

Kramer Electronics, Ltd.



USER MANUAL

Model:

FC-7501

Analog Video to SDI Converter

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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, and presentation professional on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better! Our 500-plus different models now appear in eight groups¹ that are clearly defined by function.

Thank you for purchasing your Kramer **FC-7501 Analog Video to SDI Converter**, which is ideal for broadcast and production video studios, postproduction and duplication studios, and non-linear editing.

The package includes the following items:

- **FC-7501 Analog Video to SDI Converter**
- Power supply
- This user manual²

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
- Use Kramer high-performance high-resolution cables³

1 GROUP 1: Distribution Amplifiers; GROUP 2: Video and Audio Switchers, Matrix Switchers and Controllers; GROUP 3: Video, Audio, VGA/XGA Processors; GROUP 4: Interfaces and Sync Processors; GROUP 5: Twisted Pair Interfaces; GROUP 6: Accessories and Rack Adapters; GROUP 7: Scan Converters and Scalers; and GROUP 8: Cables and Connectors

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

3 The complete list of Kramer cables is on our Web site at <http://www.kramerelectronics.com>

3 Overview

The high quality **FC-7501** is a multi-standard converter that converts professional quality video to serial digital video (SDI).

The following analog formats are supported:

- Composite video
- s-Video
- Component video (Y, B-Y, R-Y, sometimes called YUV or Y, Pb, Pr)

The **FC-7501** maintains the high level of professional video quality, prevalent with component video output devices and DVD players, when converting to SDI.

The **FC-7501** automatically detects the input standard, generating the appropriate output:

- For component video input, 50Hz/625 line (interlaced) and 60Hz/525 line (interlaced) are supported
- For YC and CV inputs, all variations of PAL, NTSC and SECAM are supported

In addition, the **FC-7501** features:

- SDI conversion on 2 buffered and reclocked SDI outputs
- Input looping connectors and a 75Ω/Hi-Z input termination switch
- An RS-232 port
- Control via a user-friendly Windows®-based program that can modify video parameters such as contrast, saturation and hue, which may be stored in non-volatile memory
- True 10-bit digitizing - ideal for broadcast applications

To achieve the best performance:

- Use only good quality connection cables¹ to avoid 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 that may adversely influence signal quality and position your Kramer **FC-7501** in a location free from moisture and away from excessive sunlight and dust

¹ Available from Kramer Electronics on our Web site at <http://www.kramerelectronics.com>



Caution – No operator-serviceable parts inside unit.

Warning – Use only the Kramer Electronics input power wall adapter that is provided with this unit¹.

Warning – Disconnect power and unplug unit from wall before installing or removing device or servicing unit.

4 Your Analog Video to SDI Converter

Figure 1, Table 1, and Table 2, define the **FC-7501**:

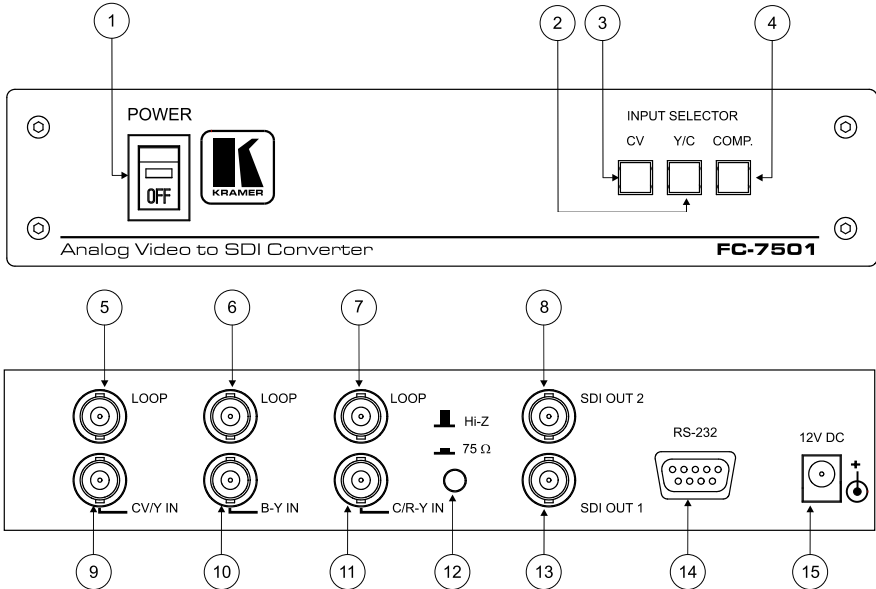


Figure 1: FC-7501 Analog Video to SDI Converter

Table 1: Front Panel FC-7501 Analog Video to SDI Converter

#	Feature	Function
1	POWER Switch	Illuminated switch supplying power to the unit
2	Y/C Button	Press to select the s-Video (Y/C) source
3	CV Button	Press to select the composite video source
4	COMP. Button	Press to select the component source

¹ For example: model number AD2512C, part number 2535-000251

Table 2: Rear Panel FC-7501 Analog Video to SDI Converter

#	Feature	Function
5	CV/Y LOOP BNC Connector	Connects to the composite, s-Video ¹ or component ² video loop
6	B-Y LOOP BNC Connector	Connects to the component ² video loop
7	C/R-Y LOOP BNC Connector	Connects to the s-Video ¹ or component ² video loop
8	SDI OUT 2 BNC Connector	Connects to the serial digital video acceptor 2
9	CV/Y IN BNC Connector	Connects to the composite, s-Video ¹ or component ² video source
10	B-Y IN BNC Connector	Connects to the component ² video source
11	C/R-Y IN BNC Connector	Connects to the s-Video ¹ or component ² video source
12	Hi-Z / 75Ω Button	Press to terminate at 75Ω or release for looping ³
13	SDI OUT 1 BNC Connector	Connects to the serial digital video acceptor 1
14	RS-232 Port	Connects to the PC or the Remote Controller
15	12V DC	Power Connector 12 VDC, 320mA

5 Using Your Analog Video to SDI Converter

You can use your **FC-7501**, to convert professional quality composite video, s-Video or component video (as the example in *Figure 2* illustrates) to one or two SDI video outputs.

To convert component video to two SDI video outputs, do the following:

1. Connect a component video source (for example, a Betacam component VCR) to the component video BNC input connectors, Y, B-Y, and R-Y.
2. Connect both SDI outputs to SDI acceptors as follows (when only one SDI output is required, use either of the SDI outputs of the **FC-7501**, and leave the other SDI output unconnected):
 - Connect the SDI OUT 1 BNC connector to an SDI acceptor (for example, a Non-Linear Editor)
 - Connect the SDI OUT 2 BNC connector to the second SDI acceptor (for example, an SDI monitor)
3. Connect the component video loop connectors, LOOP Y, LOOP B-Y, and LOOP R-Y, to a component monitor, and release the Hi-Z/75Ω button to Hi-Z (optional).
When the inputs are not looped, the Hi-Z/75Ω button should be pressed
4. Connect the 12V DC power adapter to the power socket and connect the adapter to the mains electricity.

¹ For s-Video, connect the CV/Y and the C/R-Y connectors

² For component video, connect all 3 connectors: Y, B-Y, and R-Y

³ Push in to terminate the input. Release when the input extends to another unit

5. Turn on the power and press the COMP. (Component video) button.
The component video signal converts to SDI at both SDI OUT 1 and SDI OUT 2.

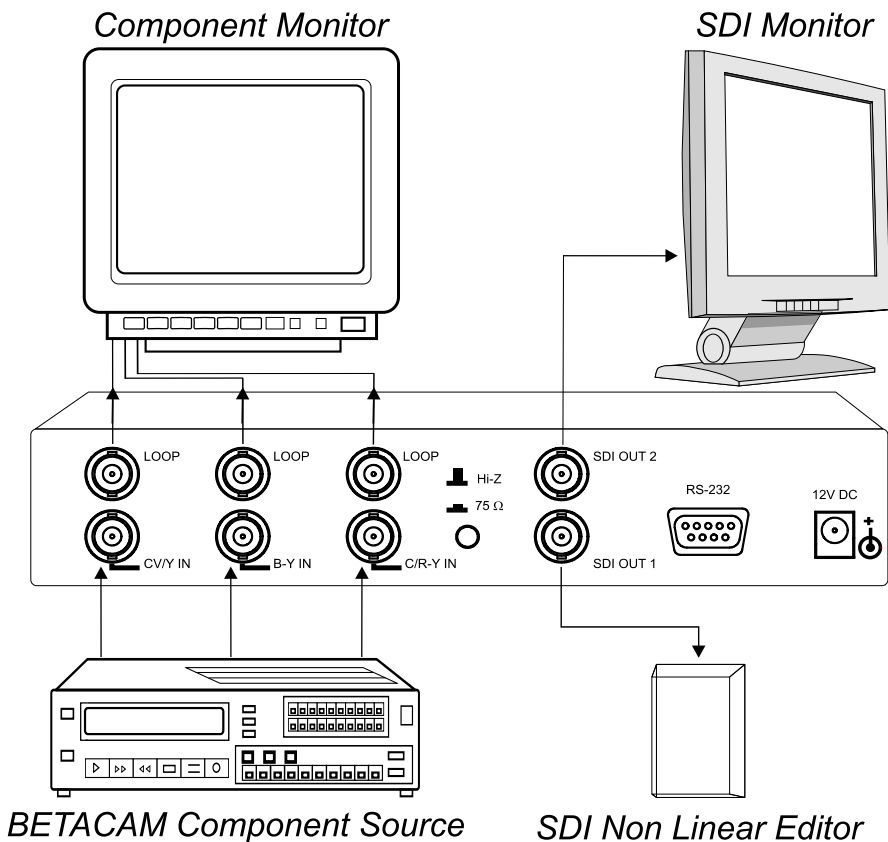


Figure 2: Connecting an FC-7501 Analog Video to SDI Converter

6 Upgrading the FC-7501 to an FC-7501P

You can improve the *SDI Pixel Jitter* by converting the **FC-7501** to an **FC-7501P** (an Analog Video to SDI Converter with very low jitter), as explained in the following steps.

6.1 Inserting the 7501M Module

1. Unfasten the two pairs of screws on each side of the cover of the **FC-7501** and remove the cover, as *Figure 3* illustrates:

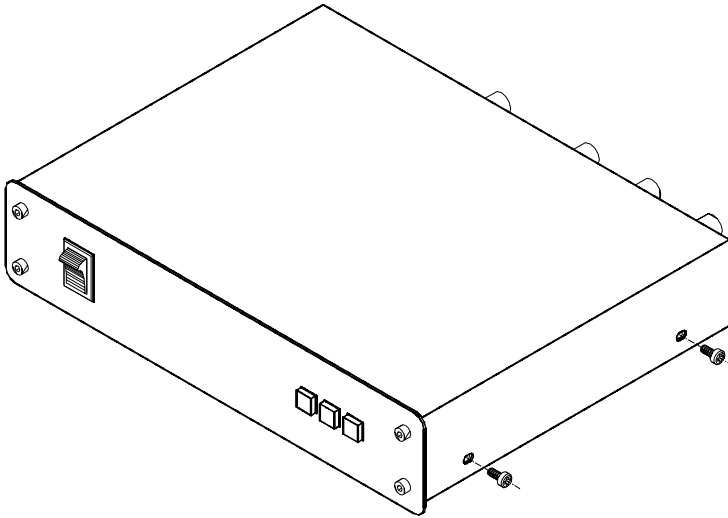


Figure 3: Removing the Cover of the FC-7501

2. Remove jumpers on J7 and J8 (see *Figure 4*.)
3. Insert the optional **7501M** module (“PLL board”) onto the two sets of 16 pins, and secure it to the spacer by fastening the washer and screw¹, as shown in *Figure 4*.

¹ Supplied with the 7501M optional module

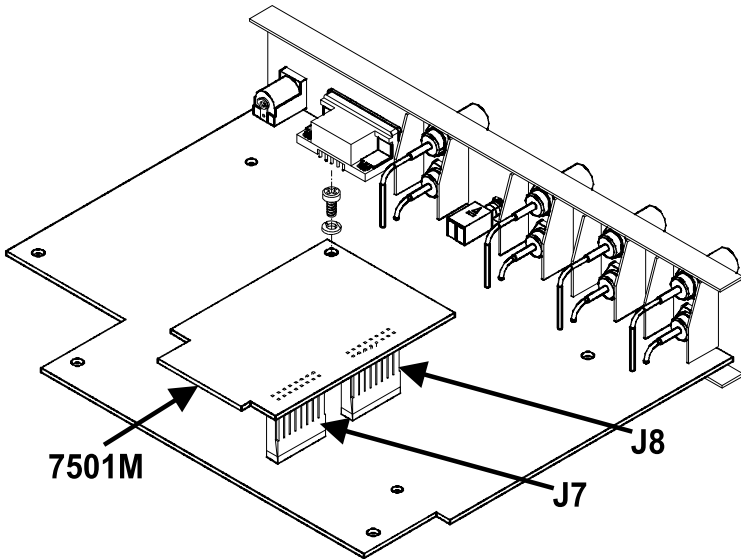


Figure 4: Upgrading the FC-7501 to FC-7501P by inserting an optional 7501M module

4. Replace the cover on the **FC-7501**, and secure it in place by fastening the two pairs of screws on each side of the cover.
The **FC-7501P** is an upgraded **FC-7501** unit (with the **7501M** added).

7 Technical Specifications

Table 3 includes the technical specifications:

Table 3: Technical specifications¹ of the FC-7501 Analog Video to SDI Converter

INPUTS:	1 composite video/Y: 1 (B-Y): 1 (R-Y)/C:	1Vpp/75Ω looping on BNC connectors with a termination switch 0.7Vpp/75Ω looping on BNC connectors with a termination switch 0.7Vpp/0.3Vpp/75Ω looping on BNC connectors with a termination switch
VIDEO STANDARDS:	CV, YC: Component:	NTSC (M, Japan, 4.43), PAL (B, D, G, H, I, M, N, Nc) and SECAM (B, D, G, K, K1, L) 50 Hz/625 line, 60 Hz/525 line
OUTPUTS:	2 SDI on BNC connectors	
BANDWIDTH:	0.2dB to 5MHz; 1dB to 6MHz	
LUMINANCE NON-LINERARITY:	1% (worst case)	
K-FACTOR:	0.1%	
S/N RATIO:	57dB (worst case)	
CHROMA/LUMA DELAY:	<10ns	
SDI PIXEL JITTER:	<500ps (10Hz HPF) with PLL option board <1ns (10kHz HPF) without PLL option board	
INPUT COUPLING:	DC or AC via internal jumpers	
POWER SOURCE:	12 VDC, 320mA	
DIMENSIONS:	22cm x 18cm x 4.5cm (8.7" x 7" x 1.7") W, D, H.	
WEIGHT:	1.3 kg (2.9 lbs.) approx.	
ACCESSORIES:	Power supply	
OPTIONS:	19" rack adapter RK-80	

8 Communications Protocol for the FC-7501²

RS-232 communication with the **FC-7501** complies with the following protocol. The protocol uses 4 bytes of information, and data is at 9600 baud, with no parity, 8 data bits and 1 stop bit. A null-modem RS-232 connection should be used between the PC (or other controller) and the **FC-7501**. That is, for a DB-9 port, connect as follows:

- Connect pin 5 of the PC to pin 5 of the machine
- Cross pins 2 and 3, ie. connect pin 2 of the PC to pin 3 of the machine, and connect pin 3 of the PC to pin 2 of the machine
- On the PC side, short pins 4 and 6
- On the PC side, short pins 1, 7 and 8.

¹ Specifications are subject to change without notice

² VER-0.3, 20/01/03. Download the Communication Protocol **FC-7501** from our Web site at <http://www.kramerelectronics.com>

This protocol complements Kramer’s “Protocol 2000” (Kramer’s switcher protocol), so the two protocols can co-exist without disturbing one another. (According to Protocol 2000, the **FC-7501** appears as machine number 22, so care should be taken not to set a switcher with this machine number).

Table 4: Structure of the Protocol

MSB		INSTRUCTION						LSB	
0	TO PC	I5	I4	I3	I2	I1	I0		
7	6	5	4	3	2	1	0		
1st byte									
		DATA							
1	D6	D5	D4	D3	D2	D1	D0		
7	6	5	4	3	2	1	0		
2nd byte									
		EXTENDED DATA							
1	E6	E5	E4	E3	E2	E1	E0		
7	6	5	4	3	2	1	0		
3rd byte									
		MSB's						ADDR	
1	E7	D7	1	0	1	1	0		
7	6	5	4	3	2	1	0		
4th byte ¹									

Note that the MSB's of the DATA (D7) and the EXTENDED DATA (E7) are in the fourth byte.

Terminology:

- TO PC is the “DESTINATION BIT”
- I4..I0 is the “INSTRUCTION”
- D7..D0 is the “DATA”
- E7..E0 is the “EXTENDED DATA”
- A0 is the “LSB of the MACHINE ADDRESS”

The destination bit, TO PC, is 0 when sending from the PC to the machine, or 1 when sending from the machine to the PC.

Table 5: Instruction Set for the FC-7501

#	INSTRUCTION	I5	I4	I3	I2	I1	I0
0	Reset	0	0	0	0	0	0
1	Read video standard	0	0	0	0	0	1
2	Write video standard	0	0	0	0	1	0
3	Read front-panel switch (video format)	0	0	0	0	1	1
4	Press front-panel switch (video format)	0	0	0	1	0	0
5	Read video field rate	0	0	0	1	0	1
6	Force video standard	0	0	0	1	1	0
10	Write EEPROM data – low address	0	0	1	0	1	0
11	Read EEPROM data – low address	0	0	1	0	1	1
12	Write I ² C	0	0	1	1	0	0
13	Read I ² C	0	0	1	1	0	1
16	Error	0	1	0	0	0	0
20	Write EEPROM data – high address	0	1	0	1	0	0
21	Read EEPROM data – high address	0	1	0	1	0	1
57	Enable “Power-down save”	1	1	1	0	0	1
61	Identify machine	1	1	1	1	0	1

¹ Note that the MSB's of the DATA (D7) and the EXTENDED DATA (E7) are in the fourth byte

8.1 Description of Instructions

INSTRUCTION 0 – RESET

DATA=0: initialize the machine.

When the machine is initialized, it will send the RESET code (DATA = 0). If the machine receives this code, it will reset to its “power-up” state.

DATA=1: configure the machine to its factory default state.

When the machine receives this code, all programmable parameters will be reset to their factory-default values.

EXTENDED DATA - set as 0.

INSTRUCTION 1 – READ INPUT STANDARD

For sending to machine, set DATA = EXTENDED DATA = 0.

When replying:- DATA = INPUT STANDARD; EXTENDED DATA = 0.

The PC sends this instruction to the machine. The machine replies by sending back the INPUT STANDARD, defined as per the table below:

Table 6: Input Standard

STANDARD	E2	E1	E0
NTSC (J, M)	0	0	0
PAL (B, G, H, I, N)	0	0	1
PAL-M	0	1	0
Combination PAL-N	0	1	1
NTSC 4.43	1	0	0

INSTRUCTION 2 – WRITE VIDEO STANDARD

DATA = set as video standard (see table above). This is valid for CV and Y/C formats.

The PC sends the video standard to the machine. The standard is implemented, and the machine replies by sending the same data back to the PC.

Note that the machine should be set for “forced video standard” (instruction #6) if using this instruction, (since the unit will otherwise detect - and revert back to - the standard of the current video input).

INSTRUCTION 3 – READ FRONT-PANEL SWITCH (read format)

When sending to machine:- DATA, EXTENDED DATA - set as 0.

When replying:- DATA = front-panel switch number (0=CV, 1=Y/C, 2=Component); EXTENDED DATA = 0.

The PC sends this instruction to the machine. The machine replies by sending back a value relating to the current video format.

INSTRUCTION 4 – PRESS FRONT-PANEL SWITCH (select format)

DATA = front-panel switch number (0=CV, 1=Y/C, 2=Component).

EXTENDED DATA - set as 0.

- When the machine receives this instruction, it selects the new video format – as is done if the front-panel switch was pressed. If this results in a change in the video format, then the unit replies by sending the same data back to the PC.

INSTRUCTION 5 – READ FIELD RATE

When sending to machine:- DATA, EXTENDED DATA - set as 0.

When replying:- DATA=0 for 60Hz field rate; DATA=1 for 50Hz field rate; EXTENDED DATA=0.

The PC sends this instruction to the machine. The machine replies by sending back a value relating to the current video field rate.

INSTRUCTION 6 – FORCE VIDEO STANDARD

DATA = 0 to allow the unit to automatically detect and decode the input standard; DATA = 1 to force the unit to decode a video standard (see instruction #2). This instruction is valid for CV and Y/C formats.

The PC sends the data to the machine, and the machine replies by sending the same data back to the PC.

INSTRUCTION 10 & 20 – WRITE EEPROM DATA

DATA = EEPROM sub-address; EXTENDED DATA = data to be written to this sub-address.

The PC sends data directly to the EEPROM. The EEPROM stores this new value, and replies by sending the same data back to the PC.

CAUTION – this function was designated for development and testing purposes. Improper use of this function may cause erratic behaviour of the machine.

INSTRUCTION 11 & 21 – READ EEPROM DATA

For sending to machine, DATA = EEPROM sub-address.

When replying:- DATA = EEPROM sub-address; EXTENDED DATA = requested data.

The PC sends this instruction to the machine. The machine replies by sending back the data of this sub-address.

INSTRUCTION 12 – WRITE PC

DATA = PC sub-address; EXTENDED DATA = data to be written to this sub-address.

The PC sends PC data (to the PC address which was last accessed via INSTRUCTION 13). The machine replies by sending the same data back to the PC.

CAUTION – this function was designated for development and testing purposes. Improper use of this function may cause erratic behavior of the machine.

INSTRUCTION 13 – READ PC

For sending to machine, DATA = PC address; EXTENDED DATA = sub-address.

When replying: - DATA = sub-address; EXTENDED DATA = data read.

The PC sends this instruction to the machine. The machine replies by sending back the data of this address and sub-address.

INSTRUCTION 16 – ERROR

If the machine receives an invalid instruction, it replies by sending this error code.

INSTRUCTION 57 – ENABLE “POWER-DOWN SAVE”

DATA = 0 disables power-down saving; DATA = 1 enables saving. EXTENDED DATA - set to 0.

The PC sends this instruction to the machine. The power-down option is enabled or disabled according to the value of DATA.

If the power-down option is enabled, then the machine will “remember” its state before being turned off, and revert to this state when turned on again.

Note that whenever the machine is turned on, the power-down save option is enabled.

INSTRUCTION 61 – IDENTIFY MACHINE

For sending, DATA = 1 to request machine name; DATA = 3 to request software version number. EXTENDED DATA - set to 0.

The PC sends this instruction to the machine. The machine replies as follows:

if the machine name is requested, the machine replies with DATA = 75 (hex), and EXTENDED DATA = 01 (hex).

if the software version is requested, the machine replies with DATA as the version number before the decimal point, and EXTENDED DATA is the value following the decimal point. For example, for version 3.4, the machine replies with DATA = 03 (hex), and EXTENDED DATA = 04 (hex).

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 your 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.



**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.**



Caution

Safety Warning:

Disconnect the unit from the power supply before opening/servicing.



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P/N: 2900-004016 REV 2