspace in editing.

The message what you sent to your abonent will be stored in the memory of his radio. Accordingly the message what will be send to you will be stored in the memory of your radio. There are only 8 messages can be stored in the memory. To read the messages stored in the memory of your radio, set the Selective Call mode, click the "Mode selector" then click the "Bell" key and finally click the "S" button. (this state is set on 20 second without pressing any key) You will see the next string, for

example: "1 12ABC" where:

"1" - the number of message,

"12ABC" - message.

Use "Volume down" and "Volume up" keys to navigate between messages. Second pressing a button "S" will lead to exit from this mode.

"Queue" also can be used to exit from this mode.

Basic program buttons from left to right and up and their functions:

"On/Off" - on/off the transceiver.

"Speaker" - on/off the audio amplifier

"Volume down" - in usual mode to decrease the audio.

In scan mode to go down by the channels or the frequency.

In the "Selective Call" mode to navigate between the messages.

"CH" then "Volume down" to registration the beginning of the channel scan.

"Mode selector" then "Volume down" to set the low transmitting power.

"Volume up" - in usual mode increase the audio.

In scan mode to go up by the channels or the frequency.

In the "Selective Call" mode to navigate between the messages.

"CH" then "Volume up" to registration the ending of the channel scan.

"Mode selector" then "Volume up" to set the nominal (full) transmitting power.

"S" - entering/ending the "scan submode". The scan indicator will shine at scan submode. Scan submode allow to scan the channels or the frequency by hand or in automatic mode.

To scan by hand press and hold "Volume up"/"Volume down" for scan up/down by the channels or the frequency.

To automatic scan click "A" to start/stop scan. (scan indicator will flash at automatic scan)

To set the beginning (ending) of the channel scan, go to the channel and perform the procedure of registration the beginning (ending) of the channel scan.

"CH" - entering the channel number - switch to the new channel. To switch to the new channel click "CH" and then enter channel number from 00 to 99 from the numeric keypad.

"CH" then "Volume down" to registration the beginning of the channel scan.

"CH" then "Volume up" to registration the ending of the channel scan.

"CH" then "CL" to unfixing the CTCSS tone from the channel

In CTCSS tone select mode "CH" used to fixing the CTCSS tone to the channel.

"CL" - clearing key basically. His functions:

Backspace in editing and during inserting frequencies.

Set/reset program squelch bypass flag - disable/enable squelch.

(will be reset at scanning)

"Queue" then "CL" will reset current channel at ROM settings (cleaning current channel in memory).

"Mode Selector" + "CL" simultaneously to reset all channels at ROM settings (cleaning current memory bank).

"Queue" - entering/ending "frequency insert mode". All inserted frequencies is checked to frequency range and space step (12.5 KHz for all radios). To enter new frequency click "Queue" and then simply enter frequency from numeric keypad. Use "CL" to backspace at insertion. Second pressing the "Queue" will lead to exit from this mode in current condition.

"Queue" then "CL" will reset current channel at ROM settings (cleaning current channel in memory).

"*" - entering/ending "simplex mode". Display will show the channel number, the frequency and the scan step. In this mode you can directly set frequency using "Queue", scan by hand using "Volume down" and "Volume up" or use automatic scan in frequency interval using "A". Scan step is switched by "Mode Selector" in rotation.

"#" - switch from microphone to Auxiliary Tx. Mod. input and back and have its own indicator - LED "System defined" - working from Auxiliary Tx. Mod. input. On transmission the microphone indicator will shine additionally.

"Mode selector" then "#" to switch On/Off radio signal strength indicator (if you have RSSI module). Range from 00 to 99 on the display correspond to the RSSI output level of the module from 0 to 2 Volt - information for adjusting.

"tone" ("Call transmitter") - switch on/off CTCSS tone transmit. The program have the 63 standard CTCSS tones + 1750 Hz tone burst. This button have its own indicator - LED "Data transmission".

"Mode selector" then "tone" ("Call transmitter") to select CTCSS tone frequency.

How to select and set the CTCSS tone frequency:

To set the CTCSS tone click "Mode selector" then "tone". In the right part of the display instead the transmission frequency, will appear the the current CTCSS tone frequency. While shine the LED indicator of the mode selector, by repeatedly pressing the "tone" or "CL" select the desired CTCSS tone. Press "CH" to fixing selected CTCSS tone to the current channel. CTCSS tone will be set only for channel stored in memory! To unfixing CTCSS tone from the channel click "CH" then "CL". New CTCSS tone can be set without unfixing the previous CTCSS tone!

"A" ("Alarm") - to alternate receive and transmit frequencies in usual mode and start/stop automatic channel scanning at the scan submode. In simplex mode at the scan submode to start/stop automatic frequency scanning from low frequency to upper independently how they was set.

"Mode selector" then "A" to switch between the channel arrays.

(sign "/" between frequencies - first channel array, sign "*" between frequencies - second channel array).

"Bell" ("External Alarm On/Off") - to switch Selective Call mode On/Off. (see above).

"Mode selector" - to expand the capacity of the keypad. The "Mode Selector" has stuck for 3 seconds to conveniently switch with one finger and own indicator - LED "MODE".

"Mode selector" then "Bell" to configure the selective call mode. (see above).

"Mode selector" then "A" to switch between the channel arrays.

"Mode selector" then "tone" ("Call transmitter") to select CTCSS tone frequency.

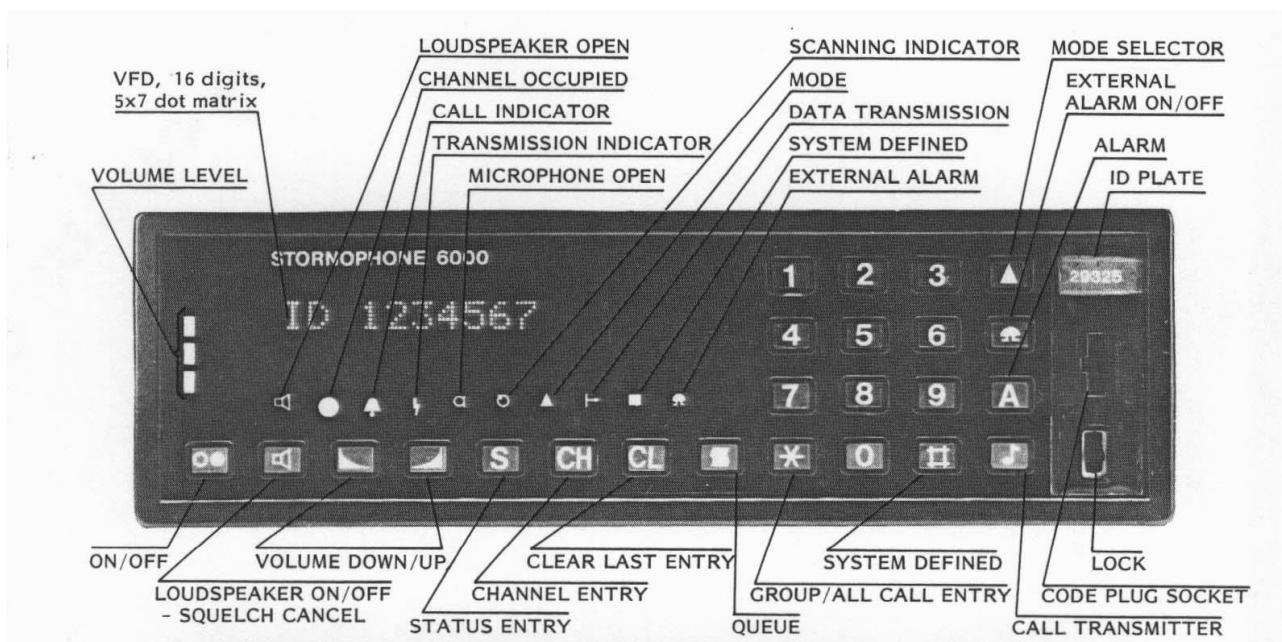
"Mode selector" then "#" to On/Off radio signal strength indicator.

"Mode Selector" + "CL" simultaneously to reset all channels at ROM settings (cleaning current memory bank).

"Mode selector" then "Volume up" to set the nominal (full) transmitting power.

"Mode selector" then "Volume down" to set the low (reduced) transmitting power.

On the transmission, the "Car radio mute" key will be open. DTMF tones from numeric keypad are also enable on the transmission like a test feature.



This is the summarized additions to old instruction to my programs.

In each new version of the program, I tried not to make any fundamental changes for the continuity of the program.

Thus, each new version only adds new features in the immutability of the previous ones.

This text should be seen as a continuation of the previous instruction to the program.

Additions in the 1.39 version:

In this release uses another generator to CTCSS tones, and tone level now can be adjusted.
At 3F8Bh address located number 14h determining the level of the CTCSS tones.
The CTCSS tone level is direct proportional to this constant, and you can modify it if require.
(14h - is the level specified in the EF software for radio with 12.5 kHz.)
At 3F8Ch address located number 28h determining the preamble duration in the SelCall.
At 3F8Dh address located number 64h = $100 * 0.1 \text{ sec} = 10 \text{ sec}$ - stop time in the channel scan mode when the input signal was detected.
At 3F8Eh address located number 32h = $50 * 0.1 \text{ sec} = 5 \text{ sec}$ - stop time in the frequency scan mode when the input signal was detected.
At 3F8Fh address located number 32h = 50 msec - time delay for detecting input signal.
(use 32h - for the 6114 radio, and 19h - for the 6112 radio).

Also main features of this version:

- Radio is turned ON immediately after power ON
- The maximum volume level is lowered down
- Volume level can be changed during automatic scanning as usual - 'V_down' and 'V_up'
- Presence of the input signal transmitted to the pin 17 on the rear connector
- Introduced ability to ban any channel for scanning - '*' key during scan or 'Mode Selectot' then '*' on the stop.

Additions to the 1.40 version:

The new version enhanced scanning capabilities in "simplex" mode:
1. When switching to "simplex" mode ("*" key), the initial frequency is stored in memory and can be restored its pressing the "Queue", then "CL".
2. By analogy with "duplex" mode, when the scan mode OFF ("S" - OFF), receiving/transmission frequencies can be interchanged by pressing the "A", which allows more convenient to change the limits of the scan.
3. During the automatic scanning process, you can prevent noisy or unwanted frequencies by pressing the "*" at the moment of stopping on them.
Frequency prohibitions are removed when changing scanning step or entry/exit this mode, but saved when change the scanning area.
Blocking individual channels and frequency areas - PE2BEN suggestion.

In the new release embedded the ability to work with the CG6001 module:

1. Now, when the "#" is ON, the CG6001 module is ON, who have it, of course.
2. The Channel Guard frequency selection performed similarly CTCSS frequency with "#" key ON.
3. The Channel Guard frequency is stored in memory, but not assigned to a channel!

In this version of the program provided 16 Channel Guard frequencies, by analogy with the EF software. Their constants (2 bytes) and description (6 bytes), starting from the address 3E40h.

If necessary, you can change them yourself using the equation:

$7400000 / 97.9 / 1\text{st byte} / 2\text{nd byte} = \text{Channel Guard frequency in Hz}$

The first byte of the divisor used only the lower half!

note: Modes "simplex" and "duplex" I call conditionally, for convenience only, realizing that this is not entirely correct.

Additions to the 1.41 version:

The final 1.41 version of the program for CQM6114, CQM6113 and CQM6112 radio for work with handset and without.

This variant of the program has not changed.

note: For the CQM6112 radios, I recommend to change the constant at the offset 3F8Fh on 19h for quick scan.

Additions to the 1.42 version:

The additions in this version is based on the suggestions of SA4ARG.

(not all suggestions of SA4ARG was entered in the program, as some of them, IMHO, have individual character).

As a result, the program slightly changed work with microphone (muting during the 1750 Hz tone transmitting),

introduced a separate constant for 1750 Hz tone level, and added "Hello" message when you turn on the radio.

The value of 1750 Hz tone constant (6Ah) located at the address 3F8Ah, was proposed and tested SA4ARG.

"Hello" message located from the address: 3F70h. The size of this record - 16 uppercase signs or digits, and you are free to change them to your liking.

The time of exposition "Hello" message is located at the address 3F89h.

This is: $14h = 20 = 2.0$ seconds. You may set any value except the 00h and 0FFh

If you want to except "hello" message from the program, please comment the lines from 6820 to 6849 in the 6114v42.asm file, and then recompile the program again (run make.bat file)

Additions to the 1.43 version:

The additions in this version is based on the suggestions of Mike (M0MLM):

1. Create two bank of the repeaters descriptions, for example:

4000h-... - frequencies data 1 st bank <---> 5000h-... - repeaters data 1 st bank

4800h-... - frequencies data 2 nd bank <---> 5800h-... - repeaters data 2 nd bank

- standard mode - frequency on the display

- description mode - repeater name on the display

2. rewrite the "chanup" subroutine so, that she would show either the frequencies or repeaters descriptions.

I added to the program two banks of a descriptions to the appropriate channels, as I described it above. So, you can arrange them as you wish. To enter this mode you need to press twice "Queue" button and once to exit.

In this mode, your description will be displayed instead of the frequencies.

This mode is saved when turned off.

Everything else is unchanged.

Additions to the 1.44 version:

In this version of the program was added one main feature - ability to stay ON or OFF after power connection.

With zeroing the byte at address 3FB0h your radio will start immediately after power connection.

Important note for some type radio:

Some recent experience has shown that the problem of the some old models of radios (rev.A) - display blinking

instead the work is associated with a watchdog circuit, which has a small difference from the later models.

A simple and affective solution to this problem was proposed by Mike (M0MLM) - shorting to the ground the capacitor C712 on the common function board, that block the watchdog circuit.

The WD circuit is needed only at the process of debugging the program and not used in my programs, and only wasting the working time of MCU, because can not be switched off by the software.