

Digital Shortcut Inc

DS2148WZ
Quick Start Guide

Rev 1.20

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1 Starting Up...

The Digital Shortcut team is pleased that you purchased our product. If you have any questions please send us an e-mail to support@digitalshortcut.com. We will be more than happy to help.

The new DS2148WZ board comes configured with our demo web server application. We strongly advise you to test it. Please use USB cable with MiniB connector as a power source (5V).

Immediately after connecting power to the board LED D7 is ON.

Our default network settings loaded to flash are compatible with typical network routers:

```
IP Address: . . 192.168.0.41
Subnet Mask: . . 255.255.255.0
Default Gateway: 192.168.0.1
Server Port: . . 80
```

It is quite possible that these settings are OK for your LAN. In case you have any doubts please contact your network administrator. In general IP address must belong to the same group your network uses and the IP address of DS2148WZ cannot be used by any other computer/device in the group. We will explain how to change DS2148WZ network settings later. If IP address is OK then connect the board to your router, switch or hub using CAT5 cable. Open your favorite web browser (i.e. Chrome, Firefox, IE, Safari) and direct it to <http://192.168.0.41/>. The browser shall display a copy of Digital Shortcut home page. The AppNotes page uses Java Script to periodical read of emulated analog to digital converter. Simple ping 192.168.0.41 (DOS command) can also be used to check network connectivity of DS2148WZ board.

1.1 DS2148WZ Software Package

We distribute our software as one zip file. Please “unzip” it into a directory of your choice. It is important that the directory tree to be preserved. If you chose C:\ as a directory then we will create a tree starting from C:\DigitalShortcut\DS2148WZ\.

Next use Microsoft Windows command “subst” to substitute path as a virtual drive:

```
subst S: C:\DigitalShortcut
```

You will create virtual drive S: and all our settings and path definitions will be preserved. We recommend to insert the above line into a batch file located in:

```
~\Start Menu\Programs\Startup
```

Virtual drive S: will be created on every power up of your computer.

2 Software Tools and Installations

2.1 GNUARM(arm-elf) C-compiler

From www.gnuarm.com (Files) download Binaries GCC-4.1 toolchain (Cygwin)
GCC: file `bu-2.17_gcc-4.1.1-c-c++_nl-1.14.0_gi-6.5.exe` is installed automatically.
Before start uncheck "Cygwin options" checkbox.

2.2 GNU make utility

Copy GNU make.exe from our Tools folder to your GNUARM\bin folder
(typically: "Program Files\GNUARM\bin").

2.3 Cygwin

The Cygwin installation doesn't require any changes or customizations. Just Run Setup.exe downloaded from Cygwin.com and select "Install from Internet". Based on the feedback from our customers we know that for some computers `cygintl-2.dll` library is required. For such cases run Setup again and in "Select Packages" window click on "+" in Libs category and then select `libintl2 GNU Internationalization runtime library`.

Check if there is only one `cygwin1.dll` file on your hard drive. Modify Path (in OS Environment Variables: `MyComputer\Properties\Advanced\Environment Variables`) to include `Cygwin\bin`.

2.4 ActiveTcl

We like Tcl/Tk. We recommend installing industry-standard Tcl distribution of ActiveTcl version 8.5 from <http://www.activestate.com/activetcl/>. It is free and easy to install. ActiveTcl is necessary to run our "SiteBuilder" utility and our handy RS232 "Terminal" application used during debugging and communicating with PicoBlaze microprocessor.

2.5 Makefile, mk.bat, mkf.bat

For each project there is dedicated **makefile** and **mk.bat** used to compile and link all the components. However this batch can be executed directly from Windows Explorer, but DOS Command Window is much more convenient, for all the compiler/linker errors and warnings will stay on the screen, ready for your "inspection". Dedicated DOS Shortcut (Target: `.. \system32\cmd.exe`) is also present in every project. The `mk.bat` produces several types of files. The Extended Intel Hex file format (*.hex) is used by Philips Flash Loader. For debugging purpo-

ses of JTAG emulators *.elf file is created. Most of general information about Flash and RAM allocations you can find in *.map file.

The **mkf.bat** batch is used in Http Server project to combine Arm object code (hex file) with binary image of the served Website.

2.6 Serial Console (printf debug channel)

For the most of our projects we use UART0 operating on 115200 kBauds, 8bits, Noparity as a serial communication channel for a small command interpreter allowing user interactions and debugging. Regular C-printf statement is configured to send data to UART0 and is very helpful in debugging. Use H command (Help) for the list of available commands. If you need any new test/debug functionality just add another command to our set.

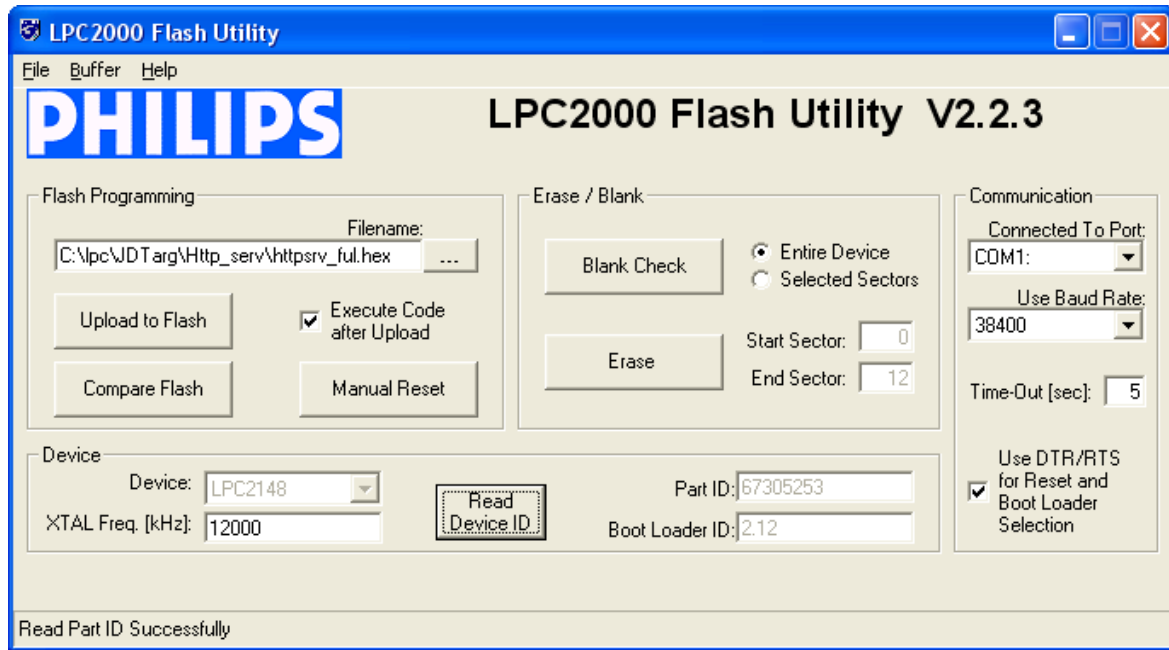
Available Commands:

- L - LogDisplay
- I - Info
- EC - Clear EEPROM
- ED - Dump EEPROM
- EL - Load/Init EE_Network Params (IP, MAC, SUBR Etc)
- EI - set EE_IP
- EM - set EE_MAC
- ES - set EE_SN
- EG - set EE_GAR
- EP - set EE_Port

“I” Command (Info) displays general information record about current firmware revision and settings of DS2148WZ board. Factory Default Info Response is presented below.

```
### HTTP Server_Demo 4/24/2009 ###
EEPROM:
000 06 44 53 01 01 02 00 00 c0 a8 00 29 00 00 00 00 #DS#####
016 c0 a8 00 01 00 00 00 00 ff ff ff 01 00 00 00 00 #####
032 50 00 ff ff ff ff ff ff ff ff ff ff ff ff ff P#####
IP: 192.168.0.41
GAR: 192.168.0.1
SUBR: 255.255.255.1
SHAR: 06:44:53:01:01:02
HttpPort: 80
```

2.7 Philips LPC2000 Flash Utility



Typical settings for LPC2148:
 Connected to Port: COM1
 Use Baud Rate: 38400
 Use DTR/RTS for Reset...: Checked
 Device: LPC2148
 XTAL Freq[kHz]: 12000

After pressing ReadDevice ID button PartID should be 67305253

2.8 USB Virtual Serial Com

If for any reason regular serial Com channels are not available the USB Virtual Com Port provides an alternate way for serial data exchange. If the USB Virtual Com is not installed on your machine, extract **usbser.sys** from \Windows\Driver Cache\i386*.cab (typically sp3.cab or sp2.cab) and copy **usbser.inf** file from Tools\Usbser folder to any convenient place. Make sure to take proper INF file because Vista version differs from WinXP counterpart.

2.9 Wireshark – Network Analyzer

It is a must for all who play with the networks. It shows and analyzes network packets. Download it from <http://www.wireshark.org/>. It is free and easy to install.

Wireshark can capture and interpret packets on your LAN and probably will capture more than you need. Declare filter similar to:

```
ip.addr == 192.168.0.41
```

to filter some of them out.

3 Digital Shortcut Inc. Reference Projects

Included reference designs are in ...\\DigitalShortcut\\DS2148WZ\\Projects folder after unzipping DS2148WZ.zip file.

3.1 Http Server Projects

Http Server Firmware consists of 2 parts:

- Arm7 Http Server Code
- Web Page Data (set of html, text, jpeg, etc files).

Both parts are loaded to Flash memory. As of now for Arm code we reserved first 192k bytes. The WebSite Data starts at 0x30000 and can use almost 320k bytes of Flash space. The proposed division is flexible and can be changed if necessary. The **mkf.bat** is combining both pieces together for convenient handling.

Of course designer can and will make changes to both parts/sections.

Below are described steps needed to generate and load to LPC2148 Flash either or both.

3.1.1 Arm Code Modification

- By using your editor change the source code (any *.c or *.h file).
- Open DOS Command Window in DigitalShortcut\\DS2148WZ\\Projects\\Http_serv folder (just click on DOS icon in this folder).
- Type mk to start mk.bat responsible for compilation and linking. Translation progress as well as errors and warnings are displayed in DOS Window. If the compilation is successful (no errors) http_serv.hex file is created.
- Connect DS2148WZ board to your PC computer by straight serial cable. Open (previously installed) Philips LPC2000 Flash Utility. Select Com Port (typically COM1), Baud Rate: 38400. Check "Use DTR/RTS for Reset and Boot Loader Selection" Box. Select Device: LPC2148 and XTAL Freq[kHz]: 12000. In Filename field navigate to .. DS2148WZ\\Projects\\Http_serv\\http_serv.hex. Check "Execute Code after Upload" Box. To make sure that Flash Loader communicates with our board click on "Read Device ID" and check if displayed Part ID is 67305253. If so click on "Upload to Flash" button. For bigger files it can take even 2-3 minutes and progress is showed by the blue bar in lower part of the screen. Newly generated version of the software will start automatically after it is loaded to LPC2148 Flash.

3.1.2 WebSite Data Modification (Html, CSS)

- Modify any of html, css,... web files
- Use our Site Builder utility described in section 4. to generate Web Data in the format acceptable by our Http Server.
- Use **mkf.bat** batch to combine newly generated Website Data with Arm code.
- Upload new firmware **httpsrv_ful.hex** by Philips LPC2000 Flash Utility.

3.1.3 Network Settings

DS2148WZ Default Network Settings:

IP: 192.168.0.41
GAR: 192.168.0.1
SUBR: 255.255.255.1
SHAR: 06:44:53:01:01:02
HttpPort: 80

Network parameters, like IP, GAR (Gateway), SUBR (Subnet Mask), MAC (Source Hardware Addr) and Http Port are changeable by serial console commands listed in the table below. Since these settings are stored in CAT1640 EEPROM(8kBx8) the commands start with letter “E”.

Command	Description	Example Syntax
EI	Set IP Address	EI 192.168.0.70
EG	Set Gateway Addr (GAR)	EG 192.168.0.1
ES	Set Subnet Mask (SUBR)	ES 255.255.255.1
EM	Set MAC Address	EM 06:12:34:56:78:90
EL	Load Factory Defaults	EL

First section of MAC address 06 configures DS2148WZ as locally administered by IEEE 820 standard.

To get back to factory defaults use EL command.

3.1.4 First Time Use (step by step)

- Connect DS2148WZ to serial port (BaudRate 115200, 8bit, 1stop, noParity). Use any terminal emulation software ie: Termite2.3 as a console output with straight DB9 serial cable.

- Connect USB cable to USB mini-B connector on DS2148WZ (it is used as a power supply).
- Sign-On message like the one below should appear on console.

```
#####==== HTTP Servr_Demo 4/06/2009 ====#####  
MR=0001 RTR=07d0 RCR=08 IDR=5300 M_21a=1234 ** OK **  
IP: 192.168.0.41  
GAR: 192.168.0.1  
SUBR: 255.255.255.1  
SHAR: 06:44:53:01:01:02  
HttpPort: 80
```

Second line of the Sign-On message shows values of some W5300 internal registers and is used as our simple “sanity indicator”. W5300 register at 0x21a is set by firmware to 0x1234 after power-up reset.

- Connect DS2148WZ to your local Ethernet Network (Router or Switch). Check with Ping 192.168.0.41 (use your own IP if you changed it) if the board is "visible".
- Start any Internet browser (Internet Explorer, FireFox, Chrome, Safari ...) and select address <http://192.168.0.41> (or your new IP) Digital Shortcut Inc. Homepage delivered by the server running on DS2148WZ board should appear on your screen.

3.2 Led Blink Project

LedBlink is a very simple C Project using UART0 based Serial Console and 1milisecond Timer0 interrupt.

In perpetual loop it:

- toggles P0.4 pin - on connector P3(13)
- blinks Led connected to LPC2148 P1.24 pin
- sends '*' character to console every second.

Serial Console operates on 115200 kBauds, 8bits, Noparity.

After Power-up or Reset Short Sign-On message: "### Blink Led (Morse)... ###" should appear on console screen.

Small Command Interpreter with 2 commands: L and I is present to allow user interactions.

L (loop) command - loops ToggleP0.5 routine, check P3(15) with the scope.

I (info) "printfs" info message on console.

The MK.Bat compiles (arm-elf GNU tool chain) all files and creates Led_Blink.hex together with *.elf *.dmp *.map files.

The Hex file is used by Philips Flash Utility to load the code to LPC2148 Flash memory.

3.3 JCW-Demo-http (FreeRTOS) Project

FreeRTOS Demo downloaded from John C. Wren with Digital Shortcut Http Server added. It is a good example of complex project using a lot of LPC2148 features operating under RTOS. More details at: <http://www.jcwren.com/arm/> and in included source code.

4 Site Builder Overview

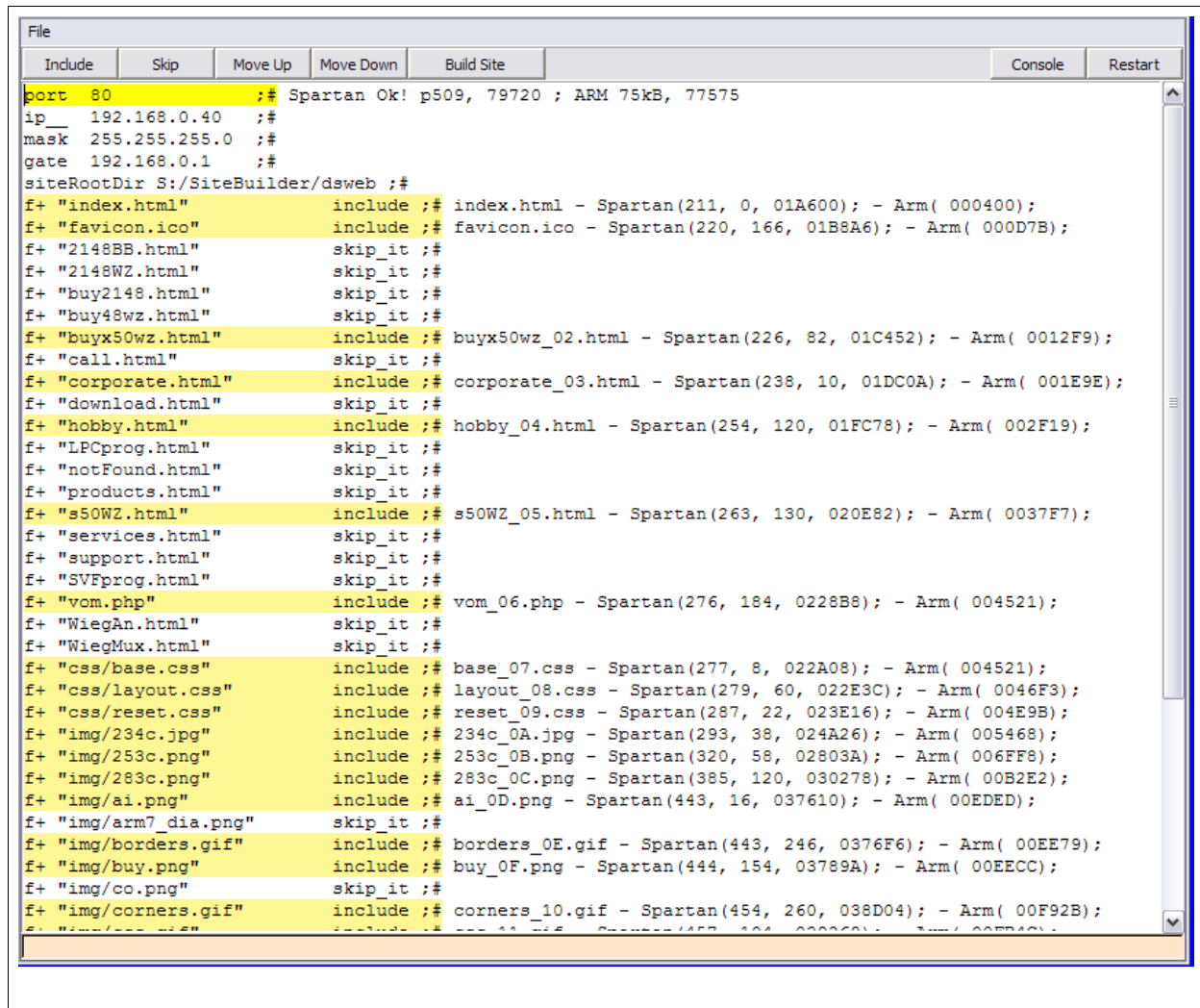
Site Builder is a simple Tcl/Tk application we use to prepare all data for our demo WebServer.

We use this application to create WebSite data

- Builds a list of all files for a web site
- Appends a hex index to file names and adjusts accordingly all links involved.
- Compresses (gzip) all files with extensions “.htm” and “.css”
- Copies all active files to a folder named “SiteBuilderGenerated”
- Creates "siteArm.hex" and "siteArm.bin" files later to be used by “make” when generating firmware for DS2148WZ board (“mkf.bat” batch file).

4.1 Site Builder Usage

First you need to select new or existing project “**File->New**” or “**File->Open**”. Script will ask to select a “root” directory (folder) of your web site. Typically this is a directory where file “**index.html**” is located. When building a new project, script will collect all the file names in a root folder and in all sub folders one level deeper. At that point you can adjust default port, IP address, mask and gate. To remove files from the list simply delete corresponding lines, HTML links will stay intact. Use "Skip" button if you need to disable all links to specific files (insertion point must be inside word "include").



The screenshot shows a window titled "File" with a menu bar containing "Include", "Skip", "Move Up", "Move Down", "Build Site", "Console", and "Restart". The main area displays a list of files and their inclusion status, along with their respective Spartan and ARM addresses. The files are listed in a table-like format with columns for the file name, the action (include or skip), and the address. The files are sorted by their Spartan address in ascending order.

File Name	Action	Spartan Address	ARM Address
port 80	;	Spartan(211, 0, 01A600)	- Arm(000400);
ip_ 192.168.0.40	;		
mask 255.255.255.0	;		
gate 192.168.0.1	;		
siteRootDir S:/SiteBuilder/dsweb	;		
f+ "index.html"	include	index.html - Spartan(211, 0, 01A600)	- Arm(000400);
f+ "favicon.ico"	include	favicon.ico - Spartan(220, 166, 01B8A6)	- Arm(000D7B);
f+ "2148BB.html"	skip_it		
f+ "2148WZ.html"	skip_it		
f+ "buy2148.html"	skip_it		
f+ "buy48wz.html"	skip_it		
f+ "buyx50wz.html"	include	buyx50wz_02.html - Spartan(226, 82, 01C452)	- Arm(0012F9);
f+ "call.html"	skip_it		
f+ "corporate.html"	include	corporate_03.html - Spartan(238, 10, 01DC0A)	- Arm(001E9E);
f+ "download.html"	skip_it		
f+ "hobby.html"	include	hobby_04.html - Spartan(254, 120, 01FC78)	- Arm(002F19);
f+ "LPCprog.html"	skip_it		
f+ "notFound.html"	skip_it		
f+ "products.html"	skip_it		
f+ "s50WZ.html"	include	s50WZ_05.html - Spartan(263, 130, 020E82)	- Arm(0037F7);
f+ "services.html"	skip_it		
f+ "support.html"	skip_it		
f+ "SVFprog.html"	skip_it		
f+ "vom.php"	include	vom_06.php - Spartan(276, 184, 0228B8)	- Arm(004521);
f+ "WiegAn.html"	skip_it		
f+ "WiegMux.html"	skip_it		
f+ "css/base.css"	include	base_07.css - Spartan(277, 8, 022A08)	- Arm(004521);
f+ "css/layout.css"	include	layout_08.css - Spartan(279, 60, 022E3C)	- Arm(0046F3);
f+ "css/reset.css"	include	reset_09.css - Spartan(287, 22, 023E16)	- Arm(004E9B);
f+ "img/234c.jpg"	include	234c_0A.jpg - Spartan(293, 38, 024A26)	- Arm(005468);
f+ "img/253c.png"	include	253c_0B.png - Spartan(320, 58, 02803A)	- Arm(006FF8);
f+ "img/283c.png"	include	283c_0C.png - Spartan(385, 120, 030278)	- Arm(00B2E2);
f+ "img/ai.png"	include	ai_0D.png - Spartan(443, 16, 037610)	- Arm(00EDED);
f+ "img/arm7_dia.png"	skip_it		
f+ "img/borders.gif"	include	borders_0E.gif - Spartan(443, 246, 0376F6)	- Arm(00EE79);
f+ "img/buy.png"	include	buy_0F.png - Spartan(444, 154, 03789A)	- Arm(00EECC);
f+ "img/co.png"	skip_it		
f+ "img/corners.gif"	include	corners_10.gif - Spartan(454, 260, 038D04)	- Arm(00F92B);

"Move Up" and "Move Down" buttons let you adjust index of a file. Files "index.html" and "favicon.ico" always have index 00 and 01 respectively and keep their names intact.

Button "Build Site" starts the whole process. Please be aware that this script works only for error free static web sites. If site doesn't work when viewed by browser from root folder, it will not work after "Site Builder". Dynamic pages generated by PHP, CGI have to be converted to static ones before running Site Builder. The "*.php" files are used to trigger embedded server services (like reading A/D converter) only. They are not interpreted.

If you need to change W5300 initialization data (say buffer size) you need to edit SiteBuilder source code.