KD-MAX8x8

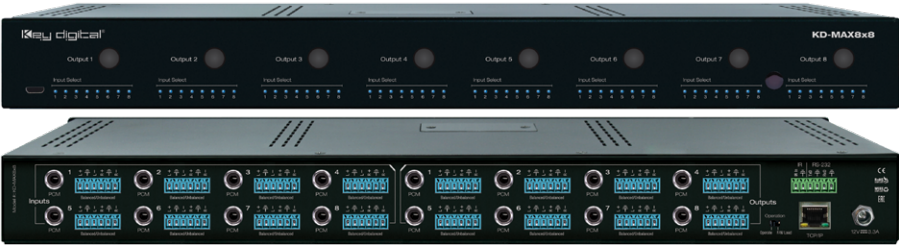**8x8 Audio Matrix Switcher with built-in Audio DSP**

Operating Instructions

Key digital®

The Experts in Digital Video Technology and Solutions™

Table of Contents

Note: Please visit www.keydigital.com for the latest product documentation and software downloads. Product features and specifications are subject to change without notice.

Introduction

Key Digital® KD-MAX8x8 is an 8x8 matrix of analog and digital audio. Inputs and outputs support balanced or unbalanced analog audio on a 6-pin phoenix connector while digital PCM audio up to 5.1 channels is supported on RCA connectors. Analog and digital outputs may listen to independent selections of the connected audio sources and each output features a digital signal processor for volume, muting, 3-band EQ, balance, and delay.

Key Features

› **Multi-format Audio Multiplexing:** DSP per output for independent matrix selection
  » Analog to Analog Matrix with DSP
  » Digital to Analog Matrix with DSP
  » Digital to Digital Matrix
  » Analog to Digital Matrix
› **Audio DSP:** Variable level settings for volume, muting, 3-band EQ, balance, and lip-sync delay per balanced output
› **Audio Delay:** Variable level set from 0ms to 170ms
› **Audio Conversion:** Analog to digital. Digital to analog
› **Balanced or Unbalanced:** Input audio type may be specified per input
› **Lossless Compressed Digital Audio:** Dolby® and DTS surround up to 5.1ch pass-thru
› **Long Cable Runs:** Enabled by balanced audio connection, signals may be run up to 1,000 ft.
› **Control Integration:** TCP/IP, RS-232, and USB with full bi-directional operation, front panel push buttons and LEDs, front/rear optical IR, serial IR,
› **Control System Support:** Key Digital® App ready, Compass Control® Pro ready, KD-Wizard® ready. Fully controllable by all IR, RS-232, and TCP/IP supported control systems via open API: AMX®, Crestron®, Control4®, KNX®, RTI®, Savant, URC®, Leviton® etc.
› **Key Digital® App Ready:** Scan & detect population for pre-built GUI and TCP/IP control via Key Digital® App

Accessories

› Power supply: +12V/2A (25W), model KD-PS12V2ASC
› IR Remote control, model KD-REMOTEHM88
› (17) 6-position terminal block
› Rack mount ears

Rack Mounting

› Secure the included rack ears to each side of KD-MAX8x8 with the supplied hardware, then fasten the unit to the rack rails with appropriate machine screw.

Connections, Buttons and LEDs

Balanced/Unbalanced Analog Audio Inputs and Outputs

> Each output and input features one analog audio connector on 6-pin phoenix connector for balanced or unbalanced audio
> Pin assignment for Analog Audio connections:
>> » Left + is Pin 1; Left Ground is Pin 2; Left - is Pin 3
>> » Right + is Pin 4; Right Ground is Pin 5; Right - is Pin 6
> Unbalanced audio is the default type for each input, and should be connected using the positive (+) and ground pins.
> Each input and accepts/drives audio signals up to 2VRMS with a sampling rate of 48KHz
> Each output features an assortment of DSP controls including Volume, Muting, 3-band EQ, and Lip-sync delay.
> There are no down/up conversion capabilities. For example, a 2ch analog audio input cannot be converted to 5.1 surround.
> Microphone inputs are not directly supported. To integrate microphones, please use external powered mixer.
> Each input may be individually set so that analog is the associated type.
>> » If the associated input type is set to analog, the output selecting the source will output the analog feed on both the analog and PCM output connectors.
>> » The default association type for each input is "both":
>>> » Analog In to Analog Out
>>> » PCM In to PCM Out

PCM Digital Audio Inputs and Outputs

> Each output and input channel features one digital audio on an RCA connector
> Compatible with SPDIF format IEC 60958 supporting 2CH PCM, Dolby 5.1ch, DTS 6.1ch
> Compatible with sampling rates up to 192KHz
> Each input may be individually set so that analog is the associated type.
>> » If the associated input type is set to analog, the output selecting the source will output the analog feed on both the analog and PCM output connectors.
>> » The default association type for each input is "both":
>>> » Analog In to Analog Out
>>> » PCM In to PCM Out

> There are no DSP features on the digital audio inputs or outputs. However, muting settings do apply.
> There are no down/up conversion capabilities:

Audio Input Signal Format	Audio L/R Output	Digital Audio Output
2CH PCM	Pass-through	Pass-through
Multi-Channel PCM	MUTE	MUTE
DOLBY/DTS	MUTE	Pass-through
HD Audio	MUTE	MUTE

Unit Control Ports

> **MAIN Control Port**
  - » 6-Pin Terminal Block for IR and RS-232
  - » RS-232 and TCP/IP commands may be found in the RS-232 & TCP/IP Commands section
  - » Pin out:
    - » Pin 1 = IR Signal
    - » Pin 2 = IR Ground
    - » Pin 3 = RS-232 Tx Data
    - » Pin 4 = RS-232 Ground
    - » Pin 5 = RS-232Rx Data
    - » Pin 6 = Ground (optional)

> **TCP/IP Control Port**
  - » Default static IP address is 192.168.1.239
  - » Connect an Ethernet cable from the KD-MAX8x8 to a network router or connect a straight-through cable directly from a PC

> **Firmware Mode Switch**
  - » Should remain in Operation setting unless instructed by Key Digital technical support
  - » If changing position of switch, do so only with unit not powered
  - » Not every firmware update requires the switch to be set to the F/W Load position
  - » If set to F/W Load, all front LEDs will be illuminated, indicating that unit is in bootloader mode and awaiting a firmware load.

> **Micro USB (front panel)**
  - » Typically used for unit configuration, control, and firmware updates
  - » It is most commonly used with KD-Wizard® software downloaded at www.keydigital.com
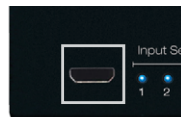
Buttons and LEDs

> **8 output buttons on the front panel**
>> » Pressing an output button will select the input
>> » A blue LED indicates selected input for each output
> **Output MUTE** is indicated by the outermost (1, 2, 7, 8) LEDs illuminated, while the inner LEDs (3, 4, 5, 6) are **NOT** illuminated
> **Output OFF** is indicated when the innermost (3, 4, 5, 6) LEDs are illuminated, while the outermost (1, 2, 7, 8) are **NOT** illuminated
> **Factory default reset** is achieved by simultaneously holding the input select buttons 1&8 for 10 seconds
>> » The matrix reboots after reset. The LEDs will ramp until reboot has completed

Application Example
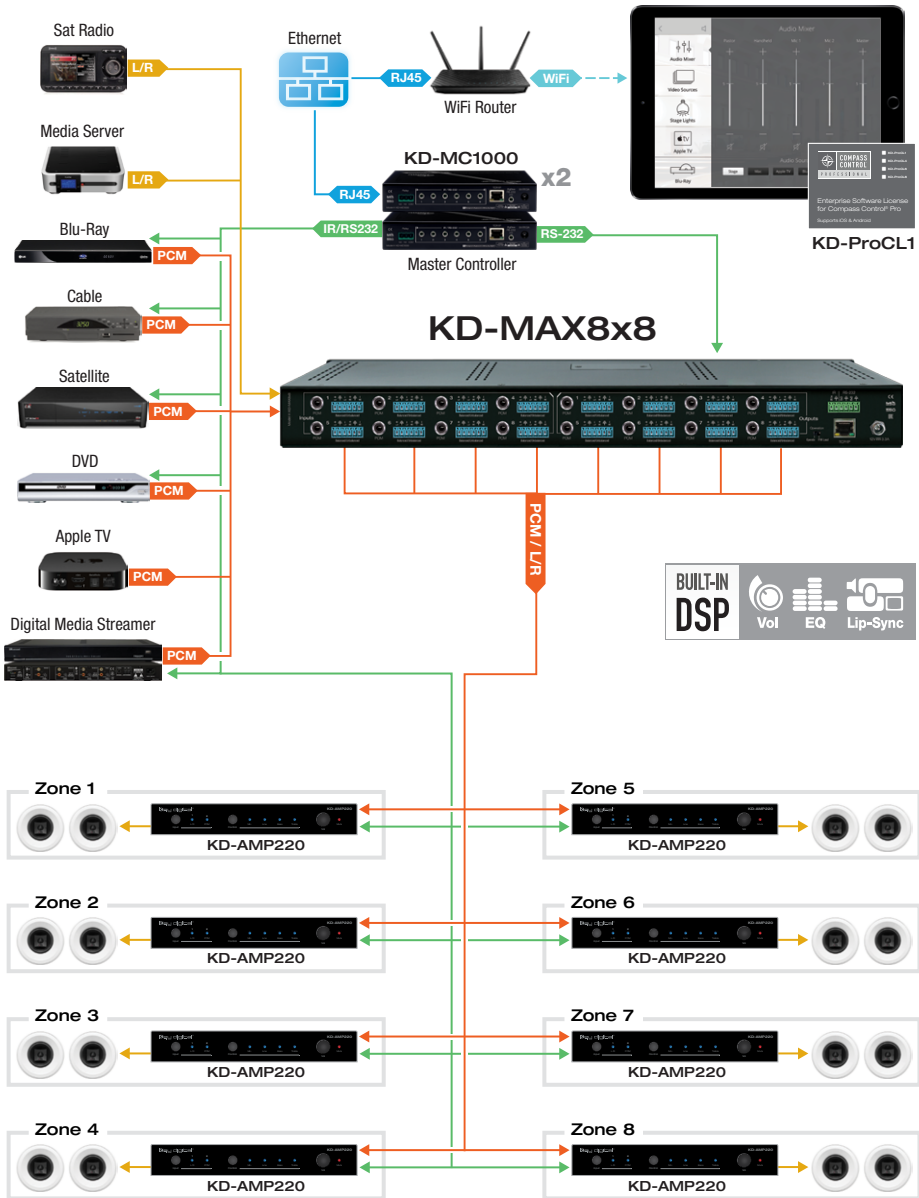
Quick Setup Guide

1. Begin with the KD-MAX8x8 and all Input/Output devices turned off and power cables removed

2. Connect analog audio sources to the desired 6-pin phoenix terminals and/or digital audio sources to the desired PCM inputs

3. Connect the analog audio output amplifiers/receivers via the analog 6-pin phoenix terminals and digital destinations via the PCM outputs

4. Connect power to the KD-MAX8x8, followed by all other input and output devices and turn them on

5. If balanced audio input type is required for any of the analog inputs, set the desired input via the IR remote control using command sequence R2, XX, Audio Mode, 3. Note that XX is the desired input number (01 – 08).

6. Operate KD-MAX8x8 switcher via the front panel buttons, IR remote, serial IR or RS-232 control

7. See TCP/IP and RS-232 Commands or Settings and Adjustments via Remote sections for more adjustments options

Settings and Adjustments via Remote

Many initial installation steps may be configured using the factory remote control. Other advanced settings may be configured using USB and software downloaded from www.keydigital.com

Input Associated Audio Type
» IR Button Sequence = R2, XX, Video Mode, Y
» XX = Input # [01-08]
» Y = Audio Type [1 = Analog, 2 = PCM, 3 = Analog to Analog, PCM to PCM]

Analog Input Audio Type
» IR Button Sequence = R2, XX, Audio Mode, Y
» XX = Input # [01-08]
» Y = Audio Type [1 = L+/R+, 2 = L-/R-, 3 = Balanced, 4 = N/C]

Matrix Switching Command (Associated Audio)
» IR Button Sequence = Audio Mode, X, Y
» X = Output # [1-8]
» Y = Input # [1-8]

Output Mute/Un-mute
» IR Button Sequence = R1, X, Mute/Restore
» X = Output # [1-8]

Output Volume Up/Down
» IR Button Sequence = R1, X, Volume, Up/Down
» X = Output # [1-8]

Output Volume Level

- » IR Button Sequence = R1, X, Volume, YY
- » X = Output # [1-8]
- » YY = Volume Level [00-99]

Set Unit Static IP Address to xxx.xxx.xxx.xxx

- » IR Button Sequence = R3, Bass, XXX, Video Mode, XXX, Video Mode, XXX, Video Mode, XXX

Set Unit Default Gateway/Router IP Address to xxx.xxx.xxx.xxx

- » IR Button Sequence = R3, Treble, XXX, Video Mode, XXX, Video Mode, XXX, Video Mode, XXX
- » Default IP address is 192.168.1.239, with default port 23 and default gateway 192.168.1.1
- » Please see the IR Remote Command List section for additional commands

Apply New Network Configuration

- » IR Button Sequence = R3, All Restore

IR Remote Command List

IR Control is possible using remote model KD-REMOTEHM88 (included). Use the numerical keypad for X, Y, and Z values below.

⚠️ **Advanced unit setup should be completed in the KD Wizard software found on www.keydigital.com**

Command	Sequence
Input Setup	
Parameters	XX = input # (01-08)
Input associated input type	R2, XX, Video Mode, Y Y = 1 (Analog) / 2 (PCM) / 3 (both)
Set analog input type	R2, XX, Audio Mode, Y Y = [1 = L+/R+, 2 = L-/R-, 3 = Balanced, 4 = N/C]
Audio Output Setup	
Parameters	XX = 01 – 08 YY = 01 – 99, Up, Down
Set Output X to Association Input Y	Audio Mode, X, Y X = Output #[1-8] Y = Input #[1-8]
Set analog + digital output XX = Analog input YY	R1, XX, Video Mode, YY
Set analog + digital output XX = PCM input YY	R1, XX, R2, YY
Set PCM output XX = PCM input YY	R1, XX, R3, YY
Set ALL output Mute/Unmute	All Mute/All Restore
Set output XX ON/OFF	R1, XX, R4, 1/0

Output DSP	
Parameters	X = 1 – 8, 01-08 YY = 00 – 99*, Up, Down *unless otherwise noted
Set output X to volume YY	R1, X, Volume, YY
Set output X balance YY	R1, X, Balance, YY (00 – 40, 20 is default)
Set output X Bass YY	R1, X, Bass, YY (00 – 24, 12 is default)
Set output X Mid YY	R1, X, Middle, YY (00 – 24, 12 is default)
Set output X Treble YY	R1, X, Treble, YY (00 – 24, 12 is default)
Set output X Delay YY	R1, X, LipSync, YY (00 – 99, 00 is default)
Set output X Mute/Unmute	R1, X, Mute/Restore
Network Setup	
Parameters	XX = 000 - 255 YY = 0001 - 9999
Set Host IP Address to xxx.xxx.xxx.xxx	R3, Bass, XXX, Video Mode, XXX, Video Mode, XXX, Video Mode, XXX
Set Net Mask to xxx.xxx.xxx.xxx	R3, Middle, XXX, Video Mode, XXX, Video Mode, XXX, Video Mode, XXX
Set Router IP Address to xxx.xxx.xxx.xxx	R3, Treble, XXX, Video Mode, XXX, Video Mode, XXX, Video Mode, XXX
Set TCP/IP Port to zzzz	R3, Volume, XXXX
Apply New Network Config	R3, All Restore

RS-232 and TCP/IP Commands

KD-MAX8x8 allows control over serial interface for bi-directional communication.

Use pins 3, 4, 5 for RS-232 communication.

In addition to RS-232, the serial interface may also be accessed using a TCP/IP connection.

> » **Default IP address is 192.168.1.239, with default port 23**

Connection Protocol:

> » Baud Rate = 57,600 bits per second
>
> » Data Bits = 8
>
> » Stop Bits = 1
>
> » Parity = None
>
> » Flow Control = None
>
> » Carriage Return: Required

Notes

> » Commands are not case-sensitive
>
> » Spaces are shown for clarity; commands should NOT have any spaces
>
> » After a new command is received, a prompt should be sent back

Response from Help command – Returns entire API in readable format:

```
KD-MAX8x8> H
--------------------------------------------------------------------------
--                Key Digital Systems HELP                              --
--------------------------------------------------------------------------
--  KD-MAX8x8          System Address = 00       F/W Version : 1.0      --
--                                                                      --
-- PN      : Power On                                                   --
-- PF      : Power Off                                                  --
-- Azz     : All Commands start by Prefix System Address zz, if [01~99]--
-- H       : Help                                                       --
-- STA     : Show Global System Status                                  --
--                                                                      --
-- Audio Input Setup Command ( xx=[01~08,A] A=All, y=[1~2] )            --
-- SPIxx AS y : Set Analog Input xx by y [1=L+/R+, 2=L-/R-, 3=Balanced]--
-- SPIxx AA y : Set Audio Association of Input xx by y                  --
--             y [1=Analog, 2=PCM, 3=Both(Analog->Analog, PCM->PCM)]  --
-- SPIxx WN cccccccccccccccc : Save Name of Input xx                    --
-- SPIxx RN   : Read Name of Input xx                                   --
--                                                                      --
-- Audio Output Setup Command ( xx=[01~08,A=All], yy=[01~08] )          --
-- SPOxx SI yy : Set Output xx to Association Input yy                  --
-- SPOxx SA yy : Set Output xx to Analog Input yy                       --
-- SPOxx SP yy : Set Output xx to PCM Input yy                          --
-- SPOxx SB yy : Set PCM Output xx to PCM Input yy                      --
-- SPOxx D E/D : Set Output xx Disconnection Enabled/Disabled           --
-- SPOxx WN cccccccccccccccc : Save Name of Output xx                   --
-- SPOxx RN   : Read Name of Output xx                                  --
--                                                                      --
```

```
-- Audio DSP Setup Command ( xx=[01~08,A] A=All )                       --
-- SPOxx AV yy : Set Output xx Audio Volume to yy,        yy=[00-99],U,D--
-- SPOxx AB yy : Set Output xx Audio Balance to yy,       yy=[00-40],U,D--
-- SPOxx AL yy : Set Output xx Audio Bass Gain to yy,     yy=[00-24],U,D--
-- SPOxx AM yy : Set Output xx Audio Middle Gain to yy,   yy=[00-24],U,D--
-- SPOxx AH yy : Set Output xx Audio Treble Gain to yy,   yy=[00-24],U,D--
-- SPOxx AD yy : Set Output xx Audio Delay to yy,         yy=[00-99],U,D--
-- SPOxx A E/D/T : Set Output xx Audio Mute Enabled/Disabled/Toggle   --
--                                                                     --
-- Network Setup Command  ( xxx=[000-255], zzzz=[0001~9999] )          --
-- SPCETIPA xxx.xxx.xxx.xxx : Set Host IP Address to xxx.xxx.xxx.xxx   --
-- SPCETIPM xxx.xxx.xxx.xxx : Set Net Mask to xxx.xxx.xxx.xxx          --
-- SPCETIPR xxx.xxx.xxx.xxx : Set Route IP Address to xxx.xxx.xxx.xxx  --
-- SPCETIPP zzzz          : Set TCP/IP Port to zzzz                    --
-- SPCETIPB               : Apply New Network Config                   --
--                                                                     --
-- System Control Setup Command ( xx=[01-99], z=[0-4] )                --
-- SPCFB E/D   : Set Front Panel Button E/D (E=Enable,D=Disable)       --
-- SPC RSB z   : Set RS232 Baud Rate to z bps                          --
--              [0:57600, 1:38400, 2:19200, 3:9600, 4:4800]            --
-- SPCDF       : Reset to Factory Default All                          --
--                                                                     --
-- System Address Setup Command  ( xx = [00-99], 00 = Single )         --
-- SPCAxx       : Set System Address to xx                             --
-------------------------------------------------------------------------
```

Status Command (STA) – Returns unit and system status in readable format:

```
KD-MAX8x8> STA
-------------------------------------------------------------------------
--              Key Digital Systems STATUS                          --
-------------------------------------------------------------------------
--  KD-MAX8x8        System Address = 00       F/W Version : 1.0    --
--                                                                     --
-- RS232 : Baud Rate=057600bps, Data=8bit, Parity=None, Stop=1bit   --
-- Front Panel Button : Enabled                                       --
--                                                                     --
--                                                                     --
-- Network Setting(Telnet Server) Status                              --
-- MAC Address = 60:89:B1:14:00:02                                    --
-- Host IP Address = 192.168.001.239                                  --
-- Net Mask = 255.255.000.000                                         --
-- Router IP Address = 192.168.001.001                                --
-- TCP port = 23                                                      --
--                                                                     --
-- Audio Input Status                                                 --
-- 01: Analog Input = Unbalanced L+/R+                                --
-- 02: Analog Input = Unbalanced L+/R+                                --
-- 03: Analog Input = Unbalanced L+/R+                                --
-- 04: Analog Input = Unbalanced L+/R+                                --
-- 05: Analog Input = Unbalanced L+/R+                                --
-- 06: Analog Input = Unbalanced L+/R+                                --
-- 07: Analog Input = Unbalanced L+/R+                                --
-- 08: Analog Input = Unbalanced L+/R+                                --
--                                                                     --
```

```
-- Audio Output Status                                              --
-- 01 : Analog Out = Analog In 03, PCM Out = PCM In 03             --
--      V=99, B=20, L=18, M=12, T=12, LP=33, Mute=ON , Out=Enabled  --
-- 02 : Analog Out = PCM In 07,    PCM Out = PCM In 07             --
--      V=99, B=20, L=18, M=10, T=16, LP=00, Mute=ON , Out=Enabled  --
-- 03 : Analog Out = Analog In 05, PCM Out = PCM In 05             --
--      V=99, B=20, L=12, M=12, T=12, LP=40, Mute=ON , Out=Enabled  --
-- 04 : Analog Out = Analog In 01, PCM Out = PCM In 01             --
--      V=99, B=23, L=12, M=12, T=12, LP=00, Mute=ON , Out=Enabled  --
-- 05 : Analog Out = Analog In 08, PCM Out = PCM In 08             --
--      V=99, B=20, L=10, M=12, T=12, LP=00, Mute=ON , Out=Enabled  --
-- 06 : Analog Out = Analog In 07, PCM Out = PCM In 07             --
--      V=99, B=20, L=12, M=12, T=12, LP=00, Mute=ON , Out=Enabled  --
-- 07 : Analog Out = Analog In 02, PCM Out = PCM In 02             --
--      V=99, B=20, L=12, M=12, T=12, LP=00, Mute=ON , Out=Enabled  --
-- 08 : Analog Out = Analog In 08, PCM Out = PCM In 08             --
--      V=99, B=20, L=12, M=10, T=12, LP=03, Mute=ON , Out=Enabled  --
-----------------------------------------------------------------------
```

Specifications

Technical:

- » Input (each): Balanced/unbalanced line level audio on 6-pin terminal block. Accepts 2VRMS line audio input with a sampling rate of 48KHz
- » Input (each): RCA female for digital audio following SPDIF format (IEC 60958). Supports sampling rate up to 192KHz
- » Output (each): Balanced/unbalanced line level audio on 6-pin terminal block. Drives 2VRMS line audio input with a sampling rate of 48KHz
- » Output (each): RCA female for digital audio following SPDIF format (IEC 60958). Supports sampling rate up to 192KHz
- » K-Factor: 0.22% @ optimal EQ » Video Isolation (Crosstalk): -45dB @ 5MHz
- » Analog Audio Max Input Level: 4dBu on 50kΩ, AC coupling
- » Analog Audio Max Output Level: 4dBu on 150kΩ, DC coupling
- » Audio Bandwidth: 20Hz to 20kHz @ 0dBu
- » TND + Noise: 0.33% @0dBu @ 1kHz » PCM Max Input Level: 1Vpp on 75Ω, AC coupling
- » PCM Max Output Level: 1Vpp on 75Ω, DC coupling
- » Wired IR: modulated IR signal input, 0-5V TTL or -10 to +10V
- » Power: 12V/2A (25W) AC Power Supply with Grounded, 2.1mm ID DC Power Jack with Screw In Type.

General:

- » Regulation: CE, RoHS, WEEE
- » Rack Mount: 1U, 1 Rack Width (rack ears included)
- » Enclosure: Black Metal
- » Product Dimensions: 17.5" x 7" x 1.75"
- » Shipping Carton Dimensions: 23.5" x 11" x 4.5"
- » Product Weight: 6 lb
- » Shipping Weight: 9 lb.

⚠ Important Product Warnings:

1. Connect all cables before providing power to the unit.
2. Test for proper operation before securing unit behind walls or in hard to access spaces.
3. If installing the unit into wall or mounting bracket into sheet-rock, provide proper screw support with bolts or sheet-rock anchors.

⚠ Safety Instructions:

Please be sure to follow these instructions for safe operation of your unit.

1. Read and follow all instructions.
2. Heed all warnings.
3. Do not use this device near water.
4. Clean only with dry cloth.
5. Install in accordance with the manufacturer's instructions.
6. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
7. Only use attachments/accessories specified by the manufacturer.
8. Refer all servicing to qualified service personnel. Servicing is required when the device has been damaged in any way including:
   » Damage to the power supply or power plug
   » Exposure to rain or moisture

⚠ Power Supply Use:

You MUST use the Power Supply provided with your unit or you VOID the Key Digital® Warranty and risk damage to your unit and associated equipment.

How to Contact Key Digital®

System Design Group (SDG)

For system design questions please contact us at:
- › Phone: 914-667-9700
- › E-mail: sdg@keydigital.com

Customer Support

For customer support questions please contact us at:
- › Phone: 914-667-9700
- › E-mail: customersupport@keydigital.com

Technical Support

For technical questions about using Key Digital® products, please contact us at:
- › Phone: 914-667-9700
- › E-mail: tech@keydigital.com

Repairs and Warranty Service

Should your product require warranty service or repair, please obtain a
Key Digital® Return Material Authorization (RMA) number by contacting us at:
- › Phone: 914-667-9700
- › E-mail: rma@keydigital.com

Feedback

Please email any comments/questions about the manual to:
- › E-mail: customersupport@keydigital.com

Warranty Information

All Key Digital® products are built to high manufacturing standards and should provide years of trouble-free operation. They are backed by a Key Digital Limited 3 Year Product Warranty Policy.
http://www.keydigital.com/warranty.htm
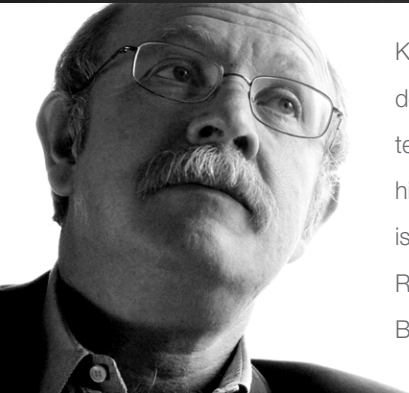
Key Digital®, led by digital video pioneer Mike Tsinberg®, develops and manufactures high quality, cutting-edge technology solutions for virtually all applications where high-end video and control are important. Key Digital® is at the forefront of the video industry for Home Theater Retailers, Custom Installers, System Integrators, Broadcasters, Manufacturers, and Consumers.