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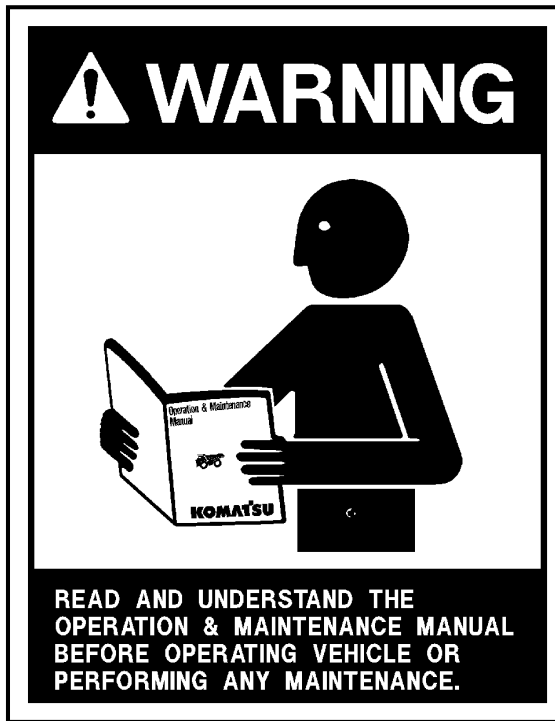
Operation & Maintenance Manual

830E-1AC

DUMP TRUCK

SERIAL NUMBERS **A30210 - A30239**

KOMATSU®



Unsafe use of this machine may cause serious injury or death. Operators and maintenance personnel must read and understand this manual before operating or maintaining this machine.

This manual should be kept in or near the machine for reference, and periodically reviewed by all personnel who will come into contact with it.

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It is the policy of the Company to improve products whenever it is possible and practical to do so. The Company reserves the right to make changes or add improvements at any time without incurring any obligation to install such changes on products sold previously.

Because of continuous research and development, periodic revisions may be made to this publication. Customers should contact their local Komatsu distributor for information on the latest revision.

CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust, some of its constituents, and certain vehicle components contain or emit chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

CALIFORNIA

Proposition 65 Warning

Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.



NON-OEM PARTS IN CRITICAL SYSTEMS

For safety reasons, Komatsu America Corp. strongly recommends against the use of non-OEM replacement parts in critical systems of all Komatsu equipment. Critical systems include but are not limited to steering, braking and operator safety systems.

Replacement parts manufactured and supplied by unauthorized sources may not be designed, manufactured or assembled to Komatsu's design specifications; accordingly, use of such parts may compromise the safe operation of Komatsu products and place the operator and others in danger should the part fail.

Komatsu is also aware of repair companies that will rework or modify an OEM part for reuse in critical systems. Komatsu does not generally authorize such repairs or modifications for the same reasons as noted above.

Use of non-OEM parts places full responsibility for the safe performance of the Komatsu product on the supplier and user. Komatsu will not in any case accept responsibility for the failure or performance of non-OEM parts in its products, including any damages or personal injury resulting from such use.

FOREWORD

This manual is written for use by the operator and/or the service technician and is designed to help these persons to become fully knowledgeable of the truck and all its systems in order to keep it operating safely and efficiently.

All operators and maintenance personnel must read and understand the materials in this manual before operating the truck or performing maintenance and/or operational checks on the truck. All safety notices, warnings and cautions are to be understood and followed when operating or accomplishing repairs on the truck.

The first section is an introduction to the manual and contains a table of contents to locate specific areas of interest. Other sections include Safety, Operation, Maintenance, Specifications, and Optional Equipment.

The illustrations used in this manual are TYPICAL of the component shown and may not be an exact reproduction of what is found on the truck.

A product identification plate is located on the frame in front of the right side front wheel and designates the truck model number, product identification number (vehicle serial number), and maximum GVW (Gross Vehicle Weight) rating.

The KOMATSU truck model designation consists of three numbers and one letter (i.e. 830E).

The three numbers represent the basic truck model.

The letter "M", when present, designates a Mechanical drive system;

The letter "E", when present, designates an Electrical wheel motor drive system.

The product identification number (vehicle serial number) contains information which will identify the original manufacturing bill of material for this unit. This complete number will be necessary for proper ordering of many service parts and/or warranty consideration.

The GVW is what determines the load on the drive train, frame, tires, and other components. **The vehicle design and application guidelines are sensitive to the total maximum GVW. GVW is TOTAL WEIGHT: the Empty Vehicle Weight + the fuel & lubricants + the payload.**

To determine allowable payload: Service all lubricants for proper level and fill fuel tank of empty truck (which includes all accessories, body liners, tailgates, etc.) and then weigh truck. Record this value and subtract from the GVW rating. The result is the allowable payload.

NOTE: Accumulations of mud, frozen material, etc. become a part of the GVW and reduces allowable payload. To maximize payload and to keep from exceeding the GVW rating, these accumulations should be removed as often as practical.

Exceeding the allowable payload will reduce expected life of truck components.

▲WARNING

Unsafe use of this machine may cause serious injury or death. Operators and maintenance personnel must read this manual before operating or maintaining this machine. This manual should be kept in or near the machine for reference and periodically reviewed by all personnel who come in contact with it.

ALERTS PAGE



This “ALERT” symbol is used with the signal words, “CAUTION”, “DANGER”, and “WARNING” in this manual to alert the reader to hazards arising from improper operating and maintenance practices.



*“DANGER” identifies a specific potential hazard
WHICH WILL RESULT
in either INJURY OR DEATH
if proper precautions are not taken.*



*“WARNING” identifies a specific potential hazard
WHICH COULD RESULT
in either INJURY OR DEATH
if proper precautions are not taken.*



*“CAUTION” is used for general reminders
of proper safety practices
OR
to direct the reader’s attention to avoid unsafe
or improper practices which may result
in damage to the equipment.*

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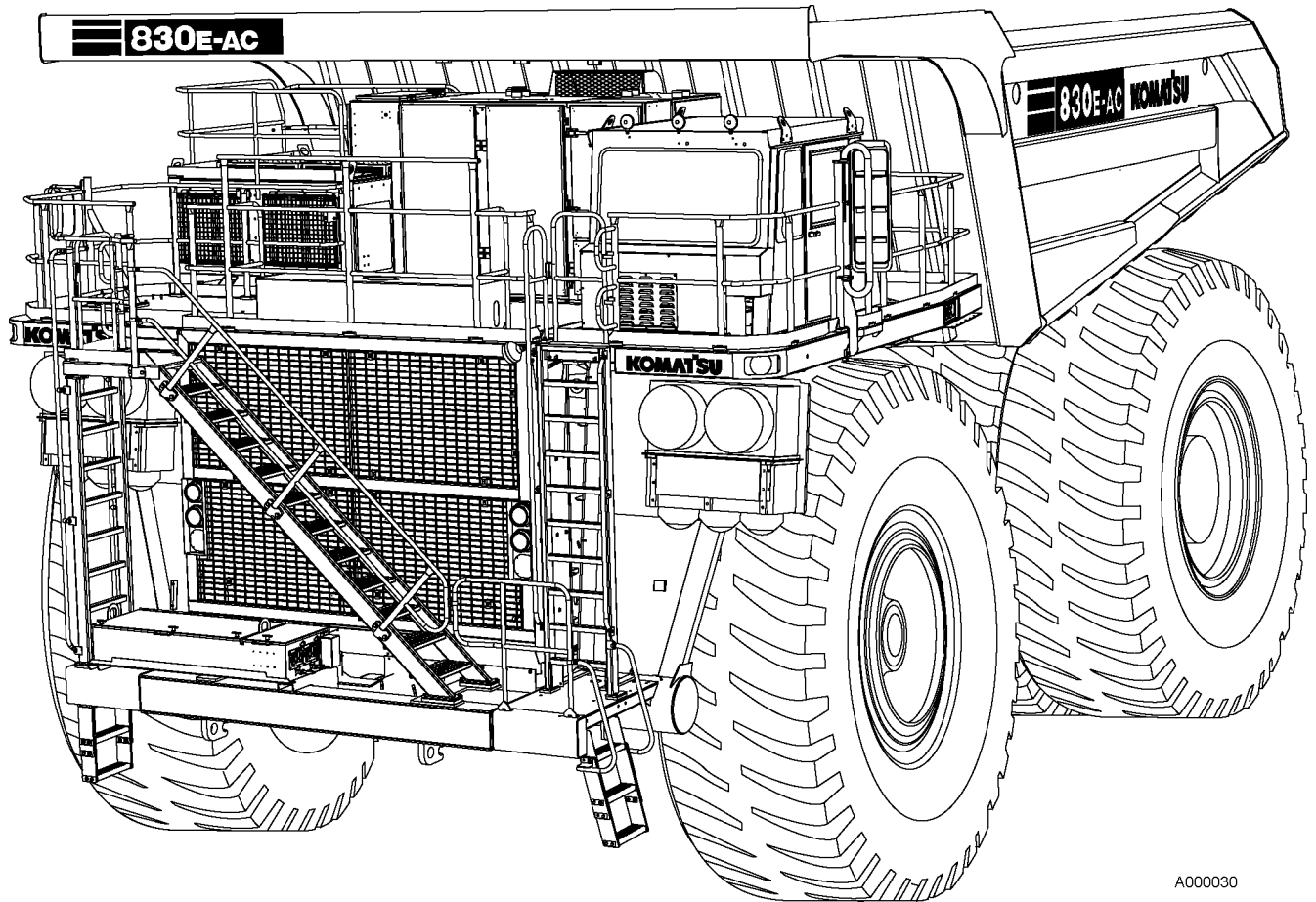
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TRUCK MODEL ILLUSTRATION



A000030

KOMATSU MODEL 830E-AC DUMP TRUCK

ABOUT THIS MANUAL

This manual is written for use by the operator and/or the service technician. It is designed to help these persons learn how to operate the truck and its systems in order to keep it operating safely and efficiently. All operators and maintenance personnel must read and understand the materials in this manual before operating the truck or performing maintenance and/or operational checks on the truck. All safety notices, warnings, and cautions should be understood and followed when operating or performing repairs on the truck.

The front cover of this manual includes a form number. This form number should be referenced when ordering additional copies of this manual, or for any other correspondence regarding the coverage in this manual.

Direct all inquiries to:

Komatsu America Corp.
Datakom, Peoria Technical Publications
P.O. Box 240
Peoria, IL 61650-0240
United States of America
Fax (309) 672-7072

This first section is an introduction to the manual and contains the table of contents to locate specific areas of interest. Other sections include Safety, Operating Instructions, Lubrication and Service, etc.

When searching for a specific area of interest, go first to the table of contents to locate the section in which the subject might generally be included. Then, go to that section of the table of contents to find a subject description that most closely describes the specific area of interest to find a page number and go to that page. Section numbers and page numbers are located at the top, outside corner of the page.

At the top, inside corner of the page is a document (module) number. If there is ever a question regarding the information in a particular section, refer to the document (module) number, the manual form number, and use the address shown above to correspond. If there is a date (month/year) behind the document (module) number, that indicates the latest revision date of that page.

The illustrations used in this manual are *TYPICAL* of the component shown and *may not* be an *exact* reproduction of what is found on the truck.

This manual shows dimensioning of U.S. standard and metric (SI) units throughout. All references to "right", "left", "front", or "rear" are made with respect to the operator's normal seated position, unless specifically stated otherwise.

When assembly instructions are provided without references to torque values, standard torque values should be assumed. Standard torque requirements are shown in torque charts on the following pages of this section, and in the General Information section of the truck service manual. Individual torques when provided in the text are in bold face type, such as **135 N.m (100 ft lbs)**. All torque specifications have $\pm 10\%$ tolerance unless otherwise specified.

STANDARD CHARTS AND TABLES

This manual provides dual dimensioning for most specifications. U.S. standard units are specified first, with metric (SI) units in parentheses.

References throughout the manual to standard torques or other standard values will be to one of the following charts or tables. For values not shown in these charts or tables, standard conversion factors for most commonly used measurements are provided in TABLE XIII, page 12-6.

Standard torque values are not to be used when “turn-of-the-nut” tightening procedures are recommended.

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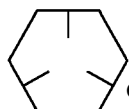
EFFECT OF SPECIAL LUBRICANTS On Fasteners and Standard Torque Values

The Komatsu engineering department does not recommend the use of special friction-reducing lubricants, such as Copper Coat, Never-Seez®, and other similar products, on the threads of standard fasteners where standard torque values are applied. The use of special friction-reducing lubricants will significantly alter the clamping force being applied to fasteners during the tightening process.

If special friction-reducing lubricants are used with the standard torque values listed below in Table I (and in Komatsu shop manuals), excessive stress and possible breakage of the fasteners may result.

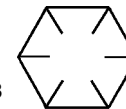
Where the torque tables specify “Lubricated Threads” for the standard torque values listed, these standard torque values are to be used with simple lithium base chassis grease (multi-purpose EP NLGI) or a rust-preventive grease (see list, page 12-2) on the threads and seats unless specified otherwise.

NOTE: Ensure the threads of fasteners and tapped holes are free of burrs and other imperfections before assembling.



Grade 5

**TABLE I. STANDARD TORQUE CHART
SAE HEX HEAD CAP SCREW AND NUT ASSEMBLY
(LUBRICATED THREADS)
TOLERANCES ±10%**



Grade 8

Capscrew Thread Size	TORQUE - GRADE 5			TORQUE - GRADE 8			Capscrew Thread Size	TORQUE - GRADE 5			TORQUE - GRADE 8		
	ft lbs	kg•m	N•m	ft lbs	kg•m	N•m		ft lbs	kg•m	N•m	ft lbs	kg•m	N•m
1/4-20	7	0.97	9.5	10	1.38	13.6	3/4-16	235	32.5	319	335	46.3	454
1/4-28	8	1.11	10.8	11	1.52	14.9	7/8-9	350	48.4	475	500	69.2	678
5/16-18	15	2.07	20.3	21	2.90	28	7/8-14	375	51.9	508	530	73.3	719
5/16-24	16	2.21	22	22	3.04	30	1.0-8	525	72.6	712	750	103.7	1017
3/8-16	25	3.46	34	35	4.84	47	1.0-12	560	77.4	759	790	109.3	1071
3/8-24	30	4.15	41	40	5.5	54	1.0-14	570	78.8	773	800	110.6	1085
7/16-14	40	5.5	54	58	8.0	79	1 1/8-7	650	89.9	881	1050	145	1424
7/16-20	45	6.2	61	62	8.57	84	1 1/8-12	700	96.8	949	1140	158	1546
1/2-13	65	9	88	90	12.4	122	1 1/4-7	910	125.9	1234	1480	205	2007
1/2-20	70	9.7	95	95	13.1	129	1 1/4-12	975	134.8	1322	1580	219	2142
9/16-12	90	12.4	122	125	17.3	169	1 3/8-6	1200	166	1627	1940	268	2630
9/16-18	95	13.1	129	135	18.7	183	1 3/8-12	1310	181	1776	2120	293	2874
5/8-11	125	17.3	169	175	24.2	237	1 1/2-6	1580	219	2142	2560	354	3471
5/8-18	135	18.7	183	190	26.2	258	1 1/2-12	1700	235	2305	2770	383	3756
3/4-10	220	30.4	298	310	42.8	420							

1 ft. lbs. = 0.138 kg•m = 1.356 N•m

STANDARD ASSEMBLY TORQUES For 12-Point, Grade 9 Cap screws (SAE)

The following specifications apply to required assembly torques for all 12-point, grade 9 (170,000 psi minimum tensile) cap screws.

- Cap screw threads and seats shall be lubricated when assembled.

NOTE: Unless the instructions specifically recommend otherwise, these standard torque values are to be used with simple lithium base chassis grease (multi-purpose EP NLGI) or a rust preventive grease (see list, this page) on the threads.

- Torques are calculated to give a clamping force of approximately 75% of proof load.
- The maximum torque tolerance shall be $\pm 10\%$ of the torque value shown.

**TABLE II. STANDARD ASSEMBLY TORQUE
for 12-Point, Grade 9 Cap screws**

CAPSCREW SIZE*	TORQUE ft lbs	TORQUE N•m	TORQUE kg•m
0.250 - 20	12	16	1.7
0.312 - 18	24	33	3.3
0.375 - 16	42	57	5.8
0.438 - 14	70	95	9.7
0.500 - 13	105	142	14.5
0.562 - 12	150	203	20.7
0.625 - 11	205	278	28.3
0.750 - 10	360	488	49.7
0.875 - 9	575	780	79.4
1.000 - 8	860	1166	119
1.000 - 12	915	1240	126
1.125 - 7	1230	1670	170
1.125 - 12	1330	1800	184
1.250 - 7	1715	2325	237
1.250 - 12	1840	2495	254
1.375 - 6	2270	3080	313
1.375 - 12	2475	3355	342
1.500 - 6	2980	4040	411
1.500 - 12	3225	4375	445
* Shank Diameter (in.) - Threads per inch			
This table represents standard values only. Do not use these values to replace torque values which are specified in assembly instructions.			

STANDARD ASSEMBLY TORQUES For Class 10.9 Cap screws & Class 10 Nuts

The following specifications apply to required assembly torques for all metric Class 10.9 finished hexagon head cap screws and Class 10 nuts.

- Cap screw threads and seats shall not be lubricated when assembled. These specifications are based on all cap screws, nuts, and hardened washers being phosphate and oil coated.

NOTE: If zinc-plated hardware is used, each piece must be lubricated with simple lithium base chassis grease (multi-purpose EP NLGI) or a rust preventive grease (see list, this page) to achieve the same clamping forces provided below.

- Torques are calculated to give a clamping force of approximately 75% of proof load.
- The maximum torque tolerance shall be within $\pm 10\%$ of the torque value shown.

**TABLE III. STANDARD ASSEMBLY TORQUE
for Metric Class 10.9 Cap screws & Class 10 Nuts**

CAPSCREW SIZE*	TORQUE N•m	TORQUE ft lbs	TORQUE kg•m
M6 x 1	12	9	1.22
M8 x 1.25	30	22	3.06
M10 x 1.5	55	40	5.61
M12 x 1.75	95	70	9.69
M14 x 2	155	114	15.81
M16 x 2	240	177	24.48
M20 x 2.25	465	343	47.43
M24 x 3	800	590	81.6
M30 x 3.5	1600	1180	163.2
M36 x 4	2750	2028	280.5
* Shank Diameter (mm) - Threads per millimeter			
This table represents standard values only. Do not use these values to replace torque values which are specified in assembly instructions.			

Suggested* Sources for Rust Preventive Grease:

- AMERICAN ANTI-RUST GREASE #3-X from Standard Oil Company (also American Oil Co.)
- GULF NORUST #3 from Gulf Oil Company.
- MOBILARMA 355, Product No. 66705 from Mobil Oil Corporation.
- RUST BAN 326 from Humble Oil Company.
- RUSTOLENE B GREASE from Sinclair Oil Co.
- RUST PREVENTIVE GREASE - CODE 312 from the Southwest Grease and Oil Company.

NOTE: This list represents the current engineering approved sources for use in Komatsu manufacture. It is not exclusive. Other products may meet the same specifications of this list.

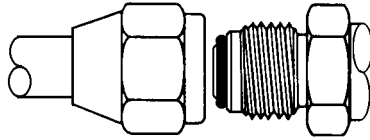


TABLE IV.
TORQUE CHART FOR JIC 37° SWIVEL NUTS
WITH OR WITHOUT O-RING SEALS

SIZE CODE	TUBE SIZE (O.D.)	THREADS UNF-2B	TORQUE FT. LBS.
- 2	0.125	0.312 - 24	4 ±1
- 3	0.188	0.375 - 24	8 ±3
- 4	0.250	0.438 - 20	12 ±3
- 5	0.312	0.500 - 20	15 ±3
- 6	0.375	0.562 - 18	18 ±5
- 8	0.500	0.750 - 16	30 ±5
- 10	0.625	0.875 - 14	40 ±5
- 12	0.750	1.062 - 12	55 ±5
- 14	0.875	1.188 - 12	65 ±5
- 16	1.000	1.312 - 12	80 ±5
- 20	1.250	1.625 - 12	100 ±10
- 24	1.500	1.875 - 12	120 ±10
- 32	2.000	2.500 - 12	230 ±20

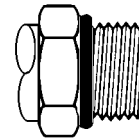


TABLE VI.
TORQUE CHART FOR
O-RING BOSS FITTINGS

SIZE CODE	TUBE SIZE (O.D.)	THREADS UNF-2B	TORQUE FT. LBS.
- 2	0.125	0.312 - 24	4 ±2
- 3	0.188	0.375 - 24	5 ±2
- 4	0.250	0.438 - 20	8 ±3
- 5	0.312	0.500 - 20	10 ±3
- 6	0.375	0.562 - 18	13 ±3
- 8	0.500	0.750 - 16	24 ±5
- 10	0.625	0.875 - 14	32 ±5
- 12	0.750	1.062 - 12	48 ±5
- 14	0.875	1.188 - 12	54 ±5
- 16	1.000	1.312 - 12	72 ±5
- 20	1.250	1.625 - 12	80 ±5
- 24	1.500	1.875 - 12	80 ±5
- 32	2.000	2.500 - 12	96 ±10

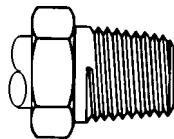


TABLE V.
TORQUE CHART FOR
PIPE THREAD FITTINGS

SIZE CODE	PIPE THREAD SIZE	WITH SEALANT FT. LBS.	WITHOUT SEALANT FT. LBS.
- 2	0.125 - 27	15 ±3	20 ±5
- 4	0.250 - 18	20 ±5	25 ±5
- 6	0.375 - 18	25 ±5	35 ±5
- 8	0.500 - 14	35 ±5	45 ±5
- 12	0.750 - 14	45 ±5	55 ±5
- 16	1.000 - 11.50	55 ±5	65 ±5
- 20	1.250 - 11.50	70 ±5	80 ±5
- 24	1.500 - 11.50	80 ±5	95 ±10
- 32	2.000 - 11.50	95 ±10	120 ±10

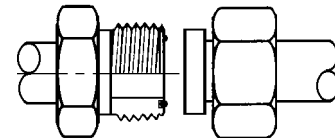


TABLE VII.
TORQUE CHART FOR
O-RING FACE SEAL FITTINGS

SIZE CODE	TUBE SIZE (O.D.)	THREADS UNF-2B	TORQUE FT. LBS.
- 4	0.250	0.438 - 20	11 ±1
- 6	0.375	0.562 - 18	18 ±2
- 8	0.500	0.750 - 16	35 ±4
- 10	0.625	0.875 - 14	51 ±5
- 12	0.750	1.062 - 12	71 ±7
- 16	1.000	1.312 - 12	98 ±6
- 20	1.250	1.625 - 12	132 ±7
- 24	1.500	1.875 - 12	165 ±15

TABLE VIII. TORQUE CONVERSIONS
Foot Pounds (ft. lbs.) to Newton-meters (N•m)

ft lbs	0	1	2	3	4	5	6	7	8	9
0	(N.m)	1.36	2.71	4.07	5.42	6.78	8.14	9.49	10.85	12.20
10	13.56	14.91	16.27	17.63	18.98	20.34	21.69	23.05	24.40	25.76
20	27.12	28.47	29.83	31.18	32.54	33.90	35.25	36.61	37.96	39.32
30	40.67	42.03	43.39	44.74	46.10	47.45	48.81	50.17	51.52	52.87
40	54.23	55.59	56.94	58.30	59.66	60.01	62.37	63.72	65.08	66.44
50	67.79	69.15	70.50	71.86	73.21	74.57	75.93	77.28	78.64	80.00
60	81.35	82.70	84.06	85.42	86.77	88.13	89.48	90.84	92.20	93.55
70	94.91	96.26	97.62	98.97	100.33	101.69	103.04	104.40	105.75	107.11
80	108.47	109.82	111.18	112.53	113.89	115.24	116.60	117.96	119.31	120.67
90	122.03	123.38	124.74	126.09	127.45	128.80	130.16	131.51	132.87	134.23

See NOTE on page 12-5 regarding table usage.

TABLE IX. TORQUE CONVERSIONS
Foot Pounds (ft. lbs.) to kilogram-meters (kg•m)

ft lbs	0	1	2	3	4	5	6	7	8	9
0	(kg.m)	0.138	0.277	0.415	0.553	0.692	0.830	0.968	1.106	1.245
10	1.38	1.52	1.66	1.80	1.94	2.07	2.21	2.35	2.49	2.63
20	2.77	2.90	3.04	3.18	3.32	3.46	3.60	3.73	3.87	4.01
30	4.15	4.29	4.43	4.56	4.70	4.84	4.98	5.12	5.26	5.39
40	5.53	5.67	5.81	5.95	6.09	6.22	6.36	6.50	6.64	6.78
50	6.92	7.05	7.19	7.33	7.47	7.61	7.74	7.88	8.02	8.16
60	8.30	8.44	8.57	8.71	8.85	8.99	9.13	9.27	9.40	9.54
70	9.68	9.82	9.96	10.10	10.23	10.37	10.51	10.65	10.79	10.93
80	11.06	11.20	11.34	11.48	11.62	11.76	11.89	12.03	12.17	12.30
90	12.45	12.59	12.72	12.86	13.00	13.14	13.28	13.42	13.55	13.69

See NOTE on page 12-5 regarding table usage.

TABLE X. PRESSURE CONVERSIONS
Pounds per square inch (psi) to Kilopascals (kPa)
Formula: psi x 6.895 = kPa

psi	0	1	2	3	4	5	6	7	8	9
0	(kPa)	6.895	13.79	20.68	27.58	34.47	41.37	48.26	55.16	62.05
10	68.95	75.84	82.74	89.63	96.53	103.42	110.32	117.21	124.1	131.0
20	137.9	144.8	151.7	158.6	165.5	172.4	179.3	186.2	193.1	200.0
30	206.8	213.7	220.6	227.5	234.4	241.3	248.2	255.1	262.0	268.9
40	275.8	282.7	289.6	296.5	303.4	310.3	317.2	324.1	331.0	337.9
50	344.7	351.6	358.5	365.4	372.3	379.2	386.1	393.0	399.9	406.8
60	413.7	420.6	427.5	434.4	441.3	448.2	455.1	462.0	468.9	475.8
70	482.6	489.5	496.4	503.3	510.2	517.1	524.0	530.9	537.8	544.7
80	551.6	558.5	565.4	572.3	579.2	586.1	593.0	599.9	606.8	613.7
90	620.5	627.4	634.3	641.2	648.1	655.0	661.9	668.8	675.7	682.6

See NOTE on page 12-5 regarding table usage.

TABLE XI. PRESSURE CONVERSIONS
Pounds per square inch (psi) to Megapascals (MPa)
Formula: $\text{psi} \times 0.0069 = \text{MPa}$

psi	0	10	20	30	40	50	60	70	80	90
0	(MPa)	0.069	0.14	0.21	0.28	0.34	0.41	0.48	0.55	0.62
100	0.69	0.76	0.83	0.90	0.97	1.03	1.10	1.17	1.24	1.31
200	1.38	1.45	1.52	1.59	1.65	1.72	1.79	1.86	1.93	2.00
300	2.07	2.14	2.21	2.28	2.34	2.41	2.48	2.55	2.62	2.69
400	2.76	2.83	2.90	2.96	3.03	3.10	3.17	3.24	3.31	3.38
500	3.45	3.52	3.59	3.65	3.72	3.79	3.86	3.93	4.00	4.07
600	4.14	4.21	4.27	4.34	4.41	4.48	4.55	4.62	4.69	4.76
700	4.83	4.90	4.96	5.03	5.10	5.17	5.24	5.31	5.38	5.45
800	5.52	5.58	5.65	5.72	5.79	5.86	5.93	6.00	6.07	6.14
900	6.21	6.27	6.34	6.41	6.48	6.55	6.62	6.69	6.76	6.83

See NOTE below regarding Table usage.

NOTE: Tables such as Table VIII, IX, X, and XI may be used as in the following example:

Example: Convert 975 psi to kilopascals (kPa).

1. Select Table X.
2. Go to psi row 90, column 7; read 668.8
97 psi = 668.8 kPa.
3. Multiply by 10:
970 psi = 6688 kPa.
4. Go to psi row 0, column 5; read 34.475
psi = 34.47 kPa. Add to step 3.
5. $970 + 5 \text{ psi} = 6688 + 34 = 6722 \text{ kPa}$.

TABLE XII. TEMPERATURE CONVERSIONS
Formula: $F^{\circ} - 32 \div 1.8 = C^{\circ}$ or $C^{\circ} \times 1.8 + 32 = F^{\circ}$

CELSIUS C°		FAHRENHEIT F°	CELSIUS C°		FAHRENHEIT F°	CELSIUS C°		FAHRENHEIT F°
121	250	482	63	145	293	4	40	104
118	245	473	60	140	284	2	35	95
116	240	464	57	135	275	-1	30	86
113	235	455	54	130	266	-4	25	77
110	230	446	52	125	257	-7	20	68
107	225	437	49	120	248	-9	15	59
104	220	428	46	115	239	-12	10	50
102	215	419	43	110	230	-15	5	41
99	210	410	41	105	221	-18	0	32
96	205	401	38	100	212	-21	-5	23
93	200	392	35	95	203	-23	-10	14
91	195	383	32	90	194	-26	-15	5
88	190	374	29	85	185	-29	-20	-4
85	185	365	27	80	176	-32	-25	-13
82	180	356	24	75	167	-34	-30	-22
79	175	347	21	70	158	-37	-35	-31
77	170	338	18	65	149	-40	-40	-40
74	165	329	15	60	140	-43	-45	-49
71	160	320	13	55	131	-46	-50	-58
68	155	311	10	50	122	-48	-55	-67
66	150	302	7	45	113	-51	-60	-76

Note: The numbers in the unmarked columns refer to temperature in either degrees Celsius (C°) or Fahrenheit (F°). Select a number in this unmarked column and read to the left to convert to degrees Celsius (C°) or read to the right to convert to degrees Fahrenheit (F°). If starting with a known temperature (either C° or F°), find that temperature in the marked column and read the converted temperature in the center, **unmarked** column.

**Table XIII. TABLE XIII
COMMON CONVERSION MULTIPLIERS**

COMMON CONVERSION MULTIPLIERS ENGLISH TO METRIC		
To Convert From	TO	Multiply By
inch – in.	millimeter (mm)	25.40
inch – in.	centimeter (cm)	2.54
foot – ft.	meter (m)	0.3048
yard – yd.	meter (m)	0.914
mile – mi.	kilometer (km)	1.61
sq. in. – in. ²	sq. centimeters (cm ²)	6.45
sq. ft. – ft. ²	sq. centimeters (cm ²)	929
cu. in. – in. ³	cu. centimeters (cm ³)	16.39
cu. in. – in. ³	liters (l)	0.016
cu. ft. – ft. ³	cu. meters (m ³)	0.028
cu. ft. – ft. ³	liters (l)	28.3
ounce – oz.	kilogram (kg)	0.028
fluid ounce – fl. oz.	milliliter (ml)	29.573
pound (mass)	kilogram (kg)	0.454
pound (force) – lbs.	Newton (N)	4.448
in. lbs. (force)	Newton-meters (N•m)	0.113
ft. lbs. (force)	Newton-meters (N•m)	1.356
ft. lbs. (force)	kilogram-meters (kg•m)	0.138
psi (pressure)	kilopascals (kPa)	6.895
psi (pressure)	megapascals (MPa)	0.007
psi (pressure)	kilograms/cm ² (kg/cm ²)	0.0704
ton (short)	kilogram (kg)	907.2
ton (short)	metric ton	0.0907
quart – qt.	liters (l)	0.946
gallon – gal.	liters (l)	3.785
HP (horsepower)	Watts	745.7
HP (horsepower)	kilowatts (kw)	0.745

COMMON CONVERSION MULTIPLIERS METRIC TO ENGLISH		
To Convert From	TO	Multiply By
millimeter (mm)	inch – in.	0.0394
centimeter (cm)	inch – in.	0.3937
meter (m)	foot – ft.	3.2808
meter (m)	yard – yd.	1.0936
kilometer (km)	mile – mi.	0.6210
sq. centimeters (cm ²)	sq. in. – in. ²	0.1550
sq. centimeters (cm ²)	sq. ft. – ft. ²	0.001
cu. centimeters (cm ³)	cu in – in. ³	0.061
liters (l)	cu in – in. ³	61.02
cu. meters (m ³)	cu ft – ft. ³	35.314
liters (l)	cu ft – ft. ³	0.0353
grams (g)	ounce – oz.	0.0353
milliliter (ml)	fluid ounce – fl. oz.	0.0338
kilogram (kg)	pound (mass)	2.2046
Newton (N)	pound (force) – lbs.	0.2248
Newton-meters (N•m)	kilogram-meters (kg•m)	0.102
Newton-meters (N.m)	ft lbs	0.7376
kilogram-meters (kg•m)	ft lbs	7.2329
kilogram-meters (kg•m)	Newton-meters (N•m)	9.807
kilopascals (kPa)	psi	0.1450
megapascals (MPa)	psi	145.038
kilograms/cm ² (kg/cm ²)	psi	14.2231
kilograms/cm ² (kg/cm ²)	kilopascals (kPa)	98.068
kilogram (kg)	ton	0.0011
metric ton	ton	1.1023
liters (l)	quart – qt.	1.0567
liters (l)	gallon – gal.	0.2642
Watts	Horsepower HP	0.00134
kilowatts (kw)	Horsepower HP	1.3410

GENERAL SAFETY

Safety records of most organizations will show that the greatest percentage of accidents are caused by unsafe acts of persons. The remainder are caused by unsafe mechanical or physical conditions. Report all unsafe conditions to the proper authority.

The following safety rules are provided as a guide for the operator. However, local conditions and regulations may add many more to this list.



Read and follow all safety precautions. Failure to do so may result in serious injury or death.

Safety Rules

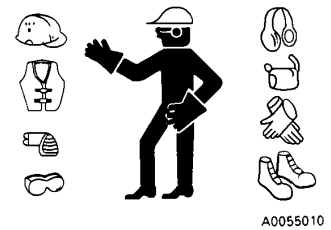
- Only trained and authorized personnel can operate and maintain the machine.
- Follow all safety rules, precautions and instructions when operating or performing maintenance on the machine.
- When working with another operator or a person on work site traffic duty, ensure all personnel understand all hand signals that are to be used.

Truck Safety Features

- Ensure all guards and covers are in their proper position. Repair any damaged guards and covers. (See Walk-Around Inspection, later in this section.)
- Learn the proper use of safety features such as safety locks, safety pins, and seat belts. Always use these safety features, properly.
- Never remove any safety features. Always keep safety features in good operating condition.
- Improper use of safety features may result in serious bodily injury or death.

Clothing And Personal Items

- Avoid wearing loose clothing, jewelry, and loose long hair. They can catch on controls or in moving parts and cause serious injury or death. Additionally, never wear oily clothes as they are flammable.



- Wear a hard hat, safety glasses, safety shoes, a mask and gloves when operating or maintaining a machine. Always wear safety goggles, a hard hat and heavy gloves if your job involves scattering metal chips or minute materials. This is particularly important when driving pins with a hammer or when cleaning air cleaner elements with compressed air. Also, ensure that the work area is free of other personnel during such tasks.

Unauthorized Modification

- Any modification made to this vehicle without authorization from Komatsu America Corp. can possibly create hazards.
- Before making any modification, consult your authorized regional Komatsu America Corp. distributor. Komatsu will not be responsible for any injury or damage caused by any unauthorized modification.

Leaving The Operator's Seat

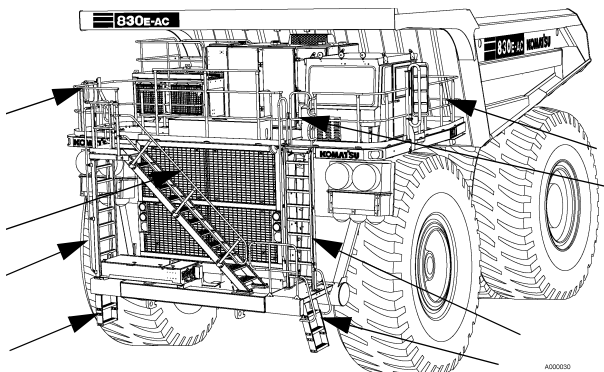
While leaving the operator's seat, DO NOT touch any controls. To prevent accidental operations from occurring, always perform the following:

- Move the directional control lever to the PARK position (this will apply the parking brake). DO NOT apply the wheel brake lock.
- Lower the dump body, and move the hoist control lever to the FLOAT position.
- Turn the key switch to the OFF position and wait for the engine to stop.
- After the engine has stopped, wait two minutes before exiting the cab. If any warning lights are illuminated or warning horns are sounding, DO NOT leave the cab and notify maintenance personnel immediately. When exiting the machine, always lock compartments, and take the keys with you to prevent entry from unauthorized persons.

Mounting And Dismounting

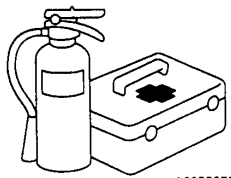
- Never jump on or off the machine. Never climb on or off a machine while it is moving.
- When climbing on or off a machine, face the machine and use the hand-hold and steps.
- Never hold any control levers when getting on or off a machine.
- Always maintain three-point contact with the hand-holds and steps to ensure that you support yourself.
- When bringing tools up to the operating deck, always pass them by hand or pull them up by rope.
- If there is any oil, grease, or mud on the hand-holds or steps, wipe them clean immediately. Always keep these components clean. Repair any damage and tighten any loose bolts.
- Use the handrails and steps marked by arrows in the diagram below when getting on or off the machine.

NOTE: Some trucks may be equipped with different boarding equipment than shown in the figure below. Refer to Options Section for additional information.



Fire Extinguishers And First Aid Kits

- Ensure fire extinguishers are accessible and proper usage techniques are known.
- Provide a first aid kit at the storage point.
- Know what to do in the event of a fire.
- Keep the phone numbers of persons you must contact in case of an emergency on hand.



Precautions For High Temperature Fluids

- Immediately after machine operation, engine coolant, engine oil, and hydraulic oil are at high temperatures and are pressurized. If the cap is removed, the fluids drained, the filters are replaced, etc., there is danger of serious burns. Allow heat and pressure to dissipate before performing such tasks and follow proper procedures as outlined in the service manual.
- To prevent hot coolant from spraying:
 1. Stop the engine, and wait for the coolant temperature to decrease.
 2. Depress the pressure relief button on the radiator cap.
 3. Turn the radiator cap slowly to allow pressure to dissipate.
- To prevent hot engine oil spray:
 1. Stop the engine.
 2. Wait for the oil temperature to cool down.
 3. Turn the cap slowly to allow pressure to dissipate.



Asbestos Dust Hazard Prevention

Asbestos dust is hazardous to your health when inhaled. If you handle materials containing asbestos fibers, follow the guidelines below:



- Never use compressed air for cleaning.
- Use water for cleaning and to control dust.
- Operate the machine or perform tasks with the wind to your back, whenever possible.
- Use an approved respirator, when necessary.

Fire Prevention For Fuel And Oil

- Fuel, oil, and antifreeze can be ignited by a flame. These fluids are extremely flammable and hazardous.
- Keep flames away from flammable fluids.
- Stop the engine while refueling.
- Never smoke while refueling
- Tighten all fuel and oil tank caps securely.
- Refuel and maintain oil in well ventilated areas.
- Keep oil and fuel in a designated location. DO NOT allow unauthorized persons to enter.



A030010

ROPS Precautions

- The Rollover Protection Structure (ROPS) must be properly installed for machine operation.
- The ROPS is intended to protect the operator if the machine rolls over. It is designed not only to support the load of the machine, but also to absorb the energy of the impact.
- ROPS structures installed on equipment manufactured and designed by Komatsu fulfill all of the regulations and standards for all countries. If it is modified or repaired without authorization from Komatsu, or is damaged when the machine rolls over, the strength of the structure will be compromised and will not be able to fulfill its intended purpose. Optimum strength of the structure can only be achieved if it is repaired or modified as specified by Komatsu.

- When modifying or repairing the ROPS, always consult your nearest Komatsu distributor.
- Even with the ROPS installed, the operator must always use the seat belt when operating the machine.

Preventing Injury From Work Equipment

- Never position any part of your body between movable parts such as the dump body, chassis or cylinders. If the work equipment is operated, clearances will change and may cause serious bodily injury or death.

Precautions For Optional Attachments

- When installing and using optional equipment, read the instruction manual for the attachment and the information related to attachments in this manual.
- DO NOT use attachments that are not authorized by Komatsu, or the authorized regional Komatsu distributor. Use of unauthorized attachments could create a safety problem and adversely affect the proper operation and useful life of the machine.
- Any injuries, accidents, and product failures resulting from the use of unauthorized attachments will not be the responsibility of Komatsu America Corp., or the authorized regional Komatsu distributor.

Precautions When Starting The Machine

- Start the engine from the operator's seat, only.
- Never attempt to start the engine by shorting across the starter terminals. This may cause fire, or serious injury or death to anyone in the machine's path.



PRECAUTIONS FOR TRUCK OPERATION

Safety Is Thinking Ahead

Prevention is the best safety program. Prevent a potential accident by knowing the employer's safety requirements and all necessary job site regulations. In addition, know the proper use and care of all the safety equipment on the truck. Only qualified operators or technicians may attempt to operate or maintain a Komatsu machine.

Safe practices start before the operator gets to the equipment!

Safety At The Worksite

- When walking to and from a truck, maintain a safe distance from all machines even when the operator is visible.
- Before starting the engine, thoroughly check the area for any unusual conditions that could be dangerous.
- Examine the road surface at the job site and determine the best and safest method of operation.
- Choose an area where the ground is as horizontal and firm as possible before performing the operation.
- If you need to operate on or near a public road, protect pedestrians and cars by designating a person for work site traffic duty or by installing fences around the work site.
- The operator must personally check the work position, the roads to be used, and existence of obstacles before starting operations.
- Always determine the travel roads to be used at the work site. Travel roads must be maintained in order to ensure safe machine travel.
- If travel through wet areas is necessary, check the depth and flow of water before crossing the shallow parts. Never drive through water which exceeds the permissible water depth.

Fire Prevention

- Remove all wood chips, leaves, paper and other flammable items accumulated in the engine compartment, as they could cause a fire.
- Check fuel, lubrication, and hydraulic systems for leaks. Repair any leaks. Clean any excess oil, fuel or other flammable fluids, and dispose of properly.
- Ensure a fire extinguisher is present and in proper working condition.
- DO NOT operate the machine near open flames.



Preparing For Operation

- Always mount and dismount while facing the truck. Never attempt to mount or dismount the truck while it is in motion. Always use handrails and ladders when mounting or dismounting the truck.
- Check the deck areas for debris, loose hardware, and tools. Check for people and objects that remain on or around the truck.
- Become familiar with and use all protective equipment devices on the truck and ensure that these items (anti-skid material, grab bars, seat belts, etc.) are securely in place.

Ventilation For Enclosed Areas

- If it is necessary to start the engine in an enclosed area, provide adequate ventilation. Exhaust fumes from the engine can kill.



Mirrors, Windows, And Lights

- Remove any dirt from the surface of the windshield, cab windows, mirrors and lights. Good visibility may prevent an accident.
- Adjust the mirrors to a position where the operator can see best from the operator's seat.
- Ensure headlights, work lights and taillights are in proper working order. Ensure that the machine is equipped with the proper work lamps needed for the operating conditions.
- Replace any broken mirrors, windows or lights.

In The Operator's Cab - Before Starting The Engine

- DO NOT leave tools or spare parts lying around or allow trash to accumulate in the cab of the truck. Keep all unauthorized reading material out of the truck cab.
- Keep the cab floor, controls, steps, and handrails free of oil, grease, snow, and excess dirt.
- Check the seat belt, buckle and hardware for damage or wear. Replace any worn or damaged parts. Always use the seat belts when operating a machine.
- Read and understand the contents of the Operation & Maintenance manual. Read safety and operating instructions with special attention. Become thoroughly acquainted with all gauges, instruments and controls before attempting operation of the truck.
- Read and understand the **WARNING** and **CAUTION** decals in the operator's cab.
- Ensure the steering wheel, horn, controls and pedals are free of any oil, grease or mud.
- Check operation of the windshield wiper, condition of wiper blades, and check the washer fluid reservoir level.
- Be familiar with all steering and brake system controls, warning devices, road speeds and loading capabilities, before operating the truck.

OPERATING THE MACHINE

Starting The Engine

- NEVER ATTEMPT TO START THE MACHINE BY SHORTING ACROSS THE STARTER TERMINALS. This may cause fire, or serious injury or death to anyone in machine's path.
- NEVER start the engine if a warning tag has been attached to the controls.
- When starting the engine, sound the horn as an alert.
- Start and operate the machine only while seated in the operator's seat.
- DO NOT allow any unauthorized persons in the operator's compartment or any other place on the machine.

Truck Operation - General

- WEAR SEAT BELTS AT ALL TIMES.
- Only authorized persons are allowed to ride in the truck. Passengers must be in the cab and belted in the passenger seat.
- DO NOT allow anyone to ride on the decks or on the steps of the truck.
- DO NOT allow anyone to get on or off the truck while it is in motion.
- DO NOT move the truck in or out of a building without a signal person present.
- Know and obey hand signal communications between the operator and spotter. When other machines and personnel are present, the operator must move in and out of buildings, loading areas and through traffic, under the direction of a signal person. **Courtesy at all times is a safety precaution!**
- Immediately report any adverse conditions on haul road, pit or dump area that may cause an operating hazard.

- Check for flat tires periodically during a shift. If the truck has been operating on a “flat”, the truck must not be parked indoors until the tire cools. If the tire must be changed, DO NOT stand in front of the rim and locking ring when inflating a tire mounted on the machine. Observers must not be permitted in the area and must be kept away from the side of such tires.

⚠ DANGER

A tire and rim assembly may explode if subjected to excessive heat. Personnel must move to a remote or protected location if there is a fire near the tire and wheel area or if the smell of burning rubber or excessively hot brakes is evident.

If the truck must be approached, such as to fight a fire, those personnel must do so only while facing the tread area of the tire (front or back), unless protected by use of large heavy equipment as a shield. Stay at least 50 ft. (15 m) from the tread of the tire.

In the event of fire in the tire and wheel area (including brake fires), stay away from the truck for at least 8 hours or until the tire and wheel are cool.

- Keep serviceable fire fighting equipment on hand. Report used extinguishers for replacement or refilling.
- Always move the directional control lever to PARK (this will apply the parking brake) when the truck is parked and unattended. DO NOT leave the truck unattended while the engine is running.

NOTE: DO NOT use wheel brake lock when parking the truck.

- Park the truck a safe distance away from other vehicles as determined by the supervisor.
- Stay alert at all times! In the event of an emergency, be prepared to react quickly and avoid accidents. If an emergency arises, know where to get prompt assistance.

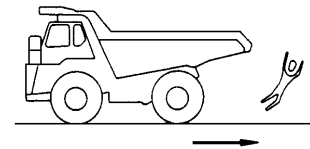
Traveling In The Truck

- When traveling on rough ground, travel at low speeds. When changing direction, avoid turning suddenly.

- Lower the dump body and move the dump lever to the FLOAT position before traveling.
- If the engine stops when the machine is in motion, the emergency steering system will be activated. Apply the brakes immediately and stop the machine as quickly and safely as possible (off of the haul road, if possible). Apply the parking brake.

Precautions When Traveling In Reverse

Before operating the machine or work equipment, do as follows:



- Ensure the backup alarm works properly.
- Sound the horn to warn people in the area.
- Check for personnel near the machine. Do a thorough check behind the machine.
- When necessary, designate a person to watch the area for the truck operator. This is particularly necessary when traveling in reverse.
- When operating in hazardous areas and areas with poor visibility, designate a person to direct work site traffic.
- DO NOT allow any one to enter the line of travel of the machine. This rule must be strictly obeyed even with machines equipped with a back-up alarm or rear view mirror.

Traveling On Slopes

- Traveling on slopes could result in the machine tipping over or slipping.
- DO NOT change direction on slopes. To ensure safety, drive to level ground before turning.
- DO NOT travel up and down on grass, fallen leaves, or wet steel plates. These materials may make the machine slip on even the slightest slope. Avoid traveling sideways, and always keep travel speed low.
- When traveling downhill, use the retarder to reduce speed. DO NOT turn the steering wheel suddenly. DO NOT use the foot brake except in an emergency.
- If the engine stops on a slope, apply the service brakes to fully stop the machine. Move the directional control lever to the PARK position (this will apply the parking brake).

Ensuring Good Visibility

- When working in dark places, install work lamps and head lamps.
- Discontinue operations if visibility is poor, such as in mist, snow, or rain. Wait for the weather to improve to allow the operation to be performed safely.

Operating On Snow

- When working on snowy or icy roads, there is danger that the machine may slip to the side on even the slightest slope. Always travel slowly and avoid sudden starting, turning, or stopping in these conditions.
- Be extremely careful when clearing snow. The road shoulder and other objects are buried in the snow and cannot be seen. When traveling on snow-covered roads, always install tire chains.

Avoid Damage To The Dump Body

- When working in tunnels, on bridges, under electric cables, or when entering an enclosed area where there are height limits, always use extreme caution. The dump body must be completely lowered before driving.



Driving with a raised dump body or raising the dump body in an enclosed area, may result in serious damage and bodily injury or death. Always drive with the dump body resting on the frame.

Driving Near High Voltage Cables

- Driving near high-voltage cables can cause electric shock. Always maintain the safe distances between the machine and the electric cable as listed below.

Voltage	Minimum Safe Distance	
6.6 kV	3 m	10 ft.
33.0 kV	4 m	14 ft.
66.0 kV	5 m	17 ft.
154.0 kV	8 m	27 ft.
275.0 kV	10 m	33 ft.

The following actions are effective in preventing accidents while working near high voltages:

- Wear shoes with rubber or leather soles.
- Use a signalman to give warning if the machine approaches an electric cable.
- If the work equipment touches an electric cable, the operator must not leave the cab.
- When performing operations near high voltage cables, DO NOT allow anyone to approach the machine.
- Check with the electrical maintenance department about the voltage of the cables before starting operations.

When Loading The Truck

- Ensure the surrounding area is safe. If so, stop the machine in the correct loading position and evenly load the body.
- DO NOT leave the operator's seat during the loading operation.

When Dumping

- Before dumping, check that there is no person or objects behind the machine.
- Stop the machine in the desired location. Check again for persons or objects behind the machine. Give the determined signal, then slowly operate the dump body. If necessary, use blocks for the wheels or position a flagman.
- When dumping on slopes, machine stability is poor and there is danger of tip over. Always perform such operations using extreme care.
- Never travel with the dump body raised.

Working On Loose Ground

- Avoid operating the machine near cliffs, overhangs, and deep ditches. If these areas collapse, the machine could fall or tip over and result in serious injury or death. Remember that ground surfaces in these areas may be weakened after heavy rain or blasting.
- Freshly laid soil and the soil near ditches is loose. It can collapse under the weight or vibration of the machine. Avoid these areas whenever possible.

Parking The Machine

- Ensure the truck body is empty. Completely lower the dump body by placing the hoist control lever in the FLOAT position.
- Choose a horizontal road surface to park the machine. If the machine must be parked on a slope, follow local regulations to secure the truck to prevent the machine from moving.
- Move the directional control lever to PARK (this will apply the parking brake).

NOTE: DO NOT apply the wheel brake lock.

- Turn the key switch to the OFF position and wait for the engine to stop. This could take up to three minutes for a hot engine to cool down. After the engine has stopped, wait two minutes before exiting the cab. If any warning lights are illuminated or warning horns are sounding, DO NOT leave the cab and notify maintenance personnel immediately.
- When exiting the machine, always lock compartments, and take the keys with you to prevent entry from unauthorized persons.
- Place wheel chocks around the wheels to prevent the truck from rolling.

TOWING

Improper towing methods may lead to serious personal injury and/or damage.

- Tow with a solid tow bar. DO NOT tow with a cable.
- Use a towing device with ample strength for the weight of this machine.
- Never tow a machine on a slope.
- When connecting a machine to be towed, DO NOT allow anyone to go between the tow machine and the disabled machine.
- Set the coupling of the disabled machine in a straight line with the towing portion of the tow machine, and secure it in position.
- DO NOT stand next to the towing device while the truck is moving.

(For towing method, see the Operation and Maintenance Manual, Section 30, Operating Instructions - Towing.)

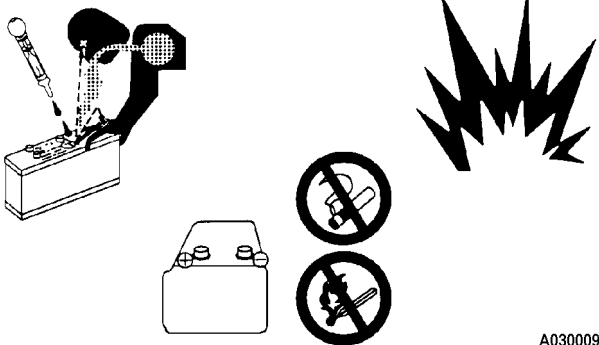
WORKING NEAR BATTERIES

Battery Hazard Prevention

Battery electrolyte contains sulfuric acid and can quickly burn the skin and eat holes in clothing. If electrolyte comes in contact with skin, immediately flush the area with water.

Battery acid can cause blindness if splashed into the eyes. If acid gets into the eyes, flush them immediately with large quantities of water and see a doctor immediately.

- If acid is accidentally ingested, drink a large quantity of water, milk, beaten eggs or vegetable oil. Call a doctor or poison prevention center immediately.
- Always wear safety glasses or goggles when working with batteries.



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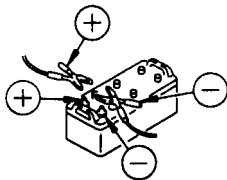
- Batteries generate hydrogen gas. Hydrogen gas is very EXPLOSIVE, and is easily ignited with a small spark or flame.
- Before working with batteries, stop the engine and turn the key switch to the OFF position. Wait two minutes after the engine has stopped, and if no warning lights illuminate, then turn the battery disconnect switches to the OFF position.
- Avoid short-circuiting the battery terminals through accidental contact with metallic objects, such as tools, across the terminals.
- When removing or installing a battery, positively identify the positive (+) terminal and negative (-) terminal and use precautions not to short circuit the terminals.
- Tighten battery caps securely.
- Tighten battery terminals securely. Loose terminals can generate sparks and lead to an explosion.

Jump Starting With Booster Cables

- Always wear safety glasses or goggles when starting the machine with booster cables.
- While jump starting with another machine, DO NOT allow the two machines to touch.
- Ensure the parking brake is applied on both machines.
- Ensure the size of the booster cables and clips are suitable for the battery size. Inspect the cables and clips for any damage or corrosion.
- Ensure the key switch and both battery disconnect switches on the disabled machine are in the OFF position.
- Connect the batteries in parallel: positive to positive and negative to negative.
- Connect the positive (24VDC +) cable from the good machine to the (24VDC +) on the disabled machine first.
- Then connect the ground cable on the good machine to the frame of the disabled machine, as far away as possible from the batteries. This will prevent a spark from possibly starting a battery fire.
- Allow time for the batteries to charge.

NOTE: The batteries will charge even with the battery disconnect switches are in the OFF position.

- If starting with a booster cable, perform the operation with two people. One person in the cab of the disabled machine, the other person working with the jumper cables.
- If the batteries are low, DO NOT attempt starting the machine with only one set of jumper cables installed. Install the second set of jumper cables in the same way as already described.
- Turn the battery disconnect switches to the ON position and attempt starting.
- For booster cable removal, disconnect the ground or negative (-) cable first, then the (24VDC +) cable last.



- If any tool touches between the positive (+) terminal and the chassis, it will cause sparks. Always use caution when using tools near the battery.

Jump Starting With Receptacles

- Always wear safety glasses or goggles when starting the machine with booster cables.
- While jump starting with another machine, DO NOT allow the two machines to touch.
- Ensure the parking brake is applied on both machines.
- Inspect the cables and connectors for any damage or corrosion.
- Ensure the key switch and both battery disconnect switches on the disabled machine are in the OFF position.
- Connect the jumper cable to the receptacle on the good machine to the receptacle on the disabled machine.
- Allow time for the batteries to charge.

NOTE: The batteries will charge even with the battery disconnect switches are in the OFF position.

- If starting with a booster cable, perform the operation with two people. One person in the cab of the disabled machine, the other person working with the jumper cables.
- If the batteries are low, DO NOT attempt starting the machine with only one set of jumper cables installed. Install the second set of jumper cables in the same way as already described.
- Turn the battery disconnect switches to the ON position and attempt starting.
- For booster cable removal, disconnect the cables from each machine.
- If any tool touches between the positive (+) terminal and the chassis, it will cause sparks. Always use caution when using tools near the battery.

PRECAUTIONS FOR MAINTENANCE

BEFORE PERFORMING MAINTENANCE

Stopping The Engine Before Service

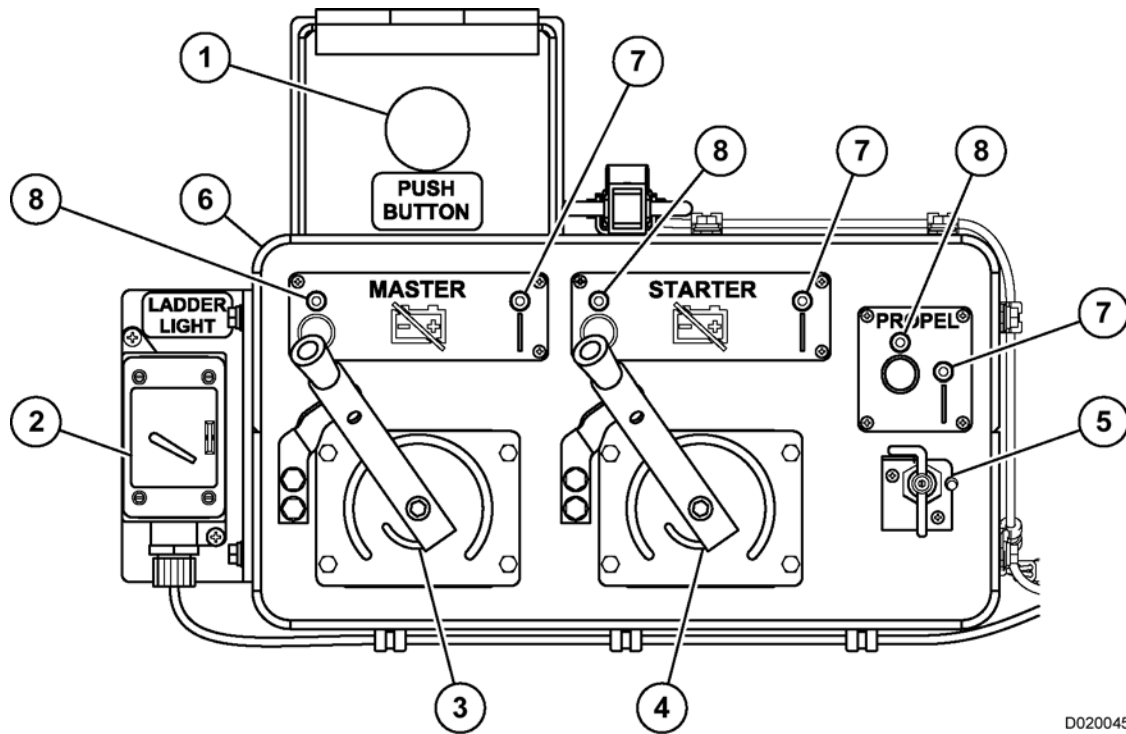
- Before performing inspections or maintenance, stop the machine on firm, flat ground. Lower the dump body, place the directional control lever to the PARK position (this will apply the parking brake), and turn the key switch to the OFF position and wait for the engine to stop.
- Wait two minutes after the engine has stopped, and if no warning lights illuminate, then turn the battery disconnect switches to the OFF position. Verify that the disconnects are functioning.
- Place wheel chocks around the wheels to prevent the truck from rolling.
- If the engine must be operated during maintenance, always move the directional control lever to the PARK position (this will apply the parking brake). Always perform this work with two people. One person must be in the operator's seat to stop the engine if necessary. Never move any controls not related to the task at hand during these situations. Apply the propel lockout lever (5, Figure 20-1) to prevent the truck from moving if the engine must operate during maintenance. When the propel lockout lever is in the OFF position and LED light (8) is illuminated, the drive system is locked out and the truck will not propel. When the propel lockout lever is in the ON position and LED light (7) is illuminated, the drive system is active and the truck can be driven.
- When servicing the machine, use care not to touch any moving parts. Never wear loose clothing.
- When performing service with the dump body raised, always place the dump lever in the HOLD position, and apply the lock (if equipped). Install the body-up safety cable securely.

Electrical Systems Isolation

- Isolation box (6, Figure 20-1) contains master disconnect switch (3), starter disconnect switch (4) and propel lockout lever (5). The isolation box is located on top of the front bumper, on the left hand side. Move both disconnect switches and the propel lockout lever to the OFF position to disable the 24VDC electrical system, starters and the AC electric drive system. When the switches and propel lockout lever are in the OFF position, LED lights (8) will be illuminated. The battery disconnect switches and propel lockout lever can be padlocked in the OFF position to prevent unauthorized truck operation. When the switches and the propel lockout lever are in the ON position, LED lights (7) will be illuminated. Refer to the following table to ensure the correct disconnect is used to isolate a desired circuit or system.

NOTE: This is the recommended usage of the battery disconnect and propel lockout switches. Local regulations may be different.

Action	Recommended Isolation
24V Electrical Troubleshooting	Starter Lockout
24V Electrical Maintenance/Repair	Master Lockout
High Voltage/Propulsion Troubleshooting	None
High Voltage Maintenance/Repair	Master Lockout
Hydraulic Troubleshooting	Propel Lockout
Hydraulic Maintenance/Repair	Starter Lockout
Engine Troubleshooting	Propel Lockout
Engine Repair	Master Lockout
Mechanical Repair	Starter Lockout
Weld Repair	Master Lockout & Alternator Isolation
Fueling	Starter Lockout
Lube/General Maintenance	Starter Lockout
Shift Change Walk Around	Starter Lockout
Oil Sample Collection	Propel Lockout



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FIGURE 20-1. ISOLATION BOX ASSEMBLY (COVERS REMOVED)

- | | | |
|-------------------------------|------------------------------|---------------------|
| 1. Engine Shutdown Switch | 3. Master Disconnect Switch | 6. Isolation Box |
| 2. Access Ladder Light Switch | 4. Starter Disconnect Switch | 7. LED Lights (on) |
| | 5. Propel Lockout Lever | 8. LED Lights (off) |

Warning Tag

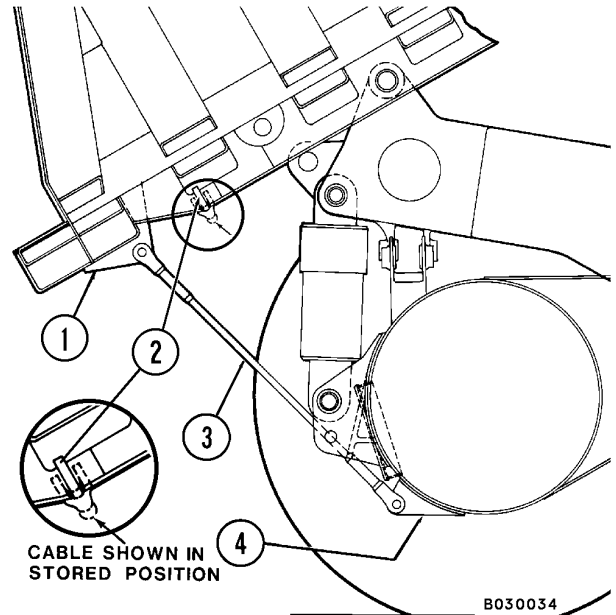
- Never start the engine or operate the controls while a person is performing maintenance. Serious injury or death may result.
- Always attach a warning tag to the control lever in the operator's cab to alert others that you are working on the machine. Attach additional warning tags around the machine, if necessary.
- These tags are available from your Komatsu distributor. Part No. 09963-03000

**Proper Tools**

- Use only tools suited to the task. Using damaged, low quality, faulty, or makeshift tools can cause personal injury.
- Extra precaution must be used when grinding, welding, and using a sledge-hammer.

**Securing The Dump Body**

Any time personnel are required to perform maintenance on the vehicle with the dump body in the raised position, the body-up retention cable MUST be installed.



1. To hold the dump body in the up position, raise the body to its maximum height.
2. Remove cable (3) from its stored position on the body, and install between rear body ear (1) and axle housing ear (4).
3. Secure the cable clevis pins with cotter pins.
4. Return the cable to stored position (2) after maintenance is complete.

DURING MAINTENANCE

Personnel

- Only authorized personnel can service and repair the machine.

Attachments

- Place attachments that have been removed from the machine in a safe place and manner to prevent them from falling.



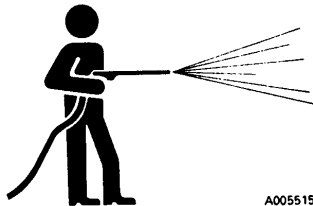
Working Under The Machine

- Always lower all movable work equipment to the ground or to their lowest position before performing service or repairs under the machine.
- Always block the tires of the machine securely.
- Never work under the machine if the machine is poorly supported.



Keeping The Machine Clean

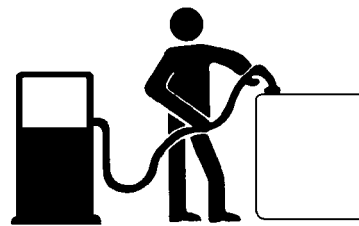
- Spilled oil, grease, scattered tools, etc. can cause you to slip or trip. Always keep your machine clean and tidy.
- If water gets into the electrical system, there is danger that the machine may move unexpectedly and/or damage to components may occur. DO NOT use water or steam to clean any sensors, connectors, or the inside of the operator's compartment.
- Use extreme care when washing the electrical control cabinet. DO NOT allow water to enter the control cabinet around the doors or vents. DO NOT allow any water to enter the cooling air inlet duct above the electrical control cabinet. If water enters the control cabinet (through any opening or crevice) major damage to the electrical components may occur.
- Never spray water into the rear wheel electric motor covers. Damage to the wheel motor armatures may occur.
- DO NOT spray water into the retarding grids. Excess water in the retarding grids can cause a ground fault, which will prevent propulsion.



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Rules To Follow When Adding Fuel Or Oil

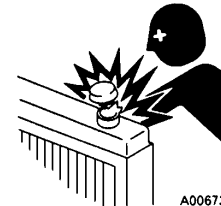
- Spilled fuel and oil may cause slipping. Always clean up spills, immediately.
- Always tighten the cap of the fuel and oil fillers securely.
- Never use fuel for washing any parts.
- Always stop the engine before adding fuel or oil.
- Always add fuel and oil in a well-ventilated area.



A030010

Radiator Coolant Level

- If it is necessary to add coolant to the radiator, stop the engine. Allow the engine and radiator to cool down before adding the coolant.
- Depress the pressure relief button on the radiator cap to relieve any pressure.
- Slowly loosen the cap to relieve pressure during removal.



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Use Of Lighting

- When checking fuel, oil, coolant, or battery electrolyte, always use lighting with anti-explosion specifications. If lighting without this protection is used, there is a danger of explosion.



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Precautions With The Battery

- Before repairing the electrical system or when performing welding, turn the key switch to the OFF position. Wait two minutes after the engine has stopped, and if no warning lights illuminate, then turn the master disconnect switch (3, Figure 20-1) and starter disconnect switch (4) located in the isolation box (6) to the OFF position. When the switches are in the OFF position, LED lights (8) will be illuminated.

**Handling High Pressure Hoses**

- DO NOT bend high-pressure hoses or hit them with hard objects. DO NOT use any bent or cracked piping, tubes or hoses. They may burst during use.
- Always repair any loose or broken hoses. Fuel and/or oil leaks may result in a fire.

Precautions With High Pressure Oil

- Always remember that work equipment circuits are always under pressure.
- DO NOT add oil, drain oil, or perform maintenance or inspections before completely releasing the internal pressure.



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- Small, high pressure pin-hole leaks are extremely dangerous. The jet stream of high-pressure oil can pierce the skin and eyes. Always wear safety glasses and thick gloves. Use a piece of cardboard or a sheet of wood to check for oil leakage.
- If you are hit by a jet of high-pressure oil, consult a doctor immediately for medical attention.

Maintenance Near High Temperatures And High Pressures

- Immediately after stopping the truck, the engine coolant and operating oils are at high temperature and under high pressure. In these conditions, opening the system or replacing filters may result in burns or other injury. Wait for the temperature to cool and pressure to subside before performing the inspection and/or maintenance as outlined in the service manual.

**Rotating Fan And Belts**

- Keep a safe distance from rotating parts such as the radiator fan and fan belts.
- Serious bodily injury may result from direct or indirect contact with rotating parts and flying objects.

**Waste Materials**

- Never dump oil or other harmful fluids into a sewer system, rivers, etc.
- Obey appropriate laws and regulations when disposing of harmful objects such as oil, fuel, coolant, solvent, filters, batteries, and others.
- Always put fluids drained from your machine in appropriate containers. Never drain fluids directly onto the ground.

INCORRECT



TIRES

Handling Tires

Rim and tire maintenance can be hazardous unless the correct procedures are followed by trained personnel.

Improperly maintained or inflated tires can overheat and burst due to excessive pressure. Improper inflation can also result in cuts in the tire caused by sharp stones. Both of these conditions can lead to tire damage, serious personal injury, or even death.

To safely maintain a tire, adhere to the following conditions:

- Before a tire is removed from a vehicle for tire repair, the valve core must be partially removed to allow deflation, and then the tire/rim assembly can be removed. During deflation, persons must stand outside of the potential trajectory of the locking ring of a multi-piece wheel rim.
- After the tire/rim assembly is installed on the vehicle, inflate the tires to their specified pressure. Abnormal heat is generated, particularly when the inflation pressure is too low.

NOTE: To prevent injury from the wheel rims during tire inflation, use one of the following:

1. A wheel cage or other restraining device that will constrain all wheel rim components during an explosive separation of a multi-piece wheel rim, or during the sudden release of air.
 2. A stand-off inflation device which permits a person to stand outside of the potential trajectory of the wheel components.
- Use the specified tires.

The tire inflation pressure and permissible speeds, given in this manual, are general values. The actual values may differ, depending on the type of tire and the specific operating conditions. For details, please consult the tire manufacturer.

When the tires become overheated, a flammable gas is produced inside the tire which can ignite. It is particularly dangerous if the tires become overheated while the tires are pressurized. If the gas generated inside the tire ignites, the internal pressure will suddenly rise, and the tire will explode, resulting in danger and/or death to personnel in the area. Explosions differ from punctures or tire bursts because the destructive force of the explosion is extremely large. Therefore, the following operations are strictly prohibited when the tire is pressurized:

- Welding the rim
- Welding near the wheel or tire.
- Smoking or creating open flames



Tire Maintenance

If the proper procedure for performing maintenance or replacement of the wheel or tire is not used, the wheel or tire may burst, causing damage, serious injury, or even death. When performing such maintenance, consult your authorized regional Komatsu distributor, or the tire manufacturer.

Refer to the Society of Automotive Engineers (SAE), SAE J1337, Off-Road Rim Maintenance Procedures and Service Precautions, Section 4.2 for additional information on demounting the tires and rim assemblies. Also, refer to Section 4.4 of SAE J1337 for assembly and inflation recommendations.

The U.S. Department of Labor Mine Safety and Health Administration (MSHA) addresses tire repairs in its Title 30 Code of Federal Regulations, 30 CFR 57.14104.

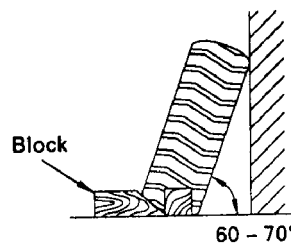


DO NOT stand in front of a rim and locking ring when inflating a tire mounted on the machine. Observers must not be permitted in the area.

DO NOT weld or heat the rim assembly with the tire mounted on the rim. Resulting gases inside the tire may ignite, causing explosion of the tire and rim.

Storing Tires After Removal

- As a basic rule, store the tires in a warehouse in which unauthorized persons cannot enter. If the tires are stored outside, erect a fence around the tires with No Entry and other warning signs.
- Stand the tire on level ground, and block it securely so that it cannot roll or fall over.
- If the tire falls, flee the area as quickly as possible. The tires for mining equipment are extremely heavy. **DO NOT** attempt to hold a tire upright when the tire is falling. The weight of these tires may lead to serious injury or death.



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Mounted tires stored as spares must be inflated to the minimum inflation pressure necessary to keep the tire beads properly seated. Maximum inflation pressure of the stored tire must, in no instance, exceed 15% of the tire's cold inflation pressure.

WHEN REPAIRS ARE NECESSARY

1. Only qualified maintenance personnel who understand the systems being repaired must attempt repairs.
2. Many components on the Komatsu truck are large and heavy. Ensure that lifting equipment - hoists, slings, chains, lifting eyes - are of adequate capacity to handle the lift.
3. DO NOT stand under a suspended load. DO NOT work under raised body unless body safety cables, props, or pins are in place to hold the body in up position.
4. DO NOT repair or service the truck while the engine is running, except when adjustments can only be made under such conditions. Keep a safe distance from moving parts.
5. When servicing any air conditioning system with refrigerant, wear a face shield and cold resistant gloves for protection against freezing. Ensure all current regulations for handling and recycling refrigerants are followed.
6. Follow package directions carefully when using cleaning solvents.
7. If an auxiliary battery assist is needed, refer to Jump Starting With Booster Cables or Jump Starting With Receptacles earlier in this section.
8. Before performing any welding on the truck, always turn the battery disconnect switches to the OFF position and disconnect the alternator positive cable. Failure to do so may seriously damage the battery and electrical equipment. It is not necessary to disconnect or remove any control circuit cards on electric drive dump trucks or any of the Alarm Indicating Device (AID) circuit control cards.
9. If a truck is to be towed for any reason, use a rigid tow bar. Check the truck cab for decals for special towing precautions. (Also refer to the Operation and Maintenance Manual, Operating Instructions - Towing.)
10. Drain, clean and ventilate fuel tanks and/or hydraulic tanks before making any welding repairs.



Any operating fluid, such as hydraulic oil or brake fluid escaping under pressure, can have sufficient force to enter a person's body by penetrating the skin. Serious injury and possibly death may result if proper medical treatment by a physician familiar with this injury is not received immediately.

11. Relieve pressure in lines or hoses before making any disconnects.
12. After adjustments or repairs, replace all shields, screens and clamps.
13. Working near tires can be dangerous. Use extreme caution when working around tires.



DO NOT stand in front of a rim and locking ring when inflating a tire mounted on the machine. Observers must not be permitted in the area.

DO NOT weld or apply heat to the rim assembly with the tire mounted on the rim. Resulting gases inside the tire may ignite, causing explosion of the tire and rim.

14. Only a qualified operator or experienced maintenance personnel who are also qualified in operation can move the truck under its own power in the repair facility or during road testing after repairs are complete.

Always fasten the welding machine ground (-) lead to the piece being welded; the grounding clamp must be attached as near as possible to the weld area. Never allow welding current to pass through ball bearings, roller bearings, suspensions, or hydraulic cylinders. Always avoid laying welding cables over or near the vehicle electrical harnesses. Welding voltage could be induced into the electrical harness and cause damage to components.

SPECIAL PRECAUTIONS FOR WORKING ON AN 830E-AC TRUCK

Preliminary Procedures before Welding or Performing Maintenance

Prior to welding and/or repairing an 830E-AC dump truck, maintenance personnel must attempt to notify a Komatsu service representative. Only qualified personnel, specifically trained for servicing the AC drive system, must perform this service.

If it is necessary to perform welding or repair to the truck without the field engineer present, the following procedures must be followed to ensure that the truck is safe for maintenance personnel to work on and to reduce the chance for damage to equipment.



Anytime the engine is operating:

- **DO NOT open any of the cabinet doors or remove any covers.**
- **DO NOT use any of the power cables for hand holds or foot steps.**
- **DO NOT touch the retarding grid elements.**



Before opening any cabinets or touching a grid element or a power cable, the engine must be shutdown and the red drive system warning lights must not be illuminated.

Engine Shutdown Procedure before Welding or Performing Maintenance

Normal operation of the drive system at shutdown will leave the system safe to maintain. However, in the event of a system failure, performing the following procedure prior to any maintenance activities will ensure that no hazardous voltages are present in the AC drive system.

1. Before shutting down the engine, verify the status of all the drive system warning lights on the overhead display panel. Use the lamp test switch to verify that all lamps are functioning properly.

If any of the red drive system warning lights remain on, DO NOT attempt to open any cabinets, disconnect any cables, or reach inside the retarder grid cabinet without a trained drive system technician present - even if engine is off.

Only qualified personnel, specifically trained for servicing the A-C drive system, must perform this service.

2. If all red drive system warning lights are off, follow all of the instructions for "Parking The Machine."
3. After the engine has been off for at least five minutes, inspect the link voltage lights on the exterior of the main control cabinet and rear of the center console. If all lights are off, the retard grids, wheel motors, alternator, and related power cables are safe to work on.
4. Locate the GF cut-out switch in the front access panel on the left side of the main control cabinet. Place the switch in the CUTOUT position. This will prevent the alternator from re-energizing and creating system voltage until the switch is returned to the previous position.
5. Ensure both battery disconnect switches are in the OFF position. Verify that the battery disconnects are functioning.
6. Before doing any welding on the truck, always disconnect the battery charging alternator lead wire.

7. DO NOT weld on the rear of the control cabinet!
The metal panels on the back of the cabinet are part of capacitors and cannot be heated.
8. DO NOT weld on the retard grid exhaust louvers - they are made of stainless steel. Some power cable panels throughout the truck are also made of aluminum or stainless steel. They must be repaired with the same material or the power cables may be damaged.
9. Power cables must be cleated in wood or other non-ferrous materials. DO NOT repair cable cleats by encircling the power cables with metal clamps or hardware. Always inspect power cable insulation prior to servicing the cables and prior to returning the truck to service. Discard cables with broken insulation.
10. Power cables and wiring harnesses must be protected from weld spatter and heat.

Always fasten the welding machine ground (-) lead to the piece being welded; the grounding clamp must be attached as near as possible to the weld area.

Always avoid laying welding cables over or near the vehicle electrical harnesses. Welding voltage could be induced into the electrical harness and cause damage to components.

Never allow welding current to pass through ball bearings, roller bearings, suspensions, or hydraulic cylinders.

11. If the red lights on the exterior of the control cabinet and/or the back wall of the center console continue to be illuminated after following the above procedure, a fault has occurred.

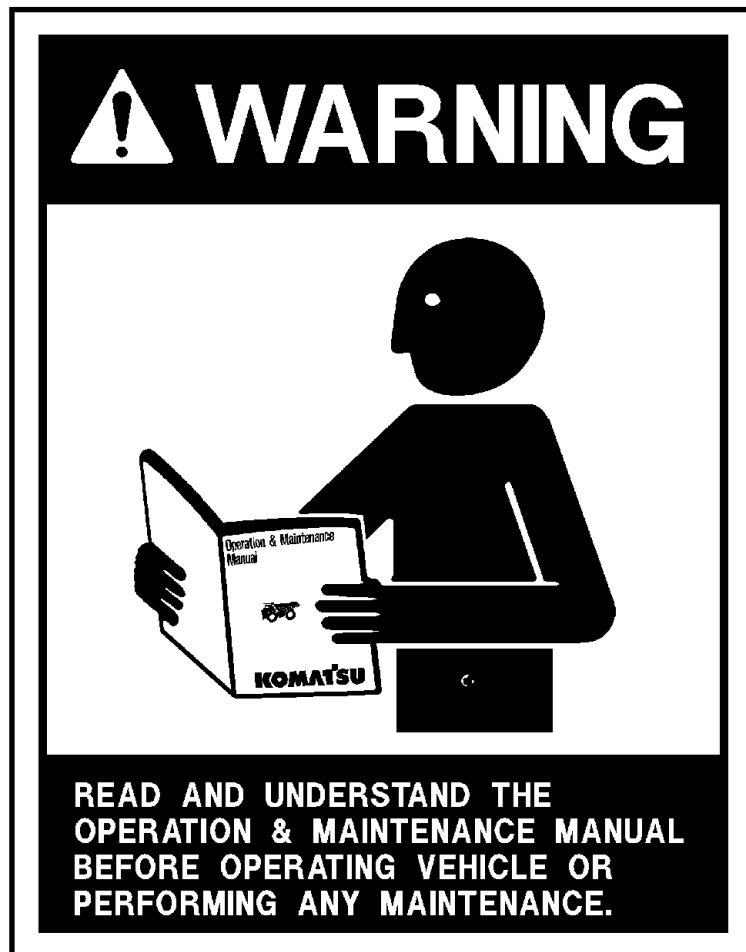
Leave all cabinet doors in place; DO NOT touch the retard grid elements; DO NOT disconnect any power cables, or use them as hand or foot holds.



Notify your Komatsu service representative, immediately. Only qualified personnel, specifically trained for servicing the A-C drive system, must perform this service.

12. Replace all covers and doors and place the GF cutout switch and battery disconnect switches in their original positions. Reconnect all harnesses prior to starting the truck.

Leave the drive system in the rest mode until the truck is to be moved.



WARNINGS AND CAUTIONS

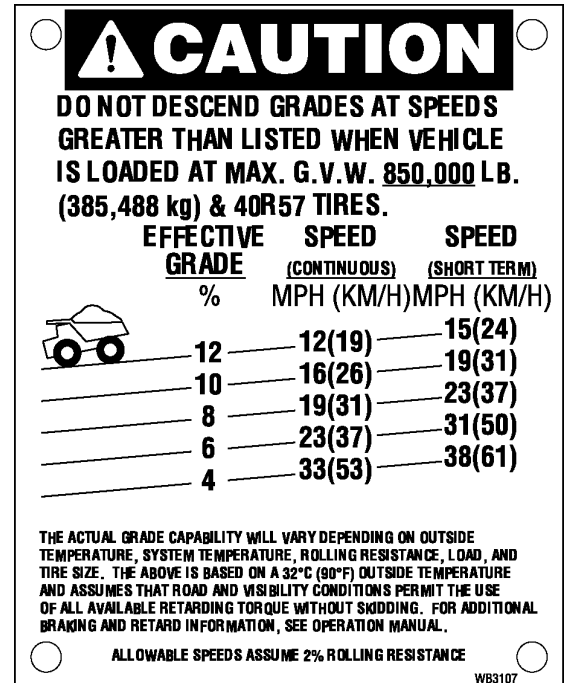
The following pages give an explanation of the warning, caution, and service instruction plates and decals attached to the truck. The plates and decals listed here are typical of this Komatsu model, but because of customer options, individual trucks may have plates and decals that are different from those shown here.

The plates and decals must be kept clean and legible. If any decal or plate becomes illegible or damaged, it must be replaced with a new one.

A warning decal surrounds the key switch located to the right of the steering column on the instrument panel. The warning stresses the importance of reading the operator's manual before operation.

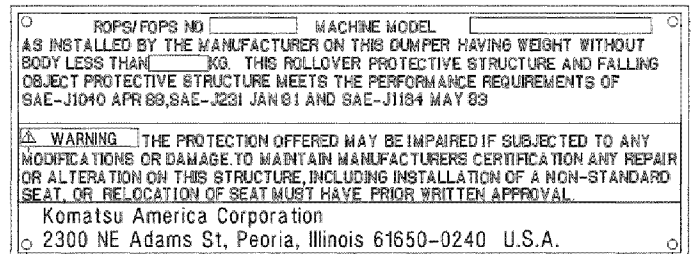


A grade/speed retard chart is located on the left front post of the operator's cab and provides the recommended MAXIMUM speeds to be used when descending various grades with a loaded truck. Always refer to the decal in operator's cab. This decal may change with optional truck equipment such as: wheel motor drive train ratios, retarder grids, tire sizes, etc.



A plate attached to the right rear corner of the cab states the Rollover Protective Structure (ROPS) and Falling Object Protective Structure (FOPS) meets various SAE performance requirements.

! WARNING! DO NOT make modifications to this structure, or attempt to repair damage without written approval from Komatsu. Unauthorized repairs will void certification.

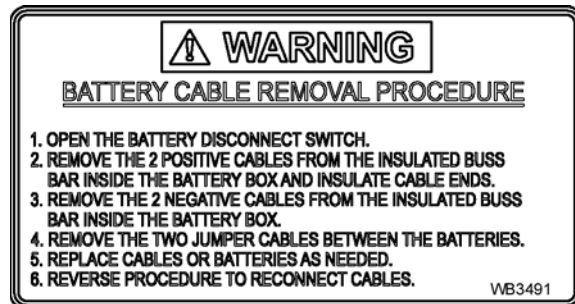
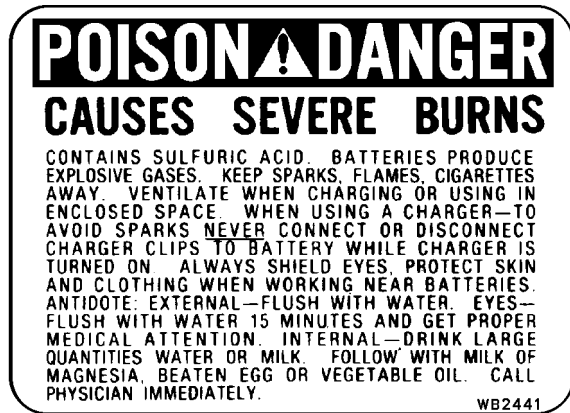


Attached to the exterior of both battery compartments is a danger plate. This plate stresses the need to keep from making any sparks near the battery. When another battery or 24VDC power source is used for auxiliary power, all switches must be OFF prior to making any connections. When connecting auxiliary power cables, positively maintain correct polarity. Connect the positive (+) posts together and then connect the negative (-) lead of the auxiliary power cable to a good frame ground. **DO NOT connect to the negative posts of the truck battery or a ground near the battery box.** This hookup completes the circuit but minimizes danger of sparks near the batteries.

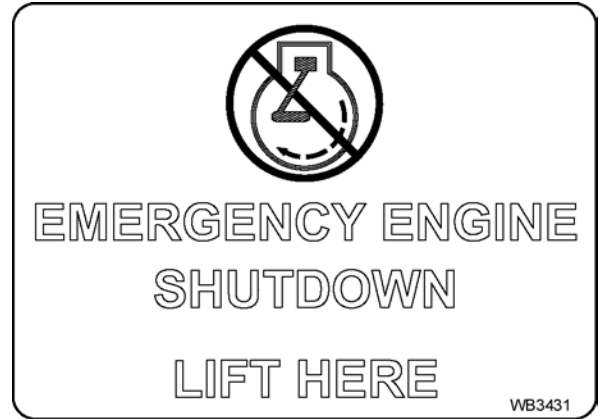
Sulfuric acid is corrosive and toxic. Use proper safety gear, goggles, rubber gloves and rubber apron when handling and servicing batteries. Get proper medical help immediately, if required.

This plate is placed on isolation box cover and the battery box cover to indicate that the battery system (24VDC) is a negative (-) ground system.

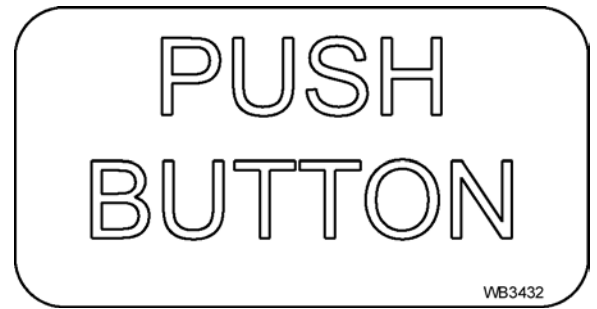
This decal is located on the battery box cover. It details the correct procedure for disconnecting the battery cables from the batteries. Before disconnecting the battery cables, turn the key switch to the OFF position and wait for the engine to stop. After the engine has stopped, wait two minutes, and if no warning lights illuminate, then turn the battery disconnect switches to the OFF position.



This decal is placed on the cover for the ground level engine shutdown switch to indicate where the emergency shutdown control is located. The shutdown switch is mounted above the isolation box.



This decal is located below the engine shutdown switch. It is used for emergency shutdown only. Push the button in to stop the engine.



This decal is located on the isolation box. The isolation box contains the disconnect switches that can be used to isolate the starter, battery and propulsion system circuits.



These plates are located above the battery disconnect switches on the isolation box to indicate the OFF and ON positions of the switches.

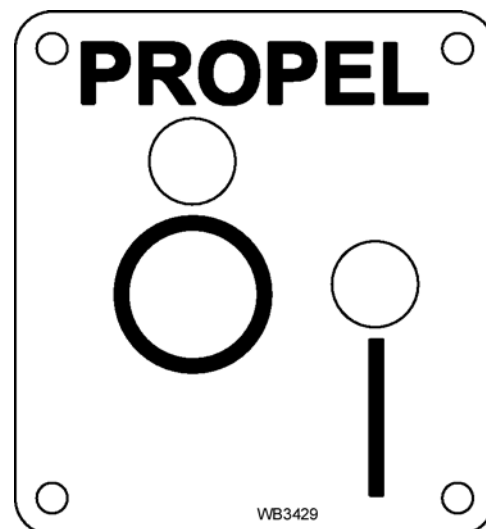
The master switch will disconnect the batteries from the entire electrical system.

The starter switch will disconnect the power supply to the two starters. This will prevent the truck from starting, but will allow for diagnostic testing of the electrical system if the master switch is still ON.

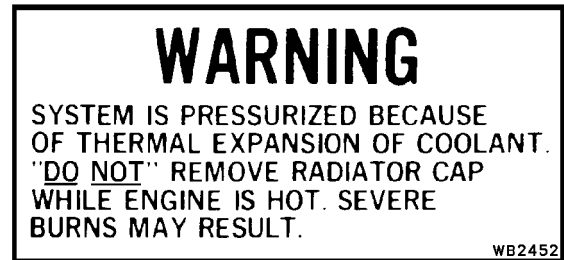
Stop the engine and turn the key switch to the OFF position. After the engine has stopped, wait two minutes, and if no warning lights illuminate, then turn the battery disconnect switches to the OFF position. After the key switch is turned OFF, the interface module remains on, monitoring the park brake function and the accumulator bleeddown function. If a failure in either system is detected, an alarm will sound to notify the operator of a failure in that system. If the battery disconnect switches are turned OFF without waiting two minutes, a potential failure could be masked. Always use the battery disconnect switches before:

- Storing the machine for more than one month
- Replacing electrical system components
- Performing welding maintenance
- Handling batteries, or starting with booster cables
- Replacing fuses or fusible links

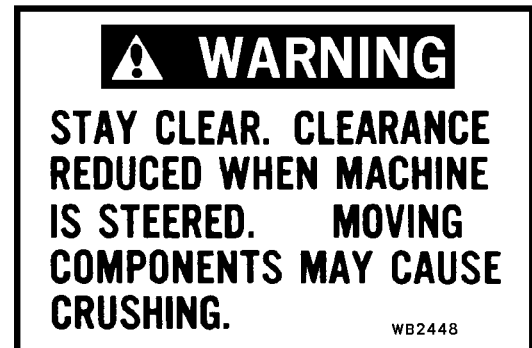
This plate is located above the propel lockout lever on the isolation box to indicate the OFF and ON positions of the lever. When this lever is placed in the OFF position, the truck's AC electric drive system is locked out and the truck will not propel. When the lever is placed in the ON position, the truck's AC electric drive system will function and the truck can be driven.



A warning plate is mounted on top of the radiator surge tank cover near the radiator cap. The engine cooling system is pressurized. **Always turn the key switch OFF and allow the engine to cool before removing the radiator cap.** Unless the pressure is first released, removing the radiator cap after the engine has been operating for a time will result in the hot coolant being expelled from the radiator. **Serious scalding and burning may result.**



Warning plates are mounted on the frame in front of, and to the rear, of both front tires. All personnel are warned that the clearances change when the truck is steered and could cause serious injury.



Warning plates are attached to both the hydraulic tank and fuel tank to alert technicians not to work on the truck with the body in the raised position unless the body-up retention device (pins or cable) is in position.



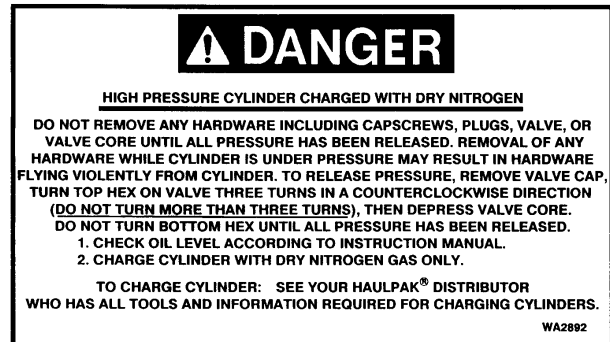
These danger plates are mounted on the outside of each frame rail to alert technicians to read the warning labels attached to the side of each of the accumulators (see below) prior to releasing internal nitrogen pressure or disconnecting any hydraulic lines or hardware. There are similar decals mounted on top of each of the accumulators (both steering and brake) with the same danger message.



This danger plate is attached to all four suspensions.

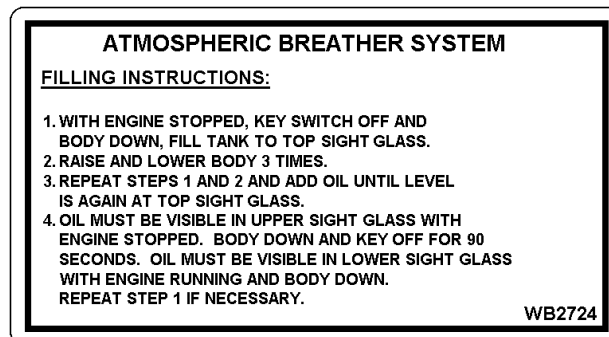
The plate contains instructions for releasing internal pressure before disconnecting any hardware.

Serious injury can occur if these directions are not followed.

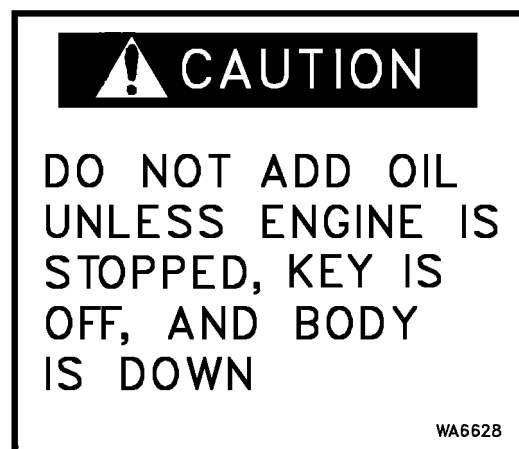


A plate on the side of the hydraulic tank furnishes instructions for filling the hydraulic tank.

Keep the system open to the atmosphere only as long as absolutely necessary to lessen the chances of system contamination. Service the tank with clean Type C-4 hydraulic oil. All oil being put into the hydraulic tank must be filtered using filters rated at three microns.



A caution decal is attached below the hydraulic tank oil level sight gauge. Check level with body down, engine stopped, and key switch OFF. Add oil per filling instructions, if oil level is below top of sight glass.



A warning plate is attached to the hydraulic tank to inform technicians that high pressure hydraulic oil is present during operation. When it is necessary to open the hydraulic system, Ensure the engine is stopped and key switch is OFF to bleed down hydraulic pressure. There is always a chance of residual pressure being present. Open fittings slowly to allow all pressure to bleed off before removing any connections.



Any operating fluid, such as hydraulic oil, escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. Serious injury and possibly death may result if proper medical treatment by a physician familiar with this injury is not received immediately.

A wheel motor oil level decal is attached to the gear cover on both electric wheel motors. This decal stresses the fact that the truck must be on a level surface and parked for 20 minutes prior to checking the oil level. This is necessary in order to get an accurate reading.

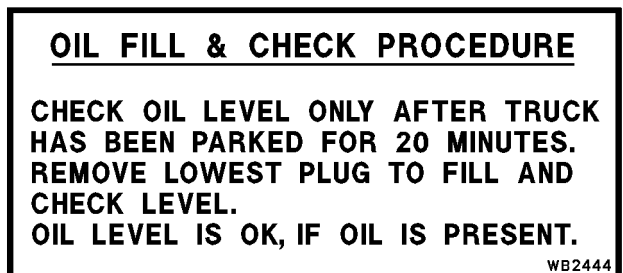
A decal plate located on the frame near the left hoist cylinder provides the operator or technician with the hook-up procedure for dumping a loaded, disabled truck. The use of a functional truck for hydraulic power is required.

Refer to the Section L for additional instructions for using this procedure.

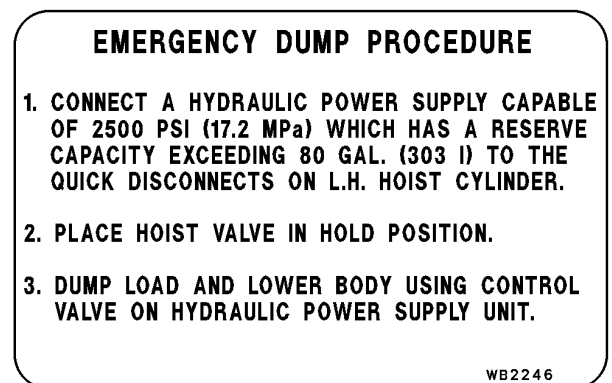
Warning decals are applied to both brake accumulators located inside the brake system cabinet behind the operator cab. These decals remind servicing technicians to close the accumulator drain valves after they have been opened to bleed brake pressure. It further warns not to over-tighten the drain valves to prevent damage to the valve seat(s).



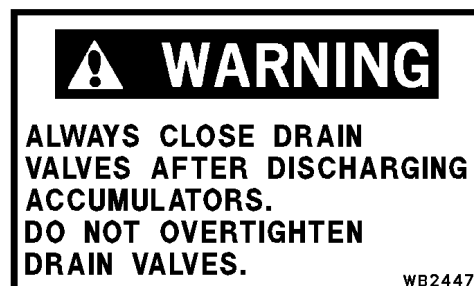
WB2439



WB2444



WB2246

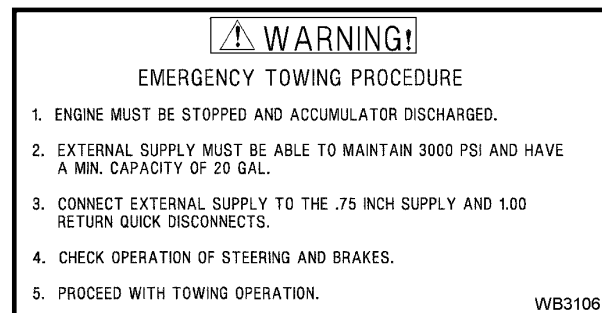


WB2447

A warning plate alerts the technician to stop the engine, turn the key switch OFF, and open the drain valves on all three accumulators to bleed the hydraulic system pressure before disconnecting a brake line.



A decal plate is located on the frame near the left hoist cylinder. It provides the operator or technician with the hydraulic hook-up procedure before towing a disabled truck, by using a functional truck for hydraulic power.



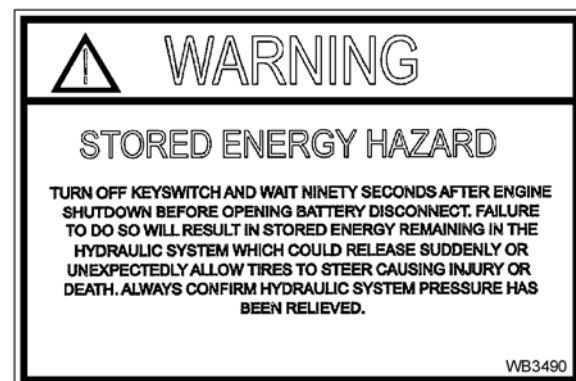
This decal is located on the automatic lubrication reservoir informing the technician that the cover must never be removed for filling purposes as there is potential for dirt or debris entering the system. Always fill the grease reservoir through the coupling provided where the grease passes through a filter before entering the reservoir.



This warning decal is located below the battery disconnect switches to warn personnel not to disconnect the batteries during the first 90 seconds after turning the key switch off.

Turn the key switch to the OFF position and wait for the engine to stop. After the engine has stopped, wait two minutes, and if no warning lights illuminate, then turn the battery disconnect switches to the OFF position.

The first 90 seconds after the key switch is turned off is the bleddown process. Turning the battery disconnect switches off within 90 seconds could interrupt the bleddown process and leave stored energy in the accumulator. Wait two minutes after the engine has stopped, then observe for bleddown malfunction warning light in overhead panel. If warning is being displayed, notify maintenance immediately. Turning the battery disconnect switches to the OFF position sooner than two minutes could mask a problem that was detected during the bleddown process.



This caution decal is placed near the battery disconnect switches to alert servicing technicians that before doing any welding on the truck, always disconnect the battery charging alternator lead wire before making any welding repairs.

Turn the key switch to the OFF position and wait for the engine to stop. After the engine has stopped, wait two minutes, and if no warning lights illuminate, then turn the battery disconnect switches to the OFF position. Then disconnect the battery charging alternator lead wire.

Always fasten the welding machine ground (-) lead to the piece being welded; **grounding clamp must be attached as near as possible to the weld area.** Never allow welding current to pass through ball bearings, roller bearings, suspensions, or hydraulic cylinders. Always avoid laying welding cables over or near the vehicle electrical harnesses. Welding voltage could be induced into the electrical harness and possibly cause damage to components.

A high voltage danger plate is attached to the door of the rear hatch cover. High voltage may be present!

Only authorized personnel can access this rear housing.

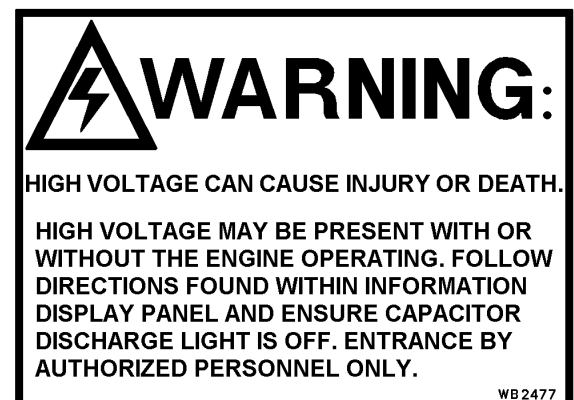
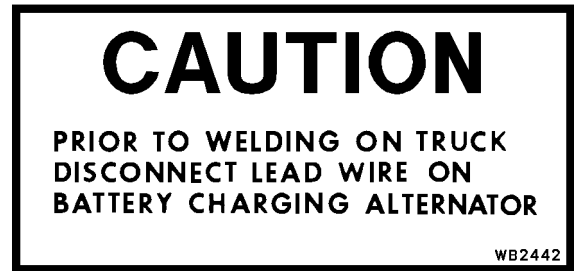
A caution decal is also attached to the door of the rear hatch cover to alert personnel that hot exhaust air is present and may cause injury.

This caution decal is also placed around the retarding grid cabinet.

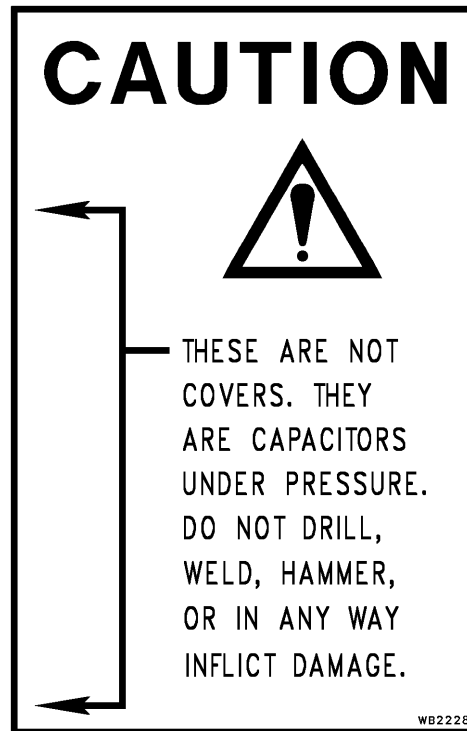
These warning plates are mounted on all of the AC drive control housings and cabinets.

High voltage may be present, with or without, the engine running!

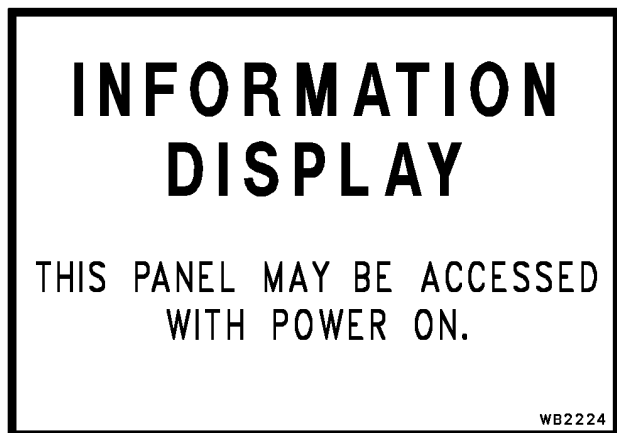
Only authorized personnel can access these cabinets.



This caution decal is placed on the back of the control cabinet to alert service technicians that this area contains capacitors and must not be disturbed in any manner.



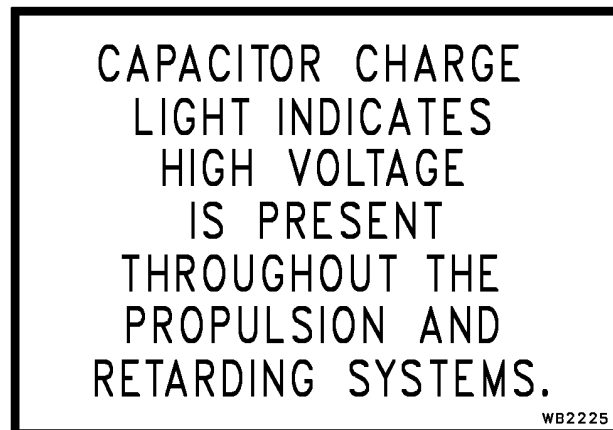
This information decal is placed on the outside of the door panel on the control cabinet wall that faces the right side of the operator cab.



This decal is placed near three different indicator lights:

- In the operator cab, on the rear of the center console.
- On the front of the control box which is mounted on the right side of the main control cabinet.
- On the outside of the left control cabinet wall that faces the right side of the operator cab. (See also Information decal above.)

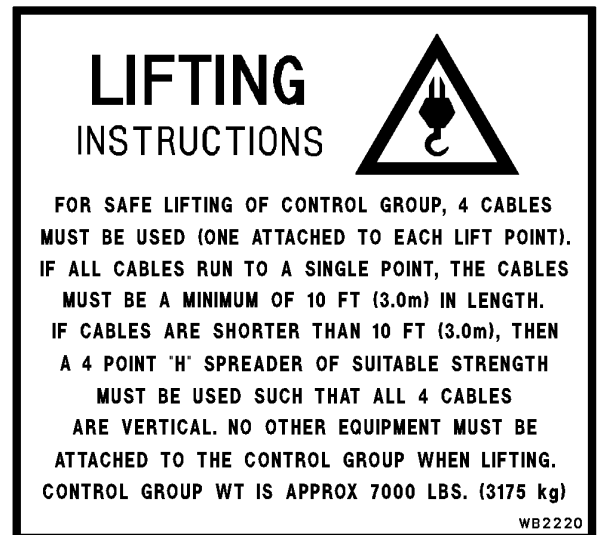
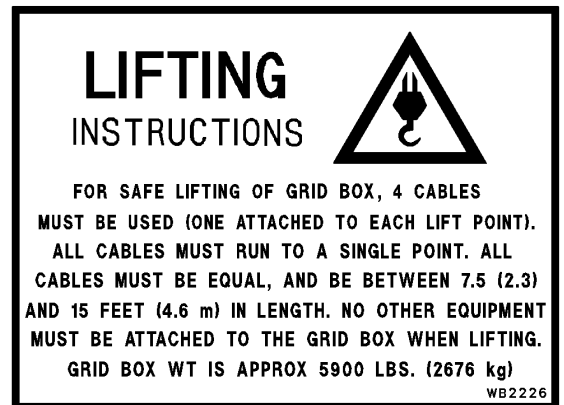
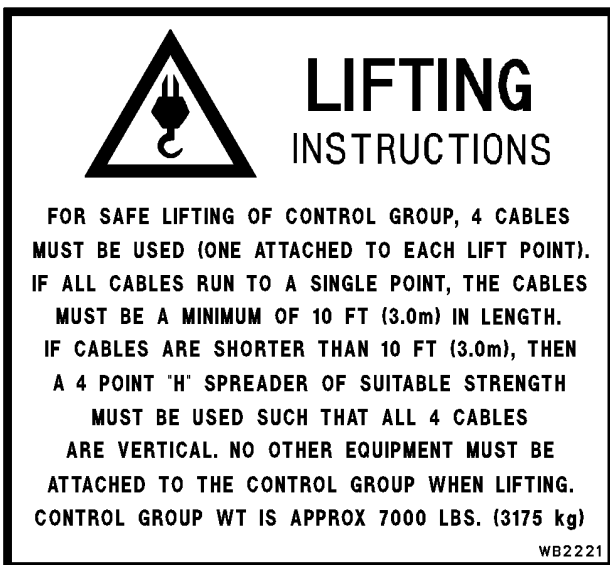
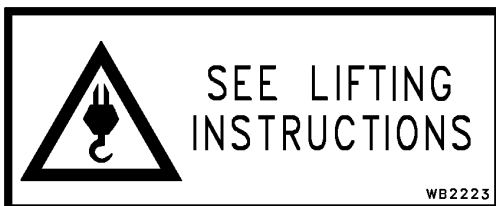
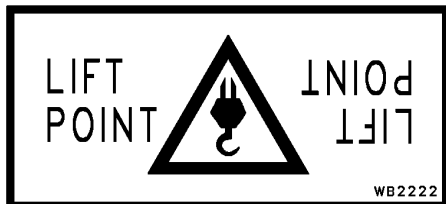
When any of these indicator lights are on, high voltage is present throughout the propulsion and retarding system. Extreme care must be exercised!



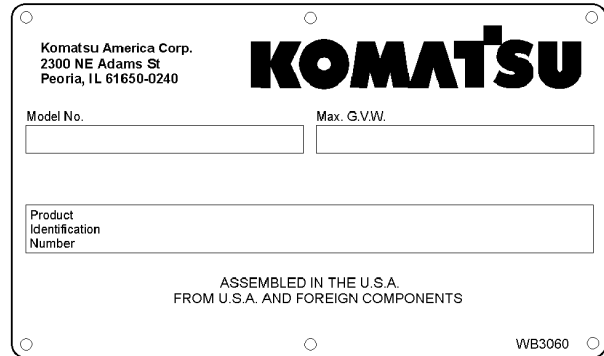
This page illustrates a variety of decals which are mounted on deck mounted cabinets, housings, and structures which must be lifted in a specific manner, and from specific points, in order to safely move or lift any of these structures.

If any of these decals are damaged or defaced, so that it is no longer legible, it must be replaced immediately.

Maintenance personnel must follow these lifting instructions.



A product identification plate is located on the frame in front of the right side front wheel and shows the truck model number, maximum GVW and Product Identification Number (PIN).



The PIN consists of 19 total characters. The first and last characters are tamper preventative symbols (*). The remaining 17 alpha/numeric characters are used to identify 5 characteristics of the machine. The 5 characteristics are detailed below.

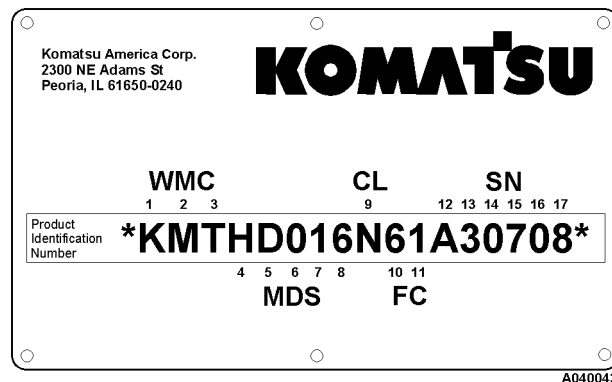
WMC - Character positions 1, 2 and 3 identify the Worldwide Manufacturer Code (WMC). The WMC designates the manufacturer of the product. Komatsu brand products are identified with the letters KMT.

MDS - Character positions 4, 5, 6, 7 and 8 identify the Machine Descriptor Section (MDS). The MDS code identifies general information regarding machine specifications. The MDS is a code for the machine type and model.

CL - Character position 9 identify the Check Letter (CL). The CL is used to verify the accuracy of the individual PIN.

FC - Character positions 10 and 11 identify the Factory Code (FC). The FC identifies the Komatsu factory in charge of claims for the product. The FC for electric drive trucks is 61.

SN - Character positions 12, 13, 14, 15, 16, and 17 identify the Serial Number (SN). The SN is a unique sequential number.



The lubrication chart is mounted on the right hand side of the radiator grille structure. Refer to Section P, Lubrication and Service, in this manual for more complete lubrication instructions.

LUBRICATION CHART

LUBRICATION SPECIFICATIONS

LUBE KEY	TYPE LUBRICANT
A	ENGINE OIL - - - - SEE ENGINE MANUAL
B	HYDRAULIC OIL - - - - SAE 10W C - 4 - - - - AUXILIARY HEATERS REQUIRED BELOW -10°F(-23°C)
C	HEAVY-DUTY SYNTHETIC GEAR OIL - - - - SEE DRIVE SYSTEM MANUAL
D	MULTI - PURPOSE EXTREME PRESSURE GREASE - - - - NLGI NO.2 (5% MIN. MOLY-DISULFIDE)
E	MULTI - PURPOSE GEAR OIL - - - - SAE 80W - 90

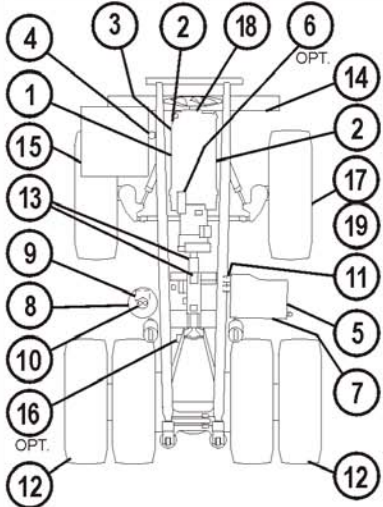
SYM	DESCRIPTION	PTS	LUBE KEY	10 HR	50 HR	100 HR	250 HR	500 HR	1000 HR	2000 HR	2500 HR
1	CRANKCASE OIL LEVEL	1	A	CHECK							
2	ENGINE LUBE OIL FILTERS			SEE ENGINE MANUAL							
3	FUEL FILTER										
4	FUEL SEPERATOR (DAVCO)										
5	FUEL TANK	1									
6	GE PREFILTER BLOWER	1	D								
7	FUEL TANK BREATHER	1								CLEAN	
8	HYDRAULIC OIL LEVEL	1	B	CHECK						*CHANGE	
9	HYDRAULIC STRAINER	2								CLEAN	
10	HYDRAULIC TANK BREATHER	2								CHANGE	
11	HYDRAULIC FILTERS	3			**	**	**			CHANGE	
12	MOTORIZED WHEEL OIL LEVEL	2	C	SEE DRIVE SYSTEM MANUAL							
13	HYD. PUMP DRIVE SHAFT	2	D							GREASE	
14	CHASSIS LUBE LEVEL	1	D							GREASE	
15	SEAT SLIDES & STEER SHAFT	4	D							GREASE	
16	WHEEL MOTOR BLOWER	2	D							GREASE	
17	FRONT WHEEL BEARINGS ***	2	E							CHECK	
18	FRONT TRUNION	1	D							GREASE	CHANGE
19	MAGNETIC PLUG FRONT WHL COVER ****	2								CHECK	

* 1000 HR INTERVAL CAN BE EXTENDED TO 2500 HR PROVIDED OIL SAMPLING AND ANALYSIS IS CONDUCTED EVERY 250 HR.

** ONE-TIME CHANGE AT 50, 100 AND 250 HR.

*** NOT APPLICABLE FOR 930E

**** APPLICABLE FOR 930E ONLY



630E, 730E, 830E, & 930E

WB2790

NOTES:

TRUCK OPERATION

PREPARING FOR OPERATION

The safest trucks are those which have been properly prepared for operation. At the beginning of each shift, a careful check of the truck must be made by the operator before starting the engine.

Safety Is Thinking Ahead

Prevention is the best safety program. Prevent a potential accident by knowing the employer's safety requirements, all necessary job site regulations, as well as use and care of the safety equipment on the truck. Only qualified operators or technicians can operate or maintain a Komatsu truck.

Safe practices start before the operator gets to the equipment!

- Wear the proper clothing. Loose fitting clothing, unbuttoned sleeves and jackets, jewelry, etc., can catch on a protrusion and cause a potential hazard.
- Always use the personal safety equipment provided for the operator such as hard hats, safety shoes, safety glasses or goggles. There are some conditions when protective hearing devices must also be worn for operator safety.
- When walking to and from the truck, maintain a safe distance from all machines, even if the operator is visible.

WALK AROUND INSPECTION

At the beginning of each shift, a careful walk around inspection of the truck must be performed before the operator attempts engine start-up. A walk around inspection is a systematic ground level inspection of the truck and its components to ensure that the truck is safe to operate before entering the operator's cab.

Start at the left front corner of the truck (see illustration, next page), and move in a counter-clockwise direction. Move front-to-rear, across the rear, and continuing forward up the opposite side of the truck to the original starting point.

If these steps are performed in sequence, and are repeated from the same point and in the same direction before every shift, many potential problems may be avoided, or scheduled for maintenance. Unscheduled downtime and loss of production can be reduced as a result.

Local work practices may prevent an operator from performing all tasks suggested here. To the extent permitted, the operator must follow this or a similar routine.

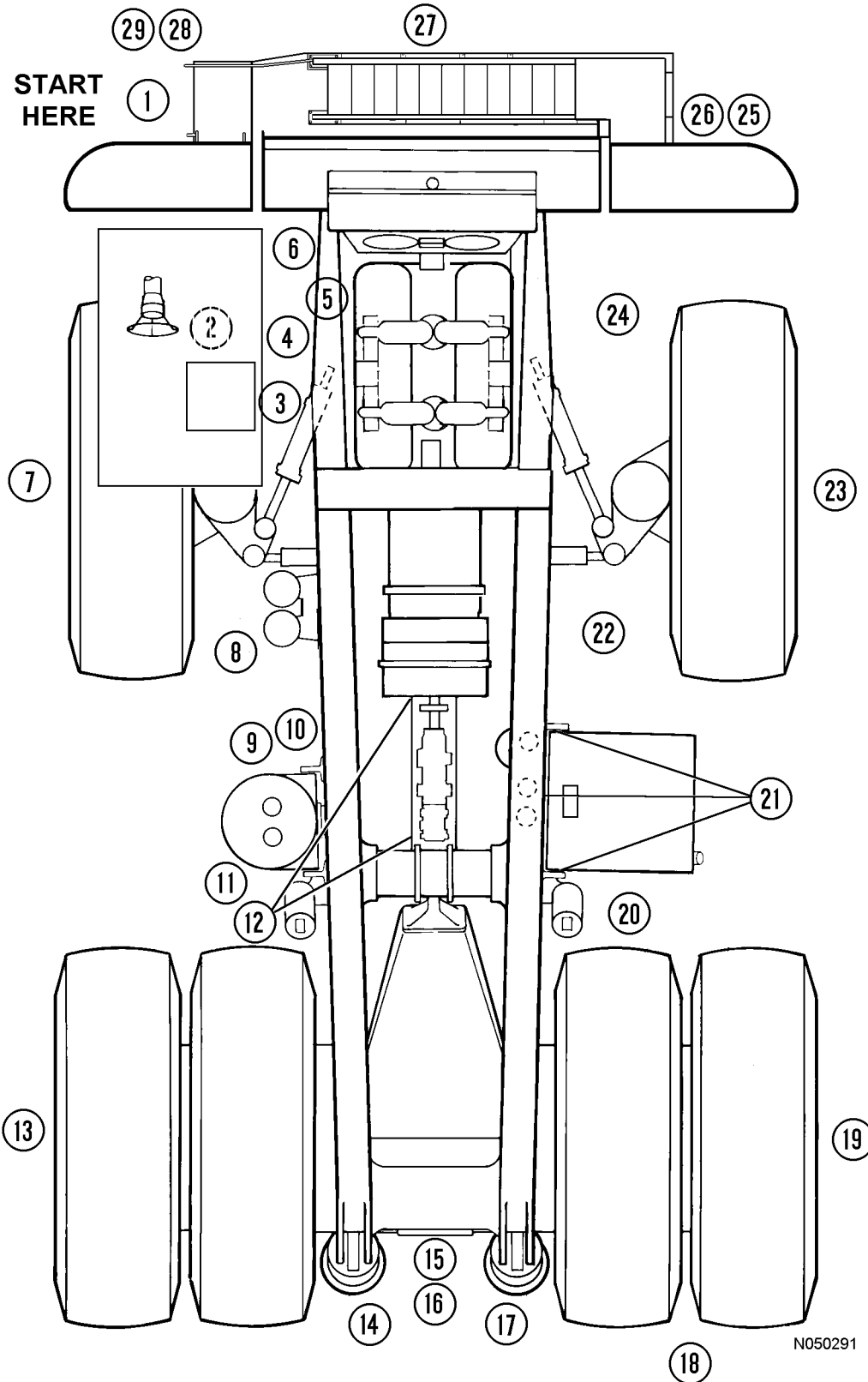


High voltage may be present on this truck! DO NOT open any electrical cabinet doors on the truck while the engine is operating! Never climb on any power cables or use power cables for handholds or footholds, unless the engine has been shut off and the system has been verified as at rest!

1. Start at left front of the truck. While performing the walk around inspection, visually inspect all lights and safety equipment for external damage from rocks or misuse. Ensure lenses are clean and unbroken.

Empty the dust pans on the left side of the air cleaners. Ensure the battery box covers are in place and secure.
2. Move behind the front of the left front tire. Inspect the hub and brake assemblies for leaks and any abnormal conditions.
3. Check that all suspension attaching hardware is secure and inspect the mounting key area for evidence of wear. Check that the suspension rod extension is correct, and that there are no leaks. Ensure the suspension protective boot is in good condition.
4. Inspect the anchor end of the steering cylinder for proper greasing and all parts are secure.
5. With the engine stopped, check the engine oil level. Use the service light if necessary.
6. Inspect air conditioner belts for correct tension, obvious wear, and tracking. Inspect fan guard security and condition. When leaving this point, be sure to turn off the service light, if used.
7. Move outboard of the front wheel. Inspect attaching lugs/wedges to be sure all are tight and complete. Inspect the tires for cuts, damage or bubbles. Check tire inflation pressure. Check sight glass for front wheel oil level.

PREPARING FOR OPERATION GROUND LEVEL CHECKS



8. Move behind the front wheel and inspect the steering cylinder. Check for proper greasing and inspect the mounting hardware to ensure it is all in place. Inspect the suspension mounting hardware to ensure it is all in place. Ensure the suspension protective boot is in good condition. Inspect the hub and brakes for any unusual conditions. Check the entire area for leaks.
9. Inspect the sight glass on the hydraulic tank. With the engine stopped and body down, hydraulic fluid must be visible in the upper sight glass.
10. Verify all hydraulic tank shut off valves are locked in their fully open positions.
11. Move around the hydraulic tank and in front of the rear dual tires. Inspect the hoist cylinder for any damage and leaks. Inspect both upper and lower hoist cylinder pins for integrity and for proper greasing.
12. Before leaving this position, look under the lower edge of the chassis to ensure the flexible duct that carries the air from the blower to the final drive housing is in good condition with no holes or breakage. Also, look up at the main hydraulic pumps to see that there is no leakage or any other unusual condition with the pumps or the pump drive shafts.
13. Move around the dual tires, and check to see that all lugs/wedges are in place and tight. Inspect latches on the wheel cover to be sure they are properly latched. Inspect the wheel for any oil that would indicate brake leakage or wheel motor leakage.

Check the dual tires for cuts, damage or bubbles. Verify that inflation appears to be correct. If the truck has operating on a flat tire, the tire must be cool before moving the truck inside a building. Check for any rocks that might be lodged between the dual tires. Inspect the rock ejector condition and straightness so that it can not damage a tire.
14. Inspect the left rear suspension for damage and for correct rod extension. Check for leaks. Ensure that the covers over the chrome piston rod are in good condition. Inspect for proper greasing.
15. Open the rear hatch cover, turn on work light, if necessary. Inspect for leaks around wheel motor mounting to rear housing, and also brake hoses and fittings. Ensure that covers on wheel motor sump are in place, and that there are no rags or tools left behind. Inspect condition of hatch cover gasket, report any bad gasket to maintenance. Turn off work light if used, close and latch hatch.
16. While standing in front of the rear hatch, look up to see that rear lights are in good condition, along with the back-up horns. Look up at the panhard rod to see that it is getting proper greasing. Also look at both body hinge pins for greasing and any abnormal condition. Check hoist limit switch and clear any mud/debris from contacts.
17. Perform the same inspection on the right rear suspension as done on the left.
18. Move around the right dual tires. Inspect between the tires for rocks, and check the condition of the rock ejector. Inspect the tires for cuts or damage, and for correct inflation.
19. Perform the same inspection for wheel lugs/wedges, wheel cover latches, and wheel leaks that was done on the left hand dual wheels.
20. Move in front of the right dual tires and inspect the hoist cylinder in the same manner as the left side. Check integrity and condition of the body-up limit switch. Remove any mud/dirt accumulation from the switch.
21. Move around the fuel tank. Inspect the fuel sight gauge, (this must agree with the gauge in the cab). Inspect the attaching hardware for the fuel tank at the upper saddles, and then at the lower back of the tank for the security and condition of the mounts. Check the hoist filters for leaks.
22. Move behind the right front wheel, and inspect the steering cylinder. Check for proper greasing and inspect the mounting hardware. Check the suspension mounting hardware and suspension extension. Ensure the suspension protective boot is in good condition. Inspect the hub and brakes for any unusual conditions. Check the entire area for leaks.

23. Move around the right front wheel; check that all lugs/wedges are in place and tight.
24. Move in behind the front of the right front wheel, check the hub and brakes for leaks and any unusual condition. Check the fuel filters for leaks. Inspect the steering cylinder for secureness and for proper greasing. Inspect the engine compartment for any leaks and unusual conditions. Inspect the fan guard and belts. Check for any rags or debris behind the radiator.
25. Inspect the auto lube system. Refer to Automatic Lubrication System in Section P, for specific details concerning the auto lube system.
26. Move around to the right front of the truck, drop the air cleaner pans and empty.
27. While in front of the radiator, inspect for any debris in the radiator and remove. Check for any coolant leaks. Inspect headlights and fog lights. Inspect the battery box cover for damage and ensure it is in place and secure.
28. Ensure the ground level engine shutdown button is pulled up. Inspect the fire control actuator to ensure the safety pin is in place and the plastic tie that prevents accidental actuation is in place and in good condition. Ensure the battery disconnect switches and propel lockout lever are ON. Always use grab rails and the ladder when mounting or dismounting the truck. Clean the ladder and hand rails of any foreign material, such as ice, snow, oil or mud.
29. Use the stairs and handrails while climbing from the first level to the cab deck.

30. When checking the coolant level in the radiator, use the coolant level sight gauge. If it is necessary to remove the radiator cap, relieve coolant pressure by depressing the pressure relief button, and then slowly removing the radiator cap.

WARNING

If the engine has been running, allow the coolant to cool before removing the fill cap or draining the radiator. Serious burns may result if skin comes in contact with hot coolant.

31. Inspect the covers over the retarding grids and ensure they are secure. Inspect the main air inlet to ensure it is clear. Ensure all cabinet door latches are secure.
32. Move to the back of the cab. Open the doors to the brake cabinet and inspect for leaks.
33. Clean the cab windows and mirrors. Clean out the cab floor as necessary. Ensure steering wheel, controls and pedals are free of any oil, grease or mud.
34. Stow personal gear in the cab in a manner that does not interfere with truck operation. Dirt or trash buildup, specifically in the operator's cab, must be cleaned. DO NOT carry tools or supplies in the cab of the truck or on the decks.
35. Adjust the seat and the steering wheel for use.
36. Read and understand the description of all operator controls. Become familiar with all control locations and functions before operating the truck.

WARNING

Always mount and dismount ladders facing the truck. Never attempt to mount or dismount while the truck is in motion.

ENGINE START-UP SAFETY PRACTICES

Never attempt to start the engine by shorting across the cranking motor terminals. This may cause a fire, or serious injury or death to anyone in the machine's path.

Start the engine from the operator's seat only.

1. Ensure all personnel are clear of the truck before starting the engine. Always sound the horn as a warning before actuating any operational controls. If the truck is in an enclosure, ensure there is adequate ventilation before start-up. Exhaust fumes are dangerous!
2. The directional control lever must be in the PARK position before starting.

NOTE: The park brake will always be applied whenever the directional control lever is in the park position and the truck is moving slower than 0.5 mph.

Move the rest switch to the ON position to put the drive system in rest mode of operation. Refer to discussion of the rest switch in Section 32, Operator Cab Controls.

3. If the truck is equipped with auxiliary cold weather heater system(s), DO NOT attempt to start the engine while the heaters are in operation. Damage to coolant heaters will result!



4. The key switch is a three position (OFF, RUN, START) switch. When the switch is rotated one position clockwise, it is in the RUN position and all electrical circuits (except START) are activated.
 - a. Turn key switch to the RUN (not START) position.
 - b. With the directional control lever in PARK, rotate the key switch fully clockwise to the START position, and hold this position until the engine starts (see *NOTE* below). The START position is spring-loaded and will return to RUN when the key is released.

NOTE: This truck is equipped with an engine prelude system. With this feature, a noticeable time delay may occur (while engine lube oil passages are being filled and pressurized) before engine cranking will begin.

- c. After the engine has started, place the rest switch in the OFF position to enable the drive system. Refer to the discussion on the rest switch in Section 32, Operator Cab Controls.



Starting fluid is extremely volatile and flammable! Use with extreme care.

If truck is equipped with optional engine starting aid and ambient temperature is below 10°C (50°F), turn the key switch to the START position, and while cranking the engine, move the engine starting aid switch to the ON position for three seconds **MAXIMUM**, then release engine starting aid. If the engine does not start, wait 15 seconds before repeating the procedure.

NOTE: The electric cranking motors have a 30 second time limit. If the 30 second limit is reached, cranking will be prohibited for two minutes. After two minutes, cranking will be allowed. If the 30 second limit is reached seven consecutive times, the key switch must be turned to the OFF position. This will allow the interface module to power down and reset, which requires seven minutes to complete. The cranking motor warning light in the overhead panel will also illuminate if the 30 second time limit or seven attempts is reached.

AFTER ENGINE HAS STARTED

1. Become thoroughly familiar with steering and emergency controls. After the engine has been started, DO NOT accelerate engine speed or drive truck until low pressure and warning systems are normal, and the coolant temperature is at least 71°C (160°F).
2. Test the truck steering in extreme right and left directions. If the steering system is not operating properly, shut the engine off immediately. Determine the steering system problem and have it repaired before resuming operation.
3. Operate each of the truck's brake circuits at least twice prior to operating and moving the truck. These circuits include individual activation from the operator's cab of the service brake, parking brake, and wheel brake lock. With the engine running and with the hydraulic circuit fully charged, activate each circuit individually.
 - a. Park the truck on level ground.
 - b. To operate the park brake, place the directional control lever in the PARK position.
 - c. To operate the wheel brake lock, apply the service brake and move directional control lever to neutral. Release service brakes, and apply wheel brake lock. Turn the wheel brake lock OFF, then back ON again.
 - d. Release wheel brake lock and apply service brakes several times.
 - e. With service brakes applied, move directional control lever to PARK.
4. If any application or release of any brake circuit appears sluggish or improper, or if warning alarms are activated on application or release, shut the engine off and notify maintenance personnel. DO NOT operate the truck until the brake circuit in question is fully operational.
5. Check the gauges, warning lights and instruments before moving the truck to ensure proper system operation and proper instrument functioning. Pay special attention to braking and steering circuit hydraulic warning lights. If warning lights come on, shut off the engine immediately and determine the cause.
6. Ensure the headlights, work lights and taillights are in proper working order. Good visibility may prevent an accident. Check operation of the windshield wipers.

EMERGENCY STEERING SYSTEM

Operation

This truck is equipped with an emergency steering system. This system is a backup in the event of loss of oil supply to the main steering system. The emergency steering system was designed to meet or exceed SAE J1511 and ISO 5010 standards.

If the low steering system pressure indicator light and alarm are activated, a failure in the hydraulic oil supply to the steering and brake system exists. When the alarm is activated, typically there is enough hydraulic pressure stored in the brake and steering accumulators to allow brief operation of the steering and brake functions. However, this oil supply is limited. Therefore, it is important to stop the truck as quickly and safely as possible after the alarm is first activated.

If the oil supply pressure drops to a predetermined level, the low brake pressure warning light will also illuminate. If the oil pressure continues to decrease, the brake auto-apply feature will activate the service brakes to stop the truck.

Pre-Operation Testing

NOTE: Komatsu recommends that operators perform this test to verify that the steering accumulator precharge pressure is adequate at the beginning of each shift before operating the truck.



Ensure no one is near the front tires during this test. All personnel are warned that the clearances change when the truck is steered and this could cause serious injury.

This test can only be performed with an empty truck.

1. Park the empty truck on flat, level ground. Lower the dump body onto the frame and stop the engine. Ensure the key switch is in the OFF position.

2. Wait at least 90 seconds to verify that all hydraulic pressure has been relieved from the steering accumulators. Turn the steering wheel from stop to stop. If the front wheels do not move, there is no hydraulic pressure.
3. Check the hydraulic tank oil level. The oil level must be visible in the center of the upper sight glass and must not cover the entire upper sight glass. Add oil if necessary. **DO NOT overfill.**
4. Turn the key switch to the ON position, but **DO NOT** start the engine.
 - a. *Steering system pressure:* Verify that the low steering pressure warning light is illuminated. If it is not illuminated, immediately notify maintenance personnel. **DO NOT** operate the truck until the problem is corrected.
 - b. *Steering accumulator precharge:* Verify that the low accumulator precharge warning light is not illuminated and the warning buzzer is not sounding. If the warning light is illuminated and the buzzer is sounding, immediately notify maintenance personnel. **DO NOT** operate the truck until the problem is corrected.
5. Start the engine and allow the steering accumulators to fully charge. Turn the steering wheel so that the front wheels are straight.
6. Check the hydraulic tank oil level while the engine is on.
 - a. If the oil level is visible in center of the lower sight glass and does not cover the entire lower sight glass, the steering accumulators are adequately charged. Proceed to Step 7.
 - b. If the oil level is below the lower sight glass, the steering accumulators are not adequately charged. Stop the engine and turn the key switch to the OFF position. Immediately notify maintenance personnel. **DO NOT** operate the truck until the problem is corrected.

7. Shut the engine off by using the engine stop button located on the center console. Leave the key switch in the ON position. This allows the steering accumulators to retain their hydraulic charge.

- ❑ If the warning light and buzzer do activate, turn the key switch OFF and notify maintenance personnel. DO NOT operate the truck until the problem is corrected.
- ❑ If the steering accumulators are adequately charged, the low steering pressure warning light and the low accumulator precharge warning light will not illuminate. Continue to the next step.

8. Turn the steering wheel from stop to stop. The front wheels must turn fully to the left and to the right. Eventually, the low steering pressure warning light will illuminate and the warning buzzer will sound. This is normal.

If the front wheels cannot be turned fully to the left and right, or if the warning light and buzzer do not activate, immediately notify maintenance personnel. DO NOT operate the truck until the problem is corrected.

If the truck passes this test, the emergency steering system is functioning properly.

Additional Guidelines

1. When the truck body is raised, DO NOT allow anyone below it unless the body-up retaining cable is in place.
2. DO NOT use the fire extinguisher for any purpose other than putting out a fire! If an extinguisher is discharged, report the occurrence so the used unit can be refilled or replaced.
3. DO NOT allow unauthorized personnel to ride in the truck. DO NOT allow anyone to ride on the ladder or outside of the truck cab. Passengers must be belted into the passenger seat during travel.
4. DO NOT leave the truck unattended while the engine is running. Move the directional control lever to PARK, then shut the engine off before getting out of the cab.

MACHINE OPERATION SAFETY PRECAUTIONS

After the truck engine is started and all systems are functioning properly, the operator must follow all local safety rules to ensure safe machine operation.



If any of the red warning lights illuminate or if any gauge reads in the red area during truck operation, a malfunction is indicated. Stop the truck as soon as safety permits, and stop the engine. Have the problem corrected before resuming truck operation.



The truck is equipped with "slip/slide" control. If this function becomes inoperative, operating the truck with stalled or free spinning wheel motors may cause serious damage to wheel motors! If the truck does not begin to move within ten seconds after depressing the throttle pedal (directional control lever in a drive position), release the throttle pedal and allow wheels to regain traction before accelerating again.

1. Always look to the rear before reversing the truck. Watch for and obey the ground spotter's hand signals before traveling in reverse. Sound the horn (three blasts). The spotter will have a clear view of the total area at the rear of the truck.
2. Operate the truck only while properly seated with seat belt fastened. Keep hands and feet inside the cab compartment while the truck is in operation.

3. Check gauges and instruments frequently during operation for proper readings.
4. Observe all regulations pertaining to the job site's traffic patterns. Be alert to any unusual traffic patterns. Obey the spotter's signals.
5. Match the truck speed to haul road conditions and slow the truck in congested areas. Keep a firm grip on the steering wheel at all times.
6. DO NOT allow the engine to run at idle for extended periods of time.
7. Check the brake lock performance periodically to ensure safe loading and dumping.



DO NOT use the brake lock for parking. When the engine is turned off, hydraulic pressure will bleed down, allowing the brakes to release!

8. Proceed slowly on rough terrain to avoid deep ruts or large obstacles. Avoid traveling close to soft edges and near the edges of a fill area.
9. Truck operation requires a concentrated effort by the driver. Avoid distractions of any kind while operating the truck.

MACHINE OPERATION ON THE HAUL ROAD

1. Always stay alert! If unfamiliar with the haul road, drive with extreme caution. Cab doors must remain closed at all times if the truck is in motion or unattended.
2. Obey all road signs. Keep the truck under control at all times. Govern truck speed by the road conditions, weather and visibility. Report poor haul road conditions immediately. Muddy or icy roads, pot holes or other obstructions can present hazards.
3. Initial propulsion with a loaded truck must begin from a level surface whenever possible. At times, starting on a hill or grade cannot be avoided. Refer to Starting On A Grade With A Loaded Truck later in this chapter.

4. Before traveling in reverse, give a back-up signal of three blasts on the horn. Before starting forward, signal with two blasts on the horn. These signals must be given each time the truck is moved forward or backward.
5. Use extreme caution when approaching a haul road intersection. Maintain a safe distance from oncoming vehicles.
6. Maintain a safe distance when following another vehicle. Never approach another vehicle from the rear, in the same lane, closer than 15 m (50 ft). When driving on a down grade, this distance must not be less than 30 m (100 ft).
7. DO NOT stop or park on a haul road unless unavoidable. If the truck must be stopped on a haul road, park in a safe place, move the directional control lever to PARK, and shut the engine off before leaving the cab. Block the wheels securely and notify maintenance personnel for assistance.
8. While driving on a slope, maintain a speed that will ensure safe driving and provide effective retarding under all conditions (Refer to Dynamic Retarding, in Section 32 Operator Cab Controls.) Refer to the grade/speed retard chart in the operator's cab to determine maximum safe truck speeds for descending various grades with a loaded truck.
9. When operating the truck in darkness, or when visibility is poor, DO NOT move the truck unless all headlights, clearance lights, and tail lights are on. DO NOT back the truck if the back-up horn or lights are inoperative. Always dim the headlights when approaching oncoming vehicles.
10. If the emergency steering light and/or low brake pressure warning light illuminate during operation, immediately steer the truck to a safe stopping area, away from other traffic if possible. Refer to item 7 above.
11. Check the tires for proper inflation during each shift. If the truck has been operating on a flat or under-inflated tire, the truck must remain outside of any buildings until the tire cools.

STARTING ON A GRADE WITH A LOADED TRUCK

Initial propulsion with a loaded truck must begin from a level surface whenever possible. There are circumstances when starting on a hill or grade cannot be avoided. In these instances use the following procedure:

1. Fully depress the service brake pedal (DO NOT use retarder lever) to hold the truck on the grade. With the service brakes fully applied, move the directional control lever to a drive position (FORWARD/REVERSE) and increase engine rpm with the throttle pedal.
2. As engine rpm approaches maximum, and when propulsion effort is felt working against the brakes, release the brakes and allow truck movement. Ensure the service brake pedal is completely released. As truck speed increases above 5-8 kph (3-5 mph) the PSC will drop propulsion if the retarder is still applied.

NOTE: Releasing and reapplying dynamic retarding during a hill start will result in loss of propulsion.

PASSING

1. DO NOT pass another truck on a hill or on a blind curve!
2. Before passing, ensure the road ahead is clear. If a disabled truck is blocking your lane, slow down and pass with extreme caution.
3. Use only the areas designated for passing.

LOADING

1. Approach the loading area with caution. Remain at a safe distance while the truck ahead is being loaded.
2. DO NOT drive over unprotected power cables.
3. When approaching or leaving a loading area, watch for other vehicles and for personnel working in the area.
4. When pulling in under a loader or shovel, follow the spotter's or the shovel operator's signals. The truck operator may speed up loading by observing the location and loading cycle of the truck being loaded ahead, and then following a similar pattern.
5. During loading, the operator must stay in the truck cab with the engine running. Place the directional control lever in NEUTRAL and apply the brake lock.
6. When loaded, pull away from the shovel as quickly as possible with extreme caution.

DUMPING

Raising The Dump Body

1. Approach the dump area with extreme caution. Ensure the area is clear of persons and obstructions, including overhead utility lines. Obey signals as directed by the spotter, if present.
2. Avoid unstable areas. Keep a safe distance from the edge of the dump area. Position the truck on a solid, level surface before dumping.



As the body raises, the truck center of gravity will move. The truck must be on level surface to prevent tipping/rolling!

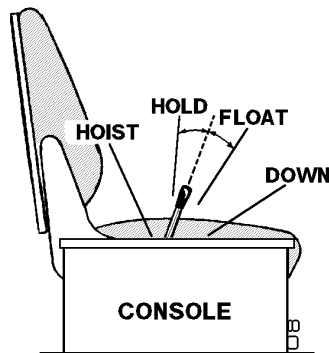
3. Carefully maneuver the truck into the dump position. When backing the truck into the dump position, use only the brake pedal to stop and hold the truck; DO NOT rely on the brake lock to stop the truck; this control is not modulated and applies the rear service brakes only.

- When the truck is stopped and in dump position, apply the brake lock and move the directional control lever to the NEUTRAL position.

⚠ WARNING

The dumping of very large rocks (10% of payload, or greater) or sticky material (loads that do not flow freely from the body) may allow the material to move too fast and cause the body to move RAPIDLY and SUDDENLY. This sudden movement may jolt the truck violently and cause possible injury to the operator, and/or damage to the hoist cylinders, frame, and/or body hinge pins. If it is necessary to dump this kind of material, slowly accelerate engine rpm while raising the body. When the material starts to move, release the hoist lever to the HOLD position. If the material does not continue moving and clear the body, repeat this procedure until the material has been dumped.

- Pull the lever to the rear (to HOIST position) to actuate the hoist circuit. (Releasing the lever anywhere during the raise cycle will hold the body at that position.)



- Raise engine rpm to accelerate hoist speed.
- Reduce the engine rpm as the last stage of the hoist cylinder begins to extend. Keep engine speed at low idle as the last stage reaches half-extension.
- Release the hoist lever as the last stage of the hoist cylinder reaches full extension.

Lowering The Dump Body

(When dumping on flat ground):

It is very likely when dumping on flat ground that the dumped material will build up enough to prevent the body from lowering. In this case, the truck will have to be driven forward a short distance (just enough to clear the material) before the body can be lowered.

- Shift the directional control lever to FORWARD, release brake lock, depress Override button and drive just far enough forward for the body to clear the material. Stop, shift the directional control lever to NEUTRAL apply the brake lock.
- Move the hoist lever forward to the DOWN position and release. Releasing the lever places the hoist control valve in the FLOAT position allowing the body to return to the frame.

NOTE: If dumped material builds up at the rear of the body and the body cannot be lowered, then perform Steps a & b below:



- Move the hoist lever back to the RAISE position to fully raise the dump body. Then, release the hoist lever so it returns to the HOLD position.
- Move the directional control lever to FORWARD, release the brake lock, depress the override button and drive forward to clear the material. Stop, move the directional control lever to NEUTRAL, apply the brake lock and lower the body, again.

NOTE: When an attempt to lower the body is unsuccessful because of material obstruction, raise the body back up. This will help to prevent the body from suddenly dropping when pulling away from the obstruction.

⚠ WARNING

The truck is not to be moved with the dump body raised except for emergency purposes only. Failure to lower the body before moving the truck may cause damage to the hoist cylinders, frame and/or body hinge pins.

- With the body returned to the frame, move the directional control lever to FORWARD, release the brake lock, and carefully leave the dump area.

Lowering The Dump Body

(When dumping over a berm or into a crusher):

1. Move the hoist lever to the DOWN position and release. Releasing the lever places the hoist control valve in the FLOAT position allowing the body to return to the frame.

NOTE: If dumped material builds up at the rear of the body and the body cannot be lowered, perform Steps a & b below:



- a. Move the hoist lever back to the HOIST position to fully raise the dump body. Release the hoist lever to return it to the HOLD position.

NOTE: DO NOT drive forward if the tail of the body will not clear the crusher wall in the fully raised position.

- b. Move the directional control lever to FORWARD, release the brake lock. Depress the override button and drive forward to clear the material. Stop, shift the directional control lever to NEUTRAL, apply the brake lock and lower the body again.

NOTE: When an attempt to lower the body is unsuccessful because of material obstruction, raise the body back up. This will help to prevent the body from suddenly dropping when pulling away from the obstruction.



CAUTION! DO NOT move the truck with the dump body raised except for emergency purposes only. Failure to lower the body before moving the truck may cause damage to the hoist cylinders, frame and/or body hinge pins.

2. With the body returned to the frame, move the directional control lever to FORWARD, release the brake lock, and carefully leave the dump area.

SUDDEN LOSS OF ENGINE POWER

If the engine suddenly stops, there is enough hydraulic pressure stored in the brake and steering accumulators to allow the operation of the steering and brake functions. However, this oil supply is limited so it is important to stop the truck as quickly and safely as possible after the loss of engine power.

If the brake supply pressure drops to a pre-determined level, the low brake pressure warning light will illuminate and a buzzer will sound. If the brake pressure continues to decrease, the auto-apply feature will activate and the service brakes will apply automatically to stop the truck.

1. Bring the truck to a safe stop as quickly as possible by using the foot pedal to apply the service brakes. If possible, safely steer the truck to the side of the road while braking.



**Dynamic retarding will not be available!
DO NOT use the service brakes for continuous retarding purposes.**

2. As soon as the truck has stopped moving, shift the directional control lever to PARK. This will apply the parking brake.
3. Slowly release the service brakes to check the capacity of the parking brake. If the parking brake can not hold the truck stationary, apply the service brakes and hold them ON. DO NOT turn the key switch OFF, and DO NOT release the service brakes.
4. Notify maintenance personnel immediately.
5. If the truck is on level ground, or if the parking brake can hold the truck stationary and the truck is in a stable condition, it is then OK to turn the key switch OFF.
6. If safe to do so, have maintenance personnel place wheel chocks or other mechanisms in front or behind the wheels to reduce the risk of the truck rolling.
7. If traffic is heavy near the disabled machine, mark the truck with warning flags during daylight hours or use flares at night. Adhere to local regulations.

FUEL DEPLETION

The high pressure injection (HPI) fuel system uses fuel to adjust fuel delivery timing by creating a hydraulic link between the upper plunger and the timing plunger. Metered fuel is also used for lubricating the injector plunger and barrel. The maximum demand for metered fuel is required during high speed / low load conditions.



Operating the truck to fuel depletion forces the injector train into a no-follow* condition. No fuel flow between the plungers may cause damage to the injectors and the overhead due to adhesive wear, resulting in costly repairs and unnecessary downtime.



Allowing the Komatsu truck to operate until fuel depletion can lead to unsafe operating conditions possibly resulting in an uncontrollable vehicle and/or personal injury.

SAFE PARKING PROCEDURES

The operator must continue to use safety precautions when preparing for parking and stopping the engine.

In the event that the equipment is being used in consecutive shifts, any questionable truck performance the operator may have noticed must be checked by maintenance personnel before the truck is released to another operator.

1. Park the truck on level ground, if possible. If it is necessary to park on a grade, the truck must be positioned at right angles to the grade.
2. Stop the truck using the service brakes. Place the directional control lever in the PARK position. This will apply the parking brake. Slowly release the service brakes. If the truck starts to roll, apply the service brakes and notify maintenance personnel immediately.
3. If the truck is stationary with only the parking brake applied, place chocks fore/aft of the wheels to reduce the risk of the truck rolling. Each truck must be parked at a reasonable distance from other trucks/equipment.
4. Haul roads are not safe parking areas. In an emergency, pick the safest spot most visible to other machines in the area. If the truck becomes disabled where traffic is heavy, mark the truck with warning flags in daylight, or flares at night.

NORMAL ENGINE SHUTDOWN PROCEDURE

The following procedure must be followed to shut the engine off.

1. Stop the truck out of the way of other traffic. Park on a level surface, free of overhead power lines or other objects that could prevent raising the dump body.
 - a. Reduce engine speed to idle.
 - b. Place the directional control lever in PARK. This will apply the parking brake. **DO NOT** apply the wheel brake lock.

NOTE: If the truck starts to roll, apply the service brakes and notify maintenance personnel immediately.

- c. Ensure the parking brake applied indicator light in the overhead display panel is illuminated.
2. Place the rest switch in the ON position to put the AC drive system in rest mode. Ensure the rest indicator light in the overhead panel is illuminated.
3. Turn the key switch counterclockwise to the OFF position to stop the engine.

The engine may continue to run for up to three minutes after the key switch is turned OFF, if the park brake has been set. The engine may also stop before three minutes has elapsed if the engine coolant is not too hot, and the engine rpm's and fuel delivery has been low for a period of time before the key switch was placed in the OFF position. The engine shutdown light in the overhead panel will be illuminated during the shutdown sequence.

NOTE: If the engine must be shut down immediately, stop the truck, shift the directional control lever to PARK, turn the key switch OFF, then pull up on the engine stop switch located in the operator cab center console. Push the switch back down to enable engine operation.

NOTE: There is also an engine stop switch located at ground level at the left front corner of the truck. When this switch is activated, the engine will stop immediately, with no cooling off time.

4. With the key switch OFF and engine stopped, wait at least two minutes. If any warning lights are illuminated, notify maintenance personnel immediately.
5. Ensure the steering circuit is completely bled down by turning the steering wheel back and forth several times. No front wheel movement will occur when hydraulic pressure is relieved. If the front tires continue to steer after the engine is stopped, notify maintenance personnel.
6. Verify all link voltage lights are off (one on the back side of the center console inside the operator cab, two on the electrical cabinet), and notify maintenance personnel if the lights remain illuminated longer than five minutes after the engine has been stopped.
7. Close and lock all windows. Remove the key from the key switch and lock the cab to prevent possible unauthorized truck operation. Properly dismount the truck. Put wheel chocks in place.

DISABLED TRUCK CONNECTORS

GENERAL

Refer to the appropriate information in this section of the manual for repair and troubleshooting procedures for the hoist system components and steering system components. Refer to Section J for repair and troubleshooting procedures for the hydraulic brake system components.

STEERING AND BRAKE SYSTEM

Quick disconnect fittings are provided to allow operation of the steering and brake circuits for temporary truck operation if the steering/brake pump is not operational. To use this feature, two hoses (supply and return) must be connected to a hydraulic source (such as an operational truck or an auxiliary power unit).

Hookup

1. When the good truck is in position, stop the engine and wait two minutes to allow the hydraulic system to bleed down. Ensure hydraulic pressure has bled off before connecting any hoses.

NOTE: Maximum hydraulic pressure is not to exceed 24 304 kPa (3,525 psi).

2. Connect the hydraulic supply hose to the supply disconnect coupling (4, Figure 30-1).

NOTE: Failure to attach the return hose from the disabled truck to the hydraulic pressure source could cause the disabled truck hydraulic tank to overflow, or potentially damage the hydraulic power source due to lack of oil.

3. Connect the return hose to the return disconnect coupling (3).

NOTE: Because there are check valves incorporated into the bleed down manifold, the pressurized fluid supplied by the hydraulic source using supply disconnect coupling (4) will not supply oil to the brake system. To enable brake system operation, a jumper hose must be installed between the brake disconnect fittings (2 & 5). Once the jumper hose is installed, pressurized oil from the hydraulic pressure source will be supplied to both the steering and the brake circuits.

4. If operable brakes are needed on the disabled truck, connect a jumper hose from brake disconnect coupling (2) to brake disconnect coupling (5).
5. Start the engine on the good truck and check the operation of the steering and brake system before moving the disabled truck.
6. To disconnect the hoses, stop the engine(s). Wait two minutes for the hydraulic system to bleed down. Ensure all hydraulic pressure has been relieved before disconnecting the hoses.
7. Ensure the brake system jumper hose is removed when the supply and return hoses are disconnected from the truck.

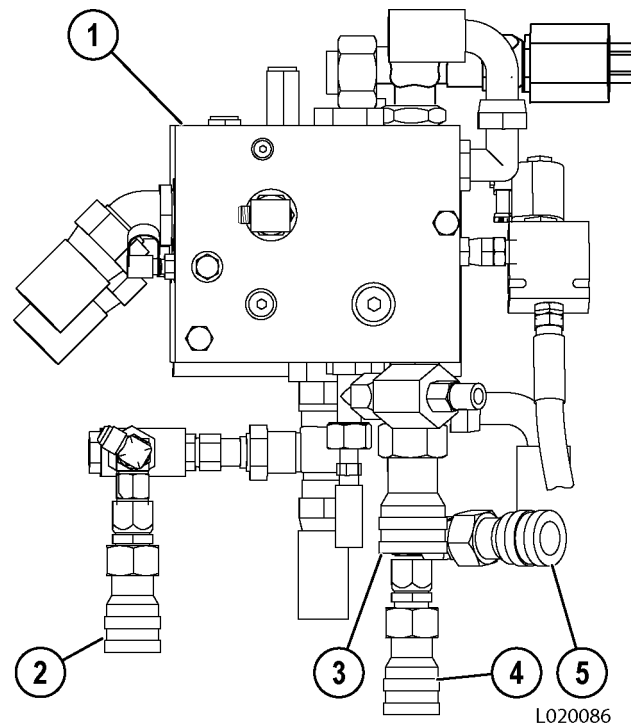


FIGURE 30-1. BLEEDDOWN MANIFOLD

1. Bleeddown Manifold
2. Brake Disconnect # 1
3. Return Disconnect
4. Supply/Inlet Disconnect
5. Brake Disconnect # 2

NOTE: The matching quick disconnect couplings for items (2, 4 & 5) is PB4682. The matching quick disconnect coupling for item (3) is PB4684.

HOIST SYSTEM

Sometimes it is necessary to dump a load from the body of a truck when the hoist system is inoperable. To use this feature, two hoses (supply and return) must be connected to a hydraulic source (such as an operational truck or an auxiliary power unit).

Quick disconnect fittings (1 & 2, Figure 30-2) are provided on the overcenter valve to allow operation of the hoist circuit for temporary truck operation if the hoist pump, hoist valve or other hoist system component is not operational. This will allow maintenance personnel to raise the truck body to dump the load before moving the disabled truck.

In the example, Figure 30-2 illustrates a typical hookup from the good truck. The disabled truck may be another Model 830E, or a different Komatsu electric drive truck model.

The hoist circuit relief valves are adjusted to 17 240 kPa (2,500 psi).

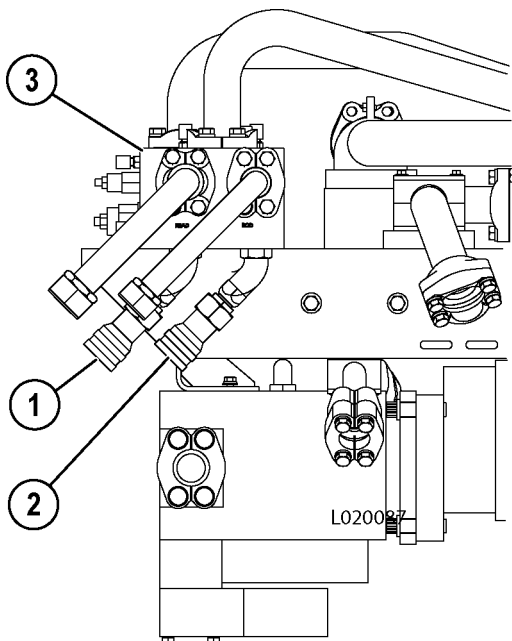


FIGURE 30-2. HOIST CONNECTIONS

1. Power Up Quick Disconnect
2. Power Down Quick Disconnect
3. Over Center Valve

NOTE: The matching quick disconnect couplings for items (1 & 2) is PB4684.

Hookup

Ensure there is an adequate, clear area to dump the loaded box. When the good truck is in position, stop the engine and wait two minutes to allow the hydraulic system to bleed down. Ensure hydraulic pressure has bled off before connecting hoses.

1. With the good truck parked as close as possible to the disabled truck, attach a hose from the **power up** quick disconnect (1, Figure 30-2) to the **power down** circuit of the disabled truck. (Hose must be rated to withstand 17 237 kPa (2,500 psi) or greater pressure.

NOTE: The power down circuit will use a smaller diameter hose (tube) than the power up circuit.

2. Connect another hose from the **power down** quick disconnect (2) to the **power up** circuit of the disabled truck.

*NOTE: If both trucks are a Model 830E, the hoses will be installed at the quick disconnects shown in Figure 30-2 and **will be crossed** when connected.*

Dumping Procedure

Raising the Body:

3. On the disabled truck, move the hoist control lever to power up and then release it to place the hoist pilot valve in the HOLD position (leave in this position during entire procedure).
4. Start the engine on the good truck, place the hoist control in the power down position and increase engine RPM to high idle to dump the disabled truck. If the body of the disabled truck fails to raise, increase the good truck power down relief pressure as follows:
 - a. Stop the engine and wait two minutes to allow the hydraulic system pressure to bleed down.
 - b. Remove the cap from the hoist pilot valve relief valve located in the hydraulics components cabinet behind the cab. While counting the number of turns, slowly screw the relief valve adjustment screw clockwise until it bottoms.
5. Repeat Step 4 to dump the disabled truck.

Lowering the Body:

6. Place the hoist lever of the good truck in FLOAT to lower the body. If necessary, momentarily place the hoist control in POWER UP until the body is able to descend in FLOAT. Do not accelerate the engine.
7. After body is lowered, stop the engine and wait two minutes to allow the hydraulic system to bleed down. Then disconnect the hoses.
8. Reduce power down relief valve pressure to normal on good truck by turning the adjustment counterclockwise the same number of turns as required in step 4 b.
9. Check power down relief pressure using instructions in Section L10.
10. Check hydraulic tank oil level.

TOWING

Prior to towing a truck, many factors must be carefully considered. Serious personal injury and/or significant property damage may result if important safety practices, procedures and preparation for moving heavy equipment are not observed. **DO NOT** tow the truck any faster than 8 kph (5 mph).

A disabled machine may be towed after the following minimum precautions have been taken.

1. Shut the engine off.
2. If equipped, install hydraulic connections for steering and dumping between the tow vehicle and disabled vehicle. Check the disabled vehicle braking and steering systems for normal operation.
3. If the disabled truck is loaded, dump the entire load. Never pull or tow a loaded truck.
4. Inspect the tow bar for adequacy. The bar must be approximately 1.5 times the gross vehicle weight of the truck being towed.
5. Ensure the tow vehicle has adequate capacity to both move and stop the disabled truck under all conditions.
6. Block the disabled truck to prevent movement while attaching tow bar.
7. Release the disabled truck brakes and remove the blocking.
8. Sudden movement may cause tow bar failure. Smooth, gradual truck movement is preferred.
9. Minimize tow angle at all times - never exceed 30°. The disabled truck must be steered in the direction of the tow bar.

RESERVE ENGINE OIL SYSTEM (Optional)

The reserve oil tank for the engine is designed to add more oil capacity to the engine and to make less frequent servicing of the engine oil. The circulation of oil between the engine sump and reserve tank increases the total volume of working oil. This dilutes the effects of contamination and loss of additives and maintains the oil quality over longer periods. A filter in the supply circuit protects the pumping unit and prevents transfer of contaminants to the engine sump which might enter the tank during servicing. It also gives an added level of oil cleanup.

Operation

Engine oil is circulated between the engine sump and the reserve tank by two electrically driven pumps within a single pumping unit (11, Figure 30-3). The pump unit is mounted on the side of the reserve tank, and is equipped with an LED monitor light on one side.

Pump 1 (in the pump unit) draws oil from the engine sump at a preset control point determined by the height of the suction tube. Oil above this point is withdrawn and transferred to reserve tank (9). This lowers the level in the engine sump until air is drawn.

Air reaching the pumping unit activates pump 2 (in the pump unit) which returns oil from the reserve tank and raises the engine sump level until air is no longer drawn by pump 1. Pump 2 then turns off. The running level is continuously adjusted at the control point by alternation between withdrawal and return of oil at the sump.

LED Monitor Light

- Steady - Pump 1 is withdrawing oil from the engine sump and bringing down the oil level.
- Regular Pulsing - Pump 2 is returning oil to the engine sump and raising the oil level.
- Irregular Pulsing - Oil is on the correct operating level.

Changing Oil

1. Drain both the engine sump and the reserve tank. Refill both the engine and reserve tank with new oil to proper levels.
2. Change engine and reserve tank filters as required.
3. Start the engine and check for proper operation.

NOTE: DO NOT use the oil in the reserve tank to fill the engine sump. Both must be at proper level before starting the engine.

4. The engine oil level must be checked with the engine dipstick at every shift change. If the oil level in the engine is incorrect, check for proper operation of the reserve engine oil system.
5. The oil level in the reserve tank must also be checked at every shift change. Use dipstick on fill cap (8) to check oil level. If necessary, add oil to the reserve tank by using the quick fill system utilizing tank fill valve (3). For filling instructions, refer to Section 40, Lubrication and Service.

NOTE: Oil must always be visible in the lower sight gauge (12). If the tank is equipped with three sight gauges, oil must always be visible in the middle sight gauge.

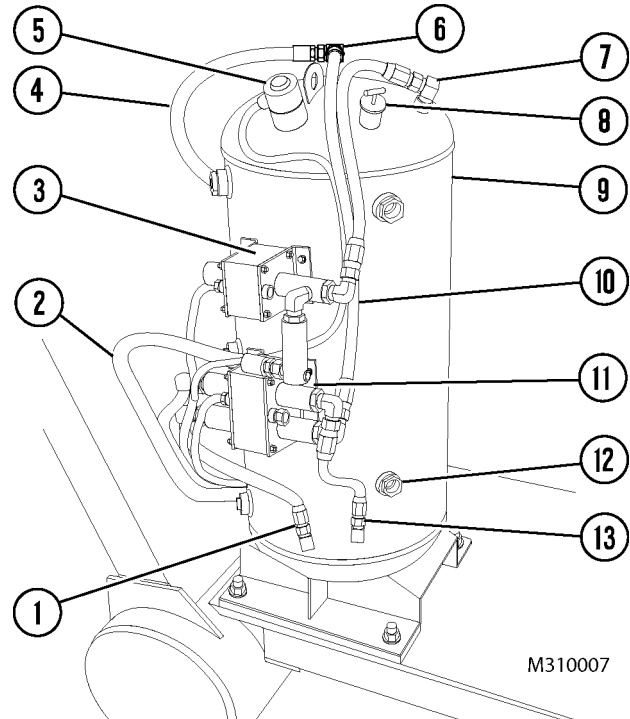
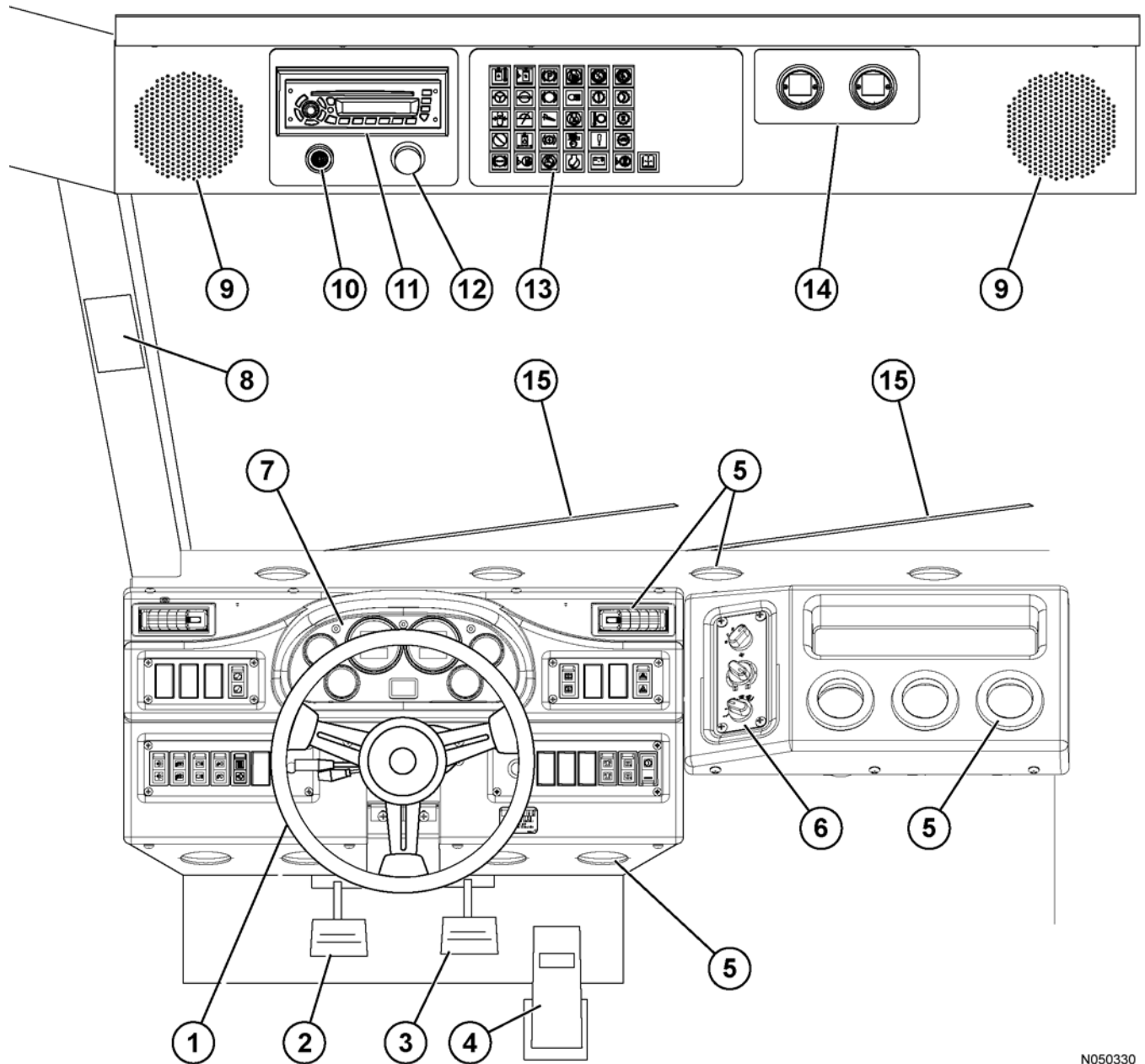


FIGURE 30-3. RESERVE ENGINE OIL SYSTEM

- | | |
|---------------------|----------------------|
| 1. Oil Suction | 8. Fill Cap |
| 2. Oil Tank Fill | 9. Reserve Oil Tank |
| 3. Fill Valve | 10. Engine Fill Line |
| 4. Engine Fill Line | 11. Pump Unit |
| 5. Oil Level Sensor | 12. Sight Gauge |
| 6. Air Valve | 13. Tank Return Line |
| 7. Tank Fill Line | |

OPERATOR CAB AND CONTROLS



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FIGURE 32-1. CAB INTERIOR - OPERATOR VIEW

- | | | |
|---------------------------------|------------------------------------|-------------------------------------|
| 1. Steering Wheel | 6. Heater/Air Conditioner Controls | 11. AM/FM Radio / CD Player |
| 2. Service Brake Pedal | 7. Instrument Panel | 12. Warning Lights Dimmer Control |
| 3. Retard Pedal | 8. Grade/Speed Retard Chart | 13. Warning/Status Indicator Lights |
| 4. Throttle/Accelerator Pedal | 9. Radio Speakers | 14. Air Cleaner Vacuum Gauges |
| 5. Heater/Air Conditioner Vents | 10. Warning Alarm Buzzer | 15. Windshield Wipers |

STEERING WHEEL AND CONTROLS

Steering wheel (1, Figure 32-2) can be telescoped "in" and "out" and the tilt angle can be adjusted to provide a comfortable steering wheel position for most operators.

Horn Button

Horn (2, Figure 32-2) is actuated by pushing the button in the center of the steering wheel. Ensure that the horn operates before moving the truck. Observe all local safety rules regarding the use of the horn as a warning signal device before starting the engine and moving the vehicle.

Tilt / Telescope Lever

The steering column can be telescoped or the wheel tilted with lever (3, Figure 32-2).

Adjust the tilt of the steering wheel by pulling the lever toward the steering wheel and moving the wheel to the desired angle. Releasing the lever will lock the wheel in the desired location.

Adjust the telescope function by pushing the lever forward to unlock. After positioning as desired, release the lever to the lock position.

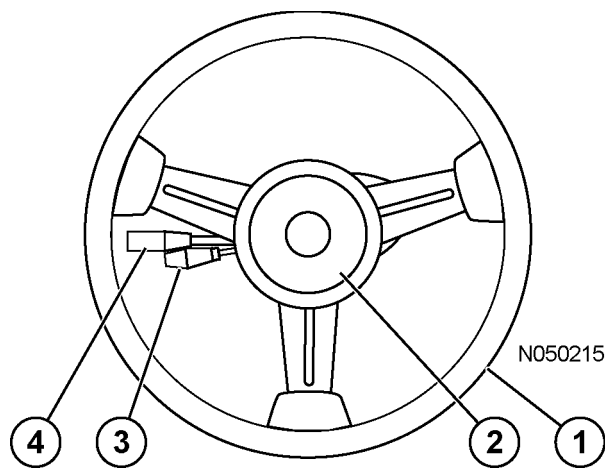


FIGURE 32-2. STEERING WHEEL & CONTROLS


- 1. Steering Wheel
- 2. Horn Button
- 3. Tilt/Telescope Lever
- 4. Multi-Function Turn Signal Switch

Multi-Function Turn Signal Switch




Multi-function turn signal switch (4, Figure 32-2) is used to activate the turn signal lights, the windshield wipers, and to select either high or low beam headlights.

Turn Signal Operation


Move the lever upward to signal a right turn. 

An indicator in the top, center of the instrument panel will illuminate to indicate turn direction selected. Refer to Instrument Panel and Indicator Lights in this section.








Move the lever downward to signal a left turn. 

NOTE: The turn signal does not automatically cancel after the turn has been completed.

High Beam Headlight Operation

Pulling the lever inward (toward the rear of the cab) changes the headlights to high beam. When the high beams are selected, the indicator in the top center of the instrument panel will illuminate. Moving the switch back to the original position will return the headlights to low beam. 

Windshield Wiper Operation

-  Windshield Wipers OFF
-  Intermittent - Long Delay
-  Intermittent -Medium Delay
-  Intermittent -Short Delay
-  Low Speed
-  High Speed
-  Depressing the button at the end of the lever will activate the windshield washer.

PEDALS

Service Brake Pedal

The service brake pedal (2, Figure 32-1) is a foot operated pedal which applies the service brakes. Service brakes must only be applied when dynamic retarding requires additional braking force to slow the truck speed quickly. They must also be used to bring the truck to a complete stop once the speed is less than 4.8 kph (3 mph).

Dynamic Retarding

Dynamic retarding is a braking torque (not a brake) produced through electrical generation by the wheel-motors when the truck motion (momentum) is the propelling force.

For normal truck operation, dynamic retarding must be used to slow and control truck speed.

Dynamic retarding is available in FORWARD/REVERSE at all truck speeds above 0 kph/mph; however, as the truck speed slows below 4.8 kph (3 mph), the available retarding force may not be effective. Use the service brakes to bring the truck to a complete stop.

Dynamic retarding will not hold a stationary truck on an incline. Use the parking brake or wheel brake lock for this purpose.

Dynamic retarding is available in NEUTRAL only when truck speed is above 4.8 kph (3 mph).

When dynamic retarding is in operation, engine rpm will automatically go to an advance retard speed setting. This rpm will vary depending on temperature of several electrical system components.

Dynamic retarding will be applied automatically if the speed of the truck obtains the maximum speed setting programmed in the control system software.

When dynamic retarding is activated, an indicator light in the overhead display will illuminate. The grade/speed retard chart must always be used to determine safe downhill speeds. Refer to Grade/Speed Retard Chart in this chapter.

Dynamic Retard Pedal

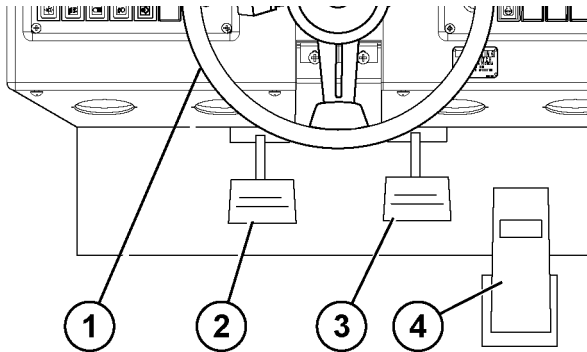
Dynamic retard pedal (3, Figure 32-1) is a foot operated pedal which allows the operator to slow the truck and maintain a safe productive speed without the use of the service brakes. For normal truck operation, only dynamic retarding must be used to slow and control the speed of the truck. The Grade/Speed Chart (8, Figure 32-1) must always be followed to determine MAXIMUM safe truck speeds for descending various grades with a loaded truck. Service brakes must be applied only when dynamic retarding requires additional braking force to slow the truck speed quickly or to bring the truck to a complete stop.

When dynamic retarding is in operation, the engine rpm will automatically go to an advance rpm retard speed setting (usually 1250 rpm)*. Dynamic retarding will be applied automatically, if the speed of the truck reaches the predetermined overspeed retard setting. Dynamic Retarding is available in FORWARD/REVERSE at all truck speeds above 0 kph/mph, but is available in NEUTRAL only when truck speed is above 4.8 kph (3 mph).

Throttle/Accelerator Pedal

Throttle/accelerator pedal (4, Figure 32-1), and shown below, is a foot-operated pedal which allows the operator to control engine rpm depending on pedal depression.

It is used by the operator to request torque from the motors when in forward or reverse. In this mode, the propulsion system controller commands the correct engine speed for the power required. In NEUTRAL, this pedal controls engine speed directly.



GRADE/SPEED RETARD CHART

Grade/speed retard chart (8, Figure 32-1), and shown below, provides the recommended MAXIMUM retarding limits at various truck speeds and grades with a fully loaded truck.

This decal in the truck may differ from the decal below due to optional truck equipment such as: wheel motor drive train ratios, retarder grids, tire sizes, etc. Always refer to this decal in the operator's cab and follow these recommendations for truck operation.

The operator must reference this chart before descending any grade with a loaded truck. Proper use of dynamic retarding will maintain a safe speed.

Two speed lists are provided, one for *continuous* retarding, and the second for *short term* (approximately three-minute) retarding. Both lists are matched to the truck at maximum Gross Vehicle Weight (GVW). The two ratings are guidelines for proper usage of the retard function on downhill grades.

! CAUTION

DO NOT DESCEND GRADES AT SPEEDS GREATER THAN LISTED WHEN VEHICLE IS LOADED AT MAX. G.V.W. 850,000 LB. (385,488 kg) & 40R57 TIRES.

	EFFECTIVE GRADE	SPEED (CONTINUOUS)	SPEED (SHORT TERM)
	%	MPH (KM/H)	MPH (KM/H)
	12	12(19)	15(24)
_____	10	16(26)	19(31)
_____	8	19(31)	23(37)
_____	6	23(37)	31(50)
_____	4	33(53)	38(61)

THE ACTUAL GRADE CAPABILITY WILL VARY DEPENDING ON OUTSIDE TEMPERATURE, SYSTEM TEMPERATURE, ROLLING RESISTANCE, LOAD, AND TIRE SIZE. THE ABOVE IS BASED ON A 32°C (90°F) OUTSIDE TEMPERATURE AND ASSUMES THAT ROAD AND VISIBILITY CONDITIONS PERMIT THE USE OF ALL AVAILABLE RETARDING TORQUE WITHOUT SKIDDING. FOR ADDITIONAL BRAKING AND RETARD INFORMATION, SEE OPERATION MANUAL.

ALLOWABLE SPEEDS ASSUME 2% ROLLING RESISTANCE

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The "short term" numbers listed on the chart indicate the combination of speeds and grades which the vehicle can safely negotiate for a short duration before system components reach the maximum allowable temperature during retarding. These speeds are faster than the "continuous" values, reflecting the thermal capacity of various system components. System components can accept heating at a higher-than-continuous rate for a short period of time. Beyond this short duration of time, the system would become overheated.

If the vehicle is operated at "short term" grade and speed limits for a period of time exceeding thermal capacity, the Propulsion System Controller (PSC) gradually reduces retarding effort from "short term" to "continuous". The "retard @ continuous" indicator light will illuminate alerting the operator of the retarding reduction and the need for a reduction in speed. The operator must use the service brakes to **quickly** slow the truck to maximum "continuous" retarding limits or less.



DO NOT LIGHTLY apply the service brakes when attempting to slow the truck on a downhill grade. Overheating of the brakes will result. FULLY apply the brakes (within safe limits for road conditions) in order to quickly slow the truck to maximum "continuous" retarding limits or less.

NOTE: The "three minute" curve is a MINIMUM; the actual time limit could be greater. Ambient temperature, barometric pressure and recent motor power levels can affect this number.

The "short term" rating will successfully accommodate most downhill loaded hauls. It is necessary to divide haul road grade segment length by allowable speed to determine actual time on grade. If actual time on the grade exceeds the allowable limits, the grade will need to be negotiated at the "continuous" speed.

The "continuous" numbers on the chart indicate the combination of speeds and grades which the vehicle can safely negotiate for unlimited time or distance during retarding.

DO NOT exceed these recommended MAXIMUM speeds when descending grades with a loaded truck.

OVERHEAD PANEL AND DISPLAYS

The items listed below are located on the overhead panel. Refer to Figure 32-1 for the location of each item. A brief description of each component is documented below.

Radio Speakers

Radio speakers (9, Figure 32-1) for the AM/FM Radio / CD Player are located at the far left and right of the overhead panel.

Warning Alarm Buzzer

Warning alarm buzzer (10, Figure 32-1) will sound when activated by any one of several truck functions. Refer to Instrument Panel and Indicator Lights in this section for a detailed description of functions and indicators that will activate this alarm.

Cab Radio

This panel will normally contain AM/FM Radio / CD Player (11, Figure 32-1). Refer to Section 70 for a more complete description of the radio and its functions. Individual customers may use this area for other purposes, such as a two-way communications radio.

Warning Light Dimmer Control

Warning light dimmer control (12, Figure 32-1) permits the operator to adjust the brightness of warning indicator lights (13).

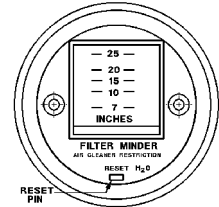
Status/Warning Indicator Light Panel

Panel (13, Figure 32-1) contains an array of indicator lights to provide the operator with important status messages concerning selected truck functions. Refer to Instrument Panel and Indicator Lights in this section for a detailed description of these indicators.

Air Cleaner Vacuum Gauges

Air cleaner vacuum gauges (14, Figure 32-1) provide a continuous reading of the maximum air cleaner restriction reached during operation.

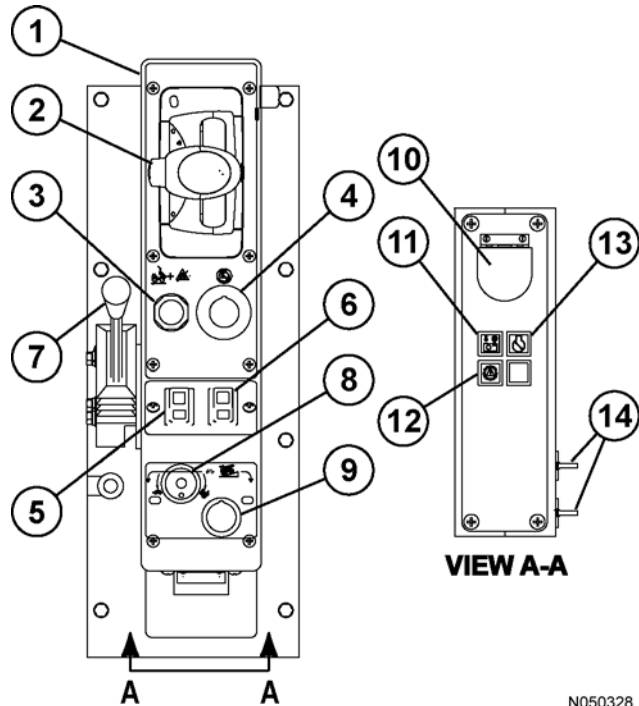
The air cleaner(s) must be serviced when the gauge(s) shows the maximum recommended restriction of 635 mm (25 in.) of H₂O vacuum.



NOTE: After service, push the reset button on face of gauge to allow the gauge to return to zero.

Windshield Wipers

Windshield wipers (15, Figure 32-1) are powered by an electric motor. Refer to Steering Wheel And Controls in this section for a location and description of the windshield wiper and washer controls.

CENTER CONSOLE

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FIGURE 32-3. CENTER CONSOLE

1. Center Console
2. Directional Control Lever
3. Override/Fault Reset Switch
4. Engine Stop Switch
5. L.H. Window Control Switch
6. R.H. Window Control Switch
7. Hoist Control Lever
8. Retarder Speed Control Dial
9. RSC Switch
10. Data Store Button
11. VHMS Snapshot In Progress Light
12. Link Energized Light (Red)
13. Service Engine Light (Blue)
14. 12V Auxiliary Power Outlets

Directional Control Lever

Directional Control Lever (2, Figure 32-3) is mounted on a console to the right of the operator's seat. It is a four position lever that controls the park, reverse, neutral, and forward motion of the truck. Before moving the directional control lever, apply the service brakes to completely stop the truck. Depress the button on the side to release the detent lock, then move the control lever to the desired position. When the control lever is in the center N position, it is in NEUTRAL. When the control lever is in the P position, it is in PARK, and the parking brake will be applied. The parking brake is spring applied and hydraulically released. It is designed to hold the truck stationary when the engine is off and the key switch is turned OFF. The truck must be completely stopped before moving the control lever to PARK, or damage may occur to the park brake. When the key switch is ON, and the control lever is in PARK, the parking brake indicator light (A3, overhead panel, Figure 32-8) will be illuminated.

▲ IMPORTANT ▲

The directional control lever must be in PARK to start the engine.

NOTE: DO NOT move the directional control lever to the PARK position at the shovel or dump.

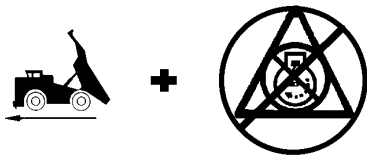
The operator can select FORWARD drive by moving the control lever to the F position.

The operator can select REVERSE drive by moving the control lever to the R position. DO NOT allow the control lever to travel too far and go into the PARK position when REVERSE is desired.

NOTE: The truck must be completely stopped before the control lever is moved to a drive position or into PARK. A GE fault will be recorded if the control lever is placed into the PARK position while the truck is still moving.

Override/Fault Reset Switch

Switch (3, Figure 32-3) is spring-loaded to the OFF position. When pushed in and held, this switch may be used for several functions.



1. This switch permits the operator to override the body-up limit switch and move the truck forward when the directional control lever is in FORWARD, the dump body is raised, and the brakes are released.

Use of the override switch for this purpose is intended for emergency situations only!

2. The push button deactivates the retard pedal function when speed of truck is below 4.8 kph (3 mph).
3. The override switch is also used to reset an electric system fault when indicated by a red warning light. Refer to Overhead Status/Warning Indicators in this section.

Engine Stop Switch

Switch (4, Figure 32-3) is used to stop the engine. Pull the switch up to stop the engine. Push the switch back down to enable engine operation.



Use this switch to stop the engine if the key switch fails to operate, or to stop the engine without turning off the 24 VDC electrical circuits.

A ground level engine stop switch is also located at the right front corner of the truck.

L.H. Window Control Switch

Switch (5, Figure 32-3) is spring-loaded to the OFF position.

- Pushing the front of the switch raises the left side cab window.
- Pushing the rear of the switch lowers the window.

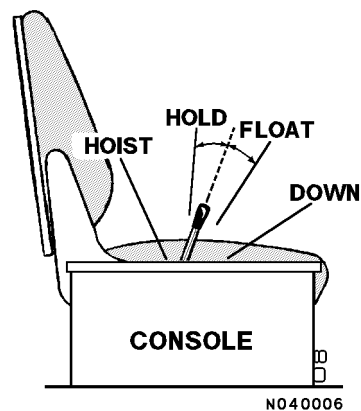
R.H. Window Control Switch

Switch (6, Figure 32-3) is spring-loaded to the OFF position.

- Pushing the front of the switch raises the right side cab window.
- Pushing the rear of the switch lowers the window.

Hoist Control Lever

Hoist control (7, Figure 32-3) is a four position hand-operated lever located between the operator seat and the center console (see illustration below).



Raising The Dump Body

1. Pull the lever to the rear to actuate hoist circuit. (Releasing the lever anywhere during "hoist up" will place the body in HOLD at that position.)
2. Raise engine rpm to increase hoist speed.
3. Reduce engine rpm as the last stage of the hoist cylinders begin to extend and then let the engine go to low idle as the last stage reaches half-extension.
4. Release hoist lever as the last stage reaches full extension.
5. After material being dumped clears the body, lower the body to frame.

Refer to Operating Instructions - Dumping, for more complete details concerning this control

Lowering The Dump Body

Move hoist lever forward to DOWN position and release. Releasing the lever places hoist control valve in the FLOAT position allowing the body to return to frame.

Retard Speed Control (RSC) Adjust Dial

Dial (8, Figure 32-3) allows the operator to vary the downhill truck speed that the retard speed control system will maintain when descending a grade. This function can be overridden by either the accelerator, retard lever, or retard pedal.

When the dial is rotated counterclockwise toward this symbol, the truck will descend a grade at lower speeds.



When the dial is rotated clockwise toward this symbol, the truck speed will increase.



Always refer to the Grade/Speed Retard Chart in the operator's cab and follow the recommendations for truck operation. DO NOT exceed these recommended MAXIMUM speeds when descending grades with a loaded truck.

Throttle pedal position will override RSC setting. If operator depresses throttle pedal to increase truck speed, dynamic retarding will not come on unless truck overspeed setting is reached or foot operated retard pedal is used. When throttle pedal is released and RSC switch is on, dynamic retarding will come on at, or above, the RSC dialed speed and will adjust truck speed to, and maintain, the dialed speed.

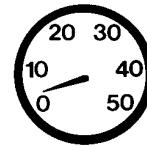
To adjust RSC control, pull switch (9) ON and start with dial (8) rotated toward fastest speed while driving truck at desired maximum speed. Relax throttle pedal to let truck coast and turn RSC adjusting dial slowly counterclockwise until dynamic retarding is activated. Dynamic retarding will now be activated automatically anytime the "set" speed is reached, the RSC switch is on, and throttle pedal is released.

With RSC switch on and dial adjusted, the system will function as follows: As truck speed increases to the "set" speed and throttle pedal released, dynamic retarding will apply. As truck speed tries to increase, the amount of retarding effort will automatically adjust to keep the selected speed. When truck speed decreases, the retarding effort is reduced to maintain the selected speed. If truck speed continues to decrease to approximately 4.8 kph (3 mph) below "set" speed, dynamic retarding will turn off automatically. If truck speed must be reduced further, the operator can turn the adjust dial to a new setting or depress the foot operated retard pedal.

If the operator depresses the foot operated retard pedal and the retard effort called for is greater than that from the automatic system, the foot pedal retard will override RSC.

Retard Speed Control (RSC) Switch

Switch (9, Figure 32-3) turns the system on and off. Push the knob in for OFF and pull the knob out to turn the system ON.



Data Store Button

Button (10, Figure 32-3) is for use by qualified maintenance personnel to record in memory a “snap-shot” of the AC drive system. It will also trigger the VHMS system to store a snap-shot of the truck operating system. Light (11, Figure 32-3) will stay illuminated while the VHMS system is recording the snap-shot.

VHMS Snapshot In Progress Light

Light (11, Figure 32-3) is an indicator that will illuminate while the VHMS system is in the process of taking a snapshot of machine data.

Link Energized Light

Light (12, Figure 32-3) is a red indicator that, when illuminated, indicates that the AC drive system is energized. No one is permitted to work on the AC drive system while this light is illuminated.

Service Engine Light

Light (13, Figure 32-3) is a blue indicator that will illuminate if a problem is detected by the electronic engine monitoring system.

Electric propulsion and dynamic retarding will still be available.

If this light is ON, notify maintenance personnel so they can diagnose and repair the problem the next time the truck is in the shop for repairs or at the next PM (Preventive Maintenance) interval.

DIAGNOSTIC PORTS

The diagnostic ports shown in Figure 32-4 are located on the back wall of the cab next to the D.I.D. Panel.

VHMS Diagnostic Port

Diagnostic port (1, Figure 32-4) is used to download truck operation data from the VHMS controller.

Interface Module (IM) Diagnostic Port

Diagnostic port (2) is used to connect the interface module to a computer for installing software.

Payload Meter Diagnostic Port

Diagnostic port (3) is used to download data from the payload meter system. Refer to Section 60, Payload Meter III, for a more complete description of the payload meter and its functions.

Truck Control Interface (TCI) Diagnostic Port

Diagnostic port (4) is used to access diagnostic information for the Truck Control Interface (TCI).

Propulsion System Controller (PSC) Diagnostic Port

Diagnostic port (4) is used to access diagnostic information for the Propulsion System Controller (PSC).

Engine Diagnostic Port (CENSE)

Diagnostic port (6) is a three pin connector used to access diagnostic information for the engine monitoring system.

Engine Diagnostic Port (QUANTUM)

Diagnostic port (7) is a nine pin connector used to access diagnostic information for the engine control system.

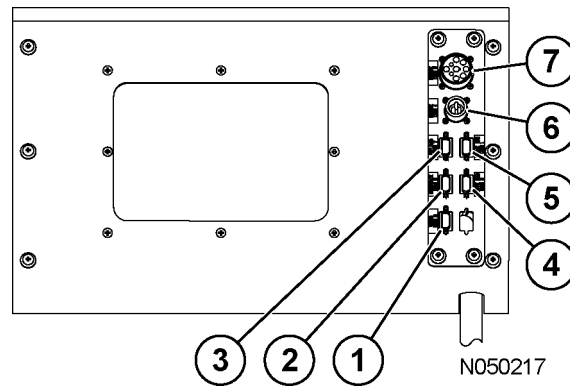


FIGURE 32-4. DIAGNOSTIC PORTS

- | | |
|----------------------------------|-------------------------------------|
| 1. VHMS Diagnostic Port | 5. PSC Diagnostic Port |
| 2. IM Diagnostic Port | 6. Engine Diagnostic Port (CENSE) |
| 3. Payload Meter Diagnostic Port | 7. Engine Diagnostic Port (QUANTUM) |
| 4. TCI Diagnostic Port | |

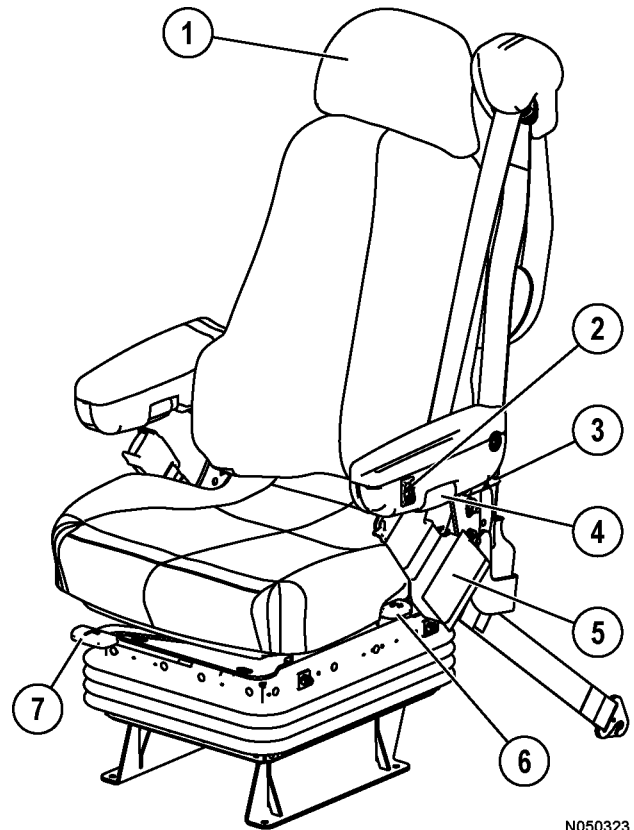
OPERATOR'S SEAT

Adjustment

The operator's seat provides a fully adjustable cushioned ride for driver comfort and easy operation.

The following adjustments must be made while sitting in the seat. Refer to Figure 32-5.

1. **Headrest** - Move headrest (1) up, down, fore, or aft to the desired position.
2. **Seat Height** - Push and hold switch (2) to adjust the height of the seat. Release the switch to lock when the desired height is reached.
3. **Lumbar Support** - Move dial (3) to adjust the lumbar support to the desired position.
4. **Armrest Tilt** - Rotate adjusting knob (4) until the armrest is in desired position.
5. **Seat Belt** - The operator must always have seat belt (5) buckled and properly adjusted whenever the truck is being operated.
6. **Backrest Recline** - Lift handle (6) to select the desired backrest recline. Release the handle to set the position.
7. **Fore/Aft Location of Seat** - Lift and hold lever (7) and move the seat to a comfortable height. Release the lever to lock the height adjustment.



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FIGURE 32-5. OPERATOR'S SEAT ADJUSTMENT CONTROLS

- | | |
|-------------------|---------------------|
| 1. Headrest | 5. Seat Belt |
| 2. Seat Height | 6. Backrest Recline |
| 3. Lumbar Support | 7. Fore and Aft |
| 4. Armrest Tilt | |

HEATER / AIR CONDITIONER CONTROLS

The heater/air conditioner compartment contains heater/air conditioner controls and some of the heater/air conditioner components, such as the blower motor assembly and the heater coil. Optimum cab air climate can be selected by using the following controls in various combinations.

Fan Speed Control Knob

Fan speed control knob (1, Figure 32-6) is provided to control the cab air fan motor. The fan motor is a 3-speed motor (low, medium and high). Speeds are selected by rotating the control knob clockwise to the desired position. OFF is in the full counter-clockwise position. The control knob must be switched ON for the air conditioner to function.

Temperature Control Knob

Temperature control knob (2, Figure 32-6) allows the operator to select a comfortable air temperature.






The control knob determines the operation of the air conditioning and heater modes.

Rotating the control knob counter-clockwise (blue zone (3)) will cause the A/C compressor to operate and result in cooler air temperatures. Full counter-clockwise position is the coldest air setting.

Rotating the control knob clockwise (red zone (4)) will affect coolant flow through the heater core and result in warmer air temperatures. The full clockwise position is the warmest heater setting.

Air Flow Directional Knob

Air flow directional knob (5, Figure 32-6) controls the direction of airflow as follows:

	Provides airflow to floor vents, only.
	Provides airflow to upper vents and floor vents.
	Provides airflow to upper vents, only.
	Defrost - Provides dehumidified air to the windshield.
	Defrost - Provides dehumidified air to the windshield as well as to floor vents.

Heater/Air Conditioner Vents

Heater/air conditioner vents (6, Figure 32-6) may be rotated 360°. There are three vents in the heater/air conditioner compartment, four vents across the top of the instrument panel, and one vent each in the RH and LH instrument panels. There are also an additional four vents under the instrument panel. Air flow through the vents is controlled by manually opening, closing or turning the louvers.

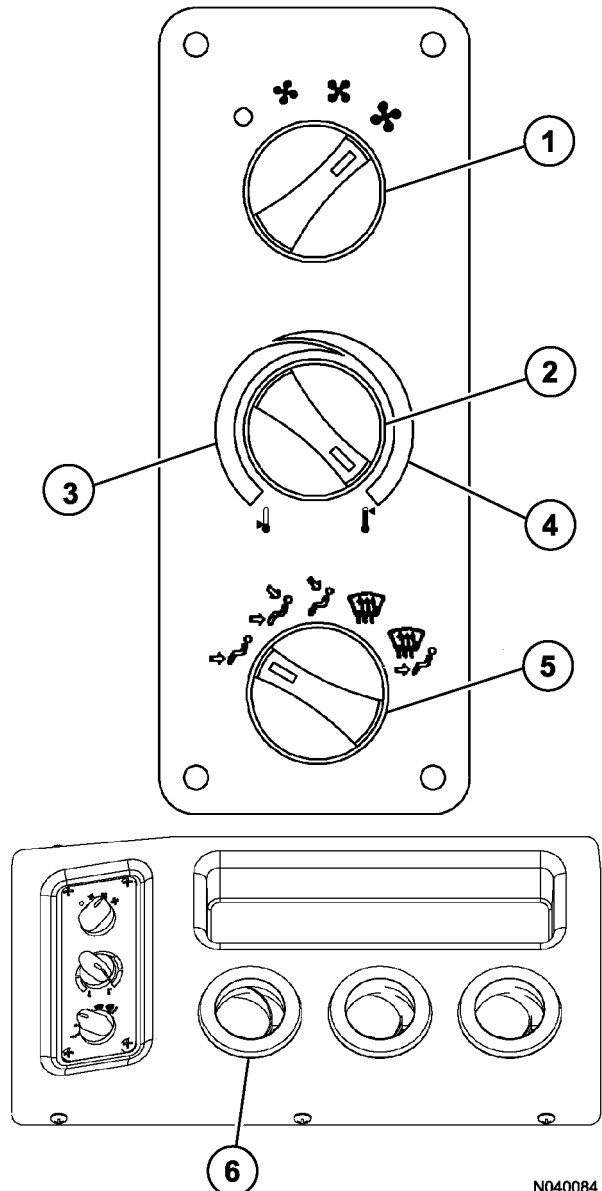


FIGURE 32-6. A/C & HEATER CONTROLS

- | | |
|-----------------------------|------------------------------|
| 1. Fan Speed Control Knob | 4. Red Zone |
| 2. Temperature Control Knob | 5. Air Flow Directional Knob |
| 3. Blue Zone | 6. Vents |

INSTRUMENT PANEL

Control Symbols

The operator must understand the function and operation of each instrument and control. Many control functions are identified with international symbols that the operator must learn to recognize immediately. This knowledge is essential for proper and safe operation.

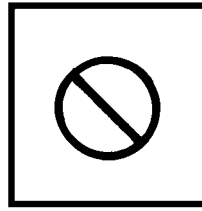
Items that are marked optional do not apply to every truck.

The following symbols are general indicators and may appear in multiple locations and combinations on the instrument panel.

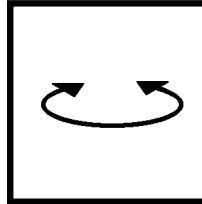
Most switches have two LED lights inside them, one amber and one green in color. The amber is located in the top portion of the switch and indicates that function has been activated. The green LED is located in the lower portion of the switch and indicates that function has not been activated.

- To activate a function, push on the top portion of the switch. At this time, the amber LED will be illuminated, and the green LED will be OFF.
- To de-activate a function, push on the lower portion of the switch. At this time, the green LED will be illuminated, and the amber LED will be OFF.

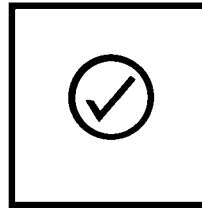
NOTE: The green LED light in the hazard light switch, head light switch and the ladder light switch will be illuminated when battery power is connected to the truck. The LED lights in the other switches will illuminate when the key switch is turned to the ON position.



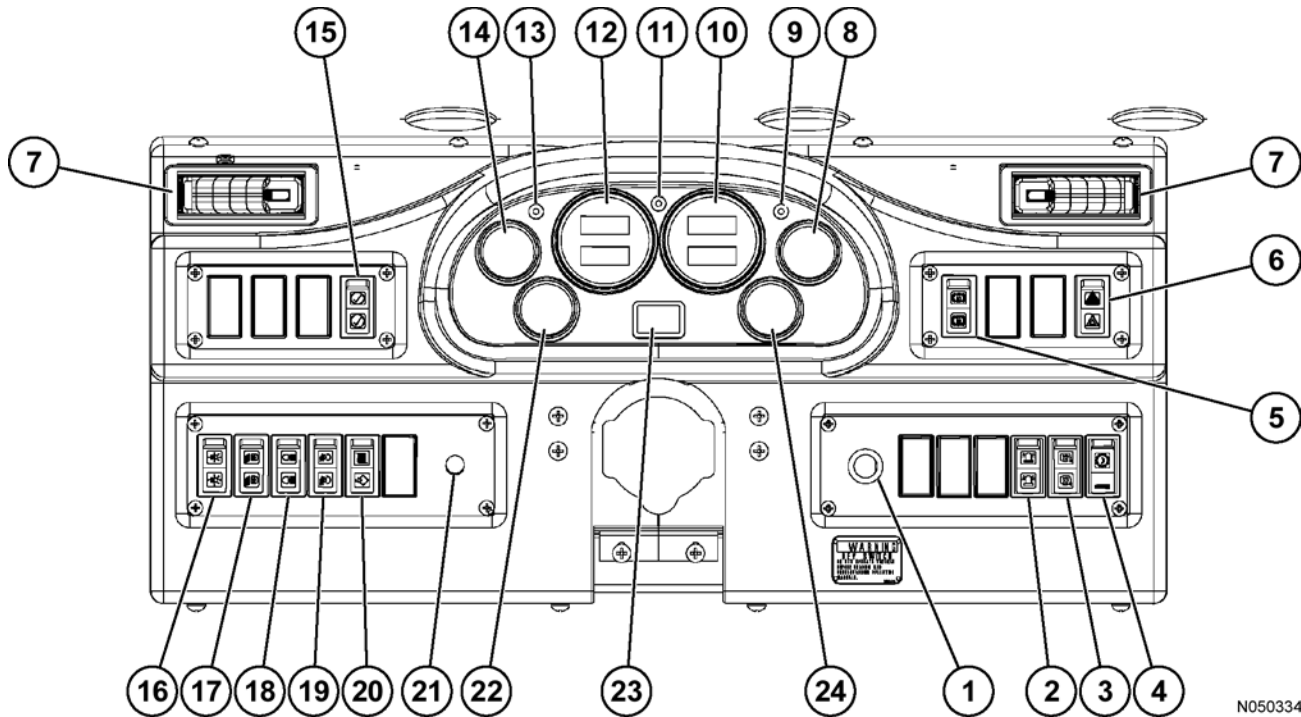
This symbol when it appears on an indicator or control identifies that this indicator or control is NOT used.



This symbol identifies a rotary control or switch. Rotate the knob clockwise or counterclockwise for functions.



This symbol identifies a switch used to test or check a function. Press the switch on the side near the symbol to perform the test.



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FIGURE 32-7. PANEL GAUGES, INDICATORS, AND CONTROLS

- | | |
|---------------------------------------|---|
| 1. Key Switch | 13. Left Turn Signal Indicator Light |
| 2. Rotating Beacon (Optional) | 14. Water Temperature Gauge |
| 3. Heated Mirrors (Optional) | 15. Lamp Check Switch |
| 4. AC Drive System Rest Switch | 16. Headlight/Panel Illumination Light Switch (3-Way) |
| 5. Wheel Brake Lock Switch | 17. Ladder Light Switch |
| 6. Hazard Lights Switch | 18. Backup Light Switch |
| 7. Heater/Air Conditioner Vents | 19. Fog Light Switch (Optional) |
| 8. Engine Oil Pressure Gauge | 20. Payload Meter Mode Switch |
| 9. Right Turn Signal Indicator Light | 21. Panel Illumination Lights Dimmer Control |
| 10. Digital Tachometer | 22. Hydraulic Oil Temperature Gauge |
| 11. High Beam Headlight Indicator | 23. Engine Hourmeter |
| 12. Speedometer/Payload Meter Display | 24. Fuel Level Gauge |

Key Switch

Key switch (1, Figure 32-7) is a three-position (OFF, RUN, START) switch.

**Starting**

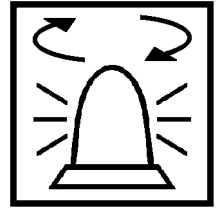
When the switch is rotated one position clockwise, it is in the RUN position and all electrical circuits except START are activated.

1. With the selector switch in PARK, rotate key switch fully clockwise to the START position, and hold this position until the engine starts. The START position is spring-loaded to return to RUN when the key is released. If the engine is equipped with a prelube system, a noticeable delay will occur before engine cranking begins.
2. After engine has started, place rest switch (4, Figure 32-7) in the OFF position, which will deactivate the rest mode of operation. Refer to the discussion of rest switch later in this chapter.

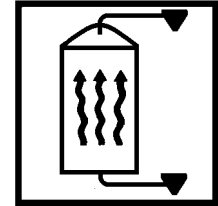
NOTE: The electric cranking motors have a 30 second time limit. If the 30 second limit is reached, cranking will be prohibited for two minutes. After two minutes, cranking will be allowed. If the 30 second limit is reached seven consecutive times, the key switch must be turned to the OFF position. This will allow the interface module to power down and reset, which requires seven minutes to complete.

Rotating Beacon Light Switch (Optional)

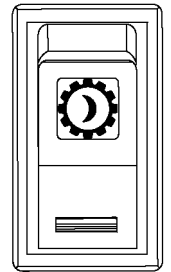
Switch (2, Figure 32-7) controls the operation of the rotating beacon light.

**Heated Mirror Switch (Optional)**

Switch (3, Figure 32-7) controls the operation of the heated mirrors.

**Rest Switch**

Switch (4, Figure 32-7) is a rocker type switch with a locking device for the OFF (lower side pressed in) position. There is no LED light to illuminate when this switch is in the OFF position. A small red tab must be pushed up to unlock the switch before the top side can be depressed to the rest position.



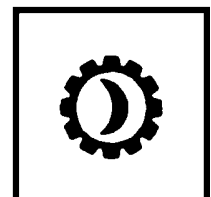
When in the rest (ON) position, an internal amber lamp will illuminate. The switch must be activated to de-energize the AC drive system whenever the engine is to be turned off or parked for a length of time with the engine running.

The selector switch must be in PARK and the vehicle not moving to enable this function. This will allow the engine to continue running while the AC drive system is de-energized.



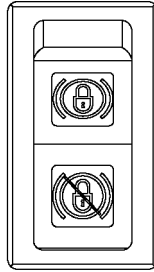
Activation of the rest switch alone DOES NOT completely ensure that the drive system is safe to work on. Refer to Section 20, Safety, for more information on servicing a 830E truck. Check all "link-on", or "link energized", indicator lights to verify the AC drive system is de-energized before performing any maintenance on the drive system. DO NOT activate the rest switch while the truck is moving! The truck may unintentionally enter the "rest" mode after stopping.

An amber (yellow) indicator light in the overhead panel (B6, Figure 32-8) will illuminate when the "rest" state has been requested and entered.



Wheel Brake Lock Control

Switch (5, Figure 32-7) must be used when the engine is running during dumping and loading operations only. The brake lock switch actuates the hydraulic brake system which locks the **rear wheel service brakes only**. When pulling into the shovel or dump area, stop the truck using the foot-operated service brake pedal. When the truck is completely stopped and in the loading position, apply the brake lock by pressing on the top of the rocker switch. Move the directional control lever to NEUTRAL. DO NOT place the control lever in PARK. To release, press the lower part of the rocker switch.



WARNING

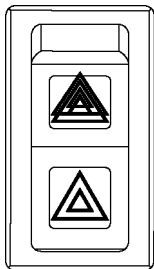
DO NOT use this switch to stop the truck unless the foot-operated treadle valve is inoperative. Use of this switch applies rear service brakes at a reduced, unmodulated pressure. DO NOT use the brake lock for parking. With the engine stopped, hydraulic pressure will bleed down, allowing the brakes to release.

Use at shovel and dump only to hold the truck in position.

NOTE: The wheel brake lock will not apply when the directional control lever is placed in the PARK position, or when the key switch is OFF, or when the engine is not running.

Hazard Warning Lights

Switch (6, Figure 32-7) flashes all the turn signal lights. Pressing the top side of the rocker switch activates these lights. When these lights are on, a red LED light will be illuminated inside the switch. Pressing on the lower side of the rocker switch turns these lights off, and a green LED light will be illuminated.



Cab/Air Conditioner Vents

Vents (7, Figure 32-7) may be directed by the operator to provide the most comfortable cabin air flow.

Engine Oil Pressure Gauge

Gauge (8, Figure 32-7) indicates pressure in the engine lubrication system in pounds per square inch (psi).



Normal operating pressure after engine warm up must be:

- Idle - 138 kPa (20 psi) Minimum
- Rated Speed - 310 - 483 kPa (45 to 70 psi)

Right Turn Signal Indicator

Indicator (9, Figure 32-7) illuminates to indicate that the right turn signals are operating when the turn signal lever on the steering column is moved upward. Moving the lever to its center position will turn the indicator off.

Tachometer

Tachometer (10, Figure 32-7) displays engine crankshaft speed in revolutions per minute (rpm).

Governed rpm

- Low Idle - 750 rpm
- High Idle - 1910 rpm
- Full Load - 1900 rpm

High Beam Indicator

Indicator (11, Figure 32-7) illuminates to indicate that the truck headlights are on high beam. To switch the headlights to high beam, push the turn indicator lever away from the steering wheel. For low beam, pull the lever toward the steering wheel.

Speedometer/Payload Meter Display

Speedometer/payload meter display (12, Figure 32-7) indicates the truck speed in kilometers per hour (kph) or in miles per hour (mph). The display also shows payload meter information. For more information, see Section 60, Payload Meter III, in this manual.

Left Turn Signal Indicator

Indicator (13, Figure 32-7) illuminates to indicate that the left turn signals are operating when the turn signal lever on the steering column is moved downward. Moving the lever to its center position will turn the indicator off.

Water Temperature Gauge

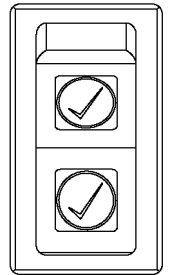
Gauge (14, Figure 32-7) indicates the temperature of the coolant in the engine cooling system. The temperature range after engine warm-up and truck operating under normal conditions must be:

85°-97°C (185°-207°F)



Lamp Test Switch

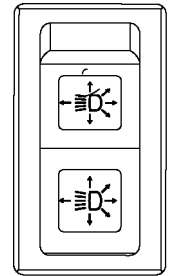
Switch (15, Figure 32-7) is provided to allow the operator to test the indicator lamps prior to starting the engine. To test the lamps and the warning horn, turn key switch (1, Figure 32-7) to the RUN position and press the top side of the rocker switch for the CHECK position. All lamps must illuminate except those which are for optional equipment that may not be installed. The warning horn must also sound. Any lamp bulbs which do not illuminate must be replaced before operating the truck. Releasing the spring-loaded switch will allow the switch to return to the OFF position. A green LED will illuminate in both switch positions.



NOTE: Do not use the lamp check switch while the engine is on. Pressing this switch while the engine is on will cause false electrical system faults. Warning light (D5, Figure 32-8) will illuminate and engine shutdown is required to turn it off.

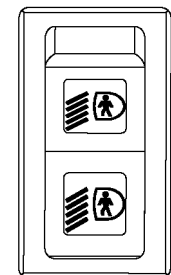
Light Switch

The instrument panel lights, clearance lights, and the headlights are controlled by this three-position rocker type switch (16, Figure 32-7). OFF is selected by pressing the bottom of the switch. Press the top of the switch until it reaches the first detent to select the panel lights, clearance lights and tail lights only. Press the top of the switch again until it reaches the second detent to select headlights, panel lights, clearance lights and tail lights.



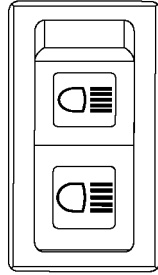
Ladder Light Switch

Ladder light switch (17, Figure 32-7) turns the ladder lights on or off. Pressing the top of the rocker switch turns the lights on. Pressing the bottom of the switch turns the lights off. A green LED light will illuminate in both switch positions. Another ladder light switch is mounted at the right front corner of the truck near the base of ladder.



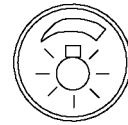
Manual Backup Switch

Manual backup switch (18, Figure 32-7) allows the backup lights to be turned on for added visibility and safety when the selector switch (see Operator Controls) is not in REVERSE position. When the switch is in the ON position, the manual back up light indicator (B4, overhead panel, Figure 32-8) will be illuminated.



Panel Light Dimmer

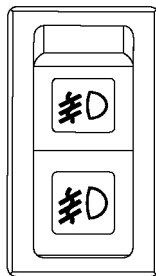
Panel light dimmer (21, Figure 32-7) is a rheostat which allows the operator to vary the brightness of the instruments and panel lights.



- Rotating the knob to the full clockwise position turns the panel lights on to the brightest condition.
- Rotating the knob counterclockwise continually dims the lights until OFF position is reached at full counterclockwise rotation.

Fog Lights (Optional)

Fog lights (19, Figure 32-7) are optional equipment that are useful in foggy conditions and heavy rain. Pressing the top of the rocker switch turns the fog lights on. Pressing the bottom of the switch turns the lights off.



Hydraulic Oil Temperature Gauge

Hydraulic oil temperature gauge (22, Figure 32-7) indicates oil temperature in the hydraulic tank. There are two colored bands: green and red.



Green indicates normal operation.

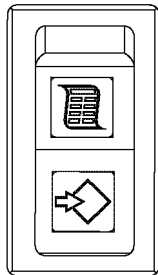
As the needle approaches the red zone, minimum engine idle speed will increase to help cool the oil.

Red indicates high oil temperature in the hydraulic tank. Continued operation could damage components in the hydraulic system. There is also a red temperature warning light in the overhead panel (A1, Figure 32-8) that will illuminate when the temperature exceeds a certain level (when the needle enters the red zone). If this condition occurs, the operator must safely stop the truck, move selector switch to PARK, and operate engine at 1200 - 1500 rpm to reduce system temperature.

If temperature gauge does not move into the green range after a few minutes, and the red overhead indicator light does not go out, stop the engine and notify maintenance personnel immediately.

Payload Meter Switch

Payload meter switch (20, Figure 32-7) is a two-way, momentary rocker switch. The top position is the SELECT position. The SELECT position is used to step through the different displays. The lower position is the SET position. The SET position is used to set the operator ID, or clear the load and total ton counters. Refer to Section 60, Payload Meter III, for a more complete description of the payload meter system and its functions.



Hourmeter

Hourmeter (23, Figure 32-7) registers the total number of hours the engine has been in operation.

**Fuel Level Gauge**

Fuel level gauge (24, Figure 32-7) indicates how much diesel fuel is in the fuel tank.



The fuel tank capacity is 4542 liters (1,200 gallons).

OVERHEAD STATUS / WARNING INDICATORS

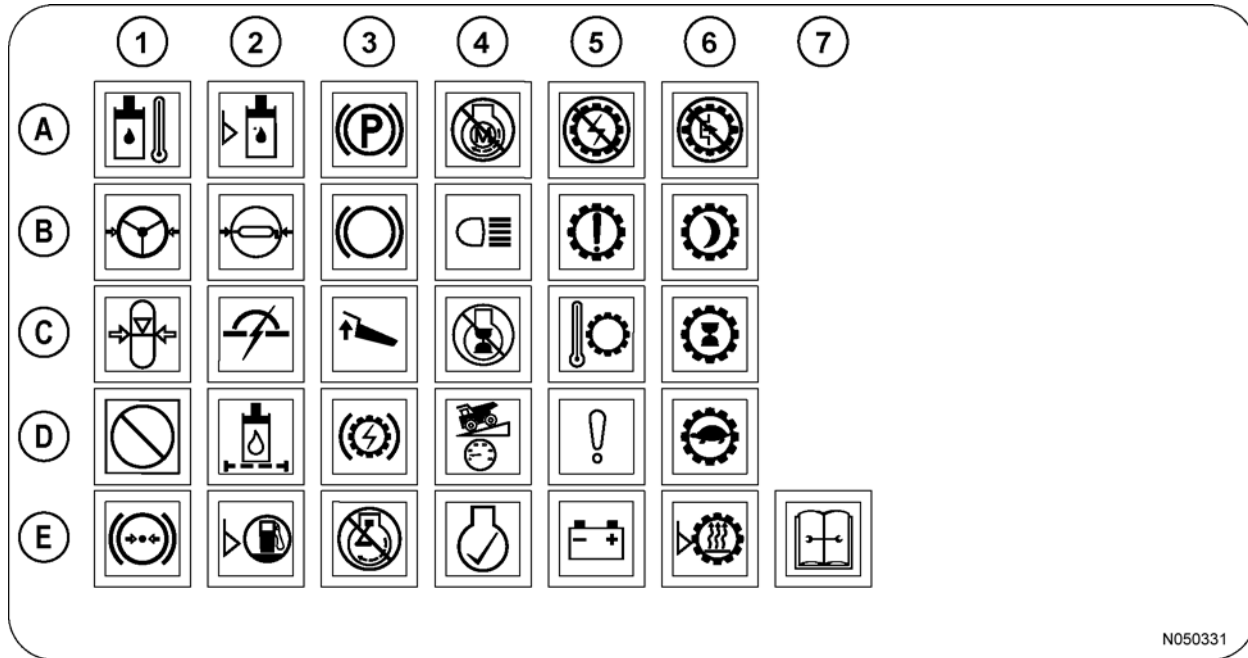


FIGURE 32-8. OVERHEAD STATUS / WARNING INDICATOR

Row / Column	Indicator Description	Indicator Color Wire Index
A1*	Hydraulic Oil Temp. High	Red-24VIM/34TL
B1*	Low Steering Pressure	Red-12F/33A
C1	Low Accumulator Press.	Red-12F/33K
D1	Not Used	
E1	Low Brake Pressure	Red-12F/33L
A2*	Low Hydraulic Oil Level	Red-12F4/34LL
B2*	Low Automatic Lubrication Pressure	Amber-12MD8/68LLP
C2*	Circuit Breaker Tripped	Amber-12MD3/31CB
D2*	Hydraulic Oil Filter	Amber-12MD/39
E2*	Low Fuel	Amber-24VIM/38
A3*	Park Brake Applied	Amber-24VIM/52AL
B3*	Service Brake Applied	Amber-12MD/44L
C3*	Body Up	Amber-12MD6/63L
D3*	Dynamic Retarding	Amber-12MD/44DL
E3	Stop Engine	Red-12M/31MT
A4*	Starter Failure	Amber-21SL/24VIM
B4*	Manual Back-Up Lights	Amber-12MD/47L
C4*	Shutdown Timer	Amber-12MD/23L1
D4*	Retard Speed Control	Amber-12MD/31R
E4*	Check Engine	Amber-12MD7/419

Row / Column	Indicator Description	Indicator Color Wire Index
A5	No Propel/ No Retard	Red-12M/75-6P1
B5	Propulsion System Warning	Amber-12F/79WI
C5	Propulsion System Temperature	Amber -12F/34TW1
D5	System/Component Failure	Red-24VIM/311MLI
E5	Battery Charge System Failure	Red-24VIM/11BCF1
A6	NO PROPEL	Red-12M/75NPI
B6	Propulsion System @ Rest	Amber-12M/72PR1
C6*	Propulsion System Not Ready	Amber-12MD/72NR1
D6*	Reduced Propulsion System	Amber-12MD/72LP1
E6*	Retard @ Continuous Level	Amber-12MD/76LR1
E7	Maintenance Monitor	Amber-24VIM/311ML2

* Brightness for these indicator lamps can be adjusted by using dimmer control (12, Figure 32-1).

Status / Warning Indicator Light Symbols

Amber indicator lights alert the operator that the indicated truck function requires some precaution when lighted.

Red indicator lights alert the operator that the indicated truck function requires **immediate action** by the operator. Safely stop the truck and turn the engine off.

DO NOT OPERATE THE TRUCK WITH A RED WARNING LIGHT ILLUMINATED!

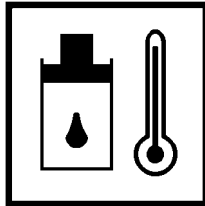
Refer to Figure 32-8 and the descriptions below it for explanations of the symbols. Location of the symbols are described by rows (A - E) and columns (1 - 7).

A1. High Hydraulic Oil Temperature

This red warning light indicates high oil temperature in the hydraulic tank. Continued operation could damage components in the hydraulic system.

The light illuminates at 107°C (225°F)

If this condition occurs, the operator must safely stop the truck, move selector switch to PARK, and operate engine at 1200 - 1500 rpm to reduce system temperature.

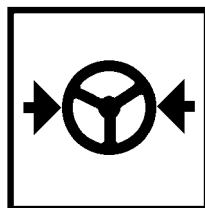


If temperature gauge does not move into the green range after a few minutes, and the red overhead indicator light does not go out, stop the engine and notify maintenance personnel immediately.

B1. Low Steering Pressure

When the key switch is turned ON, the low steering pressure warning light will illuminate until the steering system hydraulic pressure reaches 15 858 kPa (2,300 psi). The warning alarm will also turn on, and both will remain on, until the accumulator has been filled with hydraulic oil.

During truck operation, the low steering pressure warning light and warning horn will turn on if the steering system hydraulic pressure drops below 15 858 kPa (2,300 psi).



- If the light illuminates momentarily (flickers) while turning the steering wheel while at low truck speed and low engine rpm, truck operation may continue. This may be considered normal.
- If the indicator light illuminates at higher truck speed and high engine rpm, **DO NOT OPERATE THE TRUCK.**



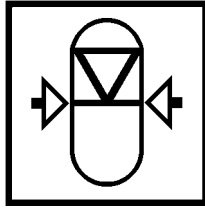
If the low steering warning light continues to illuminate and the alarm continues to sound, low steering pressure is indicated. The remaining pressure in the accumulators allows the operator to control the truck to a stop. If the oil pressure continues to decrease, the brake auto-apply feature will activate and the service brakes will apply automatically to stop the truck. DO NOT attempt further operation until the malfunction is located and corrected.

1. Stop the truck as quickly as possible by using the foot pedal to apply the service brakes. If possible, steer the truck to the side of the road while braking.
2. As soon as the truck has stopped moving, shift the directional control lever to PARK. This will apply the parking brake.
3. Slowly release the service brakes to check the capacity of the parking brake. If the parking brake can not hold the truck stationary, apply the service brakes and hold them ON. **DO NOT** turn the key switch OFF, and do not release the service brakes.
4. Notify maintenance personnel immediately.
5. If the truck is on level ground, or if the parking brake can hold the truck stationary and the truck is in a stable condition, it is then OK to turn the key switch OFF.
6. If safe to do so, have maintenance personnel place wheel chocks or other mechanisms in front or behind the wheels to reduce the risk of the truck rolling.
7. If traffic is excessive near the disabled machine, mark the truck with warning flags during daylight hours or use flares at night. Adhere to local regulations.

NOTE: If the engine is stopped, and the key switch is OFF and the light is flashing, a malfunction has been detected in the accumulator bleeddown system, indicating there is still hydraulic pressure in the system. The system/component system failure light will also be illuminated, and the warning horn will be on. DO NOT operate the truck, and notify maintenance personnel.

C1. Low Accumulator Pre-charge Pressure

The low accumulator precharge warning light, if illuminated, indicates low nitrogen precharge for the steering accumulator(s). To check for proper accumulator nitrogen precharge, the engine must be stopped and the hydraulic system completely bled down. Turn the key switch to the RUN position. The warning light will *not* illuminate if the accumulators are properly charged. The warning light will flash if the nitrogen precharge within the accumulator(s) is below 7585 ± 310 kPa (1100 ± 45 psi).



WARNING

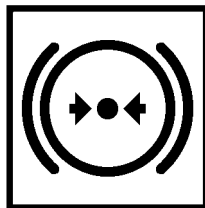
If the low accumulator precharge warning light flashes, notify maintenance personnel immediately. Do not attempt further operation until the accumulators have been recharged with nitrogen. Refer to the shop manual for proper charging instructions. If nitrogen precharge pressure is low, sufficient oil for emergency steering may not be available.

D1. Not Used

This light is reserved for future use.

E1. Low Brake Pressure

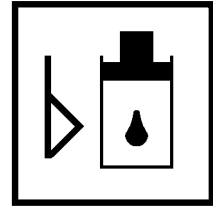
This red indicator light indicates a malfunction within the hydraulic brake circuit. If this light illuminates and the buzzer sounds, **stop the truck, shift to PARK, and turn the engine off.** Notify maintenance personnel.



NOTE: Adequate hydraulic fluid is stored to allow the operator to safely stop the truck.

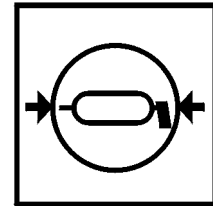
A2. Low Hydraulic Tank Level

This warning light indicates the oil level in the hydraulic tank is below recommended level. Damage to hydraulic pumps may occur if operation continues. Stop the truck and turn the engine off. Notify maintenance personnel immediately.



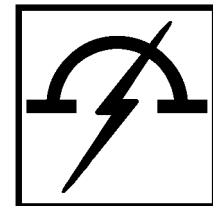
B2. Automatic Lubrication System Pressure

This amber light will illuminate if the automatic lubrication system fails to reach $13\,790$ kPa ($2,000$ psi) at the junction block located on the rear axle housing within a specified time after the lube timer initiates a cycle of grease. To turn the light off, turn key switch OFF, then back to ON again. Notify maintenance personnel at earliest opportunity after light comes on.



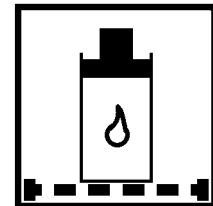
C2. Circuit Breaker Tripped

This amber light will illuminate if any of the circuit breakers in the relay circuit control boards are tripped. The relay circuit boards are located in the electrical control cabinet.



D2. Hydraulic Oil Filter Monitor

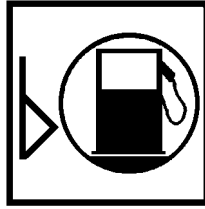
This amber light indicates a restriction in the high pressure filter assembly for either the steering or hoist circuit. This light will illuminate before filters start to bypass. Notify maintenance personnel at earliest opportunity after the light illuminates.



NOTE: The filter monitor warning light may also illuminate after the engine is initially started if the oil is cold. If the light turns off after the oil is warmed, filter maintenance is not required.

E2. Low Fuel

This amber low fuel indicator light will illuminate when the usable fuel remaining in the tank is approximately 95 liters (25 gallons). A warning buzzer will also sound.

**A3. Parking Brake**

This amber parking brake indicator will illuminate when the parking brake is applied. The parking brake is applied by placing the directional control lever in the PARK position.

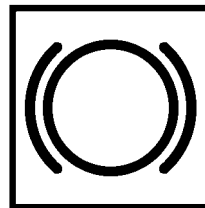


If the parking brake light is flashing, that is an indication that the parking brake is requested, but has not applied.

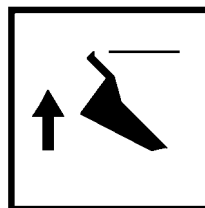
If the parking brake light is flashing, the operator must not leave the cab. Notify maintenance personnel immediately.

B3. Service Brake

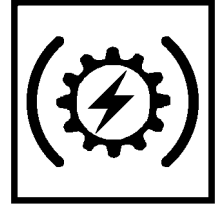
This amber service brake indicator light will illuminate when the service brake pedal is applied or when wheel brake lock is applied. **DO NOT** attempt to drive the truck from stopped position with the service brakes applied, except as noted in Section 30, Operating Instructions - Starting On A Grade With A Loaded Truck.

**C3. Body Up**

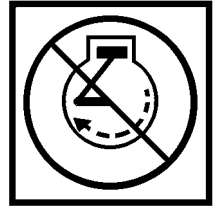
This amber body up indicator, when illuminated, indicates that the body is not completely down on the frame. The truck must not be driven until body is down and the light is off.

**D3. Dynamic Retarding**

This amber dynamic retarding indicator light illuminates whenever the retarder pedal is operated, RSC is activated, or the automatic overspeed retarding circuit is energized. It indicates that the dynamic retarding function of the truck is being used.

**E3. Stop Engine**

This red engine monitor warning light will illuminate if a serious engine malfunction is detected in the electronic engine control system.



- Electric propulsion to the wheelmotors will be discontinued.
- Dynamic retarding will still be available if needed to slow or stop the truck.

CAUTION

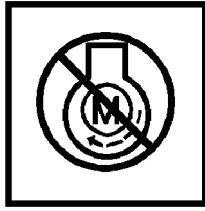
1. **Stop the truck as quickly as possible in a safe area and shift to PARK.**
2. **PULL UP ON THE ENGINE STOP SWITCH ON THE CENTER CONSOLE TO STOP THE ENGINE, THEN TURN THE KEY SWITCH OFF. Additional engine damage is likely to occur if operation is continued.**
3. **Notify maintenance personnel immediately.**

Listed below are a few conditions that could cause the stop engine light to illuminate:

- Low Oil Pressure - red warning light will illuminate, but the engine does not stop.
- Low Coolant Level - red warning light will illuminate, but the engine does not stop.
- Low Coolant Pressure - red warning light will illuminate, but the engine does not stop.
- High Coolant Temperature - red warning light will illuminate, but the engine does not stop.

A4. Cranking Motor Failure

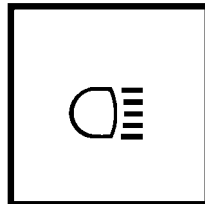
This amber indicator will illuminate when either starter motor (of two) fails to crank the engine, leaving just one cranking motor to start the engine. With only one cranking motor doing the work of two, the motor life will be shortened. If this indicator illuminates, truck operation may continue, but maintenance personnel must be alerted as soon as possible.



This light will also illuminate if the cranking motors have been operational for more than 30 seconds at a time, or if seven attempts at starting for the full 30 seconds is reached.

B4. Manual Backup Lights

This amber indicator will illuminate when the manually operated manual backup light switch (18, Figure 32-7) is turned ON.



C4. Engine Shutdown Timer

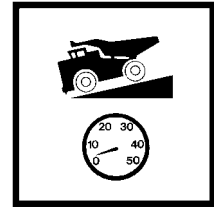
When the key switch has been turned OFF, and certain conditions have been met, this indicator light will illuminate to indicate that the shutdown timing sequence has started. The engine could operate for up to three minutes.



- If the directional control lever is moved out of PARK, the engine will stop immediately.
- If the key switch is turned back ON, the engine stop sequence will be terminated, and the engine will remain running.

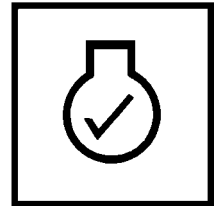
D4. Retard Speed Control (RSC) Indicator

This amber light is illuminated when the RSC switch mounted on the console is pulled out to the ON position. The light indicates the retarder is active. It is for feedback only and does not signal a problem.



E4. Check Engine

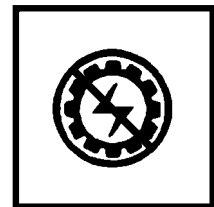
This amber check engine indicator will illuminate if a malfunction is detected by the engine electronic control system.



If this indicator illuminates, truck operation may continue, but maintenance personnel must be alerted as soon as possible.

A5. No Power

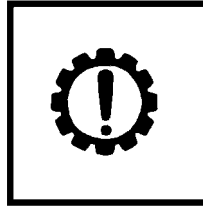
This red "no retard/no propel" indicator light indicates a fault has occurred which has eliminated the retarding and propulsion capability. A warning buzzer will also sound.



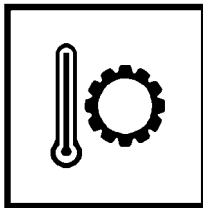
If this condition occurs, the operator must safely stop the truck, move selector switch to PARK, shutdown the engine, and notify maintenance personnel immediately.

B5. Propulsion System Warning

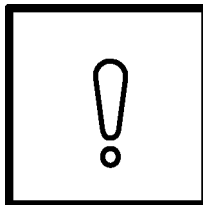
When this amber indicator is illuminated, the light indicates a “no propel” or “no retard” event may be about to occur. It is intended to provide advance notice of these events when possible. It does not require the operator to stop the truck, but may suggest that truck operation be appropriately modified, in case a red alarm does occur.

**C5. Propulsion System Temperature**

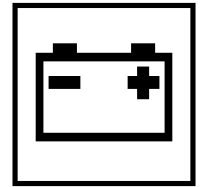
This amber AC drive system temperature warning light indicates the drive system temperature is above a certain level. When this condition occurs, the operator must consider modifying truck operation in order to reduce system temperature. The operator is not required to stop the truck at this time.

**D5. System/Component Failure**

This red warning light indicates that the interface module system detected a failure somewhere on the truck. There are many conditions that could trigger the light to illuminate. If this light illuminates, the operator must safely stop the truck, move selector switch to PARK, shut the engine off, and notify maintenance personnel immediately.

**E5. Battery Charging System Failure**

The red battery charging system light indicates a problem has been detected in the charging system, and system voltage is outside the normal operating range. If this light illuminates, the operator must safely stop the truck, move selector switch to PARK, shut the engine off, and notify maintenance personnel immediately. If truck operation continues, and the battery voltage drops below 20.0 volts, the propulsion system will not operate, but retarding will still be available.

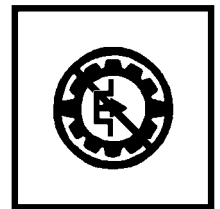


The following conditions will also illuminate this light:

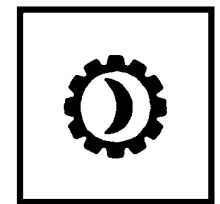
- Battery voltage below 24.5V, engine rpm above 1450. Resets at 26V.
- Battery voltage below 23V with engine off. Resets at 25.5V.
- Battery voltage above 32V with engine operating. Resets at 27.5V.

A6. No Propel

The red “no propel” light indicates a fault has occurred which has eliminated the propulsion capability. If this condition occurs, the operator must safely stop the truck, move selector switch to PARK, shut down the engine, and notify maintenance personnel, immediately.

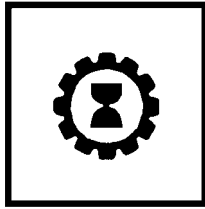
**B6. Propel System @ Rest**

The amber “propel system @ rest” light is used to indicate that the AC drive system is de-energized and propulsion is not available. This light is activated when the instrument panel rest switch is turned ON and the AC drive system is de-energized. The three link energized lights (one on rear of the center console inside the operator cab, and two on the deck-mounted control cabinets) must NOT be illuminated at this time.



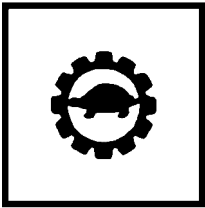
C6. Propel System Not Ready

The amber indicator light functions during start-up much like the hour glass icon on a computer screen. This light indicates the computer is in the process of performing the self-diagnostics and set-up functions at start-up. Propulsion will not be available at this time.



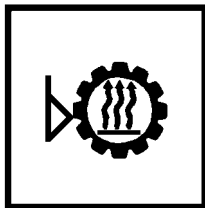
D6. Reduced Propulsion

The amber "reduced propulsion" light is used to indicate that the full AC drive system performance in propulsion is not available. At this time, the only event that should activate this light is the use of "limp home mode". This mode of operation requires a technician to enable.



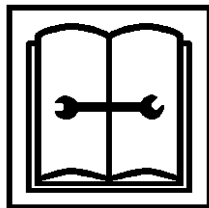
E6. Retard At Continuous Level

The amber retard at continuous level light indicates that the retarding effort is at the continuous level. The operator must control the speed of the truck in accordance to the "continuous" speeds on the GRADE/SPEED RETARD CHART on page 32-4.



E7. Maintenance Monitor

The indicator light will illuminate if a "repair" fault is detected, which must be corrected after the operator's shift is done.



VEHICLE HEALTH MONITORING SYSTEM (VHMS)

Operation

This system uses VHMS controller (2, Figure 32-10) to gather data about the operation of the truck from sensors and other controllers installed on the truck. The data stored in the VHMS controller is collected by a laptop personal computer (PC) or transmitted directly by communications satellite (utilizing the Orb-comm controller). This data is then compiled at the Komatsu computer server. Based on this information, the servicing Komatsu distributor will suggest improvements and provide information aimed at reducing machine repair costs and downtime.

When the data-store button (1, Figure 32-9) is pressed on the back side of the center console, it will store a "snapshot" of the Statex III drive system. It will also trigger the VHMS system to store a "snapshot" of the truck operating system. A light (2, Figure 32-9) will stay illuminated while the VHMS system is recording the "snapshot", which lasts for 7.5 minutes.

The VHMS system is turned on by the truck key switch. Immediately after receiving 24V power from the key switch, the VHMS controller begins the power-up initialization sequence. This sequence takes about three seconds, during which time the red LED digits (4, Figure 32-10) display a circular sequence of flashing LED segments.

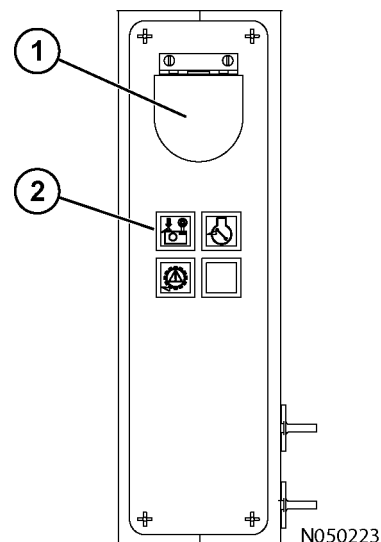


FIGURE 32-9. CENTER CONSOLE, REAR VIEW

1. Data Store Button
2. VHMS Snapshot In Progress Light

During normal truck operation, the red LED digits on the VHMS controller will count from 00-99 continuously.

When the key switch is turned OFF, the VHMS controller will remain on while it finishes processing internal data and saves the recent data into permanent memory. When the data has been safely stored, the two digit LED display will turn OFF. This process could take up to three minutes to complete.

WARNING

If 24V power is disconnected (using the battery disconnect switches) from the VHMS controller before it has completed it's shut down procedure, the VHMS controller will lose all data gathered since the key switch was last turned ON. Do not disconnect battery power until the VHMS controller has completed the shut down procedure and has turned the LED digits off.

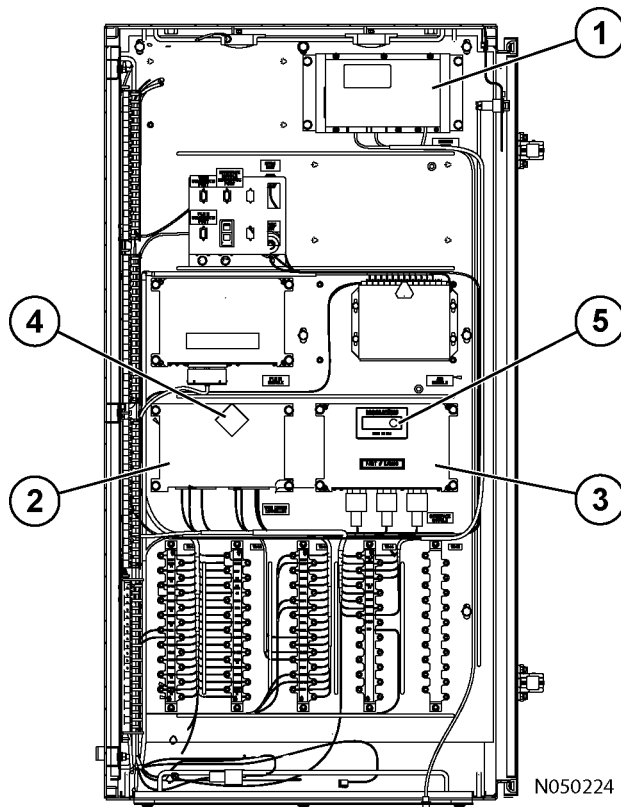


FIGURE 32-10. VHMS COMPONENT LOCATION

- 1. Orbcmm Controller
- 2. VHMS Controller
- 3. Interface Module
- 4. Red LED Lights
- 5. Green LED Light

The Orbcmm controller (1, Figure 32-10) transmits data through antenna (1, Figure 32-11) mounted on top of the cab. The antenna coaxial cable is routed through the inside of the cab to protect it from damage. If the antenna or coaxial cable is damaged, replace the parts.

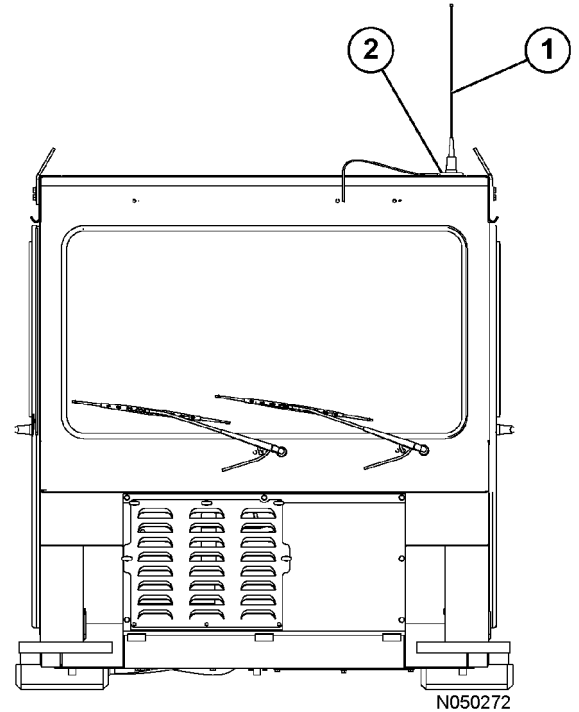


FIGURE 32-11. ORBCOMM

- 1. Orbcmm Antenna
- 2. Magnetic Base

Interface Module

Interface module (3, Figure 32-10) receives data from the sensors installed on the truck and sends this information to the VHMS controller. There is a small green LED light on the face of the controller. With the key switch ON, the light must be blinking. If the light is continuously illuminated, there is a problem in the controller.

When a new interface module controller is installed on the truck, new software has to be installed inside the controller. IM-Diag connector (1, Figure 32-12) is used to connect the interface module to a laptop PC for installing software.

Basic Precautions

When using this truck, there is no particular need to operate the VHMS system.

Never disassemble, repair, or modify the VHMS system. This may cause failure or fire on the machine or this system.

Do not touch the system when operating the machine.

Do not pull on the wiring harnesses, connectors, or sensors of this system. This may cause short circuits or disconnections that lead to failure or fire on the machine or this system.

Do not get water, dirt or oil on the system controllers.

If there is any abnormality with the VHMS system, please consult the servicing Komatsu distributor.

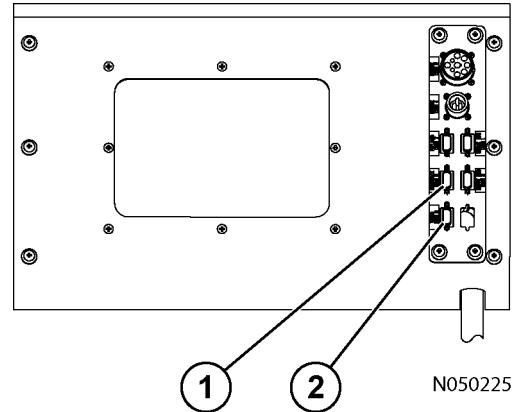


FIGURE 32-12. DIAGNOSTIC PORTS
(D.I.D. PANEL AT REAR OF CAB)

1. IM Diagnostic Port
2. VHMS Diagnostic Port

FUSE BLOCK #1

LOCATION	AMPS	DEVICES(S) PROTECTED	CIRCUIT
1	15	A/C, Heater Blower Motor	12H
2	15	Windshield Washer / Wiper	63
3	5	Instrument Panel Gauges	712G
4	10	Key Switch Power	712P
5	10	Hoist Limit Solenoid	712H
6	15	Turn Signal / Clearance Lights	712T
7	10	Engine Options	712E
8	10	AID and Indicator Lights	12M
9	5	Engine Start Failure	712SF
10	10	Engine Shutters	712R
11	10	Dome Light Switch	712A
13	10	Radio Memory	65
17	15	Key Switch Supplemental Power	11KS
18	15	Payload Meter Lights	39J
19	5	Payload Meter System	39G

FUSE BLOCK #2

LOCATION	AMPS	DEVICES(S) PROTECTED	CIRCUIT
1	15	Service Lights	11SL
2	15	Cab Dome, Fog, Ladder Lights	11L
3	15	Hazard Lights	46
4	10	Interface Module	11INT
5	10	VHMS & Orbcmm Controllers	85
6	20	Modular Mining System	11M
7	15	VHMS & Orbcmm Battery	11DISP
8	15	Headlights	11HDL
9	15	Oil Reserve System Pump	11ORS
10	15	Oil Reserve System Control	11RCNT
11	20	Hydraulic Bleed Down	11BD
12	10	Engine Load	11EM
13	10	Key Switch Power	11KS
17	20	Engine Battery Power	11E1
18	20	Engine Battery Power	11E2
19	20	Engine Battery Power	11E3
20	20	Engine Battery Power	11E4

FUSE BLOCK #3

LOCATION	AMPS	DEVICES(S) PROTECTED	CIRCUIT
1	15	Cab Drive System	71P
2	10	Automatic Lube Pump	68ES
3	15	Interface Module	71IM
4	20	Cab Drive Components	710S
13	10	Right Front Wheel Speed Sensor	15RFWS
14	10	Left Front Wheel Speed Sensor	15LFWS
17	10	Cigarette Lighter	67C
18	20	R.H. Cab Window	67R
19	20	L.H. Cab Window	67P

FUSE BLOCK #4

LOCATION	AMPS	DEVICES(S) PROTECTED	CIRCUIT
1	10	Brake Circuits	71BC
2	5	PLMIII	712K, 712PL
3	5	Interface Module	87
4	10	VHMS Supply	71VHM
5	5	Modular Mining System	712MM
6	5	Display Module	86
7	10	Hydraulic Bleeddown Signal	71BD
8	10	OP Switch LED Power	71LS
9	1	Selector Switch Power	71SS
17	5	Temperature Gauge	15V
18	15	Pedal Voltage	15PV
19	5	Engine Interface	15VL

CIRCUIT BREAKERS				
	AMPS	DEVICES(S) PROTECTED	CIRCUIT	LOCATION
CBA	5	Pay Load Meter III	396	Auxiliary Control Cabinet
CBB	15	Pay Load Meter III	11S	Auxiliary Control Cabinet
CB13	12.5	Clearance Lights	46	RB1, Auxiliary Control Cabinet
CB14	12.5	Turn Signal Flasher	11Z	RB1, Auxiliary Control Cabinet
CB15	12.5	Tail Lights	41T	RB1, Auxiliary Control Cabinet
CB16	12.5	Retard Lights	44D	RB3, Auxiliary Control Cabinet
CB17	12.5	Manual Back-Up Lights	47B	RB3, Auxiliary Control Cabinet
CB18	12.5	Stop Lights	44A	RB3, Auxiliary Control Cabinet
CB19	12.5	Backup Lights and Horn	79A	RB3, Auxiliary Control Cabinet
CB11	12.5	Backup Horn and Lights	79A	RB3, Auxiliary Control Cabinet
CB20	12.5	Engine Control Power	23D	RB4, Auxiliary Control Cabinet
CB21	12.5	Service Lights, Horn, Solenoid	11A	RB4, Auxiliary Control Cabinet
CB22	12.5	Engine Run Relay	439E	RB4, Auxiliary Control Cabinet
CB23	12.5	Headlights, Left Low Beam	11DL	RB5, Auxiliary Control Cabinet
CB24	12.5	Headlights, Right Low Beam	11DR	RB5, Auxiliary Control Cabinet
CB25	12.5	Headlights, Left High Beam	11HL	RB5, Auxiliary Control Cabinet
CB26	12.5	Headlights Right High Beam	11HR	RB5, Auxiliary Control Cabinet
CB27	12.5	Headlights and Dash Lights	11D	RB5, Auxiliary Control Cabinet
CB60	50	12VDC Power Supply	11CB2	Battery Control Box
CB61	15	Battery Monitor Relay	11C1	Battery Control Box

NOTES:

LUBRICATION AND SERVICE

Recommended preventive maintenance will contribute to the long life and dependability of the truck and its components. The use of proper lubricants and the performance of checks and adjustments at the recommended intervals is most important.

Lubrication requirements are referenced to the lube key found in the Lubrication Chart (page 40-3). For detailed service requirements for specific components, refer to the service manual section for that component (i.e. Section H for suspensions, Section L for hydraulic system, etc.).

Refer to the manufacturer's service manual when servicing any components of the General Electric system.

Refer to the engine manufacturer's service manual when servicing the engine or any of its components.

The service intervals presented here are in hours of operation. **These intervals are recommended in lieu of an oil analysis program which may determine different intervals.** However, if the truck is being operated under extreme conditions, some or all, of the intervals may need to be shortened and the service performed more frequently.

The 830E truck is equipped with an automatic lubrication system. The initial setup for this system provides for nominal amounts of lubricant to be delivered to each serviced point. The lubrication injectors can be adjusted to vary the amount of lubricant delivered. In addition, the timer for lubrication intervals is normally adjustable. For adjustments to these devices, refer to Automatic Lubrication System later in this manual.

830E SERVICE CAPACITIES

	Liters	U.S. Gallons
Crankcase: (including 4 oil filters) Komatsu SDA16V160 or SSDA16V160 Engines	280	74
Cooling System: Komatsu SDA16V160 or SSDA16V160 Engine	568	150
Hydraulic System: Refer to "Hydraulic Tank Service"	947	250
Wheel Motor Gear Box (each side)	38	10
Fuel Tank (Diesel Fuel Only)	4542	1200

HYDRAULIC TANK SERVICE

There are two sight gauges on the side of the hydraulic tank. With the engine stopped, key switch OFF, hydraulic system bled down and body down, oil should be visible in the top sight gauge. If hydraulic oil is not visible in the top sight gauge, follow Adding Oil instructions below.

Adding Oil

Keep the system open to the atmosphere only as long as absolutely necessary to lessen the chances of system contamination.

Service the tank with clean Type C-4 hydraulic oil only. All oil being put into the hydraulic tank must be filtered through filters rated at three microns.

1. With the engine stopped, key switch OFF, hydraulic system bled down and body down, check to see that hydraulic oil is visible in the top sight gauge.
2. If hydraulic oil is not visible in the top sight gauge, remove the tank fill cap. Add clean, filtered C-4 hydraulic oil (Lubrication Chart, Lube Key "B") until oil is visible in the top sight gauge.
3. Install the fill cap.
4. Start the engine. Raise and lower the dump body three times.
5. Repeat Steps 1 through 4 until oil is maintained in the top sight gauge with engine stopped, body down, and hydraulic system bled down.

WHEEL MOTOR SERVICE

Due to differences in gear ratio and component evolution/design, wheel motor service intervals may be unit number and/or mine specific. Because of the wide variety of factors involved, it is necessary to consult your area Komatsu representative for all wheel motor service intervals and instructions. General intervals for oil service and sampling are listed in the interval charts.

COOLANT LEVEL CHECK

Inspect the coolant sight gauge. If coolant cannot be seen in the sight gauge, it is necessary to add coolant to the system before truck operation. Refer to the procedure below for the proper filling procedure.

RADIATOR FILLING PROCEDURE



The cooling system is pressurized due to thermal expansion of coolant. DO NOT remove the radiator cap while the engine and coolant are hot. Severe burns may result.

1. With the engine and coolant at ambient temperature, remove the radiator cap.

NOTE: If coolant is added using the Wiggins quick fill system, the radiator cap **MUST** be removed prior to adding coolant.

2. Fill the radiator with the proper coolant mixture (as specified by the engine manufacturer) until coolant is visible in the sight gauge.
3. Install the radiator cap.
4. Operate the engine for five minutes. Check the coolant level.
5. If coolant is not visible in the sight gauge, repeat Steps 1 through 4. Any excess coolant will be discharged through the vent hose after the engine reaches normal operating temperature.

Engine coolant must always be visible in the sight gauge before truck operation.

COOLING SYSTEM ANTI-FREEZE RECOMMENDATIONS (Ethylene Glycol Permanent Type Anti-Freeze)		
Percentage of Anti-Freeze	Protection To:	
10	+ 23° F	- 5° C
20	+ 16° F	- 9° C
25	+ 11° F	- 11° C
30	+ 4° F	- 16° C
35	- 3° F	- 19° C
40	- 12° F	- 24° C
45	- 23° F	- 30° C
50	- 34° F	- 36° C
55	- 48° F	- 44° C
60	- 62° F	- 52° C

Use only anti-freeze that is compatible with engine as specified by engine manufacturer.

RESERVE ENGINE OIL SYSTEM (Optional)

The reserve oil tank for the engine is designed to add more oil capacity to the engine to reduce the frequent servicing of the engine oil. The engine oil level must still be checked every shift using the dipstick. If engine oil level is not correct, check for proper operation of the reserve oil system. Never add oil to the engine unless it has been drained.

If the engine oil has been drained from the oil pan, the new oil must be added to the engine oil pan before starting. **DO NOT** use the oil in the reserve tank to fill an empty engine with oil. After an oil change, both the engine and reserve tank must be full of oil before starting the engine.

Reserve Oil Tank Filling Procedure (Remote fill)

1. Connect the pressure supply hose from the new oil supply to the quick coupler on the truck. Open valve on supply hose to apply pressure.
2. Pull out on switch (2, Figure 40-1) to turn the system on.
3. Push start switch (3). The VALVE OPEN light (5) should illuminate and the filling process will begin.
4. When tank is full, the VALVE OPEN light will turn off and FULL light (4) will illuminate.
5. Close the oil supply valve in the fill hose.
6. Press and hold start switch (3) for a couple of seconds.
7. Disconnect the new oil supply hose.
8. Push switch (2) in to turn system power OFF.

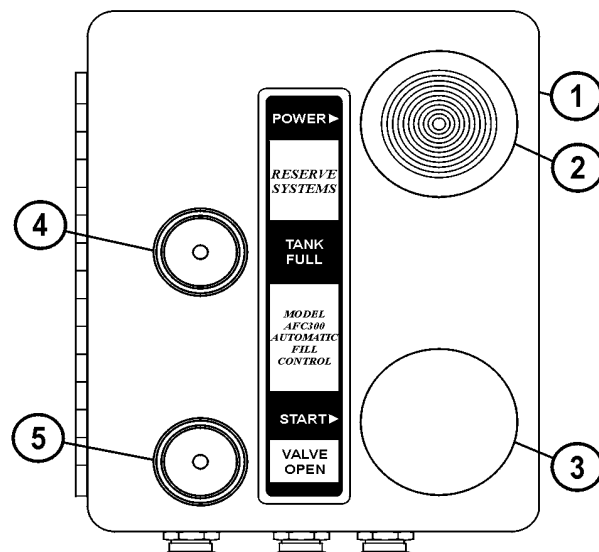


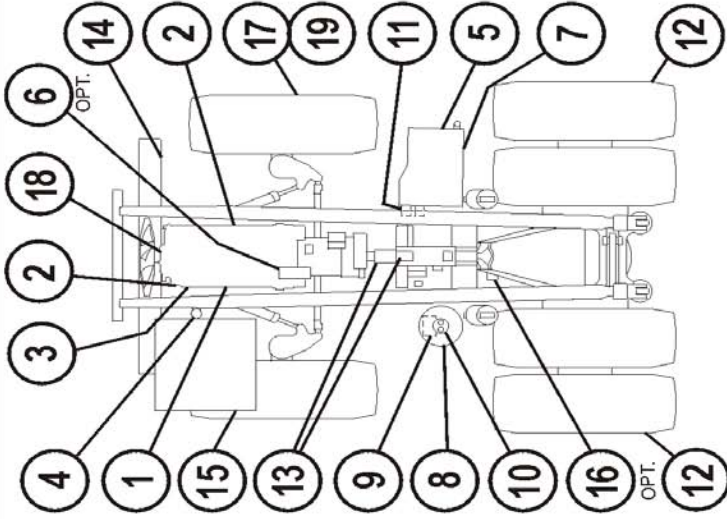
FIGURE 40-1. CONTROL PANEL

- | | |
|-----------------------|-----------------------|
| 1. Remote Control Box | 4. "FULL" Light |
| 2. System Switch | 5. "VALVE OPEN" Light |
| 3. Start Switch | |

LUBRICATION CHART

LUBRICATION SPECIFICATIONS

LUBE KEY	TYPE LUBRICANT	PTS	LUBE KEY	10 HR	50 HR	100 HR	250 HR	500 HR	1000 HR	2000 HR	2500 HR
A	ENGINE OIL ----- SEE ENGINE MANUAL										
B	HYDRAULIC OIL ----- SAE 10W C-4 -----										
C	HEAVY-DUTY SYNTHETIC GEAR OIL ----- SEE DRIVE SYSTEM MANUAL										
D	MULTI-PURPOSE EXTREME PRESSURE GREASE ----- NLGI NO.2 (5% MIN. MOLY-DISULFIDE)										
E	MULTI-PURPOSE GEAR OIL ----- SAE 80W-90										
SYM	DESCRIPTION	PTS	LUBE KEY	10 HR	50 HR	100 HR	250 HR	500 HR	1000 HR	2000 HR	2500 HR
1	CRANKCASE OIL LEVEL	1	A	CHECK							
2	ENGINE LUBE OIL FILTERS										
3	FUEL FILTER										
4	FUEL SEPARATOR (DAVCO)										
5	FUEL TANK										
6	GE PREFILTER BLOWER	1	D								
7	FUEL TANK BREATHER	1									
8	HYDRAULIC OIL LEVEL	1	B	CHECK							
9	HYDRAULIC STRAINER	2									
10	HYDRAULIC TANK BREATHER	2									
11	HYDRAULIC FILTERS	3			**	**	**	**	**	**	**
12	MOTORIZED WHEEL OIL LEVEL	2	C								
13	HYD. PUMP DRIVE SHAFT	2	D								
14	CHASSIS LUBE LEVEL	1	D								
15	SEAT SLIDES & STEER SHAFT	4	D								
16	WHEEL MOTOR BLOWER	2	D								
17	FRONT WHEEL BEARINGS ***	2	E								
18	FRONT TRUNION	1	D								
19	MAGNETIC PLUG FRONT WHL COVER ****	2									



630E, 730E, 830E, & 930E

WB2790

SEE ENGINE MANUAL

* 1000 HR INTERVAL CAN BE EXTENDED TO 2500 HR PROVIDED OIL SAMPLING AND ANALYSIS IS CONDUCTED EVERY 250 HR.

** ONE-TIME CHANGE AT 50, 100 AND 250 HR.

*** NOT APPLICABLE FOR 930E

**** APPLICABLE FOR 930E ONLY

LUBRICATION CHART

10 HOUR (DAILY) INSPECTION

Truck Serial Number _____ Site Unit Number _____ Date _____ Hourmeter _____ Name of Service Technician _____				
	TASK	COMMENTS	CHECKED	INITIALS
1.	MACHINE - Inspect the entire machine for leaks, worn parts, and damage. Repair as necessary.			
2.	FAN DRIVE AND TURBOCHARGERS - Check for leaks, vibration or unusual noise. Check alternator and fan belt condition and alignment.			
3.	RADIATOR - Check the coolant level and fill with the proper mixture as shown in the Cooling System Recommendation Chart in this chapter. Refer to the engine manual for proper coolant additives.			
4.	ENGINE - a. Check the oil level on the dipstick. Refer to the engine manual for oil recommendations. (Lube Key "A"). <i>NOTE: If the truck is equipped with a reserve engine oil tank, check the oil level with the reserve tank dipstick. If necessary, add oil to the reserve tank. Also, with the engine running, check operation of the LED indicator light. See below for description of LED light signals. Refer to Figure 40-1.</i> LED Light Signals: <ul style="list-style-type: none"> • Steady - Pump 1 is withdrawing oil from the engine sump and bringing down the oil level. • Regular pulsing - Pump 2 is returning oil to the engine sump and raising the oil level. • Irregular pulsing - Oil is at the correct operating level. b. Inspect exhaust piping for integrity. c. Check for abnormal noises and fluid leaks. d. Eliminator Filter - Check operating indicator.			
5.	HYDRAULIC TANK - Check the oil level in the tank. Add oil if necessary. Refer to Hydraulic Tank Service - Adding Oil. Oil should be visible in the top sight glass. - DO NOT overfill. Lube Key "B".			
6.	WHEELS AND TIRES - a. Inspect tires for proper inflation and wear. b. Check for embedded debris in tread and remove. c. Inspect for damaged, loose, or missing wheel mounting nuts and studs.			

10 HOUR (DAILY) INSPECTION (Continued)

Truck Serial Number _____ Site Unit Number _____ Date _____ Hourmeter _____ Name of Service Technician _____			
TASK	COMMENTS	CHECKED	INITIALS
7. COOLING AIR DUCTWORK - Inspect ductwork from the blower to the rear drive case. Ensure that ductwork is secure, free of damage, and unrestricted.			
8. AIR INTAKE PIPING - Check all mounting hardware, joints, and connections. Ensure no air leaks exist and all hardware is properly tightened. Figure 40-2.			
9. AIR CLEANERS - Check the air cleaner vacuum gauges in the operator cab, Figure 40-3. The air cleaner(s) must be serviced if the gauge(s) shows the following maximum restriction: Komatsu SDA16V160 or SSDA16V160 Engines: 25 in. of H ₂ O vacuum. Refer to Section C in the shop manual for servicing instructions for the air cleaner elements. Empty the air cleaner dust caps. <i>NOTE: After service, push the reset button on face of gauge to allow the gauge to return to zero.</i>			
10. CAB AIR FILTER - Under normal operating conditions, clean every 250 hours. In extremely dusty conditions, service as frequently as required. Clean the filter element with mild soap and water. Rinse completely clean and air dry with a maximum of 275 kPa (40 psi). Reinstall the filter. Refer to Figure 40-4.			

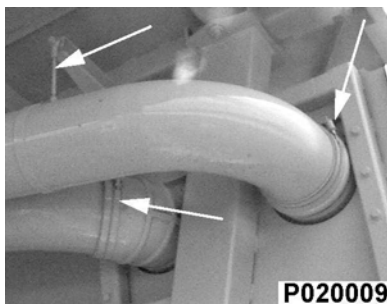


FIGURE 40-2.

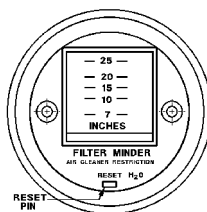


FIGURE 40-3.



FIGURE 40-4.
1. Filter Cover 2. Cab Filter

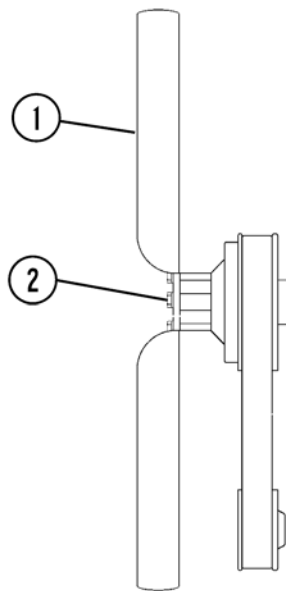
10 HOUR (DAILY) INSPECTION (Continued)

Truck Serial Number _____ Site Unit Number _____ Date _____ Hourmeter _____ Name of Service Technician _____				
	TASK	COMMENTS	CHECKED	INITIALS
11.	FUEL FILTERS (Fuel Separators) - Drain water from the bottom drain valve on each fuel separator.			
12.	AUTOMATIC LUBE SYSTEM - <ul style="list-style-type: none"> • Check the grease reservoir; fill as required. Lube Key "D". • When filling the reservoir, check the grease filter indicator. Clean or replace the grease filter if the indicator detects a problem. • Inspect the system and check for proper operation. Ensure the following important areas are receiving adequate amounts of grease. Lube Key "D". Steering Linkage Final Drive Pivot Pin Rear Suspension Pin Joints - Upper & Lower Body Hinge Pins - Both Sides Hoist Cylinders Pins - Upper & Lower Anti-sway Bar - Both Ends			

50 HOUR LUBRICATION AND MAINTENANCE CHECKS

Truck Serial Number _____ Site Unit Number _____ Date _____ Hourmeter _____ Name of Service Technician _____				
	TASK	COMMENTS	CHECKED	INITIALS
*1.	FUEL FILTERS - Change the fuel filters, (fuel separators). Refer to engine manufacturer's maintenance manual for fuel filter replacement instructions.			
*2.	HYDRAULIC SYSTEM FILTERS - Replace filter elements only, after the initial 50, 100, and 250 hours of operation; then at each 500 hours of operation thereafter.			
*3.	FAN DRIVE ASSEMBLY - Check torque for the six fan mounting cap screws: 237 N·m (175 ft lbs) . See Figure 40-5.			

*These checks are required **only after the initial 50 hours of operation** (such as: the commissioning of a new truck, or after a new or rebuilt component installation).



P020008

FIGURE 40-5.

100 HOUR LUBRICATION AND MAINTENANCE CHECKS

Truck Serial Number _____ Site Unit Number _____ Date _____			
Hourmeter _____ Name of Service Technician _____			
TASK	COMMENTS	CHECKED	INITIALS
*1. HYDRAULIC SYSTEM FILTERS - Replace filter elements only, after the initial 100 and 250 hours of operation; then at each 500 hours of operation thereafter.			

*These checks are required **only after the initial 100 hours of operation** (such as: the commissioning of a new truck, or after a new or rebuilt component installation), check:

250 HOUR LUBRICATION AND MAINTENANCE CHECKS

The 10 hour lubrication and maintenance checks should also be performed at this time.

NOTE: "Lube Key" references are to the lubrication chart.

Truck Serial Number _____ Site Unit Number _____ Date _____ Hourmeter _____ Name of Service Technician _____			
TASK	COMMENTS	CHECKED	INITIALS
1. ENGINE - Refer to the engine manufacturer's Operation & Maintenance manual for complete specifications regarding engine lube oil specifications. <i>NOTE: If the engine is equipped with the *Centinel™ oil system and/or the Eliminator™ filter system, engine oil and filter change intervals are extended beyond 250 hours. Refer to engine Operation & Maintenance manual for specific oil and filter change intervals.</i> * The Centinel™ system is a duty-cycle-dependent lubrication management system whereby oil is blended with the fuel and burned and an extension of oil change intervals can occur. <ul style="list-style-type: none"> a. Change engine oil. Lube Key "A". b. Replace engine oil filters. <i>NOTE: When installing spin-on filter elements, follow the instructions as specified by the filter manufacturer. The tightening instructions are normally printed on the outside of the filter. Do not use a wrench or strap to tighten filter elements.</i> <ul style="list-style-type: none"> c. If the truck is equipped with a reserve engine oil tank, change the reserve tank oil filter. d. Check belt tension and condition of each accessory belt. Refer to engine Operation & Maintenance manual for specific adjustment instructions. e. Check the torque on the cooling fan mounting cap screws (1, Figure 40-5). Tighten cap screws (2) to 237 N-m (175 ft lbs). 			

(CONTINUED NEXT PAGE)

250 HOUR LUBRICATION AND MAINTENANCE (Continued)

	TASK	COMMENTS	CHECKED	INITIALS
2.	<p>COOLING SYSTEM -</p> <p>a. COOLANT MIXTURE - Check for proper coolant mixture. Add coolant as required.</p> <p>b. COOLANT FILTERS - Change coolant filters.</p> <p>c. COOLING SYSTEM HOSES - Check cooling system hoses for damage and signs of deterioration.</p> <p>Refer to the engine maintenance manual for coolant filter replacement instructions and proper coolant mixture instructions.</p>			
3.	<p>FUEL FILTERS - Change the fuel filters (fuel separators). Refer to engine Operation & Maintenance manual for specific filter replacement instructions.</p>			
4.	<p>FUEL TANK - Drain water and sediment from the fuel tank. Refer to Shop Manual, Section B, Fuel Tank - Cleaning.</p>			
5.	<p>STEERING LINKAGE - Check the torque on pin retaining nuts (1, Figure 40-6) on the steering linkage - 712 N·m (525 ft lbs). Check the torque on tie rod retaining nuts (2) - 420 N·m (310 ft lbs).</p>			
6.	<p>HYDRAULIC PUMP DRIVESHAFT & U-JOINTS - Add one or two applications of grease to each grease fitting. Non - moly grease only. Check that each bearing of the cross & bearing assembly is receiving grease. Replace bearings if any wear is detected.</p>			
7.	<p>CAB AIR FILTER - Under normal operating conditions, clean every 250 hours. In extremely dusty conditions, service as frequently as required. Clean the filter element with mild soap and water. Rinse completely clean and air dry with a maximum of 275 kPa (40 psi). Reinstall the filter. Refer to Figure 40-4.</p>			

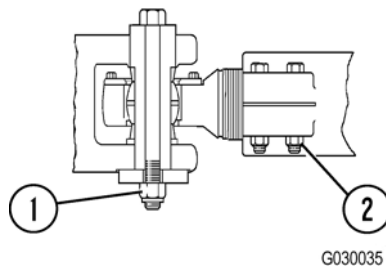


FIGURE 40-6.

250 HOUR LUBRICATION AND MAINTENANCE (Continued)

	TASK	COMMENTS	CHECKED	INITIALS
8.	MOTORIZED WHEEL GEAR CASE - Refer to the G.E. Planned Maintenance Manual and specific motorized wheel shop manual. Check for correct oil level. Lube key "C".			
*9.	HYDRAULIC SYSTEM FILTERS - Replace filter elements only after the initial 250 hours of operation; then at each 500 hours of operation thereafter. Check oil level. Add oil as necessary. Lube Key "B".			
10.	BATTERIES - Check the electrolyte level and add water if necessary.			
11.	BODY-UP & HOIST LIMIT SWITCHES - Check operation of the switches. Clean the sensing areas of any dirt accumulation and inspect the wiring for any signs of damage.			
12.	WHEEL MOTOR BLOWER (If equipped) - Grease motor blower shaft bearings. Lube key "D".			
13.	G.E. PREFILTER BLOWER (If equipped) - Add one to two applications of grease to the grease fitting. Lube key "D".			
14.	AC DRIVE BELT - Check the belt for wear or damage. Verify the belt tension is correctly set. Ensure the pulleys are aligned with each other within 3 mm (0.13 in.).			
15.	AUTOMATIC LUBE SYSTEM - Perform 250 hour checks as outlined in Automatic Lubrication System, Section 42, in this manual.			
16.	FRONT WHEELS - Check the oil level. Position the fill plug at the 12 o'clock position. The floating ball in the sight gauge must be at its highest position. Add oil as necessary. Lube key E.			

*This check is required only after the first 250 hours of operation (such as: the commissioning of a new truck, or after a new or rebuilt component installation), check:

500 HOUR LUBRICATION AND MAINTENANCE CHECKS

Maintenance requirements for every 10 & 250 hour Lubrication and Maintenance Checks should also be performed at this time.

NOTE: "Lube Key" references are to the lubrication chart.

Truck Serial Number _____ Site Unit Number _____ Date _____ Hourmeter _____ Name of Service Technician _____				
	TASK	COMMENTS	CHECKED	INITIALS
1.	FINAL DRIVE CASE BREATHERS - Remove the breather elements for the motorized wheels. Clean or replace the elements.			
2.	HYDRAULIC SYSTEM FILTERS - Replace the tank breathers and high pressure filter elements. Check the oil level. Add oil as necessary. Lube Key "B".			
3.	HYDRAULIC TANK BREATHER - Replace breather.			
4.	HYDRAIR® SUSPENSION - Check for proper piston extension (front and rear). Refer to Section H4 in the service manual for more information on proper suspension extension and maintenance procedures.			
5.	THROTTLE AND BRAKE PEDAL - Lubricate the treadle roller and hinge pins with lubricating oil. Lift the boot from the mounting plate and apply a few drops of lubricating oil between the mounting plate and the plunger.			
6.	HOIST ACTUATOR LINKAGE - Check operation. Clean, lubricate, and adjust as necessary.			
7.	PARKING BRAKE - Refer to Section J, Parking Brake Maintenance. Perform the recommended inspections.			
8.	RESERVE ENGINE OIL SYSTEM (OPTION) <ul style="list-style-type: none"> a. Check electrical system connections for tightness, corrosion and physical damage. Check the battery, oil pressure switch, junction boxes, remote control fill box and the circuit breakers. b. Examine all electrical cables over their entire length for possible damage. c. Examine all hoses, including those on the reserve tank and the ones leading to and from the engine. Check for leaks, cracks or other damage. Check all fittings for tightness, leakage or damage. 			
9.	ACCUMULATOR PRECHARGE - Check all steering and brake system accumulator pre-charge pressures. Refer to shop manual for details.			

500 HOUR LUBRICATION AND MAINTENANCE CHECKS (Continued)

Truck Serial Number _____ Site Unit Number _____ Date _____				
Hourmeter _____ Name of Service Technician _____				
	TASK	COMMENTS	CHECKED	INITIALS
10.	WHEEL MOTOR OIL SAMPLING - Refer to Section G5, Wheel Motor, for oil sampling information.			
11.	WHEEL MOTOR OIL (Initial 500 hours only) - Change or filter wheel motor gear oil only after initial 500 hours of operation. Wheel motor gear oil must be filtered or changed every 2500 hours of operation thereafter.			
12.	VHMS DATA DOWNLOAD - Using a laptop PC with the <i>VHMS Technical Analysis Tool Box</i> program, perform a data download from the VHMS controller. Send the data to WebCARE using the FTP feature. Refer to Section D in the shop manual for more detailed instructions.			
13.	FRONT BRAKE DISC - Measure the thickness of the disc. If 20 to 25% of the disc wear surface is worn below 28.7 (1.13 in.), the disc must be replaced. Refer to the shop manual, Parking Brake, Section J, for additional information.			
14.	FRONT WHEELS - Take an oil sample of the front wheel bearing oil. Refer to Section G in this shop manual for detailed instructions.			

1000 HOURS LUBRICATION AND MAINTENANCE CHECKS

Maintenance for every 10, 250, & 500 hour Lubrication and Maintenance Checks should also be performed at this time.

NOTE: "Lube Key" references are to the lubrication chart.

Truck Serial Number _____ Site Unit Number _____ Date _____ Hourmeter _____ Name of Service Technician _____				
	TASK	COMMENTS	CHECKED	INITIALS
1.	HYDRAULIC TANK - Drain the hydraulic tank and clean the inlet strainer. Refill the tank with new oil; approximate capacity 901 l (238 gal). Use Lube Key "B". <i>NOTE: Oil change interval can be extended to 2,500 hours if oil is sampled at every 250 hour intervals and no abnormalities are detected.</i>			
2.	RADIATOR - Clean the cooling system with a quality cleaning compound. Flush with water. Refill the system with anti-freeze and water solution. Check the Cooling System Recommendation Chart in this section for the correct mixture. Refer to the engine manufacturer's Operation and Maintenance Manual for the correct additive mixture.			
3.	FUEL TANK - Remove the breather and clean in solvent. Dry with pressurized air and reinstall.			
4.	OPERATOR'S SEAT - Apply grease to the slide rails. Lube Key "D".			
5.	AUTOMATIC BRAKE APPLICATION - Ensure the brakes are automatically applied when brake pressure decreases below the specified limit. Refer to the appropriate Shop Manual, Section J, Brake Check-out Procedure.			
6.	FRONT ENGINE MOUNT TRUNION - Add one or two applications of grease at fitting. Lube key "D".			
7.	AUTOMATIC LUBE SYSTEM PUMP - Check pump housing oil level. Refill to bottom of level plug with SAE 10W-30 motor oil.			
8.	ELIMINATOR FILTER - Clean and check centrifuge. Refer to engine manufacture's Operation & Maintenance Manual. (Service interval is dependent on duty cycle, oil quality, etc.)			

2500 HOUR MAINTENANCE CHECKS

Maintenance for every 10, 250, & 500 hour Lubrication and Maintenance Checks should also be performed at this time.

NOTE: "Lube Key" references are to the lubrication chart.

Truck Serial Number _____ Site Unit Number _____ Date _____				
Hourmeter _____ Name of Service Technician _____				
	TASK	COMMENTS	CHECKED	INITIALS
1.	WHEEL MOTOR GEAR OIL - Wheel motor gear oil must be replaced every 2500 hours of operation. Refer to G.E. Motorized Wheel Service & Maintenance manual.			
2.	FRONT WHEELS - Drain and refill with oil. Refer to Section G in this manual for detailed instructions on changing the oil. Lube key "E". <i>NOTE: Oil may need to be changed more frequently, depending on mine conditions and the results of the oil sample tests.</i>			

5000 HOUR MAINTENANCE CHECKS

Maintenance for every 10, 250, 500 1,000 & 2,500 hour Lubrication and Maintenance Checks should also be performed at this time.

NOTE: "Lube Key" references are to the lubrication chart.

Truck Serial Number _____ Site Unit Number _____ Date _____				
Hourmeter _____ Name of Service Technician _____				
	TASK	COMMENTS	CHECKED	INITIALS
1.	AIR CLEANERS - Clean the Donaclone tubes in the pre-cleaner section of the air filter. Use low pressure cold water or low pressure air to clean the tubes. Refer to Section C, Air Cleaners. <i>NOTE: Do not use a hot pressure washer or high pressure air to clean the tubes. Hot water/high pressure causes the pre-cleaner tubes to distort.</i>			
2.	FRONT WHEELS - If oil sampling is done every 500 hours - And the contamination trends are not rising, do not replace the wheel bearings. Refer to Section G of the service manual for more detailed instructions on oil sampling. If oil samples are not taken - Drain oil and completely disassemble the front wheel bearings and check all parts for wear or damage. Refer to Section G of the service manual for disassembly and assembly procedures. Refill with oil. Check the oil level at the oil level plug on wheel hub. Lube key "E".			

10,000 HOUR MAINTENANCE CHECKS

Maintenance for every 10, 250, 500, 1,000, 2,500 & 5000 hour Lubrication and Maintenance Checks should also be performed at this time.

NOTE: "Lube Key" references are to the lubrication chart.

Truck Serial Number _____	Site Unit Number _____	Date _____
Hourmeter _____	Name of Service Technician _____	

	TASK	COMMENTS	CHECKED	INITIALS
1.	WHEEL MOTORS - Clean the area around the grease ports to prevent dirt or other contaminants from entering. Remove the six grease port plugs on each wheel motor. Grease the inboard and outboard wheel hub bearings with one 14 oz. cartridge per each grease port.			

AUTOMATIC LUBRICATION SYSTEM

GENERAL DESCRIPTION

The automatic lubrication system is a pressurized lubricant delivery system which delivers a controlled amount of lubricant to designated lube points. The system is controlled by an electronic timer which signals a solenoid valve to operate a hydraulic motor powered grease pump. Hydraulic oil for pump operation is supplied by the truck steering circuit.

Grease output is proportional to the hydraulic motor input flow. A pump control manifold, mounted on top of the hydraulic motor, controls input flow and pressure. A 24VDC solenoid mounted on the manifold turns the pump on and off.

The pump is driven by the rotary motion of the hydraulic motor, which is then converted to reciprocating motion through an eccentric crank mechanism.

The reciprocating action causes the pump cylinder to move up and down. The pump is a positive displacement, double-acting type as grease output occurs on both the up and the down stroke.

During the down stroke, the pump cylinder is extended into the grease. Through the combination of shovel action and vacuum generated in the pump cylinder chamber, the grease is forced into the pump cylinder. Simultaneously, grease is discharged through the outlet of the pump. The volume of grease during intake is twice the amount of grease output during one cycle. During the upstroke, the inlet check valve closes. One half the grease taken in during the previous stroke is transferred through the outlet check and discharged to the outlet port.

⚠ WARNING

Over-pressurizing of the system, modifying parts, using incompatible chemicals and fluids, or using worn or damaged parts, may result in equipment damage and/or serious personal injury.

- *DO NOT exceed the stated maximum working pressure of the pump, or of the lowest rated component in the system.*
- *Do not alter or modify any part of this system unless approved by the factory.*
- *Do not attempt to repair or disassemble the equipment while the system is pressurized.*
- *Make sure all fluid connections are securely tightened before using this equipment.*
- *Always read and follow the fluid manufacturer's recommendations regarding fluid compatibility, and the use of protective clothing and equipment.*
- *Check all equipment regularly and repair, or replace, worn or damaged parts immediately.*

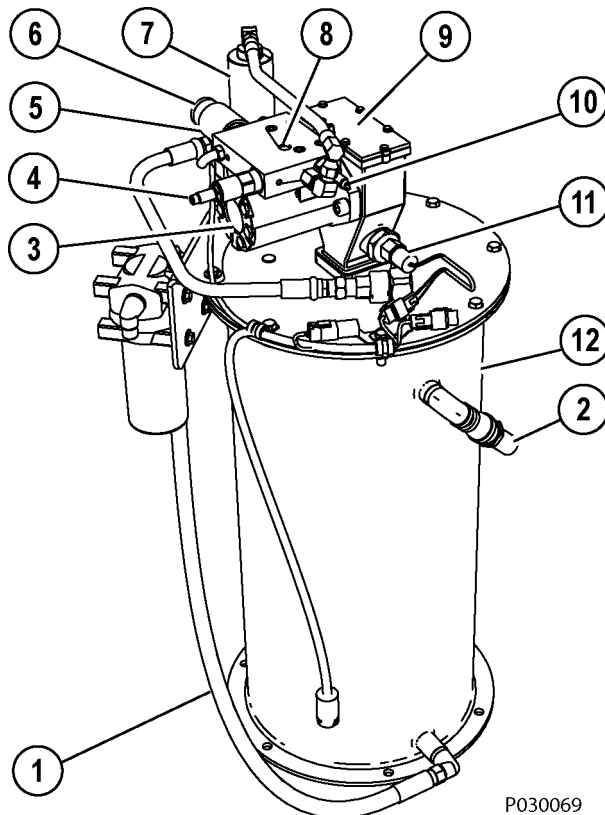


FIGURE 42-1. PUMP & RESERVOIR

- | | |
|----------------------------|------------------------|
| 1. Hose From Filter | 7. Vent Valve |
| 2. Vent Hose | 8. Pipe Plug |
| 3. Hydraulic Motor | 9. Pump Assembly |
| 4. Pressure Reducing Valve | 10. Flow Control Valve |
| 5. Solenoid Valve | 11. Pressure Switch |
| 6. Override Switch | 12. Grease Reservoir |

This equipment generates very high grease pressure. Extreme caution must be used when operating this equipment as material leaks from loose or ruptured components can inject fluid through the skin and into the body causing serious bodily injury including possible need for amputation. Adequate protection is recommended to prevent splashing of material onto skin or into the eyes.

If any fluid appears to penetrate the skin, get emergency medical care immediately! Do not treat as a simple cut. Tell attending physician exactly what fluid was injected.

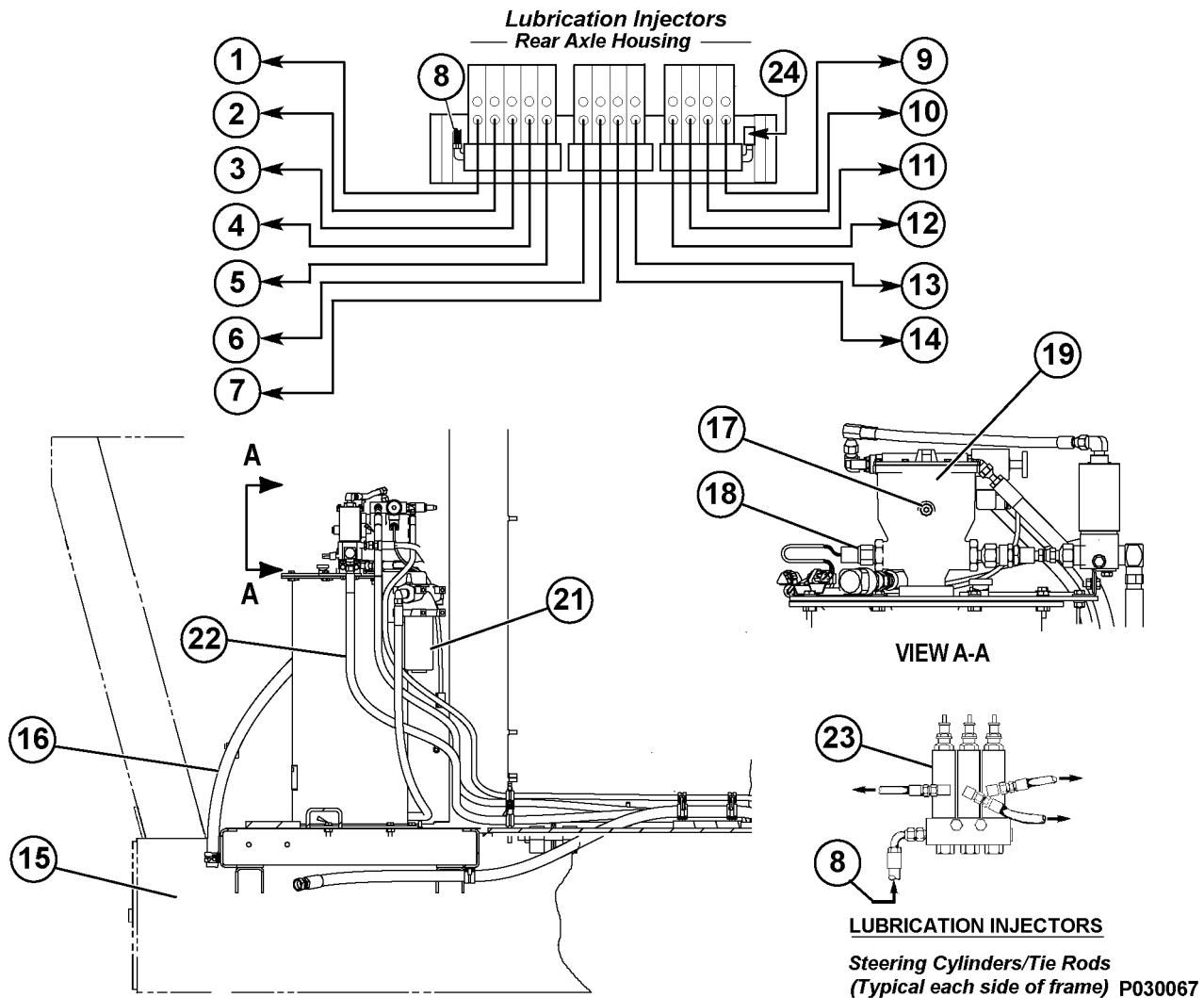


FIGURE 42-2. AUTOMATIC LUBRICATION SYSTEM INSTALLATION

NOTE: The above illustration shows the standard location for the lube pump and reservoir (right platform). This assembly may be located on the left platform on some models.

- | | |
|---|--|
| 1. L.H. Suspension, Bottom Bearing | 13. R.H. Anti-Sway Bar Bearing |
| 2. L.H. Hoist Cylinder, Top Bearing | 14. R.H. Suspension, Top Bearing |
| 3. L.H. Hoist Cylinder, Bottom Bearing | 15. Truck Frame |
| 4. L.H. Anti-Sway Bar Bearing | 16. Vent Hose |
| 5. L.H. Suspension, Top Bearing | 17. Pipe Plug (Oil Level) |
| 6. L.H. Body Pivot Pin | 18. Pressure Switch, N.O., 17,237 kPa (2500 psi) |
| 7. R.H. Body Pivot Pin | 19. Grease Pump |
| 8. Grease Supply From Pump | 20. Vent Valve |
| 9. R.H. Suspension, Bottom Bearing | 21. Filter |
| 10. R.H. Hoist Cylinder, Top Bearing | 22. Grease Supply to Injectors |
| 11. R.H. Hoist Cylinder, Bottom Bearing | 23. Injectors |
| 12. Rear Axle Pivot Pin | 24. Pressure Switch, N.O., 13,790 kPa (2000 psi) |

SYSTEM COMPONENTS

Filter

Filter assembly (21, Figure 42-2) mounted on the grease reservoir filters the grease prior to refilling the reservoir from the shop supply. A bypass indicator alerts service personnel when the filter requires replacement.

Hydraulic Motor and Pump

Rotary hydraulic pump (3 & 9, Figure 42-1) is a fully hydraulically operated grease pump. An integrated pump control manifold is incorporated with the motor to control input flow and pressure.

NOTE: The pump crankcase oil level must be maintained to the level of the pipe plug (17, Figure 42-2). If necessary, refill with 10W-30 motor oil.



Hydraulic oil supply inlet pressure must not exceed 20,685 kPa (3000 psi). Exceeding the rated pressure may result in damage to the system components and personal injury.

Grease Reservoir

Reservoir (12, Figure 42-1) has an approximate capacity of 41 kg (90 lbs.) of grease. When the grease supply is replenished by filling the system at the service center, the grease is passed through the filter to remove contaminants before it flows into the reservoir.

Pressure Reducing Valve

Pressure reducing valve (4, Figure 42-1), located on the manifold reduces the hydraulic supply pressure (from the truck steering circuit) to a suitable operating pressure of 2241 - 2413 kPa (325 - 350 psi) for the hydraulic motor used to drive the lubricant pump. **The pressure control valve has been factory adjusted and the setting should not be disturbed.**

Flow Control Valve

Flow control valve (10, Figure 42-1) mounted on the manifold, controls the amount of oil flow to the hydraulic motor. **The flow control valve has been factory adjusted and the setting should not be disturbed.**

Solenoid Valve

Solenoid valve (5, Figure 42-1), when energized, allows oil to flow to the hydraulic motor.

Vent Valve

With vent valve (7, Figure 42-1) closed, the pump continues to operate until maximum grease pressure is achieved. As this occurs, the vent valve opens and allows the grease pressure to drop to zero, so the injectors can recharge for their next output cycle.

Lubrication Cycle Timer

The solid state lubrication cycle timer provides a 24 VDC timed-interval signal to energize solenoid valve (3, Figure 42-3) providing oil flow to operate the grease pump motor. This timer is mounted in the Electrical Interface Cabinet.

Pump Cutoff Pressure Switch

Pressure switch (18, Figure 42-2) is a normally open switch set at 17,237 kPa (2500 psi). This switch de-energizes the pump solenoid relay when the grease line pressure reaches the switch pressure setting, turning off the motor and pump.

Grease Pressure Failure Switch

Pressure switch (24, Figure 42-2) is a normally open switch set at 13,789 kPa (2000 psi). This switch monitors grease pressure in the injector bank on the rear axle housing. If the proper pressure is not sensed within 60 seconds (switch contacts do not close) a warning lamp circuit to notify the operator a problem exists in the lube system.

Pressure Gauge

A pressure gauge can be installed where pipe plug (8, Figure 42-1) is located. The pressure gauge will indicate hydraulic oil pressure to the inlet of the hydraulic motor. Normal pressure is 2241 - 2413 kPa (325 - 350 psi).

Injectors

Each injector (23, Figure 42-2) delivers a controlled amount of pressurized lubricant to a designated lube point. Refer to Figure 42-2 for locations.

SYSTEM OPERATION

Normal Operation

1. During truck operation, the lubrication cycle timer will energize the system at a preset time interval.
2. The timer provides 24 VDC to energize solenoid valve (3, Figure 42-3), allowing hydraulic oil provided by the truck steering pump circuit to flow to the pump motor and initiate a pumping cycle.
3. The hydraulic oil pressure from the steering circuit is reduced to 2241 - 2413 kPa (325 - 350 psi) by pressure reducing valve (4) before entering the motor. In addition, the amount of oil supplied to the pump is limited by flow control valve (6). Pump pressure can be read using pressure gauge (5) mounted on the manifold.
4. With oil flowing into the hydraulic motor, the grease pump will operate, pumping grease from the reservoir to injectors (13), through check valve (10), and to vent valve (11).
5. During this period, the injectors will meter the appropriate amount of grease to each lubrication point.

6. When grease pressure reaches pressure switch (18, Figure 42-2) setting, the switch contacts will close and energize the relay RB7-K5, removing power from the hydraulic motor/pump solenoid and the pump will stop. The relay will remain energized until grease pressure drops (pressure switch opens again) and the timer turns off.
7. After the pump solenoid valve is de-energized, hydraulic pressure in the manifold drops and vent valve (11, Figure 42-3) will open, releasing grease pressure in the lines to the injector banks. When this occurs, the injectors are then able to recharge for the next lubrication cycle.
8. The system will remain at rest until the lubrication cycle timer turns on and initiates a new grease cycle.
9. During the normal lubrication cycle, if grease pressure fails to reach 13,790 kPa (2000 psi) at the pressure switch located on the rear axle housing, an amber indicator light will illuminate on the overhead panel.

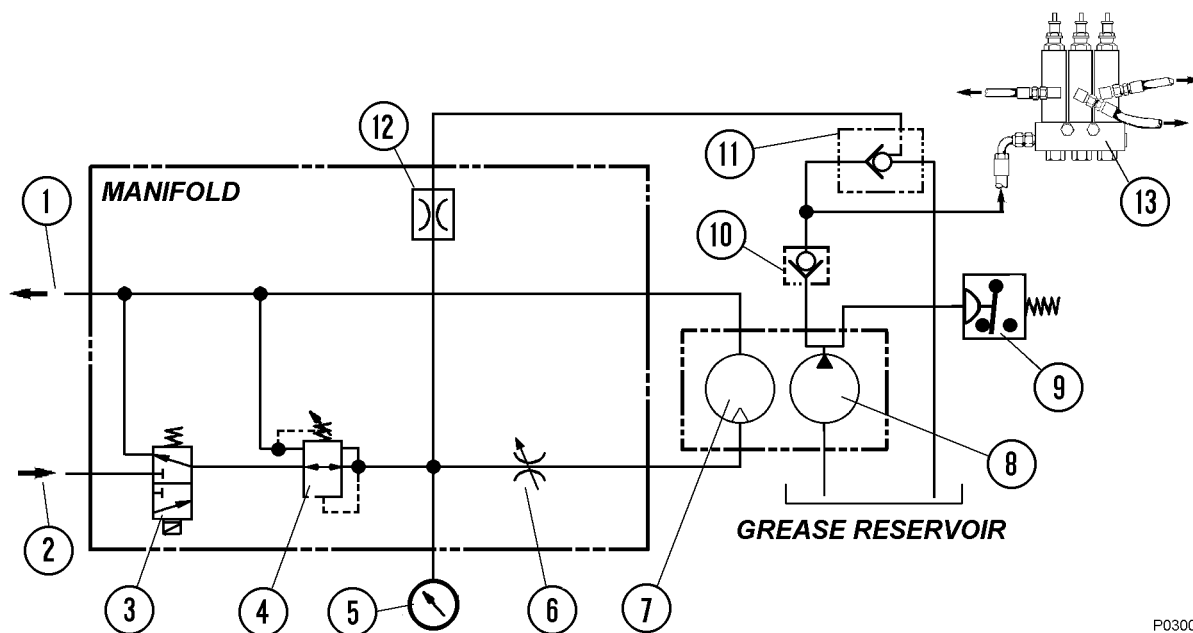


FIGURE 42-3. HYDRAULIC SCHEMATIC

- | | | |
|----------------------------|---------------------------|-------------------|
| 1. Hydraulic Oil Return | 6. Flow Control Valve | 11. Vent Valve |
| 2. Hydraulic Oil Supply | 7. Hydraulic Motor | 12. Orifice |
| 3. Solenoid Valve | 8. Grease Pump | 13. Injector Bank |
| 4. Pressure Reducing Valve | 9. Pressure Switch (N.O.) | |
| 5. Pressure Gauge | 10. Check Valve | |

P030019

GENERAL INSTRUCTIONS

Lubricant Required For System

Grease requirements will depend on ambient temperatures encountered during truck operation:

- Above 32°C (90°F) - Use NLGI No. 2 multipurpose grease (MPG).
- -32° to 32°C (-25° to 90°F) - Use NLGI No. 1 multipurpose grease (MPG).
- Below -32°C (-25°F) - Refer to local supplier for extreme cold weather lubricant requirements.

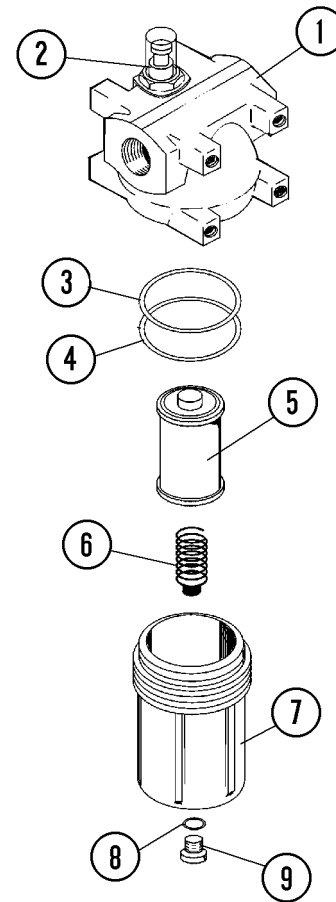
System Priming

The system must be full of grease and free of air pockets to function properly. After maintenance, if the primary or secondary lubrication lines were replaced, it will be necessary to prime the system to eject all entrapped air.

1. Fill lube reservoir with lubricant, if necessary.
2. To purge air from the main supply line, remove the main supply line at the grease canister. Connect an external grease supply to the line.
3. Remove plugs from each injector group in sequence (right front, left front, and rear axle).
4. Using the external grease source, pump grease until grease appears at the group of injectors and re-install the pipe plug. Repeat for remaining injector groups.
5. Remove the caps from each injector and connect an external grease supply to the zerk on the injector and pump until grease appears at the far end of the individual grease hose or the joint being greased.

Filter Assembly

Filter assembly element (5, Figure 42-4) must be replaced if bypass indicator (2) shows excessive element restriction.



P030023

FIGURE 42-4. FILTER ASSEMBLY

- | | |
|---------------------|-----------|
| 1. Housing | 6. Spring |
| 2. Bypass Indicator | 7. Bowl |
| 3. O-Ring | 8. O-Ring |
| 4. Backup Ring | 9. Plug |
| 5. Element | |

LUBRICANT PUMP

Pump Housing Oil Level

The pump housing must be filled to the proper level with SAE 10W-30 motor oil. Oil level should be checked at 1000 hour intervals. To add oil, remove pipe plug (4, Figure 42-5) and fill housing to bottom of plug hole.

Pump Pressure Control

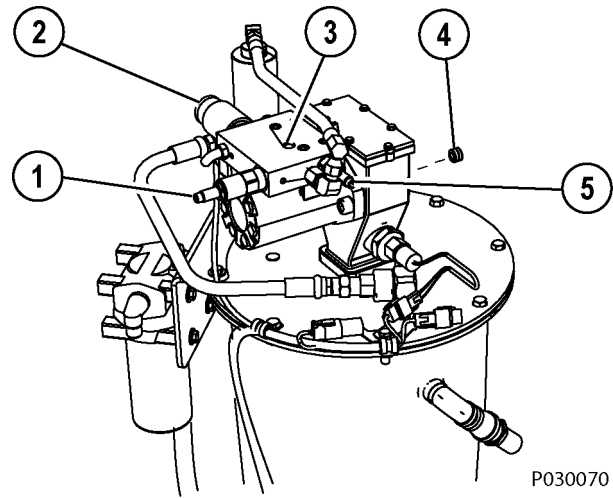
High pressure hydraulic fluid from the truck steering system is reduced to 2240 - 2413 kPa (325 - 350 psi) by the pressure reducing valve located on the manifold on top of the pump motor. This pressure can be read if pipe plug (3) is removed, and a gauge is installed on the manifold. Pressure should be checked occasionally to verify the pressure is within the above limits.

Pressure Control Valve Adjustment

The pressure control valve (1) has been factory adjusted and the setting should not be disturbed.

Flow Control Valve Adjustment

The flow control valve (5) is factory adjusted to 9.5 lpm (2.5 gpm). Do not change this setting.



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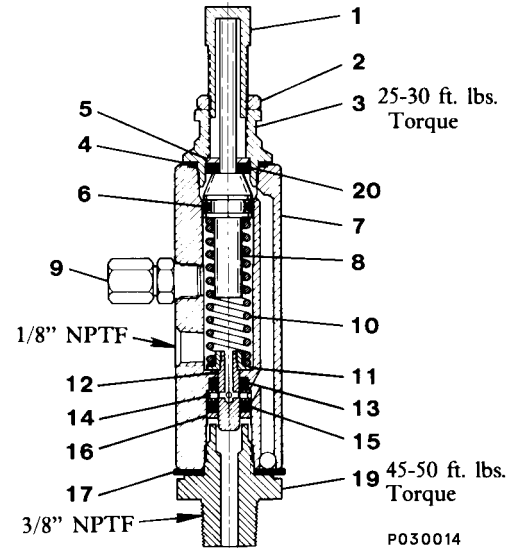
FIGURE 42-5. PUMP CONTROLS

- | | |
|---------------------------|-----------------------|
| 1. Pressure Control Valve | 4. Oil Level Plug |
| 2. Override Switch | 5. Flow Control Valve |
| 3. Pipe Plug | |

INJECTORS (SL-1 Series "H"))

Injector Specifications

- Each lube injector services only one grease point. In case of pump malfunction, each injector is equipped with a covered grease fitting to allow the use of external lubricating equipment.
- *Injector output volume:*
Maximum output = 1.31 cc (0.08 in³).
Minimum output = 0.13 cc (0.008 in³).
- *Operating Pressure:*
Minimum - 12,755 kPa (1850 psi)
Maximum - 24,133 kPa (3500 psi)
Recommended - 17,238 kPa (2500 psi)
- *Maximum Vent Pressure - (Recharge)*
. 4137 kPa (600 psi)



Injector Adjustment

The injectors may be adjusted to supply from 0.13 - 1.31 cc (0.008 - 0.08 in³) of lubricant per injection cycle. The injector piston travel distance determines the amount of lubricant supplied. This travel is in turn controlled by an adjusting screw in the top of the injector housing.

Turn adjusting screw (1, Figure 42-6) counterclockwise to increase lubricant amount delivered and clockwise to decrease the lubricant amount.

When the injector is not pressurized, maximum injector delivery volume is attained by turning the adjusting screw (1) fully counterclockwise until the indicating pin just touches the adjusting screw. At the maximum delivery point, about 9.7 mm (0.38 inch) adjusting screw threads should be showing. Decrease the delivered lubricant amount by turning the adjusting screw clockwise to limit injector piston travel. If only half the lubricant is needed, turn the adjusting screw to the point where about 4.8 mm (0.19 inch) threads are showing. The injector will be set at minimum delivery point with about 0.22 mm (0.009 inch) thread showing.

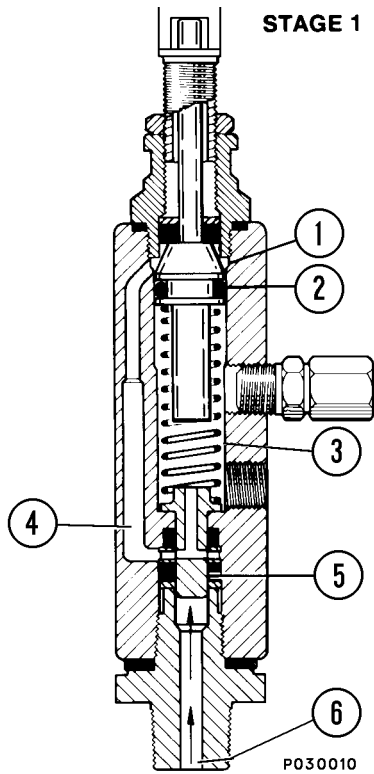
NOTE: The above information concerns adjustment of injector delivery volume. The timer adjustment should also be changed, if overall lubricant delivery is too little or too much. Injector output should NOT be adjusted to less than one-fourth capacity.

FIGURE 42-6. TYPE SL-1 INJECTOR

- | | |
|------------------------|-------------------|
| 1. Adjusting Screw | 11. Spring Seat |
| 2. Locknut | 12. Plunger |
| 3. Piston Stop Plug | 13. Viton Packing |
| 4. Gasket | 14. Inlet Disc |
| 5. Washer | 15. Viton Packing |
| 6. Viton O-Ring | 16. Washer |
| 7. Injector Body Assy. | 17. Gasket |
| 8. Piston Assembly | 18. Adapter Bolt |
| 9. Fitting Assembly | 19. Adapter |
| 10. Plunger Spring | 20. Viton Packing |

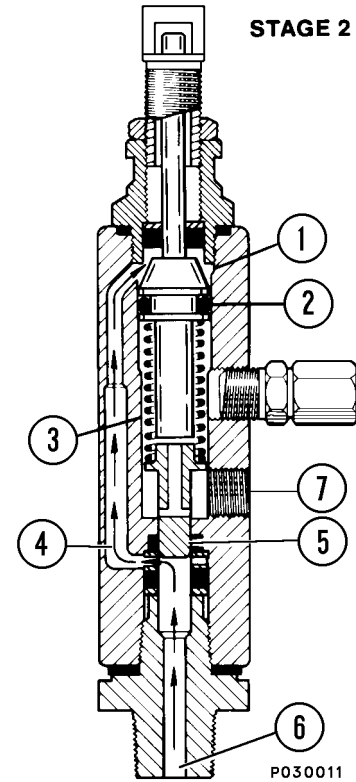
NOTE: The piston assembly (8) has a visible indicator pin at the top of the assembly to verify injector operation.

INJECTOR OPERATION



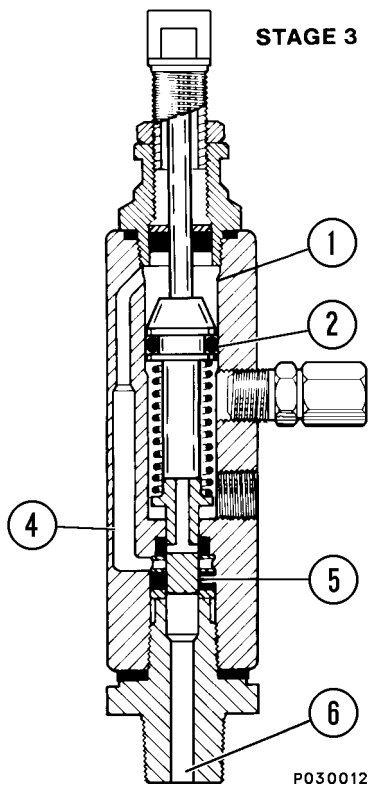
STAGE 1.

The injector piston (2) is in its normal or "rest" position. The discharge chamber (3) is filled with lubricant from the previous cycle. Under the pressure of incoming lubricant (6), the slide valve (5) is about to open the passage (4) leading to the measuring chamber (1) above the injector piston (2).



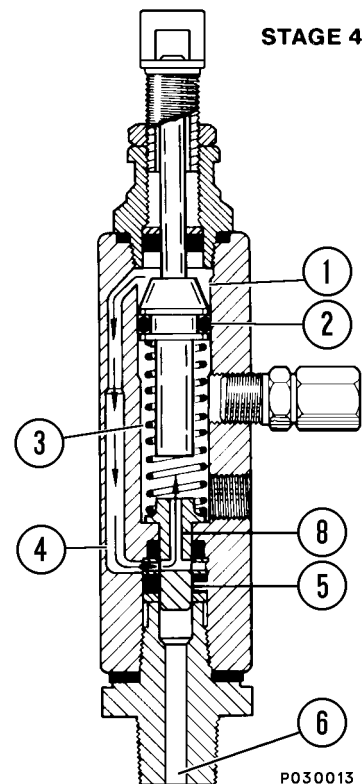
STAGE 2.

When the slide valve (5) uncovers the passage (4), lubricant (6) is admitted to the measuring chamber (1) above the injector piston (2) which forces lubricant from the discharge chamber (3) through the outlet port (7) to the bearing.



STAGE 3.

As the injector piston (2) completes its stroke, it pushes the slide valve (5) past the passage (4), cutting off further admission of lubricant (6) to the passage (4) and measuring chamber (1). The injector piston (2) and slide valve (5) remain in this position until lubricant pressure in the supply line (6) is vented.



STAGE 4.

After venting, the injector spring expands, causing the slide valve (5) to move, so that the passage (4) and discharge chamber (3) are connected by a valve port (8). Further expansion of the spring causes the piston to move upward, forcing the lubricant in the measuring chamber (1) through the passage (4) and valve port (8) to refill the discharge chamber (3).

Injector is now ready for the next cycle.

PREVENTIVE MAINTENANCE PROCEDURES

Use the following maintenance procedures to ensure proper system operation.

Daily Lubrication System Inspection

1. Check grease reservoir level.
Inspect grease level height after each shift of operation. Grease usage should be consistent from day-to-day operations.

Lack of lubricant usage would indicate an inoperative system. Excessive usage would indicate a broken supply line.
2. Check filter bypass indicator when filling reservoir. Replace element if bypassing.
3. Check all grease hoses from the SL-1 Injectors to the lubrication points.
 - a. Repair or replace all damaged feed line hoses.
 - b. Ensure that all air is purged and all new feed line hoses are filled with grease before sending the truck back into service.
4. Inspect key lubrication points for a bead of lubricant around seal. If a lubrication point appears dry, troubleshoot and repair problem.

250 Hour Inspection

1. Check all grease hoses from the SL-1 Injectors to the lubrication points (see Figure 42-2).
 - a. Repair or replace all worn / broken hoses.
 - b. Ensure that all air is purged and all new feed line hoses are filled with grease before sending the truck back into service.
2. Check all grease supply line hoses from the pump to the SL-1 injectors.
 - a. Repair or replace all worn / broken supply lines.
 - b. Ensure that all air is purged and all new supply line hoses are filled with grease before sending the truck back into service.
3. Check grease reservoir level.
 - a. Fill reservoir if low. Check filter bypass indicator when filling reservoir. Replace element if bypassing.
 - b. Check reservoir for contaminants. Clean, if required.
 - c. Check that all filler plugs, covers and breather vents on the reservoir are intact and free of contaminants.

4. Inspect all bearing points for a bead of lubricant around the bearing seal.

It is good practice to manually lube each bearing point at the grease fitting provided on each injector. This will indicate if there are any frozen or plugged bearings, and will help flush the bearings of contaminants.

5. System Checkout
 - a. Remove all SL-1 injector cover caps to allow visual inspection of the injector cycle indicator pins during system operation.
 - b. Start truck engine.
 - c. Actuate override switch (6, Figure 42-1). The hydraulic motor and grease pump should operate.
 - d. With the grease under pressure, check each SL-1 injector assembly.
The cycle indicator pin should be retracted inside the injector body.
 - e. When the system attains 17,237 kPa (2500 psi), the pump should shut off and the pressure in the system should drop to zero, venting back to the grease reservoir.
 - f. With the system vented, check all of the SL-1 injector indicator pins; all of the pins should be visible. Replace or repair injectors, if defective.
 - g. Reinstall all injector cover caps.
 - h. Check timer operation.

NOTE: With the engine on, the lube system should activate within five minutes. The system should build 13,790 - 17,237 kPa (2000 - 2500 psi) within 25-40 seconds.

- i. If the system is working properly, the machine is ready for operation.
- j. If the system is malfunctioning, refer to the troubleshooting chart.

1000 Hour Inspection

1. Check pump housing oil level. Refill to bottom of level plug with SAE 10W-30 motor oil if necessary

SYSTEM CHECKOUT

To check system operation (not including timer), proceed as follows:

1. Start the engine.
2. Actuate the test switch at the reservoir/pump assembly.
3. The motor and pump should operate until the system attains 17,237 kPa (2500 psi).
4. Once the required pressure is achieved, the pump motor should turn off and the system should vent.
5. Check for pump, hose or injector damage or leakage with the system under pressure.
6. After checking system, stop the engine. Observing normal precautions regarding high voltage present in the propulsion system before attempting to repair lube system.

Lubrication Controller Check

Pressing the manual lube button on the enclosure cover will initiate a lube event (see Figure 42-7).

Lubrication Controller Operation

The time between lube events is determined by the setting of the rotary switch, which selects the numeral setting, and the dip switch, which selects the units in either minutes or hours.

Lubrication Controller Components

Mode switch (2, Figure 42-7) consists of four dip switches. The first dip switch controls the maximum amount of "on time", either 30 seconds or 120 seconds.

The second dip switch controls the mode, either timer mode or controller mode. When the switch is set to the timer mode, the amount of time that the pump is on will be determined by the setting of the dip switch (30 seconds or 120 seconds). When the switch is set to the controller mode, a pressure switch must be installed in the lube supply line. The pressure switch will detect supply line pressure, and will reset the timer at a set pressure. If the pump fails to reach the set pressure within the dip switch setting (30 seconds or 120 seconds), the controller will initiate an alarm.

The third dip switch is for selecting the units for the "off time" to be used in conjunction with off time switch (1). Hours or minutes may be selected.

The fourth dip switch is used to select "memory off" or "memory on". When the switch is set to "memory off", a lube cycle will occur each time power is turned on. The lube cycle will start at the beginning of the on time setting.

When the switch is set to "memory on", the controller will function as follows:

1. When power is turned off during 'off time' (between cycles), the lube cycle will resume at the point of interruption after power is restored. In other words, the controller will remember its position in the cycle.
2. When power is turned off during 'on time' (during a cycle), the controller will reset to the beginning of the lube cycle after power is restored.

Off time switch (1) is used to select units of time. Possible time intervals are: 0.5, 1, 2, 4, 8, 15, 24 or 30. The mode switch determines whether the off time units will be minutes or hours.

Cover (3) contains three LED windows and a manual lube switch. The LEDs indicate system operation and status. When power is on, a green LED will illuminate. When the pump is on, another green LED will illuminate. A red LED will illuminate when an alarm condition occurs.

Lubrication Controller Adjustment

The lubrication controller is factory adjusted to the following switch settings:

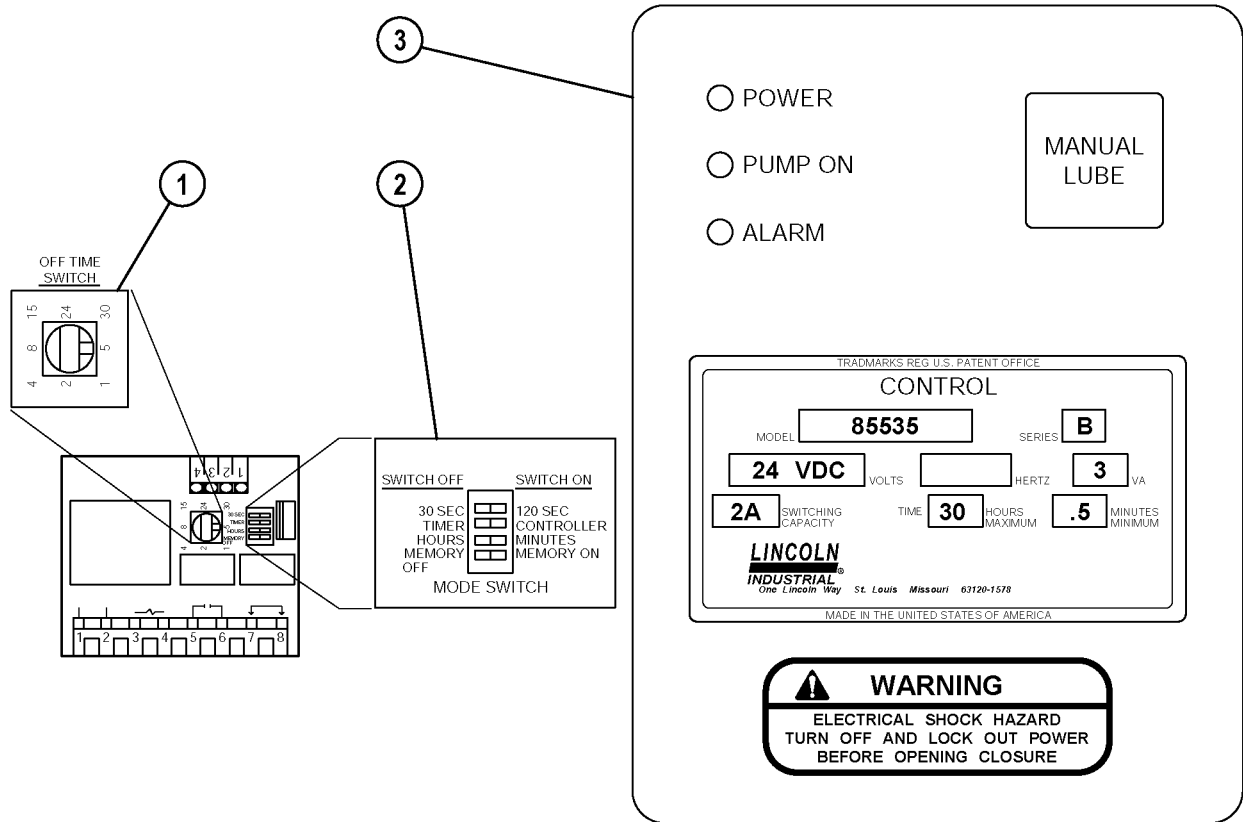
Dip Switch 1 - 120 SEC

Dip Switch 2 - TIMER

Dip Switch 3 - MINUTES

Dip Switch 4 - MEMORY OFF

Rotary Switch - 15 minutes



P030054

FIGURE 42-7. LUBRICATION CYCLE TIMER

- 1. Off Time Switch
- 2. Mode Switch

- 3. Cover

SYSTEM TROUBLESHOOTING CHART

NOTE: If the following procedures do not correct the problem, contact a factory authorized service center.

TROUBLE	POSSIBLE CAUSES	SUGGESTED CORRECTIVE ACTION
<p>Pump Does Not Operate</p>	<p>Lube system not grounded.</p> <p>Electrical power loss.</p> <p>Timer malfunction.</p> <p>Solenoid valve malfunctioning.</p> <p>Relay malfunctioning</p> <p>Motor or pump malfunction.</p>	<p>Correct grounding connections to pump assembly and truck chassis.</p> <p>Locate cause of power loss and repair. 24 VDC power required. Ensure key switch is ON.</p> <p>Replace timer assembly</p> <p>Replace the solenoid valve assembly</p> <p>Replace relay</p> <p>Repair or replace motor and/or pump assembly. (Refer to shop manual for rebuild instructions.)</p>
	<p><i>NOTE: On initial startup of the lube system, the timing capacitor will not contain a charge, therefore the first timing cycle will be about double in length compared to the normal interval. Subsequent timer cycles should be as specified.</i></p>	
<p>Pump Will Not Prime</p>	<p>Low lubricant supply.</p>	<p>Dirt in reservoir, pump inlet clogged, filter clogged.</p>
<p>Pump Will Not Build Pressure</p>	<p>Air trapped in lubricant supply line.</p> <p>Lubricant supply line leaking.</p> <p>Vent valve leaking.</p> <p>Pump worn or scored.</p>	<p>Prime system to remove trapped air.</p> <p>Check lines and connections to repair leakage.</p> <p>Clean or replace vent valve.</p> <p>Repair or replace pump assembly. (Refer to shop manual for rebuild instructions.)</p>
<p>Injector Indicator Stem Does Not Operate</p>	<p><i>NOTE: Normally, during operation, the injector indicator stem will move into the body of the injector when pressure builds properly. When the system vents (pressure release) the indicator stem will again move out into the adjusting yoke.</i></p>	
	<p>Malfunctioning injector - usually indicated by the pump building pressure and then venting.</p> <p>All injectors inoperative - pump build up not sufficient to cycle injectors.</p>	<p>Replace individual injector assembly.</p> <p>Service and/or replace pump assembly. (Refer to shop manual for rebuild instructions.)</p>
<p>Pressure Gauge Does Not Register Pressure</p>	<p>No system pressure to the pump motor.</p> <p>No 24 VDC signal at pump solenoid.</p> <p>Pressure reducing valve set too low.</p> <p>24V Relay (RB7K8 or RB7K5) may be defective.</p>	<p>Check hydraulic hose from steering system.</p> <p>Determine problem in 24 VDC electric system.</p> <p>Refer to "Pressure Control Valve Adjustment".</p> <p>Replace relay.</p>

TROUBLE	POSSIBLE CAUSES	SUGGESTED CORRECTIVE ACTION
Pump Pressure Builds Very Slowly Or Not At All	No signal at solenoid.	Check timer.
Controller Does Not Operate	No electric power to controller.	Turn on electric power to pump. "POWER" LED should light, "PUMP ON" LED should light when "MANUAL LUBE" is pressed.
"PUMP ON" LED Lights, But Load Connected To Terminals 3 & 4 Will Not Energize	Printed circuit board failure.	Remove and replace.
Load Connected To Terminals 3 & 4 Energized, But "PUMP ON" LED Does Not Light	Printed circuit board failure or keypad failure.	Remove and replace.
Bearing Points Excessively Lubricated	Controller memory mode is to OFF.	Switch controller memory mode to ON.
	Injector output adjustment setting too high.	Readjust to lower setting.
Bearing Points Are Not Sufficiently Lubricated	Timer/controller cycle time setting too low.	Set to longer cycle time or reevaluate lube requirements.
	Injector output adjustment setting too low.	Readjust injector output setting.
	Timer/controller cycle time setting does not deliver lubricant often enough.	Set to shorter cycle time or reevaluate lube requirements.
	System too large for pump output.	Calculate system requirements per planning manual.

NOTES

MAJOR COMPONENT DESCRIPTION

Truck And Engine

The 830E-AC Dump Truck is an off-highway, rear dump truck with AC Electric Drive. The gross vehicle weight is 385 852 kg (850,650 lbs.). The engine is a Komatsu SDA16V160 rated @ 1865 kW (2500 HP).

Alternator (GTA-41)

The diesel engine drives an in-line alternator at engine speed. The alternator produces AC current which is rectified to DC within the main control cabinet. The rectified DC power is converted back to AC by groups of devices called "inverters", also within the main control cabinet. Each inverter consists of six "phase modules" under the control of a "gate drive unit" (GDU). The GDU controls the operation of each phase module.

Cooling air for the control / power group and wheel motors, as well as the alternator itself, is provided by dual fans mounted on the alternator shaft.

AC Induction Traction Motorized Wheels

The alternator output supplies electrical energy to the two wheel motors attached to the rear axle housing. The motorized wheels use three-phase AC induction motors with full-wave AC power.

The two wheel motors convert electrical energy back to mechanical energy through built-in gear trains within the wheel motor assembly. The direction of the wheel motors is controlled by a forward or reverse hand selector switch located on the center console.

Suspension

HYDRAIR®II suspension cylinders located at each wheel provide a smooth and comfortable ride for the operator and dampens shock loads to the chassis during loading and operation.

Operator's Cab

The operator cab has been engineered for operator comfort and to allow for efficient and safe operation of the truck. The cab provides wide visibility, with an integral 4-post ROPS/FOPS structure, and an advanced analog operator environment. It includes a tinted safety-glass windshield and power-operated side windows, a deluxe interior with a fully adjustable seat with lumbar support, a fully adjustable tilt/telescope steering wheel, controls mounted within easy reach of the operator, and an analog instrument panel which provides the operator with all instruments and gauges which are necessary to control and/or monitor the truck's operating systems.

Power Steering

The truck is equipped with a full time power steering system which provides positive steering control with minimum operator effort. The system includes nitrogen-charged accumulators which automatically provide emergency power if the steering hydraulic pressure is reduced below an established minimum.

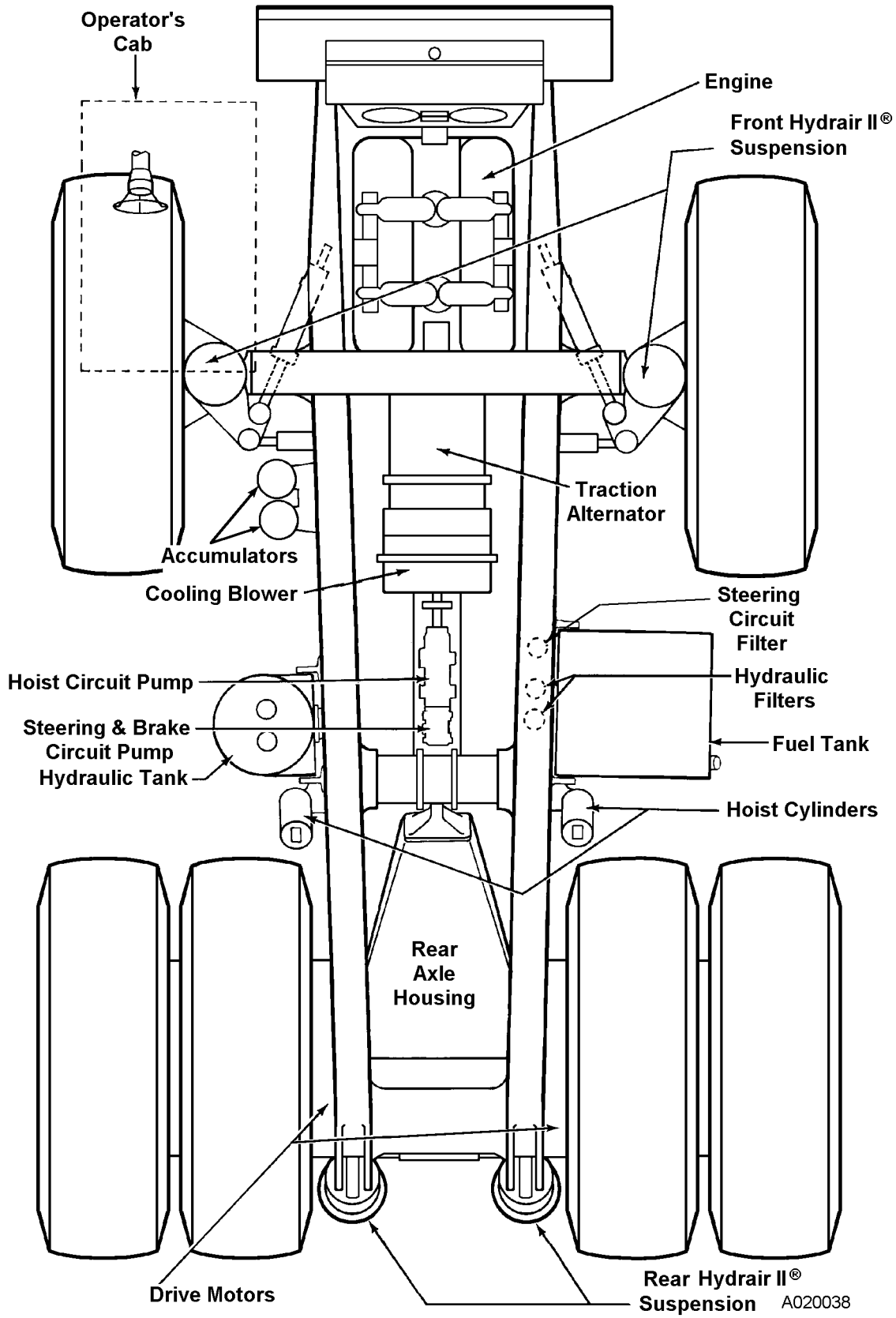
Dynamic Retarding

The dynamic retarding is used to slow the truck during normal operation or control speed coming down a grade. The dynamic retarding ability of the electric system is controlled by the operator through the activation of the retarder pedal in the operators cab and by setting the RSC (Retarder Speed Control). Dynamic Retarding is automatically activated, if the truck speed goes to a preset overspeed setting.

Brake System

The braking system consists of an all hydraulic actuation system. Depressing the brake pedal actuates wheel-speed single disc front brakes and armature-speed dual disc rear brakes. The brakes can also be activated by operating a switch on the instrument panel. The brakes will be applied automatically if system pressure decreases below a preset minimum.

The parking brake is integral with the service brake caliper, and is spring-applied and hydraulically-released. The park brake is applied by moving the directional control lever to the PARK position.



830E-AC MAJOR COMPONENTS

SPECIFICATIONS

These specifications are for the standard Komatsu 830E-AC Truck. Customer Options may change this listing.

ENGINE

Komatsu SDA16V160

No. of Cylinders 16
Operating Cycle 4-Stroke
Rated Brake HP. . . . 1865 kW (2500 HP) @ 1900 RPM
Flywheel HP 1761 kW (2360 HP) @ 1900 RPM
Weight* (Wet) 9,608 kg (21,182 pounds)

* Weight does not include Radiator, Sub-frame, or Alternator

AC ELECTRIC DRIVE SYSTEM

(AC/DC Current)

Alternator General Electric GTA - 41
Dual Impeller, In-Line Blower .255 m³/ min (9,000 cfm)
Motorized Wheels GEB25 AC Induction Traction
Motors

Standard Gear Ratio* 31.875:1
Maximum Speed 64.5 km/h (40 mph)

*NOTE: Wheel motor application depends upon GVW, haul road grade and length, rolling resistance, and other parameters. Komatsu & G.E. must analyze each job condition to assure proper application.

DYNAMIC RETARDING

Electric Dynamic Retarding Standard
Maximum Rating 2983 kW (4000 HP)

BATTERY ELECTRIC SYSTEM

Batteries . 4 x 8D 1450 CCA, 12 volt, in series/parallel,
bumper mounted with disconnect switch
Alternator 24 Volt, 140 Ampere Output
Lighting 24 Volt
Cranking Motors (2) 24 Volt

SERVICE CAPACITIES

	Liters . . . (Gallons)
Crankcase *	280 74
* Includes Lube Oil Filters	
Cooling System	568 (150)
Fuel	4542 (1200)
Hydraulic System	946 (250)
Wheel Motor Gear Box (each)	38 (10)

HYDRAULIC SYSTEMS

Hoist Tandem Gear Pump
851 lpm (225 gpm) @ 1900 rpm and
17 240 kPa (2,500 psi)
Steering/Brake Pump: . Pressure Compensated Piston
Rated @ 246 lpm (65 gpm) @ 1900 rpm
and 18 961 kPa (2750 psi)
Relief Pressure-Hoist. 17 240 kPa (2500 psi)
Relief Pressure-Steering/Brake . 27 580 kPa (4000 psi)
Hoist Cylinders (2) 3-Stage Hydraulic
Tank (Vertical/Cylindrical) Non-Pressurized
Filtration In-line replaceable elements
Suction Single, Full Flow, 100 Mesh
Hoist & Steering Filters Beta ₁₂ Rating =200
Dual In-Line, High Pressure

SERVICE BRAKES

Actuation All Hydraulic
Front Wheel Speed, Single Disc
Inboard Mounted 3 Calipers
Disc Diameter, O.D. 1213 mm (47.75 in.)
Rear Armature Speed, Dual Disc
Disc Diameter, O.D. 635 mm (25.00 in.)
Emergency Brake- . Automatically Applied (Standard)
Wheel Brake Lock Manual Switch on Panel
. (Loading and Dumping)

PARKING BRAKE

Each Rear Wheel Intregal Caliper
. Spring Applied, Hydraulically Released

STEERING

Turning Circle (SAE) 28.4 m (93 ft.)

Twin hydraulic cylinders with accumulator assist to provide constant rate steering. Emergency power steering automatically provided by accumulators.

STANDARD DUMP BODY CAPACITIES AND DIMENSIONS

Standard, Heaped @ 2:1 (SAE)	147 m ³ (193 yd ³)
Struck	117 m ³ (153 yd ³)
Loading Height Empty	6.61 m (21 ft. 8 in.)
Dumping Angle	45°
Non-heated Body w/Exhaust Mufflers	Standard

*OPTIONAL capacity dump bodies are available.

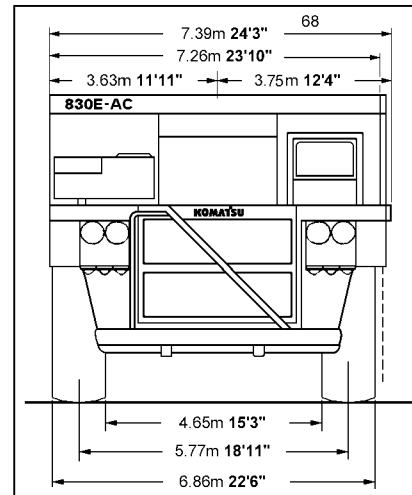
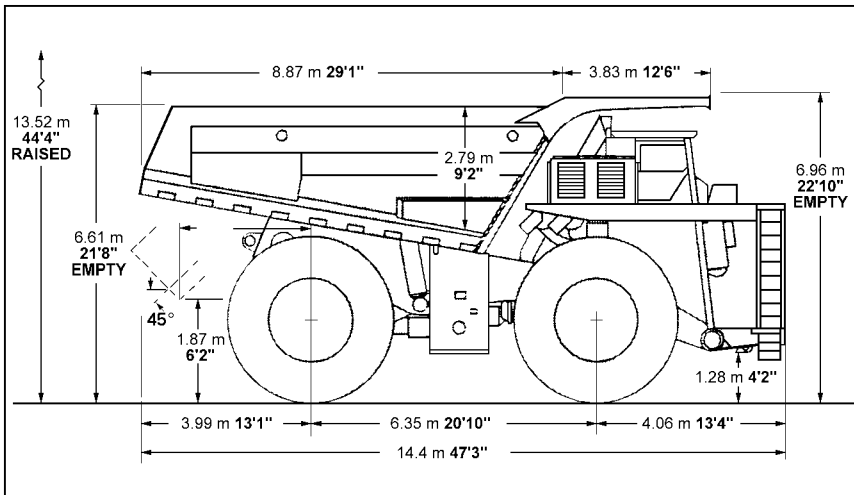
TIRES

Radial Tires (standard)	40.00 R57
Optional Tires	46/90 R57
Rock Service, Deep Tread	Tubeless
Rims, standard 5 piece	Rated to 827 kPa (120 psi)

WEIGHT DISTRIBUTION

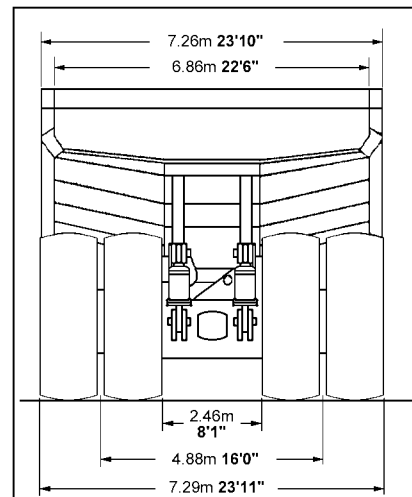
Empty Vehicle Kilograms . . . (Pounds)	
Front Axle	82 747 . . . (182,426)
Rear Axle	82 902 . . . (182,768)
Total (100% Fuel)	165 649 . . . (365,194)
Standard Komatsu Body	27 669 . . . (61,000)
Standard tire weight	21 081 . . . (46,476)
Loaded Vehicle Kilograms . . . (Pounds)	
Front Axle	127 330 . . . (280,715)
Rear Axle	258 522 . . . (569,935)
Total	385 852 . . . (850,650)
Nominal Payload* (242 U.S. Ton)	220 199 . . . (485,456)

*Nominal payload is defined by Komatsu America Corporation's payload policy documentation. In general, the nominal payload must be adjusted for the specific vehicle configuration and site application. The figures above are provided for basic product description purposes. Please contact your Komatsu distributor for specific application requirements.



OVERALL TRUCK DIMENSIONS (Empty with Standard Body)

Length	14.4 m (47 ft. 3 in.)
Width	7.32 m (24 ft. 0 in.)
Height with Canopy	6.96 m (22 ft. 10 in.)
Height with Dump Body Up	13.52 m (44 ft. 4 in.)
Turning Circle (on front track)	28.4 m (93 ft. 0 in.)



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INTRODUCTION

Payload Meter III (PLMIII) measures, displays and records the weight of material being carried by an off-highway truck. The system generally consists of a payload meter, a gauge display, deck-mounted lights, and sensors. The primary sensors are four suspension pressures and an inclinometer. Other inputs include a body up signal, brake lock signal, and speed.

Data Summary

5208 haul cycles can be stored in memory. The following information is recorded for each haul cycle:

- Payload
- Operator ID number (0000-9999)
- Distance traveled loaded and empty
- The amount of time spent empty run/stop, loading, loaded run/stop, and dumping
- Maximum speed loaded and empty with time of day
- Average speed loaded and empty
- Empty carry-back load
- Haul-cycle, loading, dumping start time of day.
- Peak positive and peak negative frame torque with time of day
- Peak sprung load with time of day
- Tire ton-mph for each front and average per rear tires

The payload meter stores lifetime data that cannot be erased. This data includes:

- Top 5 maximum payloads and time stamps.
- Top 5 positive and negative frame torque and time stamps
- Top 5 maximum speeds and time stamps

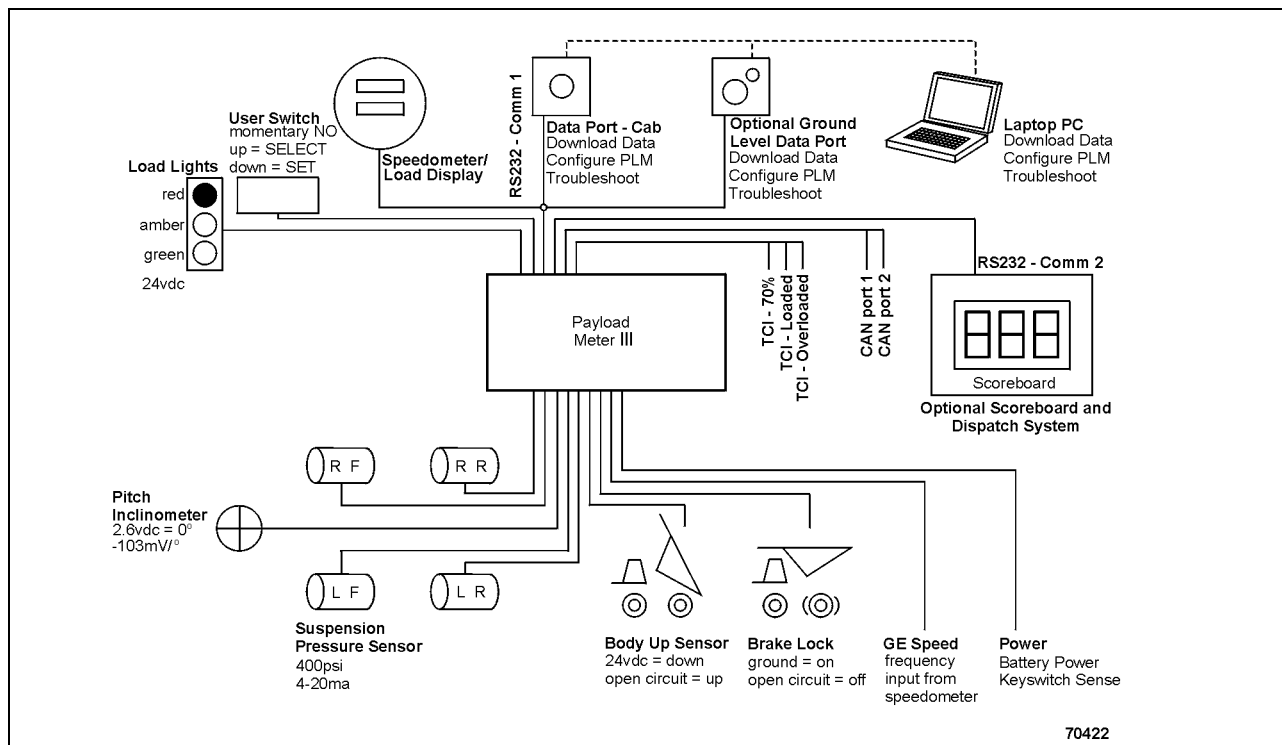
Data Gathering

Windows 95/98/NT software is available to download, store and view payload and fault information. The PC software will download an entire truck fleet into one Paradox database file. Users can query the database by date, time, truck type and truck number to produce reports, graphs and export the data. The software can export the data in '.CSV' format that can be easily imported into most spreadsheet applications. The Windows software is not compatible with the Payload Meter II system.

It is important that each payload meter be configured for each truck using the PC software. The information for frame serial number and truck number is used by the database program to organize the payload data. In addition, the payload meter must be configured to make calculations for the proper truck model. Improper configuration can lead to data loss and inaccurate payload calculations.

COMPONENT DESCRIPTION

System Diagram



Suspension Pressure Sensors

PLMIII uses a two-wire pressure sensor. The range for the pressure sensor is 4000 psi (281 kg/cm²) and the overload limit is 10,000 psi (700 kg/cm²). One wire to the sensor is the supply voltage and the other is the signal. The 0-4000 psi range is converted into an electrical current between 4-20 ma. The supply voltage for the sensor is nominally +18vdc. Each pressure sensor has an 118 in. (3000 mm) length of cable. The cable is specially shielded and reinforced to provide mechanical strength and electronic noise immunity.

Inclinometer

The inclinometer is used to increase the accuracy of load calculations on an incline. The inclinometer uses three wires. For the sensor, red is the +18vdc supply voltage, black is ground and the white is the signal. The incline signal is a voltage between 1 and 4 volts. Zero degrees of incline is represented by 2.6vdc on the signal line. The voltage signal will be decreased by 0.103vdc for every degree of nose up incline.

Operator Display

The speedometer/display gauge is used as a speedometer and payload display. The top display is used for speed and can display metric (km/h) or English (mph) units. Grounding terminal #4 on the back of the speedometer will switch the meter to display metric units. Leaving terminal #4 unconnected will cause the gauge to display English units. The speedometer can be adjusted using a calibration potentiometer in the back just like existing speedometers.

The payload meter uses the lower display for payload information. The normal display mode shows the current payload. The display can be changed to show the load and total tons counter or the Operator ID. Using the operator switch on the dash panel, the current suspension pressures and incline can be displayed. The units for display are set using the PC software. Payloads can be displayed in short tons, long tons or metric tons.

Operator Switch

The payload operator switch is used to set, view and clear the total load counter and total ton counter. It is also used to enter the operator ID number (0-9999). This switch can also be used to view the suspension pressures and inclinometer. The payload meter operator switch is located on the dashboard. It is a two-way momentary switch. The top position is the SELECT position. The SELECT position is used step through the different displays. The lower position is the SET position. The SET position is used to set the operator ID or clear the load and total ton counters. Normally the inputs from the switch to the payload meter are open circuit. The switch momentarily connects the circuit to ground.

Speed Input

PLMIII uses a speed signal to calculate speed, distance, and other performance data. This input is critical to the proper operation of the system. PLMIII receives this signal from the speedometer/operator display on the dashboard. The same signal displayed to the operator is used by the system. Distance calculations are made based on the rolling radius of the tires for a particular truck.

Body-Up Switch

The body-up input signal is received from a magnetic switch located on the inside of the truck frame, forward the pivot pin of the truck body. This is the same switch typically used for input to the drive system. When the body is down, the switch closes and completes the circuit to 71-control power. 24vdc indicates the body is down. Open circuit indicates that the body is up.

Brake Lock Switch

The brake lock is used to lock the rear brakes on the truck. It is necessary for the accurate calculation of swingloads during the loading process. Without the brake lock applied, the payload meter will not calculate swingloads during the loading process. Without the brake lock, the payload meter will assume that the truck was loaded using a continuous loader and flag the haul cycle record. All other functions will be normal regardless of brake lock usage. The brake lock input comes from the switch located on the dash panel. The brake lock switch connects the circuit to ground. Open circuit indicates brake lock off. Ground indicates brake lock on.

Payload Meter

The payload meter is housed in a black aluminum housing. There is a small window on the face of the unit. Status and active alarm codes can be viewed through the window. During normal operation, a two-digit display flashes 0 back and forth. Active fault codes will be displayed for two seconds. These codes are typically viewed using the laptop computer connected to the serial communications port.

There is one 40-pin connector on the payload meter. A jack-screw is used to hold the payload meter and wire harness connector housings together. This screw requires a 4mm or 5/32 hex wrench. The correct tightening torque for this screw is 25 lb-in. Four bolts hold the payload meter housing to its mounting bracket in the cab.

The circuit board inside the payload meter housing is made from multi-layer, dual-sided surface-mount electronics. There are no field serviceable components inside. The electronics are designed to withstand the harsh operating environment of the mining industry. Opening the payload meter housing will result in voiding the warranty.

Communications Ports

The payload meter has two RS232 serial communications ports and two CAN ports. Connections for the two serial ports are available inside the payload meter junction box. The two CAN ports are available for future electronics systems.

Serial port #1 is used to communicate with the dashboard display. It is also used to connect to the laptop computer. The display gauge will remain blank when the PC is using the serial port. This port initially operates with serial settings at 9600,8,N,1. These settings change automatically to increase the communications rate when the PC is using the port. This serial port uses a 3-wire hardware connection.

Serial port #2 is used to communicate to other on-board electronics like Modular Mining's Dispatch® system or the scoreboard from Komatsu. This port uses a 3-wire hardware connection. Connections to this serial port need to be approved by Komatsu. Several protocol options are available and detailed technical information is available depending on licensing.

Key Switch Input

PLMIII monitors the status of the key switch. 24vdc indicates that the key switch is on, open indicates the key switch is off. The payload meter does not receive its electrical power from the key switch circuit. The payload meter will remain on for several seconds after key switch is removed. When the key switch power is removed, payload meter performs a series of internal memory operations before turning itself off. To allow for these operations, the key switch should be turned off for at least 15 seconds before turning the key switch back on. The payload meter will automatically reset itself without error if not enough time is given for these operations. The display may blink briefly.

Payload Meter Power

The payload meter receives its power from the battery circuit on the truck. Removing battery power from the payload meter before removing key switch and waiting 15 seconds may result in lost haul cycle data. The payload meter turns itself off approximately 15 seconds after the key switch power is removed. Some haul cycle data will be lost if battery power is removed before waiting 15 seconds. The payload meter system operates at a nominal voltage of 24vdc at 1 to 2 amps depending on options. The payload meter is designed to turn itself off if the supply voltage rises above 36vdc. The payload meter is also protected by a 5 amp circuit breaker located in the junction box.

Power to the load lights comes from the same battery circuit. The load lights are powered through a relay. The key switch circuit controls the relay. The load lights are also protected by a 15 amp circuit breaker in the junction box.

Load Lights

PLMIII uses load lights to indicate to the shovel operator the approximate weight of the material in the truck. The load lights are illuminated only when the brake lock is applied. The lights are controlled by the payload meter through a series of relays in the junction box. The payload meter controls the relays with 24vdc outputs. A 24vdc signal from the payload meter powers the relay coil and connects battery power to the load light. When the relay is not powered by the payload meter, a pre-warm resistor connects the load light to a reduced voltage. This circuit pre-warms the load light filaments and reduces the inrush current when the light is fully illuminated. This lengthens the operating life of the load lights.

The load lights progressively indicate to the shovel operator the approximate weight of the material in the truck.

A flashing green light indicates the next swingload will make the measured load greater than 50% of rated load. A solid green light indicates that the current load is greater than 50% of rated capacity.

A flashing amber light indicates the next swingload will make the measured load greater than 90% of rated load. A solid amber light indicates that the current load is greater than 90% of rated capacity.

A flashing red light indicates the next swingload will make the measured load greater than 105% of rated load. A solid red light indicates that the current load is greater than 105% of rated capacity.

The optimal loading target is a solid green and amber lights with a flashing red light. This indicates that the load is between 90% and 105% of rated load for the truck and the next swingload will load the truck over 105%.

Wiring and Termination

Most of the PLMIII truck connections use a heavy-duty cable. This yellow multi-conductor cable uses a 16awg, finely stranded wire designed for continuous motion operations. The conductors are protected by a foil and braided shield for electronic noise immunity and physical strength. This wire is typically terminated with a #10 ring terminal. Most connections for the PLMIII system are made in the payload meter junction box.

TCI Outputs

The GE drive system on the 930E/960E requires information from the payload meter regarding the loaded condition of the truck. There are three outputs from the payload meter to GE to indicate the relative load in the truck. 24 vdc on the 73MSL circuit indicates that the load is 70% of rated load. 24 vdc on the 73FSL circuit indicates the truck is 100% loaded. The 73OSL circuit is not currently used.

OPERATOR'S DISPLAY AND SWITCH

Reading the Speedometer

The top window of the speedometer/display gauge is the speedometer section. The display shows the speed indicated by the frequency being received by the gauge. This can be adjusted using the potentiometer on the back of the gauge. In addition, the units for the display can be changed. Terminal #4 controls the displayed units. If #4 is grounded, the display will be metric. If terminal #4 is left open, the display will be in English units.

Reading the Load Display

The lower display on the speedometer/display gauge is used for payload information. The SELECT position on the operator switch allows the user to scroll through a number of useful displays. The order for the displays is as follows:

- PL = Payload
- Id = Operator ID
- LL = Total Shift Tons
- LC = Shift Load Counter
- LF = Left Front Suspension Pressure
- rF = Right Front Suspension Pressure
- Lr = Left Rear Suspension Pressure
- rr = Right Rear Suspension Pressure
- In = Inclinator

The display holds the displayed information until the SELECT switch is pressed again. The suspension pressures, inclinometer, and payload displays are based on current sensor inputs.

Communications to the display use the same serial link as the download connection. Whenever another computer is connected to serial port #1 to download or configure the system, the lower display will blank. This is not the same connection used by mine dispatch systems.

Using the Operator ID

The current operator ID number is recorded with each haul cycle. The number can be between 0 and 9999.

To set the Operator ID:

1. Press the "SELECT" switch until Id is displayed.
2. Hold the "SET" button until 0000 is displayed. The first digit should be flashing.
3. Press the "SET" button again to change the digit.
4. Press the "SELECT" button once to adjust the second digit.
5. Use the "SET" button again to change the digit.
6. Press the "SELECT" button once to adjust the third digit.
7. Use the "SET" button again to change the digit.
8. Press the "SELECT" button once to adjust the fourth digit.
9. Use the "SET" button again to change the digit.
10. Press the "SELECT" button one more time to enter the ID.

If no buttons are pressed for 30 seconds, the display will return to normal operation. The number being entered will be lost and the ID number returns to the previous ID number.

Using the Load and Ton Counter

PLMIII allows the truck operator to monitor and track the total tons hauled and the number of haul cycles during the shift. This display can be cleared at the beginning of each shift to allow the operator to record how many loads and tons have been hauled during the shift.

Total Ton Counter

The total ton counter records the number of tons hauled since the last time it was cleared. This display is in 100's of tons. For example, if the display shows 432 the total tons is 43,200. This display can be cleared at the beginning of each shift to allow the operator to record how many tons have been hauled during the shift. The units are selected using the PC software.

- To view the total ton counter press and release the "SELECT" switch until LL is displayed on the gauge.

Total Load Counter

The total load counter records the number of loads hauled since the last time it was cleared. This display can be cleared at the beginning of each shift to allow the operator to record how many loads have been hauled during the shift.

- To view the total load counter press and release the "SELECT" switch until $L\bar{C} =$ is displayed on the gauge.

Clearing the Counters

Clearing the total ton counter or total load counter clears both records.

To clear the total ton and total load counter:

1. Press the "SELECT" switch until $L\bar{L} =$ or $L\bar{C} =$ is displayed.
2. Hold the "SET" button until the display clears.

Viewing Live Sensor Data

The display can also be used to quickly show the current readings from the four suspension pressure sensors and the inclinometer. This can be used during regularly scheduled service periods to check the state of the suspensions. These displays are live and will update as the values change.

The live displays cannot be cleared and the SET button will have no effect.

The units for the display are controlled by the configuration of the payload meter. If the payload meter is set to display metric units, the pressures will be displayed in tenths of kg/cm^2 . For example, if the display shows 20.2 the actual value is $20.2 \text{ kg}/\text{cm}^2$. If the payload meter is set to display short tons, the pressures will be displayed in psi (lbs/in^2). Multiply by 14.2 to convert kg/cm^2 to psi. (example -- $1 \text{ kg}/\text{cm}^2 \times 14.2 = 14.2 \text{ psi}$). There is no way to detect the units setting for the gauge without the PC software.

The inclinometer displays whole degrees of incline. Positive incline is truck nose up. The gauge will quickly display the type of information shown every 10 seconds. For example, if the left-front pressure is being displayed, $L\bar{F} =$ will flash on the display every minute. Only the payload display, $P\bar{L} =$ does not display this information.

- Left Front Pressure - To display the pressure in the left-front suspension, press and release the "SELECT" switch until $L\bar{F} =$ is displayed.
- Right Front Pressure - To display the pressure in the right-front suspension, press and release the "SELECT" switch until $r\bar{F} =$ is displayed.
- Left Rear Pressure - To display the pressure in the left-rear suspension, press and release the "SELECT" switch until $L\bar{r} =$ is displayed.
- Right Rear Pressure - To display the pressure in the right-rear suspension, press and release the "SELECT" switch until $r\bar{r} =$ is displayed.
- Inclinometer - To display the truck incline, press and release the "SELECT" switch until $I\bar{n} =$ is displayed.

Other Display Messages

On startup of the payload meter system, the gauge display will scroll the truck type that the PLMIII is configured for. For example, on a 930E, the gauge will scroll, `---930E---`.

If the PLMIII encounters memory problems, it will display `ERR88`, where 88 is the specific memory error. In this very rare circumstance, the system should be turned off for 30 seconds and restarted.

PAYLOAD OPERATION & CALCULATION

Haul Cycle States

The typical haul cycle can be broken down into eight distinct stages or states. Each state requires the payload meter to make different calculations and store different data.

1. Tare Zone
2. Empty
3. Loading
4. Maneuvering
5. Final Zone
6. Hauling
7. Dumping
8. After Dump

Haul Cycle Description

A new haul cycle is started after the load has been dumped from the previous cycle. The payload meter will stay in the after_dump state for 10 seconds to confirm that the load has actually been dumped. If the current payload is less than 20% of rated load, the payload meter will switch to the tare_zone and begin calculating a new empty tare. If, after dumping, the payload has not dropped below 20% of rated load the meter will return to the maneuvering or hauling states. In this case, the false_body_up flag will be recorded in the haul cycle record.

While in the tare_zone state, and moving faster than 5 km/h (3 mph), the payload meter calculates the empty sprung weight of the truck. This tare value will be subtracted from the loaded sprung weight to calculate the final payload. The payload meter will switch from the tare_zone or empty to the loading state if swingloads are detected. By raising the dump body while in the empty state the payload meter can be manually switched back to the tare_zone to calculate a new tare.

From the empty state, the payload meter will switch to the loading state through one of two means. If the brake lock is applied, the payload meter will be analyzing the suspension pressures to detect a swingload. If a swingload is detected, the meter will switch to the loading state. The minimum size for swingload detection is 10% of rated load. Swingload detection usually takes 4-6 seconds. The second method to switch from empty to loading is through continuous loading. This can happen if the brake lock is not used during loading. If the load increases above 50% of rated load for 10 seconds without the brake lock applied, the meter will switch to loading

and record the continuous_loading flag in the haul cycle.

The payload meter switches from loading to maneuvering as soon as the truck begins moving. The maneuvering zone is 160m and is designed to allow the operator to reposition the truck under the shovel. More payload can be added anytime within the maneuvering zone. Once the truck travels 160m (0.1 miles) the payload meter switches to the final_zone and begins calculating payload. If the body is raised while the payload meter is in the maneuvering state, the no_final_load flag will be recorded in the haul cycle record, no payload will be calculated, and the meter will switch to the dumping state.

While in the final_zone moving faster than 5 km/h (3 mph), the payload meter calculates the loaded sprung weight of the truck. The same advanced algorithm is used to calculate the empty and loaded sprung weights. The payload meter will switch from the final_zone to the dumping state if the Body-Up signal is received. If the truck has moved for less than 1 minute in the final_zone, the payload meter will calculate the final payload using an averaging technique which may be less accurate. If this happens, the average_load flag will be recorded in the haul cycle.

The payload meter switches to the dumping state when the dump body rises. The payload meter will switch from dumping to after_dump when the dump body comes back down.

From the after_dump, the payload meter will switch to one of three states:

1. If the average payload is greater than 20% of rated load and no final payload has been calculated, the payload meter will return to the maneuvering state. After the truck travels 160m (0.1 mile) the meter will switch to the final_zone and attempt to calculate the payload again. The false_body_up flag will be recorded in the haul cycle record.
2. If the average payload is greater than 20% of rated load and the final payload has been calculated, the payload meter will switch back to the hauling state. The false_body_up flag will be recorded in the haul cycle record.
3. If the average payload is less than 20% of rated load, the payload meter will switch to the tare_zone and begin to calculate a new empty tare.

Load Calculation

The final load calculation is different from the last swingload calculation. The accuracy of the swing load calculation depends on loading conditions and the position of the truck during loading. The last swingload calculation is not the value recorded in memory as the final load. The final load is determined by a series of calculations made while the truck is traveling to the dump site.

Carry Back

Carry back is calculated as the difference between the current truck tare and the clean truck tare. The clean truck tare is calculated using the PC software. When the suspensions are serviced or changes are made that may affect the sprung weight of the truck, a new clean truck tare should be calculated.

Measurement Accuracy

Payload measurements are typically repeatable within 1%. Accuracy for a particular scale test depends on specific combinations of pressure sensors and payload meters as well as the specifics of each scale test. Comparisons from different scale tests are often made without considering the differences introduced by the specific installation and operation of the scales for each test. In addition, each pressure sensor and payload meter introduces its own non-linearity. Each truck becomes an individual combination of sensors and payload meter. Errors from these sources can introduce up to a $\pm 7\%$ bias in the payload meter calculations for a specific scale test, for an individual truck.

Because the PLMIII calculates a new empty tare for each payload, a detailed scale test must weigh the trucks empty and loaded for each haul cycle. Using a simple average of 2 or 3 empty truck weights as an empty tare for the entire scale test will introduce significant error when comparing scale weights to PLMIII weights.

SOURCES FOR PAYLOAD ERROR

Payload Error

The number one source of error in payload calculation is improperly serviced suspensions. The payload meter calculates payload by measuring differences in the sprung weight of the truck when it is empty and when it is loaded. The sprung weight is the weight of the truck supported by the suspensions. The only method for determining sprung weight is by measuring the pressure of the nitrogen gas in the suspensions. If the suspensions are not properly maintained, the payload meter cannot determine an accurate value for payload. The two critical factors are proper oil height and proper nitrogen charge.

If the suspensions are overcharged, the payload meter will not be able to determine the empty sprung weight of the truck. The suspension cylinder must be able to travel up and down as the truck drives empty. The pressure in an overcharged suspension can push the suspension rod to full extension. In this case, the pressure inside the cylinder does not accurately represent the force necessary to support that portion of the truck.

If the suspensions are undercharged, the payload meter will not be able to determine the loaded sprung weight of the truck. The suspension cylinder must be able to travel up and down as the truck drives loaded. If the pressure in an undercharged suspension cannot support the load, the suspension will collapse and make metal-to-metal contact. In this case, the pressure inside the cylinder does not accurately represent the force necessary to support that portion of the truck.

Low oil height can also introduce errors by not correctly supporting a loaded truck. This is why the correct oil height and nitrogen charge are the most critical factors in the measurement of payload. If the suspensions are not properly maintained, accurate payload measurement is not possible. In addition, suspension maintenance is very important to the life of the truck.

Loading Conditions

The final load calculation of the PLMIII system is not sensitive to loading conditions. The final load is calculated as the truck travels away from the shovel. Variations in road conditions and slope are compensated for in the complex calculations performed by the payload meter.

Pressure Sensors

Small variations in sensors can also contribute to payload calculation error. Every pressure sensor is slightly different. The accuracy differences of individual sensors along the range from 0 to 4000 psi can add or subtract from payload measurements. This is also true of the sensor input circuitry within individual payload meters. These differences can stack up 7% in extreme cases. These errors will be consistent and repeatable for specific combinations of payload meters and sensors on a particular truck.

Swingloads

Swingload calculations can be affected by conditions at the loading site. Parking the truck against the berm or large debris can cause the payload meter to inaccurately calculate individual swingloads. While the PLMIII system uses an advanced calculation algorithms to determine swingloads, loading site conditions can affect the accuracy.

Speed and Distance

The payload meter receives the same speed signal as the speedometer. This signal is a frequency that represents the speed of the truck. The payload meter uses this frequency to calculate speeds and distances. The meter assumes a single value for the rolling radius of the tire. The rolling radius may change at difference speeds by growing larger at higher speeds. The actual rolling radius of the tire will also change between a loaded and empty truck. The payload meter does not compensate for these changes.

NOTE: Earlier 730E and 830E models are subject to incorrect speed data due to electrical interference. The incorrect speeds are generated while the truck is stopped. An attenuator was added to newer production models to prevent this error from occurring. A kit was released to update older PLMIII systems with the attenuator. Consult your area service representative for details.

HAUL CYCLE DATA

PLMIII records and stores data in its on-board flash memory. This memory does not require a separate battery. The data is available through the download software.

PLMIII can store 5208 payload records. When the memory is full, the payload meter will erase the oldest 745 payload records and continue recording.

PLMIII can store 512 alarm records in memory. When the memory is full, the payload meter will erase the oldest 312 alarm records and continue recording.

All data is calculated and stored in metric units within the payload meter. The data is downloaded and stored in metric units within the Paradox database on the PC. The analysis program converts units for displays, graphs and reports.

The units noted in the Table 1 are the actual units stored in the data file. The value for the haul cycle start time is the number of seconds since January 1, 1970 to the start of the haul cycle. All other event times are referenced in seconds since the haul cycle start time. The PC download and analysis program converts these numbers into dates and times for graphs and reports.

Haul Cycle Data

The following information is recorded for each haul cycle:

Table 1: HAUL CYCLE DATA		
Data	Unit	Remark
Truck #	alpha-numeric	Up to 22 characters can be stored in this field to identify the truck. Typically this field will be just the truck number.
Haul Cycle Start Date/Time	seconds	Number of seconds from 1/1/70 to the start of the haul cycle, haul cycle starts when the meter transitions from dumping to empty state after the previous haul cycle, download program converts seconds into date and time for display
Payload	tons	Stored as metric, download program allows for conversion to short or long tons.
Number of Swingloads	number	The number of swingloads detected by the payload meter
Operator ID	number	This is a 4 digit number that can be entered by the operator at the start of the shift.
Warning Flags	alpha	Each letter represents a particular warning message about the haul cycle, details are located on page 19.
Carry-back load	tons	The difference between the latest empty tare and the clean truck tare
Empty haul time	seconds	Number of seconds in the tare_zone and empty states with the truck moving
Empty stop time	seconds	Number of seconds in the tare_zone and empty states with the truck stopped
Loading time	seconds	Number of seconds in the loading state
Loaded haul time	seconds	Number of seconds in the maneuvering, final_zone and loaded states with the truck moving
Loaded stop time	seconds	Number of seconds in the maneuvering, final_zone and loaded states with the truck stopped
Dumping time	seconds	Number of seconds in the dumping state
Loading start time	seconds	Number of seconds from the start of the haul cycle to when the meter transitions from empty to loading state
Dump start time	seconds	Number of seconds from the start of the haul cycle to the time when the meter switches from loaded to dumping state
Loaded haul distance	m	Distance traveled while loaded
Empty haul distance	m	Distance traveled while empty
Loaded max speed	km/h	Maximum speed recorded while the truck is loaded
Loaded max speed time	seconds	Number of seconds from the start of the haul cycle to the time when the max speed occurred
Empty max speed	km/h	Maximum speed recorded while the truck is empty
Empty max speed time	seconds	Number of seconds from the start of the haul cycle to the time when the max speed occurred
Peak positive frame torque	ton-meter	Positive frame torque is measured as the frame twists in the clockwise direction as viewed from the operator's seat.
Peak frame torque time	seconds	Number of seconds from the start of the haul cycle to the peak torque, download program converts to time for display
Peak negative frame torque	ton-meter	Negative frame torque is measured as the frame twists in the counter-clockwise direction as viewed from the operator's seat.
Peak frame torque time	seconds	Number of seconds from the start of the haul cycle to the peak torque, download program converts to time for display
Peak sprung load	tons	Peak dynamic load calculation
Peak sprung load time	seconds	Number of seconds from the start of the haul cycle to the peak instantaneous load calculation
Front-left tire-ton-km/h	t-km/h	Tire ton-km/h for haul cycle
Front-right tire-ton-km/h	t-km/h	Tire ton-km/h for haul cycle
Average rear tire-ton-km/h	t-km/h	Tire ton-km/h for haul cycle
Truck Frame Serial Number	alpha	The truck serial number from the nameplate on the truck frame
Reserved 1-10	number	These values are internal calculations used in the continued development of the PLMIII system and should be ignored

Haul Cycle Warning Flags

The payload meter expects haul cycles to progress in a particular way. When something unexpected takes place, the system records a warning flag. Several events within the haul cycle can cause a warning flag to be generated. Each one indicates an unusual occurrence during the haul cycle. They do not necessarily indicate a problem with the payload meter or payload calculation.

A: Continuous Loading

This message is generated when the truck is loaded over 50% full without the payload meter sensing swingloads. This indicates that a continuous loading operation was used to load the truck. It may also indicate that the payload meter did not receive the brake lock input while the truck was being loaded. There may be a problem with the wiring or the brake lock was not used. The payload meter will not measure swingloads unless the brake lock is used during the loading process.

B: Loading to Dumping Transition

This message is generated when the payload meter senses a body up input during the loading process. This message is usually accompanied by a `no_final_load` flag.

C: No Final Load

This message is generated when the payload meter is unable to determine the final payload in the truck. Typically, this means that the payload meter switched from a loaded state to the dumping state before the load could be accurately measured.

D: Maneuvering to Dumping Transition

This message is generated when the payload meter senses a body-up input during the maneuvering or repositioning process indicating that the operator has dumped the load. It may also be generated if the body-up signal is not properly reaching the payload meter and the weight in the truck falls dramatically while the truck is maneuvering or repositioning.

E: Average Load or Tare Used

This message indicates that the recorded payload may not be as accurate as a typical final load calculation. Typically, this is recorded when loading begins before an accurate tare is calculated or the load is dumped before the load can be accurately measured.

F: Final Zone to Dumping Transition

This message is generated when the payload meter senses a body-up while it is calculating the final payload indicating that the operator has dumped the load. It may also be generated if the body-up signal is not properly reaching the payload meter and the weight in the truck falls dramatically while the truck is calculating the final payload.

H: False Body Up

This message indicates that the body was raised during the haul cycle without the load being dumped. The body-up signal indicated that the truck was dumping, but the weight of the truck did not fall below 20% of the rated load.

I: Body Up Signal Failed

This message indicates that the load was dumped without a body-up signal being received by the payload meter. The weight of the truck fell below 20%, but the payload meter did not receive a body-up signal from the sensor.

J: Speed Sensor Failed

This message indicates that the payload meter sensed the truck loading and dumping without receiving a speed signal.

K: New Tare Not Calculated

The payload meter was not able to accurately calculate a new empty sprung weight for the truck to use as the tare value for the haul cycle. The tare value from the last haul cycle was used to calculate payload.

L: Incomplete Haul Cycle

The payload meter did not have proper data to start the haul cycle with after powering up. When the PLMIII powers off, it records the data from the haul cycle in progress into memory. This flag indicates that this data was not recorded the last time the payload meter was shut down. This can happen when the main battery disconnect is used to shut the truck down instead of the key switch. A haul cycle with this warning flag should not be considered accurate. Haul cycles with this warning are displayed in red on the Payload Summary window and are not included in the summary statistics for reports or display.

M: Haul Cycle Too Long

The haul_cycle_too_long flag indicates that the haul cycle took longer than 18.2 hours to complete. The times stored for particular events may not be accurate. This does not affect the payload calculation.

N: Sensor Input Error

An alarm was set for one of the 5 critical sensor inputs during the haul cycle. The five critical sensors are the four pressure sensors and the inclinometer. Without these inputs, the payload meter cannot calculate payload. A haul cycle with this warning flag should not be considered accurate. Haul cycles with this warning are displayed in red on the Payload Summary window and are not included in the summary statistics for reports or display.

Frame Torque Data

Payload meter records the top 5 peak positive and negative frame torque values and the time they occurred. The frame torque is a measure of the twisting action along the centerline of the truck. Positive frame torque is measured when the suspension forces on the front of the truck act to twist the frame in the clockwise direction as viewed from the operator's seat. Negative frame torque is measured when the forces from the suspensions act in the opposite direction.

For example, if the left front and right rear pressure rises as the right front and left rear pressure drops, the truck frame experiences a twisting motion along the longitudinal centerline. In this case, the payload meter will record a positive frame torque.

The 5 highest values in the positive and negative direction are stored in permanent memory within the payload meter.

Sprung Weight Data

The payload meter is constantly monitoring the live payload calculation. This value naturally rises and falls for a loaded truck depending on road and driving conditions. The payload meter records the top 5 highest payload calculations and the time they occurred. This information is stored in permanent memory inside the meter.

Maximum Speed Data

The payload meter records the top 5 highest speeds and the time they occurred. This information is stored in permanent memory inside the meter.

Alarm Records

The payload meter stores alarm records to give service personnel a working history of the system. All codes are viewed using the PC connected to the payload meter. Active codes are also displayed on the two-digit display on the meter itself. Each code has a specific cause and should lead to an investigation for correction. Some failures can be overcome by the payload meter. Haul cycle data will indicate if an alarm condition was present during the cycle. Failures with the suspension or inclinometer sensors cannot be overcome.

Fault Code Data

Table 2:		
Fault Code	Name	Description
1	Left front pressure high	Input current > 22 ma
2	Left front pressure low	Input current < 2 ma
3	Right front pressure high	Input current > 22 ma
4	Right front pressure low	Input current < 2 ma
5	Left rear pressure high	Input current > 22 ma
6	Left rear pressure low	Input current < 2 ma
7	Right rear pressure high	Input current > 22 ma
8	Right rear pressure low	Input current < 2 ma
9	Inclinometer high	Input voltage < 0.565 vdc
10	Inclinometer low	Input voltage > 5.08 vdc
11	Speed input failure	Not Used
12	Brake lock input failure	Not Used
13	Body-up input failure	Payload meter detected dumping activity without receiving a body up signal
16	Memory write failure	Indicates possible memory problem at power start up. Cycle power and recheck.
17	Memory read failure	Indicates possible memory problem at power start up. Cycle power and recheck.
18	Rear right suspension flat	Payload meter detected an undercharged suspension condition on the rear right suspension.
19	Rear left suspension flat	Payload meter detected an undercharged suspension condition on the rear left suspension.
20	Time change	Payload meter time was changed by more than 10 minutes. The Alarm Set time indicates original time. The Alarm Clear time indicates the new time.
21	Tare value reset	The user manually forced the payload meter to reset the haul cycle empty (tare) sprung weight. This forced the meter into the tare_zone state and lost all data for the previous haul cycle.
22	Excessive carryback	The payload meter detected an empty carryback load in excess of the user-defined carryback threshold on two consecutive haul cycles.
26	User switch fault - SELECT	Select switch on for more than 2 minutes, may indicate short to ground
27	User switch fault - SET	Set switch on for more than 2 minutes, may indicate short to ground

PC SOFTWARE OVERVIEW

PC Overview

The PC software has several basic functions:

- Configure the PLMIII system on the truck.
- Troubleshoot and check the PLMIII system.
- Download data from the PLMIII system.
- Analyze data from the payload systems.

Configuration, troubleshooting and downloading require a serial connection to the payload meter on the truck. Analysis can be done at any time without a connection to the payload meter.

Payload data is downloaded from several trucks into one database on the PC. The database can be queried to look at the entire fleet, one truck or truck model. The data can be graphed, reported, imported or exported. The export feature can take payload data and save it in a format that spreadsheet programs like Excel or word processing programs can easily import.

System Configuration

PLMIII needs to be configured for operation when it is first installed on the truck. This process requires several steps and uses the laptop computer to make the necessary settings. The setup procedure can be broken down into several steps:

- Connecting the laptop to the PLMIII system.
- Starting communications
- Setting the time & date
- Setting the truck type
- Setting the truck ID
- Setting the speedometer/display gauge units

Installing the PLMIII Software

The CD-ROM containing the Payload Data Management (PDM) software will automatically begin installation when it is inserted into the drive on the PC. If this does not happen, the software can be installed by running the Setup.exe program on the CD-ROM.

The minimum PC requirements for running the software is a Pentium 133Mhz with 64 MB of ram and at least 300 MB of free hard drive space available. For improved performance, the recommended PC would have a Celeron, AMD K6-2 or better processor with 128 MB of ram running at 400 Mhz. The PDM software uses a powerful database to manipulate the large amounts of data gathered from the PLMIII system. Using a more powerful computer and added memory to run the software can result in a significant improvement in performance. The software is written to use a minimum 800x600 screen resolution.

DOWNLOADING DATA

PLMIII records many types of data. The PLMIII PC software is designed to download the data from a whole truck fleet. Instead of creating one data file for each truck, the PC software combines all the data from many trucks into one database on the hard drive of the computer. The software then allows users to query the database to create custom reports and graphs. Data for individual trucks or groups of trucks can be easily analyzed. This same data can be exported for use in other software applications like word processors and spreadsheet applications.

As the database grows, performance of the PC software for analysis will slow down. It may be helpful to periodically export data. For example, query the database to show the oldest quarter, month, or half year and print out a summary report. Then export the data to a compressed format and save the file in a secure location. Once the data is exported, delete the entire query results from the database. If necessary, the data can easily be imported back into the main database for analysis at a future date. Removing this older data will improve performance.

To download the payload meter:

1. Connect to the payload meter and start the PC software.
2. From the main menu, select "Connect to Payload Meter". The PC will request the latest status information from the payload meter. The number of haul cycles and alarms will be displayed.
3. Select the "Begin Download" button. The PC will request the payload and alarm data from the payload meter and save it into the database. This may take several minutes. A progress bar at the bottom will show the approximate time left.



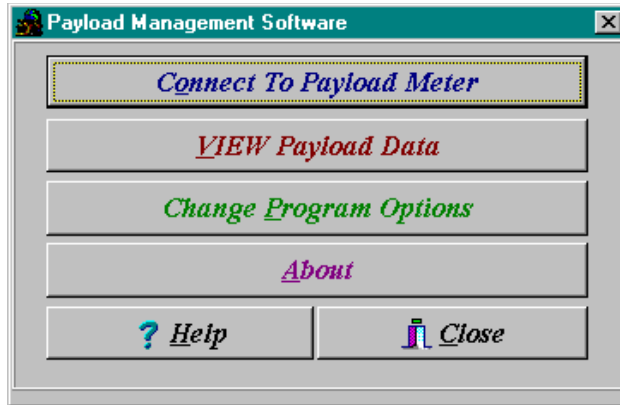
The PC software downloads the data from the payload meter into a single Paradox database. The data from all the trucks is added to the same database. Downloading the payload meter can take several minutes. The data is added to the database on the laptop used to download.

To move the data to another computer, a query must be run to isolate the particular data for export. Do not press the operator switch on the dashboard while downloading

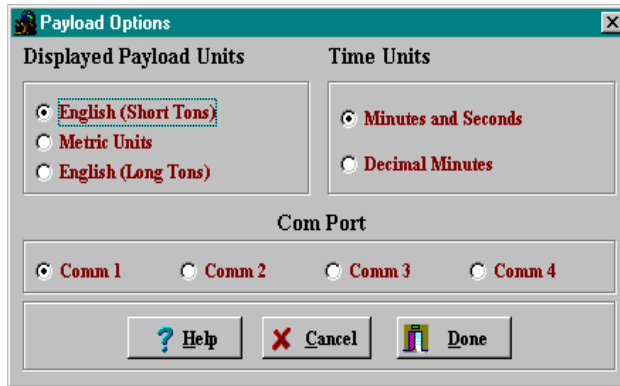
PLM III SYSTEM CONFIGURATION

Starting Communications

The PDM software allows users to download and configure the system.



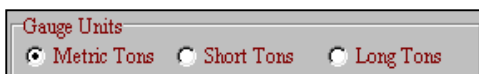
Before connecting to the payload meter, select "Change Program Options" and confirm that the program has selected the correct laptop serial port. Most laptops use Comm 1 for serial communications. The units displayed for reports and graphs by the PC software can be set on this form. Click "Done" to return to the main menu.



From the main menu, click the "Connect to Payload Meter" button. The PC will try to connect to the payload meter and request basic information from the system. In the event of communications trouble, the PC will try 3 times to connect before "timing-out". This may take several seconds.

Displayed Payload Units

Three options are available for the display of units in the PC software, reports, and graphs:



Short Tons: Payload is displayed in short tons, distances and speeds will be displayed in Miles

Metric Tons: Payload is displayed in metric tons, distances and speeds are displayed in Kilometers

Long Tons: Payload is displayed in long tons, distances and speeds are displayed in Miles

Time Units

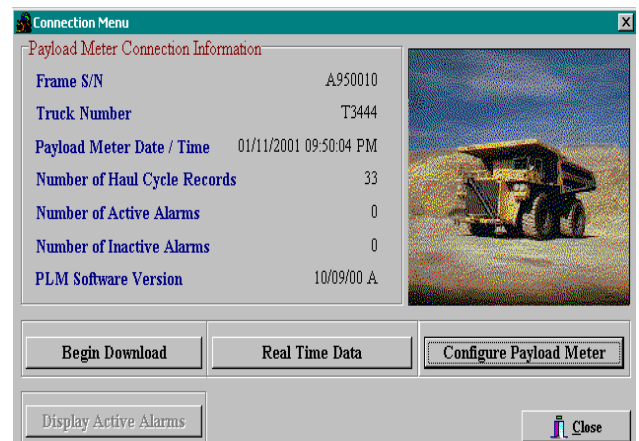
Minutes and Seconds Example:

Five minutes and thirty-two seconds = 5:32

Decimal Minutes Example:

Five minutes and thirty-two seconds = 5.53

Connection Menu



The connection screen displays basic system information to the user.

- Frame S/N should agree with the truck serial number from the serial plate located on the truck frame.
- Truck Number is an ID number assigned to the truck by the mine.
- The Payload Meter Date / Time values come from the payload meter at the moment of connection.
- Number of Haul Cycle Records is the number of haul cycles records stored in memory and available for download.
- Number of Active Alarms shows how many alarms are currently active in the system at the time of connection. If there are active alarms, the "Display Active Alarms" button is available.
- Number of Inactive Alarms shows how many alarms have been recorded in memory and are available for download.
- PLM Software Version displays the current version of software in the payload meter.

The information on the connection menu comes from the configuration of the payload system on the truck.

There are also many configuration and download options available from this screen. The Connection Menu is updated only when the connection is first made. It does not update automatically. To view changes made while connected, the user must close the window and reconnect to the payload meter.

The connection menu is displayed after a serial connection has been established and the PC software has connected to the payload meter.

Connecting to the Payload Meter

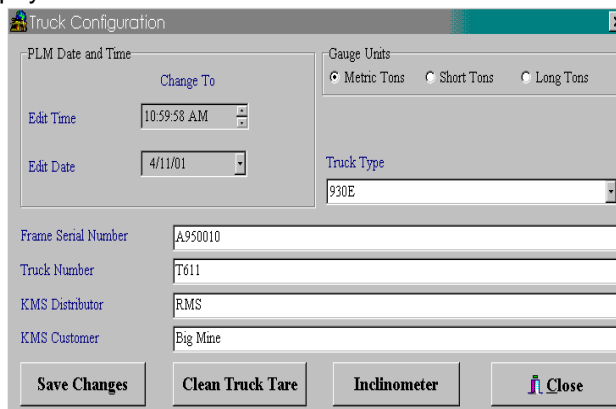
Communications to the PLMIII requires a laptop computer running the PDM software. The software connects to the payload meter through the meter's serial port #1. This is the same port used by the speedometer/display gauge. When the laptop is using the serial port, the lower display on the operator gauge on the dashboard will be blank. This does not affect the operation of the speedometer.

- Connect the laptop to the system using the EF9160 or PC2525 communications harness. The download connector is typically located on the housing mounted in the cab to the back wall. The PLMIII system uses the same connection as the Payload Meter II system.

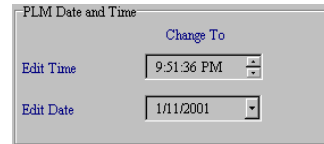
Configure the Payload Meter

Configuration of the payload meter requires a serial connection to the PLMIII system. Clicking the "Configure Payload Meter" button will bring up the Truck Configuration screen and menu. This screen displays the latest configuration information stored on the payload meter.

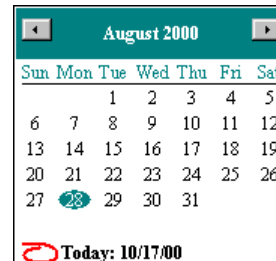
When changes are made to the configuration, the "Save Changes" button must be pressed to save the changes into the payload meter. To confirm the changes, exit to the main menu and re-connect to the payload meter.



Setting the Date and Time



The time shown on the form is the time transmitted from the payload when the connection was first established.



The date and time are maintained by a special chip on the PLMIII circuit board. The memory for this chip is maintained by a very large capacitor when the power is removed from the payload meter. This will maintain the date and time settings for approximately 30 days. After this time, it is possible for the payload meter to lose the date and time setting. It is recommended that the system be powered every 20 days to maintain the date and time. If the date and time is lost, simply reset the information using this procedure. It takes approximately 90 minutes to recharge the capacitor.

Changing the date and time will affect the haul cycle in progress and may produce unexpected results in the statistical information for that one haul cycle.

NOTE: If the truck is equipped with VHMS, do not set the time or date in the PLM III controller. The PLM III clock is synchronized by the VHMS clock.

To change the time:

1. Click on the digit that needs to be changed.
2. Use the up/down arrows to change or type in the correct value.
3. Press the "Save Changes" button to save the new time in the payload meter.

To change the date:

1. Click on the digit that needs to be changed.
2. Type in the correct value or use the pull-down calendar to select a date.
3. Press the "Save Changes" button to save the new time in the payload meter.

Setting the Truck Type



1. From the Truck Configuration screen, use the pull-down menu to select the truck type that the payload meter is installed on.
2. Press the "Save Changes" button to program the change into the meter.

Setting the Gauge Display Units

The payload meter speedometer / display gauge displays the speed on the upper display. The units for the speed display are selected using a jumper on the rear of the case.

The payload units on the lower display can be changed from metric to short tons or long tons using the Truck Configuration screen. This selection also switches between metric (kg/cm²) and psi (lbs/in²) for the live display of pressure on the gauge.

1. From the Truck Configuration screen, select the payload units to be used on the lower display of the speedometer/display gauge.
2. Press the "Save Changes" button to program the change into the payload meter.

Setting the Frame Serial Number

Frame Serial Number	A950010
Truck Number	T3444
KMS Distributor	RMS
KMS Customer	Pit Mine

The frame serial number is located on the plate mounted to the truck frame. The plate is outboard on the lower right rail facing the right front tire. It is very important to enter the correct frame serial number. This number is one of the key fields used within the haul cycle database. The field will hold 20 alpha-numeric characters.

1. On the Truck Configuration screen, enter the truck frame serial number in the appropriate field.
2. Press the "Save Changes" button to program the change into the payload meter.

Setting the Truck Number

Most mining operations assign a number to each piece of equipment for quick identification. This number or name can be entered in the Truck Number field. It is very important to enter a unique truck number for each truck using the PLMIII system. This number is one of the key fields used within the haul cycle database. The field will hold 20 alpha-numeric characters.

1. On the Truck Configuration screen, enter the truck number in the appropriate field.
2. Press the "Save Changes" button to program the change into the payload meter.

Setting the Komatsu Distributor

This field in the haul cycle record can hold the name of the Komatsu distributor that helped install the system. Komatsu also assigns a distributor number to each distributor. This number is used on all warranty claims. This Komatsu distributor number can also be put into this field. The field will hold 20 alpha-numeric characters.

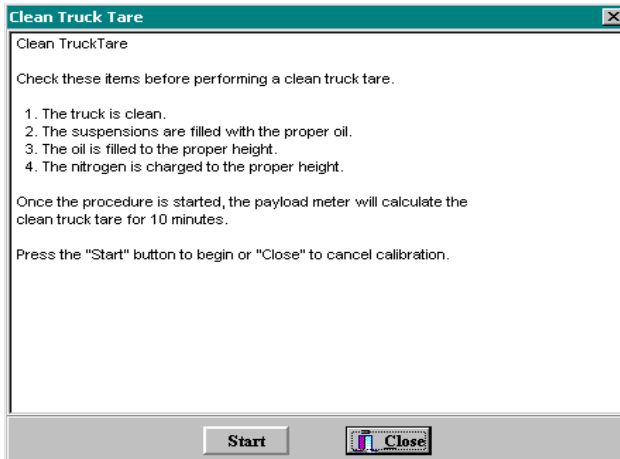
1. On the Truck Configuration screen, enter the distributor name or number in the appropriate field.
2. Press the "Save Changes" button to program the change into the payload meter.

Setting the Komatsu Customer

This field in the haul cycle record can hold the name of the mine or operation where the truck is in service. Komatsu also assigns a customer number to each customer. This number is used on all warranty claims. This Komatsu customer number can also be put into this field. The field will hold 20 alpha-numeric characters.

1. On the Truck Configuration screen, enter the customer name or number in the appropriate field.
2. Press the "Save Changes" button to program the change into the payload meter.

Clean Truck Tare



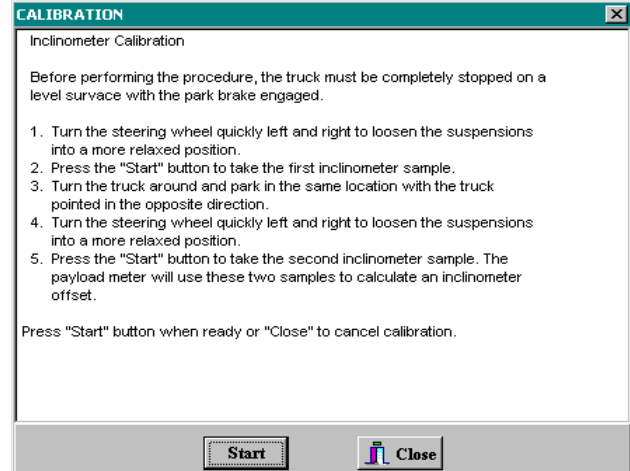
The payload meter uses the clean truck tare value to calculate carry-back load for each haul cycle. The carry-back stored in the haul cycle record is the new empty tare minus the clean truck tare.

This procedure should be performed after service to the suspensions or when significant changes are made to the sprung weight of the truck. Before performing this procedure, be sure the suspensions are properly filled with oil and charged. It is critical to payload measurement that the proper oil height and gas pressure be used.

Once the clean tare process is started, the payload meter will begin to calculate the clean empty sprung weight of the truck. This calculation continues while the truck drives to the next loading site. Once the procedure is started, there is no reason to continue to monitor the process with the PC. The truck does not need to be moving to start this procedure.

1. After cleaning debris from the truck and checking to see that the suspensions are properly serviced, use the PLMIII software to connect to the payload meter.
2. From the "Truck Configuration" screen, select "Clean Truck Tare".
3. Be sure to follow the screen instructions.

Inclinometer Calibration



The inclinometer calibration procedure is designed to compensate for variations in the mounting attitude of the inclinometer. The inclinometer input is critical to the payload calculation.

This procedure should be performed on relatively flat ground. Often the maintenance area is an ideal location for this procedure.

1. After cleaning debris from the truck and checking to see that the suspensions are properly serviced, use the PLMIII software to connect to the payload meter.
2. From the "Truck Configuration" screen, select "Inclinometer".
3. With the truck stopped and the brake lock on, press the "Start" button. This instructs the payload meter to sample the inclinometer once.
4. Turn the truck around. Drive the truck around and park in the exact same spot as before, facing the other direction.
5. With the truck stopped and the brake lock on, press the "Start" button. This instructs the payload meter to sample the inclinometer again. The payload meter will average the two samples to determine the average offset.
6. Be sure to follow the screen instructions.

DATA ANALYSIS

PAYLOAD SUMMARY FORM

Date: Sorts the data within a date range. eg. "Dec 1, 2000 through Dec 31, 2000"

Truck Number: Sorts the data by the truck unit number, eg. "374"

Time: Sorts the data within a time for each day within the data range. "8:00 AM to 5:00PM"

Truck Type: Sorts the data by the truck type, eg. "930E" or "830E"

Query Database & Display: Sorts the data by the selected query options (unit, type, date, time) and displays the results.

Output Options: Use to create reports, graphs and expert data from the selected query.

Cycle Summary: Cycle time summary from the selected query.

Summary Statistics:

Payload Data Summary		Cycle Time Summary	
Units - (Metric Tons)		Units - (minutes)	
Total Tons	28,360,482	Avg. Load Time	0.32
Max. Payload	360	Avg. Haul Time	0.40
Min. Payload	252	Avg. Haul Stop Time	0.23
Avg. Payload	318	Avg. Return Time	1.01
Std. Deviation	25	Avg. Return Stop Time	0.59
		Avg. Operating Time	4.08
		Avg. Dump Time	0.22

Haul Cycle Records:

Truck Number	Date	Time	Payload	# Swings	Total Time
351	07/10/2000	8:22:40 AM	323.8	5	7.09
351	07/10/2000	8:36:12 AM	323.8	5	5.23
351	07/10/2000	8:41:35 AM	323.8	5	5.24
351	07/10/2000	8:46:58 AM	321.5	1	30.11
351	07/10/2000	9:17:06 AM	321.9	0	0.32
351	07/10/2000	9:17:37 AM	318.0	0	0.32

Haul Cycle Records:
Summary view of the haul cycle records from the selected query. Double Click to view the details for individual haul cycle records.
Haul cycles in red area are not included in the summary statistics..

The data analysis tools allow the user to monitor the performance of the payload systems across the fleet. Analysis begins when the "View Payload Data" button is pressed. This starts an "all trucks, all dates, all times" query of the database and displays the results in the Payload Summary Form.

The user can change the query by changing the dates, times, or trucks to include in the query for display.

Haul cycles in the data grid box at the bottom can be double-clicked to display the detailed results of that haul.

Creating a Query

The program defaults to show all trucks, all types, all dates and all times for the initial query. The display can be narrowed by selecting which trucks or types to view and for what dates and times.

The query items are added in the "AND" condition. If the user selects a truck # and date range, the query will sort the data for that truck number AND the date range.

Sorting on Truck Unit Number

The truck unit number is the truck unit number entered into the payload meter when it was configured at installation. The query can be set to look for all trucks or one particular truck number. When the program begins, it searches through the database for all the unique truck numbers and creates a list to select from.

Choosing one particular truck number will limit the data in the displays, summaries and reports to the one selected truck. To create reports for truck number 374, select 374 from the pull-down menu and hit the "Query Database and Display" button.

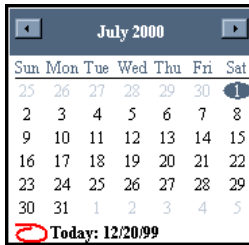
Sorting on Truck Type

The truck type is the size of the truck from the family of Komatsu trucks. This allows the user to quickly view results from different types of trucks on the property. For example, a separate report can be generated for 830E and 930E trucks.

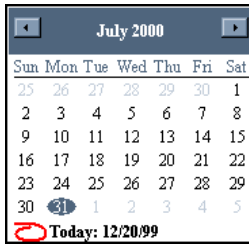
Sorting on Date Range

The default query starts in 1995 and runs through the current date on the PC. To narrow the range to a specific date, change the "From" and "To" dates. For example, to view the haul cycle reports from truck 374 for the month of July, 2000:

1. Select truck 374 from the Truck Unit pull-down menu.



2. Change the "From" date to July 1, 2000.



3. Change the "To" date to July 31, 2000.
4. Press the "Query Database and Display" to view the results.

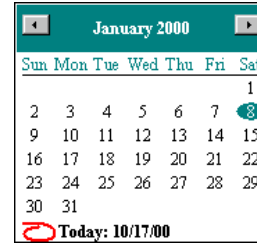
Sorting on Time Range

The time range sorts the times of the day for valid dates. Changing the time range to 6:00AM to 6:00PM will limit the payloads displayed to the loads that occurred between those times for each day of the date range. Times are entered in 24:00 format. To view the haul cycle reports from the first shift for truck 374 from January 5, 2000 to January 8, 2000:

1. Select truck 374 from the Truck Unit pull-down menu.



2. Change the "From" date to January 5, 2000.

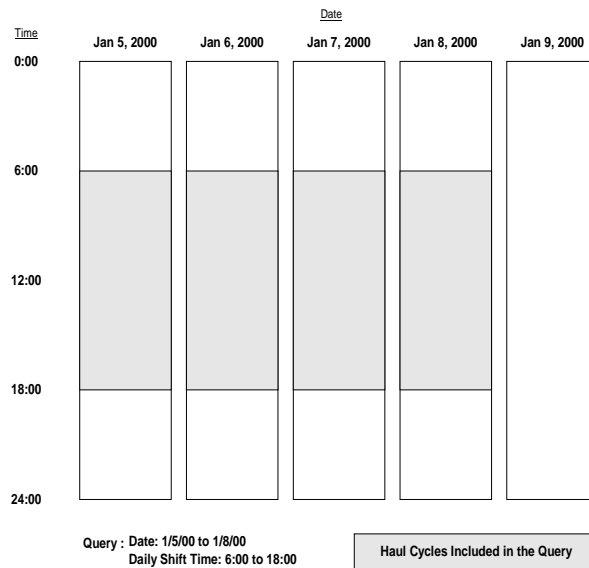


3. Change the "To" date to January 8, 2000.
4. Change the "From" time to 06:00.
5. Change the "To" time to 18:00.

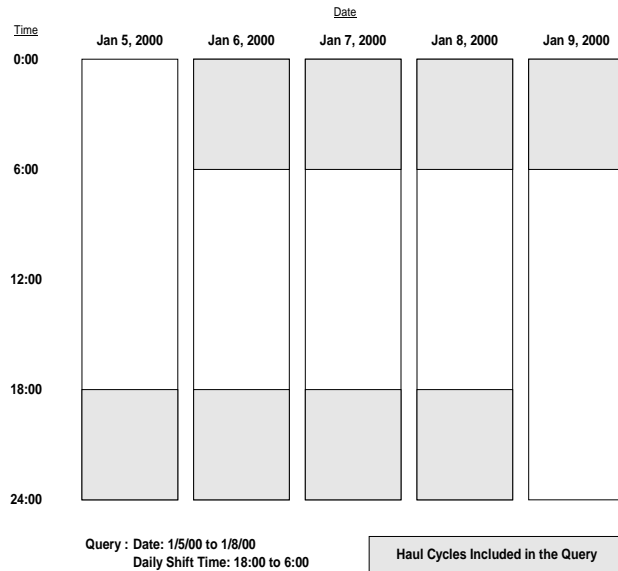


6. Press the "Query Database and Display" to view the results.

This query will display haul cycles from January 5 to January 8, from 6:00 AM to 6:00 PM.

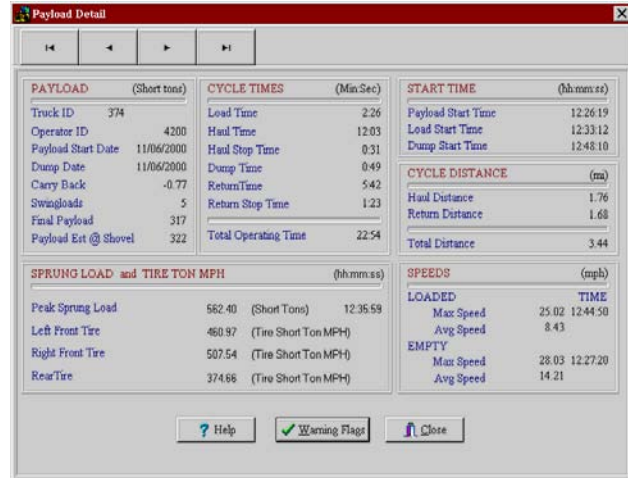


The shift times selected can extend the query past the original date. If the dates set for the query are January 5 to January 8 and the times were changed to query the 6:00 PM (18:00) to 6:00 AM (06:00) shift, the results would extend into the morning of the 9th. This can be seen in the following example:



Payload Detail Screen

The Payload Detail screen gives the details for any individual haul cycle. From the "Payload Summary" screen, double-click on any haul cycle to display the detail.



Creating Reports

Reports can be generated and viewed on the screen or printed. These reports are generated from the query displayed on the Payload Summary Screen. From the example in "Sorting on Time Range", the report printed would only contain data from truck 374 during the month of July 2000, from 8:00 AM to 5:00 PM.

It is important to carefully select the query data and press the "Query Database & Display" button before printing a report.

NOTE: Some haul cycles may contain the Sensor Input warning flag. This indicates that one of the four pressure sensors or inclinometer was not functioning properly during the haul cycle. Haul cycles with this warning are displayed in red on the Payload Summary window and are not included in the summary statistics for reports or display.

Summary - one page report

A summary of the queried data can be printed onto 1 page. The cycle data is summarized onto one sheet. Displayed is the speeds, cycle times, load statistics, frame and tire data.

Detailed - multi-page report

The detail report starts with the summary report and follows with pages of data for each haul cycle. The detailed report prints date, time, payload, cycle times, and cycle distances, speeds and the number of swing loads.

Payload Summary Report			
Report Date: April 11, 2001			
Query used for summary:			
Truck Number: ALL		Dates: 2/10/00 to 2/19/01	
Truck Type: ALL		Daily Shift Time: 00:00 to 24:00	

Time Period	Date	Time	Cycle Distance Averages (miles)
First Load	02/10/2000	03:25:30 PM	Loaded 1.9
Last Load	02/19/2001	07:20:30 AM	Empty 2.0
			Avg Total Distance 3.9

Payload Data	Short Tons	Date	Time
Final Payload			
Total, All Loads	1,495,086		
Maximum	421	01/24/2001	09:05:22 AM
Minimum	0	01/27/2001	04:11:24 AM
Average	321		
Standard Deviation	28.6		
Payload Estimate @ Shovel			
Total, All Loads	1,532,025		
Maximum	425	01/11/2001	06:45:58 PM
Minimum	250	02/11/2000	06:27:34 AM
Average	320		
Standard Deviation	36.3		
Number of Loads	4,654		
Avg Carry Back	2.2		

Cycle Time Averages (Min:Sec)	Avg Tire (Ton-MPH)
Load 2:34	Left Front 583
Haul Run 9:48	Right Front 576
Haul Stop 1:08	Rear 415
Empty Run 6:09	
Empty Stop 4:19	
Dump 1:17	
Avg Total Cycle Time 25:17	

Speed Data (mph)	
Loaded Max	37.32
Loaded Avg	10.57
Empty Max	37.97
Empty Avg	11.43

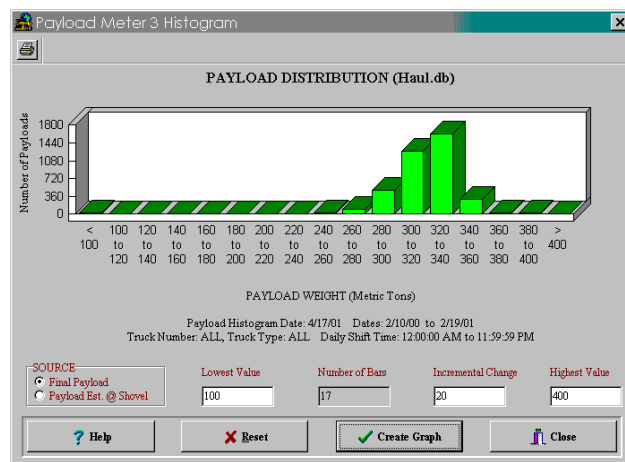
Payload Detail Report														Page 1				
Report Date: October 17, 2000																		
Query used for summary:																		
Truck Number: ALL																		
Truck Type: ALL																		
Dates: 8/28/00 to 10/3/00																		
Daily Shift Time: 00:00 to 24:00																		
No.	Date	Time	Payload S.Tons	#Swings	CYCLE Times(min.sec)					CYCLE DISTANCE(mi.)				SPEEDS(mph)				
					Load	Haul	Haul Stop	Dump	Return	Return Stop	Total	Haul	Return	Total	Max	Haul Avg	Max	Return Avg
1	8/28/00	3:54P	347	7	4.40	11:11	0:06	0:52	7:54	14:28	39:11	1.9	2.0	4.0	21.99	10.14	31.03	5.48
2	8/28/00	5:18P	301	6	3.39	11:10	0:25	0:43	8:12	3:43	27:52	1.9	1.9	3.8	23.02	9.91	26.05	9.42
3	8/28/00	5:46P	300	6	3.32	11:32	2:32	0:56	7:07	0:09	25:48	1.9	1.9	3.8	23.02	8.30	25.02	15.49
4	8/28/00	6:11P	330	4	1.58	17:51	2:49	1:58	11:34	1:41	37:51	3.9	2.6	6.5	36.21	11.37	24.07	11.73
5	8/28/00	6:49P	344	4	1.54	18:26	13:04	1:50	11:20	0:24	46:58	4.0	3.9	7.9	34.97	7.56	37.06	20.15
6	8/28/00	7:36P	380	5	2.12	19:52	1:07	1:39	11:32	0:48	37:10	4.0	4.0	8.0	30.00	11.28	34.03	19.59
7	8/28/00	8:13P	352	4	2.26	18:17	0:23	1:54	11:54	1:56	36:50	3.9	4.0	8.0	31.97	12.62	34.07	17.49
8	8/28/00	8:50P	356	4	1.56	18:52	0:21	1:55	11:59	0:38	35:41	4.0	4.0	8.0	36.17	12.34	36.21	19.09
9	8/28/00	9:25P	370	5	2.18	16:17	2:18	0:53	12:25	0:25	34:36	2.7	4.1	6.7	34.97	8.55	36.17	19.14
10	8/28/00	10:00P	363	5	3.07	16:56	5:48	0:52	9:02	0:33	36:18	2.7	2.7	5.3	32.97	6.99	32.97	16.61
11	8/28/00	10:36P	341	7	3.58	12:23	0:23	0:53	7:26	0:57	26:00	2.0	2.0	3.9	21.03	9.20	32.00	14.10
12	8/28/00	11:02P	321	4	2.24	16:19	5:06	0:50	10:17	1:05	36:01	2.7	2.6	5.3	34.03	7.49	31.97	13.71
13	8/28/00	11:38P	316	5	2.49	15:21	7:06	0:58	13:01	13:11	52:26	3.9	4.0	7.9	40.12	10.30	40.12	9.16
14	8/29/00	12:56A	320	5	2.23	15:18	0:07	0:55	13:16	11:43	43:42	3.9	3.8	7.7	36.21	14.99	41.10	9.18
15	8/29/00	1:40A	302	4	1.55	14:12	0:08	0:54	10:34	0:11	27:54	3.9	3.9	7.7	40.12	16.15	41.10	21.64
16	8/29/00	2:08A	310	5	2.21	15:14	4:55	1:01	9:46	4:59	38:16	3.9	3.9	7.7	40.12	11.51	41.16	15.67
17	8/29/00	2:46A	318	5	2.25	14:44	0:15	0:54	10:36	0:19	29:13	3.9	3.9	7.7	41.10	15.50	41.10	21.28
18	8/29/00	3:15A	278	4	2.01	15:53	1:12	0:46	10:38	2:08	32:38	4.3	3.8	8.1	38.13	15.06	41.10	18.05
19	8/29/00	3:48A	328	5	2.25	17:38	3:08	0:57	10:07	0:20	34:35	4.3	3.9	8.2	34.03	12.41	41.10	22.19
20	8/29/00	4:22A	287	4	2.49	17:00	15:44	1:02	11:59	4:49	53:23	4.3	4.0	8.2	40.12	7.87	41.10	14.09
21	8/29/00	1:41P	285	4	2.15	16:08	6:14	5:21	9:02	14:43	53:43	4.0	3.0	6.9	34.97	10.58	34.03	7.55
22	8/29/00	2:50P	340	7	3.38	10:14	0:06	0:54	8:41	7:10	30:43	1.8	3.3	5.2	27.07	10.54	39.07	12.65
23	8/29/00	3:20P	326	5	3.32	9:47	0:08	1:09	5:21	0:16	20:13	1.8	1.8	3.6	27.05	10.98	30.02	18.98
24	8/29/00	3:41P	342	6	3.59	11:24	0:08	0:47	19:49	15:18	51:25	1.9	6.2	8.1	23.02	10.02	32.00	10.56
25	8/29/00	4:43P	349	7	4.46	11:12	0:18	0:57	7:32	3:12	27:57	1.8	1.9	3.8	23.02	9.50	27.07	10.87
26	8/29/00	5:11P	322	4	2.11	5:29	19:58	1:29	15:38	59:19	104:04	1.1	5.1	6.1	42.20	2.52	42.20	4.05
27	8/30/00	4:27A	330	7	4.27	10:33	0:09	1:02	21:08	159:27	196:46	1.7	4.3	6.0	23.02	9.69	28.01	1.42
28	8/30/00	4:55P	320	6	3.52	10:42	0:14	1:00	5:43	1:42	23:13	1.7	1.7	3.4	24.07	9.55	29.06	13.47
29	8/30/00	5:18P	338	6	3.16	10:45	0:51	0:58	6:00	2:34	24:24	1.7	1.6	3.3	23.02	8.71	29.04	11.36
30	8/30/00	5:42P	343	6	3.52	10:28	0:08	1:01	6:06	0:25	22:00	1.7	1.6	3.3	24.08	9.57	28.03	14.70

Creating Graphs

The PLMIII software can generate graphs that quickly summarize payload data. These graphs can be customized for printing. Just like the reports, the graphs are generated from the query displayed on the "Payload Summary" screen. From the "Sorting on Time Range" example, the graph that is printed would only contain data from truck 374 during the month of July 2000, from 8:00 AM to 5:00 PM.

It is important to carefully select the query data and press the "Query Database & Display" button before creating a graph.

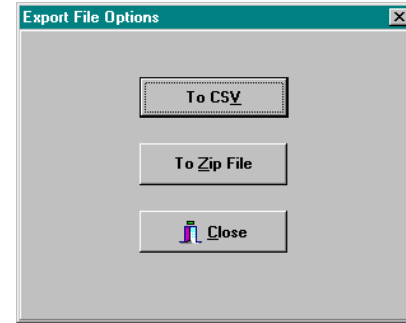
1. From the Payload Summary Screen select the "Graph" button at the bottom. The Histogram Setup screen will display



2. Enter the "Lowest Value". This will be the lowest payload on the graph. Any payloads less than this value will be summed in the first bar.
3. Enter the "Highest Value". This will be the highest value on the graph. Payloads over this value will be summed in the last bar.
4. Enter the "Incremental Change". This will determine the number of bars and the distance between them. The program limits the number of bars to 20. This allows graphs to fit on the screen and print onto 1 page.
5. Press the "Create Graph" button.

The graph will be displayed based on the query settings from the Payload Summary screen. The graph can be customized and printed.

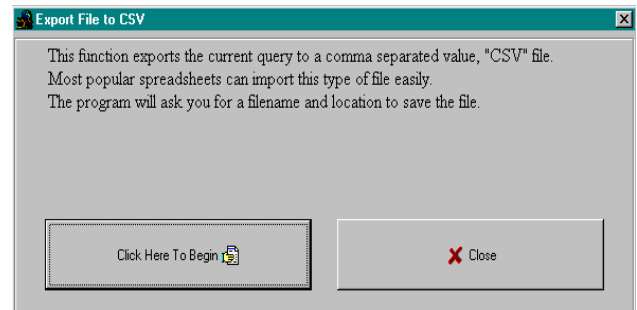
Exporting Data



The data from the database can be exported for use with other software applications. The data is selected from the currently displayed query. The exported data can be put into a ".CSV" file or a compressed ".zip" file.

- The ".CSV" format allows data to be easily imported into spreadsheet applications and word processing applications.
- The ".Zip" format allows data to be transferred from one computer to the PDM Software database on another computer. This offers a compact way to transfer data from one computer to another.

CSV Export



CSV stands for Comma Separated Value. This is an ASCII text file format that allows spreadsheet applications like Excel and Lotus 123 to import data easily. To export the data into a ".csv" file, press the "Export" button at the bottom of the payload summary screen and select "To CSV". The program will request a filename and location for the file.

Truck #	Date	Time	Payload	Swingload	Operator	Status	Fla	Carry Bac	Total Cyc	E-Run	Tim	E-Stop	Tu	Loading
374	2/11/00	4:06:48 PM	294.4	2	0	E		-1.2	2.7	1	0.2	0		
374	2/11/00	4:10:09 PM	298.6	2	0	I		-1.4	7.2	0.6	0.6	0		
374	2/11/00	4:41:01 PM	265.5	3	0			15.6	20.1	4.6	3.9	2		
374	2/11/00	5:24:54 PM	277.5	0	0	AK		0	27	4.6	6.4	1		
374	2/11/00	6:21:27 PM	231	3	0			15.5	27.7	4.5	5	1		
374	2/11/00	7:09:08 PM	265.5	3	0	H		17.1	23.9	4.2	3.2	1		
374	2/11/00	7:59:53 PM	262.4	4	0			14.1	29.7	4.3	3.7	2		
374	2/11/00	8:29:32 PM	225.1	3	0			15.6	27.7	4.5	5	1		
374	2/11/00	8:57:11 PM	265.5	3	0			15.6	20.1	4.6	3.9	2		
374	2/11/00	9:17:13 PM	265.4	3	0	H		17	23.9	4.2	3.1	1		
374	2/11/00	9:41:05 PM	277.6	0	0	AK		0	27	4.6	6.4	1		

Two sets of data are exported. At the top of the file will be the haul cycle data. The columns, left to right are:

- Truck number
- Haul cycle start date
- Haul cycle start time
- Payload
- Swingloads
- Operator ID
- Warning Flags
- Carry Back
- Total Haul Cycle time
- Empty Running Time
- Empty stop time
- Loading time
- Loaded running time
- Loaded stopped time
- Dumping time
- Loading start time
- Dumping start time
- Loaded haul distance
- Empty haul distance
- Loaded maximum speed
- Time when loaded maximum speed occurred
- Empty maximum speed
- Time when loaded maximum speed occurred
- Maximum + frame torque
- Time when the maximum + frame torque occurred
- Maximum - frame torque
- Time when the maximum - frame torque occurred
- Maximum sprung weight calculation
- Time when the maximum sprung weight calculation occurred
- Left Front Tire-kilometer-hour
- Right Front Tire-kilometer-hour
- Average Rear Tire-kilometer-hour
- Frame serial number

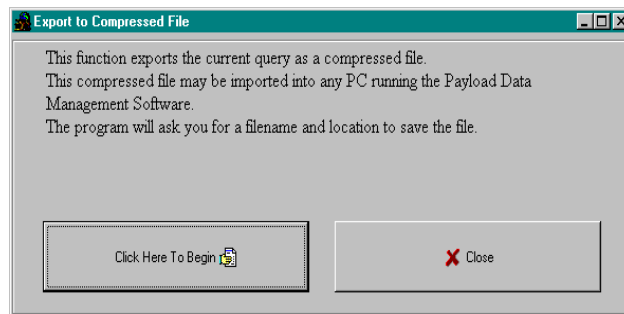
- Reserved 1-5, 7-10: These values are internal calculations used in the continued development of PLMIII and should be ignored.
- Reserved 6: This value is the payload estimate at the shovel just before the truck begins to move.

Alarm Type	Date Set	Time Set	Description	Date Cleared	Time Cleared
10	12/5/99	8:51:25 AM	INCL SENSOR LO	12/5/99	8:51:29 AM
10	12/5/99	8:56:07 AM	INCL SENSOR LO	12/5/99	8:56:12 AM
10	12/5/99	9:00:49 AM	INCL SENSOR LO	12/5/99	9:00:54 AM
10	12/5/99	9:05:31 AM	INCL SENSOR LO	12/5/99	9:05:36 AM
10	12/5/99	9:10:13 AM	INCL SENSOR LO	12/5/99	9:10:17 AM
10	12/5/99	9:14:54 AM	INCL SENSOR LO	12/5/99	9:14:59 AM
10	12/5/99	9:19:37 AM	INCL SENSOR LO	12/5/99	9:19:41 AM
10	12/5/99	9:24:19 AM	INCL SENSOR LO	12/5/99	9:24:24 AM
10	12/5/99	9:29:01 AM	INCL SENSOR LO	12/5/99	9:29:06 AM
10	12/5/99	9:33:44 AM	INCL SENSOR LO	12/5/99	9:33:48 AM
10	12/5/99	9:38:26 AM	INCL SENSOR LO	12/5/99	9:38:30 AM
10	12/5/99	9:43:08 AM	INCL SENSOR LO	12/5/99	9:43:13 AM
10	12/5/99	9:47:50 AM	INCL SENSOR LO	12/5/99	9:47:55 AM
10	12/5/99	9:52:32 AM	INCL SENSOR LO	12/5/99	9:52:37 AM
10	12/5/99	9:57:13 AM	INCL SENSOR LO	12/5/99	9:57:17 AM
10	12/5/99	10:01:55 AM	INCL SENSOR LO	12/5/99	10:01:59 AM

The second series of data below the haul cycle data is the alarms. The alarm columns, left to right are:

- The alarm type
- The date the alarm was set
- The time the alarm was set
- Alarm description
- The date the alarm was cleared
- The time the alarm was cleared

Compressed



This export function allows the data from one laptop to be transferred to another computer. This can be useful when a service laptop is used to download multiple machines and transfer the data to a central computer for analysis. This can also be used to copy haul data from a particular truck onto a diskette for analysis.

The file format is a compressed binary form of the displayed query. The file can only be imported by another computer running the PDM software.

To export data in ZIP format:

1. Confirm that the data displayed is the query data that needs to be exported.
2. From the payload summary screen, press the "EXPORT" button and select "To ZIP".
3. The program will ask for a filename and location.

Importing Data

This import function allows the data from one laptop to be transferred to another computer. This can be useful when a service laptop is used to download multiple machines and transfer the data to a central computer for analysis. This can also be used to copy haul data from a particular truck from a diskette into a database for analysis.

To import data, press the "IMPORT" button at the bottom of the "Payload Summary" screen. The program will ask for a ".zip" file to import, locate the file and press "Open". The program will only import ".zip" files created by another computer running the PDM Software.

Deleting Haul Cycle Records

To delete haul cycle records from the main database, press the "Delete" button at the bottom of the "Payload Summary" screen. The program will display a summary of the records from the displayed query. To delete a record, select one at a time and press the "Delete" button. It is recommended that records be exported to a zip file for archival purposes before deletion. Multiple records may be selected by holding down the Shift key. Pressing the "Delete All" button will select all the records from the current query and delete them.

NOTE: There is no recovery for records that have been deleted from the main database. It is highly recommended that all records be exported and archived in a compressed file format for future reference before being deleted.

Truck Number	Date	Time	Payload	# Swings	Total Time
374	08/28/2000	3:54:13 PM	346.7	7	39:11
374	08/28/2000	5:18:14 PM	301.5	6	27:52
374	08/28/2000	5:46:04 PM	300.0	6	25:48
374	08/28/2000	6:11:50 PM	330.5	4	37:51
374	08/28/2000	6:49:37 PM	343.7	4	46:58
374	08/28/2000	7:36:31 PM	379.9	5	37:10
374	08/28/2000	8:13:37 PM	351.6	4	36:50
374	08/28/2000	8:50:22 PM	356.3	4	35:41
374	08/28/2000	9:25:59 PM	369.6	5	34:36
374	08/28/2000	10:00:31 PM	362.6	5	36:18
374	08/28/2000	10:36:44 PM	340.5	7	26:00
374	08/28/2000	11:02:42 PM	320.9	4	36:01
374	08/28/2000	11:38:40 PM	316.5	5	52:26
374	08/29/2000	12:56:37 AM	319.7	5	43:42
374	08/29/2000	1:40:16 AM	301.6	4	27:54

Buttons: Help, Delete All, Delete Selection, Close

Viewing Alarms

From the Payload Summary screen, click the "Alarms" button to display the alarm screen. The alarms are sorted by the query settings from the Payload Summary screen. Alarms can be displayed as Active or Inactive.

Truck Number	Type	Set Date	Set Time	Description	Cleared Date	Cleared Time
374	13	8/31/00	2:34:48 AM	ALARM BODY UP SWITCH	8/31/00	2:34:52 AM
374	13	9/11/00	2:36:57 PM	ALARM BODY UP SWITCH	9/11/00	2:37:01 PM
374	13	9/11/00	2:45:22 PM	ALARM BODY UP SWITCH	9/11/00	2:45:26 PM
374	13	9/13/00	9:19:43 PM	ALARM BODY UP SWITCH	9/13/00	9:19:48 PM
374	13	9/30/00	2:42:05 AM	ALARM BODY UP SWITCH	9/30/00	2:42:10 AM

Buttons: Active Alarms, Inactive Alarms, All Alarms, Delete, Close

Deleting Alarm Records

To delete alarm records from the main database, press the "Delete" button at the bottom of the "Alarm Display" screen. The program will display a summary of the alarms from the query. To delete an alarm, select one at a time and press the "Delete" button. It is recommended that the query data be exported to a ".zip" file for archival purposes before deletion. Multiple records may be selected by holding down the Shift key. Pressing the "Delete All" button will select all the alarms from the current query and delete them.

NOTE: There is no recovery for alarms that have been deleted from the main database. It is highly recommended that all records be exported and archived in a compressed file format for future reference before being deleted.

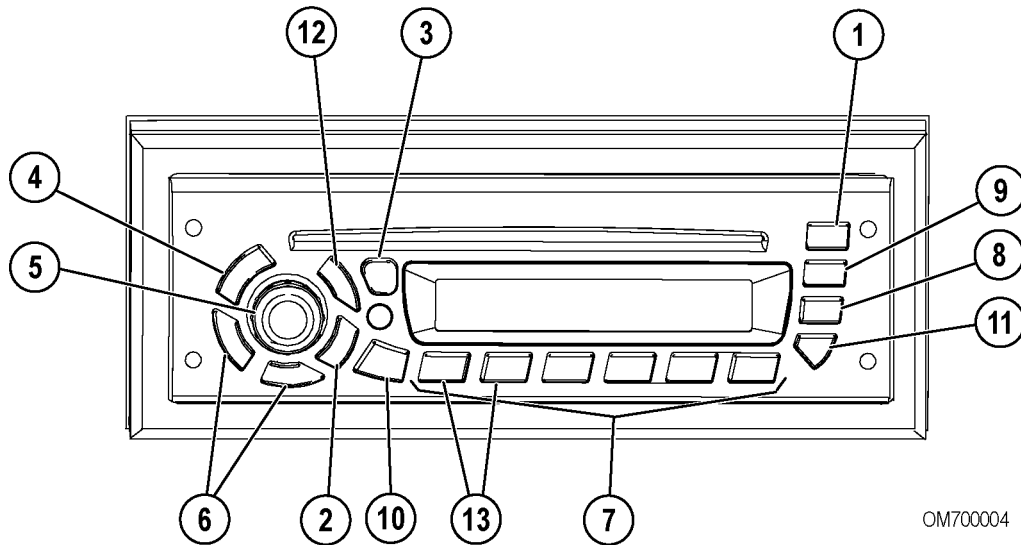
Truck Number	Alarm Type	Set Date	Set Time	Description	Cleared Date	Cleared Time
374	13	8/31/00	2:34:48 AM	ALARM BODY UP SWITCH	8/31/00	2:34:52 AM
374	13	9/11/00	2:36:57 PM	ALARM BODY UP SWITCH	9/11/00	2:37:01 PM
374	13	9/11/00	2:45:22 PM	ALARM BODY UP SWITCH	9/11/00	2:45:26 PM
374	13	9/13/00	9:19:43 PM	ALARM BODY UP SWITCH	9/13/00	9:19:48 PM
374	13	9/30/00	2:42:05 AM	ALARM BODY UP SWITCH	9/30/00	2:42:10 AM

Buttons: Help, Delete All, Delete Selection, Close

NOTES

NOTES

PORTIONS OF THIS PRODUCT RELATING TO PAYLOAD MEASURING
SYSTEMS ARE MANUFACTURED UNDER LICENSE FROM
L.G. HAGENBUCH, holder of U.S. Patent Numbers
5,416,706; 5,528,499; 5,631,832; 5,631,835; 5,644,489; 5,650,928; 5,650,930; 5,742,914

AM/FM RADIO / CD PLAYER

OM700004

FIGURE 70-1. AM/FM RADIO / CD PLAYER

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Ejects CD 2. BANDS Switches between AM, FM1, FM2, FM3, SAT 1, and SAT 2 (if equipped), WX (Weatherband) and Auxiliary Mode 3. TMSET/DSPL Switches to time set mode/Changes display 4. PWR Power 5. ON/AUDIO Power/volume/receiver settings 6. +TUNE/SEEK- Changes radio station or CD/MP3 track | <ol style="list-style-type: none"> 7. Push Buttons 1-6 Pre-set stations/CD/MP3 functions 8. PSCN/AUTO Scans presets on current band/stores strongest stations to preset 9. SCAN/DIM Scans all stations in current band or on CD/MP3 10. ALARM Switches to alarm set mode 11. RDM Plays CD/MP3 tracks randomly 12. Switches to CD/MP3 mode 13. FLDR+/- Changers folders on an MP3 disc |
|---|--|

OPERATING INSTRUCTIONS

To learn how to get the most from the receiver, read all of the instructions that follow.

GENERAL RADIO RECEIVER FUNCTIONS

The receiver is equipped with:

- An AM band with 6 AM presets
- Three FM bands for a total 18 FM presets
- One Weatherband with 6 WX presets
- Two satellite bands for a total of 12 satellite presets

Turning On the Power

With the key switch ON, the receiver can be turned on and off by pressing the PWR (4, Figure 70-1) button. Pressing the ON/AUDIO (5) knob also activates the receiver.

One-Hour Timer

With the key switch OFF, pressing the PWR (4) button or the ON/AUDIO (5) knob will turn on the receiver and activate the receiver's one-hour timer. The receiver will turn off after one hour. Pressing the PWR (4) button or the ON/AUDIO (5) knob again reactivates the one-hour timer.

Display

The receiver will display the time of day when it is off. Momentarily pressing the TMSET/DSPL (3) button when the receiver is on allows to toggle between displays.

When the receiver is set to AM, FM1, FM2, FM3 or WX, the display will toggle between the frequency and time of day.

When the receiver is in satellite mode and the satellite service provider is transmitting the information, the display will toggle between song title, artist, time of day, and station name.

When in the CD mode, the display will toggle between track number and elapsed time, and time of day.

When playing an MP3 disc, the display will toggle between the ID3 tag (song title, artist and album title) and time of day.

Setting a Default Display

1. Press the BAND (2) button to enter the mode to set a default display.
2. Press and hold the TMSET/DSPL button for 2 seconds until the hours digits flash.
3. Press push button (6) until the desired display appears.

After 5 seconds of inactivity, the selected default will be displayed.

Adjusting the Brightness of the Display

If the dash dimmer does not control the brightness of the receiver display or the receiver is operating in One-Hour Timer mode, press and hold the SCAN/DIM (9) button until DIM and the brightness level appear on the display. Rotate the AUDIO knob clockwise to increase the brightness of the receiver display and counter-clockwise to decrease it.

Auxiliary Mode

When in Auxiliary mode, the radio can play an audio source from an iPod or an MP3 player that is connected via the auxiliary radio lines.

To enable the Auxiliary mode:

- Press and hold the BAND (2) button for at least 2 seconds until the display shows EXTERNAL AUDIO.

To disable Auxiliary mode:

- Press and hold the BAND (2) button for at least 2 seconds until the radio reverts to the previous mode.

Adjusting the Receiver Settings

To adjust the Volume, Bass, Treble, Fade, Balance, Seek Sensitivity and Speakers, press and release the ON/AUDIO (5) knob repeatedly until the desired feature appears on the display.

VOLUME: Rotate the AUDIO knob clockwise to increase the volume and counter-clockwise to decrease it. The display will show VOL and the volume level.

BASS: Press the AUDIO knob until BASS and the current setting appears on the display. Rotate the knob clockwise to increase the bass sound and counter-clockwise to decrease it.

TREBLE: Press the AUDIO knob until TREBLE and the current setting appears. Rotate the knob clockwise to increase the treble sounds and counter-clockwise to decrease it.

FADE: Press the AUDIO knob until FADE and the current setting appears on the display. Rotate the knob clockwise to move the sound to the front speakers and counter-clockwise to move the sound to the rear.

BALANCE: Press the AUDIO knob until BALANCE and the level appear. Rotate the knob clockwise to move the sound to the right speakers and counter-clockwise to move the sound to the left.

SEEK SENSITIVITY: To adjust seek sensitivity, press the AUDIO knob until SEEK and the sensitivity level appear. Rotate the AUDIO knob to the desired setting. Increasing the sensitivity will help find more stations, including slightly weaker ones, while decreasing it will cause fewer, but stronger stations to be found.

SPEAKERS: Press the AUDIO knob until SPKR 4 appears on the display; rotate the knob to switch to 2-speaker functionality. SPKR 2 will appear on the display.

After 5 seconds of inactivity, the receiver will return to the default display.

USING THE CLOCK

The clock can function in a 12 or 24-hour mode. The 12-hour mode distinguishes between AM and PM. The 24-hour mode operates as military time. To toggle between the two modes:

1. Turn the key switch ON.
2. Press and hold the TMSET/ DSPL button for 2 seconds until the digits flash. This indicates you are in the time set mode.
3. Press and release push-button 5 to toggle between 12-hour and 24-hour modes.

After 5 seconds of inactivity, the display will return to the default display, and the current mode will be set.

Setting the Clock

1. Turn the key switch ON.
2. Press and hold the TMSET/DSPL button until the hours digits flash.
3. Press the +TUNE/SEEK- (6) to set the correct hour.
4. Press the TMSET/DSPL button again, and the minutes digits will flash.
5. Press the +TUNE/SEEK- (6) button to set the correct minute. Seconds are reset to zero when the minutes setting is changed.

After 5 seconds of inactivity, the display will return to the default display and the clock will be set.

USING THE ALARM

Momentarily pressing the ALARM (10) button will display the alarm set time.

When the ALARM icon is on the display, the alarm has been set. If the radio is on when the alarm sounds, there will be a beeping noise. If the receiver is off, the alarm will turn on and play the radio at the alarm volume. The alarm will continue to sound until the snooze is activated or the alarm is turned off.

Setting the Alarm

1. Press and hold the ALARM (10) button for 2 seconds until the ALARM icon and the display show AL TIME plus the current alarm time. This indicates the alarm-setting mode.
2. Press and release the +TUNE/SEEK- (6) until the desired alarm hour appears on the display.
3. Press the ALARM (10) button again to select the minutes display.
4. Press the +TUNE/SEEK- (6) until the desired alarm minutes appear on the display.

After 5 seconds of inactivity, the receiver will return to the default display, and the ALARM icon will remain illuminated indicating the alarm is set.

Turning the Alarm Off

Press and hold the ALARM (10) button until the display shows ALARM DISABLED and the ALARM icon on the display disappears.

Activating Snooze

Press any button on the radio faceplate when the alarm is sounding. The alarm will sound again in 9 minutes.

Setting Alarm Volume

1. Turn the receiver on.
2. Press and hold the ALARM button for 2 seconds until the ALARM icon and the display shows AL TIME plus the current alarm time. Rotate the AUDIO knob to increase or decrease the alarm volume as desired.

After 5 seconds of inactivity, the receiver will return to the default display and the volume level at which the receiver was previously playing.

NOTE: The alarm will be activated unless the ALARM button is held for 2 seconds again.

USING THE RADIO

Finding a Station

BAND (2): Press this button to switch between AM, FM1, FM2, FM3, Weather (WX) and Satellite Bands (XM1, XM2 or SR1, SR2). The receiver display will show your selection.

NOTE: If the radio requires an external Satellite receiver and one is not connected to the radio, the Satellite bands will NOT appear when the BAND (2) button is pressed.

NOTE: If the radio has an internal Satellite receiver but Satellite service has not been activated, the display will show XM NOT ACTIVATED or SR NOT ACTIVATED.

+TUNE/SEEK- (6): Press and hold both +TUNE and BAND (2) for 2 seconds to switch between manual tune and seek modes. The display will show either MANUAL or SEEK to indicate the mode.

MANUAL TUNE: Press the +TUNE/SEEK- (6) button once to tune to the next higher or lower station, one frequency at a time. Holding +TUNE/SEEK- for more than half a second begins fast tuning.

SEEK: Press the +TUNE/SEEK- (6) button once to tune to the next higher or lower station. Holding +TUNE/SEEK- for more than half a second activates the Seek function, and SEEK will appear on the display. When a station with a strong enough signal is found, Seek will stop and the station will play. If a station is not found with a strong enough signal after searching the band twice, the Seek function will end and NO STATION FOUND will appear for 5 seconds. Then, the default display will appear and the radio will continue to play. Seek can be cancelled by pressing +TUNE/SEEK- again.

After selecting the satellite band, press and release the +TUNE/SEEK- button to move to the next channel. Pressing and holding the +TUNE/SEEK- button for more than two seconds will increase the speed at which the radio tunes up or down to a rate of about 10 channels/second.

PROGRAM TYPE SEARCH (PTY): If subscribed to XM or Sirius Satellite Radio, Program Type Search allows you to seek by music type. To perform a PTY search:

1. Press Scan and Preset 1 at the same time. PTY will appear on the radio display.
2. Press Preset 1 until the type of programming you want to listen to (rock, classical, etc.) appears on your radio display.
3. Press the +TUNE/SEEK- (6) button to select a station of the program type you selected in step 2. Continue to press the +TUNE/SEEK- button to move through the list of stations available in that program type. Station names will appear on the radio display.

The radio can also scan all of the stations by program type. After selecting a program type:

1. Press SCAN/DIM (9) to scan all available stations of that program type.
2. Press SCAN/DIM (9) again to stop scanning.

AUDIO STORE (AUTO): AUTO automatically stores the 6 strongest stations onto pushbuttons 1-6. Press and hold PSCN/AUTO (8) until AUTO and the AS icon appear on the display. AUTO STORE only saves presets in the band to which you are listening. If you press AUTO while listening to FM1, the presets on AM, FM2, FM3 and WX will not change. Pressing and holding AUTO again for more than 2 seconds will cancel Auto Store, and the original presets will be restored.

NOTE: AUTO STORE is not active for satellite brands.

SCAN: Press SCAN/DIM (9) to scan all stations on the current band. When a frequency of sufficient strength is found, the radio will play for 5 seconds and then continue scanning until you press SCAN again. The display will show SCAN and the frequency being scanned.

PSCN: Press PSCN/AUTO (8) to scan the presets on the band the radio is currently playing (FM will scan FM1, FM2 and FM3). When a preset frequency of sufficient strength is found, the radio will play for 5 seconds and then continue scanning. The display will show PSCN, the frequency, preset number and the band icon. Preset Scan will continue until the PSCN is pressed again.

Setting the Presets

The six numbered pushbuttons allow to preset 6 favorite stations per band and easily return to them with the touch of a button. To set the presets:

1. Turn the key switch and the receiver ON.
2. Select the band.
3. Tune to the desired station.
4. Press and hold one of the six numbered buttons for more than 2 seconds to store the selected station. During the 2-second set time, the radio will be muted and the number icon will not be visible. Both the audio and selected preset icon will return, indicating the station has been set.
5. Repeat steps 1-4 for each push-button.

Pressing a preset button in the future will tune the radio to the station you set on the band to which you are listening.

SATELLITE RADIO SERVICE (Optional)

When the XM or SIRIUS logo or SAT Radio appears above the ON/AUDIO (5) knob on the radio, it is satellite radio compatible. XM and Sirius are satellite radio services that offer more than 100 channels of digital quality audio programming and can be heard uninterrupted across the contiguous United States. A service fee is required to receive satellite broadcasts. For more information, contact XM at www.xmradio.com or by phone at 1-800-852-XXXM (9696) or Sirius at <http://activate.siriusradio.com> or by phone at 1-888-539-7474.

Activating Satellite Radio (Optional)

When XM or SIRIUS appears above the ON/AUDIO (5) knob, the radio includes an integrated satellite radio receiver. To take advantage of this feature, a monthly Satellite Radio subscription must be purchased. If XM appears on the radio, the radio is XM Satellite Radio compatible and a XM subscription is required. If Sirius appears on your radio, the radio is Sirius Satellite Radio compatible and a Sirius subscription is required.

When SAT RADIO appears above the ON/AUDIO (5) knob, the radio is also satellite radio compatible. To take advantage of this feature, purchase an external satellite radio receiver kit from the dealer and a compatible monthly subscription from either XM or Sirius Satellite Radio.

To activate the integrated or external satellite receiver, furnish the satellite radio provider with the satellite receiver's Electronic Serial Number. To find the electronic serial number, complete the instructions that follow.

If the satellite radio provider is XM Satellite Radio:

1. With the key switch and the radio ON, press the BAND (2) button and select XM1 or XM2.
2. Tune the radio to channel 0 and the 8-digit serial number will appear.

If the satellite radio provider is Sirius Satellite Radio:

1. With the key switch and radio ON, press the BAND (2) button and select SR1 or SR2.
2. Tune the radio to channel 0 and the 12-digit serial number will appear.

NOTE: Only ONE satellite receiver box can be installed and connected to your radio receiver.

NOTE: Satellite radio reception may be degraded by satellite signal obstruction.

USING THE WEATHERBAND

NOAA Weather Radio is a service of the National Weather Service. It provides continuous broadcasts of the latest weather information directly from the National Weather Service offices. Taped weather messages are repeated every four to six minutes and are revised every one to three hours or more frequently if needed. Most of the stations operate 24 hours a day.

The weather for the local area can be found on one of 7 stations. When in the Weatherband mode, the display will show the WX icon and CH plus the channel number. The channel can be changed using the +TUNE/SEEK- (6) button and can also be preset to the pushbuttons.

The frequencies associated with each channel are as follows:

1. 162.550 MHz
2. 162.400 MHz
3. 162.475 MHz
4. 162.425 MHz
5. 162.450 MHz
6. 162.500 MHz
7. 162.525 MHz

The National Weather Service operates approximately 372 stations. Close to 90 percent of the nation's population is within listening range of an NOAA Weather Radio broadcast.

USING THE COMPACT DISC PLAYER

The integral CD player plays full size CDs and MP3 discs. Press the to switch to CD/MP3 mode.

Playing a Compact Disc

1. Turn the key switch and the receiver on.
2. Insert a disc partway into the slot, label-side up. The player will automatically pull the disc in once it has been partially inserted. The CD icon and the words READING DISC will appear, and the disc will begin to play.
3. If the radio is currently tuned to AM/FM/WX or Satellite radio, press the CD button to play a CD that has been loaded into the player. If no CD has been loaded, the display will show NO CD for 5 seconds and return to the default display. If a CD has been loaded, the display will show the track number and the elapsed time on the display

If a CD is ejected and not removed within 25 seconds, the CD will be reloaded, but will not start playing until the CD button is pressed.

A CD can be inserted while the key switch is OFF. To do so, press and insert a CD within 25 seconds.

Button Functions

+TUNE: Press + TUNE once to forward to the next track. The track number and elapsed time will appear. Press and hold + TUNE to advance tracks quickly.

SEEK-: Press SEEK- once to return to the beginning of the track being played. Pressing this button during the first 8 seconds of the track will play the previous track. The track number and elapsed time will appear. Press and hold SEEK- to fast reverse.

3/PAUSE: Press PAUSE to pause a CD. PAUSE will be displayed, and the audio will be muted. Press PAUSE again to resume playing the CD.

4/REV: Press and hold REV to fast reverse. Upon release, the CD will play at normal speed. The display will show the track number and elapsed time. After 5 seconds, the default display will reappear.

5/FF: Press and hold FF to fast-forward. Upon release, the CD will play at normal speed. The display will show the track number and elapsed time. After 5 seconds the default display will reappear.

6/RPT: Press RPT to repeat the current track. RPT on the display indicates that this feature is on. The track will be repeated until RPT is pressed again.

EJECT: Press to eject a CD.

RDM (11): Press RDM (11) to activate random track selection. RDM will appear on the display, and tracks on loaded CDs will play in random order. Press the RDM (11) button again to turn off "random play" beginning with the next track.

SCAN/DIM (9): Press SCAN to scan all tracks on the CD. The player will immediately advance to the next track on the CD being played. SCAN and the track number will appear on the display and 10 seconds of the track will play. Then, the CD will advance to the next track, play 10 seconds and continue. To deactivate, press SCAN again.

PLAYING AN MP3 DISC

MP3 Format Compatibility

This MP3 Player will play MP3 files recorded on a CD-R up to 700 MB. Files can be recorded at a variable bit rate or the following fixed-bit rates: 32 kpbs, 40 kpbs, 56 kpbs, 64 kpbs, 80 kpbs, 96 kpbs, 112 kpbs, 128 kpbs, 160 kpbs, 192 kpbs, 224 kpbs, 256 kpbs and 320 kpbs. Both single and multi-session discs will play. Song title, artist name and album are available when discs are recorded using ID3 tags versions 1 and 2.

The MP3 player will be able to read and play a maximum of 95 folders, 50 play lists or 20 sessions and 949 files. Long file, folder or playlists names or a combination of a large number of them can reduce the number files, folders, playlists, or sessions that can be played. To play large numbers of files, folders, playlists or sessions, minimize the length of the file, folder or play list name. It can also play an MP3 recorded without file folders. The system can support up to 11 levels of folder nesting. If a disc contains more than the maximum of 95 folders, 50 playlists, 20 sessions and 949 files, the player will only access and navigate the maximum and ignore additional items.

Root Directory

The root directory is treated as a folder. If the root directory has compressed audio files, the directory is displayed as F1 ROOT. All files contained directly under the root directory are accessed prior to any root directory folders. However, playlists (Px) are always accessed before root folders or files.

Empty Directory or Folder

If there is a root directory or a folder in the file structure that contains empty folders/subfolders, play advances to the next folder in the file structure that contains compressed audio files. The empty folder will not be displayed or numbered.

No Folder

When a disc contains only compressed files, the files are located under the root folder. The next and previous folder functions have no function on a CD recorded without folders or play lists. When displaying the name of the folder, the radio displays ROOT.

When the CD contains only playlist and compressed audio files, but no folders, all files are located under the root folder. The "folder down" and "folder up" buttons search play lists (Px) first and then the root folder. When the radio displays the name of the folder, the radio displays ROOT.

File Name Display

A song name is displayed when contained in the ID3 tag. If the song name is not in the ID3 tag, the radio displays the file name without the extension (such as.mp3) as the track name.

Track names longer than 16 characters scroll at a rate of one page every 1.5 seconds until the entire name is shown. To speed up page changes, press the TMSET/DSPL button. When all pages have been shown once, the first page of the ID3 tag appears and remains on the display. To restart automatic paging, press TMSET/DSPL.

Pre-Programmed Playlists

Pre-programmed play list function like folders containing compressed audio song files. This radio plays .pls, .m3u, and .rmp playlist formats. The pre-programmed play lists can not be edited.

Playing MP3 Files

Insert a disc partway into the slot, label side up. The player will pull it in, and READING DISC will appear on the display. The CD will begin playing, and the CD icon will appear on the display.

Play begins from the first track in the first playlist and continues sequentially through all tracks in each playlist. When the last track of the last playlist has been played, play continues from the first track of the first folder's playlist until FLDR +/- (13) is pressed. When play enters a new folder, the display will show the new folder name for 5 seconds then revert to the default display.

If the CD does not contain any playlists, play begins from the first track under the root directory. When all tracks from the root directory have been played, play continues by the numerical file listing. After playing the last track from the last folder, play begins again at the first track of the first playlist, folder or root directory.

If the songs on a playlist cannot be accessed, the radio ignores it and treats the disc as if it only has folders and tracks. If the disc contains multiple sessions and the table of contents cannot be accessed for all sessions, the radio plays the sessions with an available table of contents.

Button Functions

1/FLD (NEXT FOLDER): Press this button to go to the first track in the next folder or playlist. Pressing this button while in folder random mode will move to the first track in the next folder and play the tracks in that folder randomly.

2/FLD (PREVIOUS FOLDER): Press this button to go to the first track in the previous folder or playlist. Pressing this button while in folder random mode will move to the first track in the previous folder and play the tracks in that folder randomly.

3/PAUSE: Press this button to pause playback. PAUSE will be displayed. Press PAUSE again to resume playing the disc.

4/REV (REVERSE): Press and hold REV to fast-reverse. Upon release, the CD will play at normal speed. The display will show the track number and elapsed time. After 5 seconds, the default display will appear.

5/FF (FAST FORWARD): Press and hold FF to fast-forward. Upon release, the CD will play at normal speed. The display will show the track number and elapsed time. After 5 seconds, the default display will appear.

6/RPT: Press RPT to repeat the current track. The RPT icon on the display indicates the feature is on. The track will be repeated until RPT is pressed again.

RDM (RANDOM): Press and release this button to play the tracks in the current folder or playlist in random order. RDM will appear on the display. Once all tracks in the current folder or playlist have been played, the system will move to the next folder or playlist and play the tracks in random order. When random is activated, pressing TUNE + or SEEK - will move to the next or previous random track. Pressing RDM (11) again cancels random play.

+ TUNE: Press + TUNE once to forward to the next track. The track number and elapsed time will appear. Press and hold + TUNE to advance tracks quickly.

SEEK -: Press SEEK- once to return to the beginning of the track being played. Pressing this button during the first 8 seconds of the track will play the previous track. The track number and elapsed time will appear. Press and hold SEEK- to fast reverse.

DSPL/TM SET: Pressing this button toggles between the ID3 tag (song title, artist and album title) and time of day. There are 3 display types that can be set as default: track, folder/playlist, and time of day. The default display is track.

To display the folder/playlist or time of day, follow the instructions in the Setting a Default Display section.

- Track mode displays the current track number and ID3 tag song title.
- Folder/playlist mode displays the current folder or playlist number and name plus the ID3 tag song title.
- Time-of-day mode displays the time of day and the ID3 tag song title.

TROUBLESHOOTING

The following error messages may appear while playing a CD or MP3 disc:

- NO CD:** No CD has been loaded in the player.
- FOCUS:** Lens could not focus on CD. Possible reasons include: Disc is inserted upside down - eject and reinsert CD. Disc is dirty, scratched, or wet - try cleaning CD. Lens is dirty - clean CD lens with a lens cleaner. It is very humid - wait an hour and try again.
- TRACKING:** Loss of tracking control. Possible reasons include: Disc is dirty or scratched - try cleaning CD. Lens is dirty - clean CD lens with a lens cleaner.
- LOAD:** Load/unload motor problem - contact dealer.

NOTE: The sound quality, an increase in skipping, difficulty in finding tracks, and/or difficulty in loading/ejecting a CD-R may be affected by a CD-R's quality, the method of recording, the quality of the music that has been recorded, or the way the CD-R has been handled. If these problems occur, try a known good CD. If any error occurs repeatedly or if an error cannot be corrected, contact the local dealer. If the radio displays an error message, write it down and provide it to your dealer when reporting the problem.

NOTES: