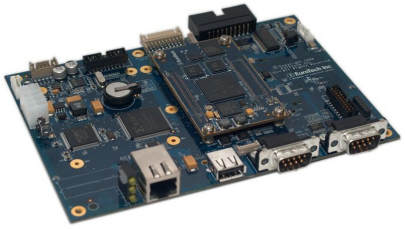
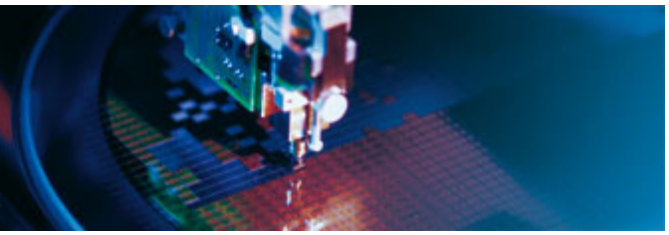
USER MANUAL





Turbo G5

Development System

Rev A – July 2011 – 110122-8101A

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Revision History

Issue no.	*PWB*	*Date*	*Comments*
1		Jan-2009	Preliminary release
A		Jul-2011	Initial release

For contact details, see page 30.

Contents

1 Introduction

1.1 Overview

The Turbo G5 is a full-featured, general-purpose computing module based on the Freescale™ i.MX31 multimedia applications processor. An application-specific carrier board integrates with the Turbo G5 module for a complete system. With unique customization capabilities, the processor module integrates readily with a wide range of carrier boards to meet customers' specific design requirements.

This manual describes the Turbo G5 development system, which includes the Turbo G5 module, the Eurotech carrier board, and supporting peripheral devices and applies to the current revision of the boards. See Section 2 for a list of system components and Section 7 for revision history.

1.2 Features

1.2.1 Processor

- i.MX31 processor based on the ARM1136JF-S™ core
- Multi-level cache system
- Vector floating point coprocessor
- Video acceleration (encode)
- Integrated 2D/3D processing unit with OpenGL support
- Clock rates up to 532 MHz

1.2.2 Power Supply

- 5 V main power input
- Backlight power input

1.2.3 Memory

- Module memory [1]
  - 128 MB mobile DDR
  - 32 MB NOR Flash memory
- Carrier board memory[2]
  - 128 MB NAND Flash memory
- External memory support
  - CompactFlash®, Type I and II, 3.3 V
  - SD/MMC card
  - USB disk drive
- Battery-backed real-time clock

[1] A 256 MB mobile DDR configuration and a 64 MB NOR Flash configuration are available as volume production options.

[2] Larger memory configurations are available as a volume production option.

1.2.4 Communications

- Up to two Universal Serial Bus ports[3]
  - One USB Host port supporting high, full, and low speeds
  - One USB Client/OTG port[4]
- Up to five serial ports[3]
  - Serial 1: 9-wire, EIA-232 or optional 3.3 V
  - Serial 2: 5-wire, EIA-232
  - Serial 3: 3-wire, 3.3 V for GPS module receiver support
  - Serial 4: optional 5-wire, 3.3 V for cellular wireless module support
  - Serial 5: 5-wire, 3.3 V for ZigBee® module support
- Up to two Secure Digital/MultiMediaCard interfaces[3]
  - One SD/MMC interface
  - Optional second SD/MMC interface
- 10/100 Mbps Ethernet
- Serial Peripheral Interface (SPI)
- CAN 2.0B interface
- I^2C bus with I^2C master device
- CompactFlash
- Optional 802.11b/g

1.2.5 User Interface and Display

- Flat panel interface
- Backlight interface with PWM and on/off control
- Resistive touch panel interface, four-wire or five wire
- Camera Sensor Interface (CSI)

1.2.6 Input and Outputs

- Keypad interface
  - Up to an 8x8 keypad with optional general-purpose inputs/outputs
- Seven general-purpose inputs and outputs
  - Optional PWM output
  - Optional 1-wire interface
- Three software-controlled LEDs
- One digital output
- Five digital inputs

---

[3] The Turbo G5 module supports optional hardware interfaces. See Section 1.4 for a description of the volume production options.

[4] The USB Client/OTG port can be replaced by a second USB Host port as a volume production option.

1.2.7 Audio Interface

- AC '97 compatible codec
- Microphone input
- Stereo speaker output
- Stereo Line in and Line out

1.2.8 Mechanical

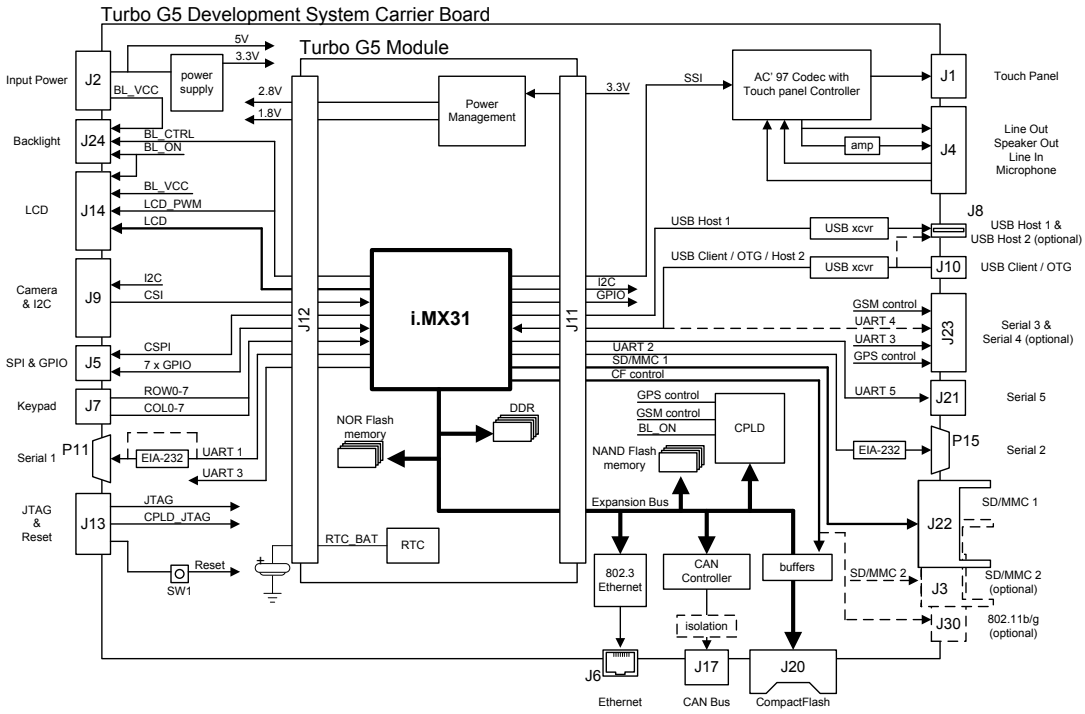
- EPIC size (165 mm x 115 mm)

1.3 Block Diagram

The following diagram illustrates the system organization of the Turbo G5 development system. Arrows indicate the direction of control and not necessarily signal flow. Reference designators shown are for the carrier board.

Notice that the Turbo G5 module provides two local power supplies, 1.8 V and 2.8 V, to the carrier board. Each signal from connector J11 and connector J12 belongs to one of the two power domains. The block diagram does not show the voltage level shifting circuitry that is included on the carrier board.

In addition, the Turbo G5 module supports optional hardware interfaces that are shown with dotted lines. See Section 1.4 for a description of the volume production options.



1.4 Hardware Interface Options

The design of the Turbo G5 module enables integration with a wide range of application specific carrier boards. The Eurotech development system carrier board is available in its standard configuration and volume production options. The standard configuration includes all interfaces enumerated in this manual. Each volume production option includes an alternate function in place of a standard function. The following table lists the mutually exclusive interfaces.

Standard	Production Option
CompactFlash	SD/MMC 2
USB Client/OTG	USB Host 2

The Serial 4 option is available in both the standard configuration and production options. This interface can be used instead of the USB Client/OTG/Host 2 capability. Selection of the Serial 4 option is software-controlled. The default for standard Turbo G5 development systems is a USB Client port.

1.5 Support Products

The Turbo G5 development system supports the following optional add-on modules:

- ZigBee Module (ZM1)

  The ZM1 is a direct plug-in option that provides ZigBee and IEEE 802.15.4 compatible wireless connectivity. This module connects to socket J21.

- ZEUS Modem-*n*

  The ZEUS Modem-*n* products are low-profile modules that provide GPS functionality and cellular wireless connectivity. These modules connect to header J23. The GPS function uses Serial 3 with the corresponding GPS control signals, while the cellular wireless connection requires the optional Serial 4 port and corresponding GSM control signals. Notice that the Serial 4 port and USB Client/OTG/Host 2 port are mutually exclusive.

- Optional 802.11b/g wireless module

Contact your local Eurotech technical support for additional information about the optional add-on modules.

2 Getting Started

2.1 Development Systems

Turbo G5 development systems are designed to get the developer up and running quickly.

To use the system, simply plug the power supply into the receptacle on the system.

If the screen does not display anything after five to ten seconds, check the *Frequently Asked Questions* in Section 2.2. Most operating systems cold boot within twenty seconds.

2.1.1 System Components

A typical BitsyX development system is shown at right. The Turbo G5 development system conforms to the same format. It consists of the following components:

- Carrier board with a Turbo G5 module installed
- Flat panel display and cable
- Backlight inverter and cable
- Touch panel and cable
- 100-240 VAC power adapter
- Plexiglas mounting
- Developer's Cable Kit including
  - DB9F/F null modem cable
  - USB A-B cable
  - USB Client adapter
- Operating system of your choice
- User's Guide (this document and operating system guide)

Please make sure you have received ***all*** the components before you begin your development.

2.2 Frequently Asked Questions

The following are some of the most commonly asked questions about development systems:

Q: When I plug in power, my screen is white and nothing comes up on it.

A: Check the connector seating. The flat panel connector may have come loose in shipping. Press it firmly into the panel and reapply power to your system.

Q: Do I have to turn off the system before I insert a CompactFlash card?

A: No. The Turbo G5 supports hot swapping of CompactFlash cards. Consult the operating system documentation for details.

Q: Do I need to observe any ESD precautions when working with the system?

A: Yes. Where possible, work on a grounded anti-static mat. At a minimum, touch an electrically-grounded object before handling the board or touching any components on the board.

Q: What do I need to start developing my application for the system?

A: You will need a flash ATA card (32 MB or larger, 128 MB recommended), SD/MMC card, or USB disk drive and the cables supplied with your system to interface your development station to the system. For further direction, consult the Eurotech guide for the installed operating system.

Q: Who can I call if I need help developing my application?

A: Eurotech provides technical support to get your development system running. For customers who establish a business relationship with Eurotech, we provide support to develop applications and drivers.

Q: Is there online support?

A: Yes. Information about the Turbo G5 hardware and software is available on the Eurotech support site at http://www.eurotech.com.

Q: Can I upgrade the version of the operating system?

A: Yes. Eurotech provides regular operating system updates on its developers' web site. For operating systems not maintained by Eurotech, contact the operating system vendor.

Q: I would like to interface to a different display panel. How can I do this?

A: Eurotech may have already interfaced to the panel of which you are interested. Consult Eurotech for availability.

3 Hardware Reference

This section gives an overview of the hardware features of the Turbo G5 development system. The overview includes a description including location and pinouts of the switches, indicators, and connectors.

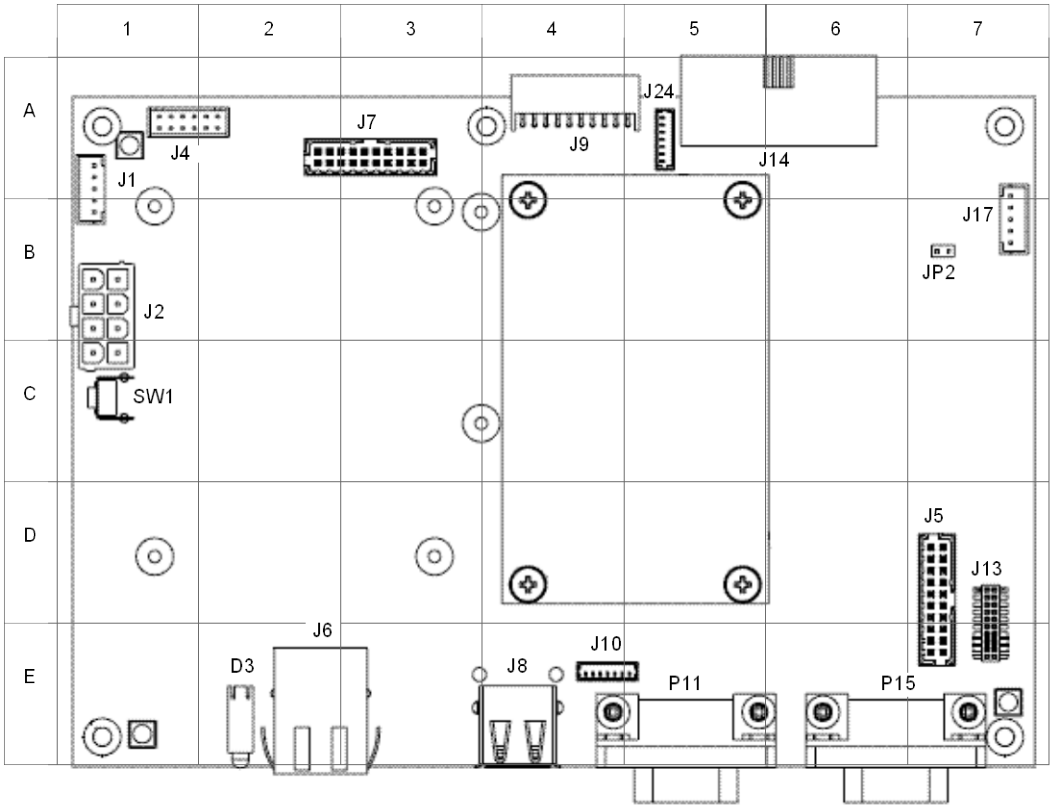
3.1 Identifying Connectors

This section describes the location and numbering of headers and connectors.

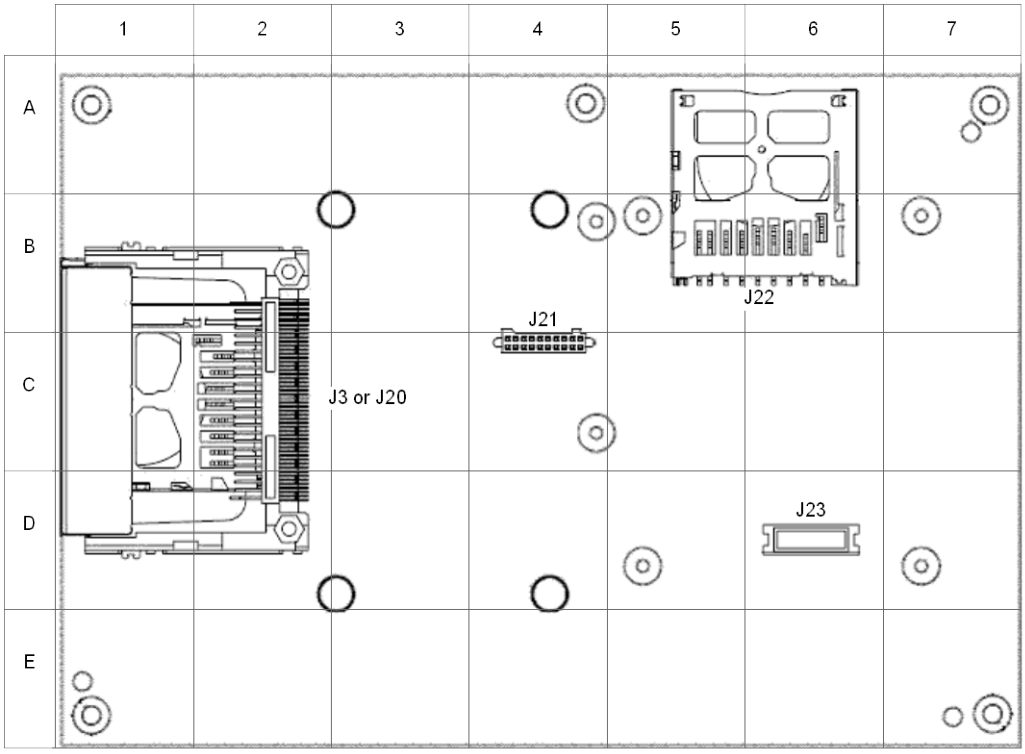
3.1.1 Locating Connectors

The diagrams in this section illustrate the location of key components on the Turbo G5 development system. Component locations given in this section refer to these diagrams.

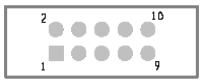
The following diagram illustrates the component side of the carrier board. The Turbo G5 module is located in the center of the carrier board. Two connectors, J11 and J12, lie under the module. Components are located based upon the grid overlay. For example, switch SW1 lies at location C1, and header J14 covers A5 through A6.



Several connectors are located on the bottom side of the carrier board as illustrated in the following diagram.



3.1.2 Determining Pin Numbers



The pins of headers and connectors on Eurotech products are numbered sequentially. Most double-row headers place even pins on one side and odd pins on the other. The diagram at right indicates how pins are numbered on most headers, as seen from the component side of the board[5].

Connectors J2, J11, and J12 are exceptions and do not follow this numbering. Connector J2 is an 8-pin header. This header places pins 1 to 4 on one side and pins 5 to 8 on the other side. Connectors J11 and J12 are 140-pin headers. These headers place pins 1 to 70 on one side and pins 71 to 140 on the other side. On each side, there is a ground pin placed between every 10 pins. These ground pins are not included in the 140 actual signal pins and are indicated by a wider printed circuit board pad.

To locate pin 1 of a connector or jumper, try the following:

1. Look for a visible number or marking on the board that indicates connector pin numbering. A notch or dot usually indicates pin 1.

2. Look at the underside of the board. The square pad is pin 1.

[5] The component side of the Turbo G5 module is the one on which the processor and most large chips are populated. The component side of the carrier board is the one that mates to the module.

3.2 Switches, Controls, and Indicators

This section describes various switches, controls, and indicators on the Turbo G5 development system. The location indicated for each item refers to the grid diagram in Section 3.1.1.

3.2.1 SW1: Reset

Location on Board: C1

SW1 is the reset button for the Turbo G5 development system. Pressing SW1 issues a hardware reset to the i.MX31 processor and system peripherals. Press this button to restart the system without cycling power.

3.2.2 LED Indicators

The Turbo G5 development system has five onboard light-emitting diodes (LEDs) to indicate system operation. Three are software-controllable, while the two others indicate the status of Ethernet activity.

D3: Software-Controllable LEDs

Location on Board: E2

LED indicator D3 includes three yellow light-emitting diodes (LEDs). These LEDs are software-controlled.

Ethernet LEDs

Location on Board: E2-E3 (Ethernet socket J6)

The Ethernet LEDs indicate valid Ethernet connection, speed, and activity. The Ethernet socket J6 integrates the LEDs with the socket.

3.3 Signal Connectors

The following tables describe the electrical signals available on the connectors of the carrier board. Each section provides relevant details about the connector including part numbers, mating connectors, signal descriptions, and references to related sections.

The location indicated for each item refers to the grid diagram in Section 3.1.1. For details about how to determine pin numbers, see Section 3.1.2.

The following table describes the abbreviations and conventions used in the signal tables.

Legend	
GND	digital ground plane
/	active low signal
+	positive signal in differential pair
-	negative signal in differential pair
( )	alternate function

Each signal includes a column that describes the direction and electrical characteristics of the signal. The following table describes the abbreviations that specify the signal types.

Type	
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
A	analog signal
OD	open-drain
1.8	1.8 V signal levels
2.8	2.8 V signal levels
3.3	3.3 V signal levels
5	5 V signal levels

Some signals include termination on the Turbo G5 module or carrier board. The following table describes the abbreviations that specify the signal termination.

Termination	
PU	pull-up resistor to the specified voltage
PD	pull-down resistor

3.3.1 J1: Touch Panel

Board Connector: 5-pin wire-to-board header, 2 mm, Neltron 2417SJ-05-F4

Mating Connector: crimp housing, Molex 87369-0500 and crimp pins, Molex 50212

Location on Board: A1-B1

A touch panel connects to the Turbo G5 development system on header J1. This header provides the signals to support a 4- or 5-wire resistive touch panel. The configuration for 4- or 5-wire touch panels is software-controlled. All signals include EMI/RFI filtering.

Pin	Name	Type	4-Wire	5-Wire	Description
1	TSRY+/TR	AIO	top	UR	
2	TSRY-/BL	AIO	bottom	LL	
3	TSRX+/BR	AIO	right	LR	Touch panel
4	TSRX-/TL	AIO	left	UL	
5	WIPER	AI	-	wiper	

3.3.2 J2: Input Power

Board Connector: 8-pin mini fit header, 4.2 mm, Neltron 5566S-08

Mating Connector: receptacle housing, Molex 39-01-2085 and crimp pins, Molex 44476-1112

Location on Board: B1-C1

Header J2 accepts input power from external supplies. The 5V_IN is the main power input to the Turbo G5 development system. Other voltages required by the Turbo G5 module and peripherals are generated from the 5V_IN. The backlight power input, BACKLIGHT_VCC, is filtered and passed through to header J14 (Section 3.3.14) and header J24 (Section 3.3.20).

Pin	Name	Type	Description
1			
2	GND	P	ground
3			
4	BACKLIGHT_VCC	PI	Backlight power input
5			
6	5V_IN	PI	5V power input
7			
8	n/c		

3.3.3 J3: Optional SD/MMC 2

Board Connector: SD memory card socket, 2.5 mm, Molex 67913-0002

Mating Connector: SD/MMC card

Location on Board: B1-D2, bottom side

Socket J3 provides an optional second Secure Digital and MultiMediaCard (SD/MMC) interface. This socket is not installed on standard Turbo G5 development systems. Socket information is given for reference only.

The i.MX31 I/O pads multiplex the SD/MMC 2 function with the CompactFlash capability. Standard Turbo G5 development systems provide a CompactFlash interface (Section 3.3.16). As a volume production option, the carrier board can include the second SD/MMC interface in place of the CompactFlash interface.

3.3.4 J4: Line Out, Speaker, Line In, and Microphone

Board Connector: 12-pin header, 2 mm, Neltron 2417SJ-12-PHD

Mating Connector: housing, JST PHDR-12VS and pins, JST SPHD-002T-P0.5

Location on Board: A1-A2

The carrier board provides an audio interface on header J4 that includes a stereo line in, stereo line out, stereo speaker output, and microphone input.

Pin	Name	Type	Description
1	LINE_IN_L	AI	Line in, left channel
2	LINE_OUT_L	AO	Line out, left channel
3	AGND	P	Analog ground
4	AGND	P	Analog ground
5	LINE_IN_R	AI	Line in, right channel
6	LINE_OUT_R	AO	Line out, right channel
7	AGND	P	Analog ground
8	SPK_OUT_L	AO	Stereo speaker, left channel
9	MIC_VREF_OUT	P	Microphone bias
10	MIC_IN	AI	Microphone
11	SPK_OUT_R	AO	Stereo speaker, right channel
12	AGND	P	Analog ground

3.3.5 J5: SPI and GPIO

Board Connector: 2x10 shrouded header, 2 mm, Molex 87832-2020

Mating Connector: crimp housing, Molex 51110-2051 and crimp pins, Molex 50394

Location on Board: D7-E7

Header J5 includes external connections to the i.MX31 Serial Peripheral Interface (SPI) and seven i.MX31 general-purpose inputs and outputs (GPIO).

Pin	Name	Type	Description
1	V_3V3	PO	3.3 V power output
2	SPI_MISO	I-3.3	SPI receive data
3	SPI_SCK	O-3.3	SPI clock
4	SPI_MOSI	O-3.3	SPI transmit data
5	SPI_FRM	O-3.3	SPI slave select
6	POWER_EN	O-3.3	System power mode indicator
7	GND	P	ground
8	GND	P	ground
9	GPIO1_6	IO-1.8	GPIO
10	GPIO1_7	IO-1.8	GPIO
11	GPIO1_8	IO-1.8	GPIO
12	GPIO1_9	IO-1.8	GPIO
13	GPIO1_25	IO-1.8	GPIO
14	GPIO1_26	IO-1.8	GPIO
15	GPIO2_17	IO-1.8	GPIO

Pin	Name	Type	Description
16	GND	P	ground
17	n/c		
18	n/c		
19	n/c		
20	V_1V8	PO	1.8 V power output

3.3.6 J6: Ethernet

Board Connector: RJ-45 socket with LEDs, Pulse J0026D21BNL

Mating Connector: RJ-45 plug

Location on Board: E2-E3

Socket J6 supports a 10/100 Mbps Ethernet, RJ-45 port. Connector shields are tied to chassis ground.

3.3.7 J7: Keypad

Board Connector: 2x10 shrouded header, 2 mm, Molex 87832-2020

Mating Connector: crimp housing, Molex 51110-2051 and crimp pins, Molex 50394

Location on Board: A2-A3

The i.MX31 keypad port is provided on header J7. This port supports up to an 8x8 keypad. Signals that are not used by the keypad could be available as GPIOs.

Pin	Name	Type	Description
1 2	V_2V8	PO	2.8 V power output
3	KEY_COL0	IO-2.8	Keypad column (GPIO)
4	KEY_COL1		
5	KEY_COL2		
6	KEY_COL3		
7	KEY_COL4		
8	KEY_COL5		
9	KEY_COL6		
10	KEY_COL7		
11 12	GND	P	ground
13	KEY_ROW0	IO-2.8	Keypad row (GPIO)
14	KEY_ROW1		
15	KEY_ROW2		
16	KEY_ROW3		
17	KEY_ROW4		
18	KEY_ROW5		
19	KEY_ROW6		
20	KEY_ROW7		

3.3.8 J8: USB Host 1 and Optional USB Host 2

Board Connector: USB type A receptacle, Tyco Electronics 292303-1

Mating Connector: USB type A plug

Location on Board: E4

Socket J8 provides the signals for a USB 2.0 Host port operating at high, full, and low speeds. Connector shields are tied to chassis ground.

A second USB 2.0 Host port is available as a volume production option. This option and the USB Client/OTG capability on header J10 (Section 3.3.10) are mutually exclusive. With the two USB Host port option, header J10 is not installed and socket J8 is replaced by a USB type A dual stacked receptacle.

Pin	Name	Type	Description
1	USB_HOST_PWR	PO	DC power output
2	USB_HOST-	IO	USB Host 1
3	USB_HOST+		
4	HOST_GND	P	ground

3.3.9 J9: Camera and I²C

Board Connector: 2x10 connector, 2 mm, Neltron 2417RJ-20-PHD

Mating Connector: housing, JST PHDR-20VS and pins, JST SPHD-002T-P0.5

Location on Board: A4-A5

Connector J9 includes an external connection to the i.MX31 camera sensor interface (CSI) and i.MX31 I^2C bus. A standard system supports a 3.3 V interface. Volume production options for 1.8 V and 2.8 V are available.

Pin	Name	Type	Termination	Description
1	V_3V3	PO		3.3 V power output
2	V_CIF	PO		Camera power output (3.3 V, 2.8 V, or 1.8 V)
3	CIF_MCLK	O		CSI master clock
4	CIF_PCLK	I	PU 47kΩ V_CIF	CSI pixel clock
5	CIF_LV	I	PU 47kΩ V_CIF	CSI line sync
6	CIF_FV	I	PU 47kΩ V_CIF	CSI frame sync
7	CIF_D0	I	PU 47kΩ V_CIF	CSI data
8	CIF_D1	I	PU 47kΩ V_CIF	
9	CIF_D2	I	PU 47kΩ V_CIF	
10	CIF_D3	I	PU 47kΩ V_CIF	
11	CIF_D4	I	PU 47kΩ V_CIF	
12	CIF_D5	I	PU 47kΩ V_CIF	
13	CIF_D6	I	PU 47kΩ V_CIF	
14	CIF_D7	I	PU 47kΩ V_CIF	

Pin	Name	Type	Termination	Description
15	I2C_SCL	IO	PU 2.2kΩ V_CIF	I^2C clock
16	I2C_SDA	IO	PU 2.2kΩ V_CIF	I^2C data
17	CIF_D8	I	PU 47kΩ V_CIF	CSI data
18	CIF_D9	I	PU 47kΩ V_CIF	
19	GND	P		ground
20				

3.3.10 J10: USB Client/OTG

Board Connector: 7-pin header with friction lock, 1.25 mm, Molex 53047-0710

Mating Connector: wire-to-wire housing, Molex 51021-0700 and crimp pins, Molex 50058

Location on Board: E4-E5

Header J10 includes the signals for a USB Client/OTG port operating at high, full, and low speeds. The Turbo G5 development system supports either a USB Client/OTG port on header J10 or a volume production option for a second USB Host 2.0 port (Section 3.3.8). The default for standard Turbo G5 development systems is a USB Client port on header J10.

In addition, the i.MX31 I/O pads multiplex the USB Client/OTG/Host 2 capabilities with the Serial 4 function (Section 3.3.19). The Serial 4 option is available in both the standard configuration and production option. This interface can be used instead of the USB Client/OTG/Host 2 capability. Selection of the Serial 4 option is software-controlled.

Pin	Name	Type	Description
1	OTG_GND	P	ground
2			
3	USB_OTG+	IO	USB Client data
4	n/c		
5	USB_OTG-	IO	USB Client data
6	OTG_ID	I	(USB OTG ID)
7	USB_OTG_PWR	PI	DC power input used to sense connection

3.3.11 J11: Docking Connector: Expansion, SSI, I^2C, SD/MMC, USB, and Serial

Board Connector: 140-pin header, 0.5 mm, Hirose FX10A-140P/14-SV(91)

Turbo G5 Module Connector: 140-pin, 0.5 mm, Hirose FX10A-140S/14-SV(91)

Location on Board: B5-D6

The Turbo G5 module connector J1 mates to the carrier board connector J11.

3.3.12 J12: Docking Connector: Display, Backlight, CSI, SPI, Keypad, and Serial

Board Connector: 140-pin header, 0.5 mm, Hirose FX10A-140P/14-SV(91)

Turbo G5 Module Connector: 140-pin, 0.5 mm, Hirose FX10A-140S/14-SV(91)

Location on Board: B4-D4

The Turbo G5 module connector J2 mates to the carrier board connector J12.

3.3.13 J13: JTAG and Reset

Board Connector: 2x10 socket, 0.05-inch, Samtec SFMC-110-02-S-D

Location on Board: D7-E7

Socket J13 includes a hardware reset input, a JTAG interface to the i.MX31, and a JTAG interface to the CPLD on the carrier board. The JTAG interfaces are used during manufacturing for programming and debug or during software development; otherwise, the two interfaces are not supported for application use.

Pin	Name	Type	Termination	Description
1	/RESET_IN	I-2.8	PU 10kΩ 2.8 V	Hardware reset
2	/CPU_TRST	I		JTAG interface
3	CPU_TMS	I		
4	GND	P		
5	CPU_TCK	I		
6	GND	P		
7	CPU_TDI	I		
8	GND	P		
9	CPU_TDO	O		
10	GND	P		
11	RTCK	O		
12	VJTG	PO		
13	CPLD_TMS	I		
14	VUC	PO		
15	CPLD_TDO	O		
16	/DE	IO		
17	CPLD_TDI	I		
18	SJC_MOD	I		
19	CPLD_TCK	I		
20	UBOOT	I-1.8		reserved

3.3.14 J14: LCD

Board Connector: 4x10 shrouded header, 0.05-inch, Oupiin 3214-40GRB

Mating Connector: socket, Oupiin 1203-40GB

Location on Board: A5-A6

Header J14 provides a parallel interface to a liquid crystal display (LCD). The following table describes the signals included on the header. Signal names shown are for TFT active matrix color LCDs at 18 bit-per-pixel (bpp).

The Turbo G5 development system includes an adjustable display power supply and display signal voltage to support a wide variety of LCDs. Standard Turbo G5 development systems are configured for 5 V display power and signal voltage. A 3.3 V option is available as a volume production option.

Pin	i.MX31 Signal Name	Color Active TFT Display at 18bpp	
		Eurotech Signal Name	Description
1		BL_ON	3.3 V backlight on/off
2		BL_VCC	Filtered backlight power output
3		LCD_PWM	Open drain low-voltage adjust for contrast control of some displays
4		V_LCD_SW	5 V display power output
5		n/c	
6		n/c	
7		GND	ground
8		GND	ground
9	LD1	PNL_BLUE1	Blue data
10	LD0	PNL_BLUE0	
11	LD3	PNL_BLUE3	
12	LD2	PNL_BLUE2	
13	LD5	PNL_BLUE5	
14	LD4	PNL_BLUE4	
15		GND	ground
16		GND	ground
17	LD7	PNL_GREEN1	Green data
18	LD6	PNL_GREEN0	
19	LD9	PNL_GREEN3	
20	LD8	PNL_GREEN2	
21	LD11	PNL_GREEN5	
22	LD10	PNL_GREEN4	
23		GND	ground
24		GND	ground

Pin	i.MX31 Signal Name	Color Active TFT Display at 18bpp	
		Eurotech Signal Name	Description
25	LD13	PNL_RED1	Red data
26	LD12	PNL_RED0	
27	LD15	PNL_RED3	
28	LD14	PNL_RED2	
29	LD17	PNL_RED5	
30	LD16	PNL_RED4	
31		GND	ground
32		GND	ground
33	DRDY0	LCD_BIAS	Data enable
34		GND	ground
35	VSYNC3	LCD_FCLK	Vertical sync
36		GND	ground
37	HSYNC	LCD_LCLK	Horizontal sync
38		GND	ground
39	FPSHIFT	LCD_PCLK	Pixel clock
40		GND	ground

3.3.15 J17: CAN Bus

Board Connector: 5-pin wire-to-board header, 2 mm, Neltron 2417SJ-5-F4

Mating Connector: crimp housing, Molex 87369-0500 and crimp pins, Molex 50212

Location on Board: A7-B7

The Turbo G5 development system supports a direct connection to a CAN physical bus compliant with the CAN 2.0 specification[6]. The CAN 2.0B interface provided on header J17 includes a CAN transceiver and optional electrical isolation. The electrical isolation is a volume production option.

Pin	Name	Type	Description
1	CAN_PWR		5 V for optional isolation
2	CAN+	IO	CAN data
3	CAN_SCRN		shield
4	CAN-	IO	CAN data
5	CAN_GND	P	ground

[6] Additional information about the CAN 2.0 specification is available from the International Organization for Standards, http://www.iso.org/iso/home.htm.

JP2: CAN Termination

Type: 2-post header, 2 mm

Location on board: B7

Jumper JP2 connects a 124Ω termination resistor between the CAN+ and CAN – data lines.

Jumper setting	Configuration
1-2	124Ω termination
n/c	No termination

3.3.16 J20: CompactFlash

Board Connector: CompactFlash card socket, Type II, 3M N7E50-M516RB-50

Mating Connector: CompactFlash card

Location on Board: B1-D2, bottom side

The 50-pin CompactFlash socket J20 conforms to the CompactFlash standard for Type I and II cards operating at 3.3 V[7]. Notice that 5 V CompactFlash cards are not supported.

Important! The CompactFlash card must be "upside-down" in order to fit in socket J20.

The i.MX31 I/O pads multiplex the CompactFlash function with a second SD/MMC interface (Section 3.3.3). Standard Turbo G5 development systems provide a CompactFlash interface. As a volume production option, the carrier board can include the second SD/MMC interface in place of the CompactFlash interface.

3.3.17 J21: Serial 5

Board Connector: 2x10 socket, 1.27 mm, Harwin M50-4321005

Mating Connector: M50-4921005

Location on Board: C4, bottom side

Socket J21 provides a serial port at 3.3 V levels with optional ZigBee[8] compatible wireless connectivity. This socket directly supports the ZM1 module (Section 1.5). When used as a standard serial port, the signal /ZB_RST is available as a general-purpose output (GPO).

Pin	Name	Type	Termination	Description
1 2	V_3V3	PO		3.3 V power output
3 4	GND	P		ground
5	n/c			
6	/ZB_RST	O-3.3		GPOUT0 digital output
7	ZB_RXD	I-3.3	PU 47kΩ 3.3 V	Serial 5 receive data
8	ZB_TXD	O-3.3		Serial 5 transmit data

[7] The specification for CompactFlash is available from the CompactFlash Association, http://www.compactflash.org.

[8] ZigBee is a standards-based wireless technology optimized for remote monitoring and control applications. Additional information about ZigBee technology is available from the ZigBee Alliance, http://www.zigbee.org/.

Pin	Name	Type	Termination	Description
9	ZB_CTS	I-3.3	PU 47kΩ 3.3 V	Serial 5 clear to send
10	ZB_RTS	O-3.3		Serial 5 ready to send
11				
12				
13				
14				
15	n/c			
16				
17				
18				
19				
20				

3.3.18 J22: SD/MMC 1

Board Connector: SD memory card socket, 2.5 mm, Molex 67913-0002

Mating Connector: SD/MMC card

Location on Board: A5-B6, bottom side

Socket J22 supplies the signals for a Secure Digital and MultiMediaCard (SD/MMC) interface[9].

Pin	Name	Type	Description
1	SD1_DAT3	IO	SD/MMC 1 data
2	SD1_CMD	IO	SD/MMC 1 command
3	GND	P	ground
4	SD1_PWR	PO	3.3 V power output
5	SD1_CLK	O	SD/MMC 1 clock
6	GND	P	ground
7	SD1_DAT0		
8	SD1_DAT1	IO	SD/MMC 1 data
9	SD1_DAT2		

[9] The MMC 4.0 specification is available from the MulitMediaCard Association, http://www.mmca.org and a simplified version of the SDIO specification is available from the SD Card Association, http://www.sdcard.org.

3.3.19 J23: Serial 3 and Optional Serial 4

Board Connector: 2x20 header, 0.5 mm, Hirose DF17C(4.0)-40DP-0.5V(57)

Mating Connector: DF17C(4.0)-40DS-0.5V(57) receptacle

Location on Board: D6, bottom side

Header J23 provides the 3-wire Serial 3 port at 3.3 V levels with optional GPS functionality and wireless modem connectivity using the optional Serial 4 port.

The i.MX31 I/O pads multiplex the Serial 4 function with the USB Client/OTG capability on header J10 (Section 3.3.10) or second USB Host port volume production option. The Serial 4 option is available in both the standard configuration and production option. This interface can be used instead of the USB Client/OTG/Host 2 capability. Selection of the Serial 4 option is software-controlled.

The default capability is a USB Client port on header J10. With the Serial 4 option, header J23 directly supports the ZEUS Modem-*n* (Section 1.5).

Pin	Name	Type	Termination	Description
1				
2				
3				
4				
5				
6	V_MDM	PO		5 V modem power output
7				
8				
9				
10				
11				
12	GSM_STS	I-3.3		GPIN2 digital input
13	GSM_TXD	O-3.3		optional Serial 4 transmit data
14	GSM_RXD	I-3.3	PU 47kΩ 3.3V	optional Serial 4 receive data
15	n/c			
16	n/c			
17	GSM_RTS	O-3.3		optional Serial 4 receive to send
18	n/c			
19	GSM_ON	OD		Serial 4 on (modem enable)
20	n/c			
21	PTT	I-3.3		GPIN1 digital input
22	GSM_CTS	I-3.3	PU 47kΩ 3.3V	optional Serial 4 clear to send
23	GPS_PSUON	I-3.3		GPIN4 digital input
24	GPS_BOOT	I-3.3		GPIN3 digital input
25	V_3V3	PO		3.3 V power output
26	V_3V3	PO		3.3 V power output

Pin	Name	Type	Termination	Description
27	GPS_ON	O-3.3		Serial 3 on (GPS enable)
28	GPS_PPS	I-3.3		GPIN0 digital input
29	GPS_TXD	O-3.3		Serial 3 transmit data
30	GPS_RXD	I-3.3	PU 47kΩ 3.3V	Serial 3 receive data
31 32 33 34 35 36 37 38 39 40	GND	P		ground

3.3.20 J24: Backlight

Board Connector: 7-pin header with friction lock, 1.25 mm, Molex 53047-0710

Mating Connector: crimp housing, Molex 51021-0700 and crimp pins, Molex 50058

Location on Board: A5

Header J24 includes the power and control signals required by an external LCD backlight inverter. The backlight power input, BACKLIGHT_VCC (J2 pin 4, Section 3.3.2) is filtered and passed through to this header.

Pin	Name	Type	Description
1 2	BL_VCC	P	Filtered backlight power output
3 4	GND	P	ground
5	/BL_ON	OD	Backlight on/off
6	BL_CTRL	AO	Backlight intensity
7	GND	P	ground

3.3.21 P11: Serial 1

Board Connector: 9-pin D-sub connector, male

Recommended Mating Connector: 9-pin D-sub connector, female

Location on Board: E4-E5

Connector P11 supplies the Serial 1 signals including hardware flow control at EIA-232 levels. This port can be configured for 3.3 V logic levels as a volume production option.

Pin	Name	Type	Description
1	DCD1	I	Data Carrier Detect 1
2	RXD1	I	Receive Data 1
3	TXD1	O	Transmit Data 1
4	DTR1	O	Data Terminal Ready 1
5	GND	P	ground
6	DSR1	I	Data Set Ready 1
7	RTS1	O	Ready To Send 1
8	CTS1	I	Clear To Send 1
9	RIBI	I	Ring Indicator 1

3.3.22 P15: Serial 2

Board Connector: 9-pin D-sub connector, male

Recommended Mating Connector: 9-pin D-sub connector, female

Location on Board: E6-E7

Connector P15 supplies the Serial 2 signals including hardware flow control at EIA-232 levels.

Pin	Name	Type	Description
1	DCD2	I	Data Carrier Detect 2
2	RXD2	I	Receive Data 2
3	TXD2	O	Transmit Data 2
4	DTR2	O	Data Terminal Ready 2
5	GND	P	ground
6	DSR2	I	Data Set Ready 2
7	RTS2	O	Ready To Send 2
8	CTS2	I	Clear To Send 2
9	n/c		

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4 Board Revision History

4.1 Identifying the Board Revision

The product revision numbers of the Turbo G5 module and carrier board are etched on the printed circuit boards. The revision number of the carrier board is located on the component side, lower left corner in the area near D3. That number is 170122-810Rx, where "x" is the board revision. The Turbo G5 module revision number is located on the bottom side and cannot be seen when the module is installed on the carrier board.

4.2 Carrier Board Revision History

The following is an overview of the revisions to the carrier board.

4.2.1 Revision 1

Prototype

4.2.2 Revision 2

Initial release

4.3 Turbo G5 Module Revision History

The following is an overview of the revisions to the Turbo G5 module.

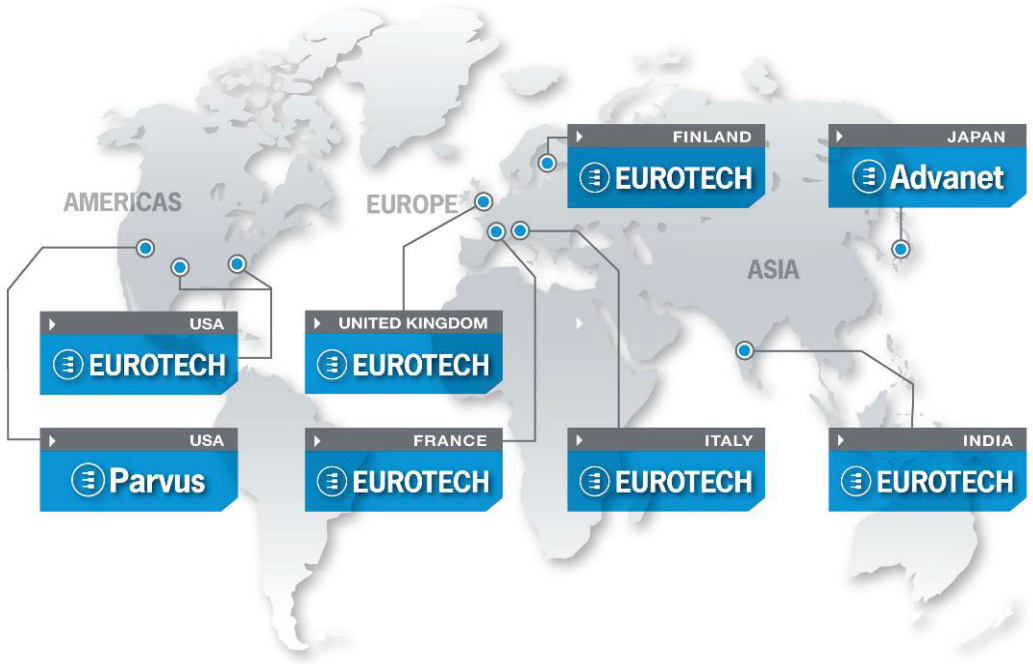
4.3.1 Revision 2

Prototype

4.3.2 Revision 3

Initial release

Eurotech Worldwide Presence



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