

Codeplug Programming

Basic Concepts - Terminology

TDMA - Time Division Multiple Access. DMR utilizes digital Time Division Multiple Access technology to divide a 12.5kHz channel into two alternating time slots (TS1 & TS2), with each carrying an individual conversation when operating in Repeater mode.

Channel - Is a specific Talk Group on a specific Timeslot of any repeater. Multiple channels can be assigned to different Zones. There are 16 channels available per Zone.

Radio Wide Feature - Setting this feature affects the radio as a whole.

Channel Wide Feature - Setting this feature ONLY affects the channel being programmed. A Channel Wide Feature does not affect operation of the radio as a whole.

Basic Concepts - Call Types

Private Call - A call from an individual radio to another individual radio

Group Call - A call from an individual radio to a group of radios

All Call - A one-way call from an individual radio to every radio on the system. All Calls do not communicate across timeslots or frequencies within the system. All call is only used in a supervisory role where a supervisor needs to communicate with all users on a local system, rather than a particular group or individual.

Basic Concepts - Call ID

Private Call - range (1 - 16776415) This is the radio ID of the target radio. Every radio has a single Radio ID.

Group Call - range (1 - 16776415) This is the ID of the Group that the user wishes to subscribe to.

All Call - This has a fixed ID of 16777215 (ie. 0xFFFFFFFF) This value is not editable.

- Building a Codeplug, steps involved -

1. You must apply for a DMR ID. You will need to enter this ID into the “**General Settings**” section of your codeplug.
2. You must program a list of “**Contacts**” consisting of Talk Groups and Private Calls (other user ID’s) you want to connect to.
3. You must build a “**Channel**” list of repeaters, or simplex frequencies you are going to use including its transmit and receive frequency, Color Code, Time Slot, and Contact.
4. You must build a list of “**Zones**” or memory banks with sixteen (16) channels per Zone using the channels you just created.
5. You should program a group of “**Digital Receive Groups**” with the channels you have added to each **Zone**.
6. You will need to update each **channel** in a **Zone** with the **Digital Receive Group** you created for that **Zone**.

The Codeplug - Sections

- ▶ Basic Information
- ▶ General Setting
- ▶ Menu Item
- ▶ Buttons Definition
- ▶ Text Message
- ▶ Privacy Setting
- ▶ Digit Emergency System
- ▶ Digital Contacts
- ▶ Digital RX Group Lists
- ▶ Zone Information
- ▶ Scan List
- ▶ Channels Information
- ▶ DTMF Signaling (not currently supported)

Basic Information

- ▶ **Frequency Range** - Shows the working band of the radio. This parameter is set by the factory.
- ▶ **Last Programmed Date** - Shows the last time data was saved, or “written”, to the radio. The last time the radio was programmed.
- ▶ **Model Name** - Shows the Model Name of the radio.
- ▶ **Serial Number** - Shows the ESN (Electronic Serial Number) of the radio.
- ▶ **CPS Software Version** - Shows the CPS software version being used on the PC.
- ▶ **Hardware Version** - Shows the radio’s Hardware Version.
- ▶ **MCU Version** - Shows the radio’s MCU (Microprocessor Control Unit) software version.
- ▶ **Unique Device ID** - Shows the unique device ID of the MCU

General Setting

- ▶ **Radio Name** - Sets an alias for the radio. On some radios when the radio powers up this alias shows up as the welcome text if the welcome image is not used. The user may enter up to a maximum of 16 characters. Valid characters are alphanumerics, spaces and special characters. This is a radio-wide feature.
- ▶ **Radio ID** - Sets an individual ID that uniquely identifies the radio. This ID is used by other calling radios when addressing the radio, for instance, when making a private call or sending a text message. This is a radio-wide feature. ID Range: 1 - 16776415. **This is your assigned DMR ID.**

General Setting cont.

- ▶ **Monitor Type** - (Analog Mode Only) Sets the Monitor mode to either Open Squelch or Silent. The user can access the Monitor feature by assigning a short or long programmable button press. This is a radio-wide feature.

Open Squelch - Radio unmutes regardless of whether there is any channel activity. If no activity is present, noise is heard through the speaker.

Silent - Radio unmutes only if there is channel activity.

- ▶ **VOX Sensitivity** - VOX automatically transmits when the audio level is higher than the configured VOX Gain Level. Off:1 (low sensitivity) - 10 (high sensitivity)

General Setting cont.

- ▶ **TX Preamble Duration(ms)** - (Digital Mode Only) Preamble is a string of bits added in front of a data message or control message (Text Messaging, LocationMessaging, Registration, Radio Check, Private Call, etc...) before transmission. This preamble prolongs the message in order to reduce the chances of the message being missed by the receiving radio. The Transmit (TX) Preamble Duration sets the duration of the preamble. This duration needs to be increased as the number of scan members increases on the target radio. This value can be increased in all the transmitting radios if scanning radios are often missing data messages. However, a larger preamble occupies the channel longer. Therefore, increasing the Transmit Preamble duration will increase the success rate of data received while other radios are scanning, but will decrease the amount of data that can be transmitted on the channel. This is a radio-wide feature.

General Setting cont.

- ▶ **RX Low Battery Interval(s)** - The Receive (RX) Low Battery tone is an alert tone that sounds when the radio's low battery threshold is reached while a call is being received, or while the radio is in idle mode. The RX Low Battery Interval sets the interval for the generation of this tone. This is a radio-wide feature.
- ▶ **PC Programming Password** - Set the Programming password. If enabled, the right password will be required to be entered while reading from or writing to the radio.
- ▶ **Radio Program Password** - When set you will need to enter this password into the radio before you can access the radio menu items. "00000000" disables the feature. This is a radio-wide feature.
- ▶ **Back Light Time(s)** - Sets the default backlight duration time. This is a radio-wide feature.

General Setting cont.

- ▶ **Set Keypad Lock Time(s)** - Sets the time to wait before locking the keypad. This is a radio wide feature.
- ▶ **Disable All LEDS** - Turns off all LEDs during radio power up and while radio is in use. All LEDs are disabled including the backlight and power up LED, regardless of the backlight setting. This is a radio-wide feature.

General Setting - Save

- ▶ **Save Preamble** - This feature enables or disables the battery saver preamble. The radio sends a preamble before each transmission to enhance the ability of receiving radios in battery saver mode to synchronize in preparation for transmissions; reducing the occurrence of late-entry. It is recommended that all radios in a system share the same setting for this field. This is a radio-wide feature.
- ▶ **Save Mode Receive** - Enabling this feature causes an idle radio to automatically enter battery saver mode where it places certain radio functions on standby. After a certain duration or when there is any user button action, the radio returns to normal operation and checks the channel for incoming calls. If no calls are detected, it returns to battery saver mode.

General Setting - Save cont.

While results vary across battery chemistry and user conditions, battery saver can deliver about a 10% improvement in battery life, but will also cause a delay in response time. When this feature is enabled, it is important to note that for the transmitting radios, there will be a slight delay in call setup (in the range of milliseconds) when pressing the PTT button. For the receiving radios, there may be an increase in late entry due to radios in battery saver mode having less opportunity to synchronize. This may cause the radios to miss the initial second of some audio transmissions in poor RF conditions. This, however, will not be experienced in good RF coverage. Although they are important to note, these delays are considered minor versus the improved battery life, therefore it is recommended to enable battery saver mode for all radios. This is a radio-wide feature.

General Setting - Alert Tone

- ▶ **Disable All Tone** - Checking this box will disable ALL tones radio wide. Leave un-checked for tones.
- ▶ **CH Free Indication Tone** - This feature sounds an alert tone when a voice call ends. It also sounds when the voice call is interrupted on the current channel, for example, by interruptions caused by a third radio making an impolite call or sending an emergency alarm. However, this tone does not sound if the interruption is caused by a corrupted radio signal. Voice calls include Group Call, Private Call, All Call, and Emergency Call. A voice call ends when the user of the calling radio releases the Push-To-Talk (PTT) button, regardless of hang time. This feature alerts the receiving radio that the channel is available for him/her to respond producing a smoother flow of conversation.

General Setting - Alert Tone cont.

This alert tone does not sound at the end of a Remote Monitor transmission, or during Priority Scan when the voice call ends while the radio is sampling the priority channel(s). This is a radio-wide feature.

- ▶ **Talk Permit Tone** - This alert tone sounds after the PTT button is pressed and the radio is able to transmit on the channel. This is the prompt to begin speaking. This feature can be enabled for digital, analog, or both modes. This is a radio-wide feature.
- ▶ **Call Alert Tone Duration(s)** - Configures the call alert tone sound duration for the radio decoding of the digital/MDC/QCII selective call alert. This is a radio-wide feature. If the 'Continue' option is selected, the call alert tone will continuously sound until the user cancels the call alert indication.

General Setting - Scan

- ▶ **Scan Digital Hang Time(ms)** - sets the time the radio will remain on a scan list member following the end of the channel activity. The hang time prevents the radio from resuming scanning until the conclusion of the response to the initial call. The timer starts at the end of the transmission and resets whenever a valid activity is detected on the channel during the hang time.
- ▶ **Scan Analog Hang Time** - same as Scan Digital Hang Time above.

General Setting - Lone Worker

- ▶ **Lone Worker Response Time(min)** - This timer defines the time period after which the radio will sound Lone Worker alert. The Lone Worker must respond to this alert, by pressing any button, within the time period set for the Lone Worker Reminder Time, otherwise the radio will go into emergency operation. Once a button is pressed the timer is reset. This operating mode may be enabled/disabled by the user if a button has been programmed for Lone Worker, or on channel change. This timer can be set from 1 to 255 minutes in 1-minute steps.
- ▶ **Lone Worker Reminder Time(s)** - This timer is used to set the time period for which the Lone Worker alert will sound. After this period the radio will go into the emergency mode of operation. This timer can be set from 0 to 255 seconds in 1-second steps.

General Setting - Power On Password

- ▶ **Password and Lock Enable** - checking this box enables the Power On Password function.
- ▶ **Power On Password** - Enter a password to be used for power up. Up to 8 numeric characters are programmable.

General Setting - Talkaround

- ▶ **Group Call Hang Time(ms)** - Sets the duration the repeater reserves the channel after the end of a group call transmission. During this time, only members of the Group that the channel is reserved for can transmit. This produces smoother conversation. Maximum 7000 ms, Minimum 0 ms, Increment 500 ms.
- ▶ **Private Call Hang Time(ms)** - Sets the duration the repeater reserves the channel after the end of a private call transmission. During this time, only the individuals involved in the call that the channel is reserved for can transmit. This produces smoother conversation. The user may want to set a longer hang time than the Group Call Hang Time as an individual tends to take a longer time to reply (talkback) in a Private Call. Maximum 7000 ms, Minimum 0 ms, Increment 500 ms.

General Setting - Intro Screen

► **Intro Screen** - Allows you to pick the intro screen displayed when the radio is powered on. The choices are:

Picture: Shows a default picture when powered on.

Char String: Displays up to two lines of (text) characters defined by setting **Intro Screen Line 1** and **Intro Screen Line 2**. (up to 10 characters max on each line)

Menu Item

- ▶ **Menu Hang Time(s)** - Sets the amount of time that the radio remains in the menu mode, after which the radio reverts back to the Home screen. If the duration is set to “Hang”, the radio remains infinitely in this mode until the user exits the menu manually by pressing the back or home button. This is a radio-wide feature. Maximum 30 sec, Minimum 1 sec, Increment 1 sec.
- ▶ **Text Message** - Allows the user to access the text message feature via the menu. The user has the ability to check the Inbox, edit Messages, Send Messages or Quick Text.

Menu Item - Contacts

- ▶ **Call Alert** - Allows the user to initiate Call Alert via the menu. Call Alert allows the user to alert another user, requesting that they call back the user (call initiator) when they (recipient) become available. Call Alert can only be received when the channel is free.
- ▶ **Edit** - Allows the user to edit the alphanumeric characters on the edit screen. The user has the ability to add a new entry to the Contacts list or edit an entry within the Contacts list.
- ▶ **Manual Dial** - Allows the user to access the Manual Dial capability of the radio via the menu. Manual Dial allows the user to initiate a call (e.g. Private Call, Call Alert) or request (e.g. Remote Monitor, Radio Check, Radio Disable, Radio Enable) or send Text Messages by keying in the destination ID using the keypad.

Menu Item - Contacts

Manual dial may be used even if the destination ID is not listed in the Contacts.

- ▶ **Radio Check** - Allows the user to initiate a Radio Check request from the menu. Radio check allows a user/console operator to determine if a radio is active in a system without showing any indication to the radio's user.
- ▶ **Remote Monitor** - Allows the user to initiate a Remote Monitor request to the target radio via the menu. Upon a successful request, the target radio's microphone and transmitter will be activated to be remotely monitored.
- ▶ **Program Key** - Allows the user to enable or disable the Program Key menu in the radio. The Program Key feature allows the user to associate a call to the number buttons on the radio keypad (1-9 and 0).

Menu Item - Contacts

When the user long presses these buttons in the home screen, the associated call entry will be displayed. The supported call types are Group, Private, or All Call calls in Digital or Capacity Plus mode. This is a radio-wide feature.

- ▶ **Radio Enable** - Allows the user to initiate the Radio Enable command to the target radio via the menu. Radio Enable is used to enable a target radio that is disabled (inhibited).
- ▶ **Radio Disable** - Allows the user to initiate a Radio Disable command to the target radio via the menu. Upon a successful request, the target radio will disable all its user interfaces (e.g. all LED indicators including Backlight, alert tones, user inputs including PTT except for Volume/On/Off knob on Portable and Power On/Off

Menu Item - Contacts

button on Mobile), ignore Emergency alarms and received data to radio or external devices, mute received voice to radio or external device and disallow transmission of data or command from the radio or external device. This disables the radio if it is lost or stolen. However, the radio continues to monitor the air interface to enable it to receive the Radio Enable command.

Menu Item - Call Log

- ▶ **Missed** - Allows the user to track the last ten incoming private calls that the user missed or failed to respond to. The user accesses the call log via the menu. This log also provides a quick way for the user to initiate a private call.
- ▶ **Answered** - Allows the user to track the last ten incoming private calls that the user answered. The user accesses the call log via the menu. This log also provides a quick way for user to initiate a private call.
- ▶ **Outgoing Radio** - This feature allows the user to track the last private call and call alert numbers that the user initiated and provides easy redial access. The maximum stored number is ten for both type of calls combined. The user accesses the call log via the menu. This log also provides a quick way for the user to initiate a private call.

Menu Item - Utilities

- ▶ **Talkaround** - Allows the user to set the radio in Talkaround mode via the menu.
- ▶ **Tone or Alert** - Allows the user to toggle all the tones and alerts on or off via the menu.
- ▶ **Power** - Allows the user to adjust the radio's transmission power level via the menu.
- ▶ **Backlight** - When enabled this feature can be toggled via the radio menu.
- ▶ **Intro Screen** - Allows the user to switch the Introduction Screen between the picture screen and character screen upon radio power up, via the radio menu.

Menu Item - Utilities cont.

- ▶ **Keyboard Lock** - Allows the user to toggle the keypad lock on or off via the menu.
- ▶ **LED Indicator** - Allows the user to toggle the radio's LED indicator on or off via the menu.
- ▶ **Squelch** - Allows the user to access the Squelch feature to select between Normal or Tight Squelch via the menu.
- ▶ **Password and Lock** - Allows the user to enable or disable the Password Lock menu in the radio. When this feature is enabled, the user has the ability to toggle the Password and Lock feature between on and off, or update the Password through the radio menu. This is a radio-wide feature.

Menu Item - Utilities cont.

- ▶ **VOX** - Allows the user to toggle the VOX (Voice Activated Transmit) feature between on and off for the current channel via the menu. VOX enables the radio to automatically transmit whenever its microphone on the VOX-capable accessory detects voice. This is a channel-wide feature.
- ▶ **Display Mode** - Allows setting the display mode, either CH (channel name) or MR (?) frequency display from the keypad. This is a radio-wide feature.
- ▶ **Program Radio** - Allows programming the radio from the keypad. This is a radio-wide feature.

Menu Item - Scan

- ▶ **Scan** - Allows the user to toggle Scan on or off via the menu for the current conventional channel personality. Scan allows the radio to search the scan list that is attached to the current channel/personality for an eligible channel/personality to receive or unmute. (note: you need a Scan List to activate scanning)
- ▶ **Edit List** - Allows the user to edit the Scan List via the menu. The Edit List allows the user to perform certain actions on the scan list, e.g. view the scan list, change the scan member's priority level, add new scan members to the scan list or delete members from the scan list. Creating a new or deleting an existing scan list is not allowed on the radio.

Buttons Definitions

- ▶ **Long Press Duration(ms)** - Sets the duration a button is required to be pressed (and held down), for it to be interpreted as a long press. This duration also controls the long press operation of the button assigned to the Emergency feature. This is a radio-wide feature.

Buttons Definitions - Radio Buttons

You can use this section to assign various functions to the two programmable buttons on the side of the radio. Button 1 is above the PTT switch and Button 2 is below the PTT switch. You can also assign two functions to each button. One function is activated by a short button press and the other is activated by a long button press, the duration being set by the previously explained **Long Press Duration** option.

Buttons Definitions - One Touch Access

- ▶ There are 6 rows that can be used to configure one touch access. Each row contains the parameters for a one touch access. Each row can then be assigned to a short or long programmable button press (One touch Access).

Buttons Definitions - Number Key Quick Contact Access

- ▶ This column represents the keys from "0" to "9" on the numeric keypad. Using these fields you can associate a contact with a numeric keypad button for quick access.

Text Message

- ▶ A user may enter up to 144 characters. Valid characters are alphanumerics, spaces and special characters. The user can then access those text messages by using the Quick Text option via the Text Message Menu feature.

Digital Emergency System

Associates any available digital emergency system to this channel for use during an emergency. Selecting the None option disables the user from transmitting an emergency call from this channel. This is a channel-wide feature.

- ▶ **Remote Monitor Duration** - Sets the duration that the target radio can be remotely monitored. This is a radio-wide feature.
- ▶ **Tx Sync Wakeup TOT(ms)** - (Digital Mode Only) This feature adjusts the value of the timer that begins immediately after a message is sent to wake up the repeater. The timer is stopped when the radio receives a repeater sync signal. If the timer expires before receiving a repeater sync signal, the radio sends another message to wake up the repeater.

Digital Emergency System cont.

The number of messages is determined by the TX Wakeup Message Limit, after which the repeater is assumed to be out of range. This is a radio-wide feature.

- ▶ **Tx Wakeup Message Limit** - (Digital Mode Only) This feature sets the number of messages sent to wake up the repeater. Setting a higher number improves the success rate of waking up the repeater. This is a radio-wide feature.
- ▶ **Radio Disable Decode** - Allows the radio to receive and process a Radio Disable command sent from another radio to remotely disable it. This feature helps to block usage of stolen or lost radios. This is a radio-wide feature.

Digital Emergency System cont.

- ▶ **Remote Monitor Decode** - (Digital Mode Only) Allows the radio to receive and process Remote Monitor command sent from another radio. This command instructs the receiving radio to activate its microphone and transmitter for the duration specified in Remote Monitor Duration. A call is silently set up on this radio and its transmission controlled remotely without any indication given to the receiving radio user. This is a radio-wide feature.

Digital Emergency System cont.

- ▶ **Emergency Remote Monitor Decode - (Digital Mode Only)**
After an emergency alarm is initiated, this feature allows the radio to receive and process Remote Monitor commands sent from another radio for the duration specified in Remote Monitor Duration. This is an exceptional case of Remote Monitor Decode whereby the radio is able to decode Remote Monitor command even if the Remote Monitor Decode feature is disabled but only for the duration as specified in Remote Monitor Duration. This is a radio-wide feature.

Digital Emergency System - Emergency System cont.

- ▶ **System Name** - This displays the name of the system.
- ▶ **Alarm Type** - Specifies the behavior of the radio's alarm when the emergency button is pressed.

Regular - The radio transmits an alarm signal and provides audio and visual indication that it is in Emergency mode.

Silent - The radio transmits an alarm signal but gives no audio or visual indication that it is in Emergency mode. In addition, it will not unmute to any received audio.

Silent w/Voice - The radio transmits an alarm signal but gives no audio or visual indication that it is in Emergency mode. The radio then unmutes to qualified channel activity.

Digital Emergency System - Emergency System cont.

- ▶ **Alarm Mode** - Specifies the behavior of the radio's alarm when the emergency button is pressed. This is a personality-wide feature.

Alarm Only - The radio sends an emergency alarm and exits the emergency mode. This alarm is a non-voice signal that triggers an alert indication on another radio.

Call Only - Once the "Emergency" button is pressed, no emergency alarm is sent but the user can make an emergency call by pressing the Push-To-Talk (PTT) button.

Alarm w/Call - Once the "Emergency" button is pressed, an emergency alarm is sent, after which an emergency call can be transmitted by pressing the Push-To-Talk (PTT) button.

Digital Emergency System - Emergency System cont.

- ▶ **Revert Channel** - This is the channel used for digital emergency alarm or voice. Any single site digital channel may be set as the Revert Channel, including the channel indicated by the radio's channel selector.
- ▶ **Impolite Retries** - An impolite transmission is a transmission that occurs even when there is activity on the current channel. The radio tries a number of impolite transmissions to get an acknowledgement and then goes on to try a number of polite transmissions. This feature sets the number of attempts to transmit an emergency alarm impolitely.

Digital Emergency System - Emergency System cont.

- ▶ **Polite Retries** - A polite transmission is a transmission that occurs only when the current channel is free of activity. The radio tries a number of impolite transmissions to get an acknowledgement before trying a number of polite transmissions. This feature sets the number of attempts to transmit an emergency alarm politely.
- ▶ **Hot Mic** - When enabled, enabled the Emergency With Voice to Follow (Emergency Hot Mic) feature. The Hot Mic feature allows for the programming of the Hot Mic related features, i.e. Hot Mic Duration. An emergency alarm is sent and the microphone is activated for an emergency call. Voice is transmitted without the need to press the Push-To-Talk (PTT) button. This is a personality-wide feature.

Digital Contacts

- ▶ **Contact Name** - Text field to describe the contact. Can be any text and will be used when programming the channels.
- ▶ **Call Type** - Lists the types of calls available to the radio user.

Group Call - A call from an individual radio to a group of radios.

Private Call - A call from an individual radio to another individual radio.

All Call - A one-way call from an individual radio to every radio on that system. All Calls do not communicate across different timeslots or frequencies within the system. The ability to initiate an All Call is only programmed into radios that are used in supervisory roles.

Digital Contacts cont.

All other radios monitor All Call transmissions by default. This feature is very useful when a supervisor needs to communicate with all the users on a logical system, rather than just a particular group or individual.

► **Call ID** - Sets an ID for a digital call member. This ID is used to identify and communicate with a target radio or group of radios (talk groups).

Group Call - This is the ID of the Group that the user wishes to subscribe to. range (1 - 16776415)

Private Call - This is the Radio ID of the target radio. range (1 - 16776415)

All Call - This has a fixed ID of 16777215 (this value is not editable).

Digital Contacts cont.

- ▶ **Call Receive Tone** - This alert tone sounds on the receiving radio prior to unmuting during a Private Call, Group Call, or All System Call. This is to notify the user that the radio is unmuting. This feature is set on a per-call basis.

Digital RX Group Lists

- ▶ **Group List Name** - Configures the RX Group List alias.
- ▶ **Available Contact** - Displays all available Digital Groups that can be added to the RX Group's Members list.
- ▶ **Contact Member** - Lists all Digital Groups which the radio is a member of (or subscribed to) on channels which the list is attached to. When the channel selected has this list attached, if the radio receives a group call that is addressed to any one of its subscribed groups, the radio will participate in that group call (i.e. it will unmute for incoming transmissions and talkback when the PTT is pressed).

Zone Information

- ▶ **Zone Name** - Configures the Zone alias.
- ▶ **Available Channel** - Displays all available Channels that can be added to the Zone.
- ▶ **Channel Member** - Lists all Channels which were added to the Zone. The Max channel number of a Zone is 16.

Scan List

- ▶ **Scan List Name** - Configures the Scan List alias.
- ▶ **Available Channel** - Displays all available Channels that can be added to the Scan List.
- ▶ **Channel Member** - Lists all Channels which were added to the Scan List. The Max channel number of a Scan List is 32.
- ▶ **Priority Channel 1** - Sets the Priority Channel 1 from the Scan List Channel Member. During scan, 50% of a radio's scans are on the Priority 1 member. If a Priority 2 member exists, scans for the Priority 1 member are reduced from 50% to 25%. Even after landing on a non-priority or Priority 2 member, the radio continues to periodically scan for transmission activity on a Priority 1 member. If the radio discovers activity on the Priority 1 member, it drops the current transmission, and unmutes to the Priority 1 member.

Scan List cont.

- **Priority Channel 2** - Sets the Priority Channel 2 from the Scan List Channel Member. During scan, 25% of a radio's scans are on the Priority 2 member. If a Priority 2 member exists, scans for the Priority 1 member are reduced from 50% to 25%. Even after landing on a non-priority channel, the radio continues to periodically scan for transmission activity on a Priority 2 member. If the radio discovers activity on the Priority 2 member, it drops the current transmission, and unmutes to the Priority 2 member. Activity on a Priority 2 member will be dropped in the event of any valid activity on a Priority 1 member.

Scan List cont.

- ▶ **Tx Designated Channel** - This feature defines the conventional channel/personality on which the radio will transmit if the user presses the Push-to-Talk (PTT) button while the radio is scanning. This paragraph is applicable to Conventional radios. If the Talkback option is disabled, this feature also defines the channel/personality where the radio will transmit if the user presses the PTT when the radio has stopped scanning to unmute to an eligible scan list member. Any channel can be selected as the TX Designated Channel. Alternatively, Selected or Last Active Channel may be chosen. This feature is disabled if the Talkback feature is enabled. When enabled, any scan member or Selected may be chosen as the TX Designated Channel in Conventional scanning (Conventional mode).

Scan List cont.

Selected - The channel indicated by the channel selector.

Channel1 - The “primary” priority channel.

Last Active Channel - The last channel where the radio in scan mode stopped and unmuted to receive audio.

- **Signaling Hold Time(ms)** - Sets the amount of time that the radio waits on an analog scan list channel when a carrier signal of sufficient amplitude is detected on the channel. This pause allows the radio time to decode the analog system signaling data. If the decoded information is incorrect, the radio reverts to scan.

Scan List cont.

- ▶ **Priority Sample Time(ms)** - Sets the duration that the radio waits, when in a call, before scanning the priority channels. If the call is taking place on a Priority 1 Channel, no scanning will take place. When scanning priority channels, the radio briefly mutes the current transmission. Increasing this interval improves the audio quality of the current transmission as fewer checks are done, but this also increases the chance of the radio missing priority channel activity.

Channel Information - Digital/Analog Data

- ▶ **Channel Mode** - Configures the channel working in either digital or analog mode.
- ▶ **Band Width** - Configures the analog channel spacing, digital channel default to 12.5KHz
- ▶ **Scan List** - Associates a Scan List to this conventional channel. All the members on this list will be scanned during a scan operation. Any available Scan List can be selected. Selecting the None option disables scanning (including Auto Scan) on this channel. This is a channel-wide feature.
- ▶ **Squelch** - Configures the analog channel tight or normal squelch (applicable to Analog mode only).

Channel Information - Digital/Analog

Data cont.

- ▶ **RX Ref Frequency** - Configures the PLL Reference Frequency to use in receiving mode
- ▶ **TX Ref Frequency** - Configures the PLL Reference Frequency to use in transmission mode
- ▶ **TOT(s)** - The Time-Out Timer (TOT) is the duration that the radio can continuously transmit before a transmission is automatically terminated. This feature is used to ensure the channel is not monopolized by any one radio. The user may set smaller time-outs for busier channels. This is a channel-wide feature.
- ▶ **TOT Rekey Delay(s)** - Sets the amount of time that the radio waits on a channel after the Time-Out Timer (TOT) expires (which stops the radio transmission) before allowing the user to transmit again. This is a channel-wide feature.

Channel Information - Digital/Analog

Data cont.

- ▶ **Power** - Sets the radio's transmission power level for this channel. This feature can be toggled between high or low, via a short or long programmable button press (High/Low Power) or Power (Utilities Menu) feature. This is a channel-wide feature.
- ▶ **Channel Name** - Configures the Channel alias
- ▶ **RX Frequency(MHz)** - Sets a frequency (in MHz) on which the signal is received for the current channel. This is a channel-wide feature.
- ▶ **TX Frequency(MHz)** - Sets a frequency (in MHz) on which a signal is transmitted for the current channel. This is a channel-wide feature.

Channel Information - Digital/Analog

Data cont.

- ▶ **Admit Criteria** - Determines when voice or data is allowed to be transmitted on the channel. This is used to prevent a radio from transmitting on channels that are already being used. If the radio has different transmit and receive frequencies, only the receive frequency is monitored for activity. If no activity is found on the receive frequency, the radio allows the user to transmit on the transmit frequency even if it is being used. This is a channel-wide feature.

Always - The radio will always transmit when the Push-to-Talk (PTT) button is pressed. This option is also referred to as "Impolite" channel access.

Channel Information - Digital/Analog

Data cont.

Channel Free - The radio will check for an idle channel prior to allowing a transmission. This option is also referred to as "Polite to All" channel access.

Color Code - The radio will check if the specified Color Code is not in use prior to allowing transmission. This option is also referred to as "Polite to Own Digital System" channel access (for Digital channels only).

- ▶ **Auto Scan** - Allows the radio to automatically begin scanning when the user selects the current conventional channel. When disabled, the user is still able to invoke the scan operation, via a short or long programmable button press (Scan On/Off) or Scan (Scan Menu) feature. This is a channel-wide feature.

Channel Information - Digital/Analog

Data cont.

- ▶ **Rx Only** - When enabled, the base radio/repeater becomes a receiver only system. All the transmit parameters in all the channels are disabled.
- ▶ **Lone Worker** - This feature enables the Lone Worker feature on a selected channel. When disabled, the user is still able to invoke the lone worker operation, via a short or long programmable button press (Lone Worker On/Off). This is a channel-wide feature.
- ▶ **VOX** - This feature enables the VOX (Voice Operated Transmit) feature on a selected channel. VOX provides a convenient means of hands-free voice activated communication, removing the need to press the Push-to-Talk (PTT) button.

Channel Information - Digital/Analog

Data cont.

This feature enables the radio to automatically assume the Push-to-Talk (PTT) button is pressed whenever its microphone on the VOX-capable accessory detects voice.

To avoid truncation at the beginning of the VOX call, Talk Permit tone (TPT) should be disabled. If TPT is enabled, the radio user shall use a trigger word to key-up the radio. This trigger word will not, in most cases, be transmitted. After uttering the trigger word, the radio user should begin speaking only after the TPT is heard. Channels may have their VOX feature toggled on/off via a short or long programmable button press (VOX On/Off) or VOX (Utilities Menu). This is a radio-wide feature.

Channel Information - Digital/Analog

Data cont.

- ▶ **Allow Talkaround** - Ensures that the Receive parameters are used in place of the Transmit parameters when transmitting. This feature enables communication between radios in close proximity without the use of a repeater, and is, therefore, particularly useful when the radios are in close proximity and the repeater is out of range. This feature can be toggled between Repeater or Talkaround mode, via a short or long programmable button press (Repeater/Talkaround) or Talkaround (Utilities Menu) feature. This is a channel-wide feature.

Channel Information - Digital Data

- ▶ **Private Call Confirmed** - This feature sets Private Individual calls on the current digital channel as confirmed. By default, Private Individual calls are unconfirmed. This is a channel-wide feature.
- ▶ **Emergency Alarm Ack** - Determines if the radio is allowed to acknowledge an emergency alarm. This is a channel-wide feature.
- ▶ **Data Call Confirmed** - This feature enables individual packets in data calls (GPS, and Text Message) on the current digital channel or personality to be confirmed (i.e. acknowledged) on the current digital channel to be confirmed on the Data Link level. The transmitting radio resends data packets in the data call if the receiving radio does not respond with Data Link level acknowledgements or confirmations upon receiving the data packets.

Channel Information - Digital Data

By default, data calls are unconfirmed. This is a channel-wide feature.

- ▶ **Compressed UDP Data Header** - Sends the UDP data header in compressed format
- ▶ **Emergency System** - Associates any available digital emergency system to this channel for use during an emergency. Selecting the None option disables the user from transmitting an emergency call from this channel. This is a channel-wide feature.

Channel Information - Digital Data cont.

- ▶ **Contact Name** - Defines the call that may be initiated on the channel by pressing the Push-to-Talk (PTT) button. However, if the channel is attached to a Group List with multiple Groups and there is an activity on one of the Groups, pressing PTT will initiate a talkback instead of a new call if it is within the hang time of the prior call. Selecting the None option prevents a call from being initiated on the channel. This is a channel-wide feature.

Channel Information - Digital Data cont.

- ▶ **Group List** - Associates any available RX Group list to the channel for reception. The user can listen to any Group in this list when there is any activity on it and talk back within the Group Call hang time. This is also known as a Group Scan. Selecting the None option disables the user from receiving any Group Calls on this channel, except when the **Call ID** is the same as the **Call ID** of the transmit member. The **Call ID** from the **Contact Name** is automatically added to the RX Group List on this channel by default. This allows the user to receive this call, even though this feature is set to None. This is a channel-wide feature.

Channel Information - Digital Data cont.

- ▶ **Color Code** - This feature allows a color code to be assigned to a given channel. Channels may have the same or different color codes. A repeater can only have one color code. A color code is used to identify a system. Different color codes are used to identify different systems. This feature enables a radio to roam between multiple systems by switching between channels with different color codes. The radio will be able to scan across channels with different color codes. Radios will ignore any channel activity not containing the matching color code for that system. Repeaters using the same frequency may be associated with different color codes. On shared channels, spectrum regulators may wish to assign different color codes to different licenses as part of their license agreement. This is a channel-wide feature.

Channel Information - Digital Data cont.

- ▶ **Repeater Slot** - DMR utilizes digital Time Division Multiple Access (TDMA) technology to divide a 12.5kHz channel into two alternating time slots, with each carrying an individual call when operating in Repeater mode. As a result, both the assigned frequency and the assigned time slot must be specified in order to completely describe a digital repeater channel. Radios or Groups that need to talk together must be assigned to the same frequency and time slot. This is a channel-wide feature.

Channel Information - Digital Data cont.

- ▶ **Privacy** - This feature allows privacy on selected digital channels. Privacy is a software-based scrambling solution that is not robust, and is only meant to prevent eavesdropping. The signaling and user identification portions of a transmission are not scrambled. Receiving radio(s) must have the same Basic Privacy Key (for Basic Privacy) or the same Key Value and Key ID (for Enhanced Privacy) as the transmitting radio in order to unscramble the privacy-enabled voice call or to receive the privacy-enabled data transmission.
- ▶ **Privacy No.** - Configures the Basic Privacy number to use.

Channel Information - Analog Data

- ▶ CTCSS/DCS Dec
- ▶ CTCSS/DCS Enc
- ▶ QT Reverse
- ▶ Tx Signaling System
- ▶ Rx Signaling System
- ▶ Reverse Burst/Turn-off Code
- ▶ Display PTT ID
- ▶ Decode 1 - Decode 8

Programming Lab

In this lab we are going to program a new repeater and two Talk Groups (channels) on that repeater into our codeplug.

Here is the information that we have found, on the web, for the repeater and talk groups that we want to add to our codeplug:

Input Frequency: 446.500

Output Frequency 446.500

Color Code: 1

Talk Group Name: ARES1 Talk Group ID: 1234567

Talk Group Name: ARES2 Talk Group ID: 1234568

both Talk Groups are on Time Slot: 1

Programming Lab

Step #1

DMR ID - Click on the **General Setting** option to open the General Setting window. Check to verify that you have set your DMR ID in the General Setting section of the codeplug in the **Radio ID** box. Close the window to exit and save the changes.

(You can also use the menu items and select “Edit” and then any item you wish to change)

Programming Lab

Step #2

You must program a list of “**Contacts**” consisting of Talk Groups and Private Calls (other user ID’s) you want to connect to.

In the **Digital Contacts** section we will need to add two new contacts with the following information:

Contact Name: “ARES1” and “ARES2”

Call Type: Group Call

Call ID: 1234567 for ARES1 and 1234568 for ARES2

Programming Lab

Step #2 cont.

1. Click on **Digital Contacts** to open the Digital Contacts window. (from the menu use Edit -> Digital Contact)
2. Click on the “Add” button and at the very bottom of the list you will see a new contact created called “Contact1”, click on the “Add” button again and you will see a second new contact added below Contact1 called “Contact2”
3. Click on the box with “Contact1” in it to allow you to rename it. In the box type “ARES1”

Programming Lab

Step #2 cont.

4. The Call Type defaults to Group Call so we don't need to modify this field. If we were entering another operators information then this field would be changed to "Private Call"
5. Click on the next box, Call ID, to allow you to modify it and enter the Talk Group ID for "ARES1" (1234567)
6. Click on the box with "Contact2" in it to allow you to rename it. In the box type "ARES2"
7. Again, the Call Type defaults to Group Call so we don't need to modify this field.

Programming Lab

Step #2 cont.

8. Click on the next box, Call ID, to allow you to modify it and enter the Talk Group ID for “ARES2” (1234568)
9. Close the window to exit and save the changes.

Programming Lab

Step #3

You must build a **Channel** list of repeaters, or simplex frequencies you are going to use including its Transmit and Receive frequency, Color Code, Time Slot, and Contact.

In the **Channels Information** section:

1. Add a new channel, either right click on **Channels Information** and select Add or open an existing channel (from the menu use Edit → Channel Information) and click on the “Add” button. You will create a new Channel called “Channel 1” in the channel list.
2. At the bottom of the channel list you will find the newly created channel called “Channel1”.

Programming Lab

Step #3 cont.

3. Click “Add” again to add an additional channel. The newly created channel will be created at the end of the list under Channel1 and will be called “Channel2”
4. Click on “Channel1” to open its configuration window.
5. Change the **Channel Name** to ARES1
6. Set the **RX and TX Frequencies** (446.500), we are using simplex for this demonstration.
7. Set the **Admit Criteria** to “Always” (*NOTE: this is ONLY because we are setting up for simplex, NEVER set the Admit Criteria to “Always” for repeater use).

Programming Lab

Step #3 cont.

8. Set the **Contact Name** to the first new contact that we just created. ARES1
9. Set the **Color Code** to 1
10. Set the **Repeater Slot** to 1
11. Close the window to exit and save your changes.

Repeat the steps in Step #3 for “Channel2” but this time set the **Channel Name** to ARES2 and the **Contact Name** to the second new contact that we just created. ARES2

Programming Lab

Step #3 cont.

1. Click on “Channel2” to open its configuration window.
2. Change the **Channel Name** to ARES2
3. Set the **RX and TX frequencies** (446.500), we are using simplex for this demonstration.
4. Set the **Admit Criteria** to “Always” (*NOTE: this is ONLY because we are setting up for simplex, NEVER set the Admit Criteria to “Always” for repeater use).
5. Set the **Contact Name** to the second new contact that we just created. ARES2

Programming Lab

Step #3 cont.

4. Set the **Color Code** to 1
5. Set the **Repeater Slot** to 1
6. Close the window to exit and save your changes.

Programming Lab

Step #4

You must build a list of “**Zones**” or memory banks with sixteen (16) channels per Zone using the channels you just created.

In the **Zone Information** section:

1. Add a new zone, either right click on **Zone Information** and select Add or open an existing zone (from the menu use Edit → Zone Information) and click on the “Add” button. You will create a new Zone called “Zone1” in the zone list.
2. At the bottom of the zone list you will find the newly created zone called “Zone1”.

Programming Lab

Step #4 cont.

3. Click on “Zone1” to open its configuration window.
4. Scroll down the **Available Channel** list to find the two new channels you just created. They should be at the bottom of the list.
5. Highlight the first new channel (ARES1) in the list and click on the “Add” button to move that channel over to the **Channel Member** box.
6. Do the same for the second new channel (ARES2).
7. Both channels, ARES1 and ARES2 should now be shown in the **Channel Member** box and no longer appear in the **Available Channel** box.
8. Change the **Zone Name** from Zone1 to ARES.

Programming Lab

Step #4 cont.

9. Close the window to exit and save your changes.

Programming Lab

At this point we are done with the basic programming of two channels in a zone. We could now use this codeplug if we wrote it to the radio. All we would need to do is select the zone called ARES from the Zone option of the radio's menu and there would be two channels available. Channel 1 would be called ARES1 and would use the ARES1 Talk Group and channel 2 would be called ARES2 and would use the ARES2 Talk Group.

However it would be nice to be able to monitor both talk groups for activity no matter which channel our radio is set to and to do that we need to create one more item and add it.

Programming Lab

Step #5

You should program a group of “**Digital Receive Groups**” with the channels you have added to each **Zone**.

In the **Digital RX Group Lists** section:

1. Add a new group list, either right click on **Digital RX Group Lists** (from the menu use Edit → Digital RX Group Call) and select Add or open an existing group list and click on the “Add” button. You will create a new Group List called “GroupList1” in the group list.
2. At the bottom of the group list you will find the newly created group list called “GroupList1”.

Programming Lab

Step #5 cont.

3. Click on “GroupList1” to open its configuration window.
4. Scroll down the **Available Contact** list to find the two new channels you just created. They should be at the bottom of the list.
5. Highlight the first new channel (ARES1) in the list and click on the “Add” button to move that channel over to the **Contact Member** box.
6. Do the same for the second new channel (ARES2).

Programming Lab

Step #5 cont.

7. Both channels, ARES1 and ARES2 should now be shown in the **Channel Member** box and no longer appear in the **Available Channel** box.
8. Change the **Group List Name** from GroupList1 to ARESZ.
9. Close the window to exit and save your changes.

Now we need to add the Group List we just created back to the Channel Information.

1. Go back to the Channels Information section.
2. Click on the Channel named ARES1 to open its configuration screen.

Programming Lab

Step #5 cont.

3. In the **Group List** box use the dropdown to find the new Digital RX Group we just created (ARES2). It should be at the bottom of the list. Click on the Group List name to add it to the **Group List** box.
4. Close the window to exit and save your changes.
5. Follow the same process for the channel named ARES2.
6. Click on the Channel named ARES2 to open its configuration screen.
7. In the **Group List** box use the dropdown to find the new Digital RX Group we just created (ARES2). It should be at the bottom of the list. Click on the Group List name to add it to the **Group List** box.
8. Close the window to exit and save your changes.

Programming Lab

The codeplug changes are now complete. You can save the codeplug and/or write the new codeplug to your radio.

You should now be able to hear traffic on either talk group in the ARES zone no matter which channel you are on and transmit on either talk group depending on which channel you have selected.

Scan Lists

_____	_____
_____	_____
_____	_____
_____	_____

Scan Lists cont.

5. Highlight a channel in the **Available Channel** list and click on the “Add” button to move that channel over to the **Channel Member** box.
6. Do the same for additional channels that you would like added to the scan list.
7. All channels added should now be shown in the **Channel Member** box.
8. Change the **Scan List Name** from ScanList1 to ARESSC.
9. Close the window to exit and save your changes.
10. Now you need to add the scan list to an available channel.

Scan Lists cont.

11. Go back to the Channels Information section.
12. Click on the Channel you would like to use with your scan list to open its configuration screen.
13. In the **Scan List** box use the dropdown to find the new Scan List we just created (ARESSC). It should be at the bottom of the list. Click on the Scan List name to add it to the **Scan List** box.
14. Close the window to exit and save your changes.

Now whenever you are on that channel and activate the scan function the radio will use the scan list associated with that channel.