KOBELCO

SERVICE BULLETINS

NATIONAL ACCOUNTS

NAT.1100REV.01 01/00

KOBELCO

SERVICE BULLETINS NATIONAL ACCOUNTS

SERVICE BULLETINS INDEX (MARK IV ~)

BULLETIN #	DESCRIPTION	MODELS
HE-011	Hydraulic Oil	K903II/ K904II/ K905II/ K907II/ K909II/ K912II/ K914II/ K916II/ SK300II/ SK400II/ SK60III/ SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK60IV/ SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300IV/ SK400IV
HE-057	Hydraulic Hammers Guidelines	K903II/ K904II/ K905II/ K907II/ K909II/ K912II/ K914II/ K916II/ SK300II/ SK400II/ SK60III/ SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK60IV/ SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300IV/ SK400
HE-059-C	Hydraulic Test Kit	SK60III/ SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK60IV/ SK100IV/ SK120IV/ SK130IV/ SK115IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
HE-082	Oil Information	K903II/ K904II/ K905II/ K907II/ K909II/ K912II/ K914II/ K916II/ SK300II/ SK400II/ SK60III/ SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK60IV/ SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300IV/ SK400
HE-172-E	Belly Pan Protection Kits -	K904II/ K905II/ K907II/ K909II/ K912II/ K914II/ K916II/ SK300II/ SK400II/ SK60III/ SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III SK60IV/ SK100IV/ SK120IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300IV/ SK400IV
HE-177-A	Bucket and Arm Digging Force	K903II/ K904II/ K905II/ K907II/ K909II/ K912II/ K914II/ K916II/ SK300II/ SK400II/ SK60III/ SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK60IV/ SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300IV/ SK400
HE-188	Hydraulic Component Rebuild	K903II/ K904II/ K905II/ K907II/ K909II/ K912II/ K914II/ K916II/ SK300II/ SK400II/ SK60III/ SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK60IV/ SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300IV/ SK400

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HE-189-C	Adjustment Harness for Mechatronics System Controller	SK60III/ SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
HE-201	Hydraulic System Clean Up	K903II/ K904II/ K905II/ K907II/ K909II/ K912II/ K914II/ K916II/ SK300II/ SK400II/ SK60III/ SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK60IV/ SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300IV/ SK400
HE-217	Three Bond Sealant	K903II/ K904II/ K905II/ K907II/ K909II/ K912II/ K914II/ K916II/ SK300II/ SK400II/ SK60III/ SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK60IV/ SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300IV/ SK400
HE-219-A	Kobelco Machine Paint and piant part numbers	K904II/ K905II/ K907II/ K909II/ K912II/ K914II/ K916II/ SK300II/ SK400II/ SK60III/ SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK60IV/ SK100IV/ SK120IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300IV/ SK400IV
HE-224-B	Mechatronics Harness Checker Trouble Shooting Kit	SK60III/ SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
HE-227	Special Attachments (Hydraulic Hammers)	SK60III/ SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK60IV/ SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
HE-230	Engine and Hydraulic Oil Cooling System Maintenance	K903II/ K904II/ K905II/ K907II/ K909II/ K912II/ K914II/ K916II/ SK300II/ SK400II/ SK60III/ SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK60IV/ SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300IV/ SK400
HE-231	Poor Engine Performance: Spin-on Filters	SK60III/ SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK60IV/ SK100IV/ SK120IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300IV/ SK400IV
HE-237	Stepping Motor - Availability of Gear Repair Kit	SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK60IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV/ K916II/ SK400II/ SK400III
HE-241-A	SK400LC Mass Excavator Parts List - Mark III and Mark IV	SK400III/ SK400IV

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HE-245-B	Engine RPM Sensor Test Harness - Isuzu and MMC	SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
HE-256-A	Dimensions of Attachments, Linkage, and Cylinders	SK60IV/ SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
HE-257-A	Lifting of Machine with Cast Counterweight - Specific Mark III	SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK100IV/ SK120IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV/ K916II/ SK400II/ SK400III
HE-261-A	Test resistor for Variable Loading Mode and KPSS	SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
HE-263-B	Estimated Fuel Consumption-Gallons per Hour	SK60IV/ SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
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HE-266	Performance Specifications for Mark IV Machines -	SK60IV/ SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
HE-267	Cummins Engine Start-Up and Warranty	SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
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HE-277	Cluster Gauge Clock Resets to 12:00 O-Clock	SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
HE-278	Fuses for Mark IV Excavators	SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
HE-280	Loose Outer Swing Bearing Bolts	SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
HE-281	Bucket Cut Circuit/Long Arm Installation	K903II/ K904II/ K905II/ K907II/ K909II/ K912II/ K914II/ K916II/ SK300II/ SK400II/ SK60III/ SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK60IV/ SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300IV/ SK400
HE-282-A	Lift Capacity Labels - Mark IV	SK60IV/ SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
HE-284	Variable Loading Mode Option - Mark IV	SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
HE-285	Radio Kit Option - Mark IV	SK60IV/ SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
HE-286	Premature Piston Type Pump and Motor Failures	K903II/ K904II/ K905II/ K907II/ K909II/ K912II/ K914II/ K916II/ SK300II/ SK400II/ SK60III/ SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK60IV/ SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300IV/ SK400

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HE-291	Pilot Gear Pump Hose Interference	SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
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HE-293	Red Dot Air-Conditioning Option - Mark IV	SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
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HE-295	Fuse for Fuel Shutoff Solenoid	SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
HE-296	Metric O-Ring Kits & Refills	SK60III/ SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK60IV/ SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
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HE-298	Pilot Manifold Assy. Change	SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
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HE-304	New Cummins / Delco-Remy Warranty Policy for Starters and Altenators	SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
HE-305	Warranty for Cummins Supplied Components	SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
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HE-311	Mark IV Minor Change Performance Specifications	SK150IV

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HE-313	Mark IV Minor Change Performance Specifications	SK300IV
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HE-323	Erratic (or Loss of) Throttle Control	SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
HE-327	Oil leakage Assessment of Track Rollers	K903II/ K904II/ K905II/ K907II/ K909II/ K912II/ K914II/ K916II/ SK300II/ SK400II/ SK60III/ SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK60IV/ SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300IV/ SK400

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HE-328	Kobelco Auxiliary Valve Kits (Breaker, Nibbler and Breaker, Extra)	SK60III/ SK100III/ SK120III/ SK150III/ SK200III/ SK220III/ SK300III/ SK400III/ SK60IV/ SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
HE-329	Red Dot Heater Blower Wheel (Fan)	SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV
HE-330	Bucket Selection Charts	SK60IV/ SK100IV/ SK115IV/ SK120IV/ SK130IV/ SK150IV/ SK200IV/ SK220IV/ SK270IV/ SK300 IV/ SK400IV
HE-331	Cummins M11 Industrial Campaign 9826-C	SK400-IV
HE-332	Travel Motor/Gear Reduction Changes	SK300LC-IV
HE-333	Travel Motor/Gear Reduction Changes	SK200-IV/SK200LC-IV
HE-337 / HE	Emergency Shut Off System	SK100/ SK115DZ/ SK120/ SK130/ SK150/ SK200/ SK220/ SK270/ SK300/ SK400 (MARK IV EXCAVATORS WITH CUMMINS ENGINES)
HE-338	Installation of Cold Start Latching Relay	SK100/ SK115DZ/ SK120/ SK130/ SK150/ SK200/ SK220/ SK270/ SK300/ SK400 (MARK IV EXCAVATORS WITH CUMMINS ENGINES)

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HE-340	Installation of Throttle Lever Adapter (One Touch Auto Decel)	SK100/ SK120LC/ SK115DZ/ SK130LC (MARK IV EXCAVATORS WITH ONE TOUCH AUTO DECEL SYSTEM)
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KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

BULLETIN: HE00011
DATE: Sept. 13, 1984

APPLICABLE MODEL : ALL KOBELCO EXCAVATORS

SUBJECT : HYDRAULIC OIL

Service bulletin no. HE C D shows that the B.P.Brand hyd. oil can not be used for our KOBELCO EXCAVATORS.

The following is the reason why the said oil is unsuitable for the machines.

1. To prevent oil leaking problems from cylinders, urethane seals which are resistant to hygh-temperature and abrasion are used on cylinders and other hydraulic components.

2. A compound of sulphur and phosphorus used in some hydraulic oil, reducing the life of these urethane seals.

3. From our investigations, B.P.H.L.P hydraulic oil has this sulphur and phosphorus compound additive whereas all the other oils do not. For this reason we do not recommend this brand of hydraulic oil.

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

BULLETIN: HE-057

DATE: AUGUST 13, 1985

SUBJECT: HYDRAULIC HAMMERS

The following information is needed by KOBELCO AMERICA INC in order to determine if a Hydraulic Hammer from an outside manufacturer can be used on KOBELCO Excavators.

1. KOBELCO model number that Hammer is to be used on.

2. Model name of Hydraulic Hammer.

3. Total weight of Hammer (Including bracket & chisel): lb.

4. Necessary oil flow: gallon/min. max & min.

5. Operating pressure: psi

6. Blows per minute:

7. Accumulator :
   1. Necessary (high pressure psi)
      (low pressure psi)
   2. Not necessary

8. Return line :
   1. Return to Hydraulic tank directly
   2. Return to Hydraulic tank through control valve

9. Back pressure : Max allowance psi

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

KOBELCO *Designated*
ESSENTIAL SERVICE ITEM

DATE: March 1997

BULLETIN: HE-059C and WL-105B (replaces HE-059B and WL-105A)

SUBJECT: Hydraulic Test Kit

AFFECTED MACHINES: All Excavators and Wheel Loaders

This bulletin is to announce the availability of the *improved* comprehensive Kobelco **Hydraulic Test Kit (p/n HTK 1000-01).** This kit can be used to test and troubleshoot the hydraulic systems of all KOBELCO Excavators and Wheel Loaders. This kit replaces the previous kit (p/n KSP 000000K06), which is no longer available.

This comprehensive test kit comes packaged in an "improved" Kinetics Brand #718 (7½"x 18½" x 14½"), waterproof ABS carrying case, which is capable of being locked. (Lock not included, see attached page for case details.) It includes six (6) liquid-filled low pressure and high pressure gauges, six (6) lightweight / high pressure thermoplastic test hoses, and seventy (70) different fittings, adapters, couplings and plugs. The attached pages identify all the components included in this kit.

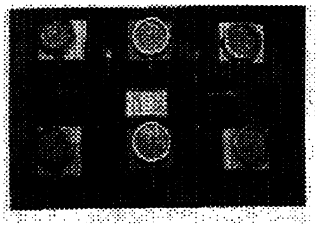
Please note: this kit contains both male and female plugs for PF 1/4" ~ PF 1", (30° flare connections), and tubing sizes 22mm ~ 35mm. These are high pressure type plugs, and can be used for "isolation type" testing, or for closing-off circuits when components are removed for repair or transport.

*The Kobelco America Product Support Section, has designated this Test Kit as an **Essential Service Item**, and recommends that one be stocked in your Service Department Tool Room, and be available to be carried on your field service trucks, when necessary.*

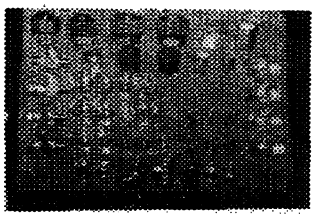
Please contact the **Kobelco America Parts Department** for price and availability. Please remember, if ordered on a parts stock order, your normal discounts will apply.

HYDRAULIC TEST KIT p/n HTK 1000-01

Complete kit in carrying case
(upper & lower levels w/hoses)



View of upper level of kit
(gauges & gauge connectors)

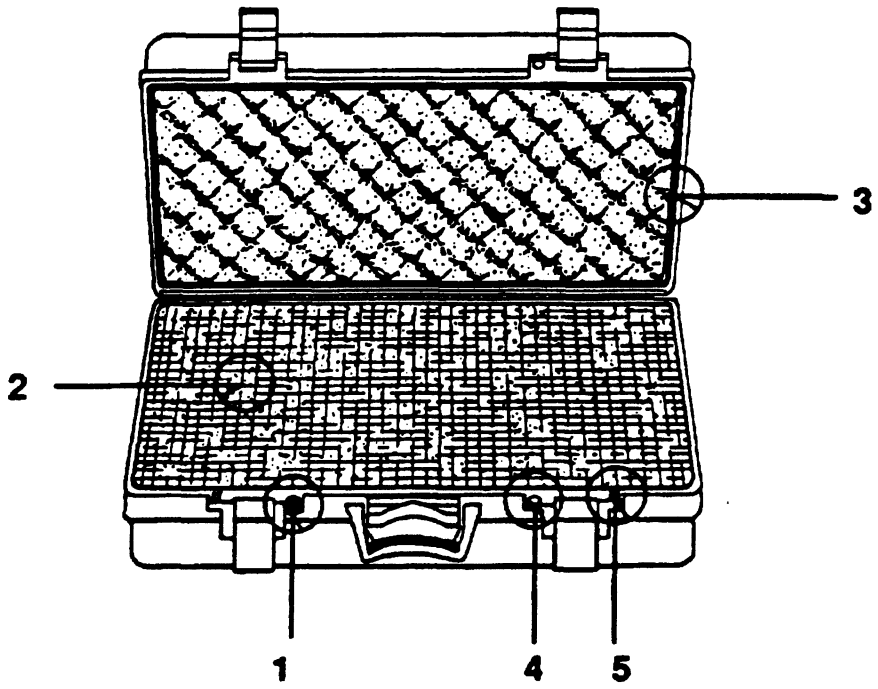


View of lower level of kit
(connectors, plugs & caps)

THIS BULLETIN IS BEING ISSUED FOR INFORMATION ONLY AND IS NOT AN AUTHORIZATION FOR ANY REPLACEMENT OR WARRANTY CLAIM SUBMITTAL.

QUICK TIPS

— ABOUT USING YOUR KINETICS DRY CASE



1. Pressure Release Valve: Important: - Be sure valve is **open** when encountering atmospheric changes; i.e., airplane travel, mountain climbing, submarine rides, etc. **Close** valve when river rafting, sailing or in otherwise wet conditions.
2. Available with adjustable dividers or no fuss die-cut foam insert (remove enough foam cubes to create a form fit for your equipment).
3. Continuous O-ring seal keeps everything dry and dust-free at all times.
4. For security: provision for a padlock.
5. For convenience: provision for adding a carrying strap.
6. For ease of opening: place palm of your hand on lid and press and release the sure-lock latches with free hand.

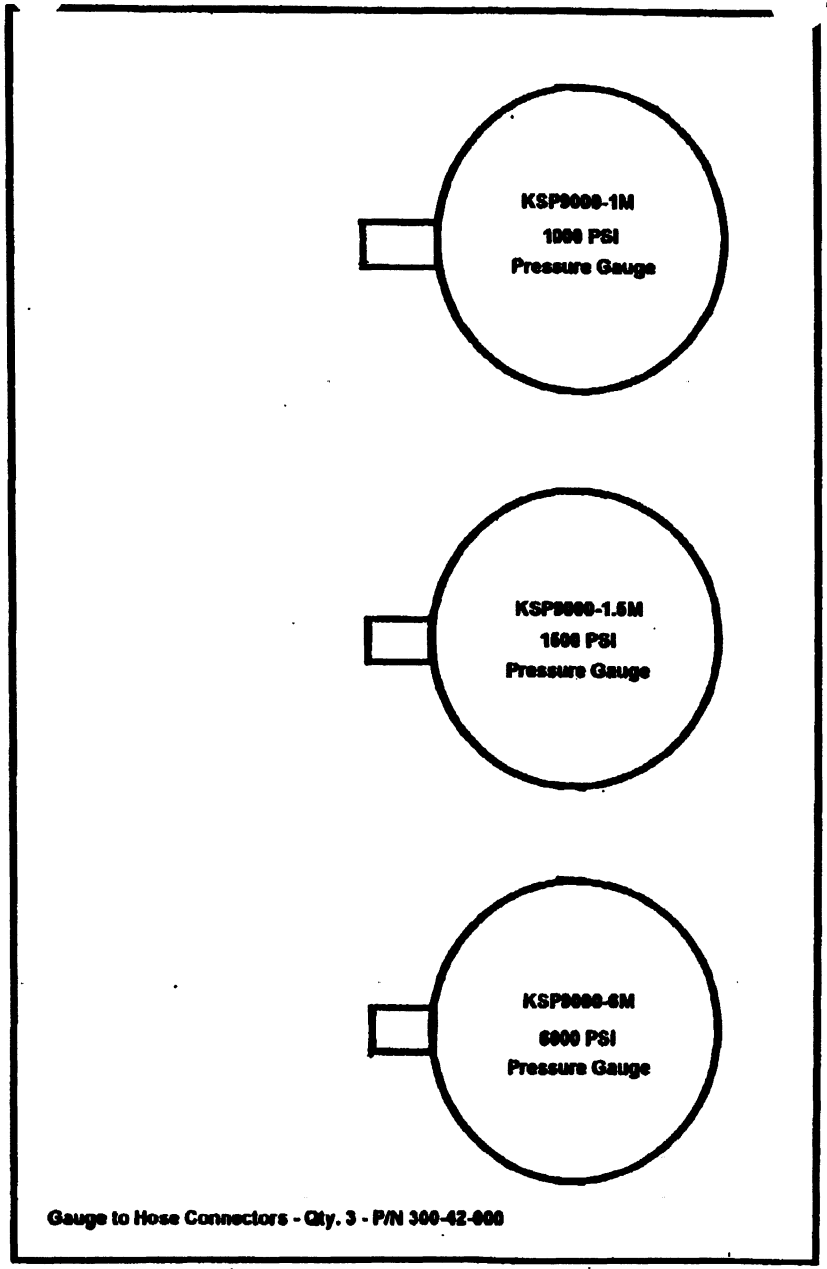
Warranty? You bet! The Kinetics Dry Case base has a lifetime warranty against any manufacturer's defects.

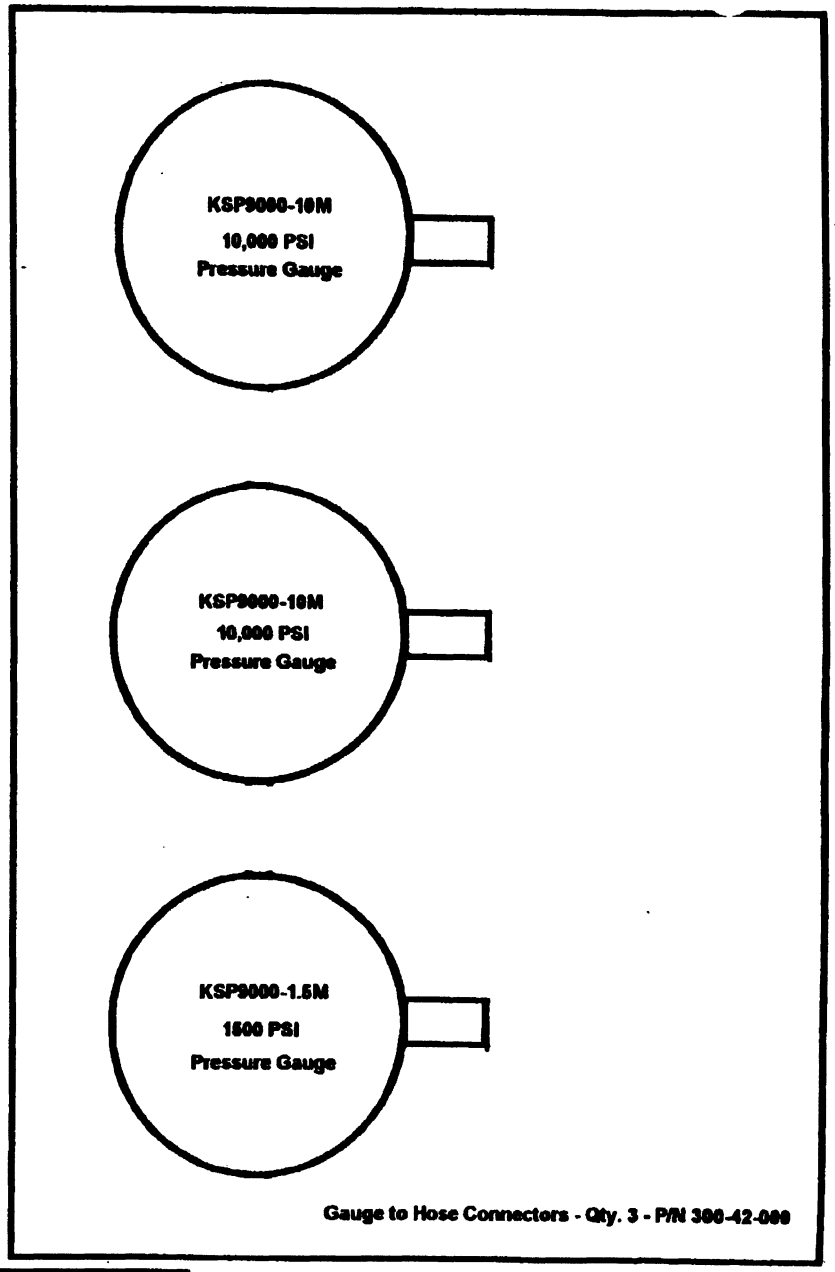
Underwater Kinetics

KOBELCO AMERICA INC.

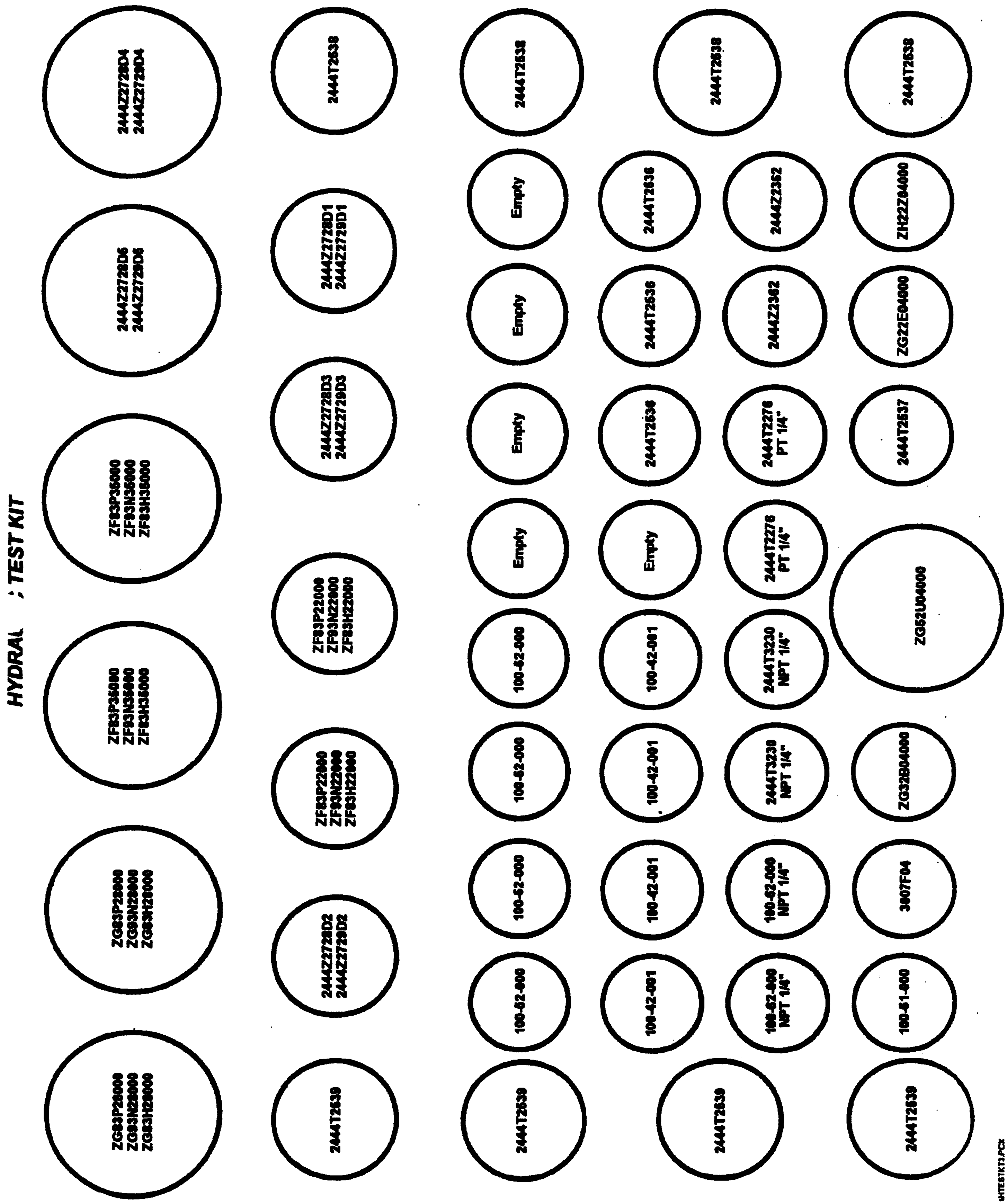
HYDRAULIC TEST KIT

ITEM	PART NUMBER	QUANTITY
Hydraulic Test Kit	HTK1000-01	
Pressure Gauge (1000 PSI)	KSP9000-1M	1
Pressure Gauge (1500 PSI)	KSP9000-1.5M	2
Pressure Gauge (6000 PSI)	KSP9000-6M	1
Pressure Gauge (10,000 PSI)	KSP9000-10M	2
H. P. Hose - 6 ft.	200-16-200	2
H. P. Hose - 12 ft.	200-16-400	4
Gauge to Hose Connector - located on gauges	300-42-000	6
Coupling PF 1/4"	100-42-001	4
Coupling PT 1/8"	100-51-000	1
Coupling PT 1/4"	100-52-000	4
Coupling NPT 1/4"	100-62-000	2
Elbow - PT 1/4" to PT 1/4"	ZG32B04000	1
Tee - PT 1/4"	ZG52U04000	1
Adapter - 30 deg. to PT 1/4" Male	ZH22Z04000	1
Adapter - 30 deg. to PT 1/4" Female	3007F04	1
Nipple - PT 1/4"	ZG22E04000	1
Adapter PT 1/4" - PF 1/4"	2444T2276	2
Adapter - PT 1/4" - PF 1/8"	2444T2536	3
Adapter - PT 1/4" - PF 1/4"	2444Z2362	2
Adapter - NPT 1/4" - PF 1/4"	2444T3230	2
Adapter Tee PT 1/4" - 1/4" - 1/4"	2444T2539	4
Adapter Tee PT 1/4" - 3/8" - 3/8"	2444T2538	4
Connector - PF 3/8" - PT 1/4"	2444T2537	1
O-Ring	ZD12P01100	8
Pilot Plug - Male - PF 1/4"	2444Z2728D1	1
Pilot Plug - Male - PF 3/8"	2444Z2728D2	1
Pilot Plug - Male - PF 1/2"	2444Z2728D3	1
Pilot Plug - Male - PF 3/4"	2444Z2728D4	1
Pilot Plug - Male - PF 1"	2444Z2728D5	1
Pilot Plug - Female - PF 1/4"	2444Z2729D1	1
Pilot Plug - Female - PF 3/8"	2444Z2729D2	1
Pilot Plug - Female - PF 1/2"	2444Z2729D3	1
Pilot Plug - Female - PF 3/4"	2444Z2729D4	1
Pilot Plug - Female - PF 1"	2444Z2729D5	1
Blank Off Plug - 22 MM	ZF83P22000	2
Blank Off Nut - 22 MM	ZF93N22000	2
Blank Off Plug - Female - 22 MM	ZF83H22000	2
Blank Off Plug - 28 MM	ZF83P28000	2
Blank Off Nut - 28 MM	ZF93N28000	2
Blank Off Plug - Female - 28 MM	ZF83H28000	2
Blank Off Plug - 35 MM	ZF83P35000	2
Blank Off Nut - 35 MM	ZF93N35000	2
Blank Off Plug - Female - 35 MM	ZF83H35000	2





Hydraulic Test - High Pressure Hoses		
Part Number	Length	Quantity
200-16-200	6 ft.	2
200-16-400	6 ft.	2


HYDRAL ; TEST KIT
2444Z2728D4
2444Z2729D4
2444Z2728D6
2444Z2729D6
ZF83P35000
ZF93N35000
ZF83H35000
ZF83P35000
ZF93N35000
ZF83H35000
ZG83P28000
ZG93N28000
ZG83H28000
ZG83P28000
ZG93N28000
ZG83H28000
2444T2638
2444Z2728D1
2444Z2729D1
2444Z2728D3
2444Z2729D3
ZF83P22000
ZF93N22000
ZF83H22000
ZF83P22000
ZF93N22000
ZF83H22000
2444Z2728D2
2444Z2729D2
2444T2639
2444T2638
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Empty
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Empty
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100-62-000
100-62-000
100-62-000
2444T2639
2444T2638
2444T2636
2444T2636
2444T2636
Empty
100-42-001
100-42-001
100-42-001
100-42-001
2444T2639
2444Z2362
2444Z2362
2444T2276
PT 1/4"
2444T2276
PT 1/4"
2444T3230
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2444T3230
NPT 1/4"
100-62-000
NPT 1/4"
100-62-000
NPT 1/4"
2444T2639
2444T2638
ZH22Z84000
ZG22E04000
2444T2637
ZG52U04000
ZG32B04000
3907F04
100-61-000
2444T2639
HTESTKT3.PCX

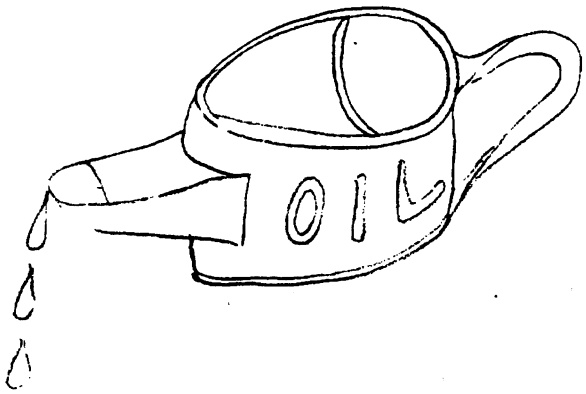
KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

March 25, 1986 1/12

BULLETIN NO. : HE-082
WL-057
APPLICABLE MODEL: All Kobelco Excavators and Wheel Loaders

SUBJECT : Oil Information



There are various kinds of oils used to lubricate. This informs you of the sample specifications of recommended oils to be used on the KOBELCO products.

Contents

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SERVICE BULLETIN

a. Usage of oils.

Lubricant	Recommended Lubricant (Initial Factory Fill)	Location	Check or Lubricating Interval (hr)	First Replacement Interval (hr)	Replac Inte (hr
Hydraulic Oil	KOBELCO Hydraulic Fluid Above −5°C: ISO VG 46 Anti-wear Type −5°~−20°C: ISO VG32 Anti-wear Type	Hydraulic Oil Tank	8		HSH 200 WL
Gear Oil	Extreme Pressure Gear Oil #90 API Classification "For Service GL-4"	Pump Power Divider Swing Reduction Unit Propel Reduction Unit	HSH 120	500	HSH 200 WL
		Control Lever Joints	120		
Grease	KOBELCO Extreme Pressure, Multipurpose Grease Cartridge 2421Z183 Pail Can 2421Z213 NLGI No. 2 Lithium base Grease EP Type	Attachment Pins	8		
		Swing Bearing	250		
		Track Tension	50		
	NLGI No. 1 Lithium base with MoS_2 Grease	Swing Gear	500		200
Engine Oil	API Classification "For Service CD" Above 40°C: SAE40 40°~−5°C: SAE30 10°~−30°C: SAE10W-30	Upper Rollers Lower Rollers Idlersss			200
		Engine Oil Pan	8	50	25
		Engine Starter	500		
Transmission Fluid	Automatic Transmission Fluid (ATF) Type C-3	Trans-mission	8	200	120C
Brake Fluid	SAE J1703	Brake System	8		100C

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SERVICE BULLETIN

b. Sample Specifications of Recommended Oils.

b-1 Engine Oil — API Service CD Class MIL-L-2104C

Grade	10W	20-20W	30	40
Viscosity cSt 40° (104°F)	38.1	53.6	96.8	14.6
cSt 100° (212°F)	6.1	7.5	11.0	14.4
Viscosity Index	105	101	98	96
Sulf. Ash m %	1.3	1.3	1.3	1.3
TBN	10	10	10	10

b-2 Gear Oil (EP) — API Service GL-4 MIL-L-2105C

Grade	90	140
Viscosity cSt 100°C (212°F)	9.5	17.6
Viscosity Index	104	100
Tinken OK load Kg	24	24

b-3 Hydraulic Oil

Grade	AW	32	46	68
Viscosity cSt 40°C (104°F)	30	31.8	44.8	67.0
cSt 100°C (212°F)	7.0	5.5	6.6	8.8
Flash point °C	190	210	216	222
(°F)	(374)	(410)	(421)	(432)
Pour point °C	-42	-33	-33	-30
(°F)	(-45)	(-27)	(-27)	(-22)

Additives:

Rust inhibitors
Oxidation inhibitors
Form inhibitors
Antiwear additives
VI Improvers (AZ)

- Continued -

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SERVICE BULLETIN

b-4 Grease NLGI-2

Grade	EP-2
Penetration, worked at 25°C (77°F)	273
Dropping point °C (°F)	195 (383)
Oil Viscosity cSt at 100°C (212°F)	16.1

Molybdenum Grease NLGI-2

Grade	EP-2
Penetration worked at 25°C (77°F)	276
Dropping point °C (°F)	195
Oil Viscosity cSt at 100°C (212°F)	15.7
Timken OK load, Kg	14
Molybdenum Disulfide, mass %	3

Lithium Base Grease NLGI-1

Grade	EP-2
Penetration worked at 25°C (77°F)	321
Dropping point °C (°F)	188
Oil viscosity cSt at 100°C (212°F)	15.7
Timken OK load, Kg	25
Molybdenum Disulfide, mass %	2.2

b- 5 Transmission Oil

1. ATF Type C-3

Viscosity, cSt at 40°C (104°F)	35.1
cSt at 100°C (212°F)	6.1
Viscosity Index	120
Pour Point °C (°F)	-30 (-22)

Other necessary properties
- Corrosion protection
- Resists forming
- Oxidation inhibited

b-6 Brake Fluid

Heavy duty brake fluid SAE 1703
U.S. Federal Motor Vehicle Standard No. 116, Grade DOT 3

Equilibrium Reflux Boiling Point, °C (°F) min	205 (401)
Viscosity, cSt at -40°C (-40°F) max	1500
cSt at 100°C (212°F) min	1.5

-CONTINUED-

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SERVICE BULLETIN

APPENDICES

c-1

API ENGINE SERVICE CLASSIFICATIONS

The API Engine Service Classification system currently includes ten classes of service: six for service stations (S series) and four for commercial applications (C series). It is an "open ended" system, which allows for the addition of new designations without changing or deleting existing ones.

"C" Commercial Classifications

CA for Light Duty Diesel Engine Service

Service typical of diesel engines operated in mild to moderate duty with high-quality fuels and occasionally has included gasoline engines in mild service. Oils designed for this service provide protection from bearing corrosion and from ring belt deposits in some naturally aspirated diesel engines when using fuels of such quality that they impose no unusual requirements for wear and deposit protection. They were widely used in the late 1940's and 1950's but should not be used in any engine unless specifically recommended by the equipment manufacturer.

CB for Moderate Duty Diesel Engine Service

Service typical of diesel engines operated in mild to moderate duty, but with lower-quality fuels which necessitate more protection from wear and deposits. Occasionally has included gasoline engines in mild service. Oils designed for this service provide necessary protection from bearing corrosion and from ring belt deposits in some naturally aspirated diesel engines with higher sulfur fuels. Oils designed for this service were introduced in 1949.

CC for Moderate Duty Diesel and Gasoline Engine Service

Service typical of certain naturally aspirated, turbocharged or supercharged diesel engines operated in moderate to severe-duty service and certain heavy-duty gasoline engines. Oils designed for this service provide protection from high-temperature deposits and bearing corrosion in these diesel engines and also from rust, corrosion and low-temperature deposits in gasoline engines. These oils were introduced in 1961.

CD for Severe Duty Diesel Engine Service

Service typical of certain naturally aspirated, turbocharged or supercharged diesel engines where highly effective control of wear and deposits is vital, or when using fuels of a wide quality range including high sulfur fuels. Oils designed for this service were introduced in 1955 and provide protection from bearing corrosion and from high-temperature deposits in these diesel engines.

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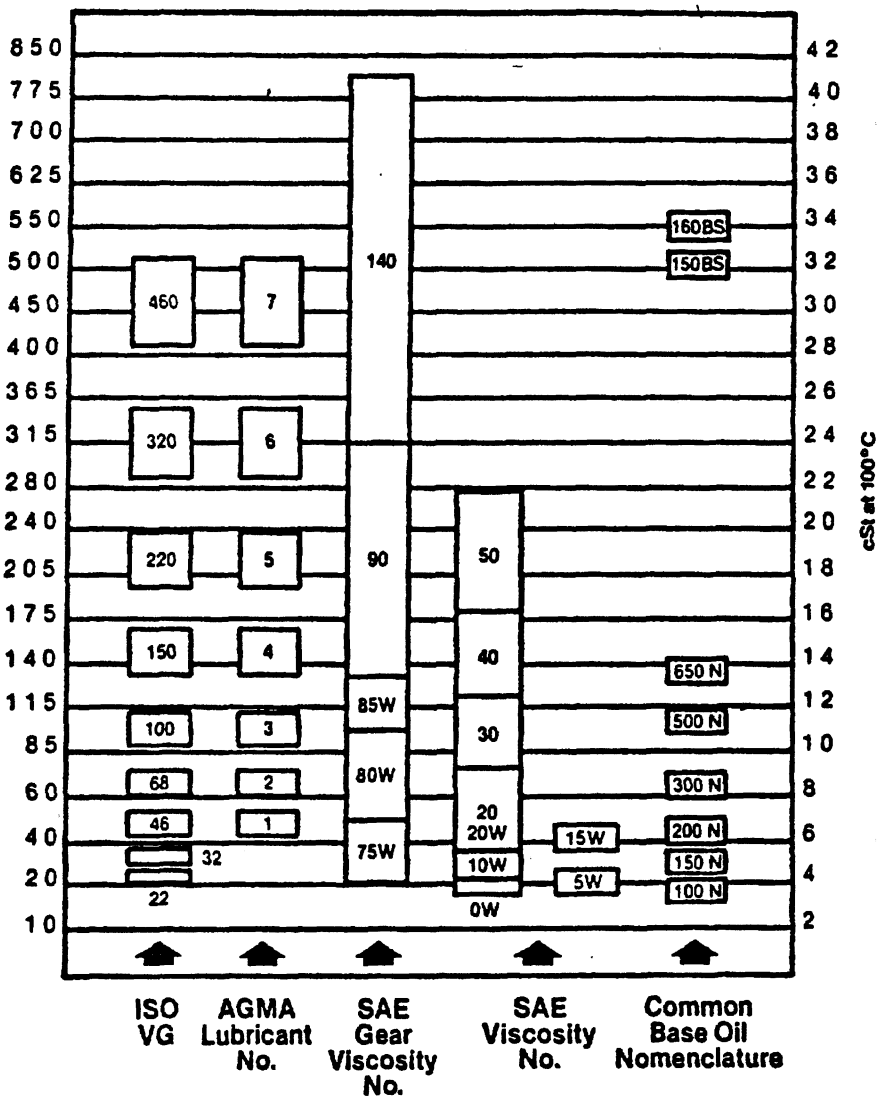
c-2

VISCOSITY GRADES
(for 90—100 VI Oils)



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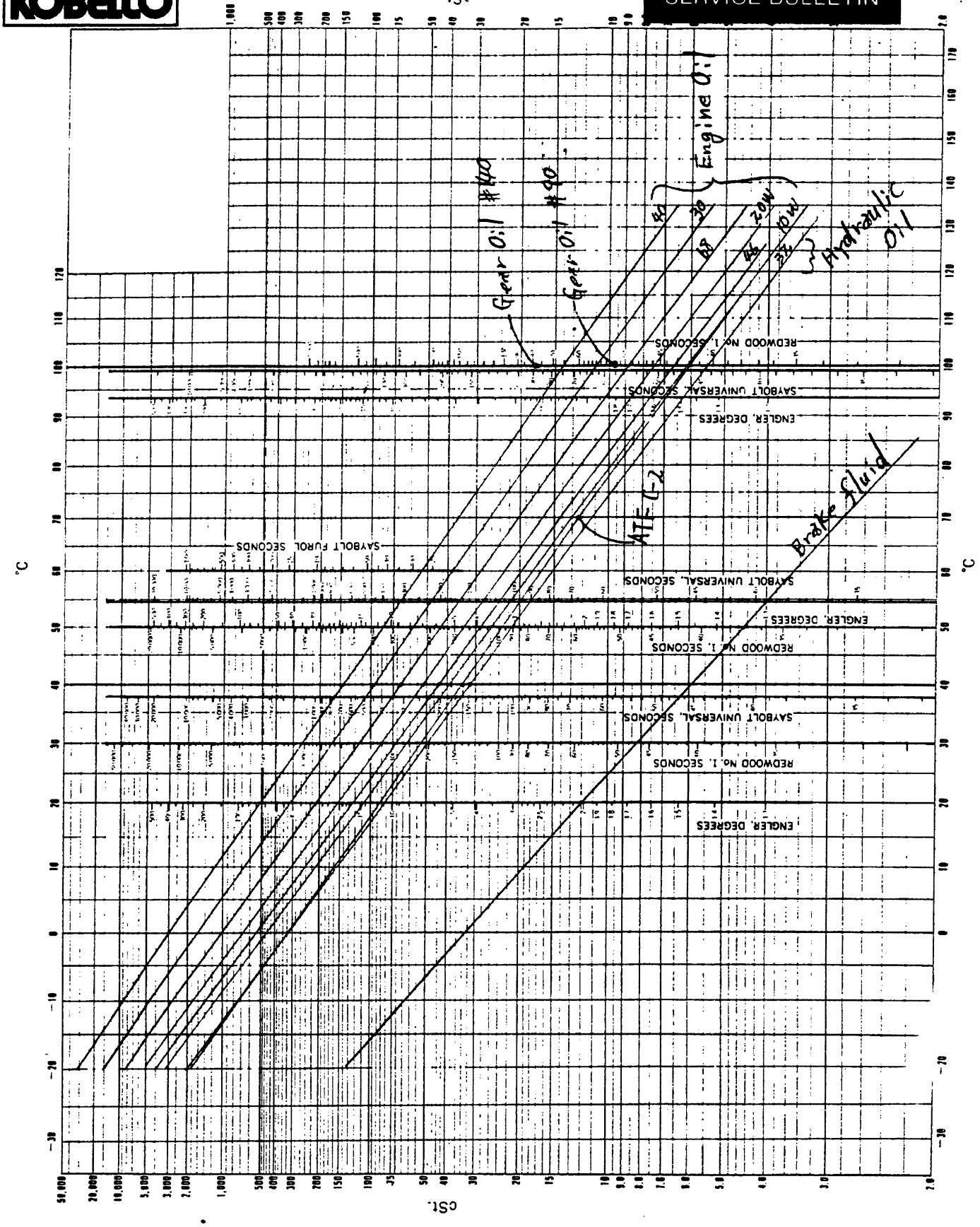
SERVICE BULLETIN



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SERVICE BULLETIN

c-3

SAE J300 SEP 80
SAE VISCOSITY GRADES FOR ENGINE OILS

SAE Viscosity Grade	Viscosity cP at Temperature °C Maximum	Borderline Pumping Temperature °C Maximum	Viscosity cSt at 100°C Minimum	Maximum
0 W	3250 at −30	−35	3.8	—
5 W	3500 at −25	−30	3.8	—
10 W	3500 at −20	−25	4.1	—
15 W	3500 at −15	−20	5.6	—
20 W	4500 at −10	−15	5.6	—
25 W	6000 at − 5	−10	9.3	—
20	—	—	5.6	< 9.3
30	—	—	9.3	<12.5
40	—	—	12.5	<16.3
50	—	—	16.3	<21.9

Note: 1 cP = 1 mPa·s; 1 cSt = 1 mm^2/s

c-4

SAE AXLE AND MANUAL TRANSMISSION LUBRICANT VISCOSITY CLASSIFICATION — SAE J306 MAY 81

SAE Viscosity	Maximum Temperature, °C for Viscosity of 150,000 cP	Viscosity at 100°C cSt Minimum	Maximum
70W	−55	4.1	.....
75W	−40	4.1	.....
80W	−26	7.0	.....
85W	−12	11.0	.....
90	...	13.5	<24.0
140	...	24.0	<41.0
250	...	41.0	.....

Note: 1 cP = 1 mPa·s; 1 cSt = 1 mm^2/s

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c-5 ISO/ASTM VISCOSITY SYSTEM FOR INDUSTRIAL FLUID LUBRICANTS

Viscosity System Grade Identification	Midpoint Viscosity cSt (mm^2/s) at 40°C	Kinematic Viscosity Limits, cSt (mm^2/s) at 40°C	
		Minimum	Maximum
ISO VG2	2.2	1.98	2.42
ISO VG3	3.2	2.88	3.52
ISO VG5	4.6	4.14	5.06
ISO VG7	6.8	6.12	7.48
ISO VG10	10	9.00	11.0
ISO VG15	15	13.5	16.5
ISO VG22	22	19.8	24.2
ISO VG32	32	28.8	35.2
ISO VG46	46	41.4	50.6
ISO VG68	68	61.2	74.8
ISO VG100	100	90.0	110
ISO VG150	150	135	165
ISO VG220	220	198	242
ISO VG320	320	288	352
ISO VG460	460	414	506
ISO VG680	680	612	748
ISO VG1000	1000	900	1100
ISO VG1500	1500	1350	1650

c-6 NLGI LUBRICATING GREASE CLASSIFICATIONS

NLGI Number	ASTM D 217 Worked Penetration at 77°F (25°C)	NLGI Number	ASTM D 217 Worked Penetration at 77°F (25°C)
000	445—475	3	220—250
00	400—430	4	175—205
0	355—385	5	130—160
1	310—340	6	85—115
2	265—295		

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d. APPENDICES
Glossary

Additive - Any material that is incorporated into a product at relatively low concentration to impart new properties or enhance existing properties.

Aniline Point - The minimum temperature for complete miscibility of equal volumes of aniline and the sample under test. Products containing aromatics or naphthenes have lower aniline points than products containing paraffins.

API - Abbreviation for American Petroleum Institute.

API Service Classification - A system of letter designations agreed on by API, SAE, and ASTM to define broad classes of engine service. Also a system of service classifications for automotive gear lubricants.

ASTM - Abbreviation for American Society for Testing and Materials.

Cetane Number - A Value determined in a standardized test engine comparing the ignition quality of a diesel fuel relative to a mixture of normal cetane and heptamethylnonane (HMN).

Dropping Point - The temperature at which the first drop of liquid separates when a grease is heated under prescribed conditions.

Extreme Pressure (EP) Additive - Chemical compound imparting extreme pressure characteristics to a lubricant with the objective of reducing wear under conditions where rubbing or sliding accompanies high contact pressures, as in heavily loaded gears, particularly of the hypoid type.

Flash Point - The lowest temperature at which vapors rising from a sample will ignite momentarily on application of a flame under specified conditions.

MIL - Prefix designation for U.S. Military specifications.

Molybdenum Disulfied - Chemical compound of molybdenum and sulfur which has excellent properties as a solid lubricant due to the type of molecular structure of the particles.

Multigrade - See Multiviscosity.

Multipurpose Grease - A lubricating grease suitable for a variety of applications, such as chassis, wheel bearings, universal joints, and water pumps on automotive equipment.

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SERVICE BULLETIN

Multiviscosity - An oil that meets the low temperature viscosity limits of one of the SAE W numbers, and the 100°C viscosity limits of one of the none-W numbers.

NLGI - Abbreviation for National Lubricating Grease Institute.

Oxidation Stability - Ability of a lubricant to resist oxidation and deterioration resulting from high temperatures and/or exposure to air.

Pour Point - Lowest temperature at which a liquid petroleum product will flow when it is cooled under the conditions of the standard test method.

SAE - Abbreviation for Society of Automotive Engineers, Inc.

SAE Number - Number indicating the viscosity range of a crankcase, transmission, or rear axle lubricant, according to systems designated by SAE.

Soap - General term for the salt of a fatty acid. Ordinary washing soaps are those of sodium and potassium. The soaps of lithium, sodium, calcium, barium and aluminum are the principle thickeners used in grease making.

Timken OK Load - Maximum load a lubricant will withstand without failure due to breakdown of the lubricant film, as determined on the Timken EP Lubricant Tester.

Total Base Number (TBN) - Quantity of hydrochloric (ASTM D664) or perchloric (ASTM D2896) acid expressed in milligrams of KOH equivalent that is required to neutralize all the basic constituents of a 1 g sample of a petroleum product. This property is used to indicate the capacity of an oil to counter the corrosive effects of acidic products of combustion.

Viscosity - Measure of the resistance to flow, or internal friction, of a fluid. Viscosity changes with temperature so the temperature at which the measurement was made must always be specified.

Viscosity Index (VI) - An arbitrary scale used to show the relative magnitude of viscosity changes with temperature. Higher VI oils have less change in viscosity with temperature.

Worked Penetration - The penetration of a sample of lubricating grease immediately after it has been brought to 25°C and worked 60 strokes in the ASTM grease worker.

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U.S. MILITARY SPECIFICATION DESCRIPTIONS

MIL-L-2104A — Obsolete specification for crankcase oils. Required performance in the L-1 diesel engine test and the L-4 gasoline engine test.

MIL-L-2104A (Supplement 1) — Obsolete specification for crankcase oils. Same engine tests as MIL-L-2104A, but performance requirements made stricter by using higher sulfur fuel in the diesel engine test.

MIL-L-2104B — Obsolete specification for crankcase oils for general duty service. Required performance in the 1-H, L-38 and LTD engine tests.

MIL-L-2104C — Current specification for crankcase oils for service in tactical military vehicles. Equivalent to API Service CD in diesel performance and API Service SC in gasoline engine performance.

MIL-L-2105 — Obsolete specification for multipurpose gear lubricants. Required performance at a level equivalent to API Service GL-4.

MIL-L-2105B — Obsolete specification for multipurpose automotive gear lubricants. Required performance in the L-37 and L-42 gear tests and L-33 moisture corrosion test. Equivalent to API Service GL-5.

MIL-L-2105C — Current specification for multipurpose automotive gear lubricants. Same performance requirements as MIL-L-2105B but covers SAE 75W, 80W-90 and 85W-140 grades.

MIL-L-45199B — Obsolete specification for crankcase oils for severe service in diesel engines. Equivalent to Caterpillar Superior Lubricants (Series 3) with addition of L-38 test.

MIL-L-46152 — Obsolete specification for crankcase oils for commercial vehicles operated by the military and government agencies. Combined requirements of API Services SE and CC.

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SERVICE BULLETIN

LIST OF LUBRICANTS THAT MEET KOBELCO SPECIFICATIONS

Catagory	Class	Shell	Esso	Mobil	Caltex	Castrol	Chevron
Engine Oil	API CD MIL-L-2104C	Rimula CT Myrina	Esso Lube D3	Delvac 1300 Series	RPM Delo 300, 400	CRD, CRF Rx Super	DELO 300, 400
Hydraulic	ISO VG 32 46 68	Tellus	Nuto H	DTE	Rand Oil		
Gear Oil	API GL-4 MIL-L-2105C	Spirax EP	Esso Gear Oil GP	Mobilube GX	Universal Thuban	Hypoy 90	Universal EP
Grease	NLGI-2	Retinax A Alvania 2	Multipurpose	Mobil JL	Marfak Multipurpose EP-2	Castrol LM	Multi-Motive 2
Trans-mission Oil	ATF Type C-3	Rimula 10W Rotella 10W	Torque Fluid 47	Delvac 1210 ATF 220	RPM Delo 400 ATF No. 5	Deusol TFC 310	Delo 400 ATF No. 5
Brake Fluid	SAE 1703	Donax B, HB	Esso Brake Fluid HD	Super HD Brake Fluid	HD Brake Fluid	Girling Brake Fluid	Atlas HD 450
Anti-Freeze	SAE J814-B	Glyco Shell Penguin	Esso Antifreeze	Mobil Permazone	AF Engine Coolant	Castrol Antifreeze	Atlas Permanguard

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LIST OF LUBRICANTS THAT MEET KOBELCO SPECIFICATIONS

Catagory	Texaco	Union	Farm Oyl	Farm Oyl			
Engine	URSA Oil LA-3	Guardol Products	GP-3 Long Life 10W-30				
Hydraulic		Unax AW 32, 46, 68	AG Master Hydraulic Fluid	Farm Oyl AW Hyd. Oil AW 150 AW 215 AW 315			
Gear Oil		MP Gear Lube LS	MP Gear Master 80W-90				
Grease		UNOBA EP2	Farm Oyl Molyplus				
Trans-mission Oil	Torque Fluid C-3	Multipurpose ATF					
Brake Fluid							
Anti-freeze							

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SERVICE BULLETIN

LIST OF LUBRICANTS THAT MEET KOBELCO SPECIFICATIONS

CATEGORY	D-A LUBRICATION COMPANY
ENGINE OIL	D-A SUPERTREATED DIESEL OIL III, D-A SUPER TREATED DIESEL OIL II, D-A EXTRA TREATED DIESEL OIL II, D-A ALL SEASON DIESEL GUARD. ALL OF THESE ARE AVAILABLE IN THE SAE 40, SAE 50 AND SAE 10W30 GRADES. IN ADDITION TO API CD, D-A ALL SEASON DIESEL GUARD ALSO MEETS CDII AND SE, AND D-A EXTRA TREATED DIESEL OIL II ALSO MEETS CE.
HYDRAULIC	D-A WEARGUARD II #45 (ISO VG 46) , D-A WEAR GUARD II HIVI (ISO VG 32)
GEAR OIL	D-A GEARGUARD II SAE 90 , D-A GEARGUARD II SAE 80W90 AND D-A UNIVERSAL GEAR LUBRICANT SAE 80W90 MAY ALSO QUALIFY FOR USE. THEY ARE MULTIGRADE 80W BY VIRTUE OF POUR POINT DEPRESSANTS, RATHER THAN BY USE OF POLYMERS. BOTH PRODUCTS HAVE VISCOSITIES AT 100 DEGREES CENTIGRADE IN THE SAE 90 RANGE.
GREASE	D-A EPT #2 , D-A EPT MOLY #2 , D-A EPT MOLY #1
T/M OIL	D-A SUPER TREATED DIESEL OIL III SAE 10, D-A SUPER TREATED DIESEL OIL II SAE 10, D-A EXTRA TREATED DIESEL OIL II SAE 10, D-A DIESEL OIL SAE 10, D-A TORQUE FLUID, D-A AUTOTRANS G-3, D-A HYDRATRANS 135

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: March 1, 1996

BULLETIN: HE-172E (Replaces HE-172D)
Page 1 of 8

SUBJECT: Belly Pan Kits to Protect the Swivel Joint and its Hydraulic Lines

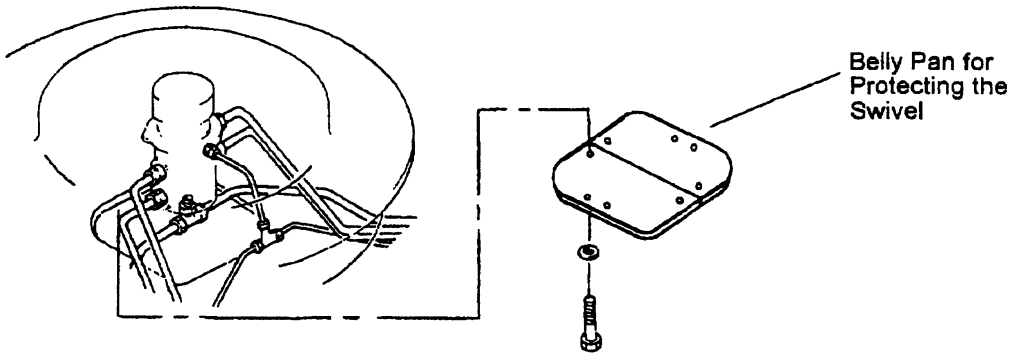
AFFECTED MACHINES:

K904II - YW00563 ~	SK100III - YW03709 ~	SK100IV - YWU1001 ~
K905LCII - YP01001 ~	SK120LCIII - YPU0301 ~	SK120LCIV - YPU1001 ~
K907LCII - YQ00101 ~	SK150LCIII - YM00101 ~	SK150LCIV - YMU1001 ~
K909LCII - LL01201 ~	SK200LCIII - YQU0401 ~	SK200LCIV - YQU2001 ~
K912LCII - YC00301 ~	SK220LCIII - LLU0301 ~	SK220LCIV - LLU1201 ~
K916LCII - YS00201 ~	SK300LCIII - YCU0001 ~	SK270LCIV - LBU0001 ~
SK300LCII - YC00738 ~	SK400LCIII - YSU0001 ~	SK300LCIV - YCU0301 ~
SK400LCII - YS00390 ~	SK400LCIII - YS00547 ~	SK400LCIV - YSJ0002 ~

Belly pans for protecting the swivel joint and its hydraulic lines are available as an option on Kobelco machines. These belly pans are assembled in kits for use on the machines listed above.

These kits are comprised of a cover plate, four (4) tapped blocks, cap screws, and washers. On the SK270LCIV, SK300LCIII/IV and the SK400LCIII/IV they are fabricated in two pieces for ease of installation and removal. After the tapped blocks are welded to the underside of the lower structure, the cover plate(s) can be easily bolted to the installation.

The kit part numbers are listed on page 2 of this bulletin. The instructions for welding the tapped blocks to the lower structure are on the following pages. **Important:** Follow these instructions carefully, paying particular attention to the "**no-weld**" areas on the lower frame bottom plate.



We recommend that you install these kits if the swivel and its hydraulic lines are exposed to jobsite hazards. Please contact the Parts Department at Kobelco America for price and availability.

THIS BULLETIN IS BEING ISSUED FOR INFORMATION ONLY AND IS NOT AN AUTHORIZATION FOR ANY REPLACEMENT OR WARRANTY CLAIM SUBMITTAL.

MODEL	KIT PART NUMBER
K904II/SK100III/SK100IV	2422P1179
K905LCII/SK120LCIII/SK120LCIV	2422P1179
SK150LCIII/SK150LCIV	2422P1179
K907LCII/SK200LCIII/SK200LCIV	2422N933
K909LCII/SK220LCIII/SK220LCIV	2422N934
K912LCII/SK300LCII	2422N928
K916LCII/SK400LCII	2422N929
SK270LCIV/SK300LCIII/SK300LCIV	2422N1666
SK400LCIII/SK400LCIV	2422N1667

References on Drawings:

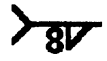
TYP-2 = Typical weld in two (2) places

TYP-4 = Typical weld in four (4) places

= No weld on one side

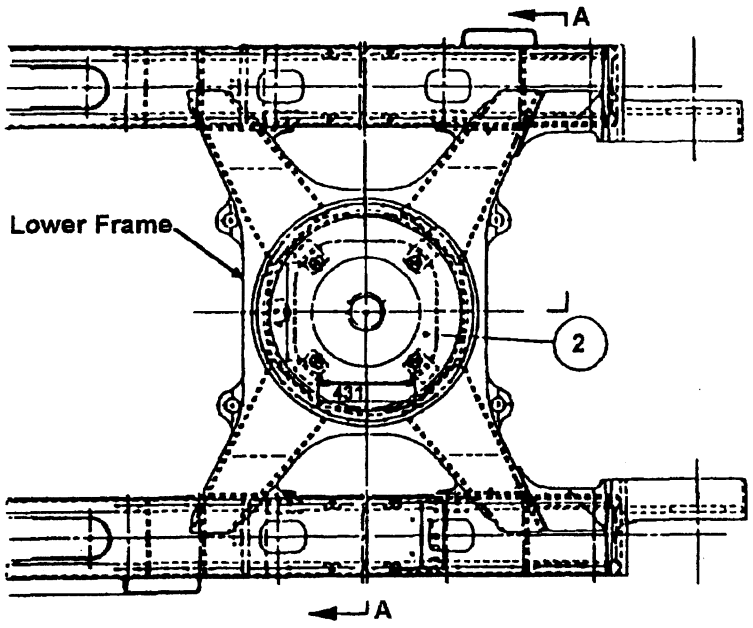
= No weld on both sides

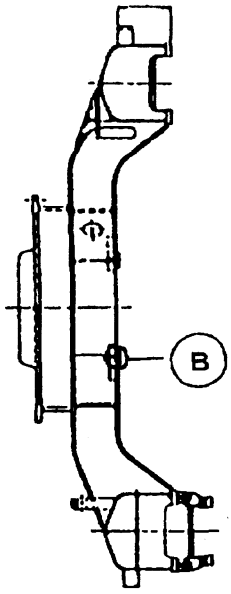
= Weld on both sides (8 mm) fillet



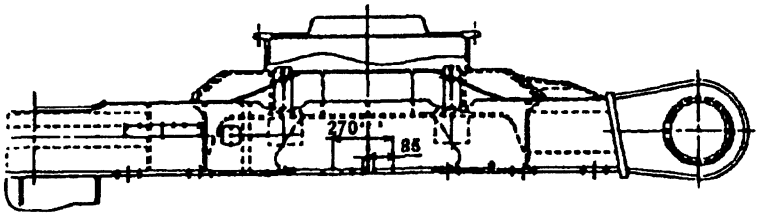
= Weld on one side (8 mm) fillet

⚠ **Please note** that any **"no weld" areas are critical to maintaining the structural integrity** of the lower frame bottom plates. **Do not weld** to the edge of the center opening of the bottom plates !



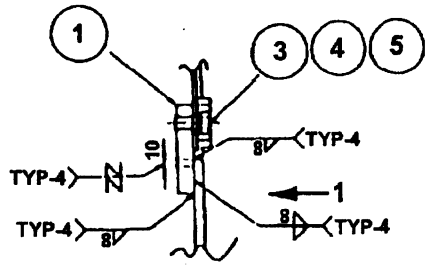


Section A-A



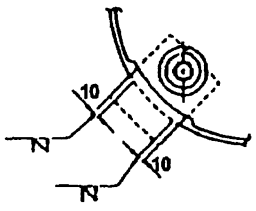
Unit = mm

Models	
K904II	K905LCII
SK100III	SK100IV
SK120LCIII	SK120LCIV
SK150LCIII	SK150LCIV



(S = 1/5)

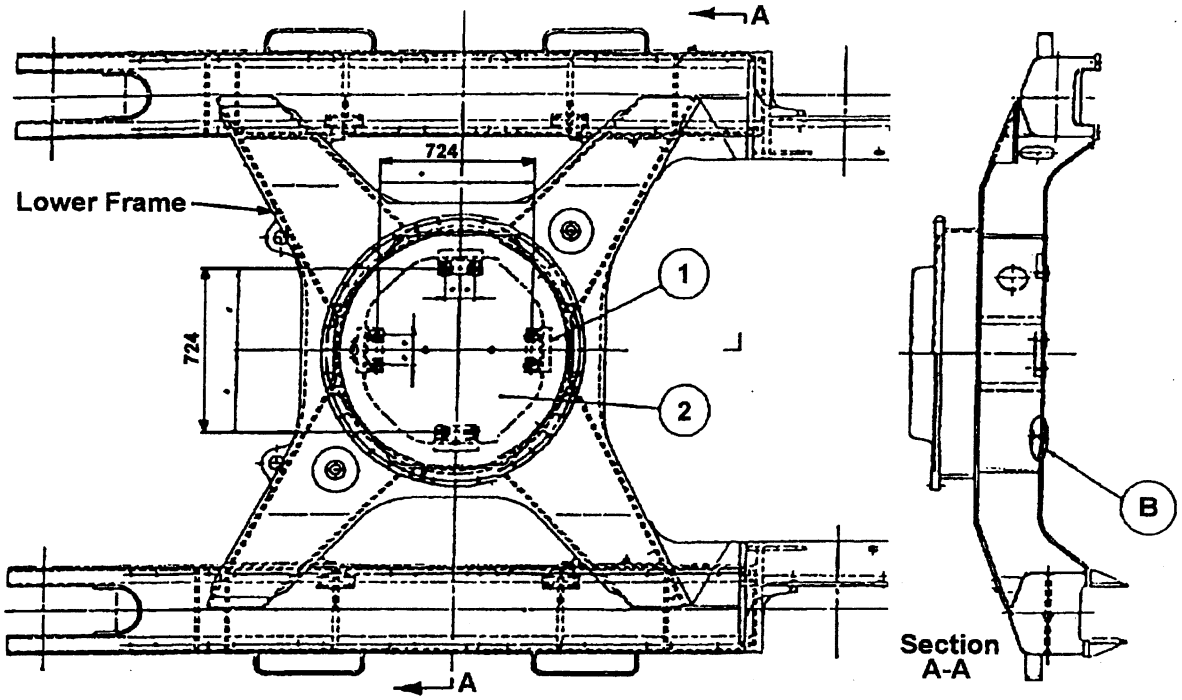
Detail B

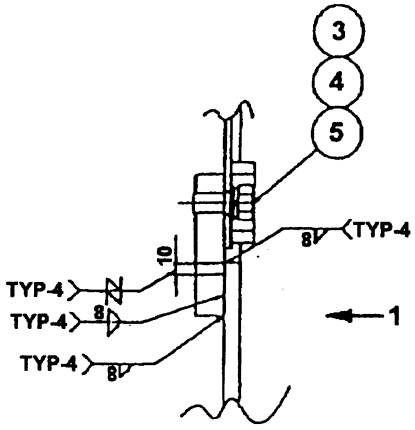


(S = 1/5)

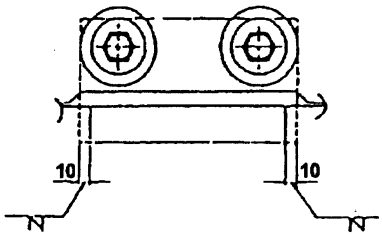
View 1

Rework, Frame Lower			
Kit Part Number: 2422P1179			
Item	Part Number	Description	Qty.
1	2416T20840	Tapped Block	4
2	2414P6258	Cover	1
3	ZS13C18050	Cap Screw	4
4	ZW22K18000	Lock Washer	4
5	ZW11X18000	Washer	4





Detail B

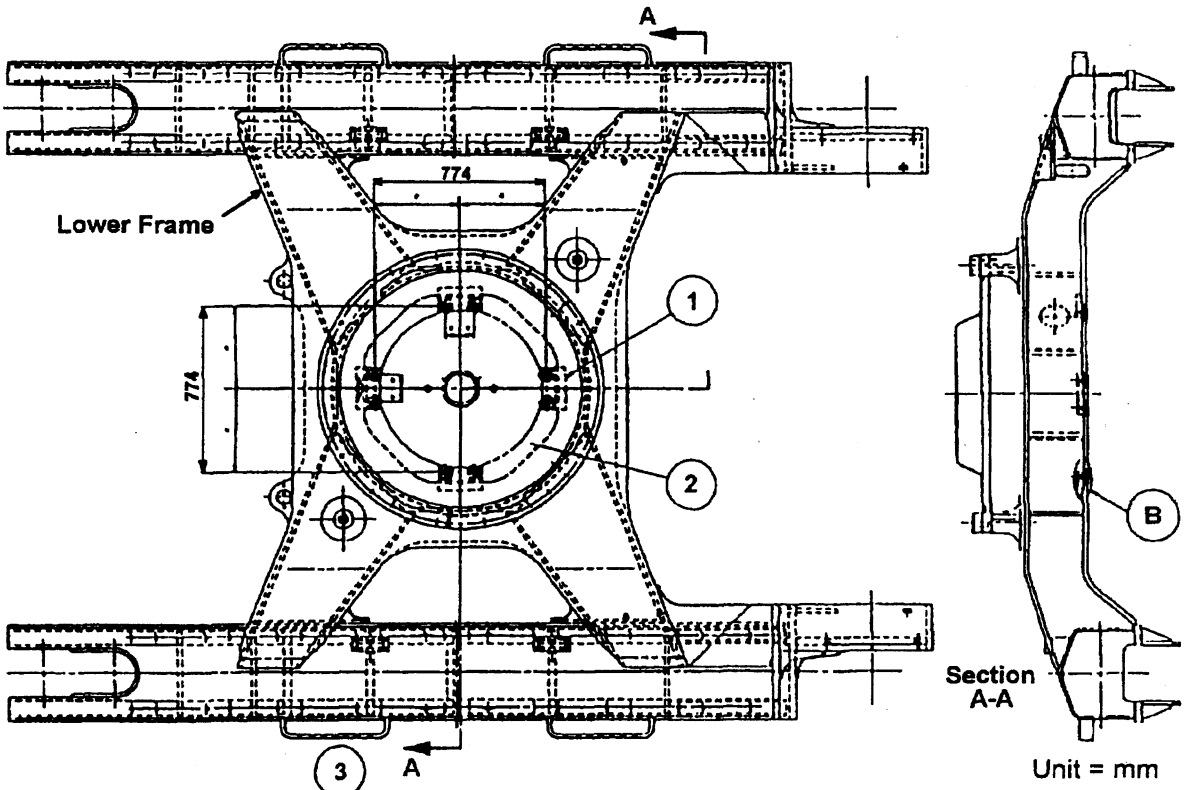


View 1

Unit = mm

Models
K907II
SK200LCIII
SK200LCIV

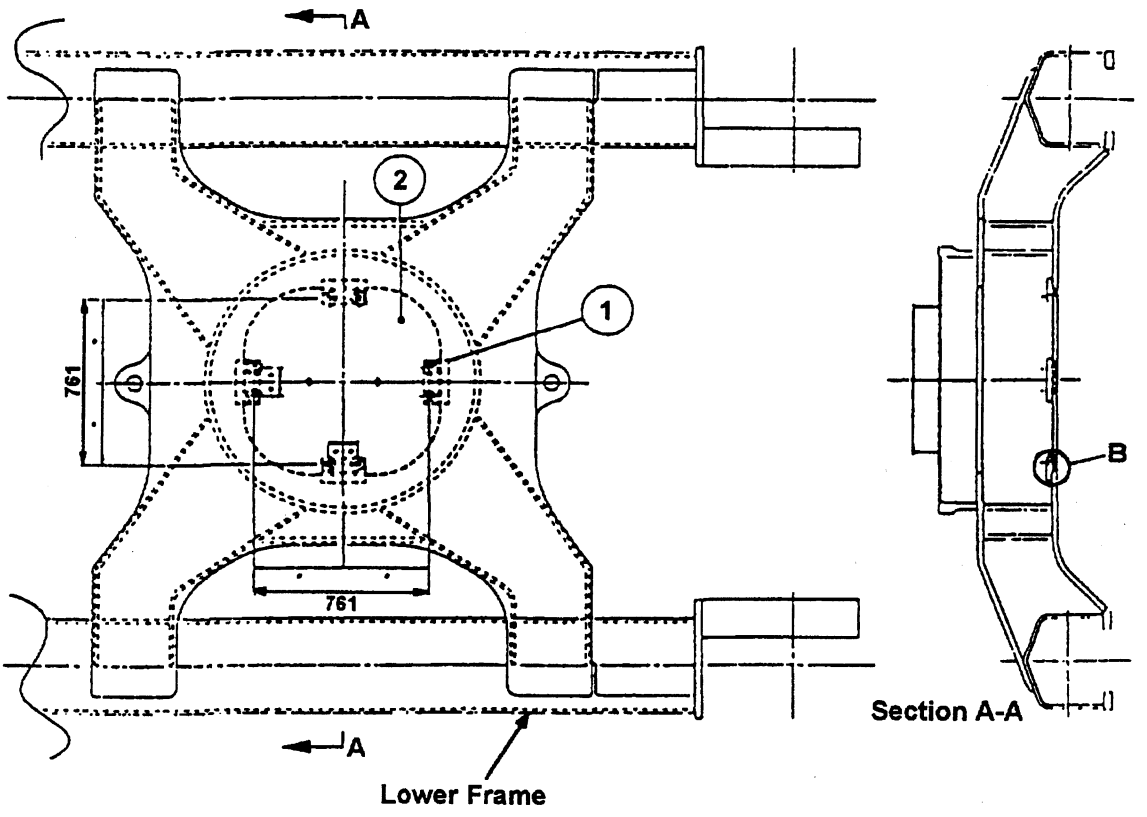
Rework, Frame Lower			
Kit Part Number: 2422N933			
Item	Part Number	Description	Qty.
1	2416T18837	Tapped Block	4
2	2414T2937	Cover	1
3	ZS13C18040	Cap Screw	8
4	ZW22K18000	Lock Washer	8
5	ZW11X18000	Washer	8

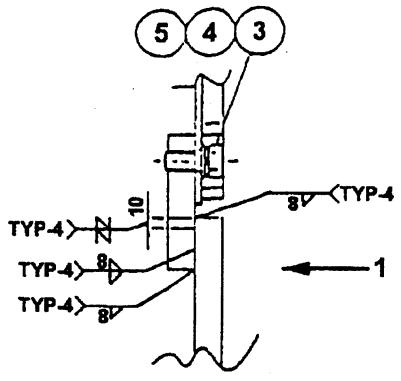


Unit = mm

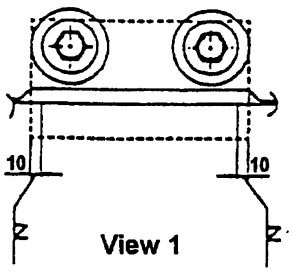
Models
K909II
SK220LCIII
SK220LCIV

Rework, Frame Lower			
Kit Part Number: 2422N934			
Item	**Part Number**	**Description**	**Qty.**
1	2416T18837	Tapped Block	4
2	2414T2938	Cover	1
3	ZS13C18040	Cap Screw	8
4	ZW22K18000	Lock Washer	8
5	ZW11X18000	Washer	8





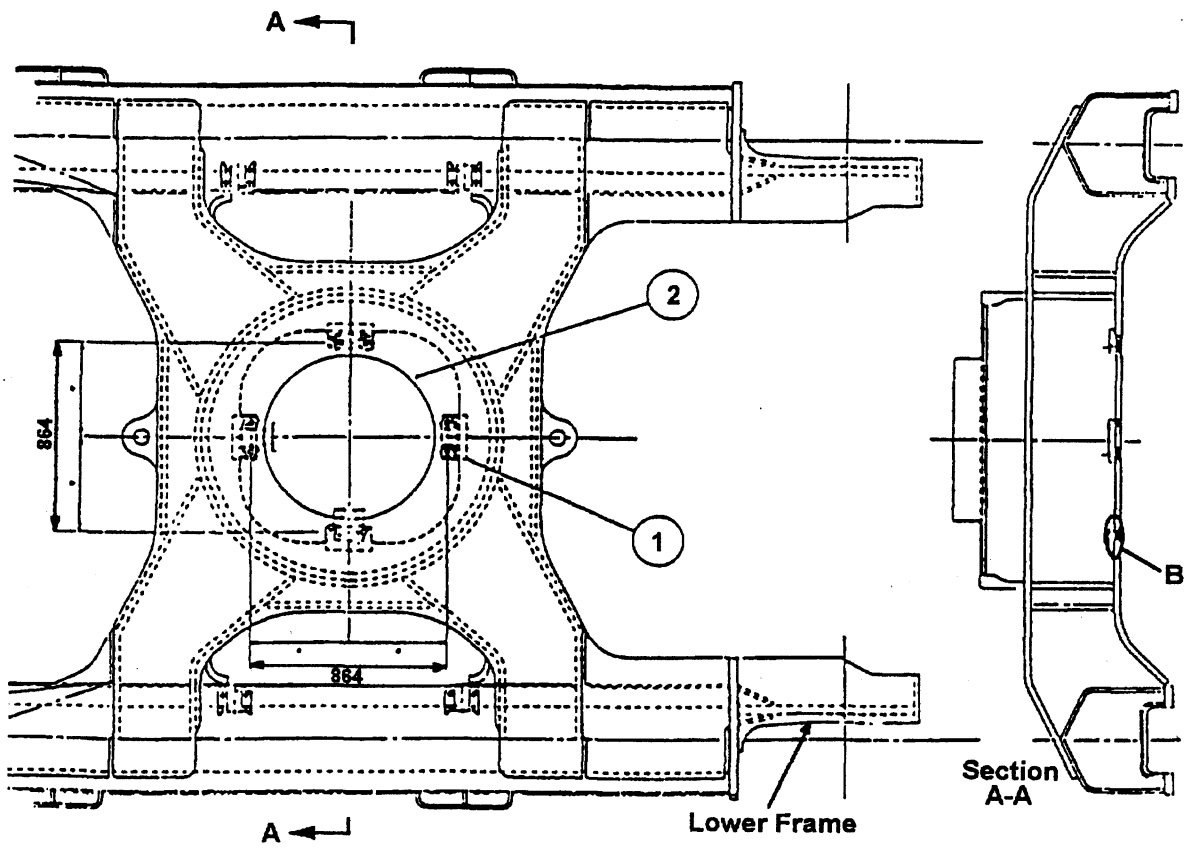
Detail B (S = 1/3)



Unit = mm

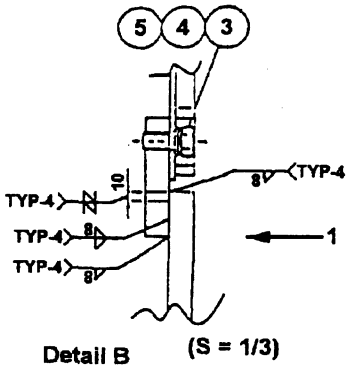
Models
K912LCII
SK300LCII

Rework, Frame Lower			
Kit Part Number: 2422N928			
Item	Part Number	Description	Qty.
1	2416T18837	Tapped Block	4
2	2414T2930	Cover	1
3	ZS13C18040	Cap Screw	8
4	ZW22K18000	Lock Washer	8
5	ZW11X18000	Washer	8

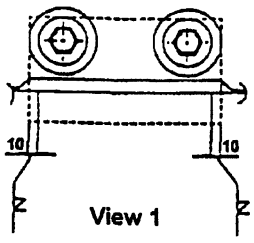


Unit = mm

Models
K916LCII
SK400LCII

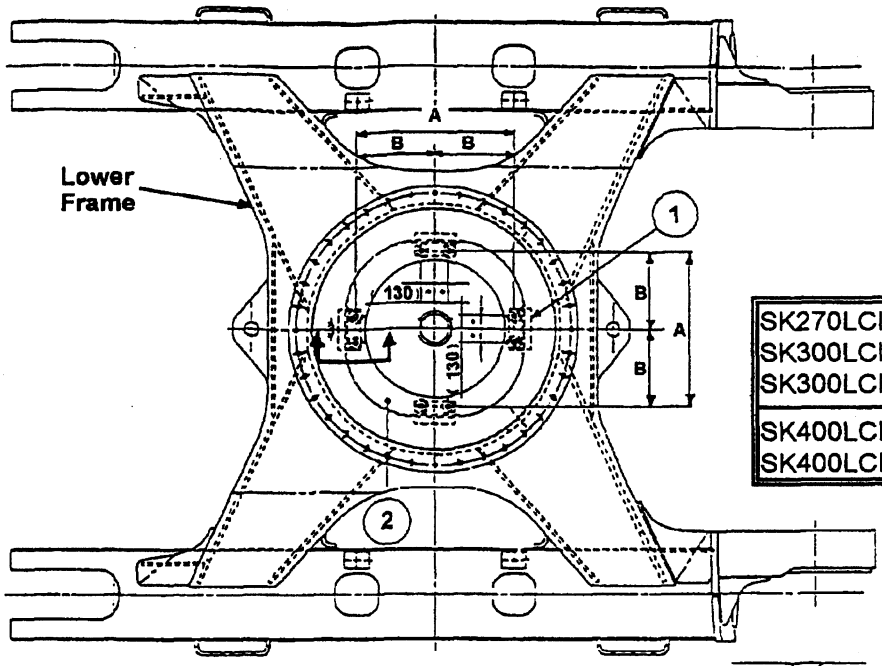


Detail B (S = 1/3)

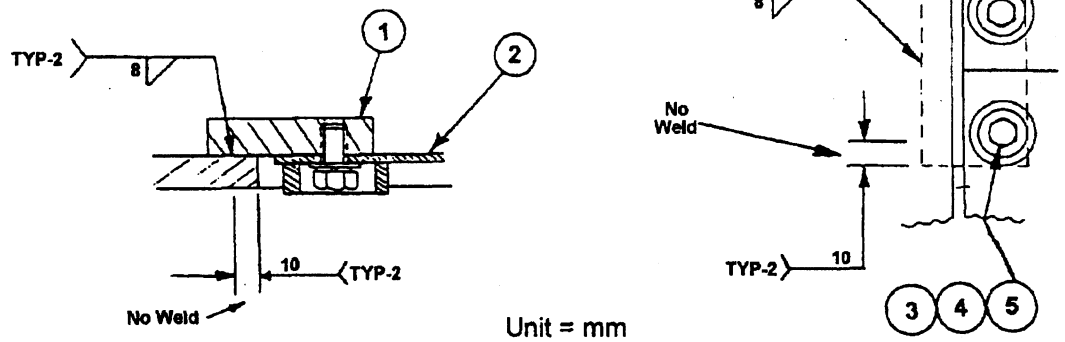


View 1

Rework, Frame Lower			
Kit Part Number: 2422N929			
Item	Part Number	Description	Qty.
1	2416T18837	Tapped Block	4
2	2414T2931	Cover	1
3	ZS13C18040	Cap Screw	8
4	ZW22K18000	Lock Washer	8
5	ZW11X18000	Washer	8



	"A"	"B"
SK270LCIV SK300LCIII SK300LCIV	761 mm (29.96")	380.5 mm (14.98")
SK400LCIII SK400LCIV	896 mm (35.27")	448 mm (17.63")



Unit = mm

Rework, Frame Lower			
Kit Part Number: 2422N1666			
SK270LCIV, SK300LCIII and SK300LCIV			
Item	Part Number	Description	Qty.
1	2416T18837	Tapped Block	4
2	2414P8854	Cover	2
3	ZS13C18040	Capscrew	8
4	ZW22K18000	Lock Washer	8
5	ZW11X18000	Washer	8

Rework, Frame Lower			
Kit Part Number: 2422N1667			
SK400LCIII and SK400LCIV			
Item	Part Number	Description	Qty.
1	2416T18837	Tapped Block	4
2	2414P8855	Cover	2
3	ZS13C18040	Capscrew	8
4	ZW22K18000	Lock Washer	8
5	ZW11X18000	Washer	8

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: December 10, 1992

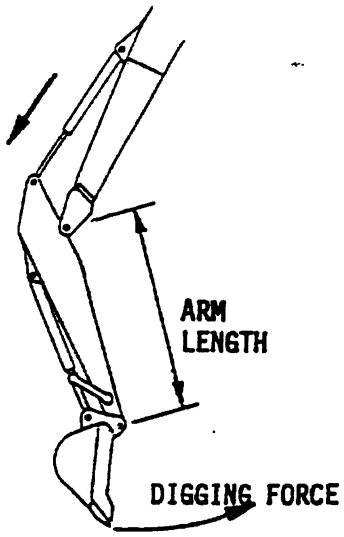
BULLETIN: HE-177A
Page 1 of 3

SUBJECT: Bucket and Arm Digging Force

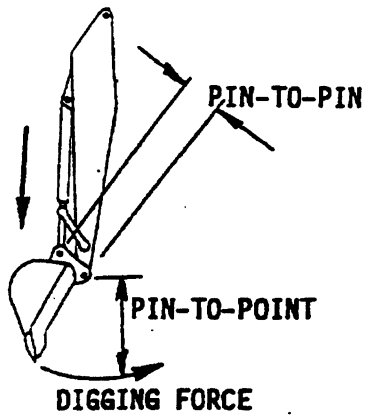
AFFECTED MACHINES: All Excavators

Recently, there have been some complaints regarding the lack of digging force in the bucket or arm circuit of KOBLECO's Hydraulic Excavators. In most of these cases, the complaints occurred while the KOBELCO excavator was being demonstrated alongside a competitive machine that was equipped with a shorter arm, or with a bucket that had a shorter pin-to-point dimension. In many cases, the KOBELCO excavator was equipped with a non-standard bucket that was not manufactured to KOBELCO specifications.

LONGER ARM DECREASES
DIGGING FORCE



LONGER PIN-TO-POINT DIMENSION
SHORTER PIN-TO-PIN DIMENSION
DECREASES DIGGING FORCE



It is important to note that the longer the arm becomes, the lower the digging forces will be. In addition to this, if the bucket is manufactured with a shorter than standard pin-to-pin dimension, or a longer than standard pin-to-point dimension, the digging force will again be reduced.

Loss of Bucket Breakout Force due to Increased Bucket Point Radius:

Due to the Federally mandated regulations requiring trench reinforcement boxes, we have received increasing reports of customers requiring narrow buckets of large capacities. That alone does not create a problem. The problem begins when our dealers and service departments receive complaints due to loss of digging performance. The loss of breakout force occurs because the attaching pin-to-point radius must increase to maintain capacity. Buckets built to our specifications of a certain pin-to-pin and pin-to-point radius will yield designed breakout forces. **Any increase in point radius will result in a reduction of breakout forces - both arm and bucket. Please keep this in mind when specifying special attachments.**

To calculate the approximate percentage of breakout force lost due to a longer bucket pin-to-point radius, use the rule-of-thumb formula as follows:

A = Standard KOBELCO pin-to-point radius

B = The pin-to-point radius of the non-standard bucket plus the attachment:

$$\frac{(B - A) \times 100}{B} = \% \text{ Loss of bucket breakout force}$$

Example:

A = Standard KOBELCO pin-to-point radius is 60"

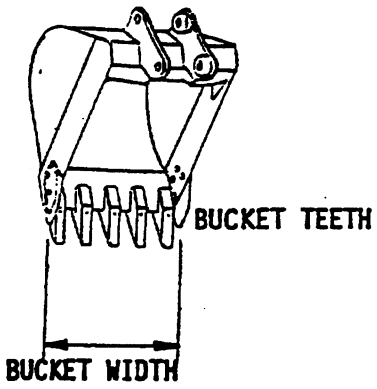
B = A longer tooth point of 8" would give a pin-to-point radius of 68":

$$\left(\frac{(68" - 60") \times 100}{68}\right) = 8" \times 100 \div 68$$

= 11.76% loss of bucket breakout force

WRONG TEETH FOR APPLICATION OR WIDER BUCKET INCREASES RESISTANCE TO DIGGING FORCE

Other aspects to consider are the bucket width and the type of bucket teeth used for the application. If a wider than standard bucket is used, the resistance to the digging force will increase and it will give the impression that the digging force has decreased. Also, if the wrong type of tooth is installed on the bucket for the digging application, it could give the impression again of decreased digging force.



If a complaint of low digging force on the bucket or arm is received, an inspection of the bucket and arm should be included with all other troubleshooting steps.

If a demonstration against competitive machines is planned, an effort should be made to ensure that all machines being compared are equally equipped.

THIS BULLETIN IS ISSUED FOR INFORMATIONAL PURPOSES ONLY AND IS NOT AN AUTHORIZATION FOR ANY REPLACEMENT OR WARRANTY CLAIM SUBMITTAL.

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

MARCH 19, 1991

SERVICE BULLETIN: HE-188 AND WL-106

APPLICABLE MODEL: ALL EXCAVATORS AND WHEEL LOADERS

SUBJECT: HYDRAULIC COMPONENT REBUILD

Sometimes it becomes necessary to remove a hydraulic component from a piece of construction equipment and have that component rebuilt. KOBELCO AMERICA is aware that its' Dealers are looking for a source who can do this rebuilding for them.

This bulletin will be used to notify you of re-builders who have exhibited proficiency in remanufacturing hydraulic components used on KOBELCO excavators and wheel loaders. This bulletin will be updated regularly to note any additions or deletions of re-builders.

It is important to note that these re-builders <u>are not</u> authorized to perform new machine warranty determinations or extended power train warranty determinations for KOBELCO products. New machine and extended power train warranty determination is decided at the sole discretion of KOBELCO AMERICA.

The re-builder is not authorized to purchase parts direct from KOBELCO AMERICA. Any parts necessary for remanufacturing the component will need to be purchased by the Dealers. Parts sold by KOBELCO AMERICA will be warranted per the conditions of the KOBELCO Parts Warranty Policy. Components remanufactured by the re-builder will be warranted per the conditions of the re-builders Warranty Policy.

If the Dealer would like to inquire about the services available from the re-builder, the Dealer will need to contact the re-builder direct. The following pages of this bulletin list the re-builders along with their Warranty Policies.

HYDRAULIC REPAIR AND DESIGN INC.
6942 S. 196TH
KENT, WA 98032

206-872-8900
FRED BUSH -- SALES
LEON ADAMS -- SERVICE

HYDRAULIC REPAIR AND DESIGN, INC.
LIMITED WARRANTY

Limited Warranty on Rebuilt Hydraulic Components:

Hydraulic Repair and Design, Inc. (HRD) warrants to the original purchaser of components rebuilt by HRD that should the rebuilt component fail at any time while owned by said purchaser, due to defects in materials or workmanship supplied by HRD, that HRD will repair or replace said component without cost, pursuant to the following terms and conditions:

1. The component shall be delivered to the offices of HRD, freight prepaid, for inspection to determine the cause and nature of the claimed defect.

2. If found to be covered by this limited warranty, the defective component shall be repaired or replaced by HRD and shipped, freight collect to the purchaser.

3. This warranty shall not cover defects caused by improper use or failure of purchaser to perform all regular and normal maintenance service specified by the original equipment manufacturer (OEM). Alteration of the component or use other than specified by the OEM shall void this limited warranty.

4. Warranty repairs performed will be performed during regular working hours of HRD personnel as said work is placed in the HRD production schedule.

5. HRD will in no event be liable for repairs or replacement by others.

6. HRD shall not be responsible for equipment down time or loss of use, overtime, production delays or any other consequential damages.

There are no other warranties except as set forth above.

TAD HYDRAULIC SERVICES DIV.
TEX-A-DRAULICS, INC.
7330 W. SAM HOUSTON PARKWAY N.
HOUSTON, TEXAS 77040-3042

713-937-8111
TEXAS WATTS 1-800-DIAL-TAD
USA WATTS 1-800-2 GET TAD
DAVE WAGER - SERVICE
AL NELSON - SERVICE

TAD TEX-A-DRAULICS, INC.
WARRANTY POLICY

Tex-A-Draulics, Inc. warrants all re-manufactured components to be free of defects in material and workmanship for a period of one (1) year from the date of repair.

TAD's obligation under this warranty is limited to and shall not exceed the correction of the defect or replacement with another article free of defect for a period of one (1) year from the date of re-manufacture.

Upon TAD's request, the buyer will make such defective article available for inspection by TAD and/or return the defective article to TAD, transportation charges prepaid. TAD shall correct the defect, at TAD's option, either by repairing or replacing the defective article or by issuing a credit for the purchase price.

Page HE-189-C

Adjustment Harness for Mechatronics System Controller – Not Available

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: February 19, 1992

BULLETIN: HE-201\WL-109

AFFECTED MODEL: HYDRAULIC EXCAVATOR - ALL MODELS

AFFECTED SERIAL NUMBER: ALL

SUBJECT: HYDRAULIC SYSTEM CLEAN UP

The purpose of this bulletin is to advise you of recommendations to utilize when clean-up of the hydraulic system is required. This could be required after a major component failure, or before installing a new component, such as a main pump assembly.

It must be noted here that the amount of clean-up required will be dependent upon the type of failure and amount of system contamination. The following guidelines recommended here will be for a hydraulic system which has been heavily contaminated, or before replacement of the main pump assembly.

CAUTION: IF THE HYDRAULIC SYSTEM OF A MACHINE HAS BEEN CONTAMINATED, CLEAN-UP OF THE HYDRAULIC SYSTEM MUST BE COMPLETED TO INSURE A GOOD SERVICE LIFE FOR THE NEW COMPONENT. THE CLEAN UP MUST BE DONE BEFORE THE NEW COMPONENT IS INSTALLED.

1. Determine the reason for the contamination/failure, and correct this condition. Assure that prior to re-start of the machine, all suction lines, tubes hoses, gaskets, etc., are in good condition and functioning properly.

2. Position machine on firm, level surface prior to repair.

3. Retract all hydraulic cylinders to their minimum length.

4. Release trapped pressure in hydraulic cylinder lines.

5. Release air pressure from hydraulic tank.

   CAUTION: WATCH FOR HOT OIL, LET COOL.

   CAUTION: OPEN ALL LINES, FITTINGS, ETC. SLOWLY AND CAREFULLY, AS THERE MAY BE TRAPPED PRESSURE IN THEM.

6. Drain the hydraulic oil from the hydraulic reservoir into a suitable sized, clean container.

7. Remove the main hydraulic return filter(s) and bypass assembly. Examine contents of filter(s) for type of contamination in them.

8. Remove and clean, or replace if damaged, the hydraulic reservoir suction strainer-filter assembly. Note the type of contamination for troubleshooting purposes.

9. Carefully clean the interior areas of the hydraulic reservoir of any foreign material or contamination.

10. Remove the pump suction-intake line(s). Clean and inspect them carefully. If any indication of damage, replace with new.

11. Reinstall suction strainer, suction lines, main return filter(s), and bypass assembly into the hydraulic reservoir.

12. Remove and inspect contents of case drain filter assembly. Install a new filter.

13. Remove and clean, or replace, pilot system filter assembly.

14. Tag for identification purposes; and then remove, inspect, and clean all tubes, hoses, and fittings between pumps and control valve, and reinstall.

    NOTE: USE A SUITABLE CONTAINER TO COLLECT ANY HYDRAULIC OIL SPILLED DURING THIS PROCEDURE.

15. Tag for identification purposes; and then remove, inspect and clean all tubes, hoses, and fittings between the hydraulic reservoir and the oil cooler.

16. Remove oil cooler and thoroughly flush out with clean hydraulic oil.

17. Reinstall oil cooler and reconnect all tubes and fittings.

18. Clean all valve and motor assemblies, if contaminated.

19. Tag for identification purposes; and then remove, inspect, and clean all tubes, hoses, and fittings between control valves and cylinders or motors. Reinstall all tubes and hoses, except those to the rod end of the hydraulic cylinders. Cap these lines and leave rod end port of cylinders open. Connect

a hose to the rod end cylinder ports. Insert the end of the hose into a suitable container for holding spilled oil.

20. Install new hydraulic oil, of the proper specification, into the hydraulic reservoir, and fill until the hydraulic reservoir is full.

    NOTE: IF HYDRAULIC OIL REMOVED IS TO BE REUSED, IT MUST BE THOROUGHLY CLEANED BY RUNNING IT THROUGH A 10 MICRON FILTER ASSEMBLY BEFORE REINSTALLING INTO THE HYDRAULIC RESERVOIR.

21. Assure that pump assembly(ies) are filled with oil and bled of air properly before start-up. Also, make sure pump suction line(s) are bled and properly filled with oil.

    CAUTION: DAMAGE COULD RESULT TO PUMP(S) IF THEY ARE NOT PROPERLY BLED OF AIR AND FILLED WITH OIL, PRIOR TO START-UP.

    CAUTION: PAY CLOSE ATTENTION TO THE HYDRAULIC RESERVOIR OIL LEVEL DURING THE FOLLOWING PROCEDURE AND REPLENISH WITH NEW HYDRAULIC OIL IF NECESSARY.

22. Start engine with throttle in low idle position. Slowly and carefully actuate all cylinder functions one at a time. Actuate each cylinder to the end of their stroke, but, not hitting relief, and catch the oil from the rod end of the cylinder in a suitable container.

    CAUTION: DO NOT ATTEMPT TO RETRACT ANY CYLINDERS WITH THE ROD END CYLINDER LINE DISCONNECTED.

    CAUTION: MAKE SURE NO PERSONNEL ARE UNDER OR AROUND THE ATTACHMENT.

23. Reinstall cylinder rod end lines and check the oil level in the hydraulic reservoir.

24. At low engine RPM's, slowly actuate all hydraulic motor circuits, one by one, to slowly circulate new hydraulic oil throughout the system.

25. Run engine at low RPM's, no load, for 15 minutes.

26. Run engine at full RPM's, no load, for 15 minutes.

27. Reduce engine RPM's to low idle and slowly cycle and actuate all hydraulic functions, making sure not to hit relief pressure, for 30 minutes.

28. Increase engine RPM's to full throttle and repeat step #27, for 30 minutes.

29. Check and adjust, if necessary, the following pressures:

    A. Pilot system relief pressure
    B. Travel main relief pressures
    C. Attachment main relief pressures
    D. Swing relief pressures

    CAUTION: IF NEW MAIN HYDRAULIC PUMPS HAVE BEEN INSTALLED, ACTUATE ALL HYDRAULIC FUNCTIONS SLOWLY AND CAREFULLY UNTIL THE SYSTEM RELIEF PRESSURES HAVE BEEN SET AND ADJUSTED PROPERLY.

    CAUTION: CHECK ALL MACHINE FUNCTIONS FOR PROPER OPERATION.

30. Remove main hydraulic return filter(s) and bypass assembly. Install new main return filter(s), clean bypass assembly and reinstall.

31. Install a new case drain filter assembly.

32. Clean, or replace, the pilot system filter assembly.

33. After 8 hours of operation, repeat steps 30 - 32.

34. After 50 hours of operation, repeat steps 30 - 32.

35. Return to recommended maintenance intervals.

    NOTE: A QUALITY OIL SAMPLING PROGRAM IS HIGHLY RECOMMENDED IN ORDER TO DETERMINE COMPONENT WEAR AND POSSIBLE FAILURE AREAS.

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: AUGUST 31, 1992

BULLETIN: HE-217 / WL-111

AFFECTED MODEL: ALL

AFFECTED SERIAL NUMBER: ALL

SUBJECT: Three Bond Sealants

Three Bond sealants and locking agents are mentioned throughout most all of our workshop manuals. The following list of Three Bond suppliers should be utilized in procuring these products. Contact the office nearest your location for the name of a dealer in your local area.

List of Manufacturers or Suppliers of THREE BOND Sealants

THREE BOND INTERNATIONAL INC.

Addr: 150 East 52nd St. (32nd Fl.)
New York, NY 10022
U.S.A.

Tel: 212-750-0611
Fax: 212-750-0612

THREE BOND OF AMERICA INC.
(THREE BOND CO., LTD. R & D
LOS ANGLES REPRESENTATIVE OFFICE)

Addr: 20815 Higgins Court
Torrance, CA 90501
U.S.A.

Tel: 213-320-3342
Fax: 213-618-9507

THREE BOND U.S.A. INC.
(THREE BOND CO., LTD., SALES DIV.
CINCINNATI REPRESENTATIVE OFFICE)

Addr: 6184 Schumacher Park Dr.
West Chester, OH 45069
U.S.A.

Tel: 513-779-7300
Fax: 513-779-7375

THREE BOND U.S.A. INC.
DETOROIT BRANCH

Addr: 2000 Town Center, Suite 1480
Southfield, Michigan 48075
U.S.A.

Tel: 313-353-2225
Fax: 313-353-2633

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: March 1, 1996

BULLETIN: HE-219A (Replaces HE-219)

SUBJECT: KOBELCO Machine Paint

AFFECTED MACHINES: All Mark II, Mark III, and Mark IV Excavators

This bulletin is to clear up any questions related to the KOBELCO Excavator paint part numbers. For paint part numbers for any other machines not listed, please refer to Parts Bulletin 93PB045-C.

KOBELCO AMERICA INC. PAINT

MARK II BEFORE MINOR CHANGE MACHINES

PART NUMBER	DESCRIPTION
KSP1000-501Y	YELLOW, 1 GALLON
KSP1000-501B	BLUE, 1 GALLON
KSP1000-512Y	YELLOW, SPRAY
KSP1000-512B	BLUE, SPRAY

MARK II AFTER MINOR CHANGE MACHINES

PART NUMBER	DESCRIPTION
KSP1000-601Y	YELLOW, 1 GALLON
KSP1000-601B	BLUE, 1 GALLON
KSP1000-612Y	YELLOW, SPRAY
KSP1000-612B	BLUE, SPRAY

MARK III BEFORE MINOR CHANGE MACHINES

PART NUMBER	DESCRIPTION
KSP1000-701Y	YELLOW, 1 GALLON
KSP1000-701B	BLUE, 1 GALLON
KSP1000-712Y	YELLOW, SPRAY
KSP1000-712B	BLUE, SPRAY

MARK III AFTER MINOR CHANGE MACHINES
AFFECTED SERIAL NUMBERS: SK120 YPU0501~, SK200 YQU0701~, SK220 LLU0601~

PART NUMBER	DESCRIPTION
KSP1000-801Y	YELLOW, 1 GALLON
KSP1000-801B	BLUE, 1 GALLON
KSP1000-812Y	YELLOW, SPRAY
KSP1000-812B	BLUE, SPRAY

MARK IV AFFECTED SERIAL NUMBERS:
SK60 LE17596~, SK60 LEJ0201~, SK100 YWU1001~, SK120 YPU1001~, SK150 YMU1001~, SK200 YQU2001~, SK220 LLU1201~, SK270 LBU1001~, SK300 YCU0301~, SK400 YSJ0002~, SK400 YSU0201~

PART NUMBER	DESCRIPTION
KSP4000-101S	SILVER, 1 GALLON
KSP4000-201G	GRAY, 1 GALLON
KSP1000-801Y	YELLOW, 1 GALLON
KSP4000-112S	SILVER, SPRAY
KSP4000-212G	GRAY, SPRAY
KSP1000-812Y	YELLOW, SPRAY

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

KOBELCO *Designated*
ESSENTIAL SERVICE ITEM

DATE: March 1997

BULLETIN: HE-224B (Replaces HE-224A)
Page 1 of 3

SUBJECT: Mechatronics Trouble Shooting Kit (KPM010007002)

AFFECTED MACHINES: All Mark III
SK 60 IV
SK 150LC IV ~ SK400LC IV

The **Mechatronics Trouble Shooting Kit [harness checker] (p/n KPM 01000 7002),** is a service tool that will give you the ability to check the mechatronics controller inputs and outputs, as well as assisting you in locating harness problems such as bad connections, shorts, and sensor conditions.

This tool is highly recommended for quick and precise trouble shooting of the Mark III Mechatronics Systems, (and Mark IV units as well).

- While this kit was originally released for use on the Mark III machines, it can be very useful in testing and trouble shooting the Mark IV units.
- The Mechatronic systems on both version machines are almost identical, and use the same theory of operation, in almost all aspects.
- Many of the component wiring harness connectors/couplers are the same, and the Harness Checker test harnesses will connect to them. These can be helpful for testing individual components.
- *There are some connector/coupler differences, in the areas of the intermediate harness connectors, and the Mark IV style relays, located in the controller area of the cab.*
- ***In the future, additional test harnesses will be made available, to make this kit more comprehensive in it's scope of coverage for the Mark IV units.***
- The *Electrical System and Mechatronics Troubleshooting Manual*, that is supplied with this kit, can be used for reference on the MK IV units. *However; be aware that there are some differences in the wiring color codes and test reading values.*

The Kobelco America Product Support Section, has designated this Test Kit as an ***Essential Service Item****, and recommends that one be stocked in your Service Department Tool Room, and be available to be carried on your field service trucks, when necessary.*

Please, contact the **Kobelco America Parts Department** for price and availability. Please remember, if ordered on a parts stock order, your normal discounts will apply.

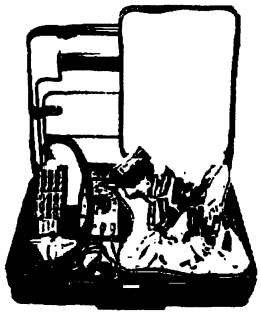
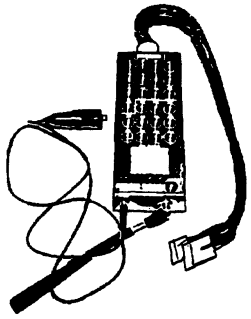
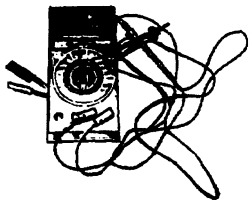
THIS BULLETIN IS BEING ISSUED FOR INFORMATION ONLY AND IS NOT AN AUTHORIZATION FOR ANY REPLACEMENT OR WARRANTY CLAIM SUBMITTAL.

MECHATRONICS TROUBLE SHOOTING KIT (harness checker) p/n KPM 01000 7002

ITEM NO.	PART NUMBER	DESCRIPTION	QUANTITY
1	KPM010007S04041	Harness	1
2	KPM010007S04061	Harness	1
3	KPM010007S04091	Harness	1
4	KPM010007S04022	Harness	1
5	KPM010007S04032	Harness	1
6	KPM010007S04042	Harness	1
7	KPM010007S04131	Harness	1
8	KPM010007S04241	Harness	1
9	KPM010007S04301	Harness	1
10	KPM010007S04201	Harness	1
11	KPM010007S01	Harness Tester	1
12	KPM010007S02	Carrying Case	1
13	KSP 9000-0001	Multimeter	1
14	92-SK200008(1)	Manual	1
*15	KSP 9000-0002	Test Resistor	1

Please Note: At the present time, these items are provided as a "kit only" (if individual items are needed, they can be provided on a special order basis).

* Only kits shipped after January, 1995 will contain this item.

Description	Part Number	Shape	Uses
Mechatronics Trouble Shooting Kit	KPM010007002		Check Mechatronics: 1. Controller 2. Sensors 3. Wiring & Connections
Harness Tester	KPM010007S01		Tee into controller and wiring harnesses to use multimeter to locate problems. Tee into sensors to check conditions using multimeter. Incorporates 24 LED's to indicate connections and circuit activity.
Multimeter	KSP9000-0001		Used with harness tester to test circuits.
Harness Case with Test Harnesses	N/A		Case holds ten (10) harnesses for testing the mechatronics system.

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: May 31, 1993

BULLETIN: HE-227
Page 1 of 2

SUBJECT: Special Attachments (Hydraulic Hammers)

AFFECTED MACHINES: All Excavators

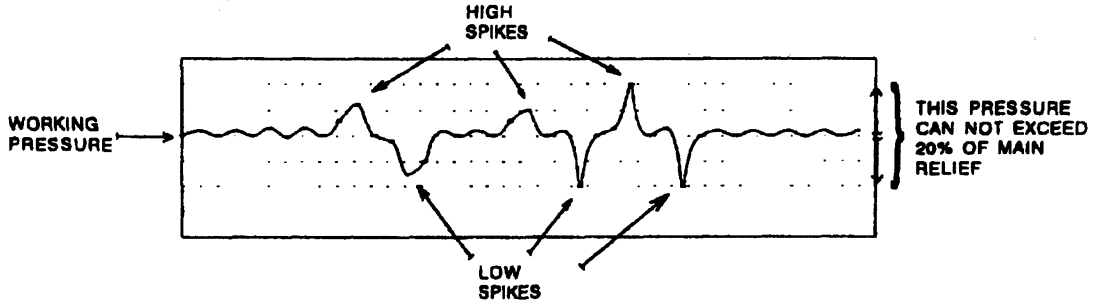
1. All hammer installations require high pressure accumulators unless testing is done and verified to meet the requirements shown in Item #5.

2. Low pressure accumulator is required if return oil from the hammer goes through the oil cooler.

3. A 10 micron filter is required when returning oil from the hammer to the hydraulic tank.

4. Check Service Bulletins for possible arm, bucket link reinforcement, and possible pin change when using hammer.

5. Test criteria to be met if hammer is to be installed without high pressure accumulator.
   a. Test is to be done in the H-Mode.
   b. Hydraulic oil temperature 122 to 140 Fahrenheit.
   c. Test done at pump on oscilloscope at 40 inches per second pressure between high side and low side of spike (can not exceed 20% of the main relief setting). See graph below.



6. All hydraulic hammer applications are severe duty in nature. KOBELCO AMERICA has developed this special maintenance schedule for machines with hydraulic hammers. Maintenance intervals on the servicing of the hydraulic oil should be as noted on the following chart:

	Hammer Work 100%	Hammer Work Alternately 50% or less	Excavator Work Only
Replacement Interval (hr)	500	1,000	2,000

7. Service of hydraulic tank fill cap valves are vital to the protection of the hydraulic pump. Specifications on cap valves:
    a. Suction valve opens at 7.1 PSI vacuum.
    b. Pressure valve relieves at 9.99 PSI.

8. For hydraulic systems that have the hydraulic tanks pressurized by an air compressor mounted to the engine, the air reduction valve and safety valve must be in correct operating order.
   Specifications are as listed below:
    a. Air reduction valve pressure:
        1. All models except K909LCII and MD240BLC: 8.5 PSI.
        2. K909LCII and MD240BLC: 4.5 PSI.
    b. Safety valve relief pressure: 17 PSI (all models).

To assist you with Item 4, we have incorporated a list of all hydraulic hammer service bulletins up to the current date (05/31/93).

Hydraulic Hammer Bulletins:

1.	HE-044-A	Summary of hydraulic system for special attachments (K903B, K904D, K904, K907C)
2.	HE-048	Installation kits (K907C, K909A)
3.	HE-049	Installation of accumulators (K907C, K909A)
4.	HE-051	Arm reinforcement when installing special attachments (K907C, K909A)
5.	HE-057	Guidelines when installing hydraulic hammer (All models)
6.	HE-070	Arm reinforcement for special attachments (K903B, K904D, K905, K907B)
7.	HE-073	Pins for special attachments (K907C)
8.	HE-075	Preventative maintenance (BK07, BK09 - Hydraulic Hammers)
9.	HE-094	Return filter for hydraulic special attachments (K907C)
10.	HE-097	Arm reinforcement for special attachments (K907C, K909A)
11.	HE-100	Arm reinforcement for special attachments (K907D)
12.	HE-101	Arm reinforcement for special attachments (K912A)
13.	HE-105	Summary of hydraulic systems for special attachments (K904E, K905A)
14.	HE-107	Piping for breaker and/or nibbler (K912A)
15.	HE-118	Pins for special attachments (K904E, K905A)
16.	HE-120	Hydraulic system for special attachments (K907DLC)
17.	HE-121	NPK breaker piping (K907DLC)
18.	HE-122	Breaker piping (K907II)
19.	HE-123	Breaker piping (K909II)
20.	HE-124	Special modifications for breaker (K907II, K909II)
21.	HE-141-B	Arm reinforcement for special attachments (K904II)
22.	HE-142-B	Arm reinforcement for special attachments (K905II)
23.	HE-150	Auxiliary hydraulic return filter for special attachments (All Mark II)
24.	HE-185	Hydraulic hammer installation kits (K905LCII, K907LCII, K909LCII)

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KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: May 31, 1993

BULLETIN: HE-230
Page 1 of 4

SUBJECT: Engine and Hydraulic Oil Cooling Systems

AFFECTED MACHINES: All Excavators

All Kobelco and Yutani excavators are designed, engineered, and manufactured for the ability to operate in ambient temperatures exceeding 100° F (37.8° C).

However, in order to retain this ability, it is imperative that the engine and hydraulic oil cooling systems be properly maintained.

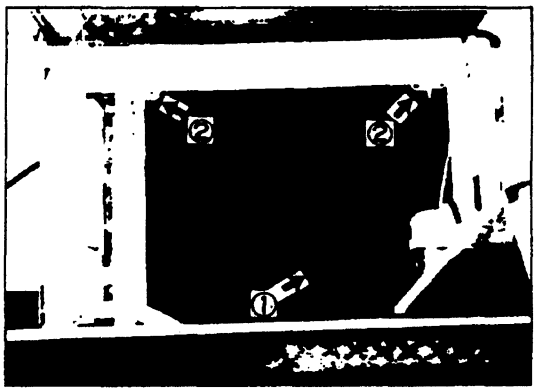
Many of our newer models are equipped with removable protector screens in front of the hydraulic oil coolers, to help prevent blockage of the oil cooler and radiator fins.

Even with these in place, it is possible (in some circumstances) for small pieces, such as milk weed "fuzz", cotton wood "fluff", or fine grass particles, to pass through the screen and block the oil cooler or radiator fins. The fins can appear outwardly clean, on the surface, but in fact can have reduced air flow between the core tubes.

In some instances, if cooling systems are <u>not maintained properly</u> on a regular basis, fin blockage can occur. This can require the removal of the hydraulic oil cooler and/or engine radiator for thorough cleaning of their exterior fins.

Virtually no two operating conditions are ever the same, so the need (and intervals) to clean the radiator and/or oil cooler fins, can vary greatly from job to job.

The following example of fin cleaning and intervals is from the SK300III Operators Manual:



Cleaning the Radiator Fins

⚠ CAUTION

<u>Wear safety goggles when using compressed air.</u>

- High -pressure air/tap water can damage the fins; therefore, spray with the nozzle at least 500 mm (19.7") from the fins.
- Cleaning interval ... Every 500 hours or when needed

Cleaning the Oil Cooler Protector

- If you are working in a dusty area, check the protector (1) each day. If the protector is clogged, loosen the wing bolts (2) and clean the protector (1).

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The best rule of thumb on checking for fin blockage is: "if light can not be seen through the fins, then air can not pass through them either.

During normal maintenance, the fins should be checked for blockage using a droplight or flashlight placed inside the fan shroud on the engine side of the radiator (with E/G stopped). By moving the light over the entire radiator surface, it should be visible enough through the radiator and oil cooler fins to be seen on the oil cooler side. If the light can not be seen through the fins, the radiator and/or oil cooler should be cleaned as mentioned previously.

Also, while performing normal maintenance in these areas, the foam rubber "insulators", "packings", or "cushions", as noted in the example below, should be checked for their presence and condition. **CAUTION: These items are essential to allowing the cooling system to operate at designed efficiency levels, and produce the proper heat balance and air flow within the system. If these are missing or damaged, they must be replaced; otherwise, overheating can occur.**

The following examples of these items are from the SK220III Parts Manual:

Power Plant Assy.

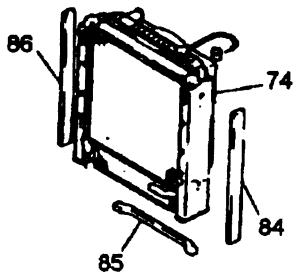


FIG. 291-49-1

Item	Description
74	Radiator Assembly
84	Insulator
85	Insulator
86	Insulator

Radiator Assy.

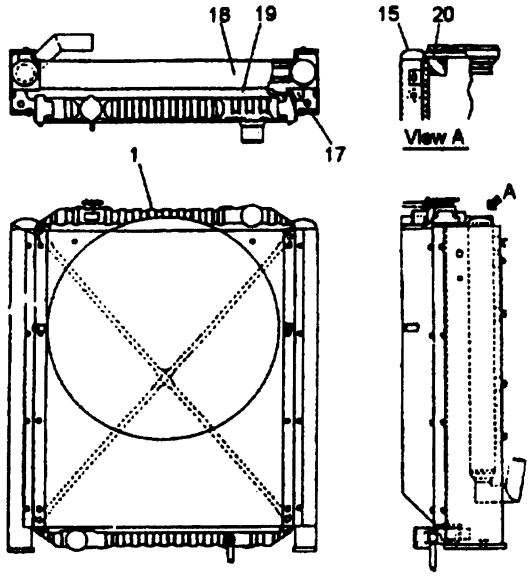
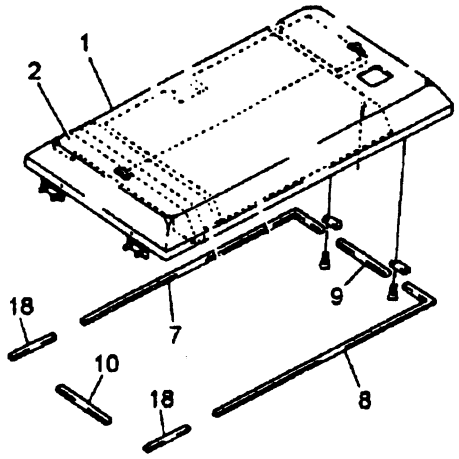


FIG. 321-01-1

Item	Description
1	Radiator
15	Oil Cooler
17	Packing
18	Packing
19	Packing
20	Protector Screen

Cover Assy.

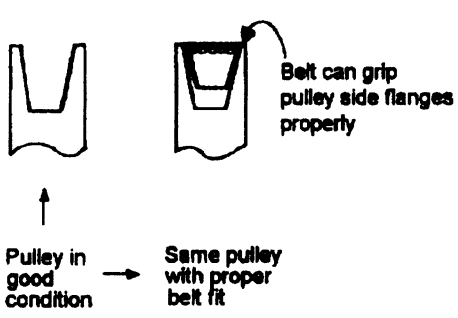


Item	Description
1	Cover
2	Insulator
7	Cushion
8	Cushion
9	Cushion
10	Cushion
18	Cushion

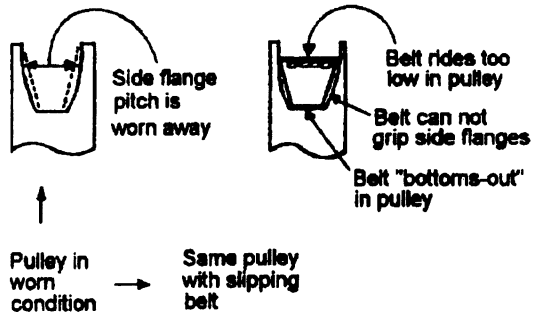
FIG. 101-01-1

Fan belts should be checked for wear and proper adjustment. The larger the engine's fan, the more power and effort is required to drive it. Loose belts can cause: poor battery charging, engine overheat, or early belt and pulley wear.

The pulleys should be checked for wear as shown below. Worn pulleys will make new belts wear rapidly by "bottoming-out".



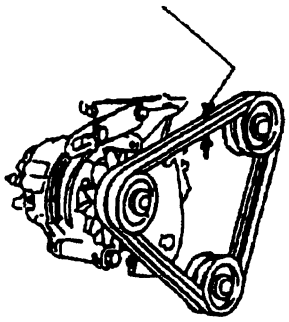
CORRECT



INCORRECT

The following examples are from the Operators Manuals:

Proper tension: 10 - 15 mm (0.39 - 0.59 in)
Deflection at a pressing force of 10 kg (22 lbs)



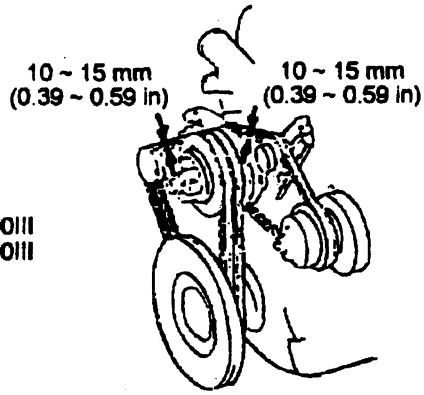
SK60III ~ SK220III

Check the Fan Belt Tension

☞ Loose belts can cause poor battery charging, engine overheat, and early belt wear. On the other hand, overly tight belts can damage the water pump and alternator bearing and can become damaged themselves.

(1) Check:
Check the fan belt tension by pressing the fan belt center with your thumb. If the deflection is about 10 ~ 15 mm (0.39 ~ 0.59 in), the adjustment is correct. Also, check for fan belt damage. If cracking is found, replace the belt with a new one.

☞ • When replacing twin type V-belt, replace them both.



SK300III
SK400III

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: May 31, 1993

BULLETIN: HE-231
Page 1 of 1

SUBJECT: Poor Engine Performance: Spin-on Filters

AFFECTED MACHINES: All Excavators

Several instances of poor engine performance have been traced to over-tightened spin-on fuel filters. These filters are to be tightened by hand only. **DO NOT USE A FILTER WRENCH !**

When this type filter is over-tightened, it distorts internally, and consequently restricts the flow of fuel through it. No external visual indications will be seen at all.

Removing the filter and re-installing with a lesser torque will not necessarily solve the problem. Once over-tightened, the filter is permanently damaged, and must be replaced.

It is possible that the same problem could occur with spin-on oil filters.

Always follow the tightening instructions provided with the filters.

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KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: August 20, 1993

BULLETIN: HE-237
Page 1 of 6

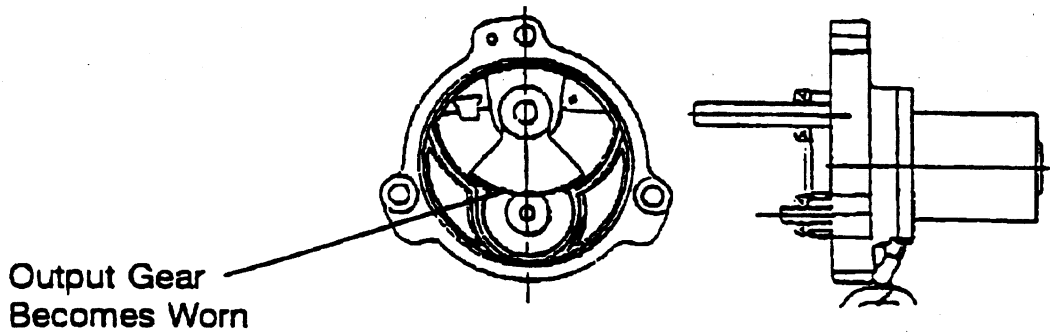
SUBJECT: Stepping Motor

AFFECTED MACHINES:

SK60	-	LE16045 ~	SK200LC	-	YQU0756
SK100	-	YW05356 ~	SK200LC	-	YQU0937 ~
SK120LC	-	YPU0538	SK220	-	LQU0016 ~
SK120LC	-	YPU0576 ~	SK220	-	LLU0663 ~
SK120LC	-	YP01915 ~	SK300	-	YCU0001 ~
SK150LC	-	YM00099 ~	SK400	-	YSU0001 ~
SK200	-	YNU0060 ~			

We have received a report that there is a possibility of a malfunction to the stepping motor due to abnormal wear on the output gear. If this malfunction occurs, the engine RPM drops to an idle or lower, even if the "A" adjustment is made properly. Also, the gap between the governor lever and the high idle set screw becomes larger than the standard value of 0.2 mm, which also causes low RPM's.

To prevent the output gear from becoming worn, the volume of grease inside the stepping motor has been increased to 50 grams. A new part number (#2406U197F4) has been assigned to identify the stepping motor with the increased amount of grease. The new stepping motor is effective on the machines listed above. If the stepping motor is removed, repaired, or replaced, mechatronics "Adjustment A" procedure must be completed from start to finish.



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SERVICE\HE237

The new stepping motor is directly interchangeable with the existing stepping motor. It is possible to use the existing stepping motor, but it is recommended to add additional grease.

Existing	Interchangeability	New
2406U197F3		2406U197F4

New part can be used for existing part
Existing part can be used for new part if additional grease is added.

GREASE SPECIFICATION

TEXACO AIRCRAFT GREASE
CODE 2346 LOW TEMP GREASE EP - OR EQUIVALENT

Appearance		Purplish Brown
Lithium Soap %		14.5
Penetration ASTM @ 77°		
	Worked	275
	Unworked	284
Dropping Point °F		375
Oil Viscosity,	cSt @ 40°C	13.1
	cSt @ 100°C	3.44
	SUS @ 100°F	74
	SUS @ 210°F	38
Guide to Usable Temperature		
	Minimum °F	-100
	Continuous Service Max °F	250
	Short Exposure Max °F	335

This product is qualified against MIL-G-23827B, specification for "Grease, Aircraft, and Instrument, Gear and Actuator Screw". Low Temp Grease EP is intended for use in ball roller and needle bearings, gears and on sliding and rolling surfaces of such equipment as electric motors, instruments, cameras, electronic gear and aircraft control systems. It is suitable for rolling and sliding surfaces of equipment having low motive power (low torque equipment).

If you encounter a machine with the symptoms mentioned, then we recommend that you inspect the stepping motor to determine if it is the cause of the malfunction. This is in addition to any other appropriate troubleshooting steps necessary.

If a worn gear is found, a repair kit is available to repair the existing motor.

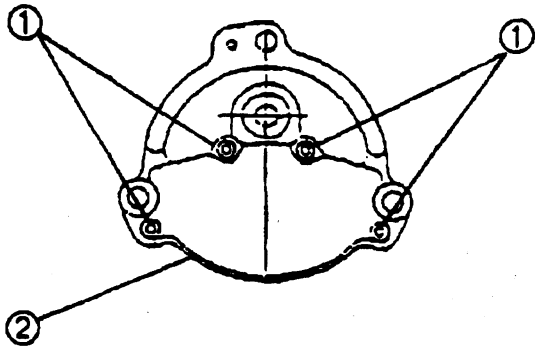
REPAIR KIT #2406U197R100

Item	Quantity	Description
3	1	O-ring
4	1	Machine Screw
10	1	Output Gear
11	1	Second Gear
13	1	O-ring
	50 g	Grease

The disassembly and assembly procedure follows:

Disassembly:

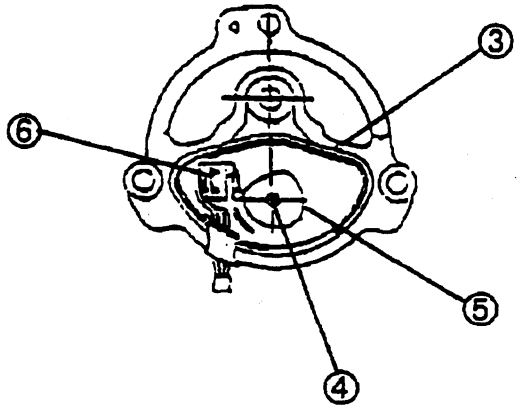
1) Loosen 4 machine screws (1) and remove the switch cover (2).



2) Remove o-ring (3).

3) Loosen 2 machine screws (6) and remove limit switch taking care not to damage the lever of the limit switch.

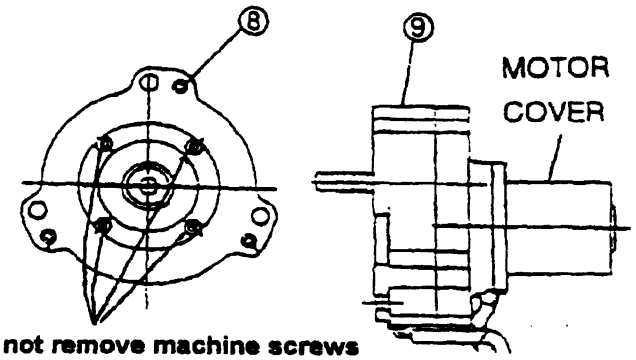
4) Loosen the machine screw (4) and remove the cam (5).



5) Loosen 3 bolts (8) and remove the gear cover (9).

Note: Be sure to clean the output axle before removing the gear cover.

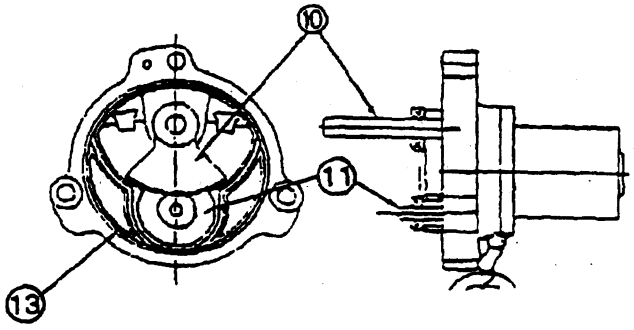
Note: Be sure not to loosen machine screws on the motor cover.



Do not remove machine screws

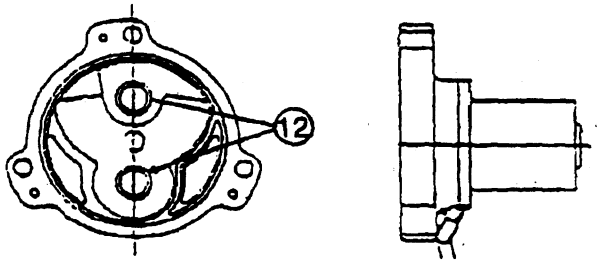
6) Remove the output gear (10) and the second gear (11).

7) Remove the o-ring (13).



8) Remove the leaf springs (12).

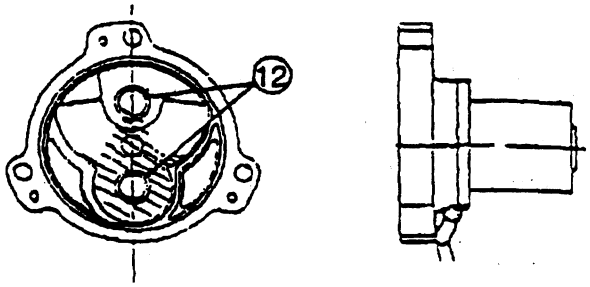
9) Clean out grease and dust in the gear case.



Assembly:

1) Place leaf springs (12) on the gear receivers.

The output gear (10)... 2 springs.
The second gear (11) ... 1 spring.

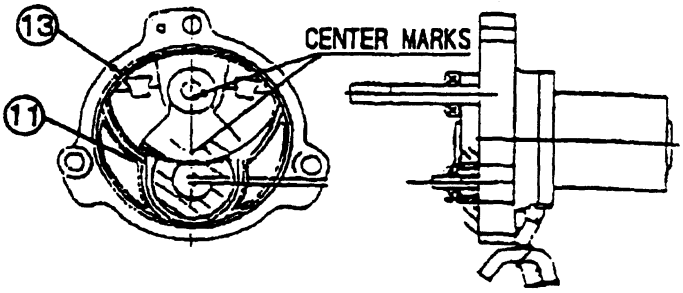


2) Coat the shaded area with grease (about 20 g).

3) Coat the tooth of the second gear (11) with grease and install it.

4) Coat the tooth of the output gear (10) with grease.

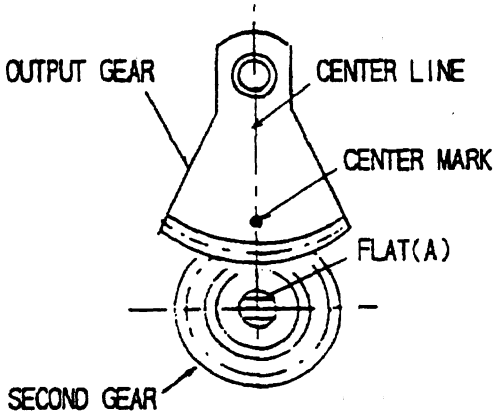
5) Install the output gear (10) so that the center line of the output gear becomes perpendicular to FLAT (A) of the second gear (11) as shown in the figure to the right.



6) Install the second gear (11).

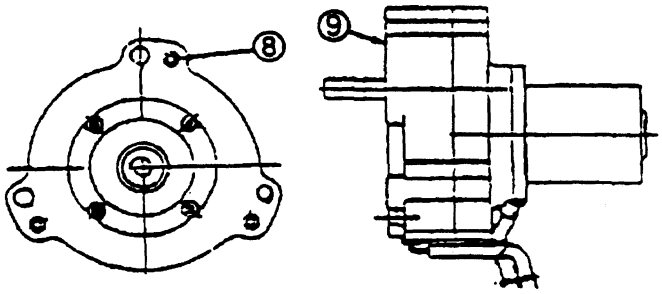
7) Coat the inside of the gear case (9) with grease after installing the output gear (10) and the second gear (11).

8) Install new o-ring (13).



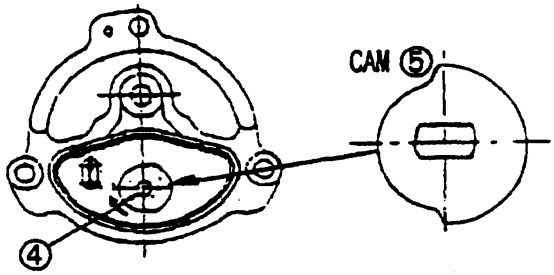
9) Install the gear cover (9) to casing, taking care not to damage the o-ring and tighten 3 bolts (8) to a torque between 23 and 25 kg-cm (20-22 lbs/in).

Note: Coat the threaded area with loctite #221.



10) Install the cam (5) to the center shaft of the second gear (11) with correct direction as shown to the right. Tighten new machine screw (4) to a torque between 23 and 25 kg-cm (20-22 lbs/in).

Note: Coat the threaded area with loctite #221.



11) Install the limit switch temporarily with machine screws (6).

12) There are two types of limit switches in the stepping motor. A bar type and a roller type.

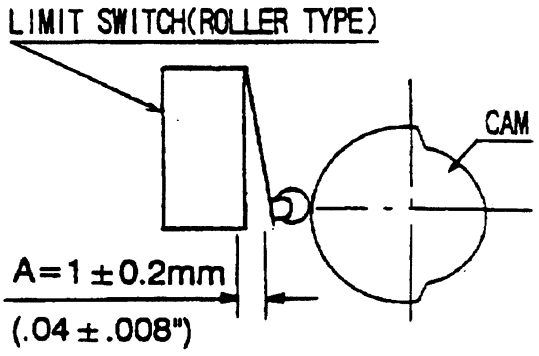
If the arm of the limit switch is the **roller type**, adjust the limit switch according to **Adjustment 1.**

If the arm of the limit switch is the **bar type**, adjust the limit switch according to **Adjustment 2.**

Adjustment 1:

0 1) Adjust clearance A to 1 ± 0.2 mm (.04 ± .008") with a thickness gauge and tighten 2 machine screws (6) to a torque between 3 and 5 kg-cm (2.6 - 4.3 lbs/in).

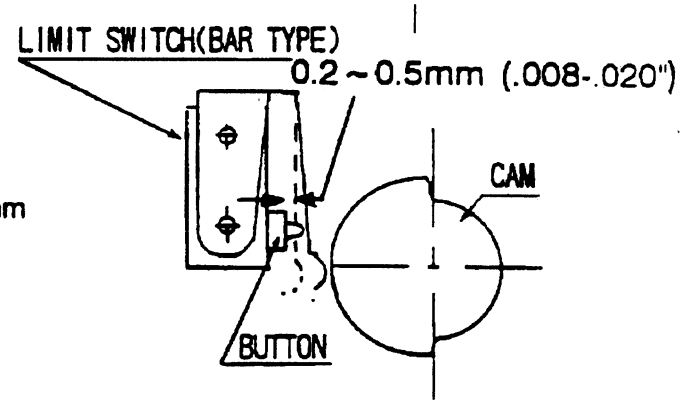
2) Use a volt-ohm meter to test the operation of the limit switch.



Adjustment 2:

1) Adjust the lever position while turning the cam so that the button moves between 0.2 mm and 0.5 mm (.008 - .020") and tighten 2 machine screws (6) to a torque between 3 and 5 kg-cm (2.6 - 4.3 lbs/in).

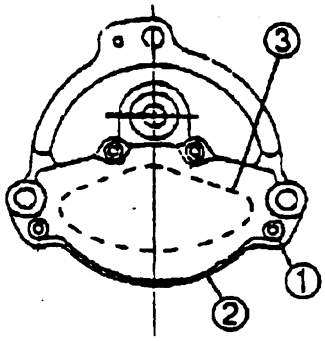
2) Use a volt-ohm meter to test the operation of the limit switch.



13) Install the o-ring (3).

14) Install the switch cover (2) and tighten 4 bolts (1) to a torque between 23 and 25 kg-cm (20-22 lbs/in) taking care not to damage the o-ring (3).

15) Reinstall on machine and complete mechatronics "Adjustment A" procedure. Verify that engine RPM's are within specification.



SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: May 31, 1995

BULLETIN: HE-241A (Replaces HE-241)
Page 1 of 7

SUBJECT: SK400 Mass Excavator Parts List

AFFECTED MACHINES: All SK400LC Mark III and Mark IV machines equipped with Mass Excavator Attachment

The attached parts list details all of the parts that are used for the Mass Excavator Attachment. In most instances, the connecting parts, such as cylinders, pins, bushings, hoses, and linkage, are standard KSL parts.

All of the parts listed in the enclosed data will be available through the Kobelco America Parts Department.

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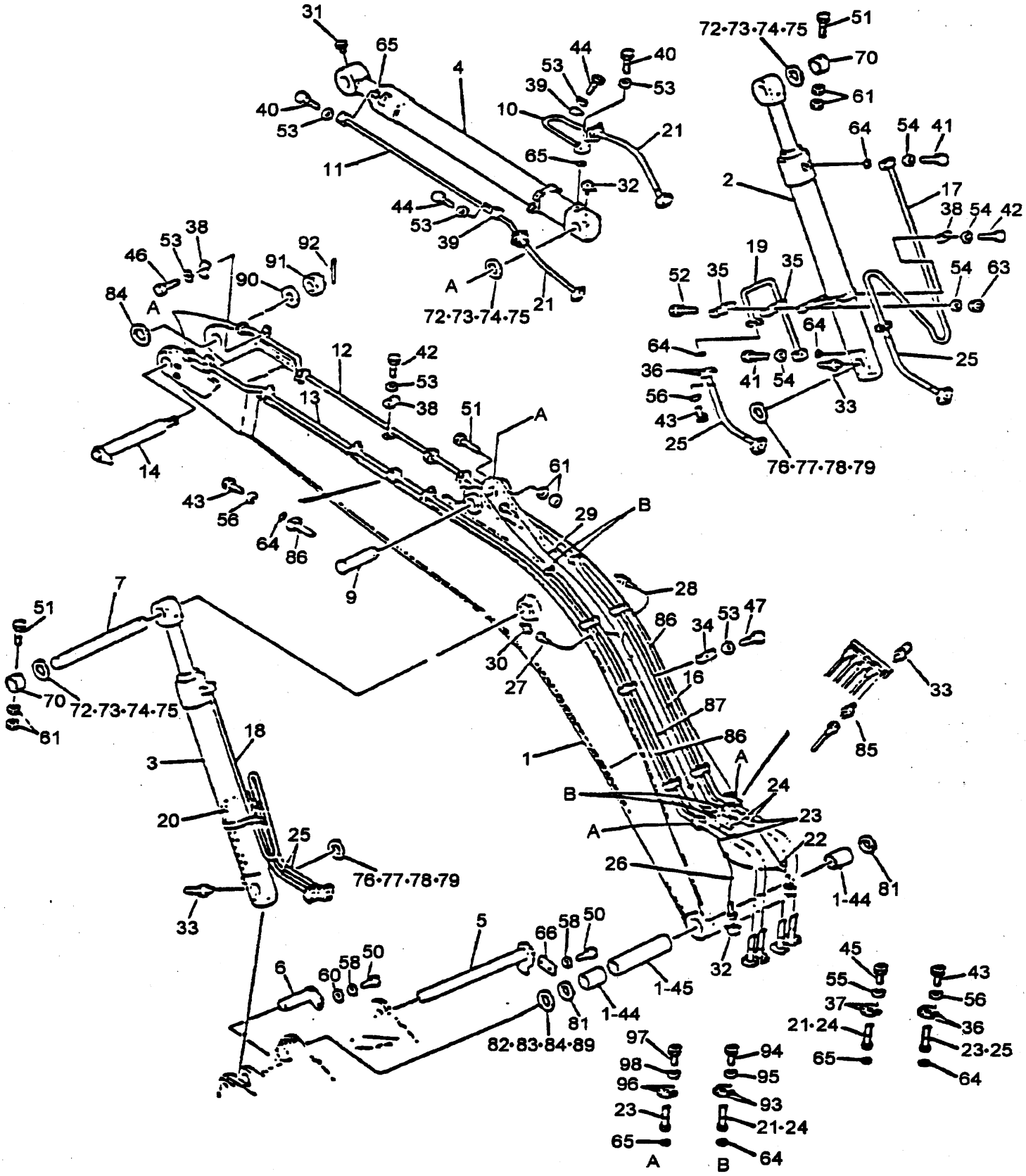
SERVICE\HE241A

Part Number: 02-00-0061
Description: SK400 Mass Excavator Main Boom

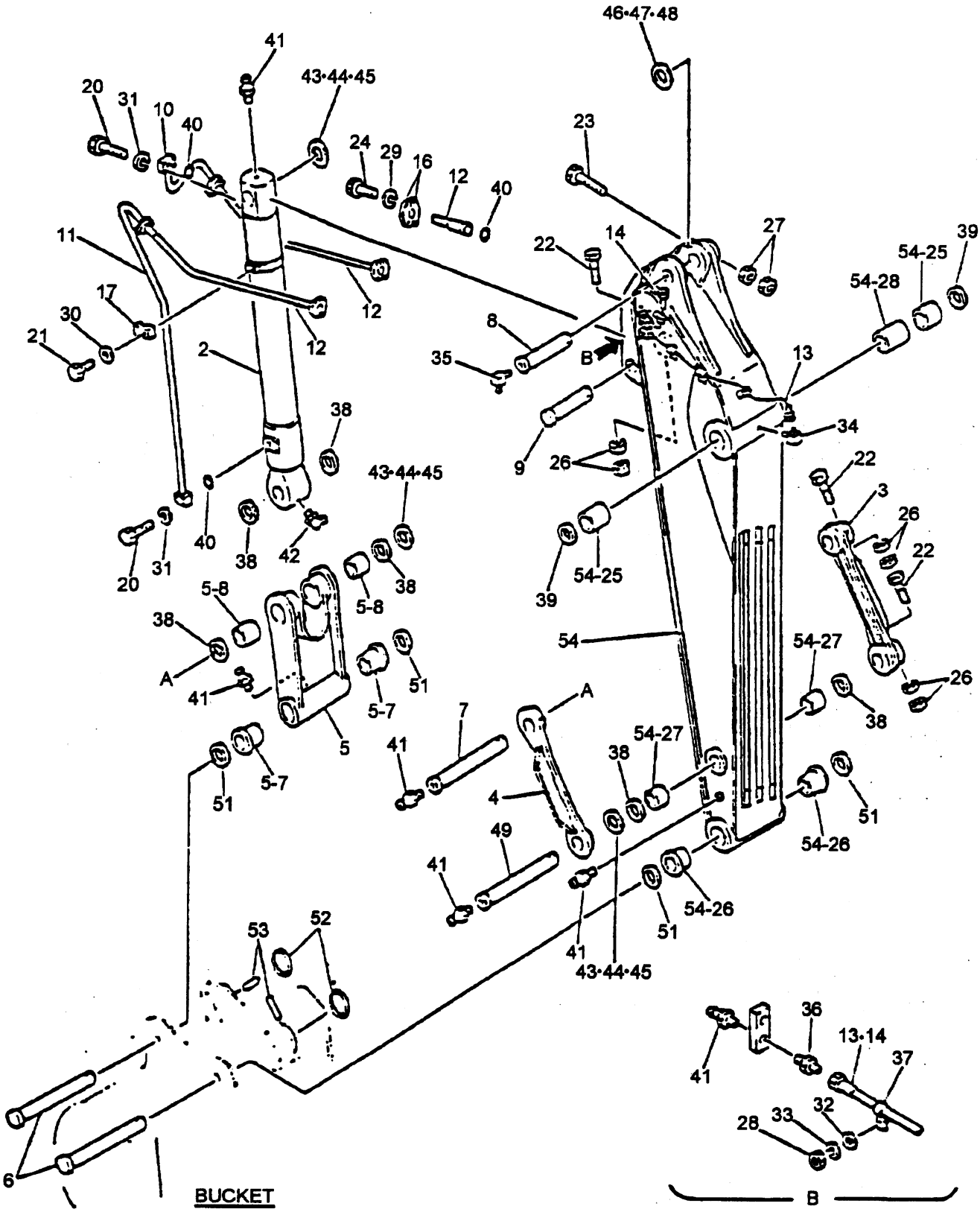


Part Number: 02-00-0061
Description: SK400 Mass Excavator Main Boom

Item	Quantity	Part Number	Description
1	1	02-01-0147	Main Boom Weldment
1-44	2	2405P690	Bushing
1-45	1	241824180	Spacer
2	1	2438U1173F2	Cylinder
3	1	2438U1176F2	Cylinder
4	1	2438U1174F2	Cylinder
5	1	2419P3735	Pin
6	2	2419P3529	Pin
7	1	2419P3526	Pin
9	1	2419P3525	Pin
10	1	2418P26257	Tube
11	1	2418P26258	Tube
12	1	02-06-0203	Tube
13	1	02-06-0203	Tube
14	1	2419P2874 ← 874	Pin
16	1	02-03-0202	Tube
17	1	2418P25308D1	Tube
18	1	2418P25308D2	Tube
19	1	2418P26223D2	Tube
20	1	2418P26223D1	Tube
21	2	2444R1154D4	Hose
22	1	R7-FUFU-04-04-04 CL 45	Hose
23	2	2444R1153D5	Hose
24	2	2444R1154D2	Hose
25	4	2444R1153D3	Hose
26	1	R7-FUFU-04-04-04 CL 48	Hose
27	1	R7-FUFU-04-04-04 CL 119	Hose
28	1	R7-FUFU-04-04-04 CL 122	Hose
29	1	R7-FUFU-04-04-04 CL 136	Hose
30	2	ZH22Z04000	Connector
31	1	ZE82T02000	Plug
32	3	ZH32Z04000	Elbow
33	7	ZG91S02000	Fitting, Grease
34	6	02-06-0031	Clamp
35	4	2432T1264	Clamp
36	16	ZE13X16000	Clamp, Half
37	8	ZE13X20001	Clamp, Half
38	8	02-06-0030	Clamp
39	2	2432T3061	Clamp
40	8	ZS18C14085	Capscrew
41	16	ZS18C12075	Capscrew
42	8	5/8 NC X 2 1/2"	Capscrew
43	56	ZS23C12045	Capscrew

Item	Quantity	Part Number	Description
44	2	ZS18C14080	Capscrew
45	32	ZS23C14045	Capscrew
46	2	ZS18C14060	Capscrew
47	6	5/8 NC X 3 1/4"	Capscrew
48	2	ZW16H20000	Washer
50	4	ZS18C24060	Capscrew
51	3	2420T8164D4	Capscrew
52	2	ZS18C12090	Capscrew
53	24	ZW16H14000	Washer
54	20	ZW16H12000	Washer
55	32	ZW26K14000	Lock Washer
56	56	ZW26K12000	Lock Washer
58	4	ZW16H24000	Washer
60	2	2418T24354	Plate
61	6	ZN18C0016	Nut
63	2	ZN18C12010	Nut
64	18	ZD12P03400	O-Ring
65	10	ZD12P03800	O-Ring
66	1	2418T24342	Plate
67	2	ZS18C20040	Capscrew
69	1	2418T25049	Plate
70	2	2418T23006	Boss
72	3	2420T2571D3	Shim (1.2)
73	3	2420T2571D4	Shim (1.6)
74	6	2420T2571D9	Shim (0.5)
75	3	2420T2571D10	Shim (0.9)
76	2	2420T2747D7	Shim (1.2)
77	2	2420T2747D8	Shim (1.6)
78	4	2420T2747D17	Shim (0.5)
79	2	2420T2747D16	Shim (0.9)
81	2	2445R372D9	Seal, Dust
82	1	2420T2747D26	Shim (1.2)
83	1	2420T2747D27	Shim (1.6)
84	4	2420T2747D28	Shim (0.5)
85	5	2444Z2002	Connector
86	2	02-03-0200	Tube
87	1	02-03-0201	Tube
89	1	2420T2747D29	Shim (0.9)
90	1	R16T0079D2	Washer
91	1	R20P0050D4	Nut
92	1	ZP15D10140	Split Ring
93	8	16PH	Flange
94	32	3/8NC X 1 3/4 GR8	Capscrew
95	32	3/8	Washer
96	8	20PH	Flange
97	32	1/2NC X 1 3/4 GR8	Capscrew
98	32	1/2	Washer

Part Number: 03-00-0068
scription: SK400 Mass Excavator Dipper Parts



Part Number: 03-00-0068
Description: SK400 Mass Excavator Dipper Parts

Item	Quantity	Part Number	Description
2	1	2438U1175F2	Cylinder
3	1	2406N1615D1	Link, Idler
4	1	2406N1615D2	Link, Idler
5	1	2406N1655F1	Link, Bucket
5-7	2	2405T1262	Bushing
5-8	2	2405T921	Bushing
6	2	2419P3582	Pin
7	1	2419P3516	Pin
8	1	2419P3517	Pin
9	1	2419P3518	Pin
10	1	2418P26224	Tube
11	1	2418P26225	Tube
12	2	2444R1153D10	Hose
13	1	R7-FUFU-04-04-04 0A30	Hose
14	1	R7-FUFU-04-04-04 0A48	Hose
16	8	ZE13X16000	Clamp, Half
17	1	2432T2417	Clamp
20	8	ZS18C12075	Capscrew
21	1	ZS18C12065	Capscrew
22	3	2420T8164D3	Capscrew
23	1	2420T8164D4	Capscrew
24	16	ZS23C12045	Capscrew
26	6	ZN18C18015	Nut
27	2	ZN18C20016	Nut
28	4	1/4 NC X 1	Nut
29	16	ZW26K12000	Lock Washer
30	1	ZW16H12000	Washer
31	8	ZW16H12000	Lock Washer
32	4	ZW16X06000	Washer
33	4	ZW26X06000	Lock Washer
34	1	ZH32Z04000	Connector
35	1	2444T2032D2	Connector
36	2	2444Z2002	Connector
37	4	2432R225D3	Clip
38	6	2445R138D9	Seal, Dust
39	2	2445Z1444	Seal, Dust
40	6	ZD12P03400	O-Ring
41	7	ZG91S02000	Fitting, Grease
42	1	ZG91U02000	Fitting, Grease
43	3	2420T2747D2	Shim (1.2)
44	3	2420T2747D3	Shim (1.6)
45	3	2420T2747D4	Shim (2.3)
46	1	2420T2571D3	Shim (1.2)

Item	Quantity	Part Number	Description
47	1	2420T2571D4	Shim (1.6)
48	1	2420T2571D5	Shim (2.3)
49	1	2419P3515	Pin
51	4	2445R372D5	Seal, Dust
52	2	2418T19567	Ring
53	2	2419T6002D4	Pin
54	1	03-01-0203	Arm
54-25	2	2405T1334	Bushing
54-26	2	2405T1884	Bushing
54-27	2	2405T920	Bushing
54-28	1	2418T18985	Spacer

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: November 20, 1993

BULLETIN: HE-243
Page 1 of 3

SUBJECT: Reports of perceived overheating in ambient temperatures above 85°F

AFFECTED MACHINES: All Mark III

There have been comments from the field concerning Mark III models thought to be running hotter than normal, and perceived to be overheating. Although this was not a comment heard concerning the Mark II units, it has been reported on the Mark III units operating in ambient temperatures above 85°F.

Investigation into these reports have found that the normal operation of the Mark III style water temperature gauge has been misinterpreted. Hopefully the following information will clarify any misconceptions concerning this issue.

The Mark II units used an **analog type** engine temperature gauge marked with green and red zones. On those units, anywhere in the green zone was considered normal operating area. The red zone was considered an overheat area.

The Mark III units use an **illuminated bar type (LCD)** gauge that consists of six (6) green bars and one (1) red bar. (Please refer to the attached page for an example of what the relationship between the bars and water temperatures are.)

When operating the Mark III units, the bar type temperature gauges will illuminate up to the fifth (5th) or sixth (6th) green bar. If the side panels are opened and the unit is continued to be operated, the indicated temperature may drop to the fourth (4th) or fifth (5th) green bar respectively (approximately one bar lower). **This is a normal condition!**

Customers and dealer service personnel are **perceiving** this as an indication that these units are overheating. **As with the Mark II units, any indications within the "green zone" are considered to be normal. The units should not be considered to be overheating unless the flashing red bar is illuminated in conjunction with the warning buzzer and "water temp" icon on the multi-purpose display of the LCD cluster gauge.** (On the SK300-III and the SK400-III units, the engines will be automatically idled-down if this occurs.)

The Kobelco excavators' coolant temperature will normally run approximately 100°F above the prevailing ambient temperature. By making reference to the attached chart, you can see that on an 85°F ambient day, the engine temperature gauge would be illuminated to the 5th green bar. On a 98°F ambient day, the temperature gauge could be illuminated to the 6th green bar.

THIS BULLETIN IS BEING ISSUED FOR INFORMATION ONLY AND IS NOT AN AUTHORIZATION FOR ANY REPLACEMENT OR WARRANTY CLAIM SUBMITTAL.

Example: 85°F ambient day + 100°F = 185°F coolant temperature (5th green bar)
98°F ambient day + 100°F = 198°F coolant temperature (6th green bar)

Again, any indication in the green bar area is considered the normal range.

To operate the temperature gauge and the overheat alarm system, there are two separate sending units utilized. A **variable-type thermo sender** operates the green bar section of the temperature gauge, and an **off/on-type thermo switch** operates the red bar, the warning buzzer, and the "water temp" icon. As the chart indicates, the overheat area occurs at 105 ± 3°C or 221 ± 5°F. When this temperature is reached, the thermo switch closes and the red bar is illuminated, along with the buzzer and icon being switched on. **When this happens, all green bars are turned off!**

As with most electrical components, these sending units are manufactured within a certain tolerance range. If the thermo switch is closing at a temperature outside its tolerance range (too low), then you would see a false overheat indication. **These senders should always be checked for proper operation, if investigating an overheat complaint.**

The attached chart shows the Mark III engine thermostat action. On the Isuzu powered units, they start to open @ 180°F and should be fully open @ 203°F. On the Mitsubishi powered units, they start to open @ 170°F and should be fully open @ 194°F. As with the sending units mentioned above, thermostats are also manufactured within a certain tolerance range. Engine coolant temperatures can run slightly higher than the fully open set point of the thermostat.

The thermostats used in the Mark II and the Mark III models are the same.

Conclusion:

With the cooling systems operating properly, all of the Mark III engines' coolant temperatures will be at or above 200°F. These temperatures are normal and necessary for proper engine thermal efficiency and emissions control.

Because of the factors stated above, all of these units can be expected to indicate in the 5th or 6th green bar while operating, depending upon work load. (Please note the tolerance factors on the temperature gauge chart actually provide for an "overlap" of the temperatures indicated at each green bar.)

It is because of these tolerances that the indicated temperatures are sometimes seen to drop slightly to a lower green bar if the units are operated with the side panels open, as previously mentioned.

This is a normal condition and should not be perceived as a problem.

The units are designed to operate with the side panels closed for proper air flow and heat balance.

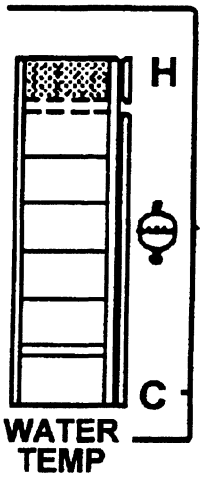
If any units set off the overheat alarms, they should be checked for proper temperature gauge and sender operation, and for proper cooling system maintenance and operation, as per the previously published service bulletin, HE-230.

MARK III WATER TEMPERATURE GAUGE

QUESTION

What are the relations between the bar positions of the water temperature gauge and the cooling water temperature?

ANSWER



Red lamp (Overheat)	105 ± 3° C	102 ~ 108° C	216 ~ 226° F
	97 ± 5° C	92 ~ 102° C	198 ~ 216° F
	90 ± 5° C	85 ~ 95° C	185 ~ 203° F
Green lamp (Normal range)	82 ± 5° C	77 ~ 87° C	171 ~ 189° F
	75 ± 5° C	70 ~ 80° C	158 ~ 176° F
	67 ± 5° C	62 ~ 72° C	144 ~ 162° F
	< 67° C		< 153° F

MARK III THERMOSTATS

The following lists the thermostat action of the Mark III engines:

Model	Start to Open	Fully Open
SK60	180° F	203° F
SK100	180° F	203° F
SK120	180° F	203° F
SK150	180° F	203° F
SK200	170° F	194° F
SK220	170° F	194° F
SK300	170° F	194° F
SK400	170° F	194° F

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SERVICE BULLETIN
KOBELCO AMERICA INC.

KOBELCO *Designated*
ESSENTIAL SERVICE ITEM

DATE: March 1997

BULLETIN: HE-245B (Replaces HE-245A)

SUBJECT: Engine Rpm Sensor Test Harness

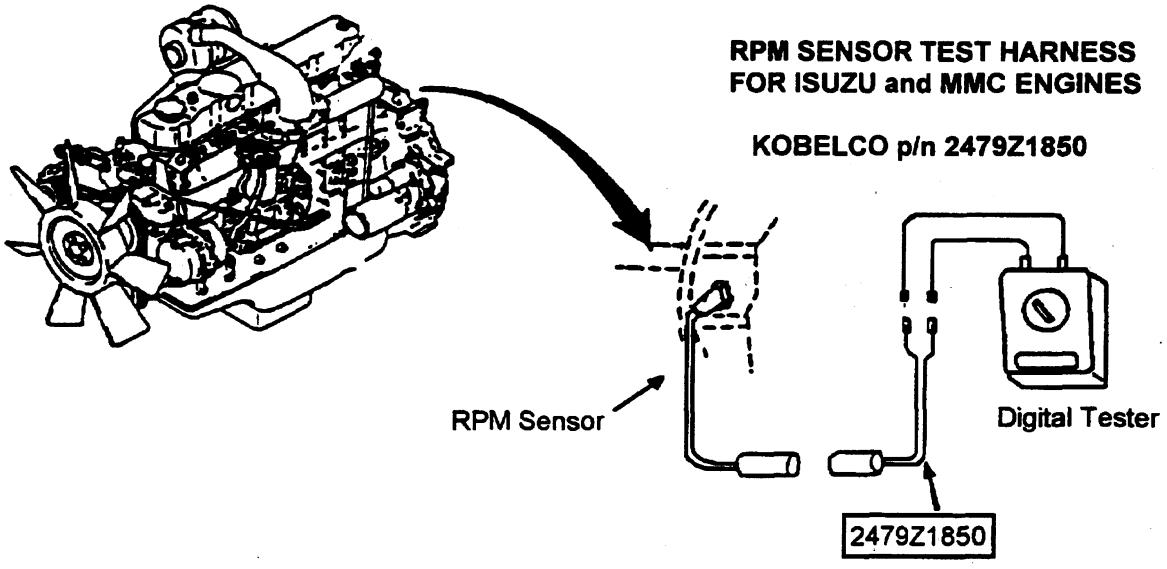
AFFECTED MACHINES: All Mark III Excavators
SK60 IV
SK300 IV, SK400 IV (with MMC engines only)

The previously announced Mark II engine **RPM Sensor Test Harness (p/n 2479Z1850),** can also be used on all Mark III units, the SK60 IV, and the SK300 IV, SK400 IV with MMC engines. This harness enables quick and accurate test readings to be taken from the RPM sensors which are located on the engine flywheel housings.

Please refer to the applicable Mechatronics and/or Shop Manual, or Servicemans' Handbook, for specific adjustment procedures.

*The Kobelco America Product Support Section, has designated this Test Harness as an **Essential Service Item**, and recommends that one be carried on each field service truck, as well as one stocked in your Service Department Tool Room.*

Please contact the **Kobelco America Parts Department** for price and availability.



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SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: April 20, 1995

BULLETIN: HE-256A (Replaces HE-256)
Page 1 of 16

SUBJECT: Dimensions of Attachments, Linkage, and Cylinders
"General Information"

AFFECTED MACHINES: All Mark IV

This bulletin outlines the information concerning the dimensional requirements of bucket to fit the respective machines.

Failure to adhere to these critical dimensions will adversely affect machine digging performance, as well as the ability to attach the bucket or attachment to the machine.

The specifications given in this bulletin are based on the use of genuine parts for linkage, rods, cylinders, support pins, sealing parts, o-rings, sticks, etc., at the bucket connection points.

Material tensile strength, welding, procedures, and design, other than these dimensions, for production of other than genuine parts are not covered under any implied or expressed warranties.

Individual design of attachments, couplers, buckets, etc. can not be strictly controlled or warranted. Always check attachments for interference after installation.

Due to our policy of continual product improvement, all designs and specifications are subject to change without advance notice.

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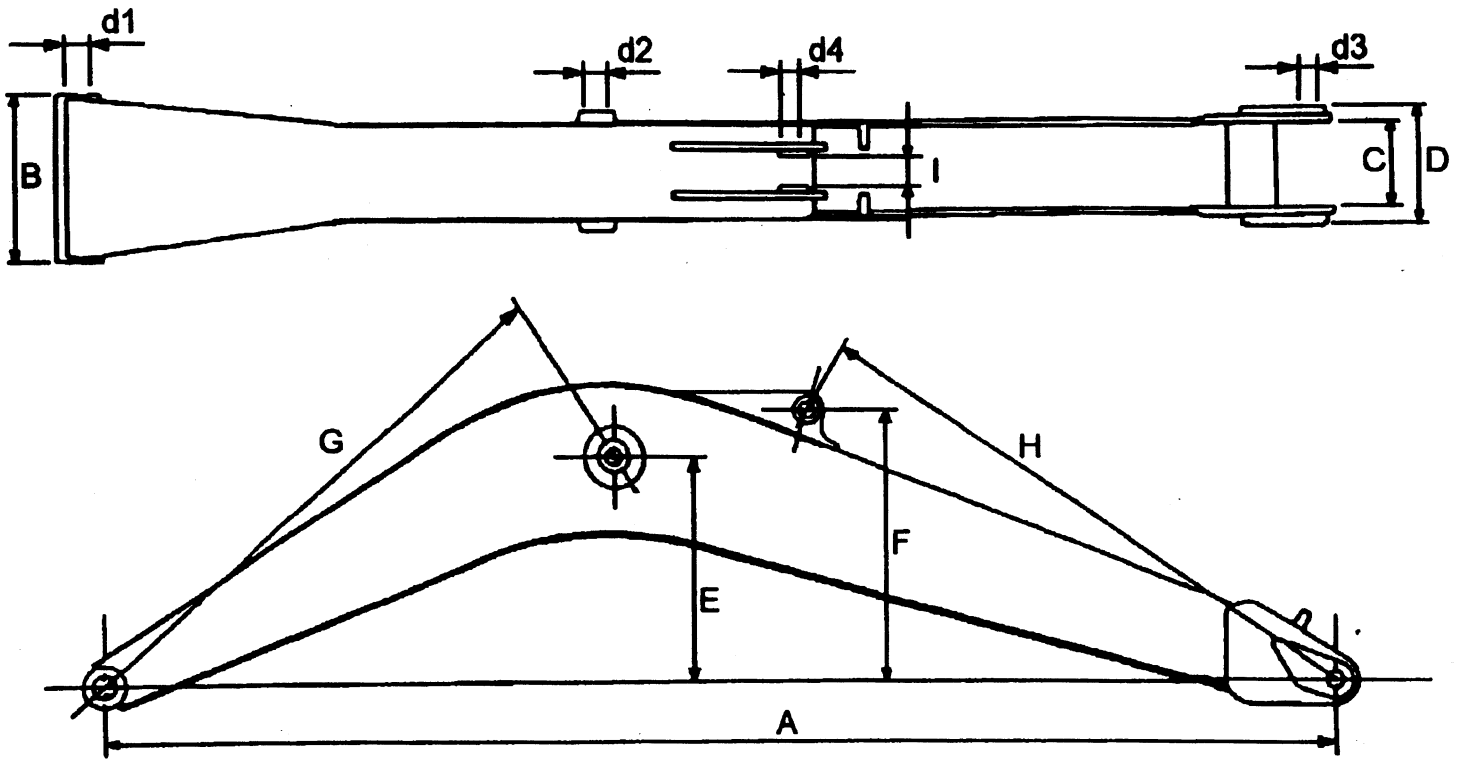
The basic dimensions for a Kobelco machine's bucket are as follows:

Model	Bucket Breakout Force	Pin to Pin * Distance (Bucket Dim. "A")	Pin to Tooth * Clearance (Bucket Dim. "B")
SK60IV	10,870	11.73" (298 mm)	40.94" (1040 mm)
SK100IV	17,000	15.16" (385 mm)	47.64" (1210 mm)
SK120LCIV	17,500	14.96" (380 mm)	48.86" (1241 mm)
SK150LCIV	22,000	16.18" (411 mm)	53.15" (1350 mm)
SK200LCIV	29,000	17.40" (442 mm)	57.08" (1450 mm)
SK220LCIV	33,380	20.23" (514 mm)	59.64" (1515 mm)
SK300LCIV	45,000	21.02" (534 mm)	66.53" (1690 mm)
SK400LCIV	55,000	23.94" (608 mm)	70.08" (1780 mm)

*** Kobelco America Inc. does not authorize any dimensional change in these areas to avoid changes in published breakout forces.**

DIMENSIONS FOR ATTACHMENT - MARK IV

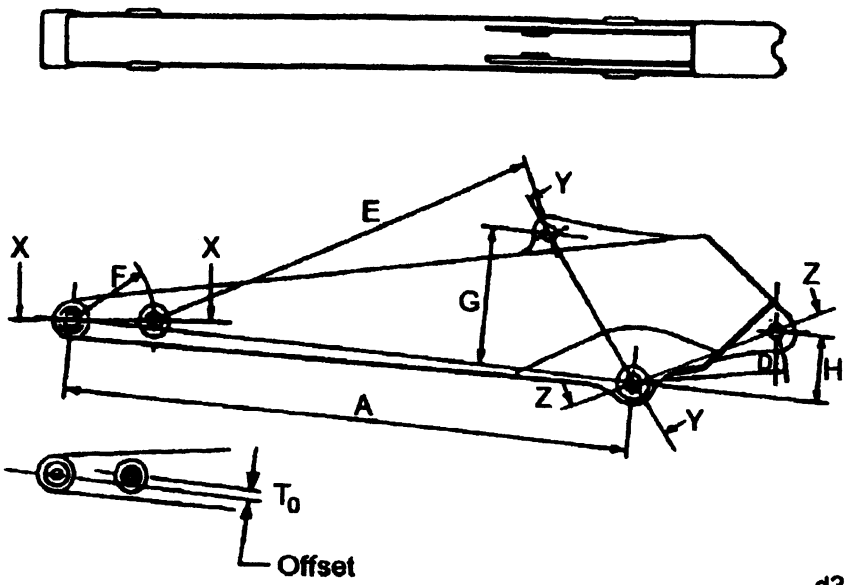
SK60
SK100
SK120
SK120LC
SK150LC
SK200
SK200LC
SK220
SK220LC
SK300LC
SK400LC

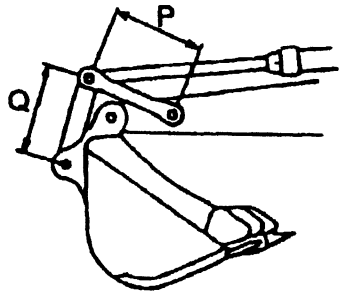


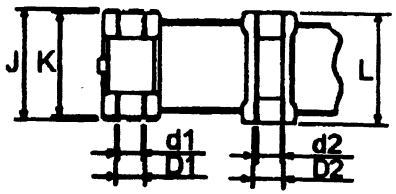
A:	Boom length
B:	Boom foot width
C:	Boom head inside width
D:	Boom head outside width
E:	Height of center pin
F:	Height of arm hydraulic cylinder pin (bottom side)
G:	Distance between pins of boss
H:	Distance between pins of bracket
I:	Arm cylinder inside width (bottom side)
d1:	Diameter of boom foot pin
d2:	Diameter of boom hydraulic cylinder pin (rod side)
d3:	Diameter of boom head pin
d4:	Diameter of arm hydraulic cylinder pin (bottom side)

MARK IV

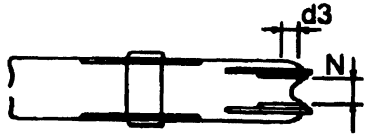
SK60
SK100
SK120
SK120LC
SK150LC
SK200
SK200LC
SK220
SK220LC
SK300LC
SK400LC



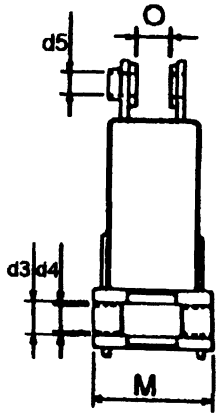




Section X - X



Section Z - Z

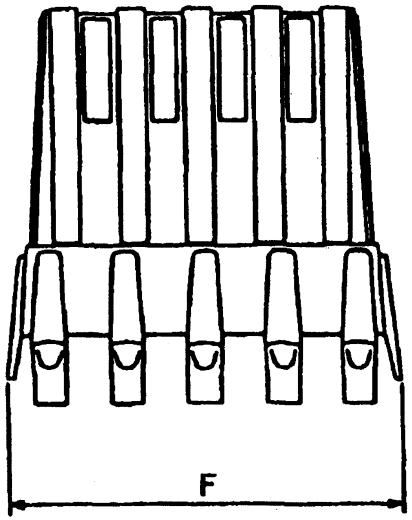


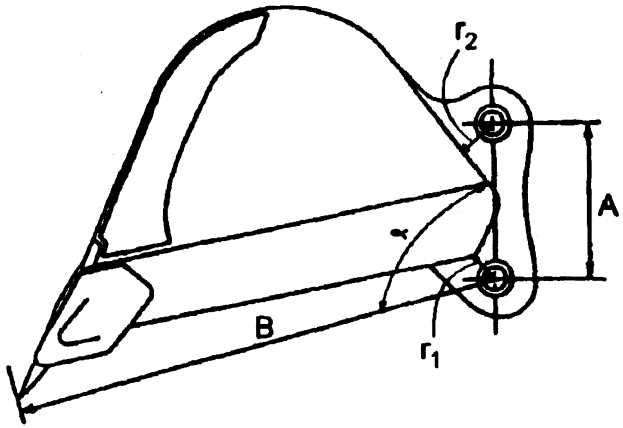
Section Y - Y

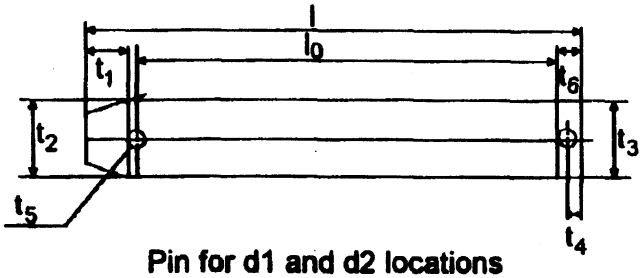
A:	Arm length				
D:	Distance between boss pin and bracket pin	H:	Height between boss pin and bracket pin	P:	Link dimension
D1:	Inside diameter of boss	J:	Arm head width (with bushing)	Q:	Rod dimension
D2:	Inside diameter of boss	K:	Boss width	d1:	Diameter of pin
D3:	Inside diameter of boss	L:	Arm head width	d2:	Diameter of pin
E:	Distance between boss pin and bracket pin	M:	Boss width	d3:	Diameter of pin
F:	Distance between pins of boss	N:	Bracket inside width	d4:	Diameter of pin
G:	Height between boss pin and bracket pin	O:	Bracket inside width	d5:	Diameter of pin

MARK IV

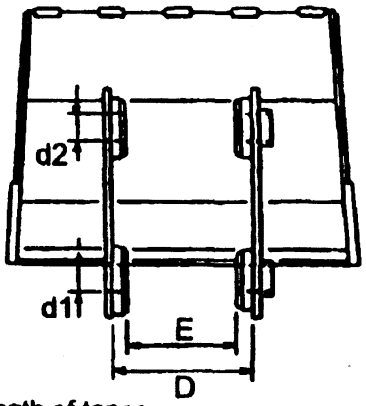
SK60
SK100
SK120
SK120LC
SK150LC
SK200
SK200LC
SK220
SK220LC
SK300LC
SK400LC







Pin for d1 and d2 locations



A: Distance between pins of bracket
B: Distance from bucket pin to tooth head
D: Bracket outside width
E: Bracket inside width
F: Side cutter outside width
r_1: Clearance radius of arm (*for reference only)
r_2: Clearance radius of linkage (*for reference only)

d1: Diameter of pin
d2: Diameter of pin
l: Overall length of pin
l_0: Length under head to center line of retainer hole

t_1: Length of taper
t_2: Diameter of pin
t_3: Diameter of head
t_4: Center line of alignment hole
t_5: Diameter of retainer and alignment hole (2 places)
t_6: Length of pin head

*Individual bucket designs could affect this clearance.

SK60 MARK IV

Unit: mm (ft.-in.)

	BOOM	ARM			BUCKET	
	3.7 M (12'1.6")	1.73 M (5'8.1")	2.15 M (7'.06")			
A	3700 (12'1.6")	1730 (5'8.1")	2150 (7'.06")			298 (11.73")
B	400 (1'3.7")	----	----			R 1040 (R 3'4.9")
C	216 (8.5")	----	----			----
D	304 (11.9")	R 515.5 (R 1'8.3")	R 509 (R 1'8.0")			238 (9.3")
D_1	----	⌀ 65 (⌀ 2.5")	⌀ 65 (⌀2.5")			----
D_2	----	⌀ 65 (⌀ 2.5")	⌀ 65 (⌀ 2.5")			----
D_3	----	⌀ 75 (⌀ 2.9")	⌀ 75 (⌀ 2.9")			----
E	825 (2'8.4")	R 1485 (R 4'10.4")	R 1485 (R 4'10.4")			182 (7.1")
F	1165 (3'9.8")	R 234 (R 9.2")	R 234 (R 9.2")			400 (1'3.7")
G	R 1828 (R 6'0.0")	420 (1'4.5")	420 (1'4.5")			----
H	1817 (5'11")	290 (11.4")	275 (10.8")			----
I	97 (3.8")	----	----		I	361 (14.21")
J	----	180 (7.1")	180 (7.1")		l_0	301 (11.85")
K	----	162 (6.3")	162 (6.3")		t_1	30 (1.18")
L	----	180 (7.1")	180 (7.1")		t_2	$50^{+.150}_{-.210}$ ($1.968"^{+.006}_{-.0082}$)
M	----	214 (8.4")	214 (8.4")		t_3	55 (2.165")
N	----	97 (3.8")	97 (3.8")		t_4	13 (.511")
O	----	87 (3.4")	87 (3.4")		t_5	13 (.511")
P	----	420 (1'4.5")	420 (1'4.5")		t_6	23 (.905")
Q	----	380 (1'2.9")	380 (1'2.9")			----
d_1	⌀ 60 (⌀ 2.3")	⌀ 50 (⌀ 1.9")	⌀ 50 (⌀ 1.9")			⌀ 50 (⌀ 1.9")
d_2	⌀ 55 (⌀ 2.1")	⌀ 50 (⌀ 1.9")	⌀ 50 (⌀ 1.9")			⌀ 50 (⌀ 1.9")
d_3	⌀ 60 (⌀ 2.3")	⌀ 55 (⌀ 2.1")	⌀ 55 (⌀ 2.1")		r_1	128 (5.06")
d_4	⌀ 55 (⌀ 2.1")	⌀ 60 (⌀ 2.3")	⌀ 60 (⌀ 2.3")		r_2	113 (4.43")
d_5	----	⌀ 50 (⌀ 1.9")	⌀ 50 (⌀ 1.9")			
T_0	Offset	28 (1.10")	28 (1.10")			
α						101.75°

SK100 MARK IV

Unit: mm (ft.-in.)

	BOOM	ARM				
	4.26 M (13'11.7")	1.9 M (6'2.8")	2.27 M (7'5.3")	2.77 M (9'1.0")	BUCKET	
A	4260 (13'11.7")	1900 (6'2.8")	2270 (7'5.3")	2770 (9'1.0")		385 (15.16")
B	580 (1'10.8")	----	----	----		R 1200 (R 3'11.3")
C	232 (9.13")	----	----	----		
D	388 (1'3.27")	R 635 (R 2'1.0")	R 622 (R 2'0.4")	R 624 (R 2'0.5")		274 (10.7")
D_1	----	⌀ 75 (⌀ 2.9")	⌀ 75 (⌀ 2.9")	⌀ 75 (⌀ 2.9")		
D_2	----	⌀ 75 (⌀ 2.9")	⌀ 75 (⌀ 2.9")	⌀ 75 (⌀ 2.9")		
D_3	----	⌀ 85 (⌀ 3.3")	⌀ 85 (⌀ 3.3")	⌀ 85 (⌀ 3.3")		
E	913 (2'11.9")	R 1960.5 (R 6'5.1")	R 1962.5 (R 6'5.2")	R 1962.5 (R 6'5.2")		218 (8.5")
F	1034 (3'4.7")	R 350 (R 1'1.7")	R 350 (R 1'1.7")	R 350 (R 1'1.7")		450 (1'5.7")
G	1921 (6'3.6")	515 (1'8.2")	465.5 (1'6.3")	502 (1'7.7")		----
H	R 2131 (R 6'11.8")	280 (11.0")	235 (9.2")	255.5 (10.0")		----
I	102 (4.0")	----	----	----	I	410 (16.14")
J	----	216 (8.5")	216 (8.5")	216 (8.5")	l_0	350 (13.779")
K	----	198 (7.8")	198 (7.8")	198 (7.8")	t_1	30 (1.18")
L	----	216 (8.5")	216 (8.5")	216 (8.5")	t_2	$60^{-.150}_{-.210}$ ($2.362"^{-.006}_{-.0082}$)
M	----	232 (9.1")	232 (9.1")	232 (9.1")	t_3	65 (2.559")
N	----	102 (4.0")	102 (4.0")	102 (4.0")	t_4	13 (.511")
O	----	92 (3.6")	92 (3.6")	92 (3.6")	t_5	15 (.59")
P	----	565 (1'10.2")	565 (1'10.2")	565 (1'10.2")	t_6	23 (.905")
Q	----	545 (1'9.4")	545 (1'9.4")	545 (1'9.4")		----
d_1	⌀ 70 (⌀ 2.7")	⌀ 60 (⌀ 2.3")	⌀ 60 (⌀ 2.3")	⌀ 60 (⌀ 2.3")		⌀ 60 (⌀ 2.3")
d_2	⌀ 75 (⌀ 2.9")	⌀ 60 (⌀ 2.3")	⌀ 60 (⌀ 2.3")	⌀ 60 (⌀ 2.3")		⌀ 60 (⌀ 2.3")
d_3	⌀ 70 (⌀ 2.7")	⌀ 70 (⌀ 2.7")	⌀ 70 (⌀ 2.7")	⌀ 70 (⌀ 2.7")	r_1	120 (4.75")
d_4	⌀ 70 (⌀ 2.7")	⌀ 70 (⌀ 2.7")	⌀ 70 (⌀ 2.7")	⌀ 70 (⌀ 2.7")	r_2	120 (4.75")
d_5	----	⌀ 60 (⌀ 2.3")	⌀ 60 (⌀ 2.3")	⌀ 60 (⌀ 2.3")		----
T_0	Offset	25 (1.0")	15 (.60")	15 (.60")		
.						105°

SK120 MARK IV

Unit: mm (ft.-in.)

	BOOM	ARM			BUCKET	
	4.6 M (15'1.1")	2.1 M (6'10.6")	2.5 M (8'2.4")	3.0 M (9'10.11")		
A	4600 (15'1.1")	2100 (6'10.6")	2500 (8'2.4")	3000 (9'10.11")		380 (14.96")
B	580 (1'10.8")	----	----	----		R 1241.3 (R 4'0.8")
C	275 (10.8")	----	----	----		----
D	386 (1'3.2")	R 670 (R 2'2.3")	R 667.5 (R 2'2.2")	R 681 (R 2'2.8")		324 (12.7")
D_1	----	⌀ 80 (⌀ 3.1")	⌀ 80 (⌀ 3.1")	⌀ 80 (⌀ 3.1")		----
D_2	----	⌀ 75 (⌀ 2.9")	⌀ 75 (⌀ 2.9")	⌀ 75 (⌀ 2.9")		----
D_3	----	⌀ 85 (⌀ 3.3")	⌀ 85 (⌀ 3.3")	⌀ 85 (⌀ 3.3")		----
E	1028 (3'4.4")	R 1876 (R 6'1.8")	R 1876 (R 6'1.8")	R 1876 (R 6'1.8")		252 (9.9")
F	1112 (3'7.7")	R 350 (R 1'1.7")	R 350 (R 1'1.7")	R 350 (R 1'1.7")		735 (2'4.9")
G	2111.5 (R 6'11.1")	490 (1'7.3")	460.5 (1'6.1")	480 (1'6.9")		
H	R 2367 (R 7'9.2")	267 (10.5")	248.5 (9.7")	280 (11.0")		
I	102 (4.0")	----	----	----	I	450 (17.72")
J	----	250 (9.8")	250 (9.8")	250 (9.8")	I_0	390 (15.354")
K	----	232 (9.1")	232 (9.1")	232 (9.1")	t_1	30 (1.18")
L	----	250 (9.8")	250 (9.8")	250 (9.8")	t_2	65^{-150}_{-210} ($2.559^{-.006}_{-.0082}$")
M	----	274 (10.7")	274 (10.7")	274 (10.7")	t_3	70 (2.7559")
N	----	102 (4.0")	102 (4.0")	102 (4.0")	t_4	13 (.511")
O	----	92 (3.6")	92 (3.6")	92 (3.6")	t_5	15 (.59")
P	----	522 (1'8.5")	522 (1'8.5")	522 (1'8.5")	t_6	23 (.905")
Q	----	500 (1'7.6")	500 (1'7.6")	500 (1'7.6")		----
d_1	⌀ 70 (⌀ 2.7")	⌀ 65 (⌀ 2.5")	⌀ 65 (⌀ 2.5")	⌀ 65 (⌀ 2.5")		⌀ 65 (⌀ 2.5")
d_2	⌀ 75 (⌀ 2.9")	⌀ 60 (⌀ 2.3")	⌀ 60 (⌀ 2.3")	⌀ 60 (⌀ 2.3")		⌀ 65 (⌀ 2.5")
d_3	⌀ 70 (⌀ 2.7")	⌀ 70 (⌀ 2.7")	⌀ 70 (⌀ 2.7")	⌀ 70 (⌀ 2.7")	r_1	127 (5.0")
d_4	⌀ 70 (⌀ 2.7")	⌀ 70 (⌀ 2.7")	⌀ 70 (⌀ 2.7")	⌀ 70 (⌀ 2.7")	r_2	120 (4.75")
d_5	----	⌀ 60 (⌀ 2.3")	⌀ 60 (⌀ 2.3")	⌀ 60 (⌀ 2.3")		----
T_0	Offset	20 (.80")	20 (.80")	20 (.80")		
						103°

SK150 MARK IV

Unit: mm (ft.-in.)

	BOOM	ARM			BUCKET	
	5.15 M (16'10.7")	2.2 M (7'2.6")	2.6 M (8'6.3")	3.06 M (10'0.4")		
A	5150 (16'10.7")	2200 (7'2.6")	2600 (8'6.3")	3060 (10'0.4")		411 (16.18")
B	620 (2'4")	----	----	----		R 1350 (R 4'5.1")
C	287 (11.3")	----	----	----		----
D	416 (1'4.3")	R 811 (R 2'7.9")	R 777 (R 2'6.5")	R 774 (R 2'6.4")		374 (14.7")
D_1	----	⌀ 85 (⌀ 3.3")	⌀ 85 (⌀ 3.3")	⌀ 85 (⌀ 3.3")		----
D_2	----	⌀ 80 (⌀ 3.1")	⌀ 80 (⌀ 3.1")	⌀ 80 (⌀ 3.1")		----
D_3	----	⌀ 95 (⌀ 3.7")	⌀ 95 (⌀ 3.7")	⌀ 95 (⌀ 3.7")		----
E	1027 (3'4.4")	R 2078 (R 6'9.8")	R 2078 (R 6'9.8")	R 2078 (R 6'9.8")		302 (11.8")
F	1165 (3'9.8")	R 330 (R 12.9")	R 330 (R 12.9")	R 330 (R 12.9")		954 (3'1.5")
G	R 2213 (R 7'3")	561 (1'10.0")	561 (1'10.0")	561 (1'10.0")		----
H	R 2580 (R 8'5.5")	278 (10.9")	233 (9.1")	228 (8.9")		----
I	122 (4.8")	----	----	----	l	511 (20.12")
J	----	300 (11.8")	300 (11.8")	300 (11.8")	l_0	449 (17.667")
K	----	280 (11.0")	280 (11.0")	280 (11.0")	t_1	30 (1.18")
L	----	300 (11.8")	300 (11.8")	300 (11.8")	t_2	70^{-153}_{-223} ($2.7559"^{-.006}_{-.0087}$)
M	----	286 (11.2")	286 (11.2")	286 (11.2")	t_3	75 (2.953")
N	----	122 (4.8")	122 (4.8")	122 (4.8")	t_4	15 (.590")
O	----	102 (4.0")	102 (4.0")	102 (4.0")	t_5	17 (.6693")
P	----	580 (1'10.8")	580 (1'10.8")	580 (1'10.8")	t_6	27 (1.06")
Q	----	525 (1'8.6")	525 (1'8.6")	525 (1'8.6")		----
d_1	⌀ 80 (⌀ 3.1")	⌀ 70 (⌀ 2.7")	⌀ 70 (⌀ 2.7")	⌀ 70 (⌀ 2.7")		⌀ 70 (⌀ 2.7")
d_2	⌀ 80 (⌀ 3.1")	⌀ 65 (⌀ 2.5")	⌀ 65 (⌀ 2.5")	⌀ 65 (⌀ 2.5")		⌀ 70 (⌀ 2.7")
d_3	⌀ 80 (⌀ 3.1")	⌀ 80 (⌀ 3.1")	⌀ 80 (⌀ 3.1")	⌀ 80 (⌀ 3.1")	r_1	140 (5.5")
d_4	⌀ 80 (⌀ 3.1")	⌀ 80 (⌀ 3.1")	⌀ 80 (⌀ 3.1")	⌀ 80 (⌀ 3.1")	r_2	115 (4.5")
d_5	----	⌀ 70 (⌀ 2.7")	⌀ 70 (⌀ 2.7")	⌀ 70 (⌀ 2.7")		----
T_0	Offset	42 (1.7")	42 (1.7")	42 (1.7")		
α						99.4°

SK200 MARK IV

Unit: mm (ft.-in.)

	BOOM	ARM			BUCKET	
	5.6 M (18'4.7")	2.4 M (7'10.4")	2.94 M (9'7.7")	3.3 M (10'9.9")		
A	5600 (18'4.7")	2400 (7'10.4")	2940 (9'7.7")	3300 (10'9.9")		442 (17.4")
B	680 (2'2.7")	----	----	----		R 1450 (R 4'9.0")
C	353 (1'1.9")	----	----	----		----
D	490 (1'7.3")	R 840 (R 2'9.0")	R 815 (R 2'8.0")	R 815 (R 2'8.0")		399 (15.7")
D_1	----	⌀ 95 (⌀ 3.7")	⌀ 95 (⌀ 3.7")	⌀ 95 (⌀ 3.7")		----
D_2	----	⌀ 85 (⌀ 3.3")	⌀ 85 (⌀ 3.3")	⌀ 85 (⌀ 3.3")		----
D_3	----	⌀ 95 (⌀ 3.7")	⌀ 95 (⌀ 3.7")	⌀ 95 (⌀ 3.7")		----
E	1025 (3'4.3")	R 2208 (R 7'2.9")	R 2205.5 (R 7'2.8")	R 2205.5 (R 7'2.8")		327 (12.8")
F	1165 (3'9.8")	R 420 (R 1'4.5")	R 420 (R 1'4.5")	R 420 (R 1'4.5")		837 (2'8.9")
G	R 2466 (R 8'1.0")	681 (2'2.8")	601 (1'11.6")	600 (1'11.6")		----
H	R 2700 (R 8'10.3")	352.3 (1'1.8")	272 (10.7")	238.5 (9.4")		----
I	122 (4.8")	----	----	----	I	542 (21.338")
J	----	325 (12.8")	325 (12.8")	325 (12.8")	l_0	480 (18.897")
K	----	301 (11.8")	301 (11.8")	301 (11.8")	t_1	30 (1.18")
L	----	325 (12.8")	325 (12.8")	325 (12.8")	t_2	$80^{-0.05}_{-0.11}$ ($3.149"^{-0.002}_{-0.0043}$)
M	----	352 (1'1.8")	352 (1'1.8")	352 (1'1.8")	t_3	85 (3.346")
N	----	122 (4.8")	122 (4.8")	122 (4.8")	t_4	15 (.590")
O	----	102 (4.0")	102 (4.0")	102 (4.0")	t_5	17 (.6693")
P	----	646 (2'1.4")	646 (2'1.4")	646 (2'1.4")	t_6	27 (1.06")
Q	----	640 (2'1.2")	640 (2'1.2")	640 (2'1.2")		
d_1	⌀ 90 (⌀ 3.5")	⌀ 80 (⌀ 3.1")	⌀ 80 (⌀ 3.1")	⌀ 80 (⌀ 3.1")		⌀ 80 (⌀ 3.1")
d_2	⌀ 85 (⌀ 3.3")	⌀ 70 (⌀ 2.7")	⌀ 70 (⌀ 2.7")	⌀ 70 (⌀ 2.7")		⌀ 80 (⌀ 3.1")
d_3	⌀ 80 (⌀ 3.1")	⌀ 85 (⌀ 3.3")	⌀ 85 (⌀ 3.3")	⌀ 85 (⌀ 3.3")	r_1	150 (6.0")
d_4	⌀ 85 (⌀ 3.3")	⌀ 80 (⌀ 3.1")	⌀ 80 (⌀ 3.1")	⌀ 80 (⌀ 3.1")	r_2	130 (5.25")
d_5	----	⌀ 80 (⌀ 3.1")	⌀ 80 (⌀ 3.1")	⌀ 80 (⌀ 3.1")		----
T_0	Offset	40 (1.6")	25 (1.0")	25 (1.0")		
x						96.75°

SK220 MARK IV

Unit: mm (ft.-in.)

	BOOM	ARM			BUCKET	
	6.02 M (19'9.0")	2.5 M (8'2.4")	2.98 M (9'9.3")	3.66 M (12'0.1")		
A	6020 (19'9.0")	2500 (8'2.4")	2980 (9'9.3")	3660 (12'0.1")		514 (20.23")
B	750 (2'5.5")	----	----	----		R 1515 (R 4'11.6")
C	351 (1'1.8")	----	----	----		----
D	508 (1'7.8")	R 975 (R 3'2.3")	R 929.5 (R 3'0.6")	R 925 (R 3'0.4")		399 (15.7")
D_1	----	⌀ 105 (⌀ 4.1")	⌀ 105 (⌀ 4.1")	⌀ 105 (⌀ 4.1")		----
D_2	----	⌀ 85 (⌀ 3.3")	⌀ 85 (⌀ 3.3")	⌀ 85 (⌀ 3.3")		----
D_3	----	⌀ 105 (⌀ 4.1")	⌀ 105 (⌀ 4.1")	⌀ 105 (⌀ 4.1")		----
E	1143.5 (3'9.0")	R 2352 (R 7'8.6")	R 2356.5 (R 7'8.7")	R 2356.5 (R 7'8.7")		327 (12.8")
F	1329.5 (4'4.3")	R 450 (R 1'5.7")	R 450 (R 1'5.7")	R 450 (R 1'5.7")		1060 (3'5.7")
G	R 2608.5 (R 8'6.7")	750 (2'5.5")	705.5 (2'3.7")	705.5 (2'3.7")		----
H	R 3080 (R 10'1.2")	373.5 (1'2.7")	324 (1'0.7")	295 (11.6")		----
I	132 (5.2")	----	----	----	I	532 (20.944")
J	----	325 (12.7")	325 (12.7")	325 (12.7")	I_0	470 (18.504")
K	----	303 (11.9")	303 (11.9")	303 (11.9")	t_1	30 (1.18")
L	----	325 (12.7")	325 (12.7")	325 (12.7")	t_2	$90^{+.070}_{-.130}$ ($3.543"^{+.0027}_{-.005}$)
M	----	350 (1'1.7")	350 (1'1.7")	350 (1'1.7")	t_3	95 (3.740")
N	----	132 (5.2")	132 (5.2")	132 (5.2")	t_4	15 (.590")
O	----	112 (4.4")	112 (4.4")	112 (4.4")	t_5	17 (.6693")
P	----	666 (2'2.2")	666 (2'2.2")	666 (2'2.2")	t_6	27 (1.06")
Q	----	599.5 (1'11.6")	599.5 (1'11.6")	599.5 (1'11.6")		----
d_1	⌀ 100 (⌀ 3.9")	⌀ 90 (⌀ 3.5")	⌀ 90 (⌀ 3.5")	⌀ 90 (⌀ 3.5")		⌀ 90 (⌀ 3.5")
d_2	⌀ 95 (⌀ 3.7")	⌀ 70 (⌀ 2.7")	⌀ 70 (⌀ 2.7")	⌀ 70 (⌀ 2.7")		⌀ 90 (⌀ 3.5")
d_3	⌀ 90 (⌀ 3.5")	⌀ 90 (⌀ 3.5")	⌀ 90 (⌀ 3.5")	⌀ 90 (⌀ 3.5")	r_1	145 (5.75")
d_4	⌀ 90 (⌀ 3.5")	⌀ 90 (⌀ 3.5")	⌀ 90 (⌀ 3.5")	⌀ 90 (⌀ 3.5")	r_2	133 (5.25")
d_5	----	⌀ 80 (⌀ 3.1")	⌀ 80 (⌀ 3.1")	⌀ 80 (⌀ 3.1")		----
T_0	Offset	44 (1.7")	37 (1.4")	37 (1.4")		
x						102.86°

SK300 MARK IV

Unit: mm (ft.-in.)

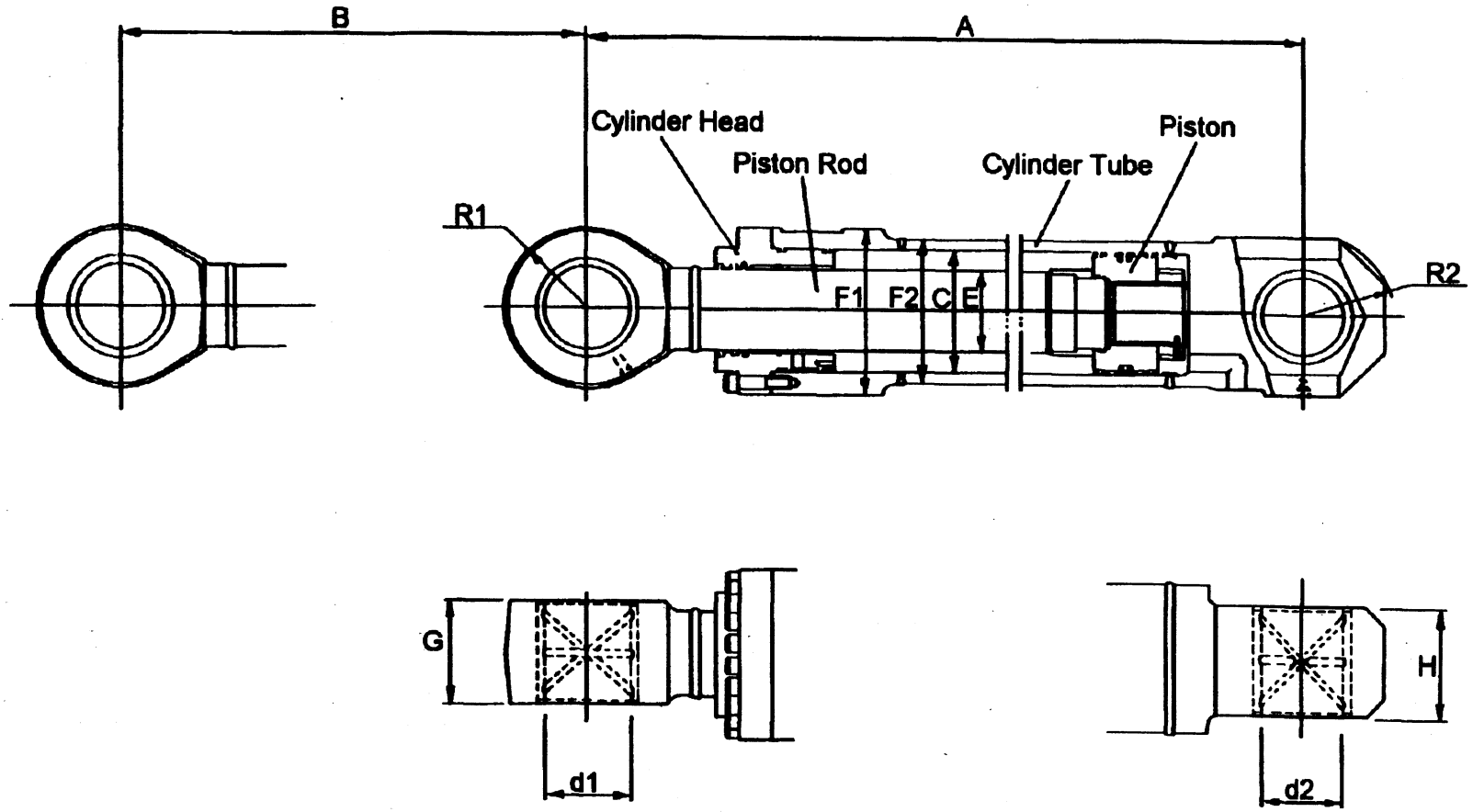
	BOOM	ARM				BUCKET
	6.5 M (21'3.9")	2.55 M (8'4.3")	3.14 M (10'3.6")	4.1 M (13'5.4")		
A	8470 (27'9.4")	2550 (8'4.3")	3140 (10'3.6")	4100 (13'5.4")		534 (21.02")
B	830 (2'8.6")	----	----	----		R 1690 (R 5'6.5")
C	401 (1'3.7")	----	----	----		
D	570 (1'10.4")	R 1069 (R 3'6.0")	R 1021 (R 3'4.1")	R 1021 (R 3'4.1")		446 (1'5.5")
D_1	----	ø 110 (ø 4.3")	ø 105 or 110 (ø 4.1 or ø 4.3)	ø 105 or 110 (ø 4.1 or ø 4.3)		----
D_2	----	ø 95 (ø 3.7)	ø 95 (ø 3.7)	ø 95 (ø 3.7)		----
D_3	----	ø 120 (ø 4.7)	ø 120 (ø 4.7)	ø 120 (ø 4.7)		
E	1150 (3'9.2")	E' R 2432 (R 7'11.7")	E' R 2432 (R 7'11.7")	E' R 1021 (R 3'4.1")		382 (1'3.0")
F	1460 (4'9.4")	F' R 417.5 (R 1'4.4")	F' R 417.5 (R 1'4.4")	F' R 417.5 (R 1'4.4")		1242 (4'0.8")
G	R 2950 (R 9'8.1")	780 (2'6.7")	672 (2'2.4")	676 (2'2.6")		
H	R 3473 (R 11'4.7")	418 (1'4.4")	303 (11.9")	255 (10.0")		
I	142 (5.5")	----	----	----	I	653 (25.708")
J	581 (1'10.8")	380 (1'2.9")	380 (1'2.9")	380 (1'2.9")	l_0	576 (22.67")
K	----	362 (1'2.2")	362 (1'2.2")	362 (1'2.2")	t_1	30 (1.18")
L	----	380 (1'2.9")	380 (1'2.9")	380 (1'2.9")	t_2	90^{-070}_{-130} (3.543" $^{-0027}_{-005}$)
M	----	400 (1'3.7")	400 (1'3.7")	400 (1'3.7")	t_3	95 (3.740")
N	----	142 (5.5")	142 (5.5")	142 (5.5")	t_4	20 (.7874")
O	----	130 (5.1")	130 (5.1")	130 (5.1")	t_5	21 (.8367")
P	----	680 (2'2.7")	680 (2'2.7")	680 (2'2.7")	t_6	35 (1.378")
Q	----	617 (2'0.2")	617 (2'0.2")	617 (2'0.2")		
d_1	ø 110 (ø 4.3")	ø 90 (ø 3.5")	ø 90 (ø 3.5")	ø 90 (ø 3.5")		ø 90 (ø 3.5")
d_2	ø 110 (ø 4.3")	ø 80 (ø 3.1")	ø 80 (ø 3.1")	ø 80 (ø 3.1")		ø 90 (ø 3.5")
d_3	ø 100 (ø 3.9")	ø 110 (ø 4.3")	ø 110 (ø 4.3")	ø 110 (ø 4.3")	r_1	190 (7.5")
d_4	ø 110 (ø 4.3")	ø 100 (ø 3.9")	ø 100 (ø 3.9")	ø 100 (ø 3.9")	r_2	160 (6.25")
d_5	----	ø 90 (ø 3.5")	ø 90 (ø 3.5")	ø 90 (ø 3.5")		
T_0	Offset	65 (2.5")	34 (1.3")	52 (2.0")		
α						100.56°

SK400 MARK IV

Unit: mm (ft.-in.)

	BOOM	ARM					BUCKET	
	7.0 M (22'11.5")	3.0 M (9'10.11")	3.45 M (11'3.8")	3.95 M (12'11.5")	4.9 M (16'0.9")		Standard	Mass Excavator
A	7000 (22'11.5")	3000 (9'10.1")	3450 (11'3.8")	3950 (12'11.5")	4900 (16'0.9")		608 (23.93")	706.1 (27.799")
B	930 (3'0.6")	—	—	—	—		R 1780 (R 5'10")	R 2032 (R 6'8")
C	449.8 (1'5.7")	—	—	—	—			
D	627 (2'0.6")	R 1095 (R 3'7.1")	R 1095 (R 3'7.1")	R 1095 (R 3'7.1")	R 1102 (R 3'7.3")		500 (1'7.6")	500 (1'7.6")
D_1	—	⌀ 120 (⌀ 4.7")	⌀ 120 (⌀ 4.7")	⌀ 120 (⌀ 4.7")	⌀ 120 (⌀ 4.7")		—	—
D_2	—	⌀ 120 (⌀ 4.7")	⌀ 120 (⌀ 4.7")	⌀ 120 (⌀ 4.7")	⌀ 120 (⌀ 4.7")		—	—
D_3	—	⌀ 145 (⌀ 5.7")	⌀ 145 (⌀ 5.7")	⌀ 145 (⌀ 5.7")	⌀ 145 (⌀ 5.7")			
E	1162 (3'9.7")	E' R 2689 (R 8'9.8")	E' R 2689(R 8'9.8")	E' R 2689(R 8'9.8")	E' R 2689 (R 8'9.8")		452 (1'5.7")	452 (1'5.7")
F	1393 (4'6.8")	F' R 540 (R 1'9.2")	F' R 540 (R 1'9.2")	F' R 540 (R 1'9.2")	F' R 540 (R 1'9.2")		1226 (4'0.2")	1226 (4'0.2")
G	R 3069 (R 10'.8")	851 (2'9.5")	851 (2'9.5")	851 (2'9.5")	851 (2'9.5")			
H	R 3441 (R 11'3.4")	530 (1'8.8")	421.5 (1'4.5")	421.5 (1'4.5")	439 (1'5.2")			
I	162 (6.3")	—	—	—	—	I	779 (30.669")	779 (30.669")
J	638 (2'1.1")	450 (1'5.7")	450 (1'5.7")	450 (1'5.7")	450 (1'5.7")	l_0	702 (27.637")	702 (27.637")
K	—	430 (1'4.9")	430 (1'4.9")	430 (1'4.9")	430 (1'4.9")	t_1	30 (1.18")	30 (1.18")
L	—	430 (1'4.9")	430 (1'4.9")	430 (1'4.9")	430 (1'4.9")	t_2	$100^{-.120}_{-.180}$ ($3.937^{-.0047}_{-.0071}$")	$100^{-.120}_{-.180}$ ($3.937^{-.0047}_{-.0071}$")
M	—	448 (1'5.6")	448 (1'5.6")	448 (1'5.6")	448 (1'5.6")	t_3	105 (4.134")	105 (4.134")
N	—	162 (6.3")	162 (6.3")	162 (6.3")	162 (6.3")	t_4	20 (.7874")	20 (.7874")
O	—	162 (6.3")	162 (6.3")	162 (6.3")	162 (6.3")	t_5	21 (.8367")	21 (.8367")
P	—	770 (2'6.3")	770 (2'6.3")	770 (2'6.3")	770 (2'6.3")	t_6	35 (1.378")	35 (1.378")
Q	—	680 (2'2.7")	680 (2'2.7")	680 (2'2.7")	680 (2'2.7")			
d_1	⌀ 120 (⌀ 4.7")	⌀ 100 (⌀ 3.9")	⌀ 100 (⌀ 3.9")	⌀ 100 (⌀ 3.9")	⌀ 100 (⌀ 3.9")		⌀ 100 (⌀ 3.9")	⌀ 100 (⌀ 3.9")
d_2	⌀ 120 (⌀ 4.7")	⌀ 100 (⌀ 3.9")	⌀ 100 (⌀ 3.9")	⌀ 100 (⌀ 3.9")	⌀ 100 (⌀ 3.9")		⌀ 100 (⌀ 3.9")	⌀ 100 (⌀ 3.9")
d_3	⌀ 120 (⌀ 4.7")	⌀ 120 (⌀ 4.7")	⌀ 120 (⌀ 4.7")	⌀ 120 (⌀ 4.7")	⌀ 120 (⌀ 4.7")	r_1	165 (6.5")	190 (7.5")
d_4	⌀ 120 (⌀ 4.7")	⌀ 120 (⌀ 4.7")	⌀ 120 (⌀ 4.7")	⌀ 120 (⌀ 4.7")	⌀ 120 (⌀ 4.7")	r_2	165 (6.5")	165 (6.5")
d_5	—	⌀ 100 (⌀ 3.9")	⌀ 100 (⌀ 3.9")	⌀ 100 (⌀ 3.9")	⌀ 100 (⌀ 3.9")			
T_0	Offset	48 (1.8")	48 (1.8")	48 (1.8")	48 (1.8")			
∝							101.48°	112.7°

HYDRAULIC CYLINDER LIST



CYLINDER DIMENSIONS

Unit: mm (ft-in)

Model	Specification	Application	Part No.	A	B	● C	● E	● F1	● F2	G	H	R1	R2	● d1	● d2	Weight (kg)	Cushion mechanism	
																	Rod side	Bottom side
SK60	Std. BH	Boom	2438U1094F1	1360 (4'5.5")	940 (3'1.0")	125 (4.9")	70 (2.7")	155 (6.1")	143 (5.6")	95 (3.7")	145 (5.7")	55 (2.1")	58 (2.2")	55 (2.1")	60 (2.3")	110 (242)	No	Yes
		Arm	2438U1095F1	1345 (4'4.9")	900 (2'11.4")	110 (4.3")	65 (2.5")	136 (5.3")	126 (4.9")	95 (3.7")	95 (3.7")	55 (2.1")	55 (2.1")	55 (2.1")	55 (2.11")	88 (194)	No	Yes
		Bucket	2438U1096F1	1110 (3'7.7")	725 (2'4.5")	95 (3.7")	60 (2.3")	120 (4.7")	110 (4.3")	85 (3.3")	85 (3.3")	50 (1.9")	50 (1.9")	50 (1.9")	50 (1.9")	59 (130)	No	No
	Loader	Boom	2438U1158F1	1185 (3'10.6")	790 (2'7.1")	125 (4.9")	70 (2.7")	155 (6.1")	143 (5.6")	95 (3.7")	145 (5.7")	55 (2.1")	56 (2.2")	55 (2.1")	60 (2.3")	110 (242)	No	Yes
		Arm	2438U1156F1	950 (3'1.4")	580 (1'10.8")	125 (4.9")	70 (2.7")	168 (6.6")	140 (5.5")	95 (3.7")	95 (3.7")	55 (2.1")	55 (2.1")	55 (2.1")	55 (2.1")	80 (176)	No	No
		Bucket	2438U1155F1	1080 (3'6.5")	695 (2'3.3")	110 (4.3")	60 (2.3")	150 (5.9")	125 (4.9")	85 (3.3")	85 (3.3")	50 (1.9")	50 (1.9")	50 (1.9")	50 (1.9")	55 (120)	No	No
	Telescopic	Slide	2438U1154F1	2200 (7'2.6")	1860 (6'1.2")	60 (2.3")	40 (1.5")	98 (3.8")	69 (2.7")	45 (1.7")	80 (3.1")	36 (1.4")	35 (1.3")	30 (1.1")	30 (1.1")	50 (110)	No	No
	Gutter	Offset	2438U1152F1	750 (2'5.5")	400 (1'3.7")	110 (4.3")	65 (2.5")	150 (5.9")	125 (4.9")	95 (3.7")	95 (3.7")	55 (2.1")	55 (2.1")	55 (2.1")	55 (2.1")	60 (132)	No	No
	Dozer	Dozer	2438U1153F1	600 (1'11.6")	160 (6.3")	80 (3.1)	50 (1.9")	114 (4.4")	93 (3.6")	60 (2.3")	60 (2.3")	45 (1.7")	45 (1.7")	40 (1.5")	40 (1.5")	26 (57)		
SK100	Std. BH	Boom	2438U1123F1	1430 (4'8.3")	975 (3'2.3")	100 (3.9")	70 (2.7")	155 (6.1")	116 (4.5")	80 (3.1")	90 (3.5")	65 (2.5")	60 (2.3")	75 (2.9")	70 (2.7")	90 (198)	Yes	No
		Arm	2438U1125F1	1585 (5'2.4")	1085 (3'6.7")	115 (4.5")	75 (2.9")	170 (6.6")	134 (5.2")	100 (3.9")	100 (3.9")	65 (2.5")	65 (2.5")	70 (2.7")	70 (2.7")	120 (264)	Yes	No
		Bucket	2438U1097F2	1435 (4'8.5")	985 (3'2.7")	95 (3.7")	65 (2.5")	150 (5.9")	109 (4.3")	90 (3.5")	90 (3.5")	55 (2.1")	55 (2.1")	60 (2.3")	60 (2.3")	80 (176)	No	No
SK120 SK120LC	Std. BH	Boom	2438U1133F1	1585 (5'1.6")	1097 (3'7.1")	105 (4.1")	70 (2.7")	160 (6.3")	122 (4.8")	80 (3.1")	90 (3.5")	65 (2.5")	60 (2.3")	75 (2.9")	70 (2.7")	100 (220)	Yes	No
		Arm	2438U1132F1	1775 (5'9.8")	1185 (3'10.6")	120 (4.7")	80 (3.1")	175 (6.8")	140 (5.5")	100 (3.9")	100 (3.9")	65 (2.5")	65 (2.5")	70 (2.7")	70 (2.7")	150 (330)	Yes	No
		Bucket	2438U1131F1	1405 (4'7.3")	915 (3'0.0")	100 (3.9")	65 (2.5")	155 (6.1")	114 (4.4")	90 (3.5")	90 (3.5")	55 (2.1")	55 (2.1")	60 (2.3")	60 (2.3")	80 (175)	No	No

Model	Specification	Application	Part No.	A	B	ø C	ø E	ø F1	ø F2	G	H	R1	R2	ø d1	ø d2	Weight (kg)	Cushion mechanism	
																	Rod side	Bottom side
SK150LCIII	Std. BH	Boom	2438U1946F1	1636 (5'4.41")	1141 (3'8.92")	120 (4.72")	80 (3.15")	184 (7.24")	139 (5.47")	100 (3.93")	100 (3.93")	70 (2.75")	65 (2.56")	80 (3.15")	75 (2.95")	143 (315)	Yes	No
		Arm	2438U1948F1	1919 (6'3.47")	1352 (4'5.23")	130 (5.12")	90 (3.54")	196 (7.71")	152 (5.98")	120 (4.72")	120 (4.72")	80 (3.15")	75 (2.95")	80 (3.15")	80 (3.15")	205 (452)	No	Yes
		Bucket	2438U1949F1	1539 (5'0.59")	1023 (3'4.28")	110 (4.33")	75 (2.95")	171 (6.73")	128 (5.04")	90 (3.54")	100 (3.93")	68 (2.67")	60 (2.36")	70 (2.75")	70 (2.75")	117 (258)	No	No
SK200 SK200LC	Std. BH	Boom	2438U1106F1	1810 (5'11.2")	1290 (4'2.7")	125 (4.9")	85 (3.3")	180 (7.1")	146 (5.7")	100 (3.9")	100 (3.9")	75 (2.9")	72.5 (2.8")	85 (3.3")	80 (3.1")	170 (374)	Yes	No
		Arm	2438U1108F1	1990 (6'6.3")	1453 (4'9.2")	145 (5.7")	100 (3.9")	210 (8.2")	170 (6.6")	120 (4.7")	120 (4.7")	79 (3.1")	70 (2.7")	85 (3.3")	85 (3.3")	250 (550)	Yes	No
		Bucket	2438U1109F1	1610 (5'3.3")	1110 (3'7.7")	120 (4.7")	80 (3.1")	175 (6.8")	139 (5.4")	100 (3.9")	100 (3.9")	70 (2.7")	70 (2.7")	80 (3.1")	80 (3.1")	130 (286)	No	No
	Std. HB (Lc Type)	Boom	2438U1102F1	1810 (5'11.2")	1290 (4'2.7")	125 (4.9")	85 (3.3")	191 (7.5")	144 (5.6")	100 (3.9")	100 (3.9")	70 (2.7")	65 (2.5")	85 (3.3")	80 (3.1")	160 (252)	Yes	No
		Arm	2438U1104F1	1990 (6'6.3")	1453 (4'9.2")	145 (5.7")	100 (3.9")	219 (8.6")	170 (6.7")	120 (4.7")	120 (4.7")	80 (3.1")	80 (3.1")	85 (3.3")	85 (3.3")	250 (550)	Yes	No
		Bucket	2438U1105F1	1610 (5'3.3")	1110 (3'7.7")	120 (4.7")	80 (3.1")	184 (7.2")	140 (5.5")	100 (3.9")	100 (3.9")	70 (2.7")	65 (2.5")	80 (3.1")	80 (3.1")	135 (297)	No	No
SK220 SK220LC	Std. BH	Boom	2438U1135F1	1930 (6'3.9")	1334 (4'4.5")	140 (5.5")	90 (3.5")	219 (8.6")	160 (6.3")	110 (4.3")	110 (4.3")	90 (3.5")	75 (2.9")	95 (3.7")	90 (3.5")	210 (462)	Yes	No.
		Arm	2438U1137F1	2300 (7'6.5")	1630 (5'4.1")	150 (5.9")	105 (4.1")	232 (9.1")	176 (6.9")	130 (5.1")	130 (5.1")	90 (3.5")	85 (3.3")	90 (3.5")	90 (3.5")	320 (705)	Yes	No
		Bucket	2438U1138F1	1750 (5'8.8")	1170 (3'10.0")	130 (5.1")	85 (3.3")	196 (7.7")	152 (5.9")	110 (4.3")	110 (4.3")	80 (3.1")	70 (2.7")	80 (3.1")	90 (3.1")	180 (296)	No	No
SK300 SK300LC	Std. BH	Boom (RH)	2438U1170F1	2120 (6'11")	1515 (4'11")	150 (5.9")	100 (3.9")	237 (9.3")	173 (6.8")	120 (4.7")	130 (5.1")	95 (3.7")	85 (3.3")	110 (4.3")	110 (4.3")	286 (630)	Yes	No
		Arm	2438U1171F1	2550 (8'4")	1835 (6'0")	170 (6.6")	120 (4.7")	283 (11.1")	200 (7.8")	140 (5.5")	140 (5.5")	110 (4.3")	110 (4.3")	110 (4.3")	110 (4.3")	504 (1,111)	Yes	No
		Bucket	2438U1172F1	1803 (5'10")	1204 (3'11")	150 (5.9")	100 (3.9")	237 (9.3")	176 (6.9")	128 (5.0")	128 (5.0")	95 (3.7")	85 (3.3")	90 (3.5")	90 (3.5")	265 (584)	Yes	No
SK400 SK400LC	Std. BH	Boom (RH)	2438U1173F1	2200 (7'2")	1590 (5'2")	170 (6.6")	115 (4.5")	232 (9.1")	199 (7.8")	140 (5.5")	150 (5.9")	110 (4.3")	----	120 (4.7")	110 (4.3")	396 (873)	No	No
		Arm	2438U1174F1	2560 (8'4")	1900 (6'2")	190 (7.4")	130 (5.1")	260 (10.2")	222 (8.7")	160 (6.3")	160 (6.3")	110 (4.3")	----	120 (4.7")	120 (4.7")	566 (1,247)	Yes	No
		Bucket	2438U1175F1	1990 (6'6")	1380 (4'6")	160 (6.3")	110 (4.3")	222 (8.7")	188 (7.4")	160 (6.3")	160 (6.3")	110 (4.3")	----	100 (3.9")	100 (3.9")	356 (784)	----	----

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: December 11, 1995

BULLETIN: HE-257A (Replaces HE-257)

SUBJECT: Lifting of machine with cast counterweight

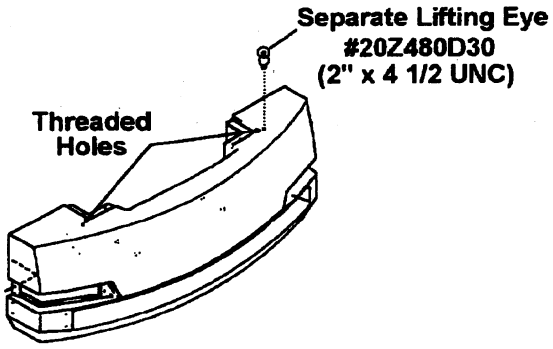
AFFECTED MACHINES:

SK120LCIII	- YPU0570 ~			SK100IV	- YWU1001~
				SK120LCIV	- YPU1001~
				SK150LCIV	- YMU1001~
SK200III	- YNU0086 ~	SK200LCIII	- YQU1110 ~	SK200LCIV	- YQU2001~
SK220III	- LQU0016 ~	SK220LCIII	- LLU0635 ~	SK220LCIV	- LLU1201~
SK300LCIII	- YCU0001 ~	SK300LCIII	- YC01031 ~	SK270LCIV	- LBU0001~
SK400LCIII	- YSU0001 ~	SK400LCIII	- YS00547 ~	SK300LCIV	- YCU0301~
				SK400LCIV	- YSJ0002~

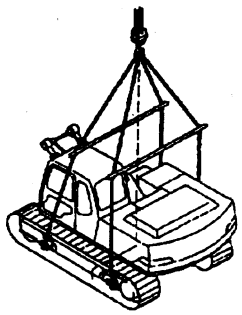
A cast counterweight was implemented effective with the serial numbers listed above. These counterweights have two threaded holes for use with lifting eyes. The lifting eye part number is: **20Z480D30**, quantity (2) required. These holes are intended for use when lifting the counterweight only. These holes cannot be used for lifting a machine with the counterweight installed.

> **⚠ Caution**
>
> Do not lift a machine by the counterweight, if a cast counterweight is installed.
>
> When a cast counterweight is installed on the machine, proper rigging, attached to the crawler sideframes, must be used to lift the machine.
>
> Failure to follow these precautions may result in property damage or injury to personnel.

Procedure for lifting counterweight only



Proper lifting arrangement for machine equipped with a cast counterweight



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SERVICE\HE257A

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: March 1997

KOBELCO Designated ESSENTIAL SERVICE ITEM

BULLETIN: HE-261A (Replaces HE-261)

SUBJECT: Test Resistor for Variable Loading Mode and KPSS circuits on Mechatronic Systems

AFFECTED MACHINES:

SK100 III - YW04601 and up	
SK120LC III - YPU0501 and up	SK150LC IV - All
SK150LC III - All	SK200LC IV - All
SK200LC III - YQU0701 and up	SK220LC IV - All
SK220LC III - LLU0601 and up	SK270LC IV - All
SK300LC III - All	SK300LC IV - All
SK400LC III - All	SK400LC IV - All

This bulletin is to re-announce the availability of the **Test Resistor (p/n KSP 9000-0002)**, for testing of the Variable Loading Mode and KPSS circuits, on the referenced machines.

Effective with the MK III serial numbers listed above, the variable loading mode was made optional. This was previously announced in Service Bulletin HE-211. *(This system is also optional on the MK IV.)*

Also in HE-211, it advised how to connect a resistor (for troubleshooting purposes), to the electrical plug that would normally be connected to the flow distribution solenoid valve. *This procedure is also detailed in the MK IV Servicemans Handbook, in the Mechatronic Section.*

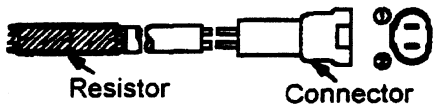
This is necessary to prevent "Code 5" from being displayed, when performing the diagnostic "Quick Check" using the buzzer stop switch. This procedure is also referred to as: "Diagnosis by the Flashing of the Auto Accel Lamp".

This resistor can also be connected to the KPSS circuit (for troubleshooting purposes), in the same manner.

*The Kobelco America Product Support Section, has designated this Test Resistor as an **Essential Service Item**, and recommends that one be carried on each field service truck, as well as one stocked in your Service Department Tool Room.*

***Please note**: The resistor is used to simulate the current load of the solenoid valve coil, and will get warm or hot to the touch during the test procedure. For this reason; use care when disconnecting the resistor from the machine harness at the completion of testing.*

Please contact the **Kobelco America Parts Department** for price and availability.



The resistor comes assembled with the proper 2 pole connector.

TEST RESISTOR p/n KSP 9000-0002

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SERVICE\HE261A

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: March 1, 1996

BULLETIN: HE-263B (Replaces HE-263A)

SUBJECT: Estimated Fuel Consumption - Gallons Per Hour

AFFECTED MACHINES: All Mark IV Excavators

Below are fuel consumption estimates for the Mark IV excavators. Actual fuel consumption may vary, depending on operating conditions, frequency of maintenance, operator experience, etc.

Model	KPSS Mode	Hard Digging Gallons/Hour	Normal Digging Gallons/Hour	Light Digging Gallons/Hour
SK60-IV	H FC	--- ---	2.2 1.8	--- ---
SK100-IV	---	3.9	2.8	1.9
SK120LC-IV	---	4.0	2.9	2.0
SK150LC-IV	H S FC	5.6 4.5 2.5	3.6 3.0 1.8	2.7 2.2 1.2
SK200LC-IV	H S FC	6.31 4.9 3.0	3.8 3.3 1.9	2.9 2.5 1.4
SK220LC-IV	H S FC	6.6 5.2 2.9	4.8 3.8 2.2	3.4 2.7 1.7
SK270LC-IV	H S FC	6.87 5.34 2.98	4.93 3.9 2.26	3.5 2.8 1.8
SK300LC-IV	H S FC	9.6 7.95 6.5	6.7 5.5 4.2	4.75 3.97 2.78
SK400LC-IV	H S FC	12.2 11.5 8.7	8.4 7.99 6.5	6.15 5.88 4.34

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SERVICE\HE263B

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: February 02, 1995

BULLETIN: HE-264
Page 1 of 2

SUBJECT: Current Kobelco Model Designations

AFFECTED MACHINES: All Mark IV and "Mark V Super Version"

1. **"Super Version"** Machine is characterized by a very rounded shape of both the machine's engine compartment area and the operator's cab. Usually painted a light blue color. These machines are built in Japan for the Japanese domestic market.

2. **"Mark V Version"** Basically the same machine as the Japanese domestic "Super Version". Marketed in the Far East and Australia.

Neither Kobelco America Inc. nor Kobelco Construction Machinery have parts books, drawings, specification sheets, shop manuals, or parts for the above machines. Parts are not interchangeable with the KCM produced Mark IV machines.

"KCM produced Mark IV European Models":
In order to match market conditions in Europe and the Middle East, the machines produced by KCM for those markets carry model designations which are different from the U. S. market machines (see comparison chart below).

U. S. Kobelco America Models	Corresponding European Models
SK60 Mark IV	SK60 Mark III
SK100 Mark IV	SK110 Mark IV
SK120LC Mark IV	SK130 Mark IV SK130LC Mark IV
SK150LC Mark IV	SK160LC Mark IV
SK200LC Mark IV	SK210 Mark IV SK210LC Mark IV
SK220LC Mark IV	SK250 Mark IV SK250LC Mark IV SK250NLC Mark IV
SK300LC Mark IV	SK330 Mark IV SK330LC Mark IV
SK400LC Mark IV	SK460 Mark IV SK460LC Mark IV

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Basically, these European units are similar to the Kobelco America Inc. U. S. specification, but usually have short track frames, narrow track pads, and various types of auxiliary hydraulic systems.

Kobelco America does not market these European models. Individually specialized (European specification) parts may not be readily available from Kobelco America Inc. Kobelco America concentrates our parts inventory on our specific model specifications.

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: April 20, 1995

BULLETIN: HE-266
Page 1 of 12

SUBJECT: Performance Specifications for Mark IV Machines

AFFECTED MACHINES:

SK100-IV	- YWU1001 ~	SK220-IV	- LQU0101 ~
SK120LC-IV	- YPU1001 ~	SK220LC-IV	- LLU1201 ~
SK150LC-IV	- YMU1001 ~	SK300LC-IV	- YCU0301 ~
SK200-IV	- YNU0201 ~	SK400LC-IV	- YSJ0002 ~
SK200LC-IV	- YQU2001 ~		

Please find attached, the performance specifications needed to pre-deliver, service, and troubleshoot the new Mark IV series machines. Please utilize this information until you receive your new shop manuals for these models. The manuals will be shipped to you as soon as they become available.

Please note that on the SK150 ~ SK400 units, if the **high idle** engine RPM's are in the ranges given in the tables, **do not attempt** to do the "Adjustment A" procedure! The Mark IV mechatronics controllers have a new style RPM-limiting processor in them that will allow only these RPM's to be achieved.

Listed below are other service bulletins and parts bulletins that may be helpful to you and pertain to the Mark IV machines.

Bulletin Type	Bulletin Number	Bulletin Subject	Comments
Service	HE-059B	Hydraulic Test Kit	Mark IV machines use the same test connections
Service	HE-172D	Mark II/III/IV Belly Pans	Mark IV machines use the same kits
Service	HE-189A	Mark III Mechatronics Adj. Harness	Mark IV machines use same harness
Service	HE-256A	Mark IV Dimensions of Attachments, Linkage, & Cylinders	
Service	HE-261	Mark III/IV Test Resistor for Mechatronics System	
Service	HE-263	Mark IV Fuel Consumption	
Service	HE-264	Mark IV Current Kobelco Model Designations	
Parts	91PB-002	Mark III Vandalism Cover Kits	Mark IV machines use the same kits

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Table 1

(Note: Take measurement in the H mode, unless otherwise specified. The standard tolerance shall be an allowable range in field measurements.)

Inspection Item				Pressure: Position	Size	Port	Specifications		Unit	Adjusting Point	Measuring Condition, Function
Stds. for Testing	Cleanliness of hydraulic oil			Hydraulic oil tank			NAS 7-9		Class	----------	Sampling
	Temperature of hydraulic oil			Tank surface			45 ~ 55	(113 ~ 131)	°C	----------	Ambient temperature -10°C ~ 50°C (14°F ~ 122°F)
	Coolant temperature			Radiator surface			60 ~ 90	(140 ~ 194)	(°F)	----------	
	Eng. RPM	Low Idle		Gauge Cluster or Tachometer			850 ~ 900		RPM		LOW Throttle
		Hi Idle					2315 ~ 2365				Full Throttle
		S or D mode					----------				
		FC mode					----------				
		Auto accel - decel					----------				
Pilot circuit	Primary pressure			Gear Pump	PF1/4	P3	47 ~ 53	(670 ~ 750)	Kg/cm2 (PSI)	PR1	H Mode, E/G Hi idle
Main Reliefs	Travel		RH	Main Pump		a1	330 ~ 335	(4700 ~ 4760)		TR1	H Mode, E/G Hi idle Simultaneous RH/LH Travel stalled
			LH			a2	330 ~ 335	(4700 ~ 4760)		TR2	
	Attachment	Boost Pressure	RH			a1	----------	----------		MR1	Bucket digging
			LH			a2	----------	----------		MR2	Boom raising
			RH			a1	300 ~ 305	(4270 ~ 4340)		MR1	Bucket digging
			LH			a2	300 ~ 305	(4270 ~ 4340)		MR2	Boom raising
Port Reliefs	Bucket		R			a1	335	(4760)		RV8	Bucket dump
			H				335	(4760)		RV7	Bucket digging
	Boom		R			a1	335	(4760)		RV6	Boom lowering
			H				335	(4760)		RV5	Boom raising
	Arm		R			a2	335	(4760)		RV10	Arm extending out; Cyl. In
			H				335	(4760)		RV9	Arm digging in; Cyl. Out
	Swing		RH			a2	230 ~ 260	(3270 ~ 3700)		RV11	Bucket lock, stall swing
			LH				230 ~ 260	(3270 ~ 3700)		RV12	
	Travel	RH	F			a1	----------	----------		RV14	H Mode, E/G Hi idle Simultaneous RH/LH Travel engaged
			R				----------	----------		RV13	
		LH	F			a2	----------	----------		RV13	
			R				----------	----------		RV14	
Loading Mode	Scale on loading mode switch OPT.		1			a2	----------	----------		----------	Set to 4th notch (incl 300kgf/cl) in H mode
			2				----------	----------		----------	
			11				----------	----------		----------	
Low Pressure Reliefs	Independent D - OFF		RH			a1	28 ~ 38	(400 ~ 540)		----------	H mode, E/G Hi idle Controls in neutral
			LH			a2				----------	
	Independent D - ON		RH			a1	----------	----------		----------	D Mode, E G Hi idle Controls in neutral
			LH			a2	----------	----------		----------	
Negative Control Pressure	Independent D - OFF		RH			Pi1	28 ~ 38	(400 ~ 540)		----------	H Mode, E G Hi idle Controls in neutral
			LH			Pi2				----------	
	Independent D - ON		RH			Pi1	----------	----------		----------	D Mode, E G Hi idle Controls in neutral
			LH			Pi2	----------	----------		----------	
Proportional Solenoid Valve	KPSS	H S FC D				a3	----------	----------		----------	E/G Hi idle Controls in neutral
		Release					----------	----------		----------	
		Boost					----------	----------		----------	

Test Port Locations:
a1 - Test Port in P1 pump
a2 - Test Port in P2 pump
a3 - Test Port in (Pf) power Shift Solenoid
Pi1 - Negative control press. Port @ P1 pump regulator
Pi2 - Negative control press. Port @ P2 pump regulator
P3 - Test Port in P3 (Pilot) pump

Table 1

(Note: Take measurement in the H mode, unless otherwise specified. The standard tolerance shall be an allowable range in field measurements.)

Inspection Item				Pressure: Position	Size	Port	Specifications		Unit	Adjusting Point	Measuring Condition, Function
Stds. for Testing	Cleanliness of hydraulic oil			Hydraulic oil tank			NAS 7-9		Class	----------	Sampling
	Temperature of hydraulic oil			Tank surface			45 ~ 55	(113 ~ 131)	°C	----------	Ambient temperature -10°C ~ 50°C (14°F ~ 122°F)
	Coolant temperature			Radiator surface			60 ~ 90	(140 ~ 194)	(°F)	----------	
	Eng. RPM	Low Idle		Gauge Cluster or Tachometer			850 ~ 900		RPM		LOW Throttle
		Hi Idle					2315 ~ 2365				Full Throttle
		S or D mode					----------				
		FC mode					----------				
		Auto accel - decel					----------				
Pilot circuit	Primary pressure			Gear Pump	PF1/4	P3	47 ~ 53	(670 ~ 750)	Kg/cm2 (PSI)	PR1	H Mode, E/G Hi idle
Main Reliefs	Travel		RH	Main Pump		a1	350 ~ 355	(4980 ~ 5050)		TR1	H Mode, E/G Hi idle Simultaneous RH/LH Travel stalled
			LH			a2	350 ~ 355	(4980 ~ 5050)		TR2	
	Attachment	Boost Pressure	RH			a1	----------	----------		MR1	Bucket digging
			LH			a2	----------	----------		MR2	Boom raising
			RH			a1	300 ~ 305	(4270 ~ 4340)		MR1	Bucket digging
			LH			a2	300 ~ 305	(4270 ~ 4340)		MR2	Boom raising
Port Reliefs	Bucket		R			a1	335	(4760)		RV8	Bucket dump
			H				335	(4760)		RV7	Bucket digging
	Boom		R			a1	335	(4760)		RV6	Boom lowering
			H				335	(4760)		RV5	Boom raising
	Arm		R			a2	335	(4760)		RV10	Arm extending out; Cyl. In
			H				335	(4760)		RV9	Arm digging in; Cyl. Out
	Swing		RH			a2	265 ~ 295	(3770 ~ 4200)		RV11	Bucket lock, stall swing
			LH				265 ~ 295	(3770 ~ 4200)		RV12	
	Travel	RH	F			a1	----------	----------		RV14	H Mode, E/G Hi idle Simultaneous RH/LH Travel engaged
			R				----------	----------		RV13	
		LH	F			a2	----------	----------		RV13	
			R				----------	----------		RV14	
Loading Mode	Scale on loading mode switch OPT.		1			a2	----------	----------		----------	Set to 4th notch (incl. 300kgf/cl) in H mode.
			2				----------	----------		----------	
			11				----------	----------		----------	
Low Pressure Reliefs	Independent D - OFF		RH			a1	28 ~ 38	(400 ~ 540)		----------	H mode, E/G Hi idle Controls in neutral
			LH			a2				----------	
	Independent D - ON		RH			a1	----------	----------		----------	D Mode, E G Hi idle Controls in neutral
			LH			a2	----------	----------		----------	
Negative Control Pressure	Independent D - OFF		RH			Pi1	28 ~ 38	(400 ~ 540)		----------	H Mode, E G Hi idle Controls in neutral
			LH			Pi2				----------	
	Independent D - ON		RH			Pi1	----------	----------		----------	D Mode, E G Hi idle Controls in neutral
			LH			Pi2	----------	----------		----------	
Proportional Solenoid Valve	KPSS	H S FC D				a3	----------	----------		----------	E/G Hi idle Controls in neutral
		Release					----------	----------		----------	
		Boost					----------	----------		----------	

Test Port Locations:
a1 - Test Port in P1 pump
a2 - Test Port in P2 pump
a3 - Test Port in (Pf) power Shift Solenoid
Pi1 - Negative control press. Port @ P1 pump regulator
Pi2 - Negative control press. Port @ P2 pump regulator
P3 - Test Port in P3 (Pilot) pump

Table 1

(Note: Take measurement in the H mode, unless otherwise specified. The standard tolerance shall be an allowable range in field measurements.)

Inspection Item				Pressure: Position	Pressure: Size	Pressure: Port	Specifications		Unit	Adjusting Point	Measuring Condition, Function
Stds. for Testing	Cleanliness of hydraulic oil			Hydraulic oil tank			NAS 7-9		Class	----------	Sampling
	Temperature of hydraulic oil			Tank surface			45 ~ 55	(113 ~ 131)	°C	----------	Ambient temperature -10°C ~ 50°C (14°F ~ 122°F)
	Coolant temperature			Radiator surface			60 ~ 90	(140 ~ 194)	(°F)	----------	
	Eng. RPM	Low Idle		Gauge Cluster or Tachometer			850 ~ 900		RPM	CPU	LOW Throttle
		Hi Idle					2355 ~ 2405				Full Throttle
		S or D mode					1950 ~ 2050				
		FC mode					1550 ~ 1650				
		Auto accel - decel					1000 ~ 1100				
Pilot circuit	Primary pressure			Gear Pump	PF1/4	P3	47 ~ 53	(670 ~ 750)	Kg/cm2 (PSI)	PR1	H Mode, E/G Hi idle
Main Reliefs	Travel		RH	Main Pump		a1	350 ~ 355	(4980 ~ 5050)		TR1	H Mode, E/G Hi idle Simultaneous RH/LH Travel stalled
			LH			a2	350 ~ 355	(4980 ~ 5050)		TR2	
	Attachment	Boost Pressure	RH			a1	----------	----------		MR1	Bucket digging
			LH			a2	----------	----------		MR2	Boom raising
			RH			a1	300 ~ 305	(4270 ~ 4340)		MR1	Bucket digging
			LH			a2	300 ~ 305	(4270 ~ 4340)		MR2	Boom raising
Port Reliefs	Bucket		R			a1	335	(4765)		RV8	Bucket dump
			H				335	(4765)		RV7	Bucket digging
	Boom		R			a1	335	(4765)		RV6	Boom lowering
			H				335	(4765)		RV5	Boom raising
	Arm		R			a2	335	(4765)		RV10	Arm extending out; Cyl. In
			H				335	(4765)		RV9	Arm digging in; Cyl. Out
	Swing		RH			a2	265 ~ 295	(3770 ~ 4200)		RV11	Bucket lock, stall swing
			LH				265 ~ 295	(3770 ~ 4200)		RV12	
	Travel	RH	F			a1	----------	----------		RV14	H Mode, E/G Hi idle Simultaneous RH/LH Travel engaged
			R				----------	----------		RV13	
		LH	F			a2	----------	----------		RV13	
			R				----------	----------		RV14	
Loading Mode	Scale on loading mode switch OPT.		1			a2	----------	----------		----------	Set to 4th notch (incl. 300kgf/cl) in H mode
			2				----------	----------		----------	
			11				----------	----------		----------	
Low Pressure Reliefs	Independent D - OFF		RH			a1	28 ~ 41	(400 ~ 580)		----------	H mode, E/G Hi idle Controls in neutral
			LH			a2				----------	
	Independent D - ON		RH			a1	0 ~ 7	(0 ~ 100)		----------	D Mode, E/G Hi idle Controls in neutral
			LH			a2				----------	
Negative Control Pressure	Independent D - OFF		RH			Pi1	28 ~ 38	(400 ~ 540)		----------	H Mode, E/G Hi idle Controls in neutral
			LH			Pi2				----------	
	Independent D - ON		RH			Pi1	26 ~ 33	(370 ~ 470)		----------	D Mode, E/G Hi idle Controls in neutral
			LH			Pi2				----------	
Proportional Solenoid Valve	KPSS	H S FC D				a3	0 ~ 3	(0 ~ 43)		----------	E/G Hi idle Controls in neutral
		Release					5.2 ~ 10.2	(74 ~ 145)		----------	
		Boost					----------	----------		----------	

Test Port Locations:
a1 - Test Port in P1 pump
a2 - Test Port in P2 pump
a3 - Test Port in (Pf) power Shift Solenoid
Pi1 - Negative control press. Port @ P1 pump regulator
Pi2 - Negative control press. Port @ P2 pump regulator
P3 - Test Port in P3 (Pilot) pump

Table 1

(Note: Take measurement in the H mode, unless otherwise specified. The standard tolerance shall be an allowable range in field measurements.)

Inspection Item				Pressure: Position	Size	Port	Specifications		Unit	Adjusting Point	Measuring Condition, Function
Stds. for Testing	Cleanliness of hydraulic oil			Hydraulic oil tank			NAS 7-9		Class	----------	Sampling
	Temperature of hydraulic oil			Tank surface			45 ~ 55	(113 ~ 131)	°C	----------	Ambient temperature -10°C ~ 50°C (14°F ~ 122°F)
	Coolant temperature			Radiator surface			60 ~ 90	(140 ~ 194)	(°F)	----------	
	Eng. RPM	Low Idle		Gauge Cluster or Tachometer			850 ~ 900		RPM	CPU	LOW Throttle
		Hi Idle					2305 ~ 2355				Full Throttle
		S or D mode					1950 ~ 2050				
		FC mode					1550 ~ 1650				
		Auto accel - decel					1000 ~ 1100				
Pilot circuit	Primary pressure			Gear Pump	PF1/4	P3	47 ~ 53	(670 ~ 750)	Kg/cm2 (PSI)	PR1	H Mode, E/G Hi idle
Main Reliefs	Travel		RH	Main Pump		a1	350 ~ 355	(4980 ~ 5050)		TR1	H Mode, E/G Hi idle Simultaneous RH/LH Travel stalled
			LH			a2	350 ~ 355	(4980 ~ 5050)		TR2	
	Attachment	Boost Pressure	RH			a1	330 ~ 345	(4690 ~ 4910)		MR1	Bucket digging
			LH			a2	330 ~ 345	(4690 ~ 4910)		MR2	Boom raising
			RH			a1	300 ~ 305	(4270 ~ 4340)		MR1	Bucket digging
			LH			a2	300 ~ 305	(4270 ~ 4340)		MR2	Boom raising
Port Reliefs	Bucket		R			a1	330 ~ 340	(4690 ~ 4830)		RV8	Bucket dump
			H				345 ~ 355	(4910 ~ 5050)		RV7	Bucket digging
	Boom		R			a1	320 ~ 340	(4550 ~ 4830)		RV6	Boom lowering
			H				345 ~ 355	(4910 ~ 5050)		RV5	Boom raising
	Arm		R			a2	330 ~ 340	(4690 ~ 4830)		RV10	Arm extending out; Cyl. In
			H				330 ~ 340	(4690 ~ 4830)		RV9	Arm digging in; Cyl. Out
	Swing		RH			a2	275 ~ 305	(3910 ~ 4340)		RV11	Bucket lock, stall swing
			LH				275 ~ 305	(3910 ~ 4340)		RV12	
	Travel	RH	F			a1	360 ~ 370	(5120 ~ 5265)		RV14	H Mode, E/G Hi idle Simultaneous RH/LH Travel engaged
			R				360 ~ 370	(5120 ~ 5265)		RV13	
		LH	F			a2	360 ~ 370	(5120 ~ 5265)		RV13	
			R				360 ~ 370	(5120 ~ 5265)		RV14	
Loading Mode	Scale on loading mode switch OPT.		1			a2	100 ~ 120	(1420 ~ 1710)		----------	Set to 4th notch (incl. 300kgf cl) in H mode
			2				130 ~ 150	(1850 ~ 2130)		----------	
			11				300 ~ 305	(4270 ~ 4340)		----------	
Low Pressure Reliefs	Independent D - OFF		RH			a1	34 ~ 44	(480 ~ 630)		----------	H mode, E G Hi idle Controls in neutral
			LH			a2				----------	
	Independent D - ON		RH			a1	0 ~ 5	(0 ~ 70)		----------	D Mode E G Hi idle Controls in neutral
			LH			a2				----------	
Negative Control Pressure	Independent D - OFF		RH			Pi1	34 ~ 44	(480 ~ 630)		----------	H Mode, E G Hi idle Controls in neutral
			LH			Pi2				----------	
	Independent D - ON		RH			Pi1	26 ~ 32	(370 ~ 460)		----------	D Mode E G Hi idle Controls in neutral
			LH			Pi2				----------	
Proportional Solenoid Valve	KPSS	H S FC D				a3	0 ~ 3	(0 ~ 43)		----------	E/G Hi idle Controls in neutral
		Release					6.7 ~ 14.7	(95 ~ 210)		----------	
		Boost					32.5 ~ 39.5	(460 ~ 560)		----------	

Test Port Locations:
a1 - Test Port in P1 pump
a2 - Test Port in P2 pump
a3 - Test Port in (Pf) power Shift Solenoid
Pi1 - Negative control press. Port @ P1 pump regulator
Pi2 - Negative control press. Port @ P2 pump regulator
P3 - Test Port in P3 (Pilot) pump

Table 1

(Note: Take measurement in the H mode, unless otherwise specified. The standard tolerance shall be an allowable range in field measurements.)

Inspection Item				Pressure: Position	Size	Port	Specifications		Unit	Adjusting Point	Measuring Condition, Function
Stds. for Testing	Cleanliness of hydraulic oil			Hydraulic oil tank			NAS 7-9		Class	----------	Sampling
	Temperature of hydraulic oil			Tank surface			45 ~ 55	(113 ~ 131)	°C	----------	Ambient temperature -10°C ~ 50°C (14°F ~ 122°F)
	Coolant temperature			Radiator surface			60 ~ 90	(140 ~ 194)	(°F)	----------	
	Eng. RPM	Low Idle		Gauge Cluster or Tachometer			850 ~ 900		RPM	CPU	LOW Throttle
		Hi Idle					2305 ~ 2355				Full Throttle
		S or D mode					1950 ~ 2050				
		FC mode					1550 ~ 1650				
		Auto accel - decel					1000 ~ 1100				
Pilot circuit	Primary pressure			Gear Pump	PF1/4	P3	47 ~ 53	(670 ~ 750)	Kg/cm2 (PSI)	PR1	H Mode, E/G Hi idle
Main Reliefs	Travel		RH	Main Pump		a1	350 ~ 355	(4980 ~ 5050)		TR1	H Mode, E/G Hi idle Simultaneous RH/LH Travel stalled
			LH			a2	350 ~ 355	(4980 ~ 5050)		TR2	
	Attachment	Boost Pressure	RH			a1	315 ~ 330	(4480 ~ 4690)		MR1	Bucket digging
			LH			a2	315 ~ 330	(4480 ~ 4690)		MR2	Boom raising
			RH			a1	300 ~ 305	(4270 ~ 4340)		MR1	Bucket digging
			LH			a2	300 ~ 305	(4270 ~ 4340)		MR2	Boom raising
Port Reliefs	Bucket		R			a1	330 ~ 340	(4690 ~ 4830)		RV8	Bucket dump
			H				330 ~ 340	(4690 ~ 4830)		RV7	Bucket digging
	Boom		R			a1	330 ~ 340	(4690 ~ 4830)		RV6	Boom lowering
			H				330 ~ 340	(4690 ~ 4830)		RV5	Boom raising
	Arm		R			a2	330 ~ 340	(4690 ~ 4830)		RV10	Arm extending out; Cyl. In
			H				330 ~ 340	(4690 ~ 4830)		RV9	Arm digging in; Cyl. Out
	Swing		RH			a2	280 ~ 310	(3980 ~ 4410)		RV11	Bucket lock, stall swing
			LH				280 ~ 310	(3980 ~ 4410)		RV12	
	Travel	RH	F			a1	360 ~ 370	(5120 ~ 5260)		RV14	H Mode, E/G Hi idle Simultaneous RH/LH Travel engaged
			R				360 ~ 370	(5120 ~ 5260)		RV13	
		LH	F			a2	360 ~ 370	(5120 ~ 5260)		RV13	
			R				360 ~ 370	(5120 ~ 5260)		RV14	
Loading Mode	Scale on loading mode switch OPT.		1			a2	120 ~ 140	(1710 ~ 1990)		----------	Set to 4th notch (incl. 300kgf/cl) in H mode
			2				150 ~ 170	(2130 ~ 2420)		----------	
			11				300 ~ 305	(4270 ~ 4340)		----------	
Low Pressure Reliefs	Independent D - OFF		RH			a1	35 ~ 49	(500 ~ 700)		----------	H mode, E/G Hi idle Controls in neutral
			LH			a2				----------	
	Independent D - ON		RH			a1	0 ~ 7	(0 ~ 100)		----------	D Mode, E/G Hi idle Controls in neutral
			LH			a2				----------	
Negative Control Pressure	Independent D - OFF		RH			Pi1	35 ~ 49	(500 ~ 700)		----------	H Mode, E/G Hi idle Controls in neutral
			LH			Pi2				----------	
	Independent D - ON		RH			Pi1	26 ~ 32	(370 ~ 460)		----------	D Mode, E/G Hi idle Controls in neutral
			LH			Pi2				----------	
Proportional Solenoid Valve	KPSS	H S FC D				a3	0 ~ 3	(0 ~ 43)		----------	E/G Hi idle Controls in neutral
		Release					13 ~ 21	(185 ~ 300)		----------	
		Boost					32.6 ~ 39.6	(465 ~ 565)		----------	

Test Port Locations:
a1 - Test Port in P1 pump
a2 - Test Port in P2 pump
a3 - Test Port in (Pf) power Shift Solenoid
Pi1 - Negative control press. Port @ P1 pump regulator
Pi2 - Negative control press. Port @ P2 pump regulator
P3 - Test Port in P3 (Pilot) pump

Table 1

(Note: Take measurement in the H mode, unless otherwise specified. The standard tolerance shall be an allowable range in field measurements.)

Inspection Item				Pressure: Position	Pressure: Size	Pressure: Port	Specifications		Unit	Adjusting Point	Measuring Condition, Function
Stds. for Testing	Cleanliness of hydraulic oil			Hydraulic oil tank			NAS 7-9		Class	----------	Sampling
	Temperature of hydraulic oil			Tank surface			45 ~ 55	(113 ~ 131)	°C	----------	Ambient temperature -10°C ~ 50°C (14°F ~ 122°F)
	Coolant temperature			Radiator surface			60 ~ 90	(140 ~ 194)	(°F)	----------	
	Eng. RPM	Low Idle		Gauge Cluster or Tachometer			850 ~ 900		RPM	CPU	LOW Throttle
		Hi Idle					1930 ~ 1970				Full Throttle
		S or D mode					1670 ~ 1730				
		FC mode					1370 ~ 1430				
		Auto accel - decel					1020 ~ 1080				
Pilot circuit	Primary pressure			Gear Pump	PF1/4	P3	50 ~ 53	(711 ~ 754)	Kg/cm2 (PSI)	PR1	H Mode, E/G Hi idle
Main Reliefs	Travel		RH	Main Pump		a1	350 ~ 355	(4980 ~ 5050)		TR1	H Mode, E/G Hi idle Simultaneous RH/LH Travel stalled
			LH			a2	350 ~ 355	(4980 ~ 5050)		TR2	
	Attachment	Boost Pressure	RH			a1	330 ~ 345	(4690 ~ 4910)		MR1	Bucket digging
			LH			a2	330 ~ 345	(4690 ~ 4910)		MR2	Boom raising
			RH			a1	300 ~ 305	(4270 ~ 4340)		MR1	Bucket digging
			LH			a2	300 ~ 305	(4270 ~ 4340)		MR2	Boom raising
Port Reliefs	Bucket		R			a1	320 ~ 335	(4550 ~ 4760)		RV8	Bucket dump
			H				320 ~ 350	(4550 ~ 4980)		RV7	Bucket digging
	Boom		R			a1	320 ~ 335	(4550 ~ 4760)		RV6	Boom lowering
			H				320 ~ 350	(4550 ~ 4980)		RV5	Boom raising
	Arm		R			a2	320 ~ 335	(4550 ~ 4760)		RV10	Arm extending out; Cyl. In
			H				320 ~ 335	(4550 ~ 4760)		RV9	Arm digging in; Cyl. Out
	Swing		RH			a2	280 ~ 300	(3980 ~ 4270)		RV11	Bucket lock, stall swing
			LH				280 ~ 300	(3980 ~ 4270)		RV12	
	Travel	RH	F			a1	350 ~ 360	(4980 ~ 5120)		RV14	H Mode, E/G Hi idle Simultaneous RH/LH Travel engaged
			R				350 ~ 360	(4980 ~ 5120)		RV13	
		LH	F			a2	350 ~ 360	(4980 ~ 5120)		RV13	
			R				350 ~ 360	(4980 ~ 5120)		RV14	
Loading Mode	Scale on loading mode switch OPT.		1			a2	----------	----------		----------	Set to 4th notch (incl. 300kgf/cl) in H mode
			2				----------	----------		----------	
			11				----------	----------		----------	
Low Pressure Reliefs	Independent D - OFF		RH			a1	32 ~ 47	(455 ~ 668)		----------	H mode, E/G Hi idle Controls in neutral
			LH			a2				----------	
	Independent D - ON		RH			a1	0 ~ 7	(0 ~ 100)		----------	D Mode, E/G Hi idle Controls in neutral
			LH			a2				----------	
Negative Control Pressure	Independent D - OFF		RH			Pi1	32 ~ 47	(455 ~ 668)		----------	H Mode, E/G Hi idle Controls in neutral
			LH			Pi2				----------	
	Independent D - ON		RH			Pi1	26 ~ 32	(370 ~ 455)		----------	D Mode, E/G Hi idle Controls in neutral
			LH			Pi2	28 ~ 34	(398 ~ 483)		----------	
Proportional Solenoid Valve	KPSS	H S FC D				a3	0 ~ 3	(0 ~ 43)		----------	E/G Hi idle Controls in neutral
		Release					10.3 ~ 16.3	(146 ~ 232)		----------	
		Boost					32 ~ 40	(455 ~ 569)		----------	

Test Port Locations:
a1 - Test Port in P1 pump
a2 - Test Port in P2 pump
a3 - Test Port in (Pf) power Shift Solenoid
Pi1 - Negative control press. Port @ P1 pump regulator
Pi2 - Negative control press. Port @ P2 pump regulator
P3 - Test Port in P3 (Pilot) pump

Table 1

(Note: Take measurement in the H mode, unless otherwise specified. The standard tolerance shall be an allowable range in field measurements.)

Inspection Item				Pressure: Position	Pressure: Size	Pressure: Port	Specifications		Unit	Adjusting Point	Measuring Condition, Function
Stds. for Testing	Cleanliness of hydraulic oil			Hydraulic oil tank			NAS 7-9		Class	----------	Sampling
	Temperature of hydraulic oil			Tank surface			45~55	(113~131)	°C	----------	Ambient temperature -10°C~50°C (14°F~122°F)
	Coolant temperature			Radiator surface			60~90	(140~194)	(°F)	----------	
	Eng. RPM	Low Idle		Gauge Cluster or Tachometer			850~900		RPM	CPU	LOW Throttle
		Hi Idle					2150~2220				Full Throttle
		S or D mode					1870~1930				
		FC mode					1570~1630				
		Auto accel - decel					1020~1080				
Pilot circuit	Primary pressure			Gear Pump	PF1/4	P3	50~53	(711~754)	Kg/cm2 (PSI)	PR1	H Mode, E/G Hi idle
Main Reliefs	Travel		RH	Main Pump		a1	350~355	(4980~5050)		TR1	H Mode, E/G Hi idle Simultaneous RH/LH Travel stalled
			LH			a2	350~355	(4980~5050)		TR2	
	Attachment	Boost Pressure	RH			a1	335~355	(4760~5050)		MR1	Bucket digging
			LH			a2	335~355	(4760~5050)		MR2	Boom raising
			RH			a1	320~325	(4550~4620)		MR1	Bucket digging
			LH			a2	320~325	(4550~4620)		MR2	Boom raising
Port Reliefs	Bucket		R			a1	335~355	(4760~5050)		RV8	Bucket dump
			H				335~370	(4760~5260)		RV7	Bucket digging
	Boom		R			a1	335~355	(4760~5050)		RV6	Boom lowering
			H				335~370	(4760~5260)		RV5	Boom raising
	Arm		R			a2	335~355	(4760~5050)		RV10	Arm extending out; Cyl. In
			H				335~355	(4760~5050)		RV9	Arm digging in; Cyl. Out
	Swing		RH			a2	275~300	(3910~4270)		RV11	Bucket lock, stall swing
			LH				275~300	(3910~4270)		RV12	
	Travel	RH	F			a1	350~365	(4980~5190)		RV14	H Mode, E/G Hi idle Simultaneous RH/LH Travel engaged
			R				350~365	(4980~5190)		RV13	
		LH	F			a2	350~365	(4980~5190)		RV13	
			R				350~365	(4980~5190)		RV14	
Loading Mode	Scale on loading mode switch OPT.		1			a2	----------	----------		----------	Set to 4th notch (incl. 300kgf/cl) in H mode
			2				----------	----------		----------	
			11				----------	----------		----------	
Low Pressure Reliefs	Independent D - OFF		RH			a1	32~47	(455~668)		----------	H mode, E/G Hi idle Controls in neutral
			LH			a2				----------	
	Independent D - ON		RH			a1	0~7	(0~100)		----------	D Mode, E/G Hi idle Controls in neutral
			LH			a2				----------	
Negative Control Pressure	Independent D - OFF		RH			Pi1	32~47	(455~668)		----------	H Mode, E/G Hi idle Controls in neutral
			LH			Pi2				----------	
	Independent D - ON		RH			Pi1	26~32	(370~455)		----------	D Mode, E/G Hi idle Controls in neutral
			LH			Pi2	28~34	(398~483)		----------	
Proportional Solenoid Valve	KPSS	H S FC D				a3	0~3	(0~43)		----------	E/G Hi idle Controls in neutral
		Release					9.7~15.7	(138~223)		----------	
		Boost					32~40	(455~569)		----------	

Test Port Locations:
a1 - Test Port in P1 pump
a2 - Test Port in P2 pump
a3 - Test Port in (Pf) power Shift Solenoid
Pi1 - Negative control press. Port @ P1 pump regulator
Pi2 - Negative control press. Port @ P2 pump regulator
P3 - Test Port in P3 (Pilot) pump

Mechatronic Adjustment:

General Precautions

Replaced Parts	Adjustment A	Adjustment B
Mechatronic Controller	O	O ①
Governor (Stepping) Motor	O	—
Proportional Reducing Valve for Loading Mode	—	O ①

Always perform the mechatronic adjustments when any of the parts below are replaced:

1. Mechatronic Controller
2. Governor (Stepping) Motor
3. Proportional Reducing Valve for Loading Mode ①

Perform adjustments A and B when the mechatronic controller is replaced; perform adjustment A when the governor motor is replaced; perform adjustment B when the proportional reducing valve for loading mode is replaced.

Before performing each adjustment, turn the switch on the mechatronic controller toward "TEST" with the engine key switch "OFF". This is common to both the A and B adjustments.

If you turn on the engine key switch with the engine stopped and the controller switch at "TEST", the auto accel lamp (LED on the cluster gauge) lights continuously. Lighting of the lamp confirms that the switch is at "TEST".

① Loading Mode is optional on Kobelco America Inc. spec. machines. Adjustment B is not necessary unless this option is installed.

1. Prior to starting Adjustment "A" procedures, if throttle control is possible, complete the following:

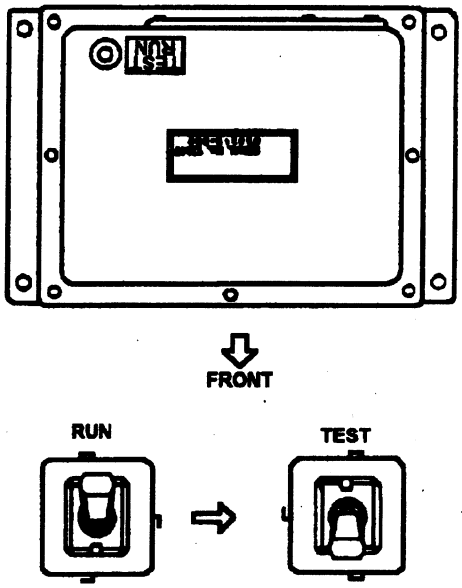
   A. Measure and record engine RPM's with the throttle knob in the full throttle position, in the following modes:
      1. H-mode RPM
      2. S-mode RPM
      3. FC-mode RPM
      4. D-mode RPM
      5. Decel RPM
      6. Lo-idle RPM

   B. Position the attachment in the "Check Hydraulic Oil" attachment position. This will assure that the low hydraulic oil level is correct.

   C. Warm up the engine and hydraulic systems to normal operating temperatures prior to completing adjustment procedures.

   D. Assure that you know which stop bolt assembly on the engine fuel pump is for engine stop position and for hi-idle position.

   E. Make sure that the engine emergency stop knob-cable assembly is pushed in fully. This knob is located on the lower right hand side of the operators seat in the cab.



   F. Remove covers behind the operators seat in the cab, to gain access to controller.

2. Turn the ignition key switch to the "OFF" position. Remember that electrical power remains on for approximately four seconds after the key switch is turned to the off position.

3. With the key switch and electrical power "OFF", turn the mechatronic controller. Internal toggle switch from the RUN position to the TEST position.

⚠ Caution:
Never switch the mechatronic controller internal test run toggle switch when electrical power is on. If this is done, computer memory will be lost and Adjustment A and/or Adjustment B procedures will be required to restore operation.

Note: When the mechatronic controller internal test-run switch is in the test position, the auto-accel L.E.D. lamp on the gauge cluster display remains on continuously to remind you that the controller is in test position.

Adjustment A Procedure

Adjustment Start Condition

① Internal Adjust Switch	Change to "TEST" side
② Work Mode	"H" Mode
③ Auto Accel	"ON"
④ Throttle	Low Idle
⑤ Engine	Stopped
⑥ Keyswitch	"ON" position

1. Positioning E/G stop and high idle <Positioning E/G stop>.

   ① Draw out the 1P coupler of the controller.

   ② Connect the special Kobelco adjust harness (part number 2479Z2364) with the coupler.

   ③ Set the adjustment start conditions shown above.

   ④ Press the adjust harness switch for 3 ~ 5 seconds and then release it.

   ⑤ The CPU should be displayed on the gauge cluster LCD display. At the same time, the governor motor is electrified and is fixed in the E/G stop position.

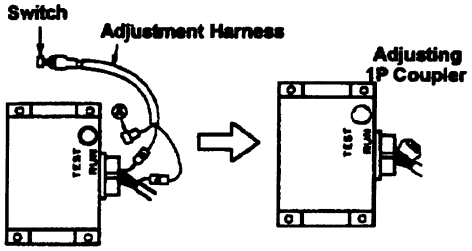
   ⑥ If the switch is pressed for more than five seconds or where the adjustment condition is wrong, the display returns to the clock display. In that case, set the adjustment conditions correctly and try once again.

   ⑦ Adjust the pin-to-pin distance of the governor rod (C) to the specified value, insert the governor rod into the linkage lever from the output shaft of the governor motor, and assemble them together.

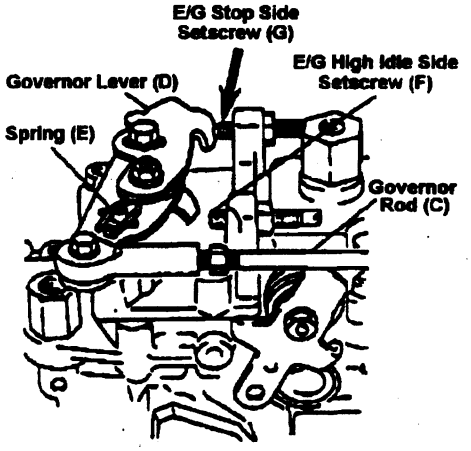
   ⑧ Then, adjust the governor rod (C) till the governor lever (D) comes in contact with the E/G stop setscrew (G).

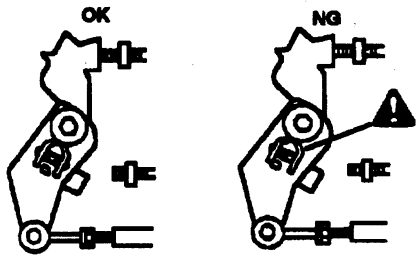
   ⑨ After tightening up the locknut of the rod, confirm the clearance once again.

This completes the positioning of the E/G stop position. Proceed to matching of high idle position.



When bringing the governor lever into contact with the E/G low idle setscrew in ⑧, set the spring (E) of the governor lever so it does not expand (extend).





Pin to Pin distance of the governor rod.

Model (S/N Prefix)	mm. (in.)
SK150LC-IV (YMU)	172 (6.77)
SK200-IV (YNU) SK200LC-IV (YQU)	227 (8.94)
SK220-IV (LQU) SK220LC-IV (LLU)	227 (8.94)

<Matching high idle position>

① Now, if the adjust harness switch is depressed, the governor motor is de-electrified and freed.

② Move and hold the governor lever (D) by hand so it comes in contact with the high idle setscrew (F).

③ If the adjust harness switch is now depressed with the governor lever held, the governor motor is fixed in the high idle position.

④ In this condition, if there is clearance between the governor lever and the high idle setscrew or if the spring is expanded by excessive pressing, adjust the clearance by means of the buzzer stop switch. If the buzzer stop switch (※1) is pressed with the auto accel switch on, the clearance decreases each time the switch is pushed. (The governor lever moves by about 0.04 mm. [0.00157"] by one pressing). If the buzzer stop switch is pressed with the auto accel switch off, the clearance increases each time it is pressed.

⑤ Next, press the adjust harness switch and power is supplied. The governor motor travels toward the stop screw by itself, indexes a high idle position and stores it in memory.

⑥ The moment the high idle position is stored in the memory, the screen changes from CPU to clock display.

This completes the matching of the high idle position.

⚠ Do not turn off key switch at this time. Proceed to engine revolution matching.

2. Engine Revolution Matching

Adjustment Start Conditions

① Internal Adjust Switch	Change to "TEST" side
② Work Mode	"H" Mode
③ Auto Accel	"OFF"
④ Throttle	Low Idle
⑤ Engine	Running
⑥ Key Switch	"ON" position

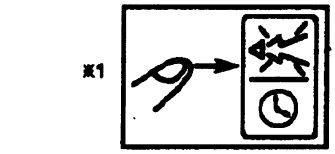
① Run the engine for warming it up.

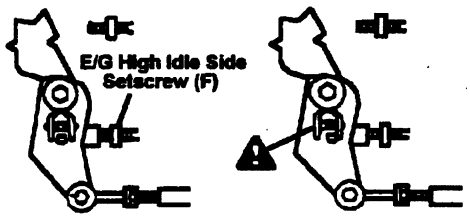
② Set the adjustment conditions shown above.

③ Press the adjust harness switch for 3 ~ 5 seconds and then release it.

Note: In case of item 2.

In bringing the governor lever in contact with the E/G high idle setscrew, set it so the spring of the governor lever does not expand (extend).





※ The adjust harness switch is of momentary type with a normally closed contact; it is opened if the switch is pressed and it is shorted if the switch is let free. Where there is no adjust harness provided, disjoint the 1P connector instead of turning off the switch.

④ The moment the multi display changes from clock to CPU display, power is supplied. The governor motor which is then electrified, drives itself for about three minutes from an engine speed below the low idle to the high idle engine speed.

⑤ The controller reads and stores changes in the engine speed.

⑥ When the storage is over, CPU on the multi display changes to clock display.

⑦ After adjustment, remove the adjust harness and connect the 1P coupler of the controller.

⑧ After turning the engine key to "OFF", always wait for electrical power to turn off, then set the controller switch to "RUN".

⑨ This completes the "Adjustment A Procedure".

After adjustment, make sure that the engine revolution falls within the following standards:

Model	Serial Number Prefix	High Idle	Low Idle
SK200-IV	YNU	2330 ± 25 RPM	875 ± 25 RPM
SK200LC-IV	YQU		
SK220-IV	LQU		
SK220LC-IV	LLU		
SK150LC-IV	YMU	2380 ± 25 RPM	875 ± 25 RPM

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: April 20, 1995

BULLETIN: HE-267
Page 1 of 4

SUBJECT: Cummins Engine Start-up and Warranty

AFFECTED MACHINES: All Mark IV Excavators equipped with Cummins Engines (United States and Canada)

Please find attached, a letter of clarification from Cummins Engine Company, Inc., which states: "Cummins does not require a start up inspection to initialize warranty." Further, it continues with owner requirements necessary to secure warranty coverage.

Also attached, is a copy of the Cummins Industrial Warranty brochure Bulletin 3381321, in which the Cummins Engine Warranty coverage is stated as:

"one year/unlimited hours, two years/2,000 hours whichever occurs first."

It continues, with an explanation of the Cummins Extended Major Components Warranty, which covers certain specified engine components for:

"three years or 10,000 hours"

Please review these attachments completely, to understand the responsibilities and limitations of the Cummins Engine Warranty.

For Cummins Engine Parts or Warranty Service, contact your nearest Cummins Dealer, as listed in the previously provided "Off Highway Authorized Dealer Directory", Bulletin 3624350.

THIS BULLETIN IS BEING ISSUED FOR INFORMATION ONLY AND IS NOT AN AUTHORIZATION FOR ANY REPLACEMENT OR WARRANTY CLAIM SUBMITTAL.

SERVICE\HE267

Cummins Engine Company, Inc.
Box 3005
Columbus, Indiana
47202-3005

March 13, 1995

Mr. Howard Schilling
Kobelco America, Inc.
10515 Harwin Drive
Houston, TX 77036

Dear Howard:

Subject: Clarification on Warranty Start

As shown in the Cummins Industrial Warranty brochure Bulletin 3381321. "Coverage begins with the sale of the Engine by Cummins. Coverage continues for two years or 2,000 hours of operation, whichever occurs first, from the date of delivery of the Engine to the first user, or from the date the unit is first leased, rented or loaned, or from the date the Engine reaches 50 hours of operation in demonstration use, whichever of the three occurs first. If the 2,000 hour limit is exceeded during the first year, coverage continues until the end of the first year".

Cummins does not require a start up inspection to initialize warranty. What we do require is that the owner show proof of warranty coverage start date at the time of a warrantable failure. This proof might be; shipping information, invoice record, log book with hours, etc.

Please also note that the coverage is indeed one year/unlimited, two years/2000 hours whichever occurs first.

Please advise if you should have any further questions.

Sincerely,

L.M. Schertz/jc

Manager - Customer Quality

Industrial Warranty

for Off-Highway Engines
United States and Canada

Cummins Engine Company, Inc.
Box 3005
Columbus, IN 47202-3005
U.S.A.

Bulletin 3381321
Printed in U.S.A. Rev. 5/93

Coverage

PRODUCTS WARRANTED

This warranty applies to new Engines sold by Cummins Engine Company and delivered to the first user on or after February 1, 1993, that are used in off-highway applications in the United States* and Canada, except for Engines used in marine, generator drive and certain defense applications, for which different warranty coverage is provided.

BASE ENGINE WARRANTY

This warranty covers any failures of the Engine, under normal use and service, which results from a defect in material or workmanship (Warrantable Failure).

Coverage begins with the sale of the Engine by Cummins. Coverage continues for two years or 2,000 hours of operation, whichever occurs first, from the date of delivery of the Engine to the first user, or from the date the unit is first leased, rented or loaned, or from the date the Engine reaches 50 hours of operation in demonstration use, whichever of the three occurs first. If the 2,000 hour limit is exceeded during the first year, coverage continues until the end of the first year.

EXTENDED MAJOR COMPONENTS WARRANTY

The Extended Major Components Warranty covers Warrantable Failures of the Engine cylinder block, camshaft, crankshaft and connecting rods (Covered Parts).

Bushing and bearing failures are not covered.

This coverage begins with the expiration of the Base Engine Warranty and ends after three years or 10,000 hours of operation, from the date of delivery of the Engine to the first user, or from the date the unit is first leased, rented or loaned, or from the date the Engine reaches 50 hours of operation in demonstration use, whichever of the three occurs first.

CONSUMER PRODUCTS

The warranty on Consumer Products in the United States is a LIMITED warranty. **CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.** Any implied warranties applicable to Consumer Products in the United States terminate concurrently with the expiration of the express warranties applicable to such products. In the United States, some states do not allow the exclusion of incidental or consequential damages, or limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you.

These warranties are made to all Owners in the chain of distribution, and coverage continues to all subsequent Owners until the end of the periods of coverage.

Cummins Responsibilities

DURING THE BASE ENGINE WARRANTY

Cummins will pay for all parts and labor needed to repair the damage to the Engine resulting from a Warrantable Failure.

Cummins will pay for the lubricating oil, antifreeze, filter elements, belts, hoses and other maintenance items that are not reusable due to a Warrantable Failure.

Cummins will pay reasonable costs for mechanics to travel to and from the equipment site, including meals, mileage and lodging, when the repair is performed at the site of the failure.

Cummins will pay reasonable labor costs for Engine removal and reinstallation when necessary to repair a Warrantable Failure.

DURING THE EXTENDED MAJOR COMPONENTS WARRANTY

Cummins will pay for the repair or, at its option, replacement of the defective Covered Part and any *Covered Part damaged by a Warrantable Failure of the* defective Covered part.

Owners Responsibilities

DURING THE BASE ENGINE WARRANTY

Owner is responsible for the cost of lubricating oil, antifreeze, filter elements and other maintenance items provided during warranty repairs unless such items are not reusable due to the Warrantable Failure.

DURING THE EXTENDED MAJOR COMPONENTS WARRANTY

Owner is responsible for the cost of all labor needed to repair the Engine, including the labor to remove and reinstall the Engine. When Cummins elects to repair a part instead of replacing it, Owner is not responsible for the labor needed to repair the part.

Owner is responsible for the cost of all parts required for the repair except for the defective Covered Part and any Covered Part damaged by a Warrantable Failure of the defective Covered Part.

Owner is responsible for the cost of lubricating oil, antifreeze, filter elements and other maintenance items replaced during repair of a Warrantable Failure

DURING THE BASE ENGINE AND EXTENDED MAJOR COMPONENTS WARRANTIES

Owner is responsible for the operation and maintenance of the Engine as specified in Cummins Operations and Maintenance Manuals. Owner is also responsible for providing proof that all recommended maintenance has been performed.

Before the expiration of the applicable warranty, Owner must notify a Cummins distributor, authorized dealer or other repair location approved by Cummins of any Warrantable Failure and make the product available for repair by such facility. Locations in the United States and Canada are listed in the Cummins Off Highway Authorized Dealer Directory.

Owner is responsible for communication expenses, meals, lodging and similar costs incurred as a result of a Warrantable Failure.

Owner is responsible for non-Engine repairs, *"downtime" expenses, cargo damage, fines,* all applicable taxes, all business costs and other losses resulting from a Warrantable Failure.

Limitations

Cummins is not responsible for failures or damage resulting from what Cummins determines to be abuse or neglect, including, but not limited to: operation without adequate coolant or lubricants; overfueling; overspeeding; lack of maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications of the Engine. Cummins is also not responsible for failures caused by incorrect fuel or by water, dirt or other contaminants in the fuel.

For power units and fire pumps (package units), this warranty applies to accessories, except for clutches and filters, supplied by Cummins which bear the name of another company.

Except for power units and fire pumps, this warranty does not apply to accessories which bear the name of another company. This category includes, but is not limited to: alternators, starters, fans, air conditioning compressors, clutches, filters, transmissions, torque converters, steering pumps, and non-Cummins fan drives, engine compression brakes and air compressors.

Cummins Compusave units are covered by a separate warranty.

Before a claim for excessive oil consumption will be considered, Owner must submit adequate documentation to show that consumption exceeds Cummins published standards.

Failures of belts supplied by Cummins are not covered beyond the first 500 hours or one year of operation, whichever occurs first.

Parts used to repair a Warrantable Failure may be new Cummins parts, Cummins approved rebuilt parts, or repaired parts. Cummins is not responsible for failures resulting from the use of parts not approved by Cummins.

A new Cummins or Cummins-approved rebuilt part used to repair a Warrantable Failure assumes the identity of the part it replaced and is entitled to the remaining coverage hereunder.

CUMMINS DOES NOT COVER WEAR OR WEAROUT OF COVERED PARTS.

CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

THESE WARRANTIES SET FORTH HEREINAFTER ARE THE SOLE WARRANTIES MADE BY CUMMINS IN REGARD TO THESE ENGINES. CUMMINS MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

* United States includes American Samoa, the Commonwealth of Northern Mariana Islands, Guam, Puerto Rico and the U.S. Virgin Islands.

SERVICE BULLETIN
KOBELCO AMERICA INC.

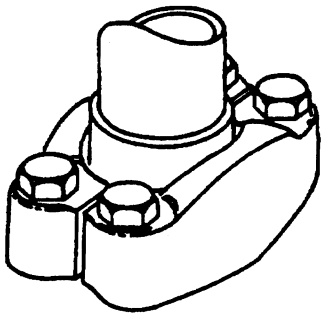
DATE: April 20, 1995

BULLETIN: HE-270
Page 1 of 3

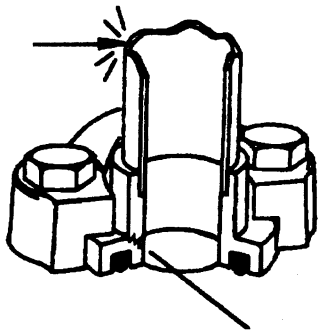
SUBJECT: Four (4) Bolt Split Flange Connection

AFFECTED MACHINES: SK400LC-III
SK400LC-IV

Reports from the field indicate that hydraulic tubes for the SK400LCIII have been failing prematurely. Inspection of the tubes reveals that the tubes are cracked in the area where the four (4) bolt flange is clamped.



4 Bolt Split Flange Connection



Cracked

A possible reason the tubes have cracked is because they have been "side loaded". The most likely cause of the side load is as follows:

1. The flanged end of the tube is not seated squarely before the four (4) bolt connection is torqued.
2. The tube is not properly seated in the clamp and bracket, prior to being torqued, at the opposite end of the tube.
3. Air wrenches are used to install split flanges, clamps, and brackets.
4. Split flanges are not torqued in a "criss cross" pattern.

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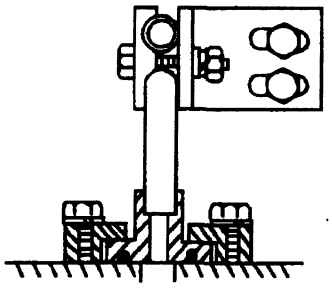
SERVICE\HE270

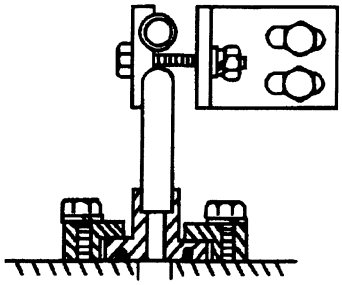
The holding clamp and bracket is aligned with the tubes, and the cap screws are *hand tight before* torquing.



The flanged end of the tubes are seated squarely and the cap screws are hand tight before torquing

Correct

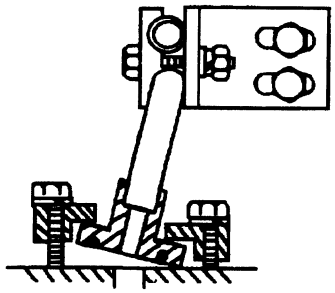
The holding clamp and bracket are not aligned properly. If the capscrews are torqued in this condition, then the tube will be side loaded.



The flanged end of the tubes are seated squarely.

Wrong

The holding clamp, brackets, and tubes are aligned properly.



The flanged end of tubes are not seated squarely. If the capscrews are torqued in this condition, the tubes will be side loaded.

Wrong

To prevent side loading the hydraulic tube, the following procedure should be followed.

1. Hand tighten all capscrews so that alignment and seating can be inspected and adjusted if necessary.

2. Inspect alignment of all holding clamps and brackets to ensure that the hydraulic tubes are not side loaded.

Note
The brackets are slotted to allow adjustment, "up and down", and "in and out".

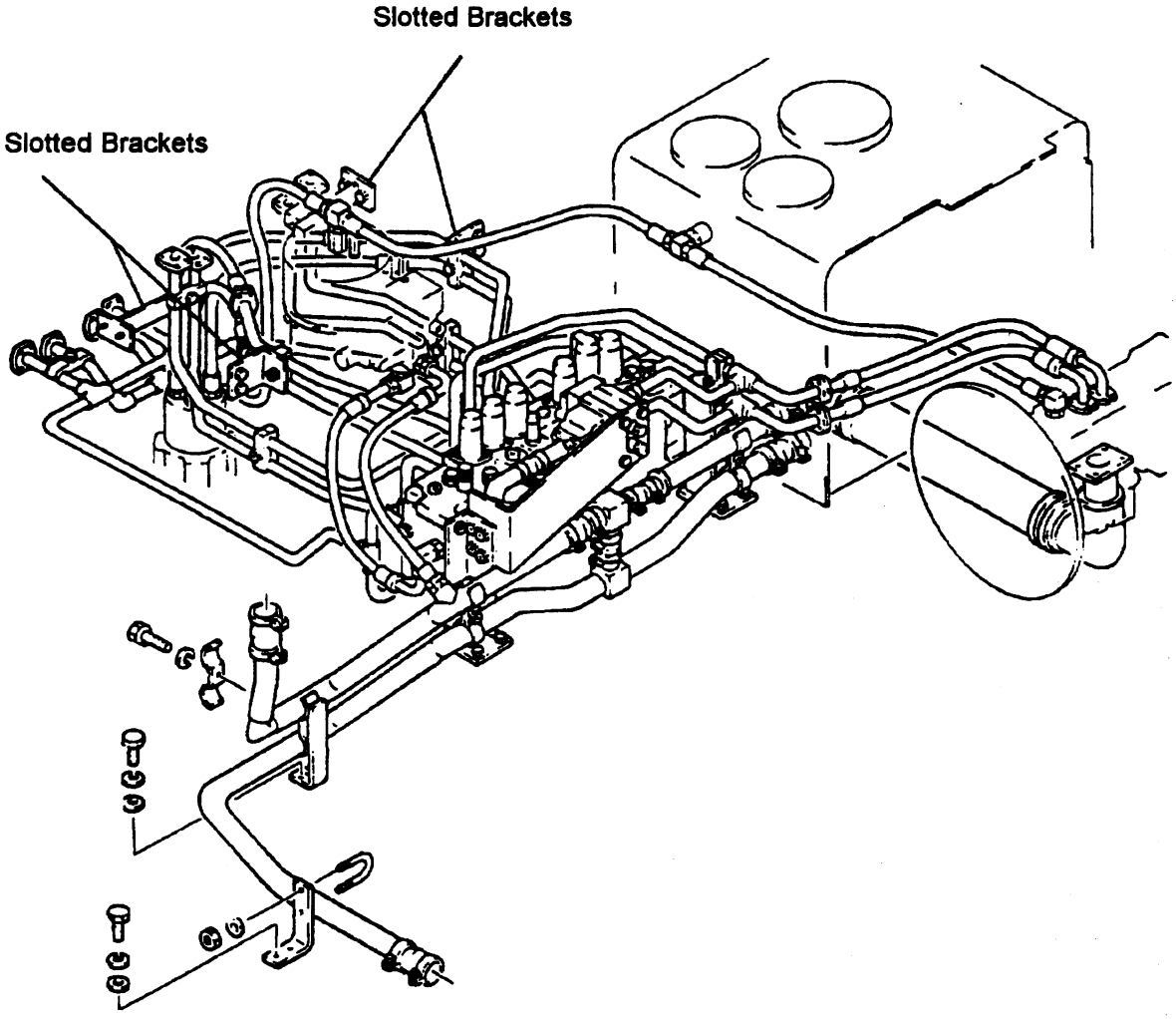
3. Inspect the seating of the flanged end to ensure that the tube is seated squarely.

4. Do not torque the capscrews until proper alignment and seating has been verified.

5. Do not tighten one capscrew fully before tightening the others. Torque the capscrews of the split flange in a "criss cross" pattern.

6. Do not overtighten the capscrews.

7. Do not use air wrenches.


Slotted Brackets
Slotted Brackets

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: April 20, 1995

BULLETIN: HE-273

SUBJECT: Machine Support Packages

AFFECTED MACHINES: All Mark IV Excavators

- Please be advised, that **only the following items** are shipped with the machine support package, of the Mark IV Excavators:

  1- "hand-type" grease gun assy.
  1- grease cartridge
  1- package of shims (for front end attachment maintenance)
  1- filter kit, for initial filter change consisting of:
  hydraulic filter(s)
  engine oil filter(s)
  fuel filter(s)
  please note: filter quantities may vary by application
  4- bucket o-rings
  1- Operators Manual
  1- Parts Manual (includes engine parts section for units w/MMC or Isuzu engine)
  1- Engine Operators Manual (for units w/Cummins engine)
  1- Engine Parts Manual (for units w/Cummins engine)

- On Cummins powered units equipped with the *Ether Starting Aid,* Ether Canisters **will not** be provided or shipped from the factory. *In climates where use of this feature is necessary, these must be procured locally by the end-user.*

- Please also note that on the SK 400 IV, the *Pneumatic Grease Pump System* is **not** standard equipment.

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SERVICE BULLETIN
KOBELCO AMERICA INC.

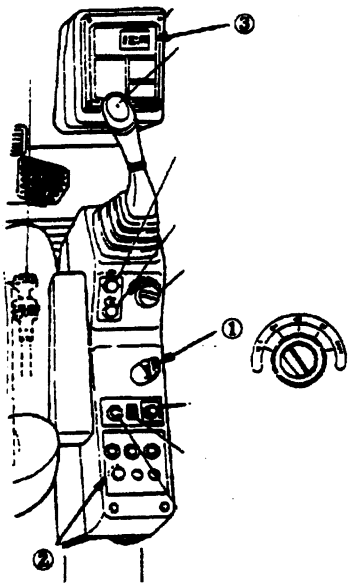
DATE: June 30, 1995

BULLETIN: HE-277

SUBJECT: Cluster Gauge Clock Resets to 12:00 o'clock

AFFECTED MACHINES: SK150LC IV, SK200LC IV, SK220LC IV, SK300LC IV, SK400LC IV
(for applicable serial numbers see below)

On the subject machines, if the key switch ① is turned off while heater switch ② is turned on, then the clock ③ will default back to 12:00 o'clock.



*If you have a machine that exhibits this condition, and is not included on either one of the following lists, then please order the **Clock Reset Countermeasure Harness**, that consists of the parts below, and install as per the attached procedure:*

Qty.	P/No.	Item
1	2479U1886	Harness
1	2420R608D3	Screw

Parts should be ordered through the Kobelco America Inc. Service Department, using the attached order form. These parts will be shipped free-of-charge (F.O.C.), only if ordered in this manner. Do not place an order for these specific parts through the Parts Department. These parts will be shipped on a "request only basis".

This condition has been addressed in two different ways on machines leaving the factory:

- ***The field countermeasure is;*** to install a harness and relay assembly between the key switch and the heater harness, as detailed in this bulletin. Please refer to the list below, of units that this harness has already been installed on at the factory:

SK150LC IV	SK200LC IV	SK220LC IV	SK300LC IV
YMU1027	YQU2065	LLU1248	YCU0306
YMU1033	YQU2066	LLU1251	YCU0311
YMU1035~1038	YQU2070	LLU1254~1284	YCU0313~0317
YMU1040~1053	YQU2072		YCU0319~0321
	YQU2073		YCU0323~0327
	YQU2081~2118		
	YQU2120~2130		

- ***The production countermeasure is;*** to install a new gauge cluster controller; p/no. 2480U371F3. Please refer to the list below, of units that this controller has been installed on at the factory:

SK150LC IV	SK200LC IV	SK220LC IV	SK300LC IV	SK400LC IV
YMU1054~	YQU2131~	LLU1285~	YCU0328~	YSJ0024~0036
				YSJ0040~

Interchangeability of controllers:

Old		New
2480U371F2	←O— / —X→	2480U371F3

←O— New Replaces Old
—X→ Old Cannot Replace New

Procedure for field installation of harness assembly:
(refer to attached drawing)

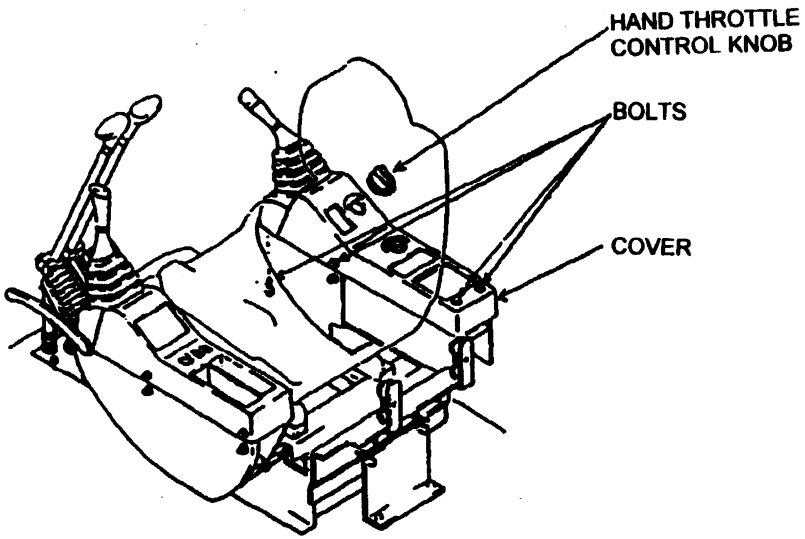
1) Removal of right side console box cover :
   ① Remove hand throttle control knob.
   ② Remove five bolts from cover (2 top rear, 2 lower front, 1side).
   ③ Remove upper cover.

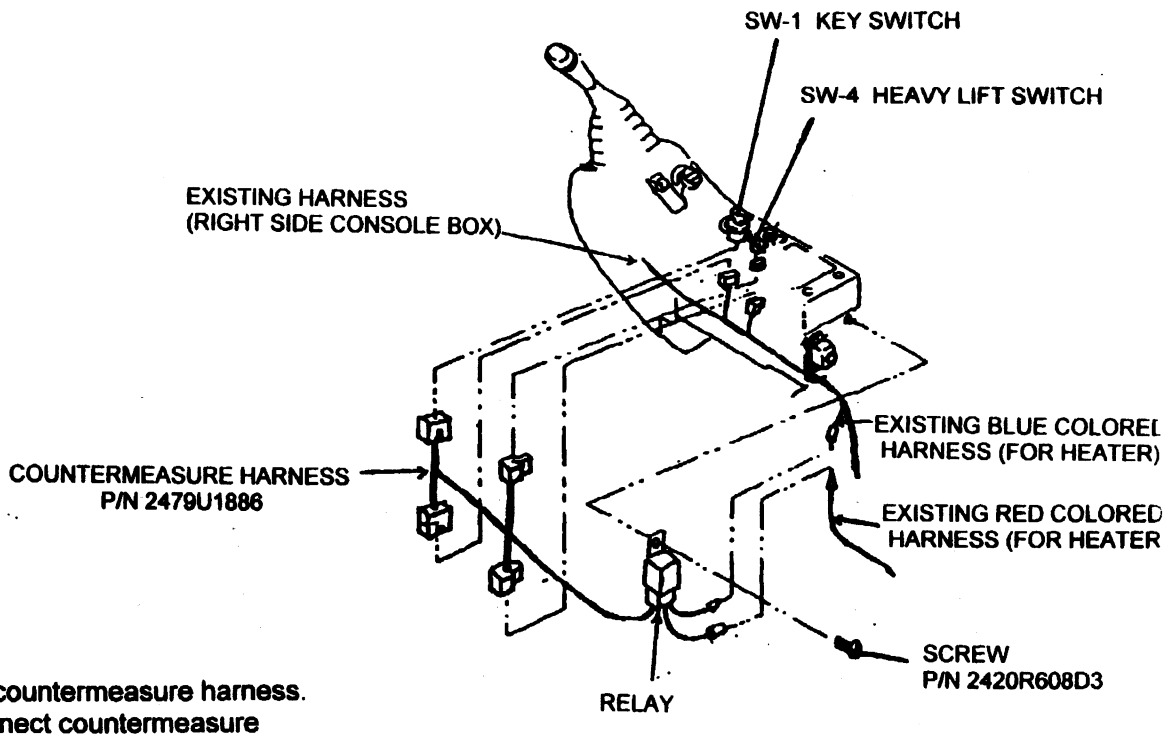
2) Add countermeasure harness:
   ① Disconnect key switch harness and connect countermeasure harness.
   ② Disconnect heavy lift switch harness and connect countermeasure harness. *Note: Although the SK150 doesn't have the heavy lift switch, the harness for it is provided in the right side console box.*
   ③ Disconnect heater harness and connect countermeasure harness.
   ④ Install the relay using the screw in the existing hole beside the buzzer.

3) Reverse steps in item 1) to reinstall console box cover.

Procedure for Field Installation of Harness Assembly

1) Removal of right side console box cover :
   ① Remove hand throttle control knob.
   ② Remove five bolts from cover (2 top rear, 2 lower front, 1side).
   ③ Remove upper cover.





2) Add countermeasure harness:
   ① Disconnect key switch harness and connect countermeasure harness.
   ② Disconnect heavy lift switch harness and connect countermeasure harness. *Note: Although the SK150 doesn't have the heavy lift switch, the harness for it is provided in the right side console box.*
   ③ Disconnect heater harness and connect countermeasure harness.
   ④ Install the relay using the screw in the existing hole beside the buzzer.

3) Reverse steps in item 1) to reinstall console box cover.

Clock Reset Countermeasure Harness Request Form

Please complete this form to receive the **CLOCK RESET COUNTERMEASURE HARNESSES** (free-of-charge), for the affected machines. Fax this form to the Kobelco America Inc. Service Department only, as noted below. All information must be provided to process the shipment.

Date: _____

To: Service Department
Kobelco America Inc.
10515 Harwin Drive
Houston, TX 77036

Phone: (713) 995-7969
Facsimile Number: (713) 981-0192

From: _____
Service Manager or Representative (please print)

_____
Dealer Name (please print)

_____
Dealer Branch Location (please print)

Machine Model	Machine S/N	Current Hr/Mtr.	Name of Owner

_____
Signature of Distributor Representative

(This form may be copied for additional units.)

For KAI use only:_____

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: June 30, 1995

BULLETIN: HE-278
Page 1 of 2

SUBJECT: Fuses for MK IV Excavators

AFFECTED MACHINES: SK100LC IV, SK120LC IV, SK150LC IV, SK200LC IV
SK220LC IV, SK300LC IV, SK400LC IV

Through an oversight in printing, the electrical system fuses for the above referenced machines, were not shown or listed in their respective parts manuals, or microfiche. Please refer to the table below for the fuse part numbers:

Mark IV Fuse Table

part number	item	rating
2487U41S2	blade type fuse	1 amp.
2479R655S10	blade type fuse	5 amp.
2479R655S8	blade type fuse	10 amp.
2479R655S9	blade type fuse	20 amp.

Please refer to the attached page which shows the fuse diagrams, and the amperage and circuit charts, from the Operators Manuals for the referenced machines.

Please note that the SK150LC IV ~ SK400LC IV machines, are additionally equipped with two 1 amp. fuses, located in the fuse box, for the following Proportional Solenoid Valve circuits:

① The K.P.S.S. (Kobelco Power Sensing System) circuit, that is utilized by the Mechatronic System, and also referred to as the Pf or powershift valve.

② The Variable Loading Mode circuit (which is an optional feature).

Item ①, the K.P.S.S. fuse, should not be overlooked, when troubleshooting the Mechatronics System. If it is blown, then code 5 may possibly be displayed when performing the Diagnostic "Quick Check" **, or item 18, AD5 "isvp" (on the 24 Item Diagnostic Display), may possibly show a "0" reading when it is checked. Always confirm that the K.P.S.S. fuse is good, and the Release Toggle Switch is in the *K.P.S.S. On Position*, before condemning a Mechatronic Controller or K.P.S.S. solenoid valve.

** Also referred to as: "Diagnosis by the flashing of Auto-Accel lamp". The Special Test Resistor : (p/no. KSP9000-0002), should be connected to the Variable Loading Mode harness while performing this test. Please refer to Service Bulletin HE-261 for further details on this resistor.

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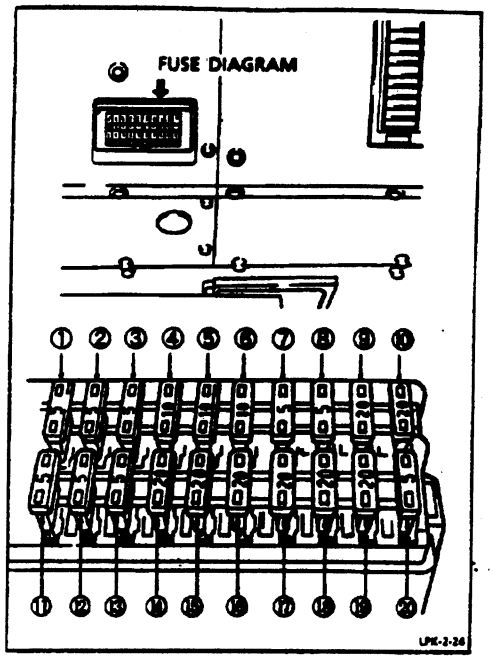
SK100LC IV and SK120LC IV

● **FUSE AMPERAGE AND CIRCUIT**

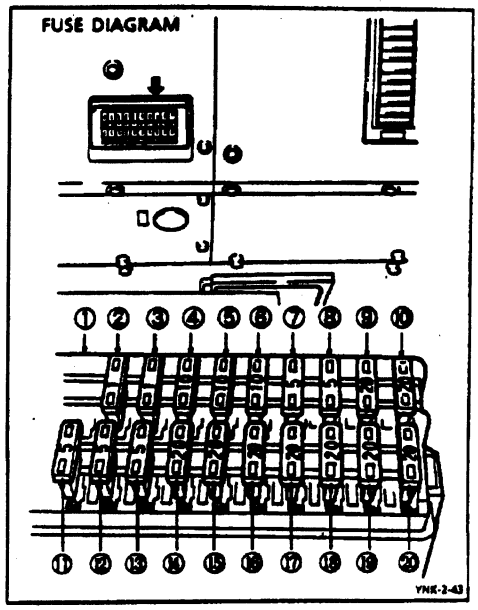
NO	Amperage	Description
1	5A	Tuner (Back up) 12V
2	5A	Tuner
3	5A	Spare (12V)
4	10A	Cigarette lighter
5	10A	DC-DC Converter
6	10A	Horn
7	5A	DC-DC converter (Back up) 24V
8	5A	———
9	20A	Room lamp
10	20A	Starter switch
11	5A	Decal motor
12	5A	Swing flasher, Buzzer (Travel)
13	5A	Cluster
14	20A	Wiper
15	20A	Solenoid valve (Lever lock, travel speed.)
16	20A	Working light (Rear)
17	20A	Working light (Front, Boom)
18	20A	Heater
19	20A	Spare (24V)
20	5A	Ether, Auto fan



SK150LC IV ~ SK400LC IV

● **FUSE AMPERAGE AND CIRCUIT**

NO	Amperage	Description
1	NO fuse	———
2	1A	Proportional solenoid valve (K.P.S.S)
3	1A	Proportional solenoid valve (variable loading mode)
4	10A	Cigarette lighter
5	10A	DC-DC converter
6	10A	Horn
7	5A	DC-DC converter (Back up) 24V
8	5A	Cluster (Back up) 24V
9	20A	Room lamp
10	20A	Starter switch
11	5A	Controller
12	5A	Buzzer, swing flasher
13	5A	Cluster
14	20A	Wiper
15	20A	Solenoid valve (travel)
16	20A	Working light
17	20A	Working light
18	20A	Heater
19	20A	Spare (24V)
20	20A	Ether, Fan



SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: Sept. 22, 1995

BULLETIN: HE-280

SUBJECT: Loose Outer Swing Bearing Bolts

AFFECTED MACHINES:

SK100 IV	~ YWU-1023	SK200LC IV	~ YQU-2250
SK120 IV	~ LPU-1001	SK220 IV	~ LQU-0101
SK120LC IV	~ YPU-1116	SK220LC IV	~ LLU-1349
SK150LC IV	~ YMU-1104	SK300 IV	~ LCU-0001
SK200 IV	~ YNU-0325	SK300LC IV	~ YCU-00368
SK400LC IV	~ YSJ-XXXX	➜ (Not applicable, built in Japan)	

It has come to our attention that some machines ***prior*** to the above listed serial numbers, have been found to have loose (outer race only), swing bearing bolts.

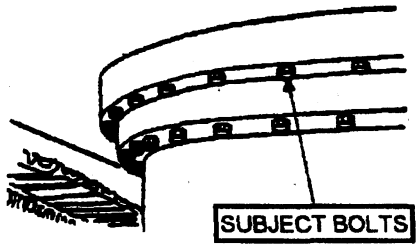
We advise that these bolts be checked for proper torque at the time of pre-delivery. If in some cases the machine has already been delivered, please check and verify bolt torque at First Inspection:

When inspecting the bolts, use the torque value shown in the table below, or the appropriate shop manual.

NOTE: IF ANY OF THE BOLTS MOVE DURING INSPECTION, YOU MUST CARRY OUT THE PROCEDURE AS FOLLOWS:

1) **Remove loose bolt.**
2) **Clean off any of the orginal Loctite bonding.**
3) **Re-apply Loctite #262 to the threads.**
4) **Tighten to the required tightening torque.**

MODEL	TORQUE	
SK100 IV	28.5±3 Kgf•m	(206± 22ft.lbs)
SK120 IV	28.5±3 Kgf•m	(206± 22ft.lbs)
SK120LC IV	28.5±3 Kgf•m	(206± 22ft.lbs)
SK150LC IV	40 ±4 Kgf•m	(289± 29ft.lbs)
SK200 IV	40 ±4 Kgf•m	(289± 29ft.lbs)
SK200LC IV	40 ±4 Kgf•m	(289± 29ft.lbs)
SK220 IV	50 ±5 Kgf•m	(362± 36ft.lbs)
SK220LC IV	50 ±5 Kgf•m	(362± 36ft.lbs)
SK300 IV	95 ±9.5Kgf•m	(687± 69ft.lbs)
SK300LC IV	95 ±9.5Kgf•m	(687± 69ft.lbs)
SK400LC IV	120 ±12 Kgf•m	(868± 87ft.lbs) ➜ *[for reference only]*



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SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: Sept. 28, 1995

BULLETIN: HE-281
Page 1 of 8

SUBJECT: Bucket Cut Circuit/Long Arm Installation

AFFECTED MACHINES: SK200 III~SK400 III
SK200 IV~SK400 IV
SK210 IV~SK460 IV ➡ (for Europe)

Whenever an optional long arm is installed on the models listed above, it is required that a "bucket cut" circuit be installed also. The bucket cut circuit will cause the bucket controls to become non-functional whenever the power boost or heavy lift circuit is activated. This prevents the machine from being used in a digging application whenever the power boost or heavy lift is activated, and a long arm is installed.

⚠ CAUTION
Do not operate a long arm equipped machine (SK200~SK400 or SK210~SK460) if the bucket cut circuit is not installed and operational. Damage to the machine may result if the power boost or heavy lift are activated on a long arm equipped machine that does not have an operational bucket cut circuit.

If your machine has a long arm installed (SK200~SK400 or SK210~SK460), then the bucket cut circuit should be tested each work day to insure that it is operating properly. If the bucket cut circuit does not operate properly, then the machine should not be used until a serviceman has remedied the malfunction. This bulletin outlines the operation of the bucket cut circuit.

NOTE
Anytime a different length arm is installed, the lift capacity of the machine is altered. The proper lift capacity labels must be installed per SAE requirements. Refer to the applicable parts manual and/or service bulletin for lift capacity label part numbers.

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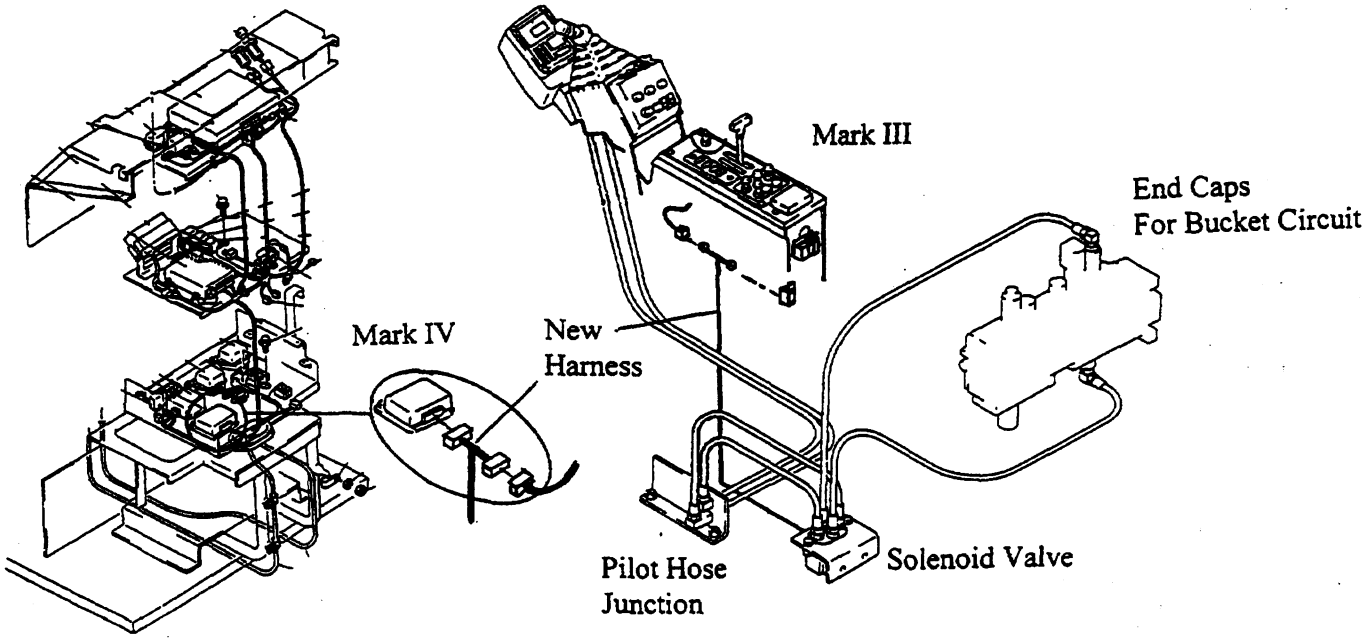
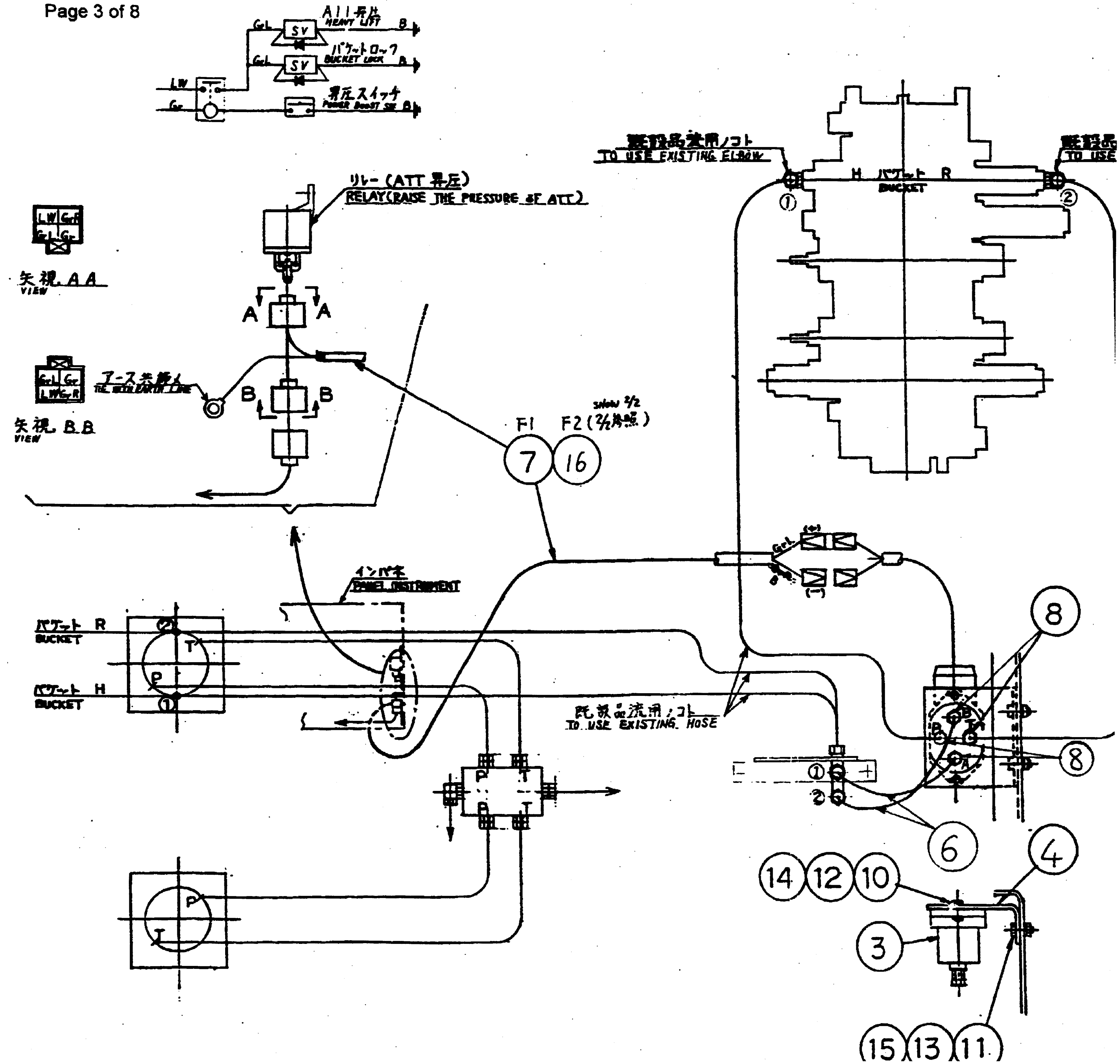
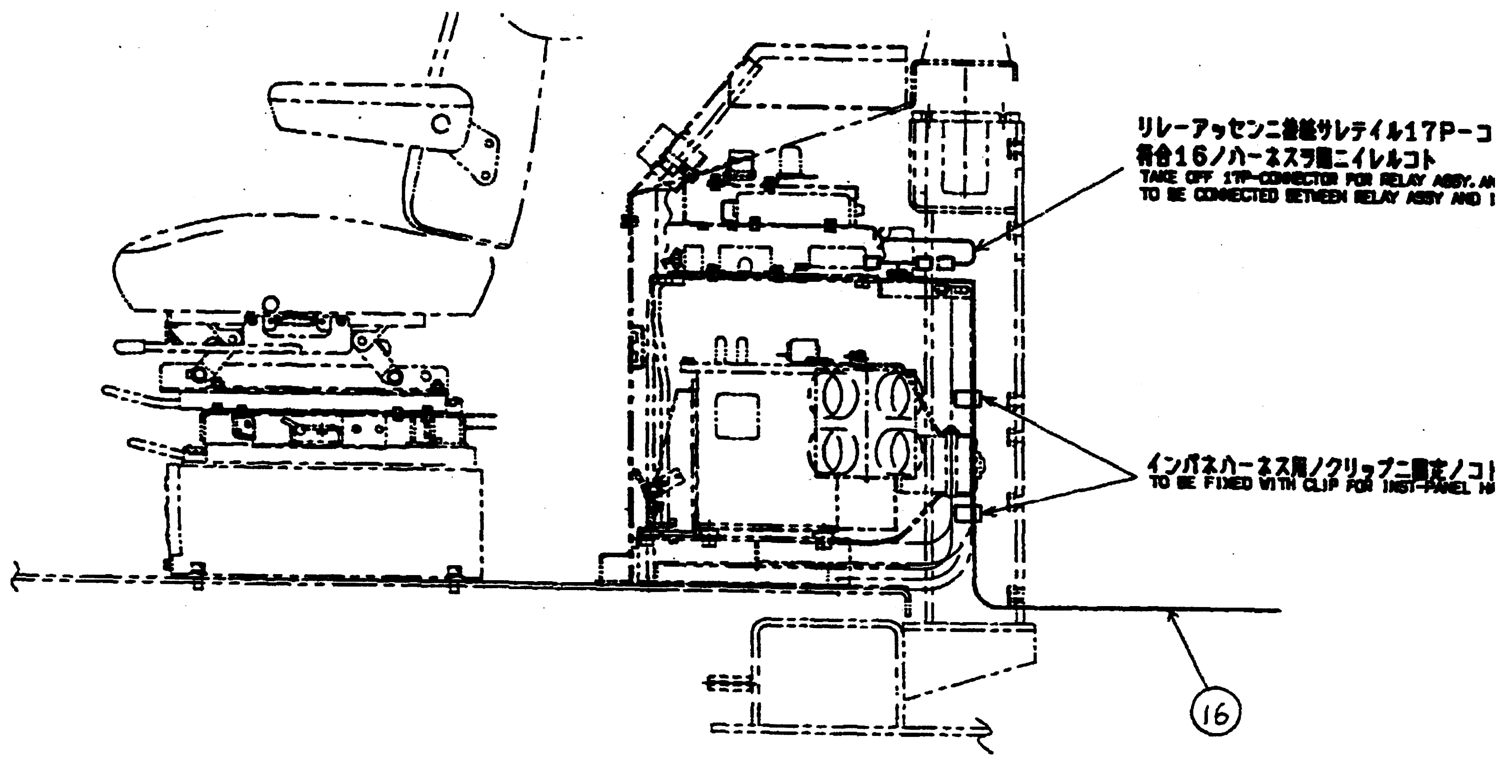
Model	Long Arm	Bucket Cut Installation
SK200-III	3.3M (10'-10")	#24100N7070F1
SK200-IV SK210-IV		#24100N7070F2
SK220-III	3.66M (12'-0")	#24100N7070F1
SK220-IV SK250-IV		#24100N7070F2
SK300-III	4.1M (13'-5")	#24100N8234F1
SK300-IV SK330-IV		#24100N8234F2
SK400-III	3.95M (12'-11") 4.90M (16'-1")	#24100N8235F1
SK400-IV SK460-IV		#24100N8235F2

Operation of Bucket Cut Circuit

1. A solenoid valve is added between the wrist controls and the end caps of the bucket control section.
2. The existing pilot hoses, on the bucket valve end caps, are re-routed into the solenoid valve.
3. New pilot hoses are added from the pilot line junction, into the solenoid valve.
4. A new electrical harness is connected to the solenoid valve, and connected "in line" with the existing power boost relay.
5. Whenever the power boost or heavy lift is activated, an electrical signal will engage the solenoid valve to disconnect pilot flow to the bucket circuit end caps.




AII昇圧
HEAVY LIFT
バケットロック
BUCKET LOCK
昇圧スイッチ
POWER BOOST SW
SV
LW
リレー (ATT 昇圧)
RELAY (RAISE THE PRESSURE OF ATT)
矢視 A A
VIEW
矢視 B B
VIEW
アース共締め
TIE WITH EARTH LINE
既設品流用ノコト
TO USE EXISTING ELBOW
TO USE
バケット R
BUCKET
バケット H
BUCKET
インパネ
PANEL INSTRUMENT
既設品流用ノコト
TO USE EXISTING HOSE
F1
F2 (2/2参照)
SHOW 2/2
7
16
8
6
4
3
10
12
14
11
13
15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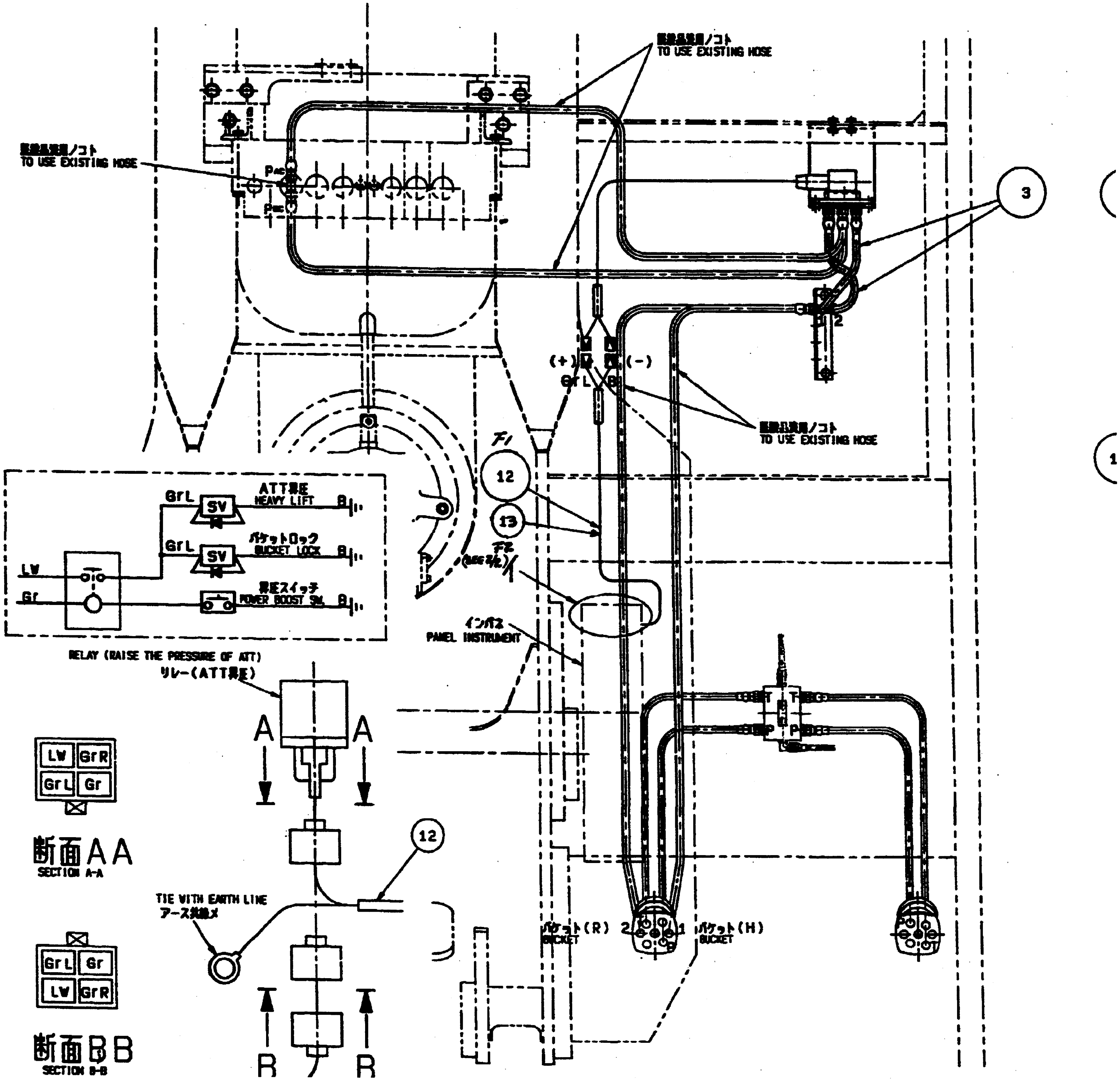
TO BE FIXED WITH CLIP FOR INST-PANEL H
16

F2, DETAIL



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RELAY (RAISE THE PRESSURE OF ATT)
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断面AA
SECTION A-A
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BUCKET
バケット(H)
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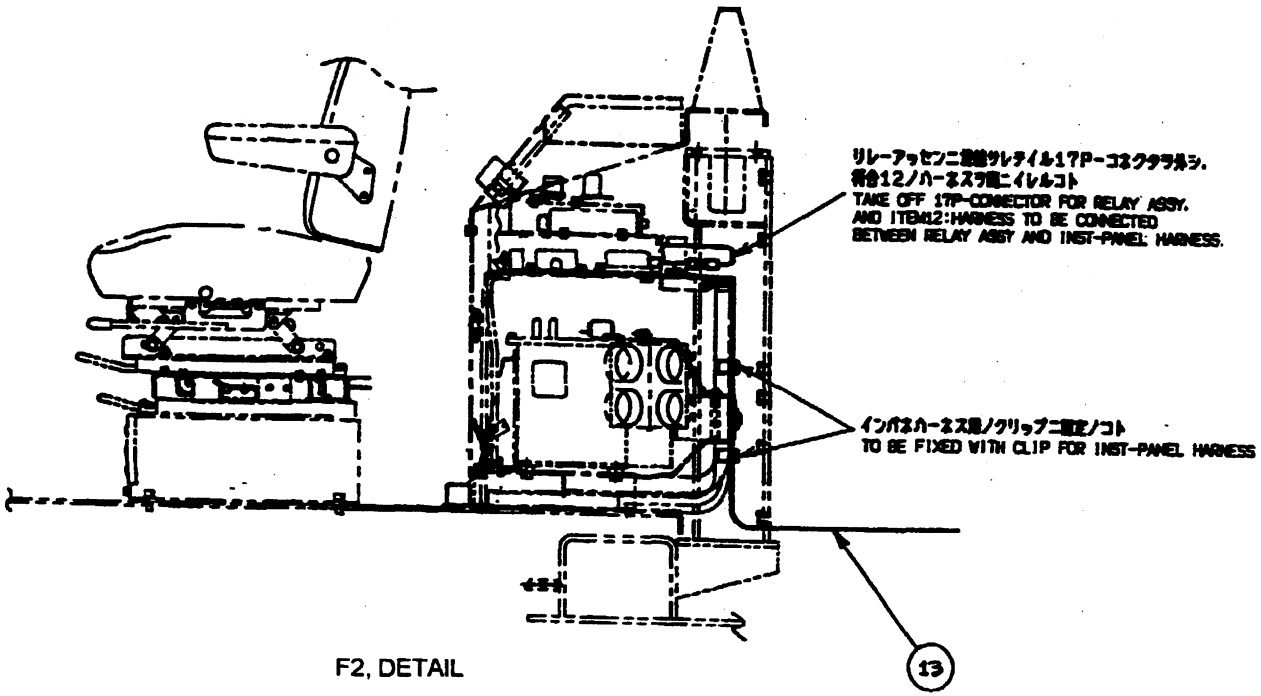
リレーアッセンニ接続サレテイル17P-コネクタヲハズシ、
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AND ITEM12:HARNESS TO BE CONNECTED
BETWEEN RELAY ASSY AND INST-PANEL HARNESS.
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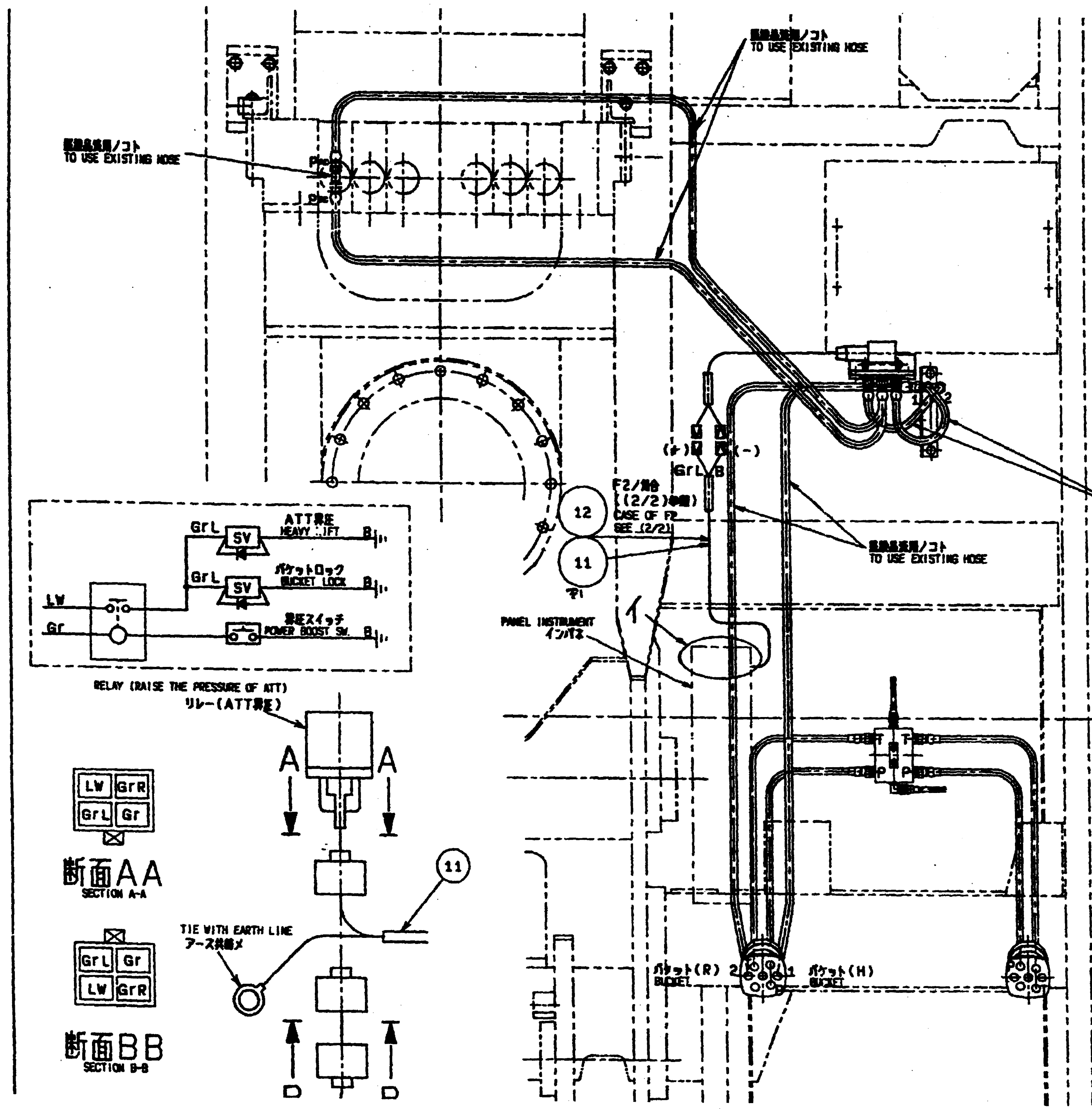
TO BE FIXED WITH CLIP FOR INST-PANEL HARNESS
13

F2, DETAIL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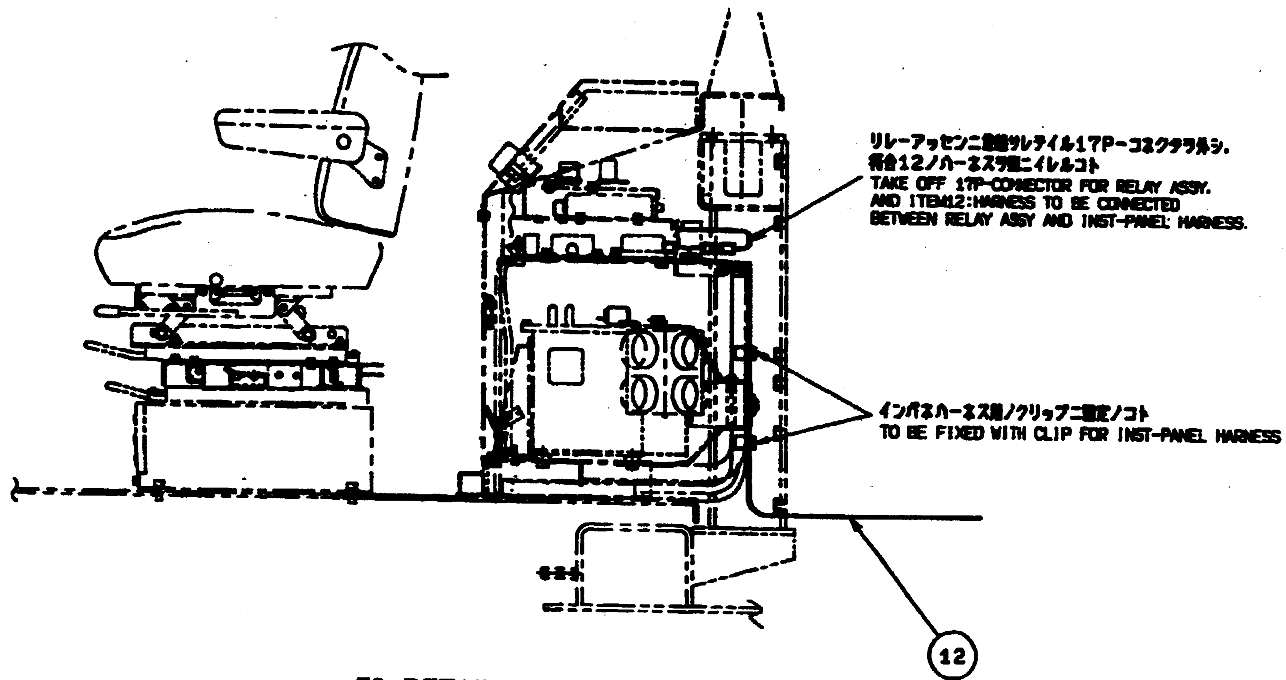

TAKE OFF 17P-CONNECTOR FOR RELAY ASSY.
AND ITEM12:HARNESS TO BE CONNECTED
BETWEEN RELAY ASSY AND INST-PANEL HARNESS.
TO BE FIXED WITH CLIP FOR INST-PANEL HARNESS
12

F2, DETAIL

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: December 14, 1995

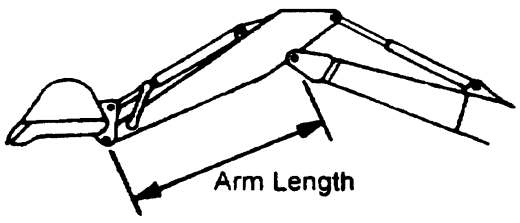
BULLETIN: HE-282A (Replaces HE-282)

SUBJECT: Lift Capacity Labels

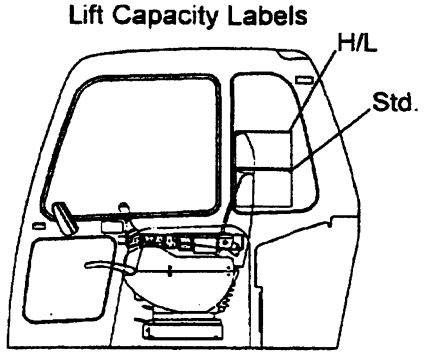
AFFECTED MACHINES: All Mark IV Excavators

It has come to our attention, that some distributors and end users have been changing the arm lengths on their excavators, and have not been changing the lift capacity labels at the same time. *A change in the arm length changes the lift capacity of an excavator!* In addition, we have received reports that some excavators are missing their lift capacity labels entirely, due to cab changes, glass replacement, etc.

The KOBELCO lift capacity label is a transparent, adhesive-backed decal that is installed on the right hand side window of the operators cab. *It is an SAE requirement that all excavators be equipped with lift capacity labels, and that the labels specify how the machine is outfitted.* The SK200 IV ~ SK400 IV units require two different lift capacity labels. One is for the Standard lift capacity, and the other one is for the Heavy Lift capacity.



Lift Capacities Differ with Change in Arm Length



Right Hand Side of Operators Cab

Included in this bulletin, is a table of part numbers for the lift capacity labels, used on the KOBELCO Mark IV excavators. Kobelco America Inc., recommends that you inspect your machines, to ensure that the correct lift capacity labels are installed. If you find an incorrect or missing label, contact the Kobelco America Parts Department, and order the correct label for your machine.

Bold selections in table indicate standard equipment arm and track shoe.

THIS BULLETIN IS BEING ISSUED FOR INFORMATION ONLY AND IS NOT AN AUTHORIZATION FOR ANY REPLACEMENT OR WARRANTY CLAIM SUBMITTAL.

Lift Capacity Labels

Model	Arm Length	Track Shoe Width *	Standard Lift Label	Heavy Lift Label
SK60 IV	5'8" (1.73M)	600mm	2432N3081	N/A
	7'1" (2.15M)	**600mm**	2432N3082	N/A
SK100 IV	6'3" (1.9M)	600mm	2432N3147	N/A
	7'5" (2.27M)	600mm	2432N3148	N/A
	9'1" (2.77M)	**600mm**	2432N2985	N/A
SK120LC IV	6'11" (2.1M)	600mm	2432N3144	N/A
	6'11" (2.1M)	700mm	2432N3172	N/A
	8'2" (2.6M)	600mm	2432N3145	N/A
	8'2" (2.6M)	700mm	2432N3173	N/A
	9'10" (3.0M)	**600mm**	2432N2979	N/A
	9'10" (3.0M)	700mm	2432N3174	N/A
SK150LC IV	7'3" (2.2M)	700mm	2432N3177	N/A
	8'6" (2.6M)	600mm	TBA	N/A
	8'6" (2.6M)	700mm	2432N3176	N/A
	10'0" (3.06M)	**600mm**	2432N2989	N/A
	10'0" (3.06M)	700mm	2432N3175	N/A
SK200LC IV	7'10" (2.4M)	800mm	2432N3130	2432N3131
	9'8" (2.94M)	600mm	2432N3354	2432N3355
	9'8" (2.94M)	700mm	TBA	TBA
	9'8" (2.94M)	**800mm**	2432N2967	2432N2968
	10'10" (3.3M)	800mm	2432N3132	2432N3133
	50' Long Reach Attachment		TBA	N/A

Model	Arm Length	Track Shoe Width *	Standard Lift Label	Heavy Lift Label
SK220LC IV	8'2" (2.5M)	800mm	2432N3134	2432N3135
	9'9" (2.98M)	600mm	2432N3356	2432N3357
	9'9" (2.98M)	700mm	TBA	TBA
	9'9" (2.98M)	**800mm**	2432N2972	2432N2973
	12'0" (3.66M)	800mm	2432N3136	2432N3137
	50' Long Reach Attachment		TBA	N/A
	60' Long Reach Attachment		TBA	N/A
SK270LC IV	8'2" (2.5M)	800mm	2432N3318	2432N3317
	9'9" (2.98M)	800mm	2432N3268	2432N3269
	11' (3.4M)	**800mm**	2432N3266	2432N3267
	12' (3.66M)	800mm	2432N3316	2432N3315
SK300LC IV	8'4" (2.55M)	800mm	2432N3358	2432N3359
	10'4" (3.14M)	**800mm**	2432N3372	2432N3373
	13'5" (4.1M)	800mm	2432N3360	3432N3361
SK400LC IV	9'10" (3.0M)	900mm	2432N3362	2432N3363
	11'4" (3.45M)	**900mm**	2432N3370	2432N3371
	13'0" (3.95M)	900mm	2432N3364	2432N3365
	16'1" (4.9M)	900mm	2432N3366	2432N3367
	Mass Excavator Attachment		Contact KAI Service	Contact KAI Service

Bold selections in table indicate standard equipment arm and track shoe.

N/A = not applicable
TBA = to be assigned

* Track Shoe Widths:

600mm	=	23.6"
700mm	=	27.6"
800mm	=	31.5"
900mm	=	35.4"

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: July, 1996

BULLETIN: HE-284
Page 1 of 14

SUBJECT: Variable Loading Mode Option

AFFECTED MACHINES:

SK150LC IV - YMU-1001~		SK270LC IV - LBU-0001~	
SK200LC IV - YQU-2001~		SK300LC IV - YCU-0301~	
SK220LC IV - LLU-1201~		SK400LC IV - YSJ-0002~	
		SK400LC IV - YSU-0201~	

The Variable Loading Mode System is an optional feature that can be installed on the above referenced MK IV machines. This system is similar to the one previously announced, for the MK III (m/c~)machines, in Service Bulletin HE-211. *However; there are some differences between the MK III and MK IV models. in the parts and adjustment values.*

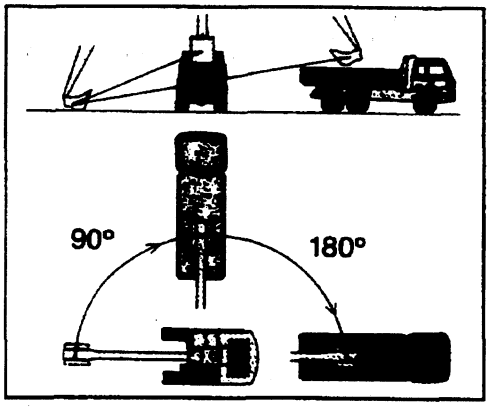
If you choose to install the Variable Loading Mode system, the components can be easily installed by following the instructions in this bulletin. *The wiring is already factory installed, and is pre-existing within the machines' main wiring harness.* After the components are installed, a simple adjustment to the Mechatronics controller (Adjustment "B" procedure), will activate the loading mode circuit. Instructions for this adjustment are included in this bulletin. Please contact the **Kobelco America Parts Department** for price and availability on these kits, and/or components.

DESCRIPTION OF OPERATION

This system allows the operator to adjust the priority flow of hydraulic oil, between the boom-up and swing functions, *during a combined operation using these two circuits.*

The operator can set the best boom/swing operating pattern (for the prevailing job conditions), to execute repetitive loading cycles at full throttle. This allows the operator to "dial-in" the height that the boom will raise-to, in relation to a selected swing position. ***Note: This is not a boom kick-out system.***

The ideal working environment, for maximum utilization of this system. is an operation such as dump truck loading, shown on the right. ➡



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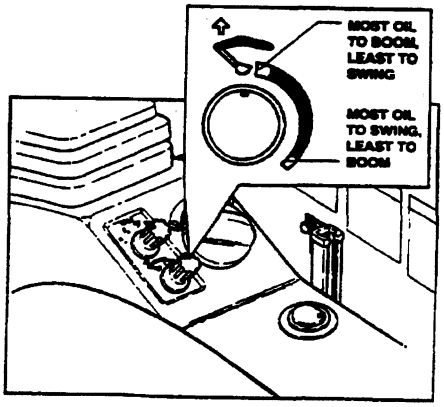
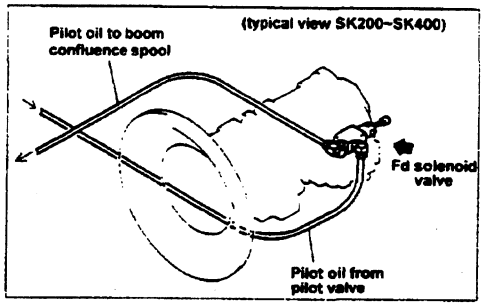
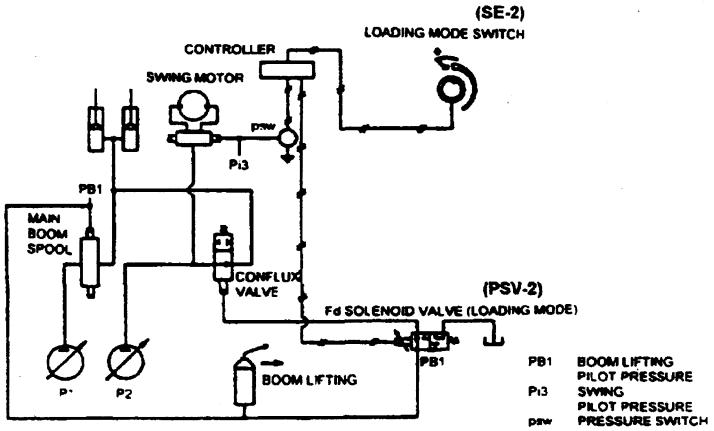
By setting the adjustable potentiometer knob (SE-2), on the dash of the machine, the operator sends an input signal to the Mechatronic controller. When he booms-up and swings simultaneously, this signal is processed and sent as an output signal, to the (Fd) proportionating solenoid valve (PSV-2), mounted on the P2 pump regulator. (The Fd solenoid valve has no internal oil connection to the pump regulator, it only mounts to it.) ➡



The Fd solenoid valve controls the pilot oil flow to the boom confluence (conflux) spool. By controlling this pilot oil flow, the second pump's oil to the boom cylinders is regulated, and therefore the speed of the boom-up function is adjustable. When the boom-up speed is decreased, the swing speed is increased. Conversely, when the swing speed is decreased, the boom-up speed is increased. This allows fast, consistent cycle times for loading operations. ➡



SYSTEM DIAGRAM



SYSTEM FUNCTIONS

In-depth explanations of system functions and circuit diagrams, can be found in the ***"Control System"*** and ***"Electrical System"*** sections of the SK300LC IV and SK400LC IV Shop Manuals. Therefore; further details will not be covered in this bulletin. Please refer to either of these Shop Manuals for more information, if necessary.

MACHINE APPLICATIONS

MACHINE MODEL	*VARIABLE LOADING MODE INSTALLATION*
SK150LC IV	24100N8908F1
SK200LC IV	24100N8907F1
SK220LC IV	"
SK270LC IV	"
SK300LC IV (w / MMC)	24100N7957F4
SK300LC IV (w / CUM) YCU-0500~	24100N7957F6
SK400LC IV (w / MMC)	24100N7957F3
SK400LC IV (w / CUM) YSU-0201~	24100N7957F5

MMC = Mitsubishi engine
CUM = Cummins engine

COMMON SYSTEM COMPONENTS

All MK IV machines listed in the application table above, share common components to be installed in the operator's cab dash, and on the hydraulic pump, in the right rear pump compartment of each unit. These are: the variable potentiometer (SE-2), it's new label, and the proportionating solenoid valve (PSV-2). Installation details for these items are shown separately on pages 5 and 6. Installation of all other items shown on the specific drawings, are basic in nature, and consist of the removal or installation of pilot hoses and fittings.

ITEMS TO BE DELETED

(Not Re-used)

Each MK IV machine will also have certain original pilot hoses, connectors, and/or fittings, that will be deleted *(no longer used)*, when this system is installed. This will vary from model to model, and will be listed on the installation drawing pages as: **"Items to Delete"**.

MACHINE PREPARATION

Prior to starting installation of the Variable Loading Mode System, place machine on firm level ground, and in a safe and suitable work area. Follow the warnings and safety instructions given below:

1) *Wear proper work clothes and safety equipment while installing this system.*

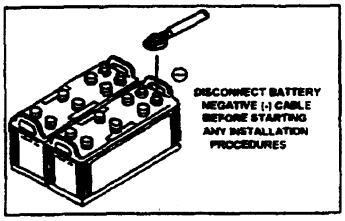
WARNING

• WEAR APPROVED SAFETY CLOTHES, SHOES AND HARD HAT WHEN PERFORMING MAINTENANCE PROCEDURES.

2) *Stop engine and turn key switch to "OFF" position. Disconnect negative ⊖ battery cable from battery.*

WARNING

DISCONNECT BATTERIES BEFORE STARTING ANY INSTALLATION PROCEDURES ON MACHINE !



3) *Use care when disconnecting battery, see cautions below.*

WARNING

1. WEAR SAFETY CLOTHES, GOGGLES OR FACE SHIELD, GLOVES AND SAFETY SHOES WHEN WORKING WITH BATTERIES.
2. WORK IN A WELL VENTILATED AREA.
3. BATTERY ELECTROLYTE (ACID) IS CORROSIVE. IF IT COMES IN CONTACT WITH SKIN, EYES OR CLOTHING, FLUSH WITH LARGE AMOUNTS OF WATER AND SEEK IMMEDIATE MEDICAL ATTENTION. SEE FIGURE 1.
4. BATTERY ELECTROLYTE (ACID) PRODUCES HYDROGEN GAS THAT IS HIGHLY EXPLOSIVE. DO NOT ALLOW NEAR SPARKS, FIRE OR FLAMES AND DO NOT SMOKE WHEN WORKING WITH BATTERIES. SEE FIGURE 1.

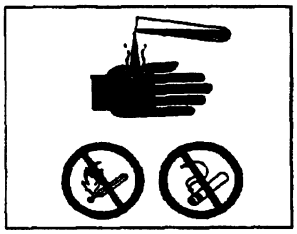
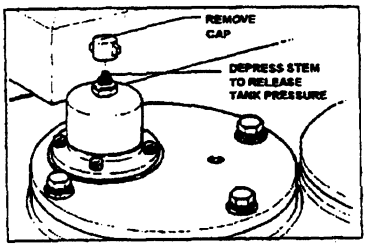


FIGURE 1

4) *Release hydraulic tank pressure. See examples given.*

WARNING

NEVER PERFORM MAINTENANCE ON A MACHINE THAT HAS JUST FINISHED WORKING. ALLOW MACHINE TO COOL FIRST UNTIL OILS AND FLUIDS ARE WARM NOT HOT. RELEASE HYDRAULIC TANK PRESSURE BEFORE WORKING WITH ANY HYDRAULIC COMPONENT.



SK150LC IV ~ SK300LC IV

5) *Prepare a suitable drain pan to receive any hydraulic oil present when pilot line hoses are disconnected.*

WARNING

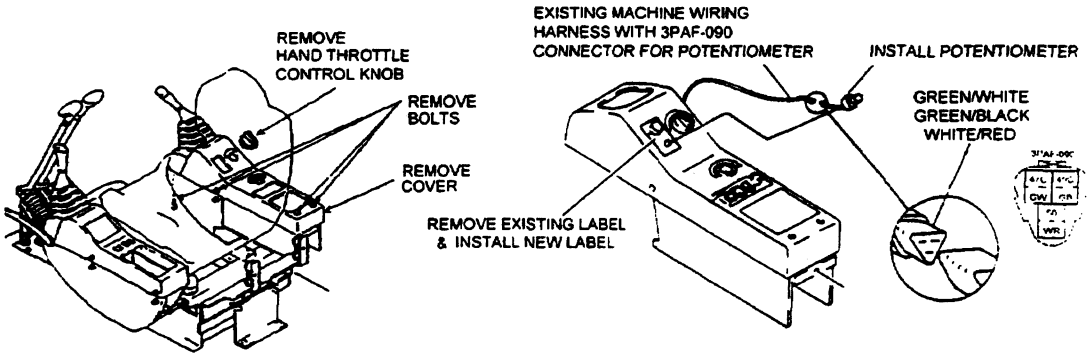
CLEAN UP ALL SPILLED OIL TO PREVENT FIRES. DISPOSE OF HAZARDOUS WASTE ACCORDING TO ENVIRONMENTAL LAWS AND REGULATIONS.

SK400LC IV

YMU-1001~
YQU-2001~
LLU-1201~
LBU-0001~
YCU-0301~
YSJ-0002~
YSU-0201~

SK150LC IV ~ SK400LC IV • REWORK CONTROL (VARIABLE LOADING MODE OPTION)

COMMON POTENTIOMETER AND LABEL INSTALLATION



Potentiometer and Label Installation

1) Removal of right side console box cover:
① *Refer to warnings and safety instructions given on Page 4 of this bulletin. (Disconnect battery)*
② Remove hand throttle control knob.
③ Remove five bolts from cover (2 top rear, 2 lower front, 1 side).
④ Remove upper cover.

2) Removal of existing label:
①Existing label covers mounting hole in dash for VLM potentiometer. *(Delete existing label.)*
② It may be necessary to temporarily remove the KPSS switch knob to completely remove label.
③ Clean surface of dash to remove any residue left from old label.

3) Installation of new VLM label:
① Label is self-adhesive, surface must be dry and free of any oil.
② Peel-off the protective paper backing.
③ Place in position and press-down firmly.
④ Re-install KPSS switch knob in correct position.

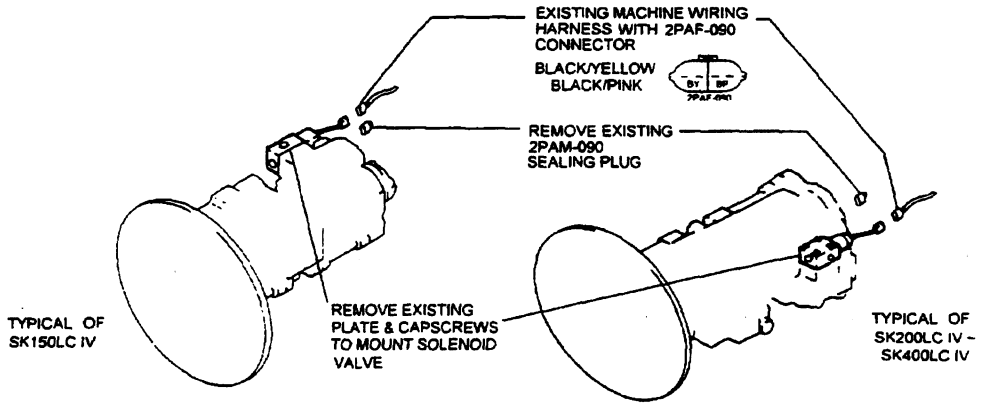
4) Installation of potentiometer:
① Locate existing wiring harness lead with 3PAF-090 connector, inside dash console.
② Lead should contain three wires: Green/White, Green/Black, and White/Red.
③ Plug potentiometer lead onto harness connector.
④ Install potentiometer in dash and tighten nut lightly.
⑤ Install knob on potentiometer.

5) Re-install right side console box cover:
① Reverse steps ②~④ in item **1)** above, to re-install cover.
② Securely replace knobs and mounting bolts. Proceed to solenoid valve installation.

YMU-1001~
YQU-2001~
LLU-1201~
LBU-0001~
YCU-0301~
YSJ-0002~
YSU-0201~

SK150LC IV ~ SK400LC IV • REWORK CONTROL (VARIABLE LOADING MODE OPTION)

COMMON SOLENOID VALVE INSTALLATION



Solenoid Valve Installation

1) Removal of existing cover plate on P2 pump regulator:
① *Refer to warnings and safety instructions given on Page 4 of this bulletin. (Vent hyd. tank)*
② Position drain pan under P2 pump.
③ Remove four capscrews from cover.
④ Remove cover. *(Delete cover and capscrews.)*
⑤ Use care, as o-rings are under cover.

2) Installation of solenoid valve:
① Pre-assemble elbow, and tee (w/connector on SK200~SK270), to solenoid valve.
② Install solenoid valve onto P2 pump regulator, using new capscrews furnished with it.
③ Torque capscrews to: 1.2 ± 0.1 Kgf•m (9 ± .7 ft. lbs.).
④ Please note: The solenoid valve has no internal connection to the regulator, it only mounts on it. It serves the same purpose for the regulator oil passages, as the plate did.

3) Connection of wiring harness to solenoid valve:
① Locate existing wiring harness lead with 2 PAF-090 connector and 2 PAM-090 sealing plug.
② This harness should have Black/Yellow and Black/Pink wires.
③ It should be secured to the harness in the vacintity of the KPSS solenoid valve lead.
④ *(Delete sealing plug)* and connect the harness lead to the solenoid valve connector.

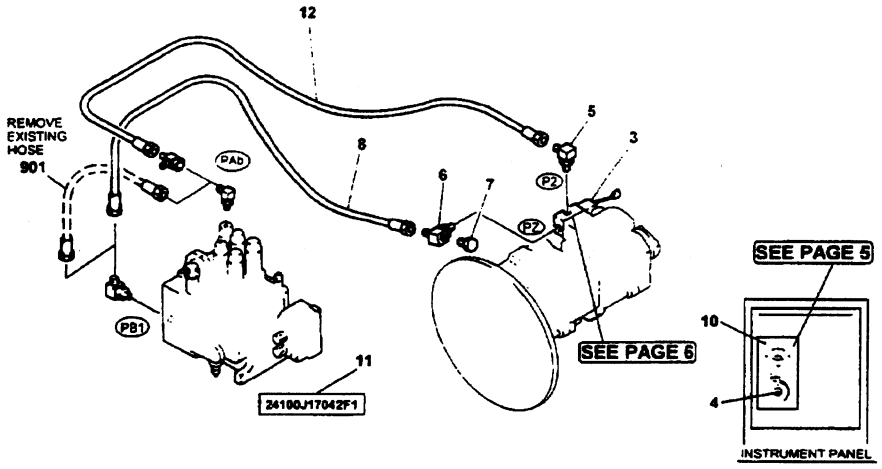
4) Installation of remaining system components:
① This completes the installation of the *common components* for SK150LC IV~SK400LC IV.
② Refer to the appropriate machine installation drawing page(s) for **"Items to Delete"**, and the remaining components to be installed.
③ Once all components are installed, re-connect ⊖ battery cable, check hydraulic oil level, and follow instructions to perform Adjustment "B" procedure.
④ ***Please note:*** *This system will not operate properly until Adjustment "B" has been completed!*

HOSE AND FITTING TORQUE TABLE • FOR ALL MODELS

PORT SIZE	WRENCH SIZE	O-RING TYPE FITTINGS		FLARE TYPE HOSE FITTINGS	
PF	mm	Kgf•m	ft .lbs.	Kgf•m	ft .lbs.
¼	19	3.7±0.2	25~28	3.0±0.5	18~25
⅜	22	7.5±0.5	51~58	5.0±0.5	33~40

SK150LC IV • REWORK CONTROL (VARIABLE LOADING MODE OPTION)

YMU-1001~ 24100N8908F1



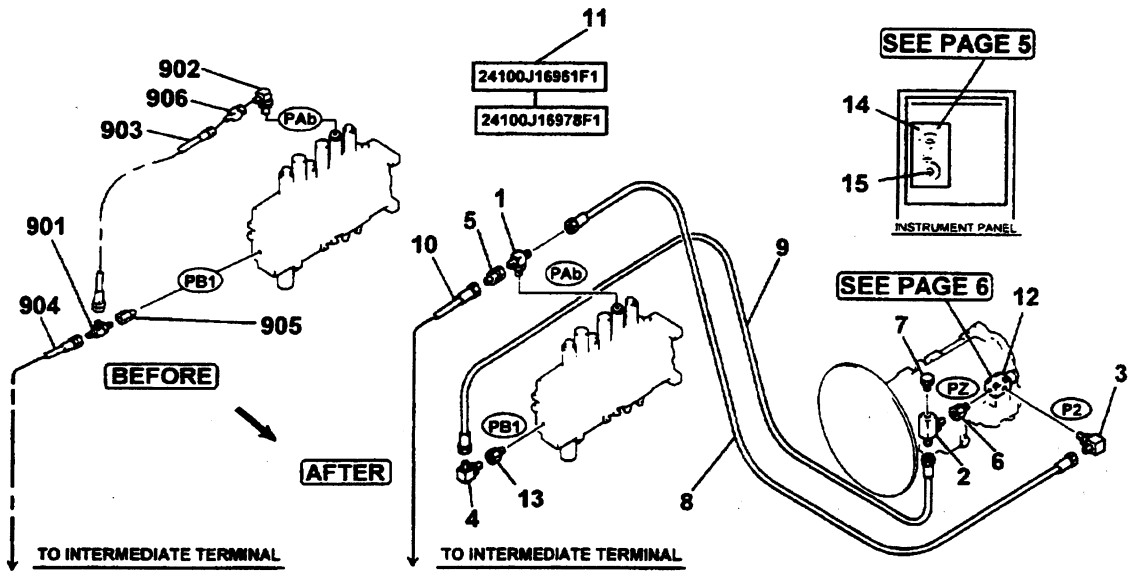
ITEM	PART NO.	DESCRIPTION	REMARKS	QTY.	APPLICABLE
	24100N8908F1	REWORK, CONTROL ASSY.	CONSISTS OF:		
3	2436R1774F2	VALVE, SOLENOID	SEE (C.P.M.)	1	
4	2480U376F1	POTENTIOMETER		1	
5	ZH32X04000	ELBOW	PF¼	1	
6	2444T2529	TEE	PF¼	1	
7	ZE72X04000	PLUG	PF¼	1	
8	HX21E04180DX	HOSE	¼ L=1800	1	
10	2432P3594	LABEL	w / VLM	1	
11	24100J17042F1	CONTROL ASSY , REMOTE	P.161-49	FOR REF.	(SK150 P/M)
12	HX21E04190DX	HOSE	¼ L=1900	1	
"ITEMS TO DELETE"					
901	HX21E04045DX	HOSE	¼ L=450	1	

SK200LC IV ~ SK270LC IV • REWORK CONTROL (VARIABLE LOADING MODE OPTION)

YQU-2001~
LLU-1201~
LBU-0001~

24100N8907F1

(page 1 of 2)

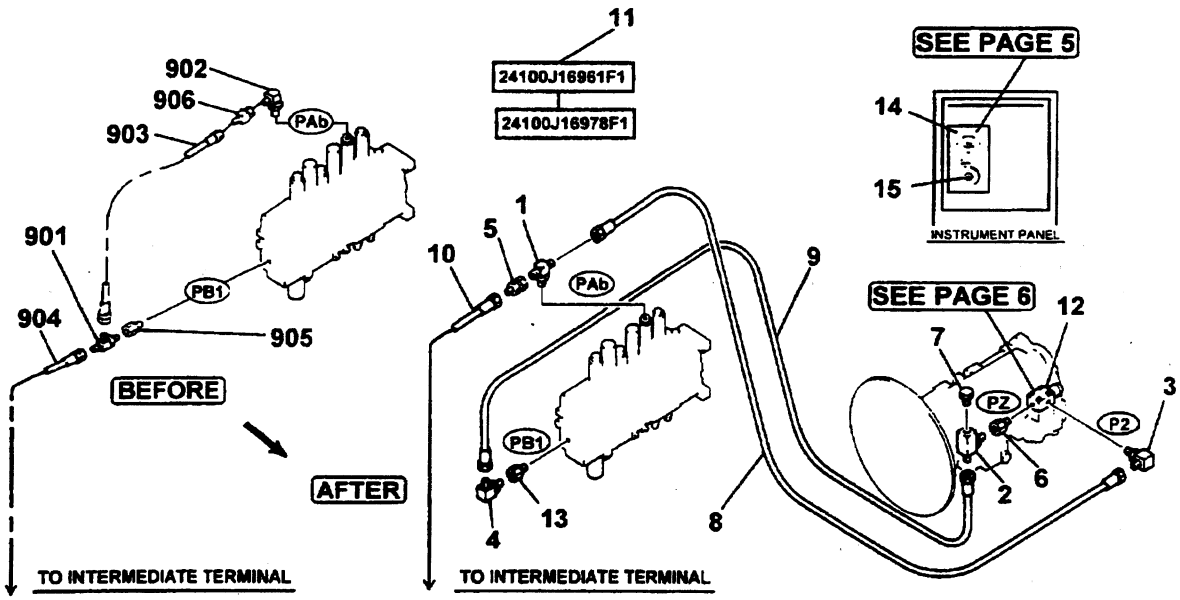


ITEM	PART NO.	DESCRIPTION	REMARKS	QTY.	APPLICABLE
	24100N8907F1	REWORK, CONTROL ASSY.	CONSISTS OF:		
1	HH55X06006G1	TEE	PF¼~PF⅜	1	
2	2444T2529	TEE	PF¼	1	
3	ZH32X04000	ELBOW	PF¼	1	
4	2444Z2447F1	ELBOW	PF¼ w/ FILTER	1	
5	2444Z3178D6	CONNECTOR	PF⅜ ø 1.2mm	1	
6	2444Z2525	CONNECTOR	PF¼	1	
7	ZE72X04000	PLUG	PF¼	1	
8	HX21E04185DX	HOSE	¼ L=1850	1	
9	HX21E04205DX	HOSE	¼ L=2050	1	
10	HX21E06160DX	HOSE	⅜ L=1600	1	
11	24100J16961F1	CONTROL ASSY., REMOTE	P.161-49	FOR REF.	(SK200 P/M)

SK200LC IV ~ SK270LC IV • REWORK CONTROL (VARIABLE LOADING MODE OPTION)

YQU-2001~
LLU-1201~
LBU-0001~

24100N8907F1 *(page 2 of 2)*

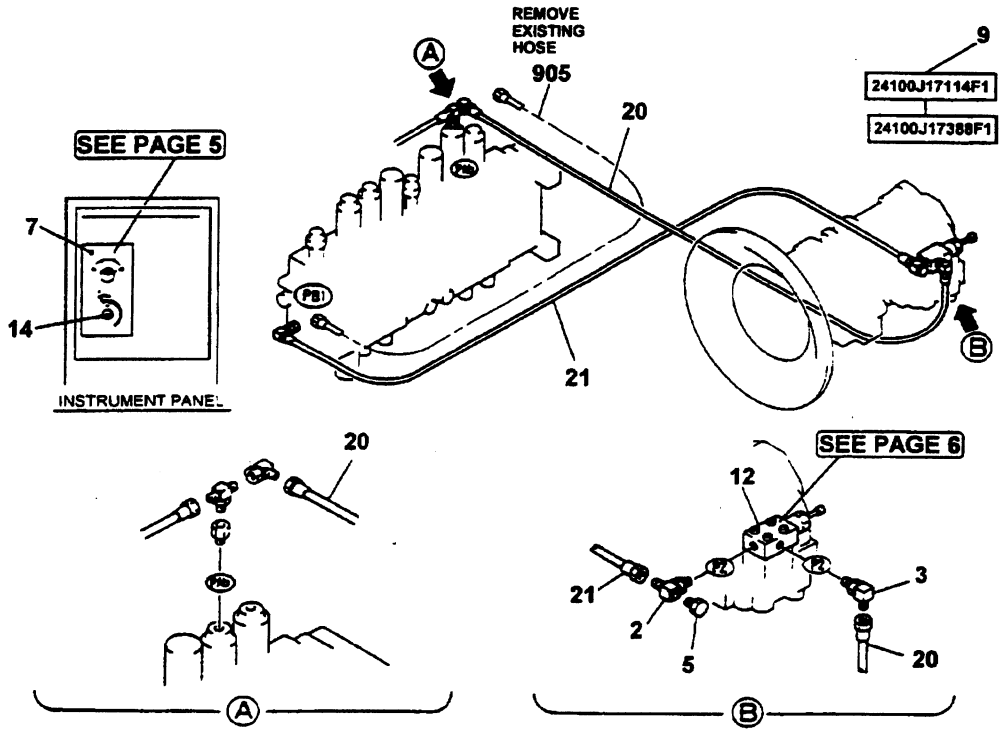


11	24100J16978F1	CONTROL ASSY., REMOTE	P.161-49	FOR REF.	(SK220/270 P/M)
12	2436R1774F2	VALVE, SOLENOID	SEE (C.P.M.)	1	
13	2444Z2542	CONNECTOR	PF¼ ø 0.7mm	1	
14	2432P3594	LABEL	w / VLM	1	
15	2480U376F1	POTENTIOMETER		1	
"ITEMS TO DELETE"					
901	2444T2592	TEE	PF¼	1	
902	2444Z3155	ELBOW		1	
903	HX21E04065DX	HOSE	¼ L=650	1	
904	HX21E06100DX	HOSE	⅜ L=1000	1	
905	2444Z2477F1	CONNECTOR		1	
906	2444T2613	CONNECTOR		1	

SK300LC IV • REWORK CONTROL (VARIABLE LOADING MODE OPTION)

YCU-0301~ (F4)
YCU-0501~ (F6)
LCU-0001~ (F6)

24100N7957F4, F6

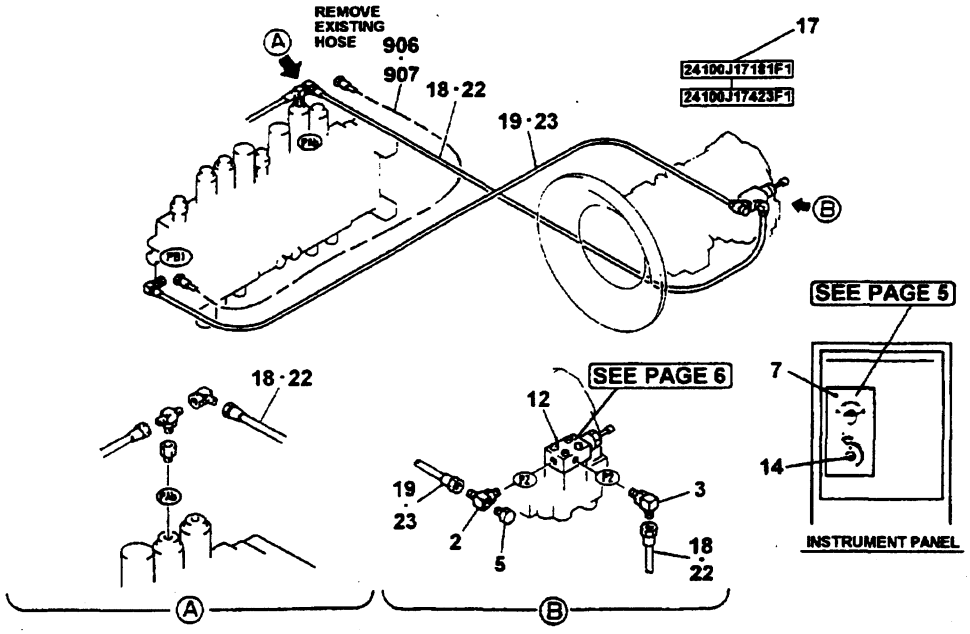


ITEM	PART NO.	DESCRIPTION	REMARKS	QTY.	APPLICABLE
	24100N7957F4,F6	REWORK. CONTROL ASSY.	CONSISTS OF:		(AS NOTED)
2	2444Z4181	TEE		1	F4, F6
3	ZH32X04000	ELBOW	PF¼	1	F4, F6
5	ZE72X04000	PLUG	PF¼	1	F4, F6
7	2432P3492	LABEL	w / VLM	1	F4, F6
9	24100J17114F1	CONTROL ASSY., REMOTE	P.161-49	FOR REF.	F4 • (SK300 P/M)
9	24100J17388F1	CONTROL ASSY., REMOTE	P.161-49	FOR REF.	F6 • (SK300 P/M)
12	2436R1774F1	VALVE, SOLENOID	SEE (C.P.M.)	1	F4, F6
14	2480U376F1	POTENTIOMETER		1	F4, F6
20	HX21E04190DX	HOSE	¼ L=1900	1	F4, F6
21	HX21E04260DX	HOSE	¼ L=2600	1	F4, F6
"ITEMS TO DELETE"					
905	HX21E04070DX	HOSE	¼ L=700	1	F4, F6

SK400LC IV • REWORK CONTROL (VARIABLE LOADING MODE OPTION)

YSJ-0002~ (F3)
YSU-0201~ (F5)
LSU-0001~ (F5)

24100N7957F3, F5



ITEM	PART NO.	DESCRIPTION	REMARKS	QTY.	APPLICABLE
	24100N7957F3,F5	REWORK. CONTROL ASSY.	CONSISTS OF:		(AS NOTED)
2	2444Z4181	TEE		1	F3, F5
3	ZH32X04000	ELBOW	PF¼	1	F3, F5
5	ZE72X04000	PLUG	PF¼	1	F3, F5
7	2432P3492	LABEL	w / VLM	1	F3, F5
12	2436R1774F1	VALVE, SOLENOID	SEE (C.P.M.)	1	F3, F5
14	2480U376F1	POTENTIOMETER		1	F3, F5
17	24100J17181F1	CONTROL ASSY., REMOTE	P.161-49	FOR REF.	F3 • (SK400 P/M)
17	24100J17423F1	CONTROL ASSY., REMOTE	P.161-49	FOR REF.	F5 • (SK400 P/M)
18	2420R349D200	HOSE	¼ L=2000	1	F3
19	2420R349D280	HOSE	¼ L=2800	1	F3
22	HX21E04200DX	HOSE	¼ L=2000	1	F5
23	HX21E04280DX	HOSE	¼ L=2800	1	F5
"ITEMS TO DELETE"					
906	2420R349D090	HOSE	¼ L=900	1	F3
907	HX21E04090DX	HOSE	¼ L=900	1	F5

ADJUSTMENT "B" PROCEDURE
(VARIABLE LOADING MODE OPTION)

Please refer to the following excerpts from the Mark IV Serviceman's Handbook, to perform the Adjustment "B" procedure:

Section VI– MECHATRONICS

6.5 ADJUSTMENT "B"– VARIABLE LOADING MODE MECHATRONIC CONTROLLER

NOTE

If Machine is not equipped with Variable Loading Mode, adjustment "B" is not necessary.

A. Conditions to use Adjustment "B"

Adjustment "B" procedures must be performed when one or more of the following components have been removed, repaired, adjusted or replaced

1. Mechatronics Controller (CPU).
2. Variable Loading Mode Components.

B. Tools & Equipment Required

1. Special Adjustment Harness Assembly. KOBELCO Part Number– 2479Z2364.
2. General hand or power tools required for removal and replacement of components.
3. 105kg/cm² (1500psi) Pressure Gauge.

C. Machine Settings & Site Conditions

1. Hydraulic oil at 45°C to 55°C (113°F to 131°F).
2. 105kg/cm² (1500psi) Pressure Gauge installed.
3. CPU Access Panel Removed.
4. CPU "TEST-RUN" Switch in "TEST" position.
5. Firm, level adjusting site.

D. Adjustment "B" Procedures

1. Move the machine to a smooth, level area to perform Adjustment "B".
2. Operate the attachment Controls until the arm, attachment and boom are in the Hydraulic Oil Check Position. See Figure 6.29.
3. Turn Engine "OFF".
4. Release hydraulic tank pressure by removing cap from pressure relief valve and depressing relief valve stem. See Figure 6.30.
5. Remove Test Port Plug from Flow Distribution Solenoid Valve. See Figure 6.31.
6. Install fitting and 105kg/cm² (1500psi) pressure gauge into test port. See Figure 6.31.

⚠ CAUTION ⚠

Oil may be hot. Wear approved safety equipment when performing any maintenance or test procedures.

MACHINE IN HYDRAULIC OIL CHECK POSITION

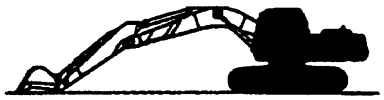


FIGURE 6.29

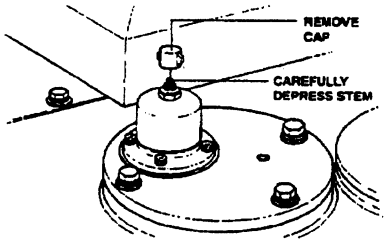


FIGURE 6.30

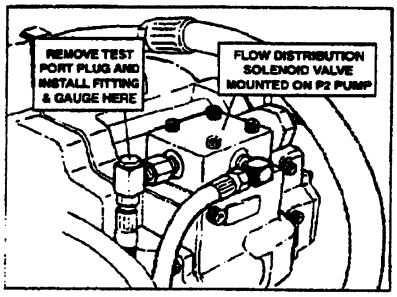


FIGURE 6.31

Section VI– MECHATRONICS

7. With keyswitch and electrical power "OFF", remove the CPU access Panel behind the operator seat. See Figure 6.32.
8. Locate and disconnect CPU 1P (1Pin) coupler. Connect Special Adjustment Harness to 1P coupler. See Figure 6.33.
9. Remove CPU grommet and carefully place CPU "TEST-RUN" Switch in the "TEST" position.

CAUTION

Never attempt to change position of the CPU "TEST-RUN" Switch with keyswitch or electrical power on.

10. Place KPSS Mode Switch to S-Mode.
11. Place Auto-Accel Switch to "OFF".
12. Start Engine.
13. Place Throttle Control in "HI-IDLE" position.
14. Depress the Special Adjustment Harness Switch and hold for 3 to 5 seconds until "CPU" is visible on display.

NOTE

"CPU" should remain on display. If it doesn't, check steps 9 through 13 and repeat step 14.
Conditions must be exactly as described in steps 9-14. Different conditions will not allow success of Adjustment "B" procedures.

15. Turn the Variable Loading Mode Switch counterclockwise to the left most setting. See Figure 6.34.
16. Operate BOOM UP Control until boom is completely up. Hold control in this position. See Figure 6.35.
17. While holding BOOM UP Control in the up position, adjust the Variable Loading Mode Switch clockwise until the pressure gauge reaches the pressure specified in chart for model being adjusted.

MODEL	UPPER LIMIT PRESSURE
SK150 - SK160	15–17kg/cm² (213–241 psi)
SK200 - SK210	17–18 kg/cm² (242–256 psi)
SK220 - SK250	17–18 kg/cm² (242–256 psi)
SK270	17–18 kg/cm² (242–256 psi)
SK300 - SK330	17–18 kg/cm² (242–256 psi)
SK400 - SK460	18.5–19.5 kg/cm² (263–277 psi)

Unit: kg/cm² (psi)

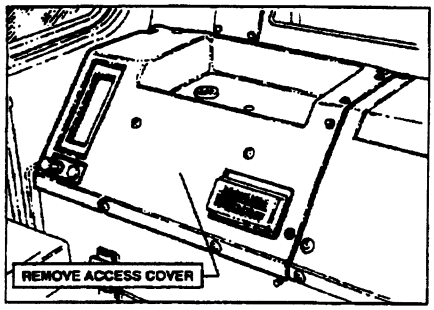


FIGURE 6.32

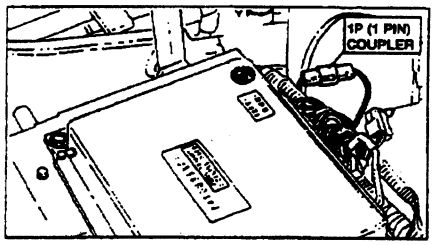


FIGURE 6.33

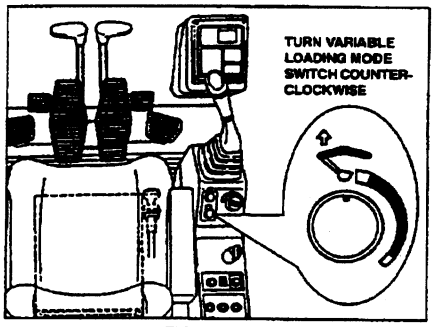


FIGURE 6.34

HOLD CONTROL IN
BOOM UP POSITION

FIGURE 6.35

Section VI– MECHATRONICS

18. When the proper pressure is reached, stop adjustment of the Variable Loading Mode Switch and depress the Special Adjustment Harness Switch once. This will program the CPU to the Upper Limit setting.
19. Release the BOOM UP Control.
20. Return the Variable Loading Mode Switch back to the Left Limit by turning switch counter-clockwise. See Figure 6.36.
21. Operate the BOOM UP Control and hold.
22. Adjust the Variable Loading Mode Switch until the pressure gauge reaches pressure specified in chart for model being adjusted.

MODEL	LOWER LIMIT PRESSURE
SK150 – SK160	10–12 kg/cm² (142–170 psi)
SK200 – SK210	11.5–12.5 kg/cm² (163.6–177.8 psi)
SK220 – SK250	11.5–12.5 kg/cm² (163.6–177.8 psi)
SK270	11.5–12.5 kg/cm² (163.6–177.8 psi)
SK300 – SK330	11.5–12.5 kg/cm² (163.6–177.8 psi)
SK400 – SK460	13.5–14.5 kg/cm² (192–206 psi)

Unit: kg/cm² (psi)

23. When the proper pressure is reached, stop adjustment of the Variable Loading Mode Switch and depress the Special Adjustment Harness Switch once. This will program the CPU to the Lower Limit setting.

NOTE
After step 23 is complete, "CPU" will automatically leave the display signaling that Adjustment "B" is complete.

24. After "CPU" has left the display, turn keyswitch to "OFF" stopping the engine and wait approximately 4 seconds for electrical power to automatically go off.
25. Remove the Special Adjustment Harness from the 1P coupler and connect 1P coupler together. See Figure 6.37.
26. Move the CPU "TEST-RUN" Switch in the "RUN" position and replace grommet. See Figure 6.38.
27. Install CPU Access Cover.
28. Remove pressure gauge and fitting. Replace Test Port Plug.
29. Confirm proper operation of machine.

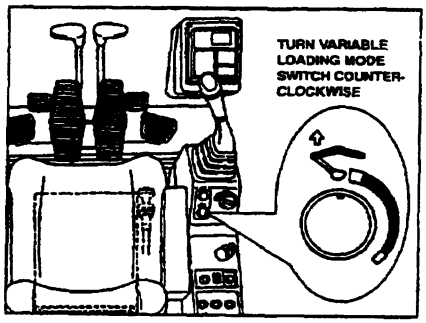


FIGURE 6.36

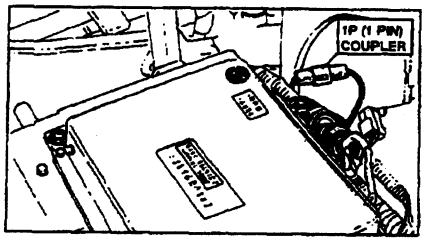


FIGURE 6.37

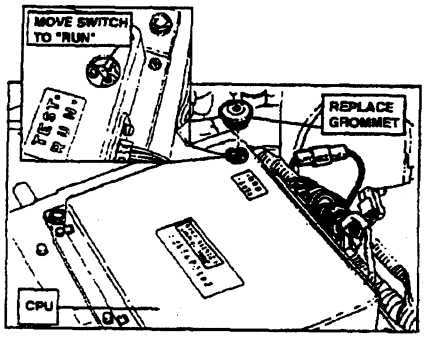


FIGURE 6.38

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: July, 1996

BULLETIN: HE-285
Page 1 of 5

Delco Music System

SUBJECT: Radio Kit Option

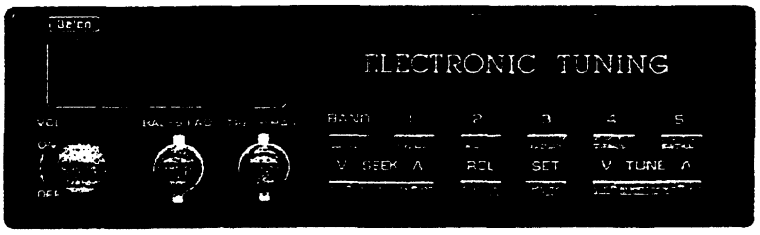
AFFECTED MACHINES:

SK100 IV	-	YWU-1001~		SK220LC IV	-	LLU-1201~
SK120LC IV	-	YPU-1001~		SK270LC IV	-	LBU-0001~
SK150LC IV	-	YMU-1001~		SK300LC IV	-	YCU-0301~
SK200LC IV	-	YQU-2001~		SK400LC IV	-	YSJ-0002~
				SK400LC IV	-	YSU-0201~

This bulletin details the installation of the optional **Delco Electronics, AM/FM Stereo Radio Kit**, for the MK IV excavators listed above. The *complete* kit is very economical, considering it is a "bolt-in and hook-up" type system, and requires no machine modifications.

RADIO & INSTALLATION KIT *(complete)*
P/N 24100P4792F1

This radio is a 12 volt type, that is provided with power from the existing power converter, which is standard equipment in the above machines. The basic power supply wiring is already factory installed, and is pre-existing within the machines' controller wiring harness. The radio harness will plug directly into the controller harness, the radio and both speakers. No modifications to the machines' electrical system are necessary, when utilizing this (complete) kit.



View of Delco Radio provided in (complete) kit P/N 24100P4792F1.

RADIO INSTALLATION KIT ONLY *(without Radio)*
P/N 24100P4792F2

Please note that the installation kit is also available without the radio. However, the radio provided in the complete kit listed above, is engineered to match the wiring harness and speakers with the kit. Any other radio may require modification to the harness, and may not be compatible with the speakers in the kit. Because of this, anyone utilizing the Radio Installation Kit Only (without radio), should do so at their own risk.

You are urged to utilize the *(complete)* factory-engineered kit, for ease of installation and O.E.M. reliability. Please contact the **Kobelco America Parts Department**, for price and availability of these kits.

THIS BULLETIN IS BEING ISSUED FOR INFORMATION ONLY AND IS NOT AN AUTHORIZATION FOR ANY REPLACEMENT OR WARRANTY CLAIM SUBMITTAL.

MACHINE PREPARATION

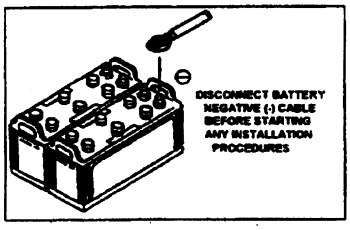
Prior to starting installation of the Radio Kit, place machine on firm level ground, and in a safe and suitable work area. Follow the warnings and safety instructions given below:

1) *Wear proper work clothes and safety equipment while installing this system.*

WARNING
• WEAR APPROVED SAFETY CLOTHES, SHOES AND HARD HAT WHEN PERFORMING MAINTENANCE PROCEDURES.

2) *Stop engine and turn key switch to "OFF" position. Disconnect negative ⊖ battery cable from battery.*

WARNING
DISCONNECT BATTERIES BEFORE STARTING ANY INSTALLATION PROCEDURES ON MACHINE !



3) *Use care when disconnecting battery, see cautions below.*

WARNING
1. WEAR SAFETY CLOTHES, GOGGLES OR FACE SHIELD, GLOVES AND SAFETY SHOES WHEN WORKING WITH BATTERIES.
2. WORK IN A WELL VENTILATED AREA.
3. BATTERY ELECTROLYTE (ACID) IS CORROSIVE. IF IT COMES IN CONTACT WITH SKIN, EYES OR CLOTHING, FLUSH WITH LARGE AMOUNTS OF WATER AND SEEK IMMEDIATE MEDICAL ATTENTION. SEE FIGURE 1.
4. BATTERY ELECTROLYTE (ACID) PRODUCES HYDROGEN GAS THAT IS HIGHLY EXPLOSIVE. DO NOT ALLOW NEAR SPARKS, FIRE OR FLAMES AND DO NOT SMOKE WHEN WORKING WITH BATTERIES. SEE FIGURE 1.

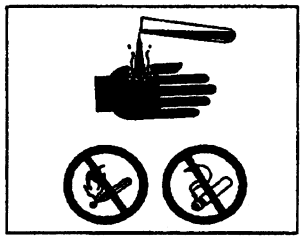


FIGURE 1

INSTALLATION PROCEDURE

(Please refer to the attached drawings for details.)

1) Place machine on firm level ground and stop engine. *Refer to warnings and safety instructions given above. (Disconnect battery)*

2) Remove items 900 (cover) and 901 (plates). These will be unnecessary parts, and will not be re-used. Retain the bolts and backup plates from items 901, to mount the item 2 (speakers) in step 5 below.

3) Note: It may be necessary to remove the covers over the controller area, for sufficient working room to install the radio and make all connections.

4) Locate the existing 3 pole connector on the controller harness. It will have yellow/purple, white/green and black wires going into it. Connect the 3 pin connector on item 4 (radio harness), to the 3 pole controller harness connector.

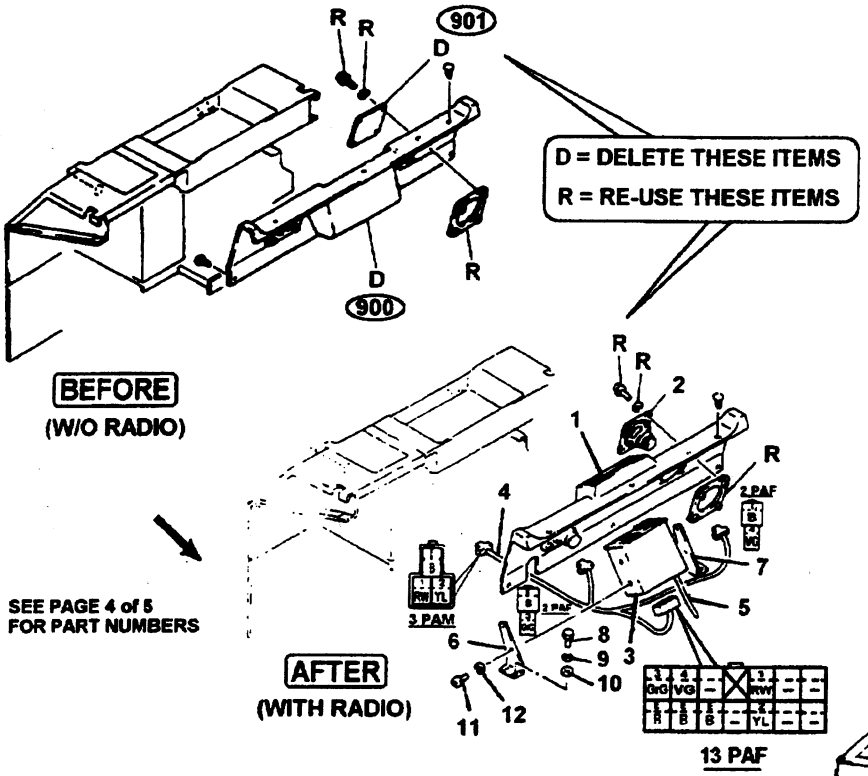
5) Install both item 2 (speakers), and connect item 4 (radio harness) 2 pin connector with grey/green wires to left speaker, and connect 2 pin connector with violet/green wires to right speaker.

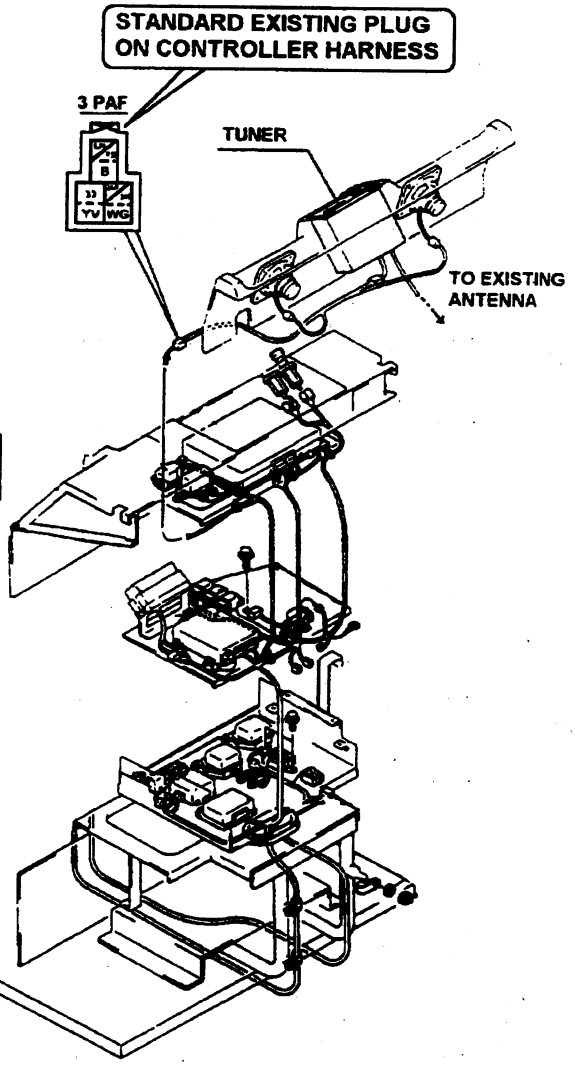
6) Assemble item 3 (radio tuner), with items 6~12 and install. Connect item 5 (cord) to back of radio and to antenna cable at lower left rear of cab. *Antenna cable may not be visible inside cab. It may be necessary to remove antenna from outside of cab. and lift-up to connect extension cord.* Connect the remaining 13 pin connector on item 4 (radio harness), to the radio itself. Install the new item 1 (cover), and reinstall any other previously removed covers.

7) Once all components are installed, re-connect ⊖ battery cable. Refer to attached instructions for operation of radio, and programming of channels and clock feature.

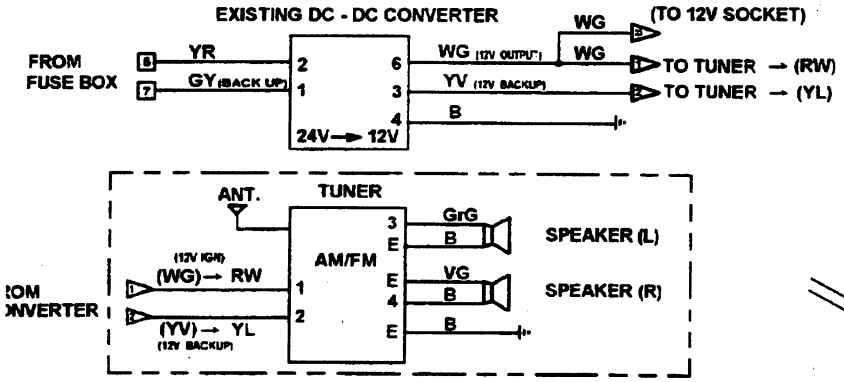
RADIO KIT OPTION
INSTALLATION DETAILS

Delco Music System





TYPICAL SCHEMATIC

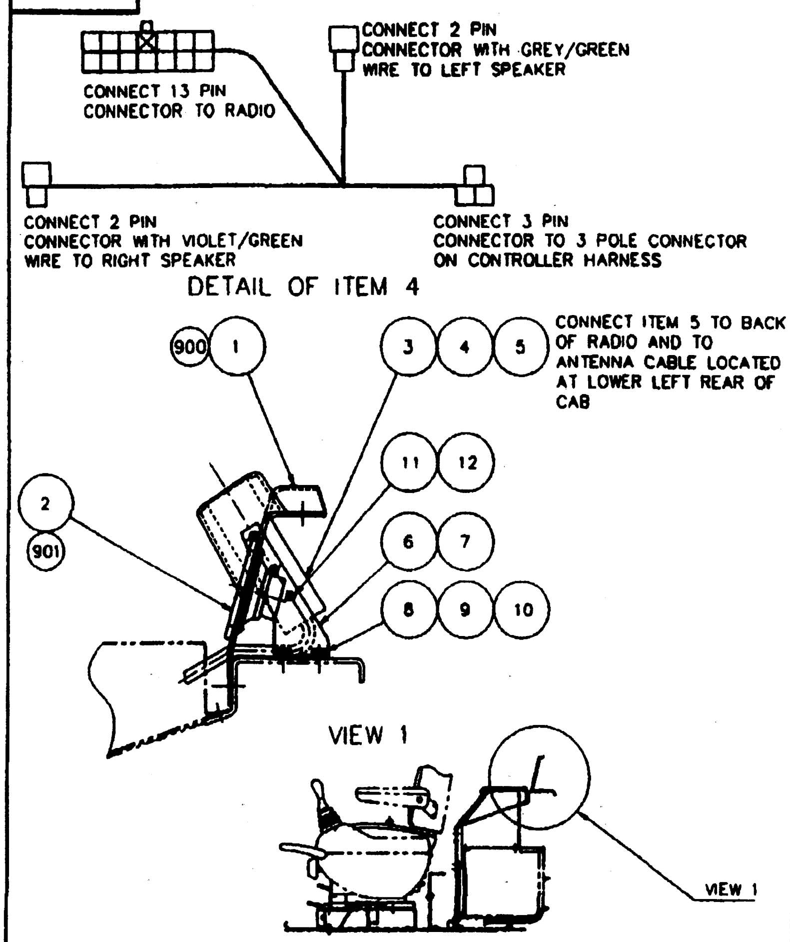


NOTE: COLOR CODE CHANGES BETWEEN
CONTROLLER AND RADIO HARNESSES

THE 24V ~ 12V CONVERTER IS STANDARD EQUIPMENT ON THE SK100 IV ~ SK400LC IV.

THE CONVERTER PROVIDES A BACKUP CIRCUIT TO MAINTAIN PROGRAMMING IN THE RADIO TUNER.

ISSUE	CAREER		DATE
01	FIRST RELEASE D95YAU56	PTT	95.05.31



NOTE:

F1 CONTAINS (COMPLETE) KIT WITH RADIO.

F2 CONTAINS INSTALLATION KIT COMPONENTS ONLY, WITHOUT RADIO.

F2	F1	PART NO.	ITEM	NAME OF PART	WEIGHT	REMARKS	CON
—	1	2418T27661	13	MANUAL, PART			
4	4	ZW22X05000	12	LOCK WASHER			○
4	4	ZS31C05016	11	MACHINE SCREW			○
4	4	ZW16X08000	10	WASHER			○
4	4	ZW26X08000	9	LOCK WASHER			○
4	4	ZS18C08020	8	CAPSCREW			○
1	1	2416P20426D2	7	BRACKET			○
1	1	2416P20426D1	6	BRACKET			○
1	1	2479R656	5	CORD			○
1	1	2479R2321	4	HARNESS			○
—	1	2479U1626	3	RADIO			○
2	2	YN54S00001F2	2	SPEAKER			○
1	1	2414N5531	1	COVER			○

NO REQ'D — LIST OF PART

COMP PART NO.	PART NO.	ITEM	NAME OF PART	MATERIAL	NO REQ'D	UNIT WT.	REMARKS
24100P4792							

F2	F1	PART NO	ITEM	NAME OF PART
2	2	YN17M01037P1	901	PLATE
1	1	2414N5536	900	COVER

NO REQ'D — LIST OF UNNECESSARY PARTS

METRIC

GENERAL TOLERANCE UNLESS OTHERWISE SPECIFIED

MORE	LESS	MACHINE ±	STRUCTURAL ±
	4	0.1	
4	16	0.2	1
16	63	0.3	
63	250	0.5	2
250	1000	0.8	
1000	2000	1.0	3
2000	4000	1.5	4
4000			6

NAME: RADIO INSTAL KIT

SCALE: NONE — DR'N DATE: 95.06.14 — MODELS: ALL — SIMILAR TO

KOBELCO — DWG NO 24100P4792 — ISSUE 01

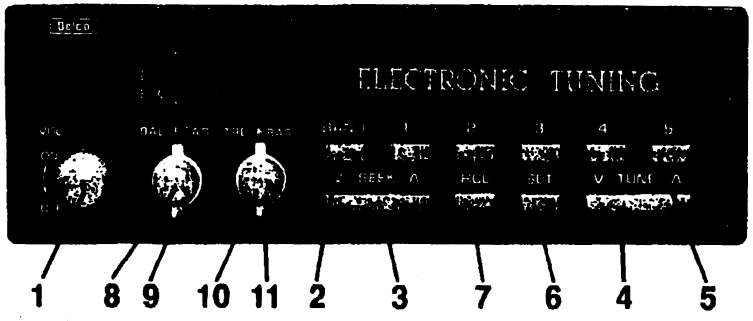
THIRD ANGLE PROJECTION

A3 SIZE

REVISED - RM

How to Operate Your . . .

Delco Music System



To Operate the Radio

1. Turn Radio On - Rotate the **ON-OFF** control clockwise to turn the radio on; rotate CCW to turn radio off.

1. Volume - Rotate **VOL** control clockwise to increase volume.

2. AM/FM - Press **BAND** switch to select desired band. (**AM** or **FM** , 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.

3. **SEEK** - Press SEEK ▲/▼ to automatically search for the next higher or lower listenable station and stay there. It will find another station each time that you press the button.

4. Manual Tuning - Press and hold **TUNE** ▲ button to increase frequency. Release as desired frequency is approached. Press **TUNE** ▼ to decrease frequency.

5. Pushbuttons - Press one of the five pushbuttons to recall a preset station. (Use the following procedure to set-up pushbuttons.)

- Locate a favorite station by using **SEEK** ▲/▼ or the **TUNE** ▲/▼ buttons.
- Press **SET (6)** pushbutton. The station frequency will flash 5 seconds or until set.
- Press the pushbutton that you want to establish for that station.
- The radio will now return to that frequency each time that button is pressed and released.)

NOTE: A total of **10** stations can be preset - 5 AM, and 5 FM.

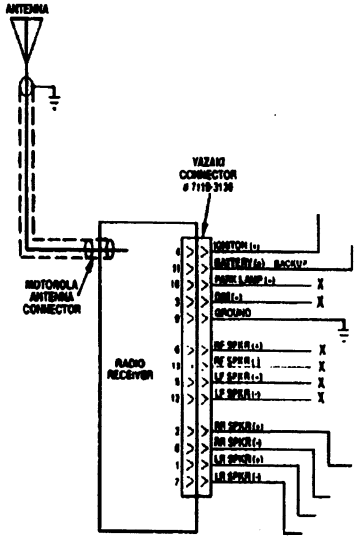
7. Clock - If time-of-day is not on the display, press **RCL**.

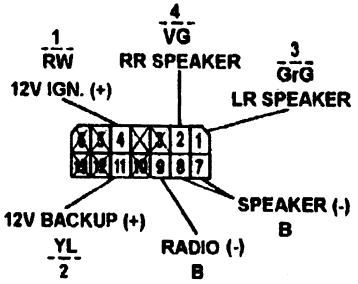
- Press and hold **SET** button and at the same time press and hold **TUNE** ▼ until the correct *hour* appears.
- Press and hold **SET** button and at the same time, press and hold **TUNE** ▲ until correct *minute* appears. (Seconds will set to 00 when adjusting minutes.)

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.

NOTE: **FADE** and **BAL**ance controls have a detent position at the center for a balance of front to rear and left to right.





RADIO CONNECTOR REAR VIEW

WIRE NUMBERS AND COLOR CODE RELATE TO RADIO HARNESS - SEE PAGE 3 of 6.

X = NOT USED IN THIS APPLICATION

8. Balance - The left-right stereo balance is adjusted by rotating the **BAL**ance control in the corresponding direction from the detent position.

9. FADE - Using the tab behind the **BAL** control, adjust the **FADE** control to the right to **FADE** toward the rear speakers. Adjust it to the left to **FADE** toward the front speakers.

10. & 11. Tone

- Rotate **TRE** control towards left to decrease treble; rotate **TRE** control towards right to increase treble.
- Rotate **BAS** control 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.

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: October 12, 1995

BULLETIN: HE-286

SUBJECT: Premature Piston-type Hydraulic Pump / Motor Failures

AFFECTED MACHINES: All Excavators - Early Units MK II
MK III MK IV

We have recently investigated several instances of premature failures of new and rebuilt piston-type hydraulic pumps, seizing one or more pistons in their rotating cylinder bores. All of these failures occurred at very low hours of operation. Some were almost immediate, and some were less than 30 days. All internal components were found to be at factory specifications and clearances in each case.

What we found to be the problem, is that some end-users are purchasing low-cost hydraulic oils that do not meet the ISO VG 32, 46, or 68 specifications. Some of these oils are claimed to have rust and oxidation inhibitor additive packages in them, but do not have the critical anti-wear additive packages. Test analysis have shown that some of the oils that created premature failures, had only 10% of the normal anti-wear additive packages, found in premium hydraulic oils.

Some machines' components, that have many hundreds or even thousands of operating hours on them, may have sufficient internal clearances to tolerate operation on low-cost hydraulic oils. However, new or rebuilt pumps and motors have very close tolerances, that require the proper additive package be present in their hydraulic oil, *especially during the initial break-in periods.*

During these investigations it was also noted that some machines had been totally neglected as to normal preventive maintenance and servicing. Radiator and hydraulic oil cooler fins were found stopped-up, fan belts were loose, hydraulic oil coolers were found leaking, and foam rubber packings and seals around the radiators and oil coolers were found missing and damaged. Some had the overheat alarm systems disconnected so they wouldn't bother the operator with the buzzer going off, when it started overheating !

Needless to say, our machines require the proper oils and maintenance to begin with, to perform properly and be reliable. However, if you experience a premature failure of this nature, we recommend that you have an oil analysis performed on the oil in question, and pay particular attention to the anti-wear additive package contents.

A typical anti-wear package analysis, that has proven to perform well in the Kobelco Excavator hydraulic systems, consists of the following:

Zinc	=	*390 ppm*	
Phosphorus	=	*300 ppm*	
Sulfur	=	*450 ppm*	*(ppm = parts per million)*

THIS BULLETIN IS BEING ISSUED FOR INFORMATION ONLY AND IS NOT AN AUTHORIZATION FOR ANY REPLACEMENT OR WARRANTY CLAIM SUBMITTAL.

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

KOBELCO *Designated*
ESSENTIAL SERVICE ITEM

DATE: July, 1996

BULLETIN: HE-290
Page 1of 10

SUBJECT: Wiring Harness Connector Repair Kit

AFFECTED MACHINES: Mark III and Mark IV Excavators

Kobelco America Inc., is pleased to announce the availability of a **Wiring Harness Connector Repair Kit, p/n 24100J18668F1**. Requests from the dealer network and allied equipment vendors, has prompted the development and release of this kit, as a means to repair the harnesses of the affected machines. In some cases, it will enable the manufacture of special application harnesses as well.

This kit is comprehensive in the scope of it's coverage of connectors, terminals, and seals. It consists of 3,777 pieces, of 137 different items, packaged in labeled, zip-lock style plastic bags. It contains a special terminal release tool, and two different types of stripping and crimping tools, necessary for factory-type installation of the connector terminals.

It also includes some of the 2P and 5P diodes utilized on these machines, and a quantity of electrical harness insulating tape. It is provided with two, compartmented plastic storage boxes, and packed in a Kinetics Brand #718 (7½"x 18½" x 14½"), waterproof ABS carrying case, which is capable of being locked. (Lock not included, see attached page for case details.) This kit weighs 23 lbs.

While this kit was designed primarily for coverage of the Mark III and Mark IV models, there are some connectors and terminals in this kit, common to the Mark II and earlier machines, some Kobelco Wheel Loaders, and other products as well, utilizing the same Japanese harness connectors and terminals. Most of these, we have found; are not available anywhere else in North or South America.

The part numbers of the connectors and terminals, are those listed in the Kobelco Parts Manuals (usually in Figs. 381 and 411), and the Shop Manuals (usually in the Control, Electric, or Mechatronic System sections). *Example: The part numbers are shown in some Connector Selection Tables as; 2PAF-090 Sumitomo **6180-2321**, or 1PAF Yazaki **7123-2810**, etc. Note: Vendor part numbers are subject to change.*

Please refer to the attached pages, for the Kit Contents Listing, and examples of typical Mark III and Mark IV connector type locations. Please contact the **Kobelco America Parts Department** for price and availability of this kit. (Refill items will be made available to purchasers of the kits.)

*The Kobelco America Product Support Section, has designated this Connector Repair Kit as an **Essential Service Item**, and recommends that one be stocked in your Parts or Service Department.*

Please note, the following items * are not included in this kit:

* p/n YN02D01001P1 Diode (please order separately if required)

* Cummins Engine Terminals - (please order from local Cummins dealer if required)					
Pole Number	Manufacturer	Housing	Terminal	Seal	Used On
2PAF-P	Packard	12015792	12089188	12015323	RPM Sensor
3PAF-P	Packard	12047911	12103881	---	Oil Press. Sw. Water Temp. Sw.

THIS BULLETIN IS BEING ISSUED FOR INFORMATION ONLY AND IS NOT AN AUTHORIZATION FOR ANY REPLACEMENT OR WARRANTY CLAIM SUBMITTAL.

PACKING LIST

24100J18668F1

NO	品名	極数	VENDOR PART#	Q'TY
1	CN HOUSING	1PM	7122-2810	10
2	CN HOUSING	2PM	7122-2228	20
3	CN HOUSING	3PM	7122-2237	10
4	CN HOUSING	4PM	7122-2446	10
5	CN HOUSING	6PM	7122 2262	5
6	CN HOUSING	8PM	7122 2186	5
7	CN HOUSING	9PM	7122-2092	1
8	CN HOUSING	10PM	7122-2107	1
9	CN HOUSING	1PF	7123-2810	10
10	CN HOUSING	2PF	7123-2228	20
11	CN HOUSING	3PF	7123 2237	10
12	CN HOUSING	4PF	7123-2446	10
12	CN HOUSING	4PF R	7123-2642	10
14	CN HOUSING	6PF	7123-2262	5
15	CN HOUSING	8PF	7123-2186	5
16	CN HOUSING	9PF	7123-2092	1
17	CN HOUSING	10PF	7123-2107	1
18	CN TERMINAL	M	225011-1	200
19	CN TERMINAL	F	225012-1	200
20	CN L HOUSING	1PM	7122 3010	5
21	CN L HOUSING	2PM	7122 3020	5
22	CN-L HOUSING	1PF	7123 3010	5
23	CN-L HOUSING	2PF	7123-3020	5
24	CN-L TERMINAL	M	235911-0	20
25	CN-L TERMINAL	F	235912-0	20
26	070 PULSE LOCK	12PF	172492 7	5
27	070 PULSE LOCK	18PF	172493-7	5
28	070 PULSE LOCK TERMINAL	F	172772-1	200
29	CAP FOR CB104	CAP M	7120-8012	50
30	CAP FOR CA104	CAP F	7120 1010	50
31	CA104	M	300501-2	50
32	CB104	F	300502-2	50
33	CAP FOR CB103	CAP M	MCA30	50
34	CAP FOR CA103	CAP F	MCB30	50
35	CA103	M	300401-1	50

PACKING LIST

24100J18668F1

NO	品名	極数	VENDOR PART#	Q'TY
36	CB103	F	300402-1	50
37	MIC Mark II HOUSING	5PM	172504-1	5
38	MIC Mark II HOUSING	5PF	172494-1	5
39	MIC Mark II TERMINAL	M	172778-1	50
40	MIC Mark II TERMINAL	F	172774-1	50
41	HM 090TYPE HOUSING	2PM	6090 1031	10
42	HM 090TYPE HOUSING	13PM	6090 1090	5
43	HM 090TYPE HOUSING	14PM	6090-1221	5
44	HM 090TYPE HOUSING	16PM	6090 1099	5
45	HM 090TYPE HOUSING	18PM	6090 1101	5
46	HM 090TYPE HOUSING	20PM	6090 1107	5
47	HM 090TYPE HOUSING	24PM	6090 1113	5
48	HM 090TYPE HOUSING	2PF	6090 1001	10
49	HM 090TYPE HOUSING	13PF	6090 1061	5
50	HM 090TYPE HOUSING	14PF	6090-1064	5
51	HM 090TYPE HOUSING	16PF	6090 1071	5
52	HM 090TYPE HOUSING	18PF	6090-1073	5
53	HM 090TYPE HOUSING	20PF	6090 1081	5
54	HM 090TYPE HOUSING	24PF	6090 1087	5
55	HM-HD 090TYPE TERMINAL	M	8230-4282	500
56	HM-HD 090TYPE TERMINAL	F	8240 4422	500
57	HD 090TYPE HOUSING	8PM	6098 0248	5
58	HD 090TYPE HOUSING	10PM	6098 0250	5
59	HD 090TYPE HOUSING	12PM	6098 0252	5
60	HD 090TYPE HOUSING	14PM	6098 0254	5
61	HD 090TYPE HOUSING	16PM	6098 0256	5
62	HD 090TYPE HOUSING	18PM	6098 0258	5
63	HD 090TYPE HOUSING	20PM	6098 0260	5
64	HD 090TYPE HOUSING	8PF	6098 0247	5
65	HD 090TYPE HOUSING	10PF	6098 0249	5
66	HD 090TYPE HOUSING	12PF	6098 0251	5
67	HD 090TYPE HOUSING	14PF	6098 0253	5
68	HD 090TYPE HOUSING	16PF	6098 0255	5
69	HD 090TYPE HOUSING	18PF	6098 0257	5
70	HD 090TYPE HOUSING	20PF	6098 0259	5

PACKING LIST
24100J18668F1

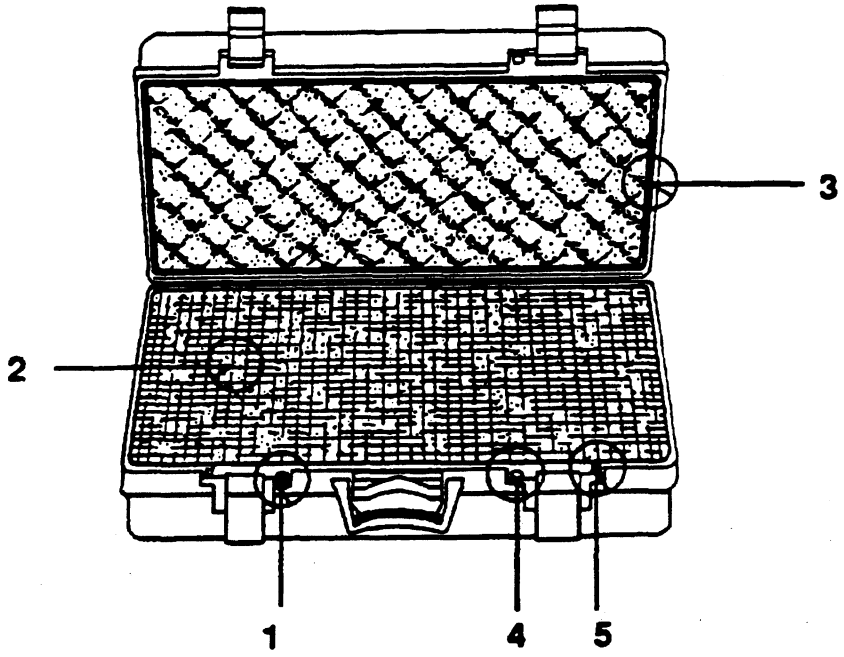
NO	品　名	極数	VENDOR PART#	Q'TY
71	HD 305TYPE HOUSING	3PM	6098 0208	5
72	HD 305TYPE HOUSING	3PF	6098-0210	5
73	HD 305TYPE TERMINAL	M	8232 4238	20
74	HD 305TYPE TERMINAL	F	8242 4068	20
75	DS 090TYPE HOUSING	13PM	6090 5012	5
76	DS 090TYPE HOUSING	13PF	6090 5014	5
77	TS 090TYPE HOUSING	16PM	6240-1031	5
78	TS 090TYPE HOUSING	16PF	6240-5033	5
79	DS·TS 090TYPE TERMINAL	M	8230-4502	100
80	DS·TS 090TYPE TERMINAL	F	8240-4892	100
81	090WP A-TYPE HOUSING	2PM	6187 2311	20
82	090WP A-TYPE HOUSING	3PM	6187-3231	10
83	090WP A-TYPE HOUSING	4PM	6188-0004	10
84	090WP A-TYPE HOUSING	2PF	6180 2321	20
85	090WP A-TYPE HOUSING	3PF	6180 3241	10
86	090WP A-TYPE HOUSING	4PF	6180-4771	10
87	090WP A-TYPE TERMINAL	M	1500 0105	100
88	090WP A-TYPE TERMINAL	F	1500-0110	100
89	090WP A-TYPE WIRE SEAL	WIRE SEAL	7160 8234	200
90	JOINT CONNECTOR	M-GREEN	6409 0072	5
91	JOINT CONNECTOR	M-GRAY	6409-0255	5
92	JOINT CONNECTOR	M-ORANGE	6409-0075	5
93	JOINT CONNECTOR	F-GREEN	6400-0013	5
94	JOINT CONNECTOR	F-GRAY	6400 0081	5
95	JOINT CONNECTOR	F-ORANGE	6400-0016	5
96	DIODE CONNECTOR	2P	2475R132	10
97	DIODE CONNECTOR	10P		5
98	040 CONNECTOR HOUSING	16PF	174046 2	5
99	040 CONNECTOR TERMINAL	F-TERMINAL	173716-1	50
100	FASTON	SLEEVE	TP250ES	50
101	FASTON	TERMINAL	225022-0	50
102	E/G OIL LEVEL	1PM	SS-1P	5
103	E/G OIL LEVEL	1PF	SS-1R	5
104	E/G OIL LEVEL TERMINAL	M	SS-P/C	10
105	E/G OIL LEVEL TERMINAL	F	SS S/C	10

PACKING LIST
24100J18668F1

NO	品　名	極数	VENDOR PART#	Q'TY
106	BS HOUSING	2PM	7118 3320	5
107	BS HOUSING	2PF	7219 3320	5
108	BS TERMINAL	M	7114 1050	10
109	BS·PA TERMINAL	F	7116 1050	50
110	BS SEAL	RUBBER	7157 3340	20
111	MWP HOUSING (STARTER)	2PM	PB621 02020	5
112	MWP HOUSING (STARTER)	2PF	PB625 02027	5
113	MWP TERMINAL	M	MT091 63280	10
114	MWP TERMINAL	F	MT095-63280	10
115	MWP SEAL	RUBBER	RS200 03100	20
116	MWP RETAINER	2PM RETAINER	PB871 02900	10
117	MWP RETAINER	2PF RETAINER	PB875 02900	10
118	HOUSING(ALTANATOR)	2PM	PH091 02017	5
119	HOUSING(ALTANATOR)	2PF	PB095 02017	5
120	TERMINAL(ALTANATOR)	M	MT061 01200	10
121	TERMINAL(ALTANATOR)	F	MT065 01200-22	10
122	SWP HOUSING(ALTANATOR)	2PM	7222-1424-40	5
123	SWP HOUSING(ALTANATOR)	2PF	7123-1424-40	5
124	SWP TERMINAL(ALTANATOR)	M	7114-1471	10
125	SWP TERMINAL(ALTANATOR)	F	7116-1471	10
126	SWP SEAL(ALTANATOR)	RUBBER SEAL	7157-7811-80	20
127	SWP RETAINER(ALTANATOR)	RETAINER	7157 7813-80	10
128	TERMINAL	LA305	8110 3050	10
129	TERMINAL	LA306	8110-3060	10
130	TERMINAL	BA506		10
131	TERMINAL	LA310	8110 3100	20
132	TERMINAL	LA210	7009 1335	20
133	PA HOUSING	17PF	7119 3170	5
134	圧着工具		AMP918253 1	1
135	圧着工具	CN端子/丸端子	B-155	1
136	端子引抜き治具		FR-A-S	1
137	HARNESS TAPE	0.13*19mm*20M		5

QUICK TIPS

— ABOUT USING YOUR KINETICS DRY CASE

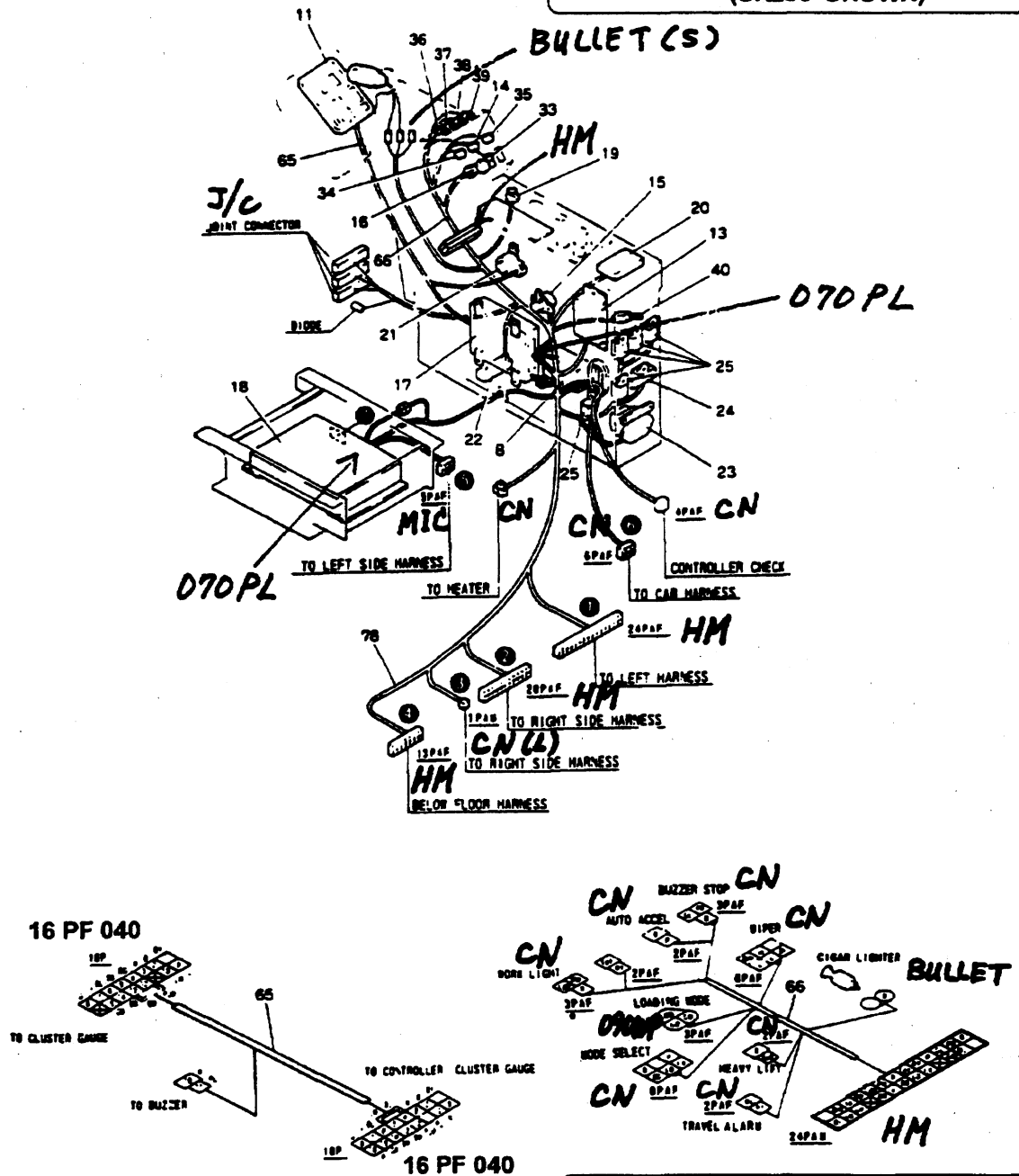


1. Pressure Release Valve: **Important**: - Be sure valve is **open** when encountering atmospheric changes; i.e., airplane travel, mountain climbing, submarine rides, etc. **Close** valve when river rafting, sailing or in otherwise wet conditions.
2. Available with adjustable dividers or no fuss die-cut foam insert (remove enough foam cubes to create a form fit for your equipment).
3. Continuous O-ring seal keeps everything dry and dust-free at all times.
4. For security: provision for a padlock.
5. For convenience: provision for adding a carrying strap.
6. For ease of opening: place palm of your hand on lid and press and release the sure-lock latches with free hand.

Warranty? You bet! The Kinetics Dry Case base has a lifetime warranty against any manufacturer's defects.

Underwater Kinetics

TYPICAL MK III TERMINAL APPLICATIONS
(SK200 SHOWN)



EXAMPLE ONLY - REFER TO APPLICABLE MANUAL FOR MACHINE BEING SERVICED

FIG 381-50-22

デンキ ハイセン アッセン・WIRING ASSY. ELEC

24100J15145F1

TQL00701 ~
YNJ00001 ~

0A	0A	0	0	0	0	0	0	0	0	0	0	0	0	0

24101J455

CONNECTOR SELECTION TABLE		
POLES	MAKER	PART NO.
1PNF	YAZAKI	7123-2810
2PNF	YAZAKI	7123-2220
3PNF	YAZAKI	7123-2237
CB1C4	YAZAKI	7328-1157
CA1C4	YAZAKI	7328-0818
CB103		300402-1
2PNF-S	SUMITOMO	6180-3221
3PNF-S	SUMITOMO	6180-3241
4PNF-S	SUMITOMO	6180-4771

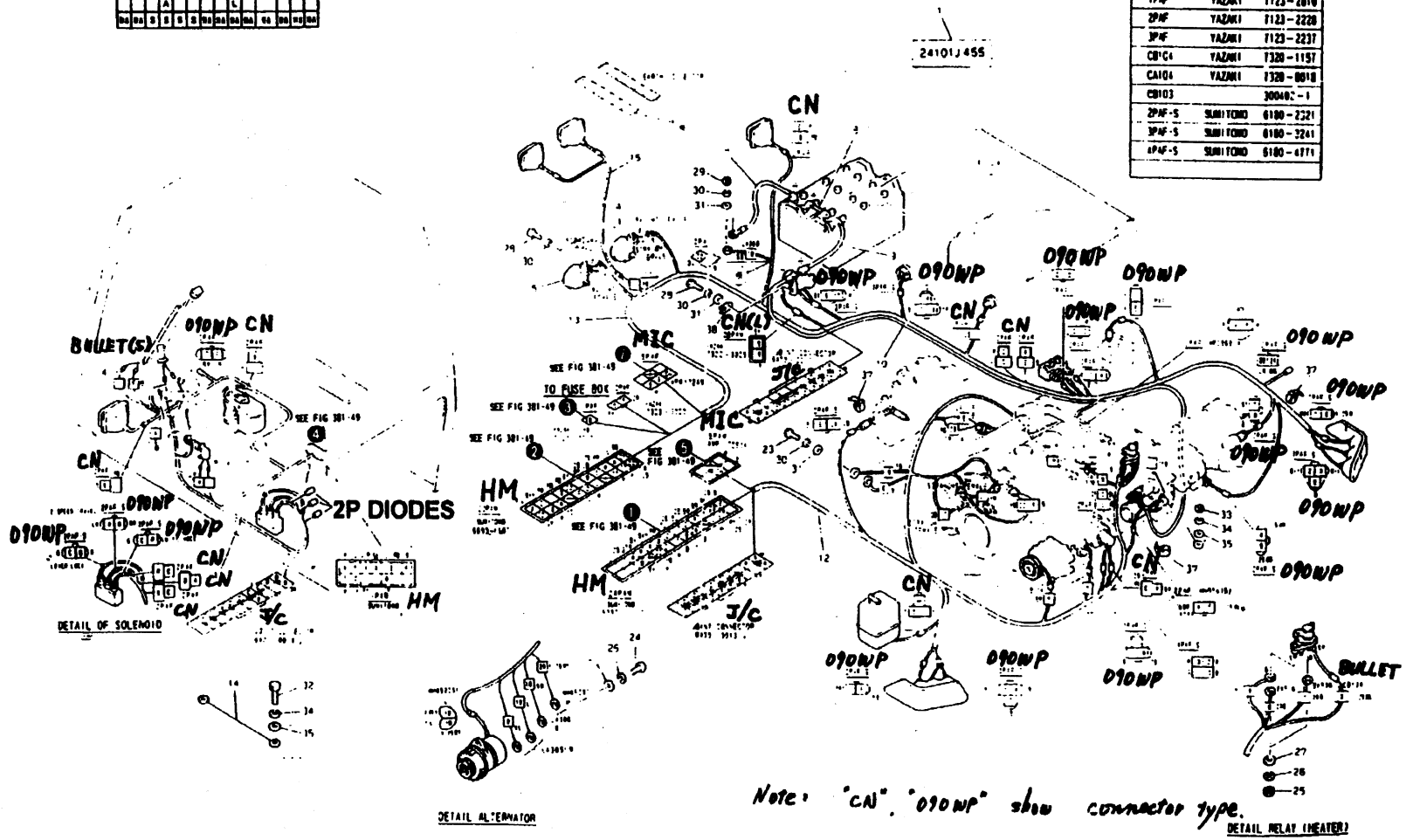


FIG411-49-1①

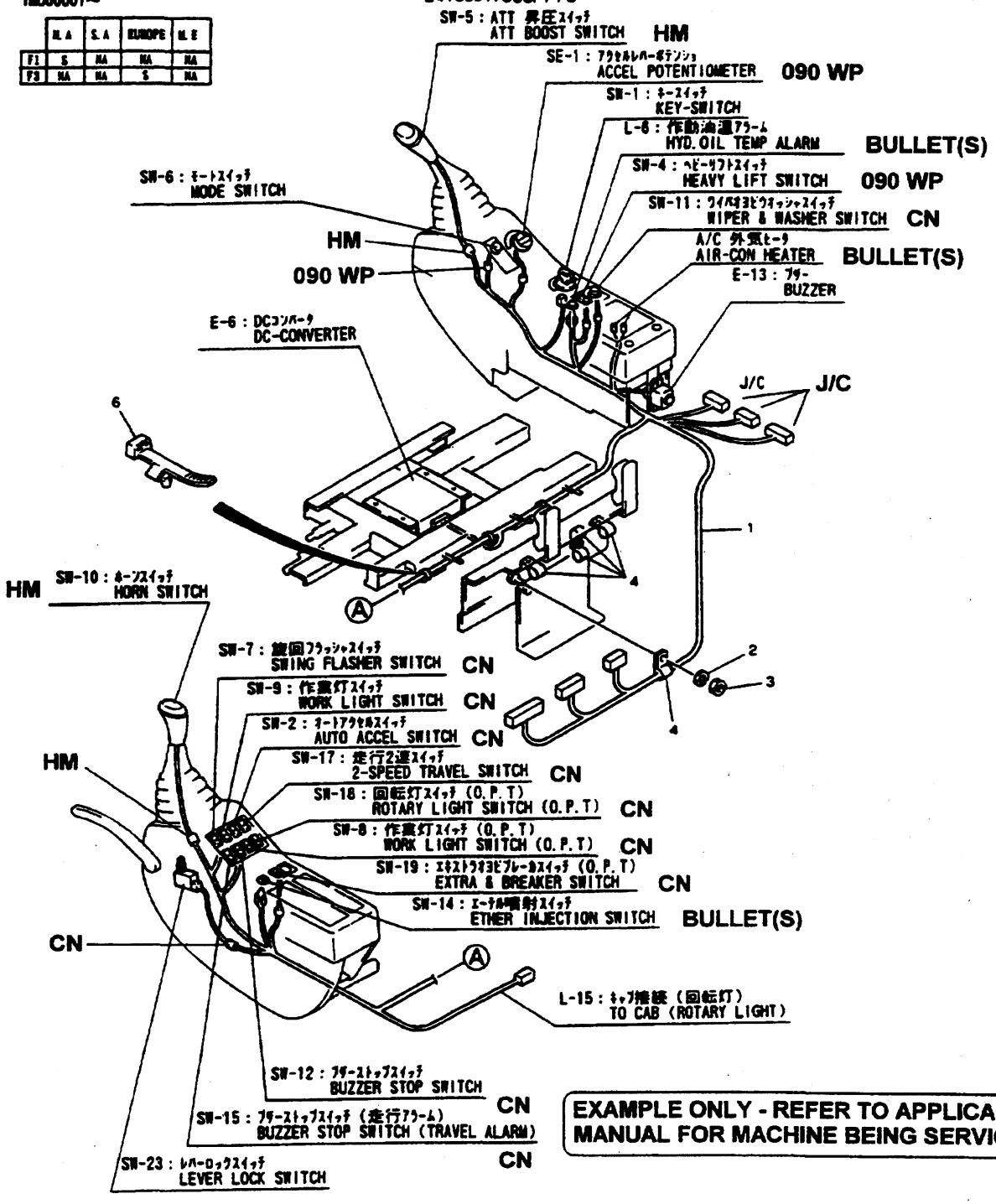
EXAMPLE ONLY - REFER TO APPLICABLE MANUAL FOR MACHINE BEING SERVICED

TYPICAL MK III TERMINAL APPLICATIONS (SK200 SHOWN)

YDU01801～
YMJ00201～
LLU01201～
LDU00101～
YMJ00001～

	N. A	S. A	EUROPE	M. E
F1	S	NA	NA	NA
F3	NA	NA	S	NA

ハーネス アッセン・HARNESS ASSY
(INST-PANEL)
24100J17093F1·F3



EXAMPLE ONLY - REFER TO APPLICABLE MANUAL FOR MACHINE BEING SERVICED

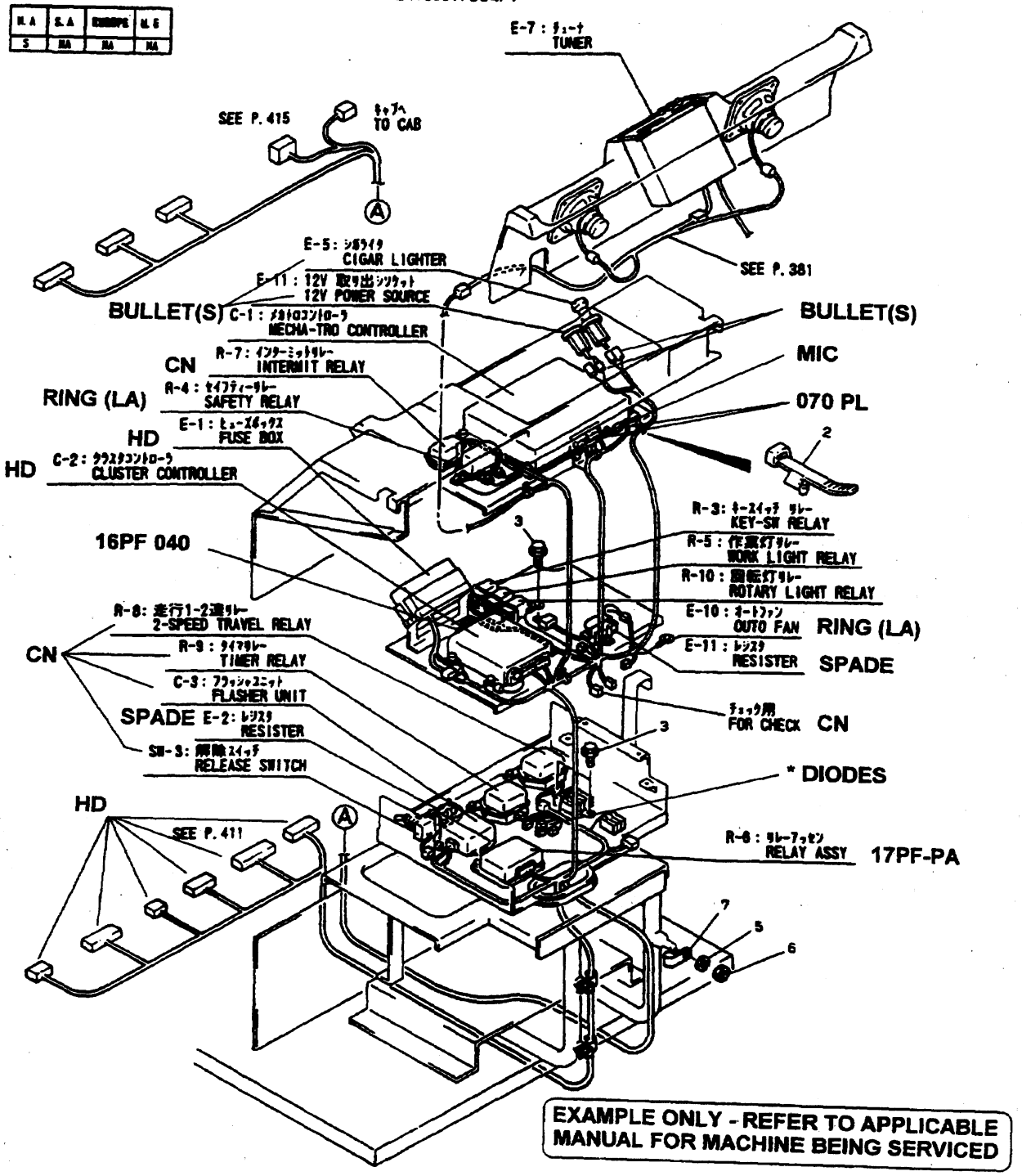
TYPICAL MK IV TERMINAL APPLICATIONS (SK220 SHOWN)

FIG 415-49-1

YDU01801～
YNU00201～
LLU01201～
LQU00101～

N. A	E. A	EUROPE	M. E
S	MA	MA	MA

ハーネス アッセン・HARNESS ASSY
(CONTROLLER)
24100J17094F1



EXAMPLE ONLY - REFER TO APPLICABLE MANUAL FOR MACHINE BEING SERVICED

FIG 416-49-1

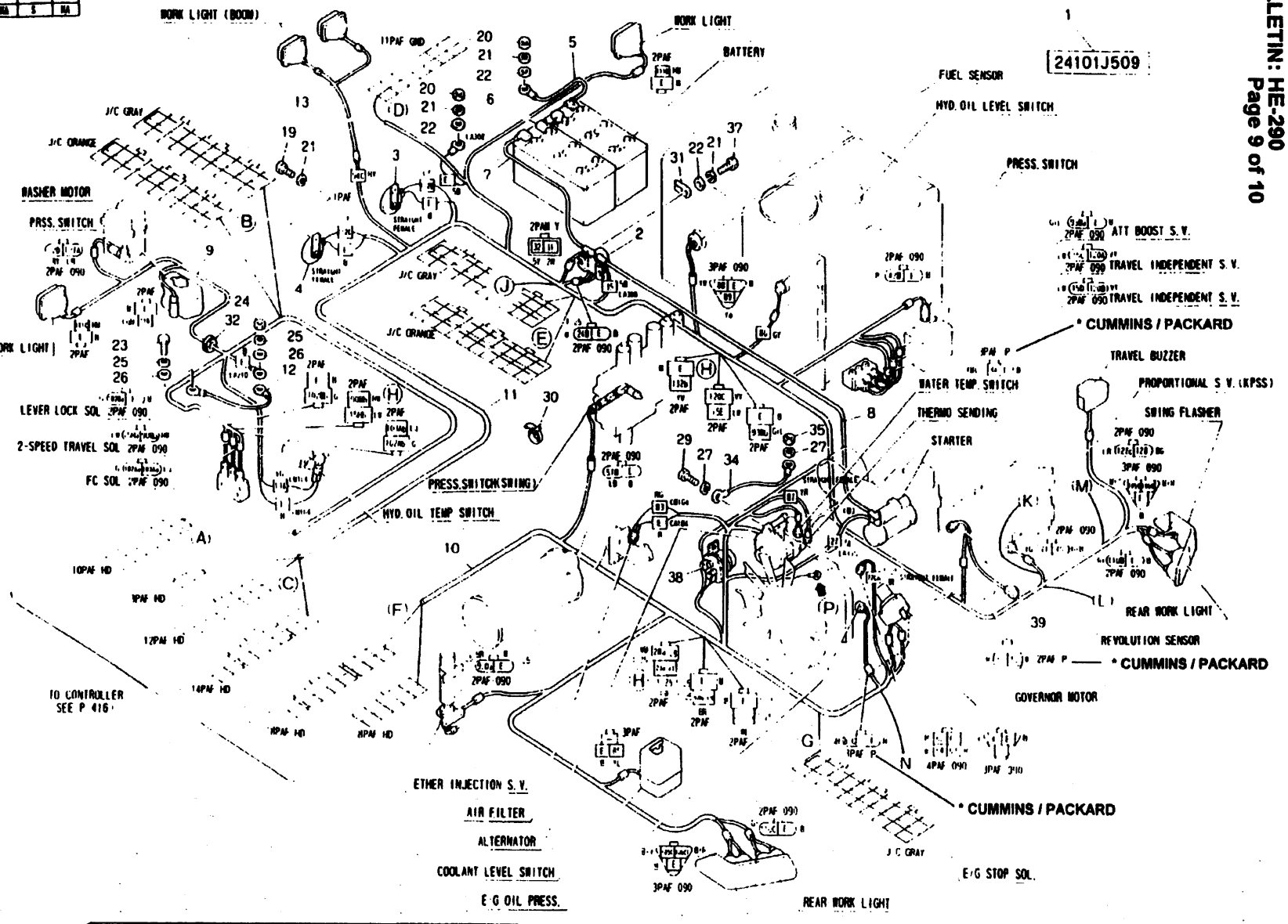
TYPICAL MK IV TERMINAL APPLICATIONS
(SK220 SHOWN)

デンキ ハイセン アッセン WIRING ASSY. ELEC

LLU01201~
LQU00101~

U.S.A	U.S.A	EUROPE	U.K
S	MA	S	MA

24100J16967F1



EXAMPLE ONLY - REFER TO APPLICABLE MANUAL FOR MACHINE BEING SERVICED

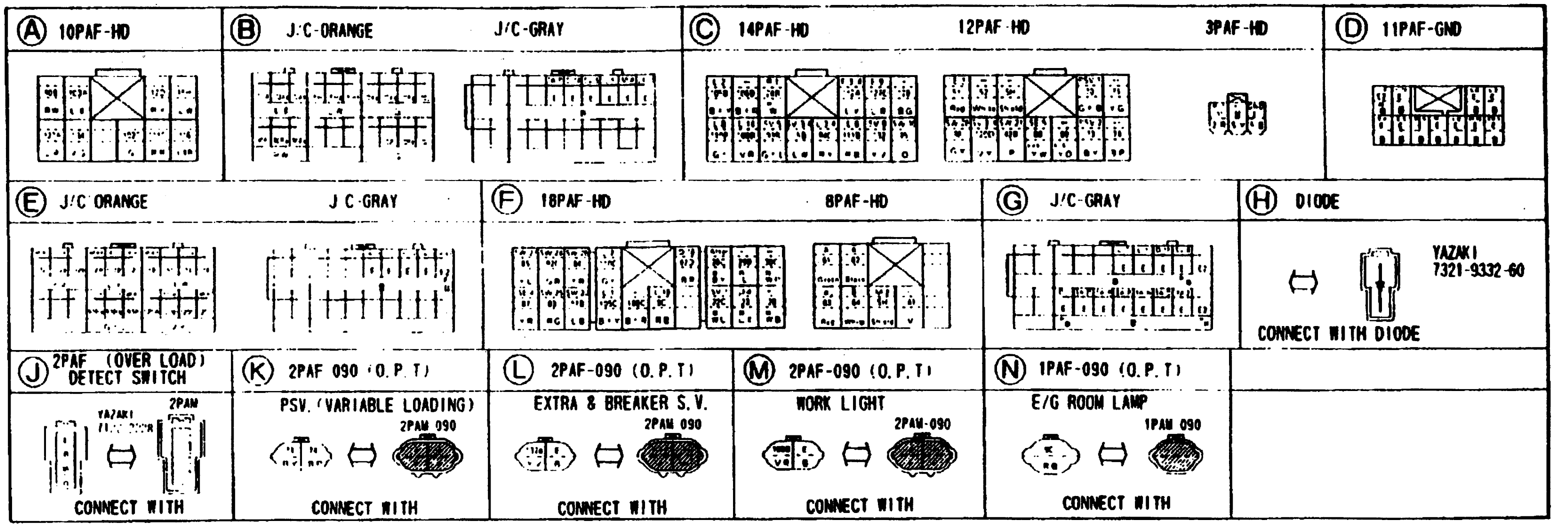
FIG 411-49-1

TYPICAL MK IV TERMINAL APPLICATIONS (SK220 SHOWN)

テンキ ハイセン アッセン WIRING ASSY. ELEC

24100J16967F1

LLU01201~
LQU00101~



ITEM 8 CONNECTOR SELECTION TABLE

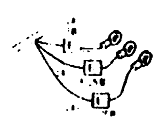
POLE NUM	MANUFAC	PART NUMBER: HOUSING	PART NUMBER: TERMINAL	PART NUMBER: SEALING
2PAF	YAZAKI	7123 [illegible]	7115 02090	
2PAF 090	SUMITOMO	6180 23[illegible]	1500 0110	7160 8214
10PAF HD	SUMITOMO	6098 0249	8240 4022	
J/C GRAY	SUMITOMO	6400 0013 6409 0072	8240 4022	
J/C ORANGE	SUMITOMO	6400 0016 6409 0075	8240 4022	

ITEM 13 CONNECTOR SELECTION TABLE

POLE NUM	MANUFAC	PART NUMBER: HOUSING	PART NUMBER: TERMINAL	PART NUMBER: SEALING
1PAF 090	SUMITOMO	6150 1[illegible]	15[illegible] 3110	7160 8234
1PAM 090	SUMITOMO	6187 1[illegible]	15[illegible] 3105	[illegible]
2PAF	YAZAKI	7123 2220	7116 2032	
2PAF 090	SUMITOMO	6190 2121	1500 3119	7160 8234
3PAF	YAZAKI	7123 [illegible]	7116 2090	
3PAF 093	SUMITOMO	6180 3281	1500 3113	7160 8234
3PAF P	PACKARD	12047911	12103881	
4PAF 090	SUMITOMO	6180 4771	1500 0110	7160 8234
8PAF HD	SUMITOMO	6098 0247	8240-4022	
18PAF HD	SUMITOMO	6098 0255	8240 4022	
J C GRAY	SUMITOMO	6400 0081 6409 0255	8240 40[illegible]	
CA104	YAZAKI	7120 0012	7113 1020	
CB104	YAZAKI	7120-1010	7115 1050	
STRAIGHT FEMALE	YAZAKI	7120-3011	7118 2270	

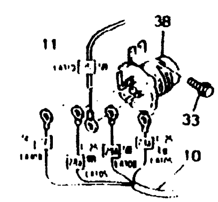
ITEM 11 CONNECTOR SELECTION TABLE

POLE NUM	MANUFAC	PART NUMBER: HOUSING	PART NUMBER: TERMINAL	PART NUMBER: SEALING
1PAF	YAZAKI	7123 2215	7116-2090	
1PAM 5RY	YAZAKI	7123 4210 30	7116-3250	7157 3580-60
2PAF	YAZAKI	7123 2220	7115 2090	
2PAF 090	SUMITOMO	6180 2321	1500-0110	7160-8234
2PAF P	PACKARD	12015792	12059168	12015323
2PAM 090	SUMITOMO	6187 2311	1500 0105	7160 8214
2PAM Y	YAZAKI	7122 3020	7114 3640 7114 2030	
3PAF 090	SUMITOMO	6180 3241	1500-0110	7160 8234
3PAF HD	SUMITOMO	6098 [illegible]	8242 4065	
11PAF GND	YAZAKI	7283 1110 7222 [illegible]	7116 4021	
12PAF HD	SUMITOMO	6098 [illegible]	8240 4022	
14PAF HD	SUMITOMO	6098 [illegible]	8240 4022	
J C GRAY	SUMITOMO	6400 [illegible] 6409 [illegible]	[illegible] 4422	
J C ORANGE	SUMITOMO	6400 [illegible] 6409 [illegible]	8240 4422	
STRAIGHT FEMALE	YAZAKI	[illegible]	7118 [illegible]	



P

DETAIL ALTERNATOR



DETAIL STARTER RELAY

LA104 YAZAKI 7034-1272
LA105 YAZAKI 7034-1275
LA106 YAZAKI 7034 1277
LA308 YAZAKI 7034-1280

FIG 411-49-2

05

EXAMPLE ONLY - REFER TO APPLICABLE MANUAL FOR MACHINE BEING SERVICED

TYPICAL MK IV TERMINAL APPLICATIONS (SK220 SHOWN)

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: July, 1996

BULLETIN: HE-291

SUBJECT: Hose interference - pilot gear pump

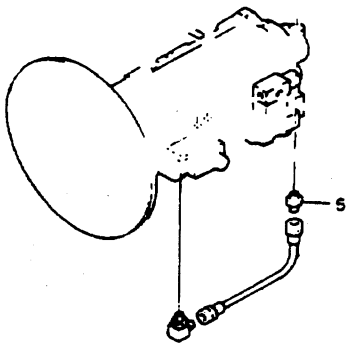
AFFECTED MACHINES: SK200LC IV YQU-2001 ~ YQU-2134
YQU-2135 ~ up

Effective with s/n YQU-2135 and up, the routing of the suction inlet hose for the pilot gear pump, was revised to eliminate the possibility of interference.

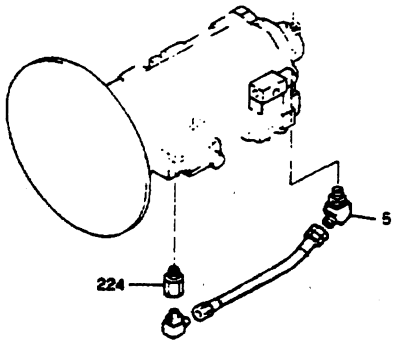
Item 5 was changed to p/n ZH42X12000, and item 224 (p/n HH25X12012G2), was added.

On machines s/n YQU-2001 ~ YQU-2134, the same components as used on the MK III machines were utilized. The MK IV parts manual does not show this difference, however; it should be added at the next re-printing.

PILOT GEAR PUMP - SUCTION INLET HOSE REVISION



s/n YQU-2001 ~ YQU-2134
(same as MK III)



s/n YQU-2135 ~ up
(revised)

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KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: July, 1996

BULLETIN: HE-292
Page 1 of 17

RED DOT CORPORATION

SUBJECT: Optional Red Dot Air Conditioning System - Early Production MK IV
(Change early style R-1500 heater only to R-1550 heater-a/c system.)

AFFECTED MACHINES:

SK100 IV	~YWU-1034	
SK120LC IV	~YPU-1140	
SK150LC IV	~YMU-1134	
SK200 IV	~YNU-0330	(EC Short Crawler)
SK200LC IV	~YQU-2325	
SK250NLC IV	~LLU-5009	(EC Narrow Long Crawler)
SK220LC IV	~LLU-1389	
SK270LC IV	~LBU-0002	
SK300LC IV	~YCU-0396	(MMC Engine)
SK400LC IV	~YSU-0200	(MMC Engine)

The above model machines, *prior to the listed serial numbers*, can be optionally equipped with a Red Dot brand air conditioning system. These machines will require the removal of the R-1500 heater only unit, to install the R-1550 heater-a/c system. Please refer to the attached Red Dot Installation Instructions, RD-3-7489-0, to verify the type system presently installed in your machine, and the items required.

Machines after the listed serial numbers , should be equipped with a different heater assembly from the factory (R-1550), and will require different Installation Instructions and kits. For these machines, refer to Service Bulletin HE-293.

We recommend that you contact your local Red Dot Dealer, for installation of this system, or any further information on the kits mentioned. For the name and phone number of your nearest Red Dot Dealer, please contact:

RED DOT CORPORATION
P.O. Box 58270
Seattle. WA 98138
(206) 575-3840

Please note: These instructions were valid and correct at time of issue, as provided by Red Dot Corporation, and are subject to change without notice.

THIS BULLETIN IS BEING ISSUED FOR INFORMATION ONLY AND IS NOT AN AUTHORIZATION FOR ANY REPLACEMENT OR WARRANTY CLAIM SUBMITTAL.

R-1550 FOR KOBELCO SK100/120/150, SK200/220, SK300 and SK400

INSTALLATION INSTRUCTIONS

These instructions are intended for use on Kobelco Mark IV excavators to replace the R-1500 heater only unit with a R-1550 heater-a/c system. To verify which heater unit is currently in the vehicle, look behind the seat: If there is NOT a filter box with an aluminum filter secured to the back access plate behind the seat then proceed with these instructions.

READ AIR CONDITIONER INSTALLATION PRECAUTIONS SHEET PRIOR TO INSTALLATION

FOR THIS INSTALL YOU WILL NEED THE FOLLOWING RED DOT KITS:

R-1550-I P

RD-3-7488-0P

RD-3-7490

- **-0P FOR SK100/120**
- **-1P FOR SK150**
- **-2P FOR SK200/220**
- **-3P FOR SK300**
- **-4P FOR SK400**

IMPORTANT NOTICE:
INSTALLATION OF THIS SYSTEM REQUIRES:
- PURCHASE OF SOME REPLACMENT PARTS FROM KOBELCO AMERICA (SEE THIS SECTION)
- REMOVAL OF THE CAB (SEE SECTION A, STEP #8)

FROM THE DOCUMENTS INCLUDED WITH THE KITS VERIFY THE COMPONENTS REQUIRED FOR THE APPROPRIATE ENGINE INSTALLATION.

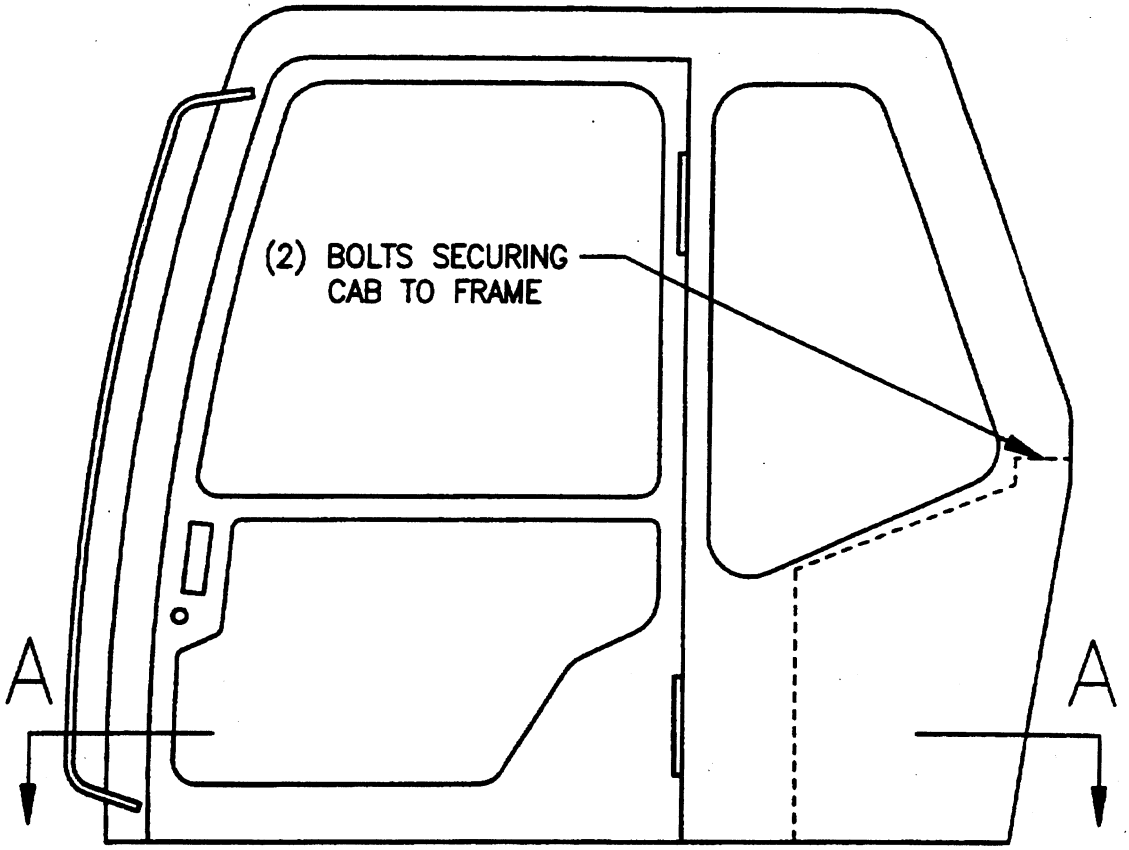
FROM KOBELCO AMERICA YOU WILL NEED THE FOLLOWING:

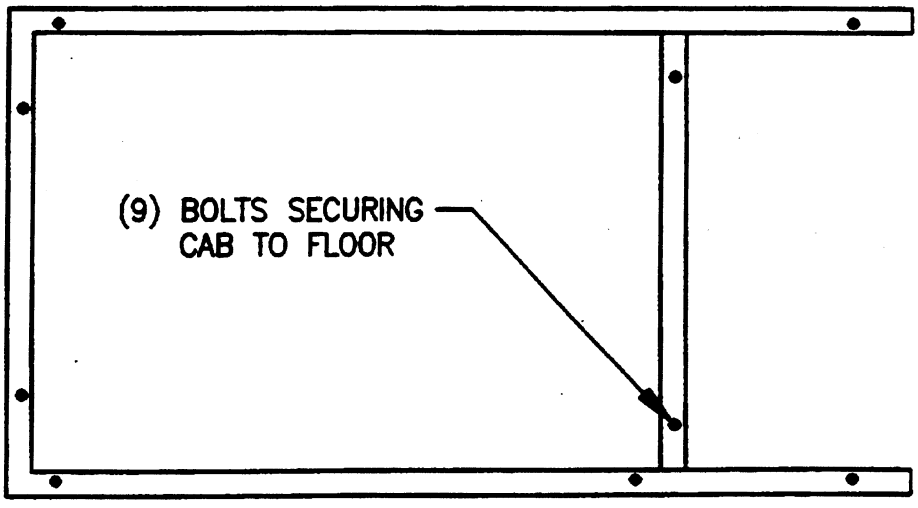
- **REPLACEMENT KICKPLATE (Kobelco #YN20MU1001F1)**
- **COMPUTER STAND BASE SUPPORT (Kobelco #2416N7081)**

A. REMOVAL OF EXISTING HEATER SYSTEM

1. Disconnect battery ground cable with power ignition off! Be sure engine is cool.
2. Remove (10) bolts holding rear cab cover panels; remove panels.
3. Remove interior back plastic panels covering computer and heater.
4. Remove (2) clamps securing heater air duct hoses to upper outlet louvers.
5. Remove (6) bolts to cab interior back access panel (hot/cold box).
6. Remove (4) clamps securing heater air duct hoses to panel.
7. Remove access panel. Discard plate but save fastening hardware.
8. Remove (11) bolts securing cab to floor plate and frame. Lift off cab. See Figure 1.
9. Remove (4) bolts securing seat; remove seat assembly. (Optional)

   CAUTION: Be sure engine coolant is not hot before proceeding to next step.
10. Shut off heater line valve at engine.





VIEW A–A

FIGURE 1
CAB MOUNTING BOLT LOCATIONS

11. Loosen (2) clamps securing heater coolant lines to heater unit and disconnect hoses; drain into suitable container.
12. Cut interior vertical tube (closest to water valve) of heater base support removing a 2" (50mm) vortical section.
13. Disconnect (3) control cables from heater unit control rods.
14. Disconnect wire harness connectors from heater unit resistor and motor.
15. Remove (2) hose clamps that secure computer wiring to heater base support tubes.
16. Remove (4) bolts that secure computer stand to heater base support
17. Remove (4) bolts securing heater unit to cab floor.

    CAUTION: Before proceeding to next step temporary support for the computer stand must be provided until the new unit is in place.

18. Slip computer wiring through cut in unit support tube and slide the old unit out from under the computer stand and drain heater core.

B. INSTALLATION OF HEATER-A/C UNIT

1. Place (1) .875 dia. spacer on each of the (4) unit mounting studs inside bottom stiffener. See Figure 2.
2. Assemble unit to computer support base and secure with (4) M8 washers, lock washers and nuts. See Figure 2.
3. Loosen clamp securing braces on motor and assemble motor brace from kit to bottom of base with (2) M6 screws and washers. See Figure 2.
4. Secure braces to motor with clamp. Tighten clamp.
5. Assemble BLK wire with (2) ring terminals from motor mount to computer base. Secure to base with (1) M6 screw and washer. Tie wrap as shown with 8" tie wrap. See Figure 2.
6. Secure motor vent tube and motor ground wire to computer stand as shown in Figure 2.
7. Prior to mounting new heater-a/c unit to cab floor, install drain hose onto unit drain tube and secure with 4" tie wrap.
8. Install new Heater-A/C unit in same location as old heater unit with original haraware.

   NOTE: When placing unit into mounting position, route unit drain hose to desired location.

9. Secure computer stand with original hardware.
10. Insert hose clamps over each end of the (2) existing heater hoses
11. Attach hose from engine outlet shut-off valve to lower heater core tube labeled INLET. Tighten hose clamps. **Re-torque hose clamps after 10 minutes to insure against leaks.**
12. Attach hose from engine inlet tube to water valve. Tighten hose clamps.
13. Attach air duct hoses to heater-a/c unit with clamps as shown in Figure 3.
14. Replace any radiator coolant lost in assembly.

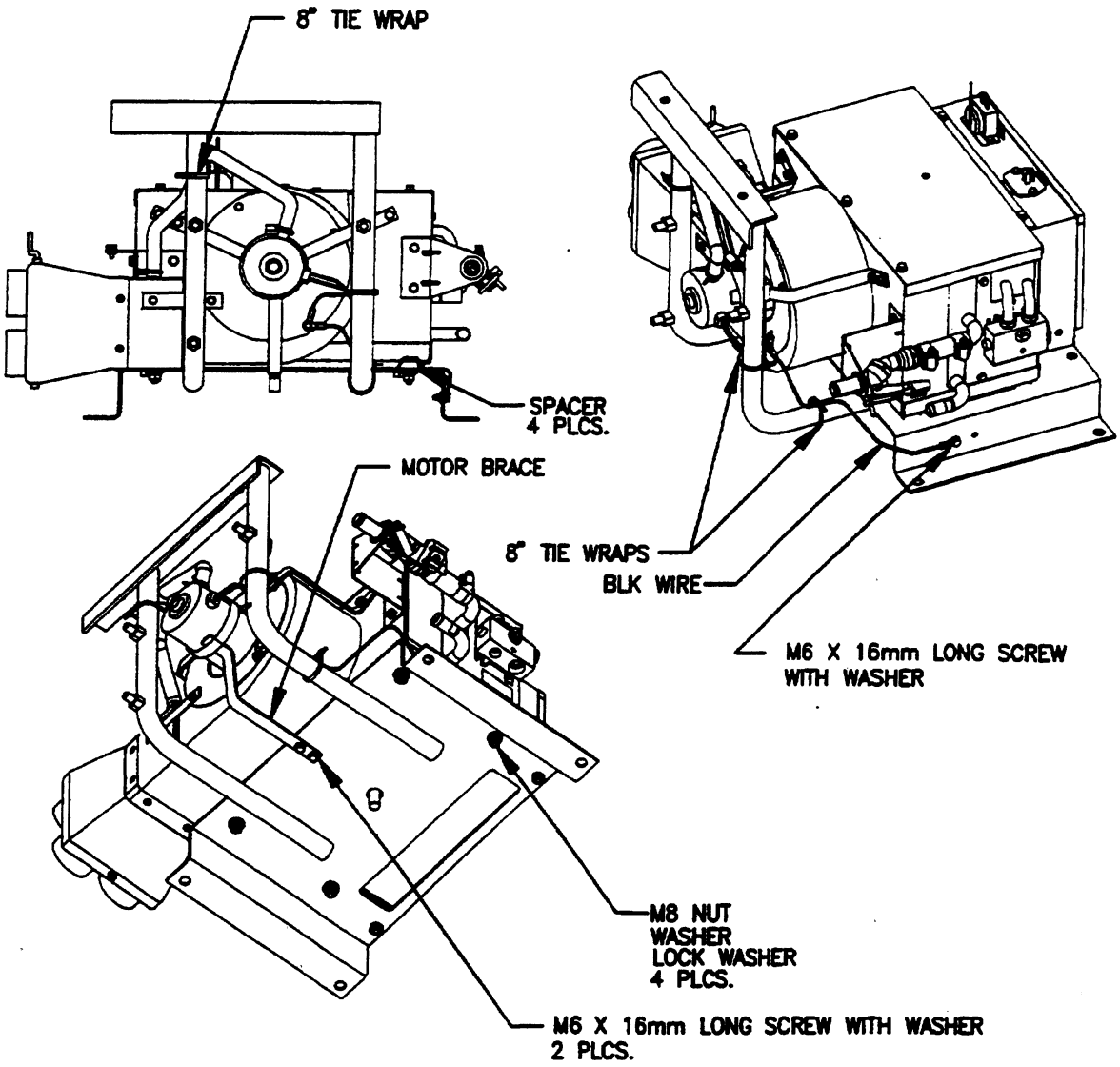

8" TIE WRAP
SPACER
4 PLCS.
MOTOR BRACE
8" TIE WRAPS
BLK WIRE
M6 X 16mm LONG SCREW
WITH WASHER
M8 NUT
WASHER
LOCK WASHER
4 PLCS.
M6 X 16mm LONG SCREW WITH WASHER
2 PLCS.

FIGURE 2

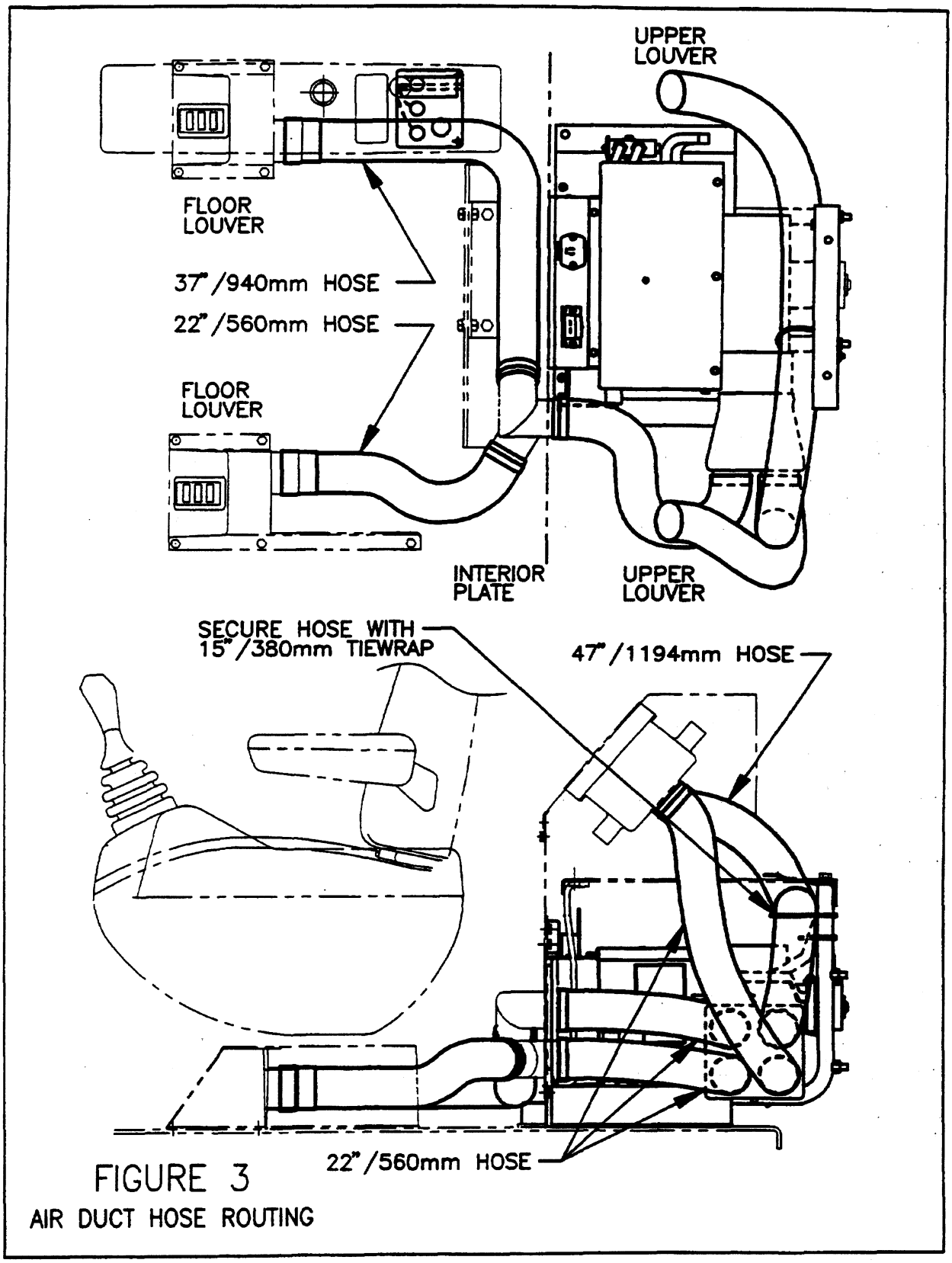


FIGURE 3
AIR DUCT HOSE ROUTING

C. CONDENSER INSTALLATION

1. For SK100/120/150 see Figure 5.

   A. For the SK100 and SK120 the upper radiator hose may need to be trimmed at radiator by 20mm on machines manufactured before October 1995 to provide clearance for compressor.

   B. On the SK100 and SK120 tractors manufactured prior to October 1995, the bar support that the radiator overflow tank is mounted on may need to be trimmed prior to condenser installation to remove any material that extends into the condenser face area.

2. For SK200/220 see Figures 4A and 4B.

3. For SK300 see Figure 6.

4. For SK400 see Figure 7.

D. COMPRESSOR MOUNT INSTALLATION for SK100/120/150, SK200/220 (See Figures 4A and 4B).

Note: For compressor mount installation also see instructions included in compressor mount kit RD-9-7184-0P. All fasteners for compressor mounting are provided in kit.

1. Install compressor mount onto engine using the (3) mounting holes in engine block and using (3) M10 x 1.50 x 35mm bolts and (3) M10 lockwashers.

2. Install compressor into mount assembly using (4) M10 x 1.50 x 40 mm screws, (4) M10 lockwashers and (4) M10 x 1.50 nuts. Tighten nuts until lockwashers are seated.

3. Install drive belt on both the compressor pulley and auxiliary pulley. Using the proper sized open-end wrench, grip eccentric near the idler pulley assembly and pull wrench putting tension on the drive belt and adjust tension, (i.e. no more than 12.7 mm of deflection in belt at midpoint of belt between drive pulleys), and tighten bolt securing eccentric to compressor mount.

Note: For SK300 compressor mount see instructions in compressor mount kit RD-9-7112-0P. For SK400 compressor mount see instructions in compressor mount kit RD-9-7208-0P. All fasteners for compressor mounting are provided in kit.

Note: For SK200/220, SK300, SK400 add 2 oz. of PAG oil to compressor.

E. RECEIVER/DRIER INSTALLATION FOR ALL MODELS (See Figures 8A and 8B.)

F. REFRIGERANT HOSE INSTALLATION FOR ALL MODELS

CAUTION: All hoses must be protected from sharp edges by wire loom.

Note: Some components will vary from vehicle to vehicle but the hose routing will remain the same. See Figures 4A, 4B and 4C for pictorial representation.

Note: Be certain all fittings are equipped with the proper O-rings and lubricate O-rings with mineral oil prior to assembly.

1. Install #6 refrigerant hose assembly with (2) 90 degree female fittings from **LOWER** condenser refrigerant outlet fitting to inlet on receiver/drier.

2. Install #6 refrigerant hose assembly with 90 degree female fitting onto drier outlet.

NOTE: Inlet on receiver/drier should be pointing toward oil-cooler assembly.

Route hose through forward bulkhead of condenser/oil-cooler compartment and make connection to #6 inlet on expansion valve on heater-A/C unit with 45 degree male fitting.

NOTE: Expansion valve inlet is the receptacle nearest engine compartment.

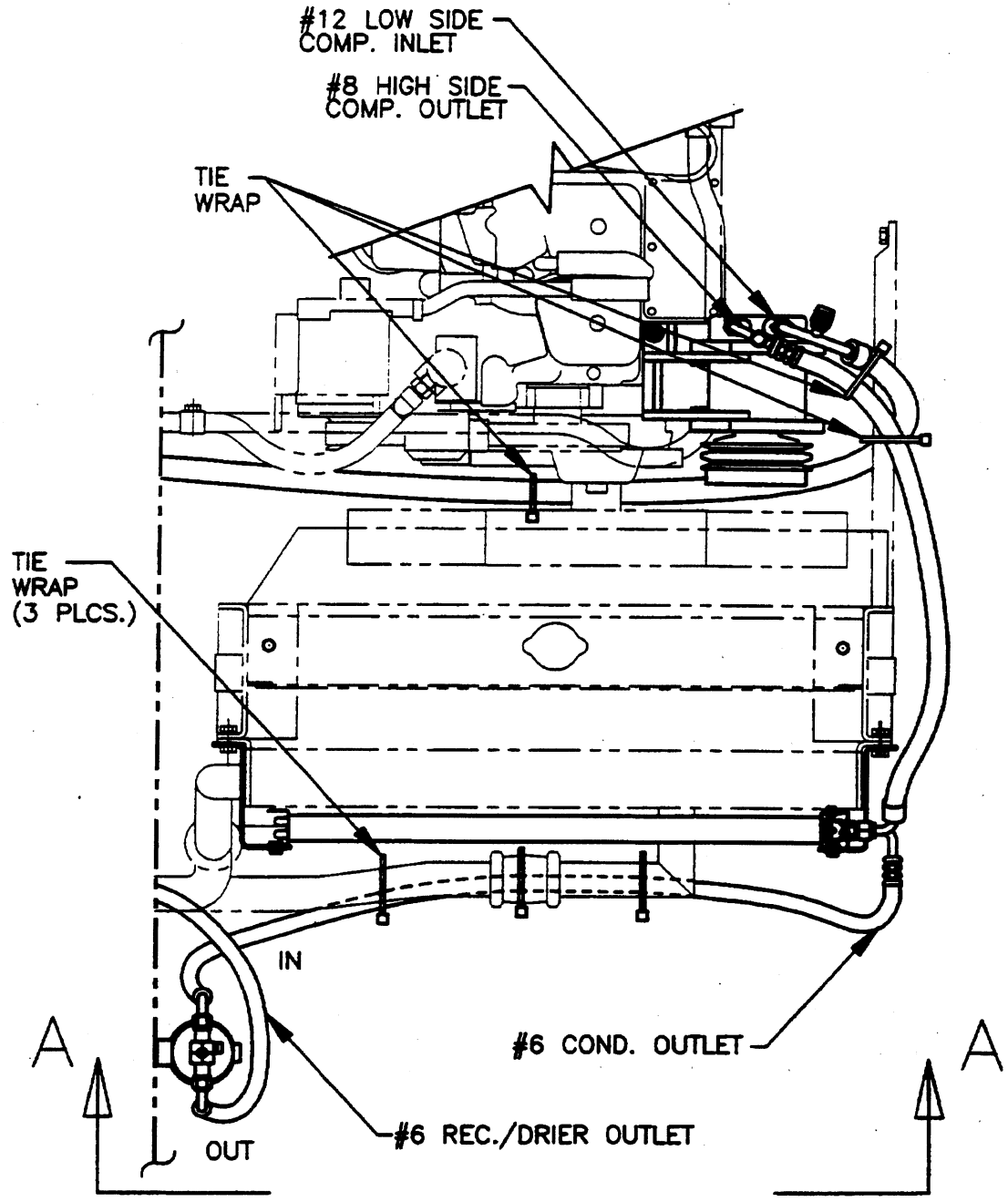


FIGURE 4a

TOP VIEW OF ENGINE COMPARTMENT HOSE ROUTINGS
USING SK200\220 CONFIGURATION

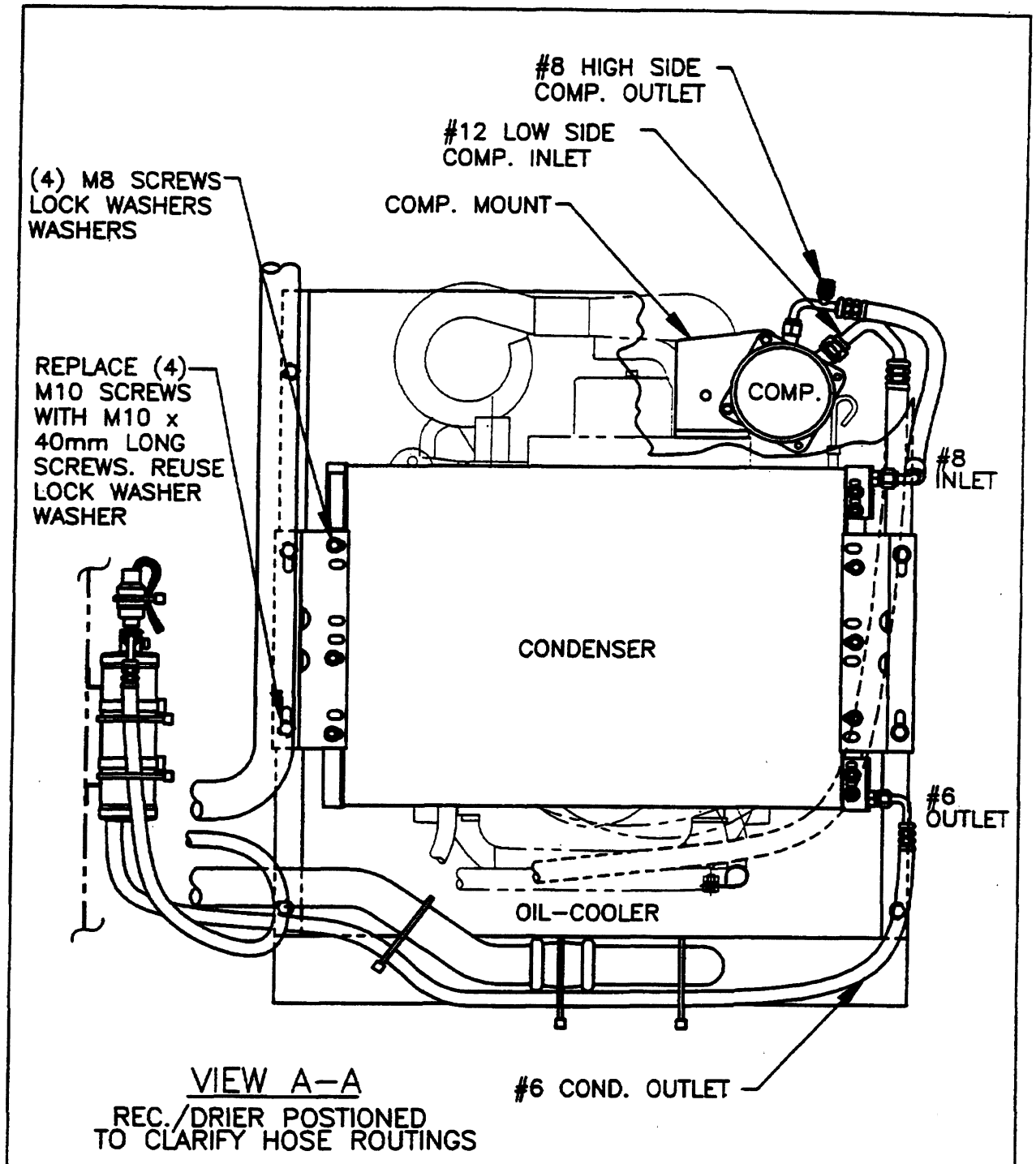


FIGURE 4b
FRONT VIEW OF ENGINE COMPARTMENT HOSE ROUTINGS
(USING THE SK200/220 CONFIGURATION)

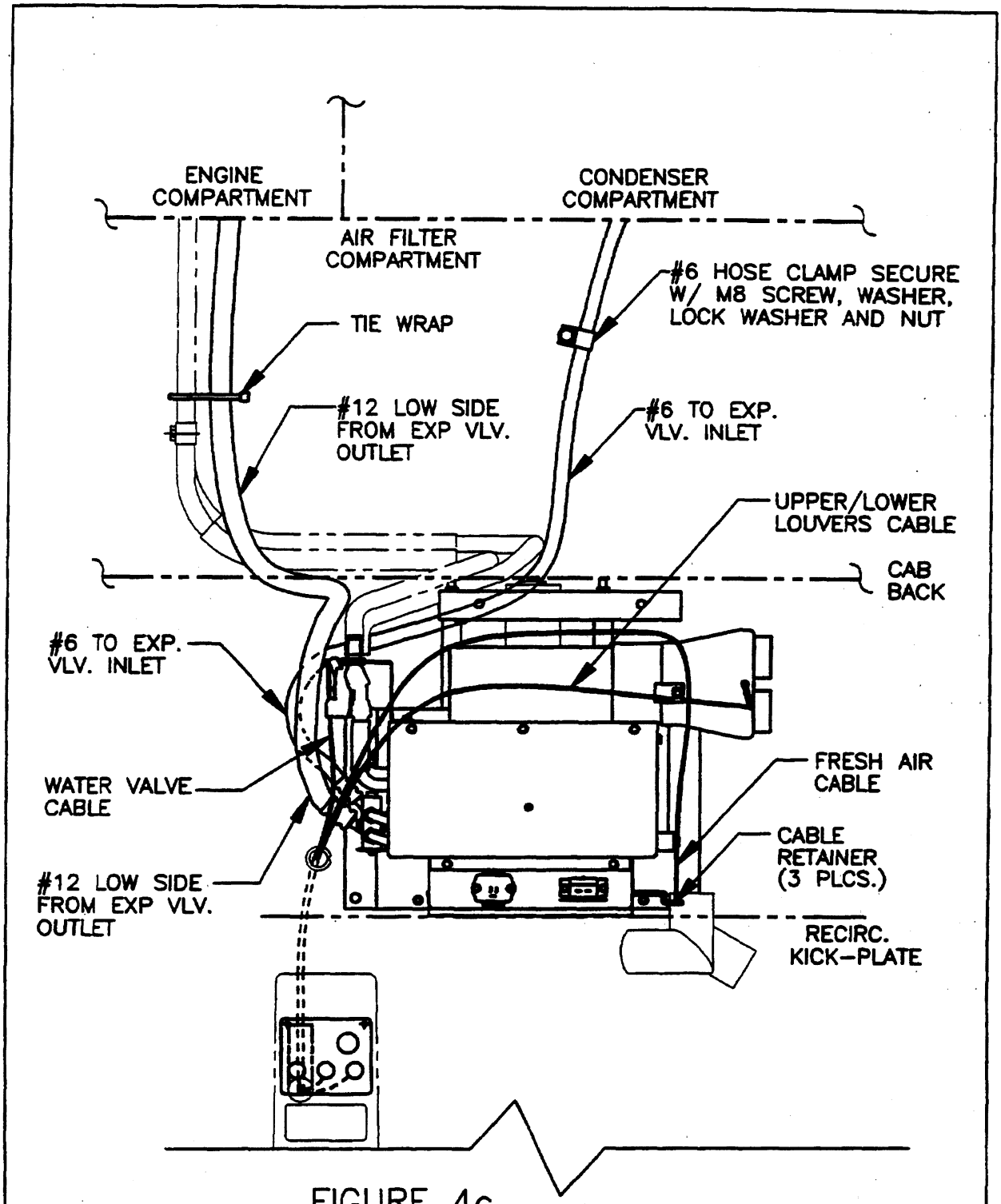


FIGURE 4c
UNIT CABLE AND A/C HOSE ROUTINGS

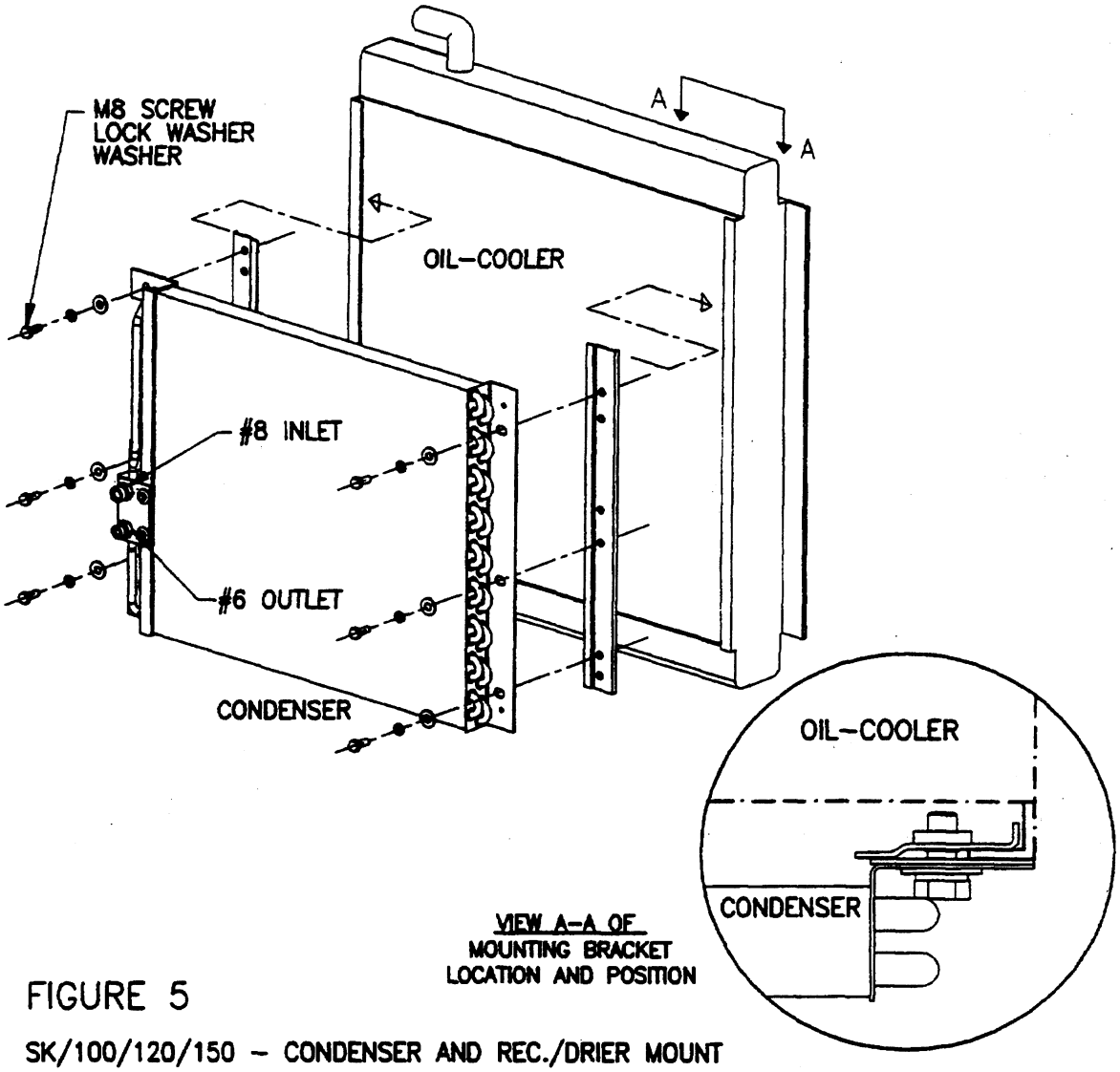


FIGURE 5

SK/100/120/150 - CONDENSER AND REC./DRIER MOUNT

1) Disconnect and remove radiator coolant over flow tank and support bracket.
   NOTE: It may be necessary to trim the end of the bar supporting the tank where the bar extends past the verticle support into the condenser face area
2) Position mounting brackets under oil-cooler face flanges as shown in View A-A.
3) Mount bottom header of condenser to bracket under right flange of oil-cooler with (3) M8 screws loosely captivating flange between header and mounting bracket.
4) Position second mounting bracket behind top header captivating left oil-cooler flange between header and mounting bracket securing condenser as in Step 3).
5) Tighten screws securing condenser to oil-cooler to manufacturer specified torque. Reassemble radiator coolant tank.
6) Mount rec./drier to left wall of compartment between air filter mounting screws with (2) M8 x 20mm long screws, washers, and lock washers. (If mounting holes are not available use rec/drier with mount as a template to locate mounting holes; drill (2) .437 dia. holes; and secure with M8 screws, lockwashers, washers and nuts)

NOTE: When positioning rec./drier take care to allow clearance for the attachment of 90° hose fittings and binary.

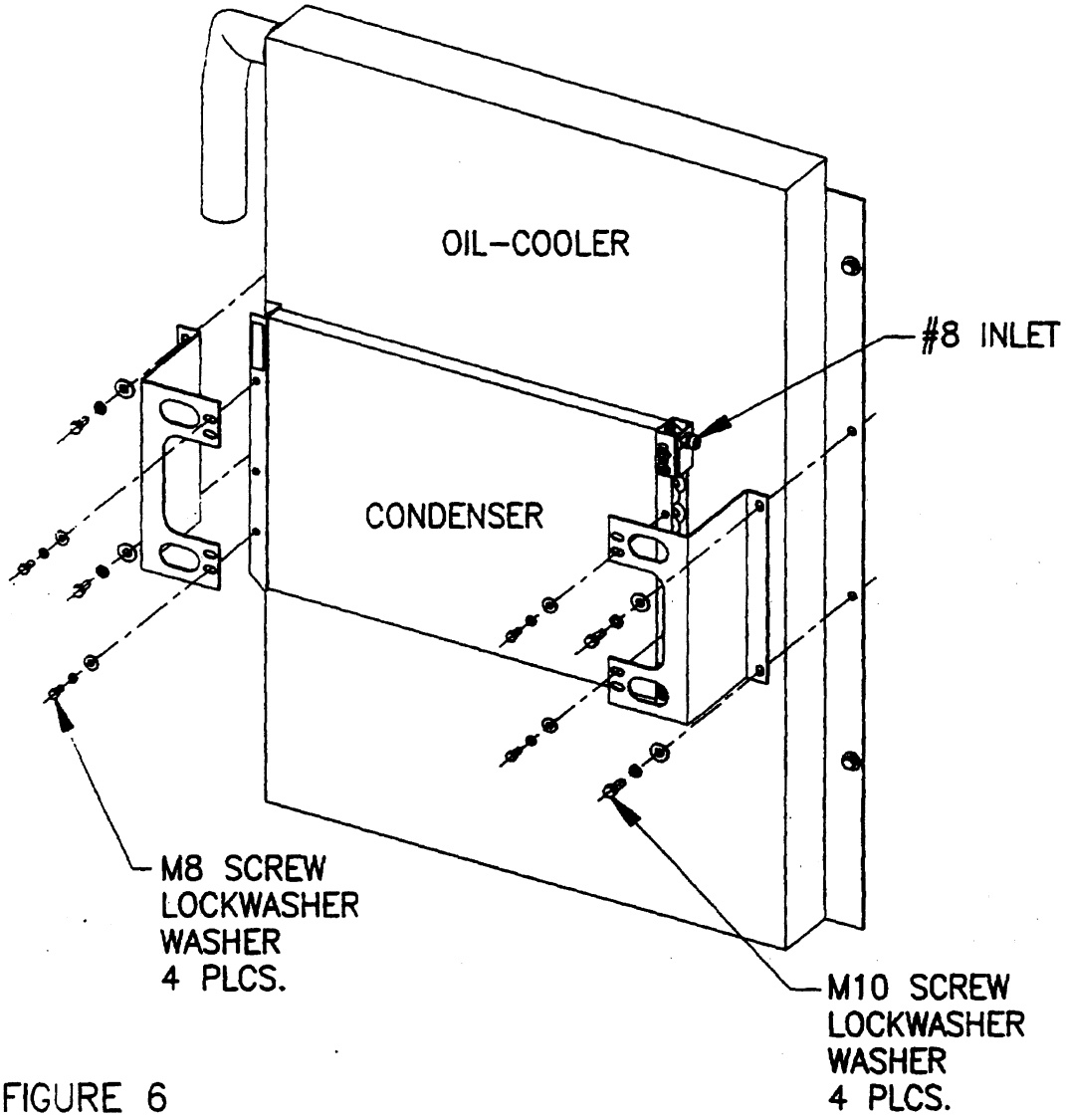


FIGURE 6

SK/300 – CONDENSER AND REC./DRIER MOUNT

1) Mount (2) brackets to oil–cooler loosely, replacing (4) existing M10 screws with (4) M10 x 40mm long screws and reusing existing washers, and lock washers.
2) Mount condenser to brackets with (4) M8 x 20mm long screws, washers, and lock washers.
3) Tighten all screws to manufacturer specified torque.
4) Mount rec./drier to left side wall of compartment below air filter cutout with (2) M8 x 20mm long screws, washers, and lock washers. (If mounting holes are not available– use rec./drier with mount as template to locate mounting holes; drill (2) .437 dia. holes; and secure with M8 nuts)

NOTE: When positioning rec./drier take care to allow room for the attachment of 90° hose fittings and binary

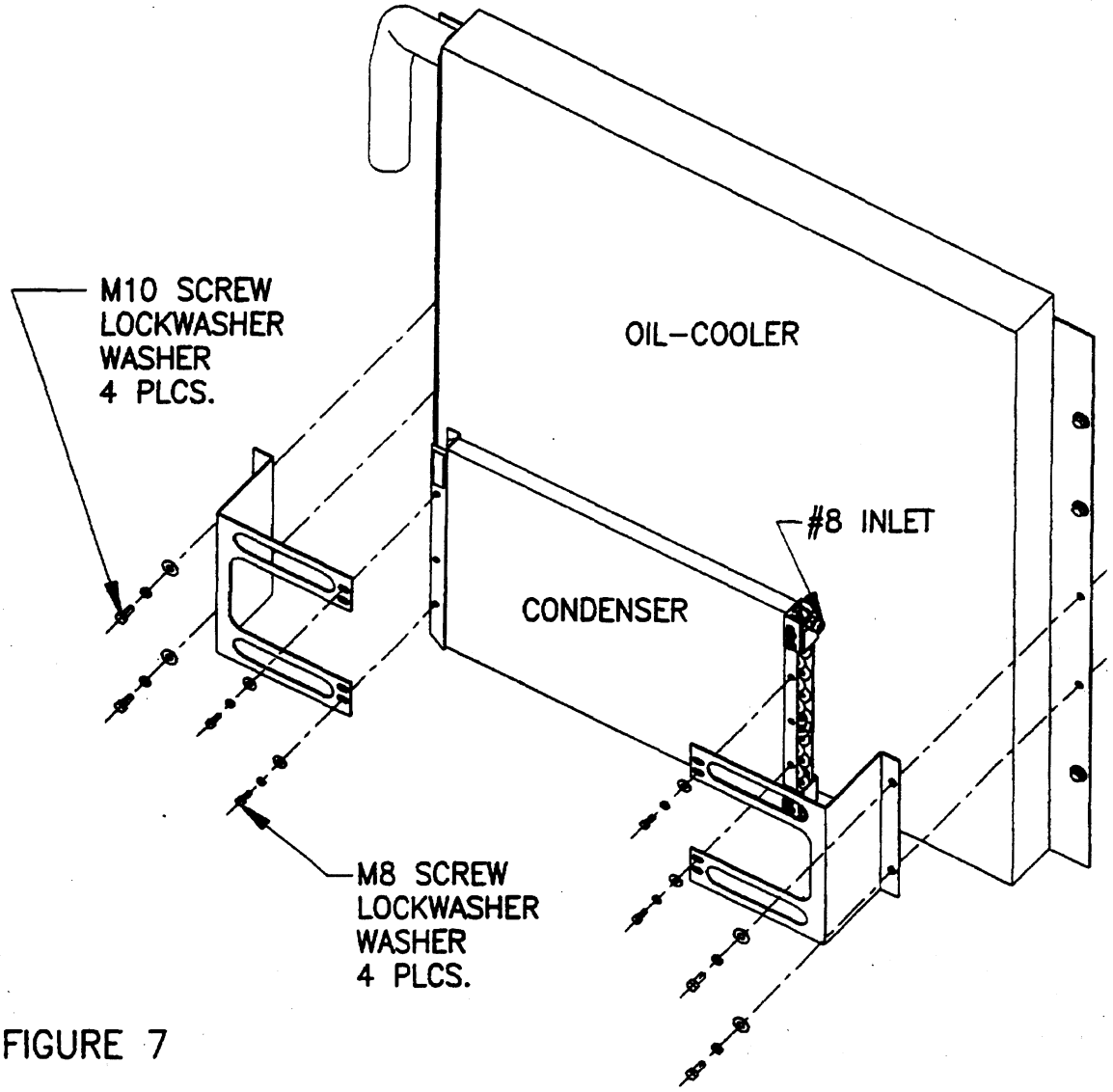


FIGURE 7

SK/400 – CONDENSER AND REC./DRIER MOUNT

1) Mount (2) brackets to oil–cooler loosely, replacing (4) existing M10 screws with (4) M10 x 40mm long screws and reusing existing washers, and lock washers.
2) Mount condenser to brackets with (4) M8 x 20mm long screws, washers, and lock washers.
3) Tighten all screws to manufacturer specified torque.
4) Mount rec./drier to left side wall of compartment above radiator overflow tank with (2) M8 x 20mm long screws, washers, and lock washers. (If mounting holes are not available– use rec./drier with mount as template to locate mounting holes; drill (2) .437 dia. holes; and secure with M8 nuts)

NOTE: When positioning rec./drier take care to allow room for the attachment of 90° hose fittings and binary.

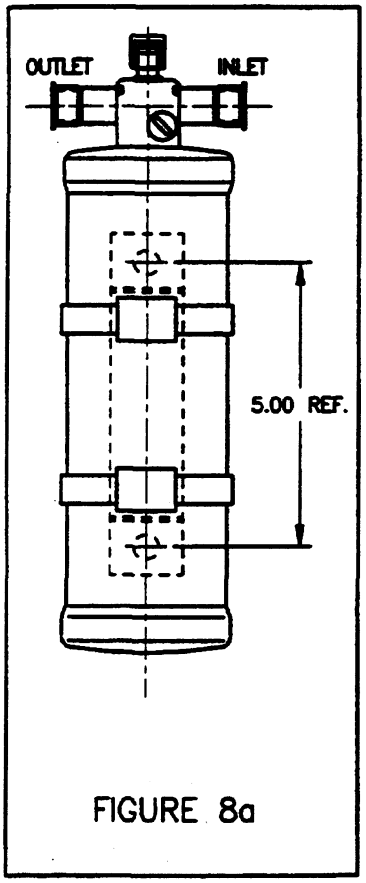


FIGURE 8a

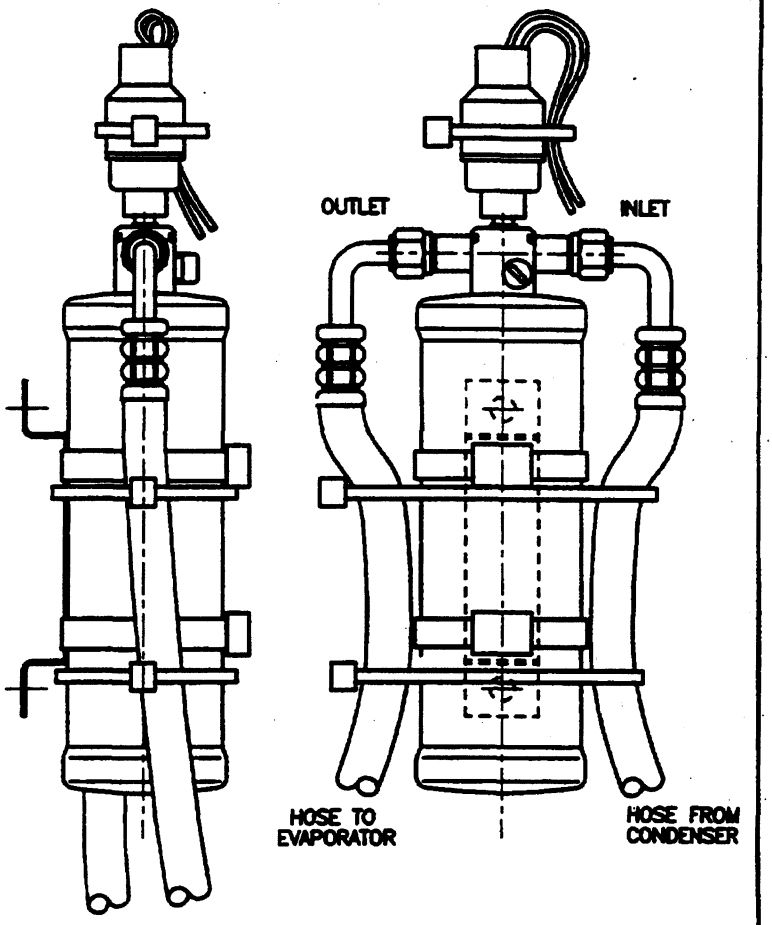


FIGURE 8b

REC./DRIER, REFRIGERANT HOSE, AND BINARY ASSEMBLY

1) Position the receiver/drier in the mounting bracket and tighten the bracket clamps securing the rec./drier in the mount as shown in Figure 8a.
2) After the receiver/drier is secured, screw the binary onto the top port of the rec./drier.
3) Mount rec./drier to mounting holes on left wall of condenser compartment using (2) M8 x 20mm long screws, washers, and lock washers.
   NOTE: If no mounting holes are available see CONDENSER AND REC./DRIER MOUNT instructions for appropriate model of vehicle.
4) Attach refrigerant hoses to rec./drier (see Fig. 8b) (for further hose routing instructions see system diagram).
5) Secure binary wiring to side of binary with (1) 8" tie wrap (see Fig. 8b).
6) Secure refrigerant hoses to receiver/drier using (2) 15" tie wraps (see Fig. 8b).

3. Connect #8 refrigerant hose 90 degree female fitting with service port to compressor discharge. Route hose to rear of excavator, through foam seal and around radiator/ oil-cooler assembly. Connect end to **UPPER** #8 refrigerant inlet fitting of condenser.
4. Install #10 male fitting onto expansion valve outlet. Route hose along side of heater hose back to compressor. Make refrigerant fitting connection at compressor with 90 degree/45 degree female fitting with service port.
5. Inspect all refrigerant fitting connections for proper torque.

G. CONTROL PANEL INSTALLATION

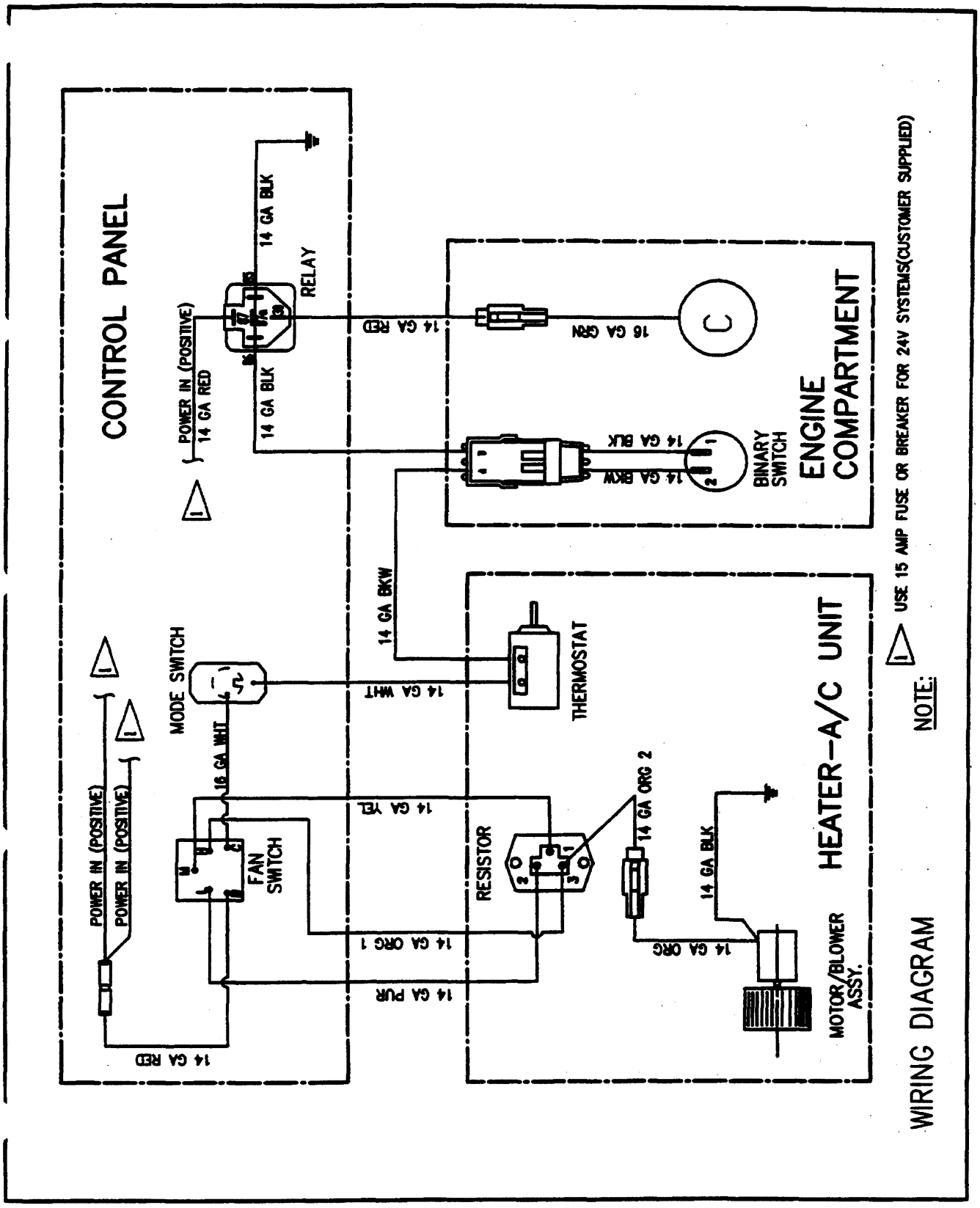
1. Remove (2) phillips head screws and disconnect wiring from control panel.
2. Remove and discard old wiring and control cables.
3. Insert new control panel in place of old panel and route control cables similar to old cable routing. See Figure 4C.
4. Secure cables to control rods with clip retainers

NOTE: Do not secure control panel down until wiring is completed.

H. WIRING INSTALLATION (SEE WIRING DIAGRAM RD-3-5940)

CAUTION: Wiring must be protected from sharp edges by wire loom.

1. Install binary wire harness assembly (RD-5-6689-0) onto binary switch located on top of receiver/drier and secure with tie wrap. See Figure 8B.
2. Connect the thermostat-binary wire harness (RD-5-3-5987) to binary harness and route wires through opening near coolant pipes in condenser compartment to heater-A/C unit.
3. Route 3-contact connector with motor lead and 2 contact connector on unit wire harness assembly (RD-3-7374-0) from control panel through cab floor and up into back compartment along cables.
4. Connect the 3-contact connector to unit resistor terminals.
5. Insert terminal on black/white wire from thermostat binary wire harness into empty slot in the flat 2 contact connector securely. Insert connector onto thermostat terminals on top of unit.
6. Insert single contact connector on 6" orange wire, in unit harness, to the orange motor lead until connectors snap into place.
7. Route black wire from thermostat-binary wire harness, on right side of unit by expansion valve through existing hole in cab floor along control cables.
8. Insert terminal on black wire from thermostat-binary harness into open slot in 4 contact connector of relay wire harness assembly as shown in wiring diagram.
9. Insert relay connector on wire harness RD-3-5986-0 onto relay (RD-5-4417-0). Using (1) M6 x 1.00 screw and (1) M6 lockwasher, fasten relay on interior of electronic control box near cab wall. Use existing M6 weldnut in forward section.
10. Insert bullet terminals from unit harness and relay harness into existing power receptacles.
11. Secure control panel with existing hardware.
12. Route remaining wires (1 red and 1 black) from relay harness out of control box along control cables.
13. Terminate black wire with ring terminal on side of unit base with screw on existing ground terminal from motor.
14. Continue to route red power lead along #12 refrigerant hose to compressor. Insert connector into compressor wire lead. Loop and secure compressor lead connection to unused mounting ear on compressor. (Loop to eliminate stress on connection.)
15. Recheck wiring to insure all terminations have good connections.
16. Secure wiring along hose lines to hoses with tiewraps. Any excess wiring should be neatly coiled and secured with tie wraps.


CONTROL PANEL
POWER IN (POSITIVE)
14 GA RED
14 GA BLK
RELAY
14 GA BLK
14 GA RED
16 GA GRN
C
ENGINE COMPARTMENT
14 GA BLK
14 GA BKW
BINARY SWITCH
14 GA BKW
THERMOSTAT
MODE SWITCH
14 GA WHT
16 GA WHT
POWER IN (POSITIVE)
POWER IN (POSITIVE)
14 GA YEL
FAN SWITCH
RESISTOR
14 GA ORG 2
14 GA BLK
14 GA ORG 1
14 GA ORG
14 GA PUR
MOTOR/BLOWER ASSY.
HEATER-A/C UNIT
14 GA RED
1 USE 15 AMP FUSE OR BREAKER FOR 24V SYSTEMS(CUSTOMER SUPPLIED)
NOTE:
WIRING DIAGRAM

I. FINAL ASSEMBLY AND CHECK

1. Evaluate system.
   A. Do all connections have O-rings?
   B. Are all connections properly torqued?
   C. Are all screws properly torqued?
   D. Are all electrical connections secure and per schematic?
   E. Was battery ground reconnected?
   F. Was 2 oz. of Pag oil added to compressor for SK200/220, SK300, or SK400 systems?
2. Perform electrical check.

   NOTE: Do not start engine.

   A. Turn ignition switch to "ON" position.
   B. Check blower motor at three speeds.
   C. Turn the A/C mode switch to A/C position. The compressor clutch should click on and be engaged.
3. Evaluate system for leaks and charge 134a as follows:
   A. SK100/120/150 @ 3lbs. 8 oz.
   B. SK200/220/SK300/SK400 @ 4lbs.
4. Reassemble computer stand to unit base.
5. Attach air duct hoses to upper louvers as shown in Figure 3. Secure 47"/1194mm hose to base as shown to prevent interference with blower control rod.
6. Reassemble cab to vehicle with original hardware.
7. Attach filter frame assembly to replacement interior access plate using (4) M8 x 16mm long bolts with lock washer and washer.
8. Connect air duct hoses to back of plate and floor louvers as shown in Figure 3.
9. Assemble replacement plate with recirc. filter box in place of old plate with existing hardware.
10. Reassemble interior back plastic covers over computer and heater-a/c unit.
11. Reassemble all access plates.

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: July, 1996

BULLETIN: HE-293
Page 1 of 18

RED DOT CORPORATION

SUBJECT: Optional Red Dot Air Conditioning System - Late Production MK IV
(Upgrade late style R-1550 heater only to R-1550 heater-a/c system.)

AFFECTED MACHINES:

SK100 IV	YWU-1034~	
SK120LC IV	YPU-1140~	
SK150LC IV	YMU-1134~	
SK200 IV	YNU-0330~	(EC Short Crawler)
SK200LC IV	YQU-2325~	
SK250NLC IV	LLU-5009~	(EC Narrow Long Crawler except LLU-5019)
SK220LC IV	LLU-1389~	(except LLU-1391~LLU-1392)
SK270LC IV	LBU-0002~	
SK300LC IV	YCU-0396~	(MMC Engine)
SK300LC IV	YCU-0501~	(Cummins Engine)
SK400LC IV	YSU-0201~	(Cummins Engine)

The above model machines, *from the listed serial numbers and after*, can be optionally equipped with a Red Dot brand air conditioning system. These machines will require the R-1550 heater only unit, to to be upgraded to the R-1550 heater-a/c system. Please refer to the attached Red Dot Installation Instructions, RD-3-7195-0, to verify the type system presently installed in your machine, and the items required.

Machines prior to the listed serial numbers , should be equipped with a different heater assembly from the factory (R-1500), and will require different Installation Instructions and kits. For these machines, refer to Service Bulletin HE-292.

We recommend that you contact your local Red Dot Dealer, for installation of this system, or any further information on the kits mentioned. For the name and phone number of your nearest Red Dot Dealer, please contact:

RED DOT CORPORATION
P.O. Box 58270
Seattle, WA 98138
(206) 575-3840

Please note: These instructions were valid and correct at time of issue, as provided by Red Dot Corporation, and are subject to change without notice.

THIS BULLETIN IS BEING ISSUED FOR INFORMATION ONLY AND IS NOT AN AUTHORIZATION FOR ANY REPLACEMENT OR WARRANTY CLAIM SUBMITTAL.

R-1550 FOR KOBELCO SK100/120/150, SK200/220, SK300 and SK400

A/C FIELD UPGRADE INSTALLATION INSTRUCTIONS

These instructions are intended for use on Kobelco Mark IV excavators to upgrade the R-1550 heater only unit to a R-1550 heater-a/c system. To verify that these are the kits and instructions required, look behind the seat: If there is a filter box on the back access plate behind the seat then proceed with these instructions.

READ AIR CONDITIONER INSTALLATION PRECAUTIONS SHEET PRIOR TO INSTALLATION

FOR THIS INSTALL YOU WILL NEED THE FOLLOWING RED DOT KITS:

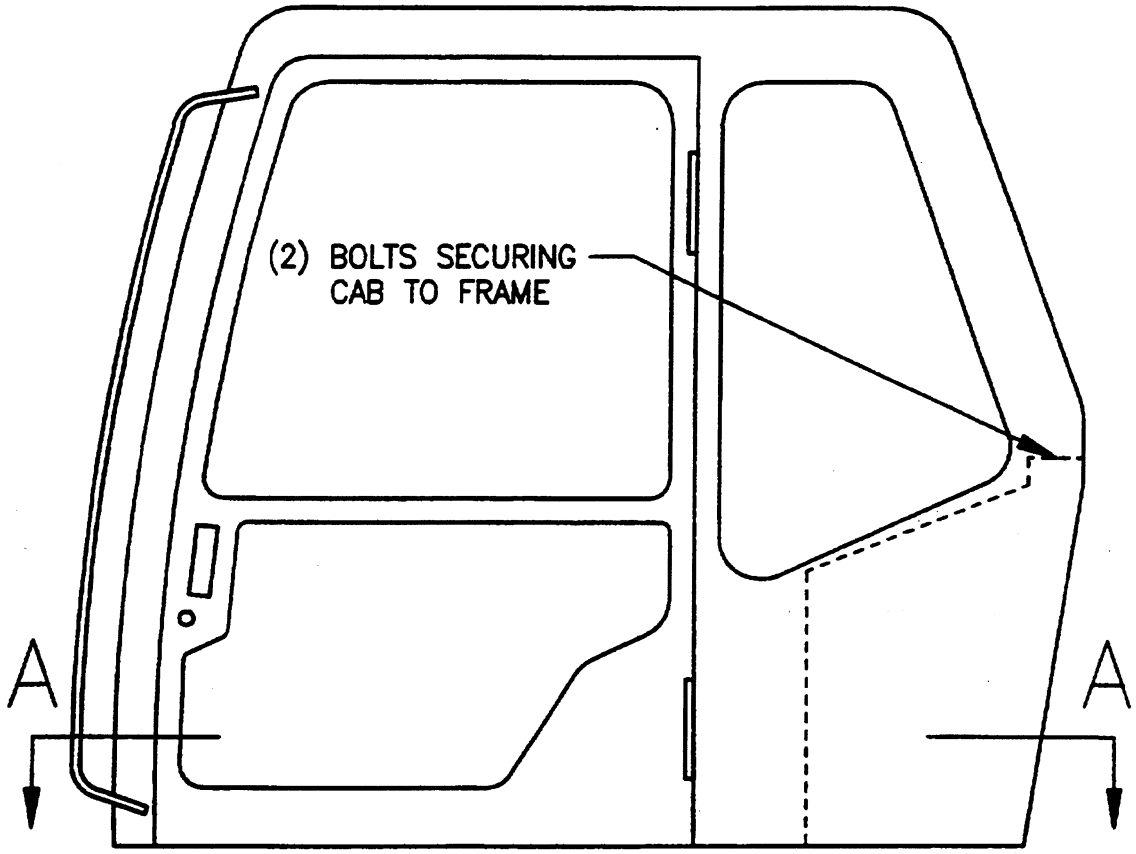
- **RD-3-7487-0P**
- **RD-3-7490:**
  - **-0P FOR SK100/120**
  - **-1P FOR SK150**
  - **-2P FOR SK200/220**
  - **-3P FOR SK300**
  - **-4P FOR SK400**

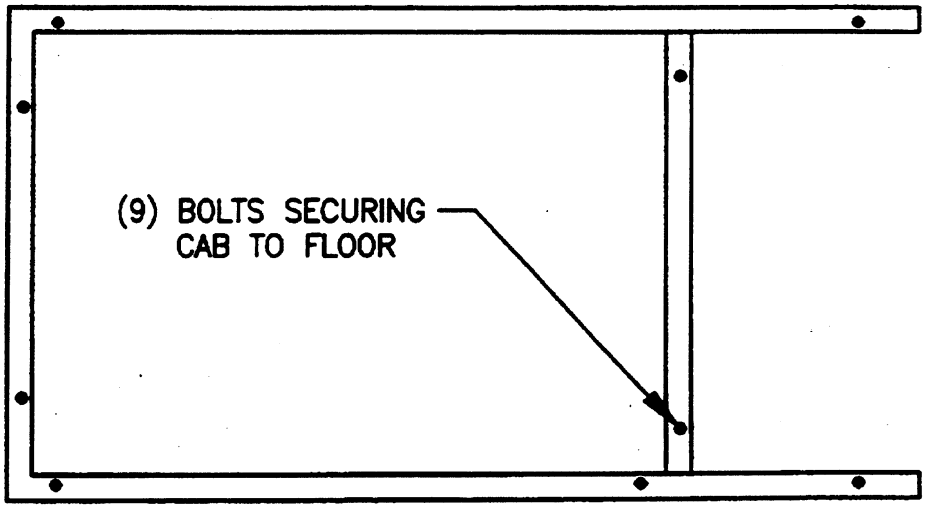
IMPORTANT NOTICE:
UPGRADE OF THIS SYSTEM MAY REQUIRE REMOVAL OF THE CAB (SEE SECTION A, STEP #8)

A. ACCESS EXISTING HEATER SYSTEM

1. Disconnect battery ground cable with power ignition off! Be sure engine is cool.
2. Remove (10) bolts holding rear cab cover panels; remove panels.
3. Remove interior back plastic panels covering computer and heater.
4. Remove (2) clamps securing heater air duct hoses to upper outlet louvers.
5. Remove (6) bolts to cab interior back access panel (hot/cold box).
6. Remove (4) clamps securing heater air duct hoses to panel.
7. Remove access panel. Discard plate but save fastening hardware.
8. Remove (11) bolts securing cab to floor plate and frame. Lift off cab. See Figure 1.

   NOTE: The installer may choose to disconnect and remove the computer and its stand located above the heater or for easier access to the heater proceed with removing the cab.
9. Remove (4) bolts securing seat; remove seat assembly. (Optional)
10. Remove (2) hose clamps that secure computer wiring to heater base support tubes at back of unit.
11. Remove (4) bolts that secure computer stand to heater base support . Lift computer with stand off of unit as far as wiring allows to gain access to heater unit cover. Secure computer and stand.
12. Disconnect wire harness connectors from heater unit resistor and motor.





VIEW A–A

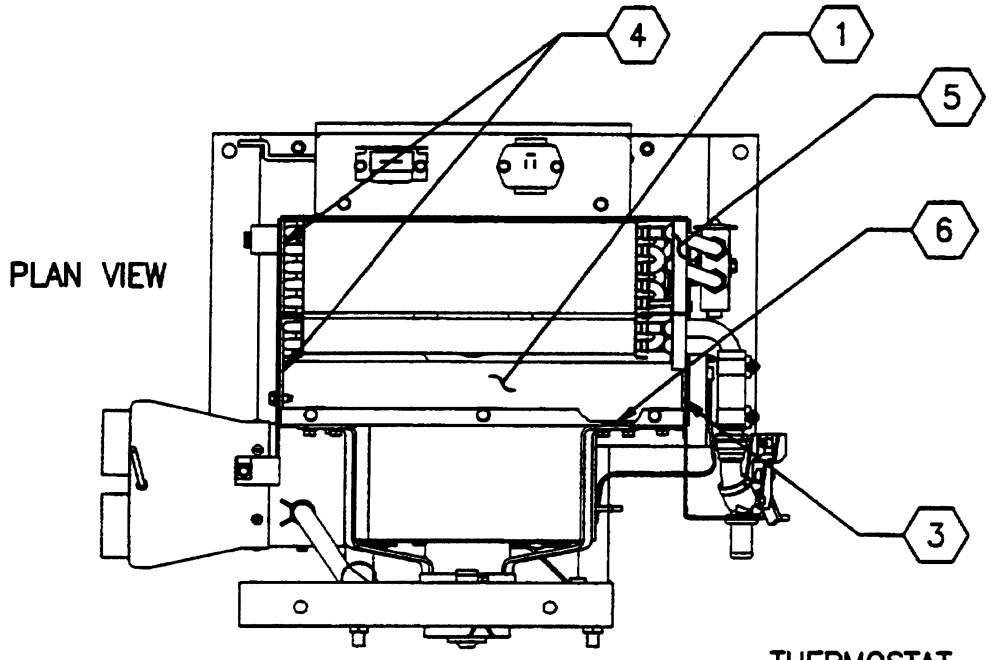
FIGURE 1
CAB MOUNTING BOLT LOCATIONS

B. UPGRADE EXISTING HEATER SYSTEM TO HEATER-A/C

1. Remove (4) bolts securing unit base to floor of cab.
2. Remove (4) nuts and (2) screws on underside of stand securing unit and motor brace to base.
3. Lift unit and attach drain pan gasket to bottom of unit between stiffeners. See item #2 on Figure 2.
4. **The unit "drain tube" should extend no more than .90" (22.9mm) from the bottom of the drain pan. On some units it may be necessary to trim the tube to this dimension.**
5. Reassemble unit to base and motor brace with existing hardware.
6. Attach drain hose assembly to drain pan nipple and secure with 4" tiewrap.
7. Route drain hose through opening in back of cab and reassemble unit base to floor of cab with existing hardware.
8. Remove (5) bolts securing cover to unit and lift off cover.
9. Remove bolt securing evaporator plate seal and remove and discard seal plate.
10. Attach evaporator gasket over inlet and outlet fittings and onto evaporator manifolds. See item #5 Figure 2.
11. Assemble expansion valve with (2) "O-rings" to evaporator.
12. Apply gaskets to housing as shown in Figure 2.
13. Attach M6 clip nut to top hole on expansion valve support bracket located below evaporator cutout.
14. Slide evaporator assembly into housing securing header flanges in top and bottom core retainers as shown in Figure 2.
15. Secure expansion valve to unit through top hole in valve with M6 x 40mm long screw, 1/4" washer and clip nut on exp. valve mounting bracket.
16. Replace cover and secure with original hardware.
17. Take thermostat and place 17" (431mm) long protective insulating tube over probe of thermostat leaving approx. 7" (178mm) of exposed probe.
18. Assemble thermostat to top of recirc. air frame with (2) M5 screws and gently insert exposed probe through grommet in cover approx. 6" (150mm) into evaporator core.

C. CONDENSER INSTALLATION

1. For SK100/120/150 see Figure 4.
   - A. For the SK100 and SK120 the upper radiator hose may need to be trimmed at radiator by 20mm on machines manufactured before October 1995 to provide clearance for compressor.
   - B. On the SK100 and SK120 tractors manufactured prior to October 1995, the bar support that the radiator overflow tank is mounted on may need to be trimmed prior to condenser installation to remove any material that extends into the condenser face area.
2. For SK200/220 see Figures 3A and 3B.
3. For SK300 see Figure 5.
4. For SK400 see Figure 6.



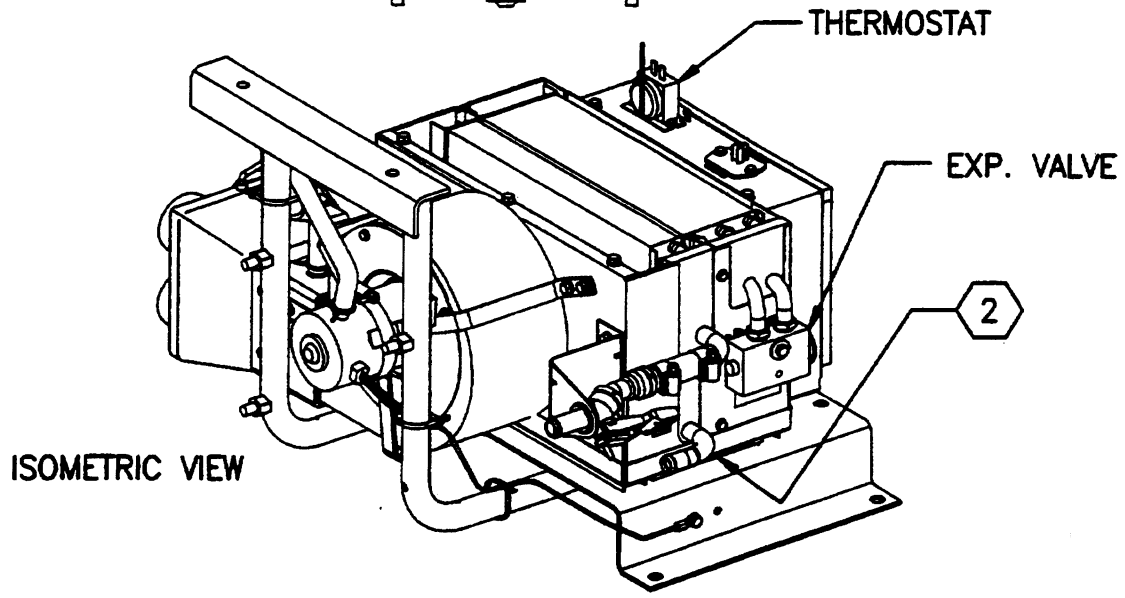


FIGURE 2

QTY	ITEM	PART NUMBER	DESCRIPTION
1	6	RD-3-7265-0	BLOWER FACE GASKET
1	5	RD-3-7328-0	EVAPORATOR CORE GASKET
2	4	RD-3-7266-0	EVAPORATOR & SIDE GASKET
1	3	RD-3-7193-0	HOUSING SIDE GASKET
1	2	RD-3-7268-0	DRAIN PAN GASKET
1	1	RD-3-7269-0	WATER BAFFLE GASKET

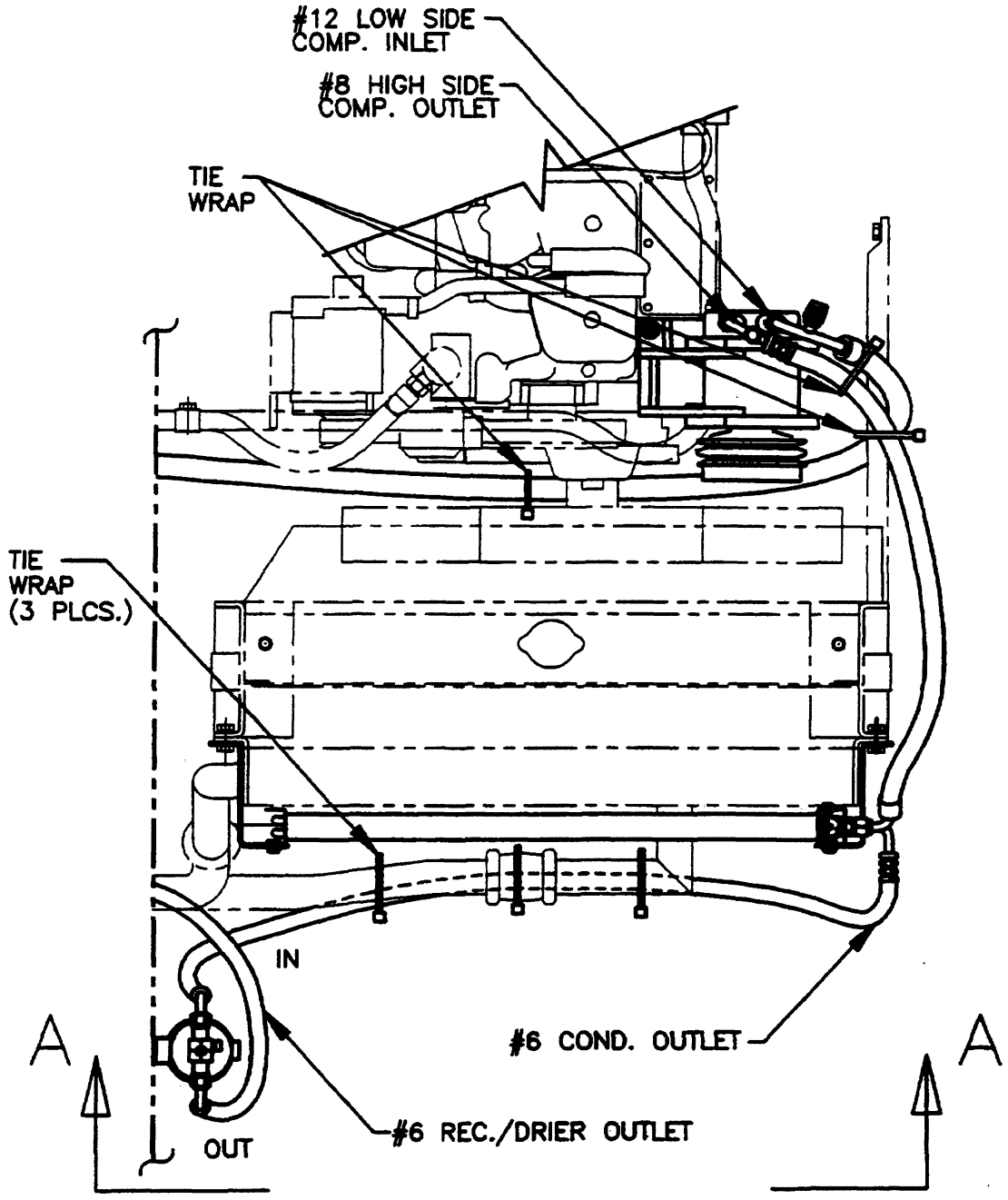


FIGURE 3a

TOP VIEW OF ENGINE COMPARTMENT HOSE ROUTINGS
USING SK200\220 CONFIGURATION

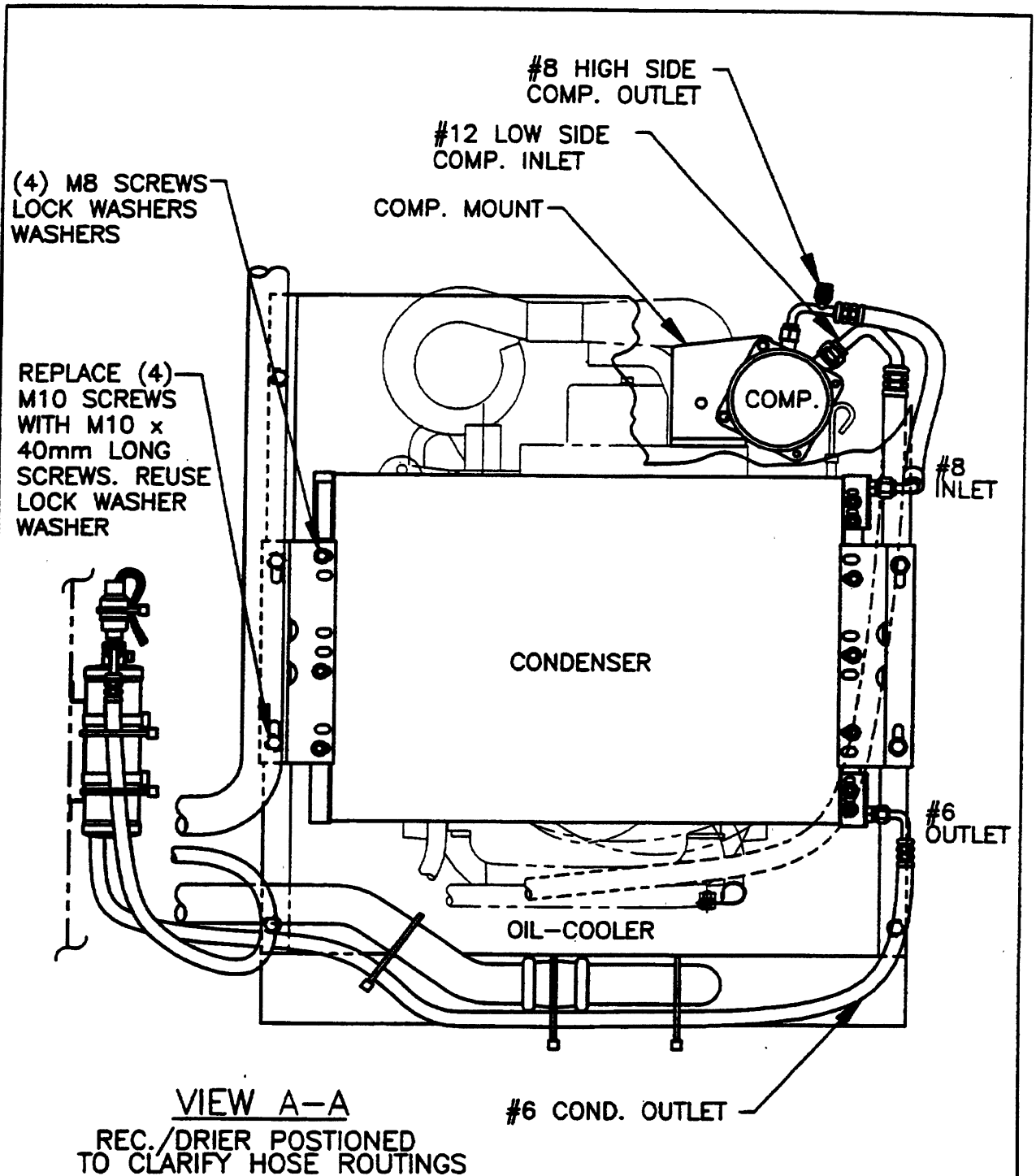


FIGURE 3b

FRONT VIEW OF ENGINE COMPARTMENT HOSE ROUTINGS
(USING THE SK200/220 CONFIGURATION)

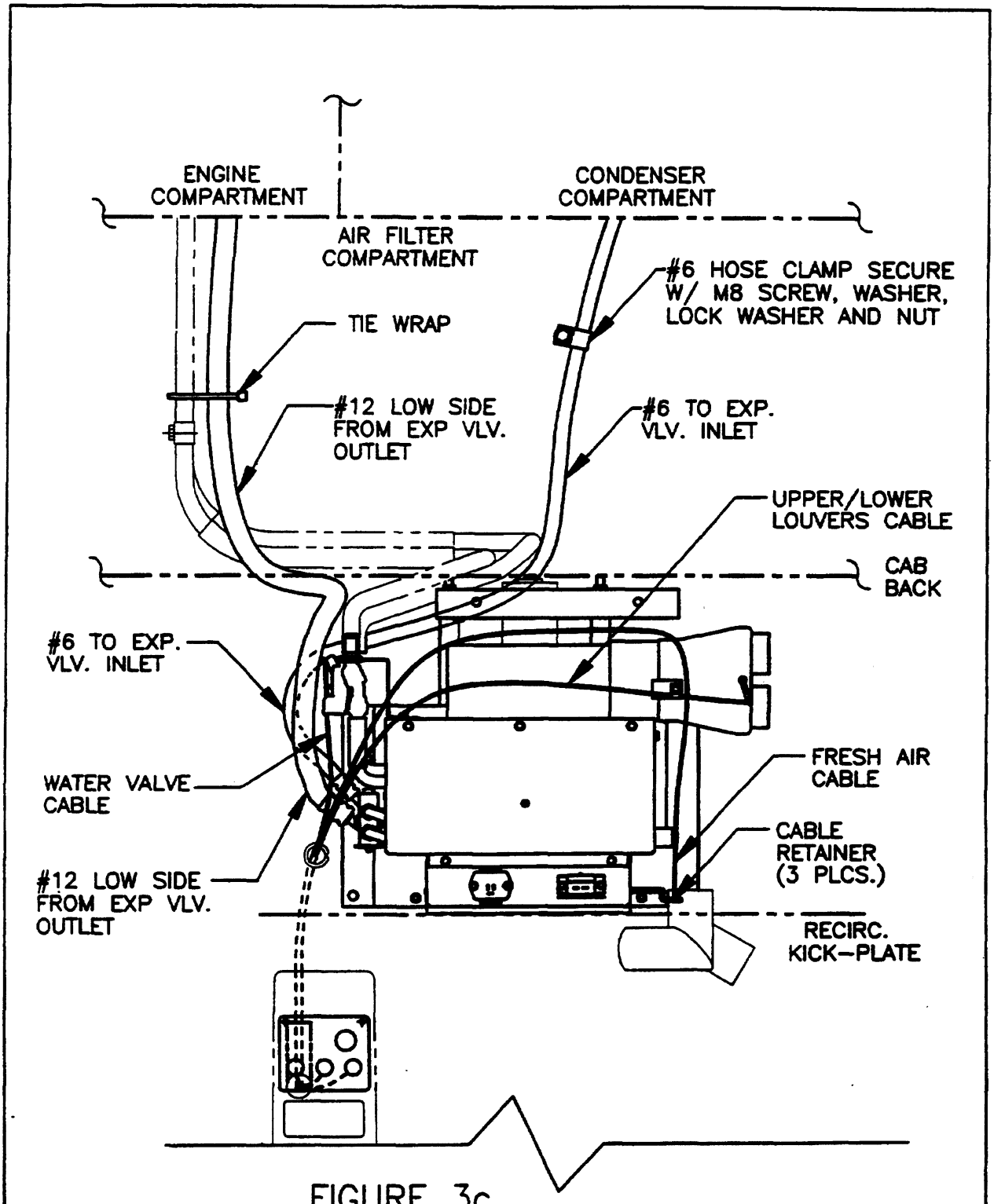


FIGURE 3c
UNIT CABLE AND A/C HOSE ROUTINGS

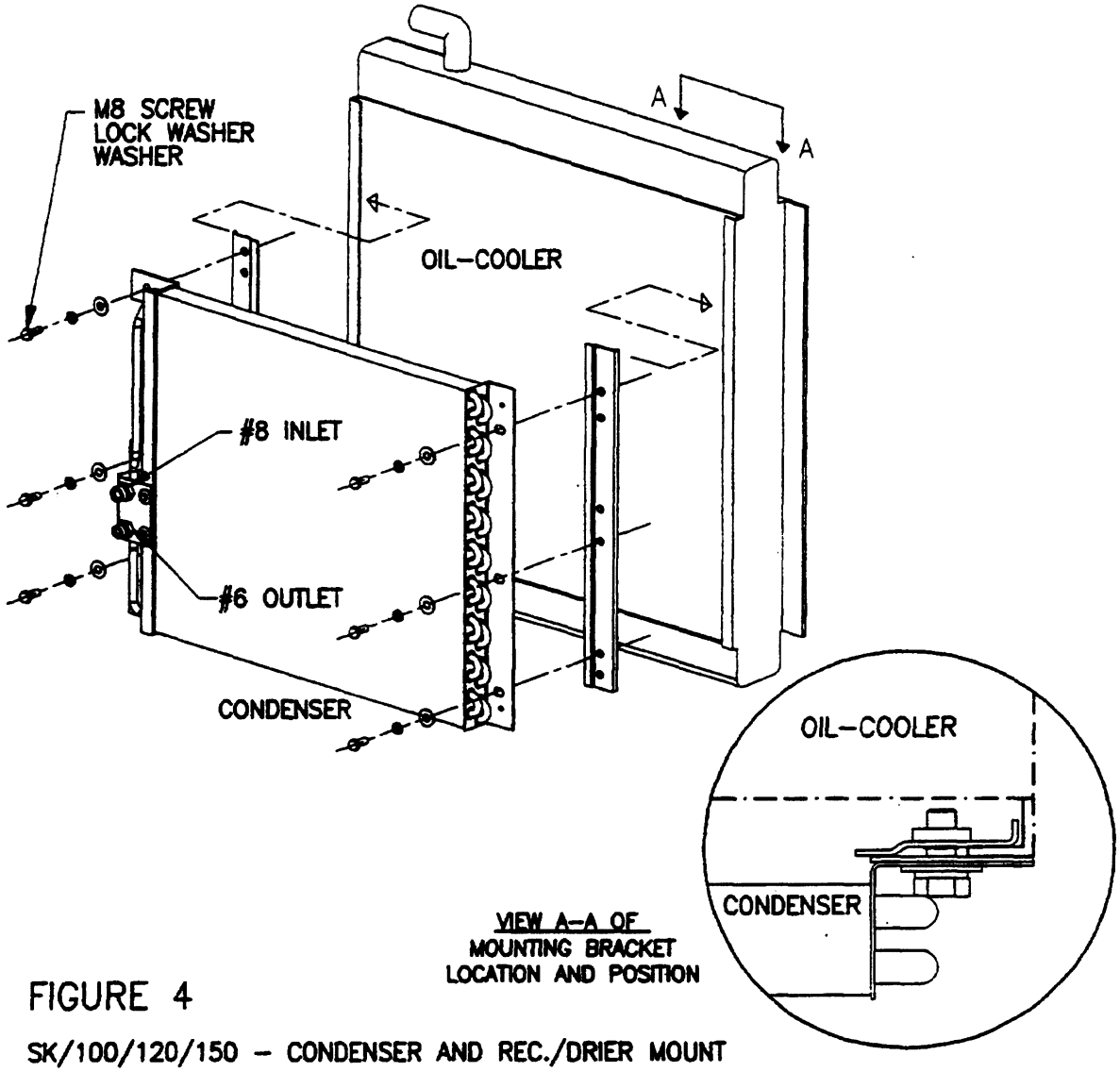


FIGURE 4

SK/100/120/150 - CONDENSER AND REC./DRIER MOUNT

1) Disconnect and remove radiator coolant over flow tank and support bracket.
   NOTE: It may be necessary to trim the end of the bar supporting the tank where the bar extends past the verticle support into the condenser face area
2) Position mounting brackets under oil-cooler face flanges as shown in View A-A.
3) Mount bottom header of condenser to bracket under right flange of oil-cooler with (3) M8 screws loosely captivating flange between header and mounting bracket.
4) Position second mounting bracket behind top header captivating left oil-cooler flange between header and mounting bracket securing condenser as in Step 3).
5) Tighten screws securing condenser to oil-cooler to manufacturer specified torque. Reassemble radiator coolant tank.
6) Mount rec./drier to left wall of compartment between air filter mounting screws with (2) M8 x 20mm long screws, washers, and lock washers. (If mounting holes are not available use rec/drier with mount as a template to locate mounting holes; drill (2) .437 dia. holes; and secure with M8 screws, lockwashers, washers and nuts)

NOTE: When positioning rec./drier take care to allow clearance for the attachment of 90° hose fittings and binary.

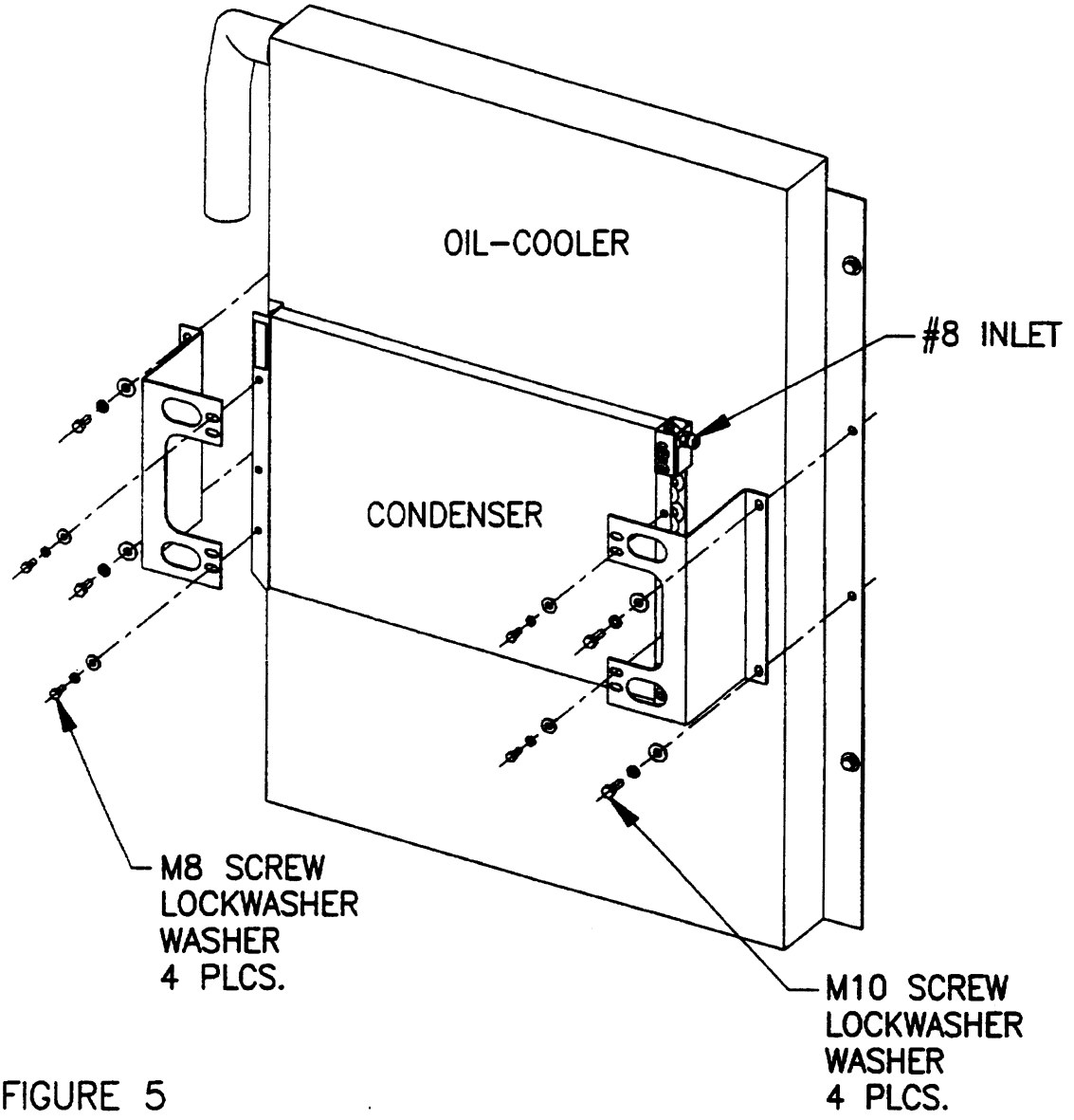


FIGURE 5

SK/300 – CONDENSER AND REC./DRIER MOUNT

1) Mount (2) brackets to oil–cooler loosely, replacing (4) existing M10 screws with (4) M10 x 40mm long screws and reusing existing washers, and lock washers.
2) Mount condenser to brackets with (4) M8 x 20mm long screws, washers, and lock washers.
3) Tighten all screws to manufacturer specified torque.
4) Mount rec./drier to left side wall of compartment below air filter cutout with (2) M8 x 20mm long screws, washers, and lock washers. (If mounting holes are not available– use rec./drier with mount as template to locate mounting holes; drill (2) .437 dia. holes; and secure with M8 nuts)

NOTE: When positioning rec./drier take care to allow room for the attachment of 90° hose fittings and binary

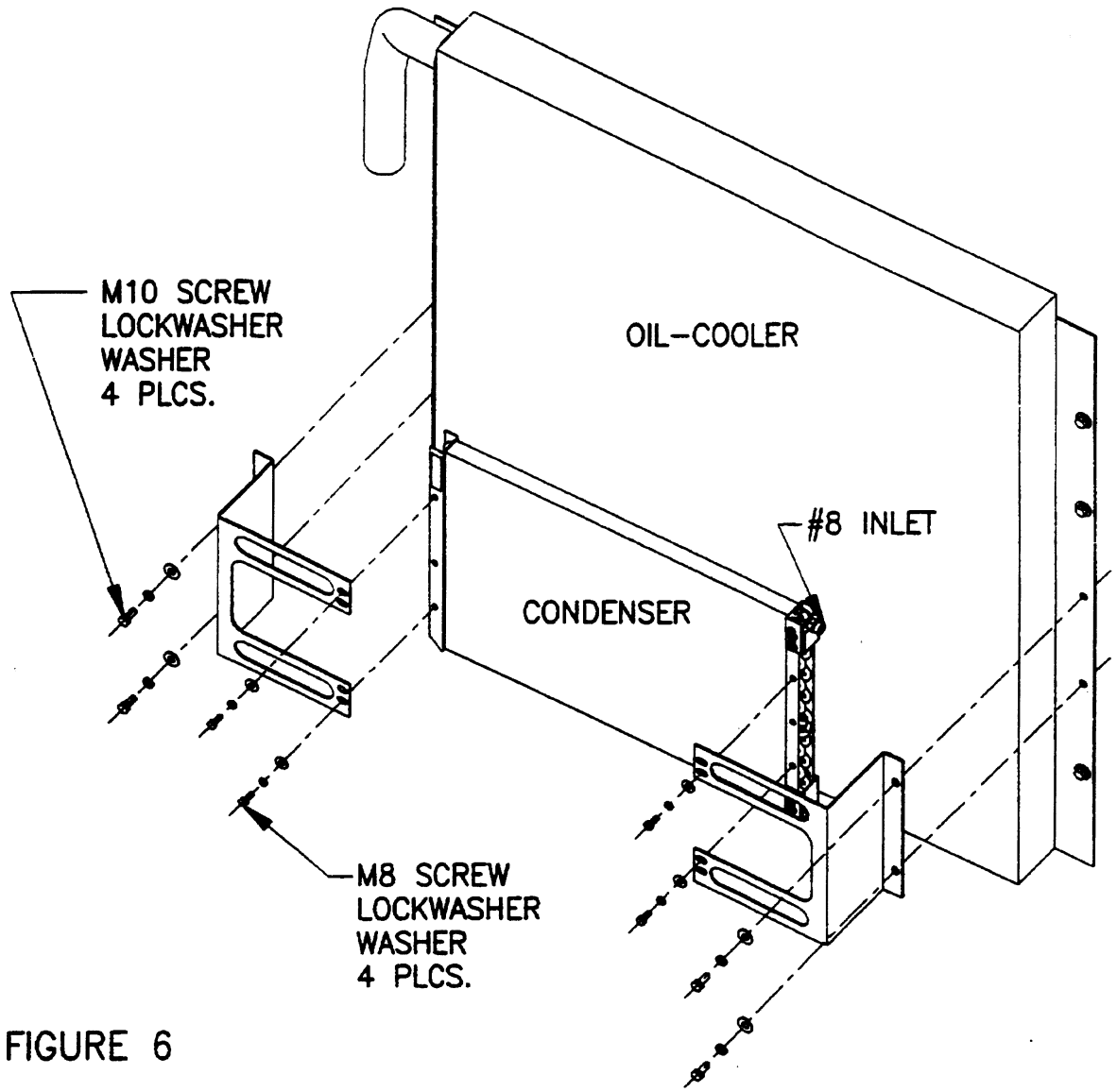


FIGURE 6

SK/400 – CONDENSER AND REC./DRIER MOUNT

1) Mount (2) brackets to oil-cooler loosely, replacing (4) existing M10 screws with (4) M10 x 40mm long screws and reusing existing washers, and lock washers.
2) Mount condenser to brackets with (4) M8 x 20mm long screws, washers, and lock washers.
3) Tighten all screws to manufacturer specified torque.
4) Mount rec./drier to left side wall of compartment above radiator overflow tank with (2) M8 x 20mm long screws, washers, and lock washers. (If mounting holes are not available- use rec./drier with mount as template to locate mounting holes; drill (2) .437 dia. holes; and secure with M8 nuts)

NOTE: When positioning rec./drier take care to allow room for the attachment of 90° hose fittings and binary.

D. **COMPRESSOR MOUNT INSTALLATION for SK100/120/150 , AND SK200/220**
(See Figures 3A and 3B)

Note: For compressor mount installation also see instructions included in compressor mount kit RD-9-7184-0P. All fasteners for compressor mounting are provided in kit.

1. Install compressor mount onto engine using the (3) mounting holes in engine block and using (3) M10 x 1.50 x 35mm bolts and (3) M10 lockwashers.
2. Install compressor into mount assembly using (4) M10 x 1.50 x 40 mm screws, (4) M10 lockwasners and (4) M10 x 1.50 nuts. Tighten nuts until lockwashers are seated.
3. Install drive belt on both the compressor pulley and auxiliary pulley. Using the proper sized open-end wrench, grip eccentric near the idler pulley assembly and pull wrench putting tension on the drive belt and adjust tension, (i.e. no more than 12.7 mm of deflection in belt at midpoint of belt between drive pulleys), and tighten bolt securing eccentric to compressor mount.

Note: For SK300 compressor mount see instructions in compressor mount kit RD-9-7112-0P. For SK400 compressor mount see instructions in compressor mount kit RD-9-7208-0P. All fasteners for compressor mounting are provided in kit.

Note: For SK200/220, SK300, SK400 add 2 oz. of PAG oil to compressor.

E. **RECEIVER/DRIER INSTALLATION FOR ALL MODELS (See Figures 7A and 7B.)**

F. **REFRIGERANT HOSE INSTALLATION FOR ALL MODELS**

CAUTION: All hoses must be protected from sharp edges by wire loom.

Note: Some components will vary from vehicle to vehicle but the hose routing will remain the same. See Figures 3A, 3B and 3C for pictorial representation.

Note: Be certain all fittings are equipped with the proper O-rings and lubricate O-rings with mineral oil prior to assembly.

1. Install #6 refrigerant hose assembly with (2) 90 degree female fittings from **LOWER** condenser refrigerant outlet fitting to inlet on receiver/drier.
2. Install #6 refrigerant hose assembly with 90 degree female fitting onto drier outlet.

NOTE: Inlet on receiver/drier should be pointing toward oil-cooler assembly.

Route hose through forward bulkhead of condenser/oil-cooler compartment and make connection to #6 inlet on expansion valve on heater-A/C unit with 45 degree male fitting.

NOTE: Expansion valve inlet is the receptacle nearest engine compartment.

3. Connect #8 refrigerant hose 90 degree female fitting with service port to compressor discharge. Route hose to rear of excavator, through foam seal and around radiator/ oil-cooler assembly. Connect end to **UPPER** #8 refrigerant inlet fitting of condenser.
4. Install #10 male fitting onto expansion valve outlet. Route hose along side of heater hose back to compressor. Make refrigerant fitting connection at compressor with 90 degree/45 degree female fitting with service port.
5. Inspect all refrigerant fitting connections for proper torque.

G. **CONTROL PANEL INSTALLATION**

1. Remove (2) phillips head screws and disconnect wiring from control panel and discard old harness.
2. Assemble mode switch from kit in space marked HEAT-A/C (See Figure 8 for clocking of switch).

NOTE: Do not secure control panel down until wiring is completed.

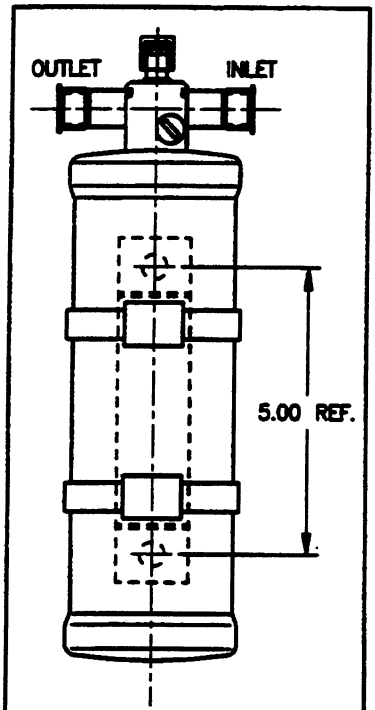


FIGURE 7a

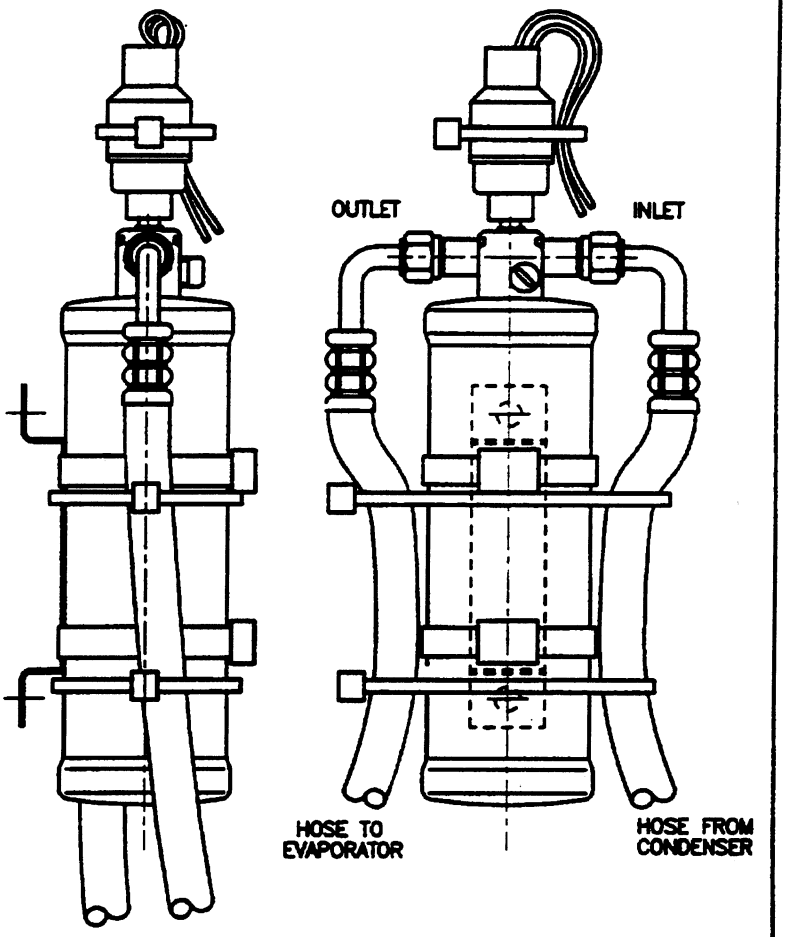


FIGURE 7b

REC./DRIER, REFRIGERANT HOSE, AND BINARY ASSEMBLY

1) Position the receiver/drier in the mounting bracket and tighten the bracket clamps securing the rec./drier in the mount as shown in Figure 7a.
2) After the receiver/drier is secured, screw the binary onto the top port of the rec./drier.
3) Mount rec./drier to mounting holes on left wall of condenser compartment using (2) M8 x 20mm long screws, washers, and lock washers.
   NOTE: If no mounting holes are available see CONDENSER AND REC./DRIER MOUNT instructions for appropriate model of vehicle.
4) Attach refrigerant hoses to rec./drier (see Fig. 7b) (for further hose routing instructions see system diagram).
5) Secure binary wiring to side of binary with (1) 8" tie wrap (see Fig. 7b).
6) Secure refrigerant hoses to receiver/drier using (2) 15" tie wraps (see Fig. 7b).

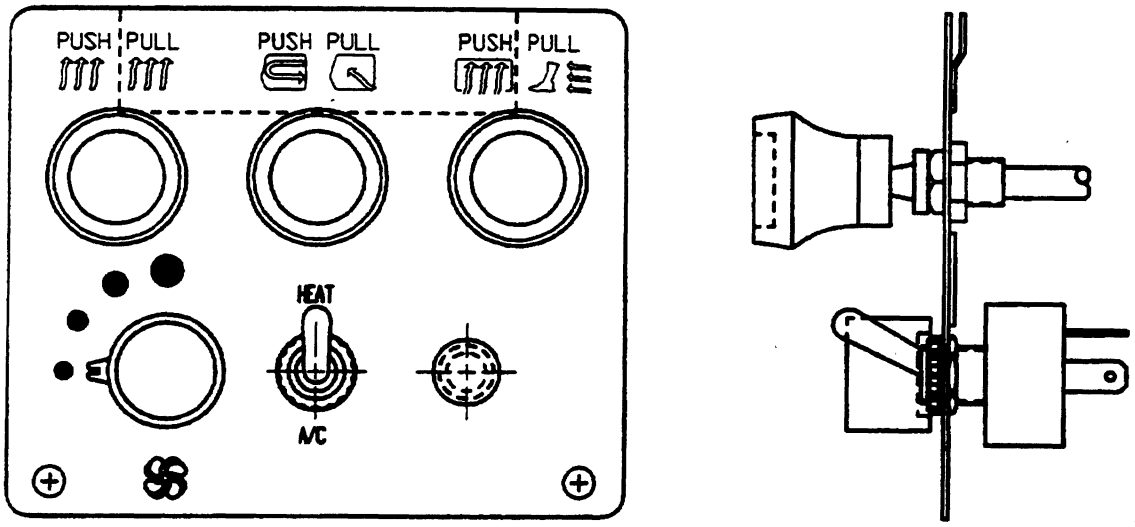
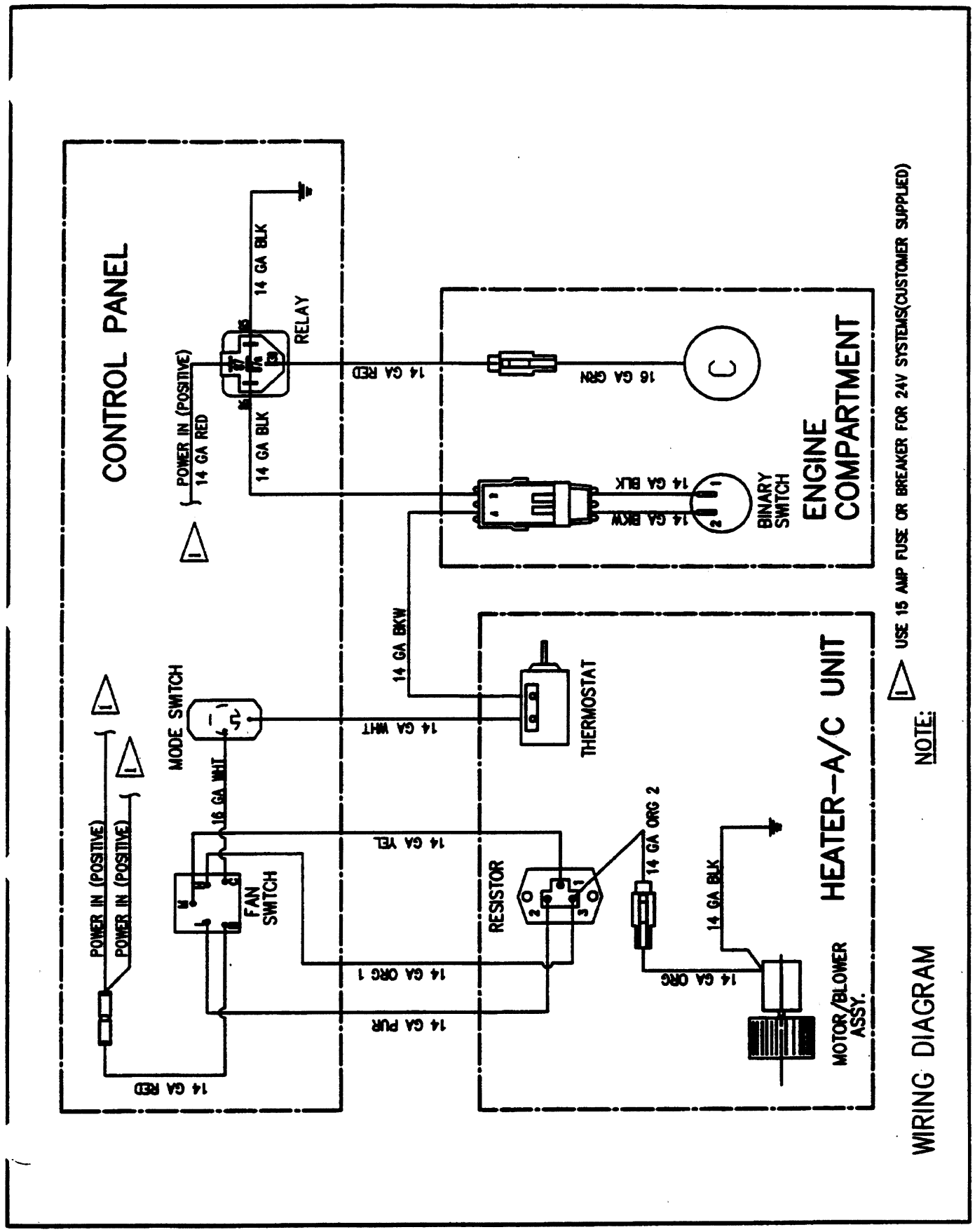


FIGURE 8
MODE SWITCH ASSEMBLY

H. WIRING INSTALLATION (SEE WIRING DIAGRAM)

CAUTION: Wiring must be protected from sharp edges by wire loom.

1. Install binary wire harness assembly (RD-5-6689-0) onto binary switch located on top of receiver/drier and secure with tie wrap. See Figure 7B.
2. Connect the thermostat-binary wire harness (RD-5-3-5987) to binary harness and route wires through opening near coolant pipes in condenser compartment to heater-A/C unit.
3. Remove and discard old unit wire harness and replace with unit wire harness assembly (RD-3-7374-0). Connect the 3-contact connector to unit resistor terminals.
4. Insert terminal on black/white wire from thermostat binary wire harness into empty slot in the flat 2 contact connector securely. Insert connector onto thermostat terminals on top of unit.
5. Insert single contact connector on 6" orange wire, in unit harness, to the orange motor lead until connectors snap into place.
6. Route remaining wires, in unit harness and remaining black wire from thermostat-binary wire harness, through existing hole in cab floor along control cables on right side of unit by expansion valve.
7. Insert, fully insulated terminals, to control panel fan switch and mode switch exactly as shown on wiring diagram (RD-3-5940).
8. Insert terminal on black wire from thermostat-binary harness securely into the open slot in 4 contact connector of relay wire harness assembly as shown in wiring diagram.
9. Insert connector onto relay (RD-5-4417-0). Using (1) M6 screw and (1) M6 lockwasher, fasten relay on interior of electronic control box near cab wall. Use existing M6 weldnut in forward section.
10. Insert bullet terminals from unit harness and relay harness into existing power receptacles.
11. Secure control panel with existing hardware.
12. Route remaining wires (1 red and 1 black) out of control box along control cables.
13. Terminate black wire with ring terminal on side of unit base with screw on existing ground terminal from motor.
14. Continue to route red power lead along #12 refrigerant hose to compressor. Insert connector into compressor wire lead. Loop and secure compressor lead connection to unused mounting ear on compressor. (Loop to eliminate stress on connection).
15. Recheck wiring to insure all terminations have good connections.
16. Secure wiring along hose lines to hoses with tiewraps. Any excess wiring should be neatly coiled and secured with tie wraps.


CONTROL PANEL
POWER IN (POSITIVE)
14 GA RED
14 GA BLK
RELAY
14 GA BLK
14 GA RED
16 GA GRN
C
ENGINE COMPARTMENT
14 GA BLK
14 GA BKW
BINARY SWITCH
14 GA BKW
THERMOSTAT
MODE SWITCH
14 GA WHT
16 GA WHT
POWER IN (POSITIVE)
POWER IN (POSITIVE)
14 GA YEL
FAN SWITCH
RESISTOR
14 GA ORG 2
14 GA BLK
14 GA ORG 1
14 GA PUR
14 GA ORG
14 GA RED
MOTOR/BLOWER ASSY.
HEATER-A/C UNIT
USE 15 AMP FUSE OR BREAKER FOR 24V SYSTEMS(CUSTOMER SUPPLIED)
NOTE:
WIRING DIAGRAM

I. FINAL ASSEMBLY AND CHECK

1. Evaluate system.
   A. Do all connections have O-rings?
   B. Are all connections properly torqued?
   C. Are all screws properly torqued?
   D. Are all electrical connections secure and per schematic?
   E. Was battery ground reconnected?
2. Perform electrical check.

   NOTE: Do not start engine.

   A. Turn ignition switch to "ON" position.
   B. Check blower motor at three speeds.
   C. Turn the A/C mode switch to A/C position. The compressor clutch should click on and be engaged.
   D. Was 2 oz. of Pag oil added to compressor for SK200/220, SK300, or SK400 systems?
3. Evaluate system for leaks and charge 134a as follows:
   A. SK100/120/150/200/220 @ 3 lbs 8 oz.
   B. SK300 @ 3 lbs. 12 oz.
   C. SK400 @ 4lbs.
4. Reassemble computer stand to unit base.
5. Attach air duct hoses to upper louvers as shown in Figure 9. Secure 47"/1194mm hose to base as shown to prevent interference with blower control rod.
6. Reassemble cab to vehicle with original hardware.
7. Attach filter frame assembly to replacement interior access plate using (4) M8 x 16mm long bolts with lock washer and washer.
8. Connect air duct hoses to back of plate as shown in Figure 9.
9. Assemble replacement plate with recirc. filter box in place of old plate with existing hardware.
10. Reassemble interior back plastic covers over computer and heater-a/c unit. Reassemble all access plates.

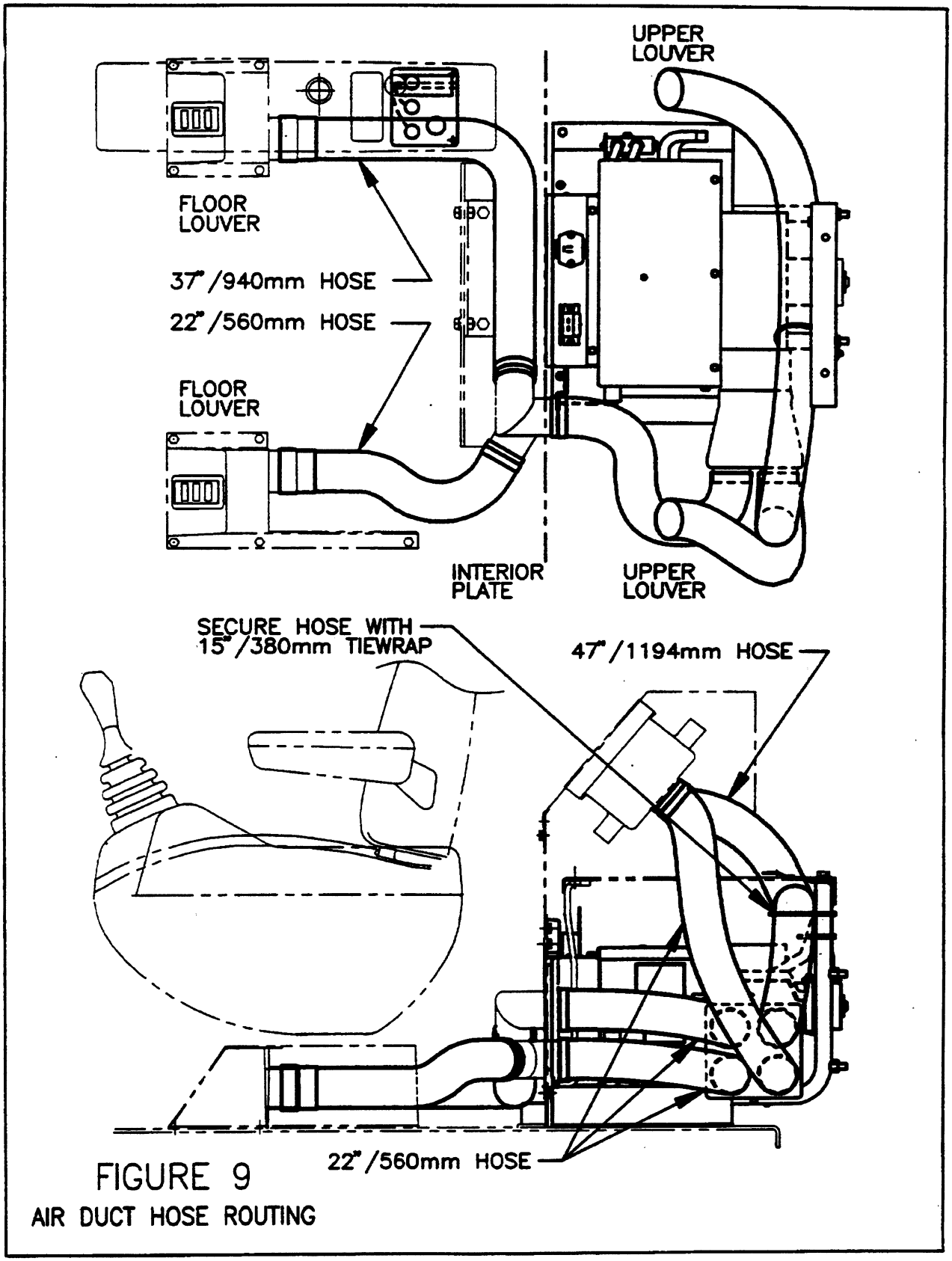


FIGURE 9

AIR DUCT HOSE ROUTING

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

KOBELCO *Designated*
ESSENTIAL SERVICE ITEM

DATE: July, 1996

BULLETIN: HE-294

SUBJECT: RPM Sensor Test Harness for Cummins engines

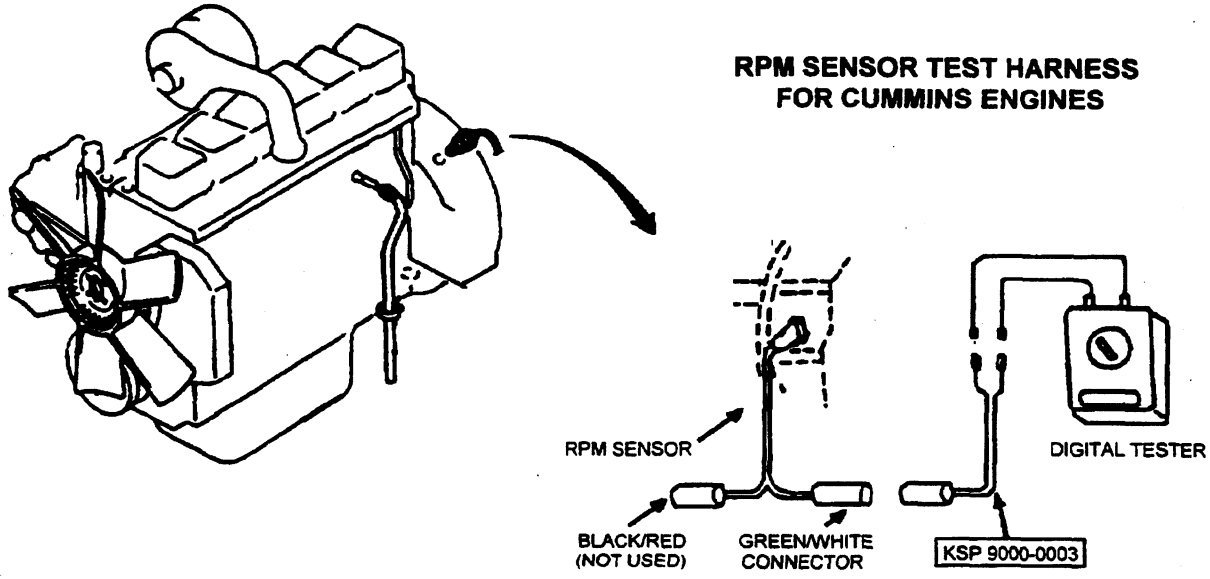
AFFECTED MACHINES: All SK150 IV ~ SK400 IV (with Cummins engines)

An engine RPM sensor test harness, **(p/n KSP 9000-0003)**, is now available for use on the Cummins engines. This harness enables quick and accurate test readings to be taken from the Cummins RPM sensors, which are located on the engine flywheel housings.

Please refer to the applicable Mechatronics and/or Shop Manual, or Servicemans' Handbook, for specific adjustment procedures.

The Kobelco America Product Support Section, has designated this Test Harness as an ***Essential Service Item****, and recommends that one be carried on each field service truck, as well as one stocked in your Service Department Tool Room.*

Please contact the **Kobelco America Parts Department** for price and availability.



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SERVICE\HE294

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: July, 1996

NOTE: SIMILAR DATA HAS BEEN PREVIOUSLY ISSUED AS TPU #003

BULLETIN: HE-295
Page 1 of 2

SUBJECT: Fuse for fuel shut-off solenoid

AFFECTED MACHINES: SK300LC IV s/n YCU-0500~up (with Cummins engines)

Please be aware that the affected machines are equipped with a fuel shut-off solenoid, that actuates the stop lever of the injection pump on the engine. This solenoid circuit incorporates it's own in-line fuse holder and fuse, separate from the machines' fuse box.

Please refer to the details below, to access the fuse and fuse holder. and the attached page which shows the correct wiring schematic used with this circuit.

To access the fuse; you must first remove the harness cover plate located behind the operator's seat. Next, locate the black-colored fuse holder. Then, raise the cover of the fuse holder, to find the 30 A fuse. Contact the **Kobelco America Parts Department** for price and availability of the fuse and fuse holder.

1- Remove Harness Cover Plate

2- Locate Fuse Holder.

3- Raise cover to find 30A Fuse.

30 AMP Fuse-
Part Number
2479R655S11

Fuse Holder-
Part Number
LE73E00001S003

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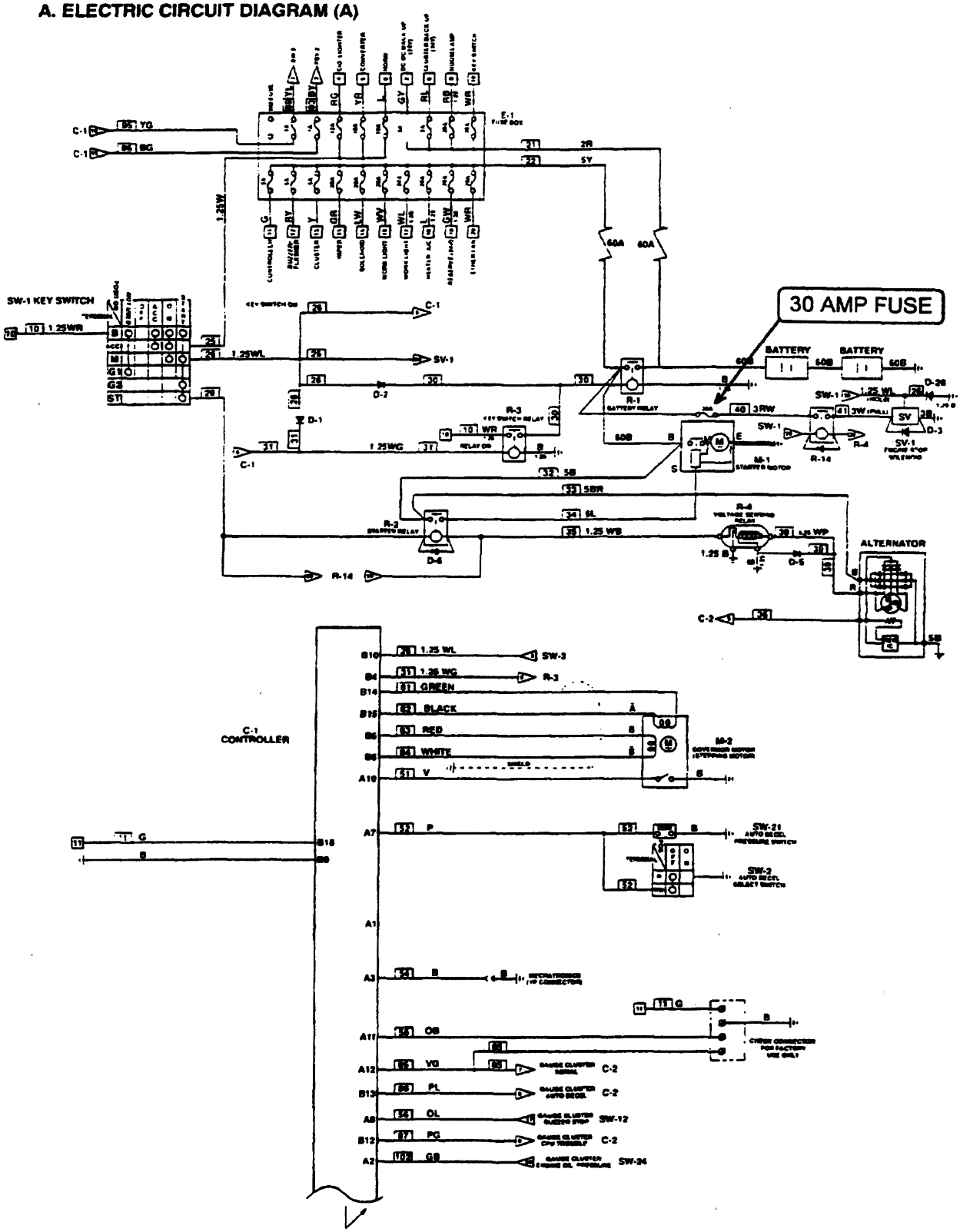
Section VII– SCHEMATICS

7.1 SK300 & SK300LC ELECTRICAL SCHEMATIC

A. ELECTRIC CIRCUIT DIAGRAM (A)



KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

KOBELCO *Designated*
ESSENTIAL SERVICE ITEM

DATE: July, 1996

BULLETIN: HE-296

SUBJECT: Metric O-Ring Kits and Complete Kit Refills

AFFECTED MACHINES: All Hydraulic Excavators

Kobelco America Inc., is pleased to announce a price reduction in it's O.E.M. quality **Metric O-Ring Kits**, and the availability of **Complete Refill Kits** to re-stock them. The O-ring Kit contains a set of brass pick tools, and is packaged in a sturdy plastic carrying case. These kits contain both 70 and 90 durometer grade o-rings. The Refill Kits will contain the o-rings only, without the pick set and case.

p/n KSP000000F31 METRIC O-RING KIT

p/n KSP000000F31R REFILL KIT

The list price of the o-rings individually, exceeds the list price of the O-Ring Kit, therefore; it is more economical to purchase the kits. Please contact the **Kobelco America Parts Department**, for price and availability of these kits.

*The Kobelco America Product Support Section, has designated this O-Ring Kit as an **Essential Service Item**, and recommends that one be carried on each field service truck, as well as one stocked in your Parts Department.*

Kit contents are listed below:

PART NUMBER	QTY.	PART NUMBER	QTY.	PART NUMBER	QTY.
ZD11G02500	10	ZD11P01600	14	ZD12P02400	9
ZD11G03000	10	ZD11P01800	14	ZD12P02600	9
ZD11G03500	10	ZD11P02000	13	ZD12P02900	9
ZD11G04000	10	ZD11P02200	13	ZD12P03000	9
ZD11G04500	10	ZD11P02600	9	ZD12P03400	9
ZD11G05000	10	ZD11P03200	9	ZD12P03600	9
ZD11G05500	10	ZD12P01100	14	ZD12P03800	9
ZD11G06000	10	ZD12P01200	14	ZD12P06000	6
ZD11G06500	10	ZD12P01400	14	ZD12G03000	10
ZD11P01000	14	ZD12P01600	14	ZD12G03500	10
ZD11P01200	14	ZD12P01800	14	ZD12G04000	10
ZD11P01400	14	ZD12P02200	13	ZD12G05500	10
————	--	ZD12P02240	9	————	--

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KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: July, 1996

BULLETIN: HE-297

SUBJECT: DC Power Converter Change

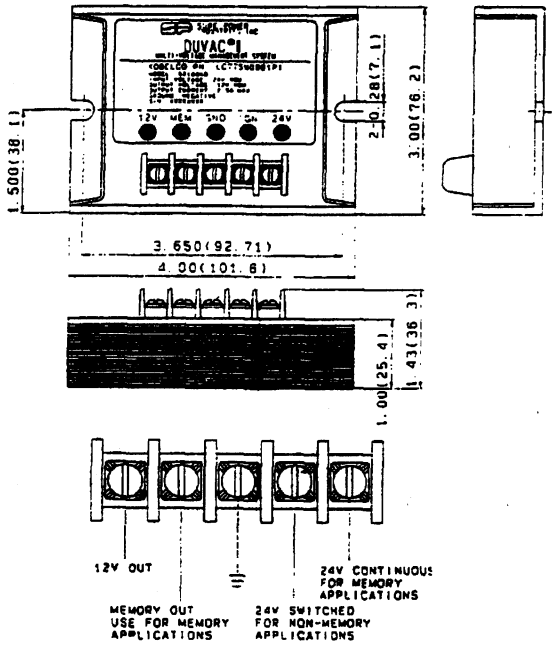
AFFECTED MACHINES:

SK300LC IV	YCU-0501~	(w/Cummins e/g)
SK400LC IV	YSU-0200~	(w/Cummins e/g)

Please be aware that at the above referenced machine serial numbers, the 24V~12V DC power converter was changed to **p/n LC77SU0001P1**. The converter is no longer located under the seat frame, and is now located in the main controller assembly area, behind the operator's seat.

The wiring harness for this converter also changed from p/n 24100J17610 >**24100J17610F1**, but the location of the radio harness plug was not affected. ***In the future, other machine models will also adopt this system.*** The new converter is now locally procured. Please see details below.

OUTPUT VOLTAGE: 12 V NOM.
OUTPUT CURRENT: 2.5 A MAX.



Unit = inches (mm)

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KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: July, 1996

BULLETIN: HE-298
Page 1 of 2

SUBJECT: Pilot Manifold Assembly Change

AFFECTED MACHINES:

SK150LC IV	YMU-1237~	
SK200LC IV	YQU-2611~2614, 2625, 2632~2636, 2640, 2641, 2643~2651, 2653, and 2656~	
SK220LC IV	LLU-1526, 1527, 1535, 5032, 5033~	
SK270LC IV	LBU-0054~	
SK300 IV	LCU-0103~	(Std. not LC)
SK300LC IV	YCU-0XXX~	(TBA)
SK400LC IV	YSU-0XXX~	(TBA)

Please be aware that at the above referenced machine serial numbers, the Pilot System Manifold Assembly changed to **p/n YN20VU0001F1**. The new manifold is interchangeable as an assembly, however; individual parts are not. Please confirm which style pilot manifold assembly is on your machine before ordering parts.

This new manifold serves the same purpose as the previous one. The new manifold is manufactured by Parker, and is locally procured. Please refer to the attached parts breakdown page, which also identifies serviceable kits and their part numbers.

Please contact the **Kobelco America Parts Department**, for price and availability of these kits, and/or components.

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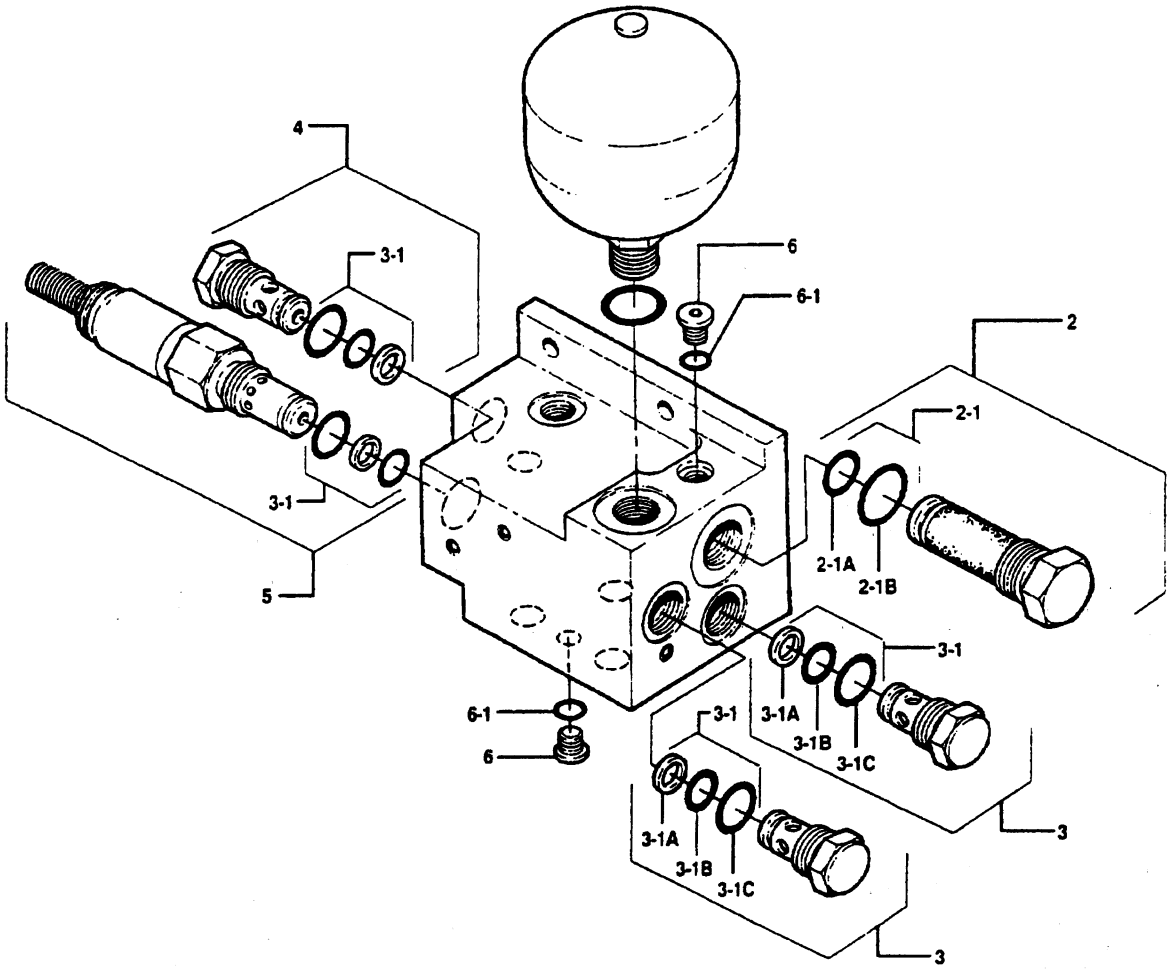
PILOT MANIFOLD ASSEMBLY
YN20VU0001F1



ITEM	PART NUMBER	DESCRIPTION	QTY
	YN20VU0001F1	MANIFOLD ASSEMBLY	1
2	YN20VU0001S002F1	FILTER ASSEMBLY	1
2-1	24100P5113	SEAL KIT (FILTER)	1
2-1A	2445Z1591	"O"-RING	1
2-1B	2445Z1592	"O"-RING	1
3	YN20VU0001S003F1	CHECK VALVE ASSEMBLY	2
3-1	24100P5114	SEAL KIT (CV & RV)	4
3-1A	2445Z1594	"O"-RING (BACK-UP)	1
3-1B	2445Z1593	"O"-RING	1
3-1C	2445Z1595	"O"-RING	1

ITEM	PART NUMBER	DESCRIPTION	QTY
4	YN20VU0001S004F1	CHECK VALVE ASSEMBLY	1
5	YN20VU0001S005F1	RELIEF VALVE ASSEMBLY	1
6	YN20VU0001S007F1	HEX PLUG ASSEMBLY	2
6-1	2445Z1596	"O"-RING	1

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: July 1997

BULLETIN: HE-301
Page 1 of 3

SUBJECTS:
- Fuel Sediment Bowl Pre-Filter - ref. p/n YN21PU1001P1
  Cummins Assembly Part Number Announced
- Alternative Fuel Filter Assembly
  Fleetguard / Cummins / Kobelco Service Part Numbers Announced

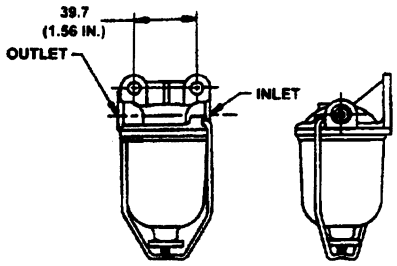
AFFECTED MACHINES: All SK100 IV ~ SK300LC IV Excavators - (w/Cummins Engines)
(See attached serial number list)

- **Fuel Sediment Bowl Pre-Filter:**

The fuel sediment bowl pre-filter assembly shown below (ref. p/n YN21PU1001P1), is supplied by Cummins Engine Co. (as part of the engine package), with each new engine delivered to the Kobelco factory for the units listed above. *Therefore, the Kobelco America Parts Department does not provide service parts for this item. We have also been informed that service repair parts are not available from Cummins for this assembly either. Cummins supplies this part as an assembly only.*

Please contact your local Cummins Engine Dealer for this assembly. The following Cummins Engine Co. numbers apply:

Cummins Option No.: FS-9008 **Cummins Assembly p/n : 3908633**



The above sediment bowl pre-filter assembly is equipped with a 100/120 mesh filter screen.

PLEASE NOTE

If due to local fuel quality conditions, you experience premature plugging of this screen, you may wish to install the following Alternative Fuel Filter Assembly, available through Fleetguard / Cummins or Kobelco America, which incorporates a spin-on element with increased filter area, and a large capacity sediment bowl.

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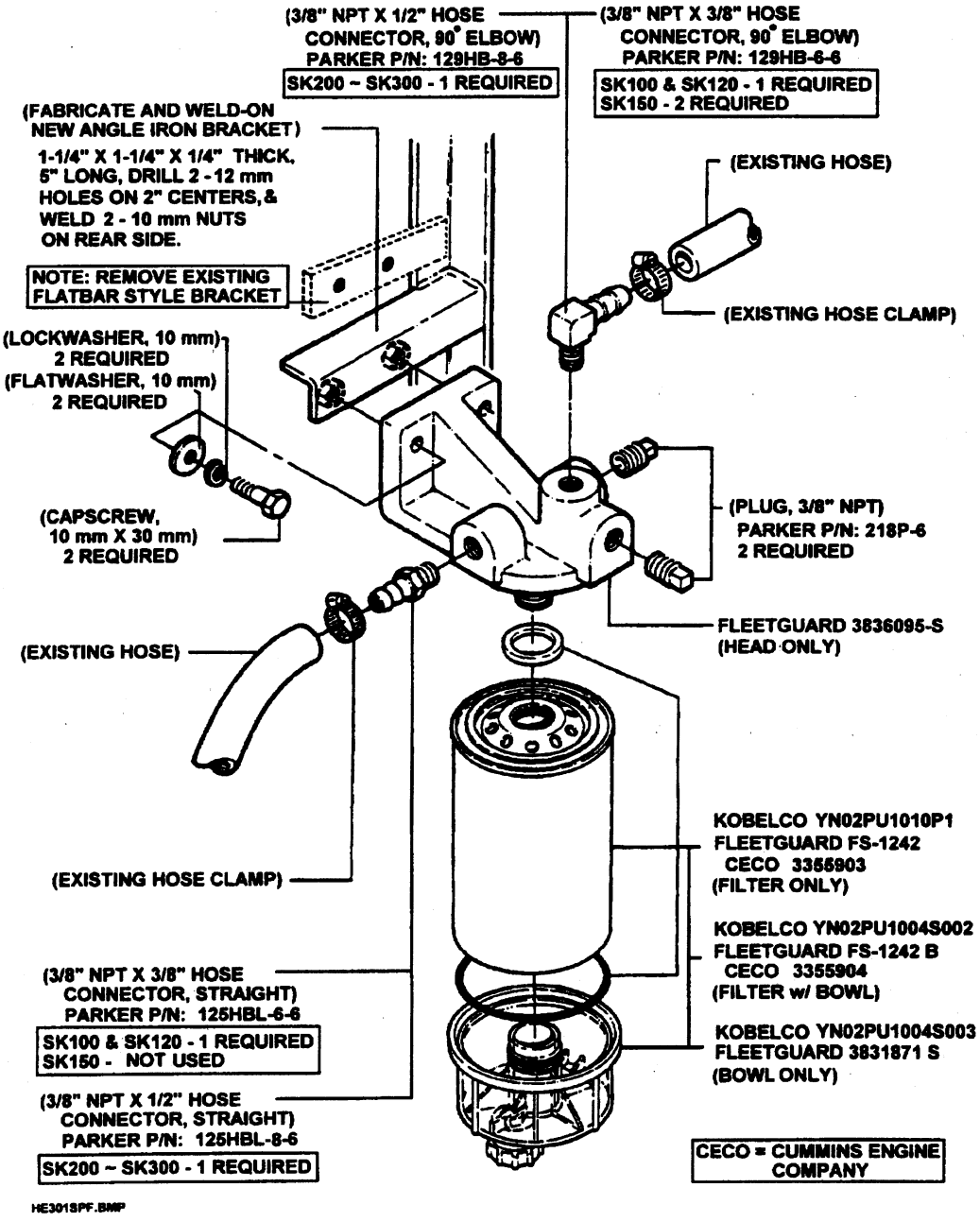
- **Alternative Fuel Filter Assembly:**

FLEETGUARD ® SUPERFILTER PLUS (w/sediment bowl)



This Superfilter assembly, can be installed in the same location as the existing sediment bowl pre-filter. It will require different hose connectors, and a new heavier angle iron style mounting bracket. ***Please note:*** *The existing flat bar style mounting bracket may not support the additional weight of the Superfilter, if it's use is attempted.*

- **Alternative Fuel Filter Assembly (cont.):**

This filter assembly is manufactured by Fleetguard, and components of it are also available through Cummins and Kobelco America, where the pertinent part numbers are shown. Contact your local Fleetguard / Cummins dealer, or the Kobelco America Inc. Parts Department, for the filter assembly items. (Hose connectors, plugs, and mounting hardware, should be procured locally.) ***Only the filter head, service replacement filter, and bowl assembly, are available through the Kobelco America Inc. Parts Department at this time.***

This filter assembly has been factory installed on the following machine serial numbers:

LBU	LLU	LPU	YCU	YMU	YNU	YPU	YQU	YWU
0116	1604	5002~	0599~	1352	0501~	1409	2838	1153
0118~0120	1678			1353		1479~1483	2839	1154
0202~	1679			1413		1601~	2918	
	1801~			1414			3101~	
				1501~				

Please note: Machines with serial numbers prior to the above list, were equipped with the sediment bowl pre-filter shown on page 1.

Some Kobelco Mark IV machines (as listed above); have alternatively incorporated this Fleetguard Superfilter since Nov. 1996, and it became standard equipment at the minor model change for the SK100 IV ~ SK300LC IV units, as detailed in Service Bulletin HE-308.

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: July 1997

BULLETIN: HE-302
Page 1 of 2

SUBJECT: KPSS (Pf) Powershift Solenoid Valve Pressure
"Revised Adjustment Procedures"

AFFECTED MACHINES: All SK150LC IV ~ SK400LC IV Excavators

The KPSS (Pf) Powershift Solenoid Valve Pressure, for the referenced machines, has been published as 0~43 psi (0~3 Kg/cm²), in the technical publications up to this point. Basically speaking; it was understood that the lower the pressure, the more average oil flow would be available from the hydraulic pump.

In the past, it has been the practice to lower this pressure (in the field), as low as it would go, for maximum performance. However; setting this pressure too low can create (under certain conditions), an imbalance in the hydraulic servos of the pump, and allow erratic operation. ***It has been found that mis-adjustment of this solenoid valve, can have an adverse effect on the balance of the Mechatronic System in general, and can be detrimental to the machines' performance in certain circumstances.***

On some of the affected MK IV units listed above, the KPSS (Pf) pressure specification has been changed. Effective at this time, when checking this pressure and it becomes necessary to adjust it, set it only to the latest specifications, published in the pertinent Service Bulletin, for the machine model being worked-on!

It is not mandatory to change this adjustment on machines presently operating (without performance complaints), but it is *recommended* they be checked and set to the latest published specification, during any future pressure testing, or at the machines' next normally scheduled maintenance interval.

REVISED TEST & ADJUSTMENT PROCEDURE

This pressure is always checked at E/G high idle speed, controls in neutral, in H, S, FC, and D modes. The proper method to check this pressure, is to use a 100 psi gauge, with a shut-off valve connected between it, and the KPSS (Pf) solenoid valve test port a3. The machines' engine and hydraulic oil, should already be at operating temperature prior to testing. **Be sure the KPSS release toggle switch is not in "Release" position. Be sure that the "Auto-Accel" select switch is turned off.** Stop the engine and bleed-off any air pressure built-up in the hydraulic tank.

Before re-starting the engine, the a3 test port plug on the KPSS (Pf) solenoid valve should be removed, and the test fitting connector, hose, shut-off valve, and 100 psi gauge connected. The shut-off valve **must be closed** before the engine can be started. ***Caution: failure to close the shut-off valve can cause the gauge to be damaged or explode when the engine is started!***

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This proportionating solenoid valve is operated by a "pulse-width-modulated" signal from the KPSS controller, therefore; the 100 psi gauge is necessary, to provide the required accuracy at the low operating pressure.

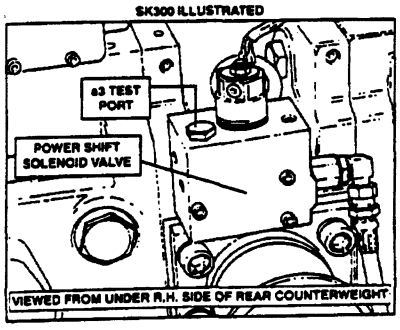
The engine should be started and then brought-up to high-idle speed, in H mode, with the controls in neutral. ***Only with the engine at high-idle speed, should the shut-off valve be opened slowly (paying close attention that the pressure doesn't exceed 100 psi), to check the KPSS (Pf) pressure.***

If the pressure attempts to exceed 100 psi while opening the shut-off valve, loosen the locknut on the adjustment screw in the center of the Pf solenoid valve coil, and back-out on the screw slightly. Again, slowly open the shut-off valve and check the pressure. Using the adjustment screw, set the KPSS (Pf) pressure to the ***latest published specification*** and tighten the locknut.

Do not, at anytime, while the shut-off valve is open, allow the engine to idle down, either manually or by the auto-decel system. Also, never engage the power-boost or heavy-lift switches, or move the release toggle switch to the "Release" position, at this time. To do so, would allow the KPSS (Pf) pressure, to exceed 100 psi and damage the pressure gauge, (possibly exploding it !) Use extreme caution while performing this test and adjustment procedure !

Once the pressure is set, **make sure to close the shut-off valve, *before*** idling the engine down. Idle engine for 5 minutes before stopping. Stop engine and bleed-off any air pressure built-up in the hydraulic tank. Remove test connector, hose, shut-off valve and gauge. Re-install a3 test port plug. Clean-up any spilled or lost hydraulic oil, and re-check the hydraulic oil level in the hydraulic tank.

Refer to the figures below for location of test port a3. *Also shown, are examples of a 100 psi pressure gauge and gauge snubber/shutoff valve assembly, which should be locally available through W. W. Grainger Co.* These items can be used in conjunction with components from the Kobelco Hydraulic Test Kit (p/n HTK 1000-01), to perform this test and adjustment procedure.



2½" STANDARD LIQUID FILLED PRESSURE GAUGE

ASHCROFT®

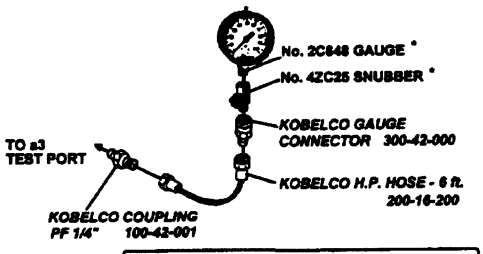
No. 2C648

- Durable ABS case
- Acrylic window
- Bronze bourdon tube
- 1/4" NPT brass lower socket
- 3-2-3% accuracy
- Glycerin filled case
- Patented spring suspended movement

Pressure Range PSI	Ashcroft Model	Stock No.
160	25-3003HL	2C648

Items from KOBELCO TEST KIT:

Coupling PF ¼" 100-42-001
Gauge connector 300-42-000
H.P. Hose - 6 ft. 200-16-200



* THESE ITEMS NOT AVAILABLE FROM KOBELCO

GAUGE SNUBBER

sun hydraulics

No. 4ZC25

Stainless steel gauge snubber is a throttling and shut-off device that isolates, protects, and extends the life and accuracy of hydraulic gauges. When partially opened, unit reduces or eliminates gauge pointer pulsations. When closed, unit positively shuts off gauge from line pressure. Leak-proof needle stem is positively retained. Viton seals. Fingertip adjustment and lock-nut. 1/4" NPT. 5000 PSI maximum pressure rating. Sun Hydraulics (#SAB-KXV-BA).

No. 4ZC25 Gauge Snubber.

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: March 1997

BULLETIN: HE-303

SUBJECT: MK IV Excavator Drawbar Performance Ratings

AFFECTED MACHINES: SK60 IV ~ SK400LC IV

Recently, we have noted that most of the published drawbar ratings in our specification sheets, are not calculated using the S.A.E. formula. They were calculated using the J.I.S. formula. This, in many cases, puts us at a distinct competitive disadvantage.

Below; are the old and new figures. Note: the SK300 and SK400 are unaffected, as they were calculated more recently. All competitive comparisons, full line spec. Sheets, and sales manuals will be updated ASAP. Sales Spec. Sheets will have to wait until the next printing.

It is not a misprint concerning the SK270. Drawbar calculations take machine weight into account. Therefore, the SK270 will have more drawbar pull than the SK300, due to its lower weight.

To standardize with S.A.E. guidelines, we will use drawbar calculation formulas based upon S.A.E.

MODEL	DRAWBAR (per J.I.S.) (LBS.)	DRAWBAR (per S.A.E.) (LBS.)
SK60 IV	**11,500**	**14,900**
SK100 IV	**19,600**	**23,300**
SK115DZ/SK120LC IV	**20,500**	**24,600**
SK150LC IV	**28,200**	**35,230**
SK200LC IV	**35,900**	**44,660**
SK220LC IV	**41,700**	**50,420**
SK270LC IV	**59,500**	**59,840**
SK300LC IV	**59,500**	**59,500**
SK400LC IV	**87,300**	**87,300**

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KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: March 1997

BULLETIN: HE-304

SUBJECT: New Cummins / Delco-Remy Warranty Policy
(for Cummins Branded Starters and Alternators)

AFFECTED MACHINES: SK100 IV ~ SK400LC IV

NEW PRODUCTION STARTERS AND ALTERNATORS WITH CUMMINS NAME PLATES

Effective immediately, Cummins will now warranty Delco-Remy Starters and Alternators (factory installed on the above machines), that have Cummins Brand name plates riveted onto them. This warranty will be administered through the Cummins dealer network, and has been announced by Cummins in their Service Bulletin # 3666191, and their Service Parts Topics # 97T13-2, (of which copies are available through Cummins Dealers). Refer to name plate examples shown below.

PREVIOUS PRODUCTION STARTERS AND ALTERNATORS WITHOUT NAME PLATES

Any Starter or Alternator *not having* the riveted-on name plates on them, will continue to be warranted through the previously announced AC-Delco Service and Parts Distributor Network. The AC-DELCO, "Authorized Delco-Remy Service and Parts Distributor Directory", was issued to Kobelco America Inc. Dealers in June 1996. *Please contact one of the distributors listed in this directory, for warranty service on the previous production components. Refer to Service Bulletin HE-267, page 4 of 4, "Limitations" section, paragraph 3, pertaining to the warranty coverage for the earlier units without name plates.*

THERE WILL BE NO EXCEPTIONS TO THIS POLICY GRANTED, AS PER CUMMINS.

STARTER NAME PLATE

ALTERNATOR NAME PLATE

Please be aware that mixed production lots may occur at first introduction of these components.

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SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: March 1997

BULLETIN: HE-305
Page 1 of 2

SUBJECT: Warranty for Cummins Supplied Components
(with Cummins part numbers)

AFFECTED MACHINES: SK100 IV ~ SK400LC IV

Some of our Kobelco dealers have had difficulty in securing warranty from Cummins Distributors on components that are furnished by Cummins Engine Company.

There are certain *Cummins branded parts*, which are supplied to the Kobelco factory with the Cummins engine package loose, and are then installed during the engine installation procedure.

Some of these items are: voltage sensing (safety) relays, magnetic (starter) relays, and certain sensors and switches to name a few. Usually these are listed in the pertinent Kobelco Machine Parts Manual on page EC 1.

Please refer to the attached letter from the Cummins Engine Company, Inc., which we hope will clear-up confusion on this issue. Should any of you experience problems with the Cummins Warranty, on the *Cummins branded parts (with Cummins part numbers)*, mentioned in this letter; please provide a copy of it to the Cummins Distributor you are dealing with.

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Cummins Engine Company, Inc.
Mail Code 60319
P.O. Box 3005
Columbus, Indiana 47202-3005

Kobelco Dealers:

Kobelco America Inc. specifies Cummins starter relays in their original engine specifications. For B/C Series Cummins Engines the starter relay is part of a kit under an SS option in the engine specification. For M11 engines the starter relay is part of an SB option.

Cummins Engine Co. warrants all Cummins branded parts with Cummins part numbers under the Cummins Industrial Engine Warranty. Claims for the starter relay in question should be filed under the normal warranty procedure.

If the dealer has any questions regarding warranty coverage, they should contact their local Cummins Distributor or Cummins RapidServe (warranty claim center) at 1 800 832-4282.

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: March 1997

BULLETIN: HE-306

SUBJECT: Operation of Travel Systems in Cold Weather Regions

AFFECTED MACHINES: All Hydraulic Excavators

Concern: Investigations of isolated travel motor failures during operation in cold climates, have been attributed to thermal shock of travel motor internal components, ie:

- Unexplained piston galling, seizing, or binding.
- Retainer plate breakage.
- Sudden catastrophic failures.

Cause: *Machines are sometimes operated in one place for extended periods of time, in extremely cold ambient temperatures, without traveling any distance at all. Under these circumstances, the upper works of the machine is at full operating temperature, but the travel motors can be very cold, particularly if the machine is sitting in snow, ice, or slushy mud.*

Many times, travel operation is then commenced immediately and abruptly, often at full engine speed in "H" mode, and in High Range (rabbit) travel. This manner of operation, can cause a sudden and abrupt flow of very hot hydraulic oil from the upper works of the unit, to rush into the extremely cold travel motors, and thermally shock the internal components. This thermal shock can almost instantly reduce the working clearances in the motor, causing unusual, unexplained, or catastrophic damage.

Recommendations: ***Avoid sudden and rapid starts in cold weather, particularly at high engine speeds and in High Range (rabbit) travel.***

Start first in Low Range (turtle) travel, at extremely slow speed, until travel motors have had a chance to equalize in temperature.

Machine can be periodically walked in Low Range (turtle) travel, to help equalize the travel motor internal component temperatures.

If possible, raise each track off the ground alternately, and slow roll the track first, in Low Range (turtle) travel, before commencing normal travel speeds.

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SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: March 1997

BULLETIN: HE-307
Page 1 of 2

SUBJECT: Damage to Arm and Bucket Cylinders

AFFECTED MACHINES:

SK200 IV	SK220 IV
SK200LC IV	SK220LC IV
SK270LC IV	SK300LC IV

Concern: Unusual arm or bucket cylinder failures, which exhibit the following conditions:

- Piston rod nuts that appear to be loose.
- Threads stripped from piston rod or piston rod nut.
- Loose or damaged pistons, or piston shims.
- Scored cylinder barrel walls, with no exterior damage, ie: dents or dings.

Cause: Investigations of a number of arm and bucket cylinder failures, have been traced to adverse machine operating conditions, and / or damage incurred during machine transport loading or unloading operations.

These damages have occurred with the arm tucked under, and the arm or bucket cylinder rods in the fully extended position, with the boom at fairly low height. In a "ramp-over-center" situation, this allows sudden and abrupt contact of the arm and bucket components, to a trailer deck, ramp, or the ground itself. *Refer to contact area * shown in figure 1.*

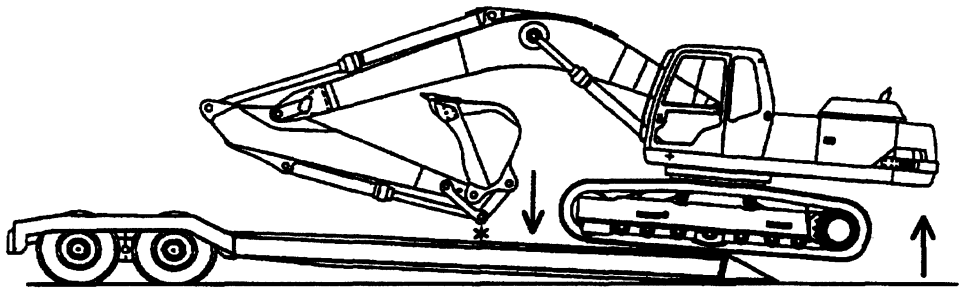

Figure 1

With the arm or bucket cylinder rods fully extended, there can be no hydraulic port relief valve protection. This allows internal mechanical contact of the piston(s) to the cylinder head gland(s), stretching the rod end(s) where the piston(s) is/are connected. *The possibility of this type damage is more likely on long crawler undercarriage machines.*

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Recommendations:

It has been determined that a one time stress to a cylinder can cause it to stretch. This usually results in loosening of the locknut, and can only be determined by measuring the piston rod O.D. and length at multiple axis points. The rod can visually appear rebuildable, but will fail again. Figure 2 shows the area that stretches. When this area is measured at different points: A, B, and C across their X and Y axis, they all have to be equal. If the dimensions differ one from another, as simulated in Figure 3, alone their X and Y axis, then the rod has been damaged.

Any arm or bucket cylinder that exhibits the conditions stated above, should be closely checked just behind the threaded piston nut area of the rod, using a dial caliper or micrometer, as shown on Figure 2. Rods that have been stretched should not be re-used, and must be replaced. ANY ARM OR BUCKET CYLINDER DAMAGED IN THIS MANNER WOULD NOT BE CONSIDERED AS A WARRANTY FAILURE.

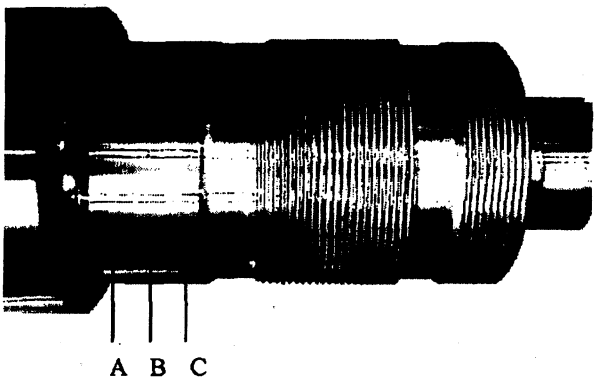

Figure 2: Area where the rod stretches

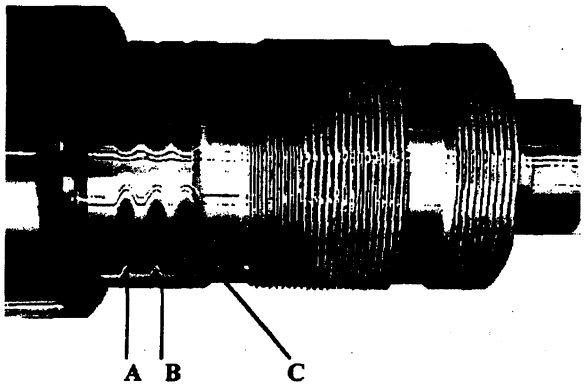

Figure 3: Exaggerated picture showing stretched areas.

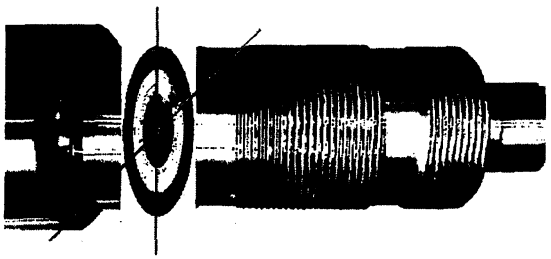

Figure 4: It is important to measure the diameters across the X and Y axis for all three areas A, B, and C, as shown in this picture.

Actual tests have shown that arm or bucket cylinder rod damage can occur without damage to the boom, arm, bucket, or other front end components. Caution must be taken in a "ramp-over-center" situation, especially when loading or unloading machines on or off of trailers.

It is important that the arm or bucket cylinder rod is not at a fully extended position, when machine *settles* or *follows-through,* during a "ramp-over-center" situation. Front attachment should be positioned to allow adequate clearance to prevent contact of any items mentioned above.

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KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: March 1997

BULLETIN: HE-308
Page 1 of 10

SUBJECT: MK IV "Minor Change" Product Improvements

AFFECTED MACHINES:

SK115DZ	LPU5001~
SK120LC IV	YPU0101~
SK150LC IV	YMU1501~
SK200LC IV	YQU3101~
SK220LC IV	LLU1801~
SK270LC IV	LBU0201~
SK300LC IV	YCU0603, YCU0607, & YCU0611~
SK400LC IV	YSU0242~

Please refer to the attached pages, previously issued as: *Product Information Bulletin No. 001.*

This bulletin explains the "Minor Change" Product Improvements on the Kobelco Mark IV Excavators, that took place at the serial numbers listed above.

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KOBELCO

PRODUCT INFORMATION BULLETIN

Bulletin No.: 001
January 20, 1997

Kobelco Excavator "Minor Change" Product Improvements

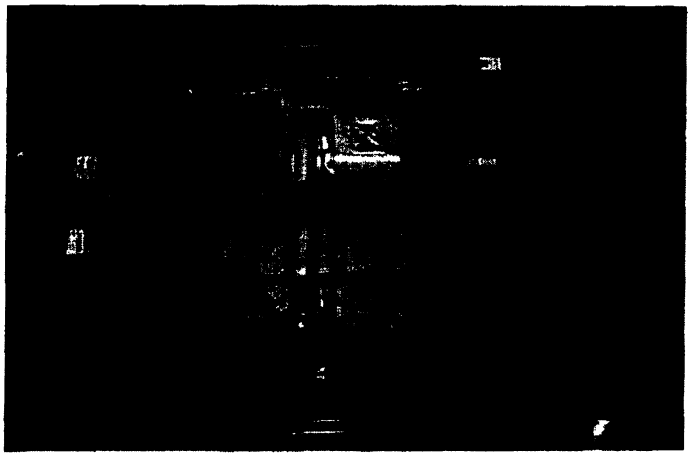
This bulletin is intended to explain the various changes taking place on the Kobelco Excavators in January 1997 production or soon thereafter. The majority of the changes are applicable to what we call the "Minor Change" machines.

"Minor Change" models include running changes for design improvement, cost reduction, emission and safety improvements. These changes occur at a specific serial number break to better support the product from a parts, service, and sales perspective.

Mark IV Minor Change Effective S/N's

Model	Effective S/N's
SK115DZ	LPU5001
SK120LC	YPU0101
SK150LC	YMU1501
SK200LC	YQU3101
SK220LC	LLU1801
SK270LC	LBU0201
SK300LC	YCU0611
SK400LC	YSU0242

Product Changes at Minor Change



1. Engines

   A. The Environmental Protection Agency has mandated that, as of January 1997, all off road diesel engines 100 gross horsepower and above must meet environmental emission standards. This means that the engines in all models from the SK150LC-IV and above must have these "clean" engines. These engines are the same family of Cummins engines as before but have significantly improved emissions through the use of different fuel pumps, turbochargers, heads, pistons, etc. In most cases, these changes boost available horsepower.

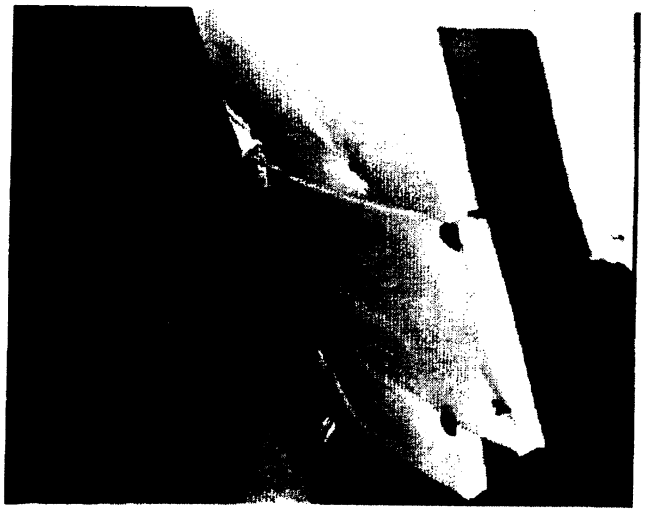
Minor Change
Engine Horsepower

	Current	**Minor Change**
SK115DZ/120LC	85 @ 2,200 RPM	86 @ 2,200 RPM
SK150LC-IV	103 @ 2,200 RPM	103 @ 2,200 RPM
SK200LC-IV	138 @ 2,200 RPM	141 @ 2,200 RPM
SK220LC-IV	163 @ 2,200 RPM	175 @ 2,200 RPM
SK270LC-IV	163 @ 2,200 RPM	175 @ 2,200 RPM
SK300LC-IV	230 @ 1,800 RPM	238 @ 1,900 RPM
SK400LC-IV	306 @ 2,000 RPM	306 @ 2,000 RPM

B. Oil change interval for SK200, SK220 and SK270LC-IV has now been increased to 500 hours via the use of a larger oil pan.

C. The ether cold weather starting aid has been discontinued on the SK150, 200, 220, and 270LC-IV and replaced with an electric grid inlet air preheater. Other Kobelco models will be upgraded when the system becomes available from Cummins.

D. The current small bowl type fuel water separator has been replaced with a large fleetguard combination filter and water separator. This moves one fuel filter from the engine to the side of the machine for better serviceability.



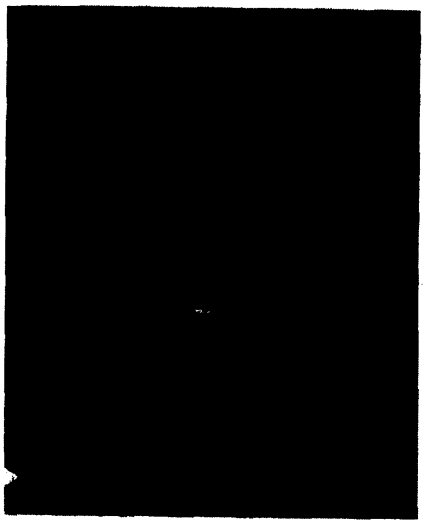
E. The foam seal between the radiator and engine hood has been redesigned for greater durability.

F. The inspection cover between the radiator and oil cooler has been removed on the SK150-SK400 for easier serviceability.

G. Paint scheme to continue with no grey strip along bottom of cab.

UNDERCARRIAGE

1. All machines will now have a bolt on side frame step extension. This will make climbing onto and off of a machine quicker and easier by being able to match step extension to track pad width.



2. The track pitch on the SK220 has changed from 203mm to 190mm. This will allow commonality of parts with the SK200. The track chain itself has been redesigned with 21.4% greater cross section around the track pins and the track pins themselves now feature 25% greater interferance fit. Additional parts commonality with the SK200 involve lower rollers and front idler.

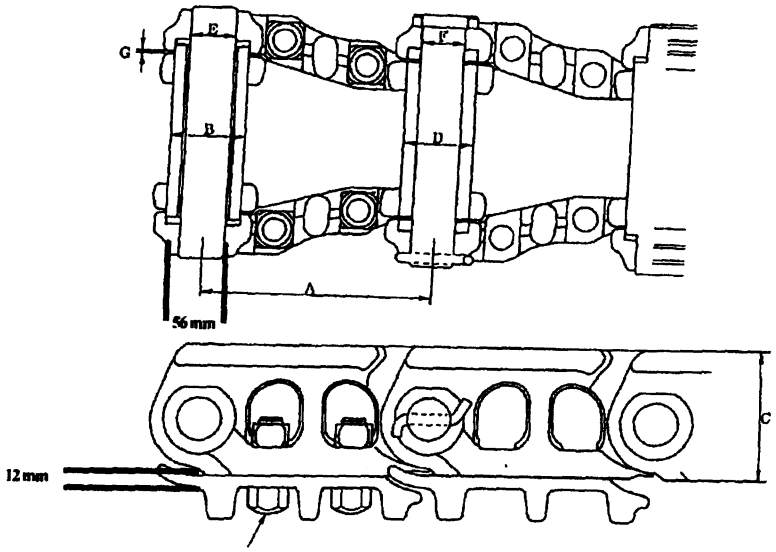
The SK220 gearbox remains the same, but a different drive sprocket is utilized.

If extremely severe conditions are anticipated, the original SK220 undercarriage is available as an option.

Please review the enclosed data for undercarriage comparison.

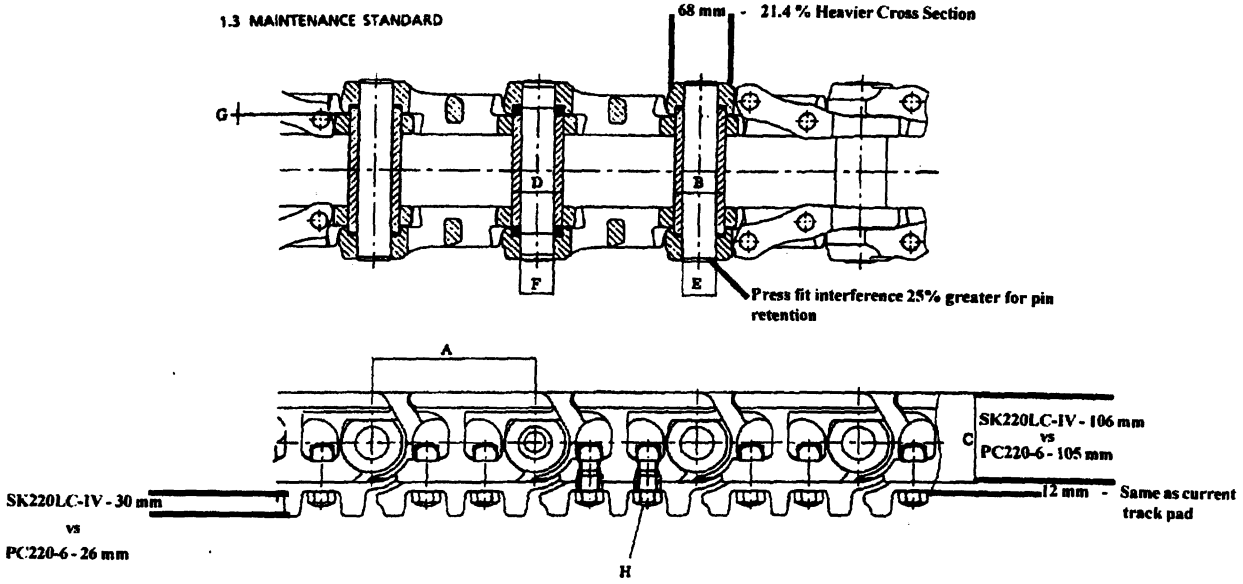
Current SK200LC-IV Track Chain

11.4 TRACK LINK



SK220LC-IV Minor Change Track Chain

1.3 MAINTENANCE STANDARD



3. To maintain lifting stability for the SK220 the counterweight has been increased by approximately 800 pounds. The lift chart for the SK220 remains unchanged, however the SK270LC-IV also uses the same SK220 counterweight. This counterweight change will increase its stability as detailed below.

SK270LC-IV MINOR CHANGE
LIFTING CAPACITY
(Overside)

	Current	**Minor Change**
15' Radius		
+10	17,040	17,100
+5	20,880	21,600
Ground Level	19,700	20,500
-5	19,210	20,100
-10	19,180	20,100
-15	19,550	20,400
20' Radius		
+10	13,400	13,500
+5	13,470	14,000
Ground Level	12,800	13,300
-5	12,420	13,000
-10	12,340	12,900
-15	12,590	13,200
25' Radius		
+10	9,970	10,306
+5	9,520	9,900
Ground Level	9,140	9,500
-5	8,910	9,300
-10	8,900	9,300

SK115DZ and SK120LC

1. Currently the monitor on the SK115DZ and SK120LC-IV shows a warning light in the event of low engine oil pressure or high engine temperature. The new units will also incorporate a warning buzzer.

2. A one touch decel, for the engine, will become available in March. This is to become standard for the SK120LC-IV and optional for the SK115DZ. Timing is subject to availability of parts.

3. The SK115DZ replaces the SK100LC which is no longer produced.

Operator's Seat

Due to numerous requests from the field, Kobelco has added a closeable seat back pocket for storage of the operator's manual to all model's. This is in addition to storage areas beside and behind already in place.

Swing Flasher

1. The rubber bumper at each corner of the counterweight has been removed from the SK120LC-SK270LC. In it's place, is an enlarged raised rib of the cast iron counterweight for additional light protection and reduced maintenance for a rental machine or contractor's unit.

2. The triangular shaped reflectors in front of the swing flashers, that fit into the side doors have been removed for increased durability and reduced maintenance.

3. Metal, rubber cushioned, swing flasher guards have been redesigned and are available in the event the machine is to be operated in severe areas such as forests, scrap, or construction sites with low overhanging trees.

SK400LC-IV

The main hydraulic pump has been changed effective s/n YSU0242 to incorporate an impeller located at the inlet of the pump to pull oil and supercharge the main pumps even in cold weather. This is similar in design to the pumps in Hitachi, Komatsu and Cat in this size class.

As a result, the compressed air system has been removed. Some customers had reported service problems due to hose failures, water freezing, and coking of lines.

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: April 1998

BULLETIN: HE-309B (Replaces HE-309A)

SUBJECT: MK IV "Minor Change" Engine High Idle RPM

AFFECTED MACHINES:

SK115DZ	LPU5001~
SK120LC IV	YPU1601~YPU1822
SK130LC IV	YPU2001~
SK150LC IV	YMU1501~
SK200LC IV	YQU3101~
SK220LC IV	LLU1801~
SK270LC IV	LBU0201~
SK300LC IV	YCU0603, YCU0607,YCU0611~0642, YCU0647~
SK400LC IV	YSU0242~

ENGINE HIGH IDLE RPM - SK60 IV ~ SK400LC IV EXCAVATORS

MACHINE MODEL	LAST UNIT SERIAL NUMBER	E/G HIGH IDLE SPEED PREVIOUS UNITS	FIRST UNIT M/C~ SERIAL NUMBER	E/G HIGH IDLE SPEED M/C~ UNITS
**SK60 IV	ALL	2,300~2,400	NA	NA
**SK100 IV	YWU-1155	2,345~2,365	NA	NA
SK115DZ	➡	➡	**LPU-5001~**	**2,330~2,365**
SK120LC IV	YPU-1483	2,345~2,365	**YPU-1601~YPU-1822**	**2,330~2,365**
SK130LC IV	➡	➡	**YPU-2001~**	**2,330~2,365**
SK150LC IV	YMU-1414	2,385~2,405	**YMU-1501~**	**2,365~2,400**
SK200LC IV	YQU-2962	2,335~2,355	**YQU-3101~**	**2,335~2,370**
SK220LC IV	LLU-1681	2,335~2,355	**LLU-1801~**	**2,335~2,370**
SK270LC IV	LBU-0120	2,335~2,355	**LBU-0201~**	**2,335~2,370**
**SK300LC IV w/MMC engine	YCU-0301~0499	1,930~1,970	---	---
**SK300LC IV w/Cummins engine	YCU-0500~0610 (except YCU-0603 & YCU-0607)	1,990~2,110	---	---
SK300LC IV w/Cummins engine	➡	➡	**YCU-0603, YCU-0607, YCU-0611~0642 YCU-0647~**	**2,065~2,100**
**SK400LC IV w/MMC engine	YSJ-0002~0199	2,150~2,220	---	---
**SK400LC IV w/Cummins engine *with air compressor*	YSU-0200~0241	2,200~2,220	---	---
SK400LC IV w/Cummins engine *without air compressor*	➡	➡	**YSU-0242~**	**2,165~2,200**

** *These units shown for reference only, they are not minor change models.*

CAUTION: ***Engine must be at full operating temperature before checking or setting RPM.***

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SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: March 1997

BULLETIN: HE-310

SUBJECT: MK IV "Minor Change" KPSS Mechatronic Controllers

AFFECTED MACHINES:

SK150LC IV	YMU1501~
SK200LC IV	YQU3101~
SK220LC IV	LLU1801~
SK270LC IV	LBU0201~
SK300LC IV	YCU0603, YCU0607, & YCU0611~
SK400LC IV	YSU0242~

Please be advised that the subject machines are equipped with the new "emissionalized" Cummins engines, which incorporate different fuel injection pumps and waste-gated turbochargers. Because of this, and other changes, these units require different Mechatronic KPSS controllers.

The controller vendor is now also providing these controllers to the factory in a different manner. Because of this, it is possible to find KPSS controllers, installed in the minor change machines, that may have manufacturing identification part numbers on their outside cases, that will not match the part number displayed on the gauge cluster during the 24 item check procedure.

The correct part number should be the one that is displayed on the gauge cluster. The following list shows these numbers, that should also be used for ordering service replacement controllers.

MK IV MINOR CHANGE KPSS MECHATRONIC CONTROLLERS

Machine Model	*Controller Part Number*
SK150LC IV	2480U411F1
SK200LC IV	2480U411F2
SK220/270LC IV	2480U411F3
SK300LC IV	2480U411F4
SK400LC IV	2480U411F5

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KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

IMPORTANT NOTE:
This Bulletin is being issued to document new adjustment procedures for the subject & affected "Minor Change" machines listed below. It provides the revised performance specifications now used on these units as well. It is suggested to place copies of this Bulletin in your SK150LC IV / SK160LC IV Shop Manual, and your Mark IV Serviceman's Handbook, for future reference. ***To Kobelco Dealers: Please copy and distribute to your Service Technicians, as necessary for this purpose.***

DATE: July 1997

BULLETIN: HE-311

SUBJECT: "Minor Change" Performance Specifications

AFFECTED MACHINES: SK150LC IV - YMU-1501 ~
SK160LC IV - YMU-1501~

Please be advised that the subject machines are equipped with the new "emissionized" Cummins 4 BTA engines, which incorporate different fuel injection pumps and waste-gated turbochargers. These units require different KPSS controllers[1], stepping motor throttle linkage, engine RPM settings[2], and Adjustment "A" procedures.

Because of these changes, use care when referring to the previously published specifications for engine R.P.M., or Adjustment "A", as shown in the existing MK IV Shop Manuals and MK IV Serviceman's Handbook.

SK150LC IV & SK160LC IV units prior to s/n YMU-1501, were equipped with "non-emissionized" Cummins 4 BTA engines; refer to Service Bulletin HE-266.

Be sure to check the serial number of the machine you are working on, and refer to the proper specifications. "Minor change" specifications are different from the earlier machines !

PLEASE NOTE

This bulletin details the following "pre-checks" to be made prior to performing the Mechatronics Adjustment "A" procedure:

A. Engine Low Idle Speed
B. Engine High Idle Speed
C. Fuel Shut-off Solenoid Rod
D. Emergency Stop Cable
E. RPM Sensor Test

Follow the instructions given in the "pre-checks" to help achieve a successful Adjustment "A" procedure. Failure to follow these instructions can result in poor engine or machine performance, and possible failure of Adjustment "A".

[1] Refer to Service Bulletin HE-310.

[2] Refer to Service Bulletin HE-309A.

These machines have various other changes to their features and equipment, that is further detailed in Service Bulletin HE-308.

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1. **PRE-CHECKS TO BE MADE PRIOR TO PERFORMING ADJUSTMENT "A" PROCEDURE**
   SK150 / SK160LC IV M/C (Cummins Engine)
   (Minor change machines.)

All items listed below are described in detail on the following referenced pages, and should be checked and confirmed prior to performing Adjustment "A".

NOTE

Engine must be at operating temperature **before** making the following pre-checks, or performing the Adjustment "A" procedure !

A. Engine Low Idle Speed

1. The proper engine low idle speed is critical to a successful Adjustment "A" procedure.
2. Confirm this speed prior to performing Adjustment "A".
3. *Particularly, if the injection pump has been replaced or rebuilt, the low idle speed must be checked and confirmed.*
4. **An incorrect low idle speed can cause Adjustment "A" to fail.**
5. Refer to Low Idle Speed Adjustment on page 3.

NOTE

The Low Idle Speed must be confirmed as per the following instructions **prior** to starting Adjustment "A". Once Adjustment "A" is completed, the Low Idle Speed should then match the specifications given in the table on page 15.

B. Engine High Idle Speed

1. The proper engine High Idle Speed is also critical to a successful Adjustment "A" procedure.
2. Confirm this speed prior to performing Adjustment "A".
3. *Particularly, if the injection pump has been replaced or rebuilt, the High Idle Speed must be checked and confirmed.*
4. **An incorrect High Idle Speed can cause Adjustment "A" to fail.**
5. Refer to Low Idle Speed Adjustment on page 3. *The High Idle Speed check is described at the end of that procedure.*

NOTE

The High Idle Speed must be confirmed as per the following instructions **prior** to starting Adjustment "A". Once Adjustment "A" is completed, the High Idle Speed should then match the specifications given in the table on page 15.

C. Fuel Shut-Off Solenoid Rod

1. Proper adjustment of the Fuel Shut-Off Solenoid Rod is critical to a successful Adjustment "A" procedure.
2. Confirm this adjustment prior to performing Adjustment "A".
3. *Particularly, if the injection pump has been replaced or rebuilt, this must be checked and confirmed.*
4. **Improper Fuel Shut-Off Rod adjustment can cause Engine Surging or Low Power.**
5. Refer to note on this subject in Low Idle Speed Adjustment on page 3. *Details of the Fuel Shut-Off Solenoid check are described at the end of that procedure.*

D. Emergency Stop Cable

1. Confirm adjustment of Emergency Stop Cable prior to performing Adjustment"A" procedure.
2. **Improper Stop Cable adjustment can cause Engine Surging or Low Power.**
3. Refer to note on this subject in Low Idle Speed Adjustment on page 3. *The Emergency Stop Cable check is described at the end of that procedure.*

E. RPM Sensor Test

1. Proper adjustment of the RPM Sensor is critical to a successful Adjustment "A" procedure.
2. **Improper adjustment can cause:**
   a. Adjustment "A" to fail.
   b. KPSS Pf pressure to be improper.
   c. Poor Hydraulic System performance.
3. Refer to RPM Sensor Test & Adjustment on page 4.

NOTE

The RPM Sensor Test & Adjustment Procedure is the same for **both** before Minor Change (~m/c), and after Minor Change (m/c~)machines. (SK150 ~ SK460 w/Cummins).

2. LOW IDLE SPEED ADJUSTMENT

NOTE

This adjustment must be made with the linkage rod removed from between the stepping motor and the governor lever arm of fuel pump. Refer to page 8.

A. LOW IDLE ADJUSTMENT PROCEDURES

1. Start the engine, with throttle in "LO" position. Depress the Buzzer Stop Switch five (5) times to show the RPM display is on the Gauge Cluster. See Figure A. *(Note: Controller "TEST-RUN" toggle switch should be in "RUN" position at this time.)*
2. With a 19mm wrench, loosen the locknut on the Bumper Spring Screw and back the Bumper Spring Screw and back the Bumper Spring Screw out with a flat blade screwdriver, until no drop in engine RPM is realized. See Figure B.
3. If RPM reads 760~775 RPM, the LO-IDLE SPEED SCREW is set correctly, and you should proceed to **Step 5** to reset the Bumper Spring Screw. *(If RPM **does not read** 760 ~ 775 RPM, proceed with **Steps 4 and 5** to set the LO IDLE SPEED SCREW and Bumper Spring Screw.)*
4. With a 10mm wrench, loosen the locknut on the LO-IDLE SPEED SCREW and adjust screw with a flat blade screwdriver until engine RPM is 760~775. Tighten locknut. See Figure C.
5. Using a flat blade screwdriver, turn the Bumper Spring Screw clockwise (IN) until the engine RPM increases 25~ 40 RPM (800 ~ 815 RPM) and tighten the locknut. See Figure B. **DO NOT RE-ADJUST THE LO-IDLE SPEED SCREW.**
6. Manually (with Linkage disconnected), check the "HI"–IDLE RPM. Minimum speed should be 2,400+ RPM. This speed is necessary for Adjustment "A" to be performed successfully. ***(Note: This is not the final No-Load Speed.)***

NOTE

With key switch "ON", check the Fuel Shut-Off Solenoid Rod to insure that it is in the full retract position. Check to insure the Emergency Stop Cable is loose or has some slack. Failure to check these could result in Engine Surging or low power. *(Note: Coil is energized (retracted) for "RUN" position)*

7. Perform the RPM Sensor tests beginning on page 4, then proceed to the Mechatronic Adjustment "A" Procedure beginning on page 7.

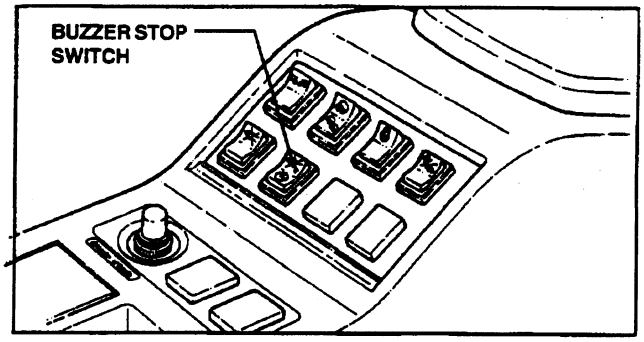


FIGURE A

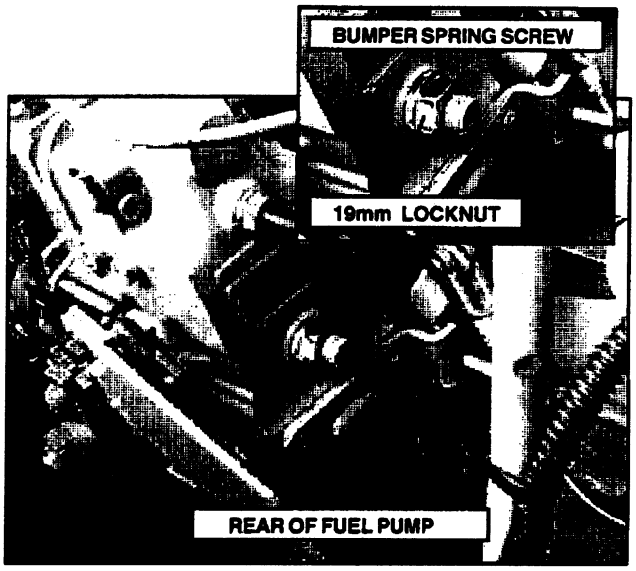


FIGURE B

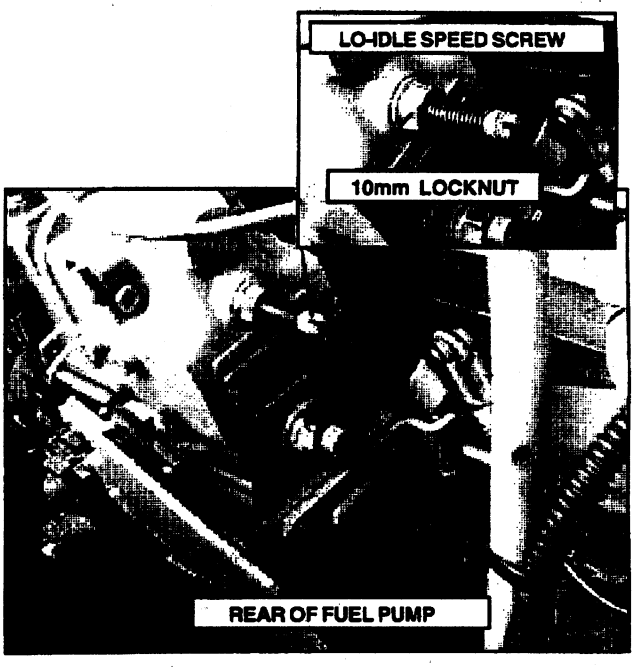


FIGURE C

3. RPM SENSOR TEST & ADJUSTMENT

Confirm tachometer accuracy and KPSS performance by performing the following RPM Sensor procedures.

A. Tools & Equipment Required

1. Volt/Ohm Meter
2. Tachometer *(for confirmation only)*
3. 1-1/8" SAE Spanner Wrench
4. 1-1/8" SAE Spanner Torque Wrench
5. KOBELCO RPM Sensor Test Harness, Part Number KSP9000-0003.

B. Machine Settings & Site Conditions

1. Engine "OFF" (Not Running)
2. Tachometer installed on machine.
3. RPM Sensor Harness (Green & White wires) disconnected.

C. Sensor Resistance Test

1. With engine "OFF" and sensor harness (Green & White wires) disconnected, connect the KOBELCO RPM Sensor Test Harness to the RPM Sensor Harness. See Figure 9.1.
2. Connect leads to meter and set meter to the 4K OHMS Position. See Figure 9.2.
3. Connect leads from meter to the Test Harness Leads, and record reading from meter. See Figure 9.2A.
4. Remove cap from the Red & Black wire harness, attach test harness, connect leads from meter to Test Harness and record reading. See Figure 9.2A.
5. Compare readings to chart below.

SENSOR HARNESS	RESISTANCE SPECIFICATION
GREEN & WHITE	0.890 ± 10%
BLACK & RED	1.340 ± 10%

6. If reading of the Green & White wire Harness exceeds the given tolerance, the Black & Red wire harness can be temporarily used until a new RPM Sensor can be obtained and installed. If both Harnesses exceed the given tolerance, replace RPM Sensor before proceeding with any further adjustment, tests, or operation of the machine.

NOTE

Contact an Authorized CUMMINS Dealer and Order Part Number– 3078152 RPM Sensor Assembly.
(This Sensor is used on the SK150 ~ SK460 w/Cummins.)

7. Should the resistance readings be within the given tolerance, proceed to Sensor Adjustment Procedures.

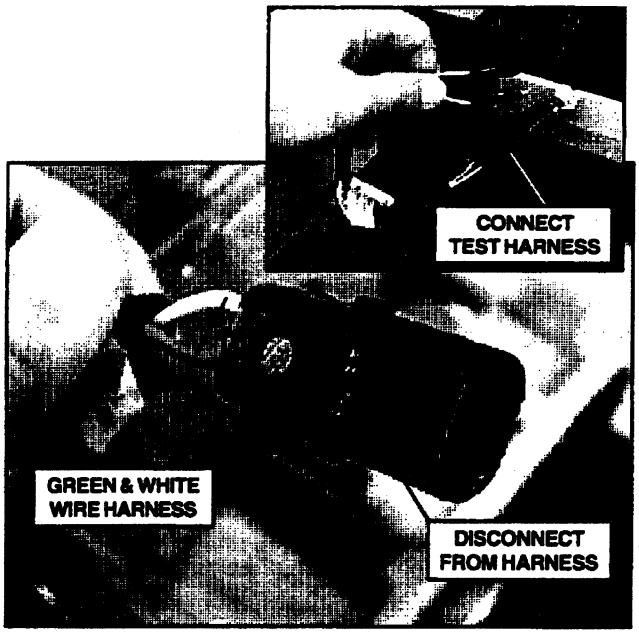


FIGURE 9.1

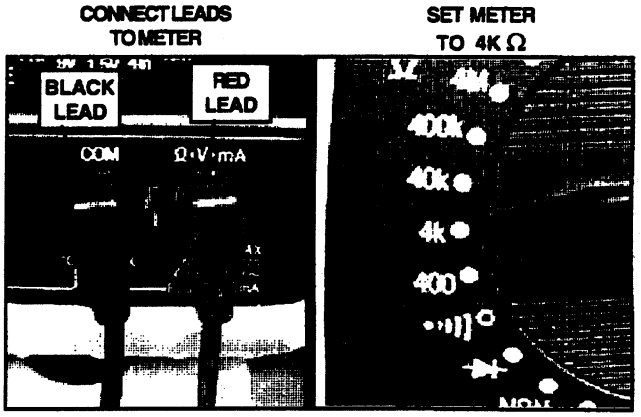


FIGURE 9.2

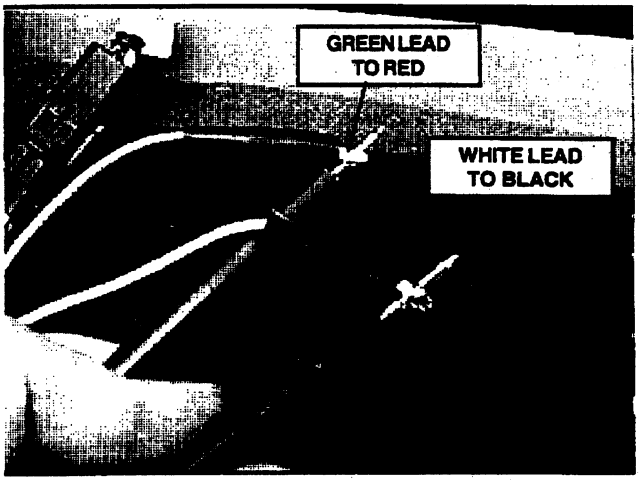


FIGURE 9.2A

D. RPM Sensor Adjustment Procedures

1. Loosen RPM Sensor Jam Nut and remove Sensor from Bell Housing. See Figure 9.3.
2. Inspect Sensor Face for damage or scarring from flywheel or other debris.
3. Clean Sensor with a clean, lint free cloth as metal particles may adhere to the magnet and cause loss of signal. See Figure 9.4.

NOTE

If Sensor is damaged, replace with new part before continuing with adjustment. Contact an Authorized CUMMINS Dealer and order Part Number- 3078152, RPM Sensor Assembly.

4. Install Sensor into Bell Housing and turn in until Sensor just touches Flywheel then, turn out one (1) complete turn.

NOTE

On the CUMMINS engine, adjustment of the RPM Sensor is primarily for adjusting the clearance between Sensor and Flywheel. Specified Clearance is 1.5mm (.060"). See Figure 9.5.

5. Tighten jam nut enough to hold sensor in position.
6. Install Tachometer *(for confirmation purposes)*, start engine and verify engine "LO" Idle RPM is in specified range of 850 ~ 900 RPM.

NOTE

Refer to previous paragraph: **2. A. 1.**, which describes how to show the RPM display on Gauge Cluster. If engine RPM is not within Specifications, adjust using hand throttle knob, to acquire 850 ~ 900 RPM "Lo" Idle, for this test.

7. Set Volt/Ohm Meter to a VAC setting that will accommodate a reading of up to 10 VAC.
8. Attach leads from meter to Sensor Harness (Green & White) wire spades inside Harness Connector.
9. With engine running at "LO" Idle, record reading. Reading should be 1.5 VAC ~ 3.0 VAC.

NOTE

a) If reading is below 1.5 VAC, replace Sensor.
b) If reading is above 3.0 VAC, turn Sensor out no more than 1/2 turn to bring reading at or below 3.0 VAC.
c) Should more than 1/2 turn be required to bring reading at or below 3.0 VAC, replace Sensor.

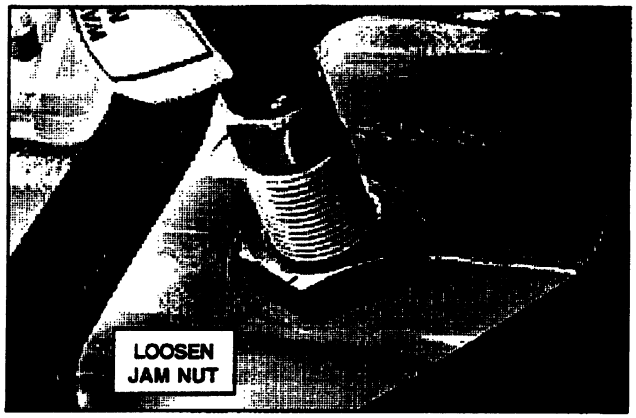


FIGURE 9.3

FIGURE 9.4

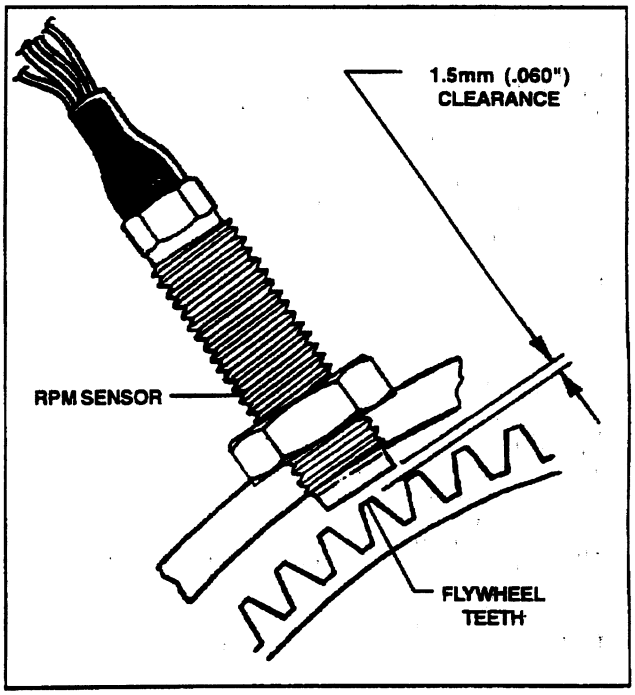


FIGURE 9.5

10. If reading is within the 1.5 ~ 3.0 VAC Specification, torque Sensor Jam Nut to 3.5kg ~ 5kg (25 ~ 35 ft lbs.).

CAUTION

Do not over tighten Sensor Jam Nut.
Over tightening will cause damage to the internal coils of the Sensor.

11. Move Throttle Control to "HI" Idle position and record reading from Volt/Ohm Meter. This reading should be 3.0 VAC ~ 6.0 VAC.
12. If reading in "HI" Idle is above 6.0 VAC, loosen Sensor Jam Nut and adjust Sensor OUT no more than 1/2 turn. If VAC reading is still above 6.0 VAC, replace Sensor.
13. Torque Sensor Jam Nut to 3.5kg ~ 5kg (25 ~ 35 ft lbs).
14. Turn engine "OFF", disconnect Volt/Ohm Meter, Tachometer and connect Sensor Harness (Green & White) to Main Wiring Harness.

WARNING

BE CAUTIOUS OF MOVING AND ROTATING PARTS WHILE PERFORMING RPM SENSOR TESTS AND ADJUSTMENT.
BE CAUTIOUS OF HOT SURFACES OF THE ENGINE.
WEAR PROTECTIVE CLOTHING, HARD HAT, SAFETY SHOES, GLOVES AND GOGGLES OR FACE SHIELD WHILE PERFORMING TESTS AND ADJUSTMENTS TO THE RPM SENSOR.

NOTE

The RPM Sensor Test & Adjustment Procedure is the same for **both** before Minor Change (~m/c), and after Minor Change (m/c~)machines. (SK150 ~ SK460 w/Cummins).

4. ADJUSTMENT "A" MECHATRONIC CONTROLLER SK150 / SK160LC IV M/C

Perform Mechatronics Adjustment "A" using the following procedure:

A. Conditions to use Adjustment "A"

Adjustment "A" procedures must be performed when one or more of the following components have been removed, repaired, adjusted or replaced.

1. Mechatronics Controller (CPU)
2. Stepping Motor Assembly
3. Linkage between Stepping Motor and Engine Fuel Pump Assembly.
4. Engine Fuel Pump Assembly.
5. Engine

B. Tools & Equipment Required

1. Special Adjustment Harness Assembly. KOBELCO Part Number– 2479Z2364.
2. General hand or power tools required for removal and replacement of components.

C. Machine Settings & Site Conditions

1. Attachment in Hydraulic Oil Check Position.
2. Verify engine RPM's in the following work modes and settings.
   a. H-Mode, S-Mode, FC-Mode, D-Mode with throttle in "Hi-Idle and "Low-Idle" positions.
   b. Decel RPM
   c. Low-Idle RPM
3. Engine Emergency Stop Knob completely "IN".
4. CPU Access Panel Removed.
5. Firm, level adjusting site.

D. Adjustment "A" – Part 1 Procedures

1. Move the machine to a smooth, level area to perform Adjustment "A".
2. Operate the attachment Controls until the arm, attachment and boom are in the Hydraulic Oil Check Position. See Figure 6.9A.
3. If throttle control is possible, verify RPM's as described above in C., step 2.
4. Push the engine Emergency Stop Knob all the way in. See Figure 6.10A.
5. Turn Switch key to "OFF". Wait approximately 4 seconds for electrical power to automatically turn off.
6. Remove mechatronic controller access cover. See Figure 6.11A.
7. Remove toggle switch grommet and carefully place the controller toggle switch in the "TEST" position. See Figure 6.12A.

MACHINE IN HYDRAULIC OIL CHECK POSITION

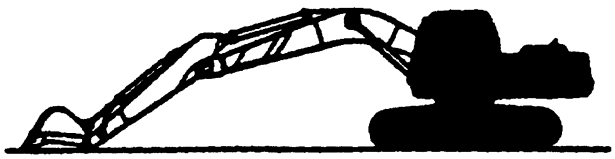


FIGURE 6.9A

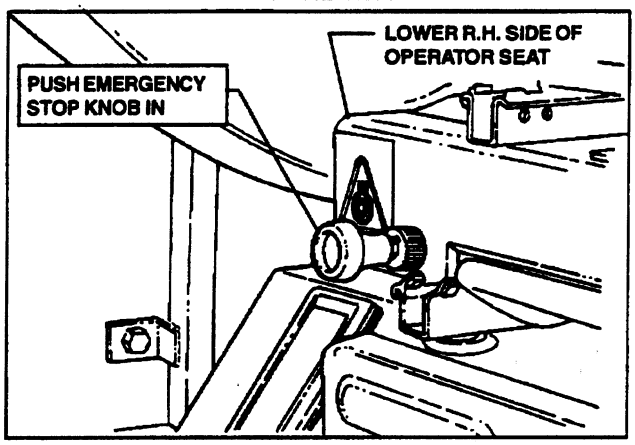


FIGURE 6.10A

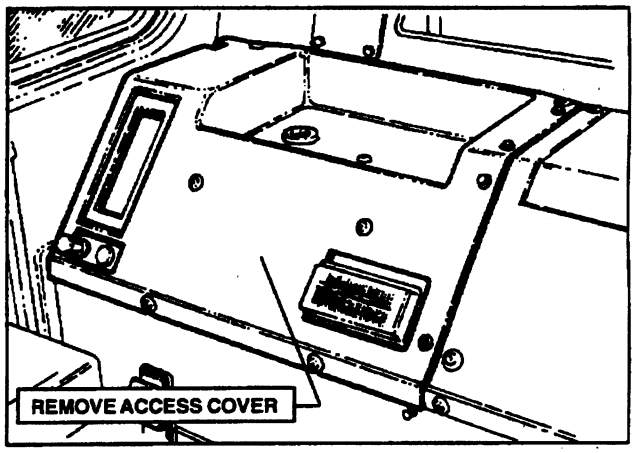


FIGURE 6.11A

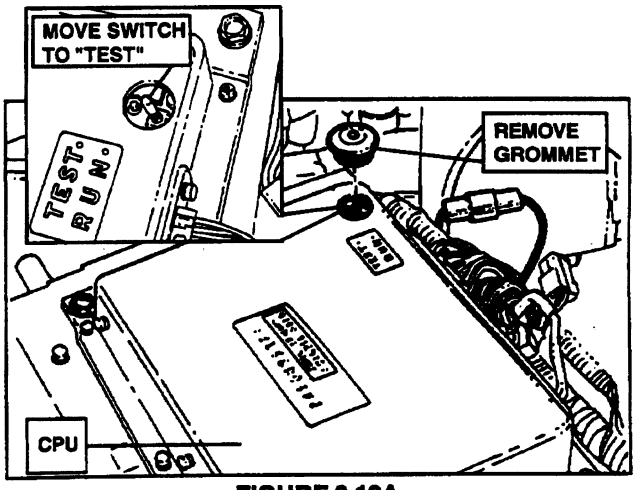


FIGURE 6.12A

CAUTION

Make certain electrical power is "OFF" before moving the controller "TEST-RUN" toggle switch. This will avoid possible damage to the Mechatronics controller and prevent loss of computer memory.

NOTE

When the Controller "TEST-RUN" Toggle Switch is placed in the "TEST" position, the Auto-Accel L.E.D. indicator light on the gauge cluster display will burn continuously as a reminder that the controller toggle switch is in the "TEST" position.

8. Locate the controller 1P (1 Pin) coupler and disconnect. Connect the KOBELCO Special Adjustment Harness Assembly to the 1P coupler. See Figure 6.13A.

9. Raise engine access cover and remove the Linkage Lever Arm from the stepping motor shaft. using a 5mm allen wrench. See Figure 6.14A.

10. Remove the Ball Joint end from the throttle governor lever arm. See Figure 6.15A.

11. Loosen the linkage jam nuts on the Adjustable Linkage and adjust until distance between linkage mounting holes is 184mm (7.25"), or 250mm (9.84"). ***Note: Both style linkage rods have been used.*** See Figure 6.16A. Finger tighten jam nuts and lay linkage aside.

NOTE

This is a temporary starting dimension. Final adjustment will be later in this procedure.

12. Make sure that "OK" and then "Clock Time" is shown on the gauge cluster display prior to performing Adjustment "A".

    <u>If any Service Function Icons are displayed, Adjustment "A"procedure will not be possible.</u>

    Resolve any Service problems relating to displayed Icons before attempting to perform Adjustment "A".

13. Make certain the CPU "TEST-RUN" switch is in the "TEST" position.

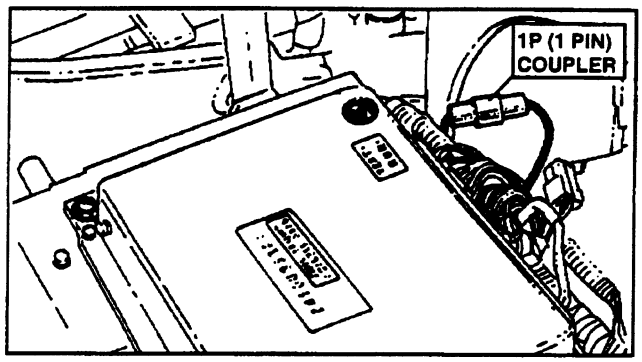


FIGURE 6.13A

FIGURE 6.14A

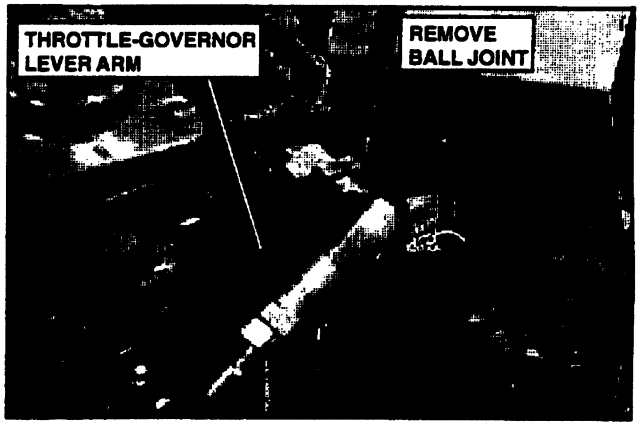


FIGURE 6.15A

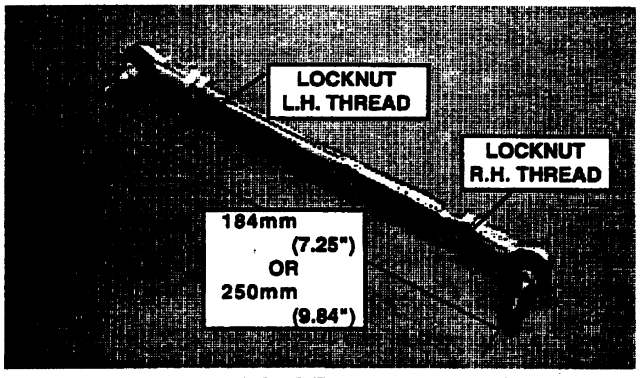


FIGURE 6.16A

14. Place the KPSS Mode Switch in the "H"-Mode. See Figure 6.17A.
15. Place the Auto-Accel Switch in the "ON" position. See Figure 6.18A.
16. Move the Throttle Control to "LO-IDLE" position. See Figure 6.17A.
17. Place Key switch in the "ON" position. Engine should not be running.

NOTE

The settings described in steps 13 through 17 must be exactly as described. Any other settings will not allow proper adjustment of the Mechatronics Controller.

18. Depress and hold the Special Adjustment Harness Switch 3 to 5 seconds until the Gauge Cluster Dis play Reads "CPU". Then release switch. See Figure 6.19A.

NOTE

"CPU" should remain on the display. If it doesn't, check conditions as described in steps 13-17 and repeat step 18. Make certain to hold the Special Adjustment Harness Switch 3 to 5 seconds.

NOTE

As soon as "CPU" is displayed and special adjustment harness switch is released, the stepping motor will move to the Low Idle position. If "CPU" goes off display, the procedure has failed. Check all settings ("LO"-IDLE adjustment and Stepping Motor) and start procedure over.

19. While holding the Governor Lever down against the Engine Low Idle position, locate the linkage lever arm onto the stepping motor splined shaft at approximately 10 o'clock position and secure the Ball Joint to the governor arm. See Figure 6.20A.

NOTE

The 10 o'clock position for the Linkage Lever Arm on the Stepping Motor Splines is a starting point. The position could vary from the 9 o'clock to 11 o'clock position. The linkage should have a small amount of slack when in position.

20. Slide the Linkage Lever Arm Lock on the splines until 1/16" to 1/8" of spline is visible. Tighten the Socket Head Screw, securing the lever arm to stepping motor shaft and tighten jam nuts on rod linkage

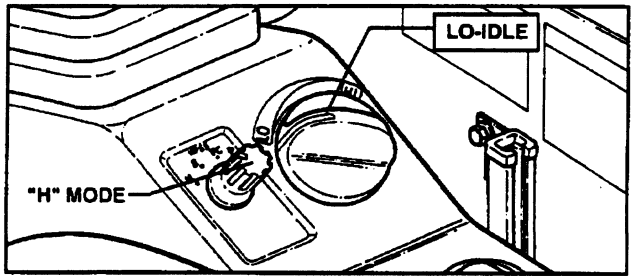


FIGURE 6.17A

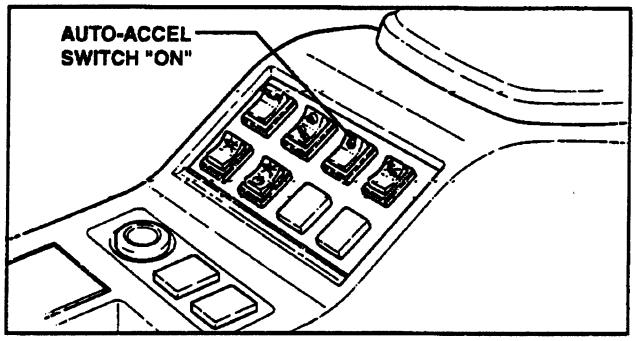


FIGURE 6.18A

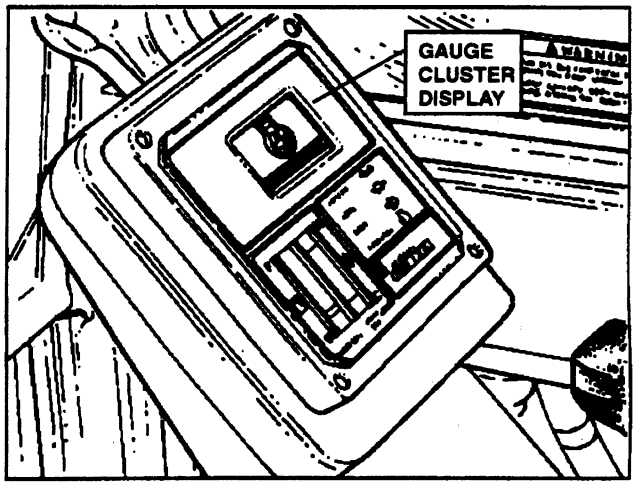


FIGURE 6.19A

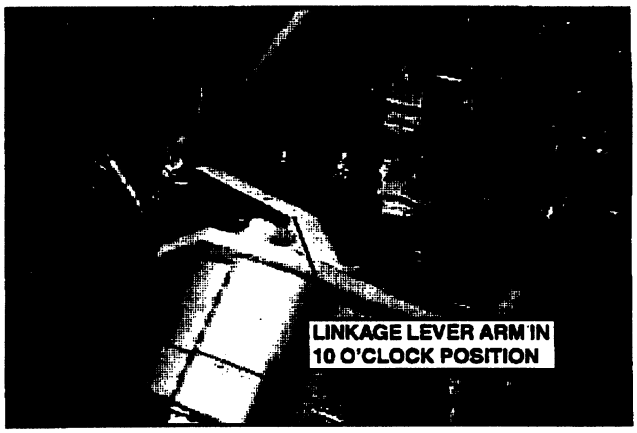


FIGURE 6.20A

21. Depress the Special Adjustment Harness Switch once. This will cause the CPU to turn power to the stepping motor off.
22. Manually rotate the stepping motor shaft until the governor lever is 0.25mm (.010") ~ 0.5mm (.020") from the Hi-Idle Stop Set Bolt. Hold in position and depress the Special Adjustment Harness Switch once to lockstepping motor in position (you will feel the stepping motor lock into position). See Figure 6.21A.

NOTE

The 0.25mm (.010") ~ 0.5mm (.020") gap between the governor lever and the Hi-Idle Stop Set Screw must be maintained. If there is no gap or gap is too small, the CPU will not complete the indexing phase and the procedure will fail. ***See directions at right.*** →

CAUTION

Never attempt to manually rotate stepping motor shaft or move linkage once the stepping motor has been locked in position as described in step 22.

23. After proper gap has been obtained, depress the Special Adjustment Harness switch once. This will cause the Stepping Motor to index from its high position back down to the low position and then CPU will program this setting in the memory. ***Do not turn key or power "OFF" proceed to Part 2 of the procedure.***

NOTE

The stepping motor will cycle to the engine stop position and back to engine start position. Also "CPU" will leave the display. If "CPU" fails to index, restart the procedure from the beginning.

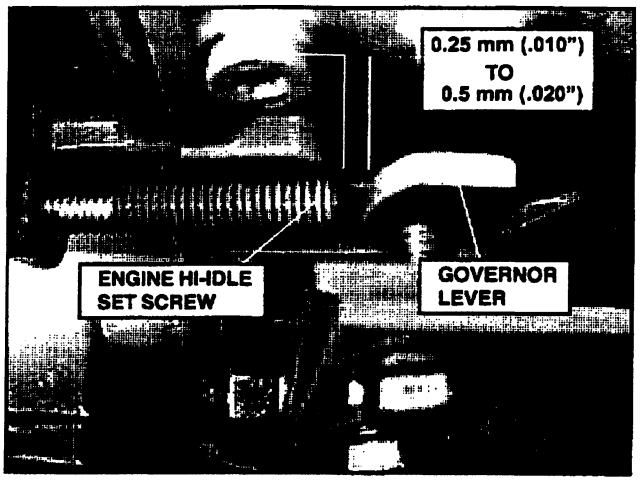


FIGURE 6.21A

How to Adjust Gap

Follow instructions below to adjust gap between governor lever and "Hi-Idle" Stop Set Bolt to 0.25~0.5mm (.010" ~.020") using the Auto-Accel and Buzzer Stop Switches. See Figure 6.23A.

1. **Auto-Accel Switch "ON"**
   a. Each push of the Buzzer Stop Switch will *decrease* the gap between the Governor Lever and the "Hi-Idle" Stop Set Bolt by approximately 0.04mm (.001").
2. **Auto-Accel Switch "OFF"**
   a. Each push of the Buzzer Stop Switch will *increase* the gap between the Governor Lever and the "Hi-Idle" Stop Set Bolt by approximately 0.04mm (.001").

Once proper clearance has been obtained, refer to step 23.

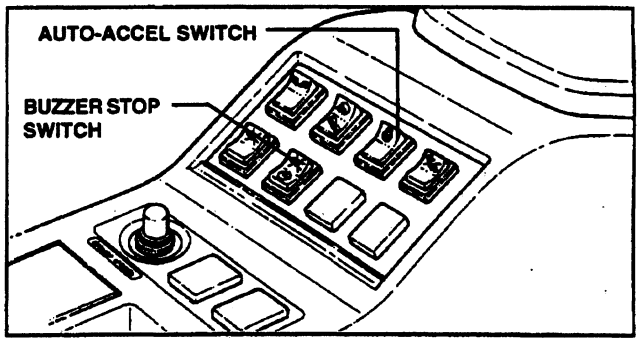


FIGURE 6.23A

E. Adjustment "A"– Part 2

1. Start Engine and allow to run at idle until engine is at normal operating temperature. Use attachment relief if necessary to heat engine.
2. Place KPSS Mode Switch in "H"- Mode.
3. Place Auto-Accel Switch in "OFF" position.
4. Throttle Control in Lo-Idle position.
5. Key switch "ON" with Engine running.

NOTE

The machine settings must be exactly as described in steps 1 through 5. Any other settings will not allow success of Adjustment "A"– Part 2.

6. After machine settings are as described in steps 1-5, depress and hold the Special Adjustment Harness Switch for 3 to 5 seconds until "CPU" is visible on display.
7. After "CPU" is on display and the switch is released, the CPU will gradually cycle the stepping motor from below Lo-Idle to Hi-Idle. This programs the CPU to all stepping motor positions and will take 3 to 5 minutes.

NOTE

If governor lever touches the "HI"-Idle Set Screw during this cycle, the procedure has failed. Adjust the gap between the governor lever and the "HI"-Idle set screw and repeat procedure "A". Refer to Page 10.

8. After this process is complete, the stepping motor will immediately return to the Lo-Idle position and "CPU" will leave the display.
9. Turn key switch to "OFF" and wait approximately 4 second for electrical power to automatically turn off.
10. Remove the Special Adjustment Harness from the 1P coupler and connect coupler together. See Figure 6.22A.
11. Move CPU "TEST-RUN" Switch to "RUN" position and replace the grommet. See Figure 6.23A.
12. Start Engine and verify Engine RPM's according to engine specifications in Section I.
13. Install CPU Access Panel. See Figure 6.24A.

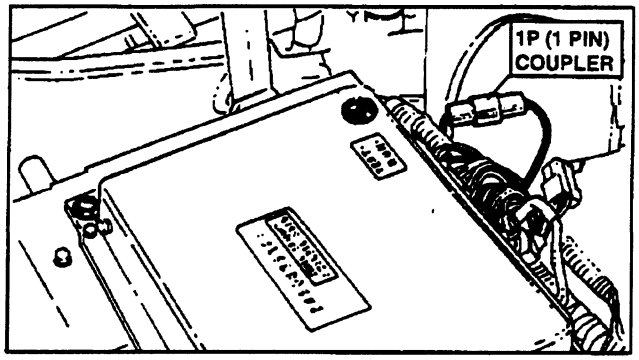


FIGURE 6.22A

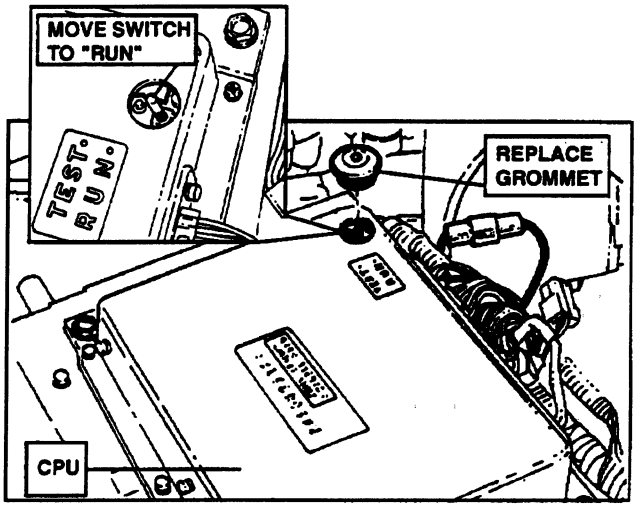


FIGURE 6.23A

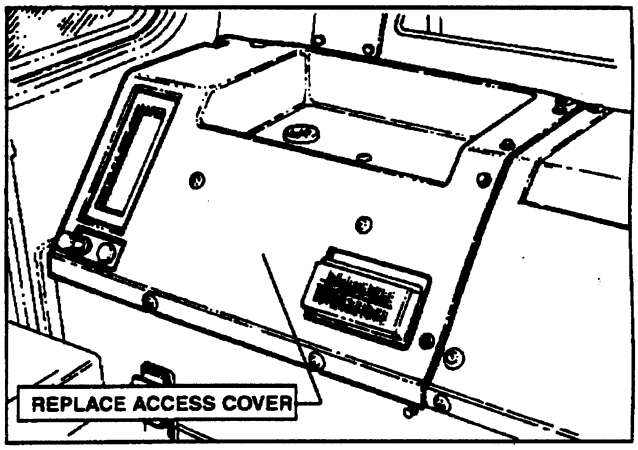


FIGURE 6.24A

5. ADJUSTMENT "B"– VARIABLE LOADING MODE MECHATRONIC CONTROLLER

NOTE

If Machine is not equipped with Variable Loading Mode, adjustment "B" is not necessary.

A. Conditions to use Adjustment "B"

Adjustment "B" procedures must be performed when one or more of the following components have been removed, repaired, adjusted or replaced.

1. Mechatronics Controller (CPU).
2. Variable Loading Mode Components.

B. Tools & Equipment Required

1. Special Adjustment Harness Assembly. KOBELCO Part Number– 2479Z2364.
2. General hand or power tools required for removal and replacement of components.
3. 105kg/cm² (1500psi) Pressure Gauge.

C. Machine Settings & Site Conditions

1. Hydraulic oil at 45°C to 55°C (113°F to 131°F).
2. 105kg/cm² (1500psi) Pressure Gauge installed.
3. CPU Access Panel Removed.
4. CPU "TEST-RUN" Switch in "TEST" position.
5. Firm, level adjusting site.

D. Adjustment "B" Procedures

1. Move the machine to a smooth, level area to perform Adjustment "B".
2. Operate the attachment Controls until the arm, attachment and boom are in the Hydraulic Oil Check Position. See Figure 6.25.
3. Turn Engine "OFF".
4. Release hydraulic tank pressure by removing cap from pressure relief valve and depressing relief valve stem. See Figure 6.26.
5. Remove Test Port Plug from Flow Distribution Solenoid Valve. See Figure 6.27.
6. Install fitting and 105kg/cm² (1500psi) pressure gauge into test port. See Figure 6.27.

⚠	**CAUTION**	⚠
Oil may be hot. Wear approved safety equipment when performing any maintenance or test procedures.		

MACHINE IN HYDRAULIC OIL CHECK POSITION

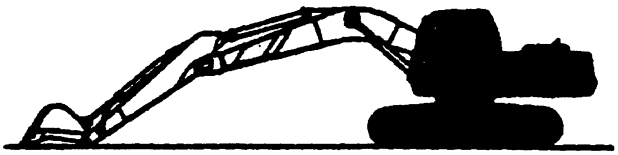


FIGURE 6.25

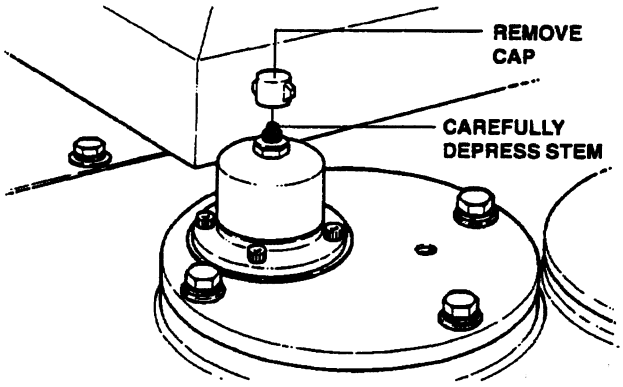


FIGURE 6.26

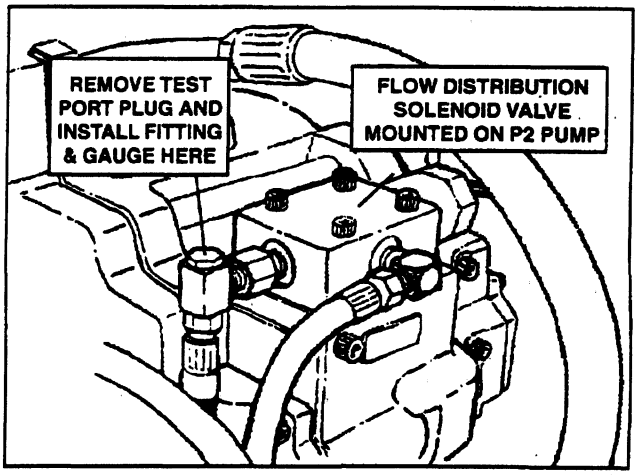


FIGURE 6.27

7. With key switch and electrical power "OFF", remove the CPU access Panel behind the operator seat. See Figure 6.28.
8. Locate and disconnect CPU 1P (1Pin) coupler. Connect Special Adjustment Harness to 1P coupler. See Figure 6.29.
9. Remove CPU grommet and carefully place CPU "TEST-RUN" Switch in the "TEST" position.

⚠ CAUTION ⚠

Never attempt to change position of the CPU "TEST-RUN" Switch with key switch or electrical power on.

10. Place KPSS Mode Switch to S-Mode.
11. Place Auto-Accel Switch to "OFF".
12. Start Engine.
13. Place Throttle Control in "HI-IDLE" position.
14. Depress the Special Adjustment Harness Switch and hold for 3 to 5 seconds until "CPU" is visible on display.

NOTE

"CPU" should remain on display. If it doesn't, check steps 9 through 13 and repeat step 14.
Conditions must be exactly as described in steps 9-14. Different conditions will not allow success of Adjustment "B" procedures.

15. Turn the Variable Loading Mode Switch counterclockwise to the left most setting. See Figure 6.30.
16. Operate BOOM UP Control until boom is completely up. Hold control in this position. See Figure 6.31.
17. While holding BOOM UP Control in the up position, adjust the Variable Loading Mode Switch clockwise until the pressure gauge reaches the pressure specified in chart for model being adjusted.

MODEL	UPPER LIMIT PRESSURE
SK150 / SK160LC	15~17 kg/cm² (213~241 psi)

Unit: kgf/cm² (psi)

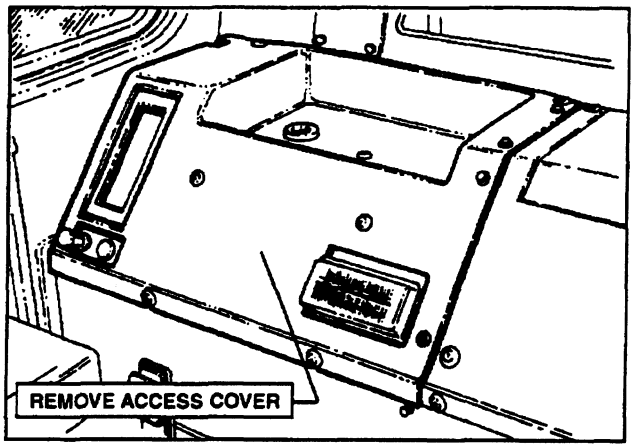


FIGURE 6.28

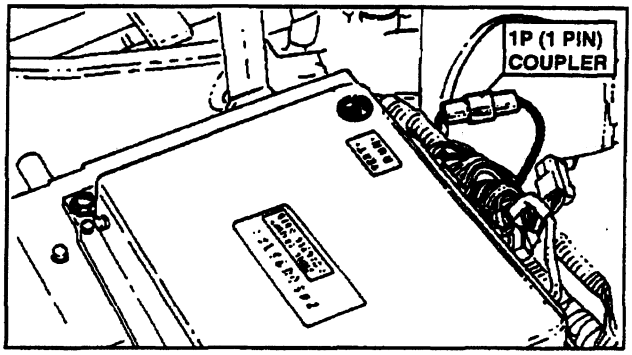


FIGURE 6.29

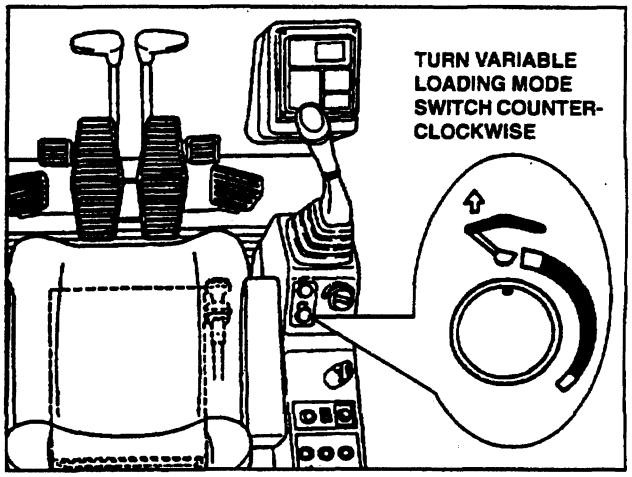
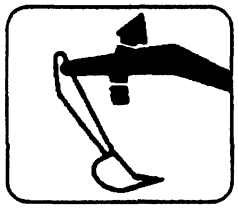


FIGURE 6.30



HOLD CONTROL IN
BOOM UP POSITION

FIGURE 6.31

18. When the proper pressure is reached, stop adjustment of the Variable Loading Mode Switch and depress the Special Adjustment Harness Switch once. This will program the CPU to the Upper Limit setting.
19. Release the BOOM UP Control.
20. Return the Variable Loading Mode Switch back to the Left Limit by turning switch counter-clockwise. See Figure 6.32.
21. Operate the BOOM UP Control and hold.
22. Adjust the Variable Loading Mode Switch until the pressure gauge reaches pressure specified in chart for model being adjusted.

MODEL	LOWER LIMIT PRESSURE
SK150 / SK160LC	10~12 kgf/cm² (142~170 psi)

Unit: kgf/cm² (psi)

23. When the proper pressure is reached, stop adjustment of the Variable Loading Mode Switch and depress the Special Adjustment Harness Switch once. This will program the CPU to the Lower Limit setting.

NOTE

After step 23 is complete, "CPU" will automatically leave the display signaling that Adjustment "B" is complete.

24. After "CPU" has left the display, turn key switch to "OFF" stopping the engine and wait approximately 4 seconds for electrical power to automatically go off.
25. Remove the Special Adjustment Harness from the 1P coupler and connect 1P coupler together. See Figure 6.33.
26. Move the CPU "TEST-RUN" Switch in the "RUN" position and replace grommet. See Figure 6.34.
27. Install CPU Access Cover.
28. Remove pressure gauge and fitting. Replace Test Port Plug.
29. Confirm proper operation of machine.

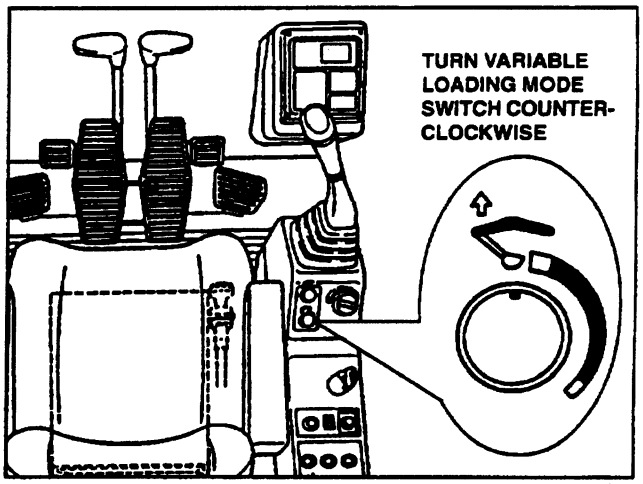


FIGURE 6.32

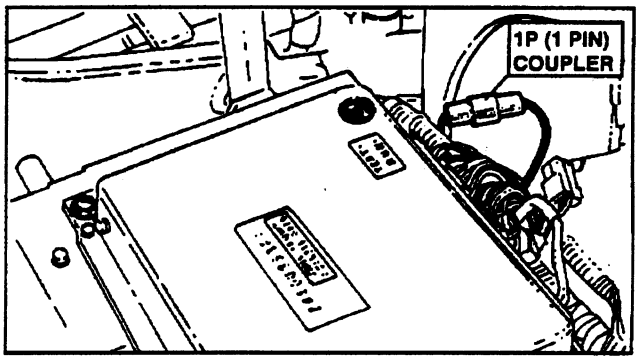


FIGURE 6.33

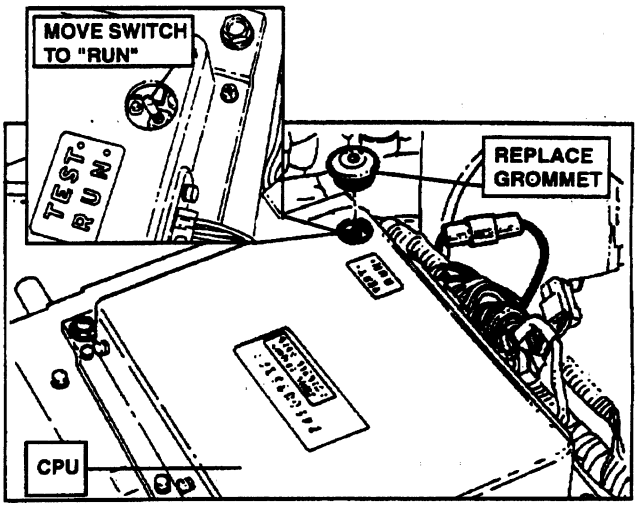


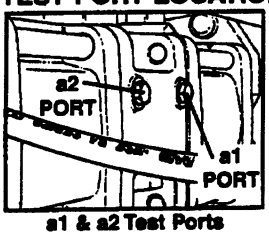
FIGURE 6.34

Measuring & Adjusting Pressures- SK150 / SK160 M/C

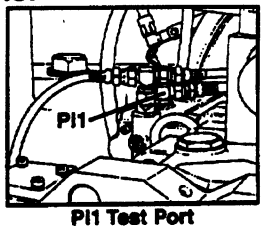
INSPECTION ITEM			PRESSURE READING FROM			PRESSURE SPECIFICATION		Adjustment Point	MEASURING CONDITION, FUNCTION
STANDARDS FOR TESTING	Cleanliness of Hydraulic Oil		Hydraulic Oil Tank			Class: NAS 7-9		N/A	Take Sample
	Temperature of Hydraulic Oil		Hydraulic Oil Tank Surface			°C- 45~55	°F- 113~131	N/A	Ambient Temperature -10°C ~ 50°C (14°F ~ 122°F)
	Engine Coolant Temperature		Radiator Surface			°C- 60~90	°F- 140~194	N/A	
	ENG RPM	Low Idle	Gauge Cluster Display or Externally Mounted Tachometer			850~900 RPM		RPM Sensor Adjustment and/or Mechatronics Adjustment "A"	Throttle @ "LO"- Idle
		Hi- Idle				2365~2400RPM			Throttle @ "HI"- Idle
		"S" or "D" Mode				1850~2050 RPM			Throttle @ "HI"- Idle
		"FC" Mode				1550~1650 RPM			Throttle @ "HI"- Idle
		Auto Accel-Decel "ON"				1000~1100 RPM			Throttle @ "HI"- Idle
SYSTEM	COMPONENT		GAUGE @	SIZE	PORT	Kgf/cm²	PSI		
PILOT CIRCUIT	PRIMARY PRESSURE		Gear Pump	PF 1/4	P3	47~53	670~750	PR1	"H"-Mode, Eng/ Hi Idle
MAIN RELIEFS	TRAVEL	RH	Main Pump	PF 1/4	a1	350~355	4980~5050	TR1	"H"-Mode, Engine at Hi Idle. Simultaneous LH/RH Operation Travel Stalled.
		LH			a2	350~355	4980~5050	TR2	
	ATTACHMENT	RH	Main Pump	PF 1/4	a1	300~305	4270~4340	MR1	Bucket Digging
		LH			a2	300~305	4270~4340	MR2	Boom Raising
PORT RELIEFS	BUCKET (DO NOT ADJUST)	ROD	Main Pump	PF 1/4	a1	330~340	4700~4835	RV8	Bucket Dump
		HEAD			a2	330~340	4700~4835	RV7	Bucket Digging
	BOOM (DO NOT ADJUST)	ROD	Main Pump	PF 1/4	a1	330~340	4700~4835	RV6	Boom Lowering
		HEAD			a2	330~340	4700~4835	RV5	Boom Raising
	ARM (DO NOT ADJUST)	ROD	Main Pump	PF 1/4	a1	330~340	4700~4835	RV10	Arm Out (Cylinder IN)
		HEAD			a2	330~340	4700~4835	RV9	Arm In (Cylinder OUT)
	TRAVEL (DO NOT ADJUST)	RH F	Main Pump	PF 1/4	a1	360~370	5120~5260	RV14	"H"-Mode, Engine at Hi Idle. Simultaneous LH/RH Travel Engaged
		RH R			a1	360~370	5120~5260	RV13	
		LH F			a2	360~370	5120~5260	RV13	"H"-Mode, Engine at Hi Idle. Simultaneous LH/RH Travel Engaged
		LH R			a2	360~370	5120~5260	RV14	
	SWING	RH	Main Pump	PF 1/4	a2	235~295	3340~4200	RV11	Bucket Lock, Stall Swing
		LH			a2	235~295	3340~4200	RV12	Bucket Lock, Stall Swing
VARIABLE LOADING MODE (OPTION)	LOADING MODE SWITCH	Upper	Flow Distribution Solenoid Valve	PF 1/4		17~18	242~256	CPU ADJ "B"	"S"Mode, Eng in "HI" Idle
		Lower				11.5~12.5	163.6~177.8		"S"Mode, Eng in "HI" Idle
LOW PRESSURE RELIEFS	INDEPENDENT "D" MODE- OFF	RH	Main Pump	PF 1/4	a1	32~47	455~668	Internal Shims	"H" Mode, Eng in "HI" Idle
		LH			a2	32~47	455~668		Controls in Neutral
	INDEPENDENT "D" MODE- ON	RH	Main Pump	PF 1/4	a1	0~7	0~100	Internal Shims	"D" Mode, Eng in "HI" Idle
		LH			a2	0~7	0~100		Controls in Neutral
NEGATIVE CONTROL PRESSURES	INDEPENDENT "D" MODE- OFF	RH	Main Pump	PF 1/4	Pi1	32~47	455~668	Low Pressure Relief Valves	"H" Mode, Eng in "HI" Idle
		LH			Pi2	32~47	455~668		Controls in Neutral
	INDEPENDENT "D" MODE- ON	RH	Main Pump	PF 1/4	Pi1	28~38	398~540		"D" Mode, Eng in "HI" Idle
		LH			Pi2	28~38	398~540		Controls in Neutral
PROPORTIONAL SOLENOID VALVE	KPSS	H•S•FC•D	Main Pump	PF 1/4	a3	0~3	0~43	Pf Solenoid Valve	Engine in "HI" Idle Controls in Neutral
		Release			a3	5.2~10.2	74~145		

(4/97)

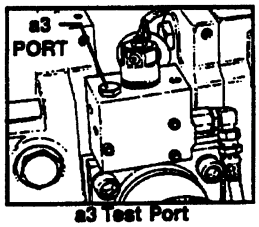
TEST PORT LOCATIONS:



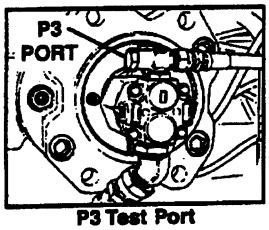
a1 & a2 Test Ports on Main Pumps



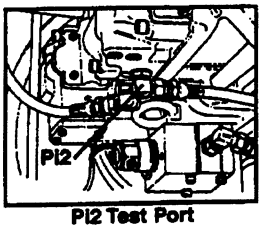
PI1 Test Port on P1 Regulator



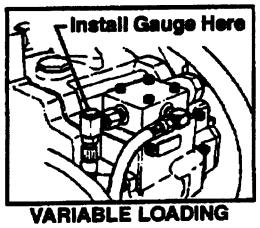
a3 Test Port on Pf Solenoid



P3 Test Port on Pilot Gear Pump



PI2 Test Port on P2 Regulator



VARIABLE LOADING MODE (OPTION)

NOTE

Take Measurements In "H" Mode unless otherwise specified.

The standard tolerance shall be an allowable range in field measurements.

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: July 1997

BULLETIN: HE-312

IMPORTANT NOTE:
This Bulletin is being issued to document new adjustment procedures for the subject & affected "Minor Change" machines listed below. It provides the revised performance specifications now used on these units as well. It is suggested to place copies of this Bulletin in the pertinent Mark IV Shop Manuals, and your Mark IV Serviceman's Handbook, for future reference. ***To Kobelco Dealers: Please copy and distribute to your Service Technicians, as necessary for this purpose.***

SUBJECT: "Minor Change" Performance Specifications

AFFECTED MACHINES: SK200 (LC) IV ~ SK210 (LC) IV - YNU-0501 ~...YQU-3101 ~
SK220 (LC) IV ~ SK250 (LC) IV - LLU-1801 ~....LLU-5105 ~
SK270 LC IV - LBU-0201 ~

Please be advised that the subject machines are equipped with the new "emissionized" Cummins 6 BT & 6 BTA engines, which incorporate different fuel injection pumps and waste-gated turbochargers. These units require different KPSS controllers[1], stepping motor throttle linkage, engine RPM settings[2], and Adjustment "A" procedures.

Because of these changes, use care when referring to the previously published specifications for engine R.P.M., or Adjustment "A", as shown in the existing MK IV Shop Manuals and MK IV Serviceman's Handbook.

SK200(LC) IV ~ SK270LC IV units prior to the s/n's listed above, were equipped with "non-emissionized" Cummins 6 BT & 6 BTA engines; refer to Service Bulletin HE-266.

Be sure to check the serial number of the machine you are working on, and refer to the proper specifications. "Minor change" specifications are different from the earlier machines !

PLEASE NOTE

This bulletin details the following "pre-checks" to be made prior to performing the Mechatronics Adjustment "A" procedure:

- ***A. Engine Low Idle Speed***
- ***B. Engine High Idle Speed***
- ***C. Fuel Shut-off Solenoid Rod***
- ***D. Emergency Stop Cable***
- ***E. RPM Sensor Test***

Follow the instructions given in the "pre-checks" to help achieve a successful Adjustment "A" procedure. Failure to follow these instructions can result in poor engine or machine performance, and possible failure of Adjustment "A".

[1] Refer to Service Bulletin HE-310.

[2] Refer to Service Bulletin HE-309A.

These machines have various other changes to their features and equipment, that is further detailed in Service Bulletin HE-308.

THIS BULLETIN IS BEING ISSUED FOR INFORMATION ONLY, AND IS NOT AN AUTHORIZATION FOR ANY REPLACEMENT OR WARRANTY CLAIM SUBMITTAL.

1. **PRE-CHECKS TO BE MADE PRIOR TO PERFORMING ADJUSTMENT "A" PROCEDURE**
   SK200 IV ~ SK270 IV M/C (Cummins Engine)
   (Minor change machines.)

All items listed below are described in detail on the following referenced pages, and should be checked and confirmed prior to performing Adjustment "A".

NOTE

Engine must be at operating temperature **before** making the following pre-checks, or performing the Adjustment "A" procedure !

A. Engine Low Idle Speed

1. The proper engine low idle speed is critical to a successful Adjustment "A" procedure.
2. Confirm this speed prior to performing Adjustment "A".
3. *Particularly, if the injection pump has been replaced or rebuilt, the low idle speed must be checked and confirmed.*
4. **An incorrect low idle speed can cause Adjustment "A" to fail.**
5. Refer to Low Idle Speed Adjustment on page 3.

NOTE

The Low Idle Speed must be confirmed as per the following instructions **prior** to starting Adjustment "A". Once Adjustment "A" is completed, the Low Idle Speed should then match the specifications given in the tables on pages 15~17.

B. Engine High Idle Speed

1. The proper engine High Idle Speed is also critical to a successful Adjustment "A" procedure.
2. Confirm this speed prior to performing Adjustment "A".
3. *Particularly, if the injection pump has been replaced or rebuilt, the High Idle Speed must be checked and confirmed.*
4. **An incorrect High Idle Speed can cause Adjustment "A" to fail.**
5. Refer to Low Idle Speed Adjustment on page 3. *The High Idle Speed check is described at the end of that procedure.*

NOTE

The High Idle Speed must be confirmed as per the following instructions **prior** to starting Adjustment "A". Once Adjustment "A" is completed, the High Idle Speed should then match the specifications given in the tables on pages 15~17.

C. Fuel Shut-Off Solenoid Rod

1. Proper adjustment of the Fuel Shut-Off Solenoid Rod is critical to a successful Adjustment "A" procedure.
2. Confirm this adjustment prior to performing Adjustment "A".
3. *Particularly, if the injection pump has been replaced or rebuilt, this must be checked and confirmed.*
4. **Improper Fuel Shut-Off Rod adjustment can cause Engine Surging or Low Power.**
5. Refer to note on this subject in Low Idle Speed Adjustment on page 3. *Details of the Fuel Shut-Off Solenoid check are described at the end of that procedure.*

D. Emergency Stop Cable

1. Confirm adjustment of Emergency Stop Cable prior to performing Adjustment"A" procedure.
2. **Improper Stop Cable adjustment can cause Engine Surging or Low Power.**
3. Refer to note on this subject in Low Idle Speed Adjustment on page 3. *The Emergency Stop Cable check is described at the end of that procedure.*

E. RPM Sensor Test

1. Proper adjustment of the RPM Sensor is critical to a successful Adjustment "A" procedure.
2. **Improper adjustment can cause:**
   a. Adjustment "A" to fail.
   b. KPSS Pf pressure to be improper.
   c. Poor Hydraulic System performance.
3. Refer to RPM Sensor Test & Adjustment on page 4.

NOTE

The RPM Sensor Test & Adjustment Procedure is the same for **both** before Minor Change (~m/c), and after Minor Change (m/c~)machines. (SK150 ~ SK460 w/Cummins).

2. LOW IDLE SPEED ADJUSTMENT

NOTE

This adjustment must be made with the linkage rod removed from between the stepping motor and the governor lever arm of fuel pump. Refer to page 8.

A. LOW IDLE ADJUSTMENT PROCEDURES

1. Start the engine, with throttle in "LO" position. Depress the Buzzer Stop Switch five (5) times to show the RPM display is on the Gauge Cluster. See Figure A. *(Note: Controller "TEST-RUN" toggle switch should be in "RUN" position at this time.)*
2. With a 19mm wrench, loosen the locknut on the Bumper Spring Screw and back the Bumper Spring Screw and back the Bumper Spring Screw out with a flat blade screwdriver, until no drop in engine RPM is realized. See Figure B.
3. If RPM reads 760~775 RPM, the LO-IDLE SPEED SCREW is set correctly, and you should proceed to **Step 5** to reset the Bumper Spring Screw. *(If RPM **does not read** 760 ~ 775 RPM, proceed with **Steps 4 and 5** to set the LO IDLE SPEED SCREW and Bumper Spring Screw.)*
4. With a 10mm wrench, loosen the locknut on the LO-IDLE SPEED SCREW and adjust screw with a flat blade screwdriver until engine RPM is 760~775. Tighten locknut. See Figure C.
5. Using a flat blade screwdriver, turn the Bumper Spring Screw clockwise (IN) until the engine RPM increases 25~ 40 RPM (800 ~ 815 RPM) and tighten the locknut. See Figure B. **DO NOT RE-ADJUST THE LO-IDLE SPEED SCREW.**
6. Manually (with Linkage disconnected), check the "HI"–IDLE RPM. Minimum speed should be 2,400+ RPM. This speed is necessary for Adjustment "A" to be performed successfully. ***(Note: This is not the final No-Load Speed.)***

NOTE

With key switch "ON", check the Fuel Shut-Off Solenoid Rod to insure that it is in the full retract position. Check to insure the Emergency Stop Cable is loose or has some slack. Failure to check these could result in Engine Surging or low power. *(Note: Coil is energized (retracted) for "RUN" position)*

7. Perform the RPM Sensor tests beginning on page 4, then proceed to the Mechatronic Adjustment "A" Procedure beginning on page 7.

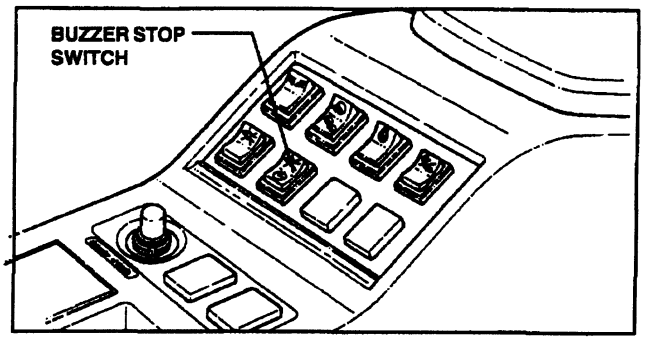


FIGURE A

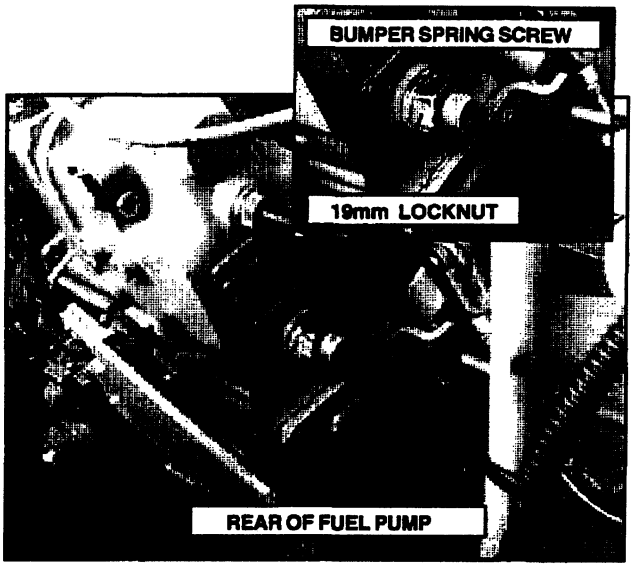


FIGURE B

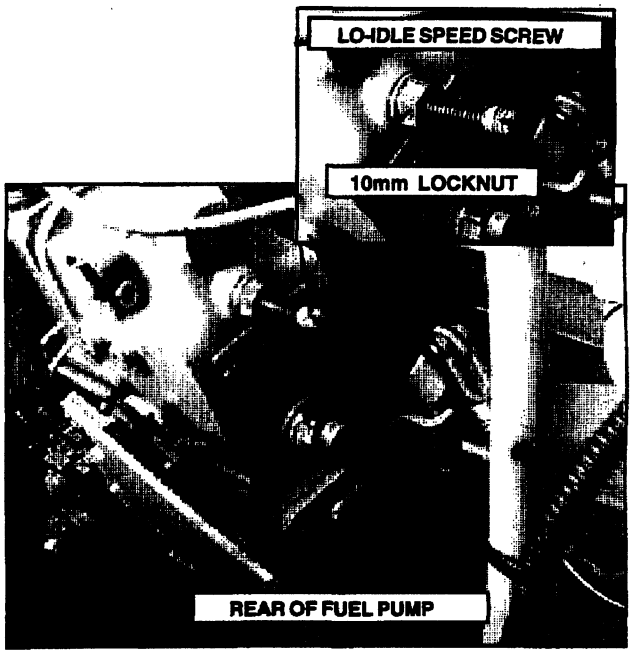


FIGURE C

3. RPM SENSOR TEST & ADJUSTMENT

Confirm tachometer accuracy and KPSS performance by performing the following RPM Sensor procedures.

A. Tools & Equipment Required

1. Volt/Ohm Meter
2. Tachometer *(for confirmation only)*
3. 1-1/8" SAE Spanner Wrench
4. 1-1/8" SAE Spanner Torque Wrench
5. KOBELCO RPM Sensor Test Harness, Part Number KSP9000-0003.

B. Machine Settings & Site Conditions

1. Engine "OFF" (Not Running)
2. Tachometer installed on machine.
3. RPM Sensor Harness (Green & White wires) disconnected.

C. Sensor Resistance Test

1. With engine "OFF" and sensor harness (Green & White wires) disconnected, connect the KOBELCO RPM Sensor Test Harness to the RPM Sensor Harness. See Figure 9.1.
2. Connect leads to meter and set meter to the 4K OHMS Position. See Figure 9.2.
3. Connect leads from meter to the Test Harness Leads, and record reading from meter. See Figure 9.2A.
4. Remove cap from the Red & Black wire harness, attach test harness, connect leads from meter to Test Harness and record reading. See Figure 9.2A.
5. Compare readings to chart below.

SENSOR HARNESS	RESISTANCE SPECIFICATION
GREEN & WHITE	0.890 ± 10%
BLACK & RED	1.340 ± 10%

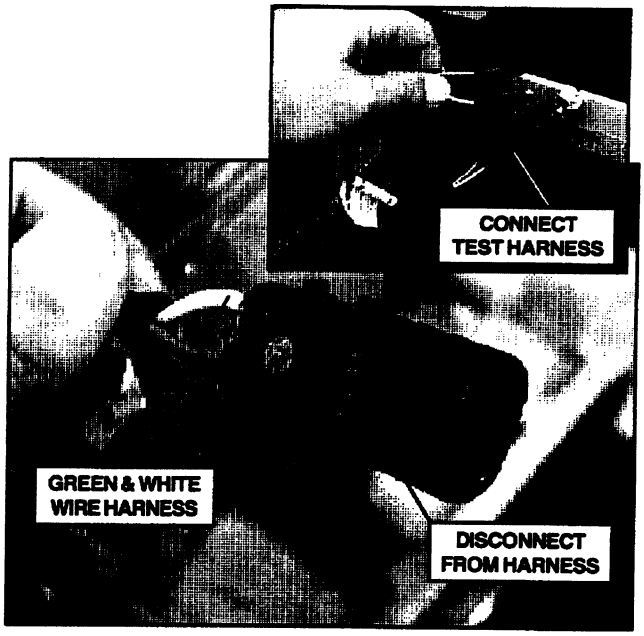


FIGURE 9.1

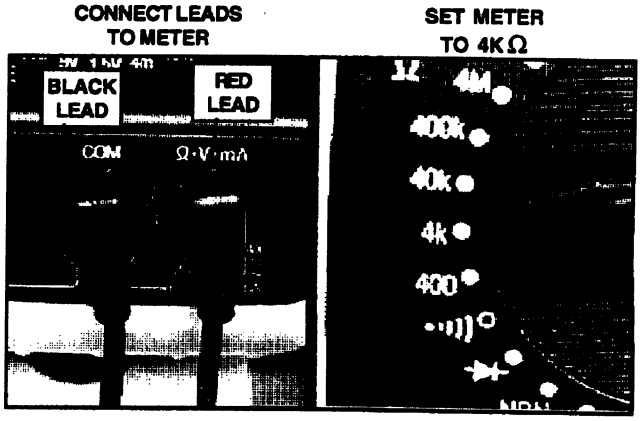


FIGURE 9.2

6. If reading of the Green & White wire Harness exceeds the given tolerance, the Black & Red wire harness can be temporarily used until a new RPM Sensor can be obtained and installed. If both Harnesses exceed the given tolerance, replace RPM Sensor before proceeding with any further adjustment, tests, or operation of the machine.

NOTE

Contact an Authorized CUMMINS Dealer and Order Part Number– 3078152 RPM Sensor Assembly.
(This Sensor is used on the SK150 ~ SK460 w/Cummins.)

7. Should the resistance readings be within the given tolerance, proceed to Sensor Adjustment Procedures.

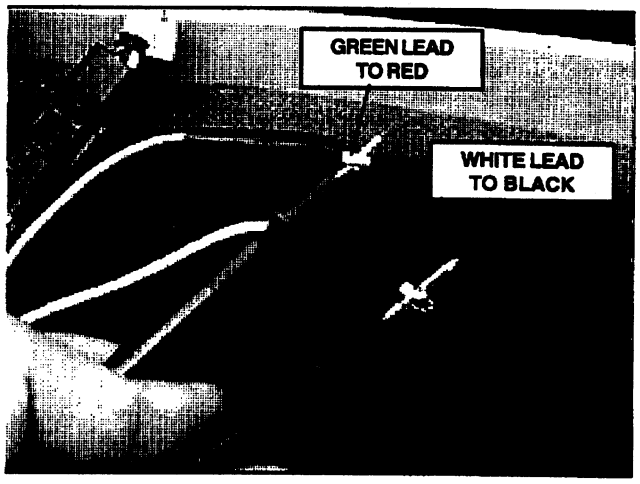


FIGURE 9.2A

D. RPM Sensor Adjustment Procedures

1. Loosen RPM Sensor Jam Nut and remove Sensor from Bell Housing. See Figure 9.3.
2. Inspect Sensor Face for damage or scarring from flywheel or other debris.
3. Clean Sensor with a clean, lint free cloth as metal particles may adhere to the magnet and cause loss of signal. See Figure 9.4.

NOTE

If Sensor is damaged, replace with new part before continuing with adjustment. Contact an Authorized CUMMINS Dealer and order Part Number- 3078152, RPM Sensor Assembly.

4. Install Sensor into Bell Housing and turn in until Sensor just touches Flywheel then, turn out one (1) complete turn.

NOTE

On the CUMMINS engine, adjustment of the RPM Sensor is primarily for adjusting the clearance between Sensor and Flywheel. Specified Clearance is 1.5mm (.060"). See Figure 9.5.

5. Tighten jam nut enough to hold sensor in position.
6. Install Tachometer *(for confirmation purposes)*, start engine and verify engine "LO" Idle RPM is in specified range of 850 ~ 900 RPM.

NOTE

Refer to previous paragraph: **2. A. 1.**, which describes how to show the RPM display on Gauge Cluster. If engine RPM is not within Specifications, adjust using hand throttle knob, to acquire 850 ~ 900 RPM "Lo" Idle, for this test.

7. Set Volt/Ohm Meter to a VAC setting that will accommodate a reading of up to 10 VAC.
8. Attach leads from meter to Sensor Harness (Green & White) wire spades inside Harness Connector.
9. With engine running at "LO" Idle, record reading. Reading should be 1.5 VAC ~ 3.0 VAC.

NOTE

a) If reading is below 1.5 VAC, replace Sensor.
b) If reading is above 3.0 VAC, turn Sensor out no more than 1/2 turn to bring reading at or below 3.0 VAC.
c) Should more than 1/2 turn be required to bring reading at or below 3.0 VAC, replace Sensor.

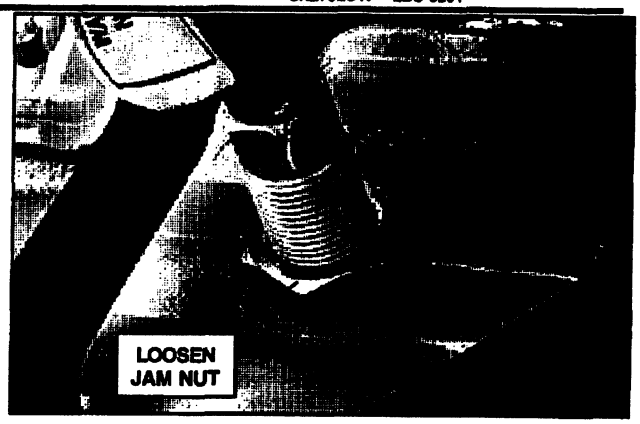


FIGURE 9.3

FIGURE 9.4

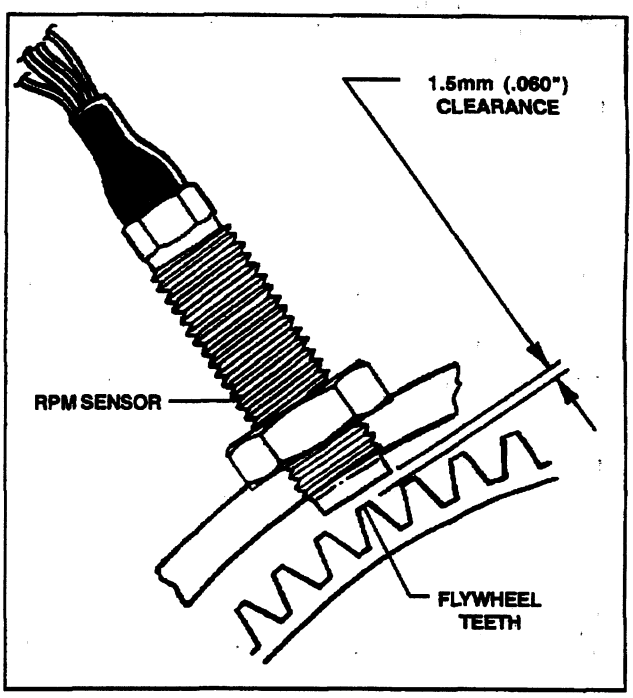


FIGURE 9.5

10. If reading is within the 1.5 ~ 3.0 VAC Specification, torque Sensor Jam Nut to 3.5kg ~ 5kg (25 ~ 35 ft lbs.).

CAUTION

Do not over tighten Sensor Jam Nut.
Over tightening will cause damage to the internal coils of the Sensor.

11. Move Throttle Control to "HI" Idle position and record reading from Volt/Ohm Meter. This reading should be 3.0 VAC ~ 6.0 VAC.
12. If reading in "HI" Idle is above 6.0 VAC, loosen Sensor Jam Nut and adjust Sensor OUT no more than 1/2 turn. If VAC reading is still above 6.0 VAC, replace Sensor.
13. Torque Sensor Jam Nut to 3.5kg ~ 5kg (25 ~ 35 ft lbs).
14. Turn engine "OFF", disconnect Volt/Ohm Meter, Tachometer and connect Sensor Harness (Green & White) to Main Wiring Harness.

WARNING

BE CAUTIOUS OF MOVING AND ROTATING PARTS WHILE PERFORMING RPM SENSOR TESTS AND ADJUSTMENT.
BE CAUTIOUS OF HOT SURFACES OF THE ENGINE.
WEAR PROTECTIVE CLOTHING, HARD HAT, SAFETY SHOES, GLOVES AND GOGGLES OR FACE SHIELD WHILE PERFORMING TESTS AND ADJUSTMENTS TO THE RPM SENSOR.

NOTE

The RPM Sensor Test & Adjustment Procedure is the same for **both** before Minor Change (~m/c), and after Minor Change (m/c~)machines. (SK150 ~ SK460 w/Cummins).

4. ADJUSTMENT "A" MECHATRONIC CONTROLLER SK200 IV ~ SK270 IV M/C

Perform Mechatronics Adjustment "A" using the following procedure:

A. Conditions to use Adjustment "A"

Adjustment "A" procedures must be performed when one or more of the following components have been removed, repaired, adjusted or replaced.

1. Mechatronics Controller (CPU)
2. Stepping Motor Assembly
3. Linkage between Stepping Motor and Engine Fuel Pump Assembly.
4. Engine Fuel Pump Assembly.
5. Engine

B. Tools & Equipment Required

1. Special Adjustment Harness Assembly. KOBELCO Part Number– 2479Z2364.
2. General hand or power tools required for removal and replacement of components.

C. Machine Settings & Site Conditions

1. Attachment in Hydraulic Oil Check Position.
2. Verify engine RPM's in the following work modes and settings.
   a. H-Mode, S-Mode, FC-Mode, D-Mode with throttle in "Hi-Idle and "Low-Idle" positions.
   b. Decel RPM
   c. Low-Idle RPM
3. Engine Emergency Stop Knob completely "IN".
4. CPU Access Panel Removed.
5. Firm, level adjusting site.

D. Adjustment "A" – Part 1 Procedures

1. Move the machine to a smooth, level area to perform Adjustment "A".
2. Operate the attachment Controls until the arm, attachment and boom are in the Hydraulic Oil Check Position. See Figure 6.9A.
3. If throttle control is possible, verify RPM's as described above in C., step 2.
4. Push the engine Emergency Stop Knob all the way in. See Figure 6.10A.
5. Turn Switch key to "OFF". Wait approximately 4 seconds for electrical power to automatically turn off.
6. Remove mechatronic controller access cover. See Figure 6.11A.
7. Remove toggle switch grommet and carefully place the controller toggle switch in the "TEST" position. See Figure 6.12A.

MACHINE IN HYDRAULIC OIL CHECK POSITION

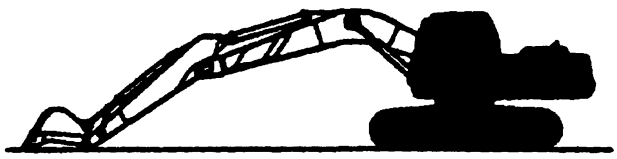


FIGURE 6.9A

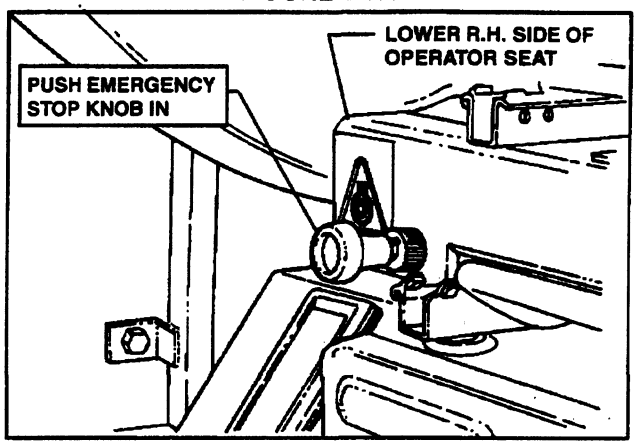


FIGURE 6.10A

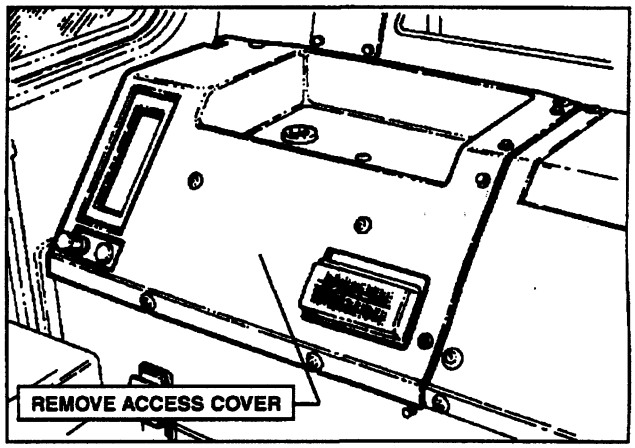


FIGURE 6.11A

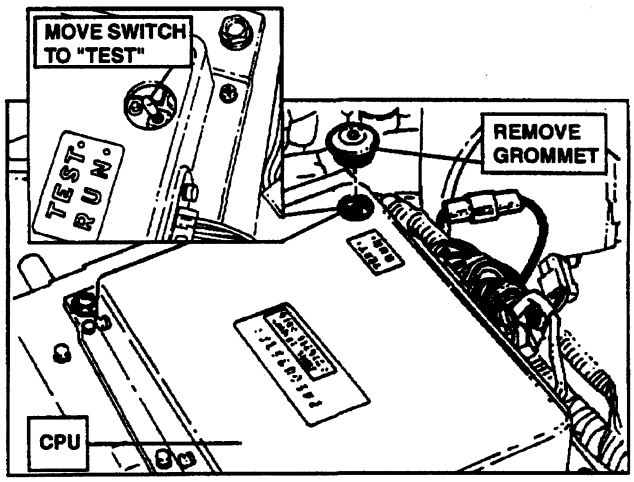


FIGURE 6.12A

CAUTION

Make certain electrical power is "OFF" before moving the controller "TEST-RUN" toggle switch. This will avoid possible damage to the Mechatronics controller and prevent loss of computer memory.

NOTE

When the Controller "TEST-RUN" Toggle Switch is placed in the "TEST" position, the Auto-Accel L.E.D. indicator light on the gauge cluster display will burn continuously as a reminder that the controller toggle switch is in the "TEST" position.

8. Locate the controller 1P (1 Pin) coupler and disconnect. Connect the KOBELCO Special Adjustment Harness Assembly to the 1P coupler. See Figure 6.13A.

9. Raise engine access cover and remove the Linkage Lever Arm from the stepping motor shaft. using a 5mm allen wrench. See Figure 6.14A.

10. Remove the Ball Joint end from the throttle governor lever arm. See Figure 6.15A.

11. Loosen the linkage jam nuts on the Adjustable Linkage and adjust to proper dimension for the machine being adjusted . See Figure 6.16A. Finger tighten jam nuts and lay linkage aside.

NOTE

This is a temporary starting dimension. Final adjustment will be later in this procedure.

12. Make sure that "OK" and then "Clock Time" is shown on the gauge cluster display prior to performing Adjustment "A".

    <u>If any Service Function Icons are displayed, Adjustment "A" procedure will not be possible.</u>

    Resolve any Service problems relating to displayed Icons before attempting to perform Adjustment "A".

13. Make certain the CPU "TEST-RUN" switch is in the "TEST" position.

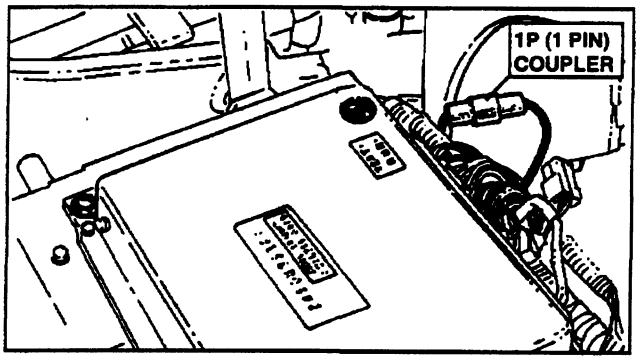


FIGURE 6.13A

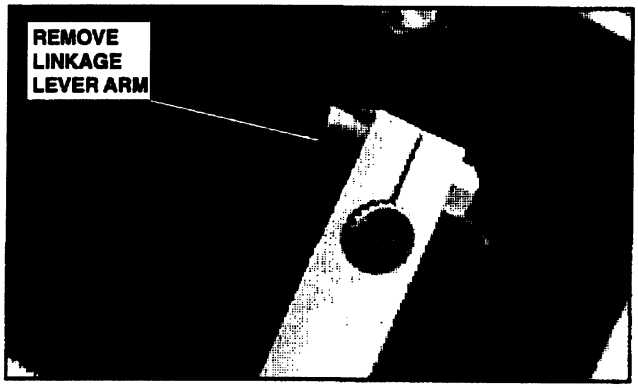


FIGURE 6.14A

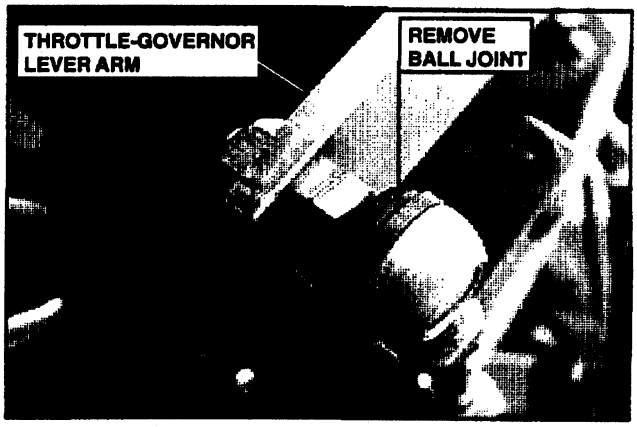


FIGURE 6.15A

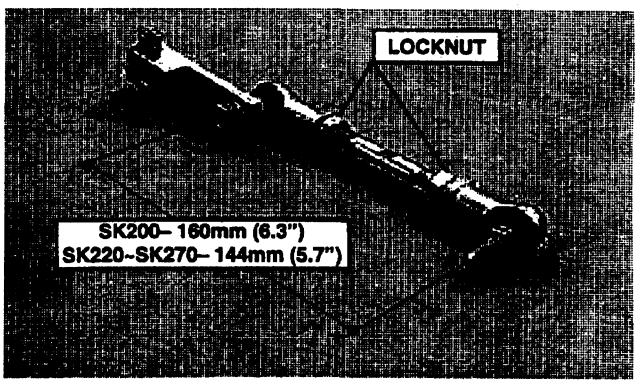


FIGURE 6.16A

14. Place the KPSS Mode Switch in the "H"-Mode. See Figure 6.17A.
15. Place the Auto-Accel Switch in the "ON" position. See Figure 6.18A.
16. Move the Throttle Control to "LO-IDLE" position. See Figure 6.17A.
17. Place Key switch in the "ON" position. Engine should not be running.

NOTE

The settings described in steps 13 through 17 must be exactly as described. Any other settings will not allow proper adjustment of the Mechatronics Controller.

18. Depress and hold the Special Adjustment Harness Switch 3 to 5 seconds until the Gauge Cluster Display Reads "CPU". Then release switch. See Figure 6.19A.

NOTE

"CPU" should remain on the display. If it doesn't, check conditions as described in steps 13-17 and repeat step 18. Make certain to hold the Special Adjustment Harness Switch 3 to 5 seconds.

NOTE

As soon as "CPU" is displayed and special adjustment harness switch is released, the stepping motor will move to the Low Idle position. If "CPU" goes off display, the procedure has failed. Check all settings ("LO"-IDLE adjustment and Stepping Motor) and start procedure over.

19. While holding the Governor Lever down against the Engine Low Idle position, locate the linkage lever arm onto the stepping motor splined shaft at approximately 7 o'clock position and secure the Ball Joint to the governor arm. See Figure 6.20A.

NOTE

The 7 o'clock position for the Linkage Lever Arm on the Stepping Motor Splines is a starting point. The position could vary from the 7 o'clock to 9 o'clock position. The linkage should have a small amount of slack when in position.

20. Slide the Linkage Lever Arm Lock on the splines until 1/16" to 1/8" of spline is visible. Tighten the Socket Head Screw, securing the lever arm to stepping motor shaft and tighten jam nuts on rod linkage

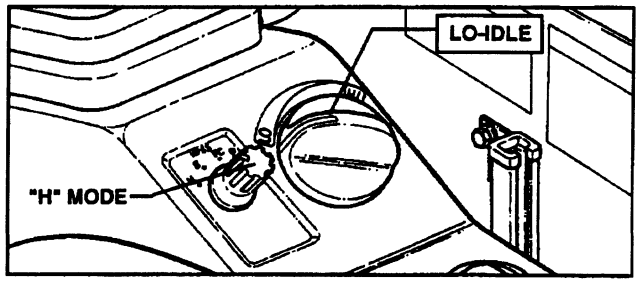


FIGURE 6.17A

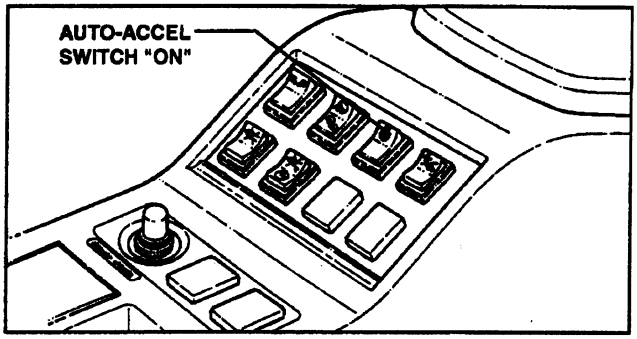


FIGURE 6.18A

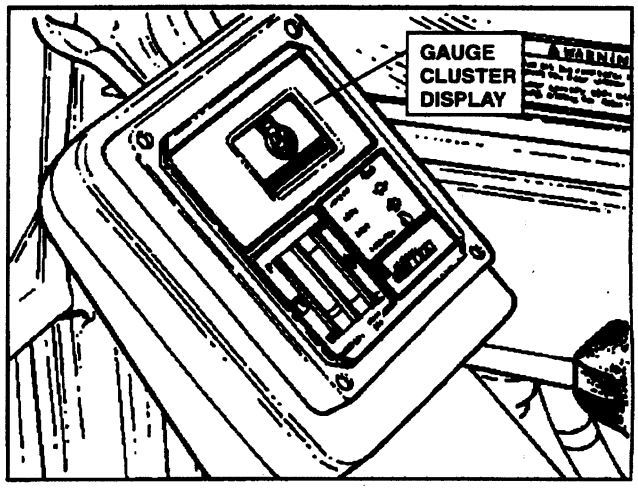


FIGURE 6.19A

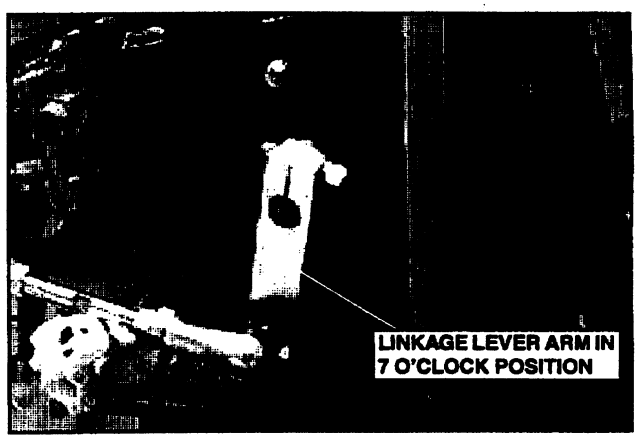


FIGURE 6.20A

21. Depress the Special Adjustment Harness Switch once. This will cause the CPU to turn power to the stepping motor off.
22. Manually rotate the stepping motor shaft until the governor lever is 0.25mm (.010") ~ 0.5mm (.020") from the Hi-Idle Stop Set Bolt. Hold in position and depress the Special Adjustment Harness Switch once to lock stepping motor in position (you will feel the stepping motor lock into position). See Figure 6.21A.

NOTE

The 0.25mm (.010") ~ 0.5mm (.020") gap between the governor lever and the Hi-Idle Stop Set Screw must be maintained. If there is no gap or gap is too small, the CPU will not complete the indexing phase and the procedure will fail. ***See directions at right.*** →

⚠ CAUTION ⚠

Never attempt to manually rotate stepping motor shaft or move linkage once the stepping motor has been locked in position as described in step 22.

23. After proper gap has been obtained, depress the Special Adjustment Harness switch once. This will cause the Stepping Motor to index from its high position back down to the low position and then CPU will program this setting in the memory. ***Do not turn key or power "OFF", proceed to Part 2 of the procedure.***

NOTE

The stepping motor will cycle to the engine stop position and back to engine start position. Also "CPU" will leave the display. If "CPU" fails to index, restart the procedure from the beginning.

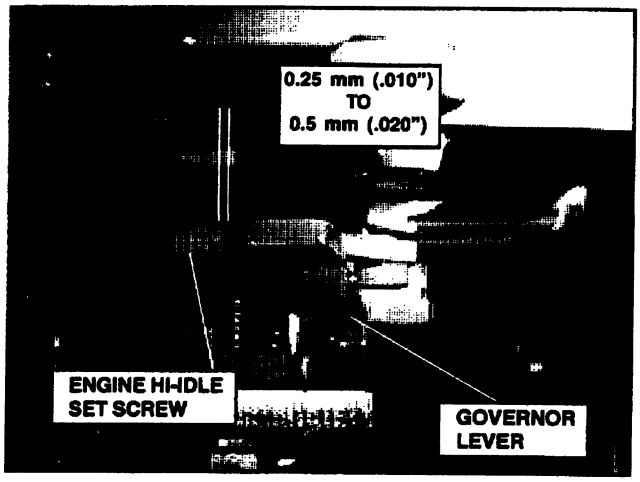


FIGURE 6.21A

How to Adjust Gap

Follow instructions below to adjust gap between governor lever and "Hi-Idle" Stop Set Bolt to 0.25~0.5mm (.010" ~.020") using the Auto-Accel and Buzzer Stop Switches. See Figure 6.23A.

1. **Auto-Accel Switch "ON"**
   a. Each push of the Buzzer Stop Switch will *decrease* the gap between the Governor Lever and the "Hi-Idle" Stop Set Bolt by approximately 0.04mm (.001").
2. **Auto-Accel Switch "OFF"**
   a. Each push of the Buzzer Stop Switch will *increase* the gap between the Governor Lever and the "Hi-Idle" Stop Set Bolt by approximately 0.04mm (.001").

Once proper clearance has been obtained, refer to step 23.

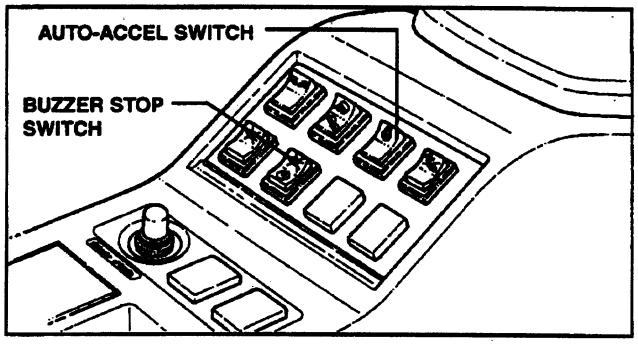


FIGURE 6.23A

E. Adjustment "A"– Part 2

1. Start Engine and allow to run at idle until engine is at normal operating temperature. Use attachment relief if necessary to heat engine.
2. Place KPSS Mode Switch in "H"- Mode.
3. Place Auto-Accel Switch in "OFF" position.
4. Throttle Control in Lo-Idle position.
5. Key switch "ON" with Engine running.

NOTE

The machine settings must be exactly as described in steps 1 through 5. Any other settings will not allow success of Adjustment "A"– Part 2.

6. After machine settings are as described in steps 1-5, depress and hold the Special Adjustment Harness Switch for 3 to 5 seconds until "CPU" is visible on display.
7. After "CPU" is on display and the switch is released, the CPU will gradually cycle the stepping motor from below Lo-Idle to Hi-Idle. This programs the CPU to all stepping motor positions and will take 3 to 5 minutes.

NOTE

If governor lever touches the "HI"-Idle Set Screw during this cycle, the procedure will fail. If it fails, repeat procedure "A", Part 1 and 2. Refer to Page 7.

8. After this process is complete, the stepping motor will immediately return to the Lo-Idle position and "CPU" will leave the display.
9. Turn key switch to "OFF" and wait approximately 4 second for electrical power to automatically turn off.
10. Remove the Special Adjustment Harness from the 1P coupler and connect coupler together. See Figure 6.22A.
11. Move CPU "TEST-RUN" Switch to "RUN" position and replace the grommet. See Figure 6.23A.
12. Start Engine and verify Engine RPM's according to engine specifications on pages 15~17.
13. Install CPU Access Panel. See Figure 6.24A.

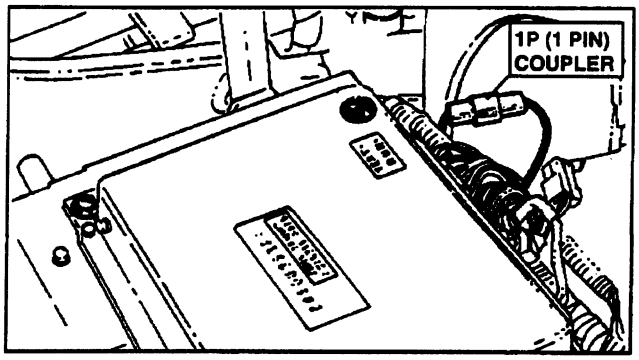


FIGURE 6.22A

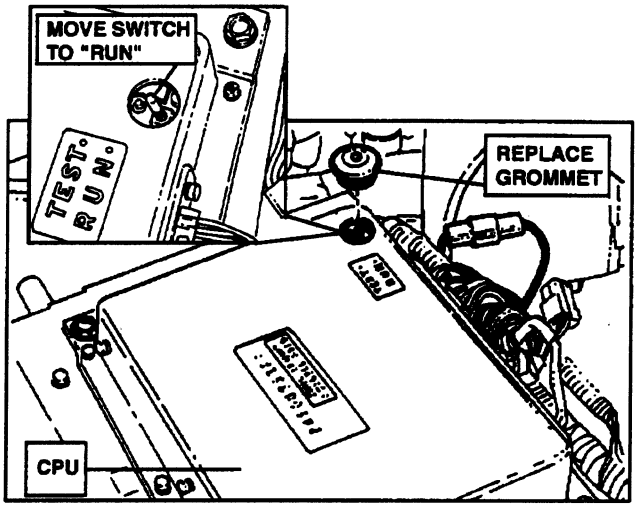


FIGURE 6.23A

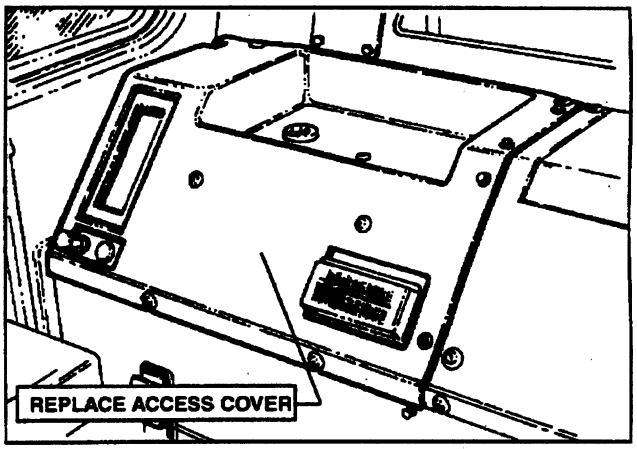


FIGURE 6.24A

5. ADJUSTMENT "B"–VARIABLE LOADING MODE MECHATRONIC CONTROLLER

NOTE

If Machine is not equipped with Variable Loading Mode, adjustment "B" is not necessary.

A. Conditions to use Adjustment "B"

Adjustment "B" procedures must be performed when one or more of the following components have been removed, repaired, adjusted or replaced.

1. Mechatronics Controller (CPU).
2. Variable Loading Mode Components.

B. Tools & Equipment Required

1. Special Adjustment Harness Assembly. KOBELCO Part Number– 2479Z2364.
2. General hand or power tools required for removal and replacement of components.
3. 105kg/cm² (1500psi) Pressure Gauge.

C. Machine Settings & Site Conditions

1. Hydraulic oil at 45°C to 55°C (113°F to 131°F).
2. 105kg/cm² (1500psi) Pressure Gauge installed.
3. CPU Access Panel Removed.
4. CPU "TEST-RUN" Switch in "TEST" position.
5. Firm, level adjusting site.

D. Adjustment "B" Procedures

1. Move the machine to a smooth, level area to perform Adjustment "B".
2. Operate the attachment Controls until the arm, attachment and boom are in the Hydraulic Oil Check Position. See Figure 6.25.
3. Turn Engine "OFF".
4. Release hydraulic tank pressure by removing cap from pressure relief valve and depressing relief valve stem. See Figure 6.26.
5. Remove Test Port Plug from Flow Distribution Solenoid Valve. See Figure 6.27.
6. Install fitting and 105kg/cm² (1500psi) pressure gauge into test port. See Figure 6.27.

⚠	**CAUTION**	⚠
Oil may be hot. Wear approved safety equipment when performing any maintenance or test procedures.		

MACHINE IN HYDRAULIC OIL CHECK POSITION

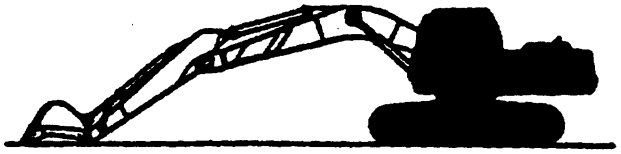


FIGURE 6.25

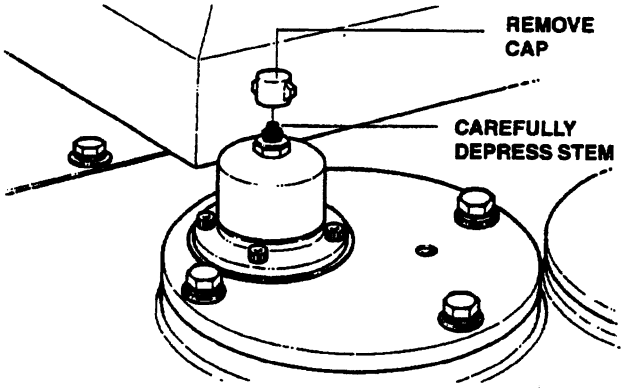


FIGURE 6.26

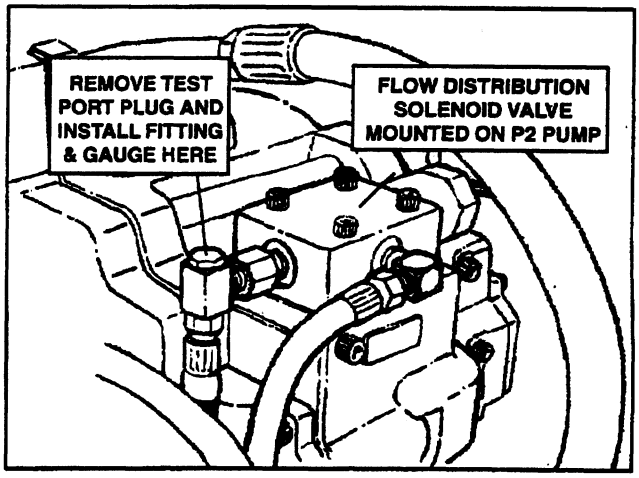


FIGURE 6.27

7. With key switch and electrical power "OFF", remove the CPU access Panel behind the operator seat. See Figure 6.28.
8. Locate and disconnect CPU 1P (1Pin) coupler. Connect Special Adjustment Harness to 1P coupler. See Figure 6.29.
9. Remove CPU grommet and carefully place CPU "TEST-RUN" Switch in the "TEST" position.

⚠ CAUTION ⚠

Never attempt to change position of the CPU "TEST-RUN" Switch with key switch or electrical power on.

10. Place KPSS Mode Switch to S-Mode.
11. Place Auto-Accel Switch to "OFF".
12. Start Engine.
13. Place Throttle Control in "HI-IDLE" position.
14. Depress the Special Adjustment Harness Switch and hold for 3 to 5 seconds until "CPU" is visible on display.

NOTE

"CPU" should remain on display. If it doesn't, check steps 9 through 13 and repeat step 14.
Conditions must be exactly as described in steps 9-14. Different conditions will not allow success of Adjustment "B" procedures.

15. Turn the Variable Loading Mode Switch counterclockwise to the left most setting. See Figure 6.30.
16. Operate BOOM UP Control until boom is completely up. Hold control in this position. See Figure 6.31.
17. While holding BOOM UP Control in the up position, adjust the Variable Loading Mode Switch clockwise until the pressure gauge reaches the pressure specified in chart for model being adjusted.

MODEL	UPPER LIMIT PRESSURE
SK200~SK270	18.5~19.5 kg/cm² (263~277 psi)

Unit: kgf/cm² (psi)

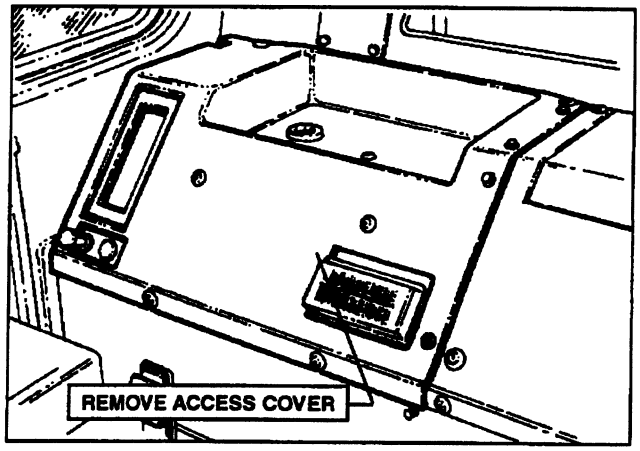


FIGURE 6.28

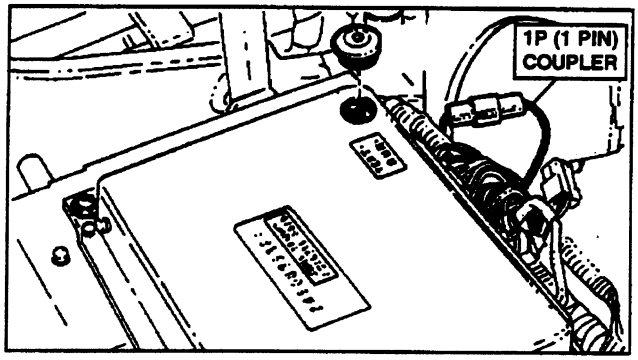


FIGURE 6.29

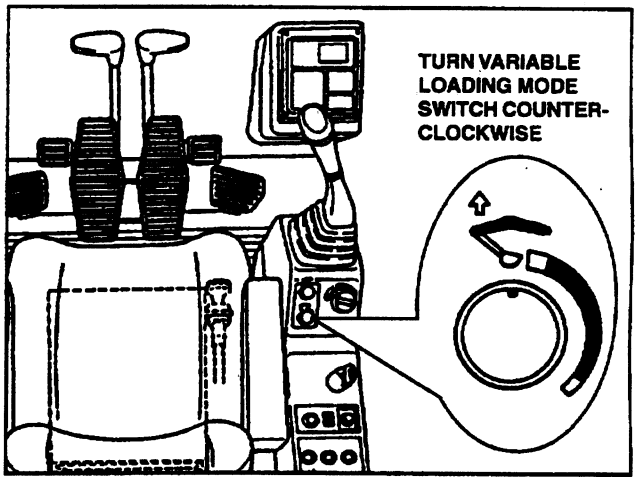
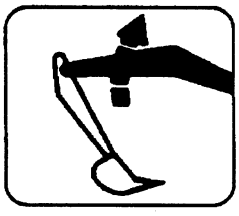


FIGURE 6.30



HOLD CONTROL IN
BOOM UP POSITION

FIGURE 6.31

18. When the proper pressure is reached, stop adjustment of the Variable Loading Mode Switch and depress the Special Adjustment Harness Switch once. This will program the CPU to the Upper Limit setting.
19. Release the BOOM UP Control.
20. Return the Variable Loading Mode Switch back to the Left Limit by turning switch counter-clockwise. See Figure 6.32.
21. Operate the BOOM UP Control and hold.
22. Adjust the Variable Loading Mode Switch until the pressure gauge reaches pressure specified in chart for model being adjusted.

MODEL	LOWER LIMIT PRESSURE
SK200 ~ SK270	13.5~14.5 kg/cm² (192~206 psi)

Unit: kgf/cm² (psi)

23. When the proper pressure is reached, stop adjustment of the Variable Loading Mode Switch and depress the Special Adjustment Harness Switch once. This will program the CPU to the Lower Limit setting.

NOTE

After step 23 is complete, "CPU" will automatically leave the display signaling that Adjustment "B" is complete.

24. After "CPU" has left the display, turn key switch to "OFF" stopping the engine and wait approximately 4 seconds for electrical power to automatically go off.
25. Remove the Special Adjustment Harness from the 1P coupler and connect 1P coupler together. See Figure 6.33.
26. Move the CPU "TEST-RUN" Switch in the "RUN" position and replace grommet. See Figure 6.34.
27. Install CPU Access Cover.
28. Remove pressure gauge and fitting. Replace Test Port Plug.
29. Confirm proper operation of machine.

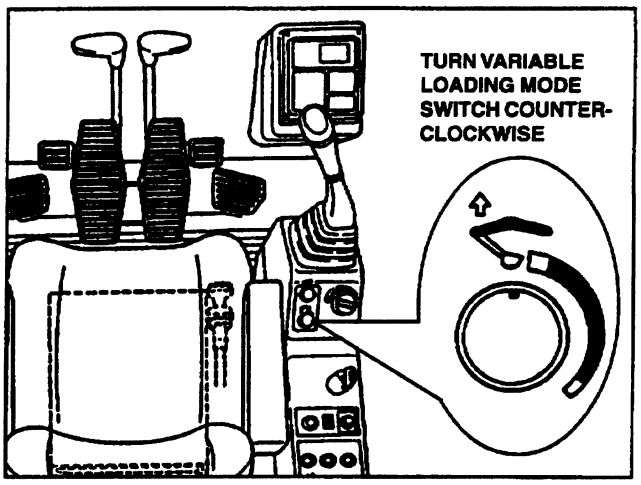


FIGURE 6.32

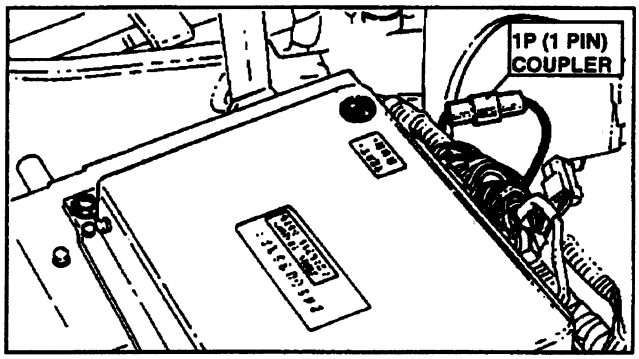


FIGURE 6.33

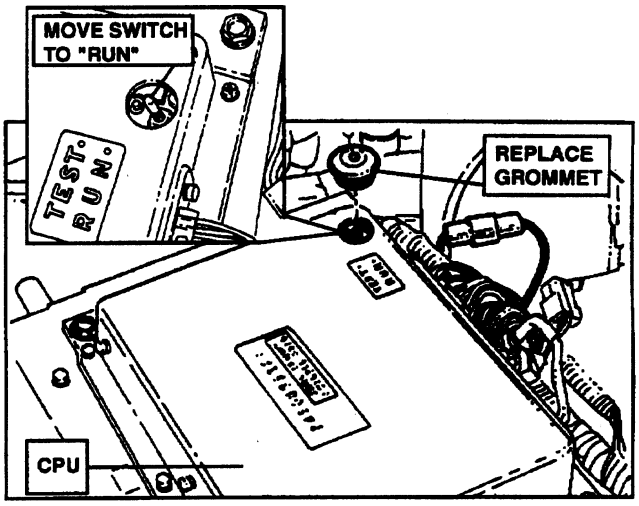


FIGURE 6.34

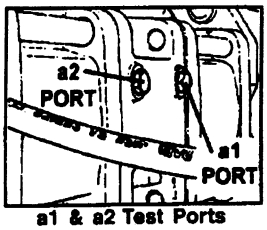
Measuring & Adjusting Pressures– SK200 / SK210 M/C

YNU-0501~
YQU-3101~

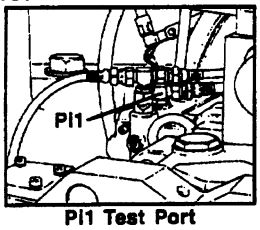
INSPECTION ITEM				PRESSURE					Adjustment Point	MEASURING CONDITION, FUNCTION
				READING FROM		SPECIFICATION				
STANDARDS FOR TESTING	Cleanliness of Hydraulic Oil			Hydraulic Oil Tank		Class: NAS 7–9			N/A	Take Sample
	Temperature of Hydraulic Oil			Hydraulic Oil Tank Surface		°C-45–55	°F-113–131		N/A	Ambient Temperature -10°C ~ 50°C (14°F ~ 122°F)
	Engine Coolant Temperature			Radiator Surface		°C-60–90	°F-140–194		N/A	
	ENG RPM	Low Idle		Gauge Cluster Display or Externally Mounted Tachometer		850–900 RPM			RPM Sensor Adjustment and/or Mechatronics Adjustment "A"	Throttle @ "LO"- Idle
		Hi- Idle				2335–2370 RPM				Throttle @ "HI"- Idle
		"S" or "D" Mode				1950–2050 RPM				Throttle @ "HI"- Idle
		"FC" Mode				1550–1650 RPM				Throttle @ "HI"- Idle
		Auto Accel-Decel "ON"				1000–1100 RPM				Throttle @ "HI"- Idle
SYSTEM	COMPONENT			GAUGE @	SIZE	PORT	Kgf/cm²	PSI		
PILOT CIRCUIT	PRIMARY PRESSURE			Gear Pump	PF 1/4	P3	47–53	670–750	PR1	"H"-Mode, Eng/ Hi Idle
MAIN RELIEFS	TRAVEL		RH	Main Pump	PF 1/4	a1	350–355	4980–5050	TR1	"H"-Mode, Engine at Hi Idle. Simultaneous LH/RH Operation Travel Stalled.
			LH			a2	350–355	4980–5050	TR2	
	BOOST PRESSURE	ATTACHMENT	RH	Main Pump	PF 1/4	a1	330–345	4695–4910	MR1	Bucket Digging
			LH			a2	330–345	4695–4910	MR2	Boom Raising
			RH	Main Pump	PF 1/4	a1	300–305	4270–4340	MR1	Bucket Digging
			LH			a2	300–305	4270–4340	MR2	Boom Raising
PORT RELIEFS	BUCKET (DO NOT ADJUST)		ROD	Main Pump	PF 1/4	a1	330–340	4694–4836	RV8	Bucket Dump
			HEAD			a2	345–355	4907–5049	RV7	Bucket Digging
	BOOM (DO NOT ADJUST)		ROD	Main Pump	PF 1/4	a1	330–340	4694–4836	RV6	Boom Lowering
			HEAD			a2	345–355	4907–5049	RV5	Boom Raising
	ARM (DO NOT ADJUST)		ROD	Main Pump	PF 1/4	a1	330–340	4694–4836	RV10	Arm Out (Cylinder IN)
			HEAD			a2	330–340	4694–4836	RV9	Arm In (Cylinder OUT)
	TRAVEL (DO NOT ADJUST)	RH	F	Main Pump	PF 1/4	a1	360–370	5120–5263	RV14	"H"-Mode, Engine at Hi Idle. Simultaneous LH/RH Travel Engaged
			R			a1	360–370	5120–5263	RV13	
		LH	F			a2	360–370	5120–5263	RV13	"H"-Mode, Engine at Hi Idle. Simultaneous LH/RH Travel Engaged
			R			a2	360–370	5120–5263	RV14	
	SWING		RH	Main Pump	PF 1/4	a2	275–310	3910–4408	RV11	Bucket Lock, Stall Swing
			LH			a2	275–310	3910–4408	RV12	Bucket Lock, Stall Swing
VARIABLE LOADING MODE (OPTION)	LOADING MODE SWITCH		Upper	Flow Distribution Solenoid Valve	PF 1/4		18.5–19.5	263–277	CPU ADJ "B"	"S"Mode, Eng in "HI" Idle
			Lower				13.5–14.5	192–206		"S"Mode, Eng in "HI" Idle
LOW PRESSURE RELIEFS	INDEPENDENT "D" MODE– OFF		RH	Main Pump	PF 1/4	a1	32–47	455–668	Internal Shims	"H" Mode, Eng in "HI" Idle Controls in Neutral
			LH			a2	32–47	455–668		
	INDEPENDENT "D" MODE– ON		RH	Main Pump	PF 1/4	a1	0–7	0–100	Internal Shims	"D" Mode, Eng in "HI" Idle Controls in Neutral
			LH			a2	0–7	0–100		
NEGATIVE CONTROL PRESSURES	INDEPENDENT "D" MODE– OFF		RH	Main Pump	PF 1/4	Pi1	32–47	455–668	Low Pressure Relief Valves	"H" Mode, Eng in "HI" Idle Controls in Neutral
			LH			Pi2	32–47	455–668		
	INDEPENDENT "D" MODE– ON		RH	Main Pump	PF 1/4	Pi1	0–7	0–100		"D" Mode, Eng in "HI" Idle Controls in Neutral
			LH			Pi2	0–7	0–100		
PROPORTIONAL SOLENOID VALVE	KPSS	H • S • FC • D		Main Pump	PF 1/4	a3	0–3	0–43	Pf Solenoid Valve	Engine in "HI" Idle Controls in Neutral
		Release				a3	6.7–14.7	95–209		
		Boost				a3	32.5–39.5	462–562		

TEST PORT LOCATIONS:

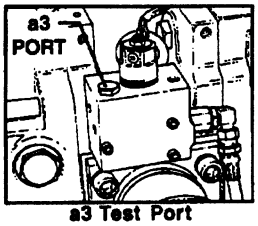
(4/97)



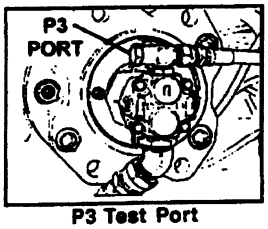
a1 & a2 Test Ports on Main Pumps



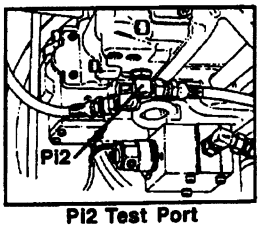
Pi1 Test Port on P1 Regulator



a3 Test Port on Pf Solenoid



P3 Test Port on Pilot Gear Pump



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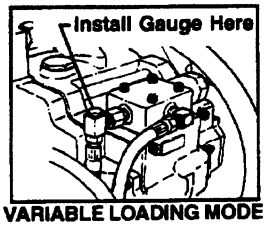


VARIABLE LOADING MODE (OPTION)

NOTE

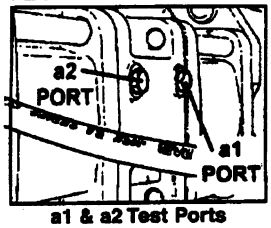
Take Measurements In "H" Mode unless otherwise specified.

The standard tolerance shall be an allowable range in field measurements.

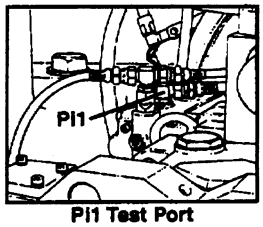
INSPECTION ITEM				PRESSURE					Adjustment Point	MEASURING CONDITION, FUNCTION
				READING FROM		SPECIFICATION				
STANDARDS FOR TESTING	Cleanliness of Hydraulic Oil			Hydraulic Oil Tank		Class: NAS 7–9			N/A	Take Sample
	Temperature of Hydraulic Oil			Hydraulic Oil Tank Surface		°C- 45~55	°F- 113~131		N/A	Ambient Temperature -10°C ~ 50°C (14°F ~ 122°F)
	Engine Coolant Temperature			Radiator Surface		°C- 60~90	°F- 140~194		N/A	
	ENG RPM	Low Idle		Gauge Cluster Display or Externally Mounted Tachometer		850~900 RPM			RPM Sensor Adjustment and/or Mechatronics Adjustment "A"	Throttle @ "LO"- Idle
		Hi- Idle				2335~2370 RPM				Throttle @ "HI"- Idle
		"S" or "D" Mode				1950~2050 RPM				Throttle @ "HI"- Idle
		"FC" Mode				1550~1650 RPM				Throttle @ "HI"- Idle
		Auto Accel-Decel "ON"				1000~1100 RPM				Throttle @ "HI"- Idle
SYSTEM	COMPONENT			GAUGE @	SIZE	PORT	Kgf/cm²	PSI		
PILOT CIRCUIT	PRIMARY PRESSURE			Gear Pump	PF 1/4	P3	47~53	670~750	PR1	"H"-Mode, Eng/ Hi Idle
MAIN RELIEFS	TRAVEL		RH	Main Pump	PF 1/4	a1	350~355	4980~5050	TR1	"H"-Mode, Engine at Hi Idle. Simultaneous LH/RH Operation Travel Stalled.
			LH			a2	350~355	4980~5050	TR2	
	BOOST PRESSURE	ATTACHMENT	RH	Main Pump	PF 1/4	a1	315~330	4480~4694	MR1	Bucket Digging
			LH			a2	315~330	4480~4694	MR2	Boom Raising
			RH	Main Pump	PF 1/4	a1	300~305	4270~4340	MR1	Bucket Digging
			LH			a2	300~305	4270~4340	MR2	Boom Raising
PORT RELIEFS	BUCKET (DO NOT ADJUST)		ROD	Main Pump	PF 1/4	a1	330~340	4694~4836	RV8	Bucket Dump
			HEAD			a2	330~340	4694~4836	RV7	Bucket Digging
	BOOM (DO NOT ADJUST)		ROD	Main Pump	PF 1/4	a1	330~340	4694~4836	RV6	Boom Lowering
			HEAD			a2	330~340	4694~4836	RV5	Boom Raising
	ARM (DO NOT ADJUST)		ROD	Main Pump	PF 1/4	a1	330~340	4694~4836	RV10	Arm Out (Cylinder IN)
			HEAD			a2	330~340	4694~4836	RV9	Arm In (Cylinder OUT)
	TRAVEL (DO NOT ADJUST)	RH	F	Main Pump	PF 1/4	a1	360~370	5120~5263	RV14	"H"-Mode, Engine at Hi Idle. Simultaneous LH/RH Travel Engaged
			R			a1	360~370	5120~5263	RV13	
		LH	F			a2	360~370	5120~5263	RV13	"H"-Mode, Engine at Hi Idle. Simultaneous LH/RH Travel Engaged
			R			a2	360~370	5120~5263	RV14	
	SWING		RH	Main Pump	PF 1/4	a2	280~310	3982~4409	RV11	Bucket Lock, Stall Swing
			LH			a2	280~310	3982~4409	RV12	Bucket Lock, Stall Swing
VARIABLE LOADING MODE (OPTION)	LOADING MODE SWITCH		Upper	Flow Distribution Solenoid Valve	PF 1/4		18.5~19.5	263~277	CPU ADJ "B"	"S"Mode, Eng in "HI" Idle
			Lower				13.5~14.5	192~206		"S"Mode, Eng in "HI" Idle
LOW PRESSURE RELIEFS	INDEPENDENT "D" MODE- OFF		RH	Main Pump	PF 1/4	a1	32~47	455~668	Internal Shims	"H" Mode, Eng in "HI" Idle Controls in Neutral
			LH			a2	32~47	455~668		
	INDEPENDENT "D" MODE- ON		RH	Main Pump	PF 1/4	a1	0~7	0~100	Internal Shims	"D" Mode, Eng in "HI" Idle Controls in Neutral
			LH			a2	0~7	0~100		
NEGATIVE CONTROL PRESSURES	INDEPENDENT "D" MODE- OFF		RH	Main Pump	PF 1/4	Pi1	32~47	455~668	Low Pressure Relief Valves	"H" Mode, Eng in "HI" Idle Controls in Neutral
			LH			Pi2	32~47	455~668		
	INDEPENDENT "D" MODE- ON		RH	Main Pump	PF 1/4	Pi1	0~7	0~100		"D" Mode, Eng in "HI" Idle Controls in Neutral
			LH			Pi2	0~7	0~100		
PROPORTIONAL SOLENOID VALVE	KPSS	H • S • FC • D		Main Pump	PF 1/4	a3	0~3	0~43	Pf Solenoid Valve	Engine in "HI" Idle Controls in Neutral
		Release				a3	13.3~16.3	189~232		
		Boost				a3	32~40	455~569		

TEST PORT LOCATIONS:

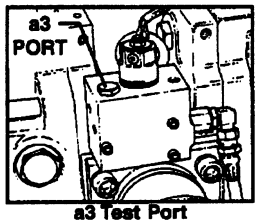
(4/97)



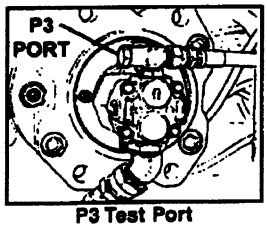
a1 & a2 Test Ports on Main Pumps



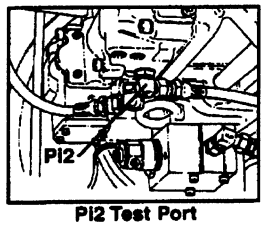
Pi1 Test Port on P1 Regulator



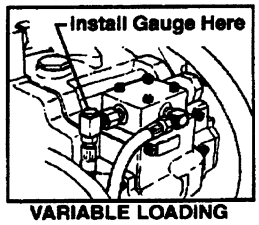
a3 Test Port on Pf Solenoid



P3 Test Port on Pilot Gear Pump



Pi2 Test Port on P2 Regulator



VARIABLE LOADING MODE (OPTION)

NOTE

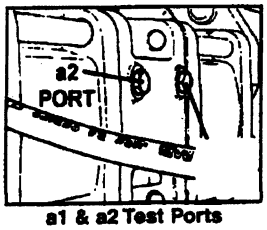
Take Measurements In "H" Mode unless otherwise specified.

The standard tolerance shall be an allowable range in field measurements.

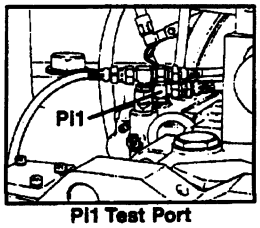
INSPECTION ITEM				PRESSURE					Adjustment Point	MEASURING CONDITION, FUNCTION
				READING FROM		SPECIFICATION				
STANDARDS FOR TESTING	Cleanliness of Hydraulic Oil			Hydraulic Oil Tank		Class: NAS 7–9			N/A	Take Sample
	Temperature of Hydraulic Oil			Hydraulic Oil Tank Surface		°C- 45~55	°F- 113~131		N/A	Ambient Temperature -10°C ~ 50°C (14°F ~ 122°F)
	Engine Coolant Temperature			Radiator Surface		°C- 60~90	°F- 140~194		N/A	
	ENG RPM	Low Idle		Gauge Cluster Display or Externally Mounted Tachometer		850~900 RPM			RPM Sensor Adjustment and/or Mechatronics Adjustment "A"	Throttle @ "LO"- Idle
		Hi- Idle				2335~2370 RPM				Throttle @ "HI"- Idle
		"S" or "D" Mode				1950~2050 RPM				Throttle @ "HI"- Idle
		"FC" Mode				1550~1650 RPM				Throttle @ "HI"- Idle
		Auto Accel-Decel "ON"				1000~1100 RPM				Throttle @ "HI"- Idle
SYSTEM	COMPONENT			GAUGE @	SIZE	PORT	Kgf/cm²	PSI		
PILOT CIRCUIT	PRIMARY PRESSURE			Gear Pump	PF 1/4	P3	47~53	670~750	PR1	"H"-Mode, Eng/ Hi Idle
MAIN RELIEFS	TRAVEL		RH	Main Pump	PF 1/4	a1	350~355	4980~5050	TR1	"H"-Mode, Engine at Hi Idle Simultaneous LH/RH Operation Travel Stalled
			LH			a2	350~355	4980~5050	TR2	
	BOOST PRESSURE		RH	Main Pump	PF 1/4	a1	315~330	4480~4694	MR1	Bucket Digging
			LH			a2	315~330	4480~4694	MR2	Boom Raising
	ATTACHMENT		RH	Main Pump	PF 1/4	a1	300~305	4270~4340	MR1	Bucket Digging
			LH			a2	300~305	4270~4340	MR2	Boom Raising
PORT RELIEFS	BUCKET (DO NOT ADJUST)		ROD	Main Pump	PF 1/4	a1	330~340	4694~4836	RV8	Bucket Dump
			HEAD			a2	330~340	4694~4836	RV7	Bucket Digging
	BOOM (DO NOT ADJUST)		ROD	Main Pump	PF 1/4	a1	330~340	4694~4836	RV6	Boom Lowering
			HEAD			a2	330~340	4694~4836	RV5	Boom Raising
	ARM (DO NOT ADJUST)		ROD	Main Pump	PF 1/4	a1	330~340	4694~4836	RV10	Arm Out (Cylinder IN)
			HEAD			a2	330~340	4694~4836	RV9	Arm In (Cylinder OUT)
	TRAVEL (DO NOT ADJUST)	RH	F	Main Pump	PF 1/4	a1	360~370	5120~5263	RV14	"H"-Mode, Engine at Hi Idle Simultaneous LH/RH Travel Engaged
			R			a1	360~370	5120~5263	RV13	
		LH	F			a2	360~370	5120~5263	RV13	"H"-Mode, Engine at Hi Idle. Simultaneous LH/RH Travel Engaged
			R			a2	360~370	5120~5263	RV14	
	SWING		RH	Main Pump	PF 1/4	a2	280~310	3982~4409	RV11	Bucket Lock, Stall Swing
			LH			a2	280~310	3982~4409	RV12	Bucket Lock, Stall Swing
VARIABLE LOADING MODE (OPTION)	LOADING MODE SWITCH		Upper	Flow Distribution Solenoid Valve	PF 1/4		18.5~19.5	263~277	CPU ADJ "B"	"S"Mode, Eng in "HI" Idle
			Lower				13.5~14.5	192~206		"S"Mode, Eng in "HI" Idle
LOW PRESSURE RELIEFS	INDEPENDENT "D" MODE- OFF		RH	Main Pump	PF 1/4	a1	32~47	455~668	Internal Shims	"H" Mode, Eng in "HI" Idle Controls in Neutral
			LH			a2	32~47	455~668		
	INDEPENDENT "D" MODE- ON		RH	Main Pump	PF 1/4	a1	0~7	0~100	Internal Shims	"D" Mode, Eng in "HI" Idle Controls in Neutral
			LH			a2	0~7	0~100		
NEGATIVE CONTROL PRESSURES	INDEPENDENT "D" MODE- OFF		RH	Main Pump	PF 1/4	Pi1	32~47	455~668	Low Pressure Relief Valves	"H" Mode, Eng in "HI" Idle Controls in Neutral
			LH			Pi2	32~47	455~668		
	INDEPENDENT "D" MODE- ON		RH	Main Pump	PF 1/4	Pi1	0~7	0~100		"D" Mode, Eng in "HI" Idle Controls in Neutral
			LH			Pi2	0~7	0~100		
PROPORTIONAL SOLENOID VALVE	KPSS	H • S • FC • D		Main Pump	PF 1/4	a3	0~3	0~43	Pf Solenoid Valve	Engine in "HI" Idle Controls in Neutral
		Release				a3	13.3~16.3	189~232		
		Boost				a3	32~40	455~569		

TEST PORT LOCATIONS:

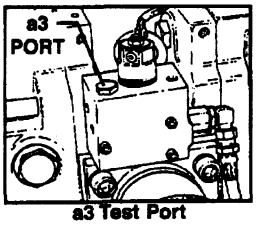
(4/97)



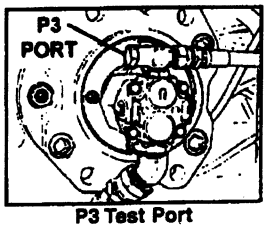
a1 & a2 Test Ports on Main Pumps



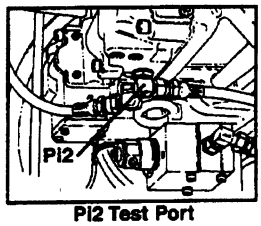
PI1 Test Port on P1 Regulator



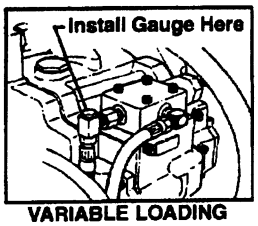
a3 Test Port on Pf Solenoid



P3 Test Port on Pilot Gear Pump



PI2 Test Port on P2 Regulator



VARIABLE LOADING MODE (OPTION)

NOTE

Take Measurements In "H" Mode unless otherwise specified.

The standard tolerance shall be an allowable range in field measurements.

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

IMPORTANT NOTE:
This Bulletin is being issued to document new adjustment procedures for the subject & affected "Minor Change" machines listed below. It provides the revised performance specifications now used on these units as well. It is suggested to place copies of this Bulletin in your SK300LC IV Shop Manual, and your Mark IV Serviceman's Handbook, for future reference. ***To Kobelco Dealers: Please copy and distribute to your Service Technicians, as necessary for this purpose.***

DATE: July 1997

BULLETIN: HE-313
Page 1 of 15

SUBJECT: "Minor Change" Performance Specifications

AFFECTED MACHINES: SK300LC IV - **KAI specification units only, not for KCME (Europe) units.**
YCU-0603, YCU-0607,
YCU-0611 ~ YCU-0642, YCU-0647 ~

Please be advised that the subject machines are equipped with the new *"revised specification"* Cummins 6 CTA engines, which incorporate different fuel injection pumps and turbochargers. These units require different KPSS controllers[1], engine RPM settings[2], and Adjustment "A" procedures.

Because of these changes, use care when referring to the previously published specifications for engine R.P.M., or Adjustment "A", as shown in the existing MK IV Shop Manuals and MK IV Serviceman's Handbook.

SK300LC IV units with s/n YCU-0301 ~ 0499 were equipped with MMC engines; refer to Service Bulletin HE-266.

SK300LC IV units with s/n YCU-0500 ~ 0610 (except YCU-0603 & 0607), were equipped with *"Initial specification"* Cummins 6 CTA engines; refer to Service Bulletin HE-300.

Be sure to check the serial number of the machine you are working on, and refer to the proper specifications. Specifications for Cummins powered, and "Minor Change" units are different from the earlier machines !

PLEASE NOTE

This bulletin details the following "pre-checks" to be made prior to performing the Mechatronics Adjustment "A" procedure:

- ***A. Engine Low Idle Speed***
- ***B. Engine High Idle Speed***
- ***C. Fuel Shut-off Solenoid Rod***
- ***D. Emergency Stop Cable***
- ***E. RPM Sensor Test***

Follow the instructions given in the "pre-checks" to help achieve a successful Adjustment "A" procedure. Failure to follow these instructions can result in poor engine or machine performance, and possible failure of Adjustment "A".

[1] Refer to Service Bulletin HE-310. [2] Refer to Service Bulletin HE-309A.
These machines have various other changes to their features and equipment, that is further detailed in Service Bulletin HE-308.

THIS BULLETIN IS BEING ISSUED FOR INFORMATION ONLY, AND IS NOT AN AUTHORIZATION FOR ANY REPLACEMENT OR WARRANTY CLAIM SUBMITTAL.

1. PRE-CHECKS TO BE MADE PRIOR TO PERFORMING ADJUSTMENT "A" PROCEDURE

SK300LC IV M/C (Cummins Engine)

(Minor change machines.)

All items listed below are described in detail on the following referenced pages, and should be checked and confirmed prior to performing Adjustment "A".

NOTE

Engine must be at operating temperature **before** making the following pre-checks, or performing the Adjustment "A" procedure !

A. Engine Low Idle Speed

1. The proper engine low idle speed is critical to a successful Adjustment "A" procedure.
2. Confirm this speed prior to performing Adjustment "A".
3. *Particularly, if the injection pump has been replaced or rebuilt, the low idle speed must be checked and confirmed.*
4. **An incorrect low idle speed can cause Adjustment "A" to fail.**
5. Refer to Low Idle Speed Adjustment on page 3.

NOTE

The Low Idle Speed must be confirmed as per the following instructions **prior** to starting Adjustment "A". Once Adjustment "A" is completed, the Low Idle Speed should then match the specifications given in the table on page 15.

B. Engine High Idle Speed

1. The proper engine High Idle Speed is also critical to a successful Adjustment "A" procedure.
2. Confirm this speed prior to performing Adjustment "A".
3. *Particularly, if the injection pump has been replaced or rebuilt, the High Idle Speed must be checked and confirmed.*
4. **An incorrect High Idle Speed can cause Adjustment "A" to fail.**
5. Refer to Low Idle Speed Adjustment on page 3. *The High Idle Speed check is described at the end of that procedure.*

NOTE

The High Idle Speed must be confirmed as per the following instructions **prior** to starting Adjustment "A". Once Adjustment "A" is completed, the High Idle Speed should then match the specifications given in the table on page 15.

C. Fuel Shut-Off Solenoid Rod

1. Proper adjustment of the Fuel Shut-Off Solenoid Rod is critical to a successful Adjustment "A" procedure.
2. Confirm this adjustment prior to performing Adjustment "A".
3. *Particularly, if the injection pump has been replaced or rebuilt, this must be checked and confirmed.*
4. **Improper Fuel Shut-Off Rod adjustment can cause Engine Surging or Low Power.**
5. Refer to note on this subject in Low Idle Speed Adjustment on page 3. *Details of the Fuel Shut-Off Solenoid check are described at the end of that procedure.*

D. Emergency Stop Cable

1. Confirm adjustment of Emergency Stop Cable prior to performing Adjustment"A" procedure.
2. **Improper Stop Cable adjustment can cause Engine Surging or Low Power.**
3. Refer to note on this subject in Low Idle Speed Adjustment on page 3. *The Emergency Stop Cable check is described at the end of that procedure.*

E. RPM Sensor Test

1. Proper adjustment of the RPM Sensor is critical to a successful Adjustment "A" procedure.
2. **Improper adjustment can cause:**
   - **a. Adjustment "A" to fail.**
   - **b. KPSS Pf pressure to be improper.**
   - **c. Poor Hydraulic System performance.**
3. Refer to RPM Sensor Test & Adjustment on page 4.

NOTE

The RPM Sensor Test & Adjustment Procedure is the same for **both** before Minor Change (~m/c), and after Minor Change (m/c~)machines. (SK150 ~ SK460 w/Cummins).

2. "LO"- IDLE SPEED ADJUSTMENT

NOTE

This adjustment must be made with the linkage rod removed from between the stepping motor and the governor lever arm of fuel pump. Refer to page 8.

A. LOW IDLE ADJUSTMENT PROCEDURES

1. Start the engine, with throttle in "LO" position. Depress the Buzzer Stop Switch five (5) times to show the RPM display is on the Gauge Cluster. See Figure A. *(Note: Controller "TEST-RUN" toggle switch should be in "RUN" position at this time.)*
2. With a 19mm wrench, loosen the locknut on the Bumper Spring Screw and back the Bumper Spring Screw and back the Bumper Spring Screw out with a flat blade screwdriver, until no drop in engine RPM is realized. See Figure B.
3. If RPM reads 760~775 RPM, the LO-IDLE SPEED SCREW is set correctly, and you should proceed to **Step 5** to reset the Bumper Spring Screw. *(If RPM **does not read** 760 ~ 775 RPM, proceed with **Steps 4 and 5** to set the LO IDLE SPEED SCREW and Bumper Spring Screw.)*
4. With a 10mm wrench, loosen the locknut on the LO-IDLE SPEED SCREW and adjust screw with a flat blade screwdriver until engine RPM is 760~775. Tighten locknut. See Figure C.
5. Using a flat blade screwdriver, turn the Bumper Spring Screw clockwise (IN) until the engine RPM increases 25~ 40 RPM (800 ~ 815 RPM) and tighten the locknut. See Figure B. **DO NOT RE-ADJUST THE LO-IDLE SPEED SCREW.**
6. Manually (with Linkage disconnected), check the "HI"–IDLE RPM. Minimum speed should be 2,400+ RPM. This speed is necessary for Adjustment "A" to be performed successfully.
   (Note: This is not the final No-Load Speed.)

NOTE

With key switch "ON", check the Fuel Shut-Off Solenoid Valve to insure that it is in the full retract position. Check to insure the Emergency Stop Cable is loose or has some slack. Failure to check these could result in Engine Surging or low power. *(Note: Coil is energized (retracted) for "RUN" position)*

7. Perform the RPM Sensor tests beginning on page 4, then proceed to the Mechatronic Adjustment "A" Procedure beginning on page 7.

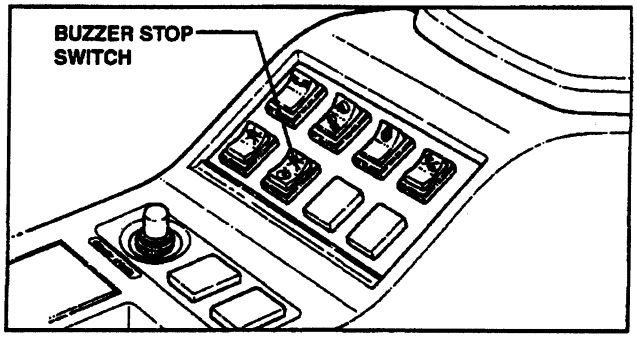


FIGURE A

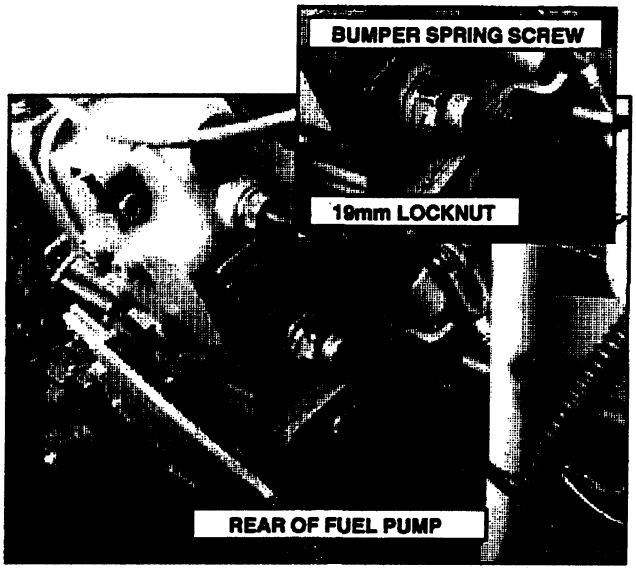


FIGURE B

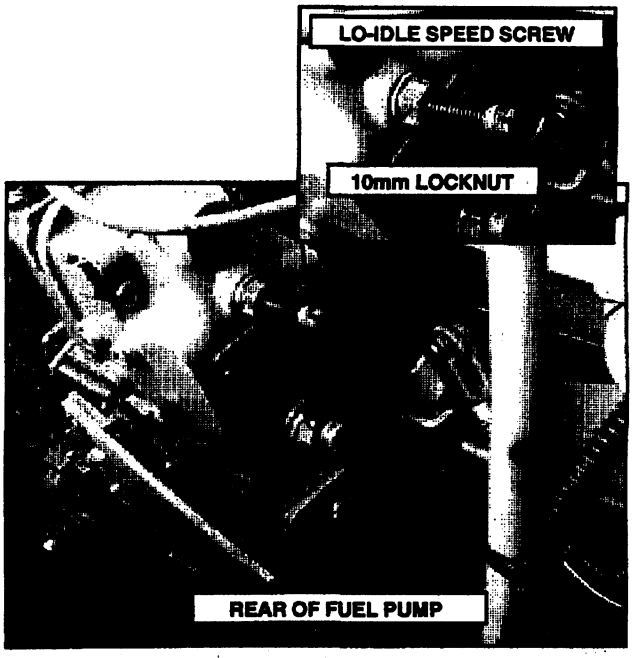


FIGURE C

3. RPM SENSOR TEST & ADJUSTMENT

Confirm tachometer accuracy and KPSS performance by performing the following RPM Sensor procedures.

A. Tools & Equipment Required

1. Volt/Ohm Meter
2. Tachometer *(for confirmation only)*
3. 1-1/8" SAE Spanner Wrench
4. 1-1/8" SAE Spanner Torque Wrench
5. KOBELCO RPM Sensor Test Harness, Part Number KSP9000-0003.

B. Machine Settings & Site Conditions

1. Engine "OFF" (Not Running)
2. Tachometer installed on machine.
3. RPM Sensor Harness (Green & White wires) disconnected.

C. Sensor Resistance Test

1. With engine "OFF" and sensor harness (Green & White wires) disconnected, connect the KOBELCO RPM Sensor Test Harness to the RPM Sensor Harness. See Figure 9.1.
2. Connect leads to meter and set meter to the 4K OHMS Position. See Figure 9.2.
3. Connect leads from meter to the Test Harness Leads and take reading from meter. See Figure 9.2A.
3. Remove cap from the Red & Black wire harness, attach test harness, connect leads from meter to Test Harness and record reading. See Figure 9.2A.
4. *Compare readings to chart below.*

SENSOR HARNESS	RESISTANCE SPECIFICATION
GREEN & WHITE	0.890 ± 10%
BLACK & RED	1.340 ± 10%

5. If reading of the Green & White wire Harness exceeds the given tolerance, the Black & Red wire harness can be temporarily used until a new RPM Sensor can be obtained and installed. If both Harnesses exceed the given tolerance, replace RPM Sensor before proceeding with any further adjustment, tests or operation of the machine.

NOTE

Contact an Authorized CUMMINS Dealer and Order Part Number– 3078152 RPM Sensor Assembly.

6. Should the resistance readings be within the given tolerance, proceed to Sensor Adjustment Procedures.

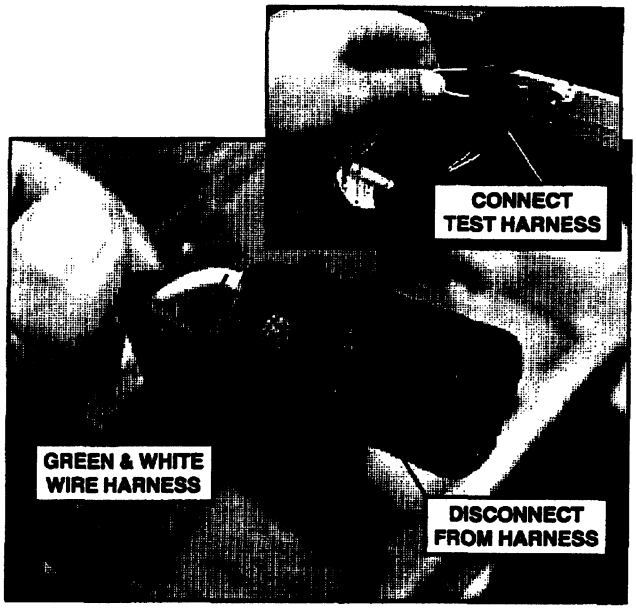


FIGURE 9.1

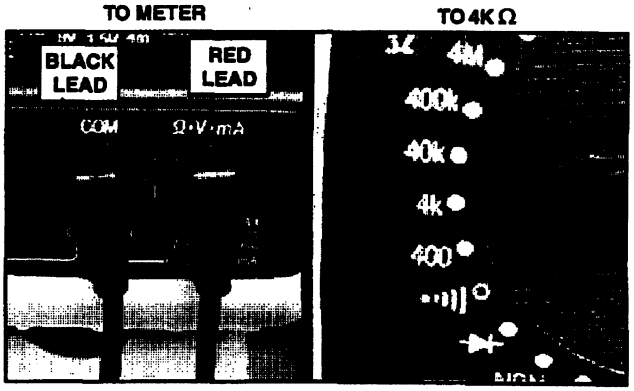


FIGURE 9.2

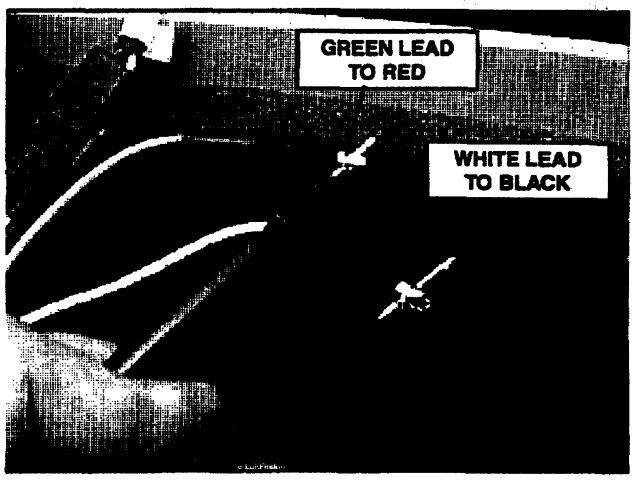


FIGURE 9.2A

D. RPM Sensor Adjustment Procedures

1. Loosen RPM Sensor Jam Nut and remove Sensor from Bell Housing. See Figure 9.3.
2. Inspect Sensor Face for damage or scarring from flywheel or other debris.
3. Clean Sensor with a clean, lint free cloth as metal particles may adhere to the magnet and cause loss of signal. See Figure 9.4.

NOTE

If Sensor is damaged, replace with new part before continuing with adjustment. Contact an Authorized CUMMINS Dealer and order Part Number- 3078152, RPM Sensor Assembly.

4. Install Sensor into Bell Housing and turn in until Sensor just touches Flywheel then, turn out one (1) complete turn.

NOTE

On the CUMMINS engine, adjustment of the RPM Sensor is primarily for adjusting the clearance between Sensor and Flywheel. Specified Clearance is 1.5mm (.060"). See Figure 9.5.

5. Tighten jam nut enough to hold sensor in position.
6. Install Tachometer *(for confirmation purposes)*, start engine and verify engine "LO" Idle RPM is in specified range of 850 ~ 900 RPM.

NOTE

Refer to previous paragraph: **2. A. 1.**, which describes how to show the RPM display on Gauge Cluster. If engine RPM is not within Specifications, adjust using hand throttle knob, to acquire 850 ~ 900 RPM "Lo" Idle, for this test.

7. Set Volt/Ohm Meter to a VAC setting that will accommodate a reading of up to 10 VAC.
8. Attach leads from meter to Sensor Harness (Green & White) wire spades inside Harness Connector.
9. With engine running at "LO" Idle, record reading. Reading should be 1.5 VAC ~ 3.0 VAC.

NOTE

a) If reading is below 1.5 VAC, replace Sensor.
b) If reading is above 3.0 VAC, turn Sensor out no more than 1/2 turn to bring reading at or below 3.0 VAC.
c) Should more than 1/2 turn be required to bring reading at or below 3.0 VAC, replace Sensor.

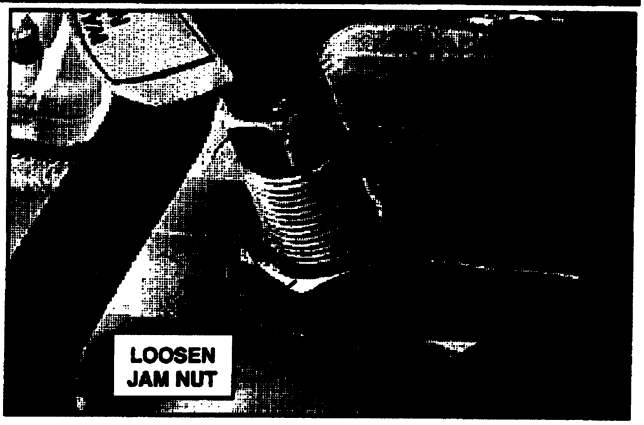


FIGURE 9.3

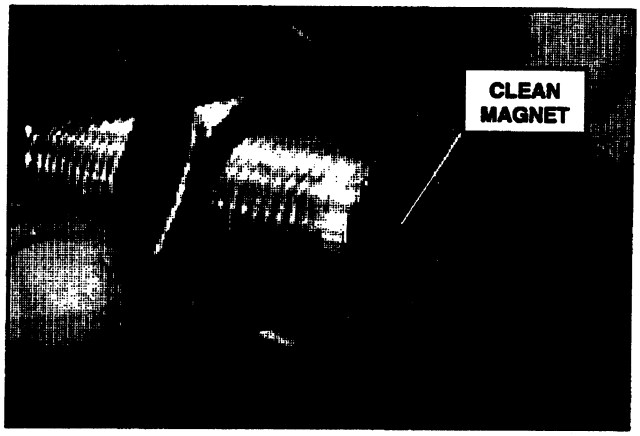


FIGURE 9.4

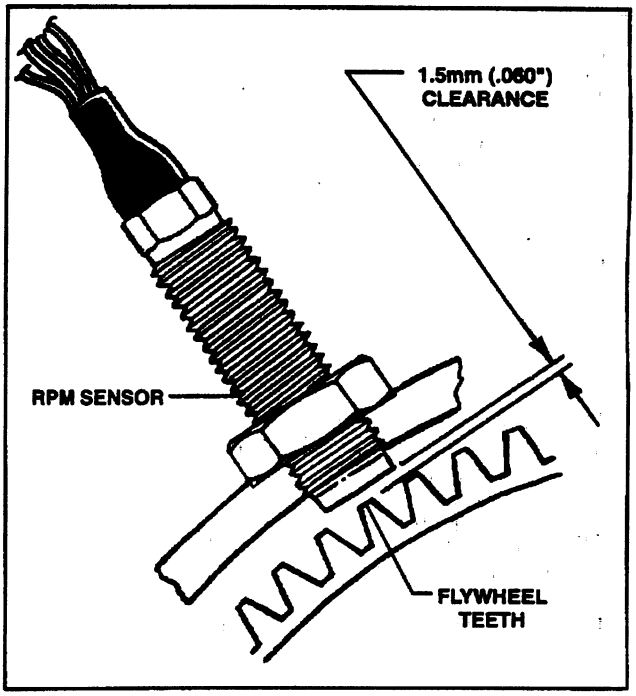


FIGURE 9.5

10. If reading is within the 1.5 ~ 3.0 VAC Specification, torque Sensor Jam Nut to 3.5kg ~ 5kg (25 ~ 35 ft lbs.).

CAUTION

Do not over tighten Sensor Jam Nut.
Over tightening will cause damage to the internal coils of the Sensor.

11. Move Throttle Control to "HI" Idle position and record reading from Volt/Ohm Meter. This reading should be 3.0 VAC ~ 6.0 VAC.
12. If reading in "HI" Idle is above 6.0 VAC, loosen Sensor Jam Nut and adjust Sensor OUT no more than 1/2 turn. If VAC reading is still above 6.0 VAC, replace Sensor.
13. Torque Sensor Jam Nut to 3.5kg ~ 5kg (25 ~ 35 ft lbs).
14. Turn engine "OFF", disconnect Volt/Ohm Meter, Tachometer and connect Sensor Harness (Green & White) to Main Wiring Harness.

WARNING

BE CAUTIOUS OF MOVING AND ROTATING PARTS WHILE PERFORMING RPM SENSOR TESTS AND ADJUSTMENT.
BE CAUTIOUS OF HOT SURFACES OF THE ENGINE.
WEAR PROTECTIVE CLOTHING, HARD HAT, SAFETY SHOES, GLOVES AND GOGGLES OR FACE SHIELD WHILE PERFORMING TESTS AND ADJUSTMENTS TO THE RPM SENSOR.

NOTE

The RPM Sensor Test & Adjustment Procedure is the same for **both** before Minor Change (~m/c), and after Minor Change (m/c~)machines. (SK150 ~ SK460 w/ Cummins).

Perform Mechatronics Adjustment "A" USING THE FOLLOWING PROCEDURE. CAUTION: Do not use the Mitsubishi engine procedure as found in the Mark IV Servicemans Handbook.

4. ADJUSTMENT "A"

MECHATRONIC CONTROLLER

SK300LC IV M/C (Cummins Engine)

A. Conditions to use Adjustment "A"

Adjustment "A" procedures must be performed when one or more of the following components have been removed, repaired, adjusted or replaced.

1. Mechatronics Controller (CPU)
2. Stepping Motor Assembly
3. Linkage between Stepping Motor and Engine Fuel Pump Assembly.
4. Engine Fuel Pump Assembly.
5. Engine

B. Tools & Equipment Required

1. Special Adjustment Harness Assembly. KOBELCO Part Number– 2479Z2364.
2. General hand or power tools required for removal and replacement of components.

C. Machine Settings & Site Conditions

1. Attachment in Hydraulic Oil Check Position.
2. Verify engine RPM's in the following work modes and settings.
   a. H-Mode, S-Mode, FC-Mode, D-Mode with throttle in "Hi-Idle and "Low-Idle" positions.
   b. Decel RPM
   c. Low-Idle RPM
3. Engine Emergency Stop Knob completely "IN".
4. CPU Access Panel Removed.
5. Firm, level adjusting site.

D. Adjustment "A" – Part 1 Procedures

1. Move the machine to a smooth, level area to perform Adjustment "A".
2. Operate the attachment Controls until the arm, attachment and boom are in the Hydraulic Oil Check Position. See Figure 6.9A.
3. If throttle control is possible, verify RPM's as described above in C. , step 2.
4. Push the engine Emergency Stop Knob all the way in. See Figure 6.10A.
5. Turn Switch key to "OFF". Wait approximately 4 seconds for electrical power to automatically turn off.
6. Remove mechatronic controller access cover. See Figure 6.11A.
7. Remove toggle switch grommet and carefully place the controller toggle switch in the "TEST" position. See Figure 6.12A.

MACHINE IN HYDRAULIC OIL CHECK POSITION

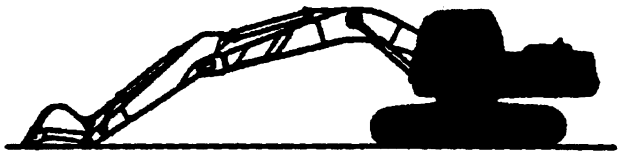


FIGURE 6.9A

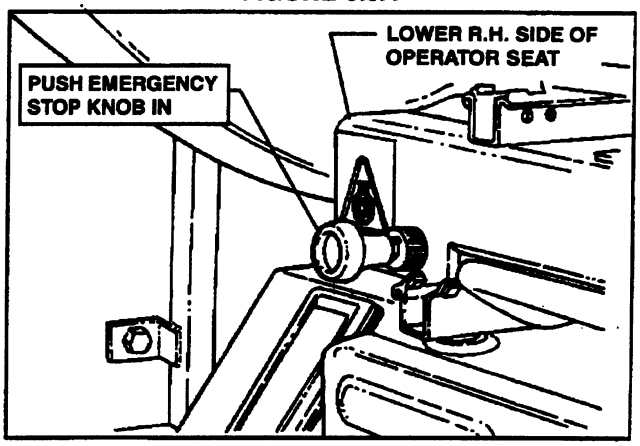


FIGURE 6.10A

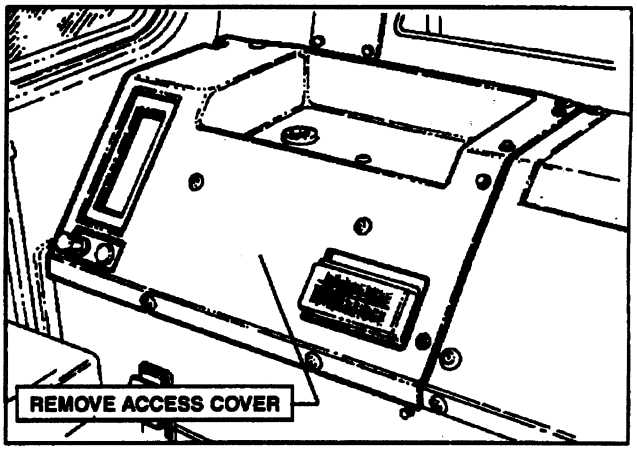


FIGURE 6.11A

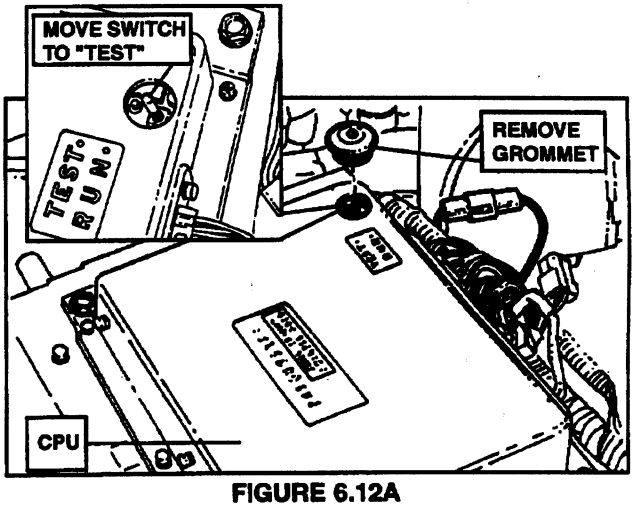


FIGURE 6.12A

CAUTION

Make certain electrical power is "OFF" before moving the controller "TEST-RUN" toggle switch. This will avoid possible damage to the Mechatronics controller and prevent loss of computer memory.

NOTE

When the Controller "TEST-RUN" Toggle Switch is placed in the "TEST" position, the Auto-Accel L.E.D. indicator light on the gauge cluster display will burn continuously as a reminder that the controller toggle switch is in the "TEST" position.

8. Locate the controller 1P (1 Pin) coupler and disconnect. Connect the KOBELCO Special Adjustment Harness Assembly to the 1P coupler. See Figure 6.13A.

9. Raise engine access cover and remove the Linkage Lever Arm from the stepping motor shaft. using a 5mm allen wrench. See Figure 6.14A.

10. Remove the Ball Joint end from the throttle gov ernor lever arm. See Figure 6.15A.

11. Loosen the linkage jam nuts on the Adjustable Linkage and adjust until distance between linkage mounting holes is 243mm (9.5"). See Figure 6.16A. Finger tighten jam nuts and lay linkage aside.

NOTE

This is a temporary starting dimension. Final adjustment will be later in this procedure.

12. Make sure that "OK" and then "Clock Time" is shown on the gauge cluster display prior to performing Adjustment "A".

If any Service Function Icons are displayed, Adjustment "A" procedure will not be possible.

Resolve any Service problems relating to displayed Icons before attempting to perform Adjustment "A".

13. Make certain the CPU "TEST-RUN" switch is in the "TEST" position.

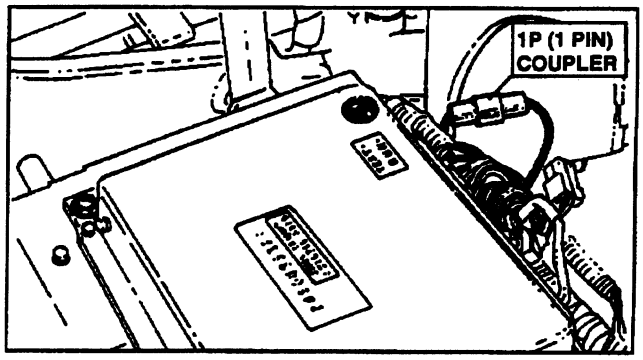


FIGURE 6.13A

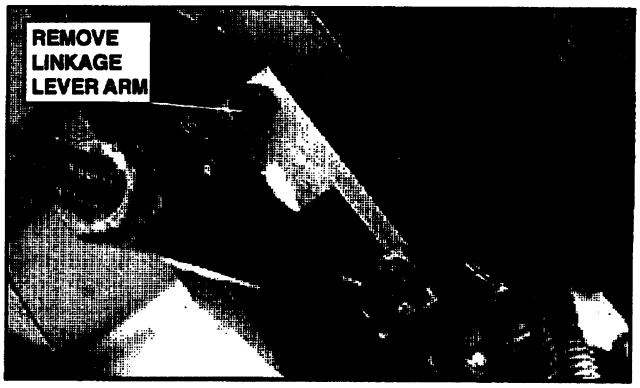


FIGURE 6.14A

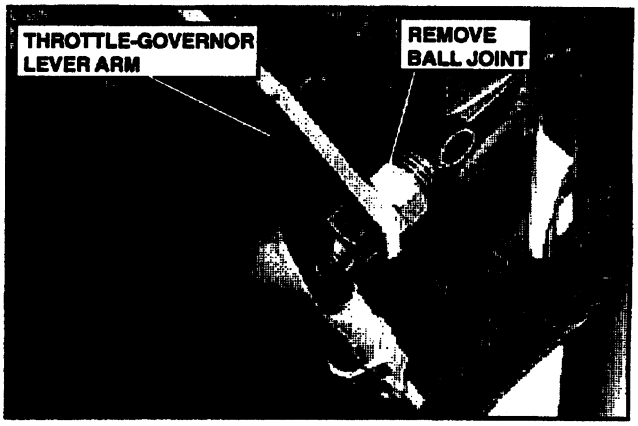


FIGURE 6.15A

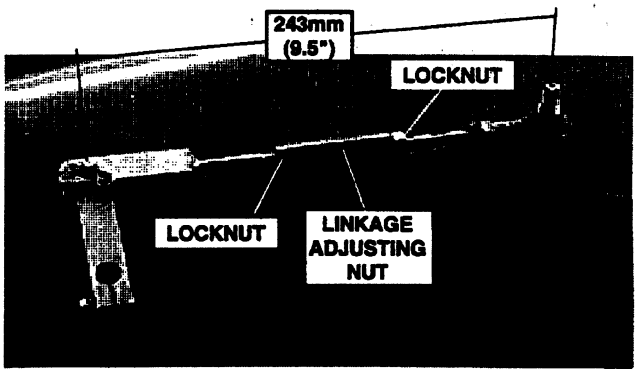


FIGURE 6.16A

14. Place the KPSS Mode Switch in the "H"-Mode. See Figure 6.17A.
15. Place the Auto-Accel Switch in the "ON" position. See Figure 6.18A.
16. Move the Throttle Control to "LO-IDLE" position. See Figure 6.17A.
17. Place Key switch in the "ON" position. Engine should not be running.

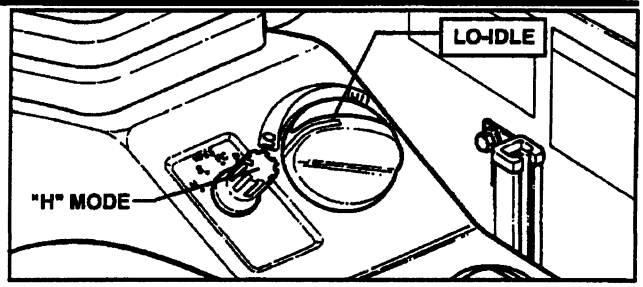


FIGURE 6.17A

NOTE

The settings described in steps 13 through 17 must be exactly as described. Any other settings will not allow proper adjustment of the Mechatronics Controller.

18. Depress and hold the Special Adjustment Harness Switch 3 to 5 seconds until the Gauge Cluster Display Reads "CPU". Then release switch. See Figure 6.19A.

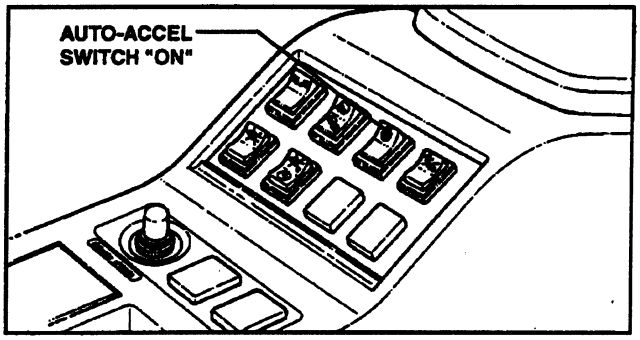


FIGURE 6.18A

NOTE

"CPU" should remain on the display. If it doesn't, check conditions as described in steps 13-17 and repeat step 18. Make certain to hold the Special Adjustment Harness Switch 3 to 5 seconds.

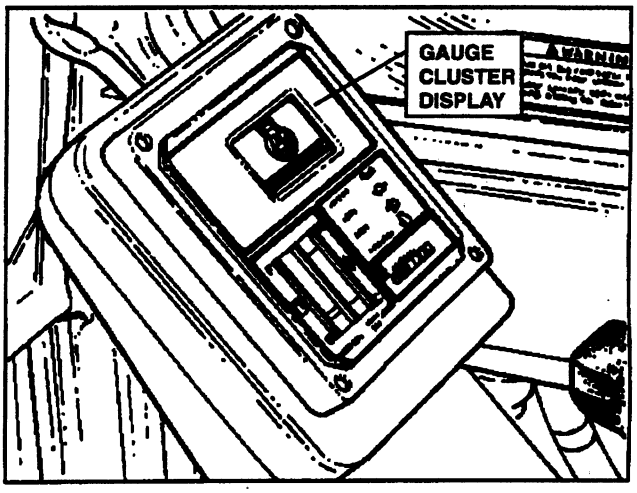


FIGURE 6.19A

NOTE

As soon as "CPU" is displayed and special adjustment harness switch is released, the stepping motor will move to the Low Idle position. If "CPU" goes off display, the procedure has failed. Check all settings ("LO"-IDLE adjustment and Stepping Motor) and start procedure over.

19. While holding the Governor Lever down against the Engine Low Idle position, locate the linkage lever arm onto the stepping motor splined shaft at approximately 3 o'clock position and secure the Ball Joint to the governor arm. See Figure 6.20A.

FIGURE 6.20A

NOTE

The 3 o'clock position for the Linkage Lever Arm on the Stepping Motor Splines is a starting point. The position could vary from the 2 o'clock to 4 o'clock position. The linkage should have a small amount of slack when in position.

20. Slide the Linkage Lever Arm Lock on the splines until 1/16" to 1/8" of spline is visible. Tighten the Socket Head Screw, securing the lever arm to stepping motor shaft and tighten jam nuts on rod linkage

21. Depress the Special Adjustment Harness Switch once. This will cause the CPU to turn power to the stepping motor off.
22. Manually rotate the stepping motor shaft until the governor lever is 0.25mm (.010") ~ 0.5mm (.020") from the Hi-Idle Stop Set Bolt. Hold in position and depress the Special Adjustment Harness Switch once to lock stepping motor in position (you will feel the stepping motor lock into position). See Figure 6.21A.

NOTE

The 0.25mm (.010") ~ 0.5mm (.020") gap between the governor lever and the Hi-Idle Stop Set Screw must be maintained. If there is no gap or gap is too small, the CPU will not complete the indexing phase and the procedure will fail. ***See directions at right.*** →

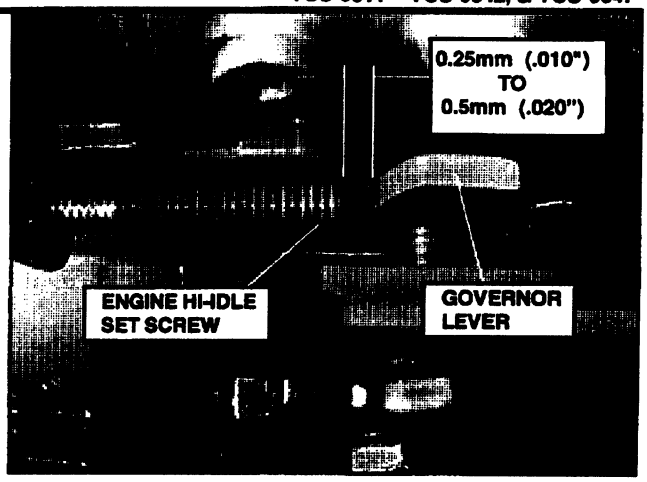


FIGURE 6.21A

CAUTION

Never attempt to manually rotate stepping motor shaft or move linkage once the stepping motor has been locked in position as described in step 22.

23. After proper gap has been obtained, depress the Special Adjustment Harness switch once. This will cause the Stepping Motor to index from its high position back down to the low position and then CPU will program this setting in the memory. ***Do not turn key or power "OFF", proceed to Part 2 of the procedure.***

NOTE

The stepping motor will cycle to the engine stop position and back to engine start position. Also "CPU" will leave the display. If "CPU" fails to index, restart the procedure from the beginning.

How to Adjust Gap

Follow instructions below to adjust gap between governor lever and "Hi-Idle" Stop Set Bolt to 0.25 ~ 0.5mm (.010" ~ .020") using the Auto-Accel and Buzzer Stop Switches. See Figure 6.23A.

1. **Auto-Accel Switch "ON"**
   a. Each push of the Buzzer Stop Switch will *decrease* the gap between the Governor Lever and the "Hi-Idle" Stop Set Bolt by approximately 0.04mm (.001").
2. **Auto-Accel Switch "OFF"**
   a. Each push of the Buzzer Stop Switch will *increase* the gap between the Governor Lever and the "Hi-Idle" Stop Set Bolt by approximately 0.04mm (.001").

Once proper clearance has been obtained, refer to step 23.

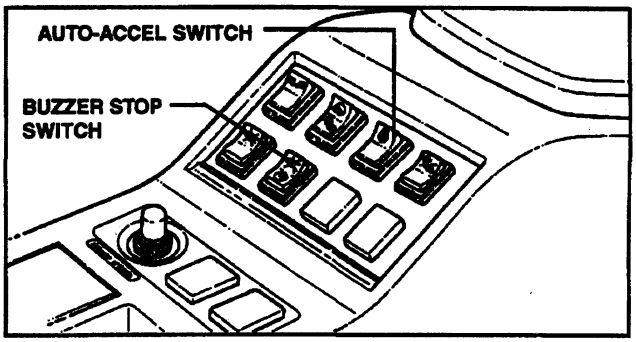


FIGURE 6.23A

E. Adjustment "A"– Part 2

1. Start Engine and allow to run at idle until engine is at normal operating temperature. Use attachment relief if necessary to heat engine.
2. Place KPSS Mode Switch in "H"- Mode.
3. Place Auto-Accel Switch in "OFF" position.
4. Throttle Control in Lo-Idle position.
5. Key switch "ON" with Engine running.

NOTE

The machine settings must be exactly as described in steps 1 through 5. Any other settings will not allow success of Adjustment "A"– Part 2.

6. After machine settings are as described in steps 1-5, depress and hold the Special Adjustment Harness Switch for 3 to 5 seconds until "CPU" is visible on display.
7. After "CPU" is on display and the switch is released, the CPU will gradually cycle the stepping motor from below Lo-Idle to Hi-Idle. This programs the CPU to all stepping motor positions and will take 3 to 5 minutes.

NOTE

If governor lever touches the "HI"-Idle Set Screw during this cycle, the procedure has failed. Adjust the gap between the governor lever and the "HI"-Idle set screw and repeat procedure "A". Refer to Page 10.

8. After this process is complete, the stepping motor will immediately return to the Lo-Idle position and "CPU" will leave the display.
9. Turn key switch to "OFF" and wait approximately 4 second for electrical power to automatically turn off.
10. Remove the Special Adjustment Harness from the 1P coupler and connect coupler together. See Figure 6.22A.
11. Move CPU "TEST-RUN" Switch to "RUN" position and replace the grommet. See Figure 6.23A.
12. Start Engine and verify Engine RPM's according to engine specifications in Section I.
13. Install CPU Access Panel. See Figure 6.24A.

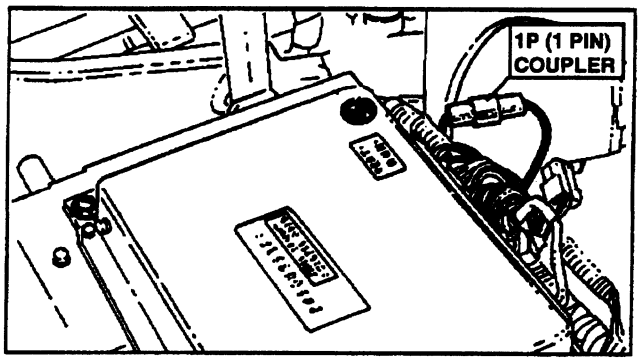


FIGURE 6.22A

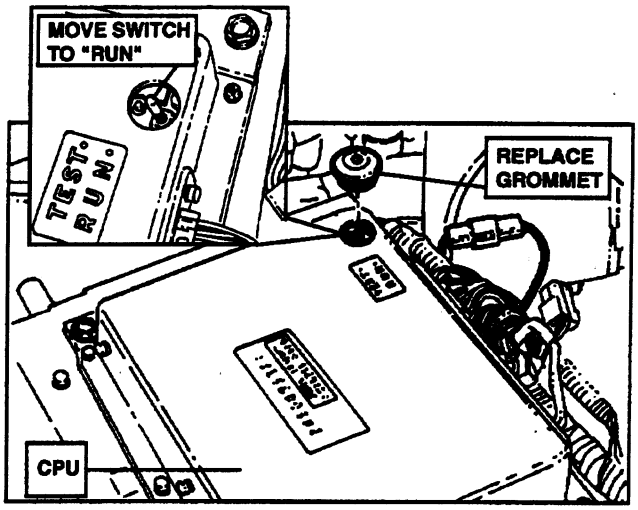


FIGURE 6.23A

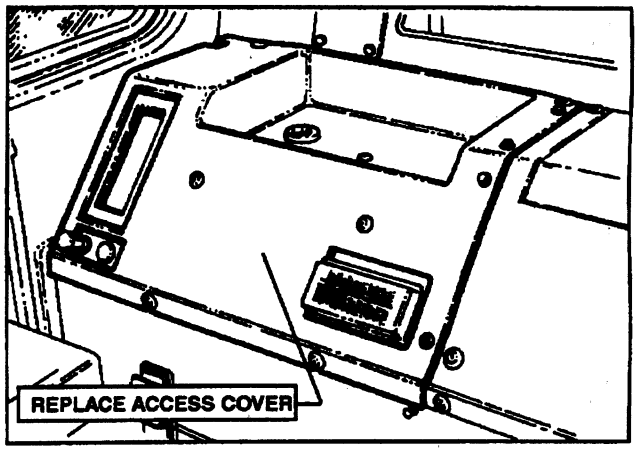


FIGURE 6.24A

5. ADJUSTMENT "B"– VARIABLE LOADING MODE MECHATRONIC CONTROLLER

NOTE

If Machine is not equipped with Variable Loading Mode, adjustment "B" is not necessary.

A. Conditions to use Adjustment "B"

Adjustment "B" procedures must be performed when one or more of the following components have been removed, repaired, adjusted or replaced.

1. Mechatronics Controller (CPU).
2. Variable Loading Mode Components.

B. Tools & Equipment Required

1. Special Adjustment Harness Assembly. KOBELCO Part Number– 2479Z2364.
2. General hand or power tools required for removal and replacement of components.
3. 105kg/cm² (1500psi) Pressure Gauge.

C. Machine Settings & Site Conditions

1. Hydraulic oil at 45°C to 55°C (113°F to 131°F).
2. 105kg/cm² (1500psi) Pressure Gauge installed.
3. CPU Access Panel Removed.
4. CPU "TEST-RUN" Switch in "TEST" position.
5. Firm, level adjusting site.

D. Adjustment "B" Procedures

1. Move the machine to a smooth, level area to perform Adjustment "B".
2. Operate the attachment Controls until the arm, attachment and boom are in the Hydraulic Oil Check Position. See Figure 6.25.
3. Turn Engine "OFF".
4. Release hydraulic tank pressure by removing cap from pressure relief valve and depressing relief valve stem. See Figure 6.26.
5. Remove Test Port Plug from Flow Distribution Solenoid Valve. See Figure 6.27.
6. Install fitting and 105kg/cm² (1500psi) pressure gauge into test port. See Figure 6.27.

CAUTION

Oil may be hot. Wear approved safety equipment when performing any maintenance or test procedures.

MACHINE IN HYDRAULIC OIL CHECK POSITION

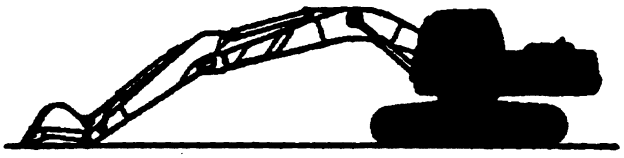


FIGURE 6.25

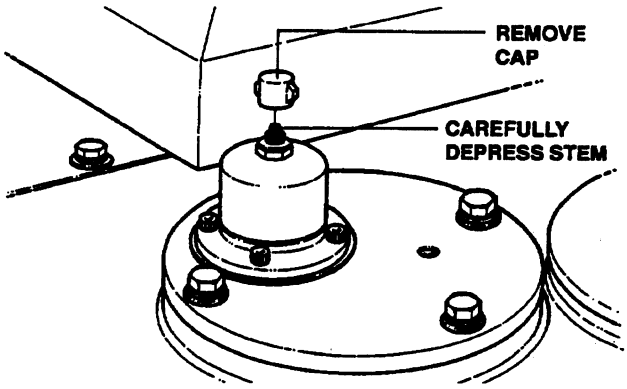


FIGURE 6.26

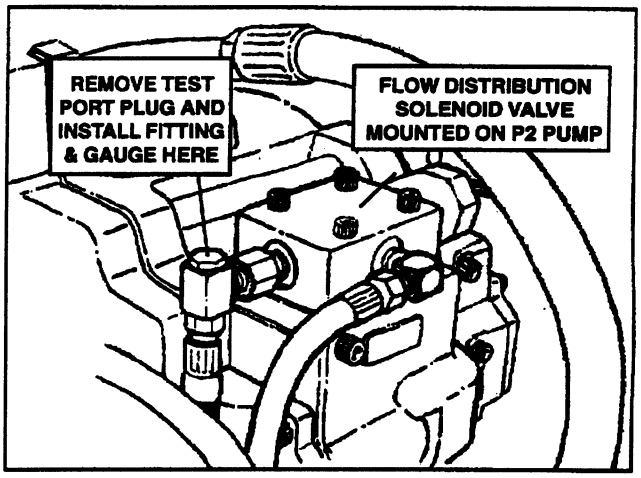


FIGURE 6.27

7. With key switch and electrical power "OFF", remove the CPU access Panel behind the operator seat. See Figure 6.28.
8. Locate and disconnect CPU 1P (1Pin) coupler. Connect Special Adjustment Harness to 1P coupler. See Figure 6.29.
9. Remove CPU grommet and carefully place CPU "TEST-RUN" Switch in the "TEST" position.

CAUTION

Never attempt to change position of the CPU "TEST-RUN" Switch with key switch or electrical power on.

10. Place KPSS Mode Switch to S-Mode.
11. Place Auto-Accel Switch to "OFF".
12. Start Engine.
13. Place Throttle Control in "HI-IDLE" position.
14. Depress the Special Adjustment Harness Switch and hold for 3 to 5 seconds until "CPU" is visible on display.

NOTE

"CPU" should remain on display. If it doesn't, check steps 9 through 13 and repeat step 14.
Conditions must be exactly as described in steps 9-14. Different conditions will not allow success of Adjustment "B" procedures.

15. Turn the Variable Loading Mode Switch counterclockwise to the left most setting. See Figure 6.30.
16. Operate BOOM UP Control until boom is completely up. Hold control in this position. See Figure 6.31.
17. While holding BOOM UP Control in the up position, adjust the Variable Loading Mode Switch clockwise until the pressure gauge reaches the pressure specified in chart for model being adjusted.

MODEL	UPPER LIMIT PRESSURE
SK300 ~ SK300LC	17~18 kg/cm² (242~256 psi)

Unit: kgf/cm² (psi)

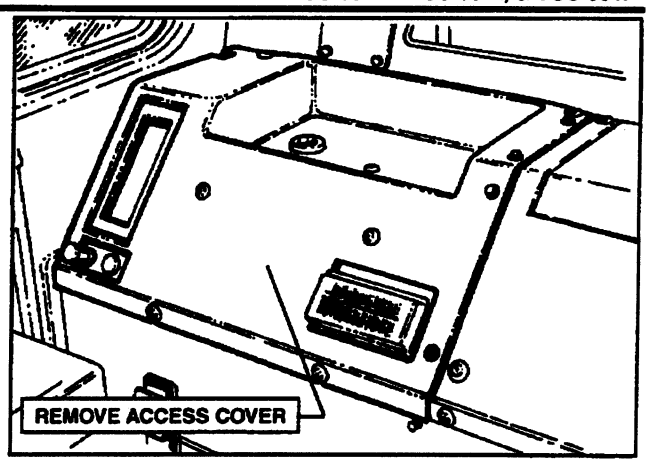


FIGURE 6.28

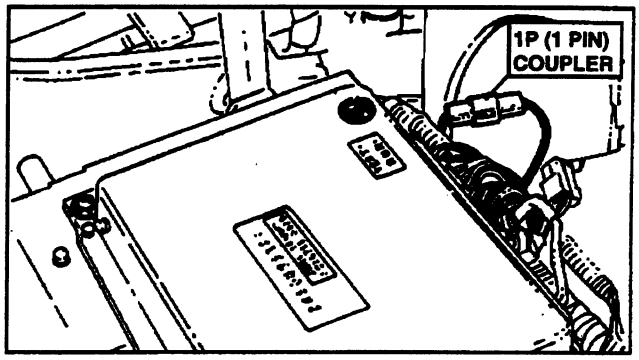


FIGURE 6.29

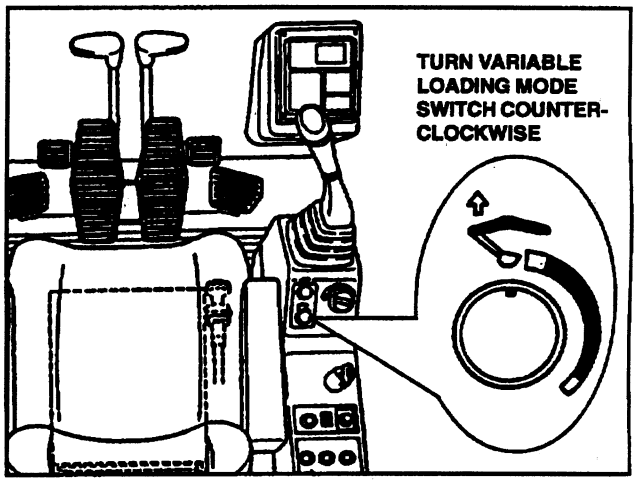


FIGURE 6.30

HOLD CONTROL IN BOOM UP POSITION

FIGURE 6.31

18. When the proper pressure is reached, stop adjustment of the Variable Loading Mode Switch and depress the Special Adjustment Harness Switch once. This will program the CPU to the Upper Limit setting.
19. Release the BOOM UP Control.
20. Return the Variable Loading Mode Switch back to the Left Limit by turning switch counter-clockwise. See Figure 6.32.
21. Operate the BOOM UP Control and hold.
22. Adjust the Variable Loading Mode Switch until the pressure gauge reaches pressure specified in chart for model being adjusted.

MODEL	LOWER LIMIT PRESSURE
SK300 ~ SK300LC	11.5~12.5 kg/cm² (163.6~177.8 psi)

Unit: kgf/cm² (psi)

23. When the proper pressure is reached, stop adjustment of the Variable Loading Mode Switch and depress the Special Adjustment Harness Switch once. This will program the CPU to the Lower Limit setting.

NOTE

After step 23 is complete, "CPU" will automatically leave the display signaling that Adjustment "B" is complete.

24. After "CPU" has left the display, turn key switch to "OFF" stopping the engine and wait approximately 4 seconds for electrical power to automatically go off.
25. Remove the Special Adjustment Harness from the 1P coupler and connect 1P coupler together. See Figure 6.33.
26. Move the CPU "TEST-RUN" Switch in the "RUN" position and replace grommet. See Figure 6.34.
27. Install CPU Access Cover.
28. Remove pressure gauge and fitting. Replace Test Port Plug.
29. Confirm proper operation of machine.

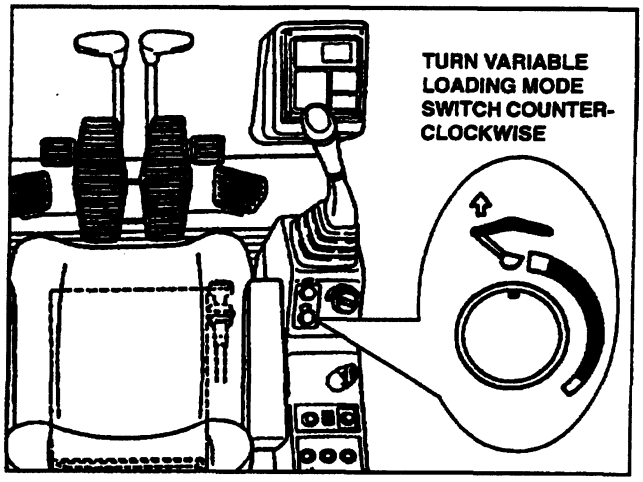


FIGURE 6.32

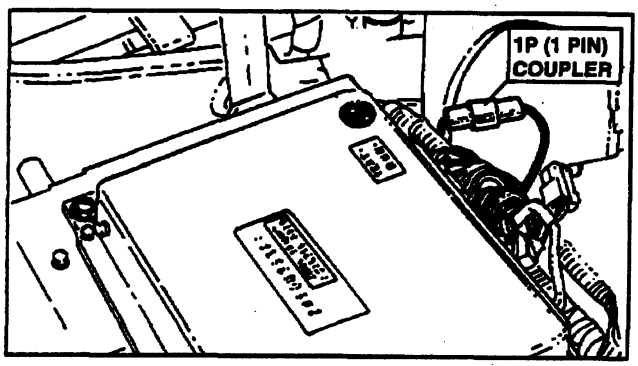


FIGURE 6.33

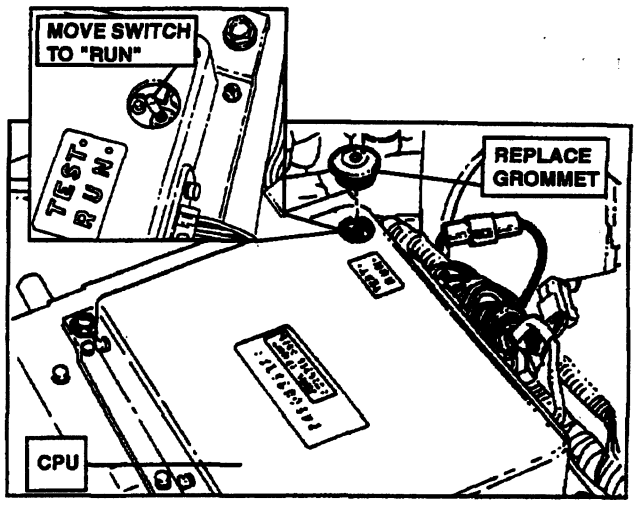
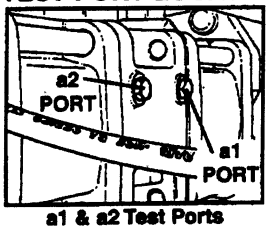


FIGURE 6.34

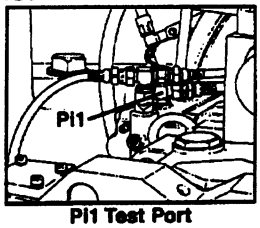
INSPECTION ITEM			PRESSURE					Adjustment Point	MEASURING CONDITION, FUNCTION
			READING FROM		SPECIFICATION				
STANDARDS FOR TESTING	Cleanliness of Hydraulic Oil		Hydraulic Oil Tank		Class: NAS 7–9			N/A	Take Sample
	Temperature of Hydraulic Oil		Hydraulic Oil Tank Surface		°C- 45–55	°F- 113–131		N/A	Ambient Temperature
	Engine Coolant Temperature		Radiator Surface		°C- 60–90	°F- 140–194		N/A	-10°C ~ 50°C (14°F ~ 122°F)
	ENG RPM	Low Idle	Gauge Cluster Display or Externally Mounted Tachometer		850–900 RPM			RPM Sensor Adjustment and/or Mechatronics Adjustment "A"	Throttle @ "LO"- Idle
		Hi- Idle			2065–2100 RPM				Throttle @ "HI"- Idle
		"S" or "D" Mode			1670–1760 RPM				Throttle @ "HI"- Idle
		"FC" Mode			1370–1430 RPM				Throttle @ "HI"- Idle
		Auto Accel-Decel "ON"			1000–1100 RPM				Throttle @ "HI"- Idle
SYSTEM	COMPONENT		GAUGE @	SIZE	PORT	Kgf/cm²	PSI		
PILOT CIRCUIT	PRIMARY PRESSURE		Gear Pump	PF 1/4	P3	47–53	670–750	PR1	"H"-Mode, Eng/ Hi Idle
MAIN RELIEFS	TRAVEL	RH	Main Pump	PF 1/4	a1	350–355	4980–5050	TR1	"H"-Mode, Engine at Hi Idle. Simultaneous LH/RH Operation Travel Stalled.
		LH			a2	350–355	4980–5050	TR2	
	BOOST PRESSURE	RH	Main Pump	PF 1/4	a1	330–345	4695–4910	MR1	Bucket Digging
		LH			a2	330–345	4695–4910	MR2	Boom Raising
	ATTACHMENT	RH	Main Pump	PF 1/4	a1	300–305	4270–4340	MR1	Bucket Digging
		LH			a2	300–305	4270–4340	MR2	Boom Raising
PORT RELIEFS	BUCKET (DO NOT ADJUST)	ROD	Main Pump	PF 1/4	a1	330–340	4695–4837	RV8	Bucket Dump
		HEAD			a2	345–355	4910–5050	RV7	Bucket Digging
	BOOM (DO NOT ADJUST)	ROD	Main Pump	PF 1/4	a1	330–340	4695–4837	RV6	Boom Lowering
		HEAD			a2	345–355	4910–5050	RV5	Boom Raising
	ARM (DO NOT ADJUST)	ROD	Main Pump	PF 1/4	a1	345–355	4910–5050	RV10	Arm Out (Cylinder IN)
		HEAD			a2	330–340	4695–4837	RV9	Arm In (Cylinder OUT)
	TRAVEL (DO NOT ADJUST)	RH F	Main Pump	PF 1/4	a1	350–360	4980–5120	RV14	"H"-Mode, Engine at Hi Idle. Simultaneous LH/RH Travel Engaged
		RH R			a1	350–360	4980–5120	RV13	
		LH F			a2	350–360	4980–5120	RV13	"H"-Mode, Engine at Hi Idle. Simultaneous LH/RH Travel Engaged
		LH R			a2	350–360	4980–5120	RV14	
	SWING	RH	Main Pump	PF 1/4	a2	225–325	3200–4625	RV11	Bucket Lock, Stall Swing
		LH			a2	225–325	3200–4625	RV12	Bucket Lock, Stall Swing
VARIABLE LOADING MODE (OPTION)	LOADING MODE SWITCH	Upper	Flow Distribution Solenoid Valve	PF 1/4		17–18	242–256	CPU ADJ "B"	"S"Mode, Eng in "HI" Idle
		Lower				11.5–12.5	163.6–177.8		"S"Mode, Eng in "HI" Idle
LOW PRESSURE RELIEFS	INDEPENDENT "D" MODE- OFF	RH	Main Pump	PF 1/4	a1	32–47	455–668	Internal Shims	"H" Mode, Eng in "HI" Idle
		LH			a2	32–47	456–668		Controls in Neutral
	INDEPENDENT "D" MODE- ON	RH	Main Pump	PF 1/4	a1	0–7	0–100	Internal Shims	"D" Mode, Eng in "HI" Idle
		LH			a2	0–7	0–100		Controls in Neutral
NEGATIVE CONTROL PRESSURES	INDEPENDENT "D" MODE- OFF	RH	Main Pump	PF 1/4	PI1	32–47	455–668	Low Pressure Relief Valves	"H" Mode, Eng in "HI" Idle
		LH			PI2	32–47	455–668		Controls in Neutral
	INDEPENDENT "D" MODE- ON	RH	Main Pump	PF 1/4	PI1	28–38	398–540		"D" Mode, Eng in "HI" Idle
		LH			PI2	28–38	398–540		Controls in Neutral
PROPORTIONAL SOLENOID VALVE	KPSS	H • S • FC • D	Main Pump	PF 1/4	a3	0-3	0-43	Pf Solenoid Valve	Engine in "HI" Idle Controls in Neutral
		Release			a3	133-163	189-232		
		Boost			a3	32-40	455-569		

(4/97)

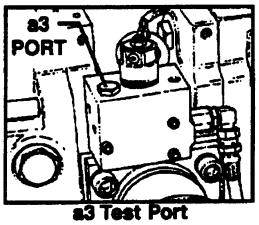
TEST PORT LOCATIONS:



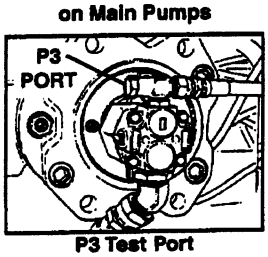
a1 & a2 Test Ports on Main Pumps



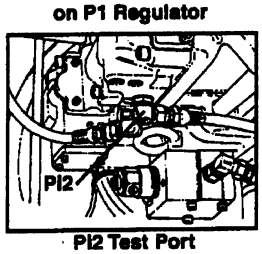
PI1 Test Port on P1 Regulator



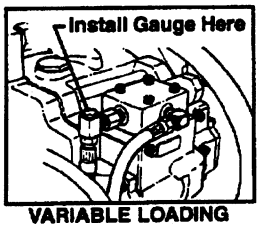
a3 Test Port on Pf Solenoid



P3 Test Port on Pilot Gear Pump



PI2 Test Port on P2 Regulator



VARIABLE LOADING MODE (OPTION)

NOTE

Take Measurements In "H" Mode unless otherwise specified.

The standard tolerance shall be an allowable range in field measurements.

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

IMPORTANT NOTE:
This Bulletin is being issued to document new adjustment procedures for the subject & affected machines listed below. It provides the revised performance specifications now used on these units as well. It is suggested to place copies of this Bulletin in your SK400/460LC IV Shop Manual, and your Mark IV Serviceman's Handbook, for future reference. ***To Kobelco Dealers: Please copy and distribute to your Service Technicians, as necessary for this purpose.***

DATE: July 1997

BULLETIN: HE-314

SUBJECT: Performance Specifications **Before & After "Minor Change", Cummins Powered units only.**

AFFECTED MACHINES: SK400 / 460LC IV - YSU-0200 ~ 0241 *(with air compressor - before "Minor Change")*
YSU-0242 ~ *(without air compressor - after "Minor Change")*

Please be advised that the subject machines are equipped with the new "emissionized" Cummins M 11 engines. Please also note that at the "Minor Change", the air compressor system was deleted. These units require different KPSS controllers[1], stepping motor throttle linkage, engine RPM settings[2], and Adjustment "A" procedures.

Because of these changes, use care when referring to the previously published specifications for engine R.P.M., or Adjustment "A", as shown in the existing MK IV Shop Manuals and MK IV Serviceman's Handbook.

SK400 / 460LC IV units prior to s/n YSU-0200 were equipped with MMC engines; refer to Service Bulletin HE-266.

Be sure to check the serial number of the machine you are working on, and refer to the proper specifications. Specifications for Cummins powered, and "Minor Change" units are different from the earlier machines !

PLEASE NOTE

This bulletin details the following "pre-checks" to be made prior to performing the Mechatronics Adjustment "A" procedure:

A. Engine Low Idle Speed
B. Engine High Idle Speed
C. RPM Sensor Test

Follow the instructions given in the "pre-checks" to help achieve a successful Adjustment "A" procedure. Failure to follow these instructions can result in poor engine or machine performance, and possible failure of Adjustment "A".

[1] Refer to Service Bulletin HE-310.

[2] Refer to Service Bulletin HE-309A.

These machines have various other changes to their features and equipment, that is further detailed in Service Bulletin HE-308.

THIS BULLETIN IS BEING ISSUED FOR INFORMATION ONLY, AND IS NOT AN AUTHORIZATION FOR ANY REPLACEMENT OR WARRANTY CLAIM SUBMITTAL.

1. **PRE-CHECKS TO BE MADE PRIOR TO PERFORMING ADJUSTMENT "A" PROCEDURE**
   SK400 / 460 IV - Before & After M/C (Cummins Engine)

All items listed below are described in detail on the following referenced pages, and should be checked and confirmed prior to performing Adjustment "A".

NOTE

Engine must be at operating temperature **before** making the following pre-checks, or performing the Adjustment "A" procedure !

A. Engine Low Idle Speed

1. The proper engine low idle speed is critical to a successful Adjustment "A" procedure.
2. Confirm this speed prior to performing Adjustment "A".
3. *Particularly, if the injection pump has been replaced or rebuilt, the low idle speed must be checked and confirmed.*
4. **An incorrect low idle speed can cause Adjustment "A" to fail.**
5. Refer to Low Idle Speed check on page 3.

NOTE

The Low Idle Speed must be confirmed as per the following instructions **prior** to starting Adjustment "A". Once Adjustment "A" is completed, the Low Idle Speed should then match the specifications given in the table on page 15.

B. Engine High Idle Speed

1. The proper engine High Idle Speed is also critical to a successful Adjustment "A" procedure.
2. Confirm this speed prior to performing Adjustment "A".
3. *Particularly, if the injection pump has been replaced or rebuilt, the High Idle Speed must be checked and confirmed.*
4. **An incorrect High Idle Speed can cause Adjustment "A" to fail.**
5. Refer to Low Idle Speed Check on page 3. *The High Idle Speed check is described at the end of that procedure.*

NOTE

The High Idle Speed must be confirmed as per the following instructions **prior** to starting Adjustment "A". Once Adjustment "A" is completed, the High Idle Speed should then match the specifications given in the table on page 15.

C. RPM Sensor Test

1. Proper adjustment of the RPM Sensor is critical to a successful Adjustment "A" procedure.
2. **Improper adjustment can cause:**
   a. Adjustment "A" to fail.
   b. KPSS Pf pressure to be improper.
   c. Poor Hydraulic System performance.
3. Refer to RPM Sensor Test & Adjustment on page 4.

NOTE

The RPM Sensor Test & Adjustment Procedure is the same for **both** before Minor Change (~m/c), and after Minor Change (m/c~)machines. (SK150 ~ SK460 w/Cummins).

2. LOW IDLE SPEED CHECK

NOTE

This check must be made with the linkage rod removed from between the stepping motor and the governor lever arm of the fuel pump. Refer to page 8.

A. LOW IDLE CHECK PROCEDURES

1. Start the engine, with throttle in "LO" position. Depress the Buzzer Stop Switch five (5) times to show the RPM display is on the Gauge Cluster. See Figure A. *(Note: Controller "TEST-RUN" toggle switch should be in "RUN" position at this time.)*
2. Manually (with Linkage disconnected), hold the governor lever of the fuel pump against the lo-idle speed stop. See Figure B. If RPM reads 600~700, the LO-IDLE SPEED SCREW is set correctly, and you should proceed to **Step 4** to check the Hi-Idle Speed.
3. *If RPM **does not read** 600 ~ 700, you should contact your local Cummins Engine Dealer. Do not re-adjust the lo-idle speed screw.* **See note below.**
4. Manually (with Linkage disconnected), check the "HI"–IDLE RPM. Hold the governor lever of the fuel pump against the Hi-idle speed stop. See Figure C. Minimum speed should be 2,400+ RPM. This speed is necessary for Adjustment "A" to be performed successfully. ***(Note: This is not the final No-Load Speed.)***
5. If RPM reads 2,400+, proceed to **Step 6.** *If RPM **does not read** 2,400+, you should contact your local Cummins Engine Dealer. Do not re-adjust the hi-idle speed screw.* **See note below.**

NOTE

On the Cummins M11 engine, the LO and HIGH IDLE speed setscrews are set and sealed from the Cummins Engine Factory, and can only be re-set by an Authorized Cummins Dealer. The engine warranty may be voided if these seals are broken, and the speeds re-set by anyone other than a Cummins Service Technician. The machine warranty may also be affected if this is done.

6. Perform the RPM Sensor tests beginning on page 4, then proceed to the Mechatronic Adjustment "A" Procedure beginning on page 7.

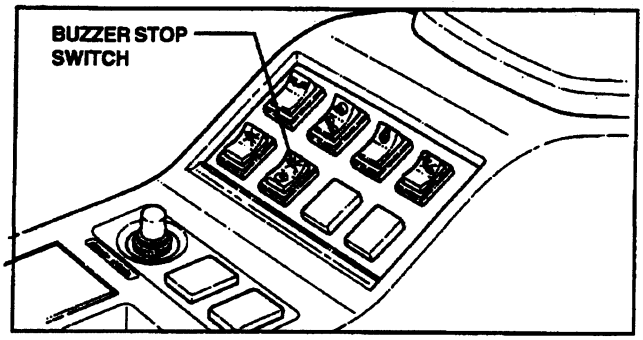


FIGURE A

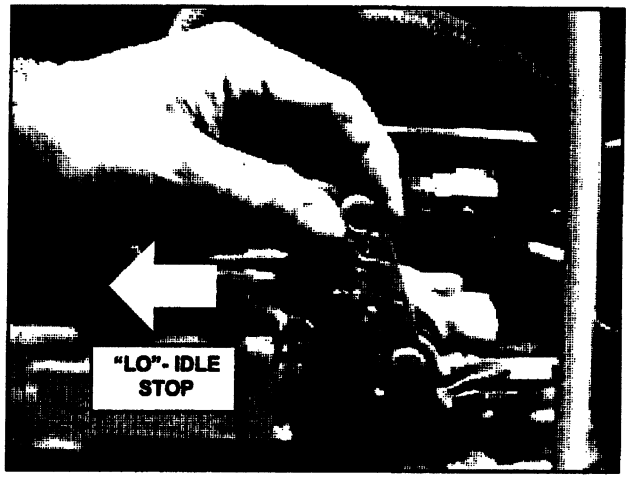


FIGURE B

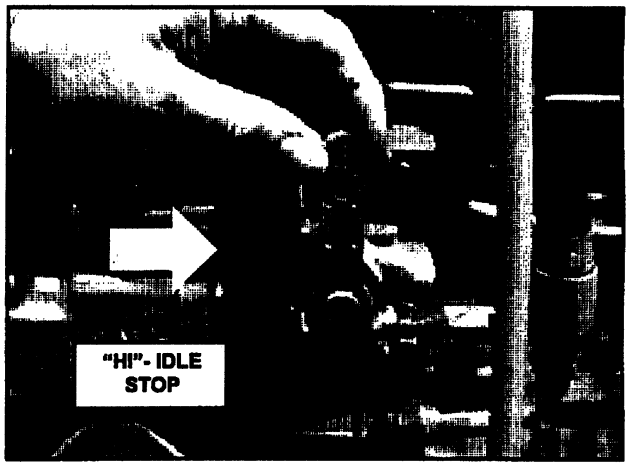


FIGURE C

3. RPM Sensor Test

Confirm tachometer accuracy and KPSS performance by performing the following RPM Sensor procedures.

1. RPM SENSOR TEST & ADJUSTMENT

A. Tools & Equipment Required

1. Volt/Ohm Meter
2. Tachometer *(for confirmation only)*
3. 1-1/8" SAE Spanner Wrench
4. 1-1/8" SAE Spanner Torque Wrench
5. KOBELCO RPM Sensor Test Harness, Part Number KSP9000-0003.

B. Machine Settings & Site Conditions

1. Engine "OFF" (Not Running)
2. Tachometer installed on engine.
3. RPM Sensor Harness (Green & White wires) disconnected.

C. Sensor Resistance Test

1. With engine "OFF" and sensor harness (Green & White wires) disconnected, connect the KOBELCO RPM Sensor Test Harness to the RPM Sensor Harness. See Figure 9.1.
2. Connect leads to meter and set meter to the 4K OHMS Position. See Figure 9.2.
3. Connect leads from meter to the Test Harness Leads and take reading from meter. See Figure 9.2A.
4. Remove cap from the Red & Black wire harness, attach test harness, connect leads from meter to Test Harness and record reading. See Figure 9.2A.
5. Compare readings to chart below.

SENSOR HARNESS	RESISTANCE SPECIFICATION
GREEN & WHITE	0.890 ± 10%
BLACK & RED	1.340 ± 10%

6. If reading of the Green & White wire Harness exceeds the given tolerance, the Black & Red wire harness can be temporarily used until a new RPM Sensor can be obtained and installed. If both Harnesses exceed the given tolerance, replace RPM Sensor before proceeding with any further adjustment, tests or operation of the machine.

NOTE

Contact an Authorized CUMMINS Dealer and Order Part Number– 3078152 RPM Sensor Assembly.
(This Sensor is used on the SK150 ~ SK460 w/Cummins.)

7. Should the resistance readings be within the given tolerance, proceed to Sensor Adjustment Procedures.

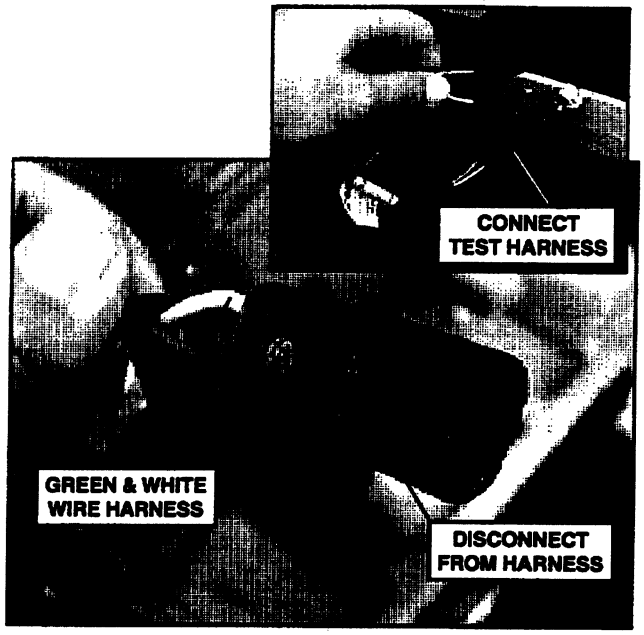


FIGURE 9.1

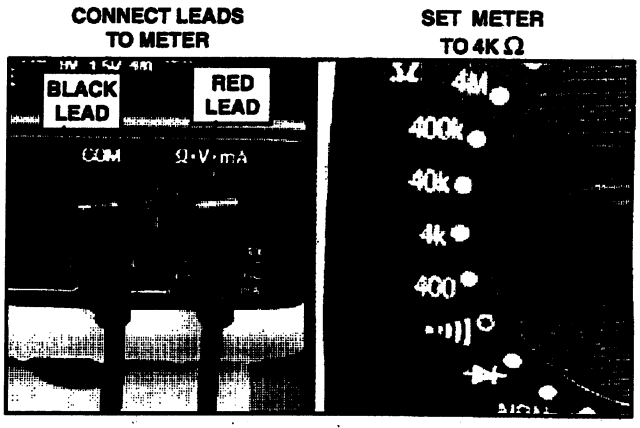


FIGURE 9.2

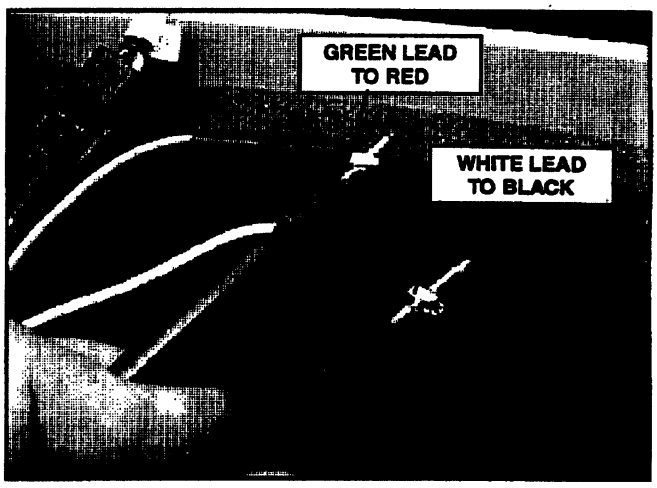


FIGURE 9.2A

D. RPM Sensor Adjustment Procedures

1. Loosen RPM Sensor Jam Nut and remove Sensor from Bell Housing. See Figure 9.3.
2. Inspect Sensor Face for damage or scarring from flywheel or other debris.
3. Clean Sensor with a clean, lint free cloth as metal particles may adhere to the magnet and cause loss of signal. See Figure 9.4.

NOTE

If Sensor is damaged, replace with new part before continuing with adjustment. Contact an Authorized CUMMINS Dealer and order Part Number- 3078152, RPM Sensor Assembly.

4. Install Sensor into Bell Housing and turn in until Sensor just touches Flywheel then, turn out one (1) complete turn.

NOTE

On the CUMMINS engine, adjustment of the RPM Sensor is primarily for adjusting the clearance between Sensor and Flywheel. Specified Clearance is 1.5mm (.060"). See Figure 9.5.

5. Tighten jam nut enough to hold sensor in position.
6. Install Tachometer *(for confirmation purposes)*, start engine and verify engine "LO" Idle RPM is in specified range of 850 ~ 900 RPM.

NOTE

Refer to previous paragraph: **2. A. 1.**, which describes how to show the RPM display on Gauge Cluster. If engine RPM is not within Specifications, adjust using hand throttle knob, to acquire 850 ~ 900 RPM "Lo" Idle, for this test.

7. Set Volt/Ohm Meter to a VAC setting that will accommodate a reading of up to 10 VAC.
8. Attach leads from meter to Sensor Harness (Green & White) wire spades inside Harness Connector.
9. With engine running at "LO" Idle, record reading. Reading should be 1.5 VAC ~ 3.0 VAC.

NOTE

a) If reading is below 1.5 VAC, replace Sensor.
b) If reading is above 3.0 VAC, turn Sensor out no more than 1/2 turn to bring reading at or below 3.0 VAC.
c) Should more than 1/2 turn be required to bring reading at or below 3.0 VAC, replace Sensor.

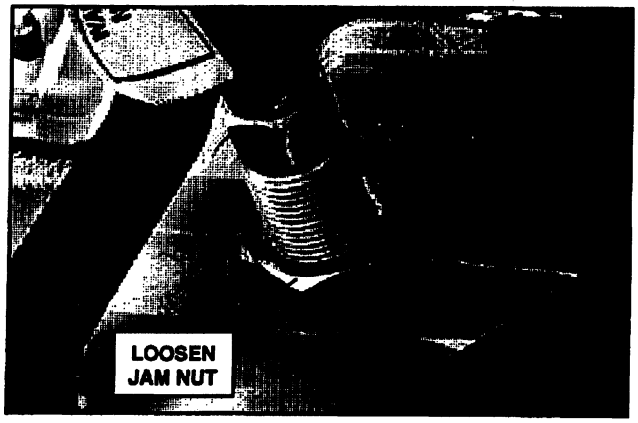


FIGURE 9.3

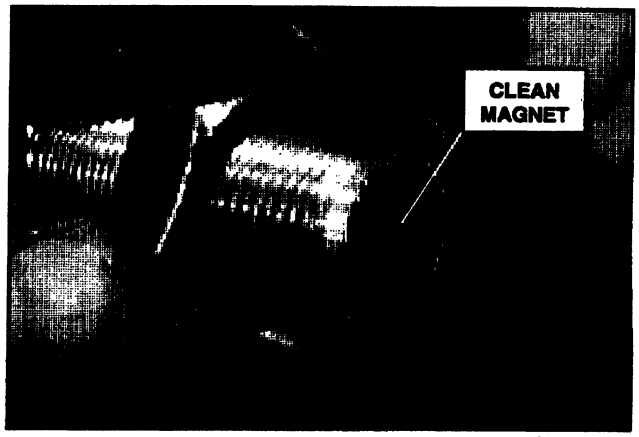


FIGURE 9.4

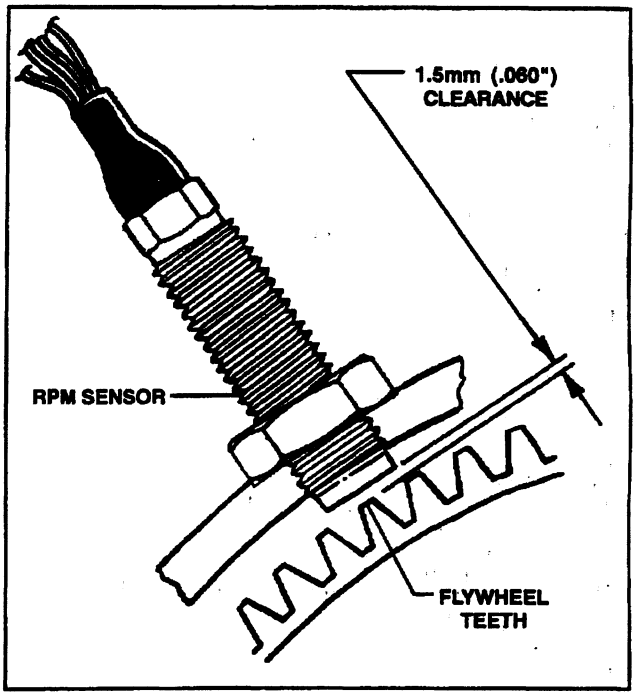


FIGURE 9.5

10. If reading is within the 1.5 ~ 3.0 VAC Specification, torque Sensor Jam Nut to 3.5kg ~ 5kg (25 ~ 35 ft lbs.).

CAUTION

Do not over tighten Sensor Jam Nut.
Over tightening will cause damage to the internal coils of the Sensor.

11. Move Throttle Control to "HI" Idle position and record reading from Volt/Ohm Meter. This reading should be 3.0 VAC ~ 6.0 VAC.
12. If reading in "HI" Idle is above 6.0 VAC, loosen Sensor Jam Nut and adjust Sensor OUT no more than 1/2 turn. If VAC reading is still above 6.0 VAC, replace Sensor.
13. Torque Sensor Jam Nut to 3.5kg ~ 5kg (25 ~ 35 ft lbs).
14. Turn engine "OFF", disconnect Volt/Ohm Meter, Tachometer and connect Sensor Harness (Green & White) to Main Wiring Harness.

WARNING

BE CAUTIOUS OF MOVING AND ROTATING PARTS WHILE PERFORMING RPM SENSOR TESTS AND ADJUSTMENT.
BE CAUTIOUS OF HOT SURFACES OF THE ENGINE.
WEAR PROTECTIVE CLOTHING, HARD HAT, SAFETY SHOES, GLOVES AND GOGGLES OR FACE SHIELD WHILE PERFORMING TESTS AND ADJUSTMENTS TO THE RPM SENSOR.

Perform Mechatronics Adjustment "A" USING THE FOLLOWING PROCEDURE. CAUTION: Do not use the Mitsubishi engine procedure as found in the Mark IV Servicemans Handbook.

4. ADJUSTMENT "A"

MECHATRONIC CONTROLLER– SK400/460 IV

A. Conditions to use Adjustment "A"

Adjustment "A" procedures must be performed when one or more of the following components have been removed, repaired, adjusted or replaced.

1. Mechatronics Controller (CPU)
2. Stepping Motor Assembly
3. Linkage between Stepping Motor and Engine Fuel Pump Assembly.
4. Engine Fuel Pump Assembly.
5. Engine

B. Tools & Equipment Required

1. Special Adjustment Harness Assembly. KOBELCO Part Number– 2479Z2364.
2. General hand or power tools required for removal and replacement of components.

C. Machine Settings & Site Conditions

1. Attachment in Hydraulic Oil Check Position.
2. Verify engine RPM's in the following work modes and settings.
   a. H-Mode, S-Mode, FC-Mode, D-Mode with throttle in "Hi-Idle and "Low-Idle" positions.
   b. Decel RPM
   c. Low-Idle RPM
3. Engine Emergency Stop Knob completely "IN".
4. CPU Access Panel Removed.
5. Firm, level adjusting site.

D. Adjustment "A" – Part 1 Procedures

1. Move the machine to a smooth, level area to perform Adjustment "A".
2. Operate the attachment Controls until the arm, attachment and boom are in the Hydraulic Oil Check Position. See Figure 6.9A.
3. If throttle control is possible, verify RPM's as described above in C. , step 2.
4. Push the engine Emergency Stop Knob all the way in. See Figure 6.10A.
5. Turn Switch key to "OFF". Wait approximately 4 seconds for electrical power to automatically turn off.
6. Remove mechatronic controller access cover. See Figure 6.11A.
7. Remove toggle switch grommet and carefully place the controller toggle switch in the "TEST" position. See Figure 6.12A.

MACHINE IN HYDRAULIC OIL CHECK POSITION

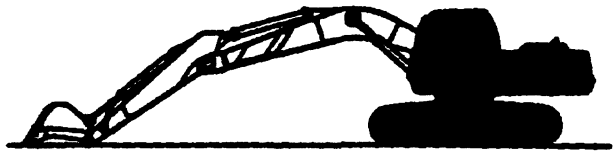


FIGURE 6.9A

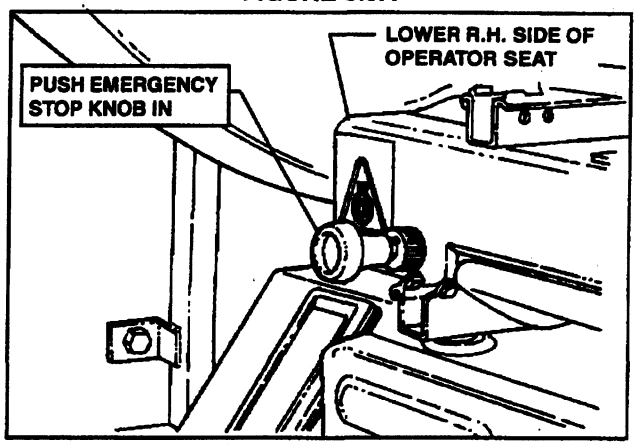


FIGURE 6.10A

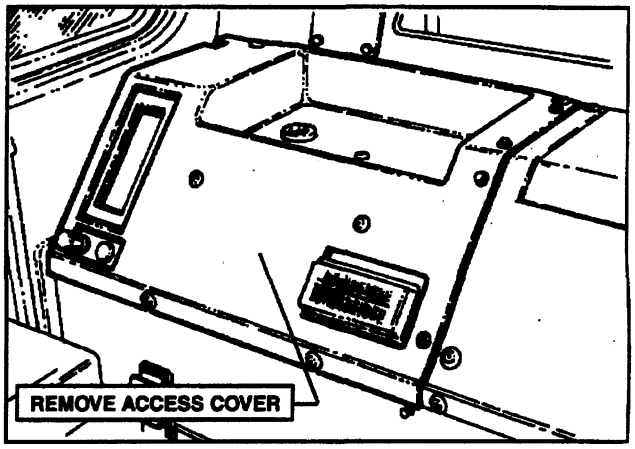


FIGURE 6.11A

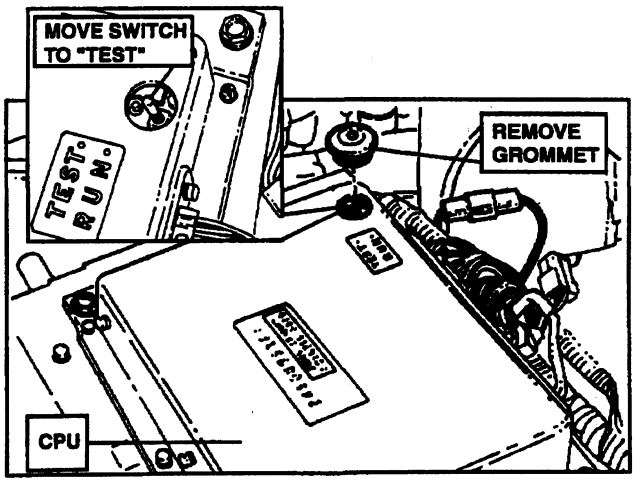


FIGURE 6.12A

CAUTION

Make certain electrical power is "OFF" before moving the controller "TEST-RUN" toggle switch. This will avoid possible damage to the Mechatronics controller and prevent loss of computer memory.

NOTE

When the Controller "TEST-RUN" Toggle Switch is placed in the "TEST" position, the Auto-Accel L.E.D. indicator light on the gauge cluster display will burn continuously as a reminder that the controller toggle switch is in the "TEST" position.

8. Locate the controller 1P (1 Pin) coupler and disconnect. Connect the KOBELCO Special Adjustment Harness Assembly to the 1P coupler. See Figure 6.13A.

9. Raise engine access cover and remove the Linkage Lever Arm from the stepping motor shaft. using a 5mm allen wrench. See Figure 6.14A.

10. Remove the Ball Joint end from the throttle governor lever arm. See Figure 6.15A.

11. Loosen the linkage jam nuts on the Adjustable Linkage and adjust until distance between linkage mounting holes is 294mm (11.57"), or 513mm (20.19"). ***Both styles have been used, see details below.*** See Figure 6.16A. Finger tighten jam nuts and lay linkage aside.

    YSU-0200~0241 - *(with air compressor)*
    Rod length = 294mm (11.57")

    YSU-0242~ - *(without air compressor)*
    Rod length = 513mm (20.19")

NOTE

This is a temporary starting dimension. Final adjustment will be later in this procedure. Please be aware that Linkage Rods and Ball Joint Ends, use components that have both right-hand and left-hand threads.

12. Make sure that "OK" and then "Clock Time" is shown on the gauge cluster display prior to performing Adjustment "A".

    If any Service Function Icons are displayed, Adjustment "A" procedure will not be possible.

    Resolve any Service problems relating to displayed Icons before attempting to perform Adjustment "A".

13. Make certain the CPU "TEST-RUN" switch is in the "TEST" position.

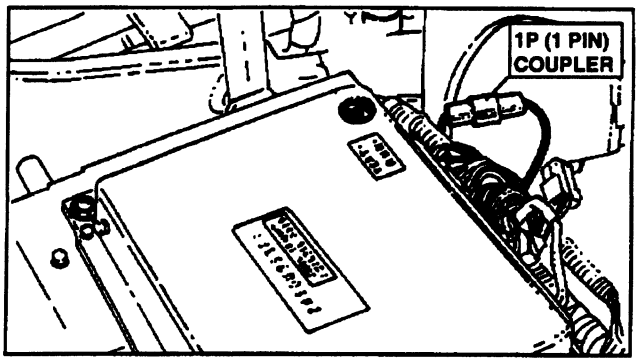


FIGURE 6.13A

FIGURE 6.14A

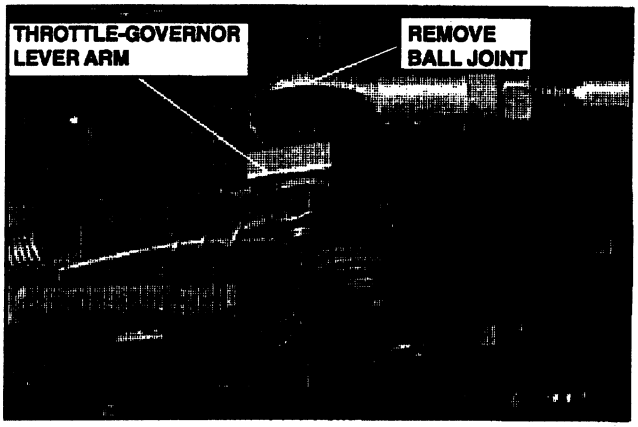


FIGURE 6.15A

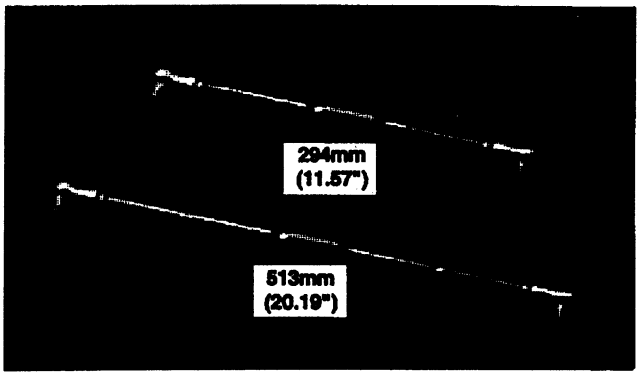


FIGURE 6.16A

14. Place the KPSS Mode Switch in the "H"-Mode. See Figure 6.17A.
15. Place the Auto-Accel Switch in the "ON" position. See Figure 6.18A.
16. Move the Throttle Control to "LO-IDLE" position. See Figure 6.17A.
17. Place Key switch in the "ON" position. Engine should not be running.

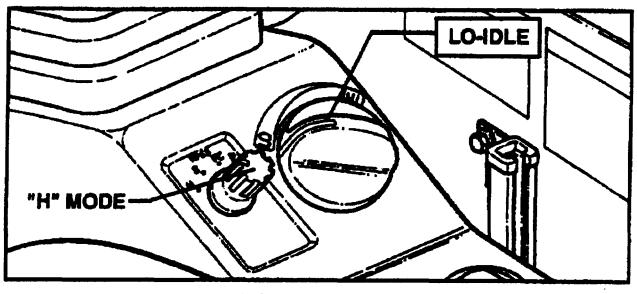


FIGURE 6.17A

NOTE

The settings described in steps 13 through 17 must be exactly as described. Any other settings will not allow proper adjustment of the Mechatronics Controller.

18. Depress and hold the Special Adjustment Harness Switch 3 to 5 seconds until the Gauge Cluster Display Reads "CPU". Then release switch. See Figure 6.19A.

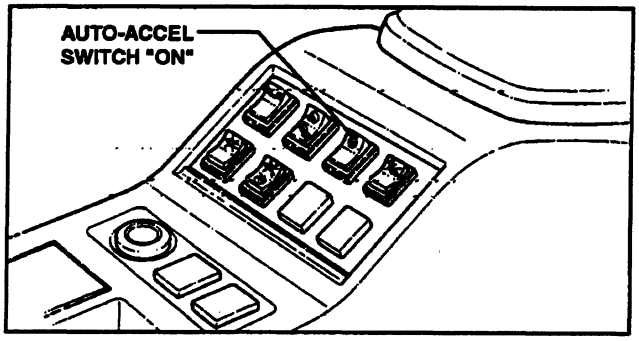


FIGURE 6.18A

NOTE

"CPU" should remain on the display. If it doesn't, check conditions as described in steps 13-17 and repeat step 18. Make certain to hold the Special Adjustment Harness Switch 3 to 5 seconds.

NOTE

As soon as "CPU" is displayed and special adjustment harness switch is released, the stepping motor will move to the Low Idle position. If "CPU" goes off display, the procedure has failed. Check all settings ("LO"-IDLE adjustment and Stepping Motor) and start procedure over.

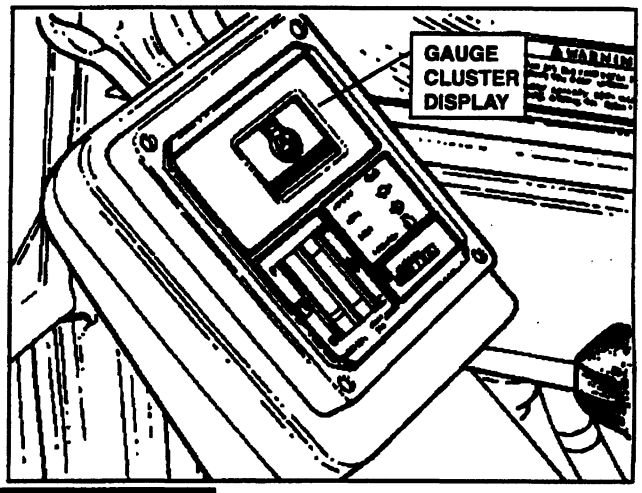


FIGURE 6.19A

19. While holding the Governor Lever against the Engine Low Idle position, locate the linkage lever arm onto the stepping motor splined shaft at approximately 12 o'clock position and secure the Ball Joint to the governor arm. See Figure 6.20A.

NOTE

The 12 o'clock position for the Linkage Lever Arm on the Stepping Motor Splines is a starting point. The position could vary from the 11:30 o'clock to 12:30 o'clock position. ***The linkage should have a small amount of slack when in position.***

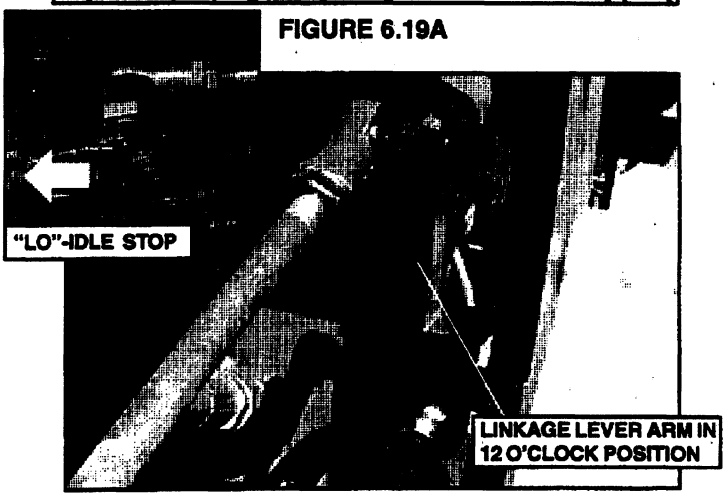


FIGURE 6.20A

20. Slide the Linkage Lever Arm Lock on the splines until 1/16" to 1/8" of spline is visible. Tighten the Socket Head Screw, securing the lever arm to stepping motor shaft and tighten jam nuts on rod linkage

21. Depress the Special Adjustment Harness Switch once. This will cause the CPU to turn power to the stepping motor off.
22. Manually rotate the stepping motor shaft until the governor lever is completely against the Hi-Idle Stop. Hold in position and depress the Special Adjustment Harness Switch once to lock stepping motor in position (you will feel the stepping motor lock into position). See Figure 6.21A. ***At this point, the linkage rod should have some slack in it, provided by the clearance in the stepping motor gears.***

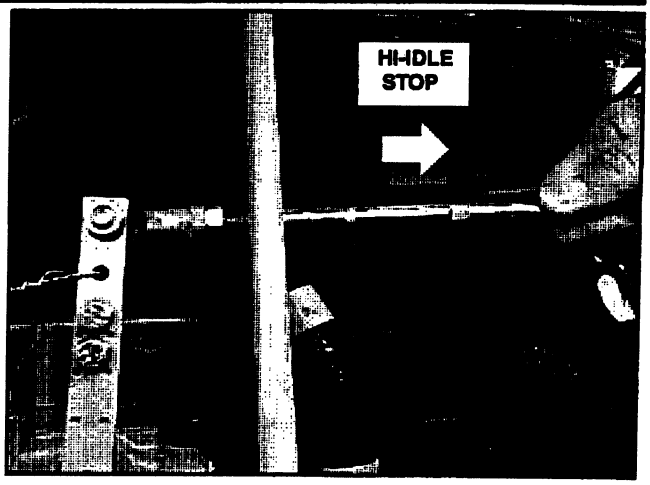


FIGURE 6.21A

NOTE

The Hi-Idle Stop Set Screw is internal. The governor lever must be held against the stop when pushing the Adjustment Harness Switch. If the lever is not against the stop, the CPU will not complete the indexing phase and the procedure will fail.

CAUTION

Never attempt to manually rotate stepping motor shaft or move linkage once the stepping motor has been locked in position as described in step 22.

23. The stepping motor should now be holding the governor lever against the Hi-Idle Stop. Depress the Special Adjustment Harness switch once more. This will cause the Stepping Motor to index from its high position back down to the low position and the CPU will program this setting in the memory. ***Do not turn key or power "OFF", proceed to Part 2 of the procedure.***

NOTE

The stepping motor will cycle to the engine stop position and back to the engine start position. Also, "CPU" will leave the display. If "CPU" fails to index, restart the procedure from the beginning.

E. Adjustment "A"– Part 2

1. Start Engine and allow to run at idle until engine is at normal operating temperature. Use attachment relief if necessary to heat engine.
2. Place KPSS Mode Switch in "H"- Mode.
3. Place Auto-Accel Switch in "OFF" position.
4. Throttle Control in Lo-Idle position.
5. Key switch "ON" with Engine running.

NOTE

The machine settings must be exactly as described in steps 1 through 5. Any other settings will not allow success of Adjustment "A"– Part 2.

6. After machine settings are as described in steps 1-5, depress and hold the Special Adjustment Harness Switch for 3 to 5 seconds until "CPU" is visible on display.
7. After "CPU" is on display and the switch is released, the CPU will gradually cycle the stepping motor from below Lo-Idle to Hi-Idle. This programs the CPU to all stepping motor positions and will take 3 to 5 minutes.

NOTE

If governor lever contacts the internal "HI"-Idle Set Screw during this cycle, the procedure has failed. Adjust the internal gap between the governor lever and the "HI"-Idle set screw by adjusting linkage rod slightly, and repeat procedure "A". Refer to Page 10.

8. After this process is complete, the stepping motor will immediately return to the Lo-Idle position and "CPU" will leave the display.
9. Turn key switch to "OFF" and wait approximately 4 seconds for electrical power to automatically turn off.
10. Remove the Special Adjustment Harness from the 1P coupler and connect coupler together. See Figure 6.22A.
11. Move CPU "TEST-RUN" Switch to "RUN" position and replace the grommet. See Figure 6.23A.
12. Start Engine and verify RPM's according to specifications on page 15.
13. Install CPU Access Panel. See Figure 6.24A.

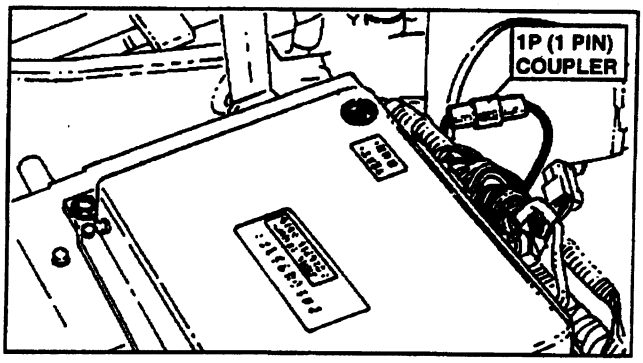


FIGURE 6.22A

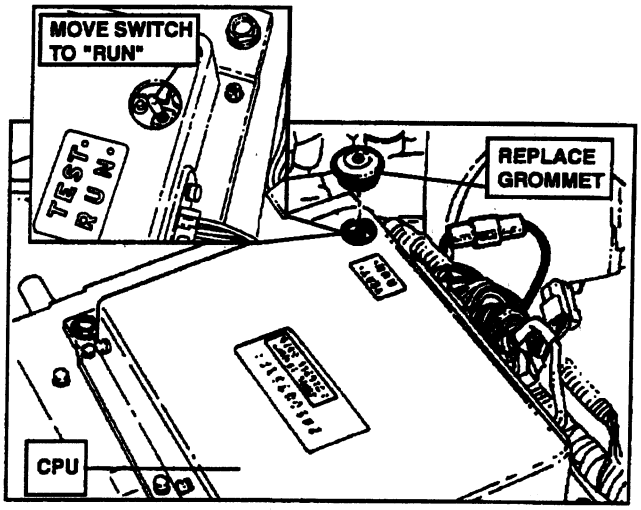


FIGURE 6.23A

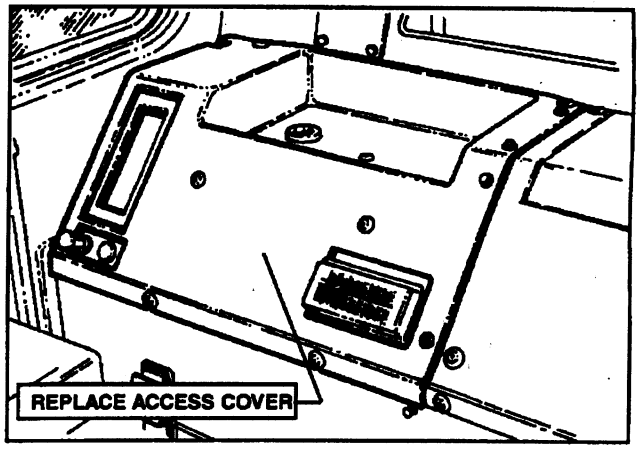


FIGURE 6.24A

5. ADJUSTMENT "B"–VARIABLE LOADING MODE MECHATRONIC CONTROLLER

NOTE

If Machine is not equipped with Variable Loading Mode, adjustment "B" is not necessary.

A. Conditions to use Adjustment "B"

Adjustment "B" procedures must be performed when one or more of the following components have been removed, repaired, adjusted or replaced.

1. Mechatronics Controller (CPU).
2. *Variable Loading Mode Components.*

B. Tools & Equipment Required

1. Special Adjustment Harness Assembly. KOBELCO Part Number– 2479Z2364.
2. General hand or power tools required for removal and replacement of components.
3. 105kg/cm² (1500psi) Pressure Gauge.

C. Machine Settings & Site Conditions

1. Hydraulic oil at 45°C to 55°C (113°F to 131°F).
2. 105kg/cm² (1500psi) Pressure Gauge installed.
3. CPU Access Panel Removed.
4. CPU "TEST-RUN" Switch in "TEST" position.
5. Firm, level adjusting site.

D. Adjustment "B" Procedures

1. Move the machine to a smooth, level area to perform Adjustment "B".
2. Operate the attachment Controls until the arm, attachment and boom are in the Hydraulic Oil Check Position. See Figure 6.25.
3. Turn Engine "OFF".
4. Release hydraulic tank pressure by removing cap from pressure relief valve and depressing relief valve stem. See Figure 6.26.
5. Remove Test Port Plug from Flow Distribution Solenoid Valve. See Figure 6.27.
6. Install fitting and 105kg/cm² (1500psi) pressure gauge into test port. See Figure 6.27.

⚠	**CAUTION**	⚠
Oil may be hot. Wear approved safety equipment when performing any maintenance or test procedures.		

MACHINE IN HYDRAULIC OIL CHECK POSITION

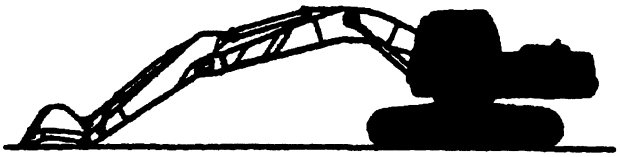


FIGURE 6.25

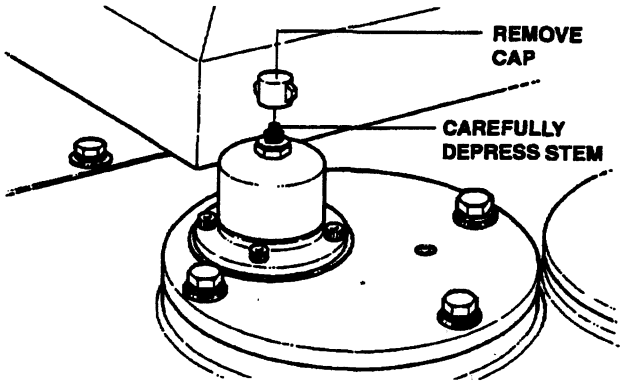


FIGURE 6.26

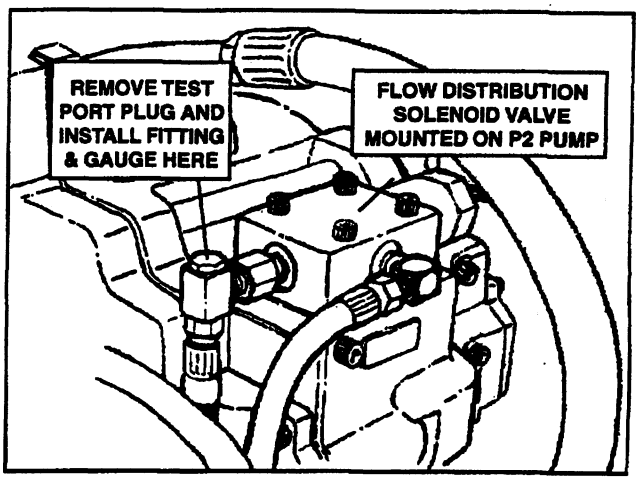


FIGURE 6.27

7. With key switch and electrical power "OFF", remove the CPU access Panel behind the operator seat. See Figure 6.28.
8. Locate and disconnect CPU 1P (1Pin) coupler. Connect Special Adjustment Harness to 1P coupler. See Figure 6.29.
9. Remove CPU grommet and carefully place CPU "TEST-RUN" Switch in the "TEST" position.

CAUTION

Never attempt to change position of the CPU "TEST-RUN" Switch with key switch or electrical power on.

10. Place KPSS Mode Switch to S-Mode.
11. Place Auto-Accel Switch to "OFF".
12. Start Engine.
13. Place Throttle Control in "HI-IDLE" position.
14. Depress the Special Adjustment Harness Switch and hold for 3 to 5 seconds until "CPU" is visible on display.

NOTE

"CPU" should remain on display. If it doesn't, check steps 9 through 13 and repeat step 14.
Conditions must be exactly as described in steps 9-14. Different conditions will not allow success of Adjustment "B" procedures.

15. Turn the Variable Loading Mode Switch counterclockwise to the left most setting. See Figure 6.30.
16. Operate BOOM UP Control until boom is completely up. Hold control in this position. See Figure 6.31.
17. While holding BOOM UP Control in the up position, adjust the Variable Loading Mode Switch clockwise until the pressure gauge reaches the pressure specified in chart for model being adjusted.

MODEL	UPPER LIMIT PRESSURE
SK400 / SK460LC	16.5~19.5 kg/cm² (263~277 psi)

Unit: kgf/cm² (psi)

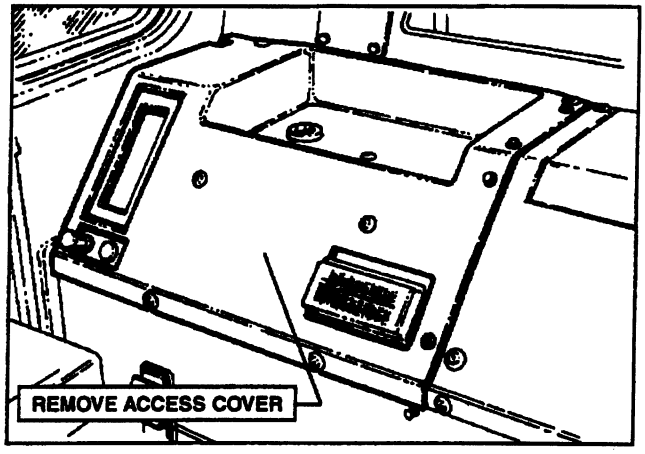


FIGURE 6.28

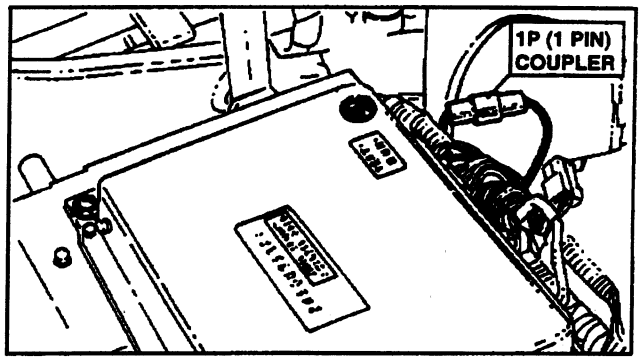


FIGURE 6.29

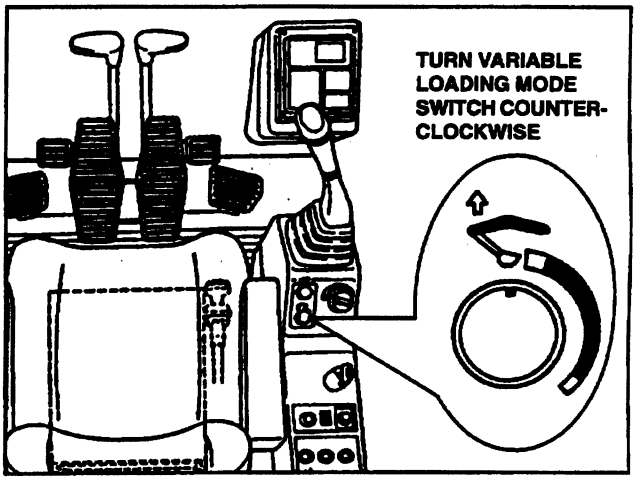
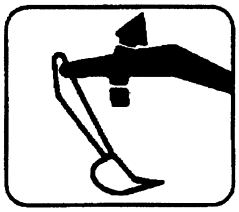


FIGURE 6.30



HOLD CONTROL IN BOOM UP POSITION

FIGURE 6.31

18. When the proper pressure is reached, stop adjustment of the Variable Loading Mode Switch and depress the Special Adjustment Harness Switch once. This will program the CPU to the Upper Limit setting.
19. Release the BOOM UP Control.
20. Return the Variable Loading Mode Switch back to the Left Limit by turning switch counter-clockwise. See Figure 6.32.
21. Operate the BOOM UP Control and hold.
22. Adjust the Variable Loading Mode Switch until the pressure gauge reaches pressure specified in chart for model being adjusted.

MODEL	LOWER LIMIT PRESSURE
SK400 / SK460LC	13.5~14.5 kgf/cm² (192~206 psi)

Unit: kgf/cm² (psi)

23. When the proper pressure is reached, stop adjustment of the Variable Loading Mode Switch and depress the Special Adjustment Harness Switch once. This will program the CPU to the Lower Limit setting.

NOTE

After step 23 is complete, "CPU" will automatically leave the display signaling that Adjustment "B" is complete.

24. After "CPU" has left the display, turn key switch to "OFF" stopping the engine and wait approximately 4 seconds for electrical power to automatically go off.
25. Remove the Special Adjustment Harness from the 1P coupler and connect 1P coupler together. See Figure 6.33.
26. Move the CPU "TEST-RUN" Switch in the "RUN" position and replace grommet. See Figure 6.34.
27. Install CPU Access Cover.
28. Remove pressure gauge and fitting. Replace Test Port Plug.
29. Confirm proper operation of machine.

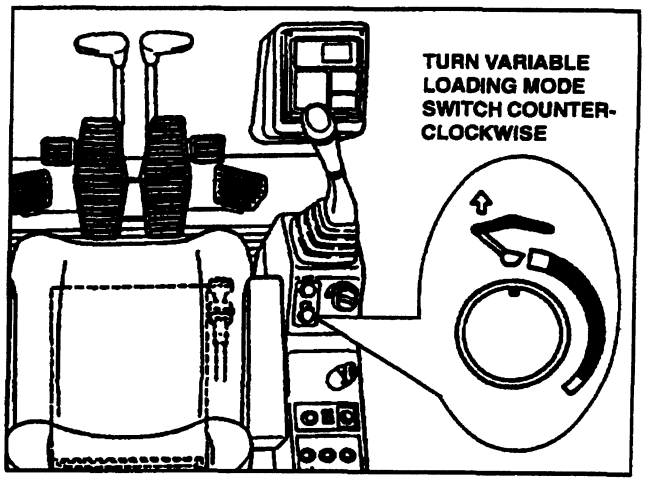


FIGURE 6.32

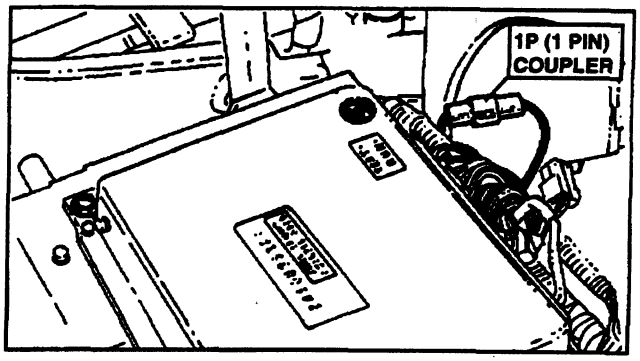


FIGURE 6.33

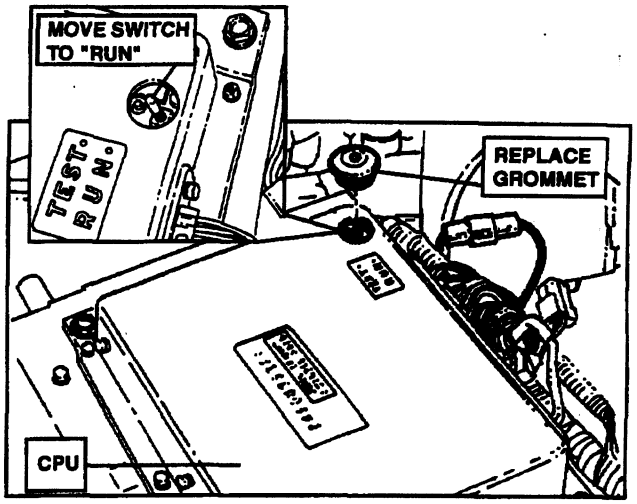
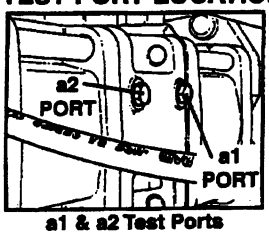


FIGURE 6.34

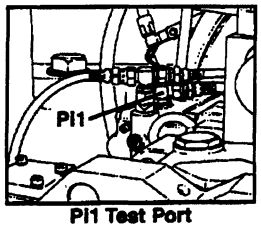
INSPECTION ITEM			PRESSURE					Adjustment Point	MEASURING CONDITION, FUNCTION
			READING FROM		SPECIFICATION				
STANDARDS FOR TESTING	Cleanliness of Hydraulic Oil		Hydraulic Oil Tank		Class: NAS 7~9			N/A	Take Sample
	Temperature of Hydraulic Oil		Hydraulic Oil Tank Surface		°C- 45~55	°F- 113~131		N/A	Ambient Temperature -10°C ~ 50°C (14°F ~ 122°F)
	Engine Coolant Temperature		Radiator Surface		°C- 60~90	°F- 140~194		N/A	
	ENG RPM	Low Idle	Gauge Cluster Display or Externally Mounted Tachometer		850~900 RPM			RPM Sensor Adjustment and/or Mechatronics Adjustment "A"	Throttle @ "LO"- Idle
		Hi- Idle **			** 2165~2200 RPM				Throttle @ "HI"- Idle
		"S" or "D" Mode			1870~1930 RPM				Throttle @ "HI"- Idle
		"FC" Mode			1570~1630 RPM				Throttle @ "HI"- Idle
		Auto Accel-Decel "ON"			1000~1100 RPM				Throttle @ "HI"- Idle
SYSTEM	COMPONENT		GAUGE @	SIZE	PORT	Kgf/cm²	PSI		
PILOT CIRCUIT	PRIMARY PRESSURE		Gear Pump	PF 1/4	P3	47~53	670~750	PR1	"H"-Mode, Eng/ Hi Idle
MAIN RELIEFS	TRAVEL	RH	Main Pump	PF 1/4	a1	350~355	4980~5050	TR1	"H"-Mode, Engine at Hi Idle. Simultaneous LH/RH Operation Travel Stalled.
		LH			a2	350~355	4980~5050	TR2	
	BOOST PRESSURE	RH	Main Pump	PF 1/4	a1	350~355	4980~5050	MR1	Bucket Digging
		LH			a2	350~355	4980~5050	MR2	Boom Raising
	ATTACHMENT	RH	Main Pump	PF 1/4	a1	320~325	4550~4620	MR1	Bucket Digging
		LH			a2	320~325	4550~4620	MR2	Boom Raising
PORT RELIEFS	BUCKET (DO NOT ADJUST)	ROD	Main Pump	PF 1/4	a1	335~355	4765~5050	RV8	Bucket Dump
		HEAD			a2	335~370	4765~5260	RV7	Bucket Digging
	BOOM (DO NOT ADJUST)	ROD	Main Pump	PF 1/4	a1	315~355	4480~5050	RV6	Boom Lowering
		HEAD			a2	335~370	4765~5260	RV5	Boom Raising
	ARM (DO NOT ADJUST)	ROD	Main Pump	PF 1/4	a1	335~355	4765~5050	RV10	Arm Out (Cylinder IN)
		HEAD			a2	335~355	4765~5050	RV9	Arm In (Cylinder OUT)
	TRAVEL (DO NOT ADJUST)	RH F	Main Pump	PF 1/4	a1	350~365	4980~5190	RV14	"H"-Mode, Engine at Hi Idle. Simultaneous LH/RH Travel Engaged
		RH R			a1	350~365	4980~5190	RV13	
		LH F			a2	350~365	4980~5190	RV13	"H"-Mode, Engine at Hi Idle. Simultaneous LH/RH Travel Engaged
		LH R			a2	350~365	4980~5190	RV14	
	SWING	RH	Main Pump	PF 1/4	a2	260~300	3700~4270	RV11	Bucket Lock, Stall Swing
		LH			a2	260~300	3700~4270	RV12	Bucket Lock, Stall Swing
VARIABLE LOADING MODE (OPTION)	LOADING MODE SWITCH	Upper	Flow Distribution Solenoid Valve	PF 1/4		18.5~19.5	260~280	CPU ADJ "B"	"S"Mode, Eng in "HI" Idle
		Lower				13.5~14.5	192.0~206.2		"S"Mode, Eng in "HI" Idle
LOW PRESSURE RELIEFS	INDEPENDENT "D" MODE- OFF	RH	Main Pump	PF 1/4	a1	32~47	455~668	Internal Shims	"H" Mode, Eng in "HI" Idle Controls in Neutral
		LH			a2	32~47	455~668		
	INDEPENDENT "D" MODE- ON	RH	Main Pump	PF 1/4	a1	0~7	0~100	Internal Shims	"D" Mode, Eng in "HI" Idle Controls in Neutral
		LH			a2	0~7	0~100		
NEGATIVE CONTROL PRESSURES	INDEPENDENT "D" MODE- OFF	RH	Main Pump	PF 1/4	Pi1	32~47	455~668	Low Pressure Relief Valves	"H" Mode, Eng in "HI" Idle Controls in Neutral
		LH			Pi2	32~47	455~668		
	INDEPENDENT "D" MODE- ON	RH	Main Pump	PF 1/4	Pi1	28~38	398~540		"D" Mode, Eng in "HI" Idle Controls in Neutral
		LH			Pi2	28~38	398~540		
PROPORTIONAL SOLENOID VALVE	KPSS	H • S • FC • D	Main Pump	PF 1/4	a3	0~3	0~43	Pf Solenoid Valve	Engine in "HI" Idle Controls in Neutral
		Release			a3	13.3~16.3	189~232		
		Boost			a3	32~40	455~569		

(4/97)

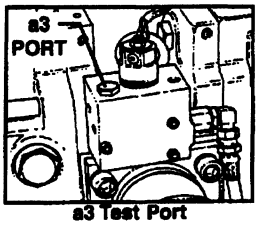
TEST PORT LOCATIONS:



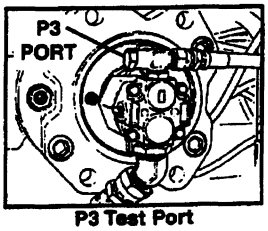
a1 & a2 Test Ports on Main Pumps



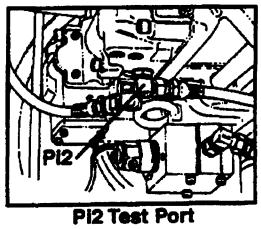
Pi1 Test Port on P1 Regulator



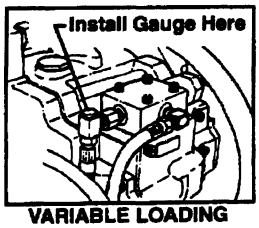
a3 Test Port on Pf Solenoid



P3 Test Port on Pilot Gear Pump



Pi2 Test Port on P2 Regulator



VARIABLE LOADING MODE (OPTION)

** NOTE : on unit serial numbers YSU-0200~0241 Hi-Idle Speed = 2,200~2,220 RPM

NOTE

Take Measurements In "H" Mode unless otherwise specified.

The standard tolerance shall be an allowable range in field measurements.

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: August 1997

BULLETIN: HE-318
Page 1 of 2

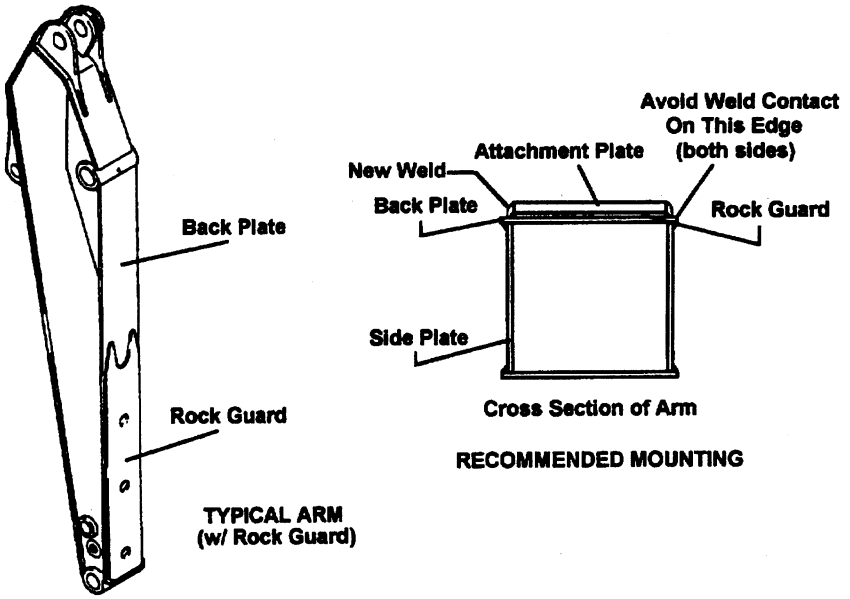
SUBJECT: Damage to Arm Rock Guard - *by After-market Attachments*

AFFECTED MACHINES: All Kobelco Excavators - (so equipped)

Some models of Kobelco Excavators are factory-equipped with arm rock guards. Please refer to the figure below. Some dealers, after-market attachment manufacturers, and end-users, perceive this guard as being a reinforcement plate that attachments (ie; thumbs, rakes, brackets, etc.), can be mounted-to.

Kobelco America would like to clarify the purpose and use of this plate. The word *reinforcement* generally means something that adds strength. The word *guard* means something that protects. The *Rock Guard* protects the bottom of the arm from some type of accidental damage by impact, from loaded materials or abrasive wear. Since it is attached to the arm, it adds some (very little) reinforcement, but it's attachment method is not conducive to the term reinforcement, only guarding.

The Rock Guard is not a reinforcement. *The weld sizes on the rock guard are not intended to provide sufficient strength, to support the mounting of after-market attachment support plates. The material thickness of the rock guard itself, may not be sufficient to support an after-market attachment.*



(Please refer to page 2 for details.)

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SERVICE\HE318

RECOMMENDATION: (Please refer to figures on page 1.)

Any attachment plate welded to the underside of the arm, should be sufficiently wide enough so the *new welds* can be done in such a manner, as to capture the rock guard side welds, as well as the arm back plate. *To avoid cracking of the arm, the new welds should not penetrate the edges of the back plate.*

Attachment support plates should be of sufficient strength (thickness), as to not require plug welding to the rock guard. If plug welding is required, then the rock guard should be cut away, to allow for direct welding to the arm back plate.

If the attachment plate is not as wide, or cannot be made wide enough to capture the rock guard side welds, the rock guard should be removed.

Any welding on Kobelco Excavator arms, should be done using AWS E-7018 "low hydrogen" electrode or equivalent MIG wire feed filler material. No welds should be positioned at right angles across the arm, but rather; positioned parallel, on a tangent, or in a radiused fashion, to prevent and/or reduce the inducement of stress.

RESPONSIBILITY:

1) Instructions:

Installation instructions are the responsibility of the after-market attachment manufacturer. *Kobelco cannot provide instructions for products not designed or manufactured by Kobelco.*

2) Damage:

Damage resulting from the installation of any attachment, other than those specifically designed and/or sold by the excavator manufacturer, becomes the responsibility of the installer and/or operator.

Warranty on the machine is not generally affected by the installation of attachments, but by the effect of those attachments on the durability of the machine by their use (shorter than normal component life), or misuse (damage).

Any damage to a Kobelco machine that results from: the installation of, the misuse, or use of, any attachment; is the responsibility of the installer or operator. *These things are beyond the control of Kobelco America Inc.*

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

PLEASE NOTE:
Some of this information has been previously issued in Parts Bulletin 97PB001.

DATE: August 1997

BULLETIN: HE-320

SUBJECT: Pin, Boom Point
Revised Kobelco Service Part Numbers Announced

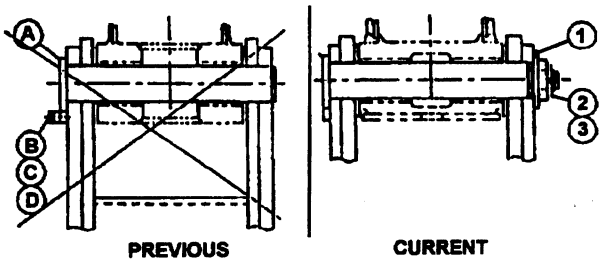
AFFECTED MACHINES:
SK300LC III - All - *(Can be used for Service Replacement.)*
SK300LC IV - All - *(Can be used for Service Replacement.)*
(Used in production on:YCU-0603, YCU-0607~)

Please be advised that the following list of pins (ref. A), have been replaced by P/N 2419P4358.

Ref.	Obsolete Part Number	New Part Number	Description
A	2419P3739	**2419P4358**	Pin
A	2419P3892	**2419P4358**	Pin
A	2419P3997	**2419P4358**	Pin
A	2419P4110	**2419P4358**	Pin

Please note, that the new pin requires an additional washer, nut, and cotter pin, for retention. These items must be purchased separately.

Ref.	Part Number	Description	Qty.
1	**R16T0152D14**	**Washer**	1
2	**2420T6798**	**Nut**	1
3	**ZP15D10100**	**Cotter Pin**	1



PREVIOUS CURRENT

Please also note, that the following items are no longer required when using the current design pin.

Ref.	Part Number	Description	Qty.
B	2418T25076	Plate	1
C	ZS18C16038	Capscrew	2
D	ZW16H16000	Washer	2

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KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: September 1997

BULLETIN: HE-322
Page 1 of 4

SUBJECT: List of Cummins Field Support Managers and Cummins Distributor Main Branches

AFFECTED MACHINES: Cummins Powered units only

Please refer to the attached pages, which give a summary listing of the Cummins Field Support Managers (FSM's) and the Cummins Distributors they are responsible for.

Please note the statement from Cummins encouraging our Kobelco Dealers to work with their local Cummins Distributor. If further assistance is necessary on a Cummins related problem, please follow the instructions given on page 2 of 4.

THIS BULLETIN IS BEING ISSUED FOR INFORMATION ONLY AND IS NOT AN AUTHORIZATION FOR ANY REPLACEMENT OR WARRANTY CLAIM SUBMITTAL.

July 7, 1997

Attached you will find a summary listing of Cummins Field Support Managers (FSM's) and the Cummins Distributors they are responsible for as of June 30, 1997. Cummins Field Support Managers are members of Cummins Marketing. They assist with technical issues but focus on customer support and review Goodwill Policy end-user concerns.

We encourage your dealers to work with their local Cummins Distributor. If further assistance is needed, please have the OEM Field Service Representative contact their Cummins FSM. If you are unable to reach a satisfactory resolution after reviewing the issue with your local Cummins Distributor and Cummins Field Support Manager, please contact Robert Newcomb--Cummins Japan Markets Quality/Service Engineer at (812) 377-3348 [FAX (812) 377-4053].

Best Regards,

Joel Lerner--Industrial OEM Marketing Manager

Field Support Managers

1	John (J.T.) Kemner	770-423-2112	770-499-8240	Cummins Alabama, Inc.
2	Graham (G.S.) Bristow	604-882-5727	604-882-9110	Cummins Alberta
3	John (J.T.) Kemner	770-423-2112	770-499-8240	Cummins Atlantic Inc.
4	Graham (G.S.) Bristow	604-882-5732	604-882-9110	Cummins British Columbia
5	Manny (M.M.) Weber	707-935-3842	N/A	Cummins Cal Pacific, Inc.
6	Joe (J.E.) Boswell	770-423-2112	770-499-8240	Cummins Chesapeake Power,
7	Ralph (R.C.) Hamer	770-423-2118	770-499-8240	Cummins Cumberland, Inc.
8	Clint (W.C.) Morris	770-423-2108	770-499-8240	Cummins Diesel Power, Inc.
9	Lucien (L.D.) Fredette	514-695-2302	514-695-8917	Cummins Eastern Canada, Inc.
10	Chuck (C.A.) Huberty	770-423-2114	770-499-8240	Cummins Gateway, Inc.
11	Gary (G.D.) Snow	317-885-4419	317-885-4420	Cummins Great Lakes, Inc.
12	Jerry (J.G.) Geiger	303-773-0278	303-779-1629	Cummins Great Plains Diesel, Inc.
13	Manny (M.M.) Weber	707-935-3842	N/A	Cummins Hawaii Diesel Power,
14	Jerry (J.G.) Geiger	303-773-0283	303-779-1629	Cummins Intermountain, Inc.
15	Dan (D.E.) Titus	317-885-4420	317-885-4423	Cummins Metropower, Inc.
16	Al (A.) Gilliard	317-885-4416	317-885-4423	Cummins Michigan, Inc.
17	Chuck (C.A.) Huberty	770-423-2114	770-499-8240	Cummins Mid-America, Inc.
18	Graham (G.S.) Bristow	604-882-5727	604-882-9110	Cummins Mid-Canada Ltd.
19	Clint (W.C.) Morris	770-423-2108	770-499-8240	Cummins Mid-South Inc.
20	Gary (G.D.) Snow	317-885-4419	317-885-4423	Cummins Mid-States Power, Inc.
21	Al (A.) Gilliard	317-885-4416	317-885-4423	Cummins North Central, Inc.
22	Dan (D.E.) Titus	317-885-4420	317-885-4423	Cummins Northeast, Inc.
23	Mike (J.M.) Plummer	317-885-4418	317-885-4423	Cummins Northern Illinois, Inc.
24	Harry (H.A.) Niese	303-773-0281	303-779-1629	Cummins Northwest, Inc.
25	Mike (J.M.) Plummer	317-885-4418	317-885-4423	Cummins Ohio, Inc.
26	Mike (M.N.)	905-842-2574	905-842-8075	Cummins Ontario Inc.
27	Joe (J.E.) Boswell	770-423-2122	770-499-8240	Cummins Power Systems, Inc.
28	Harry (H.A.) Niese	303-773-0281	303-779-1629	Cummins Rocky Mountain, Inc.
29	Ralph (R.C.) Hamer	770-423-2118	770-499-8240	Cummins South, Inc.
30	Clint (W.C.) Morris	770-423-2108	770-499-8242	Cummins Southeastern Power,
31	Dennis (D.L.) Vandesteeg	817-267-3172	817-421-5767	Cummins Southern Plains, Inc.
32	Manny (M.M.) Weber	707-935-3842	N/A	Cummins West, Inc.
33	Dennis (D.L.) Vandesteeg	817-267-3172	817-421-5767	Southern Plains Power

Cummins Engine Company
Phone Directory

Cummins Distributor Main Branches

LOCATION	NAME	PHONE	FAX
Arlington, TX	Cummins Southern Plains	(817) 640-6801	(817) 640-6852
Atlanta, GA	Cummins South	(404) 763-0151	(404) 766-2132
Baltimore, MD	Cummins Chesapeake Power	(410) 633-5161	(410) 633-6031
Birmingham, AL	Cummins Alabama	(205) 841-0421	(205) 849-5926
Boston, MA	Cummins Northeast	(617) 329-1750	(617) 329-4428
Bronx, NY	Cummins Metropower	(718) 892-2400	(718) 892-0055
Charlotte, NC	Cummins Atlantic	(704) 588-1240	(704) 587-4870
Chicago, IL	Cummins Northern Illinois	(708) 579-9222	(708) 352-7547
Columbus, OH	Cummins Ohio	(614) 771-1000	(614) 771-0769
Denver, CO	Cummins Rocky Mountain	(303) 287-0201	(303) 288-7080
DePere, WI	Cummins Great Lakes	(414) 337-1991	(414) 337-9746
Detroit, MI	Cummins Michigan	(810) 478-1570	(810) 478-1570
Edmonton, Alberta	Cummins Alberta	(403) 455-2151	(403) 454-9512
Hartford, CT	Cummins-Connecticut	(203) 527-9156	(203) 527-9955
Honolulu, HI	Cummins Hawaii Diesel Power	(808) 845-6606	(808) 842-7546
Indianapolis, IN	Cummins Midstates Power	(317) 243-7979	(317) 240-1925
Kansas City, MO	Cummins Mid-America	(816) 483-5070	(816) 483-5013
Los Angles, CA	Cummins Cal Pacific	(714) 253-6000	(714) 253-6080
Louisville, KY	Cummins Cumberland	(502) 426-9300	(502) 327-9851
Memphis, TN	Cummins Mid-South	(901) 577-0666	(901) 522-8758
Montreal, Quebec	Cummins Diesel	(514) 695-8410	(514) 695-8917
Omaha, NE	Cummins Great Plains Diesel	(402) 551-7678	(402) 551-1952
Philadelphia, PA	Cummins Power Systems	(215) 785-6005	(215) 785-4085
Phoenix, AZ	Cummins Southwest	(602) 252-8021	(602) 253-6725
Salt Lake City, UT	Cummins Intermountain	(801) 355-6500	(801) 524-1351
San Leandro, CA	Cummins West	(510) 351-6101	(510) 352-3925
Seattle, WA	Cummins Northwest	(206) 235-3400	(206) 235-8202
St. Louis, MO	Cummins Gateway	(314) 389-5400	(314) 389-9671
St. Paul, MN	Cummins Diesel Sales	(612) 636-1000	(612) 638-2442
Tampa, FL	Cummins Southeastern Power	(813) 621-7202	(813) 621-8250
Toronto, Ontario	Cummins Ontario	(905) 844-5851	(905) 844-7040
Vancouver, BC	Cummins British Columbia	(604) 882-5000	(604) 882-5080
Winnipeg, Manitoba	Cummins Mid-Canada	(204) 632-5470	(204) 697-0267

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: December 1997

BULLETIN: HE-323
Page 1 of 2

SUBJECT: Erratic (or Loss of) Throttle Control

AFFECTED MACHINES:

SK150LC IV	YMU1501 ~	SK220LC IV	LLU1801 ~
SK160LC IV	YMU1501 ~	SK250LC IV	LLU5101 ~
SK200 IV	YNU0501 ~	SK270LC IV	LBU0201 ~
SK200LC IV	YQU3101 ~	SK300LC IV	YCU0500 ~
SK210 IV	YNU0501 ~	SK330LC IV	YCU0500 ~
SK210LC IV	YQU3101 ~	SK400LC IV	YSU0200 ~
		SK460LC IV	YSU0200 ~

Please be advised that the affected machines can experience erratic or loss of throttle control, if the injection pump throttle lever becomes loose on the governor shaft. This pertains only to the Cummins powered units listed above, that use the "In-line" or "PT" style fuel injection pumps.

The throttle levers are retained on the governor shafts by a single clamp bolt, that can allow the lever to rotate on the shaft if it gets loose. Some of these pumps have a round shaft only. Others are round, but the shaft will have a notch machined in it. Even on the units with the notched shaft, the arm can rotate on it if the retaining bolt gets loose.

The symptom will be that the engine will slow down on it's own, even with the throttle control knob at high-idle position. The operator will usually return the throttle control to the low-idle position, and then bring it back up to high-idle, to see what happens.

In it's first stages (when the retainer bolt is only slightly loose), the throttle lever will re-position itself on the governor shaft, when the stepping motor pushes it back to the low-idle position. When the stepping motor returns to the hi-idle position, the throttle lever holds well enough to open the governor back up. However; it will usually slip again after a short while, and the scenario repeats itself. As the throttle lever is slipping on the governor shaft, it will wear, and finally get loose enough that all throttle control is then lost.

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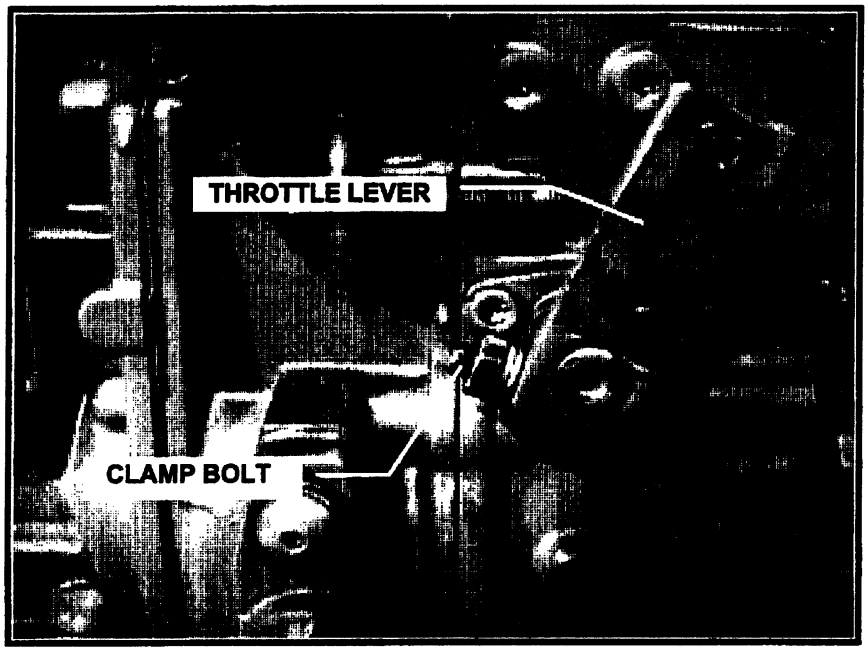
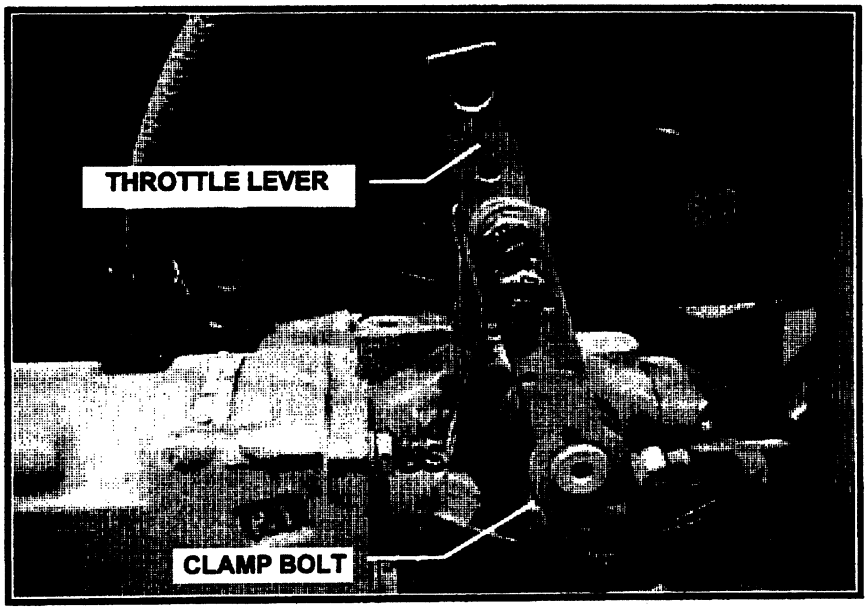
Because nothing is actually wrong with the Mechatronic Control System, there will be no Diagnostic Codes or Service Icons displayed. There have been occasions where all of the following items have been replaced in a search for the "culprit": *Mechatronic Controllers, Throttle Potentiometers, E/G Flywheel Speed Sensors, and Stepping Motors.* **Don't fail to check the simple and obvious items. If these symptoms occur, watch the throttle linkage closely while it operates, and determine the cause first, before just "changing parts".**



"IN-LINE" TYPE FUEL INJECTION PUMP



"PT" TYPE FUEL INJECTION PUMP

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: December 1997

BULLETIN: HE-327

SUBJECT: Oil Leakage Assessment of Track Rollers

AFFECTED MACHINES: All Hydraulic Excavators

Warranty Failure Analysis of replaced undercarriage components, by both Kobelco America and our O.E.M. vendors, has shown that in some instances these items are mistakenly replaced when nothing is actually wrong with them. When this occurs, the returned components do not support the warranty claims, and the claims have to be subsequently denied.

In most cases, the components in question have been replaced for the complaint of visibly leaking seals, assumed to be defective. Track rollers, Idlers, and Final Drive Reduction units all use *"floating ring seals"* to contain their lubricant. This type of seal will inherently "seep" or "sweat " during normal operation. It is this normal functioning of the seals that is perceived as a defect.

INTERTRACTOR, one of our O.E.M vendors for undercarriage components, has completed a two year investigative study of this matter and published the attached report: **"Oil Leakage Assessment of Track Rollers".** It is reprinted here with their permission, so Kobelco America Inc. can make our dealers aware of this situation. Their investigations found that approximately 80% of the rollers that had been removed for failure analysis, as suspect of leakage, were in fact *"sweating"* rollers - (not defective).

Please read this report and become familiar with: the normal function of floating ring seals (which it explains), assessing the condition it describes as *"sweating"* rollers, and most of all; the information given in **Section 6 - Conclusions**.

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Oil Leakage Assessment of Track Rollers

Intertractor

1 Case Study

The undercarriage component track roller are generally subjected to high loads during operation.

Due to the operating conditions of construction machinery, especially the sealing areas of the roller which are heavily stressed by external influences such as dirt.

In practice it repeatedly happens that lifetime lubricated track rollers are prematurely removed by users if only a little amount of lubricant shows. In many cases it is assumed - mostly without really knowing the correlation - that this is caused by a defective seal. After closer investigation, however, it is very often found that this is not a real leakage in the typical sense but just the lubricant showing under the normal loading of the track roller [1].

Although in field operation it is not so easy to differentiate between the two cases, the following text shall give some advise for a better assessment, above all, because this also plays a role with regard to environmental aspects which most users consider important.

2 Appearance of Leakage on Track Rollers of Excavators and Tractors

Principally, there are three points at which leakage on track rollers may appear [2]:

- at the oiling hole plug
- between track roller and bracket (O-ring of the shaft)
- between track roller and flange of bracket (floating ring seal).

Oil traces between roller shell and bracket flange (area of the floating ring seal) are the most frequent cause for track rollers removal by the user. In the past, these cases were left unclear whether the roller was leaky or the lubricant showing is just a normal functional effect. In the case of the latter, this is normally called a „sweating" track roller.

Therefore, in the case of oil leakage between roller shell and flange of bracket, there must be made a clear distinction between *leaky* and *„sweating"* track rollers.

2.1 Leaky Track Rollers

Track roller leakage becomes visible in the following way:

- Oil traces are clearly visible in the area of the bracket seal of the track roller.
- The track roller always remains wet and does not get dry.
- In the advanced stage of leakage drops are formed finally leaving oily shoes which are well recognizable after a longer stand-still of the machine.

This case of damage has been explained in detail under [2] so that at this point a further explanation is not required.

It should, however, be mentioned that in these cases the roller must be removed for repair before further damage occurs. If it cannot be repaired, the roller must be replaced.

2.2 *„Sweating"* Track Rollers

For functional reasons, a floating ring seal must always float on an oil film to work properly. Here, it often happens that the oil is *„sweating"* which can be regarded as normal from the structural point of view.

„Sweating" track rollers can be easily identified by slight oil traces on the roller shell although the oil is bound by dirt and dust already after a short period of operation. Principally, track rollers which are commercially available today are designed with an oil amount that allow oil losses due to *„sweating"* and will not cause a failure.

„Sweating" of track rollers may have the following causes:

- During assembly, seals are mounted in oily condition. This oil may show on the roller shell after commissioning.
- Due to the geometric design of floating rings the oil gets from the floating area cone through the seal face up to the seal gap. This oil may also show during operation (section 5).
- During dirt collection in the external mounting space of the seal floating rings may, under the influence of sudden axial motions, move away from each other temporarily leaking oil.
- If the machine is not used for a longer time, in particular, if the soil is frozen, floating rings may stick together. If the machine is taken into operation again, seals break free and some oil leaks temporarily.
- A kind of sweating effect may also be produced in winter (under cold conditions) when floating rings temporarily move off due to the changed elasticity of the O-rings until the roller has reached operating temperature.

3 Investigations

Over two years INTERTRACTOR has carried out systematic investigations on leaky rollers of various sizes having been in operation for 500 to 4000 hours.

The objective of these investigations was to find out if oil traces are due to a principal defect of the seal.

Prior to disassembly, track rollers were inspected visually for external damages and the existing oil amount of each roller was assessed by quality and quantity.

Then rollers were dismantled and the inside wear was measured. The bearing and the floating ring seal (floating ring and O-ring) required for the sealing of the roller as well as their retainer at the roller shell and bracket were assessed visually and also measured.

The removed seals were functionally tested and assessed by a floating ring seal manufacturer.

4 Results of Investigations

Checking the oil amount of the investigated track rollers proved that about 80 % of the rollers still had the total oil amount or an amount of oil sufficient for the functioning of the roller. This means, that a removal of the rollers was not necessary.

A dimensional check of the rollers did not show any obvious abnormalities. The bearings in the roller shell showed more or less wear which, however, is to be considered as normal. The wear of the bearing which is due to the loading of the roller does not affect its function.

As a result of visual tests of track rollers and roller components and leak tests, it was proved that floating ring seals did not suffer any functional shortcomings. Thus based on these comprehensive investigations it could clearly be stated that the majority of „leaky" rollers were just a result of the normal functioning of floating ring seals.

For a better illustration of the correlation explained in this section, the following is pursuant to [3] and describes again in more detail the cause of the *„sweating"* effect of rollers, in particular, with regard to the normal functioning of the seal.

5 Structural Design and Function of the Floating Ring Seal

The floating ring (fig. 1) seal consists of two metal rings of the same shape each elastically embedded in an O-ring [3].

The O-rings are designed for torque transmission and for the static tightness of the floating rings.

The seal is arranged in the roller in such a way that one of the two floating rings is rotary (roller shell) and the other one (bracket) is stationary.

The axial force required for the sealing is achieved by compression of the O-rings between the tension cones of the floating rings and the location borings on roller shell and bracket.

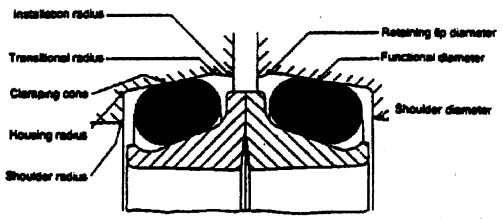

Fig. 1: Assembly condition of floating ring seal [3]

The contact surfaces of the floating rings (floating surfaces) are lapped. From these contact surfaces, the rings are wedge-shaped at a specific angle. The rings seat with their floating surface (lapping or sealing face) upon another and form a gap which is tapered towards the axis. Through this gap the lubricant gets easily to the seal faces.

During operation of the track rollers the seal faces continuously shift towards the internal diameter due to wear. Therefore, the wear reserves are relatively high and are generally sufficient for the service life of a roller in a construction machine. Life limit is reached when the floating surfaces have completely moved to the internal diameter of the floating ring.

A proper function of the seal is only granted if the floating surfaces are separated from each other by a good bearing oil film (mixed friction). Through capillary action during rotation, the lubricant gets into the seal gap. This provides an adequate lubricating and cooling effect preventing a cold welding of the sealing faces.

Due to this function, a minor amount of lubricant shows at the external sealing gap which is not to be regarded as leakage but indicates the optimum design and proper functioning of the floating ring seal.

Please take note of this statement and those which follow.

6 Conclusions

The results of investigations derived from the functioning of a floating ring seal showed that about 80% of rollers which have been removed for failure analysis were *„sweating"* rollers.

Please take note of these statements.

This means that many track rollers tested for leakage did not have to be removed, i.e. it shows that a proper assessment of the rollers would have reduced costs and prevented downtime periods of the machine.

For these reasons, track rollers showing oil traces described as „sweating" rollers should not be removed immediately.

This article should help to make a correct assessment of the real conditions.

References:

[1] Development and Innovation, Special issue of Intertractor, Gevelsberg 1995
[2] Kotte, G.: Verschleiß an Kettenlaufwerken von Baumaschinen. Verlagsgesellschaft Rudolf Müller GmbH, Köln-Braunsfeld 1984
[3] Prospekt Laufwerksdichtungen, Ausgabe 893909-2/94 AE Goetze GmbH, 51388 Burscheid,

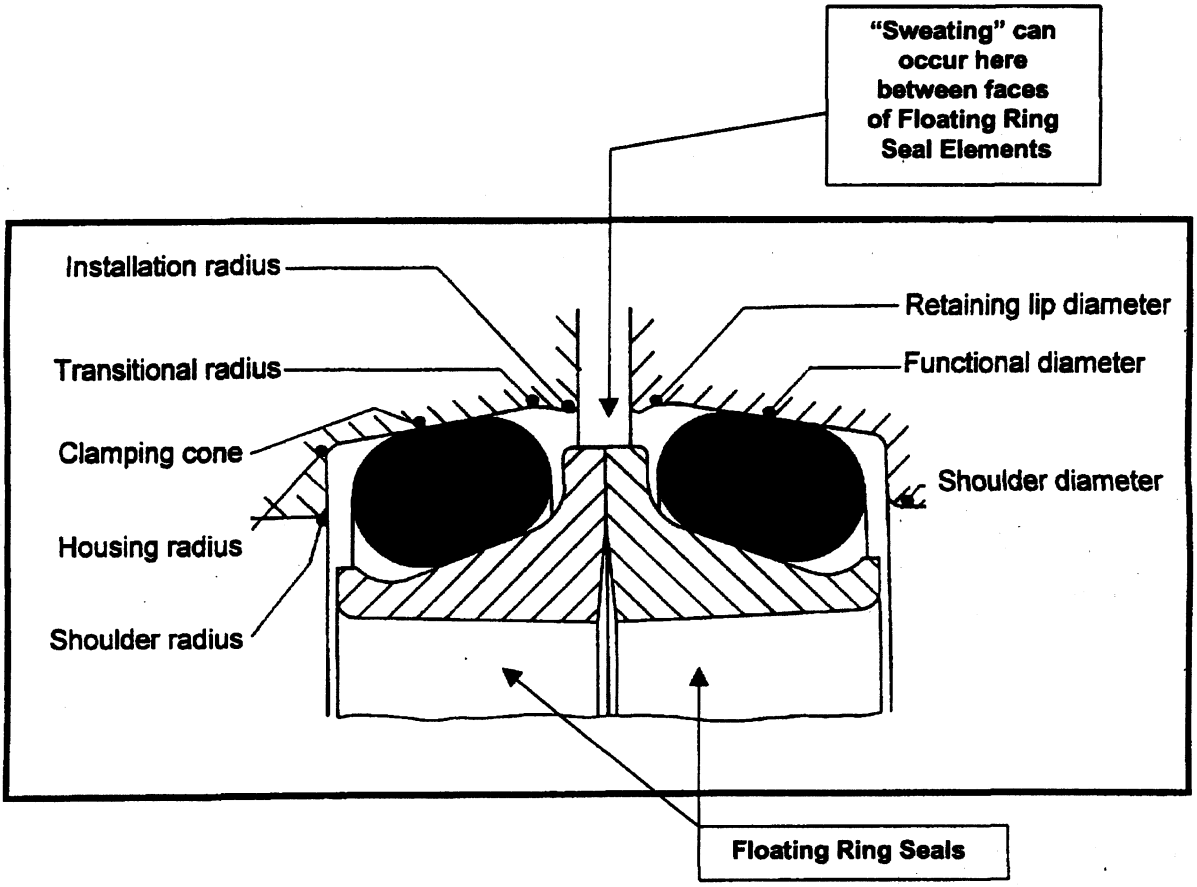

Fig. 2: Enlarged detail of Floating Ring Seal assembly

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

Please note: This material was previously published as Product Information Bulletin # PI 97-05.

DATE: December 1997

BULLETIN: HE-328
Page 1 of 11

SUBJECT: Kobelco Auxiliary Hydraulic Valve Kits

AFFECTED MACHINES: All MK IV Hydraulic Excavators

Please refer to the attached pages which detail the currently available Kobelco Auxiliary Hydraulic Valve Kits.

This information was originally prepared by Mr. Kevin Caldwell of the Kobelco America Inc. Marketing Group. It was previously published and released as Product Information Bulletin # PI 97-05, and provided to the Dealer Principals and Branch Managers.

This summary explains the system features of each kit, references the Sales Code numbers (xxx) for identification, gives the approximate flow rates to be expected, and includes color schematics as well. The Marketing Group did a very good job putting this together, and it will be very helpful to all Kobelco Excavator Dealer Service Departments.

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KOBELCO

Product Information

Bulletin # PI97-05
DATE: July 29, 1997

TO: All KOBELCO Dealer Principals & Branch Managers

SUBJECT: KOBELCO AUXILIARY VALVE KITS

In April, Kobelco announced the availability of the new Kobelco Auxiliary Valve Kits. Due to the growing applications and arrangements of such hydraulic valve kits, the following product information bulletin has been created to more thoroughly explain and simplify what many people believe are complicated systems. To dispel this myth, let us examine the special features, capabilities, and applications of each Kobelco Auxiliary Valve Kit System.

SYSTEM FEATURES

Each Kobelco Auxiliary Valve Kit is supplied with a foot control actuating pedal. This pedal is essentially a pilot valve which allows flow to begin from the auxiliary control valve. Each system will remain in neutral until the pedal is depressed. Once depressed, the system is engaged and flow is released from the valve to the auxiliary attachment.

In the **Breaker Kit (514)**, the hydraulic system's full pump flow may be utilized in a uni-directional or one way action for single speed hammers, breakers, uni-directional tampers or compactors. This is simply an on/off valve system which does not allow metering or proportional flow. Flow is simply actuated by the pedal (pilot valve) which causes the main control valve to supply full pump flow from the P1 main pump to the attachment. This flow then moves from the attachment straight back to an included hydraulic filter before returning to the hydraulic reservoir. In turn, this has been designed to reduce back-pressure to a minimum.

In the **Nibbler/Breaker Kit (519)**, this combination kit will allow the operator to select between the breaker function (same as listed above) or nibbler operations through a selector valve located in the auxiliary control valve piping. In the nibbler operation, the system is actuated from the pedal (or pilot valve), in one of two directions, through the bi-directional auxiliary control valve to the attachment. Flow then returns back through the bi-directional auxiliary control valve and to the main hydraulic filters before returning to the hydraulic reservoir. In addition, the user may also select double main full pump flow which supplies full pump flow from both the P1 main pump and the P2 main pump. This is ideal for attachments requiring additional flow such as a 3rd member mount shear.

Please note that the double main pump flow should only be used in the nibbler operations and never in the breaker function.

In the **Extra Valve Kit (521)**, the hydraulic system involves a flow divider which borrows an equal small flow from both main pumps. Again, flow begins with actuation from the pedal (or pilot valve) which triggers the valve in the flow divider and sends a small total flow to the bi-directional auxiliary control valve in one of two directions. Flow is sent to the attachment via the bi-directional control valve, and then to the main hydraulic filters before returning to the hydraulic reservoir. Please note that this kit has been designed for low flow (10 GPM) attachments such as wrist-a-twists, clamshell rotations, and small thumbs. It is not intended for hammers, large thumbs, or any attachment requiring full pump flow.

TOTAL FLOW RATES (Approximate G.P.M.)

Description	SK115/120	SK150	SK200	SK220/270	SK300	SK400
514 Breaker	31	40	55	63	83	98
519 Nibbler/Breaker	31/62	40/80	55/110	63/126	83/166	98/196
521 Extra	10	10	10	10	10	10

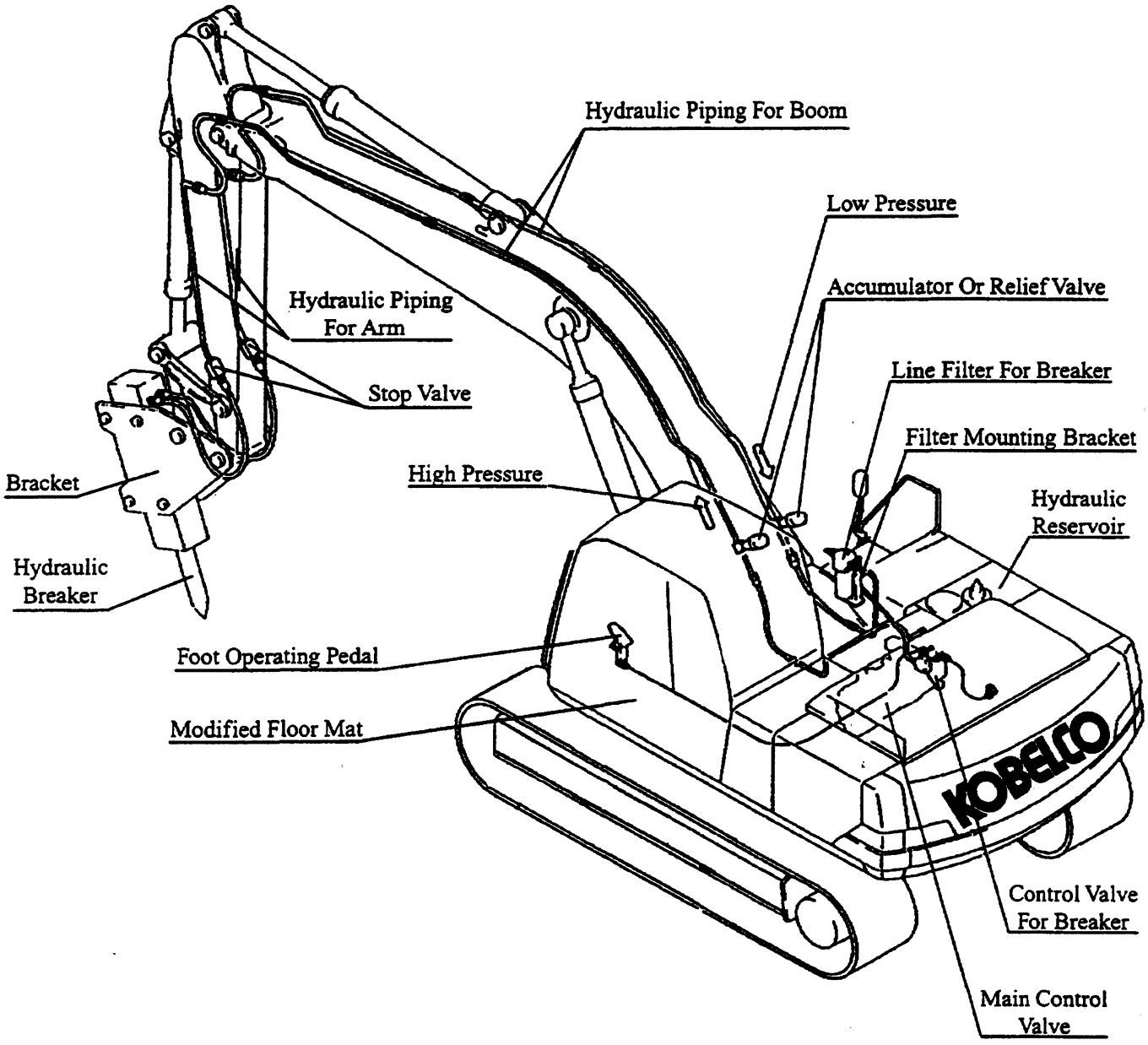
APPLICATIONS

The **(514) Breaker** has been designed to be used exclusively for single full pump flow attachments. Due to its uni-directional full pump flow, it acts as either an on or off valve. This is ideal for breakers, hammers, uni-directional tampers, or compactors.

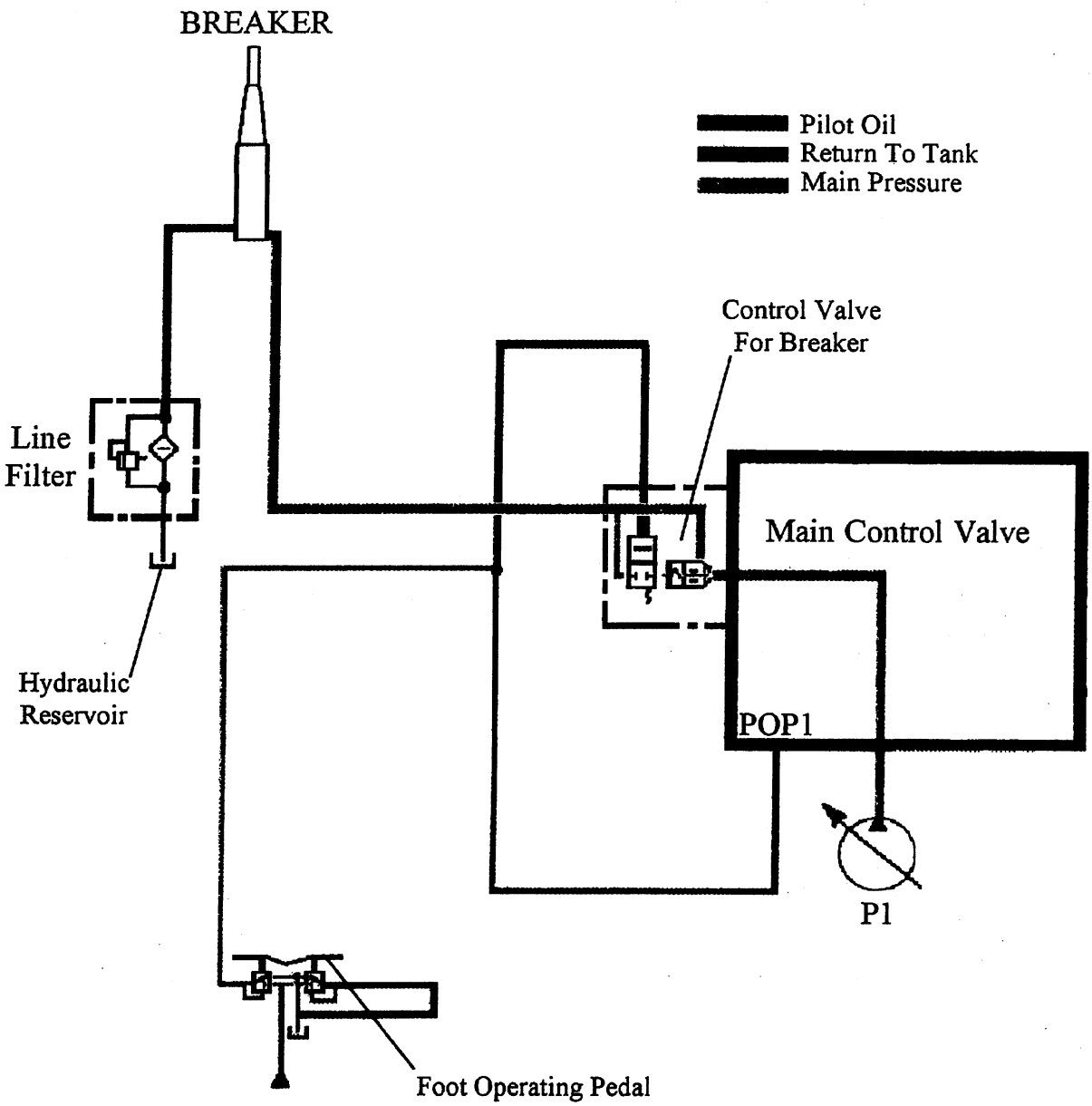
The **(519) Nibbler/Breaker** has been designed as a combination kit. Again, it may be used as either a breaker kit with single pump uni-directional full flow, or as a nibbler kit with single pump bi-directional flow or double pump bi-directional flow. This universal kit is ideal for the same breaker functions as listed above in the single pump full flow mode, for thumbs in the single pump flow mode, or for shears in the double pump bi-directional full flow mode. However, please note that the double pump main full flow mode should only be used in the nibbler operational mode and never in the breaker operational mode.

The **(521) Extra Valve Kit** has been designed to provide bi-directional low flow utilized from a double flow divider while allowing independent operation of all other hydraulic functions at the same time. This makes it ideal for attachments such as small rotation devices, wrist-a-twists, clamshells, or grapples. Please note that because it only provides a low total flow, it cannot be used to operate a breaker or hammer.

Breaker Layout



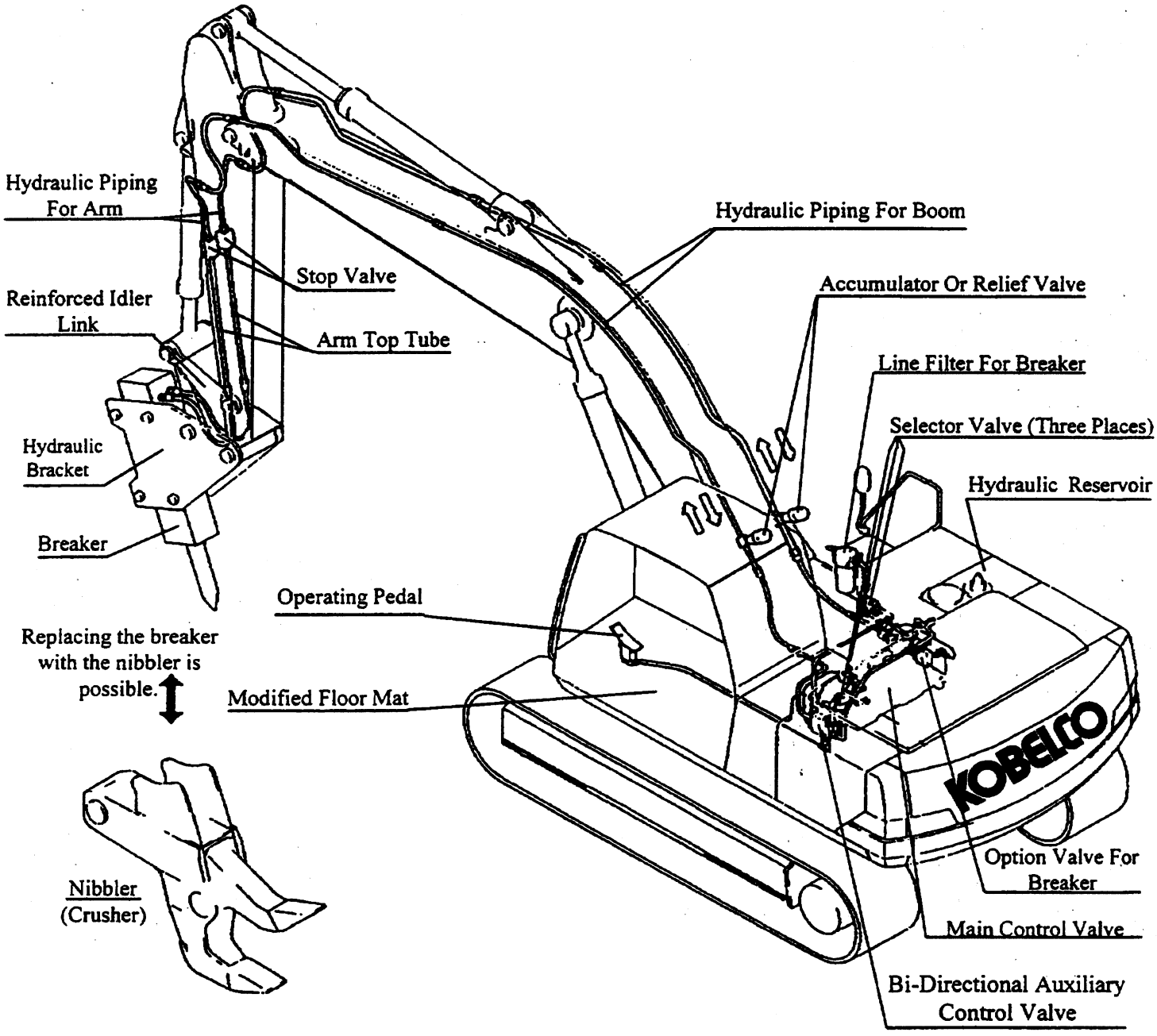
Single Full Flow (Breaker Kit)



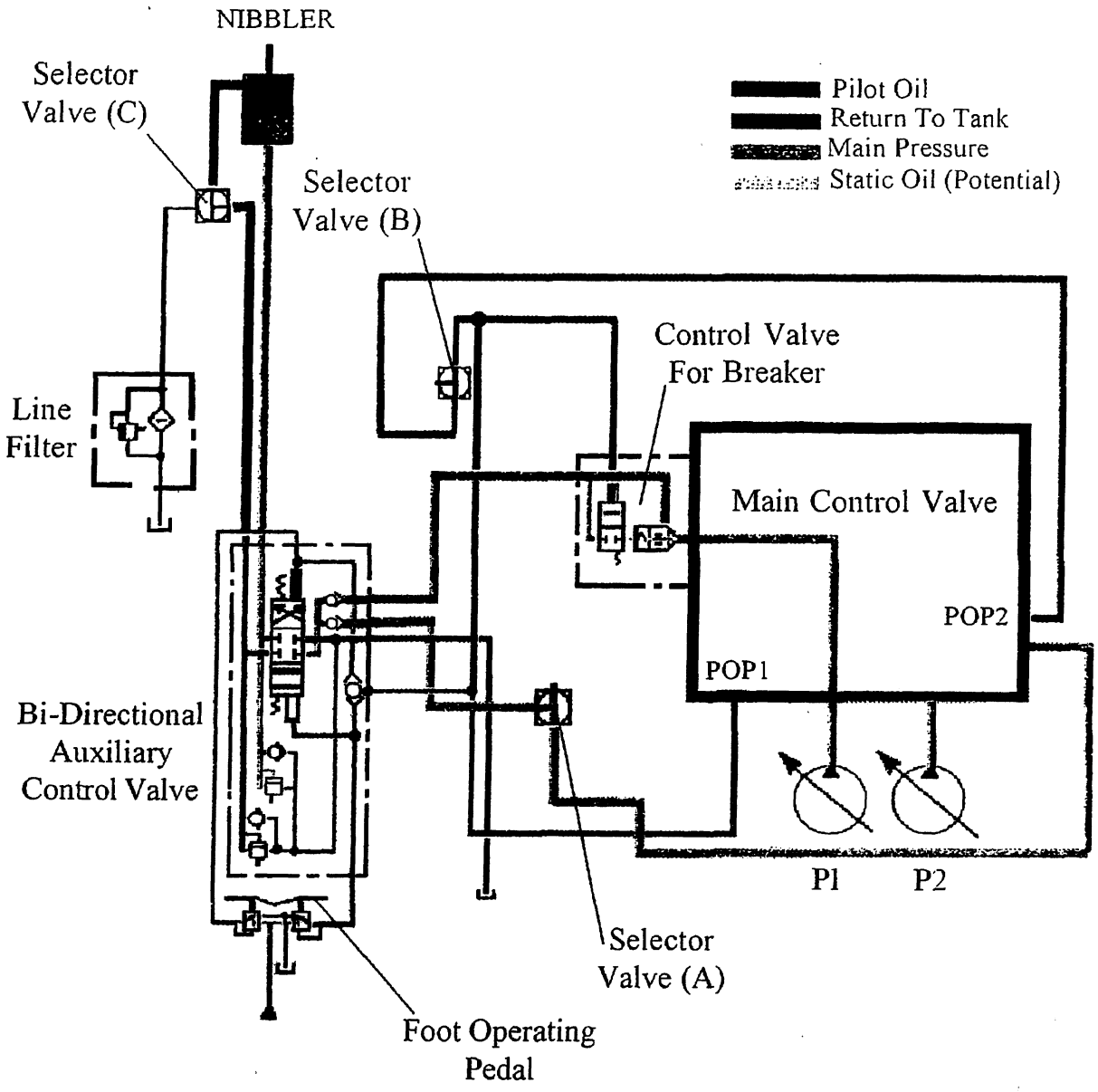
HYDRAULIC CIRCUIT FOR BREAKER

If the pilot valve is actuated by the foot operating pedal, the pilot pressure enters the control valve for breaker, shifts the spool, and opens the plunger. At the same time, the pilot pressure is also sent to ports POP1 of the main control valve and closes the neutral cut in the main control valve. As a result, the flow of hydraulic oil delivered from pump P1 to the main control valve is then transferred to the breaker through the control valve for breaker. The oil returning from the breaker comes back from the attachment directly to the hydraulic reservoir via the 10 micron line filter. If boom raising operation is performed, most of the oil to the hammer will be delivered to the boom for priority. During combined operation, flow to the breaker will be reduced. The result is that most of the oil discharged by the main pump is delivered to the boom cylinder and the breaker will not operate.

Nibbler/Breaker Layout

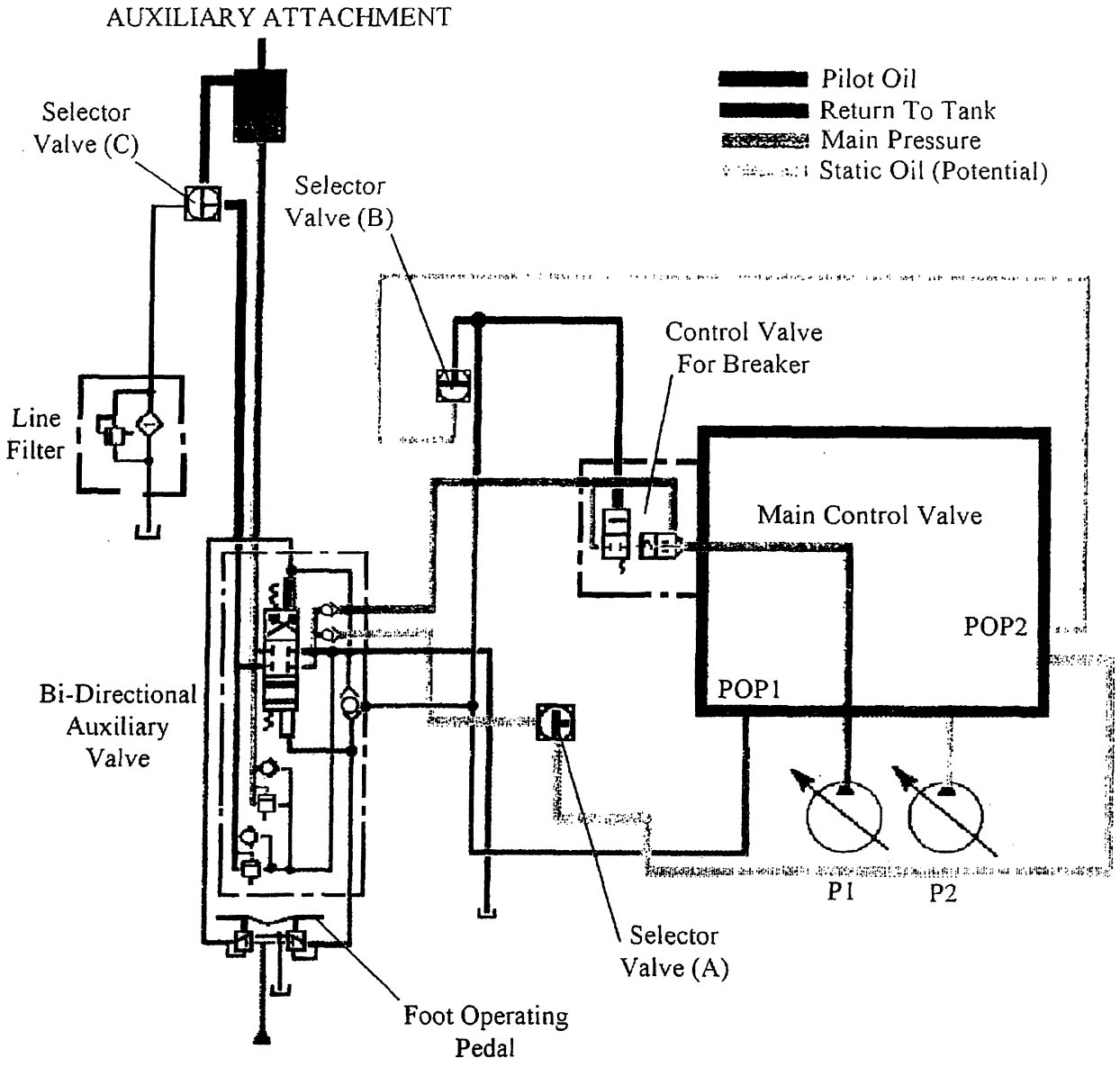


Double Main Bi-Directional Full Flow For Nibbler (Nibbler/Breaker Kit)



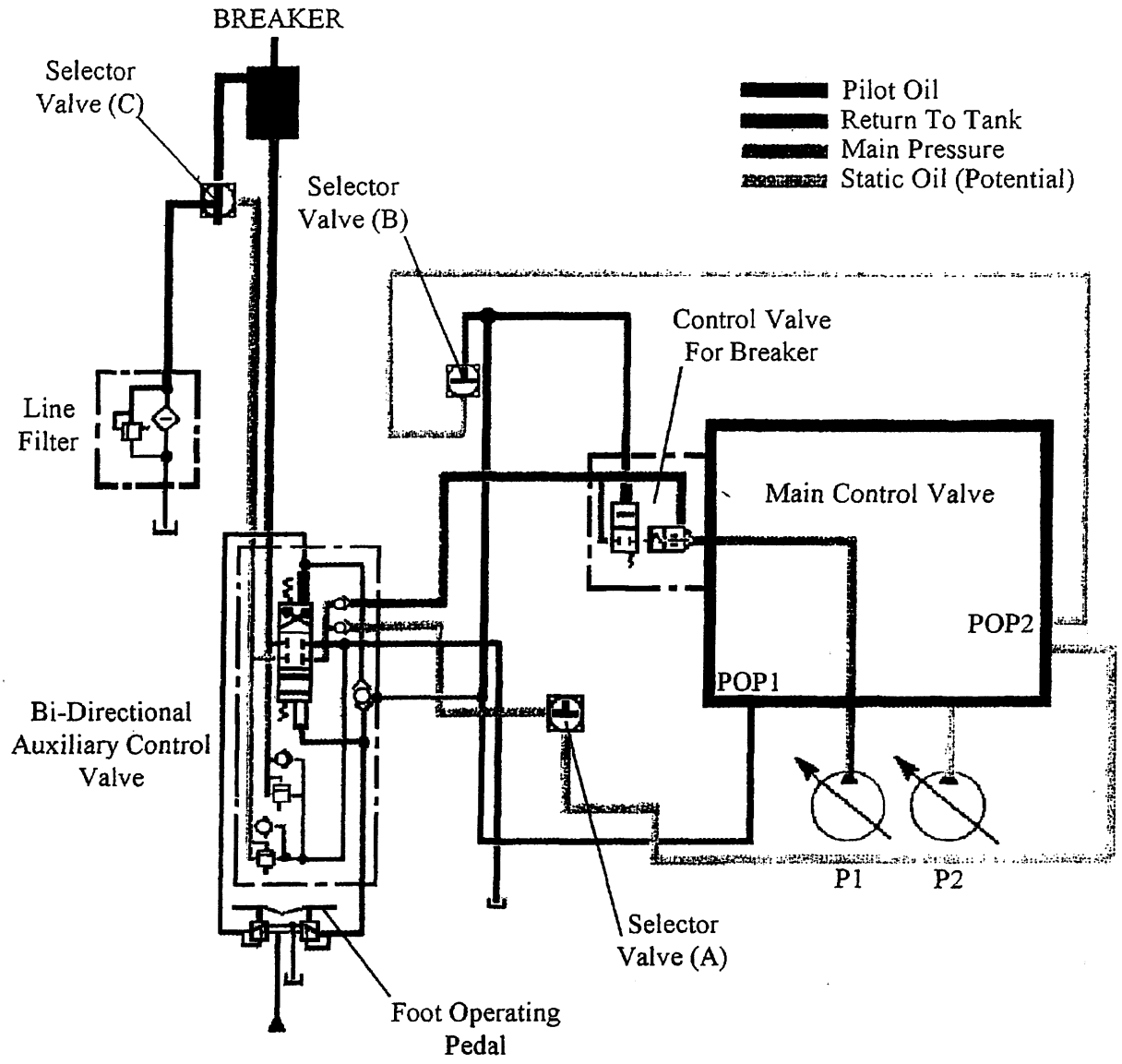
When the ***nibbler*** is being used, the operator should set the selector valves (A), (B), and (C), to the "N" position. In this setting, if the pilot valve is actuated by the foot operating pedal, pilot pressure will shift the spool within the bi-directional auxiliary control valve, open the valve in the control valve for breaker, and deliver pressure to ports POP1 and POP2 while closing the neutral cut valve in the main control valve for both pumps. The result is a double main full pump flow supplied to the nibbler cylinder from both the P1 main pump and the P2 main pump Flow then returns back through the bi-directional auxiliary control valve and then to the main hydraulic filters before returning to the hydraulic reservoir. Please note, the double main full pump flow should never be used for a breaker. Hydraulic overheating, machine damage, and possible breaker damage will occur!!!

Single Main Bi-Directional Full Flow (Nibbler/Breaker Kit)



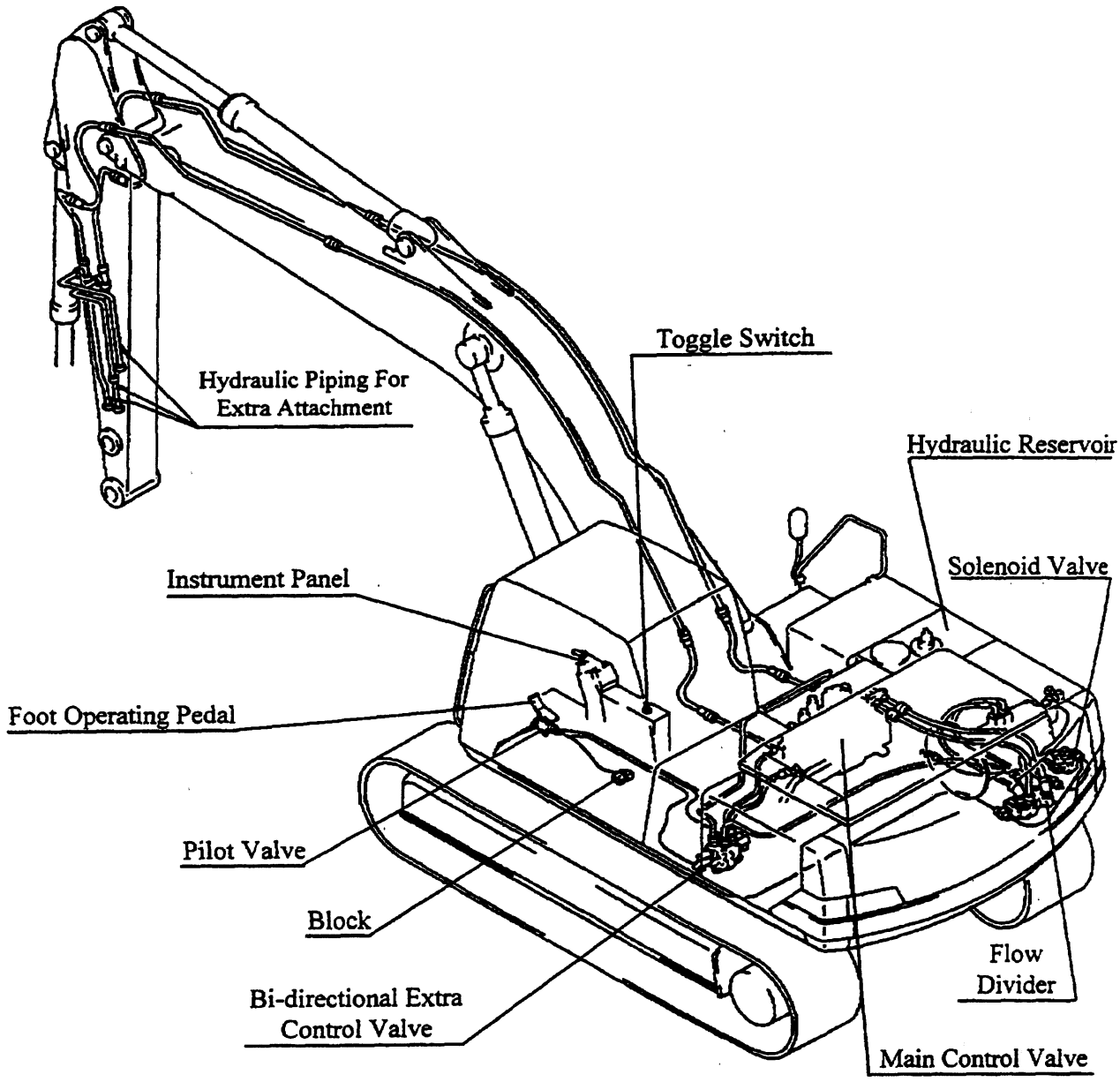
When ***clamshells, rotation devices, and thumbs*** are being used, the operator may select single pump bi-directional control by setting selector valves (A) and (B) to the "B" position and selector valve (C) to the "N" position. In this setting, if the pilot valve is actuated by the foot operating pedal, pilot pressure will shift the spool within the bi-directional auxiliary control valve, open the valve in the control valve for breaker, and deliver pressure to port POP1 while closing the neutral cut valve in the main control valve for the one main pump. (Note: This is the same operation as the nibbler setting with the exception of pilot pressure being delivered to the POP2 port and flow being sent from the P2 pump.) The result is a single main full pump flow supplied to the attachment from the P1 main pump. Flow then returns back through the bi-directional control valve and then to the main hydraulic filters before returning to the hydraulic reservoir.

Single Main Full Flow For Breaker (Nibbler/Breaker Kit)

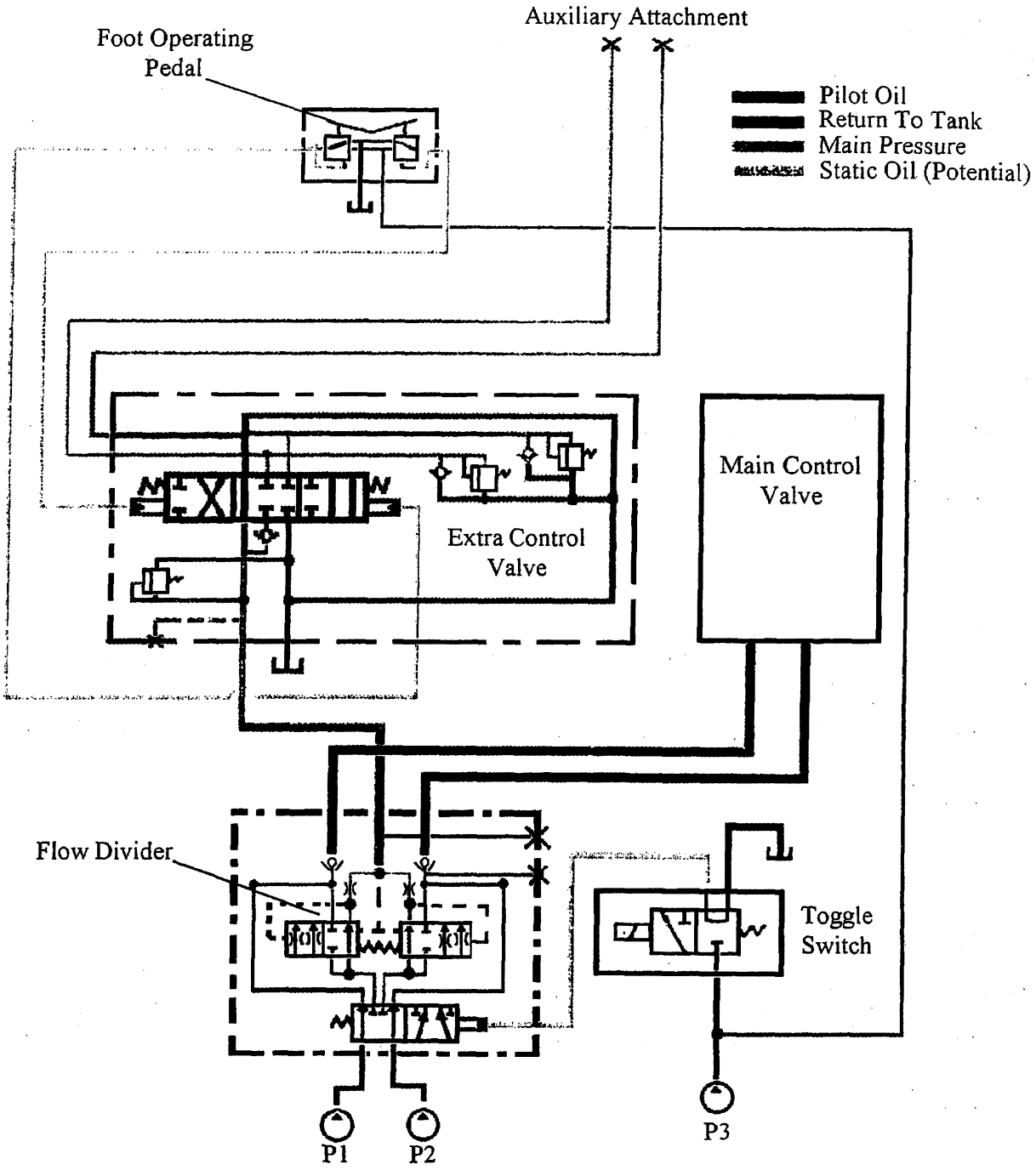


When the ***breaker*** is being used, the operator should set the selector valves (A), (B), and (C), to the "B" position. In this setting, if the pilot valve is actuated by the foot operating pedal, pilot pressure will shift the spool within the bi-directional auxiliary control valve, open the valve in the control valve for breaker, and deliver pressure to the POP1 port while closing the neutral cut valve in the main control valve. The result is a single main pump flow supplied from the P1 main pump to the breaker attachment. Flow then returns from the breaker to an included hydraulic in-line filter before returning to the hydraulic reservoir. If boom raising operation is performed, a portion of the oil to the breaker will be delivered to the boom for priority. During combined operation, flow to the breaker will be reduced.

Extra Layout



Bi-Directional Independent Low Flow (Extra Kit)



HYDRAULIC CIRCUIT FOR EXTRA

If the toggle switch on the instrument panel is turned "ON", a small but equal amount of flow is diverted from the two main pumps (5 GPM each) within the flow divider. This divided flow (10 total GPM) is then sent to the bi-directional extra control valve where it flows either to the main hydraulic filters and to the hydraulic reservoir, or upon actuation of the foot operating pedal, flows through the boom and arm auxiliary piping to actuate the extra attachment. From the extra attachment, flow will then return to the bi-directional extra control valve and then to the main hydraulic filters before returning to the hydraulic reservoir. Therefore, please note that if the toggle switch is turned "ON", but the foot operating pedal is not actuated, the flow of oil will still be divided within the flow divider and sent to the bi-directional control valve before returning to the main filters and the hydraulic reservoir. The result will be a loss of flow for other operations.

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: December 1997

BULLETIN: HE-329

SUBJECT: Red Dot Heater Blower Wheel Correct Installation (for R-1550 series heaters only)

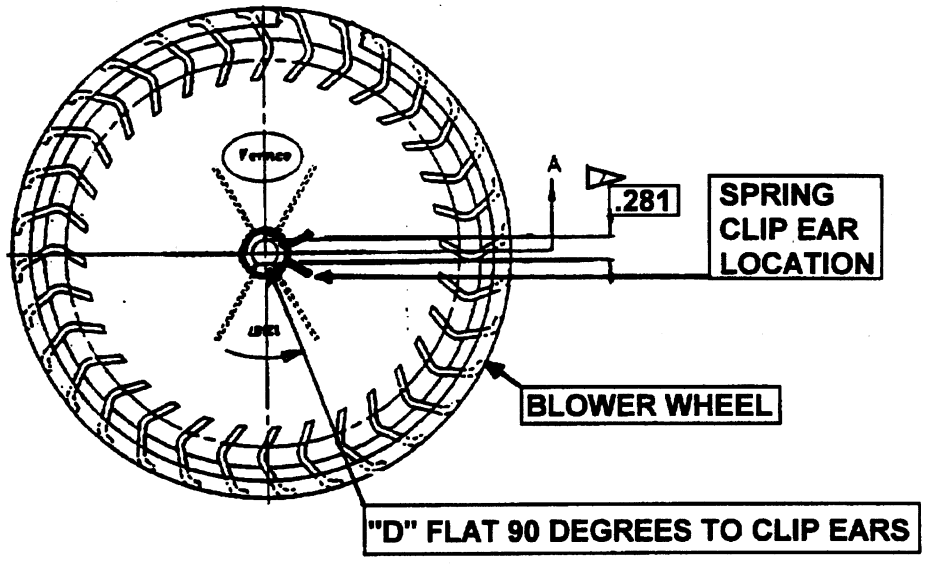
AFFECTED MACHINES:

SK120 IV	LPU-0111~	SK220LC IV	LLU-1959~
SK120LC IV	YPU-1820~	SK270LC IV	LBU-0211~
SK150LC IV	YMU-1724~	SK300 IV	LCU-0107~
SK200 IV	YNU-0548~	SK300LC IV	YCU-0776~
SK200LC IV	YQU-3561~		

Please be advised that the Red Dot heater blower wheel hub, Part # RD-5-5601-0P is the correct wheel hub for the machines listed above.

NOTE: Improper installation of spring clip may put blower wheel hub dimensionally out of tolerance, which will cause premature failure of wheel hub. This is very critical.

Below is the correct location of the spring clip in relation to " D " flat on motor shaft.



Effective with the serial numbers listed above, the subject Blower Wheels are being checked for proper installation at the factory.

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SERVICE BULLETIN
KOBELCO AMERICA INC.

Please note: This material was previously published as Product Information Bulletin # PI 97-13.

DATE: December 1997

BULLETIN: HE-330
Page 1 of 14

SUBJECT: Bucket Selection Charts

AFFECTED MACHINES: All MK IV Hydraulic Excavators:

SK60 IV ~ SK400LC IV Standard
SK300LC IV Mass Excavators
SK400LC IV Mass Excavators
SK200LC IV ~ SK400LC IV Long Reach

Please refer to the attached pages which detail the Bucket Selection Charts for the models listed above.

This information was originally prepared by the Kobelco America Inc. Marketing Group. It was previously published and released as Product Information Bulletin # PI 97-13, and provided to the Dealer Principals and Branch Managers.

This summary gives the bucket capacities, widths, and weights, for identification purposes. It specifies the bucket duty, and the arm lengths they can be used with. These recommendations should always be followed when selecting buckets for Kobelco Excavators.

The Marketing Group did a very good job putting this together, and it will be very helpful to all Kobelco Excavator Dealer Service Departments.

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KOBELCO

Product Information

Bulletin # PI97-13
DATE: October 3, 1997

TO: All KOBELCO Excavator Dealer Principals & Branch Managers

SUBJECT: **KOBELCO SK60IV - SK400LCIV Bucket Selection Charts**

Gentlemen,

Attached you will find copies of the current bucket selection charts for the Kobelco SK60IV through the Kobelco SK400LCIV. In addition, you will also find a new selection chart for the SK115DZIV, the SK130LCIV, and the SK300LCIV Mass Excavator.

Please use this information as a tool to correctly identify and to recommend to your customers the appropriate buckets respective to arm lengths, capacities, and bucket widths desired. If you have any further questions, please contact your Kobelco District Sales Manager.

Marketing Department

KOBELCO

SK60LC MARK IV

HYDRAULIC EXCAVATOR

Bucket Selection Chart

Bucket Duty	Capacity (SAE) Cubic Yard (meter)	Width Inches (m)	Bucket Weight lbs.	Arms 7'1"	Offset Boom
General Purpose	0.23 (.175)	18 (.457)	337	H	H
	0.26 (.198)	20 (.508)	360	H	H
	0.33 (.252)	24 (.609)	400	H	M
	0.43 (.328)	30 (.762)	459	M	L
	0.53 (.405)	36 (.914)	537	L	X
Heavy Duty	0.23 (.175)	18 (.457)	454	H	H
	0.26 (.198)	20 (.508)	476	H	M
	0.33 (.252)	24 (.609)	527	M	L
	0.43 (.328)	30 (.762)	641	L	X
	0.53 (.405)	36 (.914)	737	X	X

H - Used with material weight up to 3,000 lbs per cubic yard.
M - Used with material weight up to 2,500 lbs per cubic yard.
L - Used with material weight up to 2,000 lbs per cubic yard.
X - Not recommended.

KOBELCO

SK115DZIV MARK IV

HYDRAULIC EXCAVATOR

Bucket Selection Chart

Bucket Duty	Capacity (SAE) Cubic Yard (meter)		Width Inches (m)	Bucket Weight lbs.	Arms 8'2"
General Purpose	0.44	(.336)	24 (.609)	720	H
	0.58	(.443)	30 (.762)	835	H
	0.73	(.558)	36 (.914)	905	H
	0.88	(.672)	42 (1.066)	1015	M
Heavy Duty	0.44	(.336)	24 (.609)	780	H
	0.58	(.443)	30 (.762)	900	H
	0.73	(.558)	36 (.914)	975	M
	0.88	(.672)	42 (1.066)	1090	L
Severe Duty	0.50	(.382)	31 (.787)	1230	H
	0.62	(.481)	37 (.940)	1400	M
	0.75	(.573)	48 (1.219)	1570	L

H - Used with material weight up to 3,000 lbs per cubic yard.
M - Used with material weight up to 2,500 lbs per cubic yard.
L - Used with material weight up to 2,000 lbs per cubic yard.
X - Not recommended.

KOBELCO

SK130LC MARK IV

HYDRAULIC EXCAVATOR

Bucket Selection Chart

Bucket Duty	Capacity (SAE) Cubic Yard (meter)	Width Inches (m)	Bucket Weight lbs.	Arms 9'10"
General Purpose	0.30 (.229)	18 (.457)	650	H
	0.44 (.336)	24 (.609)	720	H
	0.58 (.443)	30 (.762)	835	M
	0.73 (.558)	36 (.914)	905	L
	0.88 (.672)	42 (1.066)	1015	X
	1.02 (.779)	48 (1.219)	1125	X
	1.17 (.894)	54 (2.125)	1200	X
Heavy Duty	0.30 (.229)	18 (.457)	705	H
	0.44 (.336)	24 (.609)	780	H
	0.58 (.443)	30 (.762)	900	M
	0.73 (.558)	36 (.914)	975	L
	0.88 (.672)	42 (1.066)	1090	X
	1.02 (.779)	48 (1.219)	1210	X
Severe Duty	0.38 (.29)	26 (.660)	1120	H
	0.50 (.382)	31 (.787)	1230	M
	0.62 (.481)	37 (.940)	1400	L
	0.75 (.573)	48 (1.219)	1570	X

H - Used with material weight up to 3,000 lbs per cubic yard.
M - Used with material weight up to 2,500 lbs per cubic yard.
L - Used with material weight up to 2,000 lbs per cubic yard.
X - Not recommended.

KOBELCO

SK150LC MARK IV

HYDRAULIC EXCAVATOR

Bucket Selection Chart

Bucket Duty	Capacity (SAE) Cubic Yard (meter)	Width Inches (m)	Bucket Weight lbs.	Arms	
				8'6"	10'0"
General Purpose	0.45 (.344)	20 (.508)	1045	H	H
	0.58 (.443)	24 (.609)	1120	H	H
	0.77 (.588)	30 (.762)	1280	H	M
	0.97 (.741)	36 (.914)	1395	M	L
	1.16 (.886)	42 (1.066)	1550	L	X
	1.36 (1.039)	48 (1.219)	1710	X	X
Heavy Duty	0.45 (.344)	20 (.508)	1120	H	H
	0.58 (.443)	24 (.609)	1200	H	H
	0.77 (.588)	30 (.762)	1365	H	M
	0.97 (.741)	36 (.914)	1495	M	L
	1.16 (.886)	42 (1.066)	1660	L	X
Severe Duty	0.56 (.428)	26 (.660)	1405	H	H
	0.69 (.527)	31 (.787)	1540	H	M
	0.85 (.649)	37 (.940)	1740	M	L

H - Used with material weight up to 3,000 lbs per cubic yard.
M - Used with material weight up to 2,500 lbs per cubic yard.
L - Used with material weight up to 2,000 lbs per cubic yard.
X - Not recommended.

KOBELCO

SK200LC MARK IV

HYDRAULIC EXCAVATOR

Bucket Selection Chart

Bucket Duty	Capacity (SAE) Cubic Yard (meter)	Width Inches (m)	Bucket Weight lbs.	Arms		
				7'10"	9'8"	10'10"
General Purpose	0.88 (.672)	24 (.609)	1165	H	H	H
	0.91 (.695)	30 (.762)	1325	H	H	H
	1.14 (.871)	36 (.914)	1450	H	H	M
	1.37 (1.047)	42 (1.066)	1615	H	M	L
	1.60 (1.223)	48 (1.219)	1780	M	L	X
Heavy Duty	0.68 (.519)	24 (.609)	1250	H	H	H
	0.91 (.695)	30 (.762)	1420	H	H	M
	1.14 (.871)	36 (.914)	1560	H	M	L
	1.37 (1.04)	42 (1.066)	1730	M	L	X
	1.60 (1.223)	48 (1.219)	1905	L	X	X
Severe Duty	.63 (.481)	26 (.660)	1455	H	H	H
	.75 (.573)	31 (.787)	1590	H	H	H
	.88 (.672)	37 (.939)	1790	H	M	M
	1.13 (.871)	43 (1.092)	2000	M	L	X

H - Used with material weight up to 3,000 lbs per cubic yard.
M - Used with material weight up to 2,500 lbs per cubic yard.
L - Used with material weight up to 2,000 lbs per cubic yard.
X - Not recommended.

KOBELCO

SK220LC MARK IV

HYDRAULIC EXCAVATOR

Bucket Selection Chart

Bucket Duty	Capacity (SAE) Cubic Yard (meter)	Width Inches (m)	Bucket Weight lbs.	Arms		
				8'2"	9'9"	11'2"
General Purpose	0.875 (.669)	24 (.609)	1560	H	H	H
	1.125 (.860)	30 (.762)	1710	H	H	H
	1.375 (1.051)	36 (.914)	1860	H	H	M
	1.625 (1.242)	42 (1.066)	2060	H	M	L
	1.875 (1.433)	48 (1.219)	2175	M	L	X
Heavy Duty	0.875 (.669)	24 (.609)	1675	H	H	H
	1.125 (.860)	30 (.762)	1840	H	H	M
	1.375 (1.051)	36 (.914)	2000	H	M	L
	1.625 (1.242)	42 (1.066)	2215	M	L	X
Severe Duty	0.75 (.573)	27 (.685)	2205	H	H	M
	1 (.764)	33 (.838)	2450	M	M	X
	1.125 (.860)	36 (.914)	2545	L	X	X

H - Used with material weight up to 3,000 lbs per cubic yard.
M - Used with material weight up to 2,500 lbs per cubic yard.
L - Used with material weight up to 2,000 lbs per cubic yard.
X - Not recommended.

KOBELCO

SK270LC MARK IV

HYDRAULIC EXCAVATOR

Bucket Selection Chart

Bucket Duty	Capacity (SAE) Cubic Yard (meter)	Width Inches (m)	Bucket Weight lbs.	Arms			
				8'2"	9'9"	11'2"	12'0"
General Purpose	.875 (.668)	24 (.609)	1560	H	H	H	H
	1.125 (.860)	30 (.762)	1710	H	H	H	H
	1.375 (1.051)	36 (.914)	1860	H	H	H	M
	1.625 (1.242)	42 (1.066)	2060	H	H	M	L
	1.875 (1.433)	48 (1.219)	2175	H	M	L	X
	2.0 (1.529)	54 (1.37)	2525	M	X	X	X
Heavy Duty	1.125 (.860)	30 (.761)	1840	H	H	H	H
	1.375 (1.051)	36 (.914)	2000	H	H	H	M
	1.625 (1.242)	42 (1.066)	2215	H	M	M	L
	1.875 (1.433)	48 (1.219)	2335	M	L	L	X
Severe Duty	.75 (.573)	27 (.685)	2205	H	H	H	M
	1.0 (.764)	30 (.762)	2450	H	M	M	L
	1.125 (.860)	36 (.914)	2545	M	L	L	X
	1.375 (1.051)	42 (1.066)	2795	L	X	X	X

H - Used with material weight up to 3,000 lbs per cubic yard.
M - Used with material weight up to 2,500 lbs per cubic yard.
L - Used with material weight up to 2,000 lbs per cubic yard.
X - Not recommended.

KOBELCO

SK300LC MARK IV

HYDRAULIC EXCAVATOR

Bucket Selection Chart

Bucket Duty	Capacity (SAE) Cubic Yard (meter)		Width Inches (m)		Bucket Weight lbs.	Arms 8'4"	Arms 10'4"	Arms 13'5"
General Purpose	0.875	(.669)	24	(.609)	1925	H	H	H
	1.25	(.860)	30	(.762)	2105	H	H	H
	1.50	(1.146)	36	(.914)	2365	H	H	H
	1.75	(1.337)	42	(1.066)	2550	H	H	M
	2.0	(1.529)	48	(1.219)	2700	H	M	L
	2.375	(1.815)	54	(1.37)	3825	M	L	X
	2.625	(2.006)	60	(1.52)	3020	L	X	X
Heavy Duty	0.875	(.669)	24	(.609)	2070	H	H	H
	1.25	(.860)	30	(.762)	2265	H	H	H
	1.50	(1.146)	36	(.914)	2545	H	H	H
	1.75	(1.337)	42	(1.066)	2740	H	H	M
	2.0	(1.529)	48	(1.219)	2905	H	M	L
	2.375	(1.815)	54	(1.37)	3040	H	L	X
	2.625	(2.006)	60	(1.52)	3250	M	X	X
Severe Duty	1	(.764)	27	(.685)	2330	H	H	M
	1.25	(.860)	33	(.838)	2585	H	H	L
	1.50	(1.146)	36	(.914)	2690	H	M	X
	1.75	(1.337)	42	(1.066)	2945	M	L	X
	2.0	(1.529)	48	(1.219)	3160	L	X	X

H - Used with material weight up to 3,000 lbs per cubic yard.
M - Used with material weight up to 2,500 lbs per cubic yard.
L - Used with material weight up to 2,000 lbs per cubic yard.
X - Not recommended.

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SK300LC MARK IV

MASS EXCAVATOR

Bucket Selection Chart

Bucket Duty	Capacity (SAE) Cubic Yard (meter)	Width Inches (m)	Bucket Weight lbs.	Arms	
				7'11"	Quarry Spec 8'4"
Light Duty	4.0 (3.06)	66	4,375	**	X
Medium Duty HD	3.02 (2.31)	53	3,620	H	M
	3.29 (2.52)	57	3,760	H	L
	3.50 (2.68)	60	3,965	M	X
	3.77 (2.88)	64	4,235	L	X
Heavy Duty EH	3.02 (2.31)	53	4,235	H	H
	3.29 (2.52)	57	4,400	H	M
	3.50 (2.68)	60	4,645	M	L
	3.77 (2.88)	64	4,955	L	X

H - Used with material weight up to 3,000 lbs per cubic yard.
M - Used with material weight up to 2,500 lbs per cubic yard.
L - Used with material weight up to 2,000 lbs per cubic yard.
X - Not recommended.

** - 2,000 LB material, light duty only. Truck loading.

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SK400LC MARK IV

HYDRAULIC EXCAVATOR

Bucket Selection Chart

Bucket Duty	Capacity (SAE) Cubic Yard (meter)	Width Inches (m)	Bucket Weight lbs.	Arms			
				9'10"	11'4"	13'0"	16'1"
General Purpose	1.5 (1.146)	30 (.762)	3640	H	H	H	H
	2.0 (1.529)	36 (.914)	2825	H	H	H	M
	2.375 (1.815)	42 (1.066)	3035	H	H	M	L
	2.75 (2.102)	48 (1.219)	3225	H	M	L	X
	3.125 (2.389)	54 (1.37)	3380	M	L	X	X
	3.5 (2.675)	60 (1.52)	3625	L	L	X	X
	4.0 (3.058)	66 (1.67)	4000	L	X	X	X
Heavy Duty	1.5 (1.146)	30 (.762)	2840	H	H	H	H
	2.0 (1.529)	36 (.914)	3040	H	H	H	M
	2.375 (1.815)	42 (1.066)	3265	H	H	M	L
	2.75 (2.102)	48 (1.219)	3470	H	M	L	X
	3.125 (2.389)	54 (1.37)	3635	M	L	X	X
	3.50 (2.675)	60 (1.52)	3895	L	X	X	X
Severe Duty	1.5 (1.146)	33 (.838)	3155	H	H	H	M
	1.75 (1.337)	36 (.914)	3300	H	H	M	L
	2.125 (1.624)	42 (1.066)	3640	H	M	L	X
	2.5 (1.911)	48 (1.219)	3950	M	L	X	X
	3.0 (2.293)	58 (1.473)	4475	L	X	X	X

H - Used with material weight up to 3,000 lbs per cubic yard.
M - Used with material weight up to 2,500 lbs per cubic yard.
L - Used with material weight up to 2,000 lbs per cubic yard.
X - Not recommended.

KOBELCO

SK400LC MARK IV

MASS EXCAVATOR

Bucket Selection Chart

Bucket Duty	Capacity (SAE) Cubic Yard (meter)	Width Inches (m)	Bucket Weight lbs.	Arms	
				7'11"	Quarry Spec 11'4"
General Purpose	4 (3.058)	60 (1.52)	4000	H	H
	4.625 (3.535)	60 (1.52)	4935	H	M
	5 (3.822)	64 (1.62)	5200	M	L
	5.5 (4.204)	69 (1.75)	5300	L	X
Light DutyOnly	5.875 (4.5)	73 (1.85)	5400	**	X
Heavy Duty	3.5 (2.675)	60 (1.52)	3895	H	M
	4.625 (3.535)	60 (1.52)	5920	H	L
	5 (3.822)	64 (1.62)	6250	M	X
Severe Duty	2.0 (1.529)	38.50 (.977)	4650	H	H
	2.68 (2.048)	48.50 (1.23)	5212	H	M
	3.42 (2.614)	58.50 (1.48)	5855	M	L
	4.16 (3.180)	68.50 (1.74)	6400	L	X

H - Used with material weight up to 3,000 lbs per cubic yard.
M - Used with material weight up to 2,500 lbs per cubic yard.
L - Used with material weight up to 2,000 lbs per cubic yard.
X - Not recommended.

** - 2,000 LB material, light duty only. Truck loading.

KOBELCO

SK200-400 MARK IV LONG REACH

Long Reach Bucket Selection Chart

Model	Attachment Length	Suggested Cleanout Bucket Capacity	Suggested Digging Bucket Capacity	Model Bucket
SK200LCIV	50'	.60 cyd	.60 cyd	SK100LCIV
SK220LCIV	50'	1.0 cyd	.80 cyd	SK100LCIV
	60'	.75 cyd	.60 cyd	SK100LCIV
SK270LCIV	50'	1.1 cyd	.80 cyd	SK100LCIV
	60'	1.0 cyd	.75 cyd	SK100LCIV
	62'	1.0 cyd	.75 cyd	SK100LCIV
SK300LCIV	60'	1.1 cyd	.75 cyd	SK150LCIV
SK400LCIV	55'	1.5 cyd	1.0 cyd	SK200LCIV
	65'	1.25 cyd	.75 cyd	SK200LCIV

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: December 1, 1998

BULLETIN: HE-331
Page 1 of 11

SUBJECT: Cummins M11 Industrial Engine Campaign 9826-C

AFFECTED MACHINES: YSU0201~0372

This bulletin is to inform you of the M11 Industrial Engine Campaign on all of Kobelco SK-400 IV machines that fall within the affected serial number range. The following pages will give you Description, Action, Material Disposition, Claim Instructions, Claim Codes, and all machines that need to be reworked.

Note: Some of these machines may have already been reworked. If in question, please check the appropriate CPL number that falls within this campaign, and contact your local Cummins dealer.

This is an " information only" bulletin and not a Kobelco America Inc. Campaign. Please contact your Cummins dealer for all campaign information.

THIS BULLETIN IS BEING ISSUED FOR INFORMATION ONLY, AND IS NOT AN AUTHORIZATION FOR ANY REPLACEMENT OR WARRANTY CLAIM SUBMITTAL

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FIELD CAMPAIGN

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Subject: M11 Industrial Excavator Campaign (CPL's 1897, 2336 and 2378)
Number: 9826-C **Expires:** 1Jul99 (U.S./Canada)
Date:02NOV98 1Jan00 (International)
Attention: Worldwide Distributor/Branches and Divisional/Regional Offices and
All Komatsu Dealers

This is to replace and revise Campaign 9826-B dated 15OCT98. The campaign will now include instructions to replace intake air piping on Kobelco SK400LC excavators.

DESCRIPTION: This campaign is for any CPL 1897, 2336 or 2378 M11 industrial engine in excavator applications only. These engines have experienced a higher cylinder head valve (port and tip) failure rate than other applications. This campaign replaces the old cylinder head with a ReCon cylinder head that contains restricted tip hardness (RTH) valves which correct the valve tip failure mode. This campaign also replaces the old style rocker levers with the new style inserted tip rocker levers to improve overhead wear reducing the likelihood of valve port failures CPL's 2336 and 2378 are soot fixes for CPL 1897. CPL 2336 was the production fix (timing change) and CPL 2378 was the field fix (injector change).

KOBELCO has asked that Cummins include the replacement of the four clamps in their intake system while performing the campaign work on their SK400LC excavators. The clamps are in the Cummins parts system and have been added to the parts list.

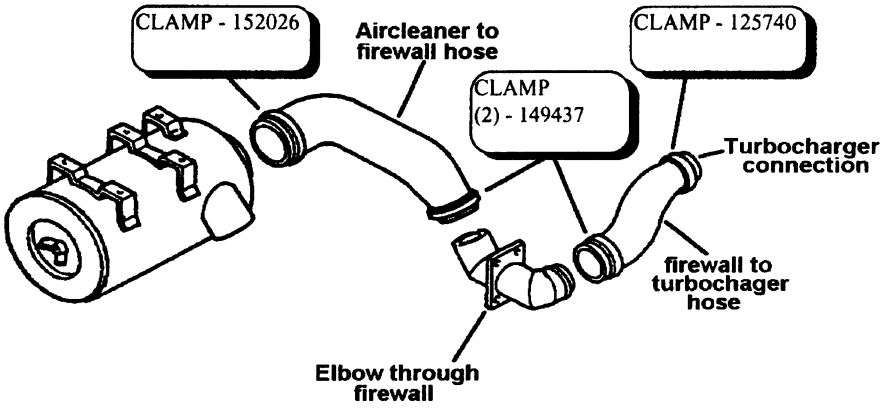
ACTION: In order to qualify for repair under this Campaign, an engine:

1. Will be covered regardless of warranty coverage status,AND
2. Must be a CPL 1897, 2336 or 2378 M11 in a excavator, AND
3. Dataplate must not be stamped 9826

NOTE: Some customer location information is available in attachment A. After verifying the engine meets the above criteria, replace the cylinder head with cylinder head P.N. 3417957RX. If the ESN is after 34894592, the engine already has the inserted rocker levers installed and should NOT have the rocker lever assemblies replaced unless overhead wear is present or a failure has made it necessary.

KOBELCO SK400LC Intake air piping:

Replace existing clamps with the clamps included in the following air intake system description.



SK400 AIR INTAKE SYSTEM

The air intake system consists of the following eight parts:

1. Air cleaner
2. Clamp P/N 152026 (goes between air cleaner and the air cleaner to firewall hose)
3. Air cleaner to firewall hose
4. Clamp P/N 149437 (goes between air cleaner to firewall hose and the firewall elbow
5. Elbow through firewall
6. Clamp P/N 149437 (goes between firewall elbow and firewall to turbocharger hose.
7. Firewall to turbocharger hose
8. Clamp P/N 125740 (goes between firewall to turbocharger hose and the turbocharger connection)..

NOTE: All intake air piping clamps torque to 50-60 IN-LB.

MATERIAL DISPOSITION: **Cylinder heads should be returned to ReCon.**

REIMBURSEMENTS:

Parts: Reimbursed in accordance with normal warranty practice.

Part Number	Description
193736	Injector O-Rings 18 each
3040817	STC Manifold Oil Supply line O-Ring 1 each
3070175	Crossheads (not ReCon) 12 each
3400971	Exhaust Rocker Levers (not ReCon) 3 each
3400972	Intake Rocker Levers (not ReCon) 3 each
3400973	Intake Rocker Levers (not ReCon) 3 each
3400974	Exhaust Rocker Levers (not ReCon) 3 each
3417957RX	ReCon M11 Industrial Cylinder Head 1 each
3882589	STC Manifold and Injector O-Rings 13 each
3803293	Upper Engine Gasket Set 1 each
	Valve Cover W/New Breather(International) 1 each

(See Table 1. Below)

For Kobelco SK400LC excavators only:

152026	air system clamp - 1 each
149437	air system clamp - 2 each
125740	air system clamp - 1 each

Table 1. Valve Cover P.N. Matrix

Valve Cover Style	**New Part #**	**Replaced Part #**
No Oil Fill w/Threaded Adapter	3401304	3080374 3896718
Front Oil Fill w/Threaded Adapter	3401306	3080376
Rear Fill w/Threaded Adapter	3401308	3080378
No Oil Fill	3401298	3896844 3895767
Front Oil Fill	3401300	3896845
Rear Oil Fill	3401302	3328412
Front Oil Fill, Metal T-Cap	3401315	3328409
Front Oil Fill, Threaded Adapter,	3401317	3895770

Labor using applicable Access Code and Time:

NOTE: No additional labor has been added to the following list to cover the Kobelco intake air system clamp replacement as SRT 17-127 is already included in the campaign.

SRT Code	Description
00-902	Administrative Time
02-104	R&I Cylinder Head
07-801	Lubricating Oil & Filter Change
17-127	Hood & Muffler or Air Cleaner R&I
17-901	Stamp Data Plate

Travel: Reimbursed in accordance with normal warranty practice.
Other Claimables: Reimbursed in accordance with normal warranty practice.

CLAIM INSTRUCTIONS:

1. Administrative time for multiple engine serial number claims will be reimbursed at 50 percent of the applicable SRT (00-901 for in-shop repairs, 00-902 for road repairs) for each engine repaired. The repair location has the responsibility of assuring that only one claim per engine repaired is filed.
2. Distributor fleets authorized to perform warranty repairs of this nature are allowed to do so under this Campaign.

CLAIM CODES:

Pay Code (1.2.3)(U.S./Canada Distributors) .....X Pay Code
(1.2.3)(International)..... I Account Code
(1.2.4).....65
Authorization Number (1.2.5).....9826
Severity Code(3.2.2).....B
Failure Code(3.2.3).....WCHVLA
****

Attachment A

KOBELCO SK400LC IV

Engine S/N	Machine S/N	Dealer Name	Customer Name/Location
34788066	YSU0201	L.B.SMITH	
34799577	YSU0218	L.B.SMITH	NELLO L. TEER CO. DURHAM, NC. 27704
34799578	YSU0217		ELLINGER BAUMACHINEN 95154 NAUKIRCHEN
34799578	YSU0273	HAYDEN-MURPHY	
34799579	YSU0216	BANE MACH.	OK CONCRETE WORKS COLBERT,OK. 74733
34799580	YSU0219	L.B.SMITH	CBM INC. LAVERGNE, TN. 37086
34799582	YSU0207	HAYDEN-MURPHY	RYAN CON. AST SHAKOPEE,MN. 55432
34802353	YSU0214	MILLER BRAD.	CONNERY COSNTRUCTION ,MADISON, WI
34802354	YSU0208	SACI	EMPRESSA CONSTRUCTION ,ANTIAGO CHILE
34802355	YSU0227	NUECES POWER	
34802550	YSU0215	SELCO EQUIP	H.E.CARSON & SONS LTD, CANADA
34802551	YSU0237	UDELSON	UDELSON ,HOUSTON , TEXAS
34802552	YSU0223	L.B.SMITH	CHERRY HILL CONST. JESSUP, MD
34806154	YSU0205	MILLER BRAD.	WIMMER SERVICES INC WAUSAU, WI 54401
34806155	YSU0204	MILLER BRAD.	HOMBURG CONTRACTORS MONONA,WI. 53716
34806156	YSU0202	SELCO EQUIP	H.E.CARSON & SONS LTD MONCTON,CAN
34810242	YSU0203	HAYDEN-MURPHY	RYAN CONSTRUCTION BURNSVILLE,MN.
34810243	YSU0221	MILLER BRAD.	RIVER VIEW CON. WAUSAU WI
34810244	YSU0206	SOUTHEASTERN EQUIP	RAY LONKARD FLORENCE,KY. 41042
34810245	YSU0226	PIONEER	
34810246	YSU0228	MILLER BRAD.	
34813561	YSU0210	L.B.SMITH	
34813562	YSU0213	SCOTT GALLAHER	H.T. BOWLING, INC. RADFORD, VA. 24141
34813563	YSU0212	MILLER BRAD.	FOX CONSTRUCTION CO. MADISON, WI. 53704
34813564	YSU0211	HAYDEN-MURPHY	BURCHVILLE HANOVER,MN. 55634
34813748	YSU0209		V. VUGT DEN BOSCH
34813749	YSU0233	CLEMONS	
34813750	YSU0234	EASTERN EQUIP	LVI DEMOLITION NEW YORK, NY. 10016
34827093	YSU0220		KNEUKER GMBH 68169 MANNHEIM
34827094	YSU0224	MILLER BRAD.	JOHN POHAR & SONS,INC. LASALLE,IL. 61301
34827692	YSU0225	MILLER BRAD.	KNAUS CONSTRUCTION CO 1692 E. MASON STREET GREEN BAY, WI 54302
34829483	YSU0235	UDELSON	RENTAL UNIT
34829484	YSU0231	BURCH-LOWE	BUTCH THOMPSON ENT. KENNESAW GA

34829485	YSU0229	L.B.SMITH	CHAMPION CONTRACTING CO. P.O. BOX 549 KINGS MTN., NC. 28086
34829486	YSU0299	FEENAUGHTY	SCOTT'S EXCAVATING WASHOUGAL WA.
34830289	YSU0232	HIGHWAY EQUIP	ATLAS EQUIP.LEASING CORP. P.O. BOX 789 WASHINGTON, PA. 15301
34830433	YSU0242	BURCH-LOWE	W.F. JACKSON HWY.24 WEST, BOX 391 SANDERSVILLE,GA.
34830434	YSU0243	BURCH-LOWE	W.F.JACKSON HWY 24 WEST, BOX 391 SANDERSVILLE,GA.
34830435	YSU0244	BURCH-LOWE	W.F.JACKSON HWY 24 WEST, BOX 391 SANDERSVILLE,GA.
34830436	YSU0277	UDELSON	R W RHINE TACOMA WA
34831455	YSU0239	COWIN	PARKER TOWING CO. P.O.BOX 020908 TUSCALOOSA,AL. 35402
34834770	YSU0267	MILLER BRAD.	J.F. AHERN FOND DU LAC WI
34834771	YSU0251	RIVERCITY AIR	WT BYLER 15203 LILLJA HOUSTON, TX.
34834772	YSU0250	SCOTT GALLAHER	H.T.BOWLING, INC. 6629 HICKMAN CEMETARY RD. RADFORD, VA. 24141
34834773	YSU0253	SCOTT GALLAHER	
34836701	YSU0246	BURCH-LOWE	W.F. JACKSON SANDERSVILLE GA
34836702	YSU0247	MILLER BRAD.	D.F. TOMASINI WAUKESHA WI
34836790	YSU0230	BANE MACH.	RODMAN EXCAVATION CO. 6831 ASH STREET FRISCO,TX.75034
34838143	YSU0238	BANE MACH.	VENUS CONST. CO. ALVARADO TX
34838144	YSU0236	COASTLINE	NAPLES ROAD BUILDING4500 EXECUTIVE DR. NAPLES,FL. 33999
34838145	YSU0240	FEENAUGHTY	BRAXLING TRUCKING CO P.O. BOX 947 MCMINNVILLE, OR 97128
34838146	YSU0241	RIVERCITY AIR	CAMP EXCAVATION

			THORNDALE, TEXAS. 76577
34839829	YSU0248	HAYDEN-MURPHY	
34839830	YSU0255	UDELSON	UDELSON EQUIPMENT
34839831	YSU0269	CASEY EQUIP	
34839832	YSU0285	MILLER BRAD.	R.T.FOX CONSTRUCTION 4800 HWY 59 EDGERTON, WI. 53534
34840865	YSU0307	RHINE	RHINE RENTALS TACOMA WA
34841131	YSU0257	RHINE	R W RHINE TACOMA WA
34841260	YSU0262	UDELSON	
34841261	YSU0252	EASTERN EQUIP	
34841262	YSU0256	SOUTHEASTERN EQUIP	
34841263	YSU0254	MILLER BRAD.	
34842091	YSU0282	MACHINERY CENTER	
34842496	YSU0311	MILLER BRAD.	
34842803	YSU0258	UDELSON	
34842804	YSU0261	L.B.SMITH	D.R.PHILLIPS CONTRACTING 1929 SWEETWATER RD. ROBINSVILLE, NC. 28771
34842805	YSU0268	HAYDEN-MURPHY	SHAFER CONTRACTING P.O. BOX ???? SHAFER, MN. 55321
34842806	YSU0249		
34844257	YSU0259	UDELSON	UDELSON EQUIP CO 850 ALDINE MAIL ROUTE HOUSTON, TX 77037
34844258	YSU0260	HAYDEN-MURPHY	LONKARD CONSTRUCTION FLORENCE KY
34845161	YSU0263	CLEMONS	WRIGHT CONSTRUCTION 5000 AIRPORT FRWY. GRAPEVINE,TX. 76051
34845162	YSU0265	MILLER BRAD.	J. DUIT K. MADISON L. WI
34845163	YSU0264	RHINE	RHINE RENTALS WA. 98111
34845164	YSU0266	BURCH-LOWE	CROSS PIPELINE CO.INC. 1221 INDUSTRIAL PARKWAY LOGANVILLE,GA. 30249
34846656	YSU0275	HAYDEN-MURPHY	SOUTHERN MINESOTA P.O. BOX 6069 MANKATO, MN. 56002
34846657	YSU0284	L.B.SMITH	
34846658	YSU0318	T-MAR IND	PEARDONVILLE DEVELOPMENT P.O. BOX 193 ALDERGROVE, BC V4W 2I8
34847495	YSU0272	L.B.SMITH	MECKLEY'S LIMESTONE PROD HERNDON

			PA
34847496	YSU0295	TRI-WEST TRACTOR	MOUNTAIN CASCADE,INC. 555 EXCHANGE CT. LIVERMORE,CA. 94550
34847497	YSU0271	L.B.SMITH	
34847499	YSU0270	HAYDEN-MURPHY	ENBAC CONSTRUCTION P.O.BOX 258 NORTHFIELD,MN. 55057
34850561	YSU0279	RHINE	R W RHINE INC 1124 112TH ST E TACOMA, WA 98445
34850562	YSU0276	BURCH-LOWE	W.F. JACKSON WRENS
34850564	YSU0278	TRI-WEST TRACTOR	MOUNTAIN CASCADE, INC. 555 EXCHANGE CT. LIVERMORE, CA. 94550
34852092	YSU0298		
34852093	YSU0293	RIVERCITY AIR	REDDICO CONSTRUCTION 2505 SOUTH HWY. 183 LEANDER, TX. 78641
34852094	YSU0316	CARLSON	CTE INV. ROSEMOUNT MN
34852095	YSU0296	NEFF	NEW RIVER ENTERPRISES HARDEEVILLE SC.
34853977	YSU0297	META	
34853979	YSU0283	L.B.SMITH	
34853980	YSU0281	SCOTT GALLAHER	ENGLISH CONSTRUCTION CO. P.O. BOX P-7000 LYNCHBURG, VA. 24505
34856080	YSU0288	L.B.SMITH	BOLDEN GRADING LIMITED 7005 WEST BELT DRIVE NASHVILLE, TN. 37209
34856081	YSU0287	MILLER BRAD.	R.T. FOX CONTRACTORS INC. P.O.BOX 331 EDGERTON, WI. 53534
34856082	YSU0286	SOUTHEASTERN EQUIP	SEC RENTAL 6415 PROMLER AVE NW NORTH CANTON, OH 44720
34856083	YSU0290	UDELSON	
34856655	YSU0274	L.B.SMITH	HARDAWAY CONSTRUCTION NASHVILLE TN
34857716	YSU0289	BANE MACH.	C.W.YOUNG COSNT. COMPANY 210 S. SIXTH AVENUE MANSFIELD,TX. 76063
34857717	YSU0291	BANE MACH.	HERMAN HUGHS & SON SALT LAKE CITY UTAH
34857718	YSU0292	DIAMOND	DELTA MATERIALS 359 MARKET ST SHAWNEETOWN,IL. 62984

34859881	YSU0304	SOUTHEASTERN EQUIP	SEC-RENTAL 6415 PROMLER AVE. NW. NORTH CANTON, OH. 44720	
34859882	YSU0294	RASMUSSEN	MOUNTAIN VALLEY COSNTR. P.O. BOX 67 HEBER, UT. 84032	
34859883	YSU0303	MILLER BRAD.	A1 EXCAVATING	
34859884	YSU0305	BANE MACH.	CULLUM CONSTRUCTION CO. DALLAS TX	
34862939	YSU0300	TRI-WEST TRACTOR	PRESTON PIPELINE 151 BOTHELO AVE. CA. 95035	MILPITAS,
34862941	YSU0301	CLEMONS	CONASTER CONSTRUCTION P.O. BOX 15804 TX. 76119	FT.WORTH,
34864481	YSU0302	TRI-WEST TRACTOR	INDEPENDENT CONSTRUCTION 1641 A CHALLENGE DR CONCORD, CA 94520	
34864482	YSU0325	TRICAN MACH.	CANADIAN EQUIP.RENT LTD. 3-321 MOUNTAIN HWY. NORTH VANOCUVER,B.C.	
34864483	YSU0306	MILLER BRAD.	G.M.S.EXCAVATING INC. 843 DEVONSHIRE RD. WI. 53589	STOUGHTON,
34865498	YSU0308	RASMUSSEN	STEEDS INC. 601 WEST 6960 SOUTH MIDVALE, UT. 84047	
34865499	YSU0312	BURCH-LOWE	CROSS PIPELINE 1221 INDUSTRIAL PKWY. LOGANVILLE, GA. 30052	
34867476	YSU0309	MILLER BRAD.		
34867477	YSU0317	MILLER BRAD.		
34867478	YSU0319	MACHINERY INC.	BATES UTILITY CO., INC. 2448 CENTERLINE DRIVE MARYLAND HGTS,MO.63043	
34868968	YSU0314	BURCH-LOWE	WF JACKSON CONST, SANDERVILLE GA	
34869231	YSU0310	BURCH-LOWE	W.F.JACKSON SANDERSVILLE GA	
34869380	YSU0321	COASTLINE	RIO-BAK CORP. 13860 WELLINGTON TRACE #12-528/WELLINGTON,FL	
34869381	YSU0326		OLIVIER CONSTRUCT, NV LODEWIJK DE RAETLAAN 24 8870 IZEGEM	
34869382	YSU0329	SCOTT GALLAHER	ENGLISH CONSTRUCTION CO. P.O. BOX P-7000 VA. 24505	LYNCHBURG,
34870105	YSU0315	M.D. MOODY	BONITA GRANDE SAND CO.	

			25501 BONITA GRANDE DR. BONITA SPRINGS,FL. 34104
34872365	YSU0313	TRI-WEST TRACTOR	GEORGE REED, INC. P.O. BOX 548 SONORA, CA. 95370
34873414	YSU0337	BANE MACH.	
34874410	YSU0320	UDELSON	
34874411	YSU0339	UDELSON	
34874412	YSU0344	BURCH-LOWE	
34874413	YSU0342	UDELSON	
34875357	YSU0322	L.B.SMITH	POPPLE CONSTRUCTION, INC. 202 MAIN STREET LAFLIN, PA. 18702
34875358	YSU0324	UDELSON	
34875359	YSU0323	KCME	
34877204	YSU0328	RIVERCITY AIR	
34877205	YSU0334	MACHINERY INC.	PURLER EXCAVATING CO. 828 O'FALLEN ROAD ST. CHARLES,MO. 63304
34877206	YSU0330	UDELSON	
34880172	YSU0333	UDELSON	
34880173	YSU0332	M.D. MOODY	RENTAL FLEET FT. MYERS FL
34880174	YSU0331	COWIN	WMB SPECIALTIES, INC. EUFAULA ALABAMA
34881048	YSU0336	ALPHA	STATE UTILITY MONROE NC
34881049	YSU0335	COASTLINE	CONE & GRAHAM HEAVY EQUIP P.O. BOX 310167 TAMPA,FL. 33680
34882344	YSU0341	CLEMONS	C.W.YOUNG CONSTRUCTION 210 S. SIXTH STREET MANSFIELD, TX. 76063
34883380	YSU0338	BURCH-LOWE	ROBERT ANDERSON STONE MOUNTAIN GA
34883381	YSU0340	CASEY EQUIP	GLENBROOK EXCAVATING PRAIRIE VIEW IL
34883382	YSU0345	TRICAN MACH.	
34887401	YSU0360	MILLER BRAD.	
34887403	YSU0343	UDELSON	
34887406	YSU0358	MILLER BRAD.	
34887407	YSU0356	HAYDEN-MURPHY	
34887702	YSU0347	NEFF	
34890562	YSU0351	EASTERN EQUIP	
34890562	YSU0359	MILLER BRAD.	
34890563	YSU0346	NUECES POWER	
34890564	YSU0350	CLM	
34890565	YSU0348	UDELSON	

34890566	YSU0362	COASTLINE	
34890567	YSU0361	J.D. EVANS	
34892347	YSU0353	COASTLINE	TEAM LAND DEVELOPMENT 1132 N.E. 48TH ST. POMPANO BEACH,FL. 33064
34892348	YSU0355	HAYDEN-MURPHY	
34892349	YSU0349	UDELSON	
34893633	YSU0354	HIGHWAY EQUIP	
34893634	YSU0352	COASTLINE	
34893635	YSU0357	MACHINERY INC.	
34897552	YSU0364	MILLER BRAD.	
34897553	YSU0367	CLM	
34897555	YSU0365	COASTLINE	JENSEN UNDERGROUND UTILI. 5585 TAYLOR RD. NAPLES, FL. 34109
34897556	YSU0366	COASTLINE	
34897557	YSU0363	KCME	
34899709	YSU0371	MILLER BRAD.	CAPITOL UNDERGROUND 5940 SEMINOLE CENTRE MADISON, WI. 53711
34899710	YSU0370	VAN KEPPEL	BROWNING FERRIS IND. 7600 SW 15TH OKLAHOMA CITY,OK. 73127
34899711	YSU0372	BANE MACH.	
34899712	YSU0369	MILLER BRAD.	
34899713	YSU0368	BANE MACH.	
N/A	YSU0222	RASMUSSEN	RDJ CONSTRUCTION INC. P.O.BOX 889 RIVERTON,UT. 84065
N/A	YSU0245	BURCH-LOWE	

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: April 1998

BULLETIN: HE-332
Page 1 of 37

SUBJECT: Travel Motor/Gear Reduction Changes

AFFECTED MACHINES: SK300LC-IV YCU0819, YCU0825~

Please be advised that the subject machines are now equipped with new Travel Motor/Gear Reduction assemblies. Effective with S/N YCU0819, and S/N YCU0825~ Kobelco America now uses Travel Motor/Gear Reduction assemblies manufactured and supplied by NABCO.

The new Travel Motor/Gear Reduction assemblies can be ordered as an assembly or separately according to the needs of the customer.

NOTE: The new NABCO Travel Motor/Gear Reduction assemblies **are not interchangeable** with the previously used KAYABA motor and reduction assemblies.

Please be advised that since the NABCO Travel Motor/Gear Reduction assemblies are not interchangeable, the sprocket assemblies are also different, and **are not interchangeable.**

The part numbers for the new NABCO Travel Motor/Gear Reduction assemblies are as follows:

Motor and Reduction Assembly	P/N 2411U1029F1
Motor Assembly Only	P/N 2411U1030F1
Reduction Assembly Only	P/N 241001682F1
Sprocket Assembly	P/N LC51DU1001P1

NOTE: *The Reduction Assembly is to be filled with Gear Oil SAE #90 - Class GL-4 or GL-5,* ***or*** *Engine Oil SAE #30 - Class CD.* The Kobelco America Inc. Parts Department furnishes KSP1000-3035, which is Gear Oil SAE #90, and KSP1000-1005, which is Engine Oil SAE 15W40, which can be used in these reduction units.

Please refer to the attached Preliminary Publications, which cover these new drive units:

Publication SS71695E	Motor Assembly	Disassembly/Repair Procedures
Publication SS71696E	Reduction Assembly	Disassembly/Repair Procedures

You may wish to copy these Preliminary Publications and insert them in the **COMPONENTS** section of your SK300(LC) IV Shop Manuals, for temporary use. Permanent Publications will be issued at a later date.

THIS BULLETIN IS BEING ISSUED FOR INFORMATION ONLY, AND IS NOT AN AUTHORIZATION FOR ANY REPLACEMENT OR WARRANTY CLAIM SUBMITTAL.

NABCO

IND.PROD.DIV.	M3V260/150Z TWO SPEED MOTOR SERVICE MANUAL	SS71695E
		DATE Feb.23, 1993

1. SPECIFICATIONS

1.1 OUTLINE DIMENSIONS

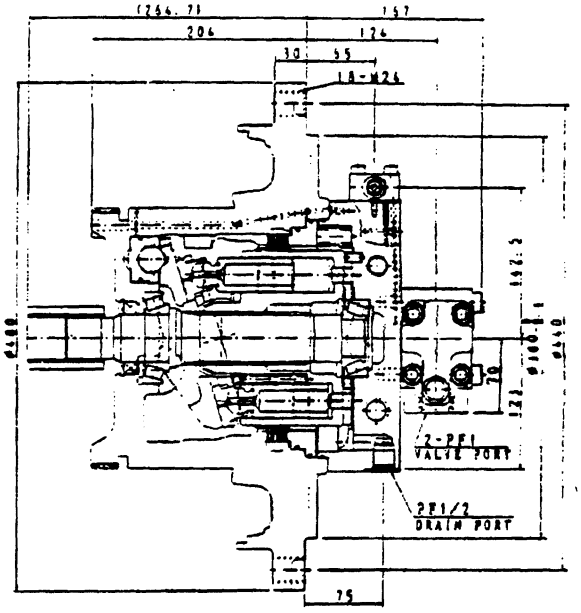


FIG. 1 OUTLINE DIMENSIONS

1.2 SPECIFICATIONS

TABLE 1

ITEM \ MODEL NO / P/NO.		M3V260/150Z 2441U1030F1 NABCO 2162-2-204848-01
MAJOR CAPACITY	(cc/rev.)	262.6
MINOR CAPACITY	(cc/rev.)	150.5
RATED PRESSURE	(kgf/cm²)	355
MAXIMUM PRESSURE	(kgf/cm²)	420
BRAKING TORQUE	(kgf·m)	OVER 92
BRAKE RELEASE PRESSURE	(kgf/cm²)	BELOW 15.7
ALLOWABLE DRAIN PRESSURE	(kgf/cm²)	NORMAL 2 (SURGE 10)
WEIGHT	(kgf)	130 (wet) (INCLUDING BRAKE VALVE 11)

2. STRUCTURE AND FUNCTION

2.1 STRUCTURE

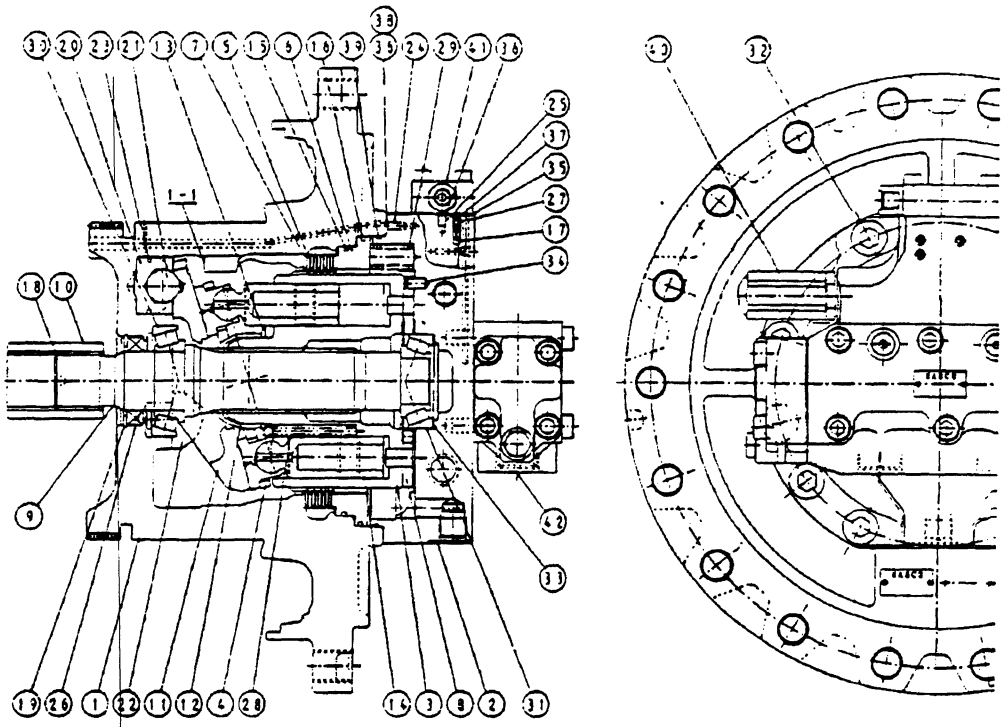


FIG.2 STRUCTURE OF PROPEL MOTOR

1. CASING
2. REAR COVER
3. CYLINDER BLOCK
4. SHOE RETAINER
5. FRICTION PLATE
6. BRAKE PISTON
7. SEPARATOR PLATE
8. VALVE PLATE
9. SHAFT
10. COUPLING
11. SHOE PLATE
12. SPHERICAL COUPLING
13. SPRING SEAT
14. PISTON ASSY
15. D-RING (SMALL)
16. D-RING (BIG)
17. CHECK VALVE
18. C-TYPE RETAINING RING
19. ROUND R RETAINING RING
20. CONTROL PISTON
21. STEEL BALL
22. PIVOT
23. PISTON SEAL
24. M6 RESTRICTOR (0.6)
25. M6 RESTRICTOR (0.8)
26. OIL SEAL
27. SPRING FOR CHECK VALVE
28. SPRING FOR CYLINDER BLOCK
29. BRAKE SPRING
30. BEARING HR32209J
31. BEARING HR32207C
32. C'SK HEAD CAPSCREW M18X50
33. SHIM
34. PARARELL PIN 8X12
35. O-RING 1B P6
36. O-RING 1B P8
37. O-RING 1B P9
38. O-RING 1B S10
39. O-RING 215.57 X 2.62
40. OVERLOAD VALVE ORV-240L4
41. PILOT VALVE MRC03
42. BRAKE VALVE RBV-24DL

2．2 BRIEF EXPLANATION OF STRUCTURE

The motor mainly consists of rotary group producing turning force to drive shaft, negative brake preventing host machine from self-running during its rest, capacity control parts that changes the motor capacity consequantly rotating speed and overload valve attched to the rear cover.

Here is another valve that plays an important role in controlling the hydraulic circuit. That is called : Brake valve or counter balance valve.
As to this RBV-24D valve, refer to S S 7 1 6 7 8 E for its function and the way of service.

(1) Rotary Group

The cylinder block(3) is inserted into the spline of shaft(9), both ends of which are supported by bearings(30,31). This cylinder block(3) is pushed toward the rear cover(2) together with valve plate(8) by cylinder spring(28).
Nine pieces of piston assembly(14) slide inside the cylinder block(3) along the surface of shoe plate(11).
Bearings are provided on the end surface of piston assy(14) to reduce the sliding resistance, and the ends of piston assy(14) are pushed toward shoe plate(11) by cylinder spring(28) through spring seat(13), spherical coupling(12) and shoe retainer(4).

(2)Negative Brake

Five separator plates(7) and four friction plates(5) are alternately set on the spline of cylinder block(3) and pushed together by fourteen brake springs(29) through brake piston (6).

(3)Capacity Control Parts

They consist of: pivots(22) that support shoe plate(11) and slide in two half-spherical recesses in shoe plate(11) : control piston(20) that change the angle of shoe plate(11) on the pivots(22) : stopper(1-1) that limits the angle of shoe plate(11) : pilot valve(41) that leads the oil to control piston(20) by external pilot signal : three check valves that select the maximum pressure from the external pilot pressure, inlet pressure and outlet pressure of the motor and send it to pilot valve(41).

(4)Overload valve

This valve is screwed in the motor rear cover(2) and consists of : socket(40-1) that is screwed and fixed in the rear cover(2) and supports the valve seat(40-3) which metallically seated in the hole of rear cover(2) : valve(40-2) that contact with valve seat(40-3) by adjusting spring(40-9) and fitted in the hole of socket(40-1) : connecting piston(40-4) that fitted in the hole of the valve(40-2) and functions also as an oil passage : piston(40-7) that is inserted in the pilot body(40-6) and : shim(40-8) that adjust the spring force.

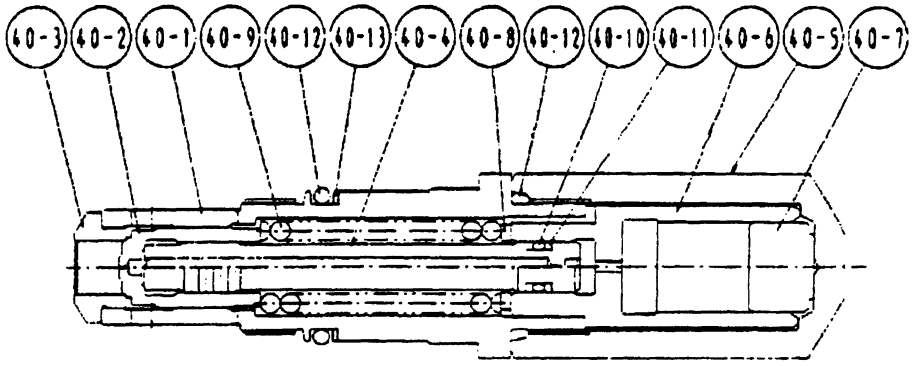


Fig. 3 Structure of Overload Valve

Parts List of Overload Valve

ITEM	DESCRIPTION	ITEM	DESCRIPTION
40- 1	Socket	40- 8	Shim
40- 2	Valve	40- 9	Adjusting Spring
40- 3	Valve Seat	40-10	O-ring, 1B P7
40- 4	Connecting Piston	40-11	Back-up Ring, T2 P7
40- 5	Plug	40-12	O-ring, 1B G25
40- 6	Pilot Body	40-13	Back-up Ring, T2 G25
40- 7	Piston		

2.3 Function

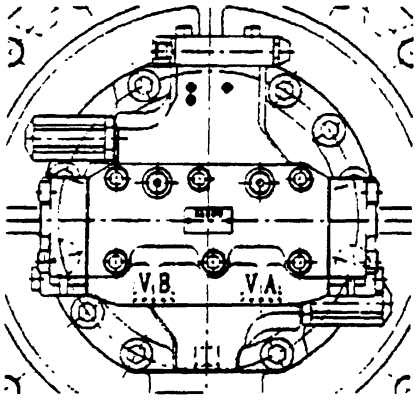


Fig. 4 Main Ports

Inlet Port	Outlet Port	Direction of Rotation (Viewing from shaft side
VA	VB	Right(clockwise)
VB	VA	Left(counterclockwise)

Table 2. Direction of Rotation

(1) Motor

High pressure oil delivered from hydraulic pump is led to inlet port that is provided in the brake valve(42) and, through the rear cover(2) and valve plate(8), led to cylinder block(3). The oil flow and direction of shaft rotation are indicated in Table 2.

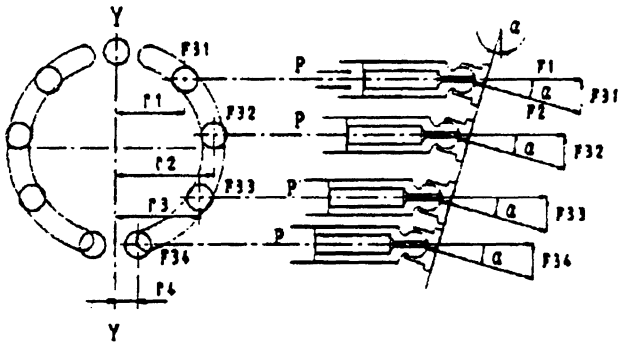


Fig. 5(a) Fig. 5(b)

As shown in Fig. 5(a), high pressure oil is supplied to the pistons which are on one side of the line Y-Y that connects upper and lower dead points and produces force F1 = P x A (P : pressure, A : area of piston section).

The shoe plate(11) with inclined angle of α divides this force F1 into thrust force F2 and radial force F31~f34 (or F35) (Fig. 5(b)) . This radial force is applied to axis Y-Y as turning force and generate drive torque of $T = r_1 \cdot F31 + r_2 \cdot F32 + r_3 \cdot F33 + r_4 \cdot F34$ (In case high pressure oil is applied to five pieces of pistons, $r_5 \cdot F35$ should be added.) This drive torque is transmitted via cylinder block(3) to driving shaft(9).

(2) Negative Brake

Negative brake is released when high pressure oil, selected by the brake valve(42) that is connected directly to the rear cover(2), is applied to the brake piston(6).

Otherwise the braking torque is always applied.

This braking torque is generated by the friction between the separator plate(7), inserted into the casing(1), and friction plates(5), coupled to cylinder block(3) by the outer splines.

When no pressure is activated on the brake piston(6), it is pushed by the brake springs(29) and it pushes friction plate(5) and separator plate(7) towards casing(1) and generates the friction force which brakes the rotation of cylinder block(3) and hence the shaft(9).

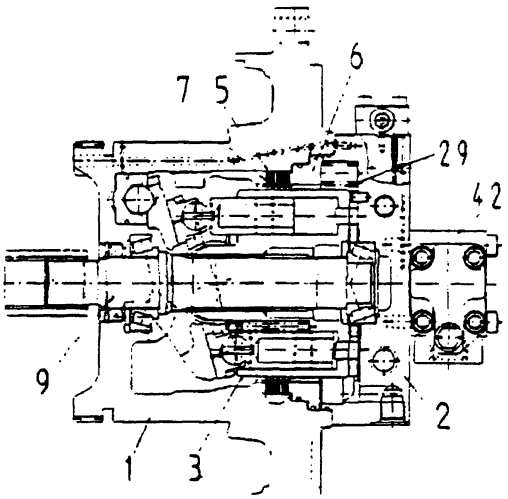


Fig. 6 Negative Brake

(3)Capacity Control Mechanism

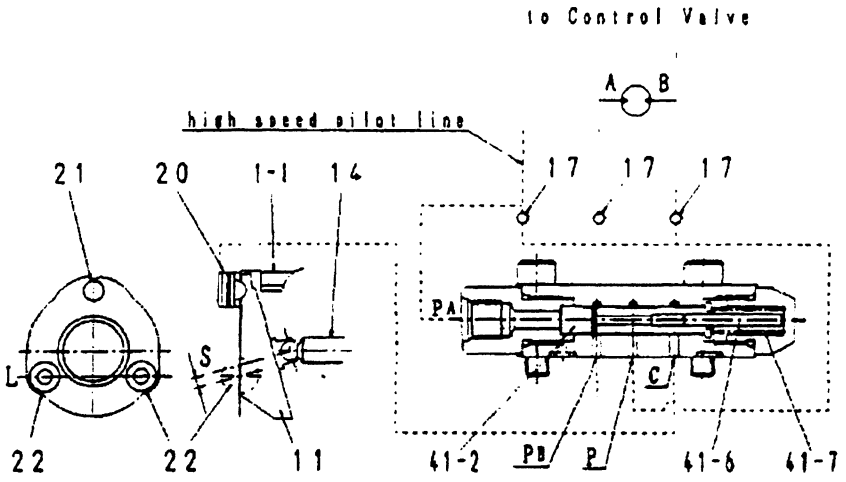


Fig. 7 Capacity Control Mechanism

Fig. 7 typically shows the capacity control mechanism.

When high speed pilot line is charged with the pressure P_A that overcome the spring(41-7), the spring(41-7) is compressed and spool(41-2) shifts to the right to connect the port P and port C. Then, the highest pressure is selected by the check valve (17) from inlet and outlet pressure of the motor and high speed pilot line pressure and pushes control piston(20). As a result, shoe plate(11) turns around the line L which connect the two pivots(22)as shown by dotted lines. The turn stops at the stopper(1-1) and shoe plate(11) keeps the position.

In this case, the piston stroke become shorter and motor capacity become smaller and motor rotates faster, around 1.5 times, by the same volume of oil.

When no pressure is in the high speed pilot line P_A, spool(41-2) is pushed back by the spring(41-7) and pressure that pressed the control piston(20) is released to the hydraulic tank. Here, nine pistons are there and they equally spaced on the shoe plate(11). The force that summed up those of pistons comes to almost the center of the shoe plate(11) as shown. Since the pivots(22) are off-set by S from the center, the rotating force of product S and the force moves shoe plate(11) to the former position and the speed returns to low.

When the power demand exceeds the engine power, such as in steep slope climbing or turning at high speed, the system step down to the low speed automatically. The mechanism is that: pump pressure is led to the port P_B (Fig. 7) and this pressure activate on pin (41-6). When the pressure at P_B exceeds predetermined value, spool(41-2) returns to the left by the counter-pressure against pin(41-6) and the pressure on the piston(20) thru port C is reliesed to the tank and the motor comes to low speed.

When P_B goes down, the spool(41-2) moves to the right and the speed become high.

(4) Overload Valve

Two pieces of overload valves are located at cross-over position in the counterbalance circuit of brake valve and have the following functions:

1) When hydraulic motor starts, keep the driving pressure below predetermined value and while accelerating, bypasses surplus oil to return line.
2) When stopping the motor, keep the brake pressure, that develops on the outlet side of motor, under the predetermined value to stop the inertial force.
3) To accelerate sharp while starting, and to mitigate the braking shock while stopping, For these purposes, the developed pressure is kept comparatively low for a short poriod, then keep the line pressure as normal value. While the pressure is low, meshing of reduction gears, crawler and sprocket etc. can be smoothly done and the shock are absorbed.

When starting, "A" port pressure of overload valve increases, this pressure is applied to the effective diameter of valve(40-2) which seats on the valve seat(40-3) and, at the same time, is delivered, via small hole, to the connecting piston(40-4) located inside the valve(40-2) and the piston bore pressure increases up to "A" port pressure.
The valve(40-2)opposes to adjusting spring(40-9) by the force of the pressure exerted on the area difference between valve seat's effective diameter and piston bore and keep the predetermined pressure.

When hydraulically braking, the piston(40-7) is at the left position by the driving pressure, and when "A" port pressure increases, the pressure is applied also to the piston (40-7) thru the small hole in the valve(40-2) and piston(40-7) moves rightward until it touches the plug(40-5). In this while, the valve(40-2) maintains "A" port pressure at comparatively low against the adjusting spring(40-9) force and exhaust oil to "B" port side. After the piston reached to the plug, the valve acts the same as at starting.

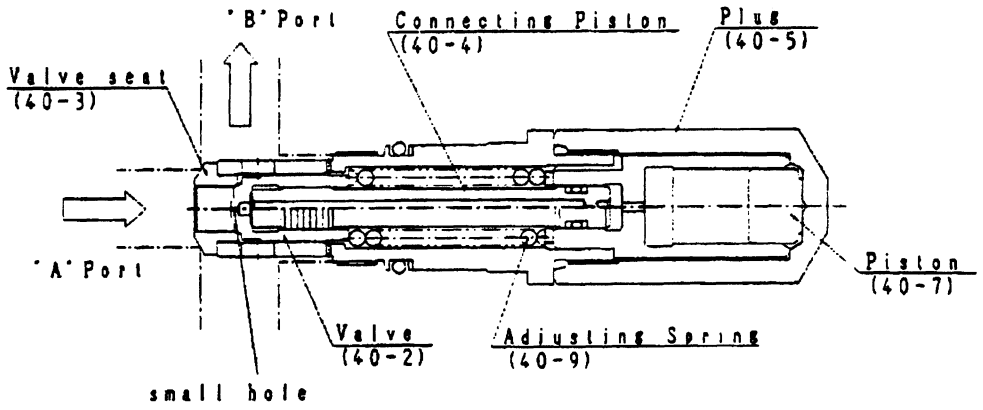


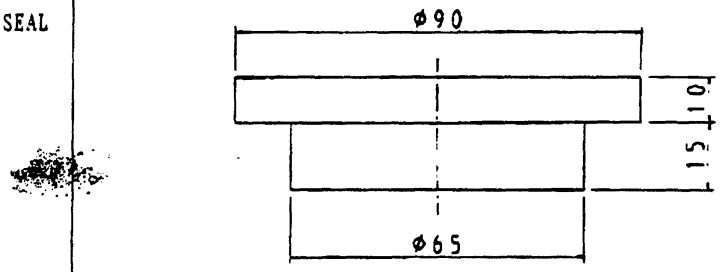
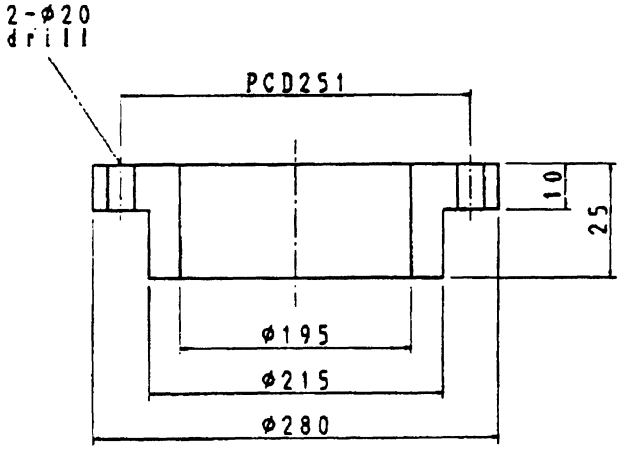
Fig. 8 Function of Overload Valve

3. DISASSEMBLING AND ASSEMBLING

3. 1 PREPARATION

(1) TOOLS AND JIGS

TABLE 3

DESCRIPTION	SPECIFICATION ETC.
HEX. WRENCH	WIDTH ACROSS FLAT 5, 6, 10, 14
SPANNER	WIDTH ACROSS FLAT 19, 27, 32, 35
SNAP RING PRIER	FOR SHAFT φ45
SNAP RING PRIER	FOR BORE φ32 ~ φ80
PLASTIC HAMMER	
SCREW DRIVER	MINUS (−), MEDIUM SIZE, 2 PIECES
TORQUE WRENCH	0~38.5 kgf·m
GEAR (BEARING) PULLER	WORK SIZE : DIA.75 X WIDTH45 can be handled.
MOUNT METAL	EX. L160, W70, H37, with 20 x 100 long hole 2 PIECES
JIG FOR INSERTING OIL SEAL	
JIG FOR INSERTING PISTON	

OTHERS
- SEAL TAPE
- KEROSENE
- GREASE
- HYDRAULIC OIL
- COMPRESSED AIR

3.2 Disassembling

3.2.1 General Instructions

1) Generally, hydraulic equipment is precisely manufactured and clearances between each parts are very narrow. Therefore, disassembling and assembling works should be performed on the clean place where dusts hardly gather. Tools and kerosene to wash parts should alsobe clean and handled with great care.

2) When motor is removed from the host machine, wash around the ports sufficiently, and put the plugs so that no dust and/or water may invade. Take off these plugs just before the piping works when re-attach it to the host machine.

3) Before disassembling, review the sectional drawing and prepare the required parts, depending on the purpose and the range of disassembling.
Seals, O-rings, etc., if once disassembled, are not reusable.
There are some parts that should be replaced as a sub-assembly.
Consult with the parts book in advance.

4) The piston can be inserted to whichever cylinder block for the first assembling. However, their combination should not be changed if they are once used. To reuse them. put the mating mark on both pistons and cylinder block before disassembling.

5) TAKE GREAT CARE NOT TO PINCH YOUR HAND BETWEEN PARTS WHILE DISASSEMBLING NOR LET FALL PARTS ON YOUR FOOT WHILE LIFTING THEM.

3.2.2 Disassembling Procedure

(1) Removing accessary valves
Before disassembling a motor, remove accessary valves.

1) Remove brake valve(42).
2) Remove pilot valve(41).
3) Remove check valve(17).
4) Remove overload valve(40).
5) Remove coupling(10)

CAUTION!
According to disassembling purpose, select the valves to be removed.

However, you cannot disassemble the motor without removing the brake valve.

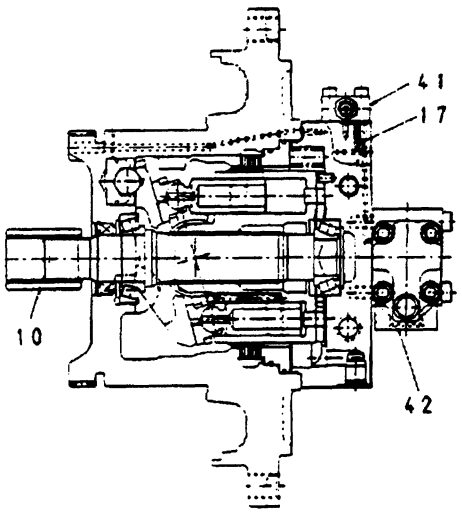


Fig.) Removing accessary valves

(2) Disassembling a motor

1) Place the motor with the shaft horizontal, remove capscrews(32) of rear cover(2) leaving two on diagonally upper and lower position.

2) Loosen slowly and simultaneously the remaining two capscrews.

3) Remove rear cover(2) and brake springs (29) taking care cylinder block(3) is not coming out stuck with rear cover(2).

ATTENTION!! Do not fall, at this moment, valve plate(8), brake springs(29) and/or O-rings(36).

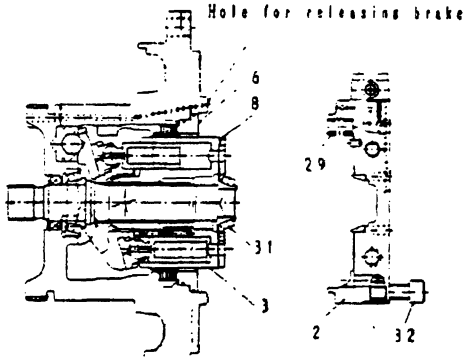


Fig.10 Removing rear cover

ATTENTION!! If cylinder block(3) would come out with rear cover(2), then push in the cylinder block(3) by a rounded point bar of $\phi 5 \sim \phi 8$ through the oil hole of rear cover(2), taking care not to make any scratch on these parts, pulling out the rear cover(2).

4) Remove valve plate(8) without pulling out cylinder block(3).

ATTENTION!! Put the mating mark on both valve plate(8) and rear cover(2) so that valve plate(8) should not be reversed on re-assembly.

5) Using removed capscrews, fasten two mount metals so as to push in cylinder block(3) without damaging it then inner race of rear bearing(31) comes out.

6) Put two fingers of gear(bearing) puller under the inner race of rear bearing(31) and remove the race.

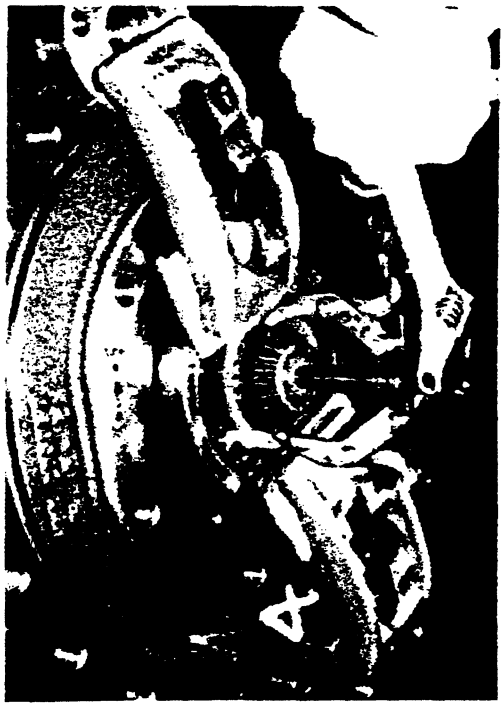


Fig. 11 Removing rear bearing

7) Attaching a hand on brake piston(6), supply plant air through oil hole for releasing brake and push out the piston(6).

DANGER!!: BE AWARE OF PISTON POPPING OUT.

8) Put as a mark on a piston(14) such as a paper pipe and put a mating mark on cylinder block(3) so that they can be re-assembled at the same position as before.

9) Remove cylinder block(3), spring seat(13)and cylinder spring(28).

10) Remove separator plates(7) and friction plates(5).

11) Remove nine piston assy's(14), shoe retainer(4) and spherical coupling(12) as an assembly.

ATTENTION !! Put piston assy's(14) into the cylinder block(3) matching the mating mark with shoe retainer(4) as if assembled. The purpose is to put pistons(14) in the same bore of cylinder block(3) as before when reassembled.

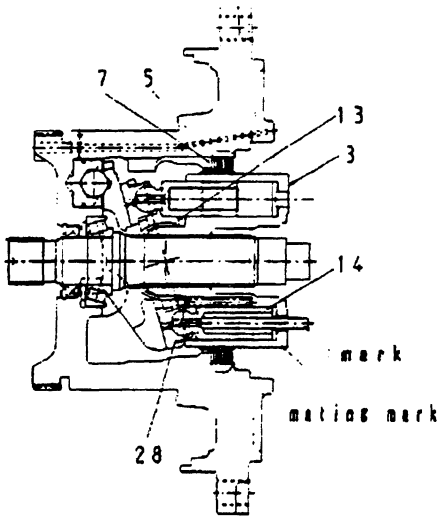


Fig. 12 Removing cylinder block

ATTENTION !!
Take care not to scratch polished surfaces.
Do not reuse damaged ones.

ATTENTION !!
It is impossible to disassemble piston and shoe because they are calked together.

FOR REFERENCE
Above disassembling is mentioned as a motor only and naturally can be applied to the motor with reduction gears. The situation is easier for with reduction gears because the shaft is rather restricted by a gear to move.

12) Remove shoe plate(11).

13) Do not detach control piston(20).
If forced to detach, attach a hand on control piston and supply plant air through the hole shown and push it out.

DANGER!!: BE AWARE OF PISTON POPPING OUT.

14) Shaft(9) comes out now.

15) Remove retaining ring(19) and knock out oil seal(26).

16) If bearings happen to be changed, remove inner races and outer races using bearing puller if needed and exchange to new ones as an assembly.

IMPORTANT !!
Under the outer race of rear bearing(31), are shims(33). Re-use them as they are when re-assemble.

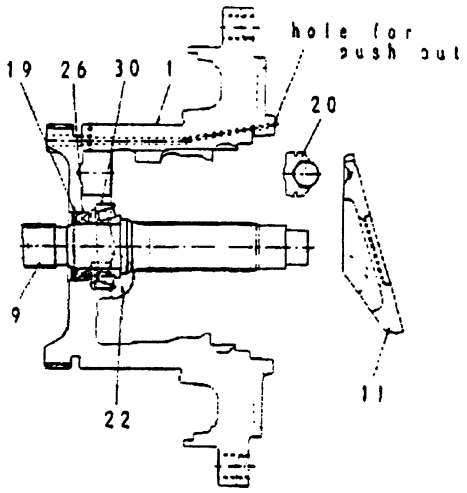


Fig. 13 Removing shoe plate

ATTENTION ! !
When changing bearings(30 or 31), shaft(9), casing(1) or rear cover(2), it affects the clearance of the bearings. So, shim(33) should be adjusted.
Shim adjustment should be performed by measuring correctly the clearnace for shim and change shim that meets the clearance.
Other jigs and tools are needed to measure and decide the thickness of the shim.
Please contact dealers for them if necessary.

ATTENTION !
Do not remove pivots(22).
If forced to remove them, put mating mark on pivots(22) with shoe plate(11).

ATTENTION !
Never detach oil seal(26) only for the purpose of inspecting it.
If disassembled, never fail to replace oil seal(26) with new one.

(3) Disassembling overload valve

1) Remove overload valve(40) as an assembly utilizing hexagonal flats on socket(40-1).

2) As a rule, overload valve(40) should be handled as one service part.
If forced to disassemble it, detach plug(40-5) from socket(40-1) and take out component parts.

ATTENTION !!
Valve seat(40-3) is fitted tight to the hole of socket(40-1).
Never disassemble them if not required, since the hole of socket may be damaged.

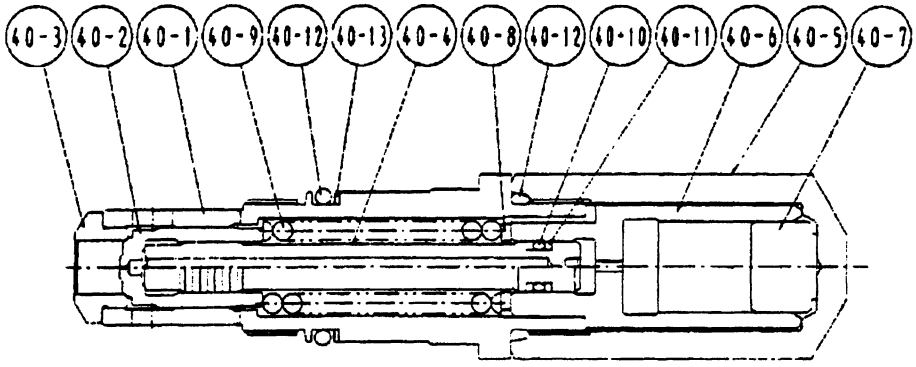


Fig. 14 Disassembling overload valve

3．3　Re-assembling

3．3．1　General instructions

1) Wash each parts sufficiently with kerosene, and blow them by plant air.

2) Assemble sliding parts after coating clean hydraulic oil on them.

3) TAKE GREAT CARE NOT TO PINCH YOUR HAND BETWEEN PARTS OR TOOLS WHILE ASSEMBLING NOR LET FALL PARTS ON YOUR FOOT WHILE LIFTING THEM.

3．3．2　Re-assembling procedure

1) Coat outer surface of oil seal(26) and inner face of casing(1) with grease. Using jig, rightly and evenly press in the oil seal(26) into casing(1).

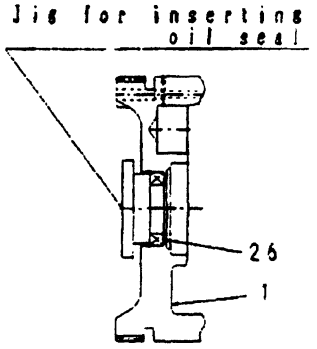


Fig. 15　assembling oil seal

2) Fix oil seal(26) by retaining ring(19).

3) Put the outer race of bearing(30) on casing(1) (this fit is loose), and press the inner race on shaft(9) (this fit is tight).

NOTE　It is easier to fit inner race if the inner race is heated or boiled under 100℃. Never over heat!

4) Insert shaft(9) into casing(1) after coating grease on the contact surface to oil seal(26) rip.

5) Put control piston(20) into casing(1).

6) Insert pivots(22) into the casing(1). Take care to match the mating mark with shoe plate(11) and also to coincide the direction of sliding trace on sphere surfac with those contact trace on shoe plate(11) if the motor was operated a certain hours.

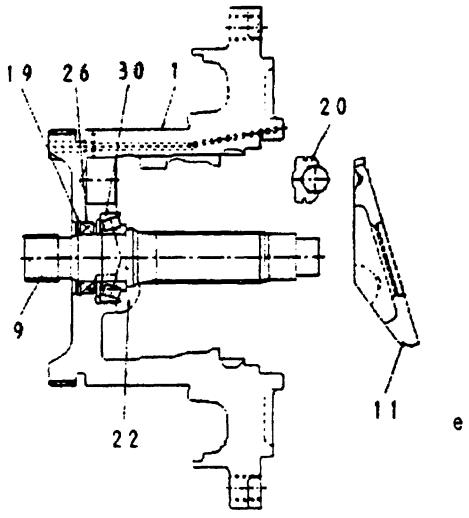


Fig. 16　Assembling shoe plate

7) Coat three spherical recess of shoe 7) Coat three spherical recess of shoe plate(11) with ample grease and assemble it in casing(1).

8) Insert piston assys(14), shoe retainer (4), spherical coupling(12), spring seat(13),

cylinder spring(28) on to cylinder block(3) as shown and then insert the whole assembly to shaft(9).

ATTENTION ! !
Piston assy(14) should be inserted into the same bore as before.

9) Rightly knock in the inner race of rear bearing(31) to the rear end of shaft(9).

10) Install all the separator plates(7) and friction plate(5) alternately between casing(1) and cylinder block(3) adjusting on the notches and splines.
Separator plates(7) comes both first and last.

11) Insert brake piston(6) into casing(1) using inserting jig after attaching D-rings (15,16) to brake piston(6).

ATTENTION ! !
Two kinds of D-rings are used on brake piston(6). The larger one(16) is first inserted into the hole, then the smaller one(15) enters.
It is impossible to see how the smaller ring goes into the hole. Therefore, never push it forcibly into the hole. Otherwise, it may be scraped off by the edge of the hole of casing(1).

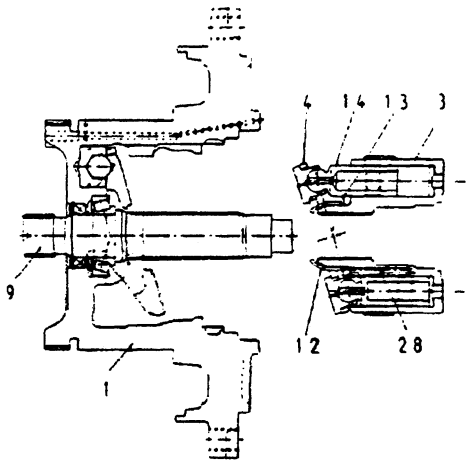


Fig. 17 Assembling piston assy

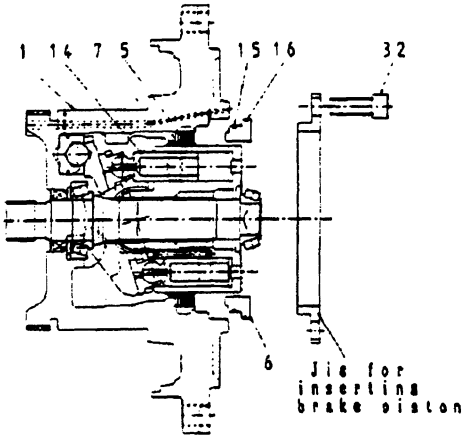


Fig. 18 Inserting brake piston

12) Lay down rear cover(2) to mount valve plate(8) coinciding mating mark made prior to disassembling and also place brake springs (29) with ample grease to be attached to rear cover(2) while this assembling.
Also set O-ring(38) on rear cover(2).
Then, insert rear cover(2) to casing(1) and fasten capscrews(32).

13) Put coupling(10) on the shaft(9).

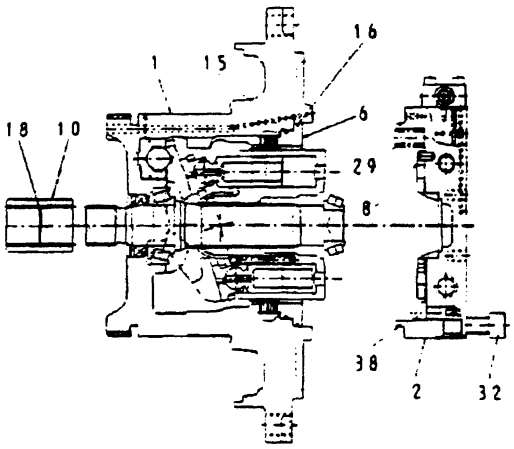


Fig. 19 Mounting rear cover

NOTE!
Tightening torque of capscrew(32) is 38.5 kgf·m. with rust preventive on the threads.

4. MAINTENANCE STANDARD

4.1 Maintenance of parts

The followings are the general maintenance standards. However,it is most important to determine which parts should be replaced, depending on the characteristics before disassembling, damages and discoloration of exterior view, the purpose of disassembling, the expected remaining service life, etc..

MAINTENANCE STANDARD

ITEM & MEASURING METHOD	JUDGING CRITERIA & DISPOSITION
(1)Sliding surface of: cylinder block, valve plate and shoe plate · Measure the surface roughness by roughness tester.	TABLE 4

Check Items	Criteria	Allowable Roughnes	Disposition
Surface roughness of cylinder block	below 0.4 Z μ	below 3.0 Z μ	Replace or Repair
Surface roughness of valve plate	below 0.4 Z μ	below 3.0 Z μ	Replace or Repair
Surface roughness of shoe plate	below 0.4 Z μ	below 3.0 Z μ	Replace or Repair

NOTE: Lap togehter the surfaces of both cylinder block and valve plate to remedy their roughness. (Lap with #1200 powder)

· Measure the surface hardness by hardness tester.

TABLE 5

Check Items	Criteria	Allowable Hardness	Disposition
Shoe plate	Over HS78	HS74	Replace

(2) Clearance between piston and cyllinder block

Measure outer dia. of piston and bore of cylinder block at least 3 places in the longitudinal direction with micrometer, and obtain:

max. outer dia. = d max
min. outer dia. = d min
min. inner dia. = Dmin
max. inner dia. = Dmax

TABLE 6

Check Items	Criteria	Allowable Clearance	Disposition
Outer dia. of piston d max - d min	0.01 mm	0.05 mm	Replace piston or cylinder block
Inner dia. of cylinder bore Dmax - Dmin	0.01 mm	0.022 mm	
Clearance D - d	0.037~0.050mm	0.065 mm	

NOTE: In exchanging pistons, replace all of nine pistons at the same time.

ITEM & MEASURING METHOD	JUDGING CRITERIA & DISPOSITION
(3) Play between piston and shoe With the jig of Fig. 23, hold down the shoe on work stand, and pull up the piston to vertical direction to measure the play between piston and shoe.	TABLE 7

Check Item	Criteria	Allowable Play	Disposition
Play between calked piston and shoe	mm 0 - 0.1	mm 0.3	Replace piston

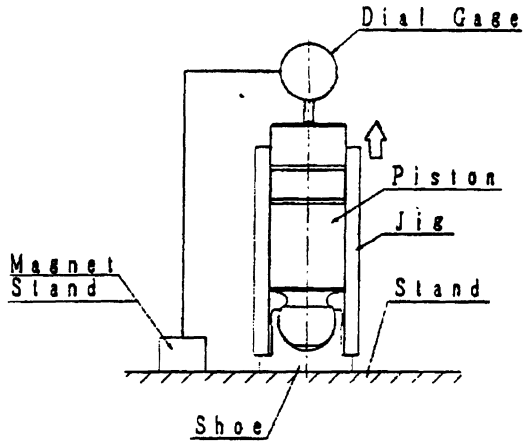


Fig. 22 Method

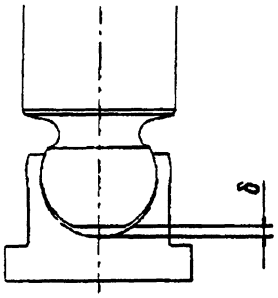


Fig. 21 Play

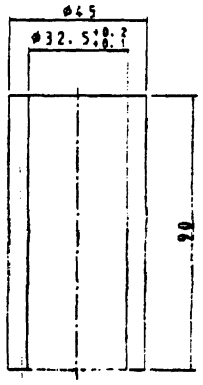


Fig. 23 Jig for measuring play

(4) Negative brake torque

After completion of assembly, set the torque wrench on the shaft end, and measure the braking torque generated when the shaft starts to rotate.

TABLE 8

Check Items	Criteria	Allowabl Torque	Disposition
Parking brake torque	kgf·m 92.0	kgf·m 83.0	Replace all separator and friction plates and springs

ITEM & MEASURING METHOD	JUDGING CRITERIA & DISPOSITION
(5) Shaft Measure the wear at contacting surface of oil seal(26) with the surface roughness tester.	If the depth of shaft wear is less than 0.05 mm, the shaft is reusable. CAUTION !! In case of replacing the shaft(9), replace oil seal(26) at the same time.
(6) Bearings Replace bearings(30 & 31) before hour meter of host machine indicates 10,000 hours.	CAUTION !! In case replacing the bearings(30,31), replace both inner and outer races at the same time. CAUTION !! Also the bearing shims(33) must be re-adjusted when replaced shaft(9) and/or bearings(30,31). Contact dealers for jigs and tools required.
(7) Splines Replace if the wear of splines exceeds the allowable value.	If the wear of splines is less than 0.3 mm, the spline is reusable.
(8) Overload relief valve Do not try to adjust the valve, since special hydraulic test bench is required for inspecting and adjusting the pressure.	Replace relief valve(40) as an assembly each time the host machine works for 10,000 hours.

4.2 Fastening torque

Use torque wrench when tightening the following capscrews, plugs and valves.
Lubricating with rust preventive oil.

Item	Description	Size	Fastening torque	
32	C'SK HD CAPSCREW	M18	38.5	kgf·m
40	OVERLOAD VALVE	M27	10～12	kgf·m
41-10	C'SK HD CAPSCREW	M8	2	kgf·m
42-14	C'SK HD CAPSCREW	M12	8±0.8	kgf·m

5. Cause of trouble and the remedy

5.1 General instructions

The followings are the general instructions to be followed when some troubles occur with hydraulic motors.

1) Judge the nature of abnormality before trouble shooting, and ascertain if the same symptom has occurred before or not.
   Review if the motor itself is actually troubled.
2) In many cases, the wear is caused by dusts.
   Take great care to prevent dusts in disassembling and assembling.
3) All the parts especially those of moving parts should be carefully handled, and be careful not to score or scratch the sliding surfaces.
4) Be careful not to score the seating surface for O-ring, etc..
   We recommend you to replace O-rings with the new ones, if once disassembled.

5.2 Cause of trouble and remedy

(1) Hydraulic motor never starts.

Symptom	Cause	Remedy
Pressure never increases	Malfuntion of built-in relief valve.	Repair or replace relief valve
Pressure increases	1. Negative brake is not released. (Clogged choke of release pressure passage.)	Check clogged passage. Wash or replace it.
	2. Stuck friction plate or stuck separator plate provided in negative brake.	Replace friction and separator plate.
	3. Stuck brake piston of negative brake.	Repair outer dia. of brake pist or replace it.
	4. Seisure of sliding portion.	Check, repair or replace piston shoe, shoe plate, cylinder block valve plate etc..

(2) Hydraulic motor is hard to start.

Symptom	Cause	Remedy
Set pressure of overload valve is correct, but brake is released belatedly.	Malfunction of brake valve	Check brake valve

Symptom	Cause	Remedy
Negative brake is released, but motor is hard to start.	high oil viscosity.	Raise oil temperature.
Negative brake is released, but motor starts weakly.	Negative brake is not completely released. (Clogged choke of pressure release passage.) Relief valve catches small particles. Seizure of sliding portion.	1. Check clogged choke. 2. Wash relief valve or che seat of it or replace sea 3. Check, repair or replace sliding portion.

(3) Drive shaft never rotate up to the set value.

Symptom	Cause	Remedy
Rotation of drive shaft never reaches the set value.	Shortage of oil coming in. Large wear or flaw made on shoe, cylinder block or valve plate.	1. Check oil flow or hydraulic circuit to motor. 2. Check, rapair or replace the parts.

(4) Brake refuses to work

Symptom	Cause	Remedy
Brake refuses to work	1. Malfunction of negative brake. a) Worn friction plate b) broken spring	Check, repair or replace brake piston,friction plate, spring, etc..

(5) Oil leakage

Symptom	Cause	Remedy
Oil leakage	1. Loose capscrew or plug. 2. O-ring is torn off. 3. Oil leaks inside gear casing	1. Fasten it with given torque. 2. Replace O-ring. 3. Replace oil seal.

(6) Would not shift from high to low

Symptom	Cause	Remedy
Would not shift from high to low.	Stick of spool of pilot valve	Replace pilot valve assy.

NABCO

IND.PROD.DIV.	M3V260/150-RG5.5B PROPELLING UNIT SERVICE MANUAL	SS71696E DATE Feb.23, 1998

1. OUTLINE DIMENSIONS

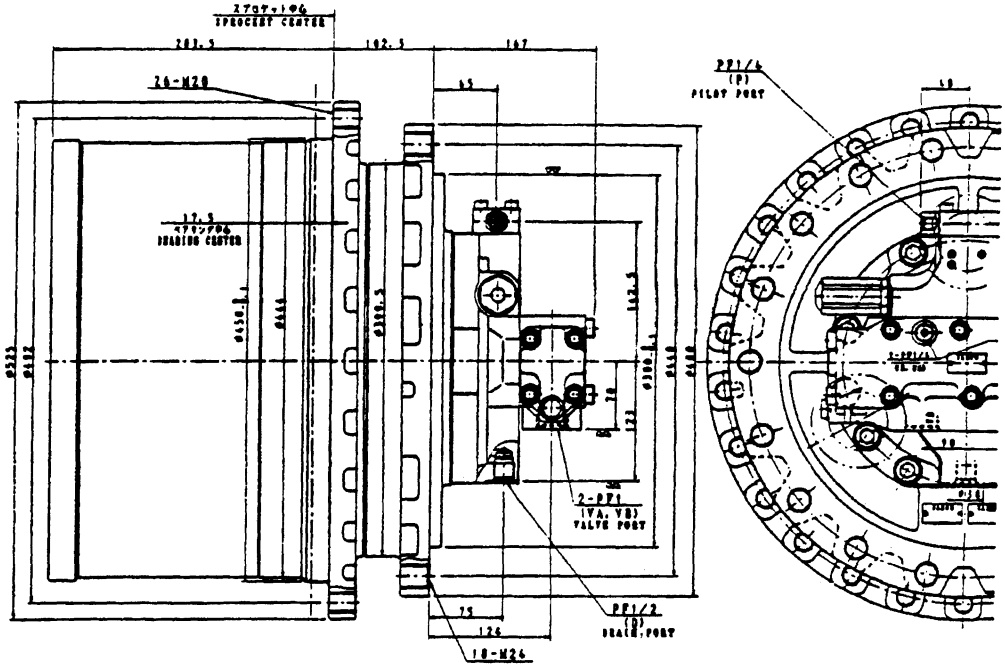


FIG.1 OUTLINE DIMENSIONS OF PROPELLING UNIT

2. SPECIFICATIONS

TABLE 1

ITEM \ MODEL No..P/No.	M3V260/150-RG5.5 NABCO 2162-2-204847-01
MOTOR DISPLACEMENT	262.6/150.5 cc/rev.
RATED PRESSURE	355 kgf/cm²
GEAR RATIO	39.875
NUMBER OF STAGES	2
OIL CAPACITY	10.5 litters
OIL SPECIFICATION	GEAR OIL SAE90 API GL-4
WEIGHT w/accessory valves	367 kgf (wet)

3. STRUCTURE and OPERATION

3.1 STRUCTURE

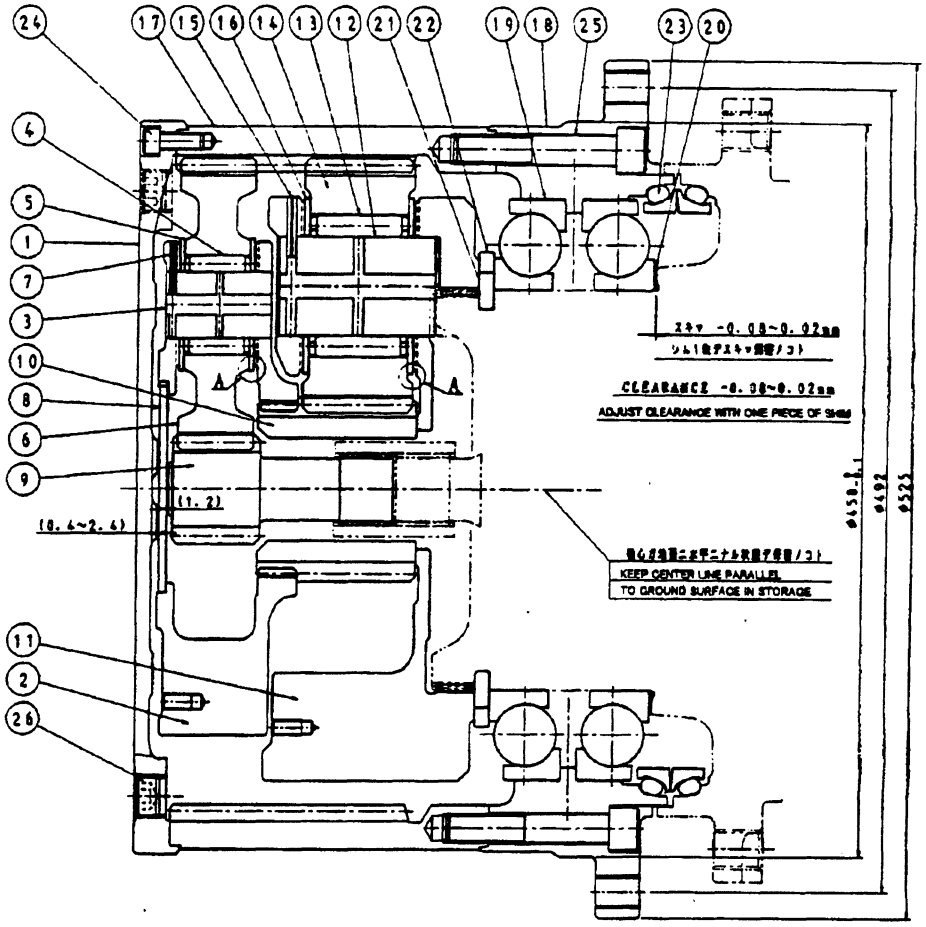


FIG. 2 STRUCTURE OF REDUCTION UNIT

1. COVER
2. CARRIER 1
3. CARRIER PIN 1
4. NEEDLE BEARING
5. THRUST WASHER 1
6. PLANETARY GEAR 1
7. SPRING PIN 4x32
8. THRUST PLATE
9. SUN GEAR 1
10. SUN GEAR 2
11. CARRIER 2
12. CARRIER PIN 2
13. NEEDLE BEARING
14. PLANETRY GEAR 2
15. SPRING PIN 6x36
16. THRUST WASHER 2
17. RING GEAR
18. HOUSING
19. ANGULAR BEARING
20. SHIM
21. LOCK WASHER
22. SUPPORT RING
23. FLOATING SEAL 368
24. SOCKET HEAD CAPSCREW M10x25
25. SOCKET HEAD CAPSCREW M18x100
26. SOCKET HEAD TAPER PLUG PT3/4

3．2 OPERATION

Reduction unit slows down the rotating speed of motor and converts motor torque to strong rotating force.

This reduction unit utilizes two stage, planetary reduction system.

Planetary reduction system consists of : sun gear, planetary gears, (planetary) carriers, and ring gear.

When the sun gear(s) is driven through input shaft, planetary pinions(b), rotating on their center, also move, meshing with fixed ring gear(a), around sun gear(s).

This movement is transferred to carrier(k) and deliver the torque.

This mechanism is called planetary gear mechanism.

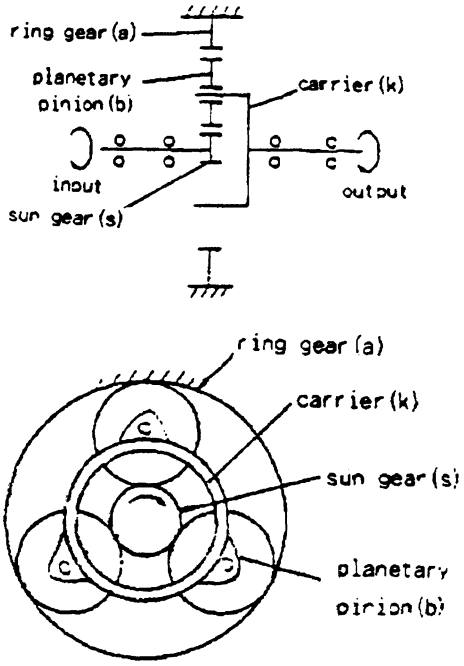


FIG.3 PLANETARY GEAR MECHANISM

See Fig.4 on the right.

when the sun gear S1 is driven by input shaft, planetary action occurs among gears S1, a and b and revolution of gear b transfers the rotation of carrier K1 to second sun gear S2, and also evokes planetary action between gear S2, a and d. This time, because carrier K2 is fixed to frame, gear d drives ring gear a and then ring gear a rotates to drive sprocket.

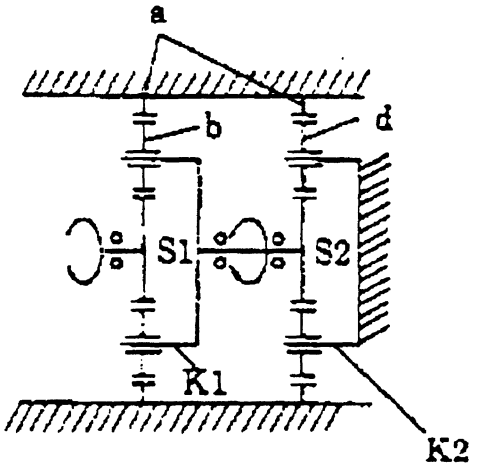
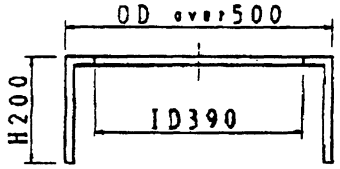


FIG.4 TWO STAGE REDUCTION GEAR

3. DISASSEMBLING AND ASSEMBLING REDUCTION UNIT

3.1 TOOLS

Prepare following tools and instruments before disassembling or assembling.

ITEM	DESCRIPTION	REMARKS
1	TORQUE WRENCH	for 0～50 kgf·m
2	HEX.SOCKET WRENCH	WIDTH ACROSS FLATS 8mm and 14mm
3	WORK STAND	 t=16
4	MICRO DEPTH GAUGE	0～25 mm
5	PIN	for knocking in spring pins φ3.5x75、φ5x55
6	EYE BOLT	M10 and M20 3 pieces each
7	OTHERS	kerosene as cleaner, solvent, gear oil, grease, Loctite No.242 and No.515, seal tape, waists etc.

3.2 DISASSEMBLING REDUCTION UNIT

(1) Preparation for disassembling

1) The reduction units removed from shovel are usually covered with mud. Wash outside of propelling unit and dry it.

2) Loosen taper screw plug of drain port and drain oil from reduction gears.

DANGER!!

While oil is still hot, inside of the unit may be pressurized.
Take care of the hot oil gushing out of the unit when loosening the plug.

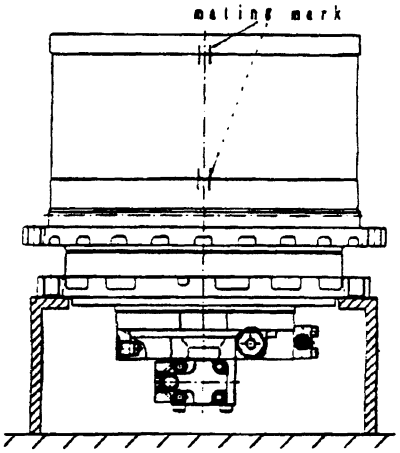
3) MARK FOR MATING

Put marks on each mating parts when disassembling so as to reassemble correctly as before.

★ Numeral in ( ) after the part name corresponds to the number on structure drawing on page 2.

(2) Setting reduction unit on work stand for disassembling

1) Remove M10 capscrews(24) at three places from cover(1) almost equally apart each other, then install eye bolts.
Lift up the unit using them and place it on work stand with cover(1) upward.

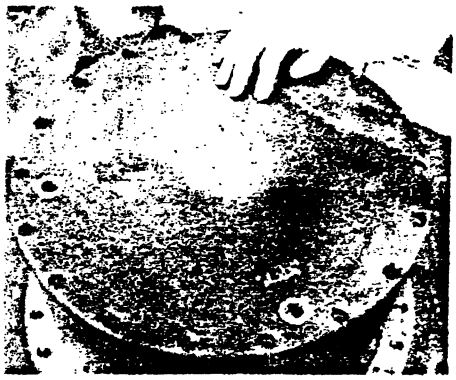


DANGER!!
TAKE GREAT CARE NOT TO PINCH YOUR HAND BETWEEN PARTS WHILE DISASSEMBLING NOR LET FALL PARTS ON YOUR FOOT WHILE LIFTING THEM.

(3) Removing cover

1) Remove the rest of M10 capscrews(24) that secure cover(1).

2) As the cover(1) is adhered to ring gear(17), remove cover(1) by lightly hammering slantwise upward by wooden bar aiming at projection of cover(1).



(4) Removing carrier 1 ass'y

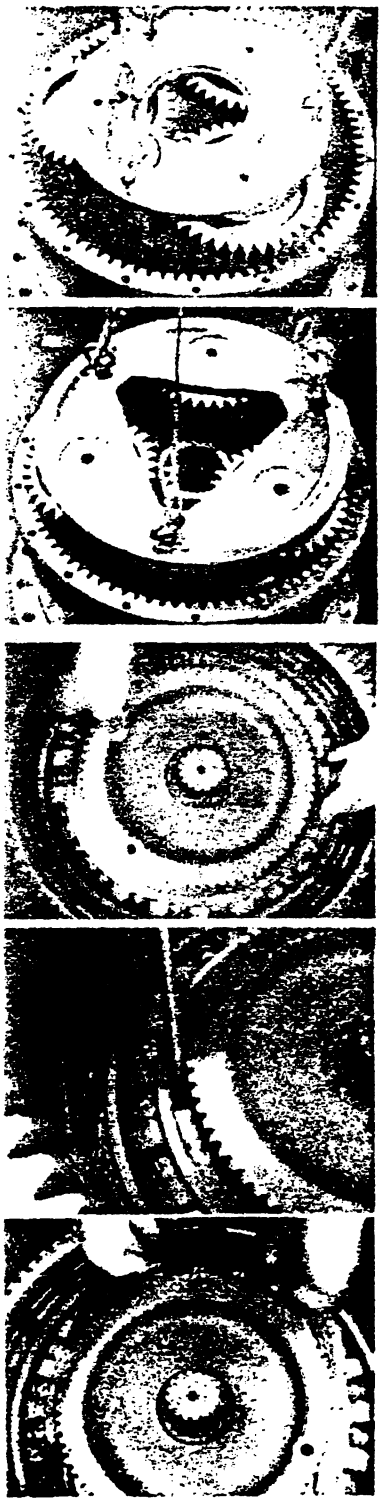
1) Remove thrust plate(8).
2) Remove sun gear 1(9).
3) Screw three M10 eye bolts in carrier 1(2) and lift up and remove carrier 1 ass'y(2, 3, 4, 5, 6, 7).

(5) Removing carrier 2 ass'y

1) Remove sun gear 2(10).
2) Screw three M10 eye bolts in carrier 2(11) and lift up and remove carrier 2 ass'y(11, 12, 13, 14, 15, 16).

(6) Removing housing ass'y

1) Remove support ring(22).
2) Take off lock washers(21) by hammering on screw driver or on similar tool placed at parting surface of them.
3) Screw three eye bolts in ring gear(17) and remove housing ass'y including ring gear(17), housing(18),bearing(19) and floating seal(23), together.



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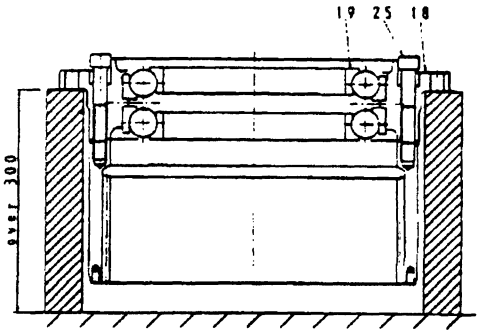
(7) Disassembling housing ass'y

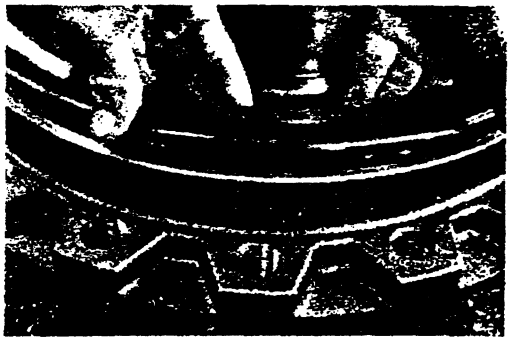
1) Place housing ass'y on steel stands with ring gear(17) below. Make the mating mark on both housing (18) and ring gear(17).
2) Remove floating seal(23) from housing(18).
3) Remove M18 capscrews(25), leaving two of above capscrews(25) at 180° apart position.
4) Loosen the two capscrews(25) and tap lightly the head of them then ring gear(17) can be easily removed from housing(18).



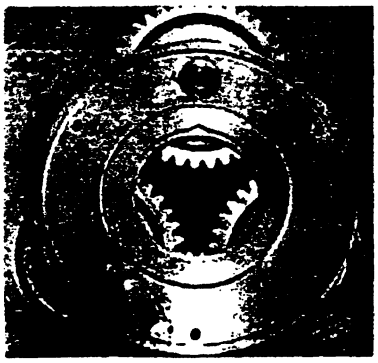
A set of three of steel stands of same height

CAUTION!
Take care not to damage the sliding surface of floating seal(23) or its O-ring.

CAUTION!
Bearings(19) have been tightly press fitted in housing(18). Don't remove the bearings(19) unless otherwise their exchange is needed.
In case bearings removed, don't re-use them. New bearings should be used and shim adjusting be required.



(8) Removing floating seal
1) Remove floating seal(23) of motor side.



(9) Disassembling carrier 1 ass'y

CAUTION!
When carrier pins 1(3) are to be re-used, mark each pin with its mated hole of carrier 1(2) to assure the same combination as before.

1) Knock spring pins(7) into carrier pins 1(3).
2) Remove carrier pins 1(3) from carrier 1(2).
3) Remove thrust washers 1(5), planetary gears 1(6) and needle bearings(4).
4) Knock out spring pins(7) from carrier pins 1(3) for reassembling.



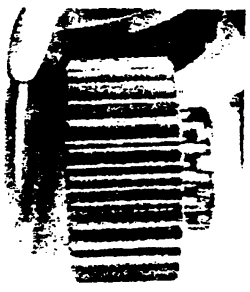

CAUTION!
When carrier pin 1(3) or planetary gear 1(6) is needed to be exchanged, three pins or three gears should be all exchanged.

(10) Disassembling carrier 2 ass'y.

CAUTION!
When carrier pins 2(12) are to be re-used, mark each pin with its mated hole of carrier 2(11) to assure the same combination as before.

1) Knock spring pins(15) into carrier pins 2(12).
2) Remove carrier pins 2(12) from carrier 2(11).
3) Remove thrust washers 2(16), planetary gears 2(14) and needle bearings(13).
4) Knock out spring pins(15) from carrier pins 2(12) for reassembling.



CAUTION!
When carrier pin 2(12) or planetary gear 2(14) is needed to be exchanged, three pins or three gears should be all exchanged.

3．3 Assembling

(1) General Notes

1) Clean every part by kerosene and dry them by air blow.
Surfaces to be applied by Loctite must be degreased by solvent.

2) Check every part for any abnormals.

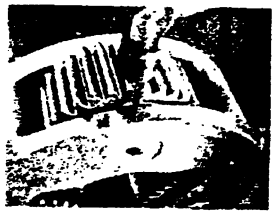
3) Each capscrew should be used with Loctite No.242 applied on its threads.

4) Apply gear oil slightly on each part before assembling.

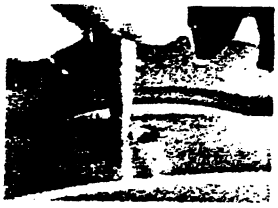
5) TAKE GREAT CARE NOT TO PINCH YOUR HAND BETWEEN PARTS WHILE ASSEMBLING NOR LET FALL PARTS ON YOUR FOOT WHILE LIFTING THEM.

(2) Assembling carrier 2 ass'y

1) Install planetary gears 2(14), needle bearings(13) and thrust washers 2(16) into carrier 2(11).



2) Install carrier pins 2(12) into carrier 2(11) where the holes for spring pins(15) are to be in line with those of carrier 2(11).



3) Install spring pins(15) into carrier 2(11) and at the same time into carrier pins 2(12)

(3) Assembling carrier 1 ass'y

1) Install planetary gears 1(6), needle bearings(4) and thrust washers 1(5) into carrier 1(2).

2) Install carrier pins 1(3) into carrier 1(2) where the holes for spring pins(7) are to be in line with those of carrier 1(2).

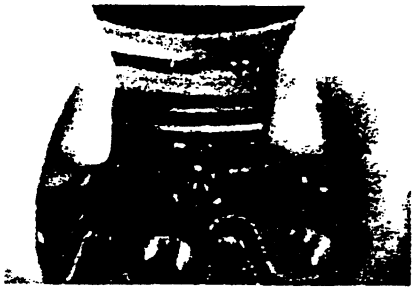
3) Install spring pins(7) into carrier 1(2) and at the same time into carrier pins 1(3)

(4) Installing floating seal

1) Install floating seal(23) on motor casing.

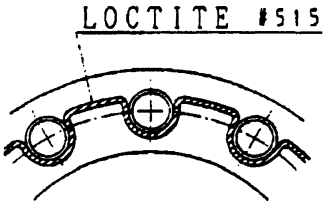
(5) Assembling housing

1) Apply Loctite No.515 on mating surfaces of housing(18) and of ring gear(17).
2) Install three M20 eye bolts equally apart on housing(18). Using the bolts, hang the housing(18) by wire rope and place it on ring gear(17), coinciding mating marks.

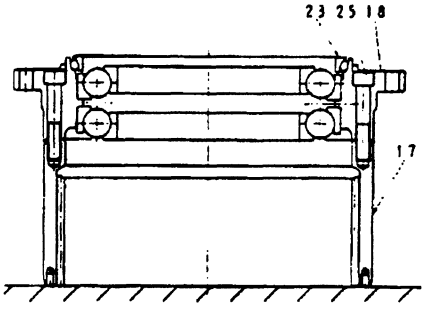


3) After applying Loctite No.242 on the threads of 22 pieces of M18x100 capscrews(25), tighten them with torque wrench to 38.5 kgf·m.

4) Install floating seal(23) on housing(18).

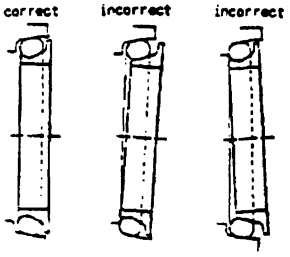


CAUTION!
Clean the groove for floating seals(23) to eliminate oil, dust, paint or other foreign material.



CAUTION!
Apply gear oil slightly on sliding surfaces of floating seals(23) before assembling but strictly dry on O-rings and on its grooves.

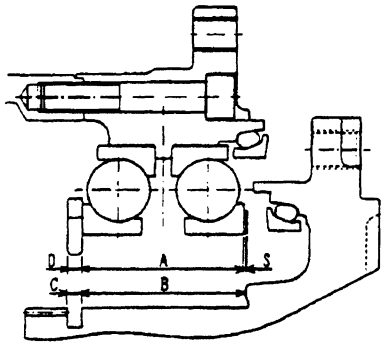
CAUTION!
Confirm that O-ring of floating seal(23) are not twisted and that floating seal is correctly installed i.e. parallel as shown each other between housing(18) and motor casing after assembled.



(6) Deciding shim thickness for angular bearings

NOTE: This work should be done only when you have changed motor(casing), housing(18), bearing(19) or lock washer(21). Unless otherwise use the same shim as before.

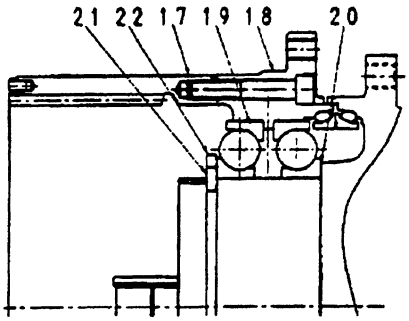
1) Pressing inner laces of two bearings(19) evenly, measure the assembling width(A) of inner laces.
2) Measure the motor side assembling width(B) for bearings(19).
3) Measure the groove width(C) of motor.
4) Measure the thickness(D) of lock washer(21).



NOTE: Measure them at 4 places evenly apart on the circumferances, then calculate and use those mean values.

5) When thickness of shim(20) to be used is placed as S, the clearance X can be calculated as follows :

$$X = (B + C) - (A + D + S)$$



6) Select a shim(20) so as the clearance X to come to -0.08(interferance) ~ +0.02(clearance) on this unit.

(7) Pressing motor in

1) Place motor on work stand with the shaft upward, and put the selected shim(20) (Refer to item 6 above) on the bearing end of motor casing.

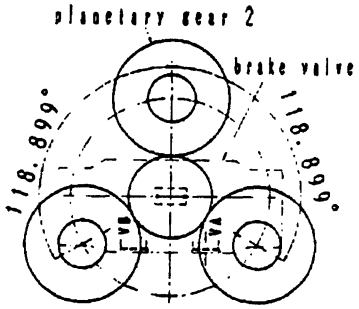
2) Install three M10 eye bolts on ring gear(17) almost equally apart and lift it up. Descend it concentric with motor and put bearings(19) of housing(18) into motor casing.
Use press machine and press inner lace of bearing(19) into full depth.
3) While pressing flange of housing(18), install lock washer(21) into groove.
4) Install support ring(22) over outside of lock washer(21).

(8) Installing carrier 2 ass'y

1) Position three planetary gears 2(14) as shown, put carrier 2 ass'y into ring gear(17) and mesh the splines to those of motor.

2) Put and mesh sun gear 2(10) on center.

NOTE: Positioning carrier 2 ass'y as above is important to obtain better lubrication.

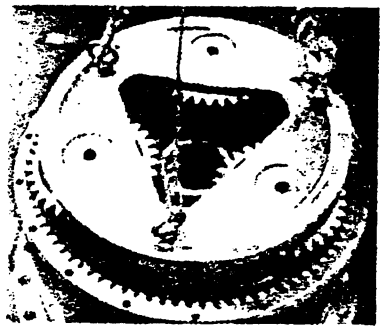


(9) Installing carrier 1 ass'y

1) Putting carrier 1 ass'y in ring gear (17), rotate planetary gears 1(6) by hand and adjust carrier 1(2) to mesh with sun gear 2(10).

2) Install sun gear 1(9) on center.

3) Place thrust plate(8) on carrier 1(2).

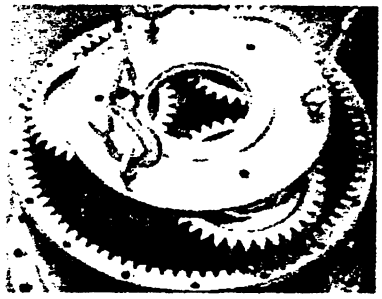


(10) Installing cover

NOTE: Gear oil can be filled before installing cover(1) if you can measure prescribed volume of oil.

1) Apply Loctite No.515 on mating surfaces of cover(1) and ring gear(17) and install cover(1) on ring gear(17).

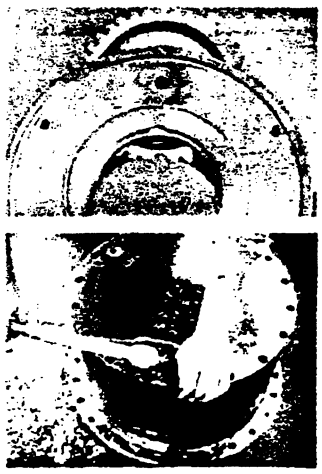
2) Apply Loctite No.242 on threads of 18-M10x25 capscrews(24) and tighten them with the torque of 5.5 kgf·m.

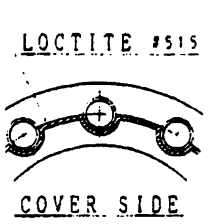


(11) Filling gear oil

1) Fill gear oil (SAE #90 API class GL-4, 10.5 litters) from two PT3/4 ports for taper screw plugs(26).

2) Wrap taper plugs(26) with seal tape and put and tighten them on cover(1).





4. Maintenance

4. 1 Inspection before re-assembling

(1) Thrust washer
1) Check if there are seizure, abnormal wear or uneven wear.
2) Check if the wear is over the allowable limit.

(2) Gears
1) Check if there are pitching or seizure on the tooth surface.
2) Check if there are clacks on the root of tooth by die check.

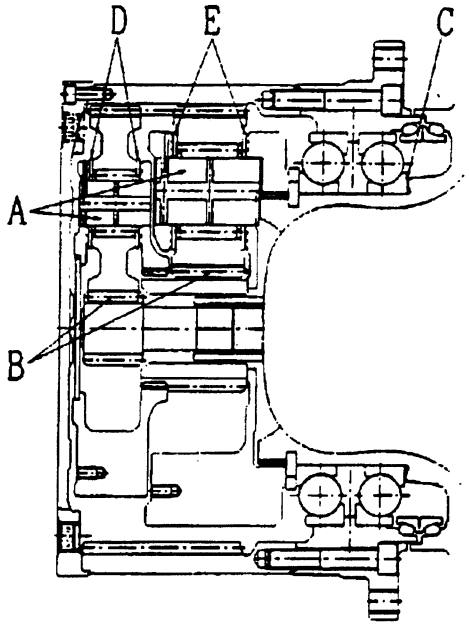
(3) Bearings
Rotate by hand to see if there are something unusual such as noise or uneven rotation.

(4) Floting seal
Check flaw or score on sliding surfaces or on O-rings.

4. 2 Maintenance of parts

The followings are the general maintenance standards. However, it is most important to determine which parts should be replaced, depending on the characteristics shown before disassembling, damages or discoloration of exterior view, the purpose of disassembling, the expected remaining service life etc..

MAINTENANCE STANDARDS



MAINTENANCE STANDARDS Refer to marks on drawing on front page.

MARK	Item	Criteria	Allowable limit	Disposition
A	Wear of planetary shaft	smooth, w/out abnormal wear or seizure	←	Change 3 pieces as a set
B	Condition of tooth surface	smooth, w/out abnormal wear or seizure	φ1.6 of pitching, no cracks at root	Change 3 pieces as a set for planet pinion
C	Thrust clearance of angular bearings	-0.08 ~ 0.02	←	Adjust shim Refer to 3.3(6)
D	Thickness of thrust washer 1	2.7 ± 0.2	wear 0.1	Replace
E	Thickness of thrust washer 2	3.2 ± 0.2	wear 0.1	Replace

4. 3 Fastening torque

Use torque wrench when tightening the following capscrews and plugs.

ITEM	Description	Size	Fastening torque
24	SOCKET HD CAPSCREW	M10x25	5.5 kgf·m with Loctite No.242
25	SOCKET HD CAPSCREW	M18x100	38.5 kgf·m with Loctite No.242
26	TAPER PLUG	PT 3/4	10.0 kgf·m with seal tape

4. 4 Inspection after assembled

(1) Lubrication

After installed the propelling unit, position the drain port at lowest position and check if lubrication oil comes out when loosen the level plug.

(2) Rotating inspection

Put the unit on the test stand and rotate with no load and check if there are abnormal noise or leak of oil. This inspection can be done also on a excavator, after mounted the unit, by lifting one side of clawlers by front attachment.

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: May 1998

BULLETIN: HE-333
Page 1 of 32

SUBJECT: Travel Motor/Gear Reduction Changes

AFFECTED MACHINES:

SK200 IV	YNU0393~
SK200LC IV	YQU2916~

Please be advised that the subject machines are now equipped with new Travel Motor/Gear Reduction assemblies. Effective with S/N YNU0393~, and S/N YQU2916~, Kobelco America now uses a new style Travel Motor/Gear Reduction assembly, manufactured and supplied by NABCO, (as in the past).

The new Travel Motor/Gear Reduction assemblies can be ordered as an assembly or separately according to the needs of the customer.

NOTE: The new style NABCO Travel Motor/Gear Reduction assemblies **are not interchangeable** with the previously used NABCO motor and reduction assemblies, *(except as complete assemblies). However, both complete motor and reduction assemblies would have to be changed together at the same time, for proper operation.*

The sprocket assemblies remain the same, and **are interchangeable.**

The part numbers for the new NABCO Travel Motor/Gear Reduction assemblies are as follows:

Motor and Reduction Assembly	P/N YN15V00007F1
Motor Assembly Only	P/N YN15V00009F1
Reduction Assembly Only	P/N YN53D00004F1
Sprocket Assembly (same)	P/N 2404N414

NOTE: *The Reduction Assembly is to be filled with Engine Oil SAE #30 - Class CD, or Gear Oil SAE #90 - Class GL-4 or GL-5.* The Kobelco America Inc. Parts Department furnishes KSP1000-1005, which is Engine Oil SAE 15W40, and KSP1000-3035, which is Gear Oil SAE #90, which can be used in these reduction units.

Please refer to the attached Preliminary Publications, which cover these new drive units:

YN15V00009F1	Motor Assembly	Disassembly/Repair Procedures
YN53D00004F1	Reduction Assembly	Disassembly/Repair Procedures

You may wish to copy these Preliminary Publications and insert them in the **COMPONENTS** section of your SK200(LC) IV Shop Manuals, for temporary use. Permanent Publications will be issued at a later date.

THIS BULLETIN IS BEING ISSUED FOR INFORMATION ONLY, AND IS NOT AN AUTHORIZATION FOR ANY REPLACEMENT OR WARRANTY CLAIM SUBMITTAL.

1. SPECIFICATION

1.1 GENERAL VIEW

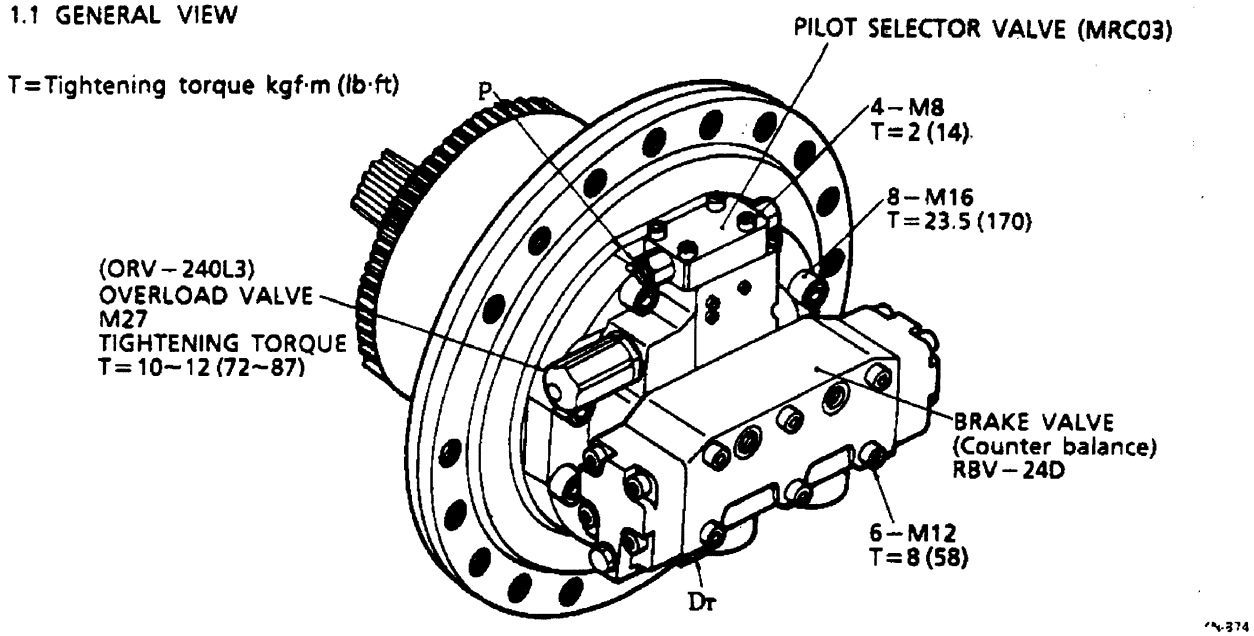


Fig. 1 General view of travel motor

PORT NAME	PORT SIZE	TIGHTENING TORQUE kgf·m (lb·ft)	FUNCTION
P	PF1/4	3.7±0.2 (27±1)	1·2-Speed select pressure port
Dr	PF1/2	11±1.0 (80±7)	Drain port

1.2 SPECIFICATION

Table 1

Part No. & Type	Travel motor unit	YN15V00007F1	M3V130/70-RG3.5
	• Motor	YN15V00009F1	M3V130/70Z
	• Reduction	YN53D00004F1	—
Max. Displacement	cc/rev (cuin/rev)	129.1 (7.88)	
Min. Displacement	cc/rev (cuin/rev)	72.1 (4.4)	
Working pressure	kgf/cm²(psi)	355 (5050)	
Max.pressure	kgf/cm²(psi)	420 (5970) Surge	
Pilot pressure for tilting control	kgf/cm²(psi)	25~50 (360~710)	
Parking brake torque	kgf·m (lb·ft)	38.5 (280) min	
Parking brake release pressure	kgf/cm²(psi)	16 (230) max	
Allowable drain pressure	kgf/cm²(psi)	Working	2 (28)
		Surge	10 (142)
Oil volume in casing	ℓ (gal)	1.4 (0.4)	
Weight	kg (lbs)	83 (183) [72kg (159) + valve 11kg (24)]	

2. CONSTRUCTION AND FUNCTION

2.1 CONSTRUCTION

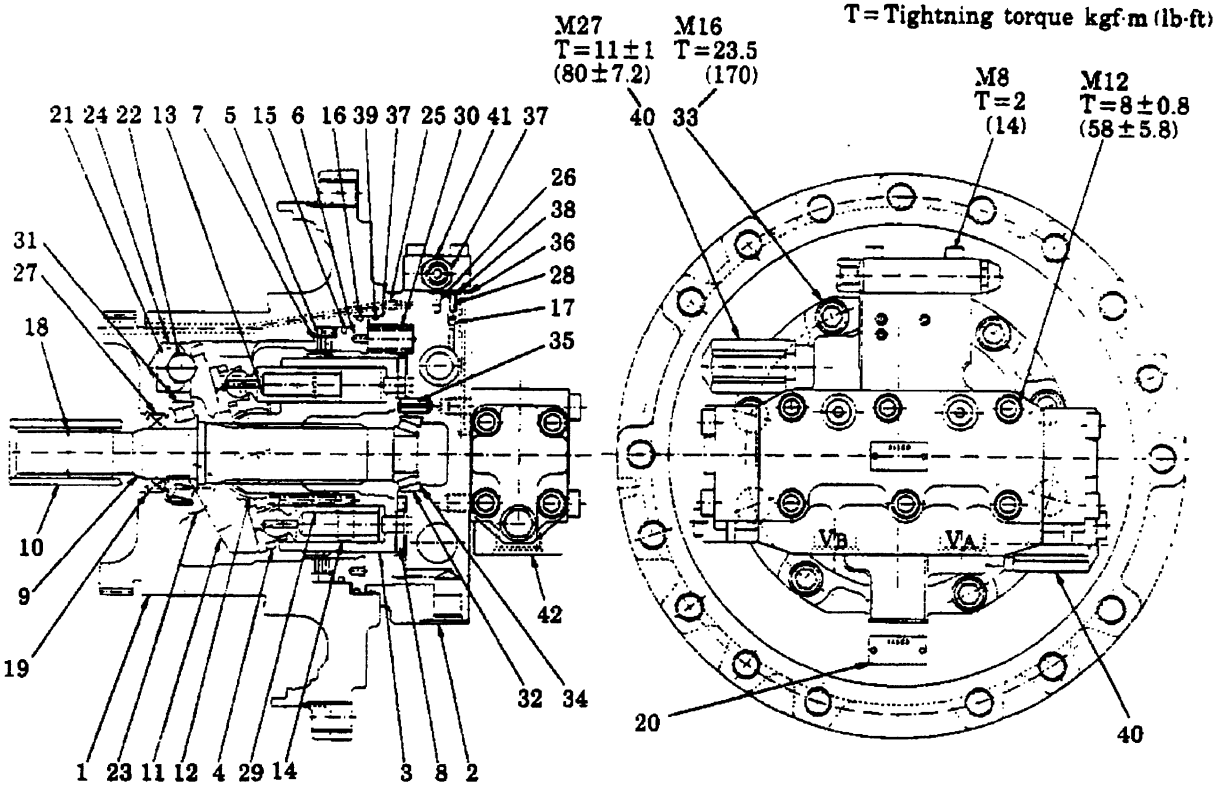


Fig. 2 Cross-sectional view of motor

No.	NAME	Q'TY	No.	NAME	Q'TY	No.	NAME	Q'TY
1	CASING	1	16	D RING (LARGE)	1	31	BEARING	1
2	REAR COVER	1	17	CHECK VALVE	3	32	BEARING	1
3	CYLINDER BLOCK	1	18	SNAP RING ; for hole	1	33	SOCKET BOLT ; M16×45	8
4	SHOE RETAINER	1	19	NAP RING ; for shaft	1	34	SHIM	1
5	FRICTION PLATE	2	20	AME PLATE	1	35	SPRING PIN ; 10×22	1
6	BRAKE PISTON	1	21	LTING PISTON	1	36	O RING ; P6 1B	3
7	SEPARATOR PLATE	3	22	EEL BALL	1	37	O RING ; P8 1B	3
8	VALVE PLATE	1	23	VOT	2	38	O RING ; P9 1B	3
9	SHAFT	1	24	PISTON SEAL	1	39	O RING ; 190.17×2.62	1
10	COUPLING	1	25	ORIFICE (0.6)	1	40	OVERLOAD VALVE	2
11	SWASH PLATE	1	26	ORIFICE (1.0)	1	41	PILOT VALVE	1
12	BALL JOINT	1	27	OIL SEAL	1	42	BRAKE VALVE	1
13	SPRING SEAT	1	28	CHECK VALVE SPRING	3		(COUNTERBALANCE)	
14	PISTON ASSY	9	29	CYLINDER SPRING	9			
15	D RING (SMALL)	1	30	BRAKE SPRING	14			

2.2 FUNCTION

The motor consists mainly of the rotary group that generates rotating power, the mechanical brake that prevents self running of the machine when parking, the variable displacement mechanism that selects small and large displacements of motor and the overload valve built in the rear cover.

(1) Rotary Group

<Construction>

Cylinder block (3) is fitted in the spline tooth groove of shaft (9) that is supported by bearings (31,32) at its both ends.

The cylinder block (3) is pressed against rear cover (2) with valve plate (8) by the action of cylinder spring (29).

Nine piston assemblies (14) slide along the surface of swash plate (11), while going in and out of cylinder block (3). The end face of piston assy (14) is equipped with a bearing that reduces the sliding resistance of the piston assy. The action of the cylinder spring (29) is transmitted to spring seat (13), ball joint (12) and shoe retainer (4), in that order, so the piston assy moves in contact with the surface of swash plate (11) and presses the end face of piston assy (14) against swash plate (11).

<Function>

High hydraulic pressure delivered by the hydraulic pump enters the motor through the oil inlet of rear cover (2) and is admitted to cylinder block (3) past valve plate (8). Table 2 shows oil inlet, discharge and output shaft's rotating directions. (Refer to Fig.2 about port.)

The high pressure oil, as shown in Fig.4 acts on the pistons located within 180° across the line Y-Y that connects the piston's top dead point and the bottom dead point, and generates force F1 = P×A (P:pressure,A :piston's cross-sectional area).

This force F1 is separated into thrust component F_2 and radial components F_{31}~F_{34} (or F_{35}) by the action of swash plate (11) having an inclination angled of α. (Fig.4) These radial components act on the shaft Y-Y as a rotating force and build up the following torque:

$T = r_1 \cdot F_{31} + r_2 \cdot F_{32} + r_3 \cdot F_{33} + r_4 \cdot F_{34}$

(Add $r_5 \cdot F_{35}$ where high pressure is applied to these five pistons.) This torque is transmitted to the spline of shaft (9) via cylinder block (3) and acts to shaft (9).

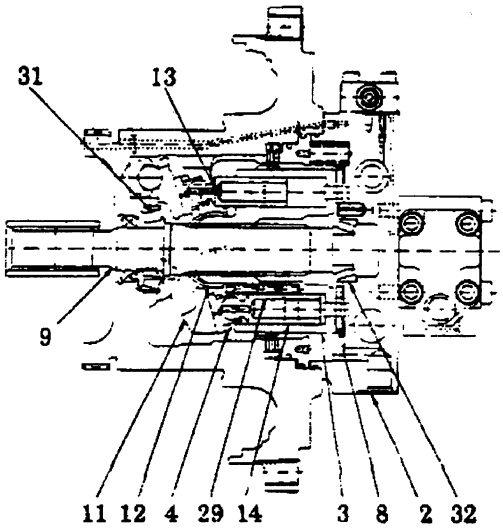


Fig. 3

Table 2

Oil inlet port	Oil discharge port	Rotating direction (as seen from shaft side)
VA	VB	Clockwise
VB	VA	Counterclockwise

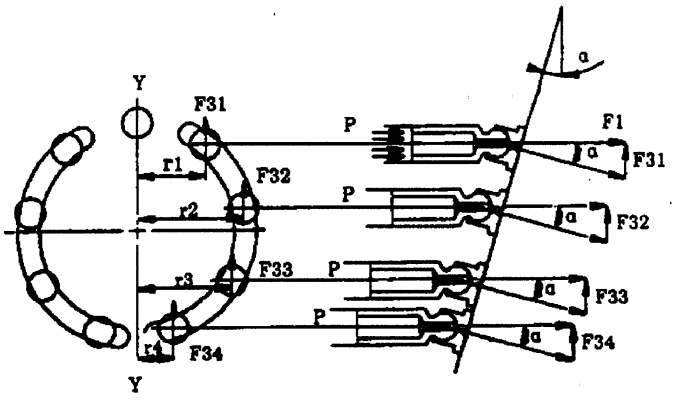


Fig. 4

(2) Mechanical Brake

<Construction>

Three separator plates (7) and two friction plates (5) are placed alternately in the spline grooves of the outer circumference of cylinder block (3). These plates are pressed by the action of fourteen brake springs (30) via brake piston (6).

<Function>

The mechanical brake released when a high pressure selected by brake valve (counterbalance valve) (42) direct -attached to rear cover (2) acts on brake piston (6) and constantly creates a brake torque when such pressure is not exerted upon the brake piston (6).

This brake torque is created by a frictional force between separator plate (7) splined to casing (1) and friction plate (5) splined to cylinder block (3).

Brake piston (6) is pressed by fourteen brake springs (30) when pressure is not working on the brake piston. The brake piston clips friction plate (5) and separator plate (7) between it and casing (1).

This pressing force creates a friction force between friction plate (5) and separator plate (7), eventually acting as the brake torque that fixes cylinder block (3).

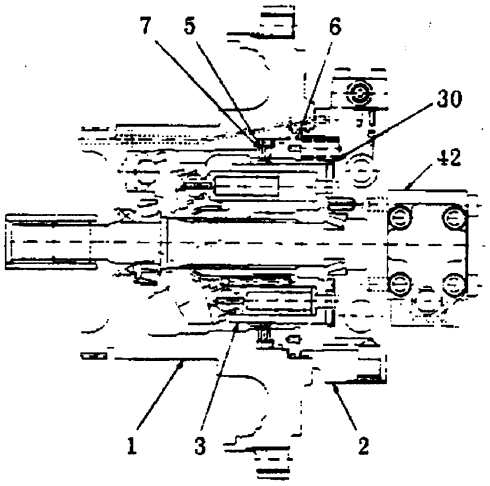
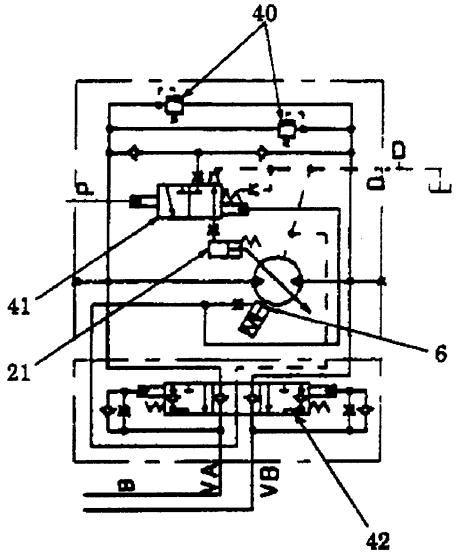


Fig.5 Mechanical brake



Hydraulic diagram

No.	NAME	Q'TY
41-1	BODY	1
41-2	SPOOL	1
41-3	JOINT	1
41-4	PLUG	1
41-5	SPRING SEAT	1
41-6	PIN	1
41-7	SPRING	1
41-8	O RING; P6 1B	2
41-9	O RING; P14 1B	2
41-10	SOCKET BOLT; M8×32	4

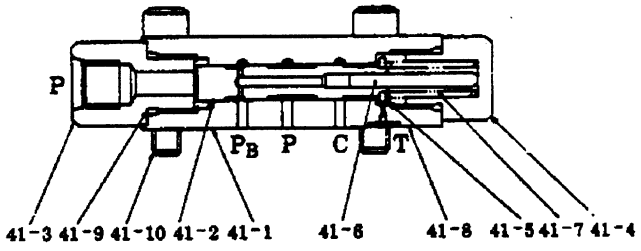


Fig.6 Pilot valve (41)

(3) Variable Capacity Mechanism

<Construction>

The variable displacement mechanism consists of the hydraulic motor consists of pivot (23) that is set in two semi-spherical concaves provided in swash plate (11) and supports swash plate (11), tilting piston (21) that obliquely rotates swash plate (11) on pivot (23), stopper (1-1) supporting the obliquely rotating swash plate in a fixed position, pilot selector valve (41) that admits pressure to tilting piston (21) by an external command, and three check valves (17) that select the highest among pilot pressure, motor inlet pressure and motor outlet pressure as external commands and transmit it to pilot selector valve (41).

<Function>

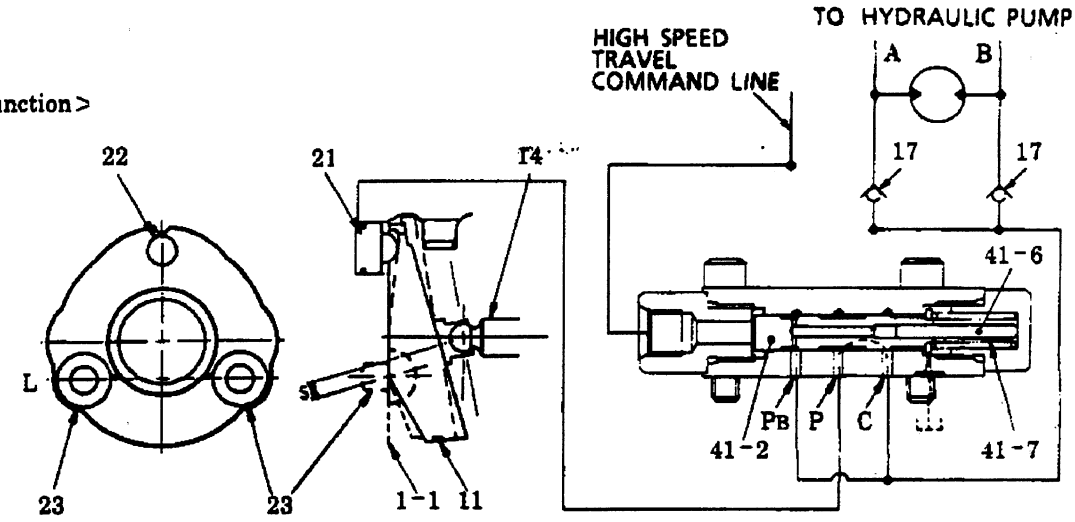


Fig. 7 Function of the variable capacity mechanism

The figure above is a modeling of the variable capacity mechanism.

When pilot pressure enters in the high speed travel command line, spring (41-7) is compressed which in moves spool (41-2) rightwards till port P connects with port C. High speed travel command line pressure presses tilting piston (21). The result is that swash plate (11) tilts on line (L) that connects two pivots (23), as indicated with a dashed line, till it strikes tilting stopper (1-1), whereupon the oil supply decreases to provide the motor with a small displacement. As the result, the motor runs at high speed without increasing the oil feed rate of the hydraulic pump. (1.8 times the regular speed for this machine)

If the high speed travel command line pressure is reduced to zero, spool (41-2) is brought back to the left by the action of spring (41-7). This releases the oil pressure to the tank.

The motor has nine pistons distributed evenly over swash plate (11) to press swash plate (11). The resultant force of the pistons lies nearly in the center of the shoe plate as illustrated in Fig. 7. Since pivot (23) position is off the center by an amount S, a rotating force equal to the torgue of S×the pressing force of the pistons. This torque brings the motor back to its original condition or low speed travel

The hydraulic motor changes the speed to low speed automatically if loads to the engine exceeds the engine power when climbing on a slope and turning the machine in the high speed mode, in order to prevent the engine from stalling. This occurs as the pressure of the hydraulic pump is admitted to port PB of Fig.7 and acts upon pin (41-6). If the pressure exceeds a specified level, spool (41-2) is brought back to the left by the reaction force of pin (41-6). This releases the oil pressure pressing tilting piston (21) and tilts swash plate (11). This increases the displacement of the motor and shifts the motor to low speed. If the pressure falls below a specified level, spool (41-2) moves to the right to shift the motor to high speed.

(4) Overload valve

<Construction>

The overload valve consists of; valve seat (40-3) that provides metallic seat in the hole of motor rear cover (2); socket (40-1) that holds valve seat (40-3) and is screwed up in the housing; valve (40-2) that is in contact with adjust spring (40-9) and the valve seat and fixed in the hole of the socket; connecting piston (40-4) acting as the oil path to pilot body (40-6) inserted in the hole of the valve (40-2); and piston (40-7) pressed against plug (40-5) by the action of spring (40-14) set in the pilot body; and spring adjusting shim (40-8).

No.	NAME	Q'TY
40-1	SOCKET	1
40-2	VALVE	1
40-3	VALVE SEAT	1
40-4	PISTON	1
40-5	PLUG	1
40-6	PILOT BODY	1
40-7	PISTON	1
40-8	SHIM	1
40-9	ADJUST SPRING	1
40-10	O RING ; P7 1B	1
40-11	BACK UP RING	2
40-12	O RING ; G25 1B	2
40-13	BACK UP RING	1
40-14	SPRING	1
40-15	SPRING GUIDE	1

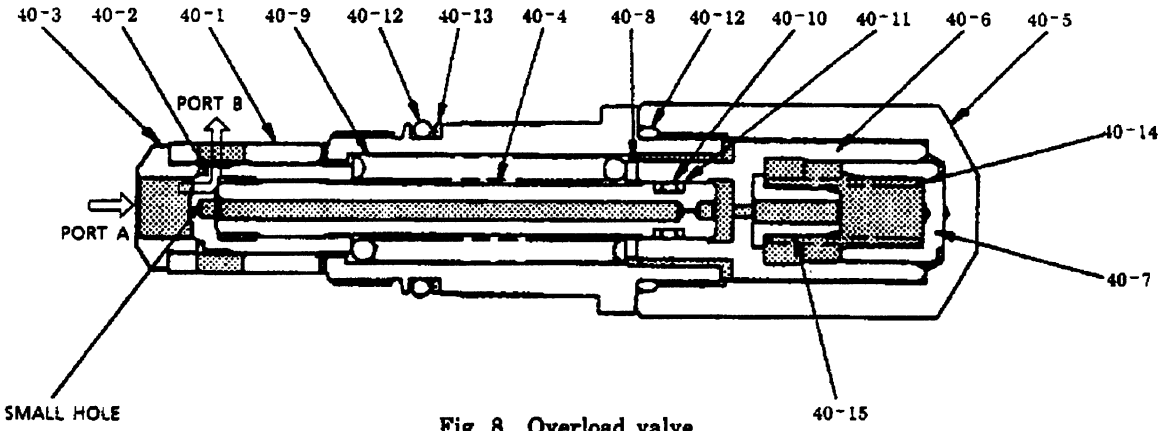


Fig. 8 Overload valve

<Function>

Two overload valves are arranged in a crossover condition and function as follows:

1) The overload valve keeps the braking pressure built up on the motor's discharge side to a constant level when the hydraulic motor is stopped, in order to relieve the load-induced inertia.
2) In order to actuate the hydraulic motor at a specified pressure and provide a sharp acceleration at its start and provide a sharp acceleration at its start and to relieve shocks created by the braking at its stop, the overload valve executes the so-called pressure rise relieving action in which generated pressure is held to a low pressure for a short time and the circuit pressure is kept to a specified pressure level after the sprocket of the reduction gear is engaged smoothly with that of the travel motor the overload valve keeps the circuit pressure at a specified set level i.e. performs boost pressure relieving action, after keeping generated the pressure low for a short time and smoothing out the meshing between the reduction gear, the travel motor. the sprocket and the like.

When the pressure of port A in the overload valve rises at the start of the hydraulic motor, it acts on the effective diameter of the overload valve that sets the valve seat (40-3) of valve (40-2) and on piston (40-4) of the valve interior through a small hole in the valve, at the same time, to raise the pressure to the port A pressure level. The overload valve brings the pressure to a specified level, counteracting the force of adjust spring (40-9) due to an areal difference between the effective diameter of the valve seat and the interconnecting piston bore diameter.

When the hydraulic motor is braked, piston (40-7) at the rear is shifted on the left side by the actuating pressure. When the pressure of port A rises, it acts upon the piston through the small hole which causes the piston to move rightwards till it touches plug (40-5), during which the valve holds the port A pressure to a relatively low level, resisting adjust spring (40-9) and discharges the oil to port B.

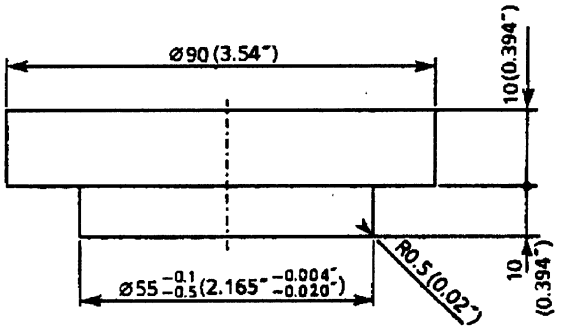
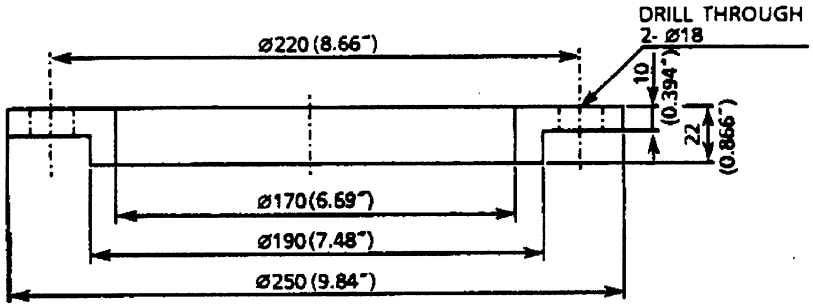
After the piston touches the plug, the same action that occurs at the start of the motor proceeds.

3. REMOVAL AND INSTALLATION

3.1 PREPARATION

(1) Necessary tools

Table 3 Unit : mm (inch)

Tool	Remarks
Hexagon key wrench	HEX 5, 6, 10,14
Wrench	HEX 19,27,32,35
Pliers for snap ring	For shaft ∅40
Pliers for snap ring	For hole ∅32~∅80
Plastic mallet	1 pc.
Screwdriver	Flat-bladed screwdriver,medium size 2pcs
Torque wrench	23.5kgf·m (170 lb·ft) max.
Gear (bearing) puller	Holding size 75 dia.×45 wide. (See Fig. 11.)
Holding-down metal fitting	Ex. L160×W70×H37, 20×100 oval hole 1FT-6 (See Fig. 11.)
Oil seal fitting jig	
Brake piston fitting jig	
Others	Seal tape , Cleaning oil, Grease, Hydraulic oil, Compressed air.

3.2 REMOVAL

3.2.1 GENERAL PRECAUTIONS

1) In general, hydraulic components are precision finished to very small clearance. Therefore, perform removal and installation in a clean place with little dust. Use clean tools and cleaning oil and handle them with sufficient care.
2) When the motor is removed from the machine, clean the area around the ports well, and plug them so no dirt and water do not enter. When installing the motor, do not remove the plugs till it is completely connected.
3) Examine the Fig. 2 before start of removal and get necessary parts ready according to the purpose of removal.
   Once removed seals and O rings can not be reused. Some parts are not available singly and are only available in subassemblies. Get such parts ready beforehand, referring to the Parts Manual.
4) If you expect to reuse the pistons and the cylinder, put a matching mark on the pistons when separating them from the cylinder.

3.2.2 REMOVAL PROCEDURE

(1) Removing Attached Valves
Remove the attached valves from the motor before removing it.

1) Remove counterbalance valve (42).
2) Remove pilot selector valve (41).
3) Remove check valve (17) and spring (28).
4) Remove the overload valve (40).
   : 35mm
5) Remove the coupling (10).

⚠ Do not remove the attached valves except for repair.
However, the motor can not be removed without removing counter-balance valve (42).

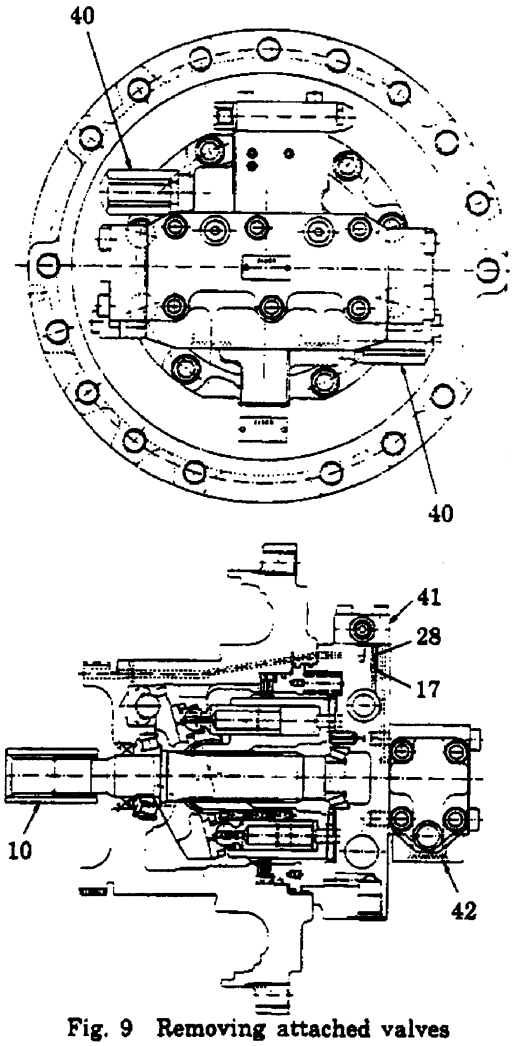


Fig. 9 Removing attached valves

(2) Removing the Motor

1) Place the motor so the motor shaft is level and remove socket bolt (33), leaving two vertical ones that are diagonally opposite intact.

: 14mm

2) Loosen the remaining two socket bolt (33) slowly at the same time.

: 14mm

3) Remove rear cover (2) and brake spring (30) so the cylinder block (3) does not come out with rear cover (2).

⚠ • On that occasion, use care so valve plate (8), brake spring (30) or O ring (37) does not fall down.
• If cylinder block (3) comes out with rear cover (2), draw out rear cover (2), while pushing cylinder block (3) through the oil hole of rear cover using a round-point rod of 5~8mm (0.197~0.315in) in diameter so as not to score the oil hole.

4) Remove valve plate (8) so cylinder block (3) does not come out.

⚠ Put a matching mark on valve plate (8) and rear cover (2) so they are not installed upside down at installation.

5) Press in cylinder block (3) into the holding-down fitting, using the removed socket bolt (33) so as not to damage the cylinder block and install them so the inner race of bearing (32) comes out.

6) Place the gear (bearing) puller on the inner race of bearing (32) and remove it.

7) Hold brake piston (6) by hand and push it out by blowing jet air through the brake release oil hole.

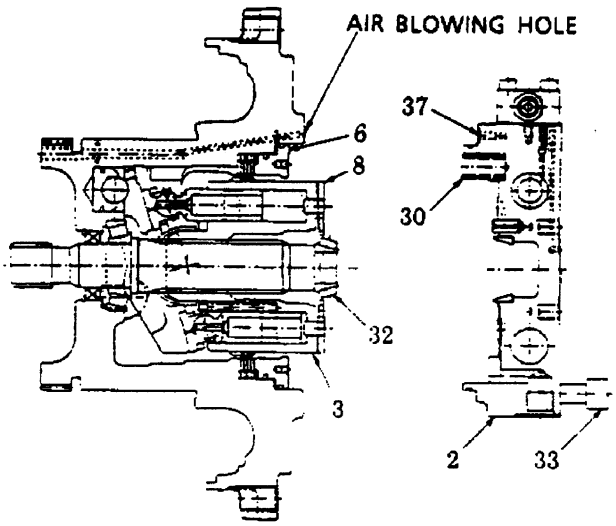


Fig. 10 Removing rear cover

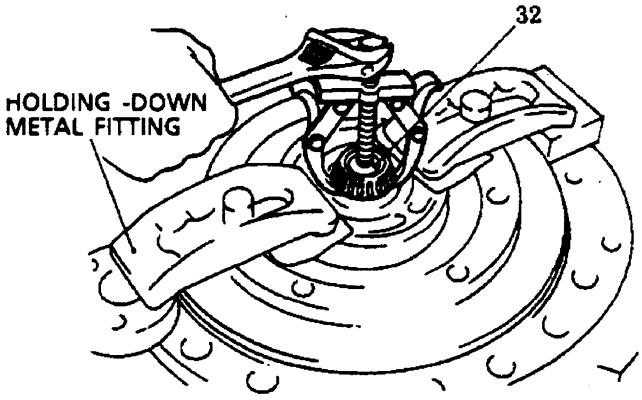


Fig. 11 Removing rear bearing (32)

8) At installation, put a rod (mark) which does not score cylinder block (3), say a tubular paper pipe, into the hole of piston (14) and give a matching mark on the outer surface of cylinder block (3), in order to align the hole of cylinder block (3) with piston assy (14) that is inserted in the hole.

9) Remove cylinder (3), spring seat (13) and cylinder spiring (29).

10) Remove separator plate (7) and friction plate (5).

11) Remove nine piston assemblies (14), shoe retainers (4) and ball joints (12) at the same time.

⚠
- With piston assemblies (14) and shoe retainers (4) installed together, align marks with matching marks and insert them into the cylinder block. This is intended to install the pistons in their own holes at installation.
- Exercise care so as not to score each of the sliding surfaces. Scratched ones can not be used again.
- The piston and the shoe are caulked together and can not be separated.

(Reference)
This is all about the disassembly of the single motor. The motor with a reduction gear can naturally be disassembled the same way. The motor with a reduction gear can be removed easier as the shaft does not shake much.

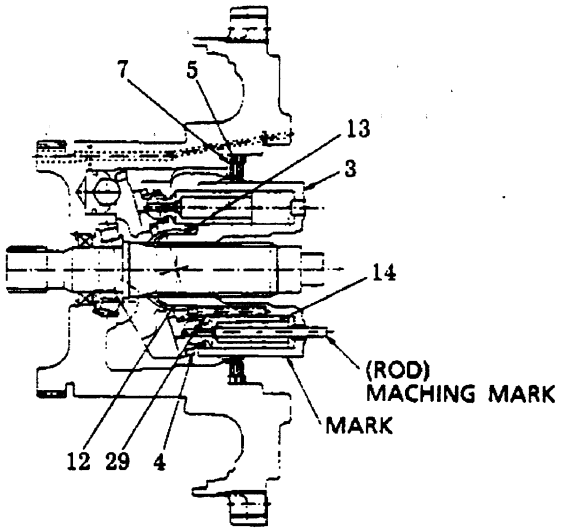


Fig. 12 Removing cylinder block

12) Remove swash plate (11).
13) Do not remove tilting piston (21). In case it must be removed for unavoidable reason, hold down tilting piston (21) by hand, and push it out by blowing air through the hole in the Fig. 13.
14) Shaft (9) comes off.
15) Remove snap ring (19) and take off oil seal (27).
16) To replace bearings, remove the inner race and the outer race by means off a bearing puller and replace each bearing assy.

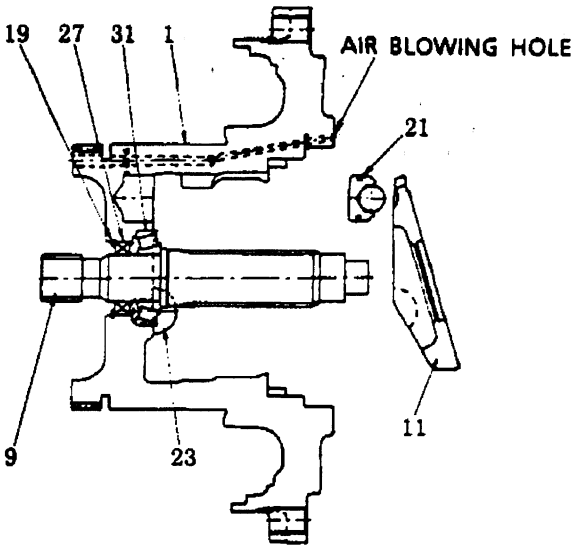


Fig. 13 Removing swash plate

⚠
- Shim (34) is located under the outer race of rear bearing (32). At installation, use care so as to place it as it is.
- When bearings (31,32), shaft (9), casing (1), rear cover (2) and the like that are related to the tightening allowance of the bearings have been replaced, the thickness of shims (34) must be adjusted. Measure the total thickness of the shims when they are placed lightly and replace them with a single shim of the same thickness so the clearance of the bearing keeps within 0~0.1mm (0~0.004in).
- Do not remove pivot (23). In case it must be removed for some reason, put a matching mark on the pivot and on swash plate (11).
- Do not remove oil seal (27) for inspection. In case it is removed, replace it with a new one.

(3) Removing overload valve
1) Remove the overload valve and motor rear cover (2) as an assembly, utilizing the opposing flats of the HEX part of socket (40-1).
: 35mm
2) The overload valve is handled as an assembly in principle, but in case it must be separated for an unavoidable reason, remove plug (40-5) from the socket and take out the inner parts.

⚠ Valve seat (40-3) is press fitted to the socket bore hole. Do not separate the valve seat as much as possible as it may scratch the socket bore surface.

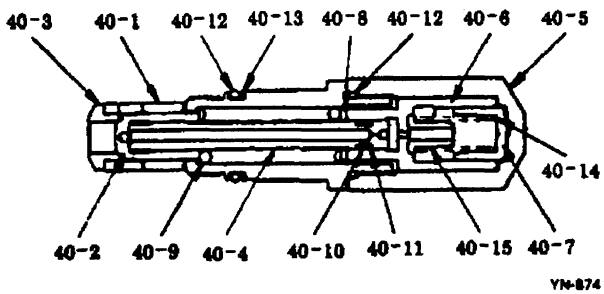


Fig. 14 Removing overload valve

3.3 INSTALLATION

3.3.1 GENERAL PRECAUTIONS

1) Wash all parts sufficiently with cleaning oil and let them dry with jet air.
2) Coat sliding surfaces with clean hydraulic oil before installation.

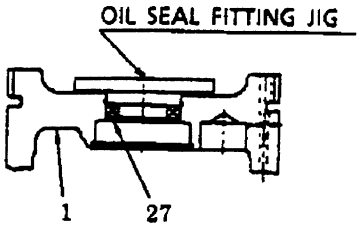


Fig. 15 Installing oil seal

3.3.2 INSTALLING PROCEDURE

1) Apply grease to the outer circumference of oil seal (27) and the inner circumference of casing (1), direct the lip of it inwards using the inserting jig, and put oil seal (27) into casing (1) while tapping it lightly so it does not tilt.
2) Fix it with snap ring (19).
3) Place the outer race of bearing (31) in casing (1) (clearance fit) and press the inner race of it into shaft (9) (interference fit).

⚠ In that case, the inner race is easier to enter if it is heated to about 100°C (212°F).

4) Put shaft (9) in casing (1). In that case, coat the surface in contact with seal (27) with grease.
5) Insert tilting piston (21).
6) Insert pivot (23). Fit the pivot to the side on which its matching mark meets that on the swash plate. For a long period of operation, set the pivot in the direction in which the sliding trace on the spherical area agree with the contact marks of swash plate (11).
7) Fill the three spherical areas of swash plate (11) with sufficient grease and install it.
8) Fit piston assembly (14), shoe retainer (4), ball joint (12), retainer seat (13) and cylinder spring (29) into cylinder block (3) as shown in Fig. 17.
   Thereafter, insert the whole assembly into shaft (9).

⚠ Each piston assembly (14) must always be fitted in the hole where it used to be.

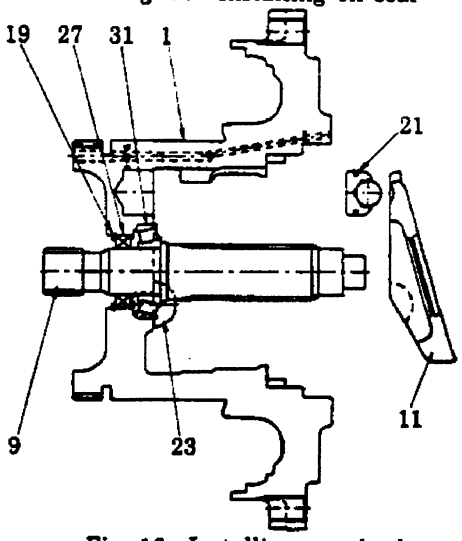


Fig. 16 Installing swash plate

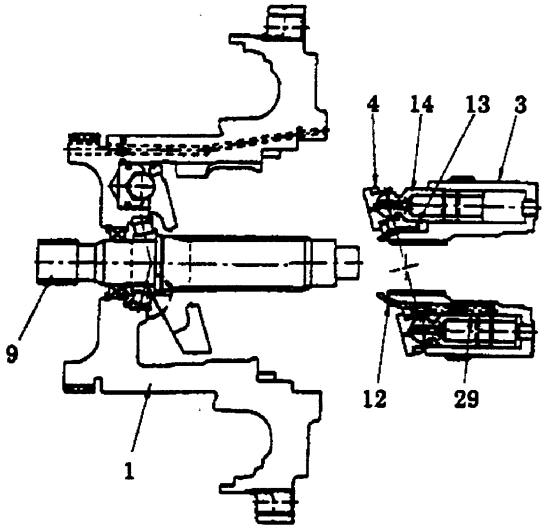


Fig. 17 Installing piston assy

9) Insert the inner race of rear bearing (32) into the end of shaft (9) by tapping it.

10) Install all separator plates (7) and friction plates (5) by turns. Note that at the beginning and at the last comes a separator plate (7).

11) Insert brake piston (6) with D rings (15,16) into casing (1), using the brake piston fixing jig.

⚠ Two D rings (15,16) (large and small) are fitted to brake piston (6).
The D ring (16) contacts the larger diameter part and thereafter the D ring (15) contacts the smaller diameter part.
You can not see the D ring (15) contacting the smaller diameter part, but do not force it in.
However, do not force it in. Otherwise, the piston ring may be scraped off by the hole in casing (1).

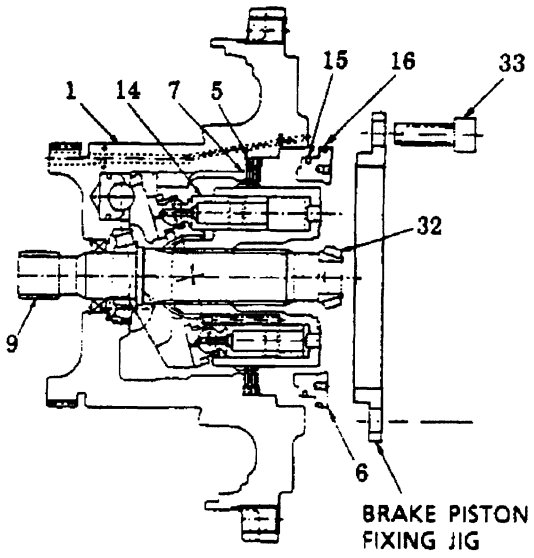


Fig. 18 Installing brake piston

12) Selecting bearing shims (34).
When bearings (31),(32), shaft (9), rear cover (2) of casing (1) and the like that are related to the tightening allowance of the bearings have been replaced, adjust shims as follows and install rear cover (2) to casing (1).

①Press the outer race of bearing (32) evenly all round and measure the distance (A) from the mounting surface of casing (1) and rear cover (2) to the end face of the outer race.

②Measure the distance (B) from the top face of the rim of rear cover (2) to the mounting surface of the outer race.

③Measure the height (C) of the rim of rear cover (2).

- In the above-mentioned measurement, measure four perpendicularly intersecting points on the circumference and get a mean value.

④Suppose the thickness of shim (34) used is (S), the clearance (X) is expressed as follows: $(B-C)=A+S+X$

⑤Choose one shim that makes the clearance X 0~0.1mm (0~0.004in). Therefore, it can be calculated by the following equation: $(B-C)-A \leqq S \leqq (B-C)-A+0.1$

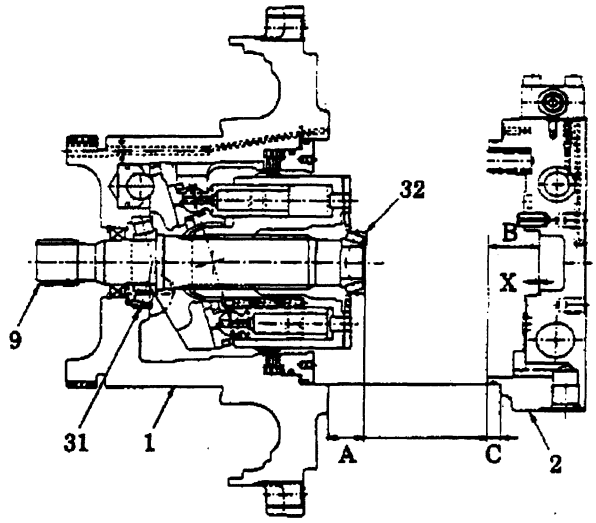


Fig. 19 Measurement for the selection of a shim

13) Put valve plate (8) into rear cover (2) according to the matching marks given at removal, fit brake spring (30) and O ring (39), put rear cover (2) into casing (1), and tighten the rear cover (2) with socket bolts (33).
: 14mm,
Tightening torque : 23.5kgf·m (170 lb·ft)

14) Install coupling (10). (See Fig. 20)

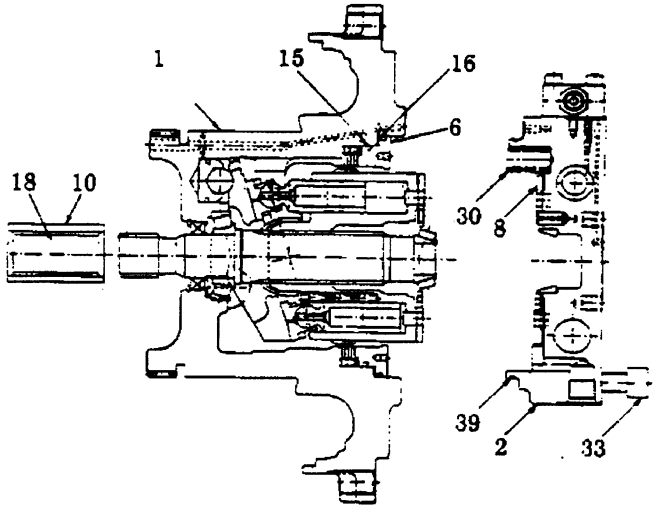


Fig. 20 Installing rear cover

4. MAINTENANCE STANDARDS

4.1 PARTS MAINTENANCE STANDARDS

Given below are guidelines to determine the serviceability of parts. These values are general standards,but it is of prime importance to determine the number of parts to be replaced, depending on the performances before removal, degree of external damage and discoloration, purpose of removal and the remaining life expectancy of parts.

Inspection Item / Method	Criterion and Remedy

(1) Sliding surface of cylinder, valve plate and swash plate

Measure the surface roughness of the sliding surface of the cylinder, valve plate and swash plate, using a surface roughness meter.

Table 4 Unit : μ

Part name and inspection item	Standard surface roughness	Allowable surface roughness	Remedy
Surface roughness of cylinder,valve plate and swash plate	0.4-Z max.	3-Z	Replace or correct.

To correct the surface roughness of the cylinder and the valve plate,lap them together. (lapping powder # 1200)

Measure the hardness of the sliding surface of the valve plate and swash plate, using a hardness meter.

Table 5

Part name and inspection item	Standard hardness	Allowable hardness requiring replacement	Remedy
Swash plate	HS78min.	HS74	Replace.

(2) Piston and cylinder clearance

Measure the outside diameter of pistons and the bore of the cylinders at least three locations longitudinally by means of a micrometer, and let the maximum O.D. value be d, the minimum O.D. value be d1, the minimun bore value be D, and the maximum bore value be D1.

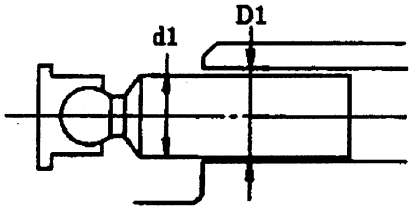
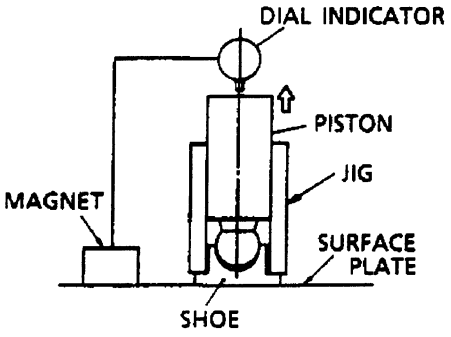
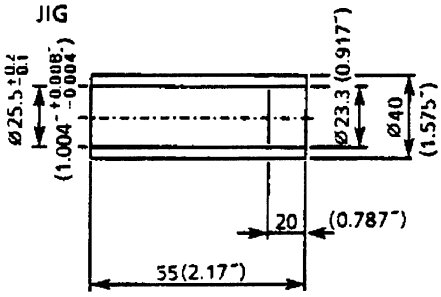
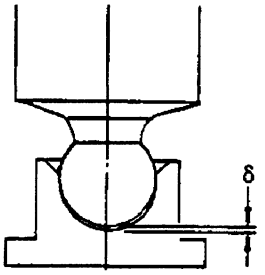


Table 6 Unit : mm (in)

Part name and inspection item	Standard	Allowable value	Remedy
Piston O.D.d~d1	0.01 (0.0004)	0.05 (0.0020)	Replace piston or cylinder.
Cylinder bore D1-D	0.01 (0.0004)	0.022 (0.00087)	
Clearance (D-d)	0.037~0.050 (0.0015~0.0020)	0.065 (0.0026)	

When any piston is to be replaced, replace nine pistons altogether.

Inspection Item/Method	Criterion and Remedy
(3) Gap of piston shoe Hold down the shoe to the surface plate by means of jig, draw out the piston upward and measure the gap between the piston and the shoe.   	 Table 7 Unit : mm (in) Part name and inspection item / Standard dimension / Allowable value / Remedy Gap of caulked part between piston and shoe / 0~0.1 (0~0.004) / 0.3 (0.012) / Replace piston. When any piston is be replaced, replace nine pistons altogether.
(4) After installation, measure the torque at the end of the shaft when it begins to turn, using a torque wrench.	Table 8 Unit : kgf·m (lb·ft) Part name and inspection item / Standard dimension / Allowable value / Remedy Brake torque / 38.5(278) / 35(253) / Replace all separator plates,friction plates and springs.
(5) Shaft Measure the wear of the shaft seal by means of a roughness meter.	Allowable stepped wear is up to 0.05mm (0.002in) When the shaft is to be replaced. replace the oil seal at the same time.
(6) Bearing Replace bearing (31) and bearing (32) within 10,000 hours of the hourmeter on the machine.	
(7) Spline Replace spline if it is worn beyond its allowable limit.	Serviceable stepped wear is up to 0.3 mm (0.012in) on the contact surface.
(8) Relief valve section This is the overload relief valve section. Pressure can not be checked and regulated without a special test bench.	Replace it as a sub-assembly every 10,000 hours.

5. TROUBLESHOOTING

5.1 GENERAL PRECAUTIONS

Given below are measures to be taken when you have found any fault on the hydraulic motor in operation.

1) Think before operation
   Before proceeding to work, determine the nature of abnormality and think if a similar symptom occurred before. Think once again if the fault really comes from the motor.
2) Beware of dust.
   Many faults are caused by dust. Therefore, take dustproofing measures at disassembly.
3) Handling parts
   Handle parts with due care, particularly the moving portions, so as not to damage the moving parts.
4) Handle O rings so as not to score the seat surfaces.
   At removal, replacing O rings with new ones is recommended.

5.2 TROUBLESHOOTING

(1) Hydraulic motor does not start.

Symptom	Cause	Remedy
Pressure does not rise.	Built-in relief valve is out of order.	Repair or replace relief valve.
Pressure rises.	1. Mechanical brake is not released. (Orifice in release pressure path is clogged.)	1. Check if orifice is not clogged. Clean or replace orifice.
	2. Friction plate or separator plate in mechanical brake is stuck.	2. Replace friction plate and separ ator plate.
	3. Brake piston in mechanical brake section is stuck.	3. Recondition O. D. of brake piston of replace brake piston.
	4. Sliding area is seized.	4. Repair or replace piston, shoe, swash plate, cylinder and valve plate.
Speed can not be changed from high to low speeds.	Pilot valve spool is stuck.	Replace pilot valve assembly.

(2) Hydraulic motor does not start powerfully.

Symptom	Cause	Remedy
A set pressure is normal, but brake release lags behind.	Brake valve malfunctions.	Investigate brake valve.
Mechanical brake is released but the motor is late to start.	The viscosity of hydraulic oil is too high.	Raise the oil temperature.
Mechanical brake is released but the motor starts feebly.	1. Mechanical brake is not released completely. The orifice in the release pressure path is clogged with dirt.	1. Investigate to see if orifice is not clogged.
	2. Dirt is included in relief valve.	2. Clean relief valve. Inspect seat surface of replace relief valve.
	3. Sliding surfaces are seized.	3. Inspect and repair sliding surface or replace relief valve.

(3) Revolution does not reach a set value.

Symptom	Cause	Remedy
Pressure does not reach a set value.	1. Oil flow is insufficient.	1. Inspect pump, delivery rate and the oil path to motor.
	2. Shoe, cylinder and valve plate are worn off or scratched much.	2. Inspect and repair faulty parts or replace faulty parts.

(4) Brake does not work.

Symptom	Cause	Remedy
Brake does not work	Mechanical brake malfunctions. (a) Friction plate is worn off. (b) Spring is broken.	Inspect and repair or replace brake piston, friction plate and spring.

(5) Oil leaks.

Symptom	Cause	Remedy
Oil leaks.	1. Socket bolt or plug is slacken.	1. Tighten screw or plug to a specified torque.
	2. O ring is scored.	2. Replace O ring.
	3. Oil leaks in gear casing.	3. Replace oil seal.

1. SPECIFICATION

1.1 GENERAL VIEW

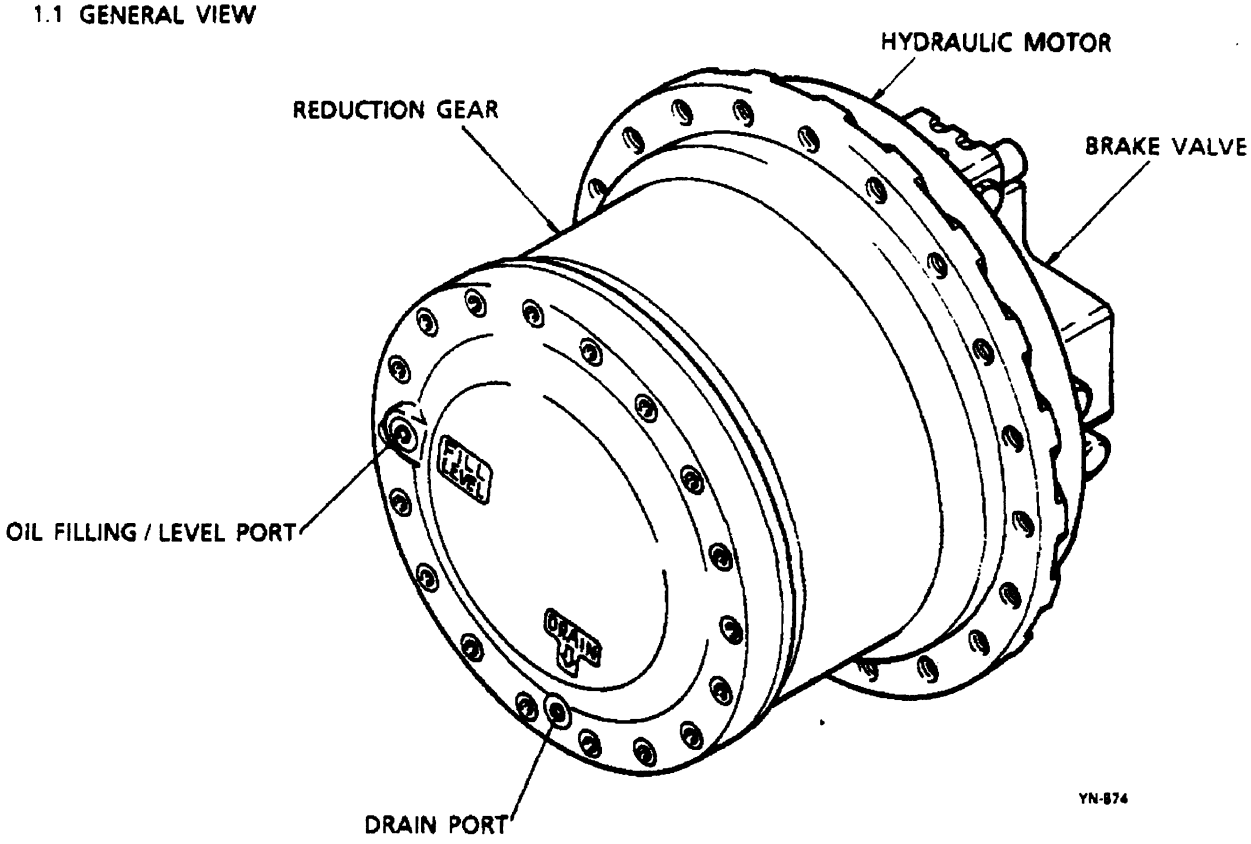


Fig. 1 Outside view of travel motor unit

1.2 SPECIFICATION

Table 1

Parts No. & TYPE	Travel motor unit	YN15V00007F1	M3V130/70−RG3.5
	• Motor	YN15V00009F1	M3V130/70Z
	• Reduction	YN53D00004F1	—
Number of reduction stages		2-Stage	
Reduction ratio		49.33	
Oil volume		7ℓ (1.85gal)	Gear oil (At shipment) SAE90 (API Group GL−4) or Engine oil SAE#30 (CD class)
Weight	Travel motor unit	240kg (529 lbs) (Dry)	
	Motor	83kg (183 lbs)	
	Reduction	157kg (346 lbs)	

1.3 CONSTRUCTION

The travel unit functions with a travel motor incorporated in its interior. Therefore, gear oil or engine oil can not be filled in unless the travel motor is mounted.

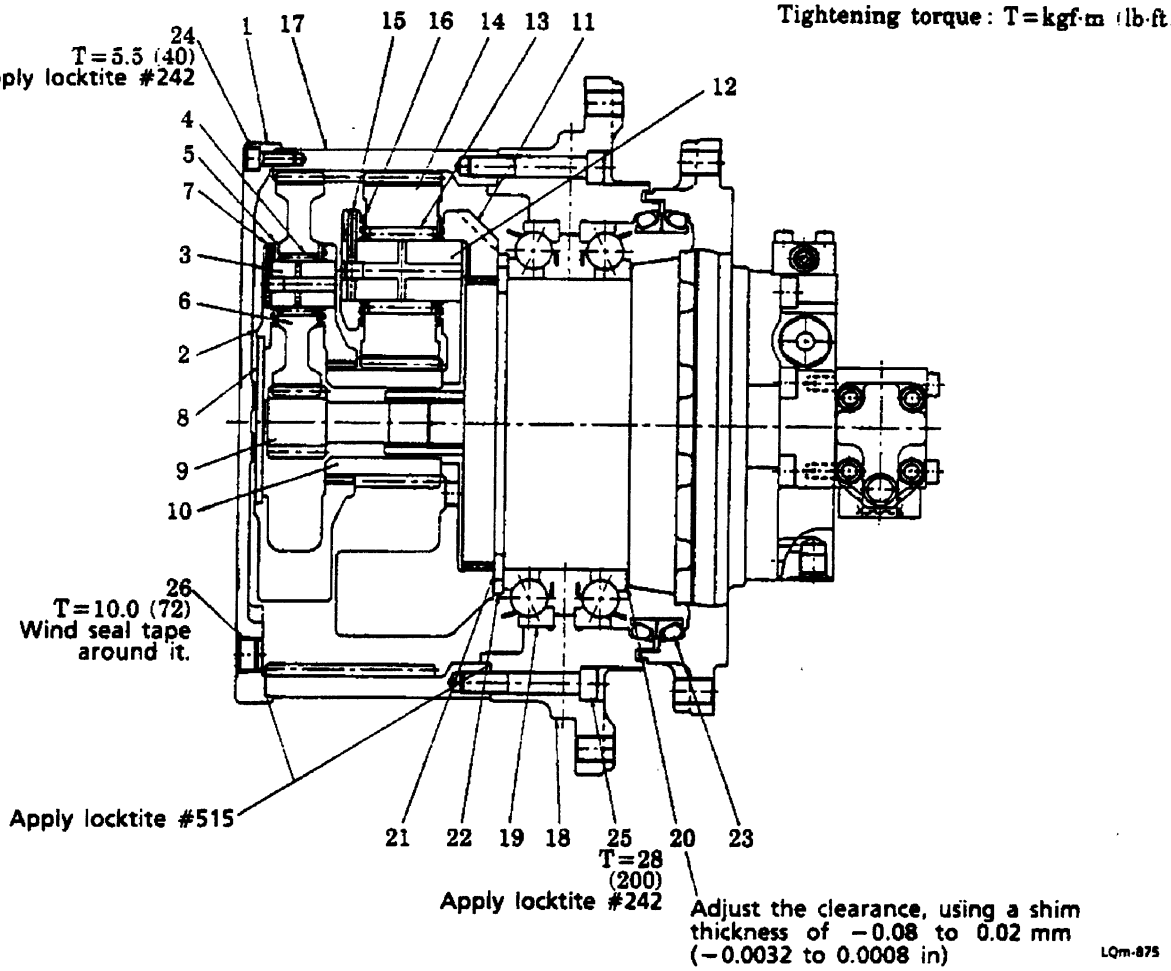


Fig. 2 Cross-sectional view of reduction unit.

Table 2 ☆ ; Apply locktite #242. ★ ; Wind seal tape around it.

TIGHTENING TORQUE kgf·m (lb·ft)	No.	NAME	Q'TY	TIGHTENING TORQUE kgf·m (lb·ft)	No.	NAME	Q'TY
	1	COVER	1		14	• PLANETARY 2	3
		#1 CARRIER ASSY			15	• SPRING PIN ; 6×36	3
	2	• CARRIER 1 (SPIDER 1)	1		16	• THRUST WASHER 2	6
	3	• CARRIER PIN 1	3			HOUSING ASSY	
	4	• NEEDLE BEARING	3		17	• RING GEAR	1
	5	• THRUST WASHER 1	6		18	• HOUSING	1
	6	• PLANETARY 1	3		19	• BEARING	2
	7	• SPRING PIN ; 4×22	3		20	• SHIM	1
	8	THRUST PLATE	1		21	• LOCK WASHER	2
	9	SUN GEAR 1	1		22	• SUPPORT RING	1
	10	SUN GEAR 2	1		23	• FLOATING SEAL	1
		#2 CARRIER ASSY		5.5 (40) ☆	24	• SOCKET BOLT ; M10×25	15
	11	• CARRIER 2 (SPIDER 2)	1	28 (200) ☆	25	SOCKET BOLT ; M16×80	18
	12	• CARRIER PIN 2	3	10.0 (72) ★	26	PLUG ; PT3/4	2
	13	• NEEDLE BEARING	3				

2.2 FUNCTIONAL PRINCIPLE

The reduction unit reduces the revolution of the hydraulic motor and converts into powerful rotating force.

The reduction unit employs a two-stage planetary reduction mechanism.

The planetary mechanism is composed of a planetary pinion, a sun gear, a carrier and a ring gear.

When sun gear (s) on the input side is turned, planetary pinion (b) rotates in mesh with fixed ring gear (a), while revolving itself.

The revolving motion is transmitted to carrier (k) to provide torque. This is the planetary mechanism.

PLANETARY MECHANISM

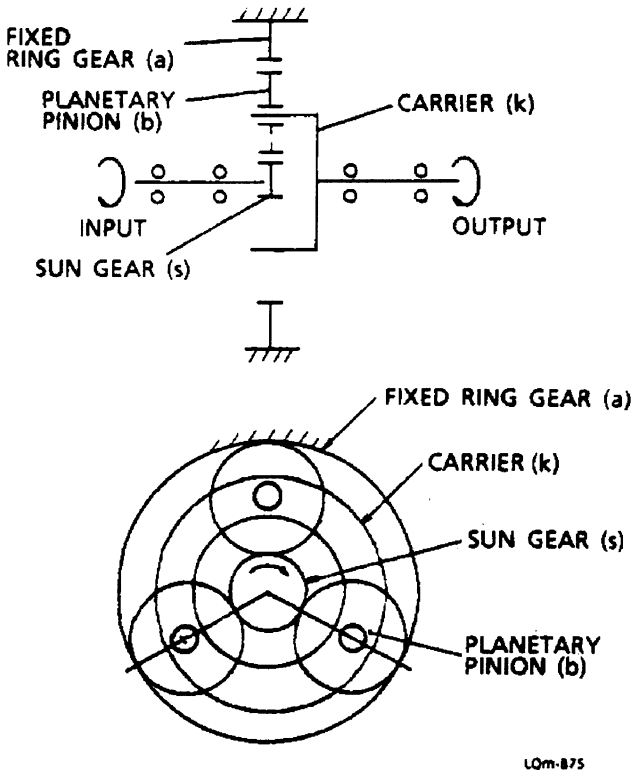


Fig. 3

In Fig. 4, if sun gear (S1) on the input side is turned, planetary motion occurs between gear (S1), (a), and (b). The revolution of gear (b) transmits the input of carrier (K1) to No. 2 sun gear (S2) which in turn brings about planetary motion between gear (S2), (a), and (d). In that case, gear (d) transmits power to the ring gear to turn it as carrier (K2) is fixed to the track frame on the travel side.

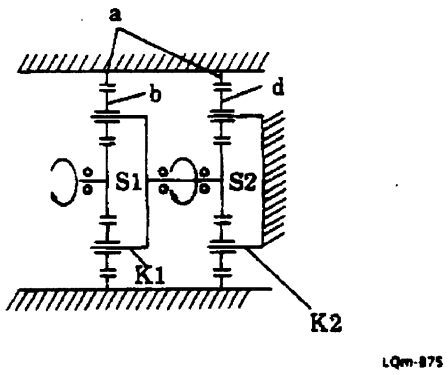


Fig. 4

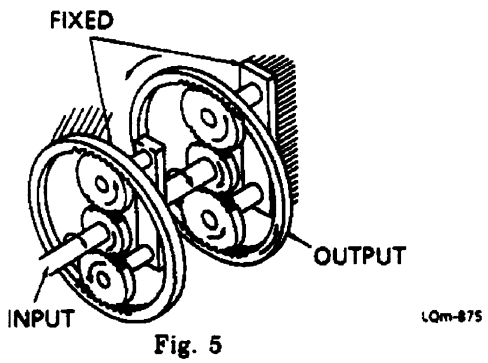


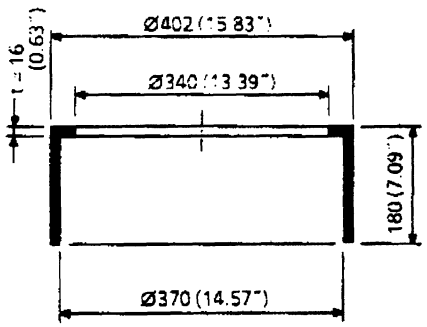
Fig. 5

3. REMOVAL AND INSTALLATION

3.1 TOOLS

Before removal and installation, prepare tools, jigs and measuring instruments.

Table 3 Unit : mm (in)

No.	NAME	Application
1	Torque wrench	0~30kgf·m (0~220 lb·ft)
2	Hexagon wrench	HEX 8, 14
3	Locktite	#242, #515
4	Stand	
5	Micro depth meter	
6	Steel rod	For driving in the spring pin Ø3.5×75 (Ø0.14"×2.95"), Ø5×55 (Ø0.20"×2.17")

3.2 PREPARATION BEFORE REMOVAL

1) The travel unit removed from the machine has dust and mud. Wash them with cleaning oil.

⚠ Clean the motor after confirming that ports are plugged.

2) Loosen drain plug (26) and drain the oil out of the reduction unit.

⚠ Note that internal pressure is generated occasionally when oil is hot. Take care as oil may blow out in some cases.

3) Put a matching mark on the outside of each matching surface so it may be installed where it was.

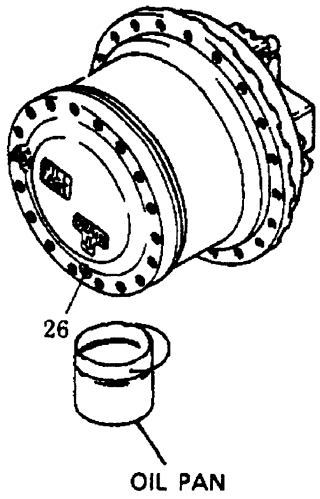


Fig. 6 Draining oil

3.3 REMOVAL

The figures in parentheses after part names in the instructions correspond to those in Fig. 2.

(1) Preparation removal

1) Remove three socket bolt M10 (24) mounting cover (1), attach eye bolts in the holes, lift the motor up, and install the motor to the mount with the cover facing up.
2) Remove the remaining twelve socket bolt M10 (24).
3) Since the contact surfaces of cover (1) and ring gear (17) are coated with adhesive, place a wooden block on the projecting part of the cover, knock it obliquely upwards with a hammer, and remove cover (1),

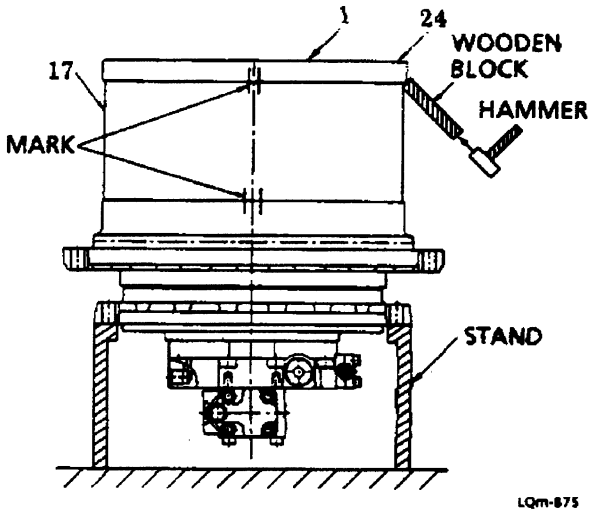


Fig. 7 Removing cover (1)

(2) Removing #1 Carrier Assy

1) Remove thrust plate (8).
2) Remove sun gear 1 (9).
3) Place three M10 eye bolt in carrier pin 1 (3) and remove #1 carrier assy (2, 3,4, 5, 6, 7).

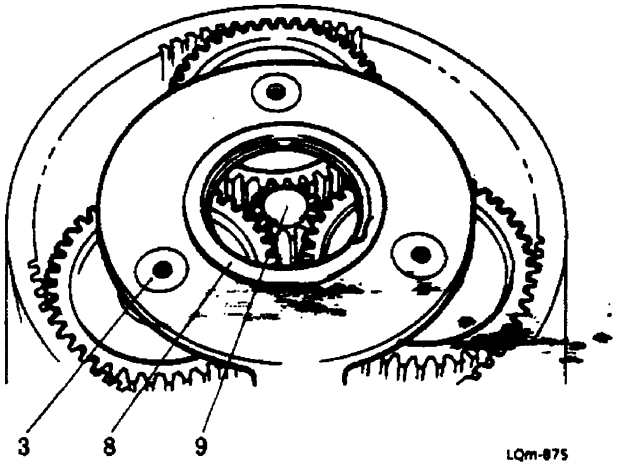


Fig. 8 Removing #1 carrier assy

(3) **Removing #2 carrier assy**

1) **Remove sun gear 2 (10). (Refer to Fig. 2.)**
2) **Place three M10 eye bolt in carrier pin 2 (12) and remove #2 carrier assy (11, 12, 13, 14, 15, 16).**

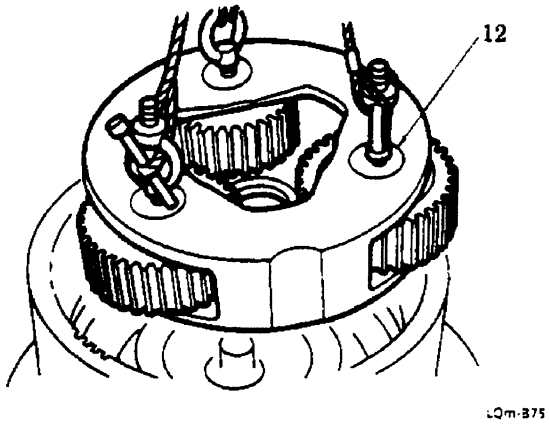


Fig. 9 Removing #2 carrier assy

(4) **Removing housing assy**

1) **Remove support ring (22).**
2) **Remove lock washer (21) by hammering on something like a screwdriver that is placed in the split surface.**

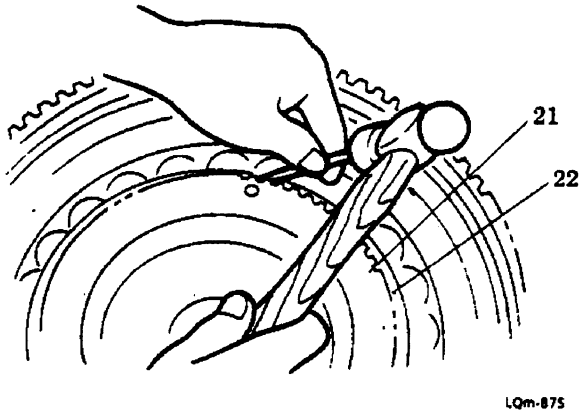


Fig. 10 Removing support ring (22)

3) **Place an eye bolt in each of the three M10 tapped holes in ring gear (17). Then remove housing assy [ring gear (17), housing (18), bearing (19), and floating seal (23)].**

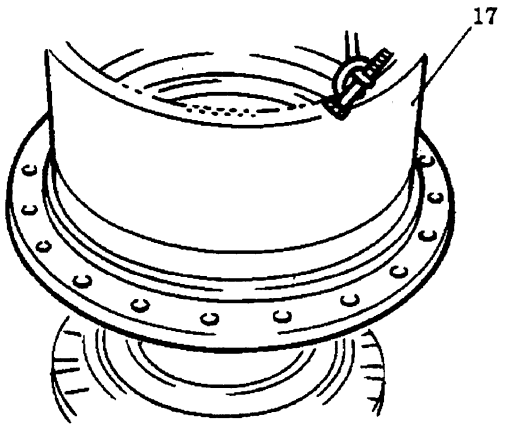


Fig. 11 Removing housing assy

(5) Removing housing assy

Place the housing assy on a work bench so ring gear (17) comes under housing (18).

1) Separate floating seal (23) from housing (18).
2) Remove eighteen socket bolt M16 (25).
3) Loosen two socket bolt M16 (25) that are located diagonally opposite to each other and keep them upright. Tap them lightly with a hammer and ring gear (17) comes off easily from housing (18).

- Use care so as not to score the moving surface of the floating seal and the O ring.

- The outer circumference of the bearing is engaged with the bore diameter of the housing by a very close fit. Do not remove them except when necessary.

- When the bearing has been separated from the housing, do not use it again, but replace it with a new one.

(6) Removing the floating seal on the travel motor side

1) Remove the floating seal (23) on the motor side.

Regarding the removal and installation of the travel motor, refer to the Travel Motor part of this shop manual.

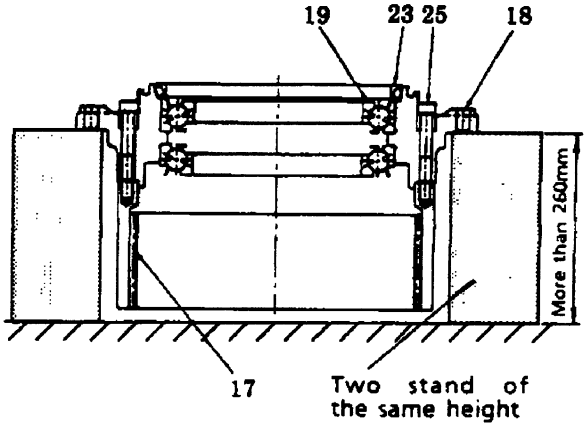


Fig. 12 Removing housing assy

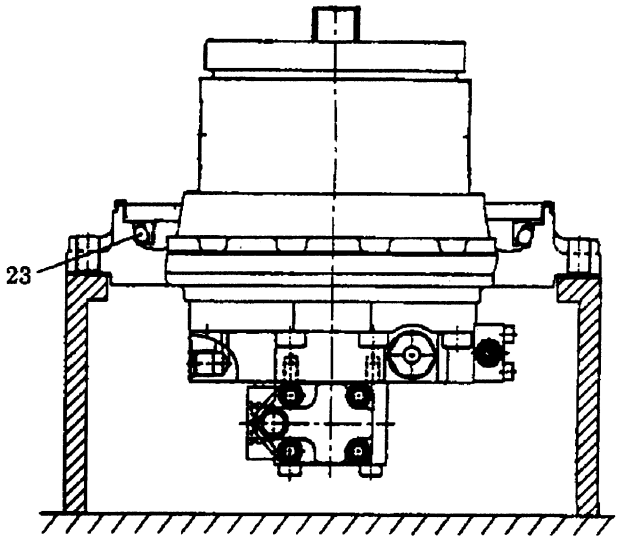


Fig. 13 Removing floating seal (23)

(7) Removing #1 carrier assy

1) Press spring pin (7) into carrier pin (3).
2) Remove carrier pin 1 (3) from carrier 1 (2).
3) Separate thrust washer 1 (5), planetary gear 1 (6), and needle bearing (4).
4) Draw spring pin (7) from carrier pin 1 (3).

- When replacing the carrier pin 1 or the planetary gear 1, always replace a set of three at one time.
- When reusing a carrier pin 1, store it by putting a sign in the carrier 1 hole and the carrier pin 1 so they are assembled the same way before they were removed.

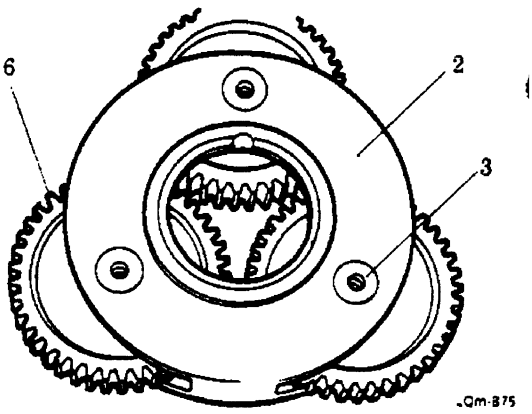


Fig. 14-1 #1 carrier assy

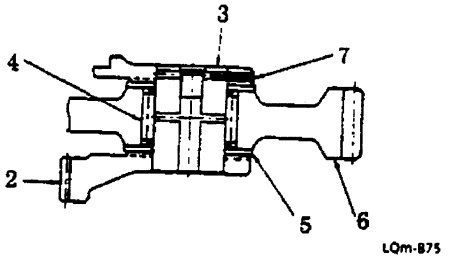


Fig. 14-2 #1 carrier assy

(8) Removing #2 carrier assy

1) Press spring pin (15) into carrier pin 2 (12).
2) Remove carrier pin 2 (12) from carrier 2 (11).
3) Separate thrust washer 2 (16), planetary gear 2 (14), and needle bearing (13).
4) Draw spring pin (15) from carrier pin 2 (12).

- When replacing the carrier pin 2 or the planetary gear 2, always replace a set of three at one time.
- When reusing a carrier pin 2, store it by putting a sign in the carrier 2 hole and the carrier pin 2 so they are assembled the same way before they were removed.

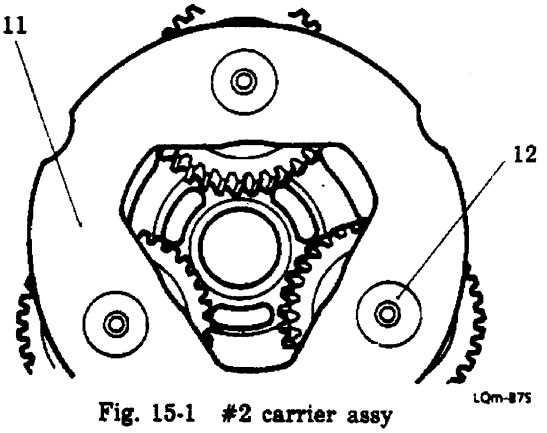


Fig. 15-1 #2 carrier assy

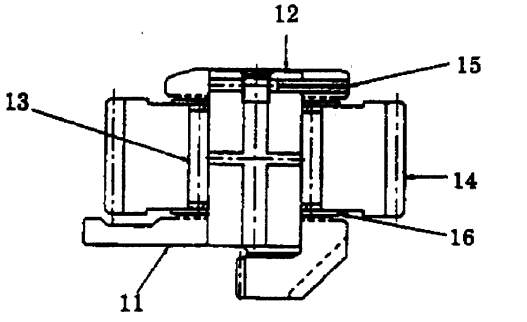


Fig. 15-2 #2 carrier assy

3.4 INSTALLATION

(1) General precautions

1) Clean parts thoroughly in cleaning oil and dry it up by jet air. Degrease areas to coated with locktite, using thinner or something.
2) Check that parts are free from fault.
3) Coat socket bolt with locktite #242, before tightening them.
4) The tightening torques for socket bolt are shown below:
   M10 – 5.5kgf·m (40 lb·ft)
   M16 – 28kgf·m (200 lb·ft)
5) Coat component parts with a thin film of gear oil before assembly.

(2) Installing #2 carrier assy

1) Install planetary gear 2 (14), needle bearing (13), and thrust washer 2 (16) into carrier 2 (11).
2) Align carrier pin 2 (12) with the direction of the spring pin bore and install it into carrier 2 (11).
3) Install spring pin (15) into carrier 2 (11) and carrier pin 2 (12).

(3) Installing #1 carrier assy

1) Install planetary gear 1 (6), needle bearing (4), and thrust washer 1 (5) into carrier 1 (2).
2) Align carrier pin 1 (3) to the direction of the spring pin hole and put it into carrier 1 (2).
3) Install spring pin (7) into carrier 1 (2) and carrier pin 1 (3).

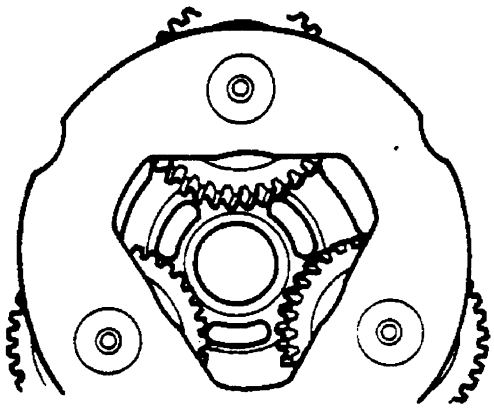


Fig. 16-1 #2 carrier assy

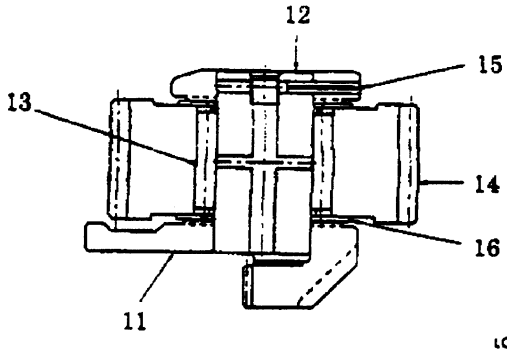


Fig. 16-2 #2 carrier assy

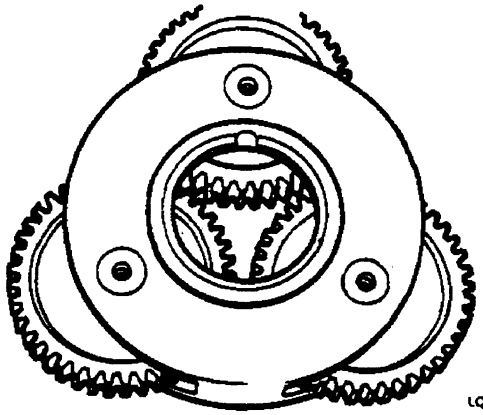


Fig. 17-1 #1 carrier assy

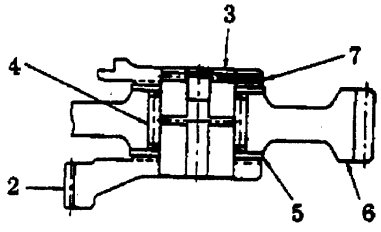


Fig. 17-2 #1 carrier assy

(4) Installing floating seal

1) Install floating seal (23) on the motor side.

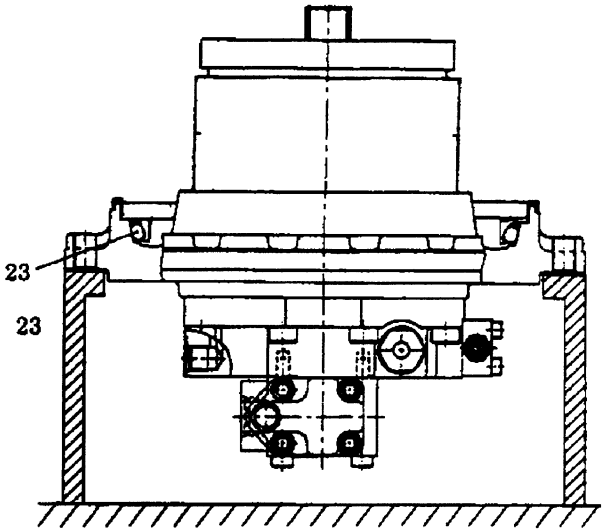


Fig. 18 Installing floating seal (23)

(5) Installing housing assy

1) Apply locktite #515 to the matching surface of housing (18) and ring gear (17).
2) Attach three eye bolt M18 in housing (18), lift it with a wire sling, align the matching marks, and install the housing to ring gear (17).
3) Apply locktite #242 to eighteen capscrews M16×80 (25) and tighten them up.
   : 14mm,
   Tightening torque 28kgf·m (200 lb·ft)
4) Install floating seal (23) to the housing side.

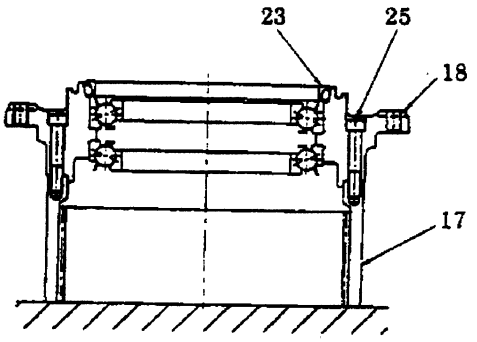


Fig. 19 Installing housing assy

- Clean the floating seal to be free from oil, dirt, paint and other foreign matter.
- Coat the moving part of the floating seal with a thin film of gear oil.
- Fix the O ring so it is not twisted.
- Confirm that the floating seal is fixed parallel to the housing and the motor, as illustrated.

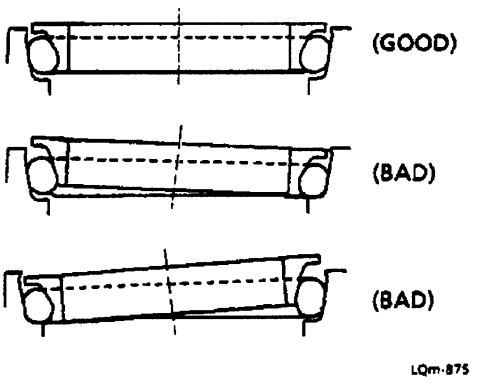


Fig. 20 Method of installing the floating seal

(6) Confirming the clearance between the bearing and the motor

1) Press the inner races of two bearing (19) evenly and measure the assembled width (A) of the inner races.
2) Measure the width (B) of the assembled part of the motor bearing.
3) Measure the width (C) of groove on the motor.
4) Measure the thickness (D) of lock washer (21).

● In the above measurements, measure four diagonally intersecting points on the circumference and get a mean value.

5) Suppose the thickness of shim (20) being used is (S), the clearance (X) is as follows:
$X=(B+C)-(A+D+S)$
6) Select one shim that makes the clearance X to $-0.08\sim0.02$mm ($-0.0032\sim0.0008$in).
("+" represents clearance, while "−" represents press-fit.)

(7) Pressing fit the motor

1) Place the motor on a level stand with its shaft facing up. Then place shims (20) selected under 6) above, on the end face in which motor bearing is inserted.
2) Attach three M10 eye bolt to ring gear (17) and lift it up, bring it down slowly vertically matching it to the center of the motor and insert bearing (19) fixed in the bore of housing (18) into the motor. Press the inner race of the bearing (19) to full depth, using a press.
3) Fix lock washer (21) into the groove, pressing the flange of housing (18).
4) Fix support ring (22) in the outside of lock washer (21).

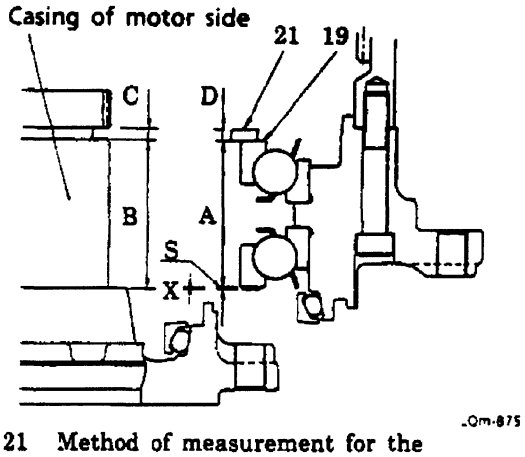


Fig. 21 Method of measurement for the selection of shims

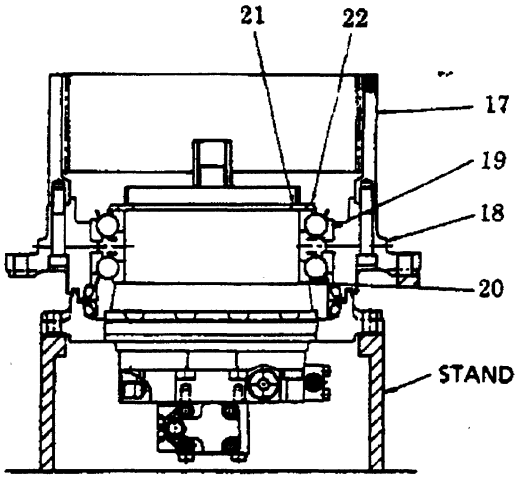


Fig. 22 Pressing fit the motor assy and the housing assy LQm-875

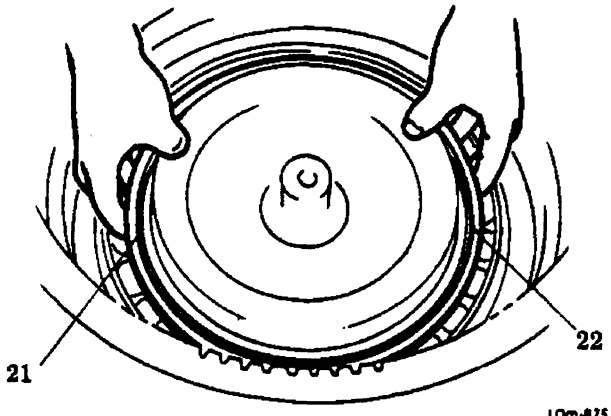


Fig. 23 Fixing support ring (22)

(8) Installing #2 carrier assy

1) Place the #2 carrier assy in ring gear (17) and engage it with the motor spline so that three #2 planetary gears are placed in the illustrated position.
2) Insert sun gear 2 (10).

- The reason why the #2 carrier assy is assembled in the illustrated position is to maintain it for oil lubrication.

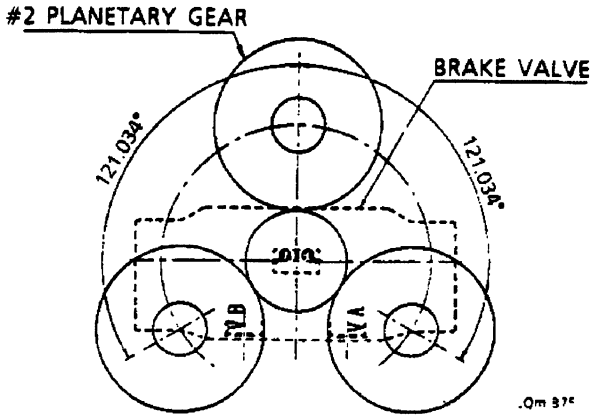


Fig. 24 Installing position of #2 carrier assy

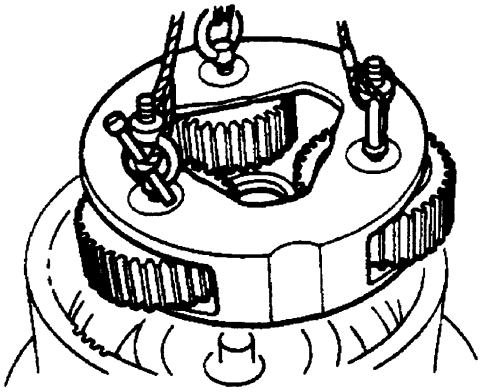


Fig. 25 Installing #2 carrier assy

(9) Installing #1 carrier assy

1) Put the #1 carrier assy into ring gear (17). Turn the ring gear by hand to correct position and engage it with sun gear 2 (10).
2) Insert sun gear 1 (9).
3) Put thrust plate (8) into carrier 2 assy.

(10) Installing cover

1) Apply locktite #515 to the matching surface between cover (1) and ring gear (17). Then install cover (1) to ring gear (17).
2) Apply locktite #242 to fifteen socket bolt M10×25 (24) and tighten them up.
   : 8mm,
   Tightening torque 5.5kgf·m (40 lb·ft)

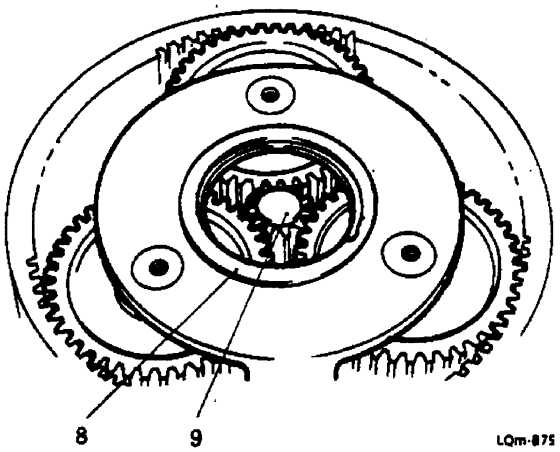


Fig. 26 Installing #1 carrier assy

(11) Filling gear oil

1) Fill gear oil (SEA90API, Group GL−4) 7ℓ (1.85gal) in through the PT3/4 hole of plug (26), wind seal tape around it and install it to cover (1).
   : 14mm,
   Tightening torque 5.5kgf·m (40 lb·ft)

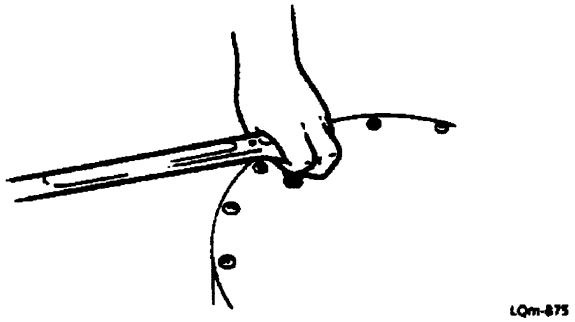


Fig. 27 Installing cover (1)

4. MAINTENANCE STANDARDS

4.1 SHIM ADJUSTING PROCEDURE

(1) For the adjustment of clearance C of the bearing, see page 11.

4.2 MAINTENANCE STANDARDS

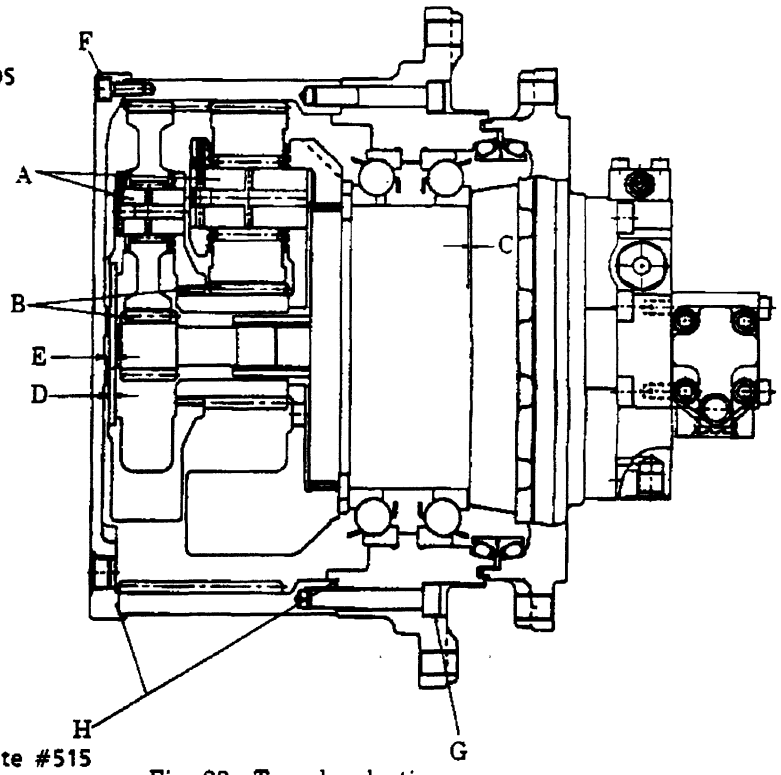


Fig. 28 Travel reduction

Table 4 Unit : mm (ft-in)

No.	Item		Standard Value	Allowable Value	Remedy
A	Wear of planetary shaft	#1 shaft #2 shaft	0	When max, wear has reached 0.5 (0.020") or over.	Replace three-piece set.
B	Tooth face condition		To be smooth	There is pitching of diameter min. 1.6mm (0.063"), abnormal wear or seizure.	Replace a three-piece set of #1, 2 planetary pinions.
C	Thrust clearance at bearing inner race		−0.08~0.02 (−0.003"~0.0008")		Shim adjustment
D	Clearance between the thrust plate and the sun gear 1		1.2 (0.047")		
E	Clearance between the thrust plate and the cover		1.5 (0.059")		
F	Tightening torque for socket bolt		M10 : 5.5kgf·m (40lb·ft)		Locktite #242 (or equivalent) and retighten to a tightening torque.
G			M16 : 28kgf·m (200lb·ft)		
H	Matching surface		Ring gear (17) and Housing (18) Ring gear (17) and Cover (1)		Apply locktite #515

KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: May 14, 1999

BULLETIN: HE-337
Page 1 of 1

SUBJECT: EMERGENCY SHUT OFF SYSTEM

AFFECTED MACHINES: SK100/SK115DZ/SK120/SK130/SK150/SK200/SK220/SK270/SK300/ SK400 MARK IV EXCAVATORS WITH CUMMINS ENGINES

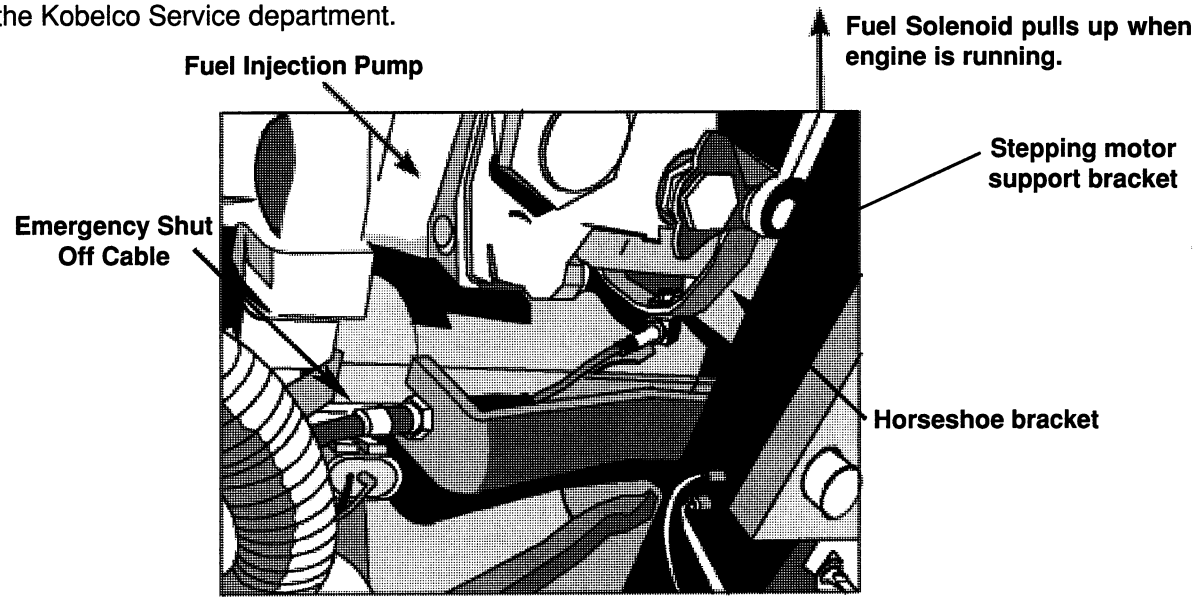
We have received complaints on problems with the emergency shut off system on the Kobelco excavators. These complaints have been mainly due to erratic functioning of the emergency shut off cable due to distortion on the brackets and linkage connected to the fuel injection pump.

Please be advised that the emergency shut off system is designed solely for the purpose of killing the engine when the ignition key fails to shut it off. Correct use of the Emergency Stop System is to first turn the key off, if the engine fails to stop, pull the emergency stop cable to shut down the engine.

Investigation reveals that many mechanics and operators tend to test the emergency system for proper functioning during the Pre Delivery Inspection with the engine running and the ignition key in the **"ON"** position. It is important to note that when the engine is running and the key is in the **"ON"** position, the engine fuel solenoid is in the hold position ***(engine run)*** requiring a great amount of force to pull it to the off position ***(engine off)***. Consequently if you pull the emergency cable when the solenoid is still energized ***(engine running)***, the forces required to pull the solenoid off the run position are extremely high on the connecting bracket. This may cause a distortion on the bracket, particularly on the horseshoe bracket used on the fuel injection pump of the SK220 Mark IV excavator equipped with Cummins engine.

The emergency shut off system should be tested with the ignition key in the **"OFF"** position only. Check for sufficient cable travel to move the governor control lever to the fuel cut off position.

The picture shown below is a close-up of the emergency shut off cable on the SK220LC Mark IV (Cummins Engine). Should you have any other questions or concerns regarding this issue, please do not hesitate to contact the Kobelco Service department.



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KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: June 7, 1999

BULLETIN: HE-338
Page 1 of 7

SUBJECT: INSTALLATION OF COLD START LATCHING RELAY
(Instalación del relé para arranques en climas extremadamente fríos)

AFFECTED MACHINES: SK100/SK115DZ/SK120/SK130/SK150/SK200/SK220/SK270/SK300/ SK400 MARK IV EXCAVATORS WITH CUMMINS ENGINES

Some cases have been reported of erratic starter functioning, particularly in extreme cold weather or when the machine has run out of fuel and air still exists in the fuel system. This pertains only to machines equipped with Cummins engine.

(Se han reportado varios casos de funcionamiento errático de los motores de arranque, particularmente en climas con temperaturas ambientales extremadamente frías, como también cuando las máquinas se han quedado sin combustible y existe aire dentro del sistema de combustible. Este problema ocurre sólo en las máquinas equipadas con motores Cummins).

Investigation reveals that when starting the engine under the above conditions, the engine could fire only in a couple of cylinders. This is not enough to start the engine, but sufficient engine RPM to make the alternator generate enough voltage to cause the safety relay to cut out, disengaging the starter. Without the starter engaged, the engine RPM and the voltage drop; thus, engaging the starter once again (all this happens without even releasing the key switch from the starting position). This repeated off and on cycle of the starter continues until the engine finally starts. If experiencing this problem, installation of latching relay P/N 2479U2136 will control the intermittent disengagement of the starter during cold starting conditions or aerated fuel start ups. Please follow the instructions in this bulletin to install this new latching relay.

(La investigación revela que durante el arranque del motor, el motor podría encender sólo en un par de cilindros, lo cual no es suficiente para darle arranque total al motor, aunque la velocidad del motor es suficiente para que el alternador genere el voltaje necesario y así el relé de seguridad corte la tierra al relé de arranque causando el desacople del motor de arranque. La velocidad del motor es reducida al igual que el voltaje generado por el alternador debido a que el arranque desacopla y a que el motor sólo gira por la acción de dos cilindros, sin ni siquiera haber soltado el interruptor de encendido. Esto hace que el relé de seguridad vuelva a conectar la tierra para permitir que el arranque enganche la cremallera del volante nuevamente. Este ciclo intermitente del arranque continúa hasta que el motor finalmente arranca. Si usted llega a tener este problema, se recomienda la instalación adicional de un nuevo relé de enganche número de parte 2479U2136 entre el relé de arranque y el relé de seguridad para controlar la tierra del relé de arranque y evitar así el desacople intermitente del motor de arranque durante los arranques en climas muy fríos, al igual que los arranques durante la presencia de aire en el sistema de combustible. Por favor siga las instrucciones de este boletín para la instalación del relé adicional para el acople apropiado del motor de arranque).

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Table of contents *(Tabla de contenido)*

WARNING (Advertencia)

Read, understand and follow all safety precautions and procedures found in the operator's manual for the machine before attempting any operation, inspection or maintenance of this machine, its attachments and/or systems. Kobelco cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this publication and on the product are therefore not all inclusive. If a tool, procedure, work method or operating technique not specifically recommended by Kobelco is used, you must satisfy yourself that it is safe for you and others. You should also ensure that the product will not be damaged or made unsafe by the operation, lubrication, maintenance and/or repair procedures you choose. *(Lea, entienda y siga todas las precauciones de seguridad y procedimientos que encuentre en este manual antes de intentar cualquier operación, inspección, o mantenimiento de los implementos o sistemas de esta máquina. Kobelco no puede abarcar todas las circunstancias que originen situaciones de peligro. Consequentemente, las advertencias mencionadas en esta publicación sirven sólo como guía para su seguimiento en estos casos. Si se utiliza alguna herramienta, procedimiento, método de trabajo o técnica de operación no recomendado por Kobelco, usted será responsable de su seguridad como la de terceros. Asímismo, deberá serciorarse de que el producto se encuentre en buen estado de trabajo y sea seguro para su operación, lubricación, o mantenimiento).*

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I. Tools needed *(Herramientas necesarias)*

A. One 3/8" drive rachet *(Un rache de 3/8")*
B. One 3/8" deep socket X 3/8" drive *(Un dado profundo de 3/8" para rache de 3/8")*
C. Two 10 mm combination wrenches *(Dos llaves combinadas de 10 mm)*
D. One 19 mm combination wrench *(Llave de combinación de 19 mm)*

II. Prepare machine *(Prepare la máquina)*

A. Move the machine to firm level ground. Place the attachments on the ground as indicated in Fig. 3A.
(Mueva la máquina hacia terreno firme y nivelado. Posicione los implementos sobre el suelo, tal como lo indica la Fig. 3A)

1. Place the throttle control in low idle and turn the ignition key off, see Fig. 3B.
   (Coloque el acelerador en relantí y apague el motor. Ver Fig. 3B).

2. Place the safety lever in the lock and up position before leaving the cab, see Fig. 3C.
   (Levante la palanca de seguridad antes de salir de la cabina. Ver Fig. 3C).

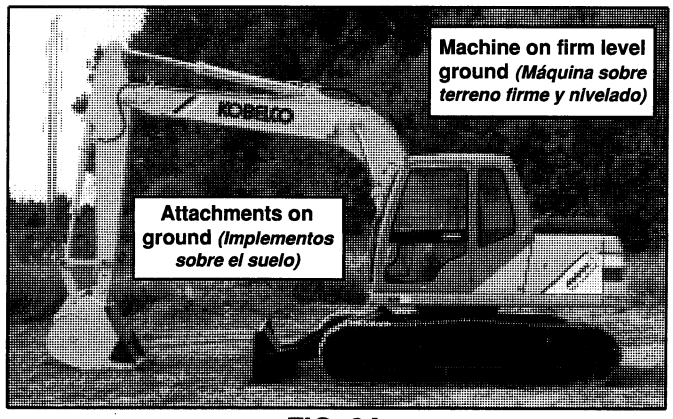


FIG. 3A

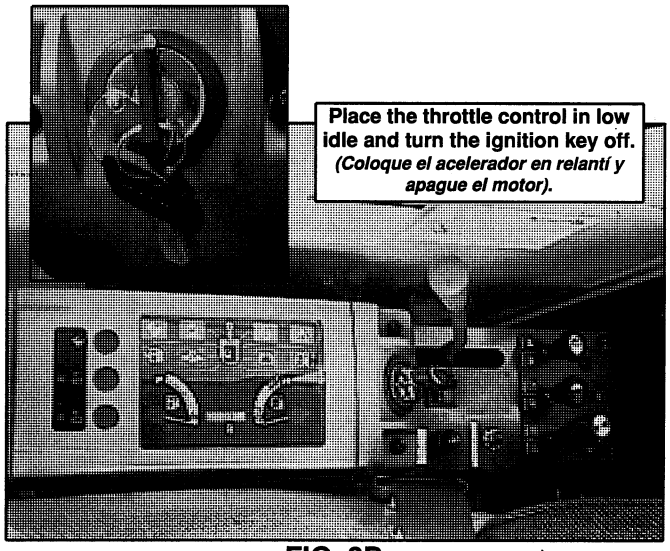


FIG. 3B

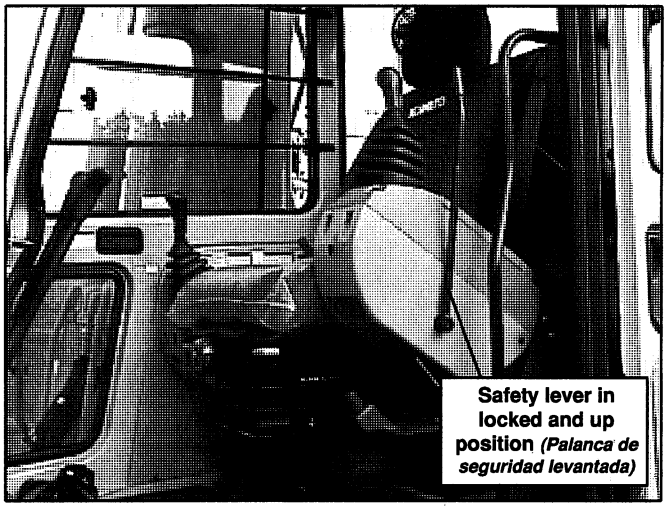


FIG. 3C

CAUTION (Cuidado)

SUDDEN MOVEMENT OF THE MACHINES /OR ITS ATTACHMENTS CAN CAUSE INJURY OR DEATH. MAKE SURE TO GROUND THE TOOLS, AND PLACE THE SAFETY LOCK LEVER IN ITS LOCKED AND UP POSITION BEFORE LEAVING THE CAB TO PREVENT SUDDEN MOVEMENT OF MACHINE AND/OR ITS ATTACHMENTS, SEE FIG. 3A & 3C. ***(PARA PREVENIR CUALQUIER MOVIMIENTO DE LA MAQUINA, SIEMPRE POSICIONE LOS IMPLE-MENTOS SOBRE EL SUELO Y LEVANTE LA PALANCA DE SEGURIDAD ANTES DE SALIR DE LA CABINA (Ver Fig. 15). SI NO LEVANTA LA PALANCA DE SEGURIDAD ANTES DE SALIR DE LA CABINA, CORRE CON EL RIESGO DE MOVER LA MAQUINA Y/O SUS IMPLEMENTOS REPENTI-NAMENTE CAUSANDO UN ACCIDENTE).***

WARNING(Advertencia)

Use safety protection such as: hard hat, working gloves, safety shoes and safety glasses when needed to perform this job.
(Protéjase apropiadamente con casco de seguridad, guantes de trabajo, zapatos y lentes de seguridad).

III. Remove engine lower cover *(Remueva la tapa inferior del motor)*

A. Use the 19 mm combination wrench to remove the three bolts located on the right side of the engine bottom cover, see Fig. 4A. *(Utilice la llave de combinación de 19 mm para remover los trés tornillos del lado derecho de la tapa inferior del motor, ver Fig. 4A).*

B. Using the same wrench, loosen the three bolts located on the left side of the cover, see Fig. 4A.

NOTE *(Nota)*

You do not need to completely remove the three bolts that support the engine bottom cover. The bolt holes are slotted for easy removal of the cover.
(No necesita sacar completamente los trés tornillos del lado izquierdo de la tapa. Las perforaciones para los tornillos son ranuradas para permitir fácilmente la remoción de la tapa).

Remove the cover by grabing it from the right side and slide it out towards the right side of the machine.
(Remueva la tapa agarrándola por el lado derecho y deslícela hacia el lado derecho).

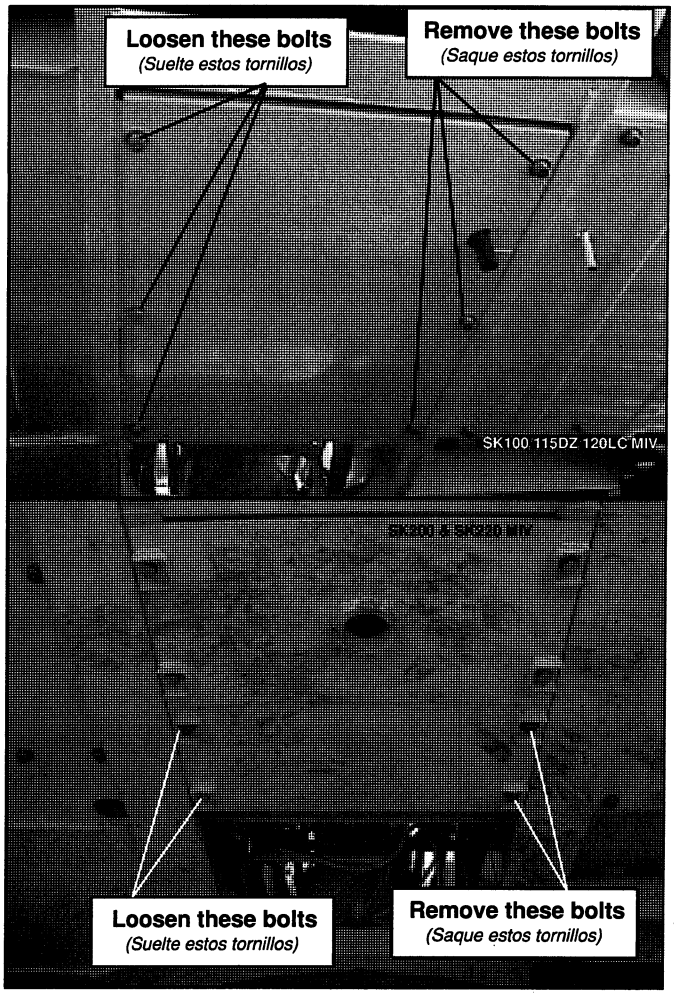


FIG. 4A

IV. Install the new Latching Relay P/N: 2479U2136 *(Instale el relé de enganche Nº 2479U2136)*

A. Locate the starter relay bolted on the upper frame towards the front of the machine, see Fig. 4B. *(Ubique el relé de arranque atornillado al chasis de la estructura superior, al frente del motor, ver Fig. 4B).*

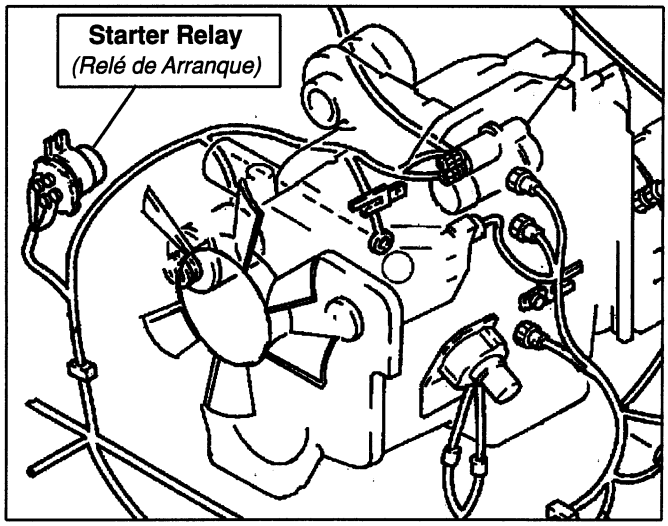
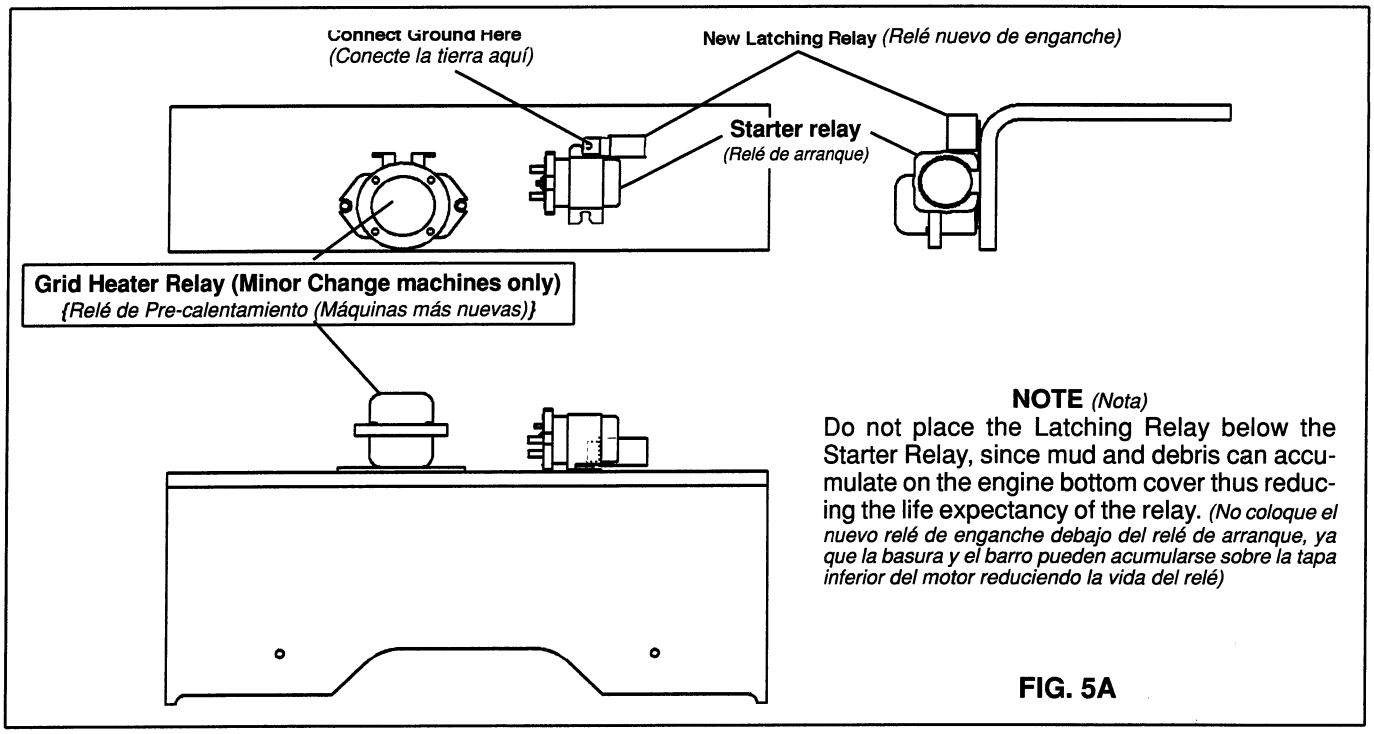


FIG. 4B

COLD START LATCHING RELAY (Relé para arranques en climas fríos)

B. Use Fig. 5A as reference, remove the top bolt (33 - Fig. 5B) that holds the starter relay and place the new latching relay on top of the starter relay. *(Utilice la Fig. 5A como referencia, remueva el tornillo superior (33 - Fig. 5B) que sujeta el relé de arranque e instale el nuevo relé de enganche encima del relé de arranque).*



NOTE *(Nota)*
Do not place the Latching Relay below the Starter Relay, since mud and debris can accumulate on the engine bottom cover thus reducing the life expectancy of the relay. *(No coloque el nuevo relé de enganche debajo del relé de arranque, ya que la basura y el barro pueden acumularse sobre la tapa inferior del motor reduciendo la vida del relé)*

FIG. 5A

C. Use Fig. 5B as reference. Use the two 10 mm combination wrenches to remove the starter relay top support bolt-33 and install the new latching relay. Make sure that the latching relay wires face the right side of the machine. *(Utilice la Fig. 5B como referencia. Use las llaves de 10 mm para sacar el tornillo superior-33 que sujeta el relé de arranque e instale el relé de enganche nuevo. Asegúrese de colocar el nuevo relé de enganche en la misma posición que indica la figura.)*

D. See Fig 5B and use the 3/8" X 3/8" drive deep socket to remove the nuts from the starter relay and install the wires of the new latching relay as follows:
(Ver Fig. 5B y use el dado profundo de 3/8" para remover las tuercas del relé de arranque e instale los cables del nuevo relé de enganche de la siguiente manera:)

1.- Connect the Blue wire with terminal 23B (Lg - Light Green wire) on the starter relay. *(Conecte el cable azúl con el terminal 23B (Lg - cable verde claro) del relé de arranque).*

2.- Connect the White-Black wire with terminal 28A (WB - White/Black wire) on the starter relay. *(Conecte el cable blanco y negro con el terminal 28A (WB - cable blanco/negro) del relé de arranque).*

3.- Install the ground (Black wire) on the same bolt that will hold the latching relay with the starter relay. *(Instale el cable negro de tierra con el mismo tornillo que sujetará el nuevo relé con el relé de arranque).*

E. Use Fig. 7 as reference to check your installation.
(Utilice la Fig. 7 como referencia para chequear la instalación)

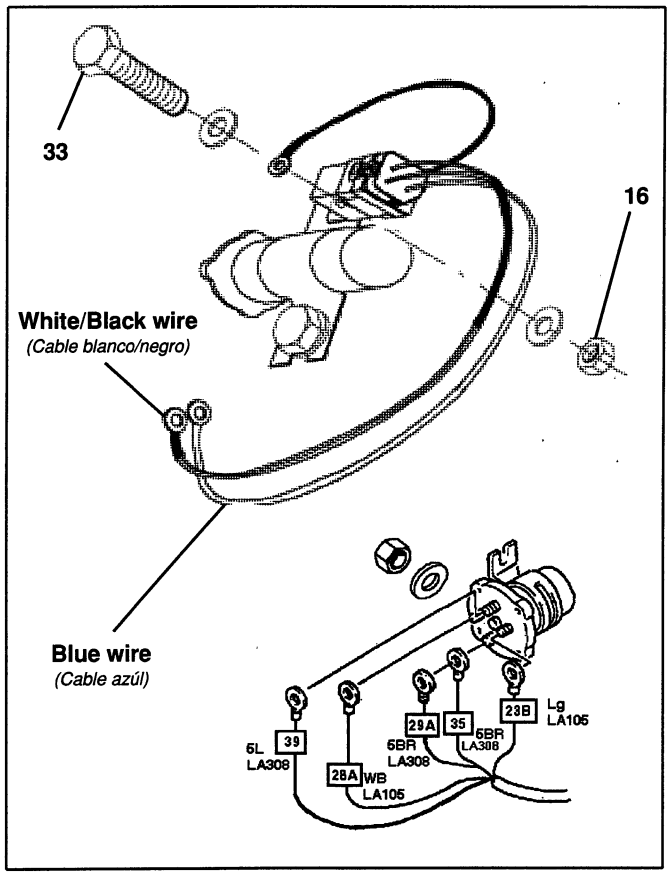


FIG. 5B

V. Test installation for proper functioning. *(Pruebe la instalación por funcionamiento apropiado).*

A. Make sure the throttle control lever is positioned in low idle, see Fig. 6A.*(Asegúrese de que la palanca de aceleración se encuentra en relantí, ver Fig. 6A)*

B. Make sure the Safety Lever is positioned in its locked and up position, see Fig. 6B.*(Asegúrese de que la palanca de seguridad se encuentra levantada, ver Fig. 6B)*

CAUTION (Cuidado)

SUDDEN MOVEMENT OF THE MACHINES &/OR ITS ATTACHMENTS CAN CAUSE INJURY OR DEATH. MAKE SURE TO GROUND THE TOOLS, AND PLACE THE SAFETY LOCK LEVER IN ITS LOCKED AND UP POSITION BEFORE LEAVING THE CAB TO PREVENT SUDDEN MOVEMENT OF MACHINE AND/OR ITS ATTACHMENTS, SEE FIG. 3A & 3C.*(PARA PREVENIR CUALQUIER MOVIMIENTO DE LA MAQUINA, SIEMPRE POSICIONE LOS IMPLE-MENTOS SOBRE EL SUELO Y LEVANTE LA PALANCA DE SEGURIDAD ANTES DE SALIR DE LA CABINA (Ver Fig. 15). SI NO LEVANTA LA PALANCA DE SEGURIDAD ANTES DE SALIR DE LA CABINA, CORRE CON EL RIESGO DE MOVER LA MAQUINA Y/O SUS IMPLEMENTOS REPENTI-NAMENTE CAUSANDO UN ACCIDENTE).*

C. Beep the horn to warn any personal around the machine that it is being started and turn the ignition key to start the engine, see Fig. 6C.*(Haga sonar la bocina para alertar al personal que se encuentra cerca de la máquina que la misma va a ponerse en funcionamiento y gire el interruptor de encendido para darle arranque, ver Fig. 6C. Deje el acelerador en relantí)*

D. With the engine running at low idle, use an Ohmmeter to measure the resistance between the ground terminal (Black wire) of the latching relay and the Black and White wire connected at the starter relay, see Fig. 6D. The resistance across these two terminals should go to infinity; that is, these two points should be open. In some Ohmmeters the infinity reading would be shown as 0.L, as indicated in the figure. In others, the infinity reading would show a blinking zero or some type of icon. If you get a resistance value equal or greater than zero, but less than infinity, you must recheck your installation. Use Fig. 7 as reference to check the latching relay installation. *(Con el motor funcionando en relantí, utilice un ohmiómetro para medir la resistencia entre el terminal de tierra -cable negro- del relé de enganche y el cable blanco y negro conectado al relé de arranque, ver Fig. 6D. La resistencia entre estos dos terminales debe ser infinita, lo que quiere decir que estos dos puntos se encuentran abiertos. En algunos ohmiómetros la lectura de infinito aparece como 0.L, tal como lo indica la figura; en otros, la lectura aparece como un cero intermitente u otro tipo de señal intermitente. Si la resistencia entre ambos terminales es igual o mayor que cero,pero menor que infinito, debe revisar la instalación. Utilice la Fig. 7 como referencia para chequear la instalación del relé de enganche).*

E. Reinstall the engine bottom cover and make sure to properly tighten the bolts. *(Vuelva a colocar la tapa inferior del motor y asegúrese de apretar apropiadamente los tornillos).*

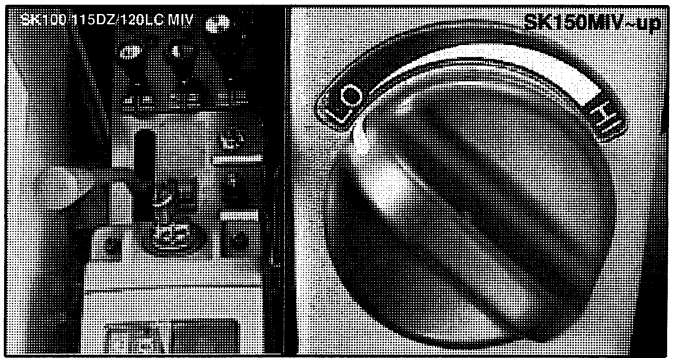


FIG. 6A

FIG. 6B

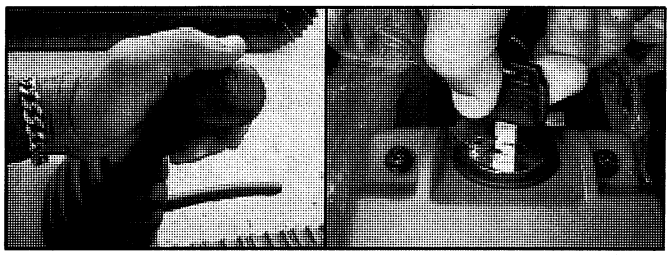


FIG. 6C

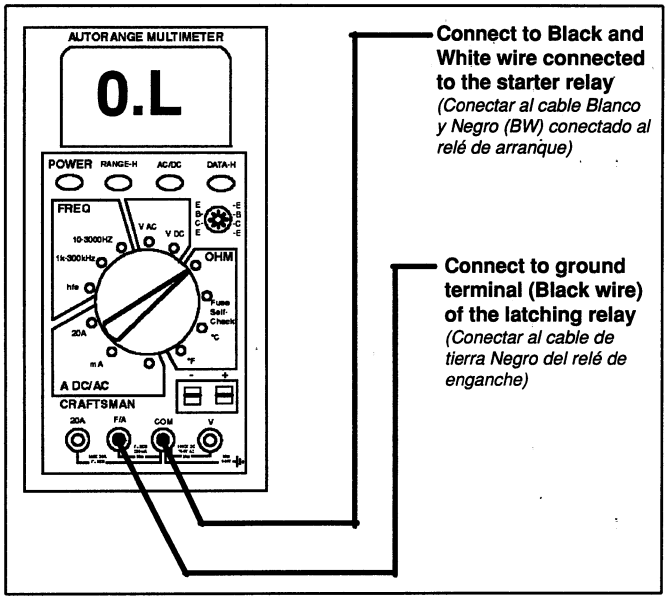
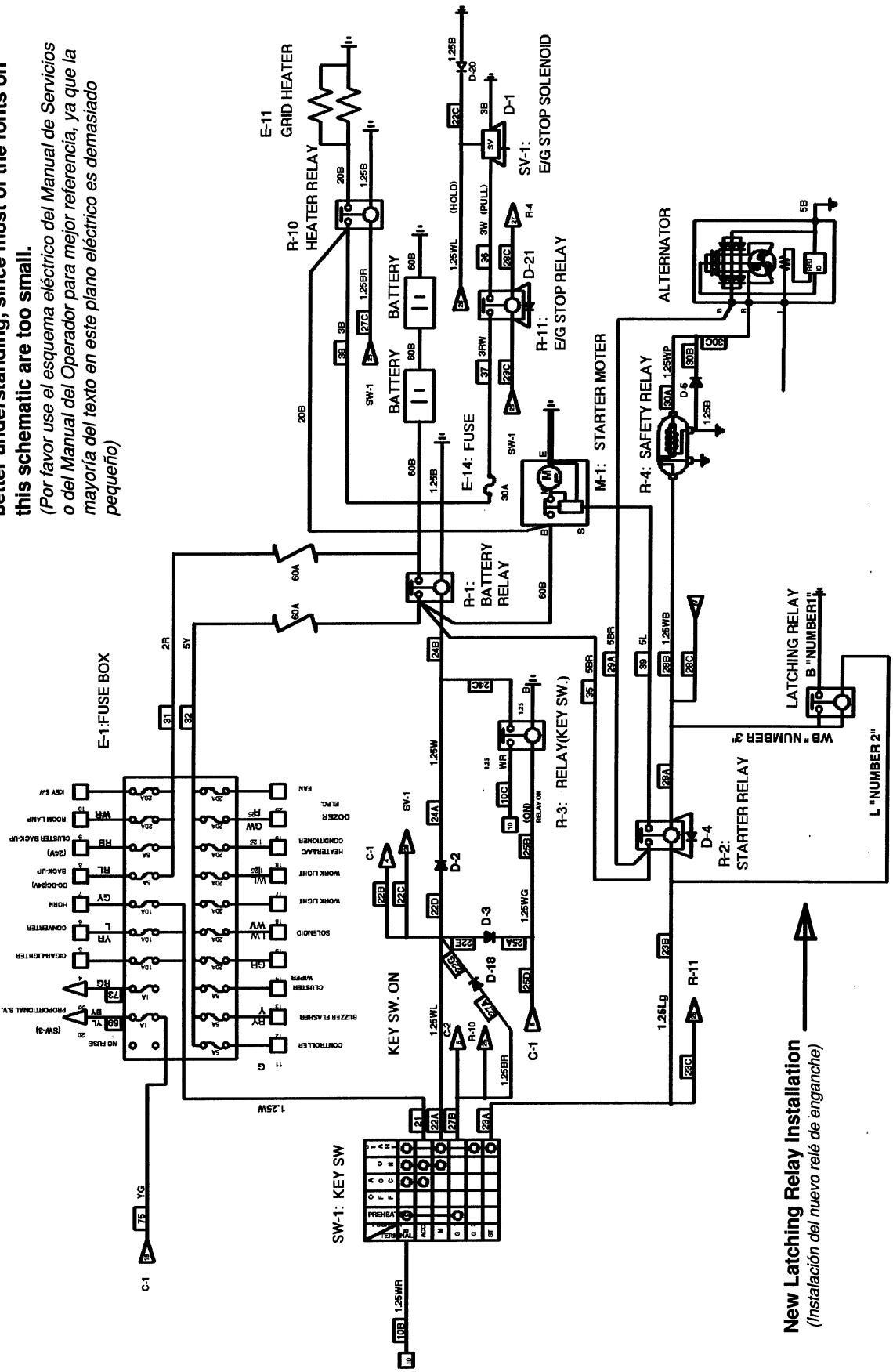


FIG. 6D

FIG. 7: Electrical Schematic showing the proper installation of the Latching Relay.
(Esquema Eléctrico de la instalación del Relé de Enganche)

NOTE *(Nota)*: **Please use the Electrical Schematic from the Shop Manual or the Operator's Manual for better understanding, since most of the fonts on this schematic are too small.**
(Por favor use el esquema eléctrico del Manual de Servicios o del Manual del Operador para mejor referencia, ya que la mayoría del texto en este plano eléctrico es demasiado pequeño)



KOBELCO

SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: May 12, 1999

BULLETIN: HE-340
Page 1 of 8

SUBJECT: INSTALLATION OF THROTTLE LEVER ADAPTER (One Touch Auto Decel)
(Instalación del adaptador en la palanca de aceleración - One Touch Auto Decel)

AFFECTED MACHINES: SK100/SK120LC AND SK115DZ/SK130LC MARK IV HYDRAULIC EXCAVATORS WITH ONE TOUCH AUTO DECEL SYSTEM

Please be advised that the affected machines can experience erratic throttle control operation. This pertains only to machines equipped with the One Touch Auto Decel function. *(Se les informa que las máquinas afectadas pueden tener problemas de aceleración. Este problema ocurre sólo con las máquinas equipadas con el sistema de aceleración automática)*

If you receive complaints of low power on the above models equipped with the O.T. Auto Decel, please start the engine and check the following: *(Si usted recibe quejas de baja potencia en los modelos equipados con el sistema de aceleración automática, por favor arranque el motor y realice el siguiente chequeo):*

A.- Bring the machine to full throttle and record the high idle value. *(Coloque la palanca de aceleración en máx. RPM y tome el valor de las revoluciones)*

B.- Engage the O.T. Auto Decel function by quickly depressing the switch located on the right control handle. *(Active el sistema de auto-aceleración presionando el interruptor ubicado en la manilla derecha del operador)*

C.- Once again, depress the O.T. Auto Decel switch to bring the RPM to the full throttle position and record the high idle value. **DO NOT MOVE THE THROTTLE LEVER FROM ITS HIGH IDLE POSITION.** *(Nuevamente, presione el interruptor para colocar las RPM en su máx. posición y tome nota de su valor. **NOT MUEVA LA PALANCA DEL ACELERADOR**)*

D.- Repeat steps **B & C** and compare the values to the original reading taken in step **A**. *(Repita los pasos **B y C** y compare sus valores con el valor original tomado en el paso A.)*

If the high idle speed value has lowered after operating the O.T. Auto Decel function, we recommend you follow the instructions issued in this bulletin and install the parts listed below. Please contact the Kobelco Service Department and refer to Bulletin HE-340, Kobelco will provide the parts at no charge in most cases. *(Si el valor de las RPM en alta es más bajo que el inicial, entonces es recomendable que prosiga con las instrucciones que se indican en este boletín, e instale las partes listadas en la siguiente tabla. Por favor contacte al Departamento de Servicios de Kobelco y haga referencia al boletin HE-340, Kobelco proveerá las partes sin cargo alguno en la mayoría de sus casos).*

Note: This problem occurs in some cases because of misalignment between the decel motor bracket and the throttle lever, as well as improper adjustment of the throttle control lever friction clutches. *(Este problema ocurre en algunos casos por desalineación entre el varillaje y el motor de aceleración, como también al ajuste inapropiado de los embragues de fricción del varillaje).*

QUANTITY	PART NUMBER	DESCRIPTION
1	ZS28C06020	Cap Screw
1	2416T28714	Bracket
1	ZW26K06000	Lock washer
1	ZN18C06005	Nut
1	ZW16X06000	Washer

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(Este boletín es creado para información solamente y no es una autorización para cualquier reemplazo o reclamo de garantía.)

Table of contents *(Tabla de contenido)*

WARNING (Advertencia)

Read, understand and follow all safety precautions and procedures found in the operator's manual for the machine before attempting any operation, inspection or maintenance of this machine, its attachments and/or systems. Kobelco cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this publication and on the product are therefore not all inclusive. If a tool, procedure, work method or operating technique not specifically recommended by Kobelco is used, you must satisfy yourself that it is safe for you and others. You should also ensure that the product will not be damaged or made unsafe by the operation, lubrication, maintenance and/or repair procedures you choose. *(Lea, entienda y siga todas las precauciones de seguridad y procedimientos que encuentre en este manual antes de intentar cualquier operación, inspección, o mantenimiento de los implementos o sistemas de esta máquina. Kobelco no puede abarcar todas las circunstancias que originen situaciones de peligro. Consequentemente, las advertencias mencionadas en esta publicación sirven sólo como guía para su seguimiento en estos casos. Si se utiliza alguna herramienta, procedimiento, método de trabajo o técnica de operación no recomendado por Kobelco, usted será responsable de su seguridad como la de terceros. Asímismo, deberá serciorarse de que el producto se encuentre en buen estado de trabajo y sea seguro para su operación, lubricación, o mantenimiento).*

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I. Tools needed *(Herramientas necesarias)*

A. One 90 º Phillips Screwdriver *(Destornillador de estrías de 90º)*
B. One Standard Phillips Screwdriver *(Destornillador de estrías estándar)*
C. Two 10 mm combination wrenches *(2 llaves combinadas de 10 mm)*
D. One 13 mm combination wrench *(1 llave combinada de 13 mm)*
E. Two 19 mm combination wrenches *(2 llaves combinadas de 19 mm)*
F. Two 27 mm combination wrenches *(2 llaves combinadas de 27 mm)*
G. One pull scale 0 ~ 30 lbs (0 ~ 14 Kg) *(Un medidor de carga de 0 ~ 30 lbs (0 ~ 14 Kg))*

II. Prepare machine *(Prepare la máquina)*

A. Move the machine to firm level ground. Place the attachments on the ground as indicated in Fig. 3A.
(Mueva la máquina hacia terreno firme y nivelado. Posicione los implementos sobre el suelo, tal como lo indica la Fig. 3A)

1. Place the throttle control in low idle and turn the ignition key off, see Fig. 3B.
   (Coloque el acelerador en relantí y apague el motor. Ver Fig. 3B).

2. Place the safety lever in the lock and up position before leaving the cab, see Fig. 3C.
   (Levante la palanca de seguridad antes de salir de la cabina. Ver Fig. 3C).

⚠ CAUTION (Cuidado) ⚠

SUDDEN MOVEMENT OF THE MACHINES &/OR ITS ATTACHMENTS CAN CAUSE INJURY OR DEATH. MAKE SURE TO GROUND THE TOOLS, AND PLACE THE SAFETY LOCK LEVER IN ITS LOCKED AND UP POSITION BEFORE LEAVING THE CAB TO PREVENT SUDDEN MOVEMENT OF MACHINE AND/OR ITS ATTACHMENTS, SEE FIG. 3A & 3C. ***(PARA PREVENIR CUALQUIER MOVIMIENTO DE LA MAQUINA, SIEMPRE POSICIONE LOS IMPLE-MENTOS SOBRE EL SUELO Y LEVANTE LA PALANCA DE SEGURIDAD ANTES DE SALIR DE LA CABINA (Ver Fig. 15). SI NO LEVANTA LA PALANCA DE SEGURIDAD ANTES DE SALIR DE LA CABINA, CORRE CON EL RIESGO DE MOVER LA MAQUINA Y/O SUS IMPLEMENTOS REPENTI-NAMENTE CAUSANDO UN ACCIDENTE).***

⚠ WARNING(Advertencia) ⚠

Use safety protection such as: hard hat, working gloves, safety shoes and safety glasses when needed to perform this job.
(Protéjase apropiadamente con casco de seguridad, guantes de trabajo, zapatos y lentes de seguridad).

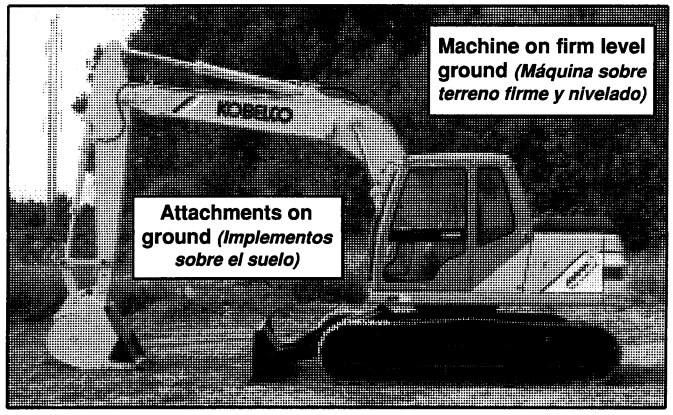


FIG. 3A

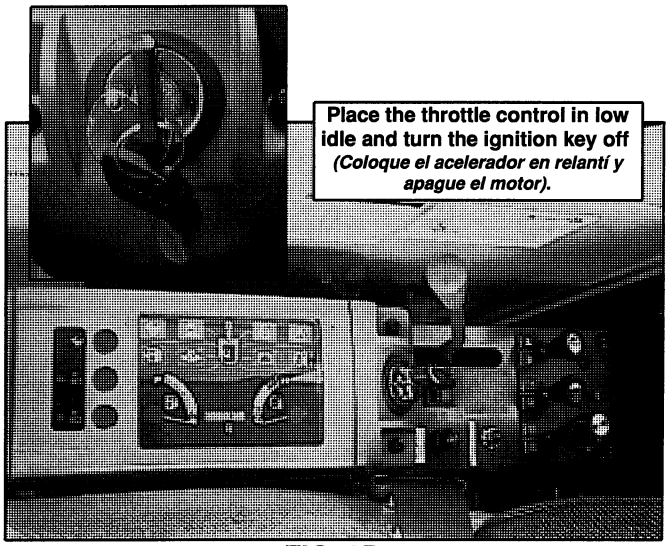


FIG. 3B

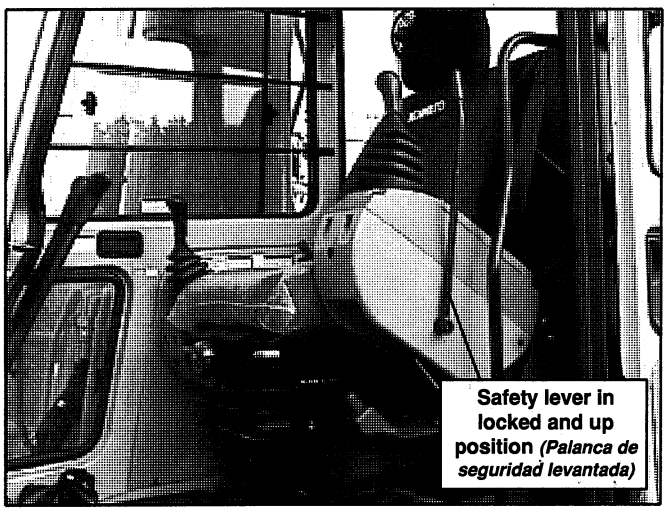


FIG. 3C

III. Disassemble Right Panel *(Desarme el panel derecho)*

A. Use the 90º phillips screwdriver to remove the lateral screws RL and RR, and use the standard phillips screwdriver to remove the front screws F from the Right Side console. Remove the cover as indicated in Fig. 4A. *(Utilice el destornillador de estrías de 90º para remover los tornillos laterales RL y RR, luego utilice el destornillador de estrías estándar para remover los tornillos frontales F. Remueva la tapa de plástico tal como lo indica la Fig. 4A).*

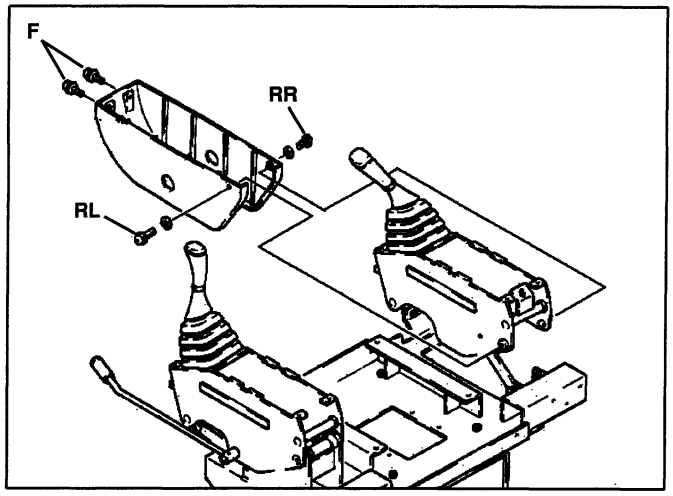


FIG. 4A

B. Remove the cleave, washer, and pin to disconnect the throttle control lever as indicated in Fig. 4B. *(Remueva el retén, la arandela y el pasador para soltar el varillaje del acelerador, tal como lo indica la Fig. 4B).*

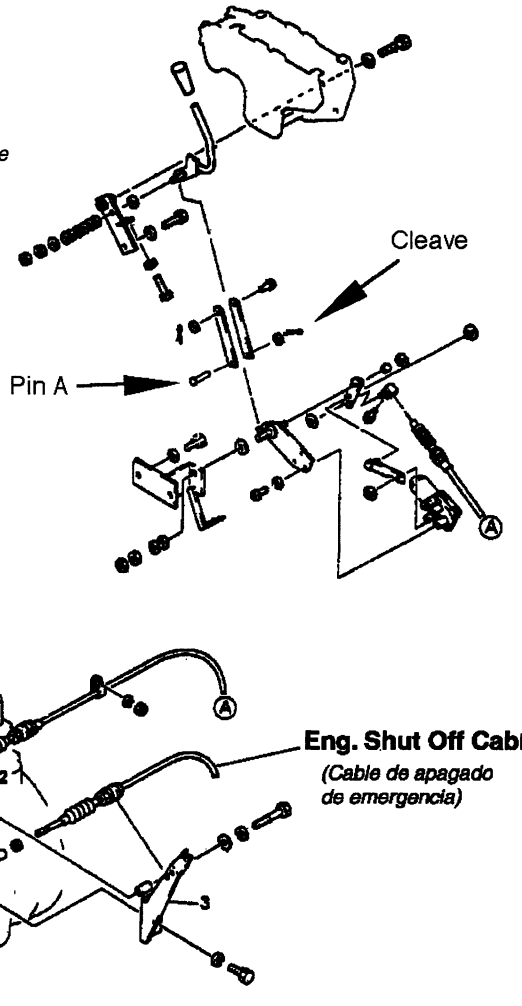


FIG. 4B

IV. Adjust throttle control clutches *(Ajuste los embragues del acelerador)*

A. With the Throttle control lever disconnected, install the scale on the upper cross of the decel motor as shown in Fig. 5A. *(Con el acelerador desconectado, instale el medidor de carga en el motor de desaceleración, tal como lo indica la Fig. 5A).*

B. Use two 27 mm wrenches to loosen the lock nut to adjust the **throttle control bottom clutch**. Tighten the clutch nut and pull on the scale to apply a force between 20 ~ 25 lbs (9 ~ 11.4 kg) on the decel motor and slowly loosen the clutch nut. Stop turning the clutch nut when any movement of the decel motor occurs and tighten the clutch lock nut. *(Utilice dos llaves de 27 mm para soltar la contratuerca del embrague inferior del acelerador. Aprete la tuerca del embrague y aplique una carga de 20~25 lbs (9~11.4 kg) en el motor de desaceleración. Afloje la tuerca del embrague cuidadosamente hasta que el motor se mueva y aprete la contratuerca).*

C. With the Throttle control lever still disconnected, install the scale on the throttle control handle as shown in Fig. 5B. *(Con el acelerador desconectado, instale el medidor de carga en la palanca de aceleración, tal como lo indica la Fig. 5B).*

D. Use two 19 mm wrenches to loosen the lock nut to adjust the **throttle control top clutch.** Tighten the clutch nut and pull on the scale to apply a force between 5 ~ 8 lbs (2.3 ~ 3.6 kg) on the throttle handle and slowly loosen the clutch nut. Stop turning the clutch nut when any movement of the throttle handle occurs and tighten the clutch lock nut. *(Utilice dos llaves de 19 mm para soltar la contratuerca del embrague superior del acelerador. Aprete la tuerca del embrague y aplique una carga de 5~8 lbs (2.3~3.6 kg) en el motor de desaceleración. Afloje la tuerca del embrague cuidadosamente hasta que el motor se mueva y aprete la contratuerca).*

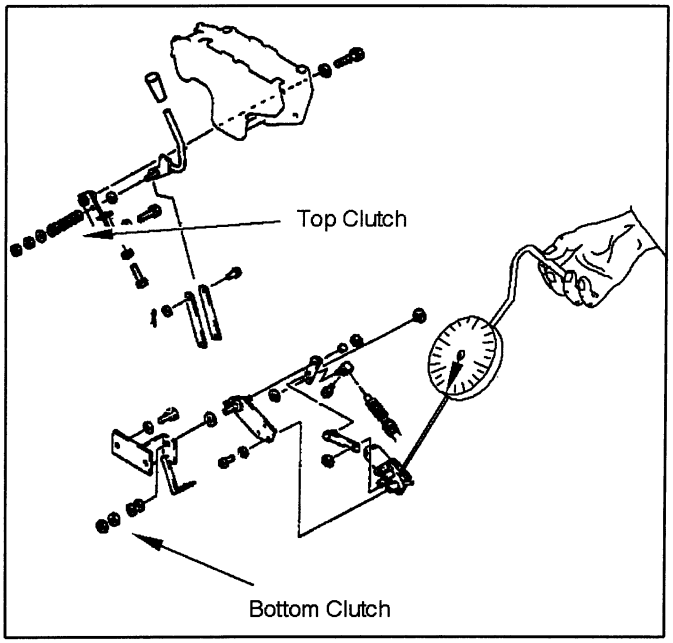


FIG. 5A

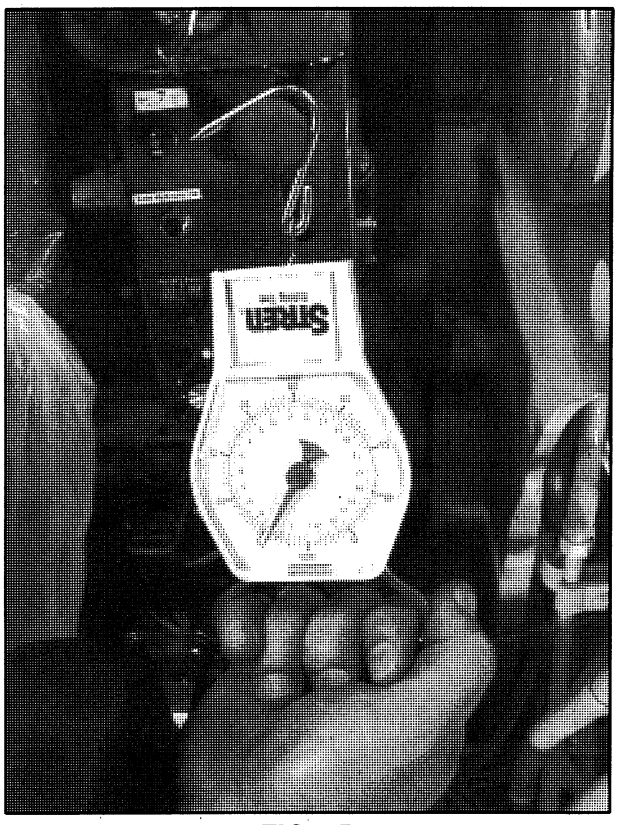


FIG. 5B

V. Install the new bracket 2416T28714 *(Instale el adaptador nuevo 2416T28714)*

A. See Fig. 6A to identify the new adapter to install on the throttle control lever. The new parts are as follows: *(Ver Fig. 6A para identificar el nuevo adapatador que debe instalarse en el control de aceleración. Las partes nuevas son:)*

1. Cap screw	**ZS28C06020**
2. Bracket	**2416T28714**
3. Lock washer	**ZW26K06000**
4. Nut	**ZN18C06005**
5. Washer	**ZW16X06000**

B. Install the new adapter as indicated in Fig. 6B and 6C. It is important that a flat washer, lock washer and nut be installed on the new bracket bolt, even though the bracket is threaded. *(Instale el adaptador nuevo tal como se indica en las Fig. 6B y 6C. Es importante que se instale una arandela plana, una de presión y una tuerca al tornillo que sujeta este nuevo adaptador, a pesar de que el tornillo enrrosca en el adaptador)*

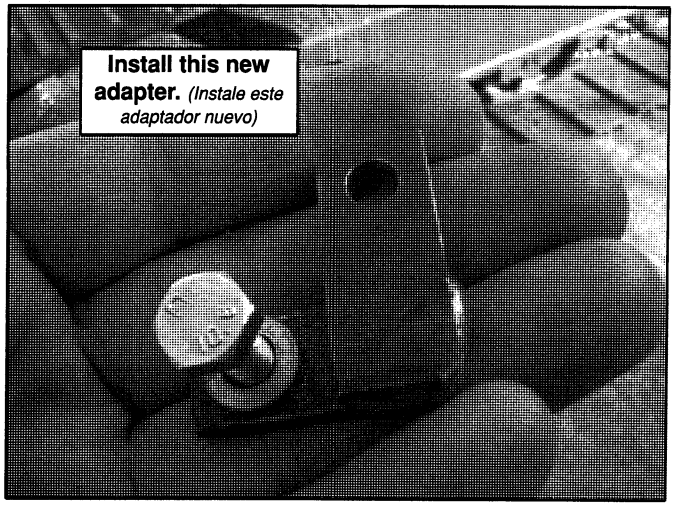


FIG. 6A

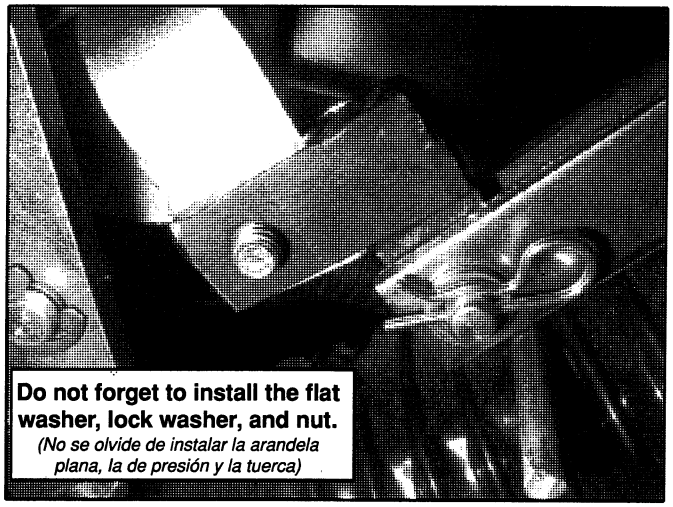
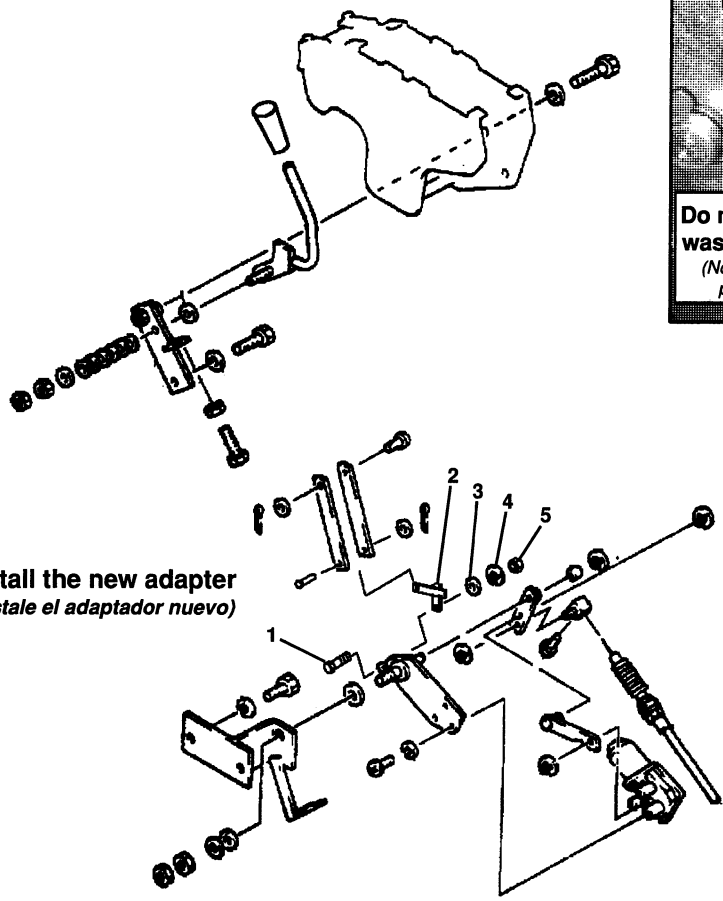


FIG. 6B



Install the new adapter
(Instale el adaptador nuevo)

FIG. 6C

VI. Adjust throttle travel *(Ajuste el desplazamiento del acelerador)*

A. Refer to Fig. 7A to locate the throttle lever stop bolt. *(Remítase a la Fig. 7A para ubicar el tornillo tope de la palanca de aceleración).*

B. Turn out the throttle lever stop bolt to the end of its adjustment. *(Saque el tornillo tope del acelerador hasta el máximo de su recorrido)*

C. Move the throttle control lever to the idle position, see Fig. 7B. *(Mueva la palanca de aceleración a la posición de relantí, see Fig. 7B)*

D. Loosen the throttle cable locking mechanism that holds the cable to the fuel injection governor control, see Fig. 7C for better reference. *(Afloje el mecanismo de seguridad que sujeta el cable de aceleración a la palanca del gobernador de la bomba de inyección, ver Fig. 7C)*

E. Hold the governor lever in low idle and pull the throttle cable to eliminate any slack. *(Sujete la palanca del gobernador en la posición de relantí y hale el cable de aceleración para eliminar juego alguno en el mismo)*

F. Lock the throttle cable mechanism to hold the cable in place. Recheck the throttle displacement by moving the throttle control lever to high idle and make sure that injection pump lever is in the full throttle position, that is against the stop in the injection pump. *(Tranque el mecanismo del cable para asegurar el cable de aceleración en su lugar. Revise el recorrido de aceleración colocando la palanca de aceleración en su máximo recorrido y asegúrese de que el acelerador en la bomba de inyección se encuentre haciendo tope con el tornillo de máximo ajuste en la bomba de inyección).*

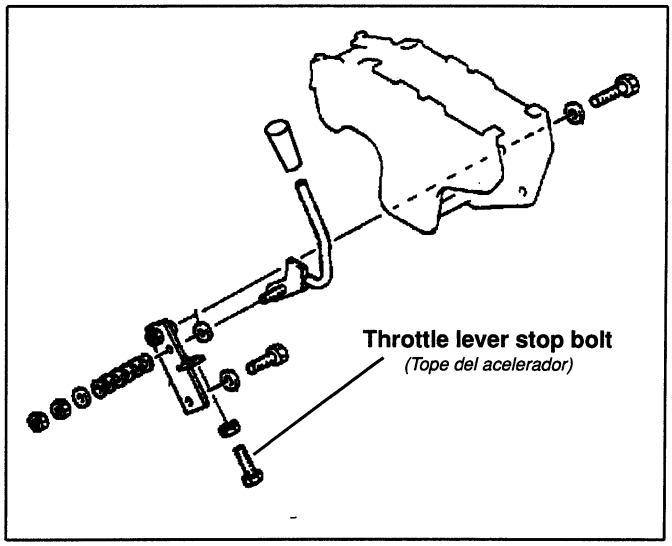


FIG. 7A

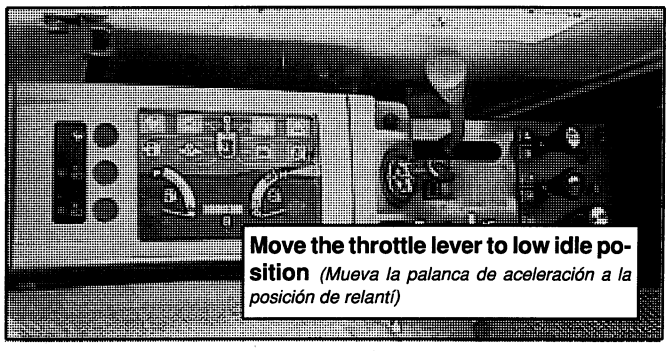


FIG. 7B

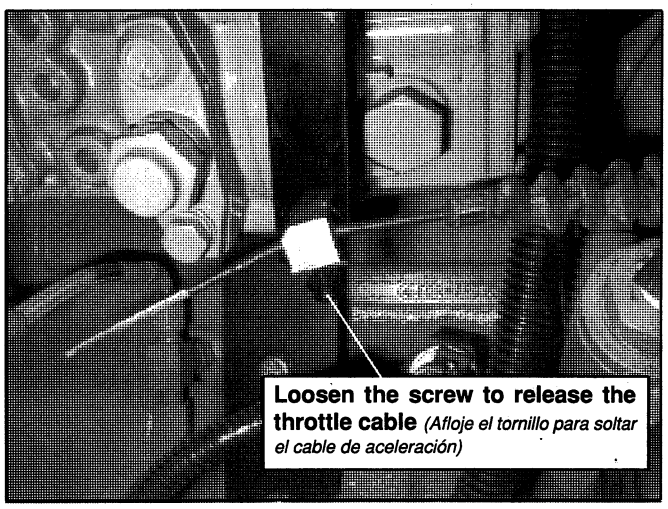


FIG. 7C

G. Make sure throttle control handle is in low idle position. see Fig. 8A *(Asegúrese de que el acelerador se encuentra en relantí).*

H. Beep the horn to warn any personnel around the machine that it is being started and turn the ignition key to start the engine, see Fig. 8B. *(Haga sonar la bocina y gire el interruptor de encendido para arrancar el motor, ver Fig. 8B).*

CAUTION (CUIDADO)

SUDDEN MOVEMENT OF THE MACHINES &/OR ITS ATTACHMENTS CAN CAUSE INJURY OR DEATH. MAKE SURE TO GROUND THE TOOLS, AND PLACE THE SAFETY LOCK LEVER IN ITS LOCKED AND UP POSITION BEFORE LEAVING THE CAB TO PREVENT SUDDEN MOVEMENT OF MACHINE AND/OR ITS ATTACHMENTS. ***(PARA PREVENIR CUALQUIER MOVIMIENTO DE LA MAQUINA, SIEMPRE POSICIONE LOS IMPLEMENTOS SOBRE EL SUELO Y LEVANTE LA PALANCA DE SEGURIDAD ANTES DE SALIR DE LA CABINA. SI NO LEVANTA LA PALANCA DE SEGURIDAD ANTES DE SALIR DE LA CABINA, CORRE CON EL RIESGO DE MOVER LA MAQUINA Y/O SUS IMPLEMENTOS REPENTI-NAMENTE CAUSANDO UN ACCIDENTE).***

I. Gradually move the throttle control lever to the high idle position, see Fig. 8C. *(Gradualmente mueva la palanca de aceleración hasta su máximo recorrido, ver Fig. 8C)*

J. The One Touch Decel switch is located on the right control handle, see Fig. 8C. Depress it twice to achieve the self centering of the throttle mechanism from the full throttle position. **"DO NOT TOUCH THE THROTTLE LEVER UNTIL THE THROTTLE LEVER STOP BOLT HAS BEEN ADJUSTED"** *(Presione el interruptor de desaceleración, ver Fig. 8C, para lograr el centrado del mecanismo de aceleración. "NO TOQUE EL ACELERADOR HASTA NO HABER AJUSTADO EL TORNILLO DE TOPE DE LA PALANCA DE ACELERACION")*

K. Turn in the throttle control lever stop bolt, see Fig. 7A, until it touches the lever, then add one more turn. Tighten the lock nut to lock the bolt in position. *(Gire hacia adentro el tornillo tope de la palanca de aceleración, ver Fig. 7A, hasta que el mismo haga tope con la palanca de aceleración, luego añada una vuelta más al tornillo. Aprete la contratuerca del tornillo para asegurarlo en posición).*

L. Check and make sure high idle is: 2330 ~ 2365 rpm, and low idle is: 850 ~ 900 rpm. *(Chequee y asegúrese de que relantí se encuentre en: y las RPM en alta en:).*

M. Reinstall the plastic cover on the right console and make sure the screws are properly tightened, see Fig. 8D. *(Instale el guradapolvo de plástico en el panel derecho del operador y asegurese de apretar los tornillos apropiadamente, ver Fig. 8D).*

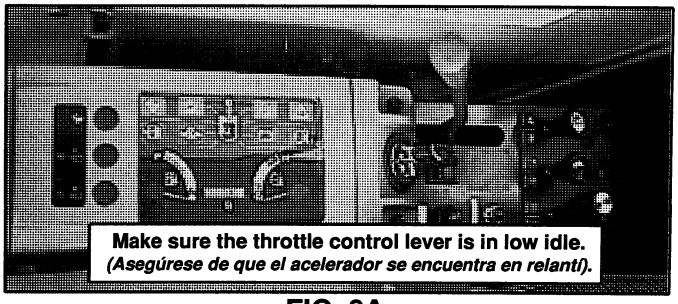


FIG. 8A

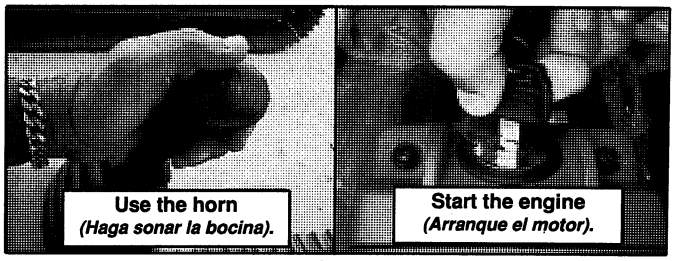


FIG. 8B

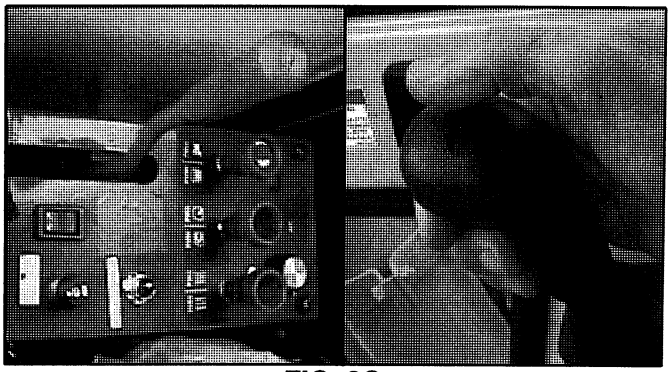


FIG. 8C

FIG. 8D

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SERVICE BULLETIN
KOBELCO AMERICA INC.

DATE: June 23, 1999

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SUBJECT: Y2K COMPLIANCE *(Conformidad para el año 2000)*

AFFECTED MACHINES:
SK60 Mark III S/N: LE11001 ~
SK60 Mark IV S/N: LE17585 ~ / LEJ0248 ~
SK100 Mark III S/N: YW02801 ~ and YWU03709 ~
SK100 Mark V S/N: YW06501 ~ / LX10101 ~
SK120 Mark III S/N: LP08001 ~ / YP01801 ~ and YPU00501 ~
SK150 Mark III S/N: YM000101 ~
SK150 Mark IV S/N: YMU1414 ~
ED180 Mark IV S/N: YLU0001 ~
SK200 Mark III S/N: YN06501 ~ / YQ01101 ~ and YNU0001 ~ / YQU0401 ~
SK200 Mark IV S/N: YNU0201 ~ / YQU2001 ~
SK200 Mark V S/N: YN18001 ~ / YQ02301 ~ / YNT0003 ~
SK220 Mark III S/N: LQU0001 ~ / LLU0301 ~
SK220 Mark IV S/N: LQU0101 ~ / LLU5001 ~
SK220 Mark V S/N: LQ03301 ~ / LL02301 ~
SK300 Mark III S/N: LCU0001 ~ / YCU0001 ~
SK300 Mark IV S/N: YCU0301 ~
SK400 Mark III S/N: YS00547 ~ / LSU0001 ~ / YSU0001 ~
SK400 Mark IV S/N: YSJ00001 ~ / YSU0201 ~

There have been many rumors and speculations about what will happen in the year 2000 to computer operated equipment. There has also been some concerns about the effect that this may have on our Kobelco Excavators equipped with CPU controllers.

(Existen rumores y especulaciones acerca de lo que pasará en el año 2000 a los equipos que operan mediante computadoras. De igual manera, existe la preocupación sobre el efecto que esto causará a las excavadoras Kobelco que trabajan mediante computadoras.)

We have checked with our Engineering Department, and found that the CPU controllers will not be affected by the Y2K syndrome.

(Hemos consultado con nuestro departamento de ingeniería, y averiguamos que los CPU's en nuestras máquinas no serán afectados por la epidemia Y2K.)

The EPROM chips used in our CPU's are not date sensitive. This system does not use data logging to store a date and time. The CPU operates in relationship to machine working hours, not by the day or date in time. As an example, # 23 Oil Supply Icon will display every 500 hours of machine operation with no relationship to what Day, Month, or Year it is operating within.

(Los microchips utilizados en nuestros CPU's no son sensibles a la fecha. Este sistema no utiliza data de ningún tipo para guardar fecha y el tiempo. El CPU opera en relación a las horas de trabajo de la máquina y no en relación a la fecha. Como ejemplo, el indicador de mantenimiento # 23 (oil supply) aparecerá cada 500 horas de operación de la máquina sin relación alguna con el dia, fecha o año en el que se trabaja.)

In conclusion, if the rumors are true and the world will shut down in January 1st, 2000; our Kobelco Excavators will still be operating.

(En conclución, si lor rumores son verdaderos y el mundo se detendrá el 1ro. de Enero de 2000, nuestras excavadoras continuarán trabajando.)

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