Test Procedure, WG39Rev7B Controller & WG30Rev3 Power PCBs 120225R0

Note: Test Assumes, both UUT PCBs loaded with all components & IC sockets. Don't load IC's Opto's or Nano yet. UUT = unit under test, WRT = with respect to, GND = ground = 0V. **USB socket on Nano faces to the outside of PCB.**
Equipment: DVM (Digital Volt Meter), 2 x Variable Voltage/Variable Current Power Supplies, an AC clamp meter, A PC or Laptop with Arduino software, a PC - USB cable that suits the Nano USB socket. A WG48R1 front panel PCB, a Nano module with latest WG39R7B 20kHz code and a WG44 LCD display unit with Nano code. You will need Cables to connect the WG39 to WG30, WG44 & WG48 PCB's, some clip leads and 3 x test resistors, 560R, 620R & 680R. The actual name of inverter code (WG39R7B) is subject to change at release.

WG39 & WG48

1) Set a Power supply to 12V @ 30mA, connect + to J1-2 and – to J1-4. Note WG39 UUT current should be less than 20mA. Increase Vin to 24V, note current is <10mA. Confirm there is +12V on J7-1 WRT J1-4 (GND). Leave the minus meter lead on GND and check for +5V on J7-6. Note LD1 is Lit green. Reduce the input voltage to 9V and note +5V now reads 0V ie off. Increase output to 24V again and power down UUT.

2) Install all ICs except the Nano module, connect WG48 to WG39. Power on & note current is still less than 10mA, note the +5V OK LED of WG44 is lit (Green) power off UUT.

3) Measure resistance between J2 terminals is ~200KOhms. Carefully connect mains to J2 (preferably through a Variac set to 230VAC), power up UUT & Variac (Vin 24V@20mA) and monitor with DVM U3 Nano Pin19 WRT GND. Adjust RV1 for 2.8V. Turn 230V mains & 24VDC Power off & disconnect mains wires from UUT J2.

4) Rotate RV2 anticlockwise (minimum), connect a clip-lead end to J7 - 6 (+5V), the other end to a leg of the test 620R. Power up UUT and momentarily touch the other end of 620R to the terminal of J4 closest to RV2. Note LD2 remains off, now repeat with the test 560R and this time LD2 should light and stay lit (latched).

5) Press the over current reset button (on WG48), next rotate RV2 fully clockwise. Connect the 3 Test resistors in parallel (~206R) and with one end connected to +5V and the other end to the J4 terminal. Now wind RV2 anti clockwise until LD2 (and WG48R1 LD3) lights. This should allow for ~ 20A AC (~ 5kW) before the over current trips. This will no doubt need to be adjusted higher again later, to the correct point for your power requirements so that it doesn't trip in normal usage, ie set higher until false trips are ignored. Power off.

6) Install the Nano (with inverter code). Connect LCD to UUT J8. Note J8 UUT and LCD J1 silk screen has a thicker band on the pin 1 end (+5V). Connect the laptop/pc to the UUT Nano via the USB cable. Power up UUT now with 24V @ 100mA, note current ~60mA & LCD should show info on the screen (adjust contrast?).

7) Open the Arduino sketch program, in the "tools" tab, setup the board, processor and port, then "get board info" a small window with Nano info should open. Now select serial monitor and type "?" and then "enter". You may have to scroll up/down a bit but a menu should have appeared for calibrating the UUT Next press "z" (load default values) & enter. Please refer to separate calibration document of Nano WG39 Controller.

WG30Rev3 & WG6Rev1

8) Connect power supply set to 12V @ 80mA, plus+ to WG30 UUT, J1-7 and negative- to J1-8 and power on. Current should be ~ 50-60mA, power off and install optos, power on & note current is now ~ 12mA more.

9) Remove J1 power connections to WG30, WG39 J11 link & J8 LCD connector. Connect an 8 way ribbon cable from WG39- J5 to WG30- J1. Note cable Pin1 is the end closest to the "J" Designator on both PCB's.

10) Connect power supply “1” set to 24V @ 60mA to WG39, + to J1-2 and – to J1-4. Connect power supply “2” set to 6V @ 0.1A to WG30 + (T1) and – (T2) terminals. Power up both supplies, note “1” WG39 current is <30mA. Check with DVM both T4(A) and T3(B) WRT GND = 0V. Increase WG39 “1” input current to 120mA, now install jumper link on J11, 1-2 (Test), note WG39 “1” current draw is now ~ 100mA and that WG30 “2” current draw is < 1mA, leave running for next step.

11) Increase WG30 “2” current limit to 300mA. Connect a 1uF (non polarised) capacitor between A(T4) and B(T3), note “2” supply current ~ 100mA is flowing, increase the WG30 “2” supply from 6V to 12V and note supply current is now ~ 200mA. Remove the 1u capacitor.

12) By now, both PCBs appear to be working fine. If any current measured is more than 10% higher (or lower) than the test value, investigate why, ie orientation of Electrolytic & Tantalum capacitor polarities etc.

13) Read whole of step 13 first. Install a 220u – 1000u (63V) capacitor to 2 x WG6 PCBs, can be just snapped in not soldered, ensure they are not loose in the PCB ie remove and bend pins apart slightly until they seat firmly. Note the capacitor (+) terminals must face the Bat + terminal of WG30 PCB, so one Bulk cap must be reversed when fitted to one PCB as it will be installed rotated by 180 degrees Now screw the WG6 PCBs with capacitors fitted to the UUT WG30, use at least 2 x M4 screw per WG6 to the + & - T5-T16 screw mounts.

14) Connect the primary of a Toroid (with ~40uH - 50uH choke in series) to terminals A(T4) & B(T3) of Power PCB. Now connect a mains rated 1 - 1.5uF polypropylene capacitor across the toroid’s mains output which is also connected in parallel to the WG39, J2 terminals and to a DVM (AC Volts).

15) Continuing on from step 10, with a separate power supply still connected to the WG30, we will slowly run power through the choke/toroid for the first time. Power up the WG39 controller board, now set the WG30’s Power supply to 0.5A limit, whilst monitoring the input current and the AC output voltage, slowly increase the voltage from 0V to 30 (or 50V if your supply goes high enough). AC volts should increase smoothly and for ~30Vin, AC volts should be ~180V and input current ~ 150mA. At around 45V the AC volts should rise to ~230VAC and stay there as the power supply volts continues up to 50V (if the supply is capable), DC supply current should be somewhere around 250mA, for 48V in 230/240V AC out.

16) Before continuing on, the Calibration of WG39 should now be carried out allowing use of the LCD and the software routines for Vin low CapV etc. WG48 PCB is required connected to WG39.

17) Now install 2 x WG6 Capacitor PCBs with at least one Bulk capacitor (4,700u – 10,000u @ 63V) soldered to each PCB, watch the polarities! (see step 11) and with some confidence we can connect the WG39, J1 pins 2&4 (+ & -) to the B+ & B- terminals of WG30 (or under the + & - screws of closest WG9 Cap board is usually where I connect to. Now connect B+ & B- terminals of WG30 to the battery source via a suitable DC breaker (set to off!!). Connect a temporary toggle switch or link to short J1 pin 1 and Pin2. Now connect a push button in series with a pre-charge resistor (10R - 47R) across the main contactor contacts.

18) Press the pre-charge button, the Run LED should light steady, when it goes off, the main breaker can be closed and the pre-charge switch released. Now remove the switch or link between J1-1 and J1-2 (ie open) which should cause the inverter to start, ramping up to the AC preset voltage and then run LED lights.

19) Congratulations, your inverter appears ok & ready to do some work. Remember RV2 may still need further clockwise adjustment to trip just a little above the maximum AC Current you encounter. The inverter should easily provide ~6 KW continuous and 15+KW for short period start ups with a suitable choke and toroid. Fit extra capacitors to WG06 PCB’s, as required - I found 2 x quality 10,000u caps on each WG06 was sufficient.