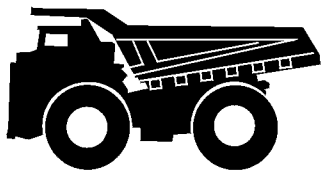
Operation & Maintenance Manual

DG716



530M

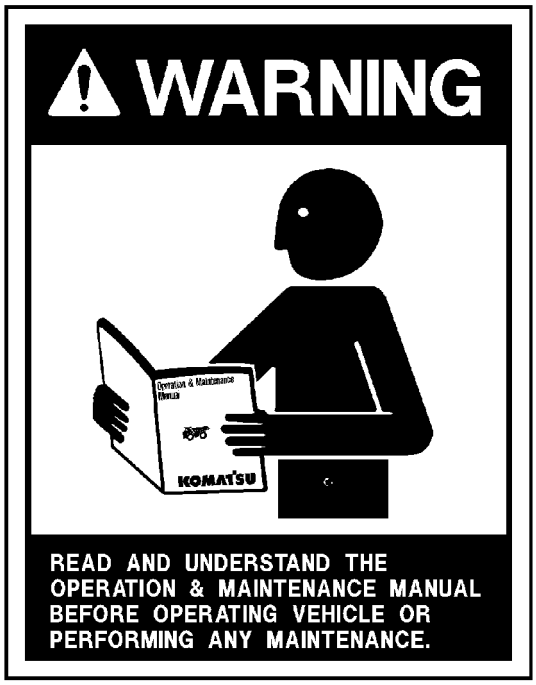
DUMP TRUCK

SERIAL SUFFIX **AFP49**
A30003 and up

KOMATSU

⚠WARNING

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.



This material is proprietary to Komatsu Mining Systems, Inc. and is not to be reproduced, used, or disclosed except in accordance with written authorization from Komatsu Mining Systems, Inc.

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 distributor for information on the latest revision.

CALIFORNIA
Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

530M

KOMATSU

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.

This manual shows dimensioning of metric and (U.S. standard) 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.

Standard torque requirements are shown in torque charts in the Introduction section and individual torques are provided in the text in bold face type, such as **723 kg.m (100 ft.lbs.)** torque. All torque specifications have ± 10% tolerance unless otherwise specified.

A Product Identification plate is normally located on the truck frame upright in front of the left 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 Haulpak Model designation consists of three numbers and one letter (i.e. 530M). The three numbers represent the basic truck model. The letter "M" designates a Mechanical drive system, 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

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

WARNING

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

CAUTION

"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.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

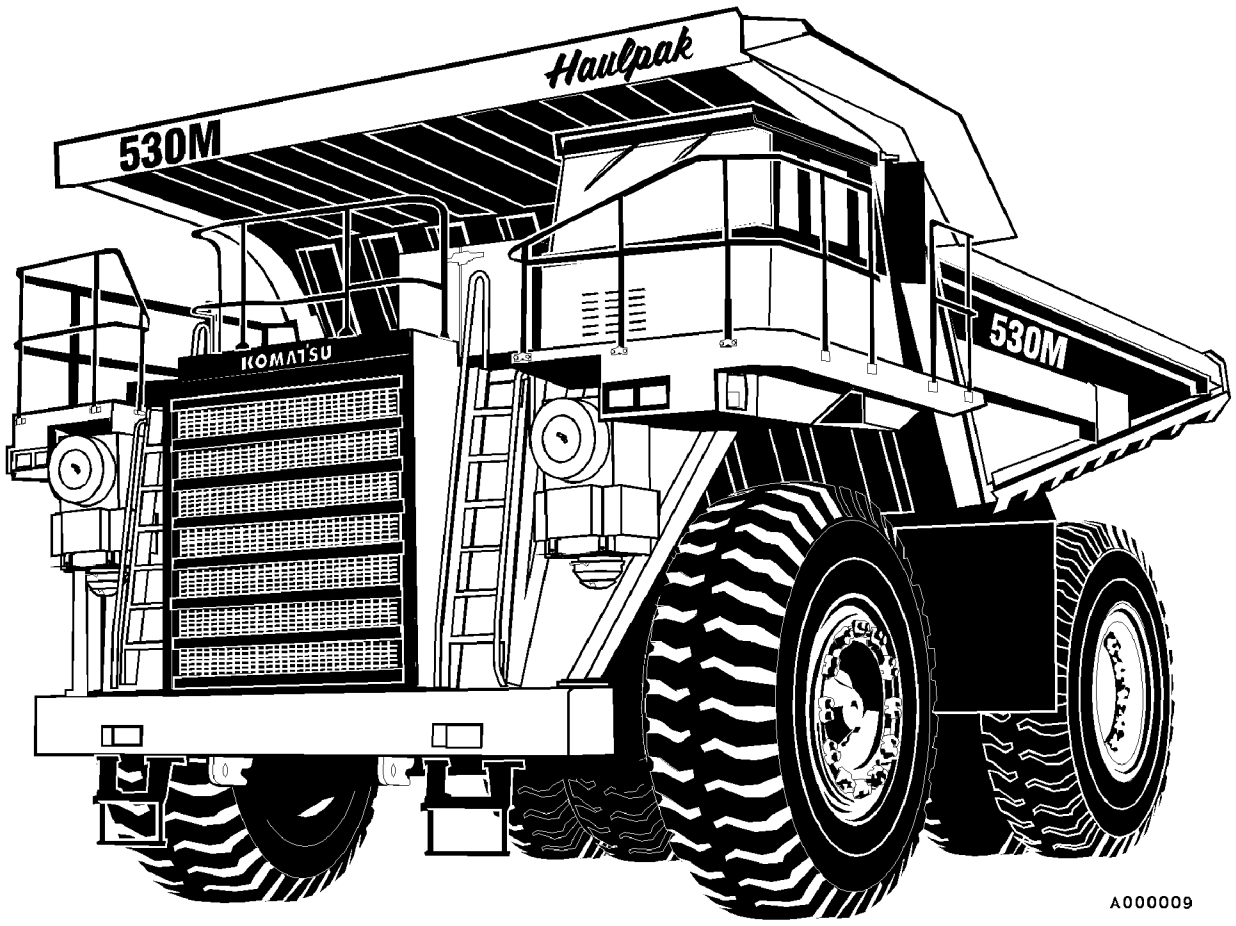
TABLE OF CONTENTS (Continued)

SUBJECT . . . . . SECTION / PAGE

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 Service Manual.
Refer to the engine manufacturer’s service manual when servicing the engine.

This portion of the manual covers major component descriptions and truck specifications.

This portion of the manual covers operation/maintenance of OPTIONAL EQUIPMENT.



KOMATSU 530M 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.

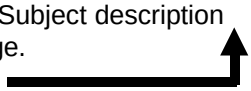
The front cover of this manual includes a Form Number. This Form No. should be referenced when ordering additional copies of this manual, or for any other correspondence regarding the coverage in this manual.

Direct all inquiries to:

KOMATSU MINING SYSTEMS, INC.
Peoria Operations, Service Publications
P.O. Box 240
Peoria, IL 61650-0240
(309)-672-7072 – FAX

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 metric and (U.S. standard) 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 **723 kg.m (100 ft.lbs.)** torque. All torque specifications have ± 10% tolerance unless otherwise specified.

NOTES

STANDARD TABLES

This manual provides dual dimensioning for many specifications. Metric units are specified first, with U.S. standard units in parentheses. References throughout the manual to standard torques or other standard values will be to one of the following Tables.

For values not shown in any of the charts or tables, standard conversion factors for most commonly used measurements are provided in TABLES I and .

NOTE: Portions of this truck may be assembled with SAE (U.S.) hardware.
BE SURE TO REFER TO THE CORRECT TABLE!

INDEX OF TABLES

TABLE I – COMMON CONVERSIONS 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)	9.8068
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

TABLE I
STANDARD TIGHTENING TORQUE FOR
METRIC HEX HEAD CAPSCREW AND NUT ASSEMBLY

Capscrew Thread Diameter (mm)	Width Across Flat (mm)	Kilogram.meters (kg.m) Tolerances ± 10%	Newton.meters (N.m) Tolerances ± 10%	Foot Pounds (ft.lbs.) Tolerances ± 10%
6	10	1.35	13.2	10
8	13	3.2	31.4	23
10	17	6.7	65.7	48
12	19	11.5	112	83
14	22	18.0	177	130
16	24	28.5	279	206
18	27	39.0	383	282
20	30	56.0	549	405
22	32	76.0	745	550
24	36	94.5	927	684
27	41	135	1320	975
30	46	175	1720	1266
33	50	225	2210	1630
36	55	280	2750	2025
39	60	335	3280	2420

This Table represents standard values only.
Do not use these values to replace torque values which are specified in the Service Manual instructions.

TABLE III
TIGHTENING TORQUE FOR SPLIT FLANGE BOLTS

Capscrew Thread Diameter (mm)	Width Across Flat (mm)	Kilogram.meters (kg.m) Tolerances ± 10%	Newton.meters (N.m) Tolerances ± 10%	Foot Pounds (ft.lbs.) Tolerances ± 10%
10	14	6.7	65.7	48
12	17	11.5	112	83
16	22	28.5	279	206

This Table represents standard values only.
Do not use these values to replace torque values which are specified in the Service Manual instructions.

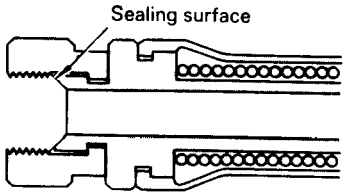


TABLE IV
TIGHTENING TORQUE FOR FLARED TUBE AND HOSE FITTINGS

Thread Diameter of Nut (mm)	Width Across Flat (mm)	Kilogram.meters (kg.m) Tolerances ± 10%	Newton.meters (N.m) Tolerances ± 10%	Foot Pounds (ft.lbs.) Tolerances ± 10%
14	19	2.5	25	18
18	24	5	50	36
22	27	8	80	58
24	32	14	140	101
30	36	18	175	130
33	41	20	195	145
36	46	25	245	180
42	55	30	295	215

TABLE V TEMPERATURE CONVERSIONS

FORMULA: F° – 32 ÷ 1.8 = C° C° x 1.8 + 32 = F°

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	293	– 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 VI TORQUE CONVERSIONS
kilogram.meter - kg.m To Foot Pounds – (ft.lbs.)
1 kg.m = 7.2339 ft.lbs.

kg.m	0	1	2	3	4	5	6	7	8	9
0	**(ft. lbs.)**	7.23	14.5	21.7	28.9	36.2	43.4	50.6	57.9	65.1
10	72.3	79.6	86.8	94.0	101.3	108.5	115.7	123.0	130.2	137.4
20	144.7	151.9	159.1	166.4	173.6	180.8	188.1	195.3	202.5	209.8
30	217.0	224.2	231.5	238.7	245.9	253.2	260.4	267.6	274.9	282.1
40	289.3	296.5	303.8	311.0	318.2	325.5	332.7	339.9	347.2	354.4
50	361.6	368.9	376.1	383.3	390.6	397.8	405.0	412.3	419.5	426.7
60	434.0	441.2	448.4	455.7	462.9	470.1	477.4	484.6	491.8	499.1
70	506.3	513.5	520.8	528.0	535.2	542.5	549.7	556.9	564.2	571.4
80	578.6	585.9	593.1	600.3	607.6	614.8	622.0	629.3	636.5	643.7
90	651.0	658.2	665.4	672.7	679.9	687.1	694.4	701.6	708.8	716.1

TABLE VII TORQUE CONVERSIONS
kilogram.meter - kg.m To Newton.meters (N.m)
1 kg.m = 9.807 N.m

kg.m	0	1	2	3	4	5	6	7	8	9
0	**(N.m)**	9.8	19.6	29.4	39.2	49.0	58.8	68.6	78.5	88.3
10	98.1	107.9	117.7	127.5	137.3	147.1	156.9	166.7	176.5	186.3
20	196.1	205.9	215.8	225.6	235.4	245.2	255.0	264.8	274.6	284.4
30	294.2	304.0	313.8	323.6	333.4	343.2	353.1	362.9	372.7	382.5
40	392.3	402.1	411.9	421.7	431.5	441.3	451.1	460.9	470.7	480.5
50	490.4	500.2	510.0	519.8	529.6	539.4	549.2	559.0	568.8	578.6
60	588.4	598.2	608.0	617.8	627.6	637.5	647.3	657.1	666.9	676.7
70	686.5	696.3	706.1	716.0	725.7	735.5	745.3	755.1	764.9	774.8
80	784.6	794.4	804.2	814.0	823.8	833.6	843.4	853.2	863.0	872.8
90	882.6	892.4	902.2	912.1	921.9	931.7	941.5	951.3	961.1	970.9

TABLE VIII PRESSURE CONVERSIONS
kilograms/cm^2 (kg/cm^2) To pounds per sq. in. (psi)
1 kg/cm^2 = 14.2231 psi

kg/cm^2	0	1	2	3	4	5	6	7	8	9
0	**(psi)**	14.2	28.4	42.7	56.9	71.1	85.3	99.6	113.8	128.0
10	142.2	156.5	170.7	185.0	199.1	213.3	227.6	241.8	256.0	270.2
20	284.5	298.7	312.9	327.1	341.4	355.6	369.8	384.0	398.2	412.5
30	426.7	440.9	455.1	469.4	483.6	497.8	512.0	526.3	540.5	554.7
40	568.9	583.1	597.4	611.6	625.8	640.0	654.3	668.5	682.7	696.9
50	711.2	725.4	739.6	753.8	768.0	782.3	796.5	810.7	824.9	839.2
60	853.4	867.6	881.8	896.1	910.3	924.5	938.7	952.9	967.2	981.4
70	995.6	1009.8	1024.1	1038.3	1052.5	1066.7	1081.0	1095.2	1109.4	1123.6
80	1137.8	1152.1	1166.3	1180.5	1194.7	1209.0	1223.2	1237.4	1251.6	1265.9
90	1280.1	1294.3	1308.5	1322.7	1337.0	1351.2	1365.4	1379.6	1393.9	1408.1

TABLE IX PRESSURE CONVERSIONS
kilograms/cm^2 (kg/cm^2) To kilopascals (kPa)
1 kg/cm^2 = 9.8068 kPa

kg/cm^2	0	1	2	3	4	5	6	7	8	9
0	**(kPa)**	9.81	19.6	29.4	39.2	49.0	58.8	68.6	78.5	88.3
10	98.1	107.9	117.7	127.5	137.3	147.1	156.9	166.7	176.5	186.3
20	196.1	205.9	215.7	225.6	235.4	245,2	255.0	264.8	274.6	284.4
30	294.2	304.0	313.8	323.6	333.4	343.2	353.0	362.9	372.7	382.5
40	392.3	402.1	411.9	421.7	431.5	441.3	451.1	460.9	470.7	480.5
50	490.3	500.1	510.0	519.8	529.6	539.4	549.2	559.0	568.8	578.6
60	588.4	598.2	608.0	617.8	627.6	637.4	647.2	657.1	666.9	676.7
70	686.5	696.3	706.1	715.9	725.7	735.5	745.3	755.1	764.9	774.7
80	784.5	794.4	804.2	814.0	823.8	833.6	843.4	853.2	863.0	872.8
90	882.6	892.4	902.2	912.0	921.8	931.6	941.5	951.3	961.1	970.9

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

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

Example: Convert 955 kg.m to foot pounds (ft.lbs.).

1. Select Table VI.
2. Go to **kg.m** row **90**, column **5**; read 931.7
   95 kg.m = 931.7 ft.lbs.
3. Multiply by 10:
   950 kg.m = 9317 ft.lbs.
4. Go to **kg.m** row **0**, column **5**; read 49.0
   5 kg.m = 49 ft.lbs. Add to step 3.
5. 950 + 5 kg.m = 9317 + 49 = 9366 ft.lbs.
   955 kg.m = 9366 ft.lbs.

SEALANTS AND ADHESIVES			
Nomenclature	Code	Three Bond	Applications
Adhesives	LT-1A	TB1521	Used to apply rubber pads, rubber gaskets and cork plugs.
	LT-1B	1000B - 1000W	Used to apply resin, rubber, metallic and non-metallic parts when a fast, strong seal is needed.
	LT-2	TB1374	Preventing bolts, nuts and plugs from loosening and leaking oil.
	LT-2A	TB2411	Preventing bolts, nuts and plugs from loosening and leaking oil. (1)
	LT-2B	TB2403	Preventing bolts, nuts and plugs from loosening and leaking oil. (2)
	LT-2C	TB2430 or TB2440	Preventing bolts, nuts and plugs from loosening and leaking oil. (2)
	LT-3 Main bond	TB2001	Provides an airtight, electrically insulating seal. Used for aluminum surfaces.
	Hardening agent	TB2105	
Liquid Gasket	LG-1	TB1108B	Used with gaskets and packings to increase sealing effect.
	LG-3	TB1107	Heat-resistant gasket for precombustion chambers and exhaust piping.
	LG-4	TB1104	Used by itself on mounting surfaces on the final drive and transmission cases. Thickness after tightening: 0.07-0.08 mm (0.0027-0.0032 in)
	LG-5	TB1110	Used by itself to seal grease fittings, tapered screw fittings and tapered screw fittings in hydraulic circuits of less than 50 mm (2 in) in diameter.
Antifriction compound	LM-P	--	Applied to bearings and taper shafts to facilitate press-fitting and to prevent sticking, burning or rusting.
Grease	G2-LI	--	Applied to bearings, sliding parts and oil seals for lubrication, rust prevention and facilitation of assembling work.
Vaseline	--	--	Used for protecting battery electrode terminals from corrosion.

(1) Used for threaded areas (for example, plug, nipple, elbow etc.) which are removable and a pressure of 20 kg/cm^2 (285 psi) or less.

(2) Used for threaded areas (for example, stud, etc.) which are not removable and a pressure of 20 kg/cm^2 (285 psi) or less.

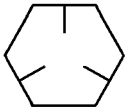
NOTE:
These sealants and adhesives are manufactured and sold by Three Bond U.S.A., Inc.

For information, call or write to:

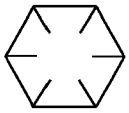
Three Bond U.S.A., Inc.
6184 Schumacher Park Drive
West Chester, OH 45069
Telephone: (513) 779-7300
Fax: (513) 779-7375

PART NUMBERS	
Three Bond	Komatsu
TB1374	09940-00030
TB1521	790-129-9030
TB1104	790-129-9020
TB1108B	790-129-9010

TABLE XI
STANDARD TORQUE CHART
SAE HEX HEAD CAPSCREW AND NUT ASSEMBLY
(LUBRICATED THREADS)
TOLERANCES ± 10%



GRADE 5



GRADE 8

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

TABLE XII – Standard Assembly Torques For 12-Point, Grade 9, Capscrews (SAE)

The following specifications appy 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 ± 10% of the torque value shown.

TABLE XII - 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.

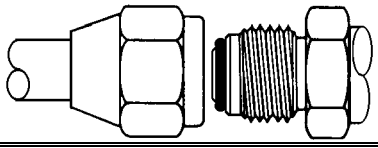


TABLE XIII
TORQUE CHART FOR JIC 37° SWIVEL NUTS
WITH OR WITHOUT O-RING SEAL

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

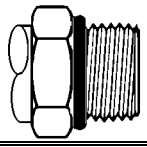


TABLE XV
TORQUE CHART FOR
O-RING BOSS FITTINGS

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

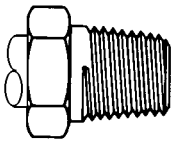


TABLE XIV
TORQUE CHART FOR
PIPE THREAD FITTINGS

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

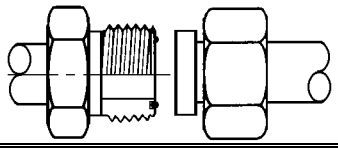


TABLE XVI
TORQUE CHART FOR
O-RING FACE SEAL FITTINGS

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 XVII – COMMON CONVERSIONS 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

GENERAL SAFETY

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

⚠WARNING

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

SAFETY RULES

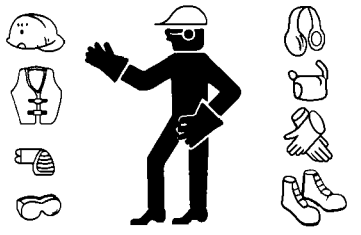
- ONLY trained and authorized personnel can operate and maintain the machine.
- Follow all safety rules, precautions and instructions when operating or performing maintenance on the machine.
- When working with another operator or a person on worksite traffic duty, be sure all personnel understand all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


A0055010

UNAUTHORIZED MODIFICATION

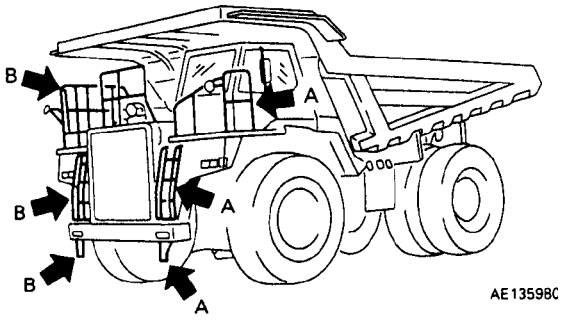
- Any modification made without authorization from Komatsu can create hazards.
- Before making a modification, consult your Komatsu distributor. Komatsu will not be responsible for any injury or damage caused by any unauthorized modification.

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 HOLD position, then apply the lock.
- 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.

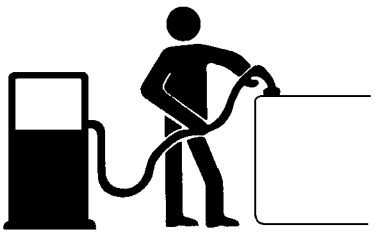


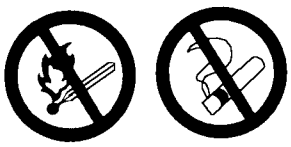
FIRE PREVENTION FOR FUEL AND OIL

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.


A0055020


A0055030


A0055040

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.


A0055050

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.

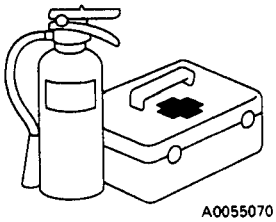

A0055060

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.


A0055070

PRECAUTIONS WHEN USING ROPS

- If ROPS is installed, the ROPS must never be removed when operating the machine.
- The ROPS is installed to protect the operator if the machine should roll over. If 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.
- When modifying or repairing the ROPS, always contact your Komatsu distributor.
- Even if the ROPS is installed, it cannot show its full effect 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

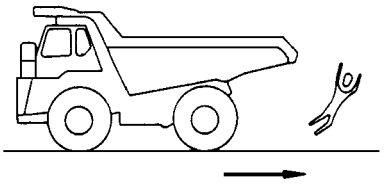
WHEN STARTING ENGINE

- 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 buzzer, check that the alarm buzzer 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.


AE132050

- 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 back-up alarm or rear view mirror.

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 brake 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.

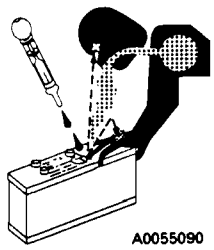
PARKING THE MACHINE

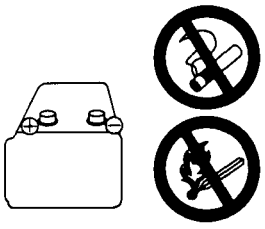
- Choose a horizontal road surface to park the machine. If the machine has to be parked on a slope, always put blocks under all the wheels to prevent the machine from moving.
- When parking on public roads, provide fences and signs, such as flags or lights, on the machine to warn pedestrians and other 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.


A0055090

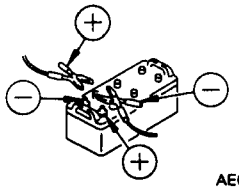

A0055100


A0055110

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

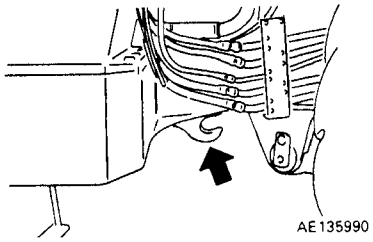

AE063650


A0055110

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.



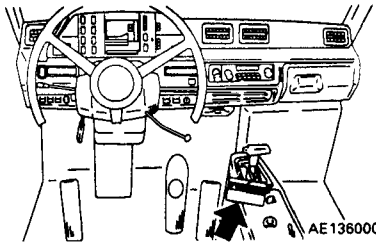
(For towing method, see Section 3, “Operating Instructions”, page 3-12.)

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.

PERIODIC REPLACEMENT OF CRITICAL PARTS

- Periodically replace parts used to insure safety or prevent accident. (See "PERIODIC REPLACEMENT OF COMPONENT PARTS FOR SAFETY DEVICES", Section 4.)
- 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 transmission lever to the neutral position and the parking brake lever to the PARKING position. Always carry out the work with two people. One person should sit on the operator's seat so that he can stop the engine if necessary. NEVER move any controls you do not need to operate.
- When servicing the machine, be careful not to touch any moving part or get your clothes caught.
- Put blocks under the wheels.
- When carrying out service with the dump body raised, always place the dump lever at the HOLD position, apply the lock, and insert the safety pins 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 on you or others, serious injury could result.

A0055130

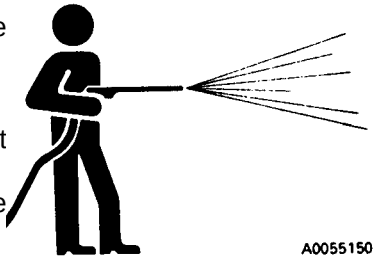
WORK UNDER THE MACHINE

- 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.

A0055140

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.

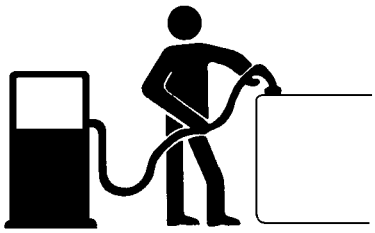


A0055150

RULES TO FOLLOW WHEN ADDING FUEL OR OIL

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

A0055020

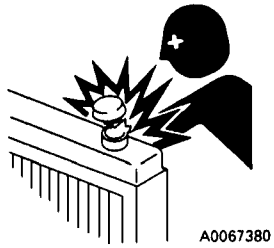


A0055030

A0055040

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.


A0067380

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.


A0055160

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.


A0055170

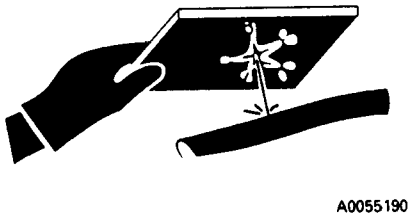
HANDLING HIGH-PRESSURE HOSES

- 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.


A0055180


A0055190

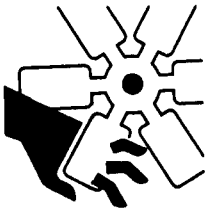
PRECAUTIONS WHEN CARRYING OUT MAINTENANCE AT HIGH TEMPERATURE OR HIGH PRESSURE

- 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.


A0055050

ROTATING FAN AND BELT

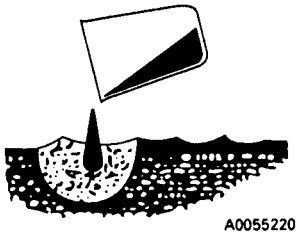
- Keep away from rotating parts and be careful not to let anything get caught in them.
- If your body or tools touch the fan blades or fan belt, they may be cut off or sent flying, so never touch any rotating parts.


A0063830

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


A0055220

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:

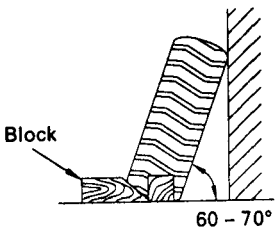
- Welding the rim
- Building fires or carrying out welding near the wheel or tire.

A0055110

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.



A0060880

A0055130

WHEN REPAIRS ARE NECESSARY

1. Only qualified maintenance personnel who understand the systems being repaired should accomplish repairs.
2. Many components on the 530M 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 auxililary 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 transmission electronic control components before making welding repairs.

   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.

ADDITIONAL JOB SITE RULES

Use this space to add any ADDITIONAL Job Site Rules not covered in any of the previous discussions.

WARNINGS AND CAUTIONS

The following pages give an explanation of the Warning, Caution, and Service Instruction plates and decals attached to the 530M Truck. The plates and decals listed here are typical of this truck model, but because of customer options, individual trucks may have plates and decals that are different from those shown here.

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

A warning decal is located at the lower right side of the instrument panel and below the key switch.
The warning stresses the importance of reading the operator's manual before operation.

A warning decal is located to the far right of the instrument panel and below the Auxiliary Brake switch.

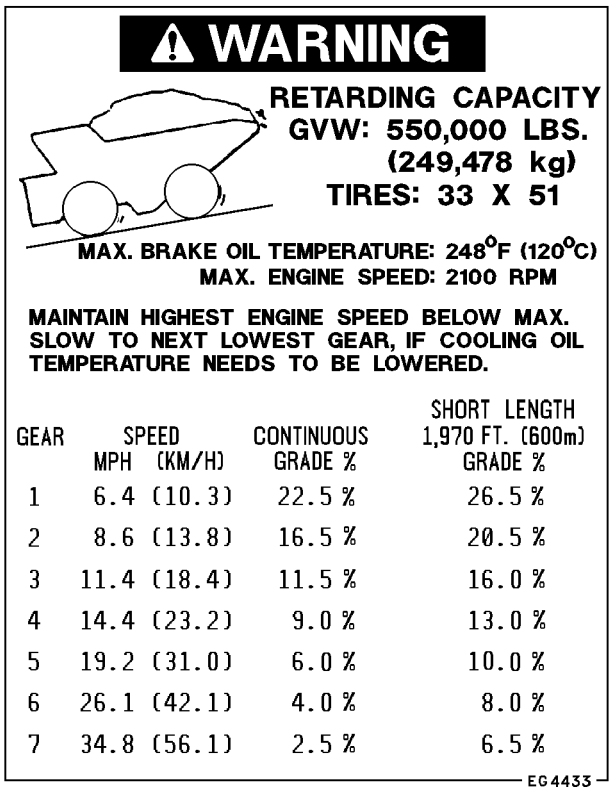
Depress the center button to apply the auxiliary brake. The RED lamp will illuminate.

Depress the button again to release the auxiliary brake; the light will turn "Off".

When the auxiliary brake switch is activated, full, unmodulated hydraulic brake pressure is applied to all wheels. The parking brake is also applied.

Never apply the auxiliary brake switch when the truck is moving, except as an emergency measure.

A Grade/Speed plate showing Retarding Capacities is located on the left front post of the operator's cab and provides the recommended MAXIMUM speeds to be used when descending various grades with a loaded truck.



Refer to OPERATING INSTRUCTIONS, Section 3, Hauling/Retarder Operation, for complete details regarding the use of the information on this chart.

Always refer to the decal in operator's cab. This decal may change with OPTIONAL truck equipment such as: tire sizes, etc.

ROPS/FOPS No. SM4248 MACHINE MODEL 530M
AS INSTALLED BY THE MANUFACTURER ON THIS DUMPER WITH EMPTY WEIGHT LESS THAN 107,600 kg. AND WEIGHT WITHOUT BODY LESS THAN 83,500 kg. THIS ROLLOVER PROTECTIVE STRUCTURE AND FALLING OBJECT PROTECTIVE STRUCTURE MEETS THE PERFORMANCE REQUIREMENTS OF SAE-J1040 APR88, SAE-J231 JAN 81, AND SAE-J1164 MAY 83.

⚠ WARNING THE PROTECTION OFFERED MAY BE IMPAIRED IF SUBJECTED TO ANY MODIFICATIONS OR DAMAGE. TO MAINTAIN MANUFACTURERS CERTIFICATION, ANY REPAIR OR ALTERATION ON THIS STRUCTURE MUST HAVE WRITTEN APPROVAL.

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

EH1336

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

! WARNING ! ***Do not make modifications to this structure, or attempt to repair damage without*** *written approval from the Manufacturer.*
Unauthorized repairs will void certification.

. . . . . .

DANGER plates are mounted on each suspension and accumulator cylinder. These plates warn that the suspensions and accumulators are charged with high pressure nitrogen. No servicing of any kind should be attempted until the service manual has been referenced and proper and safe procedures are followed.

⚠ DANGER

HIGH PRESSURE CYLINDER CHARGED WITH DRY NITROGEN

DO NOT REMOVE ANY HARDWARE INCLUDING CAPSCREWS, PLUGS, VALVE OR VALVE CORE UNTIL ALL PRESSURE HAS BEEN RELEASED. REMOVAL OF ANY HARDWARE WHILE CYLINDER IS UNDER PRESSURE MAY RESULT IN HARDWARE FLYING FROM CYLINDER. REFER TO OPERATION AND MAINTENANCE MANUAL OR SHOP MANUAL FOR PRESSURE RELEASE INSTRUCTIONS.

1. CHECK OIL LEVEL ACCORDING TO INSTRUCTION MANUAL.
2. CHARGE CYLINDER WITH DRY NITROGEN GAS ONLY.

TO CHARGE CYLINDER: SEE YOUR HAULPAK DISTRIBUTOR FOR ALL TOOLS AND INFORMATION REQUIRED FOR CHARGING CYLINDERS

EB9099

. . . . . .

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

⚠ WARNING

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

WB1019

A plate is mounted on the left hand side of the transmission oil pan to provide instructions for proper transmission oil level check.

1. **Engine Stopped**:

- Oil level must be visible in upper part of sight gauge (STOP) between "H" and "L" to be sure there is sufficient oil to safely operate transmission when engine is stopped, or if transmission oil is cold (engine has been stopped for 8 hours or more).

  Check oil level again, as described below, when transmission oil reaches operating temperature.

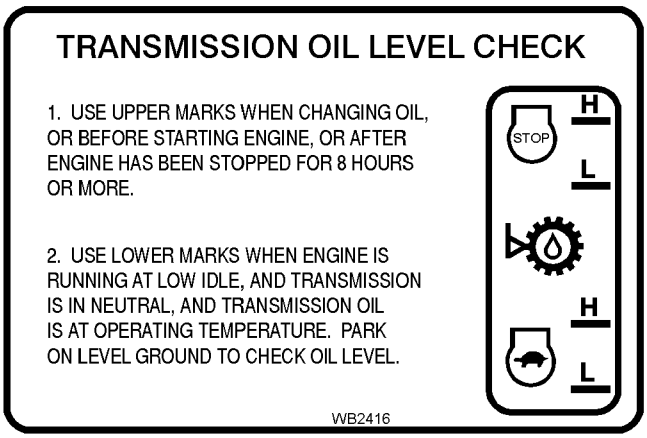
2. **Engine Running**:

- Oil level must be visible in lower part of sight gauge (turtle) between "H" and "L".

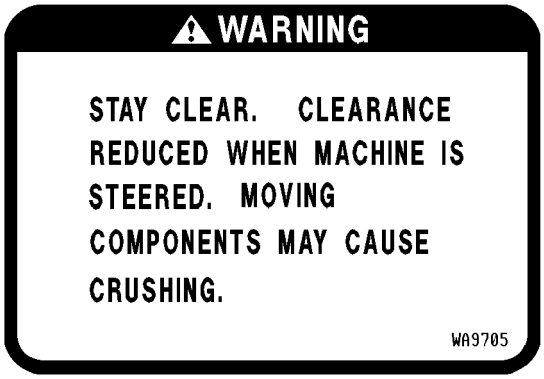
Check transmission oil level with:

- truck parked on level surface,
- engine running at low idle,
- transmission in neutral, "N", and
- transmission oil at normal operating temperature:

  Add clean oil as required through transmission oil filler tube at left rear of transmission.

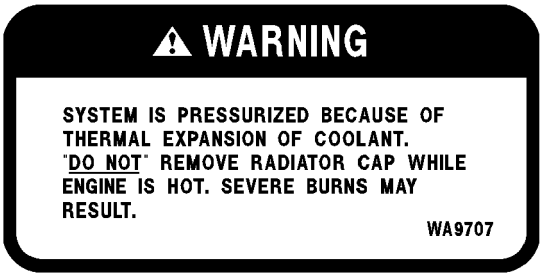


Warning plates are mounted on the truck frame in front of and to the rear of both front tires to alert all persons to stay clear when the truck is being steered.



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

Service personnel should use caution when servicing radiator. The system is pressurized because of thermal expansion of coolant. "DO NOT" remove radiator cap while engine is hot. Severe burns may result.



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

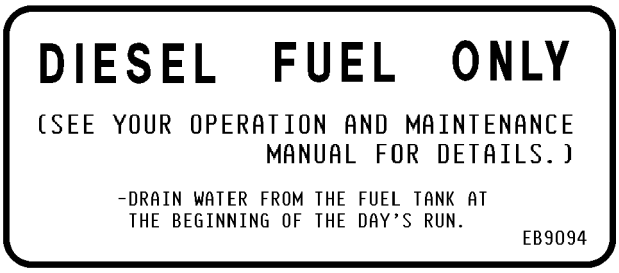
Keep the system open to the atmosphere only as long as absolutely necessary to lessen chances of system contamination. Service the tank with clean Type C-4 hydraulic oil. All oil being put into the hydraulic tank should be filtered through 3 micron filters.

A CAUTION decal is attached below the hydraulic tank oil level sight gauge. Check level with body down, engine stopped, and key switch "Off" (to assure pressure has been relieved from system) before removing fillercap.
Add oil per filling instructions, if oil level is below top of sight glass.

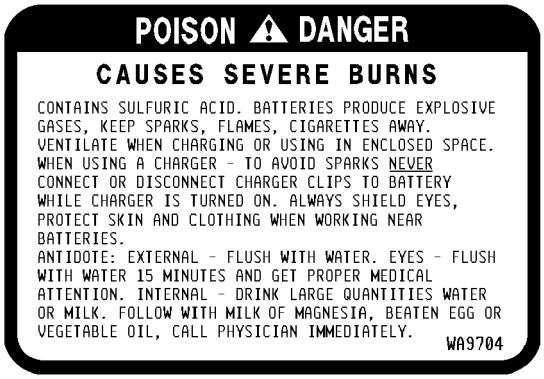
A warning plate is attached to the frame above the hydraulic system (APU) quick disconnect fittings to alert technicians that high pressure hydraulic oil is present during operation. Care must be taken when it is necessary to open the hydraulic system. There is always a chance of residual pressure being present. Open fittings slowly to allow any pressure to bleed off before removing any connections.

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

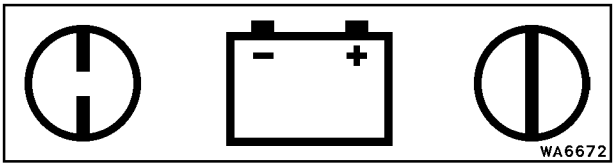
A plate is located next to filler cap on fuel cap which specifies Diesel Fuel Only. Care should be taken to open cap slowly and bleed off pressure that may be in tank when removing filler cap.
Operation and Maintenance Manual refered to is from **Engine** Manufacturer.



Attached to the interior of battery box lid is a DANGER plate. This plate stresses the need to keep from making any sparks near the battery. When another battery or 24VDC power source is used for auxiliary power, all switches must be "Off" prior to making any connections. When connecting auxiliary power cables, positively maintain correct polarity; connect the positive (+) leads together and then connect the negative (-) lead of the auxiliary power cable to a good frame ground. Do not connect to the negative post of the truck battery or near the battery box. This hookup completes the circuit but minimizes danger of sparks near the batteries.
Sulfuric acid is corrosive and toxic. Use proper safety gear, goggles, rubber gloves and rubber apron when handling and servicing batteries. Avoid contact with skin, eyes or clothing. In event of accident, immediately flush with plenty of water and call a physician. KEEP OUT OR REACH OF CHILDREN!

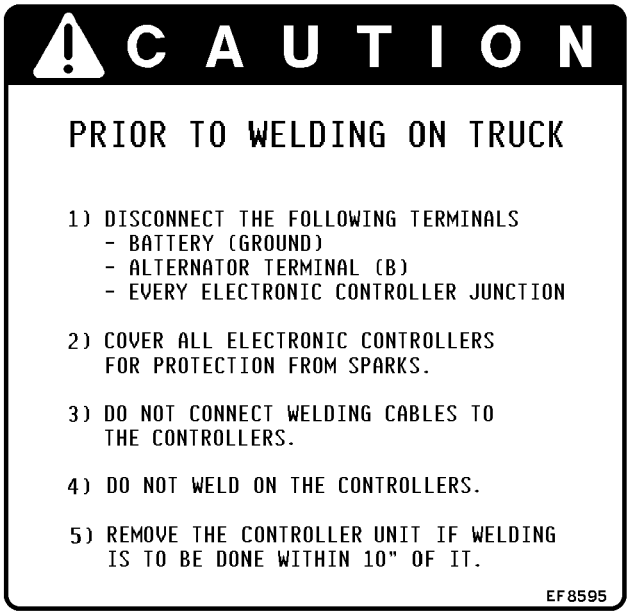


These decals are placed on the top of the battery box and near the battery disconnect switches to indicate that the battery system (24VDC) is a NEGATIVE (-) GROUND system.
This decal is placed above the battery disconnect switches on the right side of the battery box to indicate "Off" and "On" positions of the switches.

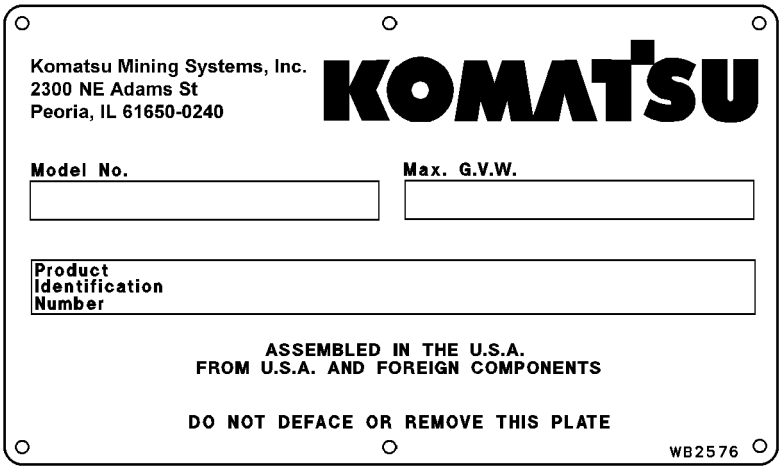


A caution plate is located on the side of the battery box.

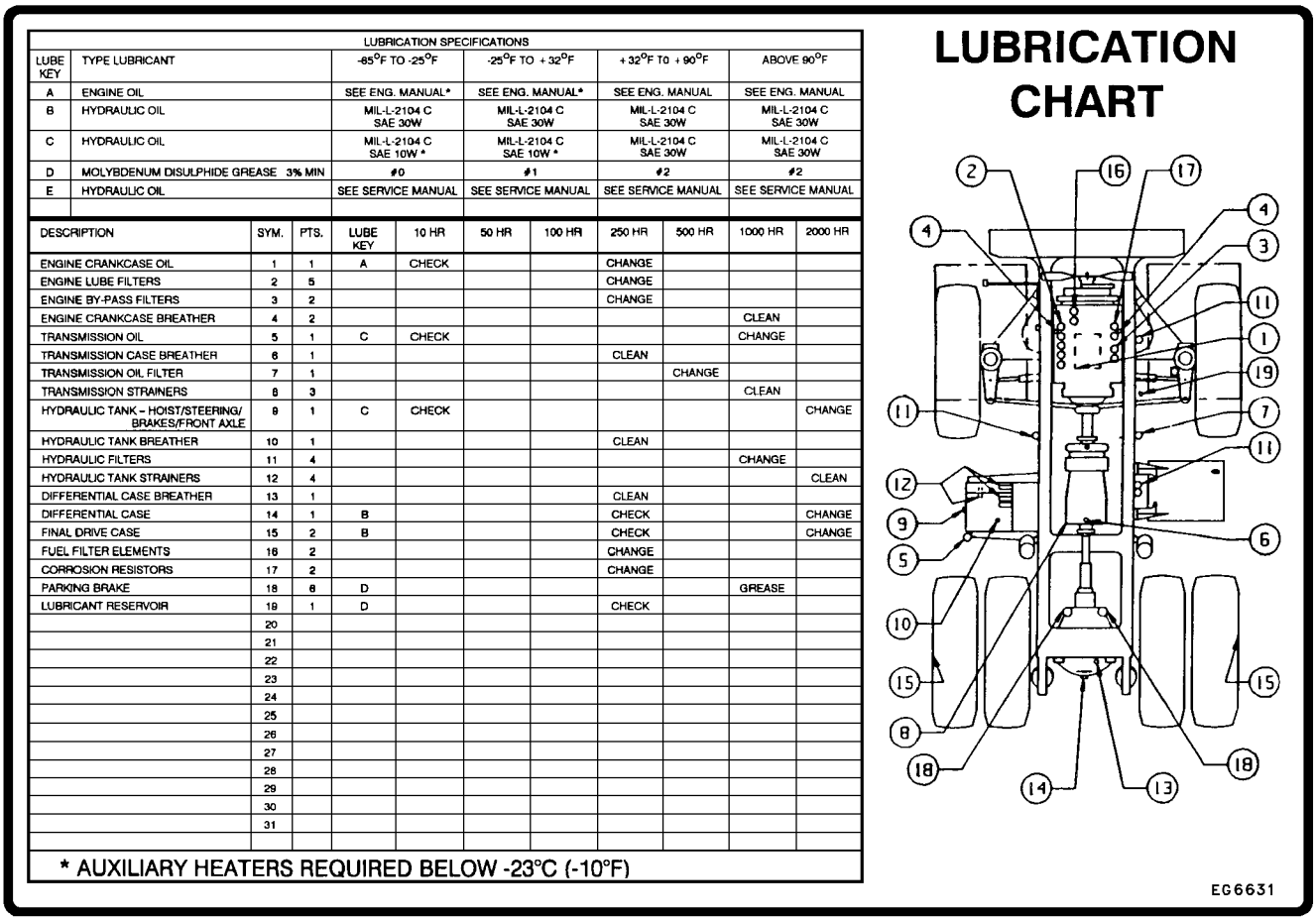
These instructions must be followed when welding is done on the truck to avoid damage to the electronic components.



A product identification plate is located on the right hand frame rail near the front bumper. This lists the vehicle model number, maximum G.V.W. and Product Identification Number. 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 the proper ordering of many service parts and/or warranty consideration.



The lubrication chart is located on the left hand front fender behind the ladder.
Refer to Maintenance - Section 4, ‘‘Lubrication and Service’’, for more complete lubrication instructions.



LUBRICATION SPECIFICATIONS

LUBE KEY	TYPE LUBRICANT	-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	SEE ENG. MANUAL
B	HYDRAULIC OIL	MIL-L-2104 C SAE 30W	MIL-L-2104 C SAE 30W	MIL-L-2104 C SAE 30W	MIL-L-2104 C SAE 30W
C	HYDRAULIC OIL	MIL-L-2104 C SAE 10W *	MIL-L-2104 C SAE 10W *	MIL-L-2104 C SAE 30W	MIL-L-2104 C SAE 30W
D	MOLYBDENUM DISULPHIDE GREASE 3% MIN	#0	#1	#2	#2
E	HYDRAULIC OIL	SEE SERVICE MANUAL	SEE SERVICE MANUAL	SEE SERVICE MANUAL	SEE SERVICE MANUAL

DESCRIPTION	SYM.	PTS.	LUBE KEY	10 HR	50 HR	100 HR	250 HR	500 HR	1000 HR	2000 HR
ENGINE CRANKCASE OIL	1	1	A	CHECK			CHANGE			
ENGINE LUBE FILTERS	2	5					CHANGE			
ENGINE BY-PASS FILTERS	3	2					CHANGE			
ENGINE CRANKCASE BREATHER	4	2							CLEAN	
TRANSMISSION OIL	5	1	C	CHECK					CHANGE	
TRANSMISSION CASE BREATHER	6	1					CLEAN			
TRANSMISSION OIL FILTER	7	1						CHANGE		
TRANSMISSION STRAINERS	8	3							CLEAN	
HYDRAULIC TANK – HOIST/STEERING/ BRAKES/FRONT AXLE	9	1	C	CHECK						CHANGE
HYDRAULIC TANK BREATHER	10	1					CLEAN			
HYDRAULIC FILTERS	11	4							CHANGE	
HYDRAULIC TANK STRAINERS	12	4								CLEAN
DIFFERENTIAL CASE BREATHER	13	1					CLEAN			
DIFFERENTIAL CASE	14	1	B				CHECK			CHANGE
FINAL DRIVE CASE	15	2	B				CHECK			CHANGE
FUEL FILTER ELEMENTS	16	2					CHANGE			
CORROSION RESISTORS	17	2					CHANGE			
PARKING BRAKE	18	6	D						GREASE	
LUBRICANT RESERVOIR	19	1	D				CHECK			
	20									
	21									
	22									
	23									
	24									
	25									
	26									
	27									
	28									
	29									
	30									
	31									

* AUXILIARY HEATERS REQUIRED BELOW -23°C (-10°F)

LUBRICATION CHART

EG6631

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 and all necessary job site regulations, as well as use and care of the safety equipment on the KOMATSU 530M Haulpak Truck.
Only qualified operators or technicians should attempt to operate or maintain the 530M 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.

If problems or potential problems are found during the "walk-around", be sure to notify maintenance. Vehicle breakdowns and UNSCHEDULED downtime and loss of production can be reduced.

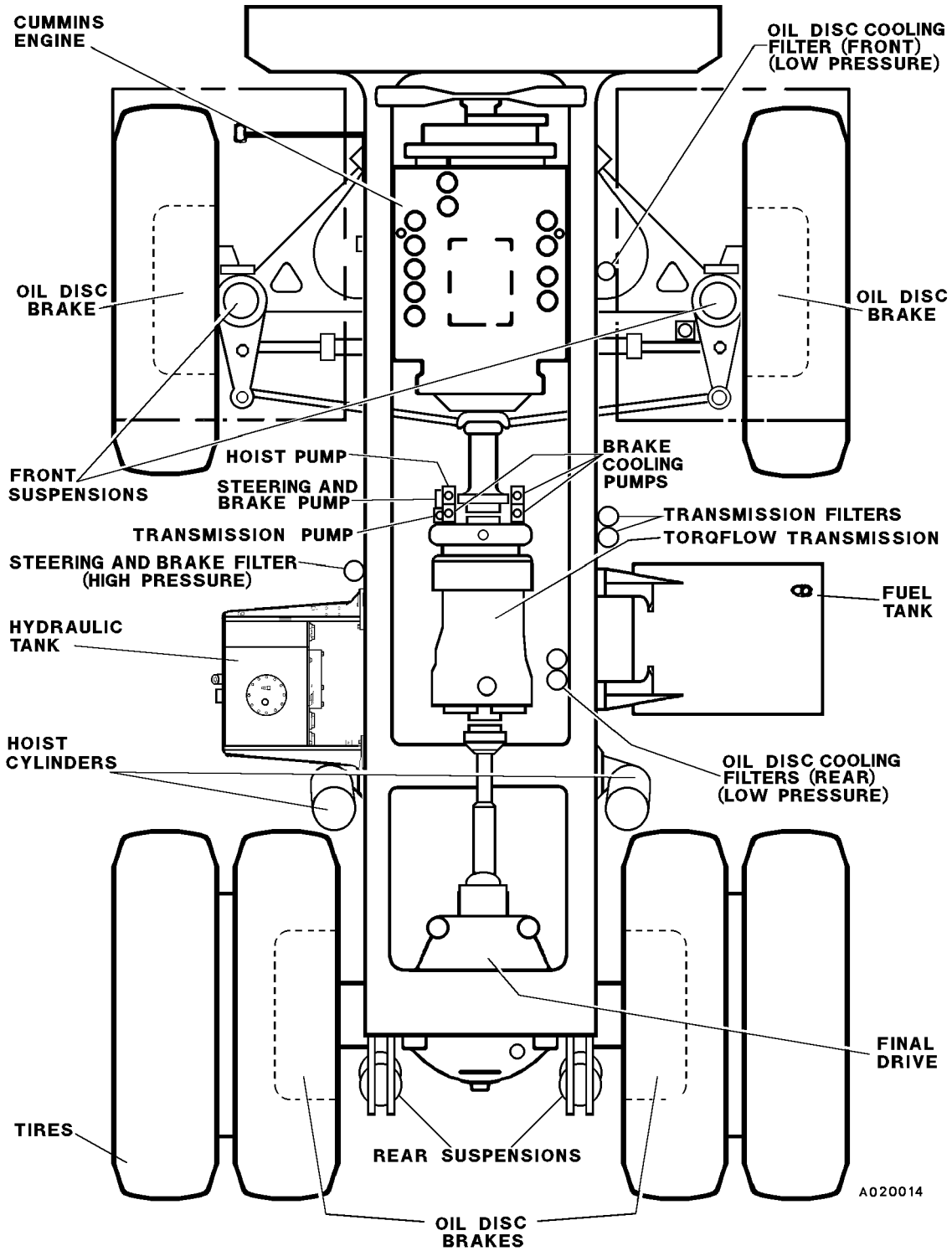
Local work practices may prevent an operator from performing all tasks suggested here, but to the extent permitted, the operator should follow this or similar routine.

1. Start at left front of truck (see illustration, next page). While performing the walk around inspection, visually inspect all lights and safety equipment for external damage from rocks or misuse. Make sure lenses are clean and unbroken.
2. Move behind the front of the left front tire, inspect the hub and the oil disc brake assemblies for leaks and any abnormal conditions.

   Check that all suspension attaching hardware is secure and inspect 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. Check that the engine oil filters or oil lines to filters are not leaking.
4. Inspect fan and air conditioner belts for correct tension, obvious wear, and tracking. Inspect fan guard for security and condition.
5. 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.
6. 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 the tie-rod pivots and steering cylinder for proper greasing, and for security of all parts. Inspect for any hydraulic leaks.
7. Inspect sight glass for transmission oil level.

   Check pumps on front of transmission for leakage and that all parts are secure.
8. Move to the side of the hydraulic tank and check the hydraulic fluid level for both the hydraulic tank and brake cooling oil. Oil should be visible in sight glass with engine stopped and body down.
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.

START HERE



KOMATSU 530M Haulpak Truck

10. Before leaving this position, look to see that there is no leakage or any other unusual condition with transmission or drive shaft.

11. Move on around the dual tires, check to see that all lugs/wedges are in place and tight. Inspect wheel for any leakage that may be coming from inside the wheel housing that would indicate planetary 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.

13. Check final drive housing breather. Replace breather if obstructed. Check for leakage around final drive housing and wet disc brake housings and the hoses connected to the housings.

14. While standing behind final drive housing, look up to see that rear lights are in good condition, along with back up horns. Inspect linkage rods to see that all locations are 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. 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 tie-rod pivots and steering cylinder for proper greasing, and for security of all parts.Be sure the suspension protective cover is in good condition. Check suspension attaching hardware and suspension extension, as well as greasing and attaching hardware for the steering cylinder.

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 the oil disc brakes for leaks and any unusual condition. Inspect the engine compartment for any leaks and unusual condition. Inspect the fan guard, and belts also for any rags or debris behind radiator.

23. Move on around to the right front of the truck.

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 headlamps and fog lights.

25. Before climbing ladder to first level, be sure ground level engine shutdown switch is "ON" (if equipped).

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.

⚠WARNING

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.

⚠WARNING

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 battery box cover for looseness or damage.

29. Check air cleaner indicator. If the RED area is showing in the indicator, the air filter must be cleaned/replaced before operating truck.
30. 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.
31. 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.
32. Adjust seat and steering wheel so that it is comfortable for use.
33. 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

Safety rules must be observed upon engine start-up.

⚠WARNING

Insure adequate ventilation before start-up, if the truck is in an enclosure. Exhaust fumes are dangerous!

1. Insure all personnel are clear of truck before starting engine. Always sound the horn as a warning before actuating any operational controls.
2. Check and insure Transmission Range Selector is in "**N**eutral" before starting.
3. Do not attempt to start engine while cold weather starting heater (if equipped) is in operation. Damage to coolant heaters will result, due to lack of circulation.
4. The key switch is a three position (Off, Run, Start) switch.

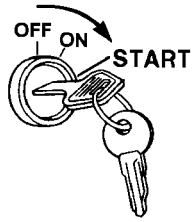
   When the key slot is in the vertical position, the electrical system is "Off" and no electrical devices are energized.

   Use this key position to stop the engine when it is running.

Key Off

   When the switch is rotated one position clockwise, it is in the "Run" position and all electrical circuits (except "Start") are energized.

   With Transmission Selector Lever in the "**N**eutral" position, rotate key switch fully clockwise to "start" position (Transmission Range Selector in "**N**eutral") and <u>*hold this position until engine starts*</u> (see NOTE below). "Start" position is spring loaded to return to "run" when key is released.



Start Engine

   NOTE: The starter is equipped with an 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 Engine Starting Aid for cold weather starting, and ambient temperature is below -5°C (23°F), push the Engine Starting Aid switch "in" for three seconds; then release. Turn the key switch to the "start" position. If engine does not start, wait at least 15 sec. before repeating the procedure.

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

5. The truck cannot be push started. Transmission lube and control systems are inoperative when engine is not running.
6. When getting a battery 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.

NOTE: 530M Haulpak Trucks are equipped with four 12 volt batteries connected in series and parallel to provide 24 volt output. Be certain to maintain correct voltage and polarity when connecting booster cables. Damage to electrical components may result if voltage and polarity are not correct.

AFTER ENGINE HAS STARTED

1. Become thoroughly familiar with steering and emergency controls. 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, retarder control lever, parking brake switch, brake lock switch, and emergency brake switch. Activate each circuit individually with the engine running and with the hydraulic circuit fully charged.

   If any application or release of any brake circuit does not appear proper or if sluggishness is apparent 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 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 and washer.

5. When truck body is in dump position, do not allow anyone beneath it, unless body-up retaining device 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 or on the deck of the truck.

8. Do not leave truck unattended while engine is running. Shutdown engine before leaving 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.

⚠WARNING

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.

1. Always sound the warning horn before moving the truck. When backing the truck, give back-up signal (three blasts on horn); when starting forward, two blasts on horn. These signals must be given each time the truck is moved forward or backward. Look to the rear before backing the truck. Watch for and obey ground spotter's hand signals before making any reverse movements. 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. Keep a firm grip on steering wheel at all times.

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. Match the truck speed to haul road conditions and slow the truck in any congested area. Obey the spotter's signals at shovel and dump.

5. Do not allow engine to run at "Idle" for extended periods of time.

6. Check parking brake periodically during working shift. **Use parking brake for *parking only*.**
   Do not attempt to apply parking brake while truck is moving!

7. Apply the **Brake Lock Switch** at the shovel and dump areas.

8. Proceed slowly on rough terrain to avoid deep ruts or large obstacles. Avoid traveling close to soft edges and the edge of fill area.

9. 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 similiar pattern.
5. Operator should remain in truck cab with engine running while truck is being loaded.
   Place Transmission Range Selector in "**N**eutral" and apply the Brake Lock Switch.

⚠WARNING

If operator must leave truck cab during loading, engine must be shut down and parking brake applied. DO NOT use emergency brake for parking. Remain far enough away from truck to avoid being struck by flying material.

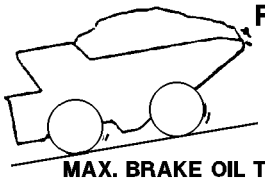
6. When truck is loaded, pull away from shovel as quickly as possible, but with extreme caution.

HAULING

1. Always stay alert! If unfamiliar with the road, drive with extreme caution.
2. Govern truck speed by the road conditions, weather and visibility.
3. Operate truck so it is under control at all times.
4. Use extreme caution when approaching a haul road intersection. Maintain a safe distance from oncoming vehicles.
5. Obey all road signs.
6. Always dim headlights when meeting oncoming vehicles.
7. Maintain a safe distance when following another vehicle. Never approach another vehicle from the rear, in the same lane, closer than 15 m (50 ft). When operating on a down grade, stay at least 30 m (100 ft) away.
8. Before starting down a grade, maintain a speed that will insure safe operation and provide effective retarding under all conditions.

   When descending a known grade with a loaded truck, the operator should *adjust the speed of the truck* if necessary, to **preselect a transmission gear range**, so that operation can be maintained within the speeds listed on the **Retarding Capacity** decal located inside the cab on the left front cab post (Shown below). Either the retarder control lever or the foot-operated brake pedal can be used to control the speed of the truck.

⚠ WARNING



RETARDING CAPACITY
GVW: 550,000 LBS.
(249,478 kg)
TIRES: 33 X 51

MAX. BRAKE OIL TEMPERATURE: 248°F (120°C)
MAX. ENGINE SPEED: 2100 RPM

MAINTAIN HIGHEST ENGINE SPEED BELOW MAX. SLOW TO NEXT LOWEST GEAR, IF COOLING OIL TEMPERATURE NEEDS TO BE LOWERED.

GEAR	SPEED MPH (KM/H)	CONTINUOUS GRADE %	SHORT LENGTH 1,970 FT. (600m) GRADE %
1	6.4 (10.3)	22.5 %	26.5 %
2	8.6 (13.8)	16.5 %	20.5 %
3	11.4 (18.4)	11.5 %	16.0 %
4	14.4 (23.2)	9.0 %	13.0 %
5	19.2 (31.0)	6.0 %	10.0 %
6	26.1 (42.1)	4.0 %	8.0 %
7	34.8 (56.1)	2.5 %	6.5 %

EG4433

Retarder Operation

Two lists are provided on the **Retarding Capacity** decal, one a continuous rating and the second a short-length rating. Both lists are matched to the truck at maximum Gross Vehicle Weight.

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

The short-length numbers listed on the chart indicate the combination of speeds and grades which the vehicle can safely negotiate for three minutes. These speeds are faster than the continuous values, reflecting the thermal capacity of various system components. System components can accept heating at a higher-than-continuous rate for a short period of time, beyond which the system would become over-temperature.

The short-length rating (sometimes called the "three-minute" limit) will successfully accommodate most downhill loaded hauls. It is necessary to divide haul road grade segment length by allowable speed to determine actual time on grade. If actual time on grade exceeds the allowable amount, the grade will need to be negotiated at the continuous speed. Ambient temperature, as well as the prior temperature of the brake cooling oil can affect this number (the brake cooling oil could already be above the normal range from recent operating conditions).

⚠WARNING

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

For Efficient Retarder Operation, the operator should:

- Maintain engine RPM between 2000 — 2100 RPM, and
- When descending a grade, the operator should apply the retarder lever/foot pedal and observe *both the Tachometer and the Brake Oil Temperature Gauge* . **The engine RPM must be maintained at 2000 – 2100 RPM and the Brake Oil Temperature must be maintained below 248°F (120°C).**

If the operator observes that **either** the maximum engine speed of 2100 RPM **or** the Brake Oil Temperature of 248°F (120°C) are about to be exceeded, the operator should immediately move the transmission range selector to the next lower range and use, either the retarder control lever, or the foot-operated brake pedal, to apply more brake pressure until the truck is slowed to a speed which will permit the transmission to downshift to the gear range selected.

Continue this procedure to downshift to the required gear range to maintain engine speed at 2000 – 2100 RPM and brake oil temperature below 248°F (120°C). When the proper gear range is attained, continue to use the retarder as needed to maintain a safe, productive speed.

If brake oil temperature exceeds 248°F (120°C), the *Brake Oil Temperature Warning light will turn on.* **As quickly as safety will permit,** bring the truck to a complete stop away from traffic, move transmission range selector to "Neutral", apply the parking brake, and run engine at high idle.

Continue to run engine at high idle until Brake Oil Temperature Warning light turns off and brake oil temperature cools to below 248°F (120°C). If temperature does not return to this range within a few minutes, report the condition **immediately** to maintenance personnel and wait for further instructions before moving truck.

9. When operating truck in darkness or when visibility is poor, do not move truck unless headlights are on. Do not back truck if back-up horn or lights are inoperative.
10. When backing the truck, give back-up signal (three blasts on horn); when starting forward, two blasts on horn. These signals must be given each time the truck is moved forward or backward.
11. Do not stop or park on a haul road unless unavoidable. If you must stop, move truck to a safe place, apply parking brake, shut down engine, block wheels securely and notify maintenance personnel for assistance.
12. If the warning light for "Low Steering Pressure" illuminates during operation, steer the truck **immediately** to a safe stopping area, away from other traffic, if possible. Refer to item 11 above.
13. Report haul road conditions immediately. Muddy or icy roads, pot holes or other obstructions can present hazards.
14. Cab doors should remain closed at all times while truck is in motion or unattended.
15. Check for flat tires periodically during shift. If truck has been run on a "flat", **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.

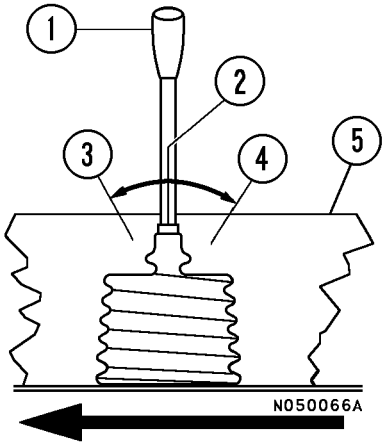
   Avoid unstable areas. Stay a safe distance from edge of dump area.
   Position truck on a solid, level surface before dumping.

⚠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.

3. When in dump position, place transmission range selector at the "**N**eutral" position, and apply the Brake Lock switch.



HOIST CONTROL VALVE

1. Hoist Control Lever
2. "FLOAT"/"HOLD" Postion
3. "DOWN" Position
4. "RAISE" Position
5. Center Console

←ARROW Points to Front of Truck

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 dump 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 the dump body hinge pins. If it is necessary to dump this kind of material, refer to the CAUTION in the following procedure:

4. Pull the Hoist Control Lever back to the "RAISE" position and release lever.

   (Releasing the hoist lever anywhere during the "Hoist Up/RAISE" operation will place the dump body in "HOLD" at that position.)

5. Raise engine RPM to accelerate hoist speed.

   Refer to the CAUTION below.

   When body is near the maximum angle, reduce engine RPM (reduce foot pressure on the accelerator pedal) to reduce shock load to the hydraulic system and hoist cylinders.

⚠CAUTION

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

6. When the dump body rises to the desired position, release the hoist control lever (it will return to the "HOLD" position). If desired to raise the body further, move dump lever again to "RAISE" position and dump body will rise until hoist cylinders are fully extended.

   (Releasing the hoist lever anywhere during the "Hoist Up/RAISE" operation will place the dump body in "HOLD" at that position.)

To Lower Body:

7. After material being dumped clears body, lower body to frame by moving the Hoist Control Lever forward to the "DOWN" position and the dump body will start to move down.

8. Releasing the lever completely will automatically return it to the "FLOAT" position. The body will then move down under its own weight.

   *If dumped material builds up at body tailgate and body cannot be lowered, shift Transmission Range Selector to "D" (Drive), release Brake Lock switch, and drive forward to clear material. Stop, shift Transmission Range Selector to "N" (Neutral), apply Brake Lock switch and lower dump body. See NOTE : * below*.

⚠CAUTION

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

NOTE: When traveling, always place the dump lever at the FLOAT position, regardless of whether or not the truck is loaded.
** If the transmission range selector is moved to any position other than "N" (neutral) when the dump lever is not at the FLOAT position, the central warning lamp will flash and the alarm buzzer will sound intermittently*.

9. With body returned to frame, move Transmission Range Selector to "D" (Drive), release Brake Lock switch, and leave dump area carefully.

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 with flares at night.

SHUTDOWN PROCEDURE

The following sequence of shutdown procedure is important and should be followed at each shutdown.

1. Stop truck, reduce engine RPM to low idle. Place Transmission Range Selector in "**N**eutral" and apply parking brake.
2. Allow engine to cool gradually by running at low idle for 3 to 5 minutes.
3. Turn keyswitch to the "off" position to stop engine.
4. Close and lock all windows, remove key from key switch and lock cab to prevent possible unauthorized truck operation.
5. Dismount truck properly.

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.

Towing a disabled truck requires a rigid tow bar capable of towing at least 1.5 times the Gross Vehicle Weight (GVW) of the vehicle being towed.
NEVER use cable for towing a disabled vehicle!

When towing becomes necessary, use the tow eyes installed under the front frame/bumper and take the following precautions:

1. Block disabled truck to prevent movement while preparing truck for towing and attaching tow bar. Inspect tow bar for capacity (it must be capable of towing at least 1.5 times the Gross Vehicle Weight of vehicle being towed).

2. Determine primary reason that vehicle is disabled.

   a. If truck is disabled because of a suspected final drive problem, both right and left planetary sun gears/drive axles should be removed before any towing. (Refer to Section "G", Final Drive, in the Shop Manual for procedure.)

      Extensive secondary damage can occur to final drive components and/or transmission, if truck is towed without first removing sun gears/drive axles.

   b. If truck is disabled because of a suspected transmission problem, and the towing distance surpasses 800m (2,625 ft), remove the drive shaft between the transmission and the differential case (if final drive sun gears have not been removed).

   c. If the engine of the disabled truck is operable; keep the engine running while towing, so that the steering and braking can be used.

   d. If the engine is NOT operable, hydraulic power for steering and braking and transmission lubrication will not be available.

      Install the necessary hydraulic connections between the towing vehicle and the disabled truck to provide hydraulic power for steering and braking. (Refer to the decals on the truck near the hydraulic manifold.)

      Disconnect transmission as stated above.

3. Determine that towing vehicle has adequate capacity to *both <u>move</u> and <u>stop</u>* the towed truck under all conditions.

4. Protect both operators in the event of tow bar failure.

5. Release disabled truck brakes and remove all blocking.

⚠WARNING

Do not tow the truck any faster than 8 kph (5 MPH).

6. Sudden movement may cause tow bar failure. Smooth and gradual truck movement is preferred.

7. Minimize tow angle at all times -
   NEVER EXCEED 30^{o}.
   The towed truck must be steered in the direction of the tow bar.

OPERATOR CAB AND CONTROLS

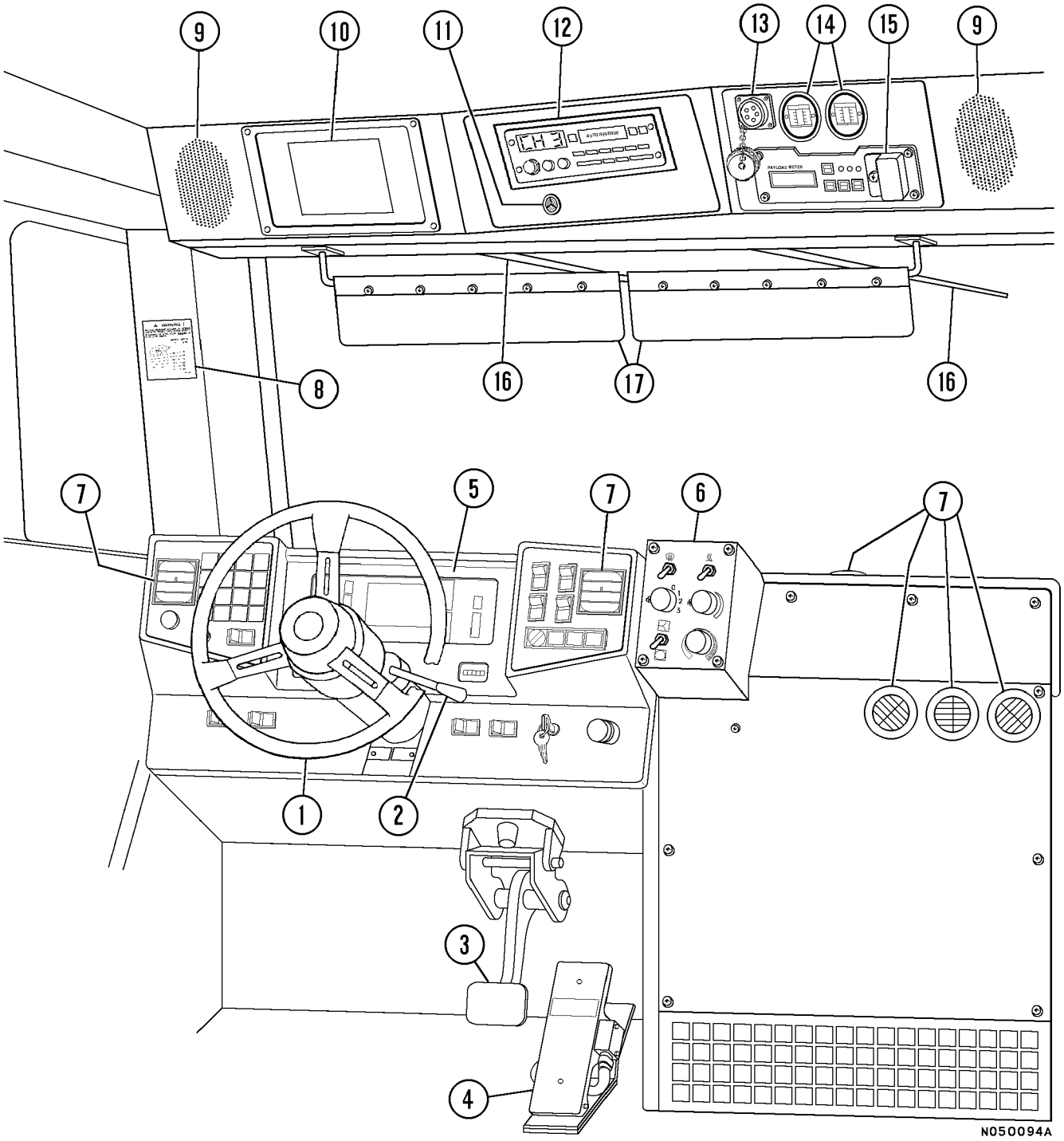


FIGURE 3-1. CAB INTERIOR - OPERATOR VIEW

1. Steering Wheel
2. Retarder Control Lever
3. Service Brake Pedal
4. Throttle/Accellerator Pedal
5. Instrument Panel, with Center Electronic Display Panel, and L.H & R.H. Control/Indicator Pods
6. Heater/Air Conditioner Controls
7. Heater/Air Conditioner Vents
8. Retarding Capacity Chart
9. Radio Speakers
10. “MOM” Display Screen
11. Warning Alarm Buzzer
12. Radio, AM/FM Stereo, Cassette
13. “PMC” Interface Connector
14. Air Cleaner Vacuum Gauges
15. Payload Meter II
16. Windshield Wipers
17. Sun Visors

STEERING WHEEL AND CONTROLS

The steering wheel (1, Figure 3-2) will telescope “in” and “out” and adjust through a tilt angle to provide a comfortable wheel position for most operators.

HORN BUTTON

The horn (2, Figure 3-2) is actuated by pushing the button in the center of the steering wheel. Operation of the horn should be verified before moving the truck. Observe all local safety rules regarding the use of the horn as a warning signal device before starting engine and moving the vehicle.

TELESCOPE LOCK RING

The Telescope Lock Ring (3, Figure 3-2) around the horn button locks/unlocks the telescoping function of the steering column. Rotating the ring (*) counter-clockwise (L.H. rotation), releases the column to move "in" or "out". Rotating the ring clockwise (R.H. rotation), locks the column in the adjusted position.

(*) **DO NOT ROTATE RING MORE THAN 90°**!
Electrical ground wire may be cut!

TILT WHEEL LEVER

Adjust the tilt of the steering wheel by pulling the tilt adjustment lever (4, Figure 3-2) 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 / HEADLIGHT DIMMER

The Turn Signal Lever (5, Figure 3-2) is used to activate turn signal lights and to select either high or low headlight beams.

Move the lever upward to signal a turn to the right.

An indicator in the top, center of the instrument display panel will illuminate to indicate turn direction selected.
Refer to INSTRUMENT PANEL & INDICATOR LIGHTS.

Move the lever downward to signal a turn to the left.

Moving the lever toward the steering wheel will change the High/Low Headlight beam.
When high beams are selected, the indicator in the top, center of the instrument display panel will illuminate.

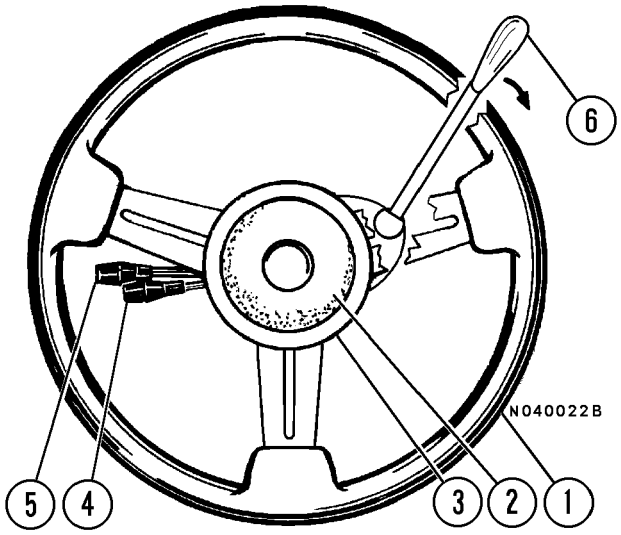
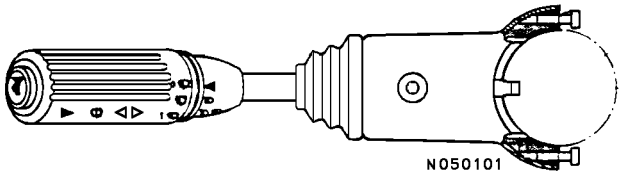


FIGURE 3-2. STEERING WHEEL AND CONTROLS

1. Steering Wheel
2. Horn
3. Telescope Lock Ring
4. Tilt Wheel Lever
5. Turn Signal Lever
6. Retarder Control Lever

Windshield Wiper / Washer Control

The Windshield Wiper Control is used to activate the wiper blades and washer system.
This control is on the Turn Signal Lever and has three wiper speed settings and a washer control:



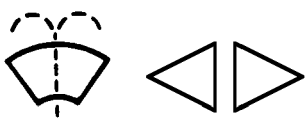
Rotate the knob on the end of the lever clockwise (from OFF position) to activate the various speed selections.

OFF: Wipers are Off.

Wipers operate at Intermittent speed.

Wipers operate at Low speed.

Wipers operate at High speed.



Grasp control knob and push in (toward steering column) to spray washer liquid onto windshield.

RETARDER CONTROL LEVER

The Retarder Control Lever (6, Figure 3-2) is mounted on the right side of the steering column. It can be used to modulate the full range of retarding/braking effort being applied to both the front and rear oil disc brakes. Any application of the retarder lever will cause an indicator light to illuminate in the L.H. instrument panel/pod (Refer to ‘‘Instrument Panel And Indicator Lights”)

a. When the lever is rotated to full ‘‘Up” (counter-clockwise) position, it is in the ‘‘Off/No Retard” position.

b. When the lever is rotated to full ‘‘Down” (clock-wise) position, it is in the full ‘‘On/Retard” position.

c. For long downhill hauls, the lever may be positioned anywhere to provide a desired retarding effort, and it will remain where it is positioned.
NOTE:
When retarding is completed, and acceleration is resumed, be sure to return the lever to the full “Up” (counterclockwise/"Off/No Retard") position, to prevent rapid wear to brake discs and/or overheating of the brake cooling system.

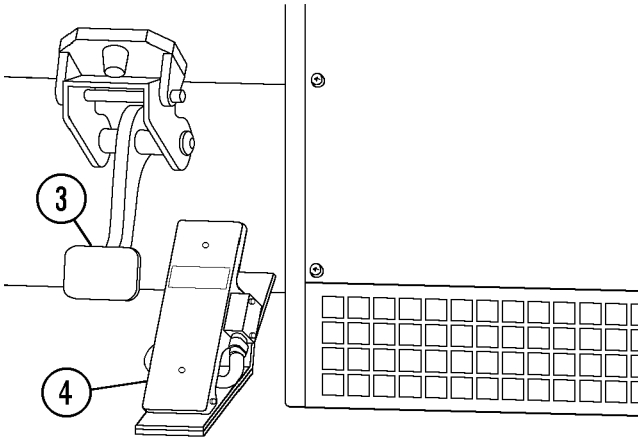
The Retarder Lever and foot-operated Service Brake pedal can be used simultaneously or independently. The Retard Control Module (RCM) will determine which device is requesting the most retarding/braking effort and apply that amount.

SERVICE BRAKE PEDAL

The Service Brake Pedal (3, Figure 3-1) is a single function, foot-operated pedal which controls and modulates service brake pressure directly through a hydraulic valve.

When the pedal is partially depressed, an indicator light in the L.H. instrument panel pod (11, Figure 3-9) will illuminate. As the pedal is further depressed, the service brakes are actuated (a slight increase in pedal resistance will be felt) through a hydraulic valve, which modulates pressure to the service brakes. Completely depressing the pedal causes full application of both the front and rear oil disc service brakes.

The Grade/Speed Chart (8, Figure 3-1) should always be followed to determine MAXIMUM safe truck speeds for descending various grades with a loaded truck.



ACCELERATOR (THROTTLE) PEDAL

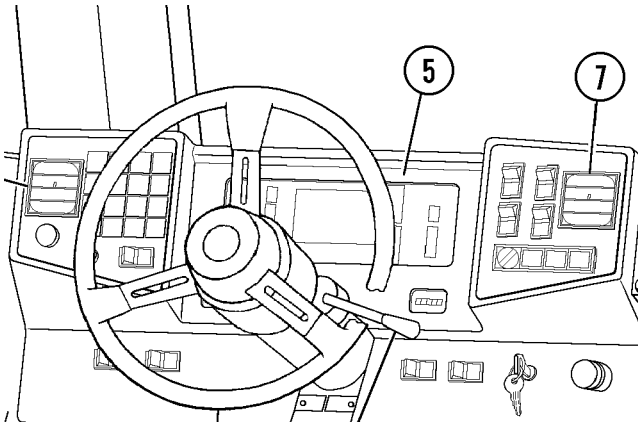
The Accelerator Pedal (Throttle) Pedal (4, Figure 3-1) is a foot-operated pedal which allows the operator to control engine RPM, depending on pedal depression.

The foot-operated treadle pedal contains an electronic sensor which sends signals to the Cummins Engine Centry™ fuel control system.The movement of the fuel governor control arm corresponds directly to the travel of the treadle pedal as it is applied by the operator. When the pedal is released, springs return the control arm and the pedal to their ‘‘rest” position and the engine speed returns to low idle.

INSTRUMENT PANEL

The Instrument Panel (5, Figure 3-1) includes a Center Electronic Display Panel, and L.H & R.H. Panels/Pods which contain a variety of switches and indicators.

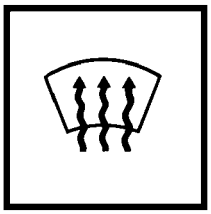
Refer to ‘‘INSTRUMENT PANEL AND INDICATOR LIGHTS” later in this Section, for a detailed description of the function and location of each of these components.



HEATER / AIR CONDITIONER COMPARTMENT AND CONTROLS

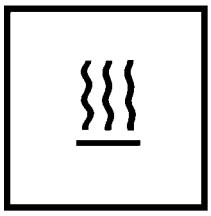
The heater/air conditioner compartment contains the heater/air conditioner controls (6, Figure 3-1) and some of the heater/air conditioner components, such as the blower motor assembly and the heater coils. Optimum cab air climate can be selected by using the following controls in various combinations.

DEFROSTER VENT CONTROL SWITCH



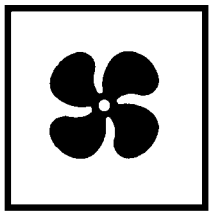
The defroster control switch (1, Figure 3-3) directs heated air for windshield defrosting. "Down" position of the toggle switch is OFF. "Up" position of the toggle switch is On.

HEAT VENT CONTROL SWITCH



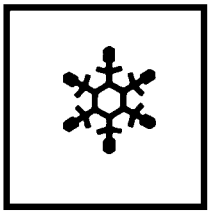
The heater control (2, Figure 3-3) directs heated air to the cab floor for heating of the cab.
"Down" position of the toggle switch is OFF. "Up" position of the toggle switch is On.

FAN CONTROL KNOB



The fan control knob (3, Figure 3-3) is provided to control the cab air fan motor. The fan motor is a 3-speed motor (low, medium and high). Speeds are selected by rotating the control knob clockwise to the desired position. "Off" is full counter-clockwise position.

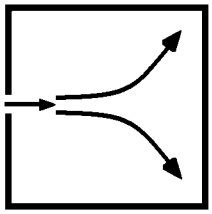
AIR CONDITIONER CONTROL KNOB



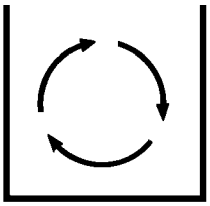
The Air Conditioner control knob (4, Figure 3-3) controls the air conditioner to cool the cab air. Cooler temperatures are selected by rotating the control knob clockwise to the desired temperature. Full clockwise position is coldest setting. "Off" is full counter-clockwise position.

OUTSIDE/INSIDE AIR CONTROL SWITCH

The outside/inside air control switch (5, Figure 3-3) allows either outside or inside air to be circulated through the cab heater assembly.



Moving the switch "Up" directs outside air to be circulated through the heater assembly and through the cab.



Moving the switch "Down" directs inside air to be recirculated through the heater assembly.

SELECTION CONTROL SWITCH

The Selection Control Switch (6, Figure 3-3) is provided for the operator to select a comfortable temperature.

Rotating the knob counter-clockwise (blue arrow) will select cooler temperatures.
Full counter-clockwise position is the coldest air setting.

Rotating the knob clockwise (red arrow) will select warmer temperatures.
Full clockwise position is the warmest heater setting.

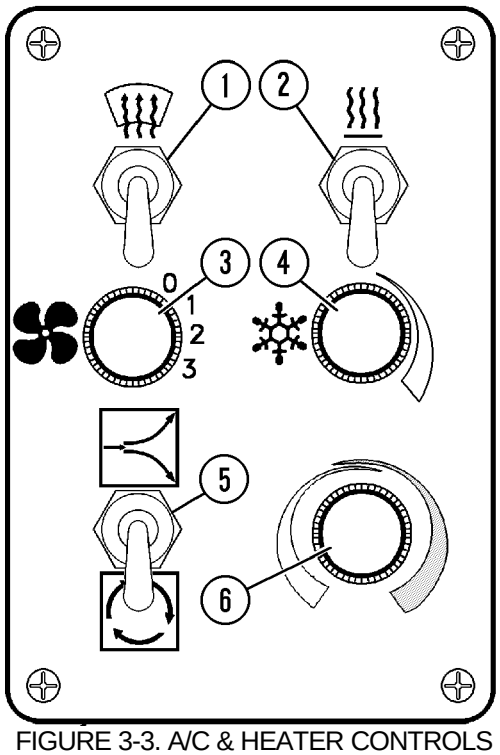
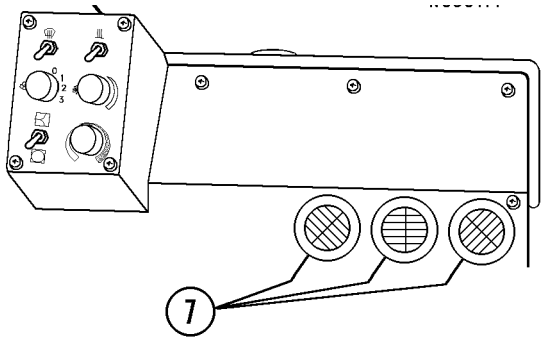


FIGURE 3-3. A/C & HEATER CONTROLS

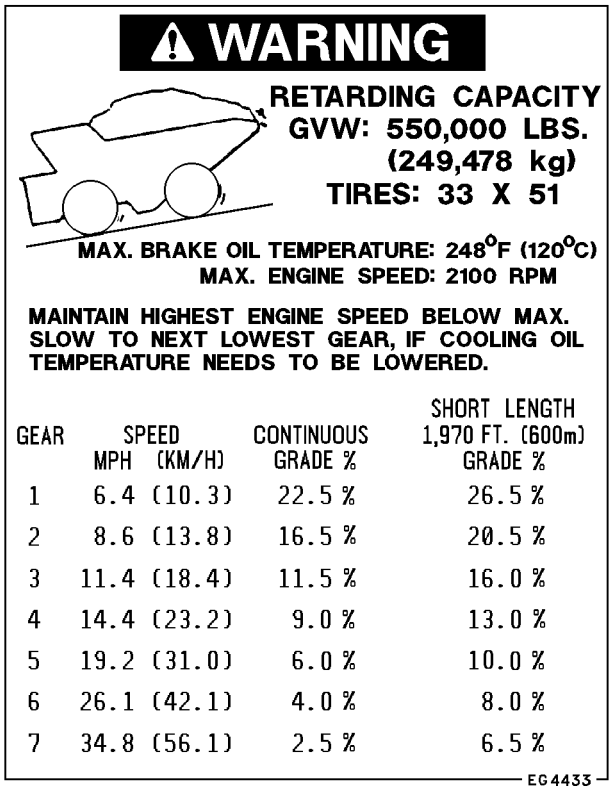
HEATER/AIR CONDITIONER VENTS

The heater/air conditioner vents (7, Figure 3-3) may be rotated 360°. There are three in the Heater/Air Conditioner Compartment (shown below), four vents across the top of the panel, and one each in the R.H. & L.H. instrument panel pods. Air flow through the vents is controlled by manually opening/closing or turning the louvers.



RETARDING CAPACITY CHART

The Retarding Capacity chart (8, Figure 3-1 & shown below) provides the recommended MAXIMUM truck speeds for descending various grades with a fully loaded truck.



RETARDING CAPACITY CHART

The operator should reference the Retarding Capacity chart before descending any grade with a loaded truck. Proper selection of road grade, truck speed, transmission gear range, and use of the retarder lever and/or brake pedal are required to maintain a safe speed.

Refer to OPERATING INSTRUCTIONS, ''Retarder Operation'', previously discussed in this Section.

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

Customer specified options may cause this decal to change: **ALWAYS refer to the Retarding Capacity chart in the operator's cab**, and follow the recommendations there for safe truck operation.

RADIO SPEAKERS

Radio Speakers (9, Figure 3-1) for the AM/FM Stereo radio are located at the far left and right of the overhead panel.

"MOM" DISPLAY SCREEN

This panel (10, Figure 3-1) contains an electronic display to provide the operator or service technician with important messages concerning selected truck functions.

Refer to "ELECTRONIC DISPLAYS AND MESSAGES" later in this Section, for a detailed description of the messages provided and the functions monitored by this display.

WARNING ALARM BUZZER

This alarm (11, Figure 3-1) will sound when activated by any one of several truck functions.
Refer to "INSTRUMENT PANEL AND INDICATOR LIGHTS", for a detailed description of functions and indicators that will activate this alarm.

CAB RADIO

This panel will normally contain an AM/FM Stereo radio (12, Figure 3-1).

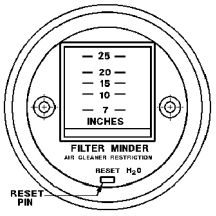
Refer to Section 5, Optional Equipment, for a more complete description of the radio and its functions.
Individual customers may use this area for other purposes, such as a two-way communications radio.

PMC INTERFACE CONNECTOR

The "PMC" Interface Connector (13, Figure 3-1) is used to communicate data between a computer and the PMC.

Refer to the Shop Manual, Powertrain Management Controller section, for a more complete description of the PMC and its functions.

AIR CLEANER VACUUM GAUGES



The air cleaner vacuum gauges (14, Figure 3-1) provide 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:

Cummins Engine: . . . 25 inches of H_2O Vacuum.

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

PAYLOAD METER

The Payload Meter (15, Figure 3-1) is used to provide management with operational data such as tonnage hauled and cycle times. Refer to Section 5, Optional Equipment, for a more complete description of the payload meter and its functions.

WINDSHIELD WIPERS

The windshield wipers (16, Figure 3-1) are powered by an electric motor. Refer to "TURN SIGNAL / HEADLIGHT DIMMER LEVER", for a description of the windshield wiper and washer controls.

CENTER CONSOLE STRUCTURE

The Center Console (1, Figure 3-4) located to the right of the operator seat, is a housing structure which provides a mounting surface for certain operator controls and a passenger seat.

The housing below the passenger seat provides an easy access to various control components (relays, solenoids, valves, etc.) for the service technican. Refer to the Shop manual for descriptions and service for these devices.

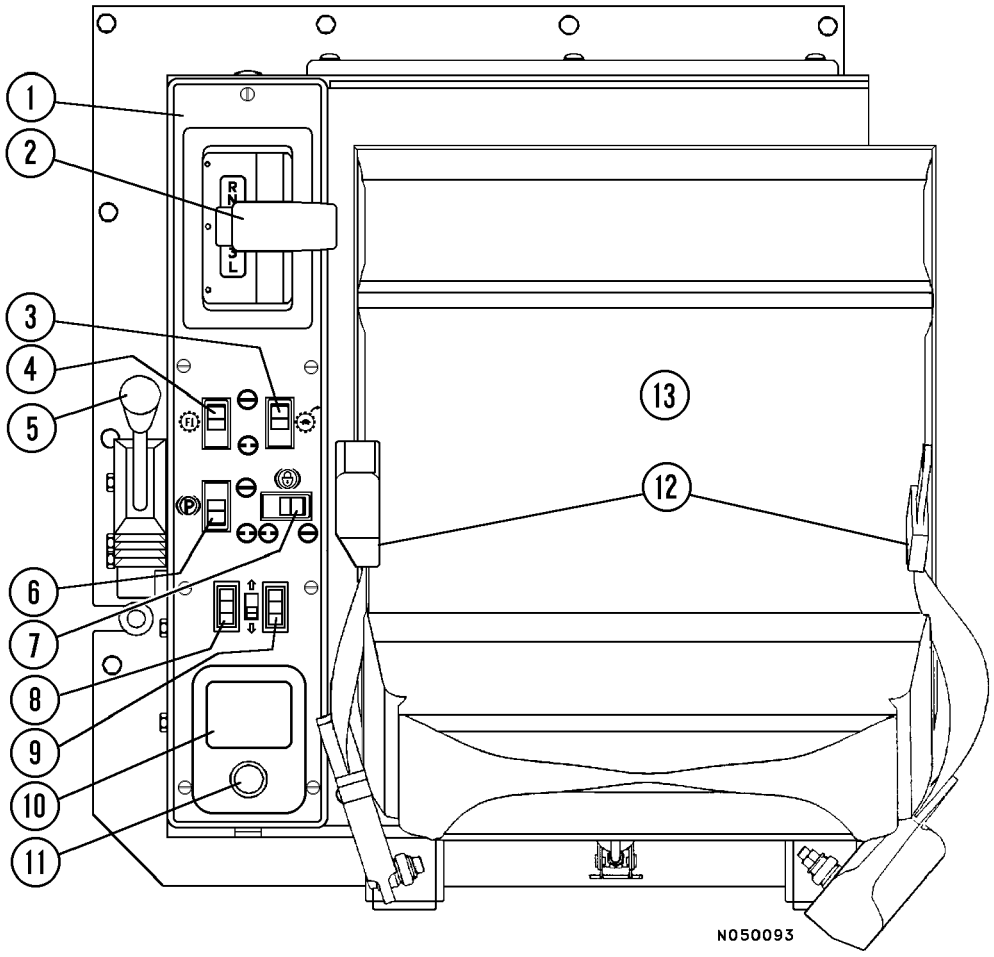


FIGURE 3-4. CENTER CONSOLE

1. Center Console Structure
2. Transmission Range Selector
3. Shift Limit Switch
4. "F1" Start Switch
5. Hoist Control Lever
6. Parking Brake Switch
7. Brake Lock Switch
8. L.H. Window Control Switch
9. R.H. Window Control Switch
10. Ash Tray
11. Cigar/Cigarette Lighter
12. Passenger Seat Belt
13. Passenger Seat

Transmission Range Selector (2, Figure 3-4)

The Transmission Range Selector is mounted to the right of the operator's seat.

The Transmission Range Selector has seven positions (R, N, D, 5, 4, 3, and L). When moving the range selector lever from "N" to "R", or from "D" to 5, press the lock button on the end of the handle before moving the selector lever.

"R" - REVERSE position - is used to move the truck backwards. Bring truck to a complete stop before shifting from DRIVE to REVERSE or vice-versa. The Reverse Warning Horn is activated when REVERSE position is selected.

"N" - NEUTRAL position - is used when starting the engine, during loading operations and parking the truck with engine running. The truck cannot be started unless the range selector is in the "N" - NEUTRAL position.

"D" - DRIVE position - When starting from a stopped position, the transmission will shift automatically to second gear. As the truck ground speed increases, the transmission will automatically upshift through each gear to seventh gear operation. As the truck ground speed slows down, the transmission will automatically down shift to the correct gear for grade/load/engine conditions.

"5, 4, 3" positions - Road and load conditions sometimes make it desirable to limit the automatic up-shifting to a lower range. These positions provide more effective retarding on grades. When the range selector is placed in any one of these positions, the transmission will not shift above the highest gear range selected. It will also down-shift to first range when required by grade/load/engine conditions.

When conditions permit, select position "D" for normal operation.

"L" - LOW position - Use this range position when maneuvering in tight spaces and when pulling through mud or deep snow. Use this range position also when driving up and down steep grades where maximum driving power or maximum retarding is required.

Control Switches (3, 4, 6, & 7, Figure 3-4)

These switches are simple "Rocker-type" switches which turn functions "On" and "Off".

The "On" and "Off" positions are maked with these symbols.

Shift Limiter Switch (3, Figure 3-4)

This switch is used to limit the highest speed range when the transmission shift lever is in "D" or "L" Ranges.

On/Off	Range	Range(s) Attainable
On	"D"	Range - F2 – F6
	"L"	Range - F1
Off	"D"	Range - F2 – F7
	"L"	Range - F1 – F2

F1 Start Switch (4, Figure 3-4)

This switch is used to electrically assure that the transmission always starts in "F1". When this switch is "On" and the transmission range selector is moved to a "Forward" range position, the transmission will shift to "F1" to start, regardless of the selector position.

Hoist Control Lever (5, Figure 3-4)

The hoist control is a four-function, three-position, hand-operated lever located between the operator seat and the Center Console.

Refer to "OPERATING INSTRUCTIONS, DUMPING" for more complete details concerning this control.

Parking Brake Switch (6, Figure 3-4)

When this switch is in the "On" position, the parking brake is applied.

When this switch is in the "Off" position, the parking brake is released.

The Parking Brake is spring applied and hydraulically released. It will hold a stationary truck when the engine is stopped and the keyswitch is in the "Off" position.

DO NOT apply the parking brake while the truck is in motion. Damage to the Park Brake components may occur.

When the keyswitch is "On" and the Parking Brake Switch is applied, an indicator light in the L.H. panel pod will illuminate.

Brake Lock Switch (7, Figure 3-4)

When this switch is in the "On" position, the Brake Lock is applied.

When this switch is in the "Off" position, the Brake Lock is released.

The Brake Lock should be used with engine running for dumping and loading operations only. The brake lock switch actuates the hydraulic brake system which locks the **rear wheel service brakes only**.

When pulling into shovel or dump area, select a loading area with as level a surface as possible. When truck is completely stopped and in loading position, apply the brake lock by pressing the rocker switch toward the "On" symbol. To release, press the rocker switch toward the "Off"symbol.

⚠WARNING

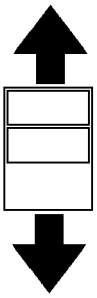
Use at shovel and dump only to hold truck truck in position.

Do not use this switch to stop truck, unless foot-operated brake valve is inoperative. Use of this switch applies rear oil disc service brakes at full, unmodulated pressure!

Do not use brake lock for parking. With engine stopped, hydraulic pressure will bleed down, allowing brakes to release!

L.H. Window Control Switch (8, Figure 3-4)

This control switch is spring-loaded to the center, "OFF", position. Pushing the front of the switch raises the left side cab window. Pushing the rear of the switch lowers the window.



R.H. Window Control Switch (9, Figure 3-4)

This control switch is spring-loaded to the center, "OFF", position. Pushing the front of the switch raises the right side cab window. Pushing the rear of the switch lowers the window.

Ash Tray (10, Figure 3-4)

The Ash Tray is used for extinguishing and depositing smoking materials. DO NOT use for flammable materials, such as paper wrappers, etc.
Be certain that all fire ash is extinguished!

Lighter (11, Figure 3-4)

The LIGHTER may be used for lighting cigars/cigarettes.
Always use CAUTION with smoking materials!.

This socket may also be used for a 12 VDC power supply.

Passenger Seat w/Safety Belt (12 & 13, Figure 3-4)

The Passenger Seat (13) is mounted on top of the right hand portion of the Center Console structure.

Any passenger riding in the truck, must use the seat belt (12) whenever the truck is being operated.

The area beneath the passenger seat provides a cabinet for various 24 VDC electrical components. Consult the Service Manual for service involving any of these components.

OPERATOR SEAT

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.

1. **Headrest**: headrest (1, Figure 3-5) will move up, down, fore, or aft by moving headrest to desired position.
2. **Armrests**: rotate adjusting knob until armrest is in desired position.
3. **Backrest**: Pull control (3) upward and hold, select backrest angle; release control handle.
4. **Front Height and Slope Adjustment of Seat Cushion**:
   a. Front height and slope; lift control lever (4) and hold.
   b. Bend knees to move seat to a comfortable position; release control lever to lock adjustment.
5. **Fore/Aft Location of Seat**:
   a. Raise adjustment lever (5).
   b. Move seat to desired position; release lever.
6. **Seat Height**: Press rocker switch (6) on top to increase ride height. Press on lower part of rocker switch to lower ride height.

7 & 8. **Air Lumbar Support** Each rocker switch (7 or 8) controls an air pillow. Switch (7) controls the lower air pillow and switch (8) controls the upper 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.

Removal

1. Remove capscrews (11, Figure 3-5) and hardware that secures the seat base to the riser. Remove capscrews (15) that secures tether (10) to floor.
2. Remove seat assembly from cab to clean work area for disassembly.

Installation

1. Mount seat assembly to seat riser. Install capscrews (11, Figure 3-5), lockwashers (12), flatwashers (13) and nuts (14). Tighten capscrews to standard torque.
2. Fasten tether straps (10) to floor with capscrews (15), flatwashers (16) and lockwashers (17). Tighten capscrews to standard torque.

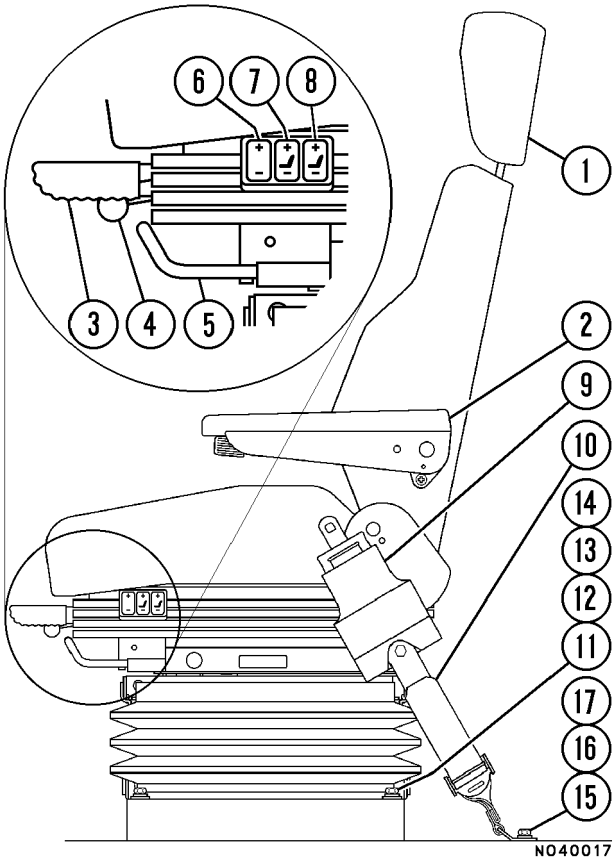


FIGURE 3-5. OPERATOR'S SEAT

1. Headrest
2. Armrest Adjustment
3. Backrest Adjustment
4. Front Height and Slope Adjustment
5. Fore and Aft Adjustment
6. Height Adjustment
7. Lower Air Pillow Lumbar Support
8. Upper Air Pillow Lumbar Support
9. Seat Belt
10. Seat Tether
11. Capscrew
12. Lockwasher
13. Flatwasher
14. Nut
15. Capscew
16. Flatwasher
17. Lockwasher

INSTRUMENT PANEL AND INDICATORS

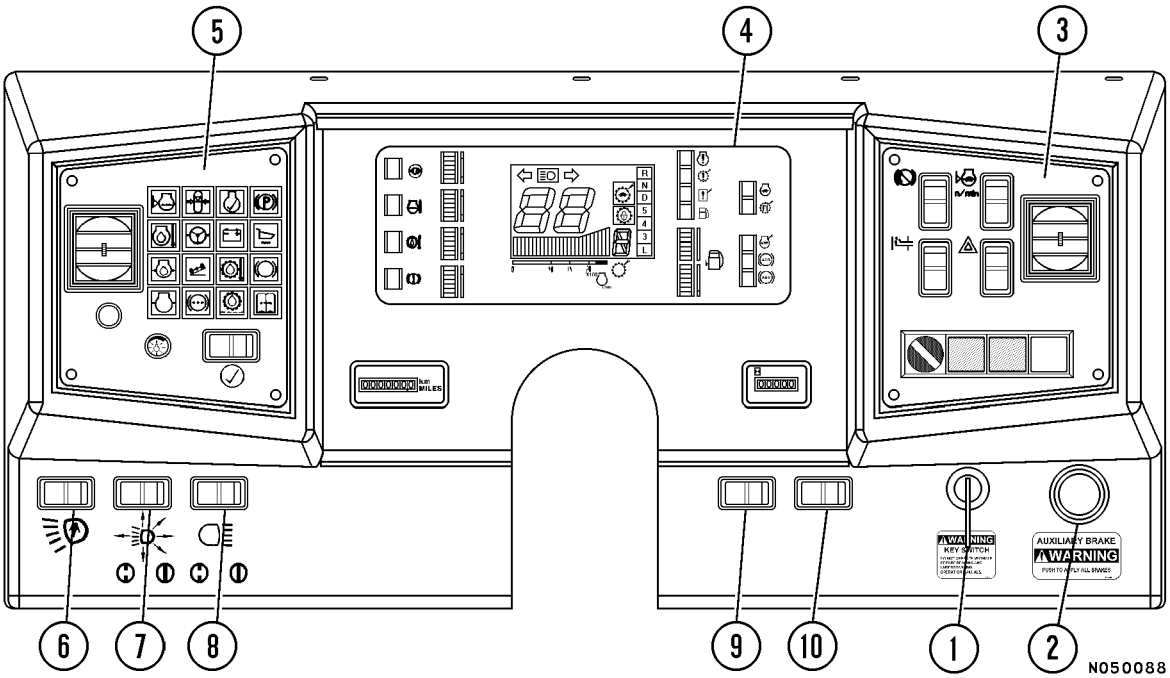


FIGURE 3-6. INSTRUMENT PANEL

1. Keyswitch
2. Auxiliary Brake Switch
3. R.H. Panel (Pod)
4. Center Display Panel
5. L.H. Panel (Pod)
6. Ladder Light Switch
7. Head Light Switch
8. BackUp/Deck Lights Switch
9. Mode Change Switch
10. Mode Change Switch (NOTE: These switches are to be used only by qualified service technicians.)

The instrument panel consists of a R.H. & L.H. Control/Indicator Panel (R.H. & L.H. Pods), a Center Display Panel (gauge and monitor module, with speedometer/tachometer module, transmission range indicator, service/hour meter, and odometer), and a row of control switches across the bottom of the panel.

The gauge and monitor module and speedometer module each have a microcomputer to process and display the signals from the sensors. Liquid crystal is used for the display area.

The monitors and gauges inside the monitor module and speedometer module are actuated by the signal from the gauge and monitor module, and the odometer is actuated by signals from the speedometer module.

The following pages will identify each element of the instrument panel and detail its function and purpose for the operator.

Keyswitch

The keyswitch (1, Figure 3-6) is a three position (Off, Run, Start) switch.

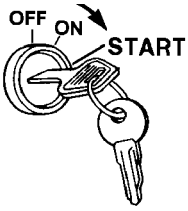
"OFF" –
Key insertion/withdrawal position – None of the electrical circuits are energized in this position.

Turn the switch to "OFF" to stop the engine.

Key Off

"ON" –
When the switch is rotated one position clockwise, it is in the "Run" position.
Lamp circuits and other electrical circuits (except "Start") are energized in this position.

"START" –
With Transmission Selector Lever in the "**N**eutral" position, rotate keyswitch fully clockwise to the "Start" position and hold until engine starts. "Start" position is spring loaded to return to "Run" when key is released.



Start Engine

NOTE: The engine start circuit 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.

Auxiliary Brake Switch

This switch (2, Figure 3-6) applies the Auxiliary Brake.

Depress the center button to apply the auxiliary brake. When the switch is "On", the RED lamp will illuminate.

Depress the button again to release the auxiliary brake; the light will turn "Off".

When the auxiliary brake switch is activated, full, unmodulated hydraulic brake pressure (or whatever pressure remains, if the system is failing) is applied to all wheels.
In addition, the parking brake is also applied.

The operator should not apply the auxiliary brake switch when the truck is moving, except as an emergency measure.

NOTE: This switch is for the manual activation of the auxiliary brake circuit by the operator.
The auxiliary brake circiut will apply automatically, if the hydraulic brake pressure decreases below a preset value.

R.H. Control/Indicator Panel (Pod)

The Control/Indicator Panel (3, Figure 3-6), located to the right of the steering wheel, provides an array of switches and controls.
For detailed inrormation on this assembly, refer to "R.H. Control/Indicator Panel (Pod)" later in this section.

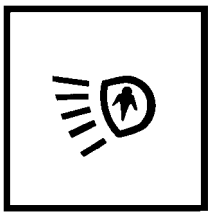
Center Display Panel

The Center Display Panel (4, Figure 3-6) provides an array of gauges and monitors, with an odometer module) and a service/hour meter module.
For detailed inrormation on this assembly, refer to "Center Display Panel" later in this section.

L.H. Control/Indicator Panel (Pod)

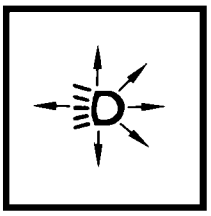
The Control/Indicator Panel (5, Figure 3-6), located to the left of the steering wheel, provides an array of indicator/monitor lights and three switches.
For detailed inrormation on this assembly, refer to "L.H. Control/Indicator Panel (Pod)" later in this section.

Ladder Light Switch



The switch (6, Figure 3-6) turns the ladder lights "On" or "Off" after or before using ladder. A similar switch is available at ground level to turn the lader lights "Off" or "On".

Head Light Switch

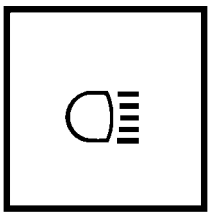


The instrument panel lights, clearance lights, and the headlights are controlled by this three position rocker type switch (7, Figure 3-6). "Off" is selected by pressing the left side of the switch. Press the right side of the switch until it reaches the first detent (middle) to select the panel, clearance, and tail lights only. Press the right side of the switch again, until it reaches the second detent to select headlights, as well as panel, clearance, and tail lights.

"OFF" These are "Rocker-type" switches. "ON"

The "Off" and "On" positions are marked with these symbols.

BackUp/Deck Lights Switch



The BackUp/Deck Lights Switch (8, Figure 3-6) allows backup lights to be turned "On" providing added visibility and safety when the Transmission Range Selector lever (see OPERATOR CONTROLS) is not in "REV" position.

Mode Change Switches

The Mode Change Switches (9 & 10, Figure 3-6) are to be used only by qualified service technicians.

R.H. Control/Indicator Panel (Pod)

The Control/Indicator Panel (3, Figure 3-6), located to the right of the steering wheel, contains the following:

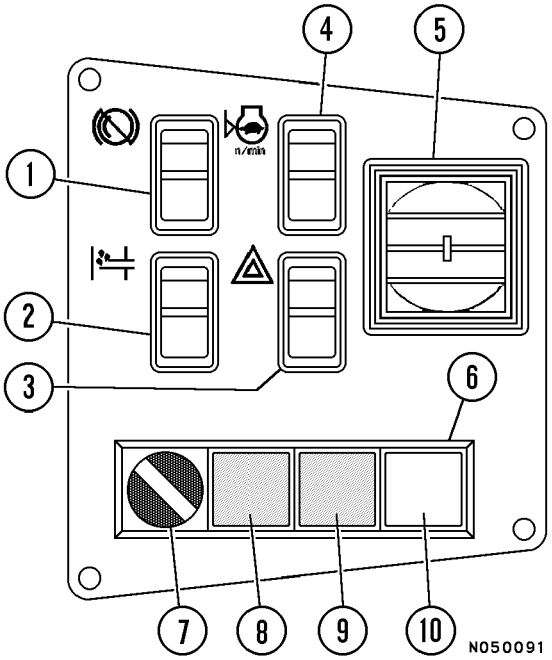


FIGURE 3-7. R.H. CONTROL/INDICATOR PANEL

1. Front Brake Cut-Off Switch (**Option**)
2. Cold Weather (Ether) Starting Aid Switch
3. Hazard Flasher Swich
4. AISS Automatic Engine Idle System
5. A/C & Heater Vent
6. Auto Cruise Control
7. On/Off Switch
8. Resume/Accel Switch
9. Set/Coast Switch
10. Cancel Switch

Front Brake Cut-Off Switch (Option)

The **Optional** Front Brake Cut-Off Switch (1, Figure 3-7) is used to change the application of the truck service brakes according to the road conditions.

The "rocker" switch is an "ON-OFF" type.
Depressing the bottom turns the switch "Off".
Depressing the top turns the switch "On".

"Off" Position
When the switch is in the "Off" position, braking force* is applied to **both** front and rear wheels. This position is used when traveling on normal road surfaces.

"On" Position
When the switch is in the "On" position, braking force* is applied only to the **rear wheels**. This position is used when traveling on slippery roads.

* The braking force is applied according to the switch position, regardles of whether the brakes are being applied by the steering wheel-mounted Retarder lever, or the foot-operated brake pedal.

Cold Weather Starting Aid (Ether Injection) Switch

The Starting Aid Switch (2, Figure 3-7) is an "ON-OFF" type "rocker" switch that is spring-loaded to the "OFF" position.

When the outside temperature is below -5°C (23°F), depress the top of this switch and hold for 2-3 seconds before starting the engine. The Cold Starting Aid atomizes ether into the engine intake manifold.

Refer to KEYSWITCH, "START" for further details regarding the use of this switch.

DO NOT push ether injection switch after engine has started!
SERIOUS DAMAGE TO ENGINE MAY OCCUR!

Hazard Warning Lights Switch

The Hazard Warning Light switch (3, Figure 3-7) causes all turn signal lights to flash simultaneously.

The "rocker" switch is an "ON-OFF" type.
Depressing the bottom turns the switch "Off".
Depressing the top turns the switch "On".

Automatic Idle Selector Switch (AISS)

The AISS Switch (4, Figure 3-7) controls the "idle" speed of the engine (released throttle pedal). With the foot-operated throttle pedal in the released position, the PMC (Powertrain Management Controller) sends a signal to the Centry™ Fuel Control System for a "low idle" RPM.

This signal may be for either:

- 750 RPM - "Normal" low idle, or
- 1000 RPM - High-Low idle;

depending on the following conditions:

1. Depressing the bottom of the switch selects the "Off/AUTO" position which is used for normal truck operations. When the AISS switch is in this position, the PMC idle signal will be determined by two conditions:
   engine coolant temperature, and
   brake application.
   a. Engine Coolant Temperature -
      If the engine coolant temperature is **below** 30°C/47°F, the PMC will signal for 1000 RPM, regardless of other conditions.
      If the engine coolant temperature is **above** 30°C/47°F, the PMC will signal for 750 RPM, except as follows:
   b. Brake Application -
      If both the parking brake and service brake are released (acceleration anticipated), the PMC will signal for 1000 RPM, regardless of other conditions.
2. Depressing the top of the switch selects the "On/Low" position.
   When the AISS switch is in this position, the PMC will signal for 750 RPM, regardless of other conditions. "On/Low position is used when fine control movements are needed, such as when parking in confined spaces.

Air Conditioner & Heater Vent

The air conditioner/heater vent (5, Figure 3-7) swivels on a vertical axis to direct air toward or away from the operator. Air flow (up, down, on, off) through the vent is controlled by manually opening/closing or turning the louver.

Auto Cruise Control (OPTIONAL)

The Auto Cruise Control (6, Figure 3-7), if installed, allows the operator to electronically control the truck travel speed.

On/Off Switch

This Switch (7, Figure 3-7) selects the On/Off status for the Auto Cruise Control feature.

Turning the switch clockwise to the vertical position turns the switch "On".
Turning the switch counter-clockwise to the diagonal position turns the switch "Off".

Resume/Accel Switch

The Resume/Accel Switch (8, Figure 3-7) is a green, back-lighted switch (power switch "On") that is used to resume a previously pre-selected speed, or to accelerate/increase to a higher speed. Depressing and releasing the switch will increase speed approximately 1 mph (0.62 kph) each time the switch is depressed.

Set/Coast Switch

The Set/Coast Switch (9, Figure 3-7) is a green, back-lighted switch (power switch "On") that is used to set the "Cruise" speed when a desired travel speed has been attained.

Depressing and releasing the switch will also decrease speed approximately 1 mph (0.62 kph) each time the switch is depressed.

Cancel Switch

The Cancel Switch (10, Figure 3-7) is a yellow, back-lighted switch (power switch "On") that is used to cancel any speed settings which have been previously selected.

Center Display Panel

The Center Display Panel (4, Figure 3-6) consists of a gauge and monitor module (1 – 27, Figure 3-8), with an odometer module (29) and a service/hour meter module (28). Liquid crystal is used for the display area.

The gauge and monitor module and the speedometer module each have a microcomputer to process and display the signals from the sensors.

The monitors and gauges inside the monitor module and speedometer module are actuated by the signal from the gauge and monitor module, and the odometer is actuated by signals from the speedometer module.

The following pages will identify each element of the Center Display Panel and detail the function and purpose for the operator.

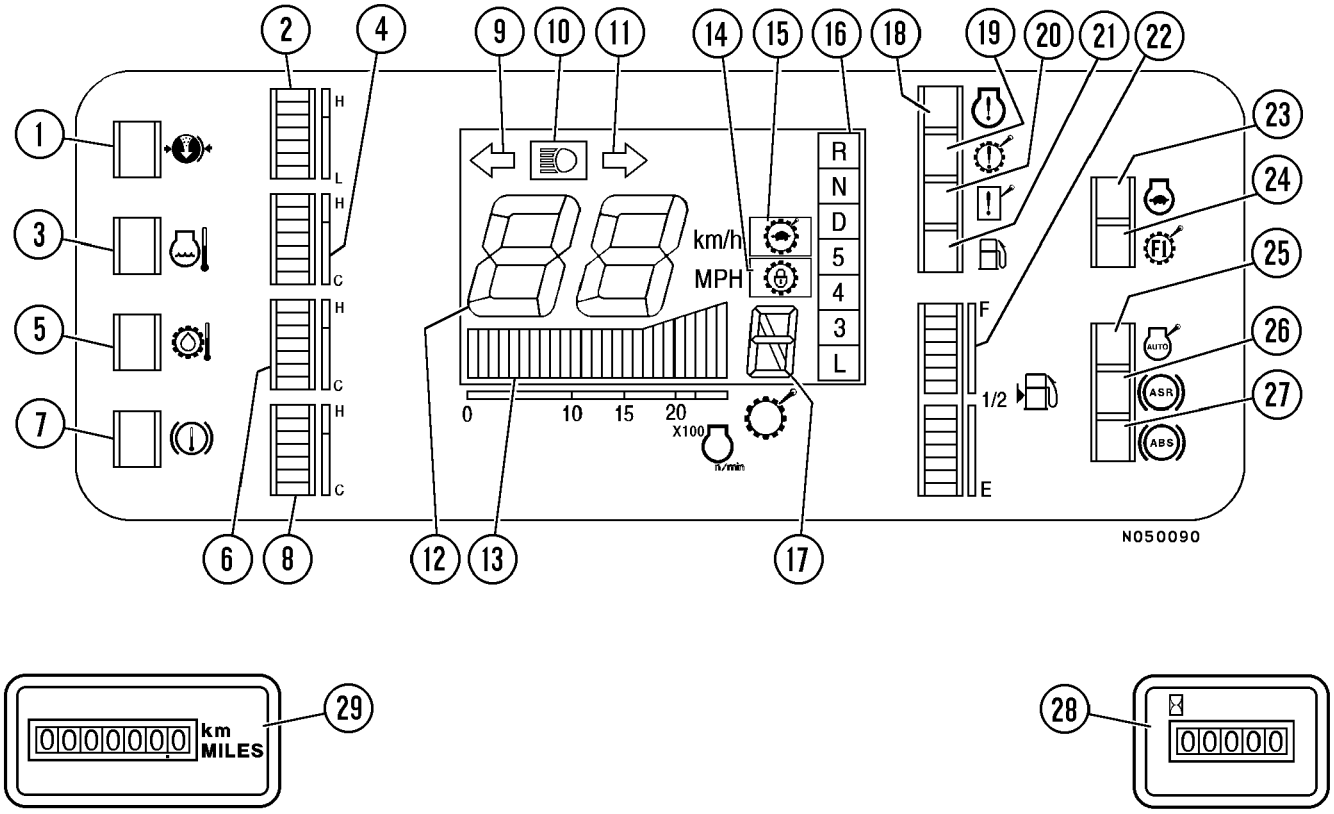


FIGURE 3-8. CENTER DISPLAY PANEL

1. Air Pressure Monitor (Not Used)
2. Air Pressure Gauge (Not Used)
3. Coolant Temperature Monitor
4. Coolant Temperature Gauge
5. Torque Converter Oil Temperature Monitor
6. Torque Converter Oil Temperature Gauge
7. Retarder Oil Temperature Monitor
8. Retarder Oil Temperature Gauge
9. Left Turn Signal Pilot Lamp
10. High Beam Pilot Lamp
11. Right Turn Signal Pilot Lamp
12. Speedometer
13. Tachometer
14. Lock-up Pilot Lamp
15. Shift Limiter Pilot Lamp
16. Shift Indicator
17. Transmission Shift Position Pilot Lamp
18. Engine Controller Monitor
19. Automatic Transmission Mechatronics Monitor
20. Other Controllers (OPTIONAL)
21. Fuel Level Monitor
22. Fuel Gauge
23. Engine Power Derate Monitor
24. F1 Start Monitor
25. Auto Cruise Control Monitor
26. ASR Monitor
27. ABS Monitor
28. Service Meter & Indicator
29. Odometer

Air Pressure Monitor (NOT USED)

The Air Pressure Monitor (1, Figure 3-8) is NOT USED on this truck.

Air Pressure Gauge (NOT USED)

The Air Pressure Gauge (2, Figure 3-8) is NOT USED on this truck.

Coolant Temperature Monitor

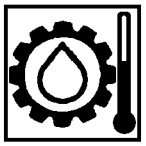
The Coolant Temperature Monitor (3, Figure 3-8) indicates a rise in the cooling water temperature.

When the monitor lamp flashes, run the engine with no load at 1200-1500 RPM until the green range of the engine water temperature gauge lights.

Engine Cooling Water Temperature Gauge

The Engine Cooling Water Temperature Gauge (4, Figure 3-8) indicates the temperature of the cooling water. If the temperature is normal during operation, the green range will light. If the red range lights during operation, the alarm buzzer will sound, the central warning lamp will flash and the coolant temperature monitor lamp will flash at the same time. If this occurs, stop the machine and run the engine with no load at 1200-1500 RPM until the green range lights.

Torque Converter Oil Temperature Monitor



The Torque Converter Oil Temperature Monitor (5, Figure 3-8) indicates a rise in the torque converter oil temperature.

When the monitor lamp flashes, stop the machine and run the engine with no load at 1200-1500 RPM until the green range of the temperature gauge lights.

Torque Converter Oil Temperature Gauge

The Torque Converter Oil Temperature Gauge (6, Figure 3-8) indicates the temperature of the torque converter oil. If the temperature is normal during operation, the green range will light. If the red range lights during operation, the alarm buzzer will sound, the central warning lamp will light up and the torque converter oil temperature monitor lamp will flash at the same time. If this occurs, stop the machine and run the engine with no load at 1200-1500 RPM until the green range lights.

Retarder Oil Temperature Monitor

The Retarder Oil Temperature Monitor lamp (7, Figure 3-8) warns that the retarder oil temperature has risen.

If it flashes, stop the machine, return the Transmission Range Selector lever to Neutral, and run the engine under no load at 1200-1500 RPM until the warning lamp goes out.

Retarder Oil Temperature Gauge

The Retarder Oil Temperature Gauge (8, Figure 3-8) indicates the temperature of the retarder cooling oil. During normal operation, a lamp in the green range should light up.

If the lamp in the red range lights up during operation, the alarm buzzer will sound, the central warning lamp will flash, and the retarder oil temperature monitor lamp will flash at the same time. If this happens, stop the machine, return the Transmission Range Selector lever to Neutral, and run the engine at 1200-1500 RPM under no load, and wait until the lamps in the green range light up.

Left Turn Signal Pilot Lamp

When the turn signal lever is moved downwards, the left turn signal pilot lamp (9, Figure 3-8) flashes.

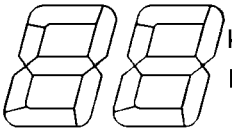
High Beam Pilot Lamp

The High Beam Pilot Lamp (10, Figure 3-8) lights up when the head lamps are on high beam.

Right Turn Signal Pilot Lamp

When the turn signal lever is moved upwards, the right turn signal pilot lamp (11, Figure 3-8) flashes.

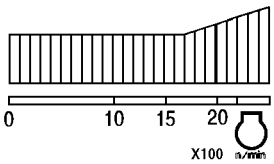
Speedometer



The digital Speedometer (12, Figure 3-8) indicates the travel speed of the truck in miles per hour, or kilometers per hour.

This figure will appear momentarily when the keyswitch is first turned "On" to demonstate that all segments are working.

Tachometer



The Tachometer (13, Figure 3-8) indicates 0-2500 RPM engine speed.
Each bar represents 100 RPM.

Lock-up Pilot Lamp

The Lock-Up Pilot Lamp (14, Figure 3-8) lights up (blue) whenever the torque converter is locked up and the transmission enters direct drive.

Shift Limiter Pilot Lamp

The Shift Limiter Pilot Lamp (15, Figure 3-8) lights up (blue) whenever the shift limiter switch (on center console) is activated.

Shift Indicator

R
N
D
5
4
3
L

The Shift Indicator (16, Figure 3-8) indicates the **lever position** of the transmission range selector.

Transmission Shift Position Pilot Lamp

The Transmission Shift Position Pilot Lamp (17, Figure 3-8) will indicate the specific gear range *in which the transmission is actually operating*; R, N, 1, 2, 3, 4, 5, 6, or 7.

Engine Controller Monitor

This red indicator (18, Figure 3-8) flashes whenever any abnormality occurs in any of the engine control systems.

Automatic Transmission Mechatronics Monitor

This red indicator (19, Figure 3-8) flashes whenever any abnormality occurs in the mechatronics related parts of the transmission control system.

Other Mechatronics Monitor (OPTIONAL)

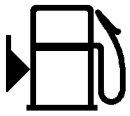
This red indicator (20, Figure 3-8) flashes whenever any abnormality occurs in the mechatronics related parts of the PMC (Powertrain Management Control) system, RCM (Retard Control Monitor) system, PLM (PayLoad Meter) system, and the suspension control system .

Fuel Level Monitor

This red indicator (21, Figure 3-8) flashes whenever the remaining fuel in the fuel tank goes below 40 gal. (150 liters).

When this indicator flashes, check the fuel level gauge (22) and/or add fuel to the truck fuel tank.

Fuel Gauge



The Fuel Gauge (22, Figure 3-8) indicates the amount of fuel in the fuel tank. If there is more than 40 gal. (150 liters) of fuel in the tank while the engine is operating, the green range illuminates. If there is less than 40 gal. (150 liters) of fuel in the tank, the red range illuminates.

Engine Power Derate Monitor

This red indicator (23, Figure 3-8) flashes to alert the operator that the PMC (Powertrain Management Controller) has detected an engine fault and is signalling the Centry™ Fuel Control system to reduce power output to protect the engine.

F1 Start Monitor

This blue indicator (24, Figure 3-8) illuminates whenever the F1 Shift Limit switch (on center console) is activated.

Auto Cruise Control (OPTIONAL)

This indicator (25, Figure 3-8) illuminates whenever the OPTIONAL Auto Cruise Control system (if installed) is activated.

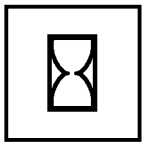
ASR Monitor (OPTIONAL)

This indicator (26, Figure 3-8) illuminates whenever the OPTIONAL traction control system (if installed) is activated.

ABS Monitor (OPTIONAL)

This indicator (27, Figure 3-8) illuminates whenever the OPTIONAL Anti-Slip Brake control system (if installed) is activated.

Service Meter



The Service Meter (28, Figure 3-8) displays the total hours of operation for the truck.The meter advances whenever the engine is operating, even if the truck is not moving.

Odometer

The Odometer (29, Figure 3-8) indicates the total distance that the truck has traveled in miles or kilometers.

L.H. Control/Indicator Panel (Pod)

The Control/Indicator Panel (5, Figure 3-6), located to the left of the steering wheel, contains the following:

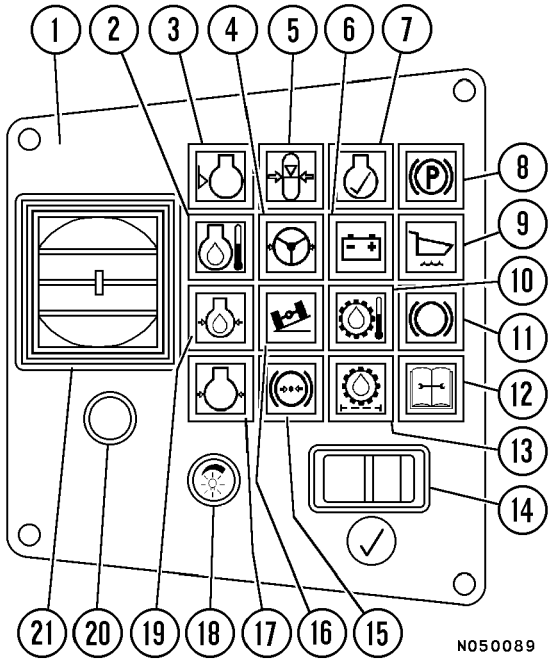


FIGURE 3-9. L.H. CONTROL/INDICATOR PANEL

1. L.H. Panel (Pod Assy.)
2. Engine Oil Temp.
3. Engine Coolant Level
4. Low Steering Press.
5. Accumulator Pre-Charge Pressure
6. Battery Charge (Amps)
7. Check Engine
8. Parking Brake
9. Body Float
10. Trans. Oil Temp.
11. Service Brakes Applied
12. Maintenance Monitor
13. Transmission Oil Filters
14. Lamp Test Switch
15. Low Brake Pressure
16. Lateral Slope Warning
17. Crankcase Pressure
18. Panel Dimmer Switch
19. Engine Oil Pressure
20. Central Warning Lamp
21. A/C & Heater Vent

L.H. Panel/Pod Assembly

The L.H. Panel/Pod Assy. (1, Figure 3-9) provides an array of indicator/monitor lights and three switches. *NOTE: All the Indicator Lamps are RED in color; Except, # 11. which is AMBER/YELLOW.*

Engine Oil Temperature

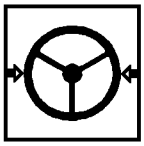
The Engine Oil Temperature Monitor light (2, Figure 3-9) will illuminate if the engine oil temperature exceeds 250°F (121°C) for a continuous period of 5 seconds. If the lamp flashes and alarm buzzer sounds, stop the engine.

At the same time, a fault code will be registered in the Centry™ System. Refer to CENTRY™ FUEL SYSTEM DIAGNOSTICS later in this section.

Engine Coolant Level

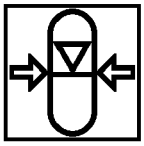
The Engine Coolant Level Monitor light (3, Figure 3-9) will illuminate, if the engine coolant level is below the sensor for a continuous period of 5 seconds. At the same time, a fault code will be registered in the Centry™ System. (Refer to CENTRY™ FUEL SYSTEM DIAGNOSTICS later in this section.)
If this monitor lamp flashes and alarm buzzer sounds, stop truck, shutdown engine, and add coolant as required.

Low Steering Pressure



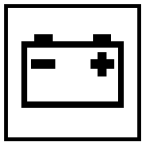
The Low Steering Pressure Monitor light (4, Figure 3-9) will illuminate if the steering system pressure is below 1850 psi (12.8 MPa). The light may also indicate that the wire from the switch to the transmission controller is cut or broken.

Accumulator Pre-Charge



The Accumulator Pre-Charge Monitor light (5, Figure 3-9) will illuminate, if the accumulator nitrogen pressure is below 850 psi (5 861 kPa). The light may also indicate that the wire from the switch to the transmission controller is cut or broken.

Battery Charge Amps



The Battery Charge Amps Monitor light (6, Figure 3-9) will illuminate, if the transmission controller detects low battery current at the "R" terminal of the alternator while the engine is running or if the wire is cut. If the monitor lamp flashes, check the charging circuit.

Check Engine

The Check Engine Monitor light (7, Figure 3-9) will illuminate if a problem occurs in the Centry™ engine control system. The light is also used to display the trouble code.

(Refer to CENTRY™ FUEL SYSTEM DIAGNOSTICS later in this section.)

Parking Brake

The Parking Brake Monitor light (8, Figure 3-9) will illuminate if the transmission controller detects that the parking brake is applied or that the wire between the switch and the controller is cut or broken.

Body Float

The Body Float Monitor light (9, Figure 3-9) will illuminate if the transmission controller detects that the body is not seated on the frame rail or that the wire from the proximity switch and the controller is cut.
When the dump body control lever is set to *any position* **other than** FLOAT, the Body Float Monitor lights up.
When traveling, always set the lever to FLOAT position.

Transmission Oil Temperature

The Transmission Oil Temperature Monitor light (10, Figure 3-9) will illuminate if the transmission controller detects that the oil temperature is over 248°F (120°C)

Service Brakes Applied

The Service Brakes Applied Monitor light (11, Figure 3-9) will illuminate (amber), if the transmission controller detects that the rear brakes have been applied, or that the wire between the switch and the controller is grounded.

Maintenance Monitor

The Maintenance Monitor lamp (12, Figure 3-9) will illuminate if the PMC (Powertrain Management Controller), detects any of the following faults:

* Low oil brake cooling oil level
* Low hydraulic oil level
* Low battery liquid level
* Front oil brake cooling filter restricted
* Rear oil brake cooling filter restricted - Right side
* Rear oil brake cooling filter restricted - Left side
* Hydraulic Oil Filters Restricted
* Brake Disc Wear Indication - Right Front
* Brake Disc Wear Indication - Left Front
* Brake Disc Wear Indication - Right Rear
* Brake Disc Wear Indication - Left Rear

Transmission Oil Filters

The Transmission Oil Filters Monitor lamp (13, Figure 3-9) will illuminate if the transmission controller detects that a transmission filter is restricted, or that the wire between the controller and the switch is cut or broken.

If this lamp flashes and the alarm buzzer sounds, notify maintenance personnel, immediately.

As soon as practical thereafter, drain the transmission oil, replace the transmission filters, and check for contamination in the oil.

Lamp Test

The Lamp Test switch (14, Figure 3-9) is a three position, two function switch. The switch is spring loaded to the middle, ''neutral'' position. If depressed on the right side and held, it is a lamp test for all of the monitor lamps except the check engine lamp.

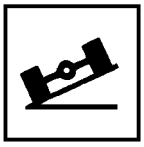
If the left side of the rocker switch is depressed held the lamp test for the check engine lamp will function.

When the check engine lamp is illuminated because of a fault in the Centry™ System, depress and release the left side of the rocker switch. Wait, and the Check Engine lamp will begin flashing the fault codes.
(Refer to CENTRY™ FUEL SYSTEM DIAGNOSTICS later in this section.)

Low Brake Pressure

The Low Brake Pressure Monitor lamp (15, Figure 3-9) will illuminate if the transmission controller detects that the brake system hydraulic pressure is below 1850 psi, or that the wire from the switch to the controller is cut.

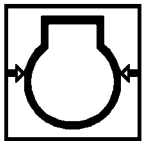
Lateral Slope Warning



The Lateral Slope Warning Monitor lamp (16, Figure 3-9) will illuminate if the dump body is off of the frame and the lateral slope of the truck is beyond a pre-set safety limit.

(This is a tip-over warning device)

Crankcase Pressure



The Crankcase Pressure Monitor lamp (17, Figure 3-9) will illuminate if the engine crankcase pressure is greater than 14.5 in. of H_2O (water) for more than 5 seconds.

At the same time a fault code will be registered in the Centry™ System. (Refer to CENTRY™ FUEL SYSTEM DIAGNOSTICS later in this section.)

Panel Dimmer Switch

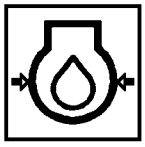
The Panel Dimmer Switch (18, Figure 3-9) is used to adjust the brightness of the lighting inside the monitor panel.

Adjust as follows:

To increase brightness, turn clockwise.

To decrease brightness, turn counter-clockwise.

Engine Oil Pressure



The Engine Oil Pressure Monitor lamp (19, Figure 3-9) will illuminate if the engine oil pressure falls below a certain value for a 5 second period of time. That value is dependent on engine RPM.

At the same time a fault code will be registered in the Centry™ System. (Refer to CENTRY™ FUEL SYSTEM DIAGNOSTICS later in this section.)

Central Warning Lamp (Red Convex Lens)

The Central Warning Lamp Monitor lamp (20, Figure 3-9) will illuminate if any of the monitor lamps in the L.H. pod (Figure 3-9) are activated. This lamp is also activated if a fault is registered on the "MOM" display.

This lamp flashes, ***and at the same time an alarm buzzer sounds intermittently***, if an abnormality has occurred in any one of the following systems:

Coolant Temperature Monitor;
Torque Converter Oil Temperature Monitor;
Retarder Oil Temperature Monitor;
Coolant Level Monitor;
Engine Oil Pressure Monitor;
High Engine Oil Temperature;
High Engine Blowby Pressure;
Transmission Oil Filter Monitor;
High Transmission Lube Oil Pressure;
Battery Charging Monitor;
Parking Brake Monitor;
Body Float Monitor;
Automatic Transmission Monitor (Mechatronics);
Other Mechatronics Monitor; or
Fuel Level Monitor.

This lamp will also flash and the alarm buzzer will sound, if **the parking brake is applied and the range selector lever is not at Neutral**.

AC/Heater Vent

The AC/Heater vent (21, Figure 3-9) is provided for circulation of cooled or heated air through the cab.

REAR OF OPERATOR CAB

The following components are located behind the operator and passenger seats across the back wall of the operator cab (Refer to Figure 3-10):

1. Circuit Breaker Panel

   This panel contains all of the electrical circuit breakers on the truck.

2. Relay Board

   This panel contains relays for various electrical circuits on the truck.
   Refer to the Service/Shop Manual for specific information regarding this relay board.

3. Relay Board

   This panel contains relays for various electrical circuits on the truck.
   Refer to the Service/Shop Manual for specific information regarding this relay board.

4. RCM - Retard Control Monitor

   This panel controls and monitors the fully hydraulic retarder system.
   Refer to the Service/Shop Manual for specific information regarding this device.

5. TMS - Tire Management System (**Optional**)

   This panel is a monitoring device for the truck tires (when installed). It supplies pressure and temperature information for each tire.
   Refer to the Service/Shop Manual for specific information regarding this device.

6. ASC - Automatic Suspension Controller (**Optional**)

   This panel (when installed) controls and monitors the Varible Rate Suspension units.
   Refer to the Service/Shop Manual for specific information regarding this device.

7. ATC - Automatic Transmission Controller

   This panel controls and monitors the Komatsu fully automatic transmission. It controls the Shift schedules and Lock-up Clutch modulation and monitors numerous other sensor inputs.
   Refer to the Service/Shop Manual for specific information regarding this device.

8. PMC - Powertrain Management Controller

   This panel controls, monitors, and manages all of the other monitors and controllers listed above.
   Refer to the Service/Shop Manual for specific information regarding this device.

9. Terminal Strips - Terminals for various electrical circuits. Refer to the Service/Shop Manual Electrical Schematic for specific information.

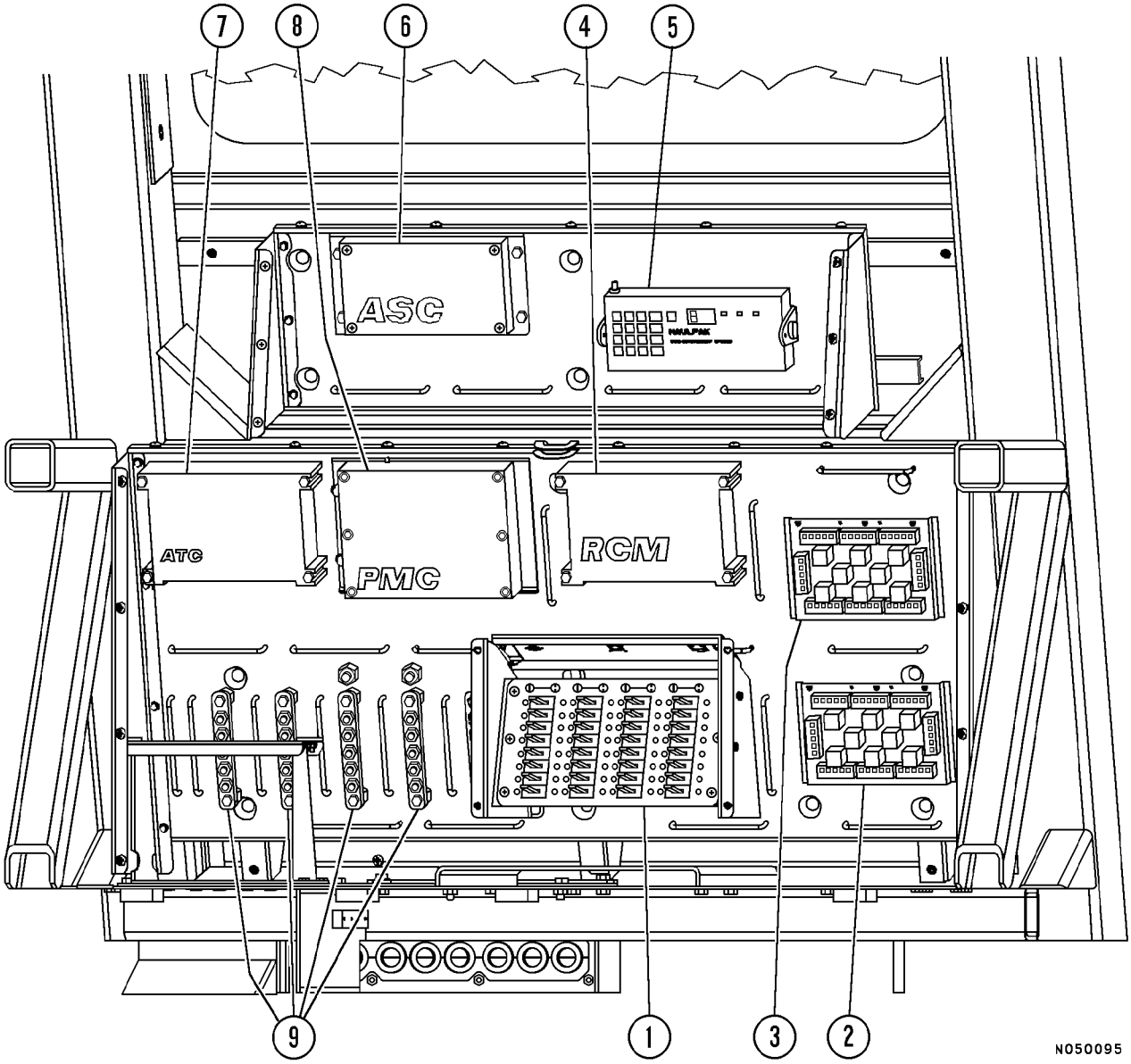
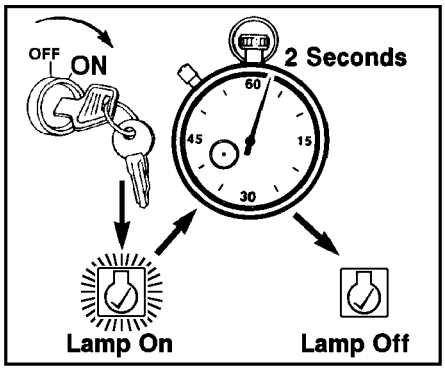


FIGURE 3-10. REAR WALL OF OPERATOR CAB

1. Circuit Breaker Panel
2. Relay Board
3. Relay Board
4. RCM - Retard Control Monitor
5. TMS - Tire Management System (OPTIONAL)
6. ASC - Automatic Suspension Controller (OPTIONAL)
7. ATC - Automatic Transmission Controller
8. PMC - Powertrain Management Controller
9. Terminal Strips

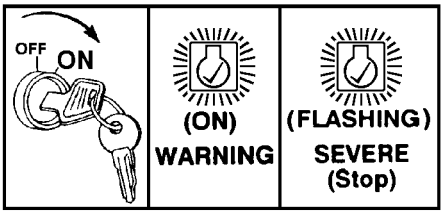
CENTRY™ FUEL SYSTEM DIAGNOSTICS - CUMMINS Engine Only -

The CHECK ENGINE Monitor Light (7, Figure 3-9) monitors the **Centry™ Fuel Control** 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 below.

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 significanly affected, *resulting in a backup mode of operation*.

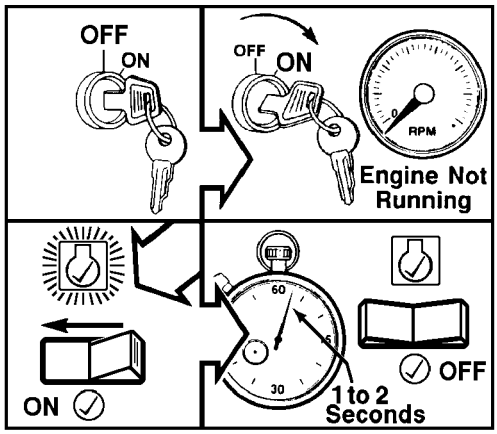
  Active fault conditions MUST be corrected as soon as possible.

The Lamp Test/Diagnostic Test Switch (14, Figure 3-9) may be used to activate the Centry™ Fuel System diagnostic codes. When the Centry™ fuel system detects a "fault" and the CHECK ENGINE Monitor Light (7, Figure 3-9) illuminates as described above, this switch will permit determination of the kind of "fault(s)" detected.

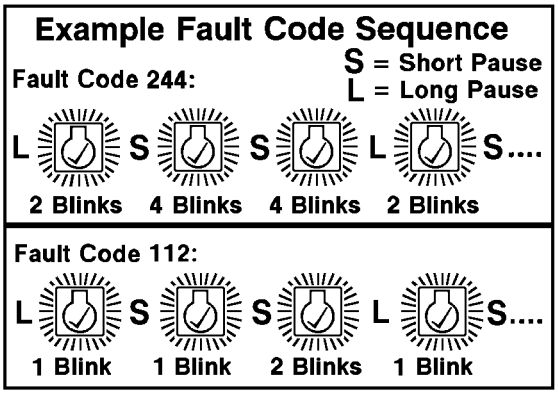
Determining "FAULT" Codes

Centry™ fault codes consist of three numerical digits. Each digit is indicated with up to five light flashes (CHECK ENGINE Monitor 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.

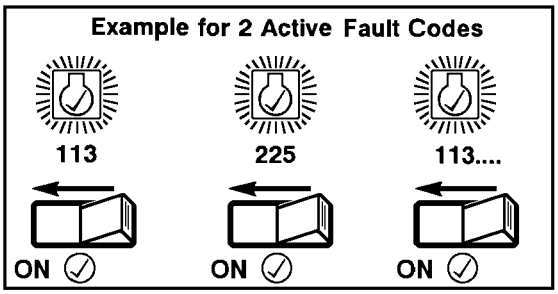
1. To determine an active Centry™ "fault", turn the keyswitch to the OFF position. Be sure engine completely stops, if it was running.
2. Turn keyswitch to ON position (engine not running) and press Lamp Test switch to the left ("√" position) for 1 – 2 seconds, then release (switch is spring-loaded to the middle, "OFF", position).



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

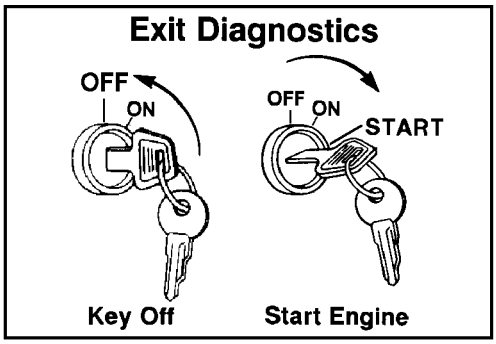


4. Pressing the Lamp Test switch to the bottom ("√") again will advance to the next fault code (if more than one code is present). Once all active fault codes have been displayed, the fault code display sequence will be repeated, starting from the first fault code.



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 Centry™ System "Troubleshooting and Repair Manual", Bulletin No. 3666070, or contact an Authorized Repair Location.

NOTES

MESSAGE FOR OPERATION AND MAINTENANCE ("MOM")

"MOM" (Message for Operation and Maintenance) is the message display screen located in the upper panel just above the operator's head. It is used to display messages to the operator and service personnel. The screen incorporates touch switches on its surface, to change displays.

Data that "MOM" can display includes:

Truck Condition-

When the key switch is turned to the run position before cranking, the display will read **OK** or **WAIT**. If the **WAIT** warning is present, the reason will also displayed.

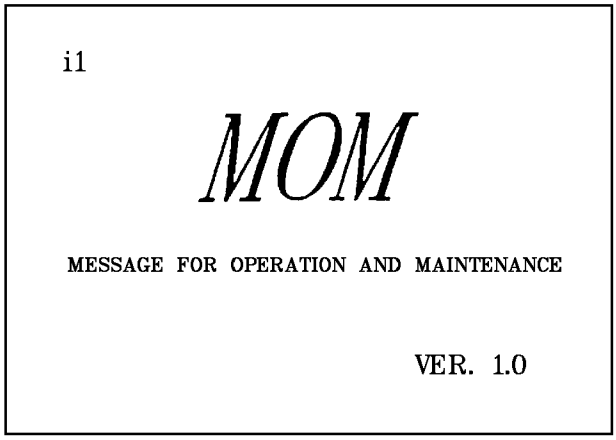
If the engine is running and the truck is ready to be moved, the screen will indicated departure is **OK** or **WAIT**. If the **WAIT** warning is present, the reason will also be displayed.

Production Data During Operation - (Information from the Payload Meter)

- The Current Payload
- The Total Payload
- The Total Number Of Cycles
- Fault Information At The Time Of Occurrence
- The Fault Code And Its Description
- The Action Code And Its Description
- Other Function - Clock

*NOTE: The operator should follow the recommendation that is displayed on the "MOM" screen. However, the operation of the truck is not prohibited. Even if the screen displays **WAIT** the truck can still be operated if an emergency situation exists*.

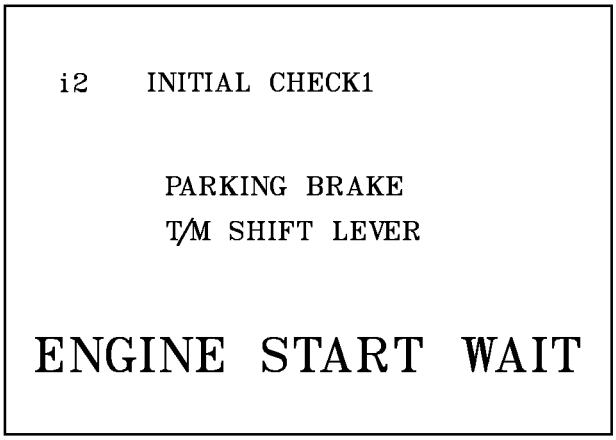
1. Screen i1, Initial Message



After the key switch is turned on, the initial message (i1) is displayed for three seconds after a system message is displayed. The picture number, i1, the title, and the program version number are all indicated on this screen. After being displayed for three seconds, i1 is changed to the first initial check, Check 1, screen i2, automatically.

If any of the controllers detect a fault in their system, the i1 screen is changed to the display of the warning message i6 automatically after three seconds.

2. Screen i2, Initial Check 1



This screen is displayed after i1 and before the engine is started. It is used to inform the operator whether the conditions are acceptable to start the engine.

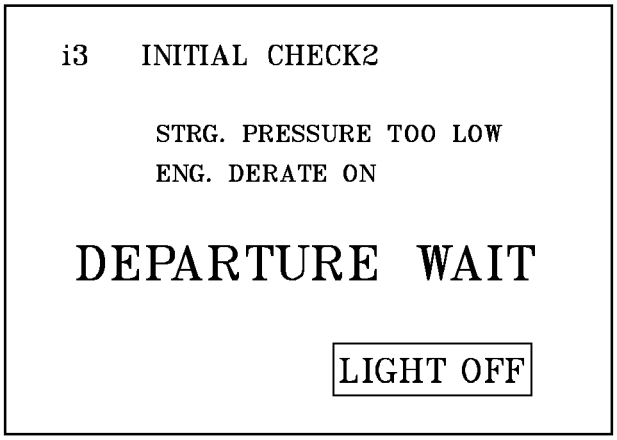
When "MOM" judges that engine start is acceptable, **"ENGINE START OK"** is indicated on the screen.

If "MOM" judges that engine start is not acceptable, **"ENGINE START WAIT"** is indicated on the screen.

The reason why the engine start is not acceptable is also indicated at the same time. If the screen displays **"PARKING BRAKE"**, it means the parking brake is not applied. If the screen displays **"T/M SHIFT LEVER",** it means the shift lever is not in the neutral position.

The engine will still start even if the screen indicates **"PARKING BRAKE"** while the shift lever must be in the neutral position for the engine to start. After the engine starts the i2 screen changes to the second initial check, Check 2, screen i3 automatically.

If any controller detects a fault, i2 is changed to the i6, Warning Message screen automatically.



3. Screen i3, Initial Check 2

This screen is displayed after the engine is running but, before the range selector lever is moved from the neutral position. The indication will be that departure is acceptable or not.

When "MOM" judges that departure is acceptable, **"DEPARTURE OK"** is indicated on the screen.

If "MOM" judges that departure is not acceptable, **"DEPARTURE WAIT"** is indicated on the screen.

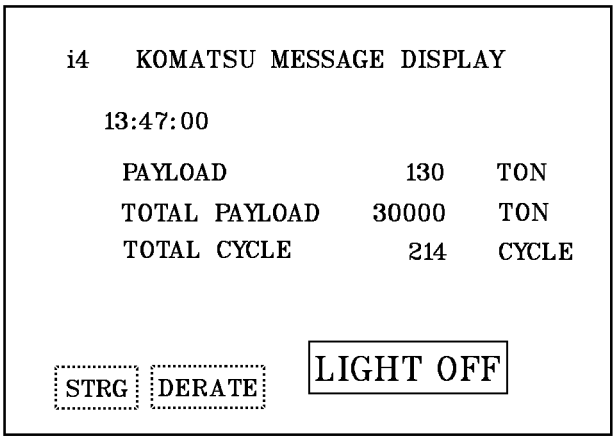
The reason why departure is not acceptable is also indicated at the same time. Possible reasons could be, **"STRG. PRESSURE TOO LOW"** when the steering accumulator pressure is too low, or **"ENG. DERATE ON"** when the engine system detects some severe fault which makes the engine power derate.

The truck is still able to depart even is **"STRG.PRESSURE TOO LOW"** or **"ENG. DERATE ON"** if in an emergency situation. When the engine is started i2 is changed to the initial check i3 screen automatically.

If the **"LIGHTS OFF"** area in the i3 screen is touched, then the back light of "MOM" is turned off and i3 is turned to a dark display.

If any controller detects a fault, i3 is changed to the warning message screen i6 automatically.

4. Screen i4, Normal Display



This screen is displayed while the truck is running and the range selector is in either a forward or reverse position. Once the range selector is changed from the neutral position the i4 screen is displayed until the key switch is turned to the off position, even is the range selector is returned to the neutral position.

Time, current payload, total payload, and total number of cycles are indicated in this display.

If during the time the i3 screen was displayed the **"DEPARTURE WAIT"** was indicated because of either **"STRG."** and/or **"DERATE"**, they will remain on until the cause is discovered and repaired.

The payload meter is the source of the information regarding payload data. "MOM" is unable to indicate this data until it is sent by the payload meter. The payload meter will send this information to "MOM" when it recognizes the truck is in a loading configuration. It will continue sending information until it realizes that the loading configuration is finished or the truck has changed to a dumping condition. After first recognizing a loading and then dumping configurations, the payload meter will then sent the data of total payload and total number of cycles.

The following situations are considered not normal.

a. If the truck was in a loading configuration and the key switch was turned off and then back on again, "MOM" will indicate no data of current payload, total payload, and total number of cycles.

b. The data for total payload and total number of cycles is not indicated in "MOM" until the payload meter recognizes that the truck has started dumping the load.

c. The data for current payload is not indicated until the payload meter recognizes that the truck is being loaded.

d. If after the current payload has been indicated and then additional material is now added to the load, the current payload data will not change.

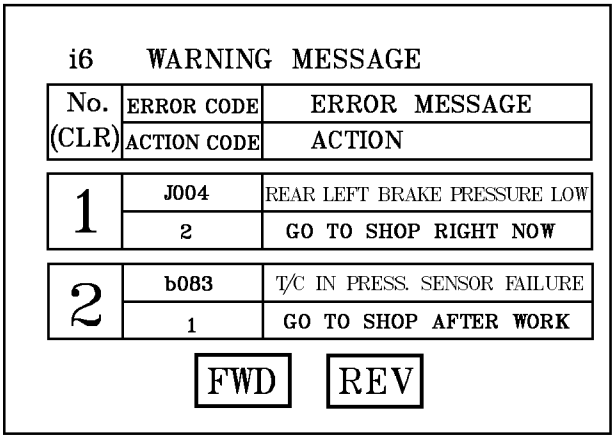
e. If data is not being recognized by "MOM", dump the load. Activate the dump cycle a second time and then assume normal operation.

Note: For additional information regarding the Payload Meter, refer to the Option section of the service manual.

If the **"LIGHTS OFF"** area in i4 is touched then the back light of "MOM" is turned off and i4 is changed to a dark display.

If any controller detects a fault, i4 is changed to the i6 warning message display automatically.

5. Screen i6, Warning Message Display



When a fault occurs in any of the controllers the operator is informed of this through the following method:

a. MOM will display the **fault** code and the **action** code along with a description of each.

b. The electronic display in the instrument panel will also display the **action** code.

c. The central warning lamp is turned on and off as a warning alarm. In certain cases the warning buzzer is also activated.

If the fault is with a component or system that also has a warning lamp, this indication will also be activated at the same time.

After the operator has been informed of the fault code the action that should be taken is as follows:

1) Stop the truck in a safe location.

2) Apply the parking brake.

3) Confirm the presence of the fault code and the action code.

4) Follow the instructions of the action code.

5) Notify a qualified technician for repairs.

The possible action codes are as follows:

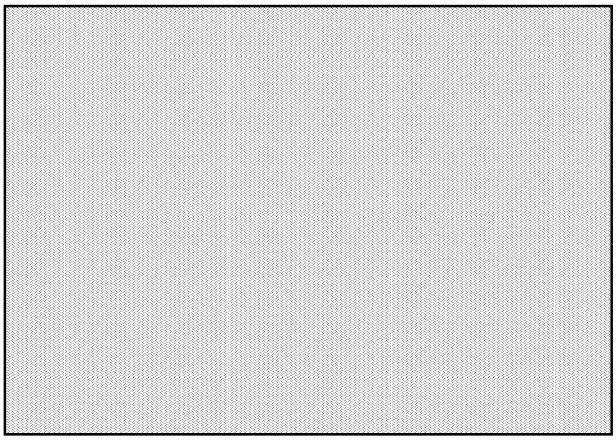
Code	Description
01	Go to shop after work.
02	Go to shop right now.
03	Reduce engine / machine speed.
04	Stop safely / shut off engine.
05	Wait with engine low idle.
06	Start engine / keep low idle.
07	Keep body seated.

Two faults can be displayed at one time along with their description and action. If three or more code are present the **"FWD"** and **"REV"** touch areas on the i6 screen can be used to view the other codes. The number that is assigned to each code, is the order of occurrence. Number 1 would be the oldest code and as the numbers increase the newer the code.

If the fault code display in MOM is not a serious code requiring immediate action, the code can be cleared from the screen by touching the number of each fault located at the left side of the code number. However, this action only erases the code in MOM. This is still an active fault, and the electronic display panel will keep indicating the action code. The central warning lamp will also remain activated.

Once the fault code is erased from MOM the same code will not appear again until the code is recovered or unless the fault occurs again. When all of the faults are recovered or cleared from MOM the screen will return to i2, i3, or i4 automatically according to the truck condition.

6. Screen i7, Back Light Off



This i7 screen shows the back light of MOM turned off and nothing indicated. Use this screen at night when the lighted display is too glaring. When in i3 or i4, by touching **'LIGHT OFF"** the display will switch to i7. If any area of the i7 screen is touched the display will return to i2, i3, or i4 depending on the condition of the truck. If a fault is detected while in the i7 screen, the display will automatically return to the i6 screen with the back light on.

Transmission Response With Fault Codes

When the transmission controller detects any of the severe fault that are listed below while the engine is running, the transmission will shift to the neutral gear position.

Fault Code	Description	Remarks
b001	Battery Voltage Low	
b002	Solenoid Voltage Failure	
b004	ROM Sum Check Fault	
b005	Clutch Engagement Double	
b006	T/M Cut Relay Failure	
b02_	Clutch Failure _: 2, 3, 9	- 2 : High Clutch - 3 : Low Clutch - 4 : 1st Clutch - 5 : 2nd Clutch - 6 : 3rd Clutch - 8 : Reverse Clutch - 9 : Intermediate Clutch
b03_	Clutch ECMV Failure 1 _ : 2 to 6, 8, 9	
b04_	Clutch ECMV Failure 2 _ : 2 to 6, 8, 9	
b07_	Clutch Solenoid Failed High _ : 2 to 6, 8, 9	

With one of the previously listed failure codes the transmission will fail to "Neutral", in order to move the truck the following procedure should be followed.

1. Bring the truck to a stop in a safe location. Apply the parking brake and move the range selector lever to the neutral position.
2. Next move the range selector to either Drive, 5th, 4th, 3rd, Low or Reverse. The transmission will then shift to F1 or F2 when either of the forward positions was selected, Drive, 5th, 4th, 3rd, Low or Reverse when the R position was attained.
3. The selection of F1 or F2 will be dependant on the type of fault.

   If the transmission controller detects any of the following severe fault codes with the engine running, the transmission will remain in the gear that it was in at the time of the fault code. When the range selector is moved to the "N" position the transmission will shift to the "N" range also.

Fault Code	Description	Remarks
b01_	Speed Signal Lost _ ; 0, 1, 2, 3	_ - : 0 : Engine _ - : 1 : T/M input _ - : 2 : T/M intermediate shaft _ - : 3 : T/M output
b06_	Speed Sensor Failure _ : 0, 1, 2, 3	
b05_	Clutch ECMV Failure 3	_ - : 1 : Lock up _ - : 2 : High _ - : 3 : Low _ - : 4 : 1st _ - : 5 : 2nd _ - : 6 : 3rd _ - : 8 : Reverse _ - : 9 : Intermediate

If the truck needs to be moved with one of these fault codes present, the following procedure is suggested:

1. Bring the truck to a stop in a safe location. Apply the parking brake and move the range selector to the neutral position.
2. Next move the range selector to either Drive, 5th, 4th, 3rd, Low or Reverse.

   The transmission will then shift to F1, F2, or F3 when either of the forward positions was selected, Drive, 5th, 4th, 3rd, Low or Reverse when the R position was attained.
3. The selection of F1, F2, or F3 will be dependent on the type of fault.

If any of the severe fault codes that are listed below appear on the warning screen,

Fault Code	Description	Remarks
b024	1st Clutch Failure	
b025	2nd Clutch Failure	
b026	3rd Clutch Failure	
b028	Reverse Clutch Failure	
b063	T/M Output Speed Sensor Failure	

perform the following procedure to move the truck:

1. Bring the truck to a stop in a safe location. Apply the parking brake and move the range selector to the neutral position.
2. Activate the limp home switch by removing and reconnecting the single wire connector located under the passenger seat.
3. Next move the range selector to either Drive, 5th, 4th, 3rd, Low or Reverse. The transmission will then shift to F1 or F2 when either of the forward positions was selected, Drive, 5th, 4th, 3rd, Low or Reverse when the R position was attained.
4. The selection of F1 or F2 will be dependent on the type of fault code.
5. The limp home switch will remain active until the key switch is turned off.

Idle Validation Feature

If there is a problem with the throttle pedal signal, not transmitting correctly, because of the harness, sensor, or controller troubles, the engine speed will go to the following settings:

Throttle Pedal Position	Engine RPM
Pressed	1300 RPM
Released	7 50 RPM

CENTER ELECTRONIC DISPLAY PANEL

Action Code Display

As previously discussed, if a fault occurs in any of the monitored systems, a code will be displayed on the "MOM" screen. At the same time an action code will also be displayed to inform the operator of a procedure to follow because of the fault. This "action code" is also displayed on the electronic display panel. The electronic display panel will display the action code of any fault informed through the serial communications network, "S-NET," from any controller that detects a fault . When the fault occurs, the action code of this fault will be displayed automatically.

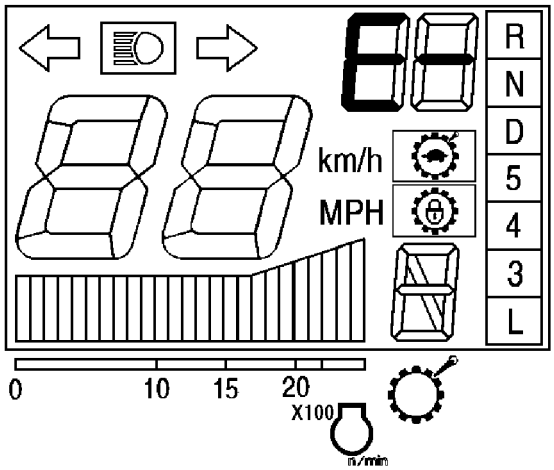


FIGURE 1.

When displaying an "03" action code, first the "E" will be displayed (Figure 1) and then, the "03" code (Figure 2) will be displayed.

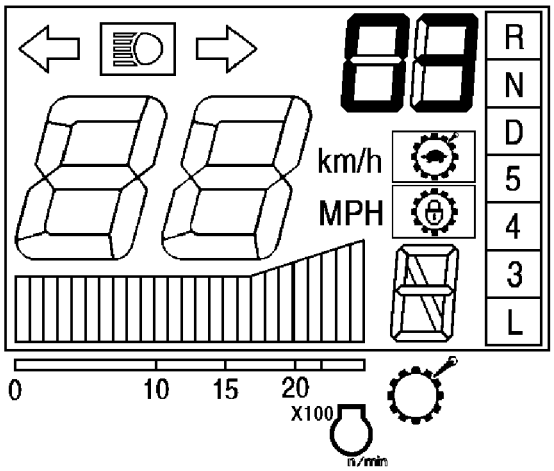


FIGURE 2.

These two displays will alternate every second. The other displays, gauges and pilots will function as normal. If more than two codes are present at the same time, the highest priority action code will be displayed. That priority is as follows: 04; 06; 05; 07; 03; 02; 01.

After the operator has been informed of the fault code, the action that should be taken is as follows:

1. Stop the truck in a safe location.
2. Apply the parking brake.
3. Confirm the presence of the fault code and the action code.
4. Follow the instructions of the action code.
5. Notify a qualified technician for repairs.

The possible action codes are as follows:

CODE	DESCRIPTION
01	Go to shop after work.
02	Go to shop right now.
03	Reduce engine/machine speed.
04	Stop safely/shut off engine.
05	Wait with engine low idle.
06	Start engine/keep low idle.
07	Keep body seated.

Cancellation of Action Code

If either of the following requirements is satisfied then the action code will be canceled.

1. If the fault which caused the action code is no longer present, then the action code will be canceled automatically, and the same, or next priority action code will be displayed automatically, if there are any other active faults.
2. If the fault remains, the action code can be canceled by a qualified technician who is trained to monitor the system.

LUBRICATION AND SERVICE

Preventive Maintenance will contribute to the long life and dependability of the KOMATSU 530M Haulpak 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 shop manual section for that component (i.e. Section "G" for Final Drive, Section "H" for Suspensions, etc.).

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.

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

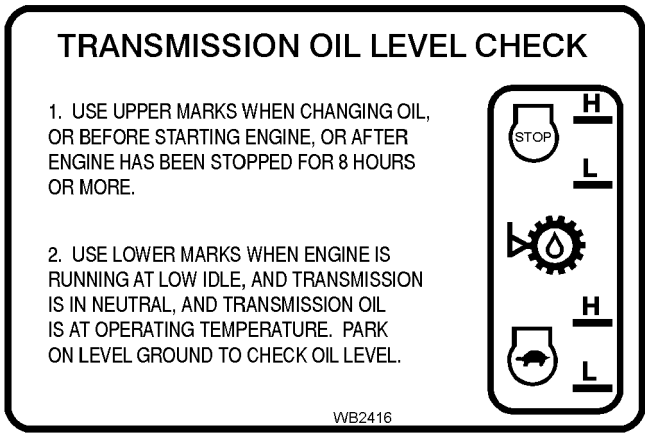
530M SERVICE CAPACITIES

	Liters	U.S. Gallons
Cummins Engine Crankcase: including lube oil filters.	170	44.9
Cooling System:	511	135
Hydraulic System: Refer to "Hydraulic Tank Service", page 4-10.	710	188
Fuel Tank Diesel Fuel–ASTM D975 No. 2 * * Below -10°C (14°F) use No. 1	2120	560
Differential Case Final Drive Case (each planetary)	300 240	79 63.5
Transmission Case: including torque converter.	120	31.7

COOLING SYSTEM ANTI - FREEZE RECOMMENDATIONS
(Ethlyene 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.



TRANSMISSION OIL LEVEL CHECK

1. **Engine Stopped**:

- Oil level must be visible in upper part of sight gauge (STOP) between "H" and "L" to be sure there is sufficient oil to safely operate transmission when engine is stopped, or if transmission oil is cold (engine has been stopped for 8 hours or more).

  Check oil level again, as described below, when transmission oil reaches operating temperature.

2. **Engine Running**:

- Oil level must be visible in lower part of sight gauge (turtle) between "H" and "L".

Check transmission oil level with:

- truck parked on level surface,
- engine running at low idle,
- transmission in neutral, "N", and
- transmission oil at normal operating temperature:

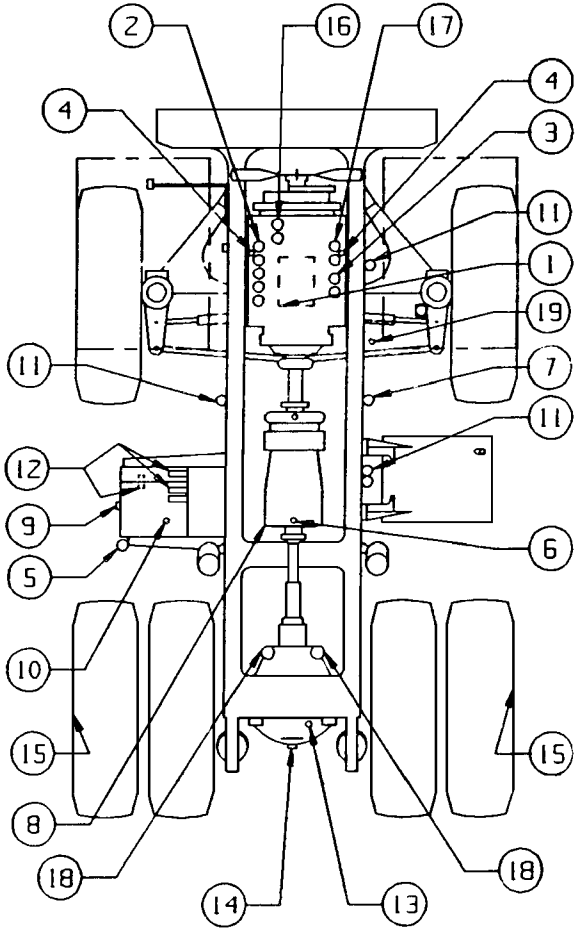
  Add clean oil as required through transmission oil filler tube at left rear of transmission.

LUBRICATION CHART

LUBRICATION SPECIFICATIONS					
LUBE KEY	TYPE LUBRICANT	-65°F TO -25°F	-25°F TO + 32°F	+ 32°F T0 + 90°F	ABOVE 90°F
A	ENGINE OIL	SEE ENG. MANUAL*	SEE ENG. MANUAL*	SEE ENG. MANUAL	SEE ENG. MANUAL
B	HYDRAULIC OIL	MIL-L-2104 C SAE 30W	MIL-L-2104 C SAE 30W	MIL-L-2104 C SAE 30W	MIL-L-2104 C SAE 30W
C	HYDRAULIC OIL	MIL-L-2104 C SAE 10W *	MIL-L-2104 C SAE 10W *	MIL-L-2104 C SAE 30W	MIL-L-2104 C SAE 30W
D	MOLYBDENUM DISULPHIDE GREASE 3% MIN	# 0	# 1	# 2	# 2
E	HYDRAULIC OIL	SEE SERVICE MANUAL	SEE SERVICE MANUAL	SEE SERVICE MANUAL	SEE SERVICE MANUAL

DESCRIPTION	SYM.	PTS.	LUBE KEY	10 HR	50 HR	100 HR	250 HR	500 HR	1000 HR	2000 HR
ENGINE CRANKCASE OIL	1	1	A	CHECK			CHANGE			
ENGINE LUBE FILTERS	2	5					CHANGE			
ENGINE BY-PASS FILTERS	3	2					CHANGE			
ENGINE CRANKCASE BREATHER	4	2							CLEAN	
TRANSMISSION OIL	5	1	C	CHECK					CHANGE	
TRANSMISSION CASE BREATHER	6	1					CLEAN			
TRANSMISSION OIL FILTER	7	1						CHANGE		
TRANSMISSION STRAINERS	8	3							CLEAN	
HYDRAULIC TANK – HOIST/STEERING/ BRAKES/FRONT AXLE	9	1	C	CHECK						CHANGE
HYDRAULIC TANK BREATHER	10	1					CHANGE			
HYDRAULIC FILTERS	11	4							CHANGE	
HYDRAULIC TANK STRAINERS	12	4								CLEAN
DIFFERENTIAL CASE BREATHER	13	1					CLEAN			
DIFFERENTIAL CASE	14	1	B				CHECK			CHANGE
FINAL DRIVE CASE	15	2	B				CHECK			CHANGE
FUEL FILTER ELEMENTS	16	2					CHANGE			
CORROSION RESISTORS	17	2					CHANGE			
PARKING BRAKE	18	6	D						GREASE	
LUBRICANT RESERVOIR	19	1	D				CHECK			
	20									
	21									
	22									
	23									
	24									
	25									
	26									
	27									
	28									
	29									
	30									
	31									

* AUXILIARY HEATERS REQUIRED BELOW -23°C (-10°F)



10 HOUR (DAILY) INSPECTION

Prior to each operating shift, a "walk around" inspection should be performed. Check the truck for general condition. Look for evidence of hydraulic leaks; check all lights and mirrors for clean and unbroken lenses; check operator's cab for clean and unbroken glass; check frame, sheet metal and body for cracks. Notify the proper maintenance authority if any discrepancies are found. Give particular attention to the following:

CHECK ALL FLUID LEVELS

a. Engine Oil-

Note: Refer to engine manufacturer service manual for oil recommendations.

b. Radiator -
Check coolant level and fill with proper mixture as shown in Cooling System Recommendation Chart.

c. Battery - Check electrolyte level and add water if necessary.

d. Steering, Brake Oil Tank - Check oil level in tanks, add if necessary. Lube key "C".
Refer to "Hydraulic Tank Service", page 4-10.

e. Hoist & Brake Cooling Oil Tank - Use Lube key "C".
Refer to "Hydraulic Tank Service", page 4-10.

NOTE: Check oil level with truck level, engine STOPPED, body down, and oil warm. Oil should be visible in sight glass. - DO NOT OVERFILL.

f. Transmission - Check oil level.
Add oil, if necessary. Lube key "C".

Refer to "Transmission Oil Level Check", page 4-1.

g. Fuel Tank - Fill as required.

h. Differential - Truck should be on level surface, oil level should be even with plug hole or at plug hole. Refill with oil as necessary. Lube key "B".

Truck Serial Number _____

Site Unit Number _____

Date:_____Hour Meter_____

Serviceperson Name_____

COMMENTS	√'d	INITIALS

10 HOUR (DAILY) INSPECTION (continued)

AIR CLEANERS

Check service indicator. If indicator shows red, clean filter. Push the indicator reset button to return the red piston to original position.

DRIVE BELTS

a. Check alternator and fan belts for proper tension and condition.

b. Inspect for alignment.

ENGINE AND TURBOCHARGERS

Inspect for leaks, vibrations or odd noises.

WHEELS AND TIRES

After each wheel mounting operation, recheck wheel mounting capscrew tightness after 4 – 5 hours of operation. Check again at the end of the shift and then periodically until all capscrews hold at the prescribed 225 ± 25 kg.m (1628 ± 180 ft.lbs.) torque. This requirement is prescribed for both front and rear wheels.

TIRES

a. Inspect for proper inflation and wear.

b. Inspect for debris embedded in cuts or tread.

COMMENTS	√'d	INITIALS

250 HOURS SERVICE

INITIAL 250 HOURS SERVICE

Perform the following maintenance **after** running the machine for **the first 250 hours**.
Thereafter, these services are to be accomplished at the 1000/2000 hour interval as scheduled.
Refer to pages 4-8, -9, & -10.

a. Fuel Filter, replace cartridges.

b. Transmission - change oil and filter elements.

c. Steering & Brake Oil Tank - change oil and filter elements.

d. Hoist & Brake Cooling Oil Tank - change oil and filter elements.

e. Differential Case, change oil.

f. Final Drive Case, change oil.

EVERY 250 HOURS SERVICE

1. Lubrication -
   Check automatic lube system to be sure ample grease supply is reaching pins and bearings.

   - Dump body hinge pin - 2 points.

   - Rear Suspension - 4 points.

   - Axle Supports pins - 8 points.

   - Hoist Cylinder pin - 4 points.

   - Front Suspension Assembly - 8 points.

   - Steering Cylinder pin - 4 points.

   - Steering Linkage - 5 points.

   - Drive Shafts -
     Front, 2 points; Rear, 3 points.

   Refill grease reservoir - Use lube key "D".
   (Reservoir Capacity is approximately 7.7 gal. or 60 lbs [27kg] of grease.)

2. BATTERY - Check electrolyte level and add distilled water if necessary to maintain proper level.

3. ENGINE - Refer to engine manufacture's service manual for oil recommendations and capacity.

   - change engine oil.

   - change engine lube oil filter.

Truck Serial Number _____
Site Unit Number _____
Date:_____Hour Meter_____
Serviceperson Name_____

COMMENTS	√'d	INITIALS

250 HOURS SERVICE (continued)

4. ALTERNATOR BELT - Check condition of the 24V alternator belt for evidence of belt slippage, looseness or physical defects.
5. AIR CONDITIONER COMPRESSOR BELT - Check for condition of belt and proper tension.
6. TRANSMISSION CASE BREATHERS - Remove breathers, disassemble breathers remove filter element, clean in solvent. Dry with air pressure and reassemble then reinstall.
7. HYDRAULIC TANK BREATHERS - Remove breathers, disassemble breathers remove filter element. Replace filter element, reassemble and reinstall.
8. DIFFERENTIAL CASE - Check oil level. Use lube key "B".
9. DIFFERENTIAL CASE BREATHER - Remove breather. Wash to flush out the dirt from inside. Reinstall after cleaning.
10. FINAL DRIVE CASE - Check oil level in R.H. and L.H. case. Use lube key "B".
11. DRIVE SHAFT - Inspect drive shafts for any abnormalities: loose joints, worn splines or bearings, unusual vibration of shaft. Refer to shop manual, Section "C", Engine and Cooling System. Notify the proper maintenance personnel, if any discrepancies are found.
12. PARKING BRAKE - Measure brake pad for proper wear and thickness. Refer to shop manual, Section "J", Brake System, for limits and specifications. Use lube key "D" chart.
13. FUEL FILTER - Remove and replace two fuel filter elements.
14. CORROSION RESISTOR - Remove and replace four corrosion resistor elements.

COMMENTS	√'d	INITIALS

500 HOUR SERVICE

In addition to the 250 hour lubrication and inspection schedule, perform the following:

Truck Serial Number _____
Site Unit Number _____
Date:_____Hour Meter_____
Serviceperson Name_____

1. FAN BELT - Check for condition of belt and proper tension.
   Refer to shop manual, Section "C", Engine and Cooling System.
2. RADIATOR FINS - Check for clogged or damaged fins. Notify the proper maintenance personnel if any discrepancies are found.
3. TRANSMISSION OIL FILTER -
   Remove and replace (2) filter elements. Refer to shop manual, Section "F", Transmission.

COMMENTS	√'d	INITIALS

1000 HOUR SERVICE

In addition to the 250 and 500 hour lubrication and inspection schedules, perform the following:

1. LUBRICATING

   - Transmission mount - 1 point. - Lube key "D".

   - Parking brake linkage - 6 point - Lube key "D".

2. TRANSMISSION CASE

   Drain oil, remove and replace element. Remove clean, and reinstall strainer. Refill tank with oil approximate 40.5 gal (153 l).
   Refer to "Lubrication Chart" for fuel, coolant and lubricants and type of oil to use. Lube key "C".

3. STEERING, BRAKE, HOIST, and REAR BRAKE COOLING OIL FILTERS.

⚠WARNING

When removing tank caps, turn cap slowly at first to relieve inner pressure. Remove cap only after pressure has been completely relieved.
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.

   Remove & replace (4) filter elements.
   Refer to "Hydraulic Tank Service", page 4-10.

4. FRONT & REAR BRAKE WEAR -
   Refer to shop manual Section "J", Brake System, for proper inspection procedure.

⚠WARNING

Carry out inspection when the oil temperature is below 60°C (140°F).
Hot oil may cause serious personal injury.

Truck Serial Number _____
Site Unit Number _____
Date:_____Hour Meter_____
Serviceperson Name_____

COMMENTS	√'d	INITIALS

EVERY 2000 HOUR SERVICE

Truck Serial Number _____
Site Unit Number _____
Date:_____Hour Meter_____
Serviceperson Name_____

Maintenance for every 250, 500 and 1000 hours should also be carried out at this time.

1. STEERING, BRAKE & COOLING OIL TANK

   Drain oil from tank and refill tank to specified level, capacity 576 liters (152 U.S. gal.).
   Refer to "Lubrication Chart" for type of oil to use. Lube key "C".
   Refer to "Hydraulic Tank Service", page 4-10.

2. FINAL DRIVE CASE

   Position machine so that casting line is horizontal and drain plug is at the bottom. Drain oil and reinstall plug, remove fill plug at castline and fill to specified level. This operation is performed on the right and left hand final drives.
   Capacity is **240 liters (63.5 U.S. gal.)** each side.
   Refer to "Lubrication Chart" for type of oil to use. Lube key "B".

3. DIFFERENTIAL CASE

   Drain oil from differential and refill to the specified level: **capacity = 300 liters (79 U.S. gal.)**.

   Refer to "Lubrication Chart" for type of oil to use. Lube key "B".

4. ENGINE VIBRATION DAMPER

   Inspect damper for cracks or separation on rubber surfaces. If any defects are noted, replace with new vibration damper.
   Refer to shop manual, Section "C", Engine and Cooling System. Notify the proper maintenance personnel, if any discrepancies are found.

COMMENTS	√'d	INITIALS

HYDRAULIC TANK SERVICE

Filling Instructions

1. Lower the dump body, shut down the engine, and turn the keyswitch "Off".

⚠WARNING

Hydraulic tank may be pressurized! Depress relief valve (2) and release hydraulic tank filler cap slowly to remove any internal pressure.

2. Depress relief valve (2, Figure 4-1) for 30 - 45 seconds to release any internal tank pressure. Turn the oil filler cap (4) slowly counterclockwise to release any posssible residual tank pressure.
3. Refer to "Lubrication Chart", Lube key "C". Fill tank with recommended oil, until oil is visible in the TOP sight glass (5).

   NOTE: If Hydraulic tank has been completely drained, ***refill capacity is: 576 Liters (152 gal.)***
4. Replace fill cap.
5. Start the engine, and raise and lower dump body 3 times to circulate oil and fill all lines, valves, cylinders, etc.
6. Repeat steps 1 through 5 and fill until oil level is again in the TOP sight glass (5).
7. If oil level falls below ***LOWER sight glass (6) with engine running***, repeat steps 1. through 5.

HYDRAULIC TANK SERVICE

When servicing the hydraulic tank, always follow the "Filling Instructions" described above to relieve any internal tank pressure before opening tank.

1. When checking oil level, or any other service, inspect the breather (3, Figure 4-2) to be certain that it is open to atmosphere.

   Clean any excess accumulations of dirt/mud, etc. from around the breather.
   Clean/replace breather element as necessary.
   Refer to "HYDRAULIC TANK BREATHER".
2. Whenever oil is drained from tank, clean diffussers (7 & 11) and strainers (8, 9, & 10).

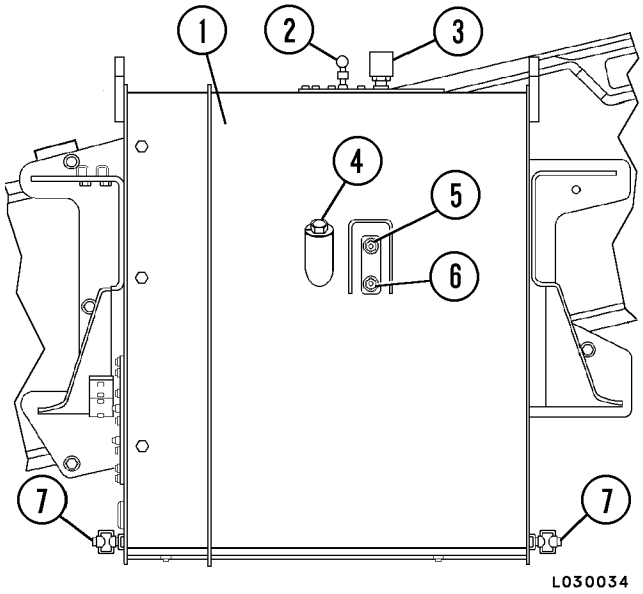


FIGURE 4-1. HYDRAULIC TANK

1. Hydraulic Tank
2. Pressure Relief Valve
3. Breather
4. Filler Cap
5. Hydraulic Oil Level Upper Sight Glass
6. Hydraulic Oil Level Lower Sight Glass
7. Hydraulic Oil Drain

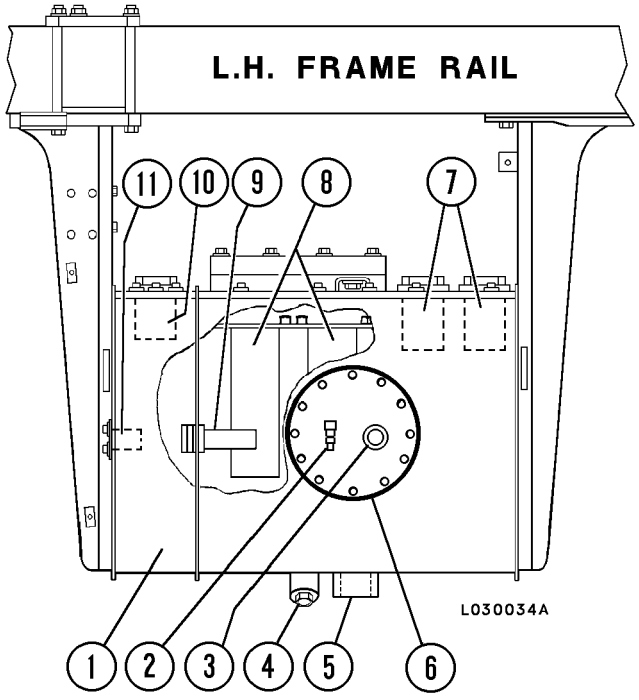


FIGURE 4-2. HYDRAULIC TANK (TOP VIEW)

1. Hydraulic Tank
2. Pressure Relief Valve
3. Breather
4. Filler Cap
5. Sight Glass Guard
6. Access Cover
7. Diffusers
8. Strainers
9. Wire Mesh Strainer
10. Strainer
11. Diffuser

STEERING CIRCUIT FILTER

Removal

The brake and steering circuit filter is located on the left frame rail, forward of the hydraulic tank.

⚠WARNING

Relieve pressure before disconnecting hydraulic and other lines. Tighten all connections before applying pressure.

Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin and cause serious injury and possibly death if proper medical treatment by a physician familiar with this injury is not received immediately.

1. With the key switch "Off" allow at least 90 seconds for the accumulators to bleed down.
2. Remove plug (10, Figure 4-3) and drain oil from the housing into a suitable container.

⚠CAUTION

Take care to avoid contact with hot oil if truck has been operating. Avoid spillage and contamination!

3. Remove housing (8) and element (7).
4. Replace O-ring (4) and backup ring (5) in filter head.

Installation

1. Install new element (7). Install housing (8) and tighten.
2. Replace drain plug (10), and O-ring (9).

NOTE :
The indicator switch (2, Figure 4-3) is preset to actuate at 35 psid (241 kPa) and is not repairable or adjustable. If the indicator switch is inoperative, replace the complete switch. Attempting to adjust the switch is not recommended.

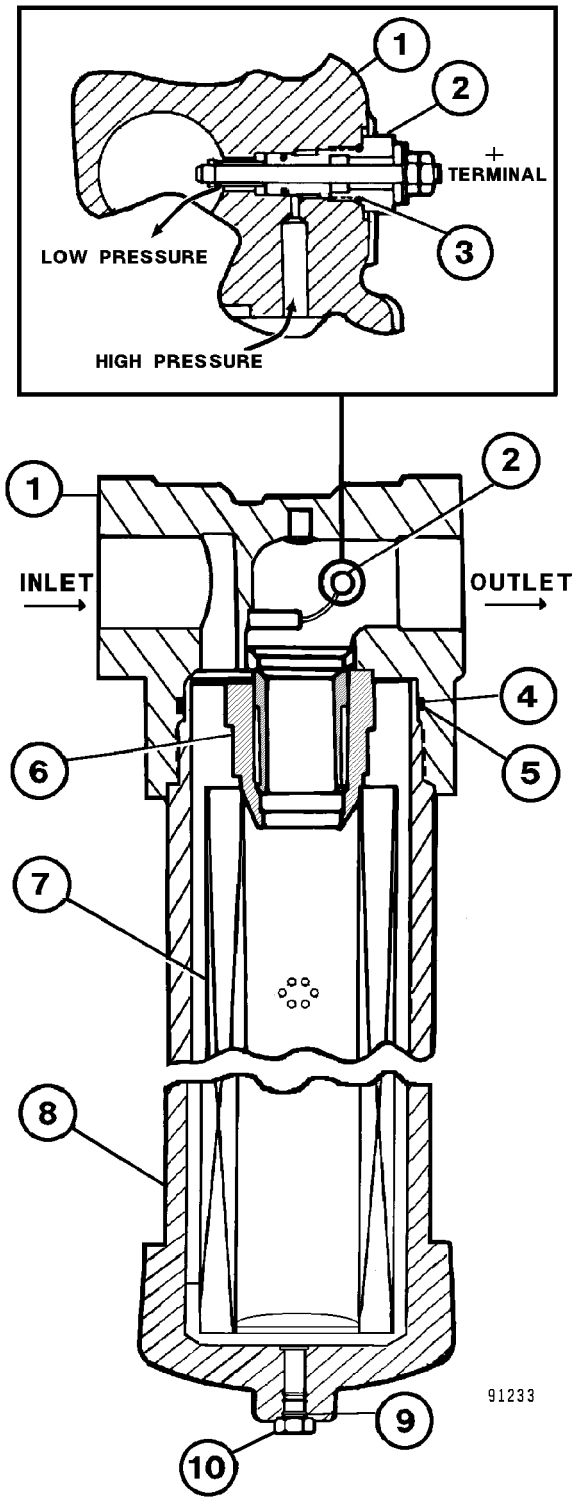


FIGURE 4-3. STEERING CIRCUIT FILTER

1. Head
2. Indicator Switch
3. O-Ring
4. O-Ring
5. Backup Ring
6. Bypass Valve
7. Filter Element
8. Housing
9. O-Ring
10. Plug

HYDRAULIC TANK BREATHER

Cleaning

1. Shut down the engine and open hydraulic tank filler caps slowly to relieve any internal pressure.
2. Clean dirt accumulation from area of breather (3, Figure 4-2).
3. Remove the breather from the tank.
4. Remove snap ring (1, Figure 4-4), cover (2) and filter element (3).
5. Clean breather element in solvent and blow dry. Clean remaining parts in solvent and dry thoroughly.
6. Install element, cover and snap ring.
7. Install breather element on hydraulic tank.

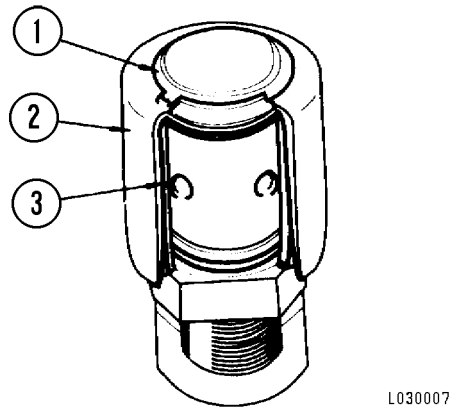


FIGURE 4-4. HYDRAULIC TANK BREATHER

1. Snap Ring
2. Cover
3. Element

LINCOLN AUTOMATIC LUBRICATION SYSTEM

The Lincoln Automatic Lubrication System is a pressurized lubricant delivery system which delivers a controlled amount of pressurized lubricant to designated lube points. The system is controlled by an electric timer which signals solenoid valves to cause operation of a hydraulically operated grease pump.

For the 530M, these components (valves, pump, and reservoir/cannister) are mounted on the right deck structure to the right of the hydraulic cabinet just above the right front suspension.

System Components

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

1. Hydraulically Powered Reciprocating Cylinder and Pump (1 & 5, Figure 4-5).

   Pump Specifications:

   16:1 Pressure Ratio.

   NOTE: The theoretical ratio of the pump is 16:1. Depending on application and variable internal friction, the operational ratio is approximately 10:1.

   Hydraulic Supply Pressure (Input):
   300-3000 p.s.i. (2.1 - 20.1 MPa)
   Input Flow (when pumping): 1.0 g.p.m. (3.8 l/min.)
   Maximum Hydraulic Temperature: 210°F (98.8°C)
   MAXIMUM Output Pressure: ***Not to Exceed***
   3500 p.s.i. (24.1 MPa)
   WARNING: Exceeding this value will damage components and/or cause components to rupture, resulting in possible serious injury to any nearby personnel.

   Output Flow: 11 cu. in./min. (180 cc/min.)
   Operating Ambient Temperature:
   -40°F to + 135°F (-40°C to + 57.7°C)
   Seals: Buna-N
   Filtration Required: 10 Micron (Hydraulic Supply)
   24VDC power source.

2. Combination Valve Body (3, Figure 4-5) includes:

   a. 24VDC Solenoid Valves (SV1 & SV2) are used to control the hydraulically operated pump.

      Solenoid Valve SVI (9) controls the supply of hydraulic fluid to the pressure reducing valve and to the vent valve.

      Solenoid Valve SV2 (8) directs the hydraulic fluid to the hydraulic cylinder which operates the grease pump.

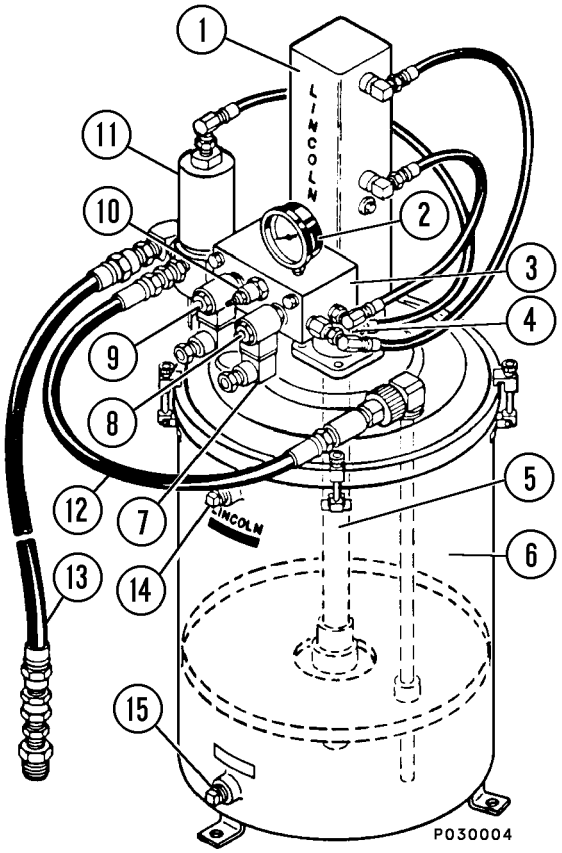


FIGURE 4-5. TYPICAL AUTO LUBE SYSTEM

1. Pump Cylinder
2. Cyl. Pressure Gauge
3. Valve Body Assy.
4. Orifice Assembly
5. Pump Assembly
6. Cannister/Reservoir
7. Pump Cycle Timer
8. Solenoid Valve, SV2
9. Solenoid Valve, SV1
10. Press. Reducing Valve
11. Vent Valve Assy.
12. Grease Return Line
13. Grease Supply Line
14. Fill Vent Port
15. Fill Supply Port

   b. Pressure Reducing Valve:
      The Pressure Reducing Valve (10) lowers hydraulic fluid pressure to the operating range of the hydraulic pump cylinder.
      It is factory set at its maximum pressure of 300 p.s.i. (2069 kPa), but may be adjusted lower.

   c. The Cylinder Pressure Gauge (2): indicates hydraulic fluid pressure going to the hydraulic pump cylinder after passing through the pressure reducing valve.

   d. Orifice Fitting Assembly (4): meters hydraulic pressure from the pressure reducing valve to the top of the vent valve assembly (this permits even operation of the vent valve, without shock). This fitting is assembled to the side of the Valve Body (3) and connected with a high pressure 1/4 in. hose to the top of the Vent Valve Assembly (11).

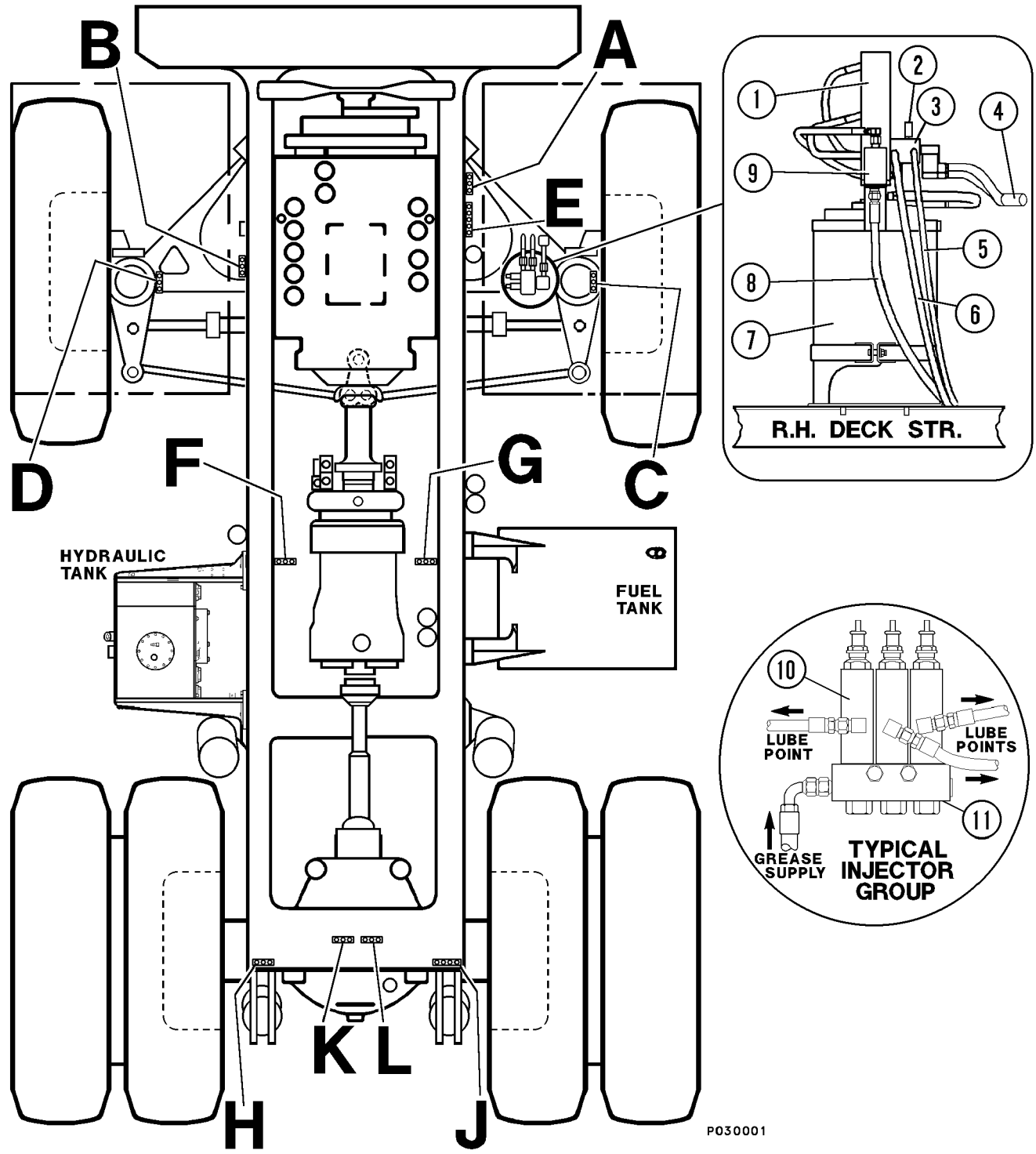


FIGURE 4-6. 530M AUTO LUBE ARRANGEMENT

Group Lube Location “A” Contains 3 Injectors
Group Lube Location “B” Contains 3 Injectors
Group Lube Location “C” Contains 3 Injectors
Group Lube Location “D” Contains 3 Injectors
Group Lube Location “E” Contains 5 Injectors
Group Lube Location “F” Contains 3 Injectors
Group Lube Location “G” Contains 3 Injectors
Group Lube Location “H” Contains 3 Injectors
Group Lube Location “J” Contains 4 Injectors
Group Lube Location “K” Contains 3 Injectors
Group Lube Location “L” Contains 3 Injectors

1. Grease Pump/Cylinder
2. Cylinder Pressure Gauge
3. Pressure Regulator/Solenoid Valve
4. Electrical Harness
5. Hydraulic Pressure Supply
6. Hydraulic Return to Tank
7. Reservoir / Cannister
8. Grease Supply Line
9. Vent Valve Assy.
10. Lube Injector
11. Typical Lube Injector Group

Figure 4-6. Lube Injector Groups		
Group Lube	**No. of Inj.**	**Injector Point of Lubrication**
"A"	3	R.H. Front Suspension, Top R.H. Front Suspension, RR "A"-Arm R.H. Front Suspension, FRT "A"-Arm
"B"	3	L.H. Front Suspension, Top L.H. Front Suspension, RR "A"-Arm L.H. Front Suspension, FRT "A"-Arm
"C"	3	R.H. Steering Cylinder, Spindle R.H. Steering Rod, Spindle R.H. Front Suspension, BTM "A"-Arm
"D"	3	L.H. Steering Cylinder,Spindle L.H. Steering Rod, Spindle L.H. Front Suspension, BTM "A"-Arm
"E"	5	R.H. Steering Cylinder, FRAME L.H. Steering Cylinder, FRAME L.H. Steering Rod, PIVOT R.H. Steering Rod, PIVOT CENTER Steering Pivot, FRAME
"F"	3	Rear Axle, BTM L.H. BAR FRAME L.H. Hoist Cylinder, FRAME Transmission, FRT MOUNT
"G"	3	Rear Axle, TOP FRT BAR FRAME Rear Axle, BTM R.H. BAR FRAME R.H. Hoist Cylinder, FRAME
"H"	3	L.H. Rear Suspension, FRAME L.H. Hoist Cylinder, BODY L.H. BODY PIVOT
"J"	4	Rear Axle, TOP SWAY BAR, FRAME R.H. Rear Suspension, FRAME R.H. Hoist Cylinder, BODY R.H. BODY PIVOT
"K"	3	L.H. Rear Suspension, AXLE Rear Axle, TOP FRT BAR, AXLE Rear Axle, TOP SWAY BAR, AXLE
"L"	3	Rear Axle, BTM R.H. BAR, AXLE L.H. Rear Suspension, FRAME R.H. Rear Suspension, AXLE

3. Pump Cycle Timer (7, Figure 4-5) [also called a "Flasher" timer, because it contains an LED that illuminates when there is power going to SV2]: The Pump Cycle Timer mounts on SV2 solenoid and generates a timed pulse signal which causes the solenoid valve to move, alternately. The alternating movement of the valve, changes the direction of hydraulic fluid flow from the top of the pump cylinder to the bottom, and vice versa, causing the grease pump piston to reciprocate, or "pump".

4. Grease Reservoir: For the 530M, the Cannister or Reservoir (6, Figure 4-5) is mounted on the right deck structure to the right of the hydraulic cabinet just above the right front suspension.
   The reservoir has an approximate capacity of 7.7 gal. or 60 lbs. (27 kg) of grease.

5. Vent Valve (11, Figure 4-5): When SV1 solenoid is energized, hydraulic pressure closes the Vent Valve, and also causes the pump to cycle. The pump cycles until SV1 solenoid is de-energized. When this occurs, hydraulic pressure is removed, causing the Vent Valve to open.
   The grease pressure drops to 0, and the injectors recharge for their next output cycle.

6. 24 VDC Solid State System Timer (Not Shown):
   The Solid State System Timer sends out a 24 VDC timed-interval signal to energize the solenoid valves, causing the grease pump to operate. This timer is mounted in the cab (in the housing under the passenger seat) to insure temperature stability. Its operating temperature range is -20°F to 131°F (-29°C to 55°C).

7. Lube Injectors (10, Figure 4-6): each injector delivers a controlled amount of pressurized lubricant to a designated lube point.
   Refer to Figure 4-6 for locations.

8. Safety Unloader Relief Valve (Not Shown); is located on the back of the vent valve (11, Figure 4-5). The Safety Unloader Relief Valve is designed to open if the pressure in the grease line rises to approximately 4000 psi (27.5 MPa)* . If this valve opens, the grease is expelled to atmospere.
   *NOTE: This setting is not adjustable.

WARNING: Exceeding 3500 p.s.i. (24.1 MPa) will damage components and/or cause components to rupture, resulting in possible serious injury to any nearby personnel.

System Operation:

1. During truck operation, with the pump and timer systems in a rest state, a preset time interval (2.5 to 80 minutes) occurs.
2. The solid state system timer sends out a 24 VDC signal to energize SV1, and also the flasher timer on SV2.
3. As SVI opens, the hydraulic fluid pressure flows through the pressure reducing valve and on to SV2.
4. The pressure reducing valve lowers hydraulic fluid pressure to the operating range of the hydraulic pump [maximum pressure 300 p.s.i. (2069 kPa)]. This pressure also signals the Vent Valve causing it to close.
5. After the system pressure has been reduced, it passes on to SV2. Each operation of SV2 moves the hydraulic cylinder which operates the grease pump. As SV2 turns "On" and "Off" (refer to cycle timer/flasher below), it changes the direction of the hydraulic cylinder movement back and forth, thus causing a "pumping" action.
6. The cycle timer/flasher sends a pulsing signal, 1 second "On" and 1 second "Off" (adjustable), to SV2. Solenoid valve SV2 directs the hydraulic fluid to the pump at 30 cycles/minute.
7. With the vent valve closed, the pump cycles until lubricant pressure reaches maximum pump output pressure* (pump stalls). As the grease supply line comes to maximum pressure, the injectors meter grease to the points of lubrication.

* ***WARNING: Maximum Pump Pressure Not to Exceed 3500 p.s.i. (24.1 MPa). Exceeding this value will damage components and/or cause components to rupture, resulting in possible serious injury to any nearby personnel***.

8. After approximately 75 seconds, the Solid State System Timer returns to the rest state, which de-energizes SV1 solenoid valve.
9. As SV1 is de-energized, the hydraulic supply to the pressure reducing valve and the vent valve is shut off, causing the vent valve to open.
10. When the vent valve opens, the pressure in the grease line is vented back to the grease reservoir and the line pressure drops to zero (0), so the injectors can recharge for their next output cycle.
11. The system is now at rest, ready for another lube cycle and the sequence repeats itself.

⚠WARNING

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

- **** DO NOT exceed the Maximum Pump Pressure of 3500 p.s.i. (24.1 MPa).***
- **** Do not alter or modify any part of this system unless approved by factory authorization.***
- **** Do not attempt to repair or disassemble the equipment while the system is pressurized.***
- **** Make sure all fluid connections are securely tightened before using this equipment.***
- **** Always read and follow the fluid manufacturer's recommendations regarding fluid compatibility, and the use of protective clothing and equipment.***
- **** Check all equipment regularly and repair, or replace, worn or damaged parts immediately.***

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

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

If overpressurizing of the equipment is believed to have occurred, contact a factory authorized warranty and service center for inspection of the pump. Specialized equipment and knowledge is required for repair of the pump or adjustments other than the maintenance specified in this manual.

Annual inspection by the factory authorized warranty and service center is recommended.

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.

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

NOTE: To run the grease pump when priming the lube system, turn keyswitch "ON" and connect a jumper wire between the "LUBE SW" and "SOL" terminals on the solid state timer.

3. Run grease pump until grease flows from any one plug opening in the system. Replace plug in this opening.
4. Repeat step 3 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. Turn Keyswitch (3, Figure 4-11) ‘‘Off’’ and shut down engine to de-energize system.
   Install a 5000 PSI (35 MPa) pressure test gauge in the grease supply line (13, Figure 4-5).
2. Turn Keyswitch ‘‘On’’ and start engine to energize system.
3. Lift the passenger seat, and connect a jumper wire between the ‘‘SOL’’ and ‘‘LUBE SW’’ terminals on the 24 VDC solid state lube timer.
   Pump should operate.

NOTE: If terminal post identification on the solid state timer is not legible, refer to Figure 4-11 for terminal positions.

4. Keep jumper wire connected until the pump stalls.
5. Observe the 5000 PSI (35 MPa) pressure test gauge in the grease supply line. Pressure should be 2500 - 3000 PSI (17.2 - 20.7 MPa).

! WARNING !: DO NOT EXCEED Maximum Pump Pressure of 3500 p.s.i. (24.1 MPa).
Exceeding this value will damage components and/or cause components to rupture, resulting in possible serious injury to any nearby personnel.

   If pressure is not correct, adjust the Pressure Reducing Valve as necessary (refer to ‘‘Pressure Reducer Adjustment’’).
   NOTE: DO NOT EXCEED 300 PSI (2.1 MPa) on the Cylinder Pressure gauge (2, Figure 4-5)

6. Disconnect jumper wire. System should vent.
7. Turn Keyswitch ‘‘Off’’ and shut down engine to de-energize system.
   Remove the 5000 PSI (35 MPa) pressure test gauge previously installed. Re-connect system.

Pressure Reducer Adjustment

NOTE: Steering accumulator pressure is necessary to power the lube system for this procedure.

⚠WARNING

While engine is running, and/or accumulators are charged, exercise extreme care while working in the vicinity of the grease pump!

Steering pressure is also available at this time. Keep personnel away from front wheels to prevent crushing!

Stay clear of moving engine parts and do not loosen/disconnect any pressure fittings or hoses.

To set the Pressure Reducing Valve:

1. With keyswitch ‘‘Off’’, engine stopped, and steering accumulator pressure bled down, install a 5000 PSI (35 MPa) pressure test gauge in the grease supply line (13, Figure 4-5).
2. At the truck Hydraulic Bleeddown Manifold, disconnect the Bleeddown Solenoid. (This will prevent accumulators from bleeding down when engine is shut down, later in step 4.)
3. Start the truck engine. When steering and brake pressures have stabilized, pull the retarder lever to the fully applied position to apply the brakes.
4. Turn keyswitch ‘‘Off’’ to completely stop engine. Then return the keyswitch to the ‘‘On’’ position.
5. Lift the passenger seat, and connect a jumper wire between the ‘‘SOL’’ and ‘‘LUBE SW’’ terminals on the 24 VDC solid state lube timer.
   Pump should operate. Keep jumper wire connected until the pump stalls.

6. Observe the 5000 PSI (35 MPa) pressure test gauge in the grease supply line. Pressure should be 2500 - 3000 PSI (17.2 - 20.7 MPa).

⚠WARNING

DO NOT EXCEED Maximum Pump Pressure of 3500 p.s.i. (24.1 MPa). Exceeding this value will damage components and/or cause components to rupture, resulting in possible serious injury to any nearby personnel.

   If pressure is not correct, adjust the Pressure Reducing Valve until the pressure gauge (installed at step 1) indicates 2500 - 3000 PSI (17.2 - 20.7 MPa) grease pressure.
   NOTE: DO NOT EXCEED 300 PSI (2.1 MPa) on the Cylinder Pressure gauge (2, Figure 4-5).

7. While jumper wire is installed, verify that the following events occur in this order:
   a. The pump starts stroking and the LED on the flasher unit atop of SV2 flashes "On" and "Off" at approximately one second intervals.
   b. All of the injectors stroke down.
   c. Pump gets to a "stalled state" with no noticeable piston movement.
8. Turn the keyswitch "Off" and remove jumper wire installed in step 5, then verify the following:
   a. The pressure on the Cylinder Pressure gauge (2, Figure 4-5) drops to zero (0).
   b. The pressure on the grease pressure test gauge (installed at step 1) drops to zero (0).
   c. All of the injectors reset (indicator pin up).
9. Remove grease pressure test gauge (installed at step 1).
10. At the Hydraulic Bleeddown Manifold, reconnect the Bleeddown Solenoid (disconnected in step 4). Verify that hydraulic system now bleeds down.

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 engine 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. With the truck keyswitch on, use a Volt-Ohm meter and read the voltage between "BAT (+)" and "BAT (-)" terminals on the solid state timer. 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 4-7) desired time interval.

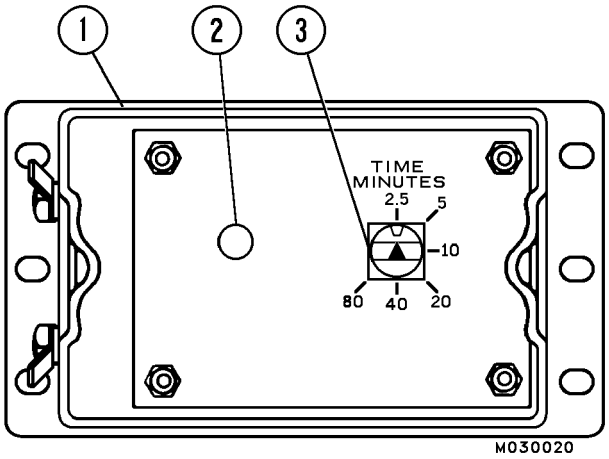


FIGURE 4-7. TIMER ADJUSTMENT (TOP COVER OFF)

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

The recommended setting is 20 minutes.

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

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 a pump malfunction, each injector is equipped with a covered grease fitting to allow the use of external lubricating equipment.

Injector Adjustment

The injectors may be adjusted to supply from 0.008 in^3 to 0.08 in^3 (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 4-8) counterclockwise to increase lubricant amount delivered and clockwise to decrease the lubricant amount.

With the Solid State Timer set at 20 minutes, the recommended setting is:

4 turns clockwise from the maximum counterclockwise position. This delivers approximately 0.04 in^3 (.66 cc) of lube per cycle.

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 foregoing information concerns adjustment of the 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.

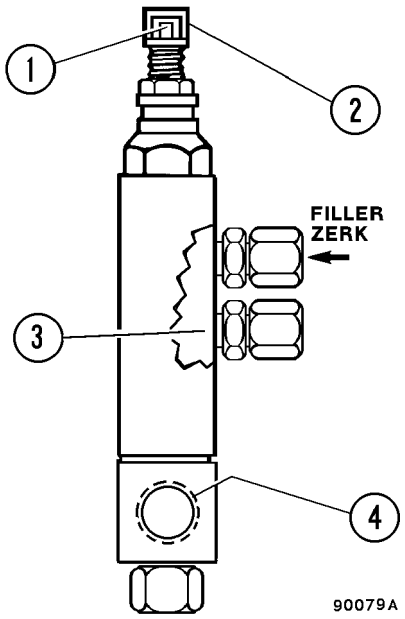


FIGURE 4-8. TYPE SL-1 SERIES INJECTOR

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

Pump Cycle Timer (Flasher Timer):

The Pump Cycle Timer mounts on SV2 solenoid and generates a timed pulse signal to control the reciprocating cycle rate of the grease pump.

Pump Cycle Timer (Flasher Timer) Installation

1. Connect cycle timer to SV2. Be sure to install gasket.
2. Connect the "Sol" from the Solid State Timer to the Brown wire from the Cycle Timer and one of the wires coming from SV1.
3. Connect the White wire from the Cycle Timer and the other (gnd) wire coming from SV1.

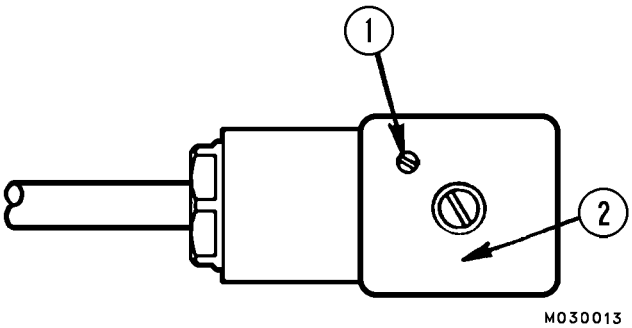


FIGURE 4-9. PUMP CYCLE TIMER

1. Adjustment Screw
2. Red LED (Indicates Timer Has Turned On.)

Pump Cycle Timer (Flasher Timer) Adjustment:

The Pump Cycle timer is factory set at 1 second "On" and 1 second "Off" for 30 cycles/minute. If adjustment is necessary, refer to Figure 4-9 and the following procedure.

The one adjustment screw adjusts both the "On" time and "Off" time equally. The adjustment range is from 0.5 seconds (60 cycles/minute) to 5.0 seconds (6 cycles/minute). The adjustment screw allows 15 turns of adjustment over the timing range.

1. The adjustment screw should be turned 20 turns counter-clockwise to insure a minimum start point.

NOTE: The timer cannot be adjusted below minimum - additional turns counter-clockwise have no effect.

2. Each clockwise turn of the adjustment screw will equal approximately 0.3 seconds.
3. Add the number of turns clockwise to reach the approximate desired timing.

   Some additional adjustment may be necessary depending on the accuracy needed.

NOTE: Use the light on the cycle timer to help in setting the time. The light will turn On when there is power going to SV2.

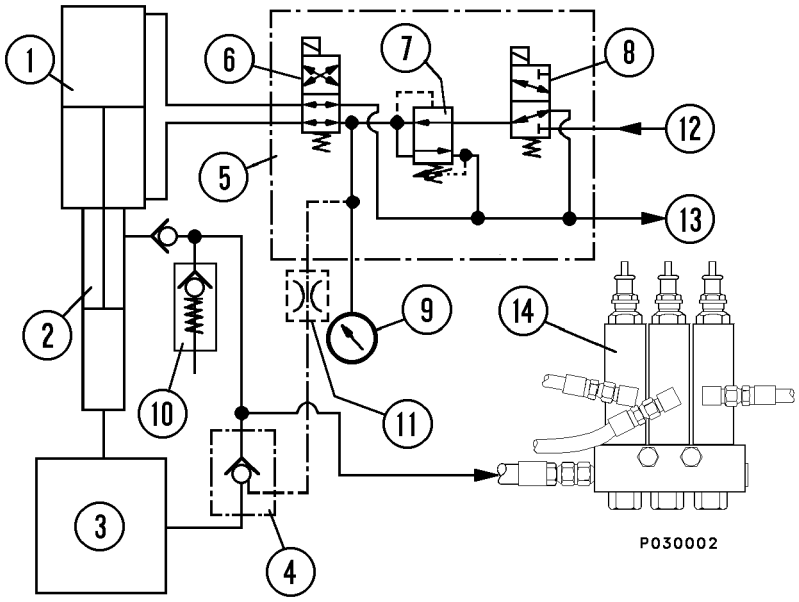


FIGURE 4-10. HYDRAULIC SCHEMATIC FOR AUTOMATIC LUBE

1. Grease Pump Cylinder
2. Grease Pump
3. Grease Reservoir
4. Vent Valve
5. Combination Valve (Pressure Reducing & Solenoid Valves)
6. Solenoid (SV2)
7. Pressure Reducer
8. Solenoid (SV1)
9. Gauge (Cyl. Press.)
10. Safety Unloader Valve
11. Orifice Assembly Fitting
12. Hydraulic Supply
13. Hyd. Tank (Return)
14. Injectors

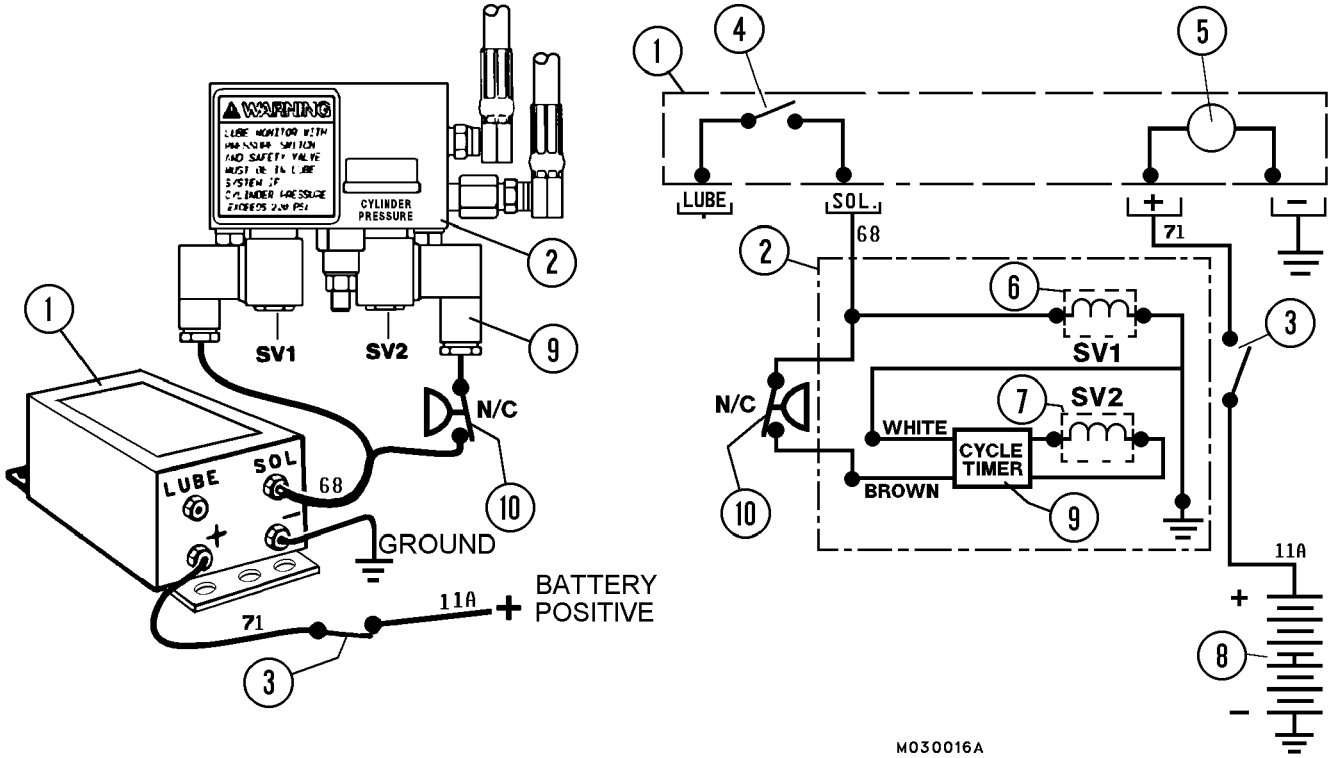


FIGURE 4-11. TYPICAL ELECTRICAL HOOKUP FOR AUTOMATIC LUBE

1. Timer Assembly
2. Combination Valve (Pressure Reducing & Solenoid Valves)
3. Keyswitch*
4. Relay
5. Timer (solid State)
6. Solenoid (SV1)
7. Solenoid (SV2)
8. Battery (24 V)
9. Cycle Timer

* Keyswitch (3) must be closed ("ON") to energize Timer (1).

TROUBLESHOOTING CHART

If the following procedures do not correct the problem, contact a factory authorized service center. When submitting equipment to be repaired, be sure to state the nature of the problem and indicate if a repair cost estimate is required.

POSSIBLE CAUSES	*SUGGESTED CORRECTIVE ACTION*
TROUBLE: Pump Does Not Operate.	
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 intial 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.	Fill Reservoir.
Dirt in reservoir, pump inlet clogged.	Clean pump and reservoir. Remove source of contamination.
Pump Jammed.	Repair/replace pump assembly.
TROUBLE: Pump Will Not Build Pressure	
Air trapped in lubricant supply line.	Prime system to remove trapped air.
Lubricant supply line leaking.	Check lines and connections to repair leakage.
Vent valve leaking.	Clean or replace vent valve.
Pump cylinder worn or scored.	Repair or replace pump cylinder or pump assembly.
Reservoir empty.	Fill Reservoir.
TROUBLE: Injector Indicator Stem Does Not Operate	

NOTE: Normally, during operation, the injector indicator stem (1, Figure 4-8) 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 pump building pressure and then venting.	Replace individual injector assembly.
All injectors inoperative -	Pump build up not sufficient to cycle injectors. Repair/replace pump assembly. Also check pump cylinder pressure and line pressure at pump.
Whole series of injectors inoperative -	Check for broken or clogged intermediate supply line and replace.

POSSIBLE CAUSES	*SUGGESTED CORRECTIVE ACTION*
TROUBLE: Cylinder Pressure Gauge Does Not Register Pressure.	
No system pressure to the pump.	Determine problem in hydraulic system.
No 24 VDC signal at solenoids SV1 and SV2.	Determine problem in 24 VDC electric system.
Pressure reducing valve set too low.	Increase setting by 1/2 turn to check operation.
Primary solenoid valve SV1 may be inoperative.	Replace solenoid coil or valve.
Broken gauge.	Replace gauge.
Damaged combination valve.	Replace combination valve.
TROUBLE: Pump Pressure Builds Very Slowly Or Not At All.	
No pulsing signal at SV2.	Check Timer.
Pressure reducing valve may be set too low.	Increase setting by 1/2 turn to check operation.
Grease viscosity may be too high for temperature at which pump is operating.	Replace grease with a lower viscosity lubricant.
If pressure is not building at all, secondary solenoid valve SV2 may be inoperative.	Replace secondary solenoid valve SV2.
Pump piston ball checks and inlet checks may have foreign matter trapped causing leakage.	Remove, inspect and clean, if necessary. Inspect sealing surfaces between upper and lower inlet checks. Replace if rough or pitted.
Shovel rod is rough or pitted.	Replace shovel rod and packing.
Lubricant supply line leaks or is broken.	Repair lubricant supply line
Pulsing signal of cycle timer incorrect.	Set flasher timer.
TROUBLE: 24VDC Timer Not Operating:	
Timer BAT (-) connection is not on grounded member.	Connect to good ground.
Timer BAT (+) connection not on circuit continuously connected to BAT (+) terminal during operation of vehicle.	Establish direct connection between Timer BAT (+) connection and 24 V BAT (+) terminal.
Fuse blown (circuit breaker tripped) on power connection on timer, or wire is otherwise damaged.	Replace fuse (reset circuit breaker) or repair damaged wire.
Loose wire connections at any of the timer terminals.	Secure wire connections.
TROUBLE: Timer Stays Timed Out:	
Commutation failure in timer caused by damaged component.	Replace Timer.
Output relay contacts welded shut caused by extended short to ground.	Replace Timer.
Solenoid valve connected to "LUBE SW" terminal of timer instead of terminal marked "SOL".	Correct wiring hook-up.

POSSIBLE CAUSES	*SUGGESTED CORRECTIVE ACTION*
TROUBLE: Timer Turns On At Intervals Two (2) To Ten (10) Times More Often Than Set Time Interval:	
Electrical noise is being introduced into the power supply to the timer overcoming suppressor capacitor causing uncontrolled turn-on of its output relay.	***IMPORTANT: In some instances, electrical noise may be generated into vehicle electrical system which may cause timer to turn on at random intervals, independent of timer setting.*** ***If this occurs, a 250 to 1,000 MFD capacitor rated 150 to 350 VDC should be added across BAT (+) and BAT (-) terminals to suppress this noise and improve timer performance.***
TROUBLE: Timer Turns On At Intervals Faster Than Allowable Tolerances Of Settings:	
Timer out of adjustment or damaged component.	Refer to "Timer Adjustment and re-adjust timer, or replace timer.

Reservoir Fill Procedure

Lubricant Required for System

Refer to "Lubrication Chart", for correct lubricant specifications.

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

Fill Procedure

1. Remove top vent plug (14, Figure 4-12).
2. Remove bottom fill plug (15).
3. Connect line from Lubricant Delivery system to bottom fill port (15) and fill reservoir until grease just begins to come out of top vent hole above.
4. Disconnect line from Lubricant Delivery system and install plugs (14 & 15) previously removed.

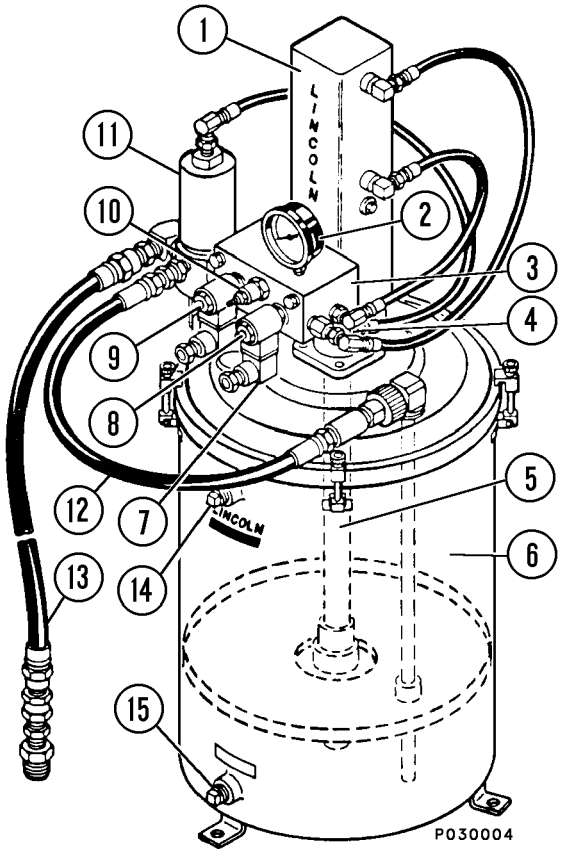


FIGURE 4-12. TYPICAL AUTO LUBE SYSTEM

1. Pump Cylinder
2. Cyl. Pressure Gauge
3. Valve Body Assy.
4. Orifice Assembly
5. Pump Assembly
6. Cannister/Reservoir
7. Pump Cycle Timer
8. Solenoid Valve, SV2
9. Solenoid Valve, SV1
10. Press. Reducing Valve
11. Vent Valve Assy.
12. Grease Return Line
13. Grease Supply Line
14. Top Vent Plug
15. Fill Supply Port

Preventive Maintenance Procedures

The following maintenance procedures should be used to insure proper system operation.

Daily Lubrication System Inspection

1. Check grease reservoir level.

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

   - Lack of lubricant usage would indicate an inoperative system.
   - Excessive usage would indicate a broken supply line.

2. Check all grease feed lines hoses from the SL-1 Injectors to the lubrication points (Figure 4-6).
   a. Repair or replace all worn / broken feed line hoses.
   b. Make sure that all air is purged and all new feed line hoses are filled with grease before sending the truck back into service.

3. Inspect key lubrication points for a bead of lubricant around seal.

   Make note of all lubrication points that look dry. Notify maintenance staff for repair service.

250 Hour Inspection

1. Check all grease feed line hoses from the SL-1 Injectors to the lubrication points (Figure 4-6).
   a. Repair or replace all worn / broken feed line hoses.
   b. Make sure that all air is purged and all new feed line hoses are filled with grease before sending the truck back into service.

2. Check all grease supply line hoses from the pump to the SL-1 injectors.
   a. Repair or replace all worn / broken supply lines.
   b. Make sure that all air is purged and all new supply line hoses are filled with grease before sending the truck back into service.

3. Check grease reservoir level.
   a. Fill reservoir if low.
   b. Check reservoir for contaminants.
   Clean, if required.
   c. Check that all filler plugs, covers and breather vents on the reservoir are intact and free of contaminants.

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

   It is good practice to manually lube each bearing point at the grease fitting (Zerk, Figure 4-8) provided on each Injector. This will indicate if there are any frozen or plugged bearings, and will help flush the bearings of contaminants.

5. System Checkout
   a. Remove all SL-1 injector cover caps to allow visual inspection of the injector cycle indicator pins during system operation.
   b. Lift the passenger seat and connect a jumper wire between the "SOL" terminal and the "LUBE SW" terminal on the 24VDC solid state timer (Figure 4-11).
   c. Start engine. The hydraulic grease pump should operate.
   d. Keep the jumper wire connected until the pump stalls out at 2000 PSI.
   e. With the pump in the stalled-out mode, check each SL-1 injector assembly.
   The cycle indicator pin should be retracted inside the injector body.
   f. Once all of the SL-1 injectors have been inspected under pressure, remove the jumper wire between the "SOL" terminal and "LUBE SW" terminal on the timer assembly. The pump should shut off, and the system should vent back to the grease reservoir, and the pressure should drop to zero.
   g. With the system vented, check all of the SL-1 injector indicator pins.
   All of the pins should be visable.

   NOTE: Refer to the system troubleshooting chart, if the injectors are not working properly. Replace or repair injectors, if defective.

   h. Reinstall all injector cover caps.
   i. Check timer operation.

   With engine running, lube system should activate within 5 minutes. The system should build 2000PSI within 25-40 seconds.

   j. If the system is working properly, the machine is ready for operation.
   k. If the system is malfunctioning, refer to the troubleshooting chart in the service manual.

NOTES

MAJOR COMPONENTS AND SPECIFICATIONS

ENGINE

The KOMATSU 530M Haulpak Truck is powered by a Cummins diesel engine.

TRANSMISSION

The TORQFLOW transmission consists of a 3-element, single-stage, two-phase torque converter and a planetary gear, multiple disc clutch transmission which is hydraulically actuated and force-lubricated for optimum heat dissipation.
The TORQFLOW transmission is capable of seven (7) forward speeds and one (1) reverse gear. Automatic shifting is controlled by electronic shift control with automatic clutch modulation in all gears. A lockup system consisting of a wet, double-disc clutch, is activated in F1–F7 gears for increased fuel savings.

FINAL DRIVE ASSEMBLY

The final drive consists of a plug-in differential with planetary wheel drive.

OPERATOR'S CAB

The 530M Operator's Cab has been engineered for operator comfort and to allow for efficient and safe operation of the truck.

The cab provides for wide visibility, with an integral 4-post ROPS/FOPS stucture, and an advanced analog operator envirnment. It includes a tinted safety-glass windshield and power-operated side windows, a deluxe interior with a fully adjustable seat with lumbar support, a fully adjustable/tilt steering wheel, controls mounted within easy reach of the operator, and an electronic display/monitoring panel to keep the operator informed of the truck's operating circuits. Audible alarms and indicator lights warn the operator of system malfunctions.

POWER STEERING

The 530M Haulpak 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

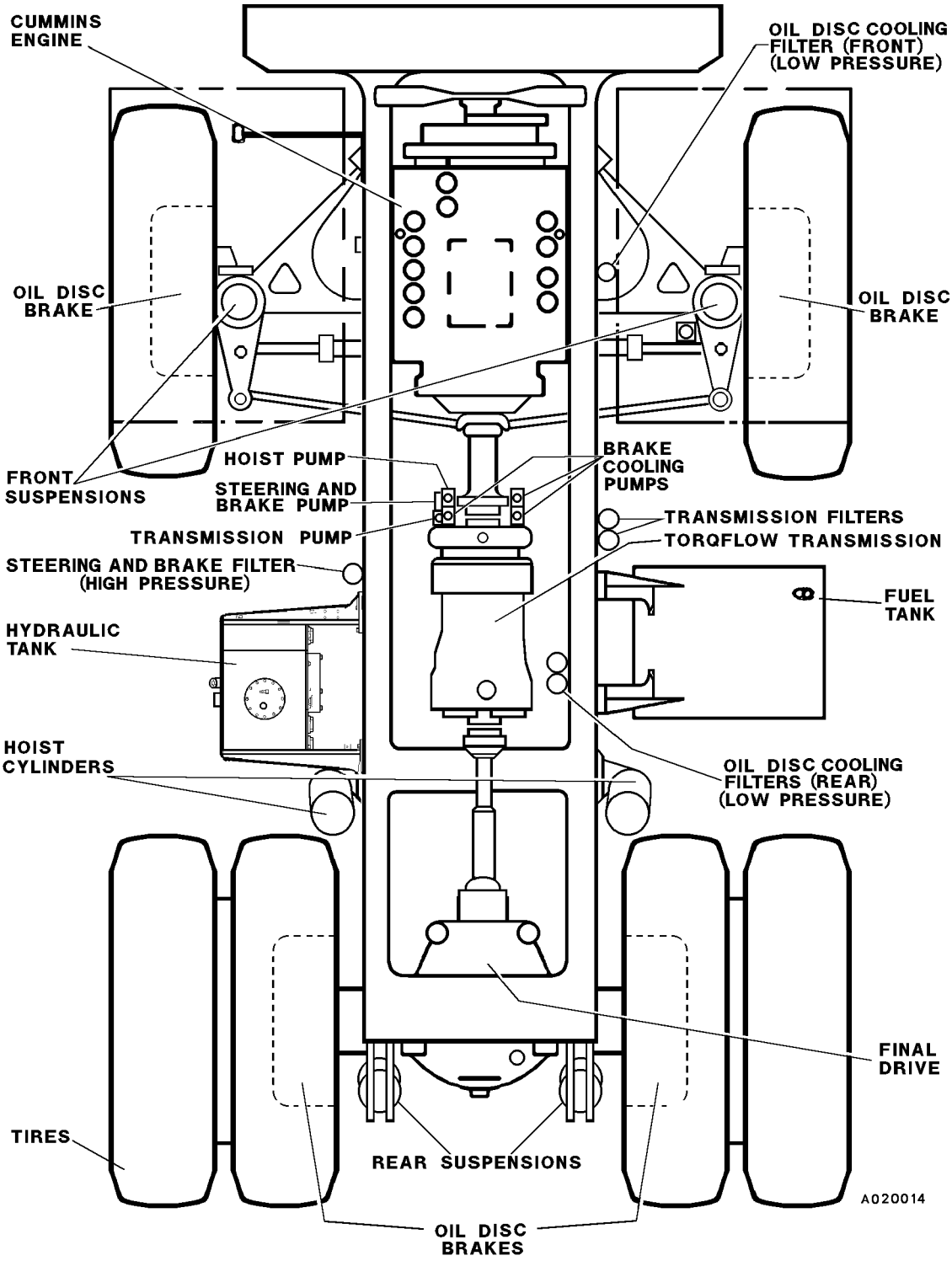
Depressing the brake pedal, or pulling the lever on the R.H. side of the steering wheel, actuates hydraulic front and rear service brakes. Both front and rear service brakes are oil-cooled, multiple-disc brakes. These brakes are automatically activated when the engine speed exceeds the rated revolutions of the shift position.

RETARDER

The operator can manually apply both the front and rear oil-cooled, multiple-disc brakes by moving the retarder contol lever which is mounted on the steering column, or by using the foot-operated brake pedal.

SUSPENSION

Hydro-pneumatic suspension cylinders are used at each wheel to reduce shock and provide riding comfort for the operator and machine stability.



530M MAJOR COMPONENTS

SPECIFICATIONS

ENGINE

Cummins KTA-50

Number of Cylinders 16

Operating Cycle (diesel) 4-Stroke

Rated 1082 kW **(1450 SAE Brake HP)** @ 1900 RPM

Flywheel . 1027 kW **(1377 SAE HP)** @ 1900 RPM

Weight (dry) . . . . . 4932 kg (**10,873 lbs**)

TORQFLOW TRANSMISSION

Automatic Electronic Shift Control
. . . with Automatic Clutch Modulation In All Gears.

Torque Converter . . . . . 3-Element, Single-stage, ... Two-phase

Lockup Clutch . . . . . Wet, Double-disc, ... Activated in F1–F7 gears.

Transmission . . . . . 7 Forward Speeds, 1 Reverse . . . . . Planetary Gear, Multiple Disc Clutch, ... Hydraulically Actuated, Force-lubricated

Gear	Km/h	MPH
1	10.3	**6.4**
2	13.8	**8.6**
3	18.4	**11.4**
4	23.2	**14.4**
5	31.1	**19.3**
6	42.0	**26.1**
7	58.0	**36.0**
Rev	9.4	**5.8**

FINAL DRIVE ASSEMBLY

Final Drive . . . . . Plug-in Differential . . . . . with Planetary Wheel Drive

Reduction Ratios:

Bevel Set 2.647:1
Planetary Final Drive 7.235:1
Total Reduction 19.151:1

ELECTRIC SYSTEM

Batteries (series-parallel) . . . . 4 x 12V / 220 A. Hr.

Alternator . . . . . 24 Volt, 100 Ampere Output

Lighting . . . . . 24 Volt

Starters . . . . . Two (2) - 24 Volt Electric

SERVICE CAPACITIES

	Liters	U.S. Gallons
Cummins (Includes Lube Oil Filters)	170	**(44.9)**
Cooling System	511	**(135.0)**
Fuel Tank	2120	**(560.0)**
Transmission And Torque Converter	120	**(31.7)**
Hydraulic System (Includes Retarder Cooling)	710	**(187.6)**
Differential	300	**(79.0)**
Final Drive (each planetary)	120	**(31.7)**

HYDRAULIC SYSTEM

Hydraulic Pumps (3)

Hoist (Tandem Gear)
. 805 l/min. **(213 gpm)** @ 18 960 kPa **(2,750 psi)**
Steering (Piston Pump)
221 l/min. **(58.5 gpm)** @ 18 960 kPa **(2,750 psi)**
Brakes (Tandem Gear) . . . 1512 l/min. **(400 gpm)**

Hoist Control Valve . . . . . Spool Type

Positions . . . . . Raise, Hold, Float, and Lower

Hydraulic Cylinders

Hoisting . . . . . 3-Stage Telescoping Piston
Steering . . . . . Twin - Double Acting Piston

Relief Valve Setting . . . . . 18 960 kPa **(2,750 psi)**

Filtration . . . . . In-line Replaceable Elements

Suction . . . . . Single, Full Flow, 100 Mesh
Hoist & Steering . . . . . Dual, Full Flow, In-line . . . . . High Pressure. Beta 12 Rating = 200
Transmission . . . . . Dual, High Pressure

SERVICE BRAKES

Actuation: . . . . . All-Hydraulic

Front . . . . . Oil-Cooled, Multiple-Disc
Rear . . . . . Oil-Cooled, Multiple-Disc
. . Both Act as both Service and Retarder Brakes

Retarder Brakes:

Normally Applied . . . . . Manually By Operator.
Automatically Actuated . . . . . when engine speed exceeds the rated revolutions of the shift position for the transmission.

Parking Brake: . . . Spring-Applied, Oil Released
. Dry Caliper Disc Actuates On Rear Drive Shaft

Emergency Brakes:

An emergency brake valve actuates the brakes automatically, if the hydraulic pressure drops below a pre-set value.
Manual operation is also possible.

STEERING

Turning Circle Diameter (SAE) . . . . 24.4 m (**80 ft**)

Automatic Emergency Steering . . 2 Accumulators

TIRES

Rock Service (E-3) . . . . . Tubeless

Standard 33.00 R51

Rim Size . . . 61x 12.95 x 12.7 cm (**24 x 51 x 5 in**.)

Phase II Generation™ . . . . . Separable Tire Rims

DUMP BODY CAPACITY (Standard)

Struck . . . . . 54 m^3 (**71 yds^3**)

Heaped @ 2:1 (SAE) . . . . . 78 m^3 (**102 yds^3**)

OVERALL TRUCK DIMENSIONS

Loading Height . . . . . 4.965 m (**16' 3"**)

Minimum Clearance Height . . . . . 5.85 m (**19' 2"**)

Overall Length . . . . . 11.48 m (**37' 8"**)

Maximum Width . . . . . 6.62 m (**21' 9"**)

WEIGHT DISTRIBUTION

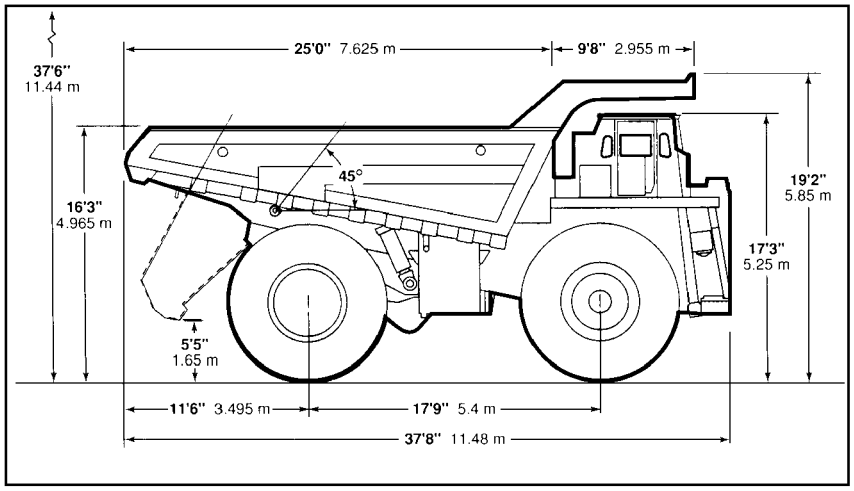
Based on SAE 2:1 Heaped . . . . 78 m^3 (**102 yds^3**)
(w/Cummins Engine; and . . . . . 33.00 R51 Tires)

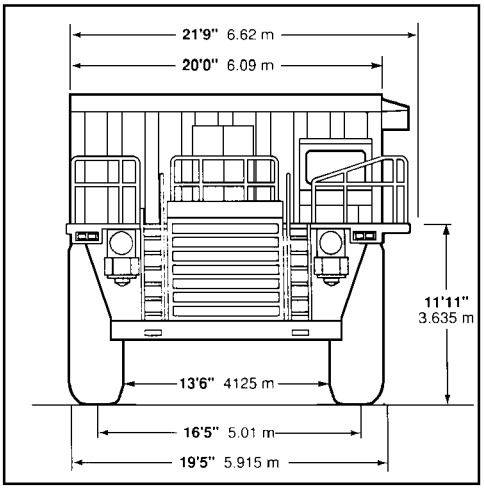
EMPTY	**Kilograms**	**Pounds**
Front Axle	48 795 . . .	**107,575**
Rear Axle	51 195 . . .	**112,865**
Total	99 990 . . .	**220,440**

LOADED (100 Ton PAYLOAD)

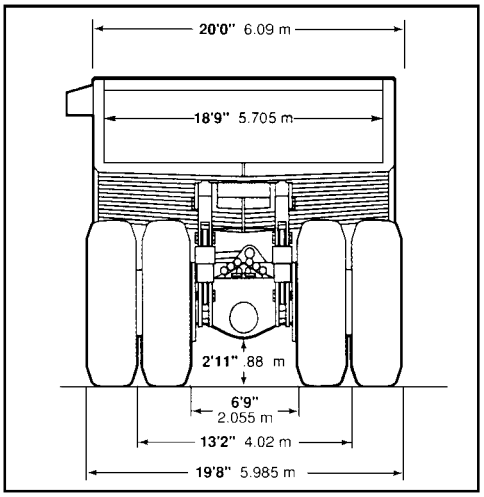
. . . . .	**Kilograms**	**Pounds**
Front Axle	82 327 . . .	**181,500**
Rear Axle	167 149 . . .	**368,500**
Total *	249 475 . . .	**550,000**

* **Not to Exceed** 249 475 kg (**550,000 lbs.**).
Including Options, Fuel & Payload





All dimensions are with **71/102 yd.**³ 54/78 m^3 body.
Vertical dimensions are for standard empty vehicle — subtract **4"**/100 mm for vehicle loaded to max. GVW.
Minimum ground clearance (at max. GVW)..... **2'9"** 838 mm



INDEX

PAYLOAD METER II
ON BOARD WEIGHING SYSTEM (OBWS)

GENERAL INFORMATION

The Payload Meter II On Board Weighing System displays and records the payload weight along with other operating information. The system consists of a payload meter, pressure sensors, deck mounted lights and an inclinometer.

The payload meter (Figure 6-1) uses the four suspension pressures and an inclinometer to determine the load in the truck. The payload weight can be displayed in short tons or metric tons.

There are three external deck-mounted lights on each side of the truck. The lights indicate payload weight divided into three separate stages. A forecast feature will flash a deck mounted light predicting the payload weight if the next bucket of material is dropped into the body.

The payload meter stores in memory various operating data. This data includes:

1) The payload, time, distance, and travel speed for each cycle.
2) The date and time that the engine was started and stopped.
3) The date and time of each fault that occurred or was canceled.
4) The total payload and the overall number of cycles for a specific time period.

This data is retained even when the power is switched off. The stored data is backed up by an internal battery.

The data can be down loaded from the payload meter to a personal computer when a communication cable is connected to the port inside the cab.

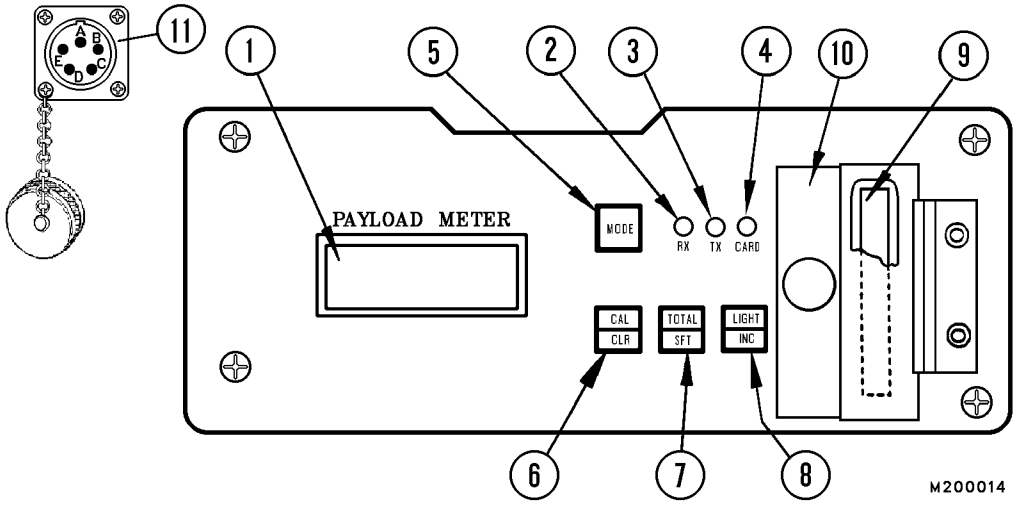


FIGURE 6-1. PAYLOAD METER II

1. Display panel
2. Reception pilot lamp (Rx busy)
3. Transmission pilot lamp (Tx busy)
4. Memory card access lamp (CARD busy)
5. Mode switch [MODE]
6. Calibration/clear switch [CAL] [CLR]
7. Total/shift switch [TOTAL] [SFT]
8. Light/increment switch [LIGHT] [INC]
9. Memory card
10. Cover
11. Diagnostic/Download Port

WARNING - When not inserting or removing memory card (9), always keep the cover (10) closed)

LIGHTS, SWITCHES, and COMPONENTS On The Face Of The Payload Meter (Refer to Figure 6-1)

1. Display Panel

   Digital display area for the data being recorded in memory. This will include items such as:

   Payload

   Date & Time

   Cycles

   Travel Distance

   Fault Codes and Warnings

2. Reception Pilot Lamp (Rx Busy)

   This light will illuminate for 3 seconds when the system is powered up. It will then be lit whenever the computer is communicating.

3. Transmission Pilot Lamp (Tx Busy)

   This light will illuminate for 3 seconds when the system is powered up. It will then be lit whenever the memory is being downloaded to a personal computer.

4. Memory Card Access Lamp (CARD Busy)

   This light will illuminate for 3 seconds when the system is powered up. It will also be lit whenever the memory data is being downloaded to the memory card.

5. Mode Switch

   This switch is used to select the mode or system that will allow a function to be performed.
   This may include:

   Various settings or corrections to the display

   Memory card downloading

   Clearing data

   Display of Abnormalities or Warnings

   Setting the speed limit

   Setting the date and time

6. Calibration/Clear Switch

   Used to calibrate the machine when the conditions regulate this action.
   Also used with the TOTAL/SFT switch to clear total payload and overall number of cycles.

7. Total/Shift Switch

   Used to display payload and overall number of cycles each time the load is dumped. Will display the error codes. This switch is also used with the CALIBRATION/CLEAR switch to clear total payload and overall number of cycles.

8. Light/Increment Switch

   Used to change the digital increments or units for the various displays. Also used to adjust the brightness of the lights on the monitor display.

9. Memory Card

   Used to receive data from the payload meter memory to this card which can then be used to transfer the data into a personal computer. This enables the memory to be downloaded and saved when a personal computer is not available.

10. Cover

    Protective cover for the Memory Card. Do not open or place foreign objects in slot.

11. Diagnostic/Download Port

    Connector port that is used for downloading the memory data to a personal computer.

TIPS FOR OPERATION

To assure that the On Board Weighing System records the most accurate and consistent data, these important steps should be followed:

* For most Haulpak Trucks:
  Use **only the Brake Lock** switch to hold the truck stationary at the loading and dumping area.

  For 330M Haulpak Trucks <u>ONLY</u>:
  Use the **Park Brake switch** to hold the truck stationary at the loading and dumping area.

  Any other method will not allow the payload system to register properly.

* Do not activate the "Lamp Test" switch during loading. Inaccurate and inconsistent data may be stored.

* At the loading area **do not release** the Brake Lock (or Park Brake switch) **until the loading is complete** and the load shock from the last load dumped has settled.

* The loading area surface **must be** maintained as flat and level as possible. The On Board Weighing System can compensate for slight variations in grade and unevenness, but ruts, berms, rocks, etc. will cause the system to record inaccurate and inconsistent data.

* Regularly remove "carryback" from the dump body.

* Calibrate periodically.

EXTERNAL DISPLAY LIGHTS

The Payload Meter II controls three light relays. The relays operate three deck mounted lights on each side of the truck. There is one green light, one amber light, and one red light. (Figure 6-3)

While the truck is stopped being loaded and the hoist lever is in the float position, the appropriate lights will remain on according to the following schedule:

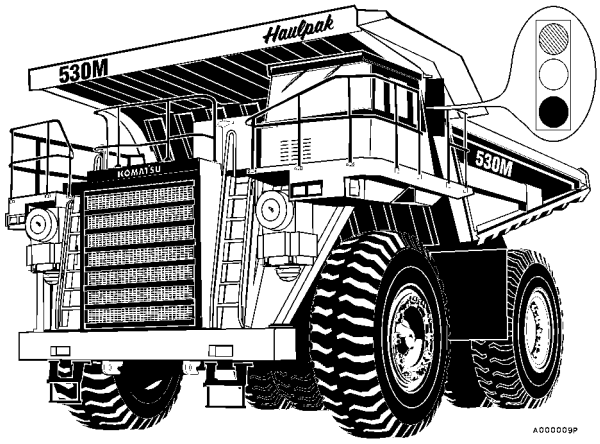


FIGURE 6-2. LOAD INDICATOR LIGHTS

INDICATOR LIGHTS			PAYLOAD WEIGHT
Off	Off	Green	50% and Greater
Off	Amber	Green	90% and Greater
RED	Amber	Green	105% and Greater

The shovel or loader operator can predict the payload weight by observing these lights. During the loading operation, a forecast feature flashes a deck mounted light predicting the payload weight after the next bucket of material is loaded 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 3 seconds, 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 the rated load, 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. One of the deck mounted lights will turn on, if another "average" size load is put in the body, and will blink at one second intervals.

THEORY OF OPERATION

Basic Description

The payload meter uses the four suspension pressures and the inclinometer to determine the load in the truck. These inputs are critical to the calculation of the load. The other inputs to the payload meter (Body Up, Speed, Brake Lock, Alternator R Terminal, and Engine Oil Pressure) are used to indicate where the truck is in the haul cycle. These inputs enable the payload meter to make time and distance measurements for the haul cycle.

The suspension pressures are the key ingredients in determining the sprung weight of the truck. These pressures are converted into forces using the formulas shown below. These forces are combined with the geometry of the truck to produce the load calculation. It is critical that the suspension pressure sensors are functioning properly.

$$\text{Sprung Weight} = \frac{\pi}{4} \text{Suspension Diameter}^2 \text{ (Psi Left + Psi Right)}$$

$$\text{Sprung Weight} = \text{Axle Weight(lbs)}/2000$$

The inclinometer gives the payload meter information regarding the pitch angle of the truck. The front and rear incline factors are determined by the pitch angle. These two factors account for the load transfer that occurs when the truck is inclined nose up or nose down.

Linkage Factor

The linkage factor is part of the complex calculations performed by the payload meter to determine the load in the truck. The linkage factor is dependent on the load on the rear suspensions.

Figure 6-3 shows the side view of a truck. The nose pin is marked with a star and there are three arrows pointing to different spots of the rear tire. This figure shows how the support under the rear tire can affect the calculation of the load. The payload meter does not directly measure the load transferred to the frame through the nose pin. To account for portion of the load carried by the nose pin, the linkage factor is multiplied by the rear suspension force. It is assumed that the truck is supported under the center of the tire. In this case the payload meter uses L2 to help compute the linkage factor. If, however, the truck is backed into a berm and the rear tire is supported towards the back of the tire, the actual linkage factor calculation should use L3. Since the payload meter assumes L2 it will overestimate the load in the truck. The opposite is true in the case where the rear tires are supported toward the front of the tire. The linkage factor should use L1 but the payload meter assumes L2. This change in leverage will cause the payload meter to underestimate the load.

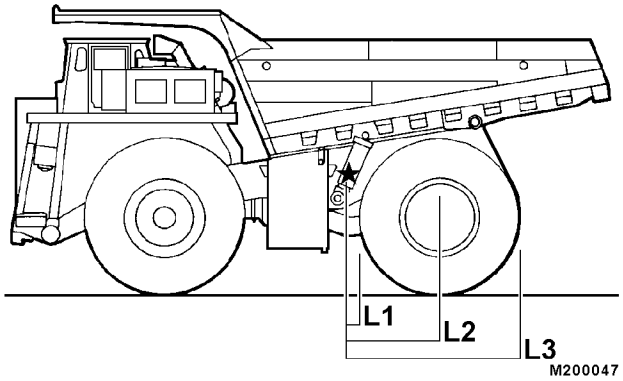


Figure 6-3.

Brake Lock

The Brake Lock only applies the rear brakes. This allows the front wheels to rotate slightly as the truck is being loaded. This is important because the payload meter assumes that the front wheels can rotate freely. As the truck is being loaded, it will begin to squat down on the suspensions. This will change the wheel base dimension of the truck. This freedom of movement prevents additional binding and friction in the front suspensions.

The incline of the grade on which the truck is loading is measured by the inclinometer. This helps determine the incline factors that are applied to the front and rear sprung weights. The tire forces on the road surface that hold the truck on grade affect the suspension pressures. If the front and rear brakes are locked, the effect on the suspension pressures cannot be determined. If only the rear brakes are applied the effect is predictable and the incline factors accurately account for the forces on the tires.

If the service brake or park brake is used and depending on the incline and other factors, the payload meter can overestimate or underestimate the load. **It is important that only the Brake Lock be used while loading the truck.**

Sources of Error

Suspensions

Poorly charged suspensions can lead to systematic error in the calculation of payload. The error is most obvious when the oil level is low. When there is too little oil in the suspensions, the cylinder may compress completely under load. The weight of the truck will be carried by the metal to metal contact within the suspension. Not only will the ride of the truck and the life of the tires be affected, but the pressure in the cylinder will not truly represent the load on the truck. In the under-charged condition the payload meter will typically weigh light and under report the load.

Typical Data From Service Check Mode

Number	Data	Description
1	13:09	Current Time
2	749.4	Front Left Pressure (Psi)
3	848.9	Front Right Pressure (Psi)
4	863.2	Rear Left Pressure (Psi)
5	1049.0	Rear Right Pressure (Psi)
6	106.0	Front Weight (Tons)
7	75.1	Rear Weight (Tons)
8	-1.85	Inclinometer (Degrees)
9	0.95	Incline Factor - Front Wheels
10	0.984	Incline Factor - Rear Wheels
11	1	Link Factor - Front Wheels
12	1.539	Link Factor - Rear Wheels
13	70.6	Calibration Sprung Weight (Tons)
14	1.000	Gain Adjustment
15	143.8	Current Load (Tons)
16	3.9	Battery Backup Voltage (Volts)

Figure 6-4.

A sample data set is shown in Figure 6-4. This data was taken in the laboratory and is used in Figure 6-5 to calculate the final load. Note that the front suspension pressures were converted into the front sprung weight using the formulas above Figure 6-5. The front sprung weight is then multiplied by the front incline factor and the front linkage factor. The same is done with the rear sprung weight. The front and rear sprung weights are then summed. This number is multiplied by the Gt gain potentiometer value. This value should be 1.000. The calibration load is subtracted from the total to produce the final load. The load displayed on the meter is this final load (item #15) multiplied by the UP gain factor.

Note - This screen is the only place that the value of the Gt gain potentiometer can be checked. THIS GAIN SHOULD BE SET TO 1.000. ANY OTHER SETTING CAN PRODUCE SYSTEMATIC ERRORS IN THE PAYLOAD MEASUREMENT.

Note - There are two gain factors that can be applied to the payload measurement. The first is the Gt gain factor and the other is the UP gain factor. They are not applied uniformly to all payload calculations. Both gain factors should be set to 1.000. See the warning on page 16 for more information.

If the G_t gain factor displayed in the Service Check Mode is not 1.000, adjust the gain to exactly 1.000.

In order to adjust this gain:

1. Start with the payload meter in normal operation mode.
2. Adjust the gain pot, left to reduce the value and right to increase the value.
3. Press and hold the LIGHT/INC and MODE switches until "CHEC" is flashing on the meter.

4. Press and hold the LIGHT/INC switch until "ALL0" is flashing on the display. "A.FUL" may also be displayed.

5. Press the LIGHT/INC switch14 times. The number displayed will be the current Gt gain. This is not a "live" reading. Any time the potentiometer is changed, this cycle must be repeated to view the change.
6. Press MODE once and "CHEC" will flash on the display.

7. Press MODE once and the meter will return to normal operation.

These calculations used a 13" front suspension diameter and 10" rear suspension diameter.

Sprung Weight = $\frac{\pi}{4}$ Suspension Diameter^2 (Psi Left + Psi Right)

Sprung Weight = Axle Weight(lbs)/2000

Example Calculation of Payload

Front Weight (6)	106.00	Rear Weight(7)	75.10
X Incline Factor (9)	0.95	X Incline Factor (10)	0.98
	100.70		73.90
X Link Factor (11)	1.00	X Link Factor (12)	1.53
Front Weight	100.70	Rear Weight	113.70
Front Weight	100.70		
Rear Weight	113.70		
Total Weight	214.40		
XGain Factor (14)	1.00		
	214.40		
- Calibration (13)	-70.60		
Current Load(15)	143.80		

Figure 6-5.

Calculation of the Calibration Load

This procedure is similar to the manual calculation of load. This calibration load is used as item #13 from the manual calculation procedure.

1. Press and hold the LIGHT/INC and MODE switches until "CHEC" is flashing on the display.

2. Press and hold the CAL/CLR switch until "CALL0" is flashing on the display.

3. Press the CAL/CLR switch to cycle through the following data. The sequence repeats.

Item and Description	Units
1. Year of Calibration	Last 2 digits of year
2. Month:Day of Calibration	XX:XX
3. Hour:Minute of Calibration	XX:XX
4. Truck Model Setting	
5. Pressure Front Left	Psi
6. Pressure Front Right	Psi
7. Pressure Rear Left	Psi
8. Pressure Rear Right	Psi
9. Front Sprung Weight	Tons
10. Rear Sprung Weight	Tons
11. Degree of Incline	±° Nose Up Positive
12. Incline Factor - Front Axle	
13. Incline Factor - Rear Axle	
14. Link Factor Front Axle	
15.Link Factor Rear Axle	
16. Calibration Weight	Tons

4. Press MODE once and "CHEC" will flash on the display.

5. Press MODE once and the meter will return to normal operation.

TYPES OF DATA STORED

Cycle Data

One cycle is considered to be from the point where a load is dumped to the point where the next load is dumped. Data between these two points is recorded in memory. Examples of the data are shown below. The maximum number of cycles that can be stored in memory is 2900 cycles.

ITEM	UNIT	RANGE	REMARKS
Engine Operation Number	Number	1 - 65535	Advances by one each time the engine is started.
Month	Month	1 - 12	
Day	Day	1 - 31	
Time Hour	Hour	24 Hour Clock	These values are stored when the load is dumped.
Time Minute	Minute	1 - 59	
Payload	Metric tons Short tons	0 - 6553.5	
Travel Time When Empty	Minute	0 - 6553.5	
Travel Distance When Empty	Miles/Km	0 - 25.5	
Maximum Travel Speed When Empty	Mph/Kmh	0 - 99	
Average Travel Speed When Empty	Mph/Kmh	0 - 99	
Time Stopped When Empty	Minute	0 - 6553.5	
Time Stopped During Loading	Minute	0 - 6553.5	
Travel Time When Loaded	Minute	0 - 6553.5	
Travel Distance When Loaded	Miles/Km	0 - 25.5	
Maximum Travel Speed When Loaded	Mph/Kmh	0 - 99	
Average Travel Speed When Loaded	Mph/Kmh	0 - 99	
Time Stopped When Loaded	Minute	0 - 6553.5	
Dumping Time	Minute	0 - 6553.5	
Speed Limit	Mph/Kmh	0 - 99	
Warnings For Each Cycle	The fault codes that occur during each cycle		

Engine ON/OFF Data

When the engine is started or stopped, the following data is recorded.

ITEM	UNIT	RANGE	REMARKS
Engine Operation Number	Number	1 - 65535	Advances by one each time the engine is started.
Last Two Digits Of The Year	Year	0 - 99	Indicates when the engine was started.
Month	Month	1 - 12	
Day	Day	1 - 31	
Time Hour	Hour	24 Hour Clock	
Time Minute	Minute	0 - 59	
Last Two Digits Of The Year	Year	0 - 99	Indicates when the engine was shut off.
Month	Month	1 - 12	
Day	Day	1 - 31	
Time Hour	Hour	24 Hour Clock	
Time Minute	Minute	0 - 59	
Total Payload	Metric tons Short tons	0 - 999900.0	Total payload from the time when the engine was started until the time the engine was shut off.
Total Number Of Cycles	Number	0 - 9999	Totals for the time that the engine was running.
The engine operation numbers are included in the fault and warning data.			

Fault Codes and Warning Data

ITEM	UNIT	RANGE	REMARKS
Error Code	Displayed by a combination of letters and numbers representing a specific error code.		
Engine Operation Number At Time Of Occurrence	Number	1 - 65535	Every time the engine is started the number advances by one.
Number Of Times Of Occurrence Since The Engine Was Switched ON	Number	1 - 255	
Last Two Digits Of Year	Year	0 - 99	
Month	Month	1 - 12	
Day	Day	1 -31	
Time Hour	Hour	24 Hour Clock	
Time Minute	Minute	0 - 59	

Engine Operation

ITEM	UNIT	RANGE	REMARKS
Number when Canceled	Number	1 - 65535	Every time the engine is started the number advances by one.
Last Two Digits Of Year	Year	0 - 99	
Month	Month	1 - 12	
Day	Day	1 - 31	
Time Hour	Hour	24 Hour Clock	
Time Minute	Minute	0 - 59	
NOTE: If the engine operation number is a 0, this indicates that the problem occurred or was canceled (depends on the operation that was performed) when the key switch was in the ON position and the engine was not running.			

Total Payload and Total Number of Cycles

The total payload and overall number of cycles can be displayed using the forced display operation. Both values start from a zero point whenever the memory has been cleared. The payload total is automatically displayed when the load is dumped.

ITEM	UNIT	RANGE	REMARKS
Total Payload	Metric Tons Short Tons	0 - 999900.0	The total payload since the unit was cleared.
Total Number Of Cycles	Digital Number	0 - 9999	The number of cycles since the unit was cleared.
Last Two Digits Of Year	Year	0 - 99	Date and time the unit was cleared.
Month	Month	1 - 12	
Day	Day	1 - 31	
Time Hour	Hour	24 Hour Clock	
Time Minute	Minute	0 - 59	

Other Data

CONTENT	ITEM	UNIT	RANGE	REMARKS
Set Up Data That The Operator Can Check	Speed Limit	Km/MPH	0 - 99	
	Option Code	Digital Number	0 - 13	Communication Mode
Calibration Data	Year	Year	0 - 99	Date and time when calibrated.
	Month	Month	1 - 12	
	Day	Day	1 - 31	
	Hour	Hour	24 Hour Clock	
	Minute	Minute	0 - 59	

OPERATOR FUNCTIONS

Using the Operator Load Counter

Description

The Payload Meter makes available to the operator a Total Load Counter and Haul Cycle Counter. This allows each operator to track the tons hauled during their shift. The total is displayed in hundreds of tons. For example, if 223 is displayed, this means that 22,300 tons have been hauled since the last time the cycle counter was cleared.

This memory location is separate from the main payload data storage. This memory is not cleared when the Data All Clear Operation is performed. Clearing this memory does not affect the main payload data storage.

Viewing the Operator Load Counter

1. Press the TOTAL/SFT switch once.

If there is a fault code present at this time:

2. The error code for that problem will be displayed. This will be a flashing display.
3. Press the TOTAL/SFT switch again. If additional faults or warnings exist, that fault code will be displayed as a flashing code.
4. Repeat step #3 until no fault codes are displayed. ":" will show when no additional faults exist. The display will then show total tons hauled since the last time the counter was cleared. The total is displayed in hundreds of tons.
5. Press the TOTAL/SFT switch again. The number displayed is the number of haul cycles since the last time the cycle counter was cleared.
6. Press the TOTAL/SFT switch again. ":" is displayed for 2 seconds before the display returns to normal operations.

Clearing the Operator Load Counter

1. Press the TOTAL/SFT switch once. The number displayed is the total tons hauled since the last time the counter was cleared. The total is displayed in hundreds of tons.
2. Press and hold the CAL/CLR switch until the display flashes.
3. Press the CAL/CLR switch until "0000" is displayed. After 2 seconds the meter will return to normal operation.

Clearing this memory **does not** affect the main payload data storage.

Dimming the Lights on the Display

There are a total of 10 brightness levels on the PLM display.

From the normal operation display:

1. Press the LIGHT/INC switch. The lighting will become one level dimmer. This will continue until the lighting has reached its lowest level.
2. After reaching the lowest level, the display will return to the brightest setting.

If the switch is held in the depressed position, the brightness will change continuously.

INITIAL SETUP OF PAYLOAD METER

There are several things that must be checked and programmed when a Payload Meter is first installed.

1. Check the Switch Settings on the side of the meter.
2. Check the Operator Check Mode settings
3. Check the Service Check Mode settings
4. Calibrate the clean truck.

The next few pages show the steps required to perform these checks. Only after all of these steps have been performed can the payload meter be released for service.

Switch Settings

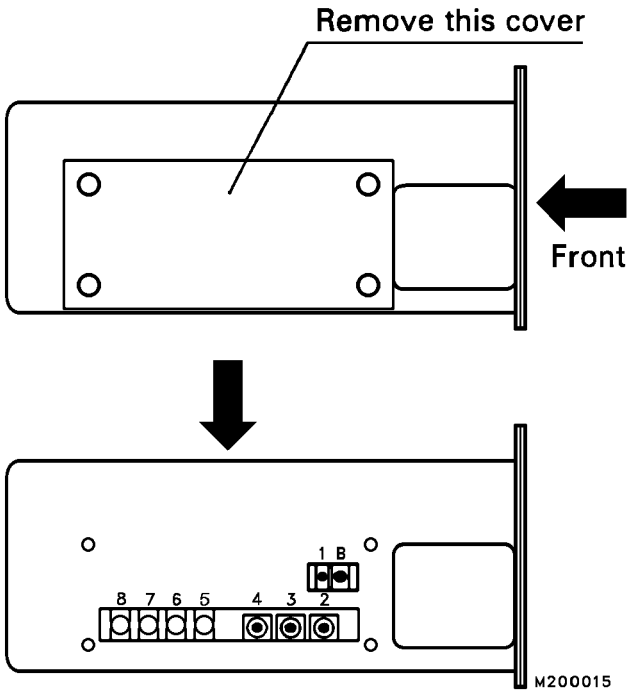


Figure 6-6.

There are nine switches located behind the panel on the left side of the payload meter. Figure 6-8 shows the switch numbers. The following switch positions should be confirmed before the meter is installed.

Switch	Position
1	G_t Gain - Do Not Adjust
B	Buzzer Volume - Do not Adjust
2	7
3	7
4*	4 - 685E
	5 - 630E
	B - 730E
	C - 930E
	D - 530M
	E - 330M
	F - 830E
5	DOWN
6	DOWN
7	DOWN - SHORT TONS
	UP - METRIC TONS
8	UP

* Set switch 4 for the appropriate model.

Checking the Operator Check Mode

The Operator Check Mode is used to check and change several settings. These should be checked before the payload meter is put into service.

1. Press and hold the MODE switch. The display will show. 

2. Press the MODE switch once. The display will show. 

Refer to "Data All Clear" on Page 17 to clear the haul cycle data.

3. Press the MODE switch once. The display will show. 

Refer to "Display of Fault Codes" on Page 19 for viewing fault codes.

4. Press the MODE switch once. The display will show. 

This is the truck ID number. Refer to "Setting The Machine ID" on Page 18 to change Machine ID.

5. Press the MODE switch once.The display will show. Refer to "Setting The Operator ID" on Page 18 to change operator.

6. Press the MODE switch once. The display will show."SP:62" should be displayed. The speed limit should be set to 62 to avoid unnecessary faults and warnings. Refer to "Setting The Speed Limit" on Page 17 to make adjustments.

7. Press the MODE switch once. The display will show. Refer to "Setting The Option Code" on Page 17 to change the option.

8. Press the MODE switch once. The current time should be displayed with the minutes flashing. Refer to "Setting The Time And Date" on Page 18 to change the time and date.

9. Push the MODE switch to return to normal operation.

Checking the Service Check Mode

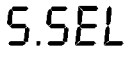
⚠ IMPORTANT ⚠

Refer to Pages 23 and 24 for additional information on UP Factor and PL Modeprior to setting these values.

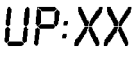
Setting "UP:00"

1. Press and hold the LIGHT/INC and MODE switches. The display will show.

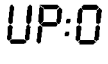
2. Press and hold the LIGHT/INC and TOTAL/SFT switches. The display will show.



3. Press the CAL/CLR switch once. The display will show.



4. Press the LIGHT/INC switch until "UP: 0" is displayed. **ONLY "UP: 0" IS RECOMMENDED.**



5. Press MODE. The display will show.

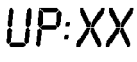
6. Press MODE and the meter will return to normal operation.

Setting "PL:00"

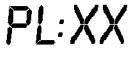
1. Press and hold the LIGHT/INC and MODE switches. The display will show.

2. Press and hold the LIGHT/INC and TOTAL/SFT switches. The display will show.

3. Press the CAL/CLR switch once. The display will show.



4. Press the CAL/CLR switch once. The display will show.



5. Press the LIGHT/INC switch until "PL:00" is displayed. **ONLY "PL:00" IS RECOMMENDED.**

6. Press the MODE switch. The display will show.

7. Press MODE and the meter will return to normal operation.

Checking the G_T setting

The G_t value must be set = 1.000. Refer to "Calculation Method" on Page 8 for display and adjustment information.

Checking the Inclinometer Settings

Refer to "Calculation Method" for instructions to display truck pitch angle. With truck on level ground, properly charged suspensions, and empty the display should indicate 0.0± 1.0. Remember this is not a live display. After adjustment, Service Check Mode must be entered again to obtain a new reading.

An alternative method is to use a Personal Computer running the Komatsu Payload Download Program for windows. The "Monitor Pressures" section of the program displays live inclinometer data. The inclinometer can be loosened and adjusted until the live display shows 0.0± 1.0 degrees with the truck on level ground, properly charged suspensions, and empty.

Another method is to use a voltmeter to read the voltage output of the inclinometer. With the truck on level ground, properly charged suspensions, and empty, the output voltage should be 2.6± .1 volts.

Calibrating a Truck

The payload meter should be calibrated whenever one of the following occurs:

1. When a new payload meter is installed.
2. When a suspension sensor has been changed.
3. Whenever the suspensions have been serviced or the Nitrogen levels have changed.
4. Once a month thereafter.

To calibrate the payload meter:

1. With the engine running and the truck stopped, press and hold the CAL/CLR switch until "CAL" is flashing on the display.
2. Drive the truck until the speed is approximately 6-10 MPH (10-15 Km/H)
3. Press the CAL/CLR switch once.
4. Drive until the display switches back to the time of day. This will take up to 30 seconds.
5. The payload meter is now calibrated and ready for normal operation.

⚠ IMPORTANT ⚠

Carry out this operation on flat level ground.

Travel in a straight line.

Maintain a steady speed, 6-10 MPH (10-15 Km/H)

DISPLAYS AT START-UP

POWER ON:

ALL external display lamps (Figure 6-2) will come on and stay on for approximately 27 seconds during the "Power-up Process".

The "Power-up Process" will display the PLM settings. Each display will occur for approximately 3 seconds:

1. The display will show: 88:88

   In addition, a buzzer will sound and the following lamps will light for 3 seconds:

   - Reception Pilot Lamp (2, Figure 6-1)
   - Transmission Pilot Lamp (3, Figure 6-1)
   - Memory Card Pilot Lamp (4, Figure 6-1)

2. The display will show: CO:XX

   The "xx" indicates the Truck Model. Refer to "Initial Setup of Payload Meter" for code definitions.

3. The display will show: Cd:- -
   This display indicates the status of the Memory Card where: Cd:oo

   "Cd : - -" indicates Card Not Used, and
   "Cd : oo" indicates Card Is Used.

4. The display will show: CL:- -
   This display indicates the status of the Inclinometer for the PLM, where CL:oo

   "CL : - -" indicates Inclinometer Not Used, and
   "CL : oo" indicates Inclinometer Is Used.

5. The display will show: US:- -
   This display indicates method of measurement where: US:oo

   "US : - -" indicates METRIC Tons.
   "US : oo" indicates U.S. Tons.

6. The display will show: SU:- -
   This function is not used. SU:oo

   "SU : - -" indicates Switch 8 is up.
   "SU : oo" indicates Switch 8 is down.

7. The display will show: d.XXX

   This display indicates the Machine ID code where "xxx" indicates a value between 0 and 200.

8. The display will show: o.XXX

   This display indicates the Operator ID code where "xxx" indicates a value between 0 and 200.

9. The display will show: SP:XX

   This display indicates the Speed Limit setting where "xx" indicates a value between 0 and 99 km/h.

10. The display will show: OP:XX

    This display indicates the Option code setting.

    Refer to "Operator Check Mode, Setting the Option Code" and to "Method of Operation" for more information on this function.

NORMAL OPERATION

If the truck engine is started before the preceding "Power-up Process" is completed, the display will shift to normal operation.

If the engine is running when the payload meter starts up, only "o:XXX" and "d:XXX" will display before switching to normal operations.

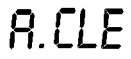
SETUP AND MAINTENANCE

Speed Limit

A warning can be displayed if the machine exceeds a preset speed.

The available range is: 10 - 99 km/h (6 - 62 mph). It is recommended to set the speed limit to 99 km/h (62 mph).

Setting The Speed Limit

1. Press and hold the MODE switch until "Cd:dP" is flashing. 
2. Press the MODE switch once. The display will show: 
3. Press the MODE switch once. The display will show: 
4. Press the MODE switch repeatedly until "SP.XX" is displayed. 
5. Press the LIGHT/INC switch to change the “unit digit” to the desired number.
6. Press the TOTAL/SFT switch and the display will then indicate: 
7. Press the LIGHT/INC switch to change the “tens digit” to the desired number.
8. Press the MODE switch to return to normal operation.

Setting the Option Code

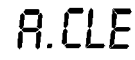
1. Press and hold the MODE switch until "Cd:dP" is displayed. 
2. Press the MODE switch once. The display will show: 
3. Press the MODE switch once. The display will show: 
4. Press the MODE switch repeatedly until "OP.XX" is displayed. 
5. Press the LIGHT/INC switch to change the “unit digit” to the desired number.
6. Press the TOTAL/SFT switch and the display will then indicate: 
7. Press the LIGHT/INC switch to change the “tens digit” to the desired number.
8. Press the MODE switch to return to normal operation.
9. The Option Code selects the PLM communication mode as follows:

Option Code	COMMUNICATION MODE
0	Stand Alone
10	PMC Mode (530M **only**)
12	Modular Mining Mode, Scoreboard and User Data Commmunication Mode

NOTES:

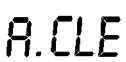
1. The Option Code is set to “0" for trucks not equipped with Modular Mining System (MMS) (Except 530M).
2. The 530M with Powertrain Management Control (PMC) system uses “10" as the setting for the Option Code.
3. For trucks with Modular Mining System (MMS) or Scoreboard, the Option Code is “12".

Setting The Machine I.D. Code

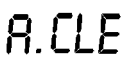
1. Press and hold the MODE switch until "Cd:dP" is displayed. 
2. Press the MODE switch once. The display will show: 
3. Press the MODE switch once. The display will show: 
4. Press the MODE switch once. "d.XXX" is displayed. 
5. Press the LIGHT/INC switch to change the last digit to the desired number.
6. Press the TOTAL/SFT switch and the display will show: 
7. Press the LIGHT/INC switch to change the middle digit to the desired number.
8. Press the TOTAL/SFT switch and the display will show: 

9. Press the LIGHT/INC switch to change the first digit to the desired number.
10. Press the MODE switch to return to normal operation.

Setting The Operator I.D. Code

1. Press and hold the MODE switch until "Cd:dP" is displayed. 
2. Press the MODE switch once. The display will show: 
3. Press the MODE switch once. The display will show: 
4. Press the MODE switch repeatedly until "o.XXX" is displayed. 
5. Press the LIGHT/INC switch to change the last digit to the desired number.
6. Press the TOTAL/SFT switch and the display will then indicate: 
7. Press the LIGHT/INC switch to change the middle digit to the desired number.
8. Press the TOTAL/SFT switch and the display will show: 
9. Press the LIGHT/INC switch to change the first digit to the desired number.
10. Press the MODE switch to return to normal operation.

Setting The Time and Date

1. Press and hold the MODE switch until "Cd:dP" is displayed. 
2. Press the MODE switch once. The display will show: 
3. Press the MODE switch once. The display will show: 
4. Press the MODE switch repeatedly until "XX:XX" is displayed. 
5. Press the LIGHT/INC switch to change the minutes.
6. Press the TOTAL/SFT switch and the display will then indicate: 
7. Press the LIGHT/INC switch to change the hours. The clock is a 24 hour clock.
8. Press the TOTAL/SFT switch and the display will then indicate: 
9. Press the LIGHT/INC switch to change the day.
10. Press the TOTAL/SFT switch and the display will then indicate: 
11. Press the LIGHT/INC switch to change the month.
12. Press the TOTAL/SFT switch and the display will then indicate: 
13. Press the LIGHT/INC switch to change the year.
14. Press the MODE switch to return to normal operation.

DOWNLOAD OF INFORMATION

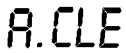
Payload information and fault codes recorded should be downloaded to a personal computer on a regular basis. The software required is available under part number AK4094. Detailed instructions for installing the software and downloading the data is provided with AK4094 PLM II download software.

Data All Clear

This function will erase all of the cycle data, engine ON/OFF data, and fault/warning data. Total payload and the overall number of cycles will not be cleared.

IMPORTANT - Before clearing the data, download the data to a personal computer.

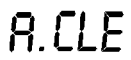
To begin, the shift lever should be in the "N" position, the brake lock set, the hoist control lever should be in the "FLOAT" position and the body in the down position.

1. Press and hold the MODE switch until "Cd:dP" is displayed. 
2. Press the MODE switch once. The display will show: 
3. Press and hold the CAL/CLR switch until "A.CLE" is flashing. 
4. Press the CAL/CLR switch again and the memory will be cleared. The meter will then return to normal operation.

This does not clear the Operator Load Counter.

DISPLAY OF FAULT CODES

1. Press and hold the MODE switch until "Cd:dP" is displayed. 

2. Press the MODE switch once. The display will show: 

3. Press the MODE switch once. The display will show: 

4. Press the TOTAL/SFT switch.

   If there are no faults or warnings, the display will show for 6 seconds. 

   If there are current faults or warnings, the codes will be displayed in order of their priority, the highest priority first. Each code will flash for **6 seconds.**

5. After the current codes have been displayed, past history codes that have been reset will be displayed. Each code will flash for **3 seconds.**

   If there are no history codes or after all history codes have been shown , the display will show for 3 seconds: 

   The system will then proceed to the following displays: Refer to Page 22 for details.

- Condition of the shift selector on mechanical trucks or brake lock on electric trucks.

  The panel will display: "C1:XX" for 3 seconds, then indicate:

  Mechanical trucks

  "C1:oo" Shift selector is in "N".

  "C1:-- --" Shift selector is not in "N'.

  Electric trucks

  "C1:oo" Brake lock is on.

  "C1:-- --" Brake lock is off.

- Condition of the Body Up Switch signal.

  The panel will display: "C2:XX" for 3 seconds, then indicate:

  "C2:oo" Body up switch is in up position.

  "C2:-- --" Body up switch is in down position.

- Condition of the Engine Oil Pressure signal.

  The panel will display ":C3:XX" for 3 seconds, then indicate:

  "C3:oo" Engine is running.

  "C3:-- --" Engine is not running.

- Condition of Alternator 'R' terminal signal.

  The panel will display "C4:XX" for 3 seconds, then indicate:

  "C4:oo" Engine is running.

  "C4:-- --" Engine is not running.

- Condition of the Spare Analog Input 1 signal.

  The panel will display "C5:XX" for 3 seconds with XX: as an input signal (V).

- Condition of the Spare Analog Input 2 signal.

  The panel will display "C6:XX" for 3 seconds with XX: as an input signal (V).

- Condition of the Spare Digital Input 1 signal.

  The panel will display "C7:XX" for 3 seconds, then:

  "C7:oo" High.

  "C7:-- --" Low.

- Condition of the Spare Digital Input 2 signal.

  The panel will display "C8:XX" for 3 seconds, then:

  "C8:oo" High.

  "C8:-- --" Low.

4. Press the TOTAL/SFT switch to view faults again or press the MODE switch to return to normal operation.

FAULT CODES				
FAULT	**CAUSE**	**CORRECTIVE ACTION**	**DECK LIGHTS**	**PRIORITY**
b-FL Steady	Brake Lock On and Body is UP and not dumping.		Flash	1
b-FL Flashing	Brake Lock Off and Body is UP.			1
Cd Flashing	Remove memory card during download.			2
F-09	Internal battery voltage below 2.7 volts.	Open controller check internal battery and connections. Check voltage using Service Check Mode.		3
L.FUL Flashing	Less than 300 haul cycle data sets memory capacity remain.	Down load data to PC and clear memory. See Operator Check Mode; Clearing the haul cycle data memory.		4
L.FUL Steady	2900 Haul cycles have been stored and the oldest data is being overwritten.			4
E.FUL Flashing	Less than 10 engine start data sets memory capacity remain.			4
E.FUL Steady	115 engine start data sets have been stored and the oldest date is being overwritten.			4
F.FUL Flashing	Less than 10 fault data sets memory capacity remain.			4
F.FUL Steady	230 fault data sets have been stored and the oldest date is being overwritten.			4
H.FUL Flashing	Haul cycle counter or payload totalizer are near capacity.	Press TOTAL/SFT to display totals, then press CAL/CLR for at least 2 seconds, then press CAL/CLR again for at least 2 seconds.		4
H.FUL Steady	Haul cycle counter exceeded 9999 or payload totalizer exceeded 999900.			4
F-18	Battery alternator R terminal is shorted or disconnected. The input to the PLM in less than 2V.	Trouble shoot wiring. Pin CN1-9, circuit # 21D.		5
F-20 Flashing	Sensor power is less than 15V or over 20V (18V normal).	Trouble shoot wiring, possible short.	Flash	6
F-21 Flashing	Left front pressure signal is less than 1V (1-5V normal).	Trouble shoot wiring, likely an open circuit.	Flash	7
F-22 Flashing	Right front pressure signal is less than 1V (1-5V normal).		Flash	8
F-23 Flashing	Left rear pressure signal is less than 1V (1-5V normal).		Flash	9
F-24 Flashing	Right rear pressure signal is less than 1V (1-5V normal).		Flash	10

M200051

FAULT CODES

FAULT	CAUSE	CORRECTIVE ACTION	DECK LIGHTS	PRIORITY
F-25 Flashing	Left front pressure signal is greater than 5V (1 - 5 V normal).	Trouble shoot wiring, likely sensor wires are shorted together.	Flash	11
F-26 Flashing	Right front pressure signal is greater than 5V (1 - 5 V normal).		Flash	12
F-27 Flashing	Left rear pressure signal is greater than 5V (1 - 5 V normal).		Flash	13
F-28 Flashing	Right rear pressure signal is greater than 5V (1 - 5 V normal).		Flash	14
F-31 Flashing	Inclinometer input less than 1.57V (more than + 10 degrees, nose up).	Trouble shoot wiring, likely an open circuit (Inclinometer output is 2.6V when horizontal, calibration: -103mV/degree)	Flash	15
F-32 Flashing	Inclinometer input greater than 3.63V (more than - 10 degrees, nose down).	Trouble shoot wiring, likely sensor wires are shorted together.	Flash	16
F.CAL	No calibration has been performed or cal data has been cleared.	Perform calibration.	Flash	17
F-41 Flashing	Light relay #1 driver short circuit.	Trouble shoot wiring, relay coil likely shorted.		18
F-42 Flashing	Light relay #2 driver short circuit.			19
F-43 Flashing	Light relay #3 driver short circuit.			20
F-44 Flashing	Light relay #4 driver short circuit.			21
F-45 Flashing	Light relay #5 driver short circuit.			22
L.bad Flashing	Payload measured while chassis is pitching.	Data ignored, error will clear for next load.		23
SP:SP Flashing	Speed limit setting is being exceeded.	Set the speed limit, using Operator Check Mode, to 62 mph or 99Km/h depending on the position of the unit selection switch (switch #7 behind the left side panel).		24
F-71 F-73 F-80 F-81 F-91 F-92 F-93 F-94 F-95 F-96 F-97 F-98 All Flashing	Communtications port error.	Check communication wiring (RS-232) to Modular Mining Hub or to Scoreboard. Check OP setting.		25

M200052

Monitoring Input Signals

This procedure can be used to monitor the current input signals to the payload meter.

1. Press and hold the LIGHT/INC and MODE switches until "CHEC" is flashing.
2. Press and hold the CAL/CLR and TOTAL/SFT switches until "S.CHE" is flashing.
3. Press the CAL/CLR switch to cycle through the following information :

C1	Mechanical Trucks	C1:oo - Shift Selector in "N" C1:-- - Shift Selector not in "N"
C1	Electric Trucks	C1:oo - Brake Lock On C1:-- - Brake Lock Off
C2	Body Up	C2:oo - Body Down C2:-- - Body Up
C3	Engine Oil Pressure	C3:oo - Engine Run C3:-- - Engine Stopped
C4	Alternator R Terminal	C4:oo -Alternator Charging C4:-- - Alternator Stopped
C5	Analog 1 - Not Used	
C6	Analog 2 - Not Used	
C7	Digital 1 - Not Used	
C8	Digital 2 - Not Used	
C9	Speed	Vehicle Speed
C10	Travel Distance - under the current loaded or empty state	xx.xx Miles
C11	Current Status Note: Sample values are shown.	03:01 - Empty Stopped 01:02 - Empty Traveling 06:03 - Loading 02:04 - Loaded Traveling 04:05 - Loaded Stopped 05:06 - Dumping
C12(a)*	Time Empty Travel	S1:xx - Minutes*10
C12(b)	Time Empty Stopped	S2:xx - Minutes*10
C12(c)	Time Loaded Travel	S3:xx - Minutes*10
C12(d)	Time Loaded Stop	S4:xx - Minutes*10
C12(e)	Time Dumping	S5:xx - Minutes*10
C12(f)	Time Loading	S6:xx - Minutes*10

* After 9.9 minutes, "S1:--" will be displayed.

4. Press the MODE switch once and "CHEC" will flash.
5. Press the MODE switch once and the meter will return to normal operation.

Service Check Mode

1. Press and hold the LIGHT/INC and MODE switches until "CHEC" is flashing.
2. Press and hold the LIGHT/INC switch until "ALL0" is flashing. "A.FUL" may also be displayed.
3. Press the LIGHT/INC switch to cycle through the following data. The sequence repeats.

Item and Description	Units
1. Current Time	Hours:Minutes
2. Pressure Front Left	Psi
3. Pressure Front Right	Psi
4. Pressure Rear Left	Psi
5. Pressure Rear Right	Psi
6. Front Weight	Tons
7. Rear Weight	Tons
8. Degree of Incline	±° Nose Up Positive
9. Incline Factor - Front Axle	
10. Incline Factor - Rear Axle	
11. Link Factor - Front Axle	
12. Link Factor - Rear Axle	
13. Calibration Weight	Tons
14. Gt - Trimmer Gain	
15. Current Load	Tons
16. Backup Battery Voltage	Volts

4. Press MODE once and "CHEC" will flash on the display.
5. Press MODE once and the meter will return to normal operation.

UP Factor - Payload Calculation Gain

Description of UP Factor

The payload calculation gain, or UP factor is multiplied to the actual calculated load. From the example shown in Figure XX, the calculated load is 143.8 tons. If the UP factor is set to +5% the displayed load will be 143.8 x 1.05 = 151 tons. This factor can be used to minimize the effects of systematic error for a particular truck. The UP factor is not applied uniformly to all load calculations. There are three operating modes for the payload meter and the UP factor is applied differently to each mode. Therefore, it is recommended that this percentage be set to 0. There are significant differences in final calculated load that can be introduced by adjusting this gain.

Payload meters sent from the factory are typically set to "UP: 5" indicating a +5% gain in final load.

This should be checked on all new meters and changed to "UP: 0".

PL Mode - Load Calculation Timing

Load Calculation Timing

The PL mode controls when the payload meter takes a sample of the data and calculates the load. There are three modes available. There are two sets of data that are affected by the PL mode setting.

- Modular Mining Transmission
- Memory Storage

⚠ IMPORTANT ⚠

The PL mode setting can have a significant impact on the perceived accuracy of the payload meter.

PL:00 is the only recommended setting.

Use of settings other than PL:00 is NOT recommended.

Careful consideration must be given to the use of PL:01 and PL:10. These modes divide the data transmitted by Modular Mining and the data stored in the payload meter's memory. Additionally, each mode handles the UP factor differently and can calculate different loads for the same haul cycle. For these reasons **it is recommended that the payload meter be set to use PL:00 in all cases.**

PL:00

Modular Mining Transmission - The data is captured at the last transition from 0 to 1 MPH prior to traveling 160 meters from the shovel. The captured data is transmitted when the truck travels 160m from the shovel. This load calculation **will use** the UP factor percentage.

Memory Storage - Same as above, the data is captured at the last transition from 0 to 1 MPH prior to traveling 160 meters from the shovel. The captured data is stored into memory when the body rises at the dump. This load calculation **will use** the UP factor percentage.

PL:01

Modular Mining Transmission - The data is captured at the last transition from 0 to 1 MPH prior to traveling 160 meters from the shovel. The captured data is transmitted when the truck travels 160m from the shovel. This load calculation **will use** the UP factor percentage.

Memory Storage - The data is captured and stored when the body rises from the frame. This calculation **will not use** the UP factor percentage.

PL:10

Modular Mining Transmission - The data is captured and transmitted when the truck travels 160 meters from the shovel. This calculation **will not use** the UP factor percentage.

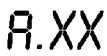
Memory Storage - The data is captured and stored when the body rises from the frame. This calculation **will not use** the UP factor percentage.

FINAL GEAR RATIO SELECTION

For an 830E truck, the proper gear ratio has to be selected.

1. Press and hold the MODE and LIGHT/INC switches until “CHEC” is displayed. 

2. Press and hold the TOTAL/SFT and LIGHT/INC switches until “S.SEL” is displayed. 

3. Press the CAL/CLR switch repeatedly until “A.XX” is displayed, where “XX” is one of the following: 

“XX”	Gear Ratio	Remarks
00	31.875	Original
01	36.400	High Traction
02	28.125	Standard
03	26.625	High Speed
NOTE: The Payload Meter is originally set to “00”.		

4. Press the TOTAL/SFT switch and "XX" will flash.
5. Press theLIGHT/INC switch to select the desired gear ratio.
6. Press the MODE switch and "CHEC" will be displayed. 

7. Press the MODE switch and the meter will return to normal operation.

BATTERY REPLACEMENT PROCEDURE ERROR CODE, F-09, DISPLAYED

Replacing the Battery

The payload meter has an internal battery used to protect the memory from being erased when the key switch is turned to the OFF position. Battery life is approximately 2 years. The capacity of the battery is monitored by the payload meter. When the voltage of the memory battery does drop, error code, F-09, will be displayed.

When the F-09 error code appears, download the data within 48 hours; otherwise, the data may be lost. The Haul Cycle data may not be recorded properly while F-09 is displayed.

At this time it will be necessary to replace the battery. This should be performed when the truck is in an unloaded condition. The data stored in the payload meter should be downloaded to a personal computer or carry out the memory card dump operation. If this is not done, when the battery is disconnected all data will be lost.

All that is required is a phillips-head screwdriver and a new battery (P/N 581-86-55710)

1. Keyswitch in the ON position, download the data stored in the payload memory, or carry out the memory card dump operation.
2. Turn the keyswitch to the OFF position.
3. Remove the four mounting screws holding the payload meter in position and then pull the payload meter out, away from the instrument panel (Figure 6-7).

NOTICE *- Be careful not to let dirt, metal or spare parts to drop inside the controller at any time*.

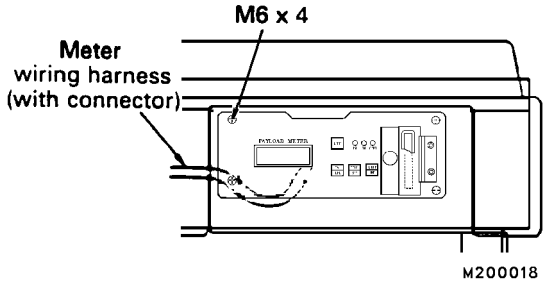


FIGURE 6-7. REMOVING PAYLOAD METER

4. Remove the electrical connector. Remove the screws on the top surface and the rear face. Remove the cover (Figure 6-8). This will expose the battery, its wires, and the connector.

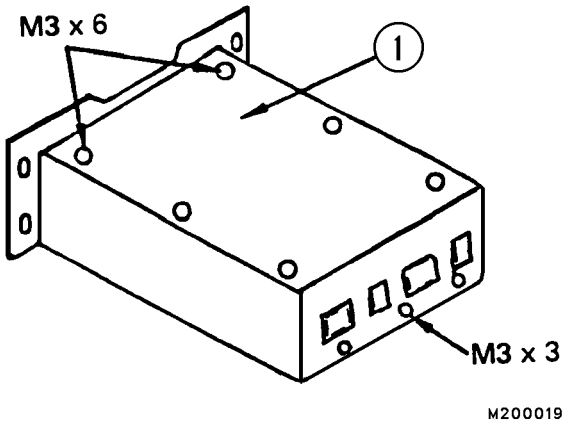


FIGURE 6-8. ACCESS TO BATTERY

5. Grasp the wires coming from the battery and pull out. By pulling perpendicular from the board, it will disconnect the connector from the board and pull the battery out of its holder all at the same time (Figure 6-9).

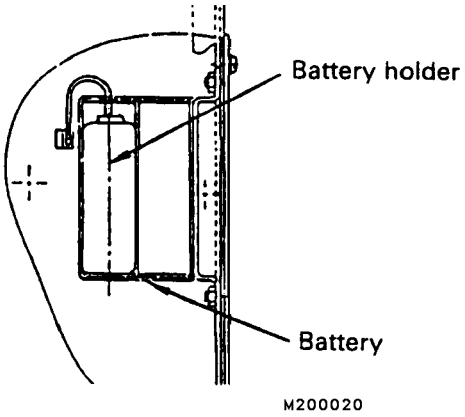


FIGURE 6-9. BATTERY INSTALLATION

6. Insert the connector of the new battery directly into the connector on the board (Figure 6-10). Place the battery in the battery holder, and pass the wiring through the notch. When doing this, insert the wiring into the bottom of the holder and pass it through the notch.
7. Install the controller cover, replace the electrical connector, and install the payload meter controller back into the instrument panel.

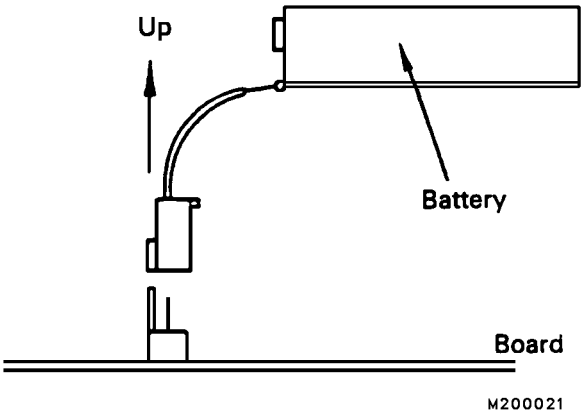


FIGURE 6-10. BATTERY CONNECTION

After Replacing the Battery

While replacing the battery, the backup power source for the memory inside the payload meter is momentarily disconnected.
This can allow unwanted data (garbage) to enter the memory and affect the meter's recognition procedures. The following will remove this unwanted data.

1. Turn the keyswitch to the ON position.

   F-CAL may flash.

2. Using the Operator Check Mode, set the speed limit option code, time and date. (These were erased from memory when the battery was disconnected).

3. Without turning the keyswitch to the OFF position advance to the start position. With the engine running, the display: F-CAL may flash.

4. Perform the Calibration procedure.
   Refer to Page 15.

5. Load the truck to the rated payload, or close to it. Dump the load.

6. Move the truck to a safe area, wait at least 5 seconds after dumping the load, then shut the truck down.

7. Turn the keyswitch back to the ON position but do not start the engine.

8. Perform the Data All Clear in the Operator Check mode.

9. Forcibly clear the data for the total payload and overall number of cycles.
   With this operation performed, all the unwanted data inside the payload meter is cleared. Except for the calibration data, all the data recorded in the previous steps is also erased.

10. After this procedure has been performed the system is ready for normal function.

SUSPENSION PRESSURE SENSOR

The pressure sensors are mounted on top of each suspension. The sensors produce a voltage signal from 1 – 5 volts output.

The pressure sensor is mounted to the suspension cylinder using a Schrader Valve assembly, adapter and sensor. The sensor can be replaced without releasing the pressure in the suspension by removing the sensor with the adapter.

Removal

⚠DANGER

Make certain the adapter and sensor are removed together from the valve assembly. Removing the complete valve assembly or just the sensor may result in the component being forced out of the suspension by the gas pressure inside.

1. Disconnect sensor from truck wiring harness.

   Note: The Schrader valve in the valve assembly will prevent gas from escaping ***when adapter and sensor are removed together****. If entire valve assembly is turned allowing nitrogen gas to escape, recharging of the suspension will be required*.

2. Hold valve (2, Figure 6-11) with wrench while removing the **adapter/sensor assembly (3 & 4)**.

3. Remove sensor (4) from adapter (3).

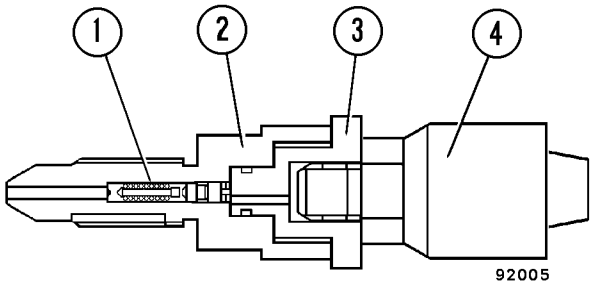


FIGURE 6-11. PRESSURE SENSOR.
1. Schrader Valve
2. Valve Assembly
3. Adapter
4. Sensor

Installation

1. Install new O-ring on sensor (4, Figure 6-11) and install sensor into adapter (3). Tighten sensor to **22–29 ft.lbs. (30–39 N.m) torque**.
2. Install new O-ring on adapter (3) and install complete **adapter/sensor assembly** into valve (2). Hold valve body and tighten **adapter/sensor** assembly to **103 ft.lbs. (176 N.m) torque**.
3. Connect sensor wiring to truck wiring harness. The sensors have three wires. Be sure that wires are connected correctly. (Figure 6-12)

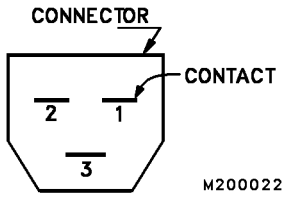


FIGURE 6-12. SENSOR SIDE CONNECTOR VIEW

Pin Number	Wire Color	Wire Function
1	Black	Ground (GND)
2	Red	+ Power
3	White	Signal

INCLINOMETER

As the truck is tilted fore or aft, the weight distribution between the front and rear axles changes. To compensate for this, the inclinometer measures the ground angle at which the truck rests. This data is then sent to the payload meter so it can calculate the correct payload weight. The inclinometer is located below the operator's center console (passenger seat structure).

Removal

1. Disconnect inclinometer wire lead from harness.
2. Remove the three capscrews, nuts and lockwashers (4, Figure 6-13) and inclinometer (3).

Installation

1. Install inclinometer (3, Figure 6-13) with capscrews, nuts and lockwashers (4).

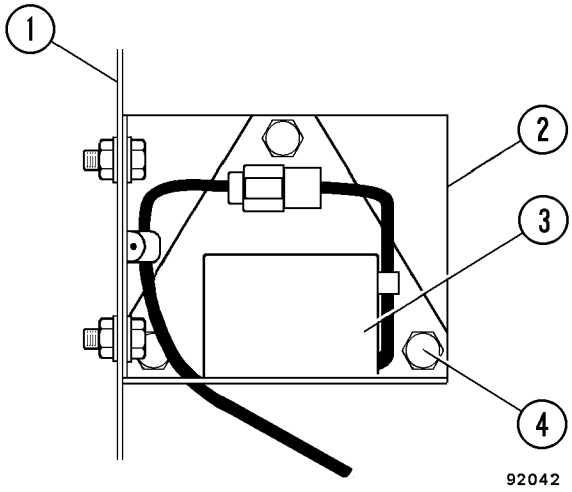


FIGURE 6-13. INCLINOMETER

1. Operator's Center Console Frame
2. Bracket
3. Inclinometer
4. Capscrew, Nut and Lockwasher

2. Connect inclinometer wiring to the truck wiring harness. (Figure 6-14)
   Be sure that wires are connected correctly.

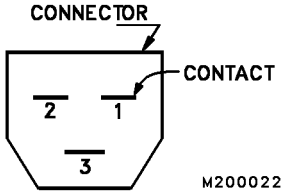


FIGURE 6-14. INCLINOMETER SIDE CONNECTOR VIEW

Pin Number	Wire Color	Wire Function
1	Black	Ground (GND)
2	White	Signal
3	Red	+ Power

Adjustment

1. Park the truck on a 0% grade.
2. Loosen the three Inclinometer mounting capscrews (4, Figure 6-13) and rotate the Inclinometer until a voltage range of 2.6 ±0.1 Volts can be measured (using aVolt/Ohm Meter) at pins 1 and 2 of the inclinometer electrical harness connector.
3. Tighten all capscrews (4, Figure 6-13) to standard torque, after adjustment.

SCOREBOARD

Description

The Scoreboard from Komatsu Mining Systems uses information from the Payload Meter to display the current load. It uses ultra-high-brightness LED technology to form 3 digits. The sign is fully sunlight readable and housed in a rugged steel enclosure.

The Scoreboard displays each swing pass as the truck is being loaded. As the truck drives away, the sign will display the last swing pass until the final load calculation is made. It will then switch to display the final load calculation and hold it until the truck dumps. The sign will then clear for the empty ride back to the shovel.

Making Connections

The Scoreboard connects to the RS232 port on the Payload Meter. It must share this connection with other dispatch systems like Modular Mining as well as the PC download connection. This sharing of the single port creates special circumstances when using a Personal Computer or dispatch system.

The Scoreboard is in constant communications with the Payload Meter and must acknowledge every message from the meter. In addition, the Scoreboard must also signal the Payload Meter that it is ready to receive messages by supplying a 5vdc signal over the CTS line. Installations that include Modular Mining or other dispatch systems must take over the responsibility for acknowledging messages from the Payload Meter. To do this, the return communications line and the CTS line from the Scoreboard must be cut and taped back. When this is done, the Scoreboard simply monitors communications between the Payload Meter and Modular Mining. The Modular Mining system acknowledges each message from the meter.

Sharing this RS232 port with the Personal Computer for downloading can also create problems with communications. The Payload Meter can confuse messages from the PersonalComputer and Scoreboard. To eliminate this problem, **the Scoreboard must be turned off during downloading of the Payload Meter.** Using the circuit breaker to turn off the main power to the Scoreboard is the best way to accomplish this. The power to the Scoreboard must be turned off before communications between a Personal Computer and the Payload Meter can start. Once the download process is finished, the power needs to be restored to the Scoreboard to keep from receiving F99 or F93 error codes.

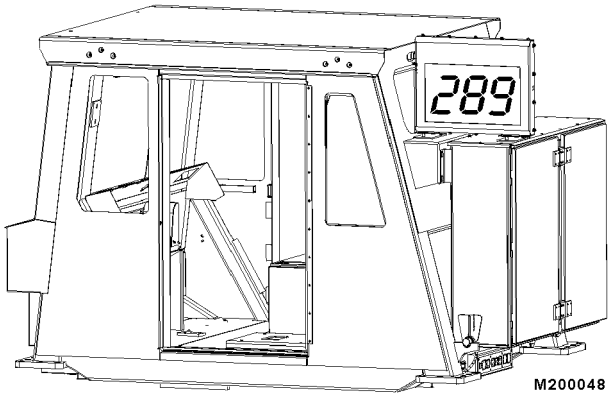


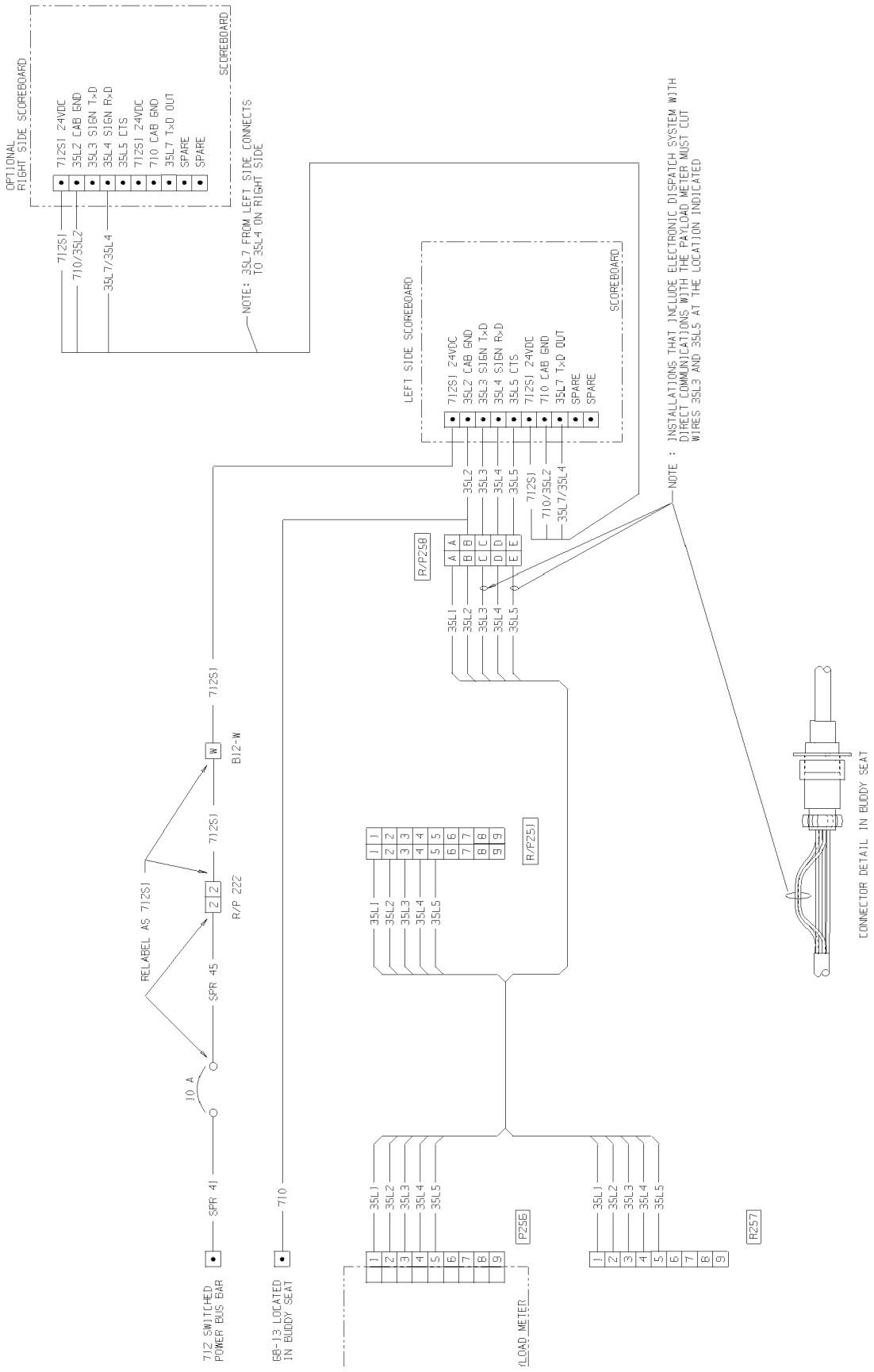
Figure 6-15. Scoreboard

The harness for the Scoreboard supplies two extra connections in the overhead compartment of the cab. One is for the existing PC port and the other is for Modular Mining.

When two Scoreboards are installed, the first sign transmits load information and power to the second sign. Note that the communications wire from the first sign connects to terminal 35L7. This is the retransmit terminal. This wire then connects to the 35L4 terminal in the second sign. This is the receive terminal of the second sign.

The Payload Meter must be set to use OP12. Refer to "Setting the Option Code" for instructions.

Once in this mode, the Payload Meter will look for the Scoreboard and attempt to communicate with it.
If there are communications problems, the Payload Meter may indicate a communications port error. Refer to "Fault Codes" for additional information.


OPTIONAL
RIGHT SIDE SCOREBOARD
712SI 24VDC
35L2 CAB GND
35L3 SIGN T×D
35L4 SIGN R×D
35L5 CTS
712SI 24VDC
710 CAB GND
35L7 T×D OUT
SPARE
SPARE
SCOREBOARD
712SI
710/35L2
35L7/35L4
NOTE: 35L7 FROM LEFT SIDE CONNECTS TO 35L4 ON RIGHT SIDE
LEFT SIDE SCOREBOARD
712SI 24VDC
35L2 CAB GND
35L3 SIGN T×D
35L4 SIGN R×D
35L5 CTS
712SI 24VDC
710 CAB GND
35L7 T×D OUT
SPARE
SPARE
SCOREBOARD
NOTE : INSTALLATIONS THAT INCLUDE ELECTRONIC DISPATCH SYSTEM WITH DIRECT COMMUNICATIONS WITH THE PAYLOAD METER MUST CUT WIRES 35L3 AND 35L5 AT THE LOCATION INDICATED
R/P258
35L1
35L2
35L3
35L4
35L5
712SI
710/35L2
35L7/35L4
712SI
B12-W
712SI
R/P 222
RELABEL AS 712SI
SPR 45
10 A
SPR 41
710
712 SWITCHED POWER BUS BAR
GB-13 LOCATED IN BUDDY SEAT
R/P251
P256
LOAD METER
R257
CONNECTOR DETAIL IN BUDDY SEAT

Normal Operation of the Scoreboard

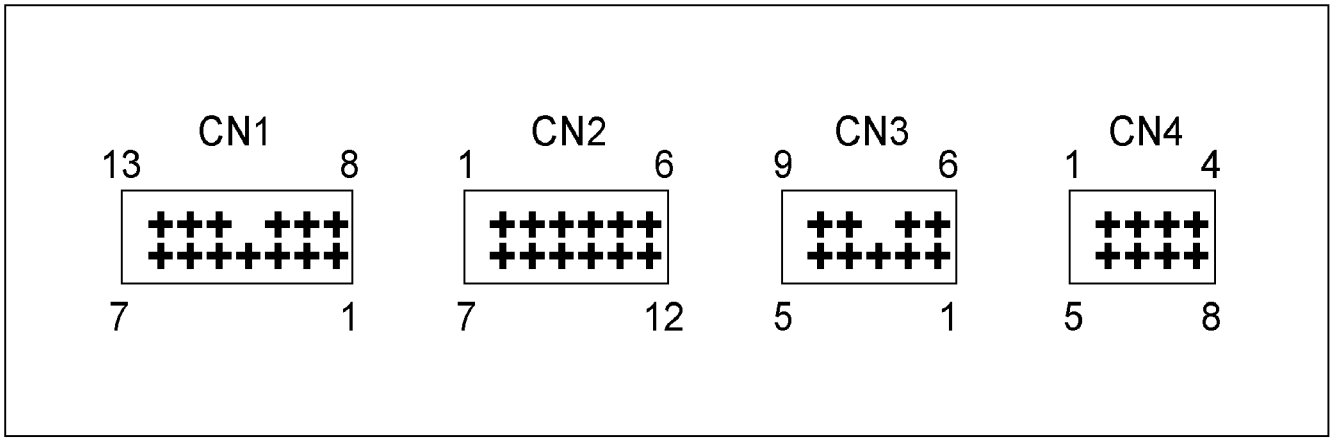
On power up, the Scoreboard will display "888" and then display the current software version, "10". The sign will then go blank until the Payload Meter begins sending load information. There is also a small light that blinks once per second in the center of the top portion of the last digit that is visible by close inspection. This light indicates that the sign is powered and operating normally.

During the typical loading cycle there is a short delay from when a bucket load of material is dumped into the body and when the Scoreboard indicates the weight. This delay is caused by the Payload Meter waiting for the oscillations in the suspensions to settle out before calculating a current load. The Scoreboard will display the current load calculated by the Payload Meter after each swingload.

If the truck operator releases the brake lock and begins to drive before the last swingload calculation is made, the Scoreboard will never display the last swingload.

The Scoreboard will display the last load calculation made during the loading process until the final load calculation is made approximately 160 meters from the shovel. At this point the final load will be displayed. This number will remain until the truck dumps the load. There will typically be a difference between the last swingload and final load calculations.

PAYLOAD METER BACK PANEL



M200050

CONNECTIONS

CN1 - AMP MIC-MKII 13 Pins White Connector		
No.	**Description**	**Comments**
1	Power +24V (Battery)	
2	Lamp Relay 1	
3	Lamp Relay 2	
4	Lamp Relay 3	
5	Lamp Relay 4	
6	Lamp Relay 5	
7	Speed Sensor (Signal)	
8	Speed Sensor (GND)	
9	Alternator R Terminal (Charge Signal)	Running - 28VDC Off - 0VDC
10	Key Switch ACC Terminal (ACC Signal)	
11		
12		
13	GND (Power GND)	

CN3 - AMP MIC-MKII 9 Pins White (RS-232C Port)	
No.	**Description**
1	RTS
2	SG
3	RD
4	TX
5	CTS
6	DTR
7	DSR
8	

CN2 - AMP 040 12 Pins Black Connector		
No.	Description	**Comments**
1	Engine Oil Pressure Switch	Running Open Off - Closed
2	Sensor Power Out	+18V
3	Sensor GND	
4	Left FrontSuspension Pressure Sensor	1-5VDC Normal
5	Right Front Suspension PressureSensor	1-5VDC Normal
6	Left Rear Suspension Pressure Sensor	1-5VDC Normal
7	Right Rear Suspension Pressure Sensor	1-5VDC Normal
8	Inclinometer	
9	Body Rise Signal	Body Down - Open Body Up - Gnd
10	Break Lock Signal/Neutral Signal	Lock Off - Open Lock On - Gnd
11		
12		

CN4 - AMP 040 8 Pins Black (Optional Input, Reserved)	
No.	**Description**
1	Optional Input GND
2	Analog Input 1
3	Analog Input 2
4	Digital Input 1
5	Digital Input 2
6	
7	

PAYLOAD CIRCUIT NUMBERS

Circuit Designation	Circuit Description
39F, 39F1...39F5	+18 volt sensor power supply
39FA	Pressure signal Right Rear
39FB	Pressure signal Left Rear
39FC	Pressure signal Right Front
39FD	Pressure signal Left Front
39FE	Inclinometer signal
39FG	Sensor ground
39A	PLM lamp output - green
39B	PLM lamp output - amber
39C	PLM lamp output - red
39D	PLM lamp output - unused
39E	PLM lamp output - unused
39G	+24 volt PLM power
39AA	Load light - green
39BA	Load light - amber
39CA	Load light - red
73FSL	TCI 100% load signal - 930E only
73MSL	TCI 70% load signal - 930E only
714A	Speed signal
714AT	Speed signal
63L	Body up (gnd = up, open = down)
39H	Brake lock (gnd = release, open = lock)
35L1	PLM RS232 RTS (request to send)
35L2	PLM RS232 signal ground
35L3	PLM RS232 receive
35L4	PLM RS232 transmit
35L5	PLM RS232 CTS (clear to send)
35L6	
35L7/35L4	Scoreboard 1 to scoreboard 2
35L8	PLM chan 2 TxD
35L9	PLM chan 2 RxD
21C	Engine oil pressure (gnd = off, open = run)
21D	Alternator R-Terminal (open = off,+24V = run)

PAYLOAD METER II RE-INITIALIZATION PROCEDURE

This procedure is designed to reset the Payload Meter II to clear repeated F.CAL errors.

This procedure is necessary to fix a rare condition in the operation of the meter. Indication for this procedure is a repeated display of **F.CAL** on the meter despite repeated calibration. If possible, download the Payload Meter before performing this procedure. This procedure will erase all memory and user settings.

NOTE:
This procedure should be performed before any Payload Meter is returned for warranty or repair.

Before performing this procedure, be sure that the engine inputs into the payload meter can be manipulated to indicate engine running and engine stopped. Some payload meter installations have hard-wired these inputs. These inputs must be accessible and able to produce the following input conditions:

Condition	21C Engine Oil Pressure	21D Alternator "R" Terminal
Engine Running	Open	24VDC
Engine Stopped	Ground	Open

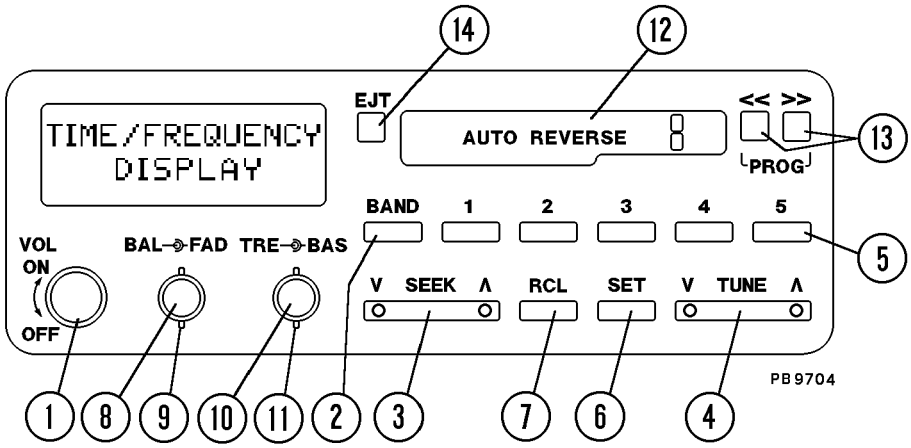
1. Turn off all systems.
2. Turn on the Payload Meter but leave the engine off.
3. Hold **MODE** and **LIGHT** until CHEC flashes.
4. Hold the **CAL**, **TOTAL** and **LIGHT** buttons until 00:00 is displayed.
5. Press **CAL** for 2 seconds. 00 00 will flash and the meter will erase its memory and reset to its factory settings. This includes and OP, UP, PL, P.SEL, and E.SEL settings.
   The meter will restart and display F.CAL.
6. Start the engine.
7. Set the time, date, OP, PL, and UP settings. All other user settings should updated at this time.
8. Calibrate the Payload Meter by holding the **CAL** button until CAL flashes.
9. Release the Brake Lock (Park Brake for 330M) and begin driving 5-8 MPH on level ground and press **CAL**.
   CAL should display until the meter finishes its calibration.
10. Load the truck to rated load and drive through one haul cycle.
11. After dumping the load, wait at least 15 seconds and drive the truck to a safe location.
12. Stop the truck and shut down the engine.
13. Turn on the Payload Meter but leave the engine off.
14. Hold **MODE** and **LIGHT** until CHEC flashes.
15. Hold **LIGHT** and **CAL** until A:CLE flashes.
16. Press **CAL** to clear the service memory.
17. When CHEC is displayed, press **MODE** to return to normal operation.
18. Clear the Haul Cycle Memory by holding **MODE** until Cd:dP is displayed.
19. Press **MODE** and A.CLE will be displayed.
20. Hold **CAL** until A.CLE flashed.
21. Press **CAL** once more to clear the haul cycle memory.
22. Clear the operator load counter by pressing the **TOTAL** button until ":" is displayed.
23. Hold the **CAL** button until the display flashes.
24. Hold the **CAL** button until 0000 is displayed to clear the memory.
25. The payload meter should now function normally.

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

CAB RADIO



To operate the Radio

1. Rotate the **ON-OFF** control (1) clockwise to turn the radio ON; rotate CCW (counter-clockwise) to turn radio OFF. Rotate **VOL** control clockwise to increase volume. Rotate **VOL** control CCW to decrease volume.

2. **AM/FM** or **WX** - Press **BAND** switch (2) to select desired band. (AM/FM or optional WX*, will be displayed depending on band choice.)

   NOTE: The last station heard on each band will be stored in memory. When switching back to that band, it will automatically return.
   * WX not available on all models.

3. **SEEK** - Press **SEEK** ∧ / ∨ (3) to automatically search for the next higher / lower listenable station and stay there. It will find another station each time that the button is pressed.

4. **Manual Tuning** - Press and hold **TUNE** ∧ button (4) to increase frequency.
   Release as the desired frequency is approached.
   Press **TUNE** ∨ to decrease frequency.

5. **Pushbuttons** - Press one of the five pushbuttons (5) to recall a preset station.

6. The following procedure will set-up pushbuttons:

   Locate a favorite station by using **SEEK** ∧ / ∨ or the **TUNE** ∧ / ∨ buttons.

   Press **SET** pushbutton (6). The station frequency will flash 5 seconds or until set.

   Press the button that is desired to be established for that station.
   The radio will now return to that frequency each time that button is pressed and released.

   NOTE: A total of fifteen stations can be preset - 5 AM, 5 FM, and 5 WX.

7. **Clock** - If time-of-day is not on the display, press **RCL** (7).

   Press and hold **SET** button and at the same time press and hold **TUNE** ∨ until the correct ***hour*** appears.

   Press and hold **SET** button and at the same time, press and hold **TUNE** ∧ until the correct ***minute*** appears. (Seconds will set to 00 when adjusting minutes.)

   Frequency - If radio is turned on and time is being displayed, press **RCL** to display frequency.

   Stereo - The radio will automatically switch to stereo when tuned to an FM station broadcasting stereo, and the stereo indicator light **ST** will be displayed.

8. **Balance** - The left-right stereo balance is adjusted by rotating the **BAL**ance (8) control in the corresponding direction from the detent position.

9. **Fade** - Using the tab behind the **BAL** control, adjust the **FAD**E control (9) to the right to **FAD**E toward the rear speakers. Adjust it to the left to **FAD**E toward the front speakers.

   *NOTE: **BAL**ance (8) and **FAD**E (9) controls have a detent position at the center for a balance of front to rear and left to right*.

10. & 11. **Tone**

    Rotate **TRE** control (10) towards left to decrease treble; rotate **TRE** control towards right to increase treble.

    Rotate **BAS** control (11) to the right to increase bass; rotate **BAS** control to the left to decrease bass.

NOTE: Both controls have a detent position at the center for a balance of treble and bass.

To Operate The Tape Player

12. Insert tape into door marked **AUTO REVERSE**. Raised portion of cassette cartridge should be to the right.

    NOTE: The arrow points in the direction of tape direction.

13. **Program** - Press both direction buttons (13) simultaneously. The direction arrow will change in the graphic display and the player will change tracks.

    Fast Forward - Viewing the arrow in the display, press button with arrow pointing in the same dirction to activate fast forward; press other button lightly to cancel and return to playing speed.

    Fast Reverse - Viewing the arrow in the display, press button with arrow pointing in the opposite direction to activate fast reverse; press other button lightly to cancel and return to speed.

14. **Eject** - Press **EJT** button (14) firmly to eject a tape.

    NOTE: When tape is ejected, the radio becomes operative. It is not necessary to eject a tape when leaving the vehicle; a solenoid removes internal pressure automatically.

NOAA - Weather Radio is a service of the "Voice of the National Weather Service." It provides continuous broadcasts of the latest weather information directly from National Weather Service offices. Taped weather messages are repeated every four to six minutes and are routinely revised every one to three hours, or more frequnetly if need be.
Most of the stations operate 24 hours daily.

Komatsu Mining Systems, Inc.
Peoria Operations, P.O. Box 240
Peoria, IL 61650-0240

Printed in U.S.A. 040398


KOMATSU