



Z i L O G

Technical Note

Interfacing an I²C LCD Module to a TCP/IP Stack

TN001001-0603

General Overview

In embedded electronic systems, there are a number of peripheral ICs that must communicate with each other. To maximize hardware efficiency and simplify circuit design, Phillips Corporation developed a simple bidirectional 2-wire bus (a serial data line and a serial clock line) for efficient inter-integrated circuit control. This bus is called the *Inter-IC* or I²C bus.

The I²C bus has become a *de facto* standard, and is implemented in most electronic devices. Its design provides added flexibility and lower interconnection costs by reducing board space and pin count.

ZiLOG's eZ80[®] devices support the I²C bus. Some of these I²C bus features are:

- Only two bus lines are required:
 - A serial data line (SDA)
 - A serial clock line (SCL)
- Each device connected via the I²C bus features a unique address; simple master/slave relationships exist at all times
- The I²C bus:
 - Is a true multimaster bus because it includes collision detection and arbitration to prevent data corruption if two or more masters simultaneously initiate data transfer
 - Can be controlled by more than one processor
- The I²C bus supports bit rates ranging from 100 to 400kbps

This ZiLOG Application Principle document discusses a program built to demonstrate I²C and protocol stack functions on ZiLOG's eZ80L92 and eZ80F92 devices. Source code is also included with this project.

Discussion

The objective of the demo program is to show the IPWorks™ protocol stack and I²C operations using eZ80L92 and eZ80F92 devices. This demo runs eZ80[®]-driven web servers and communicates to external LCD devices via the I²C bus. The eZ80[®] microcontroller obtains its IP address, and sends commands and data to the I²C LCD module, via the I²C bus. The eZ80[®] device's IP address is also displayed on the LCD.

In this demo, the eZ80L92 and eZ80F92 controllers are configured as Master devices. The Orbital 2041 LCD, from Matrix Orbital, is configured as a slave device.

The *ipaddress* function is the user-defined process that displays a machine's IP address in the LCD display. The functions *orbital_ipaddr_disp()* and *ipaddress()* shows the methods to create a user-defined process.

The I²C program files used with this demo are described below.

- `l92i2c.c`

This program provides basic I²C driver functions for eZ80L92 and eZ80F92 devices. These I²C APIs can be used for interfacing external I²C slave devices with these eZ80[®] devices.

- `orbitallcdi2c.c`

This program calls specific I²C functions derived from the `l92i2c.c` program to drive the LCD. Please refer to the [eZ80L92](#) and [eZ80F92](#) Product Specifications for more detailed information about external slave devices and their I²C capabilities.

Tools/Requirements

The following list specifies the tools used to build this project:

- IPWorks™ TCP/IP stack software, version 1.6.0.2T or later
- eZ80[®] Development Platform
- An eZ80L92 or eZ80F92 Development Module
- ZDSII, Rev 4.2 or later
- External Flash Loader 1_2_1se
- Windows NT or XP operating system
- RS-233 serial cable
- 9.0V, 1.2amp power adapter

Project Build Procedure

To build the project, IPWorks™ 1.6.0.2T or later version must be installed on the host system. IPWorks™ can be found on the [ZiLOG website](http://www.zilog.com/products/part-details.asp?id=eZ80L925048MOD) at <http://www.zilog.com/products/part-details.asp?id=eZ80L925048MOD>

1. Copy `i2clcd`, `l92include` and `i2clcddemo` directories from the `IPWorks1.6.0.2T_eZ80_i2clcddemo` directory to the `IPWorks1.6.0.2T` directory.
2. Navigate to the `i2clcddemo` directory.
 - For L92 RAM-based projects, select the `L92democs.pro` file and build the project
 - For L92 Flash-based projects, select the `L92flashcs.pro` file and build the project
 - For F92 RAM-based projects, select the `F92democs.pro` file and build the project

Run The Demo

This demonstration involves the use of an LCD panel. The Matrix Orbital LCD Module supports both UART and I²C functions. For details about this LCD module, please refer to the Orbital LCD 2401 Module User Manual, available from the [Matrix Orbital website](#). The following instructions will result in the display of an IP address on the LCD.

1. Connect the Orbital LCD module to the eZ80[®] Development Platform.
2. The SCL and SDA lines from the LCD module connector should be connected to the SCL and SDA pins available on the J6 connector which is located on the eZ80 evaluation platform .
3. Connect VCC and GND pins of the orbital LCD module to 5V DC power supply.
4. Connect HyperTerminal to the eZ80 console port available on the eZ80 family development platform
 - For eZ80L92/eZ80F92 RAM-based projects, navigate to **Build** → **Debug** → **Reset** → **Go** in ZDSII.
 - For eZ80L92/eZ80F92 Flash-based projects, download the *I92flashcs.hex* file to the eZ80[®] Development Platform; then, reset the platform.
5. Open an Internet browser and enter `192.168.1.1` in the URL bar. Observe the IP address as it is displayed on the LCD module.
6. To see a status of all processes, enter `ps` in HyperTerminal.

Source Code

The source code files for the I²C/stack demo are available in .zip format on the [ZiLOG web-site](#).

The *I2Cdemo* directory located within this .zip file contains the following projects:

- *L92DemoCS.pro*
- *L92FlashCS.pro*
- *F92DemoCS.pro*

Summary

This demo exhibits I²C and http server operations on eZ80L92 and eZ80F92 devices. It is built with the IPWorks™ protocol stack. The demo displays an IP address on an I²C-based LCD.



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