TECHNICAL SUBMITTAL
PS

Project:	IRC Heathrow	**Tech Sub No:**	TS-E-001 Rev C
Issued By:	Gloster S-Worx	**Date Issued**	02/10/2025
Issued To:	Wates Smartspace	**Date Required**	

Approval of the following equipment is required:			
Equipment:	Generator Package-65 dB(A) at 1m Generator & associated fuel line works		
Make:	FG Wilson		
Description / Location:	New Standby Generator External compound		
Contract Specification Clauses (to be inserted):	MOJ Standards STD/E/SPEC/017		
Manufacturer / Supplier specifications:	Bells		
Manufacturing period:	20 Weeks		
Size / Capacity / Duty:	1250KVA		
Additional Information:	This is compliant 65dB(A) @1M generator and enclosure. Rev B - Updated Pipework details. Rev C – Updated to include leak detection details		
Sub-contractor Signature	A Pink	Date:	02/10/2025

WATES BUILDING SERVICES MANAGER'S STATUS & FEEDBACK			
PRELIMINARY STATUS AWARDED (delete A, B or C as required) **(ONLY PROCEED FOLLOWING CLIENT FINAL STATUS BELOW)**	**A / B / C**		
Comment below:			
XXX			
Reviewed and Checked by:		Date:	

CLIENT'S STATUS & FEEDBACK			
FINAL STATUS AWARDED (delete A, B or C as required)	**A / B / C**		
Comment below:			
Updated to suit client comments			
Reviewed and Checked by:		Date:	

OVERALL STATUS OF TECH SUBMISSION TO BE COMPLETED BY SIGNED ABOVE:	
Status A	Proceed No Comment
Status B	Proceed Taking on Board Comments
Status C	Do Not Proceed – Re-issue including comments

1250kVA Generator
IRC Harmondsworth
Gloster MEP
Project 9097

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BELLS POWER SOLUTIONS	TECHNICAL SUBMITTAL SHEET TS No: 01 R01 Project: IRC Harmondsworth Date: 18/06/25 Job No: 9097	GLOSTER S-WORX

To: Ashton Pink Company: Gloster MEP Date answer is required:	From: Dino Fielding Technical Submittal: Date answer was received:

SUBJECT:

Please find attached for approval technical information for the Generator System -

RESPONSE / STATUS	A	B	C	

COMMENTS:

Section 1

Scope of work and control philosophy

The Project
The Immigration Removal Centre Harmondsworth is located at Colnbrook-by-pass, Harmondsworth, West Drayton, Middlesex, UB7 0HB.

SCOPE OF WORKS
Replacing the existing generator control panel with a control panel complete with a changeover switch that accepts 2No. generator connections, one for the existing fixed generator and one for the new fixed generator.
Provision of a new 1250kVA fixed generator complete with enclosure and 12 hour day tank within the new generator enclosure.

New Generator

Generator enclosure
The contractor shall construct a new generator enclosure to accommodate 1 no. 1250 kVA static standby diesel generator with a 12 hour fuel day tank and 1No. control panel.
Separate free standing changeover panel to accept connections to the existing 1250 kVA generator and the new 1250 kVA generator.
The contractor shall supply and install a weatherproof, acoustic enclosure constructed from mild steel incorporating air inlet attenuators. The noise break out from the enclosure is to be 65dB(A) at 1m (in free air)

The generator compound shall be provided with the following facilities:
- Heating and cooling system to achieve the operating conditions as required by MoJ Standard STD/E/SPEC/017. Include jacket water heater fitted to the engine and raditor cooling fan with a radiator to cool the engine whilst running
- Lighting
- Emergency lighting in accordance with MoJ STD/E/SPEC/018, BS EN 1838, BS EN 50172 and BS 5266 – **to be installed by main contractor**
- Flame/heat detectors in accordance with BS 5839-1 – fire drop valve with tilt switch to provide a signal for the fire alarm.
- Break glass alarm unit and strobe alarm **– to be fitted by main contractor**

Cooling system
The generator compound shall be provided with engine driven fans to circulate the cooling air for the engine. A proprietary flange to terminate the generator to the ductwork shall achieve the connection to the ductwork.
The cooling system will provide for effective cooling when the generator runs continuously at full load and on 10% overload for one hour in accordance with BS ISO 3046. The radiator core and fin design shall take into account the compensation for possible ingress of dirt which would normally clog the fins.

Exhaust system
The contractor shall provide an exhaust system that is in accordance with manufacturer's recommendations and achieves the noise limitation requirements. Special consideration shall be given to ensure that fumes are not carried back towards the adjacent buildings. The exhaust system shall comprise exhaust silencer, expansion bellows and all fittings , gaskets, joints and fixings recommended by the manufacturer and in conformance with MoJ technical standards.
The exhaust system including silencers shall be of such size that backpressure on the system will not exceed the backpressure permitted by the engine manufacturer's requirements. The engine exhaust outlet and the discharge end of the exhaust shall be connected via a flexible connection.
All exposed exhaust pipe work and manifold shall be thermally insulated. Protection shall be provided against precipitation and drain points shall be incorporated in effective locations to remove any condensate. The contractor shall ensure that the exhaust system is mounted using appropriate suspension brackets to avoid vibration impact on associated structure.

Sound attenuators will be fitted in the enclosure to ensure that noise is minimised through air inlet and exhaust attenuation and exhaust silencers, the requirement is to achieve super silent status on the generation plant.

Fuel day tank

The new generator enclosure shall contain a fuel day tank that allows for 12 hours of generator running at full load.
The fuel tank will be incorporated in the generator enclosure

New Generator

Supply and install 1 no. new diesel generator in accordance with manufacturer's requirements that fulfils the required parameters.
The generated voltage and frequency shall be maintained at all times within limits appropriate to performance class and suppress radio interference in accordance with the relevant parts of BS EN 61000.
The generator shall be capable of running up to normal speed and accepting full load in the time indicated within MoJ STD/E/SPEC/017 and the design documents. – 15 seconds
The generator shall be complete with guards to protect operatives and components from all exposed hot or moving parts in accordance with the Health and Safety at Work Act, 1974. Hot surfaces presenting a contact or combustion hazard shall be guarded or insulated with 50 mm thick mineral wool mattress to density 90 kg/m3 and suitable for a temperature of 950 °C. The mineral wool shall be encased in hammer clad aluminium overall.
Suitable wearing clothes shall be displayed on guards.

Performance Criterion

Provide a generator that complies with MoJ STD/E/SPEC/017, BS ISO 8528 and all relevant standards included within Table 1 and comprises a diesel engine, direct driven alternator/exciter, cooling system, exhaust system, engine/alternator control panel, a daily service fuel oil tank and engine starting system.
The generator shall be installed and configured as scheduled within the design documents. Anti-vibration mounts shall be provided between the base frame and the enclosure floor to eliminate structure borne noise or vibration. Consideration shall be given to the vibration and noise criteria when the generator is on part load as well as on full load.

Diesel Engine

The engine performance shall be in accordance with BS ISO 8528, BS 5514 or the equivalent IES standard. The engine type shall be four stroke and shall be water-cooled direct injection type. The fuel oil shall be Class A2 in accordance with BS 2869.
Provide suitable controls to manually adjust speed.
Torsional vibrations shall be within the limits of -5% to +10% and shall comply with BS ISO 3046-5:2001.
The rated net horsepower of the engine at the generator synchronous speed, with all accessories, shall not be less than that required to produce the kW load. The horsepower rating shall take into account generator efficiency and all parasitic losses such as fans, heaters, battery charger, etc. The generator shall be capable of producing the specified kW (without overload) for the duration of the power outage, under the specified ambient conditions as indicated within MoJ STD/E/SPEC/017.

Engine Speed Control

The engine shall be equipped with a suitable governor to maintain frequency within limits, as specified by the operational class in accordance with ISO 8528, by controlling engine and generator speed.
The generator shall be provided with an engine speed governing system in accordance with BS ISO 3046-4:2009. The nominal speed shall not exceed 1500 rev/min. An engine over speed protection device shall be provided as part of the system in accordance with BS ISO 3046-6:2020 and shall be incorporated into the speed control system.
Manual speed control shall be provided within a control panel located remotely. **(NOT REQUIRED)**

Generator Water Cooling System

The generator shall incorporate a cooling system that cools the engine when running on continuous full load and on 10% overload for one hour in accordance with BS ISO 3046.
The radiator shall be an air blast type, complete with integral header, separate sections shall be provided, where appropriate for the water and lubricating oil systems. The radiator shall be set mounted with engine driven fan upstream of radiator, or remote with motor driven fan upstream of radiator where appropriate.

The generator shall be provided with a thermostatically controlled diverting valve in the engine cooling water discharge pipe work with by-pass to circulating pump suction.
The water-cooling system shall be complete with drain points at low points in engine cooling water system.
A mixture of water and antifreeze shall be applied to the engine cooling water system. The mixture shall be the concentration stipulated by the manufacturer.

Engine Lubrication system
The engine shall be provided with a high-capacity lube oil system comprising positive displacement pumps, adjustable regulators, and replaceable element filters to maintain full pressure regulation to the main bearing, con rods, camshaft bearings, turbo charger(s) valve and timing gear.
The system shall include an oil cooler and be provided with suitable valves to allow draining of the system.
The generator system shall afford automatic engine lubrication by the use of an integral gear driven pump. The pump shall facilitate a coarse strainer on the suction side and full flow filter on the delivery side.
The engine set-up shall ensure that the engine lubricating oil dipstick is accessible and marked to indicate maximum and minimum levels.
The generator shall be provided with an engine sump that incorporates an accessible drain point or drainpipe. The generator shall be provided with an electric motor driven lubricating priming pump with automatic intermittent time control to keep engine bearings lubricated.
The generator shall provide for the lubricating oil system to enable the engine to run continuously for period detailed within the schedules, drawings and design documents at any load without replenishment. The system shall be capable of being replenished while the engine is running.

Engine Starting System
Supply and install a 24 V DC supply to start the engine from any crankshaft position, by axial type starter motor engaging with flywheel. The contractor shall ensure that the starter motor disengages automatically when engine starts or when de-energised.
The starter motor shall be accessible and installed complete with non-conducting protective shrouds to all terminals.
The DC system shall be capable of a minimum of six crank cycles (rolling) of the specified prime mover (3 x 10 second alternating crank cycles per system) and have sufficient current available for "break-away" currents for the particular engine used at the specified worse case temperature and without charge.

Starter Batteries
The contractor shall provide batteries that have the capacity to crank the engine 6 times in succession when the engine is cold, 0 °C, with 10 seconds between starts.
The batteries shall offer low maintenance, be sealed and be of the lead acid type to BS EN 50342. The connections shall be inter-cell with shielded output connections to prevent inadvertent contact. Shield/shrouds shall be impact resistant PVC.
The batteries shall be mounted on either open type acid resistant stands.
The contractor shall provide a battery charger as part of the installation. The charger shall be a current-limited constant-current/ constant-voltage type in accordance with battery manufacturer's recommendations.
Battery charger will be incorporated in to the generator control panel and not free standing.
The charger shall facilitate boost and trickle charging, include over current and over voltage protection, provide for earth fault detection and alarm where battery and charging system are not connected to the earthed system, provide battery on-load disconnection and fuses.
The battery charger shall accommodate monitoring information included but not limited to:

- Incoming supply ON/OFF switch with illuminated LED – **connected to auxiliary supply – no LED**
- Charge input and output cartridge fuses or circuit breakers – in generator control panel
- Voltmeter to indicate battery/charging voltage – shown on generator controller
- Ammeter to indicate charge /discharge – **TBC, not necessary**
- Battery charge output failure detector with volt free contacts to actuate a remote alarm – part of common alarm fault

Filtration System
Engine shall be fitted with heavy-duty dry type air filters with replacement elements. The engine shall be complete with fuel and lubricating oil filters with replaceable elements.

Automatic Voltage Regulator
The generator shall be provided with a solid-state type automatic voltage regulator that accommodates manual adjustment to set the alternator output voltage within the tolerance detailed within the schedules.
The regulator shall be mounted either on the set or within the control cubicle.
An enclosure shall be provided as part of the installation to contain regulator components that are isolated from the generator using anti-vibration mountings.

Fuel Systems
For increased resilience the new generator will not be connected automatically to the existing diesel tank and will only be supplied from its own 12-hour day tank, however provision will be made such that the existing fuel tank can be manually switched to be provide fuel for the 2nd generator if required. The gate valve for this will be locked in the closed position with suitable fuel contamination warning notices.
NOTE: Bells have offered to install a fuel fill line from the existing bulk fuel tank, with an automatic top up system to full the day tank when it reaches a low level. A shut off valve will be incorporated in the pipe work to prevent the fill if needed.
If this system is not acceptable, kindly advise what you had in mind. If the generator engine is to be fed directly from the existing bulk tank, we would need to install 2 lines – a feed and return.
Kindly advise.

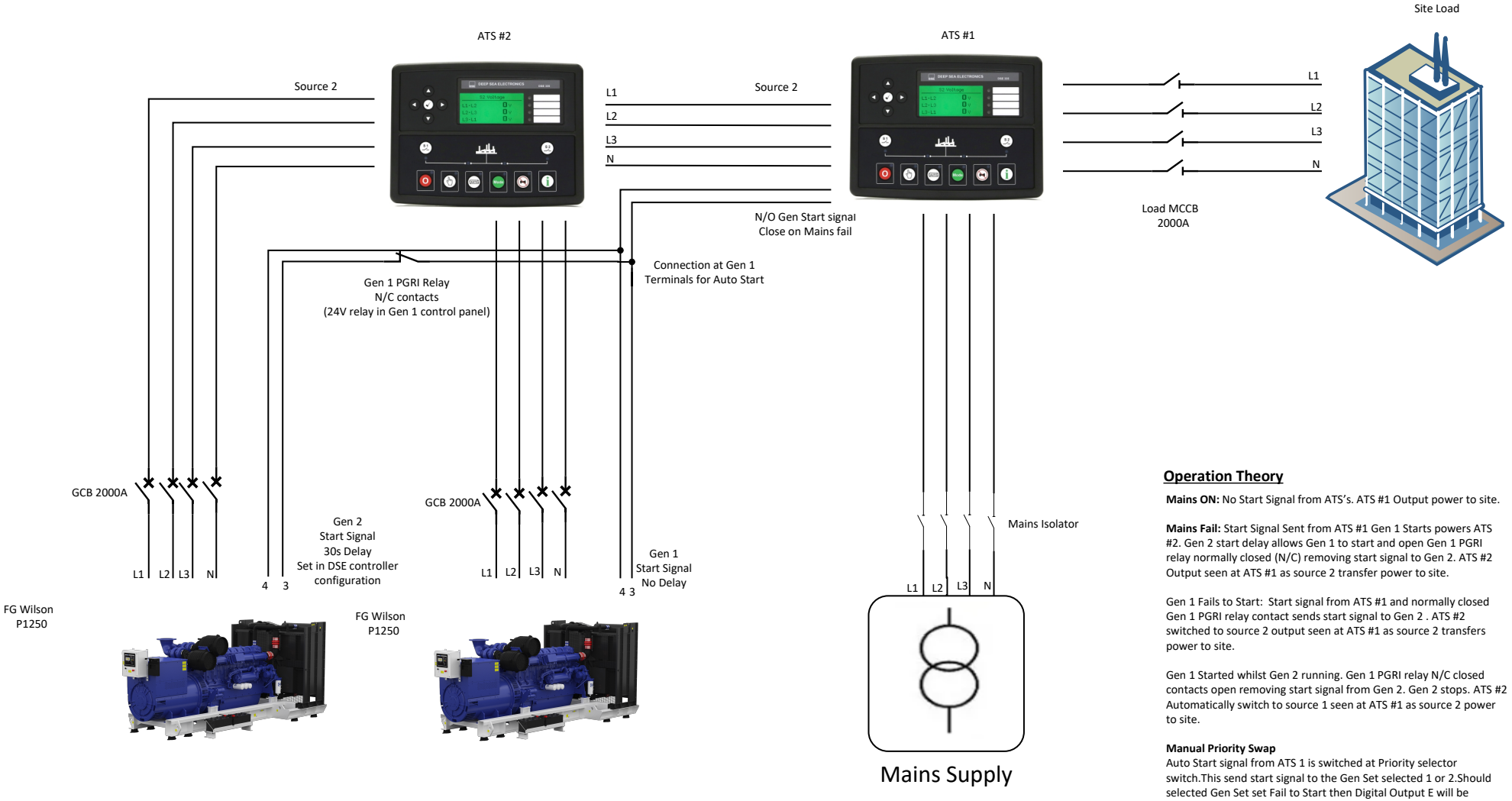
New control panel / ATS – by others
The new control panel shall comprise a changeover switch capable of connecting 2No. 1250 kVA generators via ACB breakers.
The changeover shall be fully programmable and capable of switching automatically between generators and have a manual selection control. It shall also be suited with manual controls to select which generator is to be prioritised in the case of a mains power failure.
Both audible and visual alarms are required to be installed within the gatehouse control room to show either generator offline or low fuel levels.
The controls shall be interfaced to the site wide BMS system to enable status and fault reporting

Control Philosophy
Mains ON: No Start Signal from ATS's. ATS #1 Output power to site.

Mains Fail: Start Signal Sent from ATS #1 Gen 1 Starts powers ATS #2. Gen 2 start delay allows Gen 1 to start and open Gen 1 PGRI relay normally closed (N/C) removing start signal to Gen 2. ATS #2 Output seen at ATS #1 as source 2 transfer power to site.
Gen 1 Fails to Start: Start signal from ATS #1 and normally closed Gen 1 PGRI relay contact sends start signal to Gen 2 . ATS #2 switched to source 2 output seen at ATS #1 as source 2 transfers power to site.
Gen 1 Started whilst Gen 2 running. Gen 1 PGRI relay N/C closed contacts open removing start signal from Gen 2. Gen 2 stops. ATS #2 Automatically switch to source 1 seen at ATS #1 as source 2 power to site.

Manual Priority Swap
Auto Start signal from ATS 1 is switched at Priority selector switch. This send start signal to the Gen Set selected 1 or 2. Should selected Gen Set set Fail to Start then Digital Output E will be activated. Energising Coil of respective Fail to Start Relay, closing N/O contacts. Contacts provide Start Signal to Non-Priority Gen Set.
*Digital Output E would require programming via DSE Config suite.

IRC Harmondsworth Control philosophy



Operation Theory

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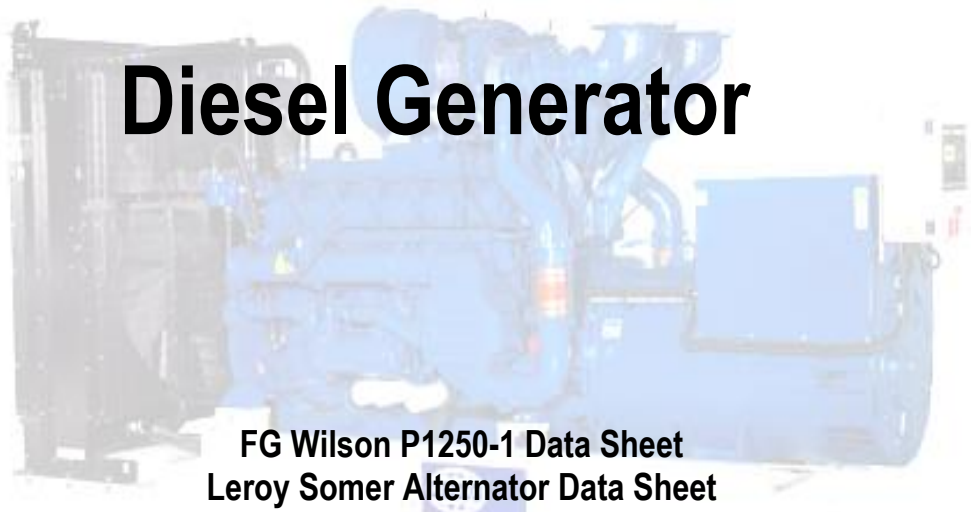
Section 2

Diesel Generator

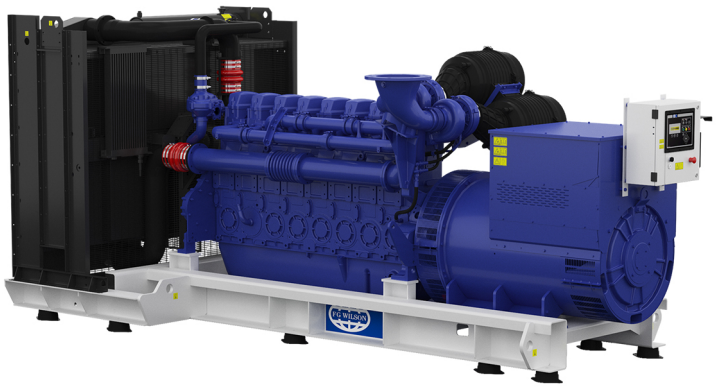


FG Wilson P1250-1 Data Sheet
Leroy Somer Alternator Data Sheet
Circuit Breaker 2000A ABB SACE Emax 2 E2.2N

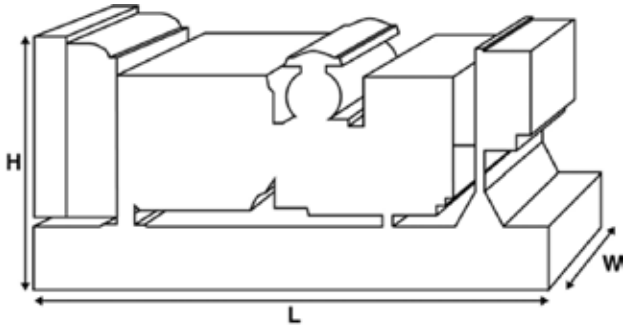
P1250-1

Output Ratings

Voltage, Frequency		Prime	Standby
400/230 V, 50 Hz	kVA	1125	1250
	kW	900	1000
	kVA		
	kW		



Ratings at 0.8 power factor.
Please refer to the output ratings technical data section for specific generator set outputs per voltage.



Dimensions and Weights

Length	mm	4789 (188.5)
Width	mm	2197 (86.5)
Height	mm	2069 (81.5)
Weight (Dry)	kg	7613 (16784)
Weight (Wet)	kg	7753 (17092)

Ratings in accordance with ISO 8528, ISO 3046, IEC 60034, BS5000 and NEMA MG-1.22.
Generator set pictured may include optional accessories.

Prime Rating

These ratings are applicable for supplying continuous electrical power (at variable load) in lieu of commercially purchased power. There is no limitation to the annual hours of operation and this model can supply 10% overload power for 1 hour in 12 hours.

Standby Rating

These ratings are applicable for supplying continuous electrical power (at variable load) in the event of a utility power failure. No overload is permitted on these ratings. The alternator on this model is peak continuous rated (as defined in ISO 8528-3).

Standard Reference Conditions

Note: Standard reference conditions 25°C (77°F) Air Inlet Temp, 100m (328 ft) A.S.L. 30% relative humidity.
Fuel consumption data at full load with diesel fuel with specific gravity of 0.85 and conforming to BS2869: 1998, Class A2.

FG Wilson offer a range of optional features to allow you to tailor our generator sets to meet your power needs.
Options available include:

- Upgrade to CE Certification
- A wide range of Sound Attenuated Enclosures
- A variety of generator set control and synchronising panels
- Additional alarms and shutdowns
- A selection of exhaust silencer noise levels

For further information on all of the standard and optional features accompanying this product please contact your local Dealer or visit:

www.fgwilson.com

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Ratings and Performance Data

Engine Make		Perkins	
Engine Model:		4008-30TAG3	
Alternator Make		Leroy Somer	
Alternator Model:		LL8224H	
Control Panel:		DSE7410	
Base Frame:		Heavy Duty Fabricated Steel	
Circuit Breaker Type:		Options Available	
Frequency:		50 HZ	60 HZ
Engine Speed: RPM	rpm	1500	
Fuel Tank Capacity:	litres (US gal)	N/A (N/A)	
Fuel Consumption Prime	litres (US gal)/hr	240.1 (63.4)	
Fuel Consumption Standby	litres (US gal)/hr	266.3 (70.3)	

Engine Technical Data

No. of Cylinders		8
Alignment		IN LINE
Cycle		4 STROKE
Bore	mm (in)	160 (6.3)
Stroke	mm (in)	190 (7.5)
Induction		TURBOCHARGED
Cooling Method		WATER
Governing Type		ELECTRONIC
Governing Class		ISO 8528
Compression Ratio		13.0:1
Displacement	L (cu. in)	30.6 (1867.3)
Moment of Inertia:	kg m^2 (lb/in^2)	15.62 (53376)
Voltage		24
Ground		Negative
Battery Charger Amps		55
Engine Weight Dry	kg (lb)	3275 (7220)
Engine Weight Wet	kg (lb)	3453 (7612)

Engine Performance Data		50 Hz	60 Hz
Engine Speed	rpm	1500	
Gross Engine Power Prime	kW (hp)	997 (1337)	
Gross Engine Power Standby	kW (hp)	1105 (1482)	
BMEP Prime	kPa (psi)	2610 (378.5)	
BMEP Standby	kPa (psi)	2892 (419.5)	

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Fuel System

Fuel Filter Type:			Replaceable Element		
Recommended Fuel:			Class A2 Diesel		
Fuel Consumption at		110 % Load	100 % Load	75 % Load	50 % Load
50 Hz Prime:	l/hr (US gal/hr)	266.3 (70.3)	240.1 (63.4)	185.5 (49)	123.8 (32.7)
50 Hz Standby	l/hr (US gal/hr)	-	266.3 (70.3)	208.4 (55.1)	141.1 (37.3)
60 Hz Prime	l/hr (US gal/hr)				
60 Hz Standby	l/hr (US gal/hr)	-			

(Based on diesel fuel with a specific gravity of 0.862 and conforming to BS2869 classA2,EN590

Air System

		50 Hz	60 Hz
Air Filter Type:		Replaceable Element	
Combustion Air Flow Prime	m^3/min (cfm)	84 (2966)	
Combustion Air Flow Standby	m^3/min (cfm)	95 (3355)	
Max. Combustion Air Intake Restriction	kPa	5 (20.1)	

Cooling System

		50 Hz	60 Hz
Cooling System Capacity	l (US gal)	140 (37)	
Water Pump Type:		Centrifugal	
Heat Rejected to Water & Lube Oil: Prime	kW (Btu/min)	300 (17061)	
Heat Rejected to Water & Lube Oil: Standby	kW (Btu/min)	331 (18824)	
Heat Radiation to Room*: Prime	kW (Btu/min)	104.4 (5937)	
Heat Radiation to Room*: Standby	kW (Btu/min)	125.5 (7137)	
Radiator Fan Load:	kW (hp)	50 (67.1)	
Radiator Cooling Airflow:	m^3/min (cfm)	1104 (38987)	
External Restriction to Cooling Airflow:	Pa (in H2O)	250 (1)	

*: Heat radiated from engine and alternator
Designed to operate in ambient conditions up to 50°C (122°F).
Contact your local FG Wilson Dealer for power ratings at specific site conditions.

Lubrication System

Oil Filter Type:		Spin-on, Full flow
Total Oil Capacity:	l (US gal)	166 (43.9)
Oil Pan Capacity:	l (US gal)	153 (40.4)
Oil Type:		API CG4 15W-40
Oil Cooling Method:		WATER

Exhaust System

		50 Hz	60 Hz
Maximum Allowable Back Pressure:	kPa (in Hg)	7 (2.1)	
Exhaust Gas Flow: Prime	m^3/min (cfm)	203 (7169)	
Exhaust Gas Flow: Standby	m^3/min (cfm)	240 (8476)	
Exhaust Gas Temperature: Prime	°C (°F)	473 (883)	
Exhaust Gas Temperature: Standby	°C (°F)	482 (900)	

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Alternator Physical Data

No. of Bearings:	1
Insulation Class:	H
Winding Pitch:	2/3
Winding Code	6S
Wires:	6
Ingress Protection Rating:	IP23
Excitation System:	AREP
AVR Model:	R450M

* dependant on voltage code selected

Alternator Operating Data

Overspeed: rpm		2250
Voltage Regulation: (Steady state)	%	+/- 0.5
Wave Form NEMA = TIF:		50
Wave Form IEC = THF:	%	2
Total Harmonic content LL/LN:	%	3.5
Radio Interference:		EN61000-6
Radiant Heat: 50 Hz	kW (Btu/min)	51.5 (2929)
Radiant Heat: 60 Hz	kW (Btu/min)	

Alternator Performance Data 50 Hz:

		415/240 V	400/230 V	380/220 V	
Voltage Code					
Motor Starting Capability*	kVA	3093	2883	2613	
Short Circuit Capacity**	%	300	300	300	300
Reactances	Xd	3.136	3.38	3.74	
	X'd	0.217	0.234	0.259	
	X"d	0.131	0.131	0.145	

Alternator Performance Data 60 Hz

Voltage Code						
Motor Starting Capability*	kVA					
Short Circuit Capacity**	%	300	300	300	300	300
Reactances	Xd					
	X'd					
	X"d					

Reactances shown are applicable to prime ratings.

*Based on 30% voltage dip at 0.4 power factor.

** With optional independant excitation system (PMG / AUX winding)

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Output Ratings 50 Hz

	Prime		Standby	
Voltage Code	kVA	kW	kVA	kW
415/240V	1125	900	1250	1000
400/230V	1125	900	1250	1000
380/220V	1125	900	1250	1000
230/115V				
220/127V				
220/110V				
200/115V				
240V				
230V				
220V				

Output Ratings 60 Hz

	Prime		Standby	
Voltage Code	kVA	kW	kVA	kW
480/277V				
440/254V				
416/240V				
400/230V				
380/220V				
240/139V				
240/120V				
230/115V				
220/127V				
220/110V				
208/120V				
240/120				
220/110				

FRAME 8224H WINDING 6S

MODELS LL8224H / LL8234H

REF: F8204HW6S-2 JULY 2010

WINDING DETAILS

Code	6S	Insulation class	H
Phase	3	Leads	6
Pole number	4	Pitch	2/3

MECHANICAL DETAILS

Standard protection		IP23
Overspeed	rpm	2250
Air flow 50Hz/60Hz	m^3/s	1.80 / 2.20

EXCITATION DETAILS

Excitation system	**AREP/PMG**
AVR model	R450M
Sustained short-circuit current	300%:10s
Steady state voltage regulation	±0.5%

WAVEFORM

Line voltage on no load or balanced linear rated load

Total harmonic content THC	<3.5%
Telephone influence factor TIF (NEMA)	<50
Telephone harmonic factor THF (IEC)	<2%

LINE VOLTAGE

No overvoltage tolerance for 440V 50Hz excitation level

Frequency / speed		**50Hz / 1500rpm**				**60Hz / 1800rpm**					
Star	**V**	**380**	**400**	**415**	**440**	**380**	**400**	**416**	**440**	**460**	**480**
Delta	V	220	230	240		220	230	240			

RATING

Power factor 0.8, Altitude <=1000m

Class H rise BR	**125/40**	**kVA**	**1250**	**1250**	**1250**	**1155**	**1235**	**1300**	**1355**	**1435**	**1500**	**1563**
		kW	*1000*	*1000*	*1000*	*924*	*988*	*1040*	*1084*	*1148*	*1200*	*1250*
Class H rise PR	**150/40**	**kVA**	**1325**	**1325**	**1325**	**1224**	**1309**	**1378**	**1436**	**1521**	**1590**	**1657**
		kW	*1060*	*1060*	*1060*	*979*	*1047*	*1102*	*1149*	*1217*	*1272*	*1325*
Class H rise PR	**163/27**	**kVA**	**1375**	**1375**	**1375**	**1271**	**1359**	**1430**	**1491**	**1579**	**1650**	**1719**
		kW	*1100*	*1100*	*1100*	*1016*	*1087*	*1144*	*1192*	*1263*	*1320*	*1375*
Class F rise BR	**105/40**	**kVA**	**1138**	**1138**	**1138**	**1051**	**1124**	**1183**	**1233**	**1306**	**1365**	**1422**
		kW	*910*	*910*	*910*	*841*	*899*	*946*	*986*	*1045*	*1092*	*1138*

EFFICIENCIES

Power factor 0.8

110%	Class H BR	%	94.7	94.9	95.0	95.2	94.2	94.4	94.5	94.7	94.8	94.9
100%	Class H BR	%	94.9	95.1	95.2	95.3	94.4	94.6	94.7	94.9	95.0	95.1
75%	Class H BR	%	95.4	95.5	95.6	95.4	94.8	94.9	95.1	95.2	95.3	95.3
50%	Class H BR	%	95.7	95.6	95.5	95.1	94.7	94.9	95.0	95.1	95.1	95.2
25%	Class H BR	%	94.4	94.1	93.8	92.7	92.8	92.9	93.0	93.1	93.0	93.0

CHARACTERISTIC PARAMETERS

Reactance base class H BR rating

K_c	Short-circuit ratio		0.26	0.31	0.36	0.51	0.20	0.21	0.23	0.25	0.27	0.30
X_d	D-Axis synchronous reactance (unsaturated)	pu	4.25	3.84	3.56	2.93	5.04	4.79	4.61	4.37	4.18	4.00
X'_d	D-Axis transient reactance (saturated)	pu	0.29	0.27	0.25	0.20	0.35	0.33	0.32	0.30	0.29	0.28
X''_d	D-Axis sub-transient reactance (saturated)	pu	0.164	0.148	0.138	0.113	0.195	0.185	0.179	0.169	0.162	0.155
X_q	Q-Axis synchronous reactance (unsaturated)	pu	2.55	2.30	2.14	1.76	3.03	2.88	2.77	2.62	2.51	2.40
X''_q	Q-Axis sub-transient reactance (saturated)	pu	0.192	0.173	0.161	0.132	0.228	0.216	0.209	0.197	0.189	0.181
X_2	Negative-sequence reactance (saturated)	pu	0.178	0.161	0.150	0.123	0.211	0.201	0.194	0.183	0.175	0.168
X_0	Zero-sequence reactance (independent)	pu	0.040	0.036	0.034	0.028	0.047	0.045	0.043	0.041	0.039	0.038
T'_d	D-Axis transient time constant	ms		180				180				
T''_d	D-Axis sub-transient time constant	ms		18				18				
T'_{do}	D-Axis open-circuit time constant	ms		2584				2584				
T_a	Armature time constant	ms		27				27				
T_r	Voltage recovery time	ms		< 500				< 500				

EXCITATION VOLTAGE AND CURRENT

No load excitation voltage	V	9.2	10.3	11.6	14.2	6.9	7.4	7.8	8.6	9.4	10.3
No load excitation current	A	0.84	0.94	1.05	1.29	0.63	0.67	0.71	0.78	0.85	0.94
Class H BR excitation voltage	V	45.4	45.3	45.9	45.4	41.4	41.9	42.6	43.7	44.9	46.5
Class H BR excitation current	A	4.13	4.12	4.17	4.13	3.76	3.81	3.87	3.97	4.08	4.23

WINDING RESISTANCE

At 20° C

Stator line-to-line (series star)	Ω	0.0032	Exciter field	Ω 11.00
Main field	Ω	0.434		

According to: IEC 60034, UTE NFC51.111, VDE 0530, BS 4999/5000, NEMA MG 1-33

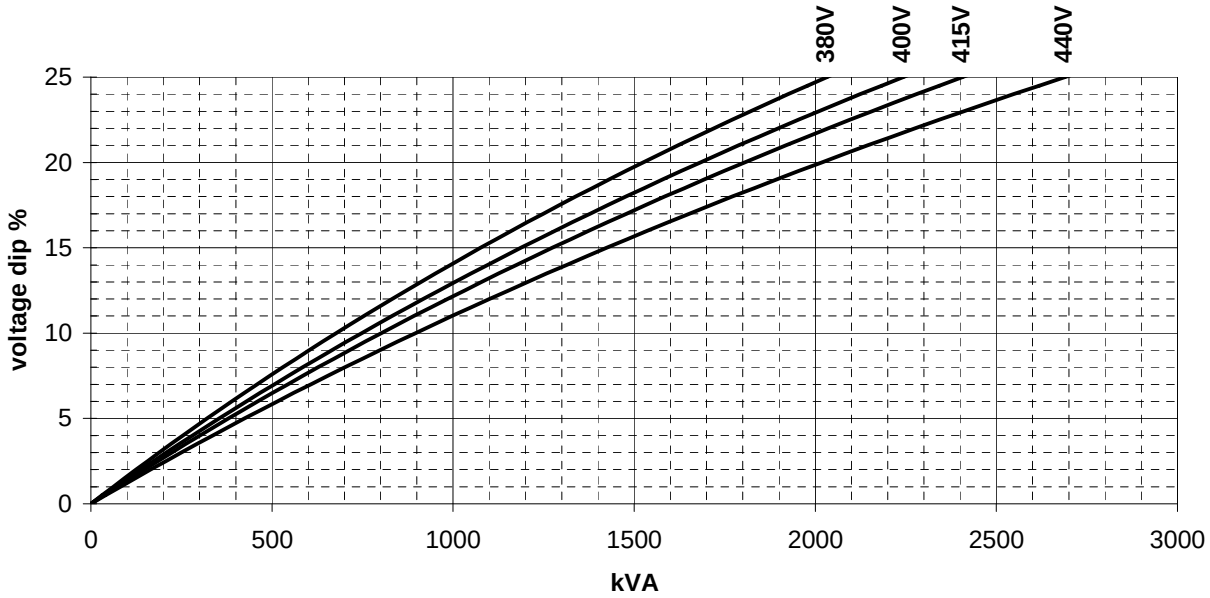
Values quoted are typical. In line with our policy of continuous improvement, we reserve the right to change specification without notice.

FRAME	8224H	WINDING	6S

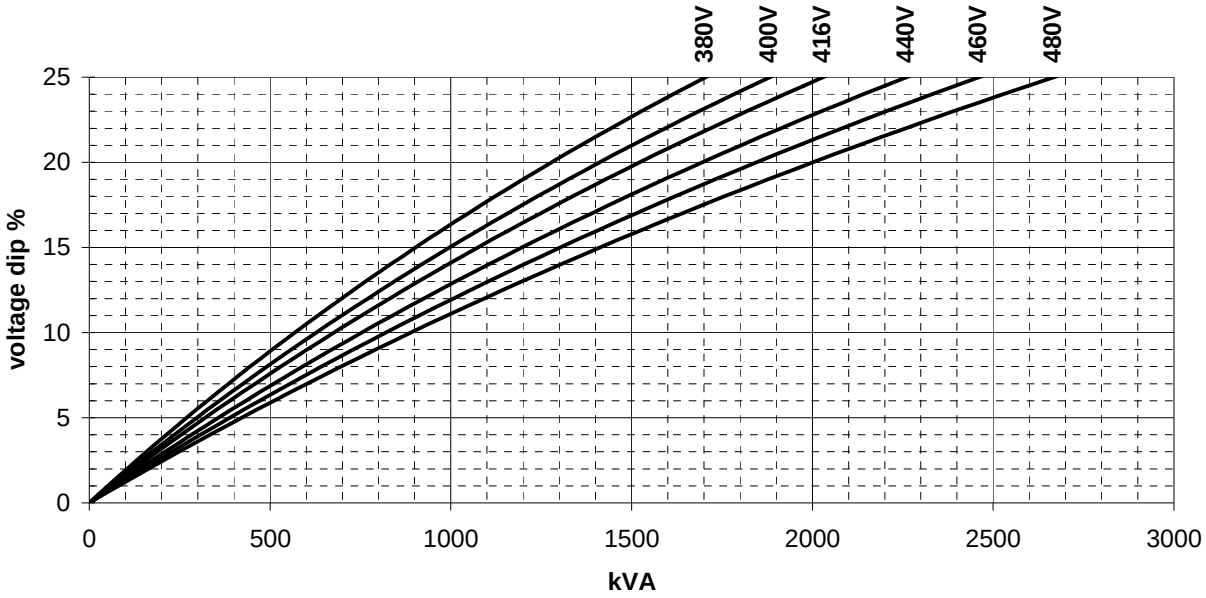
MODELS **LL8224H / LL8234H** REF: F8204HW6S-2 JULY 2010

LOCKED ROTOR MOTOR STARTING CURVES *Power factor 0.4*

50 Hz AREP / PMG



60 Hz AREP / PMG



According to: IEC 60034, UTE NFC51.111, VDE 0530, BS 4999/5000, NEMA MG 1-33

Values quoted are typical. In line with our policy of continuous improvement, we reserve the right to change specification without notice.

FRAME 8224H WINDING 6S

MODELS **LL8224H / LL8234H**

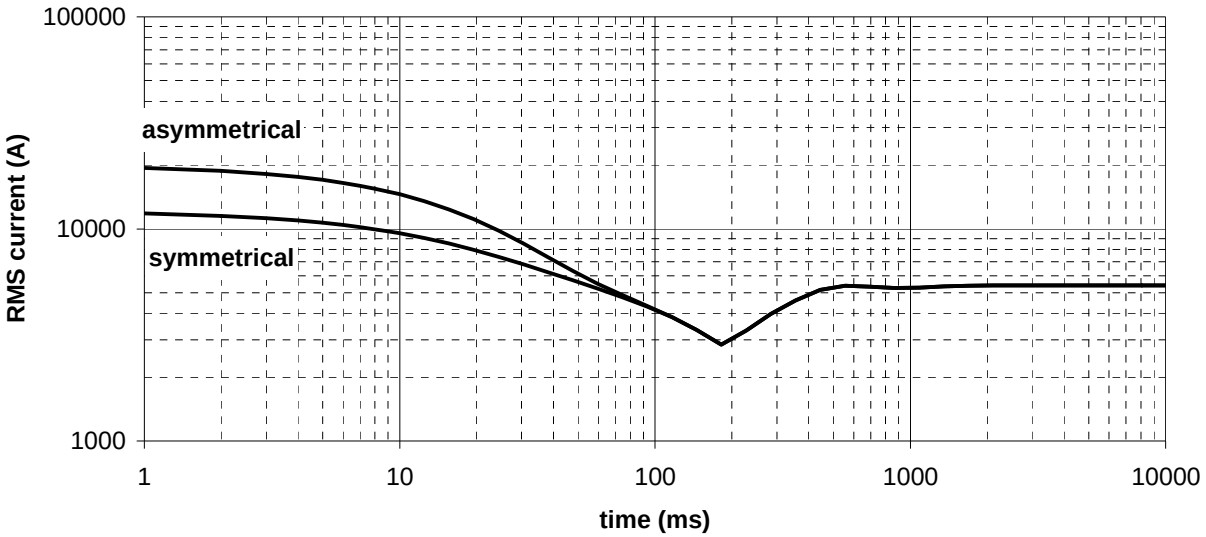
REF: F8204HW6S-2 JULY 2010

THREE-PHASE SHORT-CIRCUIT DECREMENT CURVES

No-load excitation at rated speed

400V 50Hz, 480V 60Hz

Star



Multiplication Factors

50Hz Voltages	380	400	415	440
Multiplication Factor	0.95	1.00	1.04	1.10

Apply factor up to 2xT'd, remainder of curve unchanged

60Hz Voltages	380	400	416	440	460	480
Multiplication Factor	0.79	0.83	0.87	0.92	0.96	1.00

Apply factor up to 2xT'd, remainder of curve unchanged

Winding Connection	Star	Delta
Multiplication Factor	1.00	1.73

Apply factor to the complete curve

According to: IEC 60034, UTE NFC51.111, VDE 0530, BS 4999/5000, NEMA MG 1-33

Values quoted are typical. In line with our policy of continuous improvement, we reserve the right to change specification without notice.

Product data sheet

Emax power circuit-breakers

Emax E2.2

Common data	
UL 1066	
Rated voltage	600 V AC
Rated maximum voltage	635 V AC
Test voltage (1 min. 50/60 Hz)	2.2 kV
Frequency	50 - 60 Hz
Number of poles	3 - 4
Version	Fixed (F) - Drawout (W)

Type of circuit-breaker			Emax E2.2				
Level of performance			**B-A**	**N-A**	**S-A**	**H-A**	**V-A**
Frame size		[A]	1600	1600	800	800	250
		[A]	•	2000	1200	1200	400
		[A]	•	•	1600	1600	800
		[A]	•	•	2000	2000	1200
		[A]	•	•	•	•	1600
		[A]	•	•	•	•	2000
Capacity of neutral pole for 4 pole circuit-breakers		[% Iu]	100	100	100	100	100
Rated short circuit current at max. voltage	**254 V**	[kA]	42	50	65	85	100
	508 V	[kA]	42	50	65	85	100
	635 V	[kA]	42	50	65	85	85
Rated short time current (1s)		[kA]	42	50	65	85	85
Trip units							
Ekip Dip			•	•	•	•	•
Ekip Touch			•	•	•	•	•
Ekip HI-Touch			•	•	•	•	•
Ekip G Touch			•	•	•	•	•
Ekip G HI-Touch			•	•	•	•	•
Trip times							
Break time with fault current < rated short time current		[ms]	40	40	40	40	40
Break time with fault current > rated short time current		[ms]	25	25	25	25	25
Mechanical and electrical life with regular ordinary maintenance							
Mechanical life		[No. Cycles x 1000]	25				
Operation frequency		[Cycles / hour]	60				
Electrical life (at max. voltage)		[No. Cycles x 1000]	15 (less than 1600A) ; 10 (1600A) ; 8 (2000A)				
Operation frequency		[Cycles / hour]	30				
Weights (circuit breaker complete with trip unit, Horz. rear terminals, CS. Excluding accessories)							
Fixed (3p/4p)		[kg]	52/67				
		[lbs]	115/148				
Draw out (3p/4p)		[kg]	58/68 (up to 1600A) ; 61/108 (2000A)				
		[lbs]	128/150 (up to 1600A) ; 135/239 (2000A)				

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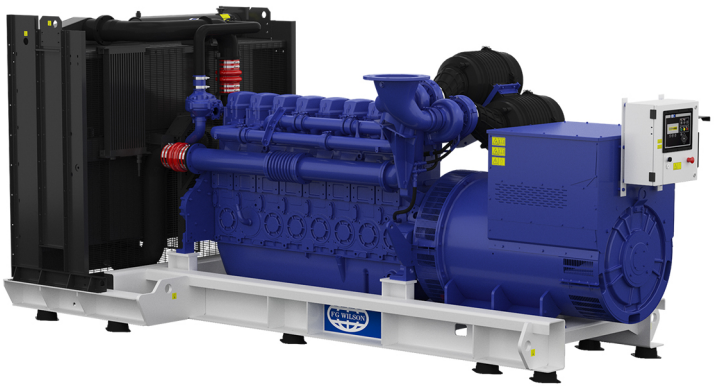

P1250-1

Dealer Contact Details

Documentation

Operation and maintenance manual including circuit wiring diagrams.

Generator Set Standards

The equipment meets the following standards: BS5000, ISO 8528, ISO 3046, IEC 60034, NEMA MG-1.22.

Warranty

The warranty for this product in prime applications is 12 months from date of start-up,
unlimited hours (8760 hours) or 24 months from date of start-up, limited to 6000 hours.
For standby applications the warranty period is 36 months from date of start-up, limited to 500 hours per year.

FG Wilson manufactures product in the following locations:
Northern Ireland • Brazil • China • India
With headquarters in Northern Ireland, FG Wilson operates through a Global Dealer Network.
To contact your local Sales Office please visit the FG Wilson website at www.fgwilson.com.

FG Wilson is a trading name of Caterpillar (NI) Limited.

Section 3

Generator Controller

DSE7410 Data Sheet Generator
Wiring Diagram
DSE335 Change over controller

DSE**7410 MKII** Auto Start & DSE**7420 MKII** Auto Mains (Utility) Failure Control Modules

Part Number: 7410-03 / 7420-03

DSE**7410 MKII**

DSE**7420 MKII**

Overview

The DSE**7410 MKII** is an Auto Start Control Module and the DSE**7420 MKII** is an Auto Mains (Utility) Failure Control Module suitable for a wide variety of single, diesel or gas, gen-set applications. Monitoring an extensive number of engine parameters, the modules will display warnings, shutdown and engine status information on the back-lit LCD screen, illuminated LEDs and remote PC.The DSE**7420 MKII** will also monitor the mains (utility) supply. The modules include USB, RS232, RS485 and Ethernet ports as well as dedicated DSE**Net**® terminals for system expansion.

Both modules are compatible with electronic (CAN) and non-electronic (magnetic pick-up/alternator sensing) engines and offer an extensive number of flexible inputs, outputs and engine protections so the system can be easily adapted to meet the most demanding industry requirements.
The comprehensive list of features includes enhanced event and performance monitoring, remote communications & PLC functionality. Dual mutual standby is now available on both the DSE**7410 MKII** & DSE**7420 MKII** using RS232 or RS485 communications.

The modules also feature SNMP functionality for connection to SNMP systems. The modules can be easily configured using the DSE Configuration Suite PC software. Selected front panel editing is also available.

Common Key Features

- Advanced PLC functionality including multi-purpose PIDs
- Flexible inputs and outputs
- DSE**Net**® expansion support
- PC configuration using DSE Configuration Suite
- Multiple language support
- Enhanced 4-line text display
- Integrated RS232 and RS485 ports providing Modbus RTU support
- Integrated Ethernet port providing Modbus TCP, SNMP v2c and in built web SCADA support.
- Data logging of up to 20 parameters
- Multi-level PIN protected front panel editor
- Manual front panel and automatic control modes
- Latest ECU / ECM support for a wide range of engine manufacturers
- IP65 rating (with supplied gasket) offers increased resistance to water ingress
- Dual mutual standby between two generators for redundancy and balancing of engine hours
- Multiple selectable configurations in one unit to suit changing requirements
- Customisable module power-up & screen saver screens

Product Documentation
053-191 – DSE**7410/20 MKII** Installation Instructions
057-263 – DSE**7410/20 MKII** Operator Manual
057-262 – DSE**7410/20 MKII** Configuration Suite PC Manual

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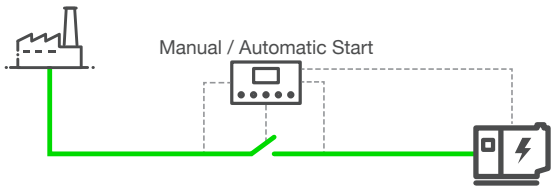
DSE**7410 MKII** Auto Start & DSE**7420 MKII** Auto Mains (Utility) Failure Control Modules

Part Number: 7410-03 / 7420-03

DSE**7410 MKII Manual / Automatic Start Controller Key Features**

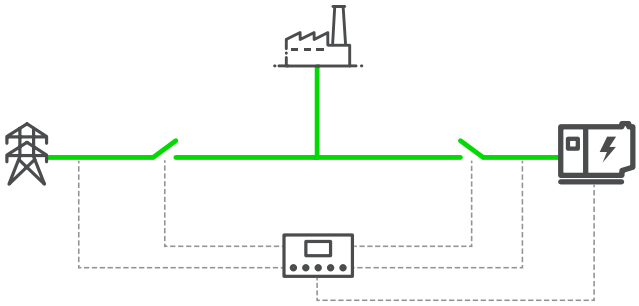
- 3 phase generator sensing with protection
- Manual starting / control by fascia button and automatic starting / control by inputs and other functions

Typical Applications



DSE**7420 MKII Automatic Mains (Utility) Failure (AMF) Controller Key Features**

- 3 phase generator and mains (utility) sensing with protection
- Manual starting / control by fascia button and automatic starting / control by inputs and other functions.
- Automatic start and stopping of generator and transfer of load based on mains (utility) availability
- Open and closed transition available with option for synchronisation when used with a CAN engine and DSE CAN AVR



Automatic Mains (Utility) Failure

Product Documentation

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057-263 – DSE**7410/20 MKII** Operator Manual
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DSE**7410 MKII** Auto Start & DSE**7420 MKII** Auto Mains (Utility) Failure Control Modules

Part Number: 7410-03 / 7420-03

Specifications	
DC Supply	
Continuous Voltage Rating	8 V to 35 V DC continuous
Cranking Dropouts	Able to survive 0 V for 100 ms, providing supply was at least 10 V before dropout and supply recovers to 5 V. This is achieved without the need for internal batteries. Backlight will not be maintained during cranking.
Maximum Operating Current	340 mA at 12 V, 160 mA at 24 V
Maximum Standby Current	160 mA at 12 V, 80 mA at 24 V
Charge Alternator Excitation / Fail Range	0 V to 35 V
Voltage Measurement	
Number	DSE**7410 MKII**: 1 DSE**7420 MKII**: 2
Measurement Inputs	3 Phase + Neutral DSE**7410 MKII**: Generator DSE**7420 MKII**: Generator and Mains
Voltage Range	15 V to 415 V Phase to Neutral 25 V to 719 V Phase to Phase
Frequency Range	3.5 Hz to 75 Hz
Resolution	1 V
Accuracy	±1 %
Current Measurement	
Number	4
Measurement Inputs	3 Phase with Earth Fault DSE**7410 MKII**: Generator DSE**7420 MKII**: Generator or Load
Current Range	0 A to 1 A 0 A to 5 A
Resolution	25 mA
Accuracy	±1 %

Product Documentation
053-191 – DSE**7410/20 MKII** Installation Instructions
057-263 – DSE**7410/20 MKII** Operator Manual
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DSE**7410 MKII** Auto Start & DSE**7420 MKII** Auto Mains (Utility) Failure Control Modules

Part Number: 7410-03 / 7420-03

Specifications	
Analogue Inputs	
Number	6
Type	Negative Switching Digital Input (6), Resistive Analogue Input (6), Current Analogue Input (4) and Voltage Analogue Input (4)
Digital Input Closed Voltage Threshold	Less than 2.1 V
Digital Input Open Voltage Threshold	Greater than 6.6 V
Resistive Analogue Measurement Range	**Input A:** 0 Ω to 240 Ω **Input B & F:** 0 Ω to 3 kΩ **Input C, D & E:** 0 Ω to 480 Ω
Current Analogue Measurement Range	**Input A, B, E & F:** 0 mA to 20 mA
Voltage Analogue Measurement Range	**Input A, B, E & F:** 0 V to 10 V
Analogue Resolution	1 %
Analogue Accuracy	±2 %
Digital Inputs	
Number	8
Type	Negative Switching Digital Input
Closed Voltage Threshold	Less than 2.1 V
Open Voltage Threshold	Greater than 6.6 V
Emergency Stop Input	
Number	1
Type	Positive Switching Digital Input
Closed Voltage Threshold	Greater than 5.0 V
Open Voltage Threshold	Less than 3.0 V
Magnetic Pick-up Input	
Voltage Input Range	0.5 V_{Peak} to 70 V_{Peak}
Frequency Input Range	5 Hz to 10 kHz
Resolution	1 Hz
Accuracy	±1 %
Flywheel Teeth	10 to 500

Product Documentation
053-191 – DSE**7410/20 MKII** Installation Instructions
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DSE**7410 MKII** Auto Start & DSE**7420 MKII** Auto Mains (Utility) Failure Control Modules

Part Number: 7410-03 / 7420-03

Specifications	
Digital Outputs	
Number	10
Type	1 Normally Open Volt-Free Contacts 1 Normally Closed Volt-Free Contacts 8 Positive Switching DC Output
Volt-Free Contact Output Rating	5 A_{DC} resistive at 30 V_{DC} 8 A_{AC} resistive at 250 V_{AC}
Positive DC Output Rating	**Output A to B (Fuel and Start):** 15 A_{DC} at Emergency Stop input supply voltage **Output E to J:** 2 A_{DC} at module supply voltage
Communications	
USB A	1 Data Storage Port
USB B	1 Programming Port
DSENet®	1 Expansion Port
RS232	1 Modbus RTU Port
RS485	1 Modbus RTU Port
Ethernet	1 10/100 Ethernet Port
CAN	2 Fully Isolated Ports ECU - Engine ECU / ECM CAN - Configurable CAN Communication
Temperature	
Operating Temperature	-30 °C to +70 °C / -22 °F to +158 °F
Storage Temperature	-40 °C to +85 °C / -40 °F to +185 °F
Dimensions	
Overall (W x H x D)	250.0 mm x 189.0 mm x 50.5 mm / 9.85” x 7.43” x 1.99”
Mounting	
Type	Panel Fascia Mounting
Panel Cut-Out (W x H)	250.0 mm x 189.0 mm / 8.66” x 6.30”
Maximum Panel Thickness	8 mm / 0.3”

Product Documentation
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DSE**7410 MKII** Auto Start & DSE**7420 MKII** Auto Mains (Utility) Failure Control Modules

Part Number: 7410-03 / 7420-03

Related Products		
DSENet®		
DSE2548	DSENet® LED Output Expansion Module	2548-01
DSE2520 MKII	DSENet® Remote Display Module for DSE7420 MKII	7320-03
DSE2510 MKII	DSENet® Remote Display Module for DSE7410 MKII	7310-03
DSE2157	DSENet® Output Expansion Module	2157-01
DSE2152	DSENet® Analogue Output Expansion Module	2152-01
DSE2133	DSENet® RTD/Thermocouple Input Expansion Module	2133-01
DSE2131	DSENet® Ratiometric Input Expansion Module	2131-01
DSE2130	DSENet® Input Expansion Module	2130-01
DSEWebNet®		
DSE890 MKII	DSEWebNet® Gateway	0890-04

Product Documentation
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Registered in England & Wales No.01319649
VAT No.316923457

055-203/01/25 (2)

DSE**7410 MKII** Auto Start & DSE**7420 MKII** Auto Mains (Utility) Failure Control Modules

Part Number: 7410-03 / 7420-03

Environmental Testing Standards	
Electro-Magnetic Compatibility	
BS EN 61000-6-2	EMC Generic Immunity Standard for the Industrial Environment
BS EN 61000-6-4	EMC Generic Emission Standard for the Industrial Environment
Electrical Safety	
BS EN 61010	Safety of Information Technology Equipment, including Electrical Business Equipment
Temperature	
BS EN 60068-2-1	Ab/Ae Cold Test -30 ºC
BS EN 60068-2-2	Bb/Be Dry Heat +70 ºC
Vibration	
BS EN 60068-2-6	Ten sweeps in each of three major axes 5 Hz to 8 Hz at ±7.5 mm, 8 Hz to 500 Hz at 2 Gn
Humidity	
BS EN 60068-2-30	Db Damp Heat Cyclic 20/55 ºC at 95% Relative Humidity 48 Hours
BS EN 60068-2-78	Cab Damp Heat Static 40 ºC at 93% Relative Humidity 48 Hours
Shock	
BS EN 60068-2-27	Three shocks in each of three major axes 15 Gn in 11 ms
Degrees of Protection Provided by Enclosures	
BS EN 60529	IP65 - From the front of the module when installed into a control panel (Integrated Gasket)

Product Documentation

053-191 – DSE**7410/20 MKII** Installation Instructions
057-263 – DSE**7410/20 MKII** Operator Manual
057-262 – DSE**7410/20 MKII** Configuration Suite PC Manual

IP65

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CE

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Part Number: 7410-03 / 7420-03

DSE**7410 MKII**	
Pin	**Description**
1 to 2	DC Supply
3	Emergency Stop
4	Fuel
5	Start
6	Charge Alternator
7	Not Applicable
8 to 13	Digital Outputs
14 to 20	Analogue Inputs
21 to 23	Magnetic Pick-Up
24 to 26	Engine ECU/ECM
27 to 29	DSENet®
30 to 32	Configurable CAN
33 to 34	Normally Closed Volt Free Output
35 to 36	Normally Open Volt Free Output
37 to 40	Generator Voltage Sensing
41 to 44	Not Applicable
45 to 50	Generator Current Sensing
51 to 58	Digital Inputs
59 to 61	RS485

DSE**7420 MKII**	
Pin	**Description**
1 to 2	DC Supply
3	Emergency Stop
4	Fuel
5	Start
6	Charger Alternator
7	Not Applicable
8 to 13	Digital Outputs
14 to 20	Analogue Inputs
21 to 23	Magnetic Pick-Up
24 to 26	Engine ECU/ECM
27 to 29	DSENet®
30 to 32	Configurable CAN
33 to 34	Normally Closed Volt Free Output
35 to 36	Normally Open Volt Free Output
37 to 40	Generator Voltage Sensing
41 to 44	Mains (Utility) Voltage Sensing
45 to 50	Generator/Load Current Sensing
51 to 58	Digital Inputs
59 to 61	RS485

Product Documentation
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057-263 – DSE**7410/20 MKII** Operator Manual
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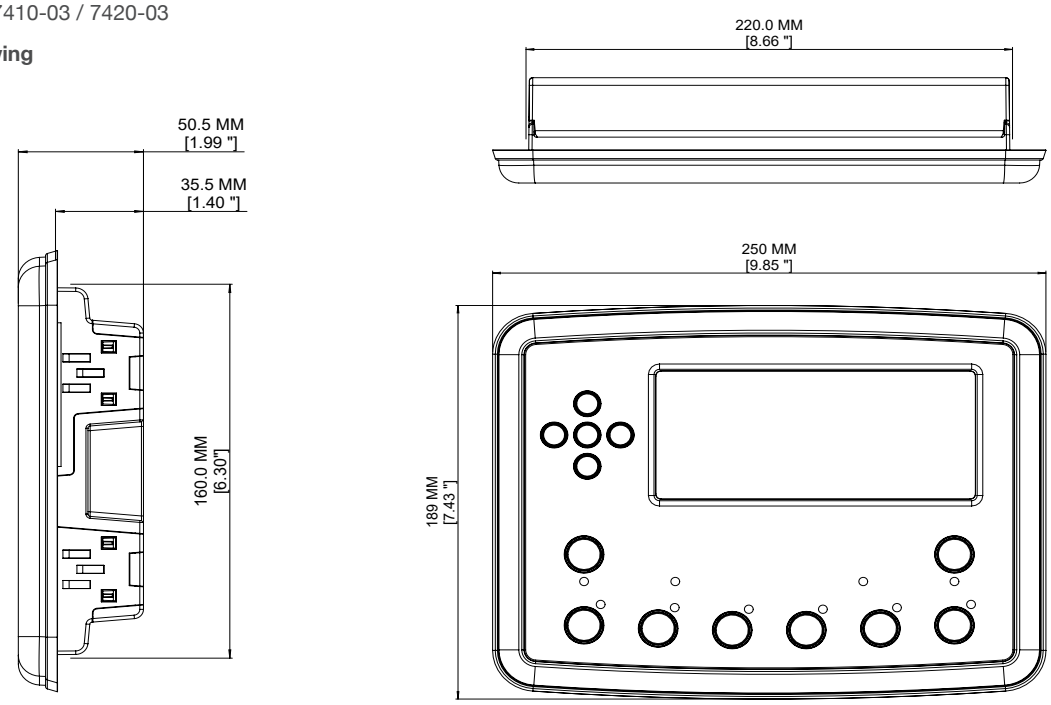
055-203/01/25 (2)

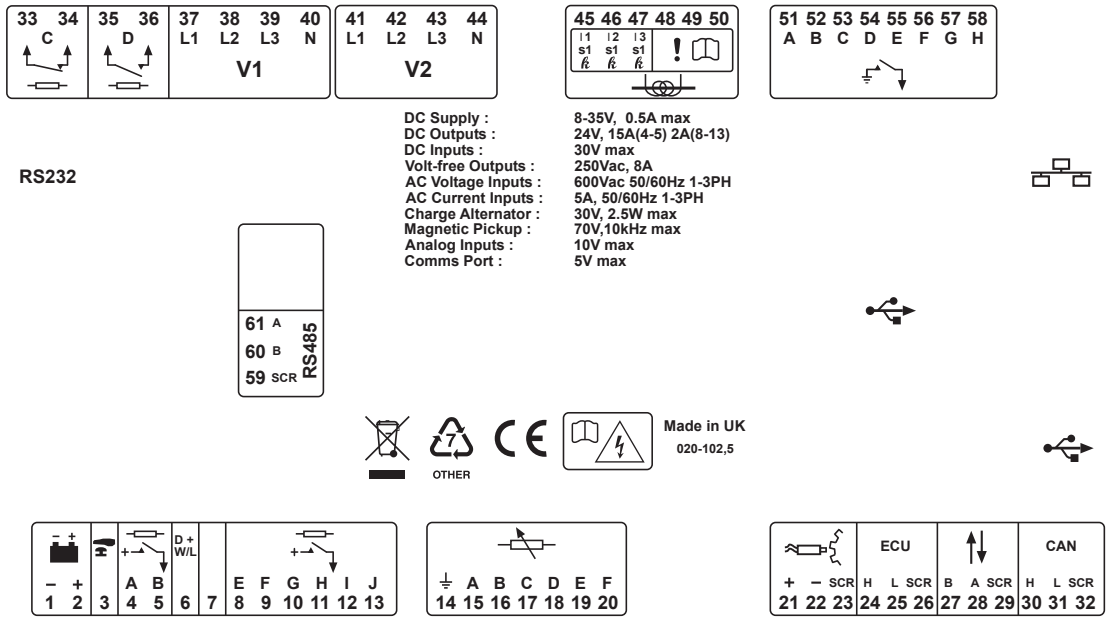
DSE**7410 MKII** Auto Start & DSE**7420 MKII** Auto Mains (Utility) Failure Control Modules

Part Number: 7410-03 / 7420-03

Technical Drawing



Connection Label



Refer to PIN out description charts for connection information on the operating mode controller is configured for.

Product Documentation

053-191 – DSE**7410/20 MKII** Installation Instructions
057-263 – DSE**7410/20 MKII** Operator Manual
057-262 – DSE**7410/20 MKII** Configuration Suite PC Manual

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055-203/01/25 (2)

THIS DIAGRAM IS FOR ENGINE MODEL 4006, 4008-30 & 4012TWG/TAG
FOR USE WITH: DEEP SEA 74XX CONTROL MODULE & ADEM5 ECM

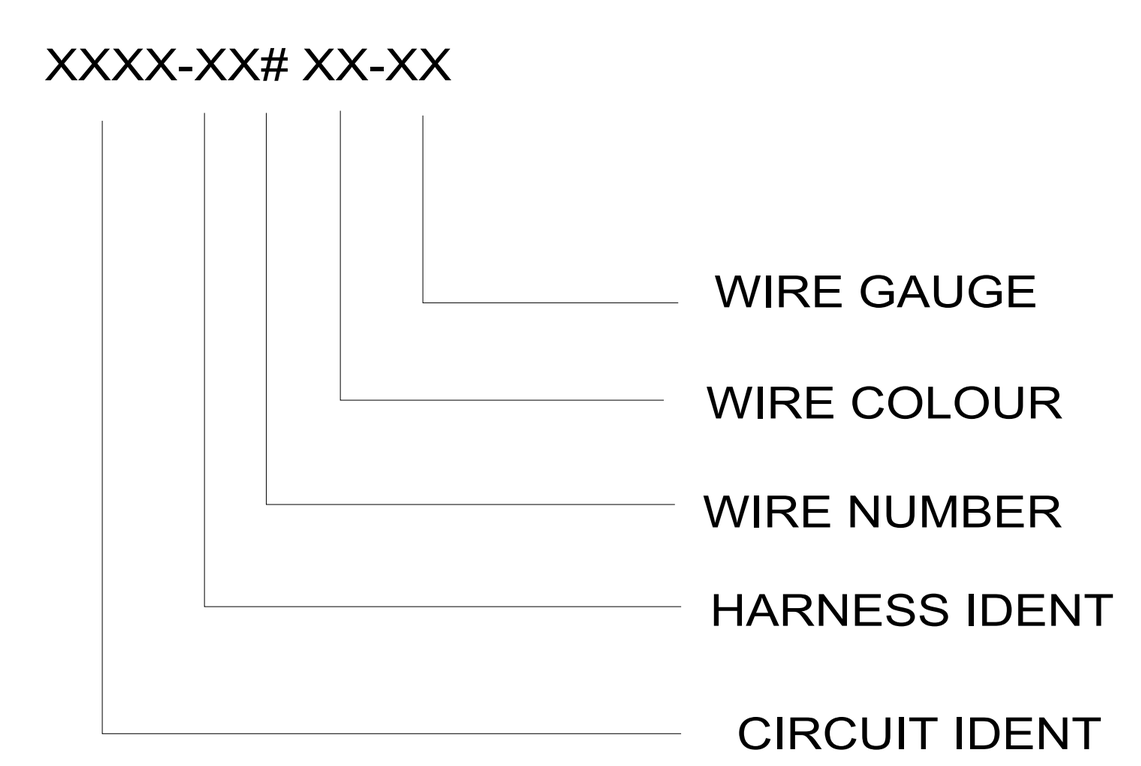
SIGNAL NAMES

CIRCUIT_ID	COLOR	DESCRIPTION
(+)	RD	BATTERY CABLE POSITIVE
(-)	BK	BATTERY CABLE NEGATIVE
(5+)	WH	ALTERNATOR EXCITER (E+)
(6-)	WH	ALTERNATOR EXCITER (E-)
1	WH	BATTERY POSITIVE
10	WH	AREP WIRING
101	WH	AC VOLTAGE SENSING (N)
102	WH	AC VOLTAGE SESNING (L1) BEFORE MCB
103	WH	AC VOLTAGE SESNING (L2) BEFORE MCB
104	WH	AC VOLTAGE SESNING (L3) BEFORE MCB
108	WH	AC VOLTAGE SESNING (L1) AFTER MCB
109	WH	AC VOLTAGE SESNING (L2) AFTER MCB
110	WH	AC VOLTAGE SESNING (L3) AFTER MCB
11	WH	AREP WIRING
12	WH	AREP WIRING
14	WH	PMG WIRING
15	WH	PMG WIRING
16	WH	PMG WIRING
17	WH	EMERGENCY STOP -PANEL
17A	WH	EMERGENCY STOP -PANEL
181	WH	MAINS SENSING NEUTRAL
182	WH	MAINS SENSING L3
183	WH	MAINS SENSING L2
184	WH	MAINS SENSING L1
19	WH	CHARGING ALTERNATOR
215	WH	BREAKER SHUNT SIGNAL
22	WH	MAINS BREAKER RELAY CONTROL
24	WH	REMOTE START
28	WH	GEN BREAKER RELAY CONTROL
3	WH	IGNITION & FUEL CONTROL SOLENOID
3/3A	WH	CANOPY EMERGENCY STOP LINK
30	WH	PANEL ANALOGUE GND
317	WH	DROOP/ISOCH (ECM)
319	WH	SPEED SELECT (ECM)
322	BK	SPEED ADJUST -ANALOGUE RETURN
323	RD	SPEED ADJUST -ANALOGUE INPUT
324	WH	SPEED ADJUST -5V SUPPLY
33	WH	ECM SWITCH INPUT RETURN
3A	WH	IGNITION & FUEL CONTROL SOLENOID
4	WH	CRANK
41	WH	MAG PICK-UP (+)
42	BK	MAG PICK-UP (-)
44	WH	SPEED ADJUST - PWM
45	BK	SPEED ADJUST -DIGITLA RETURN
5	WH	PANEL NEGATIVE
5/17A	WH	CANOPY EMERGENCY STOP LINK
51	WH	STARTER MOTOR SIGNAL
52	WH	FUSED SUPPLY CRANK/RUN/STOP
53	WH	IGNITION & FUEL CONTROL SOLENOID
57	WH	RUN/STOP
57/57A	WH	CANOPY EMERGENCY STOP LINK
57A	WH	RUN/STOP AFTER E-STOP LINK
5V	WH	5V SENSOR SUPPLY
61	WH	CAN J1939
62	BK	CAN J1939
7	WH	FUSED PANEL POSITIVE
8	WH	RUN/STOP
9	WH	AREP WIRING
93	WH	ECM POWER
96	WH	FUSED SUPPLY ECM POWER
99	WH	HI EXHAUST TEMPERATURE
C10	WH	CT SENSING L1
C30	WH	CT SENSING L2
C50	WH	CT SENSING L3
C90	WH	CT SENSING RETURN (L1/L2/L3)
E963	WH	MAG PICK-UP (+) -ECM
E964	BK	MAG PICK-UP (-) - ECM
ET	WH	ENGINE TEMPERATURE SENDER
ETH	GN-YL	EARTH
F+	WH	ENGINE FUEL SOLENOID (PERKINS)
GND	CU	MAG PICK-UP (GND)
L1	BK	L1 POWER CABLE
L2	BK	L2 POWER CABLE
L3	BK	L3 POWER CABLE
LNK	RD	BATTERY LINK
N	BK	NEUTRAL POWER CABLE
OP	WH	OIL PRESSURE SENDER
SA3	WH	SPARE ANALOGUE INPUT 3
SCR	CU	CAN J1939 SCREEN

SYMBOL LEGEND TABLE

	MINITURE CIRCUIT BREAKER
	EMERGENCY STOP PUSHBUTTON
	FUSED AUTOMOTIVE RELAY
	RESISTOR
	EARTH/GROUND
	CURRENT TRANSFORMER
	PANEL TERMINAL
	TERMINAL
	CONNECTOR
	BATTERY
	SPLICE
	WIRE
	SCREEN CABLE

WIRE NAME DEFINITION



COLOUR ABBREVIATIONS

ABBREVIATION	DESCRIPTION
BK	BLACK
CU	COPPER
GN-YL	GREEN-YELLOW
RD	RED
WH	WHITE

ABBREVIATIONS

ABBREVIATION	DESCRIPTION
AC	ALTERNATING CURRENT
AVR	AUTOMATIC VOLTAGE REGULATOR
E-STOP	EMERGENCY STOP PUSHBUTTON
CHARGE ALT	CHARGING ALTERNATOR
DC	DIRECT CURRENT
ECM	ENGINE CONTROL MODULE
ECMR	ENGINE CONTROL MODULE RELAY
ECR	ENGINE CRANK RELAY
SAR	START AID RELAY
E-STOP	PANEL EMERGENCY STOP PUSHBUTTON
ETH	EARTH/GROUND
MCB	MINIATURE CIRCUIT BREAKER
TERM	PANEL TERMINAL
DIN	EMCP DIGITAL INPUT

HARNESS TABLE

IDENT	PART NO.	CGH	LOC	DESCRIPTION
HARNESS AS	-	-	-	-
A	589-8312	-	SH 5	CONTROL PANEL (DSE)
E	540-3519	-	SH 2,3 & 4	RELAY BOX
F	540-3514	-	SH 2	4006 ENGINE
G	540-3515	-	SH 3	4008 ENGINE
H	540-3516	-	SH 4	4012 ENGINE
J	589-9498	-	SH 5	RUN/STOP RELAY (FUW ADEM)
N	589-9525	-	SH 2	HIGH EXHAUST TEMP (RLY)
P	589-9524	-	SH 2	HIGH EXHAUST TEMP (RTL)
EM	592-4008	-	SH 2,3 & 4	EMERGENCY STOP LINK (ENGINE)
EL	332-6334	-	SH 6	EARTH CABLE (4006 ONLY)
C	478-6899	-	SH 6	INTERNAL ALT & R450
-	478-6901	-	SH 6	INTERNAL ALT & D510
RR	366-4660	-	SH 7	R450/PMG ADAPTER FGL70 & LL7000
R	366-7451	-	SH 6	R450/PMG ADAPTER LL8000
ADP	591-1583		SH 7	R180 PMG
DP	595-1027		SH7	DROOP CT D350 AVR
DR	363-3064	-	SH 6	DROOP CT R450
VT	595-0999		SH7	3PH SENSING D350
LN	240-0465	-	SH 2	BATTERY LINK -4006
LK	369-0329	-	SH 3&4	BATTERY LINK -4008/4012/4016
NA	370-4031	-	SH 2	BATTERY -VE 4006
PA	325-5914	-	SH 2	BATTERY +VE 4006
NC	370-4033	-	SH 3&4	BATTERY -VE 4008/4012/4016
PC	370-4032	-	SH 3&4	BATTERY +VE 4008/4012/4016
PL	MDS5750	-	-	1250A Power Loom (Gen-set fitted)
-	Multiple	-	-	1600A Power Loom (Gen-set fitted)
-	Multiple	-	-	2000A Power Loom (Gen-set fitted)
-	500-3222	-	-	1600A Power Loom Kit
-	500-3223	-	-	2000A Power Loom Kit
-	500-3224	-	-	2500A Power Loom Kit
-	500-3225	-	-	3200A Power Loom Kit
-	500-3226	-	-	4000A Power Loom Kit
ST	461-7891	-	SH 6	SHUNT TRIP (4006 ONLY)

MATL	
HT TR	
1E5167A	INT-PROP
1E0198W	BRAND MARKINGS
1E0013Y	CONFIDENTIALITY
1E0012A	INTERPRETATION
NOTE 1E0011	INTPR & TOL
Caterpillar: Confidential Yellow	
PROD / OTHER	RECORDS
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN mm DIMENSIONS W/O TOL ARE BASIC	VERSION TYPE: PRIMARY X / SECONDARY
THIRD ANGLE PROJECTION	SHEET 1 OF 7
	DWG CONTROL NB759

CATERPILLAR

DIAGRAM-WIRING
(4000 SERIES C/W ADEM)

589-9486 | VER DK | CHG 01 | 2X3

ENGINE WIRING - 4006TAG

DC ENGINE CONNECTOR

F-C1

OP-F6 WH-18	7	OIL PRESSURE SENDER
5V-F70 WH-18	9	5V OIL PRESSURE SUPPLY
ET-F7 WH-18	8	COOLANT TEMP SENDER
16-F2 WH-18	16	COOLANT TEMP SWITCH
15-F8 WH-18	15	OIL PRESSURE SWITCH
30-F9 WH-18	6	ANALOGUE GROUND (SENDERS)
CBL-F1:42-F1 BK-18	14	MAG PICKUP (+)
CBL-F1:41-F2 WH-18	18	MAG PICKUP (-)
CBL-F1:GND-F3 CU-20	17	MAG PICKUP (SCR)
	36	
	35	
	34	
5-F18 WH-14	5	DC NEGATIVE
CBL-F3:SCR-F3 CU-20	24	CAN J1939 (+)
CBL-F3:62-F1 BK-18	23	CAN J1939 (-)
CBL-F3:61-F2 WH-18	22	CAN J1939 (SCR)
	1	
	20	
	21	
REF. [17,B] 19-F33 WH-18	19	CHARGING ALT EXCITATION
319-F30 WH-18	27	SPEED SELECT
317-F29 WH-18	28	DROOP I/P
33-F37 WH-18	29	SWITCH I/P RETURN
57-F34 WH-18	25	IGNITION & FUEL CONTROL SOLENOID
5-F32 WH-16	12	E-STOP CONNECTOR
17-F31 WH-18	11	E-STOP CONNECTOR
3-F40 WH-18	3	RUN/STOP SIGNAL
REF. [11,B] 4-F39 WH-18	4	ENGINE CRANK
REF. [9,A] 7-F41 WH-18	13	DC POSITIVE - RELAY BOX
REF. [16,C] 1-F38 WH-18	2	DC SUPPLY - PANEL
ETH-F42 GN-YL-16	10	EARTH

REFER TO PANEL SCHEMATIC FOR MATING CONNECTOR

ENGINE ECM ADEM 5

F-C9

J1-PIN38 VR+	38	5-F18 WH-14
J1-PIN37 VR-	37	
J1-PIN86 BATTERY-	81	5-F21 WH-14
J1-PIN82 BATTERY-	82	5-F20 WH-14
J1-PIN83 BATTERY-	83	5-F19 WH-14
J1-PIN27 CAN SCR	27	CBL-F3:SCR-F3 CU-20
J1-PIN26 CAN A-	26	CBL-F3:62-F1 BK-18
J1-PIN25 CAN A+	25	CBL-F3:61-F2 WH-18
J1-PIN72 5V SENSOR	72	CBL-F5:324-F3 WH-18
J1-PIN80 ANALOGUE I/P	80	CBL-F5:323-F1 RD-18
J1-PIN30 ANALOGUE RETURN	30	CBL-F5:322-F2 BK-18
		CBL-F5:SCR-F4 GN-18
		CBL-F2:SCR-F3 CU-20
J1-PIN64 DIGITAL RETURN	64	CBL-F2:44-F2 WH-18
J1-PIN79 PWM SEN	79	CBL-F2:45-F1 BK-18
J1-PIN58 SPEED SEL SW	58	319-F30 WH-18
J1-PIN74 DROOP ISO	74	317-F29 WH-18
J1-PIN36 SWITCH I/P RTRN	36	33-F37 WH-18
J1-PIN66 RUN/STOP SW	66	57A-F28 WH-18
J1-PIN84 BATTERY+	84	93-F24 WH-14
J1-PIN85 BATTERY+	85	93-F25 WH-14
J1-PIN86 BATTERY+	86	93-F26 WH-14
J1-PIN69 IGNITION	69	

F-C12 — SPEED ADJUST CONNECTOR

5	
4	
6	
7	
3	
1	
2	

93-F27 WH-14 — REF. [9,A]

EMERGENCY STOP CONNECTOR

EM-C1 F-C4

4	57A-F28 WH-18
3	57-F34 WH-18
2	5-F32 WH-16
5	17-F31 WH-18
1	3-F40 WH-18
6	3A-F36 WH-18

RELAY BOX

F-C2 E-C1

13	ETH-E1 GN-YL-16	COVER ETH
10	3A-F36 WH-18	ETH-E13 GN-YL-16 — ETH-E2 GN-YL-16 — PANEL ETH
12	53-F45 WH-16	3A-E3 WH-18 — 5-E17 WH-18 — FCR 85
22	REF. [16,C] 1-F54 WH-12	53-E6 WH-16 — FCR 86
	1-E9 WH-10 — 1-E16 WH-14 — MCB 26 (10A) — 52-E18 WH-16 — 52-E19 WH-16	FCR 87
	1-E11 WH-12 — REF. [7,A]	FCR 87A
9	REF. [3,E] 4-F39 WH-18	FCR 30
11	51-F52 WH-14	5-E12 WH-18 — ECR 85
		4-E4 WH-18 — ECR 86
		51-E5 WH-16 — ECR 87
		ECR 87A
		ECR 30
		REF. [8,B] 5-E10 WH-18 — ECMR 85
		ECMR 86
		ECMR 87
		ECMR 87A
		ECMR 30
16	5-F62 WH-16	5-E15 WH-16 — 5-E12 WH-18 REF. [8,B]; 5-E10 WH-18 REF. [4,B]; 5-E17 WH-18 REF. [4,C]
15	REF. [5,E] 7-F41 WH-18	7-E8 WH-18
1	REF. [13,F] 93-F27 WH-14	93-E7 WH-18
	REF. [7,C] 1-E11 WH-12 — MCB 27 (25A)	96-E14 WH-12

FUEL CONTROL SOLENOID

F-C13

PERKINS F+	4	5-F53 WH-14 — REF. [14,A]
PERKINS F+	3	F+-F50 WH-14
	2	F+-F49 WH-14
	1	51-F52 WH-14

PERKINS 51

FCSR

86	
85	5-F61 WH-18 — REF. [12,H]
87	F+-F51 WH-12
87A	
30	REF. [15,C] 1-F48 WH-10

STARTER MOTOR

50, S, G, 30 BTRY, MOT, 31, M

REF. [13,D] 1-F48 WH-10
REF. [9,C] 1-F54 WH-12
REF. [5,E] 1-F38 WH-18
1-F58 RD-8

CHARGE ALT

REF. [4,G] 19-F33 WH-18 — A — 1-F59 RD-8
REF. [10,I] 5-F15 BK-8 — GND

(+)-PA1 RD-2
(-)-NA2 BK-2
5-F63 WH-10
51-F52 WH-14

LNK-LN1 RD-2

BATTERY BATTERY

5-F53 WH-14 — REF. [14,D]

53-F4 WH-18 — REF. [15,L]
53-F46 WH-16

LEVEL SWITCH LOW COOLANT

F-C3

C	5-F60 WH-18 — REF. [12,H]
A	53-F4 WH-18 — REF. [11,E]
B	16-F3 WH-18

ENGINE TEMP SWITCH

F-C5

A	
B	16-F1 WH-18
C	5-F5 WH-16 — REF. [10,I]

OIL PESSURE SWITCH

F-C6

2	A	15-F8 WH-18
1	B	
3	C	5-F11 WH-16 — REF. [12,I]

MAGNETIC PICKUP

F-C7

1	1	CBL-F1:42-F1 BK-18
2	2	CBL-F1:41-F2 WH-18
		CBL-F1:GND-F3 CU-20

MAGNETIC PICKUP

F-C10

1	2	CBL-F4:E963-F2 WH-18
2	1	CBL-F4:E964-F1 BK-18
		CBL-F4:SCR-F3 CU-20

OIL PRESSURE SENDER

F-C8

2	30-F10 WH-18 — REF. [10,J]
3	OP-F6 WH-18
1	5V-F70 WH-18

ENGINE TEMP SENDER

HI EXHAUST THERMOCOUPLE

PERKINS -RTL +
PERKINS -RTL -
RTL UNIT LOCATED IN CONTROL PANEL SHEET 5

30-F12 WH-18 — ENGINE BLOCK
30-F10 WH-18 — REF. [11,K]

5-F5 WH-16 — REF. [17,K]
5-F14 WH-12 — 5-F15 BK-8 — REF. [17,B]
5-F17 WH-18
5-F61 WH-18 — REF. [12,D]
5-F11 WH-16 — REF. [15,J]
5-F60 WH-18 — REF. [17,L]

1E5167A	INT-PROP
1E0198W	BRAND MARKINGS
1E0013Y	CONFIDENTIALITY
1E0012A	INTERPRETATION
1E0011	INTPR & TOL
C	Caterpillar: Confidential Yellow

PROG OTHER RECORDS
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MM; DIMENSIONS INCL TOL ARE BASIC
SERVICE PRIMARY X
TYPE SECONDARY
THIRD ANGLE PROJECTION
SHEET 2 OF 7
ENG CONTROL N8759

CATERPILLAR

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DIAGRAM-WIRING
(4000 SERIES C/W ADEM3)
589-9486
SIZE D | DWG DK | REV 01 | 2X3

ENGINE WIRING - 4008-30

LEVEL SWITCH LOW COOLANT — G-C3
- 5-G66 WH-18 — REF. [13,H]
- 53-G2 WH-18 — REF. [11,E]
- 16-G3 WH-18

ENGINE TEMP SWITCH — G-C5
- 16-G5 WH-18
- 5-G6 WH-18 — REF. [12,H]

OIL PESSURE SWITCH — G-C6
- 15-G7 WH-18
- 5-G8 WH-18 — REF. [13,H]

OIL PRESSURE SENDER — G-C8
- 30-G11 WH-18 — REF. [10,J]
- OP-G14 WH-18
- 5V-G13 WH-18

ENGINE TEMP SENDER
- ET-G12 WH-18

HI EXHAUST THERMOCOUPLE
- PERKINS -RTL +
- PERKINS -RTL -

HI EXHAUST THERMOCOUPLE
- PERKINS -RTL +
- PERKINS -RTL -

RTL UNIT LOCATED IN CONTROL PANEL SHEET 5

30-G10 WH-18 — ENGINE BLOCK

30-G11 WH-18 — REF. [11,L]

MAGNETIC PICKUP — G-C7
- CBL-G1:42-G1 BK-18
- CBL-G1:41-G2 WH-18
- CBL-G1:GND-G3 CU-20

MAGNETIC PICKUP — G-C10
- CBL-G4:E963-G2 WH-18
- CBL-G4:E964-G1 BK-18
- CBL-G4:SCR-G3 CU-20

ENGINE ECM ADEM 5 — G-C9

J1-PIN38 VR+	38	
J1-PIN37 VR-	37	
J1-PIN86 BATTERY-	81	5-G17 WH-14
J1-PIN82 BATTERY-	82	5-G18 WH-14
J1-PIN83 BATTERY-	83	5-G19 WH-14
J1-PIN27 CAN SCR	27	CBL-G2:SCR-G3 CU-20
J1-PIN26 CAN A-	26	CBL-G2:62-G1 BK-18
J1-PIN25 CAN A+	25	CBL-G2:61-G2 WH-18
J1-PIN72 5V SENSOR	72	CBL-G5:323-G3 WH-18
J1-PIN80 ANALOGUE I/P	80	CBL-G5:322-G1 RD-18
J1-PIN30 ANALOGUE RETURN	30	CBL-G5:324-G2 BK-18
		CBL-G5:SCR-G4 GN-18
J1-PIN64 DIGITAL RETURN	64	CBL-G3:44-G2 WH-18
J1-PIN79 PWM SEN	79	CBL-G3:45-G1 BK-18
		CBL-G3:SCR-G3 CU-20
J1-PIN58 SPEED SEL SW	58	319-G28 WH-18
J1-PIN74 DROOP ISO	74	317-G29 WH-18
J1-PIN36 SWITCH I/P RTRN	36	33-G35 WH-18
J1-PIN66 RUN/STOP SW	66	57A-G27 WH-18
J1-PIN84 BATTERY+	84	93-G23 WH-14
J1-PIN85 BATTERY+	85	93-G24 WH-14 — 93-G26 WH-12 — REF. [9,A]
J1-PIN86 BATTERY+	86	93-G25 WH-14
J1-PIN69 IGNITION	69	

5-G65 WH-14
- 5-G54 WH-18 — REF. [10,B]
- 5-G60 BK-8 — REF. [17,B]
- 5-G56 BK-8 — REF. [14,B]
- 5-G63 WH-18

5-G64 WH-14
- 5-G8 WH-18 — REF. [15,J]
- 5-G6 WH-18 — REF. [17,K]
- 5-G66 WH-18 — REF. [15,L]
- 5-G67 WH-18 — REF. [13,D]

SPEED ADJUST CONNECTOR — G-C11

EMERGENCY STOP CONNECTOR — EM-C1 G-C4
- 57A-G27 WH-18
- 57-G34 WH-18
- 17-G33 WH-18
- 5-G30 WH-18
- 3-G31 WH-18

FUEL CONTROL SOLENOID
- PERKINS F+
- PERKINS F+

G-C12
- 5-G41 WH-14 — REF. [14,A]
- F+-G42 WH-14 — REF. [13,H]
- F+-G43 WH-14
- 51-G46 WH-14 — REF. [17,C] — 1-G58 WH-12
- PERKINS 51

FCSR
- 53-G1 WH-16 — 86
- 5-G67 WH-18 — 85
- F+-G44 WH-12 — 87
- 87A
- 1-G58 WH-12 — 30

STARTER MOTOR
- REF. [9,C] — 1-G57 WH-12
- REF. [12,D] — 1-G58 WH-12
- REF. [5,E] — 1-G47 WH-18
- 1-G68 RD-8

CHARGE ALT
- REF. [4,G] — 19-G61 WH-18
- REF. [10,I] — 5-G60 BK-8
- 1-G69 RD-8

5-G55 WH-10
- 5-G56 BK-8 — REF. [10,H]
- 5-G41 WH-14 — REF. [14,D]

(+)-PC1 RD-2

(-)-NC1 BK-2

LNK-LK1 RD-2

BATTERY

BATTERY

REF. [15,L] — 53-G2 WH-18

53-G1 WH-16

53-G51 WH-16

3A-G32 WH-18

ETH-G50 GN-YL-16

51-G46 WH-14

REF. [17,C] — 1-G57 WH-12

REF. [3,E] — 4-G48 WH-18

51-G46 WH-14

REF. [11,I] — 5-G54 WH-18

REF. [5,E] — 7-G49 WH-18

REF. [13,F] — 93-G26 WH-12

ETH-G52 GN-YL-16 — STARTER

ETH-G53 GN-YL-16

REFER TO PANEL SCHEMATIC FOR MATING CONNECTOR

RELAY BOX — G-C2 E-C1

ETH-E1 GN-YL-16 — COVER ETH

ETH-E13 GN-YL-16 — ETH-E2 GN-YL-16 — PANEL ETH

REF. [7,B] — 5-E17 WH-18

10 — 3A-E3 WH-18

12 — 53-E6 WH-16

22 — 1-E9 WH-10 — 1-E16 WH-14 — MCB 26 (10A) — 52-E18 WH-16 — 52-E19 WH-16

1-E11 WH-12 — REF. [7,A]

FCR: 85, 86, 87, 87A, 30

REF. [8,B] — 5-E12 WH-18

9 — 4-E4 WH-18

11 — 51-E5 WH-16

ECR: 85, 86, 87, 87A, 30

5-E12 WH-18 — REF. [8,B]

5-E10 WH-18 — REF. [4,B]

16 — 5-E15 WH-16 — 5-E17 WH-18 — REF. [4,C]

52-E20 WH-16

REF. [8,B] — 5-E10 WH-18

ECMR: 85, 86, 87, 87A, 30

15 — 7-E8 WH-18

1 — 93-E7 WH-18

REF. [7,C] — 1-E11 WH-12 — MCB 27 (25A) — 96-E14 WH-12

REF. [17,B] — 19-G61 WH-18

7	OIL PRESSURE SENDER	OP-G14 WH-18
9	5V OIL PRESSURE SUPPLY	5V-G13 WH-18
8	COOLANT TEMP SENDER	ET-G12 WH-18
16	COOLANT TEMP SWITCH	16-G4 WH-18
15	OIL PRESSURE SWITCH	15-G7 WH-18
6	ANALOGUE GROUND (SENDERS)	30-G9 WH-18
14	MAG PICKUP (+)	CBL-G1:42-G1 BK-18
18	MAG PICKUP (-)	CBL-G1:41-G2 WH-18
17	MAG PICKUP (SCR)	CBL-G1:GND-G3 CU-20
36		
35		
34		
5	DC NEGATIVE	5-G63 WH-18
24	CAN J1939 (+)	CBL-G2:SCR-G3 CU-20
23	CAN J1939 (-)	CBL-G2:62-G1 BK-18
22	CAN J1939 (SCR)	CBL-G2:61-G2 WH-18
1		
20		
21		
19	CHARGING ALT EXCITATION	19-G61 WH-18 — REF. [17,B]
27	SPEED SELECT	319-G28 WH-18
28	DROOP I/P	317-G29 WH-18
29	SWITCH I/P RETURN	33-G35 WH-18
25	RUN/STOP SIGNAL	57-G34 WH-18
12	E-STOP CONNECTOR	17-G33 WH-18
11	E-STOP CONNECTOR	5-G30 WH-18
3	IGNITION & FUEL CONTROL SOLENOID	3-G31 WH-18
4	ENGINE CRANK	4-G48 WH-18 — REF. [10,B]
13	DC POSITIVE - RELAY BOX	7-G49 WH-18 — REF. [9,A]
2	DC SUPPLY - PANEL	1-G47 WH-18 — REF. [16,C]
10	EARTH	ETH-G53 GN-YL-16

1E5167A	INT-PROP
1E0185W	BRAND MARKINGS
1E0013Y	CONFIDENTIALITY
1E0012A	INTERPRETATION
1E0011	INTPR & TOL
Caterpillar: Confidential Yellow	
PROG	RECORDS
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN mm. DIMENSIONS AND TOLS ARE BASIC	SERIOUS PRIMARY X; TYPE SECONDARY
THIRD ANGLE PROJECTION	SHEET 3 OF 7; SYS CONTROL NB759

CATERPILLAR

DIAGRAM-WIRING
(4000 SERIES C/W ADEM)

589-9486	SIS DK	DWG 2X3
	01	

ENGINE WIRING - 4012 TWG/TAG

Sensors and switches

- LEVEL SWITCH LOW COOLANT — H-C3 — 53-H34 WH-16 — REF. [11,E]; 16-H30 WH-18
- ENGINE TEMP SWITCH — H-C14 — 16-H53 WH-18; 5-H74 WH-18 — REF. [12,H]
- ENGINE TEMP SWITCH — H-C5 — 16-H19 WH-18; 5-H54 WH-18 — REF. [10,I]
- OIL PESSURE SWITCH — H-C15 — 15-H56 WH-18; 5-H73 WH-18 — REF. [14,H]
- OIL PESSURE SWITCH — H-C6 — 15-H55 WH-18; 5-H39 WH-18 — REF. [12,I]
- OIL PRESSURE SENDER — H-C8 — OP-H16 WH-18; 30-H52 WH-18; 5V-H32 WH-18 — REF. [10,J]
- ENGINE TEMP SENDER — ET-H17 WH-18
- PERKINS SUPPLIED THERMOCOUPLE — H-C13 — ETH-H63 GN-YL-16 — REF. [7,E]; 5-H64 WH-18 — REF. [12,H]; 7-H67 WH-18 — TERM 3; 5-H65 WH-18 — REF. [12,H]; 99-H66 WH-18 — TERM 24 — CONTROL PANEL TERMS
- 30-H51 WH-18 — ENGINE BLOCK
- 30-H52 WH-18 — REF. [9,K]
- MAGNETIC PICKUP — H-C7 — CBL-C1:42-H1 BK-18; CBL-C1:41-H2 WH-18; CBL-C1:GND-H3 CU-20
- MAGNETIC PICKUP — H-C10 — CBL-H1:E963-H2 WH-18; CBL-H1:E964-H1 BK-18; CBL-H1:SCR-H3 CU-20

H-C1 (to control panel terms)

7	OIL PRESSURE SENDER
9	5V OIL PRESSURE SUPPLY
8	COOLANT TEMP SENDER
16	COOLANT TEMP SWITCH (16-H29 WH-18)
15	OIL PRESSURE SWITCH (15-H20 WH-18)
6	ANALOGUE GROUND (SENDERS) (30-H31 WH-18)
14	MAG PICKUP (+) (CBL-C1:42-H1 BK-18)
18	MAG PICKUP (-) (CBL-C1:41-H2 WH-18)
17	MAG PICKUP (SCR) (CBL-C1:GND-H3 CU-20)
36	
35	
34	
5	DC NEGATIVE
24	CAN J1939 (+) (CBL-H2:SCR-H3 CU-20)
23	CAN J1939 (-) (CBL-H2:62-H1 BK-18)
22	CAN J1939 (SCR) (CBL-H2:61-H2 WH-18)
1	
20	
21	
19	CHARGING ALT EXCITATION (REF. [17,B] — 19-H33 WH-18)
27	SPEED SELECT (319-H76 WH-18)
28	DROOP I/P (317-H75 WH-18)
29	SWITCH I/P RETURN (33-H10 WH-18)
25	RUN/STOP SIGNAL (57-H35 WH-18)
12	E-STOP CONNECTOR (17-H26 WH-18)
11	E-STOP CONNECTOR (5-H27 WH-18)
3	IGNITION & FUEL CONTROL SOLENOID (3-H43 WH-18)
4	ENGINE CRANK (REF. [11,B] — 4-H68 WH-18)
13	DC POSITIVE - RELAY BOX (REF. [9,A] — 7-H13 WH-18)
2	DC SUPPLY - PANEL (REF. [16,C] — 1-H18 WH-18)
10	EARTH (ETH-H45 GN-YL-16)

ENGINE ECM ADEM 5 — H-C9

J1-PIN38 VR+	38	
J1-PIN37 VR-	37	
J1-PIN86 BATTERY-	81	5-H1 WH-14
J1-PIN82 BATTERY-	82	5-H2 WH-14
J1-PIN83 BATTERY-	83	5-H3 WH-14
J1-PIN27 CAN SCR	27	CBL-H2:SCR-H3 CU-20
J1-PIN26 CAN A-	26	CBL-H2:62-H1 BK-18
J1-PIN25 CAN A+	25	CBL-H2:61-H2 WH-18
J1-PIN72 5V SENSOR	72	CBL-H4:SCR-H4 GN-18
J1-PIN80 ANALOGUE I/P	80	CBL-H4:324-H3 WH-18
J1-PIN30 ANALOGUE RETURN	30	CBL-H4:323-H1 RD-18
		CBL-H4:322-H2 BK-18
J1-PIN64 DIGITAL RETURN	64	CBL-H3:44-H2 WH-18
J1-PIN79 PWM SEN	79	CBL-H3:45-H1 BK-18
		CBL-H3:SCR-H3 CU-20
J1-PIN58 SPEED SEL SW	58	319-H76 WH-18
J1-PIN74 DROOP ISO	74	317-H75 WH-18
J1-PIN36 SWITCH I/P RTRN	36	33-H10 WH-18
J1-PIN66 RUN/STOP SW	66	57A-H9 WH-18
J1-PIN84 BATTERY+	84	93-H7 WH-14
J1-PIN85 BATTERY+	85	93-H6 WH-14
J1-PIN86 BATTERY+	86	93-H5 WH-14
J1-PIN69 IGNITION	69	53-H34 WH-16 — REF. [15,L]

- 5-H4 WH-14 — 5-H1 WH-14; 5-H2 WH-14; 5-H3 WH-14
- 5-H40 WH-12 — 5-H65 WH-18 — REF. [6,K]; 5-H64 WH-18 — REF. [6,K]; 5-H74 WH-18 — REF. [17,K]; 5-H73 WH-18 — REF. [15,K]; 5-H38 WH-14 — REF. [12,D]
- 5-H54 WH-18 — REF. [14,K]; 5-H41 WH-18 — REF. [17,B]; 5-H42 BK-8 — REF. [15,B]; 5-H39 WH-18 — REF. [12,J]; 5-H46 WH-18

SPEED ADJUST CONNECTOR — H-C11

CBL-H4:SCR-H4 GN-18	7
CBL-H4:324-H3 WH-18	5
CBL-H4:323-H1 RD-18	4
CBL-H4:322-H2 BK-18	6
CBL-H3:44-H2 WH-18	1
CBL-H3:45-H1 BK-18	2
CBL-H3:SCR-H3 CU-20	3

EMERGENCY STOP CONNECTOR — EM-C1 / H-C4

4	
3	57-H35 WH-18
2	17-H26 WH-18
5	5-H27 WH-18
1	3-H43 WH-18
6	3A-H44 WH-18

- 93-H8 WH-12 — REF. [9,A]
- 53-H36 WH-16 — REF. [12,H]
- 1-H37 WH-10 — REF. [18,C]

FCSR

86	53-H36 WH-16
85	5-H38 WH-14
87	F+-H49 WH-12
87A	
30	1-H37 WH-10

H-C12

4	5-H71 WH-14 — REF. [15,A]
3	F+-H22 WH-14
2	F+-H21 WH-14
1	51-H28 WH-14

- FUEL CONTROL SOLENOID — PERKINS F+; PERKINS F+ — PERKINS F+; PERKINS F+
- FUEL CONTROL SOLENOID — PERKINS F+; PERKINS F+
- PERKINS - 51; PERKINS - 51
- STARTER MOTOR (S, G, 30 BTRY, MOT, 50, M, 31)
- REF. [13,D] — 1-H37 WH-10
- REF. [5,E] — 1-H69 WH-12
- REF. [5,E] — 1-H18 WH-18
- 1-H15 RD-8 — 1-H14 RD-8
- CHARGE ALT (A, GND) — REF. [5,G] 19-H33 WH-18; 5-H41 WH-18; REF. [10,I]
- (+)-PC1 RD-2; (-)-NC1 BK-2; 5-H72 WH-10; 5-H70 WH-18; (+)-PC1 RD-2; (-)-NC1 BK-2
- LNK-LK2 RD-2; LNK-LK3 RD-2
- BATTERY; BATTERY; BATTERY
- 5-H42 BK-8 — REF. [11,B]; REF. [10,I]
- 5-H71 WH-14 — REF. [14,D]
- 51-H28 WH-14

RELAY BOX — H-C2 / E-C1

13	ETH-E1 GN-YL-16 — COVER ETH; ETH-E13 GN-YL-16 — ETH-E2 GN-YL-16 — PANEL ETH
10	3A-H44 WH-18 — 3A-E3 WH-18
12	53-H11 WH-18 — 53-E6 WH-16
22	REF. [18,C] 1-H69 WH-12 — 1-E9 WH-10 — 1-E16 WH-14 — MCB 26 (10A) — 52-E18 WH-16 — 52-E19 WH-16
9	REF. [3,E] 4-H68 WH-18
11	51-H28 WH-14
16	REF. [14,A] 5-H70 WH-18 — 5-E15 WH-16 — 5-E12 WH-18 / 5-E10 WH-18 / 5-E17 WH-18
15	REF. [5,E] 7-H13 WH-18; REF. [13,F] 93-H8 WH-12 — 7-E8 WH-18
1	93-E7 WH-18

- REF. [7,B] — 5-E17 WH-18 — FCR (85, 86, 87, 87A, 30)
- REF. [7,A] — 1-E11 WH-12
- REF. [8,B] — 5-E12 WH-18; 4-E4 WH-18; 5-E11 WH-16 — ECR (85, 86, 87, 87A, 30)
- REF. [8,B] — 5-E10 WH-18 — ECMR (85, 86, 87, 87A, 30)
- REF. [7,C] — 1-E11 WH-12 — MCB 27 (25A) — 96-E14 WH-12

ETH-H47 GN-YL-16; 53-H11 WH-18

REFER TO PANEL SCHEMATIC FOR MATING CONNECTOR

- ETH-H50 GN-YL-16 — STARTER
- ETH-H63 GN-YL-16 — REF. [6,L]
- ETH-H45 GN-YL-16

1E5167A	INT-PROP		
1E0195W	BRAND MARKINGS		
1E0013Y	CONFIDENTIALITY		
1E0012A	INTERPRETATION		
1E0011	INTPR & TOL		
Caterpillar: Confidential Yellow			
PROG	DATA	RECORDS	
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN mm. DIMENSIONS AND TOL ARE BASIC		SERVICE - PRIMARY: X; TYPE: SECONDARY	
THIRD ANGLE PROJECTION	SHEET 4	OF 7	
	ENG CONTROL	NB759	

CATERPILLAR

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DIAGRAM,WIRING
(4000 SERIES C/W ADEM)

589-9490 | DR: DK | CHG: 01 | SZ: 2X3

DC PANEL WIRING

HIGH EXHAUST TEMP RELAY
FUW 4006 50Hz & 4008-30 (2 x RTL UNITS FITTED AS STANDARD)

REF SHEET 2 & 3
PERKINS -RTL (-)
PERKINS -RTL (+)
TERM 3 — P-T11 — 7-P7 WH-18 — 7-P7 WH-18
5-P5 WH-18
TERM 6 — P-T10 — 5-P1 WH-18 — 5-P14 WH-18
DIGITAL INPUT E — P-T1 — 22-P2 WH-18 — 22-P2 WH-18
TERM 20 — P-T12 — 108-P3 WH-18
TERM 23 — P-T13 — 215-P6 WH-18

L (+) I (-)
A
B
R
S
U
V
HIGH EXHAUST TEMP RELAY DAT5024P

HIGH EXHAUST TEMP RELAY
FUW 4006 60Hz & 4012TWG/TAG 50Hz

TERM 23 — N-T7 — 215-N4 WH-18
TERM 20 — N-T6 — 108-N5 WH-18
TERM 6 — N-T11 — 5-N2 WH-18
TERM 3 — N-T12 — 7-N6 WH-18
TERM 24 — N-T1 — 99-N3 WH-18
DIGITAL INPUT E — N-T13 — 22-N1 WH-18

HXTR
N-T8 11 — 14 N-T5
12
N-T4 21 — 24 N-T3
22
N-T9 A1 — A2 N-T2

DSE7XXX CONTROL MODULE

PROGRAMMABLE ANALOGUE INPUTS (NOTE A)
20 ANALOGUE I/P (F)
19 ANALOGUE I/P (E)
18 ANALOGUE I/P (D)
17 ANALOGUE I/P (C)
15 ANAL I/P (A) LOW OIL PRESS
16 ANAL I/P (B) HIGH ENGINE TEMP
53 INPUT C (NEG) COOL LVL&ENG TEMP
54 INPUT D (NEG) OIL PRESSURE
14 ANALOGUE COMMON GND

A-C1

TERM 10 — A-T07 — SA3-A1 WH-18 — A-T14
7 — OP-A2 WH-18 — OP-A2 WH-18 — A-T21
5V OIL PRESSURE SUPPLY — 9 — 5V-A3 WH-18
A-T22 TERM 9
COOLANT TEMP SENDER — 8 — ET-A4 WH-18 — ET-A4 WH-18 — A-T23
COOLANT TEMP SWITCH — 16 — 16-A5 WH-18 — 16-A5 WH-18 — A-T25
COOLANT TEMP SENDER — 15 — 15-A6 WH-18 — 15-A6 WH-18 — A-T24
ANALOGUE GROUND (SENDERS) — 6 — 30-A7 WH-18 — 30-A8 WH-18 — A-T26
A-T7 A-T1 TERM 8

14
18
17
36
35
34

TERM 11 — CBL-A2:61-A2 WH-18
120R
TERM 12 — CBL-A2:62-A1 BK-18
TERM 13 — CBL-A2:SCR-A3 CU-20

MAGNETIC PICKUP IF FITTED
22 MPU -
21 MPU +
23 MPU SCR

CBL-A1:61-A2 WH-18
CBL-A1:62-A1 BK-18
CBL-A1:SCR-A3 CU-20

DC NEGATIVE — 5 — 5-A9 WH-18 — REF. [8,F]

CAN J1939 (SCR) — 24 — CBL-A3:SCR-A3 CU-20 — CBL-A3:SCR-A3 CU-20
CAN J1939 (-) — 23 — CBL-A3:62-A1 BK-18 — CBL-A3:62-A1 BK-18
CAN J1939 (+) — 22 — CBL-A3:61-A2 WH-18 — CBL-A3:61-A2 WH-18

24 ECU CAN H
25 ECU CAN L
26 ECU CAN SCR

CHARGING ALT EXCITATION — 19 — 19-A10 WH-18 — A-T28
6 CHARGE ALT O/P

RUN/STOP RELAY (RSCR)
33-J2 WH-18
57-J3 WH-18
8-J4 WH-18 — A-T1
5-J1 WH-18
8 OUTPUT E (POS) RUN/STOP

5-A15 WH-18 — 5-A14 WH-18 — A-T30
5-A9 WH-18 — REF. [14,H]
1 BATTERY NEGATIVE

LINK TERM 15 & 16 FOR 1800RPM
TERM 17
SPEED SELECT — 27 — 319-A19 WH-18
TERM 16
SWITCH I/P RETURN — 29 — 33-A18 WH-18
TERM 15
DROOP/ISOCH — 28 — 317-A20 WH-18
TERM 14
LINK TERM 14 & 15 FOR DROOP

TERM 6 — CONNECT TO START (AUTO) — TERM 5 — 24-A16 WH-18 — 24-A16 WH-18 — A-T45
TERM 7 — TERM 4
51 INPUT A (REMOTE START)

AUTO MAINS FAILURE CIRCUITRY REFER TO SHEET 7
33 RELAY O/P C (COM-POS)
34 RELAY O/P C (MAINS BRKR N/C)
35 RELAY O/P D (COM-POS)
36 RELAY O/P D (GEN BRKR N/O)
41 MAINS SENSING L1
42 MAINS SENSING L2
43 MAINS SENSING L3
44 MAINS SENSING N

RUN/STOP SIGNAL — 25 — 57-A17 WH-18 — A-T9 J-T9 TERM 18

E-STOP
E-STOP CONNECTOR — 12 — 17A-A12 WH-18 — 17-A13 WH-18 — A-T44
3 EMERGENCY STOP

E-STOP CONNECTOR — 11 — 7-A11 WH-18 — REF. [9,C]

IGNITION & FUEL CONTROL SOLENOID — 3 — 3-A23 WH-16 — 3-A24 WH-18 — A-T43
3-A25 WH-16 — A-T50 TERM 1
4 OUTPUT A (POS) IGNITION & FUEL

ENGINE CRANK — 4 — 4-A22 WH-18 — 4-A22 WH-18 — A-T48
5 OUTPUT B (POS)

DC POSITIVE - RELAY BOX — 13 — 7-A21 WH-18 — REF. [9,C]

PROGRAMMABLE INPUTS (NOTE A)
52 INPUT B (NEG)
55 INPUT E (NEG)
56 INPUT F (NEG)
57 INPUT G (NEG)
58 INPUT H (NEG)

DC SUPPLY - PANEL — 2 — 1-A26 WH-16
EARTH — 10 — ETH-A30 GN-YL-16
REFER TO ENGINE SCHEMATIC FOR MATING CONNECTOR

CHASSIS ETH — ETH-A48 GN-YL-16
MCB 1 (6A)
7-A27 WH-18
7-A28 WH-18 — A-T46 TERM 2 — TERM 3
7-A11 WH-18 — REF. [11,D]
7-A21 WH-18 — REF. [12,D]
7-A29 WH-18

PROGRAMMABLE OUTPUTS (NOTE A)
9 OUTPUT F (POS)
10 OUTPUT G (POS)
11 OUTPUT H (POS)
12 OUTPUT I (POS)
13 OUTPUT J (POS)

DOOR ETH — ETH-A31 GN-YL-16
ETH-A32 GN-YL-16
EARTH TERM
BOX ETH — ETH-A47 GN-YL-16
ETH-A33 GN-YL-16 — REF Sheet_6-[8,E]

2 BATTERY POSITIVE

CAN J1939 CONNECTIONS (NOTE A)
31 CAN H
30 CAN L
32 CAN SCR

DSE NETLINK CONNECTIONS (NOTE A)
27 DSE NET LINK B
28 DSE NET LINK A
29 DSE NET LINK SCR

RS485 CONNECTIONS (NOTE A)
59 RS485 SCR
60 RS485 B
61 RS485 A

REQUIRED FOR 4000SERIES ENGINES ONLY - 5V SUPPLY FOR OIL PRESSURE SENSOR

DC VOLTAGE REGULATOR

Vin (6.5v - 30v) — RD — TERM 2
Vout (5v) — BR — TERM 9
GND — BK — TERM 6

1E5167A	INT-PROP	
1E0198W	BRAND MARKINGS	
1E0013Y	CONFIDENTIALITY	
1E0012A	INTERPRETATION	
1E0011	INTPR & TOL	
Caterpillar Confidential Yellow		
PROG	DTHERECORDS	
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN mm. DIMENSIONS W/O TOL ARE BASIC.	TEMPLATE PRIMARY X TYPE SECONDARY	
THIRD ANGLE PROJECTION	SHEET 5 OF 7	
	ENG CONTROL NB759	

CATERPILLAR

DIAGRAM-WIRING
(4000 SERIES C/W ADEM)
589-9486 | VER DK | CHG 01 | 2X3

POWER SCHEMATIC - LL FRAME ALTERNATOR

3PHASE 4WIRE

(6 WIRE)
3 PHASE STAR
(STANDARD ALT)

L1
L2
L3
N
E

EXCITER
AUX WINDING
L1 (U)
L2 (V)
L3 (W)
T1
T2
T3
T4
T5
T6
E

ERTH-EL1 GN-YL-00
BASEFRAME GND
4006 ONLY

CT-L1
CT-L2
CT-L3

L1-PL1 BK-00
L2-PL4 BK-00
L3-PL5 BK-00
N-PL3 BK-00
ERTH-PL2 GN-YL-2

3P BREAKER
4P BREAKER
L1
L2
L3
L4
L5
L6
CUSTOMER LOAD CONNECTION
NEUTRAL (3P BRK)
CUSTOMER EARTH CONNECTION

TERM 23
TERM 19
215-ST1 WH-16
101-ST2 WH-16
ST-73
ST-74
ST-71
ST-72
SHUNT
FITTED AS STANDARD
REF- HI EXHAUST

(6-)-LSA1 WH-16
(5+)-LSA2 WH-16
11-LSA3 WH-16
12-LSA4 WH-16
9-LSA5 WH-16
10-LSA6 WH-16

101-C9 WH-18
102-C10 WH-18
103-C11 WH-18
104-C12 WH-18
C10-C7 WH-18
C30-C6 WH-18
C50-C5 WH-18
C90-C1 WH-18
C90-C2 WH-18
C90-C3 WH-18

C-C1 A-C2
17
16
18
10
21
13
1
5
6
3
15
23
11
12

C90-C4 WH-18
C90-A43 WH-18
C50-C5 WH-18
C50-A46 WH-18
C30-C6 WH-18
C30-A45 WH-18
C10-C7 WH-18
C10-A44 WH-18
104-C12 WH-18
108-C24 WH-18
103-C11 WH-18
109-C23 WH-18
102-C10 WH-18
110-C22 WH-18
101-C9 WH-18
101-C9 WH-18
ETH-C8 GN-YL-16
ETH-A33 GN-YL-16
6.3A INLINE FUSE
REF Sheet_5-[11,B]
108-A41 WH-18
109-A39 WH-18
110-A37 WH-18
101-A35 WH-18
101-A34 WH-18
TERM 20
TERM 21
TERM 22
TERM 19

DSE7XXX CONTROL MODULE
48 GEN CURRENT SENSING N
47 GEN CURRENT SENSING L3
46 GEN CURRENT SENSING L2
45 GEN CURRENT SENSING L1
37 GEN VOLTS SENSING L1
38 GEN VOLTS SENSING L2
39 GEN VOLTS SENSING L3
40 GEN VOLTS SENSING N
C90-A43 WH-18
C50-A46 WH-18
C30-A45 WH-18
C10-A44 WH-18
108-A42 WH-18
109-A40 WH-18
110-A38 WH-18
101-A36 WH-18

SENSING CABLES TERMINATED IN ALT
ALTERNATOR EARTH
AC CONNECTOR

R45OM/T VOLTAGE REGULATOR (STANDARD)

EXT FREQ ADJ.
EXT FREQ ADJ.1
F-
F+
Z1
Z2
X1
X2
3
6
1
5
4
2
LSA-C1
R450M/T AVR
VOLTS ADJ. POT.
VOLTS ADJ. POT.1
DROOP CT S1
DROOP CT S2
W
V
U-R450T
NC-R450M
1
2
3
L3-LEROY4 WH-18
L2-LEROY5 WH-18
L1-LEROY6 WH-18

OPTION - PMG FOR D510 AVR

3
2
4
1
LSA-C4
14-LSA13 WH-18
15-LSA14 WH-18
16-LSA15 WH-18
PMG

R450M/T VOLTAGE REGULATOR C/W PMG OPTION

EXT FREQ ADJ.
EXT FREQ ADJ
R450M/T AVR
F-
F+
Z1
Z2
X1
X2
3
6
1
5
4
2
R-C2
(6-)-R1 WH-18
(5+)-R2 WH-18
16-R3 WH-14
15-R4 WH-14
14-R5 WH-14
PMG
3
6
2
1
4
5
R-C1
CONNECT TO LEROY CONNECTOR LSA-C1
VOLTS ADJ
VOLTS ADJ
CT S1
CT S2
W
V
U-R450T
NC-R450M
1
2
3
L3-LEROY3 WH-18
L2-LEROY2 WH-18
L1-LEROY1 WH-18
LEROY-C2
SENSING CABLES TERMINATED IN ALT
4 3 2 1
DR-C1
DROOP CT
S2-DR1 WH-18
S1-DR2 WH-18
OPTIONAL FOR ALL AVRS

D510 VOLTAGE REGULATOR (STANDARD -AREP)

DC SUPPLY TERMINATED IN PANEL
TERM 2
TERM 6
7-DV1 WH-18
5-DV2 WH-18
1
2
3
BAT+
BAT -
DV-C1
D510 AVR
L1
L2
U
V
W
SENSING CABLES TERMINATED IN ALT
L3-LEROY7 WH-18
L2-LEROY8 WH-18
L1-LEROY9 WH-18

AREP WIRING
AUX WINDING
AUX WINDING
X2
X1
Z2
Z1
2
4
1
3
LSA-C4
10-LSA9 WH-18
9-LSA10 WH-18
12-LSA11 WH-18
11-LSA12 WH-18
E+
E-
1
2
LSA-C3
(F+)-LSA7 WH-18
(F-)-LSA8 WH-18
ALTERNATOR EXCITER

1E5167A	INT-PROP
1E01989V	BRAND MARKINGS
1E0013Y	CONFIDENTIALITY
1E0012A	INTERPRETATION
1E0011	INTPR & TOL
Caterpillar: Confidential Yellow	
PROG	((<<HIDE>>RECORDS
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MM DIMENSIONS INCLUDE ARE BASIC	VERSION: PRIMARY X TYPE: SECONDARY
THIRD ANGLE PROJECTION	SHEET 6 OF 7 ENG CONTROL NB759

CATERPILLAR

DIAGRAM - WIRING
(4000 SERIES C/W ADEM)
589-9486
SIZE A3
DR. ST
CHK

POWER SCHEMATIC - FGL FRAME ALTERNATORS

3PHASE 4WIRE

(6 WIRE)
3 PHASE STAR
(STANDARD ALT)

EXCITER

L1 (U) T1
L2 (V) T2
T3
T4
T5
T6
L3 (W)
E

L1
L2
L3
N
E

CT-L1
CT-L2
CT-L3

L1-PL1 BK-00
L2-PL4 BK-00
L3-PL5 BK-00
N-PL3 BK-00
ERTH-PL2 GN-YL-2

3P BREAKER
4P BREAKER
L1 L4
L2 L5
L3 L6

CUSTOMER LOAD CONNECTION

NEUTRAL (3P BRK)

CUSTOMER EARTH CONNECTION

TERM 23 — 215-ST1 WH-16 — SHUNT
TERM 19 — 101-ST2 WH-16

FITTED AS STANDARD
REF- HI EXHAUST

ERTH-EL1 GN-YL-2(I)

BASEFRAME GND
4006 ONLY

(6-)-LSA1 WH-16
(5+)-LSA2 WH-16

TERMINATED IN ALTERNATOR

101-C9 WH-18
102-C10 WH-18
103-C11 WH-18
104-C12 WH-18
C10-C7 WH-18
C30-C6 WH-18
C50-C5 WH-18
C90-C1 WH-18
C90-C2 WH-18
C90-C3 WH-18
C90-C4 WH-18

C-C1 A-C2

DSE7XXX CONTROL MODULE

C90-A43 WH-18
C50-A46 WH-18
C30-A45 WH-18
C10-A44 WH-18
108-A41 WH-18
109-A39 WH-18
110-A37 WH-18
101-A35 WH-18
ETH-A33 GN-YL-16
REF Sheet_5-[11,B]
101-A34 WH-18
TERM 20
TERM 21
TERM 22
TERM 19

48 GEN CURRENT SENSING N
47 GEN CURRENT SENSING L3
46 GEN CURRENT SENSING L2
45 GEN CURRENT SENSING L1
37 GEN VOLTS SENSING L1
38 GEN VOLTS SENSING L2
39 GEN VOLTS SENSING L3
40 GEN VOLTS SENSING N

104-C12 WH-18 — 6.3A INLINE FUSE — 108-C15 WH-18
103-C11 WH-18 — 6.3A INLINE FUSE — 109-C14 WH-18
102-C10 WH-18 — 6.3A INLINE FUSE — 110-C13 WH-18
101-C9 WH-18 — 101-C9 WH-18
ETH-C8 GN-YL-16

ALTERNATOR EARTH

AC CONNECTOR

R150 AVR

F1 (+) — F2-LS1 WH-18 — LS-C1 3 — LSA-C1 3
F2 (-) — F1-LS2 WH-18 — 6 — 1
V — V-LS3 WH-18 — 1 — 5
W — W-LS4 WH-18 — 5 — 4
N — N-LS5 WH-18 — 4 — 2
ST2
ST1

(5+)-LSA2 WH-16
(6-)-LSA1 WH-16

OPTIONAL AVR R180 C/W PMG
FUW FGL70 ALTERNATORS

R180 AVR

X1 — Z1-ADP17 WH-18 — PMG-C1 4 — 14
X2 — X2-ADP18 WH-18 — 1 — 15
Z1 — X1-ADP19 WH-18 — 2 — 16
Z2 — Z2-ADP20 WH-18 — 3

PMG

F1 (+) — F1-LS6 WH-18 — 3
F2 (-) — F2-LS7 WH-18 — 6
V — V-LS8 WH-18 — 1
W — W-LS9 WH-18 — 5
N — 4
Q1 Q2 — 2

LS-C2

CONNECT TO
LSA-C1
REF [13,F]

D350 AVR UPGRADE C/W 3PH SENSING
FUW FGL70 ALTERNATORS

FREQ ADJ
FREQ ADJ
D350
AVR
S1 S2
VOLT ADJ
VOLT ADJ

Z1
Z2
X1
X2
F-
F+

W
V
U
VT-C1

W-VT1 WH-18
V-VT2 WH-18
U-VT3 WH-18

CONNECT TO
LSA-C1
REF [13,F]

CONNECT TO
ALT TERMINALS

D350 AVR UPGRADE C/W 3PH SENSING & PMG
FUW FGL70 & LL7000 ALTERNATORS

RR-C3
RR-C2
PMG-C1

Z1 — 14-RR WH-18 — 4 — 14
Z2 — 15-RR WH-18 — 1 — 15
X1 — 16-RR WH-18 — 2 — 16
X2 — 3 — PMG
F- — 6–-RR WH-18 — 3
F+ — 5+-RR WH-18 — 6
2
4
1
5
RR-C1

CONNECT TO
LSA-C1
REF [13,F]

W — W-VT1 WH-18 — 1
V — V-VT2 WH-18 — 2
U — U-VT3 WH-18 — 3
VT-C1

CONNECT TO
ALT TERMINALS

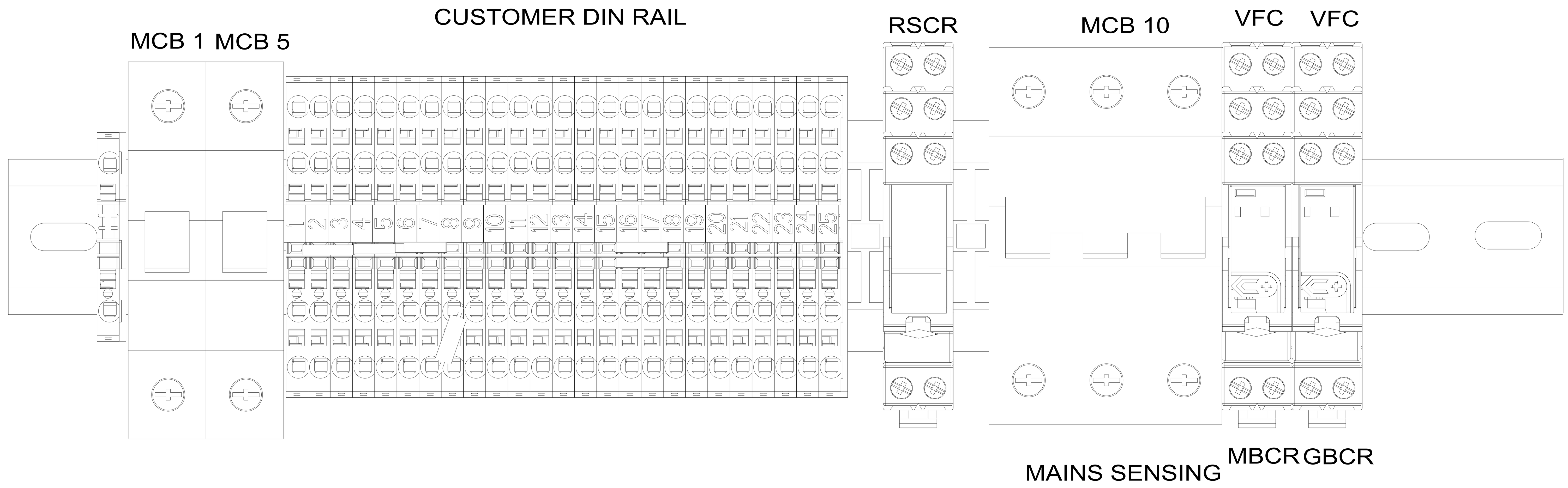
	1E5167A: INT-PROP
	1E01989W: BRAND MARKINGS
	1E0013Y: CONFIDENTIALITY
	1E0012A: INTERPRETATION
1	1E0011: INTPR & TOL
A	Caterpillar: Confidential Yellow

PROJ. [blank]
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MM. DIMENSIONS INCTOL ARE BASIC
VERSION: PRIMARY
TYPE: SECONDARY
THIRD ANGLE PROJECTION
SHEET 7 OF 8
ENG CONTROL: NB759

CATERPILLAR

DIAGRAM-WIRING
(4000 SERIES C/W HEINZ)
589-9486
REV. [blank] CHK. [blank]
DR.: 01 2X3

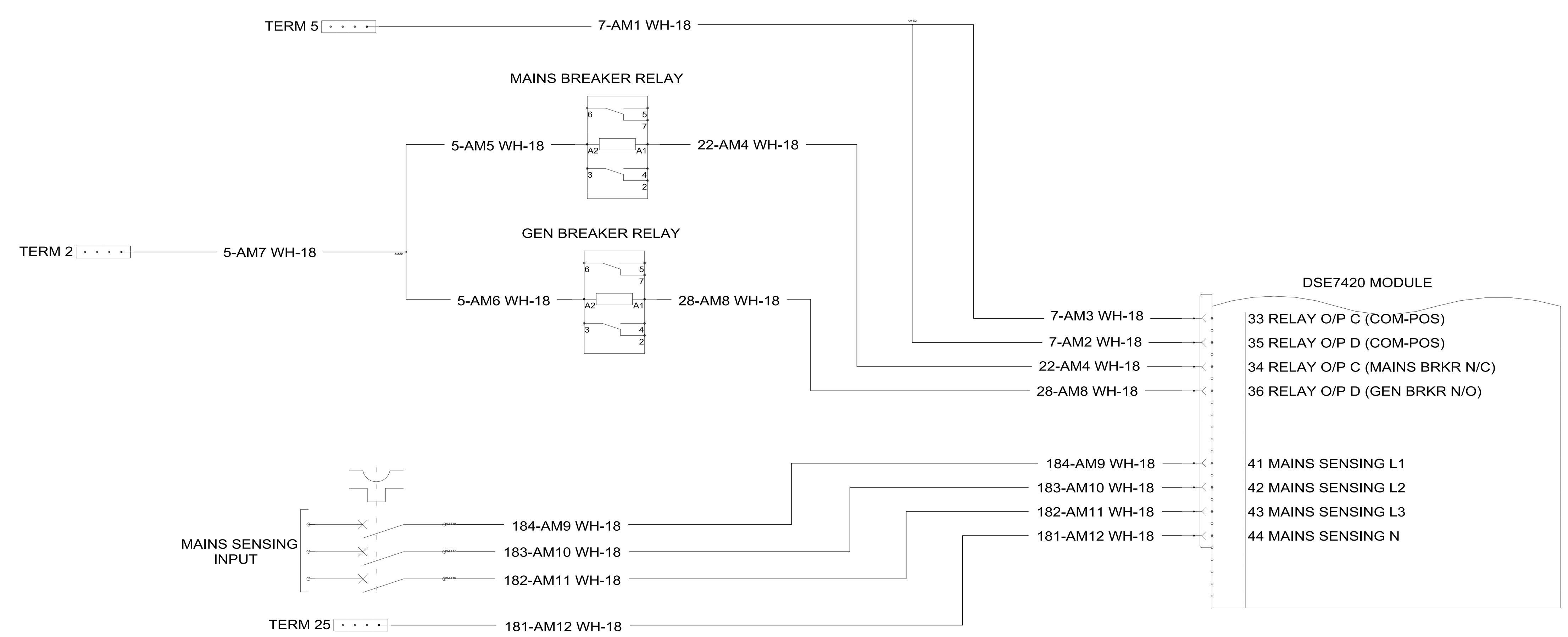
ADDITIONAL INFORMATION



CUSTOMER DIN RAIL INFORMATION

COMPONENT	WIRE ID	DESCRIPTION
EARTH		EARTH TERM
MCB 1		PANEL SUPPLY DC
MCB 5		BATTERY CHARGER (IF FITTED)
TERM 1	3	IGNITION & FUEL CONTROL SOLENOID
TERM 2	7	FUSED PANEL SUPPLY
TERM 3	LINK	FUSED PANEL SUPPLY
TERM 4	LINK	REQUIRED FOR AUTOSTART
TERM 5	24	AUTOSTART
TERM 6	5	BATTERY NEGATIVE
TERM 7	LINK	BATTERY NEGATIVE
TERM 8	30	PANEL ANALOGUE GND
TERM 9	5V	5V SENDER SUPPLY
TERM 10	SA3	ANALOGUE INPUT 3
TERM 11	61	CAN J1939 (+)
TERM 12	62	CAN J1939 (-)
TERM 13	SCR	CAN J1939 SCR
TERM 14	317	ECM INPUT DROOP/ISOCH
TERM 15	33	ECM SWITCH INPUT RETURN
TERM 16	319	ECM INPUT SPEED SELECT
TERM 17	LINK	REQUIRED FOR SPEED SELECT & DROOP/ISCOCH
TERM 18	57	RUN/STOP CONTROL SIGNAL
TERM 19	101	AC VOLTAGE SENSING NEUTRAL
TERM 20	108	AC VOLTAGE SENSING L1
TERM 21	109	AC VOLTAGE SENSING L2
TERM 22	110	AC VOLTAGE SENSING L3
TERM 23	215	BREAKER SHUNT SIGNAL
TERM 24	99	HIGH EXHAUST TEMP. SIGNAL (RELAY)
TERM 25	181	MAINS SENSING NEUTRAL
RSCR		RUN/STOP CONTROL RELAY
MCB 10		MAINS SENSING (3P)
MBCR		MAINS BREAKER CONTROL RELAY
GBCR		GENERATOR BREAKER CONTROL RELAY

DSE7420 AUTO MAINS FAILURE CIRCUITRY



ECM INFORMATION

PIN	NAME	DESCRIPTION
25	CAN A+	CAN A J1939 +
26	CAN A-	CAN A J1939-
27	CAN SCR	CAN A J1939 SCR
30	ANALOGUE RETURN	ANALOGUE RETURN
36	SWITCH I/P RETURN	SWITCH INPUT RETURN
37	MAG PICKUP VR+	ENGINE SPEED VR+
38	MAG PICKUP VR-	ENGINE SPEED VR-
58	SPEED SEL SW	1500/1800 SPEED SELECT SWITCH
64	DIGITAL RETURN	DIGITAL RETURN
66	RUN/STOP SW	RUN/STOP SWITCH
72	5V SENSOR	ANALOGUE 5V SENSOR SUPPLY
74	DROOP ISO	DROOP ISOCHRONOUS CONTROL
79	PWM SEN	PWM THROTTLE SENSOR
80	ANALOGUE I/P	ANALOGUE I/P
81	BATTERY -	BATTERY NEGATIVE
82	BATTERY -	BATTERY NEGATIVE
83	BATTERY -	BATTERY NEGATIVE
84	BATTERY +	BATTERY POSITIVE
85	BATTERY +	BATTERY POSITIVE
86	BATTERY +	BATTERY POSITIVE

MATL	
HT TR	
1E5167A	INT-PROP
1E0198W	BRAND MARKINGS
1E0013Y	CONFIDENTIALITY
1E0012A	INTERPRETATION
NOTE 1E0011	INTPR & TOL

Caterpillar: Confidential Yellow

PROD OTHER RECORDS

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN mm
DIMENSIONS W/O TOL ARE BASIC

VERSION TYPE: PRIMARY X / SECONDARY

THIRD ANGLE PROJECTION

SHEET 7 OF 7

DWG CONTROL NB759

CATERPILLAR

DIAGRAM-WIRING
(4000 SERIES C/W ADEM)

589-9486 VER DK CHG 01 2x3

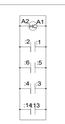
P-PRODUCT: 4000 SERIES GEN-SETS

CONTROL PANEL OPTIONS

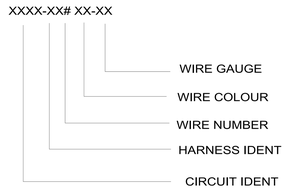
SIGNAL NAMES

CIRCUIT_ID	COLOR	DESCRIPTION
131	WH	AUXILIARY_SUPPLY_-_(AC)
132	WH	AUXILIARY_SUPPLY_+_(AC)
133	WH	ALT_HEATER_CONTACTOR_+_(AC)
134	WH	WATER_HEATER_CONTACTOR_+_(AC)
135	WH	BATT_CHARGER_CONTACTOR_+_(AC)
136	WH	CONTACTOR_CONTROL_+_(AC)
137	WH	CONTACTOR_CONTROL_+_(AC)
138	WH	WATER_HEATER_+_(AC)
139	WH	BATTERY_CHARGER_+_(AC)
140	WH	BATTERY_HEATER_+_(AC)
141	WH	ALTERNATOR_HEATER_+_(AC)
142	WH	WATER_HEATER_2_+_(AC)
3	WH	FUEL_ON
30	WH	ANALOGUE_I/P_GROUND
31	WH	BATT_CHARGER_DC_+
5	WH	PANEL_DC_NEGATIVE
7	WH	FUSED_PANEL_POSITIVE
87	WH	SIREN_+VE
88	WH	COMMON_ALARM_O/P
90	WH	GEN_RUNNING_O/P
SA3	WH	SPARE_ANALOGUE_ I/P_3
ETH	GN-YL	EARTH

SYMBOL LEGEND TABLE

	MINITURE CIRCUIT BREAKER
	RELAY
	SIREN
	EARTH/GROUND
	PANEL TERMINAL
	TERMINAL
	CONNECTOR
	SPLICE
	WIRE
	HEATER CONTACTOR
	FUEL LEVEL SENDER

WIRE NAME DEFINITION



COLOUR ABBREVIATIONS

ABBREVIATION	DESCRIPTION
BK	BLACK
CU	COPPER
GN-YL	GREEN-YELLOW
RD	RED
WH	WHITE

ABBREVIATIONS

ABBREVIATIONS	DESCRIPTION
AC	ALTERNATING CURRENT
BATT CHARGER	BATTERY CHARGER
CAR	COMMON ALARM RELAY
CR	CRANK RELAY
DC	DIRECT CURRENT
ETH	EARTH/GROUND
FL	FUEL LEVEL SENDER
GRR	GENERATOR RUNNING RELAY
HC	HEATER CONTACTOR
MCB	MINIATURE CIRCUIT BREAKER
TERM	PANEL TERMINAL

HARNESS TABLE

IDENT	PART NO	CHG	LOC	DESCRIPTION
HARNESS	-	-	-	-
BC	595-0590	0	SH02	BATTERY_CHARGER_OPTION
BCH	595-0591	0	SH02	BATTERY_CHARGER_AND_HEATER_OPTION
FL	595-0592	0	SH02	FUEL_LEVEL_OPTION
HTR	595-0593	0	SH02	HEATER_OPTION
PAA	595-0594	0	SH02	AUDIBLE_ALARM_OPTION
PAC	595-0595	0	SH02	COMMOM_ALARM_VFC_OPTION
PGR	595-0596	0	SH02	GEN_RUNNING_VFC_OPTION

1E5167A;INT-PROP
1E0198W;BRAND MARKINGS
1E0013Y;CONFIDENTIALITY
1E0012A;INTERPRETATION
1E0011 ;INTPR & TOL
Caterpillar: Confidential Yellow

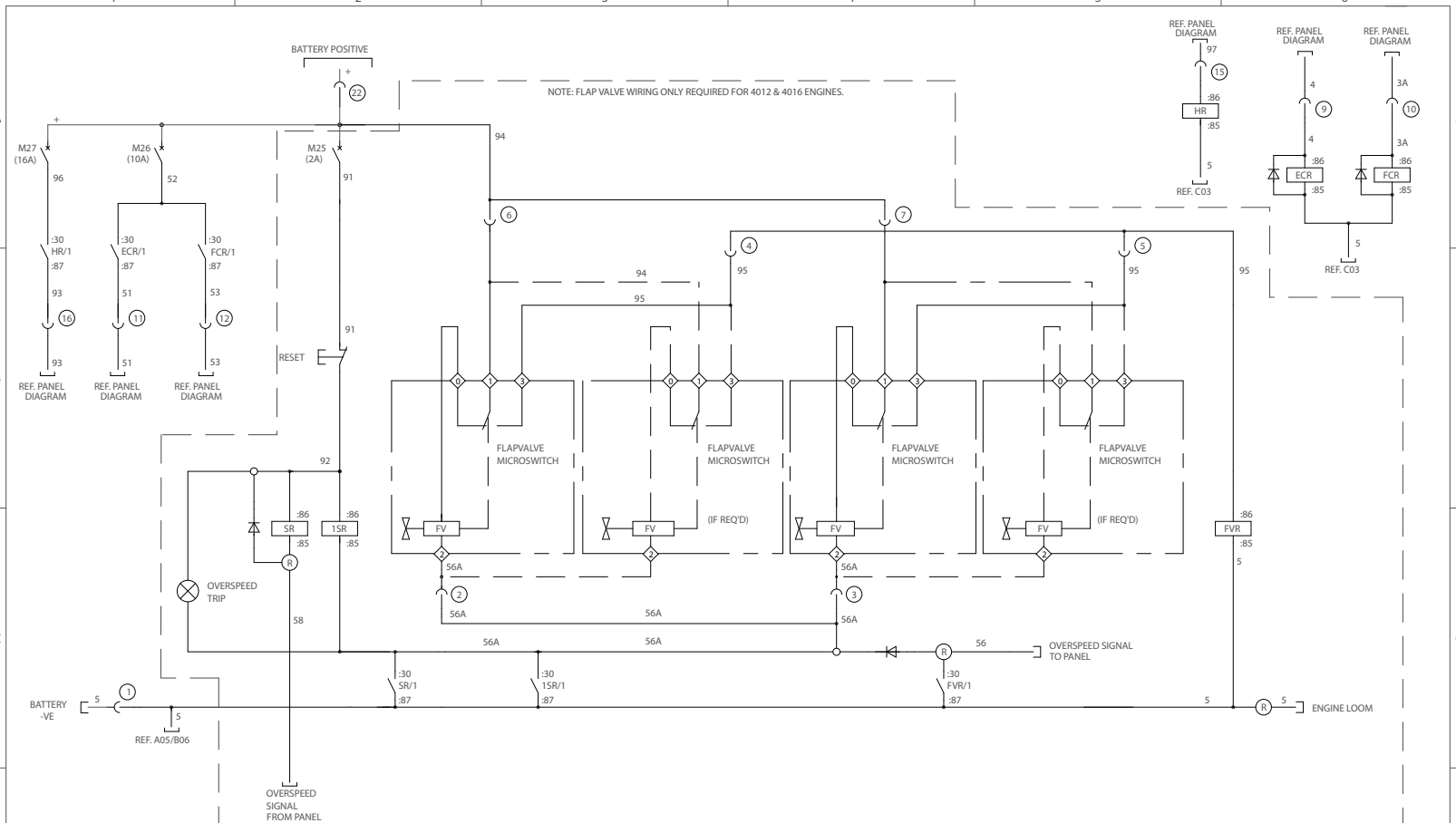
DIMENSIONS ARE IN [MM] X [OTHER]
UNLESS OTHERWISE SPECIFIED DIMENSIONS AND TOL ARE BASIC
VERSION: PRIMARY | A
TYPE: SECONDARY
THIRD ANGLE PROJECTION
SHEET 1 OF 2
ENG CONTROL: NB759

CATERPILLAR

DIAGRAM-WIRING
(4000 OPTIONS)

594-9438

VER: DK | ASC: 00 | 2X3



ISSUE	DESCRIPTION	ECR/DCR	BY	DATE
C	UPDATED AS PART OF CLEAN UP ECN FOR PWX.1/EG2500 INTRO.	35915	N.W.	04/05/12
B	UPDATED FOR POWERWIZARDX.1 INTRO.	34226	N.W.	08/09/11
A	INTRO OF PW1.1+/2.1 WITH EIM REMOVAL.	33513	N.W.	03/12/10

(R) OUTGOING/INCOMING RELAY BOX TERMINAL

(1) D.C. CONNECTOR FROM AUX. LOOM

INTERNAL PANEL/RELAY BOX TERMINAL

FLAP VALVE TERMINAL

DRN. BY	N WATSON
DATE	03/12/10
APPD. BY	David Morris
DATE	17/05/2012

TITLE: WIRING DIAGRAM OF RELAY BOX FOR 4000 SERIES ENGINES.

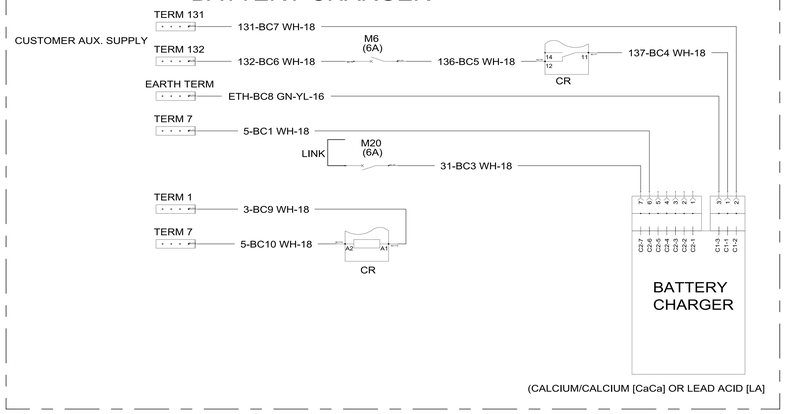
SHEET SIZE	ORIGINAL SCALE	DRAWING NO.	ISSUE
A3	N.T.S.	D48515	C

UNB/E/A3/01

P-PRODUCT: 4000 SERIES GEN-SET

CONTROL PANEL OPTIONS

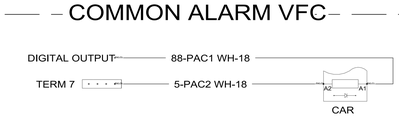
BATTERY CHARGER



(CALCIUM/CALCIUM [CaCa] OR LEAD ACID [LA])

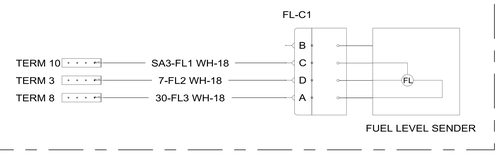
AUDIBLE ALARM

COMMON ALARM VFC

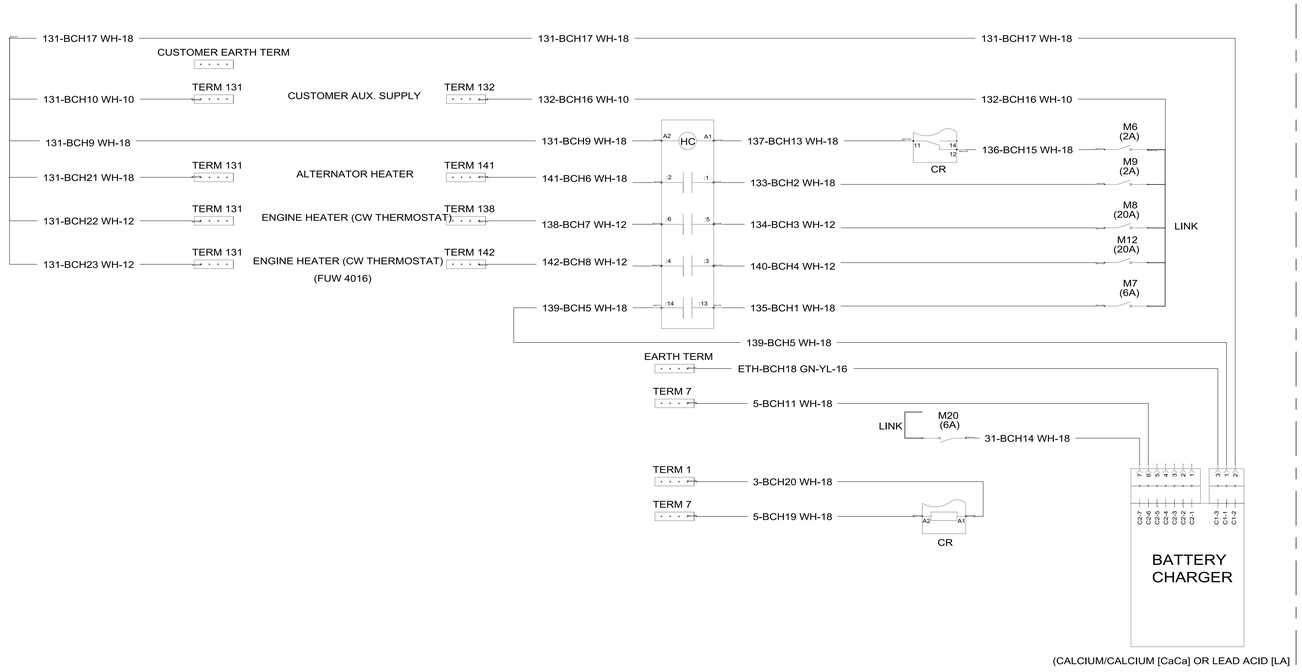


GEN RUNNING VFC

FUEL LEVEL

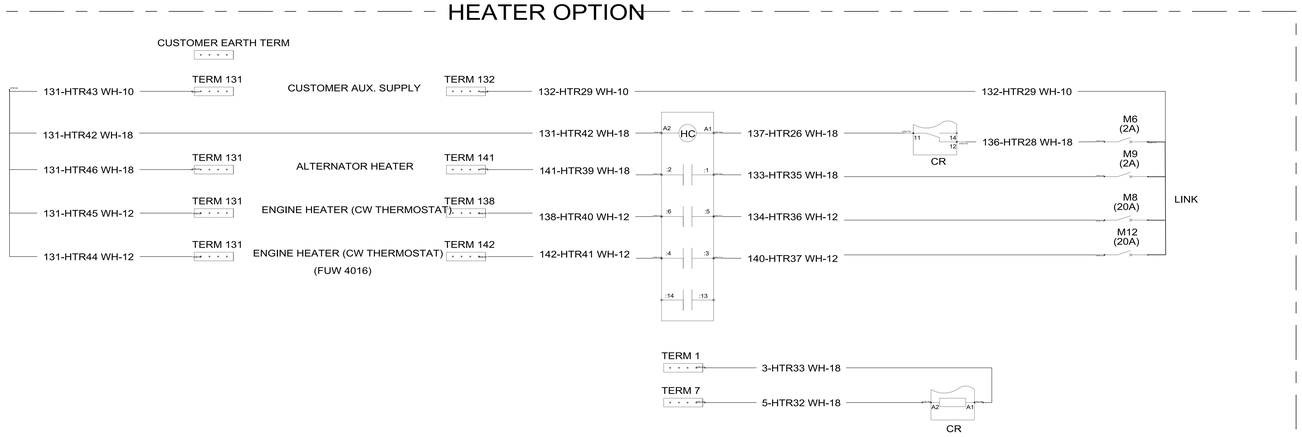


BATTERY CHARGER & HEATER OPTION



(CALCIUM/CALCIUM [CaCa] OR LEAD ACID [LA])

HEATER OPTION



1E5167A INT-PROP
1E0198W BRAND MARKINGS
1E0013Y CONFIDENTIALITY
1E0012A INTERPRETATION
1E0011 INTPR & TOL
Caterpillar Confidential Yellow

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN mm. DIMENSIONS AND TOL ARE BASIC	VERSIONS: PRIMARY: X TYPE: SECONDARY:
THIRD ANGLE PROJECTION	SHEET 2 OF 2
	ENG CONTROL NB729

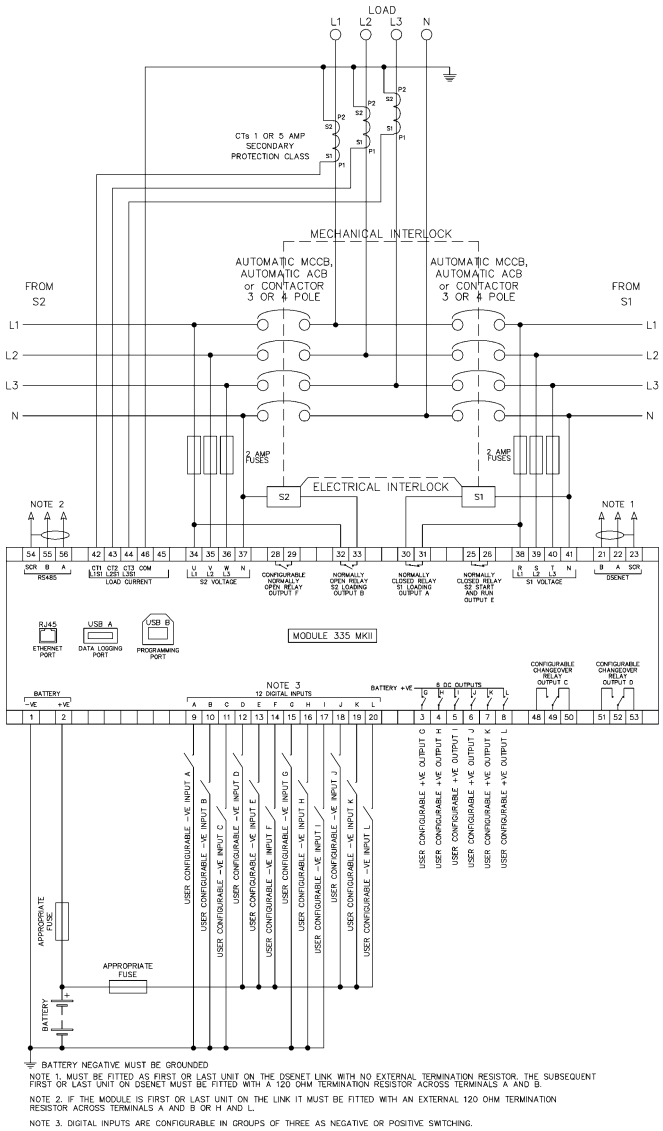
CATERPILLAR

DIAGRAM - WIRING
(4000 OPTIONS)

594-9438	VER. DK	CHG 00	2X3

TYPICAL WIRING DIAGRAM

NOTE: A larger version of the Typical Wiring Diagram is available in the product's operator manual, refer to DSE Publication: *057-368 DSE335 MKII Operator Manual* available from www.deepseaelectronics.com for more information.



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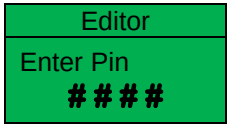
DEEP SEA ELECTRONICS

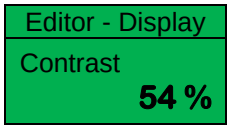
053-272
ISSUE 1

DSE335 MKII Installation Instructions

ACCESSING THE FRONT PANEL EDITOR



- Ensure the engine is at rest and the module by pressing the ***Start Inhibit Mode*** button.
- Press the ***Start Inhibit Mode*** and ***Tick*** buttons together to enter the main configuration editor.
- If a module security PIN has been set, the PIN request is then shown.
- Press the ***Tick*** button, the first '#' changes to '0'. Press the ***Up*** or ***Down*** buttons to adjust it to the correct value.
- Press the ***Right*** button when the first digit is correctly entered. The digit previously entered now shows as '#' for security.
- Repeat this process for the other digits of the PIN number. Press the ***Left*** button to move back to adjust one of the previous digits.
- When the ***Tick*** button is pressed after editing the final PIN digit, the PIN is checked for validity. If the number is not correct, the PIN must be re-entered.
- If the PIN has been successfully entered (or the module PIN has not been enabled), the editor is displayed.



EDITING A PARAMETER

- Enter the editor as described above.
- Press the ***Left*** or ***Right*** buttons to cycle to the section to view/change.
- Press the ***Up*** or ***Down*** buttons to select the parameter to view/change within the currently selected section.
- To edit the parameter, press the ***Tick*** button to enter edit mode. The parameter begins to flash to indicate that value is being edited.
- Press the ***Up*** or ***Down*** buttons to change the parameter to the required value.
- Press the ***Tick*** button to save the value. The parameter ceases flashing to indicate that it has been saved.
- Press and hold the ***Tick*** button to exit the editor and save the changes.
- Press and hold the ***Start Inhibit Mode*** button to exit the editor without saving changes.

NOTE: The editor automatically exits after 5 minutes of inactivity to ensure security.

NOTE: The PIN number is automatically reset when the editor is exited (manually or automatically) to ensure security.

NOTE: Comprehensive module configuration is possible using the DSE Configuration Suite PC Software, refer to DSE publication *057-367 DSE335 MKII Configuration Suite PC Software Manual* available from www.deepseaelectronics.com.

MAIN CONFIGURATION EDITOR PARAMETERS

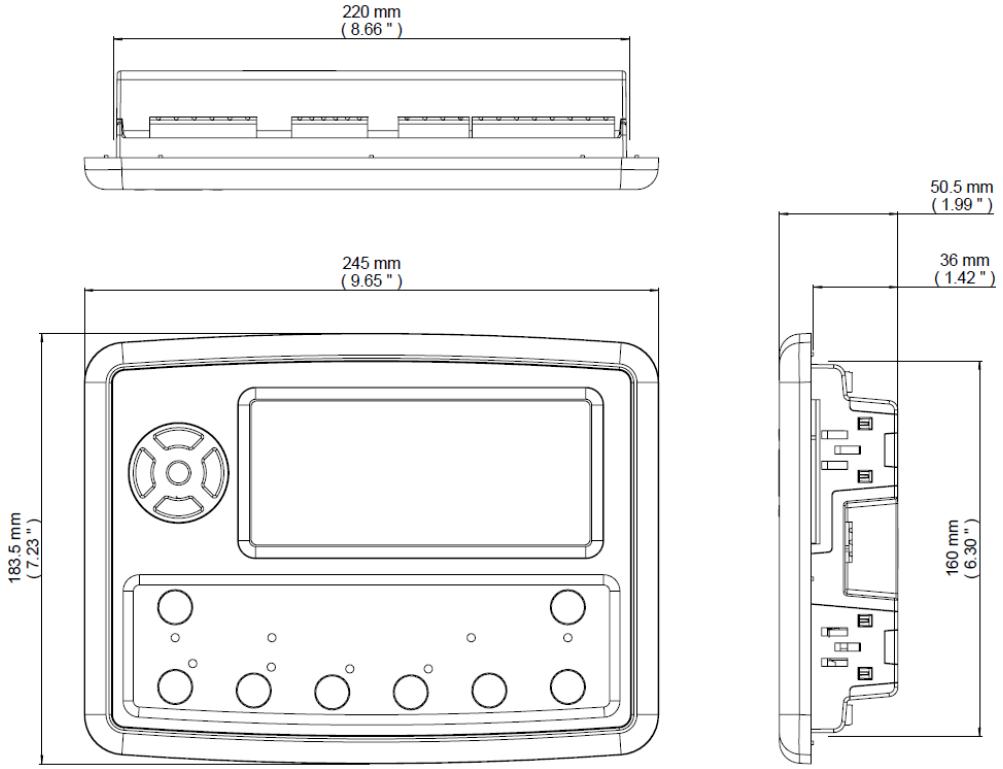
Page	Parameter	Values
Display	LCD Contrast	0%
	Language	English
	LCD Page Timer	hh:mm:ss
	Scroll Delay	hh:mm:ss
	Date and Time	dd-mm-yyyy, hh:mm:ss
S1	S1 Option	Generator, Mains
	Immediate S1 Dropout	Inactive, Active
	Under Voltage Trip	0 V
	Over Voltage Trip	0 V
	Under Frequency Trip	0 Hz
	Over Frequency Trip	0 Hz
S2	S2 Option	Generator, Mains
	Immediate S2 Dropout	Inactive, Active
	Under Voltage Trip (Generator Option)	0 V
	Over Voltage Trip (Generator Option)	0 V
	Under Frequency Trip (Generator Option)	0.0 Hz
	Over Frequency Trip (Generator Option)	0.0 Hz
	Under Voltage Trip (Mains Option)	0 V
	Over Voltage Trip (Mains Option)	0 V
	Under Frequency Trip (Mains Option)	0.0 Hz
	Over Frequency Trip (Mains Option)	0.0 Hz
Timers	S1 Transient Delay	mm:ss
	S2 Start Delay	hh:mm:ss
	S2 Warming Up Time	hh:mm:ss
	S2 Fail Delay	mm:ss
	Elevator Delay	mm:ss
	Non-sync Transfer Time	mm:ss.s
	Check-Sync Transfer time	mm:ss.s
	S2 Return Delay	hh:mm:ss
	S2 Cooling Time	hh:mm:ss
	S2 Fail to Stop Enable	Inactive, Active
	S2 Fail to Stop Delay	mm:ss
	S2 Transient Delay	s.s
Scheduler	Scheduler Enable	Inactive, Active
	Bank 1 Period	Weekly, Monthly
	Bank 2 Period	Weekly, Monthly
	Bank 1 Events Configuration	See Overleaf
	Bank 2 Events Configuration	See Overleaf

REQUIREMENTS FOR UL

Description	Specification
Screw Terminal Tightening Torque	• 4.5 lb-in (0.5 Nm)
Conductors	• Terminals suitable for connection of conductor size 12 AWG to 26 AWG (0.5 mm² to 2.0 mm²). • Conductor protection must be provided in accordance with NFPA 70, Article 240 • Low voltage circuits (35 V or less) must be supplied from the engine starting battery or an isolated secondary circuit. • The communication, sensor, and/or battery derived circuit conductors shall be separated and secured to maintain at least ¼ " (6 mm) separation from the generator and mains connected circuit conductors unless all conductors are rated 600 V or greater.
Current Inputs	• Must be connected through UL Listed or Recognized isolating current transformers with the secondary rating of 5 A maximum.
Communication Circuits	• Must be connected to communication circuits of UL Listed equipment
Mounting	• Suitable for use in type 1 Enclosure Type rating with surrounding air temperature -22 ºF to +122 ºF (-30 ºC to +50 ºC) • Suitable for pollution degree 3 environments when voltage sensing inputs do not exceed 300 V. When used to monitor voltages over 300 V, a device is to be installed in an unventilated or filtered ventilation enclosure to maintain a pollution degree 2 environment.
Max. Operating Temperature	• 158 ºF (70 ºC)
VTs	• When using voltage transformers (VTs) they must be fitted to both S1 and S2 voltage sensing, have the same ratio from the primary to secondary windings, and a 0° phase offset between the primary and secondary windings.

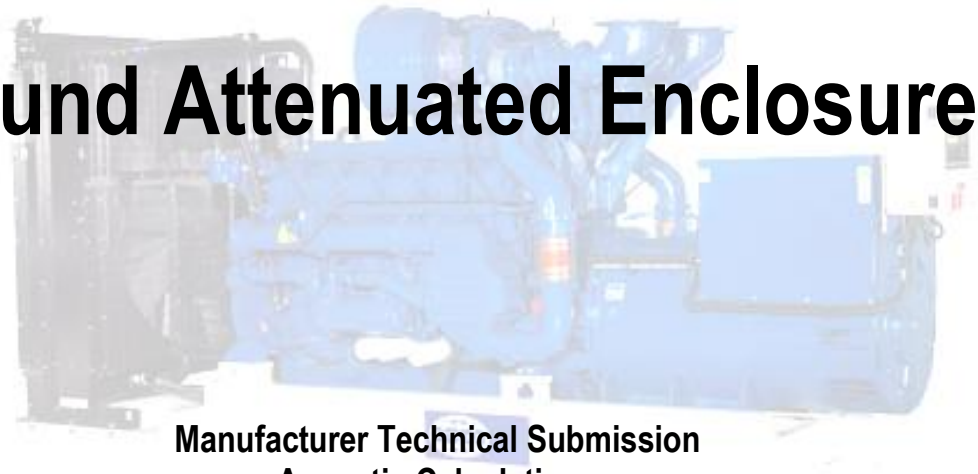
DIMENSIONS AND MOUNTING

Parameter	Specification
Panel Cutout	220 mm x 160 mm (8.66 " x 6.30 ")
Overall Size	245.0 mm x 183.5 mm x 50.5 mm (9.65 " x 7.23 " x 1.99 ")
Case Material	Polycarbonate
Keypad Material	Silicone
Protection Category	IP65 panel mounted with gasket. IP42 panel mounted with no gasket.
Weight	0.70 kg (1.54 lb)
Mounting Type	Panel Mounting. Base mounted to a vertical surface with connection terminals to the rear.
Fixing Clip Torque	0.2 Nm



Section 4

Sound Attenuated Enclosure



Manufacturer Technical Submission
Acoustic Calculations
GA Drawing

SOUND ENGINEERING LTD

Unit A4, Vanguard Industrial Estate,
Henwood, Ashford, Kent TN24 8DH
Telephone: 01233 643333
Facsimile: 01233 624174
E-Mail: sales@soundengineeringltd.com

Technical Submission

Prepared For: Bells Power
For Attention of: Dino Fielding

Ref: EA 15830-R1
Date: 30/05/2025

Project

IRC Harmondsworth

PROPOSAL FOR:

1 x Walk-Round acoustic enclosure and base to suit a Perkins 4008-30TAG3 Powered, 1250 kvA Diesel generating Set.

Generally, as shown by our sketch P.15830-001

NOISE CRITERIA

65dB(A)@1m under 'Free Field' conditions.

CLIENT:	Bells	**Quotation Ref:**	EA 15830-R1
Enquiry Via:	Dino	**Date:**	30/05/2025
Customer Ref:	IRC Harmondsworth	**From:**	Ian Jones

TECHNICAL DATA – GENERATOR PLANT

Engine Make	PERKINS	**Cooling Airflow:**	18.4 m3/s
Engine Model	4008-30TAG3	**Airflow Resistance (Max):**	250 Pa
Generator Rating	Standby 1250 kva	**Ambient Temp:**	38 C
Noise Criteria	65 dB(A)@ 1 m FFC	**Combustion Airflow:**	1.583 m3/s
Other Noise Factors	1 Sets Operating	**Exhaust Gas flow:**	4.0 m3/s
		Exhaust Gas Temp	482 C
		Exhaust:	7 kPa

EQUIPMENT DETAILS

Enclosure Base Size: 8000 Long x 3200 Wide x 200 High
Enclosure Body Size: 8000 Long x 3200 Wide x 3850 High – Including Base.

Inlet Atten Size: 2700 Tall x 3000 Wide x 2400 Deep – Installed Vertically off Enclosure Roof.
Inlet Penthouse Louvre: 1300 Tall x 3000 Wide x 2500 High – Louvres to 3 sides.

Discharge Atten Size: 2700 Long x 3000 Wide x 3500 High – With integral W/Louvre.

Exhaust:

Primary:	Bore: 350 mm / Body Dia: 1020 mm / Body Length: 3600 mm	800 kg
Secondary:	Bore: 400 mm / Body Dia: 750 mm / Body Length: 2100 mm	300 kg

Overall Size: **10600 Long x 3200 Wide x 7750 High**
Total Weight: **18550 kg – Excluding Gen-Set.**

GENERAL

The enclosure body is formed using composite 'acoustic' panel-work set into light-weight structural frame sections designed to provide required levels of strength and rigidity necessary to achieve a self-supporting finished assembly.

The acoustic panels forming the walls and roof of the enclosure are made up using 1.5mm thick sheet steel panels, formed into panels of 100mm thickness.

The panels are packed with a combination of high mass 'sound boards and high-density mineral fibre acoustic infill. The panels are finished internally using 0.7mm perforated, pre-galvanised steel sheets to protect the acoustic infill.

To add further strength & durability, the walls are finished externally using our standard 'corrugation profile' manufactured from 1.5mm MS Zintec. – These continuously seam welded along both top and bottom edge joints with the structural framework. Vertical seam joints being stitch-welded both inside & out at regular spacings.

The enclosure roof is of similar construction to the walls but with the 'corrugated' outer sheeting replaced by 'flat' sheet laid over a central pitch construction formed by an internal sub-frame.

The external roof panels are continuously seam welded to provide excellent weather protection.

Internal & External seam joints are continuously seam sealed using a high-performance silicon mastic during the painting process – applied between the primer & topcoats.

Fuel pipe and cable gland plate positioned to suit through one side wall.

BUNDED BASE

The non-detachable base comprises a structural steel frame around the perimeter with structural cross bearers spaced at nominal 350mm centres over the full base length and fully welded to the side frames at each end.

6.0mm steel tread-plates are laid over the cross bearers and fully seam welded to form a spill containment bund of nominal depth 45mm.

To limit noise break-out from beneath the base, the underside of the plate floor is insulated using 100mm thick high density mineral fibre slabs retained by 1.5mm thick steel sheeting.

A 45mm deep spillage bund is included over the full internal floor area.

LIFTING

Certified lifting points are provided as below:

4 no. lugs – Enclosure lifting set into and fully welded to side channels of the structural base.

These lifting points are designed to lift the enclosure body loaded with the generating set but with the attenuation removed as a single lift.

4 no. lugs set into and fully welded to side channels of both the air inlet and discharge attenuators.

4 no. lugs bolted to RHS side frames of Air Intake Penthouse Louvre

Lifting lugs fitted to the engine exhaust silencers are fitted by the silencer manufacturer.

ACCESS DOORS

Access into the generator enclosure is provided via 2 single leaf hinged doors, one located each side of the unit at agreed positions to suit the internal equipment layout and site space availability.

The doors are side hung using heavy duty ‘chrome finish’ bolt-on hinges supported to and bolted to vertical frame posts set within the acoustic wall structure.

Acoustic compression seals are fitted to rear door frame returns as a continuous – edge mounted seal. Where very-low noise levels are to be achieved, an additional ‘front’ mounted seal is also used – this seal fitted to return edges of each door panel.

Latching is provided by means of a ‘slam-lock’ providing compression to the acoustic seals on closing and including a cylinder lock and internal panic release push-button.

The latch bodies also include provision for fitting of external padlocks. (padlocks not supplied).

All doors are fitted with stainless steel auto latching restraints designed to hold the door in the fully open position. A pull cord mechanism releases the latch permitting closure.

ATTENUATION

Air enters & leaves the enclosure through the weather louvers & attenuators.

The air intake is via a penthouse style louvre housing mounted above a vertically installed attenuator connected to a framed opening formed within the enclosure roof.

The penthouse incorporates louvres to 3 sides and a pitched, insulated roof to prevent condensation.

The radiator fan is coupled to the discharge attenuator via a 'flexible transition duct' designed to prevent hot air re-circulation through the radiator and to create a positive flow of air through the enclosure.

The discharge attenuator is installed horizontally off one end of the enclosure and is constructed onto a base lifting frame designed to match, and bolt to, the structural base of the enclosure body.

Location dowls are fitted to the enclosure opening frames to assist with correct re-alignment of the attenuators during the reassembly process.

Acoustic performance of the attenuators is achieved by using absorptive splitter panels spaced apart by the correct gaps within the attenuator duct casing. The desired level of attenuation is achieved through correct selection of the splitter air gaps coupled with length of the splitter elements.

Attenuation is achieved through a combination of impedance, reflection & absorption.

Both the Inlet & outlet attenuators are externally mounted, are demountable and shipped loose for reassembly during site installation (by others).

EXHAUST

The exhaust system comprises Primary & Secondary silencers mounted externally onto the enclosure roof.

The Primary silencer is of multi-chamber construction with the initial section designed to reduce pulsation effects from the engine firing frequency and the following section or sections providing noise absorption through a series of baffles and acoustic linings.

The Secondary silencer provides additional noise reduction across the frequency spectrum through absorption.

An internal exhaust down pipe between the enclosure roof upstand & the engine bellows is supplied pre-fitted. Bellows supplied Free-Issue with engine.

The silencers are of mild steel construction and supplied as standard finished in 'black' heat resistant enamel.

To Limit casing noise break-out, and necessary to achieve the required noise criteria, the silencers together with the internal connecting pipework are supplied pre-fitted, lagged/clad with 50mm thickness mineral fibre wired matt and 'stucco' finish aluminium sheeting.

ELECTRICAL SERVICES

Electrical services within the enclosure comprise:

- 9-way single-phase Schneider consumer unit with 125A DP Mains Switch.
- 2 x 1200mm vapour-proof LED lights.
- 1 x 1200mm vapour-proof LED light with 3hr emergency back-up.
- 2 x 2-way metal clad light switches (1 fitted with emergency key test).
- 1 x 2 gang 13A metal clad socket outlet with integral 30mA RCD.
- 1 x 2 kw convector heater – thermostatically controlled.
- 4 x 16A 'B' type SP MCB's
- 2 x 6A 'B' type MCB's
- Earth Connection Points – Welded to Checker-plate floor.
- Wiring installed within 50 x 50 Galvanised trunking / conduit.

FUEL SYSTEM

To provide a double-skin steel, free standing fuel day tank of 3200litre useable capacity providing 12 hours runtime based on the published engine fuel consumption figures.

The tank is constructed to BS 799 type 'J' and is complete with all necessary standard fittings i.e. Fill, Vent, Top Mounted draw-off, Spill return together with 1" sockets for Level probes and direct / remote reading hydrostatic contents gauge.

Tank supplied fitted on channel base and mounted within enclosure on tapped steel pads welded to the bund floor.

All internal fuel pipework / valves are excluded.

PAINT

The paint spec is based on a 2-Pack acrylic system.
The underside of the base is coated with a high build vinyl anti corrosion paint.

The hard, durable finish gives long life in environments including Sea water Splash Zones It conforms to BS EN ISO 12944 Cat C3.

The enclosure is wiped down with Panel wipe or similar, to remove any oil or grease.
A coat of zinc phosphate primer is applied to give good anti-corrosive properties, including good humidity and salt-water resistance. The primer gives a high build coat and can be over coated with other synthetic finishes.

After allowing the appropriate drying period 2 coats of polyurethane are applied as a finish coat. The finish coat provides both superb gloss and excellent durability. It has good resistance to diesel, oil and petrol.

The finish colour can be supplied in BS 4800 or RAL.
Alternative paint systems are available upon request.

OPTIONAL EXTRAS (Not included in our offer)

To Supply:
1 x Inlet Motor Damper
1 x Discharge 'Gravity' action Damper

OPTIONAL EXTRAS (Included in our offer)

To Supply:

1 x removable metal link box fitted to side of container to prepared, framed opening.

Cable gland plates are fitted to suit incoming and outgoing cables.
An internal segregation plate is also fitted.

Size: 400 Deep x 800 Wide x 1000 High
Other sizes available on request.

To Supply:
2 x Recessed E-Stops (Wiring By Others)

TERMS & CONDITIONS

- It is the customer's responsibility to confirm & verify the cooling airflow and engine noise figures.
- Noise levels are based on an average taken from the perimeter of the assembly and under standard test conditions in FFC.
- The assembly requires a flat concrete plinth with a float finish providing an overall tolerance +/- 3mm.
- Adjustments and variations to specifications should be reported to Sound Engineering at the earliest opportunity for the purpose of re-quoting.
- Collection or delivery dates should be agreed upon placing official orders and are subject to the provision of correct data and customer/client modifications, which may cause delay.
  Goods not accepted on the agreed delivery date may be subject to storage/crane charges.
- Warranty on goods shall be a standard 12 months from date of delivery.
- Receipt of an official signed purchase order is accepted as confirmation that the client and principal designer understand and comply with the requirements of CDM2015.
- Failure by the customer to disclose relevant information that affects this quotation will invalidate the price offered.

Sound Engineering Ltd

Ref: EA 15830 **Date:** 29/05/2025
Client: Bells Power **Standby Rating:** 1250 KVA
Site Ref: IRC Harmondsworth

Engine Perkins 4008-30TAG3

Primary Attenuation

Air Inlet

Attenuator Type RVS 100, Length 2700

Air Discharge

Attenuator Type RVS 50, Length 2400

CALCULATED DATA

	Width mm	Height mm	Face Area m^2	Airways Qty	Free Area m^2	Pass Vel m/sec	Press Loss Pa
Inlet Att'r	**3000**	**2500**	7.5	10	2.5	8.0	50.9
Inlet Louvre	3000	2500	7.5	n/a	4.725	4.2	19.7
Discharge Att'r	**3000**	**3500**	10.5	12	2.1	8.8	61.1
Outlet Louvre	3000	3500	10.5	n/a	6.615	2.8	11.8
						TOTAL Resistance	**143.5**

ACOUSTIC DATA

Air Inlet

Frequency Hz				**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**AP**
Plant L*p* dB				105	107	107	102	98	98	95	97	**112.3**
Corrections				0	0	0	0	0	0	0	0	
Unsilenced L*p* dB				105	107	107	102	98	98	95	97	**112.3**
Att'n RVS	100	2700	L	-14	-27	-44	-55	-55	-55	-55	-50	
				91	80	63	47	43	43	40	47	**91.3**
Penthouse Plenum				-3	-3	-3	-3	-3	-3	-3	-3	
Silenced L*p* dB @ 1m				88	77	60	44	40	40	37	44	**88.3**
A' Weighting				-26	-16	-9	-3	0	1	1	-1	
Wtd Silenced L*p* dB(A) @ 1m				**62**	**61**	**51**	**41**	**40**	**41**	**38**	**43**	**64.8**
									Target Noise Level			65

ACOUSTIC DATA

Air Discharge

Frequency Hz				**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**AP**
Plant L*p* dB				105	107	107	102	98	98	95	97	**112.3**
Corrections				3	4	3	3	2	1	1	3	
Unsilenced L*p* dB				108	111	110	105	100	99	96	100	**115.5**
Att'n RVS	50	2400	L	-19	-38	-55	-55	-55	-55	-55	-55	
				89	73	55	50	45	44	41	45	**89.1**
				0	0	0	0	0	0	0	0	
Silenced L*p* dB @ 1m				89	73	55	50	45	44	41	45	**89.1**
A' Weighting				-26	-16	-9	-3	0	1	1	-1	
Wtd Silenced L*p* dB(A) @ 1m				**63**	**57**	**46**	**47**	**45**	**45**	**42**	**44**	**64.3**
									Target Noise Level			65

ACOUSTIC DATA

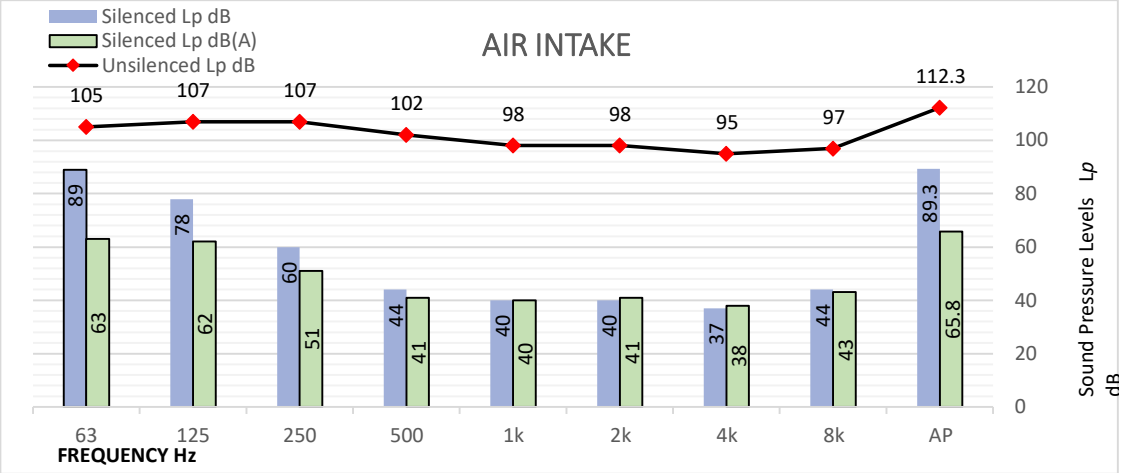
Enclosure Build

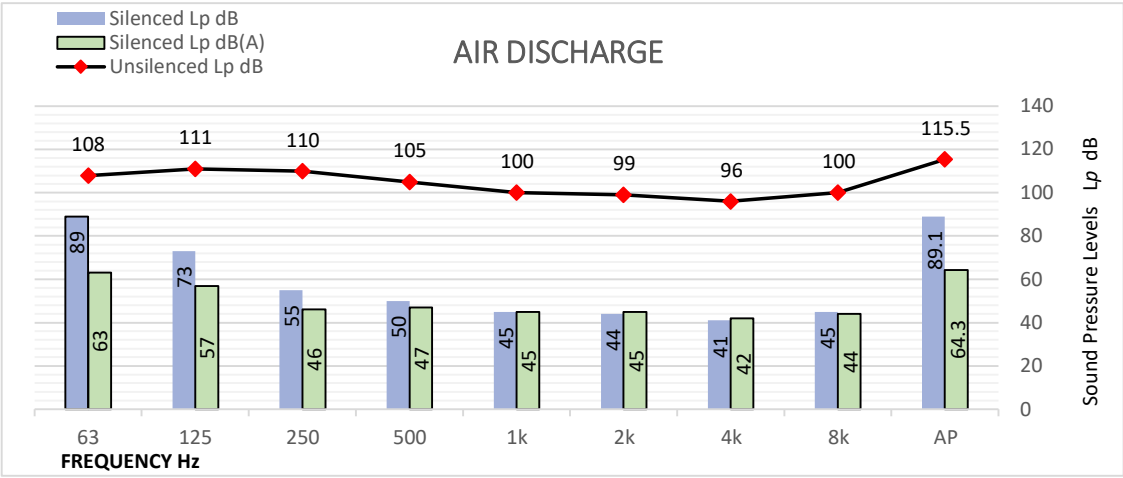
Frequency Hz				**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**AP**
Plant L*p* dB				105	107	107	102	98	98	95	97	**112.3**
Corrections				3	4	3	3	2	1	1	3	
Unsilenced L*p* dB				108	111	110	105	100	99	96	100	**115.5**
Wall Type	**SE**	**J**		-36	-35	-42	-50	-56	-62	-66	-71	
Silenced L*p* dB @ 1m				72	76	68	55	44	37	30	29	**77.9**
A' Weighting				-26	-16	-9	-3	0	1	1	-1	
Wtd Silenced L*p* dB(A) @1m				**46**	**60**	**59**	**52**	**44**	**38**	**31**	**28**	**63.1**
									Target Noise Level			65

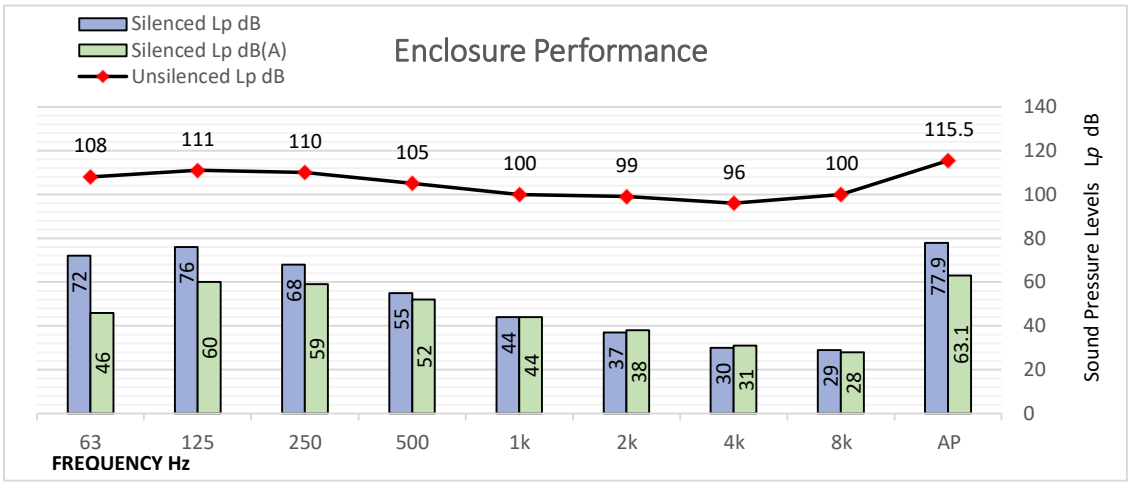
Sound Engineering Ltd

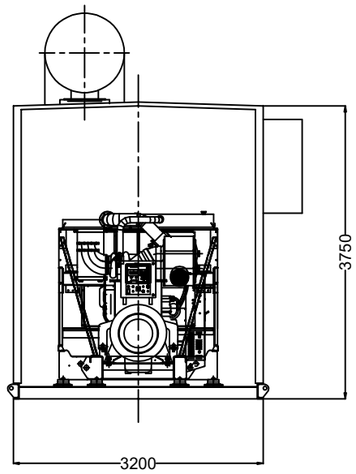
Ref: EA 15830 **Date:** 29/05/2025
Client: Bells Power **Standby Rating:** 1250 KVA
Site Ref: IRC Harmondsworth

Graphical Representation of Noise Data.

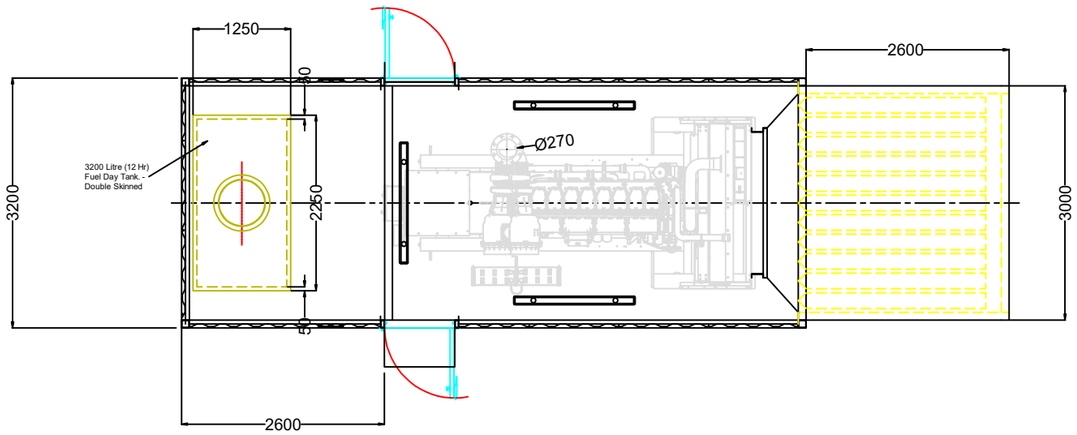








SECTION THROUGH
CONTAINER BODY

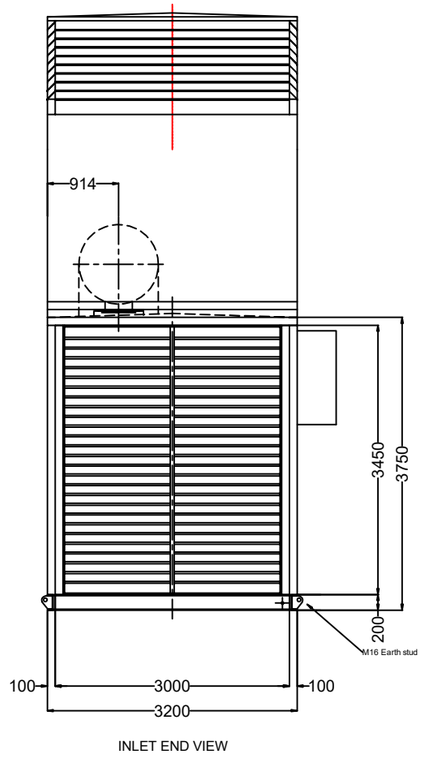


SECTION THROUGH PLAN

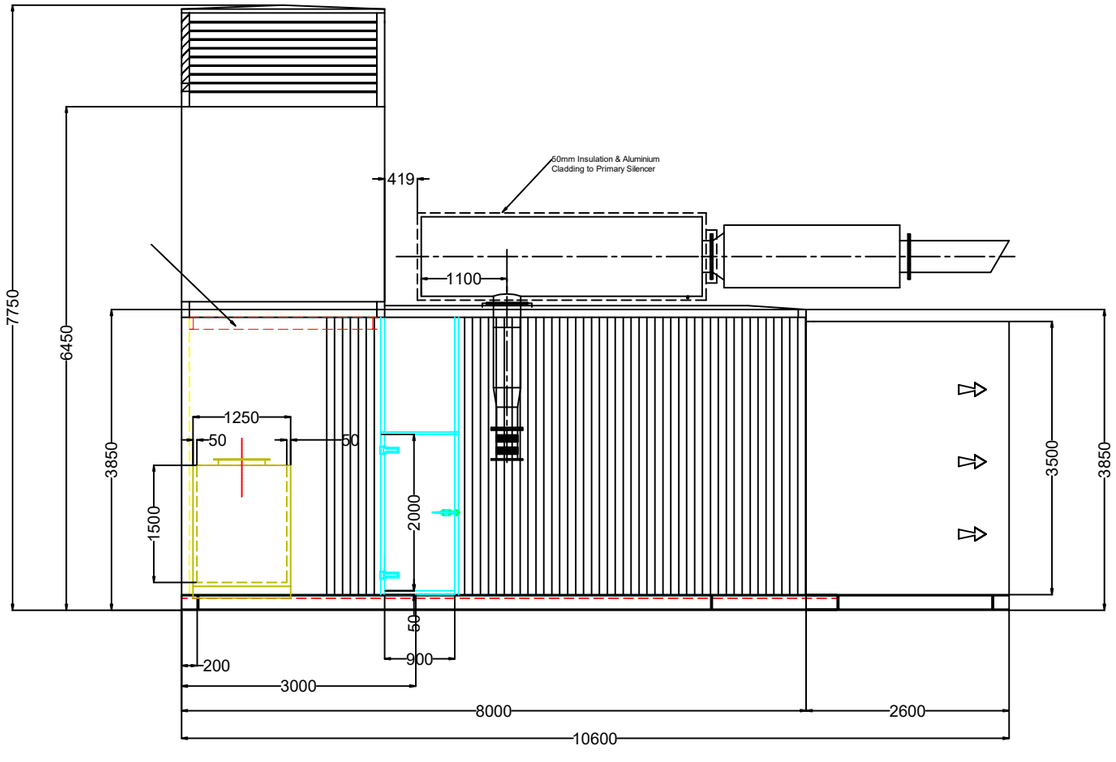
Fuel Tank:
2.15m x 1.15 x 1.5 = 3.708m3 Total Volume (3700 Litres)

Engine Consumption = 266.3 l/hr
therefore:

For 8 hr Run Time we require 2130 litres.
For 12 hr Run Time we require 3196 litres + 500 litre Ullage = 3696 litre Total Tank Capacity



INLET END VIEW



SIDE VIEW

Drg: P.15830-001-Rev C

Section 5

Fuel Transfer System

Fuel Transfer Line Diagram
Fuel Control Panel
Transfer Pumps
Fill Point Cabinet
Pipework
Fuel Polisher