

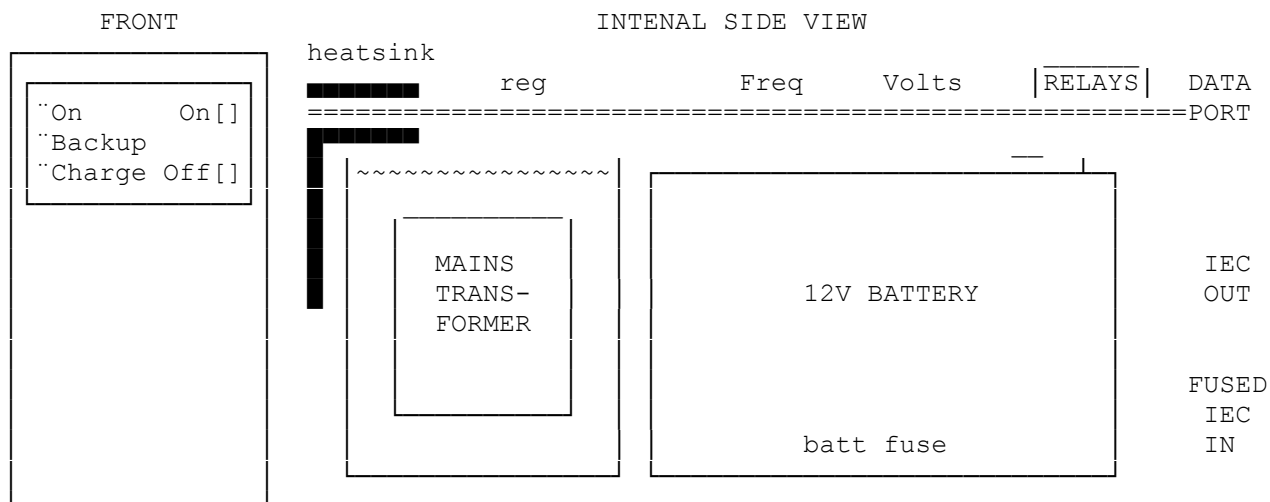
Small Alafontronica 500W UPS

By G8MNY

(Updated May 16)

(8 Bit ASCII graphics use code page 437 or 850, Terminal Font)

This small UPS, is "supposedly up to 500W" of power. It is a 50Hz pulse width stepped square wave mains inverter all from small 7AH 12V battery when in backup mode (e.g. 55A @ 11V ?)



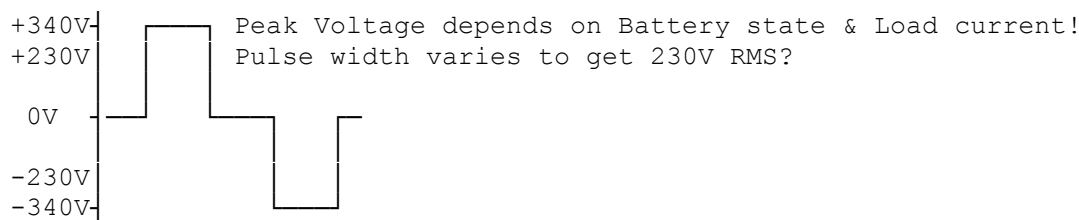
DESCRIPTION

The transformer has tapped primary & 2 secondaries, one into a bridge & SCR for charging. And the 2nd is the centre tapped inverter input winding. Two relays control the mains side, one for mains tap & other for mains connection.

On power fail the mains relay releases & the 2 large Tab FET switching transistors sandwiched in the heatsink, run at 50Hz giving the waveform below.

On mains return the 50Hz is 1st phase locked to the mains, before switching off & connecting back to the mains. Another relay also changes the output tap on backup mode.

OUTPUT WAVEFORM with load (ringy from transformer & filter)



USES

Mainly for computerised kit, that might suffer file corruption, or even HDD damage on some power fails. But note a "non on line" UPS can still be fooled by bad "brown outs", where the mains voltage does not go straight out, but has a few cycles close to the kit's PSU safe minimum voltage (e.g. drops to 150V for 1 second while someone is blowing a fuse & then out!) So kit PSU becomes desperate for power & the UPS does not cut in, in time to stop the kit's PSU giving illegal & corrupting voltages especially to CPUs, memories, & HDDs.

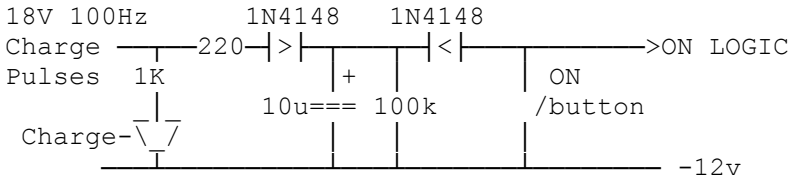
UNMANNED SITE MODIFICATIONS

As with most UPSs, this UPS is not suitable for an unmanned site. This is because, when the battery is emptied/fails on a long discharge, not only does the output fail, but the UPS then stays in OFF mode with no output power, even when the mains is power restored!

Initially I designed 2 modifications to solve this...

1/ AUTO ON RE-START

I wanted the UPS to come back in automatically when the battery has recovered after discharge. On scoping around the PCB, I found the ON button was just -12V on a low current circuit, to the ON logic. There was also a pulsed +ve 18V charging waveform feeding the charge LED via 1kΩ, that diminished to around 1V when the battery was OK. So a little scratching of head I came up with this circuit...

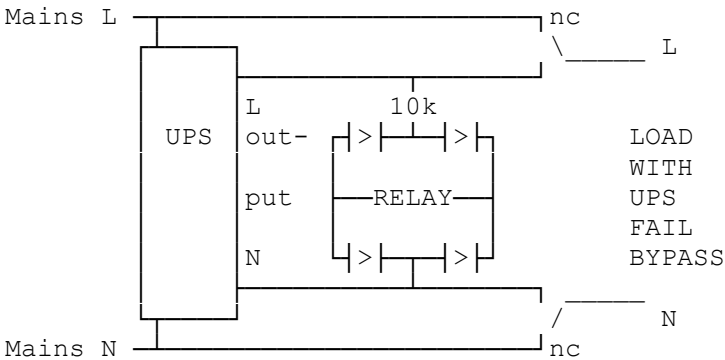


When the pulses reduce, the 10uF discharges through the 100K to level where the 12V ON electronics starts up, doing a self test & back on. Although with this circuit the UPS does not come straight back on when the battery might be usable after a UPS exhaustion event, but leaves the load on normal unprotected mains via my 2/ mod. However it does come back automatically eventually & hopefully with a usable well charged battery.

A label was added to warn of the modification & how to turn the unit off. e.g. POWER OFF UNIT WITH MAINS ON & then disconnect mains input.

2/ OUTPUT FAIL BYPASS RELAY

By adding a small 5A double pole mains changeover relay (low current 30kΩ AC winding) to the load side (on IEC socket), when the output fails, the relay releases & the load is then connected direct the mains.



But nothing is that simple, as my relay did not operate correctly & tended to Buzz on UPS changeover. So I added a 4 diodes bridge & a series R of 10K (do not use series cap on square wave mains!) This slowed down the action OK, from 10ms to <100ms.

Later after 50 days in use trouble free, a failure occurred blowing the 3.12A slow blow input mains fuse, I redesigned it with out this relay & also removed the mains OFF relay & bridged that out with a wire link,

|                     |               |   |
|---------------------|---------------|---|
| Mains filter        | Rear          | In use this is bit better as there is less arcing mains relays etc. But now there is a 2s break on "power on", as the 50Hz Osc has to be in mains sync before the C/O relay connects the mains (whether inverter is on or off!) |
| Missing Volts relay | of PCB        |   |
| Removed OFF relay   | PCB Connector |   |
| Mains ON C/O Relay  |               | However this does not happen unless the battery has flatened & then on a full recharge, you get a clean short break.  |
|                     |               | Anoying, but much prefured to blowing a fuse!   |

SAFETY WARNING

The 12V DC side has a 32A fuse, this is a lot of current from a 7AH battery! The fuse holder & battery connectons need to be kept clean & greased to ensure good operation & no corrosive heating at these currents.

The UPS has the DC battery -ve is on the mains neutral, & not mains isolated! I did all my testing with an isolated mains supply & a scope earthed to the battery -ve.

Why don't U send an interesting bul?

73 De John, G8MNY @ GB7CIP