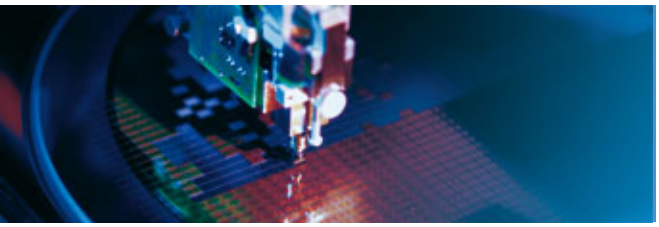
HARDWARE REFERENCE MANUAL



Helios™ Platform

Programmable Edge Controller

Rev. 2 - October 2009

DIGITAL TECHNOLOGIES FOR A BETTER WORLD

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Revision History

Issue no.	*PWB*	*Date*	*Comments*
1		Jul-09	Initial release, preliminary
2		Oct-09	Second release, preliminary

For contact details, see page 27.

Contents

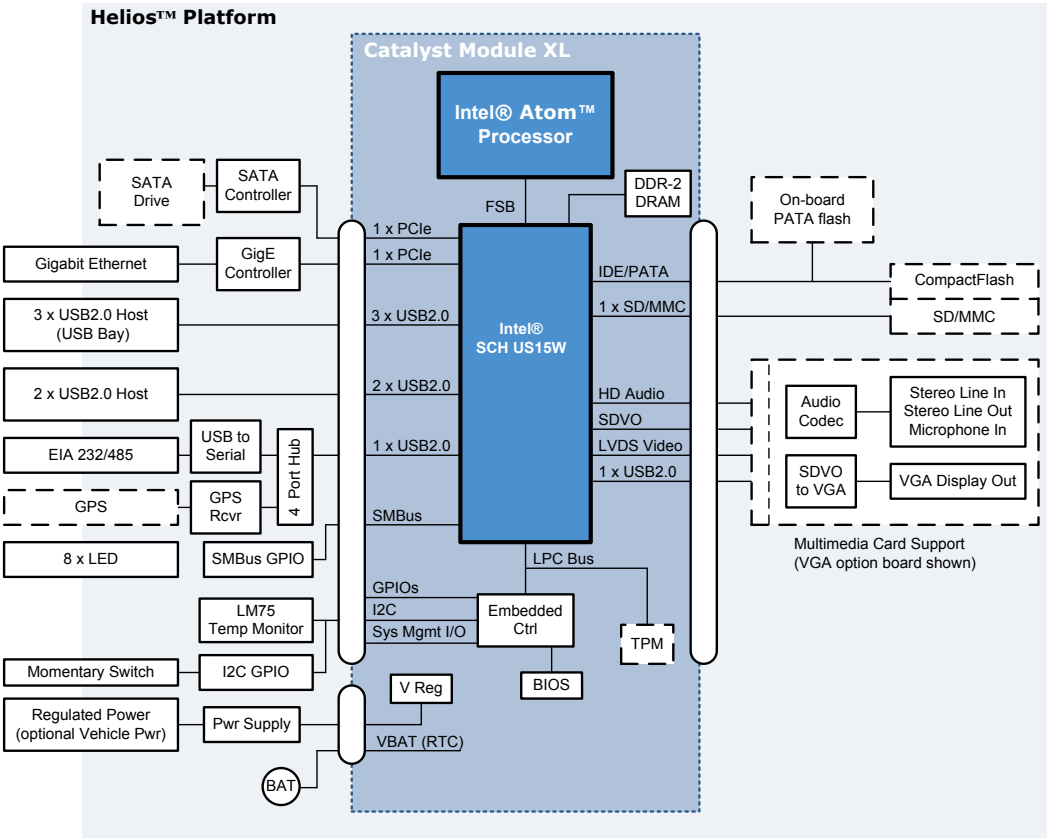
Introduction

Helios™ is a programmable edge controller that provides a flexible application-ready hardware platform with enhanced wireless capabilities. It is based on the Catalyst Module which integrates with a base board and supporting peripheral devices. All electronics are housed in an enclosure. Three USB host ports for wireless devices and additional storage are accessible in the USB Bay located under the removable cover.

With the Helios platform, you can quickly and easily create an edge controller device, loaded with your application software that precisely meets your requirements. Several options are available allowing you to choose the hardware based on your specifications. Using pre-certified wireless modules in the USB Bay, the Helios platform can be easily customized for any network. Software support includes Eurotech's Everyware™ Software Framework (ESF) offering simple to use APIs.

Block Diagram

The following diagram illustrates the system organization of the Helios platform. Notice that the data connector on the Catalyst Module has been divided into two sections for this illustration. Dotted lines indicate configuration options. For information about these options, see Configurations, page 17.



Features

Processor

- Catalyst Module
  - Intel® Atom™ processor at 1.1 GHz (up to 1.6 GHz options)
  - Intel® System Controller Hub US15W
  - 512 MB DDR-2 DRAM (up to 2 GB options)
  - Battery-backed real-time clock

Memory

- CompactFlash® card or SD card (option)
- On-board PATA flash (option)
- Internal SATA drive (option)
- External USB disk drive support

Communications

- Five USB 2.0 host ports operating low, full, and high speeds
  - Two general-purpose ports
  - Three USB Bay ports for wireless devices and storage (option for up to three external antenna connections)
- EIA-232 or EIA-485 serial port (software-selectable)
- Gigabit Ethernet port
- GPS with external antenna connection (option)

User Interface and Display

- Multimedia card support for display and audio options
  - VGA options board (currently available)
    - VGA display out
    - Stereo line output and stereo line input
    - Mono microphone input
  - (For additional options boards, see Multimedia Cards, page 18.)
- Eight software-controlled LED status indicators
- Software-readable push-button

Power Supply

- 12 V DC power input (up to 36 V vehicle power input option)
- Power management support capable of operation at < 3W

Mechanical

- ABS plastic and aluminum enclosure

Further Reading

This document describes the Helios platform and is intended for system integrators. A system-level overview is provided in the following sections. The following documents are also important resources for developing applications for the Helios platform.

Document	
Helios Platform Dev Kit Quick Start	110124-3003
Helios Platform Dev Kit with VGA option Quick Start	110124-3004

Check the Eurotech support site (http://support.eurotech-inc.com/) for errata reports and for the latest releases of these documents.

Handling Your System Safely

Anti-Static Handling

The Helios platform is designed to meet the Electrostatic Discharge (ESD) criteria contained in IEC 61000-4-2 (*EMC – Part 4-2: Testing and Measurement Techniques – Electrostatic Discharge Immunity Test*). The electronics included in the enclosure contain CMOS devices that could be damaged by electrostatic discharge (ESD). Observe industry-standard electronic handling procedures when handling these electronics. Where possible, work on a grounded anti-static mat. At a minimum, touch an electrically grounded object before handling any electronics.

Packaging

Please ensure that, should a system need to be returned to Eurotech, it is adequately packed, preferably in the original packing material.

Electromagnetic Compatibility

The Helios platform is defined as an unintentional radiator of electromagnetic energy. For additional information about the EMI/EMC specification, see EMI/EMC, page 23.

Conventions

The following table lists the symbols used in this document.

Symbol	Explanation
	Note – information that requires your attention
	Warning – proceeding with a course of action may damage your equipment or result in loss of data

The following table describes the conventions for signal names used in this document.

Convention	Explanation
GND	digital ground plane
+	positive signal in differential pair
-	negative signal in differential pair

The following table describes the abbreviations for direction and electrical characteristics of a signal used in this document.

Type	Explanation
I	signal is an input to the system
O	signal is an output from the system
IO	signal may be input or output
P	power and ground
nc	no connection
reserved	use is reserved to Eurotech

Software Support

Eurotech provides an application-ready platform including BIOS, operating system, and development environment. This section gives a brief description of the software support available for the Helios platform. For additional details, contact your local Eurotech technical support.

Operating System

The Helios platform is available with the following operating systems:

- Wind River Linux 3.0
- Windows® Embedded Standard
- Windows CE 6.0

BIOS

The Helios platform incorporates a custom system BIOS developed by Eurotech.

Boot Options

The Helios platform has the capability to boot and install the operating system from five sources. The following are the boot options:

- CompactFlash card
- USB disk drive
- SD card
- SATA drive
- On-board PATA flash

Everyware™ Software Framework

Everyware Software Framework (ESF) is an inclusive software framework that puts a middleware layer between the operating system and the OEM application. It provides industry-standard interfaces that shorten development time, simplify coding, and allow software to be ported from one Eurotech hardware platform to another. ESF is available on the Helios platform.

For information about ESF, refer to the Eurotech website (http://www.eurotech.com).

Getting Started

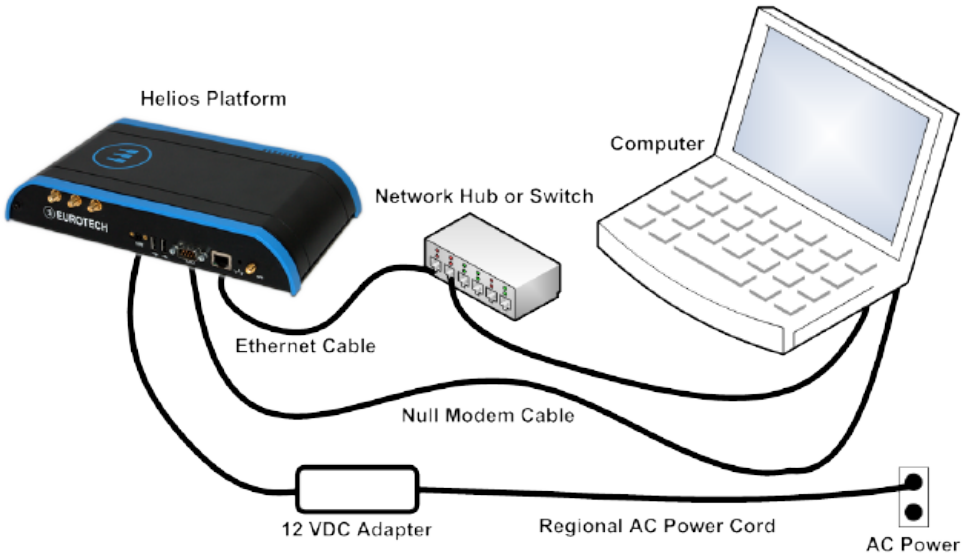
The Helios platform is configured to acquire its network address automatically using Dynamic Host Configuration Protocol (DHCP). This section describes how to determine this address before you begin development.

Components

To get started, you will need the following components:

- Helios platform
- Power supply (12 VDC adapter and regional AC power cord)
- Null modem cable (DB9FF)
- Ethernet cable
- Computer with EIA-232 serial port, terminal emulation program, network connection, and SSH client program
- DHCP server

Connectivity



To determine the network address, complete the following steps:

1. Connect any available serial port of the computer to the EIA-232 serial port using the null modem cable.
2. Open a terminal emulation program on the computer with the following port settings:

Baud rate:	9600
Data bits:	8
Parity:	none
Stop bits:	1

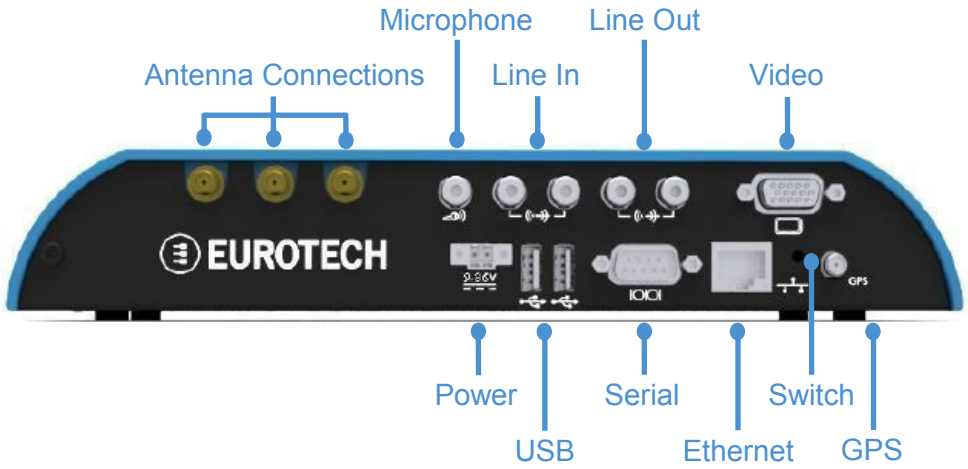
3. Connect your network cable to the Ethernet socket.
4. Connect the 12 VDC adapter to the DC power input.
5. Connect the 12 VDC adapter to AC power.
   The power LED illuminates green when the adapter is connected. After several seconds, the operating system boots and the system sends console output to the terminal.
6. Retrieve the IP address displayed on the terminal.
   After the message “Bringing up interface eth0” is displayed, the IP address is given as “inet addr:”.
7. Use a SSH client program and the IP address to log in remotely.

Hardware Reference

This section gives an overview of the hardware features of the Helios platform. The overview includes location and function of connectors, indicators, and switches and details about the enclosure.

Rear Panel

The following diagram illustrates the location of connectors and switches on the rear panel. Notice that the system shown uses the VGA options board and includes additional connectors not found on the standard system. For other multimedia card options, see Multimedia Cards, page 18.



Standard system

The following table describes the connectors on the rear panel of a standard system.

Connector	Enclosure Connector	Description
Antenna 1-3	Device dependent	USB device external antenna connections
Power	1 x 2 header, 3.5 mm	Main power input
USB 1-2	USB Type A receptacle	USB 2.0 host ports
Serial	DB-9 plug	EIA-232 (default) or EIA-485
Ethernet	RJ-45 socket	Gigabit Ethernet network
GPS	SMA socket	GPS external antenna connection

VGA Option

The following table describes the additional connectors on the rear panel of a system that includes the VGA options board.

Connector	Enclosure Connector	Description
Microphone	RCA jack	Mono microphone input
Line In	RCA jack	Stereo line in
Line out	RCA jack	Stereo line out
Video	DE-15 socket	VGA video output

Connectors

The following tables describe connectors that do not follow an industry-standard pinout.

Power Input

Connector: 2-pin header, 3.5 mm, Phoenix Contact 1937318
Mating connector: 2-pin plug, Phoenix Contact 1847055

The Helios platform accepts input power from a regulated external supply. For details about input power options, see Power Supply, page 19.

Pin	Name	Type	Description
1	GND	P	ground
2	VIN	PI	12 V (nominal) power input

Serial Port

Connector: DB9 plug
Mating connector: DB9 socket

By default the Helios platform provides an EIA-232 serial port. As a software-controlled option, this port can be configured for EIA-485 operation.

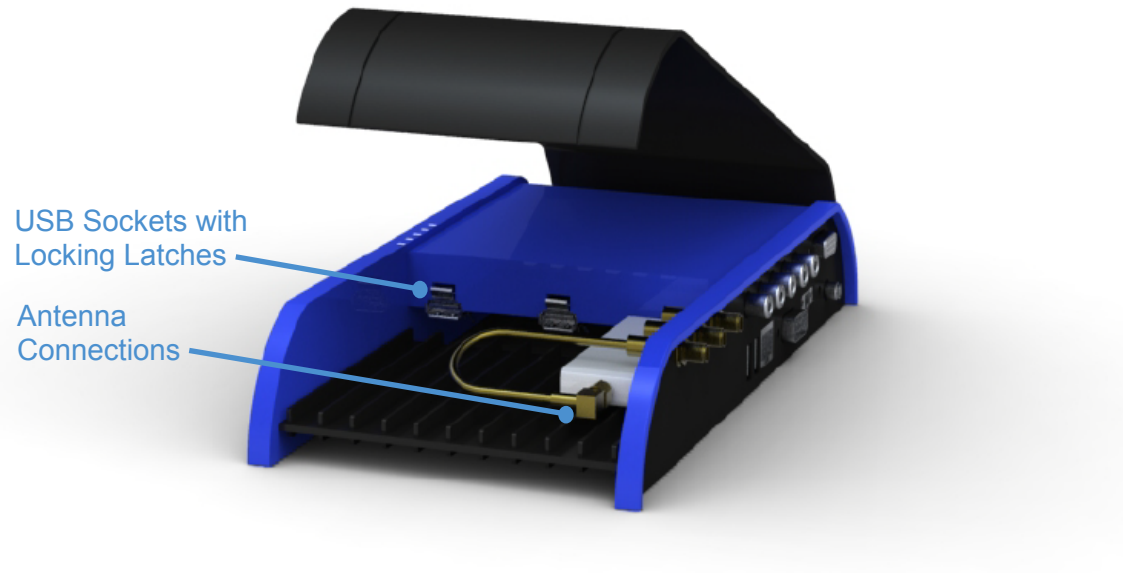
Pin	EIA-232 (default)			EIA-485		
	Name	Type	Description	Name	Type	Description
1	DCD	I	Data Carrier Detect	RX+	I	Receive Data +
2	RXD	I	Receive Data	RX-	I	Receive Data -
3	TXD	O	Transmit Data	TX-	O	Transmit Data -
4	nc			TX+	O	Transmit Data +
5	GND	P	ground	GND	P	ground
6	nc			nc		
7	RTS	O	Request To Send	nc		
8	CTS	I	Clear To Send	nc		
9	nc			nc		

Boot Mode Switch

The Helios platform includes a momentary push-button switch accessible through a small hole on the rear panel near the GPS connector. This switch generates an interrupt to the processor and is software-definable.

USB Bay

The following diagram illustrates the location of connectors inside the USB Bay.



The three USB 2.0 host ports located in the USB Bay permit use of wireless USB devices inside the enclosure. These ports use USB sockets with locking latches preventing accidental disconnects or lost connections due to vibration. Each USB port includes a corresponding connection for an external antenna. The type of connection is dependent on the USB device used.

Some USB devices will not fit in the USB Bay or require cabling external to the enclosure. For these types of devices, cables for the USB interface can plug into the locking sockets in the USB Bay and then pass through the larger external cooling vents in the bottom of the USB Bay cover. A CAN interface is one example of such a device. For additional information about the enclosure, see Enclosure, page 16.

Warning: Do not forcibly pull on the USB device to disconnect. Raise the latch on the socket to remove the device.

Indicators

The Helios platform has eight red/green/yellow light-emitting diodes (LEDs) that are software-controlled. The following diagram illustrates the location of the LEDs. The LEDs are visible to the operator on two sides of the enclosure.

The following table describes the LEDs on the enclosure.

LED	CR (note 1)	Description	Device	Controller Red Signal	Green Signal
1	8	Serial activity	USB UART IC	CBUS4	CBUS3
2	1	Power	SMBus GPIO	P1	P0
3	2	Software-definable	SMBus GPIO	P3	P2
4	3	Software-definable	SMBus GPIO	P5	P4
5	4	Software-definable	SMBus GPIO	P7	P6
6	5	SATA activity	SATA Controller		LED0
			SATA Controller		LED1
7	6	Software-definable	I2C GPIO	P1	P0
8	7	SD card activity	SMBus GPIO	P2	
			SCH US15W		SLOT0_LED

Note:

1. CR refers to the reference designator located on the base board.

LED2 indicates system power. By default, LED2 is illuminated green when power is applied.

Enclosure

The Helios platform is housed in an enclosure 25.9 x 12.1 x 4.5 cm (10.2 x 4.75 x 1.75 inches) in size, as shown in the following diagram.

This enclosure includes the following features:

- ABS plastic
- Adaptable I/O side plates
- Removable USB Bay cover
  - Accommodates USB devices with length up to 3.5 inches
  - Includes security screws to secure the cover to the enclosure
  - Uses 7/64-inch hex key to open the cover
- Aluminum base plate
  - Provides various mounting options
  - Supports thermal management
- External cooling vents
  - Allows cooling by an external fan
  - Provides openings for routing cables external to the enclosure

Note: To open the USB Bay, use the 7/64-inch hex key supplied with the development kit.

Configurations

The Helios platform's flexible design enables several options supporting many possible combinations to meet your system requirements. These options are factory-installed, and the system is configured for operation at the factory with the specific combination of options. This section describes the options available for the Helios platform.

Processor

The Helios platform bases its architecture on the high-performance, low-power Catalyst Module. This module is available in various versions based on the following features:

- Processor speed
- On-module DRAM
- Operating temperature

The standard system includes a 1.1 GHz, 512 MB Catalyst Module XL for the industrial temperature range. For the various performance variants, see Processor, page 21.

Memory

Five types of memory provide mass storage options for the Helios platform. In addition, the system can boot from any of these memory options. For information about boot options, see Boot Options, page 9. The following sections describe the memory options.

CompactFlash® Card or SD Card

As an option, the Helios platform can include a CompactFlash® card or Secure Digital/MultiMedia (SD/MMC) card. Both media provide mass storage in a wide variety of capacities. Each type of card is located internal to the enclosure and is not accessible when the system is completely assembled.

Note: The CompactFlash card option is mutually exclusive with the SD card option. Only one card can be installed.

On-Board Flash

On-board PATA flash is available as an option populated in increments of 1 GB.

SATA Drive

As an option, the Helios platform can include a single, 2.5-inch form factor SATA drive internal to the enclosure. For SATA drive specifications, see SATA Drive, page 23.

USB Disk Drive

A USB disk drive can connect to any of the five USB host ports on the Helios platform.

Communications

A key capability of the Helios platform is its network and wireless connectivity. The system offers five USB host ports, an EIA-232/485 serial port, a Gigabit Ethernet port, and GPS. The following sections describe these interfaces.

Universal Serial Bus

Five Universal Serial Bus (USB) ports included on the Helios platform support connectivity with a wide range of available USB devices. All ports support the USB 2.0 specification operating at low, full, and high speeds. For power requirements, see Power, page 21. Two ports are general-purpose USB host ports accessible on the rear panel, while the remaining three ports are located in the USB Bay. For additional information about these USB ports, see USB Device Support, page 20.

Serial Port

The Helios platform provides a serial port accessible on the rear panel. By default, this port is an EIA-232, 6-wire interface. Under software-control, the port can be configured as an EIA-485 interface.

Ethernet

For network connectivity, the Helios platform includes a Gigabit Ethernet port.

GPS

The standard system includes a “u-blox” GPS module with an external antenna connection on the rear panel. This module is a population option.

Multimedia Cards

To provide custom display and audio solutions, the Helios platform includes an internal card slot for add-in multimedia cards. This hardware flexibility enables the Helios platform to support a wide variety of display types and audio requirements.

Display Output

The Helios platform supports the following display output options:

- VGA with max resolution of 1366 x 768 (currently available)
- CVBS, S-Video, or HDTV
- HDMI
- DVI-D
- LVDS with 24-bit color, touch screen (4, 5, or 8-wire), and backlight

Note: The VGA options board is currently available. Other boards will be available as future options.

Audio Interface

The multimedia card slot includes an Intel HD Audio interface to support an audio codec on the add-in card. The Intel HD Audio specification defines an industry-standard interface for implementing high quality audio in an embedded environment.

Currently, the VGA options board provides the following audio capabilities:

- Stereo line output and stereo line output
- Mono microphone input

For electrical specifications, see Audio Interface, page 23.

Power Supply

The standard system requires a regulated DC power input. As an option, the Helios platform can be powered from vehicle rated power. For power specifications, see Power, page 21.

Peripherals

Support for a wide variety of plug-in USB devices enables the Helios platform to be easily customized for any application. This section describes the types of peripherals available for use with the Helios platform.

USB Device Support

The three USB ports located in the USB Bay expand the capability and connectivity of the Helios platform, in addition to providing the option to boot from a USB device. These ports enable customization for your specific application with no hardware modifications to the system.

The Helios platform supports the following types of USB devices:

- Cellular modem
- ZigBee
- Wi-Fi
- Bluetooth
- Telematics / CAN
- Mass storage
- HID (Human Interface Device)

For additional information about the USB Bay, see USB Bay, page 14.

Eurotech has pretested and approved several USB devices for use with the Helios platform. For the latest list of devices, contact your local Eurotech sales representative.

System Specification

Processor

The Helios platform is based on the Catalyst Module and is compatible with all versions of the module allowing several performance variants. The following table specifies the processor performance.

Parameter (note 2)	Min	Typ.	Max	Units
Processor operating frequency (commercial)	1100		1600	MHz
Processor operating frequency (industrial)	1100		1330	MHz
Front side bus clock	400		533	MHz
Front side bus width		64		bit
On-board DDR-2 DRAM	512		2000	MB

Notes:

2. The standard system includes a 1.1 GHz, 512 MB Catalyst Module XL for the industrial temperature range.

Power

Power Supply

The following table specifies the power requirements for the Helios platform. For additional information about the input voltage options, see Power Supply, page 19.

Symbol	Parameter	Min	Typ.	Max	Units
Input Voltage, Standard Application					
VIN	Input voltage	10.8	12	13.2	V
VIN_{TRANS}	Input transient voltage			36	V
Input Voltage, Vehicle Application					
VIN	Input voltage (note 3)	9		36	V
VIN_{TRANS}	Input transient voltage			100	V
USB					
I_{USB}	USB current (note 4)			1	A

Notes:

3. The Helios platform is designed to be unpowered when vehicle ignition is off.
4. The total current drawn from all USB ports must be less than 3 A.

Power Consumption

The following table lists power consumption for various configurations of the Helios platform.

Symbol	Parameter	Min	Typ.	Max	Units
Fully loaded, without USB (note 5)					
P	Power		12		W
I_{INRUSH}	Inrush current			17	A
Fully loaded, with USB devices (note 6)					
P	Power		15		W
I_{INRUSH}	Inrush current			18	A

Notes:

5. Power consumption was measured on a Helios platform with a VGA options board and the following conditions: 12 V input voltage, video and audio clips playing from a SATA drive, Ethernet port pinged, serial port transferring a file in 1K XMODEM at 115200 baud, and GPS unit responding consistently.
6. Power consumption was measured on a Helios platform with a VGA options board and the following conditions: 12 V input voltage, Belkin Wi-Fi device enabled and playing a video, Verizon cellular modem enabled, video and audio clips playing from a SATA drive, Ethernet port pinged, serial port transferring a file in 1K XMODEM at 115200 baud, and GPS unit responding consistently.

Electrical

This section provides electrical specifications for the Helios platform.

Real-Time Clock

The Helios platform provides a RTC function that retains the system date and time. To supply backup power when the power input is disconnected, the system includes a long-life, lithium coin battery. The following table specifies the RTC function.

Parameter	Typ.	Units
Accuracy per month @ 25°C	+/-55	sec
Battery	3	V
Operating temperature	-30 to +80	°C

Warning: The RTC battery is located under the Catalyst Module and is not user serviceable. Incorrect removable of the module or battery could damage the Catalyst Module.

Audio Interface

The VGA options board includes an IDT 92HD71B8 4-channel HD audio codec providing an audio option for the Helios platform. For additional information, see Multimedia Cards, page 18.

Symbol	Parameter	Min	Typ.	Max	Units
D_{VDD}	Codec digital supply voltage		3.3		V
A_{VDD}	Codec analog supply voltage		3.3		V
f_S	Sample rate		192		kHz
---	A/D sample resolution		24		bit
Line In, Microphone					
V_{IN}	Full scale input voltage	1.00	1.03		V_{rms}
$Gain_{IN}$	Microphone boost	0		30	dB
R_{IN}	Input impedance		50		kΩ
C_{IN}	Input capacitance		15		pF
Line Out					
V_{OUT}	Full scale output voltage	0.707	0.758		V_{rms}
P_{UT}	Headphone output, 32Ω load	31	42		mW (peak)

SATA Drive

The following table lists the specification for the optional SATA drive. For additional information, see SATA Drive, page 17.

Parameter	Min	Typ.	Max	Units
Transfer rate (SATA2)			300	MBps
Power consumption (seek)			3	W
Power consumption		1		W

EMI/EMC

The Helios platform is designed to meet the EMI/EMC requirements listed in the following table. The external USB wireless devices are covered by separate qualifications.

Requirement	Characteristic	Condition/Comments
EN 55022/CISPR22	Emissions	Sub-clause 8.2 - EN 55022/CISPR 22 for class B device - Radiated emissions for 30 MHz – 1 GHz
EN 55022/CISPR22	Immunity	Sub-clause 9.3 - EN61000-4-2 - Electrostatic discharge. Sub-clause 9.2 - EN 61000-4-3 - Radiated immunity
FCC CFR47 Part 15/B	Emissions	Rules 15.101-109

Environmental

The Helios platform is designed to meet the environmental specifications listed in the following table.

Parameter	Specification
Operating temperature (note 7)	-40°C to +85°C
Vibration profile	SAE J1455-2006, vehicle
Shock	Mil-Std-810F, 20 g/s, 11 ms
Drop	1 m, hard surface, cosmetic damage only
Humidity	95% non-condensing
Ingress protection (IEC 60529)	IP-50 (note 8)

Notes:

7. Operating temperature is 0°C to 70°C for the 1.6 GHz option.
8. Enclosure protects electronics from dust. It does not protect against water ingress.

Appendix A – Reference Information

Product Information

Product notices, updated drivers, support material:

www.eurotech.com

Intel

Information about the Intel Atom processor, Intel System Controller Hub US15W, Intel High Definition Audio specification:

www.intel.com

USB

Universal Serial Bus specification and product information:

www.usb.org

SD Card

SD Card Association and SDIO specification:

www.sdcard.org

MMC Card

JEDEC MMC 4.0 specification:

www.jedec.org

CompactFlash

CompactFlash Association and specification:

www.compactflash.org

Appendix B – System Revision

This manual applies to the current revision of the Helios platform as given in the following sections.

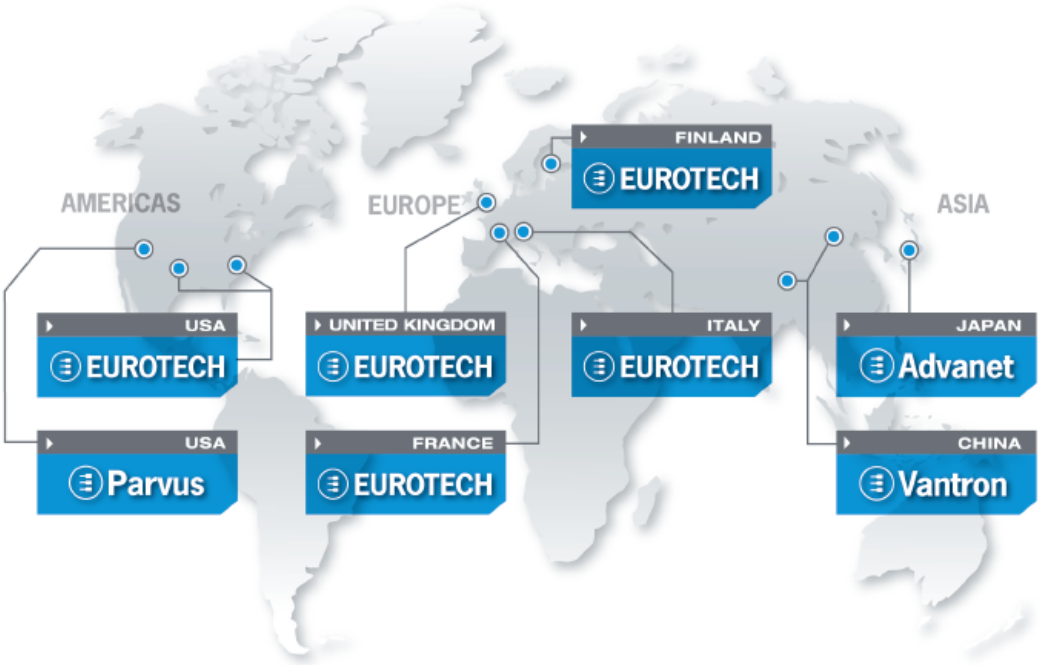
Revision History

The following is an overview of the revisions to the system.

Revision 1

Prototype

Eurotech Worldwide Presence



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