



## Summary

The ICS Backplane Board is a multi-function board designed to make working with the QED Board much easier. This application note describes how to use the ICS Backplane Board. It provides an overview of hardware and complete schematics.

## Backplane Power

The power circuitry allows the user to easily connect power to boards installed on the ICS Backplane Board as well as prototyping circuitry located on the ICS Backplane Board. The power circuitry of the ICS Backplane Board consists of 2 power jacks, a switch, 2 power connectors and 3 power rails. The power jacks are named Jack A and Jack B. The power jacks allow the user to connect unregulated power from a wall transformer to the ICS Backplane Board. The switch controls the voltage to the power connectors and the power rails. One power connector provides power to the QED Board and the other provides power to the QED Analog Signal Conditioning Board. The power rails are a unique feature that will be explained in the Prototyping section.

### *Power Jacks*

The power jacks are 2.1mm jacks for use with AC wall adapters. The two power inputs are named Jack A and Jack B. Jack A connects to a 6-12V unregulated DC to power the QED Board. If a QED Analog Signal Conditioning Board is used, Jack B connects to a 15-38V unregulated DC. If there is no QED Analog Signal Conditioning Board, any power can be brought in to be used for custom circuitry. The grounds of Jack A and Jack B are isolated if J5 is not installed.

### **Power Jumper and Holes**

Adjacent to the two power jacks are jumper holes that allow the power for Jack A and Jack B to be connected. For example, J5 connects the grounds of Jack A and Jack B. Do not install J5 if the QED Analog Signal Conditioning Board is present. This will cause ground loop problems.

If only Jack A is connected to a power supply, +V Jack A could be connected to +V Jack B in order to supply all the power connectors and power rails from the same supply.

These holes also allow for a convenient way to wire wrap to the power inputs by installing wire wrap posts.

### *Switch*

The double pole, double throw (DPDT) switch connects power from the jacks to the rest of the board. The grounds are not switched. The switch is rated for 500mA per pole.

### *Power Connectors*

The QED Board power connector is the same connector as on the QED Board. This connector is connected to Jack A. Jack B also has a connector which is a screw terminal connector. If a QED Analog Signal Conditioning Board is used, this connector provides 15-38V to the board. If not, any power input can be used for other circuitry.

## Communications Connectors

The ICS Backplane Board allows easy connections from the QED Board communications header to several external connectors.

### *QED Communications Connector*

A ribbon cable is used to connect the QED Board communications to the ICS Backplane Board.

### *DB-25 Serial Ports*

The two on board RS-232 serial ports are brought out to DB-25 connectors named Serial 1 and Serial 2. Serial 1 is the primary port on the QED Board.

### *RJ-12 Communications Connector*

This is a dual RJ-12 header for RS-232 and RS-485 which allows for three connection types: RS-232 master to slave, RS-232 slave to slave and RS-485

node to node. The dual RJ-12 jacks allow easy daisy chaining for multi-node communications. To determine which cable to use for each type of connection, see below.

<u>Connection Type</u>	<u>Cable Type</u>
RS-232 master to slave	6P-6C Crossed
RS-232 slave to slave	6P-6C Straight Thru
RS-485 node to node	6P-4C Straight Thru

A 6P-4C is 6 pin 4 conductor modular cable and a 6P-6C is 6 pin 6 conductor modular cable. Crossed and straight-thru refer to the wiring of the modular cable. Telephones use crossed modular cables and data applications use straight thru modular cable.

If you need to configure the connector to match a different RJ-12 pin-out, simply cut the six traces on the bottom side of the board next to serial port 2 (there is a label that shows you where to cut to re-configure the RJ-12 jack). Verify that the connections are cut and then rewire the 12 holes using wire wrap posts.

### ***Screw Terminal RS-485 Connector***

This connector is located next to the right field screw terminals. It allows easy RS-485 connection to twisted pair wire. Note, the DGND connector should be connected to ensure proper ground levels. The maximum ground difference between devices on the bus is  $\pm 7V$ .

## **Address/Data Bus and Protopal**

The QED Board Addr/Data bus header is connected to the ICS Backplane Board via a 40 pin ribbon cable. The address data bus connects the ribbon cable header to 2 sockets, the protopal and a set of holes for wire wrap posts. The two sockets are for use with the QED Digital I/O Boards. For more information on the protopal see Chapter 9 of the QED Hardware Manual. The set of holes for wire wrap posts make it easy to prototype memory mapped devices.

If no QED Digital I/O Board is present, the address/data bus can be connected to any other 40 pin connector on the QED board as long as the protopal (U1) is removed.

## **Prototyping Using The ICS Backplane Board**

The ICS Backplane Board can be used to prototype custom circuitry. There are many features that will

make adding the circuitry easy and make it easy to interface with.

### ***General Purpose Holes***

There are three main prototyping areas on the board. The middle area under the QED Board can be used but the QED Board may need taller standoffs, depending on the height of the circuitry. The two outer prototyping areas can also be used if there are no boards plugged into the field sockets (QED Digital I/O Board or QED Analog Signal Conditioning Board).

### ***Rails***

There are six "rails" on the board (labeled Rail 1 - Rail 6) that can be used to distribute a common signal. Each hole in the rail is connected together

### ***Power Rails***

The 3 power rails allow easy connection to the power inputs.

Power Rail 1 is directly connected to Jack A.  
Power Rail 2 is directly connected to Jack A if Jumper 2 and Jumper 3 are installed.  
Power Rail 3 is directly connected to Jack B

A regulator or jumper wire must be installed to drive the rail since the inputs are only connected to Vin and the rail is connected to Vout. There are holes for an input capacitor and an output capacitor for use with regulators.

### ***Header Holes***

These header areas are for adding headers and can accommodate larger pin diameters than the regular prototyping holes. There are three sets of header holes on the bottom edge of the board. Two areas are for .100 headers and can accommodate a variety of dual row header sizes (up to 50 pins). Another area is for 2mm headers and can accommodate a dual row 40 pin header.

### ***Field Header Wire Wrap***

Each set of field screw terminals has a set of wire wrap holes that allow the use of the screw terminals when no additional boards are installed (QED Digital I/O Board or QED Analog Signal Conditioning Board).

### ***Address/Data Bus Wire Wrap***

If the QED address/data bus is connected to the ICS Backplane Board, these holes will allow the use of wire wrap posts to add custom circuitry using the address/data bus signals.

### ***Field Headers***

The field headers are screw terminals that allow easy connection to 30 - 12 AWG wire. They connect to the field sockets and also the field wire wrap holes. The sockets are for use with the QED Digital I/O Board or with the QED Analog Signal Conditioning Board. If none of these boards are used, the wire wrap holes can be used to connect to custom circuitry. To bring any of the 40 pin connectors from the QED Board out directly to the screw terminals, a 40 pin stack connector (Samtec part number TSW-120-09-L-D - call Samtec at 800-SAMTEC-9) can be used to connect a 40 conductor ribbon cable to the socket.

## **Using The ICS With The QED Board And Peripheral Boards**

### ***Use With QED Board***

The QED Board mounts in the middle of the ICS Backplane Board with standoffs. A 10 conductor ribbon cable is used for communications and a power connector is used to power the QED Board. Connect 6-12V to Jack A and connect a serial cable from your computer/terminal to Serial 1 and the QED Board is ready to go. Remember to turn the power switch on.

The Keypad/Display connector can be connected to the QED Board with a 34 conductor ribbon cable if

access to the high current drivers (QED 3 Board) is required.

### ***Use With QED Digital I/O Board***

One or two QED Digital I/O Boards can be plugged into the ICS Backplane Board. It can plug into either side. Up to 4 QED Digital I/O Boards can be used per QED Board, two can plug into the ICS Backplane Board and the other two must be connected via ribbon cable.

### ***Use With QED Analog Signal Conditioning Board***

The QED Analog Signal Conditioning Board should plug into the Right Field Socket. In this location, it connects to the QED Board via a 40 conductor ribbon cable without twisting the cable. Power is supplied to the QED Analog Signal Conditioning Board via the power header (Jack B).

### ***Enclosure Shielding***

Jumper J7 connects ground (Jack A) to the corner standoff. This provides an electrical connection to an enclosure if the standoff is connected to the enclosure. Do not install J7 if the enclosure is already grounded, especially if it is grounded to an AC source.

### ***Note On Jumpers***

There are many jumpers on the board but they are simply a pair of holes. To install a jumper, the holes must be electrically connected together. This is done by soldering in a wire to the two holes.

The information provided herein is believed to be reliable; however, Mosaic Industries assumes no responsibility for inaccuracies or omissions. Mosaic Industries assumes no responsibility for the use of this information and all use of such information shall be entirely at the user's own risk.

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