

## Popular Chinese Dual Digital-Voltmeters/ Ammeters

### Models and connections

Issued: June 4, 2017, Revised Feb 9, 2020

At the time of writing this piece, I am familiar with at least 5 models or versions of the popular dual voltage & ammeter shown at right. Note that many units you see, may appear similar from the front, and fit the same mounting hole cutout of 45.5 x 26.5 mm, but they are often not electrically interchangeable.

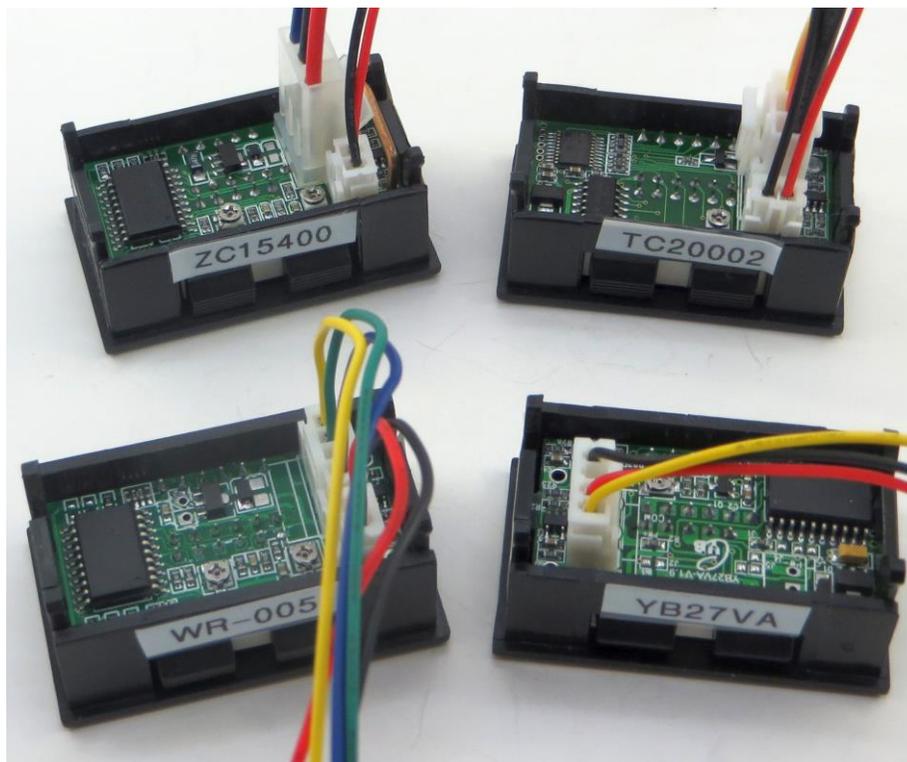


Different manufacturers supply these units, and not all mark the model number on the product itself, although some do place a small tag on the right end of the display with check boxes for the specific voltage and current range supplied. There is also no common connection scheme or even wire colours used. This, together with very limited and sometimes hard to interpret connection information, has been a source of problems with many users of these products.

Each module actually contains 2 separate digital voltmeters. One is used to display system voltage and the other to display the current to the load based on the small DC voltage drop across a shunt resistor.

This sense resistor is called a “current shunt “ and for these models has been manufactured for a full scale voltage drop across the shunt of 75mV. This works out to 1.5mV per ampere and the current meter is designed to match this.

The photo below shows the reverse side of each and the different wire colours and connector layouts.



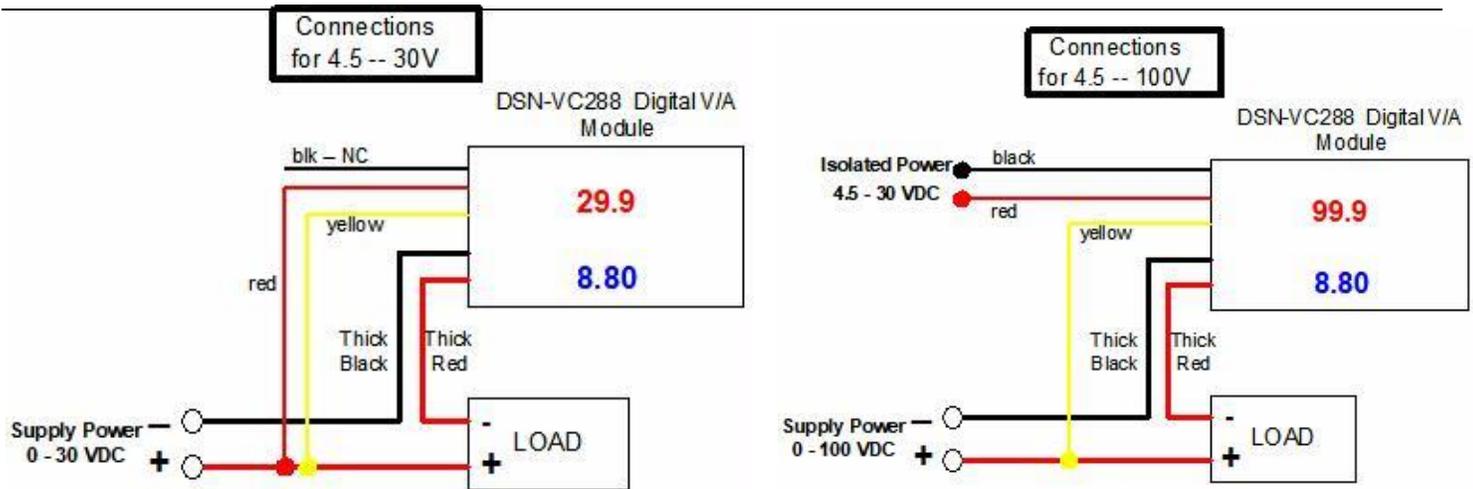
**Dec 2, 2017 revision**

**Model DSN-VC288 added**

From the front, this model looks identical to the ZC15400 described below. It also has a built in current shunt, and is rated at 100v and 10 amps. However the manufacturer has used yet a different combination of wire colours and sizes, so care must be taken in connecting the unit.

The following are the connection diagrams.

Note that for the 100volt operation, a separate, isolated power source for the 4.5-30V meter power.



**Feb. 9, 2020 revision/addendum**

These digital volt-ammeter modules are specified for installation into a 45.5mm x 26.5mm cut-out. There are 2 snap-in "fingers" near the top bezel on the 26.5 mm sides that are intended to lock the module into the cut-out.

Brian, VE7JKZ, brought to my attention that this does not really work because the "fingers" are prevented from flexing inward due to the LED components on the inside.

What seems to work is to first pop the circuit board assembly out of the bezel, then install the bezel assembly by itself in the hole and then reinstall the circuit board assembly in the bezel.

There are 2 "end tabs" that hold the circuit board assembly in place.

With just finger pressure I was able to gently bend one outward enough to release the circuit board assembly.

**Model ZC15400** (connections see figure 1)

This module has a **built in current shunt** (for 10 Amps) which makes it easy to use.

It has 2 smaller wires to connect to a voltage in the range of 4.5 to 30v provide power to the digital meters.

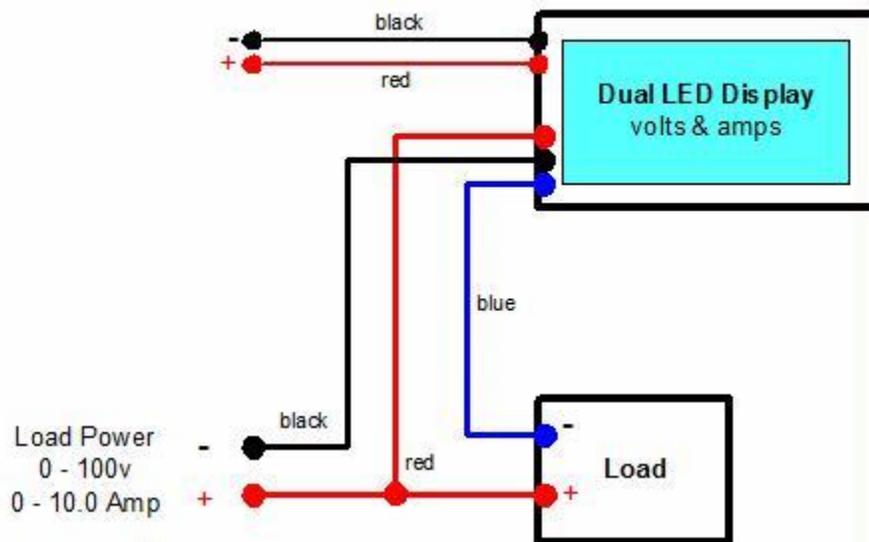
The remaining 3 larger wires connect as follows: black to Load Power Source negative, blue to Load negative, and red to Load Power Source positive/common with Load positive.

Note 1: If the Load Power Source is 30 volts or less, the meter power supply wires may be connected in parallel with the Load Power Source (red to red, black to black).

Note 2: Where the Load power source is greater than 30 volts (and less than 100v), then a separate isolated power source should be obtained to provide meter power. Refer to the section below re Isolated Meter Power.

**Figure 1**

Meter Power 4.5 - 30 V max

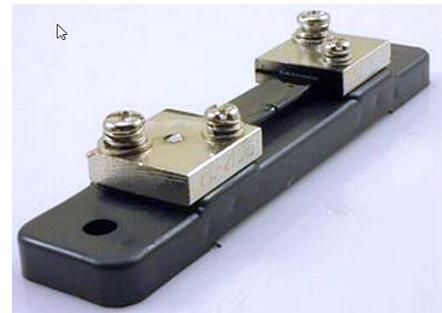


**Model WR-005 and Model TC20002 (Connections see Fig. 2.)**

Both of these modules are commonly **100volt/50amp units**, but look like they may be made by different manufacturers and may differ in wire colours and sizes.

Either module **must** be used with an external current shunt, that is designed for the higher current. The shunt will look something like the photo to the right.

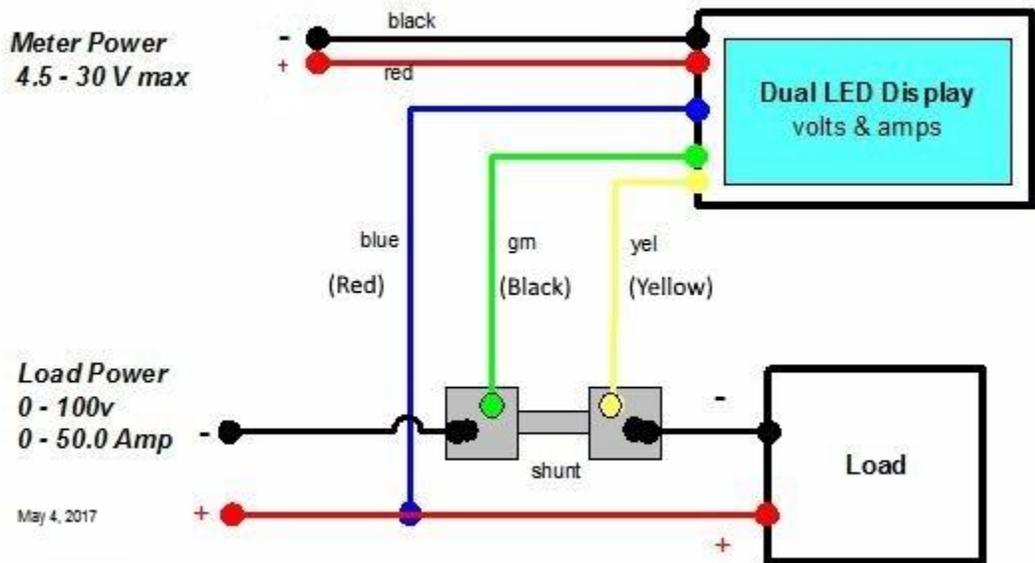
Note there are two larger screw connections on the shunt that are intended for connection of the current to be measured. One connects to the negative of the power supply, and the other to the load. The 2 smaller screw connections are the calibrated output connections which connect to the current meter in the module.



See figure 2 below:

**Figure 2.**

**LED Volt/Ammeter 100V V/50 Amp (with External Shunt)**



As you can see from the diagram, both modules have 5 wire leads, 2 for connection to meter power, which must be in the range of 4.5 to 30v, 2 for connection to the current shunt measuring terminals and 1 for the voltage measuring wire. In the diagram above, the wire colours shown in brackets refer to model TC0002. This model was also provided with spade lug terminals for connection to the shunt.

**Tip:** How the connections are made to the current shunt can affect the accuracy of the current measurement. Recommended practice is to use ring or spade lug terminals on all 4 connections, with the O.D. size of the ring terminal no larger the O.D. of the flat washers on the shunt.

**Note 1:** If the Load Power Source is 30 volts or less, then the fuzzy instructions say that the meter power supply wires may be connected in parallel with the Load Power Source (red to red, black to black). However, in this instance, I suggest that you do not initially connect the black meter power wire but leave it unconnected. Check if the module operates accurately without it. Take a look at wiring diagrams 2 and 3 at the end of this article.

**Note 2:** Where the Load power source is greater than 30 volts (and less than 100v), then a separate isolated power source should be obtained to provide meter power. Refer to the section below re Isolated Meter Power and wiring diagram 1 at the end of this article.

### Model YB27VA

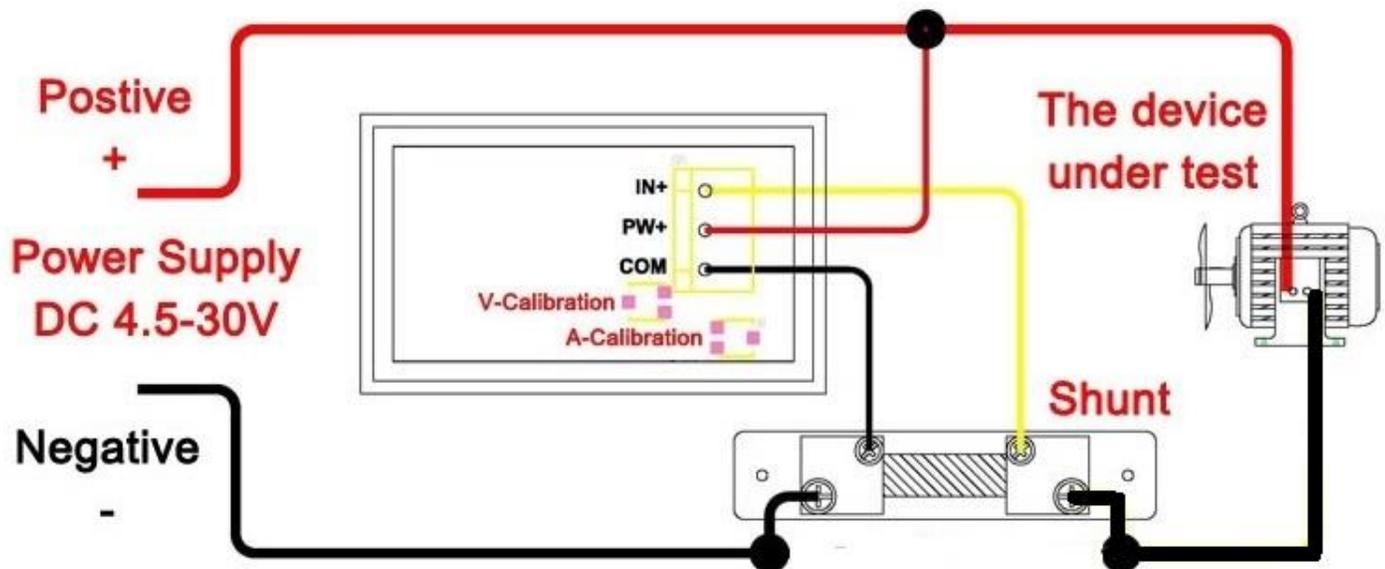
This module **must** also be used with an external current shunt. It is rated for 30 volts only and as a result has simplified connections, using only 3 wires.

See below:

**Figure 3.**

### 3 - WIRE DIGITAL V/A METER

**Note: The shunt MUST be connected ONLY between the negative lead of the power supply and the "device under test" or load.**



### Low Side Sensing

Note that in all the wiring schematics, the shunt is always placed in series with the negative or ground side of the power supply. This is called "Low-Side Sensing". With these volt/ampere meters, the shunt **CANNOT** be placed in series with the positive lead of the power supply, otherwise the module will be seriously damaged.

### Isolating Meter Power

Where it is necessary to provide a separate power source for the meters, an isolated DC-DC converter may be used as suggested in diagram 3, referred to there as a "buck" circuit. Suitable modules are available from suppliers such as CUI, Murata, Recom, Vicor etc. The input can for example be rated at 9 to 16 volts, the output 5 to 12 volts at 50mA min.

### **Location of the current shunt**

If possible, it is best to locate the shunt close to the power supply and connect it to the negative terminal. Note that if the power supply negative was previously grounded to chassis, then that “ground” connection should be moved to the load side of the shunt.

If it is necessary to extend the wiring to the digital meter, consider using twisted pair or shielded wire. The shunt element is very low resistance, in the order of 1.5 milliohm, and is unlikely to pick up noise. Not so however, for the voltmeter input connection, which might benefit from the addition of a decoupling capacitor as well. (example: 0.1uF with suitable voltage rating)

### **Calibration Potentiometers**

If you look closely at the circuit board on the back side of the module, you will see 2 tiny trim-pots (adjustable resistors) One of these will adjust the voltage readout, and the other will adjust the current meter.

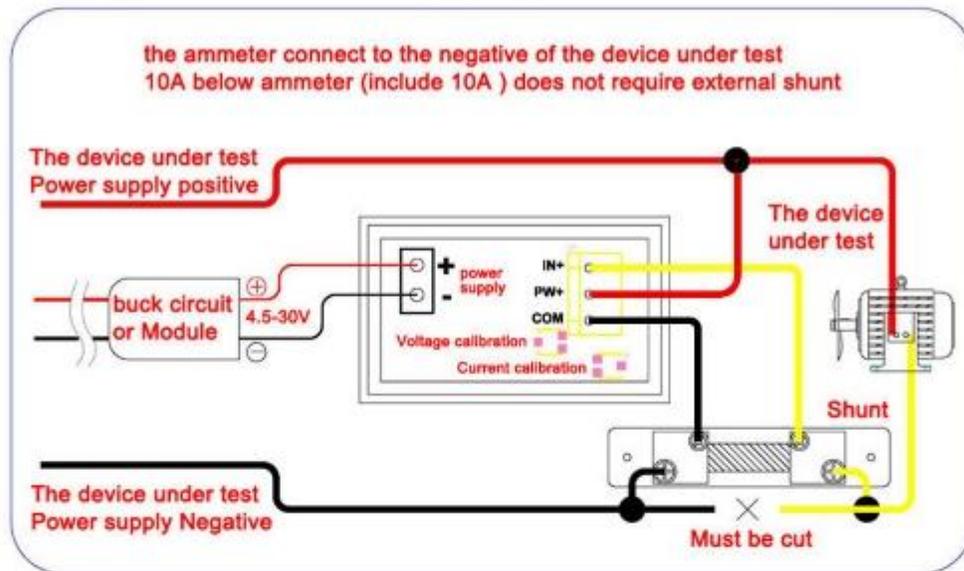
### **Verifying Current Accuracy**

A simple check may be carried out by connecting for example, a 5 ohm 5 watt resistor as the load and setting the voltage to 10 volts. The current meter should read close to 2.0 amps.

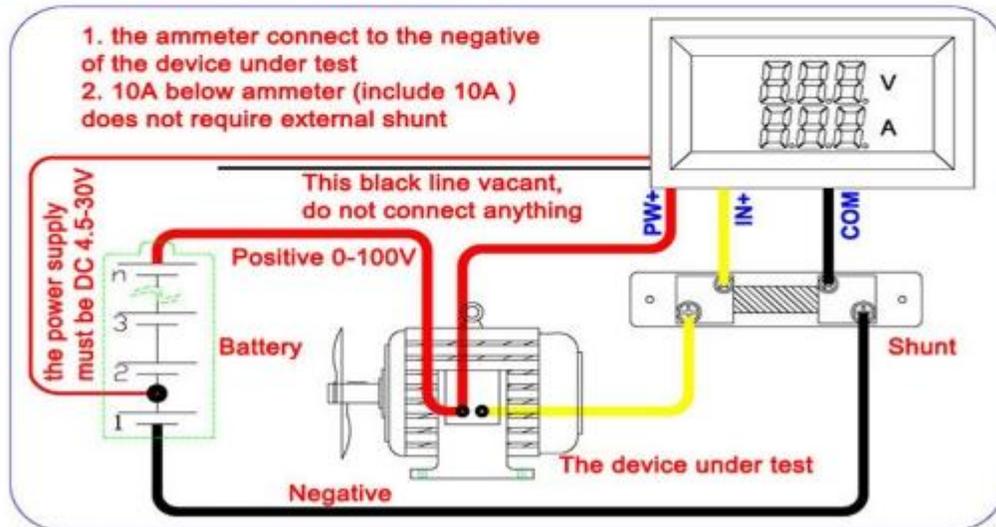
Some wiring diagrams found for Electric cars found on-line are reproduced below:

And below are diagrams:

## Electric cars wiring diagram



## Wiring diagram 2



# Wiring diagram 3

