

Operation & Maintenance Manual

630E

DUMP TRUCK

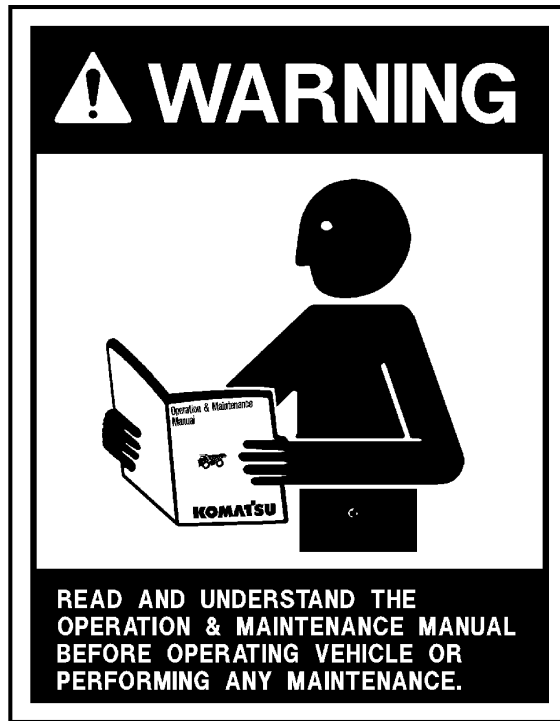
SERIAL SUFFIX

AFE42-M

AFE46-U

and up

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.

NOTES

EMISSION CONTROL WARRANTY

EMISSION CONTROL WARRANTY STATEMENT (APPLIES TO CANADA ONLY)

1. Products Warranted

Komatsu America International Company, Komatsu Mining Systems Inc. and Komatsu Utility Corporation (collectively "Komatsu") produce and/or market products under brand names of Komatsu, Dresser, Dressta, Haulpak and Galion. This emissions warranty applies to new engines bearing the Komatsu name installed in these products and used in Canada in machines designed for industrial off-highway use. This warranty applies only to these engines produced on or after January 1, 2000. This warranty will be administered by Komatsu distribution in Canada.

2. Coverage

Komatsu warrants to the ultimate purchaser and each subsequent purchaser that the engine is designed, built and equipped so as to conform, at the time of sale by Komatsu, with all U.S. Federal emission regulations applicable at the time of manufacture and that it is free from defects in workmanship or material which would cause it not to meet these regulations within five years or 3,000 hours of operation, whichever occurs first, as measured from the date of delivery of the engine to the ultimate purchaser.

3. Limitations

Failures, other than those resulting from defects in materials or workmanship, are not covered by this warranty. Komatsu is not responsible for failures or damage resulting from what Komatsu determines to be abuse or neglect, including, but not limited to: operation without adequate coolant or lubricants; over fueling; over speeding; lack of maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications of the engine. Komatsu is also not responsible for failures caused by incorrect fuel or by water, dirt or other contaminants in the fuel. Komatsu is not responsible for non-engine repairs, "downtime" expense, related damage, fines, all business costs or other losses resulting from a warrantable failure.

KOMATSU IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

This warranty, together with the express commercial warranties, are the sole warranties of Komatsu. **THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

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1. Produits garantis:

Komatsu America International Company, Komatsu Mining Systems Inc. et Komatsu Utility Corporation (collectivement Komatsu) produisent et/ou font la mise en marché de produits portant les noms de marque Komatsu, Dresser, Dressta, Haulpak et Galion. Cette garantie sur les émissions s'applique à tous les nouveaux moteurs portant le nom Komatsu, installés dans ces produits et utilisés au Canada dans des machines conçues pour utilisation industrielle non-routière. Cette garantie s'applique seulement sur les moteurs produits à partir du 1er Janvier 2000. Cette garantie sera administrée par la distribution de Komatsu au Canada.

2. Couverture:

Komatsu garantit à l'acheteur ultime et chaque acheteur subséquent que le moteur est conçu, construit et équipé en toute conformité, au moment de la vente par Komatsu, avec toutes les Réglementations fédérales américaines sur les émissions applicables au moment de la fabrication et qu'il est exempt de défauts de construction ou de matériaux qui auraient pour effet de contrevenir à ces réglementations en dedans de 5 ans ou 3000 heures d'opération, mesuré à partir de la date de livraison du moteur au client ultime.

3. Limitations:

Les bris, autres que ceux résultant de défauts de matériaux ou de construction, ne sont pas couverts par cette Garantie. Komatsu n'est pas responsable pour bris ou dommages résultant de ce que Komatsu détermine comme étant de l'abus ou négligence, incluant mais ne se limitant pas à: l'opération sans lubrifiants ou agent refroidissants adéquats; la suralimentation d'essence; la survitesse; le manque d'entretien des systèmes de lubrification, de refroidissement ou d'entrée; de pratiques non-propices d'entreposage, de mise en marche, de réchauffement, de conditionnement ou d'arrêt; les modifications non-autorisées du moteur. De plus, Komatsu n'est pas responsable de bris causés par de l'essence inadéquate ou de l'eau, des saletés ou autres contaminants dans l'essence. Komatsu n'est pas responsable des réparations non-relées au moteur, des dépenses encourues suite aux temps d'arrêts, des dommages relatifs, amendes, et de tout autre coût d'affaires ou autres pertes résultant d'un bris couvert par la garantie.

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Cette garantie, ainsi que les garanties expresses commerciales, sont les seules garanties de Komatsu. **IL N'Y A AUCUNE AUTRE GARANTIE, EXPRESSE OU SOUS-ENTENDUE, MARCHANDABLE OU PROPICE A UNE UTILISATION PARTICULIÈRE.**

INFORMATION IMPORTANTE SUR LE MOTEUR
 CE MOTEUR EST CONFORME AUX NORMES AMÉRICAINES DEL'EPA (ANNÉE DU MODÈLE) ET DE LA CALIFORNIE POUR LES MOTEURS LARGES NON-ROUTIERS A IGNITION PAR COMPRESSION. CE MOTEUR EST CERTIFIÉ POUR OPERATION À ESSENCE DIÉSEL.

AVERTISSEMENT
 DES BLESSURES PEUVENT RÉsulTER ET LA GARANTIE S'ANNULER SI LES RPM DU TAUX D'ESSENCE OU L'ALTITUDE EXCÈDENT LES VALEURS MAXIMALES PUBLIÉES POUR CE MODÈLE ET SON APPLICATION.

IMPORTANT ENGINE INFORMATION
 THIS ENGINE CONFORMS TO YYYY MODEL YEAR U.S. EPA REGULATION AND THE CALIFORNIA REGULATIONS LARGE NON ROAD COMPRESSION IGNITION ENGINES. THIS ENGINE IS CERTIFIED TO OPERATE ON DIESEL FUEL.

WARNING
 INJURY MAY RESULT AND WARRANTY IS VOIDED IF FUEL RATE RPM OR ALTITUDES EXCEED PUBLISHED MAXIMUM VALUES FOR THIS MODEL AND APPLICATION.

ENGINE MODEL		SERIAL NO.	
ENGINE FAMILY		DISPLACEMENT	LITERS
EXHAUST EMISSION CONTROL SYSTEM		FIRING ORDER	1 - 5 - 3 - 6 - 2 - 4
ADV. LOAD OUTPUT	Kw (HP)	RPM
VALVE LASH COLD (mm)	IN.	EX.	FUEL RATE AT ADV. mm ³ /STROKE
IDLE SPEED		RPM	FAMILY EMISSION LIMIT
INITIAL INJECTION TIMING	DEG. BTDC	DATE OF MANUFACTURE	
		KOMATSU LTD. MADE IN JAPAN	KOMATSU

↓
**KOMATSU LTÉE
 FABRIQUÉ AU JAPON**

MODÈLE DU MOTEUR

FAMILLE DU MOTEUR

SYSTÈME DE CONTRÔLE DES ÉMISSIONS D'ÉCHAPPEMENT

CHARGE DE SORTIE ADV.

PORTÉE DE VALVE À FROID (mm)

VITESSE STATIQUE

RÉGLAGE DE L'ALLUMAGE - INJECTION INITIALE

DEG. BTDC

NO. SÉRIE

DÉPLACEMENT

LITRES

SÉQUENCE DE MISE À FEU

mm³/BATTEMENT

TAUX D'ESSENCE À ADV.

LIMITE D'ÉMISSION DE LA FAMILLE

DATE DE FABRICATION

ENGINE DATAPLATE - ENGLISH / FRENCH

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 should 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 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 G.V.W. (Gross Vehicle Weight) rating.

The KOMATSU Haulpak Truck Model designation consists of three numbers and one letter (i.e. 630E). The three numbers represent the basic truck model. The letter "M" designates a Mechanical drive and the letter "E" designates an Electrical wheelmotor 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 Gross Vehicle Weight (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 **Gross Vehicle Weight (GVW)** and this means the **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.



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 MAY 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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SAFETY SECTION 2

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

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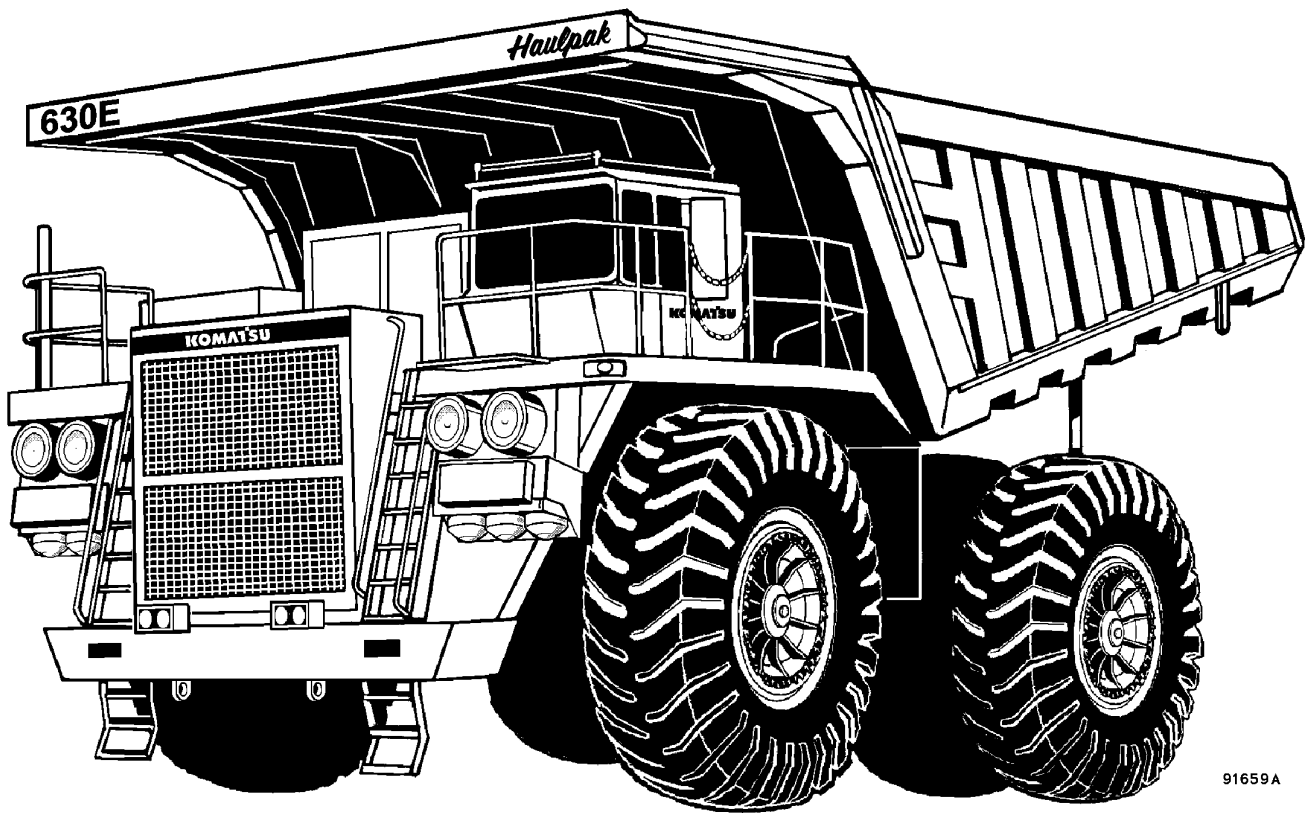
MAINTENANCE **SECTION 4**

This portion of the manual pertains mainly to the periodic Lubrication and Service required to keep the truck operating at its design potential. Routine lubrication and maintenance procedures are provided in this section. For major repairs, refer to the appropriate section in the Truck Shop Manual. Refer to the engine manufacturer's service manual when servicing the engine.

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KOMATSU 630E HAULPAK TRUCK

About This Manual


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 should 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 accomplishing repairs on the truck.


The front cover of this manual includes a Form Number. This Form No. should be referenced when ordering additional copies of this manual, or for any other correspondence regarding the coverage in this manual.

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This 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.

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 No., 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 **100 ft.lbs. (135 N.m)** torque. All torque specifications have $\pm 10\%$ tolerance unless otherwise specified.

NOTES

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 any of the charts or tables, standard conversion factors for most commonly used measurements are provided in TABLE XIII, page 1-14.

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EFFECT OF SPECIAL LUBRICANTS On Fasteners And Standard Torque Values

KOMATSU Haulpak engineering department does NOT recommend the use of special “friction-reducing” lubricants such as, “Copper Coat”, “Never Seize”, and other similar products on the threads of standard fasteners where “standard torque” values are applied.

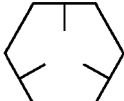
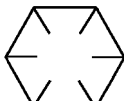
The use of special “friction-reducing” lubricants will significantly alter the clamping force being applied to fasteners during the tightening process.

If special “friction-reducing” lubricants are used with the “Standard Torque” values listed below in Table I (and in Haulpak shop manuals), *excessive stress and possible breakage of the fasteners may result.*

Where 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 1-10) on the threads and seats**, unless specified otherwise.

NOTE: Always be sure threads of fasteners and tapped holes are free of burrs or other imperfections before assembling.

Standard Torque values are not to be used when “Turn-of-the-Nut” tightening procedures are recommended.

<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;">  GRADE 5 </div> <div style="text-align: center;"> TABLE I STANDARD TORQUE CHART SAE HEX HEAD CAPSCREW AND NUT ASSEMBLY (LUBRICATED THREADS) TOLERANCES ± 10% </div> <div style="text-align: center;">  GRADE 8 </div> </div>														
CAP-SCREW 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, Capscrews (SAE)

The following specifications apply to required assembly torques for all 12-Point, Grade 9 (170,000 psi minimum tensile), Capscrews.

- Capscrew threads and seats SHALL be lubricated when assembled.

Unless 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, Capscrews			
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 in.			
This Table represents standard values only. Do not use these values to replace torque values which are specified in assembly instructions.			

Standard Metric Assembly Torque For Class 10.9 Capscrews & Class 10 Nuts

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

- Capscrews threads and seats SHALL NOT be lubricated when assembled. These specifications are based on all capscrews, nuts, and hardened washers being **phosphate and oil** coated.

NOTE: If zinc-plated hardware is used, each piece must be lubricated with a Rust Preventive Grease or Lithium-base grease 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 METRIC ASSEMBLY TORQUE			
CAPSCREW SIZE*	TORQUE N.m	TORQUE ft. lbs.	TORQUE kg.m
M 6 x 1	12	9	1.22
M 8 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 2.5	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) x Threads per mm.			
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 Company.
- RUST PREVENTIVE GREASE - CODE 312 from the Southwest Grease and Oil Company.

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

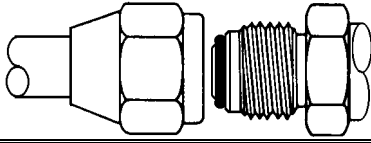


TABLE IV
TORQUE CHART FOR JIC 37° SWIVEL NUTS
WITH OR WITHOUT O-RING SEAL

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

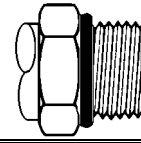


TABLE VI
TORQUE CHART FOR
O-RING BOSS FITTINGS

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

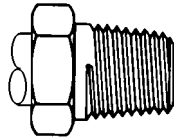


TABLE V
TORQUE CHART FOR
PIPE THREAD FITTINGS

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

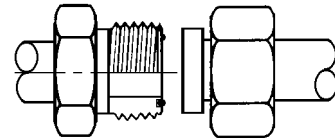


TABLE VII
TORQUE CHART FOR
O-RING FACE SEAL FITTINGS

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	61.01	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 1-13

TABLE IX TORQUE CONVERSIONS										
Foot Pounds – ft. lbs. To kilogram.meter (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 1-13

TABLE X PRESSURE CONVERSIONS										
Pounds/sq. in. [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 1-13

TABLE XI PRESSURE CONVERSIONS										
Pounds/sq. in. [psi] To Megapascals (MPa)										
Formula: psi x 0.0069 = 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 on page 1-13

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 VIII.
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 34.47
5 psi = 34.47 kPa. Add to step 3.
5. 970 + 5 psi = 6688 + 34 = 6722 kPa.
975 psi = 6722 kPa.

TABLE XII TEMPERATURE CONVERSIONS								
FORMULA:			$F^{\circ} - 32 \div 1.8 = C^{\circ}$			$C^{\circ} \times 1.8 + 32 = F^{\circ}$		
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 –
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
kilogram.meters (kg.m)	Newton.meters (N.m)	9.807
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	0.907
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. (force)	0.7376
kilogram.meters (kg.m)	ft. lbs. (force)	7.2329
kilogram.meters (kg.m)	Newton.meters (N.m)	9.807
kilopascals (kPa)	psi (pressure)	0.1450
megapascals (MPa)	psi (pressure)	145.038
kilograms/cm ² (kg/cm ²)	psi (pressure)	14.2231
kilograms/cm ² (kg/cm ²)	kilopascals (kPa)	98.068
kilogram (kg)	ton (short)	0.0011
metric ton	ton (short)	1.1023
liters (l)	quart – qt.	1.0567
liters (l)	gallon – gal.	0.2642
Watts	HP (horsepower)	0.00134
kilowatts (kW)	HP (horsepower)	1.3410

GENERAL SAFETY

This safety section also contains precautions for optional equipment and attachments.



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

SAFETY RULES

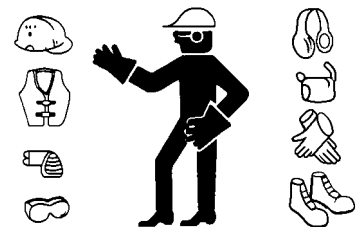
- ONLY trained and authorized personnel can operate and maintain the machine.
- Follow all safety rules, precautions and instructions when operating or performing maintenance on the machine.
- When working with another operator or a person on worksite traffic duty, be sure all personnel understand all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

SAFETY FEATURES

- Be sure all guards and covers are in their proper position. Have guards and covers repaired if damaged. (See Walk-Around Inspection, Operating Instructions - Section 3)
- Learn the proper use of safety features such as safety locks, safety pins, and seat belts, and use these safety features properly.
- NEVER remove any safety features. ALWAYS keep them in good operating condition.
- Improper use of safety features could result in serious bodily injury or death.

CLOTHING AND PERSONAL PROTECTIVE ITEMS

- Avoid loose clothing, jewelry, and loose long hair. They can catch on controls or in moving parts and cause serious injury or death. Also, do not wear oily clothes because they are flammable.
- Wear a hard hat, safety glasses, safety shoes, mask or gloves when operating or maintaining the machine. Always wear safety goggles, hard hat and heavy gloves if your job involves scattering metal chips or minute materials—this is so particularly when driving pins with a hammer and when cleaning the air cleaner element with compressed air. Check also that there is no one near the machine.



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UNAUTHORIZED MODIFICATION

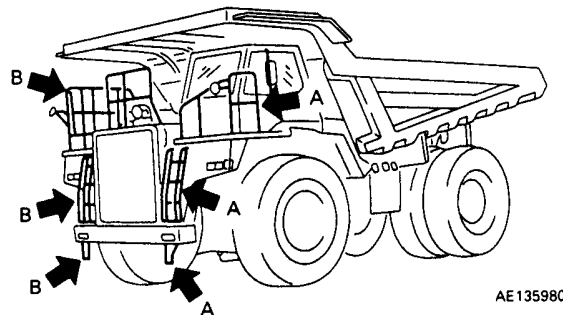
- Any modification made without authorization from Komatsu can create hazards.
- Before making a modification, consult your Komatsu distributor. Komatsu will not be responsible for any injury or damage caused by any unauthorized modification.

STANDING UP FROM THE SEAT

- To prevent any accident occurring if you should touch any control lever that is not locked, always carry out the following before standing up from the operator's seat.
- Place the gear shift lever at neutral and set the parking lever to the PARKING position.
- Lower the dump body, set the dump lever to the FLOAT position.
- Stop the engine. When leaving the machine, always lock everything. Always remember to take the key with you. If the machine should suddenly move or move in an unexpected way, this may result in serious bodily injury or death.

MOUNTING AND DISMOUNTING

- NEVER jump on or off the machine. NEVER get on or off a moving machine.
- When getting on or off the machine, face the machine and use the handhold and steps.
- Never hold any control levers when getting on or off the machine.
- Always maintain three-point contact with the handholds and steps to ensure that you support yourself.
- When bringing tools to the operator's compartment, always pass them by hand or pull them up by rope.
- If there is any oil, grease, or mud on the handholds or steps, wipe it off immediately. Always keep these parts 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.
 - A: For use when getting on or off the machine from the left door.
 - B: For use when getting on or off the machine from the engine hood or right door.



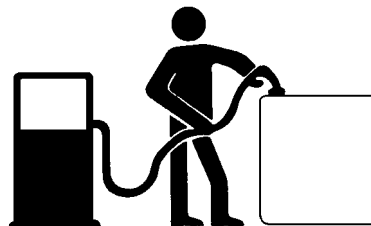
FIRE PREVENTION FOR FUEL AND OIL

Fuel, oil, and antifreeze can be ignited by a flame. Fuel is particularly FLAMMABLE and can be HAZARDOUS.

- Keep flame away from flammable fluids.
- Stop the engine and do not smoke when refueling.
- Tighten all fuel and oil tank caps securely.
- Refueling and oiling should be made in well ventilated areas.
- Keep oil and fuel in the determined place and do not allow unauthorized persons to enter.



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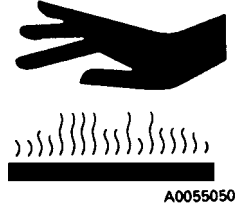
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PRECAUTIONS WHEN HANDLING AT HIGH TEMPERATURES

- Immediately after operations, the engine cooling water, engine oil, differential and final drive case oil, and hydraulic oil are at high temperature and are under pressure. If the cap is removed or the oil or water is drained or the filters are replaced, there is danger of serious burns. Always wait for the temperature to go down, and carry out the operation according to the specified procedure.
- To prevent hot water from spurting out:
 - 1) Stop the engine.
 - 2) Wait for the water temperature to go down.
 - 3) Turn the cap slowly to release the pressure before removing the cap.
- To prevent hot oil from spurting out:
 - 1) Stop the engine.
 - 2) Wait for the oil temperature to go down.
 - 3) Turn the cap slowly to release the pressure before removing the cap.

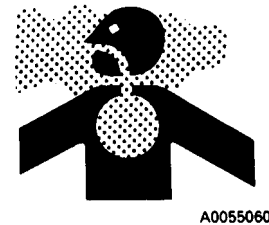


ASBESTOS DUST HAZARD PREVENTION

Asbestos dust can be HAZARDOUS to your health if it is inhaled.

If you handle materials containing asbestos fibers, follow these guidelines as given below:

- NEVER use compressed air for cleaning.
- Use water for cleaning to keep down the dust.
- Operate the machine with the wind to your back, whenever possible.
- Use an approved respirator if necessary.

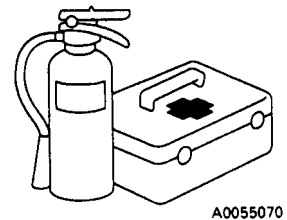


PREVENTION OF INJURY BY WORK EQUIPMENT

- Never enter or put your hand or arm or any other part of your body between movable parts such as the dump body and chassis or cylinders. If the work equipment is operated, the clearance will change and this may lead to serious bodily injury or death.

FIRE EXTINGUISHER AND FIRST AID KIT

- Be sure fire extinguishers have been provided and know how to use them.
- Provide a first aid kit at the storage point.
- Know what to do in the event of a fire.
- Be sure you know the phone numbers of persons you should contact in case of an emergency.



PRECAUTIONS WHEN USING ROPS

- The ROPS is integrated into the cab design to protect the operator if the machine should roll over. It is designed not only to support the load if the machine should roll over, but also to absorb the impact energy.
- The Komatsu ROPS fulfills all of the regulations and standards for all countries, but if it is rebuilt without authorization or is damaged when the machine rolls over, the strength will drop and it will not be able to fulfill its function properly. It can only display its performance if it is repaired or modified in the specified way.
- NEVER modify or repair the ROPS, unless authorized by the Komatsu distributor.
- The ROPS cannot provide its full protection if the operator does not fasten the seat belt properly. Always fasten the seat belt when operating.

PRECAUTIONS FOR ATTACHMENTS

- When installing and using an optional attachment, 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 your 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.

PRECAUTIONS DURING OPERATION

BEFORE STARTING ENGINE

SAFETY AT WORKSITE

- Before starting the engine, thoroughly check the area for any unusual conditions that could be dangerous.
- Examine the road surface in the jobsite and determine the best and safest method of operation.
- Choose an area where the ground is as horizontal and firm as possible before carrying out the operation.
- If you need to operate on a road, protect pedestrians and cars by designating a person for worksite traffic duty or by installing fences around the worksite.
- Check the river bed condition, and depth and flow of water before crossing shallow parts of river. NEVER be in water which is in excess of the permissible water depth.
- The operator must check personally the work position, roads to be used, and existence of obstacles before starting operations.
- Always determine the travel roads in the worksite and maintain them so that it is always safe for the machines to travel.

FIRE PREVENTION

- Thoroughly remove wood chips, leaves, paper and other flammable things accumulated in the engine compartment. They could cause a fire.
- Check fuel, lubrication, and hydraulic systems for leaks. Have any leaks repaired. Wipe up any excess oil, fuel or other flammable fluids.
- Be sure a fire extinguisher is present and working.
- Do not operate the machine near any flame.



A0055020

IN OPERATOR'S CAB

- Do not leave tools or spare parts lying around in the operator's compartment. They may damage or break the control levers or switches. Always put them in the tool box on the right side of the machine.
- 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 seat belts when operating your machine.

VENTILATION FOR ENCLOSED AREAS

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



A0055060

KEEP MIRRORS, WINDOWS, AND LIGHTS CLEAN

- Remove any dirt from the surface of the windows or lights to ensure good visibility.
- Adjust the rear view mirror to a position where the operator can see best from the operator's seat, and keep the surface of the mirror clean. If any glass should break, replace it with a new part.
- Check that the machine is equipped with the head lamps and working lamps needed for the operating conditions. Check that all the lamps light up properly.

OPERATING MACHINE

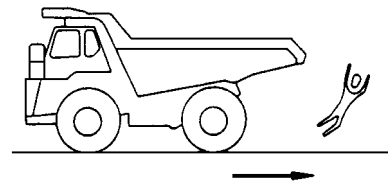
WHEN STARTING ENGINE

- Walk around your machine again just before mounting it, checking for people and objects that might be in the way.
- NEVER start the engine if a warning tag has been attached to the control.
- When starting the engine, sound the horn as an alert.
- Start and operate the machine only while seated.
- Do not allow any person other than the operator in the operator's compartment or any other place on the machine.
- For machines equipped with a back-up alarm, check that the alarm works properly.

CHECK WHEN TRAVELING IN REVERSE

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

- Sound the horn to warn people in the area.
- Check that there is no one near the machine.
Be particularly careful to check behind the machine.
- If necessary, designate a person to check the safety.
This is particularly necessary when traveling in reverse.
- When operating in areas that may be hazardous or have poor visibility, designate a person to direct worksite traffic.
- Do not allow any one to enter the line of travel of the machine. This rule must be strictly observed even on machines equipped with a backup alarm or rear view mirror.



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TRAVELING

- When traveling on rough ground, travel at low speed. When changing direction, avoid turning suddenly.
- Lower the dump body and set the dump lever to the FLOAT position when traveling.
- If the engine should stop when the machine is traveling, the steering wheel will not work, and it will be dangerous to drive the machine. Apply the brakes immediately and stop the machine.

TRAVELING ON SLOPES

- Traveling on slopes could result in the machine tipping over or slipping.
- Do not change direction on slopes. To ensure safety, go down 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. Take all possible steps to avoid traveling sideways, and always keep the 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 should stop on a slope, apply the brakes fully and apply the parking brake, also, to stop the machine.

ENSURE GOOD VISIBILITY

- When working in dark places, install working lamps and head lamps, and set up lighting in the work area if necessary.
- Stop operations if the visibility is poor, such as in mist, snow, or rain, and wait for the weather to improve to a condition that allows the operation to be carried out safely.

OPERATE CAREFULLY 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, so always travel slowly and avoid sudden starting, turning, or stopping.
- Be extremely careful when carrying out snow-clearing operations. 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 DUMP BODY

- When working in tunnels, on bridges, under electric cables, or when entering a parking place or any other place where there are height limits, always drive extremely carefully and lower the dump body completely before driving the machine.

DO NOT GO CLOSE TO HIGH-VOLTAGE CABLES

- Going close to high-voltage cables can cause electric shock. Always maintain the safe distance given below between the machine and the electric cable.

Voltage	Min. Safety 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:
 - 1) Wear shoes with rubber or leather soles.
 - 2) Use a signalman to give warning if the machine approaches too close to the electric cable.
- If the work equipment should touch the electric cable, the operator should not leave the operator's compartment.
- When carrying out operations near high voltage cables, do not let anyone come close to the machine.
- Check with the electricity company about the voltage of the cables before starting operations.

WHEN DUMPING

- Before starting the dumping operation, check that there is no person or object behind the machine.
- Stop the machine in the correct position, and check again that there is no person or object 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 carrying out dumping operations on slopes, the machine stability will become poor and there is danger that it may tip over. Always carry out such operations extremely carefully.
- Do not travel with the dump body raised.

WORKING ON LOOSE GROUND

- Avoid operating your machine too close to the edge of cliffs, overhangs, and deep ditches. If these areas collapse, your machine could fall or tip over and result in serious injury or death. Remember that the soil after heavy rain or blasting is weakened in these areas.
- Earth laid on the ground and the soil near ditches are loose. They can collapse under the weight or vibration of your machine.
- When operating in places where there is danger of falling rocks or danger of the machine turning over, always install ROPS and a seat belt.

WHEN LOADING

- Check that the surrounding area is safe, stop the machine in the correct loading position, then load the body uniformly.
- Do not leave the operator's seat during the loading operation.

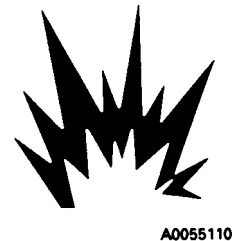
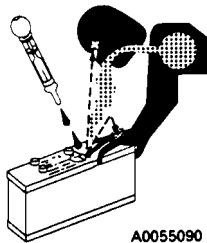
PARKING THE MACHINE

- Choose a horizontal road surface to park the machine. If the machine has to be parked on a slope, always put blocks under all the wheels to prevent the machine from moving.
- When parking on public roads, provide fences and signs, such as flags or lights, on the machine to warn pedestrians and other vehicles. Be sure that the machine, flags, or lights do not obstruct the traffic.
- Before leaving the machine, lower the dump body fully, set the parking lever to the PARKING position, stop the engine, then lock everything. Always take the key with you.

BATTERY

BATTERY HAZARD PREVENTION

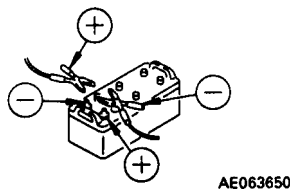
- Battery electrolyte contains sulfuric acid and can quickly burn the skin and eat holes in clothing. If you spill acid on yourself, immediately flush the area with water.
- Battery acid could cause blindness if splashed into the eyes. If acid gets into the eyes, flush them immediately with large quantities of water and see a doctor at once.
- If you accidentally drink acid, drink a large quantity of water or milk, beaten egg or vegetable oil. Call a doctor or poison prevention center immediately.
- When working with batteries ALWAYS wear safety glasses or goggles.
- Batteries generate hydrogen gas. Hydrogen gas is very EXPLOSIVE, and is easily ignited with a small spark of flame.
- Before working with batteries, stop the engine and turn the starting switch 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, check which is the positive (+) terminal and negative (-) terminal.
- Tighten the battery cap securely.
- Tighten the battery terminals securely. Loosened terminals can generate sparks and lead to an explosion.



STARTING WITH BOOSTER CABLES

- ALWAYS wear safety glasses or goggles when starting the machine with booster cables.
- When starting from another machine, do not allow the two machines to touch.
- Be sure to connect the positive (+) cable first when installing the booster cables. Disconnect the ground or negative (-) cable first when removing them.
- If any tool touches between the positive (+) terminal and the chassis, it will cause sparks. This is dangerous, so be sure to work carefully.
- Connect the batteries in parallel: positive to positive and negative to negative.
- When connecting the ground cable to the frame of the machine to be started, be sure to connect it as far as possible from the battery.

INCORRECT



TOWING

WHEN TOWING, FIX WIRE TO HOOK

- Towing in the wrong way may lead to serious personal injury or damage.
- When using another machine to tow this machine, use a wire rope with ample strength for the weight of this machine.
- Never tow a machine on a slope.
- Do not use any towing rope that has kinks or is twisted.
- Do not stand astride the towing cable or wire rope.
- When connecting a machine that is to be towed, do not let any one come between the towing machine and the machine that is being towed.
- Set the coupling of the machine being towed in a straight line with the towing portion of the machine, and secure it in position.

(For towing method, see Section 3, "Operating Instructions", TOWING)

PRECAUTIONS FOR MAINTENANCE

BEFORE CARRYING OUT MAINTENANCE

WARNING TAG

- If others start the engine or operate the controls while you are performing service or lubrication, you could suffer serious injury or death.
- ALWAYS attach the 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 could cause personal injury.



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PERIODIC REPLACEMENT OF CRITICAL PARTS

- Periodically replace parts used to insure safety or prevent accident.
- Replace these components periodically with new ones, regardless of whether or not they appear to be defective. These components deteriorate over time.
- Replace or repair any such components if any defect is found, even though they have not reached the time specified.

STOPPING THE ENGINE BEFORE SERVICE

- When carrying out inspection or maintenance, always stop the machine on firm flat ground, lower the dump body, then stop the engine.
- If the engine must be run during service, such as when cleaning the radiator, always set the shift selector lever to the neutral (N) position and the parking brake lever to the PARKING position. Always carry out the work with two people. One person should sit in the operator's seat so that the engine can be stopped, if necessary. NEVER move any controls not needed for operation.
- When servicing the machine, be careful not to touch any moving part or get clothing caught.
- Put blocks under the wheels.
- When carrying out service with the dump body raised, always place the dump lever at the HOLD position, and insert the bodyup safety pins (or safety cable, if equipped) securely.

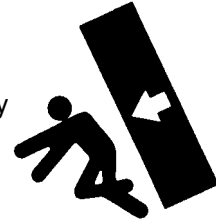
DURING MAINTENANCE

PERSONNEL

- Only authorized personnel can service and repair the machine. Extra precaution should be used when grinding, welding, and using a sledge-hammer.

ATTACHMENTS

- Place attachments that have been removed from the machine in a safe place so that they do not fall. If they fall, serious injury could result.



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WORK UNDER THE MACHINE

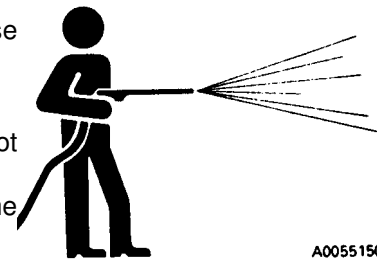
- Always lower all movable work equipment to the ground or to their lowest position before performing service or repairs under the machine.
- Always block the tires of the machine securely.
- Never work under the machine if the machine is poorly supported.



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KEEP THE MACHINE CLEAN

- Spilled oil or grease, or scattered tools or broken pieces are dangerous because they may 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 not move or may move unexpectedly. Do not use water or steam to clean the sensors, connectors, or the inside of the operator's compartment.



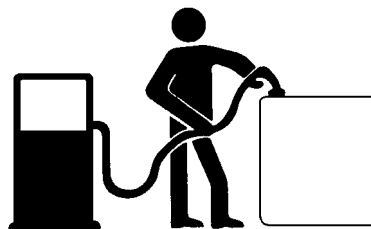
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RULES TO FOLLOW WHEN ADDING FUEL OR OIL

- Spilled fuel and oil may cause a person to slip, always wipe it up immediately.
- Always tighten the cap of the fuel and oil fillers securely.
- Never use fuel for washing parts.
- Always add fuel and oil in a well-ventilated place.



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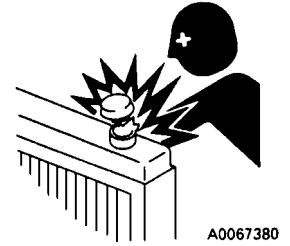
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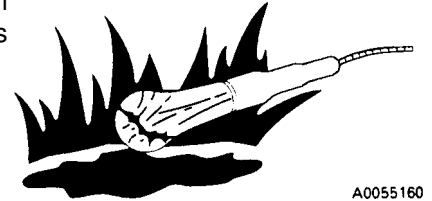
RADIATOR WATER LEVEL

- If it is necessary to add water to the radiator, stop the engine and allow the engine and radiator to cool down before adding the water.
- Slowly loosen the cap to relieve pressure before removing the cap.



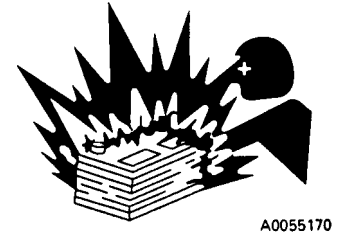
USE OF LIGHTING

When checking fuel, oil, coolant, or battery electrolyte, always use lighting with anti-explosion specifications. If such lighting equipment is not used, there is danger or explosion.



PRECAUTIONS WITH BATTERY

- When repairing the electrical system or when carrying out electrical welding, remove the negative (-) terminal of the battery to stop the flow of current.

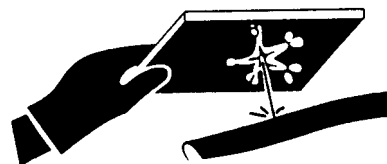


HANDLING HIGH-PRESSURE HOSES

- 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 fuel hoses or oil hoses. If fuel or oil leaks, it may cause a fire.

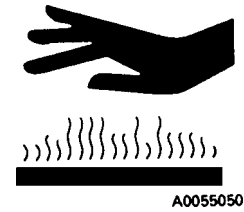
PRECAUTIONS WITH HIGH PRESSURE OIL

- Do not forget that the work equipment circuits are always under pressure.
- Do not add oil, drain oil, or carry out maintenance or inspection before completely releasing the internal pressure.
- If oil is leaking under high pressure from small holes, it is dangerous if the jet of high-pressure oil hits your skin or enters your eyes. Always wear safety glasses and thick gloves, and 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.



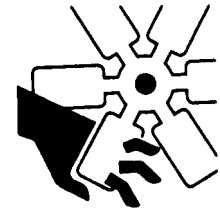
PRECAUTIONS WHEN CARRYING OUT MAINTENANCE AT HIGH TEMPERATURE OR HIGH PRESSURE

- Immediately after stopping operations, the engine cooling water and oil at all parts are at high temperature and under high pressure. In this condition, if the cap is removed, or the oil or water are drained, or the filters are replaced, it may result in burns or other injury. Wait for the temperature to go down, then carry out the inspection and maintenance in accordance with the procedures given in this manual.



ROTATING FAN AND BELT

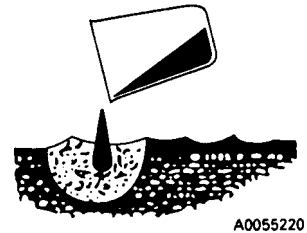
- Keep away from rotating parts and be careful not to let anything get caught in them.
- If your body or tools touch the fan blades or fan belt, they may be cut off or sent flying, so never touch any rotating parts.



WASTE MATERIALS

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

INCORRECT



TIRES

HANDLING TIRES

If tires are not used under the specified conditions, they may overheat and burst or be cut and burst by sharp stones on rough road surfaces. This may lead to serious injury or damage.

To maintain safety, always keep to the following conditions:

- Inflate the tires to the specified pressure. Abnormal heat is generated particularly when the inflation pressure is too low.
- Use the specified tires.

The values given in this manual for the tire inflation pressure and permissible speed are general values. The actual values may differ depending on the type of tire and the condition under which they are used. For details, please contact your Komatsu distributor or tire maker.

If the tires become hot, a flammable gas is produced, and this may ignite. It is particularly dangerous if the tires become overheated when the tires are under pressure. If the gas generated inside the tire ignites, the internal pressure will suddenly rise, and the tire will explode, and this may lead to serious personal injury. Explosions differ from punctures or tire bursts, because the destructive force is extremely large. Therefore, the following operations are strictly prohibited when the tire is under high internal pressure:

- Welding the rim
- Building fires or carrying out welding near the wheel or tire.

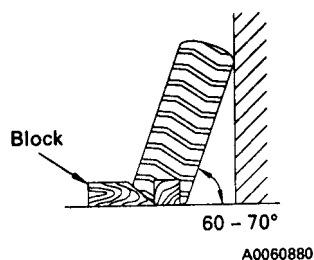


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If you do not understand the proper procedure for carrying out maintenance or replacement of the wheel or tire, and you use the wrong method, the wheel or tire may burst and cause serious injury or damage. When carrying out such maintenance, please consult your Komatsu distributor or tire maker.

STORING TIRES AFTER REMOVAL

- As a basic rule, store the tires in a warehouse which unauthorized persons cannot enter. If the tires are stored outside, always erect a fence around the tires and put up “No Entry” and other warning signs that even young children can understand.
- Stand the tire on level ground, and block it securely so that it cannot roll or fall over.
- If the tire should fall over, get out of the way quickly. The tires for construction equipment are extremely heavy, so trying to hold the tire may lead to serious injury.



A0055130

WHEN REPAIRS ARE NECESSARY

1. Only qualified maintenance personnel who understand the systems being repaired should accomplish repairs.
2. Many components on the Haulpak Truck are large and heavy. Insure that lifting equipment - hoists, slings, chains, lifting eyes - are of adequate capacity to handle the lift.
3. **DO NOT WORK** 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 truck while 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. Be certain to follow all current regulations for handling and recycling refrigerants.
6. Follow package directions carefully when using cleaning solvents.
7. If an auxiliary battery assist is needed, first use one cable to connect the 24V positive (+) post of the disabled truck batteries to the 24V positive (+) post of the auxiliary assist. Use second cable to connect the 24V negative (-) post of the auxilillary assist battery to a **frame ground (-)** on the disabled truck *away from the battery*.
8. Always disconnect the positive and negative battery cables of the vehicle before doing any welding on the unit. Failure to do so may seriously damage the battery and electrical equipment. Disconnect battery charging alternator lead wire and isolate electronic control components before making welding repairs. (It is not necessary to disconnect or remove any control circuit cards on Electric Drive Haulpak Trucks or any of the "AID" circuit control cards.)

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.
9. If truck is to be towed for any reason, use a rigid tow bar. Check truck cab for decal recommending special towing precautions. (Also refer to Towing Procedure in OPERATING INSTRUCTIONS.)
10. Drain, clean and ventilate fuel tanks and/or hydraulic tanks before making any welding repairs.

WARNING

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. Tire Care:

WARNING

Do not stand in front of rim and locking ring when inflating tire mounted on the machine. Observers should not be permitted in the area and should be kept away from the side of such tires.

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

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

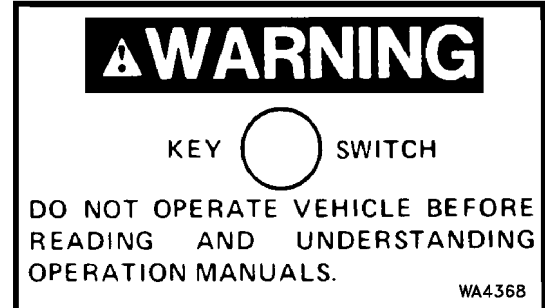
NOTES

WARNINGS AND CAUTIONS

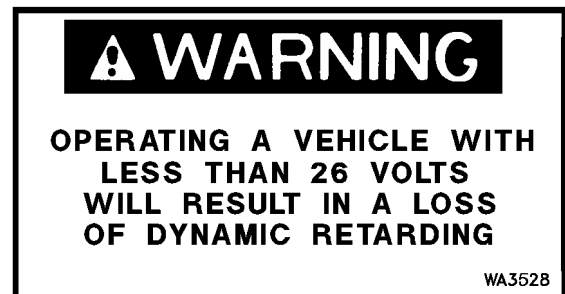
The following paragraphs give an explanation of the Warning, Caution, and Service Instruction plates and decals attached to the truck. The plates and decals listed are typical of this model, but because of customer options, individual trucks may have plates and decals that are different from those shown here. The plates and/or decals must be kept clean and legible. If any decal and/or plate becomes damaged or unable to be read, it should be replaced with a new one.

A warning plate is mounted around the key switch on the instrument panel.

The warning stresses the importance of reading the operator's manual before operation.



A warning is mounted on top of the instrument panel above the voltmeter. This decal warns operator that operating truck (engine running) with less than 26 volts may result in a loss of dynamic retarding.



A warning plate is mounted directly under the red warning lights in the center of the instrument panel. The plate warns that TRUCK SHOULD NOT BE OPERATED WITH ANY RED WARNING LIGHTS ON. If any of the red warning lights are on, the truck should be safely stopped, engine shut down, and maintenance notified.



A Warning plate is mounted on the instrument panel around the "Dry/Slippery Road" switch and the Wheel Brake Lock switch.

The "Dry/Slippery Road" switch on the instrument panel warns that the slippery road position reduces front wheel braking effort while maintaining full braking of the rear wheels. Reduced braking of the front wheels assists in steering control on slippery roads, but increases stopping distance. The Dry/Slippery road control switch permits the operator to select either full braking capability at all wheels for "dry" road or reduced braking at the front wheels for "slippery" road.

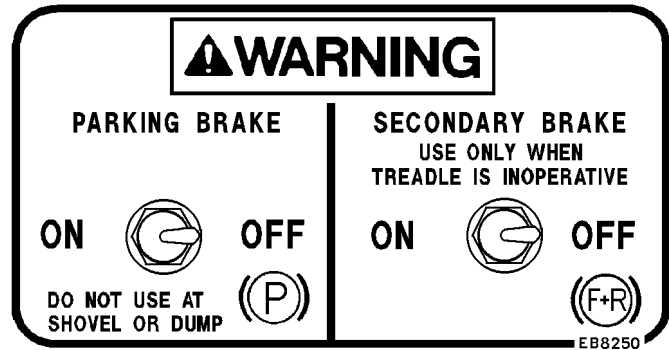
The **Wheel Brake Lock** should be used (with engine running) ONLY at the dump and loading operations. The Wheel Brake Lock applies pressure to the REAR WHEEL BRAKES ONLY. *Front wheel brakes are NOT applied. DO NOT use for stopping or for parking truck with engine shut down. With engine shut down, pressure will bleed down, and service brakes will NOT hold truck if parking brake is not applied.*



A Warning plate is mounted on the instrument panel around the Parking Brake switch and the Secondary Brake switch.

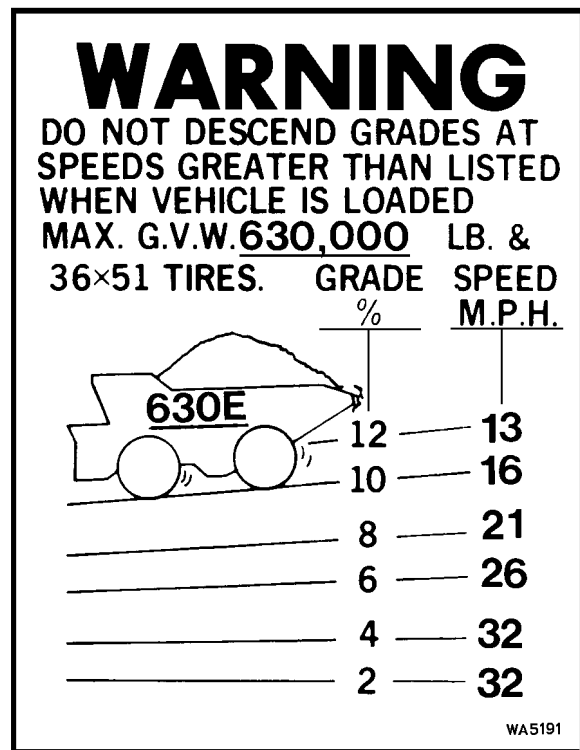
The **Parking Brake** switch *is for parking only. Do not use parking brake at shovel or dump.* Truck must be completely stopped before applying parking brake or damage may occur to parking brake. Parking brake is **not** designed to stop a moving truck.

The **Secondary Brake** switch (when switched "ON") applies full brake pressure at all four wheels. It should be used **ONLY** if the service brake treadle is inoperative.

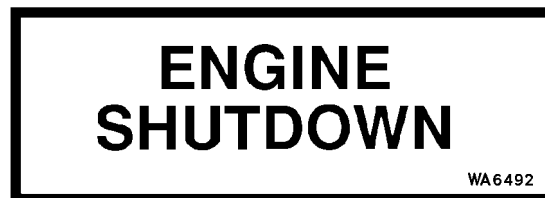


A Grade/Speed warning plate is located inside the operator's cab and provides the recommended MAXIMUM speeds to be used when descending various grades with a loaded truck.

This decal may change with wheel motor and/or tire size options. Always refer to the specific decal in operator's cab.



A plate is located on the front left corner by the ladder. This plate indicates the location of the ground level engine shutdown switch.

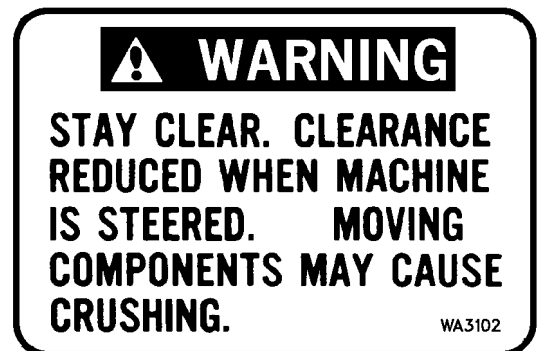
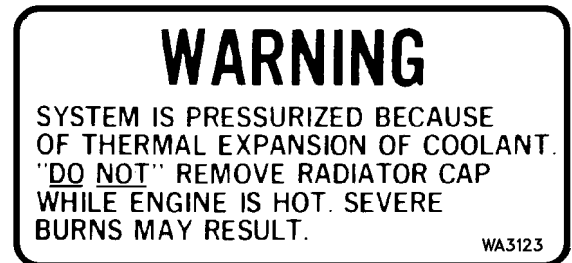
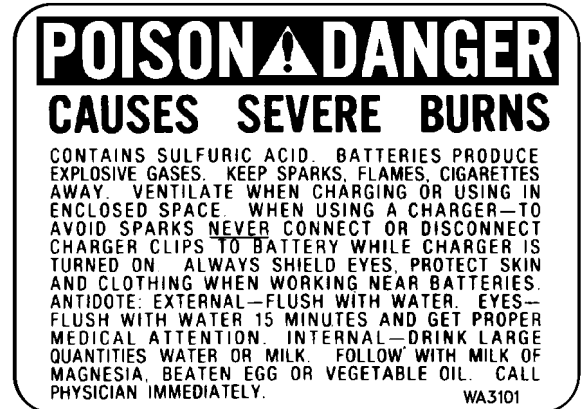


Attached to the exterior of the battery compartment is a danger plate. This plate stresses the need to keep from making any sparks near the battery. When getting an assist from one truck to another, all switches must be "Off" prior to making any connections. Be certain to maintain correct polarity. Connect one lead of booster cable to 24V positive (+) post of battery needing assist, and other lead of the booster cable to the 24V positive (+) post of auxiliary battery. Connect one lead of second booster cable to 24V negative (-) post of auxiliary battery and then connect other lead of the booster cable to a good frame ground on the disabled truck *away from the battery needing assist*. This procedure will avoid the possibility of causing sparks near the battery where explosive gases may be present.

Sulfuric Acid is corrosive and toxic. Use proper safety gear, goggles, rubber gloves and rubber apron when handling and servicing batteries.

The engine cooling system is controlled by thermostats which keep coolant temperature between 160°-190°F (71°-89°C) during operation. Unless the pressure is first released, removing the radiator cap after engine has been running for a time will result in the hot coolant being expelled from the radiator. Serious scalding and burning can result. The warning plate is mounted on top of the radiator grille near the radiator cap.

Warning plates are mounted on the frame just in front of and to the rear of the front tires. Technicians making adjustments while the truck is being steered are warned the clearances change when the truck is steered and could cause serious injury.

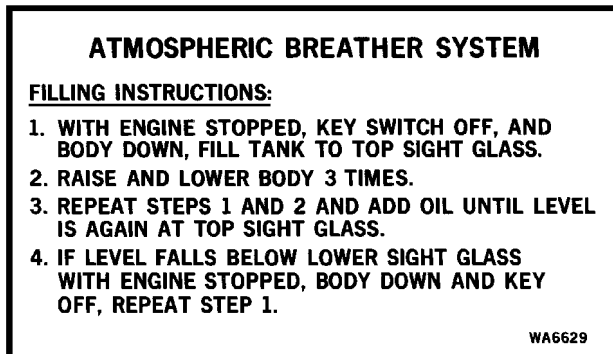


A DANGER plate and a WARNING plate are attached to the hydraulic brake accumulators mounted on deck at rear of cab. The danger plate provides instructions on how to relieve hydraulic pressure prior to loosening or disconnecting any hydraulic lines or components while accumulators are under pressure. These plates are also located on the cabinet behind cab. The warning plate is also located on the inside of the box cover.



An instruction plate is applied to the side of the hydraulic tank. This plate furnishes instructions for filling of the hydraulic tank.

Keep the system open to the atmosphere only as long as absolutely necessary to lessen chances of system contamination. Service the tank with clean Type C-4 hydraulic oil. All oil being put into the hydraulic tank should be filtered through 3 micron filters.



A CAUTION decal is attached under the hydraulic tank oil level sight gauge.

With body down, engine stopped, and oil level below top of sight glass, add oil per filling instructions.



The dump procedure for a disabled truck is located on the left side of the torque tube near the hoist valve. This decal provides the operator or technician with the proper hook-up procedure for dumping a loaded disabled truck.

DUMP PROCEDURE FOR DISABLED TRUCK

1. HOOK UP QUICK DISCONNECTS: ONE LINE FROM LARGE HOIST CROSS TUBE ON DISABLED TRUCK TO SMALL HOIST CROSS TUBE ON GOOD TRUCK. THEN OTHER LINE FROM SMALL HOIST CROSS TUBE ON DISABLED TRUCK TO LARGE HOIST CROSS TUBE ON GOOD TRUCK.
2. PLACE HOIST VALVE OF DISABLED TRUCK IN "HOLD" POSITION, AND MAINTAIN THIS POSITION THROUGH DUMP CYCLE.
3. DUMP LOAD OF DISABLED TRUCK BY ACTUATING HOIST VALVE OF GOOD TRUCK TO "POWER DOWN" POSITION.
4. AFTER LOAD HAS BEEN DUMPED, PLACE HOIST VALVE ON GOOD TRUCK TO "FLOAT" POSITION AND ALLOW TRUCK BODY ON DISABLED TRUCK TO FLOAT DOWN.

WA8890

A WARNING plate is attached to the hydraulic tank to alert technicians that hydraulic oil becomes heated during operation and care must be taken to avoid burns when it is necessary to open the hydraulic system. There is always a chance of residual pressure being present. Open fittings slowly to allow any pressure to bleed off before removing any connections.



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.

Warning plates are attached to both the hydraulic and fuel tank to alert technicians **not to work** on the truck **with the body in the raised position** unless body-up safety devices are in position.

WARNING

HIGH PRESSURE

DO NOT LOOSEN OR DISCONNECT ANY HYDRAULIC LINE OR COMPONENT UNTIL ENGINE IS STOPPED AND KEY SWITCH IS OFF.

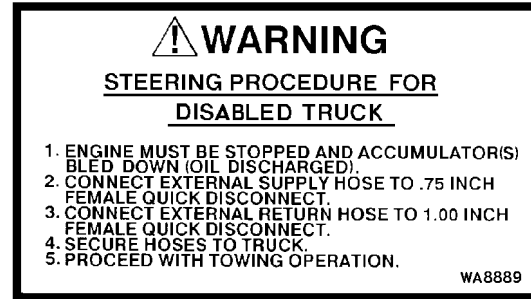
WA2998

WARNING

DO NOT WORK UNDER RAISED BODY UNLESS SAFETY DEVICE(S) ARE IN POSITION.

WA3103

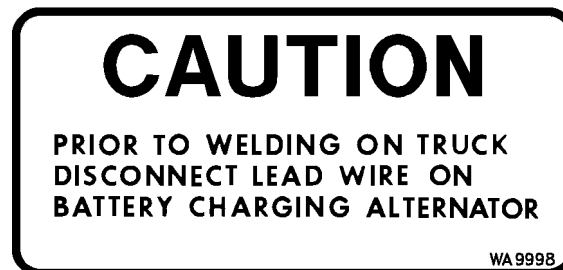
A steering procedure for a disabled truck is located on the left frame rail near the unloader valve. This decal provides the operator or technician with the proper hookup procedure for steering on a disabled truck. Quick disconnects are located at the bottom of the bleeddown manifold.



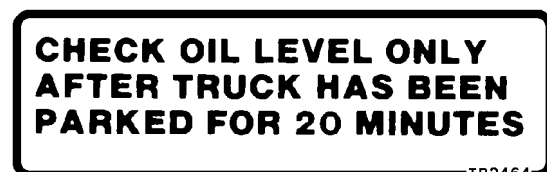
A WARNING decal is located on the left top corner of the operator's cab. This decal states that the cab assembly must not be lifted by using the handrail.



High Voltage DANGER plates and CAUTION plates are attached to both doors of the Electrical Control Cabinet. The High Voltage Plate is also attached to the blown grid housing, extended range housing, rectifier housing, inlet duct structure and rear hatch cover.



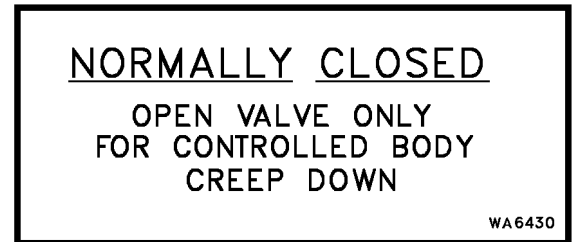
A wheel motor oil level decal is attached to the gear cover on both electric wheel motors. This decal stresses the fact that the truck must be on a level surface and parked for 20 minutes prior to checking the oil level. This is necessary in order to get an accurate reading.



A WARNING plate is located near the "HOT START" connection which is attached to the back side of the front bumper on the left side of the truck. This warning plate states that the engine should not be started while the **optional** "HOT START" is in operation. Operators should observe this area during "Ground Level Inspection" and be certain that this option is disconnected from the truck before starting engine.



A decal is attached to the frame rail near the hoist cylinder creep down valve which is located on the hydraulic tank. This decal states that the body may be lowered in a controlled manner by opening the valve and allowing the hoist cylinders to slowly retract.

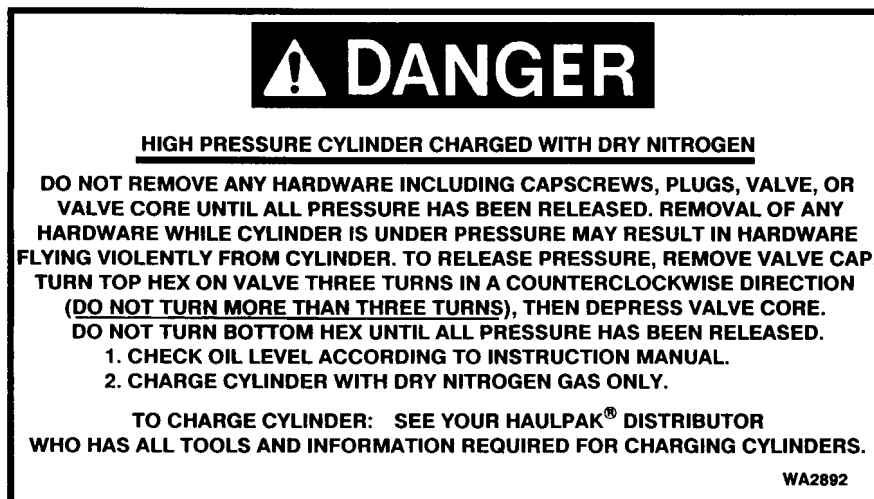


A DANGER plate is attached to or near the steering accumulator mounting bracket.

This plate alerts technicians to read the warning label attached to the top of the steering accumulator prior to releasing internal nitrogen pressure or disconnecting any hydraulic lines or hardware.



A DANGER plate is attached to each suspension cylinder and steering accumulator. The plate contains instructions for releasing internal pressure prior to disconnecting any hydraulic lines or hardware.



A Product Identification plate is located on the frame in front of the right side front wheel and gives the Model Number, Maximum G.V.W. and Product Identification Number.

Komatsu Mining Systems, Inc.
 2300 NE Adams St
 Peoria, IL 61650-0240

KOMATSU

Product Identification Number

Model No.
 Max. G.V.W.

Product Identification Number

**MADE IN
THE UNITED STATES OF AMERICA**

DO NOT DEFACE OR REMOVE THIS PLATE

WA 0708

The Lubrication Chart is located on the left hand side of the radiator grille. Refer to the "Lubrication Section" in the service manual for more complete lubrication instructions.

LUBRICATION CHART

		LUBRICATION SPECIFICATIONS									
		40°F TO 25°F	-20°F TO +32°F	+32°F TO +90°F	ABOVE 90°F						
LUBE KEY	DESCRIPTION										
A	ENGINE OIL	***	SEE ENG. MANUAL	SEE ENG. MANUAL	SEE ENG. MANUAL						
B	LUBRICATING OIL	SAE 10W	SAE 10W	SAE 10W	SAE 10W						
C	MULTI-PURPOSE GEAR OIL	MIL-L-2105D SAE 75W	MIL-L-2105D SAE 80W-90	MIL-L-2105D SAE 80W-90	MIL-L-2105D SAE 85W-140						
D	TYPE C-4 OIL	SAE 10W ***	SAE 10W ***	SAE 10W	SAE 30W						
E	MOLYBDENUM DISULPHIDE GREASE 3% MIN	#0	#2	#2	#0						
F	MULTI-PURPOSE GREASE NLGI	#0	#0	#0	#0						
SYM	DESCRIPTION	PTS.	LUBE KEY	10 HR	50 HR	100 HR	250 HR	500 HR	1000 HR	2000 HR	5000 HR
1	FAN DRIVE	1	E	SEE ENGINE MANUAL							
2	AIR STARTERS	1	E							GREASE	
3	CRANKCASE	1	A	CHECK			CHANGE				
	CRANKCASE BREATHERS	1								WASH DRY	
4	FUEL FILTER	1		DRAIN			CHANGE				
5	FUEL STRAINER	1		DRAIN			CHANGE				
6	MOTORIZED WHEEL GEAR CASE	2	C	SEE GENERAL ELECTRIC PLANNED MAINTENANCE MANUAL AND SPECIFIC MOTORIZED WHEEL SERVICE MANUAL							
	SPEED SENSOR	2	E								
7	HYDRAULIC OIL RESERVOIR	1	D	CHECK						CHANGE	
8	FINAL DRIVE PIVOT PIN	1	E	GREASE							
9	ENGINE LUBE OIL FILTERS	4				CHANGE					
10	REAR SUSPENSION BALL JOINTS	4	E			GREASE					
11	STEERING LINKAGE BALL JOINTS	8	E				GREASE				
12	HYDRAULIC PUMP DRIVE SHAFT	2	F			GREASE					
13	FUEL TANK	1				DRAIN H ₂ O & SEDIMENT					
14	HOIST CYLINDER BALL JOINTS	4	E			GREASE					
15	BODY HINGE PINS	2	E			GREASE					
16	ANTI-SWAY BAR	2	E			GREASE					
17	REAR AXLE AIR BREATHER	2						CHANGE CLEAN			
18											
19											
20	FRONT WHEEL BEARINGS	2	**			CHECK					CHANGE
21	AIR SYSTEM LUBRICATOR	1	D				REFILL				
22	SEAT ADJ. STUD & SLIDE RAILS	4	E						GREASE		
23	HYDRAULIC STRAINER	1							CLEAN		
24	HYDRAULIC FILTERS	1						CHANGE			
25	FUEL TANK BREATHER	1							CLEAN		
26	STEERING COLUMN	1	E			GREASE					
27											
28											

* 1000 HR INTERVAL CAN BE EXTENDED TO 5000 HR PROVIDED HYDRAULIC OIL SAMPLING AND ANALYSIS IS CONDUCTED EVERY 250 HR.

** DO NOT USE OTHER THAN SAE 80W-90 FOR FRONT WHEEL BEARINGS.

*** AUXILIARY HEATERS REQUIRED BELOW -10°F.

ITEM 22 NOT SHOWN WA887

OPERATING INSTRUCTIONS

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 should be made by the operator before attempting to start 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 Haulpak Truck.

Only qualified operators or technicians should attempt to operate or maintain the Haulpak 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 hat, safety shoes, safety glasses or goggles. There are some conditions when protective hearing devices should 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.

At The Truck - Ground Level Walk Around Inspection

At the beginning of each shift, a careful walk around inspection of the truck should be made before the operator attempts engine start-up. A walk around inspection is a systematic ground level inspection of the truck and its components to insure 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, 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 taken 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.

Local work practices may prevent an operator from performing all tasks suggested here, but to the extent permitted, the operator should follow this or similar routine.

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

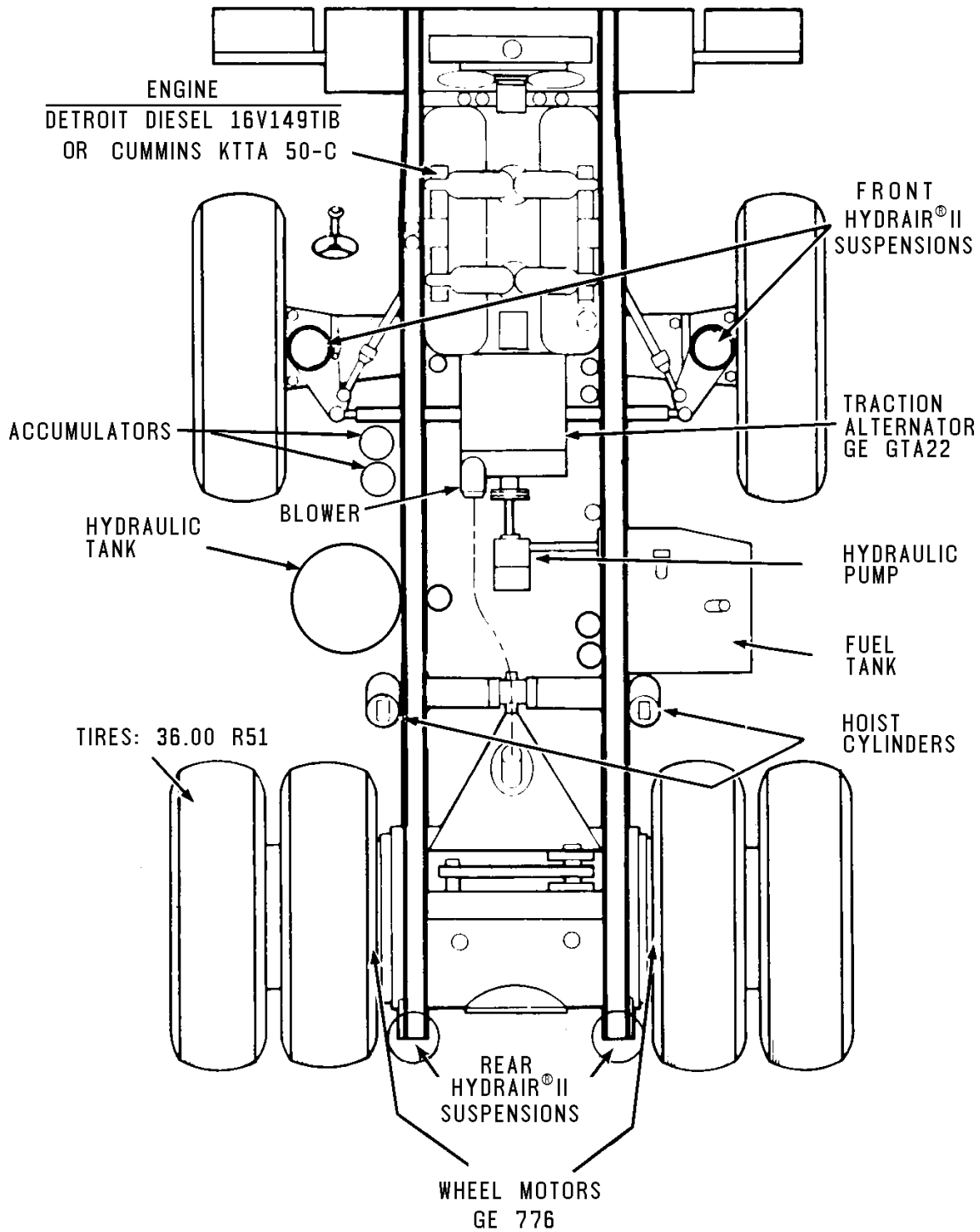
Empty the dust pans on the left side air cleaner assemblies.

2. Move behind the front of the left front tire, inspect the hub and brake assemblies for leaks and any abnormal conditions.

Check that all suspension attaching hardware is secure and inspect mounting key area for evidence of wear. Check that the suspension extension (exposed piston rod) is correct, and that there are no leaks.

3. With engine stopped, check engine oil level. If dark, turn on service light.
4. Inspect fan and air conditioner belts for correct tension, obvious wear, and tracking. Inspect fan guard for security and condition. When leaving this point, be sure to turn off service light, if used.
5. Inspect anchor end of steering cylinder for proper greasing and for security.
6. Move outboard of the front wheel, and inspect attaching lugs/wedges to be sure all are tight and complete. Check tires for cuts, damage or "bubbles" and that inflation appears to be correct. Check front wheel hub oil sight gauge for oil level.

START HERE



630E MAJOR COMPONENTS

7. Move behind the rear of the front wheel, inspect for leaks at hub or brakes or any unusual conditions. Inspect suspension hardware to be sure it is all in place. Inspect live end of steering cylinder for proper greasing, and for security of all parts. Inspect for any hydraulic leaks.
8. Inspect sight glass on hydraulic tank. With engine stopped and body down, hydraulic fluid should be visible in upper sight glass.
9. Move on 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 security, and for proper greasing.
10. Before leaving this position, look under the lower edge of the chassis to be sure the flexible duct that carries the air from the main 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 pump or pump drive shafts.
11. Move on around the dual tires, check to see that all lugs/wedges are in place and tight. Inspect wheel cover for cracks or damage, and check latches to be sure they are properly latched. Inspect wheel for any leakage that may be coming from inside the wheel cover that would indicate brake leakage, or wheel motor leakage.

Check dual tires for cuts, damage or "bubbles" and that inflation appears to be correct. If truck has been run on a "flat", **the tire must be cooled before parking truck inside**. Inspect for any rocks that might be lodged between dual tires, and that rock ejector is in good condition and straight so that it can not damage a tire.
12. Inspect left rear suspension for damage and for proper inflation, and that there are no leaks. Inspect also for proper greasing, and that covers over the chromed piston rod are in good condition. Check security and condition of body-up limit switch. Remove any mud/dirt accumulation from switch.
13. Open rear hatch cover, turn on work light, if necessary. Inspect for leaks around wheelmotor mounting to rear housing and brake hoses and fittings. Be sure 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 rear hatch cover.
14. While standing in front of rear hatch, look up to see that rear lights are in good condition, along with back up horns. Look up at panhard rod to see that it is getting proper greasing. Also look at both body hinge pins for greasing and any abnormal condition.
15. Perform the same inspection on the right rear suspension as done on the left.
16. Move on around the right dual tires, inspect between the tires for rocks, and for condition of the rock ejector, inspect the tires for cuts or damage, and for correct inflation.
17. Perform the same inspection for wheel lugs/wedges, wheel cover latches, and for leaks that was done on the left hand dual wheels.
18. Move in front of right dual tires, and inspect the hoist cylinder the same as was done on the left side.
19. Move on around the fuel tank, inspect the fuel quantity gauge, (this should agree with what will show on 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.
20. Move in behind the right front wheel, and inspect the steering cylinder, suspension attaching hardware and suspension extension, as well as greasing and attaching hardware for the steering cylinder. Inspect the hub and brakes for leaks and any unusual condition. Be sure the suspension protective boot is in good condition.
21. Move out and around the right front wheel, inspect that all lugs/wedges are in place and tight.
22. Move in behind the front of the right front wheel, check hub and brakes for leaks and any unusual condition. Inspect steering cylinder for security and for proper greasing. Inspect the engine compartment for any leaks and unusual condition. Inspect the fan guard, and belts also for any rags or debris behind radiator. Turn work light off, if used, and secure the ladder up and latched.
Inspect auto lube system. See Maintenance Section 4 for specific details concerning auto lube system.
23. Move on around to the right front of the truck, drop the air cleaner pans to remove dirt, latch up and secure.

24. As you move in front of the radiator, inspect for any debris that might be stuck in front of the radiator and remove it. Check for any coolant leaks. Inspect all head and fog lights.
25. Before climbing ladder to first level, be sure ground level engine shutdown switch is "ON". Inspect fire control actuator to be sure safety pin is in place and plastic tie that prevents accidental actuation is in place and in good condition.
26. Climb ladder to main deck. Always use grab rails and ladder when mounting or dismounting from the truck. Clean ladder and hand rails of any foreign material, such as ice, snow, oil or mud.



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

27. When checking coolant in radiator, use coolant level sight gauge (if equipped) or observe coolant level through opening in end of hood. If it is necessary to remove radiator cap, shut down engine (if running), and relieve coolant pressure SLOWLY before removing radiator cap.



If engine has been running, allow coolant to cool, before removing the fill cap or draining radiator. Serious burns may result if coolant is not allowed to cool.

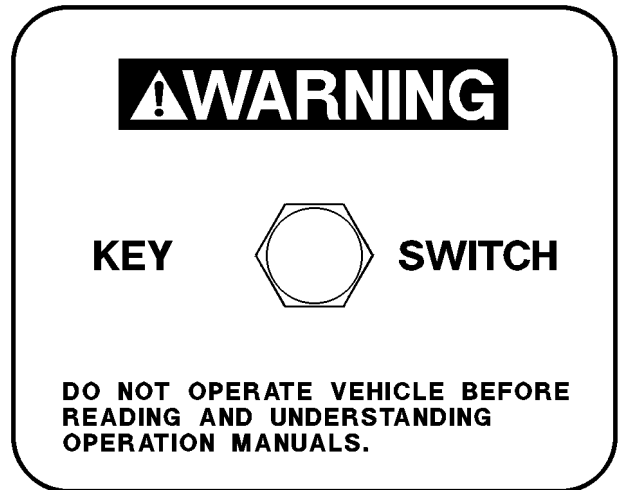
28. Inspect covers over braking grids to be sure latches are in place and secure. Inspect main air inlet to be sure it is clear. Be sure all cabinet door latches are secure.
29. Move on around the cab to the back, open the doors to the brake cabinet, inspect for leaks. Before latching doors, turn work lights off, if used.
30. Inspect battery box cover for damage and be sure it is in place and secure. Be sure battery disconnect switches are "ON".
31. Clean cab windows and mirrors; clean out cab floor as necessary. Insure steering wheel, controls and pedals are free of any oil, grease or mud.
32. Stow personal gear in cab so that it does not interfere with any operation of the truck. Dirt or trash buildup, specifically in the operator's cab, should be cleared. Do not carry tools or supplies in cab of truck or on the deck.
33. Adjust seat and steering wheel so that it is comfortable for use.
34. Read and understand the OPERATOR CONTROLS AND INSTRUMENT PANEL discussion in this section. Be familiar with all control locations and functions BEFORE operating truck.

ENGINE START-UP SAFETY PRACTICES

1. Insure all personnel are clear of truck before starting engine. Always sound the horn as a warning before actuating any operational controls. If the truck is in an enclosure, insure adequate ventilation before start-up. Exhaust fumes are dangerous!
2. Be sure parking brake switch is in "On" position. Check and insure Selector Switch is in "Neutral" before starting.
3. If truck is equipped with auxiliary cold weather heater system(s), do not attempt to start engine while heaters are in operation.
Damage to coolant heaters will result.

4. The keyswitch is a three position (Off, Run, Start) switch. When switch is rotated one position clockwise, it is in the "Run" position and all electrical circuits (except "Start") are activated. With Selector Switch in "Neutral", rotate keyswitch fully clockwise to "Start" position and hold this position until engine starts. "Start" position is spring loaded to return to "Run" when key is released.

NOTE: If truck is equipped with the Cummins Engine PreLube System, a noticeable time delay will occur (while engine lube oil passages are being filled) before starter engagement and engine cranking will begin. The colder the engine oil temperature, the longer the time delay will be. In addition, if truck is also equipped with Engine Starting Aid for cold weather starting, the Engine PreLube System should be engaged FIRST for 5-10 seconds, or until starter is engaged, BEFORE activating the Engine Starting Aid.



WARNING 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 50°F (10°C), turn the keyswitch to the "Start" position, and while cranking engine, move the Engine Starting Aid switch to the "On" position for three (3) seconds **MAXIMUM**; then release Engine Starting Aid. If engine does not start, wait at least fifteen (15) seconds before repeating the procedure.

Do not crank an electric starter for more than 30 seconds.
Allow two minutes for cooling before attempting to start engine again.
Severe damage to starter motor can result from overheating.

AFTER ENGINE HAS STARTED

1. Become thoroughly familiar with steering and emergency controls. After engine has started and low pressure and warning systems are normal, test the truck steering in extreme right and left directions. If the steering system is not operating properly, shut engine down immediately. Determine the steering system problem and have repairs made before resuming operation.
2. 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 brake lock (also emergency brake, if equipped). With the engine running and with the hydraulic circuit fully charged, activate each circuit individually. 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 down and notify maintenance personnel. Do not operate truck until brake circuit in question is fully operational.
3. Check gauges, warning lights and instruments before moving the truck to insure proper system operation and proper instrument functioning. Give special attention to braking and steering circuit hydraulic warning lights. If warning lights come on, shut down the engine immediately and determine the cause.
4. Insure headlights, worklights and taillights are in proper working order. Good visibility may prevent an accident. Check operation of windshield wiper.
5. When truck body is in dump position, do not allow anyone beneath it unless body-up retaining pin or cable is in place.
6. Do not use the fire extinguisher for any purpose other than putting out a fire! If extinguisher is discharged, report the occurrence so the used unit can be refilled or replaced.
7. Do not allow unauthorized personnel to ride in the truck. Do not allow anyone to ride on the ladder of the truck.
8. Do not leave truck unattended while engine is running. Shut down engine and apply park brake before getting out of 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 insure safe machine operation.



If any of the red warning lights come "On" or if any gauge reads in the red area during truck operation, a malfunction is indicated. Stop truck as soon as safety permits, shut down engine if problem indicates and have problem corrected before resuming truck operation.



Operating truck with stalled or free spinning wheel motors may cause serious damage to wheel motors! If truck does not begin to move within 10 seconds after depressing throttle pedal (Selector Switch in a drive position), release throttle pedal and allow wheels to regain traction before accelerating engine again.

1. Always look to the rear before backing the truck. Watch for and obey ground spotter's hand signals before making any reverse movements. Sound the warning horn (3 blasts). Spotter should 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 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 pattern. Be alert to any unusual traffic pattern. Obey the spotter's signals.
5. Match the truck speed to haul road conditions and slow the truck in any congested area. Keep a firm grip on steering wheel at all times.
6. Do not allow engine to run at "Idle" for extended periods of time.
7. Check parking brake periodically during shift. Use parking brake **ONLY** for parking. Do not use park brake for loading / dumping.
Do not attempt to apply parking brake while truck is moving!



Do not use "Brake Lock" or "Emergency Brake" (if equipped) for parking. With engine stopped, hydraulic pressure will bleed down, allowing brakes to release!

8. Check brake lock performance periodically for safe loading and dump operation.
9. Proceed slowly on rough terrain to avoid deep ruts or large obstacles. Avoid traveling close to soft edges and the edge of fill area.
10. Truck operation requires concentrated effort by the driver. Avoid distractions of any kind while operating the truck.

LOADING

1. Pull into the loading area with caution. Remain at a safe distance while truck ahead is being loaded.
2. Do not drive over unprotected power cables.
3. When approaching or leaving a loading area, watch out for other vehicles and for personnel working in the area.
4. When pulling in under a loader or shovel, follow "Spotter" or "Shovel Operator" signals. The truck operator may speed up loading operations by observing the location and loading cycle of the truck being loaded ahead, then follow a similar pattern.
5. When being loaded, operator should stay in truck cab with engine running.
Place Selector Switch in "Neutral" and apply Wheel Brake Lock.
6. When loaded, pull away from shovel as quickly as possible but with extreme caution.

HAULING

1. Always stay alert! If unfamiliar with the road, drive with extreme caution.
Cab doors should remain closed at all times if truck is in motion or unattended.
2. Obey all road signs. Operate truck so it is under control at all times. Govern truck speed by the road conditions, weather and visibility. Report haul road conditions immediately. Muddy or icy roads, pot holes or other obstructions can present hazards.
3. When backing the truck, give back-up signal (three blasts on the horn); when starting forward, two blasts on the horn. These signals must be given each time the truck is moved forward or backward.
4. Use extreme caution when approaching a haul road intersection. Maintain a safe distance from oncoming vehicles.
5. Maintain a safe distance when following another vehicle. Never approach another vehicle from the rear, in the same lane, closer than 50 ft. (15 m). When driving on a down grade, this distance should not be less than 100 ft. (30 m).
6. Do not stop or park on a haul road unless unavoidable. If you must stop, move truck to a safe place, apply parking brake, and shut down engine before leaving cab. Block wheels securely and notify maintenance personnel for assistance.
7. Before starting up or down a grade, maintain a speed that will insure safe driving and provide effective retarding under all conditions. Refer to Grade/Speed decal in operator's cab.
8. When operating truck in darkness, or when visibility is poor, do not move truck unless all headlights, clearance lights, and tail lights are on. Do not back truck if back-up horn or lights are inoperative. Always dim headlights when meeting oncoming vehicles.
9. If the "Emergency Steering" light and/or "Low Brake Pressure Warning" light (*if equipped*) illuminate during operation, steer the truck **immediately** to a safe stopping area, away from other traffic if possible. Refer to item 6 above.
10. The Statex III w/Fuel Enhancement system monitors wheel motor, ambient, and static exciter temperatures. If any one of these values is outside the limits established, the Statex III controls will cause the engine to increase to 1650 RPM. (Normal engine RPM for haul road/retarding operation is 1250 RPM.)
11. When maximum truck speed is reached, haul trucks equipped with Statex III w/Fuel Enhancement (Fuel Saver) system will experience a DECREASE in engine RPM.
NOTE: This is different from trucks equipped with Statex II or Statex III without Fuel Enhancement, which increase RPM upon reaching speed limit.
12. Check tires for proper inflation periodically during shift. If truck has been run on a "flat", or under-inflated tire, **it must not be parked in a building until the tire cools.**

PASSING

1. Do not pass another truck on a hill or blind curve!
2. Before passing, make sure 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.

DUMPING

1. Pull into dump area with extreme caution. Make sure area is clear of persons and obstructions, including overhead utility lines. Obey signals directed by the spotter, if present.

Avoid unstable areas. Stay a safe distance from edge of dump area.

Position truck on a solid, level surface before dumping.

! DANGER

As body raises, the truck Center of Gravity (CG) will move. Truck must be on level surface to prevent tipping / rolling!

2. Carefully maneuver truck into dump position. When backing truck into dump position, use only the foot-operated brake pedal to stop and hold truck; DO NOT rely on Wheel Brake Lock to stop truck; this control is unmodulated and applies REAR SERVICE BRAKES ONLY.
3. When truck is stopped and in dump position, apply Wheel Brake Lock and move the Selector Switch to the "Neutral" position.

To Raise dump body:

! 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, refer to the CAUTION in the following procedure:

4. 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.)
5. Raise engine RPM to accelerate hoist speed. Refer to the CAUTION below.

! CAUTION

If dumping very large rocks or sticky material as described in WARNING above, slowly accelerate engine RPM to raise body. When the material starts to move, release hoist lever to "HOLD" position. If material does not continue moving and clear body, repeat this procedure until material has cleared body.

6. Reduce engine RPM as last stage of hoist cylinder begins to extend and let engine go to low idle as last stage reaches half-extension.
7. Release hoist lever as last stage of hoist cylinder reaches full extension.
8. After material being dumped clears body, lower body to frame.

To Lower 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.

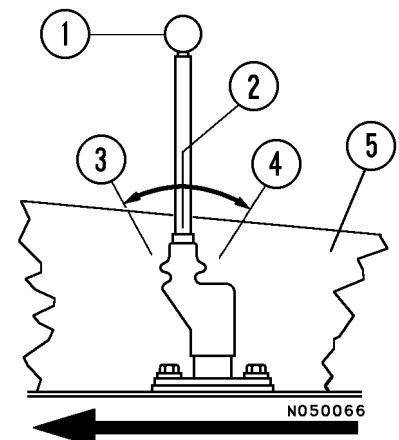
NOTE: If dumped material builds up at the rear of the body and the body cannot be lowered, shift Selector Switch to "Forward", release Brake Lock, depress Override button and drive forward to clear material. Stop, shift Selector Switch to "Neutral", apply Brake Lock and lower body.

! CAUTION

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



9. With body returned to frame, move Selector Switch to "Forward", release Brake Lock, and leave dump area carefully.



← ARROW points to Front of Truck.

1. Hoist Control Valve Lever
2. "FLOAT"/"HOLD" Position
3. "DOWN" Position
4. "RAISE" Position
5. Operator's Seat

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 5 MPH (8 kph).

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

1. Shut down engine.
2. If truck is equipped, install hydraulic connections for steering and dumping between towing and towed vehicles. Check towed vehicle for braking system.
3. Inspect tow bar for adequacy (approximately 1.5 times the gross vehicle weight of truck being towed).
4. Determine that towing vehicle has adequate capacity to both move and stop the towed truck under all conditions.
5. Protect both operators in the event of tow bar failure.
6. Block disabled truck to prevent movement while attaching tow bar.
7. Release disabled truck brakes and remove blocking.
8. Sudden movement may cause tow bar failure. Smooth and gradual truck movement is preferred.
9. Minimize tow angle at all times - NEVER EXCEED 30°. The towed truck must be steered in the direction of the tow bar.

SAFE PARKING PROCEDURES

The operator must continue the use of safety precautions when preparing for parking and engine shutdown.

In the event that the equipment is being worked 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. The truck should be parked on level ground, if at all possible. If parking must be done on a grade, the truck should be positioned at right angles to the grade.
2. The parking brake must be applied and/or chocks placed fore/aft of wheels so that the truck cannot roll. Each truck should be parked at a reasonable distance from another.
3. 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.

ENGINE SHUTDOWN PROCEDURE

The following procedure (1. – 4.) should be followed at each engine shutdown.

1. Stop truck. Reduce engine RPM to low idle. Place Selector Switch in "**N**utral" and apply Parking Brake switch.
2. Allow engine to cool gradually by running at low idle for 3 to 5 minutes.
3. With truck stopped and engine cooled down, turn keyswitch counterclockwise to "Off" for normal shutdown of engines. If engine does not shutdown with keyswitch, use Engine Shutdown Switch on center console (see "Operator Controls" section) and hold this switch down until engine stops.
4. With keyswitch "Off", and engine stopped, wait at least 90 seconds. Insure steering circuit is completely bled down by turning steering wheel back and forth several times. No front wheel movement will occur when hydraulic pressure is relieved.
5. Close and lock all windows, remove key from keyswitch and lock cab to prevent possible unauthorized truck operation. Dismount truck properly.

OPERATOR CAB AND CONTROLS

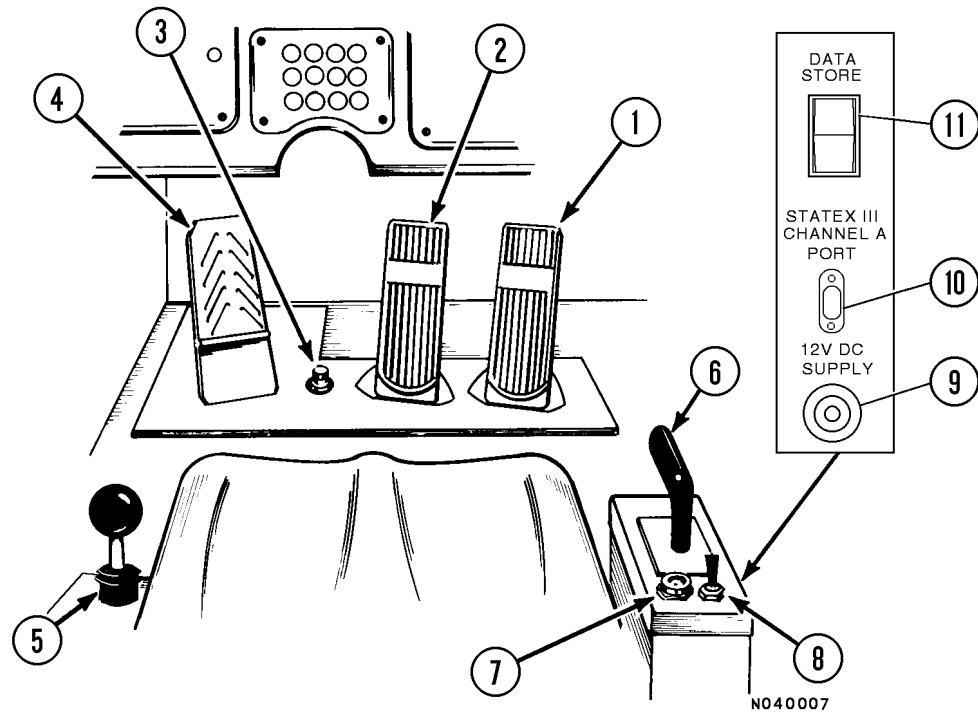


FIGURE 3-1. OPERATOR CONTROLS

- | | | |
|-------------------|---------------------------|------------------------------|
| 1. Throttle Pedal | 5. Hoist Control Valve | 9. 12VDC Power Supply |
| 2. Retard Pedal | 6. Selector Switch | 10. Computer Diagnostic Port |
| 3. Dimmer Switch | 7. Engine Shutdown Switch | 11. Data Store Switch |
| 4. Brake Pedal | 8. Engine Idle Switch | |

(1) THROTTLE PEDAL

The Throttle Pedal is a foot operated pedal which allows the operator to control engine RPM.

(2) DYNAMIC RETARDING PEDAL

The Dynamic Retarding Pedal is a foot operated pedal which allows the operator to slow the truck without the use of the service brakes to maintain a safe productive speed. The Dynamic Retarding should be used to slow and control the speed of the truck. Service brakes should be used to bring the truck to a complete stop.

When Dynamic Retarding is in operation, the engine RPM will automatically go to retard RPM setting.

The Dynamic Retarding system will be applied automatically if operator allows speed of truck to reach the predetermined overspeed retard setting.

(3) DIMMER SWITCH

The dimmer switch is a foot actuated electric switch. If headlights are on low beam, depression of the switch will change headlights to high beam and high beam indicator on instrument panel will light.

Depressing switch again, changes headlights back to low beam.

(4) BRAKE PEDAL

The Brake Pedal is a foot operated pedal controlling a hydraulic valve, which modulates pressure to the service brakes.

(5) HOIST CONTROL VALVE

The hoist control valve is a four position ("DOWN", "FLOAT", "HOLD", "RAISE") hand operated device located to the left of the operator seat.

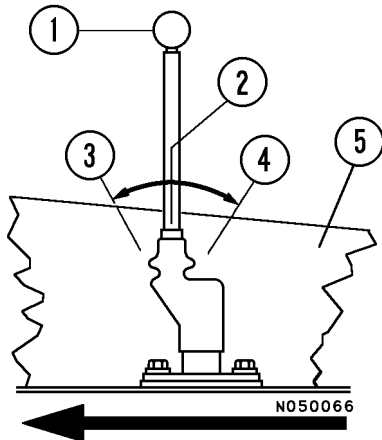


FIGURE 3-2. HOIST CONTROL VALVE
← ARROW points to Front of Truck.

1. Hoist Control Valve Lever
2. "FLOAT"/"HOLD" Position
3. "DOWN" Position
4. "RAISE" Position
5. Operator's Seat

To Raise dump body:

1. Pull the lever to the rear ("RAISE") 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 accelerate hoist speed.
3. Reduce engine RPM as last stage of hoist cylinder begins to extend and let engine go to low idle as last stage reaches half-extension.
4. Release hoist lever as last stage reaches full extension.
5. After dumped material clears body, lower body to frame before moving forward.

To lower body:

Move hoist lever forward to "DOWN" position and release. When lever is released, hoist control valve returns to "FLOAT" position allowing the body to return to frame.

NOTE: For more specific details regarding proper dumping procedures, refer to "DUMPING" in the "Operating Instructions" section of this handbook.

(6) SELECTOR SWITCH

The Selector Switch is mounted on a console to the right of the operator's seat which includes the Selector Switch handle, an Engine Idle Switch and an Engine Shutdown Switch.

The Selector Switch is a three position switch ("FOR"- "N"- "REV") which controls the directional motion of the truck. When the Selector Switch handle is straight forward, it is in the center "N" position and is in "Neutral". **Handle must be in neutral to start the truck.** The operator can select Forward drive by moving the handle left to "FOR" or Reverse drive by moving handle right to "REV".

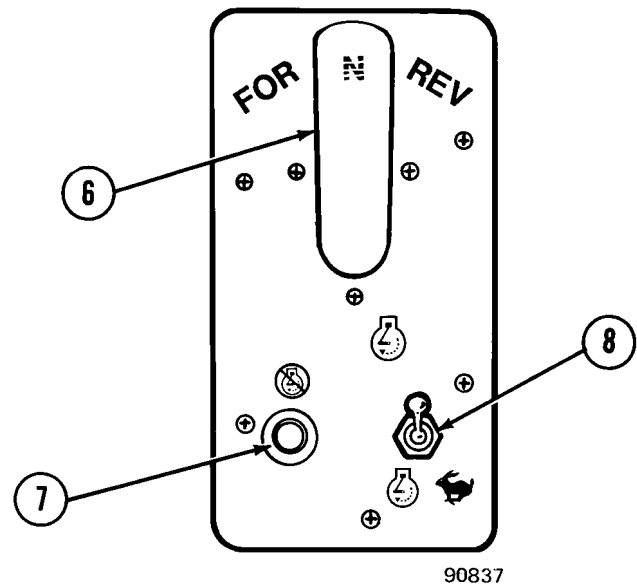


FIGURE 3-3. SELECTOR SWITCH
CONSOLE

(7) ENGINE SHUTDOWN SWITCH

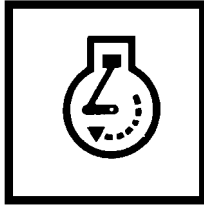
This Engine Shutdown Switch is a spring-loaded push button connected to a fuel solenoid on the engine, and must be held down until the engine stops. In certain "fault" conditions, the engine may not shut down with the keyswitch as it normally should. This switch must then be used to shut down the engine.



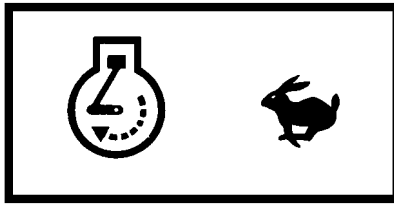
*NOTE: This switch is **Engine Shutdown ONLY**. The keyswitch must still be turned "OFF" to turn off 24VDC accessories and activate the hydraulic bleed-down sequence.*

(8) ENGINE IDLE SWITCH (Not Functional w/STATEX III & Fuel Enhancement)

The Engine Idle Switch controls the engine idle RPM. When switch lever is moved forward toward this symbol, operator can control engine speed anywhere between low idle and high idle settings. This is the "low" engine idle position. This position should be used when maneuvering in confined areas.



When switch lever is moved rearward toward this symbol and truck speed is above 3 mph (4.8 kph), the operator may control engine



speed only between dynamic retard engine speed (1675 RPM) and high idle. This is the "hauling" position. During hauling operations, Engine Idle Switch should be in this position. When truck speed is below 3 mph (4.8 kph), truck operates the same as "low" idle position.

(9) 12VDC POWER SUPPLY

This connection is located on the lower right side of the center console and provides a power source for a computer with a 12 Volt power supply adapter.

(10) COMPUTER DIAGNOSTIC PORT

This connection provides a port to plug in a computer for Statex III diagnostics.

(11) DATA STORE SWITCH

The DATA STORE should be used ONLY when the engine is running. When the DATA STORE switch is pressed, the Statex III computer controlling the electric drive system is caused to "take a snap shot" of all systems being monitored at that time. This information is then available later for qualified maintenance personnel to access and analyze. This function should be used anytime the operator might suspect a system malfunction.

STEERING COLUMN

The steering wheel (1, Figure 3-4) will adjust through a tilt angle to provide a comfortable position for operators.

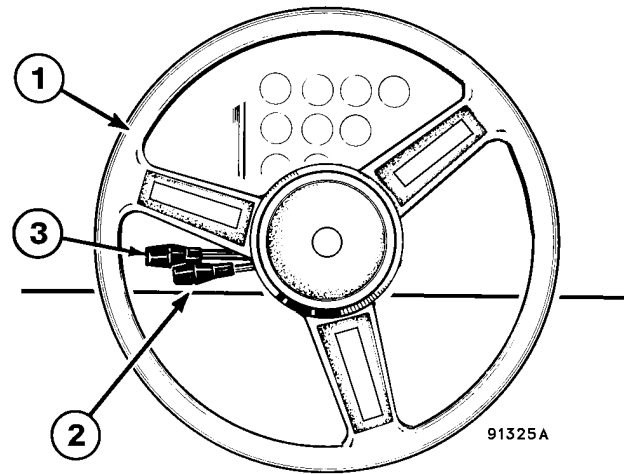


FIGURE 3-4. STEERING COLUMN

1. Steering Wheel
2. Tilt Lever
3. Turn Signal Lever

Adjusting the tilt of the steering wheel is done by pulling the tilt adjustment lever (2) toward the steering wheel and moving the wheel to the desired angle. Releasing the lever will lock the wheel in the desired location.

Turn Signal Lever (3) is used to activate turn signal lights:

Move lever upward to signal a turn to the right.

Move lever downward to signal a turn to the left.

HORN

The horn is actuated by the horn button in the center of the steering wheel. When the button is depressed, it activates the air horn solenoid allowing system air pressure to pass through the horn mechanism.

HEATER ASSEMBLY

Heat for the cab is provided by passing coolant from the engine cooling system through a heater core. Blowers move air across the heating core which warms the air for heating or defrosting. For heater operation, refer to the heater control instructions in the INSTRUMENTS AND INDICATORS section of this handbook.

CAB AIR FILTER

Service

Inlet filters in the heater cover and the cab access panel need periodic cleaning to prevent restrictions in air circulation. The recommended interval for cleaning and inspection is 250 hours, but in extremely dusty conditions, the filters may need daily service and inspection, especially the outer panel filter on the cab shell. Replace the filter element every 1000 hours or sooner if inspection indicates a damaged filter.

LADDER LIGHT

A light to illuminate the boarding ladder is mounted near the upper left side of the grille structure. Two switches control this light. One is mounted at the base of the ladder and one is in the operator's cab on the instrument panel.

GROUND LEVEL SHUTDOWN

The Ground Level Shutdown switch is located on front left side of truck below the ladder light switch near base of ladder. The switch is a spring return push button switch connected to the engine shutdown solenoid. When Ground Level Shutdown switch is depressed, solenoid is energized shutting off fuel to the engine.

The Ground Level Shutdown button must be depressed and held until engine comes to a complete stop.

Ground Level Shutdown for 'DDEC" Electronic-Controlled Engine Option

The Ground Level Shutdown switch is located on the left side of the truck on the up-right near the ladder. The switch is a two position rotary switch.

To shut down engine, turn the switch to the "OFF" position.

NOTE: Switch must be turned "ON" before the engine can be started.

STANDARD OPERATOR SEAT

The operator's seat provides a fully adjustable cushioned ride for the driver's comfort and ease of operation. The seat is independently mounted from the cab for easy maintenance and repair.

Adjustment

The following adjustments must be made while sitting in the seat.

1. To adjust fore/aft location of seat:
 - a. Raise adjustment lever "Lift to Slide" (2, Figure 3-5).
 - b. Move seat backward or forward as desired.
2. To adjust seat height:
 - a. Depress the "Height Adj. Push" lever (1).
 - b. Adjust seat assembly to desired height.
3. To adjust weight:
 - a. Turn knob "Weight Adjust" (3).
 - b. Moving knob clockwise decreases cushioning effect of seat and turning counterclockwise increases cushioning effect.
 - c. Proper adjustment results in Weight Indicator (4) being flush with seat base while operator is seated.
4. To adjust seat cushion:
 - a. Raise "Cushion Tilt Latch" lever (5) on left side of seat.
 - b. When lever is unlatched, choose between two different positions.

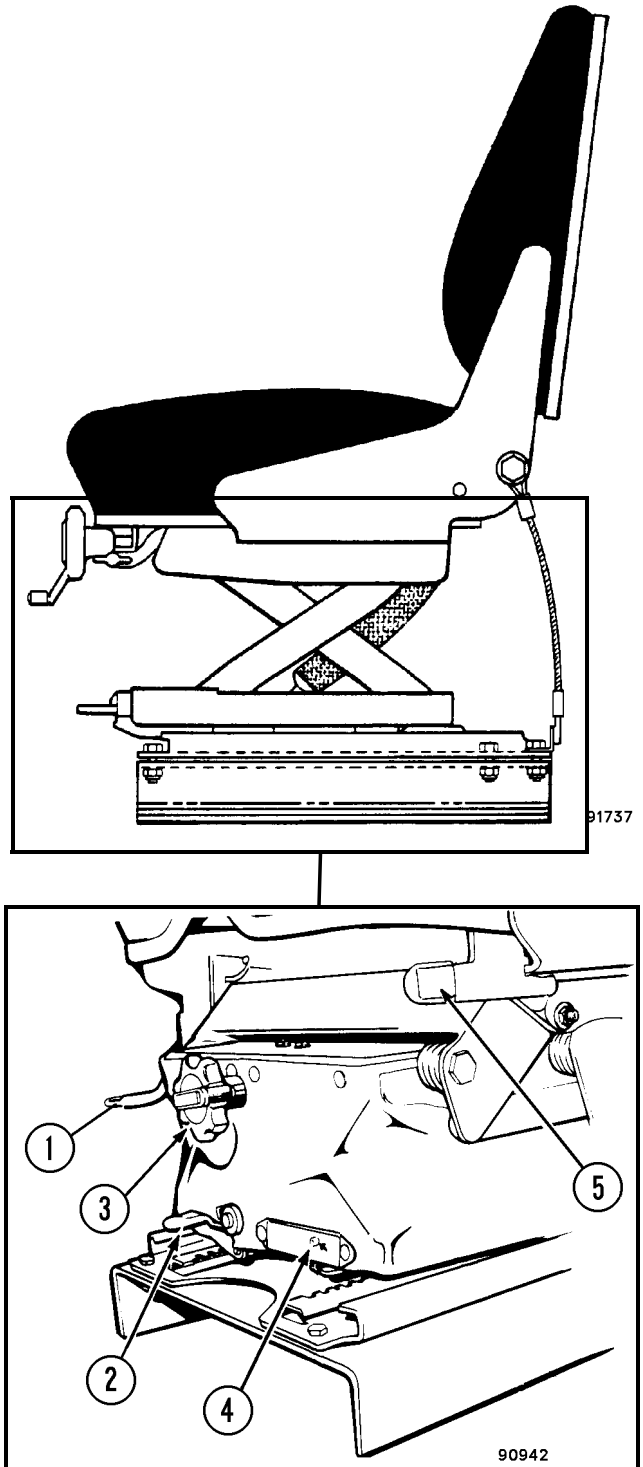


FIGURE 3-5. SEAT ADJUSTMENT CONTROLS

- | | |
|----------------------|-----------------------|
| 1. Height Adjustment | 4. Weight Indicator |
| 2. Slide Adjustment | 5. Cushion Tilt Latch |
| 3. Weight Adjustment | |

ISRINGHAUSEN OPERATOR SEAT (OPTIONAL)

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

Adjustment

The following adjustments must be made while sitting in the seat.

Seat Height: No manual adjustment is necessary; seat will automatically adjust to operator's weight.

1. **Headrest:** headrest (1, Figure 3-6) will move up, down, fore, or aft by moving headrest to desired position.
2. **Armrests:** rotate adjusting knob (2) until armrest is in desired position.
3. **Backrest:** Rotate control (3) upward and hold, select backrest angle; release control handle.
4. **Rear Height and Slope Adjustment of Seat Cushion:**
 - a. Rear height and slope; lift control lever (4) and hold.
 - b. Distribute weight to desired position; (fore, aft, up, or down). Release control lever to lock adjustment.
5. **Front Height and Slope Adjustment of Seat Cushion:**
 - a. Front height and slope; lift control lever (5) and hold.
 - b. Bend knees to move seat to a comfortable position; release control lever to lock adjustment.
6. **Fore/Aft Location of Seat:**
 - a. Raise adjustment lever (6).
 - b. Move seat to desired position; release lever.
7. **Air Lumbar Support** – (Optional) – Each rocker switch (7) controls an air pillow. To inflate, press on top of rocker switch and hold for desired support, then release. To deflate, press on bottom of rocker switch and hold for desired support, then release. Adjust each pillow for desired support.

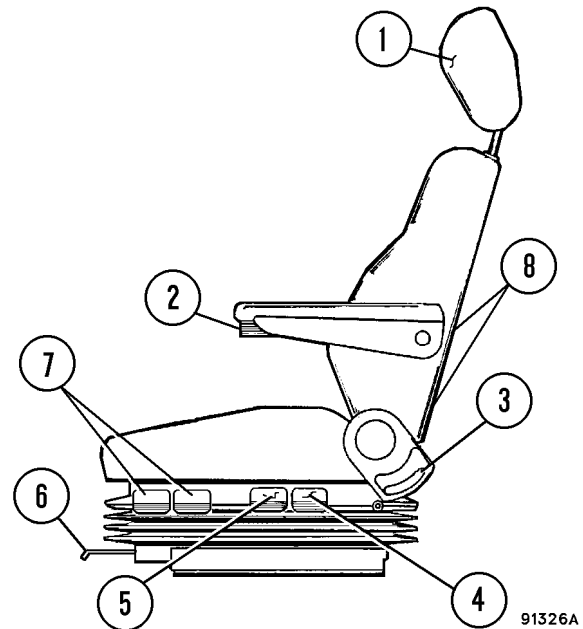


FIGURE 3-6. OPTIONAL SEAT -
ADJUSTMENT CONTROLS

1. Headrest
2. Armrest Adjustment
3. Backrest Adjustment
4. Rear Height and Slope Adjustment
5. Front Height and Slope Adjustment
6. Fore and Aft Adjustment
7. Lumbar Support Adjustment (Optional)
8. Air Pillows for Optional Lumbar Support

INSTRUMENTS AND INDICATORS

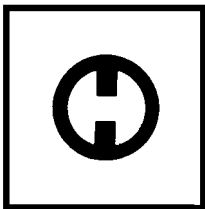
INSTRUMENT PANEL

The operator must understand the function and operation of each instrument and control. Many control functions are now identified with ISO ("International") symbols that the operator should learn to recognize immediately. This knowledge is essential for proper and safe operation of the truck. 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.

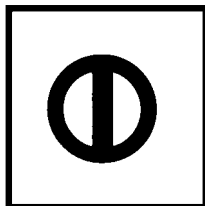
'OFF'

This symbol may be used alone or with another symbol. This symbol identifies the "Off" position of a switch or control.



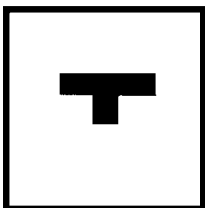
'ON'

This symbol may be used alone or with another symbol. This symbol identifies the "On" position of a switch or control.



'IN'

This symbol identifies the "Pushed-In" position of a push-pull switch or control.



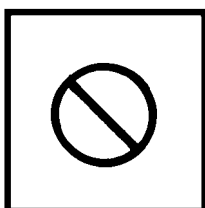
'OUT'

This symbol identifies the "Pulled-Out" position of a push-pull switch or control.

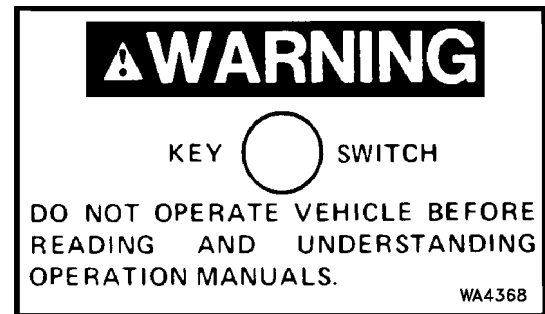


'NO'

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



(1, Figure 3-7) KEY SWITCH



The key switch is a three position (Off, Run, Start) switch. When switch is rotated one position clockwise, it is in the "Run" position and all electrical circuits (except "Start") are activated. To start engine, move Selector Switch to "Neutral", then rotate keyswitch fully clockwise to the "Start" position and hold this position until engine starts.

"Start" position is spring-loaded to return to "Run" when key is released.

NOTE: If truck is equipped with the Cummins Engine Prelube System, a noticeable time delay will occur (while engine lube oil passages are being filled) before starter engagement and engine cranking will begin (See NOTE: in Operating Instructions).

With truck stopped, turn keyswitch counterclockwise to "Off" for normal shutdown of engines equipped with Detroit Diesel electronic engine controls ("DDEC"), or Cummins Centry™ Fuel Control. If engine does not shutdown with keyswitch, use center console-mounted engine shutdown (see Operator Controls). Refer to "Operating Instructions" in next section, for more specific details.

NOTE: A switch is located at lower left front of truck for ground level engine shutdown.

(2, Figure 3-7) ENGINE SHUTDOWN (OPTIONAL)

If installed, this OPTIONAL Emergency Engine Shutdown button must be depressed and held until engine stops. See "Operator Controls and Equipment" section for normal engine shutdown location.



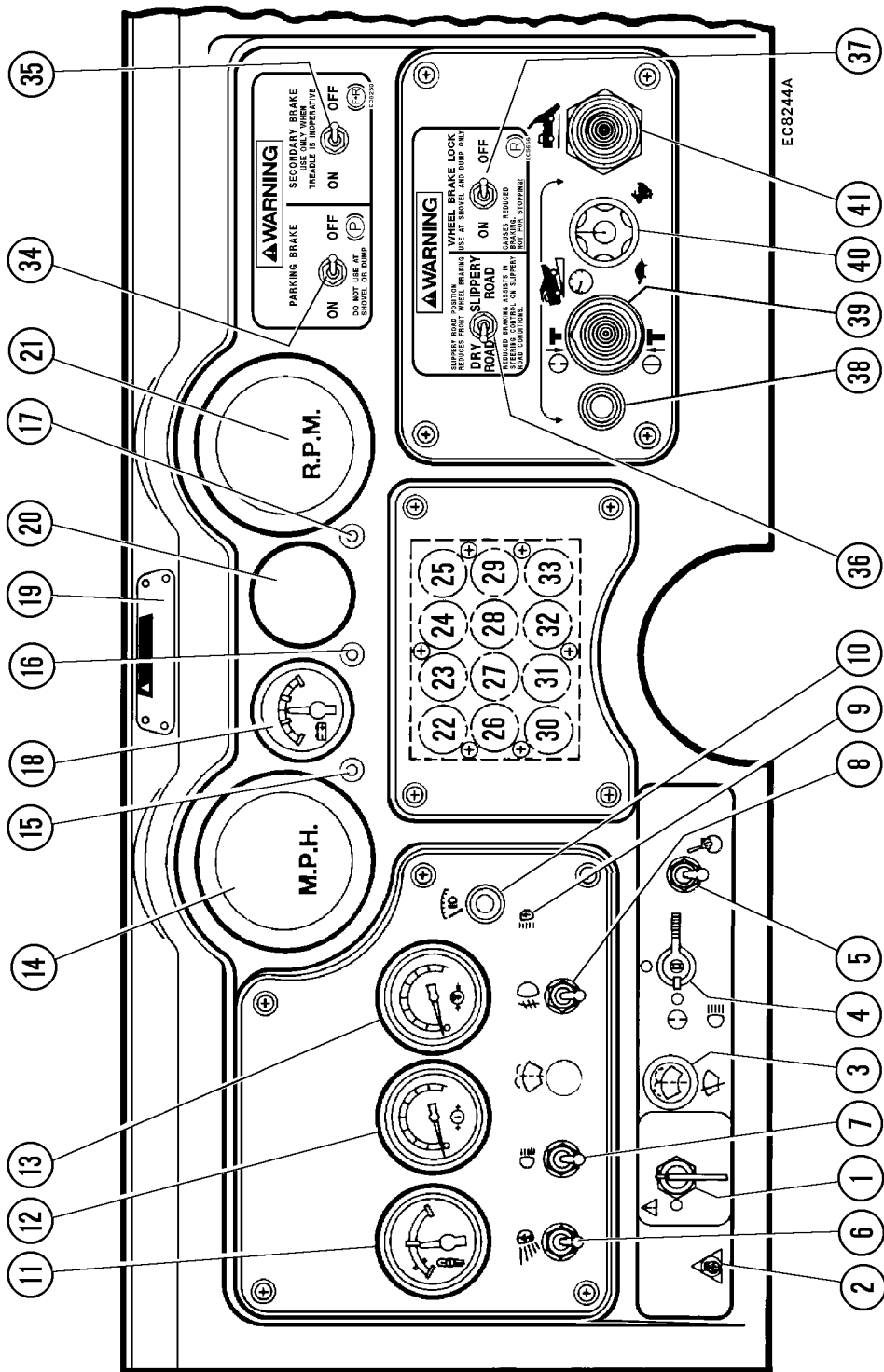


FIGURE 3-7. INST. PANEL, GAUGES, INDICATORS, & CONTROLS

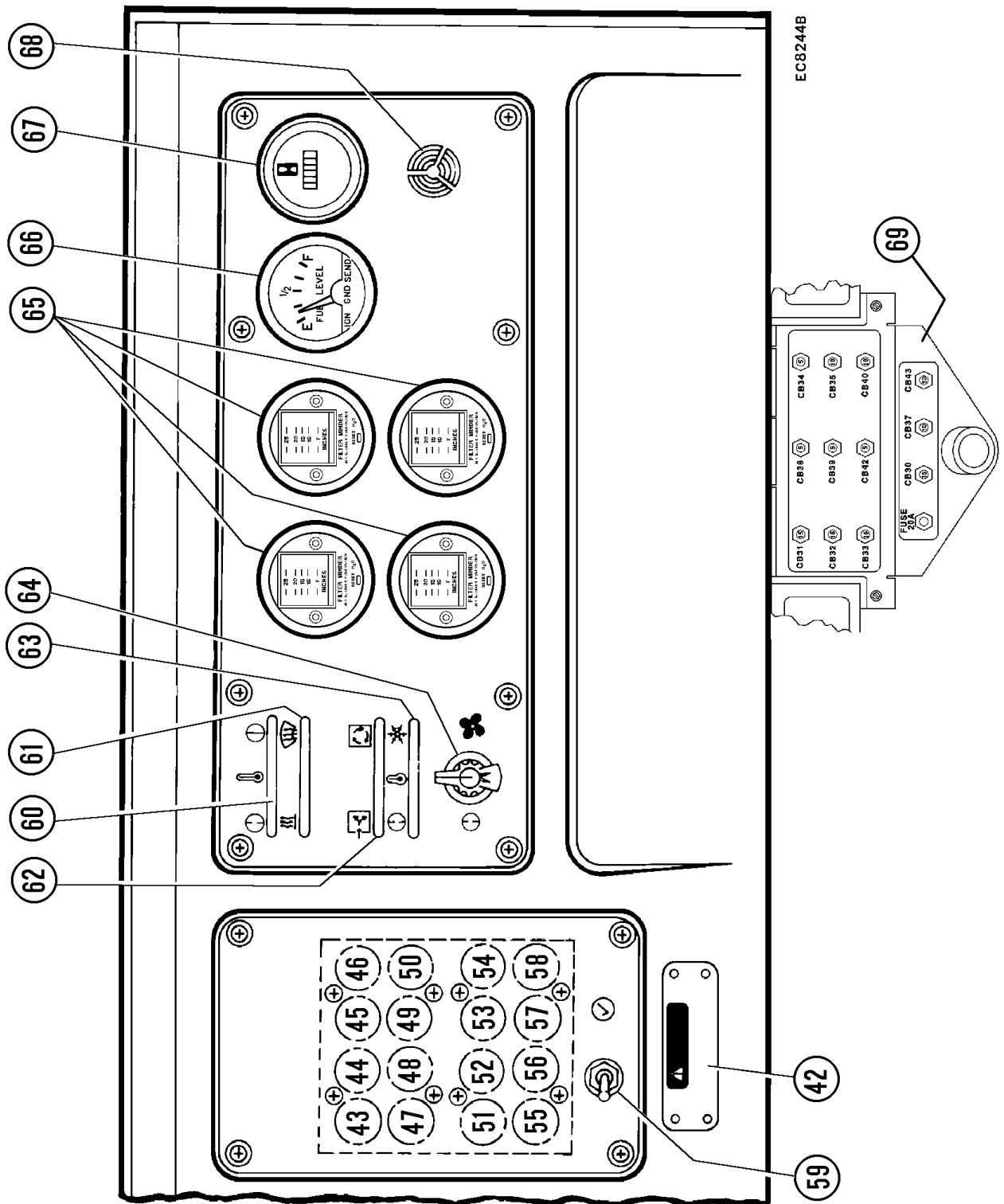
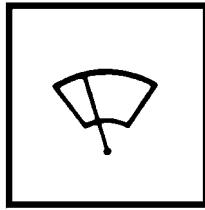


FIGURE 3-8. INST. PANEL, GAUGES, INDICATORS, & CONTROLS

(3, Figure 3-7) WINDSHIELD WIPER & WASHER SWITCH

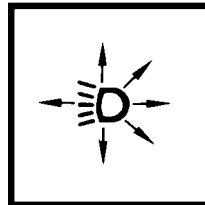
The windshield wiper control switch is a four position rotary switch with intermittent wiper delay and wash feature. "Off" position is the detented position when the knob is rotated fully counterclockwise against the stop. The intermittent wiper position is located between off and the first detent position when rotating the knob clockwise. Rotating the knob closer to the first detent position decreases the time interval between wiper strokes. Rotate the knob clockwise to the first detent position for slow speed. Rotate the knob to the second detent position for fast speed. Push the knob in to activate the windshield washer system.



(4, Figure 3-7) LIGHT SWITCH

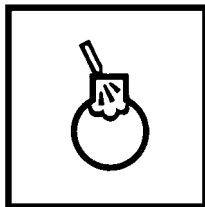
The instrument panel lights, clearance lights, and the headlights are controlled by this three position rotary type switch. "OFF" is the full counterclockwise position of the switch.

The second position clockwise from "Off" completes the circuit from the battery to the instrument panel lights, clearance lights, and taillights. The third position clockwise adds the headlights to the panel lights, clearance lights, and taillights circuit.



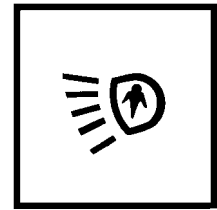
(5, Figure 3-7) ENGINE STARTING AID (OPTIONAL)

The OPTIONAL Engine Starting Aid switch is spring-loaded to the "Off" position. Use only when ambient temperature is below 50°F (10°C). When switch is held in the "On" position, ether is injected into the engine intake manifold to aid engine starting in cold weather. Move the Engine Starting Aid switch to the "On" position while cranking engine, for three (3) seconds **maximum**, and then release Engine Starting Aid. If engine does not start, wait at least fifteen (15) seconds before repeating the procedure. Refer to "Operating Instructions" in next section, for more specific operating details.



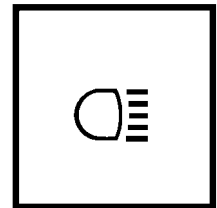
(6, Figure 3-7) LADDER LIGHT SWITCH

The switch turns ladder light "On" or "Off" after or before using ladder. A similar switch is mounted at front left of truck near the base of ladder.



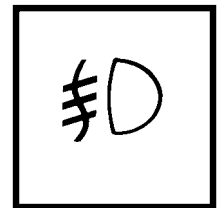
(7, Figure 3-7) MANUAL BACKUP LIGHT SWITCH

The Manual Backup Light Switch allows backup lights to be turned "On" providing added visibility and safety when the Selector Switch (see OPERATOR CONTROLS AND EQUIPMENT) is not in "REV" position. When the lever is moved upward to the "on" position, the MANUAL BACKUP LIGHT indicator (27) will be illuminated.



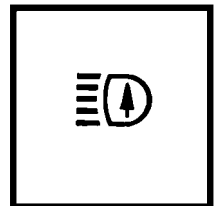
(8, Figure 3-7) FOG LIGHTS (OPTIONAL)

Fog Lights are optional equipment that are useful in foggy conditions and heavy rain. Moving the lever upward turns lights "On". Downward is "Off".



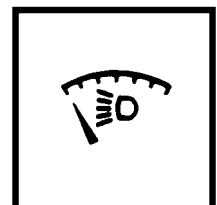
(9, Figure 3-7) HIGH MOUNTED HEADLIGHTS (OPTIONAL)

When optional headlights are mounted at top of grille structure, this switch controls these lights. Moving the lever upward turns lights "On". Downward is "Off".



(10, Figure 3-7) PANEL LIGHT DIMMER

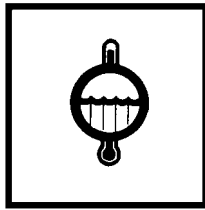
The panel light dimmer control is a rheostat which allows the operator to vary the brightness of the instruments and panel lights. Rotating knob to the full counterclockwise position turns panel lights "On" to brightest condition. Rotating knob clockwise continually dims lights until "Off" position is reached at full clockwise rotation.



(11, Figure 3-7) WATER TEMPERATURE GAUGE

The water temperature gauge indicates the temperature of the coolant in the engine cooling system. The temperature range after engine warm-up and truck operating under normal conditions should be:

165°-195°F (74°-91°C)

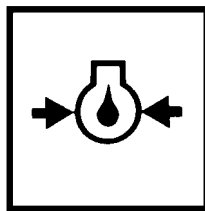


(12, Figure 3-7) ENGINE OIL PRESSURE GAUGE

The engine oil pressure gauge indicates pressure in the engine lubrication system in pounds per square inch (psi).

Normal operating pressure after engine warm up should be:

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

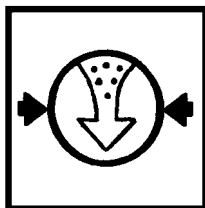


(13, Figure 3-7) AIR PRESSURE GAUGE

The air pressure gauge indicates the pressure in the air tank.

A normal pressure reading of 115-135 psi (790-930 kPa) should be indicated. Air pressure should be a minimum of 90 psi (621 kPa), on the gauge before operating the truck.

This pressure is required to operate the electrical connectors.



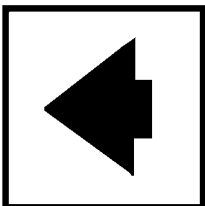
(14, Figure 3-7) SPEEDOMETER

The speedometer indicates the truck speed in miles per hour (MPH).

A speedometer that displays kilometers per hour (KM/H) is available.

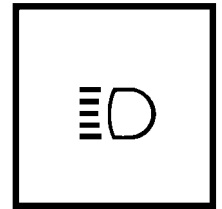
(15, Figure 3-7) LEFT TURN SIGNAL INDICATOR

This indicator illuminates to indicate 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 indicator "Off".



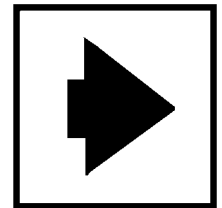
(16, Figure 3-7) HIGH BEAM INDICATOR

The high beam indicator when lit, indicates that the truck headlights are on "High" beam. To switch headlights to "High" or "Low" beam, depress dimmer switch located on the floor between service brake and retard pedals.



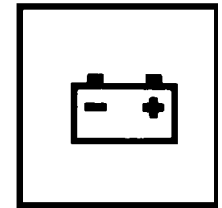
(17, Figure 3-7) RIGHT TURN SIGNAL INDICATOR

This indicator illuminates to indicate 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 indicator "Off".



(18, Figure 3-7) VOLTMETER

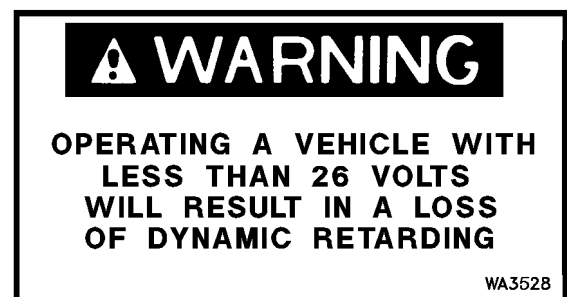
The voltmeter indicates the voltage of the 24V battery system. Normal indicated voltage with engine operating at high RPM, is 27 to 28 volts with batteries in fully charged condition.



When keyswitch (1) is "On" and engine is NOT operating, the voltmeter indicates battery charge condition.

(19, Figure 3-7) WARNING DECAL

A warning decal is mounted on top of the instrument panel above the voltmeter. This decal warns operator that operating truck (engine operating) with less than 26 volts may result in a loss of dynamic retarding.



(20, Figure 3-7) BLANK

This space not used currently. Reserved for future use.

(21, Figure 3-7) TACHOMETER

The tachometer registers engine crankshaft speed in revolutions per minute (RPM).

Governed RPM:

Low Idle - 750 RPM
(650 RPM with DDEC Fuel Saver)

Detroit Diesel –
High Idle, No load — 2040 ± 20 RPM
(1920 RPM with DDEC)

Cummins –
High Idle, No load — 2150 RPM Maximum

CAUTION INDICATOR LIGHTS (22 through 33, Figure 3-7)

Indicator lights (22) through (33) are *AMBER* in color, and alert the operator of the status of truck functions and that some precaution may be required when lighted.

(22, Figure 3-7) DYNAMIC RETARDING

The dynamic retarding indicator light glows when the retarder pedal is operated, RSC (Retarder Speed Control) is activated or the automatic overspeed retarding circuit is energized, indicating the dynamic retarding function of the truck is operating.

(23, Figure 3-7) BODY UP

The Body Up indicator, when lit, shows that the body is not completely down on the frame. Truck should not be driven until body is down and light is off.

(24, Figure 3-7) SERVICE BRAKE

The service brake indicator light will glow when the service brake pedal is applied or when wheel brake lock (or emergency brake, if equipped) is applied. Do not attempt to drive truck from stopped position with service brakes applied.

(25, Figure 3-7) PARKING BRAKE

The parking brake indicator will glow when the parking brake is applied. Do not attempt to drive truck with parking brake applied.

(26, Figure 3-7) (OPTIONAL) ACCUMULATOR BOOSTER

Indicates the accumulator booster system is functioning.

(27, Figure 3-7) MANUAL BACK UP LIGHT

Indicates backup lights are "On". Works with Manual Backup Light switch.

(28, Figure 3-7) LOW FUEL (OPTIONAL)

Indicates low fuel in fuel tank. Light will come on and buzzer will sound.
Approximately 25 gal. (95 l) of useable fuel is left when light comes on.

(29, Figure 3-7) HIGH PRESSURE FILTER (OPTIONAL)

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

(30, Figure 3-7) ENGINE CHECK MAIN ('DDEC' Electronic Engine Controls or Cummins Engines Equipped With Centry™ Fuel Control)

When the keyswitch is turned "On" (before starting engine), this *amber* "Engine Check Main" indicator light will illuminate for about 2 seconds and then turn off, if no "faults" are detected in the system. If this indicator remains "On" (or flashes with Cummins Centry™ Fuel Control system), **alert maintenance personnel as soon as possible.**

Detroit Diesel Engines w/DDEC II or III -

The *amber* "Engine Check Main" indicator will illuminate if a malfunction is detected in the "DDEC" electronic engine control system. **If this indicator illuminates, alert maintenance personnel as soon as possible.**

Cummins Engines w/Centry™ Fuel Control -

If truck is equipped with a Cummins engine and **Centry™ Fuel Control** system, this indicator monitors the Centry™ fuel system. During engine operation, if a "fault" is detected in the system, the light will turn ON and stay on for "Warning" faults, or it will turn ON and FLASH for more "Severe" faults that can affect engine operation and require immediate attention.

- "Warning" faults (light ON) are ones that require attention in the near future, but in most conditions will not greatly affect governing performance.
- "Severe" faults (light FLASHING) are ones that require **immediate** attention, because Centry™ governor performance could be significantly affected, *resulting in a backup mode of operation.*

Active fault conditions MUST be corrected as soon as possible.

Refer to "(59), Lamp Test/Diagnostic Test Switch" for additional description of this light's function.

(31, Figure 3-7) Engine Check Second ('DDEC II' Electronic-Controlled Engine Only)

The *amber* "Engine Check Second" indicator will illuminate if a malfunction is detected in the electronic engine control system. **If this indicator illuminates, alert maintenance personnel as soon as possible.**

(32, Figure 3-7) Battery Check ('DDEC' Electronic-Controlled Engine Only)

The battery check indicator light will illuminate if a malfunction is detected in the battery equalizer system. The system should be inspected and repaired as soon as possible.

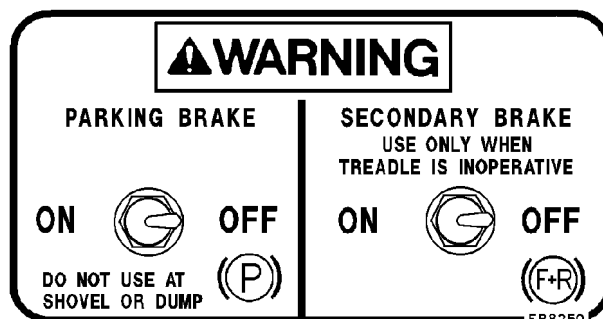
(33, Figure 3-7) CIRCUIT BREAKER TRIPPED

This 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.

(34, Figure 3-7) PARKING BRAKE CONTROL

The Parking Brake *is for parking only*. Truck must be completely stopped before applying parking brake or damage may occur to parking brake components. Parking brake is **not** designed to stop a moving truck.

Stop truck, then move switch to "ON" to apply parking brake. When the parking brake is applied, Parking Brake indicator (26) will be illuminated on the instrument panel. To release, move switch to "OFF". The parking brake is spring applied and hydraulically released; therefore, hydraulic pressure must be available to release park brake.



(35, Figure 3-7) SECONDARY BRAKE CONTROL

The Secondary Brake switch (when switched "ON") applies full brake pressure at all four wheels. It should be used **ONLY** if the service brake treadle is inoperative.

(36, Figure 3-7) DRY ROAD / SLIPPERY ROAD SWITCH

The Dry / Slippery road control switch permits the operator to select either full braking capability at all wheels for "dry" road or reduced braking at the front wheels for "slippery" road.



Slippery road position reduces front wheel braking effort while maintaining full braking of the rear wheels. Reduced braking of the front wheels assists in steering control on slippery roads, but increases stopping distance.



(37, Figure 3-7) WHEEL BRAKE LOCK

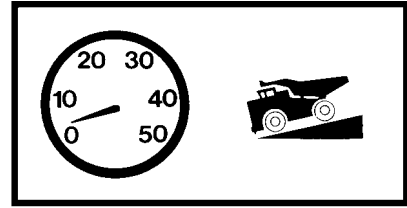
The Wheel Brake Lock should be used (with engine running) ONLY at the dump and loading operations. When pulling into shovel or dump area, stop the truck using the service brake pedal. When truck is completely stopped and in position (brake lock will not function if truck is moving above 2 MPH), apply brake lock by moving switch lever to "ON". This control applies brake pressure to the REAR WHEEL BRAKES ONLY. *Front wheel brakes* are *NOT* applied.



DO NOT use brake lock for parking! Use of the brake lock with the engine shut down will allow the brakes to release!

RETARD SPEED CONTROLS (RSC) (38, 39, & 40, Figure 3-7)

Indicator (38) and controls (39, 40) are used to monitor and control the Retard Speed Control (RSC).



(38, Figure 3-7) RETARD SPEED CONTROL INDICATOR

The amber light is illuminated when the RSC switch (39) is pulled out to the "On" position.

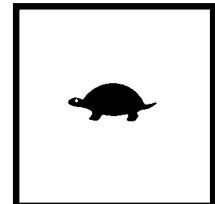
(39, Figure 3-7) RETARD SPEED CONTROL (RSC) SWITCH

The retard speed control switch turns system "on" or "off". Pull out to turn "on", push in to turn "off". See instructions at beginning of this section for symbols.

(40, Figure 3-7) RSC ADJUST DIAL

The RSC Adjust Dial allows operator to adjust safe productive downhill retarding speed of truck.

When Dial is rotated counterclockwise toward this symbol, RSC is set for slower speeds.



When Dial is rotated clockwise toward this symbol, RSC is set for faster speeds.



The 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 the RSC pre-selected speed and will maintain that maximum speed.

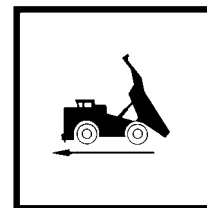
To adjust RSC control, pull switch (39) "On" and start with dial rotated toward fastest speed while driving truck at desired maximum speed. Relax throttle pedal to let truck coast and turn RSC Adjusting Dial (40) slowly counterclockwise until Dynamic Retarding (22) is activated. Dynamic Retarding will 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 come on. 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 3 mph (4.8 kph) below "set" speed, Dynamic Retarding will turn off automatically. If truck speed must be reduced further, the operator can turn 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.

For normal truck operation, only dynamic retarding should be used to slow and control the speed of the truck. The Grade/Speed Chart (refer to decal in operator's cab) should be followed to determine MAXIMUM safe truck speeds for descending various grades with a loaded truck. Service brakes should be applied only when dynamic retarding requires additional force to slow the truck speed quickly and to bring the truck to a complete stop.

(41, Figure 3-7) OVERRIDE SWITCH

This push-button switch is spring-loaded to the "OFF" position. When pushed in and held, this switch may be used for several functions.



1. The override switch permits the operator to move the truck forward when 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. If the operator stops the truck on an uphill incline, the override switch can be used to set up forward propulsion while the brakes are applied. As soon as forward propulsion is felt, completely release the brakes and a few seconds later, release the override switch.
3. The push button deactivates the retard pedal function when speed of truck is below 3 mph (4.8 kph).
4. The override switch is also used to reset the Electric System Fault (55) when indicated by the red warning light.

NOTE: STATEX III records the number of "faults/events". When a predetermined number of "faults/events" are recorded within a given time frame, the operator will not be able to reset the fault/event by using the override switch. If this occurs, notify maintenance personnel immediately.

(42, Figure 3-8) WARNING DECAL

A warning is mounted at the bottom of the instrument panel to the right of operator and beneath the warning indicator light panel. Truck should not be operated with any red warning lights on.



If any of the red warning lights, (43) through (58), are illuminated, the truck should be safely stopped, engine shut down, and maintenance notified.

(43, Figure 3-8) LOW STEERING PRESSURE

If the steering system pressure drops to 1850 psi (12.7 MPa) the steering pressure warning light will come on and a buzzer will sound.



If the low steering warning light continues to glow 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. Do not attempt further operation until the malfunction is located and corrected.

(44, Figure 3-8) LOW ACCUMULATOR PRECHARGE

The low accumulator precharge warning light, if illuminated, indicates low nitrogen precharge for the steering accumulator(s). To check for proper accumulator nitrogen precharge, engine must be stopped and hydraulic system completely bled down; then turn keyswitch to "Run" position. Warning light will NOT illuminate if system is properly charged. The warning light *will flash* if the nitrogen precharge within the accumulator(s) is below 975 psi (6.7 MPa).



If low accumulator precharge warning light flashes, notify maintenance personnel. Do not attempt further operation until the accumulators have been recharged with nitrogen to 1050 psi (7.24 MPa).

Sufficient energy for emergency steering may not be available, if system is not properly charged.

NOTE: After turning keyswitch "Off", engine must be allowed to completely stop, and hydraulic system must have time to bleed down completely (approximately 90 seconds) before turning keyswitch "On" and checking for Steering Accumulator Nitrogen Precharge. A false indication of Low Steering Accumulator Nitrogen Precharge may result if these instructions are not followed.

(45, Figure 3-8) HIGH HYDRAULIC OIL TEMPERATURE (OPTIONAL)

This warning light indicates high oil temperature in the hydraulic tank. Truck should not be operated because hydraulic components may be damaged. Light turns on at 225°F (107°C); notify maintenance personnel immediately.

(46, Figure 3-8) LOW HYDRAULIC TANK LEVEL (OPTIONAL)

This warning light indicates the oil level in the hydraulic tank is below recommended level. Damage to hydraulic pumps may occur if operation continues. Shut truck down and notify maintenance personnel immediately.

(47, Figure 3-8) HIGH COOLANT TEMPERATURE – (Not Used With 'Engine Saver' or 'DDEC' Electronic Engine Controls)

This warning light will flash on and off when the engine cooling system temperature is higher than recommended. The alarm horn will also sound. Continued operation could cause engine damage.

If the high coolant temperature warning light glows, bring truck to a safe stop out of the way of traffic as soon as possible. Move Selector Switch to 'Neutral' and run engine at 1500 RPM until light goes out or for about three minutes. If light does not go out, shut engine down and call maintenance personnel to correct problem.

NOTE: Warning indicator lights 47, 48, and 49 will illuminate with the "Lamp Test Switch", but are NOT used with the "DDEC" Electronic Engine Controls. Warning indicator lights 47 and 49 are NOT used with the "Engine Saver" engine option. These functions are monitored by the electronic control systems, but OTHER Red indicator lights will be illuminated if a malfunction is detected by the systems.

(48, Figure 3-8) LOW COOLANT LEVEL (Not Used With 'DDEC' Electronic Engine Controls)

The low coolant level warning light will flash on and off indicating insufficient engine coolant level. The warning horn will also sound. Stop the truck immediately as serious damage could result to engine and cooling system components. Notify maintenance personnel.

(49, Figure 3-8) LOW OIL PRESSURE – (Not Used With 'Engine Saver' or 'DDEC' Electronic Engine Controls)

The engine oil pressure warning light, when flashing, indicates the engine oil pressure is below normal operating range. The alarm horn will also sound when the light flashes. Shut down engine and notify maintenance personnel.

Shut down engine immediately if the low oil pressure warning light comes on. Serious damage may result to engine and engine lubricating system components.

(50, Figure 3-8) LOW OIL LEVEL (OPTIONAL)

This light indicates engine oil level is below recommended safe level. Serious damage to engine may result. Shut down engine and notify maintenance personnel.

(51, Figure 3-8) Used Only With Electronic Engine Controls

ENGINE MONITOR – ('Flight / Engine Saver' Option)

ENGINE MONITOR MAIN – ('DDEC')

The **RED** engine monitor warning light will illuminate and an alarm horn will sound if a serious engine malfunction is detected by the electronic control system. **Electric propulsion to the wheelmotors will be discontinued.** Dynamic Retarding will still be available to slow or stop the truck.

For DDEC ONLY, the maximum engine speed will be reduced to 1675 RPM. Stop the truck as quickly and safely as possible. Apply parking brake. SHUT DOWN THE ENGINE IMMEDIATELY. Additional engine damage is likely to occur if operation is continued.

(52, Figure 3-8) CRANKCASE PRESSURE WARNING LIGHT (Used Only for DDC ENGINE Without DDEC Controls)

The engine crankcase pressure warning light indicates high engine crankcase pressure when flashing. The flashing warning light will be accompanied by the alarm horn. If this light flashes during engine operation, stop the truck. Shut down the engine and alert maintenance personnel.

(53, Figure 3-8) LOW BRAKE PRESSURE

This light indicates a malfunction within the hydraulic brake circuit. If this light comes on and buzzer sounds, stop the truck as quickly as possible in a safe area and immediately notify maintenance personnel.

(54, Figure 3-8) ENGINE MONITOR SECOND (Used Only With "DDEC II" Electronic Engine Controls)

The **RED** engine monitor warning light will illuminate and an alarm horn will sound if a serious engine malfunction is detected by the electronic engine control system. **Electric propulsion to the wheelmotors will be discontinued.**

Dynamic Retarding will still be available to slow or stop the truck. *For DDEC II ONLY, the maximum engine speed will be reduced to 1675 RPM.* Stop the truck as quickly and safely as possible. **Apply parking brake. SHUT DOWN THE ENGINE IMMEDIATELY.** Additional engine damage is likely to occur if operation is continued.

(55, Figure 3-8) ELECTRIC SYSTEM FAULT

The Electric System fault warning light will flash on and off when a malfunction occurs in the electrical system. The warning horn will also signal intermittently. When light comes "On", propulsion will be dropped automatically. Stop truck. Reset by pushing override button. If fault repeats again, stop truck and report problem to maintenance personnel.

NOTE: STATEX III records the number of "faults/events". When a predetermined number of "faults/events" are recorded within a given time frame, the operator will not be able to reset the fault/event by using the override switch. If this occurs, notify maintenance personnel immediately.

(56, Figure 3-8) MOTOR BLOWER OFF

The motor blower warning light will flash ON and OFF, and an alarm will sound, if a malfunction occurs in the cooling air circuit for the alternator and motorized wheels. **Stop truck immediately and notify maintenance personnel.** Damage to electrical components may result without proper ventilation of rotating equipment.

(57, Figure 3-8) HIGH MOTOR TEMPERATURE (OPTIONAL)

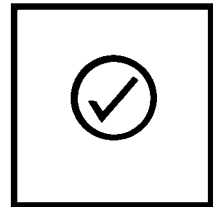
When this light is lit and alarm sounds, high wheel motor temperature is indicated. Stop truck, place Selector Switch in "Neutral" and raise engine RPM to high idle for several minutes to cool wheel motors. If indicator does not turn off, notify maintenance personnel.

(58, Figure 3-8) BLANK

Not currently used. Reserved for future use.

(59, Figure 3-8) LAMP TEST SWITCH & Centry™ Diagnostic Test Switch

This switch may be used for Lamp Test, or for diagnostic tests of a Cummins engine equipped with Centry™ Fuel Control.

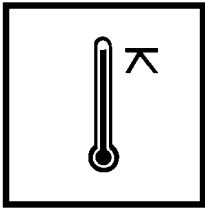


The **Lamp Test Switch** is provided for the operator to test the warning and indicator lights before engine startup. To test lamps, turn key switch to "run" position and move switch lever to the right for the "On" position. This action will complete a circuit to the warning and indicator lights. The warning horn will also sound. All red warning lights and amber indicator lights should light up except those that are "BLANK" and not currently used (see description of indicators and warning lights in this section – also see "NOTE:" following Indicator # 47). Releasing the spring-loaded switch will allow the lever to return left to the "Off" position.

For diagnostic tests of a Cummins engine equipped with Centry™ Fuel Control, refer to "**Centry™ Diagnostics**" at the end of this section.

(60, Figure 3-8) HEATER TEMPERATURE CONTROL LEVER

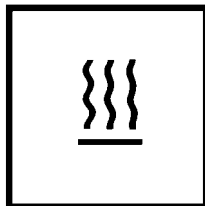
The heater temperature control lever is provided for the operator to select a comfortable temperature. The far left position turns heat off for warm weather operation (or air conditioning if so equipped). Milder temperatures can be regulated by moving the control lever to the right. Moving the control lever to the far right selects the warmest temperature for cold weather operation.



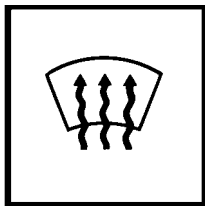
(61, Figure 3-8) DEFROSTER/HEAT CONTROL LEVER

The defroster/heat control lever permits the operator to select either defroster or heater.

Moving the control lever to the far left position directs heated air to the cab floor for most efficient heating of cab air.



Moving the lever to the far right selects the defroster function. This directs heated air to the windshield.

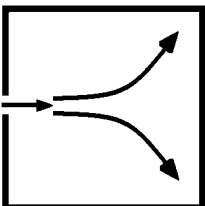


Selecting a center position for the control lever divides the air to both floor heat and defroster.

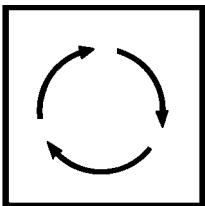
(62, Figure 3-8) OUTSIDE/INSIDE AIR CONTROL LEVER

The outside/inside air control lever is connected to a vent, which allows either outside or inside air to be circulated through the cab heater assembly.

Moving the lever to the left directs outside air to be circulated through the heater assembly.

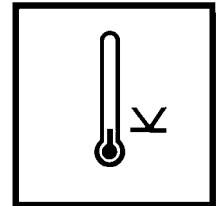


Moving the lever to the right directs inside air to be recirculated through the heater assembly.

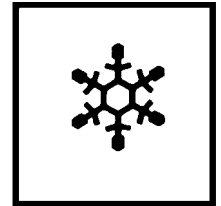


(63, Figure 3-8) AIR CONDITIONER CONTROL (OPTIONAL)

The Air Conditioner control lever is moved from left (off) to right to cool the cab air.

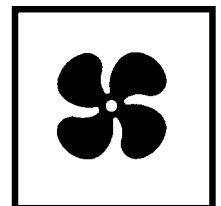


Full right position is coldest setting.



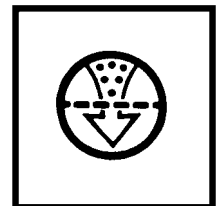
(64, Figure 3-8) FAN CONTROL KNOB

The fan control knob is provided to control the cab air fan motor. The fan motor is a 3-speed motor (low, medium and high) which are selected by rotating the control knob clockwise to the desired position. "Off" position is marked by symbol on panel.



(65, Figure 3-8) AIR CLEANER SERVICE VACUUM GAUGE

The air cleaner service gauge(s) provides a continuous reading of maximum air cleaner restriction reached during operation. The air cleaner(s) should be serviced when the gauge(s) shows the following maximum recommended restriction:



20 inches of H₂O vacuum for Detroit Diesel engine.

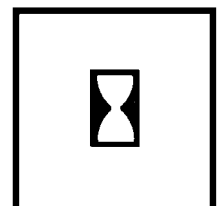
25 inches of H₂O vacuum for Cummins engine.

After service, push the reset pin on face of gauge to allow gauge to reset to zero.

When truck is equipped with a CUMMINS engine of LESS THAN 2000 HP (1491 kW), instrument panel will contain only two (2) Air Cleaner Service gauges.

(66, Figure 3-8) FUEL LEVEL GAUGE (OPTIONAL)

Allows operator to be aware of fuel status without viewing fuel tank at ground level.



(67, Figure 3-8) HOURMETER

The hourmeter registers the total number of hours the engine has been in operation.

(68, Figure 3-8) OVERSPEED ALARM HORN (OPTIONAL)

This alarm will sound when truck speed reaches overspeed setting. Dynamic Retarding and Dynamic Retard Indicator light will also come on. Refer to speed grade decal in operator's cab for correct speeds in downhill hauling.



(69, Figure 3-8) CIRCUIT BREAKER PANEL

Circuit breakers (Figure 3-9) are provided to protect various circuits from an excess current condition. If a malfunction in the circuitry occurs, the appropriate circuit breaker will open the circuit. After the circuit breaker cools, it can be reset by pushing the button.



Report any faulty circuit that is protected by a circuit breaker, as serious damage may result from overcurrent conditions.

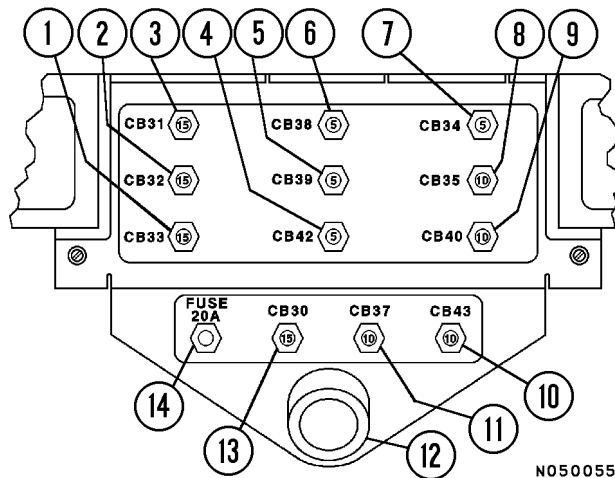


FIGURE 5-9. CIRCUIT BREAKER PANEL

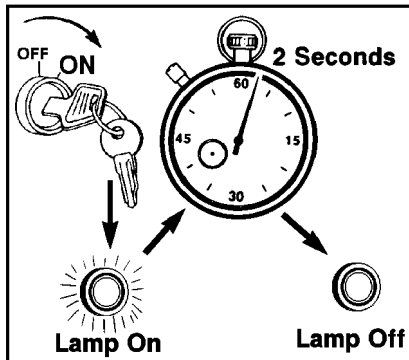
- | | | |
|---|---|--|
| 1. Hoist Limit (15 amp.) | 6. Eng. Temp. & Fuel Gauges (5 amp.) | 10. Keyswitch to Starter Solenoid (10 amp.) |
| 2. Volt Meter / Turn Signal / Relay Coils / Status Lights (15 amp.) | 7. Drain Valve and Air Dryer Heater (5 amp.) | 11. Windshield Washer (10 amp.) |
| 3. Heater Blower (15 amp.) | 8. Lincoln Lube Timer (10 amp.) | 12. Alarm (see NOTE) |
| 4. Dry/Slippery Road (5 amp.) | 9. 12VDC Power Supply (Lower Right Side of Console) | 13. Engine Service, Ladder Lights, & Opt. Fog Lights (15 amp.) |
| 5. Rad. Pre-Charge Solenoid (5 amp.) | 14. Cigar Lighter (20 amp. Fuse) | |

NOTE: Alarm Horn (12) alerts the operator of a malfunction within a system. When the alarm horn sounds during operation, a warning light will flash to provide a visual aid for determining which system is malfunctioning.

CENTRY™ FUEL SYSTEM DIAGNOSTICS - CUMMINS ENGINE ONLY -

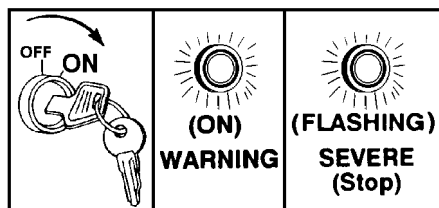
If the truck is equipped with a Cummins engine and Centry™ Fuel Control system, the "ENGINE CHECK MAIN" Indicator Light (30, Figure 3-7) monitors the Centry™ fuel system.

When the keyswitch is turned "On", this light should illuminate for about 2 seconds and then turn "Off", if no "faults" are detected in the system. If the light stays ON, or FLASHES, then active "faults" have been detected by the system and the engine should not be started.



Refer to **DETERMINING 'FAULT' CODES**.

During engine operation, if a "fault" is detected in the system, the light will turn ON and stay on for "Warning faults", or it will turn "ON and FLASH" for more severe faults that can affect engine operation and require immediate attention.



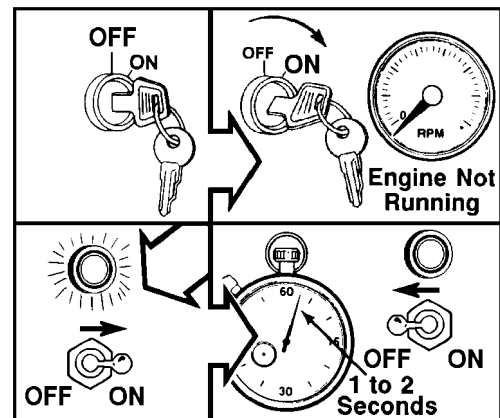
- "Warning" faults (light ON) are ones that require attention in the near future, but in most conditions will not greatly affect governing performance.
- "Severe" faults (light FLASHING) are ones that require **immediate** attention, because Centry™ governor performance could be significantly affected, *resulting in a backup mode of operation*. **Active fault conditions MUST be corrected as soon as possible.**

The Lamp Test/Diagnostic Test Switch (59, Figure 3-8) may be used to activate the Centry™ Fuel System diagnostic codes. When the Centry™ fuel system detects a "fault" and the ENGINE CHECK MAIN indicator light (30, Figure 3-7) illuminates as described above, this switch will permit determination of the kind of "fault(s)" detected.

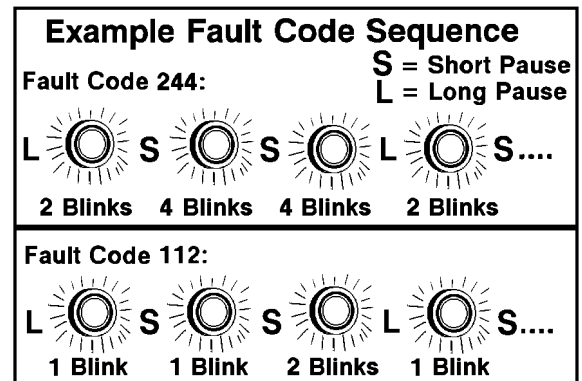
DETERMINING 'FAULT' CODES

Centry™ fault codes consist of three numerical digits. Each digit is indicated with up to five light flashes (ENGINE CHECK MAIN indicator light) per each digit. There is a short pause between each digit of the fault code. Once all three digits are flashed, there is a longer pause, followed by a repeating of the same fault code sequence.

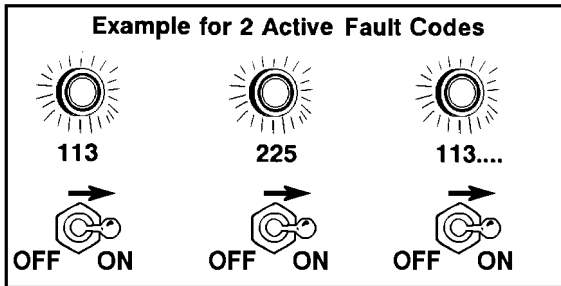
1. To determine an active Centry™ "fault", turn the keyswitch to the OFF position. Be sure engine completely stops, if it was running.
2. Turn keyswitch to ON position (engine not running) and move Lamp Test switch lever to the right (ON) for 1 – 2 seconds, then release switch (switch is spring-loaded to the left, "OFF" position). *NOTE: Since this is the Lamp Test switch, all red warning lights and amber indicator lights should light up except those that are "BLANK". The warning horn will also sound.*



3. If there is an active fault after releasing the switch, there will be a short pause, followed by the first fault code.

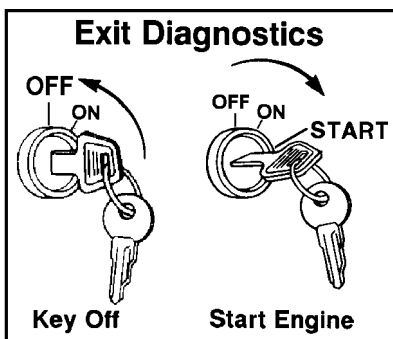


- Moving the Lamp Test switch lever to the right will advance to the next fault code. Once all active fault codes have been displayed, the fault code display sequence will be repeated, starting from the first fault code.



EXITING THE DIAGNOSTICS MODE

Starting the engine or turning the keyswitch to the OFF position will EXIT the diagnostics fault flash mode.



If active fault codes have been determined as described previously, refer to the Cummins Engine Century™ System "Troubleshooting and Repair Manual", Bulletin No. 3666070, or contact an Authorized Repair Location.

LUBRICATION AND SERVICE

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 recommended intervals is most important.

Lubrication requirements are referenced to the lube key found in the Truck Lubrication Specifications Chart. 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 manufacturer's service manual when servicing any components of the General Electric System.

Refer to 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 truck is being operated under extreme conditions, some or all, of the intervals may need to be shortened and the service performed more frequently.

Many Haulpak Trucks are equipped with an optional 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. Consult the "Options and Accessories" section of the truck service manual for adjustments to these devices.

630E/685E SERVICE CAPACITIES			
		Liters	U.S. Gallons
Engine Crankcase: (including lube oil filters).			
Detroit Diesel		189	50.0
Cummins		214	56.6
Cooling System:	630E	314	83
	685E	409	108
Hydraulic System:		507	134
Refer to "Hydraulic Tank Service".			
Wheel Motor Gear Box (each side)			
	776	17.0	4.5
	788	40.0	10.5

HYDRAULIC TANK SERVICE

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

Adding Oil

Remove any dirt build-up around fill cap and breathers and clean fill area thoroughly before removing fill cap. To reduce chances of system contamination, **DO NOT allow the system to be open to atmosphere any longer than absolutely necessary.**

Service the tank with clean Type C-4 hydraulic oil only. All oil being put into the hydraulic tank should be filtered through 3 micron filters.

1. With engine stopped, keyswitch "off", hydraulic system bled down and body down, check to see that hydraulic oil is visible in the top or lower sight gauge.
2. If hydraulic oil is not visible in the lower sight gauge, remove the tank fill cap and add clean, filtered C-4 hydraulic oil (Lubrication Chart, Lube Key "D") until oil is visible in the top sight gauge. Replace fill cap.
3. Start the engine, then raise and lower the dump body three times. Shutdown engine. Check for hydraulic oil level at the top sight glass.
4. If oil is not visible in top sight glass, repeat Steps 1 through 3, until oil level is maintained in the top sight glass with engine stopped.

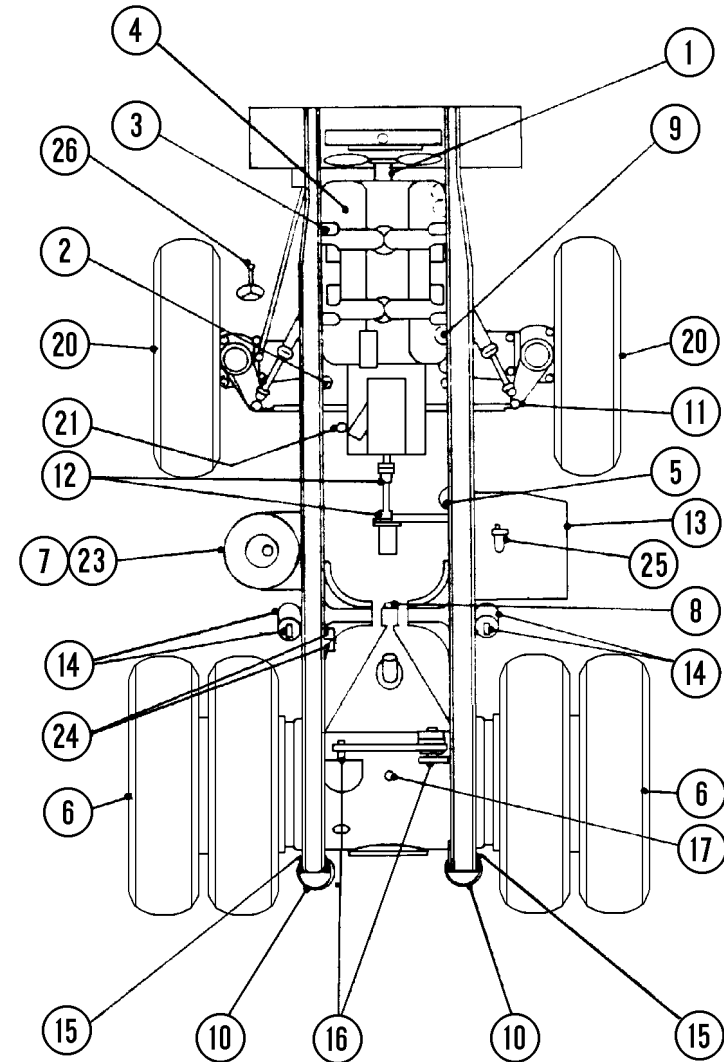
COOLING SYSTEM ANTI - FREEZE RECOMMENDATIONS (Ethylene Glycol Permanent Type Anti-Freeze)		
Percentage of Anti-Freeze	Protection To	
10	+ 23°F	- 5°C
20	+ 16°F	- 9°C
25	+ 11°F	- 11°C
30	+ 4°F	- 16°C
35	- 3°F	- 19°C
40	- 12°F	- 24°C
45	- 23°F	- 30°C
50	- 34°F	- 36°C
55	- 48°F	- 44°C
60	- 62°F	- 52°C

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

LUBRICATION CHART

LUBRICATION SPECIFICATIONS											
LUBE KEY	DESCRIPTION			-65°F TO -25°F	-25°F TO + 32°F	+ 32°F TO + 90°F	ABOVE 90°F				
A	ENGINE OIL			***	SEE ENG. MANUAL	SEE ENG. MANUAL	SEE ENG. MANUAL				
B	LUBRICATING OIL			SAE 10W	SAE 10W	SAE 10W	SAE 10W				
C	MULTI-PURPOSE GEAR OIL			MIL-L-2105D SAE 75W	MIL-L-2105D SAE 80W-90	MIL-L-2105D SAE 80W-90	MIL-L-2105D SAE 85W-140				
D	TYPE C-4 OIL			SAE 10W***	SAE 10W***	SAE 10W	SAE 30W				
E	MOLYBDENUM DISULPHIDE GREASE -3% MIN			#0	#2	#2	#2				
F	MULTI-PURPOSE GREASE NLGI			#0	#0	#0	#0				

SYM.	DESCRIPTION	PTS.	LUBE KEY	10 HR	50 HR	100 HR	250 HR	500 HR	1000 HR	2000 HR	5000 HR
1	FAN DRIVE	1		SEE ENGINE MANUAL							
2	AIR STARTERS	1	E						GREASE		
3	CRANKCASE	1	A	CHECK			CHANGE				
	CRANKCASE BREATHERS	1							WASH DRY		
4	FUEL FILTER	1		DRAIN			CHANGE				
5	FUEL STRAINER	1		DRAIN			CHANGE				
6	MOTORIZED WHEEL GEAR CASE	2	C	SEE GENERAL ELECTRIC PLANNED MAINTENANCE MANUAL AND SPECIFIC MOTORIZED WHEEL SERVICE MANUAL.							
	SPEED SENSOR	2	E								
7	HYDRAULIC OIL RESERVOIR	1	D	CHECK					CHANGE		
8	FINAL DRIVE PIVOT PIN	1	E		GREASE						
9	ENGINE LUBE OIL FILTERS	4				CHANGE					
10	REAR SUSPENSION BALL JOINTS	4	E			GREASE					
11	STEERING LINKAGE BALL JOINTS	8	E				GREASE				
12	HYDRAULIC PUMP DRIVE SHAFT	2	F			GREASE					
13	FUEL TANK	1				DRAIN H ₂ O & SEDIMENT					
14	HOIST CYLINDER BALL JOINTS	4	E			GREASE					
15	BODY HINGE PINS	2	E			GREASE					
16	ANTI-SWAY BAR	2	E			GREASE					
17	REAR AXLE AIR BREATHER	2						CHANGE CLEAN			
18											
19											
20	FRONT WHEEL BEARINGS	2	**			CHECK					CHANGE
21	AIR SYSTEM LUBRICATOR	1	D				REFILL -				
22	SEAT ADJ. STUD & SLIDE RAILS	4	E						GREASE		
23	HYDRAULIC STRAINER	1							CLEAN		
24	HYDRAULIC FILTERS	1					CHANGE				
25	FUEL TANK BREATHER	1							CLEAN		
26	STEERING COLUMN	1	E			GREASE					
27											
28											



* 1000 HR INTERVAL CAN BE EXTENDED TO 5000 HR PROVIDED HYDRAULIC OIL SAMPLING AND ANALYSIS IS CONDUCTED EVERY 250 HR.

** DO NOT USE OTHER THAN SAE 80W-90 FOR FRONT WHEEL BEARINGS.

*** AUXILIARY HEATERS REQUIRED BELOW -10°F.

ITEM 22 NOT SHOWN

WA8867

50 HOUR LUBRICATION AND MAINTENANCE CHECKS

Maintenance for every 10 hours/shift checks should also be carried out at this time.

NOTE: "Lube Key" references are to the Lubrication Specification Chart.

1. FAN - After the first 50 hours of operation (new truck or new fan installation), check the torque for fan blade mounting capscrews - **90 ft.lbs. (122 N.m)**.
2. FINAL DRIVE PIVOT PIN - Add one or two applications of grease at grease fitting. Lube Key "E".
3. HYDRAIR[®] SUSPENSION - Check the torque on the ball stud locknut after the first 50 operating hours (new truck) or first 50 operating hours since installation (replacement Hydrair[®]). Ball stud locknut torque should be **2770 ft.lbs. (3775 N.m)**.

Truck Serial Number _____

Site Unit Number _____

Date: _____ Hour Meter _____

Name of Service person _____

COMMENTS	√'d	INITIALS

500 HOUR LUBRICATION AND MAINTENANCE CHECKS

Maintenance for every 10, 50, 100, & 250 hour Lubrication and Maintenance Checks should also be carried out at this time.

NOTE: "Lube Key" references are to the Lubrication Specification Chart.

Truck Serial Number _____

Site Unit Number _____

Date: _____ Hour Meter _____

Name of Service person _____

1. REAR AXLE CASE BREATHERS - Remove breather elements for motorized wheels and clean or replace elements.
2. HYDRAULIC SYSTEM FILTERS - Replace filter elements. Check oil level in tank. Oil should be visible in sight glass, add oil if necessary. Refer to "Hydraulic Tank Service". DO NOT OVERFILL. Lube Key "D".
3. HYDRAIR[®] SUSPENSIONS - Check for correct piston extension (front and rear). Refer to Service Manual, Section "H".
4. THROTTLE AND BRAKE PEDAL (NOT SHOWN) - Lubricate treadle roller and hinge pins with lubricating oil. Lift boot from mounting plate and apply a few drops of oil between mounting plate and plunger. Lube Key "B".
5. AIR TANK SAFETY VALVE - (Not Shown) Check operation of safety valve.

COMMENTS	√'d	INITIALS

1000 HOURS LUBRICATION AND MAINTENANCE CHECKS

Maintenance for every 10, 50, 100, 250, & 500 hour Lubrication and Maintenance Checks should also be carried out at this time.

NOTE: "Lube Key" references are to the Lubrication Specification Chart.

Truck Serial Number _____

Site Unit Number _____

Date: _____ Hour Meter _____

Name of Service person _____

1. HYDRAULIC TANK - Drain hydraulic oil* and clean inlet strainer. Refill tank with oil. Refer to "Hydraulic Tank Service". DO NOT OVERFILL. Service the tank with clean Type C-4 hydraulic oil only. All oil being put into the hydraulic tank should be filtered through 3 micron filters. Lube Key "D".

* 1000 HR Interval can be extended to 5000 HR provided hydraulic oil sampling and analysis is conducted every 250 HR.

2. HYDRAULIC TANK BREATHER - Replace breather.
3. RADIATOR - Clean cooling system with a quality cleaning compound. Flush with water. Refill system with DCA or anti-freeze and water solution. Check Cooling System Recommendation Chart for correct mixture.
4. FUEL TANK - Remove breather and clean in solvent. Dry with air pressure and reinstall.
5. ENGINE - Remove, clean and dry crankcase breather elements.
6. OPERATOR'S SEAT - Apply grease to slide rails. Use Lube Key "E".
7. BRAKE ACCUMULATORS (3) -
Check precharge pressure of each accumulator. Precharge pressure is 1250 ± 25 psi (8.6 ± 0.17 MPa). Refer to Service Manual, Section "J", HYDRAULIC BRAKE ACCUMULATORS, Charging Procedure.

COMMENTS	√ ³ d	INITIALS

5000 HOURS LUBRICATION AND MAINTENANCE CHECKS

Maintenance for every 10, 50, 100, 250, 500, & 1000 hour Lubrication and Maintenance Checks should also be carried out at this time.

NOTE: "Lube Key" references are to the Lubrication Specification Chart.

1. FRONT WHEELS - Drain oil and check bearing preload as covered in the Service Manual, Section "G". Use Lube Key "C**" and refill with oil. Check the oil level at oil level sight gauge on wheel hub.

**** USE ONLY SAE 80W-90 FOR FRONT WHEEL BEARINGS.**

2. AIR CLEANER - Clean the Donaclone Tubes in the pre-cleaner section of the air filter. Use low pressure cold water or low pressure air to clean tubes. Refer to the Service Manual, Section "C".

NOTE: Do not use a hot pressure washer or high pressure air to clean tubes, high pressure causes pre-cleaner tubes to distort.

Truck Serial Number _____

Site Unit Number _____

Date: _____ Hour Meter _____

Name of Service person _____

COMMENTS	√'d	INITIALS

10000 HOURS LUBRICATION AND MAINTENANCE CHECKS

Maintenance for every 10, 50, 100, 250, 500, 1000 & 5000 hour Lubrication and Maintenance Checks should also be carried out at this time.

1. FRONT WHEELS - Completely disassemble and check all parts for wear or damage. Refer to the Service Manual, Section "G", for complete Front Wheel Disassembly and Bearing Adjustment procedure.

Truck Serial Number _____

Site Unit Number _____

Date: _____ Hour Meter _____

Name of Service person _____

COMMENTS	√'d	INITIALS

LINCOLN AUTOMATIC LUBRICATION SYSTEM

Operation

The automatic lubrication system (Figure 4-1) is controlled by an electric timer and an electrically operated solenoid valve. During truck operation, the timer periodically operates a switch which energizes the solenoid air valve. As the solenoid air valve opens, regulated air enters the pump air motor, and the pump begins to operate, delivering lubricant through the supply lines to each injector. At the same time, as regulated air is applied to the air motor, regulated air is applied to the vent valve which keeps the vent valve closed until the 3-way solenoid air valve is deenergized.

After the injectors have cycled, lubricant pressure rises quickly to 2500 psi (17.5 MPa), and the pump stalls against this pressure. The pump will remain stalled for a few seconds until the timer switch contact is broken and the solenoid air valve is de-energized, shutting off the air supply. Trapped air exhausts, the vent valve opens, and lubricant pressure in the supply line is vented back to the reservoir. The injectors reload and the system is reset and ready for the next lube cycle.

Figure 4-1 shows input air supply to the pump going through the solenoid air valve, then through an air regulator to the air powered pump. A branch line of regulated air is routed directly to the vent valve.

Components

The system is comprised of seven basic elements plus the necessary hoses and lube lines:

1. Air Pressure
2. Air Regulator and Gauge
3. 24 VDC Solid State Timer
4. 3-way Solenoid Air Valve
5. Lube Injectors
6. Grease Reservoir
7. Air Pump Motor

Description of Components

1. Air Powered Reciprocating Pump
 - a. 50:1 Pressure Ratio.
 - b. Reservoir Grease Capacity of 60 lbs. (27.2 kg).
2. Air Regulator and Gauge
 - a. Normal Operation - regulator output should be set at 60-65 psi (414-448 kPa).
 - b. Extreme Winter Conditions - regulator output may be reset to 90 psi (621 kPa).
3. 24 VDC Solid State Timer:

Operating Temperature Range -20°F to 131°F (-29°C to 55°C). The timer is mounted in the cab to help insure temperature stability.

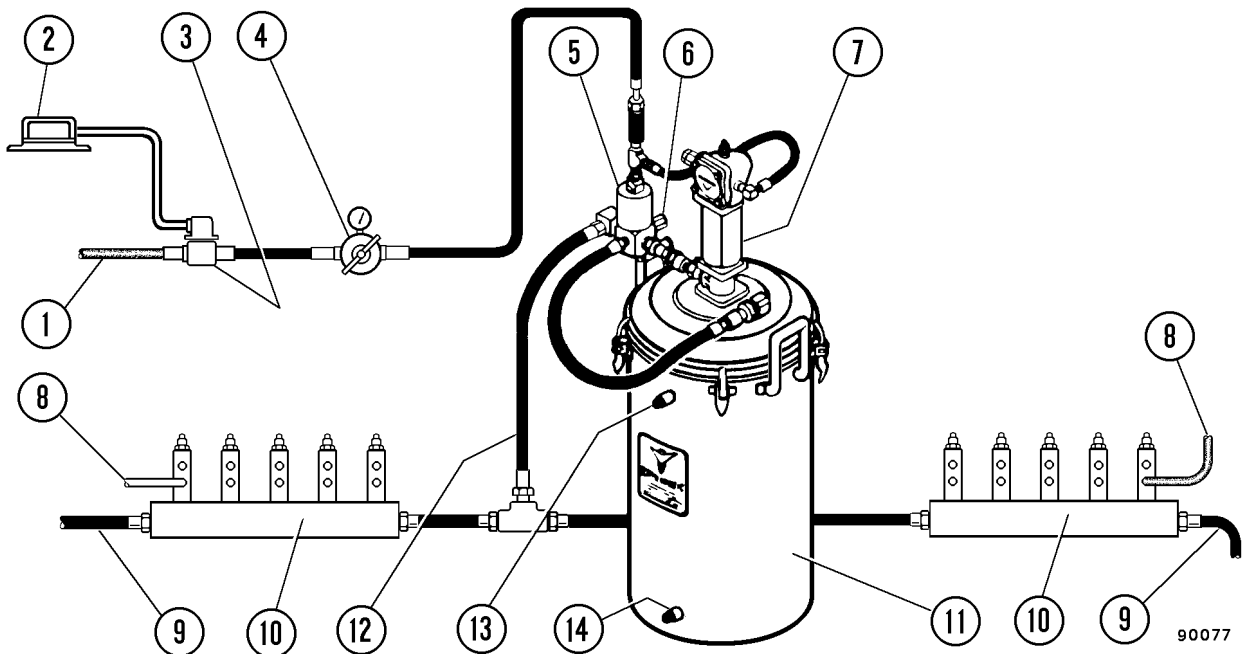


FIGURE 4-1. TYPICAL AUTOMATIC LUBRICATION SYSTEM

- | | | | |
|--------------------------|------------------|---------------------------|---------------------------------|
| 1. Air Supply | 5. Vent Valve | 9. To Next Injector Grp. | 13. Pipe Plug |
| 2. D.C. Timer | 6. Unloader | 10. Injectors | 14. Pipe Plug or Grease Coupler |
| 3. Solenoid Air Valve | 7. Pump | 11. Lubricant Reservoir | |
| 4. Air Regulator & Gauge | 8. To Lube Point | 12. Lubricant Supply Line | |

4. Solenoid Air Valve - Three-way
 - a. Routes system air to the appropriate locations in the lube system.
 - b. Power requirement for solenoid air valve and timer is 15 watts.
5. Injectors (SL-1)
 - a. Each lube injector services only one grease point.
 - b. Injectors are available in banks of two, three, four and five as well as single replacement units.
 - c. Injector output is adjustable:
Maximum output = 0.08 in^3 (1.31 cc).
Minimum output = 0.008 in^3 (0.13 cc).
 - d. In case of air pump malfunction, each injector is equipped with a covered grease fitting to allow the use of external lubricating equipment.

Initial Reservoir Fill

1. Remove 0.50 in. (1.27 cm) pipe plug (13, Figure 4-1) from upper portion of lubricant reservoir. This will prevent damage to reservoir by allowing air to escape as reservoir is being filled.
2. Clean grease coupler (14) on lower portion of reservoir.
3. Attach supply hose from external fill source to coupler (14).
4. Fill reservoir with approximately 60 lbs. (27.24 kg) of grease. When reservoir is filled, grease will appear at upper pipe plug hole (13).
5. Remove supply hose from grease coupler (14). Remove excess grease from coupler. Install pipe plug (13) and tighten to standard torque.

GENERAL INSTRUCTIONS

Lubricant Required for System

Refer to "Lubrication Chart", Lube Key E, for correct lubricant specification and for specific lube points for a specific truck model.

1. Above 90°F (32°C) - Use NLGI No.2 multipurpose grease (MPG).
2. -25° to 90°F (-32° to 32°C) - Use NGLI No. 1 MPG.
3. Below -25°F (-32°C) - 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 reprime the system to eject all entrapped air. To run the air pump when priming the lube system, connect a jumper wire between the ignition and solenoid posts on the solid state timer.

1. Fill lube reservoir with lubricant, if necessary.
2. Remove plugs from all injector manifold dead ends and supply lines.

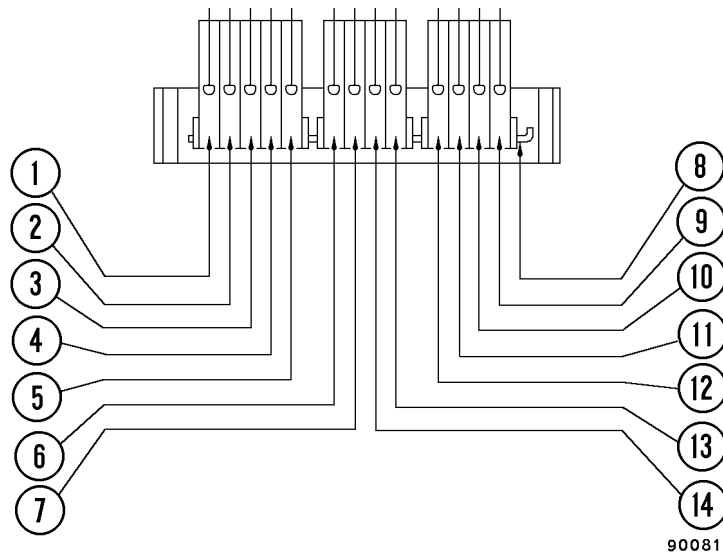


FIGURE 4-2. REAR LUBE INJECTOR INSTALLATION (TYPICAL)

- | | | | |
|----------------------------|--------------------------|-----------------------------|-------------------------|
| 1. Suspension, Lower LH | 5. Body Pivot, L.H. | 9. Suspension, Lower RH | 13. Anti-Sway Bar, L.H. |
| 2. Hoist Cyl., Top, L.H. | 6. Body Pivot, R.H. | 10. Hoist Cyl., Top, R.H. | 14. Anti-Sway Bar, R.H. |
| 3. Hoist Cyl., Lower, L.H. | 7. Suspension, Top, R.H. | 11. Hoist Cyl., Lower, R.H. | |
| 4. Suspension, Top, L.H. | 8. Grease Supply Line | 12. Axle Pivot Pin | |

3. Turn air pump vent plug counterclockwise one full turn. To expel trapped air between air pump and supply line connection, run air motor until grease flows freely from the vent plug. Close vent plug clockwise.
4. Continue to run air pump until grease flows from any one plug opening in the system. Replace plug in this opening.
5. Repeat step 4 until all lines are full and all plugs replaced.

NOTE: Fill each feed line with grease before connecting lines to the injector outlets and bearings. This will prevent having to cycle the individual injectors once for each 1.0 in. (25 mm) length of feed line between the injector and bearing fitting.

System Checkout

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

1. Lift the passenger seat and connect a jumper wire between "SOL" terminal and "LUBE SW" terminal on the 24 VDC solid state lube timer.

Turn keyswitch "ON". Pump should operate.

NOTE: If terminal post identification on the solid state timer is not legible, refer to Figure 4-5 for terminal positions.

2. Keep jumper wire connected until the pump stalls.
3. Disconnect jumper wire. System should vent.
Turn keyswitch "OFF".

24 VDC Solid State Timer Check

To check the solid state timer operation without waiting for the normal timer setting, proceed as follows:

1. Remove timer dust cover.
NOTE: The timer incorporates a liquid and dust tight cover which must be in place and secured at all times during truck operation.
2. Adjust timer to 5 minute interval setting.
3. The timer should cycle in five minutes if the truck is operating.

NOTE: If the timer check is being made on a cold start, the first cycle will be approximately double the nominal setting. All subsequent cycles should be within the selected time tolerance.

4. Voltage checks at the timer should be accomplished if the above checks do not identify the problem.
 - a. Insure timer ground connection is clean and tight.
 - b. Using a Volt-Ohm meter, read the voltage between positive and negative posts on the solid state timer with the truck keyswitch "ON".
Normal reading should be 18-26 VDC, depending upon whether or not the engine is running.

24 VDC Solid State Timer Adjustment

The timer is factory set for a nominal 2.5 minute (off time) interval. Dwell time is approximately 1 minute, 15 seconds. A longer interval (off time) is obtained by turning the Selector knob (3, Figure 4-3) to the desired position .

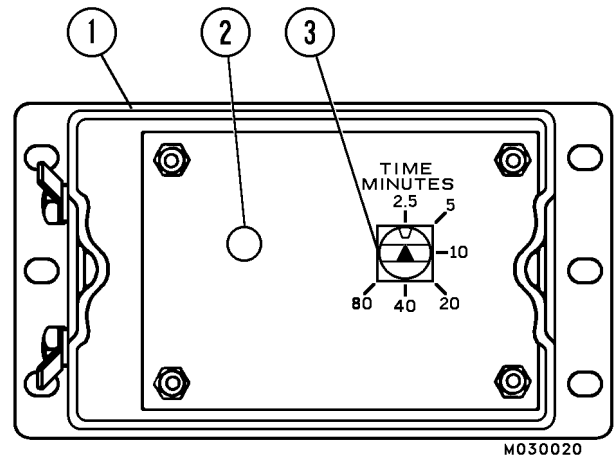


FIGURE 4-3. TIMER (TOP COVER REMOVED)

1. Timer
2. Red LED (Light Emitting Diode) indicates pump solenoid is "ON".
3. Timer Selector

NOTE: Set timer by turning the Selector knob (3) to the 2.5 minute setting point. Then, turn the Selector clockwise, one detent at a time, to the desired setting, or until the maximum limit of eighty minutes is reached.



The solid state timer is a sealed unit, do not attempt disassembly.

Injector Adjustment

The injectors may be adjusted to supply from 0.008 in³ to 0.08 in³ (0.13 cc to 1.31 cc) 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 the adjusting screw (2, Figure 4-4) 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 (2) fully counterclockwise until the indicating pin (1) just touches the adjusting screw. At the maximum delivery point about 0.38 inch (9.7 mm) 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 0.19 inch (4.8 mm) threads are showing. The injector will be set at minimum delivery point with about 0.009 inch (0.22 mm) 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.

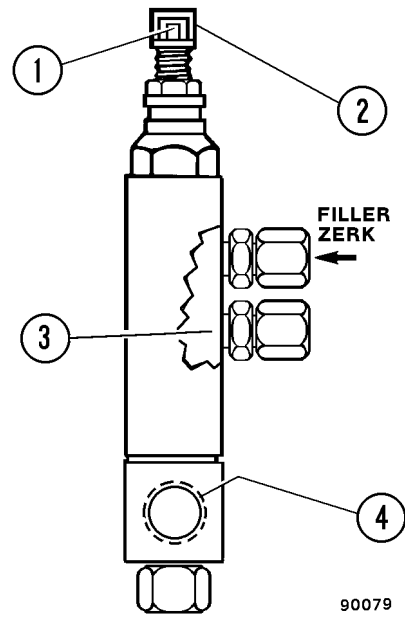


FIGURE 4-4. TYPE SL-1 SERIES INJECTOR

- | | |
|---------------------------|------------------------------|
| 1. Visible Indicator Stem | 3. Outlet – 0.125 in. N.P.T. |
| 2. Adjusting Screw | 4. Manifold |

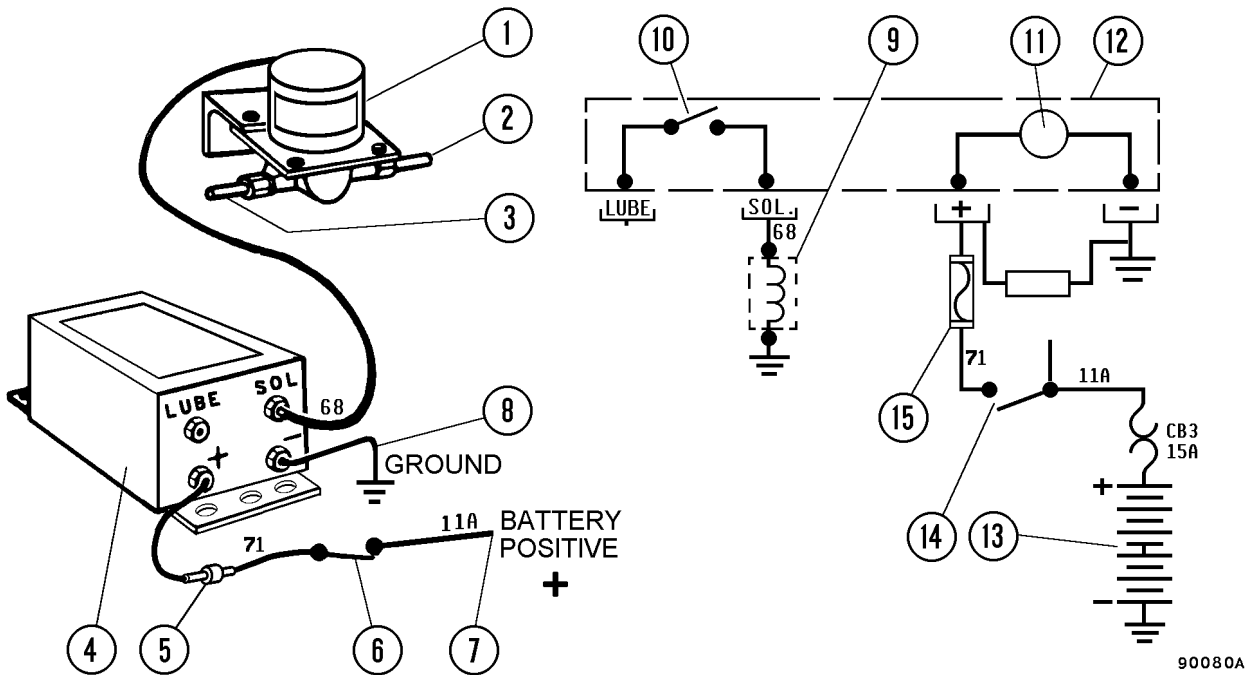


FIGURE 4-5. TYPICAL ELECTRICAL HOOKUP FOR AUTOMATIC LUBE

- | | | | |
|-----------------------|-------------------|-------------------------|------------------|
| 1. Solenoid Air Valve | 5. Fuse Holder | 9. Solenoid | 13. Battery |
| 2. Main Air Supply | 6. Keyswitch | 10. Relay | 14. Keyswitch |
| 3. To Air Pump Motor | 7. To Battery (+) | 11. Timer (solid State) | 15. 7.5 Amp Fuse |
| 4. Timer * | 8. To Ground (-) | 12. Timer (Housing) | |

* Keyswitch (6) must be closed ("ON") to energize Timer (4).

TROUBLESHOOTING CHART

POSSIBLE CAUSES

SUGGESTED CORRECTIVE ACTION

TROUBLE: Pump Does Not Operate.

Low air pressure.	Adjust air pressure to 60 – 65 psi (414 – 448 kPa), if necessary [90 psi (621 kPa) during cold weather].
Lube system not grounded.	Correct grounding connections to pump assembly and truck chassis.
Electrical power loss.	Locate cause of power loss and repair. 24 VDC power required; be sure keyswitch is "ON".
Timer malfunction.	Replace timer assembly
Solenoid valve malfunctioning.	Replace the solenoid valve assembly
Pump malfunction.	Replace pump assembly

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.

TROUBLE: Pump Will Not Prime

Low lubricant supply.	Check lubricant level in reservoir and service reservoir with specified grease until grease weeps from vent plug.
Dirt in reservoir, pump inlet clogged.	Clean reservoir completely, remove and clean pump assembly thoroughly.
Air trapped in pump.	Open vent plug counterclockwise with pump running. When grease flows freely from vent, close vent plug clockwise.

NOTE: System air applied to the lube system air pump is also applied to the vent valve. When the pump is operating, air pressure keeps the vent valve closed and grease is directed from the pump outlet and to the injectors. When air supply to the air motor is interrupted, the vent valve opens and supply pressure vents back to the reservoir.

Safety unloader valve faulty.	Replace safety unloader valve.
-------------------------------	--------------------------------

NOTE: The safety unloader valve prevents buildup of excessively high pressure in the lube system which could damage components. This valve is factory preset to open between 3750 - 4250 psi (25.9 - 29.3 MPa). The valve is not serviceable, nor is it adjustable.

Outlet check valve clogged.	Remove check valve from pump outlet, clean thoroughly or replace.
-----------------------------	---

POSSIBLE CAUSES

SUGGESTED CORRECTIVE ACTION

TROUBLE: Pump Will Not Build Pressure

Pump not primed.
Air trapped in lubricant supply line.
Lubricant supply line leaking.
Vent valve leaking.
Pump cylinder scored, by-passing air.

See items in "Pump Will Not Prime".
Prime system to remove trapped air.
Check lines and connections to repair leakage.
Clean or replace vent valve.
Repair or replace pump cylinder or pump assembly.

TROUBLE: Injector Indicator Stem Does Not Operate

NOTE: Normally, during operation, the injector indicator stem (Figure 4-4) 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.

Malfunctioning injector - usually indicated by the air pump building pressure and then venting.
All injectors inoperative - pump build up not sufficient to cycle injectors.

Replace individual injector assembly.
Service and/or replace pump assembly.

SPECIFICATIONS

ENGINE

The Komatsu 630E Haulpak truck is powered by a Detroit Diesel 16V-149TIB engine rated at 1800 HP (1342 kW) or a Cummins KTTA 50-C engine rated at 1800HP (1342 kW). Other engines may be specified as **optional** equipment.

ALTERNATOR

The diesel engine drives an alternator mounted in-line with the engine. The alternating current (AC) output of the alternator is rectified to direct current (DC) and sent to the DC drive wheel motors.

WHEEL MOTORS (GE 776)

The output of the alternator supplies electrical energy to the two wheel motors attached to the rear axle housing. 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 a console to the right side of the operator.

BLOWER

The blower supplies cooling air for the alternator, rectifiers, and both wheel motors. The air is then exhausted to the atmosphere through the wheel motors.

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 DC 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 truck goes to a preset overspeed setting.

OPERATOR'S CAB

The Operator's Cab has been engineered for operator comfort and to allow for efficient and safe operation of the truck. The cab is rubber mounted to reduce noise and vibration. It includes a tinted safety-glass windshield and sliding side windows for excellent visibility, a deluxe interior, controls mounted within easy reach of the operator, and an instrument panel which provides the operator with all instruments and gauges which are necessary to control and monitor the truck's operating systems.

POWER STEERING

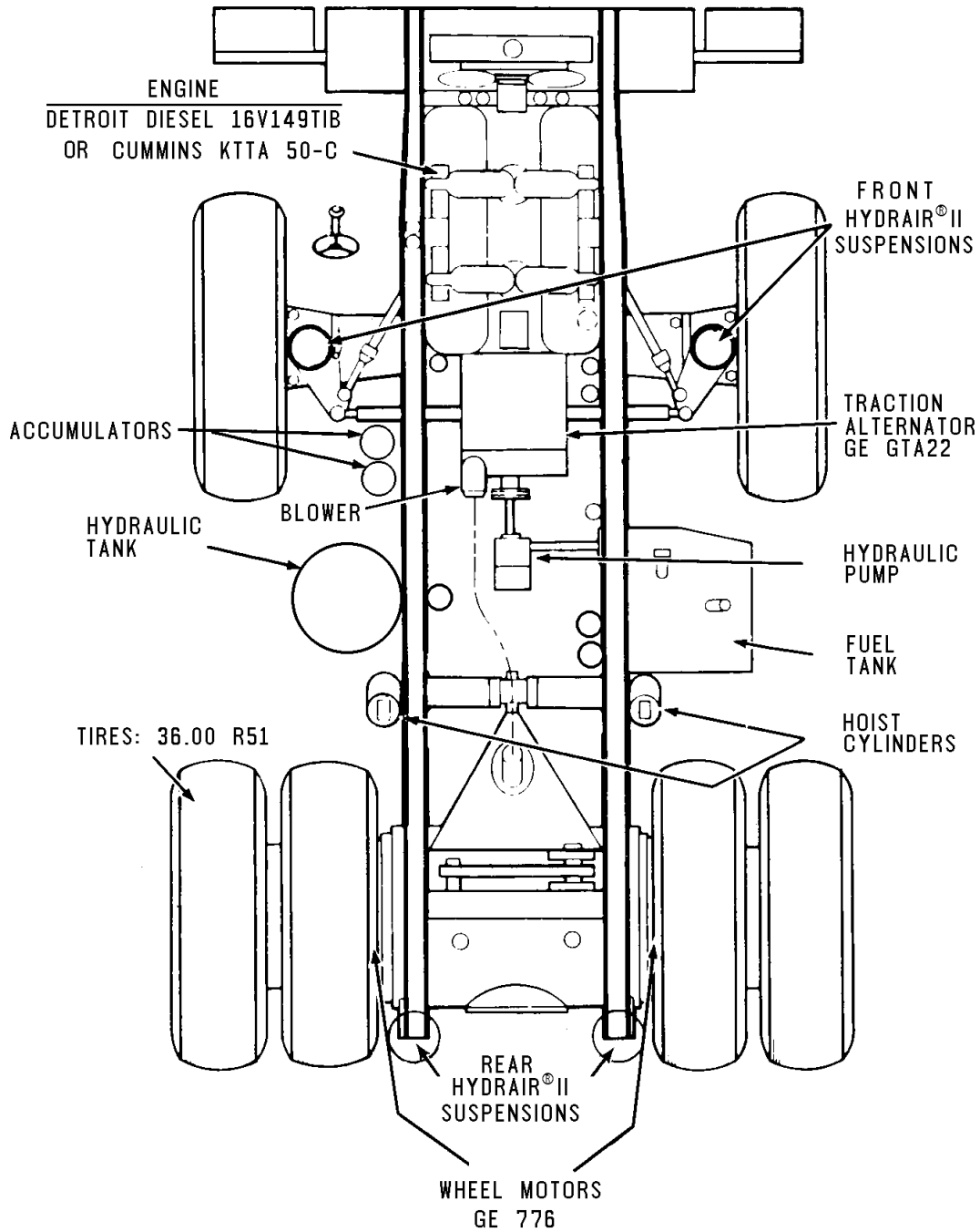
The truck is equipped with a full time power steering system which provides positive steering control with a minimum of effort by the operator. The system includes nitrogen-charged accumulators which automatically provide emergency power if the steering hydraulic pressure is reduced below an established minimum.

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 as described later in this manual. The brakes will be applied automatically if system pressure decreases below a preset minimum.

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.



630E MAJOR COMPONENTS

SPECIFICATIONS

ENGINES (Standard Options)

Cummins KTTA 50-C

Number of Cylinders 16
 Operating Cycle 4-Stroke
 Rated Brake HP . 1800 HP (1342 kW) @ 1900 RPM
 Flywheel HP . . . 1704 HP (1271 kW) @ 1900 RPM
 Weight (Dry) 10,895 lbs. (4942 kg)

Detroit Diesel 16V-149TIB

Number of Cylinders 16
 Operating Cycle 2-Stroke
 Rated Brake HP . 1800 HP (1342 kW) @ 1900 RPM
 Flywheel HP . . . 1704 HP (1271 kW) @ 1900 RPM
 Weight (Dry) 11,210 lbs. (5085 kg)

ELECTRIC DRIVE SYSTEM

STATEX III AC/DC Current

Alternator General Electric GTA - 22
 Motorized Wheels General Electric 776
 Standard Gear Ratio 28.85:1
 Maximum Speed 34.0 MPH (54.7 km/h)

DYNAMIC RETARDING

Electric Dynamic Retarding Standard
 Maximum Retarding 2677 HP (1996 kW)
 Optional 3700 HP(2759 kW)
 With Continuous Rated Blown Grids
 Extended Range Retarding
 Reverse Retarding

24Volt ELECTRIC SYSTEM

Batteries Two 12 Volt Batteries in Series
 140 Ampere-Hour Capacity
 With Disconnect Switch
 With OPTIONAL Electric Start:
 Batteries 4 (four)12 Volt Batteries
 2 in Series; 2 in parallel
 Alternator 24 Volt, 100 Ampere Output
 Lighting 24 Volt

SERVICE CAPACITIES

	U.S. Gallons	Liters
Crankcase (Includes lube oil filters)		
Detroit Diesel	50.0	189
Cummins	56.6	214
Cooling System	83	314
Fuel	850	3217
Hydraulic System	134	507
Wheel Motor Gear Box 4.5/Wheel		17/Wheel

AIR SYSTEM

Compressor . . Bendix-Westinghouse TU-FLO 501
 Capacity 12 ft³/min. (0.34 m³/min.)
 Starter with Interlock Ingersol Rand 815
 Optional, Electric Start
 Air Tank Capacity 15 cubic feet (425 liters)

HYDRAULIC SYSTEM

Pump . . . 145 GPM (549 liters/min.) @ 1900 RPM
 Relief Pressure- Hoist 2500 psi (17.2 MPa)
 Relief Pressure- Steering 3000 psi (20.7 MPa)
 Hoist 3-Stage Hydraulic Twin Cylinders
 Tank Non-Pressurized
 Service Capacity 134 U.S. Gal. (507 Liters)
 Filtration Accessible, Replaceable, Elements
 Suction Single, Full Flow, 100 Mesh
 Hoist & Steering High Pressure Filters
 Full Flow, 7 Micron

SERVICE BRAKES

Actuation All Hydraulic
 (Front) (Rear)
 Type Single Disc Dual Disc
 Wheel Speed Armature Speed

STEERING

Turning Circle (SAE) 80 ft. (24.4 m)
 Emergency Power Steering With Accumulators

DUMP BODY

Capacity:

Struck	101 yds ³	77 m ³
Heaped @ 2:1 (SAE)	135 yds ³	103 m ³
Width (Inside)	20 ft. 7 in. (6.27 m)		
Depth	7 ft. 8 in. (2.35 m)		
Loading Height	18 ft. 9 in. (5.71 m)		
Dumping Angle	45 ^o		

TIRES

Radial Tires (standard)	36.00 R51
Rock Service, Deep Tread	Tubeless
Tire Rims	Separable
Tires and Rims	Interchangeable

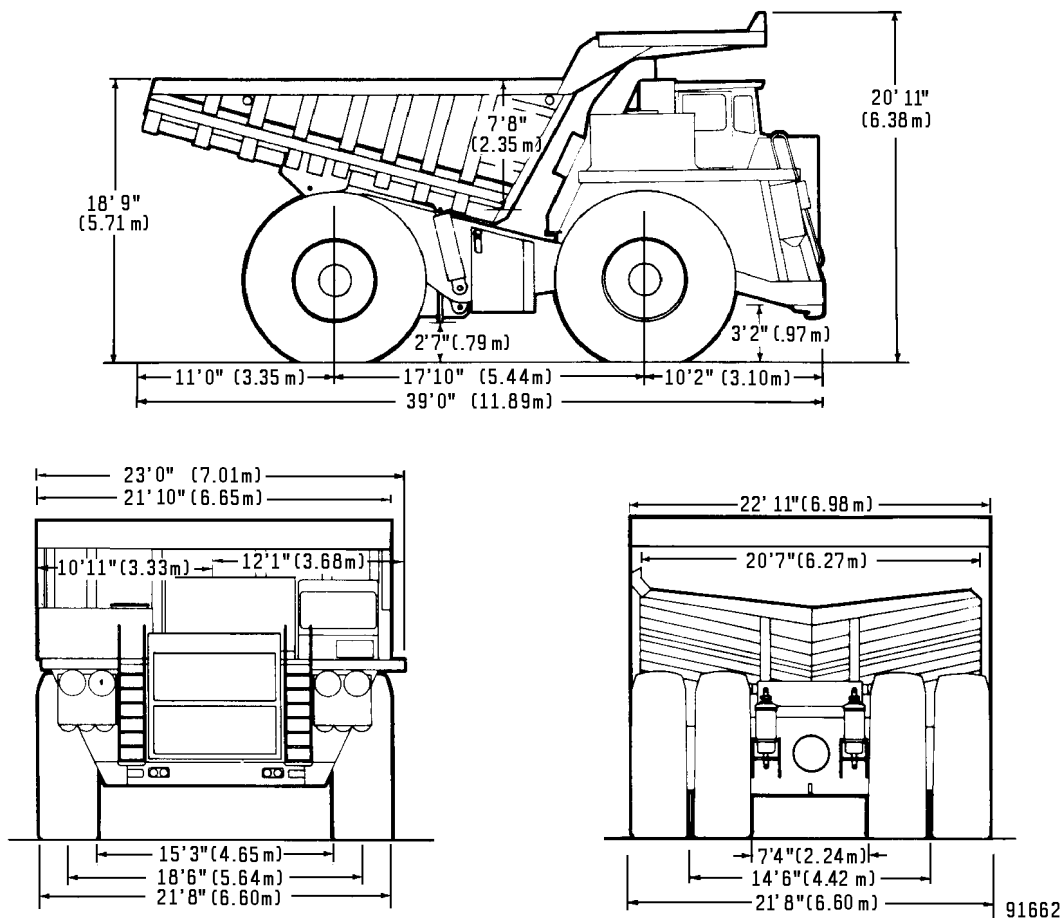
WEIGHT DISTRIBUTION

EMPTY	Pounds	Kilograms
Front Axle	117,150	53 138
Rear Axle	122,650	55 633
Total	239,800	108 771
LOADED		
Front Axle	206,600	93 712
Rear Axle	413,200	187 424
Total *	619,800	281 136

* Not to exceed 630,000 lbs. (285 763 kg) **including options, fuel and payload.**

Optional heavy duty components may be required to utilize this Gross Vehicle Weight limit. Contact Haulpak Division if clarification is required.

OVERALL TRUCK DIMENSIONS



All dimensions are with 101/135 cu.yd. (77/103 m³) body, 36.00 R51 tires, and 776 wheel motors.

PAYLOAD METER

GENERAL INFORMATION

The Payload Meter digitally displays the weight of the payload in a Haulpak truck in either short tons or metric tons. External deck mounted lights also indicate the payload weight as divided into three stages.

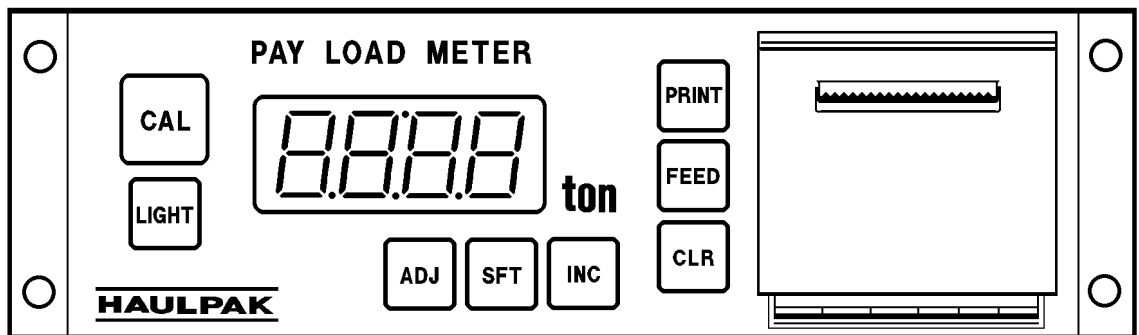
A forecast function flashes an external deck mounted light predicting the payload weight after the next bucket of material is dropped into the body.










Up to two hundred haul cycles of payload data can be stored in the payload meter's memory. The stored data is backed up by an internal battery and can be printed out on demand.

The Payload Meter calculates the payload weight by sensing Hydrair suspension pressures and the pitch angle of the truck. A pressure sensor is mounted on each suspension and an inclinometer is mounted in the cab.

Logic inputs include a wheel brake lock signal, body up signal, short/metric ton display select and two model select inputs.

FRONT PANEL CONTROLS



- | | |
|---|--|
|  | Calibration Switch - Carry out routine calibration of the Payload Meter. |
|  | Light Switch - Adjust the brightness of load indicating display. |
|  | Adjustment Switch - Select time setting mode. |
|  | Shift Switch - In time setting mode, selects the digit to be changed. |
|  | Increment Switch - Advance the digit selected in time setting mode. |
|  | Clear Switch - Erase haul cycle data stored in the Payload Meter. |
|  | Feed Switch - Feed paper to the printer. |
|  | Print Switch - Print payload data stored in the Payload Meter. |
|  | Printer paper cover. |

OPERATION AND FUNCTIONS

When power is applied to the Payload Meter, a self test function turns on all LED segments and the deck mounted lights. The LED segments remain lit for 3 seconds. Then the time of day is displayed for 7 seconds. When the 10 second self test is complete, the deck mounted lights turn off and normal display logic begins.

NOTE: For best results, the truck should be positioned on a level surface with rear tires not positioned on large rocks or berms while being loaded.

DISPLAY LOGIC

The Payload Meter displays payload weight, the time of day, or 0 according to the following logic.

1. **Time of day** is displayed if the wheel brake lock is off.
2. **Payload weight** is displayed when the wheel brake lock is on and the payload is greater than 5% of rated payload.
3. **0** is displayed:
 - a. For one second after the wheel brake lock is switched off **or**
 - b. The wheel brake lock is on and the payload is less than 5% of rated payload **or**
 - c. The body is up.

METRIC / SHORT TON SELECTION

The payload meter can display either metric tons or short tons. The displayed payload weight can be changed to metric tons by installing an EB0865 jumper wire in the plug socket provided in the payload meter harness near the number 21 pin payload meter connector.

To display and store short tons - no jumper.

To display and store metric tons - install jumper.

DECK MOUNTED LIGHTS

The Payload Meter controls three relays that are located near the payload meter. The relays operate six deck mounted lights, three on each side of the truck. On each side of the truck there is one green light, one amber light and one red light. The lights come on according to the following schedule:

DECK MOUNTED LIGHTS			PAYLOAD WEIGHT
GREEN	OFF	OFF	50% and Greater
GREEN	AMBER	OFF	90% and Greater
GREEN	AMBER	RED	105% and Greater

The shovel or loader operator can predict the payload weight by observing these lights. During the loading operation a forecast function flashes a deck mounted light predicting the payload weight after the next bucket of material is dropped into the body. The logic is as follows:

1. If the measured payload is varying 3% or less of the rated load for more than 0.5 second, the current load is deemed a steady value.
2. If the difference between the previous steady value and the current steady value is greater than 15% of rated load or greater than 10 tons, the difference is taken to be the size of the current bucket.
3. The average size of previous buckets is added to the **current** load. The deck mounted light that will come on if another "average" bucket is dropped in the body will blink at one second intervals.

DATA STORAGE LOGIC

Load data is stored in the battery-backed memory when the wheel brake lock is turned "off", if:

1. The previous payload has been reduced to a level lower than 20% of rated payload **and**
2. The current payload is greater than 50% of rated payload.

Note: This logic prevents the payload meter from recording the current payload weight more than once if the wheel brake lock is used while the truck is loaded.

The payload meter has the capacity to store data for two hundred haul cycles.

DATA PRINT OUT

The data stored in memory will be printed when the "PRINT" button is pushed for one second. If data has been cleared from memory with the clear function the message "NO DATA" will be printed. The printer is a thermal type and has an approximate life of 500,000 lines.

** PAY-LOAD**	
'90-02-27	— DATE OF PRINT OUT.
OPERATOR	
MACHINE NO.	
TOTAL CYCLE	
8 (cycle)	— NUMBER OF LOADS DUMPED.
*TOTAL WEIGHT	
1897 (ton)	— TOTAL PAYLOAD HAULED SINCE LAST CLEAR.
'90- 2-24	

NO: TIME: ton	

1: 4:51:240	
2: 5:01:236	
	LOAD NUMBER.
'90- 2-25	
3: 7:38:237	
4: 8:07:238	
5: 8:43:235	
6: 9:22:232	
'90- 2-27	— TIME WHEN WHEEL BRAKE LOCK SWITCH WAS
7:15:31:240	TURNED OFF (TRUCK LOADED, LEAVING SHOVEL).
8:15:52:239	

TOTAL: 1897	— PAYLOAD WEIGHT IN TONS.

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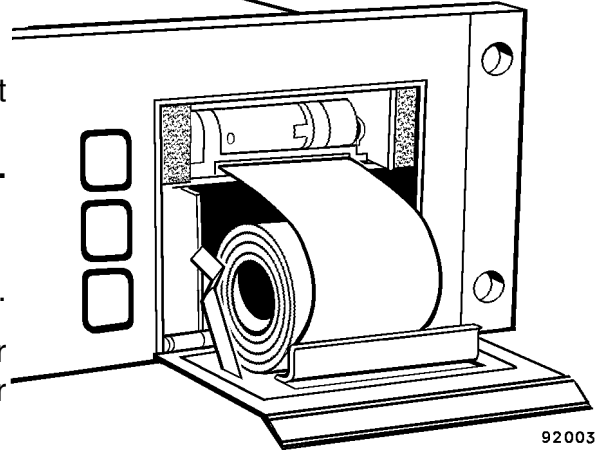
This is a sample print-out only. Actual data will vary according to truck model, payload capacity, location and operating conditions. **DO NOT** exceed the factory recommended **MAXIMUM PAYLOAD RATING**.

REPLACING PRINTER PAPER

A roll of printer paper is 26 ft. long. This will print about 1900 lines of data. When the roll of paper is 12 in. from the end a red line appears indicating replacement is necessary.

To replace paper:

1. Press the "FEED" button to roll out the remaining paper.
Do not forcibly pull the paper out.
2. Pull the cover open from the top.
3. Unroll about 3 inches from a new roll.
4. Hold the new roll in front of the printer paper input with the 3 inch leader coming from the top of the roll.



5. Insert the leader into the printer paper input and press the "FEED" button. Hold the button until about 6 inches has fed through the printer.
6. Pass the paper through the cover and close.

CLEAR MEMORY

NOTE: Print out all data stored in memory before clearing memory.

1. Push the "CLEAR" button for 1 second. Display will blink "CLEA".
2. Push the "CLEAR" button again. Display will show "CLEA" for 3 seconds then return to normal display logic.

NOTE: To cancel clear operation when display is blinking "CLEA", push "CAL".

CALIBRATION

The calibration function measures and stores in memory the empty truck sprung weight. This data is subtracted from live load data to calculate payload weight. During calibration suspension pressure sensors and inclinometer outputs are acquired and averaged over a 30 seconds interval while the empty truck is driven at a steady 6 MPH on a level smooth haul road. This data is not lost when power is removed from the payload meter. Carry out the calibration procedure:

- After delivery of the machine
- After adjusting suspension oil/gas charge
- After modifying the machine
- After adjusting tire pressure
- After replacing a sensor
- After a sensor check indicates the no load weight has changed.

To perform calibration:

1. Stop the truck and set the wheel brake lock.

NOTE: If the "CAL" button is pressed while the wheel brake lock is off, the "CAL" button will be ignored.

2. Press the "CAL" button. The display will blink "CAL". To cancel press the "CAL" button again. The display will blink "SCH". Press the "CAL" button one more time and the display will return to normal display logic.
3. Begin driving the empty truck at 6 MPH on a level smooth haul road. Press the "CAL" button again. The display will stop blinking and "CAL" will be displayed. Continue to drive the truck. After 30 seconds the display will return to the time of day display and calibration will be complete.

SENSOR CHECK

A sensor check is performed to determine if the empty condition of the truck has changed or a sensor's sensitivity has changed. Pressure and inclinometer outputs are measured under the same conditions as the calibration procedure. An error code will be displayed if a sensor is out of order. See error code table. If an error code is displayed carry out the calibration procedure.

To perform a sensor check:

1. Stop the truck and set the wheel brake lock.

NOTE: If the "CAL" button is pressed while the wheel brake lock is off, the "CAL" button will be ignored.

2. Press the "CAL" button. The display will blink "CAL".
3. Press the "CAL" button again. The display will blink "SCH". To cancel press the "CAL" button one more time and the display will return to normal display logic.
4. Begin driving the empty truck at 6 MPH on a level smooth haul road. Press the "CAL" button again. The display will stop blinking and "SCH" will be displayed. Continue to drive the truck. After 30 seconds the display will return to the time of day display **or** an error code will be displayed and the sensor check will be complete.

DIMMING DISPLAY

Press the "LIGHT" button and hold. The LED display will dim in ten steps. Release the button at the desired level.

SETTING THE TIME OF DAY

1. Press the "ADJ" button and hold until the digits begin blinking.
2. Press the "INC" button to change the blinking digits. The time is displayed as a 24 hour clock.
3. Press the "SFT" button to blink the hours digits, then month, day and year digits.
4. Press the "ADJ" button to end the time setting function.

The clock accuracy is ± 3 minutes per month.

ERROR CODES

The payload meter continually monitors the status of the sensor inputs and relay driver outputs. If an abnormality is found, an error code is displayed. Once an error code has appeared, it may be canceled by pressing the "CAL" button or cycling the power.

ERROR CODE	ERROR CODE TABLE DESCRIPTION	DETECT TIME DELAY
E-31 E-32 E-33	18 Volt sensor power short circuit to ground. Relay short circuit. Backup battery voltage less than 2.6 volts.	5.0 sec. 0.1 sec. 5.0 sec.
E-01 E-02 E-03 E-04	Right rear sensor disconnected – circuit 39FA. Left rear sensor disconnected – circuit 39FB. Right front sensor disconnected – circuit 39FC. Left front sensor disconnected – circuit 39FD.	5.0 sec.
E-11 E-12 E-13 E-14	Right rear sensor short circuit. Left rear sensor short circuit. Right front sensor short circuit. Left front sensor short circuit.	5.0 min.
E-41 E-42	Inclinometer output $\geq + 10$ degrees. Inclinometer output $\leq - 10$ degrees.	5.0 min.
PAPE	Paper jammed.	10 sec.
FULL	Memory full (200 haul cycles).	
E-21 E-22 E-23 E-24	Right rear sensor check error. Left rear sensor check error. Right front sensor check error. Left front sensor check error.	
Once an error code has appeared, it may be cancelled by pushing the "CAL" button or cycling the power.		

NOTES

PORTIONS OF THIS PRODUCT RELATING TO PAYLOAD MEASURING SYSTEMS ARE
MANUFACTURED UNDER LICENSE FROM

L. G. HAGENBUCH holder of
U.S. Patent Numbers 4,831,539 and 4,839,835

NOTES:

KOMATSU