User Manual

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Gesytec

This manual …

… provides you with all the information which you will require to use the Easylon® USB Interface.

However, this manual will neither explain aspects of Echelon's® LONWORKS® technology, nor Echelon's Microprocessor Interface Program (MIP), nor Echelon's Network Service Interface (NSI) used on this network interface card nor details concerning the Easylon® USB Interface network driver, which has been designed in accordance with the driver specifications of the Echelon Corporation. For further information on the LONWORKS technology please refer to the extensive documentation provided by Echelon.

After a general presentation of the Easylon® USB Interface in Chapter 1, Chapter 2 describes the necessary steps to install the module.

Chapter 3 gives the technical specifications of the device and Chapter 4 provides Programming Instruction for operation under Windows CE. Some tips and tricks for operation can be found in Chapter 5.

Contents

1 Product Information

This manual describes the Easylon USB Interface

Figure 1-1 Easylon USB Interface

1.1 Variants

The following variants of the Easylon USB Interface are currently available and are described in this documentation. Each variant is identifiable by a type code sticker on the rear of the module.

Order Code	Network Interface Type	Neuron Firmware
P.P10304	FTT-10	MIP/P50
P.P10314	FTT-10	NSI

Table 1-1 Variants, order-codes and type identifiers for Easylon USB Interface cards

Figure 1-2 Type code sticker

1.2 Scope of Delivery

- Easylon USB Interface module with either Echelon‘s MIP/P50 or NSI firmware
- USB cable
- Installation and documentation CD with
  - network drivers[1] for 32 bit and 64 bit versions of Windows XP, Vista, 7, 8, Server 2003, Server 2008, Server 2008 R2, Windows CE.
  - Easylon RNI Software for remote LonWorks access
  - EasyCheck utility for Easylon Interfaces
  - WLDV32.DLL
  - Documentation in Adobe Acrobat .PDF format

1.3 Overview

The Easylon USB Interface is a link between a personal computer with USB port and the LONWORKS control network. The interface module is designed for free topology LONWORKS networks and fitted with a FTT-10A transceiver. It can be used in Link Power networks as well. The driver for the Easylon USB Interface is compliant with Echelon’s driver interface. All LNS based applications like LonMaker for Windows can use the Easylon USB Interface without any problems. Applications using the driver interface directly can use the Interface too. The driver supports up to 127 USB devices. The Easylon USB Interface is compatible with the Easylon OPC Server and the Gesytec’s WLDV32.DLL.

The Easylon USB Interface is a so called full speed device, compliant with the USB 1.1 standard. Communication speed to the PC is 12 Mbps. The communica-

[1] A Linux driver is available in source code on demand

tion between the neuron chip and USB is handled by a micro controller. The firmware for this micro controller is downloaded automatically, when the Easylon USB Interface is connected to the PC. Because the USB can not guarantee a supply voltage of 5 volts, the Easylon USB Interface internally generates the 5 Volt supply for the Neuron Chip and the LONWORKS transceiver from the power, supplied via USB. So the device works more stable, because it is independent from voltage drops, especially in complex USB topologies.

LON side

The Easylon USB Interface is provided with a service button and LED. The module provides two connectors, either of which can be used:

- RJ-45 socket
- 3 pin screw-plug terminal

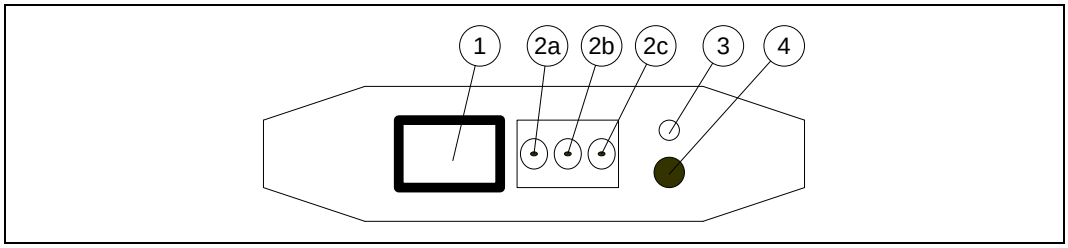


Figure 1-3 LON side connectors and LEDs

(1) RJ-45 (pin 1 and 2: network)
(2) screw-plug terminal
(2a) shield, (2b) and (2c) LON
(3) Service LED (yellow)
(4) Service button

Service LED

The service LED (Figure 1-3, (4)) signals the card status. The following signals are defined the service LED:

Service LED	Status	Remarks
Flash (1 Hz)	No Neuron communication	Error, perhaps EEBLANK required
Blink (1/2 Hz)	Driver installed, node is “unconfigured”	Configure the node.
Permanently ON	Node is „applicationless“ and „unconfigured“.	
Permanently OFF	Installation ok or USB not connected or driver not loaded	Normal operation check USB side check Windows device manager for driver

Table 1-2 Service LED

USB Side

Significant feature on the USB side is the USB socket. The red and green LED next to it indicate the following:

Green blinking: in normal operation

Red ON: error, e.g. after reset

If both LEDs are off, the module is out of operation

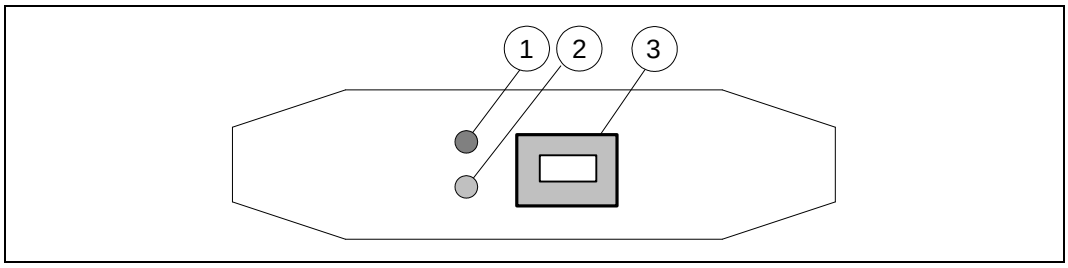


Figure 1-4 USB side connectors and LEDs

(1) Error LED (red)
(2) Status LED (green)
(3) USB socket (USB series B)

2 Installation

Please check the delivered items. You must find the Easylon USB Interface, an USB connector cable and an installation CD, also containing the documentation.

2.1 Hardware Installation

Connect the USB socket of the Interface module to an USB port of the PC using the cable delivered with the device (cf. Figure 1-4, (3)). Connectors can be identified by the sticker at the device bottom. (cf. Figure 1-2).

After installing the drivers as described in the chapter below, connect the USB device to the LonWorks network using either the RJ45 jack or the 3 pin screw plug connector which can be used alternatively (cf. Figure 1-3, (1), (2)).

2.2 Driver Installation

Drivers for different operating systems[2] are available for the Easylon PCIe Interface. Currently these are Windows 2000, XP, Vista 7 and 8 and the Windows Server OS 2003, 2008 und 2008 R2. The drivers support both, the 32 and the 64 bit version of these operating systems. Furthermore a Windows CE driver is available. Latest driver versions you can downloadvia the Easylon Support pages of our web site: www.gesytec.com
Installtion is describe in the following sections:

Windows operating systems	chapter 2.2.1
16-Bit driver under 32-bit Windows	chapter 2.2.2
Windows CE (x86)	chapter 2.2.4

This section also describes in short the diagnosis utility “EasyCheck” which can be installed separately from CD.

Note: **Driver updates:**
The Easylon USB Interface receives its firmware at a restart form the PC to which it is connected. If you update the device driver while the USB Interface is connected to the PC the driver will not be downloaded to the device. You must

[2] A Linux driver is available in source code on demand

disconnect the USB Interface and reconnect it again in order to load the new device driver.

2.2.1 Driver for Windows Operating System (WDM Drivers)

This section describes installation and setup of the Easylon Interface card drivers for the Windows operating system from Windows XP onwards.

The setup program is using the same WDM driver (Windows Driver Model) for all operating systems.

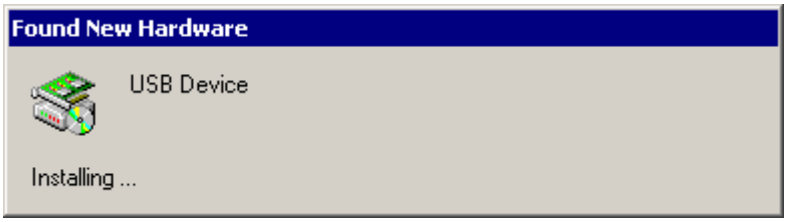
Note: For installation you can either use the Windows assistant or the program FastUpd.exe for manual installation. The latter is much more directly and especially helpful if you have to install several instances of the driver.

Finally de-installation of the driver is explained

2.2.1.1 Installation using the Windows Assistant

Insert the CD into the CD drive of your PC. Afterwards connect the Easylon USB Interface using the delivered connector cable. The USB interface does not need a separate power supply.

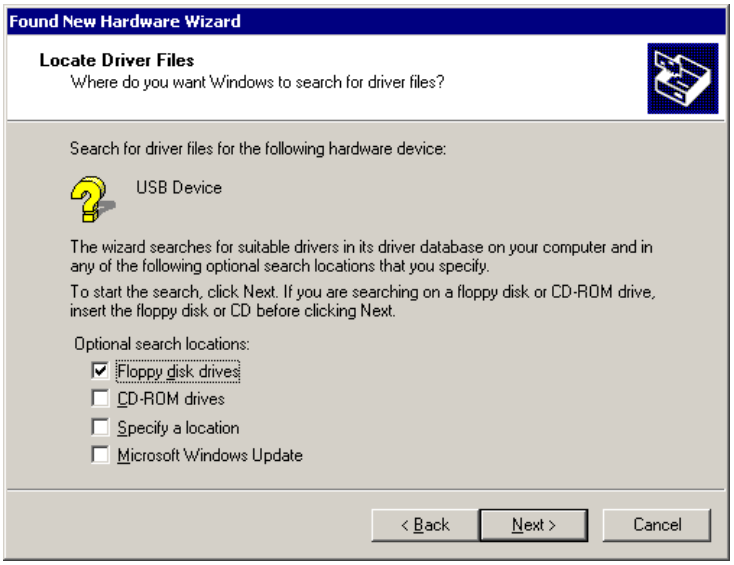
The PC will show that a new USB device has been found.



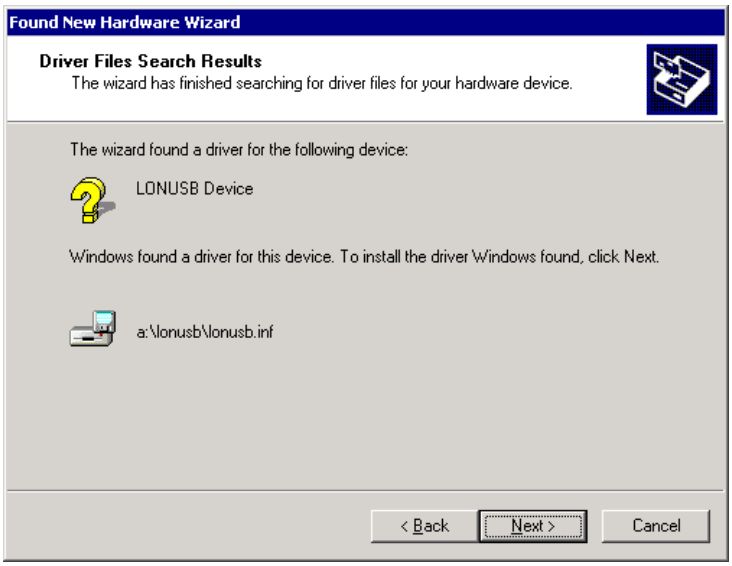
Windows will automatically start the hardware wizard

Click the **Next>** button to start the driver installation.

The option „search for a suitable driver for my device" must be selected, as Windows does not yet know a driver for the Easylon USB Interface. Please continue by clicking the **Next>** button



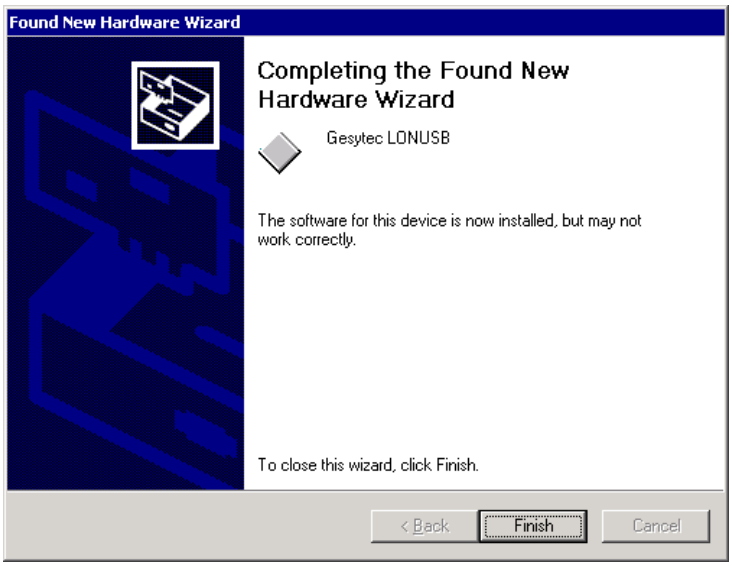
As the driver is on a CD check the "CD-ROM drives" option. Click the **Next>** button that Windows can prepare the installation procedure.



In this dialog the hardware wizard shows the driver found on the CD. Clicking the **Next>** button finally start the driver installation

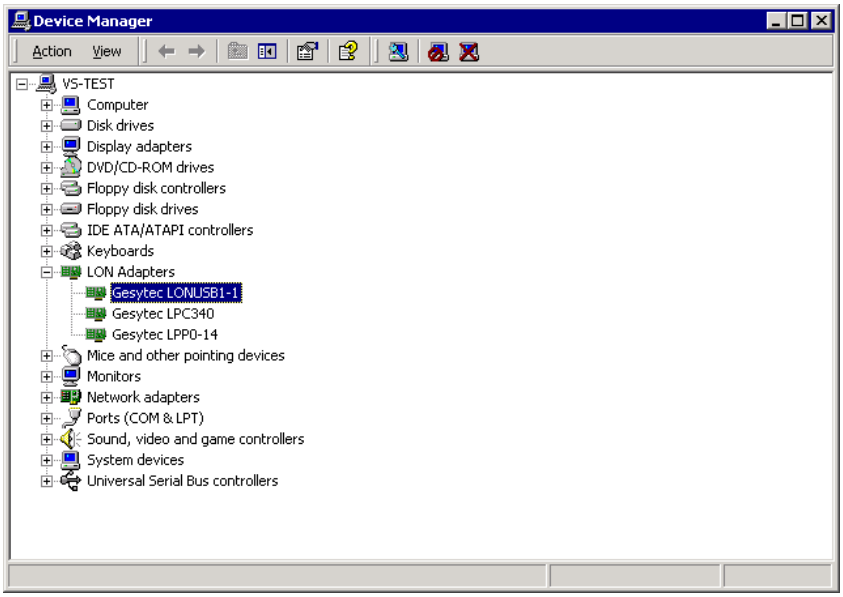
When the installation has been finished, the above message is shown. Click the **Finish>** button to terminate the installation procedure.

It is possible, that you get the following message:



This can happen due to the internal initialization of the driver during which the driver is shortly unloaded and reloaded. Normally this message does not indicate an error.

If you want to check the installation you can use the device manager. In the Universal Serial Bus Controller section you will find a „Gesytec LONUSB x-y...“ entry, with x designating the number of the USB host controller and y the port. If external hubs have been cascaded the respective port numbers are given as well.



If, after the installation the green LED does not blink an error has occurred in the Easylon USB interface installation. In that case, please disconnect the module from the PC and reconnect after a short period of non less than 10 s.

During the installation and at each Neuron reset the red LED is shortly flashing.

The device is now ready to access the LONWORKS network. The USB Interface module can be connected to the LONWORKS network either using the RJ45 jack or the 3 pin screw plug socket. Pin assignment can be taken from Figure 1-3.

2.2.1.2 Manual Installation and Update

The easiest way to install the driver is to ignore the hardware assistant and run

FastUpd.exe or **FastUpd64.exe**[3]

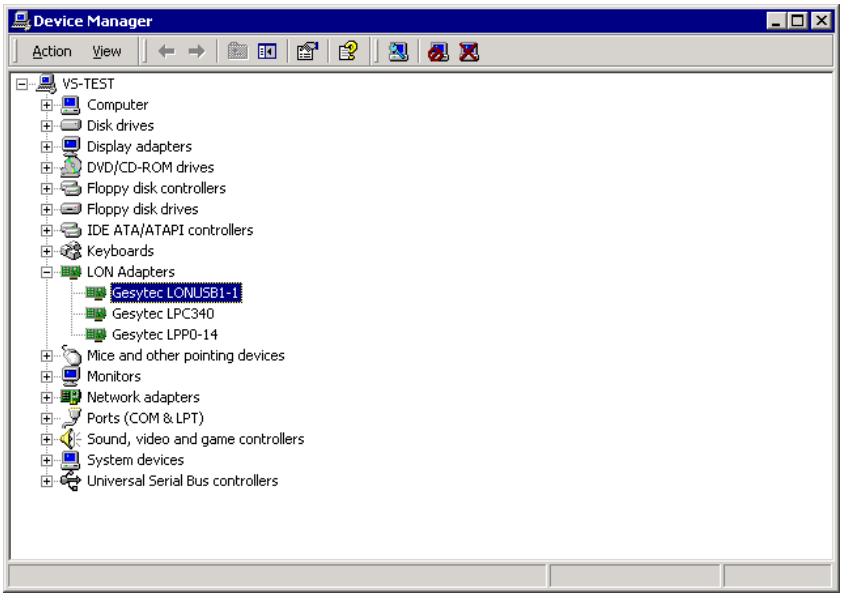
from the „ LonUsb “ folder of the CD-ROM. In order to update the firmware in the device as well, you must disconnect the USB Interface and reconnect it again.

The same program you will use to update an existing driver.

Note **Manual update:**
If you have already an older version of the LON USB driver installed, you must completely de-install it prior to installation of a new driver. Please follow the instructions in chapter De-Installation.

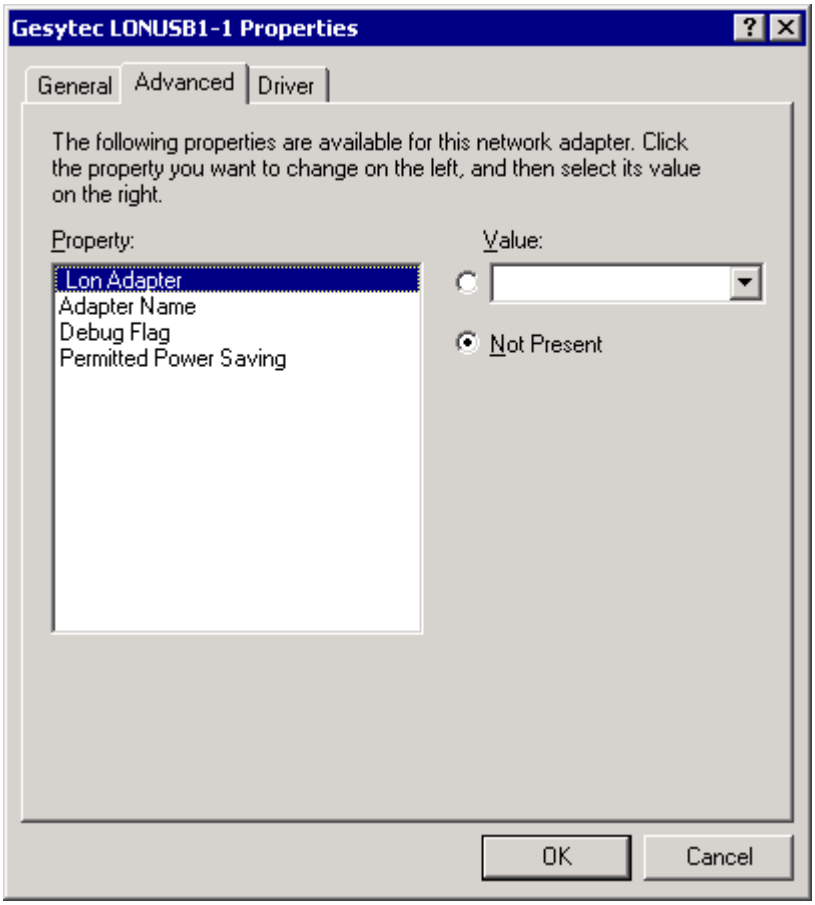
2.2.1.3 Parameter Setting

There are further settings available for the Easylon USB interface which may be helpful in certain operating conditions. They can be found in the Universal Serial Bus Controller section of the device manager. Select the properties of the desired device.



The „Advanced Properties“ offer the following settings:

3 For 64-bit systems



Lon Adapter
This will assign a name „LON1“ ... „LON9“ to the LON USB adapter, which certain application will require. Remember that the name must not be in use by any other device driver. In case of a name conflict the device can not be started. (Code 10).

Adapter Name
Alternatively an arbitrary name can be assigned to the adapter (e.g. floor 7). If both „Lon Adapter“ and „Adapter Name“ are assigned to the same device only the entry for „Lon Adapter“ will be used.

Debug Flag
The value comprises a DWORD in hexadecimal notation of different flags for debug purposes. Usually it is set to 0 (not existing). Setting the single bits will turn on special debug features. In the current driver versions bits 0, 1 and 3 are used.

Bit 0: LON telegrams at the interface from and to the application are shown in debug output.

Bit 1: LON telegrams at the interface from and to the USB bus are shown in debug output.

Bit 2: Reserved for Easylon Watcher.

Bit 3: CREATE and CLOSE) of the driver are displayed in the debug output.

Note: The debug output for instance can be displayed using the DebugView program, which is freely available at www.sysinternals.com.

Permitted Power Saving
Usually the LON USB adapter allows a standby mode with applications running (Standby). At certain conditions however, (e.g. LON USB using an external hub under Windows 2000) the current supply to the LON USB adapter will be shortly interrupted during return from the standby mode by the external hub. Under such conditions a standby mode must be turned off (None).

2.2.1.4 De-Installation

WDM drivers are de-installed using the "Device Manager". Among "LON Adapters" select the "Gesytec LONUSBx-y..." driver and click "de-install".

2.2.2 EasyCheck – Test Utility for Windows Drivers

In addition to the drivers, the test utility "EasyCheck" can be installed in the respective program directory (default: : \Easylon\Lpx). The program checks interface and software environment and displays information, from which can be concluded on the reasons for problems in connection with the interface.

EasyCheck runs an analysis of the system's software. It will open the selected interface, check the driver version and display it. By sending a "query status" command the communication with the hardware is tested. Using the "read memory" command the utility will show if the device is running MIP or NSI firmware. Properly installed Easylon Interfaces will send a corresponding answer.

2.2.3 Windows and 16 Bit Applications

The Windows driver for the 32 bit Windows versions also provides a 16 bit interface. (Unfortunately Microsoft does not support this in the 64 bit versions.) To use it, the following entry has to be made in the file „config.nt", usually found in the windows\system32 directory:

Device=%SystemRoot%\system32\ lpxdos.exe –Llonusb1-2

The 32 bit LON device used is specified by the optional –L or /L parameter:

/Lname
name =

lonusb1-2	for device LONUSB at USB host controller 1 and with port number 2 at USB root.

Note: Two subsequent “l” characters have to be entered, one indicating the parameter -L, the second as first character of the name: –Llxxxx

The 16 bit LON device used is specified by the following optional parameter:

/Dn
with n = 1...9 for LON1 to LON9

Without this parameter, the interface will be assigned the first unused name starting with “LON1”.

2.2.4 Windows CE Driver

The Windows CE driver has been designed for x86 processors. Variants for other processors can be realized on request. There are versions for Windows up to CE 6.0.

Note: Prior to using the interface please check if your Windows CE system supports USB. For instance you could connect a standard USB device like mouse, keyboard or memory stick.

The Windows CE driver comes is a DLL named lonusb.dll. Like all Windows CE drivers it must be in the Windows directory of your system. The required files can be found on the Driver & Documentation CD under Drivers/Windows CE/4.2-6.0/LonUsb.

If the driver has to be integrated into the Windows CE image, the simplest way is a respective entry in the platform.bib file. This approach is almost the same for all Windows CE versions.

Foe correct operation he driver requires registry entries. These can be found in the file lonusb.reg. In order to integrate the driver into a Windows CE image, the contents of this file has to be copied into the file platform.reg.

```
; LONUSB - Driver
[HKEY_LOCAL_MACHINE\Drivers\USB\LoadClients\3596\Default\Default\LonUsb]
    "DLL"="lonusb.dll"
    "Prefix"="LON"
    "DebugFlag"=dword:0
    "ReadTimeout"=dword:FFFFFFFF
```

3 Technical Description

CPU	Neuron 3150, 10 MHz
Memory	
ROM	48.75 Kbytes
RAM	9 Kbytes
USB Interface	
Type	according to full speed USB standard 1.1
Connector	USB socket (USB Series B)
LONWORKS Interface	
Transceiver	FTT-10A
Connectors	- RJ 45 - screw plug terminal (Phoenix: MSTB2.5/3-G-5.08)
Power Supply	
Power Supply	via USB port
Power Consumption	100 mA max.
Dimensions and Operating Conditions	
Dimensions	128 * 71 * 23 [mm]
Weight	135 g
Temperature	
Operation	0 ºC – +50 ºC
Storage	-20 ºC – + 60 ºC
Humidity	15 % – 95%, no dew class F accord. to DIN 40040
Protection Class	IP 20
EMC	EN 610 00-6-2 EN 550 22 A/B
Display and Operation	Neuron service push button Neuron service LED (yellow) Status LED (green) Error LED (red)

4 Programming Instructions

4.1 Windows CE Application Interface

Note: Some of the functions described below are marked “obsolete”. These functions and control codes are referenced her only for compatibility with older versions of LPCDRV/LG2DRV and should not used for development of new software.

4.1.1 CreateFile

Opens a LON device.

Syntax:

```
ni_handle = CreateFile(szDevName,
GENERIC_READ|GENERIC_WRITE, 0, NULL, OPEN_EXISTING, 0,
NULL);
```

Parameter	Type	Description
SzDevName	TCHAR*	Device name, e.g. TEXT("LON1:")
Return value	Type	Description
ni_handle	HANDLE	file handle of the LON device or `INVALID_HANDLE_VALUE`

4.1.2 CloseHandle

Closes a LON device.

Syntax:

```
CloseHandle(ni_handle);
```

Parameter	Type	Description
ni_handle	HANDLE	file handle of the LON device that should be closed

4.1.3 ReadFile

This synchronous function reads a telegram according to the application layer format. Synchronous means the function returns only if the NEURON received the telegram or the handle is closed.

The timeout of this blocking call can be changed via registry or via DeviceIoControl. A timeout value of 0 means, that this function returns immediately, if no data are available.

Syntax:

```
ReadFile(ni_handle, pMsg, len, &rLen, NULL);
```

Parameter	Type	Description
ni_handle	HANDLE	file handle of the LON device
pMsg	void*	pointer to an „explicit message buffer“
len	DWORD	length of the buffer [bytes]
rlen	DWORD	length of the received telegram [bytes]

4.1.4 WriteFile

Writes a telegram according to the application layer format. This function returns immediately.

Syntax:

```
WriteFile(ni_handle, pMsg, len, &rLen, NULL);
```

Parameter	Type	Description
ni_handle	HANDLE	file handle of the LON device
pMsg	void*	pointer to an „explicit message buffer“
len	DWORD	length of the buffer [bytes]
rlen	DWORD	length of the telegram to be send [bytes]

Note: The telegram according to the application layer format contains a length information of the buffer itself. That is why we ignore the parameter len in the use of function ReadFile()and WriteFile(). Note: Use the maximum length (256 bytes) of the buffer while reading a telegram.

4.1.5 GetVersion

Returns the version number of the driver as Unicode string, e.g.

```
TEXT("Easylon LonUsb Version 1.00 for WinCE from
11/05/2002").
```

Syntax:

```
#define IOCTL_LPCDRV_GET_VERSION \
     CTL_CODE( FILE_DEVICE_LPCDRV, 0x900, \
     METHOD_BUFFERED, FILE_READ_ACCESS )

#define IOCTL_GETVERSION  0x43504C01            //obsolete
result = DeviceIoControl(ni_handle,
IOCTL_LPCDRV_GET_VERSION,
     NULL, 0,  szVersion, sizeof(szVersion),
     BytesReturned, NULL);
```

Parameter	Type	Description
ni_handle	HANDLE	file handle of the LON device
szVersion	TCHAR*	Buffer for version string
BytesReturned	DWORD	length of the string [bytes] = (number of characters + 1) * 2

Return value	Type	Description
Result	BOOL	FALSE if buffer is too small, else TRUE

4.1.6 ReadFile with Timeout

Reads a telegram according to the application layer format. The `Timeout` parameter determines the functions behavior while the receive buffer is empty:

Timeout = 0:	function returns immediately
Timeout = n:	function waits n milliseconds to receive a telegram.
Timeout = INFINITE:	function works as synchronous function, see also function ReadFile.

Syntax:

```
#define IOCTL_LPCDRV_READ_WAIT \
     CTL_CODE( FILE_DEVICE_LPCDRV, 0x908, \
     METHOD_BUFFERED, (FILE_READ_DATA | FILE_WRITE_DATA) )
result = DeviceIoControl(ni_handle, IOCTL_LPCDRV_READ_WAIT,
     &timeout, 4, pMsg, len,
     &rLen, NULL);

#define IOCTL_READ0x43504C02                    // obsolete
result = DeviceIoControl(ni_handle, IOCTL_READ,
     pMsg, len, &timeout, 4,
     &rLen, NULL);
```

Note: Using IOCTL_READ the Parameters lpInBuffer and lpOutBuffer as well as nInBufferSize and nOutBufferSize are permuted as defined in the API Reference of DeviceIoControl.

Parameter	Type	Description
ni_handle	HANDLE	file handle of the LON device
timeout	DWORD	Timeout [Milliseconds]
pMsg	void*	pointer to an „explicit message buffer“
len	DWORD	length of the buffers [bytes]
Return value	Type	Description
Result	BOOL	TRUE, if telegram was received FALSE at timeout

4.1.7 Set Timeout for ReadFile

Reads a telegram according to the application layer format. The `Timeout` parameter determines the functions behavior while the receive buffer is empty:

Timeout = 0:	function returns immediately
Timeout = n:	function waits n milliseconds to receive a telegram.
Timeout = INFINITE:	function works as synchronous function, see also function ReadFile.

Syntax:

```
#define IOCTL_LPCDRV_SET_READ_TIMEOUT \
     CTL_CODE( FILE_DEVICE_LPCDRV, 0x909, \
     METHOD_BUFFERED, FILE_WRITE_DATA)
result = DeviceIoControl(ni_handle, IOCTL_LPCDRV_READ_WAIT,
     &timeout, 4, NULL, 0,
     &rLen, NULL);
```

Parameter	Type	Description
ni_handle	HANDLE	file handle of the LON device
timeout	DWORD	Timeout [Milliseconds]
Return value	Type	Description
Result	BOOL	TRUE, if timeout was stored, FALSE if an error has occured

Note: Undefined IOCTL-Codes will return FALSE and set LastError to ERROR_NOT_SUPPORTED.

4.1.8 Registry entries for Easylon USB Interface

```
; LONUSB - Driver
[HKEY_LOCAL_MACHINE\Drivers\USB\LoadClients\3596\Default\De
fault\LonUsb]
    "DLL"="lonusb.dll"
    "Prefix"="LON"
    "DebugFlag"=dword:0
    "ReadTimeout"=dword:FFFFFFFF
```

DebugFlag

The value comprises a DWORD in hexadecimal notation of different flags for debug purposes. Usually it is set to 0 (not existing). Setting the single bits will turn on special debug features. In the current driver versions bits 0 and 1 are used.

Bit 0: LON telegrams at the interface from and to the application are shown in debug output.

Bit 1: LON telegrams at the interface from and to the USB bus are shown in debug output.

ReadTimeout

The value (in milliseconds) comprises a DWORD in hexadecimal notation to affect the behavior of ReadFile().

A value of INFINITE (= 0xffffffff) makes ReadFile() a blocking call. This is the default behavior, if no parameter is given (like lpcdrv, lg2drv).

A timeout value of 0 means, that this function returns immediately, if no data are available.

5 Tips and Tricks

5.1 Hot Plugging

The Easylon USB Interface may be connected and disconnected, when the PC is already running. Windows recognizes plugging the device in and starts the driver automatically. You should not remove the device, when an application is using it.

5.2 Using an USB Hub

Of course the Easylon USB Interface can be used with an USB hub. If there are a couple of USB devices active, the communication between PC and Easylon USB Interface may be slowed down.

5.3 Standby Mode of PC

A PC with connected Easylon USB Interface may be set to standby mode, because the device will be powered during standby. However, if the device is used with an external USB hub under Windows 2000, it was observed that, at returning from the standby mode, some hubs shortly interrupt of the power supply to the Easylon USB Interface. This USB hub behavior will reinitialize the device and active applications, using the Easylon USB Interface before entering standby mode, are not able to communicate with device any longer.

In such configurations please refer to section “Parameter Setting” and set “Permitted Power Saving” to “None” to disable the standby mode. The LON USB driver will then inhibit the standby mode with applications running.

5.4 Hibernation Mode of PC

The Easylon USB Interface does not support the hibernation mode. When the PC enters hibernation mode, the USB will not be powered any longer. As this would lead to a loss of the Neuron Chip settings the LON USB driver will inhibit Windows from turning into the hibernation mode with applications running.

5.5 Registry Key

The driver of the Easylon USB Interface makes an entry in the registry database for each found device, according to Echelon's guidelines. You will find this entry at:

\\HKEY_LOCAL_MACHINE\Software\LonWorks\DeviceDrivers.

For each Easylon USB Interface you will find a key with the device name (Gesytec LONUSBx-y...) and a character value with the driver name.

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