



Service Manual

Chassis, Mast & Options

EP10KRT	ETB10-00011-up
EP12KRT	ETB10-20001-up
EP15KRT	ETB10-50001-up

FOREWORD

This service manual is a guide to servicing of Cat® lift trucks of 1.0 ton, 1.25 ton and 1.5 ton models. The instructions are grouped by systems to serve the convenience of your ready reference.

Long productive life of your lift trucks depends to a great extent on correct servicing — the servicing consistent with what you will learn from this service manual. We hope you read the respective sections of this manual carefully and know all the components you will work on before attempting to start a test, repair or rebuild job.

The descriptions, illustrations and specifications contained in this manual were of the trucks of serial numbers in effect at the time it was approved for printing. Cat lift truck reserves the right to change specifications or design without notice and without incurring obligation.

Safety Related Signs

The following safety related signs are used in this service manual to emphasize important and critical instructions:



Indicates a specific potential hazard resulting in serious bodily injury or death.



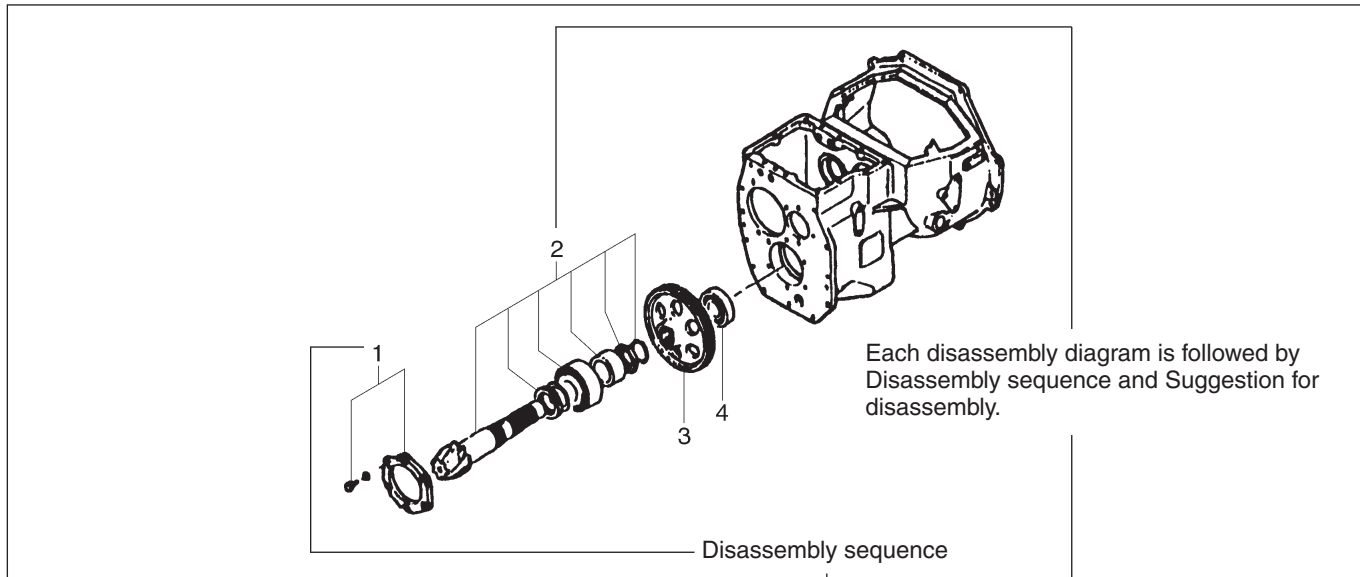
Indicates a specific potential hazard resulting in bodily injury, or damage to, or destruction of, the machine.



Indicates a condition that can cause damage to, or shorten service life of, the machine.

HOW TO READ THIS MANUAL

Disassembly diagram (example)

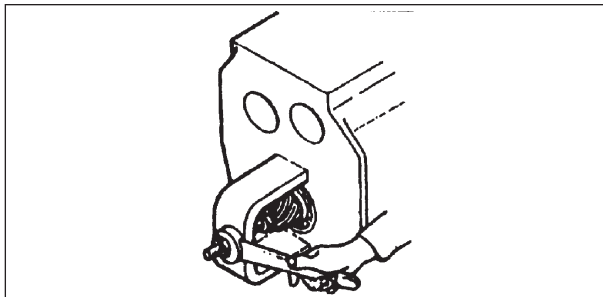


1 Cover, Bolt, Washer (part name)

2 Output shaft (part name)

Suggestion for disassembly

(1) Output shaft removal



Unit: mm

Clearance between cylinder and piston	A	0.020 to 0.105
	B	0.15

A: Standard value

B: Repair or service limit

 WARNING

SAFETY

 WARNING

The proper and safe lubrication and maintenance for this lift truck, recommended by Cat lift truck, are outlined in the **OPERATION & MAINTENANCE MANUAL** for these trucks.

Improper performance of lubrication or maintenance procedures is dangerous and could result in injury or death. Read and understand the **OPERATION & MAINTENANCE MANUAL** before performing any lubrication or maintenance.

The serviceman or mechanic may be unfamiliar with many of the systems on this truck. This makes it important to use caution when performing service work. A knowledge of the system and/or components is important before the removal or disassembly of any component.

Because of the size of some of the truck components, the serviceman or mechanic should check the weights noted in this Manual. Use proper lifting procedures when removing any components.

Following is a list of basic precautions that should always be observed.

1. Read and understand all warning plates and decals on the truck before operating, lubricating or repairing the product.
2. Always wear protective glasses and protective shoes when working around trucks. In particular, wear protective glasses when pounding on any part of the truck or its attachments with a hammer or sledge. Use welders gloves, hood/goggles, apron and other protective clothing appropriate to the welding job being performed. Do not wear loose-fitting or torn clothing. Remove all rings from fingers when working on machinery.
3. Do not work on any truck that is supported only by lift jacks or a hoist. Always use blocks or jack stands to support the truck before performing any disassembly.

 WARNING

Do not operate this truck unless you have read and understand the instructions in the **OPERATION & MAINTENANCE MANUAL**. Improper truck operation is dangerous and could result in injury or death.

4. Lower the forks or other implements to the ground before performing any work on the truck. If this cannot be done, make sure the forks or other implements are blocked correctly to prevent them from dropping unexpectedly.
5. Use steps and grab handles (if applicable) when mounting or dismounting a truck. Clean any mud or debris from steps, walkways or work platforms before using. Always face truck when using steps, ladders and walkways. When it is not possible to use the designed access system, provide ladders, scaffolds, or work platforms to perform safe repair operations.
6. To avoid back injury, use a hoist when lifting components which weigh 23 kg (50 lb.) or more. Make sure all chains, hooks, slings, etc., are in good condition and are of the correct capacity. Be sure hooks are positioned correctly. Lifting eyes are not to be side loaded during a lifting operation.
7. To avoid burns, be alert for hot parts on trucks which have just been stopped and hot fluids in lines, tubes and compartments.
8. Be careful when removing cover plates. Gradually back off the last two bolts or nuts located at opposite ends of the cover or device and pry cover loose to relieve any spring or other pressure, before removing the last two bolts or nuts completely.
9. Be careful when removing filler caps, breathers and plugs on the truck. Hold a rag over the cap or plug to prevent being sprayed or splashed by liquids under pressure. The danger is even greater if the truck has just been stopped because fluids can be hot.

10. Always use tools that are in good condition and be sure you understand how to use them before performing any service work.
11. Reinstall all fasteners with same part number. Do not use a lesser quality fastener if replacements are necessary. Do not mix metric fasteners with standard nuts and bolts.
12. If possible, make all repairs with the truck parked on a level, hard surface. Block truck so it does not roll while working on or under truck.
13. Disconnect battery and discharge any capacitors (electric trucks) before starting to work on truck. Hang "Do not Operate" tag in the Operator's Compartment.
14. Repairs, which require welding, should be performed only with the benefit of the appropriate reference information and by personnel adequately trained and knowledgeable in welding procedures. Determine type of metal being welded and select correct welding procedure and electrodes, rods or wire to provide a weld metal strength equivalent at least to that of parent metal.
15. Do not damage wiring during removal operations. Reinstall the wiring so it is not damaged nor will it be damaged in operation by contacting sharp corners, or by rubbing against some object or hot surface. Do not connect wiring to a line containing fluid.
16. Be sure all protective devices including guards and shields are properly installed and functioning correctly before starting a repair. If a guard or shield must be removed to perform the repair work, use extra caution.
17. Always support the mast and carriage to keep carriage or attachments raised when maintenance or repair work is performed, which requires the mast in the raised position.
18. Loose or damaged fuel, lubricant and hydraulic lines, tubes and hoses can cause fires. Do not bend or strike high pressure lines or install ones which have been bent or damaged. Inspect lines, tubes and hoses carefully. Do not check for leaks with your hands. Pin hole (very small) leaks can result in a high velocity oil stream that will be invisible close to the hose. This oil can penetrate the skin and cause personal injury. Use cardboard or paper to locate pin hole leaks.
19. Tighten connections to the correct torque. Make sure that all heat shields, clamps and guards are installed correctly to avoid excessive heat, vibration or rubbing against other parts during operation. Shields that protect against oil spray onto hot exhaust components in event of a line, tube or seal failure, must be installed correctly.
20. Relieve all pressure in air, oil or water systems before any lines, fittings or related items are disconnected or removed. Always make sure all raised components are blocked correctly and be alert for possible pressure when disconnecting any device from a system that utilizes pressure.
21. Do not operate a truck if any rotating part is damaged or contacts any other part during operation. Any high speed rotating component that has been damaged or altered should be checked for balance before reusing.

GROUP INDEX

GROUP INDEX	Items involved
GENERAL INFORMATION	Serial Number Locations, Dimensions, Technical Data
VEHICLE ELECTRICAL COMPONENTS	Console Box, Key Switch, Lamp Specification Chart
MAIN CONTROLLER	Outline, Controller Components, Logic Card Components, Controller Models, Operation Outline, Drive System, Hydraulic System, Fail-safe System, Malfunction Detection, Malfunction Data Record, Setting, Self-diagnosis, etc.
TROUBLESHOOTING FOR CONTROL CIRCUITS	Faulty Central Vehicle Monitor System, Faulty Diagnosis Indication, or Other Abnormalities
MOTORS	Motor Installation Positions, Specifications, Structures, Tightening of High-power Cable Terminals, Inspection of Brushes for Wear and Brush Replacement, Procedures and Key Points for Removal and Installation, etc.
FRONT AXLE	Structure and Functions, Disassembly and Reassembly of Front Axle Assembly, Service Data
REAR AXLE	Rear Axle, Rear Wheels, Removal and Installation, Disassembly and Reassembly, Adjustment, Troubleshooting, Service Data
BRAKE SYSTEM	Specifications, Structure and Functions, Procedures and Key Points for Disassembly and Reassembly, Inspection and Adjustment, Troubleshooting, Service Data
STEERING SYSTEM	Specifications, Structure and Functions, Procedures and Key Points for Removal and Installation, Steering Control Valve, Hydraulic Circuit, Troubleshooting, Service Data
HYDRAULIC SYSTEM	Tank, Pump, Control Valve, Lift and Tilt Cylinders, Flow Regulator Valve, Down Safety Valve
MASTS AND FORKS	Simplex Mast, Duplex Mast, Triplex Mast
SERVICE DATA	Inspection Standards, Periodic Replacement of Parts, Lubrication Standards, Main Component Weights, Tightening Torque for Standard Bolts and Nuts, Special Tools
OPTIONS	Amber Strobe Kit, Back Buzzer Kit, Working Lamp Kit, Tire Kit

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GENERAL INFORMATION

Vehicle Exterior

Models

Serial Number Locations

Chassis and Mast Model Identification

Dimensions

Technical Data

1 – 1

1 – 1

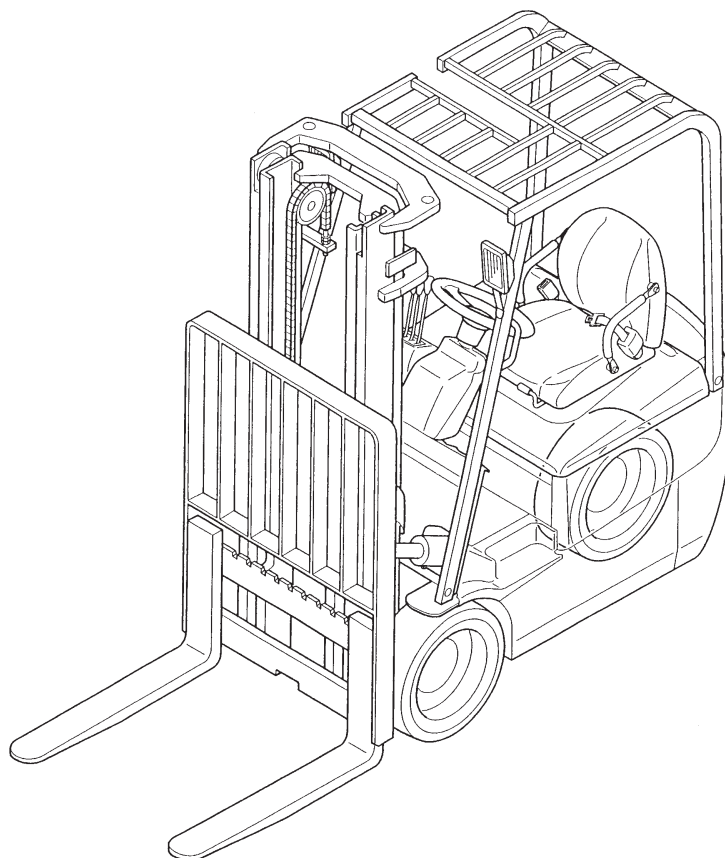
1 – 2

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Vehicle Exterior



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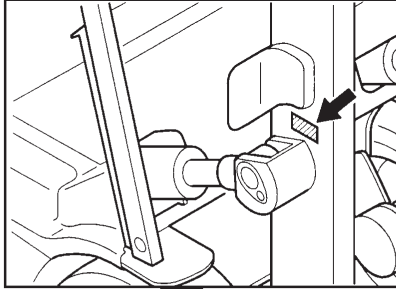
Models

This manual applies to EP10KRT, EP12KRT and EP15KRT.

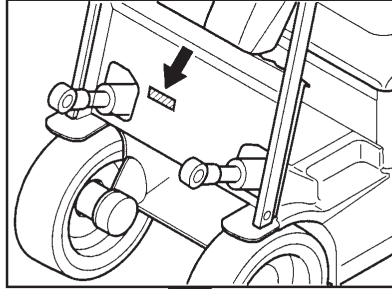
Truck Model	Serial Number
EP10KRT	ETB10-00011-up
EP12KRT	ETB10-20001-up
EP15KRT	ETB10-50001-up

Serial Number Locations

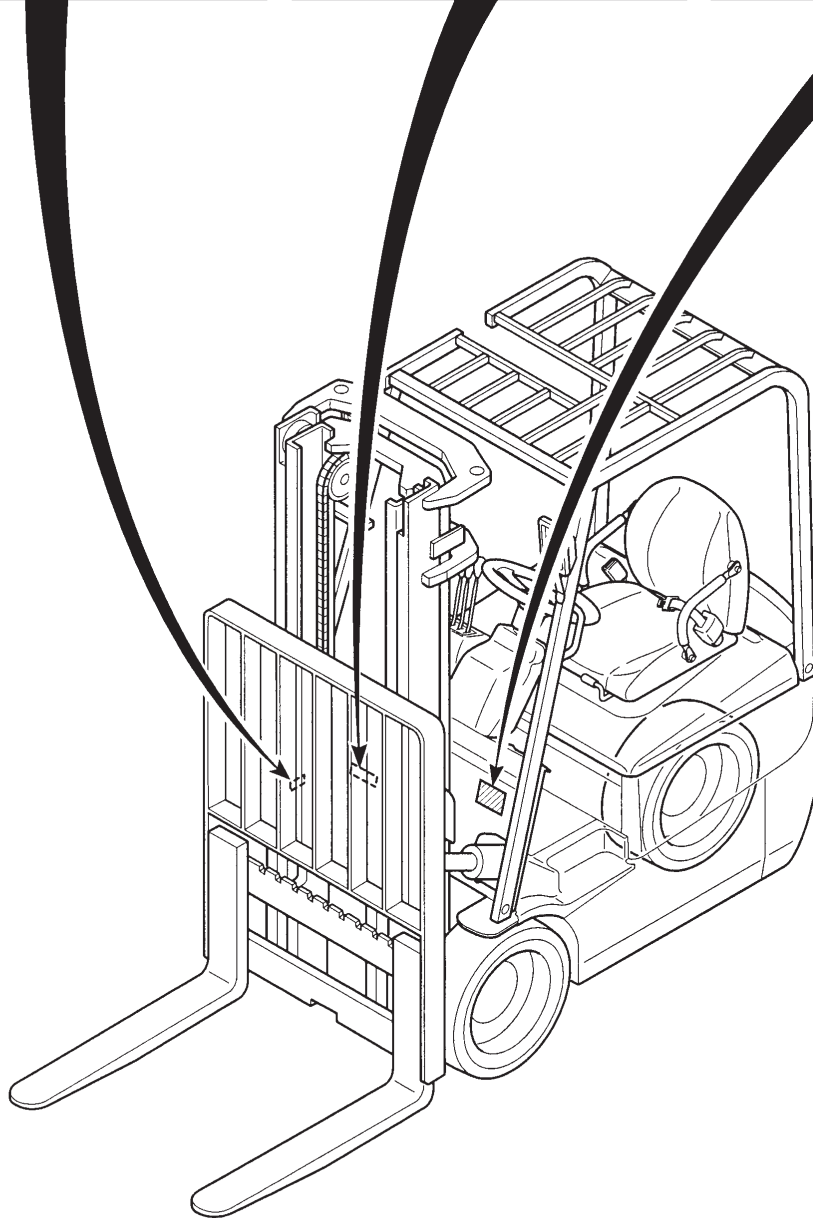
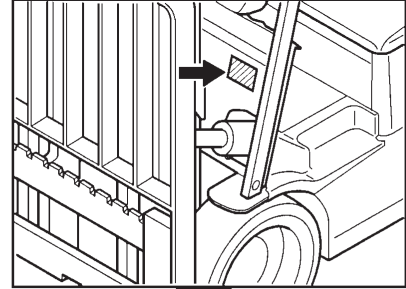
Mast number



Chassis number



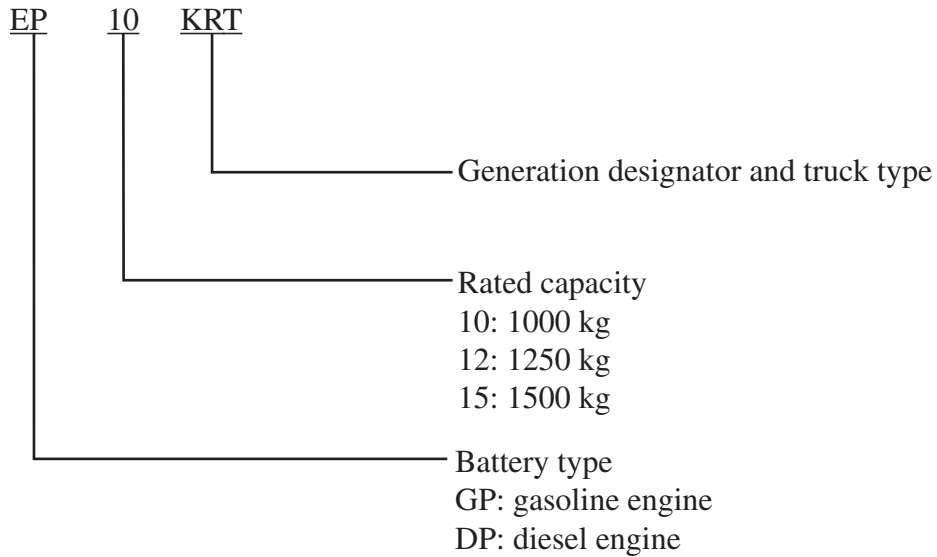
Nameplate



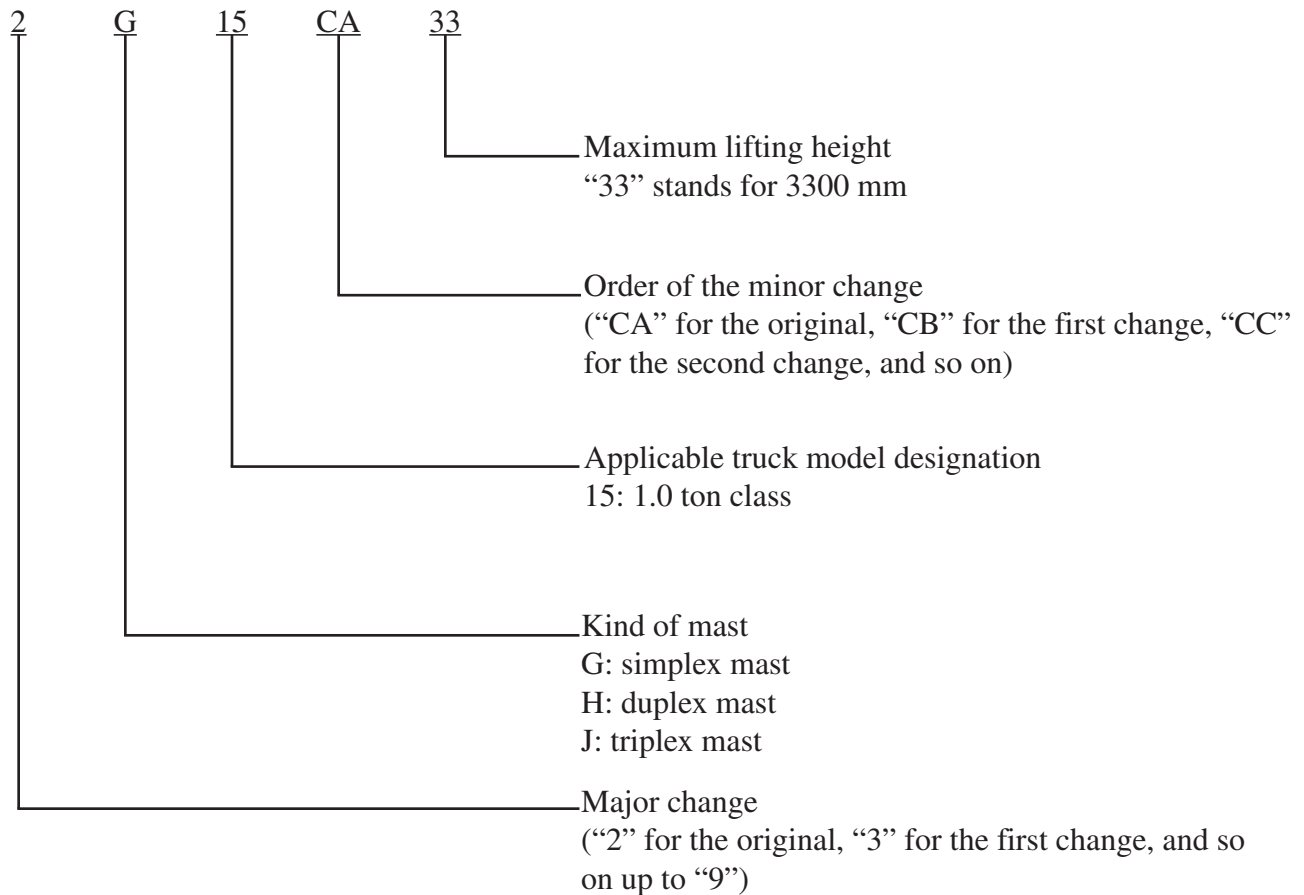
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Chassis and Mast Model Identification

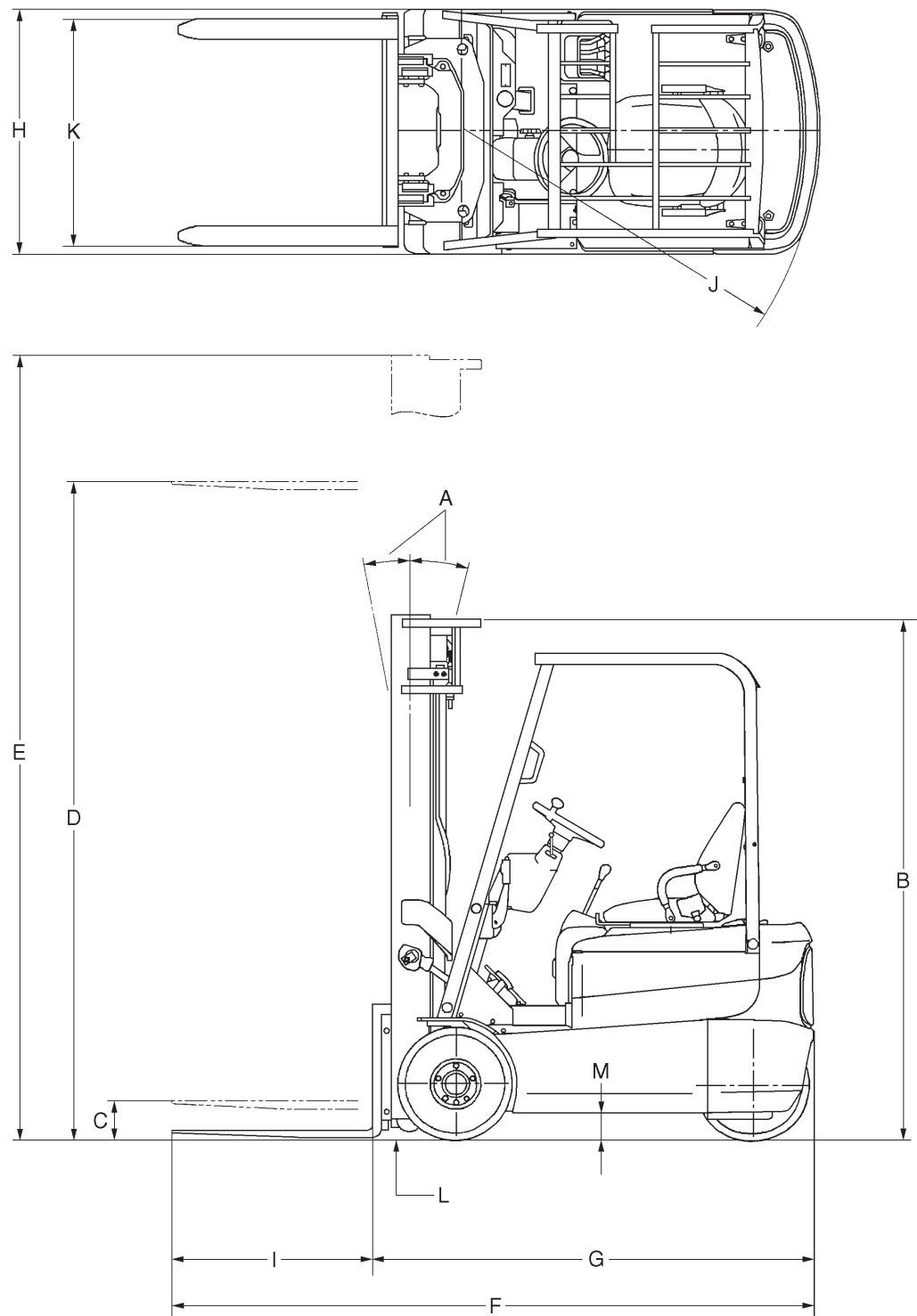
[Chassis]



[Mast]



Dimensions



Technical Data

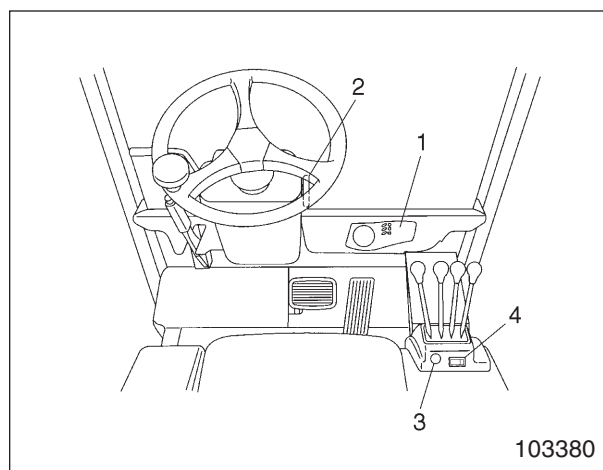
Truck model		EP10KRT	EP12KRT	EP15KRT
Mast tilt, forward/backward	A (deg)	5/7	5/7	5/7
Height with mast lowered	B (mm)	2110	2110	2110
Standard free lift	C (mm)	120	120	120
Standard lift height	D (mm)	3300	3300	3300
Overall height with mast raised (without backrest)	E (mm)	3895	3895	3895
Overall length	F (mm)	2500	2500	2575
Length to fork face (includes fork thickness)	G (mm)	1700	1700	1775
Overall width	H (mm)	997	997	997
Forks dimensions (thickness × width × length)	I (mm)	35 × 80 × 800	35 × 80 × 800	35 × 80 × 800
Turning circle radius	J (mm)	1370	1370	1445
Fork carriage width	K (mm)	920	920	920
Ground clearance under mast, with load	L (mm)	80	80	80
Ground clearance center of wheelbase, with load	M (mm)	100	100	100
Travel speed, with/without load	km/h	11.5/13.5	11.2/13	11/12.5
Lifting speed, with/without load	m/s	0.29/0.48	0.27/0.48	0.26/0.48
Lowering speed, with/without load	m/s	0.52/0.50	0.52/0.50	0.52/0.50
Rated drawbar pull, with/without load (60 min. short duty)	N	1569/1667	1520/1669	1470/1670
Maximum drawbar pull, with/without load (5 min. short duty)	N	4217/4315	4168/4315	4119/4314
Gradeability, with/without load	%	5.5/8	4.5/7.5	3.5/6.5
Maximum gradeability, with/without load	%	13/20	11/18	10/16
Battery to DIN 43531/35/36A/B/C/No.		DIN43535A		
Battery voltage/capacity at 5-hour discharge	V/Ah	24/600, 720	24/600, 720	24/720, 840
Battery weight	kg	445, 540	445, 540	540, 620
Truck weight, without load/including battery (Maximum battery)	kg	2333	2568	2778
Drive motor capacity (60 min. short duty)	kW	4.8	4.8	4.8
Pump motor output @15 % duty factor	kW	8.8	8.8	8.8
Drive motor control method		Mosfet-chopper		
Pump motor control method		Chopper		

VEHICLE ELECTRICAL COMPONENTS

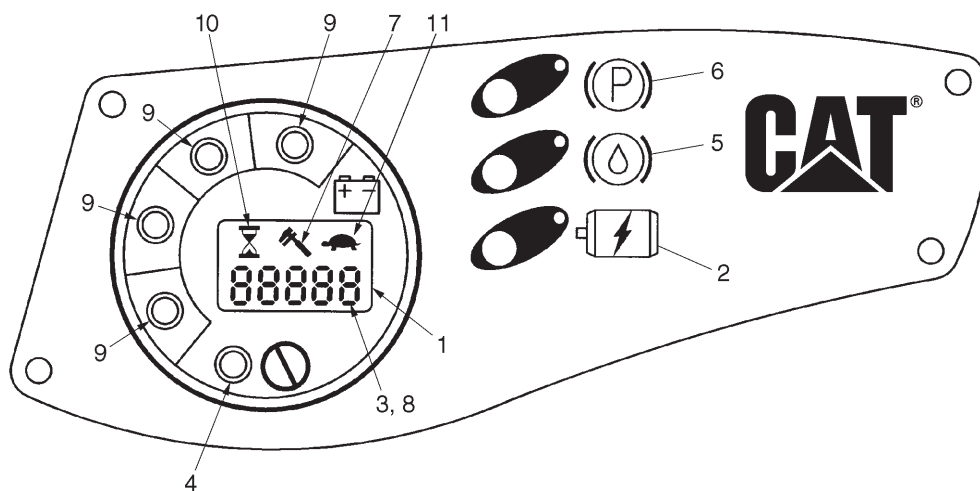
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Console Box

- 1 Vehicle monitoring system (VMS)
- 2 Steering tilt knob
- 3 Key switch
- 4 Lighting switch



Functions of Vehicle Monitor System (VMS)



Operations

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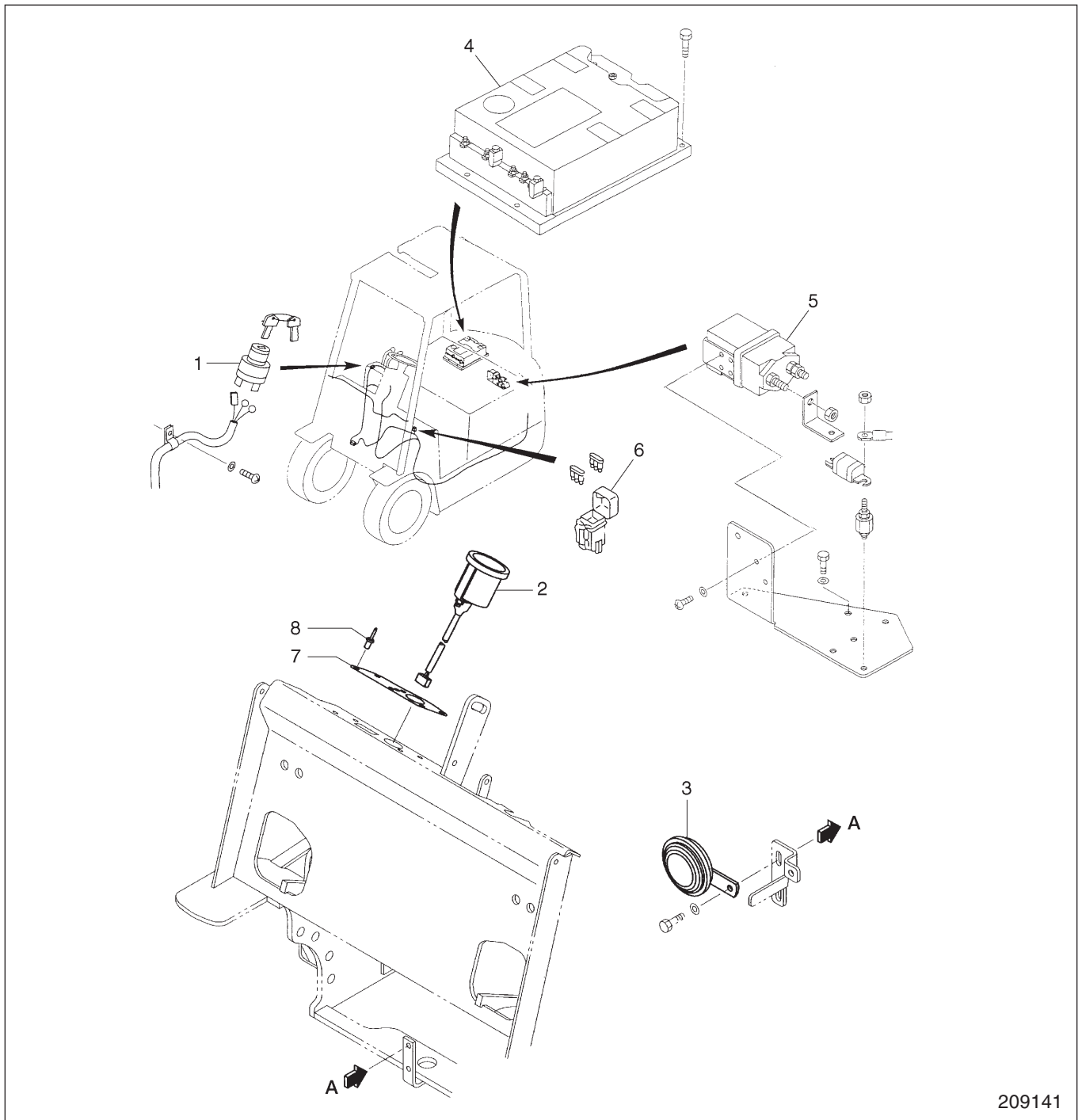
No.	Monitor name	When OFF	When ON or flashing	Remarks
1	Service indicator	Wrench-symbol warning lamp turns on when error has occurred.		
2	Worn motor brush lamp	Drive motor and pump motor brushes in operable condition	Worn brushes	After brushes are replaced, lamp turns OFF.
3	Service indicator	Controller, drive motors and pump motor in normal temperature	Overheat	Error code is indicated on display 8 when overheating condition has occurred.
4	Remaining battery charge warning lamp	Normal battery condition	Red LED turns on. Drive 1: Lifting function operates in restricted mode.	
5	Brake fluid level lamp		Normal fluid level	Low fluid level
6	Parking lamp	Parking brake disengaged	Parking brake engaged	

No.	Monitor name	When OFF	When ON or flashing	Remarks
7	Malfunction lamp	Normal	Vehicle malfunction	
8	Error indicator	Error code is displayed as follows when an error is present. A L x x x		
9	Battery discharge indicator (BDI)			Any of four green LEDs turns on when corresponding battery is discharged.
10	Hourmeter time display			
11	Truck mode indicator	Power mode (Mode B)	Economy mode (Mode A) 	

Error indicator

Indication	Condition
A L 0 7 9 ON	Key switch turned [ON] with direction lever in [F] or [R] position
A L 0 6 5 ON	Drive motor overheated
A L 0 1 7 ON	Pump motor overheated
A L 0 6 2 ON	Traction controller overheated
A L 0 0 6 ON	Data communication error
A L 0 3 5 ON	Pump motor overcurrent
A L 0 6 4 ON	Hydraulic controller overheated
A L 0 7 2 ON	Drive motor stall timer
A L 0 7 9 ON	Faulty setting of tilt lever
A L 0 7 9 ON	Faulty setting of attachment lever 1
A L 0 7 9 ON	Faulty setting of attachment lever 2
A L 0 3 2 ON	Regeneration diode error
A L 0 3 2 ON	Drive motor armature diode error
A L 0 2 8 ON	Pump motor armature diode error
A L 0 6 9 ON	Drive motor armature overcurrent
A L 0 5 7 ON	Drive motor field overcurrent

Electrical Components



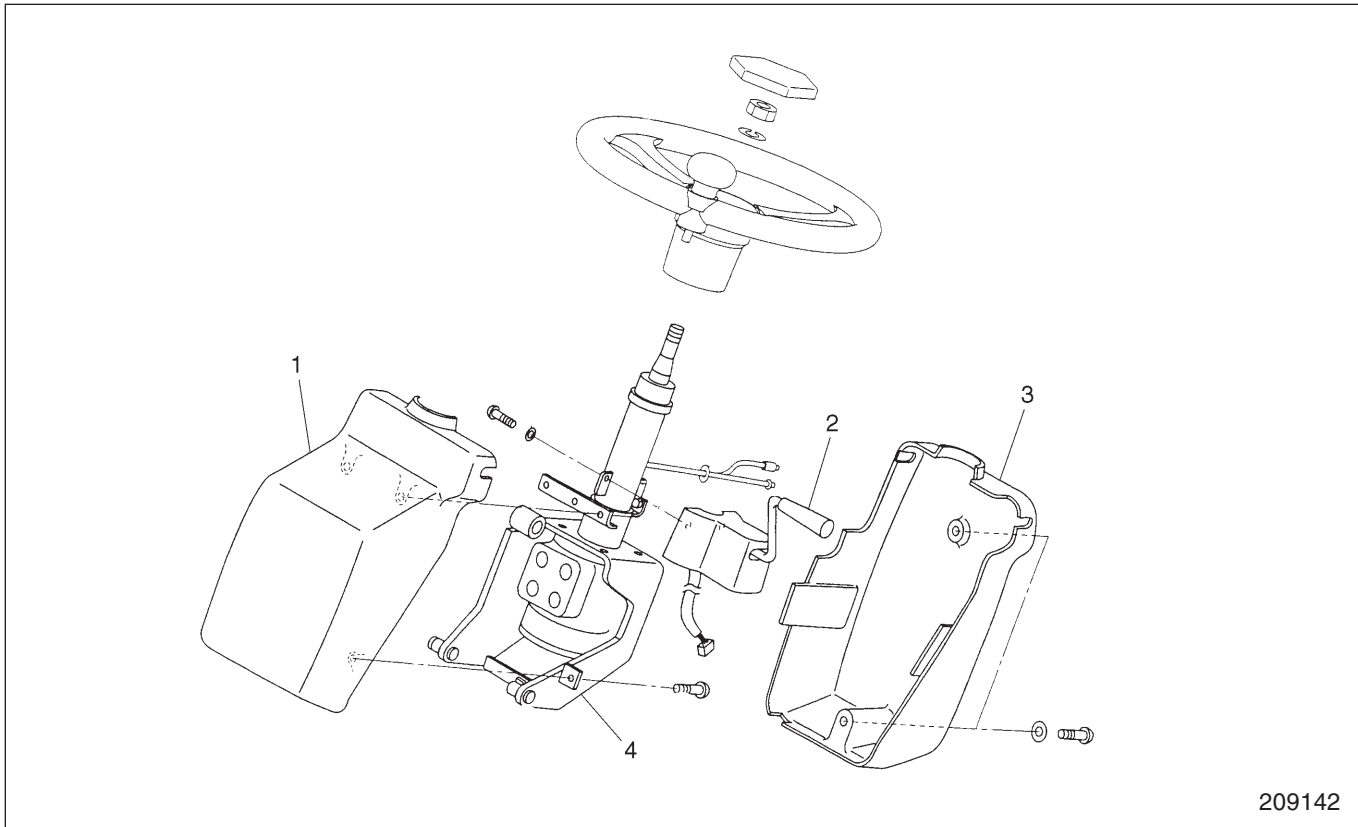
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- 1 Key switch
- 2 Display
- 3 Horn
- 4 Controller

- 5 Contactor
- 6 Fuse holder
- 7 Plate
- 8 Rivet

Disassembly and Reassembly

Disassembly

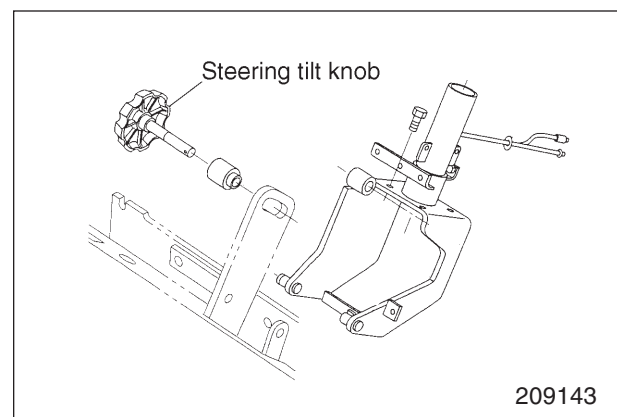


Sequence

- | | |
|-----------------------------|----------------------------|
| 1 Console box (front panel) | 3 Console box (rear panel) |
| 2 Forward/reverse lever | 4 Steering column assembly |

Disassembly procedure

- (1) Remove the rear panel and front panel from the steering column assembly.
- (2) Disconnect the harness connector at the direction lever.
- (3) Disconnect the harness connector at the horn.
- (4) Remove the steering tilt knob from the rear panel of the console box.
- (5) Remove the steering column assembly.

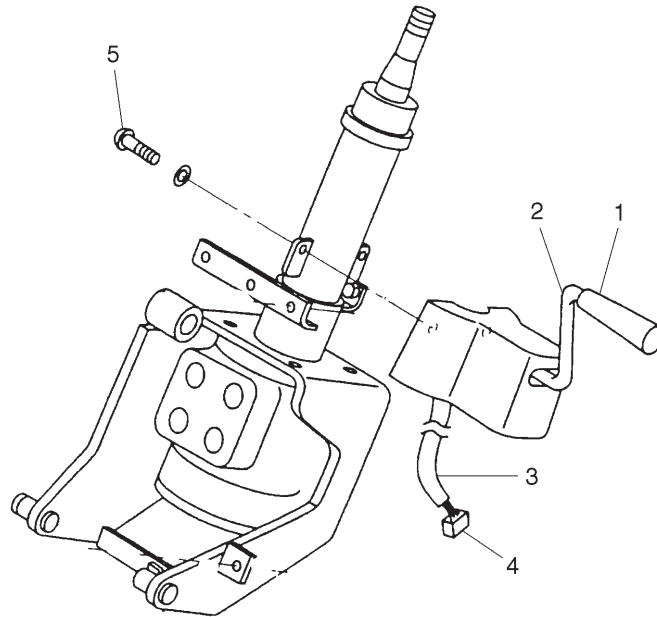


Reassembly

Follow the disassembly procedure in reverse.

Direction Lever

Structure



209144

- 1 Knob
- 2 Lever
- 3 Harness

- 4 Connector
- 5 Screw, Spring washer

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