How To Guide: Installing An Ammeter & Shunt

Introduction
This is a guide to installing a simple cheap Ammeter as can be found on ebay sites. The guide is likely to be similar for any brand ammeter.

Disclaimer
This guide is intended to demonstrate how I installed the unit, following the instructions manual and suggestions by fellow forum members. It is not intended as a best practise guide or to demonstrate my electronic ability. If you intend to install a similar unit on your boat, it is your responsibility to understand your boat electrics, your electrical capability and your ability to understand and follow the instructions.
If you damage the unit, your boat, its components or yourself, don't blame me! No liability is intended or implied.

Ammeter
The Ammeter was purchased from http://stores.ebay.co.uk/new2006power-DigitalWorld_W0QQssPageNameZstrkO3amefsO3amesstOQtZkm
You will need the meter and a shunt like these.

- http://cgi.ebay.co.uk/100A-dc-Green-Led-Digital-Panel-Amp-Meter-w-REGULATOR_W0QQitemZ150216945577Q0ihZ006Q0categoryZ46412Q0cmdZViewltem00_Q_trksidZp1742.m153.11262
- http://cgi.ebay.co.uk/SHUNT-for-DC-100A-75mV-Current-Meter-Ammeter-Ammeter_W0QQitemZ1602073253846Q0ihZ006Q0categoryZ25411Q0cmdZViewltem00_Q_trksidZp1742.m153.11262

Generally the complete unit can be installed for about £25.
Ensure that 100A is enough to cope with your power requirements especially if you have a large inverter.

Things You Will Need Before You Begin
- Install instructions supplied by email when you purchase the unit.
- A 100A 75mV shunt
- The ammeter (100A range)
- 1mm² wire – enough for 2 runs to the ammeter and shunt.
- A box to mount the shunt inside.
- The ability to crimp large power cables with ring terminals. (My local Chandlers does this for me for a small price)
- Various sized plastic cable ties (like this http://www.maplin.co.uk/Module.aspx?ModuleNo=6229&criteria=wrap&doy=24m2)
- Ring type crimp terminals (blue)
- A proper crimping tool (like this http://www.screwfix.com/prods/70036/Hand-Tools/Forge-Steel/Pliers-Cutters/Crimpers/Forge-Steel-Ratchet-Crimping-Tool)

Inside the box
There are 3 items you will need:
- The ammeter unit
- A small 4 way cable and plug.
- Shunt

**Step 1 – Identify cables**

The shunt MUST be installed in the negative cable connecting the domestic battery bank to your electrical circuits. To locate this just follow the negative lead from the battery to the circuits/fusebox inside the boat. Its possible that you have 2 negatives leads connected, one to the boats supply and one that runs to the alternator on the engine (or a split charge relay etc.)

If you want to measure both the current used by the boats electrical systems and the charge current supplied by the alternator you need to move all the negative connections that are currently on the battery to one side of the shunt (connecting to the large bolt holes).

On the other side of the shunt, you place a sufficiently thick cable which returns back to the battery negative terminal.

**Important note:** You must be able to provide high quality crimp connections on very thick cables – this needs a special tool. Ask on the forum if someone can help or check with your local chandlers.

Technically you can install this shunt in the positive cables however I have tried this and the ammeter gave incorrect readings and caused problems with other circuits – I don't advise it!

**Step 2 – Installing the shunt**

The supplied shunt does not have a mounting bracket or electrical isolation so it needs mounting in a location where there wont be a risk of other cables shorting against it.

To do this, I used a small plastic box (from Maplins) and a piece of wood cut to the internal size of the box. I drilled 2 holes in the wood at the same distance as the shunts bolts and pushed the shunt bolts into the wood to hold it securely. This also stops the shunt moving if the connection cables are pulled.

To fit the box/wood/shunt to the bulk head I simply drilled and screwed through both the wood and plastic box and screwed into place.

You will also need to cut out holes in the box to allow the cables to enter.

**Step 3 – Connecting cables to the shunt**

You may wish to cut the negative cables to make installation easier. I did this approach and then got crimp connections added.

On the left of the picture is the main battery negative cable which goes straight from the battery to the shunt.

The right side of the picture shows the main negative cable running to the inverter and electrical circuits, and the lower black cable running to the alternator negative.

Ensure the bolts are tight (I used some thread lock glue as well) and then assemble the shunt inside the box – ensuring that the cables are not pulled at awkward angles and there is no tension on them. Cable tie/clamp them into place so they wont get pulled out.

Attach a ring crimp terminal to some 1mm² wire and connect this to left hand screw terminal (again I used some thread lock glue). Repeat this for the right hand screw terminal. These will be called the sensor wires.

Run these two cables back to where you want to site the ammeter. Make sure the cables don’t chaff against steelwork – run them inside some conduit or spiral cable wrap.
Step 4 – Installing the Ammeter

The Ammeter is designed for panel mounting and needs a hole to be cut. The sizes are supplied with the Ammeter but as a guide a copy is below.

You will need to ensure that the hole is a tight fit or the meter will fall out. I used a small drill bit and a jigsaw blade to cut a hole in 9mm plywood.
Step 5 – Electrical Installation To The Ammeter

Don't let the diagram above confuse you – its straight forward enough!
The biggest problem you will have is connecting cables to the very thin plug connector supplied with the ammeter. I found it easiest to strip a large amount of insulation off each cable and then wrap this around the connecting cable, using solder iron to join the wires. Use heat-shrink tube (put on cable first!) to cover and seal the joint.

1. Hold your ammeter so it is the same as shown in the diagram above.
2. Plug in the white connector to the socket at the top right.
3. The top most cable (probably red) needs connecting to the boats +12v supply. Use a supply that is after the main isolation switch otherwise you will never be able to switch the meter off!
4. The next cable down (probably black) needs connecting to the boats negative supply.
5. The next 2 cables need joining to the 2 shunt sensor wires, one to each cable.

I'd suggest that a small fuse is placed in-line with the +12v supply to the meter. No more than 0.5A (500 milliamps).

I also cable wrapped the 4 connecting wires together at the end to prevent the small cables getting pulled out of the socket. Ideally secure to a fixed location or cable clipped to a bulkhead.

Insert the meter into the panel cut out, take care not to trap any wires.

Step 6 – Testing

1. Double check your wiring is okay and nothing is loose.
2. Switch on your boats 12v isolation switch
3. The meter should flash and then light up
4. Without the engine running, switch on a few lights.
5. The display should show a minus reading (eg. -4.5) if it shows a positive reading, switch the power off and swap the 2 sensor wires over inside the shunt & test again.
6. If all is okay, test a large load (inverter or fridge for example) and ensure the ammeter shows a negative reading.
7. Switch off the large load.
8. Start your engine, you should see a high positive reading – this is the charge being put into your battery's from the alternator.
9. Stop the engine!
10. Put the cover onto the plastic box to cover the shunt.
Your finished!