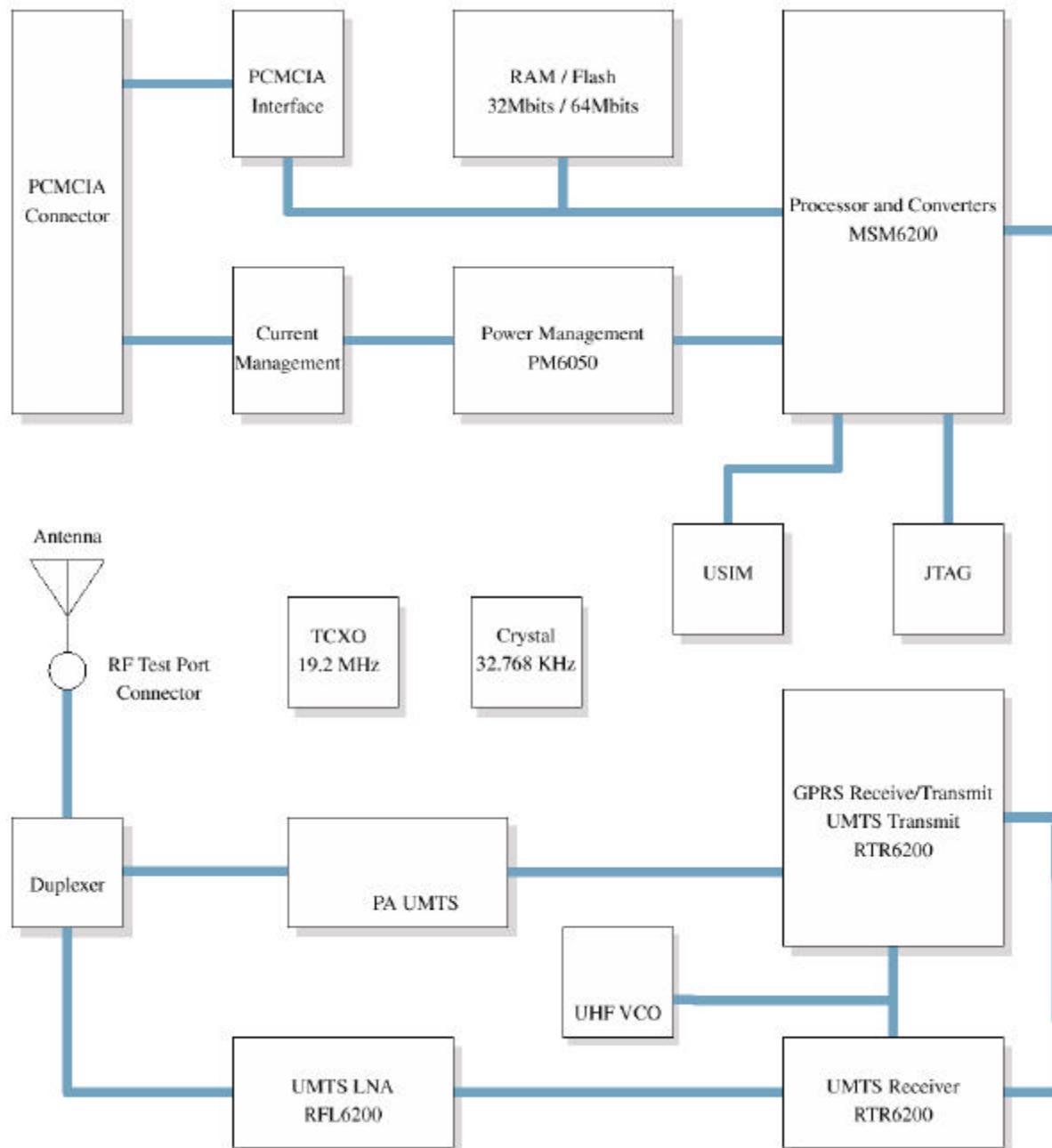


Block Diagram



Processor

The processing and DSP functions occur in the MSM6200. External to the MSM6200, 64 Mbits of Flash and 32Mbits of SRAM are provided. The FLASH is used to store the firmware and provide non-volatile storage of calibration and configuration data (NV-RAM). During operation some program code is transferred from the FLASH to the SRAM to provide the system higher operating speeds.

A 19.2 MHz clock is used for the reference for both the processor and the RF synthesizers. A 32.768 KHz crystal is used to provide the time base during the low current sleep mode.

PCMCIA Interface

The PCMCIA interface is implemented using an FPGA. This provides for the possibility of field upgrades and customized host interfaces. The FPGA is initialized by the processor during the boot-up sequence. The FPGA is directly connected to the processor address and data bus to provide maximum data throughput. The standard FPGA configuration is as a multifunction PC Card supporting attribute memory (CIS and configuration registers) and two UART modules accessed in 8 bit I/O mode.

Power

The power for the unit is supplied via the PCMCIA VCC pins. The voltage select pins are configured for 5 volt operation. The current management circuit includes a host supply current limit and a large charge reservoir.

RF

Using a Zero IF architecture for both transmit and receive minimizes the size and component count of the radio.

Host Interface

The U530 is designed to be compatible with host devices that meet the PC Card specifications as detailed in Section 4.9 of the Electrical Specification of the PC Card Standard – March 1997. Voltage Selection pins (VS1# and VS2#) are configured for 5 volt operation. The basic DC parameters for the U530 are shown below.

Table 1 U530 DC Specifications (Vcc is 5 volts unless specified otherwise)

Symbol	Parameter	Min	Typ	Max	Units
Vcc	Supply Voltage	4.75	5.0	5.25	V
Icc max	maximum supply current			1000	mA
Icc stdby	Standby supply current		120		mA
Icc csd	CSD supply current (note 1)			360	mA
Icc grps avg	GPRS supply current average (note 2)			290	mA
Icc grps peak	GPRS supply current peak (note 2)			620	mA
Icc WCDMA	WCDMA supply current (note 3)			600	mA
V ih	Input High Voltage	2		Vcc + 0.5	V
V il	Input Low Voltage	-0.5		0.7	V
V oh	Output High Voltage (12 mA)	2.4			V
V ol	Output Low Voltage (-12 mA)			0.4	V

PC Card 68 pin connector

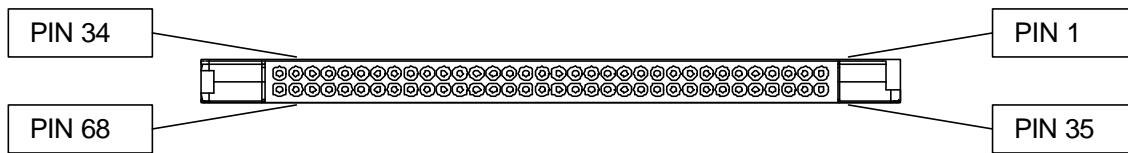


Figure 1 PC Card 68 pin connector

Table 2 PC Card Pinout

Pin	Memory mode		I/O mode		Direction	Supported
	NAME	Function	NAME	Function		
1	GND	Ground			DC	Yes
2	D3	Data bit 3			I/O	Yes
3	D4	Data bit 4			I/O	Yes
4	D5	Data bit 5			I/O	Yes
5	D6	Data bit 6			I/O	Yes
6	D7	Data bit 7			I/O	Yes
7	CE1#	Card Enable			I	Yes
8	A10	Address bit 10			I	Yes
9	OE#	Output Enable			I	Yes
10	A11	Address bit 11			I	Yes
11	A9	Address bit 9			I	Yes
12	A8	Address bit 8			I	Yes
13	A13	Address bit 13			I	No
14	A14	Address bit 14			I	No
15	WE#	Write Enable			I	Yes
16	READY	Ready	IREQ#	Interrupt Request	O	Yes
17	Vcc	Supply Voltage			DC in	Yes
18	Vpp1	Programming and Peripheral Supply 1			DC in	No
19	A16	Address bit 16			I	No
20	A15	Address bit 15			I	No
21	A12	Address bit 12			I	No
22	A7	Address bit 7			I	Yes
23	A6	Address bit 6			I	Yes
24	A5	Address bit 5			I	Yes
25	A4	Address bit 4			I	Yes
26	A3	Address bit 3			I	Yes
27	A2	Address bit 2			I	Yes
28	A1	Address bit 1			I	Yes
29	A0	Address bit 0			I	Yes
30	D0	Data bit 0			I/O	Yes
31	D1	Data bit 1			I/O	Yes
32	D2	Data bit 2			I/O	Yes
33	WP	Write Protect	IOIS16#	I/O Port Is 16-bit	O	Yes
34	GND	Ground			DC	Yes
35	GND	Ground			DC	Yes
36	CD1#	Card Detect			O	Yes
37	D11	Data bit 11			I/O	No
38	D12	Data bit 12			I/O	No
39	D13	Data bit 13			I/O	No
40	D14	Data bit 14			I/O	No

41	D15	Data bit 15			I/O	No
42	CE2#	Card Enable			I	Yes
43	VS1#	Voltage Sense 1			O	Yes
44	RFU	Reserved for future use	IORD#	I/O Read	I	Yes
45	RFU	Reserved for future use	IOWR#	I/O Write	I	Yes
46	A17	Address bit 17			I	No
47	A18	Address bit 18			I	No
48	A19	Address bit 19			I	No
49	A20	Address bit 20			I	No
50	A21	Address bit 21			I	No
51	Vcc	Supply Voltage			DC in	Yes
52	Vpp2	Programming and Peripheral Voltage 2			DC in	No
53	A22	Address bit 22			I	No
54	A23	Address bit 23			I	No
55	A24	Address bit 24			I	No
56	A25	Address bit 25			I	No
57	VS2#	Voltage Sense 2			O	Yes
58	RESET	Card Reset			I	Yes
59	WAIT#	Extend bus cycle			O	Yes
60	RFU	Reserved for future use	INPACK#	Input Port Acknowledge	O	Yes
61	REG#	Register select & I/O Enable			I	Yes
62	BVD2	Batter Voltage Detect 2	SPKR#	Audio Digital Waveform	O	No
63	BVD1	Batter Voltage Detect 1	STSCHG#	Card Status Changed	O	Yes
64	D8	Data bit 8			I/O	No
65	D9	Data bit 9			I/O	No
66	D10	Data bit 10			I/O	No
67	CD2#	Card Detect			O	Yes
68	GND	Ground			DC	Yes

USIM Interface

The USIM interface supports a 3.0 volt USIM. The VPP contact is not connected as per section 8.2 of 3GPP TS 21.111.

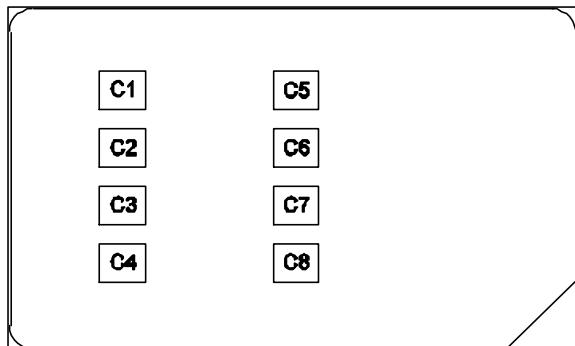


Figure 2 USIM Contacts (USIM as viewed from contact side)

Table 3 USIM Pinout

PIN	Name	Description
C1	VCC	Supply Voltage
C2	RST	Reset
C3	CLK	Clock
C4		Reserved (No contact)
C5	GND	Ground
C6	VPP	(not connected)
C7	I/O	Data input/output
C8		Reserved (No contact)

Air interface

The Air Interface of the U530 supports both the 3GPP WCDMA specifications and the 3GPP GPRS specifications.

The RF design implements a Zero-IF architecture using the Qualcomm 6200 chipset.

Table 4 WCDMA Air Interface

Specification	3GPP TS 34.121		Release 99
Band Designation	2100 UMTS		
	UE Tx Freq	1920 – 1980	MHz
	UE Rx Freq	2110 – 2170	MHz
Transmit Power	Class 4	+21	dBm

The protocol stack supplied by QCT is based on 3GPP Standard 43.108 Release 99 and Standard 334.121 Release 99.

LED Display Description

The LED Display is designed to provide the user with feedback as to the current state of the Novatel Merlin WCDMA Wireless PC Card Modem.

The following table explains the various states the LED Display can exhibit along with a description of each state and how each state is represented in terms of color and cadence.

Table 5 LED States

State	Name	Display	Cadence	Description
1	ERROR	FLASHING RED	250ms ON 250ms OFF	An error has occurred in the modem firmware, the modem is unable to read the USIM, or the USIM is not inserted.
2	NO SERVICE	SOLID RED	ON	The modem is not currently receiving a signal from the network.
3	WCDMA CS	SINGLE FLASH BLUE	250ms ON 1750ms OFF	The modem is currently receiving a WCDMA signal from the system and is registered on the circuit switch domain.
4	WCDMA PS	DOUBLE FLASHING BLUE	250ms ON 250ms OFF 250ms ON 1750ms OFF	The modem is currently receiving a WCDMA signal from the system and is registered on the packet switch domain.
5	PDP	SOLID BLUE	ON	The modem is currently PDP context activated on the WCDMA system.

Hardware ID

The revision of the PCB and BOM is identified through a hardware ID. The ID is hard coded when the U530 is manufactured via component loading. This ID can be read and reported by the software.

Firmware

Diagnostics & Logging

The U530 supports a mechanism for obtaining diagnostic information from the modem during normal operation. This mechanism is available on each shipped product to facilitate prompt investigation of field issues.

The Qualcomm CAIT extensible diagnostic monitor tool is used to create log files and interpret diagnostic information. Diagnostic monitoring and logging is available from Qualcomm on Windows 2000/XP.

Diagnostic services are supported using the secondary port on the PC Card, while the primary port is used for data. The use of MobiLink and CAIT is mutually exclusive.

Drivers

The U530 is a multifunction PC Card. It provides two ports to the host PC; a primary modem port, and a secondary communications port. These ports are available to Microsoft Windows applications. The standard Microsoft Windows serial drivers are used to access these ports. Installation of the Novatel Wireless INF files is required for Microsoft Windows to recognize the card. These should be installed prior to the card being inserted into the host PC. Refer to the Merlin U530 User Guide.

Firmware Upgrades

This U530 supports a method to locally upgrade the firmware of the device through the laptop interface only. It requires no special equipment.

Procedures are provided to ensure that all critical modem provisioning and configuration information is protected from alteration during the upgrade operation. All such information is backed up and restored as part of the upgrade operation.

No method of reprogramming the firmware of the device over the air-interface is provided. Upgrades may be wirelessly downloaded to the host PC, and subsequently run locally.

Firmware Stack & Interface to Host PC Stack

Data communication between the modem and the host PC is done through either a PPP or IP connection.
UE-Network Protocol