

## DAPcal

DAPcal is a program that guides the recalibration process for the analog input circuits of a Data Acquisition Processor at a PC workstation. Recalibration may be necessary if analog voltage range jumpers are changed or if the Data Acquisition Processor factory calibration has drifted over time.

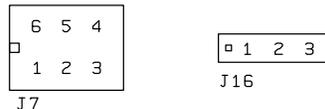
### Equipment Requirements

Data Acquisition Processor calibration requires the following equipment:

- A 4 1/2 digit digital voltmeter (DVM).
- A -10 volt to +10 volt, precision, adjustable voltage source. The voltage source must be very well regulated and must have an output impedance of less than 500 ohms.

### Connector Numbering

DAPcal prompts refer to particular pins of Data Acquisition Processor connectors. Diagrams showing connector locations on the DAP 840, DAP 4000a, DAP 4200a, DAP 4400a, DAP 5000a, DAP 5016a, DAP 5200a, DAP 5216a, DAP 5380a and DAP 5400a are at the end of this technical note. Pin 1 of a connector with a single row of pins is identified by a dot, and pin 1 of a connector with two rows of pins is identified by a notch — pins are numbered in a counter-clockwise direction in the same manner as an integrated circuit, as in the following examples:



### Preparing the Data Acquisition Processor

The Data Acquisition Processor must have power applied for at least two hours before calibration for operating temperatures to settle completely.

Different models of the Data Acquisition Processors require different initial configurations.

1) For a DAP 840, DAP 4000a, DAP 4200a, DAP 5000a, DAP 5016a, DAP 5200a, or DAP 5216a, configure the Data Acquisition Processor hardware as follows:

- Connect the S1 pin to the G1 pin.
- Apply the adjustable voltage source across S0 and G0.
- Connect the DVM to sense S0 relative to G0.
- Connect the S2 pin to the S3 pin. Also connect these two pins to DAC0 OUT.

2) For a DAP 4400a, configure the Data Acquisition Processor hardware as follows:

- Apply the adjustable voltage source across S0 and G0, S4 and G4, S8 and G8, S12 and G12.

3) For a DAP 5380a or DAP 5400a, configure the Data Acquisition Processor hardware as follows:

- Apply a precise voltage (4.99329v) to the S0 input.

## Running DAPcal

DAPcal is located on the DAPtools Basic, DAPtools Standard, and DAPtools Professional CD-ROM in the subdirectory DAPcal. To run it, type the following command line in a command processor window.

```
<drive>:\DAPcal\DAPcal.exe
```

<drive> is the drive name for your CD reader.

## Calibrating the Data Acquisition Processor

There are several items to configure at the beginning of the calibration:

1) Select the DAP

- Select the DAP to calibrate by setting the DAP Address. The DAP selected by default is the one at the address \\.\Dap0.

2) Select the input voltage range to match the configuration of your DAP board.

- Select the ADC input range using the Voltage Range|ADC menu item and then the range of your choice. The default is -5V to +5V.

3) For DAP models that support digital to analog output conversions, select the output voltage range to match the configuration of your DAP board.

- Select the DAC0 output range using the Voltage Range|DAC0 menu item and then the range of your choice. The default is -5V to +5V.
- Select the DAC1 output range using the Voltage Range|DAC1 menu item and then the range of your choice. The default is -5V to +5V.

To start calibration, press the Calibrate button. To continue, press the Next button and follow the instructions in the User Prompt. To restart calibration at any time, press the Calibrate button. To abort calibration, press the Cancel button.

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### Notes:

The DAP 5216a does not support the 0V to 5V unipolar ADC input range. It also does not support the 0V to 5V, 0V to 10V, and +/- 2.5V DAC output ranges.

The DAP 4400a does not support the unipolar 0V to 5V ADC input range. It also does not have any DACs for analog outputs.

The DAP 5380a or DAP 5400a does not support the unipolar 0V to 5V or the bipolar +/- 2.5V ADC input range. It also does not have any DACs for analog outputs. Only the voltage reference requires hardware calibration. All other calibrations are performed automatically.

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## Calibration Sequence

DAPcal performs a series of numbered calibration steps. There are three types of calibration steps:

1. Configuration step. This step sends configuration information to the Data Acquisition Processor. No user interaction is required.
2. Prompt step. This step waits for you to perform a specific action.
  - The action may be changing a jumper position on a header.

- The action may be changing the voltage of the variable voltage source.
- The action may be to monitor specific header pin locations with your DVM.

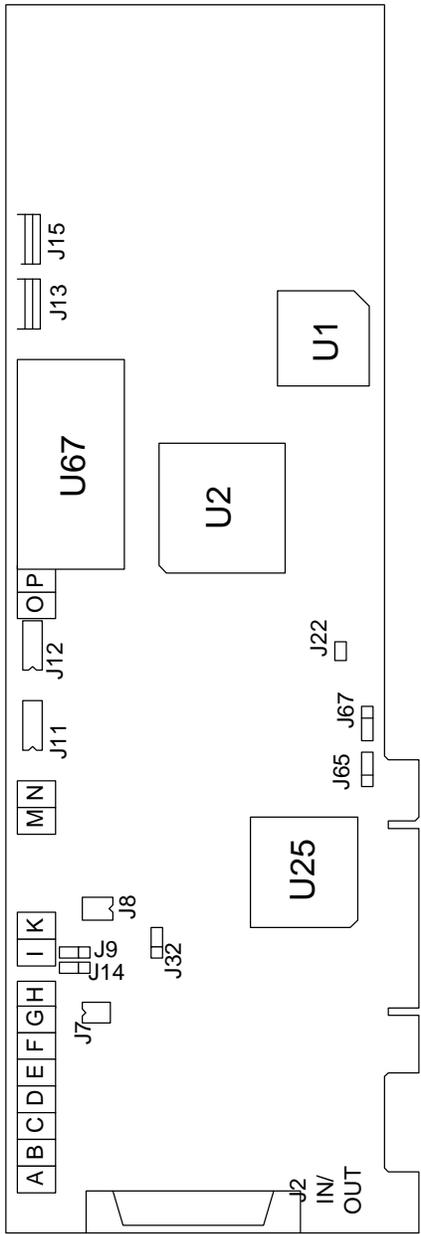
The prompts will indicate in parentheses the pin numbers you should monitor with your DVM. The following prompt line is an example.

```
Inst Out (J7:3, J7:1)
```

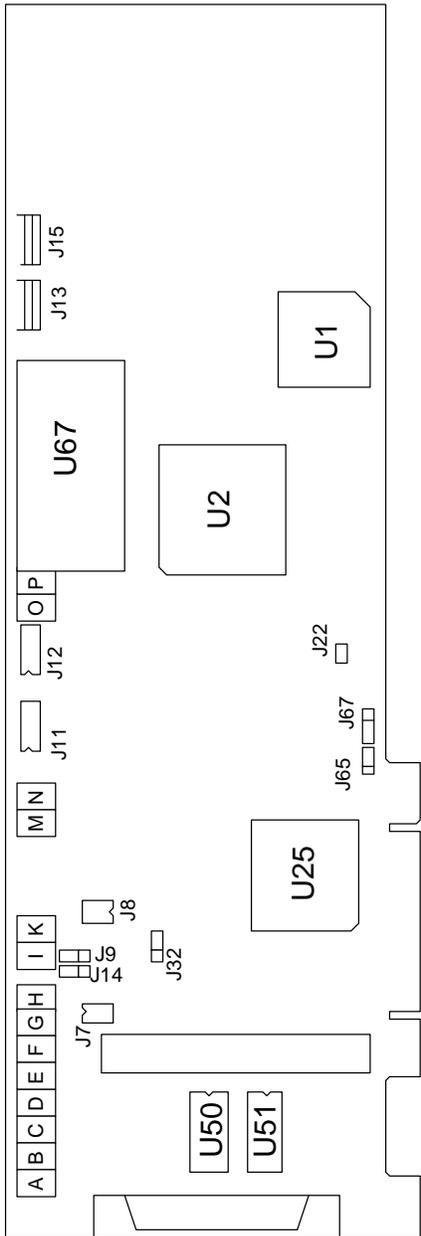
The notation J7:3 indicates that the DVM voltage sense lead should connect to connector J7 pin 3, and the notation J7:1 indicates that the DVM ground lead should connect to connector J7 pin 1.

3. Potentiometer adjustment step. This step allows interactive adjustment of a potentiometer. DAPcal displays the letter of a particular potentiometer and an arrow. The arrow indicates which direction to turn the potentiometer. Adjust the potentiometer slowly until the indicator is vertical and the display changes color, indicating that the potentiometer is adjusted correctly.

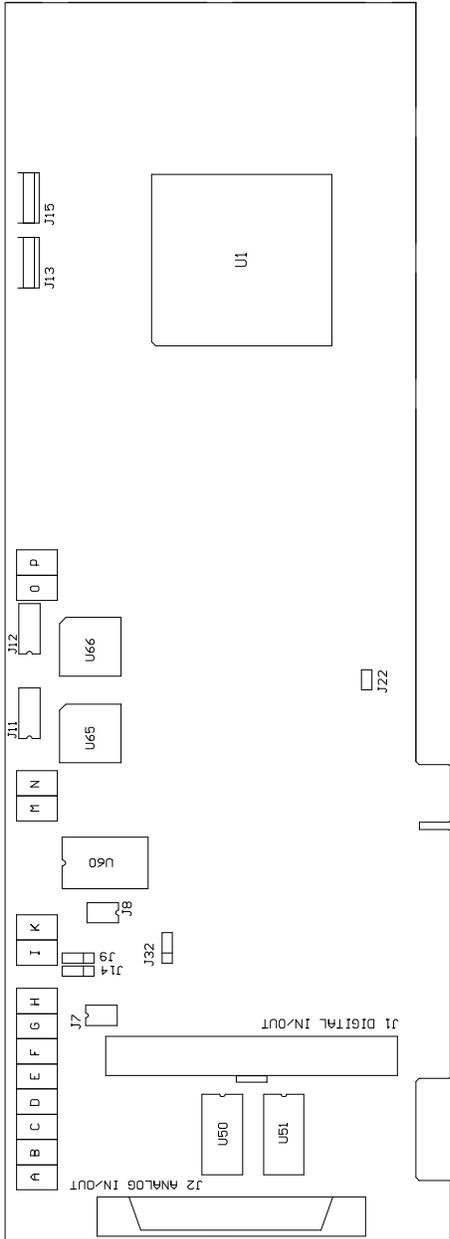
Some of the calibration sequences are iterative — calibration steps are repeated until potentiometer adjustments are consistent and accurate. If the same potentiometer is adjusted more than three times, this indicates that the DAPcal program is not finding consistent calibration settings. This usually is caused by excessive noise in the adjustable external voltage reference, but it also can be caused by damaged analog circuitry on the Data Acquisition Processor.



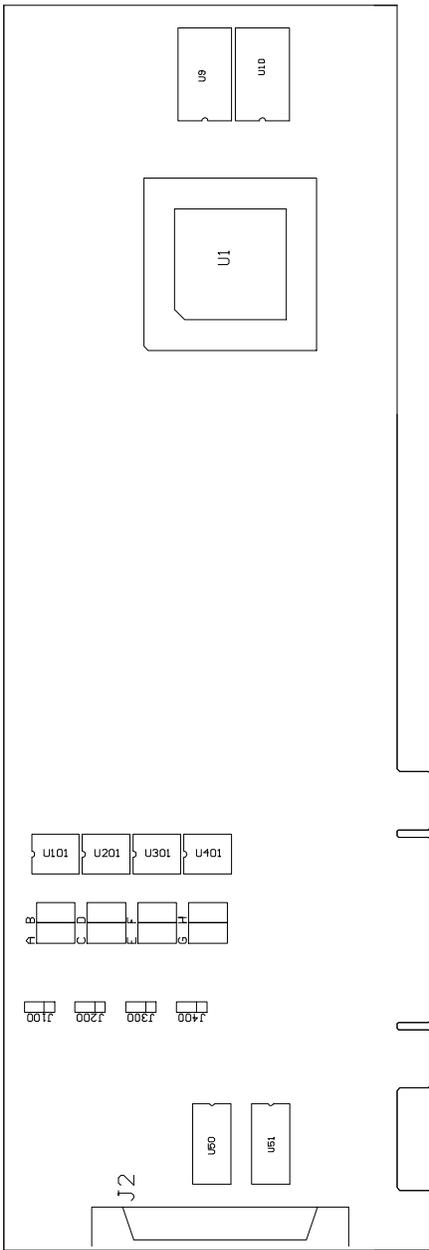
**Figure 1.**  
**DAP 840**



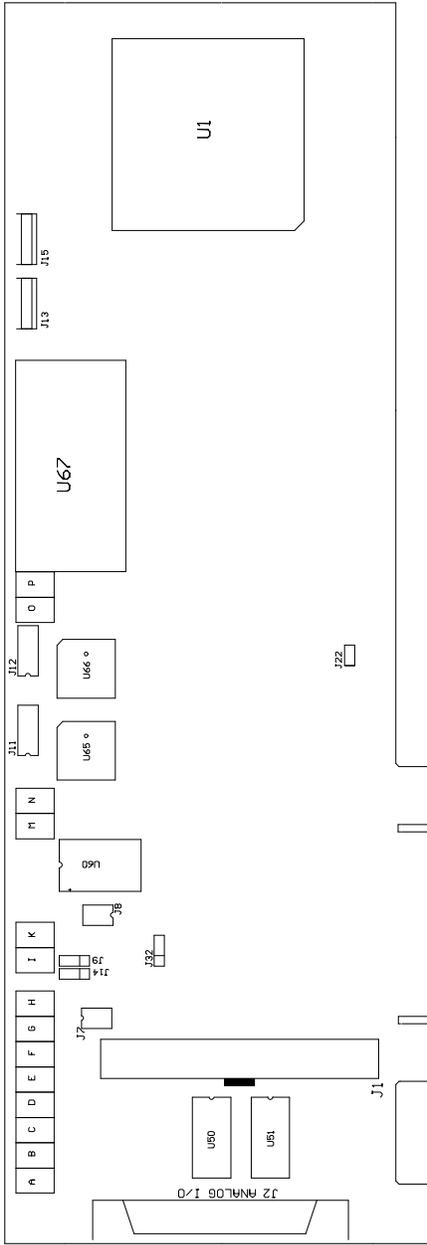
**Figure 2.**  
**DAP 4000a**



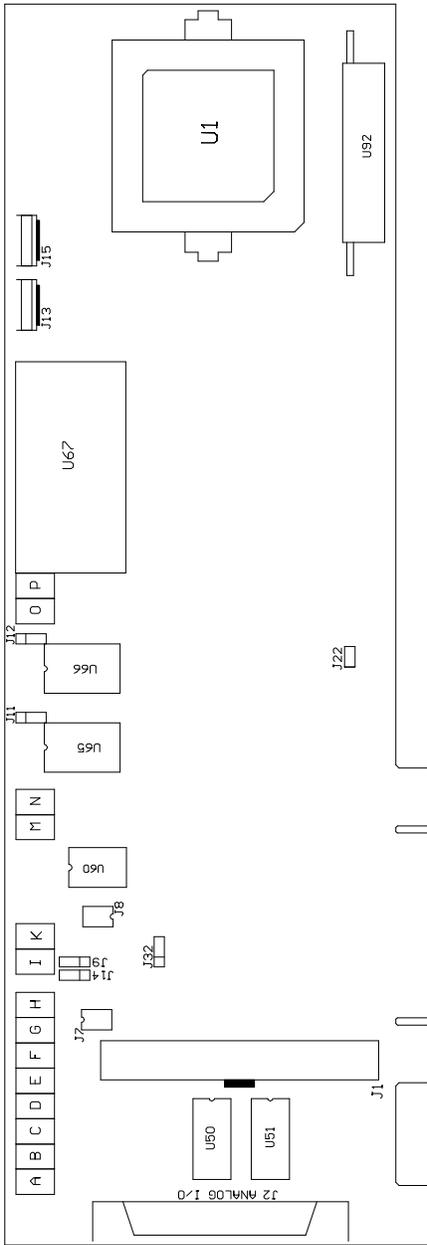
**Figure 3.**  
**DAP 4200a**



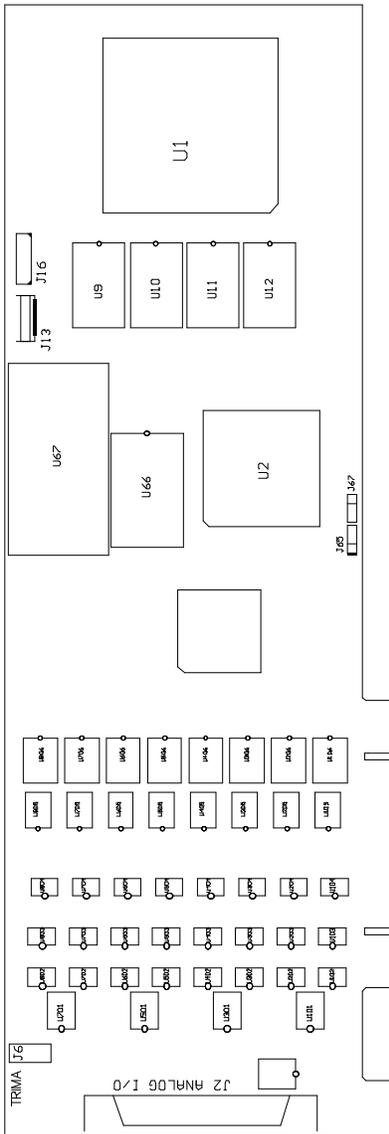
**Figure 4.**  
**DAP 4400a**



**Figure 5.**  
**DAP 5000a and DAP 5200a**



**Figure 6.**  
**DAP 5016a and DAP 5216a**



**Figure 7.**  
**DAP 5380a and DAP 5400a**