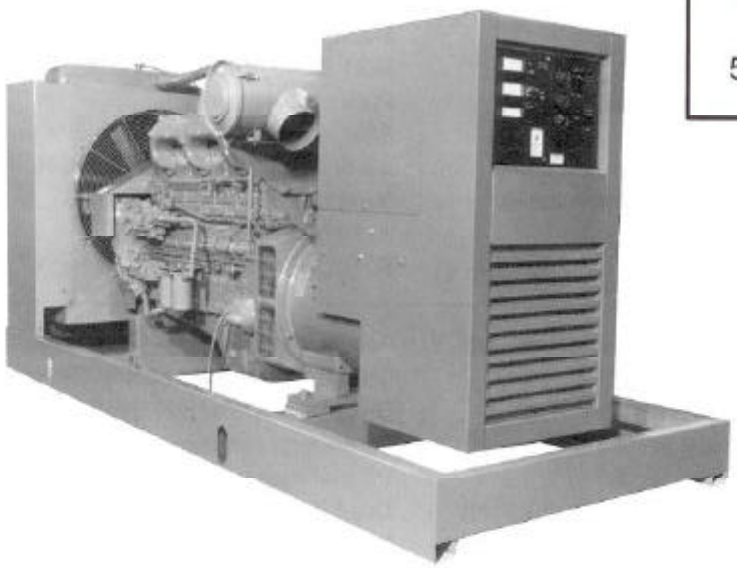
230 DFBD 60 Hz
200 DFBD 50 Hz
Diesel-Fueled Generator Set

	STANDBY	PRIME
60 Hz	230 kW 288 kVA	210 kW 263 kVA
50 Hz	200 kW 250 kVA	180 kW 225 kVA



Generator Set Features

- **Single-source design, manufacturing and testing of all set components and accessories by Onan Corporation.**
- **Accepts 100% of nameplate kW rating in one step, in compliance with NFPA 110, Paragraph 5-13.2.6.**
- **Engine torque-matched excitation system provides quick recovery from transient speed dips.**
- **Low reactance generator design offers low waveform distortion with non-linear loads and provides excellent motor starting capabilities.**

Standard Equipment

ENGINE
Cummins 4-cycle diesel engine. EFC electronic governor, externally adjustable from isochronous to 5% droop.

ALTERNATOR
Brushless Onan AC alternator provides broad range reconnectible output. Designed for service in severe environments.

CONTROL PANEL
Vibration isolated control with analog instrumentation.

VOLTAGE REGULATOR
Electronic voltage regulator with 3-phase RMS sensing.

COOLING SYSTEM
High ambient 122° F (50° C) system.

SKID BASE
Supports the alternator and engine. Battery rack and cooling system mount to the skid base.

Generator Set Testing

The Prototype Test Support (PTS) program is our commitment to verifying the integrity of our designs and products.

Before the generator sets are put into production, prototype models are subjected to demanding tests with typical/atypical loads and transients anticipated in service.

Production models earn the PTS seal only after meeting the performance criteria established by the program.

Single-Source Warranty

All generator set components and systems are covered by a limited one-year warranty. Optional two-, five- and ten-year* extended programs are available.

Standard Models are CSA certified.

*10-year coverage available in North America only.

Generator Set Performance

Voltage Regulation
Under load from no load to 100% load will be within ± 0.5%.

Random Voltage Variation
For constant loads, from no load to 100% load will not exceed + 0.5% of its mean value.

Frequency Regulation
Isochronous under varying loads from no load to 100% load.

Random Frequency Variation
Will not exceed ± 0.25% of its mean value for constant loads from no load to full load.

Electromagnetic Interference Attenuation
Meets requirements of most industrial and commercial applications.

AC Waveform Total Harmonic Distortion
Less than 5% total no load to full load, and less than 3% for any single harmonic

Telephone Influence Factor (TIF)
Less than 50 per NEMA MG1-22.43.

Telephone Harmonic Factor (THF) Less than 3.

Alternator Temperature Rise
At rated load is less than 105° C at prime power rating and less than 125° C at standby rating, per NEMA MG1.22.40, IEEE115 and IEC 34–1.

Radio Interference
Alternator and voltage regulator meet the provisions of BS.800 and VDE Class G and N.

Maximum Sound Level
At 23 feet (7m) – full load:
60 Hz: 92.0 dBA 50 Hz: 87.0 dBA

Engine: Cummins NT855-G4 in-line, 6-cylinder, direct injection diesel

Design: 4-cycle, water-cooled, turbocharged.
Bore: 5.5" (140 mm) **Stroke:** 6" (152 mm)
Piston Displacement: 855 cubic inches (14 liters)
Four Valves per Cylinder, Single Springs
Forged Steel, Integral Counterweight-Type Crankshaft
Forged Steel Connecting Rods with I-Beam Design
Compression Ratio: 14:1
Starting: 24-volt, negative ground
Cranking Current: 565 Amps at Ambient Temperature of 32° F (0° C).
45-amp battery charging alternator
Cast Iron Cylinder Block; Replaceable Wet Liners
Direct Injection Fuel System: Number 2 diesel fuel; Fuel filters; Automatic electric fuel shutoff; Cummins PT fuel injection system with integral EFC governor.
Dry-Element Air Cleaner, with Restriction Indicator
Lube Oil Capacity: 44 US quarts (42 liters)
Lube Oil Required: API CD 15W-40
Lube Oil Filter: Single Spin-On, Full Flow/Bypass
Maximum Lube Oil Consumption:
25 US quarts (24 liters) – per 100 Hours
Cooling System
High Ambient 122° F (50 ° C) Radiator.

Onan Alternator

Design:
Revolving field, single bearing, 4-pole, brushless, drip-proof construction. Standard 125° C temperature rise at standby power rating. Class H insulation system per NEMA MG1–1.65 and BS2757. The main alternator and exciter insulation systems are impregnated for operation in severe environments where sand, salt sea spray and chemical corrosion are installation factors.

Stator:
Skewed stator and 2/3 pitch windings minimize field heating and voltage harmonics.

Rotor:
Dynamically balanced assembly. Direct coupled to engine by a flexible drive disc. Complete amortisseur (damper) windings help minimize voltage deviations and heating effects under unbalanced loads. The rotor is supported by a pre-lubricated, maintenance-free ball bearing.

Torque-Matched Voltage Regulation:
The voltage regulator provides torque-matched underfrequency compensation to optimize motor starting performance and assist the engine during transient load conditions. The brushless exciter armature powers the main alternator field winding through shaft-mounted, three-phase, full wave silicon diode rectifiers. Semi-conductor surge suppressors protect the diodes from transient overvoltages induced by load surges.

PMG (Permanent Magnet Generator):
Provides more power for motor starting. Sustains main field excitation for short circuit current fault discrimination and coordination. Provides increased immunity from non-linear loads

Phase Rotation: A (U), B (V), C (W)
Alternator Cooling: Direct drive centrifugal blower

230 DFBD 60Hz Operating Data

Reactances (per unit, based on standby rating, with tolerance of ±10%)	80°C Alt				105°C Alt				125°C Alt				
	110/190 220/380	120/208 240/416	139/240 277/480	347/600	110/190 220/380	120/208 240/416	139/240 277/480	347/600	110/190 220/380	120/208 240/416	139/240 277/480	277/480	347/600
Synchronous	3.01	2.51	1.89	2.28	3.63	3.03	2.28	2.83	3.63	3.03	2.28	2.83	2.83
Direct Axis Transient	0.20	0.16	0.12	0.14	0.22	0.18	0.14	0.18	0.22	0.18	0.14	0.18	0.18
Direct Axis Subtransient	0.14	0.12	0.09	0.10	0.15	0.13	0.10	0.13	0.15	0.13	0.10	0.13	0.13
Negative Sequence	0.24	0.20	0.15	0.18	0.28	0.24	0.18	0.22	0.28	0.24	0.18	0.22	0.22
Zero Sequence	0.09	0.07	0.05	0.06	0.10	0.09	0.06	0.07	0.10	0.09	0.06	0.07	0.07
Motor Starting	Broad Range			600 V	Broad Range			600 V	Broad Range			480 V	600 V
Maximum Surge kW	248			250	248			249	248			249	249
Maximum kVA (90% Sustained Voltage)	792			648	648			569	648			569	569
Alternator Data Sheet Number	303			302	302			301	302			301	301
Full Load Current		120/208	127/220	139/240	220/380	240/416	254/440	277/480	347/600				
(Amps @ Standby Rating)		708	754	691	407	399	377	340	277				

Fuel	STANDBY				PRIME			
Fuel Consumption Load	1/4	1/2	3/4	Full	1/4	1/2	3/4	Full
kW	58	115	173	230	50	105	158	210
US gph	5.6	9.5	13.4	17.3	5.3	8.8	12.4	16.0
L/hr	21	36	51	65	20	33	47	61
Maximum Fuel Lift	5.0 ft		1.5 m		5.0 ft		1.5 m	
Maximum Fuel Return Head	4.5 ft		1.4 m		4.5 ft		1.4 m	
Cooling								
Heat Rejection To Coolant	8625	Btu/Min	9.1	MJ/Min	7820	Btu/Min	8.3	MJ/Min
Heat Radiated To Room	3490	Btu/Min	3.7	MJ/Min	3150	Btu/Min	3.3	MJ/Min
Coolant Capacity (with radiator)	16.5	US Gal	62	L	16.5	US Gal	62	L
Coolant Flow Rate	112	Gal/Min	424	L/Min	112	Gal/Min	424	L/Min
Maximum Coolant Friction Head	5.0	psi	34	kPa	5.0	psi	34	kPa
Maximum Coolant Static Head	60	ft	18.3	m	60	ft	18.3	m
Radiator Fan Load	17.0	HP	12.7	kW	17.0	HP	12.7	kW
Air								
Combustion Air	950	cfm	26.9	cu m/min	805	cfm	22.8	cu m/min
Maximum Air Cleaner Restriction	25	in H2O	6.2	kPa	25	in H2O	6.2	kPa
Alternator Cooling Air	1770	cfm	50.1	cu m/min	1770	cfm	50.1	cu m/min
Radiator Cooling Air	19700	cfm	558	cu m/min	19700	cfm	558	cu m/min
Minimum Air Opening to Room	14.2	sq ft	1.3	sq m	14.2	sq ft	1.3	sq m
Minimum Discharge Opening	11.4	sq ft	1.1	sq m	11.4	sq ft	1.1	sq m
Maximum Restriction at Radiator Discharge (static)	0.25	in H2O	62	Pa	0.25	in H2O	62	Pa
Exhaust								
Gas Flow (Full Load)	2460	cfm	69.7	cu m/min	2080	cfm	58.9	cu m/min
Gas Temperature	885	°F	474	°C	850	°F	454	°C
Maximum Back Pressure	41	in H2O	10.2	kPa	41	in H2O	10.2	kPa
Engine								
BMEP	179	psi	1237	kPa	165	psi	1135	kPa
Piston Speed	1800	ft/min	9.14	m/s	1800	ft/min	9.14	m/s
Overspeed Limit	2100	±50 rpm			2100	±50 rpm		
Regenerative Power	44	kW			44	kW		

Derating Factors

Rated power available up to 6800 ft (2074 m) at ambient temperatures up to 104°F (40°C) or up to 1000 ft (305 m) at ambient temperatures up to 122°F (50°C). Above 1000 ft (305 m), derate at 1% per 10°F (2% per 11°C) above 104°F (40°C) to 6800 ft (2074 m). Above 6800 ft (2074 m), derate at 4% per 1000 ft (305 m) and 1% per 10°F (2% per 11°C) above 104°F (40°C).

Consult Alternator Data Sheet for performance of broad range alternators below 416 (208) volts.

200 DFBD 50Hz Operating Data

80°C Alt			105°C Alt			125°C Alt		
110/190 220/380	120/208 240/415	127/220 254/440	110/190 220/380	120/208 240/415	127/220 254/440	110/190 220/380	120/208 240/415	127/220 254/440
2.14	1.79	1.60	2.63	2.20	1.96	2.63	2.20	1.96
0.15	0.13	0.11	0.17	0.14	0.13	0.17	0.14	0.13
0.11	0.09	0.08	0.12	0.10	0.09	0.12	0.10	0.09
0.18	0.15	0.13	0.23	0.19	0.17	0.23	0.19	0.17
0.07	0.05	0.05	0.09	0.08	0.07	0.09	0.08	0.07
Broad Range			Broad Range			Broad Range		
207			208			208		
594			462			462		
303			302			302		

110/190	115/200	120/208	127/220	220/380	230/400	240/415	254/440
750	722	694	656	380	361	348	328

STANDBY					PRIME				
1/4	1/2	3/4	Full		1/4	1/2	3/4	Full	
50	100	150	200		45	90	135	180	
5.0	7.9	10.9	14.1		4.6	7.3	10.0	12.8	
19	30	41	53		17	28	38	48	
5.0	ft	1.5	m		5.0	ft	1.5	m	
4.5	ft	1.4	m		4.5	ft	1.4	m	
7130	Btu/Min	7.5	MJ/Min		6300	Btu/Min	6.6	MJ/Min	
2970	Btu/Min	3.1	MJ/Min		2680	Btu/Min	2.8	MJ/Min	
16.5	US Gal	62	L		16.5	US Gal	62	L	
93	Gal/Min	352	L/Min		93	Gal/Min	352	L/Min	
5.0	psi	34	kPa		5.0	psi	34	kPa	
60	ft	18.3	m		60	ft	18.3	m	
9.9	HP	7.4	kW		9.9	HP	7.4	kW	
725	cfm	20.5	cu m/min		645	cfm	18.3	cu m/min	
25	in H2O	6.2	kPa		25	in H2O	6.2	kPa	
1475	cfm	41.8	cu m/min		1475	cfm	41.8	cu m/min	
16000	cfm	453	cu m/min		16000	cfm	453	cu m/min	
14.2	sq ft	1.3	sq m		14.2	sq ft	1.3	sq m	
11.4	sq ft	1.1	sq m		11.4	sq ft	1.1	sq m	
0.25	in H2O	62	Pa		0.25	in H2O	62	Pa	
2445	cfm	69.2	cu m/min		2000	cfm	56.6	cu m/min	
920	°F	493	°C		865	°F	463	°C	
41	in H2O	10.2	kPa		41	in H2O	10.2	kPa	
184	psi	1270	kPa		166	psi	1147	kPa	
1500	ft/min	7.62	m/s		1500	ft/min	7.62	m/s	
1850	±50 rpm				1850	±50 rpm			
33	kW				33	kW			

Rated power available up to 5800 ft (1769 m) at ambient temperatures up to 104°F (40°C) or up to 1000 ft (305 m) at ambient temperatures up to 122°F (50°C). Above 1000 ft (305 m), derate at 1% per 10°F (2% per 11°C) above 104°F (40°C) to 5800 ft (1769 m). Above 5800 ft (1769 m), derate at 4% per 1000 ft (305 m) and 1% per 10°F (2% per 11°C) above 104°F (40°C).

Voltage Selections

60 Hz, 1800 rpm, 3-phase, Reconnectible Broad Range

- ☐ 110/190V ☐ 220/380V
- ☐ 120/208V ☐ 240/416V
- ☐ 127/220V ☐ 254/440V
- ☐ 139/240V ☐ 277/480V
- ☐ 120/240V

60 Hz, 1800 rpm 3-phase, Specific Voltage

- ☐ 277/480V ☐ 347/600V

50 Hz, 1500 rpm, 3-phase, Reconnectible Broad Range

- ☐ 110/190V ☐ 220/380V
- ☐ 115/200V ☐ 230/400V
- ☐ 120/208V ☐ 240/415V
- ☐ 127/220V ☐ 254/440V
- ☐ 100/200V ☐ 115/230V
- ☐ 110/220V ☐ 120/240V

Standby Ratings

The standby power rating is applicable for supplying emergency power for the duration of normal power interruption. No overload capability is available for this rating.

Prime Power Ratings

The prime power rating is applicable for supplying electric power in lieu of commercially purchased power. Prime power is the maximum power available at variable load for an unlimited number of hours. A 10% overload capability is available for prime power ratings per BS 5514 and DIN 6271.

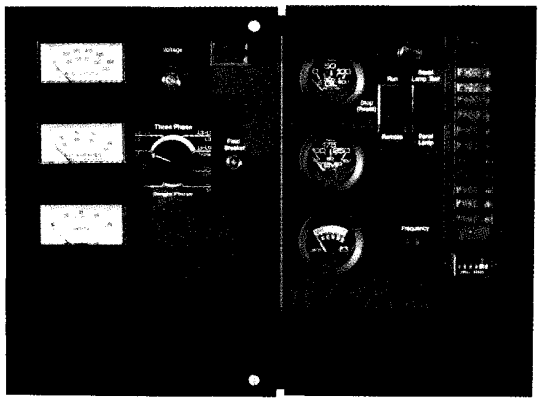
For peak shaving, interruptible service or base load applications, consult your authorized distributor.

Ratings and performance exceed conditions set forth in ISO 3046.

Note: Ratings and performance data apply to standby rating with number 2 diesel fuel. Contact an authorized distributor for operating characteristics at other than stated conditions.

Detector™ Control System

- **Monitors engine performance and AC power output.**
- **Controls generator set start and shutdown.**
- **Automatic remote start.**
- **DC panel lighting.**
- **Vibration Isolators protect control panel electronics and circuitry from generator set vibration.**
- **Analog Instrumentation displays performance trends Rugged. Non-fluctuating, easy to read.**



Control panel shown includes optional AC Meters and 12-Light Monitoring System.

☐ **Standard Control Features**

- •Run-stop-remote switch
- •Remote starting, 24-volt, 2 wire
- •Coolant temperature gauge
- •Field circuit breaker
- •DC voltmeter •Oil pressure gauge
- •Running time meter •Fault reset switch
- •Lamp test switch •Cycle cranking
- •7-light engine monitor with individual 1/2 amp relay signals and a common alarm contact for each of the following conditions:

RUN (green light)
PRE-WARNING FOR LOW OIL PRESSURE (yellow light)
PRE-WARNING FOR HIGH COOLANT TEMP (yellow light)
LOW OIL PRESSURE SHUTDOWN (red light)
HIGH COOLANT TEMPERATURE SHUTDOWN (red light)
OVERCRANK SHUTDOWN (red light)
OVERSPEED SHUTDOWN (red light)

☐ **Optional NFPA 110 12-Light Monitor**

Engine monitor with individual 1/2 amp relay signals and common external alarm contact for each of the following conditions:

RUN (green light)
PRE-WARNING FOR LOW OIL PRESSURE (yellow light)
PRE-WARNING FOR HIGH COOLANT TEMP (yellow light)
LOW OIL PRESSURE SHUTDOWN (red light)
HIGH COOLANT TEMPERATURE SHUTDOWN (red light)
OVERCRANK SHUTDOWN (red light)
OVERSPEED SHUTDOWN (red light)
SWITCH OFF (flashing red light – indicates generator set not in automatic start mode)
LOW COOLANT TEMPERATURE (yellow light)
LOW FUEL (yellow light)
TWO CUSTOMER SELECTED FAULTS (red light)

☐ **Optional AC Meter Package**

Order with NFPA 110 monitor to meet code requirements.

- •AC voltmeter (dual range) •AC ammeter (dual range)
- •Voltmeter/ammeter phase selector switch with an off position
- •Frequency meter
- •AC Rheostat (panel mounted) for ±5% voltage adjust

Generator Set Options

Engine

- ☐ Heavy-duty air cleaner with safety element
- ☐ 120/208/240-volt 2500 W coolant heater (thermostatically controlled)
- ☐ 208/240/480-volt 4000 W coolant heater UL – (thermostatically controlled)
- ☐ 120-volt 300 W lube oil heater
- ☐ 208/240-volt 300 W lube oil heater
- ☐ 480-volt 300 W lube oil heater
- ☐ Fuel/water separator
- ☐ 75 amp battery charging alternator

Cooling System

- ☐ Remote radiator cooling
- ☐ Heat exchanger cooling

Alternator

- ☐ 105° C Rise alternator
- ☐ 80° C Rise alternator
- ☐ Anti-condensation heater

Control Panel

- ☐ Remote fault signal dry contact relay package
- ☐ Run relay package
- ☐ Low coolant level shutdown
- ☐ Time delay start/stop
- ☐ Control anti-condensation space heater
- ☐ Oil temperature gauge
- ☐ Tachometer
- ☐ Wattmeter
- ☐ Power factor meter
- ☐ Fuel-pressure gauge (engine mounted)
- ☐ Panel mount engine speed control potentiometer
- ☐ Exhaust pyrometer
- ☐ Emergency stop
- ☐ Junction box
- ☐ Over/under voltage relay
- ☐ Over/under frequency relay

Exhaust System

- ☐ Industrial-grade exhaust silencer
- ☐ Residential-grade exhaust silencer
- ☐ Critical-grade exhaust silencer

Fuel System

- ☐ 185 gallon (700 liter) Sub-base tank
- ☐ 550 gallon (2082 liter) Sub-base tank
- ☐ In-skid day tank
- ☐ Day tank rupture basin

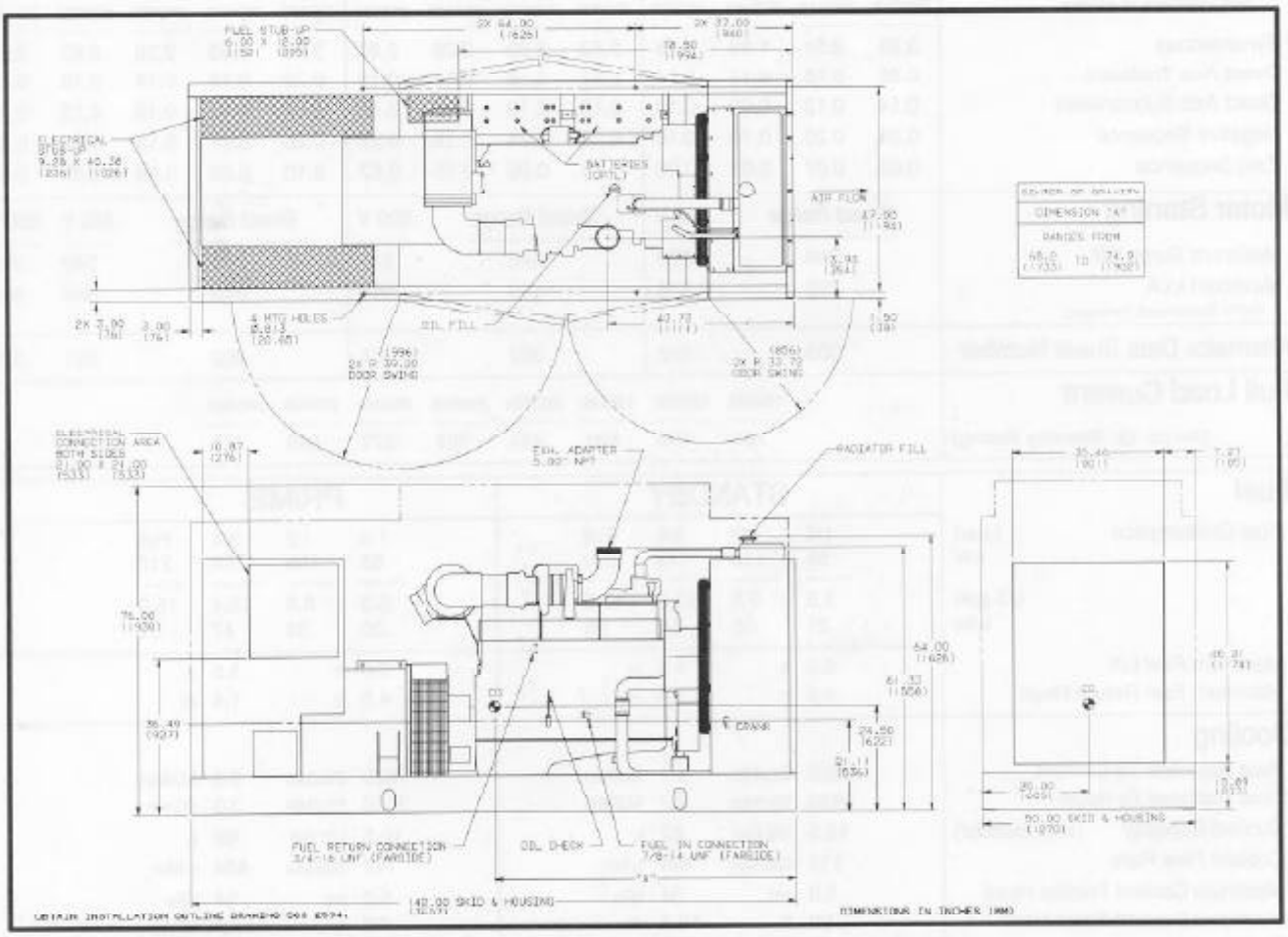
Generator Set

- ☐ Main line circuit breaker
- ☐ AC entrance box
- ☐ Battery charger, equalizer, float-type
- ☐ Batteries
- ☐ Spring isolators
- ☐ Remote annunciator panel
- ☐ Paralleling modifications
- ☐ Weather-protective enclosure with mounted silencer
- ☐ 2-year standby warranty
- ☐ 2-year prime power warranty*
- ☐ 5-year standby power warranty
- ☐ 10-year standby warranty*
- ☐ Export box packaging

*Available in North America only.

Outline Drawing

60 Hz: 230 DFBD
50 Hz: 200 DFBD



This drawing is for informational purposes only. For specific construction details, obtain installation outline drawing from your distributor.

Dry Weight	
Unhoused:	**6050 lbs./2747 kg.**
Housed:	**6890 lbs./3128 kg.**
Wet Weight	
Unhoused:	**6270 lbs./2847 kg.**
Housed:	**7110 lbs./3228 kg.**

See your distributor for more information.

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Onan is a registered trademark of Onan Corporation

Backfeed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is opened.

Detector is a trademark of Onan Corporation

Cummins is a registered trademark of Cummins Engine Company

4/90 Bulletin **DSS-230A**