Section 3
Operation

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Caution

The installation and servicing instructions in this manual are for use by qualified personnel only. To avoid electric shock do not perform any servicing other than that contained in the Operating Instructions unless you are qualified to do so. Refer all servicing to qualified service personnel.

Controls and Meters

Arrow Keys (↑, ↓, ←, →) are used for moving around screen to select a function to be changed.

Control Knob is used for changing the setting that is selected by the arrow keys.

Screen Display provides all metering information, labels the five soft-key buttons, provides control setting information.

Screen CONTRAST Control adjusts the optimum viewing angle of the screen display.

Five Soft Key Buttons provide access to all functions and controls. The functions of the buttons change with each screen, according to the labels at the bottom of each screen

ESC Button provides an escape from current screen, returns user to the next previous screen, and repeated ESC commands will always return you to the `IDLE G/R` screen.

HELP Button provides HELP information for the current screen and provides detailed help for all of the buttons on that screen (by pushing HELP button, then the screen button).

POWER LED lights when the unit is powered. (It monitors the unregulated +12V DC bus.)

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Introduction to Processing

Some Audio Processing Concepts

Compression reduces the difference in level between the soft and loud sounds to make more efficient use of permitted peak level limits, resulting in a subjective increase in the loudness of soft sounds. It *cannot* make loud sounds seem louder. Compression reduces dynamic range relatively slowly in a manner similar to riding the gain. Limiting and clipping, on the other hand, reduce the short-term peak-to-average ratio of the audio.

Limiting increases audio density. Increasing density can make loud sounds seem louder, but can also result in an unattractive busier, flatter, or denser sound. It is important to be aware of the many negative subjective side effects of excessive density when setting controls that affect the density of the processed sound.

Clipping sharp peaks does not produce any audible side effects when done moderately. Excessive clipping will be perceived as audible distortion.

Loudness is subjective. The human perception of loudness does not correlate well to the readings of any commonly-accepted level meter, whether VU, PPM, or absolute peak. This is because:

1) the absolute levels of some frequency bands are more important than others in determining how loud a sound seems to the listener,

2) a sound spread out over a wide frequency range sounds louder than would the same amount of sound energy in a narrower range, and

3) the time-constants of the individual spectral detectors in the ear affect the perceived loudness of a sound, as does

4) the overall duration of the sound.

The 8282's loudness controller is based on a model (developed as a result of twenty years of research at the CBS Technology Center) that analyzes sound with reference to these psychoacoustic factors.

Distortion in Processing

In a competently-designed processor, distortion occurs only when the processor is clipping peaks to prevent the audio from exceeding the peak modulation limits of the transmission channel. The less clipping that occurs, the less likely that the listener will hear distortion. However, to reduce clipping, you must decrease the drive level to the clipper, which causes the average level (and thus, the loudness) to decrease proportionally.

The pre-emphasis curve used in most television aural channels introduces further complications. Pre-emphasis boosts the treble at 6dB/octave starting at 2.1kHz (for 75μs countries) or 3.2kHz (for 50μs countries). This reduces the headroom available at high frequencies, and makes it difficult to achieve a bright sound. This is because bright sound requires consider-

able high frequency power to appear at the output of the receiver's de-emphasis filter, and thus requires a *very large* amount of high frequency power to be transmitted so that a sufficient amount will survive the de-emphasis process.

Without very artful processing, the pre-emphasis will radically increase the level of the peaks and force you to decrease the average level proportionally. Orban's high frequency limiting and distortion-canceling clipping systems greatly ease this trade-off, but cannot entirely eliminate it. Therefore, you can only increase brightness by reducing average modulation (loudness) — unless you accept the increased distortion caused by driving the final clippers harder.

Loudness, Brightness and Distortion

In processing, there is a *direct trade-off* between loudness, brightness, and distortion. You can improve one only at the expense of one or both of the other two. Thanks to Orban's psychoacoustically-optimized designs, this is less true of Orban processors than of any others. Nevertheless, all competent processor designers must acknowledge and work within the laws of physics as they apply to this trade-off.

Perhaps the most difficult part of adjusting a processor is determining the best trade-off for a given situation. In television audio, excessive or insufficient loudness (by comparison to other channels) is simply a viewer irritant. The advantage of Orban's optimized processing is that the processing can be adjusted to create the desired loudness, yet still remain free from irritating artifacts like audible clipping distortion or dullness caused by excessive high-frequency limiting.

Controlling Dynamic Range

The most crucial commandment in film and television audio is this: *dialog must always be intelligible*. Television audio is usually heard under less-than-ideal conditions, and the dynamic range of television audio must be controlled accordingly. Apartment-dwellers must limit the loudness of their television sets to avoid disturbing neighbors or even other members of the family. At the quiet side, intelligibility of dialog is often impacted by environmental noise such as children playing or a dishwasher going in the kitchen. When one considers the fact that the hearing acuity of a significant portion of the audience is somewhat impaired compared to that of a healthy 20-year-old, one concludes that *the dynamic range of dialog in television audio must not exceed 15dB* if it is to be intelligible to 99% of viewers under common domestic viewing conditions. Feature-film dynamic range is completely inappropriate for television audio, and the dynamic range of a significant portion of television source material must be compressed to best serve the audience. The challenge (which OPTIMOD-TV effectively meets) is to compress dynamic range unobtrusively.

OPTIMOD-TV — Processing for Any Programming

OPTIMOD-TV can be adjusted so that the output sounds as close as possible to the input at all times (using the Protection Limiter Structure), or so that it sounds open but more uniform in frequency balance than the input (using the Two-Band structure or slow Five-Band

structures), or so that it sounds dense, quite squashed, and very loud (using the fast Five-Band structure).

The dense, loud setup is almost always inappropriate for television audio unless the station has unusual programming and goals. Most stations will want to use the Protection structure when broadcasting material that has been carefully produced by people cognizant of the dynamic range limitations of television audio. For most other program material the Two-Band or Slow Five-Band structures are appropriate.

Adapting the 8282's Sound to Your Programming

The subjective setup controls on the 8282 give you the flexibility to adapt the processing to individual program segments. In most cases, your goal should be to choose the type of processing that best optimizes dynamic range while controlling the loudness of the loudest sounds so that they are not irritating and are consistent with the loudness of other stations.

When you start with one of our factory presets, there are two levels of subjective adjustment available to you to let you customize the factory preset to your requirements: LESS-MORE and FULL-CONTROL.

LESS-MORE

The LESS-MORE control allows you to set the amount of average dynamic range reduction provided by the processing. As you go from less to more, the loudness of loud sounds will stay about the same but the loudness of quieter sounds will increase. Because of the 8282's sophisticated gating circuits, very quiet material like background sounds, quiet underscoring, hiss, and hum will not be pumped up.

We have designed these presets so that the loudest sounds will be at the same level as the loudest sounds produced by our older analog Model 8182A OPTIMOD-TV processor when set for "General Programming" according to the recommended settings shown in its manual. This facilitates installation of the 8282 in a market that is already using 8182As, guaranteeing that loudness will be uniform as a viewer changes channels, thus preventing viewer irritation.

The four music presets (FL, FM, FN, and FO) are essentially different. They provide "FM radio-style" processing and are the same as the four basic Five-Band presets on Orban's 8200 OPTIMOD-FM DIGITAL processor. As you go from less to more with these presets, the air sound will become louder, but (as with any processor) processing artifacts will increase. The single LESS-MORE control changes many different subjective setup control settings simultaneously according to a table that we have created in the 8282's permanent ROM (Read-Only Memory). In this table are sets of subjective setup control settings that provide, in our opinion, the most favorable tradeoff between loudness, density, brightness, and audible distortion for a given amount of processing.

We believe that most 8282 users will never need to go beyond the LESS-MORE level of control, because the combinations of subjective setup control settings produced by this control have been optimized by Orban's audio processing experts on the basis of years of experience designing audio processing, and upon hundred of hours of listening tests.

Please note that the highest LESS-MORE settings for the four music presets are purposely designed to cause unpleasant distortion and processing artifacts! This helps assure you that the setting of the LESS-MORE control that you choose is optimum, because turning the control up to this point will cause the sound quality to become obviously unacceptable.

FULL-CONTROL

If you want to create a sound for your station that is out of the ordinary, if your market's standard for loudness is different than a market using Orban 8182A processors, or if your taste differs from the people who programmed the LESS-MORE tables, you will need to access FULL-CONTROL. At this level, you can customize or modify any subjective setup control setting to create a sound exactly to your taste. You can then save the settings in a user preset and recall it whenever you wish.

You need not (in fact, *cannot*) create a sound entirely from scratch. All user presets must be created by modifying factory presets or by further modifying factory presets that have been previously modified with a LESS-MORE adjustment. Because the LESS-MORE control also adjusts certain invisible system parameters that cannot be accessed by the user even at the FULL-CONTROL level, it is wise to set the LESS-MORE control to achieve a sound as close as possible to your desired sound before you make further modifications at the FULL-CONTROL level.

If you want to create your own user presets, the following detailed discussion of the processing structures is important to understand.

If you only use factory presets, or if you only modify them with LESS-MORE, then you may still find the material interesting, but it is not necessary to understand it to get excellent sound from the 8282.

Single-Ended Dynamic Noise Reduction

The Five-Band structure has a single-ended dynamic noise reduction system that can be activated by the user as desired. It combines a broadband downward expander with a program-dependent low-pass filter, and is designed to reduce hiss and other undesirable noise in program material with minimum degradation of the desired elements in the sound. Presets FG and FK automatically activate this noise reduction, which can be activated or defeated in any Five-Band preset by accessing its FULL CONTROL screen, setting the noise reduction on or off, and then saving the modified preset as a user preset.

Loudness Control

The Two-Band structure contains a CBS Loudness Controller algorithm that controls the loudness of most commercials well enough to eliminate viewer annoyance. It works by constantly monitoring the subjective loudness of the 8282's output. When subjective loudness is about to exceed a preset threshold, the loudness controller enhances the normal gain control produced by the processing with further gain reduction, preventing loudness from exceeding the threshold. This threshold can be adjusted by the user from the FULL CONTROL screen of any Two-Band preset. The edited preset can then be saved as a user preset.

The loudness controller may reduce the dramatic effect of certain sounds in entertainment programming, like gunshots, explosions, or screeching tires. Operators may therefore want to turn the loudness controller on during commercial breaks and off during normal programming. All Two-Band presets have the loudness controller on except for preset FB, 2B-GEN PUR NO LC. The easiest way to turn the loudness controller off is to recall this preset.

(The Five-Band structure does not have extra loudness control because its multi-band processing tends to automatically re-equalize and condition program material to control loudness variations.)

Fundamental Requirements: High-Quality Source Material and Accurate Monitoring

A major potential cause of distortion is excess clipping, although you are unlikely to encounter this while using any factory preset except for the four music presets at LESS-MORE settings of "9" or above. Another cause is poor-quality source material, including the effects of the station's playback machines, electronics, and studio-to-transmitter link. If the source material is even slightly distorted, that distortion can be exaggerated by OPTIMOD-TV — particularly if you use a large amount of gain reduction. Very clean audio can be processed harder without producing objectionable distortion.

A high-quality monitor system is essential. To adjust your air sound effectively, you must be able to *hear* the results of your modifications. In too many stations, the best monitor is significantly inferior to the receivers found in many listeners' homes!

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About the Processing Structures

In the 8282, a *processing structure* is a program that operates as a complete audio processing system. Only one processing structure can be active at a time. Just as there are many possible ways of configuring a processing system using analog components (like equalizers, compressors, limiters, and clippers), there are many possible processing structures achievable by the 8282. Unlike an analog system, where creating a complete processing system involves physically wiring its various components together, the 8282 realizes all of its processing structures as a series of high-speed mathematical computations made by Digital Signal Processing (DSP) integrated circuits. So the 8282 can be changed from one structure to another almost instantly by loading new software from high-speed semiconductor memory within the 8282.

Factory Programming Presets

Factory Programming Presets are our "factory recommended settings" for various program formats or types. The Factory Programming Presets are designed as starting points to help you get on the air quickly without having to understand anything about adjusting the 8282's sound. Each of these presets can be edited with the LESS-MORE control to set the nominal amount of dynamic range reduction provided by the processing. Because it is so easy to adjust the sound at the LESS-MORE level, we think that most users will want to customize their chosen preset to complement their programming after they have had time to familiarize themselves with the 8282's programming facilities.

Start with one of these presets. Spend some time listening critically to your on-air sound. Listen to a wide range of program material, and listen on several types of television receivers (not just on your studio monitors). Then, if you wish, customize your sound using the information in the Protection Limiter, Two-Band and Five-Band sections that follow.

Factory Presets

##	NAME
AA	PROTECTION 0dB
AB	PROTECTION 5dB
FA	2B-GEN PURPOSE
FB	2B-GEN PUR NO LC
FC	2B-FINE ARTS
FD	LIVE NEWS
FE	LIVE SPORTS
FF	2B-MUSIC VIDEO
FG	5B-GEN PURP W/NR
FH	5B-GEN PURPOSE
FI	5B-NEWS
FJ	5B-SPORTS
FK	5B-OPTICAL FILM
FL	5B-MUSIC SLOW
FM	5B-MUSIC MSLOW
FN	5B-MUSIC MFAST
FO	5B-MUSIC FAST
BY	BYPASS
TO	USER TONE

AA PROTECTION 0dB: provides no processing when its input is driven at normal program levels. It serves only as a protection limiter to prevent over-modulation of the transmitter. Because it provides no phase rotator to make speech more symmetrical (which would reduce any clipping distortion), it is noticeably quieter on-air than the other presets because its clippers cannot be driven as hard. It would only be used by a station wishing to transmit the most transparent possible audio quality while accepting a loss of loudness by comparison to other stations.

AB PROTECTION 5dB: provides approximately 5dB of gain reduction when its input is driven at normal program levels. Other than the fact that there is a small amount of compression, the discussion of PROTECTION 0dB above applies. (Because of the compression, the loudness loss would probably not be as extreme as it would for PROTECTION 0dB.)

FA 2B-GEN PURPOSE (Two-Band General Purpose): This preset is designed to accommodate most dramatic programming, providing gentle gain control that limits dynamic range to a level that provides the general audience with consistently intelligible dialog. It sounds very similar to Orban's analog OPTIMOD-TV (Model 8182A) when that unit is adjusted for "General" programming according to the instructions in its operating manual. This preset retains the spectral balance of its input as much as possible. The loudness controller prevents irritating loudness excursions but can also reduce the impact of sound effects in dramatic programming. A station may therefore wish to activate this preset during

commercial breaks, game shows, and the like, and activate 2B-GEN PUR NO LC (Two-Band General Purpose; no Loudness Controller) for dramatic programming. 2B-GEN PURPOSE is usually not the best choice for live news, sports, or films with optical soundtracks. The Five-Band presets (see below) can automatically equalize such program material when its spectral balance is inappropriate and can also apply single-ended dynamic noise reduction.

FB 2B-GEN PUR NO LC (Two-Band General Purpose; no Loudness Controller): is identical to 2B-GEN PURPOSE except that the Loudness Controller is defeated.

FC 2B-FINE ARTS (Two-Band Fine Arts): is identical to 2B-GEN PURPOSE except that it rides gain more slowly than the general purpose presets.

FD LIVE NEWS (Two-Band Live News): rides gain more quickly than the general purpose presets. Its gate threshold is lower, so it will bring up low level input material more quickly. It is designed for live news programs where input levels may be quite unpredictable. Being a Two-Band algorithm with loudness control, it controls loudness well but does not automatically re-equalize substandard audio (which is quite common in live news broadcasts). You may therefore prefer the Five-Band Live News preset.

FE LIVE SPORTS (Two-Band Live Sports): is similar to 2B-LIVE NEWS, except the release time is slower to resist pumping up crowd noise.

FF 2B-MUSIC VIDEO (Two-Band Music Video): is optimized for music — particularly classical concerts or other music that requires gentle, unobtrusive dynamic range control. (For pop music you will probably prefer one of the four Five-Band music presets.) 2B-MUSIC VIDEO is an "FM radio-style" preset that provides gentle automatic equalization of the spectral balance between the bass and the rest of the spectrum. Its release shape is linear (see below for a discussion). The loudness controller is off.

FG 5B-GEN PURP W/NR (Five-Band General Purpose with Noise Reduction): provides effective dynamic range control and "automatic equalization" of most dramatic material. It applies single-ended noise reduction to the material, which will reduce unwanted noise such as hiss, hum, or stage rumble. However, it will also reduce ambiance. If the program material is carefully produced (as are most contemporary feature-film soundtracks), you may wish to use 5B-GEN PURPOSE (which does not apply noise reduction), or, if the material is so well produced that it would not benefit from "automatic equalization," use 2B-GEN PUR NO LC.

FH 5B-GEN PURPOSE (Five-Band General Purpose without Noise Reduction): is identical to 5B-GEN PURP W/NR except that the single-ended dynamic noise reduction system is off.

FI 5B-LIVE NEWS (Five-Band Live News): rides gain more quickly than the general purpose presets. Its AGC release time is faster so it will bring up low level material more quickly. It is designed for live news programs where input levels may be quite unpredictable. It also automatically re-equalizes substandard audio (which is quite common in live news broadcasts).

FJ 5B-LIVE SPORTS (Five-Band Live Sports): is similar to 5B-LIVE NEWS, except the AGC release time is slower to resist pumping up crowd noise.

FK 5B-OPTICAL FILM (Five-Band Optical Film with Noise Reduction): is designed to make the best of the low-quality audio usually provided by optical film sound tracks (particularly 16mm). The gate threshold is quite high to avoid pumping up hiss, thumps, and other optical artifacts. The threshold of the single-ended dynamic noise reduction system is also high so that this system can reduce such artifacts as far as possible. Release times are slow, because we assume that material encoded on optical film has already been carefully level-controlled to accommodate the very limited dynamic range of the medium, and that little gain riding is therefore required from the 8282.

FL 5B-MUSIC SLOW (Five-Band Music; Slow Release Rate): is designed for pop music. It produces an extremely clean, open sound with almost no audible processing and a nice sense of dynamic range. The settings for 5B-MUSIC SLOW provide gentle automatic equalization to keep the frequency balance consistent from one piece of program material to the next. Even when the television receiver is played softly, these settings ensure that your sound doesn't lose its highs and lows. When you play rock or urban music with punchy bass, this setting preserves the punch and slam that this music requires for full impact.

FM 5B-MUSIC MSLOW (Five-Band Music; Medium-Slow Release Rate): is appropriate softer pop music. It is a bit more "processed-sounding" than 5B-MUSIC SLOW, producing a glossy "show-business" sound that is also clean and easy to listen to. It adds a tasteful amount of punch, presence, and brightness when appropriate.

FN 5B-MUSIC MFAST (Five-Band Music; Medium-Fast Release Rate): is designed for pop music. Use it if you want your audio to sound more like a typical well-processed "Top-40" FM radio station.

FO 5B-MUSIC FAST (Five-Band Music; Fast Release Rate): is a specialized preset for stations that want to sound like an "aggressively-processed" FM radio station. The fast release time of 5B-MUSIC FAST produces a very loud, consistent, dramatic, and rather synthetic sound that is typical of a highly competitive Contemporary Hit Radio (CHR) radio station whose ratings depend on attracting a large number of listeners (high "cume") but which does not assume that a listener will listen to the station for hours at a time. This is the major market competitive FM radio sound, emphasizing loudness as well as clean audio. This preset provides remarkable consistency; the texture of music is noticeably altered to a standard. The bass has an ever-present punch, there is always a sense of presence, and highs are in perfect balance to the mids, no matter what was on the original recording.

The Protection Limiter Structure

The Protection Limiter Structure is designed for stations wanting the highest possible fidelity to the source, such as a station broadcasting concert music at night when its audience is likely to listen in a concentrated and critical way. If the source audio is high-quality and has been specifically mixed for the dynamic range requirement of television audio, then this structure may also be appropriate. Unlike the other structures, the Protection Limiter Structure is *not* designed to reduce the dynamic range, to increase program density, to increase loudness, or to increase the consistency of sound from different sources. Its only function is to protect the transmitter from over-deviation while preserving the spectral and dynamic quality of the source material.

The Protection Limiter Structure is based on Orban's analog Model 4000 Transmission Limiter. Like the 4000, it is designed to be operated below the threshold of limiting most of the time. There are virtually no user controls — the parameters of the structure have been chosen to make it audibly *undetectable*.

Unlike the other structures, the maximum gain reduction in the Protection Limiter Structure is 15dB. This is entirely sufficient for the purpose, and optimizes the signal-to-noise ratio available through the system. Further, the group delay through the system is essentially constant throughout the audible frequency range.

There are two factory presets for the Protection Limiter Structure. AA sets the limiting threshold so that limiting almost never occurs, while AB sets the limiting threshold so that program material at the maximum normal input level (as determined by a PPM or VU meter monitoring the input program line) produces an average limiting of 5dB.

Setting Up the Protection Limiter

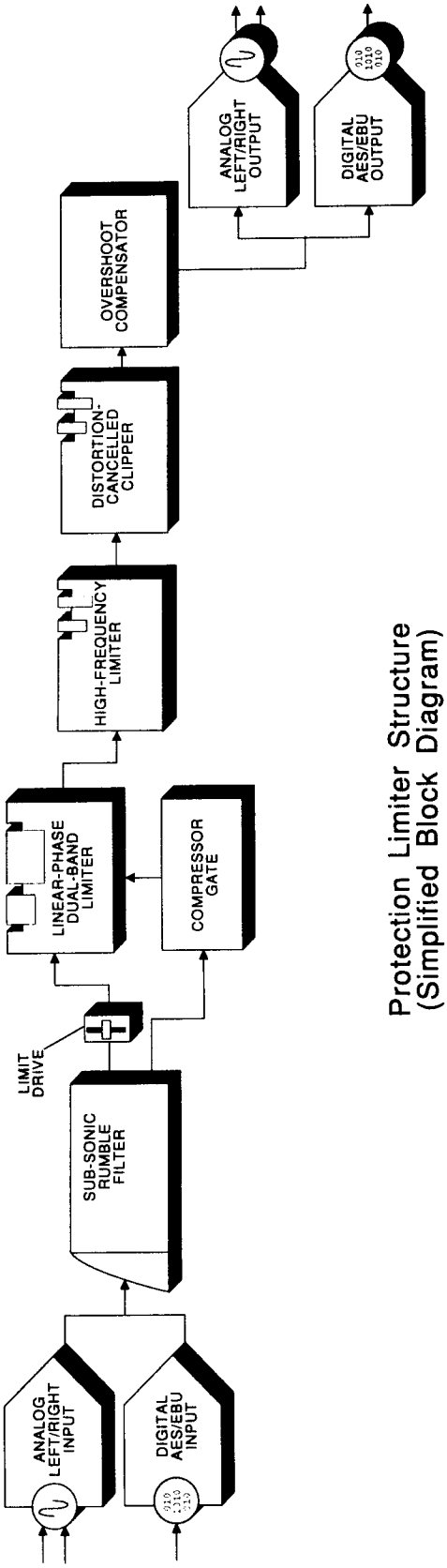
To set up the Protection Limiter, recall factory preset AA (if you want limiting to occur only when the program level exceeds the maximum normal input level as determined by a PPM or VU meter monitoring the input program line), or preset AB (if you want about 5dB of limiting to occur at the maximum normal input level).

The LESS-MORE control affects only the input drive, and you can use it to set a nominal limiting level different than 0dB or 5dB.

There are two FULL-CONTROL parameters for the Protection Limiter.

LIMIT DRIVE LEVEL duplicates the effect of the LESS-MORE control.

30 Hz HPF Control determines if the 30Hz high-pass filter prior to the limiter is in or out of the signal path.



Protection Limiter Structure
(Simplified Block Diagram)

The 30Hz high-pass filter has an 18dB/octave slope and is down 0.5dB at 30Hz. It eliminates modulation-wasting subsonic energy from acoustic rumble, and removes most of the energy from *pops* caused by breath blasts into microphones. It prevents any such subsonic energy from modulating the audio processor's AGC and compressor control signals (which could cause unpleasant distortion), and prevents the automatic frequency control loops in aural exciters from introducing modulation distortion into the audio or even becoming entirely unlocked.

The cutoff frequency of this filter is so low that the only common musical instruments producing lower fundamental frequencies are the pipe organ and synthesizer. (Feature film sound effects may also contain some energy in this region.) The bass energy in most pop music occurs above 40Hz, and even the deepest male voices produce no power anywhere close to 30Hz. The ringing introduced by the filter is insignificant. The ear is very insensitive to ringing in this frequency range. To put the issue in perspective, the ringing is comparable to that introduced by a well-designed vented box loudspeaker with a 30Hz cutoff. For all of these reasons, we recommend operating the system with the 30 Hz HPF control set ON. We can only recommend setting it OFF if the programming is exclusively from high-quality sources, and if high-pass filters are applied to all live microphones to prevent pops or rumble from disturbing later components in the broadcast chain.

Protection Limiting: Orban's Approach

Traditionally, protection limiters have used peak-sensing automatic gain control (AGC) processors to control peak levels. Superficially, this approach seems reasonable. The purpose of a protection limiter is to control the peak levels in a transmission channel.

This traditional approach ignores one crucial requirement for protection limiter performance: the limiter must provide *natural-sounding* control that is *undetectable to the ear* except by an A/B comparison to the original source material. Because the human ear is basically average-sensing, not peak-sensing, the simplistic peak-sensing AGC technique causes highly unnatural variations in subjectively-perceived loudness. Audio material with a high peak-to-average ratio emerges from such a limiter much quieter than audio material with a low peak-to-average ratio. The ear perceives this as an unnatural, unpleasant *pumping* quality. Thus the traditional peak-sensing AGC limiter fails to provide natural sound quality and we must use more sophisticated techniques.

To achieve natural sound quality, the gain control section of the limiter must respond like the ear. This means that the gain control must respond approximately to the power (not the peak level) in the signal. Further, because the sensitivity of the ear decreases dramatically below 150Hz, the control must be frequency-weighted to compensate. Otherwise, heavy bass would audibly modulate the loudness of midrange program material, a problem called *spectral gain intermodulation.*

The dual-band limiter controls the level driving the following high-frequency limiter and distortion-canceling clipper stages. Prior to the HF limiter, a phase-coherent crossover divides the signal into frequency bands above and below 150Hz. The above-150Hz material is connected to the Master Band, which determines the overall limiting. This prevents limiter-induced spectral gain intermodulation — audible modulation of the loudness of midrange and high frequency program material by bass-generated limiting.

The below-150Hz material is connected to the Bass Band. The gain-control voltage produced by the Master Band is cross-coupled into the Bass Band, so that the gain of the Bass Band ordinarily tracks the gain of the Master Band exactly, preserving frequency balances. When the Bass Band encounters exceptionally heavy bass, it momentarily provides extra limiting to preclude excessive level at the dual-band limiter's output.

The dual-band limiter has an attack time of approximately 2 milliseconds. This moderate attack time prevents it from producing limiting on every transient spike. Such limiting could otherwise create audible *holes* in the program.

The dual-band limiter is gated: when its input level drops below the factory-set *threshold of gating*, the release rate is radically slowed to avoid audible *noise breathing*.

> This compressor gate is not the same as a conventional noise gate because it is not intended to reduce noise or other low-level undesired sounds to a lower level than that occurring in the original program. Its only purpose is to prevent the unnatural exaggeration of such material.

The dual-band limiter can produce a maximum of 15dB of limiting. This is more than adequate for protection limiting. *It is important not to overdrive the limiter past 15dB gain reduction*; the sound will rapidly become highly distorted.

Because the gain control section of the Protection Limiter Structure is not peak-sensing, its output contains peak overshoots that must be eliminated by further processing. The Protection Limiter Structure provides three cascaded processors to control peaks: the high-frequency limiter, the Smart Clipper™ distortion-canceling clipper, and the Frequency-Contoured Sidechain™ overshoot corrector.

The high-frequency limiter is a program-controlled dynamic filter that temporarily rolls off excessive high frequency power (caused by pre-emphasis) to prevent distortion in the following clipper processing.

The Smart Clipper distortion-canceling clipper is the prime means for peak control. Because it *removes only instantaneous peaks in the waveform that exceed the desired limiting level,* it does not affect the average level and does not cause unnatural loudness variation. Traditionally, clippers cause objectionable distortion. Such distortion is prevented in the Smart Clipper by proprietary, patented processing that analyzes the frequency spectrum of the distortion products produced by clipping, and manipulates this distortion spectrum to ensure that the distortion products are psychoacoustically masked by the desired program material.

Such manipulation of the distortion spectrum introduces a small amount of peak overshoot into the output of the Smart Clipper. Further, this processor contains low-pass filters that strictly constrain the output spectrum to 15kHz, but which overshoot. These overshoots are eliminated by the Frequency-Contoured Sidechain overshoot corrector. This processor derives a band-limited signal that can be added to its input signal to cancel overshoots without destroying the spectral integrity of the signal, as simple clipping would do.

Modulation of Sinewaves

There is an important and sometimes confusing consequence of this system design: **the system will not permit sinewaves to reach 100% peak modulation.** It will restrain sinewave modulation to a lower level — typically 7dB below 100% (45% modulation). Therefore, in its normal OPERATE mode the Protection Limiter Structure will not pass an externally-generated line-up tone at 100% modulation; it will produce limiting that constrains the tone to approximately 45% modulation.

This is a direct consequence of the level detection's being power-sensing. For a given peak level, sinewaves have very high average power by comparison to program material. To preserve natural sound, the processing must reduce their peak level below the peak level of program material to preserve consistent average power at the limiter's output. This is a characteristic of any limiter that achieves natural-sounding dynamic performance and that does not modulate program loudness according to the peak-to-average ratio of the input signal.

Almost all program material will produce frequent peaks at 100% modulation at the 8282's output. Program material that does not produce such peaks has an unusually low peak-to-average ratio and will sound naturally balanced when applied to the transmission system below 100% peak modulation.

Delay-Line Techniques vs. Distortion-Canceling Clipping

The Protection Limiter Structure was designed to achieve maximally transparent sound below threshold and extremely natural dynamics above threshold. Our goal was to have the transition into limiting *undetectable to the ear*. We feel that delay-line techniques are inconsistent with these goals because a delay-line limiter is simply a highly refined peak-sensing AGC processor. While a delay-line limiter can achieve very low perceived distortion, it does so at the expense of having an extremely fast attack time such that limiting is produced on every transient overshoot, no matter how brief. While this effect is somewhat reduced by an automatic release algorithm, the inevitable consequence is that the average power at the output of the limiter is strongly influenced by the peak-to-average ratio of the input. Thus material with an unusually high peak-to-average ratio can unnaturally reduce the average power. Conversely, material with an unusually low peak-to-average ratio can be amplified to unnaturally loud levels. The overall subjective effect is that changes in the program waveform produce somewhat unnatural dynamic variations — the sound of the limiter is not effortless.

More on High-Frequency Limiting

A limiter that does not use clipping to control peaks must control pre-emphasis-induced overshoots with a fast peak-sensing variable-emphasis limiter. Such limiters tend to cause severe audible dulling of certain program material.

In contrast, the HF limiter in the Protection Limiter Structure operates in several frequency bands and adapts to the spectrum of the program material to prevent audible distortion in the following distortion-canceling clipper. The distortion-canceling clipper does almost all of the work in limiting HF peaks. Because it operates on *each individual peak* without affecting the peak's neighbors, the distortion-canceling clipper causes far less audible HF loss than does a traditional variable-emphasis limiter.

Please note that the HF limiter in the Protection Limiter Structure will not exhibit a swept-sinewave frequency response inverse to the pre-emphasis curve set by the Protection Limiter Structure's software setting. This is because the HF limiter, as explained above, does as little work as possible: most of the work in controlling HF overload is done by the distortion-canceling clipper. Be assured that the overall Protection Limiter Structure system is nevertheless operating to very tight tolerances on the pre-emphasis curve.

The Two-Band Structure

The Two-Band structure consists of a gated Two-Band compressor, a high-frequency limiter, and a distortion-canceled Hilbert-Transform clipper. A CBS Loudness Controller can be activated to control subjectively-perceived loudness.

The Two-Band structure is an improved version of Orban's classic 8182A OPTIMOD-TV, with increased high frequency clarity. It operates after a phase rotator (time-dispersion filter), which improves the structure's loudness capability by making positive and negative peaks more symmetrical, particularly with voice.

The Two-Band structure has an open, easy-to-listen-to sound that is similar to the source material if the source material is of good quality. However, if the spectral balance between the bass and high frequency energy of the program material is incorrect, the Two-Band structure (when its BASS COUPLING control is operated toward 0%) can gently correct it without introducing obvious coloration.

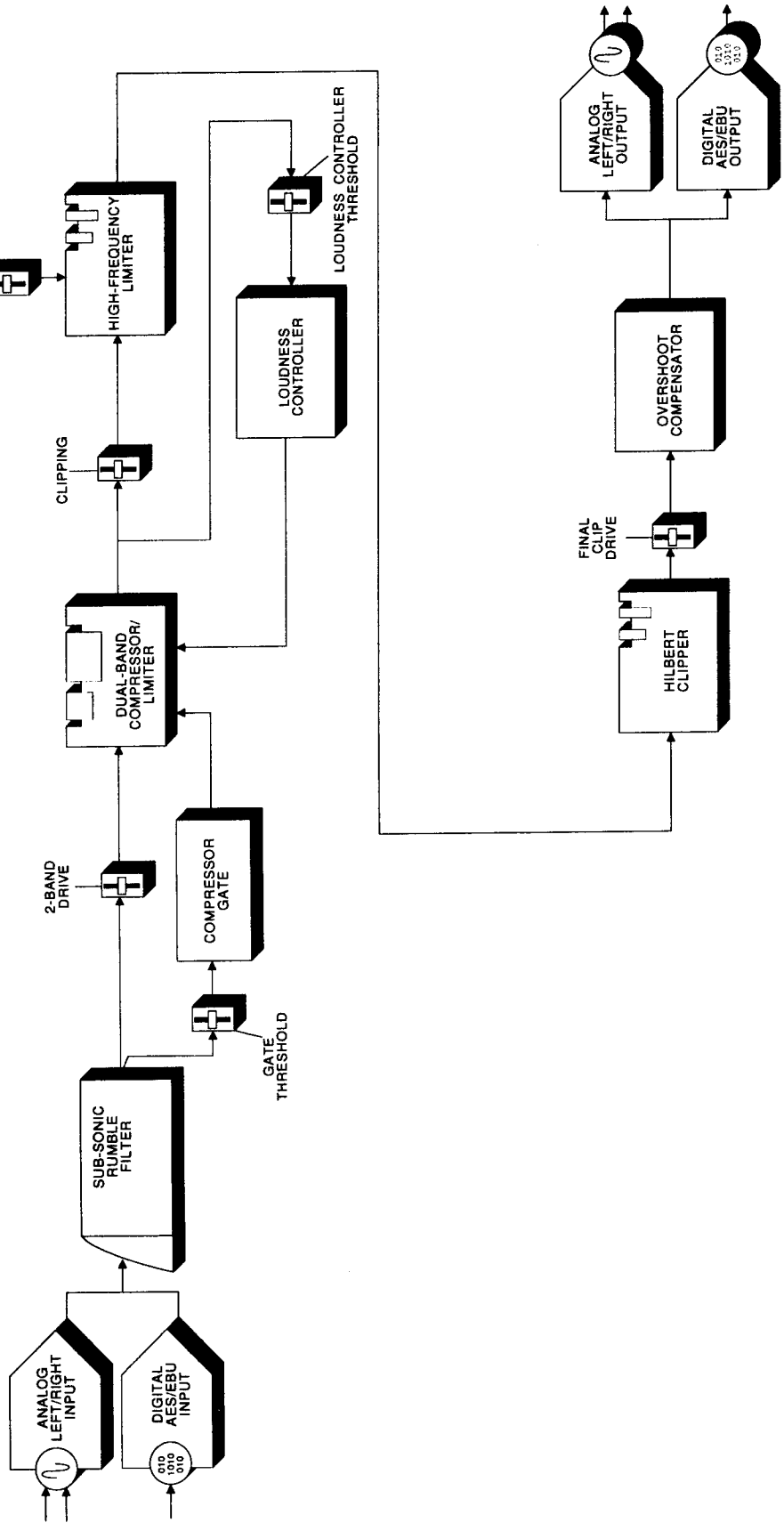
The 8282's Hilbert-Transform clipper is a mathematical construct that operates like a radio-frequency clipper below 4kHz and an audio-frequency clipper above. Further distortion cancellation significantly reduces *all* distortion below 2kHz.

An RF clipper produces no harmonic distortion — only intermodulation distortion. Voice is far more degraded by harmonic than by IM distortion. This is because the spectrum of voice falls off rapidly at high frequencies, so there is no desired program energy to psychoacoustically mask the harmonic distortion products. However, IM distortion falls mostly in-band, where it can be masked by the normal voice spectrum.

On the other hand, music usually masks harmonics effectively but gets gritty and unpleasant-sounding when passed through a system that creates substantial IM. The Hilbert-Transform clipper creates nothing but IM distortion in the frequency range where voice has most of its energy, while creating both harmonic and IM distortion (like a conventional clipper) in the frequency range where excessive IM would otherwise cause problems with pre-emphasized music. So both voice and music are optimally controlled by the Hilbert-Transform clipper with minimum perceived distortion. All of the factory presets control the drive level to the Hilbert-Transform clipper so that the distortion that it produces is psychoacoustically masked by the program material.

Setting Up the Two-Band Structure

To set up the Two-Band structure, recall factory presets FA through FF. These presets are discussed above. Of course, you can modify any preset using the LESS-MORE control or using the FULL CONTROL screen, and you can then store the resulting modified preset as a user preset for future recall at any time.



Two-Band Structure
(Simplified Block Diagram)

Gain reduction metering.

Unlike the metering on some processors, when any OPTIMOD-TV gain reduction meter indicates full-scale (at its bottom), it means that its associated compressor has run out of gain reduction range, that the circuitry is being overloaded, and that various nastinesses are likely to commence.

Although the compressor in the Two-Band structure can achieve up to 25dB of gain reduction, the meter should never come close to 25dB of gain reduction if OPTIMOD-TV has been set up for a sane amount of gain reduction under ordinary program conditions.

But be aware of the different peak factors on voice and music — if voice and music are peaked identically on a VU meter, voice may cause up to 10dB more peak gain reduction than does music! (A PPM will indicate relative peak levels much more accurately.)

Using the Two-Band Structure for Classical Music Concerts

Classical music is traditionally broadcast with a wide dynamic range. However, with many recordings and live performances, the dynamic range is so great that the quiet passages disappear into the noise in most listening environments. As a result, the listener either hears nothing, or must turn up the volume control to hear all the music. Then, when the music gets loud, the receiver blasts and distorts, making the listening rather unpleasant.

Under most listening conditions, the audience is best served when the dynamic range of this material is compressed 10-15dB so that quiet passages in the music never fade into inaudibility. OPTIMOD-TV controls the level of the music in ways that are, for all practical purposes, inaudible to the listener. Low-level passages are increased in level by up to 10dB, while the dynamics of crescendos are maintained.

If the dynamics of the program material were previously controlled by careful manual gain-riding, you may wish to switch to the Protection structure, or to create a User Preset (based on Two-Band structure preset FF, 2B-MUSIC VIDEO) in which the LESS-MORE control has been turned down so that the processing produces little gain reduction at normal peak input levels.

The Two-Band Structure's Full Setup Controls

Each Two-Band factory preset has a LESS-MORE control that adjusts the amount of nominal dynamic range reduction. LESS-MORE simultaneously adjusts the drive level to the processing and the amount of gain reduction produced after the processing has been gated for a long time. For example, if the LESS-MORE control is adjusted to produce 5dB of nominal gain reduction when driven at normal peak levels, the processing will slowly drift towards 5dB gain reduction when gated.

If you wish, you may adjust the full controls to your own taste. Always start with LESS-MORE to get as close to your desired sound as possible. Then edit the full controls using the FULL CONTROL screen, and save those edits to a USER PRESET.

The controls available on the FULL CONTROL screen are:

2B-NORMAL DRIVE control adjusts the signal level going into the Two-Band compressor, determining its nominal gain reduction. The range is 0-25dB. The gain reduction determines how much the loudness of quiet program material will be increased (and, therefore, how consistent overall loudness will be). It is also affected by the level at which the console VU meter or PPM is peaked.

This control is affected by the LESS-MORE setting.

Regardless of the release time setting, we feel that the optimal amount of gain reduction in the Two-Band compressor for most program material is 10-15dB. If less gain reduction is used, levels may not be well enough controlled to ensure that dialog is intelligible under non-ideal conditions.

RELEASE SHAPE control selects a LINear or EXPonential release shape.

Linear causes the Two-Band compressor to release at a constant number of dB per second, while Exponential causes the release to commence slowly and then speed up as it progresses. The purpose of the Exponential shape is to create the open sound of a slow release time with program material that is well-controlled in level, while permitting the processing to quickly correct excessively low input levels. We recommend using Exponential for general-purpose programming. We only recommend Linear for musical programming, where Exponential may create unnatural side-effects. (If the RELEASE RATE control is set between about 0.5 and 2dB/second, an Exponential release shape should cause no problems even with music.)

The **RELEASE RATE control** determines how fast the Two-Band compressor releases (and therefore how fast loudness increases) when the level of the program material decreases. It can be adjusted from 0.5dB/second (slow) to 20dB/second (fast). Settings toward 20dB/second result in a more consistently loud output, while settings toward 0.5dB/second allow a wider variation of dynamic range. The actual release time of the compressor is determined by the setting of the RELEASE RATE control, the setting of the RELEASE SHAPE switch, and the dynamics and level of the program material. In general, you should use faster release times for material with frequent, unexpected level changes (like live news), and slower release times for material that has already been carefully produced.

The action of the RELEASE RATE control has been optimized for resolution and adjustability. But its setting is *critical to sound quality* — listen carefully as you adjust it. There is a point beyond which increasing release rate (with faster settings of the RELEASE RATE control) will cause obvious, unnatural artifacts.

BASS COUPLING control is used to set the balance between bass and the rest of the frequency spectrum.

The Two-Band compressor processes audio in a Master Band for all audio above approximately 200Hz, and a Bass Band for audio below approximately 200Hz. The BASS COUPLING control determines how closely the on-air balance of material below 200Hz matches that of the program material above 200Hz.

Settings toward 100% (wide) make the output sound most like the input. Because setting the BASS COUPLING control at 100% will sometimes cause bass loss, the most accurate frequency

balance will often be obtained with this control between 70% and 90%. The optimal setting depends on the amount of gain reduction applied. Adjust the BASS COUPLING control until the Bass G/R and Master G/R meters track as closely as possible.

With the RELEASE RATE control set to 2dB/second or less, setting the BASS COUPLING control toward 0% (independent) will produce a sound that is very open, natural, and non-fatiguing, even with large amounts of gain reduction. Such settings will provide a bass boost on some program material that lacks bass.

With fast release times, settings of the BASS COUPLING toward 100% (wide) do not sound good. Instead, set the BASS COUPLING control toward 0% (independent). This combination of fast release and independent operation of the bands increases loudness and density. Such processing is rarely appropriate for television audio unless you are trying to achieve "FM radio-style" sound.

CLIPPING control adjusts signal level going into the Hilbert-Transform clippers and therefore determines the amount of peak limiting done by Hilbert-Transform clipping. Range is –4dB to +2dB. This control and the FINAL CLIP DRIVE control govern the trade-off between loudness and distortion.

Turning up the CLIPPING control drives the Hilbert-Transform clippers harder, reducing the peak-to-average ratio, and increasing the loudness on the air. When the amount of clipping is increased, the audible distortion caused by clipping is increased. Lower settings reduce loudness, of course, but result in a cleaner sound and better high-frequency response.

In our opinion, when the RELEASE RATE control is set between 0.5 and 8dB/second, the best setting for the CLIPPING control is between –1 and 0. If the program material is clean, this setting produces an output that sounds undistorted even on high-quality receivers.

If you use faster settings of the RELEASE RATE control, or if program material is not always clean, use lower settings of the CLIPPING control. Ultimately, your ears must judge how much distortion is acceptable. But audition difficult program material like live voice and piano before you make your final decision. (If you adjust the CLIPPING control to make the loudness of your station comparable to the loudness of other stations in your market, the resulting sound will almost always be acceptably clean.)

GATE THRESHOLD control determines the lowest input level that will be recognized as program by OPTIMOD-TV; lower levels are considered to be noise or background sounds, and cause the compressor to gate, effectively freezing its gain.

When gated for a long time, the Two-Band gain reduction will very slowly move to the nominal average gain reduction produced by your present setting of the 2B-NORMAL DRIVE control. (The LESS/MORE control has the same effect as the 2B-NORMAL DRIVE control.) This prevents OPTIMOD-TV from unnaturally exaggerating or suppressing very quiet program material, such as ambiance or quiet underscoring.

It is common to set the GATE THRESHOLD control to –40 to –48. The lower settings are primarily useful for musical programming.

LOUD CNTRL ON/OFF control sets the status of the loudness controller, which is located at the Two-Band compressor. Note that the LOUD CNTRL THRESH (Loudness Controller Threshold) control has an effect only when the LOUD CNTRL ON/OFF is set to ON.

LOUD CNTRL THRESH (Loudness Controller Threshold) control determines the maximum subjective loudness produced by the processing. This control determines the subjective loudness level at which the loudness controller will take control of the Two-Band compressor and produce more gain reduction than the compressor would have otherwise produced by itself. We believe that few users will have any reason to change this adjustment (it was not available to the users of our analog 8182A processor). However, if you feel that the loudness controller is not controlling the loudness of commercials or other subjectively loud program material sufficiently well, you may wish to set the threshold *lower*, forcing the loudness controller to do more work.

Note that the loudness controller operates on an absolute threshold. This means that if there is a transition between very quiet program material (such as footfalls through rustling leaves) and a commercial, the commercial may *still* seem offensively loud even though the loudness controller is controlling its loudness correctly with reference to other full-scale sounds. Philosophically, this is inevitable; the loudness controller cannot reduce the level of the commercial to the level of rustling leaves without destroying the effectiveness of the commercial and angering the sponsor!

HF LIMITER control determines how the processor avoids high-frequency overloads due to the pre-emphasis curve. When set toward –4dB (soft limiting), the highs are controlled mostly by limiting (a form of dynamic filtering), which tends to soften highs — this could improve the sound of marginally distorted program material. When set toward +2dB (hard limiting), the highs are controlled mostly by clipping, which could potentially distort highs.

Control of highs by limiting tends to slightly dull the sound. Control of highs by clipping doesn't reduce brightness, but the resulting sound can tend towards grittiness and smearing.

Because the OPTIMOD-TV distortion-canceling clipper does not produce significant distortion at low frequencies, the HF LIMITER control will have a different effect on clipping distortion than you might expect. Outright break-up (principally sibilance splatter) will not occur — you must listen to the upper midrange and the highs to hear the effect of the clipper. Music containing highly equalized hi-hat cymbals will clearly demonstrate the effect of adjusting the control.

FINAL CLIP DRIVE control determines the level driving the final clipper that performs protection peak limiting. (This clipper follows the distortion-canceling clipper system, and is not itself distortion-canceling.) The adjustment of this control is *very critical* — changes of 0.5dB make clearly audible differences in the amount of distortion produced by the processing. We recommend that the user not adjust this control and use the factory preset settings instead; the control has only been made available for experienced, sophisticated users who are willing to take the time necessary to listen to many different kinds of program material to verify that nothing falls apart if the clipper drive is increased. Because excessive loudness is an irritant in television sound, we see no reason why a user would want to set this control higher than the factory preset in an effort to increase loudness.

30Hz HPF control determines if the 30Hz high-pass filter prior to the AGC is in or out of the signal path.

The 30Hz high-pass filter has an 18dB/octave slope, is down 0.5dB at 30Hz, and is placed before the gain-riding AGC. It can be placed in or out-of-circuit by the 30Hz HPF control.

The 30Hz high-pass filter eliminates modulation-wasting subsonic energy from acoustic rumble and removes most of the energy from *pops* caused by breath blasts into microphones. It prevents any such subsonic energy from modulating the audio processor's AGC and compressor control signals (which could cause unpleasant distortion), and prevents the automatic frequency control loops in aural exciters from introducing modulation distortion into the audio or even becoming entirely unlocked.

The cutoff frequency of this filter is so low that the only common musical instruments producing lower fundamental frequencies are the pipe organ and synthesizer. (Feature film sound effects may also contain some energy in this region.) The bass energy in most pop music occurs above 40Hz, and even the deepest male voices produce no power anywhere close to 30Hz. The ringing introduced by the filter is insignificant. The ear is very insensitive to ringing in this frequency range. To put the issue in perspective, the ringing is comparable to that introduced by a well-designed vented box loudspeaker with a 30Hz cutoff. For all of these reasons, we recommend operating the system with the 30Hz HPF control set ON. We can only recommend setting it OFF if the programming is exclusively from high-quality sources, and if high-pass filters are applied to all live microphones to prevent pops or rumble from disturbing later components in the broadcast chain.

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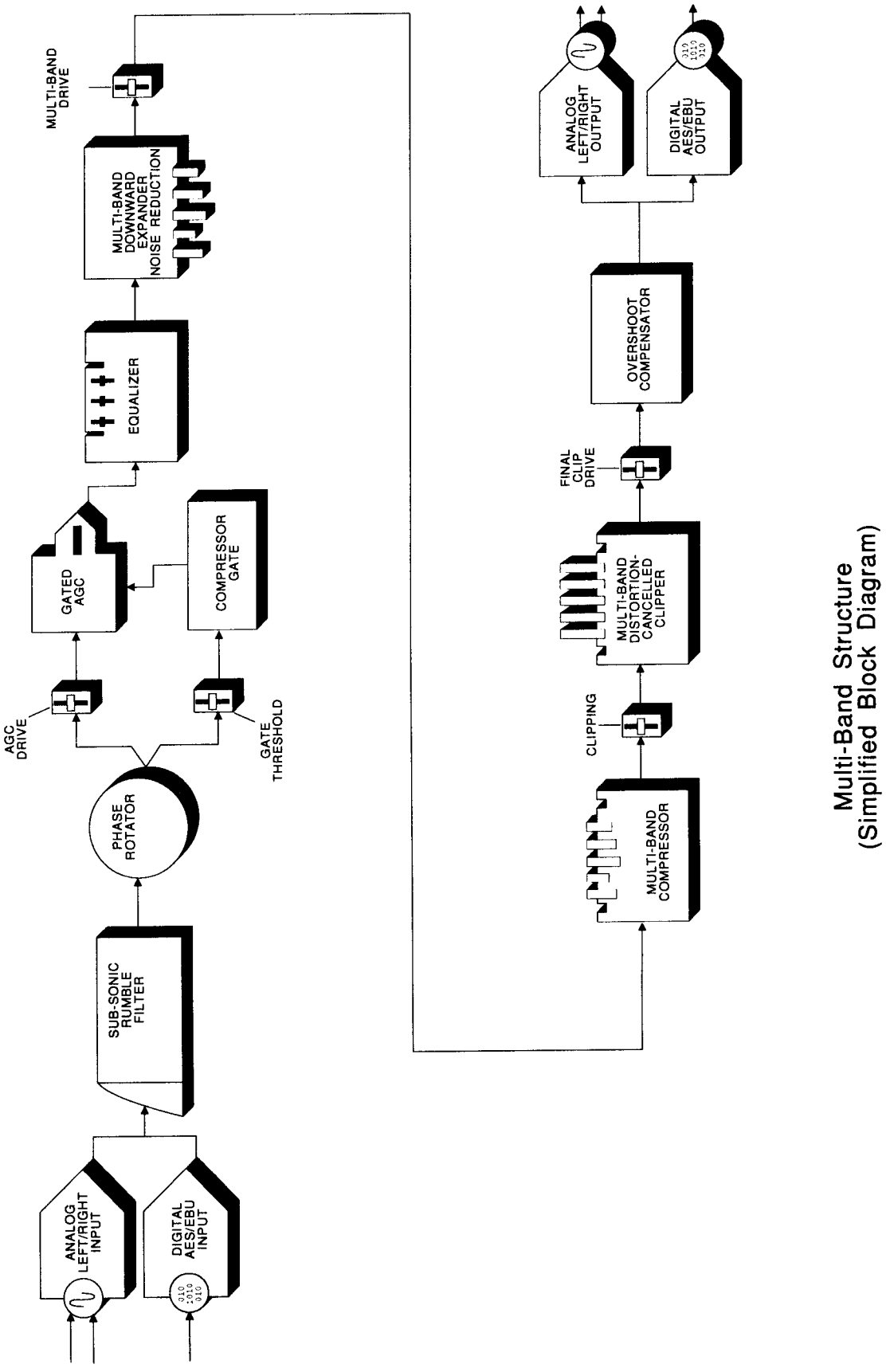
The Five-Band Structure

The Five-Band (or Multi-Band) structure consists of a slow gain-riding AGC, a Four-Band equalizer, a Five-Band compressor, a dynamic single-ended noise reduction system, a Multi-Band distortion-canceled clipper, and an overshoot compensator.

Unlike the Two-Band structure, whose Two-Band compressor has a continuously-variable release time, the release time of the Five-Band compressor is switchable to four settings: SLOW, MEDIUM-SLOW, MEDIUM-FAST and FAST. Each setting makes a very significant difference in the overall flavor and quality of the sound.

When the input is noisy, you can sometimes reduce the noise by activating the **single-ended noise reduction system.** Functionally, the single-ended noise reduction system combines a broad downward expander with a program-dependent low-pass filter. This noise reduction can be valuable in reducing audible hiss, rumble, or ambient studio noise on-air.

The Five-Band structure does not have a separate loudness controller because its Five-Band compressor automatically equalizes the spectral balance of various pieces of program material in a way that tends to make their loudness more uniform.



Multi-Band Structure
(Simplified Block Diagram)

Putting the Five-Band Structure on the Air

The Five-Band structure is very flexible, enabling you to fine-tune your on-air sound to complement your programming. There are nine basic Factory Presets for the Five-Band structure. Each of these presets can be edited with the LESS-MORE control. This control affects the "television audio" presets (FG through FK) differently than it does the "music" presets (FL through FO). When a "television audio" preset is on the air, the LESS-MORE control adjusts the average amount of gain reduction by adjusting the drive level to the Five-Band structure's input. This also adjusts the "idle gain" — the amount of gain reduction in the AGC section when the structure is gated. (It gates whenever the input level to the structure is below the threshold of gating.)

When a "music" preset is on the air, the LESS-MORE control sets the amount of overall processing, making optimum tradeoffs between loudness, brightness, and distortion. In television audio there are no "loudness wars"; for "music" presets there is probably no need to ever advance the LESS-MORE control beyond "5."

The nine Five-Band factory presets are fully discussed in "Factory Programming Presets" on page 3-12.

Customizing The Settings

The controls in the Five-Band structure give you the flexibility to customize your station sound. But as with any audio processing system, proper adjustment of these controls requires proper balancing of the trade-offs explained above. The following provides the information you need to adjust the Five-Band structure controls to suit your programming and taste.

The Five-Band Structure's Full Setup Controls

Each Five-Band factory preset has a LESS-MORE control that alters the amount of processing. Always start with LESS-MORE to get as close to your desired sound as possible. Then edit the full controls using the FULL CONTROL screen, and save those edits to a USER PRESET.

The controls available on the FULL CONTROL screen are:

AGC DRIVE control adjusts signal level going into the slow AGC, and therefore determines the amount of gain reduction in the AGC. This also adjusts the "idle gain" — the amount of gain reduction in the AGC section when the structure is gated. (It gates whenever the input level to the structure is below the threshold of gating.)

The total amount of gain reduction in the Five-Band structure is the sum of the gain reduction in the AGC and the gain reduction in the Five-Band compressor. The total system gain reduction determines how much the loudness of quiet passages will be increased (and, therefore, how consistent overall loudness will be). It is determined by the setting of the AGC DRIVE control, by the level at which the console VU meter or PPM is peaked, and by the setting of the MULTI-BAND DRIVE control.

The **AGC RELEASE dB/SEC control** can be adjusted from 0.5dB/second (slow) to 20dB/second (fast). The increase in density caused by setting the AGC RELEASE dB/SEC control

to faster release times sounds different than the increase in density caused by setting the MULTI-BAND RELEASE control FAST, and you can trade the two off to produce different effects.

Unless it is purposely speeded-up (with the AGC RELEASE dB/SEC control), the automatic gain control (AGC) that occurs in the AGC prior to the Five-Band compressor makes audio levels more consistent without significantly altering texture. Then the Five-Band compression and associated Five-Band clipper audibly change the density of the sound and dynamically re-equalize it as necessary (booming bass is tightened; weak, thin bass is brought up; highs are always present and consistent in level).

The various combinations of *AGC* and *compression* offer great flexibility:

Light AGC + light compression yields a wide sense of dynamics, with a small amount of automatic re-equalization.

Moderate AGC + light compression produces an open, natural quality with automatic re-equalization and increased consistency of frequency balance.

Moderate AGC + moderate compression gives a more *dense* sound, particularly as the release time of the Five-Band compressor is sped up.

Moderate AGC + heavy compression (particularly with a FAST Five-Band release time) results in a "wall of sound" effect which may cause listener fatigue and is only appropriate for music programming if you want to sound like an "aggressively processed" FM radio station.

Adjust the AGC (with the AGC DRIVE control) to produce the desired amount of AGC action, and then fine-tune the compression and clipping with the Five-Band structure's MULTI-BAND set of controls.

MULTI-BAND DRIVE **control** adjusts signal level going into the Five-Band compressor, and therefore determines the average amount of gain reduction in the Five-Band compressor. Range is 25dB.

Adjust the MULTI-BAND DRIVE control to your taste and programming requirements. Used lightly with a SLOW or MSLOW (medium-slow) release time, the Five-Band compressor produces an open, re-equalized sound that is appropriate for almost all television programming. The Five-Band compressor can increase audio density when operated at a FAST or MFAST (medium-fast) release time because it acts more and more like a fast limiter (not a compressor) as the release time is shortened. With FAST and MFAST release times, density also increases when you increase the drive level into the Five-Band compressor because these faster release times produce more limiting action. Increasing density can make sounds seem louder, but can also result in an unattractive *busier, flatter,* or *denser* sound. It is very important to be aware of the many negative subjective side effects of excessive density when setting controls that affect the density of the processed sound.

The MULTI-BAND DRIVE interacts with the MULTI-BAND RELEASE. With slower release time settings, increasing the MULTI-BAND DRIVE control scarcely affects density. Instead, the primary danger is that the excessive drive will cause noise to be excessively increased when the program material becomes quiet.

> You can minimize this effect by carefully setting the GATE THRESHOLD dB control to "freeze" the gain when the input gets quiet and/or by activating the single-ended noise reduction.

When the release time of the Five-Band compressor is set to FAST, or MFAST (e.g., with presets FO and FN), the setting of the MULTI-BAND DRIVE control becomes much more critical to sound quality because density increases as the control is turned up. Listen carefully as you adjust it. With these fast release times, there is a point beyond which increasing the Five-Band compressor drive will no longer yield more loudness, and will simply degrade the punch and definition of the sound. Because excessive loudness is an irritant in television audio, there is almost never any reason to push processing to the point where it degrades the audio.

We recommend no more than 10dB gain reduction as shown on the meter for band 3. More than 10dB, particularly with the FAST release time, will often create a "wall of sound" effect that many find fatiguing.

> To avoid excessive density with FAST Five-Band release time, we recommend using no more than 5dB gain reduction in band 3, and compensating for any lost loudness by speeding up the AGC RELEASE dB/SEC instead. This is what we did in the factory LESS-MORE presets for the MUSIC FAST Five-Band release time.

The **MULTI-BAND RELEASE control** can be switched to FAST, MFAST, MSLOW, and SLOW. See the detailed description on page 3-32.

MULTI-BAND CLIP control adjusts signal level going into the Five-Band clippers and therefore determines the amount of peak limiting done by clipping. Range is −4dB to +5dB. This control and the FINAL CLIP DRIVE control govern the trade-off between loudness and distortion. Note that these ranges are relative, and do not indicate the exact amount of clipping. 0dB refers to the average setting that we have found to be the best compromise for many settings of the other controls.

If the MULTI-BAND RELEASE control is set to FAST or MFAST, perceived clipping distortion will increase as the MULTI-BAND DRIVE control is advanced, and the MULTI-BAND CLIP control may have to be turned down to compensate. To best understand how to make loudness/distortion trade-offs, perhaps the wisest thing to do is to recall a given music preset (FL, FM, FN, or FO), and then to adjust the LESS-MORE control to several settings throughout its range. At each setting of the LESS-MORE control, examine the settings of the MULTI-BAND DRIVE control, the MULTI-BAND CLIP control, and the FINAL CLIP DRIVE control. (You can see them by calling up the FULL CONTROL screen by pressing the FULL CONTROL soft key.) This way, you can see how the factory programmers made the trade-offs between the settings of the various distortion-determining controls at various levels of processing.

LOW BASS BOOST dB control, the Five-Band structure low bass equalization control, is designed to add *punch* and *slam* to rock and urban music. It should be left off for general television programming and used only with pop music videos. It provides a shelving boost in two ranges with two switchable characteristics. 2P provides a range of 0dB to +12dB (in 2dB steps) with a 12dB/octave slope. 3P provides a range of 0dB to +12dB (in 2dB steps) at 110Hz and below with an 18dB/octave slope.

Because the Five-Band structure often increases the brightness of music, some bass boost is usually desirable to keep the sound spectrally well-balanced. Adjustment of bass equalization must be determined by individual taste and by the requirements of your programming. Be sure to listen on a wide variety of receivers — it is possible to create severe distortion on poor quality speakers by over-equalizing the bass. Be careful!

The moderate-slope (12dB/octave) shelving boost achieves a bass boost that is more audible on smaller receivers, but which can sound boomier on high-quality sets. The steep-slope (18dB/octave) shelving boost creates a solid, punchy bass from the better sets with decent bass response. There are no easy choices here; you must choose the characteristic you want by identifying your target audience and the receivers they are most likely to be using.

> The LOW BASS BOOST dB control steps first through the 2P curves and then through the 3P curves. For example, a 4dB boost with a 12dB/octave slope would appear as "2P +4," and a 10dB boost with an 18dB/octave slope would appear as "3P +10."

MID BASS BOOST dB control provides a 12dB/octave shelving boost at 200Hz. Use it in conjunction with the LOW BASS BOOST dB control to tailor your on-air bass to your exact requirements. (It should be off for general television programming, and only used for pop music videos.) A mid-bass boost is mainly useful to stations that program to an audience likely to be listening on smaller receivers. It can force a thin-sounding receiver with a small speaker to seem to have more bass. However, bass boost in this frequency range can make larger receivers sound very muddy and boomy, so adjust the MID BASS BOOST dB control with great care, listening to both small receivers and receivers with good bass response.

PRESENCE dB control is a 6dB/octave peaking equalizer centered at 3kHz that affects several bands in the Five-Band compressor.

The audible effect of the PRESENCE dB control is closely associated with the amount of gain reduction in the 3.7kHz band. With small amounts of gain reduction, the effect is an actual boost in the amount of power in the presence region, which can increase the loudness of such material, and may also improve voice intelligibility if the voice was poorly recorded. (Because of this loudness increase, you may want to turn down the MULTI-BAND CLIP control to compensate.)

As you increase the gain reduction in the 3.7kHz band (by turning the MULTI-BAND DRIVE control up), the PRESENCE dB control will have progressively less audible effect. The compressor for the 3.7kHz band will tend to reduce the effect of the PRESENCE dB boost (in an attempt to keep the gain constant) to prevent excessive stridency in program material that already has a great deal of presence power. So with large amounts of gain reduction, the density of presence region energy will be increased more than will the level of energy in that region. Because the 3.7kHz band compressor governs the gain reduction in the 6.2kHz band also, turning up the PRESENCE dB control will *decrease* energy in the 6.2kHz band, since you will be increasing the gain reduction in *both* the 3.7kHz and 6.2kHz bands. You may wish to compensate for this effect by slightly turning up the BRILLIANCE control.

Nevertheless, if less than 5dB gain reduction is used in the 3.7kHz and 6.2kHz bands, the PRESENCE dB control will have a significant audible effect almost all of the time. Use the PRESENCE dB control with caution. Excessive presence boost tends to be audibly strident and

fatiguing. And the sound quality, although loud, can be very irritating. We suggest a maximum of 2-3dB boost, although 6dB can be achieved.

BRILLIANCE dB control increases the gain (prior to limiting) of band 5 (6.2kHz and above). It produces an audibly attractive effect with increased *air* and *transparency* (similar to that of a psychoacoustic exciter). Unlike the PRESENCE dB control, the BRILLIANCE dB control will have an audible effect at all times.

Excessive brilliance boost can exaggerate tape hiss and distortion in program material that is less than perfectly clean. It is usually best to use no brilliance boost at all with most television audio, reserving its use for music. We suggest no more than 4dB boost as a practical maximum.

FINAL CLIP DRIVE control determines the level driving the final clipper that performs peak limiting. The adjustment of this control is very critical — changes of 0.5dB make clearly audible differences in the amount of distortion produced by the processing. In most cases, we recommend that the user not adjust this control and use the factory preset settings instead (as determined by a factory preset, or by a LESS-MORE setting); the control has only been made available for experienced, sophisticated users who are willing to take the time necessary to listen to many different kinds of program material to verify that nothing falls apart after the clipper drive has been increased.

If you increase loudness as a side-effect of advancing the PRESENCE dB control, one good way to compensate is by decreasing the FINAL CLIP DRIVE.

GATE THRESHOLD dB control determines the lowest input level that will be recognized as program by OPTIMOD-TV; lower levels are considered to be noise or background sounds, and cause the AGC to gate, effectively freezing gain to prevent noise breathing.

The gate causes the gain reduction in bands 2 and 3 of the Five-Band compressor to quickly move to the average gain reduction occurring in those bands when the gate first turned on. This prevents obvious midrange coloration under gated conditions, because bands 2 and 3 have the same gain.

The gate also independently freezes the gain of the two highest-frequency bands (forcing the gain of the highest-frequency band to be identical to its lower neighbor), and independently sets the gain of the lowest-frequency band according to the setting of the DJ BASS BOOST switch (see immediately below). Thus, without introducing blatant coloration, the gating smoothly preserves the average overall frequency response "tilt" of the Multi-Band compressor, broadly maintaining the "automatic equalization" curve it generates for a given piece of program material.

> **NOTE:** If the GATE THRESHOLD control is turned OFF, the DJ BASS BOOST control is disabled.

HF CLIPPING dB control sets the threshold of clipping in bands 4 and 5 with reference to the overall threshold set by the MULTI-BAND CLIP control. The range is 0 to +6dB. This control reveals the Five-Band structure's FM radio roots; we originally made this control available for some major-market FM radio customers who prefer a brighter sound at the expense of audible distortion on a significant amount of program material. We recommend

a setting of 0 for all program material, particularly in television audio. *This control is for audio processing experts only*; it is important to listen to a very wide range of program material before deciding to set this control above 0. When the control is set above 0, there will definitely be some program material that sounds harsh and distorted, and you must decide if the trade-off against brighter sound and more vocal presence is acceptable to your taste.

DJ BASS BOOST control determines the amount of bass boost produced on some male voices. In television audio, you will almost always want to leave it off to prevent unnatural-sounding dialog in dramatic programming. Its only potential application in television audio is for announcers who do not appear on-camera. (If the GATE THRESHOLD dB control is turned OFF, the DJ BASS BOOST setting is disabled.) In its default OFF position, it causes the gain reduction of the lowest-frequency band to move quickly to the same gain reduction as its nearest neighbor when gated. This fights any tendency of the lowest frequency band to develop significantly more gain than its neighbor when processing voice because voice will activate the gate frequently. Each time it does so, it will reset the gain of the lowest frequency band so that the gains of the two bottom bands are equal and the response in this frequency range is flat. The result is natural-sounding bass on male voice.

If you want a larger-than-life, "chesty" sound on male voice, set this switch ON. When the switch is ON, the processing simply freezes the gain of the lowest under gated conditions. Accordingly, there can be a large average gain difference between the two low-frequency bands and the system can produce considerable dynamic bass boost on voice.

This will be highly dependent on the fundamental frequency of the voice. If the fundamental frequency is far above 100Hz there will be little voice energy in the bottom band and little or no audio bass boost can occur even if the gain of the bottom band is higher than the gain of its neighbor. As the fundamental frequency moves lower, more of this energy leaks into the bottom band, and you hear more bass boost. If the fundamental frequency is *very* low (a rarity), there will be enough energy in the bottom band to force significant gain reduction, and you will hear less bass boost than if the fundamental frequency were a bit higher.

BASS COUPLING control determines the extent to which the gain of band 1 (below 100Hz) is determined by and follows the gain of band 2 (mid-). Set towards 100% (fully coupled) it reduces the amount of dynamic bass boost, preventing unnatural bass boost in general television programming. Set towards 0% (independent), it permits frequencies below 100Hz (the "slam" region) to have maximum impact in modern rock, urban, dance, rap, and other music where bass punch is crucial. The default setting is 100%.

DOWN EXPAND THR (Downward Expander Threshold) control determines the level below which the single-ended noise reduction system's downward expander begins to decrease system gain, and below which the high frequencies begin to become low-pass filtered to reduce perceived noise. Activate the single-ended dynamic noise reduction by setting the DOWN EXPAND THR control to a setting other than OFF.

The single-ended noise reduction system combines a broad downward expander with a program-dependent low-pass filter. These functions are achieved by causing extra gain reduction in the Five-Band compressor. You can see the effect of this extra gain reduction on the gain reduction meters.

If the program material is well-produced, gating on the AGC and Five-Band limiter will prevent objectionable build-up of noise, and you will want to use the single-ended noise reduction only on noisy program material. We expect that its main use will be in programming where either time or budget is lacking to produce audio with no significant background noise. Examples might include live news, sports, game shows, and soap operas.

Please note that it is impossible to design such a system to handle all program material without audible side-effects. You will get best results if you set the DOWN EXPAND THR control of the noise reduction system to complement the program material you are processing. The DOWN EXPAND THR should be set higher when the input is noisy and lower when the input is relatively quiet. The best way to adjust the DOWN EXPAND THR control is to start with the control set very high. Reduce the setting of control while watching the gain reduction meters. Eventually, you will see the gain increase in synch with the program. Go further until you begin to hear *noise modulation* — a puffing or breathing sound (the input noise) in sync with the input program material. Set the DOWN EXPAND THR control higher until you can no longer hear the noise modulation. This is the best setting.

Obviously the correct setting will be different for a sporting event than for a soap opera. It may be wise to define several presets with different settings of the DOWN EXPAND THR control, and to recall the preset that complements the program material of the moment.

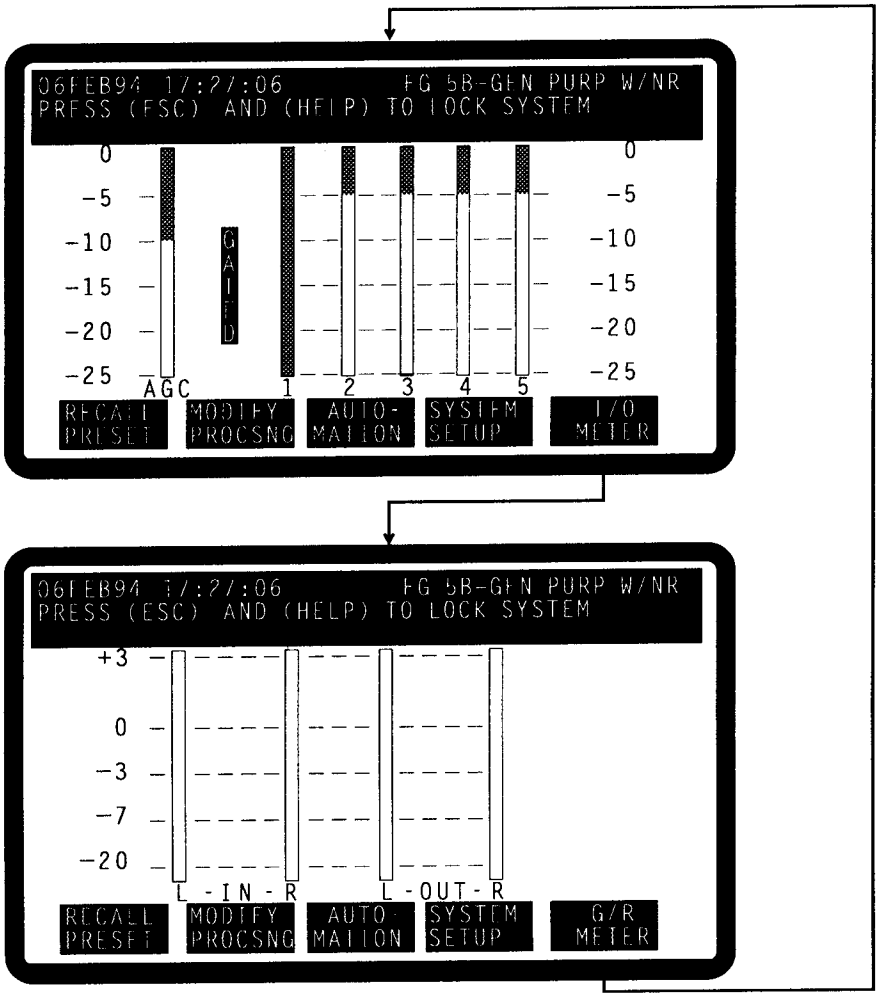
Note also that it is virtually impossible to achieve undetectable dynamic noise reduction of program material that is extremely noisy to begin with, because the noise is never masked by the program. It is may be wiser to defeat the dynamic noise reduction with this sort of material to avoid objectionable side-effects. You must let your ears guide you.

30Hz HPF control determines if the 30Hz 18dB/octave high-pass filter prior to the AGC is in or out of the signal path. For most situations, we recommend that it be ON, as explained on page 3-27.

AGC ON/OFF control activates or defeats the slow AGC prior to the Five-Band compressor.

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IDLE G/R and IDLE I/O Screens



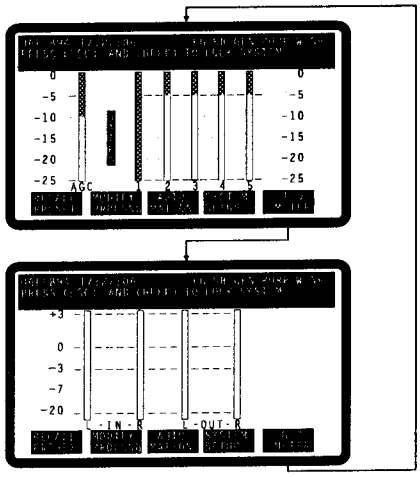
The IDLE G/R screen shows gain reduction meters for the processing structure in use.

The IDLE I/O screen shows left/right input/output levels.

Press the fifth soft key (I/O METER or G/R METER) to toggle between the two screens.

NOTE: Functions that are locked (other than RECALL PRESET) will not be shown. An ENTER PASCODE button is shown in place of the SYSTEM SETUP button, and can be used to enter in a valid pascode. (See IDLE LOCKOUT screens.)

IDLE G/R and IDLE I/O Screen Buttons



RECALL PRESET

Presets are stored settings of the processing controls (See Section 1). Press RECALL PRESET to see a list of all stored presets. You can select a preset from the list, and recall that preset on the air.

MODIFY PROCSNG

Press MODIFY PROCSNG to get to the controls that you can adjust to change the sound of the processing on the air.

AUTO-MATION

Automation is automatic programmed change of presets at scheduled times. Press AUTOMATION to see the list of programmed changes, and to change this list.

SYSTEM SETUP

Use SYSTEM SETUP to:
- Check software version number and hardware installed
- Run QUICK SETUP
- Calibrate Input/Output levels
- Set the time and date
- Program pascodes and remote control functions.

I/O METER

From IDLE G/R screen, press I/O METER to see Input/Output levels on the screen instead of gain reduction levels. Metering will show left and right input and output levels.

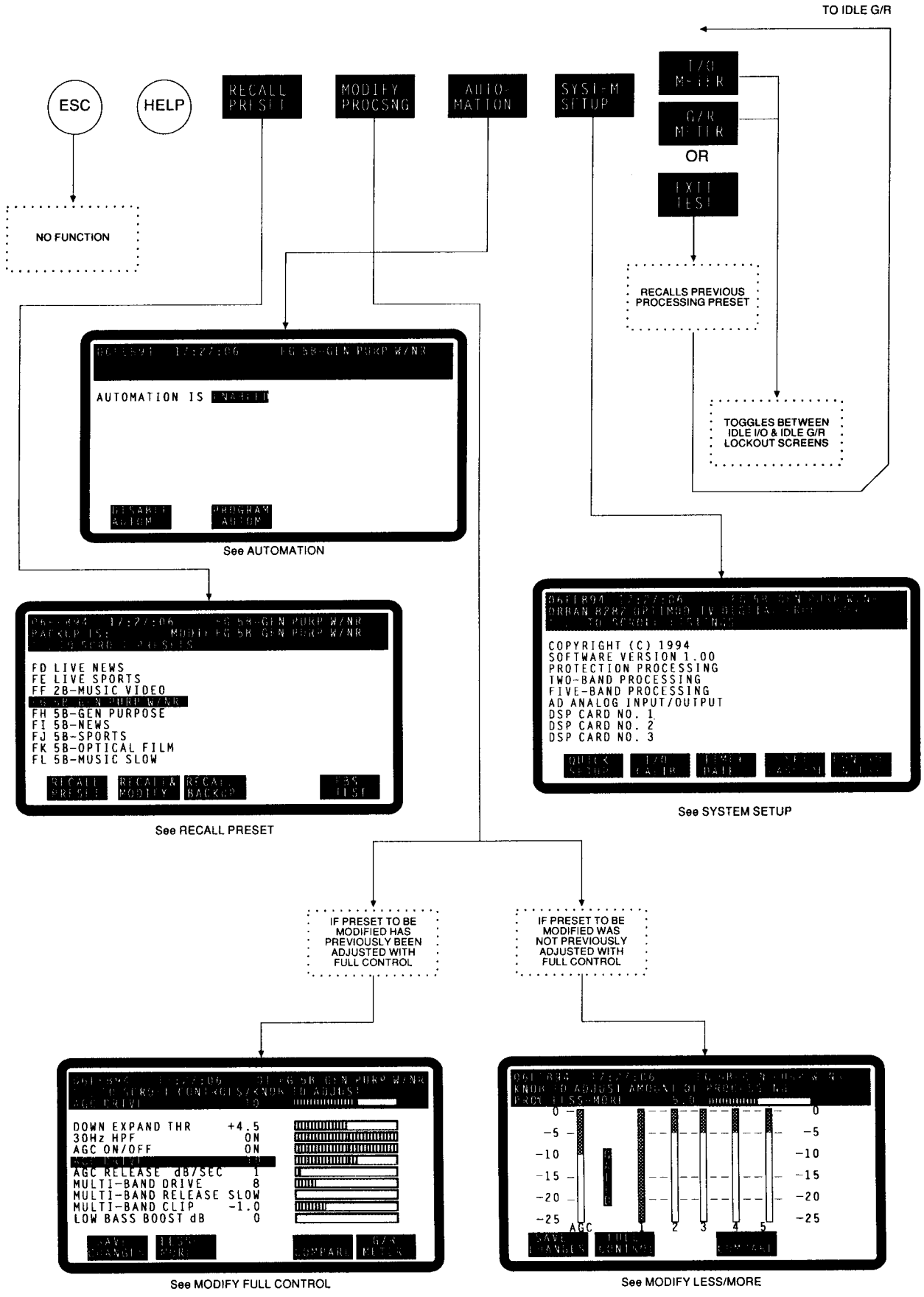
G/R METER

From IDLE I/O screen, press G/R METER to see gain reduction levels on the screen instead of Input/Output levels. Metering will show gain reduction for the processing structure in use. This button is not displayed if a special tone preset (e.g., TO, BY) is selected.

EXIT TEST

From IDLE I/O screen, press EXIT TEST to exit the test preset on air and recall previous processing preset. This button is displayed if a special test preset is selected.

IDLE G/R and IDLE I/O Flow Chart



IDLE G/R and IDLE I/O Additional Screen Information

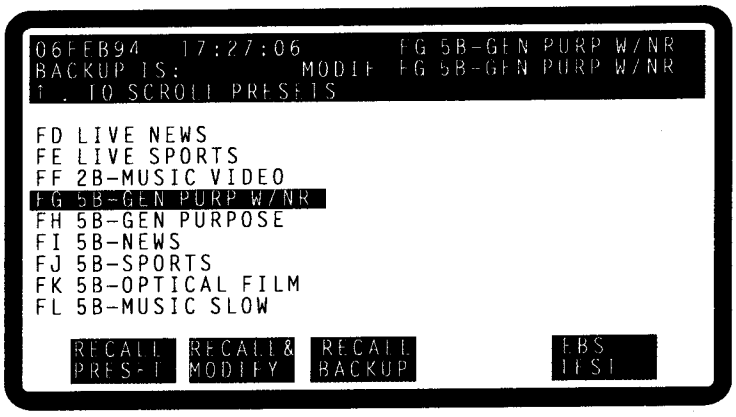
IDLE G/R screen: When a PC is connected to your 8282 for remote control operation, the third line of the IDLE G/R screen reads: PC ON LINE: Log-on name.

IDLE I/O screen: When Digital I/O is fitted, ANALOG IN, or DIGITAL IN appears on line 3 of the IDLE I/O screen, depending upon which is active. TX1, TX2, SCA1 and SCA appear at the end of the line if the function they represent is active (e.g., TX1 OSHOOT COMP).

RECALL PRESET Screen

User Preset	Preset Name
AA	PROTECTION 0dB
AB	PROTECTION 5dB
FA	2B-GEN PURPOSE
FB	2B-GEN PUR NO LC
FC	2B-FINE ARTS
FD	LIVE NEWS
FE	LIVE SPORTS
FF	2B-MUSIC VIDEO
FG	5B-GEN PURP W/NR
FH	5B-GEN PURPOSE
FI	5B-NEWS
FJ	5B-SPORTS
FK	5B-OPTICAL FILM
FL	5B-MUSIC SLOW
FM	5B-MUSIC MSLOW
FN	5B-MUSIC MFAST
FO	5B-MUSIC FAST
BY	BYPASS
TO	USER TONE

RECALL PRESET Screen and Buttons



Presets are stored settings of the processing controls.
Use the ↑ and ↓ keys to select a preset from the list. Press RECALL PRESET to recall that preset on the air.

RECALL PRESET

Press RECALL PRESET to put the selected (highlighted) preset on the air. If the selected preset is the same as the preset already on the air, the sound of the station will not change.
When you press RECALL PRESET, the previous preset is remembered. To return to it, press RECALL BACKUP.

RECALL& MODIFY

Press RECALL& MODIFY to put the selected (highlighted) preset on the air, then get to the controls that you can adjust to change the sound of the processing on the air. This is the same as pressing RECALL PRESET, ESC, then MODIFY PROCSNG.

RECALL BACKUP

When you recall a preset, the preset that was on the air previously is remembered. Or when you modify a preset, the setting of the controls before you changed them are remembered. The number and name of the backup preset is shown on the screen on line 2.
Press RECALL BACKUP to recall the previous preset or settings.

EBS TEST

Press to access EBS TEST screen. This screen makes you verify you really want an EBS TEST on air, before continuing.

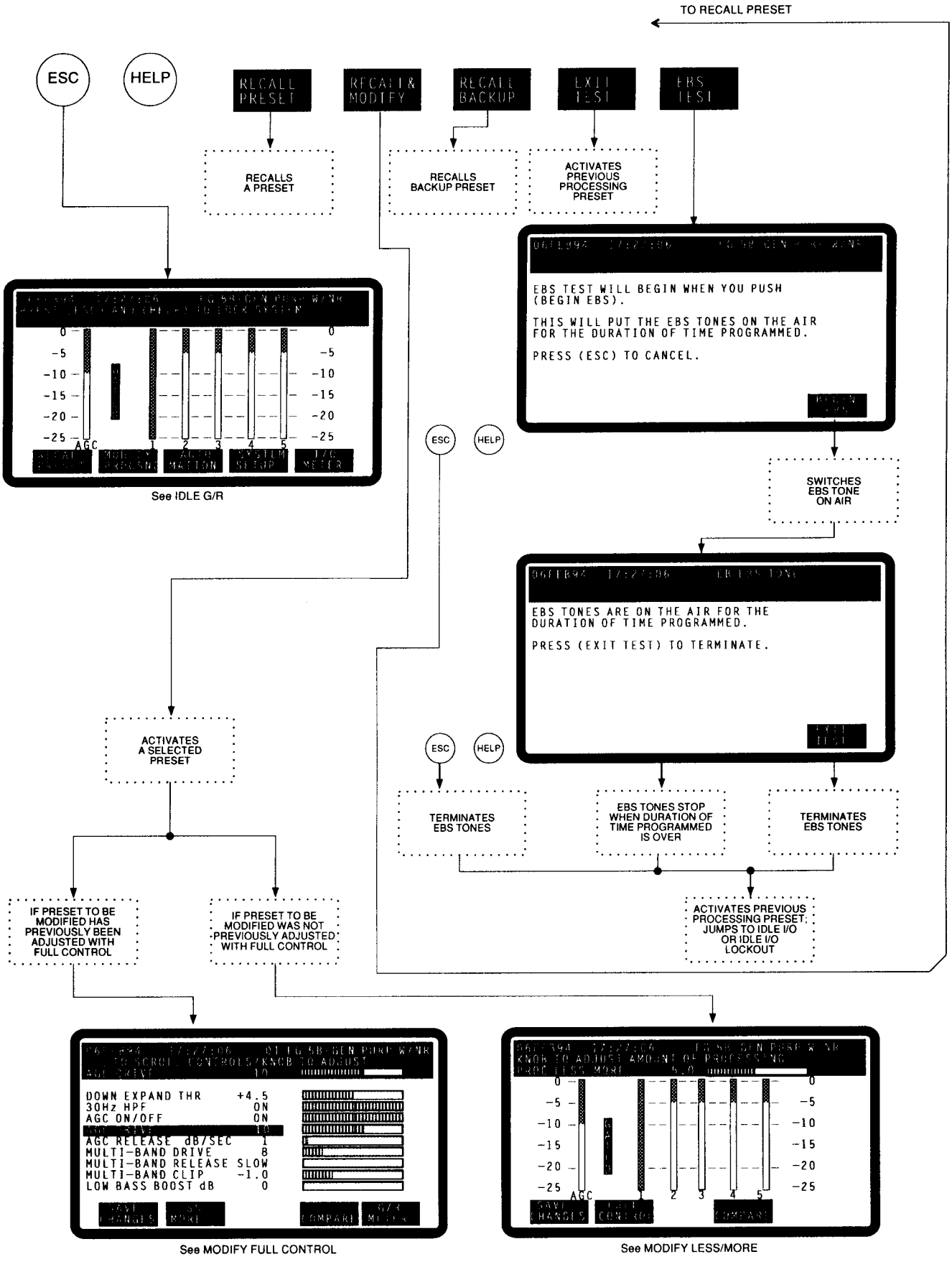
BEGIN EBS

Press to activate EBS TEST for duration programmed.

EXIT TEST

EXIT TEST is displayed on the screen only when the preset on the air is a test preset. Press to exit the test and activate the previous processing preset (not the previous test preset). (If the automation would have activated a new preset during the time you were using a test preset, EXIT TEST will activate this new preset, not the previous processing preset.)

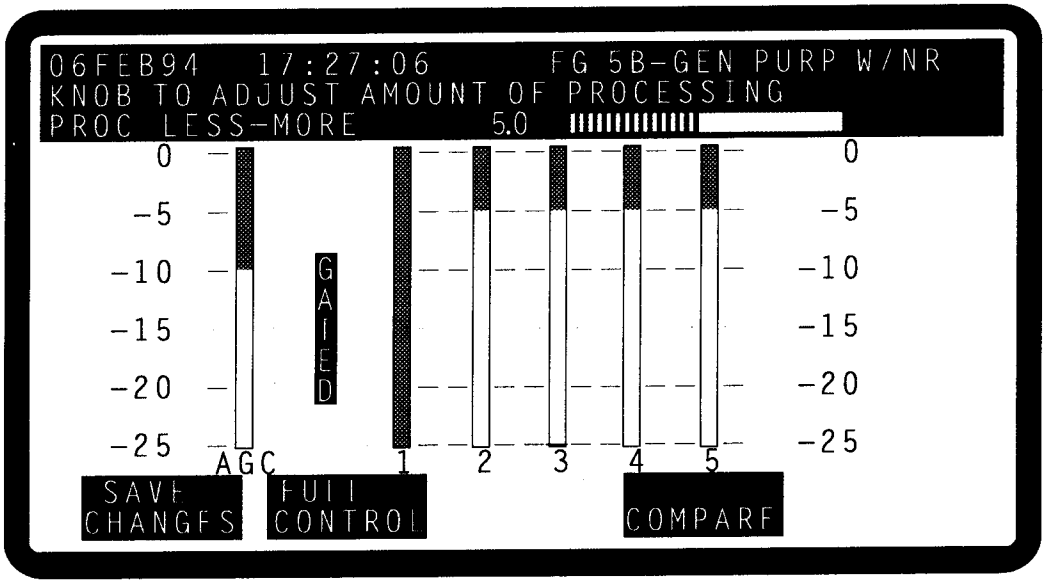
RECALL PRESET Flow Chart



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MODIFY Screens

MODIFY LESS-MORE Screen

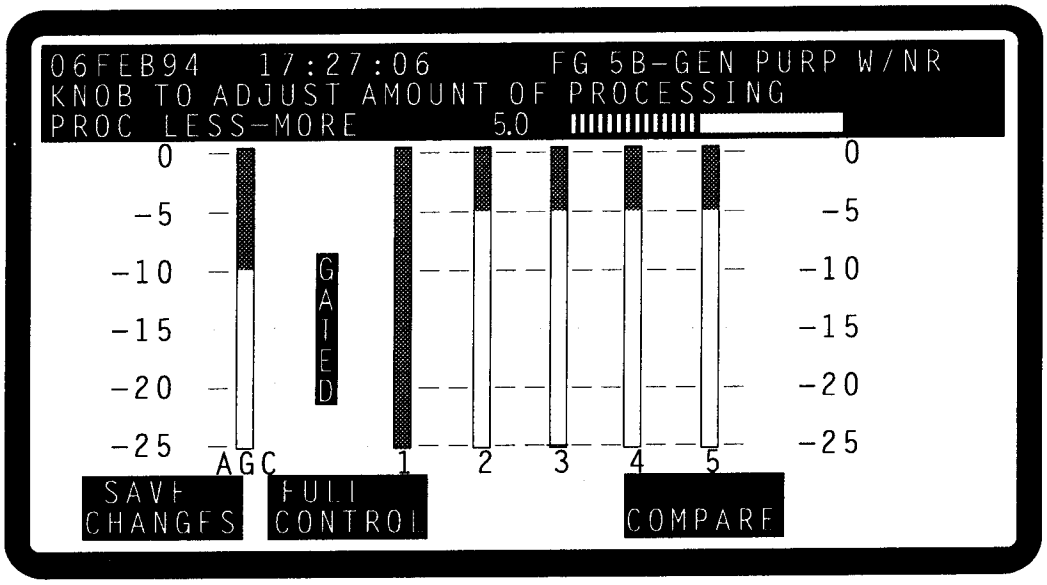


Modify Processing Less-More adjusts all of the controls precisely to factory recommended settings for various amounts of processing. It is a great way to adjust the sound on the air without having to understand what each of the many controls does.

Use the control knob to make less-more modifications. Note that as soon as the control knob is used, the ## PRESET NAME indication on line 1 changes to MODIF ## PRESET NAME to indicate a change to that preset. You can find your way back to the original setting by adjusting until the "MODIFY" flag (in front of the preset name) and the "M" flag (to the right of the active control box) are extinguished.

MODIFY Screens

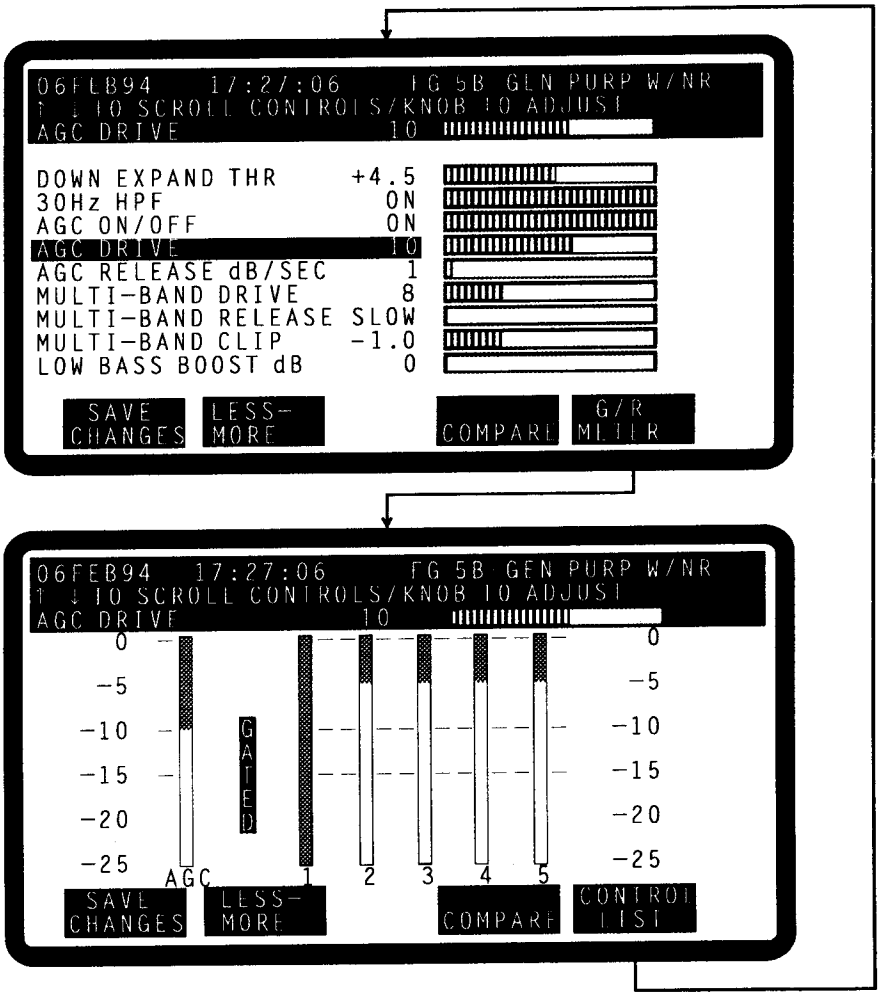
MODIFY LESS-MORE Screen



Modify Processing Less-More adjusts all of the controls precisely to factory recommended settings for various amounts of processing. It is a great way to adjust the sound on the air without having to understand what each of the many controls does.

Use the control knob to make less-more modifications. Note that as soon as the control knob is used, the ## PRESET NAME indication on line 1 changes to MODIF ## PRESET NAME to indicate a change to that preset. You can find your way back to the original setting by adjusting until the "MODIFY" flag (in front of the preset name) and the "M" flag (to the right of the active control box) are extinguished.

MODIFY FULL CONTROL and MODIFY FULL G/R Screens



The MODIFY FULL screens let you adjust individual controls. The numbers/text and box next to each control show where the control is set.

The MODIFY FULL CONTROL screen lists each control and its setting, while the MODIFY FULL G/R screen shows gain reduction meters for the processing structure in use. Both screens show the currently-selected control and its setting on the third line of the screen display. This allows for easy adjustment from either screen.

Use the ↑ and ↓ keys to select a control from the list. Change the settings of that control with the front panel control knob. If any control is changed, an "M" is displayed to the right of the meter to indicate a change to that control and the ## PRESET NAME indication on line 1 changes to MODIF ## PRESET NAME to indicate a change to that preset. Controls can be set back to their original positions by adjusting until the "MODIFY" flag (in front of the preset name) and the "M" flag (to the right of the active control box) are eliminated.

Press the fifth soft key (G/R METER or CONTROL LIST) to toggle between the two screens.

MODIFY FULL CONTROL , MODIFY FULL G/R and MODIFY LESS-MORE Buttons



When you adjust any of the processing controls, the sound on the air changes. But these changes are not yet stored in a preset. Pressing SAVE CHANGES lets you store the new settings in the same or a different preset.
See SAVE CHANGES (page 3-55).



From MODIFY FULL CONTROL screen, returns you to MODIFY LESS-MORE to change all of the controls together, to the factory-recommended settings.
But if you have changed any controls with FULL CONTROL, you cannot return to MODIFY LESS-MORE without losing your customized settings. You will first be warned that you will lose your FULL CONTROL control settings.



FULL CONTROL is for the station that wants to fine-tune the sound beyond the factory recommended settings in LESS-MORE.
Once you change the sound with FULL CONTROL, you cannot return to MODIFY LESS-MORE without losing your customized settings.



COMPARE is used for switching between a modified preset and an unmodified preset. COMPARE is also useful for toggling to COMPARE NEXT, which can be used to compare the preset in the MODIFY screen with any other preset.
See COMPARE (page 3-54).

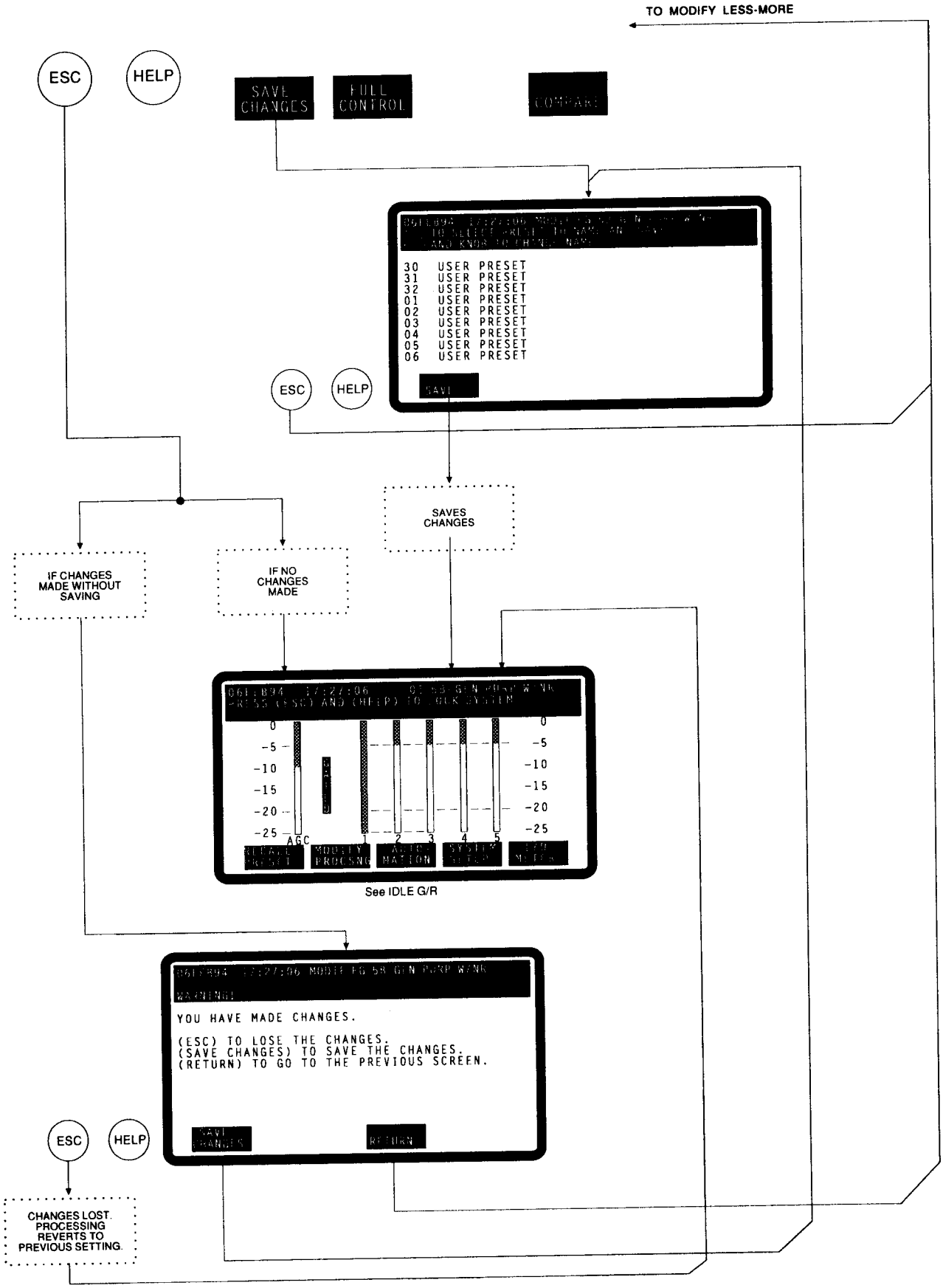


From MODIFY FULL CONTROL screen, press G/R METER to see gain reduction levels instead of full control list. Metering will show gain reduction for the processing structure in use.
You can still scroll the controls and change their settings. The selected control name and its setting are shown above the meters (on the third line of the screen display).
Press the far-right soft key (CONTROL LIST or G/R METER) to toggle between the two screens.

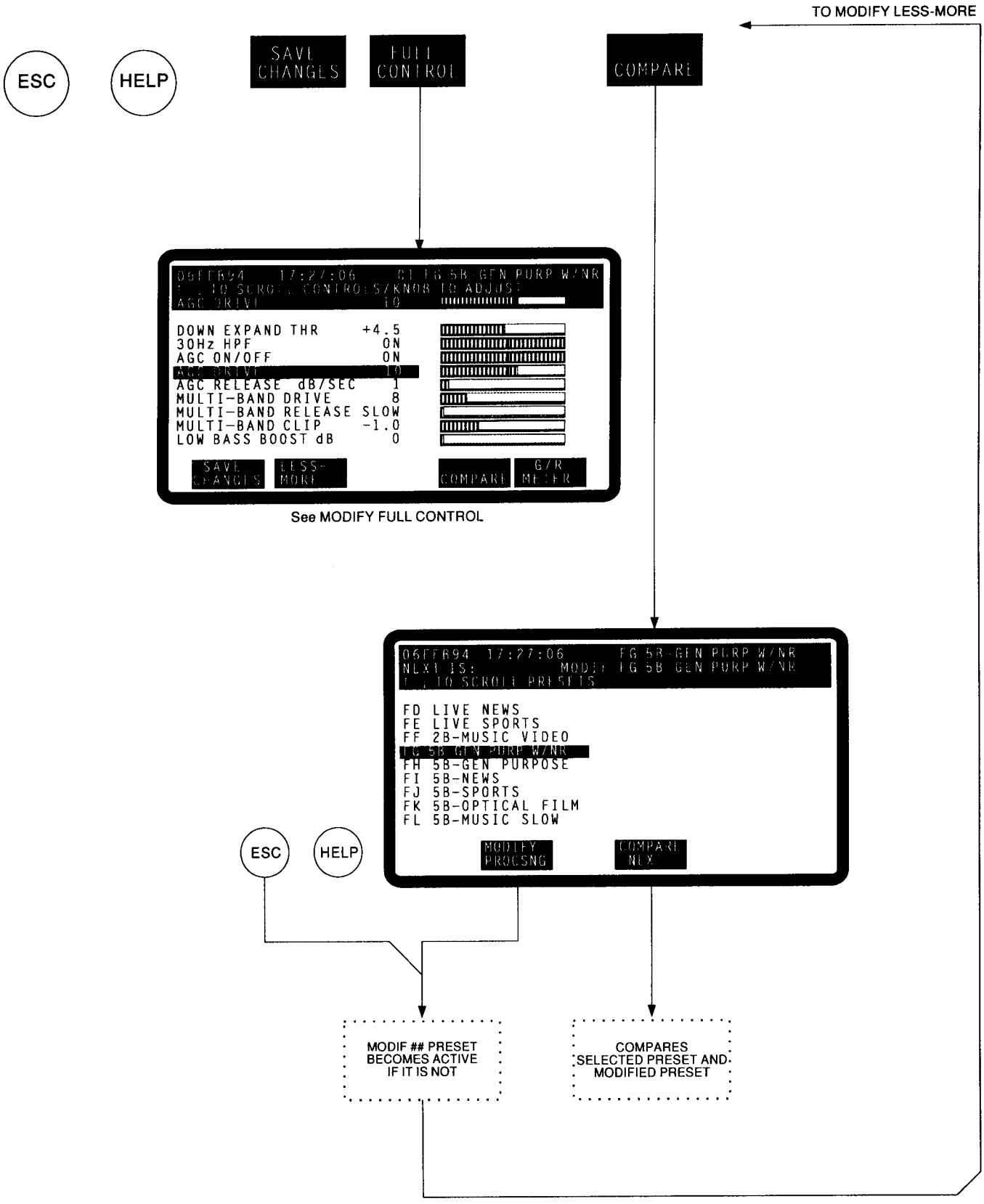


From MODIFY FULL GAIN REDUCTION screen, press CONTROL LIST to see full list of controls instead of gain reduction meters.
The selected control name and its setting are highlighted in the list, and are also shown on the third line of the screen display.
Press the far-right soft key (CONTROL LIST or G/R METER) to toggle between the two screens.

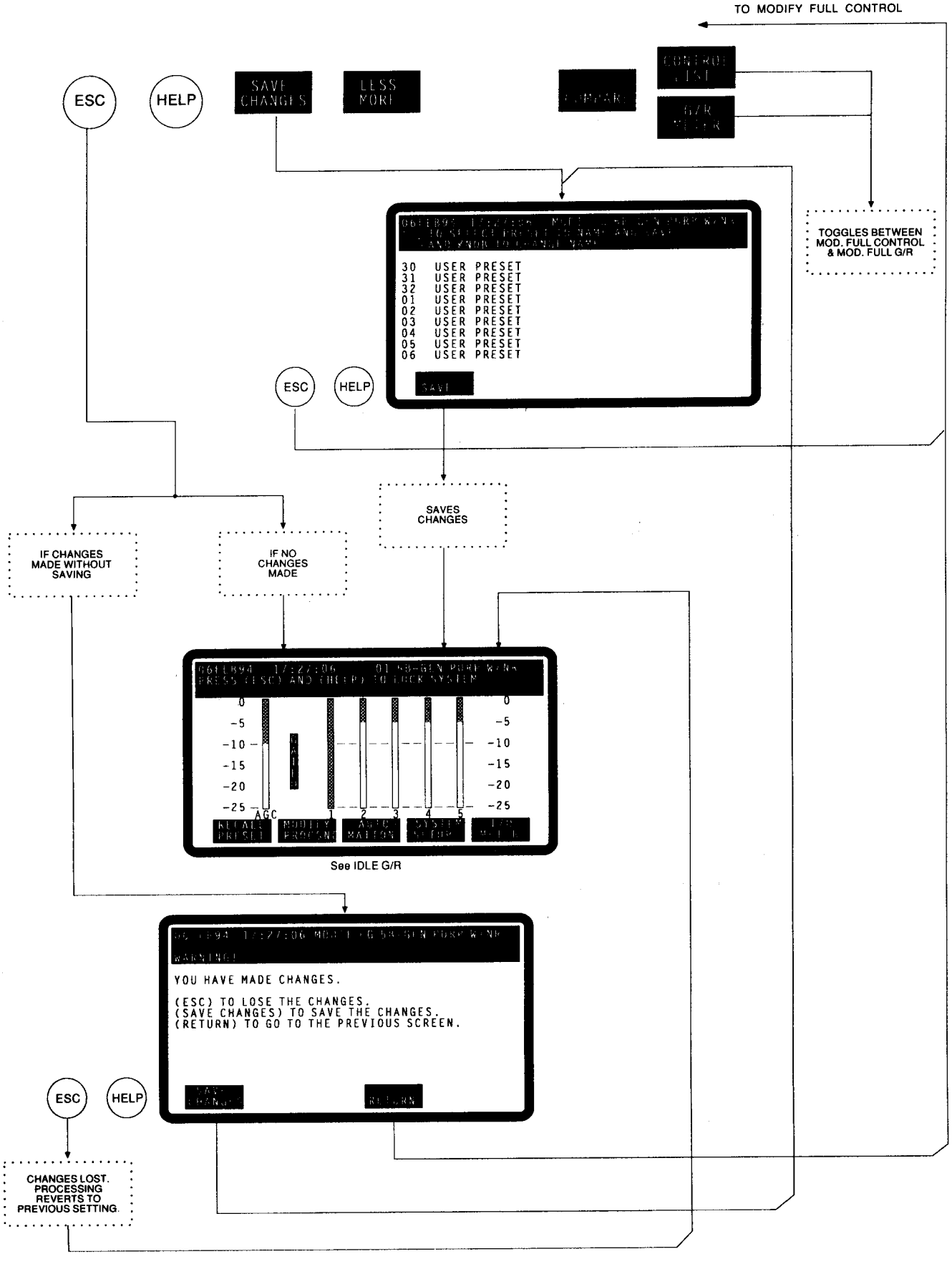
MODIFY LESS-MORE Flow Chart



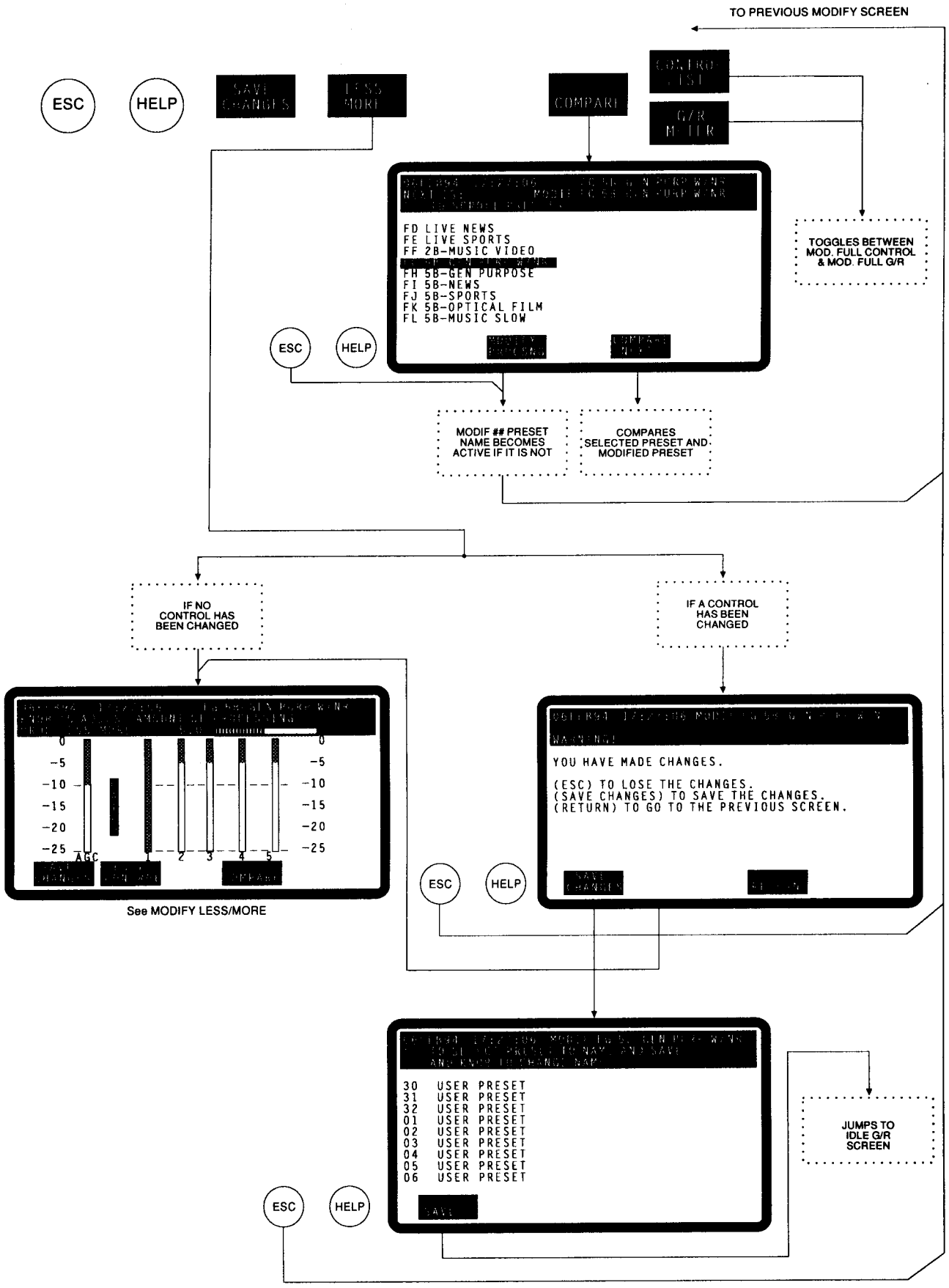
MODIFY LESS-MORE Flow Chart



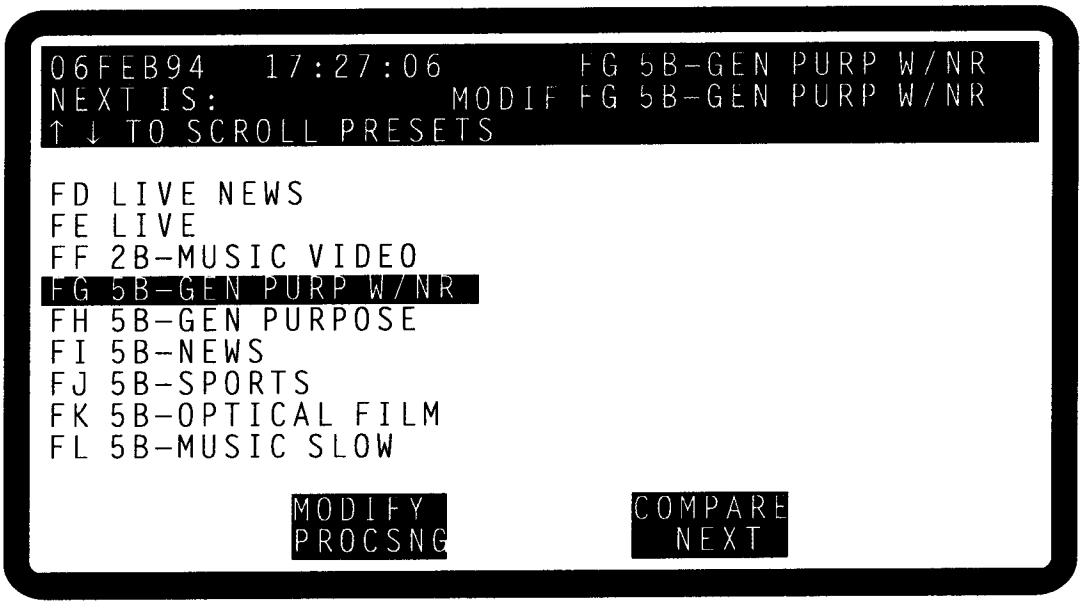
MODIFY FULL CONTROL and MODIFY FULL G/R Flow Chart



MODIFY FULL CONTROL and MODIFY FULL G/R Flow Chart



COMPARE Screen and Buttons



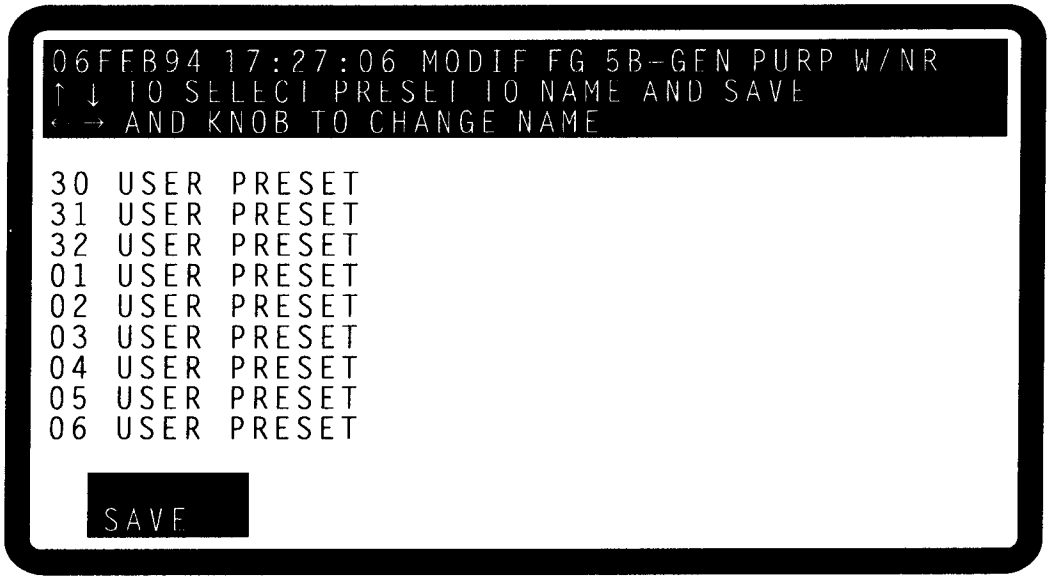
MODIFY PROCSNG

Returns you to the previous screen (MODIFY LESS-MORE).

COMPARE NEXT

COMPARE NEXT is used for switching between a selected (highlighted) preset and the preset active in the most recent MODIFY screen. Use the ↑ and ↓ keys to scroll to a preset.
The second line of the screen display shows what preset will be active if you press this button.

SAVE CHANGES Screen and Button





When you adjust any of the processing controls, the sound on the air changes. These changes are not stored in a preset until you press SAVE from this screen.

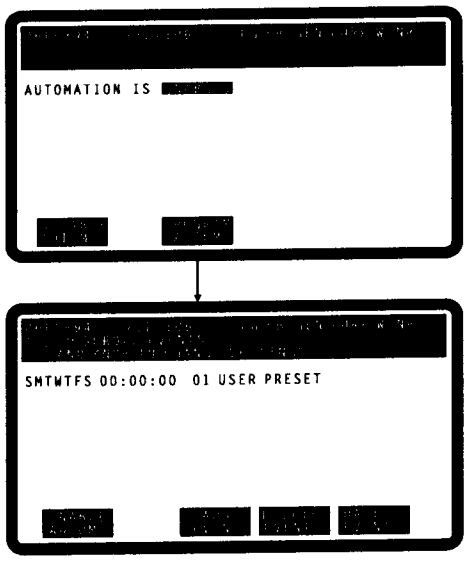
Use the ↑ and ↓ keys to select preset # to name and save.
Use ← and → keys to select each character, and the control knob to change the character. If you do not assign a new name, the name in the upper right corner of the screen is assigned.

Press SAVE to store the new settings in the selected preset.

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AUTOMATION Screens

AUTOMATION Screen and Buttons



Automation is automatic programmed change of presets at scheduled times. The AUTO PROGRAM screen shows a listing of all automation events programmed.
Use the ↑ and ↓ keys to scroll up and down event list.
Use ← and → keys to move through automation field, and the control knob to make changes.

You can set the event to happen by day(s) of the week, or on one specific date.

DISABLE AUTOM — Disables Automation. This button appears if Automation is enabled.

ENABLE AUTOM — Enables Automation. This button appears if Automation is disabled.

PROGRAM AUTOM — Access AUTO PROGRAM screen. This button is displayed if pascode permits access to program AUTO PROGRAM screen.

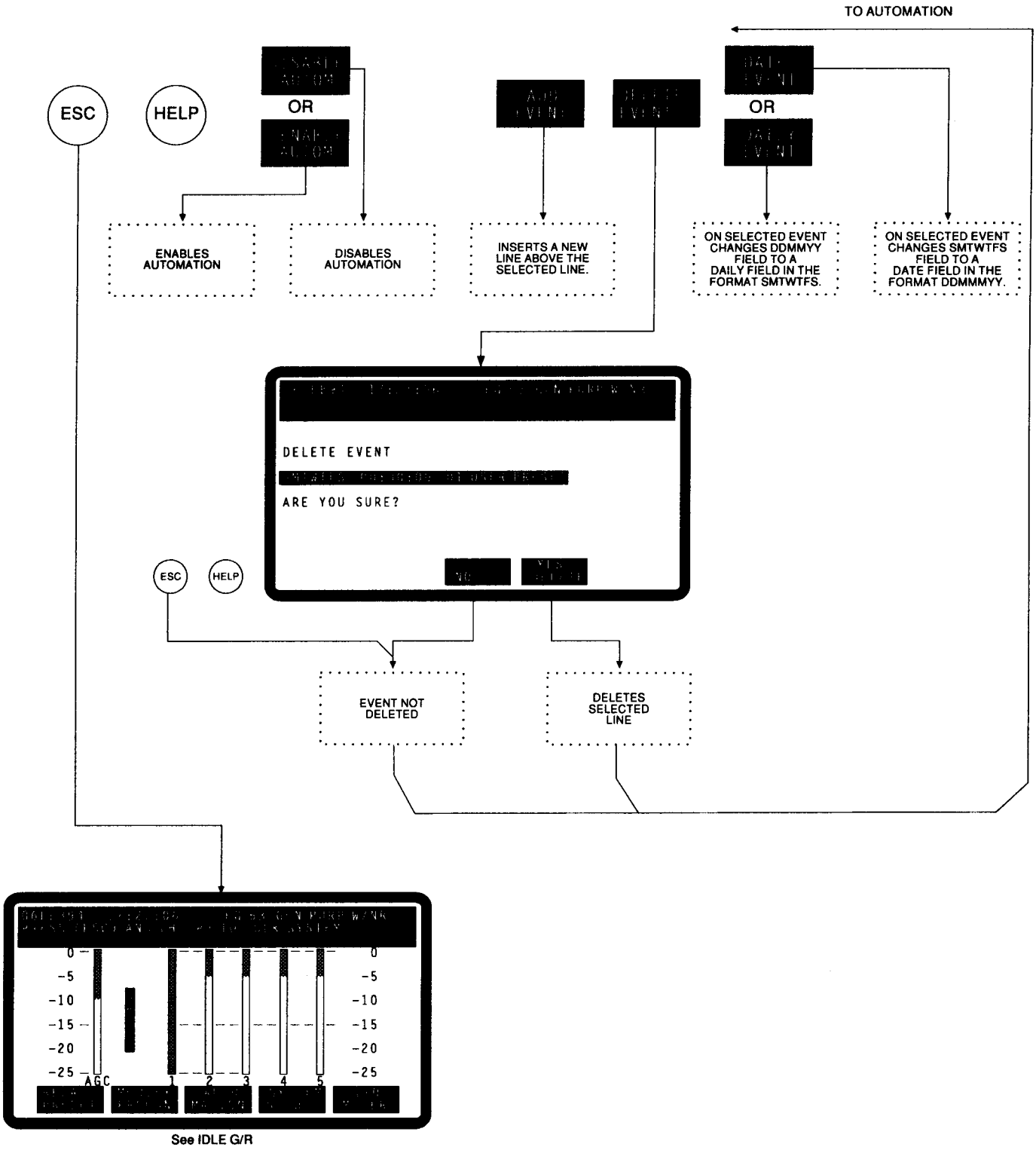
ADD EVENT — Inserts a new line above the selected line.
Use ← and → and the control knob to program the event.

DELETE EVENT — Deletes an event from Automation.
You are first given a warning, however.

DATE EVENT — On selected event, changes SMTWTFS field to a date field in the format DDMMMYY. This button appears if the highlighted event is a daily field.

DAILY EVENT — On selected event, changes DDMMMYY field to a daily field in the format SMTWTFS. This button appears if the highlighted event is a date field.

AUTOMATION Flow Chart



AUTOMATION Additional Screen Information

Using DATE EVENT and DAILY EVENT to Automatically Change Presets.

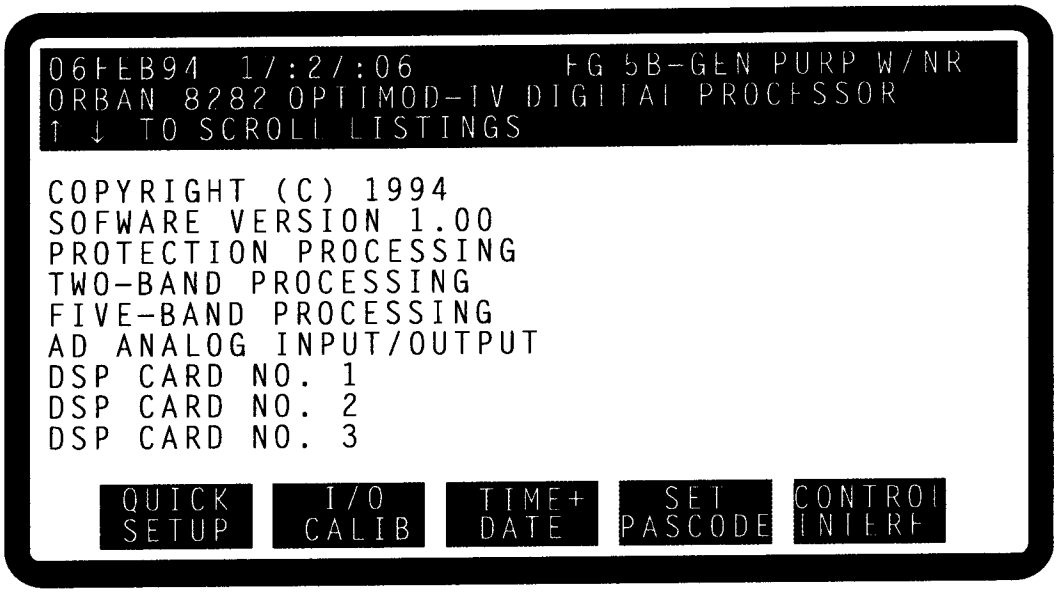
The 8282's automation software will allow a DATE EVENT to take precedent over a DAILY EVENT. This means that event changes automated by DAILY EVENT are activated as scheduled until the event specified with DATE EVENT, then the DATE EVENT overrides any previously scheduled DAILY EVENT programmed for the same time. After the DATE EVENT takes place, the next DAILY EVENT will resume its schedule. This eliminates the need for the user to delete the scheduled DAILY EVENT when DATE EVENT is programmed.

WARNING: Unless you are intentionally overriding a DAILY EVENT with a DATE EVENT, do not program two events to occur at the same time of the day. The software only recognizes the first setting listed in the event list. The second setting listed will be ignored.

IMPORTANT: If you want to activate a processing preset or test preset and an operational mode (ST DUALCH — Stereo Dual-Channel) **simultaneously**, insure that the time settings in the EVENT list are at least 1 second apart.

SYSTEM SETUP Screens

SYSTEM SETUP Screen and Buttons



The screen shows: Software version number and serial number
Which processing structures the software contains
Hardware that is installed.

QUICK SETUP

QUICK SETUP will get you on the air fast.
QUICK SETUP walks you through initial setup procedure, step by step.

I/O CALIB

Press I/O CALIB to access a detailed listing of all system calibrations. Most of these are set in the QUICK SETUP procedure.

TIME+ DATE

Press TIME+ DATE to access controls to set the time, date, and dates for daylight savings time, if used in your country.
Use the ↑ and ↓ keys to scroll preset list up and down. Use the ← and → keys on TIME or DATE settings to move through hour-minute-second or day-month-year. Change parameters with the control knob. Press ENTER CHANGE to store these changes in the system. Or press ESC to ignore the changes.

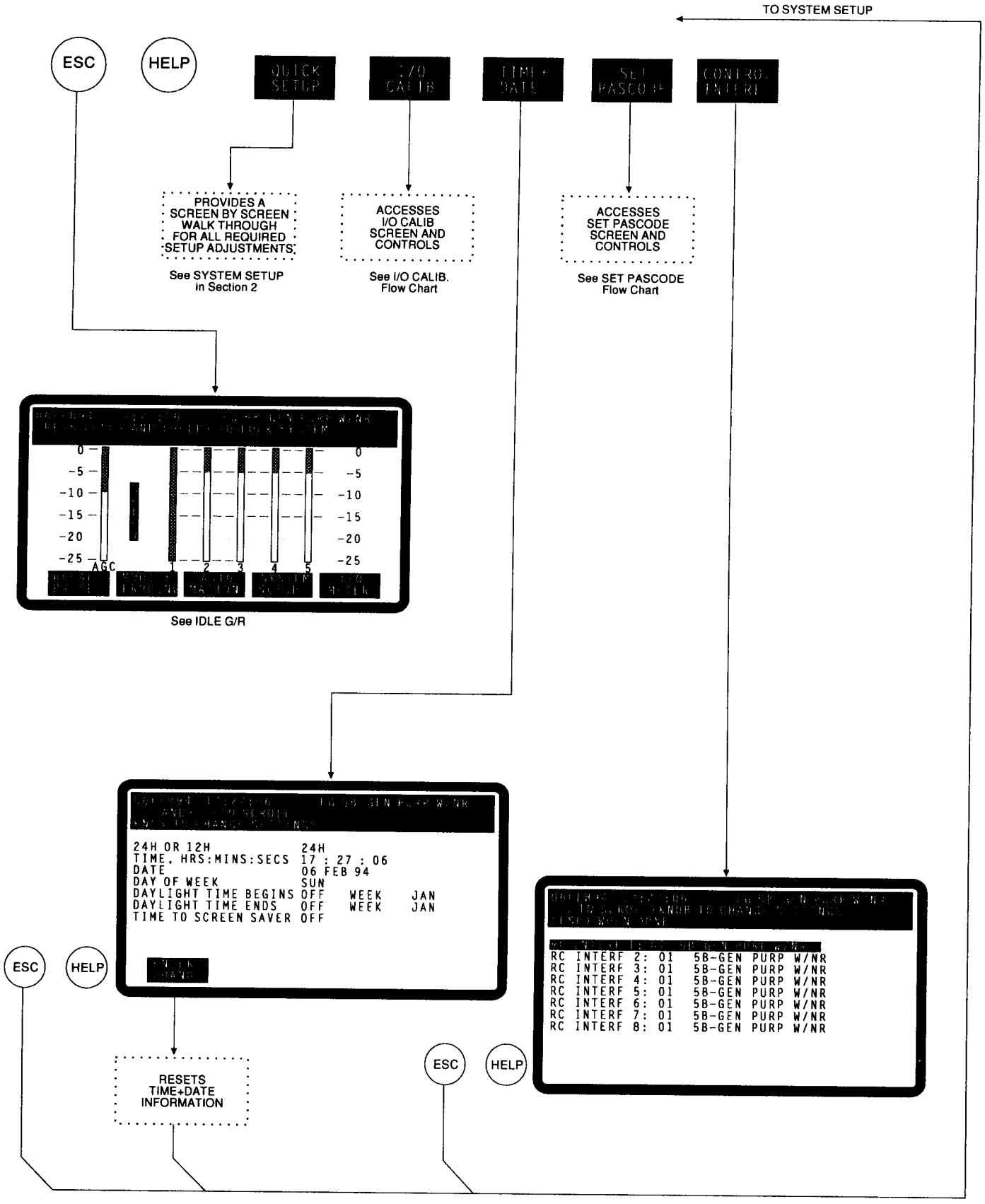
SET PASCODE

Press SET PASCODE to access pascode controls to program the security lockout of the system, and program the pascodes.

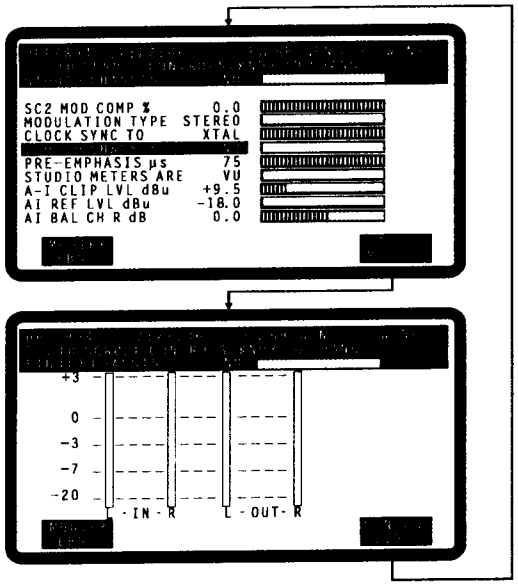
CONTROL INTERF

Press CONTROL INTERFace to program the remote control interface and its eight (8) opto-isolated inputs. Each can be programmed to recall any preset, switch to Stereo, Dual Channel, reduce level when SCA1 or SCA2 are ON, or reduce level when TX1 or TX2 are ON. Note: remote functions that reduce level do so only when current is applied to the appropriate input, so these functions must be externally held active — they do not latch.

SYSTEM SETUP Flow Chart (QUICK SETUP, TIME+ DATE, INTERFACE)



I/O CALIB and I/O CALIB I/O METER Screen Buttons



Press far-right key (I/O METER or CONTROL LIST) to toggle between the two screens.

MODIFY EBS

Accesses MODIFY EBS screen to modify EBS Test Tone. Accessing this screen does not implement EBS test (see page 44). Press ESC to store changes.

CONTROL LIST

From I/O CALIB screen, changes the screen to show the full list of controls instead of the Input/Output meters.
Use the ↑ and ↓ keys to scroll input/output list. Adjust the level or parameter with the control knob.

853 Hz ON AIR

From MODIFY EBS screen, enables 853Hz tone. This tone stays on air until 853Hz OFF button is pressed.

960 Hz ON AIR

From MODIFY EBS screen, enables 960Hz tone. This tone stays on air until 960Hz OFF button is pressed.

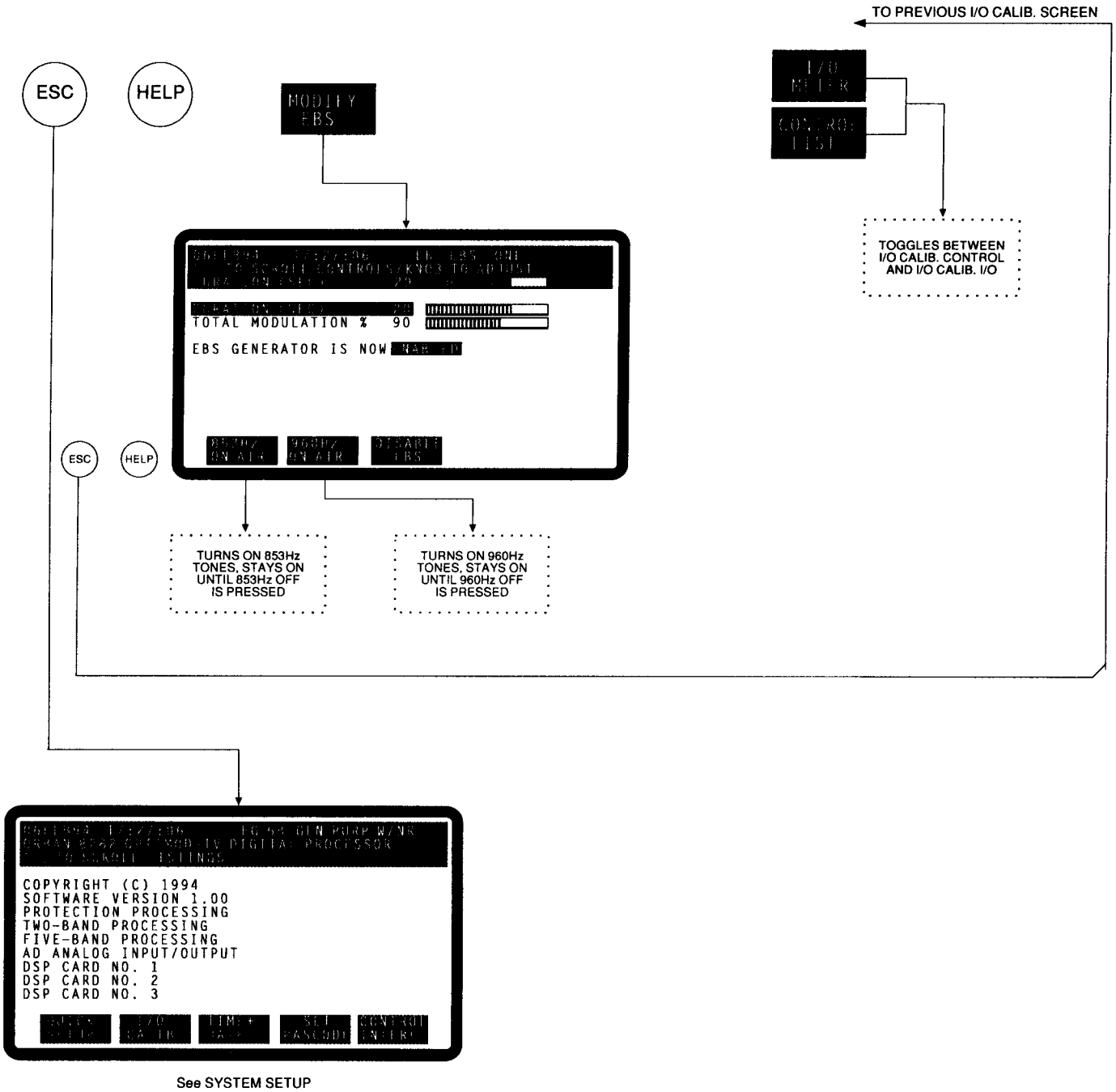
ENABLE AUTOM

From MODIFY EBS screen, enables access to EBS tone from the RECALL PRESET screen (see page 44).

DISABLE AUTOM

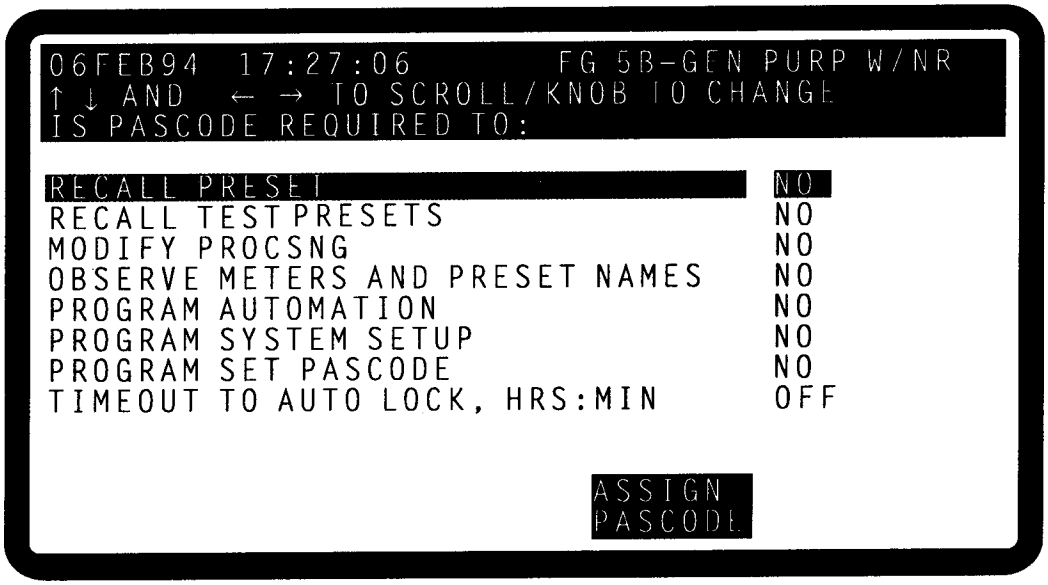
From MODIFY EBS screen, disables access to EBS tone. The EBS TEST button will no longer appear in the RECALL PRESET screen. Note, however, that the EBS Test Tone can still be accessed via remote control.

I/O CALIB CONTROL and I/O CALIB I/O Flow Chart



See SYSTEM SETUP

SET PASCODE Screen



The SET PASCODE screen provides access to the controls and screens necessary to program the security lockout of the system and program the pascodes.

Use this screen to select functions for lockout.
Use the ASSIGN PASCODE screen to assign functions to a particular pascode number.

Setting the security status of the 8282

All of the settings on this screen determine whether pascodes are required to access the various functions listed. If a function is listed as NO, the function can be accessed and changed from the front panel without the user having to enter a pascode. If a function is listed as YES, the user must first enter a pascode, and that pascode must have been previously programmed to permit access to that function.

When a pascode is entered, only those functions that are permitted by that pascode are displayed on the screen.

Use the ↑ and ↓ arrow keys to scroll through and select (highlight) the settings. Use the front panel control knob to change the setting.



When you are finished setting the security status of the 8282, press the ASSIGN PASCODE button to access the ASSIGN PASCODE screen.

If you do not wish to program pascodes at this time, press the ESC button to return to the SYSTEM SETUP *screen. Press the ESC button again to return to the* IDLE G/R *screen.*

SET PASCODE Screen Parameters

- RECALL PRESET

  [NO] or [YES]

  Selects whether a pascode (authorized to RECALL PRESET) is required to recall processing presets.

- RECALL TEST PRESETS

  [NO] or [YES]

  Selects whether a pascode (authorized to RECALL TEST PRESETS) is required to recall test presets, such as TO USER TONE and BY BYPASS.

  EBS (Emergency Broadcasting System) can be accessed at all times, with or without a pascode.

  NOTE: If the security status is set so that a pascode is required to recall test presets, and if a test preset has been stored as a user preset, it will be locked out to users not authorized to recall test presets.

- MODIFY PROCSNG

  [NO] or [YES]

  Selects whether a pascode (authorized to MODIFY PROCSNG) is required to modify the processing (change the sound of the station) and save those changes to a user preset.

- OBSERVE METERS AND PRESET NAMES

  [NO] or [YES]

  Selects whether a pascode (authorized to observe meters and preset names) is required to display the metering on the screen. Some stations may wish to restrict meter display from the screen so that their "setup" cannot be copied by another station.

- PROGRAM AUTOMATION

  [NO] or [YES]

  Selects whether a pascode (authorized to PROGRAM AUTOMATION) is required to change the automation event schedule.

- PROGRAM SYSTEM SETUP

  [NO] or [YES]

  Selects whether a pascode (authorized to change SYSTEM SETUP) is required to access QUICK SETUP, I/O CALIB, TIME+ DATE and CONTROL INTERF.

- PROGRAM SET PASCODE

  [NO] or [YES]

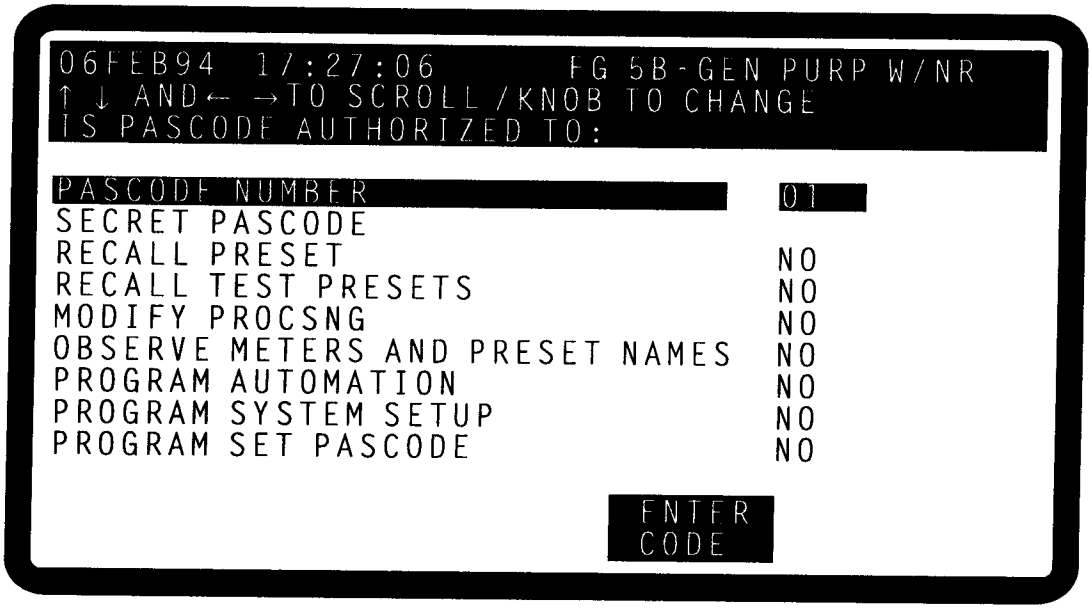
  Selects whether a pascode (authorized to program SET PASCODE) is required to access SET PASCODE.

- TIMEOUT TO AUTO LOCK, HRS:MINS

  [00:10] to [08:50] or [OFF]

  Timeout automatically locks the system after the period of time set by this control. We strongly recommend that you set timeout to a reasonable time, so that if the 8282 if left unattended, it will lock itself.

ASSIGN PASCODE Screen



The ASSIGN PASCODE screen provides the controls necessary to program the pascodes.

Use the ASSIGN PASCODE screen to assign (or "authorize") functions to a particular pascode number (after using the SET PASCODE screen to select functions for lockout).

Assigning functions to a particular pascode number:

The 8282 allows you to program up to 10 pascodes. Each pascode can be programmed to allow or deny access to the various functions listed.

PASCODE NUMBER is used to select which of the 10 pascodes you will program.

The rest of the lines show which functions that pascode is allowed to access. Note that if you previously programmed the SET PASCODE screen parameters so that a pascode is not required for a given function, the user will be allowed access to that function, even if the pascode is programmed NO for that function from the ASSIGN PASCODE screen.

Use the ↑ and ↓ arrow keys to scroll through and select (highlight) the settings. Use the front panel control knob to change the setting.

ENTER CODE

Press to access ENTER CODE screen, then enter the desired pascode, up to eight digits. If the pascode is less than eight digits, you must press ESC to store the entered pascode and return to the previous screen.

Note that if a pascode has been previously entered, and you simply escape the ENTER CODE screen, the previously entered pascode will remain valid.

ASSIGN PASCODE Screen Parameters

- PASCODE NUMBER

  [1] to [10]

  Selects which of ten pascodes to program authorization and code. As this number is changed, the other fields will change to reflect the authorization of that code.

  SET PASCODE allows you to program up to 10 secret pascodes, each with one to eight digits.

- SECRET PASCODE

  [0] to [99999999]

  Allows you to set pascode with one to eight digits.

- RECALL PRESET

  [NO] or [YES]

  Selects whether this pascode (PASCODE NUMBER displayed on the screen) is authorized to recall processing presets.

- RECALL TEST PRESETS

  [NO] or [YES]

  Selects whether this pascode (PASCODE NUMBER displayed on the screen) is authorized to recall test presets, such as TO TONE and BY BYPASS.

  EBS (Emergency Broadcasting System) can be accessed at all times, with or without a pascode.

  NOTE: If the security status is set so that a pascode is required to recall test presets, and if a test preset has been stored as a user preset, it will be locked out to users not authorized to recall test presets.

- MODIFY PROCSNG

  [NO] or [YES]

  Selects whether this pascode (PASCODE NUMBER displayed on the screen) is authorized to modify the processing (change the sound of the station) and save those changes to a user preset.

- OBSERVE METERS AND PRESET NAMES

  [NO] or [YES]

  Selects whether this pascode (PASCODE NUMBER displayed on the screen) is authorized to observe meters and preset names.

- PROGRAM AUTOMATION

  [NO] or [YES]

  Selects whether this pascode (PASCODE NUMBER displayed on the screen) is authorized to change the automation event schedule.

- PROGRAM SYSTEM SETUP

  [NO] or [YES]

  Selects whether a pascode (authorized to change SYSTEM SETUP) is required to access QUICK SETUP, I/O CALIB, TIME+ DATE and CONTROL INTERF.

  NOTE: A pascode authorized for SYSTEM SETUP will automatically be given access to all other functions (except SET PASCODES), even if that pascode is not programmed for those other functions.

- PROGRAM SET PASCODE

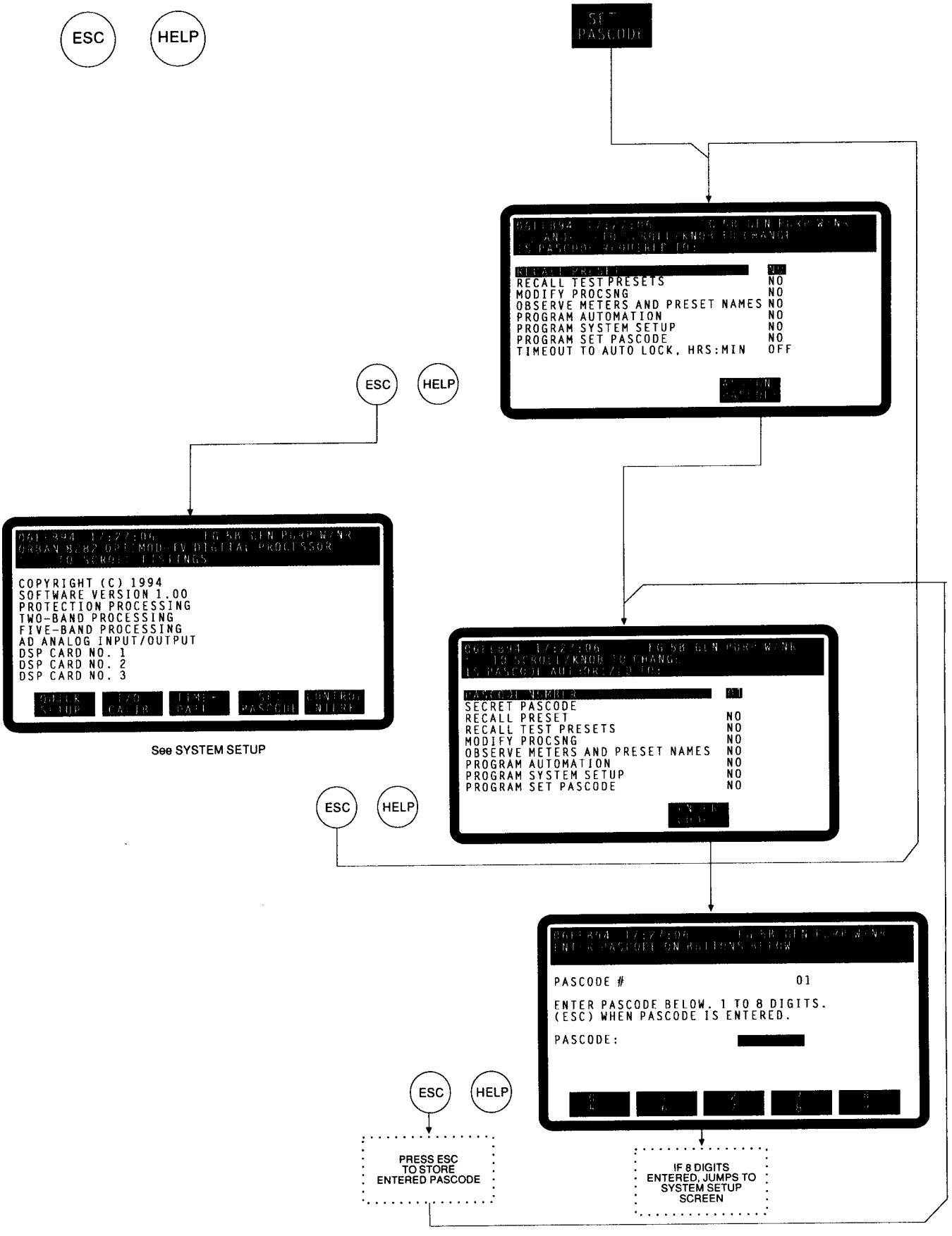
  [NO] or [YES]

  Selects whether a pascode (authorized to program SET PASCODE) is required to access SET PASCODE.

  NOTE: A pascode authorized for SET PASCODE will automatically be given access to all other functions, even if that pascode is not programmed for those other functions.

  NOTE: At least one of the ten pascodes must be authorized to program set pascode. This user has ultimate control of the 8282's security, and the unit will not lock until this requirement is fulfilled.

SET PASCODE Flow Chart



See SYSTEM SETUP

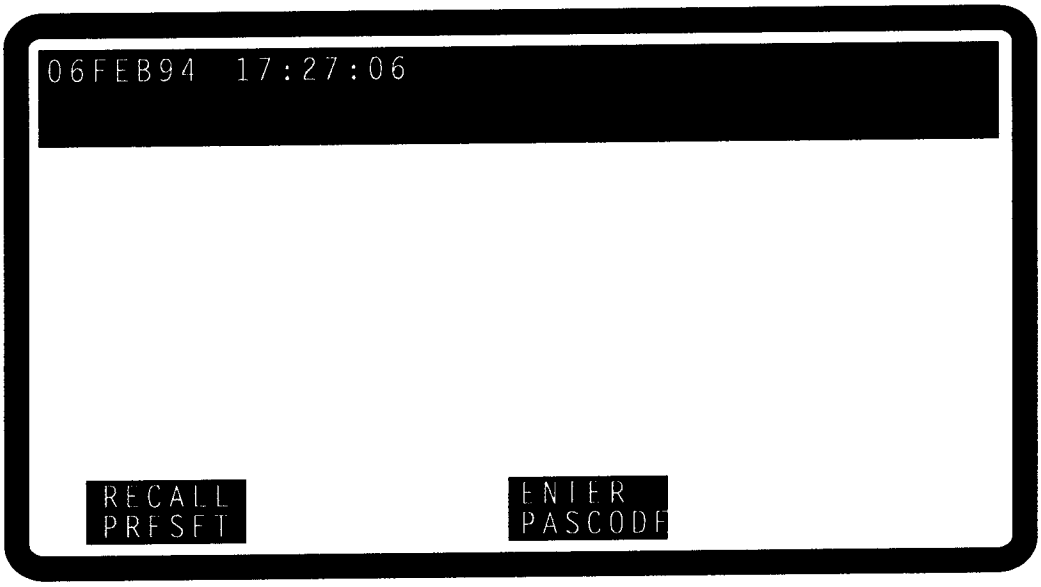
LOCKOUT Screen



The ENTER PASCODE button signifies that at least one 8282 front panel control function is locked (i.e., requires a pascode for access, according to the access permission set in SET PASCODE and the authorization for the pascode entered). If all functions are locked, the screen appears as shown above. If a function is not locked, it will be shown. RECALL PRESET button appears even when RECALL PRESET is locked. (But when RECALL PRESET is pressed, if RECALL PRESET is locked, only the EBS TEST button appears on the screen). MODIFY PROCSNG appears when MODIFY PROCSNG is allowed by pascode. AUTOMATION appears if either AUTOMATION or RECALL PRESET are allowed by pascode (But when AUTOMATION is pressed, if AUTOMATION is locked, only the DISABLE AUTOM/ENABLE AUTOM button appears on the screen). In LOCK-OUT mode, SYSTEM SETUP is always locked. Gain Reduction and Input/Output meters appear when OBSERVE METERS and PRESET NAMES is allowed by pascode.

To access locked functions, you need to enter a valid pascode. If a pascode with limited access has been entered, buttons for functions not permitted access by that pascode will not be displayed.

LOCKOUT Screen Buttons



RECALL PRESET

Presets are stored settings of the processing controls (See Section 1). Press RECALL PRESET to see a list of all stored presets. You can select a preset from the list, and recall that preset on the air. If RECALL PRESET is locked, the list will be empty, but the EBS TEST button will be available to access the EBS Test Tone.

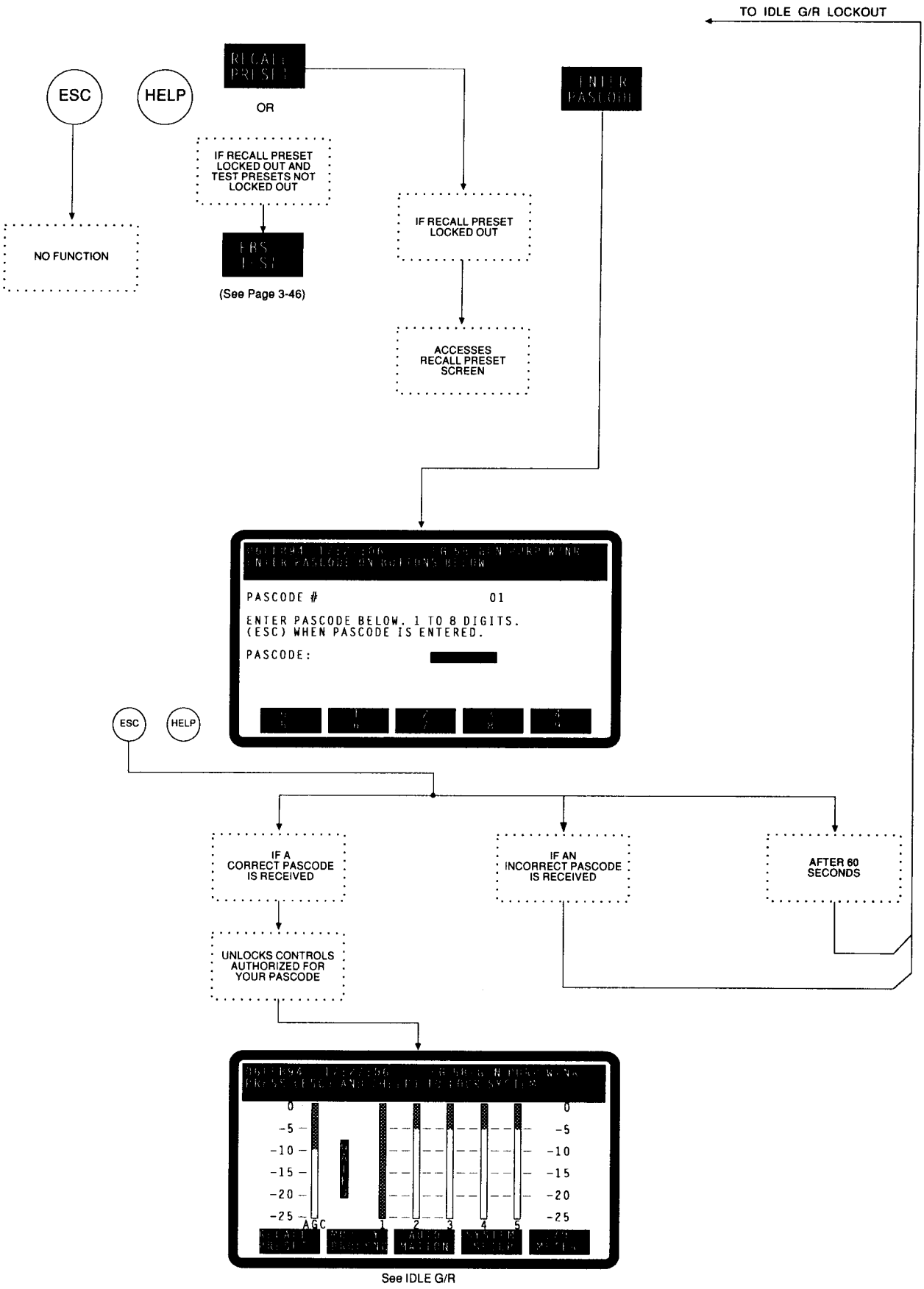
ENTER PASCODE

To enter your pascode:
1 - Press ENTER PASCODE.
2 - Enter your pascode on the five buttons below the screen.
When a correct pascode is entered, the system will unlock and access the IDLE G/R screen (or a LOCKOUT screen with limited access). If you make a mistake, press ESC, then ENTER PASCODE to try again. If you do not wish to enter a pascode, simply press ESC to return to the LOCKOUT screen.

EXIT TEST

From LOCKOUT screen, press EXIT TEST to exit the test preset on air and recall previous processing preset. This button is displayed if the preset on air is a test preset.

LOCKOUT Flow Chart



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