PART NO. TOJBL40-EN-00

HITACHI

Reliable solutions

# Technical Manual
## Operational Principle

# ZX
# 870-6
# 870LC-6
# 890H-6
# 890LCH-6
# 890R-6
# 890LCR-6
## Hydraulic Excavator

Service Manual consists of the following separate Part No.

| | |
|---|---|
| Technical Manual (Operational Principle) | : Vol. No.TOJBL40-EN |
| Technical Manual (Troubleshooting) | : Vol. No.TTJBL40-EN |
| Workshop Manual | : Vol. No.WJBL40-EN |
| Engine Manual | : Vol. No.ETJBL40-EN, EWJBL40-EN |

ZX870-6 • 870LC-6 • 890H-6 • 890LCH-6 • 890R-6 • 890LCR-6 HYDRAULIC EXCAVATOR TECHNICAL MANUAL OPERATIONAL PRINCIPLE

TOJBL40-EN-00

Hitachi Construction Machinery Co., Ltd.

URL:http://www.hitachi-c-m.com

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# SECTION 1

# GENERAL

## CONTENTS

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# SECTION 2

# SYSTEM

## CONTENTS

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# SECTION 3

# COMPONENT OPERATION

## CONTENTS

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# INTRODUCTION

## To The Reader

This manual is written for an experienced technician to provide technical information needed to maintain and repair this machine.
The machine specification and description according to destination may be explained on this manual.

- Be sure to thoroughly read this manual for correct product information and service procedures.
- If you have any questions or comments, at if you found any errors regarding the contents of this manual, please contact using "Service Manual Revision Request Form" at the end of this manual. (Note: Do not tear off the form. Copy it for usage.):
  - Technical Information Center Hitachi Construction Machinery Co., Ltd.
  - TEL: 81-29-832-7084
  - FAX: 81-29-831-1162
  - E-mail: HCM-TIC-GES@hitachi-kenki.com

## Additional References

Please refer to the other materials (operator's manual, parts catalog, engine technical material and Hitachi training material etc.) in addition to this manual.

## Manual Composition

This manual consists the Technical Manual, the Workshop Manual and the Engine Manual.

- Information included in the Technical Manual:
Technical information needed for redelivery and delivery, operation and activation of all devices and systems, operational performance tests, and troubleshooting procedures.

- Information included in the Workshop Manual:
Technical information needed for maintenance and repair of the machine, tools and devices needed for maintenance and repair, maintenance standards, and removal / installation and assemble / disassemble procedures.

- Information included in the Engine Manual:
Technical information needed for redelivery and delivery and maintenance and repair of the machine, operation and activation of all devices and systems, troubleshooting and assemble / disassemble procedures.

## Page Number

Each page has a number, located on the center lower part of the page, and each number contains the following information:

Example:

- Technical Manual: T 1-3-5

| | |
|---|---|
| T | Technical Manual |
| 1 | Section Number |
| 3 | Group Number |
| 5 | Consecutive Page Number for Each Group |

- Workshop Manual: W 1-3-2-5

| | |
|---|---|
| W | Workshop Manual |
| 1 | Section Number |
| 3 | Group Number |
| 2 | Sub Group Number |
| 5 | Consecutive Page Number for Each Group |

## Trademark

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## Safety Alert Symbol and Headline Notations

In this manual, the following safety alert symbol and signal words are used to alert the reader to the potential for personal injury of machine damage.

This is the safety alert symbol. When you see this symbol, be alert to the potential for personal injury.
Never fail to follow the safety instructions prescribed along with the safety alert symbol.
The safety alert symbol is also used to draw attention to component/part weights.
To avoid injury and damage, be sure to use appropriate lifting techniques and equipment when lifting heavy parts.

**CAUTION:**
Indicates potentially hazardous situation which could, if not avoided, result in personal injury or death.

**IMPORTANT:**
Indicates a situation which, if not conformed to the instructions, could result in damage to the machine.

*NOTE:*
Indicates supplementary technical information or know-how.

## Units Used

SI Units (International System of Units) are used in this manual.

A table for conversion from SI units to other system units is shown below for reference purposes.

| Quantity | To Convert From | Into | Multiply By |
|---|---|---|---|
| Length | mm | in | 0.03937 |
| | mm | ft | 0.003281 |
| Volume | L | US gal | 0.2642 |
| | L | US qt | 1.057 |
| | $m^3$ | $yd^3$ | 1.308 |
| Weight | kg | lb | 2.205 |
| Force | N | kgf | 0.10197 |
| | N | lbf | 0.2248 |
| Torque | N·m | kgf·m | 0.10197 |
| Pressure | MPa | $kgf/cm^2$ | 10.197 |
| | MPa | psi | 145.0 |
| Power | kW | PS | 1.360 |
| | kW | HP | 1.341 |
| Temperature | °C | °F | °C×1.8+32 |
| Velocity | km/h | mph | 0.6214 |
| | $min^{-1}$ | rpm | 1.0 |
| Flow rate | L/min | US gpm | 0.2642 |
| | mL/rev | cc/rev | 1.0 |

# SYMBOL AND ABBREVIATION

| Symbol / Abbreviation | Name | Explanation |
|---|---|---|
| TO | Technical manual (Operational principle) | Technical manual (Operational Principle). |
| TT | Technical manual (Troubleshooting) | Technical manual (Troubleshooting). |
| T/M | Technical manual | Technical manual. |
| W, W/M | Workshop manual | Workshop manual (Removal and Installation, Disassembly and Assembly). |
| MC | Main Controller | Main controller. MC controls the engine, pump, and valve according to the machine operating condition. |
| ECM | Engine Control Module | Engine controller. ECM controls fuel injection amount according to the machine operating condition. |
| VGS | Variable Geometry System controller | Variable turbo controller. VGS is an exhaust turbo charged system to supercharge the exhaust energy while running the engine at slow idle speed. VGS optimizes the turbine rotation, improves the performance at slow-speed torque and the acceleration, reduces fuel consumption, and reduces particulate matter (PM) by adjusting the nozzle opening of turbine housing. |
| GSM | Global System for Mobile communications controller | Communication controller. GSM is a type of wireless communication system, is used in more than on 100 countries around Europe and Asia, and becomes the factual global standards of the mobile telephone. |
| GPS | Global Positioning System | Global positioning system. |
| CAN | Controller Area Network | CAN communication. CAN is a serial communications protocol internationally-standardized by ISO (International Organization for Standardization). |
| A/C | Air Conditioner | Air conditioner. |
| OP, OPT | Option | Optional component. |
| MPDr. | Maintenance Pro Dr. | MPDr. is software that troubleshooting, monitoring, and adjustment. |
| A/I | Auto-Idle | Auto-idle. |
| WU | Warming-Up | Warming-up. |
| Li | Low (Slow) Idle | Slow idle engine speed. |
| ATT | Attachment | Attachment. Attachment is optional parts such as breaker, crusher, and pulverizer in this manual. |
| HI, Hi | High | Travel fast position. |
| LO, Lo | Low | Travel slow position. |

# SYMBOL AND ABBREVIATION

| Symbol / Abbreviation | Name | Explanation |
|---|---|---|
| DPF | Diesel Particulate Filter | DPF is a filter which removes particulate matter (PM) including the toxic substance of exhaust gas of the diesel engine. Exhaust particulate removal equipment. |
| DPD | Diesel Particulate Diffuser | DPD is an exhaust emission control system, a type of DPF, which cleans up particulate matter (PM) of diesel engine exhaust gas. DPD is a ceramic filter which traps and filters PM of exhaust gas. DPD burns up accumulated PM when PM increases and regenerates the filter. |
| DOC | Diesel Oxidation Catalyst | Oxidation catalyst for the diesel engine. Diesel oxidation catalyst oxidizes unburnt fuel and raises exhaust temperature. |
| CSF | Catalyzed Soot Filter | Filter. The filter traps, burns, and remove particulate matter (PM) by using high-temperature-exhaust gas with diesel oxidation catalyst. Catalyst is applied onto the filter. This advances PM burning. |
| PM | Particulate Matter | Particulate matter. |
| EGR | Exhaust Gas Recirculation | The EGR control re-circulates a part of exhaust gas in the intake manifold and combines it with intake-air. Therefore, combustion temperature is lowered and generation of oxide of nitrogen (NOx) is controlled. |
| HRV | Hose Rupture Valve | Hose rupture valve. |
| LLC | Long Life Coolant | Long life coolant. |
| SCR | Selective Catalytic Reduction | The urea SCR system injects diesel exhaust fluid to nitrogen oxide (NOx) exhausted from the engine and purifies NOx. |
| DCU | Dosing Control Unit | Urea SCR system controller. DCU controls the diesel exhaust fluid injection amount according to the machine operating condition. |
| S/M | Supply Module | Diesel exhaust fluid supply module. The diesel exhaust fluid supply module pumps diesel exhaust fluid to the dosing module (D/M). Then, it returns diesel exhaust fluid in the diesel exhaust fluid circuit when the key switch is turned OFF. |
| D/M | Dosing Module | Dosing module. The dosing module (D/M) injects diesel exhaust fluid into the exhaust piping according to the signal from DCU. |
| NOx | Nitrogen Oxide | Nitrogen oxide. |
| DEF | Diesel Exhaust Fluid | Diesel exhaust fluid. The diesel exhaust fluid concentration is 32.5 %, which is specified in ISO22241. |

# SECTION AND GROUP CONTENTS

**TECHNICAL MANUAL**

**(Operational Principle)**

## SECTION 1 GENERAL



## SECTION 2 SYSTEM



## SECTION 3 COMPONENT OPERATION



All information, illustrations and specifications in this manual are based on the latest product information available at the time of publication. The right is reserved to make changes at any time without notice.

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# SECTION 1

# GENERAL

## CONTENTS

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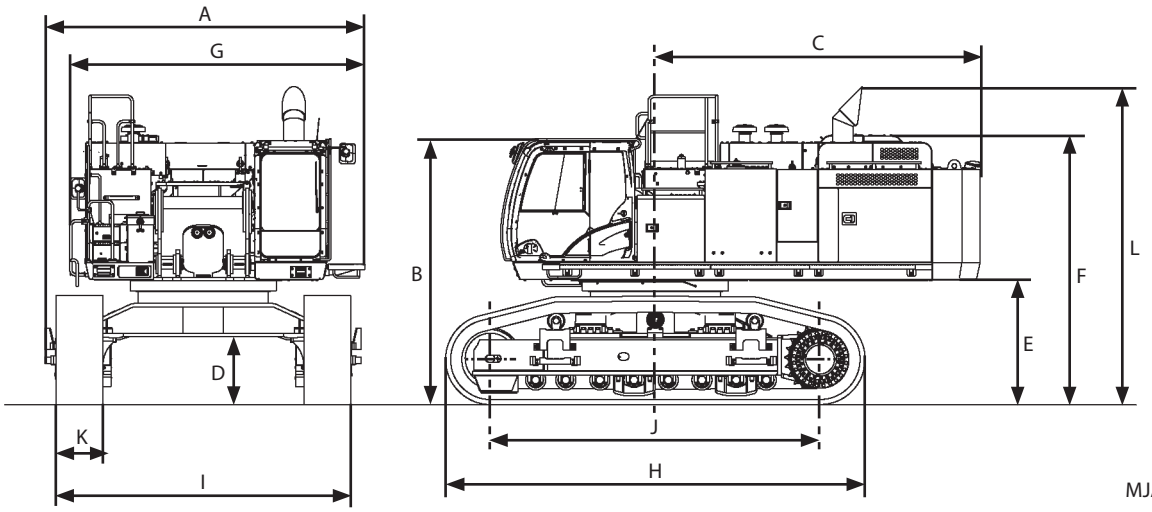
## Specifications

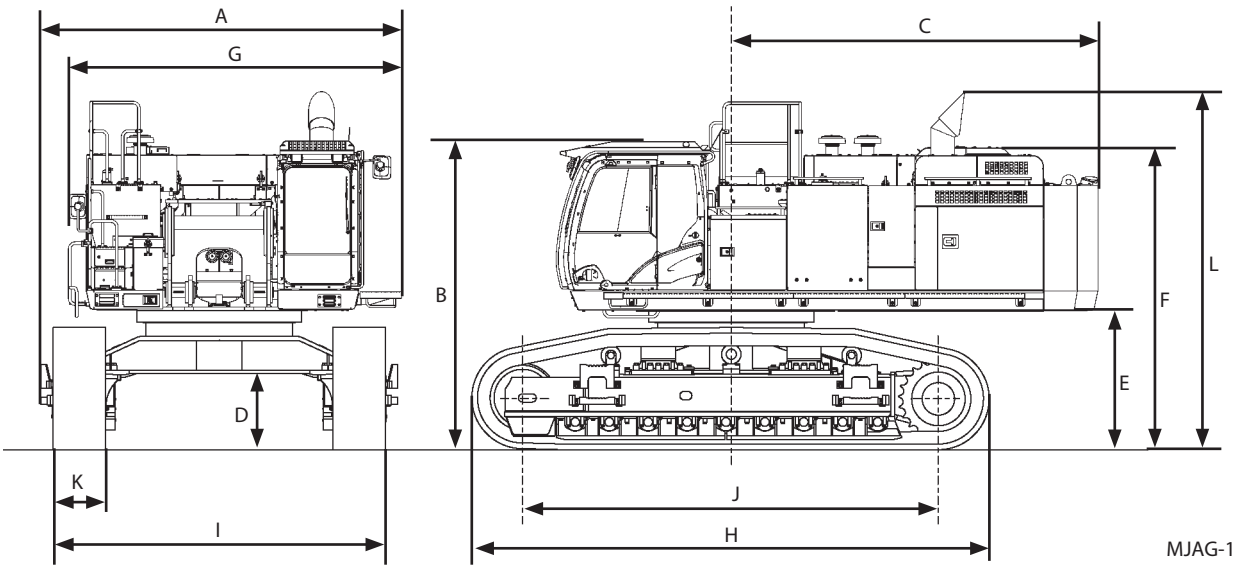
**ZX870-6, 870LC-6**




| Model | | ZX870-6 | ZX870LC-6 |
|---|---|---|---|
| Type of Front-End Attachment | - | 3.7 m Arm | |
| Bucket Capacity (Heaped) | $m^3$ | 3.4 (3.0: CECE) | 3.5 (3.1: CECE) |
| Operating Weight | kg | 81100 | 83000 |
| Base Machine Weight | kg | 61700 | 63500 |
| Engine | - | ISUZU AQ-6WG1X<br>ISO14396: 382 kW/1800 $min^{-1}$(520 PS/1800 rpm) | |
| A: Overall Width | mm | 4450 | |
| B: Cab Height | mm | 3690 | |
| C: Rear End Swing Radius | mm | 4600 | |
| D: Minimum Ground Clearance | mm | *890 | |
| E: Counterweight Clearance | mm | *1680 | |
| F: Engine Cover Height | mm | 3740 (Radiator top cover) | |
| G: Overall Width of Upperstructure | mm | 4120 | |
| H: Undercarriage Length | mm | 5840 | 6360 |
| I: Undercarriage Width (Extended/ Retracted) | mm | 4100/3480 | |
| J: Sprocket Center to Idle Center | mm | 4590 | 5110 |
| K: Track Shoe Width | mm | 650 (Grouser shoe) | |
| L: Overall Height | mm | 4410 | |
| Ground Pressure | kPa ($kgf/cm^2$) (psi) | 122 (1.24) (17.6) | 113 (1.15) (16.4) |
| Swing Speed | $min^{-1}$ (rpm) | 7.8 | |
| Travel Speed (fast/slow) | km/h | 4.7/3.2 | |
| Gradeability | % (Degree) | 70 (35) | |

*NOTE: *The dimensions do not include the height of the shoe lug.*

**ZX890H-6, 890LCH-6, 890R-6, 890LCR-6**

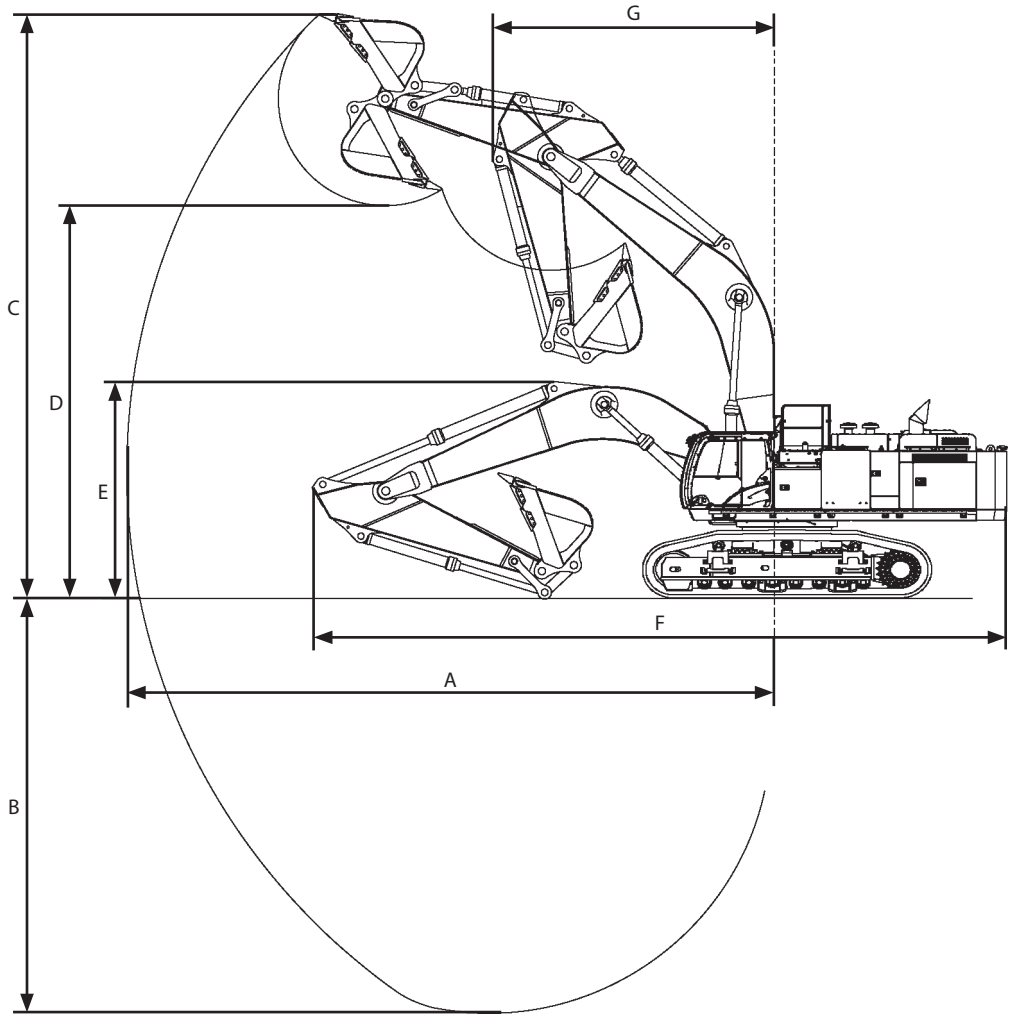



| Model | | ZX890H-6 | ZX890LCH-6 | ZX890R-6 | ZX890LCR-6 |
|---|---|---|---|---|---|
| Type of Front-End Attachment | - | 3.7 m H Arm | | 3.7 m R Arm | |
| Bucket Capacity (Heaped) | $m^3$ | 3.4 (3.0: CECE) | 3.5 (3.1: CECE) | 3.4 (3.0: CECE) | 3.5 (3.1: CECE) |
| Operating Weight | kg | 82700 | 84800 | 84300 | 86300 |
| Base Machine Weight | kg | 62400 | 64200 | 62700 | 64600 |
| Engine | - | ISUZU AQ-6WG1X<br>ISO14396: 382 kW/1800 $min^{-1}$ (520 PS/1800 rpm) | | | |
| A: Overall Width | mm | 4450 | | | |
| B: Cab Height | mm | 3800 | | | |
| C: Rear End Swing Radius | mm | 4600 | | | |
| D: Minimum Ground Clearance | mm | *890 | | | |
| E: Counterweight Clearance | mm | *1680 | | | |
| F: Engine Cover Height | mm | 3740 (Radiator top cover) | | | |
| G: Overall Width of Upperstructure | mm | 4120 | | | |
| H: Undercarriage Length | mm | 5840 | 6360 | 5840 | 6360 |
| I: Undercarriage Width (Extended/ Retracted) | mm | 4100/3480 | | | |
| J: Sprocket Center to Idle Center | mm | 4590 | 5110 | 4590 | 5110 |
| K: Track Shoe Width | mm | 650 (Grouser shoe) | | | |
| L: Overall Height | mm | 4410 | | | |
| Ground Pressure | kPa ($kgf/cm^2$) (psi) | 124 (1.27) (18.0) | 115 (1.18) (16.7) | 126 (1.29) (18.3) | 117 (1.20) (17.0) |
| Swing Speed | $min^{-1}$ (rpm) | 7.8 | | | |
| Travel Speed (fast/slow) | km/h | 4.7/3.2 | | | |
| Gradeability | % (Degree) | 70 (35) | | | |

*NOTE: *The dimensions do not include the height of the shoe lug.*

## Working Ranges

### ZX870-6, 870LC-6



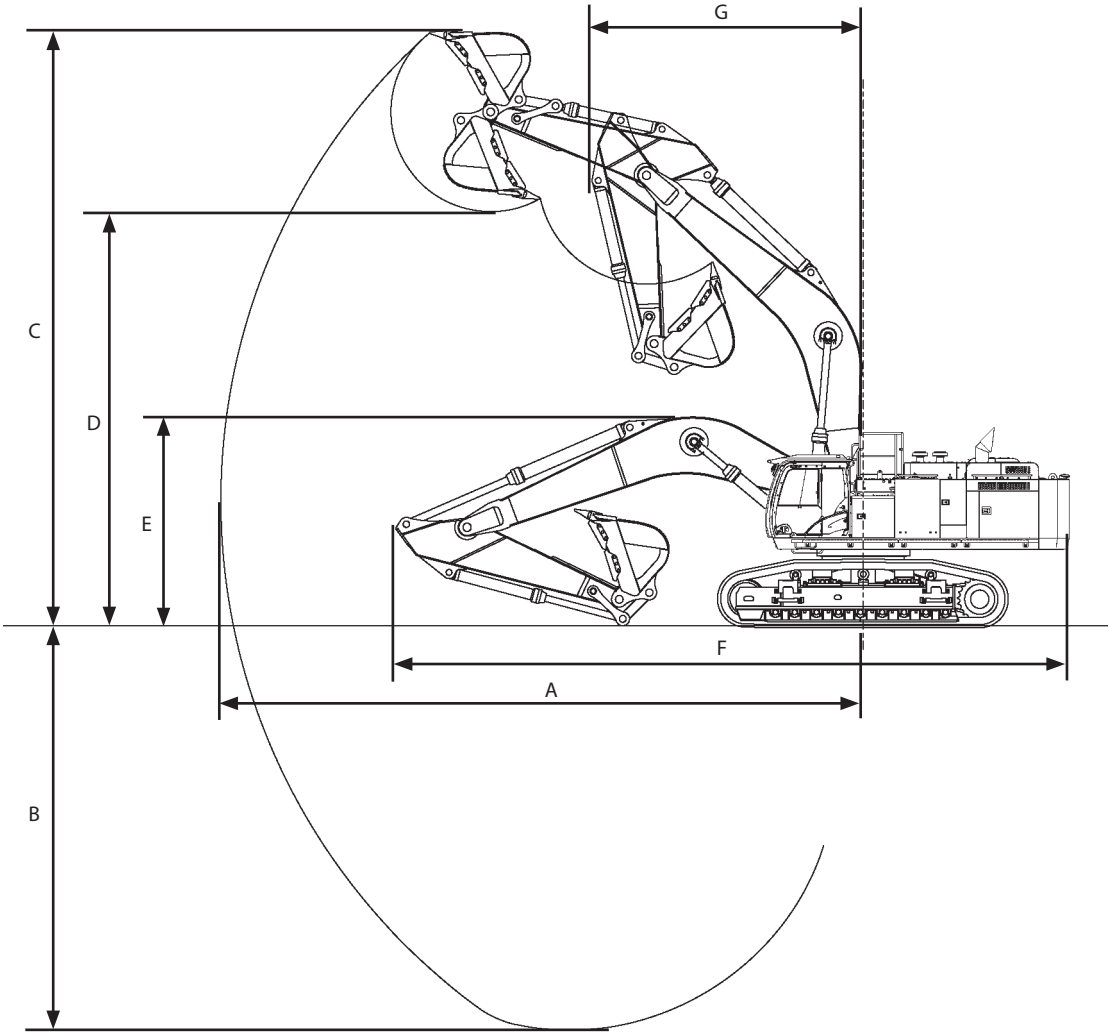

MJAG-12-006

Backhoe

| Model | | ZX870-6/ZX870LC-6 | | |
|---|---|---|---|---|
| Boom Type | | 8.4 m | | 7.1 m (BE) |
| Arm Type | | 3.7 m | 4.4 m | 2.95 m (BE) |
| A: Maximum Digging Reach | mm | 14100 | 14910 | 12340 |
| B: Maximum Digging Depth | mm | 8870 | 9570 | 7140 |
| C: Maximum Cutting Height | mm | 13030 | 13820 | 12010 |
| D: Maximum Dumping Height | mm | 9080 | 9740 | 8130 |
| E: Overall Height | mm | *4770 | *5130 | *5200 |
| F: Overall Length | mm | *14800 | *14800 | *13550 |
| G: Minimum Swing Radius | mm | 5950 | 5950 | 5210 |

*NOTE: *The dimension includes the height of the shoe lug. Other dimensions do not include the height of the shoe lug.*

**ZX890H-6, 890LCH-6, 890R-6, 890LCR-6**



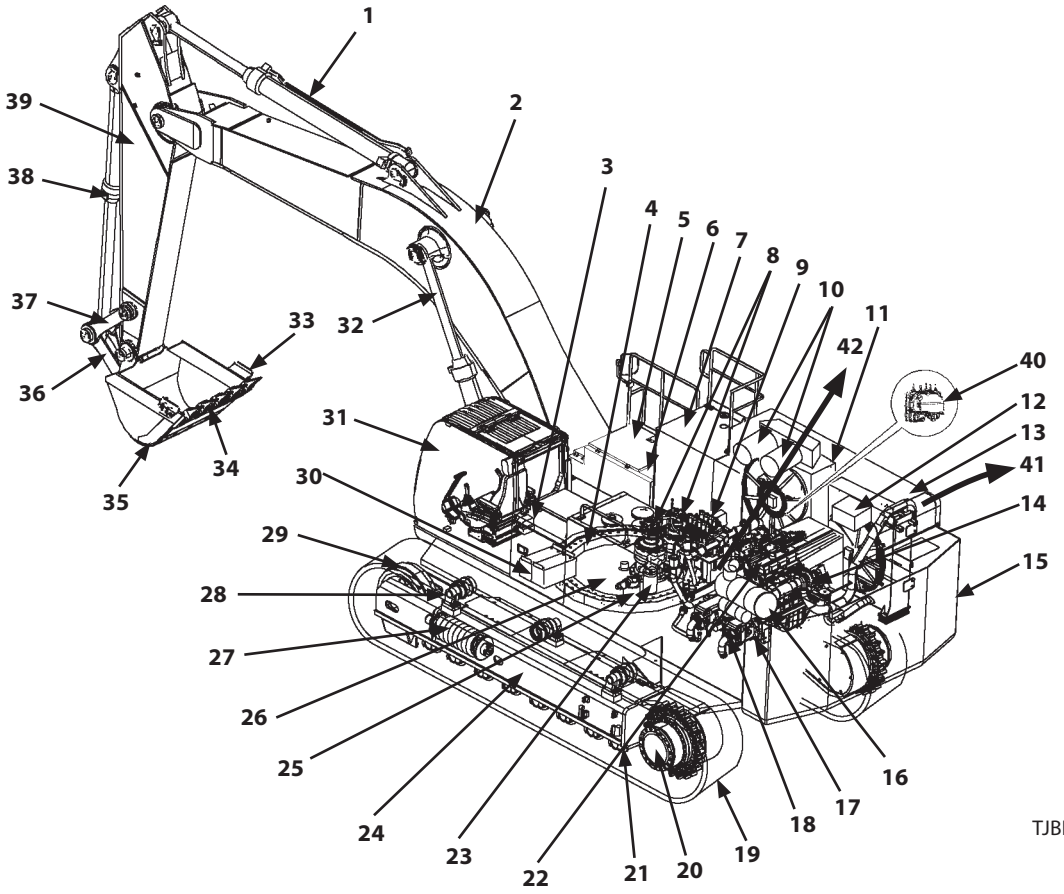

MJAG-12-010

Backhoe

| Model | | ZX890H-6, 890LCH-6, 890R-6, 890LCR-6 | | |
|---|---|---|---|---|
| Boom Type | | 8.4 m (H, R) | 7.1 m (BE, BER) | |
| Arm Type | | 3.7 m (H, R) | 2.95 m (BE, BER) | 3.7 m (H, R) |
| A: Maximum Digging Reach | mm | 14100 | 12340 | 12820 |
| B: Maximum Digging Depth | mm | 8870 | 7140 | 7820 |
| C: Maximum Cutting Height | mm | 13000 | 12010 | 12130 |
| D: Maximum Dumping Height | mm | 9080 | 8130 | 8180 |
| E: Overall Height | mm | *4770 | *5200 | *5000 |
| F: Overall Length | mm | *14800 | *13550 | *13510 |
| G: Minimum Swing Radius | mm | 5950 | 5210 | 5090 |

*NOTE: *The dimension includes the height of the shoe lug. Other dimensions do not include the height of the shoe lug.*

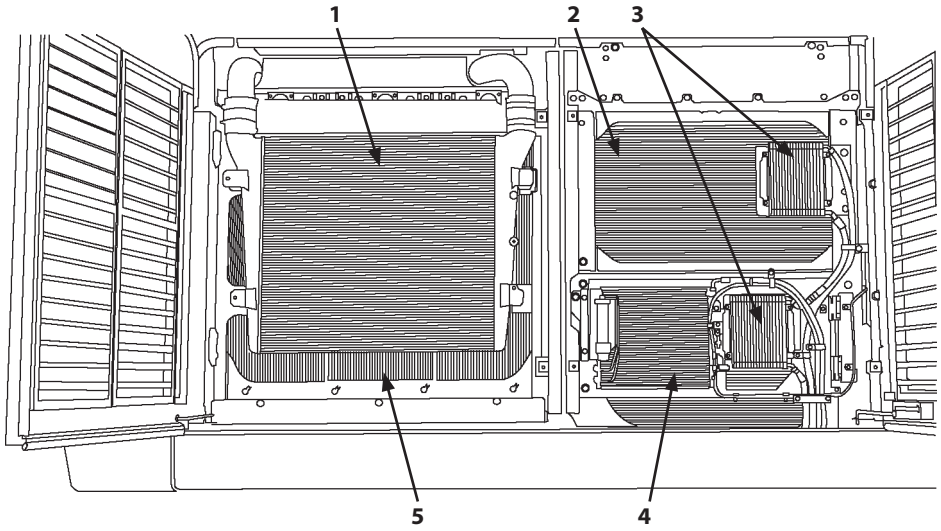
## Main Component




TJBL40-01-02-001

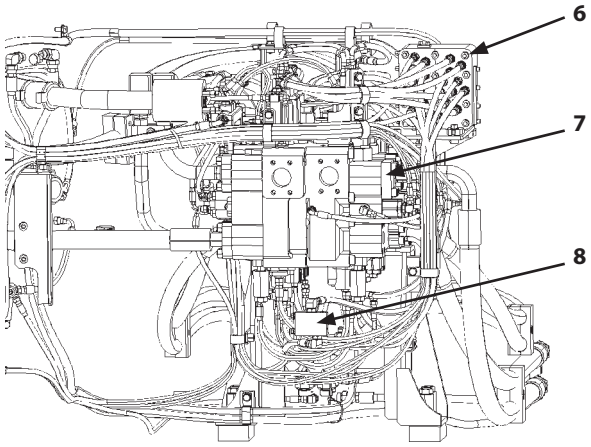
1- Arm Cylinder
2- Boom
3- Washer Tank
4- Swing Bearing
5- Tool Box, Auto-Lubrication Device
6- DEF Tank
7- Fuel Tank
8- Swing Device
9- Control Valve
10- Air Cleaner
11- Oil Cooler, Fuel Cooler
12- Expansion Tank
13- Radiator, Inter Cooler
14- Engine
15- Counterweight
16- Aftertreatment Device
17- Main Pump
18- Fan Pump
19- Shoe, Track Link
20- Travel Reduction Gear
21- Lower Roller
22- Fuel Filter
23- Pilot Filter
24- Track Frame
25- Pump Drain Filter
26- Hydraulic Oil Tank
27- Track Adjuster
28- Upper Roller
29- Front Idler
30- Battery
31- Cab
32- Boom Cylinder
33- Side Cutter
34- Tooth
35- Bucket
36- Link A
37- Link B
38- Bucket Cylinder
39- Arm
40- DEF Supply Module
41- Around Radiator (Refer to T1-2-2.)
42- Components Related with Shockless Valve (Refer to T1-2-2.)

## Around Radiator




TJBC-01-02-003

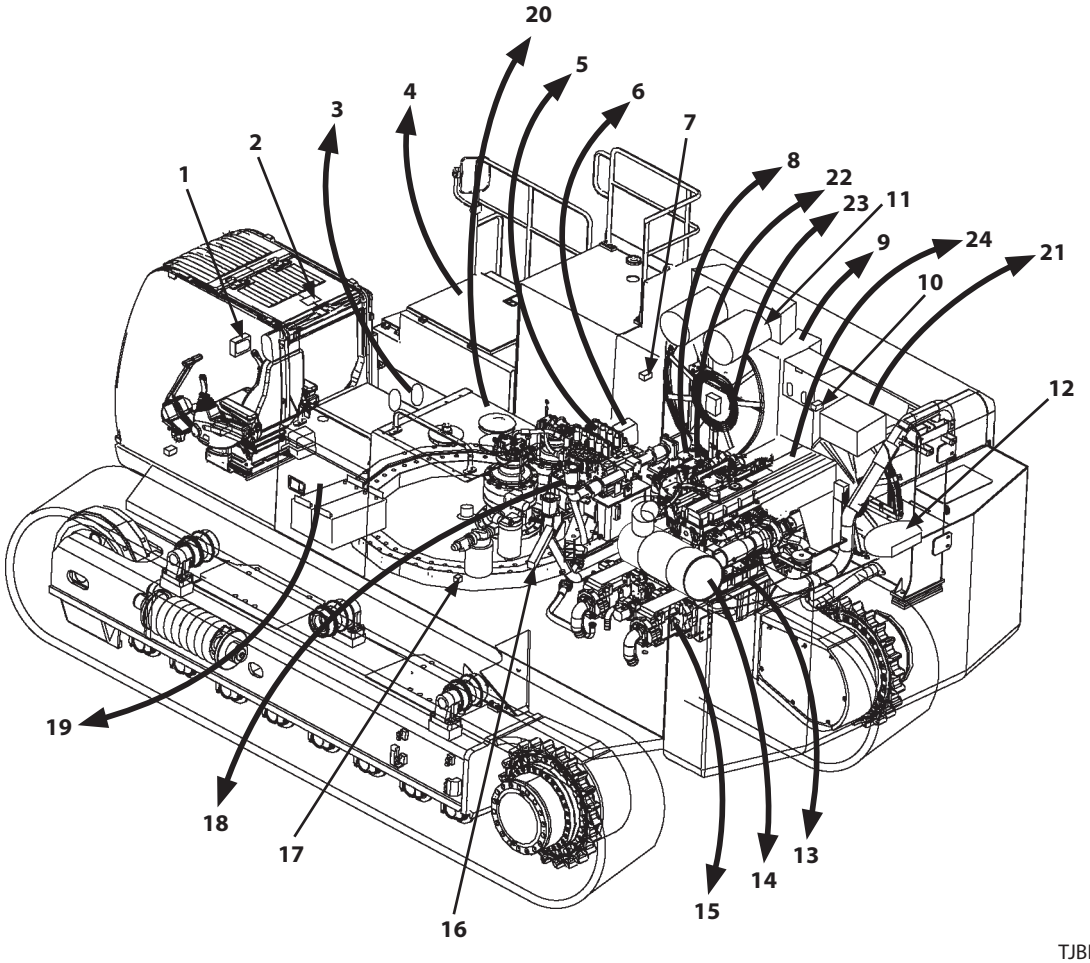
### Shockless Valve




TJAA-01-02-008

1- Inter Cooler
2- Oil Cooler
3- Fuel Cooler
4- Air Conditioner Condenser
5- Radiator
6- Signal Control Valve
7- Control Valve
8- Shocklesss Valve

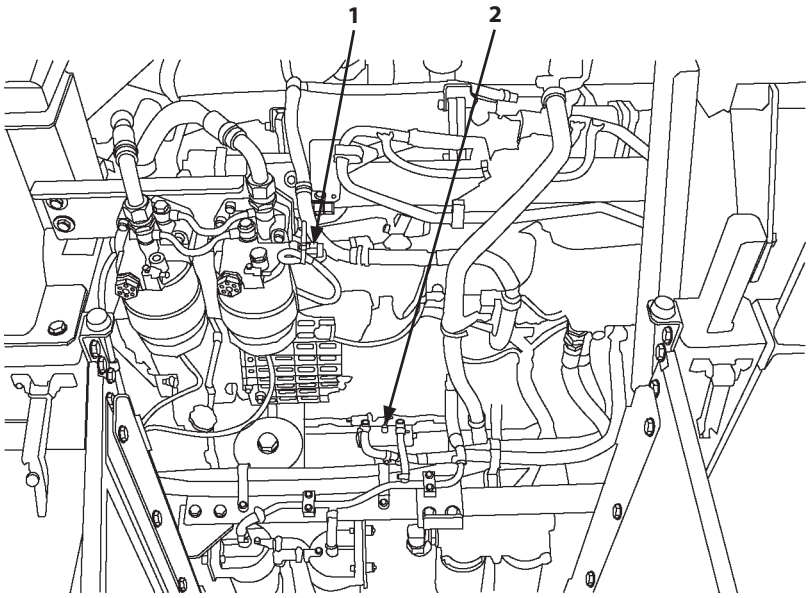
## Electrical System (Overview)




TJBL-01-02-001

1- Monitor
2- GPS Aerial
3- Around Horn (Refer to T1-2-8.)
4- Auto Lubricating System (Refer to T1-2-9.)
5- Components Related with Control Valve (Refer to T1-2-14.)
6- Components Related with Signal Control Valve (Refer to T1-2-15.)
7- Fuel Sensor
8- Fuel Pump (Refer to T1-2-4.)
9- Around Oil Cooler (Refer to T1-2-9.)
10- Coolant Level Switch
11- Air Cleaner Restriction Switch
12- Rear Camera
13- Components Related with Engine (Refer to T1-2-10.)
14- Components Related with Aftertreatment Device (Refer to T1-2-11.)
15- Components Related with Pump Device (Refer to T1-2-13.)
16- Components Related with 4-Spool Solenoid Valve Unit (Refer to T1-2-18.)
17- Hydraulic Oil Temperature Sensor
18- Components Related with Check Valve (Refer to T1-2-15.)
19- Electrical System (Cab Behind Side) (Refer to T1-2-7.)
20- DEF Tank (Refer to T1-2-19.)
21- Expansion Tank (Refer to T1-2-20.)
22- Components Related with Fan Valve (Oil Cooler) (Refer to T1-2-18.)
23- Components Related with DEF Supply Module (Refer to T1-2-19.)
24- Components Related with Fan Valve (Radiator) (Refer to T1-2-18.)

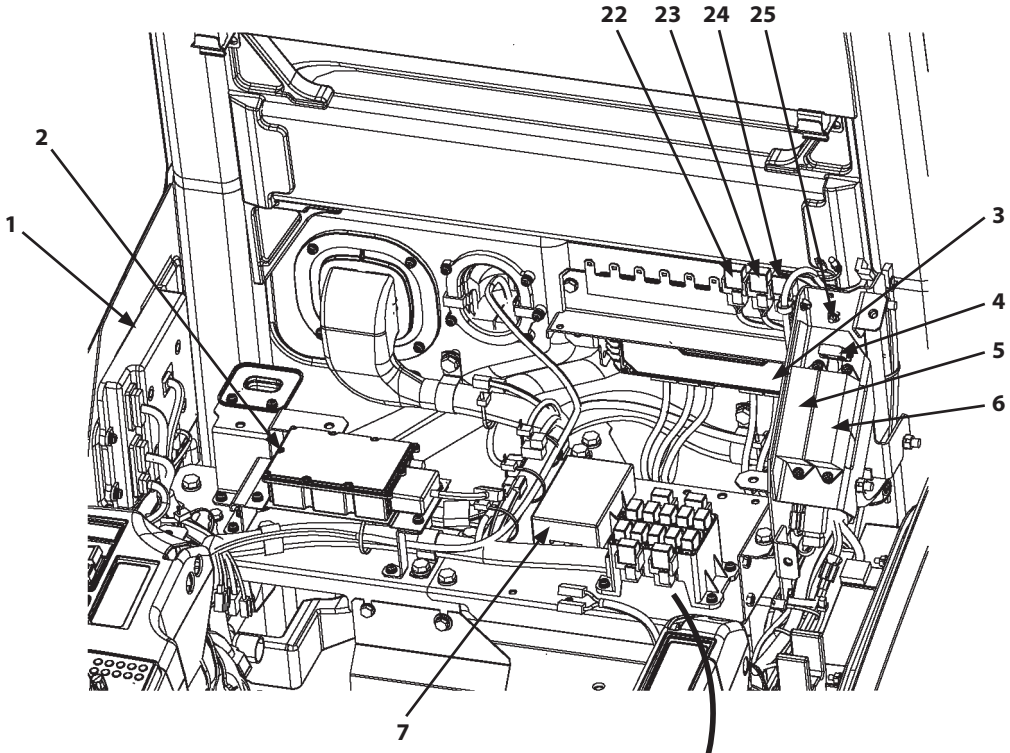
## Fuel Pump



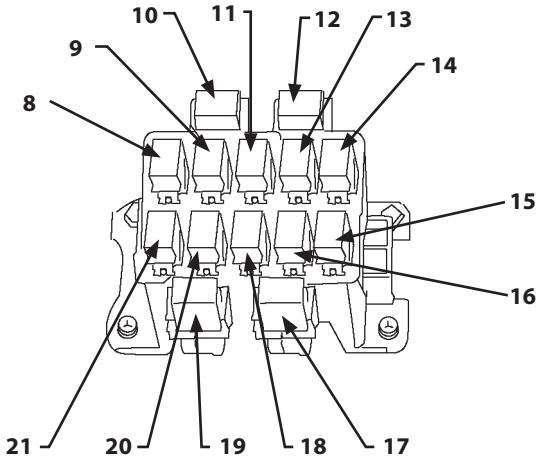

TJBC-01-02-005

1- Fuel Filter Differential Pressure Sensor
2- Fuel Pump

## Electrical System (Rear Tray)



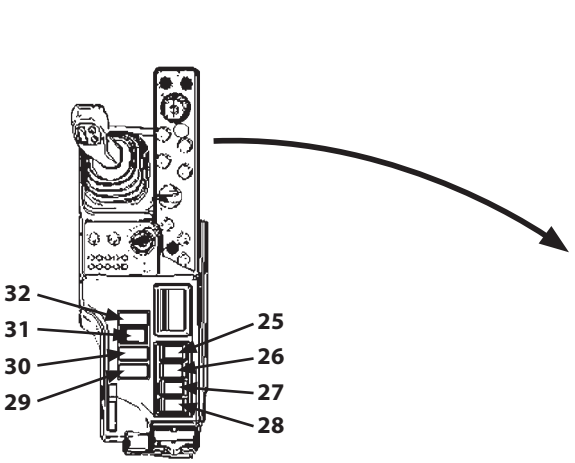

TJAA-01-02-004




T1V1-01-02-009

1- Monitor Controller
2- GSM (Option)
3- MC (Main Controller)
4- MPDr. Connector (Download Connector Using Conbinedly)
5- Fuse Box 1
6- Fuse Box 2
7- Wiper/Light Controller
8- Wiper Relay (R6)
9- Work Light Relay 1 (R7)
10- ACC Cut Relay (R12)
11- Work Light Relay 2 (R8)
12- Auto Shut-Down Relay (R11)
13- Washer Relay (R9)
14- Horn Relay (R10)
15- Security Relay (R5)
16- Starter Cut Relay (R4)
17- Key Switch ON Cut Relay (R13)
18- Security Horn Relay (R3)
19- ECM Main Relay (R14)
20- Pilot Shut-Off Relay (R2)
21- Load Damp Relay (R1)
22- Auto Lubrication Relay (R15)
23- Fuel Pump Relay (R16)
24- Work Light Relay 3 (R17)
25- Pump Regulator Pressure Learning Switch

## Electrical System (Switch Panel)

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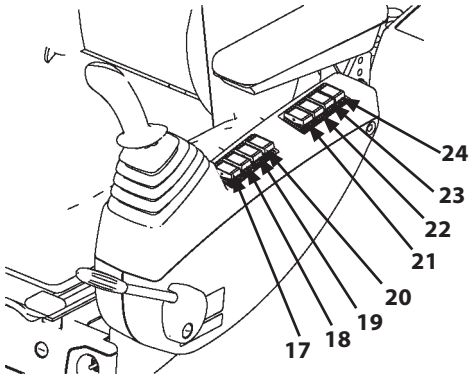
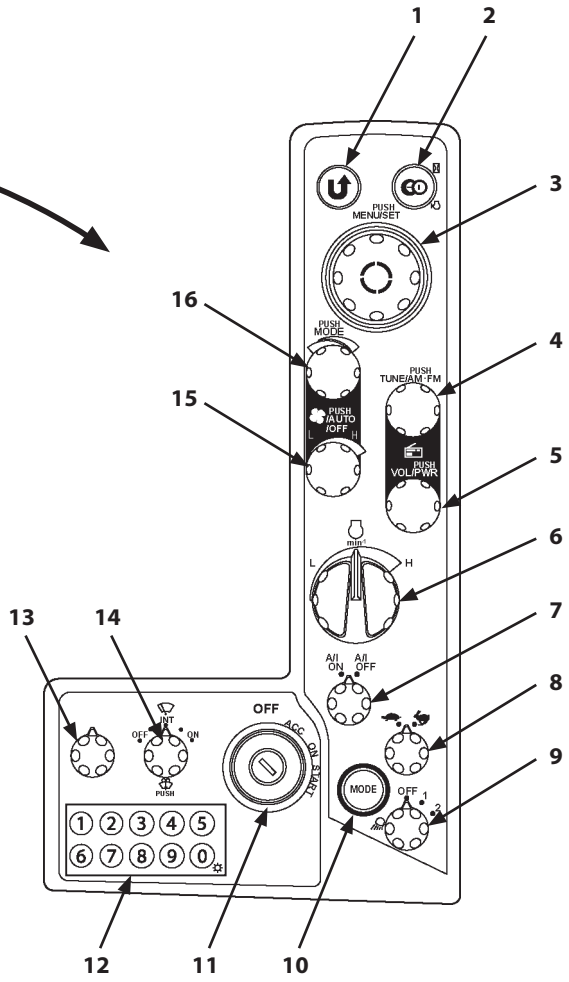


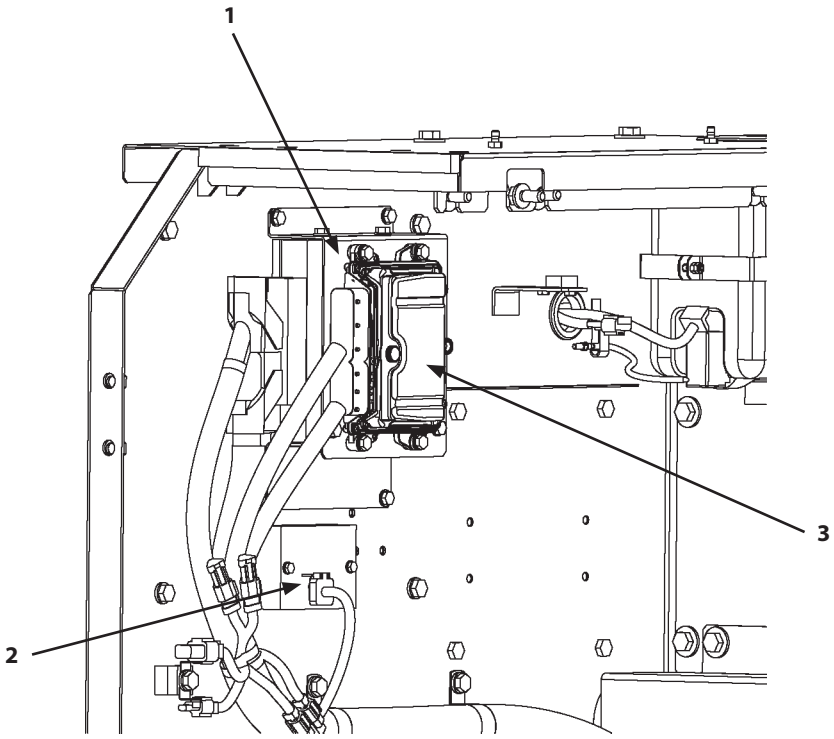

TJAA-01-02-003



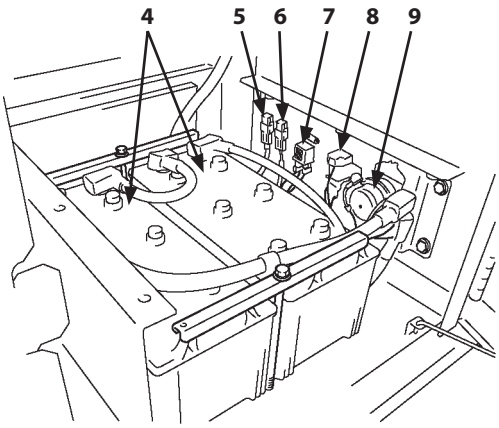

TDAA-05-02-059

1- Return to Previous Screen Switch
2- Return to Basic Screen Switch
3- Selector/Set Switch
4- AM·FM Switch/Tuning Switch
5- Power Switch/Volume Control Switch
6- Engine Control Dial
7- Auto-Idle Switch
8- Travel Mode Switch
9- Work Light Switch
10- Power Mode Switch
11- Key Switch
12- TEN-key Switch
13- Overhead Window Wiper/ Overhead Window Washer Switch (Option)
14- Wiper/Washer Switch
15- AUTO/OFF Switch/Blower Switch
16- Temperature Control Switch/ MODE Switch
17- Travel Alarm Cancel Switch (Optional)
18- Seat Heat Switch (Optional)
19- Boom Mode Selector Switch
20- Fan Reverse Switch
21- Overload Alarm Switch (Optional)
22- Swing Alarm Cancel Switch (Optional)
23- Auto-Lubrication Switch (Optional)
24- Counterweight Removal/ Installation Switch (Optional)
25- Aftertreatment Device Regeneration Switch
26- Rear Work Light Switch (Optional)
27- Beacon Light Switch (Optional)
28- Auxiliary Switch (Optional)
29- Auxiliary Switch (Optional)
30- Auxiliary Switch (Optional)
31- Auxiliary Switch (Optional)
32- Auxiliary Switch (Optional)

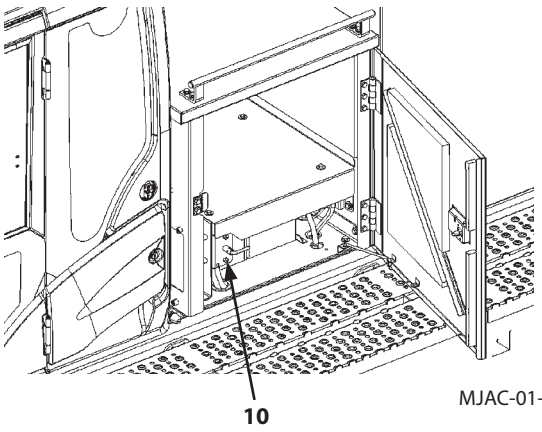
## Electrical System (Cab Behind Side)




TJAG-01-02-005



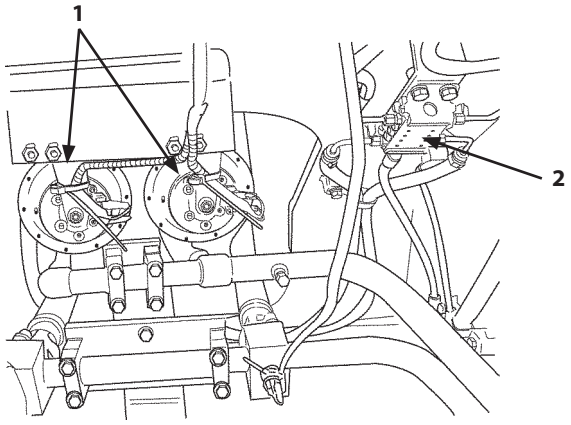

M1JB-07-012



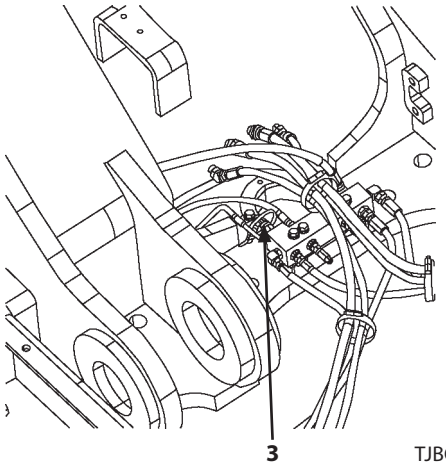

MJAC-01-052

1- ECM (Engine Control Module)
2- VGS Controller
3- DCU
4- Battery
5- Fusible Link (45A)
6- Fusible Link (75A)
7- Glow Plug Relay
8- Starter Relay 1
9- Battery Relay
10- Battery Disconnect Switch

## Around Horn




T1J7-01-02-004



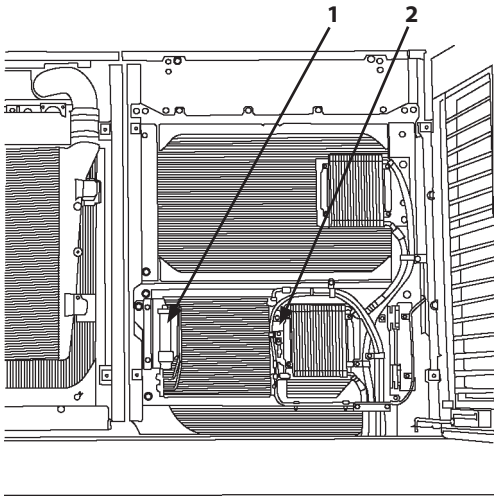

TJBC-01-02-011

1- Horn

2- Distribution Valve / Proximity Switch (Optional)

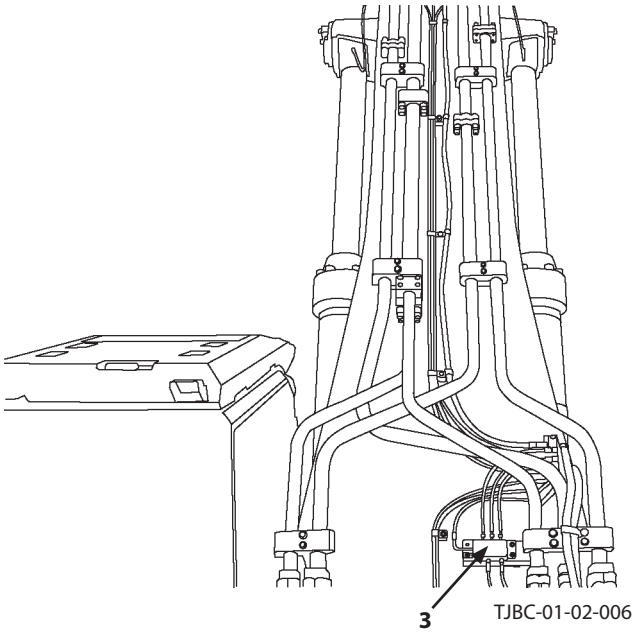
3- Boom Bottom Pressure Sensor (Optional)

## Around Oil Cooler



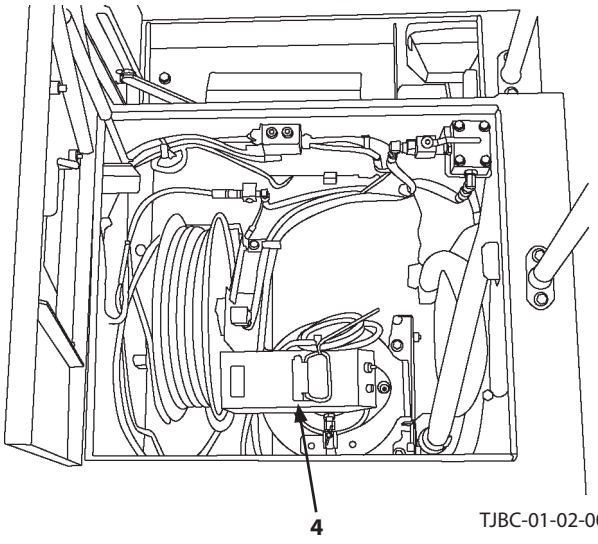

TJBC-01-02-004

## Boom Upper Side




TJBC-01-02-006

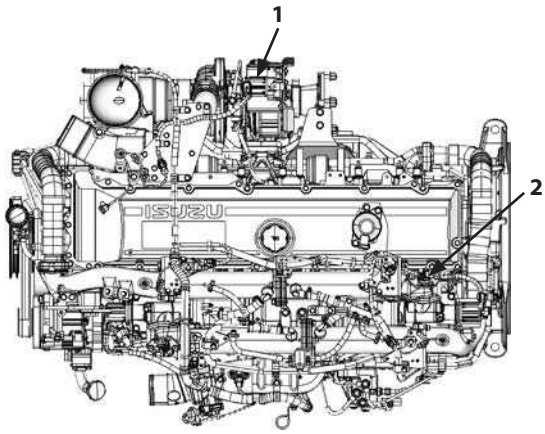
## Auto Lubricating System



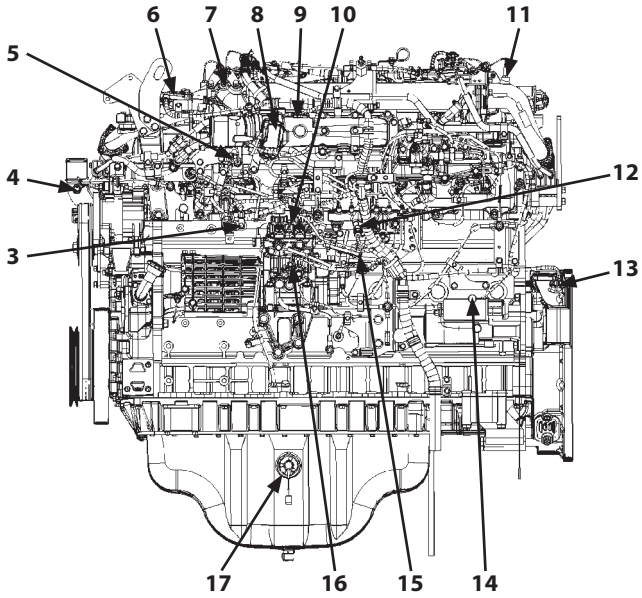

TJBC-01-02-007

1- Receiver Tank
2- Fresh Air Temperature
3- Distribution Valve (Optional)
4- Grease Gun Pump (Optional)

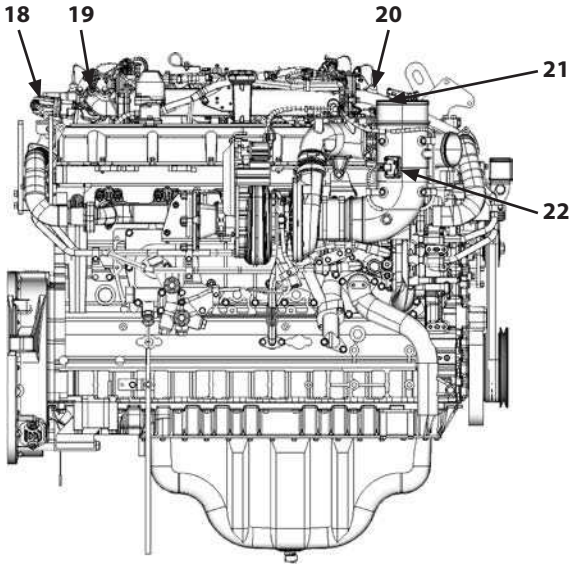
## Engine




TJBK-01-02-002




TJBK-01-02-003




TJBK-01-02-004

1- VGS Turbo Controller
2- Injector/Glow Plug
3- Coolant Temperature Sensor
4- Overheat Switch
5- Intake Manifold Temperature Sensor
6- EGR Valve 2
7- EGR Cooler Outlet Temperature Sensor 2
8- Intake Throttle Valve
9- Boost Pressure Sensor/Boost Temperature Sensor
10- Supply Pump
11- EGR Cooler Inlet Temperature Sensor 2
12- Common Rail Pressure Sensor
13- Crank Speed Sensor
14- Engine Oil Pressure Sensor
15- Fuel Temperature Sensor
16- Cam Angle Sensor
17- Engine Oil Level Switch
18- EGR Valve 1
19- EGR Cooler Inlet Temperature Sensor 1
20- EGR Output Temperature Sensor 1
21- Intercooler Inlet Temperature Sensor
22- MAF Sensor/Intake-Air Temperature Sensor