

**MSD600C
MSD600C-SA
MASTER STEREO DISPLAY**

MK II

USER'S MANUAL

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1 INTRODUCTION

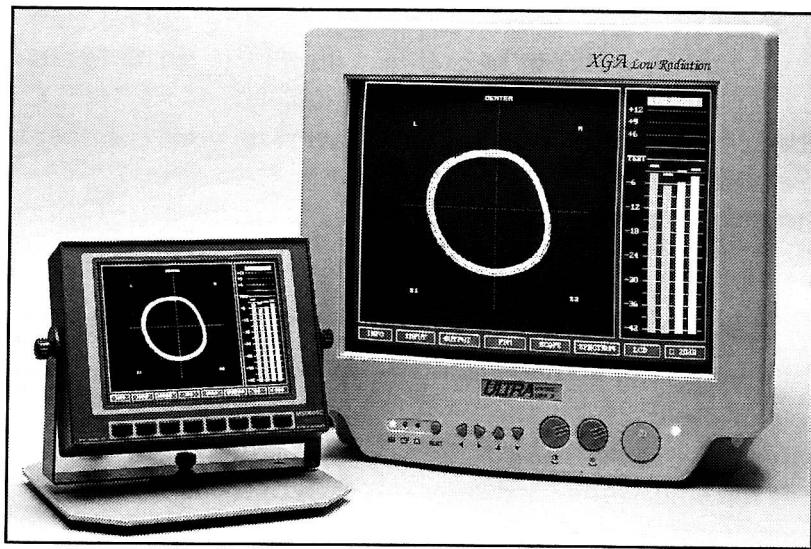
1.1 AUDIO METERING

In the audio industry one of the most important instruments used is the human ear. Producers, sound engineers and technicians rely on their hearing to create the desired sound, be it either the accurate reproduction of an acoustic instrument, or a new electronic musical. Many people from different walks of the audio industry have truly "Golden Ears" that will tell them all they need to know about the sound, and while the human ear is a highly sophisticated instrument, it is very subjective and as such may well be misleading as to what is expected of the final product. And, of course, if you do not believe in "Golden Ears", you may want help from other sources.

As the eyes account for as much as 4/7 of all the human senses, it is an obvious strength to be able to see what you hear, and it is certainly a great way to confirm the opinions formed by your hearing.

By being able to visualize the audio signal with the assistance of various metering options, things that before were extremely difficult to hear (read: impossible) now become obvious to the eye. The primary tools for this purpose are: The Correlation Meter, The Audio Vector Oscilloscope, and The Level Meter.

Until very recently, level metering, phase indication and stereo image monitoring have been left to traditional instruments such as bar graphs, LED's, and oscilloscopes. Enter the Master Stereo Displays from DK-Audio combining all these functions and more in one compact audio monitoring workstation.



The family of Master Stereo Displays now ranging from simple monochrome versions over bright electroluminescent displays to multichannel colour versions all share the same basic functions: The Correlation Meter displaying the average relationship between two audio signals, The Level Meter indicating the level of the signal on up to as many as 7 international scales with peak and overload indication, and The Audio Vector Oscilloscope producing a visual picture of the audio signal and thus making it easy to recognize mono or stereo patterns. Add to this options such as Spectrum Analysers, Surround Sound Monitoring, Level Recording, and Acoustical and Vibration Analysers, and you have a complete metering system available.

By purchasing a Master Stereo Display from DK-Audio you have decided to actually "see what you hear!". We wish you a good return on your investment, and hope that your Master Stereo Display will prove a useful tool in your daily work.

MSD600C USER'S MANUAL

If you have any comments or suggestions for future functions or options, we would like to hear from you. Please write to DK-Audio at the address on front page, or call +45 44 53 02 55. Or use the enclosed Registration Card to send us your comments. The Registration Card is also your easy way to receive information from DK-Audio on future Master Stereo Display products.

1.2 ABOUT THE MSD600C MASTER STEREO DISPLAY

The MSD600C can be used as the master meter of any mixing console or other studio and broadcast applications.

It displays the stereo information and the stereo programme level at the same time, and provides the engineer with the maximum information about the recorded audio signal. The VGA-output makes it easy to display the information on a separate, larger monitor.

The characteristic of the PPM can be selected from softkeys, and most international standards are supported. The input reference level is individually selectable, together with an additional 20 dB of input gain (analogue mode only). All processing is digital and ballistic, and scale errors are virtually eliminated.

A flash prom chip will store all user defined parameters.

The high quality colour LCD display has a very high contrast ratio and viewing angle, and the life-time of the dual CCT backlight averages more than 15 years of normal use (50.000 hours).

The mounting bracket and the supplied base plate make it easy

to fix the unit to the console or desk, and allows the unit to be adjusted to obtain best viewing angle.

1.3 PRECAUTIONS

Important: Before removal of the housing disconnect the power supply. Never apply power while the housing is removed.

Please observe the following guidelines for a longer, troublefree life of your MSD600C:

- never operate the unit while opened, as high voltage (600 V AC) applied to the LCD background illumination is dangerous.
- avoid getting the unit wet or humid, since water will create leakage currents on the PCB board and may damage the circuitry.
- as the LCD display and backlight elements are made from fragile glass material, impulse and pressure to the module should be avoided.
- do not touch the display surface or stain it. As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.
- do not allow water or liquids to remain on the surface for long. This may cause local deformation or discolouration.
- if the LCD breaks, and the liquid crystal runs out, keep well clear of your mouth and eyes. If it sticks to your skin or clothes, wash it off immediately with soap and water.

2 HARDWARE (VERSION 1.2)

In this section we take a closer look at the components of the MSD600C Master Stereo Display in some detail.

2.1 THE AUDIO INPUTS

The MSD600C is equipped with both analogue and digital inputs. All connections are made via standard DSUB connectors on the rear of the cabinet. The sensitivity is 1,55V.

2.2 THE POWER SUPPLY

The power supply is based on the switch-mode and linear regulation principle. The power input is through the 9-pin DSUB connector on the rear of the cabinet .

Recommended supply voltage is 12V DC, 2 A.

A 230V Power Supply Adapter is supplied with the MSD600C as a standard accessory (Europe only).

High voltage for the LCD background light is generated internally.

NOTE: Special care must be taken in a service or maintenance situation as 600 V AC is present on the PCB.

2.3 THE CODEC CIRCUIT

The Codec circuit integrates the key audio data conversion and control functions into a single integrated circuit. Anti-alias and anti-imaging filters are incorporated on-chip. Dynamic range and signal-to-noise will typically exceed 80 dB over the 20 kHz audio band. Sample rate is fixed at 48 kHz.

The Codec includes a pair of Σ analogue-to-digital converters (ADC's), and a pair of Σ digital-to-analogue converters (DAC's). Gain can be controlled independantly for each channel.

The Σ DAC's are preceded by a digital attenuator and a digital interpolation filter. Nyquist images are removed from the DAC's analogue stereo pairs by on-chip switched-capacitor and continuos-time filters.

2.4 THE DSP MICROCOMPUTER

The Analog Devices® ADSP-2181 is a single chip microcomputer optimized for digital signal processing (DSP) and other high speed numeric processing applications. The computer has 16K words of (16-bit) data memory RAM, and 16K words (24-bit) program memory RAM on-chip. It runs with an instruction cycle of 30 ns from 16.67 MHz crystal @ 5.0 Volts.

2.5 THE FLASH-PROM (PROGRAM STORAGE MEDIA)

All software is stored in the FLASH-PROM circuit. The FLASH-PROM circuit is only active during program loading, all real-time computation takes place internally in the DSP.

The FLASH-PROM configuration allows new software to be downloaded via the RS232 serial communication port.

2.6 THE LCD DISPLAY

The LCD display is a full TFT VGA dot matrix display. It has a graphic resolution of 480 dots (vertical) by 640 dots (horizontal). The display has two cold cathode tube units (CCFT) installed inside the unit for background illumination. The display is controlled directly from the DSP.

3 INSTALLATION

3.1 MOUNTING

The MSD600C is supplied with complete mounting bracket and fittings, making it easy to mount on any console or desk. The bracket makes it possible to adjust the unit both horizontally and vertically for the best viewing position.

The enclosed fittings for mounting are:

- 1 bracket (U-form)
- 1 circular base plate
- 3 finger screws w/washers

Mounting screws are not supplied.

To mount the MSD600C in as flexible manner as possible use the supplied base plate. Screw the base plate to your console or work surface using 2 pcs. 4 mm wood screws (or appropriate alternative depending on material). Fix the bracket on top of the base plate and secure with a finger screw. Now fix the MSD600C to the bracket by two finger screws. Insert starwashers between bracket and cabinet/base-plate.

This will allow the MSD600C to be turned both horizontally and vertically thus allowing for best viewing angle.

If you want a firm mount only allowing the unit to be turned vertically, screw the bracket directly to your console or work surface using 2 pcs. 4 mm screws.

A standard base-plate to mount the MSD600C is available as an optional extra. This is made of 4 mm aluminum with four rubber feet to ensure a solid grip on the work desk. Order number: MSD-BASE/O.

3.2 AUDIO CONNECTIONS

The MSD600C is connected to your audio source via the standard 25-pole DSUB socket (analogue inputs) and the 9-pole DSUB socket (digital inputs) on the rear of the unit. See pin configuration in Appendix A. All audio inputs may be connected at the same time, and the selection of the four chosen channels is made via the softkeys. Any two pairs of audio inputs may be active at the same time, i.e. analogue 1 and 2 plus AES/EBU 3-4, or all 4 analogue or all 4 digital inputs.

Note: When digital input is selected but no digital source is connected the PPM will show maximum or minimum output, and the status display will show corrupt data (and flicker). If only one pair of inputs is selected digital with no signal, the other inputs (in analogue mode) will operate slower. It is recommended that input channels with no digital source present always be set to ANALOGUE mode.

A standard connection cable set is available from DK-AUDIO under Order No. MSD-CABLE600/O. The cable set has all necessary DSUB connectors to XLR (audio in/out), RS232 and DIN (power). When mounting make sure to allow enough loose cable for the unit to be tilted and turned.

3.3 POWER CONNECTION

The MSD600C operates on 12V DC, 2 A. Power is connected to the unit via the 9-pole DSUB connector socket on the rear of the unit which also houses the RS232 and digital audio input connections. Feed it either from the standard power adapter supplied with the unit or from an appropriate power source in your console or desk. Make sure that the connection is secure and allow enough loose cable for the unit to be tilted and turned.

A standard 230V/50Hz power adapter is supplied with the unit (Europe only).

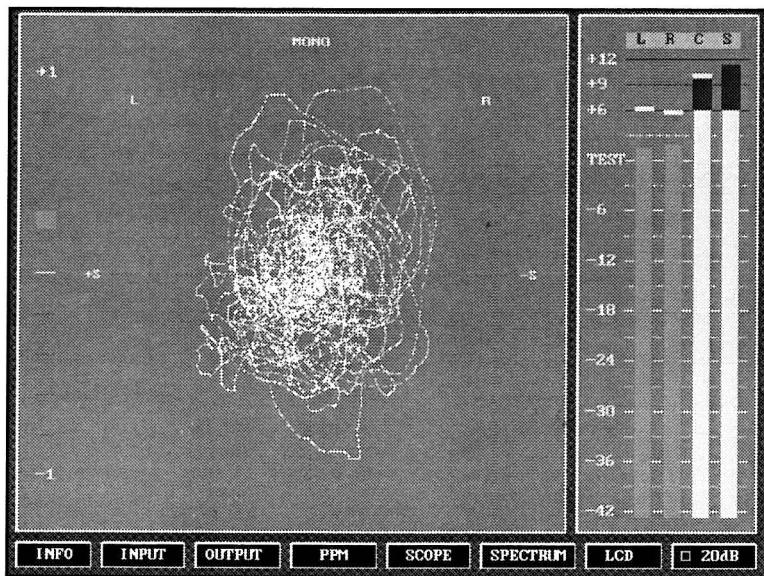
3.4 EXTERNAL VGA OUTPUT CONNECTION

The output for an external VGA monitor is through the 15-pole DSUB connector on the rear of the cabinet.

4 OPERATION

4.1 THE MAIN DISPLAY AND CONTROL KEYS

The main display shows all three types of information simultaneously: The Phase Correlator (or Phase Meter) (left), The Audio Vector Oscilloscope (center) and The Level Meter (PPM) (right). Below these main displays are displayed the menu text line for softkeys and additional information for the selected function.



The eight keys under the display are assigned to the functions displayed in the menu text line.

4.2 THE PHASE CORRELATION METER

The Phase Correlation Meter is of the so-called “Center-Zero” type, and displays the phase relationship between the two input signals. A stereo signal will ideally show [0] which is random distributed phase, and therefore the maximum ambient effect. Mono will indicate [+1], and a signal with reversed phase components will indicate in the range [0] to [-1].

When the indicator moves into the negative or ‘non mono-compatible’ area it will change to red colour for easy identification.

Never allow negative indication if your signal is going to be reproduced in mono.

Input signals below a predefined threshold will force the indication towards zero. Only major phase components are considered.

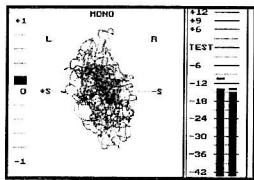
4.3 THE AUDIO VECTOR OSCILLOSCOPE (Stereo Image Monitor)

The Audio Vector Oscilloscope is also known under the names of Stereo Image Monitor and Goniometer. It is based on continuous graphic illustration of the phase and amplitude of the stereo signal in the Lissajous-format.

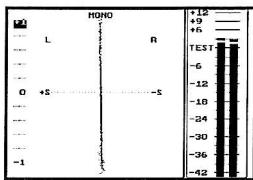
If phase and amplitude are randomly distributed, the signal is an ideal stereo signal.

Normally this will only happen with a live recorded signal. Applause from a live recorded audience gives you an excellent example of a true stereo signal. The figure of a true stereo signal should be represented on the oscilloscope as a perfect

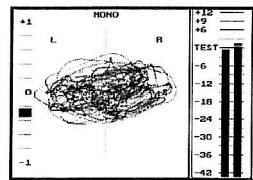
circle, or rather as a "ball". See the illustrations below for examples of different types of signals as they appear on the display, and note also the relationship between the representations on the correlation meter and the oscilloscope.



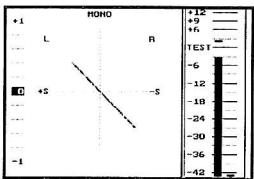
IDEAL STEREO
SIGNAL



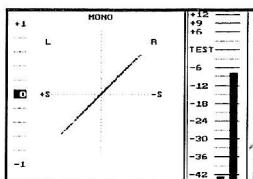
MONO SIGNAL



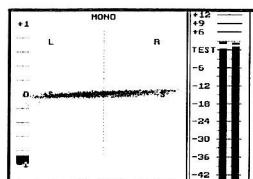
REVERSED PHASE
STEREO SIGNAL



LEFT SIGNAL



RIGHT SIGNAL



REVERSED PHASED
MONO SIGNAL

4.4 THE PEAK PROGRAMME METER (PPM)

The Peak Programme Meter (or Level Meter) is designed for direct measurement of the quasi-peak level of complex electrical signals occurring in the transmission of music and speech, without varying the sensitivity of the device, to achieve optimum technical utilization of the transmission channel, or of the recording medium.

For this purpose a full-wave rectifier is used, and the integration time is chosen to obtain an amplitude as high as possible, without overloading the transmission link for a period long enough to give rise to audible non-linear distortion of the programme. The return time is relatively long in order to avoid unnecessary viewer fatigue.

The MSD600C features 4 different international PPM scales in accordance with IEC 268-10, IEC 268-17 and DIN 45406, as well as a standard VU and two digital scales. The available scales are:

1	Type I	Nordic
2	Type IIA	BBC
3	Type IIB	EBU
4	Type DIN	DIN
5	Type VU	VU
6	Type DIG 1	Digital
7	Type DIG 2	Digital

The different scales are selected from the [**PPM**] menu. Please refer to the drawing of the scales in section 4.7.1. The level meter of the MSD600C features the following additional functions:

- “Flying” Peak Indication
- Peak Hold
- Overload Indication
- Coloured (red) lines in overload section of scale
- Individual reference level selection

4.5 INPUT GAIN

The input sensitivity can be increased by 20 dB by pressing the **[20 dB]** key in the main menu. The function is used to obtain the best possible dynamic range and accuracy of measuring a weak signal.

☞**Note:** The input gain function is only available in analogue mode.

4.6 LCD MENU [LCD]

This is the menu point where the light (or brightness) adjustment is selected. Press **[LCD]** to access the menu point.

4.6.1 BRIGHTNESS [LIGHT]

To adjust the LCD display's brightness, enter the light menu by pressing the **[LCD]** key. Now adjust light by stepping the **[LIGHT]** arrow keys up or down as indicated. This will adjust the background lighting for the best possible clarity of viewing.

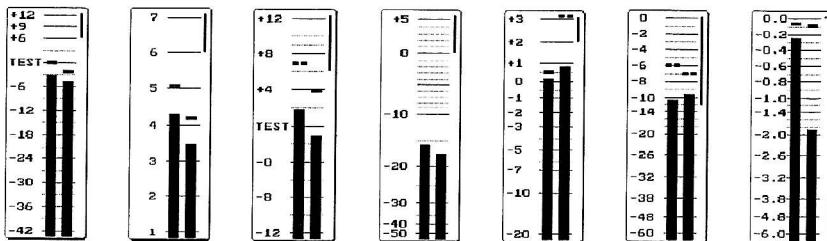
After making the above adjustment press the **[EXIT]** key to return to main menu.

4.7 PEAK PROGRAMME METER [PPM]

Enter the PPM menu by pressing the **[PPM]** key. From the PPM menu you can choose one of the 7 international scales defined in the unit by pressing **[SCALE]** as well as selecting the options **[PEAK]**, **[FAST]** and **[HOLD]**.

4.7.1 SELECT PREFERRED PPM SCALE

7 international scales are supported as described in paragraph 4.4. Please study the following reference reports to obtain the complete set of specifications: the IEC268-10 Peak Programme Level Meters, the DIN 45406 and the Pflichtenhefte 3/6, the IEC 268-17 VU Meter, the Nordic N9, the CCIT Report 292-2 and BS6840 part 10.



To select the preferred scale first enter the [**SCALE**] menu. Then select the preferred scale by pressing the appropriate key.

4.7.2 SETTING THE PPM REFERENCE LEVEL

After selecting the preferred scale you have the option of setting the reference (test) level individually for that scale. To do so first take off the write-protection: go to the INFO-menu, and press [**WR-PROTECT**]. Then [**EXIT**] to MAIN-menu and select [**PPM**]. Select the menu-point [**SCALE**] and choose the preferred scale, then use the arrow up and down keys to set the reference level for that scale. Repeat the procedure for each of the scales. When you have set the level press [**EXIT**] to go back to the main menu.

Note: Any changes made with the write protection OFF will permanently change the reference point of the PPM. After setting the reference level as described above, do not forget to step back to the INFO-menu to put the WR-PROTECT back on.

Note: Test level 0 dBu (0.775V RMS) is standard.

4.7.3 PPM PEAK AND PEAK HOLD

The PEAK function activates the ‘flying’ peak indicators above each PPM bar. To toggle this function on/off press **[PEAK]**. This function works closely with the Peak HOLD described below.

The Peak HOLD function will allow you to check the maximum signal level during, or especially after, the recording session. Thus you can ascertain that the level does not exceed any predetermined limits. To select Peak HOLD press first the **[PPM]** key, then **[PEAK]** and **[HOLD]**. Then toggle the HOLD function on or off by pressing the **[HOLD]** key.

In the HOLD mode, the “flying” segments on the PPM bars will indicate the highest bar-graph value since the last hold reset.

4.7.4 PPM FAST MODE

To select FAST mode press first the **[PPM]** key, then **[FAST]**. Then toggle the FAST function on or off by pressing the **[FAST]** key. In the FAST mode the PPM integration time is set to zero. The bar-graph therefore indicates the peak value of the input signal. Please note: with a steady sinusoidal signal the bar-graph indication is the same whether FAST is enabled or not.

4.7.5 PPM TEXT BAR

The text bar above the four PPM’s has two switchable modes: 1 2 3 4 or L R C S. Switch the text as preferred, by selecting **[WR-PROTECT]** off, then **[PPM]** and **[MISC]** and toggle between 1 2 3 4 and L R C S.

4.7.6 PPM COLOUR

The colour of the PPM bars can be selected individually for each channel. There are six colours to choose from. To select colour take off [**WR-PROTECT**] and select [**PPM**], then [**MISC**]. Choose the number (1,2,3 or 4) for the channel you wish to change colour. Press the key for the appropriate colour (green, yellow, blue, cyan, blue, white). Repeat the process for each channel if desired. Put [**WR-PROTECT**] back on.

4.7.7 PHASE CORRELATOR (SCOPE)

The phase correlator can operate in either FAST or SLOW mode. To change the setting select [**SCOPE**] from the MAIN-menu, then [**CORRELAT**] and press the [**SLOW**] or [**FAST**] keys as required.

4.8 SELECT INPUT DIGITAL OR ANALOGUE [INPUT]

The MSD600C can be user configured from the softkeys to operate either in digital or in analogue input mode, or a combination. To select input mode press the [**INPUT**] key to open the INPUT menu. Now set the two pairs of channels to analogue or digital mode by pressing the [**DIGITAL**] and [**ANALOG**] keys. You can select the following combinations for the two pairs of input channels:

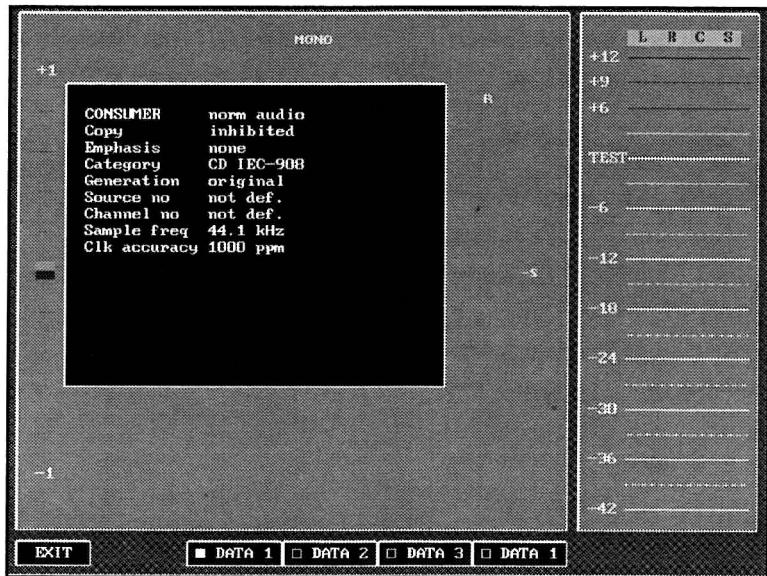
CH1+2	CH3+4
ANALOG	ANALOG
ANALOG	DIGITAL
DIGITAL	DIGITAL
DIGITAL	ANALOG

Note: When digital input is selected but no digital source is present the PPM will show minimum output, and the status dis-

play will show corrupt data (and flicker). If only one pair of inputs is selected digital with no signal, the other inputs (in analogue mode) will operate slower. It is recommended that input channels with no digital source present always be set to ANALOGUE mode.

4.9 BITSTREAM STATUS DISPLAY

When digital mode is engaged for any input channel the bitstream information for that channel can be displayed on the screen. This will allow you to determine for example the following:



PROFESSIONAL/CONSUMER

This indicates whether the signal originated from professional or

consumer type equipment, and thus indicates the necessary decoding mode.

EMPHASIS

SAMPLE FREQ.

CHANNEL MODE

USER BIT

WORD LENGTH

REF.SIGNAL

ORIGIN

DESTINATION

In addition to this the unit can show hours, minutes, seconds, as well as a frame counter in the following format:

H:M:S:FRAM 00:00:00:000

For further information on the status display please refer to IEC928.

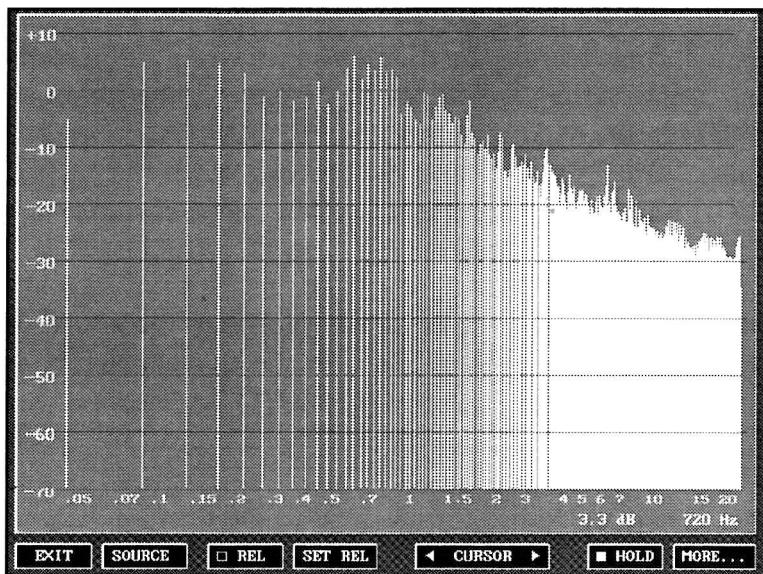
The above information may be displayed for each of the four channels when digital mode is selected. To display the bitstream status select **[INPUT]** in the MAIN-menu, then **[CH-DATA]**. Then select the appropriate channel by pressing the corresponding keys, for example **[DATA 1]** for the left Channel 1. Toggle between the four channels by pressing the appropriate DATA-keys.

Displaying of the bitstream data is conditional to the source equipment actually transmitting these data. When the selected channels are in analogue mode, the function **[CH-DATA]** cannot be shown.

5.0 SPECTRUM ANALYSER (ONLY MSD600C-SA)

5.1 FFT-SPECTRUM ANALYSIS

Most spectrum analysers for sound engineering are based on analogue filtering techniques. For many years this has been the only practical solution for real-time analysers at a sensible size and cost. Modern signal processors like the MSD600C-SA has made it possible to implement the complex FFT (Fast Fourier Transform) algorithm, which outperforms its analogue counterpart by many lengths. The number of frequency bands are increased from the traditional 27 or 31 to 1024, and the dynamic range to 80 dB. The improvements make it possible to analyse noise, distortion(IM) and frequency response in a much more detailed way.



5.2 SPECTRUM ANALYSER OPERATION

To enter the FFT Spectrum Analyser mode select [**SPECTRUM**]. This opens the FFT screen on the display, with frequency indicators from 42 Hz to 20 000 Hz at the bottom, and level indicators on the left hand side. The level is indicated in 10 dB intervals from +10 to -70 dB.

5.3 SELECTING INPUT SIGNAL

To select the **SIGNAL** for FFT analysis on the display press the [**SOURCE**] key in the **SPECTRUM**-menu. Now select the channel to be analysed by pressing the appropriate key, for example [**CH.1**]. A small white square in the key will indicate that the key is selected. This “flag” toggles on/off as the key is pressed. Each of the four channels can be analysed individually, or together in pairs (1+2) and (3+4). The difference signal between the two pairs can be analysed by pressing the [**A-B**] key.

5.4 FREQUENCY CURSOR MOVE

The arrow keys [**CURSOR**] in the **SPECTRUM** menu will move the frequency cursor left or right. While holding the key down the speed of the cursor movement is increased by a factor of ten. Exact placement of the cursor is done with individual key strokes. The numeric field shows the level and frequency of the cursor position. The resolution of the spectrum analyser is higher than the screen resolution. Consequently not all analysis results are displayed. The frequency cursor can be used to obtain the ‘hidden’ data since it will display the complete set of data.

5.5 FREQUENCY CURSOR RELATIVE SET [SET REL]

This function works together with the Display Relative Set function (5.6). With the **[SET REL]** key the curve readings can be normalized to the reading at cursor. If the display relative set is active the complete curve is shifted up or down until the cursor reading is zero. The **[SET REL]** key will only manipulate the on-screen data and should generally not be used to raise a weak signal since accuracy is lost.

The numeric readout will always follow the graph.

5.6 FREQUENCY CURSOR RELATIVE DISPLAY [REL]

The display relative function is used in conjunction with the set relative function (5.5). The **[REL]** function key will toggle between an absolute and a relative readout for both the graph and the numeric readout.

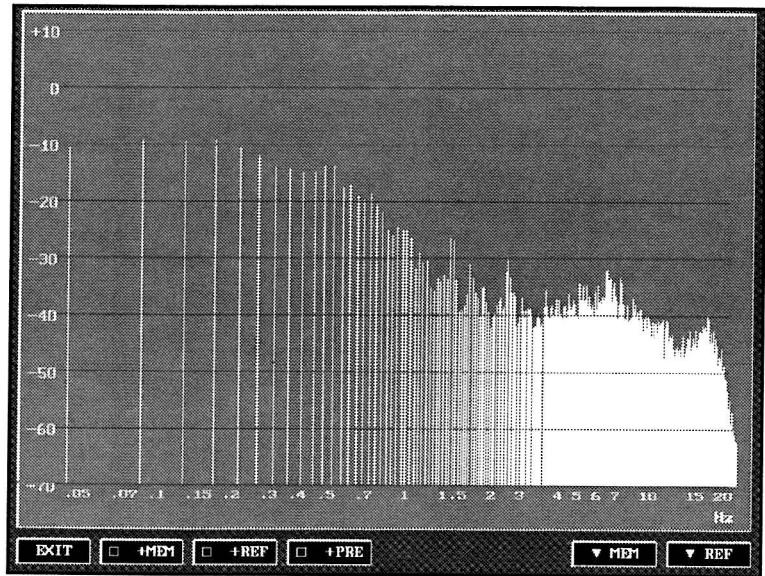
5.7 HOLD FUNCTION

The HOLD function will disable the display fall back function and thus show the maximum value since the HOLD was activated.

The HOLD function may be toggled on/off by pressing the **[HOLD]** key.

5.8 SPECTRUM ANALYSER MENU LEVEL TWO [MORE]

Menu level two provides more data manipulation functions. At this menu level the frequency cursor is not displayed. Select **[MORE]** to access the level two menu.



5.8.1 CURVE MENU

The curve menu is used to display the spectrum analysis relative to a temporary or predefined reference curve. The relative display functions can all be active at the same time.

To access the CURVE menu press **[CURVE]**.

5.8.1.1 TEMPORARY CURVE STORAGE [REF]

This function is used to store a curve temporarily in order to show the difference curve with the display relative function (5.8.2.1).

Press **[REF]** and the curve currently on screen will be memorized. The memorized curve is reset to 'flat' response every time the spectrum analyser is terminated.

This function is useful for acoustic testing of rooms, loudspeakers etc.

5.8.1.2 PERMANENT CURVE STORAGE [MEM]

This function is used to store a curve permanently in the FLASH-PROM in order to show the difference curve with the display relative function (5.8.1.4). The curve currently on screen will be memorized by pressing the **[MEM]** key, and will be recalled when ever the spectrum analyser is engaged.

The memory function is sensitive to the write-protection **[WR-PROTECT]**. If write-protection is on the **[MEM]** can be used for temporary storage only.

This function is useful for acoustic testing of rooms, loudspeakers etc.

5.8.1.3 RELATIVE DISPLAY TEMPORARY CURVE [+REF]

Select the **[+REF]** function to add the temporary curve storage (5.7.2.1) to the current audio spectrum.

5.8.1.4 RELATIVE DISPLAY PERMANENT CURVE [+MEM]

Select the **[+MEM]** function to add the permanent curve storage (5.8.1.2) to the current audio spectrum.

5.8.1.5 RELATIVE DISPLAY PRE-EMPHASIS CURVE [+PRE]

The pre-emphasis is 'lifting' the data readout with 3 dB/octave, resulting in a visual appearance of a 1/3 octave analyser.

This lift provides a closer relationship between the aural and the visual judgement of the musical audio spectrum.

5.8.2 WINDOW MENU

Since the spectrum analyser is based on the Fast Fourier Transformation principle the sampled audio data need *windowing*. An in depth mathematical explanation is not the scope for this manual and should be retrieved from other technical literature.

The audio is sampled with 48kHz and entered in a digital buffer having the length of 1024 entries. This amount of audio samples is then analysed and displayed. While calculating the FFT a new set of data is recorded. No data is lost.

Since the 1024 samples used for the calculations is a *window* of the continuous audio samples the beginning and the end of the 1024 need some smoothing in order not to develop erroneous results. The data needs *windowing*.

The system is implemented with several different window functions. The recommended window function for most applications is the HANNING window (5.8.2.1).

To access the WINDOW menu press [**WINDOW**].

5.8.2.1 RECTANGULAR WINDOW [RECT]

In the rectangular window function all samples are multiplied with one. This window function is merely a method of disabling windowing of the data. **The rectangular window provides the highest selectivity, but the lowest dynamic range.**

5.8.2.2 HANNING WINDOW [HANN]

The Hanning window is useful in most applications and should be selected as default.

The HANNING window provides high dynamic range, but low selectivity.

5.8.2.3 HAMMING WINDOW [HAMM]

The Hamming window is ideal for applications where the requirement for the dynamic range is known. **The HAMMING window compromises between selectivity and dynamic range.**

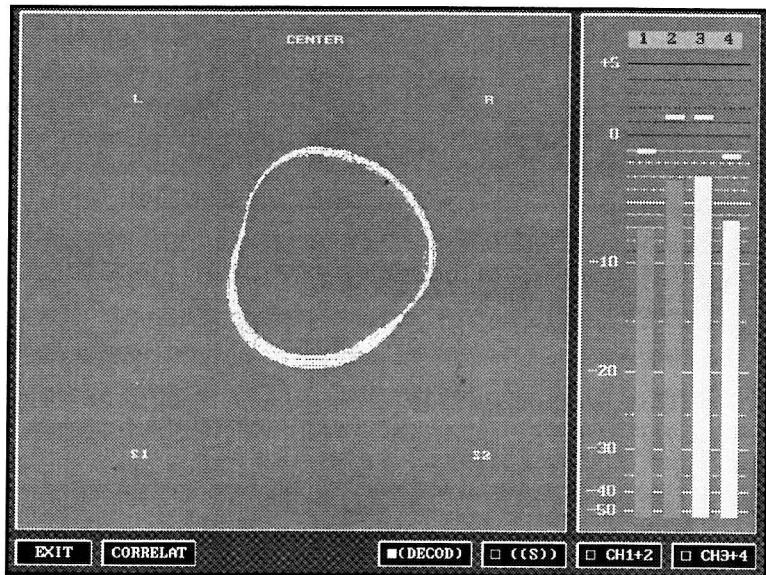
5.8.2.4 NUTTALL WINDOW [NUTT]

The Nuttall window is especially useful for distortion measurements. **The Nuttall window provides the highest dynamic range and compromises the selectivity.**

6 ((S)) SURROUND SOUND OPTION (WHERE INSTALLED)

The MSD600C has two Surround Sound monitoring functions: the "Jelly-Fish" image and the pseudo-decoder. Use the Jelly-Fish image to monitor a standard LRCS surround signal, and use the pseudo decoder to monitor an encoded signal. There is no need for an external surround sound decoder.

The Surround Sound Option is available from your local dealer under the product code: MSD-SURROUND/O.



6.1 THE "JELLY-FISH" SURROUND SOUND MONITOR

To select the Surround Sound monitor format press the [SCOPE] key and select [(S)]. This will change the scope trace to surround mode and the figure will now show a circular "jelly-fish". The figure

represents the five surround channels in vector format as indicated on the screen: left (L), right (R), center (C), surround left (S1) and surround right (S2).

A circular shaped figure will indicate perfect surround signal, center information is indicated by a top pointing bullet shape, and left/right information is a heart shape.

6.2 PSEUDO-SURROUND DECODER (BUILT-IN)

With Left-Total and Right-Total signals fed to Channels 1 and 2, surround indications as described in 6.1 can be presented on the screen. This pseudo-surround decoder is a standard feature of the Surround Sound software for MSD600C, and no external decoder is necessary. To access this function select [**SCOPE**] then [**(DECOD)**].

6.3 SELECT TRACE COLOUR

The surround sound figures can be presented in different colours for each of the above modes for easier recognition of operation mode. To change colour select [**WR-PROTECT**] off in the INFO-menu, then select [**SCOPE**] and the appropriate surround sound mode. Now select the desired colour by pressing the key (blue, green, blue, red, cyan, yellow, white). Repeat process for the second surround mode, and return to INFO-menu to put [**WR-PROTECT**] back on.

7 OUTPUT MENU [OUT]

From the output menu the electronically balanced analogue outputs are controlled. To access the OUTPUT menu press **[OUTPUT]** in the MAIN menu.

7.1 SELECT TONE SIGNAL [TONE]

This function will enable or disable the low distortion tone generator.

7.1.1 TONE GENERATOR SETTINGS [SETTINGS]

The tone generator is driving all outputs with the same signal, but each output driver is separate. To enter the SET menu press **[SETTINGS]**.

7.1.1.1 TONE GENERATOR FREQUENCY

The output frequency is set with the arrow left and right keys. The frequency can be chosen with large steps by activating the **[x10]** key, or in smaller steps without this key.

7.1.1.2 OUTPUT AMPLITUDE SETTING

With the arrow up and down keys the output amplitude for tone generator is set in whole dBu.

The output amplitude can be set in large or small steps by use of the **[x10]** key.

7.2 SELECT INPUT SIGNAL

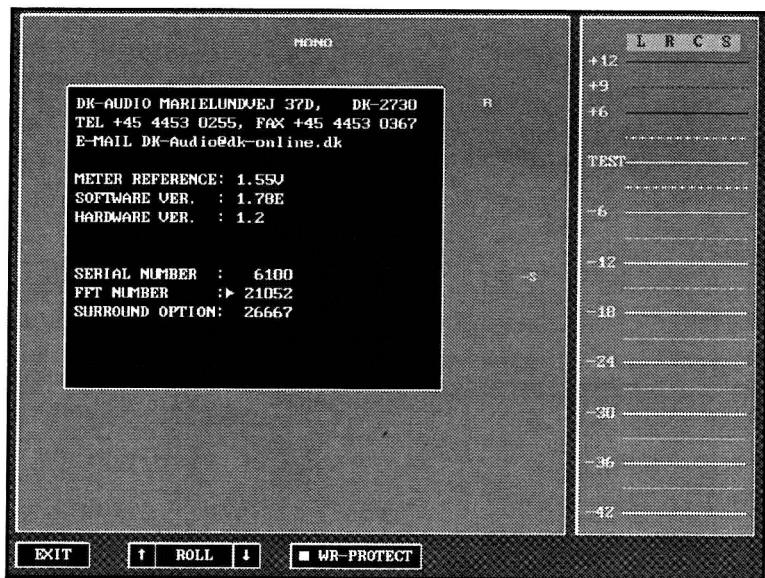
If input **[INPUT]** is selected, the input signal will be 'echoed' to the output. This function is used to monitor the audio signal to the MSD600C, and is not intended as an actual 'loop-through' function. This function operates with both analogue and digital input signals.

7.3 SELECT TEST OUTPUT [NOISE]

From this menu point you can select white noise.

8 DEFAULT SETTINGS

The MSD600C has a permanent storage for default settings which will be the actual setting when the unit is powered up.



8.1 PERMANENT DEFAULT SETTINGS [WR-PROTECT]

To set the MSD600C to always power-up with user selected default settings, as for instance PPM scales, reference levels etc., proceed as follows:

Set PPM scale and individual reference level:

1. Select **[WR-PROTECT]** off
2. Select preferred PPM scale as per para. 4.7.1
3. Put the **[WR-PROTECT]** on

8.2 PERMANENT DEFAULT PARAMETERS

The following parameters can be set to permanent default:

1. PPM Scales, analogue and digital
2. PPM Scale reference level, analogue and digital
3. Input selection, analogue or digital
4. Windowing function (FFT-spectrum analyser)
5. Individual colour selection of PPM bars, and scope trace
6. Light intensity (brightness)

9 SOFTWARE UPGRADE

To up-grade the MSD600C to newer software versions or to add new options, connect the RS232 port of the MSD600c to a PC via the COM1 or COM2 port.

The new software will be supplied on floppy-disk or may be retrieved from the Internet.

☞ Please note that the unit must be in ANALOGUE input mode on all channels while down-loading software.

9.1 COM PORT SELECTION

A COM port must be selected on your PC. If you use COM1, type 'SET MSD-LOAD=1' at the DOS-PROMPT. If you use COM2, type 'SET MSD-LOAD=2'.

If a COM port has not been set, the up-date program will prompt you for this.

9.2 UP-DATE PROCEDURE

While in DOS-PROMPT in the correct library for MSD600C up-date software (for example A:\ if you have chosen to run the up-date from the floppy-disk) type 'update' and [ENTER]. This will download the new software from the PC to the MSD600C.

Following this you must re-power the MSD600C to implement the new software. The new software version number will be shown in the INFO menu.

Make sure that you do not strike any key on the MSD600C while the PC is downloading software.

9.3 SOFTWARE OPTION INSTALLATION BY LICENSE NUMBER

The FFT-Spectrum Analyser option may also be installed by keying in a license number. Order the option and obtain the FFT-license number from your local dealer. To install FFT-option go to the INFO-menu and select [**WR-PROTECT**] off, then use the up and down arrow keys to ROLL the numbers until you have set the correct license number. Put the [**WR-PROTECT**] back on, and return to main menu. Repower unit to implement the new option, and from the MAIN-menu select [**SPECTRUM**] to open. Follow instructions in Section 5 to use the spectrum analyser.

Note: If you purchase the FFT-Spectrum Analyser option and the Surround Sound option together they will both be supplied on a disk. In this case it will not be necessary to key in the FFT-option license number.

10 CALIBRATION

The MSD600C is factory calibrated. In normal use it should not be necessary to re-calibrate the unit at all. Unless you are very familiar with this type of product/procedure, we recommend that you do not attempt to calibrate your MSD600C.

10.1 PPM CALIBRATION

The **[CALIBRATE]** menu point in the PPM menu is for service use only. Do not adjust these settings without the complete calibration procedure available from DK-Audio.

11 TECHNICAL SPECIFICATIONS

11.1 POWER SUPPLY

Supply voltage range:	12-15 V DC
DC Power consumption@ 12 V nominal supply :	approx. 18 Watt
Safety according to:	IEC 65

A 230V/50 Hz AC power supply adapter with a 12V 2A DC output is supplied as standard with MSD600C (Europe only).

11.2 CABINET DIMENSIONS

Width:	184mm
Height w/o bracket:	144 mm
Depth:	49 mm

11.3 PPM (LEVEL METER)

Analogue:

Reference indication:	0 dBu
Reference input voltage:	1.55 V
Ref. input voltage adj.:	+14 dB to -2 dB

Digital:

Formats:

AES/EBU and SPDIF

Shifts automatically to the incoming format.

Sample frequency: 44.1 and
48 kHz

Shifts automatically to the incoming sample rate.

Division of scales:

Type I -42 dB to +12 dB

Type IIA: 1 to 7

Type IIB: -12 dB to + 12 dB

Type DIN: -50 dB to + 5 dB

Type VU: -20 dB to + 3 dB

Type DIG 1: -60 dB to +3 dB

Type DIG 2: -72 dB to 0 dB

Amplitude frequency response

30 Hz to 20 kHz: +/-0,3 dB

Dynamic response:

a)Pflichtenheft 3/6: 3 ms / -3 dB

b)IEC 268-10 5 ms / -2 dB

c)IEC-268-17 VU:300 ms

Overswing: none

Return time:

a)Pflichtenheft 3/6 20 dB / 1.5 s

b)IEC 268-10 20 dB / 2.0 s

Reversibility error:	none
Input impedance:	>20 kOhm
Distortion introduced by the PPM:	none
Temperature range:	0° C to 45° C
Overload characteristics:	>21 dBu
Max. input level:	90 V RMS cont.

11.4 PHASE CORELLATION METER

Indication range:	-1 to +1
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11.5 AUDIO VECTOR OSCILLOSCOPE

Automatic gain adj. range:	30 dB, default
Phase error between channels:	none
Display area:	90 x 90 mm

11.6 LCD DISPLAY

Resolution:	640 x 480 dots
Pixel size:	0,2 mm
Lifetime:	50.000 hours
Contrast ratio:	100:1
Viewing area:	135 x 100 mm
Viewing angle:	> 90°

11.7 TONE GENERATOR OUTPUT

Frequency range:	31 Hz to 15500 Hz
Level range:	-3 to +17 dBu

APPENDIX A

Pin Configuration for MSD600C MK II

The MSD600C MK II has three DSUB connectors on the rear of the cabinet:

1. The 25-pole DSUB connector for AUDIO INPUTS and Vcc.
2. The 9-pole DSUB connector for AUDIO OUTPUTS, RS232, Communication and Vcc.
3. The 15-pole High Density DSUB connector for external VGA monitor.

Note: Power may be supplied either through the 25-pole or the 9-pole DSUB.

25-pole DSUB Pin Configuration:

IN	CHANNEL 1	14=HOT	01=COLD
	CHANNEL 2	03=HOT	15=COLD
	CHANNEL 3	17=HOT	04=COLD
	CHANNEL 4	06=HOT	18=COLD
OUT	CHANNEL 1	20=HOT	07=COLD
	CHANNEL 2	09=HOT	21=COLD
	CHANNEL 3	23=HOT	10=COLD
	CHANNEL 4	12=HOT	24=COLD
GND	2,5,8,11,13,16,19,22		
Vcc	25		

9-pole DSUB Pin Configuration:

DIGITAL IN ^{*)}	CHANNEL 1	07=SIGNAL	06=SIGNAL
	CHANNEL 2	09=SIGNAL	08=SIGNAL
RS232	TX=2	RX=3	
GND	1, 5		
Vcc	4		

^{*)} Note that in Digital mode there is no conflict between hot and cold

12 REGISTRATION

Please fill in the enclosed Registration Card and mail or fax it to DK-Audio at address below to obtain the latest information about new MSD products. If your Registration Card is missing, you may use this page instead.

Name: _____

Company: _____

Address: _____

City: _____

Country: _____

Phone: _____

Fax: _____

Unit serial no.: _____

Purchase Date: _____

Which features would you like to see in new versions of this model?

Comments: _____

Mail or fax to:

DK-AUDIO • Marielundvej 37D • DK-2730 Herlev • Denmark

Phone: +45 44 53 02 55 • Fax: +45 44 53 03 67

Place
Stamp
Here

DK-AUDIO
Marielundvej 37D
DK-2730 Herlev
Denmark