BUILT FOR **PRO** TOOLS HD

LM5D/LM5 & AM6

RADAR METER BUNDLE

tc electronic®

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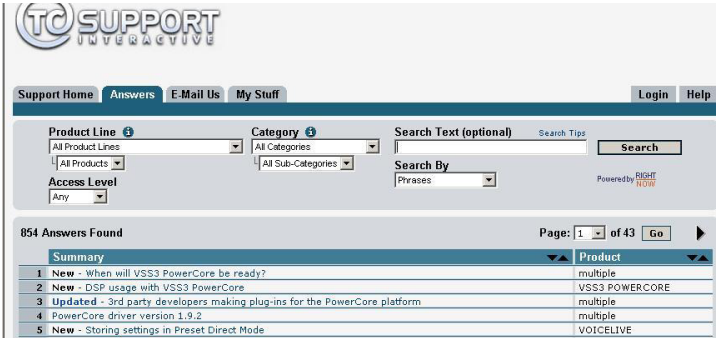


www.tcelectronic.com

ENGLISH

INTRODUCTION

LM5D Radar Loudness Meter

LM5D represents a quantum leap away from simply measuring audio level to measuring perceived loudness. The old level method is responsible for unacceptable level jumps in television, for music CDs getting increasingly distorted, and for different audio formats and program genres becoming incompatible: Pristine music tracks from the past don't co-exist with new recordings, TV commercials don't fit drama, classical music or film and broadcast doesn't match. The most fundamental audio issue of all – control of loudness – every day makes millions of people adjust the volume control over and over again.

LM5D is part of a universal and ITU standardized loudness control concept, whereby audio may easily and consistently be measured and controlled at various stages of production and distribution.

LM5D works coherently together with other TC equipment, or with equipment of other brands adhering to the same global standard. Follow the guidelines given to allow audio produced for different purposes to be mixed, without low dynamic range material such as commercials or pop CD's always emerging the loudest.

General Note

Loudness and True-Peak standards is work in progress. Please stay informed and up to date via our Loudness Glossary at www.tcelectronic.com/loudness

FEATURES

- Realtime loudness meter adhering to ITU-R BS.1770-2
- Loudness History Radar display.
- True-peak Bargraph display.
- Universal Descriptors
- Supports mono, stereo and 5.1.
- Presets for use in Broadcast, Music, Post and Film.

SYSTEM REQUIREMENTS

- Mac OS X (10.5 or higher) / Windows XP / Windows 7
- Pro Tools TDM 8.0 software (or higher)
- Pro Tools HD or HD Accel hardware
- iLok USB key
- iLok.com account and internet access required for product authorization
- System must meet Digidesign's system requirements for Pro Tools TDM systems!

Since 1998, TC has performed listening tests and evaluation of loudness models; and therefore holds an extensive, Universal Database of loudness, based on ten thousands of assessments. The database covers all sorts of broadcast material, music, commercials, feature film and experimental sounds, and is verified against other independent studies.

The Universal Database is authoritative from an academic as well as a practical point of view. It has been indispensable when designing the LM5D meter, because it provided the missing link between short-term and long-term loudness, and enabled the statistically founded Universal Descriptors of LM5D.

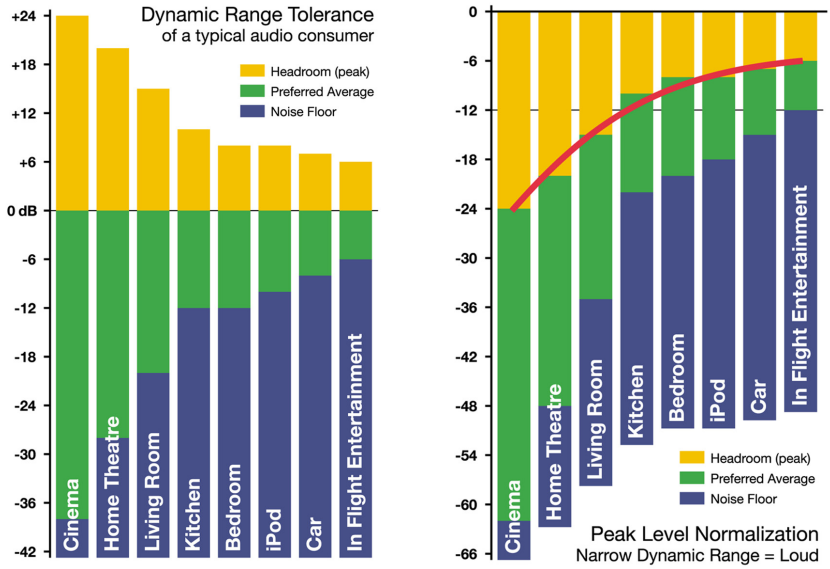


Fig 1. Left: DRT for consumers under different listening situations
Right: Peak level normalization means that material targeted low dynamic range platforms gets loud.

The chart of Dynamic Range Tolerance in Fig 1 is a side-effect of the studies mentioned: Consumers were found to have a distinct Dynamic Range Tolerance (DRT) specific to their listening environment. The DRT is defined as a Preferred Average window with a certain peak level Headroom above it. The average sound pressure level, which obviously is different from one listening condition to another, has to be kept within certain boundaries in order to maintain speech intelligibility, and to avoid music or effects from getting annoyingly loud or soft.

Audio engineers instinctively target a certain DRT profile when mixing, but because level normalization in broadcast and music production is based on peak level measures, low dynamic range signatures end up the loudest as shown by the red line in Fig 1, right. Audio production is therefore trapped in a downwards spiral, going for

ever decreasing dynamic range. By now, the pop music industry is “right of” In Flight Entertainment in the illustration.

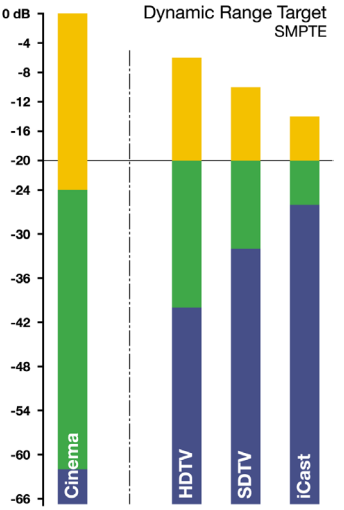
LM5D offers a standardized option: The visualization of loudness history and DRT in combination with long-term descriptors from production onwards, is a transparent and well sounding alternative to our current peak level obsession. Not only for music, but also in production for broadcast or film. The engineer, who may not be an audio expert, should be able to identify and consciously work with loudness developments within the limits of a target distribution platform, and with predictable results when the program is transcoded to another platform.

LM5D therefore color codes loudness so it’s easy to identify target level (green), below the noisefloor level (blue), or loud events (yellow), see Fig 2.

Fig 2, Color coding and target loudness for selected broadcast platforms based on a consumer’s Dynamic Range Tolerance, DRT.

The aim is to center dynamic range restriction around average loudness, in this case the –20 dB line, thereby automatically avoiding to wash out differences between foreground and background elements of a mix.

Note how different the broadcast requirements are from those of Cinema.



When production engineers realize the boundaries they should generally stay within, less dynamics processing is automatically needed during distribution, and the requirement for maintaining time-consuming metadata at a broadcast station is minimized. In broadcast, the goal is to use the same loudness measure for

- Production,
- Ingest,
- Linking
- Master Control Processing
- Logging

thereby ensuring better audio quality not only in DTV audio, but across all broadcast platforms. LM5D and TC processing can co-exist with PPM meters, VU meters or Dolby’s LM100 meter. LM5D greatly increases the usability of LM100 in production environments because it provides running status, and gives a standardized indication of both dialog and non-dialog program.

BASIC USE

LM5D makes use of a unique way of visualizing short-term loudness, loudness history, and long-term statistical descriptor. It may be used with mono, stereo and 5.1 material for any type of program material.

Press the “Radar” key to bring up the Radar page. This page will probably be used most of the time. The basic functionality of the Radar page is shown in Fig 3.

RADAR PAGE

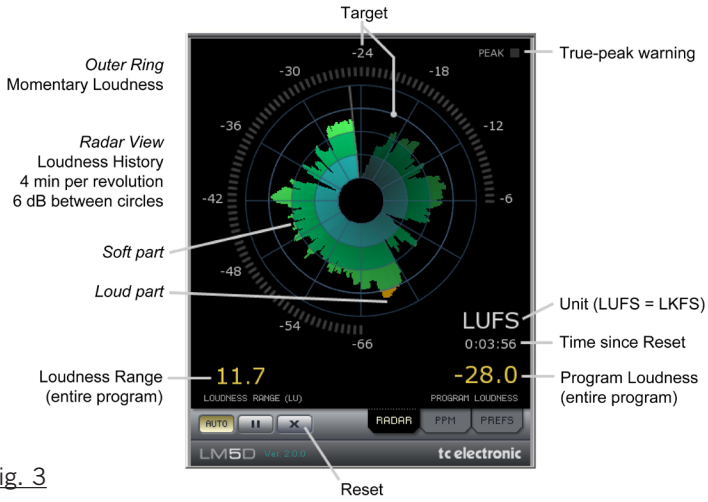


Fig. 3

LM5D Radar page features

Target Loudness is displayed at 12 o’clock of the outer ring, and at the bold, concentric circle of the radar. The Universal Descriptors, Loudness Range and Program Loudness (LM5D only), are the yellow numbers in the lower part of the display. Press the “X” key to reset Radar and Descriptors.

The “Transport Controls”, Auto, Pause and Reset, are used to make the radar and descriptor measurements run, pause and reset. When “Auto” is pressed, run (green) and pause (yellow) follows the ProTools transports.

Press the “PPM” key to bring up the PPM page as shown in Fig 6. The PPM display is used to inspect balance between channels, overload of channels etc.

Press the “Prefs” key to bring up the Preferences display as shown in Fig 8. Note that you can “zoom” in time or radar resolution, as long as the history is not reset. For instance, change between 4 min per revolution to 1 hour per revolution, or 6 dB per division to 10 dB per division.

Presets can be stored specifying target loudness, noise floor, overload conditions etc.

Current Loudness: Outer Ring

The outer ring of the Radar page displays current loudness. The 0 LU point (i.e. Target Loudness) is at 12 o'clock, and marked by the border between green and yellow, while the Low Level point is marked by the border between green and blue. The "0 LU Equals" and "Low Level Below" parameters are found on Prefs page. Keep the outer ring in the green area, and around 12 o'clock on the average. Excursions into the blue or the yellow area should be balanced, and not only go in one direction.

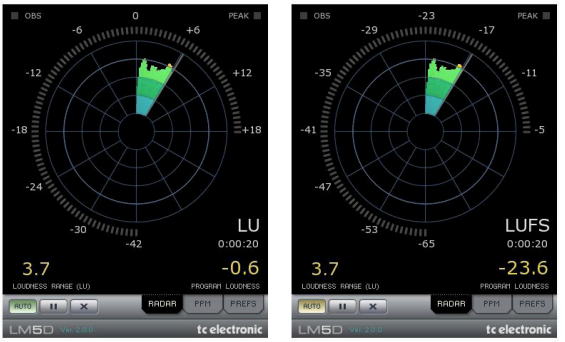
LKFS, LUFS and LU

The units used on loudness meters from different vendors may vary, so it's important to be aware of the differences and similarities between these units. First of all, LKFS (Loudness 'K-weighted' Full Scale) and LUFS are interchangeable and both denote an absolute measure of the loudness of a digital signal. For instance, -24 LUFS is precisely the same as –24 LKFS.

LU, on the other hand, is a relative measure of loudness. When displaying loudness level on an LU meter, a certain Target Loudness is explicit. For instance, if the target loudness level of a station is –24 LUFS, the radar meter can be configured to show that number as '0 LU' which causes a level of –27 LUFS to be shown as –3 LU, while one of –20 LUFS will be shown as +4 LU.

In other words, it's merely a question of preference whether an absolute or a relative display of loudness level is preferred. See Fig 4 as an example of the same program shown on the LU scale and on the LUFS scale.

Fig. 4 - LU vs. LUFS



In both cases, Target level is set to -23 LUFS. Some users find it easier to use LU as it gives an indication of the number of dB you're too hot or too soft on the average, but the measurement remains exactly the same regardless of the LUFS vs. LU selection.

Switch beteeen LUFS (the same as LKFS) and LU viewing styles on the Prefs page.

LOUDNESS HISTORY: RADAR

The Loudness Radar shows a history of loudness over time. The loudness "landscape" may be used to judge if loudness emphasis is put where you want it to be: If dialog segments are balanced against action parts, if the chorus of a song has a lift against the verse, if the audience is too loud in a gameshow, or maybe as a target to aim for during a live transition etc.

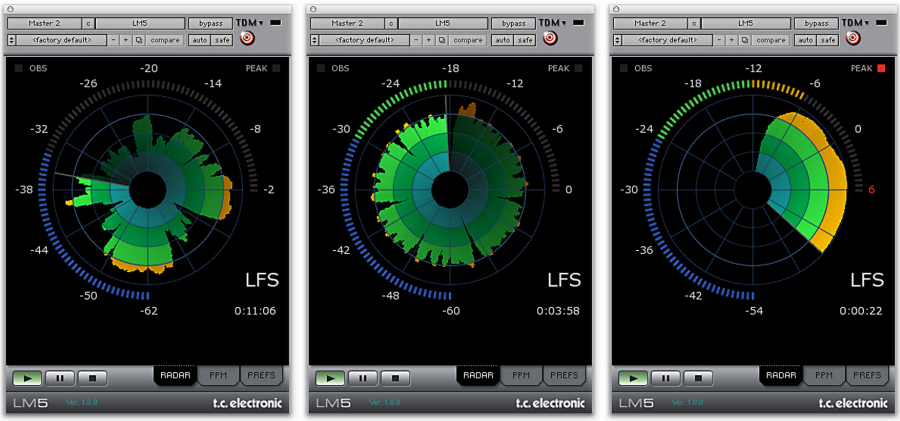


Fig. 5, Different types of program shown on the Radar.

Left: 5.1 movie:
Pirates of the Caribbean on a 12 minute per revolution Radar: Low Loudness Range.

Center:
German news broadcast on a 4 minute per revolution Radar: Medium Loudness Range.

Right:
Madonna's Hung Up pop on a one minute per resolution Radar: High Loudness Range.

The duration of one radar revolution may be set between 1 minute and 24 hours. The Radar has 3, 4, 6, 8, 10 or 12 dB between each concentric circle, while the 0 LU point is always marked as the border between green and yellow at the bold concentric circle, see Fig. 3. The 0 LU point is set on the Prefs page, typically between -12 and -24 LUFS.

The "Transport Controls" (lower left on the display) are used to make the Radar run, pause or reset. Note that these controls in LM5D appear as shown in Fig. 3.

The OBS indicator is lit to show certain inter-channel anomalies. Such conditions may be defined on the Prefs page. The OBS indicator would typically trigger the operator to switch to PPM page for a closer look of what's going on.

The Peak indicator is lit to show that at least one channel is exceeding its true-peak max. The threshold of the Peak Indicator is defined on the Prefs page, and recalled with an LM5D preset.

Universal Descriptors and Dolby LM100

Unlike methods that measure dialog only, LM5D may be used with any type of audio – which includes dialog, of course. If you wish to measure dialog, it's recommended to do a manual spot check of a program or a film. Find 10-30 secs of regular dialog and measure it with LM5D . Where dialog may be soft, regular or loud, and shift by more than 15 dB inside a film, regular dialog tends to be less ambiguous and more consistent across a program.

Universal Descriptors and AC3 Metadata

The "Dialnorm" parameter in AC3 metadata should indicate the average loudness of a program. Basic dynamic range and level control that rely on this parameter may take place in the consumer's receiver. Therefore, its value should not be far off target, or the consumer results become highly unpredictable.
Program Loudness in LM5 is directly compatible with Dialnorm in AC3. Most broadcast stations work with a fixed dialnorm setting, for instance –23 LUFS. This would be the Program Loudness target level for any program.
If your station is more music than speech, better inter- channel leveling may be obtained with dialnorm permanently set 1 or 2 LU lower than the Program Loudness target level.

True-peak meters

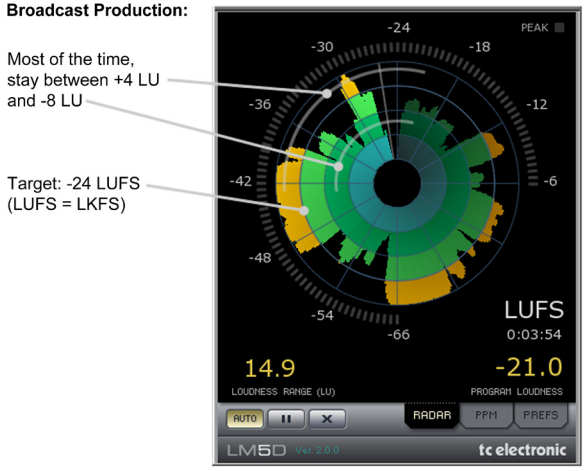
The peak meters of LM5 display true-peak as specified in ITU-R BS.1770-2.
True-peak meters give a better indication of headroom and risk of distortion in dowstream equipment such as sample rate converters, data reduction systems and consumer electronics than digital sample meters used e.g. in CD mastering. Note that the standard level meters in most digital workstations and mixers are only sample peak (Final Cut, Avid, ProTools, Yamaha etc.), and should only be used as a rough guideline of the headroom.
Note that the meter scale is extended above 0 dBFS. Most consumer equipment distorts if you see readings above 0. It's not a problem to have true-peak level going to -1 dBFS in production, but legacy platforms (analog, NICAM etc.) and some data-reduction codecs may distort unless true-peak level is kept lower. With Dolby AC3 and with low bitrate codecs, -3 dBFS should be considered the limit, while legacy platforms requiring emphasis may need even further restriction. Like described in EBU R128, it's recommended to make full use of the headroom with true-peaks going to -1 dBFS in production, and to only restrict peak level further during distribution/transmission.

THE RADAR METER IN USE

The meter displays momentary loudness and Loudness History in a single, unique Radar View, see Fig. 3. The circular, color-coded display makes it easy to balance audio visually and to see when level falls below or exceeds the end-listener's loudness range tolerance.

Fig. 3 shows a scene from Desperate Housewives which is generally too soft. It's a tremendous help for a mixing engineer or a video editor to know which radar area to stay inside as shown in Fig. 6, where a film scene (Pirates "On Stranger Tides") clearly falls outside normal broadcast expectations.

Fig. 6



The radar itself is complemented by a true-peak warning and by two numbers to characterize the entire loudness 'landscape' of a program, film or music track precisely. By default, the numbers displayed are Program Loudness and Loudness Range.

Program Loudness is a standardized integrating loudness measurement. If one program should be aligned in loudness with another using only a gain offset, that offset would be the difference between the Program Loudness values of the two. Practically speaking, both programs should simply be normalized to a certain Target Loudness. In the US, the value to aim for is –24 LUFS. That number is directly compatible with AC3's dialnorm parameter which should also be set to 24.

Loudness Range is a standardized measure of the loudness range of a program and measures the difference between soft and loud parts. From an application's point of view, Loudness Range is compelling 1) as a production guideline, 2) for prediction of platform compliance during ingest or on a server and 3) for verifying a transparent signal path all the way from the studio to the home-listener. Note that the number stays the same downstream of production, even if a program is later normalized.

PPM PAGE

Press the “PPM” key to bring up the PPM display, Fig. 7. The PPM page is used to inspect balance between channels, headroom, overload of channels etc.

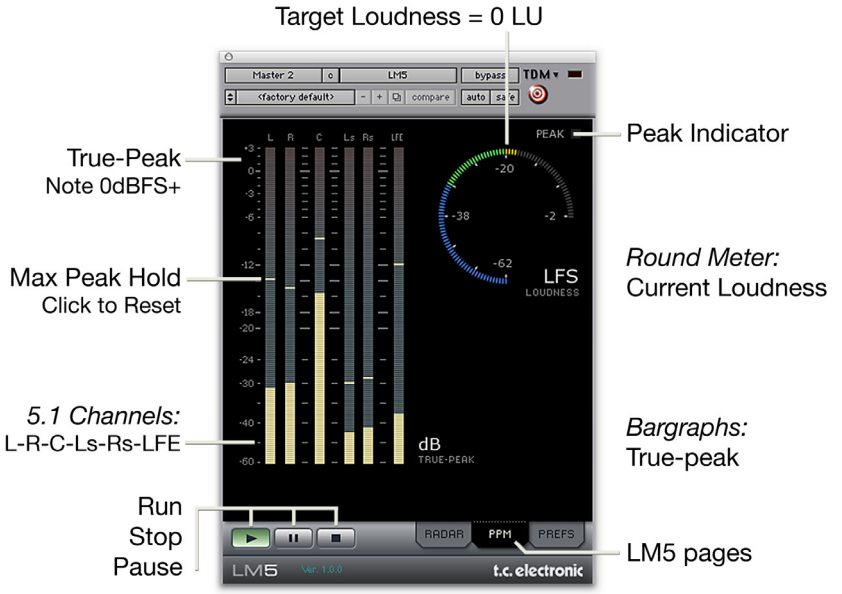


Fig. 7, PPM True-peak meter features.

Bargraph PPM meters are shown next to the round Current Loudness display, which is identical to the Outer Ring of the Radar page. The True-peak meters operate regardless of the status of the Run/Stop/Pause controls. Click on the bargraphs to reset the peak history.

The peak meters of LM5D display true-peak as specified in ITU-R BS.1770-2. True-peak meters give a better indication of headroom and risk of distortion in downstream equipment such as sample rate converters, data reduction systems and consumer electronics than digital sample meters used e.g. in CD mastering.

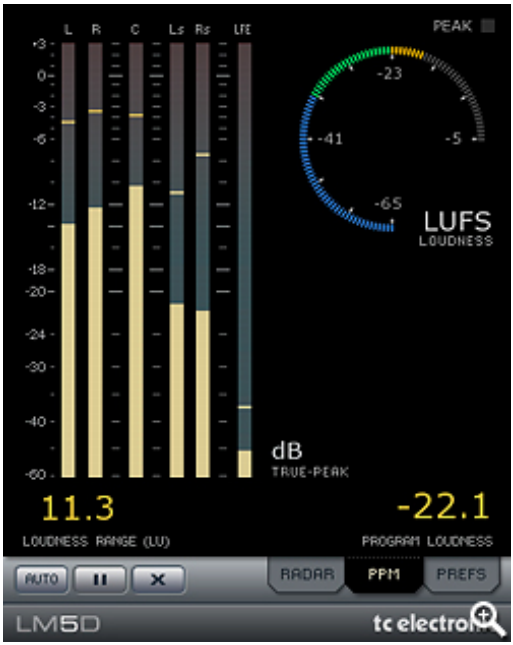


Fig. 8, PPM True-peak meter example showing film in 5.1.

True-peak meters in LM5D are fully synchronous and inlcude internal headroom. Consequently, the meters are capable of viusalizing 0 dBFS+ incidents that create havoc in down-stream devices, sample rate converters and data reduction systems.

PREFERENCES PAGE

Fig. 9, LM5D Prefs page.
Preferences may be stored as Presets, thereby having suitable settings for different conditions easily at hand.

Loudness Scale

Can be set to either “Loudness Units, LU” or “Loudness Full Scale, LUFS”.
Note how LUFS is the same as LKFS. For more info, see paragraph about LKFS, LUFS and LU.

When “LU” is selected, the radar and numbers appear as shown in Fig 4 Left. Note numbers in the outer ring and the Program Loudness descriptor are based on a relative scale with Target Level as 0 LU.

When “LUFS” is selected, the radar and numbers appear as shown in Fig 4 Right. Note how numbers in the outer ring and the Program Loudness descriptor are based on an absolute scale.

0 LU Equals

Sets the loudness required to obtain a 12 o’clock reading on the outer ring, which is the same as the border between green and yellow on the Radar page. 0 LU is the reference to aim at.

Low Level Below

Determines where the shift between green and blue happens in the outer ring. It indicates to the engineer that level is now at risk of being below the noise floor.

True Peak Indicator

Sets the level at which the Peak indicator lights up.

OBS Indicator

Sets the conditions for the OBS indicator to light up. Turn it off, if you don't want warnings.

Time Reference

Time Reference can take two values: "Actual Computer Time" or "Program Time". The first is synchronized to the realtime clock of the computer, the latter to when a new measure was started, i.e. when the "run" key was pressed. Note: The meter history resets when you switch between Time Reference settings.

Radar Speed

Radar Speed controls how long time each radar revolution takes. Select from 1 minute to 24 hours. You may "zoom" between the settings, as long as the history isn't reset. Pressing the "X" key, or changing the Time Reference, resets the meter and descriptor history.

Radar Resolution

Sets the difference in loudness between each concentric circle in the Radar between 3 and 12 dB. Choose low numbers when targeting a platform with a low dynamic range tolerance. You may "zoom" between the settings, as long as the history isn't reset. Pressing the "X" key, or changing the Time Reference, resets the meter and descriptor history.

Loudness Standard

The Program Loudness measurement in LM5D is always based on the Leq(K) weighted model. However, since the introduction in 2006, the ITU-R BS.1770 standard has been updated with a relative gating function, improving the model's cross-genre normalization capabilities.

The Loudness Standard should therefore normally be set to "ITU-R BS.1770-2" for compliance with the ITU standard, with EBU R128, with TR-B32 and with ATSC A85. This setting applies a relative gate at -10 LU when computing the Loudness Range number.

Two legacy settings are also provided: "Leq(K)", reflecting the original BS.1770 measurement without gating, and "Center of Gravity" which was available in LM5D version 1. Center of Gravity makes use of a relative gate at -20 LU.

Only Program Loudness is influenced by the Loudness Standard setting while Loudness Range, Momentary Loudness and Short-term loudness remain unaffected. Note how a meter reset, flushing the loudness history, is performed when this parameter is changed.

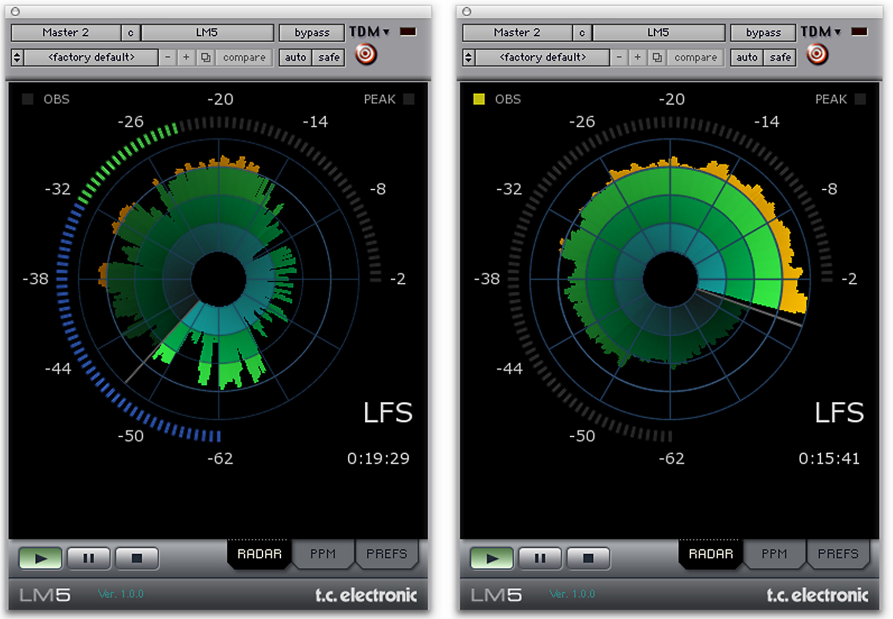


Fig 10, Examples of 5.1 movie left (Matrix) and stereo, classical music right (Bolero). Both examples are shown on a 12 minute per revolution Radar with 10 dB between divisions.

Level versus Loudness

When level normalization in audio distribution is based on a peak level measure, it favors low dynamic range signatures as shown in Fig 1. This is what has happened to CD.

Quasi-peak level meters have this effect. They tell little about loudness, and also require a headroom in order to stay clear of distortion. Using IEC 268-18 meters, the headroom needed is typically 8-9 dB.

Sample based meters are also widely used, but tell even less about loudness. Max sample detection is the general rule in digital mixers and DAWs. The side effect of using such a simplistic measure has become clear over the last decade, and CD music production stands as a monument over its deficiency. In numerous TC papers, it has been demonstrated how sample based peak meters require a headroom of at least 3 dB in order to prevent distortion and listener fatigue.

The only type of standard level instrument that does not display some sort of peak level is the VU meter. Though developed for another era, this kind of meter is arguably better at presenting an audio segment's Program Loudness. However, a VU meter is not perceptually optimized, or ideal for looking at audio with markedly different dynamic range signatures.

Unlike electrical level, loudness is subjective, and listeners weigh its most important factors - SPL, Frequency contents and Duration - differently. In search of an "objective" loudness measure, a certain Between Listener Variability (BLV) and Within Listener Variability (WLV) must be accepted, meaning that even loudness assessments by the same person are only consistent to some extent, and depends on the time of day, her mood etc. BLV adds further to the blur, when sex, culture, age etc. are introduced as variables.

Because of the variations, a generic loudness measure is only meaningful when it is based on large subjective reference tests and solid statistics. Together with McGill University in Montreal, TC Electronic has undertaken extensive loudness model investigation and evaluation.

The results denounce a couple of Leq measures, namely A and M weighted, as generic loudness measures. In fact, a quasi-peak meter showed better judgement of loudness than Leq(A) or Leq(M). Even used just for speech, Leq(A) is a poor pick, and it performs worse on music and effects. An appropriate choice for a low complexity, generic measurement algorithm, which works for listening levels used domestically, has been known as Leq(RLB).

In 2006, ITU-R Working Party 6J drafted a new loudness and peak level measure, BS.1770-2, and the standard has subsequently come into effect. It has been debated if the loudness part is robust enough, because it will obviously get exploited where possible. However, with a variety of program material, Leq(RLB) has been verified in independent studies to be a relatively accurate measure, and correlate well with human test panels. It therefore seems justified to use Leq(RLB) as a baseline measure for loudness, especially because room for improvement is also built into the standard. The final BS.1770-2 standard included a multichannel annex with a revised weighting filter, R2LB – now known as "K" weighting - and a channel weighting scheme. These two later additions have been less verified than the basic Leq(RLB) frequency weighting.

The other aspect of BS.1770-2, the algorithm to measure true-peak, is built on solid ground. Inconsistent peak meter readings, unexpected overloads, distortion in data reduced delivery and conversion etc. has been extensively described, so in liaison with AES SC-02-01, an over-sampled true-peak level measure was included with BS.1770-2.

In conclusion, BS.1770-2 is an honorable attempt at specifying loudness and peak level separately, instead of the simplistic (sample peak) and mixed up measures (quasi-peak) in use today. The loudness and peak level measurement engine of LM5D follows the standard precisely. Possible updates to the ITU standard may be released as LM5D updates.

Technical papers from AES, SMPTE, NAB and DAFX conferences with more information about loudness measurement, evaluation of loudness models, true-peak detection, consequences of 0 dBFS+ signals etc., are available from the TC website. Visit the Tech Library at www.tcelectronic.com/techlibrary.asp for details.

Meter Calibration

Because of the frequency and channel weighting, and of the way channels sum, only specific tones and input channels should be used for calibration.

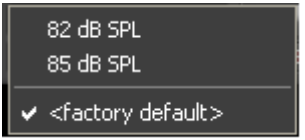
The most transparent results are obtained using a 1 kHz sine tone for calibration. Other frequencies or types of signal may be used (square wave, noise etc.), but don't expect similar results. The beauty of the system lies in its RMS foundation, so this is a feature, not an error. The same feature enables the loudness measure to identify overly hot CDs or commercials, and to take out of phase signals into account just as much as signals that are in phase.

If we stick to standard methods for measuring peak audio level in a digital system, where a sine wave (asynchronous of the sample rate) with digital peaks at 0 dBFS, is regarded a 0 dBFS tone, BS.1770-2 and LM5D output these results:
One front channel fed with a –20 dBFS, 1 kHz sine tone => Reading of –23,0 LUFS.
Two front channels fed with a –20 dBFS, 1 kHz sine tone => Reading of –20,0 LUFS.
All 5.1 channels fed with a –20 dBFS, 1 kHz sine tone => Reading of –15,4 LUFS.

PRESETS

LM5D

AM6



POST SCRIPT

Control of loudness is the only audio issue that has made It to the political agenda. Political regulation is currently being put into effect in Europe to prevent hearing damage and disturbances from PA systems, and to avoid annoying level jumps during commercial breaks in television. In Australia, something similar may happen.

Many years of research into loudness of not only dialog, but also of loudness relating to any type of audio programming, has brought TC to the forefront of companies in the world to perform realtime loudness measurement and control. Therefore, TC has taken active part in loudness standardization efforts in Japan, the United States, Europe and other areas.

In broadcast, digitization is driving the number of AV channels and platforms up, while the total number of viewers remains roughly the same. On the sound production side, it is therefore important that delivery criteria can be easily specified and met, even by people not primarily concerned with audio: Journalists, musicians, video editors, marketing professionals etc.

Using only dialog based audio measurements in digital broadcast, has led to ambiguous level management, more level jumps between programs, and extra time spent on audio production and management in general. Non-dialog based level jumps are currently creating havoc in digital TV, and LM5D helps correct that situation. The LM5D Loudness Meter can be used to control level and improve sound, not only in Dolby AC3 based transmissions, but also on other broadcast platforms, such as analog TV, mobile TV and IPTV.

To summarize: LM5D is part of a holistic and universal approach to loudness control, starting at the production or live engineer. When she realizes the dynamic range at her disposal, less processing is needed at later stages of a distribution chain. The chain ends with the capability of quality controlling everything upstream by applying the same loudness measure for logging purposes: A closed loop.

Welcome to a new, standardized world of audio leveling. Across genres, across formats, across the globe.

Preset Management note

LM5D, LM5 and AM6 uses the standard Pro Tools preset handling.

AM6 - TRAILER AND COMMERCIAL METER

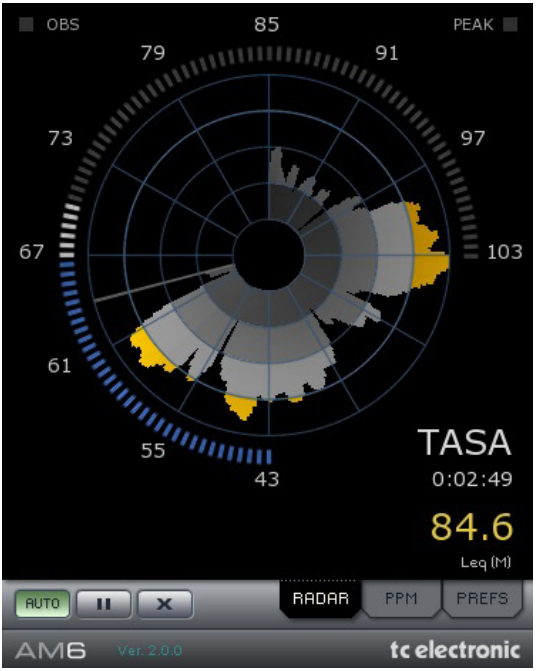
Radar Leq(M) meter for Cinema Production

Pro audio is moving decisively away from the peak level based normalization method that has caused so much havoc with trailers in movie theaters. The new and better mantra is to combine frequency weighting with an energy-integrated measure of sound, or equivalent continuous sound level, abbreviated Leq, and the level regulation of commercials and trailers in movie theaters is based on a measure of annoyance, also known as Leq(M).

TASA, MPAA, Dolby, DTS and others were involved in the definition of Leq(M), and the principle has since been adopted in several countries. Today, movie trailers and commercials are therefore generally under satisfactory control, though movies themselves may sometimes be annoyingly loud.

Recognizing requests from many Pro Tools users producing audio for broadcast as well as for cinema, an Leq(M) based radar meter is now available: The AM6. The radar epitomizes an intuitive and efficient way of visualizing loudness or annoyance over time, while the integrated Leq(M) number indicates the status of the entire trailer or commercial with regard to regulatory limits.

RADAR PAGE

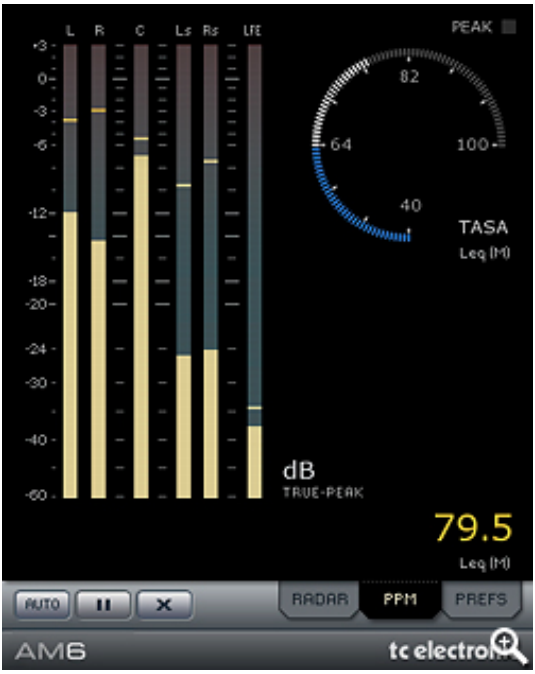


When developing AM6, an important, new function was added to complement the integrated Leq(M) number: A proficient way of measuring peak level. Sample-based peak level detection is long past its age of retirement, while true-peak assessment as defined by AES and ITU is trustworthy. A true-peak measure is demanding on the topology of the meter, and it requires more processing power than a futile sample-based meter, but it's a big improvement when it comes to predicting whether or not a film or music track can be distributed and reproduced without producing overload and distortion.

The AM6 meter includes true-peak measurement of all 5.1 channels, so you're the first to know if a production is likely to create downstream problems. Recall a preset based on Leq(M) limits of 82 dB or 85 dB, or go to the Preference page to scale AM6 to a level and a time resolution of your own choice.

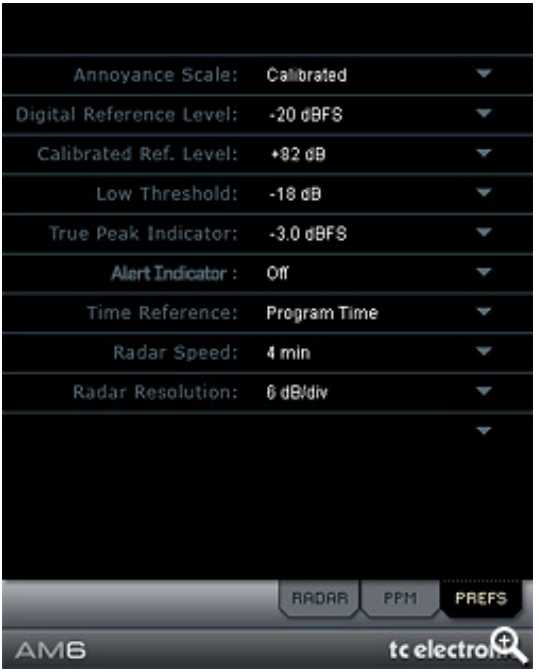
Please read the LM5D manual section on pages 10 to 13 for more information on True Peak metering.

PPM PAGE



ENGLISH

PREFERENCE PAGE



Annoyance scale

Indicate numbers in the radar and in the Leq(M) readout on a scale related to cinema SPL by selecting “Calibrated”, or on a scale relating to Digital level. Regulation in most countries are based on “Calibrated” numbering.

Digital Reference Level

When the digital scale is selected, this parameter sets the value shown at 12 o’clock position on the radar outer ring, and at the bold circle of the radar. This would normally be set to the standard operating level. Note that this setting doesn’t affect the Leq(M) readout below the radar, but it scales the outer ring and the radar itself. The setting has no influence at all if Scale is set to Calibrated.

Calibrated Ref. Level

When the calibrated scale is selected, this parameter sets the value shown at 12 o’clock position on the radar outer ring, and at the bold circle of the radar. This parameter can for instance be set to give a clear indication of the Leq(M) number that shouldn’t be exceeded for too long. Note that this setting doesn’t affect the Leq(M) readout below the radar, but it scales the outer ring and the radar itself. The setting has no influence at all if Scale is set to Digital.

Low Threshold

Low Threshold determines where the shift between green and blue happens in the outer ring. It indicates to the engineer that level is now at risk of being below the noise floor.

True Peak Indicator

Sets the level at which the Peak indicator lights up.
OBS Indicator sets the conditions for the OBS indicator to light up. Turn it off, if you don't want warnings.

ALERT indicator

This is where you set the conditions for the ALERT indicator to light up. Turn it off, if you don't want warnings.

Time Reference

Time Reference can take two values: "Actual Computer Time" or "Program Time". The first is synchronized to the realtime clock of the computer, the latter to when a new measure was started, i.e. when the "run" key was pressed. Note: The meter history resets when you switch between Time Reference settings.

Radar Speed

controls how long time each radar revolution takes. Select from 1 minute to 24 hours. You may "zoom" between the settings, as long as the history isn't reset. Pressing the "X" key, or changing the Time Reference, resets the meter and the Leq(M) readout beleow the radar.

Radar Resolution

sets the difference in loudness between each concentric circle in the Radar between 3 and 12 dB. Choose low numbers when targeting a platform with a low dynamic range tolerance. You may "zoom" between the settings, as long as the history isn't reset. Pressing the "X" key, or changing the Time Reference, resets the meter and the Leq(M) readout beleow the radar.

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