

# Corporate Services for the Natural Resource Sector

## Communication Services Section

### Radio Operator Training

#### ROC 100 RADIO OPERATOR COURSE



## **Training Presentation Overview**

### **Part I – Introduction To The Radio System**

- The Natural Resource Sector (NRS) Radio System
- NRS Repeaters and Maps
- Radio Channels and Banks
- Radio System Range
- NRS Radio Equipment and Maintenance
- Introduction to Tones
- How To Set Tones On NRS Radios

### **Part II – Procedures, Policy and Legislation**

- Speech Transmission Techniques
- Call Signs
- Calling Procedures
- General Call
- Radio Signal Check
- Emergency Communications
- Employer Operating Policy
- Industry Canada and the Radio Communications Act

### **Part III – Conclusion**

- Troubleshooting Tips
- Important Points

# Part I

## Introduction to the Radio System

## **Part I: The Natural Resource Sector (NRS) Radio System**

- **The primary focus of the NRS Radio System has been to provide reliable two-way radio service to personnel required to operate in the rural and remote locations of BC and to provide emergency radio communications where and when required.**

**The NRS Radio System is comprised of:**

- **29 separate district repeater networks in 3 regions**
- **300+ Mountain Top Repeater Sites**
- **Base stations, mobile units for trucks and vessels, portables**
- **Mobile Emergency Fire Repeaters and Communications Trailers**

## **Part I: NRS Repeaters and Maps**

### **Radio Repeaters:**

- **Relay or “repeat” radio signals to extend range**
- **Receive on one frequency while simultaneously transmitting on another (Duplex)**
- **Transmit about the same power as a portable radio**
- **Most are powered by batteries charged by solar panels**
- **Most are linked to other repeaters in either a “star” or “chain” arrangement called a “District Network”**
- **The NRS has over 300 Fixed Repeater Sites**
- **Each Site costs about \$50,000**
- **The NRS has 14 sets of duplex repeater frequencies which are assigned “Color” names (e.g. Red, Blue, Green)**
- **Additional frequencies for temporary “Fire Repeaters”**
- **To access a repeater to transmit or receive you must know it’s CHANNEL COLOUR and TONE**



# Natural Resource Sector – Communication Services

## ROC 100 RADIO OPERATOR COURSE

### Part I: NRS Repeaters and Maps



**Skidegate Repeater  
Building and Tower**



**Bute Repeater  
Comshell**

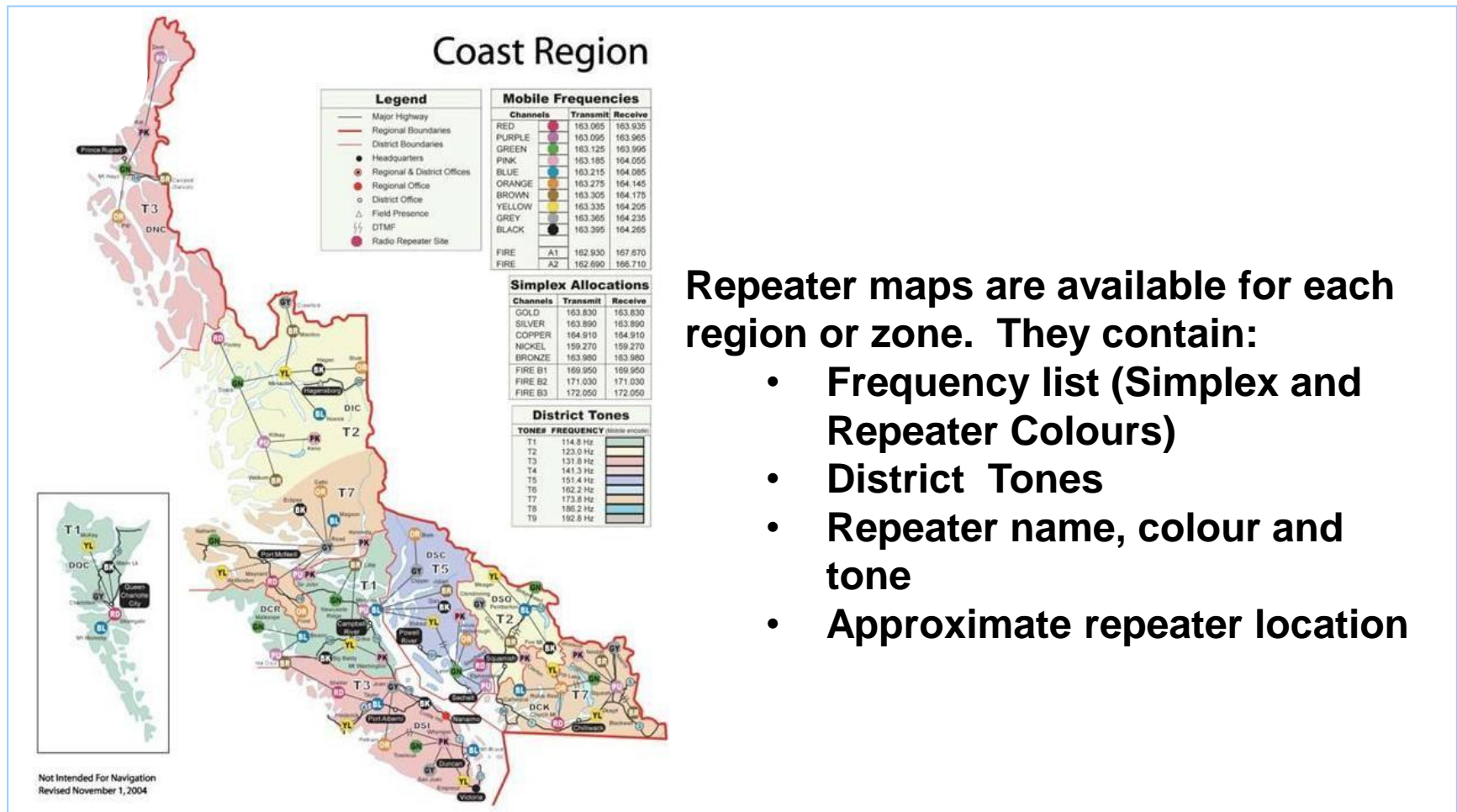


**Fire Repeater  
Type A or Type B**

# Natural Resource Sector – Communication Services

## ROC 100 RADIO OPERATOR COURSE

### Part I: NRS Repeaters and Maps



Repeater maps are available for each region or zone. They contain:

- Frequency list (Simplex and Repeater Colours)
- District Tones
- Repeater name, colour and tone
- Approximate repeater location

# Natural Resource Sector – Communication Services

## ROC 100 RADIO OPERATOR COURSE

### Part I: NRS Repeaters and Maps

## Reading the Maps

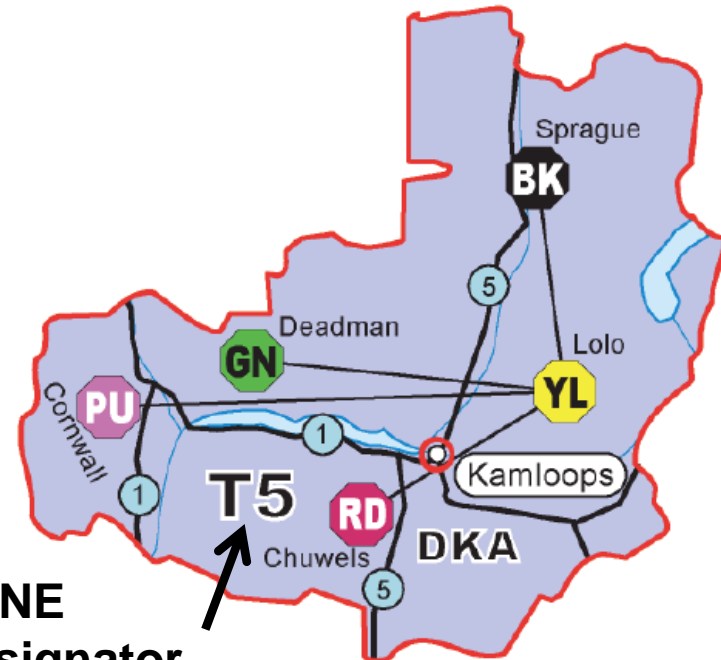
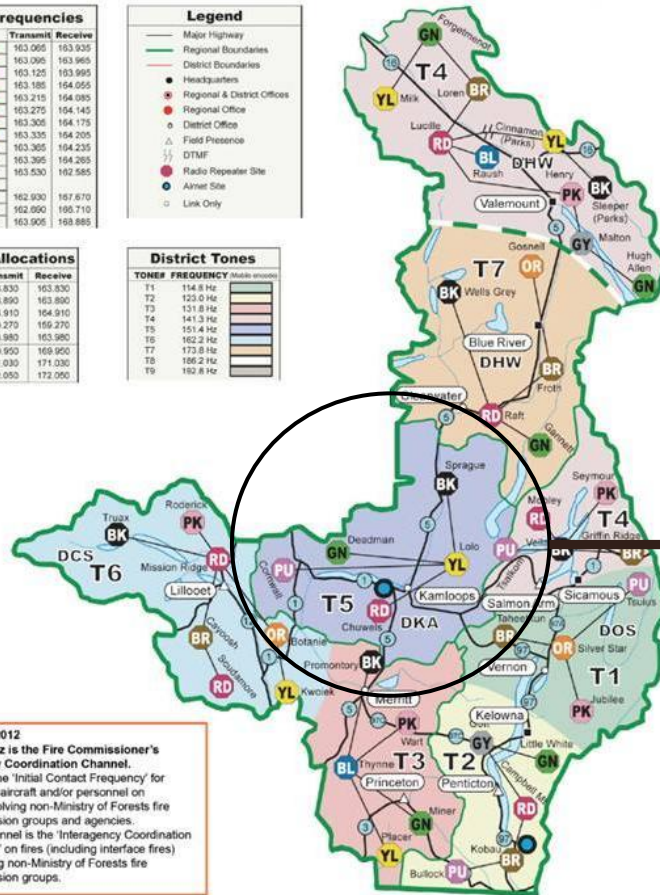
Mobile Frequencies		
Channels	Transmit	Receive
RED	163.065	163.935
PURPLE	163.095	163.905
GREEN	163.125	163.875
PINK	163.185	164.055
BLUE	163.215	164.085
ORANGE	163.275	164.145
BROWN	163.305	164.175
YELLOW	163.335	164.205
GREY	163.365	164.235
BLACK	163.395	164.265
WHITE	163.530	162.585
FIRE	A1 162.930	167.670
FIRE	A2 162.050	166.710
FIRE	A3 163.905	168.885

Legend	
—	Major Highway
—	Regional Boundaries
—	District Boundaries
●	Headquarters
●	Regional & District Offices
●	Regional Office
●	District Office
△	Field Presence
△	DTMF
●	Radio Repeater Site
○	Alarm Site
○	Link Only

Simplex Allocations		
Channels	Transmit	Receive
GOLD	163.830	163.830
SILVER	163.890	163.890
COPPER	164.910	164.910
NICKEL	169.270	169.270
BRONZE	163.980	163.980
FIRE B1	169.950	169.950
FIRE B2	171.030	171.030
FIRE B3	172.050	172.050

District Tones	
TONES	FREQUENCY
T1	114.8 Hz
T2	123.0 Hz
T3	131.8 Hz
T4	141.3 Hz
T5	151.4 Hz
T6	162.2 Hz
T7	173.8 Hz
T8	186.2 Hz
T9	192.8 Hz

**Rules For 2012**  
 155.460 MHz is the Fire Commissioner's Interagency Coordination Channel.  
 • This is the 'Initial Contact Frequency' for inbound aircraft and/or personnel on fires involving non-Ministry of Forests fire suppression groups and agencies.  
 • This channel is the 'Interagency Coordination Channel' on fires (including interface fires) involving non-Ministry of Forests fire suppression groups.



**TONE  
Designator**



## **Part I: Radio Channels and Banks**

# **BANKS**

- ⊕ **A group of similar channels**
- ⊕ **Determined by NRS Communication Services Section**

<b>Bank Number</b>	<b>Channel Group</b>
Bank 1	Repeater and Simplex
Bank 2 (Older Radios)	Road Channels
Bank 2-25 (Newer Radios)	Road Channels

### Part I: Radio Channels and Banks

#### NRS CHANNELS

Bank 1		
Channel 1	Red	<b>Repeater Channels</b>  <b>Dispatch</b>  <b>PHONE TONE REQUIRED</b>
Channel 2	Purple	
Channel 3	Green	
Channel 4	Pink	
Channel 5	Blue	
Channel 6	Orange	
Channel 7	Brown	
Channel 8	Yellow	
Channel 9	Gray	
Channel 10	Black	
Channel 11	White	
Channel 12	Gold	<b>Simplex Channels</b> <b>Person to Person</b> <b>NO TONE!</b>
Channel 13	Silver	
Channel 14	Copper	
Channel 15	Nickel	
Channel 16	Bronze	

## **Part I: Radio Channels and Banks**

### **Road Channels**

- **For Safety, while driving on logging roads, monitor the posted logging road channel**
- **Use of portable radios for monitoring road channels is not sanctioned, as they do not perform properly inside a vehicle cab**
- **Scanning channels is not permitted. If required, pull over in a safe place to change from road channels to NRS frequencies**
- **For the [BC Forest Safety Council - Road Safety](http://www.bcforestsafe.org/forestry_trucksafe/safe_driving_info.html) “Rules of the Road” for traveling on logging roads, see the following web site:**

**[http://www.bcforestsafe.org/forestry\\_trucksafe/safe\\_driving\\_info.html](http://www.bcforestsafe.org/forestry_trucksafe/safe_driving_info.html)**

## **Part I: Radio System Range**

### **Radio Range:**

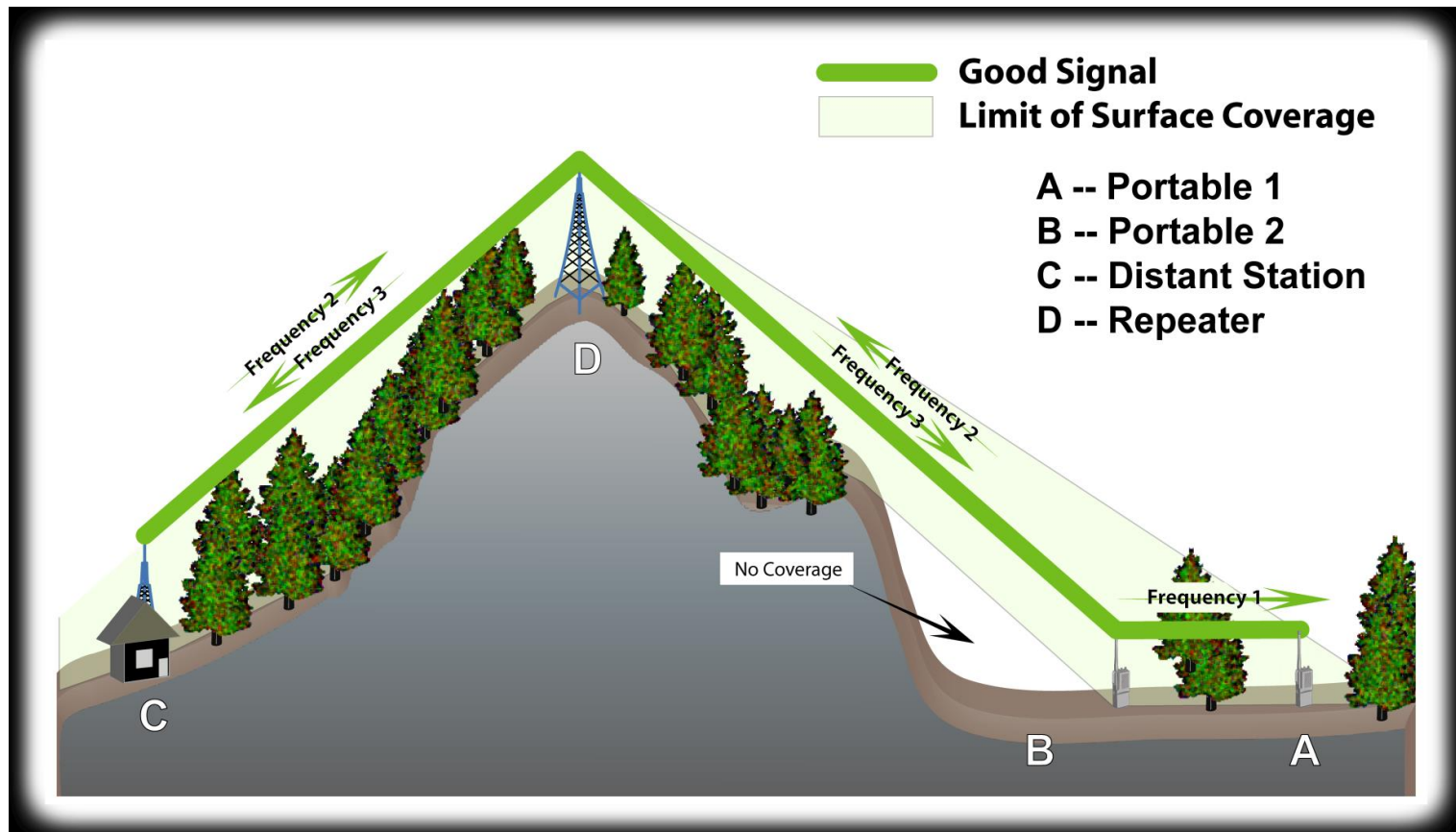
- **The range of your radio is influenced by the antenna system, battery condition and power setting**
- **The NRS mobile radio equipment has been designed to transmit and receive radio signals that are vertically polarized. For best reception and transmission, your handheld radio should be used with the antenna in a vertical position**

### **Antenna location is very important:**

- **Your body will absorb some of the signal, try holding the radio up and away from your body. ( Remember that performance will be compromised when using a chest pack)**

### Part I: Radio System Range

#### Line of Sight





## **Part I: Radio System Range**

**Communication between radios may be impacted by one or more of the following :**

- **Line-of-Sight**
- **Trees, Foliage, Rocks or Hills**
- **Gullies or Knolls**
- **Weather Conditions**
- **Distance**
- **Over water**

## **Part I: Radio System Range**

### **Failure of Communications:**

- **When contact with a base station fails on the selected frequency, the mobile should try to establish contact on another frequency and correct tone appropriate to the area in which it is operating.**
- **Due to topography, you may be able to ‘hit’ a repeater which is actually farther away, yet has a better ‘line of site’ path.**
- **When normal communications from a base station to a mobile cannot be established, the base station should try to relay the message via any other station or operator which may be able to establish communications**

## **Part I: NRS Radio Equipment and Maintenance**

### **The Equipment:**

- **Portable radios: ICOM F3, ICOM F30GT**
- **Mobile radios: Kenwood TK780, TK7180**
- **Base station remotes: Deskon II, Vega C2002, C1614, C1616**
- **Kenwood TK780 Base station**

## **Part I: NRS Radio Equipment and Maintenance**

### **Equipment Maintenance – Microphone & Antenna Connections:**

- **There are various types of connectors used to attach cables to the electronic equipment. Each connector requires its own assembly technique. Care should be exercised when repairing or replacing connectors. The main problems with connectors are shorts (when two bare wires are touching each other or the metal case) or open wires (when the wire is broken inside the plastic shield or outer covering)**
- **All connections should be tight and clean. Where connections are exposed to the weather, they should be protected.**

## **Part I: Introduction to Tones**

# **TONES**

**“CONTINUOUS TONE CODED SQUELCH SYSTEM”  
- CTCSS -**

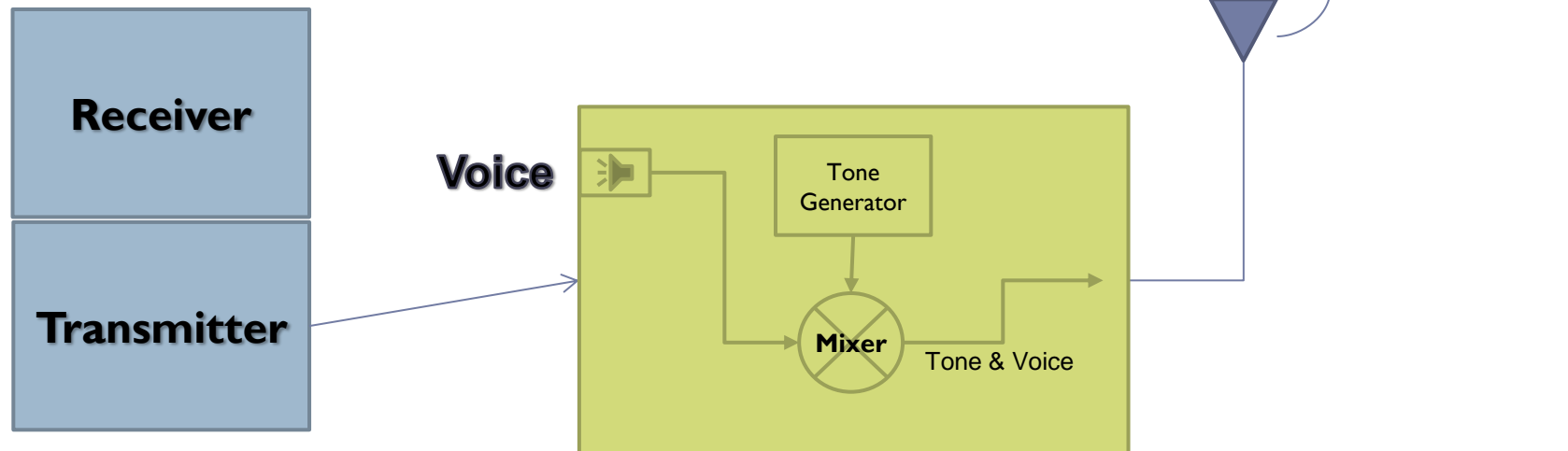
- **Used to stop interference and overlap between repeaters**
- **For rainbow color repeater channels ONLY**
- **NOT for Silver, Gold, Nickel, Copper, Bronze or Road Channels**
- **May be used with Fire Repeaters, if required**



## Part I: Introduction to Tones

# Transmitting a Tone

- When tone is on, the transmitter will mix the selected tone with the voice

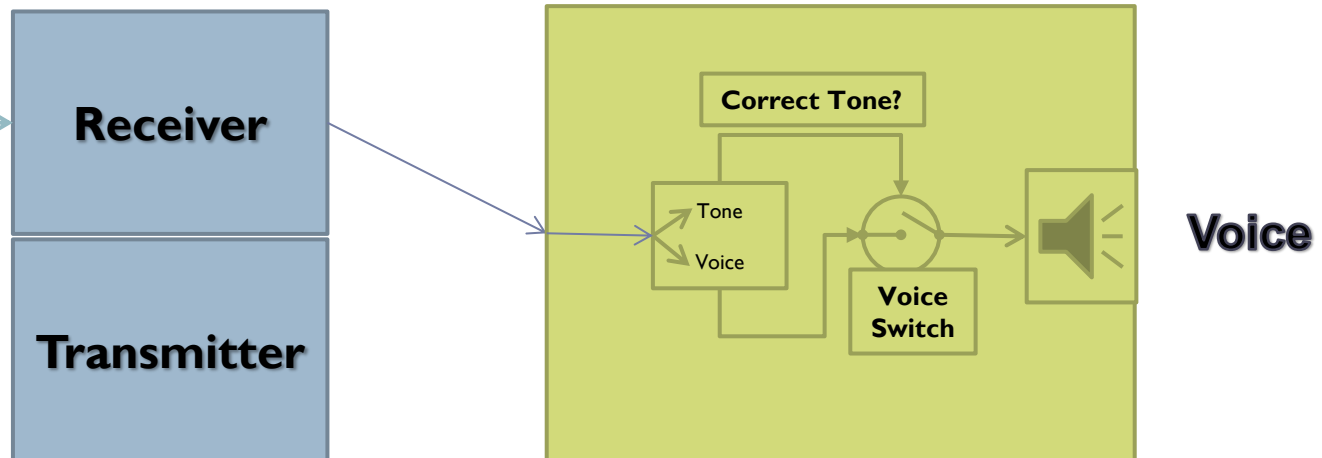


## Part I: Introduction to Tones

# Receiving a Tone

**Tone &  
Voice**

- When tone is on, if the correct tone is received, the “Voice Switch” allows the Voice audio to pass



## **Part I: How to Set Tones On NRS Radios**

# **Setting Tones – F30**



The diagram shows an ICOM F30S radio. A red circle around the top rotary switch is labeled 'Bank'. A red circle around the side-mounted 'Up' and 'Down' buttons is labeled 'Up and Down'. A red circle around the 'P0' button is labeled 'Tone Menu'. The radio's LCD screen displays 'ch254' and 'icom F30S'.

- 1. Select Bank**
- 2. Select Channel (Up and Down Buttons)**
- 3. IF a tone is required:**
  - Press P<sub>0</sub> to enter the tone menu
  - Select Tone (Up and Down Buttons)
  - Press P<sub>0</sub> to save

## **Part I: How to Set Tones On NRS Radios**

# **Setting Tones – TK-780**



Tone Menu

Bank

Up  
and  
Down

- 1. Select Bank**
- 2. Select Channel (Up and Down Buttons)**
- 3. IF a tone is required:**
  - **Press A to enter the tone menu**
  - **Select Tone (Up and Down Buttons)**
  - **Press A to save**

## Part I: How to Set Tones On NRS Radios

# Setting Tones – TK-7180 or NX-700



Tone Menu

Bank

Up  
and  
Down

1. Select Bank
2. Select Channel (Up and Down Buttons)
3. IF a tone is required:
  - Press S to enter the tone menu
  - Select Tone (Up and Down Buttons)
  - Press S to save



# Part II

## Procedures, Policy and Legislation

## **Part II: Speech Transmission Techniques**

### **Speech Transmission Techniques:**

- **Keep the rate of speech constant**
- **Not too fast nor too slow**
- **Preserve the rhythm of ordinary conversation**
- **Not too loud nor too quiet**
- **Articulate: separate words so they do not run together**
- **Avoid unnecessary sounds such as “er”, “um” or “ah” between words**

## **Part II: Speech Transmission Techniques**

### **Time and Date:**

- **The twenty-four hour clock should be used to express time**
- **Time should be expressed by means of four figures**
  - **The first two digits represent the hour past midnight**
  - **The last two digits represent the minutes past the hour**

### **Examples:**

***12:45am -> 0045***

***12:00 Midnight -> 2400 or 0000***

***1:45pm -> 1345***

## **Part II: Speech Transmission Techniques**

### **Transmission of Numbers:**

- **All numbers except whole thousands should be transmitted by pronouncing each digit separately**
- **Whole thousands should be transmitted by pronouncing each digit in the number of thousands followed by the word “Thousand”**
- **Numbers containing a decimal point should be transmitted with the decimal point indicated by the word “Decimal”**

### **Example:**

***321.5 – Three Two One Decimal Five***

***32,150 – Three Two Thousand One Five Zero***

## **Part II: Speech Transmission Techniques**

### **Phonetic Alphabet**

<b>A</b>	<b>Alpha</b>	<b>J</b>	<b>Juliet</b>	<b>S</b>	<b>Sierra</b>
<b>B</b>	<b>Bravo</b>	<b>K</b>	<b>Kilo</b>	<b>T</b>	<b>Tango</b>
<b>C</b>	<b>Charlie</b>	<b>L</b>	<b>Lima</b>	<b>U</b>	<b>Uniform</b>
<b>D</b>	<b>Delta</b>	<b>M</b>	<b>Mike</b>	<b>V</b>	<b>Victor</b>
<b>E</b>	<b>Echo</b>	<b>N</b>	<b>November</b>	<b>W</b>	<b>Whiskey</b>
<b>F</b>	<b>Foxtrot</b>	<b>O</b>	<b>Oscar</b>	<b>X</b>	<b>X-ray</b>
<b>G</b>	<b>Golf</b>	<b>P</b>	<b>Papa</b>	<b>Y</b>	<b>Yankee</b>
<b>H</b>	<b>Hotel</b>	<b>Q</b>	<b>Quebec</b>	<b>Z</b>	<b>Zulu</b>
<b>I</b>	<b>India</b>	<b>R</b>	<b>Romeo</b>		



## **Part II: Speech Transmission Techniques**

### **Procedural Words and Phrases:**

**While it is not practical to set down precise phraseology for all radio-telephone procedures, use professional dialogue: concise and appropriate**

### **DO NOT USE SLANG EXPRESSIONS**

**Bad example:**

**“BREAKER BREAKER  
GOOD BUDDY  
HAVE YA GOT YER EARS ON?”**

## **Part II: Call Signs**

### **Call Signs:**

- **A call sign is assigned to each station and person**
- **Should be used at least when initial contact is being established and again when the communication is concluded**

### **Call Signs - Examples:**

#### **Base Stations**

***XLT40 – PORT ALBERNI***

***XMW348 – CHILLIWACK***

#### **Mobile Stations**

***C-GNTA***

***(Golf November Tango Alfa)***

***2P 19***

***(Two Papa One Nine)***

***8 ST 5***

***(Eight Sierra Tango Five)***

## **Part II: Calling Procedures**

### **Calling Procedures:**

- **Make sure your radio is ON, and set to the right channel**
- **Before transmitting, listen for a period of time to ensure that your transmission will not cause interference to calls already in progress**
- **Wait for the channel to clear**
- **Distress, urgency or safety communications are entitled to interrupt a transmission of lower priority**

## **Part II: Calling Procedures**

### **➤ *Push – Pause – Talk***

**If you are at the end of a district repeater system you may experience a slight delay as the district repeater system is engaged.**

- 1. Listen to make sure the channel is un-used**
- 2. Push the “PTT” (Push To Talk) button**
- 3. Pause - (Hold the PTT button for a second before speaking)**
- 4. Speak directly into the microphone**
- 5. Release the PTT button**

## **Part II: General Call**

### **General Call - Procedure:**

- 1. Call sign of the station called (up to 3 times)**
- 2. The expression “This is”**
- 3. The call sign of the station calling (up to 3 times)**
- 4. Invitation to reply (e.g. “Do you copy?”)**

### **Examples:**

<b>Initial Call</b>	<b>“Fire Center this is Romeo, Alpha, 1, 4”</b>
<b>Response</b>	<b>“Romeo, Alpha, 1, 4 this is Fire Center, go ahead”</b>

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<b>Initial Call</b>	<b>“Papa, 7, 3 this is Romeo, Alpha, 1, 4”</b>
<b>Response</b>	<b>“Romeo, Alpha, 1, 4 this is Papa, 7, 3, go ahead”</b>

## **Part II: General Call**

### **Replying:**

- **An operator hearing a call directed to their station shall reply as soon as possible**
- **Advise the calling station to proceed with their message with the expression “Go Ahead”**
- **When an operator hears a call but is uncertain that the call is intended for their station, they should WAIT until the call has been repeated and is understood**

### **Not Ready to Receive:**

- **If the station is not ready to receive the message, the operator should reply to the call and advise the calling station to “Stand By”, followed by the anticipated number of minutes of delay**

***DO NOT JUST IGNORE THE CALL IF YOU ARE BUSY***

## **Part II: General Call**

### **Aircraft:**

- **At the speeds aircraft travel, a delay in answering their call (Even a few seconds) can result in the aircraft moving a long distance, affecting your ability to communicate with them. Give aircraft a higher priority when responding to calls**

### **Corrections:**

- **When an error has been made in transmission, the expression “Correction” should be spoken, and the last correct word or phrase repeated and the correct version transmitted**

### **Repetitions:**

- **If the receiving station desires repetition of a message, the operator should request it by using the expression “Say Again”**

## **Part II: Radio Signal Check**

### **Radio or Signal Checks - Procedure:**

- 1. Call another radio station to request a radio check**
- 2. Your call sign should be transmitted during the test transmissions**
- 3. The radio check consists of:**

**“XLV-Six Zero, This is Eight Tango Four for a Radio Check.  
How do you read me?”**

**This test should be done before you go out to the field,  
to ensure your radio equipment is functioning**



## **Part II: Radio Signal Check**

### **Readability and Strength System**

#### **Signal Strength**

- 5 Strong signal
- 4 Moderate signal
- 3 Fair signal
- 2 Weak signal
- 1 Faint signal barely perceptible

#### **Readability**

- 5 Perfectly readable
- 4 Readable with practically no difficulty
- 3 Readable considerable difficulty
- 2 Barely readable
- 1 Unreadable

**Example: I read you ‘five by five’**

**Use the *Strength* and *Readability* scale, or use plain words to describe what you hear on the radio**

**Examples:**

**“I read you loud and clear”**

**“I read you quiet with some background noise”**

## **Part II: Emergency Communications**

### **Emergency Communications:**

- **Use of emergency procedures in Land Communications is Very Rare**
- **A station in distress should make use of any means at its disposal to attract attention, to make known its position and obtain assistance**
- **Use the frequency you would normally use but if unable to establish communications, use ANY other frequency at your disposal**

## **Part II: Emergency Communications**

### **Distress Signal – Mayday:**

- **The distress signal indicates that the station sending the signal is either:**
  - **Threatened by grave and imminent danger and requires immediate assistance**
  - **Aware that an aircraft, ship or other vehicle is threatened by grave and imminent danger and requires immediate assistance**
- **The Distress signal is the word “MayDay” spoken three times.**

## **Part II: Emergency Communications**

### **Urgency Signal – Pan Pan:**

- **The Urgency signal indicates that the station calling has a urgent message to transmit concerning the safety of an aircraft, ship or other vehicle, or the safety of a person.**
- **The Urgency signal is the word “Pan Pan” spoken three times.**
- **The urgency signal and the urgency message may be addressed to all stations or to a specific station.**

## **Part II: Emergency Communications**

### **Safety Communications – Security:**

- **The Safety signal is used mainly in the maritime mobile service. It indicates that the station calling is about to transmit a message concerning the safety of navigation or giving important meteorological warnings**
- **The safety signal is the word “Security” spoken three times.**
- **The safety signal and the safety message may be addressed to all stations or to a specific station**

## **Part II: Emergency Communications**

### **Priorities of Communications:**

- 1. Distress Communications**
- 2. Urgency Communications**
- 3. Safety Communications**
- 4. All Other Communications**

### **Priority of Communications:**

- 5. Aircraft**
- 6. Marine**
- 7. Fire Related**
- 8. Other**

➤ **Distress, Urgency and Safety Communications take precedence**

## **Part II: Employer Operating Policy**

### **Employer Operating Policy:**

#### **DO NOT:**

- **Discuss private affairs of anyone**
- **Discuss policy or personnel matters**
- **Voice opinions of employees**
- **Make detrimental remarks about your employer or colleagues**
- **Discuss salaries or appointments**
- **Mention bids, quotes or contract prices**
- **Discuss anything other than the official business at hand**
- **Use profane or obscene language**
- **Transmit superfluous (unnecessary) signals**

## **Part II: Employer Operating Policy**

### **Radio Log:**

- **Base stations are required to keep a log or diary of the activities of the station**
- **Mobile or portable stations are not required to keep a log**
- **Logs are to be retained on file**
- **Radio logs shall be available for inspection**



## **Part II: Industry Canada and the Radio Communications Act**

**Industry Canada is the overall authority for radio use in Canada as specified in the RADIOCOMMUNICATIONS ACT and Radio Communications Regulations**

**Industry Canada:**

- **Allocates Frequencies**
- **Supervises Licensing**
- **Issues Directives and Regulations**
- **Monitors Activities to Ensure Compliance with the Radio Communications Act**

**All NRS Radios are licensed**

## **Part II: Industry Canada and the Radio Communications Act**

### **Radio Communications Act Prohibits:**

- **Transmitting False Distress Signals**
- **Interference or Obstruction of ANY Radio Communications**
- **Divulgence or Interception of ANY Radio Communications**
- **Profane language**

## **Part II: Industry Canada and the Radio Communications Act**

### **False Distress Signals:**

- **Any person who transmits or causes to be transmitted any false distress signal, is guilty of an offence**
- **Upon conviction the individual offender is liable to a fine not exceeding \$5,000**
- **Or to imprisonment for a term not exceeding twelve months**
- **Corporation is liable for a fine up to \$25,000**

## **Part II: Industry Canada and the Radio Communications Act**

### **Interference & Jamming:**

- **All Radios shall be installed and operated so as not to interfere with or interrupt another radio station**
- **The only exception is to transmit a higher priority call. For example, distress, urgency or safety**
- **Any person who interferes with or obstructs any radio communication is liable, upon conviction to:**
  - **A fine not exceeding \$5,000**
  - **Or, to imprisonment for a term not exceeding twelve months**
  - **Corporation liable for fines not exceeding \$25,000**

## **Part II: Industry Canada and the Radio Communications Act**

### **Privacy of Communications:**

- **All persons are bound to preserve the privacy of correspondence**
- **Does NOT apply to distress, urgency, or safety**
- **Does NOT apply to messages addressed to 'All Stations'**
- **Penalty up to \$25,000**
- **And / Or to imprisonment not exceeding twelve months**
- **Corporation responsible for fines not exceeding \$75,000**

## **Part II: Industry Canada and the Radio Communications Act**

### **Letters of Authority**

- **Ministry of Forests, Lands and Natural Resource Operations requires Letters of Authority from licensed frequency holders for use of company radio channels**
- **District staff are to acquire Letters of Authority from companies, and provide copies to their Regional Radio Shop**

# Part III

## Conclusion

## **Part III: Troubleshooting Tips**

- **Can't get an answer? You may be out of range**
- **Ensure your radio is on the right Channel**
- **Ensure your radio has Tones turned OFF if using a Metallic Simplex channel**
- **Ensure your radio is on the right tone if using an FS Repeater Channel**
- **Check antenna system (Connections Clean? Tight? Damaged? Cable ok?)**
- **Check power source (Battery Polarity correct? Car Battery Charged? Dry Batteries Dead?)**
- **Check microphone cable (Connections Clean? Tight? Coil-Cord Damaged?)**



## **Part III: Important Points**

### **Some things to Remember:**

- **Once contact has been established, keep the radio in that location until your conversation is finished**
- **Speak directly into the radio MICROPHONE**
- **Vehicle mobiles have more output power and better antenna systems, which improves chances of successful communications**
- **Never operate a radio without an antenna**
- **Never pick up or hold a portable radio by the antenna**
- **Keep your radio secure, they are valuable**
- **A Radio Communication Field Handbook and Map Supplement is provided for additional information on the NRS Radio System and how to use your radio effectively**