

Creating your first AT-D878UV Codeplug

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This document will walk you through the steps involved in configuring an Anytone AT-D878UV radio for use on a nearby repeater. Although this article focuses on repeaters, the process for DMR hotspots is similar. The radio has many features that are also beyond the scope of this article. The goal of this document is to cover the basics needed to get on the air. It does not attempt to cover every possible way to configure the radio (one of which, for example, is to create two channels for every DMR repeater and then manually enter desired talkgroups on the radio).

Obtain the correct programming cable

You'll need a cable to send data from your computer to the radio. The cable should have a "Kenwood-style," two-pin, speaker mic connector on one end and a USB connector on the other. Note that cables built for the ubiquitous, Baofeng UV-5R FM radio and its kin will not work, even though they have the same connectors. The UV-5R cable contains a chip that converts serial signals to USB signals. The AT-D878UV does the conversion in the radio, so its cable doesn't have a conversion chip. Make sure you have the correct cable at hand. If your radio did not come with a cable, you'll need to order one separately.



Figure 1. AT-D878UV programming cable, which I labeled to distinguish it from other cables.

Install the customer programming software

To program the radio, you must use the customer programming software (CPS) provided by the manufacturer. You will likely need to download the software from a vendor's website and then install it as you would any other software. Anyone has published many versions of the CPS. It is important to obtain the CPS whose version number matches the version of firmware that's currently in your radio. If you're uncertain, use the radio's menu to go to "Settings" and then "Device Info" and then scroll down as necessary until the firmware version number is displayed. The popular radio programming software, CHIRP is not appropriate for this radio.

The file that the CPS creates is called a *codeplug*.

DMR Use

The section immediately below covers DMR repeaters. A section on FM (analog) repeaters follows it.

Obtain a DMR ID

Every radio amateur who wishes to use a DMR radio must first obtain a unique, numerical ID from radioid.net. If you have not already done so, apply for a DMR ID. You may proceed with other parts of codeplug writing while awaiting your DMR ID assignment. After you receive your ID, enter it into the CPS. In the tree view on the left side of the CPS, expand the "Digital" section (if it isn't already expanded) by clicking the "+" sign and then click "Radio ID List." A table will open. Double-click the first row of the table and a "Radio ID Edit" dialog box will open. Enter your numeric, DMR ID in the "Radio ID" field. In the "Radio ID Name" field, enter your call sign and your first name, e.g., "W9LW Jay".

Obtain repeater information

It is essential to gather certain information about the DMR repeater you intend to use, including:

- Transmitter and receiver frequencies
- Color code, which, despite its name, is a *numerical code* ranging from 1 to 15.
- A list of supported *talkgroups*, including the *time slot* assigned to each.

About talkgroups

DMR networks are divided into talkgroups. You can think of each talkgroup as a virtual channel. Users select different talkgroups, based on with whom they wish to communicate. Some talkgroups are devoted to geographic areas. Others are devoted to topics or purposes. Each talkgroup has a name and a numerical ID. For example, 3118 is the numerical ID for the Indiana statewide calling talkgroup, devoted to establishing communications with users anywhere in Indiana, USA.

It is important to understand that not every DMR repeater supports the same set of talkgroups. In addition, not every talkgroup with the same name has the same numerical ID, depending on the network to which a repeater is connected. For example, on the [Brandmeister network](#), talkgroup 91 is the worldwide talkgroup, but other repeater networks use numerical ID 1 for their worldwide talkgroup.

Causing further confusion is the fact that sometimes talkgroups are cross linked across networks and sometimes they are not. For example, a statewide talkgroup for a U.S. state on the Brandmeister network might have the same numerical ID as the same state's statewide talkgroup on another network,

with no connection between the two. Another state's statewide talkgroup, however, might be interconnected between the same two networks, depending on local decisions.

It is therefore imperative to learn exactly what networks and talkgroups — including their numerical IDs — the repeater you wish to use supports. Some repeater owners put such information in online repeater directories, such as RepeaterBook.com and php.rfinder.net/websearch.html. Unfortunately, those directories often contain out-of-date or otherwise incorrect information. A more reliable source, therefore, is often a repeater owner's own web page, which can sometimes be found via web searches. In some cases, it is necessary to contact a repeater owner directly (e.g. by looking up their call sign on qrz.com) to obtain current network, talkgroup and the time slot information.

Brandmeister repeaters are a special case

When a repeater is part of the Brandmeister network, that repeater automatically supports *every talkgroup that the Brandmeister network carries*. You are not limited to talkgroups listed by the repeater owner. In fact, knowing that you can use any Brandmeister talkgroup, some Brandmeister repeater owners don't even provide lists of supported talkgroups. You can find a searchable list of Brandmeister talkgroups on the Brandmeister website at <https://brandmeister.network/?page=talkgroups>. Also, Brandmeister repeaters allow you to use any talkgroup on any time slot. Repeater owners, however, might have time slot preferences that you should learn and follow. For example, an owner might prefer that time slot 2 be reserved for local and regional talkgroups and that all wider-area talkgroups (e.g. Worldwide) use timeslot 1.

If you plan to use a DMR hotspot, it is up to you to know to what network your hotspot is connected and what talkgroups that network offers.

Static vs. Dynamic talkgroups

When gathering repeater information, it is also helpful to know which talkgroups are configured as *static* on that repeater and which are *dynamic*. Static talkgroups are always on. A repeater will transmit any traffic on a static talkgroup without action by users. Just set your radio to the correct channel and you'll hear the traffic. Dynamic talkgroups are available on a repeater but the repeater will not transmit traffic from a dynamic talkgroup unless a local repeater user has recently activated it. Users activate dynamic talkgroups by transmitting briefly on ("kerchunking") them. If no local user has activated a dynamic talkgroup recently, the repeater will not transmit that talkgroup's traffic. The definition of "recently" varies, depending on repeater owner and network preferences. Typically, a repeater shuts off a dynamic talkgroup 15 minutes after the last time a local user transmitted on it. That timer can, however, be considerably shorter.

Add talkgroups to your codeplug

When you have a list of talkgroups supported by your local repeater, add them to the list of talkgroups in your codeplug.

In the tree view on the left side of the CPS, under "Digital," click "Contact/Talk Groups" ("contact" is misspelled in version 1.21 of the CPS). A table will appear. Double click on the first row. A "Talk Group Edit" dialog box will appear (see figure 2, below). Put the talkgroup name (e.g., "Worldwide") in the

Name field. Assure that the “Call Type” field is set to “Group Call.” Put the talkgroup number (e.g. 1 or 91) in the “TG/DMR ID” field.

As a personal preference, I include the talkgroup number in the name field, even though I must also put the number in the TG/DMR ID field. This is because different networks use different numbers with the same names. So, for example, I created a digital contact named “Worldwide 1” for the Worldwide talkgroup on the DMR-MARC network and another digital contact named, “Worldwide 91” for the Worldwide talkgroup on the Brandmeister network, because I intend to use different repeaters, of which some are on Brandmeister and some are on DMR-MARC.

Repeat the above process for each talkgroup supported by your local repeater.

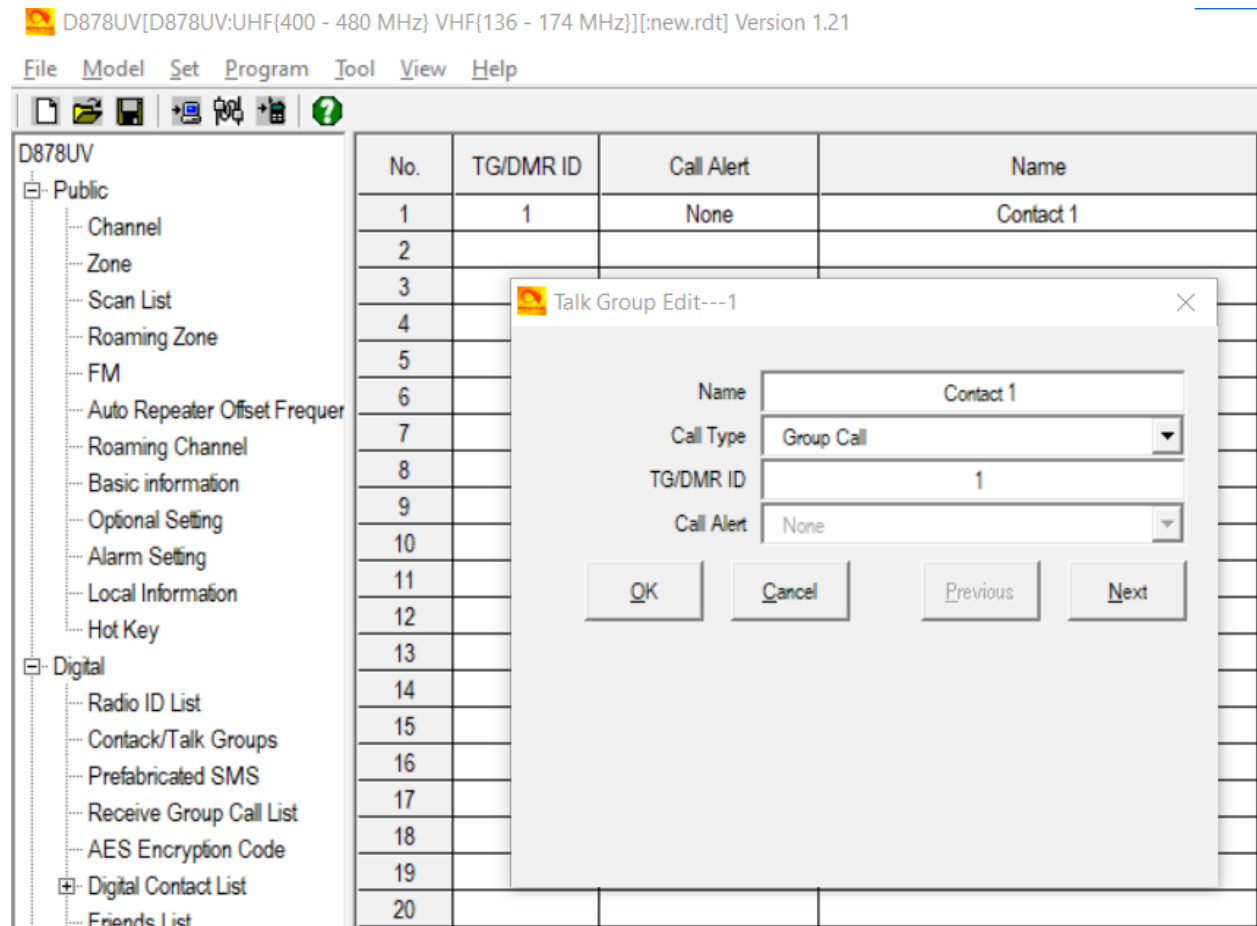


Figure 2. Adding a group call (talkgroup) to the talkgroup list

Parrot or echo – a special digital contact

Most repeaters support a service that echoes whatever you transmit. Some people refer to this as the “parrot” or “echo” service. This helps you know whether you are within range of the repeater and how well the repeater hears your signal. There are different parrots, depending on to what network your local repeater is connected.

For repeaters on the **Brandmeister** network, the parrot is a *private call* to ID 9990. In this case, the “Call Type” must be set to “Private Call” and the TG/DMR ID must be set to “9990.” I name this entry “BM Parrot” in my codeplug.

For repeaters on other networks (DMR-MARC, etc.) the parrot is talkgroup 9998. Enter it as a *group call*, just like any other talkgroup.

Obviously, it’s important to know to what network your local repeater is connected. You might be able to tell by its list of supported talkgroups. For example, if the repeater uses talkgroup 91 for Worldwide, it’s probably a Brandmeister repeater. If it uses talkgroup 1 for Worldwide, it’s probably not a Brandmeister repeater. If you’re not sure, ask the repeater owner what network it is on and/or what ID to use for the parrot.

Optional: Receive group call lists

Receive group call lists are optional with the AT-D878UV. Such lists enable you to monitor multiple talkgroups simultaneously, without channel scanning. My preference is to create a receive group call list for each repeater and to put all the talkgroups I use on that repeater in a receive group call list dedicated to that repeater. This helps me know whether a time slot on which I intend to transmit is already in use. It also allows me to monitor multiple talkgroups without channel scanning. This practice might, however, confuse newer users, because they will sometimes hear transmissions on channels to which they are not tuned. When I hear a call I want to answer, I must look at the radio quickly to see what talkgroup that user was on (because it might not be the talkgroup I’m set to) and then change channels as necessary before answering.

To create a receive group call list, in the tree view on the left side of the CPS, click “Receive Group Call List.” A table will appear. Double click on the first row of the table. A new dialog box will open. In the Name field, type a relevant name. Because I create a group list per repeater, I name my group lists after each repeater, for example, “LaGrange” for the repeater in LaGrange, Indiana, USA. Now, in the “Available” list at left, select all the talkgroups you want in this group list and then click the “Add” button.

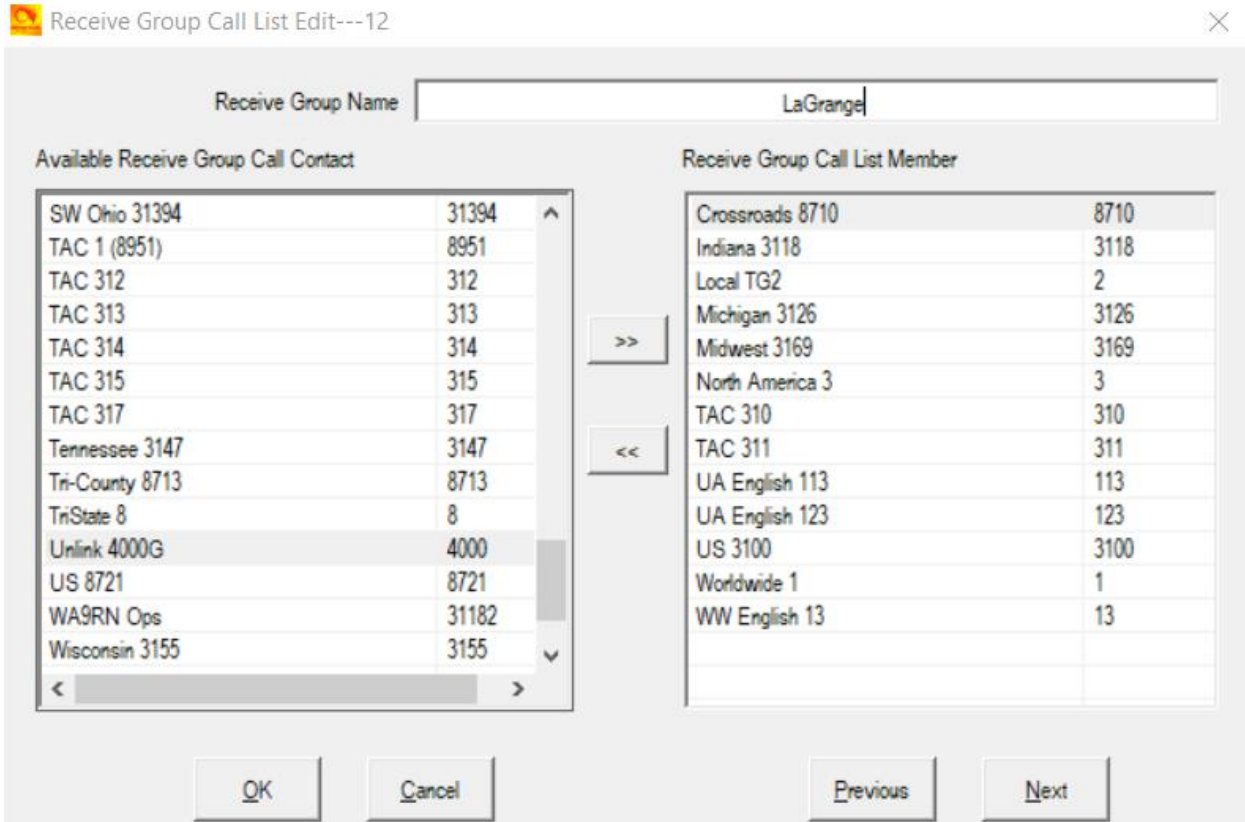


Figure 3. Creating a receive group call list for a single repeater.

Repeat this process for each receive group call list you wish to create, double-clicking a different table row for each list.

Channels

Create a channel for each talkgroup-repeater combination. For example, if you plan to use talkgroup 13 on two different repeaters that operate on different frequencies, you'll need two channels devoted to talkgroup 13, one for each repeater, because repeater frequency and talkgroup information are stored in each channel record.

In the tree view on the left side of the CPS, in the "Public" section, click "Channel." A table will appear. Double click on the first row. A new "Channel Information Edit" dialog box will appear.

In the Channel Information Edit dialog box, make the following settings:

- **Channel Name:** Enter a relevant name. I always use include two bits of information in each channel name; first, I identify the repeater and then the talkgroup. For example, if I'm creating a channel to use the Worldwide talkgroup (talkgroup number 1) on the K9MMQ repeater in Fort Wayne, Indiana, USA, I might name the channel "FW WW" for "Fort Wayne repeater, Worldwide talkgroup". If I also create a Worldwide channel to use on the NT9M repeater in LaGrange, Indiana, USA, I might name that channel, "LaGrange WW".
- **Receive Frequency:** Enter the frequency on which you will receive the repeater (the repeater's *transmit* frequency).

- **Transmit Frequency:** Enter the frequency on which you will transmit to the repeater (the repeater’s receiver frequency).
- **Channel Type:** Set to “D-Digital” for DMR use.
- **Tx Permit:** Set this to “Same Color Code.”
- **DMR Mode:** Set this to “Repeater” for repeater use.
- **Contact:** This setting controls on what talkgroup the radio will transmit when this channel is selected. It also controls what talkgroup the radio will receive, unless you also select a receive group call list (below). Set this to the talkgroup this channel is for. Using the example from the Name field above, I’d choose “Worldwide 1”.
- **Radio ID:** This should default to the radio ID you entered in a step described above.
- **Color Code:** Set this to the color code used by the repeater this channel will use (see, “Obtain repeater information”, above).
- **Slot:** Set this to the *timeslot* that your repeater uses with the above-referenced talkgroup. For example, the K9MMQ repeater in Fort Wayne, Indiana, USA supports Worldwide 1 only on time slot 2. For Brandmeister repeaters, follow any timeslot preferences communicated by the repeater owner.
- **Receive Group List:** This setting is optional and enables you to receive more than one talkgroup when the radio is set to this channel. If you created a Receive Group Call List (see section above) for use with this repeater, select it here. If you leave Receive Group List set to “none,” the receiver defaults to the talkgroup in the “Contact” setting, above.

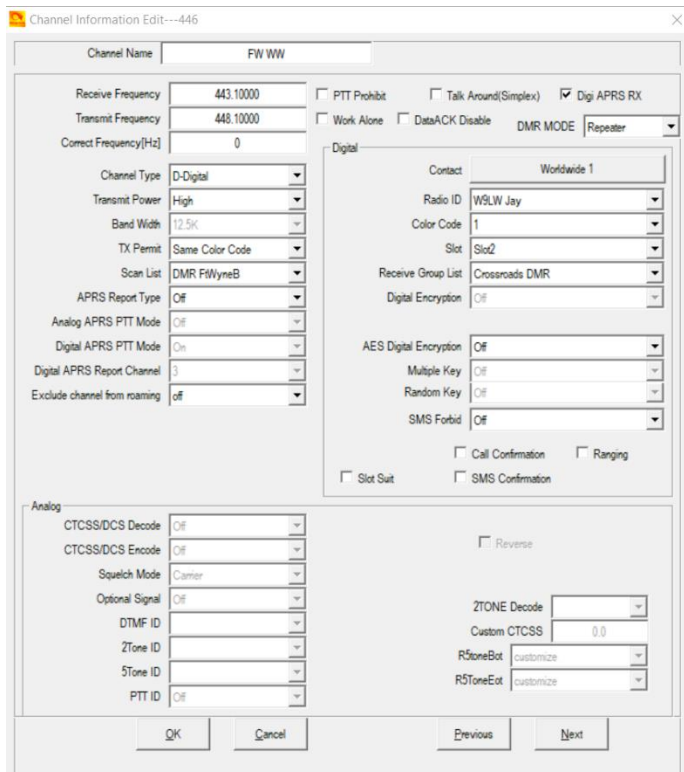


Figure 4. Example channel settings to use Worldwide talkgroup 1 on a DMR repeater.

Repeat the steps above for every combination of talkgroup and repeater you wish to use, double-clicking a different table row for each channel.

Zones

The channels you create in the step above *will not appear on your radio unless you create a zone* to hold them. A zone is analogous to a memory bank on a typical, amateur FM radio. Unlike such FM radios, however, there is no default, “all channels” zone on the AT-D878UV. You must therefore manually put every channel you want to see on your radio in at least one zone.

My personal preference is to dedicate a zone to each DMR repeater, to hold only channels associated with that repeater. If you wish, you may assign any channel to multiple zones, but I rarely find this helpful.

In the tree view at the left side of the CPS, in the “Public” section, click on “Zone.” A table will appear. Double click on the first row. A “Zone Edit” dialog box will open. Enter something relevant into the “Zone Name” field, such as the location or name of the repeater that this zone is for. In my example (see Figure 5, below), I might enter “Ft Wayne B, IN” for the K9MMQ repeater in Fort Wayne, Indiana, USA. (There are two DMR repeaters in Fort Wayne, so I label one “A” and the other “B.”)

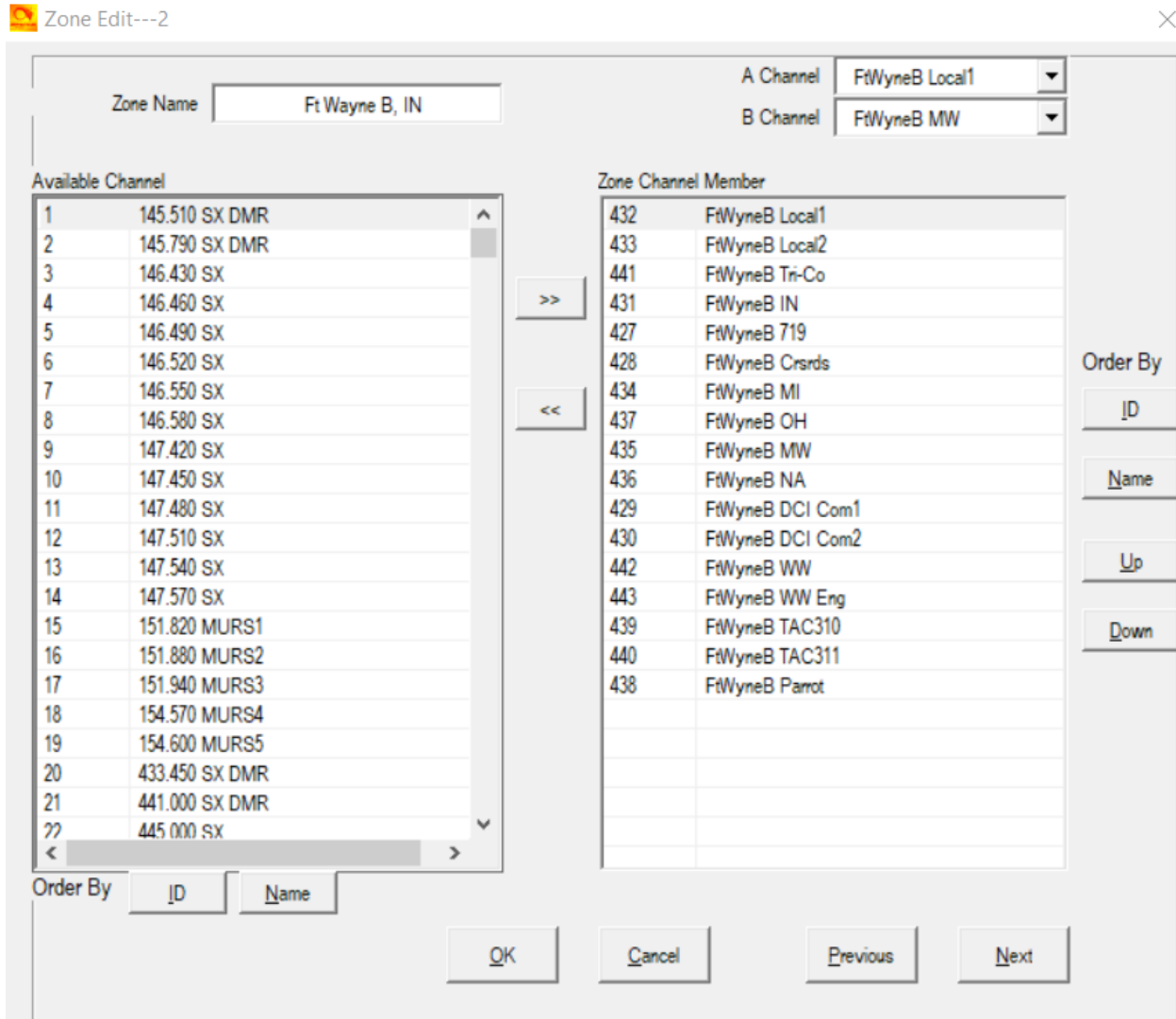


Figure 5. Example zone settings for a DMR repeater

In the “Available Channel” list on the left side of the dialog box, select the channels that you want in this zone. To the right of the “Available Channel” list, click the button that points to the right. The channels you selected will move to the “Zone Channel Member” list.

Optionally, select a channel in the “Member” list and then use the “Up” or “Down” buttons to move that channel up or down in the list. This is how you control the order in which channels appear on your radio.

Optional: Scan lists

The AT-D878UV will scan channels. Unlike typical FM-only radios, however, pressing a scan button won't do anything unless you first create a scan list (in which you define the channels to scan) and second, select that scan list in the configuration of at least one channel. Even then, the scan button will only work when the radio is set to that channel. Unlike FM radios, the AT-D878UV will not by default scan every channel (memory) in a zone (memory bank) nor will it by default scan every channel on the radio. Also, the scan speed of the AT-D878UV is considerably slower than it is on typical FM radios.

In the tree view on the left side of the CPS, in the “Public” section, click “Scan List.” A table will appear. Double click on the first row. A “Scan Edit” dialog box will appear. Using the same procedure described for zones, above, name the scan list something relevant and add channels from the “Available Channel” list to the “Scan Channel Member” list.

You may create more than one scan list. For example, you may create a unique scan list for each zone in your codeplug. Any channel may appear in as many scan lists as you choose. For example, you might wish to have 146.52 MHz simplex in multiple zones and therefore, in multiple scan lists. You may include *any channel* in any scan list, including channels that aren’t in any zone. For example, if you wish to scan a public safety frequency on which you are not authorized to transmit, you might put it in a scan list without putting it in a zone.

In the tree view, click “Channel” and then in the table that appears, double click a channel from which you’d like the radio to begin scanning. In the channel dialog box that opens, select a scan list in the Scan List drop-down list near the upper left-hand corner of the dialog box. This part of the configuration sometimes confuses users. You are not at this point adding the channel to the scan list. You are telling the radio which (of potentially many) scan list it should scan when you start scanning while the radio is set on this channel.

You may assign the same scan list to multiple channels. So, for example, if you created a scan list to match a zone, you might want the ability to begin scanning that list from any channel in the zone. In that case, edit each of the zone’s channels and select the zone’s scan list in each of them. Remember, if you set your radio to a channel for which a scan list is not selected, pressing the scan button will do nothing.

DMR Hotspots

Some users install DMR hotspots in their homes, autos or elsewhere. These devices connect to the Internet (via Wi-Fi or ethernet) and receive and send DMR signals on amateur radio frequencies. Configuring a hotspot is beyond the scope of this document.

Configuring the AT-D878UV for hotspot use is, however, essentially the same as the procedure described above, with a few exceptions. Hotspots typically operate on simplex, meaning the transmit and receive frequencies in the CPS channel dialog box must match. Most (but not all) hotspots use time slot 2 for all talkgroups, so all channels configured for such hotspots would need to be set to “Slot” 2. If your hotspot connects to the Brandmeister network, you may choose any talkgroup listed on the Brandmeister website (see link above) and the parrot channel would be a private call to ID 9990 (see above). Any users whose hotspot differs from the description above must understand how their hotspots are configured and configure their codeplugs accordingly.

Digital contact list

The AT-D878UV can display the call sign and name of the person you are receiving. In some cases, however, this requires loading the DMR ID database into the radio, an operation that is beyond the scope of this document.

Analog (FM) Repeaters

The section below covers adding analog (FM) repeaters to your code plug.

Obtain repeater information

It is essential to gather certain information about the repeater(s) you intend to use, including:

- Transmitter and receiver frequencies.
- Continuous tone-coded squelch system (CTCSS) frequency or digital code squelch (DCS) code (if required).

You can often obtain such information from the websites of clubs or individuals that operate repeaters, or online repeater directories, such as RepeaterBook.com and php.rfinder.net/websearch.html.

Channels

Create a channel for each FM repeater you wish to use, using the same procedure described in the DMR section above, with the following differences.

- **Channel Type:** Set to “A-Analog” for FM use.
- **Band Width:** Set to “25K.”
- **CTCSS/DCS Encode:** Set to the code type and code the repeater requires, e.g., CTCSS 141.3

Ignore all the settings in the “Digital” part of the dialog box.

Repeat the steps above for every FM repeater you wish to use, as always, starting by double clicking on a new table row.

Zones

Following the procedure described in the Zones section above, add every newly created channel to at least one zone. My personal preference is to dedicate a zone to each geographical grouping of FM repeaters. For example, I put all FM repeaters located in Fort Wayne, Indiana, USA in one zone.

Optional: Scan lists

If you wish, create a scan list for your FM repeaters, following the same procedure described in the Optional: Scan lists section above.

FM simplex frequencies

The procedure for adding FM simplex frequencies to the AT-D878UV is essentially the same as that described above. In the channel dialog box, you must assure that the transmit and receive frequencies are the same. It's a good idea to indicate in the channel name that it's simplex (e.g., “146.52 S”). CTCSS tones are not typically used in FM simplex communication.

Save your completed codeplug

When you have finished creating your codeplug, save it somewhere on your computer's hard drive.

Write your codeplug to the radio

On the CPS main menu bar, click “Set” and then “Set COM.” Note the listed comm ports. Plug the programming cable into the radio and the other end into a USB port on your computer. Turn on your radio. A new comm port should appear in the CPS comm port list. Select the new comm port and then click the “OK” button.

On the CPS main menu bar, click “Program” and then “Write To Radio.” Confirm that you wish to continue by clicking the “OK” button on the dialog box that appears. A new, “read or write objects” dialog box will appear. Click the “Other Data” check box and then the “OK” button. Wait for the process to complete and then unplug the programming cable from your radio. Your radio should now be ready to use with the codeplug you created above. My first action after programming my radio is to set the radio to a parrot channel and test the repeater’s ability to hear me.