



basic MOST 6161

MOST150 Interface

User Manual

(Translation of Original docu)

Document Version 1.4



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1 Notes on the EC Declaration of Conformity

**GOPEL electronic GmbH
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With the EC Declaration of Conformity we declare the compliance of the GOPEL electronic GmbH product described in this Manual with the requirements of the Directive 2006/95/EG – Low Voltage Directive and with the Directive 2004/108/EG about the Electromagnetic Compatibility. Any modification to the product, not authorized by us, will invalidate the corresponding declaration.

The product is marked with the symbol 

2 Installation

2.1 Hardware Installation



Please make absolutely certain that all of the installation procedures described below are carried out with your system switched off.

For the hardware installation of a basic MOST 6161, only the cables for USB or Ethernet and Power supply have to be connected (see [Hardware](#)).




Electro Static Discharge (ESD) can harm your system and destroy electronic components. This can lead to irreparable damage on both, the basic MOST 6161 device and the belonging system, as well as to unexpected malfunction of your test system.

Therefore do not touch the board surface inside the device or any connector pins and electronic components.

2.2 Driver Installation

2.2.1 USB For proper installation of the GOEPEL electronic USB driver on your system, we recommend to execute the G-USB driver setup. To do that, start the *G-USB-Setup-*.exe* setup program of the supplied CD ("***" stands for the version number) and follow the instructions.

 The available USB device driver supports Windows® XP and Windows® 7 systems.

 The following step is only required in case you do not use the G-API.

If you want to create your own software for basic MOST 6161, you need the files for user specific programming (**.DLL*, **.LLB*, **.H*). These files are not automatically copied to the computer and have to be transferred individually from the supplied CD to your development directory.

After hardware installation/ driver installation, you can check (for example by the Windows® Device Manager) whether the devices are properly embedded by the system.

The following figure shows the successful embedding of a basic MOST 6161 device (appears as USB 6161):

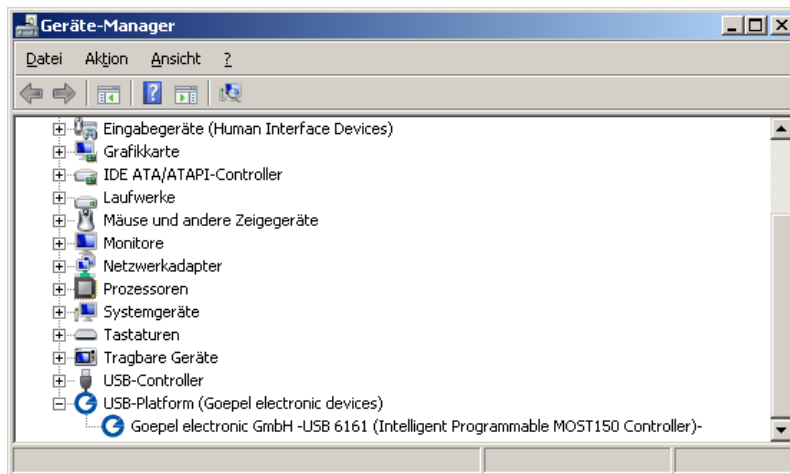



Figure 2-1:
Display of Device Manager

 Please note that the Device Manager shows ALL USB controllers supported by this *G-USB* driver.

2.2.2 Ethernet

If the Ethernet interface is used for communication with the control PC, there is no driver installation required.

The device can be directly addressed via the IP Address (see also [Addressing](#)). This IP Address can be changed by the HardwareExplorer. The newly set IP Address becomes effective after a restart.

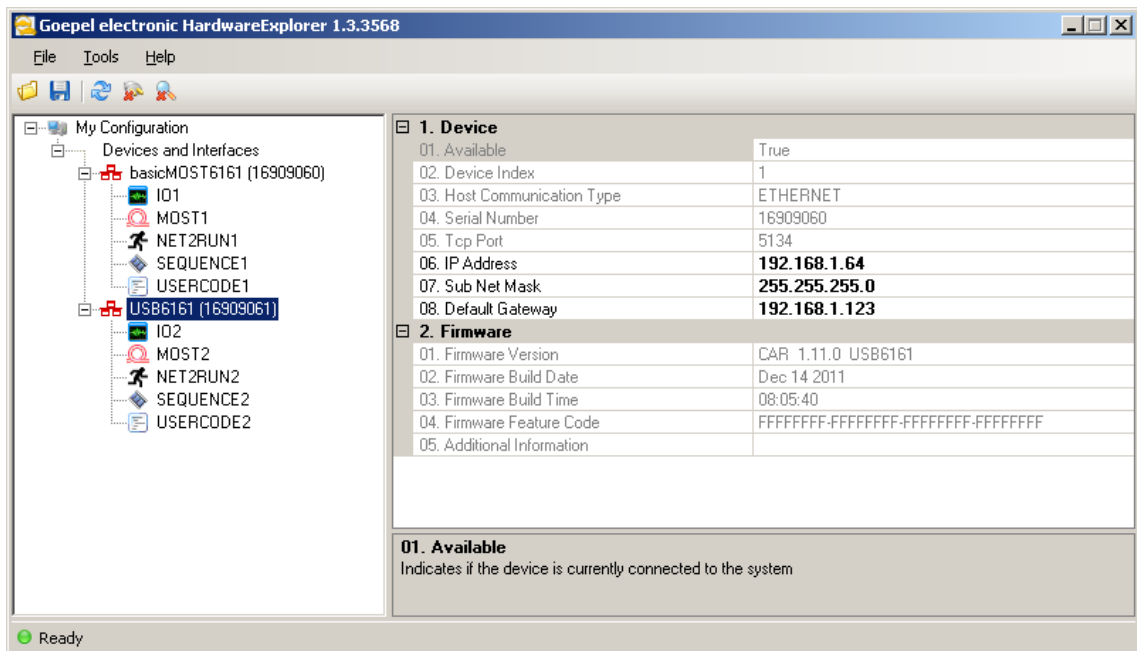


Figure 2-2: IP Address in the GOEPEL electronic HardwareExplorer

3 Hardware

3.1 Definition

basic MOST 6161 of GOPEL electronic GmbH was developed as stand-alone device to be connected to a PC or Laptop for the use outside of complex test environments. The device is a programmable, intelligent MOST150 controller for multimedia applications in automotive and consumer electronics. Optionally it can be extended by additional communication interfaces.

basic MOST devices offer the following resources:

- 1 optical MOST150 interface with data rates up to 150Mbit/s
- 3 operation modes: **Master**, **Slave**, **Bypass**
- **Spy** function: Possibility of monitoring the MOST data as passive bus member (device in the **Bypass** mode) or as active bus member (device in the **Master** or **Slave** mode)
- Independent on-board timer with time stamp resolution greater than or equal to 8 ns
- The master frame rate can be switched over between 44.1 kHz and 48 kHz
- optionally 1 DVI output, 1 S/PDIF input/ 1 S/PDIF output by the [AV Extension](#)
- **Ring break diagnosis** function via frontal connector
- 4 digital inputs and 4 digital outputs at the frontal connector (e.g. for extended trigger functions)
- optionally 2 CAN/ LIN/ or K-Line interfaces (also mixed) (see [On-board Interfaces](#))
- 600MHz Power PC with 512MB RAM, 256MB Flash
- The Communication and I/O interfaces are galvanically separated from the USB or Ethernet interface (but **not** the resources of the AV Extension board!)
- High flexibility by pluggable transceiver modules and the AV Extension board
- Control of the device via USB 2.0 or Ethernet (see [Addressing](#) and [Ethernet](#))
- 1 GBit Ethernet interface at the Front panel ("LAN") also useable as volume data and debug interface
- Visualization of the operating states by four LEDs arranged at the front panel (see [LED Display](#))

The following picture shows a GOPEL electronic basic MOST 6161:



Figure 3-1:
basic MOST 6161

An external supply voltage of 7..25 VDC is required to operate a basic MOST 6161. For this, a 12 VDC wall AC adaptor is included in the scope of delivery, to be connected via the ext. Power Supply barrel connector at the device's rear side (2.1 x 5.5mm/ + polarity inside).



Figure 3-2:
basic MOST 6161 rear view

This socket is used to supply the internal logic. The GND connection of the socket is connected with the GND connection of the USB interface. Alternatively, you may use the two banana sockets for the supply of the internal logic (red = plus/ blue = minus).



For external power supply, please use either the two banana sockets OR the ext. Power Supply connection.

3.2 Technical Data

3.2.1 General

In its basic version, a basic MOST 6161 device comes with one MOST150 interface and a Ring Break Diagnosis interface as well as four Trigger inputs and four Trigger outputs.

Optionally a basic MOST 6161 can be extended by two CAN or LIN/ K-Line interfaces and, depending on the AV Extension board, by Audio and Video interfaces.

All interfaces, except for the MOST150 interface, have to be connected via the frontal 50-pole Extended Signals connector (marked by blue color in Figure 3-3).

The following figure shows the schematic structure as a block diagram:

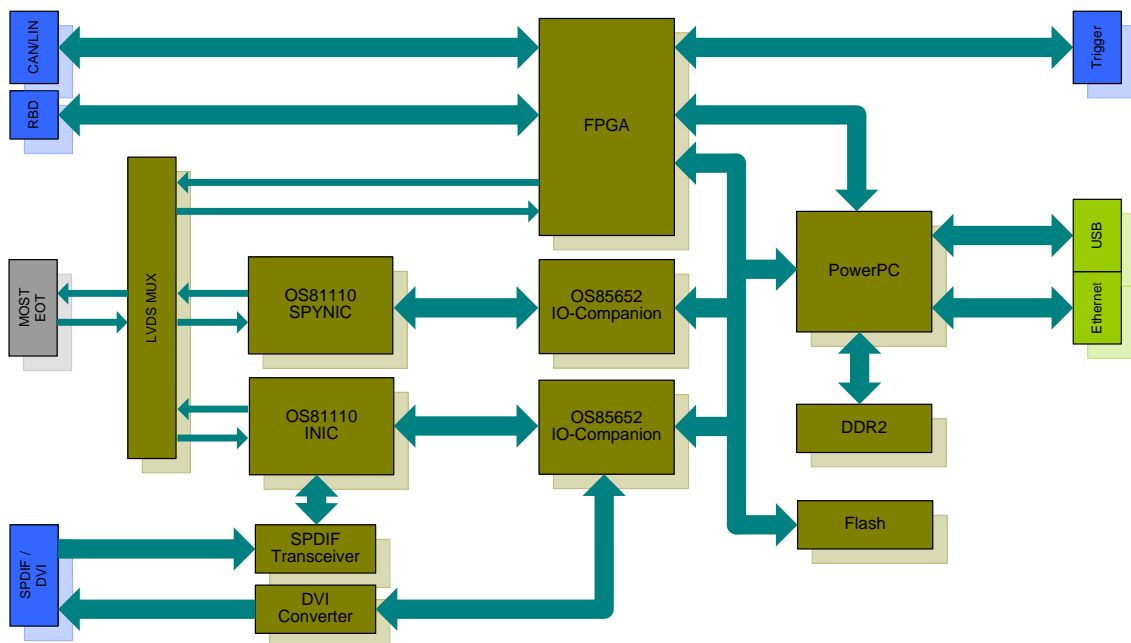


Figure 3-3: Block diagram of a basic MOST 6161

3.2.2 Dimensions (width x height x depth):

- basic MOST 6161: 130 mm x 55 mm x 200 mm

3.2.3 basic MOST 6161 Properties

A basic MOST 6161 device has the following characteristics:

Symbol	Identification	Min.	Typ.	Max.	Unit	Remarks
Optical MOST150 Interface						
N	Number		1			
C	Transmission rate			150	MBit/s	
Ring break diagnosis interface						Reference potential GND _{iso}
N	Number		1			
U _O	Output voltage	1		UBAT	V	
UBAT _{internRBD}	Internal battery voltage		12		V	detachable
UBAT _{externRBD}	External battery voltage		12	27	V	
Digital inputs						Reference potential GND _{iso}
N	Number		4			
U _{IH}	High level input voltage	3.5		5.5	V	
U _{IL}	Low level input voltage			1.5	V	
I _L	Input leakage current			35	μA	
Digital outputs						Reference potential GND _{iso}
N	Number		4			
U _{OH}	High level output voltage	4.8		5	V	
U _{OL}	Low level output voltage			0.5	V	
I _{OUT}	Output current			8	mA	
Additional interfaces						
	CAN/ LIN/ K-Line Interfaces			2		See On-board Interfaces
	AV Resources Extension			1		See AV Extension

3.3 Construction and Function

3.3.1 General

A strong 600MHz AMCC 460EX PowerPC builds the core of a basic MOST 6161. This dual-issue, superscalar 32-bit RISC CPU is based on the Book-E enhanced PowerPC architecture. With features including out-of-order execution, dynamic branch prediction and a highly pipelined double precise floating-point unit, this processor provides the calculation power required for processing complex residual bus simulation on multiple bus interfaces. Furthermore, the device comes equipped with a 512MB fast 400MHz DDR2 RAM and 256MB Flash memory of which over 80% is available for user programs.

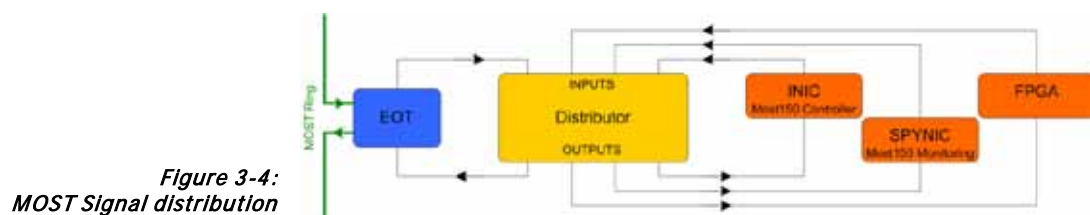
The basic MOST 6161 device has been designed as highly flexible MOST150 controller platform. It provides an optical MOST150 interface for the transmission of asynchronous, isochronous, control and MOST Ethernet data packets.

Three different operation modes are supported:

- Master (active bus member)
- Slave (active bus member)
- Bypass (passive bus member)

In any operation mode, the monitoring of received or sent MOST150 data is possible.

The following schematic figure shows the distribution of the MOST signal:



The device is by the electrical-optical transceiver (EOT) included into the MOST ring.

On the front plate, there is a socket for the 1 GBit Ethernet interface ("LAN"). This is intended for the control of the device. Additionally, it can be used as debug interface as well as to transfer large data amounts (e.g. monitor data). Another socket at the device's rear side is for the control of the basic MOST 6161 via USB 2.0.

Additionally, the basic MOST 6161 device offers optionally two further serial bus nodes, each of them configurable as CAN, LIN or K-Line interface. A transceiver slot belongs to each node. The type of the plugged-in transceiver determines the type of the corresponding node (see also [On-board Interfaces](#)).

These bus nodes are conducted to the 50-pole frontal Extended Signals connector (same as all other interfaces like ring break diagnosis, audio and video outputs) as well as the digital IOs.

Besides the frontal connector, there are four LEDs indicating the operating state of the basic MOST 6161 device (see [LED Display](#)).

3.3.2 Isolation

Electric surges can harm expensive test equipment and lead to unreliable test results. Electric isolation protects against electric surges and can help to suppress dangerous electrical transients. It also eliminates ground loops, responsible for data errors due to ground potential differences.

The **basic MOST 6161** device provides electric isolation between the USB or Ethernet system and the IO signals available at the front connector. This includes the CAN, LIN (K-Line) and MOST communication interfaces as well as digital and analog IOs (but **not** the resources of the AV Extension board!).

3.3.3 MOST Interface

For proper operation of a MOST interface in a network, all partners must communicate with the same system clock. This depends, among others, on the Master frame rate of the system.

basic MOST 6161 devices support the following Master frame rates:

- 48 kHz and
- 44.1 kHz

(G-API command `G_Most_Node_SetProperties`, parameter `ClockMode`).

3.3.4 Addressing

basic MOST 6161 units provide a 1Gbit Ethernet interface and a USB2.0 interface. Both interfaces can be used for the communication of the unit with the host PC.

In case of using the Ethernet interface, the device can be controlled via the default IP Address 192.168.1.62, Port 5134, which can be changed if required (see also [Driver Installation/ Ethernet](#)).

In principle, there are two ways for this:

- HardwareExplorer: Select the device, under Device set the required IP Address; the new IP Address is effective after restart
- G API Command `G_Common_Ethernet_IpAddress_Set`; the new IP Address is effective after restart

basic MOST 6161 devices controlled via the USB interface are exclusively addressed according to their serial numbers:

Device number 1 is always assigned to the device with the least serial number.

3.3.5 Trigger behavior

The MOST interface has four additional Input and four additional Output Trigger lines at the frontal connector that can be interconnected by the corresponding driver configuration (presently not supported by the software).

3.3.6 LED Display

The LEDs arranged at the front panel indicate the actual operation state of the basic MOST 6161.

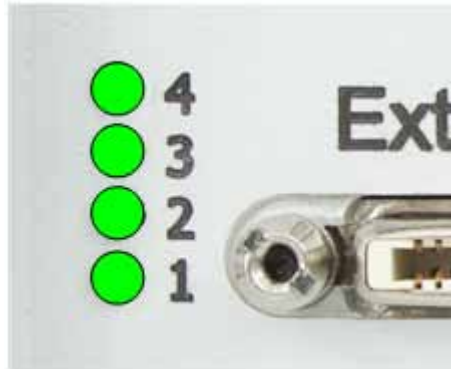


Figure 3-5:
LED Display

The following table explains important display states of these LEDs:

State				Remarks
LED 1	LED 2	LED 3	LED 4	
alternately blinking				Bootloader software runs Error reason (probably): Software reset not executed
	blinking			Firmware runs
ON (shortly)				Display while a Firmware command is executed
			ON	Ethernet connection established



This LED display is effected with low priority and can be affected by other running programs.

3.3.7 Connector Type: Samtec VRDPC-50-01-M-RA
Pinout Required connecting cable: Samtec VPSTP-16-1000-01

The pinout of the frontal **Extended Signals** connector is shown in the following table:

<i>Pin</i>	<i>Signal</i>	<i>Pin</i>	<i>Signal</i>
1	GND	26	GND
2	CAN1_H LIN1 K-Line1	27	CAN2_H LIN2 K-Line2
3	CAN1_L L-Line1	28	CAN2_L L-Line2
4	GND	29	GND
5	UBAT _{externCAN1}	30	UBAT _{externCAN2}
6	GND _{iso}	31	GND _{iso}
7	GND	32	GND
8	DIGITAL_OUT1	33	DIGITAL_IN1
9	DIGITAL_OUT2	34	DIGITAL_IN2
10	GND	35	GND
11	DIGITAL_OUT3	36	DIGITAL_IN3
12	DIGITAL_OUT4	37	DIGITAL_IN4
13	GND	38	GND
14	RingBreakDiagnosis	39	GND _{iso}
15	UBAT _{externRBD}	40	N.C. DVI.+5Vout
16	GND	41	GND
17	N.C. S/PDIF in	42	N.C. DVI.SDA
18	N.C. S/PDIF out	43	N.C. DVI.SCL
19	GND	44	GND
20	N.C. DVI.TX0_p	45	N.C. DVI.TX2_p
21	N.C. DVI.TX0_n	46	N.C. DVI.TX2_n
22	GND	47	GND
23	N.C. DVI.TX1_p	48	N.C. DVI.TXC_p
24	N.C. DVI.TX1_n	49	N.C. DVI.TXC_n
25	GND	50	GND

The pinout of the **Communication interfaces** depends on the plugged-in transceiver (see [On-board Interfaces](#)), while the **Pins 17..24** and **40..49** remain empty (but not the GND pins), OR, with plugged in **AV Extension board 1**, have the pinout according to the table above (see also [AV Extension](#)).

3.3.8 On-board Interfaces

Besides the MOST interface, a basic MOST 6161 device is providing two further communication interfaces, either remaining empty or optionally designed as CAN, LIN or K-Line interface (the assignment is determined by the type of the belonging transceiver).

If necessary, you can change the assignment of an interface by plugging in another transceiver.



Warning

For changing or plugging in additional transceivers, open the stand-alone device (with the system **switched off**). To do that, unscrew the four screws of the frontal plate and extract the board until the transceiver positions can be seen.

Please proceed extremely carefully, otherwise the device could be damaged.

When plugging in transceivers, please attend to their correct position and orientation. In the case of further inquiries, please contact our support department (ats_support@goepel.com).

The transceiver's position and orientation are shown in the following figure:

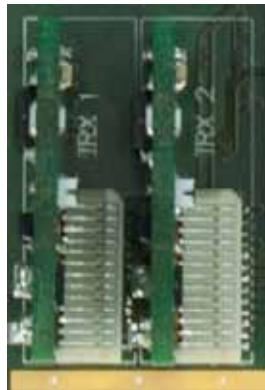


Figure 3-6
Transceiver positions

Each transceiver type is coded and can be identified clearly. For the available types of transceivers, see [Product Information](#).

Generally both interfaces are supplied by an internal voltage of 12V (UBAT_{intern}). In case of using other voltages, this internal voltage can be switched off individually by software.

(G-API commands

G_Can_Node_InternalVBat_Disable or

G_Lin_Node_InternalVBat_Disable or

G_KLine_Node_InternalVBat_Disable)

Then, an external voltage (UBAT_{extern}) must be supplied via the predefined pins of the frontal connector.



Both communication interfaces, including the belonging UBAT_{extern} inputs, use the GND_{iso} pins as reference potential.

In case the internal power supply should be used again, proceed the

G_Can_Node_InternalVBat_Enable

G_Lin_Node_InternalVBat_Enable or

G_Kline_Node_InternalVBat_Enable G-API commands.

The following table shows the assignment of the additional communication interfaces:

ID	Interface	Node
1	CAN 1	TRX1
2	CAN 2	TRX2
3	Reserved	
4	Reserved	
5	LIN 1	TRX1
6	LIN 2	TRX2
7	Reserved	
8	Reserved	
9	K-LINE 1	TRX1
10	K-LINE 2	TRX2

Symbol	Identification	Min.	Typ.	Max.	Unit	Remarks
CAN V2.0B Interfaces						GND _{iso} ref. potential
C	Transmission rate			1	Mbit/s	
UBAT _{intern}	Internal battery voltage		12		V	detachable
UBAT _{extern}	External battery voltage			27	V	
RCAN	Termination high-speed transceiver		120		Ω	detachable
RCAN	Termination low-speed transceiver		10		kΩ	
LIN V2.1 Interfaces						GND _{iso} ref. potential
C	Transmission rate			19.2	kbit/s	
UBAT _{internCAN}	Internal battery voltage		12		V	detachable
UBAT _{externCAN}	External battery voltage		12	27	V	
RLIN	Pullup resistor	1	30		kΩ	switchable Master/Slave
K-Line Interfaces						GND _{iso} ref. potential
C	Transmission rate			9.6	kbit/s	
UBAT _{intern}	Internal battery voltage		12		V	detachable
UBAT _{extern}	External battery voltage		12	27	V	



Notes on R_{CAN} for the high speed transceiver:
The 120Ω bus termination can be deactivated by software (G-API command G_CAN_Node_BusTermination_Disable, reactivation by G_CAN_Node_BusTermination_Enable).



Notes on R_{LIN}: The 1kΩ pullup resistor corresponds to the LIN Master bus termination and can be activated by software (G-API command G_Lin_PullUpResistor_Enable à Master, Deactivation by G_Lin_PullUpResistor_Disable à Slave).
If it is not active, the internal termination resistance of the LIN transceiver becomes effective (typically 30kΩ for TJA1020).

3.3.9 AV Extension

Plugging-in an AV Extension board provides additional interfaces for audio/ video signals.

At present, GOEPEL electronic GmbH offers the Type 1 AV Extension board with the following characteristics:

Symbol	Identification	Min.	Typ.	Max.	Unit	Remarks
DVI D Output		DVI 1.0 compliant				GND ref. potential
N _{LINK}	Number of links		1			Single link
C _{DVI}	Transmission rate	25		48	MBit/s	
R	Resolution	640x420		1600x1200	Pixel	
S/PDIF Audio output		IEC60958-3 compliant				GND ref. potential
C _{SPDIF OUT}	Transmission rate	32		48	k Frames/s	
S/PDIF Audio input		IEC60958-3 compliant				GND ref. potential
C _{SPDIF IN}	Transmission rate	32		48	k Frames/s	



All pins of the Type 1 AV Extension board use the GND pins as reference potential.

This way, the GND potential is connected to the ground potential of the USB bus or Ethernet.

3.4 Product Information

The basic MOST 6161 as intelligent, programmable MOST150 controller forms a highly flexible, adaptable controller platform that can be combined with a multitude of hardware and software resources.

basic MOST 6161 MOST Controller for Windows XP/ Windows 7	
	Basic device: MOST Controller with one optical MOST150 interface including RingBreakDiagnosis function via the frontal connector as well as 4 digital inputs and 4 digital outputs (all on-board)

Options for basic MOST 6161	
CAN Node	Additional CAN node to upgrade on 1 or 2 further communication nodes, incl. transceiver module Note: The total quantity of installable CAN/ LIN/ K-Line nodes at the same time amounts 2 per basic MOST 6161 device
LIN Node	Additional LIN node to upgrade on 1 or 2 further communication nodes, incl. transceiver module Note: The total quantity of installable CAN/ LIN/ K-Line nodes at the same time amounts 2 per basic MOST 6161 device
K-Line Node	Additional K-Line node to upgrade on 1 or 2 further communication nodes, incl. transceiver module Note: The total quantity of installable CAN/ LIN/ K-Line nodes at the same time amounts 2 per basic MOST 6161 device
AV Extension board Type 1	AV Extension board Type 1 incl. 1 electrical S/PDIF input/ 1 electrical S/PDIF output and 1 DVI output Note: The total quantity of installable AV Extension boards at the same time amounts 1 per basic MOST 6161 device This option is useable independent from and additional to options CAN/ LIN/ K-Line
CAN TJA1054	CAN low speed transceiver module type TJA1054
CAN TJA1041A	CAN high speed transceiver module type TJA1041A
CAN NCV7356D1G	CAN single wire transceiver module type NCV7356D1G
LIN TJA1020	LIN transceiver module type TJA1020
K-Line L9637D	K-Line transceiver module type L9637D

For the continuation of this table please see next page.

Options for basic MOST 6161	
DIAG KW2000 TP1.6	Keyword 2000 on TP1.6 on-board CAN diagnostic software
DIAG KW2000 TP2.0	Keyword 2000 on TP2.0 on-board CAN diagnostic software
DIAG KW2000 ISO-TP	Keyword 2000 on CAN-ISO-TP on-board CAN diagnostic software
DIAG UDS ISO-TP	UDS on CAN-ISO-TP on-board CAN diagnostic software
DIAG GMLan	GMLan on-board CAN diagnostic software
DIAG J1939	J1939 on-board CAN diagnostic software
CAL CCP2.1	CAN Calibration protocol CCP2.1
LIN adv-lib	Advanced library for test of the LIN protocol specific. 2.0/ 2.1
Net2Run	<p>Software tool to generate signal based Rest bus Simulation(s) in heterogeneous car networks.</p> <p>Note: For basic MOST 6161 devices, Net2Run and Net2Run Runtime are ONLY applicable for the CAN/ LIN/ K-Line interfaces, NOT for the MOST interface.</p> <p>The software solution is based on the AUTOSAR approach. Direct signal access (reading and manipulation) is provided via G-API functions.</p> <p>Further Net2Run features a gateway routing editor with PDU and signal mapping functionality.</p> <p>Net2Run supports the automatic import of bord net data in the <i>*.dbc</i> and <i>*.ldf</i> format.</p>
Net2Run Runtime	<p>Runtime module for executing the rest bus simulation files (<i>*.rbs</i> files) created by Net2Run;</p> <p>This option is necessary for each basic MOST 6161 device.</p>
Net2Run IDE	<p>Software programming environment (Windows host) to build on-board G-API based on-board UserCode programs for basic MOST 6161;</p> <p>includes: Net2Run IDE, QNX Neutrino CLT, G-API on-board libraries, single developer license</p>
UserCode Runtime	<p>UserCode runtime module for the execution of G-API based on-board UserCode programs on basic MOST 6161 devices;</p> <p>This option is necessary for each basic MOST 6161 device.</p>

4 Software

There are the following ways to integrate basic MOST 6161 hardware in your own applications:

- [G-API Programming](#)
- [UserCode Programming](#)

4.1 G-API Programming

The G-API (GOPEL-API) is the C-based user interface for GOPEL electronic hardware under Windows®.

It provides a wide hardware independent command set for CAN, LIN, K-Line, MOST, FlexRay, LVDS, ADIO and Diagnostic services. No matter whether a PXI/ PCI, USB or Ethernet device is used, the commands remain the same.

The hardware abstraction introduced with the G-API gives the test application parallel access to the hardware, allowing one application to access multiple hardware interfaces, as well as multiple applications can access the same hardware interface in parallel.

Another feature introduced by the G-API is the asynchronous hardware access. This means no execution blocking for pending firmware commands. The command acknowledgement is provided via a callback mechanism.

With the HardwareExplorer (see also [Ethernet](#)) GOPEL electronic provides an efficient hardware configuration and management tool, offering users an easy way to manage their hardware configurations and identifying specific hardware interfaces by logical names. Using logical interface names in the application saves from rebuilding the application when porting it to another interface or controlling device, as the interface can be easily reassigned in the HardwareExplorer. Furthermore, the HardwareExplorer provides a simple means of testing the interaction between hardware and software by executing the integrated self-tests.



Please consult the G-API documentation for further information. This documentation and the installation software are located in the *G-API* folder of the supplied "Product Information" CD.

4.2 UserCode Programming

The basic MOST 6161 device can execute user programs direct on its PowerPC processor. This requires the UserCode run-time module being enabled.

The UserCode run-time module is an option for basic MOST 6161 devices (plus other GOPEL devices) and requires one license per device.

Executing programs directly on the PowerPC improves the real-time performance remarkable and frees up PCI bandwidth on the host system.

Therefore GOPEL electronic has ported and enhanced by additional on-board functionality their C-programming user interface called G-API from Windows® to the QNX Neutrino real-time operating system.

The QNX Neutrino real-time operating system is based on a micro kernel architecture, providing clear separation between the kernel and each individual application.

This allows user applications to run in a separate virtual memory space, which ensures safe test execution and improves reliability.

The UserCode run-time module uses a superset of the G-API commands for Windows® ensuring an easy migration of existing program source code. Additional functions will provide access to event notifications, timer tasks, the FLASH file system and other RT OS resources as well as standard C libraries.

The PowerPC processor uses big-endian byte order which must be taken care of when writing or porting code for the UserCode run-time module.

For smooth migration from little to big-endian, a library of conversion macros is provided with the Net2Run IDE development system.

With the Net2Run IDE development system, GOPEL electronic provides a complete tool chain for creating UserCode programs and for their direct execution on basic MOST 6161 devices.

The Net2Run IDE development system is based on Eclipse IDE and contains the QNX Neutrino Command Line Tools (CLT), including PowerPC-Compiler, Linker and Debugger.

UserCode programs can be downloaded and debugged direct from Net2Run IDE via an Ethernet connection.

The figure below shows the Net2Run IDE development system:

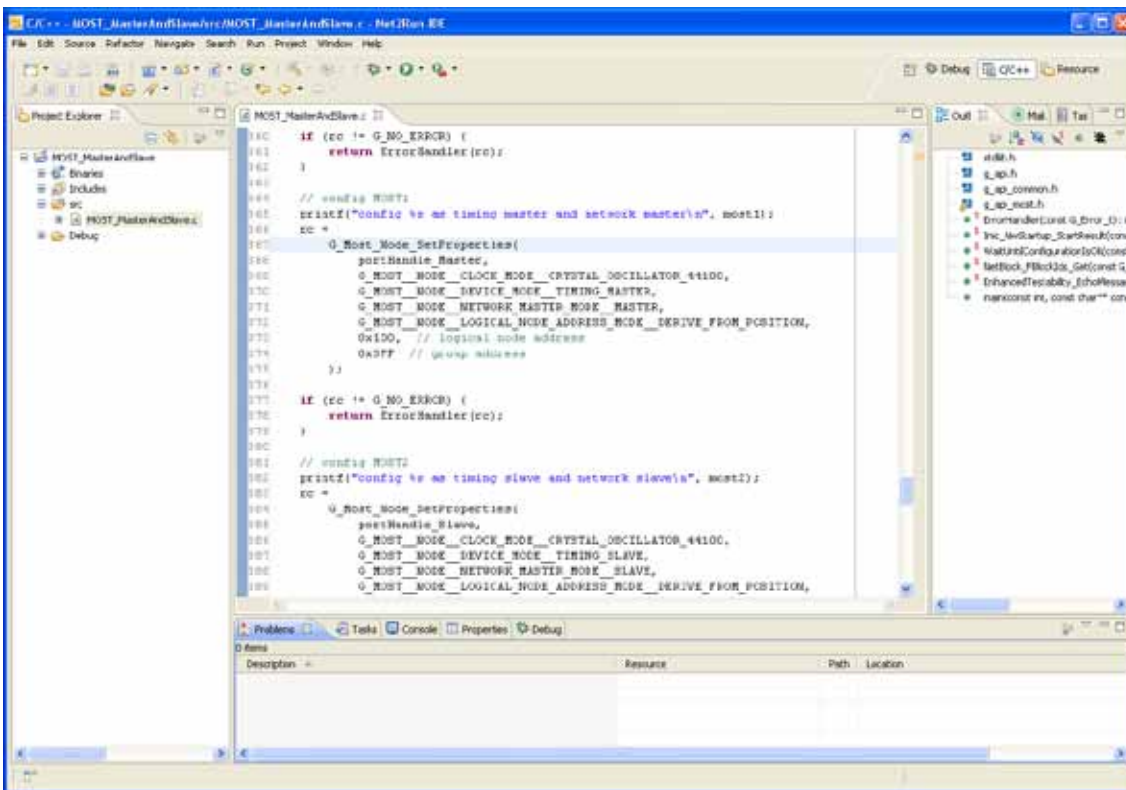


Figure 4-2: Net2Run IDE Development system



Please consult the G-API documentation for further information. This documentation and the installation software are located in the G-API folder of the supplied "Product Information" CD.

A

Addressing
 Ethernet3-6
 USB3-6
AV Extension
 Characteristics3-11

B

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