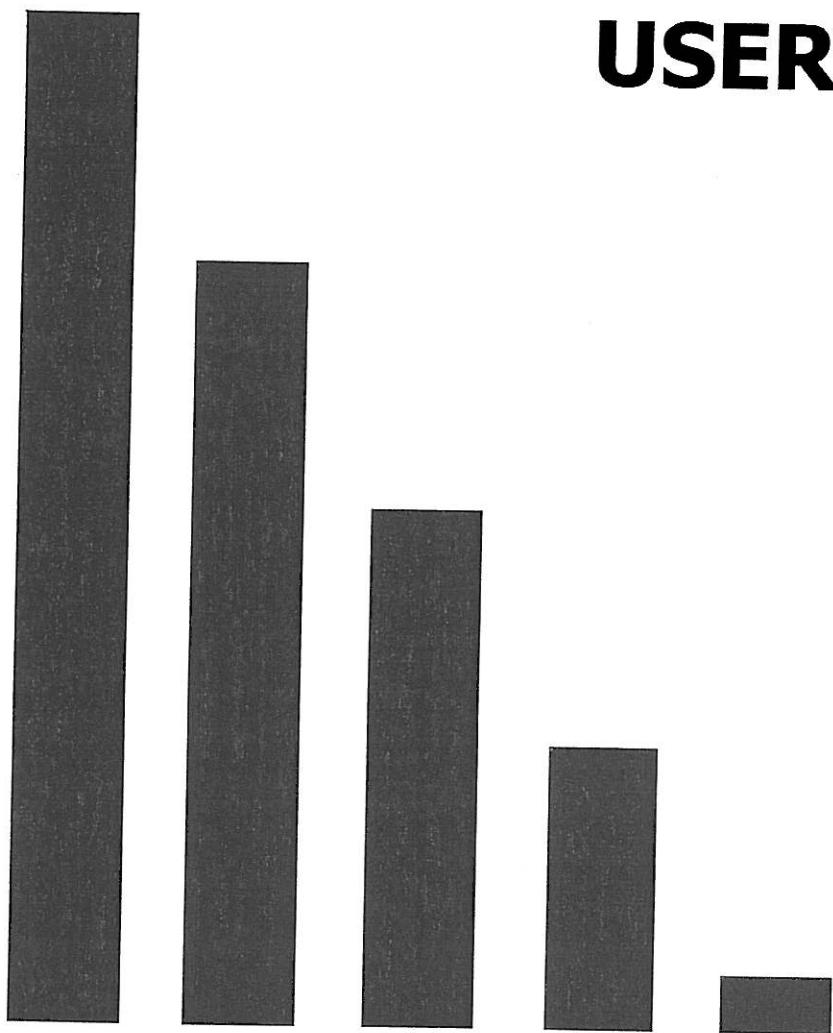
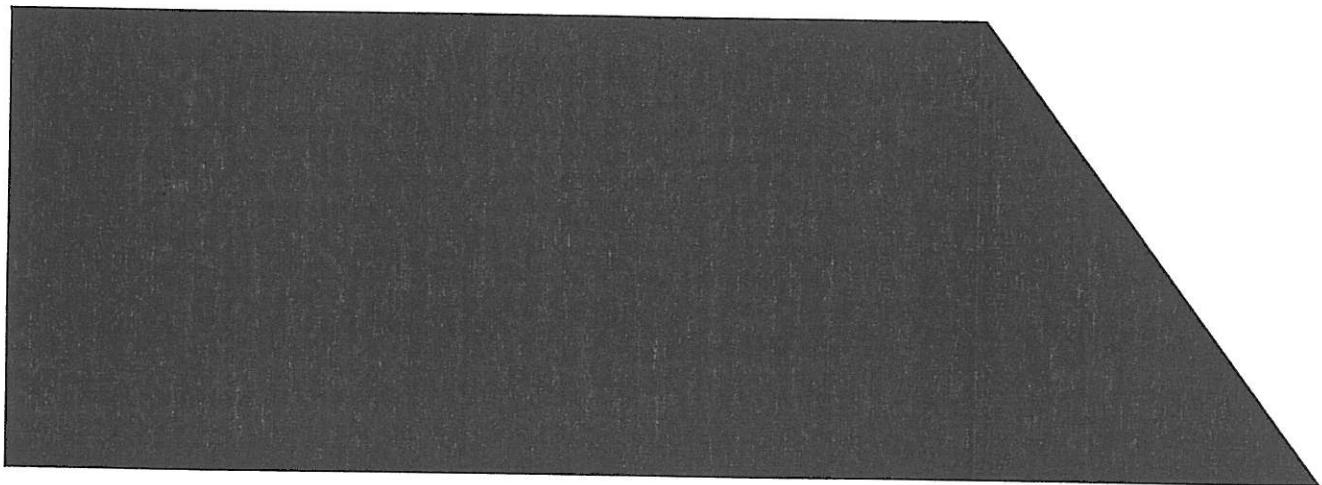


USER'S MANUAL

CDR1616



DIGITAL AUDIO MATRIX



CDR-1616
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USER'S MANUAL

MARCH 1999

Software version 1.22

CONTENTS:

| | | |
|-----------|---|-----------|
| 1 | INTRODUCTION | 3 |
| 2 | ABOUT THE CDR-1616 DIGITAL AUDIO MATRIX..... | 4 |
| 3 | PRECAUTIONS..... | 4 |
| 4 | HARDWARE | 5 |
| 4.1 | The Power Supply | 5 |
| 4.2 | The Audio Inputs | 5 |
| 4.3 | The Audio Outputs | 5 |
| 4.4 | The RS232 Communication Ports | 5 |
| 4.5 | The Reference Clock Input | 5 |
| 4.6 | The Sample Rate Converters | 5 |
| 4.7 | DSP Array Technology | 5 |
| 4.8 | The Control Panel | 6 |
| 5 | INSTALLATION..... | 6 |
| 5.1 | Power Connection | 6 |
| 5.2 | Audio Connections | 6 |
| 5.3 | RS232 Connections (Remote control options) | 6 |
| 5.4 | Reference Clock Connection | 6 |
| 5.5 | Key Inserts for Source and Destination Identification | 7 |
| 6 | OPERATION | 7 |
| 6.1 | Set and Remove X-points | 7 |
| 6.2 | Store X-point Settings (Presets) (SAVE) | 7 |
| 6.3 | Recall X-points (RECALL) | 7 |
| 6.4 | Auto/External Clock | 8 |
| 7 | USER OPTIONS MODE | 8 |
| 7.1 | User options | 8 |
| 7.2 | Exit User options mode | 9 |
| 8 | CONFIGURATION | 9 |
| 8.1 | Enter the Configuration mode at power on | 9 |
| 8.2 | Enter the Configuration mode by the service mode | 9 |
| 8.3 | Exit Configuration mode | 9 |
| 8.4 | Configuration mode | 9 |
| 8.5 | Service mode | 10 |
| 9 | REMOTE CONTROL OPTIONS | 11 |
| 9.1 | External Control Panel | 11 |
| 9.2 | MSD-Remote Software | 11 |
| 9.3 | PC Windows Software | 11 |
| 10 | OTHER OPTIONS | 11 |
| 10.1 | Signal manipulation | 12 |
| 10.2 | Multichannel PPM Software | 12 |
| 12 | SPECIFICATIONS | 13 |

1 INTRODUCTION

2nd Generation Routing

The new CDR-1616 Digital Audio Matrix is the first product in a new series of routing switchers from DK-Audio that we call 2nd Generation Routers. Mostly because DK-Audio have been manufacturing audio routers and matrices since the birth of the company in 1987, and we believe our new technology now justifies the term in general, but also because the CDR-1616 features many unique technical solutions seen here for the first time.

The design concept behind the CDR-1616 was to make digital switching "as easy as analogue!". As the broadcast and studio industries move into the digital world not only to achieve superior audio quality, but also expecting an easier operational life, many engineers are finding themselves confronted with new, and unwanted problems: how to connect product X from manufacturer Z to product A from manufacturer B? Although they may both be digital, they are not the same format and cannot be directly connected, but must be interfaced and synchronized. And with a great many of such products the problems are just beginning....

This is one of the main problems solved by the new CDR-1616: It can accept both AES/EBU and SPDIF digital input formats and automatically synchronize to an internal clock (or external, if you so wish). This means that you can connect practically any digital product, consumer or professional, to the inputs and route it to any output without unwanted delays, synchronization errors or clicks! In fact, you can now perform digital on-air switching with no problem at all.

We wish you all the best with your new 2nd Generation Router, and trust that the new CDR-1616 will make your digital switching "as easy as analogue!"

If you have any comments or suggestions for improvements for future functions, we would like to hear from you. Please write to DK-Audio at the address on the front page of this manual, or call us at +45 44 88 02 55. In any case we would appreciate if you send us the enclosed Registration Card. Returning the registration to us is the easy way to receive information from DK-Audio on future products and/or improvements and options to your CDR-1616.

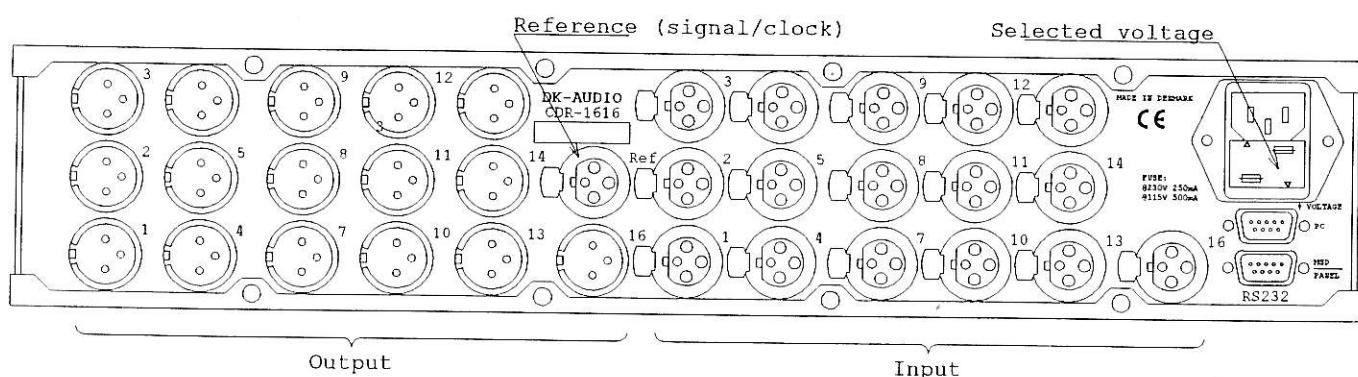
2 ABOUT THE CDR-1616 DIGITAL AUDIO MATRIX

The CDR-1616 can be used in all professional broadcast and studio environments. It offers easy digital routing of 16 inputs (stereo) to 16 outputs (stereo) and synchronizes all incoming signals to the internal clock of 48 kHz, or to an external of your own choice. It is easily operated from a large and logical control-panel on the front of the 19"-2U package. The selector keys are large, illuminated, professional type (Olten/EAO) with film inserts for source and destination identification, and the XLR connectors are industry standard. The keys are illuminated by LED's instead of the more traditional lamps securing a much longer service life.

3 PRECAUTIONS

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

The CDR-1616 is supplied ready to use with an IEC power cable included. Before operation please ensure that the voltage selector (mains/fuse box) on the rear is set to the correct voltage, i.e. 115 or 230V. The unit is factory set to 230V for Europe and 115V for Japan and North America.



4 HARDWARE

In this section we take a closer look at the hardware components of the CDR-1616 in more detail.

4.1 The Power Supply

The power supply is a secondary switched, galvanic separated unit with a toroidal transformer. The power input is through the combined IEC power socket/fuse box on the rear of the cabinet. The power socket has a cable clamp to secure a firm connection. The design of the power supply allows it to handle larger voltage fluctuations without excessive heating. The approximate power consumption is 15 Watt.

4.2 The Audio Inputs

The CDR-1616 is equipped with 16 digital AES/EBU inputs (IEC Norm. 958). The unit accepts signals with sampling frequencies of 32 to 48 kHz, and relations and/or synchronization between the individual signals are not necessary. All input connections are made via female XLR sockets on the rear of the unit. The input impedance is 110 ohm.

4.3 The Audio Outputs

The 16 digital AES/EBU outputs (IEC Norm. 958) are also found on the rear of the cabinet. The output impedance is 110 ohm, and all the sockets are male XLR.

4.4 The RS232 Communication Ports

The CDR-1616 has two RS232 communication ports on the rear of the cabinet. The levels are as per the RS232 standard, but with a pin configuration similar to that of a common PC. The ports only have RX and TX signals (no handshake).

4.5 The Reference Clock Input

This input is used to synchronize the AES/EBU output signals. The external reference input frequency sample range is 43.7 - 48.4 kHz AES/EBU or SPDIF. When the external reference signal is recognized by CDR-1616 the LED-indicator on the front panel changes from INT. to EXT.CLK. The LED will flash for the first 10 seconds to indicate a change. If there is excessive noise in the signal making it difficult for CDR-1616 to interpret the signal the LED EXT.CLK will flash.

If no external reference clock input is connected the CDR-1616 automatically synchronizes to the internal clock frequency of 48 kHz.

Note: Don't loop output signals from the same CDR-1616 to the Ref. Clock Input, as this will cause incorrect AES/EBU signals on the output side. A similar problem may occur if you are running more units parallel and create a loop where, for example, Unit A is supplied from Unit B, and vice versa.

4.6 The Sample Rate Converters

The CDR-1616 has sample rate converters on all inputs, allowing different digital signal formats such as standard 44.1 kHz from a CD-player to be mixed freely with professional 48 kHz signals.

4.7 DSP Array Technology

One of the new technologies employed in the CDR-1616 is the DSP Array Technology. Based on the Analog Devices DSP-2181 microprocessor, this technology combines the power of each component to form an effective processing machine. This facilitates the CDR-1616's switching capacity of multiple digital formats.

4.8 The Control Panel

The controls on the front panel of the CDR-1616 has a very user friendly and easy to use layout. The 32 dedicated keys for inputs/outputs are placed in two rows of 16, each divided into groups of 8. Thus it becomes very easy to identify each individual key. With the added convenience of key illumination and text inlays, sources and destinations can be named and easily identified. The 32 keys doubles as selectors for the 32 presets for switching combinations. 16 of these are 'primary' presets with ready access, and 16 are 'secondary' which are "hidden" to avoid inadvertent erasing. The SAVE and RECALL keys are used to store and retrieve switching set-ups.

The LED indicators show whether the internal or the external clock frequency is in use, and also signals any errors to the reference input signal.

5 INSTALLATION

5.1 Power Connection

Power is connected via the enclosed IEC cable. Before connecting the unit please check that the voltage selector on the back is set to the correct voltage in your country. The unit is factory set to 230V for Europe and 115V for Japan and North America. To change the voltage take out the fuse box and turn it 180 degrees. The fuse box can be taken out by removing the power plug from the socket, and release the fuse box with the help of a small screwdriver or knife. The white pointer (triangle) should point downward to indicate the selected voltage.

To avoid the cable from falling out during operation a cable clamp has been provided. Please make sure this is securely clamped over the power plug after it is inserted in the socket.

5.2 Audio Connections

The audio in/outputs are connected to the XLR connectors on the rear of the unit. All connectors are marked 1-16 individually for input and outputs as indicated on the drawing, page 5.

For complete pin configuration of input/output connectors please see Section 11, page 12.

5.3 RS232 Connections (Remote control options)

The RS232 communication ports are used to connect a PC or an optional remote control unit. Two such units can be connected at the same time. The 9-pin DSUB RS232 connectors on the rear of the unit are marked PC and REMOTE/MSD respectively. Both have the same basic software function, but are dedicated to individual functions as follows:

1. (top socket) PC
2. (bottom socket) for Remote Control panel or Master Stereo Display (MSD)

The connections 1. and 2. above have been dedicated to their individual uses by switching the TX and RX signal pins in the RS232 sockets. Thus you can connect a PC and/or a remote control/MSD without any crossing of cables.

5.4 Reference Clock Connection

The external reference clock can be connected to the XLR socket on the rear marked REF. The CDR-1616 accepts input sample frequencies from 43.7 to 48.4 kHz. It must be a **SPDIF** or **AES/EBU** signal that is used as the master reference clock, i.e. one of your inputs to the **CDR1616**.

5.5 Key Inserts for Source and Destination Identification

The 32 input and output keys on the front panel have inserts to write or print individual identification, such as for example STUDIO 1, REC, OB, OUT-2 etc.

Write the ID on a piece of clear foil (16 x 16 mm). Remove the plastic cover from the key with the tip of a knife, and insert the foil in the key. Then replace the cover and secure with a light push until it clicks in place.

6 OPERATION

In its normal operating condition all keys will be dimly lit. Once a key is activated, it will light up to indicate that selection. The user interface is designed so that the CDR-1616 returns to normal condition if no key has been activated for three seconds. In this condition all selected input and output keys are lit fully to indicate active selection, while idle input/output key remains dimly lit.

6.1 Set and Remove X-points

All 16 inputs may be routed to all 16 outputs. To set a X-point, first press the input key (it will light up), then select the corresponding output key(s). As soon as the selected output key(s) is pressed the X-point has been set. To select more outputs to one input, keep the input key pressed by one finger, while selecting the outputs one by one with another. A X-point setting can naturally also be selected in the opposite order, i.e. the output key is pressed first, then the input key.

To check the connection of a given input press the key, and all connected outputs will light up. The same procedure can be made to control the connections of an output: press the output key and the connected input keys will light up.

If you select an output key that has already been selected, the first selection will be cancelled. When a change of X-point settings has been made, these will be saved in the NOV-RAM memory (Non-Volatile RAM) if no other keys are activated for 5 seconds. If the option '**Power on with last X-point setting**' (see section 8.4.1) is selected, the CDR-1616 always stores the last X-point entry, and thus ensures that it will be rebooted to start with its previous X-point settings, in case of power failure in the studio.

6.2 Store X-point Settings (Presets) (SAVE)

The 32 presets (X-point memory) is divided into two groups each of 16 presets. The input and output keys double as preset keys, and each key can store one preset memory. Input keys 1-16 stores presets 1-16, while the output keys 1-16 store presets 17-32.

The two groups function in the same manner, but presets 17-32 have additional protection against accidental overwriting (erasure)(from software version 1.3 onwards only – when available this may be downloaded from our web-site: www.dk-audio.dk).

To store a preset make the X-point settings as described in para. 6.1 then store by holding the SAVE key pressed while pressing the appropriate preset key. To store a setup in the overwrite protected presets 17-32, the SAVE key must be pressed for min. 10 seconds. After 10 seconds the SAVE key will flash to confirm that a preset storage can be made. Then hold in the SAVE key and press the appropriate preset key.

6.3 Recall X-points (RECALL)

To recall a stored preset X-point setting combination from one of the 32 presets press the RECALL key. It will flash to indicate active operation. By pressing the appropriate preset key (1 to 16 or 17 to 32) the stored combination will be retrieved from the memory.

6.4 Auto/External Clock

One of the main features of the CDR-1616 is its ability to synchronize any input signal to a common clock frequency. If no external clock is connected the unit will automatically synchronize to the internal clock frequency of 48 kHz.

Note: The unit can be delivered from the factory with an internal clock frequency of 44.1 kHz as an option. Please contact your dealer.

To use the external clock frequency, connect a standard AES/EBU signal to the XLR connector on the rear marked REF. The CDR-1616 will accept external clock frequencies from 43.7 to 48.4 kHz after receiving a stable signal for 5 seconds.

Note: if you keep the RECALL key pressed with one hand while selecting a preset with the other, the CDR-1616 will remain in RECALL mode even after the preset combination has been activated.

7 USER OPTIONS MODE

The **user options mode** is implemented from software version 1.22 onwards. To enter the user options mode follow these steps:

1. Press and hold in the SAVE and RECALL keys
2. Wait until the SAVE and RECALL keys are alternately flashing (after approx. 5 seconds).
3. Release the SAVE and the RECALL keys.

The user option mode is indicated by alternating flashing of the SAVE and RECALL keys. This confirms that each of the lower keys (output 1 -16) now functions as a user option. If one of these options have been selected, the key will be lit. The parameters are changed by pressing the appropriate key(s).

7.1 User options

The available user options may change from software version to software version. Please read the release note for your software version. Before initiating any new software version update please make sure that all your preferred user options are available also in the new version and have not changed. User options in program version 1.22.

| Paragraph: | Key: | Function: |
|-------------------|--------------------------|--|
| 7.1.1.1 | OUTPUT-1 | Enforce 50/15uS emphasis in channel status |
| 7.1.1.2 | OUTPUT-2 | Cancel emphasis |
| | OUTPUT-3 to OUTPUT-16 | No function at this time |

7.1.1.1 Emphasis

It is possible to enforce a 50/15uS emphasis in all output channels. To enter this option go into User options mode (paragraph 7).

7.1.1.2 Cancel emphasis

It is possible to cancel the emphasis in all output channels. This function has a lower priority than the enforce emphasis (section 7.1.1.1), i.e. if the enforce emphasis function is selected it will override the cancel function.

7.2 Exit User options mode

You can exit the user option mode and save the changes by pressing the SAVE key and the new configuration will be stored after approx. 5 seconds. To exit the User options mode without saving the changes press RECALL to cancel the changes made.

8 CONFIGURATION

It is possible to change the basic configuration of the CDR-1616 by using the **configuration mode** option. You enter the configuration mode at power on or by the **service mode** if this is enabled.

8.1 Enter the Configuration mode at power on

To enter the **configuration mode** at power on please follow these steps:

1. Disconnect the power.
2. Press and hold in the INPUT-8 and INPUT-9 keys.
3. Connect the power.
4. Wait until INPUT-1 starts flashing (after approx. 2 seconds).
5. Release the INPUT-8 and INPUT-9 keys.

8.2 Enter the Configuration mode by the service mode

To enter the **configuration mode** by the service mode, you must activate **the service mode enable option** (see 8.4.6). Then proceed as follows:

1. Press and hold in the SAVE and RECALL keys
2. Wait until SAVE and RECALL flashes alternating (after approx. 5 seconds).
3. Release the SAVE and the RECALL keys.
4. Press and hold in the SAVE and RECALL keys
5. Wait until SAVE and RECALL flashes simultaneously (after approx. 5 seconds).
6. Release the SAVE and the RECALL keys.
7. Press and release INPUT-1 key

Note: please note that this procedure has changed from software version 1.21 to 1.22. For versions before V1.22 you must skip items 2 to 4 in the above procedure.

8.3 Exit Configuration mode

You can exit the configuration mode and save the changes by pressing SAVE and the new configuration will be stored after approx. 5 seconds. To exit without saving changes press RECALL to cancel the changes made.

8.4 Configuration mode

You can enter **configuration mode** at power up or by the **service mode menu**. The configuration mode is indicated by the INPUT-1 key flashing. This confirms that each of the lower keys (output 1 - 16) now functions as a configuration option. If one of these options have been selected, the key will be lit. The parameters are changed by pressing the appropriate key(s).

Configuration options:

| Paragraph: | Key: | Function: |
|-------------------|--------------------------|---|
| 8.4.1 | OUTPUT-1 | Automatic recall of "power-down" X-point's |
| 8.4.2 | OUTPUT-2 | Disable control panel flash when no input signal |
| 8.4.2 | OUTPUT-3 | Disable control panel flash if input noise occurs |
| | OUTPUT-4 to OUTPUT-12 | No function at this time |
| | OUTPUT-13 | Read input status from sample rate converter |
| | OUTPUT-14 | No function at this time |
| 8.4.3. | OUTPUT-15 | Disconnect main control panel of CDR-1616 |
| 8.4.6. | OUTPUT-16 | (Default: OFF) Activate Service MODE . |

8.4.1 Power-on with last X-point setting (OUTPUT-1)

To restart the CDR-1616 with the previous X-point configuration (at last power down) select OUTPUT-1 in the configuration mode. If this is not selected, all X-points will be disabled at power-on.

8.4.2 Flash Keys at "No Input Signal" or "Signal Error" (OUTPUT-2 & OUTPUT-3)

During normal operation the selected in- and outputs keys will flash if the input signal is lost, or if there is excessive noise on the signal.

This function can be cancelled by selecting configuration options OUTPUT-2 (no signal) and OUTPUT-3 (noise) in the configuration mode.

8.4.3 Disconnection of Main Control Panel (OUTPUT-15)

To disconnect the main control panel of the CDR-1616, when using alternative options as remote control panel, Master Stereo Display (MSD) or a PC, select OUT-15 in the configuration mode. This will disable the control panel as default.

Note: To reconnect the main control panel temporarily press any key during "power-on", and the control panel will be connected until next power down. To reconnect permanently as default, cancel the OUTPUT-15 in the configuration mode.

8.4.4 Gain (only via PC or MSD) (Available later)

8.4.5 Swap L-R signals (only via PC or MSD) (Available later)

Enable service mode

The **service mode enable option** is toggled on by pressing the OUTPUT-16 key in the configuration mode. When the option OUTPUT-16 is lit, the **service mode** can be entered as described in 7.4.7.

8.5 Service mode

The **service mode enable option** (see 8.4.6) must be selected to enter the **service mode**. The procedure to enter the **service mode** is :

1. Press and hold in the SAVE and RECALL keys
2. Wait until SAVE and RECALL flashes alternating (after approx. 5 seconds).
3. Release the SAVE and the RECALL keys.
4. Press and hold in the SAVE and RECALL keys
5. Wait until SAVE and RECALL flashes simultaneously (after approx. 5 seconds).
6. Release the SAVE and the RECALL keys.

Note: Please note than this procedure has changed from software version 1.21 to 1.22. For versions before V1.22 you must skip point 2 to 4 in the above procedure.

The service mode menu is indicated by the SAVE and RECALL keys flashing simultaneously. The different options are selected with the INPUT-keys.

Configuration options:

| Paragraph: | Key: | Function: |
|------------|------------------------|---|
| 8.4 | INPUT-1 | Enter Configuration mode . |
| | INPUT-2 | RESET the unit. |
| | INPUT-3 to INPUT-14 | No function at this time |
| 8.5.1 | INPUT-15 | Read program version |
| | INPUT-16 | Memory debugger (for internal use only) |

8.5.1 View Software version

The **software version view** function is indicated by flashing of keys INPUT-15, SAVE and RECALL . The location of the lit keys in the OUTPUT-1 to OUTPUT-16 row indicate the program version. Please compare the indication with the program release note. The program version view function is implemented from program version 1.21. The **program version view** function is exited by pressing the SAVE or RECALL key.

9 REMOTE CONTROL OPTIONS

The CDR-1616 can be conveniently remote controlled in a number of ways: with an external control panel similar to the main unit; with a Master Stereo Display (MSD200 or 600-Series) or a PC. Two of these remote controls can be connected and operated at the same time in the following combinations: PC + RCU or PC + MSD. The combination RCU + MSD requires a special cable with crossed TX and RX connections.

9.1 External Control Panel

An external control panel with the same key layout and configuration as the main unit may be connected to the RS232 input marked RC/MSD on the rear of the CDR-1616. The external control panel can operate simultaneously with the main unit, or it may be the sole control (In this case disconnect the control function from the main unit as described in para. 6.4.3. Configuration, function OUTPUT-15). Order number for the external control panel is: RCU-1616/O.

9.2 MSD-Remote Software

A special remote control software has been developed for the MSD-200 and MSD600-Series of Master Stereo Displays from DK-Audio. This allows you to use your MSD to control all the functions of the CDR-1616 on the display of the MSD, while retaining all the audio metering functions of the MSD. As it is common to have the MSD mounted in the mixing console or work desk close to the operator it is conveniently located for quick and easy switching control. For further information on Master Stereo Displays please contact your dealer or request further information from DK-Audio.

9.3 PC Windows Software

The CDR-1616 may also be remote controlled from a standard PC. The software required is running in Windows format, and requires no special hardware installation. Please request further information from your dealer or from DK-Audio.

10 OTHER OPTIONS

Other options of the CDR-1616 include a number of signal manipulation functions and multichannel PPM software to use in connection with a Master Stereo Display from the MSD200 or MSD600-Series.

10.1 Signal manipulation

The signal manipulation options are available on separate control software disk and include Input Fading and Summation functions. Further options may be included at a later stage. For more information on these options please contact your dealer or DK-Audio.

10.2 Multichannel PPM Software

Special multichannel software has been prepared to allow the CDR-1616 to monitor in- and output signal levels and display these on a Master Stereo Display of the MSD200 or MSD600-Series. Up to 32-channels may be displayed at one time making it possible to monitor all in- and outputs simultaneously. We recommend the use of the MSD600-Series because it comes with a colour LCD display where individual colours can be assigned to individual channels or groups of channels to make identification quicker and easier. The MSD600 further has a VGA output so you can monitor the 32-channel display on a larger colour screen.

For further information please contact your dealer or DK-Audio.

11 PIN CONFIGURATION

Signal input (1-16) : XLR female

Zin = 110 ohm

pin1 : Ground
Pin2 : Signal
Pin3 : Signal

Reference input : XLR female

Zin = 110 ohm

pin1 : Ground
Pin2 : Signal
Pin3 : Signal

Signal output (1-16) : XLR male

Zout = 110 ohm

pin1 : Ground
Pin2 : Signal
Pin3 : Signal

RS232 – PC : DB9-sub female

Pin2 : TX
Pin3 : RX
Pin5 : GND

RS232 – MSD/Panel : DB9-sub female

Pin2 : RX
Pin3 : TX
Pin5 : GND

12 SPECIFICATIONS

| | |
|-----------------------------------|--|
| Mechanical size: | 19"-2U, depth 225 mm |
| Weight: | 5 kilos |
| Supply voltage range (AC): | 115V +/-22%, 230V +/-10%, 50/60 Hz |
| Power consumption: | < 15W |
| Gain adjustment: | +/- 12 dB (in 0,1 dB steps) |
| Input impedance: | 110 ohm |
| Output impedance: | 110 ohm |
| Frequency response 20-20.000 Hz: | < 0,1 dB |
| Phase difference spread: | <40 Hz = < 5° 40-15.000 Hz = < 2° > 15.000 Hz = < 5° |
| Dynamic range: | |
| THD + noise@full scale: | < -100 dB |
| Signal dynamics@ -60 dB: | /= 120 dB |
| Switching click (rel. to input): | < -80 dB |
| Internal clock frequency: | 48 kHz +/- 50 ppm (44.1 kHz +/- 50 ppm optional) |
| AES digital phase difference: | +/- 0,5 cycle (80 nS) |
| Channel status delay: | < 1 frame (4 mS) |
| User channel delay: | < 1 frame (37 mS) |
| Sound delay: | < 3 mS |
| AES input frequency sample range: | 43.7 ~ 48.4 kHz |

