PC/104 Bus Capabilities of the SBC1625 ARM Processor Board

The SBC1625 provides a PC/104 expansion connector in order to allow a wide variety of I/O boards to be plugged in and used. Analog I/O, digital I/O, serial ports, and many other types of boards may be accessed. However, there are some differences between this implementation of the PC/104 bus and the implementation on most x86-based CPU boards. Because of this, some types of boards may not be plugged into the bus.

PC/104 Bus Origin

The PC/104 bus is based off of the ISA (Industry Standard Architecture) bus as originally implemented on the IBM PC/AT architecture. The signals were easily derived from the x86 signals using the discrete logic found in those computers. As the x86 processors increased in speed and complexity, the discrete logic was replaced by highly integrated chipsets that still interfaced using the same ISA signals. The PC/104 bus uses most of these same signals, but in a more compact, more rugged, stackable form factor.

ARM (XScale) Processor

The Intel IXP42x XScale Processor used on the SBC1625 is based off of the ARM RISC core. This allows it to have reduced power and cooling requirements, while still achieving high performance. However, there are major differences in the internal architecture and external signals between the x86 processor and the IXP42x processor. These differences cause the PC/104 implementation to be different on the SBC1625 than on x86-based CPU boards.

Differences between x86 and XScale Processors

1. Differences in instructions at both the assembly language and binary levels.
2. The x86 has both a memory and I/O space, whereas the ARM/XScale processors have memory-mapped I/O.
3. The x86 chipsets support DMA (direct memory access) cycles, whereas the IXP42x ARM/XScale processors have no support for off-chip DMA cycles.

The SBC1625 PC/104 Bus Implementation

The SBC1625 has implemented a subset of the full PC/104 signal set. This set of signals was designed to allow both 8-bit and 16-bit PC/104 I/O cycles to occur. Additionally, five interrupt signals are also supported. This allows a wide variety of PC/104 I/O boards to be plugged into the SBC1625. The following table shows the specific PC/104 signals that are supported. All standard PC/104 signals are shown in the table below, however, it is only the bold signal names that are implemented. This table shows the pinout for J2 and J6.

SBC1625 PC/104 Bus Signals

PC/104-P2 J6		
Pin	D	C
0	**GND**	**GND**
1	MEMCS16*	**SBHE***
2	**IOCS16***	**GND** (LA23)
3	IRQ10	**GND** (LA22)
4	IRQ11	**GND** (LA21)
5	IRQ12	**GND** (LA20)
6	IRQ15	**GND** (LA19)
7	IRQ14	**GND** (LA18)
8	**+5V** (DACK0*)	**GND** (LA17)
9	DRQ0	**+5V** (MEMR*)
10	**+5V** (DACK5*)	**+5V** (MEMW*)
11	DRQ5	**SD8**
12	**+5V** (DACK6*)	**SD9**
13	DRQ6	**SD10**
14	**DACK7***[1]	**SD11**
15	DRQ7	**SD12**
16	**+5V**	**SD13**
17	**MASTER***[1]	**SD14**
18	**GND**	**SD15**
19	**GND**	(KEY)

PC/104-P1 J2		
Pin	A	B
1	IOCHCK*	**GND**
2	**SD7**	**RESET**
3	**SD6**	**+5V**
4	**SD5**	**IRQ9**
5	**SD4**	-5V(unused)
6	**SD3**	DRQ2
7	**SD2**	-12V (unused)
8	**SD1**	ENDXFR*
9	**SD0**	**+12V**
10	**IOCHRDY**	(KEY)
11	**GND** (AEN)	**+5V** (SMEMW*)
12	**GND** (SA19)	**+5V** (SMEMR*)
13	**SA18**[1]	**IOW***
14	**SA17**[1]	**IOR***
15	**SA16**[1]	**+5V** (DACK3*)
16	**SA15**	DRQ3
17	**SA14**	**+5V** (DACK1*)
18	**SA13**	DRQ1
19	**SA12**	**+5V** (REFRESH*)
20	**SA11**	SYSCLK
21	**SA10**	**IRQ7**
22	**SA9**	IRQ6
23	**SA8**	**IRQ5**
24	**SA7**	**IRQ4**
25	**SA6**	**IRQ3**
26	**SA5**	**+5V** (DACK2*)
27	**SA4**	**GND** (TC)
28	**SA3**	**BALE**
29	**SA2**	**+5V**
30	**SA1**	**OSC**
31	**SA0**	**GND**
32	**GND**	**GND**

Notes:
1. Factory use only

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Types of PC/104 I/O Boards Supported

Since the SBC1625 supports both 8- and 16-bit I/O cycles, as well as interrupts, a great many I/O boards can be used with it. Some of the more common boards that would probably work with the SBC1625 would be digital I/O, serial ports, analog input (non-DMA), analog output, modems, and relay boards.

Unsupported PC/104 Boards

There are two categories of PC/104 boards where it would not be advisable to use them with the SBC1625. The first consists of memory-mapped boards. The PC/104 memory control lines are not implemented on the SBC1625 and thus, memory-mapped boards cannot be accessed. The second category consists of boards that actually could work from a hardware standpoint, but the complexity of implementing the software drivers may make a different architecture more economical.

Some of the boards that will not work because of the lack of memory access or DMA include: memory-mapped flash boards and VGA boards.

Some of the boards that are technically possible, but probably not feasible from an economic standpoint would be Ethernet boards and PCMCIA boards.

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