

SC12

Getting started

This document explains how the SC12 IPC@CHIP is put into operation. The DK40 evaluation board is used through this manual.

BECK IPC GmbH

Author: Ing. E. Schlösser

Date: November, 1st 1999

<http://www.beck-ipc.com/chip>

Table of contents.

INTRODUCTION	3
THE SC12	4
What do we need to get started ?	4
The DK40	5
The first test.	6
The next step.	7
Using a terminal program.	8
Using the Chiptool software.	10
THE HTTP WEBSERVER.	11
THE FTP SERVER.	12
IP NETWORKING	13
WHERE TO FIND OTHER INFORMATION ON THE SC12 IPC@CHIP ?	15
WHERE TO GET SUPPORT ?	15
USEFUL WEB LINKS	15
KNOWN PROBLEMS	16

Introduction

This document provides a step by step guide on how to put an SC12 IPC@CHIP into operation. Although some knowledge about IP networking is advised, an introduction into IP Networking is also provided in this document.

This documents concentrates on the use of the software integrated into the SC12 and less on the hardware.

Throughout this manual, the DK40 evaluationboard is used.

All trademarks and trade names are the properties of their respective owners.

The SC12

Congratulations on your SC12 IPC@CHIP. The SC12 is a single chip PC that integrates all features needed for modern Ethernet and Internet applications. Not only does the hardware supply you with features such as Ethernet, Serial ports and programmable I/O pins, the software to use these interfaces is already integrated into the BIOS. Some of the software features included in the current version (0.5) are:

- A real time operating system (RTOS) that is capable of running common DOS applications.
- A full TCP-IP stack with application interfaces for UDP and TCP sockets.
- DHCP client.
- FTP server.
- A Web server (http) capable of CGI

Future versions will add PPP server, I/O API, time client, email client, telnet server and much more. With future, we mean 'near' future. The priorities of the developments are controlled by your feedback: <mailto:atchip@beck-ipc.com>

Before we can start explaining the software, we will first put the SC12 into operation.

What do we need to get started ?

- A DK40 evaluation board
- A SC12 IPC@CHIP
- A PC running Windows 95/98/NT, connected to your Ethernet network.
- An Ethernet network with a free twisted pair connection for the DK40. (Details follow).
- A DC power supply (24 VDC will do fine)

Strongly advised is:

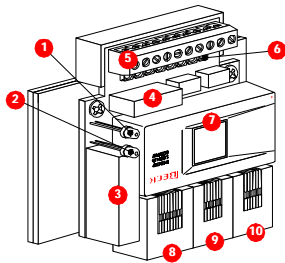
- A SM14. The SM14 actually consists of three parts: a null-modem cable with D-9 connectors on either end, the interface converter integrated into the metallized connector and a short flat cable with 'telephone type' connectors.
- A free serial port (9 pin sub-D) on your windows PC
- A terminal program such as Hyper Terminal (part of Windows 9X) or Tera Term (refer to the web links later in this document) or others.
- The Chiptool software available from our web site at <http://www.beck-ipc.com/chip>
- A graphical FTP client such as WS FTP Lite (again refer to the web links) or the command line FTP client of Win9X or similar..

For Ethernet connection you can use two alternatives:

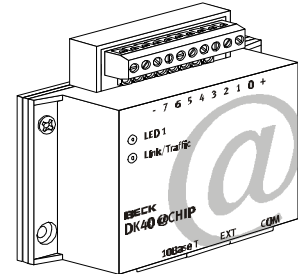
1. You have a network with multiple clients. The network uses HUB's and or switches. In this case, you need a regular twisted pair Ethernet cable from one of your HUB's to the DK40.
2. You have a network of two devices only (your PC and the DK40) without a HUB or a 'switch'. In this case you need a so called 'cross over' twisted pair Ethernet cable.

The DK40

The DK40 is an evaluation platform for the SC12. It provides two serial ports, an Ethernet interface, eight digital I/O, a 'link/traffic' led, a free programmable LED and a switching DC/DC converter (10 ... 36 V -> 5 V).



- 1 Free programmable user LED
- 2 Combined link/traffic/reset LED
- 3 Network transformer for twisted pair
- 4 Interference capacitor
- 5 Socket strip with screw terminal for voltage supply and combined inputs/outputs
- 6 Control LEDs for combined inputs/outputs
- 7 IPC @CHIP SC10/SC11/SC12
- 8 Twisted pair network connection for 10Base T
- 9 EXT interface
- 10 COM interface



- First of all, you have to place the SC12 in the socket inside the DK40. The small dot on the top of the SC12, diagonally from the BECK logo, indicates pin 1. The notch in the socket indicates the position of pin 1 in the socket. Please also refer to the drawing of the DK40 and make sure you insert the chip on the correct orientation.
- Connect the power supply (24 VDC) to the DK40, but do not switch it on at this time.

The first test.

1. First make sure that the power is off and the Ethernet cable is NOT connected.
2. Now switch on the power. The Link/Traffic led will blink for half a second, followed by two shorter blinks.

The explanation: At power on, the led will be on. The software will then reset the Ethernet controller, causing the LED to go off. During configuration of the Ethernet, the led will blink twice.

If the activity of the led does not match the pattern described here, you must check:

- The power supply voltage and polarity.
- The orientation of the SC12 in the DK40.
- The Ethernet cable should not be connected.

It is essential that during this test, the Ethernet cable is not connected.

After confirming that this test was successful, we proceed to the second part of the test: we connect the Ethernet network cable. Now, the LED should be lit continuously only to dim shortly when an Ethernet data packet is on the Ethernet network. With the

Ethernet cable connected, the Link/Traffic led indicates (when lit) that it detects another Ethernet device (in most cases a HUB) at the other end of the cable.

If the Link/Traffic led does not light up you should check:

- Is the other end connected to the 'other' device ? In most cases the HUB.
- Is this other device powered on ?
- Is it the right cable ? Normal twisted pair for a HUB, cross over twisted pair for a direct SC12 to PC connection.

If any problems remain, chances are that either the software on the chip is missing or your hardware is defective. In either case, contact our support at

<mailto:atchip@beck-ipc.com>

The next step.

Next you want to check or change the IP configuration of the SC12. At this stage, it is strongly recommended that you read the chapter 'IP Networking' before continuing.

Before moving on, you must decide if you want to use either DHCP or fixed addressing. With DHCP, the SC12 retrieves a valid IP configuration from a DHCP server. With fixed addressing, you define the IP address, network mask and gateway.

The default configuration for the SC12 is DHCP since this will assure that the SC12 adapts to the existing network if this network has a DHCP server. If you do not have a DHCP server, the SC12 will not disturb the operation of your network.

We advise however, that you start with fixed addressing. This might sound like a controversy, but it is not: We can not ship with a fixed IP configuration since we have no knowledge of your network configuration.

If you have chosen for fixed addressing, please make a note here for future reference:

SC12 Serial number	
IP Address	
Network mask	
Gateway	

Again we want to refer to the chapter 'IP Networking' on how to obtain these data.

To review or change the IP configuration, you can either access the SC12 using a terminal program connected to the COM port of the SC12, or use the 'Chiptool' software that communicates over the Ethernet to the SC12.

Using a terminal program.

- Connect the DK40 to the Ethernet
- Connect the SM-14 to the 'COM' port of the DK40. Connect the other end to a free COM port of your PC.
- Start your terminal software (Tera Term or Hyperterm). Configure your software for a direct connection using the PC's COM port you used to connect the SM14. Set the communication parameters to 19200 baud, 8 data bits, no parity, one stop bit and no handshake.
- Switch on the DK40

On the terminal window you will see the output from the startup procedure. The serial number, bios version and build, available memory and other startup results.

- In the terminal window, press the 'Enter' key once or twice until you see the 'A:>' sequence.
- Enter the command 'ipcfg' followed by the 'Enter' key. The output will show the current IP configuration. An example:

```
Serialnumber=14  
Bios version 0.5 BETA  
Build: Oct 31 1999
```



```
Memory for DOS 419 KByte
Reading chip.ini file
Starting TCPIP
WebServer
FTP server

A:\>ipcfg
IP      =
Netmask=
Gateway=
DHCP=1
Serialnumber=14
MAC=0x00 0xBE 0xCF 0xF0 0x00 0x14
A:\>
```

In this example, the DHCP is enabled (DHCP=1). Since no IP address or netmask is listed, we can conclude that no DHCP server was found.

To change the IP configuration, we can use the commands 'ip', 'netmask', 'gateway' and 'dhcp', each followed by a blank and the new entry.

An example:

```
A:\>
A:\>ip 192.168.200.2
A:\>netmask 255.255.255.224
A:\>dhcp 0
A:\>
```

In this example, we defined an IP address, a network mask and the DHCP was disabled. Please note that the gateway is not needed at this stage. Only when an application or service communicates to another network device that can only be reached over a 'router', then you enter the address of this router as the 'gateway'.

The IP configuration information is stored in the file 'chip.ini' on the flash disk.

Now cycle the power of the DK40 or use the reboot command. *The new IP configuration only becomes valid after a reboot.*

Using the Chiptool software.

- Connect the DK40 to the Ethernet
- Switch on the DK40
- Start the 'Chiptool' software (if not yet installed on your PC, use the 'setup' program to install the chiptool software, if you do not have on your PC download from the homepage of the IPC@CHIP: <http://www.beck-ipc.com/chip>).
- Select the menu option 'Chip' and 'IP Config'
- Fill in the dialog:

IPconfigSnr

Use this form to define the IP configuration of a chip with a known serial number.

Your IP address: 192.168.200.1

Your network mask: 255.255.255.0

Serial number of CHIP: 14

Chip IP configuration

IP Address: 192.168.200.2

Network mask: 255.255.255.0

Gateway:

Use DHCP

Yes Close

The data shown here is just an example. At 'Your IP address' is the address of the PC you are working on. Likewise, 'Your network mask' is the network mask of the PC you are working on (these entries will be filled automatically in a future version of Chiptool). At 'Serial number of CHIP' you enter the serial number of the SC12 that you want to configure. The Serial number is a 5 digit hexadecimal number (valid

hexadecimal digits: 0..9 and A..F). In the area 'Chip IP configuration' you enter the IP address, network mask and optionally the gateway address or alternatively you select the 'Use DHCP' option.

Now click the 'Yes' button. This will send several IP broadcasts over the network which include the serial number of the SC12 and the new IP configuration. This broadcast will also work if your SC12 is not correctly configured for your network. With the current software version of the SC12 (version 0.5) *you must reboot the SC12* after changing the network configuration with the Chiptool software. We will change this in a future version.

To verify the new IP configuration, use the 'Chip' 'Find' menu option of the Chiptool software. This dialog will show all SC12 devices it finds on this section of the Ethernet network. The scan is repeated continuously, new devices that are switched on will be found within seconds. Devices that disappear (get switched off) are NOT removed from the list.

The http webserver.

The SC12 BIOS includes a webserver. This means that you can store so called 'html' pages on the device and retrieve (show) them using a web browser such as Netscape or Internet Explorer. These pages can include images, Java applets, sounds, etc. The webserver includes a CGI interface. This allows you to define functions within your program that are called by the webserver if certain page names are requested by the browser, your program code then produces the contents of the page that is presented to the browser.

One CGI page is activated if you enter the IP address of the SC12 device, without specifying any page name. Analogues to the examples given earlier, this would be the address <http://192.168.200.2>

Remember:

As long as the IPC@CHIP is connected to your network, you only need to enter the IP address in your Browser and you are connected to the WEB@CHIP.

To find the IP address your SC12 is using, use the 'Chip', 'Find' option of the Chiptool software or enter the 'ipcfg' command in the terminal window.

On the page shown, you find a second link to 'Current chip configuration'. This link will produce a page showing you the current IP configuration. Possibly not very useful, but it shows that with CGI you can produce html pages with a changing content.

You can produce your own html pages and store them on the SC12. Please consider the following:

- Use 'short' file names in the 8.3 format. (extension htm instead of html)
- The current version of the software is case sensitive with file names.
- Only a limited number of files can be stored on the root directory (32 with version 0.5). Use a subdirectory if you need more files

Remember:

Having created your own Web pages and downloaded in the @CHIP you need to enter the IPC address followed by a blank and the name of the first page you want to open.

The FTP server.

FTP stand for File Transfer Protocol and has become a standard for transferring files over TCP-IP networks. All you need to transfer a file from or to the SC12 is a FTP client. Your Windows system has a FTP client that has a command line interface. This means that to connect to the SC12 and for every 'action' like transferring a file, you must enter a command. The FTP client is started from the command prompt by entering FTP as a command. A question mark '?' can be used to get a small menu. It is clear that a graphical user interface such as with the WS-FTP (refer to web links later in this document) is much more comfortable.

To connect to the FTP server, you need a user name and a password. For the SC12 you use 'ftp' as user name and also 'ftp' as password. These are default settings that can be changed at a later point of time.

We will integrate a graphical FTP client in the Chiptool software.

You may use a graphical FTP client like WS-FTP, the worlds most used FTP client.

You find it: <http://www.ipswitch.com/Products/index.html>

IP Networking

On an IP (Internet Protocol) network we use IP addresses to define the source and the destination of an information packet. An intelligent 'trick' of the IP address is that it not only identifies the device, it also tell us where to find the device in a large network. This is best explained by an example:

Suppose we have the address 192.168.200.1 and the network mask 255.255.255.0.

Let us look at these data in a 'binary' format:

Address	192.168.200.1	1100 0000. 1010 1000. 1100 1000. 0000 0001
Network mask	255.255.255.0	1111 1111. 1111 1111. 1111 1111. 0000 0000
Logic 'AND'	192.168.200.0	1100 0000. 1010 1000. 1100 1000. 0000 0000

The first 24 bits of the network mask are '1'. This means that the first 24 bits of the address identify the network. The last 8 bits (those that are '0' in the network mask) identify the device within this network. This would mean that in the given example, that we can give the devices in our network the addresses 192.168.200.0 through 192.168.200.255, thus allowing for 256 devices. This is almost correct, but not 100%. The lowest (here 192.168.200.0) and the highest address (here 192.168.200.255) are not to be used. Thus limiting us to 254 devices on this network. This we call a 'ClassC' network.

The highest address (here 192.168.200.255) has a special meaning: this is the address used for a broadcast to all devices on this section of the network. Any message send to this address is received by all devices.

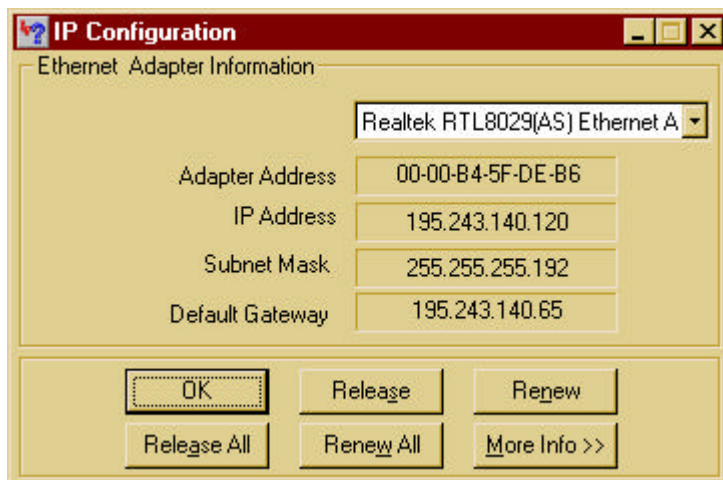
Any address that is not within the range of the current network, is passed to the gateway address (the router). A gatetway is a physical machine, hardwired into two or more physical networks. A gateway knows how to transfer a IP packet from one network to another.

You can find the network configuration of the network that you are connected to by starting the 'winipcfg' program. This program is not listed in the Windows start menu,

but can be started from the command line. Using WIN NT the program is called winipconfig. Here is an example output of winipcfg if no DHCP is used:



If DHCP is used, the output could look like this:



On a network, no two devices are allowed to have the same address. For this reason, only one person can tell you what IP address you are allowed to use: your network supervisor or administrator. Tell him where you want to connect your SC12 and ask for an IP address, network mask and optionally the gateway.

This is a short introduction and if you are looking for good material to read about TCP/IP, we suggest the following books:

1. "Internetworking with TCP/IP, Volume 1" by Douglas Comer

2. "TCP/IP Illustrated, Volume 1" by W. Richard Stevens

Where to find other information on the SC12 IPC@CHIP ?

Regularly check the contents of our internet pages at <http://www.beck-ipc.com/chip>
Here you will find application interfaces, tools, examples, new BIOS versions, etc,
etc.

Remember that the IPC@CHIP is a very young product. It makes sense to visit the
IPC@CHIP homepage often

Where to get support ?

We kindly ask you to use email as the main means of communication. This not only
reduces the time you spend on the phone, it also allows us to easily administer the
questions and identify problem area's. From the questions and the answers, we also
build a 'frequently asked question list' that will be published in the internet.

To get support: <mailto:atchip@beck-ipc.com>

Useful web links

Here is a list of some useful internet links:

- <http://hp.vector.co.jp/authors/VA002416/teraterm.html> Homepage for Tera Term Pro. A fine freeware terminal program for Windows 95/NT/CE
- <http://www.beck-ipc.com/chip> Our start page for all IPC@CHIP information.
- <http://www.ipswitch.com/Products/index.html> Here you can find a fine FTP client for Windows 95/NT that is fully graphical

Known problems

Here is a list of known problems and, if possible, their 'work arounds'

- The file system is case sensitive. Tip: configure your FTP tool to force remote file names in lowercase.
- If no http requests are made during a longer period of time (it is not known how long), the webserver will not respond to new http requests. Currently you can only solve this by restarting the system.
- If during a FTP transfer the flash disk is full, the Ethernet is blocked. The SC12 must be rebooted.

Fixed problems:

- Using a delete command with a wild card (such as del *.*) when in a subdirectory, will cause the system to keep trying to delete a not existing file. Only a reboot will stop this. Fixed with version 0.51.
- After changing the IP configuration of the SC12 using the Chiptool software, you must manually reset the device. Fixed with version 0.51.
- When changing the IP configuration of a SC12 using Chiptool, all SC12 devices on your network will accept the new network configuration if you enter a '0' as the serial number. Fixed with version 0.51.
- DHCP seems to fail if your DHCP server is a Windows NT server. DHCP works fine with Linux. Fixed with version 0.51.

End of this document.