PSR-500 Operating Hints

The Object Oriented User Interface

Why doesn't my PSR-500/600 stop in the current Scan List when I press the "MAN" button after the Scanner stops on an active Object?

You may have noticed that, when you are scanning and the scanner stops on an active Scannable Object, and you press MAN to hold the scanner on the object, the Scanlist and Object ID displayed in the upper left-hand corner of the LCD display show a Scan List number that is not what you believe to be the "current Scan List", or, the Scan List/Object ID display shows a Scan List that you do not currently have enabled.

This is probably one of the more difficult things to explain about object oriented scanning. The very short answer is as follows:

Once the radio begins scanning, it really doesn't know what the "current Scan List" is.

A more detailed explanation is as follows:

In traditional bank/channel scanner designs, the scanner processes each bank of channels individually and in sequence until all enabled banks are scanned, then the process repeats. If you want a channel to appear in more than one bank, for example, an important channel that you want to monitor regardless of which banks you have enabled or disabled, you must make a separate copy of it for each bank that you want it in, and, it will be scanned multiple times in each scanning cycle if it is stored in more than one enabled bank.

Your PSR-500/600 does not work like this. It does not process Scan Lists sequentially when scanning. Rather, it uses Scan Lists to organize your Scannable Objects into logical groups of your choosing. We call this "mapping objects to Scan Lists".

Scan Lists make it easy for you to find your objects, and make it easy for you to enable and disable groups of objects when scanning. The objects aren't really stored "in" Scan Lists. Rather, they are "members of" one or more Scan Lists that you have identified in the Scan List mapping for each individual object.

Once scanning begins, the radio doesn't know what Scan List(s) an object is a member of. It just knows that an object it is scanning is mapped to one or more enabled Scan Lists, and is not locked out. In this way it is possible to have objects that are mapped to multiple Scan Lists, without having separate and independent "copies" of an object for each Scan List that you want it to appear in, making memory usage much more efficient, and making scanning more effective, since the same object is not checked multiple times during a single scan cycle.

It is important to remember that when you press MAN while scanning to stop the radio on an active Scannable Object, the radio always displays the lowest number Scan List that the object is a member of. You may then use the left and right arrow keys to navigate to another Scan List if desired.

We suggest that you keep the following "OOUI Tenets" in mind as you use the radio. If you find yourself confused or stuck about the basics of Object Oriented Scanning, it may be helpful to review this list again.

The OOUI memory organization is nothing more than a large list of "Scannable Objects". A "Scannable Object" is simply "something that can be scanned", including conventional channels, trunking talkgroups, limit searches, service searches and Spectrum Sweeper setups. In OOUI scanning, there are no "systems", "banks", "groups", "sub-groups" or "ID lists". There is simply a very large collection of objects, each with their own attributes. Scannable Objects all exist at the same level or hierarchy within the scanner - no single type of Scannable Object is more important than another, and Scannable Objects do not have dependencies on or links to other Scannable Objects in order for them to function properly. The primary method of grouping the collection of objects is by mapping them to Scan Lists. Mapping a Scannable Object to one or more Scan Lists does not change the physical location of the object in the memory system. Even when an object is mapped to one or more Scan Lists, the object itself has not moved nor changed from what it is - a simple, standalone object that is part of a larger collection.

Operating Tips

Activate/Deactivate Scan Lists: Sets membership in Scan Lists. Use left and right keys to scroll through Scan Lists. Use SEL key to toggle Scan List membership. A "*" next to the Scan List number indicates that the object is mapped to that Scan List.

Default Scanlist: When programming an object, select the scan list using the menu or the default scan list one will be used. To return an object to your selected scanlist, set the default the scanlist to the number you want. To return an object to the default during EDIT or NEW press Dflt.

Dupe function: To repeat commonly used object attributes, use the Dupe function.

Object access: To go to an object, press MAN or PGM and the object number, then press E to go to the object.

Force Analog: If you have a CONV object that you know is analog, You can set the object to tone search to force it as analog.

Force Digital: If you have a CONV object (or trunked) that you know is digital, you can force it as digital by forcing it to search for P25 NAC.

Flex Step: "Super Expert Setting Menu". PGM, FUNC F3:GLOB Scroll down to "flexStep" and Rt-Arrow it to "On" F1:Save. FlexStep allows entry of frequencies that are a multiple of 1250 Hz except in the civil air band 108-136 where the step size is fixed at 8.333 kHz.

Audio Boost: Expert menu, AudioBoost, On or OFF, Applies a 6 dB boost to audio levels when the object is active

EDACS expert settings: control how the scanner behaves after it has already recognized a "call grant" message:
EndtoneEDACS - while on a "voice frequency", qualifying time in bits for the "endtone" to indicate end of transmission
EDACS UnMute - after tuning to a "voice frequency", a delay before unmuting audio
EDACS ET HO - after returning to the CC from a "voice frequency", how long to ignore any calls on the same "voice frequency"

Delete Alpha Characters during entry: Func + CL will delete all the characters in a line. Use the "." (decimal) key to delete a character and make a blank space.

Heap Error 2187lF: 218E is often caused by having one or more TGRP objects that aren't assigned to any TSYS. Either delete those TGRP objects or assign them to a TSYS.

Battery Settings: Change the battery setting in the Global menu: Alkaline, NiCad, or NiMIH, to set the proper battery warning levels for the battery type you are using.

Quick Menu Move: Func + Up or Down will move to the top or bottom of a menu.

Go directly to a newly saved conventional object: Press MAN right after pressing "Stor" in the search, you'll be taken right to the CONV object you just stored.

Object Search: If you press manual, you can then scroll through the scanlist (the default save to, is scanlist 1) with the up/down arrows. You can also use the Find feature. press Program, Edit, Find enter a alpha text or frequency. And you can find it by object type by pressing Program, Edit, press left or right key to select the object type, such as CONV, the up down arrow to select the conventional object.

Signal Strength Meter Settings: Settings of 470 540 610 680 750 provide a wider range indication of signal strength than the default settings. To change the settings, press PGM + FUNC + F3 (GLOB) and scroll through the menu to RSSI Sig Cal. Press SEL and edit the entries for each RSSI Bar (1-5).

DG/Dg: means that a digital transmission is being received.
DG means that the digital AGC is on for that object being monitored.
Dg means that the digital AGC is off for the object being monitored.

PGM/FUNC/GLOB/DG Int Prime (or "Digital Detect Timeout" in Win500) controls how long the scanner waits to automatically detect digital (P25 CAI) transmissions, when the type of transmission isn't known / expected ahead of time. This is in three cases:
1. MOT trunking systems (can be either analog or P25 CAI)
2. CONV objects where "Sq Mode" is set to "Search"
3. The various "searching" modes (TUNE, SWPR, SRCH)

A P25 TSYS isn't affected, as all voice transmissions must be P25 CAI. EDACS and LTR systems aren't affected, as they must be analog. A CONV object whose squelch mode is set to P25, CTCSS, or DCS isn't affected, as those settings imply the voice type.

For example, here I listen to several CONV channels where I know the "voice type". I set each one's Sq Mode to "force" either analog or digital. So, my CONV channels aren't affected by the DG Int Prime setting. However, I also listen to two MOT trunked systems - one is all analog, the other is all digital voice. If I set "DG Int Prime" too low, the scanner pften gives up on waiting for digital on the second system (giving me "motorboating"), though the first system's analog voice is very fast. My "happy medium" for the two is 30 - corresponding to a 300mS delay while waiting for digital. I do get that 300mS delay at the beginning of every new transmission on the analog system, but I never get motorboating on the digital system.

Pause vs. Man: PAUSE: stops on the currently-active TGRP object, does not perform any "MultiSite" sequencing in the TSYS. If the current CC is lost for some reason, the scanner *will* look through the TSYS's list for a new one. You'll also see any alpha tags programmed for detected RadioIDs. MAN: stops on the currently-active TGRP object, performs full "MultiSite" sequencing in the TSYS. Any detected RadioIDs are shown as the "raw" ID value - the scanner won't lookup any alpha tags you may have programmed for those RadioIDs. If you want to "pause on and follow" a particular talkgroup ID as its users move between sites (sites that use different control channel frequencies), you want to use the "MAN" method.

Priority: Unfortunately, there's no way to catch priority talkgroups "no matter what" if you're also scanning conventional channels. To do that would require either a) the huge audio gaps in the CONV objects in order to go look at the trunked system's control channel and wait some noticable amout of time for one of your priority talkgroups to appear or b) a second tuner/receiver that is looking at the control channel(s) of the trunked system(s) whose talkgroup(s) you want to set as "priority".

Here's how the PSR-500/600 handles priority for CONV and TGRP objects:
1. Currently monitoring a non-priority CONV object: periodically tune to any priority CONV objects to check for activity. This can be pretty fast, without too much of "gap" in the non-priority object's received audio. It can slow down noticably (with much larger gaps in the audio) if the priority CONV objects are opening squelch, but not matching any CTCSS/DCS/NAC values programmed.

2. Currently monitoring a non-priority TGRP object:

a) if the "TGRP Pri Int" option is turned ON, periodically tune to any priority CONV objects to check for activity. This can lead to some gaps in the TGRP's audio, since returning to it requires a re-check of the control channel in case the TGRP is either no longer active or on a different voice frequency. It can also have the squelch-related gaps in #1.

b) during breaks in the TGRP's conversation, where the scanner returns to the control channel to look for continued activity on that TGRP, if any priority TGRP activity is seen, monitor it instead

c) on some trunked systems (e.g. Mot 3600 if the system is programmed for it, and LTR for some talkgroups), look at low-speed data on the voice frequency, checking for any priority TGRP information.

Once the radio starts scanning, scan list membership is irrelevant for TGRPs. The scanner builds a list of "things to scan" based on enabled scan lists and each object's scan list membership. Priority does "transcend scan lists", as long as the objects flagged as "priority" belonged to at least one enabled scan list when you hit the SCAN key (or as long as you subsequently enable the objects' scan list(s) while scanning). In SCAN mode (unless you're PAUSEd on an object), any priority-flagged object in any enabled scan list can "override" the current object, as long as the current object itself is not flagged as priority.

I have a PSR 600 and I am using Win 500 software to program the scanner.
I noticed that the program lets me select multiple priority channels.
How many priority channels can I have
Any conventional channel or talkgroup object can be set for "priority", so
the limit is how many of those objects you have programmed.
and in what order do they go to the priority channel?
They're all "peers", with equal priority.
Does one priority channel have priority over another?
No. An object flagged as "priority" will never be interrupted by any other
"priority" object.
How does it know which one to go to?
Once per <priority check interval>, and only if no "priority" object is
currently active, the scanner checks up to <priority channels to check>
conventional channels flagged as "priority".
Also how often does it check for an active channel that is a priority,
is there a way to change that to make it seek an active channel faster?
PGM GLOB
"Pri Channels:" = <priority channels to check>, the number of CONV objects
flagged as "priority" that the scanner will check each <priority check interval>.
0 = "all"
"Pri Interval:" = <priority check interval>, the time (in deciseconds) between
each priority check
In Win500, the above two items are on the "General Settings" tab and are named
"CONV to check each pass" and "Priority check interval", respectively.

Show CC Info On TGRP Display: Causes "CCnn ffff.ffffff" to appear on line 2
of the display (alternating with the voice frequency) when a call is active.
<nn> is the index of the Control Channel in the TSYS's list, and <ffff.ffffff>
is the Control Channel frequency.

Site Setting:
  Stationary: sites contain different traffic and/or you want to check all CCs
              on all sites all the time. With the option "scan all
              control channels on every pass" turned off, the scanner will
              check a new control channel on each pass, starting with the next
              frequency in line after the previous pass. It will check only one
              control channel per pass. With that option turned on, the scanner
              will check every control channel it can find on each pass through
              the TSYS object.
  Roam: sites contain the same traffic and/or you're moving around among sites
        and only want to check "the strongest"

Presuming there are 32 or fewer control channels for all the desired towers
in one TSYS:
        1. Create one TSYS with all the control channels
        2. Set the TSYS to "Multi-Site = ROAM"
        3. Enter the desired TGRPs for that TSYS, and only enter each TGRP once
        4. Assign each TGRP to one or more scan lists, depending on how you want to
           turn groups of TGRPs on/off

EDACS Narrow: For some systems, the control channel data may need to be
inverted. Once the EDACS narrow system is created, arrow down to the "Expert
Below" section until you see "Invert Data: No", arrow right or left to
display "Yes", press Save (F1) to save changes.

Show RadioID: added in CPU firmware 1.4 in SE-GLOB. If enabled, shows
radio ID (where available) during voice calls.

Organizing Scan Lists:

In various threads, it's been mentioned that the PSR-500's 20 Scan Lists might be somewhat limited, based on users' preferences for subdividing groups of talkgroups in trunking systems. Sometimes, comparisons are made to some brand-U radios that have "systems" and "quickkeys", that essentially let you create complex hierarchies of things to be scanned (I don't own such a radio, so my terminology may be off).

I think I've come up with a potential workaround for the PSR's apparent limitation here. It makes use of the fact that you can lock out a trunking system ("TSYS object"). It does require some kind of PC software, something that can assign "Object IDs" to any object...

If I want to monitor my local trunked system (City of Santa Clara, CA, an analog-only Mot 3600 system), and have control over whether I'm monitoring a) everything, b) just police, c) just fire, d) police and fire, etc., but only use Scan List 01 for everything, here's what I'd do: Create three TSYS objects. They're all identical. Their object IDs are 0010, 0011, and 0012. TSYS 0010 will have all of the interesting talkgroups except police and fire. TSYS 0011 will have police only. TSYS 0012 will have fire only. Add TGRP objects to each TSYS, according to the filtering in (2) By my convention, the TGRP objects are in scan list 01. This is the "tens place" of the three TSYS object IDs. If I was putting the TGRPs in scan list 02, the TSYS object IDs would be 0020, 0021, and 0022. (My convention limits me to the first 10 scan lists).

Normally, I'd be scanning all three TSYS objects - leaving the TSYSs "not locked out" and enabling scan list 01.

If something interesting happens on the Fire talkgroups, I might want to ignore all of the talkgroups in the "everything" (0010) and "police" (0011) TSYS objects. Via a few key presses, I can lock out all of those TGRPs, by locking out the TSYS objects: MAN 1 0 ENT L/OUT 1 1 ENT L/OUT SCAN I've just locked out TSYS 0010 ("everything") and TSYS 0011 ("police"), and am only scanning the Fire talkgroups.

To re-enable the "police" TSYS, I'd hit: MAN 1 1 ENT L/OUT SCAN

Drawbacks of this method: My definition of "a few key presses" may not be the same as yours. To lock out the two TSYS objects above and return to Scan mode required 10 key presses. Still, it's far less than locking out 50 TGRP objects individually. It requires PC software that can directly manipulate the TSYS Object IDs, since the radio doesn't let you do that from the keypad For MOT and P25 systems, each TSYS object beyond the first takes 10 additional "blocks" of memory (EDACS and LTR would be 4 blocks each). If you do this for too many trunked systems, it could have significant memory usage effects. It may increase scan cycle times. Each TSYS would be "scanned" for the default "dwell time", unless you change that value in the TSYS menu. My local system uses "scan markers", which the scanner seems to recognize - the PSR-500 only camps on each of my TSYS objects for 100-200 mS (watching the "CCDump" data, it looks like the radio leaves a Mot 3600 system if it has seen two of these "scan markers", even if the dwell time has not yet elapsed). It only works for trunking systems, where you want to subdivide categories of talkgroups

Problems:

A small screw inside the scanner near the BNC antenna connector has been
found to be loose on early production units. If it falls out, it can cause
a short circuit and damage the scanner. To gain access to the screw, remove
the four long external screws. Carefully remove the rear cover and locate a
small silver colored screw near the BNC antenna connector. Do not over
tighten it and apply a drop of Super Glue or other glue. Re-assemble the
scanner and enjoy. GRE is aware of this problem.

Rebanding for 800 MHz Motorola 3600 bps trunked systems:

Here is the custom table to program:

```
ChLO ChHI Step    Offset Base
440  559  25.000 440     851.025000
000  719  25.000  0      851.012500
720  759  25.000  0      848.000000
815  831  25.000  0      846.625000
958  958  25.000 958     868.975000
961 1022  25.000  0      843.400000
```

This is meant to support systems whether they are in the process of
transitioning from 866MHz freqs or have already switched over and only use
850MHz frequencies.

To simplify programming, if your system has rebanded and does NOT use any
frequencies above 862MHz you only need to program the two ranges below.

```
ChLO ChHI Step    Offset Base
440  559  25.000 440     851.025000
000  719  25.000  0      851.012500
```

YOU MUST PUT THE 440 ROW FIRST OR IT WILL NOT WORK PROPERLY. A higher row
takes priority over a lower row.

PSR-500 Expert Settings: PGM + FUNC + F3 (GLOB); Press FUNC-SEL to see menu help text

Setting Type	Menu Name	Menu Help Text*	Default	Values	Win500 Name	PSREdit Name	Description/Notes
General Tuning	Max Tunes	Max tunes before complete RF HW update.	20	1 to 1000 tunes	Max cached tunes	Resume Delay Time	
General Tuning	SQ Wait 1	Squelch wait time, same band	10	1-200, x1 ms	In-band SQ Timeout	Squelch Time Same Band	Length of time to wait for a signal on a frequency while scanning (scan speed). Lower value = faster scan speed. Higher value = slower scan speed.
General Tuning	SQ Wait 2	Squelch wait time, new band	15	1-200, x1 ms	Out-of-band SQ Timeout	Squelch Time Different Band	Length of time to wait for a signal on a frequency while scanning (scan speed)
General Tuning	RF SQ Fade	RF SQ fade delay	10	0-99, x10 ms	RF SQ Fade Timeout	RF Fade Time	Length of time to wait before to closing the squelch after lost signal (squelch tail)
Digital Tuning	DG Int Prime	Preselect DG audio	60	1-100, x10 ms	Digital detect timeout	Digital Detect Time	Length of time to wait to detect a digital signal on a frequency (in auto Mode). Lower values cause analog transmissions to unmute faster but increase the chance of initial motorboating on digital signals. A setting of 30 may be a good compromise. Analog only channels can be set to CTCSS search to eliminate the delay.
Digital Tuning	Noise Thresh	Noise threshold value for DSP.	20	1-128	Noise threshold	Noise Threshold	A lower value may deliver better results.
Weather Settings	WX Check Int	Weather 1050 chk interval in SCAN and MAN modes	60	5-250, x100 ms	Check interval	Tone Detect Threshold	The interval of time to check for a Weather Alarm signal while scanning (WX Priority)
Weather Settings	WX 1050Hz Th	Weather 1050Hz qualify time	20	7-250, x10 ms	1050Hz qualifier	Tone Detect Timeout	Length of time to wait on the Weather frequency to check for the Alarm signal
Weather Settings	WX Alrm Time	WX SAME alert time to unmute 0=unmute @1050	0	0-600, x1 sec	Alarm timeout	Alarm Settings Length	Length of time to wait before unmuting the Weather frequency after an Alarm
Weather Settings	WX Lstn Time	WX Listen Time Auto-remute time after unmute	90	30-999, x1 sec	Listen time	Alarm Settings Listen	Length of time to listen to the Weather frequency after an Alarm unmuted the radio
Spectrum Sweeper	SweepScanSQ2	Sweeper scan large sig qual	5	1-100, x1 ms	Wide SQ timeout	Squelch Delay in Scan Mode	Length of time to wait for a signal on a frequency during Sweeper while scanning
Spectrum Sweeper	SweepSrchSQ2	Sweeper search large sig qual	5	1-100, x1 ms	Narrow SQ timeout 2	Squelch Delay #2 in Search Mode	Length of time to wait for a signal on a frequency during Sweeper while searching
Spectrum Sweeper	SweepSrchSQ1	Sweeper search small sig qual	10	1-100, x1 ms	Narrow SQ timeout 1	Squelch Delay #1 in Search Mode	Length of time to wait for a signal on a frequency during Sweeper while searching
Spectrum Sweeper	SweepAMDelay	Sweeper unmute delay - AM mode	150	1-300, x1 ms	AM unmute delay	Unmute Delay (AM Mode)	Length of time to wait to unmute in AM mode during Sweeper
Spectrum Sweeper	SweepFMDelay	Sweeper unmute delay - FM mode	50	1-300, x1 ms	FM unmute delay	Unmute Delay (FM Mode)	Length of time to wait to unmute in FM mode during Sweeper
Spectrum Sweeper	SpclSweepLmt	Special sweeper lockout count before skip	5	1-20	'Special' lockout limit	Max Lockouts Per Range in SPCL	The maximum number of special Sweeper lockouts per range before skipping
General Tuning	SearchTunes	Max search tunes per scan loop 0=entire range	0	0-9999 tunes	SRCH tunes in SCAN	Max Search Tunes per Scan Cycle	The maximum number of frequencies to check in each search object while scanning
Misc Setting	FlexStep	On= Allow any 1250Hz freq Off=enforce fixed steps	Off	Off/On	Enable FlexStep	Enable FlexStep	Enable the FlexStep feature
Misc Setting	ADC Cal	Show various data within Tune Mode on LCD line 3	OFF	OFF, RSSI, ZM, DSP	TUNE mode display	Tune Mode Text	This setting is used to customize the text to show on the display while tuning
Misc Setting	RSSI Sig Cal	Signal strength meter thresholds	370 450 520 610 680	1-750	RSSI Bar Thresholds	Signal Strength Values	This setting is used to customize the signal strength meter bar threshold values. Recommended values: 470 540 610 680 750
Misc Setting	Bat Icon Cal	Battery icon thresholds		1-1023	Battery Settings	Battery Settings	Customize the battery icon threshold values for NiMH, alkaline, and NiCd type batteries (icon off, icon on, icon blink off, icon blink on)
Zeromatic Setting	Zeromatc Cal	Zeromatic tune thresholds		1-1023	Zeromatic Thresholds	ZeroMatic Settings	Customize the Zeromatic tune threshold values for 5kHz ranges and non-5kHz ranges (entrance low value and high value, exit low value and high value)
Zeromatic Setting	ZM Delay	Zeromatic check delay	5	0-1000, x1 ms	ZM Check delay	Check Delay	
CTCSS/DCS/NAC	ACSQ SrcInt	Wait for HD5 sig in auto CSQ srch	500	10-2000, x1 ms	Search Interval	Search Delay	Length of time to wait for a CTCSS/DCS/NAC signal in auto carrier squelch search
CTCSS/DCS/NAC	ACSQ PolInt	Interval to poll for CSQ value	100	10-1000, x1 ms	Query Interval	Query Interval	The interval of time to check for a CTCSS/DCS/NAC signal
CTCSS/DCS/NAC	HD5 Fade	CSQ fade delay	2000	10-10000, x1 ms	Fade Timeout	Fade Delay	Length of time to wait after losing a CTCSS/DCS/NAC signal. Max value changed from 2500 to 10000 in firmware 1.4
CTCSS/DCS/NAC	HD2 Qualify	CSQ end detect threshold	75	1-1000, x1 ms	End detect qualify	Qualify Time (Analog)	Length of time to check to detect an end of signal turn off code command
CTCSS/DCS/NAC	HD2 Holdoff	CSQ post-end wait time	500	10-1000, x1 ms	Delay after end	Mute Time	Length of time to mute a signal after an end of signal turn off code command
P25 Trunking	96CC HD2 TO	9600CC SQ to HD2 timeout	30	10-250, x10 ms	CC detect timeout	CC HD2 Timeout	Length of time to wait for P25 control channel detection timeout
P25 Trunking	96VC SQ TO	9600VC RF SQ timeout	50	10-250, x10 ms	VC RF SQ timeout	VC SQ Timeout	Length of time to wait for P25 voice channel RF squelch timeout
P25 Trunking	96VC XF TO	9600VC SQ to XF timeout	100	10-250, x10 ms	VC Digital timeout	VC XF Timeout	Length of time to wait for P25 voice channel digital IMBE timeout
P25 Trunking	HD2 Qual DG	HD2 qual time to unmute 96CC	100	10-250, x10 ms	Qualify CC in analyze	Qualify Time (Digital)	Length of time to check for a P25 control channel before unmuting in Analyze
Motorola Trunking	SubaudDelay	Delay before we start subaudible decode	150	0-65535, x1 ms	Subaudible start delay	Delay Time	Length of time to wait to check for Motorola subaudible data to decode
Motorola Trunking	M36 ET Patt	Mot3600 Endtone 16-bit pattern to detect	2B2B	0x0000-0xFFFF	Endtone pattern	End Tone Pattern	The Motorola 3600 End Tone 16-bit pattern to detect an end of signal command
Motorola Trunking	EndtoneMot	# of >baud bits to trig 3600CC analog end	80	0-250	Endtone threshold	End Tone Threshold	The Motorola 3600 End Tone number of bits required to mute at end of signal. Default changed from 250 to 80 in firmware 1.2
EDACS Trunking	EndtoneEDACS	# of >baud bits to trig 4800CC analog end	10	0-250	Endtone threshold	End Tone Threshold	The number of bits of the 4800 Hz end tone to detect before muting the audio and returning to the control channel. The default of 10 is 1.04 milliseconds plus microprocessor polling time which can be up to two milliseconds.
EDACS Trunking	EDACS UnMute	EDACS unmute delay	18	0-100, x10 ms	GCG unmute delay	GCG Unmute Delay	Length of time to wait before unmuting an EDACS trunking signal
EDACS Trunking	EDACS ET HO	EDACS post end-tone holdoff	35	0-100, x10 ms	Endtone holdoff	End Tone Holdoff	Length of time to wait after an EDACS end of signal command
Misc Setting	Trunking Ch#	Show CC Chan # while showing VC	Off	Off/On	Show trunked chan w/VC	Show Trunking Channel	This setting is used to show the trunking channel number on the display
Misc Setting	Show RadioID	Show RadioID in group calls, if available on line 4	No	No/Yes	Show Radio IDs for group calls	Enable Radio ID Display	If enabled, shows radio ID for P25, EDACS, and Mot type II (where available) during voice calls. Added in firmware 1.4
Misc Setting	RadioIDAlert	Use RadioID's alert setting if showing tag on line 4	No	No/Yes	Use RadioID Alert	Use RadioID Alert Values	If set, then we'll show the private TGRP's alert when: showing a group call, showing the private TGRP's tag on line for the radio ID, private TGRP's "LED Color" is non-zero (the default 'off'), or new menu item enabled. Added in firmware 1.5
Misc Setting	138-174 5kHz	Allow 5 kHz steps between 138 and 174 MHz	No	No/Yes	Allow 5kHz steps 138-174 MHz	Use 5khz Steps from 138 - 174Mhz	If turned on, 5 kHz steps are used in ALL modes. Added in firmware 1.5
Misc Setting	CCDump	Dump CC msgs to PC/IF	No	No/Yes	Dump trunking data to PC/IF	Enable CC Dump	Enable the Control Channel Dump feature
Misc Setting	DSPDump	Dump CPU<->DSP msgs to PC/IF	No	No/Yes	Echo DSP comms to PC/IF	Enable DSP Dump	Enable the DSP Dump feature

Abbreviations
CC = Control Channel
CSQ = Carrier Squelch
DG = Digital
ET = End Tone
HD2 = in DG, P25 CC detect; in CTCSS/DCS, reverse burst/turn off code detect
HD5 = CTCSS/DCS/NAC detect
HW = Hardware
SQ = Squelch
VC = Voice Channel
WX = Weather
XF = IMBE detect
ZM = Zeromatic

The chart below compares the GRE made PRO-2096, PRO-97, PRO-2055, and PSR-500 to the Uniden PRO-83, BC246T, BC780XLT, BC796D, BCD396T, and BC996T. This is a bench test for raw sensitivity and does not test overload, desense etc. A single signal is applied to the scanner and the squelch control is set at minimum.

20 dB Quieting Test, All Channels NFM Mode except PRO-83 and PRO-2096 FM mode

Frequency	PRO-2096	PRO-83	BC246T	PSR500	PRO97*	PRO2055	BCD396	BC796D	BC780XLT	BCD996
030.00000	0.31uV	0.32uV	0.28uV	0.28uV	0.33uV	0.27uV	0.33uV	0.34uV	0.44uV	0.32uV
040.00000	0.26uV	0.29uV	0.30uV	0.24uV	0.24uV	0.24uV	0.30uV	0.25uV	0.45uV	0.31uV
050.00000	0.26uV	0.29uV	0.29uV	0.24uV	0.26uV	0.25uV	0.31uV	0.25uV	0.43uV	0.29uV
125.00000	0.30uV	------	0.38uV	0.35uV	0.29uV	0.29uV	0.30uV	0.34uV	0.50uV	0.27uV
135.00000	0.31uV	------	0.36uV	0.31uV	0.28uV	0.28uV	0.34uV	0.31uV	0.43uV	0.27uV
144.00000	0.28uV	0.33uV	0.32uV	0.35uV	0.28uV	0.29uV	0.27uV	0.35uV	0.43uV	0.25uV
155.00000	0.28uV	0.31uV	0.33uV	0.34uV	0.28uV	0.28uV	0.30uV	0.29uV	0.42uV	0.25uV
170.00000	0.31uV	0.33uV	0.33uV	0.37uV	0.32uV	0.33uV	0.30uV	0.34uV	0.46uV	0.25uV
250.00000	0.87uV	------	------	0.61uV	0.48uV	0.49uV	0.32uV	0.27uV	0.40uV	0.28uV
300.00000	5.50uV	------	------	0.78uV	0.54uV	0.57uV	0.35uV	0.32uV	0.55uV	0.26uV
350.00000	2.20uV	------	------	0.85uV	0.51uV	0.70uV	0.33uV	0.34uV	0.24uV	0.33uV
410.00000	0.40uV	0.27uV	0.29uV	0.50uV	0.37uV	0.53uV	0.35uV	0.23uV	0.25uV	0.32uV
460.00000	0.42uV	0.29uV	0.32uV	0.53uV	0.40uV	0.39uV	0.39uV	0.23uV	0.26uV	0.32uV
500.00000	0.60uV	0.27uV	0.30uV	0.71uV	0.55uV	0.60uV	0.39uV	0.24uV	0.32uV	0.31uV
765.00000	2.10uV	------	------	0.37uV	------	------	0.47uV	------	------	0.39uV
855.00000	0.48uV	0.36uV	0.38uV	0.29uV	0.59uV	0.44uV	0.44uV	0.41uV	1.20uV	0.29uV
935.00000	0.49uV	0.38uV	0.40uV	0.43uV	0.44uV	0.44uV	0.57uV	0.43uV	1.40uV	0.32uV

*PRO97 column is an average of four units

PSR-500 S-meter
Settings: 470 540 610 680 750
The radio does not accept a setting above 750.
The table below lists the minimum signal in microvolts needed to turn on a given S-meter bar.

Bars	46.08	155.475	159.435	452.600	460.700	853.4875
1	0.3	0.5	0.5	0.8	0.9	0.4
2	0.4	0.8	0.8	1.4	1.5	0.7
3	0.7	1.3	1.4	2.3	2.5	1.1
4	1.1	2.3	2.4	3.9	4.4	1.9
5	2.1	4.2	4.3	7.2	8.0	3.4

Fluke 6060B Signal Generator
Wavetek A151 20dB Attenuator DC-2000 MHz
Pomona 2249-C-36 RG-58 cable (Belden 8262), 3 feet long, -0.6dB @ 900 MHz
Audio isolated detector circuit
Fluke 8050A meter, DC scale, dB function

The prevailing myth is that GRE radios are more sensitive therefore overload more easily. No data is ever offered to support this opinion, just scattered anecdotal reports in uncontrolled environments.

When judging sensitivity blanket statements are not useful as there are variations for each band among the radios. At VHF-LO and the civil air band all the radios are about equal except the BC780 which is worse than the others. On the VHF-HI band there is a spread of sensitivity values with the BCD996 best and the BC780 worst; my PSR500 was less sensitive than most other radios on VHF-HI. On the Mil-Air band the 2096 is by far the worst since it wasn't really designed to cover that band. Among the other radios the PSR-500 is worst in this band. At UHF frequencies the PSR-500 is also the worst and in general GRE radios are not as sensitive as Unidens at UHF. At 800 MHz The PSR-500 and BCD996 are the most sensitive, and the BC780 is the worst.

Scanner sensitivity is greatly affected by the front end filters and it appears that GRE did some tinkering in the PSR-500 because the sensitivity varies from the GRE Radio Shack models measured. In particular they made the 800 MHz band hot while some other bands were less sensitive than the typical GRE made Radio Shack model.

GRE radios have tended to overload on VHF-HI more than Uniden radios and clearly it is not because of sensitivity. The schematics for the PRO92, 93, 95, 97, 2055, and 96 all show that the civil air band and VHF-HI band run through a single broadband front end filter. Uniden breaks the range up into two filters, 108-136 and 136-174. FM broadcast (88-108) can hammer the VHF-HI band in a GRE radio because the wide front end filter passes the FM broadcast signals while the Uniden filter cuts off at 136 and does a better job suppressing FM broadcast. In the civil air band the GRE radio might be affect by VHF paging where the Uniden would probably be immune. Both brands will have trouble in the civil air band with FM broadcast since it uses adjacent frequencies. If the PSR-500 has the same number of filters as the PRO-96 and the others, it will have the same overload problems in the 108-174 range.

The sensitivity chart is mostly single sample measurements except for the PRO-97 where I had access to four units. There is some variation among different samples and over a production history of tens of thousands of units there are probably a few that are much better than average and a few that are much worse. The RF environment plays a huge role in the perceived sensitivity of the radios. All these factors give rise to conflicting reports about performance. You can get a general idea of how a particular scanner model might perform from measurements and schematics but in the end there is no substitute for using the radio in your environment to decide how well it works.

PSR-500 Firmware versions

CPU Updates

```
1.0  09/03/2007  Initial production release
0.1  11/05/2007  Beta revision
0.2  11/09/2007  Beta revision
1.1  11/19/2007  Production revision
1.2  02/19/2008
1.3  03/31/2008
1.4  06/10/2008
1.5  07/14/2008
1.6  08/21/2008
```

DSP Updates

```
0.2  11/06/2007  Beta revision
0.3  11/09/2007  Beta revision
1.1  11/19/2007  Production revision
1.2  02/19/2008
1.3  06/10/2008
```

****

CPU Update Details

```
==============================================================================
```
0.1

-Fixed: EDACS will no longer trunk to encrypted (Pro-Voice) calls

-Fixed: Properly display SiteID for M36 in trunking analysis mode (SiteID was previously one too low in number)

-Fixed: Pressing ATT at power-up, changing the setting, then saving will now preserve the new value

-Fixed: P25 dwell timeout when not holding/paused

-Fixed: Mot3600 CC dwell timeout when receiving RF SQ but no CC messages

-Fixed: RF Squelch timers on CCs. Should fix cases where CC could not be found

-Fixed: Monitoring of DG signals in Tune mode (would pulse the audio every few seconds)

-Improved: Unmuting on start of DG calls

-Improved: Less falsing of Mot subaudible detect in Tune mode

-Fixed: When paused while scanning, better handle changing CCs

-Improved: PC/IF remote control presents the radio's speaker mute state
 within more real time

==
0.2

-Fixed: FUNC key problem in V-Scanner mode (sometimes gave an error beep)

-Fixed: Disappearing "FrLO" softkey in TUNE mode

-Fixed: Cancel WX alerts when any WX mode "exit" key (including WX) key is
 pressed

-Fixed: SAME event/area matching when 000000 area codes are received

-Fixed: Allowed values in GLOB 'Dflt ScanList' item to match the [correct]
 help text

-Fixed: Default scan list' GLOB item to allow "0" (no scan list)

-Improved: While on a CONV object in MAN, pressing MAN again now resets the
 tuned object to allow a new mode detect (DG/FM, SQ:Search, etc.)

-Improved: While the "ShowCCInfo" GLOB setting is enabled: Removed control
 channel (CC) index/quality display from TGRP/MAN display. Within P25/M36
 modes, while showing TGRP and the voice channel (VC), show the CC index-slot
 and CC freq (blinking/alternating) with the VC frequency. This is an aid to
 understanding which CC the radio used to trunk to the VC. This is especially
 useful within multi-site areas

==
1.1

-Fixed: WX mode would occasionally / unintended increment to the next freq.

==
1.2

- This is the user loadable version of the Factory 1.2 CPU firmware.
  Will display as "uP Appl Ver:U1.2" after loading and is identical to the
  factory "F1.2" load.

- Please use with DSP version 1.2 or higher, otherwise some features
  may not operate properly

New features:

- Added brief ScanList tag and "ON vs OFF" display when toggling ScanLists
  on/off. This is displayed for >= 500 mS, depending on how large the toggled
  ScanList is

- Added find by lockout status F1:"L/Out" feature to the PGM EDIT FIND menu
  for objects that have the permanent lockout set.

- Added a low duty cycle battery icon blink (200 mS on, 1300 mS off) when
  battery charge is active (yellow vs black battery holder is not detected)

- Added a "Is Mobile" bit to remote control Get Status PC/IF command - bit 5
  of byte 1 (the byte with the RF squelch, mute, and DSP pin states). This
  will be described in additional detail within the updated user manual

- Added FUNC+F1 to Sweeper and Limit Search. Allows access to alternate
  function that is not visible when a signal is being received (in Sweeper:
  toggles band; in Limit: enters the Limits menu)

- Added within a TSYS object a "Check All CCs" option for MultiSite=STAT. If
  selected, on every SCAN mode pass, will force a check of all CC frequencies
  instead of stopping after the 'dwell' time expires.

Fixes / Enhancements:

- Improvements to P25 control channel message processing, particularly on
  non-800 MHz systems

- Improved control channel hunt speed, should result in significant speed
  improvements for MultiSite STAT and ROAM trunking systems with large
  control channel lists

- Corrected an issue where, in certain programming configurations, custom
  P25 trunking table information from one system could corrupt the stored
  values for another system

- Fixed channel selection menus in channel-based search objects

- Fixed CTCSS/DCS menu items (malfunction when F3 is pressed)

- Fixed Sweeper lockup when moving from All Bands to Public Safety, with
  certain combinations of "enabled groups"

- Changed default "EndtoneMot" value from 250 to 80. The value 80 is used
  to correct squelch tails at the end of voice transmissions on narrowband
  EDACS systems

- Corrected minor discrepancies in Motorola 3600 trunking 800 MHz default
  and splinter tables

- Improved AM unmute delay to prevent audio pops when squelch opens on AM
  transmissions. Uses current PGM FUNC GLOB "SweepAMDelay" parameter
  [150 mS])

- Minor corrections to help text for "SweepAMDelay" and "SweepFMDelay"

- Fixed MultiSite=Stat mode problem, if active CC is the first one in the
  TSYS control channel list it was never checked

- Changed GLOB menu's "default scan list" item to allow entries up to 22 (for
  Fav [Scan List 21] and SkyWarn [Scan List 22]), changed all areas of radio
  operation that allow a numerical scanlist value to be specified to allow
  values up to 22, allows Fav and SkyWarn to be specified as valid Scan
  Lists in addition to the normal Scan Lists 01-20

- Fixed issue with EDACS CCDump in Analyze mode, and corrected the order of
  the EDACS messages dumped within each two-message block

- Changed Mot 3600 Site ID display format (analyze mode) to decimal

- Fixed issue with CONV object delay time early expiration when priority
  check hits

- EDACS I-Call 00000 problem fixed

- Fixed blinking '000' in DCS Search mode menu item

- Fixed Sweeper "All Bands" group 9 text

- Fixed Sweeper line 1 display when toggling bands while "paused"

- Fixed up/down key in SCAN mode when stopped on Wx Priority (1050Hz detected)

- Fixed Private Call TGID display format in PGM menus

- Fixed P25 CC quality display percentage "%" formatting in analyze mode

- Fixed issue where a PSR-500 or PC application may not properly clone to a
  PSR-600

- Improved Tune mode ability to properly detect and display EDACS-Narrow
  control channel information

- Fixed source / target radio ID display for P25 user-to-user ("private")
  calls. They were swapped previously. This is primarily a user interface
  issue, and did not affect the operation of the scanner.

===
1.3

- This is the user loadable version of the Factory 1.3 CPU firmware.
  Will display as "uP Appl Ver:U1.3" after loading and is identical to
  the factory "F1.3" load.

- Please use with DSP version 1.2 or higher, otherwise some features
  may not operate properly

New features:

- Added 'C' command to PC/IF protocol:
  STX 'C' <bitmap> ETX <sum>
  <bitmap>:   bit 0 = CCDump on=1, off=0
               bit 1 = DSPDump on=1, off=0
   These settings are temporary. They're not written to the EEPROM
   Glob area. A power cycle will revert to the EEPROM Glob settings.

Fixes / Enhancements:

- Fixed CCDump output for EDACS message pairs for 3rd party software
  compatibility.

- Improved reliability of the NAC display within the TSYS Analyze mode.

- Changed P25 TSYS Analyze LCD display to increase readability against
  publicly available system data. ("HHH" = Hex, "DDD" = Decimal):

  From: "Sys:HHH RHH SHH"
  To: "Sy:HHH RDDD SDDD"

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1.4

- This is the user loadable version of the Factory 1.4 CPU firmware.
  Will display as "uP Appl Ver:U1.4" after loading and is identical to
  the factory "F1.4" load.

- Please use with DSP version 1.2 or higher, otherwise some features
  may not operate properly

New features:

 * Added power-up password option to the FUNCT + GLOB menu. Press PGM,
   F3:GLOB and Func-Down to go to the new item. If enabled (a non-"0000"
   password entered), the password must be entered at power up before the
   scanner will respond. The password can only be cleared by a 0-1
   initialization. The password is not transferred over the PC/IF port, so
   it is not clone-able or set/read by a PC program. The password is alpha
   numeric so there are many possibilities for its use. One can make the
   password a variable number of key presses. For example to require a
   keypress of "12" when the radio is powered on, set the password to:
   "2000". Another example is to require "2122" press on power on, set the
   password to: "AB00". Set the password back to "0000" to disable this
   feature.

 * Moved private call radio IDs to line 4, alternating between source and
   target. (Line 2 now shows VC/CC info like in group calls). P25 IDs follow
   hex/dec convention like Mot and EDACS. The radio IDs will override softkey
   text (e.g. "TGL/O", "TSYS", "Stor"), but the softkeys are still active.

 * Added "Show RadioID" option in SE-GLOB. If enabled, shows radio ID (where
   available) during voice calls.

   The RadioID will be shown on line 4 of the LCD, in place of the any
   softkey text that might normally be there (e.g. "TGL/O", "TSYS", or
   "Stor"), but the softkeys are still active.

   Radio IDs will be displayed as HEX if the "TGID Format" GLOB item is set
   to "HEX"; otherwise, they will be shown as a decimal value. (Note: the
   radio won't prefix Motorola IDs with '7').
`
   Additionally, if there is a Private Call TGRP object in the current TSYS
   for the received Radio ID, that object's alpha tag will be displayed
   instead of "RadioID:xxxxxxxx"

   RadioID information is only available for Project25, EDACS, and Motorola
   (3600 bps CC) Type-II systems. Additionally, the ID is only available if
   the radio trunks to the VC based on a "call grant" message, as opposed to
   an "update" message. The reason for this is simple: the ID(s) of the
   radio(s) involved in the call are only present in the initial grant
   messages; they generally are not contained within subsequent update
   messages.

   If monitoring a single TGRP in MAN mode, or if the only things enabled for
   scanning are TGRPs in a single TSYS, then RadioID display should be fairly
   reliable. You may not see the IDs under several conditions. Some examples
   include, but are not necessarily limited to, the following:

    * Scanning multiple trunking systems, or a single trunking system with any
      CONV objects enabled. By the time the scanner is able to sample the CC,

the initial "grant" messages will likely have been issued, leaving only
the "update" messages.
  * Scanning a single TSYS, multiple TGRPs (or even a wildcard TGRP in MAN
    mode), where the radio is in a voice call, returns to the CC when that
    call ends, then immediately goes to a new, in-progress voice call based
    on "update" messages.
  * Motorola systems, even within a single call, may only give the ID of the
    radio that initiated the call. Responses within the same call, if the
    scanner never returns to the CC, will continue to show that initial ID -
    even though other radios are involved. This is due to "transmission"
    versus "message" trunking.

  It is anticipated that users who will be interested in the RadioID feature
  will generally understand these necessary limitations.

 * Changed radio ID display for private TGRP objects so that they can be
   displayed in decimal. The format will follow the "TGID Format" item in the
   GLOB menu. IDs will be shown in HEX only if that menu item is set to
   "HEX"; otherwise, they're displayed in decimal.

Fixes / Enhancements:

 * Fixed bug in Mot 3600 CC handling which will facilitate faster and more
   reliable trunking for these systems.

 * TUNE mode: don't do trunking analysis if RxMode == AM

 * Changed max HD5 Fade value (in menu) to 10000

 * TSYS Menu: removed invalid T Tables settings from P25 ("splinter") and MOT
   VHF/UHF ("default" and "splinter")

 * Added ability to handle "mixed-mode" frequencies, where we previously
   would "stick" on DG if we ever saw DG, until a new tuning operation. Now
   it will be able to switch between FM – DG – FM automatically.

 * Trunking: added priority TGRP checks at start of each trunking pass to
   enhance priority operation.
   Stops after earlier of:
     a. priority TGRP found,
     b. 200 mS delay expires,
     c. first TGID seen again, or
     d. two scan markers seen
   This doesn't wait for new priority TGRPs to *go* active; it makes us look
   for priority TGRPs that are *already* active, since it's not a rigid time-
   based delay (early outs if not a very active system). However, any that do
   go active while we're waiting will be picked up.

 * Disable DSPDump while V-Scanner Load, Store, or "read folder info"
   operations are running. This is to fix the "V-Folder error" message seen
   when loading a V-Folder that has DSPDump enabled.

 * Enhanced the P25 CC message handling code to facilitate the RadioID
   feature above which has a nice side effect to speed the P25 CC (trunking)
   operation.

 * In Mot 3600, setting a TSYS "Dwell" to anything other than the default of
   0 (setting 0 = "use an internal 'auto' time") will also make the scanner
   ignore Scan Markers - *forcing* the selected Dwell time. When Dwell = 0,
   two Scan Markers, on systems that send them, will cause the radio to leave

the TSYS immediately, even if the internal 'auto' time has not yet
expired. Previously, Scan Markers would have this same effect, even if the
user had selected non-zero Dwell time for the TSYS.

* Fixed menu entry of private call TGRP IDs (now just a 'number' whose
  format defaults to the "TGID Format" setting). When switching a TGRP
  object between Group and Private, the ID menu item's type is toggled
  between "Talkgroup" and either "Hex" or "Dec" (depending on TGID Format
  setting). Within the "Hex" and "Dec" settings, of course, the user is free
  to toggle between the two formats for data entry.

Other:

 The following enhances the ability of PC based trunking analysis
 applications to better track the overall trunking system's state:

* Mot 3600: when purging CC message queue when demod errors are detected,
  dump the purged messages to PC/IF. Also dump the "offending" message. This
  is to address apparent drops in CC rate if/when bad messages are detected.
  (Purged/erroneous messages were not dumped previously.) The purged (but
  otherwise good) messages will have a ":P" suffix; the bad messages will
  have an ":Err" suffix.

* P25 (9600): Please load DSP version 1.3 which has a similar change to the
  above to benefit the analysis of these systems. When DSP version 1.3 is
  loaded the PC/IF will dump the P25 error messages with a suffix of ":CRC
  Error".

===
1.5

- This is the user loadable version of the Factory 1.5 CPU firmware.
  Will display as "uP Appl Ver:U1.5" after loading and is identical to
  the factory "F1.5" load.

- Please use with DSP version 1.2 or higher, otherwise some features
  may not operate properly

New features:

* Per FCC approval, changed 700 MHz frequency tunable range to:
  764000000 MHz - 805996875 MHz
  (all on 3.125 kHz steps)

* Changed 700 MHz ranges in Public Safety Search and Sweeper to:
  764000000 MHz - 766996875 MHz
  769000000 MHz - 775996875 MHz
  794000000 MHz - 796996875 MHz
  799000000 MHz - 805996875 MHz
  (all on 3.125 kHz steps)

* Added "connect tone" display to M36 analyze mode, alternating with other
  data (QQ% SID:xxxx Syy).

* Added "OmniLink" 6-char site name to M36 Analyze mode alternating with
  other data (QQ% SID:xxxx Syy).

* Added "RadioIDAlert" item to FUNC+GLOB menu. If set, then we'll show the
  private TGRP's alert when:
  a. showing a group call.
  b. showing the private TGRP's tag on line for for the radio ID.
  c. private TGRP's "LED Color" is non-zero (the default 'off').
  d. new menu item enabled.

Fixes / Enhancements:

 * Fixed missing 'DG' display for digital trunked VCs (bug that was
   introduced in F1.4).

 * Fixed P25 CC analyze problem with system ID info (bug that was introduced
   in F1.4).

 * Added timeout to trunking analysis results in TUNE mode, so spurious false
   detects (esp. Mot 3600 low-speed) won't cause persistent display of
   trunking data.

 * Fixed issue where occasionally, pressing MAN while in SCAN mode would not
   go to the last active object.

 * Fixed problem when multi-scanning some EDACS systems.

 * Swapped Source vs Target Radio IDs in handling of EDACS "I-Calls" per
   customer reports.

 * Un-swap (version 1.4) source and destination radio IDs when showing a
   Private Call Wild Card where the source ID was locked out.

 * Fixed search modes possibly skipping a freq while paused, if zeromatic is
   turned on. While waiting for unmute delay, we were checking zeromatic
   even if paused.

 * Added additional qualification to storing polled P25 NAC. We only store it
   if:
    the new NAC is non-zero, OR
    we don't already have a NAC value, OR
    the NAC value we already have is zero

Other:

   For users that have VHF trunked systems which utilize 5 kHz centers, the
   following changes were made:

 * Allow 5 kHz steps between 138 MHz and 174 MHz. These are enabled with a
   new menu item in FUNC+GLOB. If not turned on, use the 'normal' steps. If
   turned on, 5 kHz steps are used in ALL modes. CONV objects created in one
   "mode" will tune based on the "active mode" - that is, if you create a
   CONV object 138.005 MHz with the feature enabled, the radio will tune to
   138.000 MHz if the the feature is not enabled (although 138.005 will be
   displayed)

 * Changed default receive mode for 138 MHz to 144 MHz to AM if the new
   "5 kHz" feature is disabled in the FUNC+GLOB menu (default).

 * Changed default rx mode for 138 MHz to 144 MHz to FM, if the new
   "5 kHz" feature is enabled in the FUNC+GLOB menu.

```
================================================================================
```
1.6

- This is the user loadable version of the Factory 1.6 CPU firmware
  which will display as "uP Appl Ver:U1.6" after loading and is
  identical to the factory "uP Appl Ver:F1.6" firmware.

- Please use with DSP version 1.2 or higher, otherwise some features
  may not operate properly

New features:

 * Allow Temporary Lock Out (TLO) to also apply to TSYS objects per customer
   requests.

Fixes / Enhancements:

 * Change 3600CC CT display from "76.60" to "76.76" and improve Mot3600 CT
   display decode.

 * Improve 3600CC OmniLink site name decode.

 * Improve the reliability of the LTR trunking decode analysis display
   within Tune mode.

 * P25 Analyze: Improve the reliability of the NAC decode.

 * When displaying a CONV object, show the scan list tag alternating on line
   3 (along with the CONV tag):
   The Scan List displayed will be:
   - MAN and PGM modes: the current scan list
   - SCAN mode: the lowest-numbered enabled scan list to which the CONV
     object belongs
   The Scan List will not displayed while scanning FAV or SKY, or when those
   two scan lists are shown in MAN and PGM modes.

 * Fixed occasional "SW" Scan List indication displayed to the left of the
   object number, when pressing MAN.


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********************************************************************************
```

DSP Update Details

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================================================================================
```
0.2

- Fix V-Folder numbering error on U0.1, otherwise identical to U0.1

```
================================================================================
```
0.3

- Slight improvement over U0.2, especially on very weak signals.

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===============================================================================
```
1.1

- This is the loadable version of the Factory 1.1 DSP firmware.
  Will display as "U1.1" after loading and is identical to the
  factory "F1.1" load.

  This is identical to the beta version "U0.3" which provides improvement
  in Project-25 decoding on most systems over the factory "F1.0" firmware.

```
===============================================================================
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1.2

- This is the user loadable version of the Factory 1.2 DSP firmware.
  Will display as "DSP App Ver:U1.2" after loading and is identical to the
  factory "F1.2" load.

- Please use with CPU version 1.2 or higher, otherwise some features may not
  operate properly

- Improves P25 control channel message processing, particularly on non-800
  MHz systems

- Fixed control channel message processing issue that, on certain systems,
  resulted in missed talkgroup calls

- Fixed control channel message processing issue that, on certain systems,
  resulted in an abnormally low control channel quality % display, even in
  areas with strong signals. ** Please note that if you use the TSYS
  Multi-Site "Roam" mode, on a system where the CC displayed low quality
  values, you may need to modify the "Threshold Hi" and "Threshold Lo"
  settings to higher values for the Roam feature to properly work

- Fixed issue of not being able to properly use NACs starting with "3" or
  with an "03" in the last two digits

```
===============================================================================
```
1.3

- This is the user loadable version of the Factory 1.3 DSP firmware.
  Will display as "DSP App Ver:U1.3" after loading and is identical to the
  factory "F1.3" load.

- Please use with CPU version 1.2 or higher, otherwise some features
  may not operate properly

- On P25 9600bps Control Channels, will dump multi-packets to the PC/IF port
  while CCDump is enabled. This is to add further support for 3rd party
  trunking analysis PC software for P25 systems.

  This [new feature] will have slightly increased reliability when used with
  CPU version 1.4 firmware or above.

  Otherwise this version is identical to DSP version 1.2. Everyone can
  upgrade to version 1.3 even if external trunking analysis software is never
  used.