

GENCON^(R) II PRO Features*

Wexler Computer Systems Development Ltd.

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1 General

GENCON^(R) II PRO is a comprehensive computer system for measurement, protection, management, paralleling and remote monitoring of generator-sets. The system is designed for OEM's with emphasis on software flexibility – using the GENCON^(R) II PRO system enables the OEM to manufacture a single control panel that fits all generator-set applications.

The GENCON^(R) system is made of three parts:

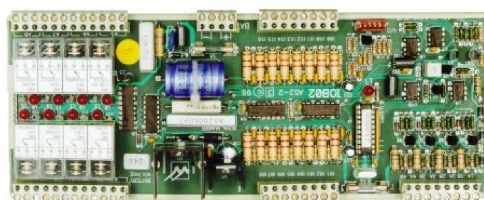
1.1 GENCON^(R)



The main unit, responsible for computation, measurement, paralleling and communication.

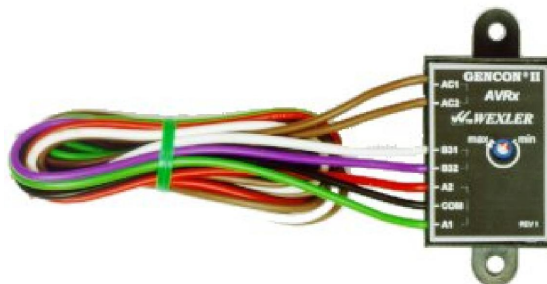
*Specifications are subject to change without notice.

1.2 IOB2



An auxiliary input/output board with digital and analogue channels that mainly serves the engine (IOB1 is a simpler alternative with digital I/O channels only).

1.3 AVRx



An interface module for the generator voltage regulator.

2 Measurements

GENCON^(R) measures the electrical parameters of the genset 10 times per second. The measurements are true RMS and 0.5% accurate. GENCON^(R) averages the incoming measurements and updates the display (LCD) approximately once per second.

GENCON^(R) measures all the electrical parameters of three phase generators, see table 1. One phase of the mains (or the generator bus) that serves as a reference for the built-in synchronizer is also measured, see table 2. The “synchroscope” measurements, see table 3,

	Parameter	Transducer
1	Volts Gen Phase A	None
2	Volts Gen Phase B	None
3	Volts Gen Phase C	None
4	Volts Gen Phase A-B	None
5	Volts Gen Phase B-C	None
6	Volts Gen Phase C-A	None
7	Amps Gen Phase A	5A CT
8	Amps Gen Phase B	5A CT
9	Amps Gen Phase C	5A CT
10	Frequency Gen	None
11	kW Gen Phase A	None
12	kW Gen Phase B	None
13	kW Gen Phase C	None
14	Total kW Gen	None
15	kVA Gen Phase A	None
16	kVA Gen Phase B	None
17	kVA Gen Phase C	None
18	Total kVA Gen	None
19	kVAr Gen Phase A	None
20	kVAr Gen Phase B	None
21	kVAr Gen Phase C	None
22	Total kVAr Gen	None
23	kW-Hour Count	None
24	P.F. Gen Phase A	None
25	P.F. Gen Phase B	None
26	P.F. Gen Phase C	None
27	% THD Gen Phase A	None
28	% THD Gen Phase B	None
29	% THD Gen Phase C	None

THD = Total Harmonic Distortion

Table 1: Generator measurements

	Parameter	Transducer
1	Volts Bus/Mains Phase A	None
2	Frequency Bus/Mains	None
3	% THD Bus/Mains Phase A	None

Table 2: Mains/Bus measurements

	Parameter	Transducer
1	Phase Shift	None
2	Voltage Match	None
3	Frequency Hz Slip	None

Table 3: Synchroscope

	Parameter	Transducer
1	Volts Battery	None
2	RPM Speed	Magnetic Pick-up
3	Hours-Run Count	None
4	Engine Temperature	Resistive sender
5	Oil Pressure	Resistive sender
6	Fuel Level	Resistive sender
7	Oil Temperature	Resistive sender

Table 4: Engine measurements

show the difference between the generator parameters and the parameters of the reference phase.

Table 4 shows the engine related measurements. Single lead resistive senders, the common automotive type, can also be used as GENCON^(R) effectively cancels the battery ground noise.

GENCON^(R) has three 4-digit counters that record the system's activity, see table 5. Like the kW-Hour and the Hours-Run, the value of these counters is preserved while GENCON^(R)'s DC supply is switched off. The counters are protected by *two* passwords from user tampering.

	Counter name
1	Engine Cranks
2	GenSet Runs
3	GenSet OnLoad

Table 5: Activity counters

	Alarm
1	Gen Over Volts
2	Gen Under Volts
3	Gen Over Current
4	Gen Over Frequency
5	Gen Under Frequency
6	Gen High % THD
7	Illegal Gen Phase Order
8	Gen Reverse Power
9	Gen Loss Of Excitation
10	Loss Of Mains During Paralleling
11	Gen Voltage Not Built
12	Gen Frequency Not Built
13	Dead Bus Protection

Table 6: Generator protection

3 Protection

The generator protective functions (table 6) and the engine protective functions (table 7) are based on the measurement system. All these functions have user adjustable trip-points and time-delays.

Table 8 lists the genset protective functions that are contact based. GENCON^(R) protections comply with the American NFPA level 1 recommendation.

4 Engine Management

GENCON^(R) has eleven 380Vac/10A command relays. Table 9 shows a typical use of these relays in direct engine management. GENCON^(R) can also be used with external Engine Control Units, not required to have a magnetic pickup unit of its own.

5 Paralleling

GENCON^(R) includes all the necessary functions for running a genset in parallel with the mains or for running the genset in parallel with other GENCON^(R) II PRO based gensets, see table 10. The governor¹ and the AVR² do not need to have a “droop kit”, hence, the engine speed and the generator voltage will remain constant when the load level changes.

¹Engine speed control unit

²Generator voltage regulator

	Alarm
1	Battery High Volts
2	Battery Low Volts
3	Engine Temperature Low
4	Engine Temperature High
5	Oil Pressure Low
6	Oil Pressure High
7	Fuel Level Low
8	Fuel Level High
9	Oil Temperature Low
10	Oil Temperature High
11	RPM Over Speed
12	Engine Slow Crank
13	Engine Over Crank
14	Oil Pressure Not Built
15	Engine Shutdown Failed
16	RPM vs. Frequency Mismatch

Table 7: Engine protection

	Alarm
1	Remote Emergency Stop
2	Low Oil Pressure Shutdown
3	Low Oil Pressure Warning
4	High Temp Engine Shutdown
5	High Temp Engine Warning
6	Low Temp Engine Warning
7	Low Coolant Level
8	Low Fuel Level
9	Battery Charger Fault
10	Air Damper Closed
11	External Overload

Table 8: Engine protection (contact inputs)

	Function
1	Preglow or Idle Speed
2	Fuel Solenoid
3	Starter Crank
4	Air Damper
5	Lubrication Pump
6	Set Running Indication
7	Visual Alarm Control
8	Audible Alarm Control

Table 9: Engine control relays

	Function
1	Auto Synchronizer
2	Phase & Frequency Matching
3	Voltage Matching
4	Check Synchronizing
5	Load Sharing
6	kW Load sharing
7	kVAr Load Sharing
8	Export with Power Ramp
9	kW Export Control
10	kVAr Export Control

Table 10: Paralleling functions

6 Automatic Transfer Switch

GENCON^(R)II *PRO*, as the tradition in Europe requires, has a built-in ATS logic. It includes:

- Mains Failure Detector. It is based on the reference phase that GENCON^(R) measures, see table 2.
- Time Delayed Transfer Logic (with an adjustable break to make delay).
- In-Phase Transfer Logic

7 Applications

The GENCON^(R)II *PRO* system can be used in any genset application. In most cases it provides a complete solution. Where the requirements are non-standard, GENCON^(R) offers a special operating mode, the generic mode, where it operates under the command of an external PLC.

Single genset applications include:

- Prime Power.
- Mains Standby.
- Mains Standby with Soft Transfer.
- Peak Shaving (aka Peak Lopping).
- Cogeneration (aka Combined Heat & Power).

Multiple³ genset applications include:

- Random Access Load-Sharing with Power Ramp.
- Load Dependent Start/Stop Sequencing (with optional balancing of the runtime and the breaker engagement counters).

GENCON^(R)II *PRO* can interface with most speed control (governor) and voltage regulator (AVR) models and in addition:

- It can cooperate with external engine management units.
- It can share the load with “foreign genset controls” through built-in speed and voltage droop loops.
- It can operate hydraulic and mechanical speed controllers through up/down contacts.

8 Miscellaneous

- Front panel
 - Display
 - * 20 characters x 4 lines LCD with backlight
 - * User translatable texts
 - Faults logging
 - * Last 8 reports (time tagged)
 - Keys
 - * Stop
 - * Alarm mute/reset
 - * 4 menu navigation keys
 - * 10 digit keys
 - Parameters (delays, etc.)
 - * Field adjustable
 - * Non volatile
 - Security
 - * Three password system
 - Indicators
 - * High intensity shutdown, warning and activity LEDs

³Up-to 8 load-sharing gensets

9 Remote control & monitoring

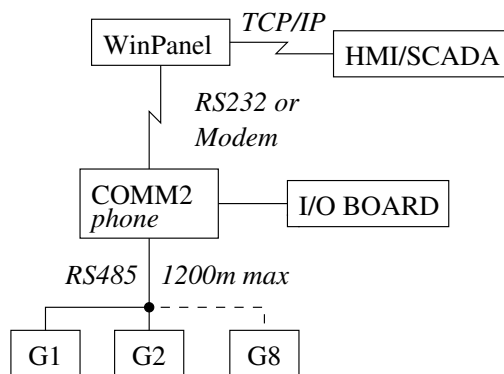


Figure 1: WinPanel/Phone block diagram

Up to eight GENCON^(R) controllers can be connected through a single twisted pair RS485 cable to various supervisory systems. The maximal length of the RS485 cable is 1200m (=4000ft). The supervisory systems can be:

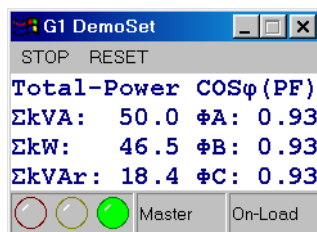


Figure 2: WinPanel GENCON^(R)#1

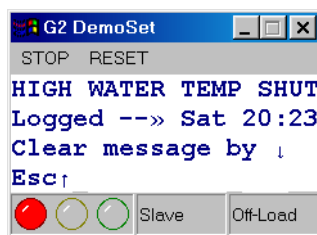


Figure 3: WinPanel GENCON^(R)#2

WinPanel A Windows based control panel that connects to the power plant via a cable or a dial-up modem. The screen displays update


at real-time speed, see figures 2 and 3. A Modbus/TCP server gives HMI/SCADA systems on the LAN or in the same computer access to all GENCON^(R) measurements and statuses. The COMM2 unit is required. An optional IOB1 module adds 8 relays and 16 digital inputs for general supervision.

Annunciation Remote annunciation panels can be driven using the COMM2 unit and the IOB3 module. Each IOB3 module can drive 32 indicators.

Modbus PLC systems can gain access to all GENCON^(R) measurements and statuses through a serial Modbus ASCII or Modbus RTU port. The COMM2 unit is required.

Server System that is based on open source software is available for data acquisition and event logging. Graphical user interface is provided through a web server.

10 Technical data

-  listing E219920 (safety standard UL508).
- Battery Voltage, 8 Vdc to 40 Vdc continuous (load-dump protected).
- Accuracy, 0.5% (true RMS).
- Front panel, completely sealed (IP65).
- Operating temperature, -20°C to +70°C (storage -30°C to +80°C).
- Four AC volts inputs (V1/V2/V3/V4), each electrically isolated to 7500 V (IEEE 587 class C).
- Three AC amps inputs (I1/I2/I3), each electrically isolated to 1500 V (1 minute).
- RS485 port, electrically isolated to 1600 Vac (1 minute) or 2000 Vac (1 second).