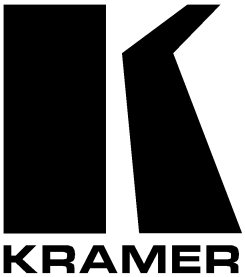
Kramer Electronics, Ltd.



USER MANUAL

Model:

FC-6801

SDI De-Embedder

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1 Introduction

Welcome to Kramer Electronics (since 1981): a world of unique, creative and affordable solutions to the infinite 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 350-plus different models now appear in 8 Groups[1], which are clearly defined by function.

Congratulations on purchasing your **FC-6801** *SDI De-Embedder*, which is ideal for broadcast and production studios, as well as digital / analog audio video authoring. The package includes the following items:

- **FC-6801** *SDI De-Embedder*
- Power cord
- Null-modem adapter and Windows®-based Kramer control software[2]
- This user manual[3] and the Kramer concise product catalog/CD

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 cables[4]

3 Overview

The **FC-6801** is a high quality audio de-embedder for serial digital video. It accepts a standard definition SDI source (270MHz), has an equalized (up to 350m automatic cable equalization) and reclocked SDI output (loop), and de-embeds the audio from the SDI stream.

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 Downloadable from our Web site at http://www.kramerelectronics.com (click "DOS and Windows®-based software drivers for Kramer machines" in the Technical Support section)

3 Download up-to-date Kramer user manuals from the Internet at this URL: http://www.kramerelectronics.com/manuals.html

4 The complete list of Kramer cables is on our Web site at http://www.kramerelectronics.com (click "Cables and Connectors" in the Products section)

In addition, the **FC-6801**:

- De-embeds four audio channels
- Provides de-embedded audio in both analog (balanced on XLR connectors) and digital (AES/EBU on BNC connectors) audio formats
- Includes automatic selection for 20/24 bit digital audio stream
- Includes a selectable audio delay of up to one second that lets you adjust for lip sync errors so that the audio delay will match the video delay[1]
- Includes auto-detect 525/625 line format and EDH insertion and generation
- Has an embedded SDI input with active, reclocked and equalized output (loop)
- Can be cascaded to de-embed up to 16 channels
- Fits in one vertical space of a standard 19" professional rack enclosure

3.1 Controlling your FC-6801

The **FC-6801** can be controlled via a user-friendly RS-232 Windows®-based Kramer control software[2], which lets you recall group setup and the audio delay setting. Hardware control is via the rear panel AUDIO DELAY dipswitches, as well as via the front panel:

- GROUP SELECT button, that lets you select the audio group that you want to de-embed (the active audio channel LEDs light)
- Potentiometers that let you control the gain level of the analog output pairs
- Set of status LEDs, that indicate the bit resolution (20 or 24), the video input standard (PAL or NTSC), Video LOCK and Audio (DEMUX) LOCK

3.2 Achieving the Best Performance

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 that may adversely influence signal quality and position your Kramer **FC-6801** away from moisture, excessive sunlight and dust

4 Your SDI De-Embedder

Figure 1, Table 1, and Table 2 define the **FC-6801**:

1 Total delay per AES channel is 1.024 seconds in 8 msec steps (8 msec x 128 = 1.024 seconds)

2 Downloadable from our Web site at http://www.kramerelectronics.com (click "DOS and Windows®-based software drivers for Kramer machines" in the Technical Support section)

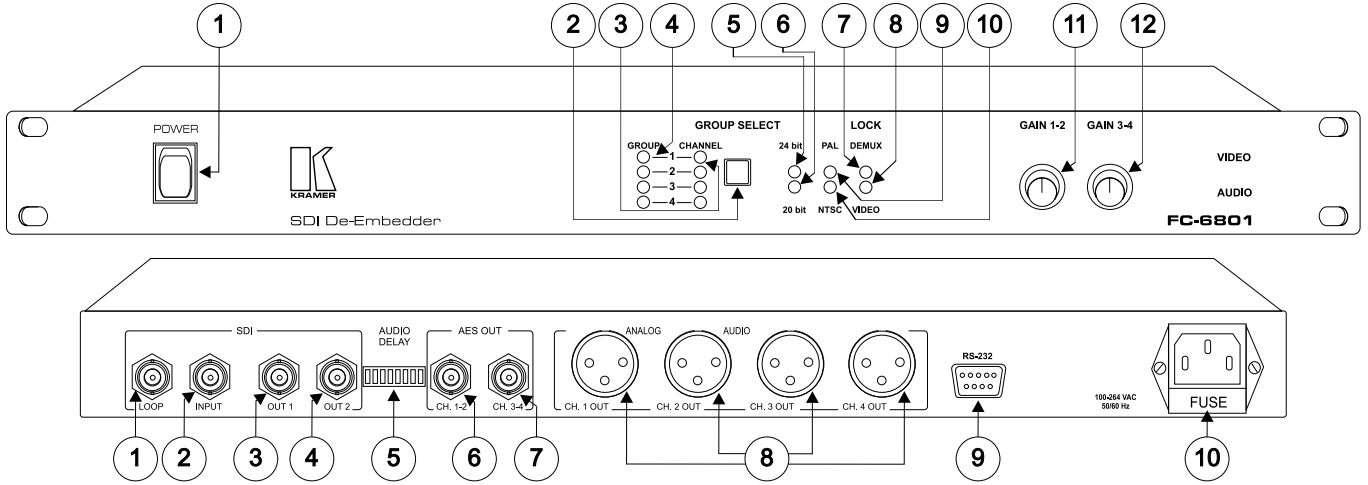

Figure 1: FC-6801 SDI De-Embedder

Table 1: Front Panel FC-6801 SDI De-Embedder

#	Feature	Function
1	*POWER* Switch	Illuminated switch supplying power to the unit
2	*GROUP SELECT* Button	Press to select the desired group[1]
3	*CHANNEL* Green LEDs	Automatically indicate the active channels[2]
4	*GROUP* Green LEDs	Indicate the selected group (1, 2, 3, or 4)
5	*24 bit Red* LED	Automatically lights when the AES/EBU stream is 24 bit
6	*20 bit Red* LED	Automatically lights when the AES/EBU stream is 20 bit
7	*LOCK* *DEMUX Red* LED	Automatically lights when de-embedding audio from the video signal
8	*LOCK* *VIDEO Red* LED	Automatically lights when receiving an SDI signal
9	*PAL Red* LED	Lights when recognizing a PAL input video standard
10	*NTSC Red* LED	Lights when recognizing an NTSC input video standard
11	*GAIN 1-2* Knob	Adjusts the gain level of the analog outputs 1 and 2
12	*GAIN 3-4* Knob	Adjusts the gain level of the analog outputs 3 and 4

Table 2: Rear Panel FC FC-6801 SDI De-Embedder

#	Feature	Function
1	*SDI* *LOOP* BNC Connector	Reclocked and equalized SDI output for active looping of the SDI input[3]
2	*SDI* *INPUT* BNC Connector	Connects to the SDI source
3	*SDI* *OUT 1* BNC Connector	Connects to the SDI[4] acceptor 1[5]
4	*SDI* *OUT 2* BNC Connector	Connects to the SDI[4] acceptor 2[5]
5	*AUDIO DELAY* Dipswitches	Dipswitches for setup of the delay time[6] DIPS 1 to 7 determine the delay DIP 8 determines if audio delay is set via RS-232 (ON) or via the dipswitches (OFF)
6	*AES OUT* *CH. 1-2* BNC Connector	Connects to the digital audio acceptor (for channels 1 and 2)[7]
7	*AES OUT* *CH. 3-4* BNC Connector	Connects to the digital audio acceptor (for channels 3 and 4)[7]
8	*ANALOG AUDIO OUT* XLR Male Connectors	Connect to the balanced audio acceptors (from 1 to 4)[5]
9	*RS-232* Port	Connects to the PC or the Remote Controller
10	Power Connector with *Fuse*	AC connector enabling power supply to the unit

1 If the selected group contains audio channels, the CHANNEL Green LEDs will automatically indicate those channels

2 Either 2 LEDs, 4 LEDs, or no LEDs will light

3 See the example in Figure 4

4 De-embedded, reclocked and equalized SDI output

5 As required. Outputs may be connected or left unconnected

6 Total delay per AES channel is 1.024 seconds in 8 msec steps (8 msec x 128 = 1.024 seconds)

7 In accordance with the standard, the audio digital stream contains 2 audio channels

5 Using Your FC-6801 SDI De-Embedder

Sections 5.1 and 5.2 describe how to connect and operate your **FC-6801** *SDI De-Embedder*.

5.1 Connecting the FC-6801 SDI De-Embedder

To connect the **FC-6801** *SDI De-Embedder*, as the example in Figure 3 illustrates, do the following[1]:

1. Connect an SDI source (for example, a digital video player) to the SDI INPUT BNC connector.
2. Connect the SDI LOOP BNC connector (OPTIONAL) to the SDI INPUT BNC connector on an additional unit to increase outputs (see the illustration in Figure 4 which shows how to cascade four **FC-6801** units).
3. Connect both SDI outputs to SDI acceptors as follows (when only one SDI output is required, use either of the SDI outputs, and leave the other SDI output unconnected):
   - Connect the SDI OUT 1 BNC connector to an SDI acceptor (for example, SDI monitor 1)
   - Connect the SDI OUT 2 BNC connector to the second SDI acceptor (for example, SDI monitor 2)
4. Connect the AES OUT channel 1-2 BNC connector[2] to a digital audio acceptor for channels 1 and 2 (for example, DAT-Recorder A)
5. Connect the AES OUT channel 3-4 BNC connector[2] to a digital audio acceptor for channels 3 and 4 (for example, DAT-Recorder B)
6. Connect up to 4 analog audio outputs to analog balanced audio acceptors, as required. Outputs may be connected[3] or left unconnected.
7. Connect a PC (optional - see section 5.1.1) or other RS-232 controller.
8. Connect the power cord[4].

1 Switch OFF the power on each device before connecting it to your FC-6801. After connecting your FC-6801, switch on its power and then switch on the power on each device. Switching on the FC-6801, recalls the last status prior to powering down

2 When only one digital audio stream containing 2 audio channels is required, use either of the AES outputs, and leave the other AES output unconnected

3 For example, connect the channel 1 and channel 2 OUT XLR connectors to a balanced stereo analog audio acceptor (amplifier 1), and connect the channel 3 and channel 4 OUT XLR connectors to a balanced stereo analog audio acceptor (amplifier 2)

4 The power connector is not illustrated in Figure 3

5.1.1 Connecting a PC

To connect a PC to the **FC-6801** unit, using the Null-modem adapter provided with the machine (recommended):

- Connect the RS-232 DB9 rear panel port on the **FC-6801** unit to the Null-modem adapter and connect the Null-modem adapter with a 9 wire flat cable to the RS-232 DB9 port on your PC

To connect a PC to the **FC-6801** unit, without using a Null-modem adapter:

- Connect the RS-232 DB9 port on your PC to the RS-232 DB9 rear panel port on the **FC-6801** unit, as Figure 2 illustrates (depending on whether the PC has a 9-pin or 25-pin connector)

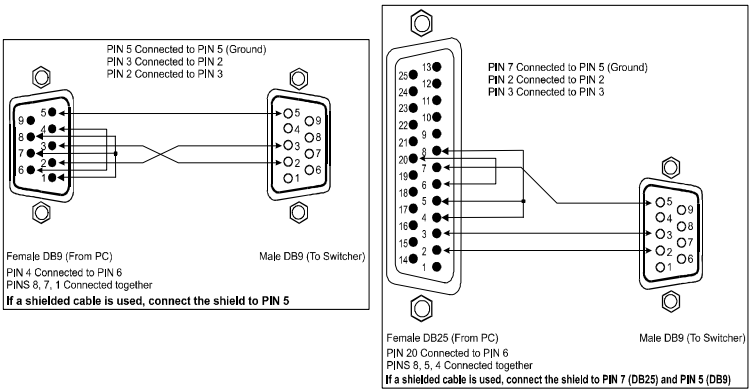

Figure 2: Connecting a FC-6801 Unit to a PC without using a Null-modem Adapter

5.1.2 Setting the AUDIO DELAY Dipswitches

Table 3 defines the AUDIO DELAY dipswitch settings:

Table 3: AUDIO DELAY Dipswitch Settings

DIPS	Description
1 to 7	Delay setting
8	Operation via PC (or other controller) = ON; Operation via DIPS 1 to 7 = OFF

Table 4 includes examples of how to set DIPS 1 to 7:

Table 4: Setting the AUDIO DELAY Control Time

msec	Binary Value	Increment	DIP 1	DIP 2	DIP 3	DIP 4	DIP 5	DIP 6	DIP 7
8	1	1	ON	ON	ON	ON	ON	ON	OFF
40	101	5	ON	ON	ON	ON	OFF	ON	OFF
80	1010	10	ON	ON	ON	OFF	ON	OFF	ON
160	10100	20	ON	ON	OFF	ON	OFF	ON	ON
400	110010	50	ON	OFF	OFF	ON	ON	OFF	ON
800	1100100	100	OFF	OFF	ON	ON	OFF	ON	ON
1024	1111111	128	ON	ON	ON	ON	ON	ON	ON

The example in Figure 3 illustrates how to connect the **FC-6801**:

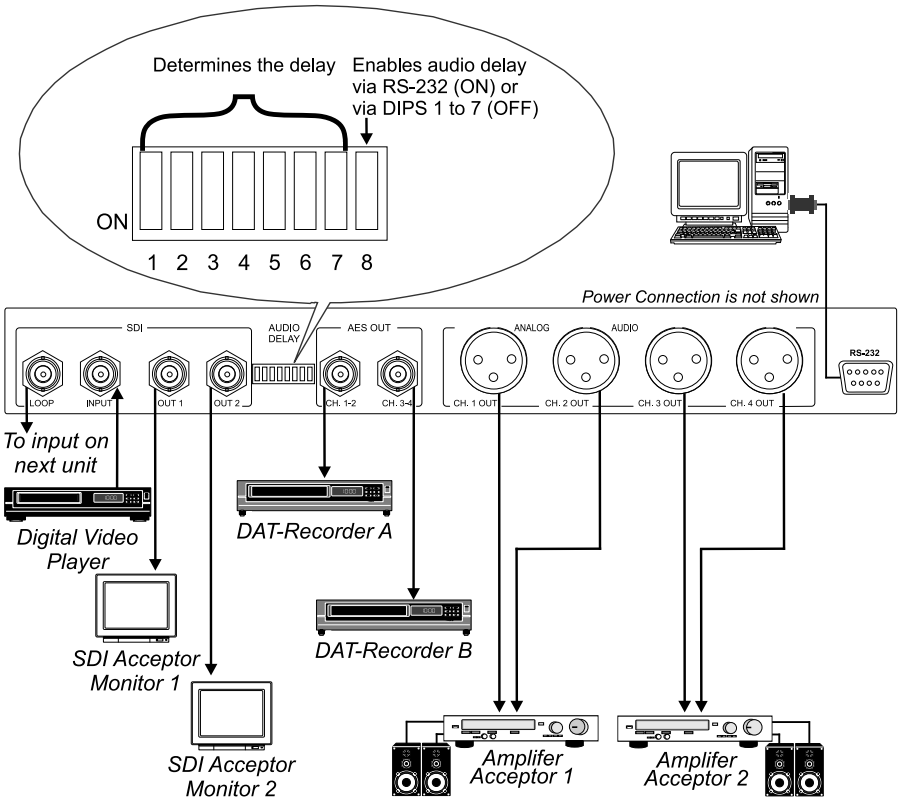

Figure 3: Connecting an FC-6801 SDI De-Embedder

5.1.3 Cascading FC-6801 SDI De-Embedder Units

To cascade up to four **FC-6801** *SDI De-Embedder* units, as the example in Figure 4 illustrates, do the following[1]:

1. Connect an SDI source (for example, a digital video player) to the SDI INPUT BNC connector on **FC-6801** unit # 1 and interconnect the four **FC-6801** units:
   - Connect the SDI LOOP BNC connector on unit # 1 to the SDI INPUT BNC connector on unit # 2
   - Connect the SDI LOOP BNC connector on unit # 2 to the SDI INPUT BNC connector on unit # 3
   - Connect the SDI LOOP BNC connector on unit # 3 to the SDI INPUT BNC connector on unit # 4
2. Connect the two AES OUT BNC connectors on each of the four **FC-6801** units to eight digital audio acceptors (a total of 16 channels):
   - Connect the AES OUT channel 1-2 BNC connector on unit # 1 to an AES acceptor A (channels 1 and 2), and connect the AES OUT channel 3-4 BNC connector on unit # 1 to an AES acceptor B (channels 3 and 4)
   - Connect the AES OUT BNC connectors on unit # 2 to an AES acceptor C (channels 5 and 6), and to an AES acceptor D (channels 7 and 8)
   - Connect the AES OUT BNC connectors on unit # 3 to an AES acceptor E (channels 9 and 10), and to an AES acceptor F (channels 11 and 12)
   - Connect the AES OUT BNC connectors on unit # 4 to an AES acceptor G (channels 13 and 14), and to an AES acceptor H (channels 15 and 16)
3. Connect the four analog audio OUT XLR connectors on each of the four **FC-6801** units to 16 analog balanced audio acceptors:
   - Connect the XLR connectors on unit # 1 to balanced audio acceptors 1 to 4
   - Connect the XLR connectors on unit # 2 to balanced audio acceptors 5 to 8
   - Connect the XLR connectors on unit # 3 to balanced audio acceptors 9 to 12
   - Connect the XLR connectors on unit # 4 to balanced audio acceptors 13 to 16
4. Connect the SDI outputs (OPTIONAL) on each of the four **FC-6801** units to up to two SDI acceptors (eight in total)[2].
5. Connect the power cord on each of the four **FC-6801** units[2].

1 Switch OFF the power on each device before connecting it to an FC-6801 unit. After connecting each FC-6801 unit, switch on its power and then switch on the power on each device

2 Not illustrated in Figure 4

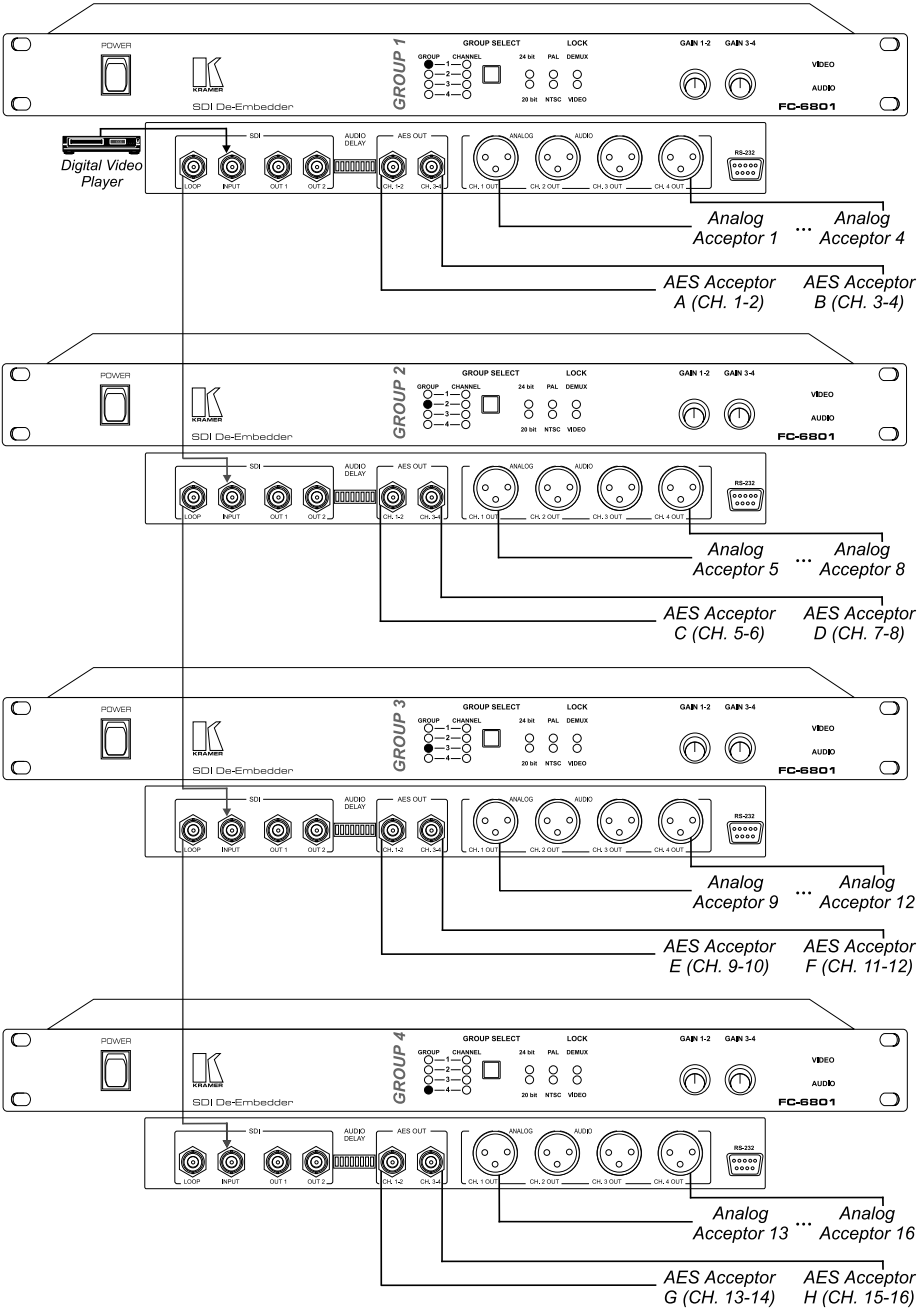

Figure 4: Cascading FC-6801 SDI De-Embedder Units

5.2 Operating the FC-6801 SDI De-Embedder

To operate the **FC-6801** *SDI De-Embedder*:

1. Set the audio delay, via the:
   - AUDIO DELAY dipswitches (see section 5.1.2); and/or
   - Windows®-based Kramer control software[1]
2. Adjust the gain level of the balanced analog audio outputs, if required, via the:
   - GAIN 1-2 knob[2], and/or the GAIN 3-4 knob[3]; and/or
   - Windows®-based Kramer control software[1]

6 Technical Specifications

Table 5 includes the technical specifications:

Table 5: Technical Specifications[4] of the FC-6801 SDI De-Embedder

INPUT:	1 x SDI with embedded audio on BNC connector
OUTPUTS:	2 x SDI on BNC connectors with EDH 1 x SDI reclocked Loop output 2 x AES-EBU on BNC connectors 4 x balanced audio on XLR connectors
MAX. OUTPUT LEVEL:	7Vpp
BANDWIDTH (-3dB):	20Hz – 20kHz
S/N RATIO:	–90dB
CONTROLS:	Analog audio level control, Delay settings, Group Select
COUPLING:	DC
AUDIO THD + NOISE:	0.014%
AUDIO 2nd HARMONIC:	–90dB
POWER SOURCE:	90-260VAC 50-60Hz 18VA
DIMENSIONS:	19 inch (W), 7 inch (D), 1U (H) rack mountable
WEIGHT:	2.5 kg (5.5 lbs) approx.
ACCESSORIES:	Power cord, Null-modem adapter and Windows®-based Kramer control software[5]

1 Downloadable from our Web site at http://www.kramerelectronics.com (click "DOS and Windows®-based software drivers for Kramer machines" in the Technical Support section)

2 Rotate to adjust the gain level of the balanced analog audio outputs 1 and 2

3 Rotate to adjust the gain level of the balanced analog audio outputs 3 and 4

4 Specifications are subject to change without notice

5 Downloadable from our Web site at http://www.kramerelectronics.com (click "DOS and Windows®-based software drivers for Kramer machines" in the Technical Support section)

7 Communication Protocol

The **FC-6801** is compatible with Kramer's Protocol 2000[1] (version 0.43). 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 6 defines the Hex Code commands and Table 7 lists the Hex Codes for the AUDIO DELAY settings.

Table 6: Hex Code Commands

Command Name	Hex Send	Hex Receive	Function
Reset	00 80 80 92	40 80 80 92	Reset the machine
Factory default	00 81 80 92	40 81 80 92	Set machine to factory default
Identify machine	3D 81 81 92	7D E8 81 92	
Sw rev	3D 83 80 92	7D 8**R1** 8**R2** 92	Software revision
Group select	01 8**GR** 80 92	41 8**GR** 80 92	Audio group select
Set delay	02 **DL** 80 92	42 **DL** 80 92	Set audio delay time
Read led's	05 80 80 92	45 **LED**1 **LED**2 92	Read the LED's status
Read delay	06 80 80 92	46 **DL** 80 92	Read the delay settings

NOTES on the above table:

NOTES on the above table:

NOTE 1 - **R1** – Sw revision number.
NOTE 2 - **R2** – Sw sub revision number.
NOTE 3 - **GR** – audio group number:
0 mute
1 group 1
2 group 2
3 group 3
4 group 4
NOTE 4 - **DL** – delay time:
The MSB (bit(7)) should be '1'
Bits [6..0] set the delay time in steps of 8ms
To set no delay send "10000000"
To set a delay of 8ms send "10000001"
To set a delay of 16ms send "10000010"
To set delay of 1.024 sec, send "11111111"
To send any value in the middle, use the appropriate number
NOTE 5 - **LED**1 – reply of the status of the following:
The MSB (bit(7)) will be '1'
Bits [6..4] – audio group:
0 mute
1 group 1
2 group 2
3 group 3
4 group 4
bits[3..0] – Audio channel status – '1' on, '0' off
bit(3) channel 4
bit(2) channel 3
bit(1) channel 2
bit(0) channel 1
NOTE 6 - **LED**2 – Video & audio status
Bits[7..4] are "1000"
Bit(3) when audio is detected in the video stream this bit will be '1' else '0'
Bit(2) when video is detected this bit will be '1' else it will be '0'
Bit(1) video standard '0' for PAL, '1' for NTSC
Bit(0) if 24 bit of audio is detected '1', else '0'

1 See the Technical Support section of our Web site: http://www.kramerelectronics.com

Table 7: AUDIO DELAY Settings

Decimal	Hex Codes	Delay Time (in ms)
1	01	8
2	02	16
3	03	24
4	04	32
5	05	40
6	06	48
7	07	56
8	08	64
9	09	72
10	0A	80
11	0B	88
12	0C	96
13	0D	104
14	0E	112
15	0F	120
16	10	128
17	11	136
18	12	144
19	13	152
20	14	160
21	15	168
22	16	176
23	17	184
24	18	192
25	19	200
26	1A	208
27	1B	216
28	1C	224
29	1D	232
30	1E	240
31	1F	248
32	20	256
33	21	264
34	22	272
35	23	280
36	24	288
37	25	296
38	26	304
39	27	312
40	28	320
41	29	328
42	2A	336
43	2B	344

Decimal	Hex Codes	Delay Time (in ms)
44	2C	352
45	2D	360
46	2E	368
47	2F	376
48	30	384
49	31	392
50	32	400
51	33	408
52	34	416
53	35	424
54	36	432
55	37	440
56	38	448
57	39	456
58	3A	464
59	3B	472
60	3C	480
61	3D	488
62	3E	496
63	3F	504
64	40	512
65	41	520
66	42	528
67	43	536
68	44	544
69	45	552
70	46	560
71	47	568
72	48	576
73	49	584
74	4A	592
75	4B	600
76	4C	608
77	4D	616
78	4E	624
79	4F	632
80	50	640
81	51	648
82	52	656
83	53	664
84	54	672
85	55	680
86	56	688

Decimal	Hex Codes	Delay Time (in ms)
87	57	696
88	58	704
89	59	712
90	5A	720
91	5B	728
92	5C	736
93	5D	744
94	5E	752
95	5F	760
96	60	768
97	61	776
98	62	784
99	63	792
100	64	800
101	65	808
102	66	816
103	67	824
104	68	832
105	69	840
106	6A	848
107	6B	856
108	6C	864
109	6D	872
110	6E	880
111	6F	888
112	70	896
113	71	904
114	72	912
115	73	920
116	74	928
117	75	936
118	76	944
119	77	952
120	78	960
121	78	968
122	7A	976
123	7B	984
124	7C	992
125	7D	1000
126	7E	1008
127	7F	1016

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 three 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.
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.

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

Kramer Electronics, Ltd.
Web site: www.kramerelectronics.com
E-mail: info@kramerel.com
P/N: 2900-006801 REV 2