television

orban crl

audio processing

OPTIMOD SURROUND 8585

From Orban/CRL —

the industry-standard brand in television audio processing

loudness control you trust
now in surround.

OPTIMOD 8585: Orban Television Audio Processing – Sound That Keeps Audiences Listening

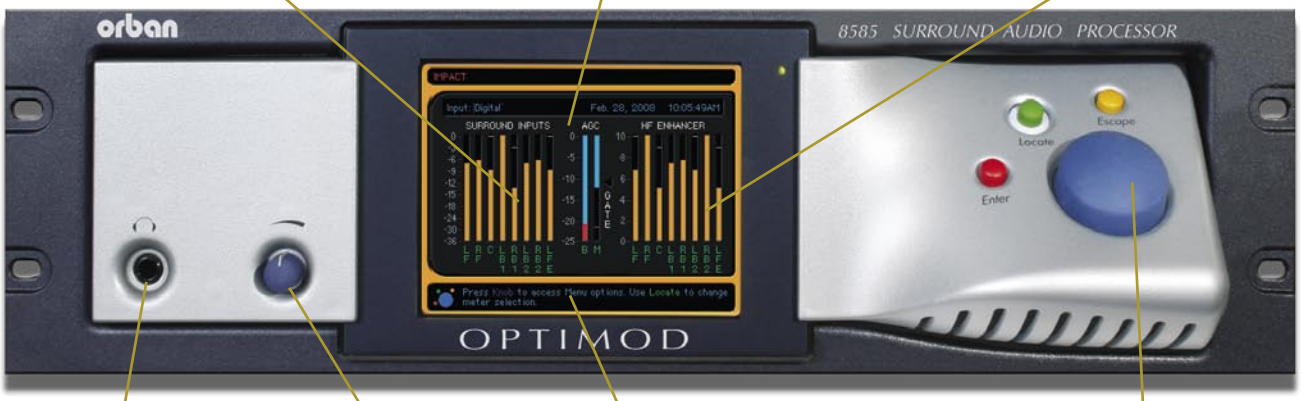
Experience has shown that the mass television audience wants two things from television audio: dialog should be comfortably intelligible and commercials should not be irritatingly loud compared to program material. Home theater owners may want the opportunity to watch feature films while hearing a wide dynamic range signal. However, even these viewers usually consume television in a much more passive way when viewing garden-variety programs. To be an acceptable part of the domestic environment, television sound cannot overwhelm household members not interested in viewing (not to mention neighbors, particularly in multi-family dwellings). For a variety of reasons, the dynamic range of sound essential to the intelligibility of the program should not exceed 15 dB in a domestic listening environment. Underscoring and ambient sound effects will, of course, be lower than this.

The issue of loud commercials is particularly important. In the U.S., it is against Federal Communications Commission rules to broadcast irritatingly loud commercials. As a result of viewer complaints, the FCC has twice investigated the problem.

Orban understands such issues well. Since 1980, we have provided analog television broadcasters with industry-standard dynamics processors: OPTIMOD-TV 8180, 8182, 8282 and 8382. In 1998, we introduced OPTIMOD-DAB 6200 — two-channel processing specifically tailored for digital channels using lossy compression like Dolby's AC-3, which is used for ATSC transmissions. Our 6300, introduced in 2006, is a second-generation two-channel processor for digital channels, including DTV, DAB and netcasting.

In typical analog television practice, all audio is applied to a single transmission audio processor that automatically controls the average modulation and the peak-to-average ratio while smoothing out transitions between program elements. Simple compression and peak limiting cannot do this effectively.

details



Input level meters.

Active matrix quarter-VGA screen can show meters, presets, processing parameters, system setup controls and more.

High Frequency Enhancer meters — just one of many metering facilities available.

Headphone jack offers plenty of drive to overcome ambient noise at transmitters.

Headphone volume control.

Help for navigation.

Easy-to-use user interface makes navigation and adjustment effortless.

Starting with the 8182, all OPTIMOD-TV processors have incorporated the CBS Loudness Controller™. Developed after 15 years of psychoacoustic research at CBS Laboratories, the CBS LC accurately estimates the amount of perceived loudness in a given piece of program material. If the loudness exceeds a preset threshold, the controller automatically reduces it to that threshold. The CBS algorithm has proven its effectiveness by processing millions of hours of on-air programming and greatly reducing viewer complaints.

In ITU parlance, the CBS LC relies on a "short-term" loudness measurement that takes into account the human ear's loudness integration time — approximately 200 milliseconds. The CBS algorithm's attack time is fast enough to prevent audible and irritating loudness overshoots — blasts of sound that have viewers scrambling for their remote controls. Loudness control is always smooth and unobtrusive. Unlike "long-term" loudness measurement and control technologies, the CBS LC recognizes that a piece of program material whose average loudness seems acceptable according to a long-term loudness measurement may nevertheless have short sections whose loudness should be reduced because it is extremely annoying. While main purpose of this processing is to control the loudness of commercials, other exuberantly mixed elements can also benefit. (A good example is applause with whistling.)

for processing demands of

5.1
7.1

OPTIMOD-Surround 8585:
Effective Automatic Loudness Control for Up to 7.1 Channels

For many years our television customers have been asking for OPTIMOD-quality surround sound processing along with the ability to process the local insertion of news, weather and sports independently. Our customers know that there is no substitute for the smooth, natural-sounding control that only OPTIMOD provides, particularly with speech material.

Orban's response is the 8585. This next generation OPTIMOD provides the function and control necessary for up to eight channels simultaneously. It can help you achieve the highest audience satisfaction in digital audio broadcasting, digital television and netcasting.

excellent loudness consistency...

The 8585 features OPTIMOD-quality two-band and five-band audio processing for surround sound broadcasting and netcasting. Thanks to versatile compression ratio controls and a mastering-quality look-ahead peak limiter, the 8585 is also ideal for mastering audio in broadcast productions as well as productions intended for media such as DVD and Blu-ray.

details

Five AES3id digital inputs – highly configurable via remote-controllable internal routing switchers.

Two analog outputs can emit any output channel or channel pair, including a stereo downmix of the multichannel processing's outputs.

RS232 serial connector for computer control, simple ASCII remote control and future developments.

Two RS485 can accept and emit Dolby Digital® metadata.

Six AES3id outputs – highly configurable via remote-controllable internal routing switchers.

Sync input, configurable to accept AES11id or wordclock sync.

100 Mbps Ethernet facilitates network control.

Eight optically isolated GPI inputs for contact-closure remote control.

The 8585 starts with the technology of Orban's popular OPTIMOD 6300 and takes it to the next level with surround processing that reflects the latest psychoacoustic research into loudness perception. The 8585's CBS Loudness Controller works in both two-band and five-band modes. Third generation improvements reduce annoyance better than simple loudness control alone, doing so without audible gain pumping.

The 8585 is two processors in one, offering surround processing for either 7.1 channels or 5.1 channels plus an independent 2.0 channel processor (equivalent to OPTIMOD 6300 processing) that can operate stand-alone with its own CBS Loudness Controller. Additionally, the 2.0 processor's output can be mixed into the left and right front channels of the surround processing so that the surround processing's Loudness Controller and look-ahead limiters control the loudness and peak level of the mix. Built-in CBS Loudness Meters indicate the subjective loudness of the surround and 2.0 channel processing.

The multichannel and 2.0 processors can operate with separate audio processing parameters like release times. For example, the 2.0 processing could be set up for relatively heavy processing to make a newsroom feed more consistent, while the main processing was set up more conservatively to correct network material and commercials unobtrusively.

Because the 2.0 processing has its own loudness controller and peak limiters, another important application is processing subchannels in digital television. The 2.0 processing can operate in dual-mono mode, so it can process one subchannel in stereo or two subchannels in mono.

The 8585 is built on Orban's flagship hardware platform. This features a GUI displayed on a quarter-VGA active matrix color LCD, making it easy to do all setup and adjustment from the 8585's front panel. To minimize latency and to achieve highest reliability, the 8585 uses a dual hardware architecture. Freescale 24-bit DSP chips do all audio processing while a separate microcontroller supports the GUI and control functions. Even if this controller malfunctions, the 8585 will continue to process audio normally.

Minimum latency of the fully processed signal is 21 milliseconds, which can be padded to exactly one frame delay for any video standard. The low latency headphone feed (containing all processing except for peak limiting) has a latency of approximately 6 milliseconds.

The 8585 and

There are three important pieces of metadata in the AC3 bitstream.

- Dialog Normalization, which in essence sets the receiver's volume control to complement the dynamic range of the program material being transmitted.
- Line-Mode Dynamic Range Control, which allows the receiver to perform wideband dynamics compression if the listener chooses.
- RF-mode Dynamic Range Control, which applies more extreme compression.

When used correctly, these can help address the problem of inconsistent loudness between different sources while allowing viewers to individually choose the amount of dynamic compression they hear. However, experience so far has shown that the metadata implementation in the broadcast chain has often been too haphazard to prevent audience irritation.

Orban believes that the most realistic approach to handling AC3 dialog normalization is a hybrid approach. It is important to consider carefully what program material will truly benefit from the ability to be heard with unprocessed dynamic range. Prime-time dramatic shows, newer feature films, and classical music concerts all use dynamic range for dramatic impact and are therefore candidates for full exploitation

Dolby Digital® (AC3) Metadata

of the AC3 DRC metadata. Material that airs with full Dynamic Range Control implemented should be refined in production so that it sounds polished and consistent without further processing. Each show, film, and concert must have a dialog normalization value pre-assigned to it, derived from a long-term loudness meter or by human audition. It is probably impractical to pass through, without review, dialog normalization values created by program and commercial providers because some commercial providers will inevitably try to game the system to make their commercials excessively loud. Instead, if dialog normalization is to be actively used in transmission, the broadcaster must strip its existing value from the program and then must preview each piece of program material, replacing the value with one that will ensure consistency from one piece of program material to the next.

Even program segments whose Dialnorm value is set automatically according a long-term loudness measurement like ITU BS.1770 may still have short-term loudness peaks that are extremely annoying. Any program material that will not benefit from being heard with full dynamic range should be processed with the 8585 so that viewers can hear the audio comfortably. They should not be blasted by loud effects or commercials or being forced to strain to understand dialog. Most program material, including commercials, live news, sports, most documentaries, game shows, talk shows, soap operas, and pop music videos and concerts, can receive 8585 processing. The 8585 controls subjective loudness very well, so a single dialog normalization value can be applied to all program material whenever the 8585 is online. The advantage of this strategy is that the 8585 will guarantee that all of this material is comfortably listenable and that commercials are not excessively loud. With the possible exception of sport and some concerts, this program material does not rely on extreme dynamic range to make its point, so it is unlikely that compression will damage the artistic integrity of this programming.

No one needs more dynamic range on talk shows or on the local news! The 8585 can smoothly activate and defeat its dynamics processing on-air via GPI triggers or other remote control, so it is easy to implement this strategy.

Another important 8585 feature is "automatic re-equalization" of program material. The 8585's multiband compressor can automatically re-equalize program material towards a preset target spectral balance by applying more gain reduction to frequency bands containing more power. The 8585's compressor's band coupling controls determine the maximum amount of re-equalization permitted.

In the two-band compressor, re-equalization tames excessive bass, which can otherwise cause muddy balances. The five-band compressor can perform more detailed automatic re-equalization, which can be particularly useful for program material such as live news and for any material where dialog intelligibility is a problem. Approximately 60% of digital OPTIMOD-TV users use two-band compression; the rest use five-band compression.

Dynamic range compression in Dolby Digital (using DRC metadata to achieve compression at the receiver) is a simple dynamic gain adjustment performed over the entire audio bandwidth; it does not do automatic re-equalization. The level detector determining the amount of DRC compression can be frequency-contoured to mimic the equal-loudness curves of the ear and has the ability to "look ahead" at upcoming program level changes. This is sufficient for many applications, but may be improved with the addition of a multiband device like the 8585 to handle certain programming that may not get sufficient treatment from a single-band device like that in DRC.

The 8585 has RS485 serial connections that can accept and emit AC3 metadata. Although metadata is not exploited in the initial 8585 software release, we expect to use this metadata the future to make the 8585's processing even more "intelligent."

features & benefits

USER-FRIENDLY INTERFACE	
Color LCD and **large rotary knob**	A large (quarter-VGA) **color liquid crystal display** (LCD) makes setup, adjustment and programming of the 8500 easy. Navigation is by a miniature joystick, two dedicated buttons, and a large rotary knob. The LCD shows all metering functions of the processing structure in use.
Navigation Joystick	Use the Locate **joystick** to navigate through a menu that lets you recall a preset, modify processing (at three levels of expertise), or to access the system's setup controls.
ABSOLUTE CONTROL OF PEAK MODULATION	
Precise control of **peak levels**	The 8585 **precisely controls peak levels** to prevent digital clipping. The maximum level of the digital samples is controlled to better than 2%.
Pre-emphasis limiting for the two standard pre-emphasis curves of **50 µs** & **75 µs**	While **primarily oriented toward "flat" media**, the 8585's 2.0 channel processor can also provide **pre-emphasis limiting** for the two standard pre-emphasis curves of 50 µs and 75 µs. This allows it to protect pre-emphasized microwave links, satellite uplinks and similar channels where protection limiting or light processing is required.
FLEXIBLE CONFIGURATION	
Two processors in one	A gain-coupled multichannel processor for **up to 7.1 channels**, plus an additional, **independent 2.0 channel processor** (whose performance is equivalent to an OPTIMOD 6300) that can be used for many tasks such as processing the audio for a second language or up to two ATSC subchannels. Because its output can be mixed into the LF and RF outputs of the multichannel processing, the 2.0 channel processor can also be used to **process an independent feed** (like the output of a sports truck, news truck, or newsroom) before it is mixed with the station's main multichannel audio path.
Separate audio processing parameters for **surround** and **2.0 processors**	The multichannel and 2.0 processors can operate **with separate audio processing parameters** like release times. For example, the 2.0 processing could be set up for relatively heavy processing to make a newsroom feed more consistent, while the main processing was set up more conservatively to correct network material and commercials unobtrusively.
AES3id Inputs & Outputs	The 8585 includes **five AES3id digital inputs** and **six AES3id outputs**, **all transformer-coupled**. These inputs and outputs appear on BNC connectors and have 75 Ω impedance. The digital inputs and digital outputs have sample-rate converters and can operate at 32 kHz, 44.1 kHz, 48, 88.2 and 96 kHz sample rates. We chose AES3id because it is uses the 75 Ω coaxial cable and BNC connectors that are ubiquitous in television facilities and because it is universally compatible with any non-AES distribution system (like SDI) via readily available converters and de-embedder/embedder hardware.
Configurations via **remote-controllable internal routing switchers**	OPTIMOD 8585's AES3id inputs and outputs are **highly configurable via remote-controllable internal routing switchers**. Additionally, the outputs of the multichannel and 2.0 processing chains can be independently configured to emit the output of the **AGC** or the output of the **multiband compressor/limiter**, all configurable to use or bypass look-ahead limiting.
Use **8585** as an **AES splitter**	Via the internal output routing switcher, a given output signal can be applied to more than one hardware output. This allows using the 8585 as an **AES splitter.**
Stereo headphone jack	A **stereo headphone jack** is available on the front panel. It can be configured to emit any 8585 output signal and is independent of the stereo analog monitor output.

features & benefits

RS485 ports for **Dolby Digital Metadata I/O**	Two **RS485 serial ports** allow the 8585 to **accept and emit Dolby Digital metadata**.
Dual-mono mode	The 8585's 2.0 processing offers a **dual-mono** mode that allows two entirely separate mono programs to be processed, facilitating multiple-language operation. *In this mode, both processing channels operate using the same processing parameters (like release time); you cannot adjust the two channels to provide different processing textures.*
Sync Input	A **sync input** is configurable to accept **AES11id** or **wordclock sync**. You can synchronize the output sample rate of all AES3id outputs to this input. You can also **synchronize the outputs to any AES3 digital input or to the 8585's internal clock**. The sync source of each AES3 output is independently selectable.
Analog Outputs	The **analog outputs** are transformerless, balanced, and floating (with 50 Ω impedance) to ensure highest transparency and accurate pulse response. They can be used to drive a transmitter, although their normal function is monitoring.
All connections are **rigorously RFI-suppressed**	All input, output and power connections are **rigorously RFI-suppressed** to Orban's traditional exacting standards, ensuring trouble-free installation.
Certified	The 8585 is designed and certified to **meet all applicable international safety and emissions standards**.
ADAPTABILITY THROUGH MULTIPLE AUDIO PROCESSING STRUCTURES	
Complete **audio processing system**	A **processing structure** is a program that operates as a complete audio processing system. Only one processing structure can be on-air at a time. OPTIMOD 8585 realizes its processing structures as a series of high-speed mathematical computations made by Digital Signal Processing (DSP) chips.
Two processing structures	The 8585 features two processing structures: **Five-Band** for a spectrally consistent sound and **Two-Band** for a more transparent sound that preserves the frequency balance of the original program material.
"Protect" function	A special **Two-Band** preset creates a no-compromise "Protect" function that is functionally similar to the "**Protect**" structures in earlier Orban digital processors.
Switching between **processing structures**	The Five-Band and the Two-Band structures can be switched via a **mute-free crossfade**.
Rides gain over an adjustable range of up to 25 dB	The 8585's AGC **rides gain** over an adjustable range of up to 25 dB, compressing dynamic range and compensating for both operator gain-riding errors and gain inconsistencies in automated systems. The AGC output is available to drive STLs, so the 8585 can be used as a studio AGC.
Phase-linear processing structures	The 8585's processing structures are all **phase-linear** to maximize audible transparency.
Mastering-quality noise and **distortion performance**	The 8585's equalizers and crossovers use 48-bit arithmetic to ensure **mastering-quality noise** and **distortion performance**.
CBS Loudness Controllers™	The 8585 includes third-generation **CBS Loudness Controllers™** for DTV applications. **Separate loudness controllers are available in the multichannel and 2.0 processing chains** and work with the both Two-Band and Five-Band structures. The third-generation improvements **reduce annoyance more than simple loudness control alone**, doing so without audible gain pumping. Attack time is fast enough to prevent audible loudness overshoots, so the control is smooth and unobtrusive.

features & benefits

ADAPTABILITY THROUGH MULTIPLE AUDIO PROCESSING STRUCTURES	
Orban's **PreCode™** technology	Orban's **PreCode™** technology manipulates several aspects of the audio to minimize artifacts caused by low bit rate codecs, ensuring consistent loudness and texture from one source to the next. It is particularly useful when processing for netcasts or mastering for any low bit rate channel. PreCode includes special audio band detection algorithms that are energy and spectrum aware. This can improve codec performance on some codecs by reducing audio processing induced codec artifacts, even with program material that has been preprocessed or mastered by other processing than OPTIMOD. There are several factory presets tuned specifically for low bit rate codecs. These presets have "LBR" in their names.
CONTROLLABLE	
Eight programmable, optically isolated GPI ports	The 8585 can be **remote-controlled** by 5-12 V pulses applied to eight programmable, optically isolated "general-purpose interface" (GPI) ports.
8585 PC Remote software	**8585 PC Remote software** is a smooth, responsive graphical application that runs under Windows® XP and Vista. It communicates with a given 8585 **via TCP/IP** over **modem**, **direct serial** and **Ethernet connections**. You can configure PC Remote to switch between many 8585s via a convenient organizer that supports giving any 8585 an alias and supports grouping multiple 8585s into folders. Clicking an 8585's icon causes PC Remote to connect to that 8585 through an Ethernet network or initiates a Windows Dial-Up or Direct Cable Connection if appropriate. The PC Remote software allows the user to access all 8585 features and allows the user to archive and restore presets, automation lists, and system setups (containing I/O levels, digital word lengths, GPI functional assignments, etc.).
Remote administration over TCP/IP	An API provides **remote administration over TCP/IP** via the **RS232 serial** or **Ethernet ports**. The 8585 hosts a TCP/IP terminal server to allow external control of the 8585 from either a Telnet/SSH client or a custom third party application. All commands are **simple text strings**. You can recall presets, operate the input and output routing switchers and more. Password security is provided.
Versatile **real-time clock**	The 8585 contains a versatile **real-time clock**, which allows automation of various events (including recalling presets) at pre-programmed times. To ensure accuracy, the clock can be synchronized to an Internet timeserver.
Silence alarm & **Tally Outputs**	**Silence alarm** and **digital audio fault tally outputs** are available.
Bypass Test Mode	A **Bypass Test Mode** can be invoked locally, by remote control (from either the 8585's GPI port or the 8585 PC Remote application), or by automation to permit broadcast system **test and alignment** or "proof of performance" tests.
Built-in **line-up tone generator**	The 8585 contains a built-in **line-up tone generator**, facilitating quick and accurate level setting in any system.
Software Upgrade	The 8585's software **can be upgraded** by running Orban-supplied downloadable upgrade software on a PC. The upgrade can occur remotely through the 8585's Ethernet port or serial port (connected to an external modem) or locally (by connecting a Windows® computer to the 8585's serial port through the supplied null modem cable)

About Surround Synthesis

After substantial research, we chose not to include surround synthesis (more formally call "blind upmixing") in the 8585. Here's why:

1. Most TV sets are either mono or stereo. As specified in the Dolby Digital® standard, when the transmission is flagged as 5.1 channel these sets reproduce a downmix of the five main surround channels. (The .1 channel is discarded.) If you transmit stereo, stereo TVs will accurately reproduce the original mix. This is not true if you synthesize an arbitrary surround mix from the original stereo and expect the TV to extract stereo from it through a downmix. Unlike the old Orban stereo synthesizers (which were completely mono-compatible), 5.1 upmixes are not stereo-compatible and can cause comb filtering and other coloration.

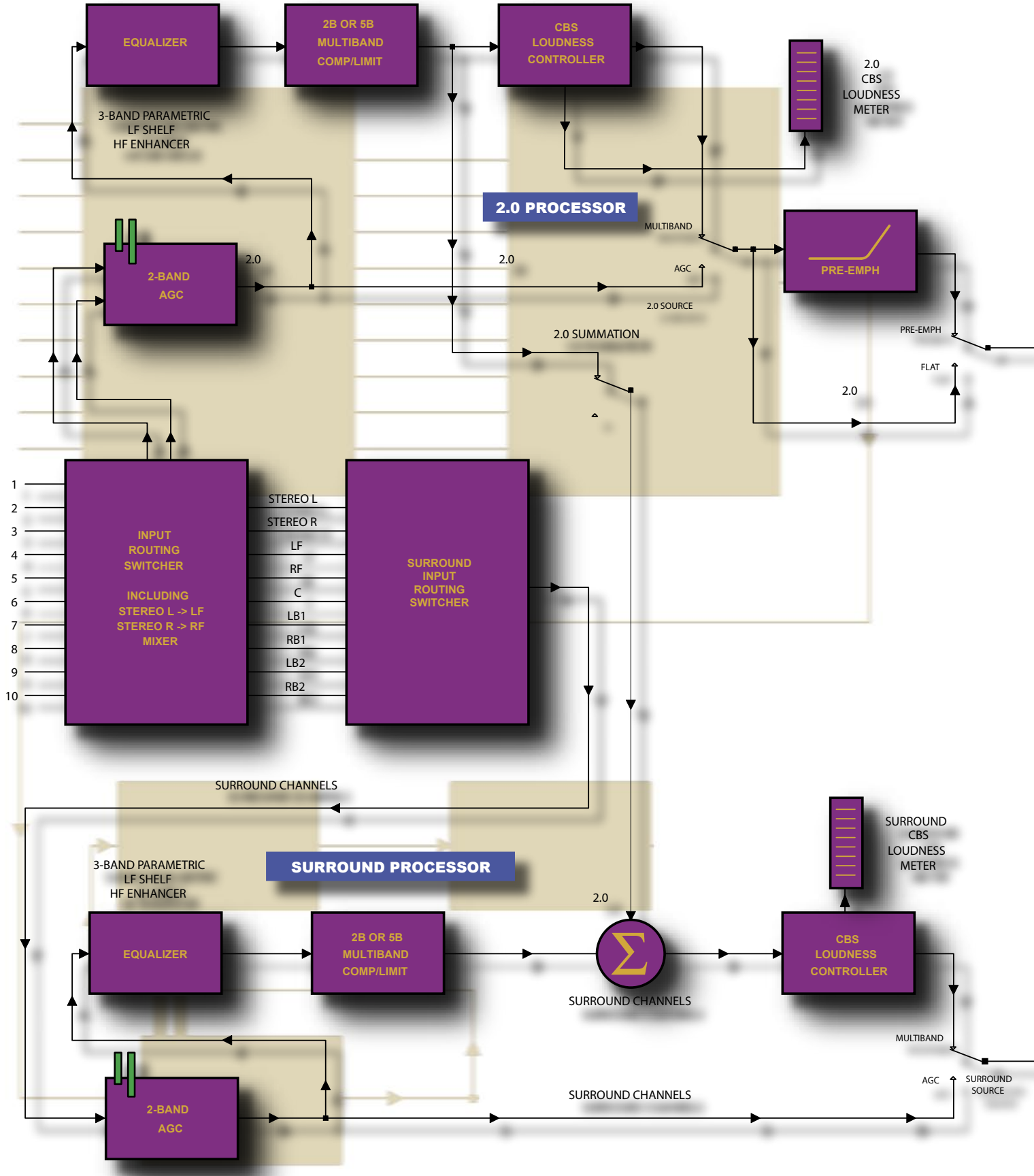
2. Synthesized upmixes are particularly hard for the Dolby AC3 codec to pass to the receiver without adding without adding audible artifacts. The codec is much more transparent to stereo and to normally mixed 5.1 material.

3. If you want viewers with surround setups to hear an upmix, just set the Dolby ProLogic flag in the Dolby Digital bitstream you transmit to viewers and let the Dolby ProLogic or ProLogic II decoder in every surround receiver create the surround.

4. Even this may be a bad idea. In AES Convention Paper 6915 ("Perceptual Evaluation of Algorithms for Blind Up-mix"), Spore, Walther, Liebetrau, Bube, Fabris, Hohberger and Köhler described double-blind listening tests comparing stereo music with blind upmixes of it using a variety of upmix algorithms. All major algorithms from USA, Germany, Switzerland and Denmark were included in the test.

For listeners in the center stereo "sweet spot," none of the upmixing schemes was rated significantly better than the original 2-channel stereo input and most of the schemes were rated worse. Upmixes were only preferred if listeners were located away from the sweet spot. Because the program material was music, the results may not apply to typical television programming. Nevertheless, we have heard some extremely weird and unpleasant-sounding upmixes on the air. Certainly, dialog emerging from what sounds like 16-foot wide heads wrapped halfway around the living room should concern any broadcaster who does not want to give viewers an excuse to hit the "mute" button or fast-forward the program material.

processing


EQUALIZER
2B OR 5B MULTIBAND COMP/LIMIT
CBS LOUDNESS CONTROLLER
2.0 CBS LOUDNESS METER
3-BAND PARAMETRIC LF SHELF HF ENHANCER
2.0 PROCESSOR
MULTIBAND
PRE-EMPH
2-BAND AGC
2.0
2.0
AGC
2.0 SOURCE
2.0 SUMMATION
PRE-EMPH
FLAT
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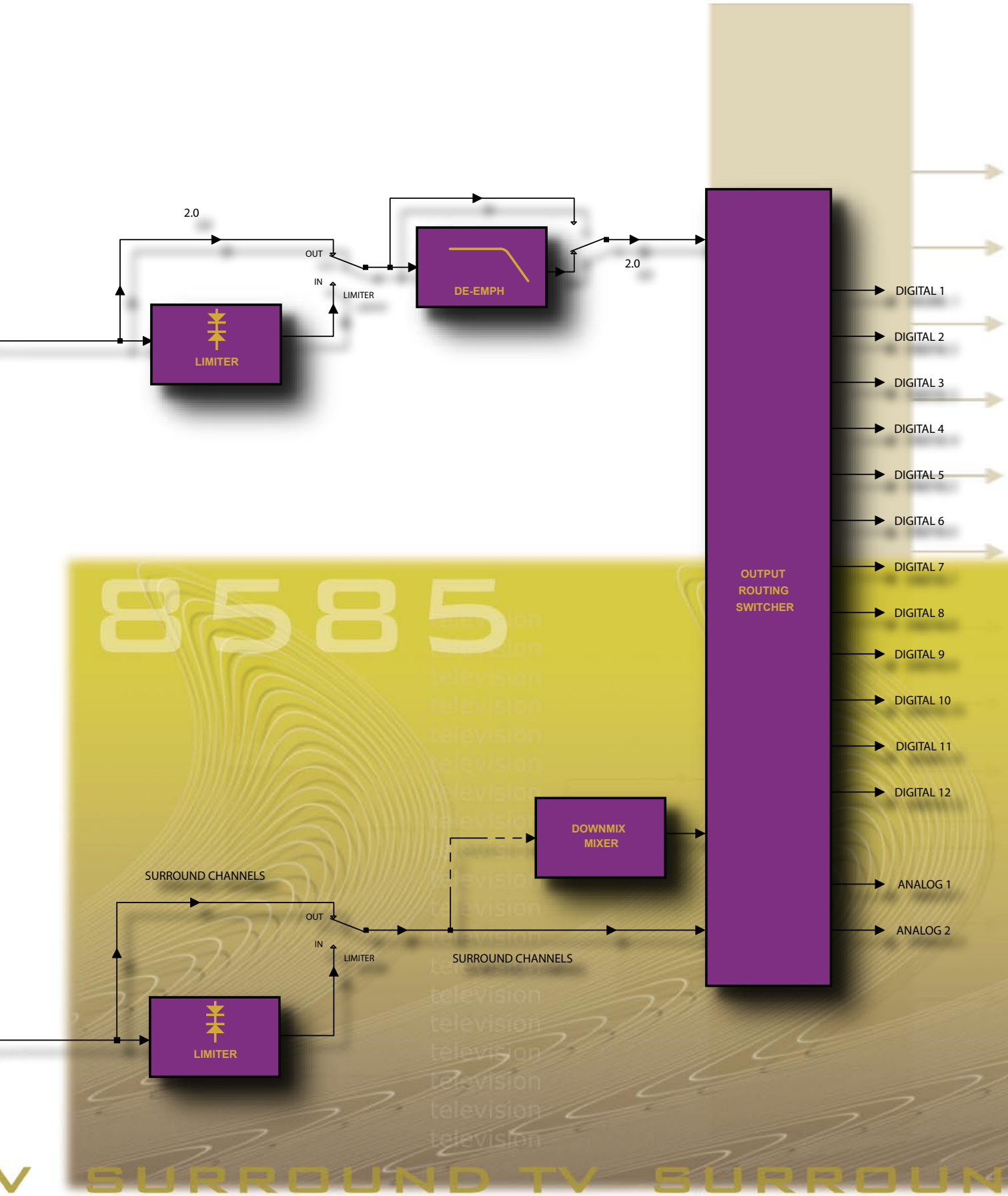
INPUT ROUTING SWITCHER
INCLUDING STEREO L -> LF STEREO R -> RF MIXER
STEREO L
STEREO R
LF
RF
C
LB1
RB1
LB2
RB2
SURROUND INPUT ROUTING SWITCHER
SURROUND CHANNELS
SURROUND PROCESSOR
3-BAND PARAMETRIC LF SHELF HF ENHANCER
SURROUND CBS LOUDNESS METER
2.0
EQUALIZER
2B OR 5B MULTIBAND COMP/LIMIT
SURROUND CHANNELS
CBS LOUDNESS CONTROLLER
MULTIBAND
2-BAND AGC
SURROUND CHANNELS
AGC
SURROUND SOURCE

simplified block diagram



specifications

It is impossible to characterize the listening quality of even the simplest limiter or compressor based on specifications because such specifications cannot adequately describe the crucial dynamic processes that occur under program conditions. Therefore, the only way to evaluate the sound of an audio processor meaningfully is by subjective listening tests.

Certain specifications are presented here to assure the engineer that they are reasonable, to help plan the installation, and make certain comparisons with other processing equipment.

PERFORMANCE	**Frequency Response** (Bypass Mode)	Surround Processing: ±0.10 dB, 20 Hz – 20 kHz for 44.1 kHz or higher input/output sample rates. At 32 kHz input and/or output sample rate, the passband is reduced to approximately 14.7 kHz. 2.0 Processing: Depending on settings, is flat or follows standard 50 µs or 75 µs preemphasis curve ±0.10 dB, 20 Hz – 20 kHz (except at 32 kHz; see above). Output can be user-configured to be flat or pre-emphasized. (Pre-emphasis limiting is offered to accommodate certain older analog studio/transmitter links.)
PERFORMANCE	**Noise**	Output noise floor will depend upon how much gain the processor is set for (Limit Drive, AGC Drive, Two-Band Drive and/or Multiband Drive), gating level, equalization, noise reduction, etc. The noise floor of the digital input signal primarily governs it. The dynamic range of the 8585's digital signal processing is greater than 100 dB.
PERFORMANCE	**Processing Sample Rate**	48 kHz. We believe this provides maximum audible transparency by minimizing numerical "noise" in the equalizers and filters while still preserving a pure, transparent sound. The double-precision equalizers and crossover filters used throughout the 8585 produce at least 6 dB lower noise and nonlinear distortion than they would at 96 kHz.
PERFORMANCE	**Processing Resolution**	Internal processing has 24 bit (fixed point) or higher resolution; uses 12 Freescale (formerly Motorola) 150 MHz DSP56367 DSP chips.
PERFORMANCE	**Delay**	The minimum available input/output delay is approximately 21 ms with look-ahead limiting active and 6 ms with look-ahead limiting bypassed. This can be padded to exactly one frame of 24, 25, 29.97 or 30 frames / second video up to a maximum delay of 50 ms.
PERFORMANCE	**Surround Processing Stereo Coupling**	All channels of the AGC and compressors are coupled using r.m.s. summation. The user can select whether or not the LFE channel contributes to the r.m.s. sum in the AGC and compressor control sidechains. Peak limiters in the multiband compressor limiter and look-ahead limiters all operate uncoupled to prevent transients in a given channel from causing audible loudness modulation in other channels.
PERFORMANCE	**2.0 Processing Stereo Coupling**	Stereo or dual-mono. In dual-mono mode, both processing channels have the same subjective adjustments (as determined by the active preset) but are otherwise independent, making this mode appropriate for dual-language transmissions. In stereo mode, the user can set the maximum permitted gain difference between the channels in each band of the multiband compressor/limiter. 2.0 Stereo/Dual-Mono operating mode can be set via GPI, Ethernet and serial connections, internal clock-based automation and AES3 Status Bits.
PERFORMANCE	**Loudness Level Meter (x2)**	One meter for the surround processing and one meter for the 2.0 processing, both meters realized in software. Meter can be displayed on the 8585's front-panel screen and on its PC Remote software. In ITU terminology, this meter measures "short-term" loudness. Its display time constants are matched to the loudness integration time of the human ear, reaching steady-state level in approximately 200 ms and having a decay time constant of approximately 300 ms. Meter uses the Jones & Torick algorithm developed at CBS Technology Center and published in the 9/1981 issue of the SMPTE Journal, pp. 772-777.
INSTALLATION	***Digital Audio Input (x5)***	
INSTALLATION	**Configuration**	Each of five hardware inputs accepts two audio channels per AES3id standard, 24 bit resolution. Internal programmable routing switcher allows any of the 10 physical input channels to be routed to the LF, RF, C, LB1, RB1, LFE, LB2, RB2, STEREO L or STEREO R inputs of the audio processing. For the 2.0 processing, unit can detect Stereo or Two-Channel status bits appearing at Input #1 and switch the 2.0 processor between stereo and dual-mono modes.
INSTALLATION	**Sampling Rate**	32, 44.1, 48, 88.2 or 96 kHz, automatically selected.
INSTALLATION	**Connector**	BNC, female, transformer-coupled, shell bypassed to chassis via 1000 pF capacitor, EMI-suppressed. 75 Ω impedance, terminated.
INSTALLATION	**Input Reference Level**	Variable within the range of -30 dBfs to -10 dBfs.
INSTALLATION	**Filtering**	RFI filtered.
INSTALLATION	***Digital Audio Output (x6)***	
INSTALLATION	**Configuration**	AES3id. Internal, remote-controllable routing switcher allows sending LF, RF, C, LB1, RB1, LFE, LB2, RB2, STEREO L, STEREO R, DOWNMIX L and DOWNMIX R to any hardware output channel. J.17 pre-emphasis can be applied to digital audio output.
INSTALLATION	**Sample Rate**	Internal free running at 32, 44.1, 48, 88.1 or 96 kHz, selected in software. Can also be synced to the AES3id Input #1,or to the sync input (which supports AES11id and wordclock) at 32, 44.1, 48, 88.1 or 96 kHz, as configured in software. (Passband is limited to approximately 14.7 kHz when using 32 kHz input and/or output sample rate.)
INSTALLATION	**Word Length**	Software selected for 24, 20, 18 or 16-bit resolution. First-order high-pass noise-shaped dither can be optionally added, Dither level is automatically adjusted to complement the word length.
INSTALLATION	**Connector**	BNC, female, transformer-coupled, shell bypassed to chassis via 1000 pF capacitor, EMI-suppressed. 75 Ω impedance.
INSTALLATION	**Output Level**	(100% peak modulation) –20.0 to 0.0 dBfs software controlled.
INSTALLATION	**Filtering**	RFI filtered.

Analog Audio Outputs	
Configuration	One pair of outputs, which can be configured in software to emit LF, RF, C, LB1, RB1, LFE, LB2, RB2, STEREO L, STEREO R, DOWNMIX L, DOWNMIX R, LF/RF, C, LB1/RB1, LB2/RB2, STEREO L/R and DOWNMIX L/R signals.
Source Impedance	50 Ω, electronically balanced and floating.
Load Impedance	600 Ω or greater, balanced or unbalanced. Termination not required or recommended.
Output Level (100% peak modulation)	Adjustable from –6 dBu to +24 dBu peak, into 600 Ω or greater load, software-adjustable.
Signal-to-Noise	≥100 dB unweighted (Bypass mode, 20 Hz – 20 kHz bandwidth, referenced to 100% modulation).
Distortion	≤0.01% THD (Bypass mode, de-emphasized) 20 Hz – 20 kHz bandwidth.
Connectors	Two XLR-type, male, EMI-suppressed. Pin 1 chassis ground, Pins 2 (+) and 3 electronically balanced, floating and symmetrical.
D/A Conversion	24 bit 128x oversampled.
Filtering	RFI filtered.
Sync Input	
Configuration	Can accept wordclock or AES11id (75 Ω) sync, automatically selected.
Connector	Female BNC, shell bypassed to chassis via 1000 pF capacitor, transformer-coupled.
Termination	Unterminated. Use an external 75 Ω terminator if the 8585 is the last item in the chain.
Remote Computer Interface	
Configuration	TCP/IP protocol via direct cable connect, modem, or Ethernet interface. Modem is not supplied.
Serial Port	115 kbps RS232 port DB–9 male, EMI-suppressed.
Ethernet Port	100 Mbit / sec on RJ45 female connector.
RS485 Serial Interface (x2)	
Hardware	115 kbps RS485 port DB–9 male, EMI-suppressed.
Compatibility	Designed to be hardware-compatible with Dolby Digital® hardware that sends and receives Dolby Digital metadata. (Metadata I/O is not supported by 8585 V 1.0 software. We expect to support it in a future software release.)
Remote Control (GPI) Interface	
Configuration	Eight (8) inputs, opto-isolated and floating.
Voltage	6 – 15 V AC or DC, momentary or continuous. 12 VDC provided to facilitate use with contact closure.
Connector	DB–25 male, EMI-suppressed.
Control	User-programmable for any eight of user presets, factory presets, bypass, test tone, stereo or mono modes, analog input, digital input.
Filtering	RFI filtered.
Tally Outputs	
Circuit Configuration	Two NPN open-collector outputs.
Voltage	+15 Volts maximum. Do not apply negative voltage. When driving a relay or other inductive load, connect a diode in reverse polarity across the relay coil to protect the driver transistors from reverse voltage caused by inductive kickback.
Current	30 mA maximum.
Indications	Tally outputs can be programmed to indicate a number of different operational and fault conditions.
Power	
Voltage	100 – 132 VAC or 200 – 264 VAC, switch-selected on the rear panel, 50 – 60 Hz, 50 VA.
Connector	IEC, EMI-suppressed. Detachable 3-wire power cord supplied.
Safety Standards	ETL listed to UL standards, CE marked.
Environmental	
Operating Temperature	32 to 122 °F / 0 to 50 °C for all operating voltage ranges.
Humidity	0 – 95% RH, non-condensing.
Dimensions (W x H x D)	19” x 5.25” x 15.5” / 48.3 cm x 8.9 cm x 39.4 cm. Depth shown indicates rack penetration; overall front-to-back depth is 17.75” / 45.1 cm. Three rack units high.
RFI / EMI	Tested according to Cenelec procedures. FCC Part 15 Class A device.
Shipping Weight	40 lbs. / 18.1 kg
Warranty	
Two Years, Parts and Service	Subject to the limitations set forth in Orban‘s Standard Warranty Agreement.

Because engineering improvements are ongoing, specifications are subject to change without notice.

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