

GENCON® II *PRO* Features*

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

1 General

GENCON® is a comprehensive computer system for the measurement, protection, management, paralleling and remote monitoring of generator-sets. The system is designed for OEMs, putting the emphasis on software flexibility – using the GENCON® system enables the OEM to manufacture a single control panel that fits practically all generator-set applications.

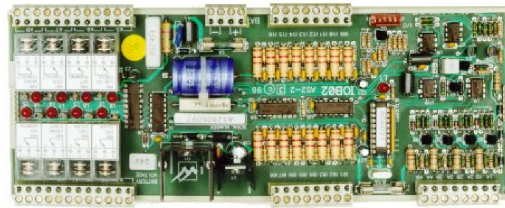
The GENCON® system is made of three parts:

1.1 GENCON®



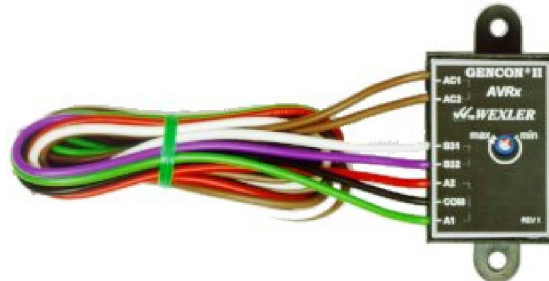
*Specifications are subject to change without notice

1.2 IOB2



An auxiliary input/output board with digital and analog 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[®] measures the electrical parameters of the gen-set 10 times per second. The measurements are true RMS and 0.5% accurate. GENCON[®] averages the incoming measurements and updates most LCD displays about once per second.

GENCON[®] measures all the electrical parameters of three-phase¹ generators in 4-wire and 3-wire configurations, see table 1. Also measured is one phase of the mains or the generator-bus that is the reference phase to synchronize the generator with, see table 2. The “synchroscope” measurements, see table 3, 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[®] effectively cancels the battery ground noise.

GENCON[®] has three 4-digit counters that record the system’s activity, see table 5. A secret 10 year service counter is also in built for the optional “**MAINTENANCE REQUIRED**” alarm. Like the kW-Hour and the Hours-Run, the value of these counters is preserved while GENCON[®]’s DC supply is switched off. The counters are protected by *two* passwords from user tampering.

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 gen-set protective functions that are contact based. GENCON[®] protections comply with the American NFPA level 1 recommendation.

4 Engine Management

GENCON[®] has eleven 380Vac/10A command relays. Table 9 shows a typical use of these relays in direct engine management. GENCON[®] can also be used

¹Single-phase support is available on order

	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	Amps/Per-Unit Sequence Currents	None
11	Hz Gen Frequency	None
12	kW Gen Phase A	None
13	kW Gen Phase B	None
14	kW Gen Phase C	None
15	Total kW Gen	None
16	kVA Gen Phase A	None
17	kVA Gen Phase B	None
18	kVA Gen Phase C	None
19	Total kVA Gen	None
20	kVAr Gen Phase A	None
21	kVAr Gen Phase B	None
22	kVAr Gen Phase C	None
23	Total kVAr Gen	None
24	kW-Hour Count	None
25	P.F. Gen Phase A	None
26	P.F. Gen Phase B	None
27	P.F. Gen Phase C	None
28	% THD Gen Phase A	None
29	% THD Gen Phase B	None
30	% THD Gen Phase C	None

THD = Total Harmonic Distortion

Table 1: Generator measurements

	Parameter	Transducer
1	Volts Bus/Mains Phase A	None
2	Hz 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

	Counter name
1	Engine Cranks
2	Gen-Set Runs
3	Gen-Set OnLoad
4	Service Weeks/Days

Table 5: Activity counters

	Alarm
1	Over Voltage
2	Under Voltage
3	Over Frequency
4	Under Frequency
5	Inverse Time Overcurrent
6	Negative Sequence Overcurrent
7	Harmonic Distortion
8	Illegal Phase Order
9	Reverse Power
10	Loss of Excitation
11	Loss of Mains During Paralleling
12	Voltage Not Built
13	Frequency Not Built
14	Dead Bus Protection

Table 6: Generator protection

	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	Phase/Frequency Synchronizer
2	Voltage Matching
3	Sync Check, dwell-time or freq-slip
4	kW Load sharing, isochronous speed or droop
5	kVAr Load Sharing, constant voltage or droop
6	kW Export Control, adjustable ramp
7	kVAr Export Control, adjustable ramp

Table 10: Paralleling functions

with external Engine Control Units where it does not require, for instance, to have a magnetic pickup unit of its own.

5 Paralleling

GENCON[®] includes all the necessary functions for running a gen-set in parallel with the mains or for running the gen-set in parallel with other GENCON[®] based gen-sets, see table 10. The governor² and the AVR³ *do not need to have a “droop kit”*, hence, the engine speed and the generator voltage will remain constant when the load level changes.

6 Automatic Transfer Switch

GENCON[®], as the tradition in Europe requires, has a built-in ATS logic. It includes:

²Engine speed control unit
³Generator voltage regulator

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

7 Applications

The GENCON[®] system can be used in any gen-set application. In most cases it provides a complete solution. Where the requirements are non-standard, GENCON[®] offers a special operating mode, the generic mode, where it operates under the command of an external PLC.

Single gen-set applications include:

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

Multiple gen-set 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[®] 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 gen-set controls” through in built speed and voltage droop loops.

8 HMI/SCADA

Up to eight GENCON[®] controllers can be connected via the Communicator⁴ unit to any HMI⁵ or SCADA⁶ system that uses the Modbus protocol, see figure 1. The maximal length of the RS485 cable is 1200m (=4000ft). The Communicator can also drive a 32 lamp alarm annunciator through the optional IOB3 module.

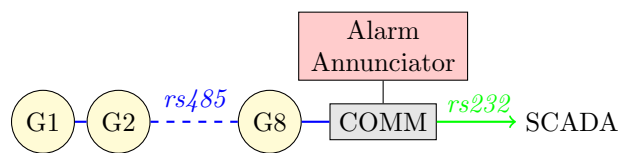


Figure 1: The Communicator

Gpanes is a powerful Windows/Linux based HMI/SCADA system that is designed for the GENCON[®] controllers. **Gpanes** connects to the Communicator via a cable, a dial-up modem or a Modbus/TCP data link and provides the remote operator control screens that update at “real-time” rate, see figure 2. **Gpanes** can be used safely across the Internet as it incorporates a standard, certificate based, Transport Layer Security (TLS).

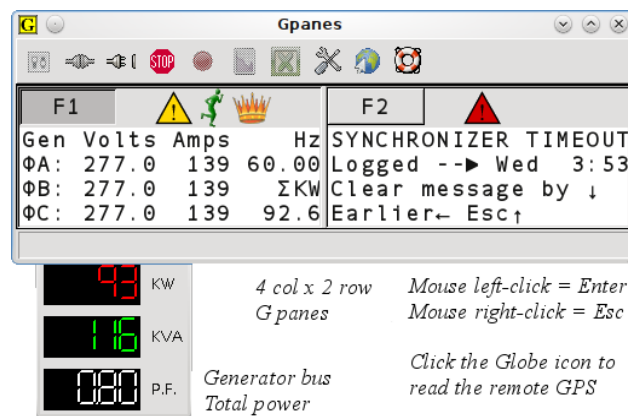


Figure 2: Gpanes

⁴COMM II PRO model

⁵Human Machine Interface

⁶Supervisory Control and Data Acquisition

Gpanes also includes a subsystem for data and event logging (using a constant storage footprint round-robin database). **Gpanes** can chart any logged data interval or export the data to a spreadsheet program for further analysis. A shutdown event can automatically generate an “SOS” e-mail message.

9 Misc

Display 20 char 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 Non-volatile field-adjustable options, set-points and delays.

Security Three password system.

Indicators High intensity shutdown, warning and activity LEDs.

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).