~~*the Society for Advanced Energy Concepts [SAEC Lab] 09Feb18-11:33:05Z*~~

USING THE INVERTER SECTION OF A DUAL FUEL INTERNAL COMBUSTION INVERTER/GENERATOR WITH A RUSLAN TYPE ELECTRONIC EXCESS ENERGY PRODUCTION SCHEME

NOTES Re: Inverter-Generator - Project ~~IGC090218-SAEC~~

This is an OPEN SOURCE project 01 January 2019 (Preliminary Brief For Review - Not Fully Tested)

This tech brief is primarily "a general design approach" regarding the application of a "Ruslan type
Grenade Coil" (GC) or "Melnichenko Coil" (MC) apparatus that is used to feed an Inverter Generator (IG); where the GC or MC replaces the IG internal combustion engine and multi-phase rotor/stator rotating magnetic generator assembly with a development test device Coil, or other, excess energy producing mechanism.

Integration of the Ruslan Generator concept with an off-the-shelf inverter provides a method that facilitates rapid project completion while producing a stable, usable device with minimum cost, time and effort.

PRIMARY TECHNICAL REQUIREMENT/OBJECTIVE

Keep this one simple primary objective in mind as you study this brief:

IT IS REQUIRED THAT THE INVERTER INPUT FEED CAPACITOR BE KEPT CHARGED FOR THE INVERTER TO FUNCTION.

This Capacitor * is shown in the simplified schematic found in Figure 3. below. It is located after the bridge rectifiers, and before the IGBT Inverter transistors. Charging of this capacitor is accomplished by a *Ruslan* type generation scheme.

TEST-SET CONCEPT (Maintaining a measurement and analysis project baseline)

Using the "Inverter" (INV) only portion of an Inverter Generator (IG) functions as a good Test-Set back end for excess energy device development. Various schemes demonstrating energy gain employing magnetics, high voltage and other methods can be easily and accurately measured and otherwise tested by simply "driving" the INV source capacitor, with appropriate input signal conditioning; diodes for example; in single or three phase or other configurations.

ADVANTAGES

Of the many advantages to be gained through this approach, one of the initial appeals is in the primary system design phase by partitioning the development tasks such that the GC and MC investigation

is the only real focus. Also, the "feed voltage and frequency tolerance specifications" that are required in feeding the seperated IG inverter with the GC or MC produced excess energy signals are expanded considerably while the INV output voltage and frequency remain within a tight tolerance for use in both powering the loop-back circuit (self running) and powering external loads.

As projects progress the Testing and Varification maintain a true baseline throught the process; even when a portion of the regulated output power is looped-back to provide a source for the input GC or MC raw energy production.

BACKGROUND STUDY INFORMATION

Dan Rohas - GreenPowerScience video - Good explainations of generator types including inverter

https://www.youtube.com/watch?v=0TG2uZfE-PQ

3 phase rectifier wiki

https://en.wikipedia.org/wiki/Rectifier#Three-phase_bridge_rectifier

Inverter article

https://web.wpi.edu/Pubs/E-project/Available/E-project-042507-092653/unrestricted/MQP_D_1_2.pdf

ARRL - article Inverter Generator

http://www.arrl.org/files/file/QST%20Binaries/QS0608Kleinschmidt.pdf

[quotes from the article] Unlike conventional generators, which typically use a two-winding core that must turn at 3600 RPM to produce 120 V ac power at 60 Hz, inverter generators produce multiple-phase ac power at high frequencies, which is electronically “converted” to dc, then “inverted” back to rock-solid, low-distortion, 120 V, 60 Hz ac.

Because an inverter generator can draw more power per revolution from the generator core (thanks to several hundred overlap ping sine waves per revolution), the core doesn’t need to operate at a fixed speed to maintain regulation. Inverter generators are lighter, quieter, and more fuel efficient because generator speed is automatically adjusted to match load conditions.

In an inverter generator, the core uses multiple coils and multiple magnets. Each full rotation of the engine produces more than 300 three phase ac sine waves at frequencies up to 20 kHz, which produces more electrical energy per engine revolution. A microprocessor-controlled inverter module converts the high-frequency ac to dc (about 200 V in at least one unit) before “inverting” it back to clean, stable 120 V, 60-Hz ac power.

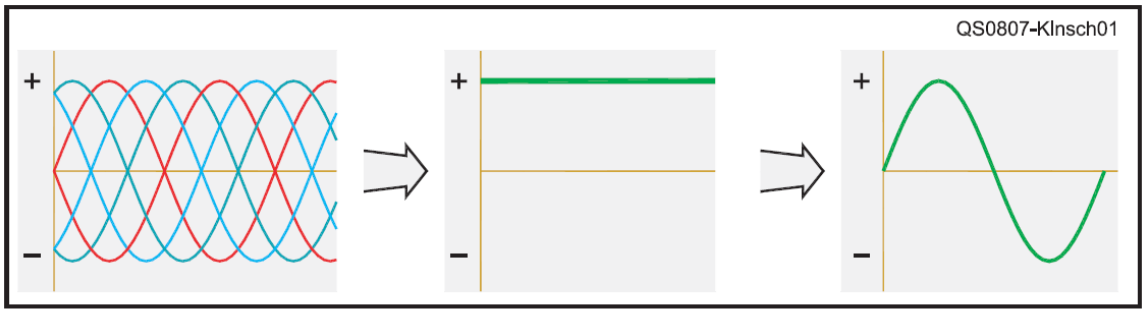

Figure 1 — The three phases of the inverter generator process: high frequency ac; converted to dc; inverted to stable, clean 120 V, 60 Hz ac.

Figure 1.

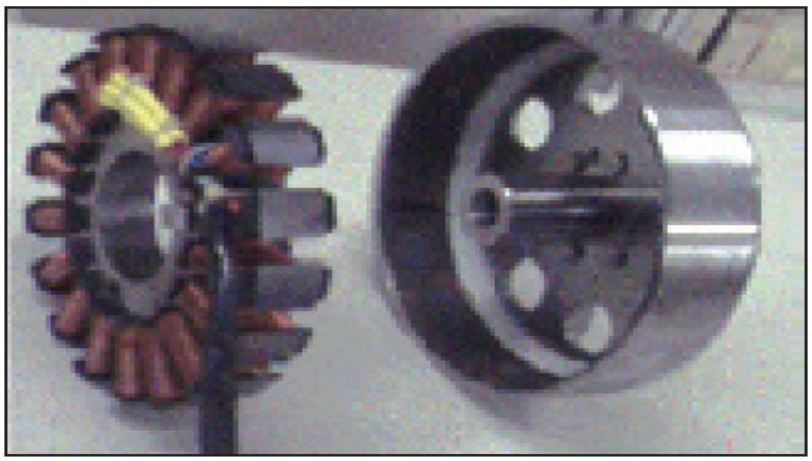

Figure 2 — Core parts from a modern inverter generator. Note the multiple windings.

Figure 2.

The brains behind the braun — the inverter modules — are typically designed to function beyond their rated loads. Most incorporate a suite of temperature, voltage and current sensors to make sure everything is operating correctly, even in demanding field conditions, and to ensure that the generators can put out extra power for short time periods to start demanding loads such as air conditioners or other motor driven equipment.

Parallel Inverter Generator Operation - overview

http://www.generatorpowersource.com/paralleling-generators-running-generators-in-parallel/

Yamaha EF4500iSE Theory and Diagnostics Guide [Inverter Generator] (218 pages - very good)

https://www.manualslib.com/manual/804060/Yamaha-Ef4500ise.html

UNDERSTANDING PORTABLE INVERTER GENERATORS (brief article with simplified diagram)

https://generators.smps.us/inverter-generator.html

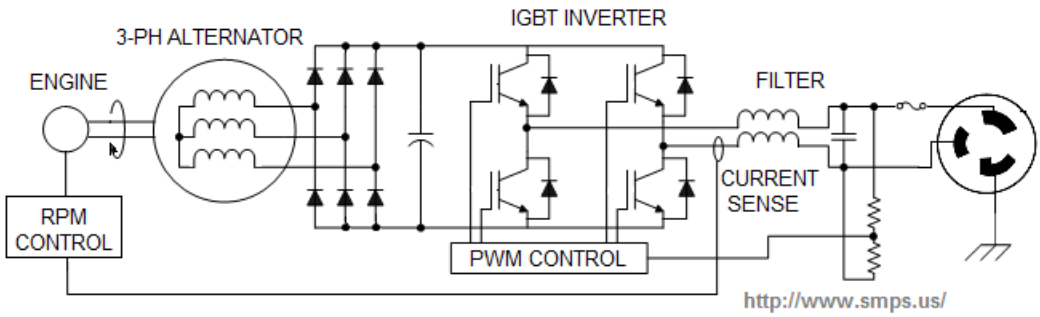

Figure 3.

* The Capacitor mentioned in the Objective Requirement is located after the bridge rectifiers, and before the IGBT Inverter transistors. Engine and 3-Phase Alternator are replaced by an electronic excess energy generator scheme of the Ruslan, or similar type. Thus rendering the resultant power unit fueless, noiseless and polution free. The housing and output plug sections remain intact. The unit also becomes lighter in weight for portability; however there is still the requirement for earth grounding.

Using inverters with AC generators (brief article)

http://www.circuitstoday.com/using-inverters-with-ac-generators

[quotes from the article]

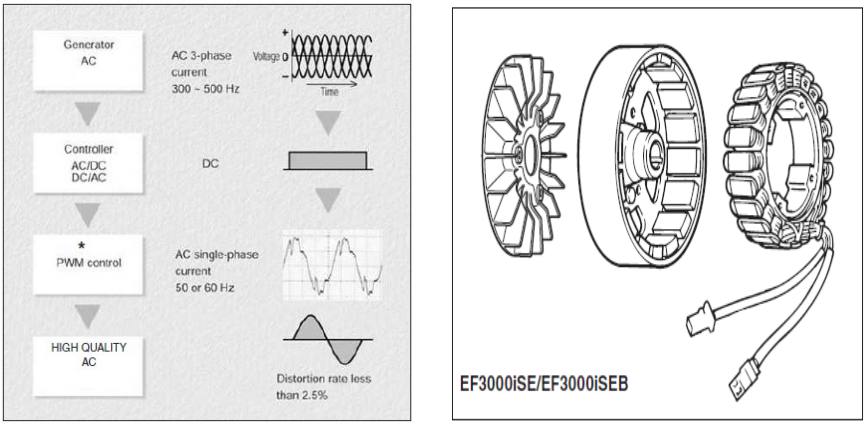

Figure 4.

Control Unit
The control unit is a sealed unit.
Functions:
AC power generation
Electronic governor (throttle control)
Economy control program
Self-protective function
Over current
Over voltage
High temperature

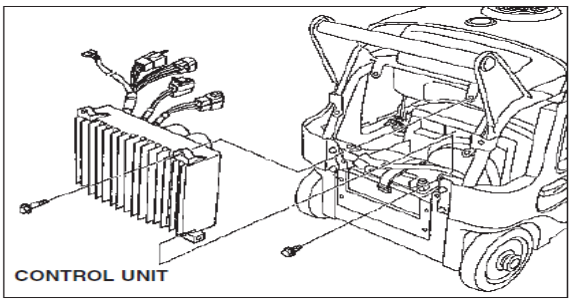

Figure 5.

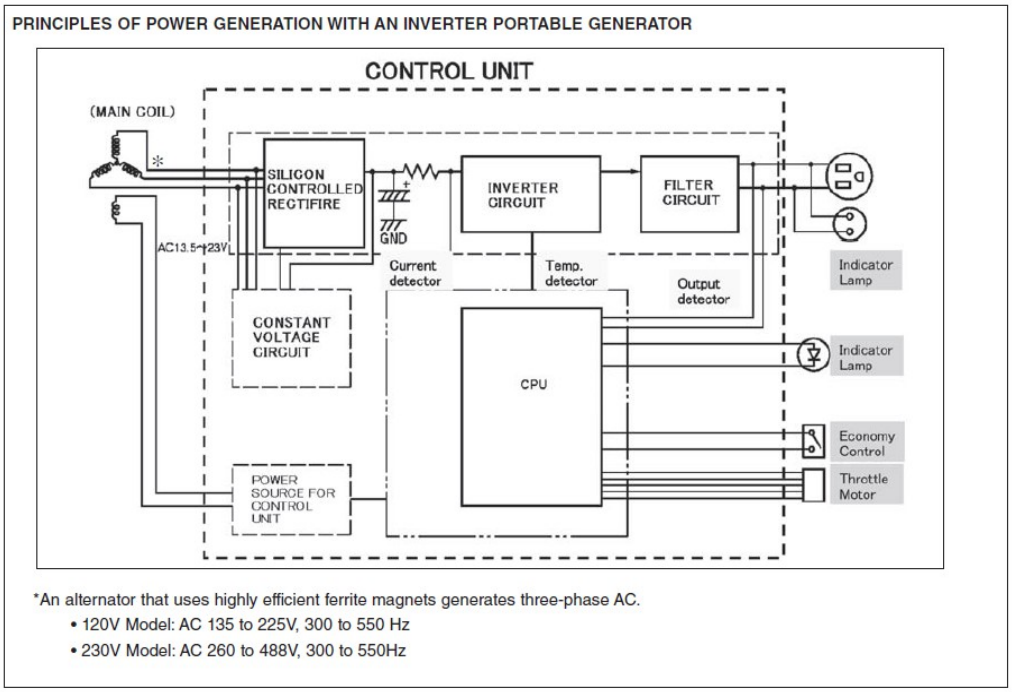

Figure 6.

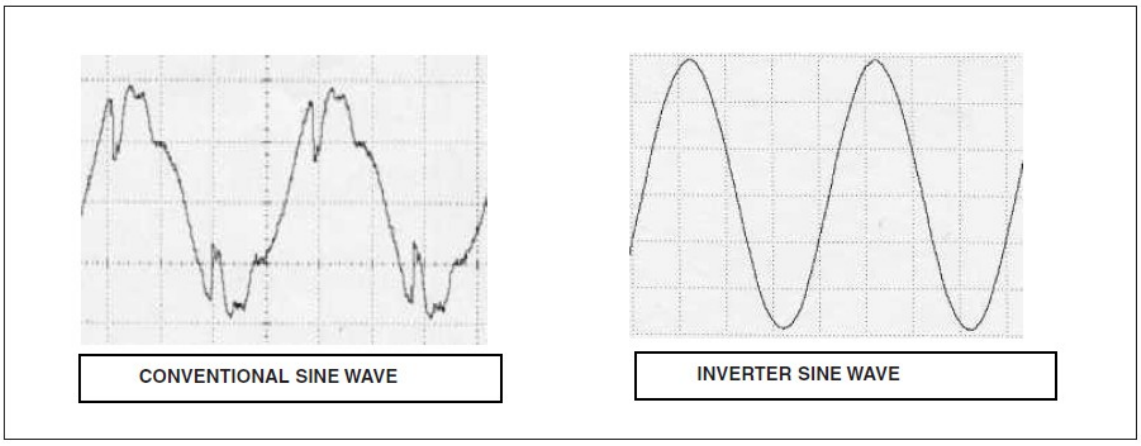

Figure 7.

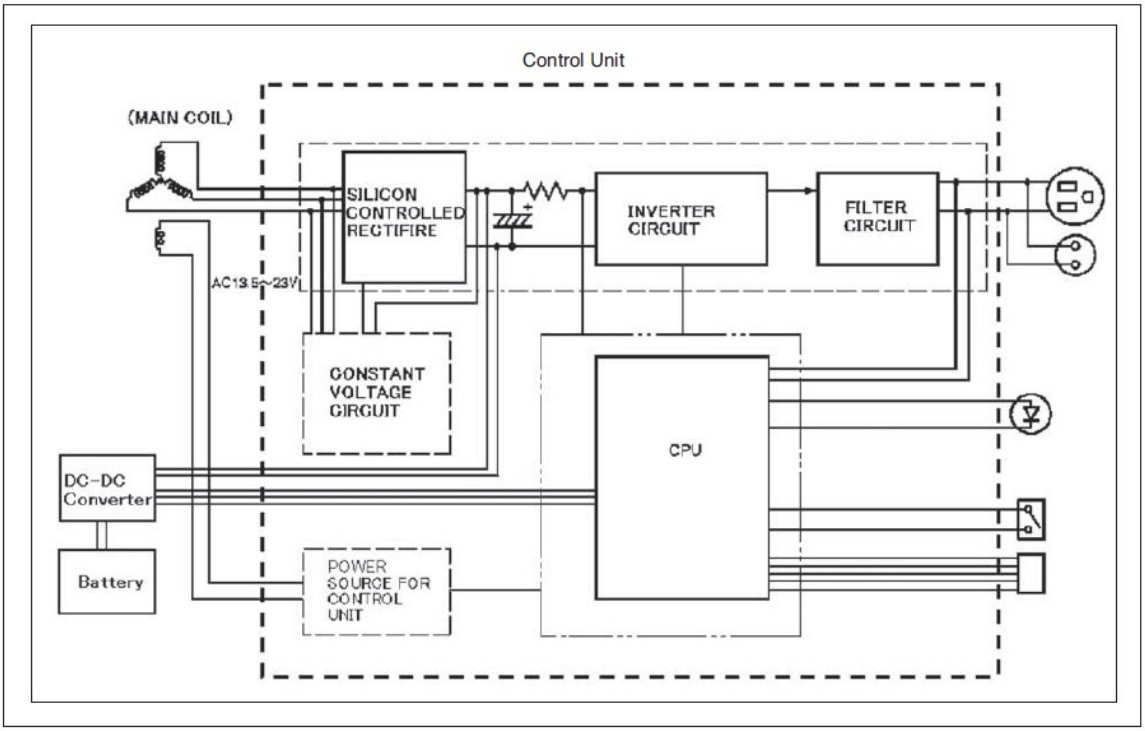

Figure 8.

DC-DC Converter (Power Boost Technology)

The DC-DC converter is an electrical device to step up DC voltage. The EF3000iSEB DC-DC converter steps up the battery voltage from 12 volts to 190 volts.

DC-DC converter is automatically activated to increase generator output when the AC output current exceeds 20 amps and the voltage at the condenser inside the control unit drops down to below 190 volts.

The power source is a 12-V battery installed in the generator to operate the starter motor. DC-DC converter works for maximum 10 seconds, only when a large amount of starting current is needed and increases maximum output of generator from 3000 VA to 3200 VA temporarily.

Specifications of DC-DC converter
1. DC input 12V Battery
2. DC output DC190V
3. Rated DC current 2.53 A

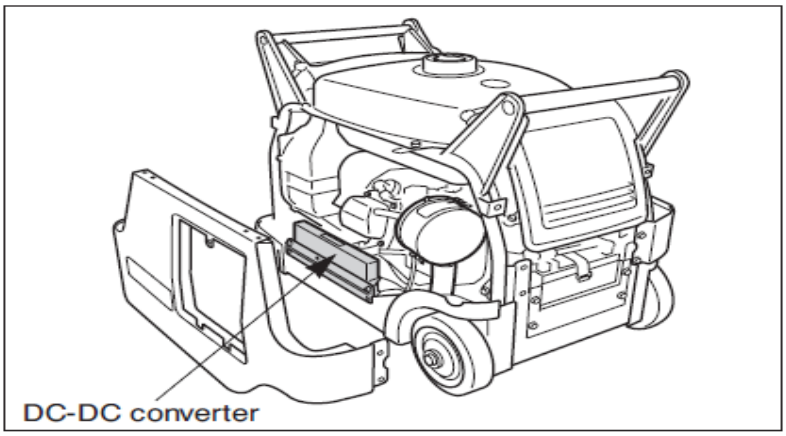

Figure 9.

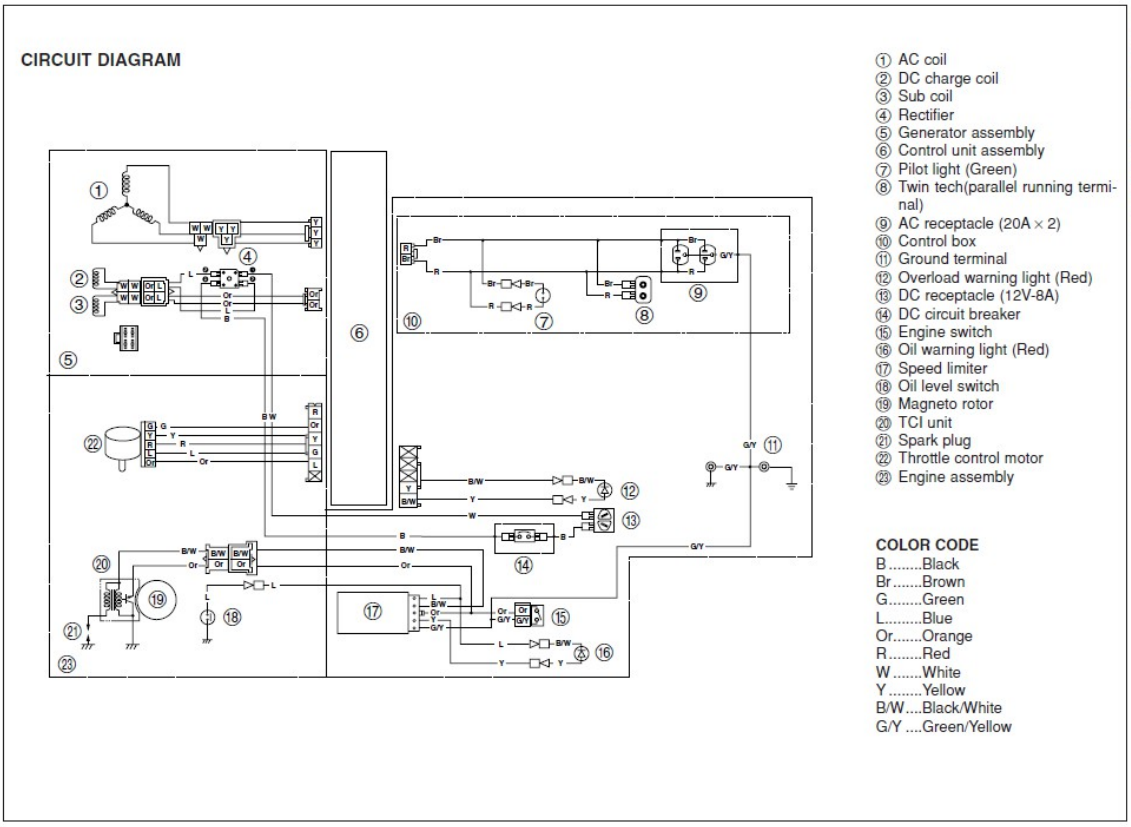

Figure 10.

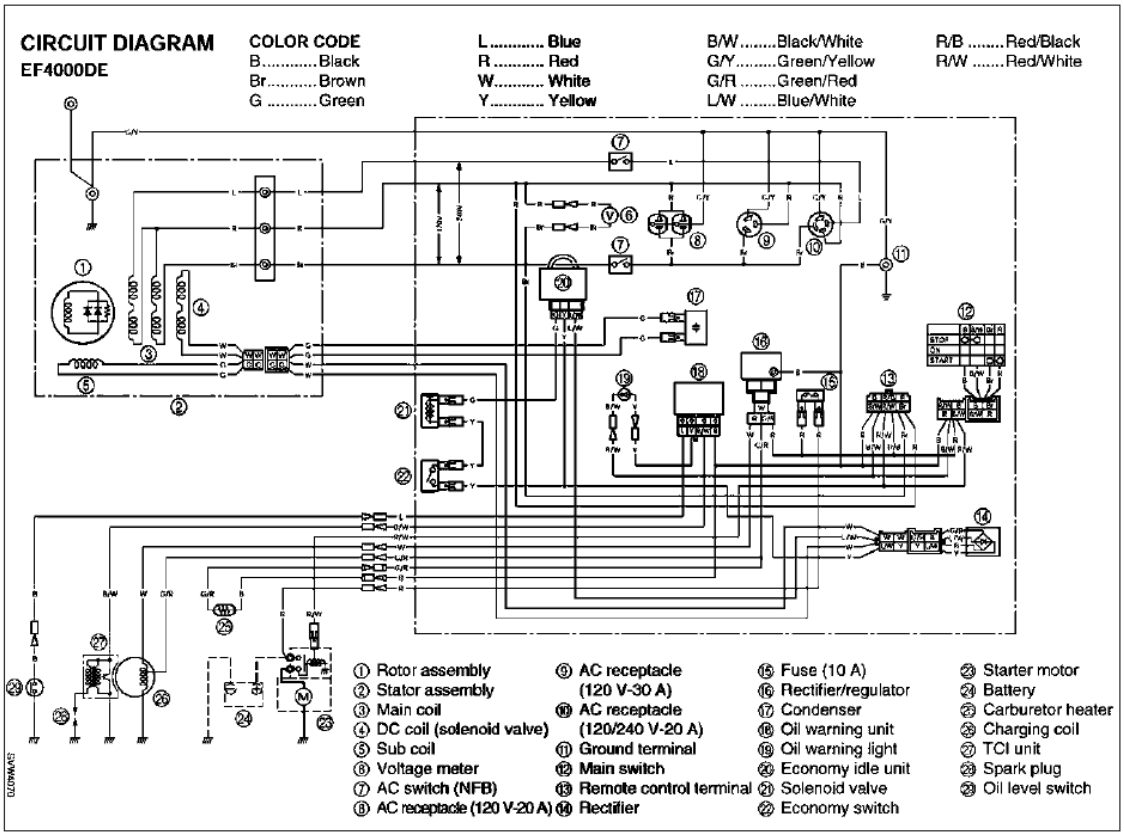

Figure 11.

Inverter Generator patent US20120074912

https://patents.google.com/patent/US20120074912?oq=20120074912

[quotes from the article]

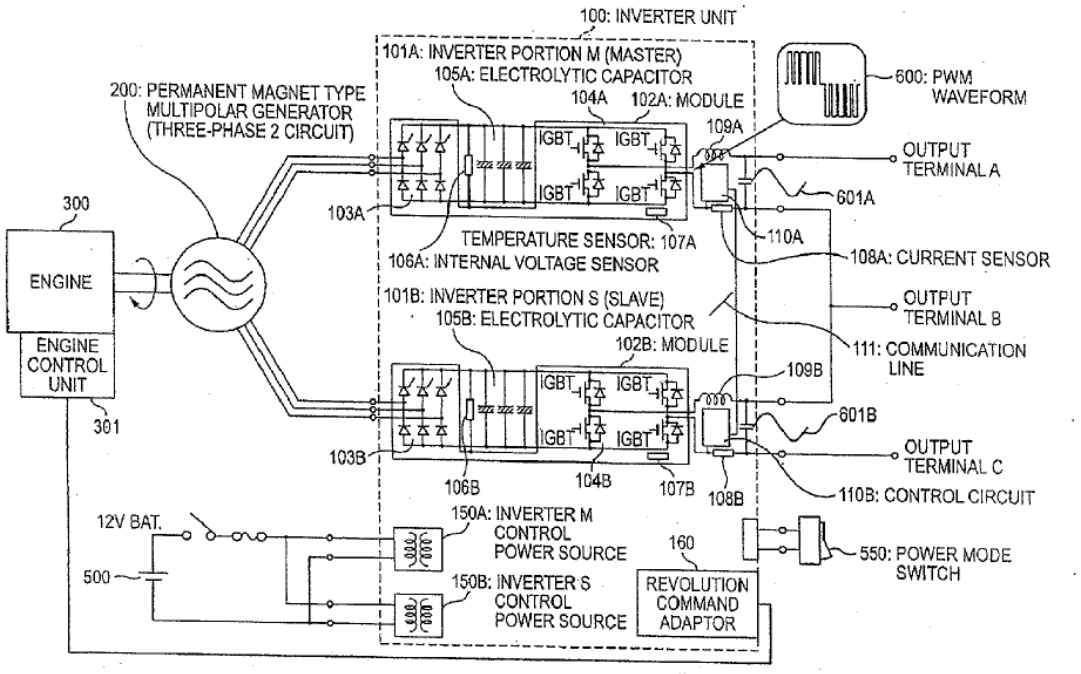

Figure 12.

INVERTER DESIGN NOTES

DC/AC Pure Sinewave Inverter:
https://web.wpi.edu/Pubs/E-project/Available/E-project-042507-092653/unrestricted/MQP_D_1_2.pdf

CONCLUSION AND SUMMARY

OBSERVE: A major advantage of the inverter/generator gen-sets are that several units can be operated in parallel thus increasing the output as required (phasing of the two units is transparent and accomplished via the control circuit's internal electronics).

Purchase of a Commercial Off-The-Shelf (COTS) "Dual Fuel Inverter Generator" avoids the long cycle of having to build such a unit while instantly yielding a tested, varified and supported test-set platform. Addition of a single DPDT switch with connectors will facilitate splitting the IC Generator portion from the Inverter (INV) portion; thus allowing the split generation sections ready for immediate test-set use while still supporting dual deployment [test-set or original IC Generator functions].

Quick Thoughts -

1. Replace the internal combustion engine and generator rotor/stator assembly with "Ruslan" type
coils - fueless generator scheme to charge the capacitor that feeds the inverter/generator

"converter" (inverter section of the gen-set). Note that in some gen-sets it appears they need to be supplied with A/C (3, or more, phase). TBD.

2. Permanent Magnet Motors might be able to use an adapted "inverter/generator stator/rotor"
concept. For example - space the stator pickup coils between the driving/driven permanent magnets; achieving both rotation and output A/C electricity. TBD.

3. This scheme should be considered for a "General Benchmark" excess energy method comparison fixture.

4. Consider submission of the detailed "Test-Set" to NASA Tech Briefs "Created the Future" for 2019.

END Rev 1. *{scrub bulk down to Executive Summary} 03Dec18-13:14:16Z*