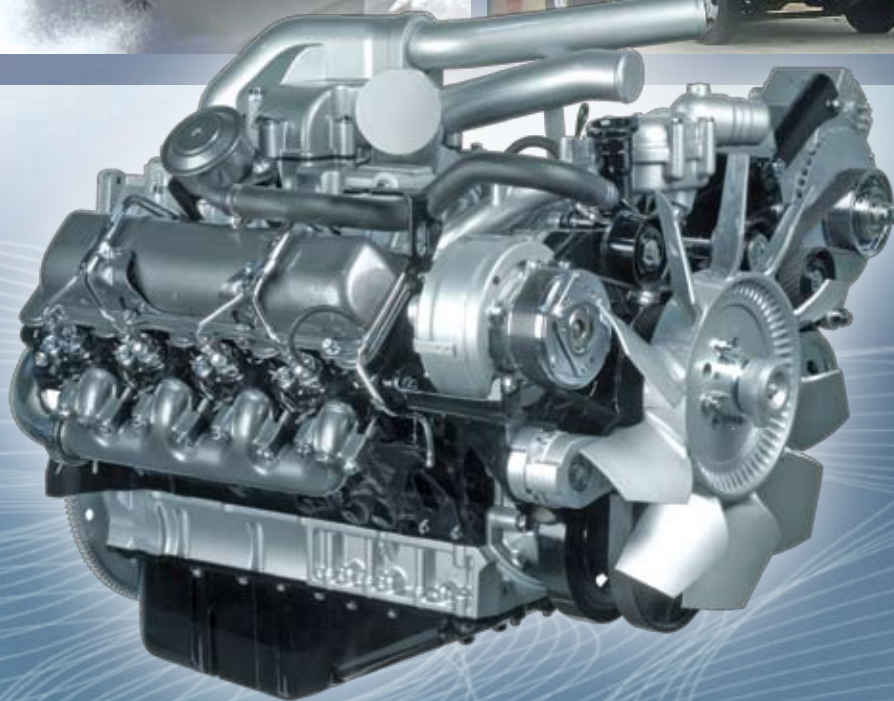




# OPTIMIZER 6500<sup>®</sup>

## V8 TURBO DIESEL ENGINES

POWERING THE FAMOUS HUMVEE<sup>®</sup>



**RENOWNED FOR RELIABILITY, DURABILITY AND PERFORMANCE**





## General Engine Products

General Engine Products (GEP) was formed in 1999 by AM General® — manufacturer of the legendary HUMVEE® — as a wholly-owned engine development and manufacturing subsidiary. The company's mission is to design, produce and continually improve the Optimizer 6500® 6.5L diesel engine.

Exclusive producer of Optimizer 6500® V8 diesel powerplants for the military HUMVEE®, GEP also assembles new 6.5L engines for OEM sales to delivery truck, SUV, bus, marine and industrial users. The company is the sole source of 6.5L service engines to General Motors Service and Parts Operations (GMSPO). GEP has won multiple supplier awards from GM® for customer service. Located in Ohio, GEP's Franklin Engine Plant began full-scale production in July 2000. By the end of 2009, over 250,000 engines will have been produced.

## World-Class Manufacturing Facility

The success of the Optimizer 6500® engine is due in large part to GEP's highly capable and proficient manufacturing group. As one of the highest quality engine assembly plants in the world, GEP's Franklin Engine Plant applies flexible manufacturing and TS-16949 certified production procedures, allowing the facility to meet all customer requirements.

*Authentic American*



## Quality Assurance — Key to Our Success

Maintaining consistent product quality is a key element in the success of the Optimizer 6500® engines. General Engine Product's Franklin assembly plant recently received TS-16949 certification, an indication of GEP's commitment to quality. In addition, all GEP suppliers are certified through QS-9000, ISO-9000 or TS16949 to guarantee that every Optimizer 6500® engine meets customer expectations for build quality and long-term reliability. In fact, the Optimizer 6500® has the highest level of internal cleanliness of any heavy-duty diesel engine in the world.

## Technical and Service Support — Dedication to Excellence

Located 300 miles north of the Franklin assembly plant, GEP Engineering maintains its offices in Livonia, Michigan. The engineering group is responsible for developing and releasing all Optimizer 6500® diesel engine calibrations and applications.

Constantly working to improve the Optimizer 6500® engine, GEP engineers provide complete powertrain solutions, as well as other services covering:

- Specialty engine development
- Vehicle integration engineering
- Exhaust emission control technology
- Electronic controls development
- Program design, development, testing and validation
- Prognostics and diagnostics
- Web-based service support



- ▲ The Franklin Engine Plant has passed eight consecutive Det Norske Veritas (DNV) QS-9000 quality audits with zero non-conformities. The facility recently received TS-16949 certification (shown above), also with zero non-conformities.



# GENERAL ENGINE PRODUCTS

## NEW HIGH OUTPUT OPTIMIZER 6500®-550 V8 TURBO DIESEL ENGINE

There are a number of features that differentiate it from the rest of the Optimizer line, including a recalibrated turbocharger, charge-air intercooler, high-output fuel pump, and a new fully-electronic engine controller.

To accommodate the large increase in power, the Optimizer 6500®-550 uses upgraded components including stronger connecting rods and a forged steel crankshaft, while a ductile iron ladder-frame girdle replaces the individual main bearing caps. This girdle provides not only better crankshaft retention, but adds to the overall rigidity of the Optimizer engine block.

**550 LB-FT, A 45% INCREASE OVER 380 LB-FT**

**250 HP, A 32% INCREASE OVER 190 HP**

**HIGHER TURBOCHARGER  
BOOST PRESSURE WITH  
IMPROVED FLOW OUTLET**

**NEW MOTOR DRIVEN  
ACTUATOR FOR WASTEGATE  
CONTROL**

**REDESIGNED CROSS SECTION  
CONNECTING RODS**

**HIGH STRENGTH, FORGED  
STEEL CRANKSHAFT**

**NEW DUCTILE IRON LADDER  
FRAME/GIRDLE REPLACING  
INDIVIDUAL MAIN BEARING CAPS**

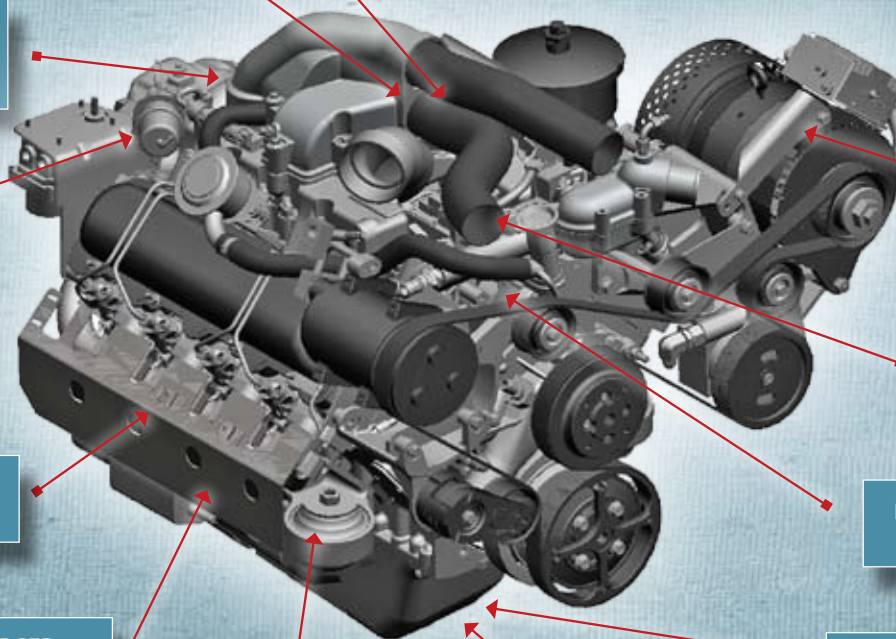
**210 AMP ALT STD,  
400 AMP ALT OPT**

**NEW CHARGE AIR INTERCOOLER**

**RECALIBRATED HIGH OUTPUT  
ELECTRONIC FUEL PUMP**

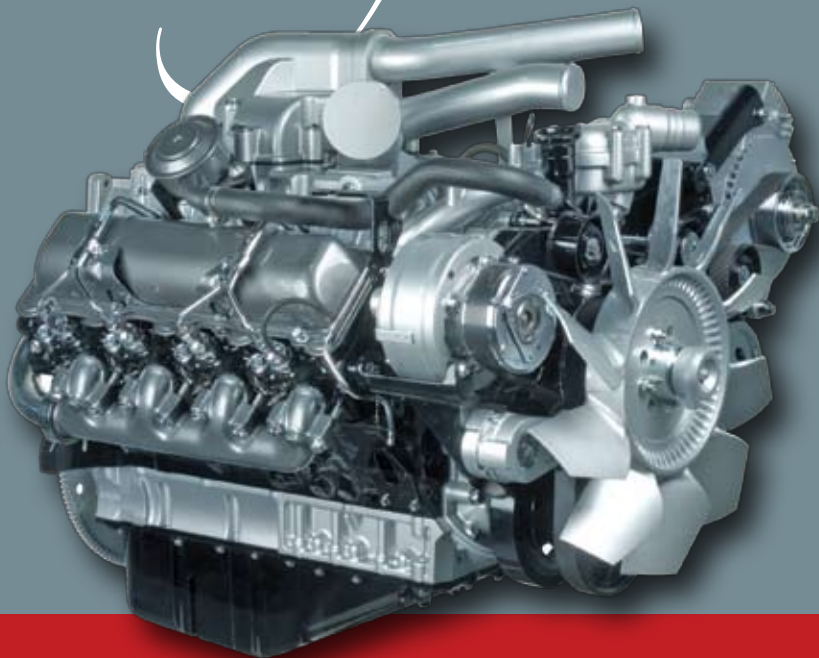
**NEW CAST ALLOY STRUCTURAL OIL PAN**

**NEW FULLY ELECTRONIC ENGINE CONTROL  
UNIT DESIGNED BY GEP ENGINEERING**





# Legend



◀ The Optimizer 6500®-550 is the latest chapter in the 25-year history of HUMVEE® powerplants, satisfying one of the world's most demanding customers — the United States Military.

## The Optimizer 6500®

## Field-Proven Powerplant



General Engine Products was formed out of the need to sustain the production of the military's 6.5L powerplant. Supporting the HUMVEE's heritage of power and reliability, the Optimizer 6500® has progressively built on technological and manufacturing knowledge.

GEP strengthened the engine by adding a cast-iron "moly" alloy engine block with robust main bearing caps and high chrome-content cast-iron cylinder heads with optimized head bolt bosses for increased performance and long-term reliability. The Optimizer 6500® has one of the best torque-to-horsepower ratios in today's heavy-duty diesel market.

General Engine Product's largest customers — the U.S. Army and U.S. Marine Corps — have put more than 200,000 military HUMVEE® vehicles to the test in the world's most extreme environments. This experience in the field enables GEP to produce the toughest most reliable diesel engines available.

The Optimizer 6500® meets all General Motors®, AM General® and Department of Defense (DoD) requirements. This is why the Optimizer 6500® is also used in a wide range of commercial uses around the world, including fleet trucks, powerboats, industrial equipment and agricultural applications.



◀ Every Optimizer 6500® engine benefits from its military HUMVEE® heritage resulting in a field-proven powerplant to complete any mission.



## Major Optimizer 6500® Engine Applications

- U.S. Military HUMVEE® family of light tactical vehicles (LTV)
- General Motors HUMMER H1® SUV, the benchmark of Sport Utility Vehicles
- General Motors Service Parts Operations
- AM General Service Parts Logistics Operations
- Marine watercraft engines
- Power units for industrial generator sets, water pumps and hydraulic units
- Light-duty construction equipment
- Commercial delivery truck fleets

## The Optimizer 6500® Family — Power to Fit Every Need

General Engine Products offers customers a choice of engines, each with the same reliability the U.S. Military demands. Every Optimizer 6500® engine offers exceptional value due to low lifecycle costs, which meet Department of Defense and Federal acquisition goals. General Engine Products has ensured this through competitive pricing, as well as design for extreme durability and high reliability.

**Optimizer 6500®-290** — 160 hp / 290 lb.-ft.  
Naturally-aspirated and mechanically controlled

**Optimizer 6500®-380** — 190 hp / 380 lb.-ft.  
Turbocharged and mechanically controlled

**Optimizer 6500®-440** — 205 hp / 440 lb.-ft.  
Turbocharged and electronically controlled

**Optimizer 6500®-550** — 250 hp / 550 lb.-ft.  
Turbocharged and electronically controlled

## Multi-Fuel Capability

All Optimizer 6500® military engines can run on JP-8 military fuel or No. 2 diesel. In addition, GEP offers a multi-fuel version of the Optimizer 6500®-550 for power units. These engines can operate on a choice of fuels including natural gas, methanol or propane. This addresses one of the biggest concerns for operating power units in remote locations — a source of readily available fuel.

## Optimizer 6500®-550 — High Output for Tough Jobs

General Engine Products' latest model is the Optimizer 6500®-550 V8 Turbo Diesel engine. Using electronic controls and an intercooler, the engine is rated at 250hp and 550 lb.-ft. of torque.

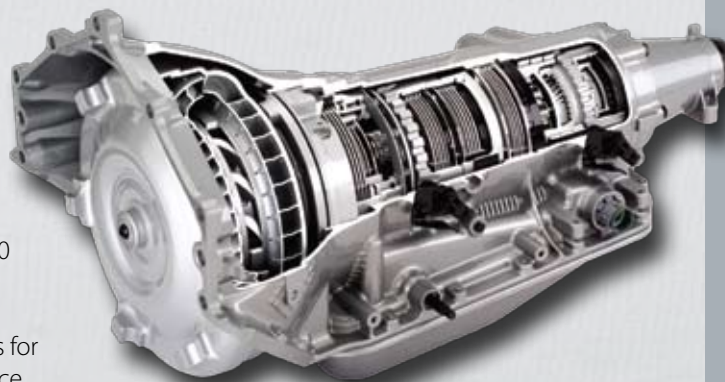
## Operation and Maintenance — Taking Reliability to Higher Level

The Optimizer 6500® is designed for trouble-free operation and easy access to routine maintenance parts. However, should service be required, parts support is facilitated by a worldwide parts network. In fact, Optimizer 6500® engine parts are available through most General Motors® service locations. For ease of service, the Optimizer 6500® is compatible with the Tech II engine analyzer.

## Transmission Compatibility and Powertrain Offerings

Another clear advantage that all Optimizer 6500® engines feature is compatibility with a popular automatic transmission. Many of the Optimizer family of engines can be mated to the GM-designed 4L80E 4-speed automatic transmission.

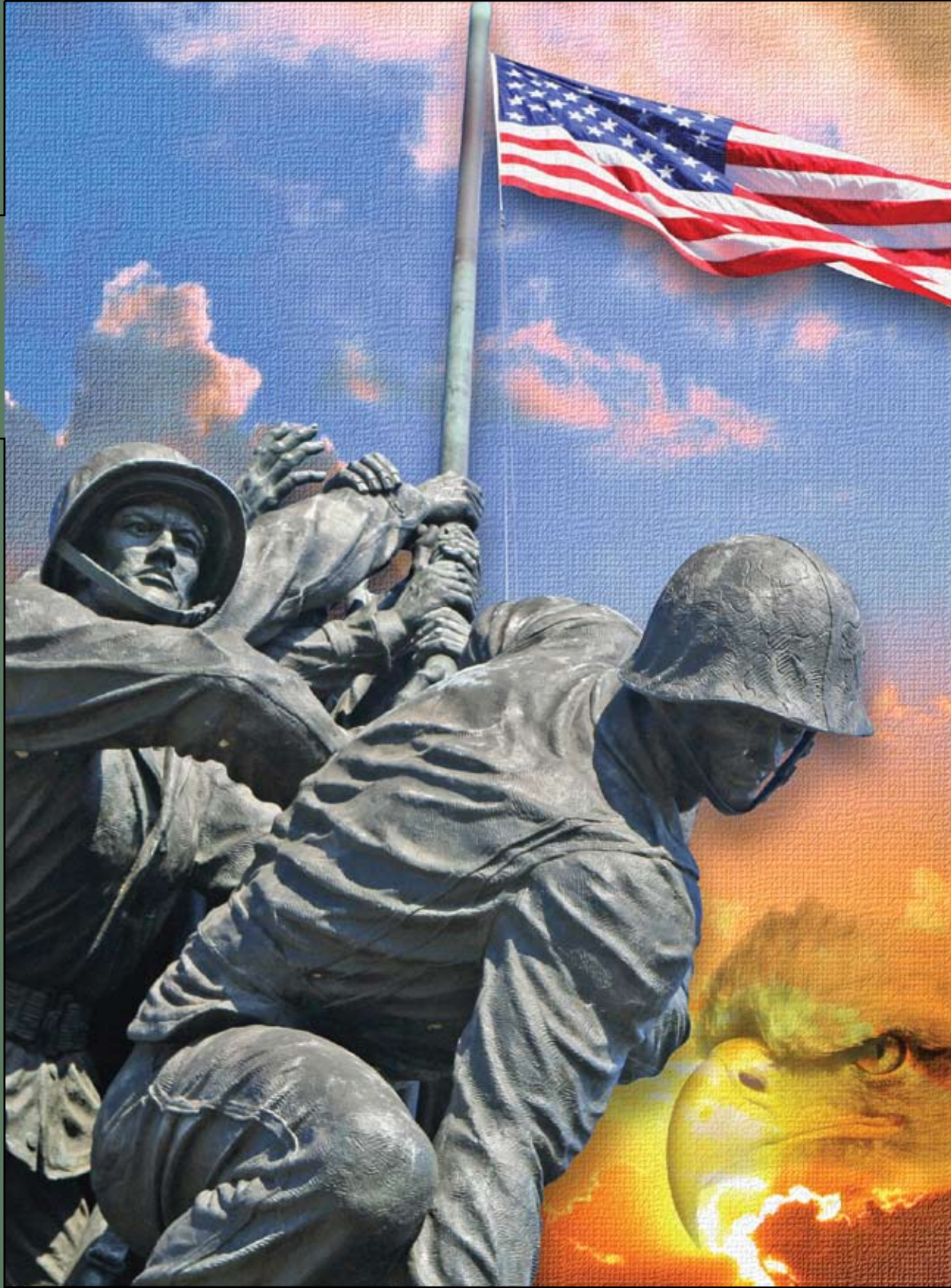
General Transmission Products (GTP), also a subsidiary of AM General®, builds the 4L80E 4-speed automatic transmission. The GEP Optimizer 6500® engine mated to the GTP 4L80 transmission is a powerful powertrain choice. This is the same powertrain chosen for the HUMVEE®.



▲ The General Transmission Products 4L80E 4-speed automatic transmission has earned a durable reputation in the U. S. Military as the HUMVEE® transmission. Commercial customers also appreciate its low maintenance, proven performance and smooth shifting.







## The Optimizer 6500®

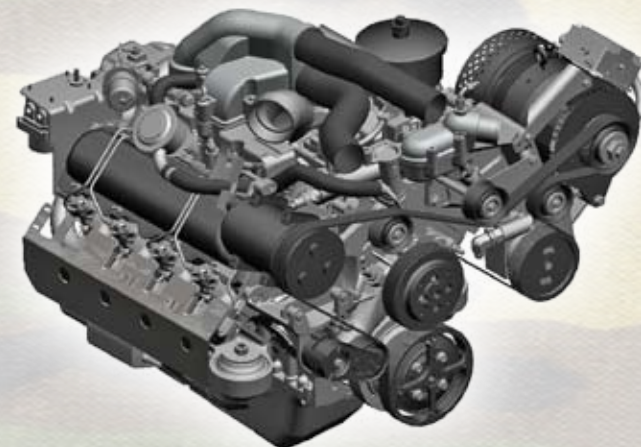
# A Proud American Heritage



The Optimizer 6500® was originally designed for the most well-known military vehicle of all time — the HUMVEE®. Because of its mission, the Optimizer 6500®-550 benefits from a 25-year history of military engine development and application.

### **DF-2 / JP-8 Fuel Capability**

All Optimizer military engines can operate on DF-2 or JP-8 military fuel. Remarkably the Optimizer 6500®-550 features a unique engine control system that ensures the same level of performance using either DF-2 diesel or JP-8 fuel.



▲ The Optimizer 6500®-550 engine is the powerplant of choice for advanced development military vehicles.



*The GEP Optimizer 6500® engine is designed with one primary focus — support the troops in the field. No matter what the mission, military or civilian, the Optimizer has the credentials to get the job done.*



▲ Ready for anything, a HUMVEE® fords a river. With sealed components and engines tested for water intrusion and corrosion, these measures add to the field-proven durability of the Optimizer 6500®.



▲ Engine parts and components meet all military specifications and allow the Optimizer 6500® to shrug off the adverse effects of extreme battlefield conditions.





# Optimizer

**Marine Power — Rock-Solid Reliability**



Used in marine applications throughout the United States and globally, the Optimizer 6500® can be tailored to meet a multitude of requirements. General Engine Products supplies marinizers who produce a series of Optimizer engines for powerboats and other watercraft. From a naturally-aspirated 160-horsepower base engine to turbocharged and supercharged versions producing 300 horsepower, there is a reliable Optimizer-based marine powerplant available for most any application.

General Engine Products' Optimizer 6500® can easily weather the rigorous duty cycles experienced in selected marine applications. Already protected against water intrusion and corrosives, Optimizer 6500® engines need little additional modification for marine use.



▼ The GEP Optimizer 6500® diesel engine is the perfect choice for many marine applications thanks to its military heritage of extreme durability and reliability. ▲

## Suppliers Who Use GEP Engines

- MarineDiesel Sweden AB  
Metallgatang, 262 72 / Engleholm, Sweden  
+46-431-80130 / [www.marinediesel.nu](http://www.marinediesel.nu)
- Peninsular Engines  
3056A Dixie SW / Grandville, Michigan 49418  
616-530-1298 / [www.peninsulardiesel.com](http://www.peninsulardiesel.com)
- General Engine Powered Products  
15570 Red Rock Road / Reno, Nevada 89506  
715-970-3516 / [www.geppdiesel.com](http://www.geppdiesel.com)
- International Diesel Ltd.  
155 Raynor Avenue / Ronkonkoma, NY 11779  
631-737-7050 / [www.65engineparts.com](http://www.65engineparts.com)





# Power Unit

**The Optimizer 6500® Power Unit — Tireless Workhorse**





The Optimizer 6500® power unit, whether used in open or closed configurations, diesel or alternative fuel options, can satisfy a critical need for power. The Optimizer 6500® is one of the best choices for a stationary or mobile power source, especially in remote areas.

◀ The Optimizer 6500®-550 multi-fuel power unit offers a valuable combination of stationary power, reliability and fuel versatility — perfect for remote locations where maintenance visits are hampered by difficult terrain and diesel fuel is scarce.

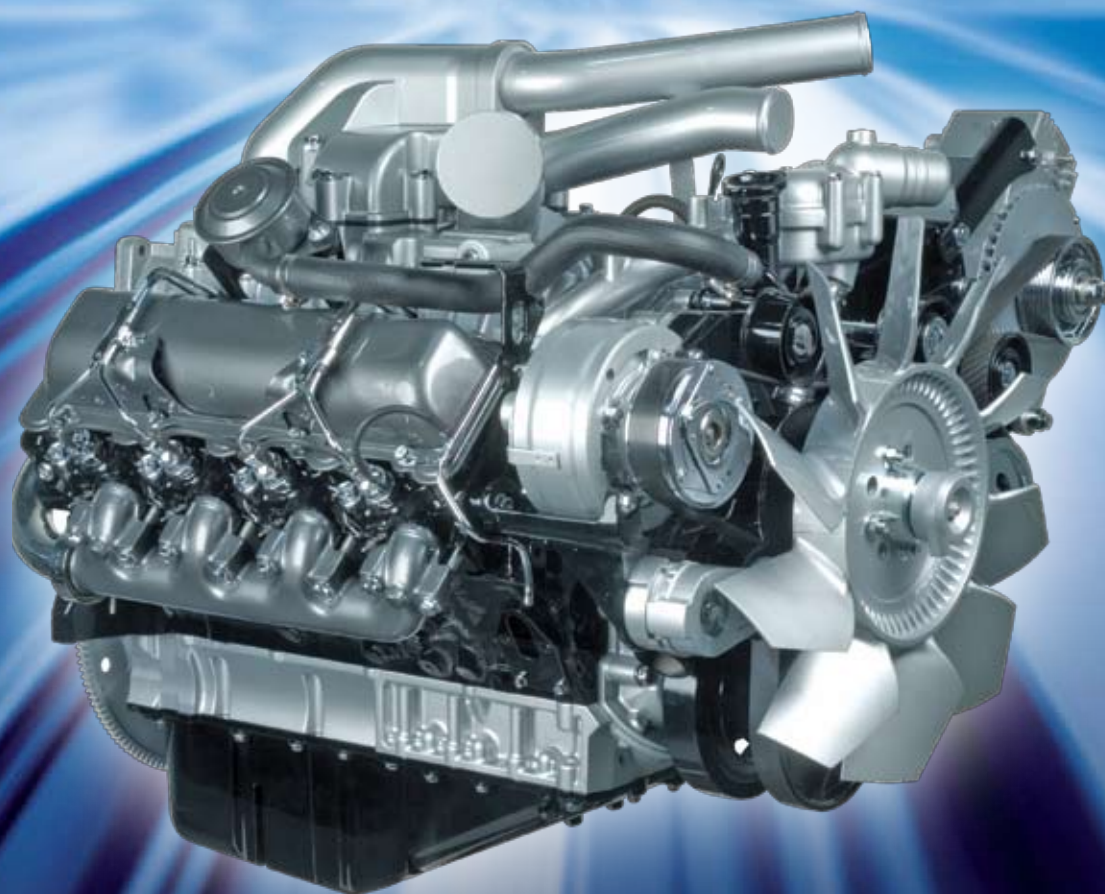
### Long-term Durability — Multiple Fuel Choices

Whether powering a generator set, irrigation pump or other stationary drive system, the Optimizer 6500®-550 power unit offers even more flexibility with the available multi-fuel option. Custom built, Optimizer 6500® power units can accommodate one of several operating fuels including DF-2, JP-8, biodiesel, natural gas, methanol or propane.

▼ Whether powering generators for a tent city in a remote location, or in the farmer's field providing critical crop irrigation, the Optimizer 6500® has earned its stripes.







# Optimizer 6500<sup>®</sup>

**Proudly Built in America at the Franklin Engine Plant**





▲ Every Optimizer 6500® engine is hot tested prior to shipment.



▲ Every GEP plant operator uses TS-16949 quality procedures at their work station.

## FRANKLIN ENGINE PLANT

GEP's advanced manufacturing facility in Franklin, Ohio is dedicated to producing the highest quality Optimizer 6500® engines. TS-16949 certified production procedures ensure that every engine exceeds customer expectations.

### Contact Information:

General Engine Products LLC  
Franklin Engine Plant  
2000 Watkins Glenn Drive  
P.O. Box 488  
Franklin, OH 45005-0488  
937 704-1800 / Fax: 937 704-1874



▲ Optimizer 6500® engines are assembled at GEP's Franklin, Ohio Engine Plant.



# Specifications

## OPTIMIZER 6500® FAMILY OF ENGINES

The Optimizer 6500® family of engines offers a range of power options, yet shares a common architecture. Durability and reliability are also common to this remarkable line of heavy duty powerplants. The following lists the shared specifications of the Optimizer 6500®.

TYPE:	6.5L V8 Turbo (T) or Naturally-Aspirated (N/A) Diesel
Displacement:	6468cc
Compression Ratio:	20.2:1 (18:1 — Marine)
Valve Configuration:	Overhead
Valve Lifters:	Hydraulic Roller
Firing Order:	1-8-7-2-6-5-4-3
Bore x Stroke:	103mm x 97.03mm
Fuel Delivery:	Indirect Electronic Fuel Injection (EFI) or Indirect Mechanical Fuel Injection (MFI)
HORSEPOWER:	
6500-290	160 hp @ 3400 rpm (NA) (MFI)
6500-380	190 hp @ 3400 rpm (T) (MFI)
6500-440	205 hp @ 3200 rpm (T) (EFI)
6500-550	250 hp @ 3000 rpm (T) (EFI)
TORQUE:	
6500-290	290 lb.-ft. @ 1800 rpm (NA) (MFI)
6500-380	380 lb.-ft. @ 1800 rpm (T) (MFI)
6500-440	440 lb.-ft. @ 1800 rpm (T) (EFI)
6500-550	550 lb.-ft. @ 2000 rpm (T) (EFI)
Max. Governed Engine Speed:	3400 rpm
Emissions Controls:	Positive Crankcase Ventilation, Catalyst

### Mission-Specific Materials — For More Durable Components

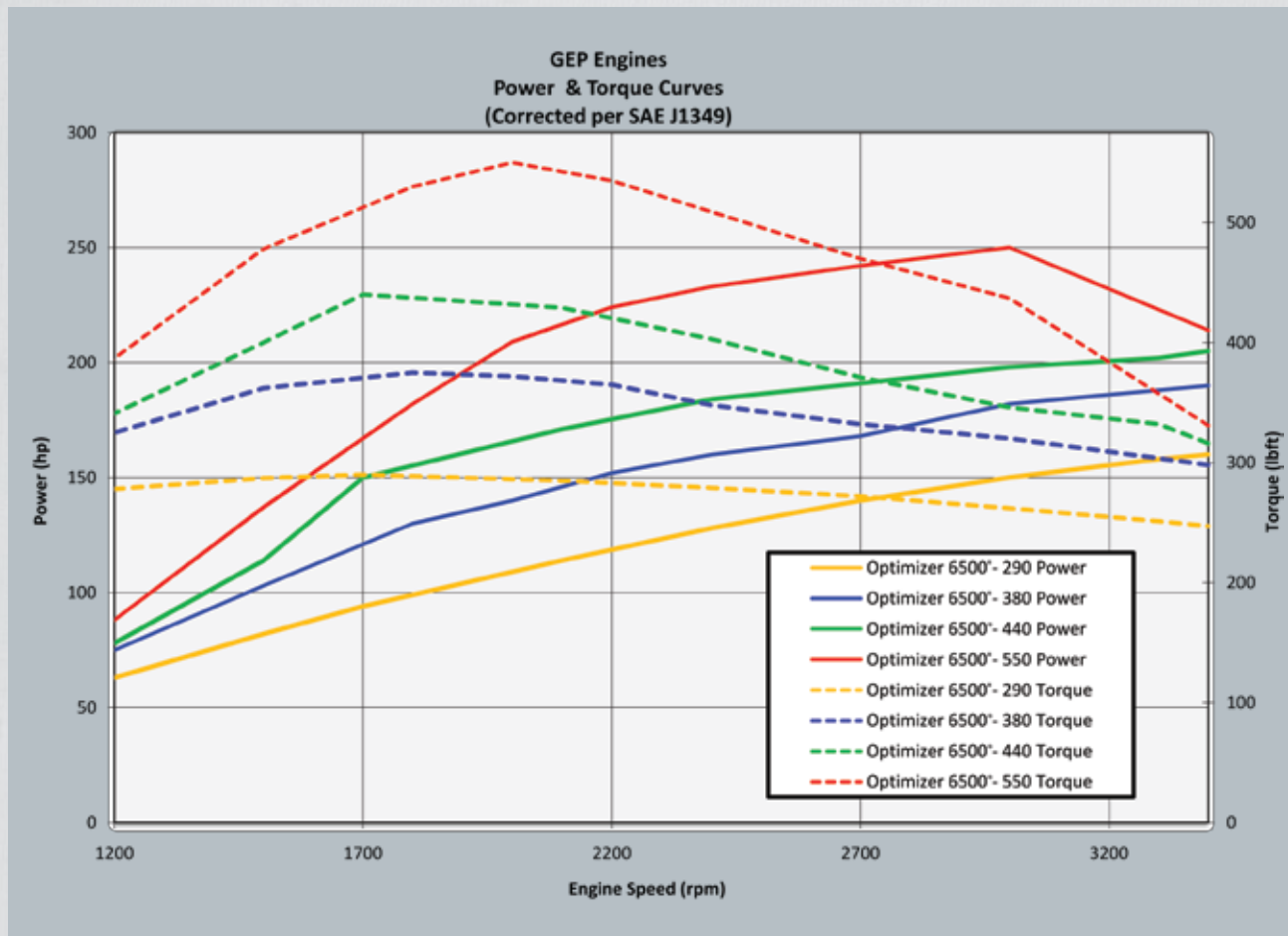
The Optimizer 6500® family of engines has benefited over the years from numerous upgrades over the early GM-based 6.5L engine. The following is a list of some key components and their related material.

Engine Block:	Grey Iron/Molybdenum
Cylinder Head:	Grey Iron with High Chrome Content
Intake Manifold:	Cast Aluminum
Exhaust Manifold:	Cast Nodular Iron
Main Bearing Caps:	Cast Nodular Iron
Crankshaft:	Cast Nodular Iron/Forged Steel (Optimizer 6500-550)
Camshaft:	Forged Carbonized Steel
Connecting Rods:	Forged Steel
Lower Girdle (6500-550 only):	Ductile Iron

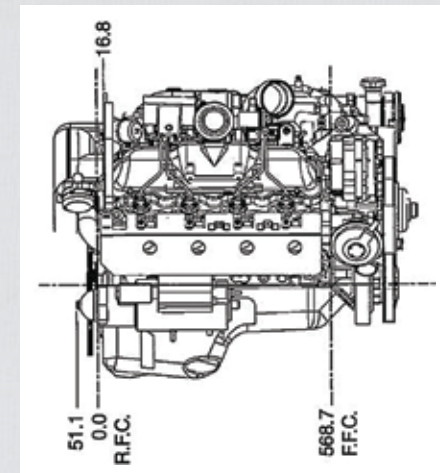




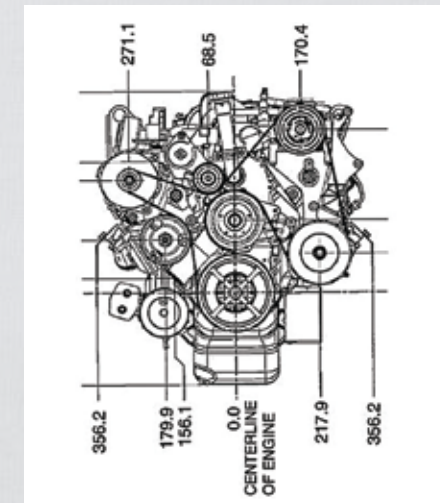
## OPTIMIZER HORSEPOWER AND TORQUE COMPARISON



RIGHT HAND SIDE VIEW OPTIMIZER  
6500°-440



FRONT VIEW OPTIMIZER 6500°-440







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