Digital control range for
diesel/gas engine generators

Si-TEC *Xtend* CGC-D / CGC-G

DATA SHEET

Model

Si-TEC *Xtend* Recip Control is available in two variations:

CGC-D Co Generation Control Diesel

CGC-G Co Generation Control Gas

Description

Si-TEC (Smart Integrated Turbine & Engine Control) is the world's only digital governor fully integrated with an automatic synchroniser and kW/kVAr control, and was developed in 1991.

With more than 4000 systems now in operation throughout Australia and internationally, the Si-TEC *Xtend* control provides a further enhancement of this already successful product.

Designed for use with all sizes of generators, the Si-TEC *Xtend* can be used for islanded or co-generation (mains/grid parallel) applications on diesel and gas reciprocating engines, steam turbines and gas turbines.

Key features

- Precise speed governing
- Dual MPU for redundancy
- Automatic engine start up sequence (including pre-heat/purge, crank, start fuel limiting and speed ramping)
- Driving wide range of actuators (incl. HEINZMANN all-electric)
- Wide range of PIDs
- Boost pressure limiting
- Interfacing wide range of AVR systems
- Auto synchronising
- kW control & load share
- kVAr/PF control & load share
- Flexible configuration
- User-friendly tuning software (pcTune)
- Extensive system diagnostics
- Optional I/O expansion

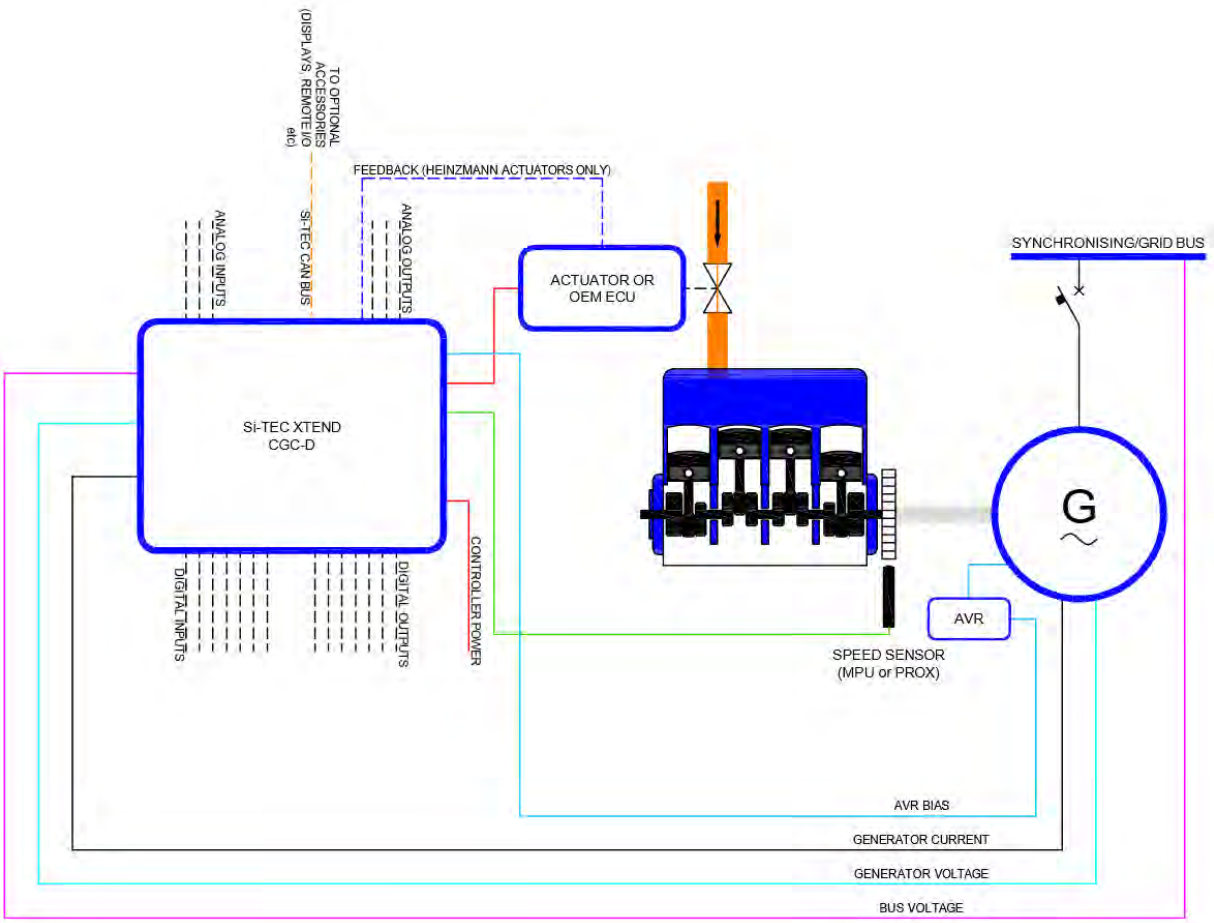
Features

- Precise speed governing typically within 0.1 % of operating (rated) speed at steady state
- Dual MPU (or prox.) speed sensors for redundancy
- Automatic start/stop sequence initiated by a single logic input to give fuel limited “Guaranteed Start®”
- Typically interfaces with all-electric actuators that provide “instantaneous” position feedback
- Capable of driving wide range of actuators including electro-hydraulic (e.g. 0-200 mA, Solenoid, etc.) and EFI engine systems (4-20 mA, 0-5 V, +/-3 V & PWM)
- Multiple and wide range PIDs (includes 5x speed PIDs, kW PID, process PID, voltage bias control, synchronising control, kVAr/PF control, etc.)
- Multi-point “Boost Pressure” limiting curve
- Grouping Control logic allows “Bumpless” transfer from single bus to split bus applications (& vice versa)
- Extensive I/Os that may be expandable via CAN bus (e.g. remote digital I/Os, thermo-couples, etc.)
- Noise and harmonic issues eliminated by design
- 3-phase AC RMS voltage and current sensing
- Smart self-tuning torsional filtering
- Configurable alarms can be multi-functional
- Bump® feature to optimise tuning of governor
- Accumulated data recording of engine running hours, kW hours, kVAr hours, etc.
- Extensive diagnostic functions
- Engine monitoring via Opal Generator Annunciator

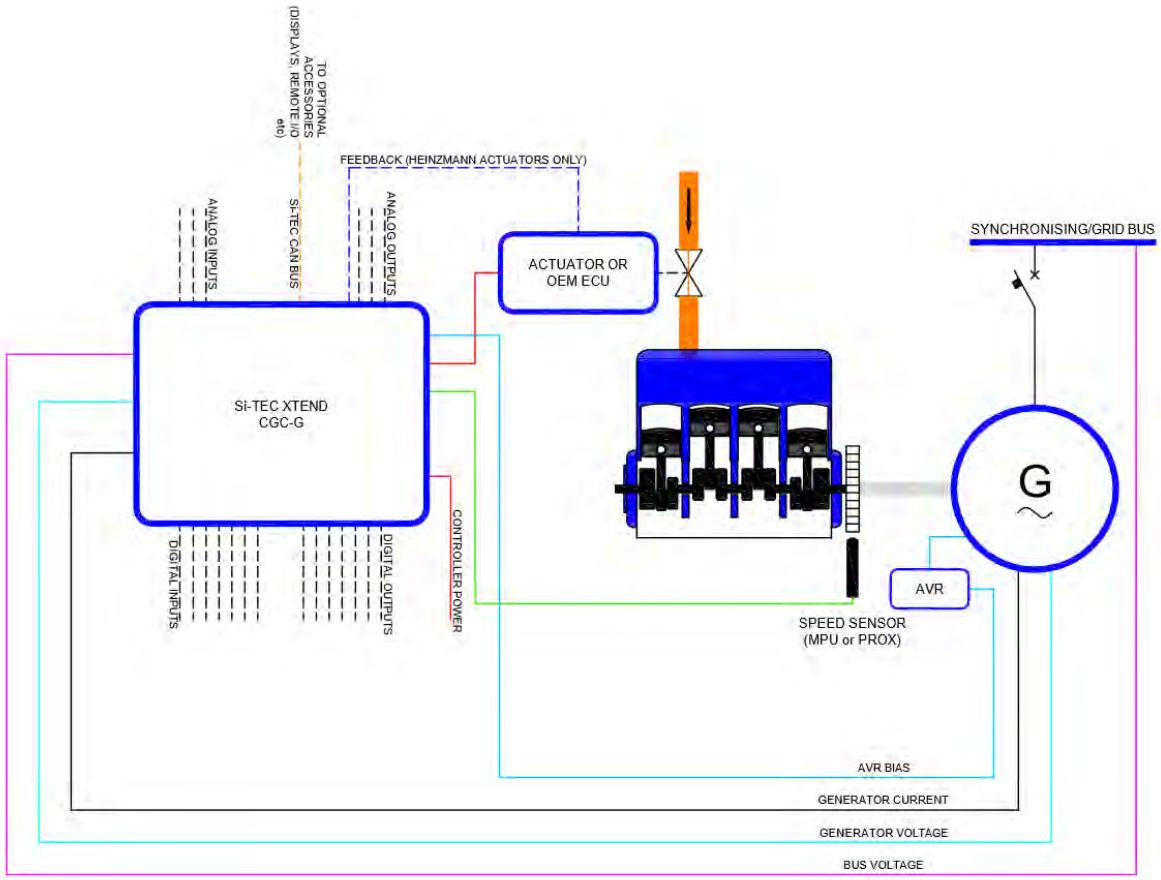
Application range

- Power generation applications where up to 24 generators can be paralleled together. Multiple groups can be combined via GSM modules.
- Single or multiple GSM’s for more complex applications, e.g. multiple bus and/or feeders
- Co-generation operation – parallel to the grid for:
  - Soft “bumpless” transfer of loads
  - Peak shaving – set max. limit for import power
  - Base Loaded to the grid
  - Export excess power to the grid
  - Prime power – only export to grid
- Systems requiring high quality power based upon precise frequency and calculations of active and reactive power
- Generating sets in sugar, mining and general industry, mining sites and townships, rural & remote communities, hospitals, commercial buildings, marine & shipping, defence & telecommunications facilities as well as oil & gas industry

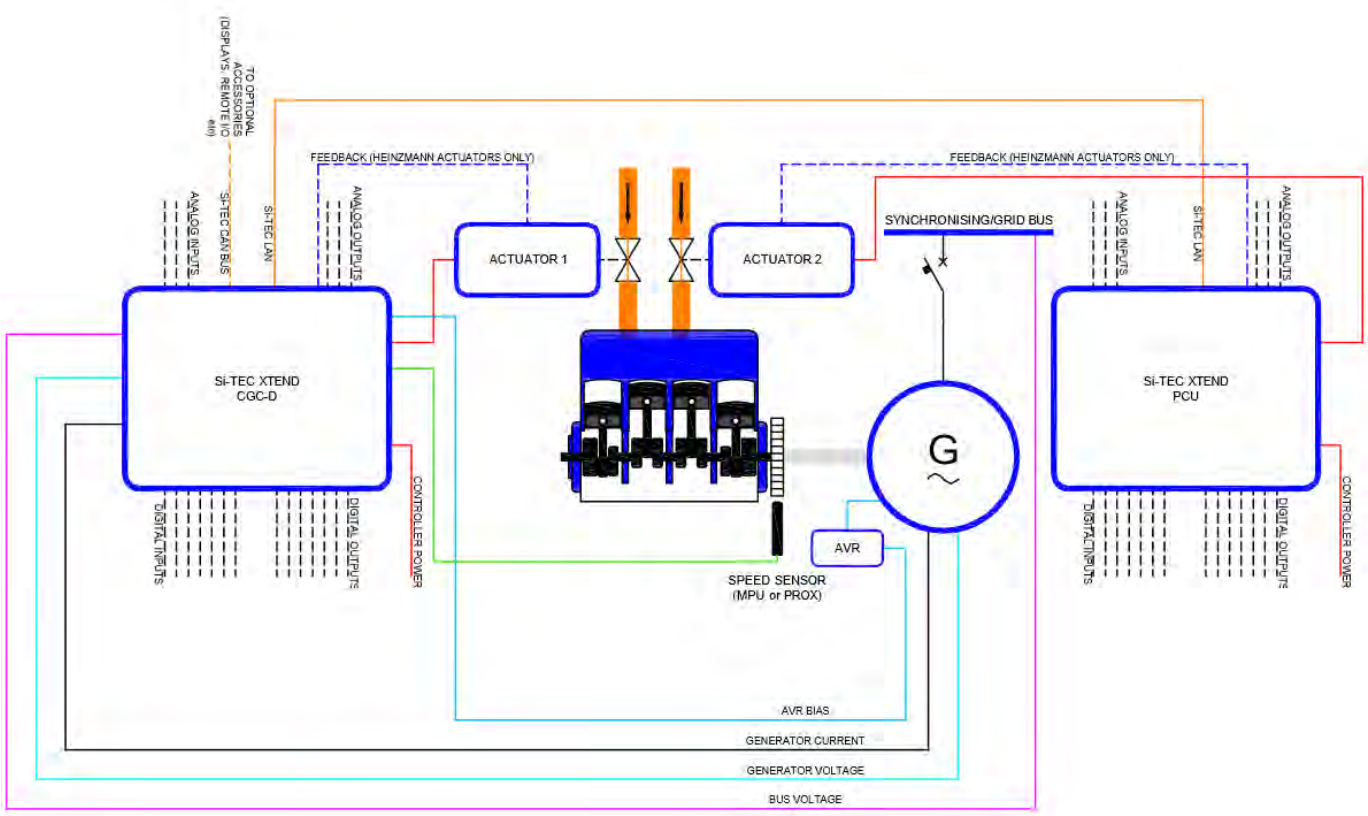
Si TEC CGC-D System Overview



Si TEC CGC-G System Overview



Si TEC CGC-D / CGC-G Dual Act. System Overview



Synchroniser

- Digitally integrated with governor
- Better than 10 secs (typically within 5 secs for 0.1 Hz, 1.0 % Volts & 5° phase match) for most applications
- Phase rotation check during synchronising
- Integrated independent "Sync Check" hardware (3-ph bus & gen check)
- Optional "Permissive" synchronising function
- Intelligent "Dead Bus" detection and closure
- Menu adjustable synchronising parameters

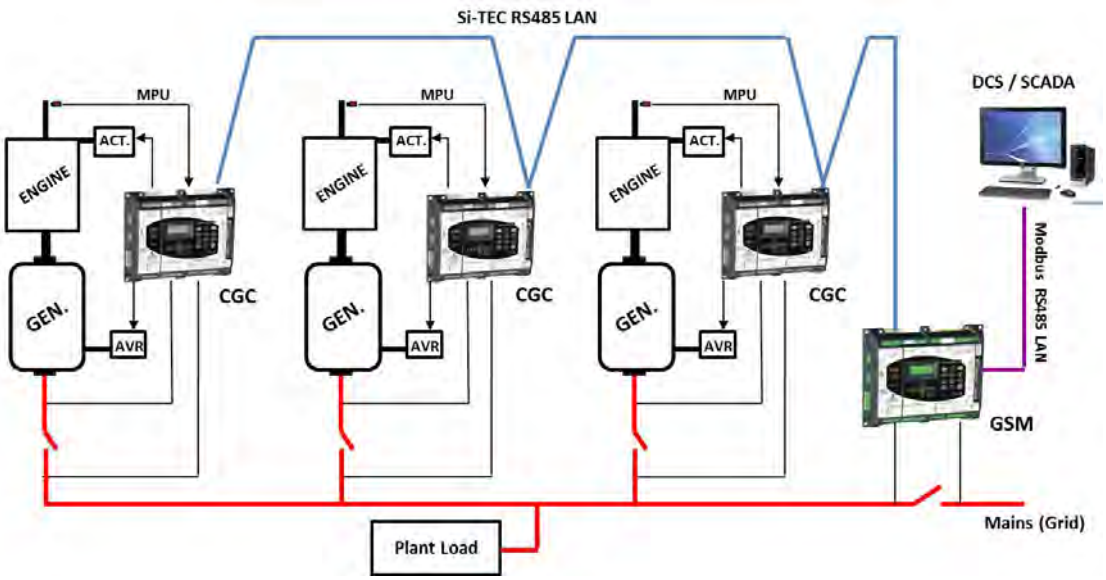
Load sharing and load control

- Digitally integrated with governor
- Automatic and isochronous (islanded) kW and kVAr load sharing
- Load sharing accuracy to better than 0.5 %
- True RMS AC measurement (3-phase voltage & current) better than 0.25 % accuracy
- Optimum control of active power (kWs) and reactive power (kVAr/PF) when grid paralleled
- "Bumpless" transfer of active and reactive power
- kW limiting based on temperature, boost pressure, etc. (via 4-20 mA signal)
- Adjustable load/unload ramp rates
- Multi-mode kW & kVar power factor control
- AVR bias to directly interface wide range of AVRs (digital outputs or +/- 8.4 VDC) for PF sharing/ control
- 4-20 mA and Modbus RS-485 referencing available
- Power factor or kVAr control when base loaded
- Vector disturbance feature senses loss of grid within 40 mSec to maintain full operation of station

Display features via opal generator annunciator

- 4x 20 character LCD display, with "back-light flash" feature for active alarms
- Metering of essential generator information (e.g. voltage, frequency, real power and power factor)
- Multiple "Short-Cut" keys to display useful data (e.g. peak hold, running hours, control status & alarms)
- Engine monitoring parameters including oil pressure, water temperature, oil temperature, crank battery. Various alarms and shutdown conditions (e.g. low oil pressure, high water temperature, overspeed, etc.).

Si-TEC *Xtend* CGC used for mains (grid) parallel application



I/O features

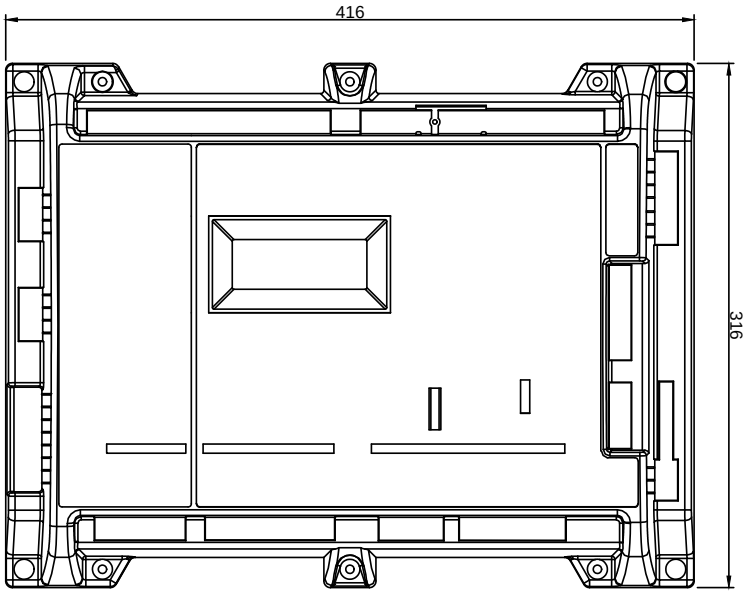
- 16 logic inputs, with LED status indication, of which 12 are user defined for a wide variety of uses, including, “Rated Speed”, “Fast Rate”, “Sequence Hold”, “Base Load”, “Overspeed Test (Auto)”, etc.
- 9 relay outputs, with LED status indication, of which 8 are user defined for control or alarm functions

  Typical control functions include:
  - “Fuel Solenoid”
  - “Engine Cranking”
  - “Engine Pre-Heat/Pre-Lube”
  - “Generator C/B”, etc.

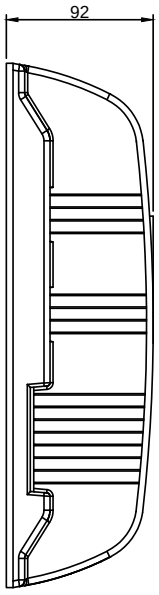
  Typical alarm functions include:
  - “Reverse Power”
  - “Reverse kVAr”
  - “High kW load”
  - “High/Low Frequency”
  - “High/Low Voltage”
  - “Phase out of balance”
  - “Vector Disturbance” etc.
- Individual output relays can have multiple functions by combining alarms
- Each “alarm” can be selected to directly “Trip” the Generator C/B
- 4 analogue inputs (3x 4-20 mA, 1 x RTD) for user selectable applications. E.g. kW, kVAr, PF & base load references, engine temp, etc.
- 3 analogue outputs (4-20 mA) for direct driving user applications, E.g. kW, kVAr, PF, RPM meters, actuator position & fuel % indication
- I/O connections utilise plug-in terminal strips
- Further I/Os expansion is possible via CAN bus

Dimensional drawing

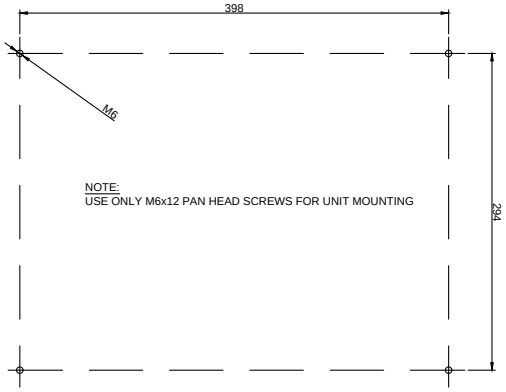
Si-TEC Xtend Physical



FRONT VIEW



SIDE VIEW



MOUNTING DETAIL

Communications

- RS-232 Diagnostic port for Si-TEC support software
- "Customer RS-485 LAN" has read/write facility for a wide range of registers. Standard LAN protocols are Modbus RTU and ASCII.
- "Si-TEC LAN" for inter-module communications for up to 24 Si-TEC *Xtend* modules of any type combination
- "CAN Bus" port for CGC to Opal & RIO interface

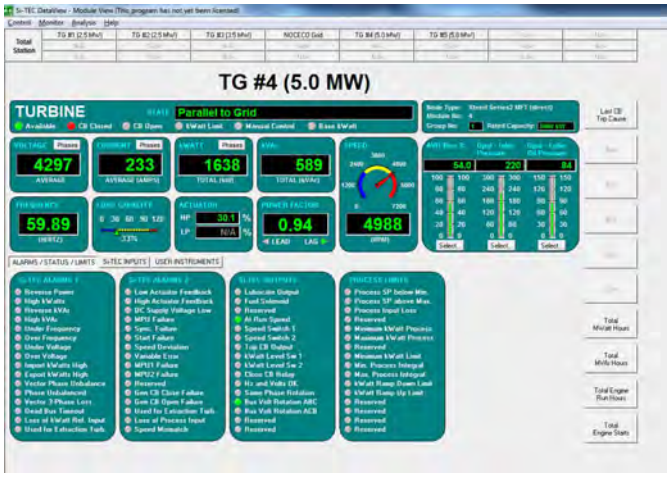
Software tools (Windows® based)

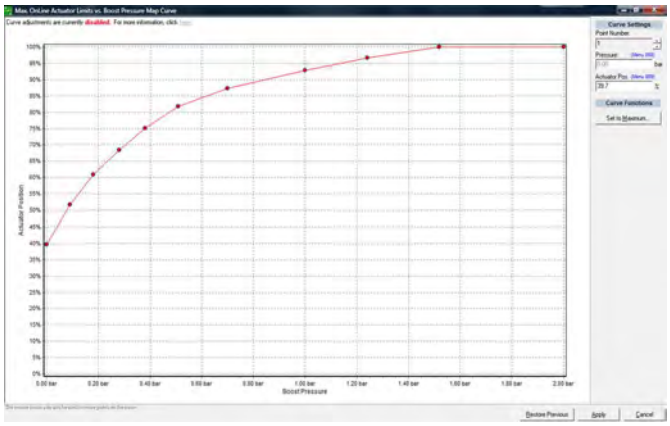
Si-TEC pcConfigure

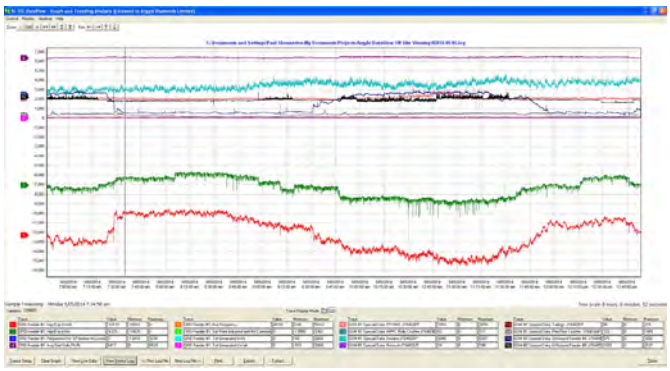
- Allow storage & retrieval of set point parameters to & from a Si-TEC *Xtend* module via a PC
- Graphical configuration of "Boost Pressure" mapping & linearisation curve
- Operates in a safe controlled environment
- Saves all set point parameters to disk
- Data can be sent by email
- Data can be printed for archival records
- Menu driven set-up & alarm configuration
- Software interface via PC or remote access

Si-TEC pcTune

- llows generator tuning to be performed remotely and in a controlled environment
- Allows generator tuning to be performed with increased accuracy in true engineering values
- Provides 100 % repeatable results
- Recovery characteristics tested by inducing errors and recording results graphically
- 16 traces of user selected digital values can be selected for display
- Multiple PID tuning menus
- Other displays include "Digital Instrument Panel", "System Overview" and "Live Steam Map"
- Data can be sent by email
- Data can be printed for archival records
- Software interface via PC or remote access







Si-TEC DataView

- High speed power station monitoring system for PC, configurable for up to 24 nodes (including CGC, GSM, ADG, temp scanner, feeders, etc.)
- Includes extensive data logging (up to 100 data per node), event recording, and archiving (up to several years).
- Data extracted via Modbus RS-485 or Ethernet (Modbus TCP/IP)
- Exporting of log file via CSV format for up to 20 parameters
- Operates independent of PLC/SCADA

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