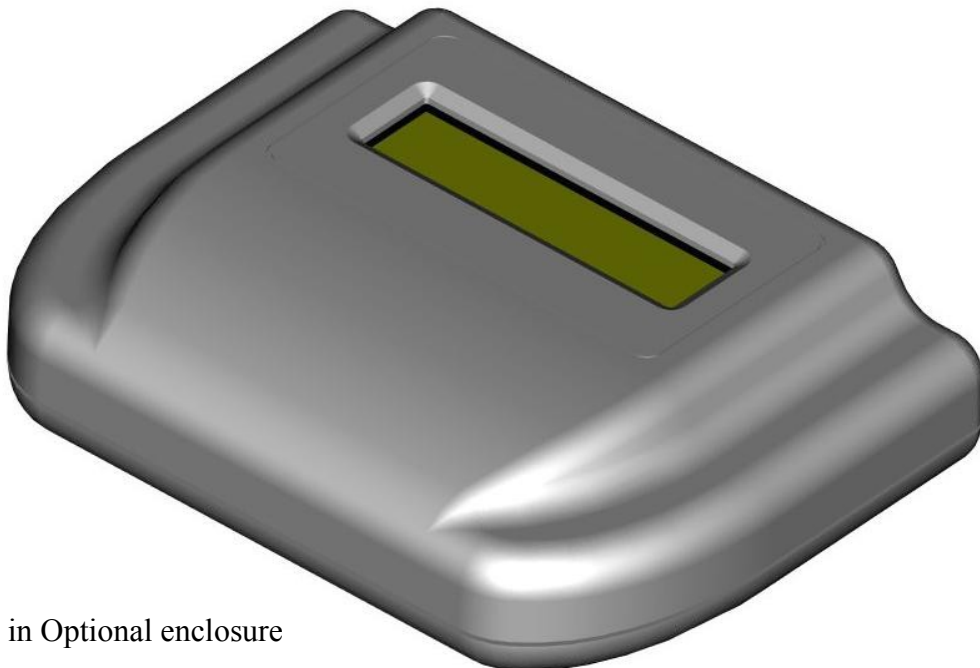


# EDP-II

## LCD Module Evaluation & Development Platform

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Shown in Optional enclosure

The EDP-II 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.

EDP-II enhancements:

- redesigned to fit directly into the AG-54 enclosure from Polycase with a 16x2 LCD.
- blank prototype area for adding your own circuitry
- footprint for an optional RS-232 driver/connector.

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 H1 is removed from the EDP-II!** 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-II 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). Refer to the schematic for more details.

### 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.

**H4:** additional pins for the Crystalfontz 2004L

**A, K:** pads for connecting the backlight.

**+5Vdc and ground:** additional power connections.

### Bottom of board:

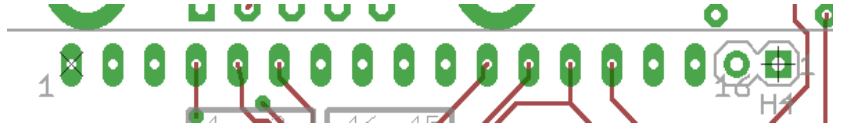
**Vo:** connects the contrast control circuit to the contrast input on the module.

**H1:** connects the modules 'A' backlight terminal to +5 VDC.

**H2:** there is no H2

**H3:** power and ground for the prototype area

## 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 H1.

If it does output a negative voltage on pin 15, do not install a shunt on H1 and wire A and K terminals to the Header labeled “A” and “K” using external wires.

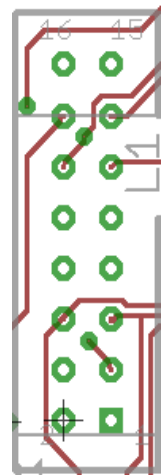
Note: the “16” in the figure above is the last oval pad. Some larger displays have 2 additional pins: 17 and 18. Generally pin 18 is a NC and pin 17 provides a negative voltage. Pin 17 is connected to a solder pad, P17, for external use if desired.

## 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 H1.

If your module outputs a negative voltage on pin 15, you MUST remove H1 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.

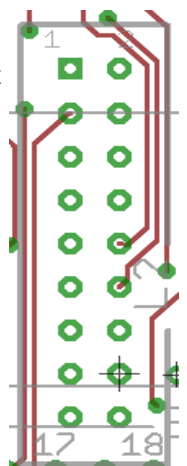


## 40x4 Left pinout (connector L2)

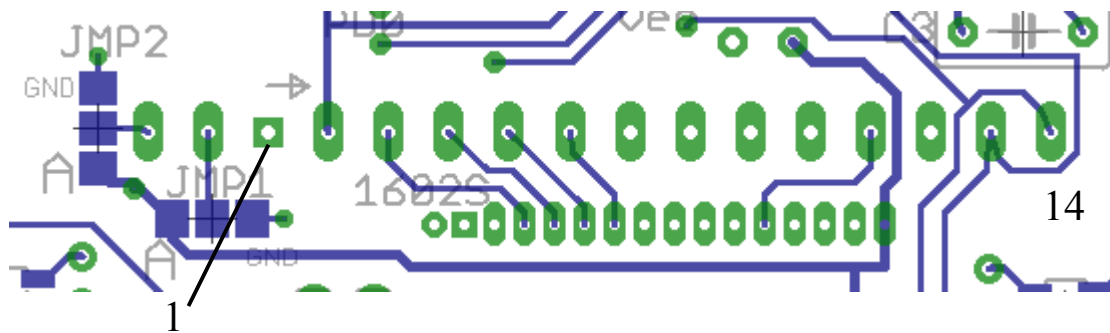
This is the other left handed pinout that is used on many, (but not all!!), 40 x 4 modules. Again, if your module does NOT provide a negative voltage on pin 16, then install a shunt on H1.

If it does output a negative voltage on pin 15, you MUST remove H1 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-II 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.



## Connector B1 (bottom view)



From what we can see, this layout exists solely to make things complicated! Note that the pins 1 - 14 run right-to-left (**left-to-right in bottom view above**) 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. You can connect the either pin to Anode voltage or GND.

JMP2 configures the *last* pin on the left

JMP1 configures the 2<sup>nd</sup> pin from the end

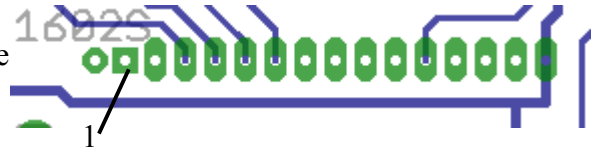
If your module outputs a negative voltage on pin 15: don't use either shunt and wire the "A" and "K" terminals, (on the right end of your module), using external wire.

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. Note that some of these have the backlight Cathode tied to ground on the module itself. Put a shunt on H1.



Other modules have 16 pins, provide the Anode voltage from the Vdd pin and need an extra ground pin on the left (octagon pad in the bottom view above).

If your module does output a negative voltage on any pin, you **MUST** remove H1 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-II 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-II software cannot account for these variations. Therefore, the EDP-II 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 H1, (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-II 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-II

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-II it is no longer an EDP-II! 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-II 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.

LM358: There is also a spare op amp available in IC3. See schematic for details.

## EDP-II General Operation

The EDP-II 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 x1, 8 x2, 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 x4. 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 H1, (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](http://www.jeminnovation.com).



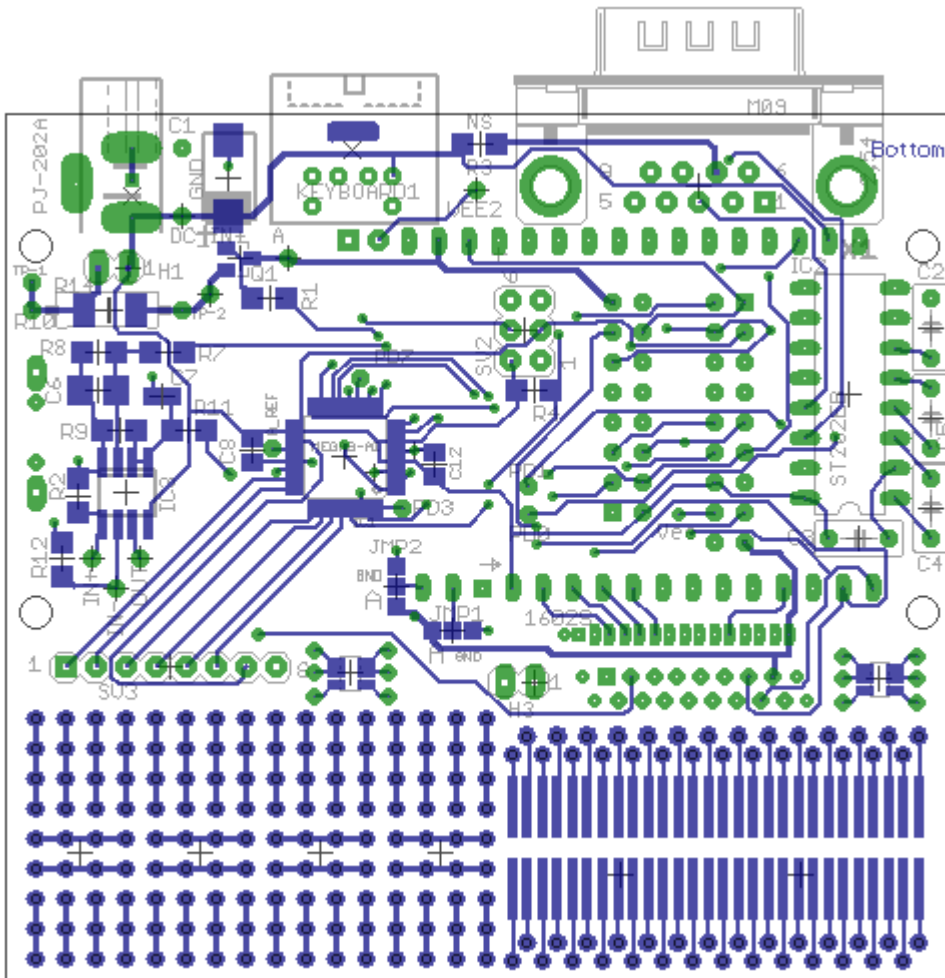
## EDP-II Optional Features:

The EDP-II circuit board provides several options for building your own LCD equipped platform embedded platform. *NOTE: if you reprogram the EDP-II processor it will no longer function as an EDP!*

Prototype area: the EDP-II has a prototype area for both through-hole and surface mount components along the bottom edge of the board.

RS-232: The board also has the footprint for an RS-232 serial chip, required capacitors and the DB9 connector. Several manufactures build pin compatible devices such as the ADM202E or the ST202. Consult the schematic for details.

Enclosure: The EDP-II and a 16x2 LCD will fit into the AG-54 enclosure from Polycase. You will need spacers and 3mm screws.



*Special features, custom boards, other products:*

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

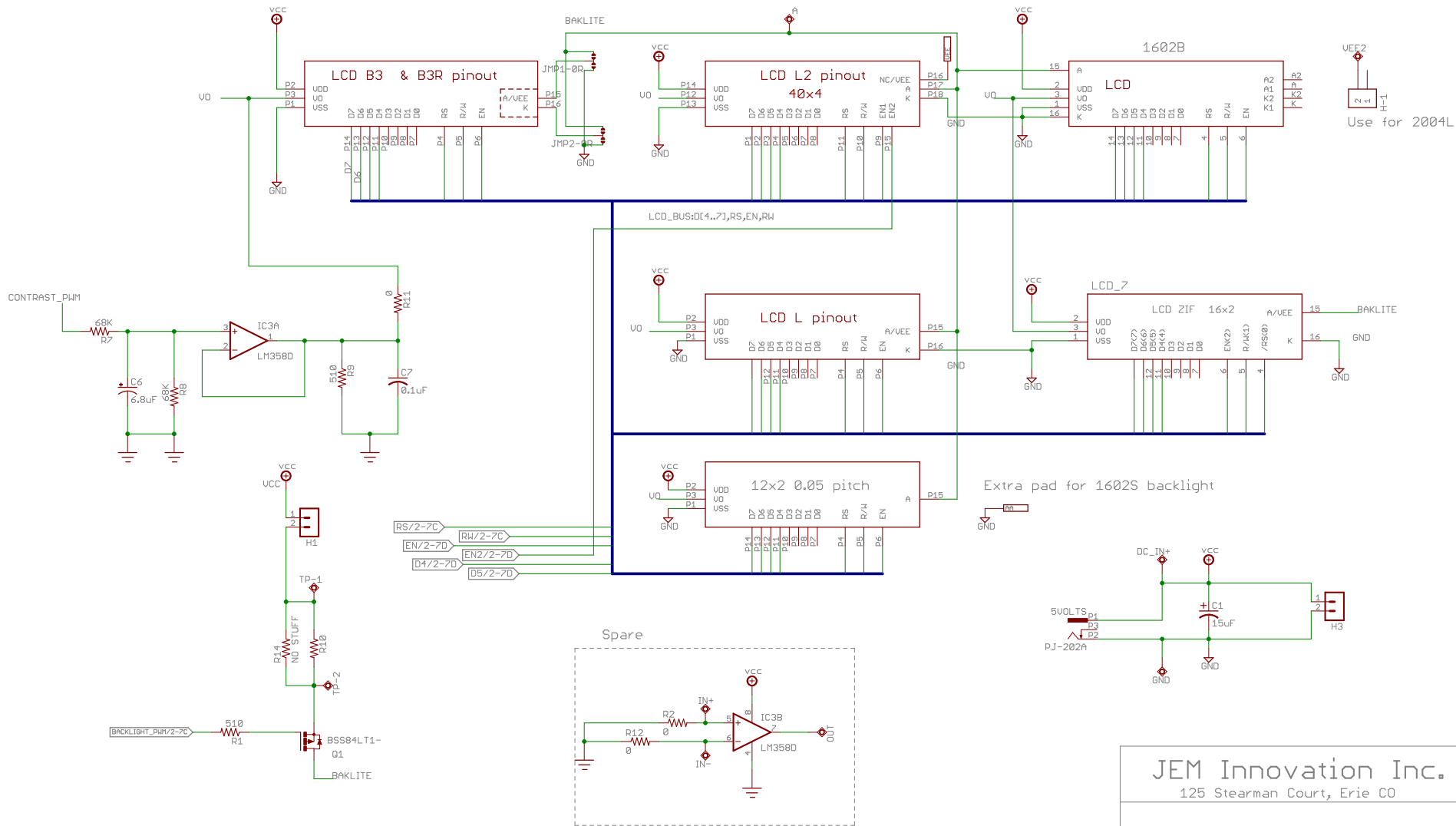
JEM Innovation has helped out on some interesting projects, from cloud seeding to welding railroad rails. We'd be happy to talk about customizing the EDP-II for your unique application. Visit our website [www.jeminnovation.com](http://www.jeminnovation.com) and check out our other products such as the 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-II 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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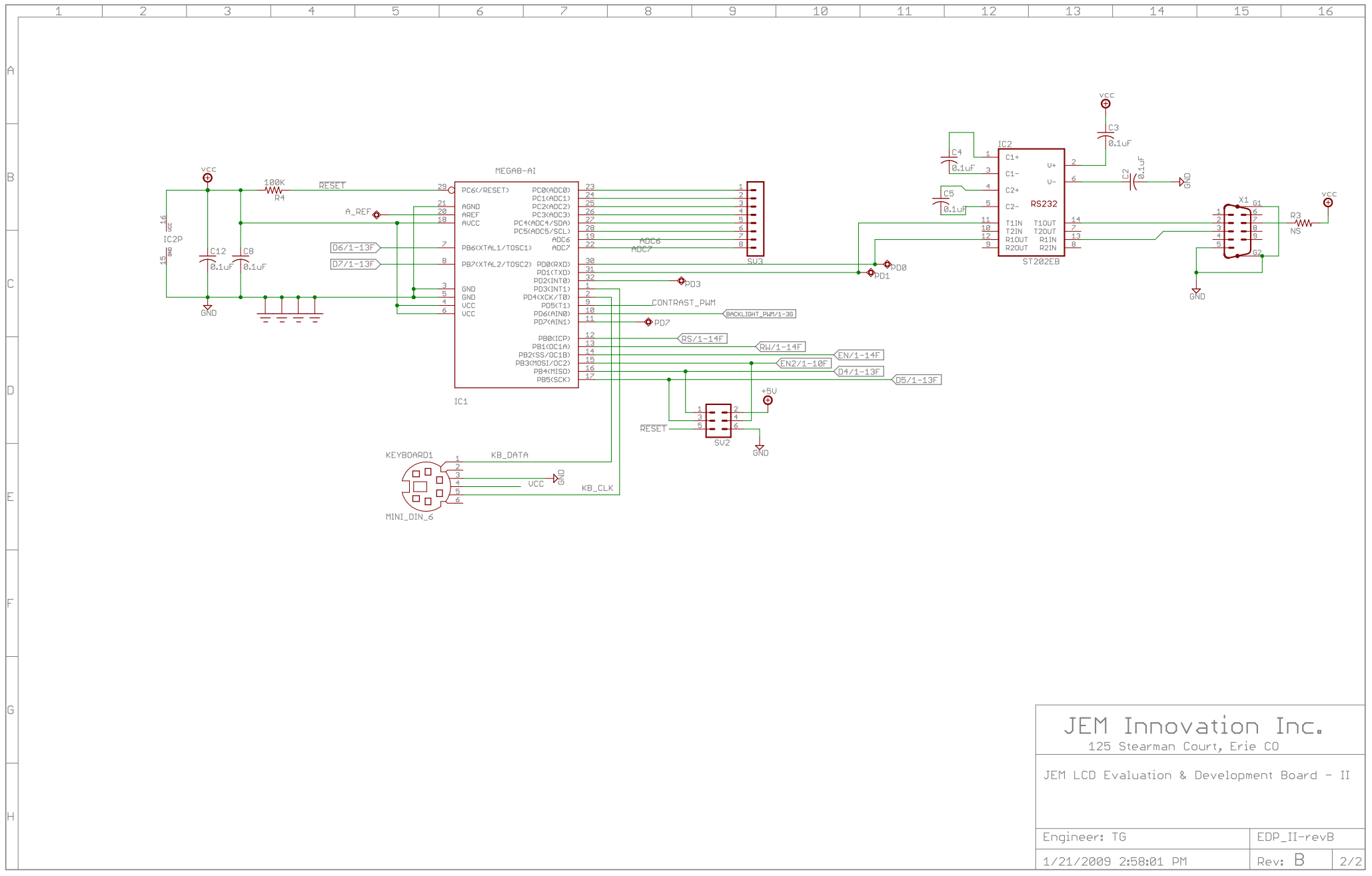
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JEM LCD Evaluation & Development Board - II

Engineer: TG	EDP_II-revB
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