OPERATIONS MANUAL
LPM-LX800-G

NOTE: *This manual has been designed and created for use as part of WinSystems website. Web access is required.*

REVISION HISTORY

P/N   400-0351-000

Date Code	Rev Level	ECO Number
080421	Preliminary	
080814	A	08-99
090715	A.1	09-66
090717	C	
090805	C.1	
101019	C.2	10-65

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NOTE: The reference line to each component part has been drawn to Pin 1, and is also highlighted with a square, where applicable.

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NOTE: The reference line to each component part has been drawn to Pin 1, and is also highlighted with a square, where applicable.

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NOTE: The reference line to each component part has been drawn to Pin 1, and is also highlighted with a square, where applicable.
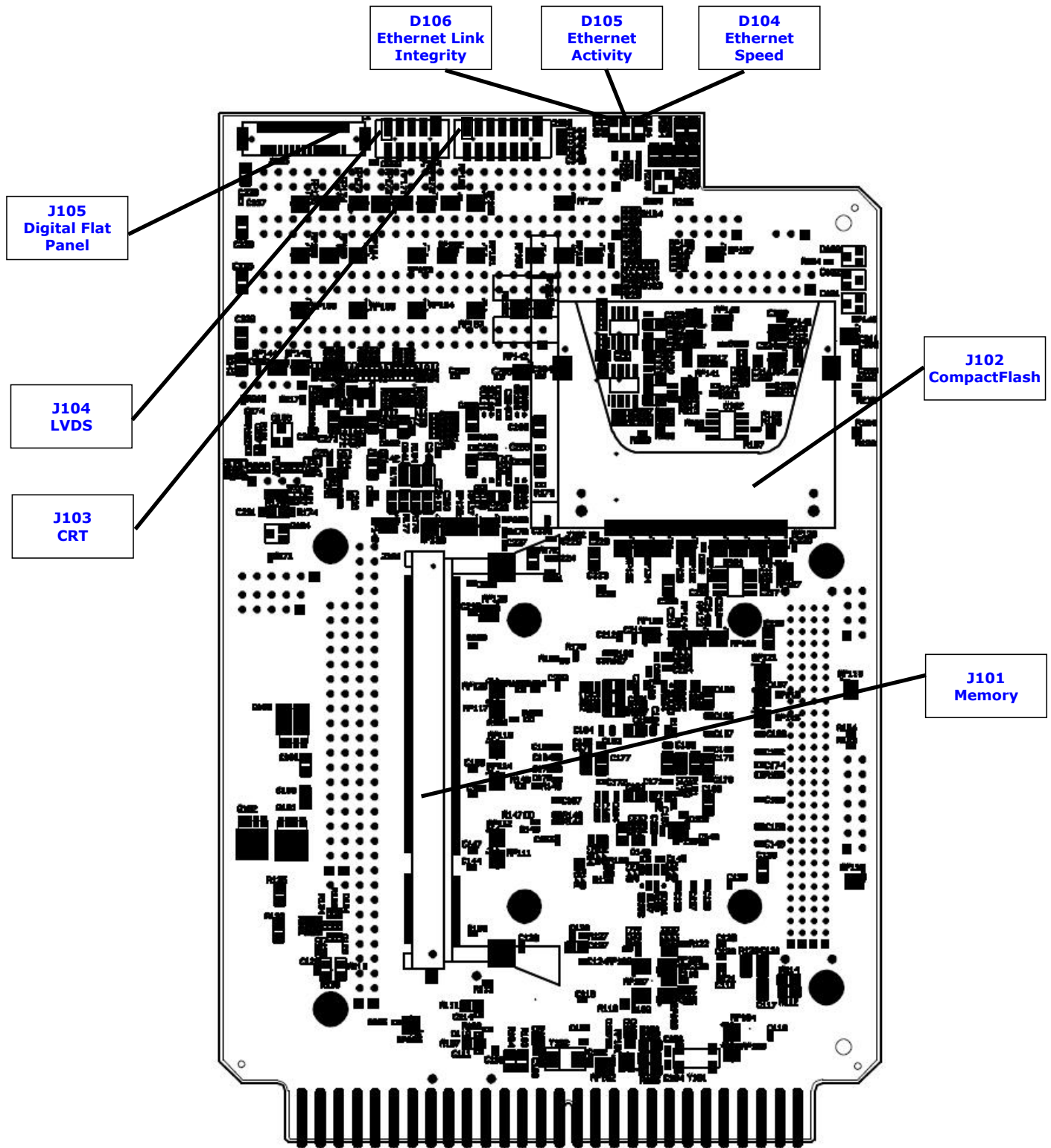
Introduction

This manual is intended to provide the necessary information regarding configuration and usage of the LPM-LX800-G board. WinSystems maintains a Technical Support Group to help answer questions not adequately addressed in this manual. Contact Technical Support at (817) 274-7553, Monday through Friday, between 8 AM and 5 PM Central Standard Time (CST).

Features

Processor
- AMD Geode™ LX800

Compatible Operating Systems
- Windows XP Embedded, Linux, DOS, Windows XP, x86 RTOS

Memory
- Up to 1 GB of 200-pin SODIMM PC2700 DDR SDRAM (Socketed)

Video
- CRT or Flat Panel operation (simultaneous operation supported)
- Up to 1920x1200 CRT resolution
- Up to 1600x1200 Flat Panel resolution
- Digital Flat Panel and LVDS Supported
- Up to 18-bits/pixel color panel support

Ethernet
- Intel 82551ER 10/100 Mbps controller

Digital I/O
- 48 Bidirectional lines (WS16C48)

Serial I/O
- Four (4) serial ports (RS-232/422/485)

Line Printer Port
- Bidirectional (SPP)

USB
- Four (4) USB 2.0 ports

Watchdog Timer
- Up to 255 minute reset

CompactFlash
- Types I & II supported

IDE
- One (1) Ultra DMA IDE port supports up to two (2) devices

Power
- +5V required, 1.6A typical

Industrial Operating Temperature Range
- -40°C to 85°C

Form Factor
- STD Bus-compliant
- 4.50" x 7.00" (114.30 mm x 177.80 mm)

Additional Specifications
- RoHS compliant
- PC/104 and PC/104-*Plus* expansion connectors
- InSyde BIOS
- Backlight power supported
- On-board battery plus connector for off-board battery
- Replaces WinSystems' products: LPM/MCM-6117, LPM/MCM-TX, LPM/MCM-DX5
- Custom splash screen on start up
- Real-time clock
- Activity status LEDs on-board
- AC97 Support
- PS/2 Keyboard Supported
- PS/2 Mouse Supported

Functional Capability

System Processor

The LPM-LX800-G board is based upon a 500 MHz AMD Geode™ LX800 and the CS5536 companion chip. These devices incorporate the CPU, 128 KB of cache, FPU, DDR SDRAM controller, Flash/ROM controller, an integrated display controller, audio controller, PCI controller and the RTC/CMOS RAM.

Memory

The LPM-LX800-G can support a maximum of 1 GB of RAM with the SODIMM socket located on the back of the board at **J101**.

Qualified SODIMMS are available directly from WinSystems.

The RAM can be user supplied, but must meet the following criteria:

200-Pin SODIMM PC2700 DDR SDRAM with gold fingers (up to 1 GB)

WinSystems cannot guarantee the operation of systems using nonqualified SODIMM modules.

Installation is accomplished by inserting the module into the connector at approximately a 30 degree angle. Press firmly to fully seat the module into the connector and then press the module downward to snap it into the retaining clamps.

Removal is accomplished by gently pulling outward on the retaining clamps until the module springs up to the appropriate removal angle.

Interrupt Routing

Two 82C59A-compatible interrupt controllers accept inputs from the on-board peripherals and the PC/104 Bus, PC/104-*Plus* Bus and STD Bus connectors. The configuration of interrupt inputs is achieved in the BIOS CMOS setup.

OTT

An Over The Top (OTT) connector is provided at **J3** to allow front-plane routing of additional interrupt inputs. The interrupts must be configured in the BIOS. The pinout for **J3** is listed below.

J3

GND	**1 o o 2**	Configurable IRQ
GND	**3 o o 4**	Configurable IRQ
GND	**5 o o 6**	Configurable IRQ
GND	**7 o o 8**	Configurable IRQ
GND	**9 o o 10**	Configurable IRQ

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Interrupt Status Register

One of the unique features of the LPM-LX800-G is the Interrupt Status Register located at 1ECH. This read-only register allows all COM channels to share interrupts and thus frees interrupts for other peripherals. If more than one COM port is configured in the BIOS to use the same interrupt, the Interrupt Status Register can be read to determine which port generates an interrupt. Once a pending interrupt is serviced, the status register should be read again to see if another interrupt is pending before exiting the routine.

Interrupt Status Register - 1ECH

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
N/A	N/A	N/A	N/A	COM4	COM3	COM2	COM1

Note: A **1** will be read for the device(s) with an interrupt pending.

WinSystems does not provide software support for implementing the Interrupt Status Register to share interrupts. Some operating systems, such as Windows XP and Linux, have support for sharing serial port interrupts and examples are available. The user will need to implement the appropriate software to share interrupts for the other devices.

Power and Reset Interface

Power is supplied to the LPM-LX800-G through the STD Bus.

Power Fail Reset

A precision voltage comparator monitors the +5V status. Upon detection of an out-of-tolerance condition, the board is reset. This action is critically important in the event of brown-out or power fail conditions. The reset circuit also ensures that the power is nominal before releasing reset.   A reset condition occurs when VCC drops between 4.6V and 4.75V for more than 130 ms.

Real-Time Clock/Calendar

A real-time clock is used as the AT-compatible clock/calendar. It supports a number of features including periodic and alarm interrupt capabilities. In addition to the time and date keeping functions, the system configuration is kept in CMOS RAM contained within the clock section.
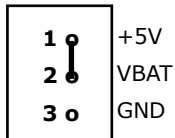
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Battery Backup

A 350 mAH battery supplies the LPM-LX800-G board with standby power for the real-time clock and CMOS setup RAM.

An optional external battery, connected at **J5**, supplies the LPM-LX800-G board with standby power for the real-time clock and CMOS setup RAM. An extended temperature lithium battery capable of backing up the LPM-LX800-G is available from WinSystems, part number BAT-LTC-E-36-27-1 (or BAT-LTC-E-36-16-1 if applicable). Contact your WinSystems' Application Engineer for additional information.

A power supervisory circuit contains the voltage sensing circuit and an internal power switch to route the battery or standby voltage to the circuits selected for backup. The battery automatically switches ON when the VCC of the systems drops below the battery voltage and back OFF again when VCC returns to normal.

Master Battery Enable (J31)

J31

```
1 o   +5V
2 o   VBAT
3 o   GND
```

Enables On-board Battery (default)	1-2
Disables On-board Battery	1 2

⚠ **WARNING:** The on-board battery must be DISABLED when using the external battery.

J5

```
o  o  o
1  2  3

GND  +VBAT  NC
```

(For external battery. Provides battery backup to RTC and BIOS CMOS.)

⚠ **WARNING:** BAT-LTC-E-36-27-1 (or BAT-LTC-E-36-16-1 if applicable) must be connected at J5. Improper connection may result in explosive failure. It is possible for the battery to violently explode if installed incorrectly. Please be careful to note correct connection at location J5.

Rotational Disk Support

An industry standard 16-bit IDE interface is provided to support up to two hard disks. An IDE activity LED, **D1**, provides visual status during IDE data transfers. The IDE interface is provided via connector **J9**, which is a 40-pin standard connector. WinSystems offers the cable CBL-126-G-10-2.0 to simplify the connection. The pinout for the cable is listed in detail in the cable drawing. The pinout for **J9** is listed below.

J9

	LED	HDCS1	A0	A1	IRQ	DACK	RDY	IOR	IOW	DRQ	GND	D0	D1	D2	D3	D4	D5	D6	D7	RESET*
	39	37	35	33	31	29	27	25	23	21	19	17	15	13	11	9	7	5	3	1
	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12	10	8	6	4	2
	GND	HDCS3	A2	66/100 MHz	N/C	GND	GND	GND	GND	GND	N/C	D15	D14	D13	D12	D11	D10	D9	D8	GND

CompactFlash

The LPM-LX800-G supports solid state CompactFlash storage devices for applications where the environment is too harsh for mechanical hard disks.

NOTE: The CompactFlash is an IDE device. Use of a CompactFlash device therefore reduces the number of available hard disks to one.

The CompactFlash socket at **J102** supports modules with TrueIDE support. WinSystems offers industrial grade CompactFlash modules that provide high performance and extended temperature operation (-40ºC to +85ºC). An IDE activity LED is present at **D1**.

When using a CompactFlash device, Master/Slave selection is made using jumper field **J21**.

J21

3 o		
2 o	CompactFlash Master	1-2
1 o	CompactFlash Slave (default)	1 2

Optionally, a USB FLASH drive can be connected in addition to, or instead of the CompactFlash device. Legacy USB operation is supported by the system BIOS.

Multi-I/O Interface

The interface to I/O serial channels (COM1-COM2), the printer port and keyboard are all terminated via the connector at **J2**. A cable, part number CBL-247-G-1-1.0, is available from WinSystems to adapt to the conventional I/O connectors. The pinout definition for **J2** is listed below.

J2

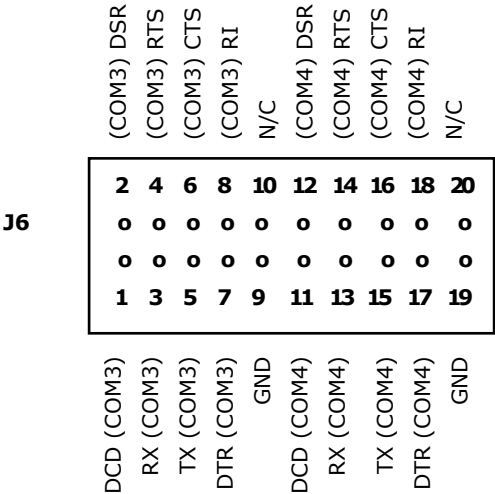| Even pin	Signal (top)	Odd pin	Signal (bottom)
2	(COM1) DSR	1	DCD (COM1)
4	(COM1) RTS	3	RXD (COM1)
6	(COM1) CTS	5	TXD (COM1)
8	(COM1) RI	7	DTR (COM1)
10	(COM2) DCD	9	GND (COM1)
12	(COM2) RSX	11	DSR (COM2)
14	(COM2) TXD	13	RTS (COM2)
16	(COM2) DTR	15	CTS (COM2)
18	(COM2) GND	17	RI (COM2)
20	(LPT) AUTOFD	19	STROBE
22	(LPT) ERROR	21	PD0 (LPT)
24	(LPT)INIT	23	PD1 (LPT)
26	(LPT) SLCTIN	25	PD2 (LPT)
28	(LPT) GND	27	PD3 (LPT)
30	(LPT) GND	29	PD4 (LPT)
32	(LPT) GND	31	PD5 (LPT)
34	(LPT) GND	33	PD6 (LPT)
36	(LPT) GND	35	PD7 (LPT)
38	(LPT) GND	37	ACK (LPT)
40	(LPT) GND	39	BUSY (LPT)
42	(LPT) GND	41	PE (LPT)
44	(KEYBD) GND	43	SLCT (LPT)
46	(KEYBD) GND	45	GND (KEYBD)
48	(KEYBD) CLK	47	KDATA (KEYBD)
50	(KEYBD) +5V	49	+5V (KEYBD)

Serial Interface

Four independent, asynchronous serial channels are on-board. All four ports are RS-232/RS-422/RS-485 configurable. COM1 and COM2 are terminated at **J2**, which is a 50-pin Multi-I/O connector and is described in the Multi-I/O Interface section of this manual. An adapter cable, part number CBL-247-G-1-1.0, is available from WinSystems to adapt to the conventional I/O connectors. Configuration options for RS-232, RS-422 and RS-485 are listed on the following page.

All serial channels are configured as Data Terminal Equipment (DTE). Both the send and receive registers of each channel have a 16-byte FIFO. All serial ports have 16C550-compatible UARTs. The RS-232 drivers have a charge pump to generate the plus and minus voltages so that the LPM-LX800-G only requires +5V to operate.

Independent control of transmit, receive, line status and data set interrupts are on all channels. Each channel is setup to provide internal diagnostics such as loopback and echo mode on the data stream. An independent, software programmable baud rate generator is selectable from 50 through 115.2 kbps. Individual modem handshake control signals are supported for all channels.

COM3 and COM4 are accessible via the connector at **J6**. WinSystems offers an adapter cable, CBL-173-G-1-1.0, which adapts **J6** to two standard DB9M connectors. For additional information on cable connection, refer to the cable drawings. The pinout for **J6** is:

	(COM3) DSR	(COM3) RTS	(COM3) CTS	(COM3) RI	N/C	(COM4) DSR	(COM4) RTS	(COM4) CTS	(COM4) RI	N/C
	2	4	6	8	10	12	14	16	18	20
J6	o	o	o	o	o	o	o	o	o	o
	o	o	o	o	o	o	o	o	o	o
	1	3	5	7	9	11	13	15	17	19
	DCD (COM3)	RX (COM3)	TX (COM3)	DTR (COM3)	GND	DCD (COM4)	RX (COM4)	TX (COM4)	DTR (COM4)	GND

COM1, COM2, COM3 and COM4 Configuration Options

1. RS-232 Mode
2. RS-422 Mode with RTS transmitter enable
3. RS-422 Mode with auto transmitter enable
4. RS-485 Mode with RTS transmitter enable
5. RS-485 Mode with RTS transmitter enable and echo back
6. RS-485 Mode with auto transmitter enable
7. RS-485 Mode with auto transmitter enable and echo back

Modes 2, 4 and 5 require the RTS bit (MCR Bit 1) to be set in order to transmit.
Mode 4 requires that RTS (MCR Bit 1) be de-asserted in order to receive.

Each of the RS-422/RS-485 modes also allows for jumper selection of transmit and/or receive termination and biasing resistor(s). A 8-pin configuration jumper is provided for each port as described below.

COM1 = **J16**
COM2 = **J17**
COM3 = **J14**
COM4 = **J15**

TX(100)   : Places a 100Ω resistor across the **TX+/TX-** pair (Pins 3-4)

RX(100)   : Places a 100Ω resistor across the **RX+/RX-** pair (Pins 7-8)

TX/RX(300)   : Places a 100Ω resistor from +5V to **TX/RX+** (Pins 1-2), a 100Ω resistor from **TX/RX-** (Pins 3-4) to ground and a 100Ω resistor between **TX/RX+** and **TX/RX-** (Pins 5-6).

Serial Connector Summary

RS-232 Mode	RS-422 Mode	RS-485 Mode
1. DCD	1. N/A	1. N/A
2. RX	2. TX+	2. TX/RX+
3. TX	3. TX-	3. TX/RX-
4. DTR	4. N/A	4. N/A
5. GND	5. GND	5. GND
6. DSR	6. RX+	6. N/A
7. RTS	7. RX-	7. N/A
8. CTS	8. N/A	8. N/A
9. RI	9. N/A	9. N/A

Visual Index

DB9 Male

```
1  2  3  4  5
o  o  o  o  o
  o  o  o  o
  6  7  8  9
```

Serial Port Termination Jumpers

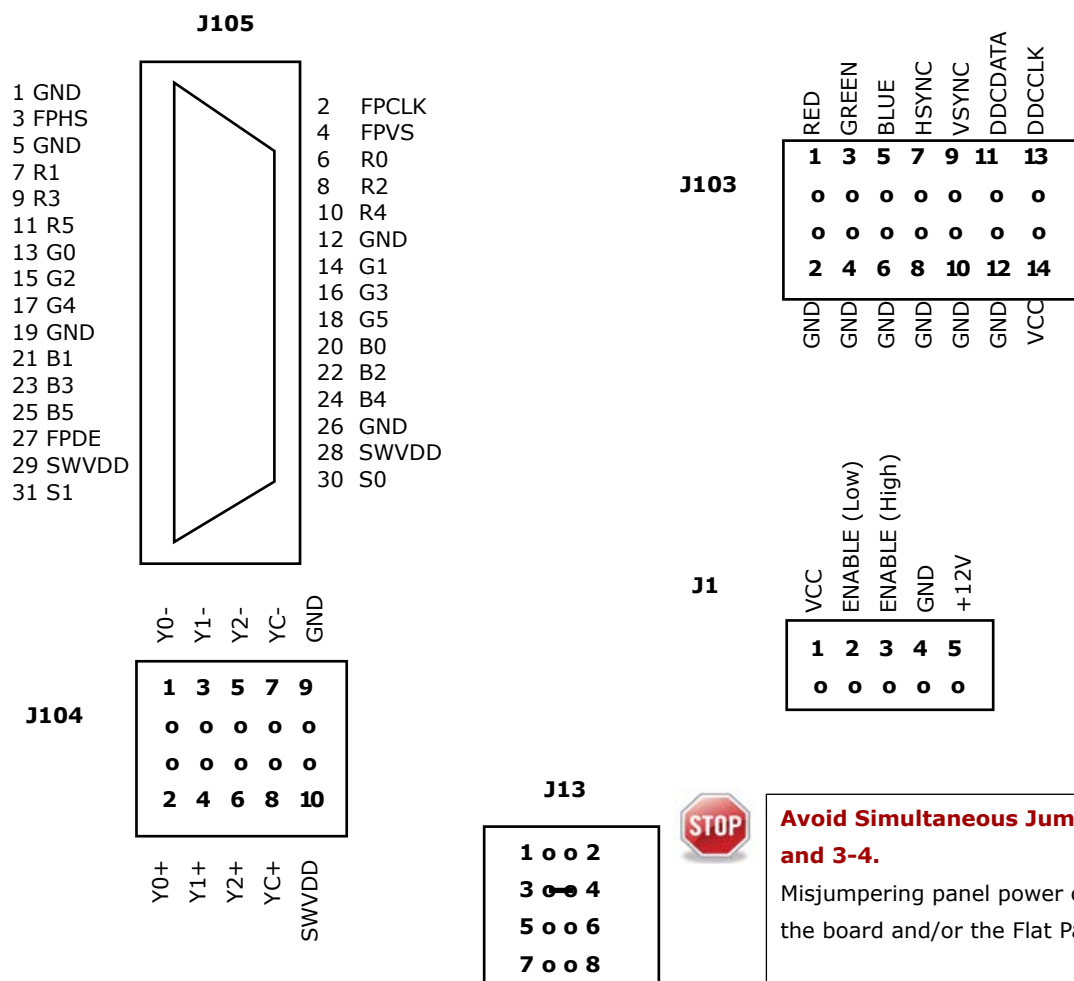| Mode #	Description	Termination J14, J15, J16, J17		
		TX (100)	RX (100)	TX/RX (300)
1	RS-232	N/A	N/A	N/A
2	RS-422 RTS ENABLE	3-4	7-8	1-2 3-4 5-6
3	RS-422 AUTO ENABLE	N/A	7-8	1-2 3-4 5-6
4	RS-485 RTS ENABLE	3-4	N/A	1-2 3-4 5-6
5	RS-485 RTS ENABLE with Echo-Back	3-4	N/A	1-2 3-4 5-6
6	RS-485 AUTO ENABLE	3-4	N/A	1-2 3-4 5-6
7	RS-485 AUTO ENABLE with Echo-Back	N/A	N/A	1-2 3-4 5-6

Video Interface

The LPM-LX800-G has an integrated display controller that interfaces to both CRT and flat panel displays. The video output mode is selected in the CMOS setup. Simultaneous flat panel and CRT mode is also supported. The CRT connector is located at **J103**. The direct digital flat panel interface is located at **J105**. The mode is selected in the BIOS. An LVDS interface is located at **J104**. The backlight power connector is located at **J1**. Panel option selection is made at **J13**.

⚠️ **HAZARD WARNING: LCD panels can require a high voltage for the panel backlight. This high-frequency voltage can exceed 1000 volts and can present a shock hazard. Care should be taken when wiring and handling the inverter output. To avoid the danger of shock and to avoid the panel, make all connection changes with the power removed.**

Contact your WinSystems' Applications Engineer for information about available cable kits and supported panels. **This manual does not attempt to provide any information about how to connect to specific LCDs.**

J105

1 GND	2 FPCLK
3 FPHS	4 FPVS
5 GND	6 R0
7 R1	8 R2
9 R3	10 R4
11 R5	12 GND
13 G0	14 G1
15 G2	16 G3
17 G4	18 G5
19 GND	20 B0
21 B1	22 B2
23 B3	24 B4
25 B5	26 GND
27 FPDE	28 SWVDD
29 SWVDD	30 S0
31 S1	

J103

	RED	GREEN	BLUE	HSYNC	VSYNC	DDCDATA	DDCCLK
	1	3	5	7	9	11	13
	o	o	o	o	o	o	o
	o	o	o	o	o	o	o
	2	4	6	8	10	12	14
	GND	GND	GND	GND	GND	GND	VCC

J104

	Y0-	Y1-	Y2-	YC-	GND
	1	3	5	7	9
	o	o	o	o	o
	o	o	o	o	o
	2	4	6	8	10
	Y0+	Y1+	Y2+	YC+	SWVDD

J1

	VCC	ENABLE (Low)	ENABLE (High)	GND	+12V
	1	2	3	4	5
	o	o	o	o	o

J13

| 1 o o 2 |
| 3 o—o 4 |
| 5 o o 6 |
| 7 o o 8 |

🛑 **Avoid Simultaneous Jumpering of pins 1-2 and 3-4.**

Misjumpering panel power could cause damage to the board and/or the Flat Panel.

Panel Power	5V	1-2, 3 4
	3.3V (default)	1 2, 3-4
Panel Options	S0 Low	5-6
	S0 High	5 6
	S1 Low	7-8
	S1 High	7 8

Ethernet Controller

An Intel 82551ER 32-bit PCI Ethernet controller chip is used for high-speed data transfer. It has auto-negotiation capability for speed, duplex and flow control. It supports IEEE 802.3 10Base-T and 100Base-T in either full- or half-duplex mode at both 10 and 100 Mbps. In full-duplex mode, it adheres to the IEEE 802.x Flow Control Specification.

The Ethernet interface is provided at connector **J18**. WinSystems offers the cable CBL-342-G-1-1.5 to simplify the connection. The pinout for the cable is listed in detail in the cable drawing. The pinout for **J18** is listed below.

J18

+3V	**12 o o 11**	LED2
LED1	**10 o o 9**	LED0
N/C	**8 o o 7**	N/C
ERX-	**6 o o 5**	N/C
N/C	**4 o o 3**	ERX+
ETX-	**2 o o 1**	ETX+

There are light emitting diodes (LEDs) on the LPM-LX800-G to provide a visual indication of the link status, network activity and network speed. The yellow Link Integrity LED is lit when a valid connection is detected. The green Activity LED blinks on and off when activity is detected on the wire. The red LED is on if a 100Base-T link is detected and off if a 10Base-T link is detected.

On-board Ethernet activity signals are also provided at connector **J18**, as shown above, to allow optional status LEDs to be mounted off-board. The Ethernet activity signals are active low and require an external resistor to limit current to 12-16 mA.

D106	LED0	(YELLOW)	LINK INTEGRITY
D105	LED1	(GREEN)	ACTIVITY
D104	LED2	(RED)	SPEED

NOTE: WinSystems cannot provide technical support for direct programming of the 82551ER controller. We suggest utilizing a TCP/IP stack or Network O/S that allows the use of preexisting 82551ER drivers.

Status LED

A status LED is populated on the board at **D2** which can be used for any application specific purpose. The LED can be turned on in software applications by writing a **1** to I/O port 1EDH. The LED can be turned off by writing a **0** to 1EDH.

D2	---	(GREEN)	STATUS

Digital I/O

The LPM-LX800-G has 48 lines with 10K pullup with a default base address of 120H. These 48 lines are capable of fully latched event sensing with sense polarity being software programmable. Two 50-pin connectors allow for easy mating with industry standard I/O racks. WinSystems' offers an optional 50-pin conductor ribbon cable, CBL-115-4, to adapt to the connectors.

Digital I/O Connectors

The 48 lines of digital I/O are terminated through two 50-pin connectors at **J7** and **J4**. The **J7** connector handles I/O Ports 0 through 2 while **J4** handles Ports 3 through 5. The pin definitions for **J7** and **J4** are shown below.

J7 pin assignments:

Top row (even pins, all GND): 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50

Bottom row (odd pins): 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49

Bottom signal labels: Port 2 Bit 7, Port 2 Bit 6, Port 2 Bit 5, Port 2 Bit 4, Port 2 Bit 3, Port 2 Bit 2, Port 2 Bit 1, Port 2 Bit 0, Port 1 Bit 7, Port 1 Bit 6, Port 1 Bit 5, Port 1 Bit 4, Port 1 Bit 3, Port 1 Bit 2, Port 1 Bit 1, Port 1 Bit 0, Port 0 Bit 7, Port 0 Bit 6, Port 0 Bit 5, Port 0 Bit 4, Port 0 Bit 3, Port 0 Bit 2, Port 0 Bit 1, Port 0 Bit 0, +5V

J4 pin assignments:

Top row (even pins, all GND): 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50

Bottom row (odd pins): 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49

Bottom signal labels: Port 5 Bit 7, Port 5 Bit 6, Port 5 Bit 5, Port 5 Bit 4, Port 5 Bit 3, Port 5 Bit 2, Port 5 Bit 1, Port 5 Bit 0, Port 4 Bit 7, Port 4 Bit 6, Port 4 Bit 5, Port 4 Bit 4, Port 4 Bit 3, Port 4 Bit 2, Port 4 Bit 1, Port 4 Bit 0, Port 3 Bit 7, Port 3 Bit 6, Port 3 Bit 5, Port 3 Bit 4, Port 3 Bit 3, Port 3 Bit 2, Port 3 Bit 1, Port 3 Bit 0, +5V

Digital I/O VCC Enable

The I/O connectors can provide +5V to an I/O rack or for miscellaneous purposes by jumpering **J26**. When **J26** is jumpered (13-14), +5V is provided at pin 49 of **J4** and **J7**. It is the user's responsibility to limit current to a safe value (less than 400 mA) to avoid damaging the CPU board.

J26

```
 1 o o 2
 3 o o 4
 5 o o 6
 7 o o 8
 9 o o 10
11 o o 12
13 o o 14
```

+5V is provided at pin 49 of **J4/J7**	13-14
No Power at Pin 49 of **J4/J7** (default)	13 14

WS16C48 Compatible Digital I/O
This device provides 48 lines of digital I/O. The following table summarizes the registers and the text that follows provides details on each of the internal registers.

I/O Address Offset	Page 0	Page 1	Page 2	Page 3
00H	Port 0 I/O	Port 0 I/O	Port 0 I/O	Port 0 I/O
01H	Port 1 I/O	Port 1 I/O	Port 1 I/O	Port 1 I/O
02H	Port 2 I/O	Port 2 I/O	Port 2 I/O	Port 2 I/O
03H	Port 3 I/O	Port 3 I/O	Port 3 I/O	Port 3 I/O
04H	Port 4 I/O	Port 4 I/O	Port 4 I/O	Port 4 I/O
05H	Port 5 I/O	Port 5 I/O	Port 5 I/O	Port 5 I/O
06H	Int_ Pending	Int_ Pending	Int_ Pending	Int_ Pending
07H	Page/Lock	Page/Lock	Page/Lock	Page/Lock
08H	N/A	Pol_0	Enab_0	Int_ID0
09H	N/A	Pol_1	Enab_1	Int_ID1
0AH	N/A	Pol_2	Enab_2	Int_ID2

Register Details

Port 0 through 1 I/O – Each I/O bit in each of the six ports can be individually programmed for input or output. Writing a **0** to a bit position causes the corresponding output pin to go to a high-impedance state (pulled high by external 10 KΩ resistors). This allows it to be used as an input. When used in the input mode, a read reflects the inverted state of the I/O pin, such that a high on the pin will read as a **0** in the register. Writing a **1** to a bit position causes that output pin to sink current (up to 12 mA), effectively pulling it low.

INT_PENDING – This read-only register reflects the combined state of the INT_ID0 through INT_ID2 registers. When any of the lower three bits are set, it indicates that an interrupt is pending on the I/O port corresponding to the bit position(s) that are set. Reading this register allows an Interrupt Service Routine to quickly determine if any interrupts are pending and which I/O port has a pending interrupt.

PAGE/LOCK – This register serves two purposes. The upper two bits select the register page in use as shown here:

D7	D6	Page
0	0	Page 0
0	1	Page 1
1	0	Page 2
1	1	Page 3

Bits 5-0 allow for locking the I/O ports. A **1** written to the I/O port position will prohibit further writes to the corresponding I/O port.

POL0 - POL2 – These registers are accessible when Page 1 is selected. They allow interrupt polarity selection on a port–by–port and bit-by-bit basis. Writing a **1** to a bit position selects the rising edge detection interrupts while writing a **0** to a bit position selects falling edge detection interrupts.

ENAB0 - ENAB2 – These registers are accessible when Page 2 is selected. They allow for port-by-port and bit-by-bit enabling of the edge detection interrupts. When set to a **1** the edge detection interrupt is enabled for the corresponding port and bit. When cleared to **0**, the bit's edge detection interrupt is disabled. Note that this register can be used to individually clear a pending interrupt by disabling and re-enabling the pending interrupt.

INT_ID0 – INT_ID2 – These registers are accessible when Page 3 is selected. They are used to identify currently pending edge interrupts. A bit when read as a **1** indicates that an edge of the polarity programmed into the corresponding polarity register has been recognized. Note that a write to this register (value ignored) clears ALL of the pending interrupts in this register.
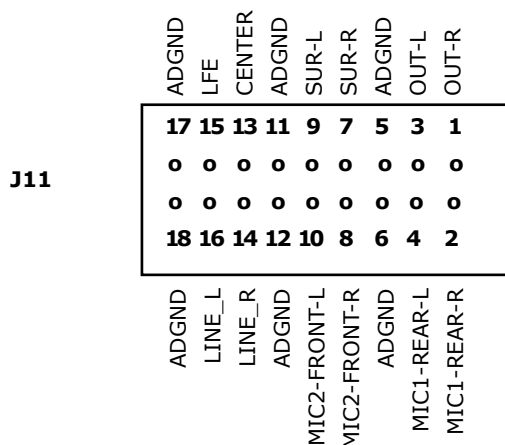
Audio Interface

The LPM-LX800-G has an audio interface designed to provide high-quality audio reproduction for embedded systems use. The LPM-LX800-G provides three stereo line level channels (or 5.1 surround), line level input and microphone.
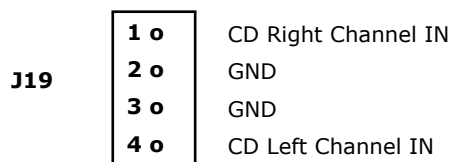
Audio External Connection

J11 provides the audio connection. WinSystems offers both a simplified cable CBL-270-G-3-1.5 and a full 6 channel cable CBL-270-G-2-1.5 to accomplish this connection. The pin definitions for **J11** are provided below:

	ADGND	LFE	CENTER	ADGND	SUR-L	SUR-R	ADGND	OUT-L	OUT-R
J11	17	15	13	11	9	7	5	3	1
	o	o	o	o	o	o	o	o	o
	o	o	o	o	o	o	o	o	o
	18	16	14	12	10	8	6	4	2
	ADGND	LINE_L	LINE_R	ADGND	MIC2-FRONT-L	MIC2-FRONT-R	ADGND	MIC1-REAR-L	MIC1-REAR-R

CD Input

A secondary line level input is also provided at **J19**. This input is designed primarily for feeding the CD-ROM audio output to the board for multimedia presentations. The pin definitions for **J19** are:

J19		
	1 o	CD Right Channel IN
	2 o	GND
	3 o	GND
	4 o	CD Left Channel IN

Speaker

An on-board speaker, **SP1**, is available for sound generation. A beep code is generated that corresponds to any BIOS error codes (if required) during the power-up or reset sequence.

Beep Codes

Reference the chart below for the appropriate Insyde BIOS Beep Codes.

Number of Beeps	Beep Code Description
1	No problem
2	Time/Date/CMOS checksum failure
3 or more	Video RAM failure

Line Printer Port

The LPT port is a multimode parallel printer port that supports the PS/2 Standard Bidirectional Parallel Port (SPP). The output drivers support 9 mA per line.

The LPT interface is provided at connector **J2**, which is the Multi-I/O connector. WinSystems offers the cable CBL-343-G-1-1.375 to simplify the connection. Pinouts for the connector and cable are listed in detail in the cable drawing.
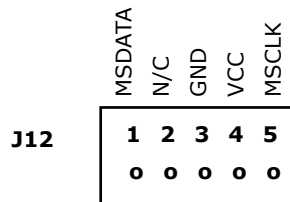
The printer port can also be used as two additional general-purpose I/O ports if a printer is not required. The first port is configured as eight input or output only lines. The other port is configured as five input and three output lines.

Keyboard

An integrated 80C42 equivalent keyboard controller supports a PS/2 keyboard. Interface is provided at the Multi-I/O connector, **J2.** Optionally, a USB keyboard can be connected in addition to, or instead of the standard PS/2 keyboard.
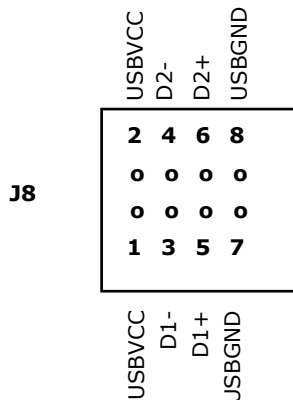
Mouse Interface

A PS/2 mouse port provides connection for a compatible mouse and is terminated at **J12**. An adapter cable, CBL-343-G-1-1.375, is available from WinSystems to simplify the connection. Optionally, a USB mouse can be connected in addition to, or instead of the standard PS/2 mouse.

J12

	MSDATA	N/C	GND	VCC	MSCLK
	1	2	3	4	5
	o	o	o	o	o

USB

Up to two USB cables may be attached to the LPM-LX800-G via the connectors for a total of four USB 2.0 ports.   These are terminated to an 8-pin, 2 mm connector at **J8** and **J10**. An adapter cable CBL-275-G-1-0.5 is available from WinSystems for connection. The pinout for the connector is:

J8

	USBVCC	D2-	D2+	USBGND
	2	4	6	8
	o	o	o	o
	o	o	o	o
	1	3	5	7
	USBVCC	D1-	D1+	USBGND

J10

	USBVCC	D4-	D4+	USBGND
	2	4	6	8
	o	o	o	o
	o	o	o	o
	1	3	5	7
	USBVCC	D3-	D3+	USBGND

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Watchdog Timer

The LPM-LX800-G features an advanced watchdog timer which can be used to guard against software lockups. Three interfaces are provided to the watchdog timer. The Advanced interface is the most flexible and recommended for new designs. The other two interface options are provided for software compatibility with older WinSystems single board computers.

Advanced
The watchdog timer can be enabled in the BIOS Settings by entering a value for Watchdog Timeout on the Peripherals screen. Any non-zero value represents the number of minutes prior to reset during system boot. Once the operating system is loaded, the watchdog can be disabled or reconfigured in the application software.

NOTE: It is recommended that a long timeout be used if the watchdog is enabled when trying to boot any operating system.

The watchdog can be enabled, disabled or reset by writing the appropriate values to the configuration registers located at I/O addresses 565h and 566h. The watchdog is enabled by writing a timeout value other than zero to the I/O address 566h and disabled by writing **00h** to this I/O address. The watchdog timer is serviced by writing the desired timeout value to I/O port 566h. If the watchdog has not been serviced within the allotted time, the circuit resets the CPU.

The timeout value can be set from 1 second to 256 minutes. If port 565h bit 7 equals **0**, the timeout value written into I/O address 566h is in minutes. The timeout value written to address 566h is in seconds if port 565 bit 7 equals **1**.

Watchdog Timer Examples

Port Address	Port Bit 7 Value	Port Address	Value	Reset Interval
565H	x	566H	00h	DISABLED
565H	1	566H	03h	3 SECONDS
565H	1	566H	1Eh	30 SECONDS
565H	0	566H	04h	4 MINUTES
565H	0	566H	05h	5 MINUTES

Standard
The watchdog can be enabled or disabled via software by writing an appropriate timeout value to I/O port 1EEH. See the chart provided below.

Port Address	Value	Reset Interval
1EEH	00h	DISABLED
	01h	3 SECONDS
	03h	30 SECONDS
	05h	300 SECONDS
1EFH	ANY	RESET TIMER

Legacy
The Legacy watchdog timer has a fixed reset interval of 1.5 seconds. The watchdog can be enabled by writing 1 or disabled by writing a 0 to I/O port address 1D0.

Port Address	Value	Reset Interval
1D0	00h	DISABLED
	01h	Enabled 1.5 sec
1D8H	ANY	RESET TIMER

PC/104 Bus Interface

The PC/104 bus is electrically equivalent to the 16-bit ISA bus. Standard PC/104 I/O cards can be populated on LPM-LX800-G's PC/104 buses, located at **J27** and **J29**. The interface does not support hot swap capability. The PC/104 bus connector pin definitions are provided here for reference. Refer to the PC/104 Bus Specification for specific signal and mechanical specifications.

J27

GND	D0 o o C0	GND
MEMCS16#	D1 o o C1	SBHE#
IOCS16#	D2 o o C2	LA23
IRQ10	D3 o o C3	LA22
IRQ11	D4 o o C4	LA21
IRQ12	D5 o o C5	LA20
IRQ15	D6 o o C6	LA19
IRQ14	D7 o o C7	LA18
DACK0#	D8 o o C8	LA17
DRQ0	D9 o o C9	MEMR#
DACK5#	D10 o o C10	MEMW#
DRQ5	D11 o o C11	SD8
DACK6#	D12 o o C12	SD9
DRQ6	D13 o o C13	SD10
DACK7#	D14 o o C14	SD11
DRQ7	D15 o o C15	SD12
+5V	D16 o o C16	SD13
MASTER#	D17 o o C17	SD14
GND	D18 o o C18	SD15
GND	D19 o o C19	KEY

J29

IOCHK#	A1 o o B1	GND
SD7	A2 o o B2	RESET
SD6	A3 o o B2	+5V
SD5	A4 o o B4	IRQ9
SD4	A5 o o B5	-5V
SD3	A6 o o B6	DRQ2
SD2	A7 o o B7	-12V
SD1	A8 o o B8	SRDY#
SD0	A9 o o B9	+12V
IOCHRDY	A10 o o B10	KEY
AEN	A11 o o B11	SMEMW#
SA19	A12 o o B12	SMEMR#
SA18	A13 o o B13	IOW#
SA17	A14 o o B14	IOR#
SA16	A15 o o B15	DACK3#
SA15	A16 o o B16	DRQ3
SA14	A17 o o B17	DACK1#
SA13	A18 o o B18	DRQ1
SA12	A19 o o B19	REFRESH#
SA11	A20 o o B20	BCLK
SA10	A21 o o B21	IRQ7
SA9	A22 o o B22	IRQ6
SA8	A23 o o B23	IRQ5
SA7	A24 o o B24	IRQ4
SA6	A25 o o B25	IRQ3
SA5	A26 o o B26	DACK2#
SA4	A27 o o B27	TC
SA3	A28 o o B28	BALE
SA2	A29 o o B29	+5V
SA1	A30 o o B30	OSC
SA0	A31 o o B31	GND
GND	A32 o o B32	GND

= Active Low Signal

NOTES:
1. Rows C and D are not required on 8-bit modules.
2. B10 and C19 are key locations. WinSystems uses key pins as connections to GND.
3. Signal timing and function are as specified in ISA specification.
4. Signal source/sink current differ from ISA values.

PC/104-*Plus* Bus Interface

The PC/104-*Plus* is electrically equivalent to the 33 MHz PCI bus and is terminated to a 120-pin, nonstackthrough connector. The standard PC/104-*Plus* I/O modules can be populated on LPM-LX800-G's PC/104-*Plus* bus. The interface does not support hot swap capability. The PC/104-*Plus* bus connector is located at **J28**. Refer to the PC/104-*Plus* Bus Specification for specific signal and mechanical specifications. The pin definitions are:

Pin	A	B	C	D
1	GND	RESERVED	+5	AD00
2	VI/O	AD02	AD01	+5V
3	AD05	GND	AD04	AD03
4	C/BE0#	AD07	GND	AD06
5	GND	AD09	AD08	GND
6	AD11	VI/O	AD10	M66EN
7	AD14	AD13	GND	AD12
8	+3.3V	C/BE1#	AD15	+3.3V
9	SERR#	GND	RESERVED	PAR
10	GND	PERR#	+3.3V	RESERVED
11	STOP#	+3.3V	LOCK#	GND
12	+3.3V	TRDY#	GND	DEVSEL#
13	FRAME#	GND	IRDY#	+3.3V
14	GND	AD16	+3.3V	C/BE2#
15	AD18	+3.3V	AD17	GND
16	AD21	AD20	GND	AD19
17	+3.3V	AD23	AD22	+3.3V
18	IDSEL0	GND	IDSEL1	IDSEL2
19	AD24	C/BE3#	VI/O	IDSEL3
20	GND	AD26	AD25	GND
21	AD29	+5V	AD28	AD27
22	+5V	AD30	GND	AD31
23	REQ0#	GND	REQ1#	VI/O
24	GND	REQ2#	+5V	GNT0#
25	GNT1#	VI/O	GNT2#	GND
26	+5V	CLK0	GND	CLK1
27	CLK2	+5V	CLK3	GND
28	GND	INTD#	+5V	RST#
29	+12V	INTA#	INTB#	INTC#
30	-12V	REQ3#	GNT3#	GND

NOTE: 1. The shaded area denotes power or ground signals.

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BIOS Supplemental

General Information

The LPM-LX800-G includes BIOS from Insyde Software, Inc. to assure full compatibility with PC operating systems and software. The basic system configuration is stored in battery backed CMOS RAM within the clock/calendar. As an alternative, the CMOS configuration may be stored in EEPROM for operation without a battery. For more information of CMOS configuration, see the BIOS Settings Storage Options section of this manual. Access to this setup information is via the Setup Utility in the BIOS.

Entering Setup

To enter setup, power up the computer and press **F1** when either the splash screen is displayed or when the **Press F1 for Setup** message is displayed. It may take a few seconds before the main setup menu screen is displayed.

Navigation of the Menus

Use the **Up** and **Down** arrow keys to move among the selections and press **Enter** when a selection is highlighted to enter a sub-menu or to see a list of choices. Pressing the letter corresponding to each menu option is a shortcut that opens the next dialogue box with one key press.

Following are images of each menu screen in the default configuration along with a brief description of each option where applicable. Available options are listed in reference tables. Menu values shown in **bold** typeface are factory defaults.

Visual Index

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

Main Menu
A. Time 11:34:30
B. Date 08/05/2009
C. Peripheral Device, PCI, USB, STD, and PC-104 Buses
D. Memory and Cache
E. Environmental
F. Power Management
G. Miscellaneous Configuration
H. Serial Console
O. Boot Order
L. Load Defaults
S. Save Changes Without Exit
Q. Exit Without Save
X. Save Changes and Exit
T. Save Changes to EEPROM and Exit
Z. Clear EEPROM

Each available option is listed in detail in the following sections.

Navigation to the screens is located at the top of each screen's layout.

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

C. Peripheral Device, PCI, USB, STD, and PC-104 Buses   >
A. Storage

IDE Configuration

Primary ATA Controller: **Enabled**

BIOS Support: **Enabled**

Cable Sense: **Auto**

DMA/UDMA Support: **Enabled**

Drive 1 Mode: **Auto**

Drive 2 Mode: **Auto**

Options:

Primary ATA Controller:	BIOS Support:	Cable Sense:	DMA/UDMA Support:	Drive 1 Mode:	Drive 2 Mode:
Enabled	Enabled	Auto	Enabled	Auto	Auto
Disabled	Disabled	None (Disabled)	Disabled	PIO 0	PIO 0
		Force 40 Conductor Cable		PIO 1	PIO 1
		Force 80 Conductor Cable		PIO 2	PIO 2
				PIO 3	PIO 3
				PIO 4	PIO 4
				MDMA 0	MDMA 0
				MDMA 1	MDMA 1
				MDMA 2	MDMA 2
				UDMA 0	UDMA 0
				UDMA 1	UDMA 1
				UDMA 2	UDMA 2
				UDMA 3	UDMA 3
				UDMA 4	UDMA 4
				UDMA 5	UDMA 5

USB Floppy Support: **Enabled**

Options:
Enabled
Disabled

Force USB Floppy to Drive A: **Enabled**

Options:
Enabled
Disabled

CD-ROM Boot Support: **Enabled**

Options:
Enabled
Disabled

C. Peripheral Device, PCI, USB, STD, and PC-104 Buses   >
B. Peripherals

Serial Ports

Port A: **Enabled**	BRG: **LO**	Addr: **0x03F8**	IRQ: **4**	I/F: **RS232**
Port B: **Enabled**	BRG: **LO**	Addr: **0x02F8**	IRQ: **3**	I/F: **RS232**
Port C: **Enabled**	BRG: **LO**	Addr: **0x03E8**	IRQ: **5**	I/F: **RS232**
Port D: **Enabled**	BRG: **LO**	Addr: **0x02E8**	IRQ: **6**	I/F: **RS232**

Options:

Port x:	**BRG:**	**Addr:**	**IRQ:**	**I/F:**
Enabled	LO	0x0100-0xfff8	None	RS232
Disabled	HI		3	RS422 RTS
			4	RS422 Auto
			5	RS485 RTS
			6	RS485 RTS w/Echo
			7	RS485 Auto
			9	RS485 Auto x/Echo
			10	
			11	
			12	
			14	
			15	

Parallel Port: **Enabled**	Addr: **0x0378**	IRQ: **7**	MODE: **Compatible**

Options:

Parallel Port:	**Addr:**	**IRQ:**	**MODE:**
Enabled	0x0100 - 0xfff8	None	Compatible
Disabled		3	PS/2 Bidir
		4	
		5	
		6	
		7	
		9	
		10	
		11	
		12	
		14	
		15	

Digital I/O: **Enabled**	Addr: **0x0120**	IRQ: **None**

Options:

Digital I/O:	**Addr:**	**IRQ:**
Enabled	0x0100 - 0xfff8	None
Disabled		3
		4
		5
		6
		7
		9
		10
		11
		12
		14
		15

Assign IRQ 12 to Mouse: Enabled

Options:
Enabled, Disabled

Watch-Dog Timeout: 0

Options:
{Enter any value between 0-255 for minutes.}

CTC IRQ: None

Options: None, 3, 4, 5, 6, 7, 9, 10, 11, 12, 14, 15

C. Peripheral Device, PCI, USB, STD, and PC-104 Buses   >
C. Graphics

Internal Controller Mode: **Secondary Controller**	
Options: Secondary Controller Disabled Primary Controller	
Graphics Memory: **24**	Driver Controls Init: **Disabled**
Options: {Enter any value between 2-254 for graphics memory size.}	*Options:* Enabled Disabled
Output Display: **CRT**	DOTPLL Bypass: **Disabled**
Options: CRT Flat Panel Panel and CRT Auto	*Options:* Disabled Enabled

Flat Panel Configuration (All properties and options are disabled by default due to Output Display set to CRT.)

Type: **TFT**	
Options: TFT LVDS Auto	
Resolution: **800x600**	HSYNC Polarity: **Active Low**
Options: 800x600 1024x768 1152x864 1280x1024 1600x1200 320x240 640x480	*Options:* Active Low Active High
Data Bus Type: **9-24 bits, 1 ppc**	VSYNC Polarity: **Active Low**
Options: 9-24 bits, 1 ppc 18,24 bits, 2 ppc	*Options:* Active Low Active High
Refresh Rate: **60 Hz**	LP Active Period: **Free Running**
Options: *60 Hz* *70 Hz* *72 Hz* *75 Hz* *85 Hz* *90 Hz* *100 Hz*	*Options:* Free Running Active Only
	SHFCLK Active Period: **Free Running**
	Options: Free Running Active Only

Software Backlight Control (All properties and options are disabled by default due to Output Display set to CRT.)

Backlight Enable: **Enabled**	Initial Brightness: **Last Value**
Options: Enabled Disabled	*Options:* Last Value 0% (Off) 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% (Full On)

C. Peripheral Device, PCI, USB, STD, and PC-104 Buses   >
D. PCI, USB, and STD Buses

PCI Interrupt Steering

PCI INTA#: **IRQ 11**	PCI INTB#: **IRQ 10**
PCI INTC#: **IRQ 10**	PCI INTD#: **IRQ 11**

Options:
None
IRQ 3
IRQ 4
IRQ 5
IRQ 6
IRQ 7
IRQ 9
IRQ 10
IRQ 11
IRQ 12
IRQ 14
IRQ 15

USB Settings

OHCI: **Enabled**	EHCI: **Enabled**
Options: Enabled Disabled	*Options:* Enabled Disabled
UDC: **Disabled**	UOC: **Disabled**
Options: Enabled Disabled	*Options:* Enabled Disabled
Overcurrent Reporting: **Disabled**	Port 4 Assignment: **Host**
Options: Enabled Disabled	*Options:* Host Device Not Used

OverTheTop Interrupt Steering

PIN 2: **None**	PIN 4: **None**	PIN 6: **None**	PIN 8: **None**	PIN 10: **None**

Options: None, 3, 4, 5, 6, 7, 9, 10, 11, 12, 14, 15

STD Bus Interrupt Sterring

PIN 37: **None**	PIN 44: **None**	PIN 46: **None**	PIN 50: **None**

Options: None, 3, 4, 5, 6, 7, 9, 10, 11, 12, 14, 15

STD Bus PIN Function

PIN 39: **MEMCS16**	PIN 40: **IOCS16**
Options: MEMCS16 STATUS0	*Options:* IOCS16 STATUS1

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

E. PC-104 Bus

PC-104 Bus Interrupt Steering	
IRQ3: **Disabled**	
IRQ4: **Disabled**	
IRQ5: **Disabled**	
IRQ6: **Disabled**	
IRQ7: **Disabled**	
IRQ9: **Disabled**	
IRQ10: **Disabled**	
IRQ11: **Disabled**	
IRQ12: **Disabled**	
IRQ14: **Disabled**	
IRQ15: **Disabled**	
Options: Enabled Disabled	

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

D. Memory and Cache

Cache Enable:	**Enabled**	Cache Mode:	**Write-Back**
Options: Enabled Disabled		*Options:* Write-Back Write-Through	
L2 Cache Enable: **Enabled**		Cache Allocate: **Disabled**	
Options: Enabled Disabled		*Options:* Enabled Disabled	

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

E. Environmental

Thermal SetPoints

Ambient High Temperature: **45**

Options:
{Enter temperature value in Celsius.}

CPU High Temperature: **80**

Options:
{Enter temperature value in Celsius.}

Read Current Temperatures and Voltages...
(default values vary depending on current temperatures and voltages)

Ambient Temperature: 0

CPU Temperature: 0

2.60V Voltage: 0

1.26V Voltage: 0

3.30V Voltage: 0

5.00V Voltage: 0

12.0V Voltage: 0

1.30V Voltage: 0

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

F. Power Management

BIOS PM at Boot: **Disabled**

Options:
Enabled
Disabled

APM Available: **Yes**

Options:
Yes
No

ACPI Available: **Yes**

Options:
Yes
No

S1 Clocks: **On (Most Power)**

Options:
On (Most Power)
Off (Least Power)
Off (With PS2 Wake) (Middle Power)

P-State Limit: **P0**

Options:
P0
P1

CPU Clock Gating: **Enabled**

Options:
Enabled
Disabled

Chipset Clock Gating: **Enabled**

Options:
Enabled
Disabled

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

G. Miscellaneous Configuration

Display F1 Messages: **Enabled**

Options:
Enabled
Disabled

Splash Screen Configuration

Splash Screen: **Enabled**

Options:
Enabled
Disabled

Splash Screen Timeout: **0**

Options:
{Enter milliseconds to wait (0, 1-65535 - 0=default:3000).}

Clear Splash Screen: **Enabled**

Options:
Enabled
Disabled

Summary Screen/AUX BIOS Message Configuration

Summary Screen/AUX BIOS Messages: **Enabled**

Options:
Enabled
Disabled

Summary Screen Timeout: **0**

Options:
{Enter milliseconds to wait (0, 1-65535 - 0=default:3000).}

PC Speaker Configuration

AC Beeper: **Enabled**

Options:
Enabled
Disabled

Setup Password Configuration

Set Password Enable: **Disabled**

Options:
Enabled
Disabled

Setup Pin: **0**

Options:
{1,1-9999}
Unsigned decimal number (Prefix with x or $ for Hex)

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

H. Serial Console

Console Type: **Normal Video/Keyboard**	*Baud rate defaults to 38400

Options:
Normal Video/Keyboard
Serial Console Only
Keyboard/Video and Serial

Port: **COM1 (3F8 IRQ 4)**

Options:
COM1 (3F8 IRQ 4)
COM2 (2F8 IRQ 3)
COM3 (3E8 IRQ 5)
COM4 (2E8 IRQ 6)

Baud Rate: **38400**

Options:
1200
2400
4800
9600
19200
38400
57600
115200

* Serial console in Normal Video/Keyboard mode is still available using WINCOM when attached to COM1 using 38400.

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

O. Boot Order

Boot Order	
1. Hard Drive	
2. USB Floppy Disk	
3. USB Hard Disk/Flash Drive	
4. USB CD-ROM Drive	
5. CD-ROM Drive	

Options:
None
Hard Drive
CD-ROM Drive
USB Floppy Disk
USB Hard Disk/Flash Drive
USB CD-ROM Drive

BIOS Settings Storage Options

CMOS Storage Location

The LPM-LX800-G's BIOS configuration is stored in three (3) locations:

      (1) CMOS RAM (nonvolatile if battery backed)
      (2) EEPROM (nonvolatile storage for user defaults)
      (3) FLASH PROM (nonvolatile storage for factory defaults)

Saving the CMOS Configuration

The Real-Time Clock and the CMOS RAM settings can be maintained by an optional battery when the board is powered off. The battery can be enabled/disabled with jumper pins 1 and 2 at **J31**. A battery is always required to maintain time and date functions when the board is powered off.

The EEPROM feature allows the user to save CMOS configuration settings to nonvolatile storage that does not require a battery. This feature can be enabled/disabled using pins 11 and 12 of **J26**. When enabled, the user's CMOS settings can be saved to EEPROM from the BIOS utility's Main Menu. If the board is powered off with no battery, the user's CMOS settings will be restored from EEPROM but time and date information will be lost and returned to default values.

J26

```
1 o o 2
3 o o 4
5 o o 6
7 o o 8
9 o o 10
11 o—o 12
13 o o 14
```

Reserved	1-10
EEPROM Enabled (default)	11-12
EEPROM Disabled	11 12
+5V is provided at pin 49 of **J4/J7**	13-14
No Power at Pin 49 of **J4/J7** (default)	13 14

At system boot, the BIOS first performs a checksum validation on the contents of the CMOS RAM. Invalid checksums usually occur due to a low or disabled battery. If the checksum is valid, the system boots using values stored in CMOS RAM. If a checksum error occurs, the BIOS attempts to load CMOS values from the EEPROM.

After a checksum validation, the BIOS configuration is loaded from the EEPROM and the boot process continues. If the EEPROM is disabled or the contents of the EEPROM fail the checksum validation, the system loads the factory default settings from the FLASH PROM and continues the boot sequence.

For applications where the battery is present, CMOS settings should be saved to both the CMOS RAM and to the EEPROM. If the battery fails, the CMOS defaults will be loaded from the EEPROM so the system can continue to function without user interaction and only time and date information will be lost.

Resetting CMOS to EEPROM defaults

If a battery is present, you can reset the CMOS RAM to the values stored in EEPROM by turning the system off and removed the jumper from **J31** pins 1 and 2 for a few seconds. Replace the jumper and reboot. When power is applied to the board, the system will boot with the CMOS settings that were stored in EEPROM.

Resetting CMOS and EEPROM to Factory Defaults

The LPM-LX800-G can normally be returned to the factory default BIOS configuration by selecting option **L. Load Defaults** on the BIOS Main Menu. If you need to reload the factory defaults, be sure to save them to CMOS RAM and to EEPROM using the options on the BIOS Main Menu.

If you have saved CMOS values that prevent you from accessing the BIOS menus, the board can be reset to factory defaults as follows:

1) Turn the system off.
2) Remove the jumper from pins 11-12 on **J26**.
3) Turn the system on and enter the BIOS Main Menu using the **F1** key.
4) Select **L. Load Defaults**.
5) Replace the jumper on pins 11-12 at **J26**.
6) Save the restored defaults to CMOS and EEPROM (options S and T, respectively).

Updating the BIOS FLASH PROM

The most recent LPM-LX800-G BIOS is available on the WinSystems website. However, it is highly recommended that an Applications Engineer be consulted prior to any BIOS FLASH PROM update. If the BIOS PROM is updated, the steps described above must be followed to reset the CMOS and EEPROM to the newly loaded factory defaults and to clear the data from the previous BIOS version.

Serial Console Reference

Introduction

This section documents the usage of the WinSystems Serial Console feature present on the LPM-LX800-G board. The serial console consists of special BIOS code and a special terminal program used to communicate with the board. The serial console WINCOM.EXE provides access to the Insyde CMOS setup options via a serial port. This allows embedded system designers and technicians access to CMOS setup on the LPM-LX800-G using only a laptop computer with a serial port.

WINCOM.EXE Serial Console Client

WINCOM.EXE is a DOS application that runs on a laptop or other 100% PC-compatible system. The client is started on the DOS command line with:

wincom [port] [interrupt] [baud_rate]

(NOTE: Words in [] represent command arguments)

Argument **port** is replaced with the I/O port address of the desired COM port in hex (i.e. 3F8 for COM1 and 2F8 for COM2). This allows for the usage of nonstandard addresses for COM ports.

Argument **interrupt** is replaced with the IRQ number assigned to the desired COM port. Typically the values would be 4 for COM1 and 3 for COM2.

Argument **baud rate** is replaced with one of the following values which is the baud rate to use for the connection.
1200
2400
4800
9600
19200
38400
57600
115200

NOTE: WINCOM runs best in a pure DOS environment. It is possible to use WINCOM in a DOS box under Windows, but there are a number of limitations in doing so and success is not guaranteed due to differences in low-level hardware drivers. It is recommended that a DOS boot disk be made containing WINCOM.EXE, which can be used when access to the LPM-LX800-G is desired.

When run in a pure DOS environment, WINCOM passes all keys and key combinations directly to the target LPM-LX800-G. For example, **<CTRL><ALT><DEL>** will cause the LPM-LX800-G to reboot. If WINCOM is run from a DOS box under Windows, the same key combination will be interpreted as a Windows command. WINCOM will not receive the keystrokes and cannot pass them to the serial console.

There are however, three keystroke combinations reserved by WINCOM and are not passed to the target system:

<ALT><END>   Exits WINCOM.
<ALT><PgUp>   Prompts for upload filename. (Used in conjunction with SCOPY.EXE)
<ALT><PgDn>   Prompts for download filename. (Used in conjunction with SCOPY.EXE)

Getting Started with the Serial Console

The LPM-LX800-G defaults to a standard video/keyboard configuration. In order to gain access to the system via the serial console for the first time, the following steps must be followed.

1. Copy WINCOM.EXE onto a DOS boot disk for the client (terminal) machine.
2. Attach a Null-Modem cable between COM1 of the LPM-LX800-G and a free COM port on the client machine.
3. Boot up the client machine and run WINCOM.EXE.   If attached to COM1 on the client, type:
   wincom 3f8 4 38400 <Enter>, or if attached to COM2 on the client, type:
   wincom 2f8 3 38400 <Enter>
4. Wait for WINCOM to finish initializing and the screen to clear. A totally blank screen is perfectly normal at this point.
5. Apply power to the LPM-LX800-G. The BIOS should sense the WINCOM attachment to its COM1 port and turn on the serial console for that port at the default rate of 38400 baud.
6. The **Press F1 for Setup** messages should be visible on the WINCOM client screen. Press <**F1**> to access CMOS setup. Several key presses are often necessary.
7. Make whatever CMOS changes are required. If permanent serial console access is desired, select the **Serial Console Configuration** option and select the desired mode, COM port and baud rate. Refer to the next section for details on selecting these items.
8. Exit CMOS setup, saving the changes as desired.

Copy File using the Serial Console

Besides being useful for accessing the CMOS setup menu, the serial console can be used effectively with non-graphical DOS applications or for command prompt access. The serial console can also be used in conjunction with the SCOPY.EXE utility to provide the ability to serially upload or download files from the LPM-LX800-G to the client PC and vice versa.

To use SCOPY, or any other DOS program, it must already be present on a disk currently accessible to the LPM-LX800-G. SCOPY is invoked at the DOS command prompt on the LPM-LX800-G with the command :

scopy [com1 | com2] [-rq | -sq] file name [-bbaud_rate]

[com1 | com2] is the COM port in use. This should match the COM port used by the LPM-LX800-G for serial console operations.

[-rq | -sq] is the direction flag. -rq will cause the LPM-LX800-G to receive a file. -sq will cause the LPM-LX800-G to send a file.

file name is the name of the file to be sent or received.

File Upload

To send a file called APP.EXE from a WINCOM client PC to the LPM-LX800-G, run SCOPY on the LPM-LX800-G from WINCOM. Assuming the serial connection is using COM2 on the LPM-LX800-G at a baud rate of 115200, a file upload would be initiated with following command:

scopy com2 -rq app.exe -b115200

Once SCOPY has been started on the LPM-LX800-G in receive mode, WINCOM must be told to send the file. To start the upload, press <ALT><PgUp> on the WINCOM client keyboard and WINCOM will present the following prompt:

File to upload :

Type the name of the file to be sent and press **<ENTER>**. If no file path is provided, the file must exist in the current directory on the WINCOM client PC. Otherwise, a path must be specified.

When a transfer starts, WINCOM will display the progress of the transfer as the number of records processed, similar to the statement below:

Sending Record Number 000040

When the file transfer is completed successfully, WINCOM reports:

wincom : File transfer complete

SCOPY also reports the result of the transfer:

scopy : File transfer complete

If there is a problem, either WINCOM or SCOPY will report that an error has occurred.

File Download

Assuming the same connection settings as those referenced above, to send a file called APP.EXE from the LPM-LX800-G to a WINCOM client PC, use the following command:

scopy com2 -sq app.exe -b115200

If no file path is provided, the file must exist in the current directory on the LPM-LX800-G. Otherwise, a path must be specified.

Once SCOPY has been started on the LPM-LX800-G in send mode, WINCOM must be told to receive the file. To start the download, press <ALT><PgDn> on the WINCOM client keyboard. WINCOM will respond with:

File to Download :

Type the name of the file to be downloaded and press **<ENTER>.**

I/O Port Map

Following is a list of PC I/O ports. I/O addresses marked with '**' are generally unused and should be the basis for the first choices in I/O address selection for external I/O boards.

NOTE: The LPM-LX800-G uses a PnP BIOS resource allocation. Care must be taken to avoid contention with resources allocated by the BIOS.

Hex Range	Usage
000-00F	8237DMA Controller #1
**010-01F	Free
020-021	8259 PIC #1
**022-03F	Free
040-043	8254 PIT
**044-04D	Free
04E-04F	Reserved for on-board configuration
**050-05F	Free
060-06F	8042 Keyboard / Mouse Controller
070-07F	CMOS RAM, Clock / Calendar
080-09F	DMA Page Registers
0A0-0BF	8259 PIC #2
0C0-0DF	8237 DMA Controller #2
**0E0-0EF	Free
0F0-0F1	Math Co-processor Control
**0F2-0F7	Free
0F8-0FF	Math Co-processor
100-102	Video Controllers
**103-11F	Free
120-12F	Digital I/O
**130-14F	Free
150	Reserved for on-board configuration
**151-1CF	Free
1D0-1DF	Legacy Watchdog (1D0-Enabled; 1D8 - Pet)
1E8-1EB	Reserved for on-board configuration
1EC	Interrupt Status Register
1ED	Status LED
1EE-1EF	Watchdog Timer Control
1F0-1FF	IDE Controller #1
**200-277	Free
**278-27F	Free (Option for LPT)
**280-2A7	Free
**2A8-2AF	Free (Option for on-board serial ports)
2B0-2DF	Video Controllers
**2E0-2E7	Free
2E8-2EF	COM4 – (Default)
**2F0-2F7	Free
2F8-2FF	COM2 – (Default)
**300-377	Free
378-37B	LPT (Default)
**37C- 3A7	Free
**3A8- 3AF	Free (Option for on-board serial ports)
3B0-3BB	Video Controllers
**3BC-3BF	Free (Option for LPT)
3C0-3DF	Video Controllers
**3E0-3E7	Free
3E8- 3EF	COM3 – (Default)
**3F0-3F7	Free
3F8-3FF	COM1 – (Default)
564-568	Advanced Watchdog

Interrupt Map

Hardware Interrupts (IRQs) are supported for both PC/104 (ISA) and PC/104-*Plus* (PCI) devices. The user must reserve IRQs in the BIOS CMOS configuration for use by legacy devices. The PCI/PnP BIOS will use unreserved IRQs when allocating resources during the boot process. The table below lists IRQ resources as used by the LPM-LX800-G.

IRQ	Description
IRQ0	18.2 Hz heartbeat
IRQ1	Keyboard
IRQ2	Chained to Slave controller (IRQ 9)
IRQ3	COM2 *
IRQ4	COM1 *
IRQ5	COM3 *
IRQ6	COM4 *
IRQ7	LPT *
IRQ8	Real Time Clock
IRQ9	FREE **
IRQ10	PCI Interrupts
IRQ11	PCI Interrupts
IRQ12	Mouse
IRQ13	Floating point processor
IRQ14	IDE
IRQ15	FREE **

* These IRQ references are default settings that can be changed by the user in the CMOS Settings utility. Reference the PCI Configurations section under Advanced Settings.

** IRQ15 is currently unavailable under the Windows XPe or CE
operating systems. IRQ9 is used by ACPI in XP and is unavailable for other uses.

Some IRQs can be freed for other uses if the hardware features they are assigned to are not being used. To free an interrupt, use the CMOS setup screens to disable any unused board features or their IRQ assignments.

Cables

Part Number	Description
CBL-SET-351-G-1	Cable set for LPM-LX800 includes:
CBL-173-G-1-1.0	20-pin ribbon to two 9-pin male D connector adapter
CBL-234-G-1-1.375	14-pin ribbon to 15-pin D-sub CRT adapter
CBL-247-G-1-1.0	1-ft., Multi-I/O adapter
CBL-270-G-3-1.5	Stereo Audio Access Cable (Line Out, MIC1, Line In)
CBL-275-G-1-0.5	2-mm., 8-pin, Dual USB
CBL-342-G-1-1.5	Ethernet Adapter Cable
CBL-343-G-1-1.375	PS/2 Mouse Adapter
Additional Cables	
CBL-115-4	4-ft., Opto rack interface
CBL-126-G-10-2.0	ATA100 IDE Disk Cable
CBL-270-G-2-1.5	Audio Access Cable (Line Out, MIC1, Line In, Surround, Center/LFE, MIC2)
CBL-296-1-1.5	LVDS Transmitter Cable
External Batteries	
BAT-LTC-E-36-16-1	External 3.6V, 1600 mAH battery with plug-in connector
BAT-LTC-E-36-27-1	External 3.6V, 2700 mAH battery with plug-in connector

Software Drivers & Examples

BIOS	
LPM-LX800-G BIOS	See WinSystems website.
Ethernet Driver	
(Drivers for 82551ER/82559ER 10/100 Ethernet Controller)	
NDIS 4 (Windows 98)	82559ERWIN98.zip
NDIS 4 (Windows NT4/2000)	e100ndis4.zip
Windows NT Embedded 4.0	e100ent.zip
Windows XP/2000	e100exp.zip
DOS	e100bdos.zip
Linux 2.4, 2.6 10/100 Adapter Base Driver	e100-3.5.14.tar.gz
Linux 2.2, 10/100 Adapter Base Driver	e100-2.1.15.tar.gz
DOS Packet Drivers	packet.zip
Examples	
(For WS16C48 Compatible Digital I/O Chip)	
DOS Driver - C Functions	uio48ebc.zip
Linux Drivers - Kernel 2.2, 2.4	linux_uio48_96.zip
Linux Drivers - Kernel 2.6	uio48io_kernel_2.6.zip
Windows XP Driver	wsuio48_96xp.zip
(Counter Timer Demo)	
Reprogramming DOS tick for high resolution timing	tickdemo.zip
Serial Console Utilities	
Serial Console Client	wincom.zip

Mechanical Drawing

Jumper Reference

Drawings ONLY - for more detailed information on these parts, refer to the descriptions shown previously in this manual.

Top View - Connectors

| J1 Backlight Power |
| J3 OTT IRQ Connector |
| J5 External Battery |
| J6 COM3/COM4 |
| J8 USB (1 & 2) |
| J10 USB (3 & 4) |
| J18 Ethernet |
| J28 PC/104-*Plus* |

| J2 Multi-I/O |
| J4 Digital I/O (Ports 3,4,5) |
| J7 Digital I/O (Ports 0,1,2) |
| J9 IDE |
| J12 Mouse |
| J11 Audio |
| J27 PC/104 Bus Interface |
| J29 PC/104 Bus Interface |
| J32 STD Bus |

J20, **J22**, **J23**, **J24**, **J25**, **J30** - RESERVED

NOTE: The reference line to each component part has been drawn to Pin 1, and is also highlighted with a square, where applicable.

Top View - Jumpers & LEDs

D1
IDE Activity
LED

D2
Status LED

D3
USB_C

D4
USB_D

D5
USB_A

D6
USB_B

J13
Flat Panel
Options

J14
COM3

J15
COM4

J16
COM1

SP1
Speaker

J26
EEPROM Access;
Digital I/O
Power

J21
CompactFlash
Master/Slave

J31
Master Battery
Enable

J17
COM2

NOTE: The reference line to each component part has been drawn to Pin 1, and is also highlighted with a square, where applicable.

Master Battery Enable

J31

Enables On-board Battery (default)	1-2
Disables On-board Battery	1 2

1 o	+5V
2 o	VBAT
3 o	GND

J6 (COM3/COM4)

	(COM3) DSR	(COM3) RTS	(COM3) CTS	(COM3) RI	N/C	(COM4) DSR	(COM4) RTS	(COM4) CTS	(COM4) RI	N/C
	2	4	6	8	10	12	14	16	18	20
	o	o	o	o	o	o	o	o	o	o
	o	o	o	o	o	o	o	o	o	o
	1	3	5	7	9	11	13	15	17	19
	DCD (COM3)	RX (COM3)	TX (COM3)	DTR (COM3)	GND	DCD (COM4)	RX (COM4)	TX (COM4)	DTR (COM4)	GND

CompactFlash Master/Slave

J21

| 3 o |
| 2 o |
| 1 o |

CompactFlash Master	1-2
CompactFlash Slave (default)	1 2

Panel Options

J13

| 1 o o 2 |
| 3 o—o 4 |
| 5 o o 6 |
| 7 o o 8 |

🛑 **Avoid Simultaneous Jumpering of pins 1-2 and 3-4.**
Misjumpering panel power could cause damage to the board and/or the Flat Panel.

Panel Power	5V	1-2, 3 4
	3.3V (default)	1 2, 3-4
Panel Options	S0 Low	5-6
	S0 High	5 6
	S1 Low	7-8
	S1 High	7 8

EEPROM Access; Digital I/O Power

J26

```
 1 o o  2
 3 o o  4
 5 o o  6
 7 o o  8
 9 o o 10
11 o—o 12
13 o o 14
```

Reserved	1-10
EEPROM Enabled (default)	11-12
EEPROM Disabled	11 12
+5V is provided at pin 49 of **J4/J7**	13-14
No Power at Pin 49 of **J4/J7** (default)	13 14

Multi-I/O

Top row labels (even pins 2–50):
(COM1) DSR, (COM1) RTS, (COM1) CTS, (COM1) RI, (COM2) DCD, (COM2) RSX, (COM2) TXD, (COM2) DTR, (COM2) GND, (LPT) AUTOFD, (LPT) ERROR, (LPT)INIT, (LPT) SLCTIN, (LPT) GND, (LPT) GND, (LPT) GND, (LPT) GND, (LPT) GND, (LPT) GND, (LPT) GND, (KEYBD) GND, (KEYBD) GND, (KEYBD) CLK, (KEYBD) +5V

Even pins: 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50

J2

Odd pins: 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49

Bottom row labels (odd pins 1–49):
DCD (COM1), RXD (COM1), TXD (COM1), DTR (COM1), GND (COM1), DSR (COM2), RTS (COM2), CTS (COM2), RI (COM2), STROBE, PD0 (LPT), PD1 (LPT), PD2 (LPT), PD3 (LPT), PD4 (LPT), PD5 (LPT), PD6 (LPT), PD7 (LPT), ACK (LPT), BUSY (LPT), PE (LPT), SLCT (LPT), GND (KEYBD), KDATA (KEYBD), +5V (KEYBD)

Specifications

Electrical

LPM-LX800-G CPU	:AMD Geode™ LX800
Clock	:500 MHz
PC/104 Interface	:16-bit, nonstackthrough
PC/104-*Plus* Interface	:32-bit PCI, nonstackthrough
Ethernet data rate	:10/100 Mbps
USB Interface	:Four (4) USB 2.0-compliant ports
Serial Interface	:Four (4) Serial channels with RS-232/RS-422/RS-485
Digital I/O	:48 lines
CRT	:Up to 1920x1200 resolution
Flat Panel	:Up to 1600x1200 resolution
Audio	:AC97, 6 channels
LPT Interface	:Bidirectional LPT with SPP
IDE Interface	:Supports two (2) drives (UDMA 33/66)
Keyboard	:Standard PS/2 or USB interface
Mouse	:Standard PS/2 or USB interface
VCC	:+5V required, 1.6A typical

System Memory

Capacity	:Up to 1 GB 200-pin PC2700 SDRAM SODIMM
Solid State Disk Device	:One (1), Type I/II CompactFlash card

Mechanical

Dimensions	:4.50" x 7.00" (114.30 mm x 177.80 mm)
Jumpers	:0.025" square posts

Connectors

Serial, Parallel, Keyboard	:50-pin 0.100"
COM3/COM4	:20-pin 0.100"
EIDE	:40-pin 0.100" (Primary)
Digital I/O	:Two (2), 50-pin 0.100"
CRT	:14-pin 2 mm
Digital Panel	:31-pin Hirose
LVDS	:20-pin 2 mm
Ethernet	:12-pin 2 mm
USB	:Two (2), 10-pin 2 mm
OTT	:10-pin 0.100"
Audio	:18-pin, 2 mm
Mouse	:5-pin inline Molex
PC/104 Bus	:64-pin, 0.100"
	:40-pin, 0.100"
PC/104-*Plus*	:120-pin (4 x 30, 2 mm)
STD Bus	:56-pin 0.125" card edge
Backlight Power	:5-pin inline Molex

Environmental

Operating Temperature	:-40°C to +85°C
Noncondensing relative	
Humidity	:5% to 95%

Warranty Information

(http://www.winsystems.com/company/warranty.cfm)

WARRANTY

WinSystems warrants to Customer that for a period of two (2) years from the date of shipment any Products and Software purchased or licensed hereunder which have been developed or manufactured by WinSystems shall be free of any material defects and shall perform substantially in accordance with WinSystems' specifications therefore. With respect to any Products or Software purchased or licensed hereunder which have been developed or manufactured by others, WinSystems shall transfer and assign to Customer any warranty of such manufacturer or developer held by WinSystems, provided that the warranty, if any, may be assigned. Notwithstanding anything herein to the contrary, this warranty granted by WinSystems to the Customer shall be for the sole benefit of the Customer, and may not be assigned, transferred or conveyed to any third party. The sole obligation of WinSystems for any breach of warranty contained herein shall be, at its option, either (i) to repair or replace at its expense any materially defective Products or Software, or (ii) to take back such Products and Software and refund the Customer the purchase price and any license fees paid for the same. Customer shall pay all freight, duty, broker's fees, insurance charges for the return of any Products or Software to WinSystems under this warranty. WinSystems shall pay freight and insurance charges for any repaired or replaced Products or Software thereafter delivered to Customer within the United States. All fees and costs for shipment outside of the United States shall be paid by Customer. The foregoing warranty shall not apply to any Products of Software which have been subject to abuse, misuse, vandalism, accidents, alteration, neglect, unauthorized repair or improper installations.

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WARRANTY SERVICE

1.   To obtain service under this warranty, obtain a return authorization number. In the United States, contact the WinSystems' Service Center for a return authorization number. Outside the United States, contact your local sales agent for a return authorization number.

2.   You must send the product postage prepaid and insured. You must enclose the products in an anti-static bag to protect from damage by static electricity. WinSystems is not responsible for damage to the product due to static electricity.