

Motorola SM50/SM120

Packet/APRS application notes



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Credits

Grateful thanks to the following people for helping put these notes together;

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Abstract

The Motorola SM50 and SM120 make ideal 1200 baud Packet/APRS transceivers for both the 2 meter and 70 centimeter amateur radio bands. They can be obtained for a modest price (usually under US\$50 at your favorite auction websites). While it is true that these radios are getting very long in the tooth at almost 40 years old they were a sterling workhorse in the LMR/PMR industry and still provide great service today. For help identifying the radio you have purchased visit the repeater-builder.com website <https://www.repeater-builder.com/motorola/sm50/sm50.html>

Assumptions

To make use of the SM50 or SM120 you will require a copy of the DOS based Motorola RSS Programming Software of at least version R03.00.00. This software is a Motorola proprietary application but can be found “out there” on the Internet.

A suitable programming cable or “RIC” will also be required. USB based programming cables can be obtained from your favorite auction site for around \$15.

All the interconnecting cables and antennas required for your particular Packet/APRS hardware.

Finally, you will require a machine capable of running DOS or a DOS emulator. For the purposes of this document the “DOSBox” program will be run on Linux. DOSBox is available for all modern operating systems.

Software configuration

This document does not aim to teach the use of the DOSBox package. DOSBox binaries and documentation can be obtained from <http://dosbox.com>. Linux users may find it by doing

```
sudo apt install dosbox (Debian)
sudo yum install dosbox (RedHat)
```

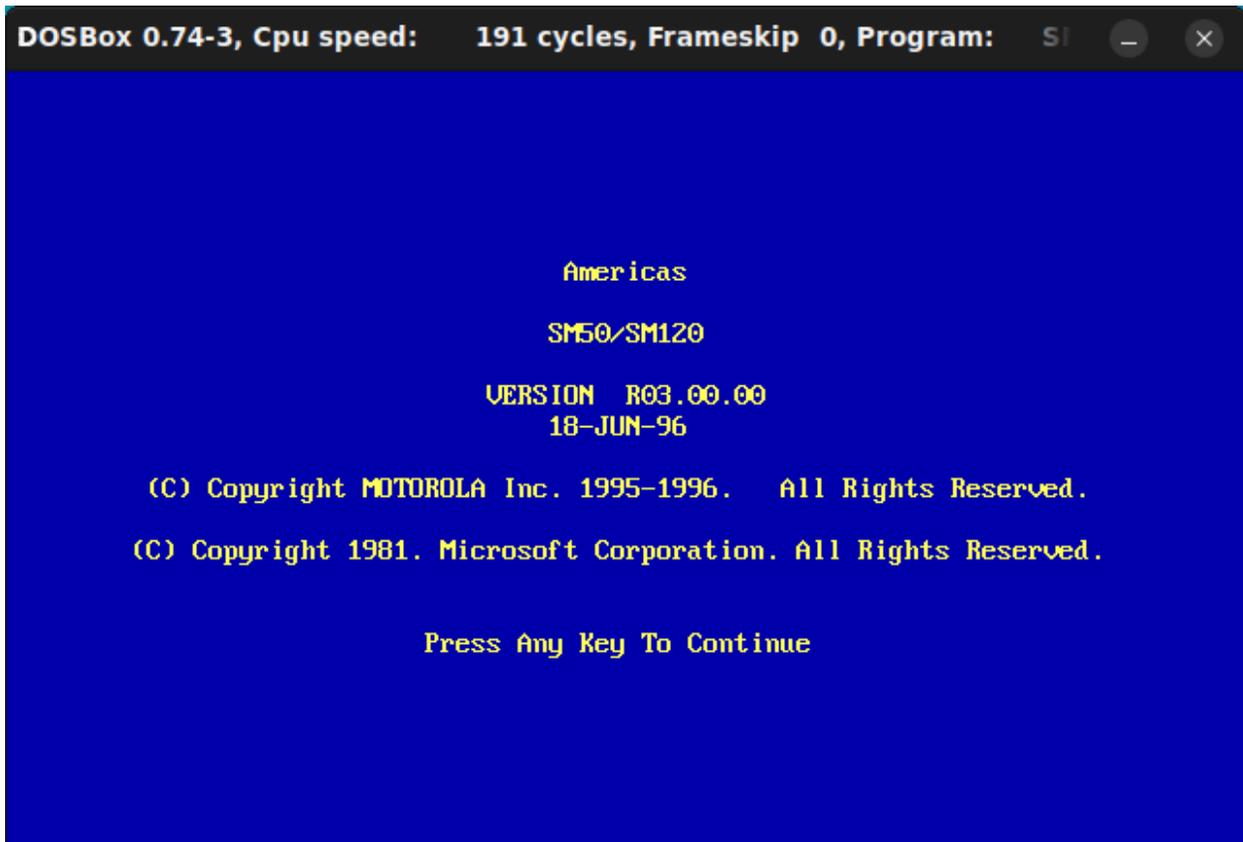
The below configuration file is required to properly run the DOSBox software. Copy this configuration into a regular text file called sm50dosbox.conf somewhere on your computer.

```
[cpu]
core=auto
cputype=auto
cycles=191
cycleup=10
cycledown=20
[serial]
# check the name of your serial port
serial1=directserial realport:ttyUSB0
serial2=dummy
serial3=disabled
serial4=disabled
[dos]
xms=true
ems=true
umb=true
keyboardlayout=auto
[autoexec]
# Lines in this section will be run at startup.
# You can put your MOUNT lines here.
mount C /home/g7l1t/Filestore/DOS # path to your DOS root
mount M /home/g7l1t/Filestore/motocd/SM50/R030000 # path to your RSS
m:
m:\SM50.EXE
```

To start the RSS software and program your radio type the following:

```
dosbox -conf [path to this file]/sm50dosbox.conf
```

If all has gone well you should see the below screen. Now it's time to program your Motorola SM25/SM120 radio. Again, this document does not aim to teach you how to operate the RSS software. A video walkthrough detailing a high level programming session can be found at <https://www.youtube.com/watch?v=jeuSrK1AKMo>



Programming recommendations

For the 2 channel SM50 it is recommended that the user programs BOTH of the channels (called “modes” by Motorola) identically. For the SM120 the user may program up to 16 channels however it is recommended that only 1 channel gets programmed and the other 15 get disabled. The risk is that the radio may somehow have its channel changed inadvertently and thus the tracker will be unable to do its job properly.

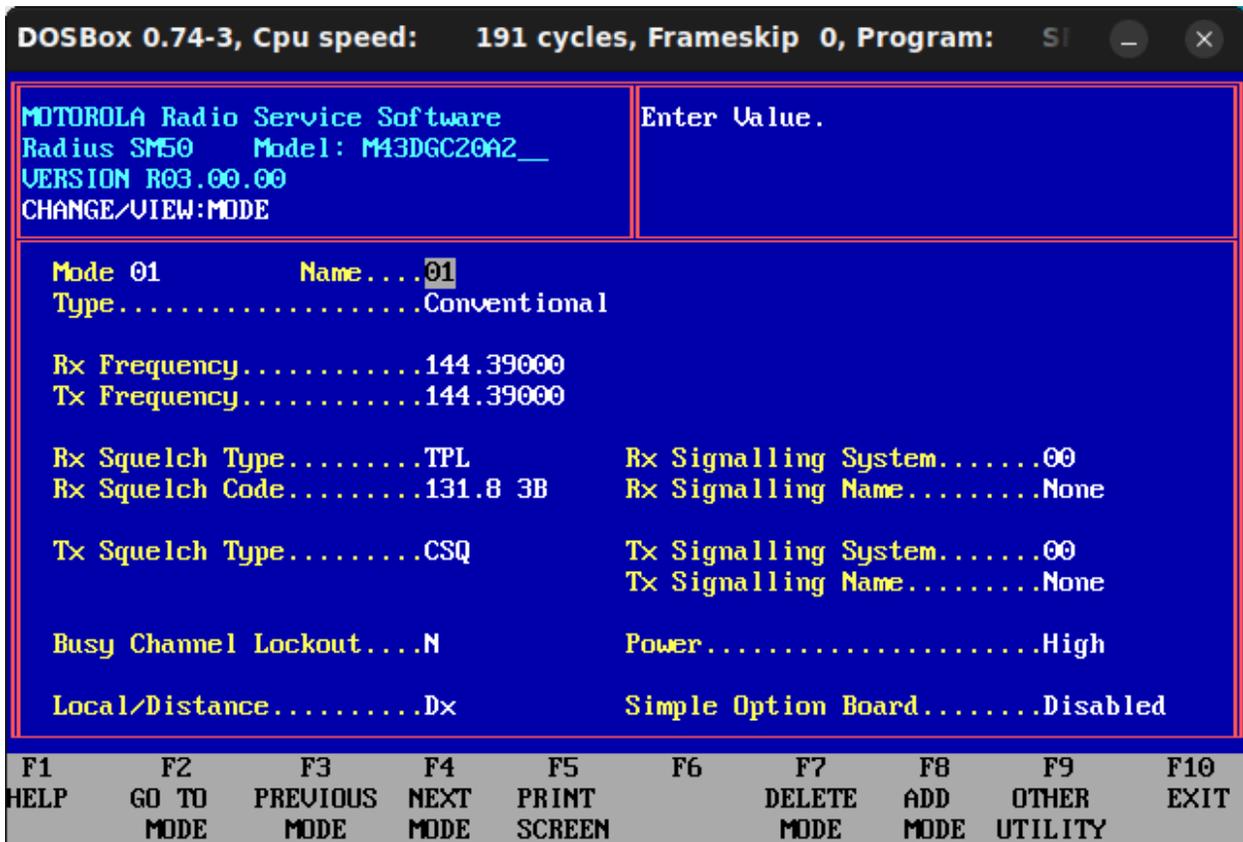
In the US/Canada the common 2 meter APRS frequency is 144.390MHz with no PL tone or repeater shift. Packet frequencies vary according to area, but commonly can be found in the 144.910-145.090MHz region.

It is recommended that you program a receive PL/CTCSS tone to enable the radio’s microphone “hangup” feature. This feature shuts off the speaker when the mic is placed on a metal mic hook (or a “hook switch” plug is installed). Only a signal bearing the correct PL tone will activate the

speaker thus protecting the user from having to hear all the noise that is the APRS data in transit.

All received audio will still flow through to the rear 16 pin accessory connector which we'll be using for the TNC/APRS modem itself.

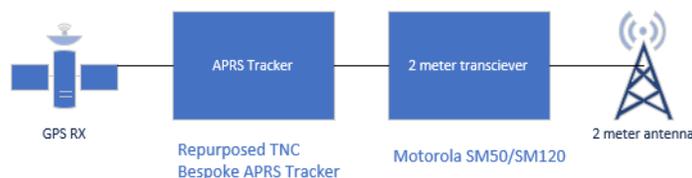
An example of a typical channel configuration is shown below.



Connect your Packet/APRS modem

Your APRS modem, TNC or Tracker may come in various formats. They all have more-or-less the same interfaces that we need to connect to this radio. You may need to fabricate or purchase additional interfaces and/or cables in order to make this connection.

A typical Packet/APRS setup may look like this:



The best way to connect your modem is via the 16 pin connector found at the rear upper right of the radio (labeled “Pin 1” below). Your favorite auction site can supply pre-terminated cables for this connector. Alternatively an adapter such as the RPC-Electronics [Motorola 16 Pin Mini Din Packet Adapter](#) may be used to convert the interface into a standard 6 pin MiniDIN interface.

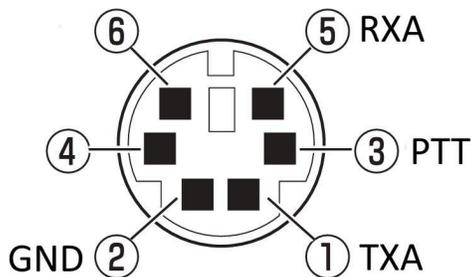


Ideally you should wire your modem to make use of the unfiltered inputs and outputs of the radio. This will allow you to increase the modem speed at a later date without having to rewire your cables. For a full discussion on what to wire where go here <https://nbviewer.org/github/mobilinkd/MotorolaSM50/blob/master/MotorolaSM50.ipynb>

A functioning cable can be made using these pins

Left			Top				Right
15	13	RX AF	09	GND	TX AF	PTT	01
16	14	SQL	10	08	06	04	02

MiniDin 6 Radio Connector



Pin Description

1: TXA	Transmit Audio
2: GND	Ground
3: PTT	Push To Talk
5: RXA	Receive Audio