

# SERVICE MANUAL

CX Forklift Truck

Federal Environmental Protection Agency (EPA) Emission-Control Compliant  
S/N 130001A~

Gasoline and LP 800/1000CGL-8  
800/1000CGB-8  
800/1000PG(S/L)(2)-8  
900PG(2)-8  
1100PGA2-8

# CX20

Diesel 800/900PD(2)-8  
1000PD(S)(2)-8  
1100PD(S)A2-8



## WARNING

Read and observe all warnings on this unit before operating it.

**DO NOT** operate this equipment unless all factory-installed guards and shields are properly secured in place.



ISSUED: MARCH 2006

# INTRODUCTION

This Service Manual has been developed as an information resource to help the reader learn about, understand, repair and maintain the CX20 Series forklift trucks, and the various equipment, systems, inspections, sensors, diagnostic procedures and diagnostic equipment utilized to maintain, adjust and troubleshoot these systems. Although reference is made to maintenance procedures necessary to perform servicing of this vehicle, you should refer to the applicable *Operation and Maintenance Manual* for these lift trucks for more complete maintenance information.

TUSK is involved in a concentrated and highly technical program of designing and developing cleaner burning, more efficient and more powerful engines for use in the industrial truck market. As a result, new computerized sensors, systems and diagnostic monitors have been created to make the job of maintaining and repairing these systems simple and easy.

Read this manual carefully, refer to it often and learn the repair, testing and adjustment procedures to the best of your ability. Please note that some illustrations are generic and may not look exactly like your unit in every detail.

Ensure that, when you are working on or around industrial trucks, **Safety is priority Number One**. Read, understand and obey all **WARNINGS** and **CAUTIONS**.

Follow the instructions and procedures presented in this manual when working on these lift trucks and their systems. Damage to the equipment, and possible injury to yourself or others, may result if these procedures are not adhered to carefully.

Keep this manual nearby and accessible for use when necessary. If this book becomes dirty, worn or illegible, contact TUSK for a replacement. The procedures outlined in this manual will be updated periodically. Be sure that you have the latest revision in order to learn the newest information available. Revision dates will be clearly displayed on the lower left hand corner of the cover page.

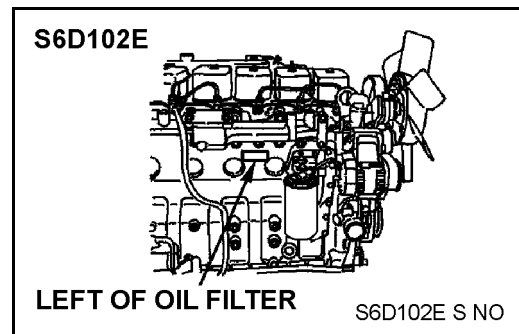
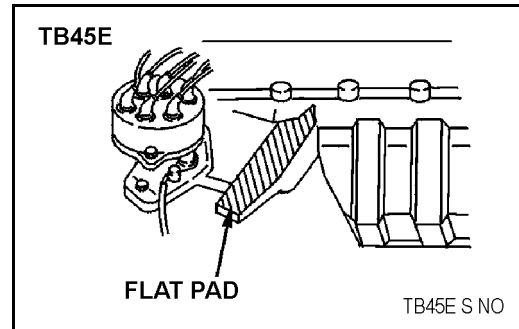
This will aid in maintaining your equipment in excellent condition and in ensuring that these lift trucks will operate safely at maximum efficiency.

# ENGINE SERIAL NUMBER LOCATION

The TB45E series engine serial number is stamped on a flat machined, painted pad on the right side of the engine block just behind the distributor. The right side is determined by the operator's right side when seated on the lift truck.

The serial number faces upwards for ease of identification.

The S6D102E series engine serial number is stamped on the left side of the engine to the left of the oil filter.



## NOTICE

For EPA TB45E(D)(G)(L) engine-related troubleshooting, refer to the following manual:

- TM100 - "EPA Engine Training Manual"

## NOTICE

For EPA S6D102E engine-related troubleshooting, refer to the following manual:

- SM140 - "S6D102E Service Manual"

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# FORKLIFT TRUCKS COVERED IN THIS PUBLICATION

S/N 130001A~

MODEL DESIGNATION	DESCRIPTION	ENGINE
<b>GASOLINE AND LPG TRUCKS</b>		
<b>800CG-8</b>	8,000 lb. capacity, cushion tire truck, 1-speed transmission	TB45
<b>800CGB-8</b>	8,000 lb. capacity, cushion tire truck, Box Car Special (BCS), 1-spd. trans.	TB45
<b>800PG-8</b>	8,000 lb. capacity, pneumatic tire truck, compact wheelbase, 1-spd. trans.	TB45
<b>800PG2-8</b>	8,000 lb. capacity, pneumatic tire truck, compact wheelbase, 2-spd trans.	TB45
<b>900PG-8</b>	9,000 lb. capacity, pneumatic tire truck, long wheelbase, 1-spd. trans.	TB45
<b>900PG2-8</b>	9,000 lb. capacity, pneumatic tire truck, long wheelbase, 2-spd. trans.	TB45
<b>1000PG-8</b>	10,000 lb. capacity, pneumatic tire truck, long wheelbase, 1-spd. trans.	TB45
<b>1000PG2-8</b>	10,000 lb. capacity, pneumatic tire truck, long wheelbase, 2-spd. trans.	TB45
<b>1000CG-8</b>	10,000 lb. capacity, cushion tire truck, long wheelbase, 1-spd. trans.	TB45
<b>1000CGB-8</b>	10,000 lb. capacity, cushion tire truck, Box Car Special (BCS), 1-spd. trans.	TB45
<b>1100PGA2-8</b>	11,000 lb. capacity, pneumatic tire truck, long wheelbase, 2-spd. trans.	TB45
<b>DIESEL TRUCKS</b>		
<b>800PD-8</b>	8,000 lb. capacity, pneumatic tire truck, compact wheelbase, 1-spd. trans.	S6D102E
<b>800PD2-8</b>	8,000 lb. capacity, pneumatic tire truck, compact wheelbase, 2-spd. trans.	S6D102E
<b>900PD-8</b>	9,000 lb. capacity, pneumatic tire truck, long wheelbase, 1-spd. trans.	S6D102E
<b>900PD2-8</b>	9,000 lb. capacity, pneumatic tire truck, long wheelbase, 2-spd. trans.	S6D102E
<b>1000PD-8</b>	10,000 lb. capacity, pneumatic tire truck, long wheelbase, 1-spd. trans.	S6D102E
<b>1000PD2-8</b>	10,000 lb. capacity, pneumatic tire truck, long wheelbase, 2-spd. trans.	S6D102E
<b>1100PDA2-8</b>	11,000 lb. capacity, pneumatic tire truck, long wheelbase, 2-spd. trans.	S6D102E

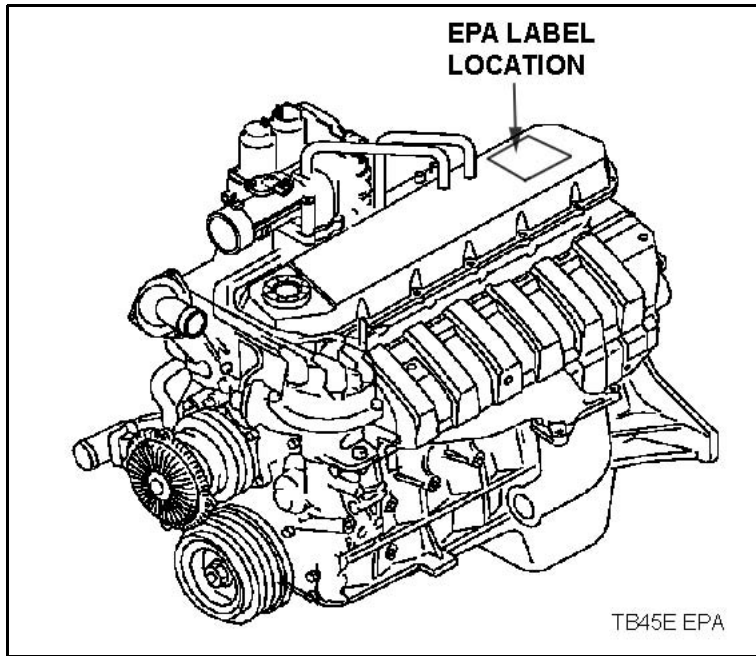
**FEDERAL EPA EMISSION CONTROL STATEMENT  
FOR OFF-ROAD LSI (NON-DIESEL) ENGINES (TB45E ENGINES)**

This section presents information concerning the correct labeling, warranty, parts and maintenance of TB45E engines in order to comply with the EPA off-road, large-spark-ignition (LSI) engine regulations.

**1. LABELS REQUIRED AND LABEL LOCATIONS**

All engines will display the required identification label as follows. Note that decal content will vary between gasoline, LP and Dual-Fuel engines.

**Location on TB45E Series engines: (Includes TB45D, TB45G and TB45L Series)**



**Emission compliance label (DUAL-FUEL (D) SAMPLE shown below)**

<b>EMISSION CONTROL INFORMATION</b>		2003	NOV
ENGINE FAMILY: 4NSXB04.546C, ENGINE DISPLACEMENT: 4.5 LITER			DEC
ENGINE MAXIMUM POWER: 106.1 HP		2004	JAN
THIS ENGINE IS CERTIFIED TO OPERATE ON GASOLINE AND LPG.			FEB
ENGINE'S USEFUL LIFE IS 5000 HOURS OF OPERATION OR SEVEN YEARS.			MAR
EXHAUST EMISSION CONTROL TYPE: MPI, TBI, TWC, HO2S			APR
TEST MODE: VARIABLE-SPEED ONLY			MAY
IDLE SPEED	NO OTHER ADJUSTMENTS NEEDED		JUN
VALVE LASH	0.35 mm (HOT)		JUL
IGNITION TIMING	10° B.T.D.C.		AUG
SPARK PLUG GAP	0.9 mm		SEP
NO OTHER ADJUSTMENTS NEEDED.			OCT
THE ENGINE MEETS CALIFORNIA AND U.S. EPA REGULATIONS FOR 2004 LARGE NONROAD SI ENGINES.			NOV
NISSAN MOTOR CO., LTD.			DEC
TB45 D			

TB45E EPA LABEL

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## **2. WARRANTY**

The following statement is hereby provided as required by regulations of the United States Environmental Protection Agency (EPA).

### **YOUR WARRANTY RIGHTS AND OBLIGATIONS**

All off-road large spark-ignition (LSI) engines must be designed, built and equipped to meet the Federal EPA's stringent anti-smog standards.

Tusk Lift Trucks ("TUSK") must warrant the emission control system on your engine for the periods of time listed below provided there has been no abuse, damage, neglect or improper maintenance of your engine.

Your emission control system may include parts such as the carburetor, regulator or fuel-injection system, ignition system, engine computer unit (ECM), catalytic converter and air induction system.

Also included may be sensors, hoses, belts, connectors and other emission-related assemblies.

Where a warrantable condition exists, an Authorized Tusk Lift Trucks Dealer will repair your LSI engine at no cost to you, including diagnosis, parts and labor.

### **MANUFACTURER'S WARRANTY COVERAGE**

Beginning January 1, 2004 off-road large spark-ignition EPA engines are warranted for the time periods listed below. If any emission-related part on your engine is defective, the part will be repaired or replaced by an Authorized Tusk Lift Trucks Dealer.

### **OWNER'S WARRANTY RESPONSIBILITIES**

As the off-road LSI engine owner, you are responsible for the performance of the required maintenance listed in your Operation and Maintenance Manual.

TUSK recommends that you retain receipts covering maintenance on your off-road engine, but TUSK cannot deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.

As the off-road large spark-ignition engine owner, you should be aware, however, that TUSK may deny you warranty coverage if your off-road large spark-ignition engine, or a part thereof, has failed due to abuse, damage, neglect, improper maintenance or unapproved modifications.

Your engine is designed to operate on gasoline and/or LPG fuel. Use of any other fuel may result in your engine no longer operating in compliance with the Federal EPA's emissions requirements.

You are responsible for initiating the warranty process. It is suggested that you present your off-road large spark-ignition engine to an Authorized TUSK Dealer as soon as you become aware that a problem exists. The warranty repairs should be completed by the dealer as expeditiously as possible.

If you have any questions regarding your warranty rights and responsibilities, you should contact the TUSK Product Support Dept. at 1-770-385-4815.

In addition to the standard warranty periods, the components listed below are covered by the following specific warranty periods.

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## **EMISSION CONTROL WARRANTY – 36 MONTHS OR 2,500 HOURS FOR GENERAL PARTS**

For the first 2,500 operating hours, or for a period of thirty-six months from the date of the first use by the original purchaser from an Authorized Tusk Lift Trucks Dealer, whichever occurs first, TUSK warrants the following emission-related parts:

- Oxygen sensor
- Water temperature sensor
- LPG injector
- LPG solenoid
- Mass air flow sensor
- Ignition coil
- Camshaft position sensor
- Spark plugs
- PCV valve
- Gasoline injector
- LPG pressure sensor
- LPG switching module
- Throttle chamber
- Crankshaft position sensor
- Distributor

## **EMISSION CONTROL WARRANTY – 36 MONTHS OR 4,000 HOURS FOR POWER TRAIN PARTS**

- Intake manifold
- Exhaust manifold

## **EMISSION CONTROL WARRANTY – 60 MONTHS OR 3,500 HOURS FOR GENERAL PARTS**

- ECM
- Catalytic converter
- Vaporizer

<b>NOTICE</b>
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**Follow the instructions in the Operations Manual concerning any other maintenance programs not required for EPA compliance.**

**For questions and additional information concerning EPA Gasoline Engine Exhaust Regulations, contact:**

Tusk Lift Trucks  
14481 Lochridge Blvd., Bldg. #2  
Covington, GA 30014-4908

Voice phone: (770) 385-4815  
Fax phone: (770) 385-4838

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## FEDERAL EPA EMISSION CONTROL STATEMENT FOR OFF-ROAD DIESEL ENGINES (S6D102E ENGINES)

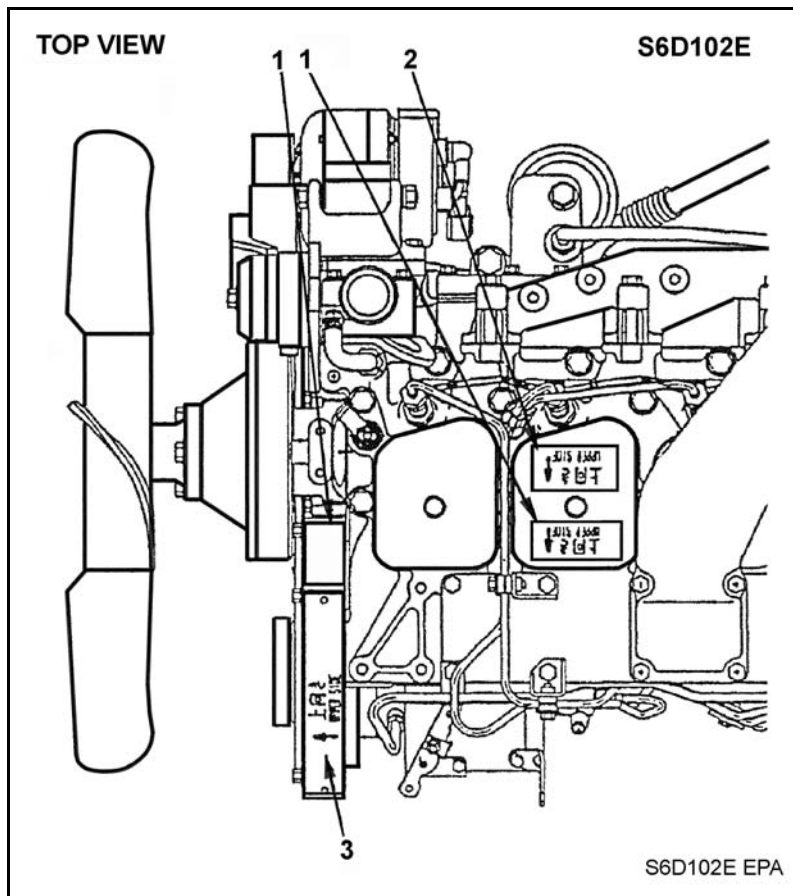
Exhaust emissions produced by diesel engines are regulated by the United States Environmental Protection Agency (EPA). This section presents information concerning the correct labeling, warranty, parts and maintenance of S6D102E diesel engines in order to comply with current EPA regulations.

### 1. LABELS REQUIRED AND LABEL LOCATIONS

All certified S6D102E diesel engines will display the required identification labels (4) as follows:

- S6D102E diesel engines: Labels will be affixed to all appropriate engines on TUSK production trucks.

**Locations on S6D102E Series diesel engines:**



- 1.1 EPA/EC CERTIFICATION DECAL (2 LOCATIONS) (SEE ITEM #1 IN PRECEEDING ILLUSTRATION)
- 1.2 EPA/EC CERTIFICATION ASSISTANCE PLATE (SEE ITEM #2 IN PRECEEDING ILLUSTRATION)
- 1.3 EPA/EC CERTIFICATION DATA PLATE (SEE ITEM #3 IN PRECEEDING ILLUSTRATION)

**1. EPA/EU CERTIFICATION DECAL**

**IMPORTANT ENGINE INFORMATION**  
 This engine conforms to 2004 U. S.  
 EPA and California and EU Stage  
 regulations for heavy duty non-road  
 compression ignited diesel cycle  
 engines as applicable  
**THIS ENGINE IS CERTIFIED TO OPERATE  
 ON DIESEL FUEL**

**2. EPA/EU CERTIFICATION ASSISTANCE PLATE**

<b>REGISTRATION</b>		Komatsu Ltd.
Engine Model S6D102E-2 ESN XXXXXXXX		
EPA Cert. Family: XXXXXXXXXXXX		
EU Approval NO. XX+XX/XXX+XX/XX+XXX+XX		
Gross Rated HP/kW XX/XX at XXXXrpm		
FRXXXX	Low Idle RPM XXX rpm	
CPL XXXX	CID/L. XXXX/X.X	
Timing BTDC XXdeg.	Firing Order XXXXXX	
Valve Lash Cold	In X.XXXmm Ex X.XXXmm	
Fuel Rate at Rated HP/kW XXXmm <sup>3</sup> /st		
Date of Manufacture XXXXXXXX		6732-81-5070

**3. EPA/EU CERTIFICATION DATA PLATE**

<b>KOMATSU</b> Komatsu LTD.	CID/L.		CPL		ENGINE SERIAL NO.	
	FAMILY				KOMATSU PN	
⊕ WARNING: Injury may result and warranty is voided if fuel rate, RPM or altitudes exceed published maximum values for this model and application. Date of Mfg. Made in JAPAN	VALVE LASH		INT.	EXH.	TIMING - TDC	
	COLD	MM	INT.	EXH.	FUEL RATE AT RATED HP mm <sup>3</sup> /st	
	FIRING ORDER				FR	LOW IDLE RPM
	GROSS RATED HP/KW			AT	RPM	

S6D102E EPA DECALS

**2. WARRANTY**

The following statement is hereby provided as required by regulations of the United States Environmental Protection Agency (EPA).

**YOUR WARRANTY RIGHTS AND OBLIGATIONS**

The Federal EPA and Tusk Lift Trucks (hereinafter referred to as "TUSK") are pleased to explain the emission control system warranty on your 2004 or later Diesel heavy duty off-road engine. All new, heavy-duty off-road engines must be designed, built and equipped to meet the EPA's stringent anti-smog standards. TUSK must warrant the emission control system on your engine for the period of time listed below, provided there has been no abuse, damage, neglect or improper maintenance of your engine.

Your emission control system may include parts such as fuel injection pump. Also included may be hoses, belts, connectors and other emission-related assemblies.

Where a warrantable condition exists, an authorized TUSK dealer will repair the heavy-duty off-road engine at no cost to the owner, including diagnosis, parts and labor.

Now, TUSK hereby certifies that diesel engines for lift trucks produced in 2004 model year and after shall be regulated by Federal EPA exhaust gaseous regulations. The difference between current and EPA-certified engines is only the labels attached on the engine. See available drawing and/or illustration of emission label and its location.

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## **MANUFACTURER'S WARRANTY COVERAGE**

Beginning January 1, 2004 heavy-duty off-road EPA engines are warranted for a period of five (5) years, or three-thousand (3,000) hours of operation, whichever occurs first. If any emission-related part on your engine is defective, the part will be repaired or replaced by at an authorized Tusk Lift Trucks dealer.

### **EMISSION-RELATED PARTS**

- Fuel injection pump
- Fuel injection nozzles
- Turbocharger

### **OWNER'S WARRANTY RESPONSIBILITIES**

As the heavy-duty off-road engine owner, you are responsible for the performance of the required maintenance listed in owner's manual (Instruction Manual). TUSK recommends that you retain all receipts and records covering the maintenance on your engine, but TUSK cannot deny warranty solely for the lack of receipts and records or for your failure to ensure the performance of all scheduled maintenance. For your reference, the following is an emission control maintenance schedule for certified Diesel engines.

- Check oil level and coolant level – Everyday
- Change of lubricating – Every 200 hours
- Change lubricating oil filter – Every 200 hours
- Initial adjustment of valve clearance – Every 200 hours
- Change fuel filter – Every 500 hours
- Check turbocharger, rebuild or replace if necessary – Every 2,000 hours
- Adjust valve clearance – Every 2,000 hours
- Check fuel injection nozzles, replace if necessary – Every 2,000 hours

Keep records to show proof of compliance with the required maintenance practices and intervals.

- As the heavy-duty off-road engine owner you should, however, be aware that TUSK may deny your warranty coverage if your heavy-duty off-road engine or part has failed due to abuse, damage, neglect, improper maintenance or disapproved modifications.
- Your engine is designed to operate on commercial diesel fuel only. Use of any other fuel in our engine will result in the engine operating in non-compliance with the Federal EPA regulations. You are responsible for initiating the warranty process. It is suggested that you present your heavy duty off-road engine to an authorized TUSK dealer as soon as you become aware that problem exists. The warranty repair should be completed by the dealer as expeditiously as possible.
- If you have any questions regarding your warranty rights and responsibilities, you should contact the authorized TUSK dealer.

### **LIMITATIONS**

TUSK is not responsible for resultant damages to an emission-related part or component resulting from:

- Any application or installation TUSK deems improper as explained in the Instruction Manual.
- Attachments, accessory items or parts not authorized for use by TUSK.
- Improper off-road engine maintenance, repair or abuse.
- Owner's unreasonable delay in making the product available after being notified of a potential product problem.

This warranty is in addition to the TUSK standard warranty applicable to the off-road engine product involved.

Remedies under this warranty are limited to the provision of material and services as specified herein. TUSK is not responsible for incidental or consequential damages, such as downtime or lost use of the forklift truck.



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## **CUSTOMER ASSISTANCE – EMISSION CONTROL SYSTEMS WARRANTY**

Tusk Lift Trucks aims to ensure that the Emission Control Systems Warranty is properly administered. In the event that you do not receive the warranty service to which you believe you are entitled under the Emission Control Systems Warranty, call or write to your Tusk Lift Trucks Dealer.

Authorized dealers are recommended for major maintenance and repair work, as they are staffed with trained personnel, proper tools and are aware of the latest maintenance methods and procedures. Owners and others who desire to perform their own work should purchase a service manual and obtain current service information from their TUSK engine dealer.

### **NOTICE**

**Follow the instructions in the Operations Manual concerning any other maintenance programs not required for EPA compliance.**

**For questions and additional information concerning EPA Diesel Engine Exhaust Regulations, contact:**

Tusk Lift Trucks  
14481 Lochridge Blvd., Bldg. #2  
Covington, GA 30014-4908

Voice phone: (770) 385-4815  
Fax phone: (770) 385-4838