But I just want to listen to the Police. Why does this have to be so complicated?

<sigh>

Well, unfortunately the days of "enter this frequency to hear the police" are nearly over. Several major trends have converged that have resulted in police (and other agencies) moving to more efficient, "trunked" radio systems:

- Higher levels of radio usage has meant that there aren't enough individual frequencies available to allow every group to have their own frequency.
- Technology advances have brought down the overall cost and complexity of implementing a trunked radio system while increasing the features available to the agency and individual radio users.
- Roll-out of major statewide trunked systems makes it easier for even small agencies to "piggy back" onto the larger system for less cost than replacing existing systems.

Of course, to the average radio user, the complexity of a trunked system is invisible. Their radio is programmed up at the radio shop. They can still easily select who they need to communicate with by selecting a channel on their two-way. They can even directly call other radio users without tying up a dispatch channel…something they could never do, before.

The scanner user, on the other hand, needs to be a lot more savvy about the different types of Trunking systems in use, the different options available on each system, and a host of other arcania in order to successfully monitor their favorite agency.

In this article, I'm not going to the level of arcania. Instead, this article will introduce the features that most Trunking systems have in common. Once you understand this, there are other resources you can use to dig deeper.

Trunked System Basics

There are three major elements to a Trunked system that you need to be familiar with before you begin:

- System Controller – Assigns voice frequencies to active channels.
- Voice Frequency Pool – Used for voice communications within the system.
- Talk Group IDs – Used to identify channels within the system.

Here's how these three elements come together in a trunked system.
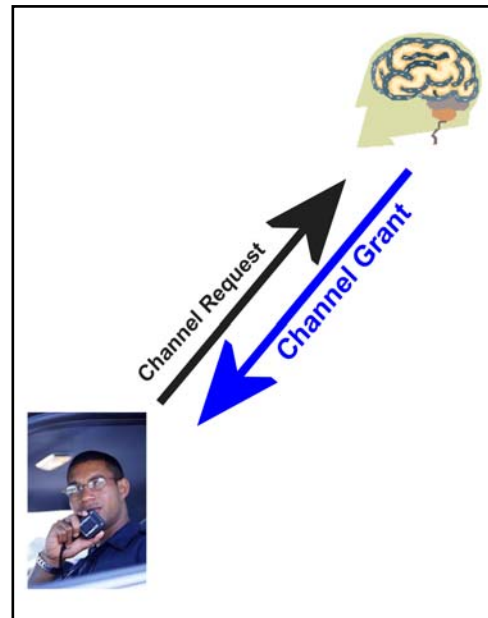
The System Controller

The system controller – a special computer that assigns voice channels to users as they key up their radio. The controller is the "brains" behind the Trunking system. Let's take a look at how the controller does its job.

A typical communication starts by someone selecting the channel they want to communicate on, and then pressing the PTT button on the side of their radio. This sends a channel request message to the controller that the user wants to start a transmission on the channel (Talk Group ID) that they selected. The controller sends out a channel grant message to all radios assigning a voice frequency to that channel. At this point, the original user's radio beeps and they can begin their transmission. While this sounds complicated, in real life this process takes less than ½ second.

When the user releases PTT, the controller releases the Talk Group ID from the assigned voice frequency…freeing the frequency up for the next user that becomes active.

Voice Frequencies

Voice frequencies are a pool of frequencies available to the system controller for assigning voice traffic. When a frequency is assigned to an active channel, it is temporarily pulled out of the pool. When the channel is no longer active, the frequency is released back into the pool so it is available to other channels that might become active. By assigning voice frequencies to channels only as they are needed, a trunked system can support many more channels than it actually has frequencies.

Talk Group IDs

Talk Group ID's identify who is talking on a voice channel frequency at any particular moment. Whereas in the "olden days" the *frequency* identified the user or agency, on a trunked system, the frequency gets reused over and over by all the agencies on the system. A "Channel" is now defined by the Talk Group ID, since the Talk Group ID is what identifies the particular user or agency talking.

Channels vs Frequencies

This can get a little confusing, because the terms have been used interchangeably in the past (and to some extent, still are). For our purposes, however, on a trunked system a Channel is defined as the Talk Group ID and any other settings (such as an alpha tag, alert settings, etc) associated with that Talk Group ID.

When talking about the system itself, it is still common to refer to the "Control Channel Frequency" and "Voice Channel Frequencies". These are unfortunate facts of the radio lingo and aren't going to go away, but for our purposes, try to ignore the word "Channel" when it is used in that context.

A Real Life Example

A typical 20-frequency trunked system can support hundreds of channels. For example, the Fort Worth system includes over 400 channels providing communication support for Fort Worth Police, Fire, Ambulance, plus agencies in the surrounding cities of Kennedale, North Richland Hills, Forest Hill, Haltom City, Richland Hills, Tarrant County Sheriff, and Texas Christian University. You can see its setup in the RadioReference database at http://www.radioreference.com/apps/db/?sid=31.

Before moving to the trunked system, the Police had only 6 channels (North, South, East, West, Information, and Tactical). Since moving to the trunked system, they are now able to provide 11 channels for North Side PD alone! This provides a main dispatch channel, three "talkaround" channels, a supervisor channel, a bike patrol channel, and several community patrol channels. Other police districts have similar channels, and now special operations teams such as SWAT, Narcotics, and Traffic each have one or more dedicated channels for their use.

I think you should be getting some glimpse as to why an agency might want to switch to a trunked system. But now, lets look at how you use your knowledge of how trunked systems work to program your scanner.

Programming a Trunked Scanner

Ok, now you know a little bit about trunked radio systems. In order to actually program a trunked scanner based on that knowledge, you need to know three key pieces of information about the system before you start:

- System Type
- System Frequencies
- Talk Group IDs you want to hear

All of this information is usually available from the database at RadioReference.com.

Note that I'm not going to actually program a scanner in this article…how you program the scanner depends on the specific scanner you are programming. Use the scanner's Owner's Manual for specific programming instructions.

System Type and System Voice

I recommend you look at a system setup in RadioReference. At the top of the page for a system, there is a block of information about the system:

System Name:	Fort Worth / Tarrant County Public Safety
Location:	Fort Worth, TX
County:	Tarrant
System Type:	Motorola Type II Smartnet
System Voice:	Analog
Last Updated:	*Added a set of talkgroups*
Hits:	21299

The two key lines in this block are the System Type and the System Voice. Additionally, to determine how to program the scanner, you need to look a little further down on the page to the System Frequencies.

System Frequencies

Red* are Primary Control Channels | **Blue*** are alternate control channels | Click a Site Name for additional site information

Site	Name	Freqs								
001	Primary	866.16250	866.21250	866.28750	866.36250	866.38750	866.66250	866.68750	866.71250	866.83750
		866.88750	867.16250	867.21250	867.26250	867.33750	867.38750	867.66250	867.71250*	867.76250*
		867.83750*	867.88750*							

System Type
There are five major types of scannable systems, and some of these then have sub types. In the RadioReference database, you can generally determine the radio system type by looking at the line labeled "System Type" and at the frequencies used by the system

- P25 Systems – These are identified in the RadioReference database as "Project 25 Standard." If the "System Type" line says anything else, then it is not a P25 system (even though it might have some P25 channels).
- Motorola Systems – These fall into several subcategories, but they will all show "Motorola Fleetnet", "Motorola Smartnet", "Motorola Smartzone", or similar. Once you have identified that it is a Motorola system, determine its subtype:
  - Motorola 800 – all of the frequencies are in the 800 MHz range
  - Motorola 900 – all of the frequencies are in the 900 MHz range
  - Motorola UHF – all of the frequencies are between 400 and 512 MHz
  - Motorola VHF – all of the frequencies are between 100 and 200 MHz.
- EDACS Systems – These fall into two categories
  - EDACS Wide – identified by a system type of "EDACS Standard."
  - EDACS Narrow – identified by a system type of "EDACS Narrowband."
  - EDACS SCAT – identified as EDACS Scat; these systems operate on a single frequency.
- LTR Systems – all LTR systems are identified as LTR Standard.
- Conventional – this is the general catchall for non-trunked systems, and is not the subject of this article.

Note that there are several system types that cannot be monitored. These are identified as:
- EDACS w/ESK
- LTR Passport
- OpenSky Standard
- MPT1327
- Tetra

These either use proprietary digital formats that are not licensable by manufacturers or are not used enough to be economical for scanner manufacturers to develop solutions for.

System Voice
This line in the database can cause a lot of confusion. It summarizes the kinds of voice modulation used on the system, but does not define the system type. You'll find the following voice types:
- Analog – can be heard with any Trunking scanner.
- APCO-25 – can be heard with a digital scanner.
- ProVoice – cannot be heard by any scanner
- VSELP – cannot be heard by any scanner

System Name:	Mansfield Public Safety
Location:	Mansfield, TX
County:	Tarrant
System Type:	Motorola Type II SmartZone
System Voice:	Analog and APCO-25 Common Air Interface
Uniden DSP:	983 1985 2892
Last Updated:	*Added a single talkgroup*
Hits:	4505

Note that, as in this example, APCO-25 can be a Voice type on a Motorola non "P25" system. It can also be mixed in with analog channels on such a system. In any event, **ignore the "System Voice" line when you are trying to determine whether a system is P25 or not.** This is determined solely by the "System Type." If there is P25 Voice on a non-P25 system, the scanner will determine this while scanning.

System Frequencies

The frequencies used by the system are listed in the database. For Motorola and P25 systems, you only need to make a note of the system control channel frequencies (these are shown in Blue and Red in the database). For EDACS and LTR systems, you need to make a note of all frequencies and their associated LCN (that is a small number right next to the frequency).

Site	Name	Freqs							
101	Arapahoe Admin (Denver Metro)	866.22500	867.10000	867.36250	867.93750*	868.23750*	868.43750*	868.66250*	
102	Riley Peak (Denver Metro)	866.35000	866.60000	866.92500	867.17500	867.58750	867.73750*	868.33750*	868.58750*	868.91250*
103	Silver Heights (Denver Metro)	866.30000	866.82500	867.13750	867.38750	867.70000	867.92500*	868.20000*	868.52500*
104	West Creek (Denver Metro)	866.03750	866.27500	866.97500*	867.31250*	867.90000*	868.93750*		
105	Mount Thorodin (Denver Metro)	866.12500	866.27500	866.46250	866.62500	866.80000	867.08750	867.23750	867.66250	867.98750*
		868.16250*	868.33750	868.55000*	868.97500*				
106	Squaw Mtn (Denver Metro)	866.16250	866.47500	866.86250	867.18750	867.45000	867.62500	867.95000*	868.45000*	868.61250*
		868.85000*							
107	Smoky Hill (Denver Metro)	764.93125	765.18125	765.43125	866.11250	866.27500	866.45000	866.73750	867.15000	867.28750
		867.47500	867.71250	868.17500*	868.40000*	868.62500*	868.87500*		
108	Lookout Mtn (Denver Metro)	854.16250	857.78750	866.11250	866.40000	866.48750	866.68750	866.98750	867.03750	867.20000
		867.41250	867.48750	868.06250*	868.41250*	868.48750*	868.77500*		
109	DRDC CF (Denver Metro)	851.15000	851.95000*	852.70000	853.47500*	853.96250*			
110	Franktown (Denver Metro)	867.97500	868.25000*	868.50000*	868.95000*				
111	Mines Peak	866.26250	866.41250*	868.22500*	868.57500*				
112	Mead	851.61250	852.42500*	852.80000*	853.38750*	853.98750*			
116	Vertamont	867.31250	867.90000*	868.11250*	868.40000*	868.93750*			
117	Tenderfoot II	852.22500	853.30000*	853.53750*	853.75000*				
118	Lamar	851.78750	852.10000*	852.60000*	852.93750*	853.23750*			
120	DTB (Denver Metro)	764.41875	764.66875	764.91875	765.16875	765.41875	851.43750	852.56250*	852.81250*	853.70000*
122	Boyero	851.23750	851.85000*	852.72500*	853.13750*	853.31250*			
123	Ramah	866.32500	866.83750*	868.03750*	868.28750*				
124	Dakota	851.96250	852.46250*	852.96250*	853.46250*				
126	Sheridan Lake	851.05000	851.28750*	852.05000*	853.07500*	853.76250*			
127	Mt. Carmel	866.61250	867.42500*	867.80000*	868.38750*	868.98750*			
128	Toonerville	866.36250	866.56250*	866.88750*	867.12500*				

Some systems like the one shown above have multiple sets of frequencies. These are called "MultiSite" systems…each set of frequencies corresponds to a different physical antenna site.

Talk Group IDs You Want to Hear (Channels)

Once you determine the system type, look at the list of channels available for the system and make a note of the channels you want to hear. RadioReference subscribers can print out a nicely formatted hardcopy of each system that makes this task easier. Highlight the channels you want to hear and start thinking about how you want to organize the channels. Below are just a few of the channels on the Fort Worth, Texas system I mentioned earlier.

FWPD North Talkgroups

DEC	HEX	Alpha Tag	Description	Tag
2992	0bb	N-PTRL	NORTH DIVISION - PATROL	
3024	0bd	N-CID	NORTH DIVISION - CID	
3056	0bf	N-COPS	NORTH DIVISION - CRO/CODE BLUE	
3088	0c1	N-SUPV	NORTH DIVISION - SUPERVISOR	
3120	0c3	N-FOOT	NORTH DIVISION - FOOT/BIKE PATROL	
3152	0c5	N-TLK1	NORTH DIVISION - TALK CH 1	
3184	0c7	N-TLK2	NORTH DIVISION - TALK CH 2	
3216	0c9	N-TLK3	NORTH DIVISION - TALK CH 3	
6864	1ad	N-COPS2	NORTH DIVISION - CRO/CODE BLUE	
18832	499	N-COPS3	NORTH DIVISION - CRO/CODE BLUE	
18864	49b	N-COPS4	NORTH DIVISION - CRO/CODE BLUE	

FWPD South Talkgroups

DEC	HEX	Alpha Tag	Description	Tag
2448	099	S-PTRL	SOUTH DIVISION - PATROL	
2480	09b	S-CID	SOUTH DIVISION - CID	
2512	09d	S-COPS	SOUTH DIVISION - CRO/CODE BLUE	
2544	09f	S-SUPV	SOUTH DIVISION - SUPERVISOR	
2576	0a1	S-DIR	SOUTH DIVISION - DIRECTED PATROL	
2608	0a3	S-TLK1	SOUTH DIVISION - TALK CH 1	
2640	0a5	S-TLK2	SOUTH DIVISION - TALK CH 2	
2672	0a7	S-TLK3	SOUTH DIVISION - TALK CH 3	
2960	0b9	S-K9	SOUTH DIVISION - K9	
6896	1af	S-COPS2	SOUTH DIVISION - CRO/CODE BLUE	
18896	49d	S-COPS3	SOUTH DIVISION - CRO/CODE BLUE	
18928	49f	S-COPS4	SOUTH DIVISION - CRO/CODE BLUE	

FWPD East Talkgroups

DEC	HEX	Alpha Tag	Description	Tag
2160	087	E-PTRL	EAST DIVISION - PATROL	

Finishing Up

You are now armed with all the information you need to program basic trunked system information into your scanner. While there is a lot more to know, much of it depends on the specific system you want to scan, the specific scanner you want to program, and the specific things you want to listen to. If you get stuck, scoot over to the forums at RadioReference (http://www.radioreference.com/forums) or the specific Yahoo! group for your scanner. I've listed many of them, below:

- http://groups.yahoo.com/group/BCD396T
- http://groups.yahoo.com/group/BCD996T
- http://groups.yahoo.com/group/BC246T
- http://groups.yahoo.com/group/BCT15
- http://groups.yahoo.com/group/BR330T
- http://groups.yahoo.com/group/PSR-500
- http://groups.yahoo.com/group/PSR-600
- http://groups.yahoo.com/group/PRO-96
- http://groups.yahoo.com/group/PRO-97

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