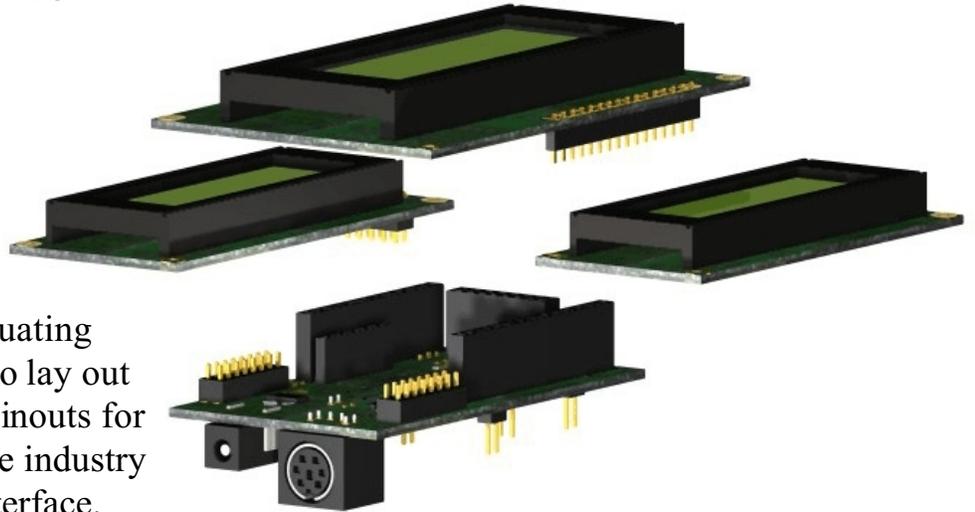


EDP-I

LCD Module Evaluation & Development Platform

The simplest way to evaluate LCD modules!



The EDP-I is designed for evaluating LCD modules without having to lay out your own design. It provides pinouts for the most popular modules in the industry and an easy to use keyboard interface.

Demonstrating, comparing and evaluating different modules has never been easier. Just plug in a standard AT style keyboard and the LCD module of your choice. The built-in line editor will give you complete control over the display.

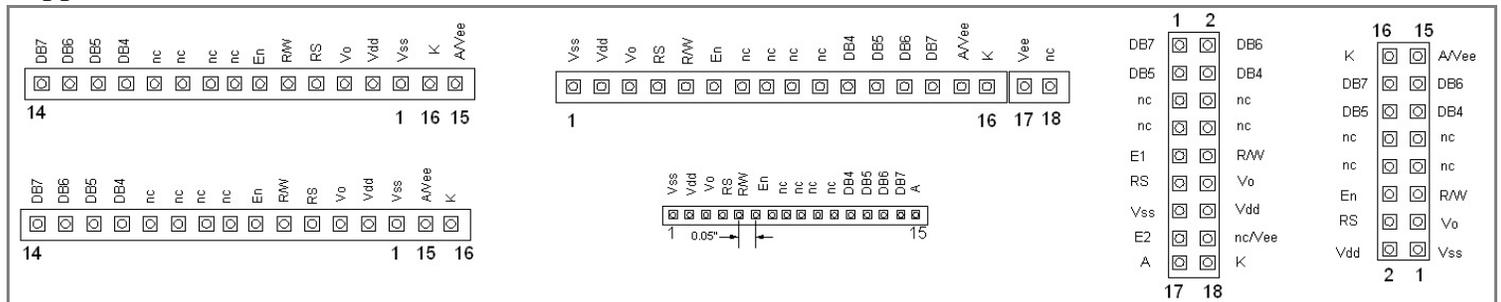
Software selectable modes:

- 8x1, 8x2,
- 12x2
- 16x1, 16x2, 16x4
- 20x2, 20x4
- 24x2
- 40x2, 40x4

Contrast and backlight levels can be controlled via the keyboard. Two user defined screens can be stored in memory, one of which is displayed on power up.

Supported pinouts are shown below. These allow most LCD modules that use an HD44780 compatible controller to be connected directly. Of course, non-standard pinouts can always be wired in using ribbon cable.

Supported Pinouts



EDP-I Technical Specifications and Features:

Basic software Functions:

F1: toggle between modes: 8x1 → 8x2 → 12x2 ... 40x4 → 8x1; optionally stored in non-volatile memory

F2: recall screen 1 <shift> F2: store current screen in memory 1

F3: recall screen 2 <shift> F3: store current screen in memory 2 (displays at power up)

F5: Increase contrast F6: Decrease contrast

F7: Increase backlighting F8: Decrease backlighting

Standard editor keys: backspace, enter, home, delete, end, page up, page down, arrow keys, caps lock, num lock.

Tab: centers cursor on the current line.

Due to the wide current range of backlighting options, the EDP-I must be used with an external regulated 5 volt supply (5 VDC +/- 5%). Both a standard 2.1 mm (P-5) connector and solder connections are provided.

EDP-I only:	< 5mA
EDP-I, LCD (no backlight), with typical keyboard:	350 mA
Backlight alone, using on-board control	0 - 650 mA

The EDP-I uses an Atmel ATMEGA8 processor and can be reprogrammed for custom embedded applications. There are 12 available I/O pins (including 8 ADC inputs).

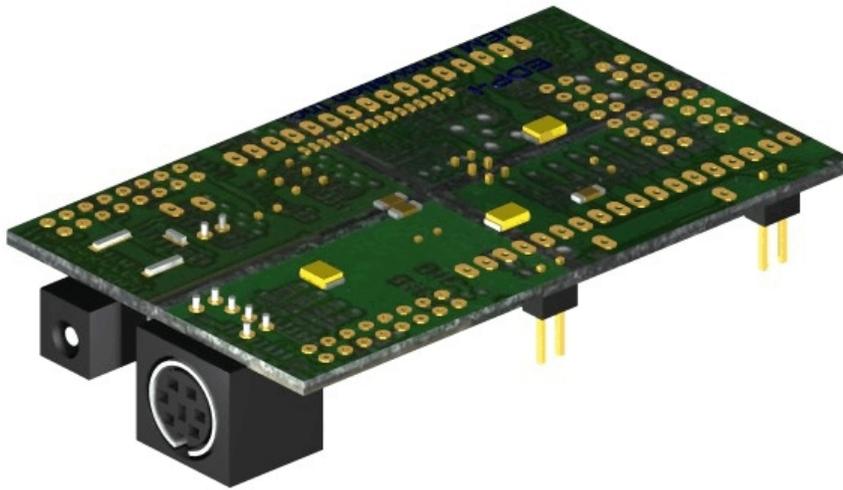
Of course, we'd be happy to provide custom features such as a serial port interface; monitoring and displaying ADC inputs or just about anything you can dream up. Contact JEM Innovation for details.

Notes:

1. All connectors are top view. All pins are on 0.10" centers unless otherwise noted.
2. The EDP-I does not include headers, connectors, keyboard or power supply. These are available from our distributors.
3. Some modules may require separate connection to A or K for the backlight. Solder pads are provided on the board.
4. Backlight currents above 650 mA require external control. See users guide for details.
5. This board supports the pseudo-standard HD44780 7 bit interface; DB0, DB1, DB2 and DB3 are not used and are labeled as NC. An extra Enable line is provided for 40 x 4 displays.
6. Only one display can be used at a time; verify interface prior to installation.
7. Numerous jumpers and test points are provided. These include access for measuring the backlight current.
8. The user can reprogram the board using the ATMEL development connector. However, source code for the keyboard interface is NOT provided. *Reprogramming the EDP-I will erase the keyboard interface routine.*
9. Users must ensure that they do not exceed the maximum backlight current for the particular module they are using!
10. Very few modules require a negative voltage at room temperature; therefore, we recommend using modules without Vee.
11. Software contrast control must be disabled to use the negative voltage in the contrast circuit.
12. Configuration details are available in the user's guide.

EDP-I

LCD Module Evaluation & Development Platform



JEM Innovation Inc.

125 Stearman Court

Erie, CO 80516

The EDP-I has been designed for evaluating LCD modules without having to lay out your own design. It provides pinouts for the most popular modules in the industry and a standard keyboard interface. It will interface to most modules that use the industry-standard HD44780 controller (or equivalent), running in 7-bit mode.

Just plug in a standard AT style keyboard and the LCD module of your choice. The built-in line editor will give you complete control over the display, including contrast and backlighting.

IMPORTANT NOTES: If your module generates a negative voltage for contrast control, you MUST ensure that J1 is removed from the EDP-I! It has been our experience that most modern modules do not require a negative voltage for contrast until the temperature reaches -30 C. Therefore, the EDP-1 does not directly support Vee and we recommend that most evaluations be done with standard modules. If you want to connect the Vee from your module you will need to use external wires and a separate potentiometer.

Backlight Current: Before connecting a module be sure to read the section on Backlight Current. Failure to do so could shorten the life of your backlight to only a few seconds!

The EDP-I provides 5 pinouts to support a variety of modules. However, it will only drive one module at a time.

Please review the following descriptions and ensure that your board is properly configured. The locations of the various connectors are shown below looking at the top of the board (the keyboard and power connectors are on the bottom).

Top of board:

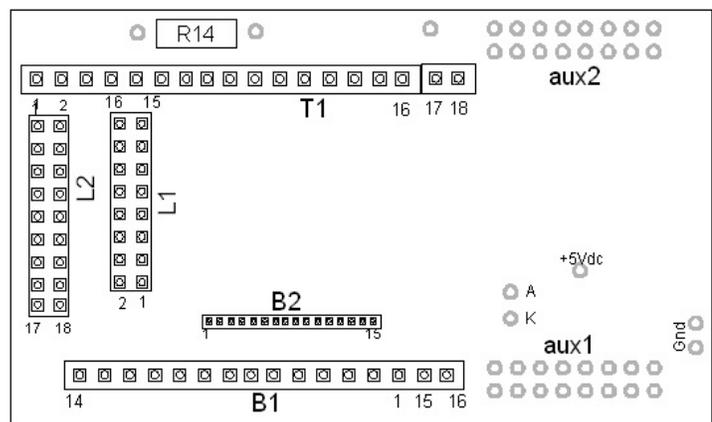
T1, L1, L2, B1, B2: pinouts for most standard LCD modules. See the following sections for details.

Aux1 and Aux2: access to I/O pins

R14: optional current limiting resistor.

A, K: pads for connecting the backlight.

+5Vdc and ground: additional power connections.



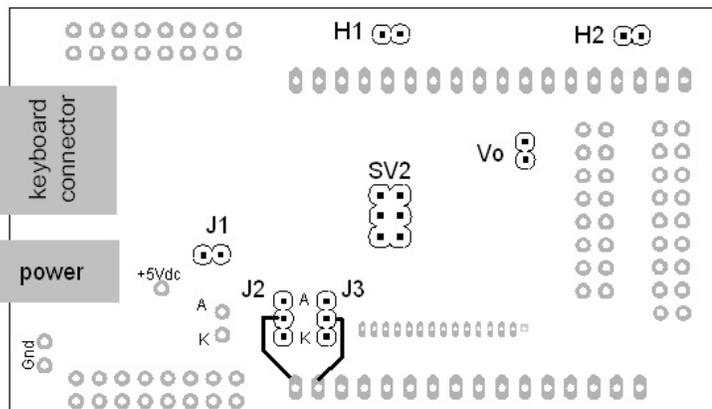
Bottom of board:

H1: connects backlight terminal 'K' to the current control circuit.

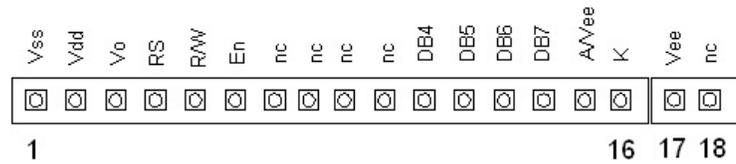
H2: bypasses the current limiting resistor

Vo: connects the contrast control circuit to the contrast input on the module.

J1: connects the modules 'A' backlight terminal to +5 VDC.



Top pinout (connector T1)



This is a relatively standard layout. If your module does NOT provide a negative voltage on pin 15, then install a shunt on J1.

If it does output a negative voltage on pin 15, you MUST remove J1 and wire A and K terminals to the Header labeled “A” and “K” using external wires.

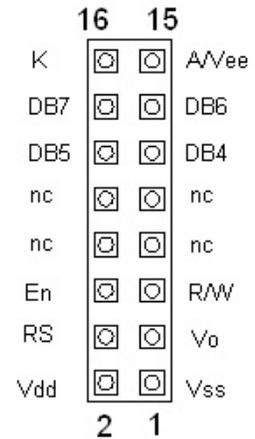
Note that some larger displays have 2 additional pins: 17 and 18. Generally pin 18 is a NC and pin 17 provides a negative voltage. Pin 17 is connected to a solder pad, P17, for external use if desired.

Standard Left pinout (connector L1)

This is the most common of the pinouts on the left side of the module. Again, if your module does NOT provide a negative voltage on pin 15, then install a shunt on J1.

If your module outputs a negative voltage on pin 15, you MUST remove J1 and wire A and K terminals to the Header labeled “A” and “K” using external wires.

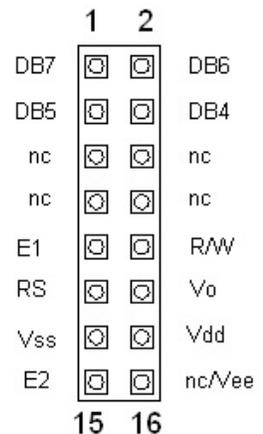
Note for 8x2 modules: Most 8x2 modules don’t have pins 15 and 16. Install the modules using the lower 14 pins. Also, the backlight will have to be connected externally.



40x4 Left pinout (connector L2)

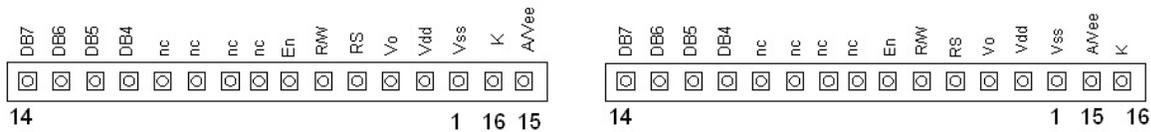
This is the other left handed pinout that is used on many, (but not all!!), 40 x 4 modules. Again, if your module does NOT provide a negative voltage on pin 16, then install a shunt on J1.

If it does output a negative voltage on pin 15, you MUST remove J1 and wire A and K terminals to the Header labeled “A” and “K” using external wires. Also, note that this pinout uses an additional Enable line, E1. The EDP-I software will automatically enable this when the 40x4 module is selected.



If your 40x4 module doesn't match this pinout, you'll have wire an adapter cable.

Bottom pinout (connector B1)



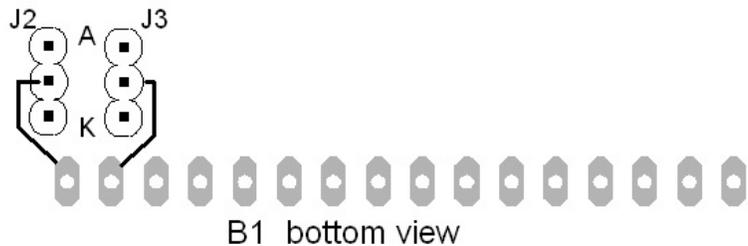
This layout exists solely to make things complicated! Note that the pins 1 - 14 run right-to-left but pins 15 and 16 are on the right end. Additionally, pins 15 and 16 may be reversed!

NOTE: Some modules with a bottom connector will need to use the T1 pinout! Check your module.

There is no easy way to describe how to configure this! Refer to the following figure and the pinout for your particular module.

J2 configures the *last* pin on the left

J3 configures the 2nd pin from the end



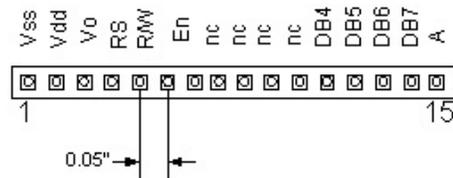
If your module outputs a negative voltage on pin 15: REMOVE both shunts and wire the “A” and “K” terminals, (on the right end of your module), using external wire.

If your module does NOT generate a negative voltage on pin 15, then install the shunt between A and pin 15 for your module. Install a shunt between the center pin and “K” on the other jumper.

If your backlight doesn’t work after hooking this up, you probably have it backwards. The good news is that it probably didn’t hurt anything; try again.

Bottom pinout (connector B2)

This pinout is used on smaller 12 x 2 modules and requires a connector with a 0.05" pitch. There shouldn’t be any negative voltage present; install a shunt on J1.



If it does output a negative voltage on any pin, you MUST remove J1 and wire A and K terminals to the Header labeled “A” and “K” using external wires.

Other pinouts

We have tried to address the majority of the pinouts that we've seen. However, there are far too many variations for one board to cover them all. The EDP-I should be able to handle any module that supports the pseudo-standard 7 bit interface if you can solder up the correct wires.

Backlight Current

The maximum allowable backlight current varies widely, even for modules with the same format. For example, for different 20x2 modules, the maximum current ranges from 20 mA to 210 mA! The EDP-I software cannot account for these variations. Therefore, the EDP-I is shipped without a shunt on H2. This ensures that a current limiting resistor is in series with the module's backlight and will limit the backlight current to around 75 mA. This is still enough to damage some modules. Check with your LCD datasheet before running the module at full brightness.

To increase the backlight current, we recommend installing a current limiting resistor at location R14. Check with your display manufacturer for the correct value.

We highly recommend connecting an amp meter to J1, (in place of the shunt) and measuring the actual current being drawn. **IF YOUR BACKLIGHT LOOKS TOO BRIGHT, IT PROBABLY IS!** This can shorten the life of the backlight; possibly to only several seconds! Be careful!

Power:

The EDP-I requires regulated 5VDC. An on-board connector, commonly referred to as a "P-5", can be used (center pin is +5). The board itself uses less than 5 mA and you can figure about 350 mA for a keyboard. However, the total required is determined by the current draw of your backlight (which is the main reason we didn't include a regulator on board). A wall mounted, 2.4 Amp switching supply is available from JEM.

Reprogramming the EDP-I

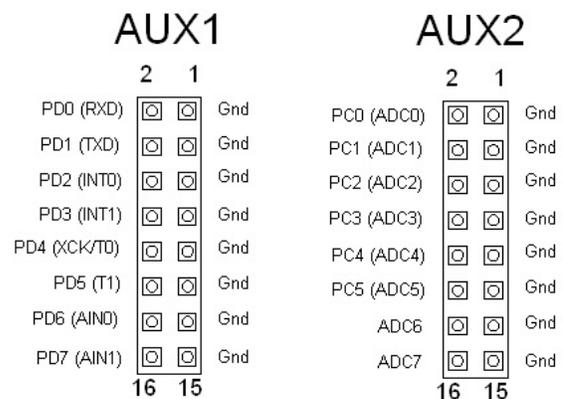
Of course, we left the 6 pin programming header on board. This allows users familiar with the ATMEL processor to develop their own software (and you'd better be REAL familiar). Just be careful, if you reprogram your EDP-I it is no longer an EDP-I! You will need to provide your own keyboard interface routines and other functions as needed. We may someday release the keyboard, contrast and backlight routines as a compiled library but they are NOT currently available.

Of course, custom features and functions are available for an additional charge. Contact JEM Innovation to discuss your requirements.

Spare Pins

The EDP-I provides users with access to 16 of the processor's I/O pins as shown. These pins are not supported in EDP firmware and must be programmed by the user. Refer to ATMEL documentation for details.

Note that PD3 and PD4 are used by the Keyboard interface.



EDP-I General Operation

The EDP-I interfaces to the industry standard "AT" style keyboard using a PS/2 sized connector and provides a 'line' based editor. This allows users to enter/edit one line without disturbing other lines on the display. The exceptions to this are:

The cursor will wrap-around to the next line when typing text; reaching the last space on the last line will move the cursor to the first space of the first line.

The backspace key will also wrap around to the line above when reaching the start of the line. If on the first line, it will wrap around to the last space on the last line.

The following functions are supported:

All alphabetic characters and punctuation characters are displayed as they are typed in.

arrow keys: moves the cursor in the direction of the arrow.

auxiliary key pad: as selected by the 'num lock' key.

Enter Pressing either enter key will move the cursor to the start of the next line. If the cursor is on the last line of the display, it will be moved to the top, left corner.

Tab: The 'tab' key will center the cursor in the middle of the current line.

End: Moves the cursor to the right of last character of the current line. If the line is full, it will be moved to the last space.

Home: Moves the cursor to the start of the current line.

Page up: Moves cursor to the top of the display.

Page down: Moves the cursor to the bottom of the display.

Insert: Pressing the 'insert' key will toggle between the 'insert' mode and the 'overwrite' mode. In the insert mode, typed characters will be inserted to the left of the cursor and characters to the right will be shifted right. The last character on the line will be discarded. During the insert mode, the cursor will be displayed as an '_'. During 'overwrite' mode, the cursor will be a solid box '█'.

Delete As expected, the delete key will delete the character at the current cursor location. Characters to the right of the cursor on the current line are shifted to the left.

Backspace Deletes the character to the left of the cursor and shifts the cursor one space to the left. Does not affect characters to the right. If it reaches the end of a line it will move up one line and continue deleting. If it reaches the top left corner it will move to the bottom right.

^C Pressing both the left control key and the 'c' character will clear the screen and move the cursor to 0,0.

F1	This key will toggle through the available screen modes: 8 x 1, 8 x 2, 12 x 2, 16 x 1, 16 x 2, 16 x 4, 20 x 2, 20 x 4, 24 x 4, 40 x 2 or 40 x 4. Press 'esc' to abort or 'Enter' to accept the mode. The user will have the option to store the new setting as the power-on default. Warning: if you save the mode as 40x4 you can only use a 40x4 module! (Since the software is looking for "lcd ready" on both enable lines.) You should always select (and save to memory), a lower resolution mode when switching from the 40x4 module.
F2	Recalls the user defined screen from memory.
Shift F2	Stores the current screen in non-volatile memory. Also stores the current backlight and contrast settings.
F3	Recalls the power-on default screen.
Shift F3	Stores the current screen in non-volatile memory as the power-on default. Also stores the current backlight and contrast settings.
F4	Inserts an 'Ω' sign (seemed like a good idea at the time).
Shift F4	Inserts a 'μ' sign (also seemed like a good idea).
F5	Increases the display's contrast every time it's pressed; stops at the maximum setting.
F6	Decrease the display's contrast; stops at the minimum setting.
F7	Increases the backlight level; stops at the maximum setting. WARNING: there is nothing preventing you from over driving the backlight and burning it out! It is highly recommended that you install an amp meter on J1, (in place of the shunt), and monitor the current.
F8	Decreases the backlight level; stops at the minimum setting.
num lock	Toggles the 'Num lock' function for the auxiliary keyboard. The Num Lock LED will indicate the active mode.
caps lock	Toggles the caps lock function. The Caps lock LED will indicate the active mode.

Notes:

The "Print Screen", "Scroll Lock", "Pause", F9 through F12, "Alt", and "Windows" keys are ignored.

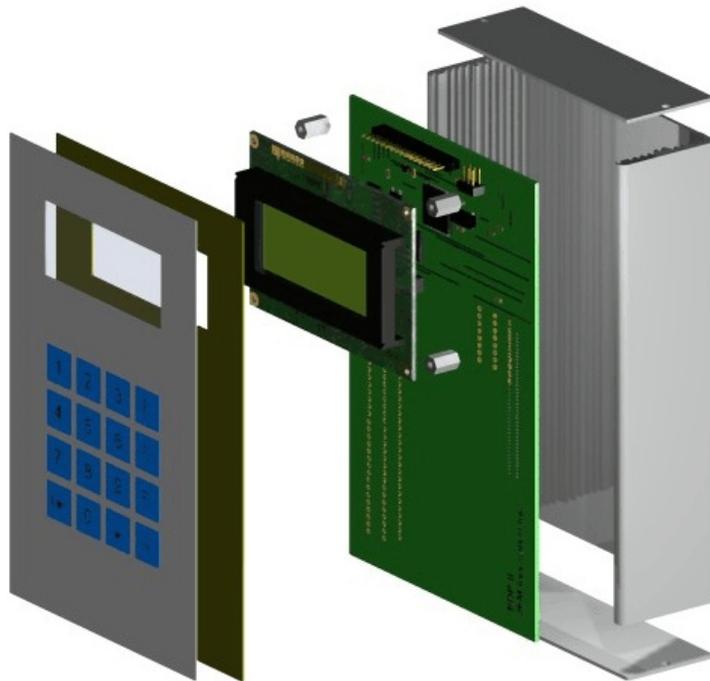
The '\ ' character is not available on standard lcd displays. This application has defined it as a special character stored in the LCD memory as "user defined Character 1".

For the latest user's guide and a copy of the schematic visit: www.jeminnovation.com.

Special features, custom boards, other products:

(sorry, but we had some blank space and Marketing said 'put in an ad')

JEM Innovation has helped out on some interesting projects, from cloud seeding to welding railroad rails. We'd be happy to talk about customizing the EDP-I for your unique application. Visit our website www.jeminnovation.com and check out our other products such as the EDP-III. It includes an ATMEL ATMEGA128 based PCB (with lots of extra room for your own circuitry), an LCD display, membrane keypad, and a machined case. It also includes reference software ready for your customization (or we can do that too)!



Standard disclaimers (things our lawyer wants you to know):

The EDP-I is warranted against defects in material or workmanship for 90 days. However, under no circumstances will JEM Innovation be liable for indirect or consequential damages; no other warranty is expressed or implied. This warranty does not apply to units that have been modified or abused. This includes, but is not limited to damage from improper soldering, over voltage, static discharge, mechanical abuse or reprogramming the on-board processor. The processor firmware is copyrighted by JEM Innovation and will not be released.

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www.jeminnovation.com