Automatic Loudness Control (ALC)

Advanced loudness control solutions which prevent excessive audio jumps

Excessive loudness variation is probably the most common viewer complaint, and it's now something you can eliminate entirely. Our Automatic Loudness Control solutions for our Densité interfaces are designed to address all typical loudness problems, including audio jumps between programs and commercials, without adversely impacting the program content.

Uniquely, Miranda offers three distinct Automatic Loudness Control solutions which bring together the very best loudness technology:
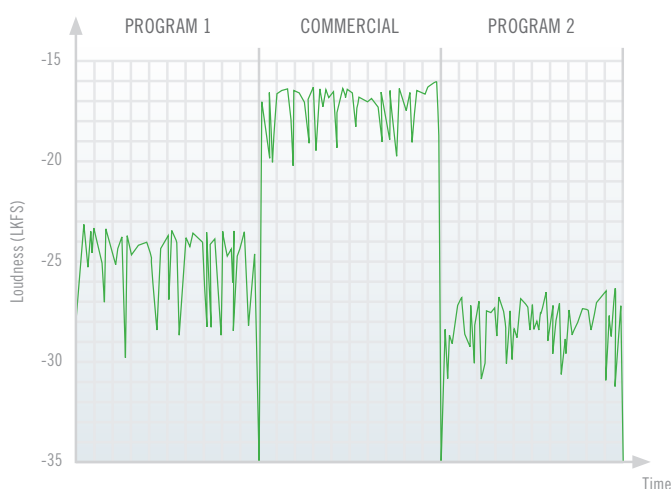
• ALC with Linear Acoustic AEROMAX™ processing
• ALC with Jünger Audio Level Magic processing
• ALC with Miranda wideband audio processing

All three solutions can be used effectively to address loudness problems across multiple applications, such as broadcast playout, server ingest, production and post-production. However, the best fit solution will depend on an individual facility's particular channel mix and program dynamics, as well as the associated playout workflow and equipment.

ALC
AUTOMATIC
LOUDNESS
CONTROL

KEY FEATURES AND BENEFITS

❯ Automatic Loudness Control option for Densité interfaces smoothes out irritating loudness level differences between program segments, and between different channels

❯ High quality processing prevents adverse effects to program content

❯ Three different processing variants allow selection to best match a facility's content and workflow

❯ All ALC variants are options for the XVP-3901 up/down/cross converter (see page 78), AMX-3981 embedder (see page 125), ADX-3981 de-embedder (see page 128), EAP-3901 embedded audio processor (see page 160), and EAP-3101 embedded audio processor (see page 600)

❯ Multiband or wideband processing

❯ Up to 16 audio channels processing capacity

❯ Multi-program support using mono, stereo, 5.1 or 7.1 audio

❯ 'Set and forget' mode with setting of output Target Loudness per program

❯ Actively managed processing modes, with playout automation driving a bypass mode or different profiles

❯ Loudness monitoring according to ITU-R BS.1770

❯ Upmixing can be combined with ALC for optimal integration (Linear Acoustic and Jünger Audio ALC variants)

❯ Manual remote control by iControl, iControl Solo PC GUI or RCP-200 remote panel

**Typical loudness variation between programs**
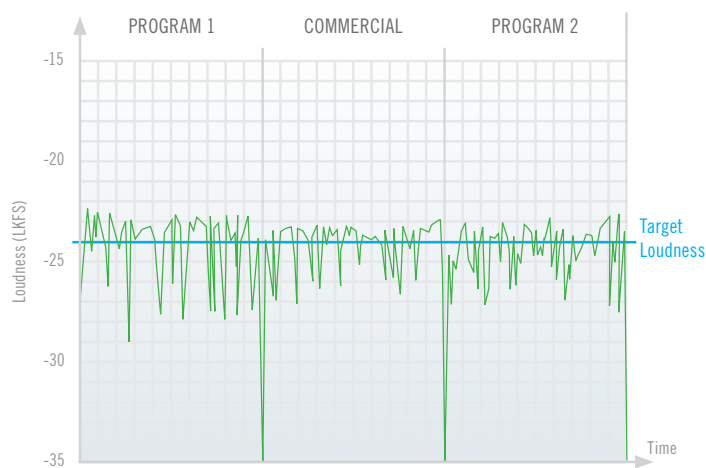
Automatic Loudness Control eliminates irritating loudness jump

ALC solutions overview

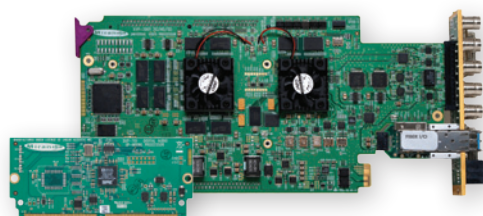## ALC with Linear Acoustic AEROMAX™ processing (see page 68)

> Advanced loudness control, using proven Linear Acoustic AEROMAX multi-band audio processing
> Highly flexible processing, with excellent performance with vocal tracks
> Up to 8 channels of loudness processing per module
> Audio processing for up to 2 programs per module (mono, stereo, 5.1 audio)
> Optional 2.0 to 5.1 upmixing using Linear Acoustic technology
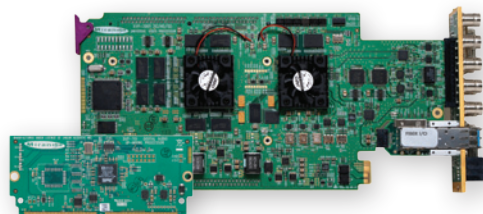
ALC option uses daughter-board with Densité module

ALC with Jünger Audio Level Magic™ processing (see page 69)

> Advanced loudness control, using proven Jünger Audio Level Magic wideband audio processing
> Designed for easy configuration and control
> Up to 8 channels of loudness processing per module
> Audio processing for up to 8 programs per module (mono, stereo, 5.1 audio)
> Optional 2.0 to 5.1 upmixing using Linear Acoustic technology

ALC option uses daughter-board with Densité module

ALC with Miranda wideband audio processing (see page 70)

> Lower cost, high performance wideband audio processing
> Designed for easy configuration and control
> Up to 16 channels of loudness processing per module
> Audio processing for up to 4 programs per module (mono, stereo, 5.1 or 7.1 audio)
> Firmware based solution leaves the daughter module sockets on the host card free for other advanced processing functions

ALC option uses firmware upgrade for Densité module

Automatic Loudness Control using Linear Acoustic AEROMAX™

Advanced loudness control is offered by ALC with Linear Acoustic AEROMAX™ audio processing. It uses a third generation audio processor to provide a simple and cost-effective solution for guarding against loudness shifts.
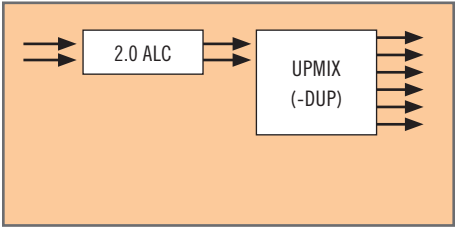
Multiband architecture

The AEROMAX™ algorithms use a multiband approach to loudness control. These algorithms can apply multiband, multistage loudness control to the audio, resulting in audio free from abrupt loudness or image shifts, while preserving more of the original content than previously possible.

This version of ALC can be packaged with, or without, the Linear Acoustic upMAX™ upmixer on the same daughter-board for optimal integration.
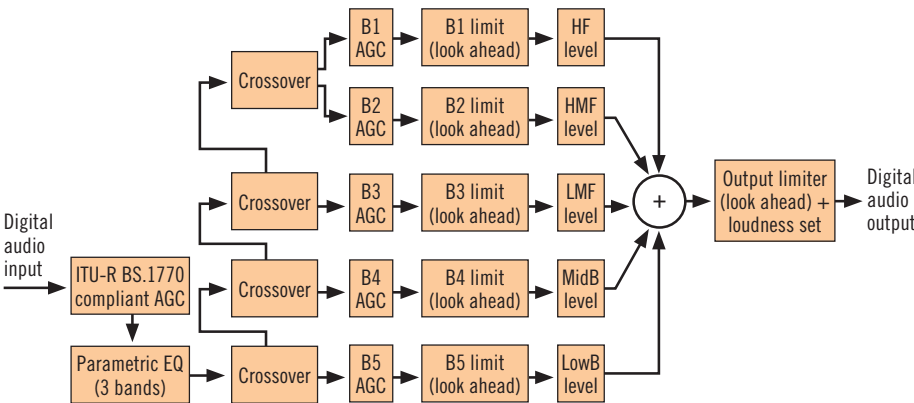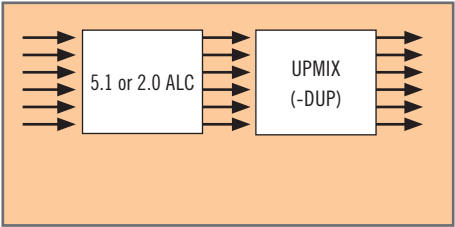

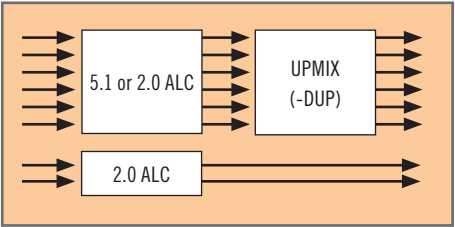## Typical program configurations using AEROMAX™

2-channel ALC with optional upmix

Upmixing is only available with the —DUP ordering codes.

6-channel ALC with optional upmix

8-channel ALC with optional upmix

Other channel configurations are also supported. Please visit www.miranda.com/ALC for more information.

SPECIFICATIONS

Architecture:	8 channel multiband (5) processing
Number of programs:	1 or 2
Program configuration:	2 and/or 6 audio channels
Loudness measurement:	ITU-R BS.1770
Sampling:	Up to 24 bits @ 48 kHz
Processing profiles:	6
Limiter set range:	-6 to 0 dBFS or ±6 dB
AGC pulling range:	±36 dB

ORDERING INFORMATIONS

|	
MOD-LA-ALC-2	2-channel ALC licensed by Linear Acoustic
MOD-LA-ALC-6	6-channel ALC licensed by Linear Acoustic
MOD-LA-ALC-8	8-channel ALC licensed by Linear Acoustic
MOD-LA-ALC-2-DUP	2-channel ALC and up mix licensed by Linear Acoustic
MOD-LA-ALC-6-DUP	6-channel ALC and up mix licensed by Linear Acoustic
MOD-LA-ALC-8-DUP	8-channel ALC and up mix licensed by Linear Acoustic

Automatic Loudness Control using Jünger Audio Level Magic™

Advanced loudness control is provided by ALC with the Level Magic™ processing from Jünger Audio. It relies on a sophisticated adaptive level control algorithm, which is capable of adjusting the right audio level from any source at any time. Transient Processing + Peak Limiting offers continuous unattended broadcast loudness control for any program material.

Wideband architecture

With Level Magic™, the desired Loudness Target or Operating Level and Peak Level are dialed in once. Thereafter, Level Magic™ will give continuous control, regardless of the source, and without negatively impacting the sound of the audio material. No breathing, no pumping, no spectral changes because of the wideband processing architecture. Just well controlled loudness and peak level.

This version of ALC can be packaged with, or without, the Linear Acoustic upMAX™ upmixer on the same daughter-board for optimal integration.
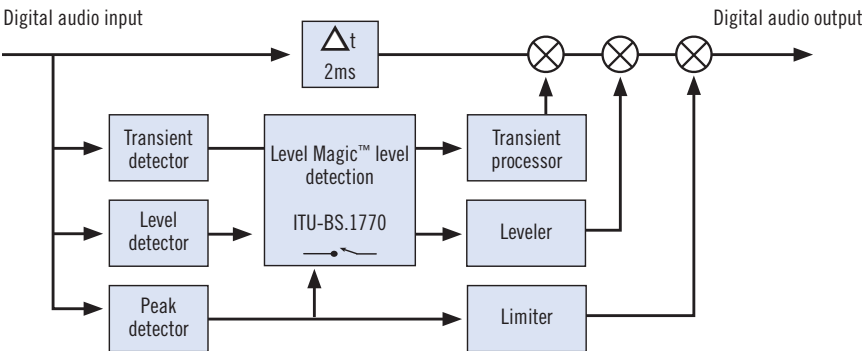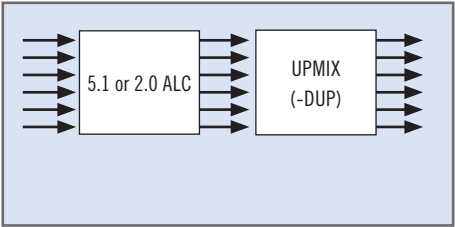

Typical program configurations using Level Magic™
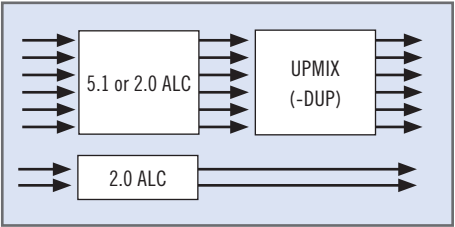
2-channel ALC with optional upmix
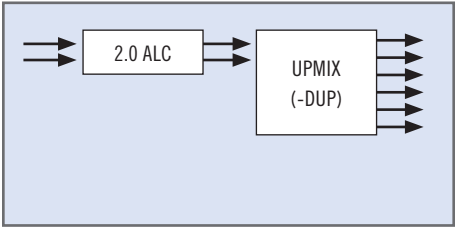
6-channel ALC with optional upmix

8-channel ALC with optional upmix

Upmixing is only available with the -DUP ordering codes.

Other channel configurations are also supported. Please visit www.miranda.com/ALC for more information.

SPECIFICATIONS

Architecture:	8 channel wideband processing	Sampling:	Up to 24 bits @ 48 kHz
Number of programs:	up to 8	Processing profiles:	4 / 5
Program configuration:	1, 2, 3, 4, 6, 8 audio channels	Target Loudness range:	-40 to -10 LKFS
		Limiter set range:	-20 to 0 dBFS
		AGC pulling range:	±40 dB
Loudness measurement:	ITU-R BS.1770		

ORDERING INFORMATIONS

|	
MOD-JA-ALC-2	2-channel ALC licensed by Jünger Audio
MOD-JA-ALC-6	6-channel ALC licensed by Jünger Audio
MOD-JA-ALC-8	8-channel ALC licensed by Jünger Audio
MOD-JA-ALC-2-DUP	2-channel ALC licensed by Jünger Audio and upmix by Linear Acoustic
MOD-JA-ALC-6-DUP	6-channel ALC licensed by Jünger Audio and upmix by Linear Acoustic
MOD-JA-ALC-8-DUP	8-channel ALC licensed by Jünger Audio and upmix by Linear Acoustic

ALC with Miranda wideband audio processing

Lower cost, high performance loudness control is provided by ALC using Miranda's proprietary wideband audio processing algorithms. This variant of ALC offers versatile, easily configured loudness processing, which does not adversely affect the program content.
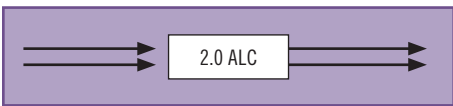
Wideband architecture

This ALC option uses a firmware upgrade to the hosting card. Up to 4 different programs of up to 8 channels can be processed simultaneously, with independent controls and loudness meters on each program. This ALC variant leaves the daughter module sockets on the host card free for other advanced processing functions.
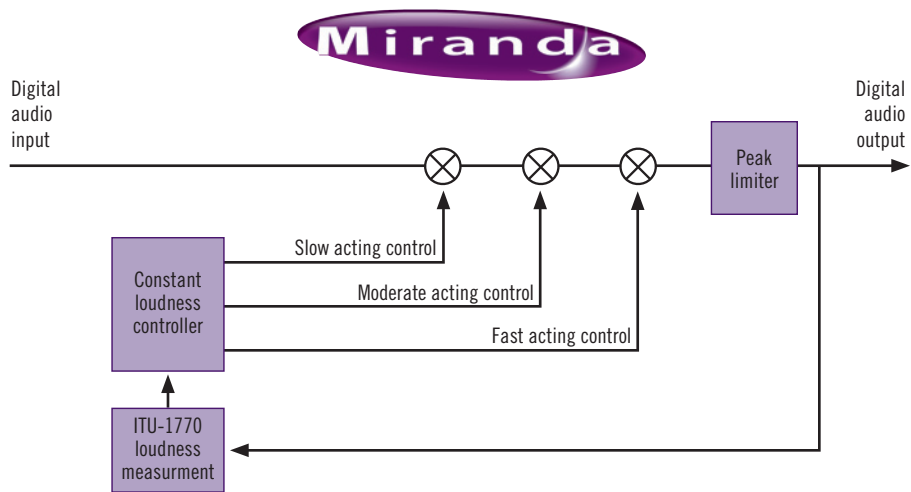
Typical configurations

2-channel ALC

8-channel ALC

8-channel ALC
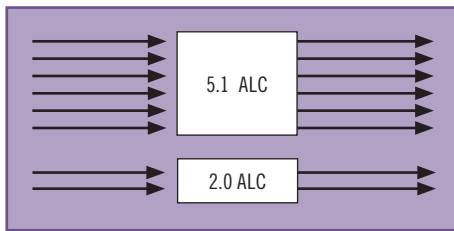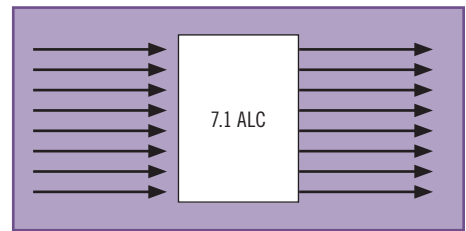
6-channel ALC

Other channel configurations are also supported.
Please visit www.miranda.com/ALC for more information.

SPECIFICATIONS

Architecture:	16 channel wideband processing	Loudness measurement:	ITU-R BS.1770 or flat	Processing profiles:	3 / 5
Number of programs:	Up to 4	Sampling:	Up to 24 bits @ 48 kHz	Target loudness range:	-31 to -10 LKFS
Program configuration:	1, 2, 3, 4, 6 or 8 audio channels			Limiter set range:	-20 to 0 dBFS

AGC pulling range: -31 to +18 dB

Pre-gain stage range: -20 to 20 dB

ORDERING INFORMATIONS

ALC options for XVP-3901 up/down/cross converter host module
XVP-3901-OPT-ALC-2   2-channel on-board ALC option by Miranda
XVP-3901-OPT-ALC-6   6-channel on-board ALC option by Miranda
XVP-3901-OPT-ALC-8   8-channel on-board ALC option by Miranda
XVP-3901-OPT-ALC-16   16-channel on-board ALC option by Miranda

Upmixing done on a separate module if required
MOD-LA-DUP-701   Upmixing using Linear Acoustic Technology upMAX™

ALC options for AMX-3981 embedder
AMX-3981-OPT-ALC-2   2-channel on-board ALC option by Miranda
AMX-3981-OPT-ALC-6   6-channel on-board ALC option by Miranda
AMX-3981-OPT-ALC-8   8-channel on-board ALC option by Miranda
AMX-3981-OPT-ALC-16   16-channel on-board ALC option by Miranda

ALC options for ADX-3981 de-embedder
ADX-3981-OPT-ALC-2   2-channel on-board ALC option by Miranda
ADX-3981-OPT-ALC-6   6-channel on-board ALC option by Miranda
ADX-3981-OPT-ALC-8   8-channel on-board ALC option by Miranda
ADX-3981-OPT-ALC-16   16-channel on-board ALC option by Miranda

ALC options for EAP-3901 embedded audio processor
EAP-3901-OPT-ALC-2   2-channel on-board ALC option by Miranda
EAP-3901-OPT-ALC-6   6-channel on-board ALC option by Miranda
EAP-3901-OPT-ALC-8   8-channel on-board ALC option by Miranda
EAP-3901-OPT-ALC-16   16-channel on-board ALC option by Miranda

ALC options for EAP-3101 embedded audio processor
EAP-3101-OPT-ALC-2   2-channel on-board ALC option by Miranda
EAP-3101-OPT-ALC-6   6-channel on-board ALC option by Miranda
EAP-3101-OPT-ALC-8   8-channel on-board ALC option by Miranda
EAP-3101-OPT-ALC-16   16-channel on-board ALC option by Miranda

Quick ALC comparison table

	ALC with Linear Acoustic processing	ALC with Jünger Audio processing	ALC with Miranda proprietary processing
Max number of programs	2	8	4
Max number of channels	8	8	16
Number of channels/pgm	1, 2 or 6	1, 2, 3, 4, 5, 6, 7, 8	1, 2, 3, 4, 6 or 8
Audio formats	PCM in / PCM out up to 24 bits at 48 kHz	PCM in / PCM out up to 24 bits at 48 kHz	PCM in / PCM out up to 24 bits at 48 kHz
Technology	AeroMAX™, multiband	Level Magic™, wideband	Wideband
Pulling range	±36 dB	±40 dB	-31 to 18 dB
Limiter range	-6 to 0 dBFS	-20 to 0 dBFS	-20 to 0 dBFS
Embedded Upmixing option	Yes	Yes	No
Loudness Measurement methods	ITU-R BS.1770	ITU-R BS.1770, Jünger Audio level mode	ITU-R BS.1770, no filtering
Profile switching (including ALC bypass) via automation/GPI	Yes	Yes	Yes
Form factor	Sub-module	Sub-module	Software option

Segment-to-segment: active loudness control

Miranda's ALC solutions can be operated in a 'set-and forget' mode, with the setting of an output Target Loudness per program. This mode can achieve excellent results, and the performance can be optimized by selecting a loudness processing profile that best matches the content of the facility.

An alternative approach to loudness processing involves using playout automation to actively control the loudness processing profile, according to the type of content. This can yield improved results when the facility uses a significant amount of programming with a controlled loudness level or a reliable Dialnorm value.

In the example below, a facility controls three different profiles by playout automation to create an optimal loudness processing result, with minimal impact to the original program dynamics. The three different profiles provide aggressive loudness control for commercials, light processing for a movie with an uncontrolled loudness level, and a complete bypass of the ALC processing for a program with the correct loudness level or a reliable Dialnorm value. Traditionally, the most problematic content from a loudness control perspective has been commercial and promo insertions.

|	**Program**	**Promo**	**Movie**
Program segments	**Program with correct loudness level or reliable Dialnorm value**	**Loud promo**	**Movie with uncontrolled loudness level**
Automation decisions	ALC is bypassed	ALC is engaged with an agressive profile	ALC is engaged with a light profile
Effects on original audio	Audio remains intract with its original dynamics while the program meets station's target loudness	Audio level matches target loudness but compression will likely affect original dynamics	Audio level matches target loudness with a slight impact on the original film audio dynamics

Active control of ALC by playout automation

Playout using 'set and forget' mode with Automatic Loudness Control

› Output Target Loudness set per program, and is maintained by ALC

› Loudness control can be optimized by choosing an ALC profile that best matches the facility's content

Densité signal processor module

Consistent loudness

Constant 5.1
surround Field (-DUP)
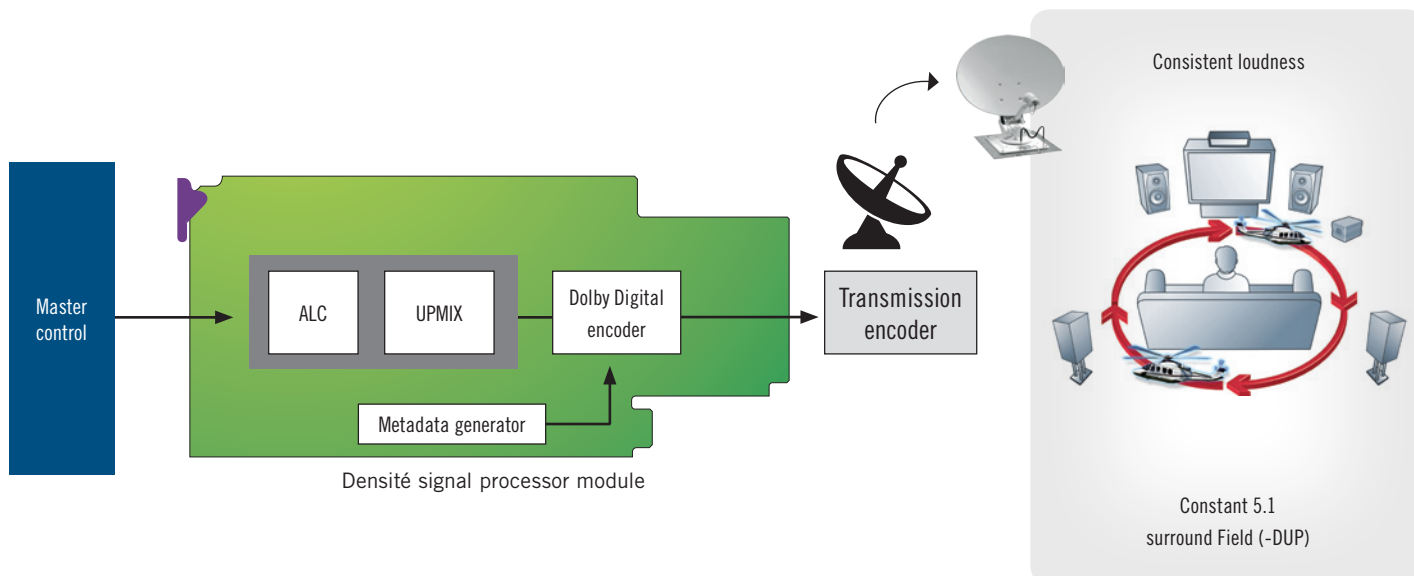
Playout using active control of ALC by automation system

› Automation triggers different ALC profiles according to the program content, driven by content tagging performed by the traffic team

› By adapting the ALC profiles to the content, there is minimal impact to original program dynamics

Densité signal processor module

Consistent loudness
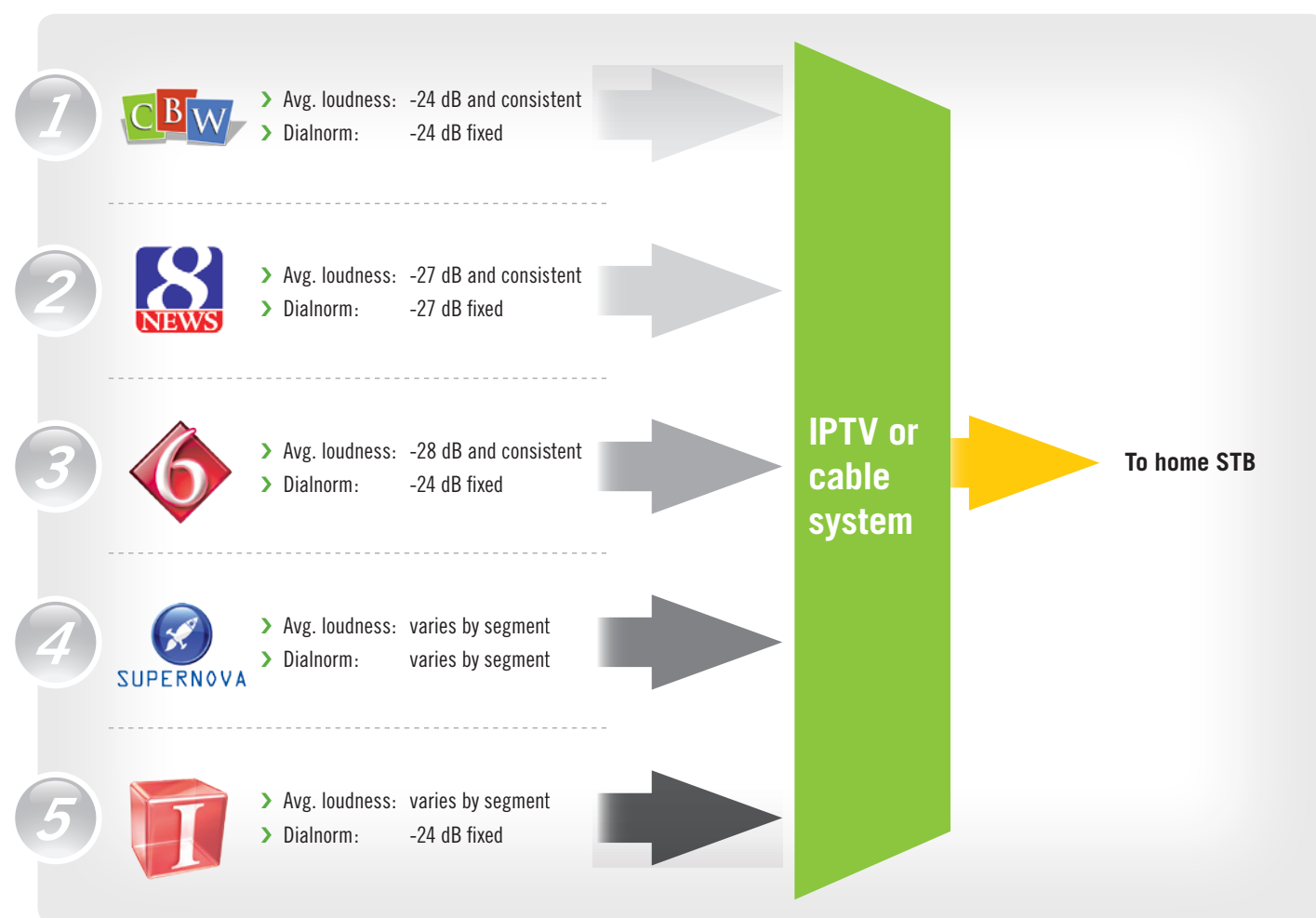
Constant 5.1
surround Field (-DUP)
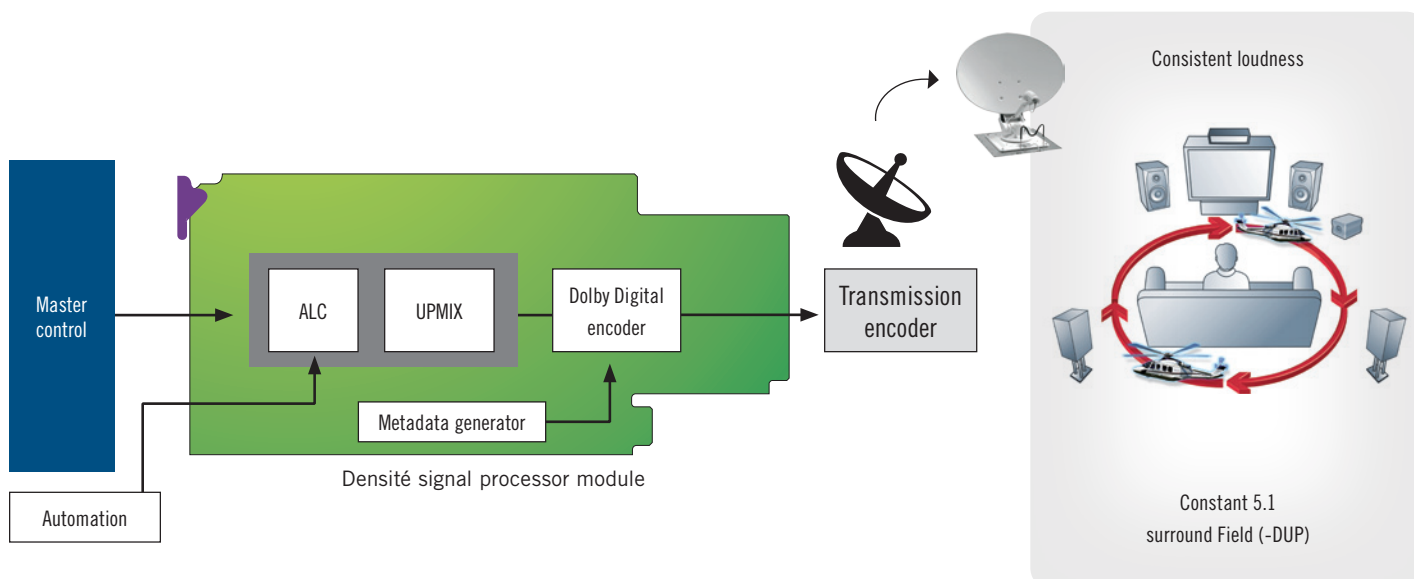
Channel-to-channel loudness control: ALC at head-ends

Channel-to-channel loudness inconsistencies are another key issue, especially for cable and IPTV service providers. It's common for viewers to experience different loudness levels as they switch between channels, and this is because the channels will have different Average Loudness and inconsistent dialnorm values.

Often, the cause of this channel-to-channel loudness variation is the broadcaster's use of a default -27 dB DialNorm value for the Dolby Digital encoder when there is significant variation in the average loudness of the program segments. An example of this type of problem is shown in the diagram below.

Fortunately, Miranda's Automatic Loudness Control solutions can be used to address the problem by decoding and processing the audio with ALC, and then re-encoding (see opposite page). The Densité signal processor card can re-stamp a consistent Dialnorm value to match the target loudness value used by the ALC processor.

1 CBW	❯ Avg. loudness:	-24 dB and consistent
	❯ Dialnorm:	-24 dB fixed
2 8 NEWS	❯ Avg. loudness:	-27 dB and consistent
	❯ Dialnorm:	-27 dB fixed
3 6	❯ Avg. loudness:	-28 dB and consistent
	❯ Dialnorm:	-24 dB fixed
4 SUPERNOVA	❯ Avg. loudness:	varies by segment
	❯ Dialnorm:	varies by segment
5 I	❯ Avg. loudness:	varies by segment
	❯ Dialnorm:	-24 dB fixed

IPTV or cable system → **To home STB**

Typical loudness scenario in IPTV / cable system with a mix of loudness levels across channels

Head-end uses decoding, ALC audio processing, and re-encoding

❯ Can fix both channel-to-channel and segment-to-segment loudness problems

❯ This configuration is possible if the audio compression algorithm and the bit rate in use allow for an extra generation of encoding without creating audible artifacts when decoded at final destination