

Technical Manual

Operational Principle

ZAXIS

450-3

450LC-3

470H-3

470LCH-3

500LC-3

520LCH-3

Hydraulic Excavator

Service Manual consists of the following separate Part No;
Technical Manual (Operational Principle) : Vol. No.TO1J1-E
Technical Manual (Troubleshooting) : Vol. No.TT1J1-E
Workshop Manual : Vol. No.W1J1-E

INTRODUCTION

TO THE READER

- This manual is written for an experienced technician to provide technical information needed to maintain and repair this machine.
- 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.)
Publications Marketing & Product Support
Hitachi Construction Machinery Co. Ltd.
TEL: 81-29-832-7084
FAX: 81-29-831-1162

ADDITIONAL REFERENCES

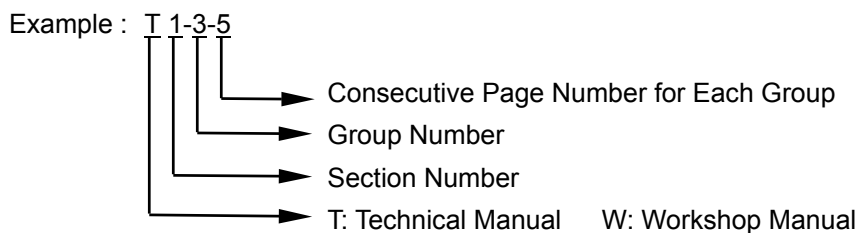
- Please refer to the materials listed below in addition to this manual.
 - The Operator's Manual
 - The Parts Catalog
 - The Engine Manual
 - Parts Catalog of the Engine
 - Hitachi Training Material

MANUAL COMPOSITION

- This manual consists of three portions: the Technical Manual (Operational Principle), the Technical Manual (Troubleshooting) and the Workshop Manual.
- Information included in the Technical Manual (Operational Principle):
technical information needed for redelivery and delivery, operation and activation of all devices and systems.
- Information included in the Technical Manual (Troubleshooting):
technical information needed for 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.

PAGE NUMBER


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



INTRODUCTION


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 or 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:**
Indicated 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. MKSA system units and English units are also indicated in parentheses just behind SI units.

Example : 24.5 MPa (250 kgf/cm², 3560 psi)

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

Quantity	To Convert From	Into	Multiply By	Quantity	To Convert From	Into	Multiply By
Length	mm	in	0.03937	Pressure	MPa	kgf/cm ²	10.197
	mm	ft	0.003281		MPa	psi	145.0
Volume	L	US gal	0.2642	Power	kW	PS	1.360
	L	US qt	1.057		kW	HP	1.341
	m ³	yd ³	1.308	Temperature	°C	°F	°C×1.8+32
Weight	kg	lb	2.205	Velocity	km/h	mph	0.6214
Force	N	kgf	0.10197		min ⁻¹	rpm	1.0
	N	lbf	0.2248	Flow rate	L/min	US gpm	0.2642
Torque	N·m	kgf·m	1.0197		mL/rev	cc/rev	1.0
	N·m	lbf·ft	0.7375				

SECTION AND GROUP CONTENTS

TECHNICAL MANUAL

(Operational Principle)

SECTION 1 GENERAL

Group 1 Specification	
Group 2 Component Layout	
Group 3 Component Specifications	

SECTION 2 SYSTEM

Group 1 Controller	
Group 2 Control System	
Group 3 ECM System	
Group 4 Hydraulic System	
Group 5 Electrical System	

SECTION 3 COMPONENT OPERATION

Group 1 Pump Device	
Group 2 Swing Device	
Group 3 Control Valve	
Group 4 Pilot Valve	
Group 5 Travel Device	
Group 6 Signal Control Valve	
Group 7 Others (Upperstructure)	
Group 8 Others (Undercarriage)	

TECHNICAL MANUAL (Troubleshooting)

SECTION 4 OPERATIONAL PERFORMANCE TEST

Group 1 Introduction
Group 2 Standard
Group 3 Engine Test
Group 4 Excavator Test
Group 5 Component Test
Group 6 Adjustment

SECTION 5 TROUBLESHOOTING

Group 1 Diagnosing Procedure
Group 2 Monitor Unit
Group 3 Dr. ZX
Group 4 ICF
Group 5 Component Layout
Group 6 Troubleshooting A
Group 7 Troubleshooting B
Group 8 Electrical System Inspection

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.

WORKSHOP MANUAL

SECTION 1 GENERAL INFORMATION

- Group 1 Precautions for Disassembling and Assembling
- Group 2 Tightening Torque
- Group 3 Painting
- Group 4 Bleeding Air from Hydraulic Oil Tank

SECTION 2 UPPERSTRUCTURE

- Group 1 Cab
- Group 2 Counterweight
- Group 3 Main Frame
- Group 4 Pump Device
- Group 5 Control Valve
- Group 6 Swing Device
- Group 7 Pilot Valve
- Group 8 Pilot Shut-Off Solenoid Valve
- Group 9 Solenoid Valve
- Group 10 Signal Control Valve
- Group 11 Shockless Valve
- Group 12 Fan Valve
- Group 13 Fan Motor

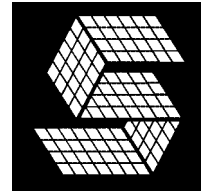
SECTION 3 UNDERCARRIAGE

- Group 1 Swing Bearing
- Group 2 Travel Device
- Group 3 Center Joint
- Group 4 Track Adjuster
- Group 5 Front Idler
- Group 6 Upper and Lower Roller
- Group 7 Track

SECTION 4 FRONT ATTACHMENT

- Group 1 Front Attachment
 - Group 2 Cylinder
-

SECTION 1 GENERAL



—CONTENTS—

Group 1 Specifications

Specifications.....	T1-1-1
Working Ranges	T1-1-3

Group 2 Component Layout

Main Component Layout.....	T1-2-1
Electrical Component Layout	T1-2-3
Engine	T1-2-9
Pump Device	T1-2-10
Swing Device	T1-2-10
Travel Device.....	T1-2-10
Control Valve	T1-2-11

Group 3 Component Specifications

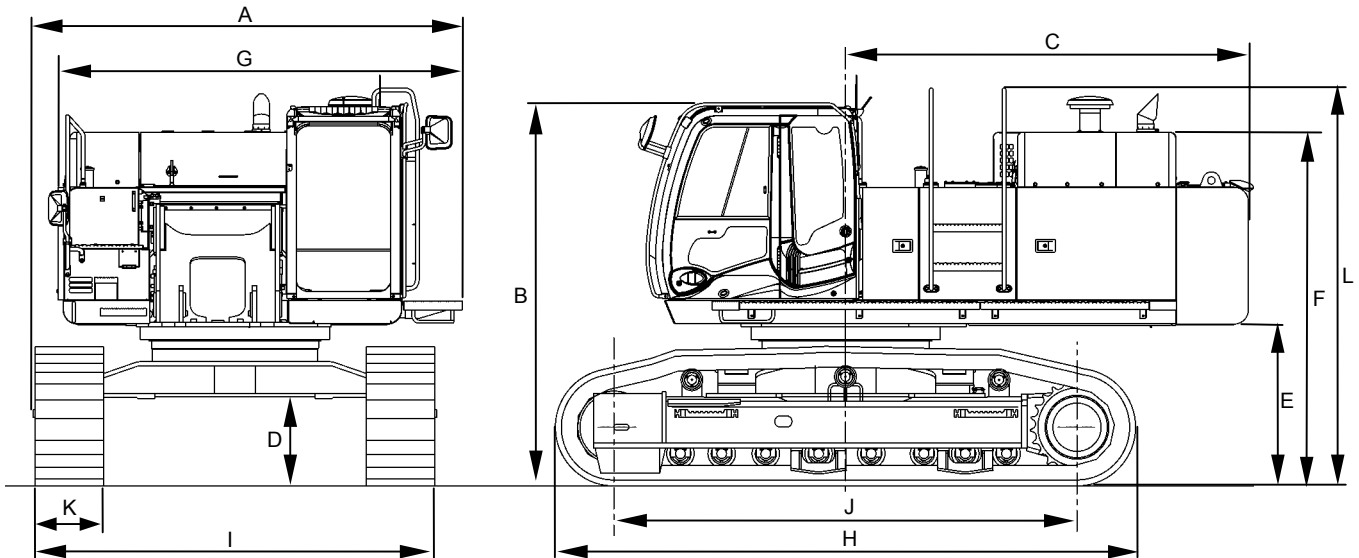
Engine	T1-3-1
Engine Accessories	T1-3-4
Hydraulic Component	T1-3-5
Electrical Component.....	T1-3-9

(Blank)

GENERAL / Specifications

SPECIFICATIONS

ZAXIS450-3, ZAXIS450LC-3, ZAXIS500LC-3



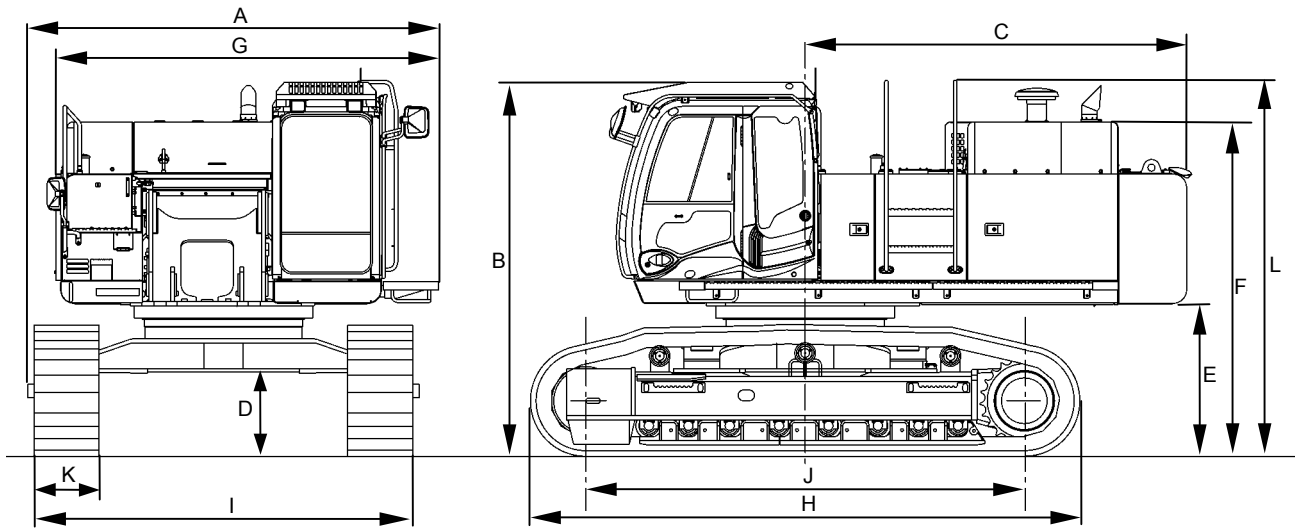
M1J1-12-001

Model	ZX450-3	ZX450LC-3	ZX500LC-3
Type of Front-End Attachment	3.4 m (11 ft 2 in) Arm		
Bucket Capacity (Heaped)	PCSA 1.9 m ³ (2.5 yd ³), CECE 1.7 m ³	PCSA 2.1 m ³ (2.7 yd ³), CECE 1.8 m ³	PCSA 2.1 m ³ (2.7 yd ³), CECE 1.8 m ³
Operating Weight	45700 kg (100750 lb)	46600 kg (102734 lb)	49500 kg (109128 lb)
Basic Machine Weight	35600 kg (78484 lb)	36500 kg (80468 lb)	39400 kg (86861 lb)
Engine	ISUZU AH-6WG1X 260 kW/1800 min ⁻¹ (353 PS/1800 rpm)		
A: Overall Width	3740 mm (12 ft 3 in)	3740 mm (12 ft 3 in)	3860 mm (12 ft 8 in)
B: Cab Height	3330 mm (10 ft 11 in)	3330 mm (10 ft 11 in)	3410 mm (11 ft 2 in)
C: Rear End Swing Radius	3520 mm (11 ft 7 in)	3520 mm (11 ft 7 in)	3520 mm (11 ft 7 in)
D: Minimum Ground Clearance	*760 mm (2 ft 6 in)	*760 mm (2 ft 6 in)	*840 mm (2 ft 9 in)
E: Counterweight Clearance	*1400 mm (4 ft 7 in)	*1400 mm (4 ft 7 in)	*1470 mm (4 ft 10 in)
F: Engine Cover Height	3080 mm (10 ft 1 in)	3080 mm (10 ft 1 in)	3160 mm (10 ft 4 in)
G: Overall Width of Upperstructure	3530 mm (11 ft 7 in)	3530 mm (11 ft 7 in)	3530 mm (11 ft 7 in)
H: Undercarriage Length	5040 mm (16 ft 6 in)	5470 mm (17 ft 11 in)	5330 mm (17 ft 6 in)
I: Undercarriage Width (Extended/Retracted)	3490 mm (11 ft 5 in)/ 2990 mm (9 ft 10 in)	3490 mm (11 ft 5 in)/ 2990 mm (9 ft 10 in)	3520 mm (11 ft 7 in)/ 3020 mm (9 ft 11 in)
J: Sprocket Center to Idler Center	4040 mm (13 ft 3 in)	4470 mm (14 ft 8 in)	4250 mm (13 ft 11 in)
K: Track Shoe Width	600 mm (24 in) (Grouser shoe)		
L: Overall Height	3460 mm (11 ft 4 in)	3460 mm (11 ft 4 in)	3540 mm (11 ft 7 in)
Ground Pressure	85 kPa (0.87 kgf/cm ² , 12 psi)	79 kPa (0.81 kgf/cm ² , 11 psi)	87 kPa (0.89 kgf/cm ² , 13 psi)
Swing Speed	9.0 min ⁻¹ (rpm)		
Travel Speed (fast/slow)	5.5 km/h (3.4 mph)/ 3.4 km/h (2.1 mph)		4.0 km/h (2.5 mph)/ 2.9 km/h (1.8 mph)
Gradeability	35 ° (tan θ = 0.70)		

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

GENERAL / Specifications

ZAXIS470H-3, ZAXIS470LCH-3, ZAXIS520LCH-3



M1J1-12-003

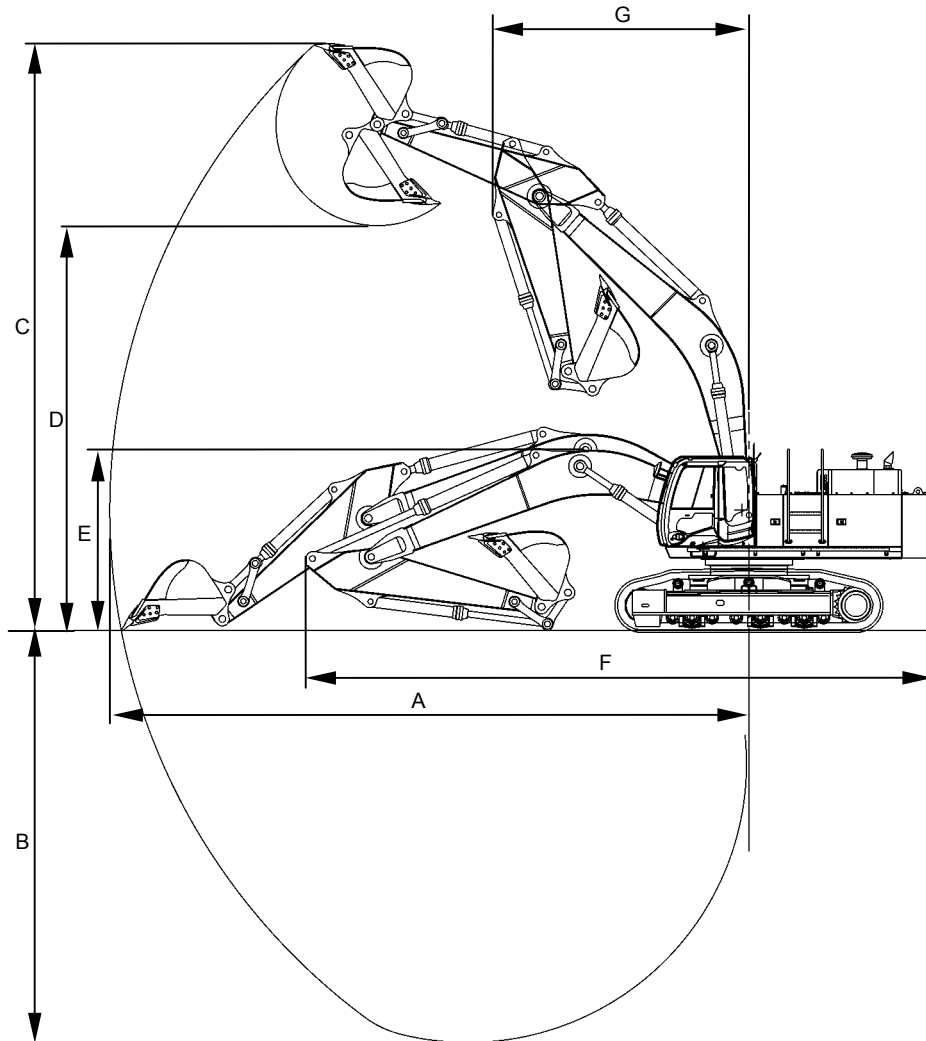
Model	ZX470H-3	ZX470LCH-3	ZX520LCH-3
Type of Front-End Attachment	H front (with 3.4 m (11 ft 2 in) Arm)		
Bucket Capacity (Heaped)	PCSA 1.9 m ³ (2.5 yd ³), CECE 1.7 m ³		
Operating Weight	47100 kg (103837 lb)	48100 kg (106041 lb)	51700 kg (113978 lb)
Basic Machine Weight	36100 kg (79586 lb)	37100 kg (81791 lb)	40600 kg (89507 lb)
Engine	ISUZU AH-6WG1X 260 kW/1800 min ⁻¹ (353 PS/1800 rpm)		
A: Overall Width	3770 mm (12 ft 4 in)	3770 mm (12 ft 4 in)	3860 mm (12 ft 8 in)
B: Cab Height	3450 mm (11 ft 4 in)	3450 mm (11 ft 4 in)	3520 mm (11 ft 7 in)
C: Rear End Swing Radius	3520 mm (11 ft 7 in)	3520 mm (11 ft 7 in)	3520 mm (11 ft 7 in)
D: Minimum Ground Clearance	*760 mm (2 ft 6 in)	*760 mm (2 ft 6 in)	*840 mm (2 ft 9 in)
E: Counterweight Clearance	*1400 mm (4 ft 7 in)	*1400 mm (4 ft 7 in)	*1470 mm (4 ft 10 in)
F: Engine Cover Height	3080 mm (10 ft 1 in)	3080 mm (10 ft 1 in)	3160 mm (10 ft 4 in)
G: Overall Width of Upperstructure	3530 mm (11 ft 7 in)	3530 mm (11 ft 7 in)	3530 mm (11 ft 7 in)
H: Undercarriage Length	5040 mm (16 ft 6 in)	5470 mm (17 ft 11 in)	5330 mm (17 ft 6 in)
I: Undercarriage Width (Extended/Retracted)	3490 mm (11 ft 5 in)/ 2990 mm (9 ft 10 in)	3490 mm (11 ft 5 in)/ 2990 mm (9 ft 10 in)	3520 mm (11 ft 7 in)/ 3020 mm (9 ft 11 in)
J: Sprocket Center to Idler Center	4040 mm (13 ft 3 in)	4470 mm (14 ft 8 in)	4250 mm (13 ft 11 in)
K: Track Shoe Width	600 mm (24 in) (Grouser shoe)		
L: Overall Height	3460 mm (11 ft 4 in)	3460 mm (11 ft 4 in)	3540 mm (11 ft 7 in)
Ground Pressure	88 kPa (0.89 kgf/cm ² , 13 psi)	82 kPa (0.83 kgf/cm ² , 12 psi)	91 kPa (0.93 kgf/cm ² , 13 psi)
Swing Speed	9.0 min ⁻¹ (rpm)		
Travel Speed (fast/slow)	5.5 km/h (3.4 mph)/ 3.4 km/h (2.1 mph)		4.0 km/h (2.5 mph)/ 2.9 km/h (1.8 mph)
Gradeability	35 ° (tan θ = 0.70)		

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

GENERAL / Specifications

WORKING RANGES

ZAXIS450-3, ZAXIS450LC-3



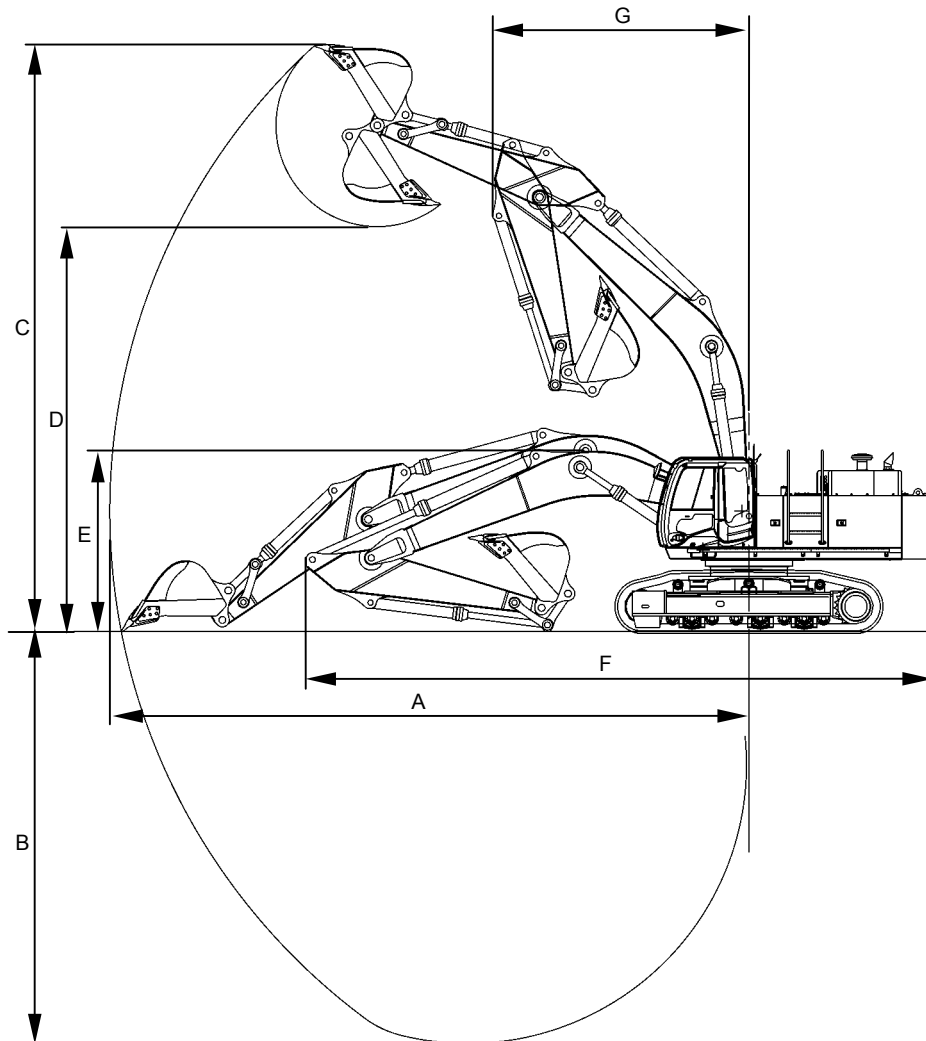
M1J1-12-002

Category	7.0 m (22 ft 12 in) Boom								8.2 m (26 ft 11 in) Boom	
	2.9 m (9 ft 6 in) Arm		3.4 m (11 ft 2 in) Arm		3.9 m (12 ft 10 in) Arm		4.9 m (16 ft 1 in) Arm		4.9 m (16 ft 1 in) Arm	
	Backhoe		Backhoe		Backhoe		Backhoe		Backhoe	
Item	ZX450-3	ZX450LC-3	ZX450-3	ZX450LC-3	ZX450-3	ZX450LC-3	ZX450-3	ZX450LC-3	ZX450-3	ZX450LC-3
A: Maximum Digging Reach mm (ft-in)	11400 (37'5")		12060 (39'7")		12490 (40'12")		13340 (43'9")		14510 (47'7")	
B: Maximum Digging Depth mm (ft-in)	7280 (23'11")		7770 (25'6")		8270 (27'2")		9110 (29'11")		10230 (33'7")	
C: Maximum Cutting Height mm (ft-in)	10250 (33'8")		11060 (36'3")		11160 (36'7")		11730 (38'6")		12240 (40'2")	
D: Maximum Dumping Height mm (ft-in)	7030 (23'1")		7650 (25'1")		7770 (25'6")		8670 (28'5")		9220 (30'3")	
E: Transport Height mm (ft-in)	*3600 (11'10")		*3480 (11'5")		*3500 (11'6")		*4550 (14'11")		*4430 (14'6")	
F: Overall Transport Length mm (ft-in)	*12000 (39'4")		*11910 (39'1")		*11910 (39'1")		*11900 (39'1")		*13130 (43'1")	
G: Minimum Swing Radius mm (ft-in)	5020 (16'6")		4840 (15'11")		4810 (15'10")		4850 (15'11")		5870 (19'3")	

NOTE: "*" The dimensions include the height of the shoe lug.

GENERAL / Specifications

ZAXIS500LC-3



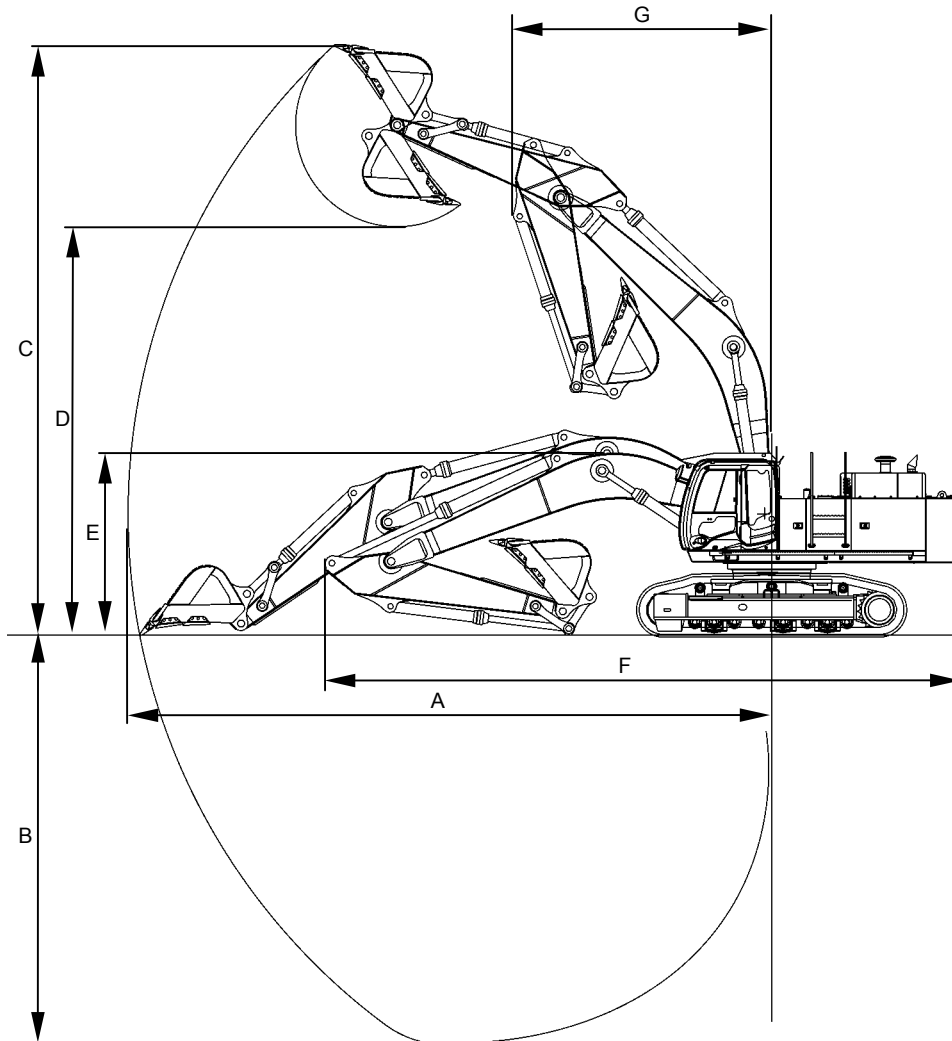
M1J1-12-002

Category	7.0 m (22 ft 12 in) Boom				8.2 m (26 ft 11 in) Boom
	2.9 m (9 ft 6 in) Arm	3.4 m (11 ft 2 in) Arm	3.9 m (12 ft 10 in) Arm	4.9 m (16 ft 1 in) Arm	4.9 m (16 ft 1 in) Arm
	Backhoe	Backhoe	Backhoe	Backhoe	Backhoe
A: Maximum Digging Reach	11400 (37'5")	12060 (39'7")	12490 (40'12")	13340 (43'9")	14510 (47'7")
B: Maximum Digging Depth	7200 (23'7")	7690 (25'3")	8200 (26'11")	9030 (29'8")	10150 (33'4")
C: Maximum Cutting Height	10330 (33'11")	11130 (36'6")	11240 (36'11")	11810 (38'9")	12310 (40'5")
D: Maximum Dumping Height	7100 (23'4")	7730 (25'4")	7840 (25'9")	8750 (28'8")	9290 (30'6")
E: Transport Height	*3620 (11'11")	*3500 (11'6")	*3510 (11'6")	*4540 (14'11")	*4440 (14'7")
F: Overall Transport Length	*11980 (39'4")	*11890 (39')	*11890 (39')	*11940 (39'2")	*13150 (43'2")
G: Minimum Swing Radius	5020 (16'6")	4840 (15'11")	4810 (15'10")	4850 (15'11")	5870 (19'3")

NOTE: "*" The dimensions include the height of the shoe lug.

GENERAL / Specifications

ZAXIS470H-3, ZAXIS470LCH-3, ZAXIS520LCH-3



M1J1-12-004

Item	Category	3.4 m (11 ft 2 in) H Arm		
		Backhoe		
		ZX470H-3	ZX470LCH-3	ZX520LCH-3
A: Maximum Digging Reach mm (ft·in)		12060 (39'7")		
B: Maximum Digging Depth mm (ft·in)		7770 (25'6")		7690 (25'3")
C: Maximum Cutting Height mm (ft·in)		11060 (36'3")		11130 (36'6")
D: Maximum Dumping Height mm (ft·in)		7650 (25'1")		7730 (25'4")
E: Transport Height mm (ft·in)		*3480 (11'5")		*3500 (11'6")
F: Overall Transport Length mm (ft·in)		*11910 (39'1")		*11890 (39')
G: Minimum Swing Radius mm (ft·in)		4840 (15'11")		

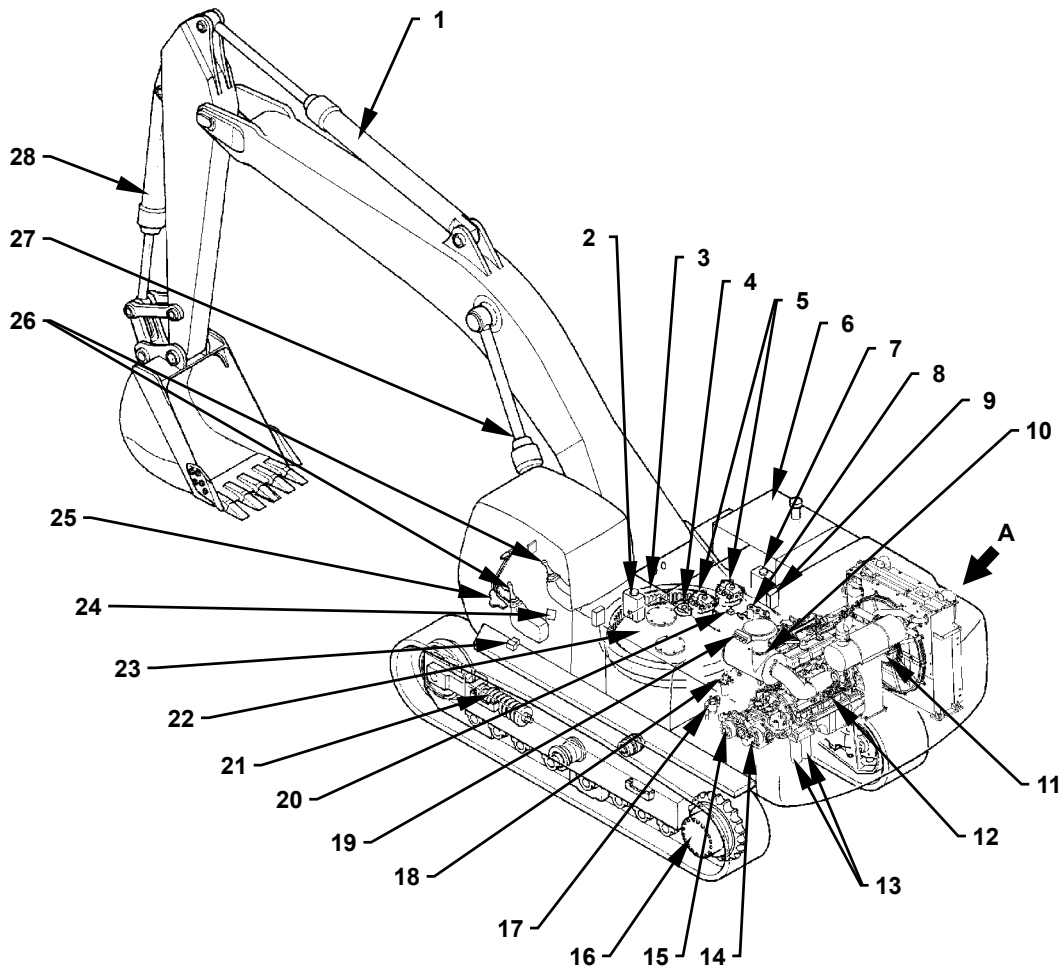
NOTE: "*" The dimensions do not include height of the shoe lug.

GENERAL / Specifications

(Blank)

GENERAL / Component Layout

MAIN COMPONENT LAYOUT

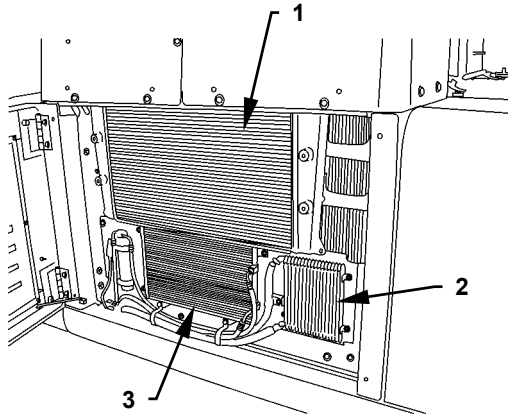


T1J1-01-02-002

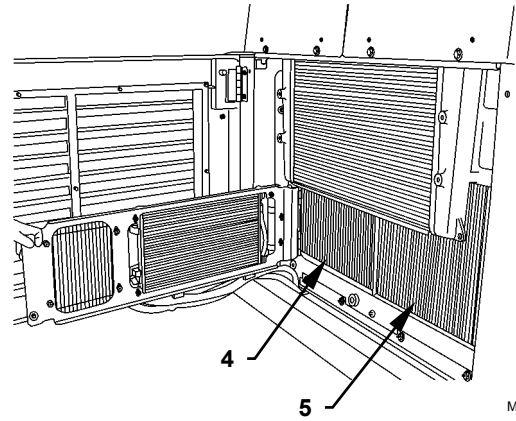
- | | | | |
|-------------------|--------------------------|---------------------------------------|---|
| 1 - Arm Cylinder | 8 - Control Valve | 15 - Fan Pump | 22 - Hydraulic Oil Tank |
| 2 - Washer Tank | 9 - Signal Control Valve | 16 - Travel Device | 23 - Pilot Shut-Off Solenoid Valve |
| 3 - Swing Bearing | 10 - Air Cleaner | 17 - Drain Filter | 24 - Shockless Valve |
| 4 - Center Joint | 11 - Fan Motor | 18 - Pilot Filter/ Pilot Relief Valve | 25 - Travel Pilot Valve |
| 5 - Swing Device | 12 - Engine | 19 - Solenoid Valve Unit | 26 - Front Attachment / Swing Pilot Valve |
| 6 - Fuel Tank | 13 - Engine Oil Filter | 20 - Check Valve | 27 - Boom Cylinder |
| 7 - Reserve Tank | 14 - Pump Device | 21 - Track Adjuster | 28 - Bucket Cylinder |

GENERAL / Component Layout

View A (Around the Radiator)

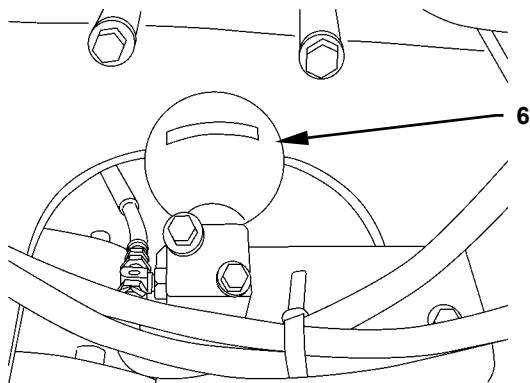


M1J1-07-032



M1J1-07-034

Lower of Control Valve



T1J1-01-02-009

1 - Inter Cooler
2 - Fuel Cooler

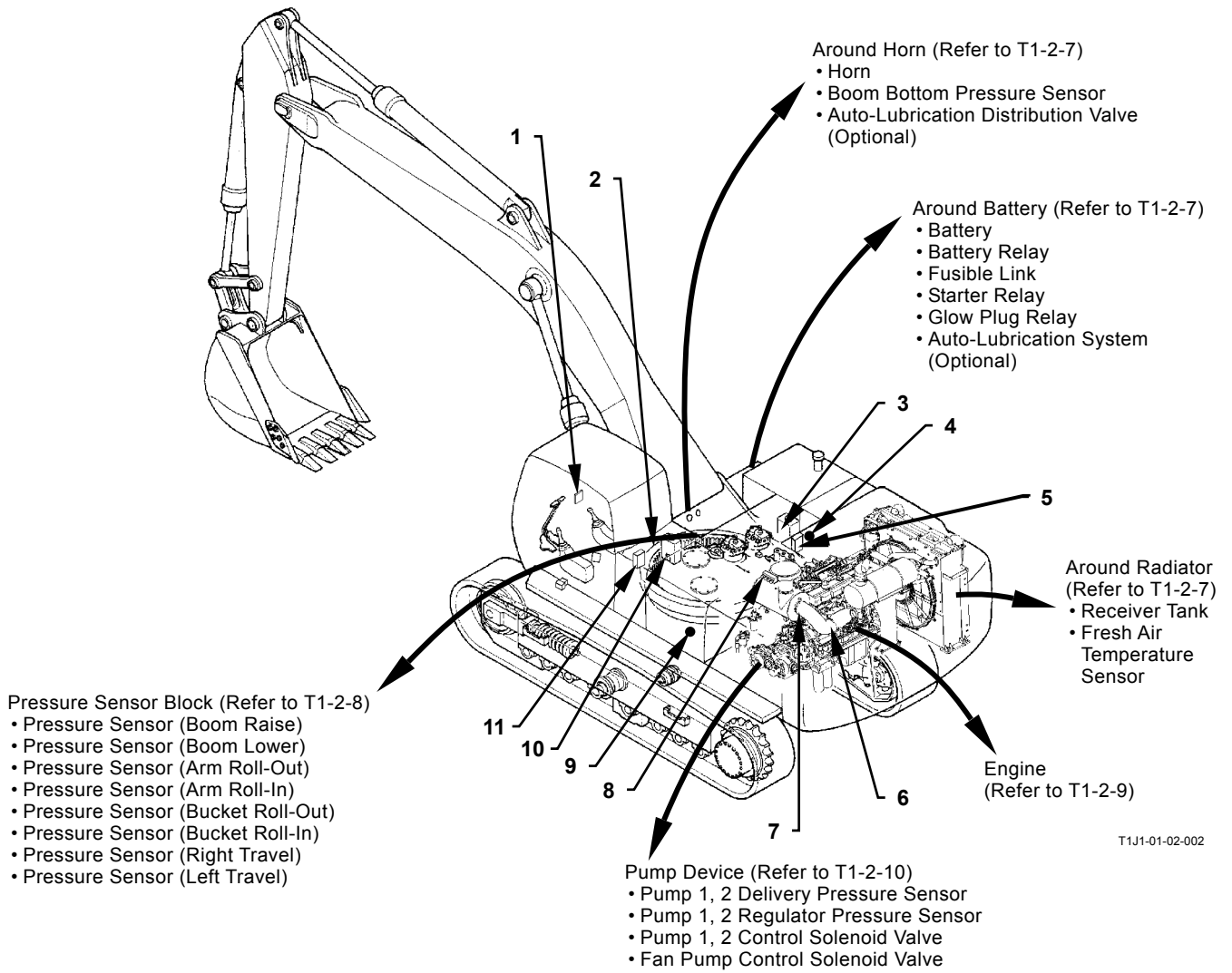
3 - Air Conditioner Condenser
4 - Radiator

5 - Oil Cooler

6 - Accumulator

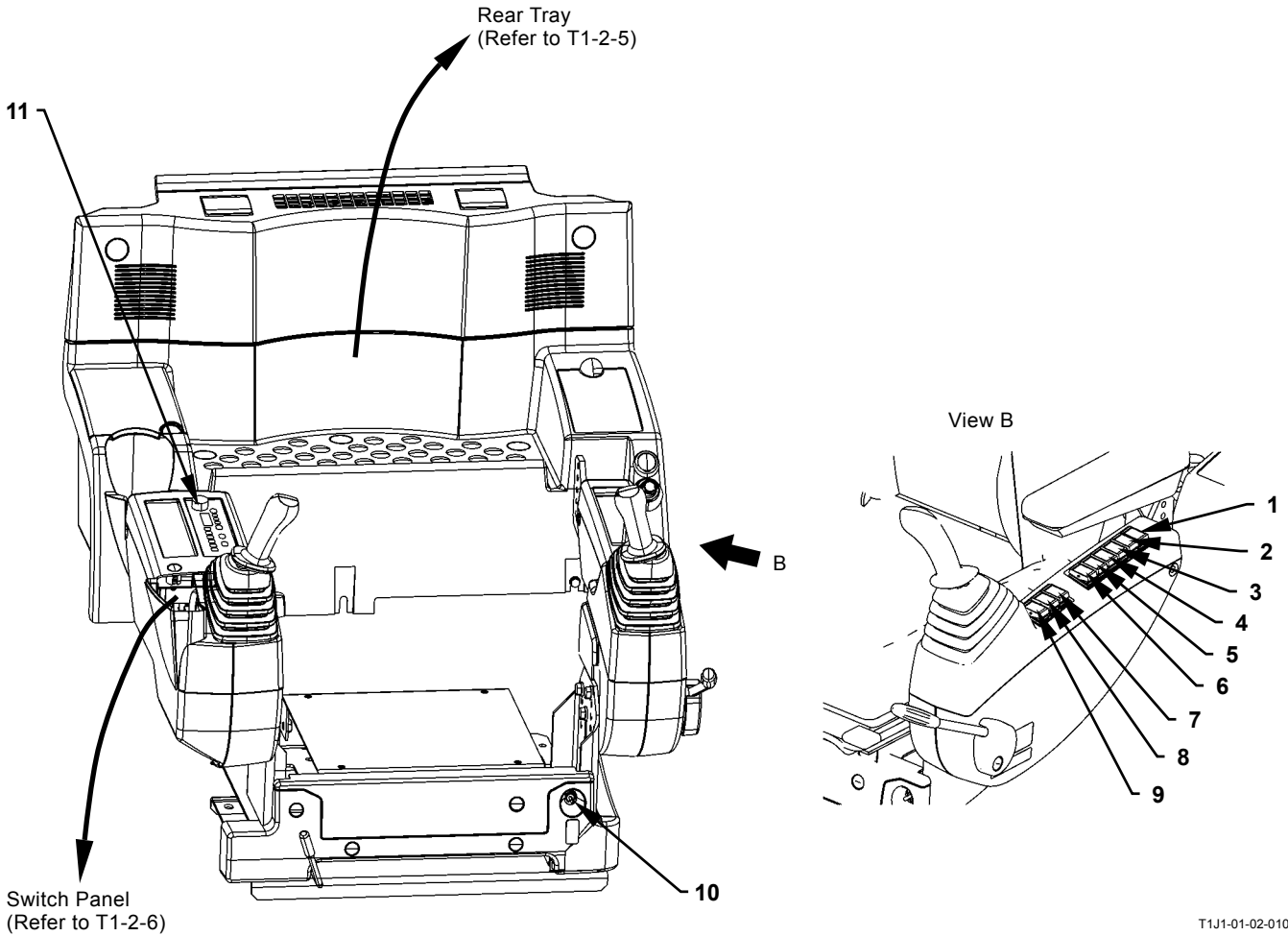
GENERAL / Component Layout

ELECTRICAL COMPONENT LAYOUT (Overview)



GENERAL / Component Layout

Electrical Component Layout (In Cab)

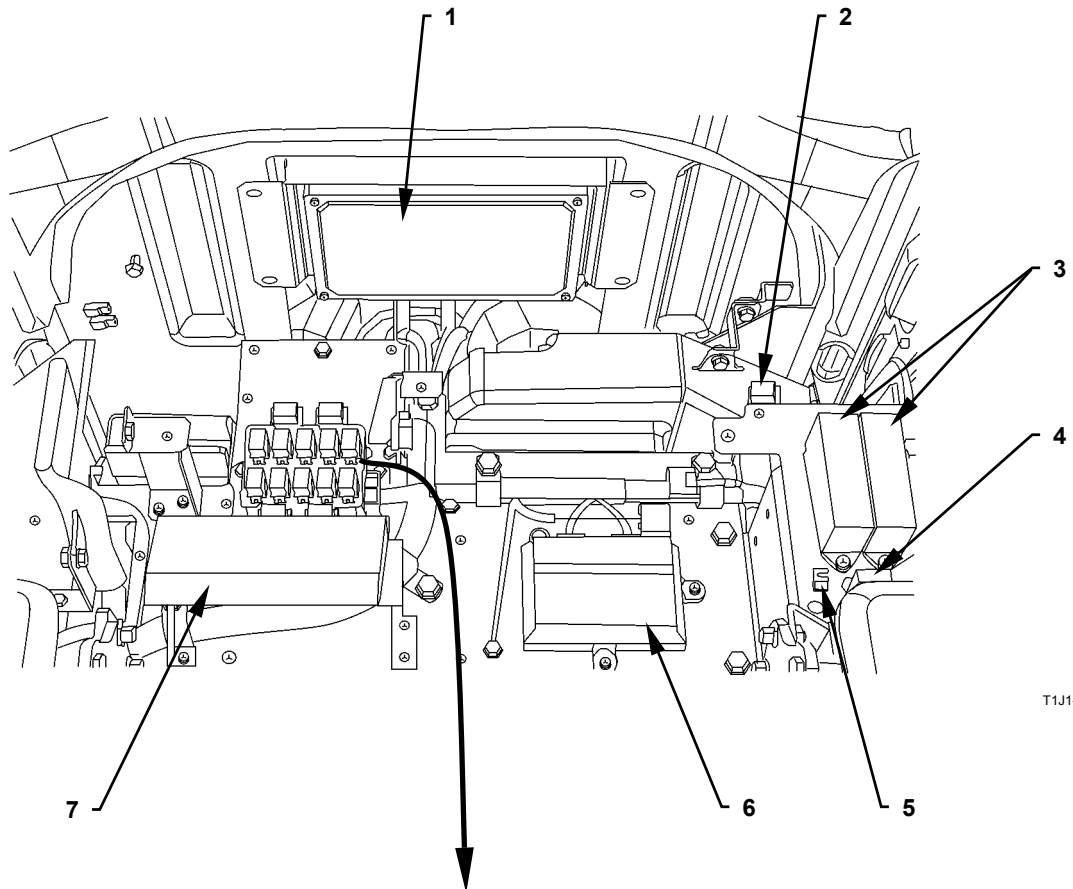


T1J1-01-02-010

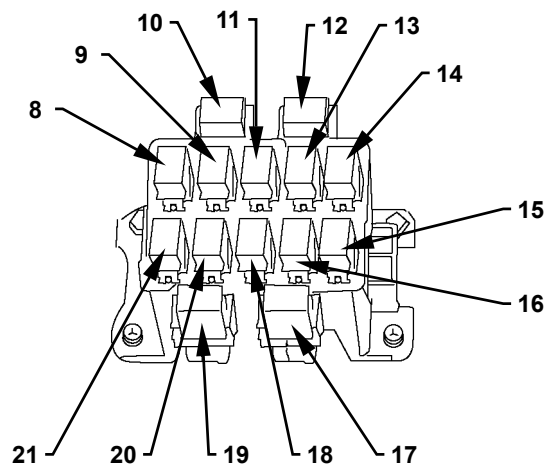
- | | | | |
|--|---|---|-------------------------|
| 1 - Fan Rotation Direction Switch (Optional) | 4 - Auto-Lubrication Switch (Optional) | 7 - Overload Alarm Switch (Optional) | 10 - Engine Stop Switch |
| 2 - Rotating Light Switch (Optional) | 5 - Level Check Switch (Engine Oil Level / Coolant Level) | 8 - Seat Heat Switch (Optional) | 11 - Radio |
| 3 - Rear Light Switch (Optional) | 6 - Boom Mode Selector Switch | 9 - Travel Alarm Deactivation Switch (Optional) | |

GENERAL / Component Layout

Electrical Component Layout (Rear Tray)



T1J1-01-02-003

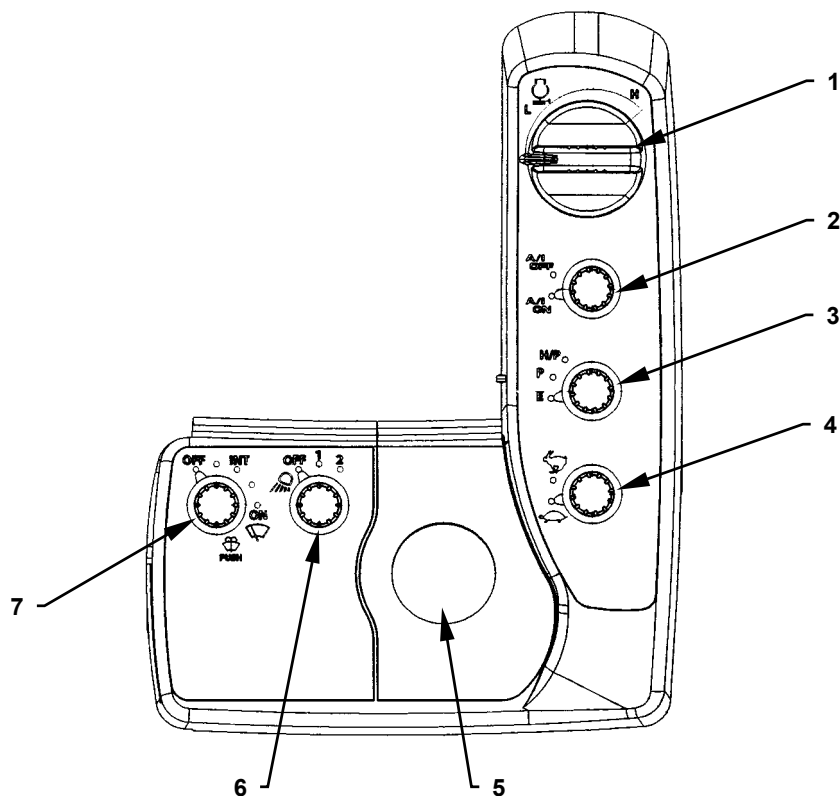


T1V1-01-02-009

- | | | | |
|--|---|--|-------------------------------------|
| 1 - MC (Main Controller) | 7 - Satellite Communication Terminal (Optional) | 12 - Auto-Lubrication Relay (R11) (Optional) | 17 - Light Relay 3 (R13) (Optional) |
| 2 - Overload Alarm Relay (Optional) | 8 - Security Relay (R5) | 13 - Lock Relay (R2) | 18 - Light Relay 2 (R8) |
| 3 - Fuse Box | 9 - Starter Cut Relay (R4) | 14 - Load Damp Relay (R1) | 19 - ECM Main Relay (R14) |
| 4 - Dr. ZX Connector (Use as Download Connector) | 10 - Hour Meter Relay (R12) (Optional) | 15 - Wiper Relay (R6) | 20 - Washer Relay (R9) |
| 5 - Pump Learning Switch | 11 - Security Horn Relay (R3) | 16 - Light Relay 1 (R7) | 21 - Horn Relay (R10) |
| 6 - ICF (Information Controller) | | | |

GENERAL / Component Layout

Electrical Component Layout (Switch Panel)



T1V1-04-02-001

1 - Engine Control Dial
2 - Auto-Idle Switch

3 - Power Mode Switch
4 - Travel Mode Switch

5 - Key Switch
6 - Work Light Switch

7 - Wiper/Washer Switch