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## **KIM-1 I/O Board**

Revision C or Later Boards  
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Thank you for purchasing a KIM-1 I/O expansion board, which has been one of our most popular products. It was developed as a result of what capabilities we wanted to add to our KIM-1 collection to make it easier to use and interface with more common communication standards.

This board has been sold with few changes for many years, but the revision C board has a number of changes to address needs of our customers:

- Power connector now has three terminals instead of four.
- A power LED has been added.
- The audio connectors are now a more common 1/8<sup>th</sup> inch.
- The KBD/TTY option is now set via a switch instead of a jumper.
- Smaller board.
- Silkscreen labels instead of copper.

For references to direction through this document, the board is assumed to be in “normal” position, with the edge connector facing to the right, ready to plug into the KIM’s Application connector. The Application connector is along the lower, left-hand edge of the KIM. The Expansion connector is the upper connector.

## **Installation**

We’re going to begin the installation in a somewhat unusual way... we’re not going to plug the board into the KIM-1 at first. Trust me, this will make sense eventually.

The first step is to connect a 5 volt power supply and ground to the green J1 connector at the upper left hand corner of the board. There are three terminals on this connector, each of which is labeled just to the left of the connector. Make sure you connect a well-regulated 5 volt DC supply that is capable of at least the 1.2 amps required of the KIM. If you wish to use the cassette interface, you also need to connect a 12 volt supply on the appropriate jack on J1. The KIM-1 does not use 12 volts except for the cassette interface, so if you don’t need this, then there is no need for the 12 volt supply.

Next, you'll want to find JP1 which is almost at the exact center of the board and has a label that reads DECODE. There are two positions for the black jumper: EXT and INT. The jumper should be on the INT (internal decode) setting, but if not, pull the black plug straight up and then re-insert it so one side is on the INT pin and the other side is on the middle pin of JP1.

Make sure the board is not plugged into the KIM, then turn on your 5 volt power supply. The LED right behind the power connector should be on. If not, double check to make sure your power supply works and is connected properly. Do not go any further unless the LED comes on.

Turn off the power supply and make sure the LED goes out. You do not want to plug in the I/O board with power on!

Now go ahead and plug the board into the Application connector, which is the lower of the two connectors on the left hand side of the KIM. The connector should be snug, but make sure it is all the way in and straight.

For our first test, let's use the KIM's default keyboard and LED displays. To make sure this is enabled, locate SW2, the small red slid switch near the bottom right-hand side of the board. This switch has two settings labeled TTY and KBD. Slide the switch up to the KBD setting.

Now it's time to give it a test. Apply power and press the RS key on the keypad. Your KIM should be displaying data on the LED displays above the keypad just like usual.

## **Connecting an RS-232 Terminal**

By default, the KIM "talks" to the user via the keypad and LED display on the main board. To force KIM to communicate via the TTY port, you need to connect a suitable device, set a switch, and do some easy setup steps.

I use a PC for my terminal, using the Windows HyperTerm package. When you configure it, make sure you set the proper COM port. The KIM will auto-baud detect, but I tend to stay at 2400 baud. Make sure you set Hyperterm to 8 data bits, no parity, two stop bits (that's a bit unusual, but important) and no flow control.

Run a cable from the PC's COM port to J8 on the I/O board.

Now you'll need to change the setting of SW2, the small red slide switch near the bottom right of the I/O board. Slide the switch down to the TTY (teletype) position.

Once again, turn on your KIM and press the RS button. You won't see anything on the LEDs, but the KIM monitor is waiting to measure the baud rate. Press either the BACK SPACE or RETURN key on your Hyperterm session, and the KIM should immediately respond.

If you've never used a terminal with your KIM, you should reference section 4.3 of the KIM-1 User Manual for a list of commands and examples for using it. The interface is not intuitive initially, but is not hard to learn.

## Cassette Interface

The I/O board has two connectors and a jumper for setting up the KIM tape storage system. J6, labeled AUDIO OUT, is meant to go to the recorder's microphone in line. J4, labeled AUDIO IN, goes to the recorder's headphone jack. The jumper JP2 is used to select whether you need to drive the microphone with the AUDIO HI or AUDIO LO line from the KIM. This jumper is located behind the AUDIO OUT connector and is labeled LEVEL. There are HI and LO settings. Which is right for your tape recorder is a matter of trial and error.

If both of the connectors are unplugged, then the tape input and output are connected. This is meant to allow you to easily run a program for adjusting the tape's PLL potentiometer on the main KIM board, such as "PLL SET" from the excellent book "The First Book of KIM." If you own a KIM, you really should have a copy of that book.

## Jumpers and Connectors

### J1

This is the power connector. The KIM needs 5 volts at approximately 1.2 amps. In order to use the cassette I/O circuitry, it also needs 12 volts. The top connector on J1 is for the +5 VDC connection. The next connector is ground. The lowest connection is for 12 VDC.

### J2

This is plugged into the KIM's Application Connector, which is the one on the lower left-hand edge of the KIM.

### J3

This is the I/O connector. Many of the pins on the Application connector are I/O pins for anything you want to build. These are all brought out to J3:

J3 Pin	KIM pin	Name
1	1	Ground
2	2	PA3
3	3	PA2
4	4	PA1
5	5	PA4
6	6	PA5
7	7	PA6
8	8	PA7
9	9	PB0
10	10	PB1
11	11	PB2
12	12	PB3
13	13	PB4
14	14	PA0

15	15	PB7
16	16	PB5

### **J5**

This is memory block decode header. If you refer to Chapter 6 in the “KIM-1 USER MANUAL”, you’ll see an explanation of the lines K1 to K4, and how to go beyond the first 8K block that is decoded by the KIM memory decode logic. This header brings all the associated pins to one place for easy expansion. This header is used for our 60K RAM board.

J5 Pin	KIM pin	Name
1	I	Ground
2	B	K0
3	C	K1
4	D	K2
5	E	K3
6	F	K4
7	H	K5
8	J	K7
9		From pin 2 of J9
10		To JP1

### **J4 and J6**

These are the audio lines to/from an external audio source, typically a cassette recorder for saving and restoring programs or data. J4 connects to the KIM’s L pin, AUDIO IN. This should be connected to the output from the cassette recorder.

J6, AUDIO OUT, is connected to the center pin of JP2. Depending on where the jumper on JP2 is placed, either AUDIO OUT HI (pin P) or AUDIO OUT LO (pin M) is connected to J6. This jack is connected to the microphone input on the recorder.

Note that if nothing is plugged into J6 and J4, then the audio out and audio in lines are connected together. This can be used for adjusting the KIM’s PLL.

### **TTY**

This is the serial connector. All signals are at RS-232 levels, and connected to the KIM’s TTY interface.

Pin	Use
2	RS-232 data out
3	RS-232 data in
5	Signal Ground

### **J9 and SW1**

The KIM brings four lines, K1 to K4, to the Application connector to make it easy to add four more KB of RAM. The switches on SW1 select which bank(s) of memory has the chip select

brought to J9. J9 is meant to have a cable plug between it and J2 of my 4K memory expansion board. J9 pin 1 is ground, while pin 2 is the output. Note that you must externally pull-up this line. This connector mates with the matching connector on Corsham Technologies' KIM-1 4K Memory Board.

Each of the DIP switches selects a bank:

Switch Name	KIM pin	Address
K1	C	\$0400 - \$07FF
K2	D	\$0800 - \$0BFF
K3	E	\$0C00 - \$0FFF
K4	F	\$1000 - \$13FF

To allow that bank to be selected for external RAM, slide the appropriate switch(es) to the ON position to the right.

### ***JP1***

This jumper is used to select whether the KIM has more than 8K of memory decode logic or not. By default, the jumper should be in the INT position. This grounds pin K (DECODE ENAB) so that the on-KIM memory decode logic is always active. This is the normal configuration.

If you jumper the center and EXT pins, then decode signal comes from pin 10 of J5. Use this if you externally decode the top three address bits.

### ***JP2***

This selects the audio level to the tape recorder on AUDIO OUT. Shorting the middle and HI pin causes the AUDIO HI output to be made available on AUDIO OUT. Shorting the middle and LO pin causes the AUDIO LO output to be made available.

### ***SW2***

When in the TTY position, this creates a short between Application connector pins 21 and V. This effectively tells the KIM software to use the TTY port instead of the keypad and LED displays on the KIM board.