

User's Manual

K_Line - Connect it

Embedded Web Server Technology Demonstration Using the K_Line - Connect it! Evaluation Board

Getting Started

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CE

K_Line – Connect 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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Revision History

Date	Revision	Chapter	Description
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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 was 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 support 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.

K_Line – Connect it has been developed as Internet-enabling technology for the NEC 78K0 & V850 families of the 8- and 32-bit microcontrollers respectively.

The product described in this documentation, uses the standard "K_Line - Connect it" evaluation Board to demonstrate the NEC 78K0 family as a platform for Embedded Web Server technology.

1.4. Main features of K_Line - Connect it

- Easy to use device demonstration capabilities
 K_Line Connect 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
 K_Line Connect 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
 - o 4 analogue input lines
 - 8 I/O ports connected to LED
 - o 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 μPD78F0148 and μPD70F3210, C Compilers, Windows Workbench and 78K0 System Simulator
- Full Documentation for API calls to integrate embedded application examples included.

The K_Line - Connect it Kit is ready to use. Please follow the installation instructions on the following pages.

K_Line - Connect it is not intended for code development. NEC does not allow and does not support in any way any attempt to use *K_Line - Connect it* in a commercial or technical product.

1.5. System requirements

HOST PC	A PC supporting Windows NT or Windows 2000/XP 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 *K_Line Connect It,* if available, may be downloaded from the NEC WEB page(s) at http://www.nec.de/micro, or <u>www.nec.de/inetcon</u>.

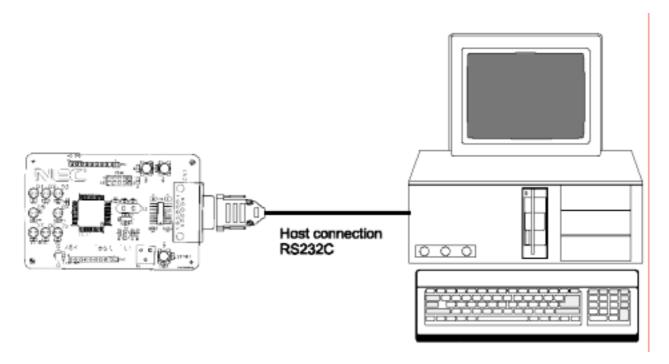
2. Installation

2.1. Hardware

The K_Line - Connect it Starter Kit hardware consists of

- K_Line Connect it Evaluation Board
- 3 x AA batteries Included
- RS 232 Serial Cable

The K_Line 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 K_Line - Connect it Demonstration Kit for the 78K Family. Chapter $3(K_Line - Connect it \text{ Components})$.

2.2. Software

For detailed information about the software installation please read the K_Line - Connect it Demonstration Kit for the 78K and V850 Families. Chapter 4 (*K_Line - Connect it* installation and operation).

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

NOTE: 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."

Install New Modem	X
	Windows NT will now tay 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. If
	<34% Next> Cancel

2.3.1.3. Within the Modems Properties Press Add

Iodems Properties	2 ×
General	
The following moderns are set up on this cor	ipule:
Modern	Attache
	- 11
x	1
Add Berrow Bree	\$137
Dialing Preferences	
Dialing from: New Location	
Use Dialing Properties to modily how your calls are dialed.	
Qialing Properties	
Date	Ganod

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

Click the manufacturer	and model of your modern. If your modern is not listed.
Manufachurers: [Standard Modern Types] (Voice/lev Modern Types] 34 Acces A	Iation disk, click Have Disk. Models Example Control Cable Determined PECE Standard 300 bps Modern Standard 1200 bps Modern Standard 3600 bps Modern Standard 14400 bps Modern Standard 1400 bps Modern Standard 1400 bps Modern Standard 1900 bns Modern Standard 1900 bns Modern Standard 1900 bns Modern
	(gack Med) Cancel

2.3.1.5. Choose the COM port you wish to connect to the K_Line - Connect it Evaluation board.

Install New Modem	×
-	You have selected the following moders
	Dial-Up Networking Serial Cable between 2 PCs
R.	On which ports do you went to install it?
	C All ports
	Selected ports
e 🖉 🖉 🖉	
	COM1 COM2
16	
	<back next=""> Cancel</back>
	- Tour Theory

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.

odems Properties	1	2 2
General		
The Isla	owing moderns are set up on thi	is computer:
Modem		Attache
Ciel-Up Netw	orking Serial Cable between 2 F	PC: COM1
1		!
ådd	<u>Remove</u>	operties
Dialing Preferen	ces	
Dialing from:	New Location	
Use Dialing Pr dialed.	operties to modily how your call	is are
	Dialing Properties	
	Cicce	Genesi

2.3.1.7. Under *General, Maximum Speed* select the 38400 BAUD rate required for the K_Line - Connect it Evaluation board to operate at.

ial-Up Networking Serial Cable between 2 PCz Pr 😰
General Connection
🖏 Diał-Up Networking Serial Cable between 2 P
Pat COM1
Speskervalure
Low J High
Maximum speed
38400
Caly convect 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 K_Line - Connect it Evaluation board.

Flow control options must also be changed to operate the K_Line -Connect it Evaluation board. To do this press Advanced to enter the Advanced Connection Settings.

Dial-Up Networking Serial Cable between 2 PCs Pr	2 ×
General Connection	
Connection preferences	
Data bits. 8	
Barity: None	
Stop bits: 1	
Call preferences	
E <u>w</u> at for dial tone before dising	
E Censel the call it not connected within 📃 secs	
Disconnectie cellifide for more than in mins	
Advanced	
DK. Cance	1

2.3.1.9. Under Advanced Connection Settings de-select Use flow control NO flow control is enabled on the K_Line - Connect it evaluation board.

Designer central Designer central Designer central Designer central Designer central	C Deriver MONACHT
Modifision (gen	
Egtra settings	
Recgrd a log Ne	OK Cancel

2.3.1.10. If *Dial-up Networking* has not been installed on you version of NT you will need to add this via *Programs* – *Accessories* – *Dial-Up Networking*. 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.

?	Dial up Networking needs to be configured because the fot of installed readens has changed. Would you like to do the new?

2.3.1.11. Once you have selected Yes to proceed and the following <i>Remote Access Setup</i> box appears. Press the <i>Configure</i> button select <i>Dial out only</i> option. Press the <i>Network</i> button to select the <i>Dial out Protocols</i> to be <i>TCP/IP</i> . After this has been completed press <i>Continue</i> .	Network Configuration X Dial out Protocols: OK □ NetBEU! Cancel ☑ ICP/IP Help □ IPX Help
Port Device Type	*
COM1 Dia/Up Networking Serial Ca. Modern (unincodern) Continue	
Cancel <u>Network.</u> Hele	
Add. Benove Configure Qove	
	Configure Port Usage
	Port COM1 OK
	Device: Dial-Up Networking Serial Cable between 2 Cancel
	Port Usage Dial gut only Beceive calls only Dial out and Receive calls

2.3.1.12. After completion it will be necessary 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. Do you want to restart your computer now?
Yez No

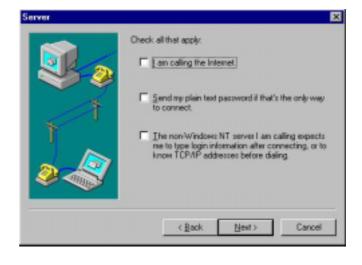
2.3.1.13. Once your PC has been restarted. Go to *Dial-Up Networking* Press *New* to set up a new connection to the K_Line -Connect it evaluation board.

Dial-Up Networking	Phonebook entry to d	iał	? ×
3.	MyDialUpServer	<u>N</u> ew	
1	Phone number preyle Dialing figure New Location	PE	_
2	[rew cocator)	Dial	Location

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*

20	Dial-Up Networking connects you to remote networks using your modern, ISDN, or other WAN adapter. This excard helps you create a phonebook entry that stores the settings needed to connect to a particular remote network.
*	Name the new phonebook grity: Connect it
	I grow all about phonebook entries and would rather edit the properties directly

2.3.1.15. Make sure that none of the boxes below are checked. Then select *Next*.



2.3.1.16. Since this is a direct PPP connection to the K_Line - Connect it evaluation board. Make sure that a phone number is NOT entered below. Press *Next* to continue.



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

New Phonebook Entry \	Wizard 🛛
	That's R. Press Finish to save 'Test It'.
	<gack cancel<="" finish="" td=""></gack>

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 K_Line - Connect it evaluation board. Under the *More* drop down menu select *Edit entry and modem properties...*

	Phonebook entry to diat
X 3	New. More +
1	Phone number pregieve
¥ '	
1 2	Dialing light
a 10	NewLocation
*	"acetion…
	Dial Dore

Edit entry a	ind modern properties
Clone entry	and modern properties.
Delete entr	у
Create ghor	rtout to entry
Monitor sta	hut
Operator as	ssisted or manual dialing
User prejer	ences
Logon prefi	etences
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
Entry name:	Connect it			
Cogment:				
Phone gumber.			_	Alternates
	∏ Use To	slephony dialing	properties	
Dial using:	Dial-Up N	etworking Serie	i Cable be 💌	<u>C</u> onligue
	I⊽ Uge an	other port if bu	a.	

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

dit Phonebook Entry					2 🗵
Basic Server	Script	Security	1	X.25	٦,
Dialup perver type:					
PPP: Windows NT, Windows 9	5 Plus, Inte	net			
- Network protocols					
₽ ICP/IP	TCP/IP	Settings			
F JPX/SPX.compatible			-		
MetBEUI					
Enable software compression					
Enable PPP LCP extensions					
		OK.		Cancel	

2.3.1.21. You MUST specify an IP address for you PC. This is referred to as the destination address by the K_Line -Connect 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.

Specily an I <u>P</u> addre P gddress:	192.6.94.5
Server assigned na	me server addresses
Specily name serve	r addresses
Ainey <u>D</u> NS:	0.0.0.0
Seconday O <u>N</u> S:	0.0.0.0
Binop <u>is</u> (NS:	0.0.0.0
	0.0.0.0

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

Edit Phonebook Entry			? ×
Basic Server	Script	Security	X25]
Atter dialing login			
(None			
C Pop up a terminal wind	law		
C Bun this goript			
Inone			×
	Edit sorig	pt Behes	hlist
		Before d	iolng
		OK I	Cancel

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.

Edit Phoneboo	ik Entry			2 ×			
Basic	Server	Script	Security	X.25			
Automical	ion and encamb	an police					
	Authentication and encryption policy Accept any authentication including plear text						
	only gracypted						
	only Microsoft e		nication				
E	lessire gista ero						
E)							
	browned			_			
			OK	Cancel			

2.3.2. Windows 2000/XP Installation

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



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.*

Do you want Windo	est to defect your modern?
	Windows will now by its defect your modern. Datase conference, you should 1. If the modern is obtained to your computer, have a set if a turned on. 2. Built any poop and that may be using modern. Club. Next release you are ready to continue. (I will arbitrat my modern, I will arbitrat have a bet)
	clack Bet : Caroli

2.3.2.3. Select Communications cable between two computers and press Next

Install New Hodem		1
Select the manufactur force on including di	ee and model of your modern. If your modern is sk, click Maxim Disk.	net lided, as it pos-
and achiever.	Nobile	
Thandard Modern Typeri Con 34 Access Access	Bonnen Bioge Biol Index and 200 E Sandard 200 bps Moden Sandard 200 bps Moden Sandard 2400 bps Moden Sandard 2400 bps Moden	ogi.Ant
· ·	Sandard 14400 ber Modern Gandard 1970 ber Modern	Have Disk.
		Dava proces

2.3.2.4. Select required communications port and press *Next*

2	You have selected the following nucleus Communications cable between two computers	Ē
	On which parts do you want to initial #?	
	C Al parts C Selected parts	
	COM1 BOIL28	

2.3.2.5. Press *Finish* to complete this stage



2.3.2.6. From Control Panel launch 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

Dial-up to grivate network Connect using my phone line (inciden or ISDN). Dial-up to the Internet Connect to the Internet Connect to the Internet using my phone line (inciden or ISDN). Connect to a prigotiv network through the Internet Deale a Virtual Private Nativark (VPN) connections or turned through the Internet. Concept Incoming connections Let other compacts or one of to phone line, the Internet, or direct code.	S.
Connect to the Internet using nu phone line (Inciden or SDN). Connect to a prigate network through the Internet Deate a Visual Private Nativark (VPN) connection is "served through the Internet. C Accept Incoming connections	
Deale a Virual Private Nativa's (VPN) correction in "served through the Internet.	
	6.1
Ennect deactly to another computer Derest using my small, pendid, or infused port.	

2.3.2.9. Select Guest and press Next



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



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 키지
User name:	J
Password	
	Save Password
Connect	Cancel Properties Help

2.3.2.14. Select Configure from the dialog box

Test-Dt		<u>? x</u>
General Options Security Netwo	sking Sharing	
Select a device:		
Connunications cable between two	o computers (DC	M2)
		Configure
_		
Show icon in taskbar when connected		
	OK	Carcel

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



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

- 2.3.2.17. Select Use the following IP address automatically and enter the following number 192.6.94.5 and select Advanced
- Test-It <u> 1 x</u> General Options Security Networking Sharing Type of dial-up cerver I an calling: PPP: Windows 95/98/NT4/2000, Internet ٠ Settings Components checked are used by this connection: Tritemet Protocol (TCP/IP) File and Printer Sharing for Microsoft Networks
 FIF PGPnet VPN
 Sient for Microsoft Networks Uninctal Install. Properties Description Transmission Control Protocol/Internet Protocol. The default vide area network protocol flat provides communication across diverse interconnected networks. 0K Cancel
- Internet Protocol (TCP/3P) Properties 75 10 Germal You can get P settings assigned automatically if your retries suggests the capability. Otherwise, you need to ask your retri-activishments for the appropriate P settings. Dittor as P address extendeday (F) Up the following IP address: 192 6 . 54 |P addent -C. Himmittel annual at him a training F Urg the tollowing DNS server within Endered DMS server Alternate DNS server Adjanced. D Eres
- 2.3.2.18. Clear the check boxes and then press *OK*

dvanced TOP/IP Settings	YIX
General DNS WINS Options	- 30
This check bei only applies when you are connected to a local retricol, and a darks network similareously. When checked, data that cannot be sent on the local retricols is lowaded to the darks retricols.	
Use default gateway on sendle network.	
PPP ba	11
I Uje P teader compression	
OK C	ancei -

2.3.2.19. Select Yes when the following dialog appears



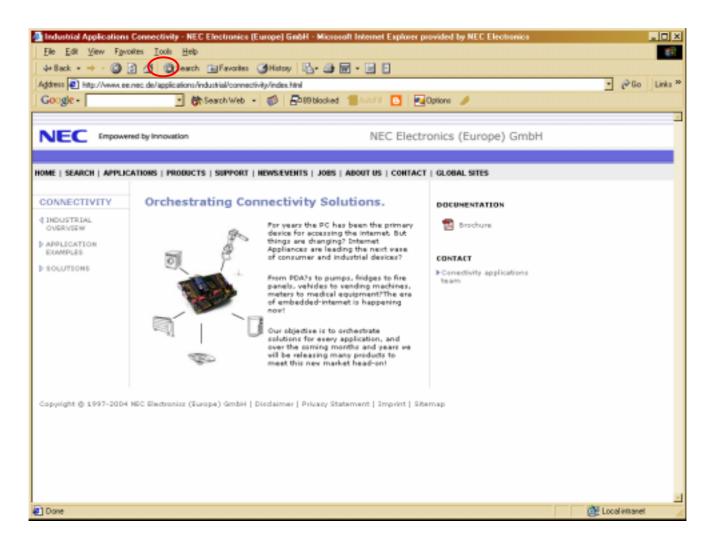
2.3.2.20. Keep pressing *OK* until the following dialog appears. Press *Cancel* this will create a dial-up icon for Test-it in the Networking program group.

Connect Test-I	
User name:	
Password:	
	Save Password
Connect	Cancel Properties Help

2.4. Setting up Web Browser to Connect to K_Line - Connect 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.



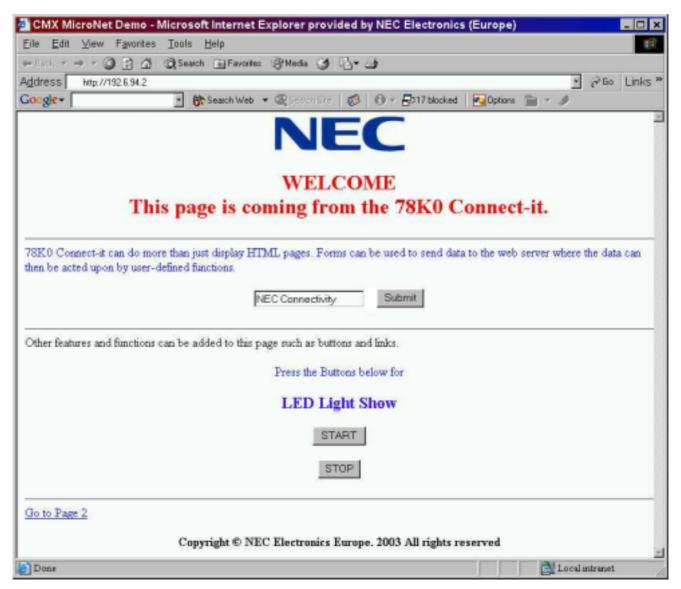
2.4.1.2. Select the *Connections* Tab. Highlight the Test It *Dial-Up Settings*. Select *Always dial my default connection*. Then press *Set Default*. Then press *OK*. This will set the PPP connection to the K_Line - Connect it evaluation board. It can be changed back to your original settings for access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

met Options	
annual Security Contest Connections Program	Atveces
Use the Internet Connection Wissel to connect pace computer to the Internet	Sega.
Disfugratings	
MoleUpSever Dela.40	Add.
A DESCRIPTION OF THE OWNER OWNER OF THE OWNER OWNER OF THE OWNER	Bettove
	Service
Nover dal a gomection Dal ghenever a network convection is not per Always dal na default convection Convert default: MyDialLIpGeven	SgtDefault
Local Area Network (LAN) settings	UMI Settings.

2.4.1.3. Type in the following at the address line within Windows Explorer. <u>http://192.6.94.2</u>. The following *Dial-Up Connection* window will appear. 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	×
	t the service you want to con d then enter your user name a vord.	
Connect to:	Connect it	•
<u>U</u> ser name:	[
Password:		
	Save password	
	Connect automatically	
Connect	Settings Work <u>O</u> f	fline
	W M	_
al la l		

2.4.1.4. You should now be connected to the K_Line - Connect it evaluation board and the following first page will be displayed.



2.4.1.5. After evaluation of this demonstration kit, it is possible to develop your application by customisation of this software.

This software is purchasable in modules as shown below:

Description	Part Number
- Basic TCP/IP Stack	NEC-CMX-MNT
- Embedded Web Server Module	NEC-CMX-EWS
- Ethernet Module	NEC-CMX-ETH
- PPP Module	NEC-CMX-PPP
- FTP Module	NEC-CMX-FTP
- SMTP Module	NEC-CMX-SMTP
- DHCP Module	NEC-CMX-DHCP
- TFTP Module	NEC-CMX-TFTP

Please contact your nearest NEC Electronics (Europe) GmbH sale representative for further detail