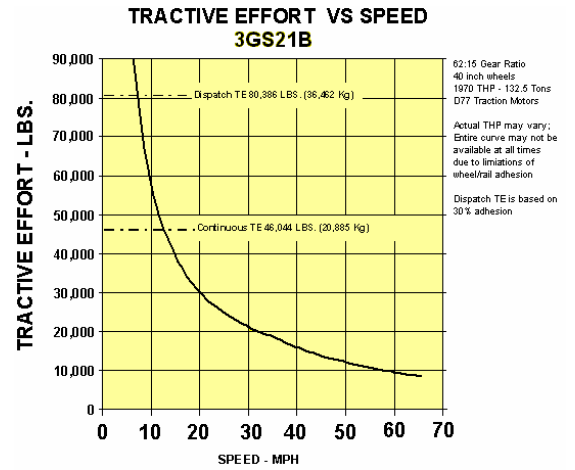




National Railway Equipment Co.

N-ViroMotive 3GS-21B ULEL Switcher



Specifications

General Data

Model designation	3GS-21B
Locomotive power (gross).....	2100 HP
Wheel arrangement (AAR).....	B-B

Dimensions¹

AAR Plate ²	Plate L
Length over coupler pulling faces	62'6"
Width over grab irons	10'6"
Maximum height above rail.....	16'3"
Wheel diameter.....	40"
Minimum curve radius-single unit.....	147ft-39°

Weight

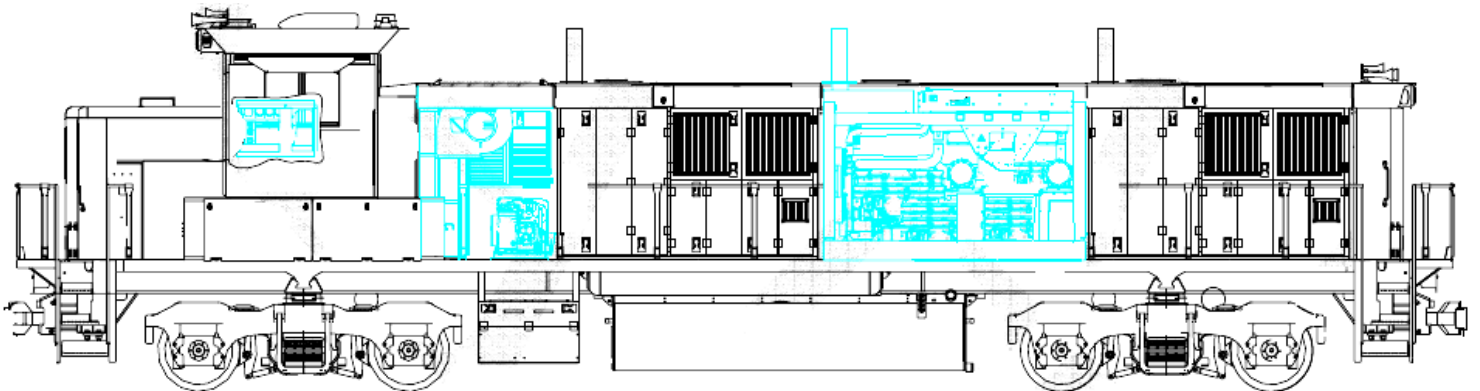
Fully Serviced.....	268,000lbs
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Supplies

Fuel ¹	2900gal
Sand.....	48ft ³
Coolant per NGen	45gal
Lubricating oil per NGen	80gal
Used lube oil reservoir	200gal
Retention tank	100gal

Equipment

Engine model	QSK19C
Generator model.....	572RDL
Air compressor model	GAR30
Air brake model.....	CCB26
Microprocessor model.....	N-Force
Traction motors	D77-78



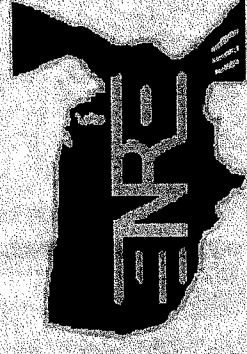
¹ Actual dimensions and capacities might differ from new to repower units.

² N-ViroMotive models are available in Plate C and alternative Plate dimensions.

*Images are artist rendering and are only meant to represent possible N-ViroMotive models.

The N-ViroMotive Product Line
Multi-Engine GenSet
Ultra Low Emissions
Road-Switcher
Locomotives

National Railway Equipment Co.



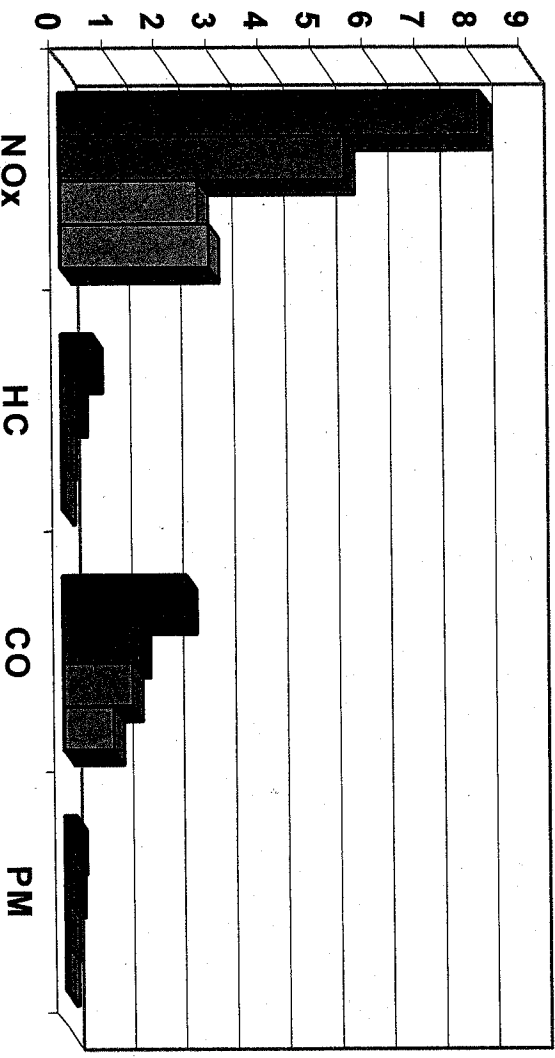
Making Locomotive Technology Work Better

- **Uses Multiple Diesel Engine GenSets that are EPA Tier III Off-Road certified to significantly reduce exhaust emissions.**
- **The locomotive is EPA Tier II Railway Industry certified and is recognized by the California Air Resources Board (CARB) as an Ultra Low Emitting Locomotive (ULEL).**
- **Controls the horsepower and rpm levels for each engine in order to achieve even better emissions and fuel consumption rates.**
- **Manages start and stop functionality to minimize engine idling.**
- **Provides all electrical power to a common buss connection so that DC power can be managed to individual traction motors for better adhesion to the rail and provides all necessary power for the operator's cab, air brake system and equipment cooling.**
- **Unit configuration arranges all the major components on the locomotive frame to substantially improve ease of replacement and dramatically reduce maintenance hours.**

Uses Multiple Diesel Engine Gensets that are EPA Tier III Off-Road certified to significantly reduce exhaust emissions.

USA EPA EMISSIONS LIMITS FOR LOCOMOTIVES VS. NREC'S N-VIROMOTIVE

EMISSIONS (G/BHP-H)	EPA TIER II RAIL		N-VIROMOTIVE			
	SWITCHER	LINE HAUL	SWITCHER	LINE HAUL	% LOWER	% LOWER
NOx	8.1	5.5	2.67	2.88	67%	48%
HC	0.6	0.3	0.08	0.06	87%	81%
CO	2.4	1.5	1.34	0.98	44%	35%
PM	0.24	0.2	0.08	0.07	67%	67%



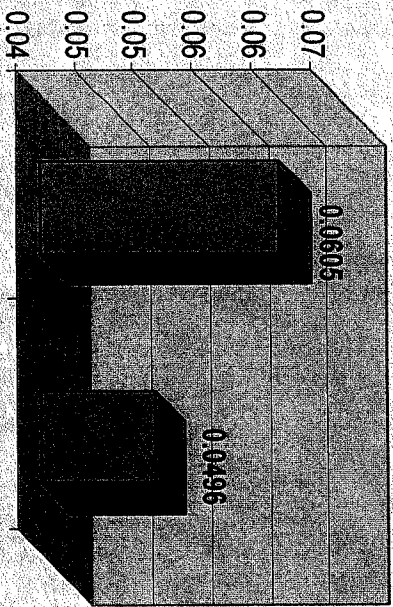
- USA EPA RAIL TIER II SWITCHER
- USA EPA RAIL TIER II LINE HAUL
- NREC SWITCHER
- NREC SWITCHER - LINE HAUL

FUEL CONSUMPTION DATA USING 25% LINE-HAUL DUTY CYCLE AND 75% SWITCHER DUTY CYCLE

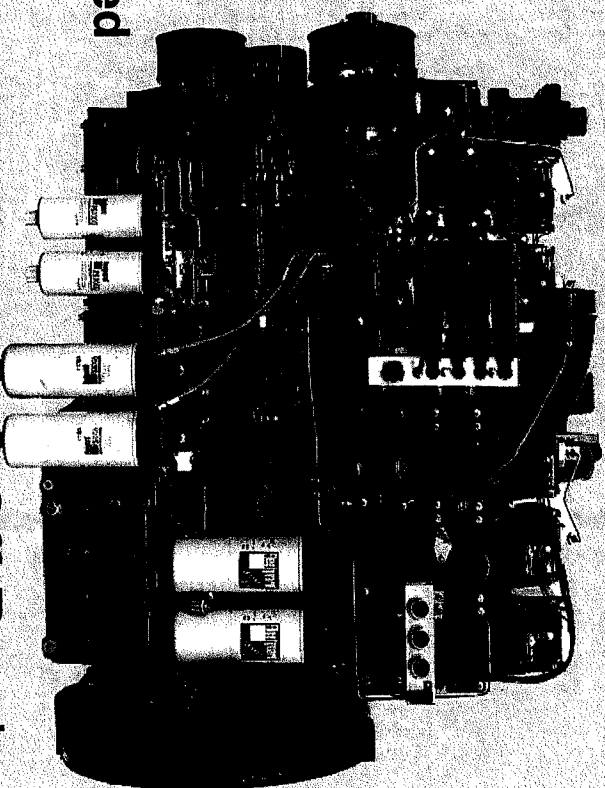
Throttle Notch	TIER III ENGS RUN	16 645E BHP	TIER III BHP	16 645E FUEL RATE Gal/Hr	TIER III FUEL RATE Gal/Hr	DUTY CYCLE %	16 645E WEIGHTED BHP	TIER III WEIGHTED BHP	16 645E WEIGH TED Gal/Hr	TIER III WEIGH TED Gal/Hr
8	3	2193	2069	122.40	109.65	4.7%	101.97	96.21	5.69	5.10
7	3	1854	1841	102.80	96.98	0.9%	16.69	16.57	0.93	0.87
6	3	1523	1537	83.10	82.52	2.1%	31.98	32.28	1.75	1.73
5	2	1214	1146	63.80	60.10	3.7%	44.31	41.83	2.33	2.19
4	2	911	937	46.80	50.70	3.8%	34.62	35.61	1.78	1.93
3	1	624	685	31.40	35.21	5.7%	35.26	38.70	1.77	1.99
2	1	328	388	16.00	21.31	10.9%	35.59	42.10	1.74	2.31
1	1	110	228	7.00	12.85	10.9%	12.02	24.91	0.76	1.40
Idle	1	17	67	5.00	2.27	54.4%	9.24	36.41	2.72	0.57
Totals:							321.67	364.61	19.46	18.10

ROAD/SWITCHER BSFC:

16 645E	TIER III	% DIFF
0.0605	0.0496	18.0%



Cummins QSK19 Tier III



Engine Type = In-Line, 4-Cycle, 6-Cyl

Displacement = 1159 cu. In. 19 Liters

Rated Power = 510-700 BHP 379-522 kW

Aspiration = Turbocharged

Air-to-Air Charge Air Cooled

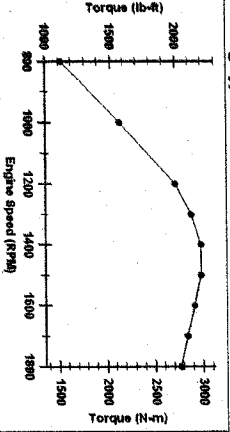
- The Engine is designed and certified as EPA Tier III Off-Road compliant
- Full Authority Electronic Controls
- Cummins Modular Common-Rail Fuel System
- Over 6500 QSK19 Engines in Industrial Applications

CUMMINS QSK19 ENGINE

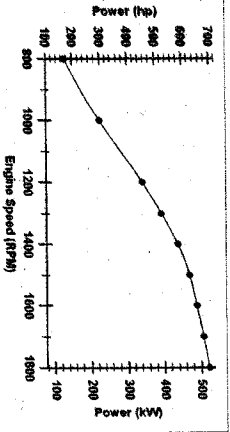
Engine Performance Data Cummins Inc. Columbus, Indiana 47202-3005 http://www.cummins.com		Industrial QSK19 FR 4443	700 BHP (522 kW) @ 1800 RPM 2,199 lb-ft (2,981 N-m) @ 1500 RPM
Configuration D19310C303	CFI Code 8533	Revision 9-Mar-2006	

Compression Ratio: 16:1
Fuel System: Cummins MCRS
Emission Certification: U.S. EPA Tier 3, CARB Tier 3, EU Stage IIIA
Aspiration: Turbocharged and Charge Air Cooled
Displacement: 1,199 in³ (19.0 L)
Rating Type: Intermittent

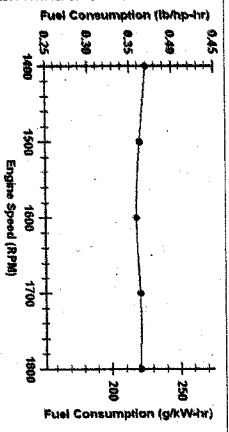
All data is based on the engine operating with fuel system, water pump, and 20 in H₂O (4.97 kPa) inlet air restriction with 5.8 in (147 mm) pipe diameter, and with 2 in Hg (7 kPa) exhaust restriction with 8 in (203 mm) pipe diameter; not included are alternator, fan, and other equipment and driven components. Coolant flow and heat rejection data based on coolant as 50% ethylene glycol/50% water. All data is subject to change without notice.



RPM	lb-ft	N-m
800	1,125	1,525
1,000	1,575	2,135
1,200	2,000	2,712
1,300	2,125	2,881
1,400	2,200	2,983
1,500	2,300	2,983
1,600	2,417	2,911
1,800	2,095	2,840
1,700	2,042	2,769



RPM	hp	kW
800	171	128
1,000	300	224
1,200	457	341
1,300	526	392
1,400	566	437
1,500	628	468
1,600	684	499
1,700	678	506
1,800	700	522



RPM	lb/hp-hr	g/kWh
1,400	0.37	225
1,500	0.363	221
1,600	0.358	218
1,700	0.363	221
1,800	0.363	221

Curves shown above represent gross engine performance capabilities obtained and corrected in accordance with SAE J1995 conditions (25.0 in Hg (100 kPa) barometric pressure, 3300F (1811) inlet air temperature, and 0.30 in Hg (4 kPa) outlet air pressure) with No. 2 diesel fuel. The engine may be operated up to 7,000 ft (2,134 m) altitude before electronic derate is applied.

STATUS FOR CURVES AND DATA: Limited-(measured data)
TOLERANCE: Within +/- 5%

CHIEF ENGINEER:
 Herbert C Moore

FR 4443 (Continued) Page: 2

Parameter	Rated Power	Maximum Power	Torque Peak
Engine Speed	1,800 RPM	522 kW	1,400 RPM
Output Power	700 hp	522 kW	628 hp
Torque	2,042 lb-ft	2,769 N-m	2,981 N-m
Fuel System	79 hp	59 kW	64 hp
Inlet Air Temperature	68 in-Hg	230 kPa	68 in-Hg
Turbo Comp. Outlet Pressure	72 in-Hg	243 kPa	72 in-Hg
Inlet Air Flow	387 deg F	197 deg C	378 deg F
Charge Air Flow	1,763 ft ³ /min	841 L/s	1,443 ft ³ /min
Exhaust Gas Temperature	128 in-Hg	68 kPa	103 in-Hg
Exhaust Gas Pressure	4,410 ft ³ /min	2,081 L/s	3,667 ft ³ /min
Maximum Fuel Flow to Pump	895 deg F	474 deg C	895 deg F
Maximum Fuel Flow to Coolant	705 bar	320 kg/hr	705 bar
Head Rejection to Fuel	0.950 ft ³ /min	174.96 kW	0.950 ft ³ /min
Head Rejection to Ambient	136 ft ³ /min	2.30 kW	136 ft ³ /min
Head Rejection to Exhaust	2,720 ft ³ /min	47.83 kW	2,720 ft ³ /min
Steady State Stroke	20,000 ft ³ /min	492.36 kW	20,000 ft ³ /min
	0.4 Boosh		0.8 Boosh

Parameter	Value
Maximum low idle speed:	1,200 RPM
Maximum low idle speed:	600 RPM
Minimum engine speed for full load sustained operation:	

Parameter	Value
Maximum low idle speed:	136 BTU/min
Maximum low idle speed:	452 kWh
Maximum low idle speed:	176 deg F
Maximum low idle speed:	705 kWh
Maximum low idle speed:	452 kWh
Maximum low idle speed:	3 psi
Maximum low idle speed:	DF1, DF2
Maximum low idle speed:	21 kPa

Parameter	Value
Maximum low idle speed:	2.39 kW
Maximum low idle speed:	205 kWh
Maximum low idle speed:	80 deg C
Maximum low idle speed:	303 kWh
Maximum low idle speed:	205 kWh
Maximum low idle speed:	117 kPa

*When operating at Maximum Available Power, the engine will increase due to combustion instabilities associated with a reduction in the air to fuel mixture.

CUMMINS QSK19 ENGINE

FR 4443 (Continued) Page: 3

Cranking System (Cold Starting Capability)

Unladen Cold Start	Minimum cranking speed:	150 RPM	
	Maximum ambient temperature for unladen cold start:	10 deg F	-12.2 deg C
	Operating torque at maximum unladen cold start temperature:	1,302 ft-lb	1,765 N-m
Aided Cold Start:			
	Maximum ambient temperature with Grid Heater only:	N/A deg F	N/A deg C
	Maximum ambient temperature with Ether only:	-5 deg F	-21 deg C
	Maximum ambient temperature with auxiliary heater only:	-5 deg F	-21 deg C
	Cold starting aids available:	Ether	

Noise Emissions

Top	96.8 dBA
Right Side	102.2 dBA
Left Side	100 dBA
Front	102.1 dBA
	122.2 dBA

Estimated from Road Speed Pressure Level of 2.3kPa (17 and 17.4 kcal covered Speed
Excludes noise from intake, Exhaust, Cooling System and Drive Components)

End of Report

Revised after 17-Jan-2006
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