SDC-WB40NBT

HARDWARE INTEGRATION GUIDE
VERSION 3.8

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REVISION HISTORY

Version	Revision Date	Change Description	Approved By
1.0	02/24/12	Initial Release Version.	Andrew Chen
1.1	03/05/12	Changed RSTN to RESET.	Andrew Chen
1.2	03/20/12	Resolved outstanding TBDs. Added AS/NZS (Australia, New Zealand) certifications. Updated AS/NZS links.	Andrew Chen
1.3	6/29/12	Updated BT Transmit Power.	Andrew Chen
1.4	7/5/12	Updated Receiver Sensitivity Values.	Andrew Chen
2.0	10/2/12	Laird formatting and removal of schematic links to website.	Andrew Chen
2.1	11/01/12	Changed Voltage Rise Time maximum from 5 ms to 100 ms.	Andrew Chen
3.0	1/29/13	Updated Receive Sensitivity data	Andrew Chen
3.1	1/30/13	Updated 5ghz channel and 5ghz frequency data Updated operating temperature data.	Andrew Chen
3.2	3/4/13	Updated Pin Table. Changed Operating and Storage Humidity (Specs Table)	Andrew Chen
3.3	4/26/13	Changed Operating and Storage Humidity (Specs Table)	Andrew Chen
3.4	5/2/13	Updated Intro. Updated operating Linux kernel and version used for testing. Lowered Storage Humidity.	Andrew Chen
3.5	17 May 2013	Added BT Priority *Important* note to the Block Diagram.	Andrew Chen
3.6	14 Oct 2013	Removed references to summitdata.com	Andrew Chen
3.7	11 March 2014	Added Bluetooth SIG section.	Jonathan Kaye
3.8	22 Oct 2015	Added Approved By section to Revision History; fixed internal links	Sue White

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SCOPE

This document describes key hardware aspects of the Laird SDC-WB40NBT wireless bridge module. This document is intended to assist device manufacturers and related parties with the integration of this module into their host devices. Data in this document are drawn from a number of sources including data sheets for the Broadcom BCM4329 and Atmel AT91SAM9G20 CPU.

Please contact Laird or visit the Laird website to obtain the most recent version of this document:
http://www.lairdtech.com/Products/WB40NBT

PRODUCT DESCRIPTION

The SDC-WB40NBT Wireless Bridge Module is a wireless communications subsystem that may be integrated into a variety of host devices via a number of available electronic and logical interfaces. The SDC-WB40NBT provides complete enterprise-class Wi-Fi connectivity with an integrated TCP/IP stack, full support for IEEE 802.11a/b/g/n air standards and a fully integrated security supplicant providing 802.11i/WPA2 Enterprise authentication and data encryption.

The SDC-WB40NBT has a wide variety of interfaces including Fast Ethernet, serial UART, USB, SPI and I2C. The wireless bridge may be configured, monitored and managed via a Command Line Interface over an available dedicated console port, via a web interface over a wireless or Ethernet interface, or via a remote SDK interface over wireless or Ethernet.

The SDC-WB40NBT incorporates the Laird SDC-SSD40NBT radio module and provides all the Wi-Fi capabilities of that device. The product features an ARM9 processor running at 396 MHz, 32 MB of SDRAM memory, and 64 MB of NAND flash storage. Several GPIO lines are available for data acquisition and similar applications. The platform runs an embedded Linux operating system based on the 3.2 kernel. A Software Developer's Kit with Application Programming Interfaces and software tools are available for the development of custom software applications on the device.

The SDC-WB40NBT measures 47 mm long by 37 mm wide by 3 mm tall. The wireless bridge physically interfaces to the host device via a 120 pin board to board connector that has a variety of mating options. The SDC-WB40NBT may be secured to the host device via available grounded mounting holes. The SDC-WB40NBT operates at temperatures between -30° to +80°C degrees Celsius.

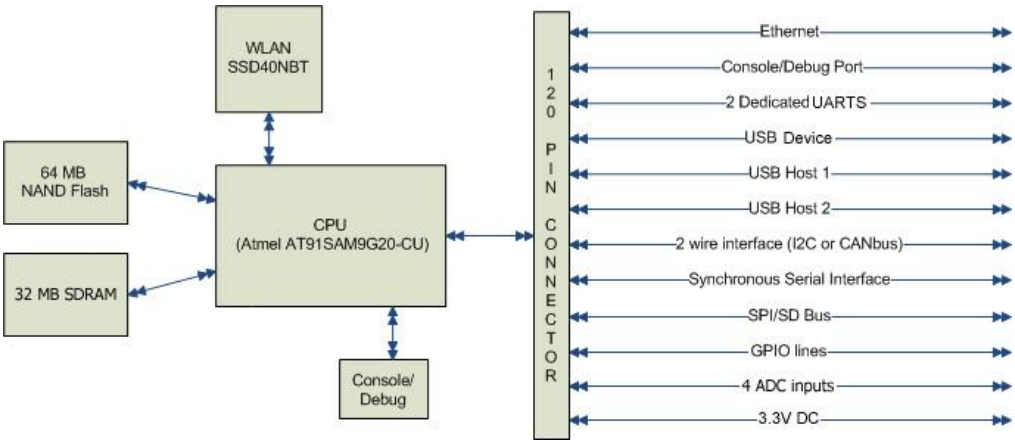
SDC-WB40NBT is a fully integrated module: It has its own RF shielding and does not require shielding provided by the host device into which it is installed in order to maintain compliance with applicable regulatory standards. As such, the device may be tested in a standalone configuration via an extender card.

The SDC-WB40NBTprovides two unique U.FL type antenna connectors to support dual band transmit and receive diversity. Supported host device antenna types include dipole and monopole antennas.

Regulatory operational requirements are included with this document and may be incorporated into the operating manual of any device into which the SDC-WB40NBT is installed. The SDC-WB40NBT is designed for installation into mobile devices which typically operate at distances greater than 20 cm from the human body and portable devices which typically operate at distances less than 20 cm from the human body. See "Documentation Requirements" for more information.

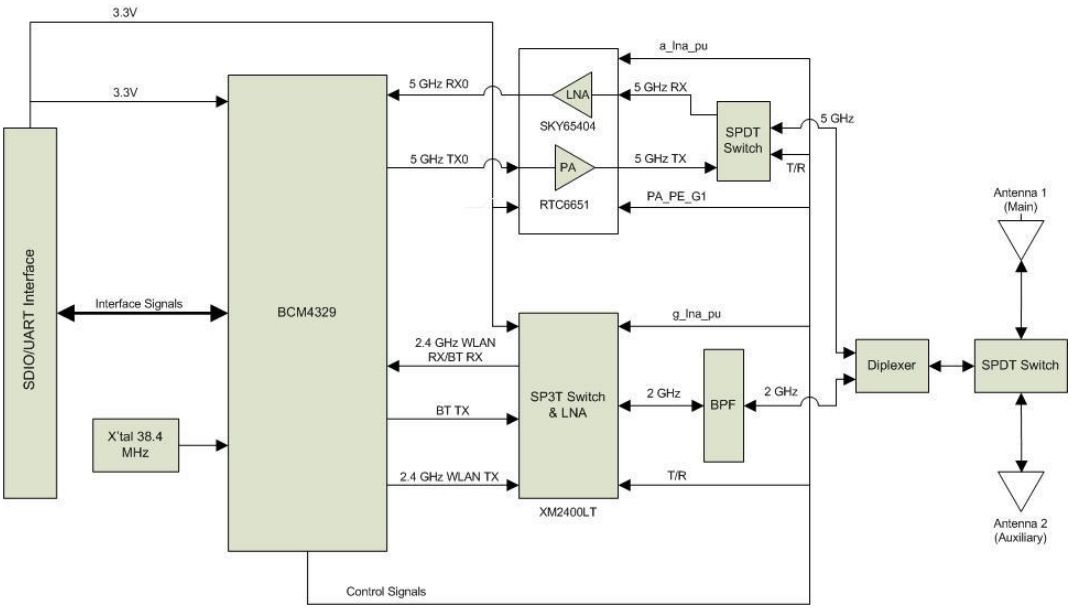
Block Diagram

The following is the SDC-WB40NBT block diagram:



Note: Transmitter frequencies for Wi-Fi are 2412-2462 MHz and 5180-5805 MHz. Transmitter frequencies for BT are 2402-2480 MHz.

The SDC-SSD40NBT block diagram displays the RF circuitry of the SDC-WB40NBT.



Note: BT functions on the AUX port and *not* on the Main port. For Wi-Fi and BT single-antenna implementations, the AUX port *must* be used.

IMPORTANT: When BT is transmitting high priority traffic (such as during a scan and/or when sending audio traffic) Wi-Fi receive is sent to the main antenna port (even when set to *AUX only)*. When high priority transmission ends, Wi-Fi receive functionality returns to the AUX port (when set to AUX only). For optimal Wi-Fi performance, we recommend that you populate both the Main and the AUX ports with an antenna.

SPECIFICATIONS

Feature	Description
Physical Interface	Kyocera Elco Series 5046 120 Pin Connector P/N 24 5046 120 000 829+ (see Mounting Instructions for mating connector options)
Ethernet Interface	10/100 Mbps RMII (Reduced Media Independent Interface)
Asynchronous Serial Port Interfaces (3.3 V TTL interface)	Nine-wire UART DCE with full modem signaling, ring indication, and carrier detect Four-wire UART with hardware handshaking Two-wire UART (console)
Synchronous Serial Port Interface	Six-wire
Secure Digital I/O Interface	Six Wire ***Note:*** *Cannot be used simultaneously with SPI interface*
SPI Interface	Five Wire, Master and Slave modes supported ***Note:*** *Cannot be used simultaneously with SDIO interface*
USB Interfaces	Two 12 Mbps USB Host Ports One 12 Mbps USB Device Port
Two Wire Interface	Two-wire I^2C (Inter-IC) or CANbus (Controller-area Network)
Antenna Interface	2 Hirose U.FL connectors for dual-band antenna diversity, 50 ohm
Wi-Fi Interface	Laird SDC-SSD40NBT
Processor Chip Set	Atmel 400 MHz ARM 9, P/N AT91SAM9G20-CU
Operating System	Embedded Linux, 3.2 kernel
Memory	32 MB SDRAM
Storage	64 MB NAND flash
Input Voltage Requirements	3.3 VDC ±5% (core)
Wi-Fi Current Consumption ***Note:*** *These current consumption measurements were taken using Linux kernel version 3.2.0.* ***Note:*** *Standby refers to the radio operating in PM1 powersave mode.* ***Note:*** *During calibration and initialization the SDC-WB40NBT may reach a 700 mA peak, which only lasts several milliseconds.*	**Mode** / **Avg. Current** **802.11a** Transmit 369 mA (1218 mW) Receive **167 mA (551 mW)** Standby 79 mA (261 mW) **802.11b** Transmit **392 mA (1294 mW)** Receive **167 mA (551 mW)** Standby 79 mA (261 mW) **802.11g** Transmit **355 mA (1294 mW)** Receive **167 mA (551 mW)** Standby 79 mA (261 mW) **802.11n** (2.4 GHz) Transmit 324 mA (1069 mW) Receive 167 mA (551 mW) Standby 79 mA (261 mW) **802.11n** (5 GHz) Transmit 359 mA (1185 mW) Receive 167 mA (551 mW) Standby 79 mA (261 mW)
Operating Temperature	-30° to 80°C (-22° to 176°F)
Operating Humidity	10% to 90% (non-condensing)
Storage Temperature	-30° to 85°C (-22° to 185°F)
Storage Humidity	5% to 90% (non-condensing)
Maximum Electrostatic Discharge	Maximum Contact Discharge (CD): 4 kV Maximum Air Discharge (AD): 8 kV
Length	47 mm (1.85") ***Note:*** *Length, width, and thickness measurements include the metal shielding.*
Width	37 mm (1.46")
Thickness	3.6 mm (0.14")

Feature	Description
Weight	7.8 g (0.275oz)
Mounting	Connector and Through Holes, See "Mounting" section for more information.
Wi-Fi Media	Direct Sequence-Spread Spectrum (DSSS) Complementary Code Keying (CCK) Orthogonal Frequency Divisional Multiplexing (OFDM)
Wi-Fi Media Access Protocol	Carrier sense multiple access with collision avoidance (CSMA/CA)
Network Architecture	Infrastructure and ad hoc
Wi-Fi Standards	IEEE 802.11a, 802.11b, 802.11d, 802.11e, 802.11g, 802.11h, 802.11i, 802.11n
Wi-Fi Data Rates Supported	802.11a (OFDM) 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11b (DSSS, CCK) 1, 2, 5.5, 11 Mbps 802.11g (OFDM) 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n (OFDM, MCS 0-7) 6.5, 7.2, 13.0, 14.4, 19.5, 21.7, 26.0, 28.9, 39.0, 43.3, 52.0, 57.8, 58.5, 65.0, 72.2 Mbps
Modulation	BPSK @ 1, 6, 6.5, 7.2 and 9 Mbps QPSK @ 2, 12, 13, 14.4,18, 19.5 and 21.7 Mbps CCK @ 5.5 and 11 Mbps 16-QAM @ 24, 26, 28.9, 36, 39 and 43.3 Mbps 64-QAM @ 48, 52, 54, 57.8, 58.5, 65, and 72.2 Mbps
802.11n Spatial Streams	1 (Single Input, Single Output)
Regulatory Domain Support	FCC (Americas, Parts of Asia, and Middle East) ETSI (Europe, Middle East, Africa, and Parts of Asia) MIC (Japan) (formerly TELEC) KC (Korea) (formerly KCC)
2.4 GHz Frequency Bands	**ETSI** 2.4 GHz to 2.483 GHz **FCC** 2.4 GHz to 2.483 GHz **MIC** (Japan) 2.4 GHz to 2.495 GHz **KC** 2.4 GHz to 2.483
2.4 GHz Operating Channels	ETSI: 13 (3 non-overlapping) FCC: 11 (3 non-overlapping) MIC (Japan): 14 (4 non-overlapping) KC: 13 (3 non-overlapping)
5 GHz Frequency Bands	**ETSI** 5.15 GHz to 5.35 GHz 5.47 GHz to 5.725 GHz **FCC** 5.15 GHz to 5.35 GHz 5.47 GHz to 5.725 GHz 5.725 GHz to 5.82 GHz **MIC** (Japan) 5.15 GHz to 5.35 GHz **KC** 5.15 GHz to 5.35 GHz 5.725 GHz to 5.82 GHz
5 GHz Operating Channels	ETSI: 19 non-overlapping FCC: 23 non-overlapping MIC (Japan): 8 non-overlapping KC: 12 non-overlapping

Feature	Description
Maximum Transmit Power ***Note:*** *Maximum transmit power varies according to individual country regulations. All values nominal, +/-2 dBm.* ***Note:*** *Laird 40 series radios support a single spatial stream and 20 MHz channels only.*	**802.11a** 6 Mbps 16 dBm (40 mW) 54 Mbps 14 dBm (25 mW) **802.11b** 1 Mbps 17 dBm (50 mW) 11 Mbps 16 dBm (40 mW) **802.11g** 6 Mbps 15 dBm (32 mW) 54 Mbps 13 dBm (20 mW) **802.11n** (2.4 GHz) 6.5 Mbps (MCS0) 15 dBm (32 mW) 65 Mbps (MCS7) 11 dBm (13 mW) **802.11n** (5 GHz) 6.5 Mbps (MCS0) 16 dBm (40 mW) 65 Mbps (MCS7) 13 dBm (20 mW) **Bluetooth** 0 dBm (1mW) (Class 2)
Typical Receiver Sensitivity ***Note:*** *All values nominal, +/-3 dBm.*	**802.11a:** 6 Mbps -90 dBm 24 Mbps -84 dBm 54 Mbps -75 dBm (PER <= 10%) **802.11b:** 1 Mbps -96 dBm 11 Mbps -89 dBm (PER <= 10%) **802.11g:** 6 Mbps -90 dBm 24 Mbps -84 dBm 54 Mbps -74 dBm (PER <= 10%) **802.11n (2.4 GHz)** MCS0 Mbps -90 dBm MCS4 Mbps -79 dBm MCS7 Mbps -72 dBm **802.11n (5 GHz)** MCS0 Mbps -89 dBm MCS4 Mbps -79 dBm MCS7 Mbps -71 dBm **Bluetooth:** 1 Mbps TBD 2 Mbps TBD 3 Mbps TBD

Feature	Description
Security	**Standards** Wireless Equivalent Privacy (WEP) Wi-Fi Protected Access (WPA) IEEE 802.11i (WPA2) **Encryption** Wireless Equivalent Privacy (WEP, RC4 Algorithm) Temporal Key Integrity Protocol (TKIP, RC4 Algorithm) Advanced Encryption Standard (AES, Rijndael Algorithm) **Encryption Key Provisioning** Static (40-bit and 128-bit lengths) Pre-Shared (PSK) Dynamic **802.1X Extensible Authentication Protocol Types** EAP-FAST EAP-TLS EAP-TTLS PEAP-GTC PEAP-MSCHAPv2 PEAP-TLS LEAP
Compliance	**ETSI Regulatory Domain** EN 300 328 EN 300 328 v1.7.1 (BT 2.1) EN 301 489-1 EN 301 489-17 EN 301 893 EN60950-1 EN55022:2010 Class B EU 2002/95/EC (RoHS) **FCC Regulatory Domain** FCC 15.247 DTS – 802.11b/g (Wi-Fi) – 2.4 GHz & 5.8 GHz FCC 15.407 UNII – 802.11a (Wi-Fi) – 2.4 GHz & 5.4 GHz FCC 15.247 DSS – BT 2.1 **Industry Canada** RSS-210 – 802.11a/b/g/n (Wi-Fi) – 2.4 GHz, 5.8 GHz, 5.2 GHz, and 5.4 GHz RSS-210 – BT 2.1 **MIC (Japan) Regulatory Domain (formerly TELEC) (PENDING)** Article 2 Item 19, Category WW (2.4GHz Channels 1-13) Article 2 Item 19-2, Category GZ (2.4GHz Channel 14) Article 2 Item 19-3 Category XW (5150-5250 W52 & 5250-5350 W53)VCCI Class B Article 2-1 Item 19-2 (BT 2.1) National Communications Commission (NCC): LP0002 (100-06-28) - Wi-Fi LP0002 (100-06-28) - Bluetooth **AS/NZS** AS/NZS 4268:2008 +A1:2010 (RLAN device) AS/NZS 4268:2008 +A1:2010 (BT device)

Feature	Description
Certifications	**Wi-Fi Alliance** 802.11a, 802.11b, 802.11g , 802.11n WPA Enterprise WPA2 Enterprise **Cisco Compatible Extensions** (Version 4)
Warranty	**Limited Lifetime**
All specifications are subject to change without notice	

ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings

Parameter	Comments	Conditions	Min.	Typ.	Max.	Unit
Input Voltage	VCC pin	With respect to ground	-0.3	-	3.6	V
	Any IO pin		-0.3	-	3.6	
DC Output Current	Any IO pin		-	-	8	mA

Power Supply

Parameter	Comments	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	VCC		3.0	3.3	3.45	V
Voltage Ripple			-	-	100	mV
Voltage Rise Time	At power on		-	-	100	ms
Operating Current	WLAN sub-system	Continuous receive	-	200	260	mA
		IEEE PSM	10	-	-	
		Continuous transmit	-	360	450	
	CPU sub-system	Varies with system load	-	35	150	mA

Reset Characteristics

Parameter	Comments	Conditions	Min.	Typ.	Max.	Unit
Under voltage Threshold Level	VCC to GND	VCC falling	2.59	-	2.67	V
Under voltage Threshold Hysteresis			-	55.2	*	mV
Reset Delay	Power on or under voltage		0.9	1.1	1.4	s
External Reset Pulse Width	Reset driven low by external circuitry		92	-	-	µs
Output Current High Level RESET	Internal reset controller drives external circuitry	U_H = 2.0 V	-	-	650	µA
Input Current Low Level RESET	Manual reset from external circuitry	Internal reset controller drives high level	2.2	-	-	mA

I/O Pin Characteristics (including UART interfaces)

Parameter	Comments	Conditions	Min.	Typ.	Max.	Unit
Input Low Level Voltage			-	-	0.8	V
Input High Level Voltage			2.0	-	-	V
Output Low Level Voltage		I_{OL} = 8 mA	-	-	0.4	V
		I_{OL} = 0 mA	-	-	0.2	
Output High Level Voltage		I_{OL} = 8 mA	VCC – 0.4	-	-	V
		I_{OL} = 0 mA	VCC – 0.2	-	-	V
Output High Level Voltage LED0		I_{OL} = 6 mA	VCC – 0.4	-	-	V
Input Leakage Current		Pull-up-disabled	-	-	1	µA
Input Pull-Up Current	Vin = 0 V	VCC = 3.0 V	8	-	-	µA
		VCC = 3.45 V	-	-	30	
Internal Pull-Up Value			-	200	-	kOhm

USB Transceiver Characteristics

Parameter	Comments	Conditions	Min.	Typ.	Max.	Unit
Input Low Level Voltage			-	-	0.8	V
Input High Level Voltage			2.0	-	-	V
Differential Input Sensitivity			0.2	-	-	V
Differential Input Common Mode Range			0.8	-	2.5	V
Transceiver Capacitance		To ground, each line	-	-	20	pF
High-Z State Data Line Leakage		0V < Vin < 3.3V	-5		5	µA
Recommended External Series Resistor		In each data line, 5% tolerance	-	27	-	Ohm
Low Level Output		RL = 1.425 kOhm Tied to 3.6V	-	-	0.3	V
High Level Output		RL = 1.425 kOhm Tied to GND	2.8	-	-	V
Output Signal Crossover Voltage			1.3	-	2.0	V
Transition Rise Time	Slow Speed	CL = 400 pF	75	-	300	ns
Transition Fall Time	Slow Speed	CL = 400 pF	75	-	300	ns
Rise/Fall Time Matching	Slow Speed	CL = 400 pF	80	-	120	%
Transition Rise Time	Full Speed	CL = 50 pF	4	-	20	ns

Parameter	Comments	Conditions	Min.	Typ.	Max.	Unit
Transition Fall Time	Full Speed	CL = 50 pF	4	-	20	ns
Rise/Fall Time Matching	Full Speed	CL = 50 pF	90	-	111.11	%

PIN DEFINITIONS

Note: Unused pins should be left open. All GND pin shall be connected to system ground.

Note: The maximum output current is 8 mA except for the following pins (which have a maximum output current of 2 mA): 3, 4, 6, 8, 14, 16, 41, 47, 72, 87, and 89.

Pin #	Name	Section	I/O	Reference	Description	If unused
1	GND	SPI	--	--	Signal Ground	Must be connected to GND
2	GPIO_1/ADC0	GPIO	I/O	VCC3_3	General Purpose I/O	Leave open
3	SPI1_NPCS_1	SPI	O	VCC3_3	SPI1 Peripheral Chip Select 1	Leave open
4	GPIO_2/ADC1	GPIO	I/O	VCC3_3	General Purpose I/O	Leave open
5	SPI1_NPCS_0	SPI	O	VCC3_3	SPI1 Peripheral Chip Select 0	Leave open
6	PC22	GPIO	I	VCC3_3	Reserved for input to BT device. Indicates that Bluetooth is transmitting or receiving high priority packets (i.e., SCO and LMP). Not currently supported in the firmware.	Leave open
7	GND	SPI	--	--	Signal Ground	Must be connected to GND
8	PC23	GPIO	O	VCC3_3	Output to BT device. Indicates that the WLAN is transmitting or receiving high priority packets. Not currently supported in the firmware.	Leave open
9	SPI1_MOSI	SPI	O	VCC3_3	SPI1 Master Out / Slave In	Leave open
10	DRXD	DBGU	I	VCC3_3	Console / Debug Serial Input	47K pull-up
11	SPI1_MISO	SPI	I	VCC3_3	SPI1 Master In / Slave Out	47K pull-up
12	DTXD	DBGU	O	VCC3_3	Console / Debug Serial Output	Leave open
13	GND	SPI	--	--	Signal Ground	Must be connected to GND
14	PC24	GPIO	I/O	VCC3_3	General-purpose use	Leave open
15	SPI1_CLK	SPI	O	VCC3_3	SPI Serial Clock	Leave open
16	PC25	GPIO	I/O	VCC3_3	General-purpose use	Leave open
17	GND	Ethernet RMII	--	--	Signal Ground	Must be connected to GND
18	LED0	LED	O	VCC3_3	Gerneral purpose LED0 out; Active low	Leave open
19	EREFCLK	Ethernet RMII	I	VCC3_3	Ethernet Reference Clock (50 Mhz max)	Leave open
20	LED1	LED	O	VCC3_3	Gerneral purpose LED1 out; Active low	Leave open
21	GND	Ethernet RMII	--		Signal Ground	Must be connected to GND

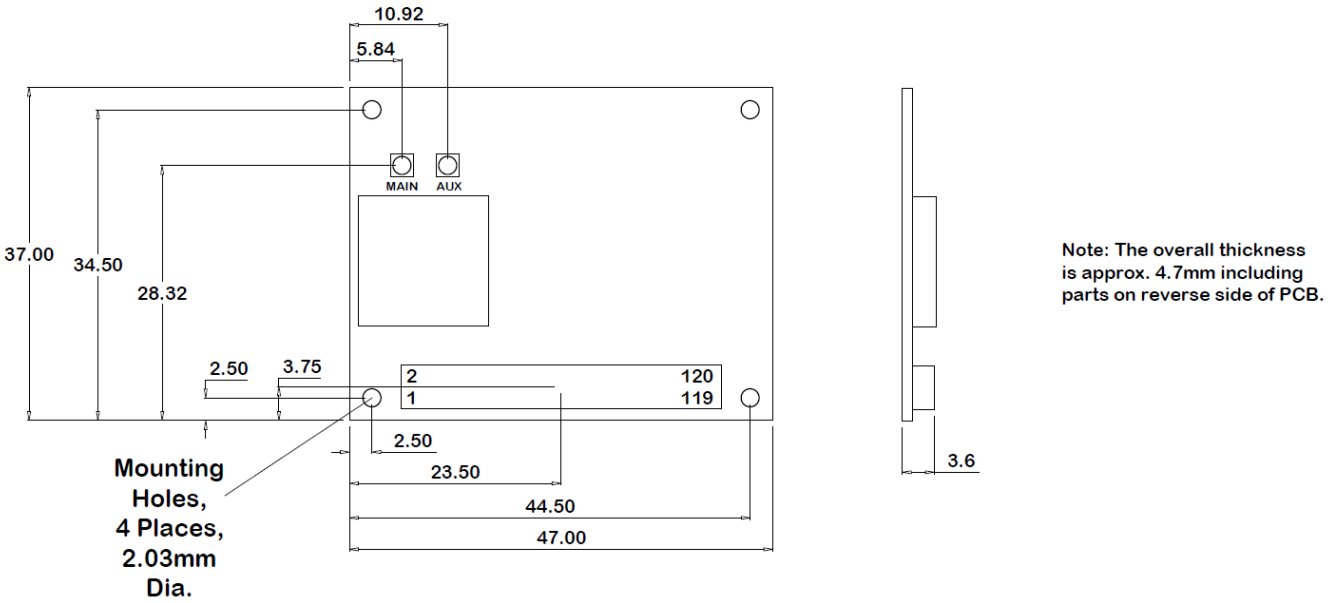
Pin #	Name	Section	I/O	Reference	Description	If unused
22	LED2	LED	O	VCC3_3	Gerneral purpose LED2 out; Active low	Leave open
23	ETX0	Ethernet RMII	O	VCC3_3	Ethernet data output 0	Leave open
24	STAT0	Status	O	VCC3_3	Status High while system in reset, bootloader or OS boot, low when OS is up	Leave open
25	ETX1	Ethernet RMII	O	VCC3_3	Ethernet data output 1	Leave open
26	STAT1	Status	O	VCC3_3	Status High while system running, low while system in suspend state	Leave open
27	GND	Ethernet RMII	--		Signal Ground	Must be connected to GND
28	/PWDN	Control	I	VCC3_3	Powers down the module, active low	Leave open
29	ERX0	Ethernet RMII	I	VCC3_3	Ethernet Data Input 0	Leave open
30	/RESET	Control	I/O	VCC3_3	This line will be pulled low momentarily during power-on by the CPU's internal power-on circuitry. The CPU then samples the state of this line after it de-asserts /RESET. Therefore, do not add more than 100pF external capacitance to this pin outside of the module.	Leave open
31	ERX1	Ethernet RMII	I	VCC3_3	Ethernet Data Input 1	Leave open
32	GND	Two Wire Interface	--	--	Signal Ground	Must be connected to GND
33	GND	Ethernet RMII	--	--	Signal Ground	Must be connected to GND
34	TWD	Two Wire Interface	I/O	VCC3_3	Two-wire Serial Data	Leave open
35	ETXEN	Ethernet RMII	O	VCC3_3	Ethernet Transmit Enable	Leave open
36	TWCK	Two Wire Interface	I/O	VCC3_3	Two-wire Serial Clock	Leave open
37	ECRSDV	Ethernet RMII	I	VCC3_3	Ethernet Carrier Sense and Data Valid	Leave open
38	GND	UART1	--	--	Signal Ground	Must be connected to GND
39	ERXER	Ethernet RMII	I	VCC3_3	Ethernet Receive Error	Leave open
40	TXD1	UART1	O	VCC3_3	Serial UART1 Transmit Data	Leave open
41	ERST/ADC2	Ethernet RMII	O	VCC3_3	Ethernet Reset	Leave open
42	RXD1	UART1	I	VCC3_3	Serial UART1 Receive Data	47K pull-up
43	EMDC	Ethernet RMII	O	VCC3_3	Ethernet Management Data Clock	Leave open

Pin #	Name	Section	I/O	Reference	Description	If unused
44	CTS1	UART1	I	VCC3_3	Serial UART1 Clear To Send; Active low	47K pull-up
45	EMDIO	Ethernet RMII	I/O	VCC3_3	Ethernet Management Data Input/Output	Leave open
46	RTS1	UART1	O	VCC3_3	Serial UART1 Request To Send; Active low	Leave open
47	EMIRO/ADC3	Ethernet RMII	I	VCC3_3	Ethernet Interrupt Request	Leave open
48	GND	UART0 (DCE)	--	--	Signal Ground	Must be connected to GND
49	GND	MMC/SD	--	--	Signal Ground	Must be connected to GND
50	CTS0	UART0 (DCE)	I	VCC3_3	Serial UART0 Clear To Send; Active low	47K pull-up
51	MCDA3	MMC/SD	I/O	VCC3_3	SD/MMC Slot A Data 3	Leave open
52	RTS0	UART0 (DCE)	O	VCC3_3	Serial UART0 Request To Send; Active low	Leave open
53	MCDA2	MMC/SD	I/O	VCC3_3	SD/MMC Slot A Data 2	Leave open
54	DSR0	UART0 (DCE)	I	VCC3_3	Serial UART0 Data Set Ready	47K pull-up
55	GND	MMC/SD	--	--	Signal Ground	Must be connected to GND
56	DTR0	UART0 (DCE)	O	VCC3_3	Serial UART0 Data Terminal Ready	Leave open
57	MCDA1	MMC/SD	I/O	VCC3_3	SD/MMC Slot A Data 1	Leave open
58	RI0	UART0 (DCE)	I	VCC3_3	Serial UART0 Ring Indicate	47K pull-up
59	MCDA0	MMC/SD	I/O	VCC3_3	SD/MMC Slot A Data 0	Leave open
60	DCD0	UART0 (DCE)	I	VCC3_3	Serial UART0 Data Carrier Detect	47K pull-up
61	GND	MMC/SD	--	--	Signal Ground	Must be connected to GND
62	GND	UART0 (DCE)	--	--	Signal Ground	Must be connected to GND
63	MCCK	MMC/SD	O	VCC3_3	SD/MMC Clock	Leave open
64	SCK0	UART0 (DCE)	I/O	VCC3_3	Serial UART0 Serial Clock	Leave open
65	GND	MMC/SD	--	--	Signal Ground	Must be connected to GND
66	TXD0	UART0 (DCE)	O	VCC3_3	Serial UART0 Serial Transmit	Leave open
67	MCCDA	MMC/SD	I/O	VCC3_3	SD/MMC Command	Leave open
68	RXD0	UART0 (DCE)	I	VCC3_3	Serial UART0 Serial Receive	47K pull-up
69	GND	MMC/SD	--	--	Signal Ground	Must be connected to GND
70	GND	Reserved	--	--	Signal Ground	Must be connected to GND
71	TK	SSI	I/O	VCC3_3	Transmit Clock	Leave open
72	IRQ0	Control	I	VCC3_3	No Connect; Reserved for future use	Leave open
73	TD	SSI	O	VCC3_3	Transmit Data	Leave open

Pin #	Name	Section	I/O	Reference	Description	If unused
74	--	Reserved	--	--	No Connect; Reserved for future use	Leave open
75	TF	SSI	I/O	VCC3_3	Transmit Frame Sync	Leave open
76	GND	Reserved	--	--	Signal Ground	Must be connected to GND
77	GND	SSI	--	--	Signal Ground	Must be connected to GND
78	--	Reserved	--	--	No Connect; Reserved for future use	Leave open
79	RK	SSI	I/O	VCC3_3	Receive Clock	Leave open
80	--	Reserved	--	--	No Connect; Reserved for future use	Leave open
81	RD	SSI	I	VCC3_3	Receive Data	Leave open
82	GND	Reserved	--	--	Signal Ground	Must be connected to GND
83	RF	SSI	I/O	VCC3_3	Receive Frame Sync	Leave open
84	--	Reserved	--	--	No Connect; Reserved for future use	Leave open
85	GND	USB Device	--	--	Signal Ground	Must be connected to GND
86	--	Reserved	--	--	No Connect; Reserved for future use	Leave open
87	DPUCNTRL	USB Device	O	VCC3_3	USB device pull-up resistor enable, active high	Leave open
88	--	Reserved	--	--	No Connect; Reserved for future use	Leave open
89	DBUSSENSE	USB Device	I	VCC3_3	USB device bus sense signal from peripheral to host, active low	47K pull-up
90	--	Reserved	--	--	No Connect; Reserved for future use	Leave open
91	GND	USB Device	--	--	Signal Ground	Must be connected to GND
92	--	Reserved	--	--	No Connect; Reserved for future use	Leave open
93	DDM	USB Device	I/O	VCC3_3	USB Device Data Negative	Leave open
94	--	Reserved	--		No Connect; Reserved for future use	Leave open
95	DDP	USB Device	I/O	VCC3_3	USB Device Data Positive	Leave open
96	--	Reserved	--	--	No Connect; Reserved for future use	Leave open
97	GND	USB Host A	--	--	Signal Ground	Must be connected to GND
98	--	Reserved	--	--	No Connect; Reserved for future use	Leave open
99	HDMA	USB Host A	I/O	VCC3_3	USB Host A Data Negative	Leave open
100	GND	Reserved	--	--	Signal Ground	Must be connected to GND

Pin #	Name	Section	I/O	Reference	Description	If unused
101	HDPA	USB Host A	I/O	VCC3_3	USB Host A Data Positive	Leave open
102	--	Reserved	--	--	No Connect; Reserved for future use	Leave open
103	GND	USB Host B	--	--	Signal Ground	Must be connected to GND
104	--	Reserved	--	--	No Connect; Reserved for future use	Leave open
105	HDMB	USB Host B	I/O	VCC3_3	USB Host B Data Negative	Leave open
106	--	Reserved	--	--	No Connect; Reserved for future use	Leave open
107	HDPB	USB Host B	I/O	VCC3_3	USB Host B Data Positive	Leave open
108	--	Reserved	--	--	No Connect; Reserved for future use	Leave open
109	GND	Power Supply	--	--	Supply Ground	Must be connected to GND
110	--	Reserved	--	--	No Connect; Reserved for future use	Leave open
111	GND	Power Supply	--	--	Supply Ground	Must be connected to GND
112	--	Reserved	--	--	No Connect; Reserved for future use	Leave open
113	GND	Power Supply	--	--	Supply Ground	Must be connected to GND
114	GND	Power Supply	--	--	Supply Ground	Must be connected to GND
115	VCC3_3	Power Supply	--	--	3.3V Module Power	3.3V must be supplied
116	GND	Power Supply	--	--	Supply Ground	Must be connected to GND
117	VCC3_3	Power Supply	--	--	3.3V Module Power	3.3V must be supplied
118	VCC3_3	Power Supply	--	--	3.3V Module Power	3.3V must be supplied
119	VCC3_3	Power Supply	--	--	3.3V Module Power	3.3V must be supplied
120	VCC3_3	Power Supply	--	--	3.3V Module Power	3.3V must be supplied

MECHANICAL SPECIFICATIONS



Mounting

The WB40NBT board provides the following: 245046120600829+ CONN RECEPT 120 POS SMD 0.5MM

There are four Kyocera Elco options for mating connectors, each option providing for four different stack heights. Depending on the board to board space required the main board part number is:

Part Number	Contacts	B2B	(mm)	Newark PN
145046120630829+	120	Plug	3.0	96M9299
145046120635829+	120	Plug	3.5	96M9300
145046120640829+	120	Plug	4.0	96M9301
145046120645829+	120	Plug	4.5	03M4923

The WB40NBT provides four grounded mounting holes located on the corners of the module. One or more of these mounting holes may be used to secure the module to the host device with conductive screws with bushings that correspond to the selected stack height.

INTEGRATION GUIDELINES

The following is a list of RF layout design guidelines and recommendation when installing a Laird module into your device.

- Do not run antenna cables directly above or directly below the module.
- If there are other radios or transmitters in the device (such as a Bluetooth radio), place the devices as far apart from each other as possible.
- Ensure that there is the maximum allowable spacing separating the antenna connectors on the Laird radio from the antenna. In addition, do not place antennas directly above or directly below the radio.
- Laird recommends the use of a double shielded cable for the connection between the radio and the antenna elements.

REGULATORY

Certified Antennas

The SDC-WB40NBT was tested to the regulatory standards defined in the "Certifications" section of the Specifications table above. Testing was conducted with the following antennas:

Cisco AIR-ANT 4941

- **Form Factor:** Whip
- **Type:** Dipole
- **Maximum 2.4 GHz Gain:** 2.2 dBi
- **Tested and Certified 2.4 GHz Transmit Power:** 100% of maximum setting (no reduction of power is required in the 2.4 GHz band)

Radiall Larson Dipole

- **Form Factor:** Whip
- **Type:** Dipole
- **Maximum 2.4 GHz Gain:** 1.6 dBi (not used during testing)
- **Maximum 5 GHz Gain:** 5 dBi
- **Tested and Certified 5 GHz Transmit Power:** 100% of maximum setting (no reduction of power is required in the 5 GHz band)

HUBER+SUHNER

- **Form Factor:** Whip
- **Type:** Monopole
- **Maximum 2.4 GHz Gain:** 3dBi
- **Maximum 5 GHz Gain:** 6.5dBi
- **Tested and Certified 2.4 GHz Transmit Power:** 100% of maximum setting (no reduction of power is required in the 2.4 GHz band)
- **Tested and Certified 5 GHz Transmit Power:** 100% of maximum setting (no reduction of power is required in the 5 GHz band)

Ethertronics

- **Form Factor:** Isolated Magnetic Dipole™ (IMD)
- **Type:** GY Internal Antenna
- **Maximum 2.4 GHz Gain:** 2.5 dBi
- **Maximum 5 GHz Gain:** 5 dBi
- **Tested and Certified 2.4 GHz Transmit Power:** 100% of maximum setting (no reduction of power is required in the 2.4 GHz band)
- **Tested and Certified 5 GHz Transmit Power:** 100% of maximum setting (no reduction of power is required in the 5 GHz band)

Note: If the formal test reports for the SDC-WB40NBT show that transmit power was decreased to less than 100% on 2.4 GHz edge channels, Laird will make these transmit power reductions in firmware for the edge channels. Integrators do not need to reduce transmit power on a channel-by-channel basis to comply with band edge regulations.

Antennas of differing types and higher gains may be integrated as well. If necessary, with the Summit Manufacturing Utility software utility, OEMs may reduce the transmit power of the SDC-WB40NBT to account for higher antenna gain. In some cases, OEMs may be able to reduce certification efforts by using antennas that are of like type and equal or lesser gain to the above listed antennas.

Documentation Requirements

In order to ensure regulatory compliance, when integrating the SDC-WB40NBT into a host device, it is necessary to meet the documentation requirements set forth by the applicable regulatory agencies. The following sections (FCC, Industry Canada, and European Union) outline the information that may be included in the user's guide and external labels for the host devices into which the SDC-WB40NBT is integrated.

FCC

Note: You must place "Contains FCC ID: TWG-SDCWB40NBT" on the host product in such a location that it can be seen by an operator at the time of purchase.

User's Guide Requirements

As outlined in the Operational Description, the SDC-WB40NBT complies with FCC Part 15 Rules for a Modular Approval. To leverage Laird's grant, the two conditions below must be met for the host device into which the SDC-WB40NBT is integrated:

1. The antenna is installed with 20 cm maintained between the antenna and users.
2. The transmitter module is not co-located with any other transmitter or antenna that is capable of simultaneous operation.

As long as the two conditions above are met, further *transmitter* testing is typically not required. However, the OEM integrator is still responsible for testing its end-product for any additional compliance requirements required with this module installed, such as (but not limited to) digital device emissions and PC peripheral requirements.

IMPORTANT! In the event that the two conditions above ***cannot be met*** (for example certain device configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID ***cannot*** be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

When using Laird's FCC grant for the SDC-WB40NBT, the integrator must include specific information in the user's guide for the device into which the SDC-WB40NBT is integrated. The integrator must not provide information to the end user regarding how to install or remove this RF module in the user's manual of the device into which the SDC-WB40NBT is integrated. The following FCC statements must be added in their entirety and without modification into a prominent place in the user's guide for the device into which the SDC-WB40NBT is integrated:

"**IMPORTANT NOTE:** To comply with FCC RF exposure compliance requirements, the antenna used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter."

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and receiver.
3. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
4. Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT NOTE: FCC Radiation Exposure Statement:
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Industry Canada

Note: You must place "Contains IC ID: 6616A-SDCWB40NBT" on the host product in such a location that it can be seen by an operator at the time of purchase.

User's Guide Requirements (for Model # SDC-WB40NBT)

RF Radiation Hazard Warning

To ensure compliance with FCC and Industry Canada RF exposure requirements, this device must be installed in a location where the antennas of the device will have a minimum distance of at least 20 cm from all persons. Using higher gain antennas and types of antennas not certified for use with this product is not allowed. The device shall not be co-located with another transmitter.

Installez l'appareil en veillant à conserver une distance d'au moins 20 cm entre les éléments rayonnants et les personnes. Cet avertissement de sécurité est conforme aux limites d'exposition définies par la norme CNR-102 at relative aux fréquences radio.

Maximum Antenna Gain – If the integrator configures the device such that the antenna is detectable from the host product.

This radio transmitter (IC ID: 6616A-SDCWB40NBT) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio (IC ID: 6616A-SDCWB40NBT) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

European Union

User's Guide Requirements

The integrator must include specific information in the user's guide for the device into which the SDC-WB40NBT is integrated. In addition to the required FCC and IC statements outlined above, the following R&TTE statements must be added in their entirety and without modification into a prominent place in the user's guide for the device into which the SDC-WB40NBT is integrated:

This device complies with the essential requirements of the R&TTE Directive 1999/5/EC. The following test methods have been applied in order to prove presumption of conformity with the essential requirements of the R&TTE Directive 1999/5/EC:

- EN60950-1:2001 A11:2004

  Safety of Information Technology Equipment

- EN 300 328 V1.7.1: (2006-10)

  Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband Transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using spread spectrum modulation techniques; Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive

- EN 301 489-1 V1.6.1: (2005-09)

  Electromagnetic compatibility and Radio Spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements

- EN 301 489-17 V1.2.1 (2002-08)

  Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for 2,4 GHz wideband transmission systems and 5 GHz high performance RLAN equipment

- EN 301 893 V1.5.1 (2008-12)

  Electromagnetic compatibility and Radio spectrum Matters (ERM); Broadband Radio Access Networks (BRAN); Specific conditions for 5 GHz high performance RLAN equipment

- EU 2002/95/EC (RoHS)

  Declaration of Compliance – EU Directive 2003/95/EC; Reduction of Hazardous Substances (RoHS)

This device is a 2.4 GHz wideband transmission system (transceiver), intended for use in all EU member states and EFTA countries, except in France and Italy where restrictive use applies.

In Italy the end-user should apply for a license at the national spectrum authorities in order to obtain authorization to use the device for setting up outdoor radio links and/or for supplying public access to telecommunications and/or network services.

This device may not be used for setting up outdoor radio links in France and in some areas the RF output power may be limited to 10 mW EIRP in the frequency range of 2454 – 2483.5 MHz. For detailed information the end-user should contact the national spectrum authority in France.

cs **Česky [Czech]**	*[Jméno výrobce]* tímto prohlašuje, že tento *[typ zařízení]* je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.
da **Dansk [Danish]**	Undertegnede *[fabrikantens navn]* erklærer herved, at følgende udstyr *[udstyrets typebetegnelse]* overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
de **Deutsch [German]**	Hiermit erklärt *[Name des Herstellers]*, dass sich das Gerät *[Gerätetyp]* in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
et **Eesti [Estonian]**	Käesolevaga kinnitab *[tootja nimi = name of manufacturer]* seadme *[seadme tüüp = type of equipment]* vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
en **English**	Hereby, *[name of manufacturer]*, declares that this *[type of equipment]* is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
es **Español [Spanish]**	Por medio de la presente *[nombre del fabricante]* declara que el *[clase de equipo]* cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.
el **Ελληνική [Greek]**	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ *[name of manufacturer]* ΔΗΛΩΝΕΙ ΟΤΙ *[type of equipment]* ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.
fr **Français [French]**	Par la présente *[nom du fabricant]* déclare que l'appareil *[type d'appareil]* est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.
it **Italiano [Italian]**	Con la presente *[nome del costruttore]* dichiara che questo *[tipo di apparecchio]* è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Latviski [Latvian]	Aršo*[name of manufacturer / izgatavotājanosaukums]* deklarē, ka*[type of equipment / iekārtas tips]*atbilstDirektīvas 1999/5/EK būtiskajāmprasībām un citiemar to saistītajiemnoteikumiem.
Lietuvių [Lithuanian]	Šiuo *[manufacturer name]* deklaruoja, kad šis *[equipment type]* atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.
nl **Nederlands [Dutch]**	Hierbij verklaart *[naam van de fabrikant]* dat het toestel *[type van toestel]* in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG.

mt Malti [Maltese]	Hawnhekk, *[isem tal-manifattur]*, jiddikjara li dan *[il-mudel tal-prodott]* jikkonforma mal-ħtiġijiet essenzjali u ma provvedimenti oħrajn relevanti li hemm fid-Dirrettiva 1999/5/EC.
hu Magyar [Hungarian]	Alulírott, *[gyártó neve]* nyilatkozom, hogy a *[... típus]* megfelel a vonatkozó alapvetõ követelményeknek és az 1999/5/EC irányelv egyéb elõírásainak.
pl Polski [Polish]	Niniejszym *[nazwa producenta]* oświadcza, że *[nazwa wyrobu]* jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 1999/5/EC.
pt Português [Portuguese]	*[Nome do fabricante]* declara que este *[tipo de equipamento]* está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
sl Slovensko [Slovenian]	*[Ime proizvajalca]* izjavlja, da je ta *[tip opreme]* v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES.
Slovensky [Slovak]	*[Menovýrobcu]* týmtovyhlasuje, že *[typzariadenia]* spĺňazákladnépožiadavky a všetkypríslušnéustanovenia Smernice 1999/5/ES.
fi Suomi [Finnish]	*[Valmistaja = manufacturer]* vakuuttaa täten että *[type of equipment = laitteen tyyppimerkintä]* tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
sv Svenska [Swedish]	Härmed intygar *[företag]* att denna *[utrustningstyp]* står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.