Active Extenders

MODELS PC/AT150 & PC/AT200

Hot Swap PC/AT Bus Extender Boards

User Manual

Revision 8.1

March 30, 1999

Catalyst

Enterprises, Inc.

1439 Torrington Court

San Jose, CA 95120

(408) 268-4145

Fax: (408) 268-8280

Email support@catalyst-ent.com

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INTRODUCTION

These Active Extenders allow insertion or removal of the UUT into any PC/AT bus without having to turn the system Off and On. This feature eliminates repeated system power cycling and rebooting. Therefore speeds up rework, characterization and test of UUT in the development phase as well as production testing. The elimination of the repeated power cycling also helps prolonging the system life and the hard disc operation. These Active Extenders use a new CMOS technology for switching the signals on and off. These switches have a very fast propagation delay, typically about 250 picoseconds, resulting in no timing degradation between the bus and the UUT. The switches are also bidirectional allowing the entire address range to be supported without any jumper setting or running a background software to use the board.

These Active Extender boards isolate all signals and voltages to the UUT when the On-Off switch is in the Off position. All voltages are ramped down and ramped up during the power down and power up to eliminate any spikes. During the power down the signals to the bus become isolated as soon as the main supply, +5V, reaches down to +3.7V and during the power up the signals stay isolated until the main voltage is at least +3.7V.

These Active Extenders also allow voltage margin testing of the UUT by allowing external power supplies to replace the bus supplies as the inputs to the UUT.

An on-board current-to-voltage converter for the main supply, +5V, allows current measurement of the +5V at any time, using just a voltmeter at the J5 test points. The maximum current draw for the +5V supply is set to 5 Amp at the factory.

INSTALLATION

To install the Active Extender, make sure to turn the PC power off. Insert the Active Extender in any available slot and secure it's bracket to the main chassis. You are now ready to use your new extender board.

NOTE: If you are planning to use software to control the board, the On-Off switch must be in the Off position and the dip switches must be in the OPEN position, otherwise, all of the switches on the dip switch must be in the CLOSED position.

NOTE: The software command is disabled at the factory by not having the JP16 installed. To enable the software command operation please install JP16.

OPERATION

Using these Active Extender boards is no different than using a regular extender board. However, the extra features that these boards have to offer, are explained below:

ON-OFF

To insert or remove any UUT into and out of the Active Extender, make sure that the Active Extender is turned Off, if the PC power is to stay on. There are three ways to turn the Active Extender power On and Off. 1) The mechanical toggle switch. 2) External control signal connected to JP8. 3) By software commands (see details in that section).

External control can be used if remote controlling is desired for turning the power On and Off. Leave the mechanical switch in the Off position, then use a CMOS or TTL level signal to control turning the power On, via JP8. The left connector of JP8 is ground and the right connector is the control signal. A Low level, less than 1.5V will turn the switch On.

When the power is turned Off, +5V to the UUT becomes less than 3.7V, all signals become isolated between the bus and the UUT.

NOTE: If you are running software that relies on a response from the UUT, do not turn Off the Active Extender board, unless the handshaking has taken place. Otherwise you may experience a system hang-up. It may be a good practice to stop the software from running, before isolating the power and the signals to the UUT.

POWER-ON RESET

Each time the Active Extender board is turned Off and then On, a reset signal will be generated from the extender to the UUT automatically. The duration of this reset is about 180 milliseconds. The reset to the UUT is also activated every time there is a reset from the bus.

BANK SWITCHES

In a normal operation, the bank switches should be left in the closed position. In this case when the power to the extender is turned On, all of the bus signals will be active to and from the UUT. However, when there is a problem with the signals from the UUT, the signals can be activated in a smaller group. The bank switch 1 (switch closest to the Red LED D2) controls U1 (bus signals A1-A10), bank switch 2 (second switch closest to the RED LED D2) controls U2 (bus signals A11-A20). Therefore bank switches 1-5 control signals on the A side and the bank switches 6-10 control the signals on the B side. Switch numbers 1-10 correspond on a one-to-one to U1 - U10.

NOTE: These switches can also be controlled by software. In this case the switches on the dip switch must be in the open position and the software will control the open and closure of the switches. See the software commands section for more details.

CURRENT MEASUREMENT

To measure the current being drawn by the UUT, just connect a voltmeter to J5, polarity should be as shown on the board. Every Volt read by the meter represent 1 Amp. So if the voltmeter reads 0.35, it represents that the UUT is drawing 350 milliampere of current from +5V supply.

CURRENT LIMIT CIRCUITRY

Red LED's, when illuminated, indicate shorts or a very low voltage at the output for their corresponding voltages. Green LED's when illuminated, indicate voltages at their corresponding outputs. In the case of the +5V short, from the UUT, the Active Extender will automatically switch the current limit down to about 200 milliamperes and will continue to deliver this current for troubleshooting purposes. In the case of shorts or excessive current draw for the other voltages (-5V, +/-12V), the resetable fuses will open up until the problem is corrected.

The current limit value for the +5V is set to 5 Amps with JP9 not installed and 1 Amp with JP9 installed. Consult the factory for current requirement other than 5 Amps.

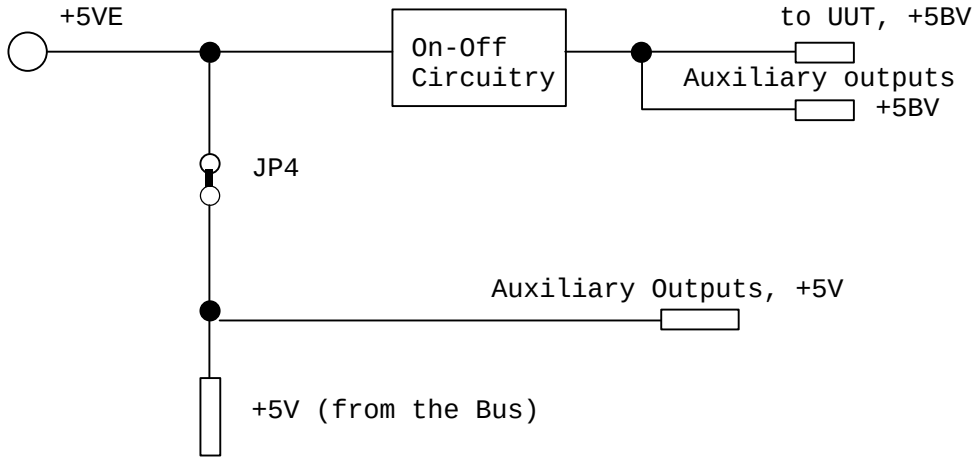
EXTERNAL POWER SUPPLY

J6 or JP5 terminals can be used for the external power supply input. J6 is used with a ribbon cable for ease of interconnecting (see the pinout on page 8). However, remember never to connect any other supply to these inputs so long as you have JP1, JP2, JP3 and JP4 installed. In case you want to use the external supply as an input you must remove these 4 jumpers in order not to cause any conflict with the bus voltages. These jumpers are, however, independent from each other. For instance if you would want to bring in only a +5V from the external supply and continue to use the bus voltages for +12V and -12V and -5V, you would only need to remove JP4.

The list below identifies which jumper is for which supply:

JP1 = +12V
JP2 = -12V
JP3 = -5V
JP4 = +5V

The following diagram indicates the interconnections of the UUT voltages to the bus voltages and the external voltages.



As indicated in the diagram, there will be a conflict if the external supply is connected while the jumper is still in place. This circuit is repeated for each of the 4 voltages.

If you are using external power supplies do not forget to connect the Ground (GND) signals. If your external power supply outputs are not isolated, make sure the ground of the PC (containing the extender board) and the ground of the power supply are at the same voltage level with respect to a common point, before connecting the GND signal.

AUXILIARY OUTPUT VOLTAGES

The voltages at the pads to the left of Q1/Q2/Q3 are auxiliary output voltages. The voltages with "B" reference designations are switched voltages. Meaning they will be turned On and Off when the extender power is turned On and Off. The other voltages are directly from the bus and will be On as long as the system is On. These voltages are not fused.

SOFTWARE COMMANDS

The On-Off power control and the signal isolation to and from the bus can be controlled with software. There are two registers on the Active Extenders to control these functions. The base address for these registers is set at 200 at the factory. The definition of these registers are as explained below. Please note that the output of these registers are set to FF after the system is powered-on each time.

You may change the base address if this address is conflicting with another module in the system. The jumper illustration below give examples of few other addresses.

Address	Data, D7-D0	Function
0X201	1XXX XXXX	TURN THE POWER OFF
0X201	0XXX XXXX	TURN THE POWER ON
0X201	0XXX XXX0	POWER ON AND SWITCH 9 (U9) ACTIVE
0X201	0XXX XX0X	POWER ON AND SWITCH 10 (U10) ACTIVE
0X201	0XXX XX00	POWER ON AND SWITCH 9 AND 10 ON
0X200	XXXX XXX0	SWITCH 1 ON
0X200	XXXX XX0X	SWITCH 2 ON
0X200	0XXX XXXX	SWITCH 8 ON
0X200	0000 0000	SWITCHES 1-8 ALL ON

NOTE: For the switches to be ON, the power has to be ON first or simultaneously.

ADDRESS SELECTION EXAMPLE

A11	A10	A9	A8	A7	A6	A5	A4	DECIMAL	HEX
0	0	1	0	0	0	0	0	512	200
0	0	1	0	0	0	1	0	544	220
0	0	1	1	0	0	0	0	768	300

Existence of Jumpers on the board represent 0 and no jumper represents 1. The jumpers, JX, are located below RP2 and please note that they are not in descending order as shown here, but are marked correctly.

NOTE: For the software command to work, the corresponding switches that are being controlled must be in the OFF (open) positions.

EXAMPLE 1

The following example is a C program that allows the user to type in the register value in hex and the program will load the value to the probe register on the board. The base address for this example is assumed to be set at 0x200.

```
  #include <stdio.h>
  #include <stdlib.h>
  int main(int argc, char **argv)
  {
   long  i, port;

    /* Scan in Register1 */
    printf(
     Enter Data for SW8-SW1 (D7-D0), in Hex:
    );
    scanf(
    %lx , &i);

    /*Set Register1 */
   outp(0x200, i);

    /* Scan in Register2 */
    printf(
     Enter Data for ON-OFF, SW10 & SW9 (D7,D1,D0), in Hex:      );
    scanf(
    %lx , &i);

    /*Set Register2 */
    outp(0x201, i);

    /* Quit */
    exit(0);

  }
```

EXAMPLE 2

You can use the DEBUG mode on your system to control the board manually. Type debug and you will see the prompt "-". Type ? for list of commands if you need to. Command "o" is for output and "q" for exit from the DEBUG. After you type debug and you get the dash prompt then 1) type o for output, 2) space, 3) the address, 4) space and then the 5) data.

```
C:\>debug
-o 200 00     To enable the switches 1-8.
-o 201 00     To enable switches 9 &10 and turn the board on (should see the
              LEDs turn On)
-o 201 ff     To turn the board Off (should see the LEDs go Off)
```

Please note to have the On-Off switch and the dip switch in the Off positions.

AUXILIARY PINOUT

NOTE: These signals are only active when the Active Extender power is On and the corresponding switches are closed. When the power is Off, these signals are open impedance.

	SIGNAL	PIN B(BACK)	PIN A(FRONT)	SIGNAL	
	JP7 TOP ROW			**JP7 BOTTOM ROW**	
	GND	1	1	BIOCHK*	
	RESET (1)	2	2	D7	
	+5VB (2)	3	3	D6	
	IRQ9	4	4	D5	
		5	5	D4	
S2-6	DRQ2	6	6	D3	S2-1
		7	7	D2	
	ENDXFR*	8	8	D1	
		9	9	D0	
	GND	10	10	IOCHRDY*	
	MEMW*	11	11	AEN	
	MEMR*	12	12	A19	
	IOW*	13	13	A18	
	IOR*	14	14	A17	
	DACK3*	15	15	A16	
S2-7	DRQ3	16	16	A15	S2-2
	DACK1*	17	17	A14	
	DRQ1*	18	18	A13	
	REFRESH	19	19	A12	
	SYSCLK	20	20	A11	
	IRQ7	21	21	A10	
	IRQ6	22	22	A9	
	IRQ5	23	23	A8	
	IRQ4	24	24	A7	
	IRQ3	25	25	A6	
S2-8	DACK2*	26	26	A5	S2-3
	TC	27	27	A4	
	BALE	28	28	A3	
	+5VB	29	29	A2	
	OSC	30	30	A1	
	GND	31	31	A0	

		D(BACK)	C(FRONT)		
	JP6 TOP ROW			**JP6 BOTTOM ROW**	
	MEMCS16*	1	1	SBHE*	
	IOCS16*	2	2	A23	
	IRQ10	3	3	A22	
	IRQ11	4	4	A21	
S2-9	IRQ12	5	5	A20	S2-4
	IRQ15	6	6	A19	
	IRQ14	7	7	A18	
	DACK0*	8	8	A17	
	DRQ0	9	9	MEMR*	
	DACK5*	10	10	MEMW*	
	DRQ5	11	11	D8	
	DACK6*	12	12	D9	
	DRQ6	13	13	D10	
	DACK7*	14	14	D11	
S2-10	DRQ7	15	15	D12	S2-5
	+5VB	16	16	D13	
	MASTER*	17	17	D14	
	GND	18	18	D15	

(1) RESET Signal status is only controlled by the On-Off switch (not the dip switch) and or the RESET signal of the BUS.
(2) +5VB is only active when the extender board is on, (when the green LED next to the

power switch is on).

JUMPERS

In addition to the jumpers already explained in the previous sections, there are a few other jumpers for use, in more advance debugging applications. These Jumpers are JP10 through JP15 and are explained here.

JP10, installed at the factory, allows +5V current limiting to function as specified. Disabling the current limiting function can be done by removing the JP10 if it is so desired. Extreme caution is recommended. Otherwise permanent damage can be done to the UUT, the extender board and the system motherboard.

JP11 to JP15 are used for a few selected control signals. In addition to disabling the signals in groups of 10 via the dip switch, the listed control signals can also be isolated from the bus on an individual bases.

Since the jumpers are not installed at the factory the extender board has hard traces connecting these jumpers. Prior to installing any jumpers, the traces need to be cut. A 2X1 (100 mil) shunt jumpers can be installed at these locations and when jumpers are removed the signals will be isolated. Signals controlled by these jumpers are:

JP11	DREQ1
JP12	DREQ3
JP13	IOCHRDY
JP14	DREQ2
JP15	IOCHECK

J6 PINOUT

+5EV	J6.1	J6.2	+5EV
+5EV	J6.3	J6.4	+5EV
+5S	J6.5	J6.6	
	J6.7	J6.8	
+12S	J6.9	J6.10	-12EV
-5EV	J6.11	J6.12	ON/OFF
+12EV	J6.13	J6.14	+12EV
ON/OFF	J6.15	J6.16	-5EV
-12EV	J6.17	J6.18	+12S
	J6.19	J6.20	
	J6.21	J6.22	+5S
+5EV	J6.23	J6.24	+5EV
+5EV	J6.25	J6.26	+5EV

MODEL PC/AT200

Model PC/AT200 offers an extended PC board area for the user's specific circuitries. The bus on the component side of this area is connected to the ground plane. The bus on the solder side is connected to 4 pads marked +V. Please make sure that you connect the power and ground of any added circuitry to the appropriate bus. Connect the +V pad(s) to the desired auxiliary output voltage pads provided at the left of the grid area (i.e. +5V or +12V).

Voltages with "B" reference designations are switched voltages. The other voltages are directly from the bus.

SPECIFICATIONS

Bus:	ISA 8 and 16-bit, edge connector 31X2, 18X2.
Voltages:	
Inputs	From PC bus or the external input, Configurable by jumpers per voltage.
Output Ratings	+5V, Jumper selectable to 5 Amp or 1 Amp, -5V, 1 Amp. +/- 12V, 1 Amp.
Drop Across the Switches	40 millivolts drop for every 1 Amp drawn for +5V. 30 millivolts drop for every 1 Amp drawn for -5V. 30 millivolts drop for every 1 Amp drawn for -12V. 30 millivolts drop for every 100 milliampere drawn for +12V.
Propagation Delay:	Less than a nano-second from the PC bus to the UUT. The switch propagation delay is rated at only 250 pico-seconds.
Controls:	
On-Off	SPST switch on-board, software command, or external logic input.
Bus Signals	Bus signals can be turned on all at once or selectively in any group of 10, via the dip switch or software.
Outputs:	
J5	+5V current draw by the UUT can be measured at a two-point terminal, J5, by a voltmeter. Each volt represents 1 Amp.
JP6, JP7- Auxiliary	JP7-A01 through JP7-A31, JP6-A01 through JP6-A18. JP7-B01 through JP7-B31, JP6-B01 through JP6-B18.
J3, J4- Main	J3-A01 through J3-A31, J4-A01 through J4-A18. J3-B01 through J3-B31, J4-B01 through J4-B18.
Mechanical Dimensions:	
PC/AT 150	Short size, Single slot, Length 9.6 inches, Height 6.3 inches.
PC/AT 200	Half size, Single slot, Length 13.5 inches, Height 6.3 inches.