Kramer Electronics, Ltd.

USER MANUAL

Model:

6502

4x1 S/PDIF Switcher / DA

Contents

Figures

Tables

1 Introduction

Welcome to Kramer Electronics! Since 1981, Kramer Electronics has been providing a world of unique, creative, and affordable solutions to the vast range of problems that confront the video, audio, presentation, and broadcasting professional on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better! Our 1,000-plus different models now appear in 11 groups[1] that are clearly defined by function.

Congratulations on purchasing your Kramer **6502** *4x1 S/PDIF Switcher / DA*.

This product is ideal for the following typical applications:

- Video broadcast studios for On-Air switching and signal routing
- Non-linear editing suites
- Video production studios, to connect various sources to acceptors

The package includes the following items:

- **6502** *4x1 S/PDIF Switcher / DA*
- Power adapter (5V DC Input)
- Windows®-based Kramer control software[2]
- Kramer **RC-IR2** Infrared Remote Control Transmitter (including the required batteries and a separate user manual[3]) and this user manual[3]

2 Getting Started

We recommend that you:

- Unpack the equipment carefully and save the original box and packaging materials for possible future shipment
- Review the contents of this user manual

2.1 Quick Start

This quick start chart summarizes the basic setup and operation steps of the **6502**.

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1 GROUP 1: Distribution Amplifiers; GROUP 2: Switchers and Matrix Switchers; GROUP 3: Control Systems; GROUP 4: Format/Standards Converters; GROUP 5: Range Extenders and Repeaters; GROUP 6: Specialty AV Products; GROUP 7: Scan Converters and Scalers; GROUP 8: Cables and Connectors; GROUP 9: Room Connectivity; GROUP 10: Accessories and Rack Adapters; GROUP 11: Sierra Products

2 Downloadable from our Web site at http://www.kramerelectronics.com

3 Download up-to-date Kramer user manuals from our Web site at http://www.kramerelectronics.com

Step 1: Connect the inputs and the outputs - see section 5

1 Connect the inputs.

2 Connect the outputs.

3 If required, connect the RS-232 port.

DVD Player 1

DVD Player 4

Power Amplifier 1   Power Amplifier 2
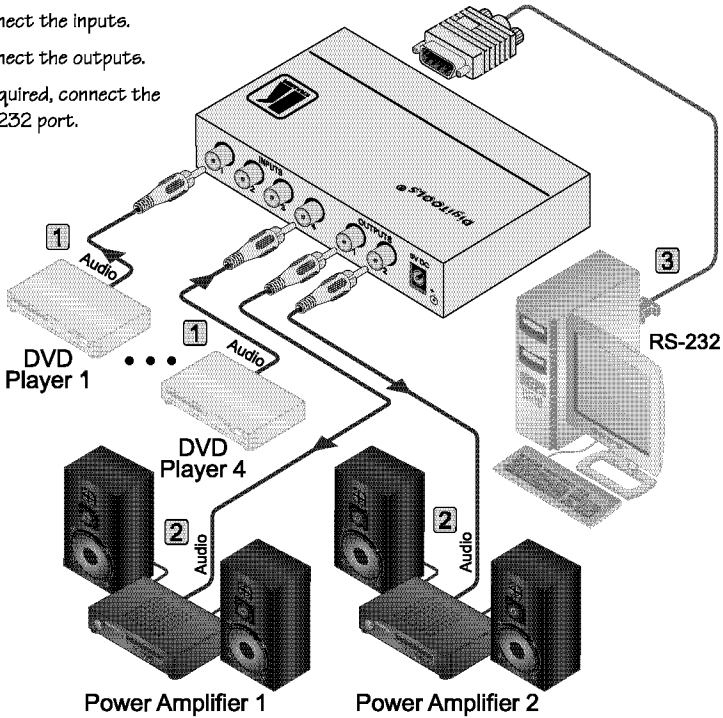
RS-232

Step 2: Connect the power

Step 3: Control the machine

Operate via the front panel buttons, IR remote control and RS-232

3 Overview

The **6502** *4x1 S/PDIF Switcher / DA* is a small-sized but efficient switcher and distributor for S/PDIF digital audio signals. The **6502**:

- Lets you select one of four S/PDIF digital audio signals and outputs that signal simultaneously to two S/PDIF acceptors
- Is compatible with EIAJ CP1201, IEC-60958, AES3id and S/PDIF standards
- Features a 32kHz to 192kHz sample frequency range
- Includes equalizing and reclocking of incoming data for low jitter recovery of the digital audio data stream
- Is 5V DC fed and is housed in a DigiTOOLS® enclosure

Control the **6502** using the INPUT SELECTOR buttons, or remotely via:

- RS-232 serial commands transmitted by a touch screen system, PC, or other serial controller
- The Kramer **RC-IR2** Infrared remote control transmitter

To achieve the best performance:

- Connect only good quality connection cables, thus avoiding interference, deterioration in signal quality due to poor matching, and elevated noise levels (often associated with low quality cables)
- Avoid interference from neighboring electrical appliances and position your **6502** away from moisture, excessive sunlight and dust

⚠	**Caution** – No operator-serviceable parts inside unit. **Warning** – Use only the Kramer Electronics input power wall adapter that is provided with this unit[1]. **Warning** – Disconnect power and unplug unit from wall before installing or removing device or servicing unit.

1 For example, part number 2535-052002

4 Your 6502 4x1 S/PDIF Switcher / DA

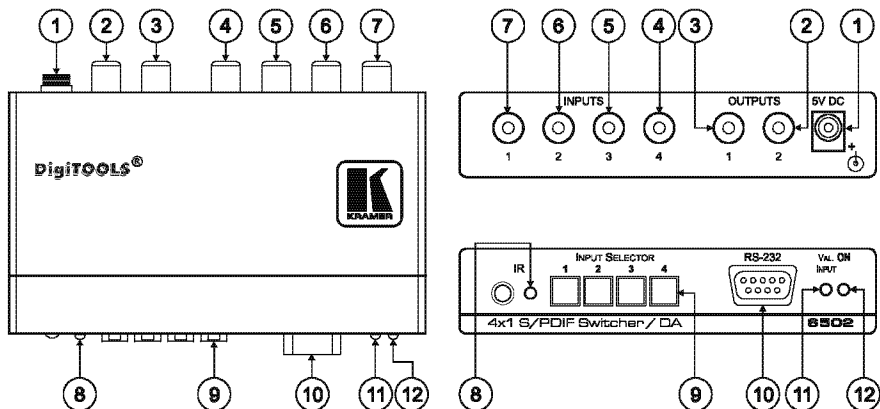Figure 1 and Table 1 define the **6502** *4x1 S/PDIF Switcher / DA*:

Figure 1: 6502 4x1 S/PDIF Switcher / DA

Table 1: Features and Functions of the 6502 4x1 S/PDIF Switcher / DA

#	Feature		Function
1	5V DC		+5V DC connector for powering the unit
2	OUTPUT	2	Connect to the digital audio acceptor 2
3	RCA Connectors	1	Connect to the digital audio acceptor 1
4	INPUT	4	Connect to the digital audio source 4
5	RCA Connectors	3	Connect to the digital audio source 3
6		2	Connect to the digital audio source 2
7		1	Connect to the digital audio source 1
8	REMOTE IR		The red LED lights when receiving signals from the Infrared remote control transmitter
9	INPUT SELECTOR Buttons		Press to select the digital audio sources (from 1 to 4)
10	RS-232 9-pin D-sub Port		Connects to the PC or the Remote Controller
11	VAL. INPUT LED		Illuminates when a valid input is connected to the selected source
12	ON LED		Illuminates when receiving power

5 Connecting the 6502 4x1 S/PDIF Switcher / DA

To connect the **6502** *4x1 S/PDIF Switcher / DA*, as illustrated in the example in Figure 2, do the following[1]:

1. Connect[2] up to four digital audio sources (for example, DVD players) to the INPUT RCA connectors (from 1 to 4).

2. Connect[2] the OUTPUT RCA connectors to up to two digital audio acceptors (for example, power amplifiers).

3. If required, connect a PC and/or controller to the RS-232 port (see section 5.1).

4. Connect the 5V DC power adapter to the power socket and connect the adapter to the mains electricity (not shown in Figure 2).
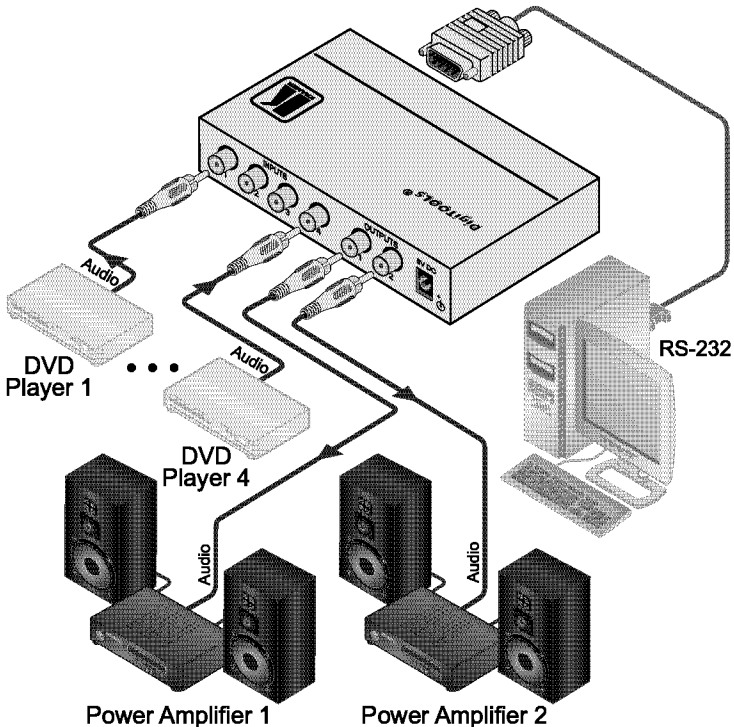

Figure 2: Connecting the 6502 4x1 S/PDIF Switcher / DA

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1 Switch OFF the power on each device before connecting it to your 6502. After connecting your 6502, switch on its power and then switch on the power on each device

2 You do not have to connect all the inputs or outputs

5.1 Controlling via RS-232 (for example, using a PC)

To connect a PC to the **6502** unit, using the Null-modem adapter provided with the machine (recommended):

- Connect the RS-232 9-pin D-sub rear panel port on the **6502** unit to the Null-modem adapter and connect the Null-modem adapter with a 9-wire flat cable to the RS-232 9-pin D-sub port on your PC

To connect a PC to the **6502** unit, without using a Null-modem adapter:

- Connect the RS-232 9-pin D-sub port on your PC to the RS-232 9-pin D-sub rear panel port on the **6502** unit, as Figure 3 illustrates
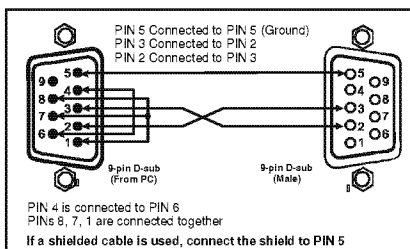

Figure 3: Connecting a PC without using a Null-modem Adapter

6 Technical Specifications

Table 2: Technical Specifications of the 6502 4x1 S/PDIF Switcher / DA

INPUTS:	4 digital audio S/PDIF on RCA connectors
OUTPUTS:	2 digital audio S/PDIF on RCA connectors
SAMPLING RATE:	32kHz to 192kHz
STANDARDS:	CP1201, IEC 60958, AES3ID and S/PDIF
DIMENSIONS:	12cm x 6.95cm x 2.44cm (4.72" x 2.74" x 0.96", W, D, H)
POWER SOURCE:	5V DC, 140mA
WEIGHT:	0.3kg (0.66lbs.) approx.
ACCESSORIES:	Power supply (5V/2A), mounting bracket, IR remote control transmitter
OPTIONS:	19" rack adapters

7 Table of Hex Codes for Serial Communication

Table 3 lists the Hex values for a single machine (*MACHINE #* 1):

Table 3: 6502 Hex Codes for Switching via RS-232

	OUT 1
IN 1	01, 81, 81, 81
IN 2	01, 82, 81, 81
IN 3	01, 83, 81, 81
IN 4	01, 84, 81, 81

8 Communication Protocol

The **6502** is compatible with Kramer's Protocol 2000 (version 0.50) (below). This RS-232/RS-485 communication protocol uses four bytes of information as defined below. For RS-232, a null-modem connection between the machine and controller is used. The default data rate is 9600 baud, with no parity, 8 data bits and 1 stop bit.

Table 4: Protocol Definitions

MSB							LSB
	DESTI-NATION	INSTRUCTION					
0	D	N5	N4	N3	N2	N1	N0
7	6	5	4	3	2	1	0

1st byte

	INPUT						
1	I6	I5	I4	I3	I2	I1	I0
7	6	5	4	3	2	1	0

2nd byte

	OUTPUT						
1	O6	O5	O4	O3	O2	O1	O0
7	6	5	4	3	2	1	0

3rd byte

			MACHINE NUMBER				
1	OVR	X	M4	M3	M2	M1	M0
7	6	5	4	3	2	1	0

4th byte

1st BYTE: Bit 7 – Defined as 0.
D – "DESTINATION": 0 - for sending information to the switchers (from the PC);
1 - for sending to the PC (from the switcher).
N5…N0 – "INSTRUCTION"
The function that is to be performed by the switcher(s) is defined by the INSTRUCTION (6 bits). Similarly, if a function is performed via the machine's keyboard, then these bits are set with the INSTRUCTION NO., which was performed. The instruction codes are defined according to the table below (INSTRUCTION NO. is the value to be set for N5…N0).

2nd BYTE: Bit 7 – Defined as 1.
  I6…I0 – "INPUT".
When switching (ie. instruction codes 1 and 2), the INPUT (7 bits) is set as the input number which is to be switched. Similarly, if switching is done via the machine's front-panel, then these bits are set with the INPUT NUMBER which was switched. For other operations, these bits are defined according to the table.

3rd BYTE: Bit 7 – Defined as 1.
  O6…O0 – "OUTPUT".
When switching (ie. instruction codes 1 and 2), the OUTPUT (7 bits) is set as the output number which is to be switched. Similarly, if switching is done via the machine's front-panel, then these bits are set with the OUTPUT NUMBER which was switched. For other operations, these bits are defined according to the table.

4th BYTE: Bit 7 – Defined as 1.
  Bit 5 – Don't care.
  OVR – Machine number override.
  M4…M0 – MACHINE NUMBER.
Used to address machines in a system via their <u>machine numbers.</u> When several machines are controlled from a single serial port, they are usually configured together with each machine having an individual machine number. If the OVR bit is set, then all machine numbers will accept (implement) the command, and the addressed machine will reply.
For a single machine controlled via the serial port, always set M4…M0 = 1, and make sure that the machine itself is configured as MACHINE NUMBER = 1.

Table 5: Instruction Codes for Protocol 2000

INSTRUCTION		DEFINITION FOR SPECIFIC INSTRUCTION		NOTE
#	DESCRIPTION	INPUT	OUTPUT	
2	SWITCH AUDIO	Set equal to audio input which is to be switched (0 = disconnect)	Set equal to audio output which is to be switched (0 = to all the outputs)	2
6	REQUEST STATUS OF AN AUDIO OUTPUT	Set as SETUP #	Equal to output number whose status is reqd	4, 3
61	IDENTIFY MACHINE	1 - video machine name 2 - audio machine name 3 - video software version 4 - audio software version	0 - Request first 4 digits 1 - Request first suffix 2 - Request second suffix 3 - Request third suffix 10 - Request first prefix 11 - Request second prefix 12 - Request third prefix	13
62	DEFINE MACHINE	1 - number of inputs 2 - number of outputs 3 - number of setups	1 - for video 2 - for audio	14

NOTES on the above table:

NOTE 2 - These are bi-directional definitions. That is, if the switcher receives the code, it will perform the instruction; and if the instruction is performed (due to a keystroke operation on the front panel), then these codes are sent. For example, if the HEX code

01	85	88	83

was sent from the PC, then the switcher (machine 3) will switch input 5 to output 8. If the user switched input 1 to output 7 via the front panel keypad, then the switcher will send HEX codes:

41	81	87	83

to the PC.
When the PC sends one of the commands in this group to the switcher, then, if the instruction is valid, the switcher replies by sending to the PC the same four bytes that it was sent (except for the first byte, where the DESTINATION bit is set high).

NOTE 3 - SETUP # 0 is the present setting. SETUP # 1 and higher are the settings saved in the switcher's memory, (i.e. those used for Store and Recall).

NOTE 4 - The reply to a "REQUEST" instruction is as follows: the same instruction and INPUT codes as were sent are returned, and the OUTPUT is assigned the value of the requested parameter. The replies to instructions 10 and 11 are as per the definitions in instructions 7 and 8 respectively. For example, if the present status of machine number 5 is breakaway setting, then the reply to the HEX code

0B	80	80	85

would be HEX codes

4B	80	81	85

NOTE 13 - This is a request to identify the switcher/s in the system. If the OUTPUT is set as 0, and the INPUT is set as 1, 2, 5 or 7, the machine will send its name. The reply is the decimal value of the INPUT and OUTPUT. For example, for a 2216, the reply to the request to send the audio machine name would be (HEX codes):

7D	96	90	81 (i.e. 128dec+ 22dec for 2nd byte, and 128dec+ 16dec for 3rd byte).

If the request for identification is sent with the INPUT set as 3 or 4, the appropriate machine will send its software version number. Again, the reply would be the decimal value of the INPUT and OUTPUT - the INPUT representing the number in front of the decimal point, and the OUTPUT representing the number after it. For example, for version 3.5, the reply to the request to send the version number would be (HEX codes):

7D	83	85	81 (i.e. 128dec+ 3dec for 2nd byte, 128dec+ 5dec for 3rd byte).

If the OUTPUT is set as 1, then the ASCII coding of the lettering following the machine's name is sent. For example, for the VS-7588YC, the reply to the request to send the first suffix would be (HEX codes):

7D	D9	C3	81 (i.e. 128dec+ ASCII for "Y"; 128dec+ ASCII for "C").

NOTE 14 - The number of inputs and outputs refers to the specific machine which is being addressed, *not* to the system. For example, if six 16X16 matrices are configured to make a 48X32 system (48 inputs, 32 outputs), the reply to the HEX code

3E	82	81	82 (ie. request the number of outputs)

would be HEX codes

7E	82	90	82

ie. 16 outputs

LIMITED WARRANTY

Kramer Electronics (hereafter *Kramer*) warrants this product free from defects in material and workmanship under the following terms.

HOW LONG IS THE WARRANTY

Labor and parts are warranted for seven years from the date of the first customer purchase.

WHO IS PROTECTED?

Only the first purchase customer may enforce this warranty.

WHAT IS COVERED AND WHAT IS NOT COVERED

Except as below, this warranty covers all defects in material or workmanship in this product. The following are not covered by the warranty:

1. Any product which is not distributed by Kramer, or which is not purchased from an authorized Kramer dealer. If you are uncertain as to whether a dealer is authorized, please contact Kramer at one of the agents listed in the Web site www.kramerelectronics.com.
2. Any product, on which the serial number has been defaced, modified or removed, or on which the WARRANTY VOID IF TAMPERED sticker has been torn, reattached, removed or otherwise interfered with.
3. Damage, deterioration or malfunction resulting from:
    i) Accident, misuse, abuse, neglect, fire, water, lightning or other acts of nature
    ii) Product modification, or failure to follow instructions supplied with the product
    iii) Repair or attempted repair by anyone not authorized by Kramer
    iv) Any shipment of the product (claims must be presented to the carrier)
    v) Removal or installation of the product
    vi) Any other cause, which does not relate to a product defect
    vii) Cartons, equipment enclosures, cables or accessories used in conjunction with the product

WHAT WE WILL PAY FOR AND WHAT WE WILL NOT PAY FOR

We will pay labor and material expenses for covered items. We will not pay for the following:

1. Removal or installations charges.
2. Costs of initial technical adjustments (set-up), including adjustment of user controls or programming. These costs are the responsibility of the Kramer dealer from whom the product was purchased.
3. Shipping charges.

HOW YOU CAN GET WARRANTY SERVICE

1. To obtain service on you product, you must take or ship it prepaid to any authorized Kramer service center.
2. Whenever warranty service is required, the original dated invoice (or a copy) must be presented as proof of warranty coverage, and should be included in any shipment of the product. Please also include in any mailing a contact name, company, address, and a description of the problem(s).
3. For the name of the nearest Kramer authorized service center, consult your authorized dealer.

LIMITATION OF IMPLIED WARRANTIES

All implied warranties, including warranties of merchantability and fitness for a particular purpose, are limited in duration to the length of this warranty.

EXCLUSION OF DAMAGES

The liability of Kramer for any effective products is limited to the repair or replacement of the product at our option. Kramer shall not be liable for:

1. Damage to other property caused by defects in this product, damages based upon inconvenience, loss of use of the product, loss of time, commercial loss; or:
2. Any other damages, whether incidental, consequential or otherwise. Some countries may not allow limitations on how long an implied warranty lasts and/or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations and exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights, which vary from place to place.

NOTE: All products returned to Kramer for service must have prior approval. This may be obtained from your dealer.

This equipment has been tested to determine compliance with the requirements of:

EN-50081:	"Electromagnetic compatibility (EMC); generic emission standard. Part 1: Residential, commercial and light industry"
EN-50082:	"Electromagnetic compatibility (EMC) generic immunity standard. Part 1: Residential, commercial and light industry environment".
CFR-47:	FCC* Rules and Regulations: Part 15: "Radio frequency devices Subpart B Unintentional radiators"

CAUTION!

⊠ Servicing the machines can only be done by an authorized Kramer technician. Any user who makes changes or modifications to the unit without the expressed approval of the manufacturer will void user authority to operate the equipment.

⊠ Use the supplied DC power supply to feed power to the machine.

⊠ Please use recommended interconnection cables to connect the machine to other components.

* FCC and CE approved using STP cable (for twisted pair products)

For the latest information on our products and a list of Kramer distributors, visit our Web site: www.kramerelectronics.com, where updates to this user manual may be found. We welcome your questions, comments and feedback.

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