User Manual

DK - Technologies

DK Meter

DK-Technologies A/S
Marielundvej 37D
DK-2730 Herlev
Denmark
t +45 44 85 02 55
f +45 44 85 02 50
email: info@dk-technologies.com
web: www.dk-technologies.com

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1 Important notes

1.1 Disclaimer

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Despite considerable effort to produce up to date information, no literature published by the company nor any other material that may be provided should be regarded as an infallible guide to the specifications available nor does it constitute an offer for sale of any particular product.
StarFish and JellyFish are registered trademarks of DK-Technologies A/S. Dolby®E is a registered trade mark of Dolby Laboratories, Inc. The ownership of any trademarks referenced is acknowledged.

1.2 Purpose

Any fitness for purpose legislation or other determination that may be applied in the area where this equipment is installed must take due cognisance that it is designed for use in professional broadcast, audio and video systems by appropriately trained personnel. The equipment is not intended for use in a domestic environment and regulations designed for such situations are not applicable.

1.3 After sales modifications

Any modifications to the equipment not specifically authorised and approved by DK-Technologies A/S may invalidate the equipment warranty. This includes changes to cabling and variations to the recommended installation as detailed in the documentation issued by DK-Technologies A/S. Modifications can invalidate EMC and safety features designed into this equipment and the manufacturer can not be liable for any legal proceedings or problems that may arise relating to such modifications. No sales agent or other person involved in the supply chain is permitted to authorise variations from the content of this documentation.

1.4 Versions

The DK Meter is available in two versions. The DK1 is a stereo only unit and the DK2 is suitable for use with stereo and also 5.1 surround signals. If used with a DK1, ignore all references in this manual to the surround features.

This manual is intended for use with units running software version 2011-12-06 or later.

2 Installing

2.1 Unpacking

The DK Meter is supplied with the following items:

a. DK Meter display/control unit with a 15 pin D connector (female)

b. Interface cable with a male 15 pin D connector and three 1.4 m BNC terminated co-axial cables and a USB-A connection for data and power,

c. AC mains to USB power adapter. This has several interchangeable pin sets to suit most styles of international mains connectors.

d. Adjustable mounting adapter to allow fixing to a variety of surface angles and six fixing screws.

2.2 Mounting

The meter is supplied with an adjustable mounting bracket. The meter has the connector in the lower part of the back panel.

When fixing the mounting plate to the rear of the meter, use only the screws supplied and be sure to fit the two hole bracket, not the four hole one, to the back of the meter.

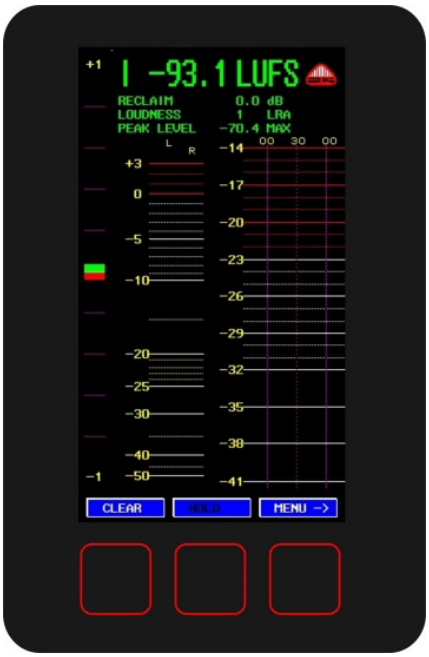
Damage can be caused by allowing longer screws to penetrate the rear panel. The supplied screws may also cause damage if used to fit a thinner plate to the back of the meter. If fixing through a thin surface, use shorter screws which are sufficient only to engage in the case material.

2.3 DC power

The meter is supplied with a DC power supply with a USB outlet. If being used in conjunction with a computer, any conventional USB-A outlet with the standard USB 5 volt supply may be used instead of the DC power unit.

2.4 Controls

The DK Meter has a high quality colour display screen. At the base are three control buttons which use capacitive touch sensitive technology. This means that to operate, they must be touched with a finger, not a stylus or similar object.



The function of the buttons changes, depending on the menu selected and the label above each describes what they do at any given time.

The meter is shown here with the power-up default as delivered from the factory.

2.5 Shorthand

Many setup options are arranged in folders some of which contain further sub-folders. Getting to a particular setup option might require steps such as:

Touching the right most button which on power up is labelled MENU▶

Touching the MENU▶ button again

Touching the MENU▶ button again

Select SETUP (on the middle button)

Scroll to the ABOUT folder using the middle button, now labelled MOVE▼. This particular step requires two presses of the middle button

Touching SELECT to open the ABOUT folder

Touching the MOVE▼ to go to SYSTEM

Opening this folder by pressing SELECT

Opening the SOFTWARE folder by going down to it with several touches on the MOVE▼ button then pressing select.

This documentation describes such a sequence by using the shorthand:

MENU \ MENU \ MENU \ SETUP \ ABOUT \ SYSTEM \ SOFTWARE

This example allows the currently installed software version to be verified.

To return to an audio display mode from this, use the MOVE▲ to go to the EXIT function then press SELECT.

3 Essential setup

3.1 Delivery defaults

Loudness and amplitude measurements can be made to specifications which include a number of optional parameters. As shipped the main meter defaults are:

Preset	2.0 DIGITL	(Set under SYSTEM \ MENU \ PRESET)
Peak meter scale	WEBP	(Set under BARGRAPH OPTION \ SCALE)
FS Input	+18dBu	(Set under AUDIO GLOBALS)
Filter	K filter enabled	(Set under LOUDNESS SETUP)
Sliding window	3 seconds	(Set under LOUDNESS SETUP)
Loudness ref	-23.0 dBFS	(Set under LOUDNESS SETUP)
Peak level	-2.0 dBFS	(Set under LOUDNESS SETUP)
Gate level	-10.0 dBFS	(Set under LOUDNESS SETUP)
Gate level	Floating	(Set under LOUDNESS SETUP)
Peak mode	True peak	(Set under LOUDNESS SETUP)
Reference	1 KHz	(Set under LOUDNESS SETUP)

If these settings are correct for your needs, there is nothing further to do but to connect the audio inputs and begin using the meter. The various option changes are described in later sections of this manual.

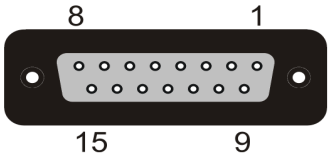
3.2 Signal connections

The supplied cable harness has three BNC connectors. These allow three AES-3id digital audio signals to be connected to the 75 ohm inputs. Because each AES input is a dual channel path, up to six digital mono signals can be brought into the meter. These can be either 16 or 24 bits in depth and the intended sample rate is 48K.

An internal matrix allows the required signals to be routed to the measurement and display system. SPDIF signals can also be connected and are accepted.

The meter also has two balanced analogue inputs and if required, a suitable cable connector needs to be wired in accordance with the information below. The view below shows the wiring side of the cable mounted male connector. Pins 5 and 13 are used for factory diagnostics and must be left unwired.

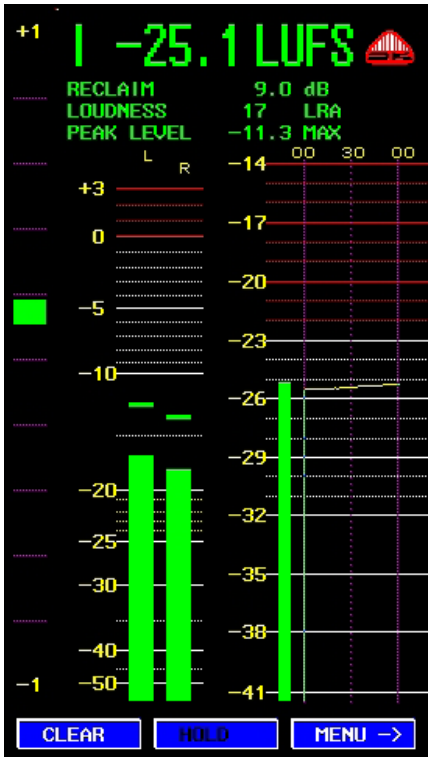
Signal		**Pin**
AES 1	Signal	3
AES 2	Signal	4
AES 3	Signal	12
AES	Ground	11
USB	0V	1
USB	+5V	9
USB	Data+	2
USB	Data-	10
USB	Screen	Shell



Signal		**Pin**
Analogue L	Hot	6
Analogue L	Cold	14
Analogue R	Hot	8
Analogue R	Cold	15
Analogue	Ground	7

4 Default screen

As delivered from the factory, the power-up default is a stereo meter with digital inputs. The screen display is shown here.



4.1 Phase meter

The left most part of the display is a phase bargraph with purple graticule lines. This displays information on the main left/right inputs, with the factory supplied default for this being the first AES input.

Audio meters are rarely used to display pure sine waves and the term “in-phase” is applied here meaning a signal where the mono sum is equal to or greater than the higher of the left and right signals. “Out of phase” is a signal where the mono sum would be less than the higher of the left and right signals.

Signals which are predominantly “in phase” have a green marker in the upper half of the range. Fully correlated signals such as double mono read on the +1 mark. Signals which are “out of phase” are shown with a red marker in the lower half of the range.

With no input, with only the left or right driven or with correlated mono but with a 90 phase shift, the marker position is the halfway point with the upper section of the marker green and the lower part red.

4.2 Amplitude meter

The parallel bars with white and red graticule lines provide a conventional amplitude meter which can be VU, peak, PPM or some other standard. This factory defaults to being a true peak meter with a dBFS scale but a variety of commonly used meter standards can also be selected. These include:

IEC 268-I	IEC 268-II (BBC)	IEC 268-II (EBU)
DIN	SMPTE VU	ABC VU
NBC VU	CNN VU	WEB PEAK

The two additional “indications on the screen provide a short term peak hold function.

4.3 Integrated loudness bar

The single bar at the left of the right-most graticule lines shows the integrated loudness value. This same value is also shown numerically at the top of the display in the factory delivery setting of the window text area.

4.4 Graphical loudness

To the right of the integrated loudness bar is a graph of integrated loudness values plotted against time. Approximately the first minute can be seen from the opening display but the MENU▶ button allows over three minutes of display to be viewed.

4.5 Window text

There are four lines of window text with the uppermost having a larger size. Each of the four lines can be chosen to display one of the following values:

OFF	LOUDNESS SELECT	MOMMTRY
SLIDING	INTEGRT	LOUDNESS LRA
RECLAIM FACTOR	SLIDING MIN	SLIDING MAX
GATE HOLD	PEAK LEVEL MAX	SMPTE TIME
START TIME	STOP TIME	RESUME TIME
SLIDING TIME	FILTER TYPE	PRESET AUDIO

5 Meter modes

The following changes to the meter configuration are available with

MENU \ MENU \ MENU \ SETUP \ ABOUT \ USER MODE

There are three modes:

RESTRICTED
NORMAL
ADMINISTRAT
SUPERVISOR

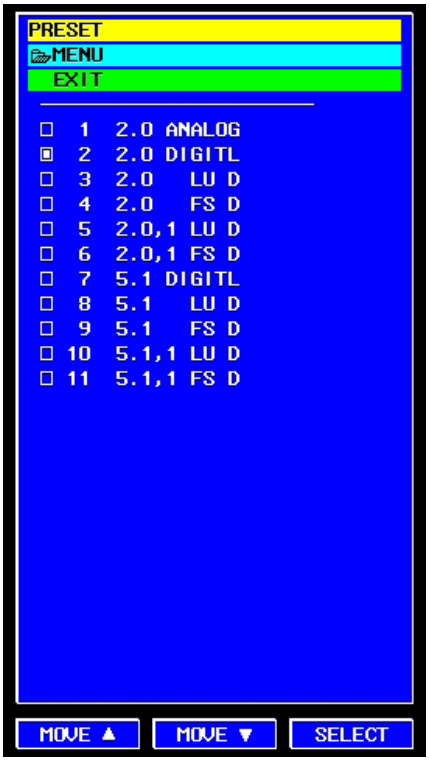
Upon initial power-up the meter defaults to be in Administrator mode. When set to Administrator or Supervisor, a full range of options are available to the user. More restricted user options are provided under Normal and Restricted, but any user has the ability to change the security level at any time to gain access to more advanced options.

All meter settings, including the presets, are retained at switch off and become the new power-up defaults. The descriptions that follow all assume use of the default Administrator mode.

6 Display options

6.1 Delivery presets

The DK2 Meter comes delivered with the factory switch-on defaults as described previously. Alternative configurations are stored as 11 separate presets. Most common needs can be met by selecting one or other of the factory supplied presets. This list provides



1 2.0 ANALOG
2 2.0 DIGITAL
3 2.0 LU D
4 2.0 FS D
5 2.0,1 LU D
6 2.0,1 FS D
7 5.1 DIGITL
8 5.1 LU D
9 5.1 FS D
10 5.1,1 LU D
11 5.1,1 FS D

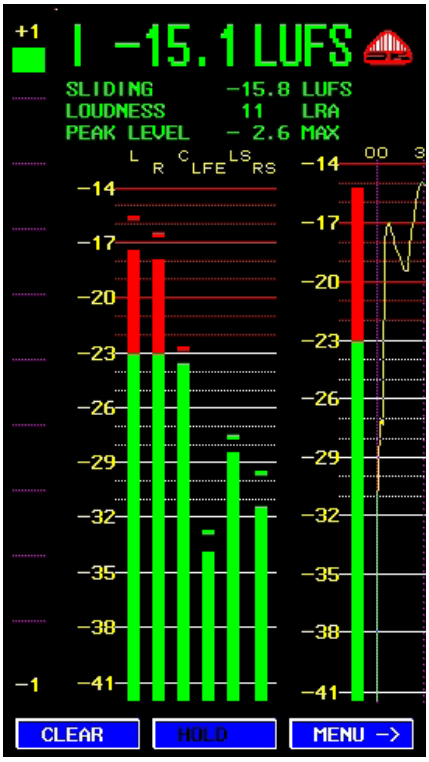
The DK1 meter has only the first six presets.

To change to a different preset, go to:

MENU \ MENU \ MENU \ PRESET

The cursor will highlight the presently selected preset. Use the MOVE▼ and MOVE▲ buttons to get to the required mode. Then press SELECT. The meter reverts immediately to the audio display screen with the new preset enabled.

6.2 Basic variations



The DK2 version can be changed to a 5.1 surround mode which gives a display such as the one here.

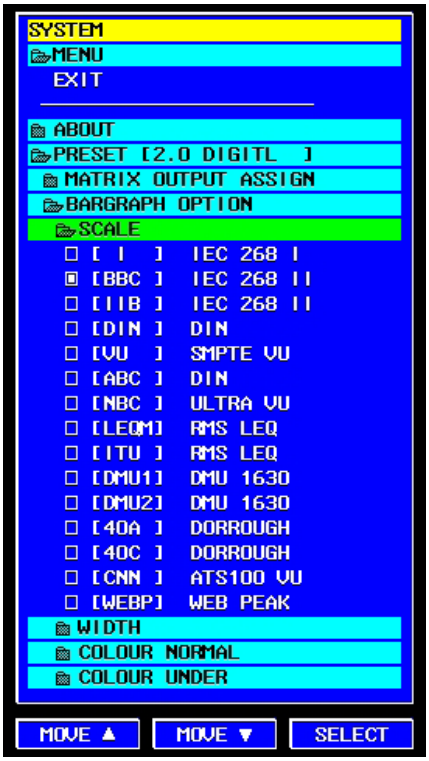
A detailed overview of loudness parameters follows later and the matter most often needing changing to suit local conditions in the meter scale on the amplitude meters.

It is important to remember that there is only one loudness bargraph, shown here reading -15.1 LUFS. The ITU BS.1770 measurement method takes account of the content on the left, centre right and surround programme legs. Material on the LFE is not used in the ITU BS.1770 loudness measurement algorithm.

The other bargraphs are conventional amplitude bargraphs and different organisations may require these to be true peak, quasi-peak or average reading meters, to give similar readings to those on other conventional programme meters in the same system.

Whatever parameters are changed are automatically saved as new power-on defaults.

6.3 Changing amplitude scales



A variety of different meter scales are offered and the one selected is stored as part of each preset. To change the selected scale go to:.

MENU \ MENU \ MENU \ SETUP

Use the MOVE▼ button to get to the presently selected preset. SELECT the preset, opening the folder then use the MOVE▼ button to go to the BARGRAPH OPTION folder then go down to the SCALE folder. The full process is:

MENU \ MENU \ MENU \ SETUP \ PRESET *[name]* \
BARGRAPH OPTION \ SCALE

The scale currently assigned to that preset is highlighted and the MOVE▼ and MOVE▲ buttons allow a different one to be selected. The change is made by clicking SELECT on the required one.

If no other changes are needed to that preset, going to EXIT allows the meter to return to the audio level display screen.

6.4 Changing analogue references

The “digital scales” such as DMU1630 have absolute value. Scales designed first for analogue measurements such as IEC268 I, SMPTE VU etc can have alternative analogue calibration values. The meter sensitivity is set for all meter scales and presets by going to:

MENU \ MENU \ MENU \ SETUP \ AUDIO GLOBAL \
ANALOGUE REFERENCES

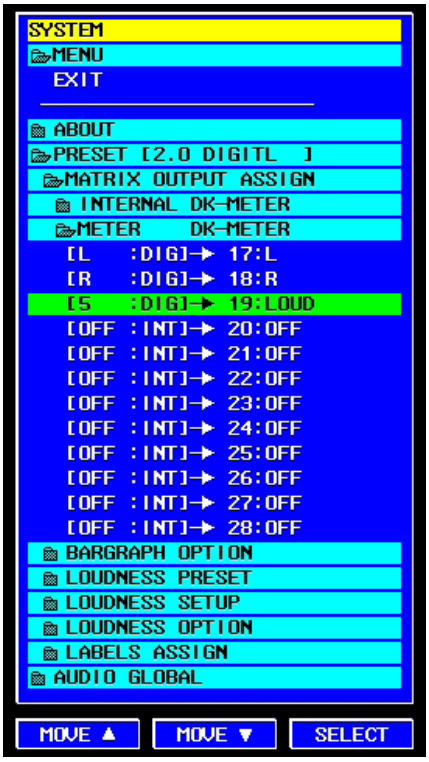
Once the cursor is on the line showing the current value, press SELECT. Use the MOVE▼ and MOVE▲ button change the setting equivalent to 0 dBFS in 1dB increments between +12 dBu and +24 dBu.

Three particular levels, +15 dBu, +18 dBu and +24 dBu have additional labelling identifying markets where those values are commonly used. It should be noted that the +24 dBu level represents 20 dB above the level of +4 dBu sometimes adopted in those markets as the level to make a conventional analogue VU meter display 0 VU. In other words, it equates to what is often referred to as the ‘-20 dBFS’ calibration setting frequently used in the USA and elsewhere.

When the required value is set, press SELECT to confirm it.

6.5 Selected inputs

The DK Meter has both analogue and AES3 digital inputs. With DK1 meters, only the analogue inputs and first AES input is available. The input which feeds the meter system is stored as part of each preset. This selection is done with an internal routing matrix.



To change input routing, go to:

MENU \ MENU \ MENU \ SETUP \ PRESET *[name]* \ MATRIX
OUTPUT \ METER DK-METER

Enabling meter channels currently set to OFF will cause additional bargraphs to be displayed on the screen up to the maximum of six (i.e. a 5.1 display).

Once a matrix configuration has been changed, the meter should be re-started to ensure the new routing is enabled.

6.6 Preset names

When significant changes have been made to a preset, it can be helpful to give the preset a name to identify it's function. Go to:

MENU \ MENU \ MENU \ SETUP \ AUDIO GLOBAL \ LABELS \ PRESET

Go to the preset to be renamed and press SELECT. The highlighted name then gains a flashing cursor beneath the first letter. To change the value press SELECT again. The displayed character is then incremented using the MOVE▼ button. The character sequence includes upper and lower case letters, numbers and a variety of other symbols. Press SELECT to store that character. The MOVE▼ button steps the cursor one character to the right. Preset names are limited to being ten characters long.

To save the revised preset name use the MOVE▲ button until the first character is reached then press it once more.

6.7 Signal names

The signals displayed on the meter screen are normally satisfactory when left in the factory default conditions. These include commonly needed labels such as L, R, LFE, RS etc. If it is necessary, names can be edited. Go to:

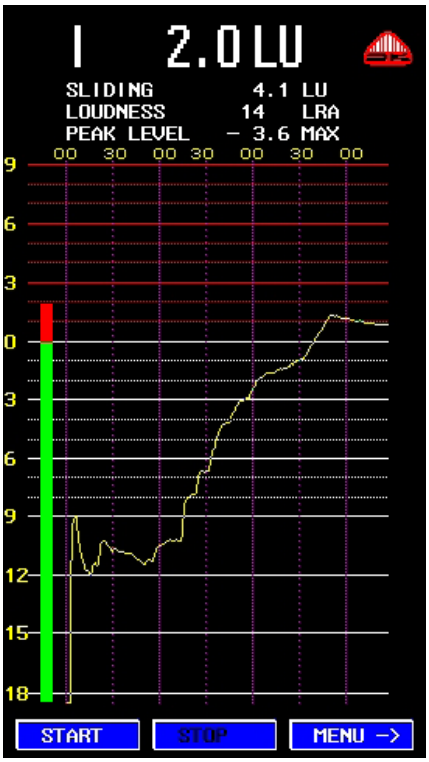
MENU \ MENU \ MENU \ SETUP \ AUDIO GLOBAL \ LABELS \ SIGNAL

Go to the signal to be renamed and use a similar method to that for renaming presets. This can be convenient if a different language is preferred.

6.8 Graphical display

The same information used to drive the loudness bargraph is also used to draw a graph of loudness versus time. The graph period can run indefinitely, but only the first three and half minutes is visible. The MENU▶ button can scroll the screen as required.

Press START to begin plotting the loudness. The graph develops as shown.



6.9 Text colour

The default colour for the text information shown at the top of the main screen is green. Where viewing conditions suggest an alternative may be preferable, it can be changed by going to:

MENU \ MENU \ MENU \ SETUP \ AUDIO GLOBAL \ COLOUR

The choices are:

BLUE	GREEN	L(IGHT) BLUE
RED	VIOLET	YELLOW
WHITE		

7 Loudness measurements

7.1 Loudness background

Loudness measurements differ from conventional signal amplitude measurements in that they are also influenced by the frequency content of the signal and the duration of transient components. The way these various elements are handled to give a value for display has been defined by the International Telecommunications Union in their standard ITU BS1770 which is the only loudness standard to have achieve any degree of international acceptance.

The DK Meter allows a number of parameters to be adjusted to suit whatever options your organisation and perhaps regulatory body has decided to mandate.

Two organisations leading the way in the standardisation of loudness measurements are the Advanced Television Systems Committee (ATSC) in the USA and the European Broadcasting Union (EBU) in Europe. The background information to the measurement norms is contained in the ATSC document “Techniques for establishing and maintaining audio loudness for digital television”, document A/85:2011. The EBU document R128 is supplemented by EBU Tech 3341, 3342, 3343 and 3344 between them they define a number of terms and set out the reasons behind many of the objectives of loudness measurements.

7.2 Terminology

The documents define a number of terms.

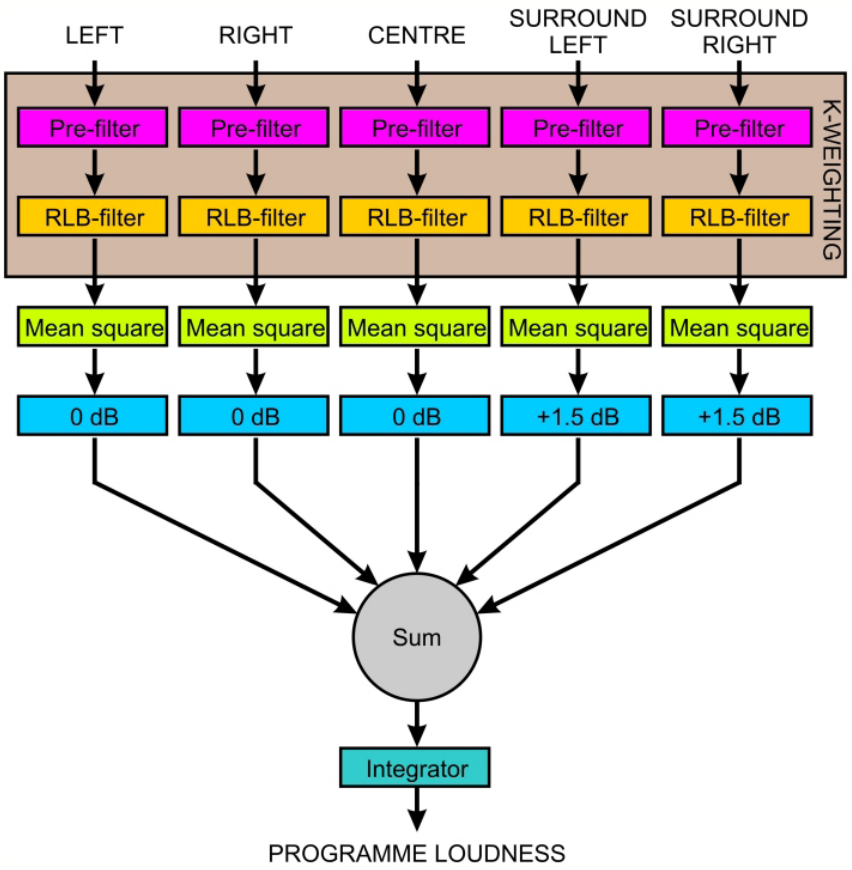
loudness unit (LU)

loudness unit referenced to full scale (LUFS)

programme loudness

loudness range

The LU is the quantity already set out in the ITU BS.1770 and LUFS is a re-naming of the LKFS also described there and commonly used in the USA. The EBU’s R 128 also states that programme loudness should have a target level of -23 LUFS, though it notes that for some programmes such as live events it may be necessary to accept deviations from that by +/- 1 LU.



The Tech3341 and 3342 documents clarify some of the measurement parameters that are needed in order to set a meter to operate in “EBU mode”. Such a meter will have a sliding time window length of 0.4 seconds and that is used to obtain an ungated momentary loudness figure, referred to as ‘M’. In addition a meter in EBU mode will also have a window length of 3 seconds, updated at least ten times per second and without gating and this loudness figure is the short term loudness, named ‘S’

Finally there is a third mode that produces an integrated value known as the ‘I’ value and for this measures loudness over the entire duration of that programme and has a gate which operates at a threshold 8 dB below the current momentary loudness value. This is designed to create an indication of foreground loudness, ignoring extended quiet periods.

The loudness range uses gated information, to prevent it being unduly influenced by extended periods of little but background noise. It is defined as the difference between the estimates of the 10th and the 95th percentiles of the distribution of the ‘S’ values across the entire programme. Excluding values above the 95% percent level prevents content such as a single gunshot from disturbing the loudness range value and ignoring those below 10% avoids a low music fade from influencing the figure.

With these three simultaneous modes, the system is intended to address issues of balancing the loudness of short duration material such as commercials and upcoming promotions against longer content such as programmes including films etc. It is a difficult challenge to have an automated system achieve the artistic balance that twenty years ago might have been done by a human operator. It will be interesting to see how adoption of these recommendations eliminates the viewer complaints of poor loudness matching.

7.3 Loudness presets

Beneath each preset are six commonly used sets of defaults. In addition a USER mode allows custom variations to be created. To define the loudness measurement parameters, go to:

MENU \ MENU \ MENU \ PRESET *[name]* \ LOUDNESS PRESET

and select the required set of parameters. USER must be selected if custom settings are to be created and used

7.4 Loudness setup

In addition to the defaults offered in the presets, slsecting USER as the loudnjess preset allows custom variations to be created.

Beneath each preset are six commonly used sets of defaults. In addition a USER mode allows custom variations to be created.

To define the loudness measurement parameters, go to:

MENU \ MENU \ MENU \ PRESET *[name]* \ LOUDNESS SETUP

The variable parameters have options as follows:

FILTER

Can be K-FILTER or LEQM.

SCALE MODE

Two different scales have been adopted for displaying the loudness value. One of these is defined by the ITU in their document ITU BS1771 and that uses “Loudness Units” - LU. These have values ranging from -18 to +9 with the typical aiming point for signals being a specification close to the 0 point. The other commonly used scale has only negative values going down from a 0 LUFS mark at the very top of the scale.

The required scale can be chosen by highlighting the parameter and using the MOVE▼ and MOVE▲ buttons followed by SELECT.

SLIDING WINDOW

The currently displayed loudness value is based on the averaged loudness values over a defined time window. Setting the window to 0 provides a display of value that are as instantaneous as the system permits. The window can be adjusted to be 0, 3, 10 or 30 seconds.

REFERENCE

A range of REFERENCE levels can be chosen for the purpose of loudness measurement as part of the loudness measurement standard which your organisation (or client) has adopted. It can be set between -9 and -24 dBFS (1 dB steps).

PEAK LEVEL

The PEAK level is a user defined reference point and can be set between -1 to -10 dBFS (1 dB steps).

GATE LEVEL (-a)

It is often the high level parts of a programme which are often of most interest for assessing compliance with broadcast criteria. To prevent an extended length of low level programme content reducing the averaged loudness value to a degree that affects the measured value, the meter has an optional gating function. Once the signal drops below the gate threshold, the meter will continue to hold, display and use for averaging purposes, the previous value that was above the threshold. The gate threshold can be adjusted from -8 to -20 dB in 1 dB steps. Setting it to -20 causes the gate to remain open and the unit displays the actual loudness for the vast majority of the time.

GATE LEVEL (-b)

The gate level can be an absolute value or a floating one. Absolute values offer a degree of simplicity but at the risk of a high setting causing gating out quieter sections which might sometime comprise a significant part of material such as a feature film soundtrack. Adopting a low absolute value can cause background noise that is at a relatively high level (for example a documentary by a waterfall) not to be gated out, even though it is not a significant contributor to the perceived loudness. Making the gate level relative may then offer results that more closely reflect perceived programme loudness..

PEAK MODE

Selecting DIGITAL based the reading on individual sample values. TRUE PEAK measurements take the maximum value of the interpolated wave shape.

REFERENCE

This is the frequency chosen for the calibration alignment and is either 400 or 1000 Hz.

CAPTURE

The graph mode can be initiated automatically when the signal starts. The options are MANUAL START, AUTO RESUME and AUTO START.

7.5 Loudness option

This allows the threshold of the colour change in the loudness bar to be set. It can be varied between 0 dB and -20 dB.

8 DK utility program

8.1 USB connection to PC

Conventional use of the DK Meter connects it to the provided mains power supply via the USB cable. The USB connection can be used to install software updates such as updating a DK1 meter the DK2. To do this, a DK port driver must be installed on your Windows PC. DK programs are designed for PCs operating on Windows XP, Vista or Windows 7. Software may be supplied as a “ZIP” file which should be stored somewhere convenient on your computer and unpacked, taking note of the path where files are being place.

1 Connect the DK Meter to a PC USB port and ensure the meter and PC are switched on. The Windows PC will normally detect the connection of the DK meter and provide a dialogue box as shown.

2 Do not have the PC attempt any automatic software location option but click the option that you have a disk and then browse to the location of the file DKT_COM_XP.INF for Windows XP systems, or DKT_COM_VISTA.INF for Vista and Windows 7 systems.

3 The security system of the Windows install process may query if you are sure you wish to install this driver or to stop. Continue with the installation and when it is completed the PC will be able to communicate with the meter.

8.2 Software updates

Software updates will be supplied with the installation utility “dkMeterUpdate.exe”.

1 Once the driver is installed as described in the previous section, and with the DK Meter connected, run the DK program “dkMeterUpdate.exe”.

2 If the USB driver for the DK meter has just been installed it may be necessary to click the REFRESH PORTS button. If you are unsure which COM port has been assigned for the connection to the DK meter, click FIND INSTRUMENT.

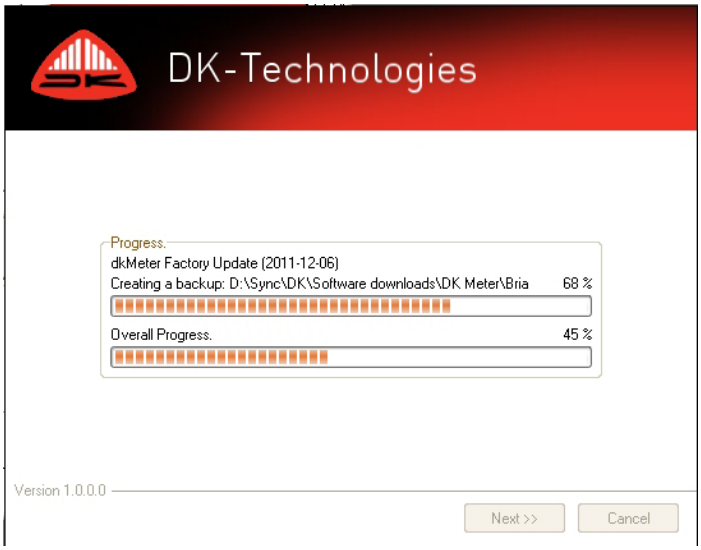
3 Once the port is confirmed, click CONNECT and information about the meter will be displayed..

4 To install new software into the meter, click on the browse button (with three dots) and locate where the installation file has been stored. NEXT and on the following screen select the file to be installed.

6 You will be invited to make a backup copy of the software currently in the meter and this is always prudent if you do not already have a copy of the currently installed software.

7 When you click on NEXT the software installation begins, once any backup that was requested has been completed.

8 The update concludes with a meter reboot and computer screen confirmation is needed to complete the process.



8.3 Software activation

Some feature enhancements are sold by way of new software activation keys. If you have bought a new SWA, it is also installed using the installation utility “dkMeterUpdate.exe”. Follow steps 1 to 3 as described above as though installing new software. The driver must be installed as described previously but instead of entering a file name to be installed enter the text:

SWA/****-****-****-****

The ‘*’ are replaced by the sixteen digits of the new SWA key. No space characters should be entered, only hypens between each block of four.

Click on NEXT to install the new activation key. If the meter does not automatically re-boot, switch it off and back on again to ensure the new SWA is in operation. The installed key can be verified by going to:

MENU \ MENU \ MENU \ SETUP \ ABOUT \ SYSTEM \ SOFTWARE \ ACTIVATION KEY

9 Product support

If any aspect of your product gives cause for concern or you wish to enquire about options and upgrades, the normal point of contact is the dealer who supplied the unit. In case of difficulty locating them, DK-Technologies will be pleased to assist as fully as possible. No unit should ever be returned to DK Technologies without prior agreement that this is the right procedure and a Return Authorisation Number must be obtained from DK and shown on the package and accompanying paperwork.

DK-Technologies A/S
Marielundvej 37D
DK-2730 Herlev
Denmark
t +45 44 85 02 55
f +45 44 85 02 50
email: info@dk-technologies.com
web: www.dk-technologies.com