XQ1000 RENTAL

CATERPILLAR®

Image shown may not reflect actual package

STANDBY 1000 kW
PRIME 910 kW

Frequency	Voltage	Standby kW (kVA)	Prime kW (kVA)
50 Hz	400V 3 Phase	800 (1,000)	728 (910)
60 Hz	480/277V 3 Phase	1000 (1,250)	910 (1,137)
60 Hz	240/139V 3 Phase	1000 (1,250)	910 (1,137)
60 Hz	208/120V 3 Phase	860* (1,075)	783* (1,075)

FEATURES

Factory designed, certified prototype tested with torsional analysis. Production tested and delivered in a package that is ready to be connected to your fuel and power lines. Electric Power Design Pro computer sizing available. Supported 100% by your Caterpillar® dealer with warranty on parts and labor. Extended warranty available in some areas. The generator set is designed and manufactured in an ISO 9001:2000 compliant facility. Generator set and components meet or exceed the following specifications: AS1359, AS2789, ABGSM TM3, BS4999, DIN6271, DIN6280, EGSA101P, JEM1359, IEC 34/1, ISO3046/1, ISO8528, NEMA MG1-22

CATERPILLAR SR4B GENERATOR

Two bearing, wye-connected, static regulated, brushless permanent magnet excited generator designed to match the performance and output characteristics of the Caterpillar diesel engine that drives it.

RELIABLE, FUEL EFFICIENT DIESEL ENGINE

The compact, four-stroke-cycle diesel engine combines durability with minimum weight while providing dependability and economy. The fuel system operates on a variety of fuels.

CATERPILLAR COOLING SYSTEM

Sized compatible to rating with energy efficient fan and core.

CATERPILLAR SWITCHGEAR

Provides single unit and/or utility paralleling components. Standby, Load Sense/Load Demand, Import, Export, and Base Load modes.

EXCLUSIVE CATERPILLAR DIGITAL VOLTAGE REGULATOR (CDVR)

Three-phase sensing and adjustable Volts-per-Hertz regulation give precise control, excellent block loading, and constant voltage in the normal operating range.

ENVIRONMENTALLY FRIENDLY

110% full spill containment of all onboard fluids.

LINK BOARD ASSEMBLY

Set mounted generator multi-voltage adjust plate. Voltage nodes 208V*, 240V, 400V and 480V – wye configuration.

* Output limited by generator at 208V

SOUND ATTENUATED CONTAINER

For ease of transportation and protection. Meets 72 dB(A) at 15 m (50 ft) below per SAE J1074 measurement procedure.

FACTORY INSTALLED STANDARD EQUIPMENT

SYSTEM	STANDARD EQUIPMENT
Engine	EPA approved Tier 2 C-32 Caterpillar engine – 50/60 Hz capable Air cleaner – single element canister type with service indicator 45-Amp charging alternator Fuel filters – primary and duplex secondary with integral water separator and change-over valve Lubricating oil system Jacket water heater Fuel cooler and priming pump Electronic ADEM™ A4 controls
Generator	Multi-voltage, dual frequency SR-4B brushless, three phase, 12-lead design Permanent magnet excited Digital Voltage Regulator Space heater Class H insulation operating at Class F temperature for extended life
Containerized Module	30' ISO high cube container, CSC certified 2-axle, 30' ISO container chassis Sound attenuated air intake louvers and 3 lockable personnel doors with panic release Bus bar access door, external access load connection bus bars Shore power connection via distribution block connections for jacket water heater, battery charger, space heaters, and generator condensate heaters Standard lighting 3 AC/3 DC, one (1) single duplex service receptacle, 2 external break-glass emergency stop push buttons Fuel tank UL listed, double wall, 23.5 hr runtime @ 75% of 60 Hz prime rated load Sound attenuated 72 dB(A) @ 15 m (50 ft), spill containment 110% of all onboard fluids Oversized maintenance-free battery, battery rack and 20-Amp battery charger Critical grade internally insulated exhaust silencer Vibration isolators, corrosion resistant hardware and hinges External drain access to standard fluids Standard Cat rental decals and painted standard Cat power module white
Cooling	Standard cooling provides >45° C ambient capability (50 Hz) or 43° C (60 Hz) at prime +10% rating Engine mounted, 38 split JW/CAC vertical radiator, vertical air discharge, and fuel cooler
Generator Paralleling Control	Custom switchgear control with EMCP 3.3 components automatic start/stop with cool down timer Protection: 32, 59, 27, 40, 810, 81U, 40, complete with device 15, 25, 65 & 90 Reverse compatibility module provided for interface to legacy power modules Touch screen controls with event log Multi-mode operation (island, multi-island and utility parallel), load sharing (multi-unit only) Import & export control (utility parallel only), manual and automatic paralleling capability Touch screen display (status and alarms) 3000-Amps circuit breaker, UL listed, electrically operated, fixed mounted, 3-phase, 50% rated neutral bus Metering display: voltage, current, frequency, power factor, kW, WHM, kVAR, and synchroscope 3000-Amps reconnectable link board for 208/240/400/480V – wye configuration
Quality	Standard genset and package factory tested UL, NEMA, ISO and IEEE standards O&M manuals

SPECIFICATIONS

CAT SR4B GENERATOR

Frame Size 692
Winding Pitch. 0.6667
Excitation . . . . . Static regulated brushless PM excited
Constructions . . . . . Two bearing, close coupled
Insulation. . . . . Class H
Enclosure . . . . . Drip proof
Alignment. . . . . Pilot shaft
Overspeed capability – % of rated . . . . . 130% of rated
Wave deviation form 2%
Voltage regulator. . . . . 3 phase sensing with Volts-per-Hertz
Voltage regulation . . . . . Less than ± ½% voltage gain
Adjustable to compensate for engine speed droop and line loss
Wave form . . . . . Less than 5% deviation
Telephone Influence Factor (TIF) . . . . . Less than 50
Harmonic Distortion (THD) . . . . . Less than 3%

CAT C32 DIESEL ENGINE

C32 TA, V-12, 4-Stroke diesel
Bore – mm (in). 145 (5.71)
Stroke – mm (in) 162 (6.38)
Displacement – L (cu in) 32.10 (1,958.86)
Compression ratio. 15:1
Aspiration. . . . . TA
Fuel system . . . . . MEUI
Governor type . . . . . Caterpillar ADEM™ A4 Control System

TECHNICAL DATA

		C32-30' XQ1000	
Power Rating		**Standby**	**Prime**
50 Hz	ekW (kVA)	800 (1,000)	728 (910)
60 Hz	ekW (kVA)	1000 (1,250)	910 (1,137)
Engine and Container Information			
Engine model		C32	
Container size	m (ft)	9 (30)	
Container dimensions	mm (in)	Length – 9144 (360)	
	mm (in)	Width – 2438 (96)	
	mm (in)	Height – 2896 (114)	
Fuel Capacity	L (gal)	4730 (1,250)	
Operation at 75% Prime Load Factor (60 Hz)	hours	23.5	
Approximate Weight			
Container with lube oil and coolant	kg (lb)	16 103 (35,500)	
Container and chassis with lube oil and coolant	kg (lb)	19 732 (43,500)	
Container with fuel, lube oil and coolant	kg (lb)	17 690 (39,000)	
Container and chassis with fuel, lube oil and coolant	kg (lb)	21 319 (47,000)	
Sound Level @ 15 m (50 ft)	dB(A)	72	
Fuel Consumption @ 60 Hz			
100% prime rated load	L/hr (gph)	278.7 (73.6)	252 (66.6)
75% prime rated load	L/hr (gph)	218.5 (57.7)	200.7 (53.0)
50% prime rated load	L/hr (gph)	151.6 (40.1)	139.3 (36.8)
Fuel Consumption @ 50 Hz			
100% prime rated load	L/hr (gph)	258.6 (68.3)	240.1 (63.4)
75% prime rated load	L/hr (gph)	205.6 (54.3)	186.5 (49.3)
50% prime rated load	L/hr (gph)	136.5 (36.1)	123.8 (32.7)

STANDARD FEATURES

GENERATOR SET EMCP 3.3 LOCAL CONTROL PANEL

- Generator mounted EMCP 3.3 provides power metering, protective relaying and engine and generator control and monitoring.
- Provides MODBUS datalink to paralleling control for monitoring of engine parameters.
- Convenient service access for Caterpillar service tools (not included).
- Integration with the CDVR provides enhanced system monitoring.
- Ability to view and reset diagnostics of all controls networked on J1939 datalink.
- Network modules via the control panel removes the need for a separate service tool for troubleshooting.
- Real-time clock allows for date and time stamping of diagnostics and events.

EMCP 3.3 ENGINE OPERATOR INTERFACE

- Graphical display with positive image, transflective LCD, adjustable white backlight/ contrast.
- Two LED status indicators (1 red, 1 amber).
- Three engine control keys and status indicators (Run/Auto/Stop).
- Lamp test key.
- Alarm acknowledgement key.
- Display navigation keys.
- Two shortcut keys: Engine Operating Parameters and Generator Operating Parameters.
- Fuel level monitoring and control.

CIRCUIT BREAKER

- 3000A fixed type, 3 poles, genset mounted, electrically operated, insulated case circuit breaker.
- Solid state trip unit for overload (time overcurrent) and fault (instantaneous) overcurrent protection.
- Includes DC shunt trip coil activated on any monitored engine or electrical fault, 100 KA-interrupting capacity at 480 VAC.

VOLTAGE REGULATION AND POWER FACTOR CONTROL CIRCUITRY

- Generator mounted automatic voltage regulator, microprocessor based.
- Manual raise/lower voltage adjust capability and VAR/power factor control circuitry for maintaining constant generator power factor while paralleled with the utility.
- Includes RFI suppression, exciter limiter and exciter diode monitoring.
- Voltage and power factor adjustments are performed on the setting screen of the HMI touch screen.

CURRENT TRANSFORMERS

- CTs rated 3000:5 for Genset sensing and second set of CTs rated 2000:5 for switchgear sensing with secondaries wired to shorting terminal strips.

POTENTIAL TRANSFORMERS

- 4:1 and 2:1 dual ratio with primary and secondary fuse protection.

BUS BARS

- Three phase, plus full rated neutral, bus bars are tin-plated copper with NEMA standard hole pattern for connection of customer load cables and generator cables.
- Bus bars are sized for full load capacity of the generator set at 0.8 power factor.
- Includes ground bus, tin-plated copper, for connection to the generator frame ground and field ground cable.

AC DISTRIBUTION

- Requires 240 VAC for all module accessories.
- Includes controls to de-energize jacket water heaters and generator space heater when the engine is running.

LINK BOARD ASSEMBLY

- 3000A link board for 208/240/400/480 – wye operation.
- Reconnection via movable jumpers in the link board.
- Includes switch to determine the mode of operation and to enable an overcurrent relay included in 480V operation.

SHORE POWER PLUGS

- One (1) shore power connection distribution block for jacket water heaters, generator space heater and battery charger.

INTERNAL LIGHTING

- Three (3) internal DC lights with one (1) timer installed at each side of the container door.
- Three (3) internal AC lights.
- One (1) single duplex service receptacle.

BATTERY CHARGER AND BATTERIES

- 24 VDC/20A battery charger with float/equalize modes and charging ammeter.
- Maintenance free batteries.

EMERGENCY STOP PUSHBUTTON

- Two external ESPs located near each access door.

FUEL TANK

- UL listed 1250 gallon double walled.
- Fuel transfer system.

MODES OF OPERATION

Caterpillar utility paralleling controls are intended for automatic or manual paralleling with a utility power source as a load management system, with provisions for standby operation feeding an isolated load network. Load management operation involves microprocessor-based automatic loading controls with soft loading, base load, Import/Export control and soft unloading. For Standby operation, the generator operates as an isochronous machine isolated from the utility supply. The controls allow for automatic operation, initiated locally or remotely by the customer's SCADA system. Detailed modes of operation are listed below:

SINGLE UNIT ISLAND AND MULTI-UNIT ISLAND OPERATION

1. Utility Standby Mode (Normal)
   a. The utility is providing power for the plant loads.
   b. The Power Module Generator breaker is open.
   c. The pm is in automatic standby mode to respond to a utility failure.
2. Emergency Mode (Emergency)
   a. Utility Failure
      1) The customer protective relaying senses a utility abnormal condition.
      2) A run request is sent to the Power Module Generator plant.
      3) The first Power Module Generator to reach rated voltage and frequency is closed to the bus.
      4) In Multi-Unit Island Mode, the remaining Power Module Generators are paralleled to the bus as they reach rated voltage and frequency. This function is performed via the ModBus Plus data link connected between the Power Modules.
      5) Plant load is transferred to the Power Modules, which share load equally via ModBus Plus data link.
      6) The system is now in Emergency Mode.

GENERATOR DEMAND PRIORITY CONTROL

The System Controls include a Generator Demand Priority Control function to automatically match the on-line Power Module Generator capacity to the loads in order to avoid unnecessary operation of all the Power Module Generators when the plant loads are low.

The following controls are provided for each Power Module Generator:

a. User-settable Generator Priority Selector
b. Status indicator for the Generator Priority selected
c. Status indicator for Power Module Generator on-line or off-line.
d. Generator Demand Priority Control Switch (On/Off)
e. User-settable Generator Remove Level (% as a function of single generator capacity)
f. User-settable Generator Remove Time Delay
g. User-settable Generator Add Level (% as a function of single generator capacity)
h. User-settable Generator Add Time Delay

Upon entrance into Emergency Mode, all generators will be started and paralleled to the bus. After the Remove Time Delay, Power Module Generators will be removed from the bus as a function of the generator percentage loading. Generators will be removed from the bus in descending priority order.

Should the generator percentage loading increase to the user-selected Generator Add Level after the user-selected Generator Add Time Delay, the next priority generator will be started, synchronized and paralleled to the bus. Should the Power Module Generator plant ever reach 100% loading, the next priority generator will be started and added to the bus, bypassing the Generator Add Time Delay.

MODES OF OPERATION (continued)

SINGLE UNIT IMPORT, EXPORT OR BASE LOAD OPERATION

During periods of peak demand the system may be placed in operation using the operator interface panel on the front of the switchgear.

1. Entry – Local
   a. The operator places the System Control Switch into Load Management.
   b. The operator selects Import, Export or Base Load Operation.
   c. The Load Management Setpoint is the amount of power Imported, Exported or Base-Loaded. A 4-12-20mA signal is provided by the customer and is linearly proportional to the utility load, with 12mA equaling 0 kW. The 4-12-20mA utility load signal is wired to one and only one Power Module. If the Power Module selected for Load Management is not available, the 4-12-20mA signal will be routed to a different Power Module.
   d. The operator sets the Load Management Setpoint and Power Factor Setpoint.
   e. A Run request signal is received by the Single Unit Power Module.
   f. The Power Module Generator is started and will run for a predetermined warm-up time before it is synchronized and paralleled to the utility.
   g. When the generator is on the bus, it is soft-ramp-loaded until the generator output reaches the Load Management Setpoint.
   h. The generator output is dynamically adjusted to maintain the Load Management Setpoint.
   i. Should the utility fail during Load Management Operation, the Protective Relay will cause the Paralleling Circuit Breaker 52G to open and be locked out until the Lockout Relay is manually reset by an operator on site. The generator is allowed to run for the duration of the cooldown time.
2. Exit – Local
   a. The operator places the System Mode Switch into Automatic.
   b. The generator is soft-ramp-unloaded until the plant load is fully supported by the utility.
   c. The Paralleling Circuit Breaker 52G is opened.
   d. The generator is allowed to run for the duration of the cooldown time.

STANDARD PARALLELING SWITCHGEAR CONTROL

GENERATOR PARALLELING SWITCHGEAR AND CONTROLS

The switchgear includes:

- Single unit island mode.
- Multiple unit island mode.
  - Includes Load Sense/Load Demand control.
  - Load sharing capability is provided via network communication.
- Single unit utility parallel mode.
  Selectable for Import/Export control.
  If import control is selected a 4-12-20mA signal is required (provided by others) scalable to the utility contribution.
- 6 inch black and white HMI touch screen.
- Reverse compatibility module provided for interface to legacy designed Power Module Switchgear. Includes PLC, load share and voltage droop.
- 50/60 Hz selectable.

Incoming Utility Breaker Status Circuit – Circuit to accept customers contact from remote utility disconnect device. Customer to provide a normally open form 'a' contact to indicate when the local load network is connected to the utility grid.

Utility Transfer Trip Circuit – Circuit accepts input (normally open dry contact) from customer's system protective relay(s) or other controlling device. Operation of contacts causes tripping of the generator circuit breaker via the generator (software) 86 lock-out function and places the engine in cooldown mode. Circuit is disabled when operating in single unit or multiple unit island.

GENERATOR PARALLELING CONTROLS OPERATOR INTERFACE

Graphical mimic one line diagram that shows generator with its respective circuit breaker in a one-line representation of the system. The graphics utilize black and white indicators and bar graphs while actively displaying the following information:

- Utility CB Open/Closed. Input contacts provided by others.
- Utility kW 4-12-20mA signal required and provided by customer that is scalable to the utility contribution.
- Generator CB Open/Closed/Tripped.
- Generator Volts/Amps/kW/Frequency.
- Engine Stopped/Running/Cooldown/Pre-Alarm/Shutdown.
- Engine ECS Position Stop/Auto/Run.
- Utility Output kW.
- System Summary Alarm.

Event logging is also included with up to 500 stored events.

GENERATOR METERING AND PROTECTION

Generator metering that will graphically display 3Ø Voltage, 3Ø Current, Frequency, Power Factor, kW, kVAR and a Synchroscope Display of EMCP 3.3 faults, CDVR or ADEM 3 and 4 will be provided via Modbus RTU interface to EMCP 3.3.

Generator/Intertie Protective Relaying including:

- Device 27/59 – Under/Over Voltage.
- Device 81O/U – Under/Over Frequency.
- Device 40 – Loss of Excitation.
- Device 32 – Reverse Power.
- Device 25 – Synchronizing Check.
- Device 15 – Auto Synchronizer.
- Device 65 – Governor Load Sharing, Soft Loading Control.
- Device 90 – VAR/PF and Cross Current Compensation Controller.

PROGRAMMING AND DIAGNOSTICS

Includes field programmable set points for engine control and monitoring variables and self-diagnosis of the EMCP 3.3 system component and wiring failures.

ENGINE CONTROL SWITCH

Keypad selectable, four (4) positions – Off, Auto, Man, Cool:

- Off for engine shutdown and resetting faults.
- Auto for local or remote automatic operation when initiated by switch operation or contact closure.
- Man for local starting and manual paralleling.
- Cool for cooldown.

CIRCUIT BREAKER CONTROL SWITCH

Heavy duty, three- (3) position spring return to center with momentary trip and close position and slip contacts for automatic closing. Includes circuit breaker position indicating lamps.

EMERGENCY STOP PUSHBUTTON

- Mushroom head, twist to reset, causes engine shutdown and tripping of the generator circuit breaker. Prevents engine starting when depressed.

ELECTRONIC LOAD SHARING GOVERNOR

- Includes speed adjustment, and auto load share capability when in parallel with legacy power modules.

STANDARD PARALLELING SWITCHGEAR CONTROL (continued)

AUTOMATIC/MANUAL PARALLELING

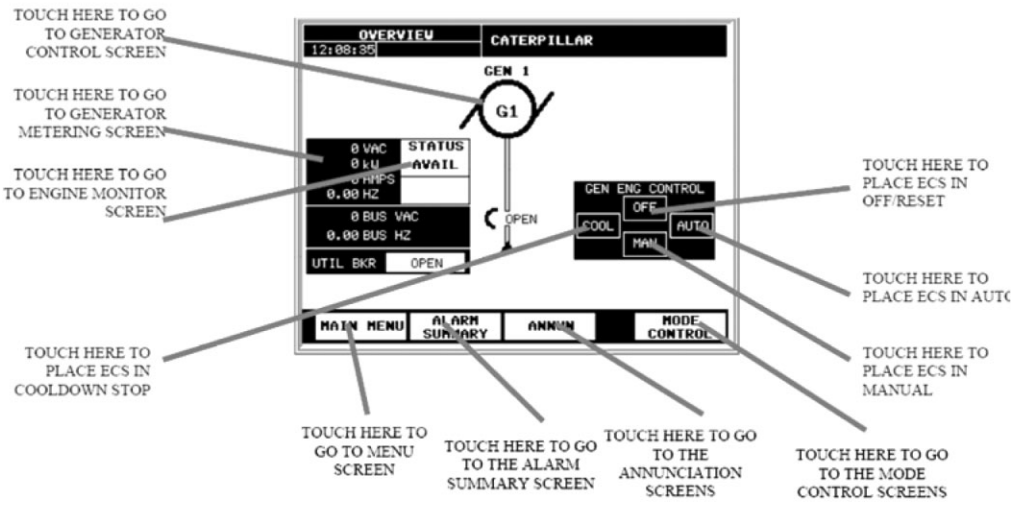
- Automatically synchronizes and parallels the generator with another power source.
- Includes provisions for manual permissive paralleling.

HUMAN MACHINE INTERFACE (HMI) HIGHLIGHTS

- Engine/Generator function is performed thru the 6" HMI touch screen interface.

Overview Screen (Typical)

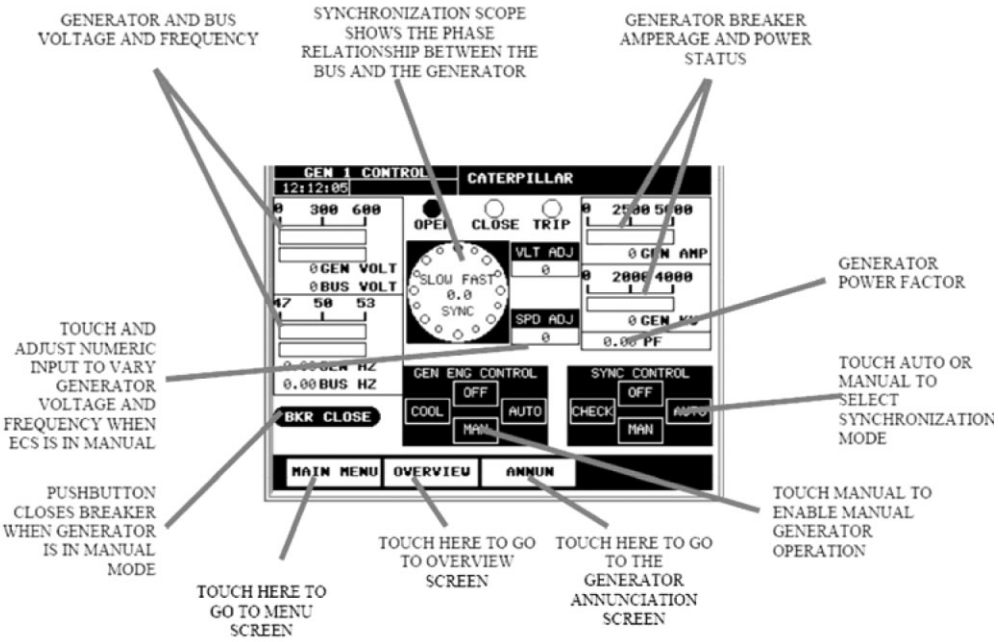
Shows the generator status, generator metering data, bus metering data, ECS position, and generator/utility breaker status.



STANDARD PARALLELING SWITCHGEAR CONTROL (continued)

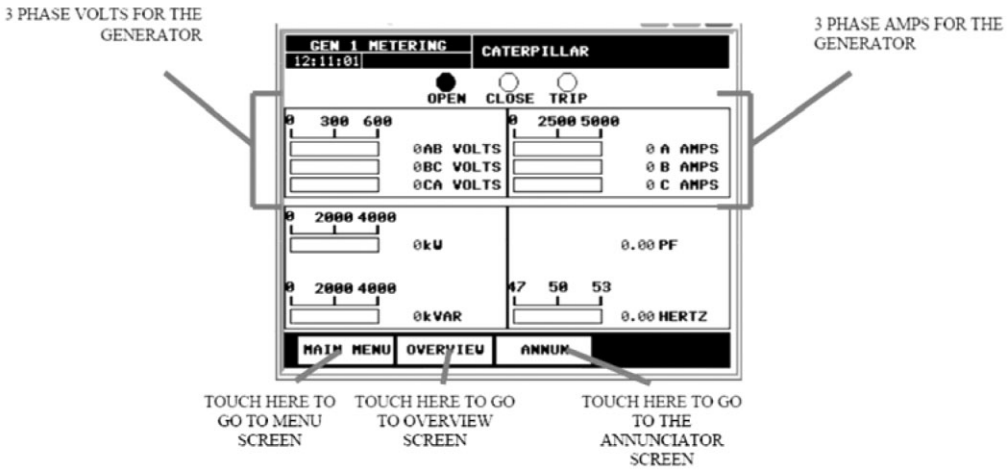
Generator Control Screen (Typical)

It allows the operator to observe the automatic synchronization and transfer of the load to and from the generator. Engine control allows the operator to run the engine in manual, or switch to automatic modes. Voltage and frequency offset adjustment allows the operator to control generator frequency and voltage.



Generator Metering Screen (Typical)

Allows the operator to view three phases of voltage and amperage for the bus and the generator.

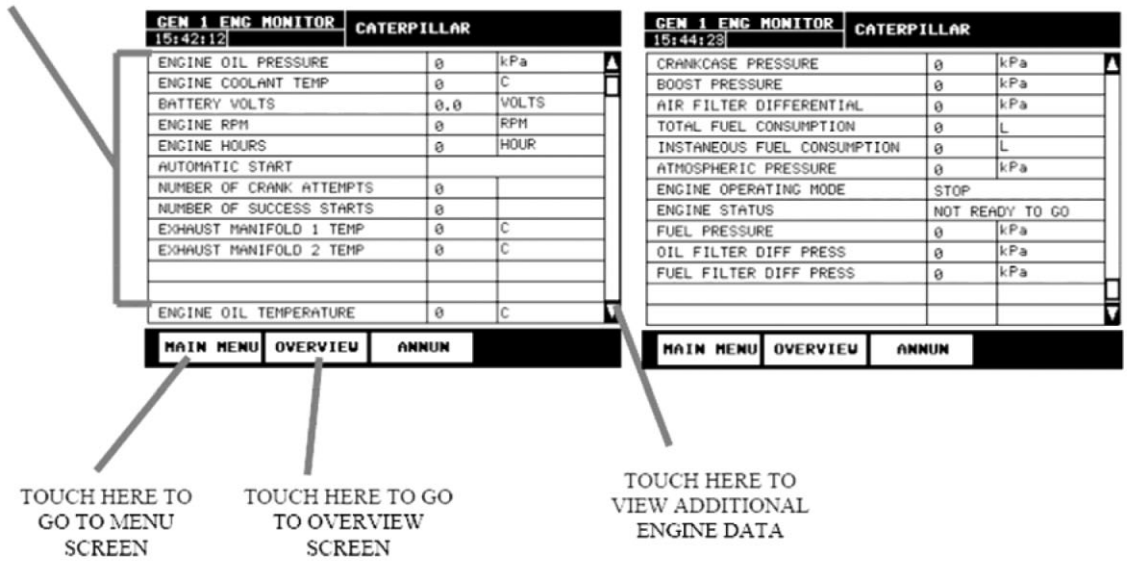


STANDARD PARALLELING SWITCHGEAR CONTROL (continued)

Engine Monitoring Screen (Typical)

Engine status is obtained directly from the EMCP 3. Engine starts and total hours can be used by the operator to determine when regular preventive maintenance is required. Other metering includes engine battery and oil filter health.

EMCP 3.3 ENGINE DATA



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