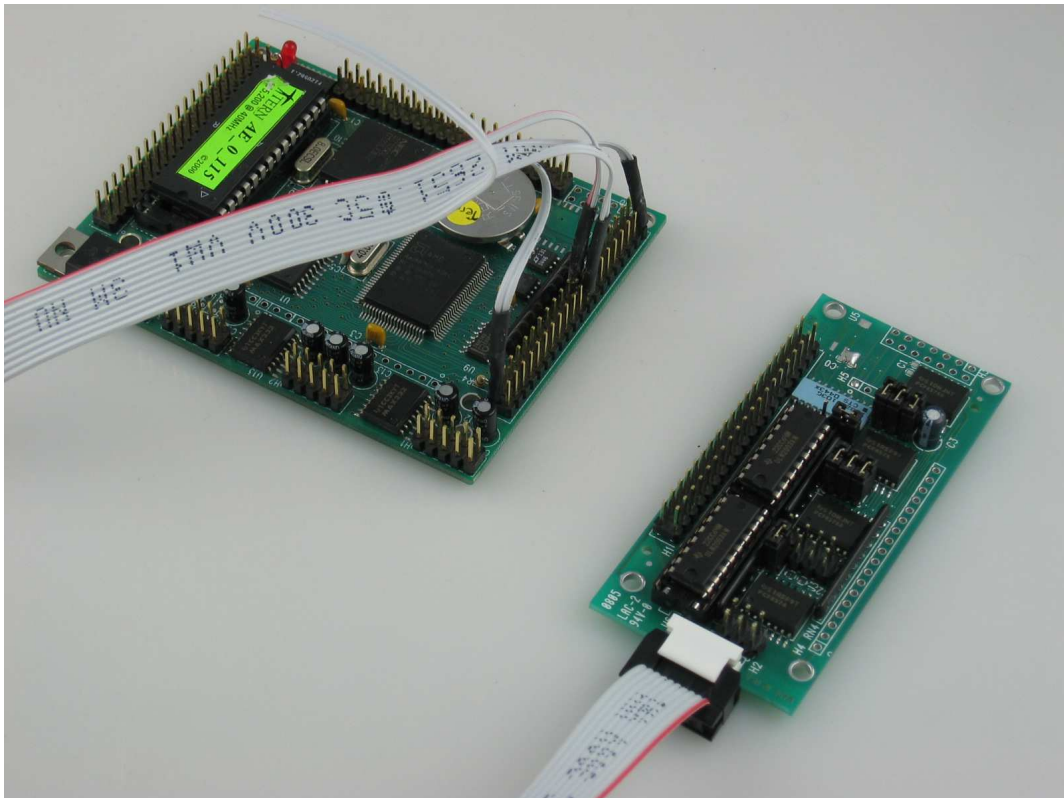


*i2x-D32*TM

TERN *i2x*TM I/O expanders with 32 I/O lines



Technical Manual



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Temperature readings for controllers are based on the results of limited sample tests; they are provided for design reference use only.

Chapter 1: Introduction

1.1 Functional Description

TERN controllers are designed to offer a rich array of I/O, but experienced embedded engineers know you can never have enough. TERN's i2x™ I/O expanders are intended to solve this problem once and for all by providing a low cost, simple, reliable, and nearly *limitless* expansion for TERN controllers. TERN's i2x product line adds an unprecedented degree of flexibility to your application design.

BUS DETAILS

TERN i2x™ I/O expansion is designed around an i2c-compatible bus. The bus is driven by only two host TTL signals: one output line acting as **clock**, and one bi-directional I/O acting as **data**. This allows a TERN controller, with its many tens of TTL I/O lines, to control numerous buses at a single time (even better since the **data** line can be shared by multiple buses). Each bus, with its integrated support for node addressing, can further support up to 16 remote node addresses used to control and communicate with remote i2x expanders.

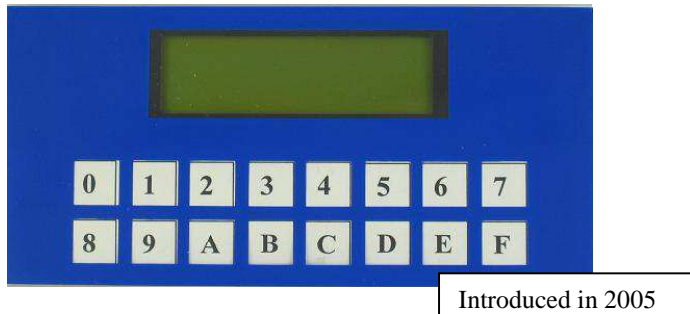
The expanders can be addressed at a maximum rate of approximately 1 KHz; Expander I/O lines can sink up to 25 mA each, making it useful for driving LEDs, lights, or even small relays.

All remote i2x nodes must be used within 5 meters of the host controller.

The i2x network consists of up to 5 physical wires: **clock**, **data**, **GND**, **5V** power, and an optional **interrupt**. Every i2x expander device has the same standard 5-pin header for easy wiring.

i2x DEVICES

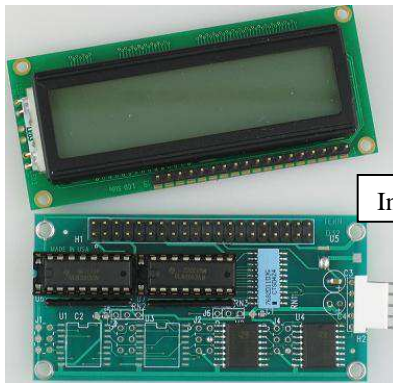
Three expanders are available at this time: **KP**, **D32**, and **R16**. TERN provides software drivers and sample programs.



i2x-KP™

The **KP** is a simple user interface solution supporting a LCD display (16x2 character LCD by default, or 132x32 graphics LCD), and 8x2 dome keys occupying two i2x node addresses. The keys are covered by blue color plastic overlay with clear windows, allowing the user to use custom key legends.

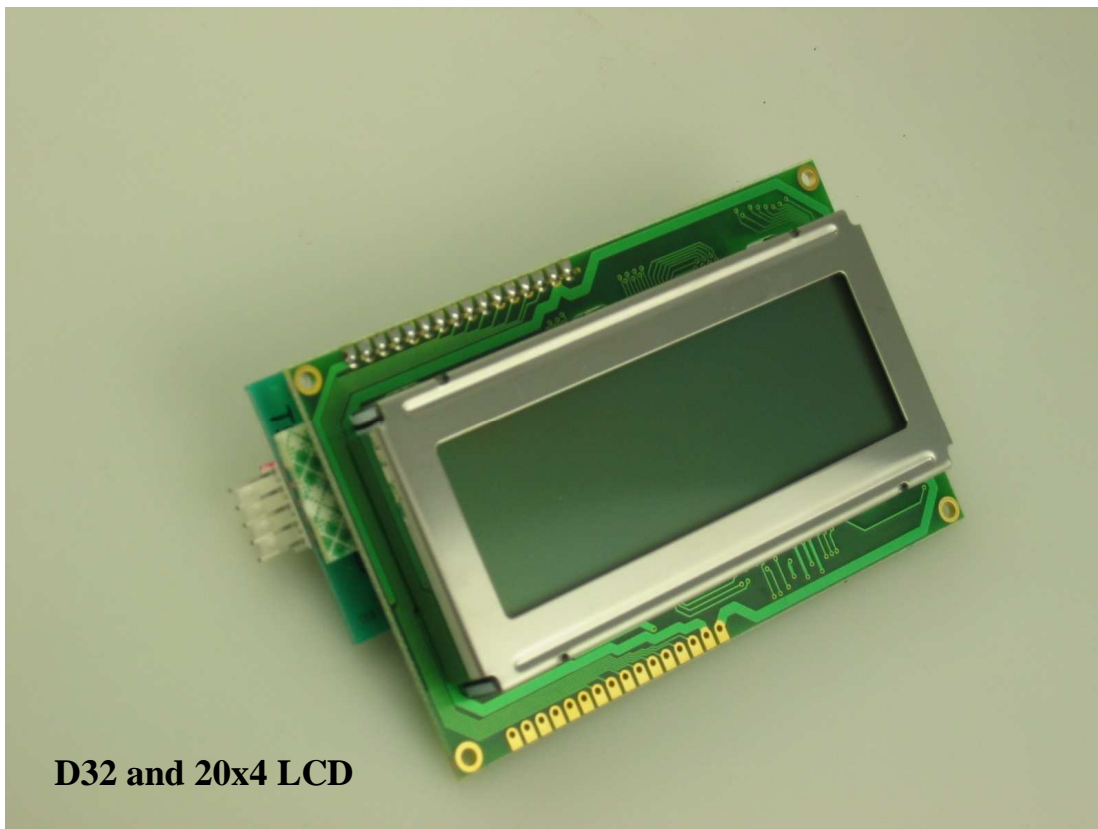
The optional graphics LCD can display standard 18x2 ASCII characters, or a range of Chinese/Japanese characters. Optional 7 solenoid drivers, 7 high voltage inputs, and 2 mechanical relays can be installed (requires additional i2x node addresses). The KP can be powered by 9-12V unregulated DC with on-board 5V regulator or powered with a regulated 5V DC power.



Introduced in 2005

i2x-D32™

The very small foot-print **D32** occupies four i2x node addresses, and can provide an 32 I/O lines. It also supports a character/graphics LCD. It has 14 hardware configurable high voltage I/Os, capable handling upto 30V DC.



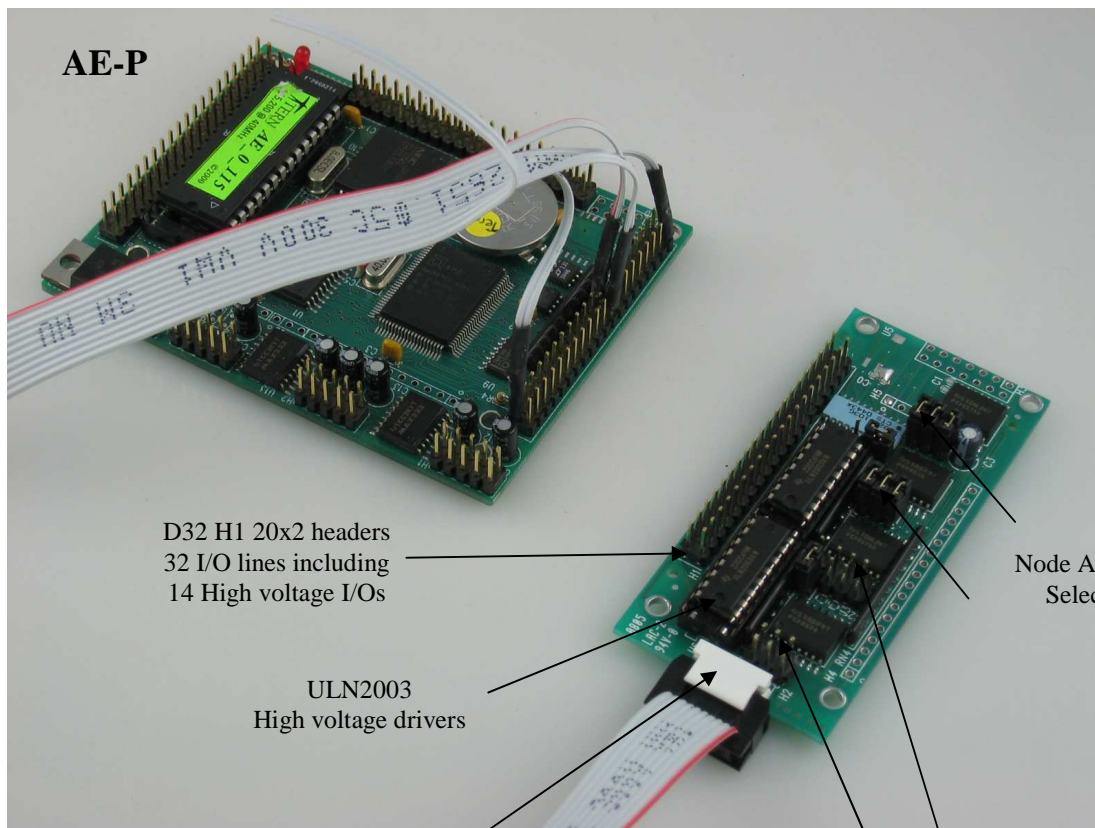
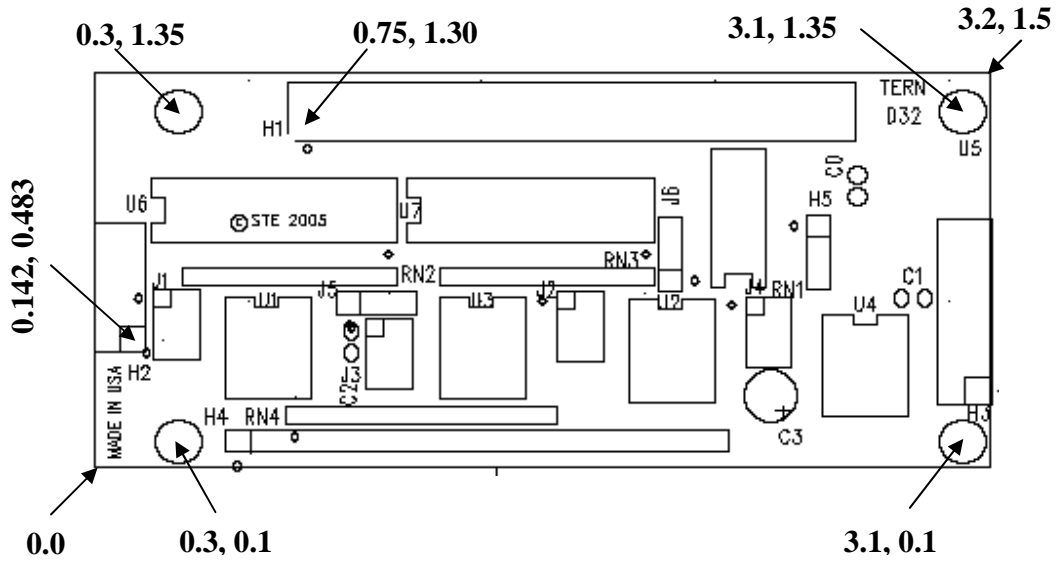
D32 and 20x4 LCD

Features:

- * 3.2 x 1.5", 5 V DC power
- * 4 i2x chips providing 8 I/O lines on each chip
- * Jumper selectable "Node Address"
- * 14 High voltage drivers
- * Easy I/O expansion with i2x bus.
- * 144x32 pixels Graphics LCD support
- * 16x2 or 20x4 character LCD support

1.2 Physical Description

Below shows the physical layout of the D32.



5 pin i2x header:
CLK, GND, 5V, DAT, /INT

1.3 D32 Sourcing

By default, the D32 comes with two ULN2003 seven channel high-voltage sinking drivers. Optionally, the D32 can be configured with two UDN2982A eight channel voltage sourcing drivers. The following jumper settings enable the voltage sourcing drivers to source 5 volts:

For U6:

H1.1 = H1.3 (GK = GND)

H1.2 = H1.4 (5V = VS)

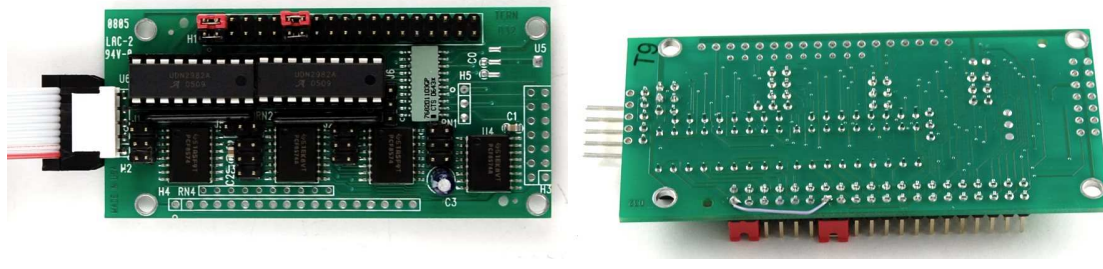
Remove J5 jumper

For U7:

H1.13 = H1.15 (GK1 = GND)

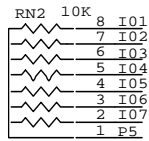
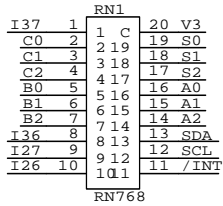
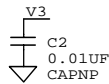
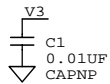
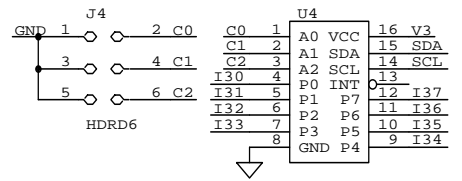
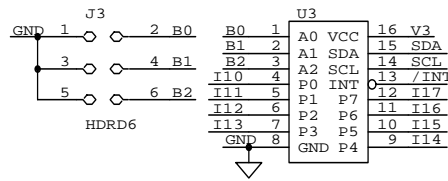
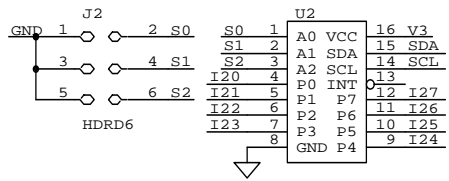
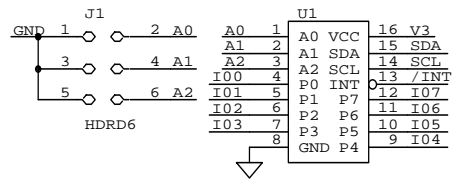
H1.14 = H1.16 (5V* = VS1) *Wire H1.2 = H1.14

Remove J6 jumper

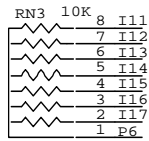


1.4 Programming Overview

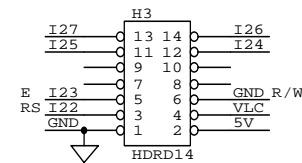
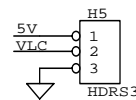
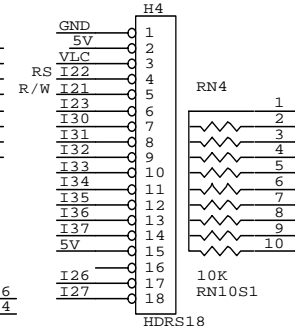
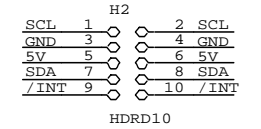
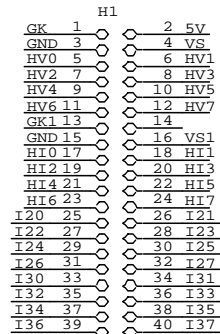
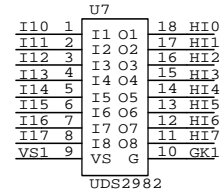
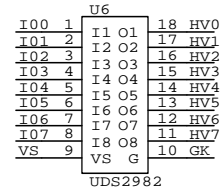
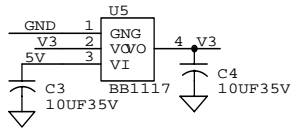
i2x I/O expanders can be driven by 2 TTL I/O lines from TERN controllers. You can use 2 PPI lines or 2 PIO lines. See samples on TERN CD, under tern\samples\i2x\i2x.ide



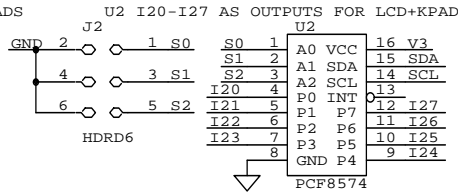
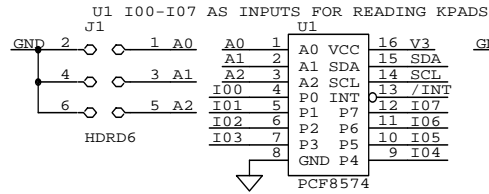
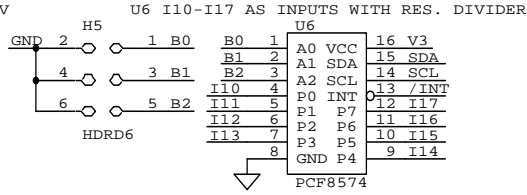
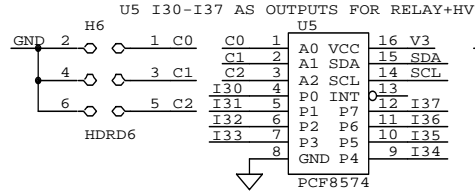
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J5.2=3 FOR HV1-7 OUTPUTS



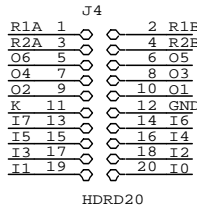
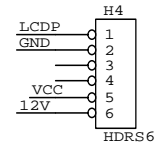
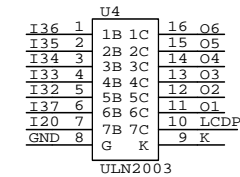
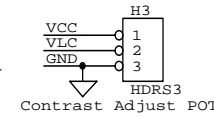
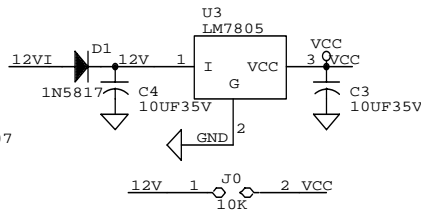
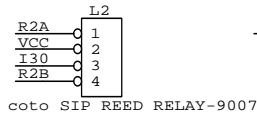
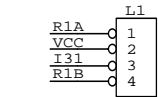
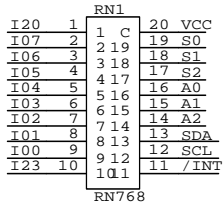
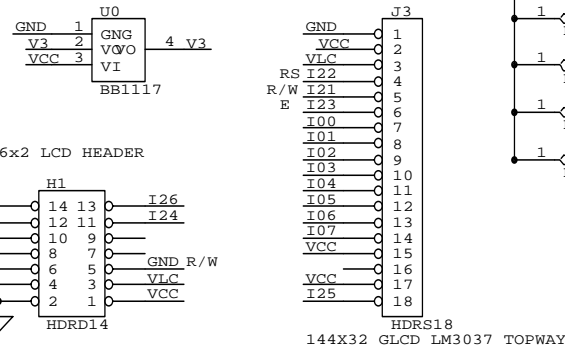
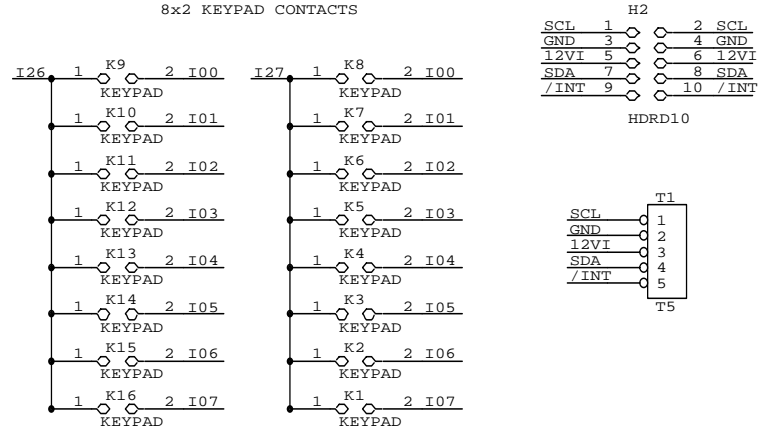
J6.1=2 FOR HI1-7 INPUTS
J6.2=3 FOR HI1-7 OUTPUTS



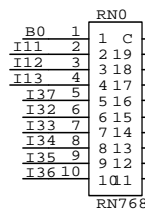
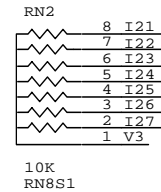
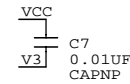
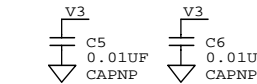
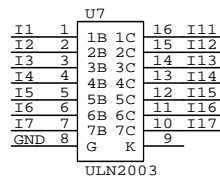
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8x2 KEYPAD CONTACTS



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