# A brief user guide – Universal Learning Remote Controller

Program from a PC:

1. Construct a programming cable with a DB-9 female connector. Locate pad J1 from the Universal Learning Remote Controller (ULRC) PCB. Solder wires as follows. The schematic is available from the same web site you have downloaded this guide, too.


DB-9 female, connector facing us

The connection is:
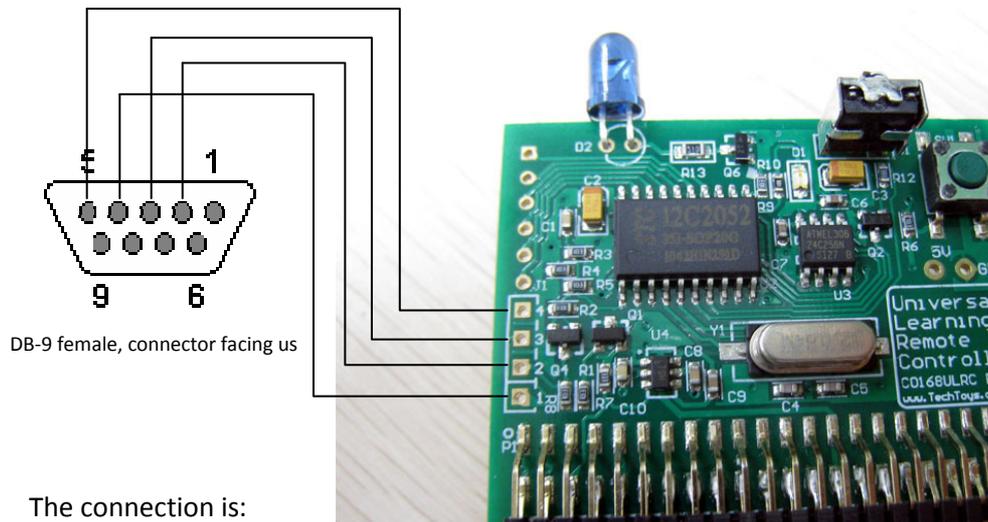
J1 on PCB	DB-9 Female
1	4
2	2
3	3
4 (GND)	5 (GND)

2. Download Docklight from www.download.com or google search it.
3. Install and launch the application. Use 8-n-1, manual –RST/DTR. **This is very important. Uncheck DTR and RTS.**
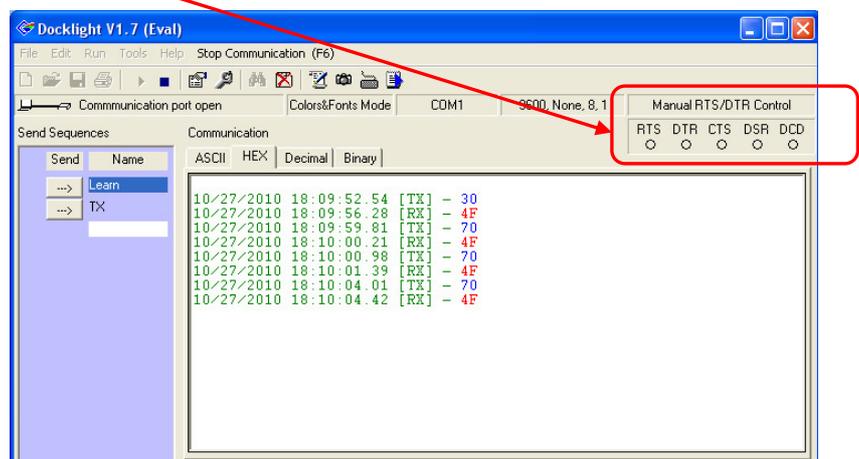
4. Apply power. A DC-DC booster circuit (LTC3200-5) is included on the PCB. This low noise, regulated charge pump circuit generates a stable 5V dc for the whole circuit from any voltage in the range 2.7V to 4.5V. There are two locations to apply power with different voltage levels. One may apply 2.7-4.5V unregulated power to pin 5 of LTC3200-5 IC, which is wired to pin 27 & 28 of the 2.00mm 22x2 pin header as shown below. This is good if you don't have a regulated 5V power supply. If you have got a 5V regulated supply of 100mA or higher, it is possible to apply it here. Both schemes are acceptable.

GND   **2.7-4.5V DC (e.g. 2x1.5V battery)**
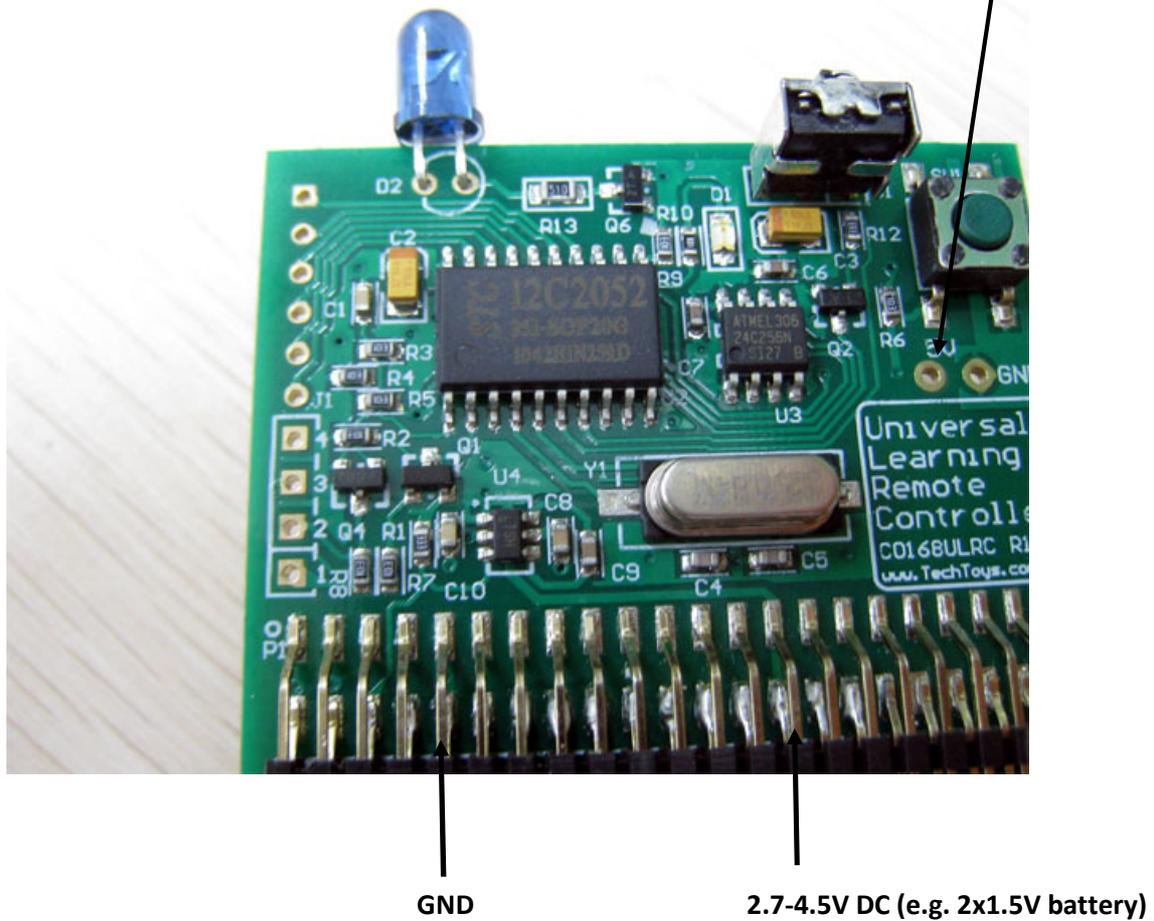
5. Construct a learn command by double click on the left panel of Docklight, in this example the Learn command as 0b00110000 (0x30). See screen shot on next page for illustration. Once a successful learning message has been received, the LED D1 on ULRC will be turned on. Now, point your target remote controller to learn at around 10-20cm from the <u>receiver U1</u> and fire for teaching ULRC.
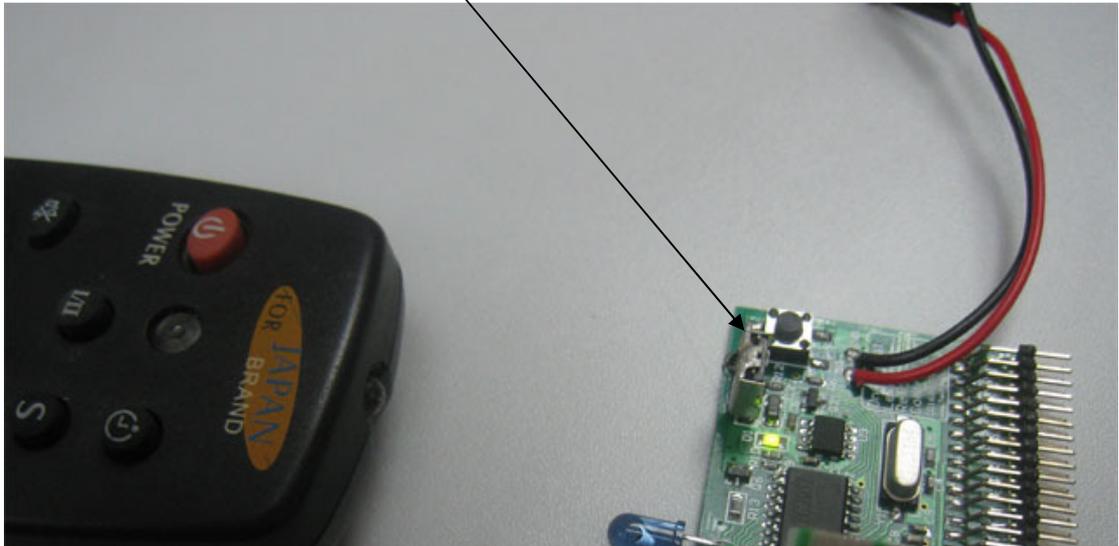
LED D1 on PCB will flash as you press any button of your target remote controller, meaning that the ULRC device is learning. LED D1 will be turned off upon successful learning. In this example, the learn command 0x30 is used to illustrate the idea. The learn code is constructed with bits 7:6 of the MSB at 0:0 as learn command, and bits[5:0] as the code ID to learn. Code ID can be anything from 0-63. In this example, code 0b110000 (dec. 48, hex 0x30) has been used to learn a key from the target remote controller. It is an arbitrary choice made by the user. Say, you may design a code table as follows for your application:

Button on the target remote controller	Code ID	Command
Power ON	0	0b00000000
Volume Up	1	0b00000001
Volume Down	2	0b00000010
Channel Up	3	0b00000011
Channel Down	4	0b00000100
….		

For details of the communication protocol, please refer to the document Doc 04 under the same web page you have downloaded this guide.

6. After a successful learning, you would like to fire it back. Now, construct a Transmit command to fire a learned code with bits 7:6 = 0b01, in this example the TX command became 0b01110000 (0x70) to fire the learned code at 0x30. Successful learn and transmit will return 0x4F to PC.
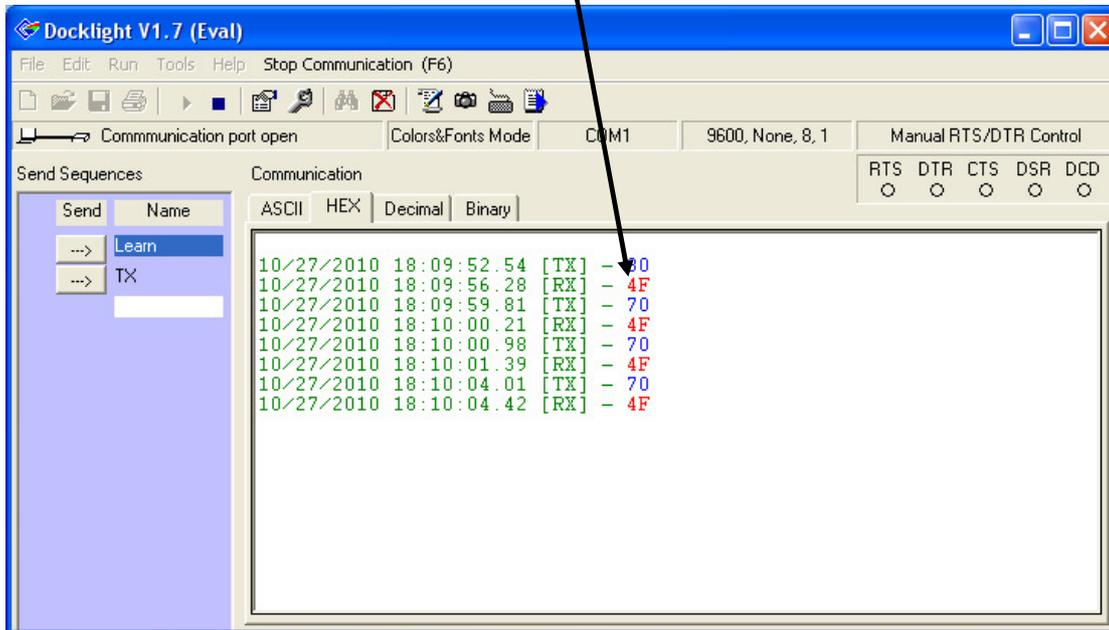
Program from PIC18F67J50 USB controller kit:

The ULRC was designed to be compatible with our evaluation kit for Microchip PIC18F67J50 MCU with 1.5" OLED display. Details of this kit can be found at this hyperlink.

http://www.techtoys.com.hk/PIC_boards/PIC18%20OLED%20EVK/PIC18%20OLED%20EVK.htm
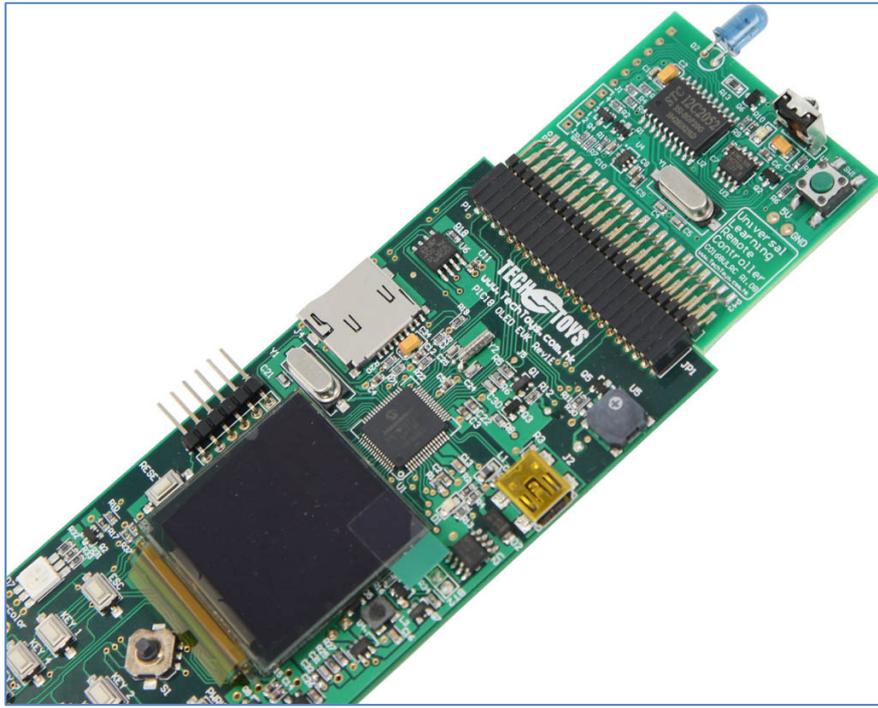
The idea is to make a universal remote controller with keypad and a small display. Command to learn and fire IR codes is not much different from that in part one of this manual when COM Port of a PC is used, except that UART of the MCU now interfaces directly to C0168 IC of ULRC.

Procedure:

1. Download the source code under Doc 10 of the web site above.

|				
		Document & Software		
Doc 01	Schematic (5 pages)	90 KB		
Doc 02	User's Guide (Rev1.0)	1.6 MB		
Doc 03	Simple IO Demo	17 KB		
Doc 04	USB Bootloader	402 KB		
Doc 05	USB Mass Storage - SD Card reader			
Doc 06	USB Device - HID - Joystick			
Doc 07	USB Device - CDC - Basic Demo			
Doc 08	USB Device - Composite - WinUSB + MSD			
Doc 09	OLED Keypad Demo			
Doc 10	* Source code for Doc 05-09 now online	55 MB		
Doc 11	Soft power on/off like a mobile phone	61 KB		

2. Unzip the folder and locate the project under ..\Firmware\CD-ROM Contents\CD-ROM Contents\Firmware\ULRC Demo. There is a hex code ULRC Demo.hex there.
3. Follow the procedure described in the manual of the 1.5" OLED demo kit to program the MCU with Bootloader. The full source code is also there. You will see a Frog on OLED to indicate a successful programming.

4. Important: use battery to power the board. This is because the ULRC device sources power from EXT VIN pin, which are connected to batteries of the OLED demo kit.
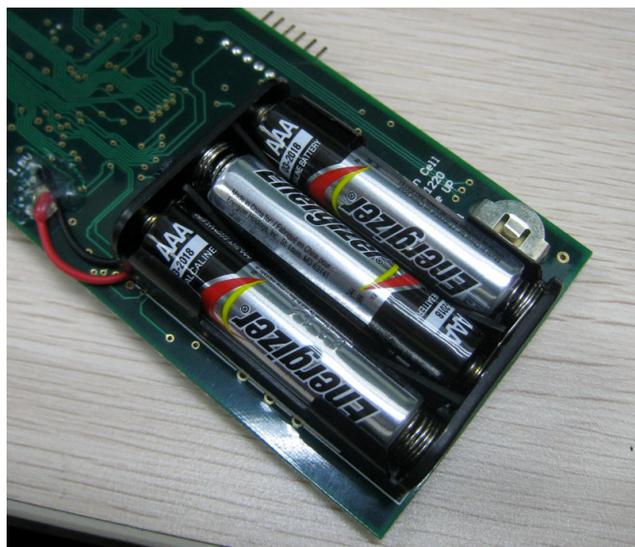
5. The key combination to learn an IR code is to press & release #-key followed by the key number to learn. Say, if we want to teach key 1 as the power ON button, press & release #-key and then followed by pressing KEY 1 to assign KEY 1 as the power ON button IR code.
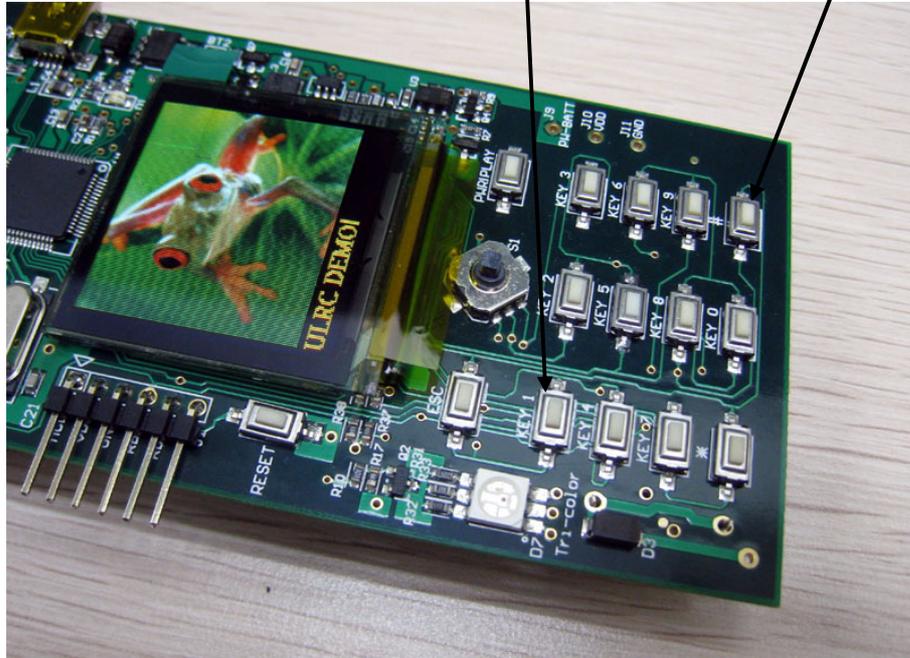
6. Similar to programming with a PC, LED D1 on ULRC will flash as you teach. Now, fire it back to your home appliance with KEY 1 to see if your TV can be switched ON/OFF.