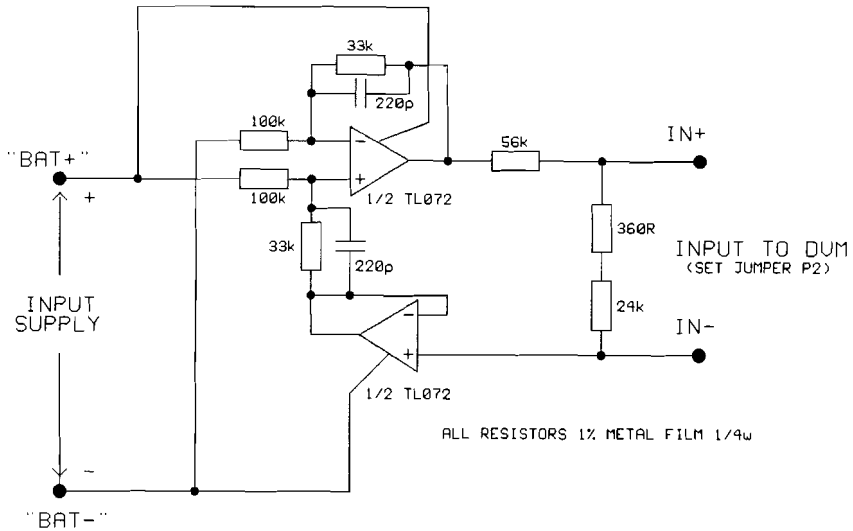
## Circuit to enable the panel meter to measure its own supply voltage




CIRCUIT TO READ INPUT SUPPLY ON PM-438

*Circuit Function*

The DVM cannot measure its own supply by direct connection of the supply to the measurement input terminals, because both IN+ and IN- inputs sit at approximately 6.3V above the supply 0V.

There are several ways to scale and level-shift the monitored supply voltage. The solution given above, using the *Howland* current source is probably the most economical in components.

The accuracy obtained with typical op-amp offsets and 1% resistors is approximately ± 2%. For improved accuracy, trim R5 to give the correct reading for a known power supply input.

# LCD Panel Meter
# PM438

***Product Code:***
***375-102***

Distributed by:

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## Introduction

This DVM is a 3½ digit panel meter with FSD ±199.9 mV, automatic polarity indication, with accuracy ± 0.5 % ± 1digit.

*Technical Data*

| | |
|---|---|
| Input impedance | >100MΩ |
| Accuracy | ± 0.5% ± 1digit |
| Measurement range | 199.9mV |
| Indication method | LCD display |
| Measurement method | Dual-slope integration A/D |
| Power supply | 8 — 12V DC (9V battery) |
| Supply current | ≈1mA |
| Operating temperature range | 23°C ± 5°C |
| Size | 68mm x 44mm |

*DCSupply*

The input required is 8 — 12V DC @ 1mA from battery or power supply. Connections are labelled V+ and V-.
Check the polarity "+" and "-" before connection.

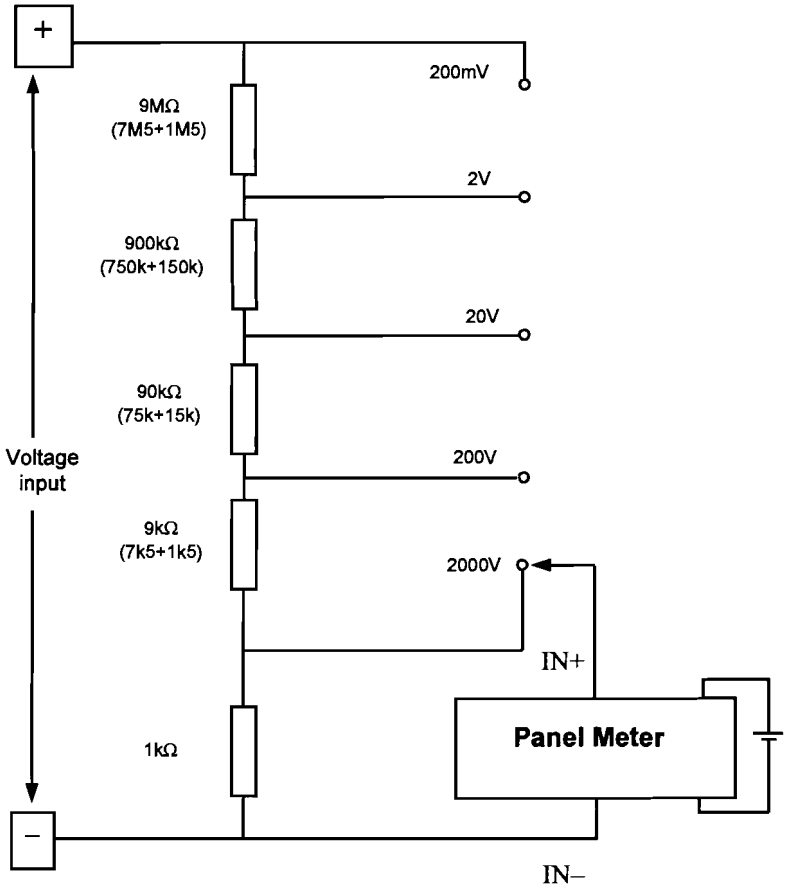
## General Description

*Analogue-to-digital Converter*
This panel meter uses a low power CMOS 3½ digit analogue-to-digital converter.
The DC voltage at the input measurement connection (IN-) is approximately +6.3V relative to the negative terminal (V-) of the power supply or battery).

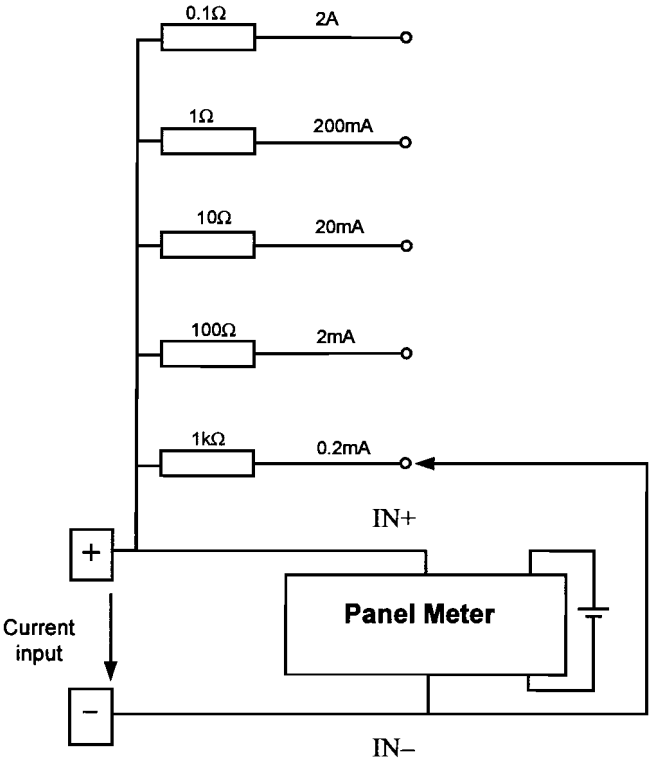
*Reference Adjustment*
The internal reference is factory-set to give the correct reading for a known voltage applied to the input terminals.

*Decimal Point*
The decimal point is set by jumpers P1, P2 and P3 (*see* "How to expand").

## Multirange Voltmeter Expansion

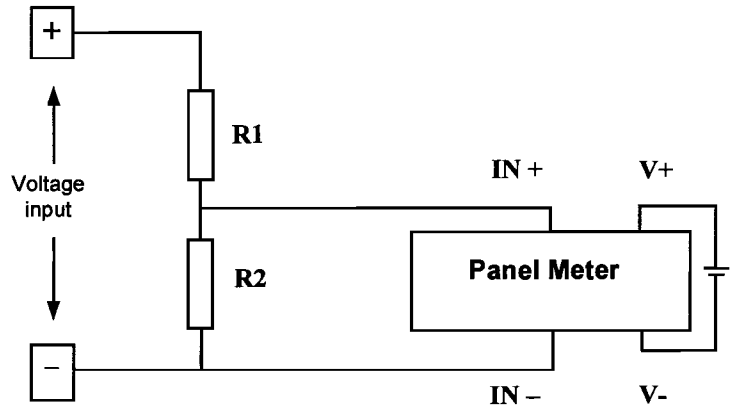



## Multirange Current Meter Expansion



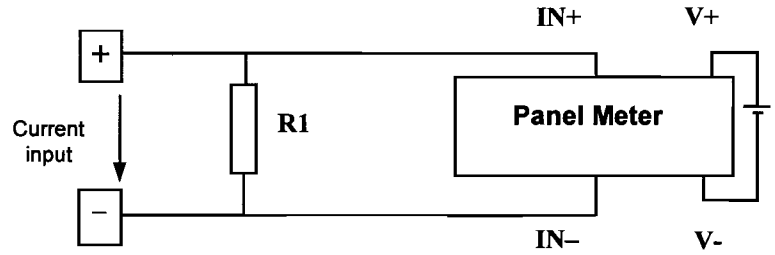
## How to Expand

To expand the range of voltage to be measured, remove RA (10MΩ) and RB (s/c link) from meter PCB and connect external resistors as follows:




| Range | R1 (Theoretical value) | R1 (Practical combination) | R2 | Fit Jumper link |
|---|---|---|---|---|
| 20V | 9.9MΩ | 7.5MΩ + series 2.4MΩ | 100kΩ | P2 |
| 200V | 9.99MΩ | 10MΩ | 10kΩ | P3 |
| 2000V | 9.999MΩ | 10MΩ | 1kΩ | *no jumper* |

To expand the range of current to be measured, use the correct value of shunt resistor R1 as shown below:




| Range | R1 |
|---|---|
| 0.2mA | 1kΩ |
| 2mA | 100Ω |
| 20mA | 10Ω |
| 200mA | 1Ω |
| 2A | 0.1Ω |