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Standard Generator Control Systems
PLC Operated Generator Control & Paralleling System

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Systems Insight is a generator systems specialist, with extensive experience in the design engineering, manufacture and installation of custom built generator control packages.
Systems Insight has designed a range of standard generator control systems, suitable for use in a variety of applications and incorporating the most commonly requested features.

A major product in our range is our PLC operated generator control and paralleling system. The system features a manufactured control cubicle, with intelligence from a fully programmed 'Modicon' programmable logic controller. Paralleling is performed using a *Woodward digital synchroniser and load control unit* (DSLC). The PLC also provides continuous monitoring of the normal mains supply, with automatic generator start and signalling to operate an external power supply transfer switch and up to 10 prioritised stages of load shedding.

The system is primarily designed for use with dual, paralleled generators in isolated operation, in standby power applications. The system can be expanded to include control and paralleling for additional generators by linking the main control panel to extra stand alone PLC control cubicles.
The system can also be expanded to include a Master Synchroniser, to allow mains paralleling for load testing and to provide seamless, uninterrupted transfer of building loads from generator to mains power. **

The package is suited for use with all major generator manufacturers and is compatible with most generator manufacturer's standard engine control panels.

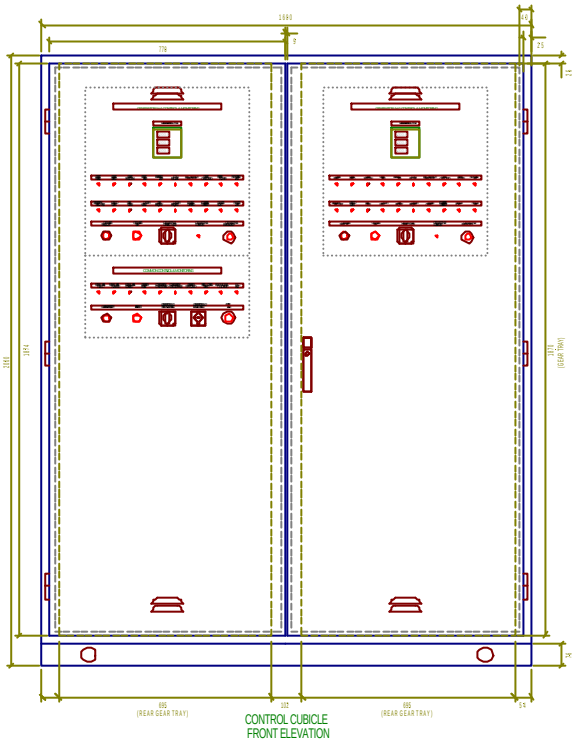
The PLC control system includes monitoring of day tank and bulk fuel storage levels and control signalling to an external fuel transfer system.
Where required, the control system can be expanded by the addition of extra PLC I/O modules, to provide greater power distribution management (eg: load shedding) and site specific control functions.

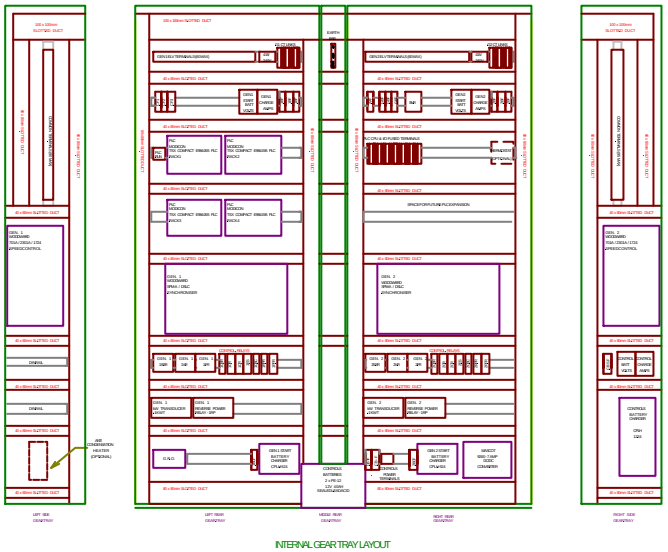
Systems Insight has introduced these standard generator control systems to provide ready made, flexible and adaptable packages to suit a variety of generator control applications. On request, our systems can be further customised to comply with the customer's specific requirements.

Standard PLC Operated Generator Control System:

Standard PLC Operated Generator Control Panel:

Our standard PLC control cubicle is manufactured in 2mm steel with a 75mm galvanised plinth. The unit is powder coated in a choice of four standard colours, with either plain or ripple finish. Colours include Beige (RAL 7032), Magnolia (Cream), Storm Grey & Electrical Orange.
Standard external dimensions are 2000mm High x 1600mm Wide x 500mm Deep.





CAD design (front construction and internal gear tray views) of our standard PLC operated generator paralleling control panel. The standard system is fully expandable with a range of options to suit the customer's specific requirements.

Standard PLC Operated Generator Control System:

Main Features:

Engine Control & Management:

- Local and/or Remote Generator Start
- Engine speed monitoring
- Start battery voltage monitoring
- Protection and alarming for:
  - Engine over rated speed
  - Start Fail
  - Emergency Stop
  - Low Engine Fuel

Synchronising & Metering:

- Safe 'Dead Bus' closing logic
- Digital signal processing
- Synchronisation of multiple isolated generators
- Adjustable phase & voltage windows and dwell times
- Digital display of Electrical Metering Parameters via a Crompton 'Integra 1000' digital power meter.
- Supply & Installation of Metering Current Transformers (if required)

Real kW Load Control:

- True RMS power calculations
- Configurable load bias signal to engine speed control
- Soft load/unload when ramping back to single set operation or ramping up to join an operative set on multiple set operation.

Reactive kVAR Control:

- VAR sharing on isolated load buses
- Configurable voltage bias signal to voltage regulator
- Power factor or VAR control

Generator Sequencing:

- Automatic start/stop of generators according to load demand
- Configurable start/stop demand levels and run timers
- Configurable engine priority sequencing

Electrical Protection:

- Over/Under Voltage
- Over/Under Frequency
- Reverse Power
- Loss of Utility supply detection
- Monitoring of external over current alarm (On Sync. C/B)
- High alternator winding temperature (via thermistors)

Communications:

- RS-422 or RS-232 serial communications on 'Modbus' protocol.
- DSLC online configuration upload/download via Hand Held programmer (available as an option)

Standard PLC Operated Generator Control System:

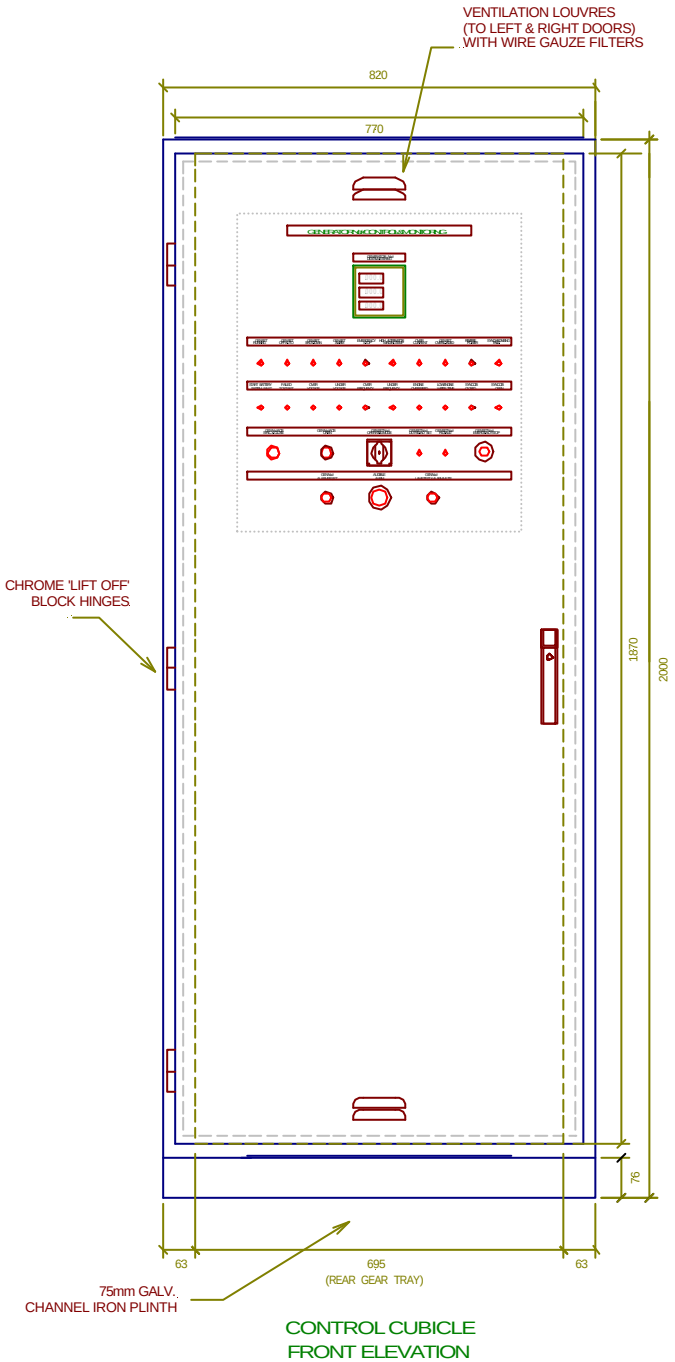
Other Features:

- Segregation of Generator and Common control equipment
- Generator Operating Mode Selector Switch
  - Off (Generator offline & disabled)
  - Auto (Gen. started remotely – eg: Mains fail relay)
  - Start (Gen. start & enable manual control of paralleling by push buttons)
  - Online Test (Gen. Started with auto. sync. & close C/B)
- System Operating Mode Selector Switch
  - Off (Generator system offline & disabled)
  - Auto (System is enabled for auto start on mains fail)
  - Manual (Start available generators and enable manual control of paralleling by push buttons on cubicle door)
  - Test (Start available generators and automatically parallel and close to supply bus in duty sequence)
- Manual control to initiate synchronising and closure of paralleling circuit breakers via 'sync & close' push button
- Manual control to initiate soft unload and open of paralleling circuit breakers via 'unload & open' push button
- Generator operation and paralleling functions are operative in manual mode with PLC offline. *The PLC is NOT required for manual operations.*
- Designated Control System battery charger with charge fail & low/high volts alarm, battery volts meter & charge amps meter.
  Long life sealed lead acid batteries rated at 24V 40AH.
- Engine start battery chargers with charge fail & low/high volts alarms, battery volts meters & charge amps meters
- Installation of engine speed control to system control cubicle
- Low fuel level monitoring & alarming
- Emergency Stop buttons & Electronic audible alarm
- Fluorescent light & 110/220/240V power outlet fitted inside control panel
- Common system status LED indicators to control panel door:
  - Normal Mains Failed
  - Normal Mains Available
  - Normal Mains Connected
  - Generator Bus Live
  - Controls Battery Charger Failed
  - Controls Battery Volts Out of Range
  - Generator Start Called
  - System Control Off Auto
  - Bulk Fuel Level Out of Limits
  - PLC Fault

Other Features (Cont…)

- Generator status LED indicators to control panel door:
  - Emergency Stop
  - Generator Running
  - Generator Shutdown
  - Generator Alarm
  - Generator Overloaded
  - Generator Failed to Start
  - Generator ‘Off Auto’
  - Generator Low Fuel Level
  - Over Current
  - Generator Circuit Breaker Closed
  - Generator Circuit Breaker Open
  - Start Battery System Fault
  - High Alternator Winding Temperature
  - Engine Overspeed
  - Over Voltage
  - Under Voltage
  - Over Frequency
  - Under Frequency
  - Reverse Power
  - Synchronising Fault
  - Gen set duty/lead set
- Synchronising circuit breaker/contactor open & close control interposing relays
- Remote indication via volt free contacts:
  - Generator Running
  - Generator Online (Circuit Breaker Closed)
  - Generator Alarm/Fault (common)
  - Generator ‘Available in Auto’
- Provision of electronically drafted construction drawings & wiring schematics with all systems

Expansion Control Panel - For Additional PLC Controlled Generator Sets



The expansion control panel is linked to the main control panel by a high level, high speed communications interface. Expansion can be made to provide control and paralleling for up to six generators.

Standard PLC Operated Generator Control System:

Options:

Additional PLC operated control and synchronising panels may be added for paralleling of more than two generators. Additional 'single set' paralleling control panels include synchroniser and all other specified features, as supplied for our dual generator paralleling control system.

Contact Systems Insight for further details.

Notes:

- Each system includes supply and installation of current transformers and voltage reference fuses to the alternator enclosure (if required).

- Installation of control and auxiliary cabling on site is excluded and can be provided as an option, considering the customer's site conditions and other project specific requirements.

- Each system includes up to a maximum of 32 labour hours to test and commission the installed equipment. (Plus 24 hours for each additional expansion cubicle)

All installation and commissioning inclusions are based on works within the Melbourne Metropolitan area. Travel and other associated costs apply for interstate and overseas works.

** Where mains paralleling is employed, the local supply authority or project engineer may impose specific electrical protection requirements. Incorporation of this protection into the control systems would incur additional cost.

Exclusions:

The following items are normally excluded from our standard package but are available as options:

- Provision of engine speed controller (by generator supplier or customer)
- Provision and set-up of load banks for testing
- Provision of external control and power cabling on installation site
- Transport and delivery to customer or project site