Systronix
Hardware
Accessories

Instructions for
Systronix 4x4 Keypad
Old Part #100222-XXX
New Part #2702

4x4KEYPAD

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Systronix®, Inc.
555 South 300 East
Salt Lake City, UT 84111
TEL: 801-534-1017
FAX: 801-534-1019
www.systronix.com

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Java Systems: SBX2 with STEP board (Dallas TINI) and SaJe

This keypad is an excellent addition to our SBX2 expansion board for the STEP TINI socket board, and also works very well with our aJile-based high speed SaJe board. There is complete information on this in the SBX2 area of our website, including sample code for all our embedded Java systems. Please see: http://www.systronix.com/expansion/sbx2/sbx2.htm

The keypad pinout and all other details are in the SBX2 technical reference. SBX2 schematics are also available online.

Using the Keypad with Systronix Enclosures

The keypad fits into machined pockets in Systronix plastic enclosures. Information about these, including photographs and dimensioned CAD drawings, are online at http://www.systronix.com/access/enclosure.htm

DPB2 I/O Map

The DPB2 on-board peripherals use some of the processor port pins. These are described in the following table. Other Systronix development or OEM board have different I/O maps, please consult the schematics and technical reference for your specific product. DPB2 is discussed here as a typical example of using the keypad. Many other options and uses are possible.

PROCESSOR PINS USED BY DPB2 I/O PERIPHERALS
Note: this I/O map may change in future revisions

Serial I/O	Keypad Encoder	ADC	LCD	Digital Inputs	Relay Drivers
The main RS232 port uses P3.0 and P3.1, RXD and TXD.	Keypad data D0..D3 use Port 0, bits 0..3 (P0.0-P0.3)	P0.4 is the ADC serial data	LCD data uses Port 0 bits 0-7 (P0.0-P0.7).	Digital input 0 can use P3.2 (INT0)	Relay data is P0.0-P0.3
The serial printer output uses P1.7	Keypad interrupt uses the processor INT1 input, P3.3	P1.0 is the ADC chip select, active low	LCD RS uses P1.4	Digital input 1 can use P3.3 (INT1)	Relay register strobe is P1.1
	Keypad read enable strobe uses P1.3	P0.5 is the ADC clock which shifts out data	LCD Read strobe uses P1.5	Digital input 2 can use P3.4 (T0)	Relay output enable is P1.2
			LCD EN strobe uses P1.6	Digital input 3 can use P3.5 (T1)	

Keypad use with DPB2

Connect a "matrix-pinout" keypad with up to 4 rows and 4 columns to the 1x8 header U10 (this is the DPB2 location). Keypads are available from Systronix and many electronic supply distributors. Membrane keypads with a flex cable tail usually have a color dot or arrow on pin 1 of their 1x8 receptacle. JP17 is provided on DPB2 to map your keypad's row and column order to the U9 keypad encoder's input pins. JP17 has rows 1-4 labeled as X1-X4, and columns 1-4 are Y1-Y4. JP17 has straight-through connections on the back side of the PC board connecting its even pins (which come from the keypad header U10) to its odd pins (which are connected to the 74C922 keypad encoder).

Our enclosure 100205-100 has a recess milled to accept our 4x4 keypad 100222-100.

If your keypad requires significantly different row and column wiring, you can cut the traces on the back of the PC board and wire-wrap, solder, or jumper whatever connections you need.

EXAMPLE KEYPAD CONNECTOR PINOUT

8	7	6	5	4	3	2	1
ROW4	ROW3	ROW2	ROW1	COL4	COL3	COL2	COL1

If your keypad does not have the above pinout, don't panic! As long as your keypad rows and columns are connected to any rows and columns of the 74C922, you can correct other wiring easily in a keypad lookup table. Examples are included in your DPB2 firmware disk. For example, you can fix a swap between row 1 and row 4 in a lookup table. The file LCD222.INC (in the example file DPB2DXMP) in fact does this to correct a row swap of rows 1 and 2 in our keypad 100222-100 on the older DPB2 rev D. But if a keypad *row* is swapped with a keypad *column* it may not be possible to sort this out in a lookup table. Files KEY*.INC include other sample keypad code.

KEYPAD ENCODER MAPPING

This is what the output of the 74C922 would be for an ideal keypad wired straight to the 922 with all keypad rows and columns matching the 922's row and column inputs.

ROW/COL	Col Y1	Col Y2	Col Y3	Col Y4
Row X1	0	4	8	12
Row X2	1	5	9	13
Row X3	2	6	10	14
Row X3	3	7	11	15

KEYPAD 100222-100

This map shows the value of each key as if it were written on the keypad. As you press keys on the keypad and read their hexadecimal value from the 74C922, this is what you would obtain. Note that rows 1 and 2 are swapped in the keypad. Note that this mapping assumes pin 1 of the keypad connector to be the rightmost pin as you face the keypad with the connector tail emerging from the top of the pad.

ROW/COL	Col 4	Col 3	Col 2	Col 1
Row 1	D	9	5	1
Row 2	C	8	4	0
Row 3	E	A	6	2
Row 4	F	B	7	3

DESIRED KEYPAD LAYOUT

This possible keypad layout is similar to the numerical keypad on your PC. The left arrow is the backspace/rubout key. This is the standard keypad legend layout we provide with our 4x4 keypad 100222.

7	8	9	←
4	5	6	↑
1	2	3	↓
ESC	0	.	ENTR

The easiest way remap keys is in a lookup table. The file KEY_E.INC illustrates this. The lookup table also appears here:

```
key_get_val:
    gosub key_get_data
#ASM
    mov     DPTR,#__KEY_DAT     ; addr in DPTR
    movx    A,@DPTR             ; put value into acc
    add     A,#02H              ; adjust for jump
    movc    A,@A+PC             ; get lookup value into acc
    sjmp    OVER_KEY_TABLE      ; jump over data
;
; lookup data entries
; this translates Systronix keypad 100222 into the keys used
; in our DPB and HPC systems.  Note that pin 1 of the keypad connector is
; the rightmost pin as you face the keypad with the flex cable
; extending away from you, out of the top of the keypad.
;
; 1xH are the non-numeric keys
    DB      14H         ; 0 - del/backspace
    DB      15H         ; 1 - up arrow
    DB      13H         ; 2 - down arrow
    DB      12H         ; 3 - enter
    DB      06H         ; 4 -
    DB      09H         ; 5 -
    DB      03H         ; 6 -
    DB      11H         ; 7 - dec point
    DB      05H         ; 8 -
    DB      08H         ; 9 -
    DB      02H         ; A -
    DB      00H         ; B -
    DB      04H         ; C -
    DB      07H         ; D -
    DB      01H         ; E -
    DB      10H         ; F - escape
```

```
OVER_KEY_TABLE:
    movx    @DPTR,A    ; store value in KEY_DAT
#ASM_END
    return
```

If you have a 20x4 LCD, program DPB2E_B.BAS includes a routine which displays the original and remapped key values on the LCD.

Keypad Legends& Assembly

If your ordered a keypad and enclosure from us, they will probably be delivered assembled and tested, with the keypad legends shown on the attached mechanical drawing.

The keypad 100222-100 is also available with no imprinted legends. In this case, it comes in two pieces: the actual membrane keypad and a protective overlay with a clear area for each key. You can easily create your own legends on a word processor or drawing program. Copy them onto 20 lb bond paper on a laser printer (heavier paper reduces tactile feedback). Or you can use a color photocopy of a color inkjet print for a more elaborate custom appearance. You can easily and quickly make low-volume custom keypads which look like they are an expensive full-custom design.

The keypad and its protective overlay are intended to be held together by the adhesive strips on the keypad. Position your legends (either in strips or a whole sheet) over the keypad. Peel off the adhesive release liner and position your legends. Be sure your legends are small enough to leave a border of adhesive around them to hold the overlay. Press the overlay carefully in place. This adhesive is very tenacious, so you only get one attempt at this!

If you leave one edge of the release liner in place you can create a "pocket" between the keypad and overlay to let you insert different key legends at any time.

Finally, the keypad back also has laminated adhesive for permanent mounting to an enclosure or panel. Be sure the mounting surface is clean - some isopropyl alcohol will remove any grease or oil from plastic and metal surfaces. Line up the keypad carefully since the adhesive is very permanent and cannot be easily repositioned.

Keypad Legends Online

Keypad legends are available online at http://www.systronix.com/access/keypad.htm