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# M62 TU & M73 TU WATER COOLED GENERATOR

## OVERVIEW

With continual expansion of electrical systems in the areas of emission compliance and added occupant convenience features, the demands placed on vehicle power supply and charging systems also increases.

To keep up with electrical system demands BMW is utilizing a new water cooled generator on M62 TU and M73 TU equipped vehicles.

The water cooled generator (F-alternator) has a variable output of 90 to 150 Amps based on engine speed.



## MECHANICAL BENEFITS

- High overall power output varied by engine speed
  - idling speed = 90 A
  - part load: =150 A
- Stabilized water cooling temperatures
- Generator noise levels are significantly reduced.
- Improved durability and longer component lifespan due to omission of carbon brushes.
- Omission of air cooled generator ram air ducting freeing up precious underhood space.

## FUNCTIONAL BENEFITS

The generator is fitted with a load response feature. This feature activates a time delay of generator output between engine start-up and engine running phases of operation. This prevents generator induced drag during engine start-up.

The charts below show the demands placed on the vehicle batteries and charging system of the M73 TU engine with E-CAT control system.

<b>Consumers during electric cat operation:</b>	<b>Minimum power consumption</b>	<b>Maximum power consumption</b>
Electric cat for 30 s	240 A	240 A
Engine	23 A	23 A
Suspension	4 A	4 A
Body	3 A	3 A
Secondary air pump	30 A	30 A
<b>Possible additional consumers:</b>		
Low-beam light		13 A
High-beam light		9 A
Foglight		9 A
Brake light		4 A
Reading light		1 A
Fan blower		29 A
Rear compartment fan blower		16 A
A/C unit		3 A
Audio systems and telephone		10 A
Wiper stage 2		9 A
Auxiliary fan 1/2		25 A
<b>Total power consumption:</b>	<b>300 A</b>	<b>428 A</b>
Alternator current (depending on alternator speed)	110 A	95 A
<b>Load on battery:</b>	<b>190 A</b>	<b>333 A</b>



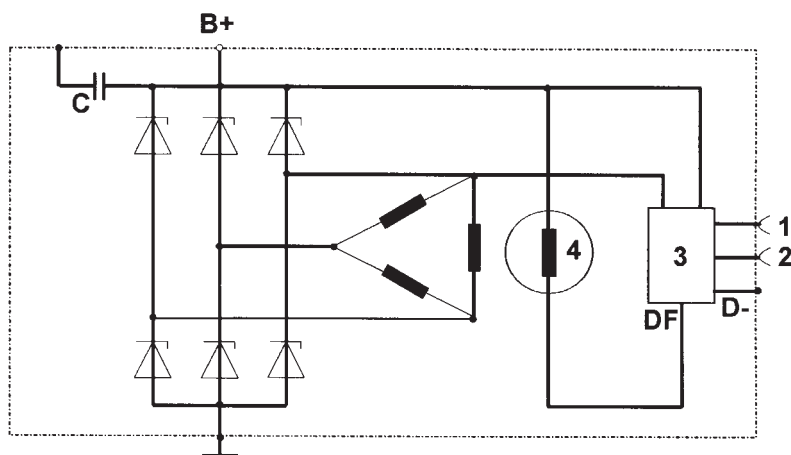
## GENERATOR MULTI-FUNCTION CONTROL ELECTRONICS

As well as regulating output charging voltage, the multi-function control electronics provide the following features:

- Load response during start-up
- Load response during driving
- Fault display

The start-up load response system provides for the alternator exciter current to be started by a transistor two seconds after the battery indicator (KL 61 E) goes out. This means that engine start-up is unaffected by generator induced drag.

With the engine running, the load response system is particularly useful when the engine is at idling speed. It ensures that when large current consumers are switched on (blower motor, headlights, rear window defroster, etc.) the sensed additional load causes the generator to linearly increase power output allowing the DME/EML system to stabilize the engine speed and or modify injection time if necessary.



1: KL 15, 2: KL 61 E, 3: Multi-Function Control Electronics

### SERVICE INFORMATION

On early production vehicles (up to 12/18/98 production), the generator's multi-function controller may be affected by extreme fluctuations in the KL 15 voltage input. The generator will not produce charging voltage and the battery indicator remains on.

The voltage fluctuation causes the multi-function controller to stop operating (lock-up). This condition can be remedied by disconnecting the battery cable to interrupt B+ to the generator. When reconnected the multi-function controller "reboots" and functions correctly.

A Service Action is being developed for all vehicles within the affected production range. Contact the Technical Hotline for further information.

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## GENERATOR TEMPERATURES

In a conventional air-cooled generator, rapid temperature increases occur immediately after engine start-up and during peak current demands (rainy day: lights on, wipers on, etc.). As engine speed increases, air flow increases which provides generator cooling. Conventional air cooled generator temperatures fluctuate based on engine speed, vehicle speed (ram air) and generator load.

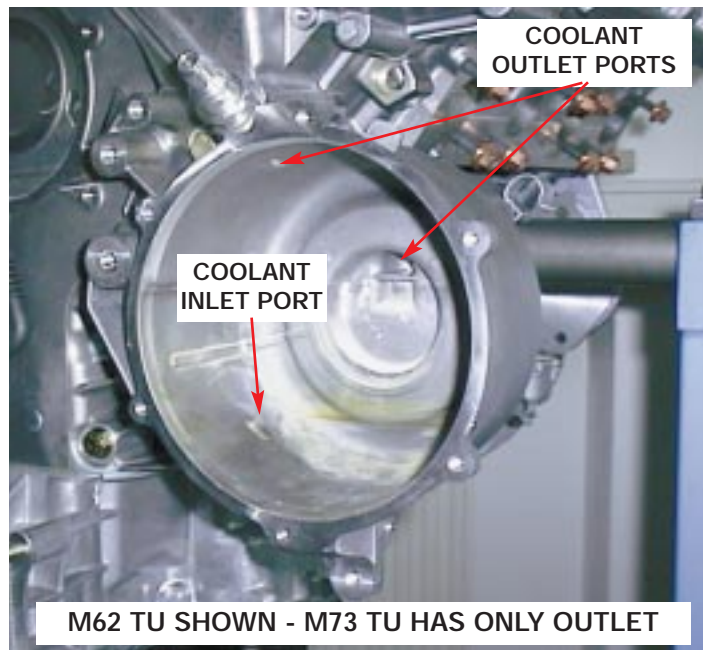
On the other hand, water cooled generator temperatures are more stable since they are not influenced by engine or vehicle speed. This stabilizes the internal temperature significantly improving the lifespan of the generator since individual components are not subjected to stress of fluctuating temperature.

## GENERATOR COOLING SYSTEM

The generator is installed in an aluminum shell that essentially becomes an extension of the engine cooling system. The space between the inner surface of the shell and the outer surface of the generator creates a water jacket that engine coolant flows through.

The aluminum shell is an integral part of the lower timing case cover on the M62 TU (shown) or as a separate bolt on component used on the M73 TU.

Coolant flows from the engine into the shell through internal ports and exits via hose connection(s).



The thermostatically controlled transmission oil heat exchanger is provided with warm engine coolant from the outlet port of the shell.

## REDUCED NOISE EMISSIONS

Since the generator is fully encapsulated and surrounded by a coolant jacket, generator noise is reduced significantly. Additionally, the water cooled generator does not use a fan for cooling purposes as on a conventional generator which also contributes to noise.