

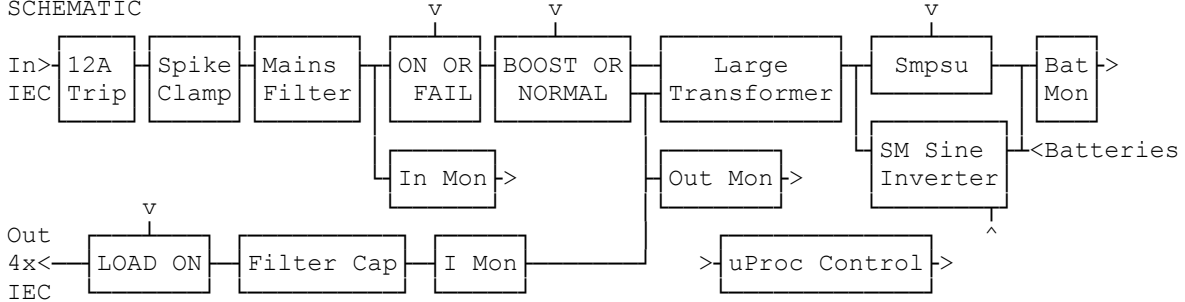
APC Smart 900 UPS

By G8MNY

(Update Dec 07)

This is some info I have found out on this American Power Conversion UPS.
(Uninterruptible Power Supply)

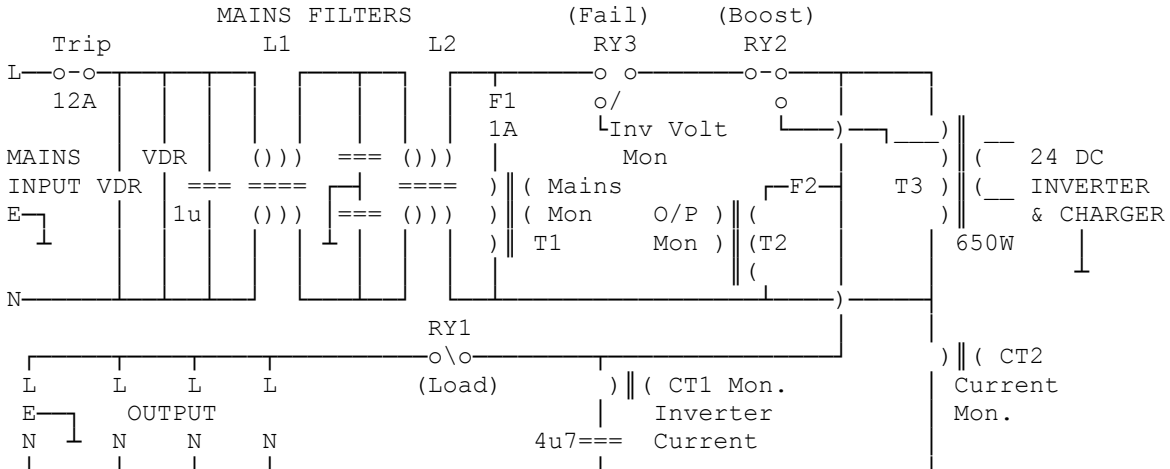
SCHEMATIC



The control sorts out what is the required state for the 3 relays (CAPITALS) from the various monitoring function inputs. It also predicts battery life.

It is a switched UPS system, which means there is a very short break (10ms?) in the output when the supply goes out of limits (fails) & the inverter cuts in.

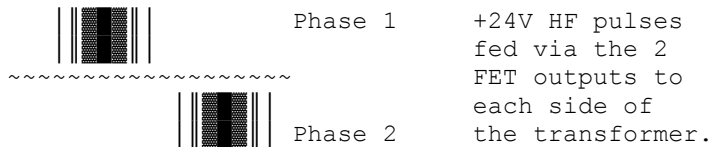
MAINS CIRCUIT

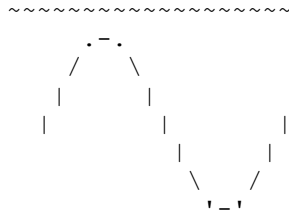


If the mains is just low, then RY2 is operated to obtain more voltage.

INVERTER

The 24V volt inverter uses a powerful bridged Class D 16 FET amp at many kHz.





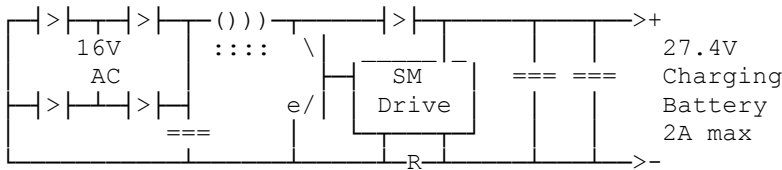
These pulses do not get through T3 & the 4u7 capacitor so the resultant filtered output is a rounded mean of those needle pulses to make a 50Hz sine wave.

There are several feedback loops that control the output.

- 1) The 50Hz is locked in phase to the incoming supply when it is present so there is less of a voltage jump on changeover.
- 2) Output Voltage feedback ensures regulated voltage.
- 3) Over current alarms & then kills the inverter, protecting it from damage.

BATTERY CHARGING

The 24V charging system uses a SMPSU fed from T3 secondary. This "rings up" a ferrite choke to reach the higher battery voltage something like this.

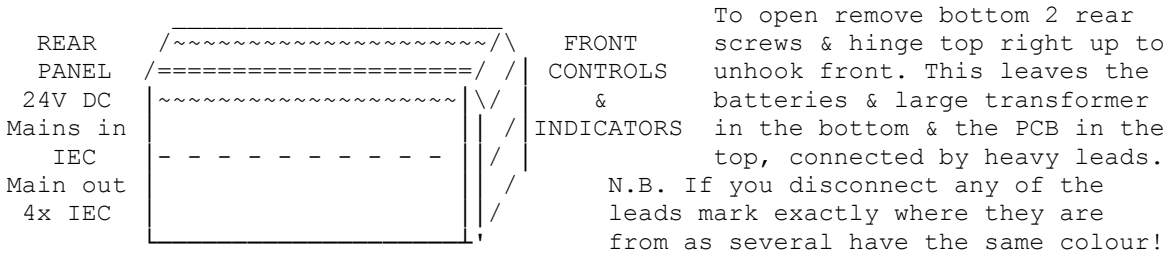


Batteries, as with most UPSs of the sort they are literally CAINED to get the performance! So don't expect them to last long. On full discharge something like 33 amps is drawn from 4 small 6V dry fit 11AH batteries. This is like pulling your car starter for 5-10 mins! OK for the odd 2 second start, but not for mains replacement. In my application these will be boosted by large external batteries.

APPROX SPECIFICATION of APC SMART 900

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Input	Option 1(1)2(1)3(1)4(0)	204-263V	48-56Hz
Output	Option 2(1)	as input or 240V frequency locked to input	
Mains neutral always left connected unswitched			
Mains filter removes high frequency spike components (>10kHz 40dB)			
Mains clamp removes high voltage transients (> 400V peaks @ 25Amps)			
Low mains is boosted with Smart Boost of 20V (step up auto transformer)			
Switch over time	< 20ms ?		
Inverter type	Class D bridged HF		
Output shape	Sine wave output		
Power	630W max		
24V DC Lead Acid storage,	23V @ 33A load for 630W		
Charging up to	2A @ 27.4V		
Size 18" Long, 7" Wide, 9.5" Tall, Weight 40lb (18kg)			



REAR SWITCH OPTIONS

SW	0	1	MEANING	For UK use
1	± 10 %	± 13 %	Sensitivity	0 <-> 1
2	230V	240V (+4%)	Voltage	#
3	1 Sec	30 Sec	Initial Alarm wait	#
4	2 Min	5 Min ??	Batt Dead Warning	# (1 Seems to stop Options!)

Factory setting all 0s

OPERATION

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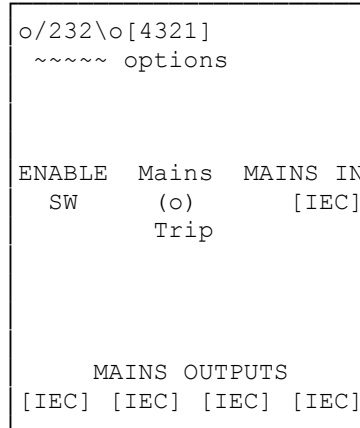
Connections:

With the rear panel rocker ENABLE switch set to (0) off..

Connect the IEC mains input & up to 4 IEC mains loads.

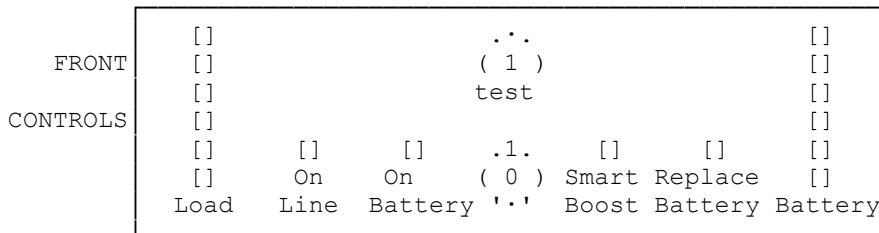
9 pin RS232 connection can be made with the right software. Connection may override control buttons.

REAR PANEL



 From Lod PA3BNX@PI8SHB.#NBO.NLD.EU
 General rs232 control lines with a UPC.
 Power Failure CTS When mains fails.
 Low battery DCD Accu almost empty.
 Remote UPS shutdown DTR Pc asks to switch UPC off.
 You can use UPS in Control Panel from WINNT and XP Pro

Power up: Switching the rear ENABLE to ON while pressing (1) test button will immediately switch the power on if the mains is present or not, & if mains is OK, a battery test with the LINE IN & BATTERY bargraph LEDs flashing while the system readies itself for 5 secs then the inverter test runs for 10 secs.



The green mains ON LINE LED will be flashing in test node (if there is mains present), & the yellow ON BATTERY LED will be on. After the 10 second test it will switch back to the mains if it is OK, & the green mains ON LINE LED stays on & out goes the yellow ON BATTERY LED.

If mains is just goes a bit to low the yellow SMART BOOST LED lights after a second of inverter fill in power.

If the battery will not accept a charge the red REPLACE BATTERY LED is lit up.

Bargraphs: The battery status bargraph indicates the battery voltage & is a good indication of the condition.

The mains load bargraph lights up as the output loading is increased to the maximum 630W load. (100W/0.4A per LED)

Alarms: The beeper sounds 4 beeps every 30 seconds after mains fails (1/30 seconds initial delay option SW3).

And when the battery is too low (2min/5min warning) rapid pulse.

And if the load is excessive.

Mains Fail: As options set near instant changeover to synchronised inverter on failure, e.g. under/over volts, under/over frequency.

Mains Reset: After 5 seconds of good mains, near instant change back to mains.

Power off: Just throw the rear ENABLE switch to off. This disconnects the output & stops all battery drain. Pressing the (0) button only works with no mains, otherwise you get a briefly interrupts the output only (dirty changeover).

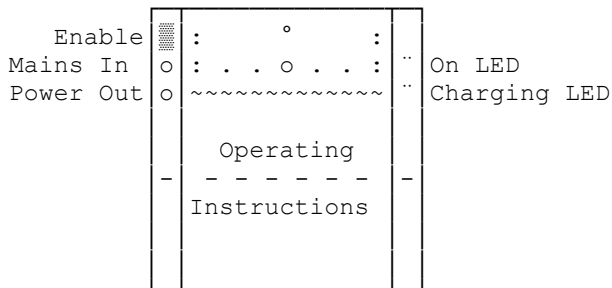
Charging: If just charging is needed then leave the rear ENABLE switch on without pressing (1) test button.

As with most things with uProc control that can go wrong & a full power off with battery disconnection may be needed in the worst case. (e.g. before you buy a new set of batteries!) Then do a fresh power up on recharged batteries with a 30% mains load to recalibrate the uProc's battery predictions during the self test.

MODIFICATIONS

As it will be used on a 24V Bus /P for broadcast/PA work where there may be mains or not, I have done these modifications.

- 1/ Moved rear Enable switch to front of case
- 2/ Added 24V External battery point (externally fused @ 40A)
- 3/ Added "Mains In" neon to tell there is external power. (double insulated)
- 4/ Added "Power Out" neon to confirm output. (double insulated)
- 5/ Added "On" LED fed via 470R from 12V reg tab
- 6/ Added "Charging" LED, NPN base to charging R via 1k, & 330R to LED +12V
- 5/ Blackened internal heatsinks [runs a bit cooler on heavy loads (no fan)]



See my buls on "META HF Melenium 810 UPS", "Lead Acid Batteries", "Constant Voltage Transforemers" & "Mains Power Protector".

Why don't U send an interesting bul?