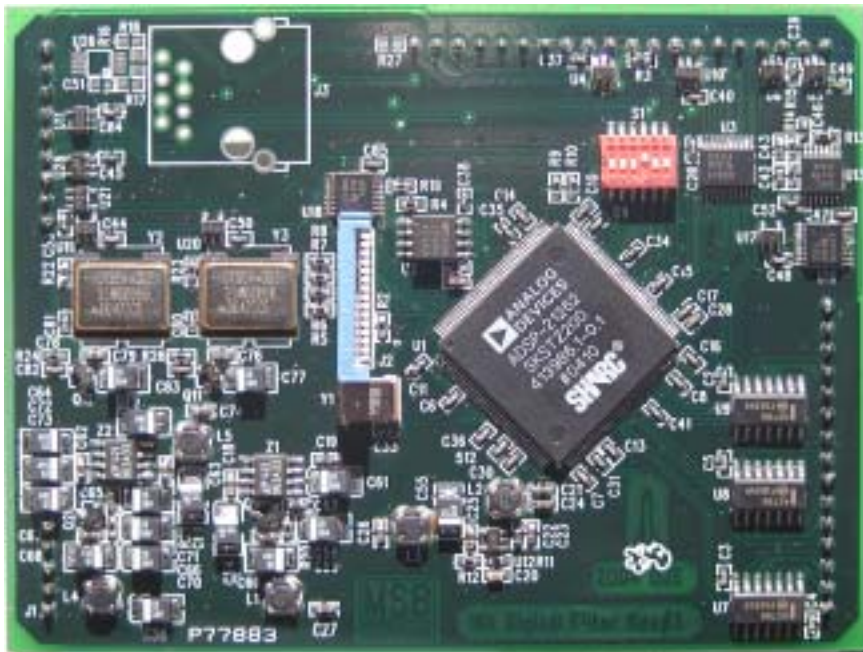


# PLATINUM

---

## BY MSB TECHNOLOGY



## 16x PLATINUM DIGITAL FILTER INSTRUCTION MANUAL

# INSTALLATION

---



## 16x Digital Filter Installation Procedure:

1) Remove one Side Panel (End Cap) by removing 4 Allen Screws as shown.

2) Remove 6 Philips screws from top and bottom of cover. Remove cover, and disconnect ribbon cable that attaches the Front Display to the Platinum Main Board. Reference CD Players will have more than one ribbon cable; both will have to be removed. Set cover, Screws and End cap aside.



Platinum Revision #

16x Digital Filter

# INSTALLATION

3) Remove old Digital Filter Board, and install your new 16x Digital Filter. Be sure to properly align the board so the pins of the filter board are properly mated to the socket on the Main Board. Depending on your Platinum, there may be extra pins on the Filter Board. This is OK.

Note: The DIP switch on the 16x Digital Filter board is pre-set by MSB. It does allow you certain options; please see the “Operation” section of this manual.

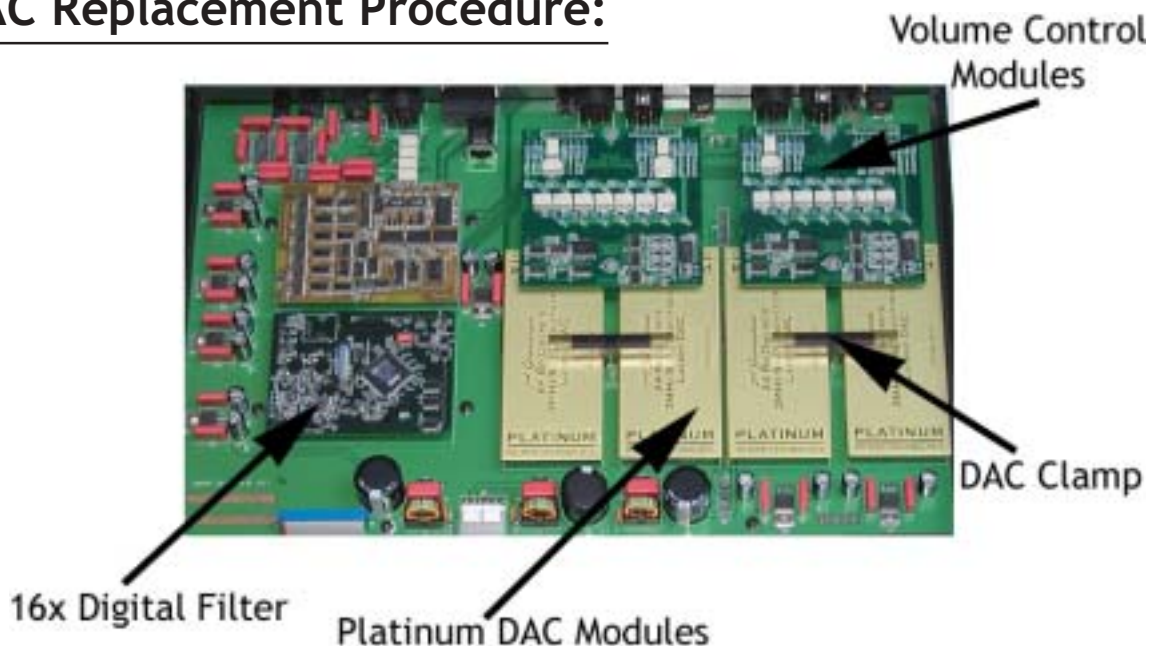
3) Locate the Revision Number of the Platinum Main Board. If your Board Revision is 6.0 or above, you may skip the rest of this installation and proceed to the “Operation” section of this manual.

For Revision 5.2 and below please check the Serial Number on the back of the machine. If the Serial Number is followed by the letter “T” then you may proceed to the “Operation” section of this manual.

If the Serial Number does not contain the letter “T” you will need to replace the DAC Modules in your machine at this time for proper operation. If you did not receive new DAC Modules with this upgrade, please contact MSB to make proper arrangements. For the best performance gain of your new upgrade, we highly recommend that you upgrade your DAC Modules at this time to the latest Generation II DAC, or the Platinum Signature DACs. It is possible to use your first generation DAC Modules but they must be sent to MSB to be modified for proper operation with this upgrade.

NOTE: If you have a Rev. 5.2 or earlier Main Board, and have previously Installed Generation II or Signature DACs as part of another upgrade, you will need to send these Modules to MSB for modification or exchange.

## DAC Replacement Procedure:



### 1) Volume Module Removal

Remove Volume Control Modules. These are the two boards that are mounted directly above the four DAC modules. To remove these boards, first lift the edge that over hangs the DAC modules to disconnect the plastic standoff. Once the plastic standoff is disconnected on the DAC side, lift evenly on the back panel side of the volume module to disconnect the second standoff and the two multi pin electrical connectors. Be sure to pull straight up or the electrical connectors pins can be damaged. These are very well connected and do require a bit of force to remove them.

# INSTALLATION

---

2) Remove DAC Modules. Depending on the version of your Platinum DAC product, these modules may have a restraining device (clamp) that must be removed before the DAC modules can be removed. Remove the DAC module restraining devices and set them aside. The four DAC Modules can now be removed. Pull straight up on each module, one at a time. Caution, the DAC cover can be extremely sharp. Place these modules in a safe place.

3) Install the new DAC Modules. The DAC Modules will be marked for a specific location of your Platinum Main Board. The Main Board is also marked with positions (- Right DAC, + Right DAC, - Left DAC, + Left DAC). It is extremely important that the DAC Modules be installed in the proper location. Failure to do so will cause your Platinum to not operate correctly.

4) Replace the Restraining Clamp Device. - If you are upgrading your DAC Modules at this time you may notice the clamps do not fit in the same way they did with the older modules. If your DAC uses the two black center clamps (as shown in the picture) these can be installed upside down (with the pointed end up) to keep the DACs in position. If your unit used the two brass rails, these can be installed as before for safe shipping, but be sure to check that the DAC modules are fully seated before powering the DAC up after shipping.

5) Install the Volume Control Modules (DAC II and CD Station II users). Care must be taken when installing the volume control boards to be sure the long pins are seated properly and not bent or misaligned.

6) Reconnect the Ribbon Cable(s) and place the cover on top of the unit. Install 6 screws on the top and bottom of the cover. Replace side panel (End Cap) with 4 Allen screws.

## Quick Operation:

1) Turn Upsampling Off (light off).

2) Filter Option button toggles between to filter choices. For most systems the button out (light off) is the preferred filter setting.



# THEORY

---

The MSB 16x Digital Filter is an ultra high-resolution digital front end for your Platinum DAC or CD Player. The combination of a high-speed onboard computer and carefully optimized software and hardware result in the best possible music quality from your Platinum. During the development of this peerless digital audio system MSB has accumulated a wide body of unique knowledge allowing us to design the ultimate digital filter.

One of our primary goals at MSB is to provide the music lover with the most accurate musical experience possible. During years of careful design and improvement of our custom discrete DACs, which form the heart of your Platinum DAC, we realized that the Platinums sound quality was no longer limited by them. We soon narrowed the problem to the Digital Filter which was feeding our DACs. While the excellent Burr-Brown (Now owned by Texas Instruments) DF1704 Digital Filter had served us well in the past, it had become the bottleneck once we started using our new Second Generation DAC modules. After a thorough search of all the available off the shelf and custom DSP based Digital Filters we realized that little improvement could be had from any of them. With no other option in sight we decided to build our own solution.

Converting the ones and zeros of Digital Audio into music is an enormously delicate and critical process. Each individual sample that makes up the audio stream must be converted into the high resolution, continuous analog voltage that can be transformed into the sound that you hear. Any misstep can corrupt the final result ending with audio that does not sound anything like the original recording. Errors in translation can make a harsh, veiled, muddy, and/or tonally colored result. Minimizing each potential problem allows the original recording to shine through.

Audio reproduction starts when the DAC receives the binary coded information from the source. The first step requires recovering the audio samples, which represent the final output voltages, and the timing, which tells the DAC when to output those voltages. Next the sample rate is raised and the data is digitally filtered. While it is possible to feed the DAC with the original audio samples thereby avoiding the use of a digital filter skipping this step has many unintended consequences. After being digitally filtered the digital stream is feed to the DAC. The DAC receives the digital audio samples and converts them into a continuous analog voltage. The best DACs, such as our Second Generation DAC Modules or Signature DAC Modules, instantly convert the data into a precise continuous voltage waveform with timing determined by the DACs conversion clock.

The digital filter is necessary because mirrored image frequencies created during the conversion process must be removed. If the DAC did not have a digital filter, an analog filter with an aggressive response must remove these image frequencies. These brick wall analog filters seriously damage the signal by corrupting the original phase of the sound and cannot fully remove the high frequency images. This results in harsh or rolled off high frequencies and poor soundstage focus.

Traditional digital filter designs consist of cascaded FIR (Finite Impulse Response) filters, each of which raise the sample rate by two. The intermediate data between the filters is usually stored at less than 40bit resolution. Since the next filter works with previously computed data the resolution decreases with each filter pass. This limits higher quality digital filters to a low oversampling rate (usually 8x) before the output starts to deteriorate. The loss in resolution is typically not apparent when using the best conventional digital filters with standard DAC chips, but in combination with our high resolution 24bit Second Generation, or Signature DACs the problem is very apparent. The sound becomes muddy, veiled and un-involving when using any off the shelf digital filter. To counter this problem the MSB 16x Digital Filter does it's filtering in one filter stage that raises the sampling rate by 16.

FIR filters operate by multiplying each sample in the data by a set of filter coefficients and then summing the result. Most digital filters round the result of each addition before the adding next sample. This repeated roundoff results in a similar problem to the cascaded 2x filter approach, muddy sound. MSBs digital filter uses bit perfect accumulation in an 80bit accumulator completely eliminating these debilitating round-off errors. Only as the last step do we carefully convert the audio to the 24bits our DACs require. The

# THEORY

---

high sampling rate of the output allows us to include advanced ultrasonic dither and noise shaping techniques in this step to achieve greater than 24bit effective resolution.

Through extensive listening tests we have found that the choice of filter coefficients has a great impact on the tone of the music. We have found that steep, phase perfect "Brick Wall" filters tend to sound the most neutral but are also the most difficult to implement without problems. Improvements we have made in our digital filter, with its single stage design and 80bit computation, allow us to use very steep filters with no compromises.

We recognize however that different people often have very different taste in their music. For those who do not like the standard choice of filter, or require a different filter response, we have provided a very easy method for customizing your MSB 16x Digital Filter. By playing a standard CD containing a custom filter algorithm you can temporarily change the filter inside your 16x Digital Filter. This CD filter loading allows you to load almost any FIR filter quickly and easily. You may also upgrade your MSB 16x Digital Filter with the latest custom software just by playing a special Firmware Upgrade CD.

The timing of the DACs conversion clock also has a large impact on sound quality. Any periodic frequency change or "jitter" causes a loss of focus in the reproduced audio. The high power and large memory space of the SHARC DSP we use allows us to offer a unique Ultra Clock upgrade to your MSB 16x Digital Filter. The Ultra Clock upgrade adds two ultra precision, ultra low jitter TCXO oscillators and custom clock handling circuitry to your board. This custom circuitry allows us to do much more than simply reclock the data, as other jitter reduction boxes do, but completely replace the incoming clock!

Most jitter reduction schemes rely on Phase Locked Loops or Asynchronous Sample Rate Converters. The Phase Locked Loop is able to reduce jitter to a significant degree but not eliminate it because the output clock must be related to the input clock. The Asynchronous Sample Rate Converter, which completely replaces the data and clock, seems ideal until you realize that the complex computation involved harms the data by permanently imbedding a portion of the clock jitter into the data. Sample Rate conversion is also detrimental to the sound due to the complex and sub optimal digital filters involved, which must change their filter response to track minute changes in the input to output clock ratio.

The Ultra Clock upgrade sidesteps both of these problems by storing the incoming data in an extremely large buffer (1/2 second of audio.) The onboard clock then reads out the data without jitter. The onboard clocks are totally independent from the input clock so that no jitter is transferred to the output. True absolute digital silences such as a track skips are selectively shortened or lengthened by the DSP to keep the buffer synchronized. This process is carried out seamlessly by the DSP to assure that all compatible sample rates have their clocks properly replaced. Compatible sample rates are 44.1Khz, 96Khz, 176.4Khz, 192Khz, and 384Khz. Other sample rates automatically use the recovered clock from the transport without user intervention. The 48Khz sample rate does not support clock replacement due to the large latency incurred by the buffer, which would cause audio from a DVD movie to be unsynchronized.

# OPERATION

## The Filter Option Button

On most Platinum products, the Platinum DAC, Platinum Plus, Platinum DAC II and the Platinum Reference CD Player, a single front panel button allows some control over the DSP. The Filter Option button allows you to select each of the two standard filters programmed into the DSP. The Filter Option button also allows you to cancel any temporary filter that has been loaded (See the Temporary Loadable Filter section).

The Filter Option Button Out is the preferred filter setting of MSB. This filter has been optimized for extremely flat pass band response, excellent tonal balance and perfect phase response. This Filter is a 3000+ tap symmetrical "brick wall" FIR with extended high frequency response and a very low image energy of -180db. This Setting is the most tonally neutral of the two standard filter settings.

The Filter Option Button In attenuates the High Frequency content of all digital sources a small amount to reduce brightness in already harsh sounding systems.

Toggling the Filter Option Button will cancel any externally loaded Temporary Custom Filter which may be active.

## The Onboard Option Switch

The MSB 16x Digital Filter includes an onboard option DIP switch, which is a small multiple position switch on the 16x Digital Filter board that allows additional configuration. With this switch you may select the onboard Ultra Clock operation, Dither, Mute Mode, Single Ended Operation and the Motherboard Revision.

Switch 1, Clock Replacement Mode:

- Switch 1 ON = Clock Replacement Mode
- Switch 1 Off = Low Latency Synchronized Mode, or no onboard clocks installed.



Switch 1 allows you to enable the onboard Ultra Clock option. When enabled this option will completely replace the incoming clock with an ultra low jitter TCXO based clock. The DSP monitors the incoming sample frequency and detects standard sample rate signals, 44.1Khz, 96Khz, 176.4Khz, 192Khz and 384Khz. The onboard clock then completely replaces the incoming clock. Other sampling frequencies use the incoming clock from the source. The DSP allocates a huge internal FIFO buffer (1/4 second) that stores the incoming audio to decouple the incoming and outgoing data streams. Long absolute digital silences in the music stream, such as between tracks and during pauses, are selectively shortened or lengthened by the DSP to maintain data synchronization. This results in a significant delay between the audio source and the analog audio. You will not normally notice this delay unless video is synchronized to the audio. For this reason the 48Khz sampling rate (which is 99% video) only operates in Low Latency Mode with no clock replacement. While using the onboard clock some very long musical performances greater than one hour with no silences, pauses or track skips may cause a buffer overflow when using a standard transport. This will sound like a small CD skip. You will probably never encounter this case but if you do MSB can install a special ultra high accuracy clock in your transport or other audio source to totally eliminate this possibility.

Switch 2, Dither Mode:

- Switch 2 ON = Dither On
- Switch 2 Off = Dither Off

Switch 2 allows you to enable the onboard dither generator. With the dither activated the MSB 16x Digital Filter continuously adds a tiny amount (-110db) of random ultrasonic dither to the Output. We have found through extensive listening tests that this tiny amount of dither greatly increases the perceived resolution of the audio without harming the music in any way. The dither is added separately in common

# OPERATION

---

mode to the positive and negative DACs in the Platinum and mostly cancels itself on playback helping to linearize the DACs. The dither is generated by a highly random, non-repeating white noise generator and is then digitally filtered to remove all dither content close to the audio band. All of the dither between 0Hz and 40Khz is removed. Unlike some noise shaping algorithms like DSD the very low level of the ultrasonic dither involved should never cause system high frequency related problems. MSB highly recommends that you keep the dither enabled.

## **Switch 3, Reserved:**

Switch 3 ON = Future Upgrade Feature On  
Switch 3 Off = Future Upgrade Feature Off

Switch 3 is reserved for future upgrades. Please keep this switch off.

## **Switch 4, Mute Mode:**

Switch 4 ON = Play any Source  
Switch 4 Off = Mute Data Sources

Switch 4 allows your Platinum to play audio marked as data. If the digital source marks the audio as data, as sometimes happens, and this switch is off no sound will be produced by the Platinum. Turning this switch off will allow the Platinum to mute unwanted data such as Dolby Digital data. Turning this switch on will allow the Platinum to play audio from any source.

## **Switch 5, Balanced Mode:**

Switch 5 ON = Normal Balanced and SE Mode  
Switch 5 Off = Special Single Ended Only Mode

Switch 4 allows manipulation of the individual data streaming to each DAC. If the switch is ON, the Platinum operates normally with both the balanced and single ended outputs active. If this switch is OFF, the Platinum reverts to a special mode in which all four DACs in the Platinum reproduce the same analog phase. This allows some interesting custom analog outputs from the Platinum. Each phase on the balanced XLR connector is the same allowing the connection of a Platinum to three single ended components. This mode also gives MSB the ability to custom modify your Platinum to sum together each pair of DACs. This upgrade increases the sound quality of the single ended RCA output while disabling the balanced XLR jack. If you are interested in this custom upgrade contact MSB for details.

## **Switch 6, Mother Board Revision:**

Switch 6 ON = Motherboard Revision 6.0 or Higher  
Switch 6 Off = Motherboard Revision 5.9 or Lower

Motherboard Revisions 5.x and below require this switch to be OFF. Motherboard revisions 6.x and higher require this switch to be ON. You may read the motherboard revision at the lower right corner of the motherboard or as the second digit from the right in you Platimums serial number. The serial number is

# CUSTOM SOFTWARE AND TEMPORARY FILTERS

---

located on the lower right rear corner of the Platinum's jack panel.

The MSB 16x Digital Filter allows you to load custom filters and software from a standard CD transport with MSB's CD update service. Special features and filters are available to customize your MSB 16x Digital Filter. If you have special requirements please contact MSB Technology.

A custom digital filter will allow you to tailor the sound of your Platinum. Any form of custom FIR filter may be loaded into the MSB 16x Digital Filter. You may select a custom filter from our library, you may have MSB design a filter to your specifications or you may send MSB a list of FIR Filter coefficients that we can format into a CD Loadable file for you. You cannot permanently damage your 16x Digital Filter Board by loading a Temporary Custom Filter, it is only active until you toggle the Filter Option Button, Power down the Platinum or play an audio track containing the Special Cancellation Code. Contact MSB Technology for details on custom filters.

## **Step One, Verify Your Equipment Compatibility**

To successfully load your custom filter you must have your Platinum connected to a transport that will not change the Data. Almost all CD players are acceptable, however there are some important exceptions. Upsampling CD transports will not work; this includes the drive internal to the Platinum Reference CD Player and Platinum Reference CD Station II. To load a filter to these machines you will have to connect your Platinum to another source to load the custom filter file. The Upsampling drives are fine for playing audio after the upload however. DVD players should work fine when they are configured in a mode that does not affect the Data such as CD pass-through mode.

## **Step Two, Burn the CD**

When burning a CD containing the custom filter you must burn the WAVE audio file directly to a CD without first converting it to another audio format such as MP3. Converting the WAVE file to another format will destroy the careful formatting which allows DSP to load filters directly from a CD. You may however burn other audio to the CD as separate tracks. This allows you to create a CD with a custom sound that differs from the rest of your collection. A suggestion is to place a track containing the Custom Filter on the CD as track 1 and place the Special Filter Cancellation Code as the last track. This will allow a CD to play through with a custom filter leaving your Platinum in the normal filter mode at the end of the CD.

## **Step Three, Play the CD**

To ensure a proper load of the filter you must remember to disable any digital processing before the 16x Digital Filter. This includes turning off processing in DVD players, Upsampling in CD Players and Upsampling in the Platinum itself. If the Filter Load Fails because the equipment is not compatible or the track is not played through the MSB 16x Digital Filter the track containing the Custom Filter will play a short very quiet noise burst followed by a Filter Update Failed message. A successful load will just be a short, five-second silence.

## **Step Four, Cancel the Filter**

A custom loaded filter in a MSB 16x Digital Filter will remain the dominant filter of the DSP until some action is taken by the user to cancel it. Toggling the Filter Option Button, powering down the unit, playing a CD track with the Special Filter Cancellation Code or loading a new Temporary Custom Filter will immediately cancel the filter.

# LOADING NEW FIRMWARE

---

Loading custom 16x Digital Filter Firmware will permanently change the operation of your DSP. MSB Technology can configure custom software for your DSP to meet virtually any requirement. Playing a CD track containing the new firmware will erase the current software in your 16x Digital Filter and replace it with the contents of the update file. This is just as safe as loading a Custom Digital Filter if one precaution is faithfully observed. The firmware update process takes about 20-30 seconds and you **MUST NOT INTERRUPT THE POWER TO THE PLATINUM** while the new firmware is loading. You must wait for the message after the Firmware Update before interrupting your Platinum's power. If the power to the Platinum is interrupted during a firmware update you will have to return your 16x Digital Filter Board to MSB for reprogramming. MSB will charge you a small fee for this service. If you have accidentally loaded firmware that you do not wish to have on your Platinum do not try to cancel it while it is loading, simply wait for the update to complete and then load the firmware you do wish to have on your 16x Digital Filter Board.

## **Step One, Verify Your Equipment Compatibility**

To successfully load your new Firmware you must have your Platinum connected to a transport that will not change the DATA. Almost all CD Players are acceptable however there are some exceptions. Upsampling CD transports will not work; this includes the drive internal to the Platinum Reference CD Player and Platinum Reference CD Station 2. To load a firmware file to these machines you will have to connect your Platinum to another source to load the firmware. The Upsampling drives are fine for playing audio after the upload however. DVD players should work fine when they are configured in a mode that does not affect the Data such as CD pass-through mode when connected to their s/pdif digital output.

## **Step Two, Burn the CD**

When burning a CD containing the new firmware you must burn the WAVE audio file directly to a CD without first converting it to another audio format such as MP3. Converting the WAVE file to another format will destroy the careful formatting which allows DSP to load its new Firmware directly from a CD. You cannot however corrupt the Firmware in a way that will allow it to load incorrect software. The firmware update file is protected by powerful error detection and encryption that will not allow a damaged file to be loaded into the DSP. A corrupted or damaged firmware CD will simply be rejected by the DSP and fail to load the new software.

## **Step Three, Play the CD**

To ensure a proper load of the firmware you must remember to disable any digital processing before the 16x Digital Filter. This includes turning off any processing in DVD players, Upsampling in CD players and Upsampling in the Platinum itself. If the Filter Load Fails (the equipment is not compatible or the track is not played through the MSB 16x Digital Filter) the track containing the new firmware will play a short very quiet noise burst followed by a Firmware Update Failed message. A successful load will just be a 20-30 second silence followed by a New Firmware Confirmation message. The new firmware is running at this point, you do not have to restart your Platinum to enable the new features.

## **Step Four, Enjoy Your New Features**

Custom Firmware permanently changes the software running on your DSP. This change occurs immediately following a firmware update. You do not need to reset or power off your Platinum. Powering the unit off after a firmware update will load the new software on power-up, the old software was completely erased. If you are not happy with your new firmware simply load your old firmware using the instructions above.