ACC-916
PROGRAMMING MANUAL

FOR

SD-160 / SD-170 SERIES
DATA RADIOS

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1. INTRODUCTION

Functions of ACC-916 PC(Personal Computer) programmer, hereafter called ACC-916, will be illustrated. Main goal of this manual is to save time for user by supporting exact usage of ACC-916, at the same time, give a help to user who wants to utilize the radio for another applications. This ACC-916 programming software enables the various parameters of SD-160 series to be read, modified, programmed and printed.

In chapter 2, detailed method for installation will be given in order. To set up ACC-916 successfully, all you have to do is just to follow the instruction as mentioned.
In chapter 3, for fundamental operation of radio, SD-161, SD-164, data input method for frequency, Rx option and Tx option of each channel will be showed. Tone setting procedure, such as CTCSS, DCS and Two tone, are specified in Rx option and, as same way, also same options except for Two tone are discussed in Tx option. After finishing the normal data input stage on each channel, system option will be explained to help all other operational conditions. In addition, various options for GMSK/FFSK (ACC-513/ACC-514) modem are illustrated. Moreover, operating test items for radio are explained in SQUELCH & CALIBRATION option section. Finally, writing and reading all established channel and option data for operating radio, in short, data communication between radio and PC(Personal Computer) is illustrated. This procedure is very important because it is ultimate purpose of ACC-916.

For your reference, because this manual doesn't contain the specified description for some functional options, hope to refer to feature list and other manuals supported by maxontelecom for more detailed information.

2. HARDWARE INSTALLATION

To apply ACC-916 to radio application, ACC2016, individual programming cable and PC(Personal Computer) are needed. In this chapter, instruction for connection of these equipments will be illustrated.

2.1. SYSTEM Requirements

Computer
Pentium processor or faster (recommended)

Operating System
Microsoft Windows® 95, 98

RAM
8MB or more (16MB recommended)

Hard Disk Space
1MB

Disk Driver
3.5-inch

Communication Port
One available communication port (COM1, 2, 3 or 4)

Hardware Accessories
ACC2016 Individual programming cable

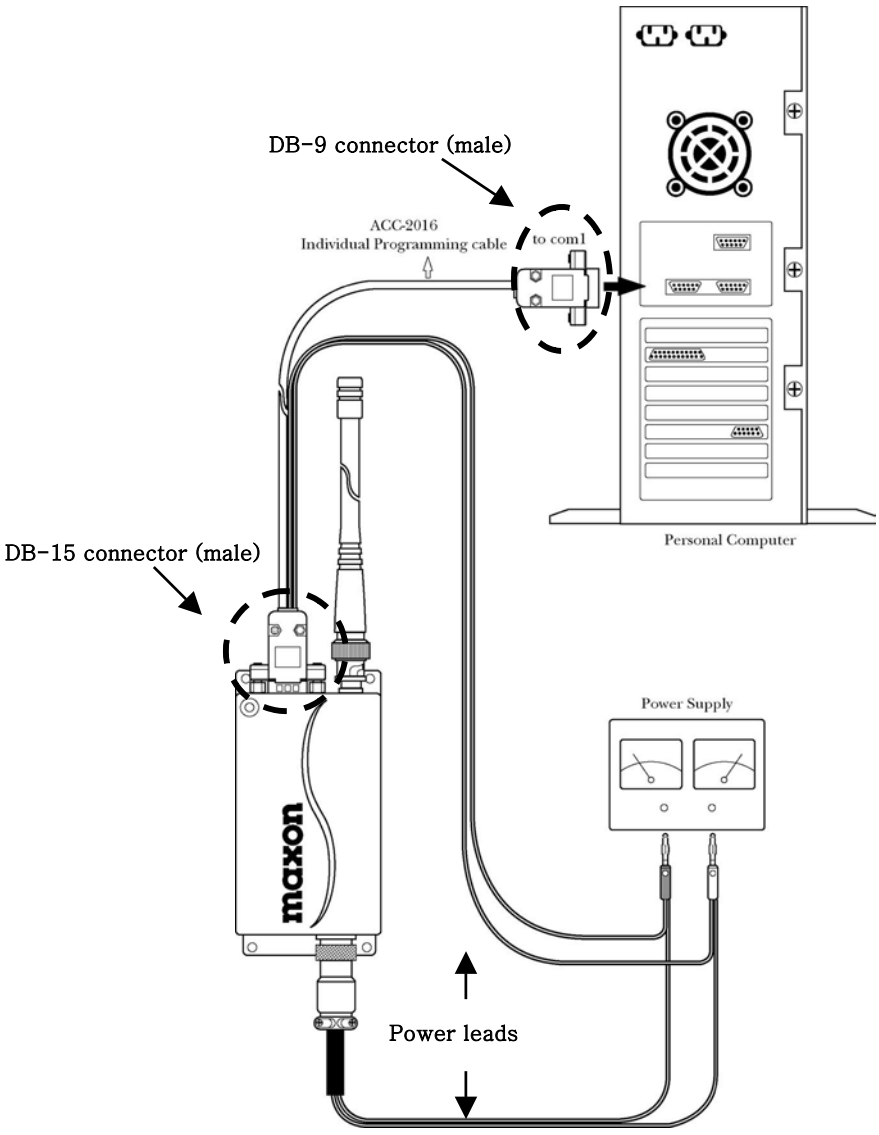
2.2. Connecting the SD-160

Locate the communications port on the rear of the computer.

NOTICE
This port is usually located at the rear of the computer. However, since this is

dependent upon the design of your computer refer to the computer operator's manual for directions.

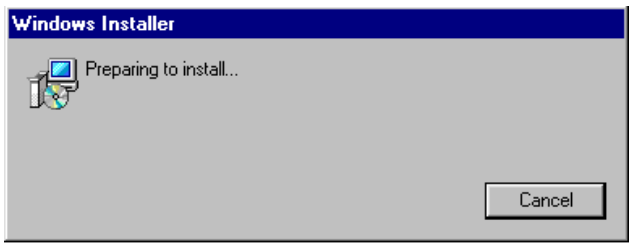
The ACC-2016 has two connectors, DB-9 male and DB-15 male. DB-9 male connector should be inserted into com1 port on the rear of the computer and DB-15 male connector should be inserted into DB-15 female connector on the radio. In addition, two power leads which supply power to the radio and ACC-2016 are connected to the power supply like the figure below.



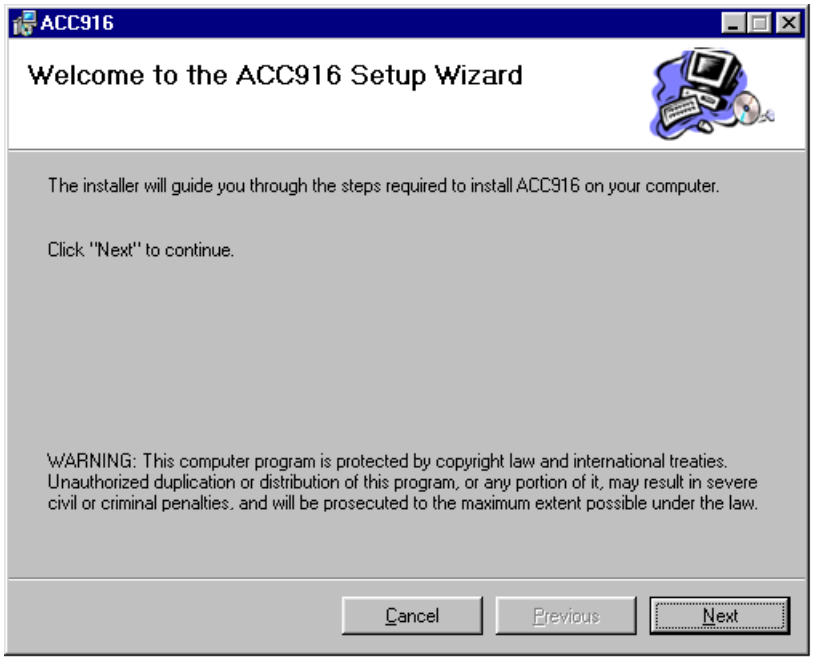
3. SOFTWARE INTALLATION

In this chapter, detailed method for installation of ACC-916 is explained.
Five files are needed to install ACC-916 for user's PC like below.

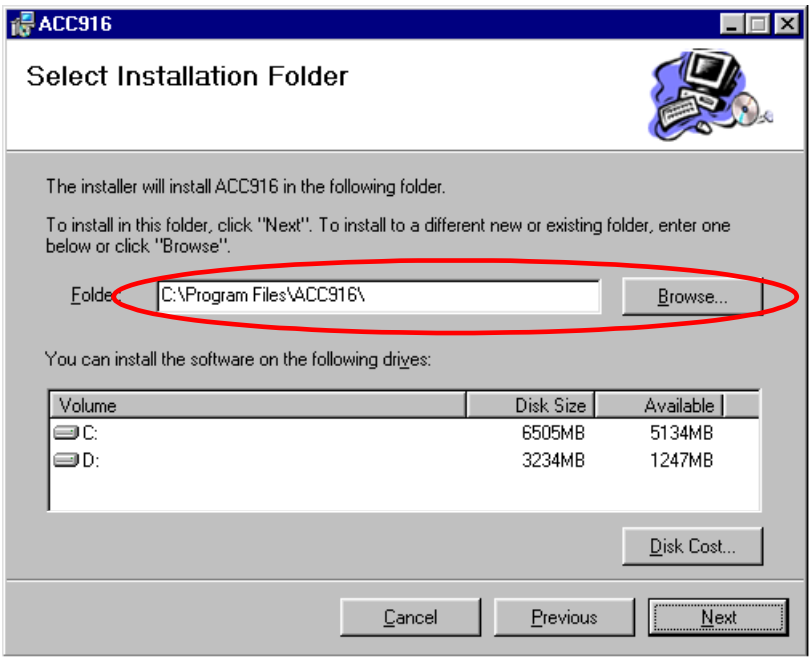
First of all, double-click on the "setup" icon inside red circle, the following preparation window shows up.



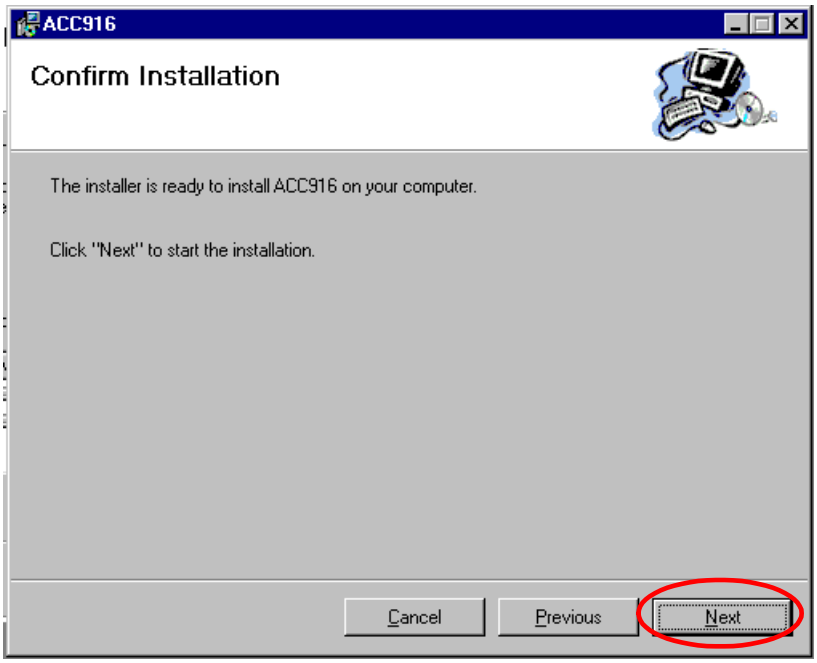
Click on the "Next" button to continue to set up.



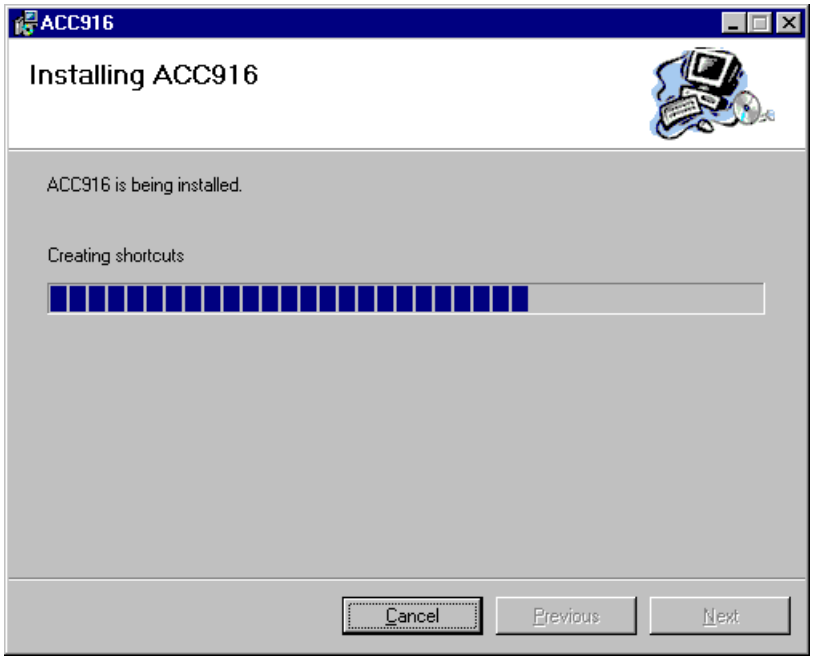
In this window, user can selects the folder of his PC to install ACC-916.
Write down the location of wanted folder directly or designate folder location by using “Browse” button. Click on the “Next” button for successive process.



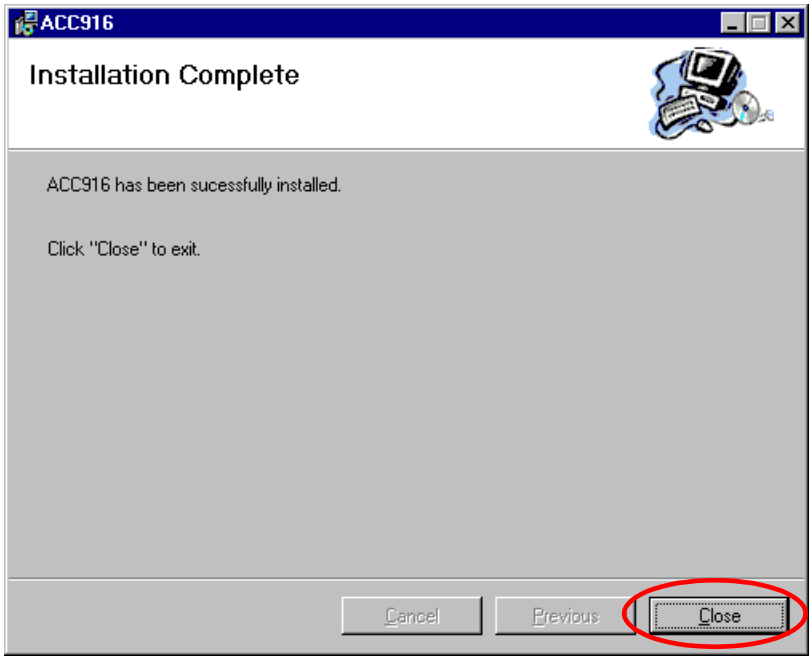
This window is stage of confirming installation on user’s computer.
Click on the “Next” button to start installing.



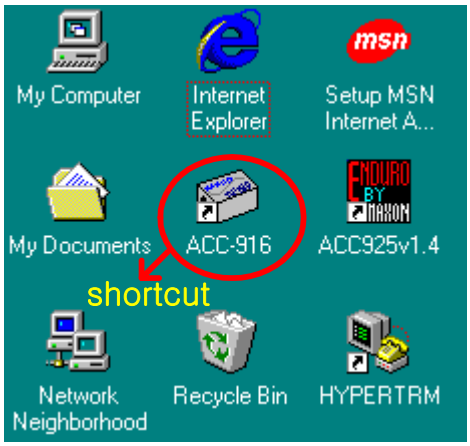
The state of installation is showed by progress bar.



Click on the “Close” button to complete installation.



Generated shortcut is displayed on desktop.

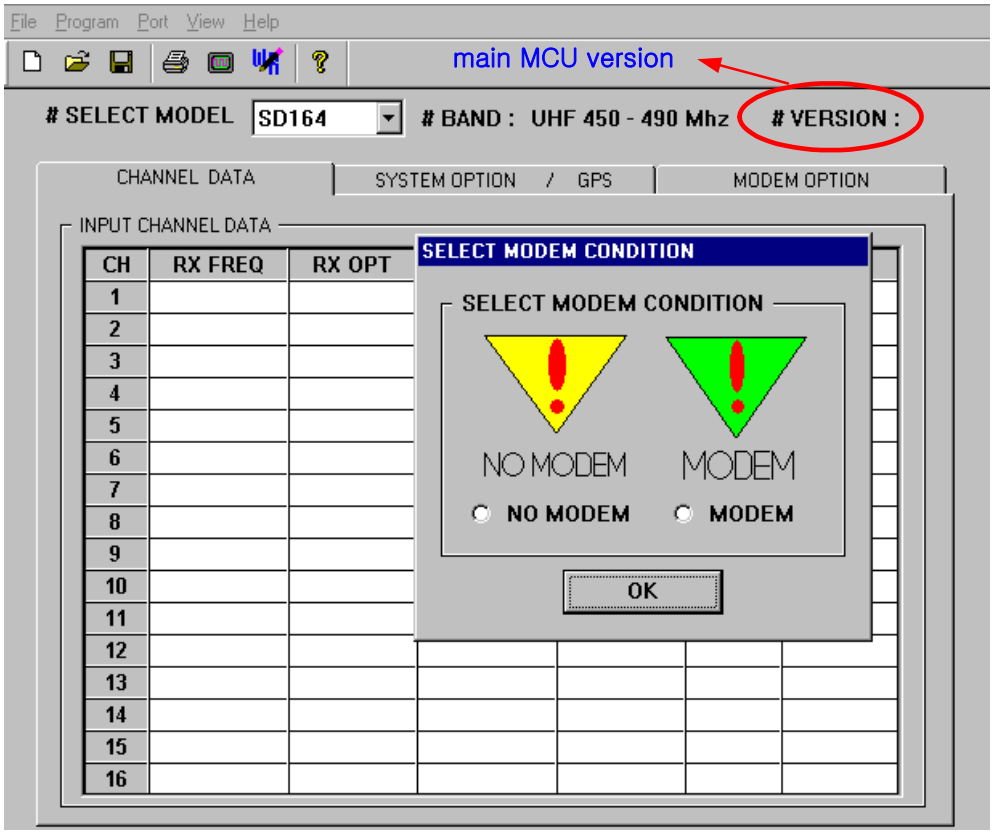


4. EXPLANATION OF OPERATION

Detailed instruction for model and modem selection, channel data, system & GPS option, and modem option is described. Especially, in input channel data, data input method for R,Tx frequency, R,Tx option such as CTCSS, DCS, Two Tone, scan list and bandwidth is explained specifically. In addition, system option such as selection of squelch type, data value setting for power saving function, Tx time out time, hang on time, scan delay and speed is detailed. Specification for GPS and modem option is also added.

4.1. OVERALL

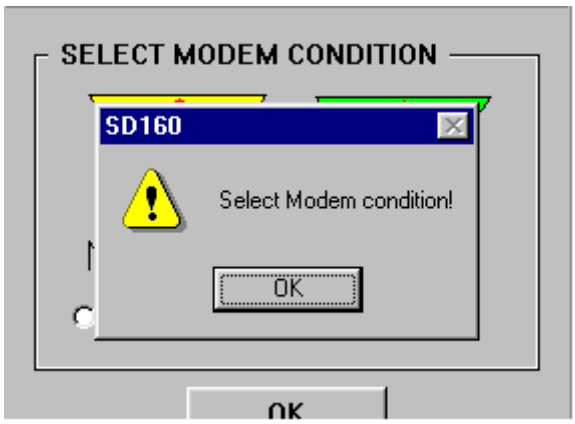
Initially, click on the shortcut of ACC-916 and then the following window shows up.



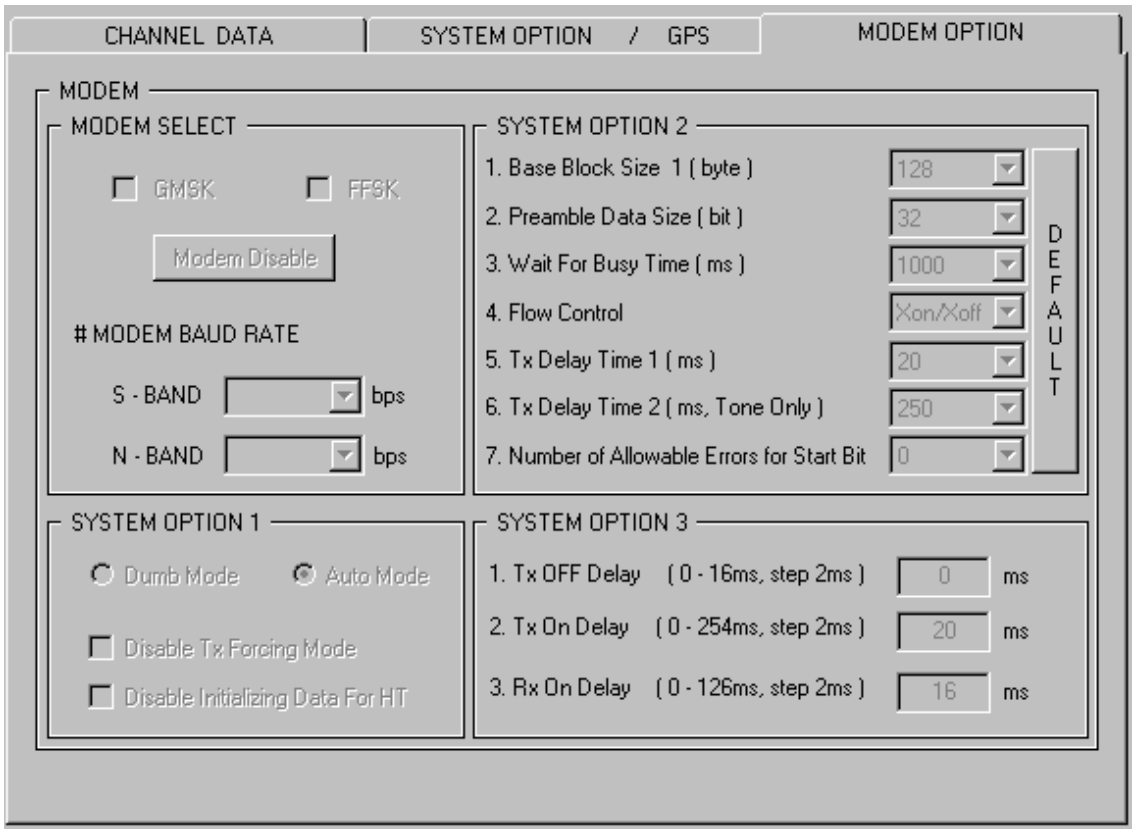
First of all, select the modem state, NO MODEM or MODEM.

If click on the “OK” button without any selection, error message occurs like the following.

For your reference, main MCU version indication will be discussed in chapter6

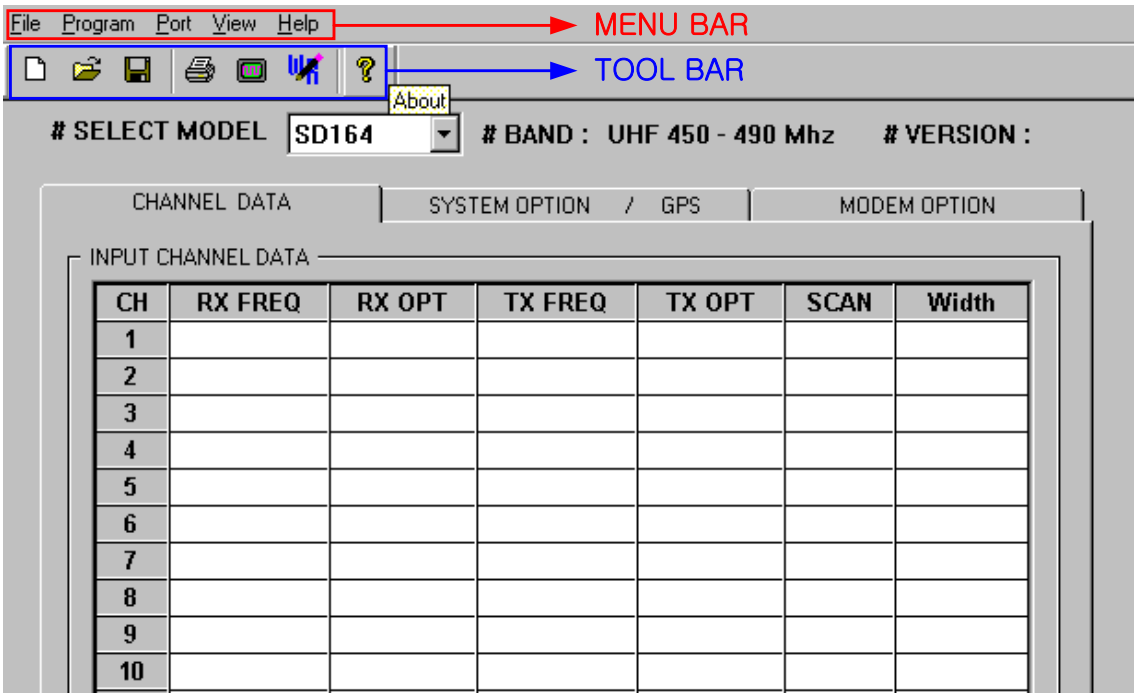


If you select the “NO MODEM”, all of modem options are disabled like below.

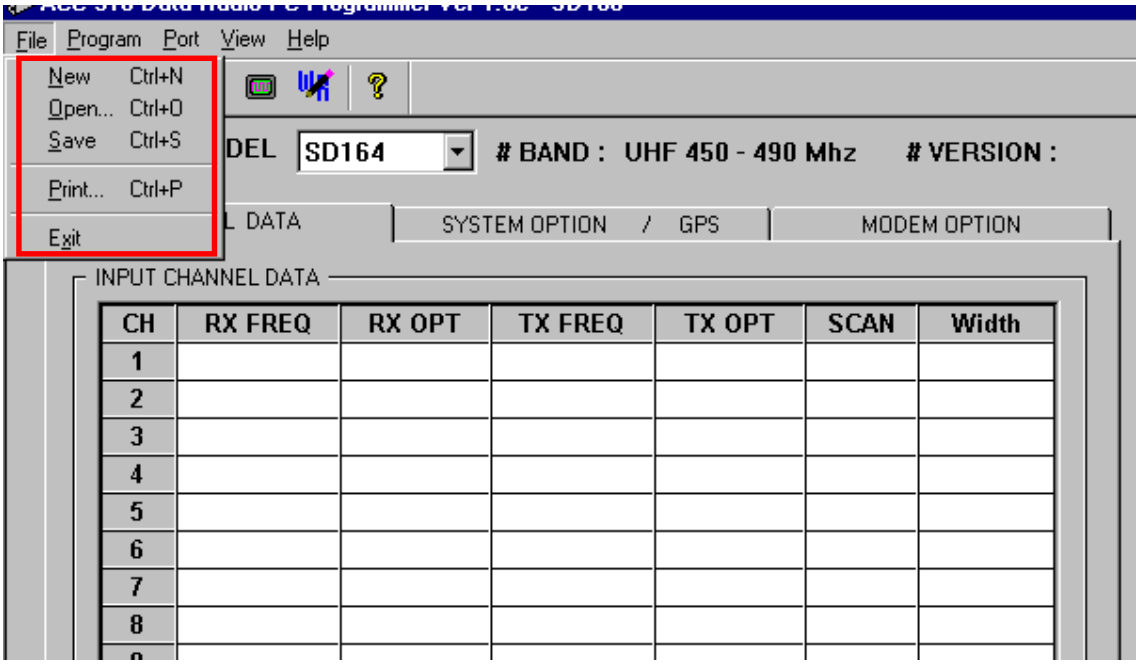


After selecting any modem, initial window is the following.

If user puts mouse cursor on the each icon in tool bar for a second, message for function indication is displayed like “About” for icon”?”.



Click on the one of menus such as File, Program, and its pull-down menu shows up.



4.2. MODEL SELECTION

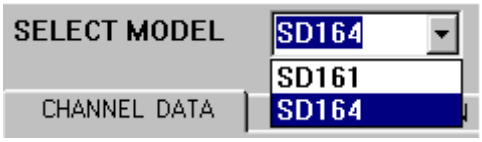
This program is available for two models of data radio and user should select one of them.

Frequency coverage of each model is the following.

** Frequency range. **

SD161 (VHF) : 148 ~ 174 MHz
SD164 (UHF) : 450 ~ 490 MHz

Operational frequency is band type specific within each model.



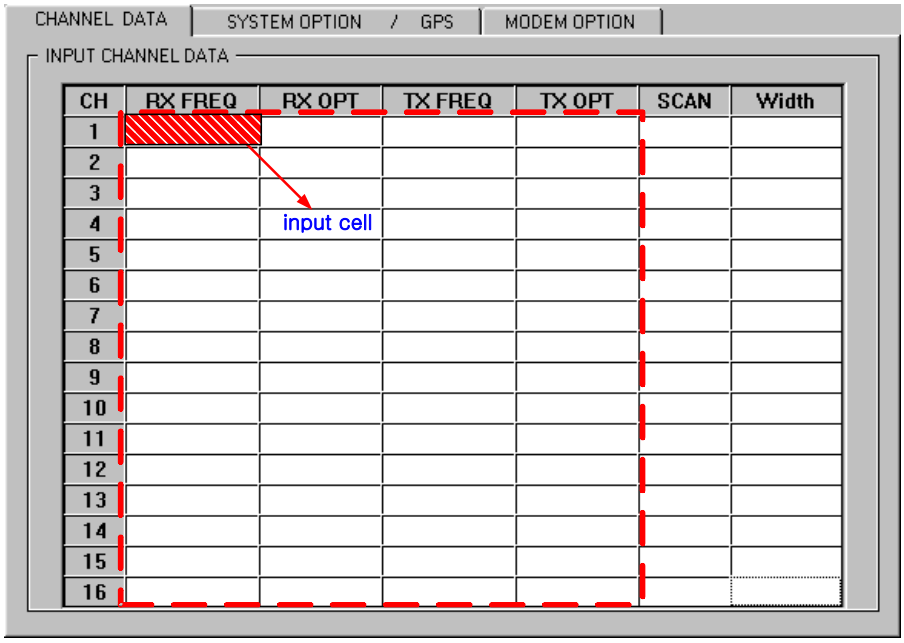
If you want to change model, select model number like picture above.

Caution

If you change model without saving data, all of data are eliminated.

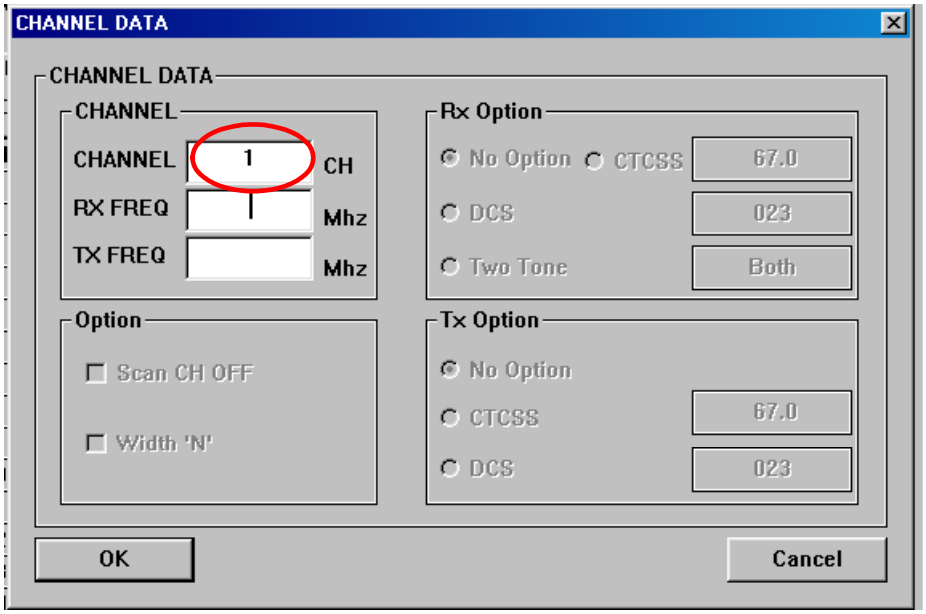
4.3. INPUT CHANNEL DATA

In this option part, user can input channel selection from 1 to 16, R,Tx frequency, R,Tx tone option such as CTCSS, DCS, Two Tone, and make SCAN list, and choose bandwidth, N or S according to each channel.



Double-click on the any window cell inside red-rectangle area to set R,Tx frequency, R,Tx option for each channel

Then, channel data input window pops up.



If double-click any input cell in channel 1, '1' is displayed like inside red-circle.

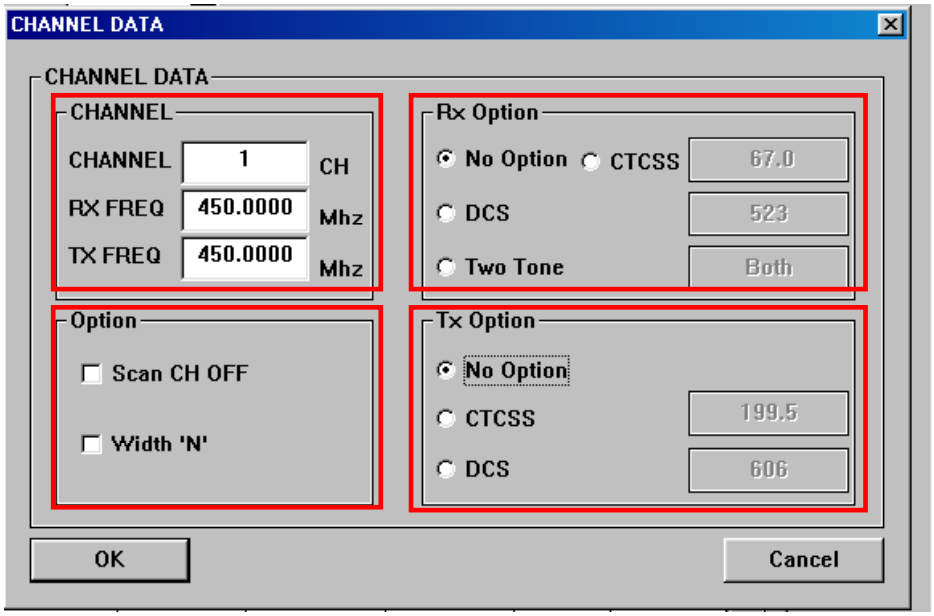
As same with channel 1, if double-clicking any window cell in channel 2, '2' will be displayed.

Press Tab key to move.

After moving to 'cancel' using Tab key, press Tab key again, and moves to next channel automatically. If frequency is not inputted, all other options would be disabled.

In other words, frequency should be inputted to make options available.

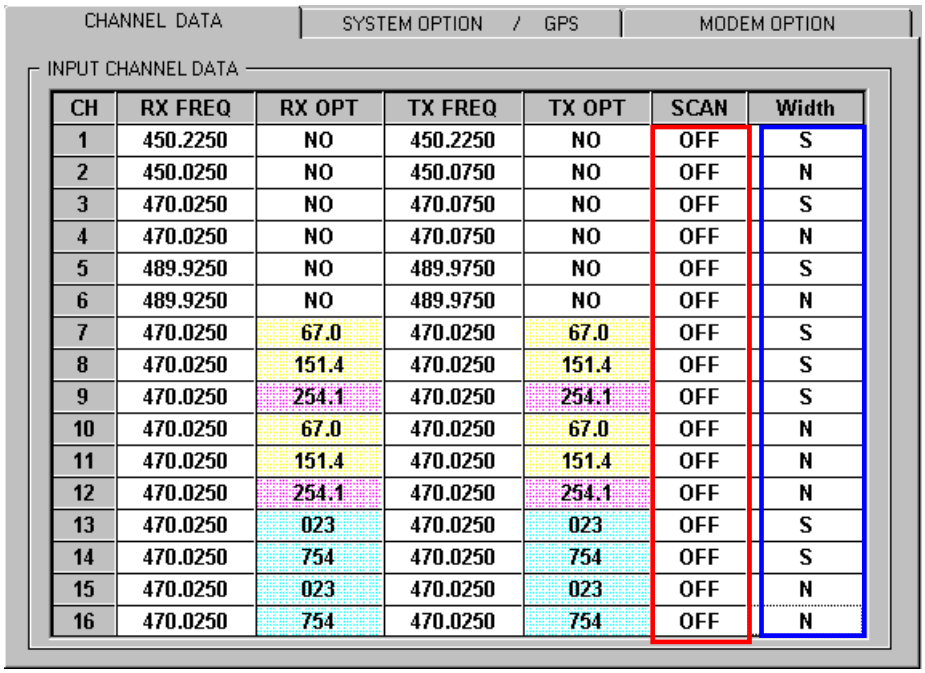
R,Tx tone option, R,Tx frequency, option for scan, channel space in each channel are determined.



There are No Option, CTCSS, DCS, and Two Tone in Rx Option and No Option, CTCSS and DCS in Tx Option and their defaults are No Option.

In case of CTCSS, see below section a. CTCSS.
If DCS, see below section b. DCS.
If Two Tone, see below section c. Two Tone.

After inputting wanted data, it is displayed as the table below.
Each tone data is distinguished from others by different colors.



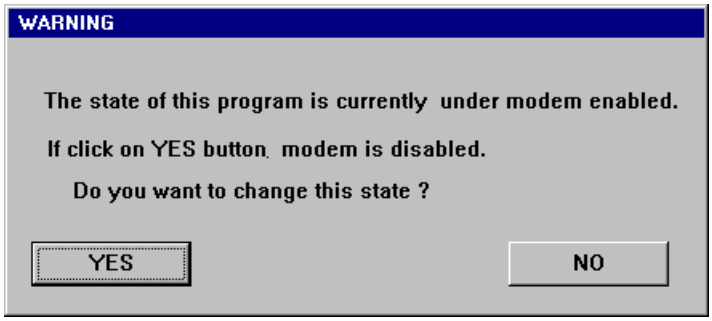
CH	RX FREQ	RX OPT	TX FREQ	TX OPT	SCAN	Width
1	450.2250	NO	450.2250	NO	OFF	S
2	450.0250	NO	450.0750	NO	OFF	N
3	470.0250	NO	470.0750	NO	OFF	S
4	470.0250	NO	470.0750	NO	OFF	N
5	489.9250	NO	489.9750	NO	OFF	S
6	489.9250	NO	489.9750	NO	OFF	N
7	470.0250	67.0	470.0250	67.0	OFF	S
8	470.0250	151.4	470.0250	151.4	OFF	S
9	470.0250	254.1	470.0250	254.1	OFF	S
10	470.0250	67.0	470.0250	67.0	OFF	N
11	470.0250	151.4	470.0250	151.4	OFF	N
12	470.0250	254.1	470.0250	254.1	OFF	N
13	470.0250	023	470.0250	023	OFF	S
14	470.0250	754	470.0250	754	OFF	S
15	470.0250	023	470.0250	023	OFF	N
16	470.0250	754	470.0250	754	OFF	N

In Scan and Width, each state is toggled OFF to ON or N to S and vice versa respectively by double-clicking each input cell without opening channel data window.

NOTICE

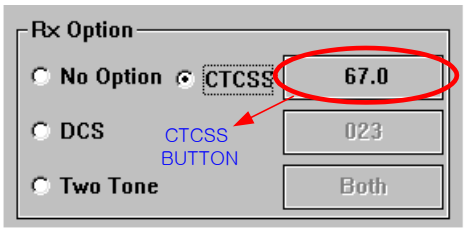
Under modem enabled state, if user wants to program 'Scan List' on that channel, warning message shows up as below. In other words, to program 'Scan List' on any channel, modem should be under disabled state.

In this warning message, if clicking on the "YES" and then modem enters under disabled state and user can program 'Scan List'.

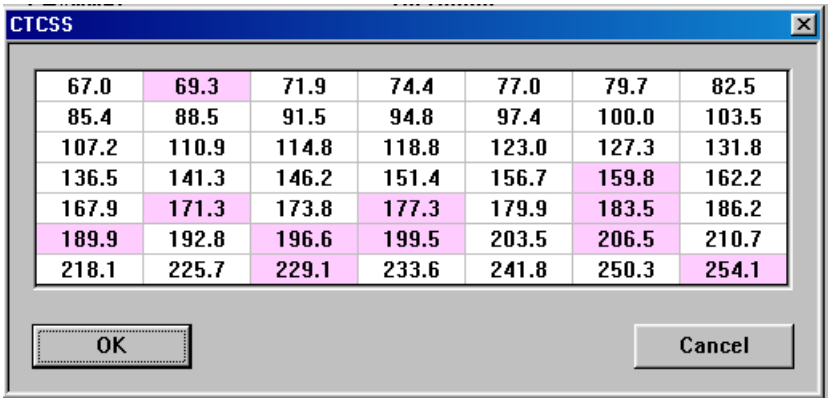


4.3.1. CTCSS Frequencies

If selected CTCSS, its default value is 67.0 Hz.



If want to change tone, click on CTCSS button and the following window appears.

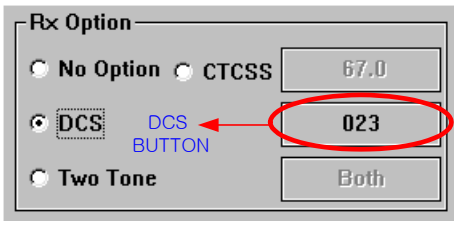


Colored CTCSS is Non Standard CTCSS. Click the wanted CTCSS and push the “OK” button.

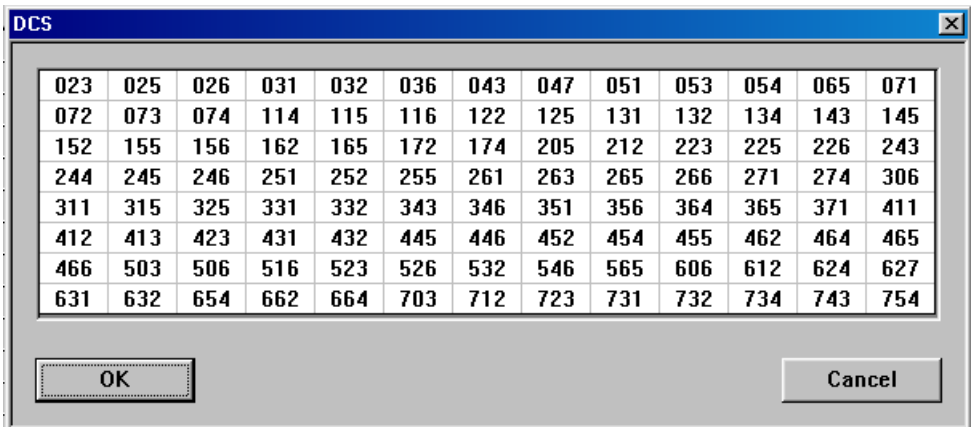
Selection method of Tx CTCSS is same with Rx.

4.3.2. DCS Tones

If selected DCS, its default value is 023.



If want to change DCS tone, click on the DCS button and the following window pops up.



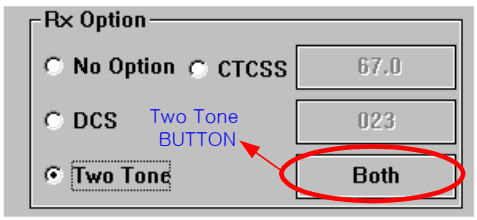
Click the wanted DCS and push the “OK” button.

Selection method of Tx DCS is same with Rx.

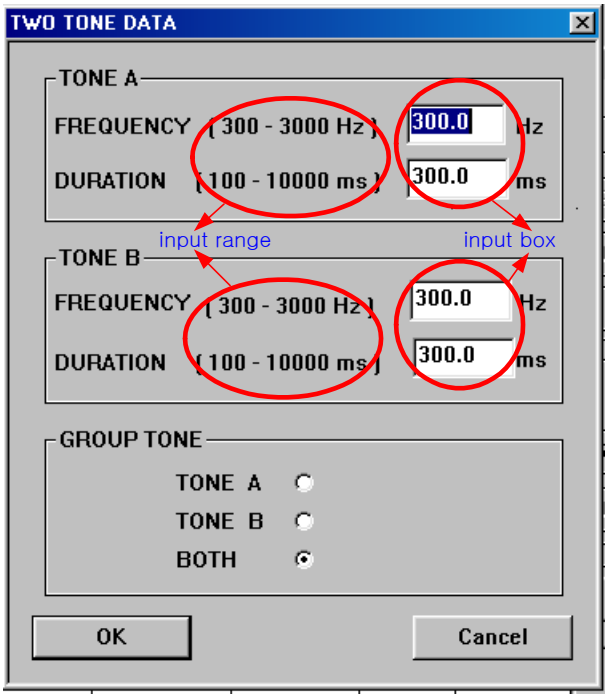
4.3.3. Two Tone Parameters

For your reference, the radios will support Motorola-Format, Two-Tone (Type 99) decoding. This is receive only, decode only feature. It will allow a dispatcher to call individuals and groups. Each System/Group will be programmable to respond to any combination of the code, with a distinctive alert for each System/Group.

If selected Two Tone, its default value is Both.



If want to change tone, click on the Two Tone button and the following window.



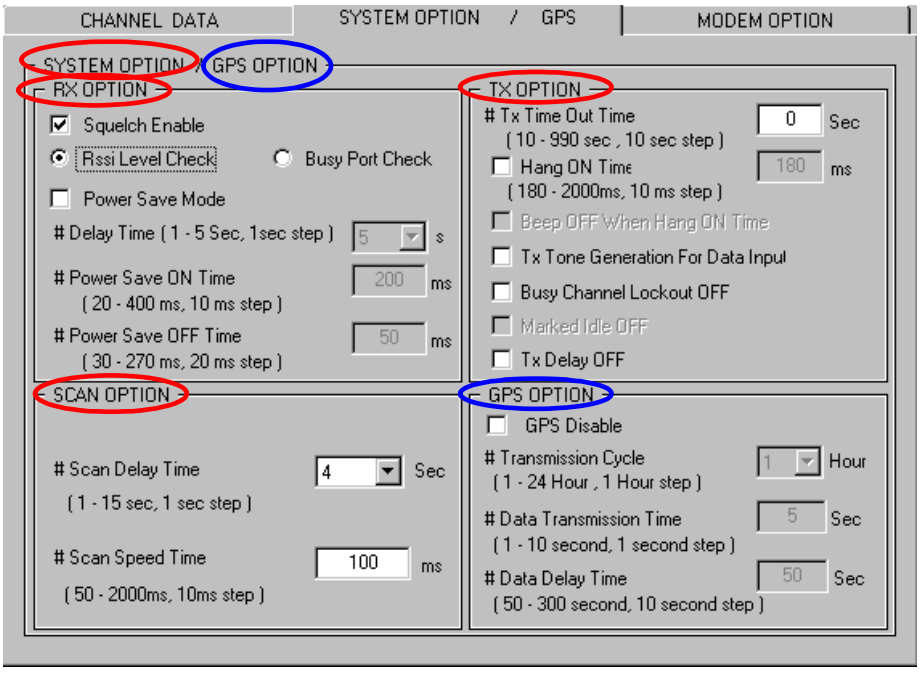
After inputting wanted frequency and duration time on input box within input range, select one type among “GROUP TONE”, TONE A, TONE B and BOTH and then click the “OK” button.

5. SYSTEM & GPS OPTION DATA

This option part consists of system and GPS option. There are Rx, SCAN, Tx, option in system option, which general control parameters such as squelch system, power save mode, scan delay and speed time, Tx timing setting and so on for radio are established. In addition, GPS option is used when GPS receiver is placed into radio, timing parameters for data transmission are also selectable. Especially, user should be aware that exact meaning and practical use of these parameters for their wider applications.

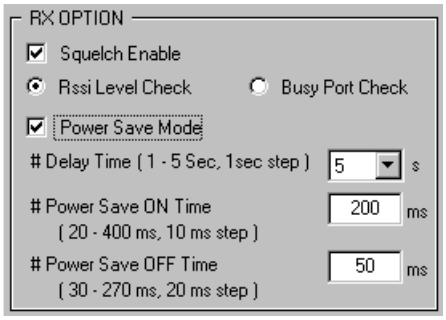
For your reference, refer to ***feature list*** supported by maxon for more detail information on each parameter, especially, for Tx timing setting.

5.1. SYSTEM OPTION



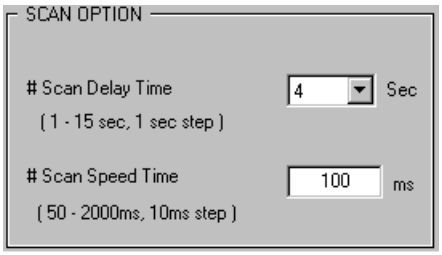
5.1.1. Rx option

You can select squelch system and set timings for Power save mode.
The Power Save feature is used when an external battery is used as the power source. When Power Save is enabled, the receiver ON and OFF time can be programmed into the radio and allows the operator to set the length of time the receiver is asleep.



5.1.2. Scan option

You can select timings related to scan delay and speed.
If user tries to transmit during scanning, the transmission will be made on the channel that the call was received during the programmable scan delay time. (The scan delay time is the amount of time the radio will stay on that channel once activity has ceased. Dealer programming of 4 ~ 7 seconds is typical). The radio will resume scanning once the scan delay time has expired, and will continue to scan until the serial command for scan stop is inputted by external equipment.



5.1.3. Tx option

Parameters related to Tx are selected.

a. Busy Channel Lockout

This feature, when enabled, disables the transmitter when the receiving channel is busy and the user attempts to transmit. It will be dealer-programmable on/off and applicable to all channels.

b. Marked Idle

When used in conjunction with Busy Channel, lockout transmitter is allowed to operate as long as valid RX tone is received. Dealers program this feature as ON or OFF. This feature will be dealer-programmable on/off and applicable to all channels.

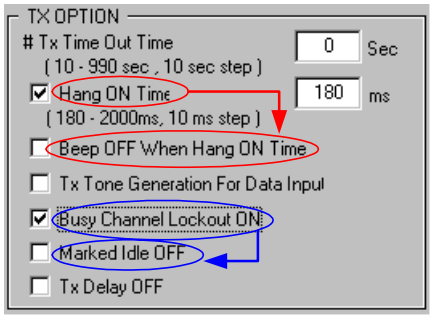
c. TX Time-out

This feature, when enabled, limits the amount of time that the user can continuously transmit. This time can be set in increments of 10 seconds from 10 seconds to 990 seconds. If the user attempts to transmit longer than the TX Time-out period, five seconds prior to expiration, the radio will release Time-out alert signal through pin 9 of the DB-15 connector and will cease transmission.

d. Tx Delay

The TX will remain active for 150 ms at the end of TX when using CTCSS tones. This eliminates squelch tail. Dealer programs this feature as ON or OFF.

When item " Hang ON Time" is checked, item "Beep OFF When Hang ON Time" is selectable, in same way, when item " Busy Channel Lockout ON" is checked, item "Marked Idle OFF" is selectable.



5.2. GPS OPTION

Data transmission time

GPS receiver releases position data every 1sec. after GPS data enabled. It always occupies RF channel if user transmits these data to other radio or system. Therefore, GPS data release time controls outputted data from GPS. It can be programmed from 1sec. to 10sec. by 1sec. increment.

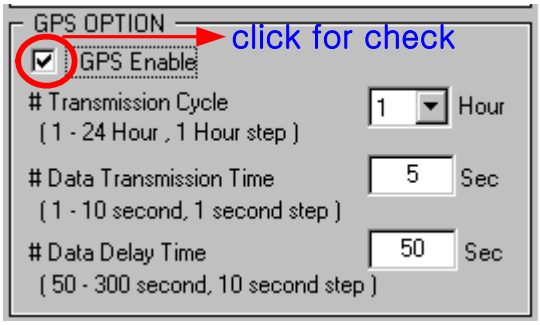
Transmission cycle

To offer timed position reports, GPS receiver releases position data every programmed time. It works only as much as the sum of GPS start time (it's defined by data delay time) and GPS data release time for GPS data transmission cycle. And then, it enters sleep mode to save power for the rest of time.

Data Delay time

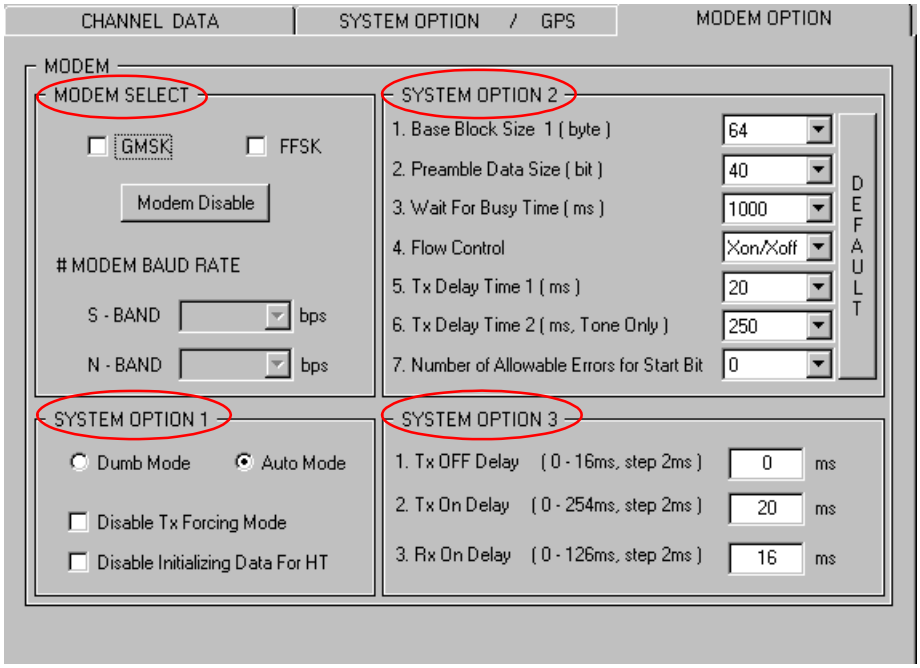
Original GPS engine for SD-160 releases NMEA-0183 format data every 1sec. from the moment of applied power. To prevent transmission of invalid position data before lock, GPS data output is controlled by parameter of Data Delay time. In other words, position data will be released after an elapse of Data Delay time since applied power to GPS (GPS Enable). Generally, our GPS receiver needs about 40 sec. for cold start, but it's affected by geographical environment. To ensure time margin, it can be programmed from 50sec. to 300sec. by 10sec. increments.

To input parameters, click on the "GPS Enable" first.



6. MODEM OPTION

In this option part, you can set overall optional values for established modem on the radio according to user application. One of data transmission modes, dumb or auto mode is selected in system option 1 and format for data transmission, flow control according to transmission mode and Tx delay time are determined in system option 2, timings for R,Tx on, off delay are selectable in system option 3.



6.1. MODEM SELECTION

GMSK/FFSK

You can select modem type (GMSK/FFSK). Mark on the check box.

Modem Enable/Disable

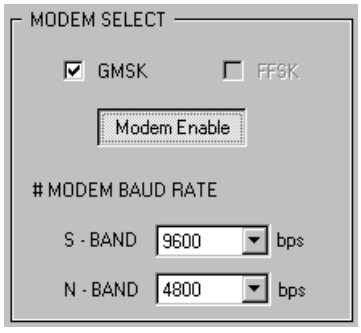
If you want to use modem, click on the "**Modem disable"** Button.

Modem Baud Rate

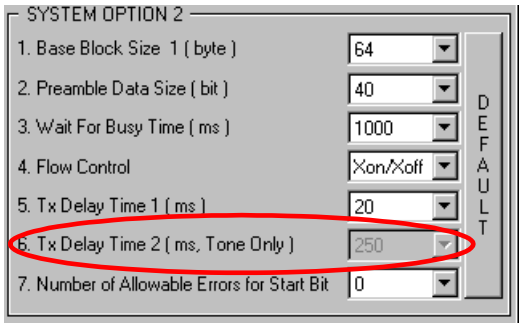
Modem	Channel Space	Baud rate
GMSK (ACC-513)	Standard (25KHz)	9600 bps
		4800 bps
	Narrow (12.5KHz)	4800 bps
FFSK (ACC-514)	Standard (25KHz)	4800 bps
		2400 bps
		1200 bps
	Narrow (12.5KHz)	2400 bps
		1200 bps

Above all, user should choose either GMSK or FFSK and then click on the "Modem Disable" button and then it is toggled to "Modem Enable".
If user selects either GMSK or FFSK Modem and make them enabled, the window appears as below.

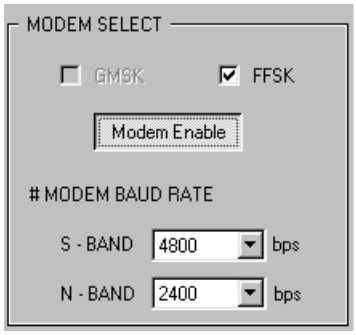
a. Selection of GMSK



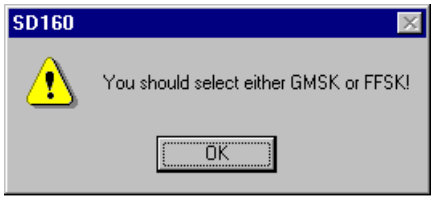
For your reference, selecting GMSK, parameter 6, Tx Delay Time 2 in system option 2 is disabled as below.



b. Selection of FFSK

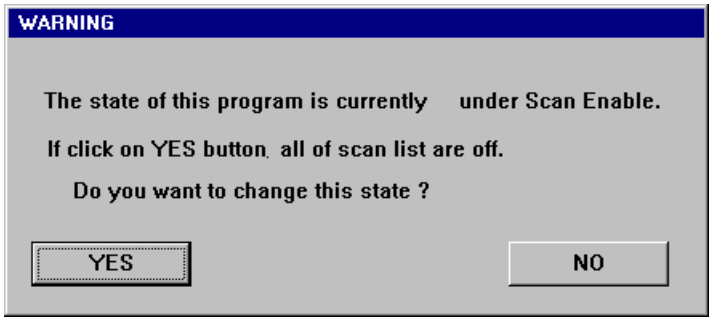


Unless you select any kind of modem, error message occurs as below.



NOTICE

Under modem enabled state, user wants to program 'Scan List' on any channel, the warning message shows up as below.



If click on “YES” button, all programmed scan list on that channel will be off.

6.2. SYSTEM OPTION 1

a. Auto Mode

Radio will be automatically controlled by existence of inputted data from DTE. There is no need for the user to be concerned with operation of radio. SD-160 will transmit simply by sending it data.

b. Dumb Mode

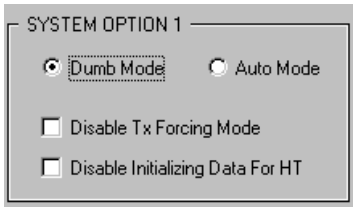
Radio should be controlled by user application, manually. For instance, to transmit some data, you should input PTT(RTS) signal besides assigned data. Moreover, in control of radio, exact timing should be defined by user. This mode is only provided to give compatibility with existent radio

c. TX Forcing Mode

During RX mode, when Radio receives data from DTE, if *TX Forcing Mode* Option is enable, radio will transmit data. If disable, radio will not.

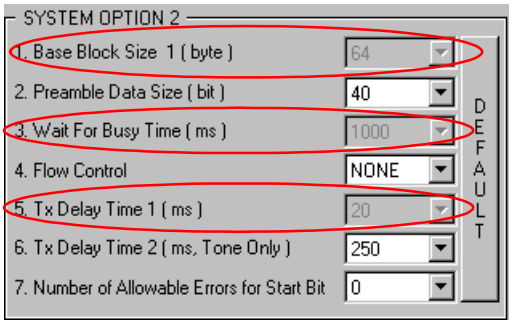
d. Initializing Data for HT (Hyper Terminal)

This is strongly recommended option when using Hyper Terminal. In addition, user can check the present version of modem.



For your reference, when selecting dumb mode parameter 1, 3, and 5 in system option 2 is disabled as below.

Refer to modem user manual for more detailed instruction about dumb mode.



6.3. SYSTEM OPTION 2

a. Base Block Size 1

This option is about data size to be transmitted at one time. If data flow control is selected in Auto mode, radio will try handshaking after transmission of assigned data. User can select ***Base Block Size1*** according to communication conditions. Proper value is maximum data size to complete successful transmission without any error. Usually, under 128 byte (Default) is recommended.

b. Preamble Data Size

This size of bit is for synchronization of modem. Generally, in case of SD160 series, at least 32 bits (Default) is recommended.

c. Wait for Busy Time

After radio transmits established data, radio waits response signal. If there is no response signal, after this specified time elapses, next data will be transmitted, but if any, next data will be transmitted on receiving response signal. Normally, in case of SD160 series, 1000ms (Default) is recommended.

d. Flow Control

There are three methods to control data. In case that Radio is under Auto Mode, User can select Xon/Xoff, RTS/CTS or NONE but in Dumb Mode, this is fixed to NONE.

Software : Flow Control is controlled by Xon/Xoff code.
Hardware : Flow Control is controlled by RTS/CTS of RS-232
None : Radio does not use any Flow Control.

e. Tx Delay Time 1(ms)

At Auto Mode, to prevent frequent transmission due to irregular data input, this option allows for the radio to enter transmission mode after assigned time. For your reference, frequent transmission spends too much time for its preparation such as PLL lock, Power-Up, stabilizing Power, and etc. So, it will degrade overall system performance. Usually, SD160 series uses at least 20ms (Default).

f. Tx Delay Time 2

It is required time to detect tone, and so only available for FFSK Modem and channel with Tone (CTCSS/DCS). In case of SD160 series, 250ms (Default) is recommended.

g. Number of Allowable Errors for Start Bit

This option prevents radio from receiving invalid data by external disturbance. Consequently, the more unwanted signal radio receives, the less selectable value user may select.

6.4. SYSTEM OPTION 3

a. Tx Off Delay

If all assigned data are transmitted, after Radio keeps TX status during this period of time, TX stops. Normally, in case of SD160 series, 0ms (Default) is recommended.

b. Tx On Delay

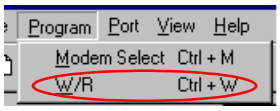
Radio transmits data after elapsing this period of time since TX starts. In case of SD160 series, 20ms (Default) is recommended.

c. Rx On Delay

Radio enters RX status after elapsing this period of time since receiving carrier. In case of SD160 series, 16ms (Default) is recommended.

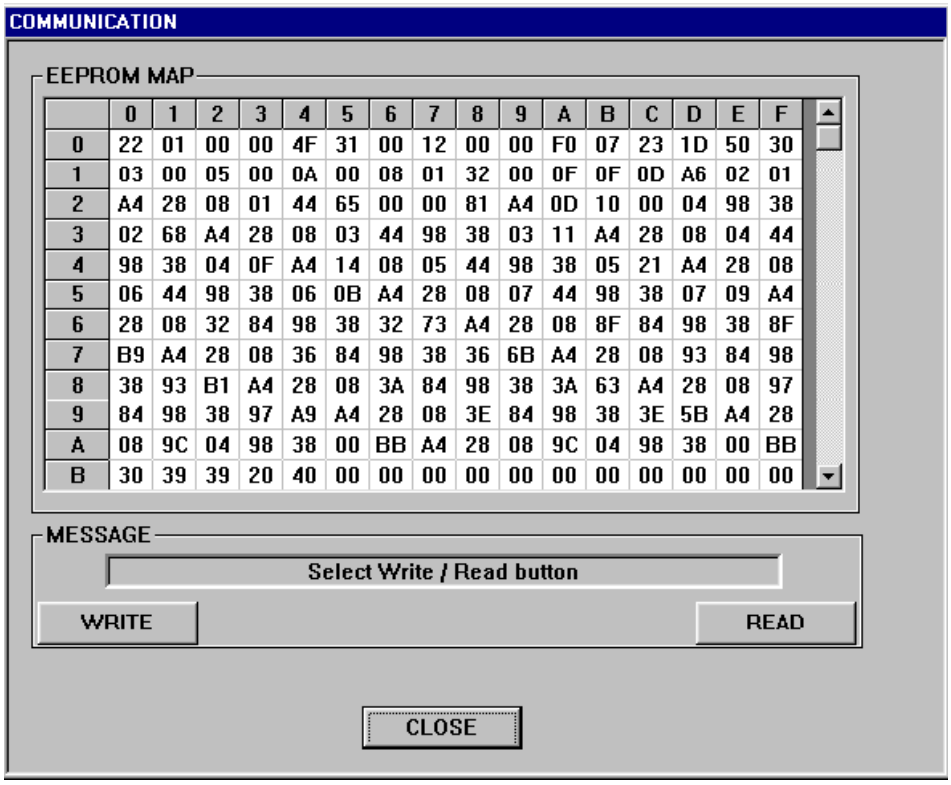
7. COMMUNICATION (Read & Write)

In this chapter, specific procedure of data communication, writing and reading, is detailed. ACC-916 enables user to write/read data related to channel data, system options, and modem options and so on onto/from radio.

Click on the icon  in Toolbar or 

.

If the above window appears, the radio is turned off and turned on again.
After this, the window appears as the following.



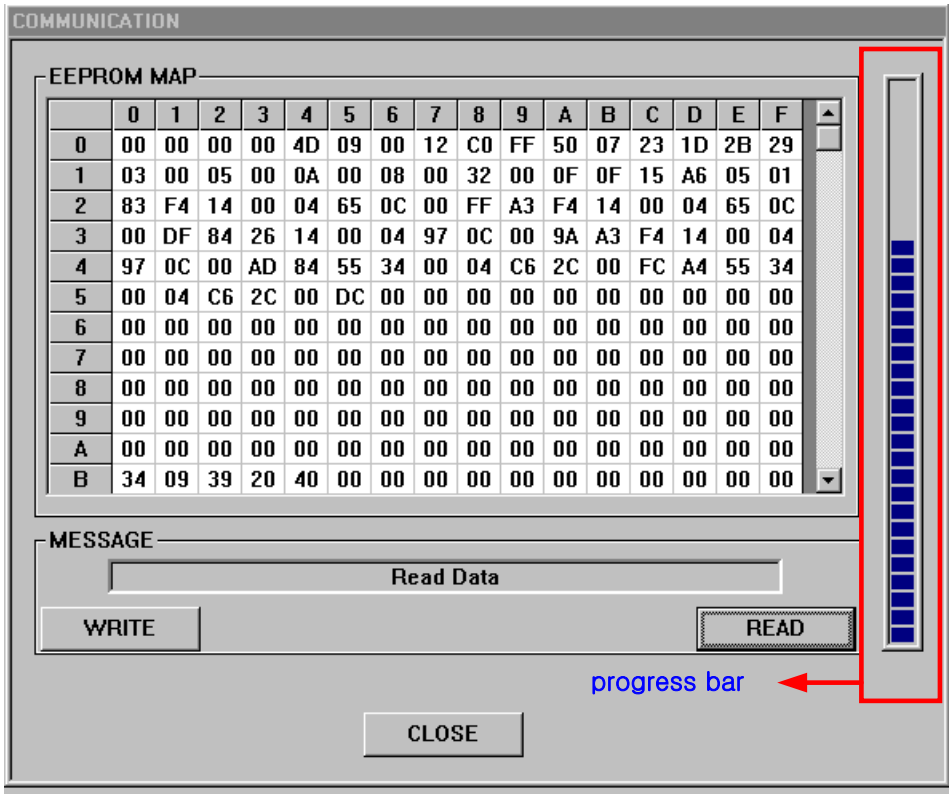
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	22	01	00	00	4F	31	00	12	00	00	F0	07	23	1D	50	30
1	03	00	05	00	0A	00	08	01	32	00	0F	0F	0D	A6	02	01
2	A4	28	08	01	44	65	00	00	81	A4	0D	10	00	04	98	38
3	02	68	A4	28	08	03	44	98	38	03	11	A4	28	08	04	44
4	98	38	04	0F	A4	14	08	05	44	98	38	05	21	A4	28	08
5	06	44	98	38	06	0B	A4	28	08	07	44	98	38	07	09	A4
6	28	08	32	84	98	38	32	73	A4	28	08	8F	84	98	38	8F
7	B9	A4	28	08	36	84	98	38	36	6B	A4	28	08	93	84	98
8	38	93	B1	A4	28	08	3A	84	98	38	3A	63	A4	28	08	97
9	84	98	38	97	A9	A4	28	08	3E	84	98	38	3E	5B	A4	28
A	08	9C	04	98	38	00	BB	A4	28	08	9C	04	98	38	00	BB
B	30	39	39	20	40	00	00	00	00	00	00	00	00	00	00	00

Please check that the radio and test jig are connected correctly.

If disconnection or failure of communication with the radio happens, below warning message shows up.

At this moment, turn off and on the radio power.

If click on the “WRITE” or “READ” button, data will be written or read.



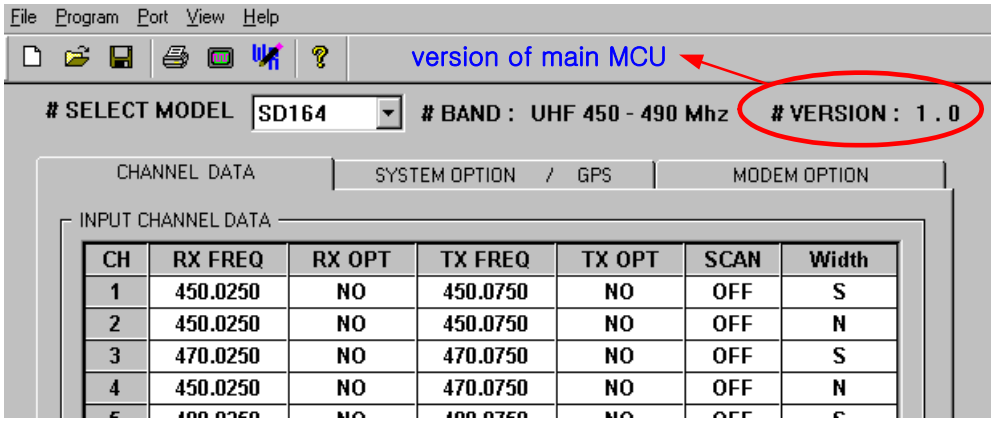
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	00	00	00	00	4D	09	00	12	C0	FF	50	07	23	1D	2B	29
1	03	00	05	00	0A	00	08	00	32	00	0F	0F	15	A6	05	01
2	83	F4	14	00	04	65	0C	00	FF	A3	F4	14	00	04	65	0C
3	00	DF	84	26	14	00	04	97	0C	00	9A	A3	F4	14	00	04
4	97	0C	00	AD	84	55	34	00	04	C6	2C	00	FC	A4	55	34
5	00	04	C6	2C	00	DC	00	00	00	00	00	00	00	00	00	00
6	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
7	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
8	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
9	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
A	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
B	34	09	39	20	40	00	00	00	00	00	00	00	00	00	00	00

User can see the writing or reading process by the progress bar.

If finishing the writing or reading process, the following message appears.

If click on the “OK” button, and then push “CLOSE” button of communication window, the following window shows up.

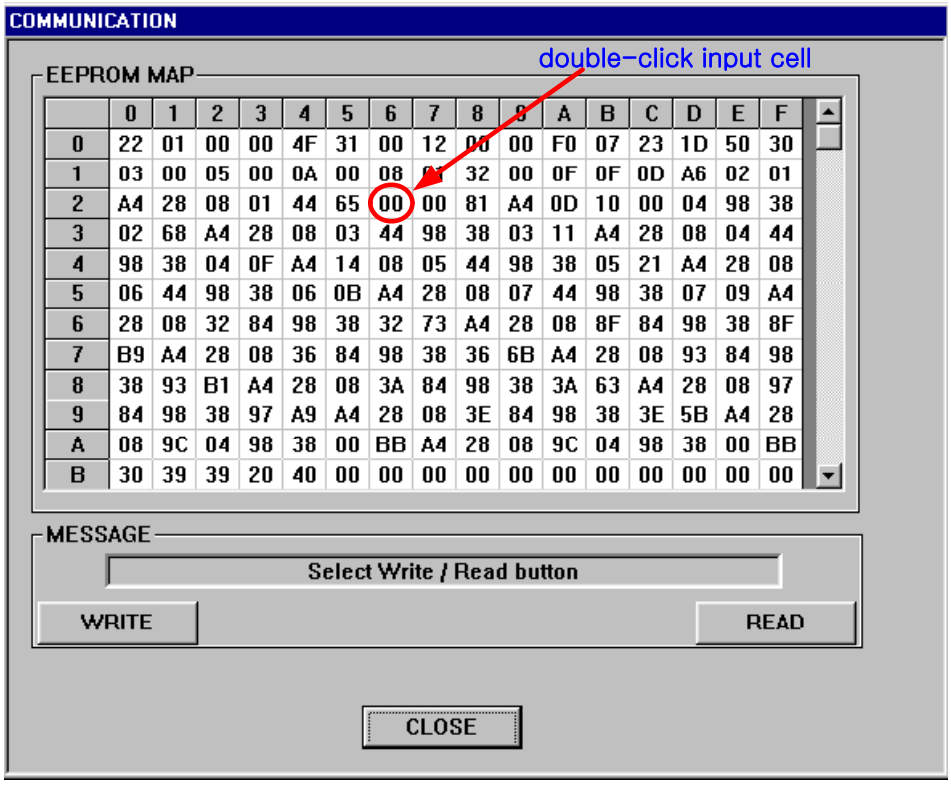
In this window, user can check the version of main MCU placed currently in the radio.



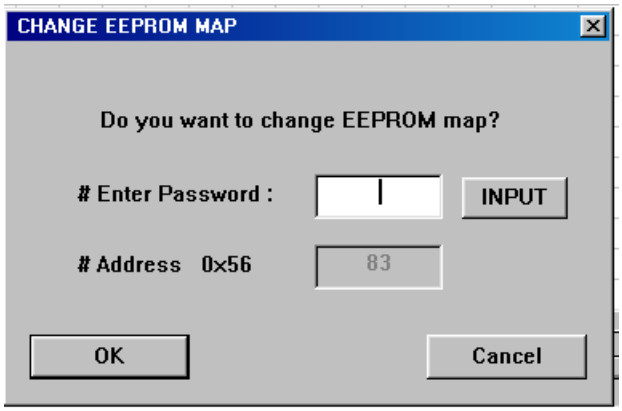
In case of clicking on “READ”, data from main MCU of radio is read and displayed them on the PC program.
In case of clicking on “WRITE”, data on PC program sends to main MCU of radio.

7.1. EEPROM MAP

EEPROM MAP displays established data which is read(when READ) from the radio or to be written(when WRITE) to the radio.

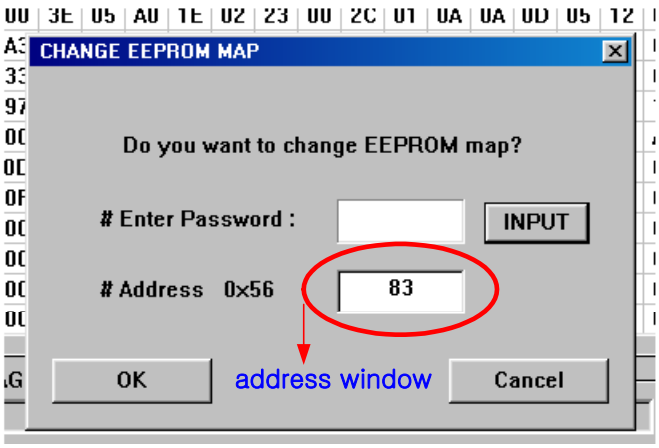


If double-click wanted input cell on EEPROM map, the below pop-up window appears.



Password should be inputted so that user can input data.

Input the right password, and then click on the “INPUT” button.



Address window is enabled to input wanted data.

After inputting the proper data, click on the “OK” button.

NOTICE

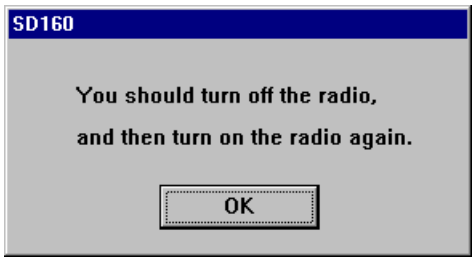
If user changes the data without exact information about *EEPROM MAP*, the radio would not work properly. So, user should change the data carefully.

8. SQUELCH & CALIBRATION

In this chapter, user can set up the RF signal level for closing and opening the squelch or use of established default level is possible. In calibration section, overall conditions for radio test such as channel, R,Tx mode, scan, GPS, modem

If click on the icon  in Toolbar, the message appears as below.

And user should turn off and on the radio.



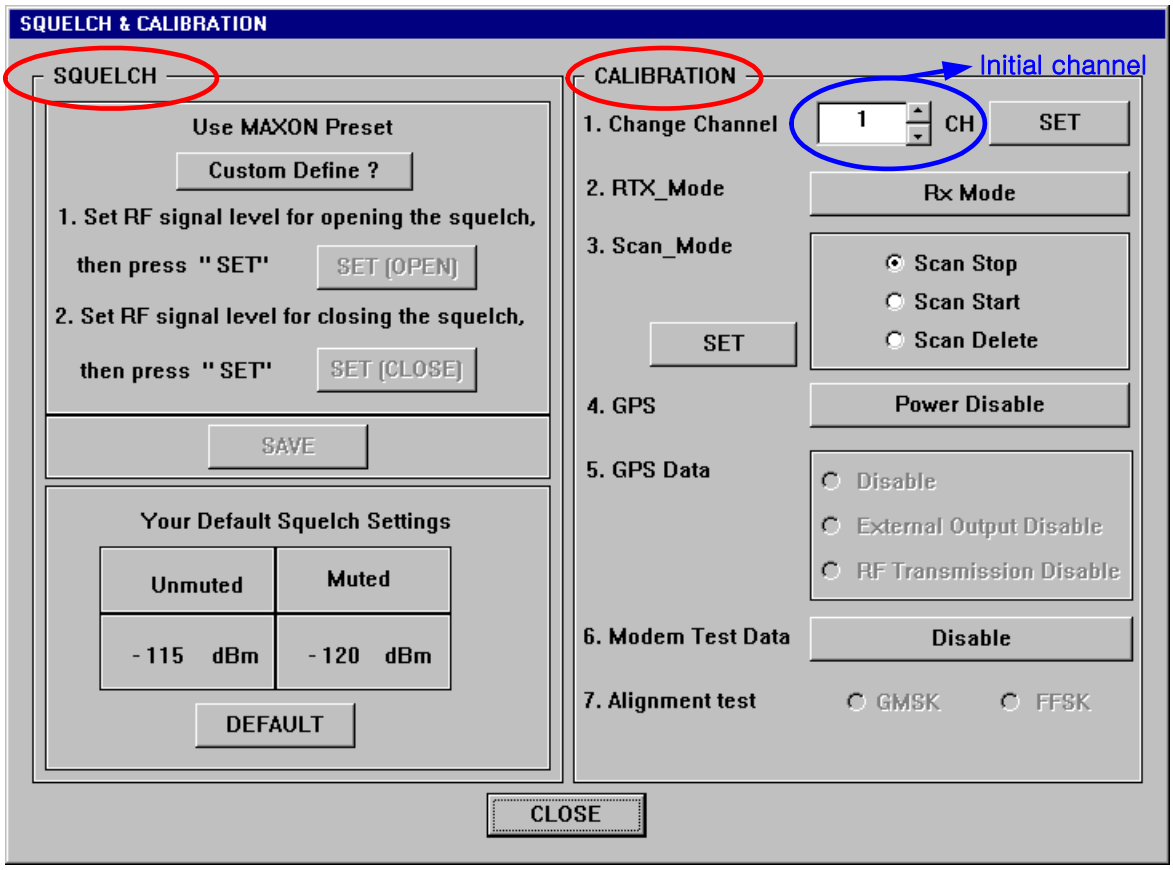
NOTICE

After clicking on “OK” button, if radio condition doesn’t match, error message occurs.

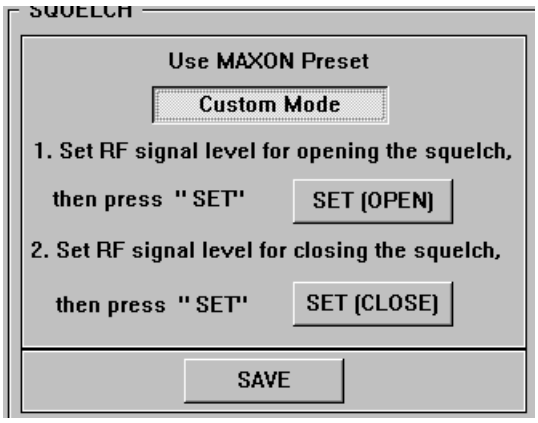
In this case, user should turn off the radio and click on squelch & calibration icon  .

Then, turn on the radio, and click on the “OK” button.

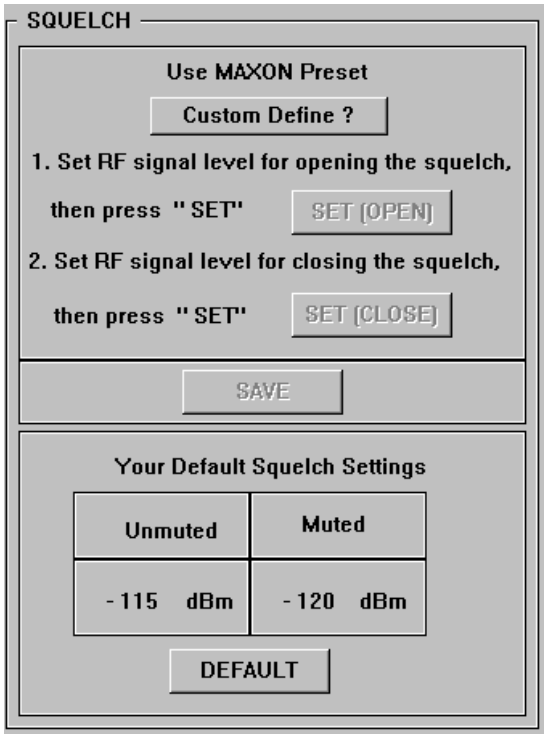
Initial channel is decided according to position of dip switch located on digital board of radio.



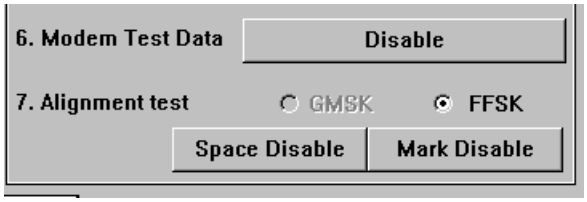
If user wants to change the squelch point, click on the “Custom Define?” button



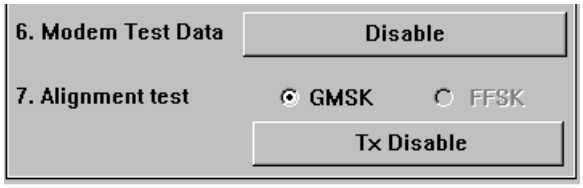
After defining the point of squelch using communication test set, user should click on the “SAVE” button to complete the setting. Otherwise, this setting point is deleted when radio is turned off.



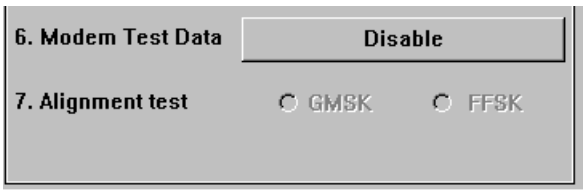
In squelch points settings, if do not want to use function of custom define, click on the "DEFULT" button and default setting points will be established.



If FFSK Modem is installed in the radio, above window appears.



If GMSK Modem is installed in the radio, above window appears.
If there is no modem or communication failure, the following window appears.



If item 6 of “Modem Test Data” is enabled, all of selectable options are disabled.