

## GM MEDIUM DUTY ELECTRICAL SPECIFICATIONS

### INDEX

Battery General Information and Specifications	2
Battery Chart	3
Electrical System Connectors	4
Electrical System Features	5
Alternator General Information	6
Alternator Standard Specifications	7
Ignition Switch Key Release and Horn Options	8
Starters	9-11

### BATTERY - Side Terminal Type

#### Description

The battery is a maintenance-free lead calcium design available in top post, side terminal, and dual terminal configurations. The wrought lead-calcium grid design provides excellent current conductivity and resists damage from overcharging, heat, thermal runaway, and vibration. High density plates provide excellent reserve capacity and cycling capability to meet the increasing electrical accessory loads of today's vehicles.

#### Typical Application:

To meet our customer's electrical system requirements, the battery performs four key functions in the automotive electrical system. First, it supplies electrical energy for the accessories when the engine is not running. Second, it supplies energy to the cranking motor and ignition system or glow plugs as the engine is started. Third, it intermittently supplies current for accessories when energy demand is greater than generator output. Fourth, it acts as a voltage stabilizer in the electrical system.

#### Features:

- Factory sealed maintenance-free
- High density plate paste/thicker plates
- Wrought lead-calcium grid design with plastic bottom border
- No antimony in plates
- Built in hydrometer (state of charge indicator)
- Flexible manufacturing to meet all O.E. and aftermarket requirements (wide variety of cases, handles, performances, and terminal configurations)
- Flat top design

### HEAVY DUTY BATTERY - Top Terminal Type

#### Description:

The batteries are designed to withstand the punishment of commercial applications. With center cast-on plate straps and anchored plates they offer excellent resistance to vibration damage, in fact they exceed industry vibration standards. Our lead-calcium design resists corrosion, overcharging, gassing, water usage, self discharge, and thermal runaway. When used with sealed connectors, the studded terminal design also stops corrosion of cables and terminals, eliminating the need for regular cleaning. Models are available to meet specific application requirements for high cycling and deep cycling capability, and cold cranking amperage.

#### 750 CCA Series, AC Delco G1110

The 750 is rated at 750 cold cranking amps. A three-battery complement satisfies most engine starting requirements where battery mounting area is limited. And a two-battery complement is suitable for mid-range diesel trucks with limited cycling and where less starting power is required.

#### 700 CCA High-Cycle Series, AC Delco G1150

The 700 high-cycle, rated at 700 cold cranking amps, was designed to achieve maximum performance and durability in commercial applications. It optimizes the combination of cranking power, cycling capability, vibration resistance and system capacity, assuring reliability and economical operation. The 700 CCA's unique characteristics make it the ideal choice for line-haul truck, coach, off-road, emergency vehicle, and gasoline powered pick-up and delivery applications.

**BATTERY CHART**

Batteries are available, as shown in the chart below. The batteries, originally designed for passenger car and light duty truck usage, offer optimum cost and performance.

<b>GAS ENGINES</b>	<b>RPO</b>	<b>NO. USED</b>	<b>12 VOLT SERIES</b>	<b>RATING CCA / RC</b>	<b>BATTERY SIZE LXWXH (cm)</b>	<b>MODEL</b>	<b>POST LOCATION</b>
BASE	TM1	1	CCA 600	600 / 115	10.24 x 7.01 x 7.24 (26 x 17.8 x 18.4)	Conventional	SIDE
OPTIONAL	TNQ	1	CCA 700 AC Delco G1150	700 / 180	12.99 x 6.77 x 9.45 (33 x 17.2 x 24)	Conventional	TOP
OPTIONAL	TM2	1	CCA 770	770 / 115	10.24 x 7.01 x 7.24 (26 x 17.8 x 18.4)	Conventional	SIDE
OPTIONAL	TNN	2	CCA 700 AC Delco G1150	1400 / 360	12.99 x 6.77 x 9.45 (33 x 17.2 x 24)	Conventional	TOP
<b>DIESEL ENGINES</b>							
BASE	TNL	2	CCA 750 AC Delco G1110	1500 / 320	12.99 x 6.77 x 9.45 (33 x 17.2 x 24)	Conventional	TOP
OPTIONAL	TNN	2	CCA 700 AC Delco G1150	1400 / 360	12.99 x 6.77 x 9.45 (33 x 17.2 x 24)	Conventional	TOP
OPTIONAL	TNR	3	CCA 700 AC Delco G1150	2100/540	12.99 x 6.77 x 9.45 (33 x 17.2 x 24)	Conventional	TOP
OPTIONAL	TPL	3	CCA 750 AC Delco G1110	2250 / 480	12.99 x 6.77 x 9.45 (33 x 17.2 x 24)	Conventional	TOP

<b>DIESEL ENGINES</b>	<b>RPO</b>	<b>NO. USED</b>	<b>12 VOLT SERIES</b>	<b>RATING CCA / RC</b>	<b>BATTERY SIZE LXWXH (cm)</b>	<b>MODEL</b>	<b>POST LOCATION</b>
BASE	TNL	2	CCA 750 AC Delco G1110	1500 / 320	12.99 x 6.77 x 9.45 (33 x 17.2 x 24)	Tilt	TOP
OPTIONAL	TNN	2	CCA 700 AC Delco G1150	1400 / 360	12.99 x 6.77 x 9.45 (33 x 17.2 x 24)	Tilt	TOP

## ELECTRICAL SPECIFICATIONS

### ELECTRICAL SYSTEM FEATURES

#### **METRI-PACK SEALED LOCKING CONNECTORS**

On C-Series, Metri-Pack sealed and locking connectors are used nearly in all applications outside the cab. This eliminates the possibility of corroded connections in the engine compartment and chassis, which can result in high resistance, loss of ground, and open circuits. Additionally, positive-locking Metri-Pack connectors are used extensively inside the cab to provide positive engagement and retention.

#### **AIR-CONDITIONING CONFIGURATIONS RPO (C60)**

##### **Vortec 8100 MD and Duramax 6600 Diesel:**

The PCM monitors the HVAC high-pressure switch (A/C Request). The high-pressure switch remains closed and only opens when the pressure reaches an abnormally high pressure. As the pressure on the low side of the A/C pressure line drops, the low-pressure switch opens shutting off the compressor. As the temperature increases the pressure increases until the low-pressure switch closes and the compressor turns on. The low-pressure switch cycles as the pressure changes. The PCM enables the A/C Enable Relay allowing the A/C Clutch to engage. Using a vacuum pump motor opens the shutters located in the HVAC system. The HVAC Control Head operates the temperature control motor, blower motor and relay (fan speed).

##### **HVAC switch for ISUZU 6HK1-TC 7.8L I6 Diesel:**

The ECU monitors the HVAC high-pressure switch (A/C Request) and energizes the A/C Enable Relay allowing the A/C Clutch to engage. A low-pressure switch is used to control the A/C Enable Relay by providing a ground, when the pressure increases the switch closes. The A/C Request is also monitored because the ECU must control the EV Clutch cooling fan according to an algorithm that need to know when A/C is requested, not when it is actually on. Since the low-pressure switch is cycling on and off when the A/C is on, the ECU needs to see the requested state rather than the instantaneous state of the clutch. Using a vacuum pump motor operates the shutters located in the HVAC system. The HVAC Control Head operates the temperature control motor, blower motor and relay (fan speed).

## ALTERNATORS AD SERIES

### DIGITAL INTEGRATED CIRCUIT REGULATOR

Electronic regulator is an integral part of the charging system eliminating wiring. The unit is pre-tested as a system and features positive turn-on, integral load response control and over/under voltage monitoring for safe and reliable operation. This reduces radio noise potential and uses less power. The "P" and "F" terminals for idle boost and permit on-board computer interface. Also, the protected connectors are weatherproof.

### UP-INTEGRATION BRIDGE RECTIFIER

Bridge incorporates press fit diodes in place of passivated chips, offering higher reliability. Integral capacitor eliminates wiring, suppresses radio interference, and reduces required space. The centralized load dump and voltage transient protection, 40 volt maximum, protects the electrical system from surges.

### ROTOR AND STATOR

Rotor assembly is dynamically balanced to provide stable operation at speeds up to 18,000 Rev/Min. The contoured rotor segments reduce magnetic noise and double-sealed ball bearings support the shaft at the drive end and slip ring end for quiet and dependable operation. Stator and field windings are securely anchored and bonded with high viscosity resin to resist damage from heat, vibration, and corrosion. Reduced air gaps provide for higher output potential.

### COOLING SYSTEM

High efficiency internal and external fans provide the pulling power for increased airflow and cooler operating temperatures. Large airflow ducts in the rear frame allow for cool air to pass over the bridge and regulator. Externally cooled stator windings help dissipate heat out of the charging system. All of these add up to cooler operation and more output potential.

### BRUSH RIGGING

The improved brush grades result in a longer service life. Brush contact surface is designed for minimum brush bounce and wear. Shielded assembly with coil springs for consistent pressure and even brush wear to maximize performance and service

## ELECTRICAL SPECIFICATIONS

### 22SI SERIES

A generator is a voltage creating machine. Generators produce voltage that is rectified to DC. Since generators are commonly referred to as alternators, that is the practice that is utilized by Delco Remy America (DRA). Alternators also include devices that produce non-rectified AC voltage, which ironically are commonly referred to as generators, as in power generation.

The voltage regulator is internal in all current production of DRA air-cooled alternators (this feature is denoted by the "SI" – System Integrated suffix). The regulator limits the maximum voltage that is produced at output terminal, by controlling the magnetic field in the rotor. The magnetic field in the rotor is produced by passing a small amount of current, called the field current, through a winding in the rotor. The voltage produced allows current to flow to satisfy the electrical demands placed on the system, up to maximum current characteristic inherent in the alternator design.

In brush-type alternators, with the alternator rotor turning, the magnetic field created induces voltage in the stator windings. In brushless alternators, the field coil is stationary, and the magnetic field around it is conducted by rotor poles to induce voltage in the stator. This difference is the reason why brush-type alternators inherently have higher output than brushless. In both brush-type and brushless alternators, the voltage induced in the stator is an AC voltage and is rectified to DC by the diode bridge, which is also referred to as rectifier bridge. The faster the rotor spins, the higher the induced voltage will be. The voltage at start-up is generated either by residual magnetism in the rotor, or by externally supplying field current. As speed and output increase, voltage available at the diode bridge becomes sufficient to supply field current for normal operation.

The 22SI generators are standard on the C7 and available on Duramax engines. They offer the following features:

- Heavy Duty
- Higher output
- Lighter weight
- 4-way integral connection with 'P' terminal
- Case pin (front drive end) ground
- Needle bearing (slip ring end) stud
- Higher temperature at 221°F (105°)
- Improved reliability and durability due to pad mount design.

## TRUCK ALTERNATOR CHART

ALT RPO	ALT	AMPS	ENG.	DRIVE RATIO	ENG. IDLE RPM	AMPS @ IDLE (AVG.)		RATED OUTPUT COLD 81°F (27°C) ENGINE RPM
						COLD 81°F (27°C)	HOT <sup>1</sup>	
KG4	AD244	150	Vortec 8.1L	3.25	550	62	46	2000
K65	AD230	105	Vortec 8.1L	3.25	550	60	46	2000
KG4	AD244	150	Duramax 6600		660			
K65	AD230	105	Duramax 6600		660			
KH5	DR44G	Dual 150	Duramax 6600	3.35	660	70	63	
K60	22 SI	100	ISUZU 6HK1-TC 7.8L I6		630			
KG8	AD244	130	ISUZU 6HK1-TC 7.8L I6		630			
KW1	22 SI	160	ISUZU 6HK1-TC 7.8L I6		630			

Note: Hot temperature output for AD series AD230 is measured at 257°F (125°C).  
Hot temperature output for AD series AD244 is measured at 221°F (105°C).

## ELECTRICAL SPECIFICATIONS

### IGNITION SWITCH RELEASE

The same ignition cylinder parts are used for C4500/5500 and C6500/7500/8500 vehicles. However, there are two “styles” of switches, those with a thumb button and those without. The thumb button ignition cylinders are used for all manual transmission vehicles and C6500/7500/8500 vehicles with Allison 3000/3500 Series automatic transmissions. The ignition cylinder without the thumb button is used on all 1000/2000/2200/2400/2500 Series automatic transmission vehicles equipped with column shift.

#### With Allison LCT Series Automatic Transmissions

The rationale for the thumb button is to meet the FMVSS requirement that states the key cannot be moved to the full off position or removed from the ignition cylinder unless the vehicle is in a “park” position. With the LCT automatic transmissions that have a column shift, this is accomplished with a mechanical lock incorporated in the steering column which physically prevents the key from being rotated to the full off position unless the column shift is in park.

#### With Manual Transmissions or Allison 3000/3500 Series Automatic Transmissions

This same method cannot be used for the manual transmissions or Allison 3000/3500 Series automatic transmissions. The thumb button was incorporated to prevent the forceful key rotation to the full off position.

### HORN OPTIONS AND SOUND LEVELS

	RPO	10' Forward of Front Bumper (Sound Level) <sup>1</sup>	23' Forward of Front Bumper (Sound Level) <sup>1</sup>
Single Electric Horn	(Base)	97.0dB (A)	94.6dB (A)
Dual Electric Horn	(U08)	101.8dB (A)	95.4dB (A)
Roof Mounted Air Horn <sup>2</sup>	(UUE)	113.7dB (A)	110.7dB (A)

1) Outside with engine running

2) Requires Air Compressor

## STARTING MOTOR

- **Solenoid Switch**

The solenoid switch provides positive pinion engagement and safely handles maximum starting current. The seamless, one-piece solenoid case is sealed to prevent entry of foreign material and to increase contact life. Solenoid switch contacts are made with special alloy material that prevents sticking. The solenoid contact rod moves inside a nylon insert to resist cycling wear.

- **Frame**

The frame utilizes tube stock to provide for improved sealing and uniform air gap tolerances.

- **Long-Life Brushes**

Four, wide, one-piece brushes and constant pressure spring design provide even brush wear, uniform pressure, and better cycle life.

- **High-Durability Armature**

Conductors are welded to the commutator for added strength and heat resistance. Armature is epoxy impregnated and glass banded for increased reliability.

- **Totally-Enclosed Shift Mechanism**

Nodular iron drive housing and a polys "O" ring seal, completely enclose overrunning drive and positive engagement mechanism for

protection from dirt and moisture. This two-piece assembly allows rotation of mounting flange to provide 24 different positions with respect to solenoid location.

- **Bearing Lubrication and Sealing**

Three oil-impregnated, sintered-bronze bearings support the armature shaft. Bearings are constantly lubricated by extra-large oil reservoirs and tangent wick oilers, eliminating need for regular maintenance. The shaft seal and special "O" rings prevent entry of oil, dirt, or moisture into the motor. The sealing boot prevents entry of oil into solenoid when used on wet clutch applications. The plunger boot is also used to prevent bell housing moisture or contamination from the customer bell housing from entering the solenoid contact area. Not just for wet clutch.

- **LR-5 Heavy-Duty Drive**

A special internal lubricant retains characteristics over a wide temperature range. The pinion overruns when engine starts to reduce possibility of damage to motor armature and bearings.

**RPO K67 41MT Starter:** This option is a heavy duty Delco Remy starter that is available with CAT diesel engines and is recommended where a high number of engine starts are required. A big benefit of this starter is that the motor will not turn until there is a positive pinion pinion engagement. This is to help eliminate potential problems that may occur when the starter bendix and flywheel start turning before the bendix is fully engaged with the flywheel.

## ELECTRICAL SPECIFICATIONS

### STARTING MOTOR 41MT

The Delco Remy 41MT Starter is standard with all Caterpillar 3126E engines. This starter can be protected from overcranking by adding RPO KQR (Starter Overcrank Protection) to all your orders.

The overcrank protection is accomplished by a simple thermostat controlled mechanical circuit breaker built into the motor that senses heat buildup. If heat does start to build up in the starter, the thermostat opens interrupting the cranking cycle by breaking the ground circuit, thus deenergizing the solenoid. This feature protects the cranking motor from overcrank heat damage but does not limit cranking ability for a startable engine.

The overcrank protection feature has been introduced to satisfy customer requirements for long life, dependable vehicles that are 100% reliable, and that begins with each start cycle.

Medium trucks historically are used in pickup and delivery operations, thus will incur many starts per day. This fact, coupled with technology of higher CCA batteries, makes the overcrank protection (SOP) feature a very cost efficient option.

#### Features

- Cold Weather Cranking
- Low Battery Capacity
- High Circuit Resistance
- Battery Technology (High CCA)
- Customer Requirements
- Provides Longer Life

Cranking Time	Cooling Time	Engine Temperature
1 Minute	1.5 Minutes	-10°F (-23°C)
3.5 Minutes	4.5 Minutes	70°F (21°C)
3.0 Minutes	6 Minutes	160°F (71°C)

NOTE: Recommended normal crank cycle is 30 seconds on all Delco Remy Cranking Motors.

OCP Motors may be retrofitted on existing vehicle.

#### Heavy-Duty Applications

- Trucks, Farm and Construction Equipment, Stand-by Power and Industrial Vehicles
- Mid-Range Diesel Engines

#### Solenoid Switch

- Provides positive pinion engagement
- Seamless one-piece solenoid case
- Special alloy contact disk
- Low-friction nylon bushing
- Thick connector strap

#### Rotatable Drive Housing

- Two-Piece Rotatable Drive Housing
- 24-Positions Available

#### Totally-Enclosed Shift Mechanism

- Solenoid-Operated Shift Lever
- "O" Ring Seals
- Solenoid Sealing Boot
- Shaft Sealing for Wet-Clutch Applications

#### Bearing Lubrication and Sealing

- Three Sintered-Bronze Bearings
- Extra-Large Oil Reservoirs with Wicks

#### LR-5 Heavy-Duty Drive

- Positive-Shift Overrunning Clutch
- Positorq type drive

#### Long-Life Brushes

- Four, Wide, One-Piece Brushes
- Constant Pressure Brush Springs
- Extra-Large Brush Leads

#### High-Durability Armature

- Welded Commutator
- Glass Banded
- Epoxy Impregnated

#### Specifications

- System Voltage: 12 or 24-Volt
- Rotation: Clockwise or Counter-Clockwise
- Mounting: S.A.E. 1, 2, or 3
- Pinion Data: - S.A.E.: No. Teeth/Pinion Blank: 10 / 11; 12 / 13  
Pitch: 8-10  
Metric: Module 3 Available
- Weight: 50 lb. (22.7 kg)
- Type: Straight Drive
- Drive Shaft Support: Nose type
- Mounting: Flange
- Frame Diameter: 130mm
- Length from Flange: 307mm
- Overall Length: 401mm
- Max. Displacement: 10.0L
- Engagement Feature: Positive Engagement
- KW Rating: 6.0 kw
- Duty Cycle Rating: 1400 amps

## STARTING MOTORS

MODEL	RPO	ENGINE	VOLT	TYPE	CLUTCH TYPE
C4C/U/V042, C5C/U/V042, C6C/V042, C7C/V042, C8C/V042, C8C/V064	BASE	Vortec 8100 MD	12	PG-260L	5 Roll over-running
C4C/U/V042, C5C/U/V042	BASE	Duramax 6600	12	Hitachi	
C6C/V042, C7C/V042, C8C/V042, C8C/V064	BASE	ISUZU 6HK1-TC 7.8L I6	12	Denso Includes (OCP)	Long Life Brushes
C6C/V042, C7C/V042, C8C/V042, C8C/V064	BASE	CAT C7	12	37MT	5 Roll over-running
C6C/V042, C7C/V042, C8C/V042, C8C/V064	KQR	CAT C7	12	37MT(OCP)	5 Roll over-running
C6C/V042, C7C/V042, C8C/V042, C8C/V064	K67	CAT C7	12	41 MT	5 Roll over-running
C6C/V042, C7C/V042, C8C/V042, C8C/V064	K67 & KQR	CAT C7	12	41 MT (OCP)	5 Roll over-running

**Delco Remy PG-260L Starter**

Planetary gear drive offers superior performance in a starter with exceptional durability. The 4-pole permanent magnet field consists of shunted magnets mounted inside a zinc-chromated frame. No field coils are required. The armature is banded, varnish impregnated and dynamically balanced for high performance and durability. The armature drives the planetary gear set, which in turn is connected to a roller type overrunning drive. The solenoid is sealed with an integral cover for maximum reliability with minimum weight, yet is still serviceable. Four long-life brushes are used in radial brass brush holders with torsion springs. All brush rigging materials are corrosion resistant.

**KQR (Over Crank Protection) is available with 41MT:**

Prevents internal damage due to extended operation caused by batteries in low stage of charge or when the engine is hard to start during extremely low temperatures. Includes a built-in temperature limiting switch which disconnects the grounding circuit from the magnetic switch in the cranking motor solenoid control circuit.