
KNJN I2C bus development boards

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<http://www.knjn.com/>

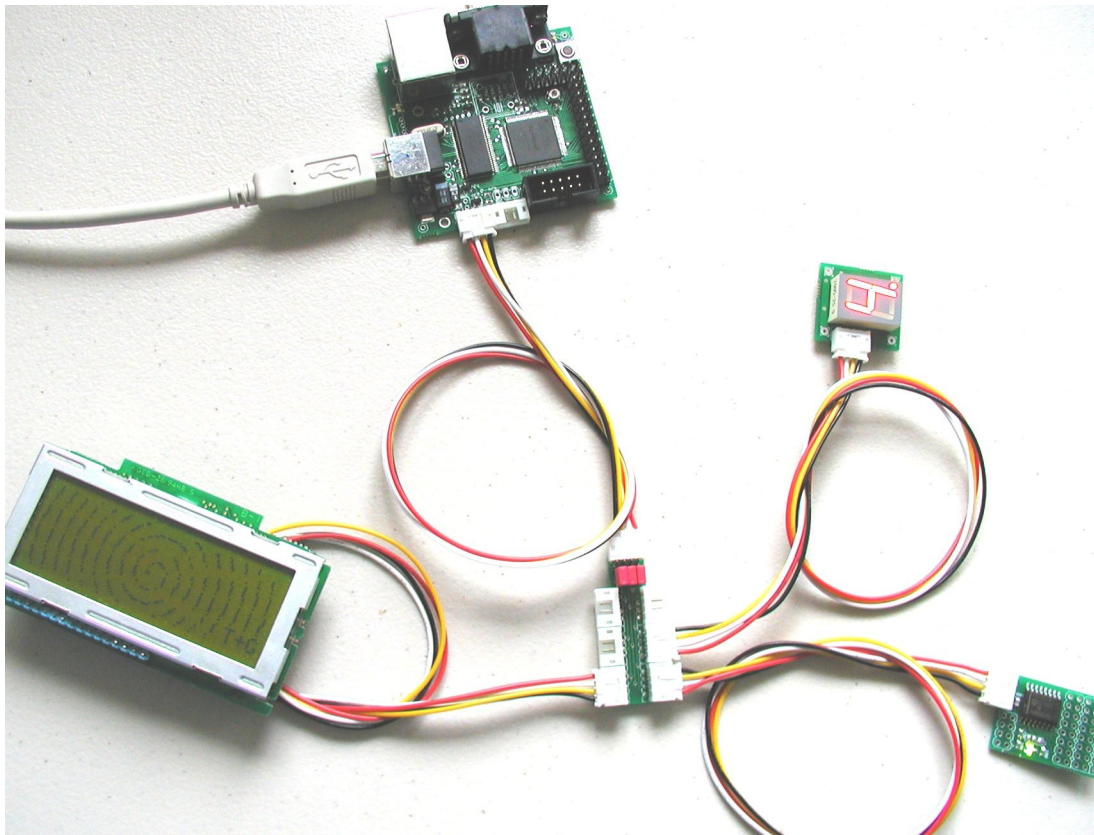


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1 The I2C bus

The I2C bus is an easy to use, yet powerful bus. Here's a short introduction about it.

1.1 I2C characteristics

The I2C bus allows multiple peripherals to communicate together.

- An I2C bus uses only 2 signal wires (named "SDA" and "SCL") in addition to power and ground. The wires can be a few meters long.
- An I2C bus can support multiple devices on the same bus (each device on the bus has an address to be individually accessible).
- An I2C bus is made of masters and slaves. The masters are the ones that initiate transactions (reads or writes). A minimum I2C bus would consist of one master and one slave, while a typical I2C bus would have one master and a few slaves.

I2C slaves use a unique address on the bus to be accessible by a master. Addresses use 7 bits plus a Read/Write bit, to make an 8-bits value:

- Even addresses are used for write accesses (0x00, 0x02, ... 0xFE).
- Odd addresses are used for read accesses (0x01, 0x03, ..., 0xFF).

1.2 KNJN I2C connector

KNJN boards use a 4 pins connector with the following pinout:

Pin	Name	Wire color	Use
1	GND	Black	Ground
2	SCL	Yellow	I2C clock
3	SDA	White	I2C data
4	VCC	Red	Power (+5V typical)

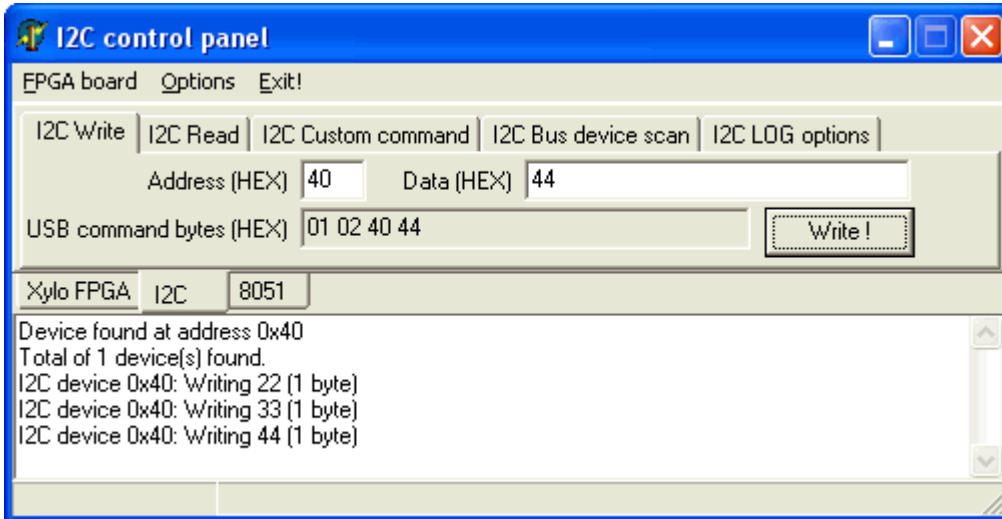
1.3 KNJN I2C boards

Many I2C boards can be purchased from KNJN, see for example [here](#),

2 I2C masters

2.1 USB port

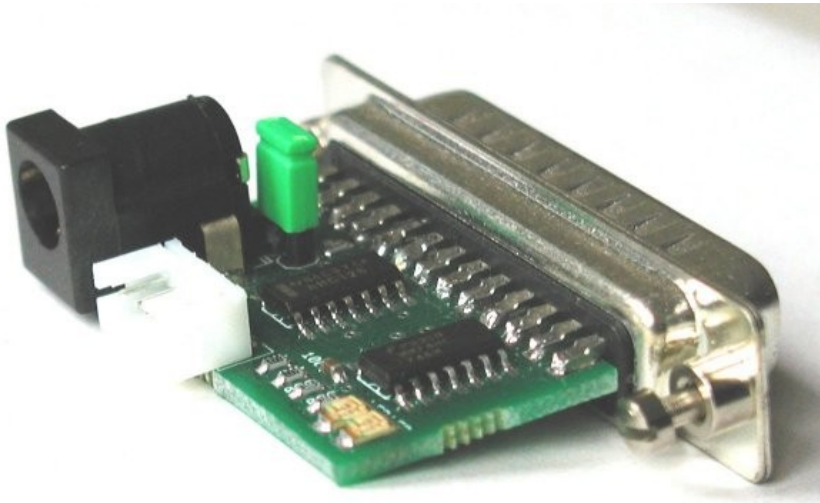
The Dragon and Saxo/Xylo family of boards have an integrated I2C master that is controlled from USB. These boards come with a powerful I2C control panel.



In addition to the control panel, you can also write your own control routines. See the documentation that comes with your boards for details.

2.2 Parallel port

The I2C parallel master is a board that plugs into a PC's parallel port and creates an I2C bus.



3 I2C addresses

3.1 Unique addresses

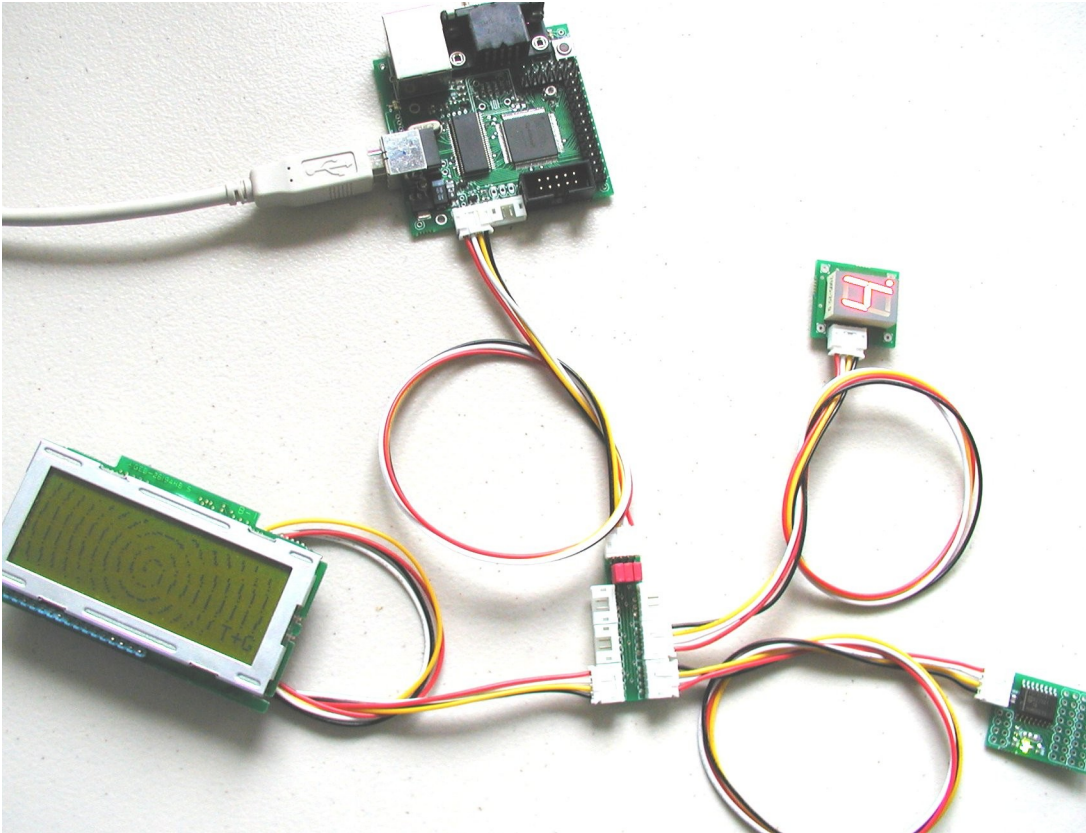
Each peripheral (slave) on an I2C bus needs to use a unique address.

It is possible to put several identical I2C modules on the same I2C bus, as long as they are configured to use different addresses. For example, many modules are based on the PCF8574 chip. This chip has 3 address pins, so 8 of them can cohabit on the same I2C bus.

For more details, see the PCF8574 datasheet [here](#).

3.2 I2C hubs

An I2C hub allows connecting multiple peripherals to the bus.



An I2C hub also allows creating a multi-voltage I2C bus by isolating the main power supply from the branches of the bus (using a jumper on the hub).

4 I2C 7-segments display

4.1 A nice debug tool

The I2C 7-segments display makes it very easy to try your new I2C bus:

- Writes change the display.
- Reads read back the last value written.



By default, the display is controlled at these I2C addresses:

I2C address	Action
0x40	Write to display
0x41	Read from display

For example:

- Write data 0x88 to I2C address 0x40, and the symbol '0' is displayed.
- Read from address 0x41, you should get 0x88.

4.2 Segments mapping

The segments are active low. The power-up value is 0xFF (display all off). The segments are decoded below:

Data bit	Segment
1	A
0	B
2	C
5	D
4	E
6	F
7	G
3	Dot

If you want to display digits from 0 to 9, use these values:

Digit	Data
0	0x88
1	0xFA
2	0x4C
3	0x58
4	0x3A
5	0x19
6	0x09
7	0xF8
8	0x08
9	0x18

The module is based on the PCF8574 chip. It can be configured to use addresses 0x40 to 0x47 by modifying PCB-trace jumpers.

5 I2C IO extender

5.1 Eight IOs controlled from I2C

IO extenders provide 8 IOs and allow connecting your own peripherals to the I2C bus. Each IO can either be digital, or connected to a relay.



5.2 Up to 64 IOs

The IO extenders are based on the PCF8574, and a header is provided that controls 2 address bits of the PCF8574. The header can be populated by DIL-switches or jumpers. The third address bit is controlled through a PCB-trace jumper. So by using 8 IO controllers, a total of 64 IOs can be controlled on a single I2C bus.

6 I2C Text LCD

6.1 Text LCD

The KNJN I2C text LCD display shows 1 line of 20 characters.



This display uses three I2C addresses.

I2C address	Action
0x20	Write LCD command
0x22	Write LCD data
0x24	Write LCD contrast

6.2 Command and data

The LCD command and data values are the same used with industry standard text LCDs.

For example, to write “ABC” to the LCD, use the following:

1. Write data 0x38, 0x0F and 0x01 to address 0x20.
This initializes the LCD, sets the cursor, and erases the display.
2. Write data 0x41, 0x42 and 0x43 to address 0x22.
This writes the characters “ABC” on the display.

For more information, check [here](#) for example.

6.3 LCD contrast

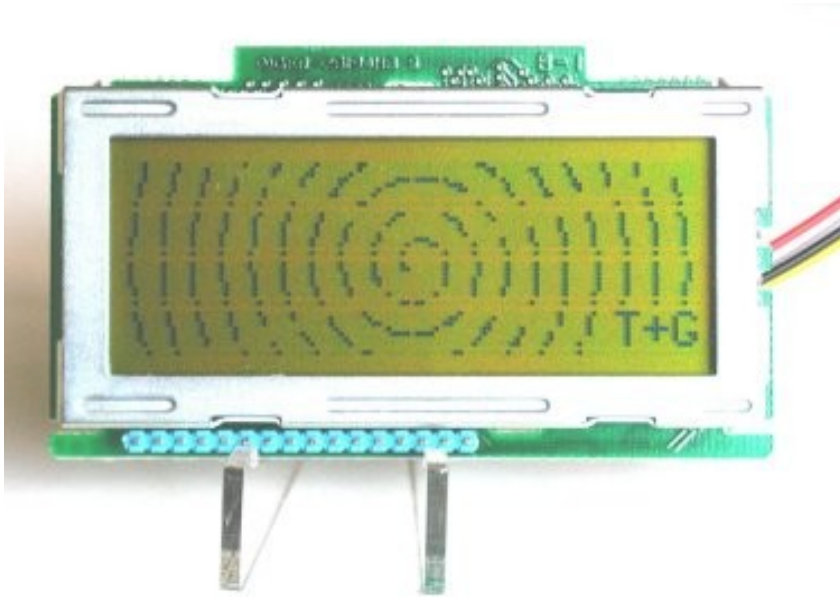
The LCD contrast register accepts the following values:

Hex Value	Binary value	Contrast
0x03	011	+3
0x02	010	+2
0x01	001	+1
0x00	000	0 (default)
0x07	111	-1
0x06	110	-2
0x05	101	-3

7 I2C LCD 4x20T+G semi-graphic

7.1 LCD with pixel-level control

This LCD can display 4 lines of 20 characters, and also allows control of individual pixels. Here's an example where text and semi-graphics are mixed:



7.2 LCD control

The display uses one single I2C address:

I2C address	Action
0x30	Write LCD command/data/contrast

See the "LCD_HD44102.c" file that comes with your display for a programming example.

8 I2C PLL

8.1 Frequency generator

The I2C PLL generates frequencies from 8MHz to 150MHz (typical).

The PLL comes in two forms:

- Regular PCB with three outputs.
- Compact with one output (DIL-8 oscillator replacement).

