

User's Manual

78K - Hopper

Embedded Web Server Technology Demonstration Using the 78K-Test it! Evaluation Board

Getting Started

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CE

78K - Test It! complies with the EMC protection requirements

CAUTION

This equipment should be handled like a CMOS semiconductor device. The user must take all precautions to avoid build-up of static electricity while working with this equipment. All test and measurement tool including the workbench must be grounded. The user/operator must be grounded using the wrist strap. The connectors and/or device pins should not be touched with bare hands.

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1. Introduction

1.1. Embedded Systems and the Internet

In recent years the Internet has become a more and more important instrument for communication. It is built on standard protocols defined over the last 30 years, so that now any computer can be connected to the World Wide Web.

Currently most computers with Internet access are PCs running large operating systems. Now, however, with the entry of embedded systems into the Internet world, there has become a definite requirement for solutions without the traditional overheads of PC connectivity.

1.2. Remote Access Applications

Internet connected embedded systems have become key to remote access applications. Up to now, remote access applications have been based on high-cost, inflexible proprietary solutions to provide

- the communications protocol between a remote location and the embedded system
- the embedded system software
- the graphical user interface at the remote location

If it were possible to use the standard TCP/IP and additional protocols used in the Internet, development costs for remote access solutions would be dramatically reduced:

- the communications protocols are standard: PPP, Ethernet, TCP/IP, UDP, HTTP, FTP, TFTP
- the graphical user interface is available on every PC without costs: a standard Internet Browser (e.g. Netscape Communicator[™] or Microsoft Internet Explorer[™]).

So it has become necessary to provide a communication software solution for microcontrollers which supports the protocols mentioned above.

1.3. Embedded Web Server

To fit these demands, a Web server has to become "Embedded". An Embedded Web Server works with minimal resource requirements, handles the protocols and provides the low-level functions required to access the hardware.

78K-Hopper has been developed as Internet-enabling technology for the NEC 78K0 family of 8-bit microcontrollers.

The product described in this documentation, uses the standard 78K-Test it! Evaluation Board to demonstrate the NEC 78K0 family as a platform for Embedded Web Server technology.

1.4. Main features of 78K – Test it!

- Easy to use device demonstration capabilities 78K – Test it! contains elements to easily demonstrate simple I/O-functions, i.e. push buttons, LED output, AD reference voltage, I/O lines, RS232 serial interface using CMX Micronet[™] TCP/IP Stack
- Battery powered
 78K Test it! is battery powered for portability reasons.
- Serial communication for PPP/SLIP connection to PC
 A Windows based Internet browser allows selection and control of application programs to 78K Test it! for evaluation purposes.
- Analogue to digital signal conversion is supported
- Various input / output signals available, such as
 - 12 I/O ports prepared to be connected to user hardware
 - Timer input / output signals
 - Two or three wire serial I/O
 - RS232 signals including RTS / CTS
 - 4 analogue input lines
 - 8 I/O ports connected to LED
 - 2 push buttons prepared for external interrupt generation
- 78K0/K0S C Compiler package, Windows Workbench and 78K0 System Simulator / Debugger are included. These packages are restricted in such that maximum program code size is limited to 4 KB of program code.
- Full documentation is included for the NEC µPD78F0066, C Compiler, Windows Workbench and 78K0 System Simulator
- Full Documentation for API calls to integrate embedded application examples included.

The 78K – Test It! Kit is ready to use. Please follow the installation instructions on the following pages.

78K – Test it! is not intended for code development. NEC does not allow and does not support in any way any attempt to use 78K – Test it! in a commercial or technical product.

1.5. System requirements

HOST PC	A PC supporting Windows NT or Windows 2000 is required for the IAR Workbench demo and NEC Simulator. Pentium 166 MHz (at least), 64 MB of RAM, 256-color display (1024 * 768), mouse, CD- ROM drive and 40 Mbytes of free hard disk space are required to install the tool packages. Above listed requirements are valid if the IAR Embedded Workbench or the NEC System Simulator shall be installed. The communication interface program does not need to be installed to the local hard disk. It can be started from the CDROM.
Host interface	Serial (RS232C) interface capable to handle communication at 38600 baud.
Note:	Updates to this User Manual, additional documentation and/or utilities for 78K – Test it, if

Note: Updates to this User Manual, additional documentation and/or utilities for 78K – Test it, if available, may be downloaded from the NEC WEB page(s) at www.ee.nec.de/78K, or www.ee.nec.de/inetcon..

2. Installation

2.1. Hardware

The 78K – Test It! Starter Kit hardware consists of 78K – Test It! Evaluation Board 3 x AA batteries Included RS 232 Serial Cable

The 78K module is plugged directly into PC via DB-9 RS232 serial connector to either COM 1, or COM 2.



For detailed information about the hardware please read the 78K – Test It! Demonstration Kit for the 78K Family. Chapter 3(78K – Test it! Components).

2.2. Software

For detailed information about the software installation please read the 78K – Test It! Demonstration Kit for the 78K Family, chapter 4 (78K – Test it! Installation and Operation).

2.3. Installing TCP/IP - PPP connection on Host PC

Make sure that Host PC is either Windows NT, 2000, or XP. (Windows 95/98 do not allow a PPP connection through a serial cable.)

2.3.1. Windows NT Installation

- 2.3.1.1. In Control Panel select Modems
- 2.3.1.2. Do not allow Windows to detect a MODEM. Select *Don't detect my modem. I will select it from the list.*



2.3.1.3. Within the *Modems Properties* Press *Add*

odems Properties	?
The following moderns an	e set up on this computer:
Modem	Attache
Add <u>H</u> emove	Properties
Dialing Preferences	
Dialing from: New Location	
Use Dialing Properties to modify dialed.	how your calls are
<u>D</u> ialing Pro	perties

2.3.1.4. From the list of MODEMs available choose *Dial-Up Networking Serial Cable between 2 PCs* and Press *Next*.

tanufacturers:	Models
(Standard Modem Types) (VoiceView Modem Types) 3X Aceex Acer Allyron	DiaLUp Networking Serial Cable between 2 PCs Standard 300 bps Modem Standard 1200 bps Modem Standard 2400 bps Modem Standard 9600 bps Modem Standard 1400 bps Modem Standard 1400 bps Modem
	Have Disk

2.3.1.5. Choose the COM port you wish to connect to the 78K – Test It! Evaluation board.

	Dial-Up Networking Serial Cable between 2 PCs
	On which ports do you want to install it?
	C <u>All ports</u>
	Selected ports
	COM1
*	COME
Ť.	

2.3.1.6. After you have set up your MODEM correctly you will find added to the *Modems Properties* window the *Dial-Up Networking Serial Cable between 2 PCs.* Select this option and press the *Properties* option.

ems Properties		?
eneral		
🕘 The follo	wing modems are set (up on this computer:
Modem		Attache
C Dial-Up Netwo	rking Serial Cable betv	ween 2 PCs COM1
	-	
•		•
<u>A</u> dd	<u>R</u> emove	Properties
Distan Destance		
- Vialing Preferenc	es	
Dialing from: N	lew Location	
Use Dialing Pro dialed.	perties to modify how	your calls are
	Dialing Propertie	s
-		-
	21	1

2.3.1.7. Under General, Maximum Speed select the 38400 BAUD rate required for the 78K – Test It! Evaluation board to operate at

al-Up Netu	vorking Serial Cable between 2 PCs Pr ?
ieneral Ci	onnection
2	Dial-Up Networking Serial Cable between 2 P
Port: C	OM1
<u>S</u> peake	volume
	w J High
- <u>M</u> aximu	m speed
Ī	38400
Г	Only connect at this speed
	OK Cancel

2.3.1.8. Under Connection tab set Data bits to 8, Parity to None and Stop bits to 1. These are the default settings for the 78K – Test It! Evaluation board. Flow control options must also be changed to operate the 78K – Test It! Evaluation board. To do this press Advanced to enter the Advanced Connection Settings.

ieneral	Conne	ction		1999 P.
Conne	ection p	references		
Dal	ta bits:	8	-	
Par	ity:	None	.	
<u>S</u> to	p bits:	1	-	
	<u>C</u> ance Discor	the call if not connect nect a call if idle for m	ited within [secs mins
1			Ady	anced

2.3.1.9. Under Advanced Connection Settings de-select Use flow control NO flow control is enabled on the 78K – Test It! evaluation board.

iodulation type-	uired to connect C H. press data C So cellular protocol	ardware (RTS/CTS) oftware (XON/XOFF)
	m type	Y
	ings	
Rec <u>o</u> rd a log file	ord a log file	

- 2.3.1.10 Modem Setup If Dial-up Networking has not been installed on you version of NT you ?) Dial-up Networking needs to be configured because the list of installed modems has changed. Would you like to do this now? will need to add this via Programs -Accessories - Dial-Up Networking. Yes No The dialog box for *Modem Setup* may not appear. Once the MODEM setup has been completed NT will need to configure Dial-Up Networking to use the added installed modem option. Press Yes to proceed. 2.3.1.11. Once you have selected Yes to proceed and the following Remote **Network Configuration** × Access Setup box appears. Press Dial out Protocols: the Configure button select Dial out 0K only option. Press the Network button □ NetBEU Cancel to select the Dial out Protocols to be ICP/IP TCP/IP. After this has been Help completed press Continue. Remote Access Setup × Port Device Туре COM1 Dial-Up Networking Serial Ca... Modem (unimoder Continue Cancel Network. Configure Port Usage X Help COM1 Port ÖK <u>R</u>emove Configure. Clone Device: Dial-Up Networking Serial Cable between 2 Add.. Cancel Port Usage <u>H</u>elp Dial out only C $\underline{\mathbf{R}}$ eceive calls only C Dial out and Receive calls
- 2.3.1.12. After completion it will be nessesary to restart your computer for the new network settings to take effect.

	You must shut down and restart your computer before the new settings will take effect.
<u>.</u>	Do you want to restart your computer now?

2.3.1.13. Once your PC has been restarted. Go to *Dial-Up Networking* Press *New* to set up a new connection to the 78K – Test It! evaluation board.

	MyDialUpServer		5
		<u>N</u> ew	<u>M</u> ore ▼
*	Phone number pr	e <u>v</u> iew:	
₩ 1			
۱	Dialing from:		1
	Dialing fr <u>o</u> m:		

- 2.3.1.14. Once New has been pressed you will need to give the dial-up networking connection a name to add to the phonebook. This can be any name but for the example type in: Test It into the Name the new phonebook entry:. After the name has been entered press Next
- New Phonebook Entry Wizard
 Image: Comparison of the sector of the se
- 2.3.1.15. Make sure that none of the boxes below are checked. Then select *Next*.

Check all that apply:
Send my plain text password if that's the only way to connect.
 The non-windows NT server 1 am calling expects me to type login information after connecting, or to know TCP/IP addresses before dialing.

2.3.1.16. Since this is a direct PPP connection to the 78K – Test It! evaluation board. Make sure that a phone number is NOT entered below. Press *Next* to continue.

El Ca au re nu	nter the phone number of the dial-up server you are alling. Alternate phone numbers, if any, are dialed utomatically if the primary phone number cannot be sached. They may also be used to set different umbers on individual multi-linked ISDN lines.	
Ť Ť	hone number: Alternates	
- 🍣	Use Telephony dialing properties	

2.3.1.17. Dial-Up Networking setup is now completed. Press *Finish* to continue.

lew Phonebook Entry	Wizard	×
	That's it.	
	Press Finish to save 'Test It'.	
Ť		
1		
2		
	< <u>B</u> ack Finish C	Cancel

2.3.1.18. Now you have the new *Test It* option under the *Phonebook entry to dial* Press *More* to setup IP addresses for the 78K - Test It! evaluation board. Under the *More* drop down menu select *Edit entry and modem properties...*

🖏 Dial-Up Networking	? 🗙
	Phonebook entry to dial:
	Testit
	<u>N</u> ew <u>M</u> ore ▼
*	Phone number pre <u>v</u> iew:
▶ 1	
	Dialing fr <u>o</u> m:
	New Location
	Location
	Dial Close
	Edit entry and modem properties
	Clone entry and modern properties
	Delete entry
	Create shortcut to entry
	Monjtor status
	Operator assisted or manual dialing
	User preferences
	Lugun preierendes
	Help

2.3.1.19. Make sure that Under the Basic tab the Entry name: Test It is set up for Dial using: Dial-Up Networking Serial Cable between to PCs

Basic	Server	Script	Security	×.25
Intry name:	Test It			
Co <u>m</u> ment:				
Phone <u>n</u> umber:				<u>A</u> lternates
	Use Tel	ephony dialing	properties	
Dial using:	Dial-Up Ne	tworking Seria	I Cable be 💌	<u>C</u> onfigure
	✓ Use and	ther port if bu:	şγ	

2.3.1.20. Under the *Server* tab make sure that the following options are selected. Next Press the *TCP/IP Settings* button.

Basic	Server	Script	Security	X.25
ial-up <u>s</u> erve	er type:			_
PP: Wind	ows NT, Windov	ws 95 Plus, Inter	net	-
Network p	rotocols			
	'IP	T <u>C</u> P/IF	Settings	
	SPX compatible			
<u>∏</u> <u>N</u> etB	EUI			
<u>E</u> nable s	oftware compre	ssion		
Enable F	PPP <u>L</u> CP extensi	ions		
			<u>a</u>	336

2.3.1.21. You MUST specify an IP address for you PC. This is reffered to as the destination address by the 78K – Test It! evaluation board. For the evaluation the *IP address* is specified as: 192.6.94.5. *Use default gateway on remote network* must also be deselected. Press *OK* once PPP TCP/IP Settings have been configured.

P address:	192 6 94 5
<u>_</u>	1 102 . 0 . 01 . 0
· · ·	, L
Server assigned har	ne server addresses
Specity name server	addresses
'mmary LINIS:	0.0.0.0
iecondary D <u>N</u> S:	0.0.0.0
rimary. <u>₩</u> INS:	0.0.0
econdary WINS:	0.0.0.0
ise IP header compre	ession

2.3.1.22. Under the *Script* tab *After dialing* (*login*) must be selected to be *None*

Basic	Server	Script	Security	X.25
After dialing	; (login)			
• None				
O Pop u	p a <u>t</u> erminal wind	wob		
C Bun t	nis <u>s</u> cript:			
(none	1			-
		<u>E</u> dit scrip	t Befrea	h list
			<u>B</u> efore of	lialing

2.3.1.23. Under the Security tab Authentication and encryption policy must be set to Accept an authentication including clear text. Once completed press OK. Dial-Up networking has now been set up. Press Close to exit Dial-Up Networking.

Basic	Server	Script	Security	X.25
Authentica	ition and encrypt	ion policy		
 Accept 	ot any authentica	ition including <u>c</u>	lear text	
C Accep	t only <u>e</u> ncrypted	authentication		
C Accep	t only <u>Microsoft</u>	encrypted auth	entication	
Г	Bequire data en	cruption		
Ē	Use current use	name and pass	word	
				10
	password			
Unsave	Contraction of the second second			
Unsave				
Unsave				
Unsave				

2.3.2. Windows 2000 Installation

2.3.2.1. In *Control Panel* select *Modem*. Select *Add* from the modem propertis dialog box

Phone And Modem Options	? ×
Dialing Rules Modems Advanced	
The following modems are installed:	
Modem Attached To	
Standard 56000 bps V90 Modem COM1	
Add <u>Bemove</u> Propert	ies
OK Cancel As	oply

2.3.2.2. Do not allow Windows to detect a MODEM. Select Don't detect my modem. I will select it from the list.

Add/Remove Hardware Wiz	ard
Install New Modem Do you want Windows to	o detect your modem?
	 Windows will now try to detect your modern. Before continuing, you should: 1. If the modern is attached to your computer, make sure it is turned on. 2. Quit any programs that may be using the modern. Click Next when you are ready to continue. Ir [Don't detect my modern; I will select it from a list.]
	< <u>B</u> ack <u>N</u> ext > Cancel

2.3.2.3. Select Communications cable between two computers and press Next

Add/Remove Hardware Wizard
Install New Modem
Select the manufacturer and model of your modern. If your modern is not listed, or if you have an installation disk, click Have Disk.
Manufacturers: Modejs: [Standard Modem Types] Image: Communications cable between two computers 3Com Standard 300 bps Modem 3K Standard 2400 bps Modem Aceex Standard 2400 bps Modem Acer Standard 2400 bps Modem Standard 1200 bps Modem Standard 1400 bps Modem Standard 1400 bps Modem Standard 1400 bps Modem Standard 1900 bps Modem Image: Computer Standard 1900 bps Modem
< <u>B</u> ack <u>N</u> ext> Cancel

2.3.2.4. Select required communications port and press *Next*

Add/Remove Hardware Wi	zard
Install New Modem Select the port(s) you w	want to install the modem on.
	You have selected the following modem: Communications cable between two computers On which ports do you want to install it? All ports Selected ports COM1 COM2
	< <u>B</u> ack <u>N</u> ext> Cancel

2.3.2.5. Press *Finish* to complete this stage



2.3.2.6. From Control Panel lauch Network and Dial-up connections and select Make New Connection



2.3.2.7. Select *Next* to launch the wizard



2.3.2.8. Select Connect directly to another computer and press Next

etwork Connection Wizard		
Network Connection Type You can choose the type of network connection you want to create, based on your network configuration and your networking needs.		
 Dial-up to private network Connect using my phone line (modem or ISDN). Dial-up to the Internet Connect to the Internet using my phone line (modem or ISDN). Connect to a private network through the Internet Create a Virtual Private Network (VPN) connection or 'tunnef' through the Internet. 		
 Accept incoming connections Let other computers connect to mine by phone line, the Internet, or direct cable. Connect directly to another computer Connect using my serial, parallel, or infrared port. 		
<u> < B</u> ack. <u>N</u> ext > Cancel		

2.3.2.9. Select *Guest* and press *Next*

Network Connection Wizard
Host or Guest To connect two computers, specify which one you are using.
Choose the role you want for this computer: Thost This computer has the information you want to access. Conjuent This computer will be used to access information on the host computer.
< <u>B</u> ack <u>N</u> ext> Cancel

2.3.2.10. Select the device as Communications cable between two computers and press Next



2.3.2.11. Select required option and press *Next*

Network Connection Wizard		
Connection Availability You may make the new connection available to all users, or just yourself.		
You may make this connection available to all users, or keep it only for your own use. A connection stored in your profile will not be available unless you are logged on.		
Create this connection: Eor all users Duly for myself		
< <u>B</u> ack <u>N</u> ext > Cancel		

- 2.3.2.12. Enter connection name and press *Finish*
- 2.3.2.13.



Blank out the User name field and then press Properties

Connect Test-I	t	<u>?</u> ×
		Y
<u>U</u> ser name:		
<u>P</u> assword:		
	Save Password	
<u>C</u> onnect	Cancel Properties	Help

2.3.2.14. Select *Configure* from the dialog box

Test-It ? X
General Options Security Networking Sharing
Select a device:
Communications cable between two computers (COM2)
Configure
Show icon in taskbar when connected
OK Cancel

2.3.2.15. Select 38400 as the speed setting and leave all other check boxes clear. Press *OK*.

Modem Configuration		? ×
Communications cab	le between two computers (COM2)	
<u>M</u> aximum speed (bps):	38400	•
Modern protocol		7
Hardware features Enable hardware flow co Enable modem error con Enable modem compres Initialization Show terminal window	ontro(trol sion	
🗖 <u>B</u> un script:		-
	Edit Browse,	
Enable mo <u>d</u> em speaker		
	OK Car	icel

2.3.2.16. Select *Networking* and clear all of the check boxes *except Internet Protocol* (*TCPIP*). Then press *Properties*.

fest-It		<u>? ×</u>	
General Options Sec	curity Networking Sh	aring	
Typ <u>e</u> of dial-up server I am calling:			
PPP: Windows 95/98	/NT4/2000, Internet	•	
		<u>S</u> ettings	
Components checked	are used by this connec	tion:	
Internet Protoc	ol (TCP/IP)		
File and Printer Sharing for Microsoft Networks GPnet VPN ECient for Microsoft Networks			
Install	<u>U</u> ninstall	Properties	
Description			
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.			
wide area network p across diverse interc	protocol that provides co connected networks.	mmunication	
wide area network p across diverse inter	connected networks.	mmunication	

2.3.2.17. Select Use the following IP address automatically and enter the following number 192.6.94.5 and select Advanced

iternet Protocol (TCP/IP) Properties			
General			
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.			
O Detain an IP address automatically			
✓● Use the following IP address:			
IP address: 192 . 6 . 94 . 5			
O Ligtain DNS server address automatically O Ligtain DNS server addresses: Preferred DNS server: Alternate DNS server:			
Advanced			
OK Car	ncel		

2.3.2.18. Clear the check boxes and then press *OK*

Advanced	TCP/IP Settings	<u>? ×</u>
General	DNS WINS Options	
This che network that can network	eckbox only applies when you are connected to a local and a dial-up network simultaneously. When checked, data not be sent on the local network is forwarded to the dial-up default gateway on remote network	
- PPP li	nk J <u>s</u> e IP header compression	
	ОК С	ancel

2.3.2.19. Select Yes when the following dialog appears

Microsoft	: TCP/IP
•	This connection has an empty primary WINS address. Do you want to continue?
	Yes No

2.3.2.20. Keep pressing *OK* until the following dialog appears. Press *Cancel* this will create a dial-up icon for Test-it in the Networking program group.

Connect Test-I	It	? ×
	1.000	く そ
<u>U</u> ser name:		
Password:		
	Save Password	
<u>C</u> onnect	Cancel Properties <u>H</u> e	lp

2.4. Setting up Web Browser to Connect to 78K – Test It! evaluation board.

2.4.1. Windows Explorer

2.4.1.1. Within Windows Explorer select the *Tools* drop down menu and select *Internet Options*.



2.4.1.2. Select the *Connections* Tab. Highlight the Test It *Dial-Up Settings*. Select *Always dial my default connection*. Then press *Set Default*. Then press *OK*. This will set the PPP connection to the 78K – Test It! evaluation board. It can be changed back to your origial settings for access to the normal internet.

nternet Options	? ×
General Security Content Connections Programs	Advanced
Use the Internet Connection Wizard to connect your computer to the Internet.	Setup
Dial-up settings	
MyDialUpServer (Default)	Add
	<u>R</u> emove
	<u>S</u> ettings
C Never dial a <u>c</u> onnection	
C Dial whenever a network connection is not press	ent
Always dial my default connection	
Current default: MyDialUpServer	S <u>e</u> t Default
Local Area Network (LAN) settings	
	LAN Settings
	1

2.4.1.3. Type in the following at the address line within Windows Explorer: http://192.6.94.2. The following *Dial-Up Connection* window will apear. A user name and password are not required just press the *Connect* button. The PC will start *Dialling attempt 1* within a few seconds the message will appear *Connected to remote computer Verifying user name and password...*

Dial-up Conne	ction	×
Selec to, an passw	t the service you (d then enter your vord.	want to connect user name and
Connect to:	Test It	•
<u>U</u> ser name:		
Password:		
	Save passwo Connect auto	ord matically
<u>C</u> onnect	Se <u>t</u> tings	Work Offline
1		

2.4.1.4. You should now be connected to the 78K – Test It! evaluation board and the following first page will be displayed.

🗿 CMX MicroNet Demo - Microsoft Internet Explorer 📃 🗗 🗙		
Eile Edit View Favorites Iools Help		
부 · · · · · · · · · · · · · · · · · · ·		
Address 😰 http://192.6.94.2		
Plug your application into the Internet.		
This page is coming from CMX-MicroNet.		
CMX-MicroNet can do more than just display HTML pages. Forms can be used to send data to the web server where the data can then be acted upon by user-defined functions.		
Welcome to NEC		
Submit		
The buttons below don't do anything. They are here to show that multiple graphics files can be included in web pages.		
Home About CMX Benchmarks Press Releases E-mail US		
Go to Page 2 Copyright © CMX Systems, Inc. 2001 All rights reserved		
🖉 CMX-MicroNet Demo		