

Operating Manual

OPTIMOD-FM 8200

Digital Audio Processor

orban[®]

IMPORTANT NOTE: Refer to the unit's rear panel for your Model #.

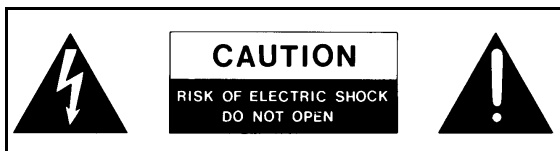
Model Number:	Description:
8200/U3S	OPTIMOD-FM 8200 DIGITAL with three DSP cards, Stereo Encoder, Protection Structure, Two-band Purist Structure, Two-band Normal Structure, Multi-band Processing Structure, set to 115V (for 90-130V operation), switchable to 50 μ s or 75 μ s.
8200/E3S	OPTIMOD-FM 8200 DIGITAL with three DSP cards, Stereo Encoder, Protection Structure, Two-band Purist Structure, Two-band Normal Structure, Multi-band Processing Structure, set to 230V, (for 180-260V operation), switchable to 50 μ s or 75 μ s.

OPTIONS AVAILABLE:

Model Number:	Description:
CIT25	Composite Isolation Transformer.
8200D/32	Digital I/O Card, 32kHz
8200 PC	Remote Control Software for IBM PC compatible computers

MANUAL:

Part Number:	Description:
95100-301-01	8200 Manual (includes 8200 PC Manual)



CAUTION: TO REDUCE THE RISK OF ELECTRICAL SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRICAL SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.



This symbol, wherever it appears, alerts you to the presence of uninsulated dangerous voltage inside the enclosure — voltage that may be sufficient to constitute a risk of shock.



This symbol, wherever it appears, alerts you to important operating and maintenance instructions in the accompanying literature. Read the manual.

IMPORTANT SAFETY INSTRUCTIONS

All the safety and operating instructions should be read before the appliance is operated.

Retain Instructions: The safety and operation instructions should be retained for future reference.

Heed Warnings: All warnings on the appliance and in the operating instructions should be adhered to.

Follow Instructions: All operation and user instructions should be followed.

Water and Moisture: The appliance should not be used near water (e.g., near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, etc.).

Ventilation: The appliance should be situated so that its location or position does not interfere with its proper ventilation. For example, the appliance should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or, placed in a built-in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.

Heat: The appliance should be situated away from heat sources such as radiators, heat registers, stoves, or other appliances (including amplifiers) that produce heat.

Power Sources: The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.

Grounding or Polarization: Precautions should be taken so that the grounding or polarization means of an appliance is not defeated.

Power-Cord Protection: Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.

Cleaning: The appliance should be cleaned only as recommended by the manufacturer.

Non-Use Periods: The power cord of the appliance should be unplugged from the outlet when left unused for a long period of time.

Object and Liquid Entry: Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.

Damage Requiring Service: The appliance should be serviced by qualified service personnel when:

- The power supply cord or the plug has been damaged; or
- Objects have fallen, or liquid has been spilled into the appliance; or
- The appliance has been exposed to rain; or
- The appliance does not appear to operate normally or exhibits a marked change in performance; or
- The appliance has been dropped, or the enclosure damaged.

Servicing: The user should not attempt to service the appliance beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.

The Appliance should be used only with a cart or stand that is recommended by the manufacturer.

Safety Instructions (European)

Notice For U.K. Customers If Your Unit Is Equipped With A Power Cord.

WARNING: THIS APPLIANCE MUST BE EARTHED.

The cores in the mains lead are coloured in accordance with the following code:

GREEN and YELLOW - Earth BLUE - Neutral BROWN - Live

As colours of the cores in the mains lead of this appliance may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

The core which is coloured green and yellow must be connected to the terminal in the plug marked with the letter E, or with the earth symbol, (\perp), or coloured green, or green and yellow.

The core which is coloured blue must be connected to the terminal marked N or coloured black.

The core which is coloured brown must be connected to the terminal marked L or coloured red.



The power cord is terminated in a CEE7/7 plug (Continental Europe). The green/yellow wire is connected directly to the unit's chassis. If you need to change the plug and if you are qualified to do so, refer to the table below.

WARNING: If the ground is defeated, certain fault conditions in the unit or in the system to which it is connected can result in full line voltage between chassis and earth ground. Severe injury or death can then result if the chassis and earth ground are touched simultaneously.

CONDUCTOR		WIRE COLOR	
		Normal	Alt
L	LIVE	BROWN	BLACK
N	NEUTRAL	BLUE	WHITE
E	EARTH GND	GREEN-YELLOW	GREEN

AC Power Cord Color Coding

Safety Instructions (German)

Gerät nur an der am Leistungsschild vermerkten Spannung und Stromart betreiben.

Sicherungen nur durch solche, gleicher Stromstärke und gleichen Abschaltverhaltens ersetzen. Sicherungen nie überbrücken.

Jedwede Beschädigung des Netzkabels vermeiden. Netzkabel nicht knicken oder quetschen. Beim Abziehen des Netzkabels den Stecker und nicht das Kabel erfassen. Beschädigte Netzkabel sofort auswechseln.

Gerät und Netzkabel keinen übertriebenen mechanischen Beanspruchungen aussetzen.

Um Berührung gefährlicher elektrischer Spannungen zu vermeiden, darf das Gerät nicht geöffnet werden. Im Fall von Betriebsstörungen darf das Gerät nur von befugten Servicestellen instandgesetzt werden. Im Gerät befinden sich keine, durch den Benutzer reparierbare Teile.

Zur Vermeidung von elektrischen Schlägen und Feuer ist das Gerät vor Nässe zu schützen. Eindringen von Feuchtigkeit und Flüssigkeiten in das Gerät vermeiden.

Bei Betriebsstörungen bzw. nach Eindringen von Flüssigkeiten oder anderen Gegenständen, das Gerät sofort vom Netz trennen und eine qualifizierte Servicestelle kontaktieren.

Safety Instructions (French)

On s'assurera toujours que la tension et la nature du courant utilisé correspondent bien à ceux indiqués sur la plaque de l'appareil.

N'utiliser que des fusibles de même intensité et du même principe de mise hors circuit que les fusibles d'origine. Ne jamais shunter les fusibles.

Eviter tout ce qui risque d'endommager le câble seueur. On ne devra ni le plier, ni l'aplatir. Lorsqu'on débranche l'appareil, tirer la fiche et non le câble. Si un câble est endommagé, le remplacer immédiatement.

Ne jamais exposer l'appareil ou le câble à une contrainte mécanique excessive.

Pour éviter tout contact avec une tension électrique dangereuse, on n'ouvrira jamais l'appareil. En cas de dysfonctionnement, l'appareil ne peut être réparé que dans un atelier autorisé. Aucun élément de cet appareil ne peut être réparé par l'utilisateur.

Pour éviter les risques de décharge électrique et d'incendie, protéger l'appareil de l'humidité. Eviter toute pénétration d'humidité ou fr liquide dans l'appareil.

En cas de dysfonctionnement ou si un liquide ou tout autre objet a pénétré dans l'appareil couper aussitôt l'appareil de son alimentation et s'adresser à un point de service après-vente autorisé.

Safety Instructions (Spanish)

Hacer funcionar el aparato sólo con la tensión y clase de corriente señaladas en la placa indicadora de características.

Reemplazar los fusibles sólo por otros de la misma intensidad de corriente y sistema de desconexión. No poner nunca los fusibles en puente.

Proteger el cable de alimentación contra toda clase de daños. No doblar o apretar el cable. Al desenchufar, asir el enchufe y no el cable. Sustituir inmediatamente cables dañados.

No someter el aparato y el cable de alimentación a esfuerzo mecánico excesivo.

Para evitar el contacto con tensiones eléctricas peligrosas, el aparato no debe abrirse. En caso de producirse fallos de funcionamiento, debe ser reparado sólo por talleres de servicio autorizados. En el aparato no se encuentra ninguna pieza que pudiera ser reparada por el usuario.

Para evitar descargas eléctricas e incendios, el aparato debe protegerse contra la humedad, impidiendo que penetren ésta o líquidos en el mismo.

En caso de producirse fallas de funcionamiento como consecuencia de la penetración de líquidos u otros objetos en el aparato, hay que desconectarlo inmediatamente de la red y ponerse en contacto con un taller de servicio autorizado.

Safety Instructions (Italian)

Far funzionare l'apparecchio solo con la tensione e il tipo di corrente indicati sulla targa riportante i dati sulle prestazioni.

Sostituire i dispositivi di protezione (valvole, fusibili ecc.) solo con dispositivi aventi lo stesso amperaggio e lo stesso comportamento di interruzione. Non cavallottare mai i dispositivi di protezione.

Evitare qualsiasi danno al cavo di collegamento alla rete. Non piegare o schiacciare il cavo. Per staccare il cavo, tirare la presa e mai il cavo. Sostituire subito i cavi danneggiati.

Non esporre l'apparecchio e il cavo ad esagerate sollecitazioni meccaniche.

Per evitare il contatto con le tensioni elettriche pericolose, l'apparecchio non deve venir aperto. In caso di anomalie di funzionamento l'apparecchio deve venir riparato solo da centri di servizio autorizzati. Nell'apparecchio non si trovano parti che possano essere riparate dall'utente.

Per evitare scosse elettriche o incendi, l'apparecchio va protetto dall'umidità. Evitare che umidità o liquidi entrino nell'apparecchio.

In caso di anomalie di funzionamento rispettivamente dopo la penetrazione di liquidi o oggetti nell'apparecchio, staccare immediatamente l'apparecchio dalla rete e contattare un centro di servizio qualificato.



PLEASE READ THIS FIRST!

Manual

The Operating Manual contains instructions to verify the proper operation of this unit and initialization of certain options. You will find these operations are most conveniently performed on the bench before you install the unit in the rack.

Please review the Manual, especially the installation section, before unpacking the unit.

Trial Period Precautions

If your unit has been provided on a trial basis:

You should observe the following precautions to avoid reconditioning charges in case you later wish to return the unit to your dealer.

Note the packing technique and save all packing materials. It is not wise to ship in other than the factory carton. (Replacements cost \$35.00).

- (1) Avoid scratching the paint or plating. Set the unit on soft, clean surfaces.
- (2) Do not cut the grounding pin from the line cord.
- (3) Use care and proper tools in removing and tightening screws to avoid burring the heads.
- (4) Use the nylon-washed rack screws supplied, if possible, to avoid damaging the panel. Support the unit when tightening the screws so that the threads do not scrape the paint inside the slotted holes.

Packing

When you pack the unit for shipping:

Tighten all screws on any barrier strip(s) so the screws do not fall out from vibration.
Wrap the unit in its original plastic bag to avoid abrading the paint.
Seal the inner and outer cartons with tape.

If you are returning the unit permanently (for credit), be sure to enclose:

- The Manual(s)
- The Registration Card
- The Line Cord
- All Miscellaneous Hardware (including the Rack Screws)
- The Extender Card
- The COAX Connecting Cable

Your dealer may charge you for any missing items.

If you are returning a unit for repair, do not enclose any of the above items.

Further advice on proper packing and shipping is included in Section 5: Troubleshooting.

Trouble

If you have problems with installation or operation:

- (1) Check everything you have done so far against the instructions in the Manual. The information contained therein is based on our years of experience with OPTIMOD and broadcast stations.
- (2) Check the other sections of the Manual (consult the Table of Contents and Index) to see if there might be some suggestions regarding your problem.
- (3) After reading the section on Factory Assistance, you may call Orban Customer Service for advice during normal California business hours. The number is (1) 510/351-3500.



MAINTAINING 8200 SECURITY

Important: *Ensure 8200 security by making it standard policy for each 8200 user to manually re-enable lockout when finished with normal operation.*

If your 8200 uses security pascodes and TIMEOUT TO AUTO LOCK is OFF (as set in the SET PASCODE screen), the last successful pascode entry defines the current security level. Until lockout is re-enabled, subsequent users with a lower security level will have access to more functions than they should.

Therefore, we recommend that each user re-enable lockout mode when finished with normal operation. Re-enabling lockout ensures that each user is allowed to enter a pascode to have access to the correct amount of functions for which their pascode was previously assigned.

If a previous user does forget to re-enable lockout, simply complete the following steps:

If the IDLE G/R screen does not appear, press ESC repeatedly until you see it.

Hold down the ESC button, while pressing HELP button.

With 8200 lockout now re-enabled, enter a valid pascode and continue with normal operation.

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Manual Addendum

8200 Version 3.0 Upgrade

For OPTIMOD-FM 8200 Digital

8200 Version 3.0 Manual Addendum

New Format Presets

Insert the following page, titled “New Format Presets In Version 3.00,” into your 8200 Operation Manual, in Section 3, directly after the blue-tabbed “About Processing Structures” page, at page 3-9.

There are 21 new format-specific presets, each named for a programming format. There are two Urban/Rap presets, for instance, that add bottom-end slam to the sound. Three new Rock presets add punch and sizzle while Adult Contemporary and Country presets balance warmth and clarity, with up-front vocals that stand out. There are also presets for Pop, Classical, Instrumental, Jazz, Folk/Traditional, News, and Sports. There are even two Oldies presets that ensure consistent sound balance with material from different eras. Programmed by Bob Orban and Greg Ogonowski, each preset has full LESS-MORE capability.

Multi-Band Controls

Insert the following “New Multi-Band Features For Version 3.00” pages into your 8200 Operation Manual, in Section 3, at the end of the discussion on “The Multi-Band Structure,” directly preceding the red-tabbed “Screen Displays” page.

New controls include: High Frequency Coupling, Multi-Band Output Mix controls, Bass Clip Threshold, and Phase Rotator In/Out. The range for the existing Final Clip Drive has also been extended.

D-O Status Enable?

[Yes] or [No]

For 8200s equipped with the 8200 D/SRC, the 8200's controls now include a switch that allows you to defeat Orban's special implementation of AES/EBU status bits which are used to control Orban 8208 and 8218 Stereo Encoders. This special implementation may be defeated to accommodate certain digital STLs that misinterpret these status bits.

Beginning with V 1.20 software and revision 3.0 of the 8200D/SRC Digital I/O board, the 8200 set the emphasis bits in the AES/EBU status bits (byte 0, bits 2 through 4) according to an Orban proprietary standard that extends the AES/EBU official definition. The Orban standard allows the 8200 to automatically set the 8218 (and 8208) Stereo Encoder's emphasis/de-emphasis to complement the 8200's emphasis/de-emphasis.

<u>Byte 0 Bits 2-4</u>	<u>AES/EBU Definition</u>	<u>8200 Implementation</u>	<u>8218 Response</u>
000	not indicated	not indicated	applies FM pre-emphasis
001	undefined	undefined	doesn't alter emphasis
010	undefined	undefined	doesn't alter emphasis
011	undefined	undefined	doesn't alter emphasis
100	no emphasis	no emphasis	applies FM pre-emphasis
101	undefined	J.17+FM pre-e*	applies J.17 de-emphasis
110	50/15 μ s	FM pre-e*	doesn't alter emphasis
111	J.17	J.17	applies J.17 de-emphasis and FM pre-emphasis

* FM pre-emphasis is 50 or 75 μ s

Since the implementation of the Orban standard, some digital STLs were released that misinterpret these status bits. Some respond to the AES/EBU emphasis bits (110) by applying an EIAJ (50/15uS) shelving de-emphasis. This will cause an audible (10.5 dB) loss of high frequencies. Version 3.00 software allows the user to enable- or disable the Orban implementation of status bits. When disabled, the 8200 sends status bits identifying that emphasis is "not indicated," which ensures that the affected digital STLs will not inappropriately apply EIAJ de-emphasis.

When these digital STLs are used in combination with an 8200 and 8218 (or 8208), DO STATUS ENABLE must be set to No, and the 8218 (or 8208), cannot utilize the "AES determines emphasis" feature.

PC Security Enable

[On] or [Off]

The OPTIMOD 8200 with software Version 3.00 or higher, can be controlled with a computer utilizing RS-232 and the Orban supplied 8200PC software for Microsoft Windows, or through binary commands.

The Orban 8200PC software offers full access to all 8200 features, while the binary communications method can only recall presets.

When set to On (default), this control allows remote control of the 8200 through RS-232 communications, only with the Orban supplied 8200PC software for Microsoft Windows. Access to the 8200 is the same as under Version 1.2x.

When set to Off, this mode disables all password protection entirely. PC access using binary commands is allowed for recalling presets only. Complete control by 8200PC is still allowed, however password protection is

disabled. Please note that in this mode, unauthorized access is possible, so take measures to insure that a secure link is used to the 8200. Concurrent 8200PC and binary communications method is not possible.

The binary communications method is intended to be used primarily by programmers for third-party software development. Orban Customer Service will supply a developer's white paper upon request. We cannot, however, provide any technical support for third-party software.

New Format Presets In Version 3.00

The 21 named format presets in Version 3.00 are entirely new. They exploit new Version 3.00 features, including the OUTPUT MIX controls for the 5-Band Limiter and the HIGH FREQUENCY COUPLING control. They apply appropriate amounts of BASS, PRESENCE, and BRILLIANCE equalization.

Of these 21 presets, five are duplicates because we felt that they were appropriate for more than one format. So there are actually 16 distinct and different presets. Each preset has full LESS-MORE Capability. The table below shows the presets, including the source presets from which they were taken and the nominal LESS-MORE setting of each preset.

Many of the presets come in several "flavors," like "dense," "medium," and "open." These refer to the density produced by the processing. "Open" uses SLOW multi-band release time, "Medium" uses MEDIUM-SLOW release, and "Dense" uses MEDIUM-FAST. FAST release is only used in the NEWS/TALK and SPORTS presets.

Important! These presets are only suggestions. Try using the LESS-MORE control to trade off loudness against processing artifacts and side effects. Once you have used LESS-MORE, save your edited preset as a USER PRESET.

Do not be afraid to experiment with presets other than the ones named for your format if you think these other presets have a more appropriate sound. Also, if you want to fine-tune the frequency balance of the programming, feel free to enter FULL CONTROL and make small changes to the BASS, PRESENCE, and BRILLIANCE controls. Remember to do this after you have decided on a LESS-MORE setting that's right for you. Once you have edited a preset using FULL CONTROL, LESS-MORE is no longer available for that edited preset. (Of course, LESS-MORE is still available for the unedited preset if you want to go back to it. There is no way you can erase or otherwise damage the factory presets. So feel free to experiment.)

##	PRESET NAME	SOURCE PRESET	NORMAL LESS-MORE
FB	GENERAL-MEDIUM	ADLT CONTEMP-MED	5.0
FC	GENERAL-OPEN	ADLT CONTMP-OPEN	5.0
FD	URBAN/RAP-DENSE	URBAN/RAP-DENSE	7.0
FE	URBAN/RAP-MEDIUM	URBAN/RAP-MEDIUM	7.0
FF	ROCK-DENSE	ROCK-DENSE	7.0
FG	ROCK-MEDIUM	ROCK-MEDIUM	7.0
FH	ROCK-OPEN	ROCK-OPEN	7.0
FI	ADLT CONTEMP-MED	ADLT CONTEMP-MED	5.0
FJ	ADLT CONTMP-OPEN	ADLT CONTMP-OPEN	5.0
FK	COUNTRY-MEDIUM	ADLT CONTEMP-MED	5.0
FL	COUNTRY-OPEN	ADLT CONTMP-OPEN	5.0
FM	POP-DENSE	POP-DENSE	5.0
FN	POP-MEDIUM	POP-MEDIUM	5.0
FO	POP-OPEN	POP-OPEN	5.0
FP	JAZZ	JAZZ	5.0
FQ	INSTRUMENTAL	JAZZ	5.0
FR	OLDIES-DENSE	OLDIES-DENSE	7.0
FS	OLDIES-OPEN	OLDIES-OPEN	7.0
FT	FOLK/TRADITIONAL	POP-MEDIUM	5.0
FU	NEWS/TALK	NEWS/TALK	5.0
FV	SPORTS	SPORTS	5.0

ROCK: The ROCK presets are designed for a bright high end and punchy low end (although not as exaggerated as the URBAN/RAP presets). There is enough presence energy to ensure that vocals stand out. A modest amount of HIGH FREQUENCY COUPLING allows reasonable amounts of automatic HF equalization (to correct dull program material), while still preventing exaggerated frequency balances and excessive HF density. These presets are appropriate for general rock and contemporary programming. For Contemporary Hit Radio (CHR) we recommend the DENSE or MEDIUM versions. For Album-Oriented Rock (AOR) use ROCK-MEDIUM or OPEN, although you might prefer the more conservative Adult Contemporary presets here.

URBAN/RAP: The URBAN/RAP presets are similar to the ROCK presets, but with more bass. They use the 3-pole (18dB/octave) shape on the bass equalizer. They are appropriate for Urban, Rap, Black, R&B, Dance and other similar formats.

ADLT CONTEMP: The Adult Contemporary presets are a compromise between ROCK and POP. They have a gentle bass and treble lift, along with enough presence energy to help vocals to stand out. This preset is also used for COUNTRY, and is a useful candidate for AOR formats.

POP: POP is a more conservative preset designed for a mellow, open high end. There is substantial HIGH FREQUENCY COUPLING to ensure that the high frequencies do not become dense. This is an ideal preset for formats designed primarily for women listeners (who, by and large, dislike hyped treble) or for any preset designed for long time-spent-listening formats because of its open, clean sound, which leads to very low listener fatigue. Because of its conservative nature, this preset is also used for the FOLK/TRADITIONAL preset.

OLDIES: OLDIES is similar to ROCK except HIGH FREQUENCY COUPLING is less. This allows the preset to do substantially more automatic equalization than ROCK, making recordings of different eras more uniform. OLDIES-OPEN might be a useful alternative to FOLK/TRADITIONAL if the recordings being played are very inconsistent in frequency balance.

JAZZ: JAZZ is quite similar to POP, and is specifically tailored toward stations that play mostly instrumental music. It has a relatively mellow high end and produces very low listening fatigue.

NEWS/TALK: This preset is quite different from the others above. It is based on the FAST 5 Band Release Time setting, so it can quickly perform automatic equalization of substandard program material, including telephone. It is very useful for creating a uniform, intelligible sound from widely varying source material, particularly source material that is “hot from the field” with uncontrolled quality.

SPORTS: Similar to NEWS/TALK except the AGC RELEASE TIME is slower and the GATE THRESHOLD is higher. This recognizes that most sports programming has very low signal-to-noise ratio due to crowd noise and other on-field sounds, so the preset does not pump this up as the NEWS/TALK preset would tend to do.

New Multi-Band Features For Version 3.00

High Frequency Coupling Control (Band 3&4 Coupling)

High Frequency Coupling couples a certain percentage of the Band 3 gain control signal into Bands 4 and 5. This forces Bands 4 and 5 to follow the gain reduction in Band 3 to a user-adjustable extent. Because Band 3 has a slower release time than Bands 4 and 5, this results in a more open high end. It also limits the amount of dynamic HF boost that the processing can produce.

Even with the control at 100%, Bands 4 and 5 are still active and will produce further gain reduction if this is necessary to prevent distortion. So in this mode they are acting as a high frequency limiter.

Multi-Band Mix Controls (Band 1-5 Out Mix dB)

All of the equalization described so far occurs *before* the multi-band limiter. The advantage of this is that the multi-band limiter protects you against overloads or program material with unusual spectral balance, which might otherwise combine with your equalization curve to cause unpleasant distortion or coloration. In particular, it protects the final clipper from being overdriven.

However, the *downside* is that the “automatic equalization” effect of the multi-band limiter tends to fight equalization settings that you made with the various equalizer controls, reducing their effect. We have therefore provided a mix control with a ± 3 dB range at the *output* of each limiter in the five-band limiter.

These act as fixed equalizer controls because no gain reduction occurs after them. They determine the overall target spectral balance of the processing when the multi-band limiter exhibits substantial amounts of gain reduction. In popular music formats this is almost always the case.

Please note that these controls are *very risky*. The thresholds of OPTIMOD-FM's 5-band limiter and multi-band clippers were tuned at great length to ensure that under virtually no circumstances would program material come along to cause unpleasant clipping distortion in the following clippers. By adjusting the multi-band mix controls, you upset this carefully tuned relationship. Therefore, program material can come along that causes unexpected (and sometimes very nasty-sounding) distortion because the final clippers are being overdriven. This will occur if the program material in question has a significant part of its energy concentrated in a frequency band that is being boosted.

In general, it is safe to turn a given output mix control *down* (in the 0 to -3 dB range) without danger of introducing distortion. However, you will lose loudness. If you turn an output mix control *up* ($+0.5$ to $+3$ dB range), you should listen at great length to a wide variety of program material to make sure that nothing falls apart due to excessive

clipping distortion. If it does, you will need to back off the control in question and/or back off the Final Clip control.

If you turn up the control for Band 1 (below 100 Hz), you may wish to turn down the Bass Clip Thrsh dB control by an equal amount. This will preserve the relationship between the bass multi-band clipper and the final clipper.

Bass Clip Threshold Control (Bass Clip Thrsh dB)

The 8200 uses Orban's patented multi-band distortion-cancelling clipper system to achieve a low peak-to-average ratio without creating audible distortion due to clipping. The bass clipper is part of this system. It is embedded in the multi-band crossover so that harmonics created by clipping are rolled off by part of the crossover filters. The threshold of this clipper is ordinarily set between 4dB and 6dB below the threshold of the final clipper in the processing chain, depending on the setting of the LESS-MORE control in the parent preset upon which you are basing your full control adjustments. This provides headroom for contributions from the other four bands, so that bass transients don't smash against the final clipper and "shut it down," momentarily blocking any other program material and causing a sound similar to very hard pumping. The bass clipper also protects against overt intermodulation distortion between the bass and higher frequency program material.

Some 8200 users feel that the bass clipper unnecessarily reduces bass punch at its factory settings. To accommodate these users, Version 3.00 software makes the threshold of the bass clipper a user-adjustable control. The range (with reference to the final clip threshold) is 0 to -6dB. As you raise the threshold of the clipper you will get more bass but also more distortion and pumping. Be careful when setting this control; do not adjust it casually. Listen to program material with heavy bass combined with spectrally sparse midrange material (like a singer) and listen for IM distortion induced by the bass' pushing the midrange into the final clippers. In general, unless you have a very good reason to set the control elsewhere, we recommend leaving it at the factory settings, which were determined as a result of exhaustive listening tests with many types of critical program material.

Phase Rotator In/Out

The multi-band limiter receives the output of a three-pole phase rotation circuit. This has a flat frequency response but a phase response that is nonlinear with frequency. Its purpose is to make voice waveforms symmetrical, which minimizes clipping distortion and makes voice (particularly live voice from microphone feeds) sound cleaner.

The downside of the phase rotator is that it subtly reduces the clarity and definition of music. While this is unlikely to be heard on the vast majority of consumer radios, many people listening with audiophile-quality gear will be able to perceive it. We therefore have provided the ability to bypass this circuit, leaving only the phase rotation intrinsic to the crossover topology in the multi-band limiter. This residual phase rotation is

approximately 25% of the total phase rotation that occurs when the three-pole phase rotator is active.

When you bypass the phase rotator, many voices sound audibly harsher because more clipping occurs. This can be particularly problematical if you are processing heavily for loudness. If you notice increased harshness on voice, we recommend that you use external phase rotation (three cascaded poles, each tuned to 200Hz) in your live microphone chain and in your production studio mic chain. If this is impractical, we recommend leaving the 8200's built-in phase rotator active because we find the increased voice distortion caused by leaving it off substantially more objectionable than the slight loss of clarity that results when it is active.

Refer to the "Phase Rotator For Microphone Channel" diagram, on the following page.

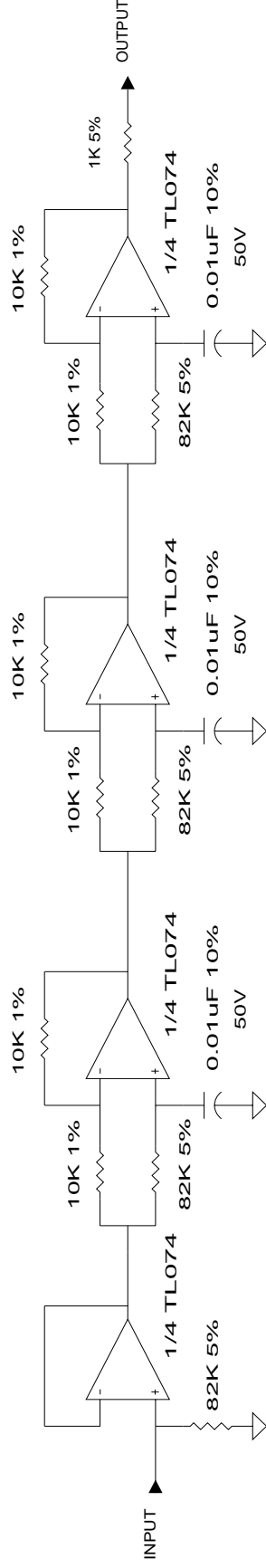


Figure 1: Phase Rotator for Microphone Channel

Notes: Unity Gain, Line Level.

Bypass (+) and (-) Power Leads of TL074 to Ground with 0.1uF 50V monolithic ceramic capacitors.

Operate from +15V and -15V DC power.

Many audio opamps could be substituted for the TL074, like a pair of NE5532s.

If you substitute a high-speed amplifier, layout and power supply bypassing become more critical.

Final Clip Drive Control

Version 3.00 extends the range of the FINAL CLIP DRIVE control by 3dB at the lower end of its range. This means that you can turn down the clipping by 3dB by comparison to earlier versions of 8200 software. The purpose of this extension is to allow users in ITU countries to comply with the requirements of ITU-R Recommendation BS.412-7 if they are required to do so by the regulatory authority in their country.

Based on measurements with a wide variety of program material using the Rundfunk-Betriebstechnik, GMBH Hubmess System MPX-EBENE (a modulation analyzer), we have developed the following formula for ensuring compliance. First, you must start with one of the basic 2-Band or 5-Band factory presets with LESS-MORE at 1.0. You must then edit the preset (using FULL CONTROL) to set the FINAL CLIP DRIVE to the following settings:

Preset	LESS-MORE	Final Clip Drive
DA 5B SLOW	1.0	-1.5
DB 5B-MEDIUM SLOW	1.0	-1.5
DC 5B-MEDIUM FAST	1.0	-3.0
DD 5B-FAST	1.0	-2.5
CA 2B-NOR PROCESSED	1.0	-1.5

To ensure that you meet the requirements, do not increase the settings of these controls beyond the settings provided in LESS-MORE = 1.0: RELEASE TIME, CLIPPING, and MULTI-BAND DRIVE.

Note: The BB (Purist Classical) and BA (Purist Processed) presets will comply with a CLIPPING setting of -2 or lower. There is no need to reset the FINAL CLIP DRIVE control when using these presets.

The Protection Limiter Structure will not comply and cannot be adjusted to do so. However, you can use the BB (Purist Classical) preset instead and set its CLIPPING control to -2.

If you want to use any of the new presets in Version 3.00, you should follow a similar formula. Set them for LESS-MORE = 1.0. Then edit the FINAL CLIP DRIVE control for -1.5, except for “dense” presets (FINAL CLIP DRIVE = -3.0) and News or Sports (FINAL CLIP DRIVE = -2.5). While we have not specifically measured all of the Version 3.00 presets using this formula and therefore cannot guarantee compliance, we believe that compliance is nevertheless very likely.

8200 Software History

Version 3.00

- Replaces the original factory “format” presets FB - FO with new format presets FB- FV.
- Adds new Multi-Band Control: High Frequency Coupling.
- Removes EBS Test Mode.

Version 2.00

- **Multi-Band Controls**

New controls include: Multi-Band Output Mix controls, Bass Clip Threshold, and Phase Rotator In/Out. The range for the existing Final Clip Drive has also been extended.

- **D-O Status Enable?**

[Yes] or [No]

For 8200s equipped with the 8200 D/SRC, the 8200's controls now include a switch that allows you to defeat Orban's special implementation of AES/EBU status bits which are used to control Orban 8208 and 8218 Stereo Encoders. This special implementation may be defeated to accommodate certain digital STLs that misinterpret these status bits.

- **PC Security Enable**

[On] or [Off]

When set to Off, password security is disabled, allowing access to 8200 via remote PC, utilizing custom-developed software, and limited to recalling presets only. When set to On, 8200 functions the same as under Version 1.2x, with full password security.

Version 1.20

- 8200PC Remote Control Software for Windows™
- TIME TO SCREEN SAVER default setting is now 1:00 HRS. Removed Off setting.
- AGC IDLE GR (for Two-Band Normal, Two-Band Purist and Five-Band processing) is now a value proportional to the AGC DRIVE, instead of a fixed value of -10dB.
- With Two-Band Normal, LF noise is no longer detectable at low drive levels.
- For Five-Band processing, bass boost at low signal levels has been eliminated.

- A-O 100% LVL dB resolution has been increased for more accurate level adjustment.
- Cleaner Audio When Switching Between Analog and Digital Source Material.
- Pressing DISABLE EBS now eliminates the EBS TEST button from the RECALL PRESET screen.
- AGC DRIVE Control adjustable range changed to -10 to 25; previously 0 to 25.

Version 1.10

- Software to control 8200D/SRC Digital Sampling Rate Converter.
- D-O 100% LVL dB maximum level increased from -2.75dBFS to 0dBFS; resolution has been increased for more accurate level adjustment.

Version 1.00

Calibration Controls

- Adds Transmitter Overshoot and SCA Modulation Compensation.
- Adds control for Stereo Encoder Modulation Type: [STEREO], [MONO FROM L], [MONO FROM R].
- Input Analog or Digital.
- Clock Sync To, for synchronizing the 8200's real-time clock to the AC line frequency (LINE) or to the internal crystal oscillator (XTAL).
- Adds Pilot On/Off control.

Time and Date Controls

- Daylight Savings Time.
- Screen Saver.

Other Changes

- Additional Remote Control Interface functions. Complete list includes: ## PRESET NUMBER AND NAME, ST STEREO, ML MONO FROMLEFT, MR MONO FROM RIGHT, ET EXIT TEST, TX1 MOD COMP %, TX2 MOD COMP %, SC1 MOD COMP %, SC2 MOD COMP %, IA INPUT ANALOG, ID INPUT DIGITAL, RH RESET CLOCK TO HOUR, RM RESET CLOCK TO MIDNIGHT.
- EBS tone preset for use with the USA Emergency Broadcast System.

- Security PASCODE authorized for SYSTEM SETUP.
- Protection Structure pre-emphasis filters are now phase-linear.
- Adds Protection Limiter control: 30 Hz HPF switch to set the 30Hz high-pass filter prior to the limiter in or out of the signal path.
- Adds Two-Band Purist Structures: 2B-PUR PROCESSED, 2B-PUR CLASSICAL.
- Adds Two-Band control: AGC SWITCH.
- Additional Multi-Band Controls, including: AGC SWITCH, HIGH FREQUENCY CLIPPING, PRESENCE, LOW BASS BOOST, MID BASS BOOST, BASS COUPLING, DJ BASS BOOST, NOISE REDUCTION THRESHOLD, 30Hz HPF (Highpass Filter) switch.
- EXIT TEST Test preset now stored as the BACKUP preset.

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Operating Manual

OPTIMOD-FM 8200

Digital Audio Processor

orban[®]



WARNING

This equipment generates, uses, and can radiate radio-frequency energy. If it is not installed and used as directed by this manual, it may cause interference to radio communication. This equipment complies with the limits for a Class A computing device, as specified by FCC Rules, Part 15, Subpart J, which are designed to provide reasonable protection against such interference when this type of equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference. If it does, the user will be required to eliminate the interference at the user's expense.



WARNING

"This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications." "Le present appareil numerique n'emet pas de bruits radioelectriques dépassant les limites applicables aux appareils numeriques (de la class A) prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada."

IMPORTANT

Perform the installation under static control conditions. Simply walking across a rug can generate a static charge of 20,000 volts. This is the spark or shock you may have felt when touching a doorknob or some other conductive item. A much smaller static discharge is likely to completely destroy one or more of the CMOS semiconductors employed in OPTIMOD-FM or the software module. Static damage will not be covered under warranty.

There are many common sources of static. Most involve some type of friction between two dissimilar materials. Some examples are combing your hair, sliding across a seat cover or rolling a cart across the floor. Since the threshold of human perception for a static discharge is 3000 volts, many damaging discharges will not even be noticed.

Basic damage prevention consists of minimizing generation, discharging any accumulated static charge on your body or work station and preventing that discharge from being sent to or through an electronic component. A static grounding strap (grounded through a protective resistor) and a static safe workbench with a conductive surface should be used. This will prevent any buildup of damaging static.

The OPTIMOD-FM 8200 Digital Audio Processor is protected by U.S. patents 4,249,042; 4,208,548; 4,460,871; and U.K. patent 2,001,495. Other patents pending.

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H A Harman International Company

1525 Alvarado Street, San Leandro, CA 94577 USA

Phone: (1) 510/351-3500; Fax: (1) 510/351-0500; E-mail: custserv@orban.com; Web: www.orban.com

Orban

OPTIMOD-FM 8200

Operating Manual

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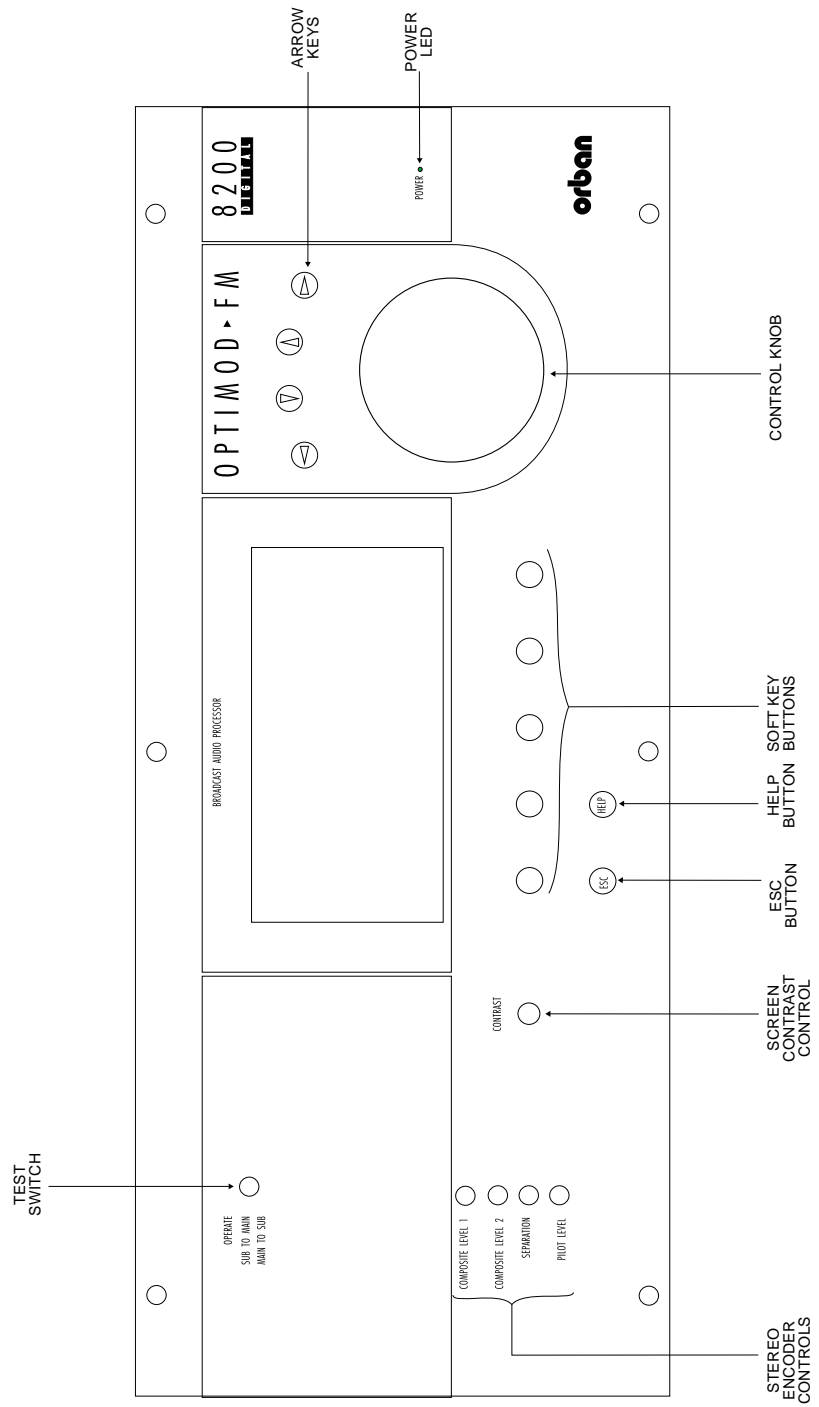
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OPTIMOD-FM 8200 DIGITAL Audio Processor

Orban's OPTIMOD-FM 8200 DIGITAL Audio Processor is a complete audio processing system for FM broadcast.

User-Friendly Interface

- A large liquid-crystal display (LCD) makes setup, adjustment and programming of the 8200 easy. The screen clearly shows all metering functions of the processing structure in use.
- Push one of the clearly labeled soft keys to RECALL a preset, to MODIFY processing, to program Automation Preset Switching, or to access SYSTEM SETUP.
- HELP is always available at the push of a button. If you get lost, ESC will always bring you back home. If you desire, you don't even need this manual to adjust and program the 8200. Step-by-step instructions are on the screen.

Absolute Control of Peak Modulation

- The 8200 provides universal transmitter protection and audio processing for FM broadcast. It can be configured to interface ideally with any commonly-found transmission system in the world.
- The 8200 Audio Processor provides pre-emphasis limiting for the internationally-used pre-emphasis curves of 50 μ s and 75 μ s. Its pre-emphasis control is almost never audibly apparent, producing a clean, open sound with subjective brightness matching the original program.
- The 8200 achieves extremely tight peak control; overshoot is limited to <0.3dB!
- The 8200's stereo encoder (stereo generator) uses Orban's ROM-based, digitally-controlled Hadamard-Transform™ circuit topology to produce a circuit with excellent specs, high stability, and uncompromising baseband spectrum control. The encoder has two outputs with independent level controls, each capable of driving 75 Ω in parallel with 47,000pF, (100ft/30m of coaxial cable).
- By integrating the stereo encoder with the audio processing, the 8200 eliminates the overshoot problems that waste valuable modulation in traditional external encoders.
- The 8200 prevents aliasing distortion in subsequent stereo encoders or transmission links by providing bandwidth-limiting and overshoot compensated 15kHz low-pass filters ahead of the 8200's audio outputs and stereo encoder.

Flexible Configuration to Interface With Analog and Digital Systems

- The 8200 Audio Processor is designed to meet all applicable international safety standards.

- The 8200 Audio Processor can be configured for analog and/or digital inputs and outputs.
- The analog inputs are transformerless, balanced 10k Ω instrumentation-amplifier circuits, and the outputs are transformerless, balanced, and floating with 30 Ω impedance to ensure highest transparency and accurate pulse response.
- The optional Digital I/O follows the AES/EBU standard, operating at 32kHz.
- All input, output, and power connections are rigorously RFI-suppressed to Orban's traditional exacting standards, ensuring trouble-free installation.
- The 8200 Audio Processor is designed to work perfectly with Orban's studio level control units (which are commonly used to protect transmission links in installations where the audio is passed from studio to transmitter in left/right form, using telephone/post lines, dual-microwave STLs, or similar).

Adaptability Through Switchable Audio Processing Structures

- 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 (such as equalizers, compressors, limiters, and clippers), there are many possible processing structures achievable by the 8200. The 8200 realizes its processing structures as a series of high-speed mathematical computations made by Digital Signal Processing (DSP) chips.
- The 8200 is shipped in various versions containing different sets of processing structures. Refer to the unit's rear panel for your Model # and the inside of the front cover of this manual for the structures included in your model.
- The optional Multi-Band Structure is the ultimate processing for the competitive major market sound. It gives your station more punch, more consistency, more presence, and more brightness, without pumping or other unnatural artifacts. It lets you set the speed limit — FAST, MEDIUM FAST, MEDIUM SLOW, SLOW. FAST creates a synthetic sound, an illusion, a dramatic, "theatrical" sound that is ideal for competitive, high-energy hit music formats. SLOW creates a very open sound, a sound that is very life-like with a distinct improvement in clarity.
- The Two-Band Normal Structure is an improved version of Orban's classic 8100A OPTIMOD-FM sound that has helped make thousands of stations successful. It produces an open and natural sound, whether used for light control over levels, or for the heavier processing often desired for some popular music formats. It can be set up to maintain high fidelity to the source material, or to create a sound that is loud and dense.
- The Two-Band Purist Structure is designed for the purist who wants to trade-off 3dB of loudness for constant group delay at all frequencies (linear phase) throughout the 30Hz to 15kHz range.

- The Protection Structure is designed for stations wanting the highest possible fidelity to the source, such as a station broadcasting concert music at night.
- The 8200 applies to digital processing a distillation of Orban's sixteen years of market-leading analog processing experience; the unit builds and improves on the uniquely successful sound of the Orban analog processors.
- All structures except the Protection Structure ride gain over a range of as much as 25dB, reducing dynamic range and compensating for gain riding errors on the part of operators. The amount of dynamic range reduction ordinarily produced is adjustable.
- The 8200 can be changed from one processing structure to another almost instantly.

Programmable

- The 8200 is supplied from the factory with factory-programmed presets for virtually all program formats. Presets specify both a processing structure and its control settings.
- Factory Presets can be user-modified and stored in 32 user presets. They can be recalled either locally or by remote control.

Controllable

- The 8200 Audio Processor contains a versatile real-time clock, which permits presets to be recalled at pre-programmed times.
- All compression, limiting, and clipping can be defeated by remote control to permit broadcast system test and alignment or "proof of performance" tests.

The 8200 Audio Processor is fully remote-controllable from an RS-232/RS-422 serial port (for computer or modem interface) using the optional 8200 PC Remote Control Software, and by optically-isolated terminals that can be operated with contact closures (to facilitate interfacing to older-technology remote controls). Orban's optional 8200 PC Remote Control Program for IBM PC compatibles lets you do everything from the remote computer that you can do from the 8200's front panel.

- The 8200 Audio Processor contains a built-in line-up tone generator, facilitating quick and accurate level setting in any system, as well as a Bessel-null tone for calibrating modulation.
- The 8200 Audio Processor can produce the standard EBS (U.S. standard Emergency Broadcast System) tones. It is FCC type accepted.

Expandable

- The 8200 is expandable, so you can add more DSP processing power as needed to accommodate future software upgrades and processing structures.

ESCape and HELP

The front-panel ESCape and HELP buttons are always there to aid you in your travels around the 8200's functions.

Use ESCape to get back to the previous screen. Pressing ESC repeatedly will get you back to the main gain reduction meter screen (IDLE G/R), no matter where you are.

The 8200 offers extensive on-screen help. Wherever you are, you can press the dedicated HELP button to give you a brief explanation of what that screen is showing you, and what it does. The names of the buttons of the screen being explained remain at the bottom. Press a button, and you will get a detailed explanation of what that button will do. Press ESCape to go back to the screen information. Press ESCape again to return to the screen from where you first requested HELP.

Presets in the 8200

There are three distinct kinds of presets in the 8200: Factory Processing Presets, Factory Test Presets, and User Presets.

Factory Processing Presets (including Factory Programming Presets)

Factory Processing Presets are various "factory recommended settings" for each processing structure. They are indicated on the RECALL PRESET list on the 8200 by a two-letter designation followed by a description, such as "AA PROTECTION 0dB" or "DB 5B-MEDIUM SLOW." The description indicates the processing structure and the type of processing.

Each Factory Processing Preset on the RECALL PRESET list is really a library of 20 separate presets, selected using the MODIFY LESS-MORE control to adjust the 8200 for more or less processing.

Factory Processing Presets are stored in the 8200's non-volatile memory, and cannot be erased. You can change the settings of a Factory Processing Preset, but you must then store those settings as a User Preset, which you are free to name as you wish. The factory preset remains unchanged.

Factory Programming Presets are our "factory recommended settings" for various program formats or types. They are indicated on the RECALL PRESET list on the 8200 by a two-letter designation (beginning with the letter F) followed by a format description, such as "FA CLASSICAL" or "FO TALK." Each Factory Programming Preset is a Factory Processing Preset set to the LESS-MORE setting that is likely to be appropriate for that program format.

Factory Test Presets

Factory Test Presets include TO USER TONE and BY BYPASS. But unlike Factory Processing Presets, the settings of Factory Test Presets can be changed, and these changes are remembered in the Factory Test Preset. For example, you use the TO USER TONE preset in the same way that you use any normal oscillator. Set the frequency and level, and they remain that way until you change them.

User Presets

User Presets permit you to change a Factory Processing Preset or a Factory Test Preset to suit your requirements, and store those changes. You may store up to 32 User Presets. They are indicated on the RECALL PRESET list by a number designation from 01 to 32, followed by a description. You may enter in any description you wish, up to 16 characters.

User Presets cannot be created from “scratch.” You must always start by recalling a Factory Preset. You can then immediately store this in a User Preset, give it whatever name you wish, then make changes to the settings. Or you can recall a Factory Preset, make the changes, then store this in a User Preset.

Either way, the Factory Preset remains for you to return to if you wish.

Input/Output Configurations

The OPTIMOD-FM 8200 DIGITAL is designed to simultaneously accommodate:

- analog left/right inputs and outputs
- stereo analog baseband composite output
- Digital AES/EBU left/right inputs and outputs.

Each of these is accomplished with a plug-in card. The standard configuration includes analog in/out and stereo composite out. AES/EBU in/out is accommodated by a separate optional, user-installed card, available from your dealer.

Analog Left/Right Input/Output

The left and right analog inputs are on XLR-type female connectors on the rear panel. Input impedance is greater than 10k Ω ; balanced and floating. Inputs can accommodate up to +27dBu (0dBu = 0.775Vrms). The left and right analog outputs are on XLR-type male connectors on the rear panel. Output impedance is 30 Ω ; balanced and floating. Outputs can drive up to +24dBm into 600 Ω .

Level control of the analog inputs and outputs is via software control through SYSTEM SETUP. (See page 2-41 and 2-55.)

Provided that the Analog I/O Card is installed, the left and right analog outputs are always available regardless of whether the Stereo Encoder Card and/or Digital I/O Card is installed.

Digital AES/EBU Left/Right Input/Output

The digital input and output follow the professional AES/EBU standard. The left/right digital input is on one XLR-type female connector on the rear panel; the left/right digital output is on one XLR-type male connector on the rear panel.

If digital AES/EBU left/right input or output is required and presently not installed, install the Digital I/O Card according to the instructions provided with it.

The 8200 is designed to simultaneously accommodate digital and analog inputs and outputs. You select whether the 8200 uses the digital or the analog input on the SYSTEM SETUP I/O CALIB screen or by REMOTE INTERFACE. Both analog and digital outputs are active continuously. Level control of the AES/EBU input is via software control through SYSTEM SETUP.

At the time of publication of this manual (January, 1995), there are two available versions of the optional Digital I/O Card. The less expensive version (8200D/32) operates at a 32kHz sample rate, the standard sample rate used for transmission of 15kHz bandwidth audio. Its output is pre-emphasized to the 50 μ s or 75 μ s curve selected for the processing. It cannot provide a “flat” output. The more advanced version (8200D/SRC) incorporates sample rate conversion of 32, 44.1, or 48kHz.

Please note that the AES/EBU standard is not the same as the S/P-DIF (Sony/Philips Digital Interface) standard used in consumer digital applications, such as the “digital outputs” of CD players. The AES/EBU interface will not work with S/P-DIF signals.

Stereo Analog Baseband Composite Output

The stereo encoder has two unbalanced analog baseband outputs on two BNC connectors on the rear panel. Each output can be strapped for 0 Ω or 75 Ω source impedance, and can drive up to 8V peak-to-peak into 75 Ω in parallel with up to 0.047 μ F (100ft/30m of RG-59/U cable) before any noticeable performance degradation occurs.

Level control of each output is via a separate screwdriver control accessible from the front panel.

A ground lift switch is available on the rear panel. This is useful to prevent ground loops between the 8200 and the transmitter.

Subcarriers

The stereo encoder has an unbalanced 600 Ω subcarrier (SCA) input with rear-panel BNC connector to accept any subcarrier at or above 23kHz. The subcarrier will be mixed into each composite output, and its level will be affected by the composite level control for that output. The gain is scaled so that 1.5V peak at the subcarrier input produces 10% subcarrier injection with reference to 100% deviation of the FM carrier.

If the stereo encoder is installed, a 19kHz TTL-level square wave is available on pin 18 of the REMOTE INTERFACE, located on the rear panel of the unit. This provides a means for synchronizing an external subcarrier generator, like an RDS (Radio Data Systems) subcarrier, to the 19kHz pilot tone.

The correct peak level of the stereo program applied to the stereo encoder sometimes depends on the number of subcarriers in use. Some regulatory authorities require that total baseband modulation be maintained within specified limits. Thus the level of the stereo main and subchannel must be reduced when a subcarrier is turned on.

The 8200's remote control feature allows you to reduce the stereo main and sub-channel level by connecting an on/off signal from your subcarrier generator (See page 2-14). You define the amount of reduction in % on the SYSTEM SETUP I/O CALIB screen (See page 2-60). See page 2-74 for information on programming the remote control.

Ultrastable Pilot for the 8200 Stereo Encoder

This section explains how the OPTIMOD 8200 Stereo Encoder Board can be modified to generate a pilot with ultrastable frequency.

This modification will allow a station's carrier frequency to be maintained within 100Hz of the assigned channel frequency when using the 8200's stereo pilot as a reference. With a 100MHz carrier, this requires a stability of 1 part per million (ppm). This stability can only be realized with a Temperature Compensated Crystal Oscillator (TCXO).

The 8200 Stereo Encoder Board has four unused pads that are spaced for a certain TCXO package to be soldered into place. Four components also have to be removed from the Stereo Encoder Board to make room for the TCXO. They are R102, Y1, C40 and C41.

We have found three different TCXOs that can be used on the 8200 Stereo Encoder Board. They are:

Manufacturer	Model	Frequency	Stability
Monitor Products	7402 Series, Model B	4.864MHz	$\pm 1.5\text{ppm}$ (-25°C to $+60^{\circ}\text{C}$)
Raltron	TF69100-4.864	4.864MHz	$\pm 1\text{ppm}$ (0°C to $+50^{\circ}\text{C}$)
RXD	621B	4.864MHz	$\pm 1\text{ppm}$ (-10°C to $+50^{\circ}\text{C}$)

As we do not have a Retrofit Kit available at the time this manual was printed, you will need to contact the manufacturer's representative directly to place an order. Addresses for the manufacturers and their reps are listed below.

Monitor Products

502 Via Del Monte
Oceanside, CA 92054
(619) 433-4510/434-0255 (fax)

Raltron

2315 NW 107th Ave.
Miami, FL 33172
(305) 593-6033/594-3973 (fax)

RXD

P.O. Box 1494
Norfolk, NE 68701
(402) 379-0112/379-3074 (fax)

DLDI

13455 Ventura Blvd #220
Sherman Oaks, CA 91423
(408) 496-6996/(818) 995-6451 (fax)

Kelex Electronics

16631 Milliken Ave.
Irvine, CA 92714
(714) 863-1230/474-1231 (fax)

California Capacitor

1579 Centre Pointe Dr.
Milpitas, CA 95035
(408) 262-6000/262-0272 (fax)

Remote Control Interface

The Remote Control Interface is a set of eight optically-isolated inputs on a DB-25 connector that can be activated by 6-24V DC or 6-24V AC 50/60Hz signals. They can control various functions of the 8200:

- 1) Recall any Factory Processing Preset, Factory Test Preset, User Preset, or exit from a test preset to the previous processing preset.
- 2) Switch the stereo encoder to stereo, mono from left audio input, or mono from right audio input.
- 3) Switch the 8200 to use either the analog input or the digital input.
- 4) Reduce the stereo main and subchannel modulation to compensate for transmitter overshoot and subcarrier inputs (SCAs).

The remote control of overshoot compensation and SCA modulation (See page 2-59) is not latching. You must supply a continuous current to the remote to hold the gain at its compensated level. Use the status outputs of your transmitter and/or SCA generators to provide the switching signal, so the compensation will automatically follow the transmitter and/or subcarrier generator on the air.

- 5) Reset the 8200's internal clock to the nearest hour or to midnight.

The functions of the eight inputs can be re-configured by the user via SYSTEM SETUP. For example, if you are not using the stereo encoder, the three inputs ordinarily dedicated to controlling the state of the stereo encoder can instead be re-configured to call three additional presets. See page 2-74 for information on programming the remote control interface.

Computer Interface

Your Orban dealer can provide a program for any IBM-compatible PC (running Microsoft Windows 3.1 or higher) that permits you to adjust any 8200 preset by remote control, or to do most anything else that you can do from the 8200's front panel controls. The program displays all of the 8200's "soft meters" on the computer screen to aid remote adjustment. It can run on systems using VGA graphics and can drive a modem or create a direct connection between the computer and the 8200 through their RS-232 serial ports.

There are two serial connectors. One meets the RS-232 standard; you can connect it to any modem designed to interface with an IBM or compatible PC. You can also establish connection between the 8200 and an IBM PC or compatible by connecting the computer's COM port to the 8200's RS-232 port through a null modem cable. (The other connector meets the RS-422 standard.)

Location of OPTIMOD-FM

Optimal Control of Peak Modulation Levels

The audio processing circuitry in OPTIMOD-FM produces a signal that is pre-emphasized to either the 50 μ s or 75 μ s standard curve, is precisely and absolutely high frequency-controlled and peak-controlled to prevent over-modulation, and is filtered at 15kHz to protect the 19kHz pilot and prevent distortion caused by aliasing-related non-linear crosstalk.

If this signal is fed directly into a stereo encoder, peak modulation levels on the air will be precisely controlled. But if the audio processor's signal is fed to the stereo encoder through any circuitry with frequency response errors and/or non-constant group delay, the peaks will be magnified. Peak modulation will increase, but average modulation will not. The modulation level must therefore be reduced to accommodate the larger peaks. Reduced average modulation level will result in reduced loudness, and a poorer signal-to-noise ratio at the receiver.

Frequency response errors and non-constant group delay are typically introduced by land line equalizers, transformers, and 15kHz low-pass filters and pre-emphasis networks in stereo encoders.

There are three criteria for preservation of peak levels through the audio system:

- 1) The system group delay must be essentially constant throughout the frequency range containing significant energy (30-15,000Hz). If low-pass filters are present, this may require the use of delay equalization. The deviation from linear phase must not exceed $\pm 10^\circ$ from 30-15,000Hz.
- 2) The low-frequency -3 dB point of the system must be placed at 0.15Hz or lower (this is not a misprint!). This is necessary to ensure less than 1% overshoot in a 50Hz square wave and essentially constant group delay to 30Hz.
- 3) Any pre-emphasis used in the audio transmission system prior to the stereo encoder must be canceled by a precisely complementary de-emphasis: Every pole and zero in the pre-emphasis filter must be complemented by a zero and pole of identical complex frequency in the de-emphasis network (an all-pole de-emphasis network is not appropriate).

Low-pass filters (including anti-aliasing filters in digital links), high-pass filters, transformers, distribution amplifiers, and long transmission lines can all cause the above criteria to be violated, and must be tested and qualified.

It is clear that the above criteria for optimal control of peak modulation levels are most easily met when the audio processor directly feeds the stereo encoder. In the 8200, no circuit elements that might distort the shape of the waveform are interposed between the audio processor and the stereo encoder. We therefore recommend using the 8200 with its built-in stereo encoder whenever practical.

Best Location for OPTIMOD-FM

The best location for OPTIMOD-FM is as close as possible to the transmitter, so that its stereo encoder output can be connected to the transmitter through a circuit path that introduces the least possible change in the shape of OPTIMOD-FM's carefully peak-limited waveform — a short length of coaxial cable.

If this is impossible, the next best arrangement is to feed the stereo encoder's baseband output to the transmitter's exciter either via a well-conditioned broadband STL radio or digital link with essentially flat frequency response and constant group delay from 30Hz to 53kHz.

Use the 8200's left and right analog audio outputs in situations where the stereo encoder and exciter are under the jurisdiction of an independent transmission authority, and where the programming agency's jurisdiction ends at the interface between the audio plant and the link connecting the audio plant to the transmitter. (The link might be telephone/post lines, analog microwave radio, or various types of digital paths.) This situation is not ideal because artifacts that cannot be controlled by the audio processor can be introduced by the link to the transmitter, by transmitter peak limiters, or by the external stereo encoder.

If the transmitter is not accessible:

All audio processing must be done at the studio, and you must tolerate any damage that occurs later.

If you can obtain a broadband (0-75kHz) phase-linear link to the transmitter, and the transmitter authority will accept the delivery of a baseband encoded signal, use the 8200's internal stereo encoder at the studio location to feed the STL. Then feed the output of the STL receiver directly into the transmitter's exciter with no intervening processing.

If only an audio link is available, use the 8200's left and right audio outputs and feed the audio, without pre-emphasis, directly into the link. If possible, request that any transmitter protection limiters be adjusted for minimum possible action — OPTIMOD-FM does most of that work. Transmitter protection limiters should respond only to signals caused by faults or by spurious peaks introduced by imperfections in the link.

To ensure maximum quality, all equipment in the signal path after the studio should be carefully aligned and qualified to meet the appropriate standards for bandwidth, distortion, group delay and gain stability, and such equipment should be re-qualified at reasonable intervals. (See Optimal Control of Peak Modulation Levels on page 1-11).

If the transmitter is accessible:

You can achieve the most accurate control of modulation peaks by locating OPTIMOD-FM at the transmitter site, and using its stereo encoder to drive the transmitter. You can usually also obtain good results by locating OPTIMOD-FM at the studio and connecting the baseband output of its stereo encoder to the transmitter through a composite baseband STL (see next page). However, many composite baseband STLs do not control peaks perfectly because of bounce (see next page), and locating OPTIMOD-FM at the transmitter site (where it can control peaks just prior to the transmitter's RF exciter) is thus likely to maximize loudness.

Because OPTIMOD-FM controls peaks, it is irrelevant whether the audio link feeding OPTIMOD-FM's input terminals is phase-linear. However, the link should have low noise, the flattest possible frequency response from 30-15,000Hz, and low non-linear distortion.

We very strongly recommend that you use the 8200's internal stereo encoder to feed the output of the encoder directly to the baseband input of the exciter through less than 100 feet (30 meters) of coaxial cable. You will achieve a louder sound on the air, with better control of peak modulation, than if you use an external stereo encoder.

The shorter the baseband cable run from OPTIMOD-FM to exciter, the less likely that ground loops or other noise problems will occur in the installation. If you require a long cable run, you can use Orban's CIT25 Composite Isolation Transformer to break any ground loops. This transformer will ordinarily cure even the most stubborn hum or noise caused by the composite connection between OPTIMOD-FM and the exciter. Its instruction manual contains complete information on its installation and application.

If a separate stereo encoder must be used, feed the encoder directly from the 8200's left and right analog outputs. If possible, bypass the pre-emphasis network and the input low-pass filters in the encoder so that they cannot introduce spurious peaks. Because of their special design, OPTIMOD-FM's pre-emphasis network and low-pass filters perform the same functions while retaining tight peak control.

Transmission from Studio to Transmitter

There are five types of studio-to-transmitter links (STLs) in common use in FM stereo service: composite baseband microwave, digital, video STLs with PCM adapters, analog land line (telephone/post line), and dual microwave.

Except for the composite baseband microwave STL and certain digital links, all these links carry the left and right channels directly or in some encoded form other than the standard 19kHz pilot-tone stereo baseband. These links are normally fed both left and right audio channels in non-encoded form, and their output is in the form of left and right channels.

Composite baseband microwave:

The composite baseband microwave STL carries the standard pilot-tone stereo baseband, and is therefore fed from the output of a stereo encoder located at the studio site. The receiver output of the composite STL is the stereo baseband signal, which is applied directly to the wideband input of the FM broadcast transmitter's exciter. Thus, no stereo encoder is needed at the transmitter.

In general, a composite microwave STL provides the highest audio quality, as long as there is a line-of-sight transmission path from studio to transmitter of less than 10 miles (16 km). If not, RF signal-to-noise ratio, multipath distortion, and diffraction effects can cause serious quality problems.

Where a composite STL is used, use the 8200's stereo encoder to drive the composite STL transmitter from the encoder's composite output.

Although a microwave STL exhibits satisfactory stereo separation, it is nevertheless not unusual for it to bounce because of a large infrasonic peak in its frequency response caused by an under-damped automatic frequency control (AFC) phase-locked loop. This bounce can increase the peak carrier deviation by as much as 1dB, reducing average modulation. Many commercial STLs (and FM exciters as well) have this problem.

Some consultants presently offer modifications to minimize or eliminate this problem. If your exciter or STL has this problem, you may contact Orban Customer Service for the latest information on such services.

Digital links:

There are several types of digital links presently available. One type encodes the entire composite stereo baseband on the link, functionally replacing a composite microwave STL. Such a link should be driven by the 8200's stereo encoder.

Other digital links pass the audio in left and right form, and may apply data-rate-reduction processing to the signal to reduce the number of bits per second required for transmission through the digital link. Such processing may distort peak levels, and such links must therefore be carefully qualified before you use them to carry the peak-controlled output of the 8200 to the stereo encoder.

Older-technology links may use straightforward PCM (pulse-code modulation) without data rate reduction. These can be very transparent and can exhibit accurate pulse response provided that their input anti-aliasing filters and output reconstruction filters are rigorously designed to achieve constant group delay over the frequency range that contains significant program energy. This is not particularly difficult to do with modern over-sampled converter technology.

Older-technology converters usually exhibit rapid changes in group delay around cut-off because their analog filters are ordinarily not group-delay equalized. Additionally, they may exhibit quantization distortion unless they have been correctly dithered. The installing engineer should be aware of all of these potential problems when designing a transmission system.

Video microwave STLs with PCM adapters:

The video STLs in use typically operate above 20GHz, with consumer PCM adapters (from Sony or dbx, for example) to encode left and right audio into a video-like signal. The quality of signal received at the transmitter through this type of STL is high. However, the high carrier frequencies make these links subject to rain fading. Other potential problems include very sharp high-frequency cut-off, rapid changes in group delay around cut-off, and quantization distortion.

The Sony and dbx encoders are no longer manufactured, but may be found on the used market.

Analog land line (PTT/post office line):

Analog land line quality is extremely variable, ranging from excellent to poor. Whether land lines should be used or not depends upon the quality of the lines locally available, and upon the availability of other alternatives. Even the best land lines tend to slightly veil audio quality, due to line equalizer characteristics and phase shifts. Slight frequency response irregularities and non-constant group delay characteristics will alter the peak-to-average ratio, and will thus reduce the effectiveness of any peak limiting performed prior to their inputs (see Optimal Control of Peak Modulation Levels on page 1-11).

Dual microwave STLs:

Dual microwave STLs offer greater noise immunity than composite microwave STLs. However, problems include gain- and phase-matching of the left and right channels, overloads induced by pre-emphasis, and requirements that the audio applied to the microwave transmitters be processed to prevent over-modulation of the microwave system. Unless carefully designed, dual microwave STLs can also introduce non-constant group delay in the audio spectrum, thus distorting peak levels.

Some left/right microwave links can be modified to meet the specification for frequency response and phase linearity stated in Optimal Control of Peak Modulation Levels on page 1-11. Many such links have been designed to be easily configured at the factory for composite operation, where the entire FM stereo baseband is passed, including the pilot tone and stereo subchannel. The requirements for maintaining stereo separation in composite operation are similar to the requirements for high waveform fidelity with low overshoot. Therefore, most links have the potential for excellent waveform fidelity if they are configured for composite operation (even if a composite FM stereo signal is not actually being applied to the link).

Nevertheless, in a dual-microwave system, the 8200 is usually located at the main FM transmitter and is driven by the microwave receivers. The microwave transmitters at the studio are protected from overload by one of Orban's Studio Level Control Systems, such as the Co-Operator 464A. These units also perform the gain riding function ordinarily executed by the AGC section of the 8200's processing, and optimizes the signal-to-noise ratio obtainable from the dual-microwave link.

If the STL microwave uses pre-emphasis, its input pre-emphasis network will probably introduce overshoots that will increase peak modulation without any increases in average modulation. If the Studio Level Control System is capable of producing a pre-emphasized output, we strongly recommend that microwave STL's pre-emphasis be defeated, and pre-emphasis performed in the Studio Level Control System. This frees the system from political overshoot. (The Orban 464A Co-Operator can be easily configured to produce a pre-emphasized output.)

Level Control Before the STL

If the audio link between the studio and the transmitter is noisy, you can minimize the audibility of this noise by performing the gain-riding function at the studio site. Gain-riding applied before the link to the transmitter improves the signal-to-noise ratio because average level on the link will be greater, so its noise will have less effect on the overall noise level of the broadcast.

You can use the Orban Co-Operator 464A to perform OPTIMOD-FM's AGC function before the STL. The 464A also contains high-frequency and peak control circuitry to protect the STL transmitters or digital encoders from over-modulation.

When you use any studio level controller, defeat the gain-riding function in the main 8200 processing. This is covered in the setup information in Section 2 (page 2-46 or 2-56).

If you are using an Orban 4000 Transmission Limiter to protect your STL, *do not* defeat the gain-riding function in the main 8200 processing. The Orban 4000 is a transmission system overload protection device; it is normally operated below threshold. It is not designed to perform an AGC or gain-riding function, and cannot substitute for the AGC function in the 8200.

Using the Orban 8100AST (or 8100A/ST) Studio Chassis with the 8200

If you have an OPTIMOD-FM 8100A1 (or 8100A or 8100A/1) installation that uses an Orban 8100AST (or 8100A/ST) Studio Chassis at the studio to protect an STL (with the main 8100A, 8100A1 or 8100A/1 chassis at the transmitter), you may wish to continue to use the Studio Chassis to protect the STL when you install the 8200 at the transmitter.

If you are keeping your analog OPTIMOD-FM as a standby processor, you will probably want to use the Studio Chassis to drive both the 8200 and the 8100A1 (or 8100A/1) transmitter chassis in parallel. This is usually practical, although complications will occur if you are not using an Orban 8100AXT2 (or 8100A/XT2) Six-Band Limiter Accessory with your 8100A1 (or 8100A/1), because, to correctly drive an 8200, the Studio Chassis must be strapped as if it were driving an 8100A1 (or 8100A/1) + 8100AXT2 (or 8100A/XT2) system. Therefore, if you have only an 8100A1 (or 8100A/1), you will have to re-strap the Studio Chassis for operation *without* the XT2 before you can put the standby 8100A1 (or 8100A/1) on the air.

STL and Exciter Overshoot

Earlier in this section, we discussed at length what is required to prevent STLs from overshooting. There are similar requirements for FM exciters. Nevertheless, in some installations some overshoot is inevitable. If this is a problem in your installation, the 8200's remote control feature offers the means to reduce the peak level of the 8200's audio output as necessary.

This way, you can still use the 8200's line-up tone to adjust the steady-state deviation to ± 75 kHz. Yet the reduced peak level of the audio emitted from the 8200 ensures that the carrier deviates no further than ± 75 kHz after overshoot.

This overshoot reduction can be selected on the SYSTEM SETUP I/O CALIB screen.

About Transmission Levels and Metering

Meters

Studio engineers and transmission engineers consider audio levels and their measurements differently, so they typically use different methods of metering to monitor these levels.

The VU meter is an average-responding meter (measuring the approximate RMS level) with a 300ms rise time and decay time; the VU indication usually under-indicates the true peak level by 8 to 14dB.

The Peak Program Meter (PPM) indicates a level between RMS and the actual peak. The PPM has an attack time of 10ms, slow enough to cause the meter to ignore narrow peaks and under-indicate the true peak level by 5dB or more.

The absolute peak-sensing meter or LED indicator shows the true peak level. It has an instantaneous attack time, and a release time slow enough to allow the engineer to easily read the peak level.

Figure 1-1 shows the relative difference between the absolute peak level, and the indications of a VU meter and a PPM.

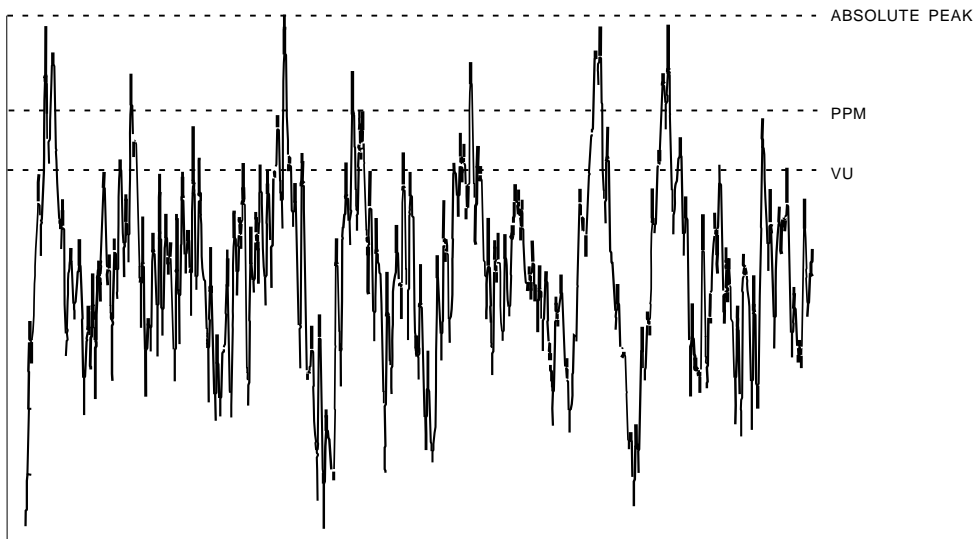


Figure 1-1: Absolute Peak Level, VU and PPM Reading
For a Few Seconds of Music Program

Studio Line-up Levels and Headroom

The studio engineer is primarily concerned with calibrating the equipment to provide the required input level for proper operation of each device, and so that all devices operate with the same input and output levels. This facilitates patching devices in and out without recalibration. For line-up, the studio engineer uses a calibration tone at a studio standard level, commonly called line-up level, reference level, or operating level.

Metering at the studio is by a VU meter or PPM (Peak Program Meter). As discussed above, the VU or PPM indication lags the true peak level. Most modern studio audio devices have a clipping level of no less than +21dBu, and often +24dBu or more. So the studio standardizes on a maximum program indication on the meter that is lower than the clipping level, so that peaks that the meter doesn't indicate will not be clipped. Line-up level is usually at this same maximum meter indication.

In facilities that use VU meters, this level is usually at 0VU, which corresponds to the studio standard level, typically +4 or +8dBu. For facilities using +4dBu standard level, instantaneous peaks can reach +18dBu or higher (particularly if the operator overdrives the console or desk). Older facilities with +8dBu standard level and equipment that clips at +18 or +21dBu will experience noticeable clipping on some program material.

In facilities that use the BBC-standard PPM, maximum program level is usually PPM4 for music, PPM6 for speech. Line-up level is usually PPM4, which corresponds to +4dBu. Instantaneous peaks will reach +17dBu or more on voice.

In facilities that use PPMs that indicate level directly in dBu, maximum program and line-up level is often +6dBu. Instantaneous peaks will reach +11dBu or more.

Transmission Levels

The transmission engineer is primarily concerned with the peak level of a program to prevent overloading or over-modulation of the transmission system. This peak overload level is defined differently, system to system. In FM modulation (FM/VHF radio and television broadcast, microwave or analog satellite links), it is the maximum-permitted RF carrier frequency deviation. In AM modulation, it is negative carrier pinch-off. In analog telephone/post/PTT transmission, it is the level above which serious crosstalk into other channels occurs, or the level at which the amplifiers in the channel overload. In digital, it is the largest possible digital word.

For metering, the transmission engineer uses an oscilloscope, absolute peak-sensing meter, calibrated peak-sensing LED indicator, or a modulation meter. A modulation meter usually has two components — a semi-peak reading meter (like a PPM), and a peak-indicating light which is calibrated to turn on whenever the instantaneous peak modulation exceeds the over-modulation threshold.

Line-Up Facilities

Metering of Levels

The I/O (Input/Output) METER screen on the 8200 shows left/right input and output levels, and composite modulation.

Left/Right Input Level

Left and right input level is shown on a VU-type scale (–20 to +3dB), while the metering indicates *absolute instantaneous peak* (much faster than a standard PPM or VU meter).

Depending upon your requirements, you can operate the left/right input metering in one of two basic styles: METERS INDICATE CLIP or METERS INDICATE REFERENCE. You can choose between these styles on the SYSTEM SETUP I/O CALIB screen.

When METERS INDICATE CLIP is chosen, the input meter is scaled so that 0dB corresponds to the absolute maximum peak level that the 8200 can accept, at the current setting of its A-I level (Analog Input) control. If you are using the AES/EBU digital input, the maximum digital word at the input corresponds to the 0dB point on the 8200's input meter.

When METERS INDICATE REFERENCE is chosen, the left/right input meters are recalibrated to match your station's line-up or reference level, as set on the SYSTEM SETUP I/O CALIB screen. Program material produces frequent peaks that will read full-scale due to the absolute instantaneous peak response of the meters. Reference tone should be set to indicate 0dB on these meters.

Left/Right Output Level

Left and right output level is shown on a VU-type scale (–20 to +3dB), where the metering indicates absolute instantaneous peak (much faster than a standard PPM or VU meter).

The meter is scaled so that 0dB is calibrated to the highest left and right peak modulation level, before de-emphasis, that the processing will produce, under any program, processing, or setup condition (except when the processing is switched to bypass). The meter indication is not affected by the setting of the output level control.

Composite Output Level

The Orban 8200 Audio Processor controls instantaneous, absolute peak levels to a tolerance of approximately ± 0.1 dB. Composite modulation is indicated in % modulation, absolute instantaneous peak indicating. 100% is calibrated to the highest composite peak modulation level that the processing will produce, including the pilot tone, under any program, processing, or setup condition (except when the processing is switched to bypass).

100% ordinarily corresponds to ± 75 kHz carrier deviation. Note that if subcarriers (SCAs) are used, the meter will ordinarily read higher than 100%. For example, in the U.S.A., if two subcarriers are used, the meter will usually read peaks of 110%, corresponding to ± 82.5 kHz deviation.

Built-in Calibrated Line-up Tones

To facilitate matching the output level of the 8200 to the transmission system that it is driving, the 8200 contains an adjustable USER TONE that produces sine waves at 8200's left, right and composite outputs. The frequency and modulation level of the line-up tones can be adjusted from the front panel.

The stereo encoder is calibrated so that 100% left or right modulation will provide 100% modulation of the stereo composite signal, including pilot tone, but excluding any SCA subcarriers (See the note about interleaving on page 4-9).

When the 8200's left/right analog output is switched to FLAT, a de-emphasis filter is inserted between output of the 8200's audio processing and its line output. Thus, as the frequency of the tone preset is changed, the level at the 8200's line output will follow the selected de-emphasis curve.

In most cases the pre-emphasis filter in the driven equipment will undo the effect of the 8200's internal de-emphasis, and the 8200's output level should be adjusted so that the tone produces 100% modulation of the transmission link as measured after the link's pre-emphasis filter. At 100Hz, switching the de-emphasis out or in will have negligible effect on the level appearing at the 8200's left and right audio outputs.

You can adjust the frequency and modulation level of the built-in line up tone, and then save this to a user preset, so that recalling this preset turns on the tone at the frequency and modulation level you preset. You can use the front panel, the serial port, or the opto-isolated remote control interface ports to recall the preset.

Built-in Calibrated BYPASS Preset

A bypass preset is available to transparently pass line-up tones generated earlier in the system. It will also pass program material, with no gain reduction or protection against overmodulation. It can transparently pass any line-up tone applied to its input up to about 130% output modulation, at which point clipping may occur.

Internal Clock

The 8200 contains an internal clock that is used to automatically change presets on a programmed time and date schedule.

The clock is designed to provide *short-term* and *long-term* accuracy sufficient for the application of changing the sound of the processing. It runs from the 8200's internal time base, which provides exceptionally good short-term stability, and is usually accurate to better than one second in 24 hours. At the same time, the clock monitors the AC mains frequency. In most developed countries, the power company maintains *long-term* accuracy of the mains to precisely 60Hz or 50Hz. Once each 24 hours, at approximately one minute after midnight, the 8200 resets its internal clock to the long-term (24 hour) average frequency of the mains.

For installations that require better accuracy, clock reset capability is provided at the Remote Control Interface connector. Using a pulse generated by your station's standard clock system, you can reset the 8200's clock to the nearest hour, or to 00:00:00 (midnight).

For installations where the power company does not maintain long-term accuracy of the main's frequency, the clock can be set to run only from the 8200's internal time base.

For more information, see page 2-74.

Future Updates

From time to time, Orban will introduce new features to the control system or the processing. As these features are introduced, you will be given the opportunity to purchase the new features. Some may only require software updating; some may require additional hardware.

To be assured of receiving notification of updates, stop now, complete the Registration Card that came with the unit, and mail it in to us.

Software updates will be distributed on a module that plugs into a socket on the Control Card. Instructions will be provided.

Warranty, Feedback

Warranty

The warranty, which can be enjoyed only by the first end-user of record, is located on the inside back cover of this manual. Save it for future reference. Details on obtaining factory service are provided on page 5-9.

User Feedback Form

We are very interested in your comments about this product. Your suggestions for improvements to either the product or the manual will be carefully reviewed. A postpaid User Feedback Form is provided in the back of this manual for your convenience. If it is missing, please write us at the address printed in the front of the manual, or call or fax our offices at the number listed. We will be happy to hear from you.