Modular Test System Electrical Specification

Revision 0.1 – December 2019

Chris Elwood

Backplane

The backplane board accepts one controller card and up to 8 I/O cards. It distributes 3.3V, 5V, and 12V power to each card, as well as data signals between the controller and I/O cards. Power would typically be supplied by an ATX PC power supply connected via a 24-pin Molex connector, but this is not a requirement.

Card ID and Presence

I/O card slots contain pins named PRSNT1 and PRSNT2 for determining card presence. PRSNT1 must be pulled low by the backplane, to allow the card to detect when it is inserted. PRSNT2 pins must be pulled low on all cards, to allow the backplane to detect when a card is inserted in a slot.

An I2C bus runs between each I/O card slot, the main controller slot, and the (optional) backplane controller. The main controller uses this bus to identify the type of card installed in each slot. I/O cards must have a M24C02 EEPROM or equivalent connected to the I2C bus, with a data structure as described below. Each card slot includes three address pins, A0-A2, which the backplane must pull high or low to provide a unique 3-bit address for each slot. The I/O card EEPROM address lines should be connected to these pins so the EEPROM will receive an address corresponding to its slot number.

TODO: EEPROM data structure definition

I/O Cards

I/O cards connect to the backplane through 36-pin PCIe connectors.

Card connector pinout:

Pin #	Name	Description
A1	PRSNT1	Card presence. Pulled to ground by backplane.
A2	GND	Ground
A3	5V	5V power
A4	3.3V	3.3V power
A5	12V	12V power
A6	12V	12V power
A7	GND	Ground
A8	SDA	I2C bus serial data
A9	SCL	I2C bus serial clock
A10	A0	Slot address bit 0.
A11	A1	Slot address bit 1.
A12	GND	Ground
A13	A2	Slot address bit 2.
A14	Reserved	Reserved for future use. Do not connect.
A15	Reserved	Reserved for future use. Do not connect.

A16	Reserved	Reserved for future use. Do not connect.
A17	GND	Ground
A18	Reserved	Reserved for future use. Do not connect.
B1	GND	Ground
B2	GND	Ground
B3	5V	5V power
B4	3.3V	3.3V power
B5	12V	12V power
B6	12V	12V power
B7	GND	Ground
B8	MOSI	SPI data from controller to card
B9	MISO	SPI data from card to controller
B10	SCK	SPI clock
B11	CS	SPI chip select. Active low.
B12	GND	Ground
B13	INT	Interrupt. Can be driven by card or controller depending on configuration.
B14	Reserved	Reserved for future use. Do not connect.
B15	Reserved	Reserved for future use. Do not connect.
B16	Reserved	Reserved for future use. Do not connect.
B17	PRSNT2	Card presence. Pulled to ground by card.
B18	Reserved	Reserved for future use. Do not connect.

Main Controller

The main controller connects to the backplane through a 98-pin PCIe connector.

Controller connector pinout:

Pin #	Name	Description
A1	PRSNT1	Card presence. Pulled to ground by card.
A2	GND	Ground
A3	5V	5V power
A4	3.3V	3.3V power
A5	12V	12V power
A6	12V	12V power
A7	GND	Ground
A8	SCL	I2C bus serial clock
A9	SDA	I2C bus serial data
A10	MOSI4	SPI data out to slot 4
A11	MISO4	SPI data in from slot 4
A12	GND	Ground
A13	SCK4	SPI clock to slot 4
A14	CS4	SPI chip select to slot 4. Active low
A15	INT4	Interrupt signal to/from slot 4
A16	MOSI5	SPI data out to slot 5
A17	GND	Ground
A18	MISO5	SPI data in from slot 5
A19	12V	12V power
A20	12V	12V power
A21	SCK5	SPI clock to slot 5
A22	GND	Ground
A23	CS5	SPI chip select to slot 5. Active low
A24	INT5	Interrupt signal to/from slot 5
A25	MOSI6	SPI data out to slot 6
A26	MISO6	SPI data in from slot 6
A27	GND	Ground
A28	SCK6	SPI clock to slot 6
A29	CS6	SPI chip select to slot 6. Active low
A30	INT6	Interrupt signal to/from slot 6
A31	MOSI7	SPI data out to slot 7
A32	GND	Ground
A33	MISO7	SPI data in from slot 7
A34	SCK7	SPI clock to slot 7
A35	CS7	SPI chip select to slot 7. Active low
A36	INT7	Interrupt signal to/from slot 7
A37	GND	Ground
A38	Reserved	Reserved for future use. Do not connect.
A39	Reserved	Reserved for future use. Do not connect.
A40	Reserved	Reserved for future use. Do not connect.

A41	Reserved	Reserved for future use. Do not connect.
A42	Reserved	Reserved for future use. Do not connect.
A43	Reserved	Reserved for future use. Do not connect.
A44	Reserved	Reserved for future use. Do not connect.
A45	Reserved	Reserved for future use. Do not connect.
A46	Reserved	Reserved for future use. Do not connect.
A47	Reserved	Reserved for future use. Do not connect.
A48	Reserved	Reserved for future use. Do not connect.
A49	Reserved	Reserved for future use. Do not connect.
B1	GND	Ground
B2	GND	Ground
B3	5V	5V power
B4	3.3V	3.3V power
B5	12V	12V power
B6	12V	12V power
B7	GND	Ground
B8	Reserved	Reserved for future use. Do not connect.
B9	Reserved	Reserved for future use. Do not connect.
B10	MOSI3	SPI data out to slot 3
B11	MISO3	SPI data in from slot 3
B12	GND	Ground
B13	SCK3	SPI clock to slot 3
B14	CS3	SPI chip select to slot 3. Active low
B15	INT3	Interrupt signal to/from slot 3
B16	MOSI2	SPI data out to slot 2
B17	PRSNT2	Card presence. Pulled to ground by card.
B18	MISO2	SPI data in from slot 2
B19	12V	12V power
B20	12V	12V power
B21	SCK2	SPI clock to slot 2
B22	GND	Ground
B23	CS2	SPI chip select to slot 2. Active low
B24	INT2	Interrupt signal to/from slot 2
B25	MOSI1	SPI data out to slot 1
B26	MISO1	SPI data in from slot 1
B27	GND	Ground
B28	SCK1	SPI clock to slot 1
B29	CS1	SPI chip select to slot 1. Active low
B30	INT1	Interrupt signal to/from slot 1
B31	PRSNT2	Card presence. Pulled to ground by card.
B32	GND	Ground
B33	MOSI0	SPI data out to slot 0
B34	MISO0	SPI data in from slot 0
B35	SCK0	SPI clock to slot
B36	CS0	SPI chip select to slot 0. Active low

B37	GND	Ground
B38	INT0	Interrupt signal to/from slot 0
B39	Reserved	Reserved for future use. Do not connect.
B40	Reserved	Reserved for future use. Do not connect.
B41	Reserved	Reserved for future use. Do not connect.
B42	Reserved	Reserved for future use. Do not connect.
B43	Reserved	Reserved for future use. Do not connect.
B44	Reserved	Reserved for future use. Do not connect.
B45	Reserved	Reserved for future use. Do not connect.
B46	Reserved	Reserved for future use. Do not connect.
B47	Reserved	Reserved for future use. Do not connect.
B48	PRSNT2	Card presence. Pulled to ground by card.
B49	Reserved	Reserved for future use. Do not connect.