https://truckmanualshub.com/

Mark 8 Series Excavators



Service Support

KOBELCO Construction Machinery LLC®
A Brand of CNH

KOBELCO Construction Machinery America LLC
245 E. North Avenue
Carol Stream, IL U.S.A.
Phone: 866-264-6404
Web Page: www.kobelcoamerica.com

Service Support Staff

FIELD SERVICE:

TBA
District Service Manager
NY,RI,CT,MA,ME,NH,VT
PHONE: 630-235-6290

John Adams
District Service Manager
OH,MI
PHONE: 614-864-5863

Scott Emmans
District Service Manager
FL,GA
PHONE: 630-881-8458

David Dunning
District Service Manager
KS,CO,IA,NE
PHONE:630-235-2601

TBA
District Service Manager
KY,TN
PHONE:

Richard Manning
District Service Manager
TX,NM,AZ
PHONE: 936-258-9218

Brian Wise
District Service Manager
WA,OR,ID,MT,WY
PHONE: 630-251-4204

Wes Brubaker
District Service Manager
AL,LA,MS
PHONE: 256-236-6194

Doug Hoernig
District Service Manager
VA,WV,DE,MD
PHONE: 717-227-2179

Rob Hyslop
District Service Manager
ON,PQ,NB,NS,PEI
PHONE: 905-308-5624

Service Support Staff - Cont.

Ken Folden
District Service Manager
BC,Alberta,Sask.,Manitoba
PHONE: 403-519-8820

John Rutt
District Service Manager
PA,NJ
PHONE: 717-336-4087

Jeff Schoch
District Service Manager
NC,SC
PHONE: 864-294-9613
FAX:

Bruce Romer
District Service Manager
IL,IN
PHONE:419-380-9236
FAX: 419-380-9237

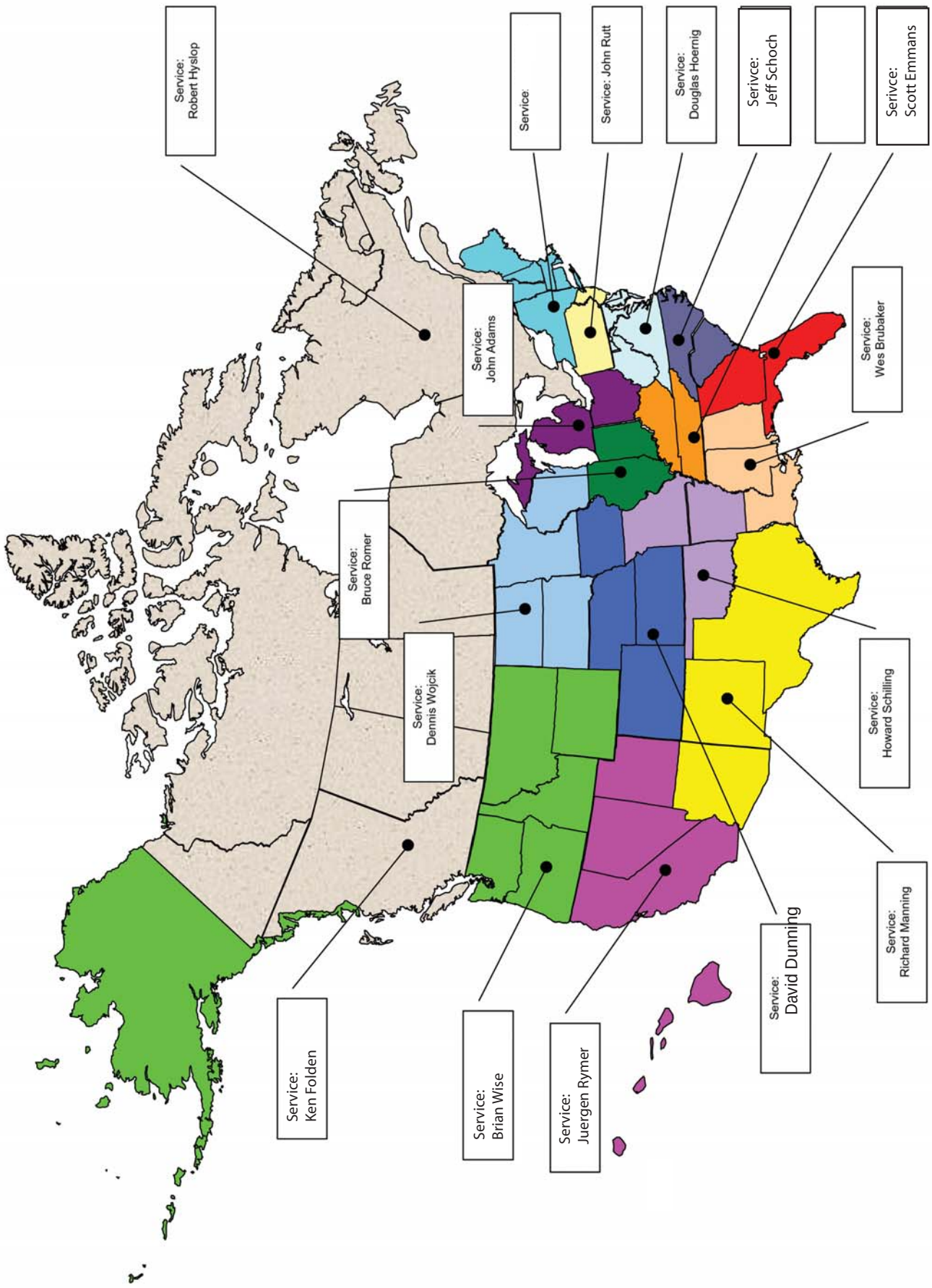
Juergen Rymer
District Service Manager
CA,UT,NV,HI
PHONE: 702- 642-0010
FAX: 702-642-5326

Dennis Wojcik
District Service Manager
MN,ND,SD,WI
PHONE: 715-447-8357

Howard Schilling
District Service Manager
OK,AR,MO
PHONE: 630-699-7706
FAX:



https://truckmanualshub.com/



https://truckmanualshub.com/

Kobelco

Mark 8 Series



Kobelco Construction Machinery America LLC

Safety

KOBELCO

Kobelco Construction Machinery America LLC

https://truckmanualshub.com/

1.1 GENERAL SAFETY INFORMATION

WARNING

Do Not operate or perform any maintenance on this machine until all instructions found in this manual have been thoroughly read and understood. Improper operation or maintenance of this machine may cause accidents and could result in serious injury or death.
Always keep this manual in the operators seat pocket.
If it is missing or damaged, place an order with an authorized KOBELCO distributor for a replacement.
If you have any questions, please consult an authorized KOBELCO distributor.

1. Most accidents, which occur during operation, are due to neglect of precautionary measures and safety rules. Sufficient care should be taken to avoid these accidents. Erroneous operation, lubrication or maintenance services are very dangerous and may cause injury or death of personnel. Therefore all precautionary measures, NOTES, DANGERS, WARNINGS and CAUTIONS contained in this manual and on the machine should be read and understood by all personnel before starting any work with or on the machine.

2. Operation, inspection, and maintenance should be carefully carried out, and safety must be given the first priority. Messages of safety are indicated with marks. The safety information contained in this manual is intended only to supplement safety codes, insurance requirements, local laws, rules and regulations.

3. Messages of safety appear in this manual and on the machine. All messages of safety are identified by the words “DANGER”, “WARNING” and “CAUTION” .
   a. **DANGER** – Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury and is represented as follows:

DANGER

   b. **WARNING** – Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury and is represented as follows:

WARNING

   c. **CAUTION** – Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against possible damage to the machine and its components and is represented as follows:

CAUTION

4. It is very difficult to forecast every danger that may occur during operation. However, safety can be ensured by fully understanding proper operating procedures for this machine according to methods recommended by KOBELCO.

5. While operating the machine, be sure to perform work with great care, so as not to damage the machine, or allow accidents to occur.

6. Continue studying this manual until all Safety, Operation and Maintenance procedures are completely understood by all persons working with the machine.

1.2 SAFETY PRECAUTIONS

WARNING

The proper and safe lubrication and maintenance for this machine, recommended by KOBELCO, is outlined in the OPERATORS MANUAL for this machine.

Improper performance of lubrication or maintenance procedures are dangerous and could result in injury or death. Read and understand the OPERATORS MANUAL before performing any lubrication or maintenance.

The serviceman or mechanic may be unfamiliar with many of the systems on this machine. This makes it important to use caution when performing service work. A knowledge of the system and or components is important before the removal or disassembly of any component.

Because of the size of some of the machine components, the serviceman or mechanic should check the weights noted in this manual. Use proper lifting procedures when removing any components. Weight of components table for SK210(LC)-VI is shown in Page 6-5 and for SK250(LC)-VI in page 6-23 of Section VI - SPECIFICATIONS.

https://truckmanualshub.com/

The following is a list of basic precautions that must always be observed.

1. Read and understand all Warning plates and decals on the machine before Operating, Maintaining or Repairing this machine.

2. Always wear protective glasses and protective shoes when working around machines. In particular, wear protective glasses when using hammers, punches or drifts on any part of the machine or attachments. Use welders gloves, hood/goggles, apron and the protective clothing appropriate to the welding job being performed. Do not wear loose fitting or torn clothing. Remove all rings from fingers, loose jewelry, confine long hair and loose clothing before working on this machinery.

3. Disconnect the battery and hang a “Do Not Operate” tag in the Operators Compartment. Remove ignition keys.

4. If possible, make all repairs with the machine parked on a level, hard surface. Block the machine so it does not roll while working on or under the machine. Hang a “Do Not Operate” tag in the Operators Compartment.

5. Do not work on any machine that is supported only by lift, jacks or a hoist. Always use blocks or jack stands, capable of supporting the machine, before performing any disassembly.

WARNING

Do not operate this machine unless you have read and understand the instructions in the OPERATORS MANUAL. Improper machine operation is dangerous and could result in injury or death.

6. Relieve all pressure in air, oil or water systems before any lines, fittings or related items are disconnected or removed. Always make sure all raised components are blocked correctly and be alert for possible pressure when disconnecting any device from a system that utilizes pressure.

7. Lower the bucket, blade, or other attachments to the ground before performing any work on the machine. If this cannot be done, make sure the bucket, blade, ripper or other attachment is blocked correctly to prevent it from dropping unexpectedly.

8. Use steps and grab handles when mounting or dismounting a machine. Clean any mud, grease, oil, or debris from steps, walkways or work platforms before using. Always face the machine when using steps, ladders and walkways. When it is not possible to use the designed access system, provide ladders, scaffolds, or work platforms to perform safe repair operations. *Refer to item M on page 1-3.*

9. To avoid back injury, use a hoist when lifting components which weigh 23 kg (50 lbs) or more. Make sure all chains, hooks, slings, etc., are in good condition and are the correct capacity. Be sure hooks are positioned correctly. Lifting eyes are not to be side loaded during a lifting operation.

10. To avoid burns, be alert for hot parts on machines which have just been stopped and hot fluids in lines, tubes and compartments.

11. Be careful when removing cover plates. Gradually back off the last two bolts or nuts located at opposite ends of the cover or device and carefully pry cover loose to relieve any spring or other pressure, before removing the last two bolts or nuts completely.

12. Be careful when removing filler caps, breathers and plugs on the machine. Hold a rag over the cap or plug to prevent being sprayed or splashed by liquids under pressure. The danger is even greater if the machine has just been stopped because fluids can be hot.

13. Always use the proper tools that are in good condition and that are suited for the job at hand. Be sure you understand how to use them before performing any service work.

14. Reinstall all fasteners with the same part number. Do not use a lesser quality fastener if replacements are necessary.

15. Repairs which require welding should be performed only with the benefit of the appropriate reference information and by personnel adequately trained and knowledgeable in welding procedures. Determine type of metal being welded and select correct welding procedure and electrodes, rods or wire to provide a weld metal strength equivalent at least to that of the parent metal. Make sure to disconnect battery before any welding procedures are attempted.

https://truckmanualshub.com/

16. Do not damage wiring during removal operations. Reinstall the wiring so it is not damaged nor will be damaged in operation of the machine by contacting sharp corners, or by rubbing against some object or hot surface. Do not connect wiring to a line containing fluid.

17. Be sure all protective devices including guards and shields are properly installed and functioning correctly before starting a repair. If a guard or shield must be removed to perform the repair work, use extra caution and replace the guard or shield after repair is complete.

18. The maintenance and repair work while holding the bucket raised is dangerous due to the possibility of a falling attachment. Don't fail to lower the attachment and place the bucket to the ground before starting the work.

19. Loose or damaged fuel, lubricant and hydraulic lines, tubes and hoses can cause fires. Do not bend or strike high pressure lines or install ones which have been bent or damaged. Inspect lines, tubes and hoses carefully. Do not check for leaks with your hands. Very small (pinhole) leaks can result in a high velocity oil stream that will be invisible close to the hose. This oil can penetrate the skin and cause personal injury. Use cardboard or paper to locate pin hole leaks.

20. Tighten connections to the correct torque. Make sure that all heat shields, clamps and guards are installed correctly to avoid excessive heat, vibration or rubbing against other parts during operation. Shields that protect against oil spray onto hot exhaust components in event of a line, tube or seal failure must be installed correctly.

21. Do not operate a machine if any rotating part is damaged or contacts any other part during operation. Any high speed rotating component that has been damaged or altered should be checked for balance before reusing.

22. Be careful when servicing or separating the tracks. Chips can fly when removing or installing a track pin. Wear safety glasses and long sleeve protective clothing. Tracks can unroll very quickly when separated. Keep away from front and rear of machine. The machine can move unexpectedly when both tracks are disengaged from the sprockets. Block the machine to prevent it from moving.

23. Caution should be used to avoid breathing dust that may be generated when handling components containing asbestos fibers. If this dust is inhaled, it can be hazardous to your health. Components in KOBELCO products that may contain asbestos fibers are brake pads, brake band and lining assemblies, clutch plates and some gaskets. The asbestos used in these components is usually bound in a resin or sealed in some way. Normal handling is not hazardous as long as airborne dust which contains asbestos is not generated.

If dust which may contain asbestos is present, there are several common sense guidelines that should be followed.

- **a.** Never use compressed air for cleaning.
- **b.** Avoid brushing or grinding of asbestos containing materials.
- **c.** For clean up, use wet methods or a vacuum equipped with a high efficiency particulate air (HEPA) filter.
- **d.** Use exhaust ventilation on permanent machining jobs.
- **e.** Wear an approved respirator if there is no other way to control the dust.
- **f.** Comply with applicable rules and regulations for the work place.
- **g.** Follow environmental rules and regulations for disposal of asbestos.
- **h.** Avoid areas where asbestos particles may be in the air.

https://truckmanualshub.com/

1.3 PRE-START SAFETY

Many failures that occur during machine operation or servicing result from neglecting fundamental safety precautions. The following safety precautions are given to prevent such failures, but they are only a part of what you must follow. Read, understand and follow all safety precautions found in this manual and on the machine thoroughly before operating the machine.

A. OBSERVE SAFETY PRECAUTIONS

Follow all safety rules, precautions, and operating procedures.If there are other personnel and flagmen working in the area, have them observe the specified signs.

B. WEAR PROTECTIVE CLOTHING

Wear well fitting safety shoes, hard hat, and working clothes, and put on protective glasses, face shield, ear protection and gloves. When necessary, wear reflective vest.

C. READ and UNDERSTAND THE OPERATORS MANUAL

Before operating the machine, read and understand this operators manual thoroughly in order to use the mchine effectively and safely.

D. KEEP OPERATORS MANUAL IN MACHINE CAB

Keep this manual in the specified storage area located behind the operators seat for quick reference. Should the operators manual become lost or damaged, contact an authorized KOBELCO distributor to order the operators Manual.

E. HOW TO HANDLE LIFE HAMMER

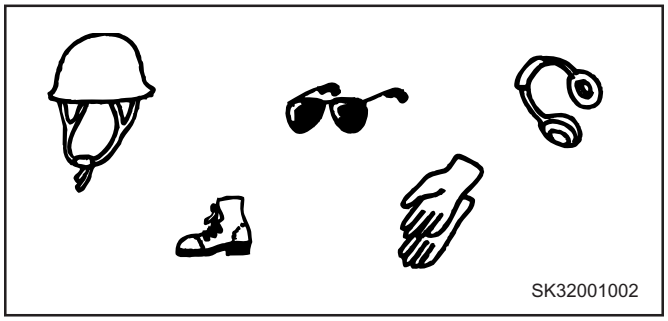
A life hammer is provided on the right side of cab. In case of emergency, take the life hammer, break the cab glass, and escape from the cab. In addition, the life hammer is equipped with a cutter on the lever side to cut the seat belt, etc.

F. PREPARE FOR EMERGENCIES

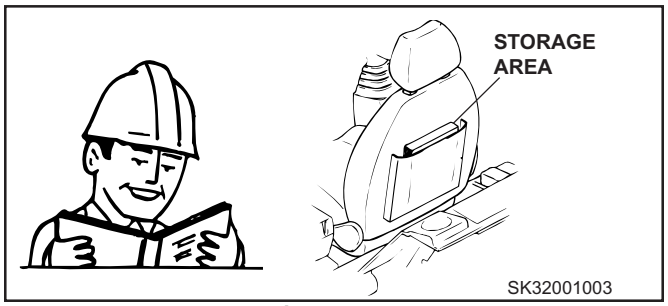
Have a fire extinguisher and first aid kit ready for emergencies. Know how to operate the fire extinguisher and know where the First Aid Kit is located for easy access in case of emergency.



OBSERVE ALL SAFETY PRECAUTIONS



WEAR PROTECTIVE CLOTHING



READ MANUAL / KEEP IN MACHINE CAB



HOW TO HANDLE LIFE HAMMER



PREPARE FOR EMERGENCIES

https://truckmanualshub.com/

G. ENSURE SAFETY AT THE WORK SITE

Know the work area! Before operating the machine, carefully survey and record the land and worksite features to prevent the machine from falling or the soil from caving in.

H. PERFORM PRE-START INSPECTION

Before starting the machine, perform a PRESTART inspection of the machine. If any problems are found, repair or replace defective components immediately. ***DO NOT OPERATE THE MACHINE*** until all problem areas are properly repaired. Always keep the windshield, working lamps, and mirrors clean for good visibility.

I. ENGAGE SAFETY LOCK LEVER BEFORE LEAVING MACHINE

Before leaving the operator's seat, move the safety lock lever to the "LOCKED" (Up) position. This will not allow operation of any hydraulic controls should they be accidentally moved. If the lever is not set to the "LOCKED" position and hydraulic controls are touched accidentally, the machine may move suddenly resulting in serious injury. Also before leaving the machine, lower the bucket to the ground, place the safety lock lever in the "LOCKED" (Up) position, stop the engine and remove the starter switch key.

J. SIGNS, SIGNALS & FLAGMEN

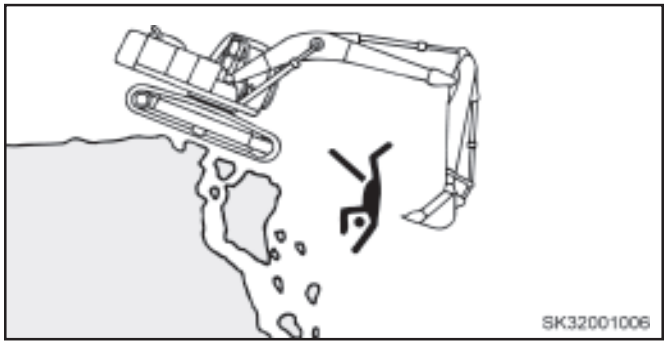
Install signs on soft shoulders and ground areas, have a flagman direct the operation if necessary. The operator should note marks and follow signals from the flagman. All personnel should know the meaning of the signs, marks, and signals. Only one flagman should give the signs and signals.

K. KEEP FIRE AWAY FROM FUEL AND OIL

Oil, antifreeze, and especially fuel are highly flammable. Never use fire near the machine. Securely tighten all fuel and oil caps. Keep fuel and oil in the designated storage areas. Promptly clean up any all spills and dispose of waste properly.

L. USE CAUTION NEAR NOISE

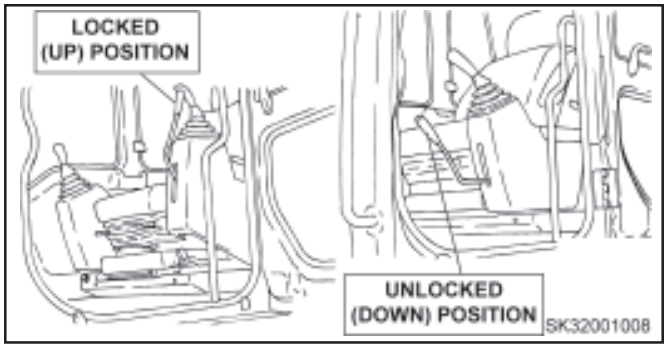
If noise is high during operation, hearing loss may result. Approved hearing protection should be used if personnel will be exposed to high noise levels for a long period of time.



WORKSITE SAFETY– KNOW THE AREA



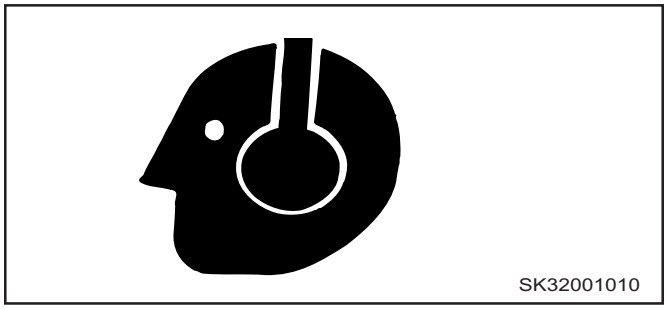
PRE-START INSPECTION OF MACHINE



SAFETY LOCK LEVER



KEEP FIRE AWAY FROM FUEL & OIL



USE CAUTION NEAR NOISE

https://truckmanualshub.com/

M. MOUNTING & DISMOUNTING MACHINE

When getting on and off the machine, always maintain three point contact by using the handrails and step. Inspect and clean handrails, step, and mounting parts. Remove slippery materials, such as lubricants, and mud. Always place the cab door entrance parallel to the tracks before stopping the engine for dismounting.

N. AVOID HOT SURFACES & AREAS

Immediately after the machine is operated, the temperature and pressure of the engine coolant, engine oil, and hydraulic oil are very high. Burns may result if caps are removed, or oil, water, or filters are changed under these conditions. Wait until the temperature goes down, before attempting to check fluids or change filters.

O. USE THE PROPER OPTIONAL ATTACHMENT

Use only optional attachments designed for and approved by KOBELCO. Read, understand and follow all instructions in the manual accompanying the optional attachment. Use of any optional attachment not approved by KOBELCO in writing, can cause serious injury to personnel, damage to the machine and its components and shorten the life of the machine. Contact an authorized KOBELCO Dealer for optional attachments available for the machine.

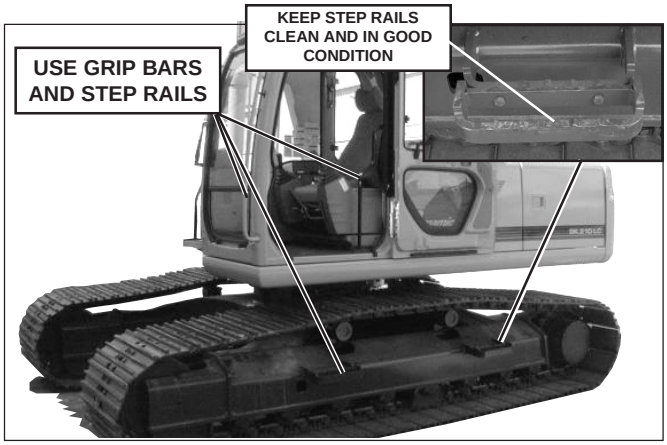
P. PREVENT FIRES

Leaking or spilled fuel, lubricants and hydraulic oil are fire hazards. Clean and properly dispose of spills as they occur. Repair or replace all leaking components to prevent fire. Also, clean the machine regularly removing all debris to help prevent fires, pay particular attention to removal of leaves, sticks, paper etc. Keep fire extinguisher in an accessible area and know how to use the fire extinguisher should a fire occur.

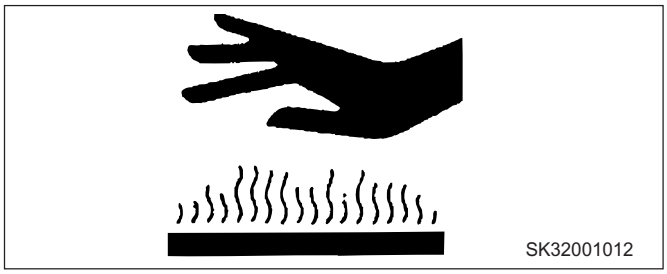
1.4 SAFETY DURING OPERATION

A. STARTING ENGINE

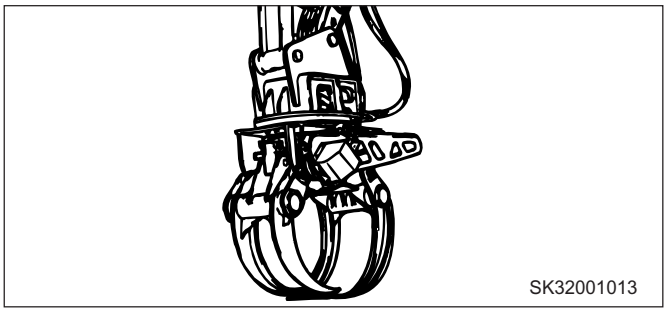
Sit in the operator's seat. Sound the horn before starting the engine to alert people the machine is being started. Make sure no one is near the machine. Do not short circuit the starter circuit or battery to start the engine. This may cause serious injury or cause damage the electrical system.



MOUNTING/DISMOUNTING MACHINE



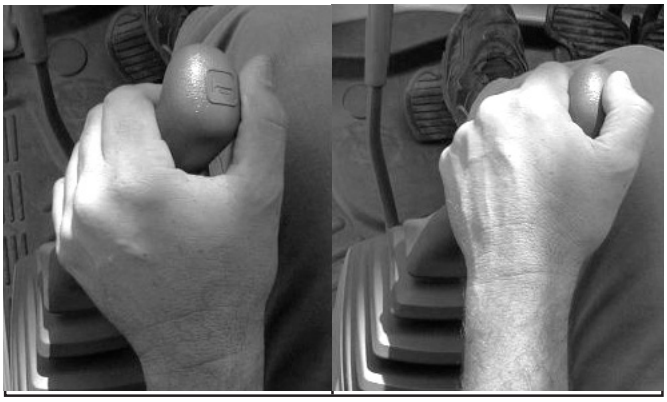
HOT SURFACES



USE PROPER ATTACHMENT



PREVENT FIRES– CLEAN UP SPILLS



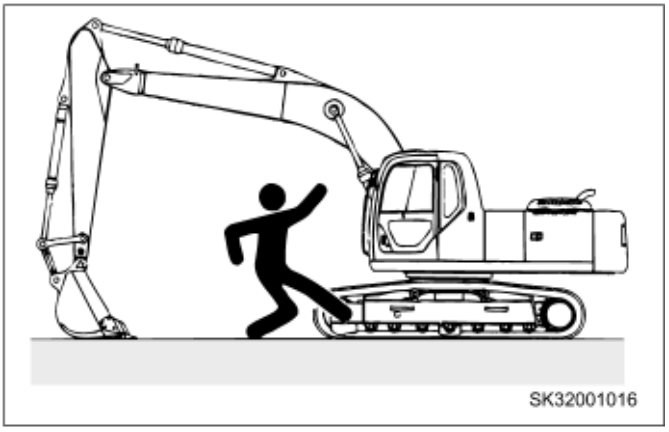
SOUND HORN BEFORE STARTING

MOUNTING/DISMOUNTING MACHINE

https://truckmanualshub.com/

B. PASSENGERS

This equipment is not intended or designed for the transportation of persons. Never allow persons to ride on the machine. Serious injury or death can result from allowing passengers on or in the machine.



NO PASSENGERS

C. TRAVEL

Make certain of the location of the travel motors before operating travel controls. Sound horn before mov ing the machine to inform persons that the machine is travelling. Position the attachment as shown in-illustration before beginning travel. Move the machine at slow speeds. Do not turn suddenly on rough terrain. Avoid travelling over obstacles. Should it become necessary to travel over an obstacle, keep the attachment low to the ground and travel at extremely slow speed.



KNOW TRAVEL MOTOR POSITION

D. SWING

Make certain the swing area of machine is clear of all persons and obstacles before operating swing controls. Sound horn before swinging machine. If necessary, have a flagman signal operator during operation to help prevent injury to persons or damage to obstacles and equipment.

E. BOOM, ARM & ATTACHMENTS

Give the work you are doing your undivided attention. Make certain the attachment being used is suited for the job at hand. Make certain of obstacles in the work area and operate the machine within those limits. If necessary have a flagman signal the operator to prevent injury to persons or damage to the machine or obstacles in the work area.

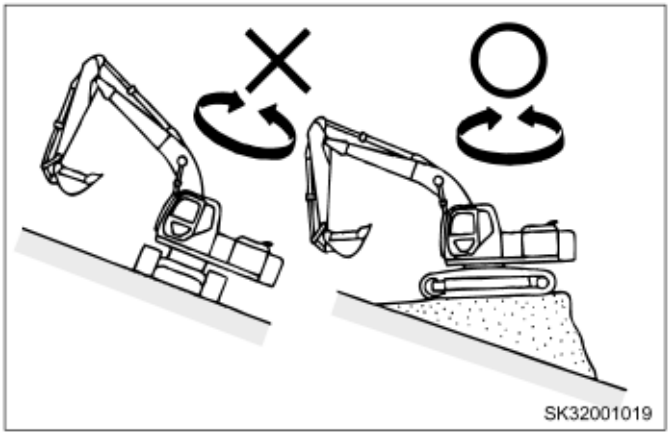
ALWAYS PLACE ATTACHMENTS ON THE GROUND AND RAISE THE SAFETY LOCK LEVER BEFORE LEAVING THE CAB.



SWING SAFETY / USE SWING FLASHERS

F. OPERATING ON INCLINES OR SLOPES

Operation of this machine on an incline or slop may cause the machine to become unstable or unbalanced. Work up and down inclines or slopes never across. Never Swing or turn machine around on slopes. Build a level area for the machine to operate. Operate controls carefully to prevent sud den movements which may cause the machine to slide or tip over. Use a flagman to direct the operator.



BUILD BANKING FOR SLOPE OPERATION

https://truckmanualshub.com/

G. WORKING AROUND UTILITIES

If it is suspected that utility lines such as, gas, water, phone or electrical power are in the work area, contact the local utility authority for line location BEFORE beginning work in the area.Use extreme caution around electrical power lines. Keep a sufficient distance away from electrical lines during operation. See chart below for minimum distances.

LINE VOLTAGE	MINIMUM DISTANCE-M (FEET)
0 ~50,000	3.0M (10)OR MORE
50,000 ~200,000	4.5M (15)OR MORE
200,000 ~350,000	6.0M (20)OR MORE
350,000 ~500,000	7.5M (25)OR MORE
500,000 ~750,000	10.5M (35)OR MORE
750,000 ~1,000,000	13.5M (45)OR MORE

H. LIFTING

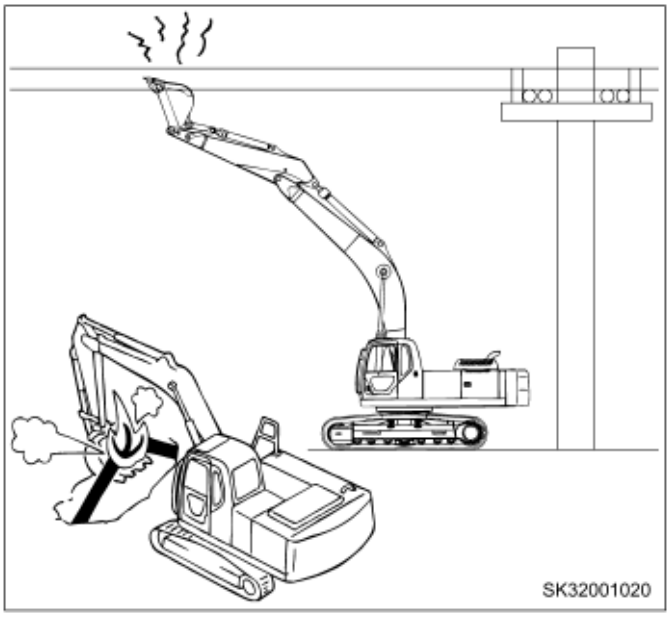
This machine is an excavator.Use extreme caution when lifting or moving heavy loads.Use proper lifting equipment rated at a capacity to handle the load. ***NEVER USE BUCKET TEETH TO LIFT OR MOVE HEAVY LOADS.***

I. FROZEN & SNOW COVERED WORK SITES

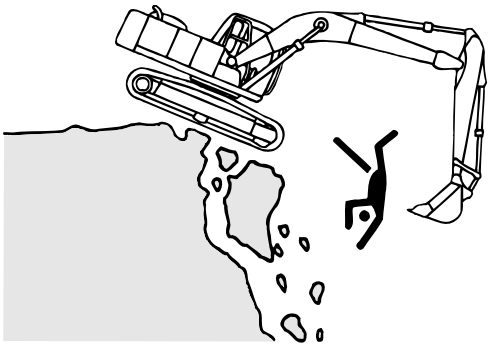
Use extreme caution when operating the machine on frozen or snow covered work sites.Operate all controls slowly and cautiously to prevent sudden movements that may cause the machine to unexpectedly shift, slide or move.Even on the slightest slope, when snow is present or work area is frozen can allow a machine to unexpectedly move. Snow on shoulders or snow drifts can be much deeper than expected.The machine can easily become buried under such conditions.Use extreme caution while operating the machine around or in snow.

J. FILLED OR UNSTABLE GROUND

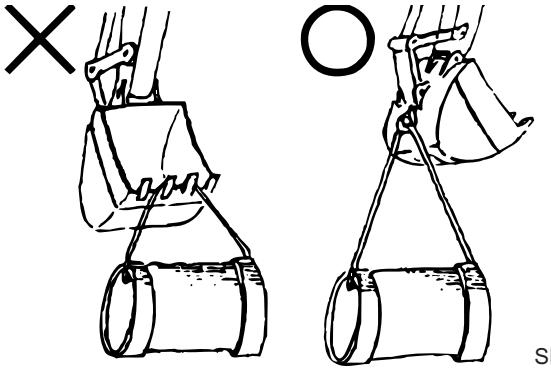
Be certain the condition of the work site is stable and capable of supporting the machine during operation. Do not operate attachment too close to the machine. Operation of the machine on shoulders or filled areas could cause the machine to become unstable presenting a work hazard.Position the travel motors to the rear of the machine, allowing for quick reversal, should the work area become un stable.



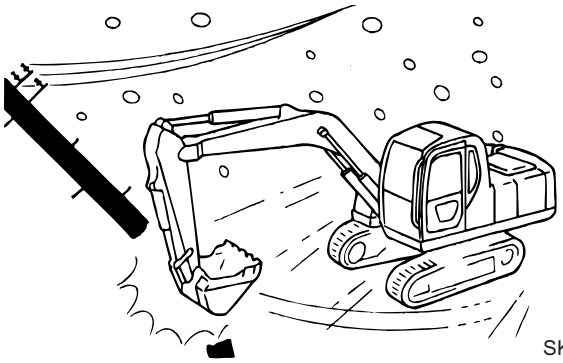
KEEP A SAFE DISTANCE FROM UTILITIES



USE EXTREME CAUTION ON FROZEN OR SNOW



USE PROPER LIFTING DEVICES



WORK ON STABLE GROUND

https://truckmanualshub.com/

K. RESTRICTED WORK AREAS

In work sites with limited height and swing areas such as tunnels,bridges,around electrical power lines, other utilities,or inside structures,use extreme caution in keeping the machine and its attachment a safe distance away to prevent personal injury and / or equipment or structure damage.Use a flagman to direct the operator.

L. PARKING THE MACHINE

Always park the machine on a firm,level surface. If no firm level surface is available,block the tracks and lower attachment to the ground to help prevent machine movement. Should the machine be parked on a roadway, move the machine to the shoulder to allow passing of traffic. Also post reflective warning signs and markers at a distance from the machine to safely warn motorists. Refer to local code and regulations regarding the posting of work area warnings and markers.

M. STABILIZE ATTACHMENTS

Stabilize all attachments removed from the machine to prevent the attachment falling over.

1.5 INSPECTION &MAINTENANCE SAFETY

A. "TAG-OUT " MACHINE

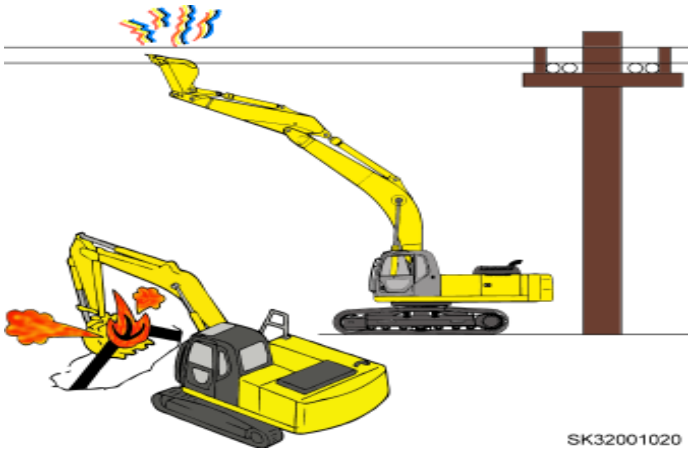
Before performing any inspection or maintenance procedures to the machine,fill out and post to the operators controls a "DO NOT OPERATE " tag to warn persons not to start the machine.Also inform the supervisor and all operators that the machine is under inspection or maintenance and they will be informed when the machine is ready for normal operation.

B. TOOLS &EQUIPMENT

Use the proper tools and equipment for the task at hand. Know the proper use of the tools and equipment before starting any inspection or maintenance procedures.

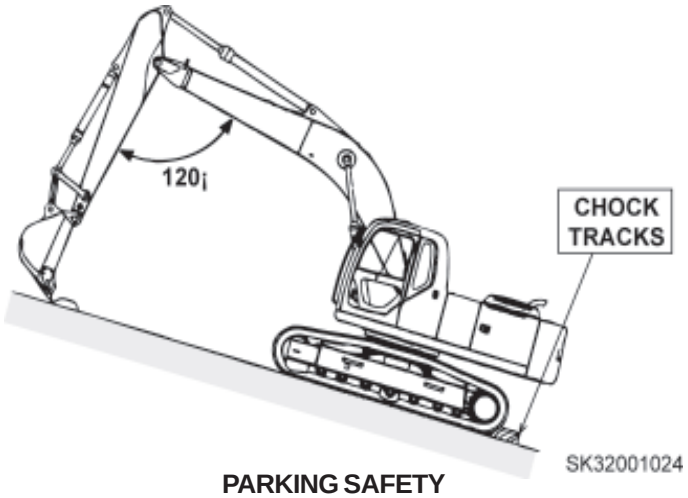
C. PERSONAL EQUIPMENT

Wear well fitting work clothes,hard hat,safety shoes and gloves. Confine long hair,loose clothing and remove all jewelry before attempting any inspection or maintenance procedures to this machine or attachments.



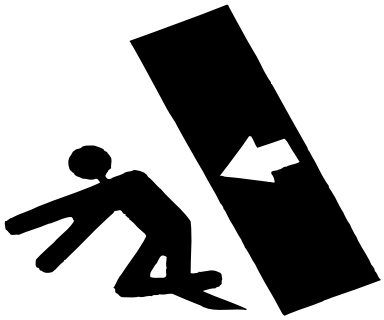
SK32001020

BE AWARE OF OBSTACLES



SK32001024

PARKING SAFETY



SK32001025

STABILIZE ATTACHMENTS WHEN REMOVED

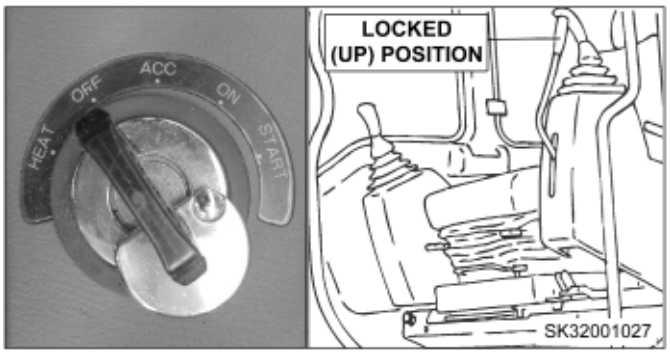


SK32001026

USE PROPER TOOLS

D. STOP THE ENGINE

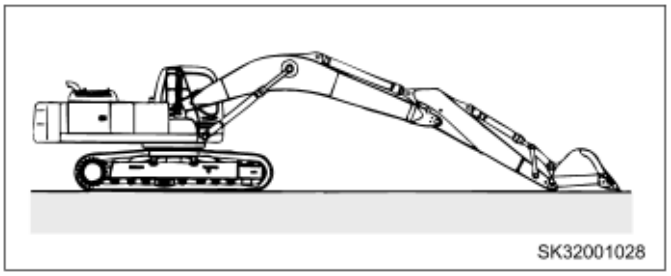
BE CERTAIN TO TURN ENGINE OFF AND LACE THE SAFETY LOCK LEVER IN THE "LOCKED" (UP) POSITION before attempting any inspection or maintenance procedures to the machine. Failure to stop engine could result in serous bodily injury or death.



STOP ENGINE/ENGAGE SAFETY LOCK LEVER

E. SET THE ATTACHMENT

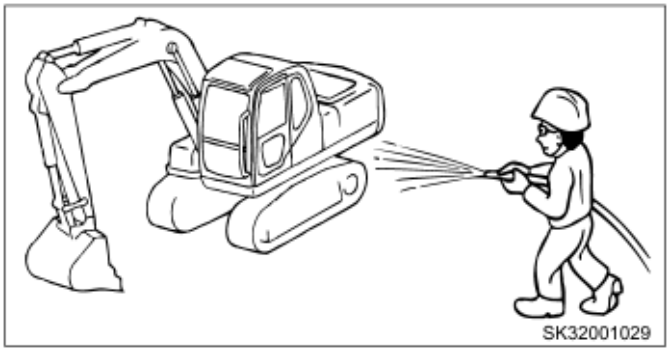
Always set the machine in the hydraulic oil check position on firm level ground before attempting any in spection or maintenance procedures to the machine. If it is not possible to put the machine in this position, secure the boom, arm and attacment to help prevent sudden movement. ***ALWAYS PLACE ATTACHMENTS ON THE GROUND AND RAISE THE SAFETY LOCK LEVER BEFORE LEAVING THE CAB.***



HYDRAULIC OIL CHECK POSITION

F. CLEAN THE MACHINE

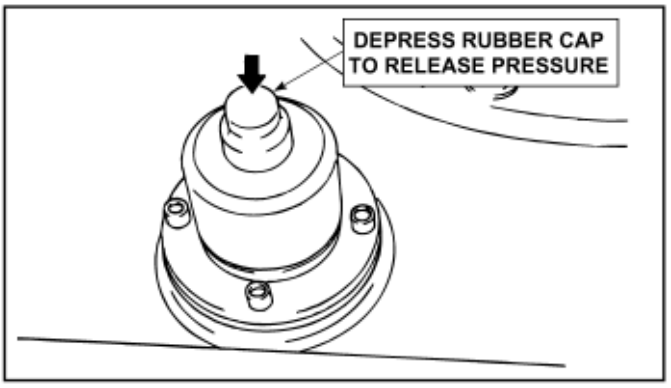
Keep the machine clean and free of debris, excess or spilled lubricants, fuel and fluids. Use aproved solvents, detergents and water to clean the machine and its components on a regular basis. Be careful not to allow water to reach electri cal components. Serious damage can occur to the electrical system by allowing water to reach the electrical components. Never clean inside of cab, or electrical components with pressurized water or steam.



KEEP MACHINE CLEAN

G. PRESSURIZED FLUIDS & LUBRICANTS

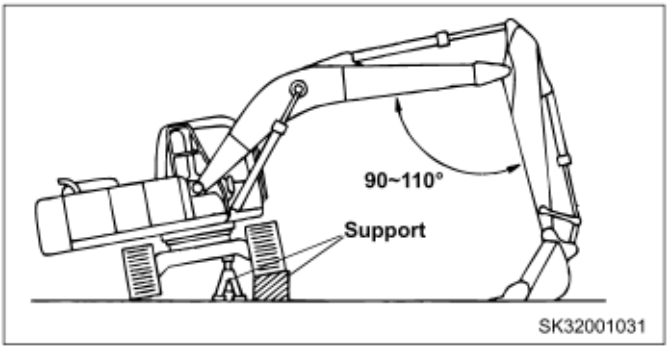
Always release pressure from hydraulic reservoir, engine coolant, fuel system and all systems cotaining pressure before removing any caps or components **BE CAUTIOUS OF HOT FLUIDS AND GASSES FROM SYSTEMS ON MACHINES THAT HAVE JUST BEEN STOPPED. ALLOW SUFFICIENT TIME FOR SYSTEMS TO COOL BEFORE PERFORMING ANY INSPECTION OR MAINTENANCE PROCEDURES.**



RELEASE HYDRAULIC TANK PRESSURE

H. SUPPORT THE MACHINE

If it becomes necessary to raise the machine for inspection or maintenance, always support the machine by positioning the machine as shown in the illustration and use safety supports or blocks, with a sufficient capacity rating to support the machine, under the tracks. ***NEVER INSPECT OR PERFORM MAINTENANCE PROCEDURES UNDER A RAISED MACHINE THAT IS NOT SUFFICIENTLY SUPPORTED.***



SUPPORT THE MACHINE

https://truckmanualshub.com/

I. REFUELING

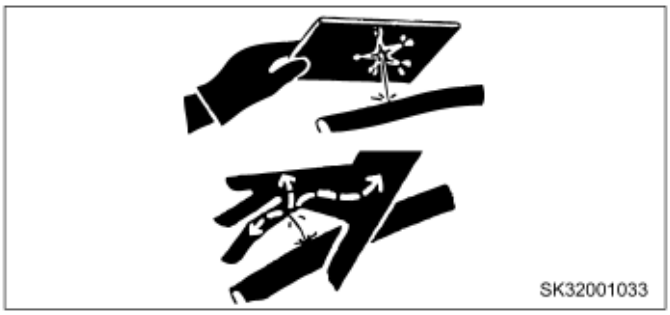
Move the machine to a well ventilated area for refueling. Use only specified fuel as described in the MAINTENANCE section of this operators manual. Immediately clean up all spilled fuel and dispose of properly. After refueling is complete, securely tighten fuel cap.



REFUELING

J. HYDRAULIC PRESSURE

Under normal conditions,all circuits of the hydraulic system are under extreme pressure.When inspecting for leaks, use a small piece of cardboard, wood or metal to locate leaks.**SMALL (PINHOLE) LEAKS CAN BE DANGEROUS IF CONTACT WITH SKIN OR EYES IS MADE.**Wear approved safety glasses or face shield,gloves, hard hat, safety shoes and work clothes during all inspection and maintenance pro - cedures.

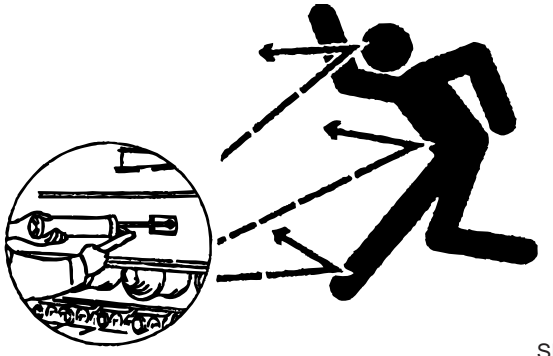


CHECKING FOR HIGH PRESSURE LEAKS

K. TRACK SHOE TENSION

The grease used to adjust the track shoe tension is under extreme pressure in the cylinder.Use ex-treme caution when adjusting track shoe tension.

KEEP FACE,HANDS AND LEGS AWAY FROM THE GREASE NIPPLE AREA. Carefully and slowly loosen the grease nipple when lessening track shoe tension. Never loosen grease nipple more than one complete turn.

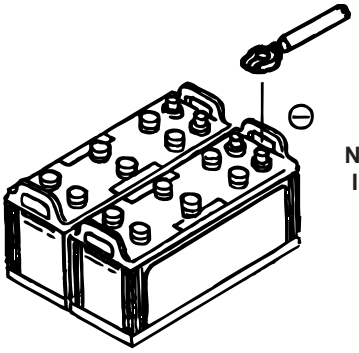


SK32001034

USE CAUTION WHEN ADJUSTING TRACKS

L. ELECTRICAL SYSTEM

Before performing any inspection or maintenance to the electrical system,or performing any welding procedures, disconnect the negative(–)cables from the battery terminals.Not disconnecting the negative (–) cable could cause extensive damage to the electrical system.



DISCONNECT BATTERY NEGATIVE (-) CABLE WHEN INSPECTING ELECTRICAL OR WELDING

SK32001035

ELECTRICAL SYSTEM PRECAUTION

M. USE APPROVED WORK LIGHTS

Use only approved work lights when performing inspection and maintenance procedures to prevent possible fire or explosion.Certain types of work lights should not be used due to the possibility of ignition of certain flammable gasses and fluids from the machine.

N. DISPOSE OF WASTE PROPERLY

Dispose of oils,fuel,coolant,solvents, filters, batter - ies etc. according to federal,state and local codes and regulations regarding hazardous waste disposal. Contact Local authorities for proper disposal methods of such materials.



SK32001036

USE PROPER LIGHTING

https://truckmanualshub.com/

1.6 BATTERY SAFETY

A. WEAR PROPER PROTECTIVE CLOTHES

Wear long sleeve shirt,gloves and approved safety glasses or face shield when working with or around batteries.Battery electrolyte (acid)ill cause severe burns if allowed to make contact the clothing, skin or eyes. Should electrolyte (acid) come in contact with clothes, skin or eyes,immediately remove effected clothing, flush area with clean water for 15 minutes and get prompt medical attention.



SK32001037

WEAR PROTECTIVE CLOTHES

B. KEEP AWAY FROM FIRE OR FLAMES

Never allow batteries in the vicinity of fire or flames and do not smoke when working with batteries. Explosive hydrogen gas is produced by the electrolyte (acid) in the batteries.Always work with batteries in a well ventilated area.



SK32001038

KEEP AWAY FROM FIRE OR FLAMES

C. CHARGING BATTERY

Charge battery off of and away from machine in a well ventilated area. When charging battery, remove cell covers to allow gasses to escape. Avoid breathing gasses from battery.Wear approved Safety equipment when working with batteries.

D. USING BOOSTER CABLES

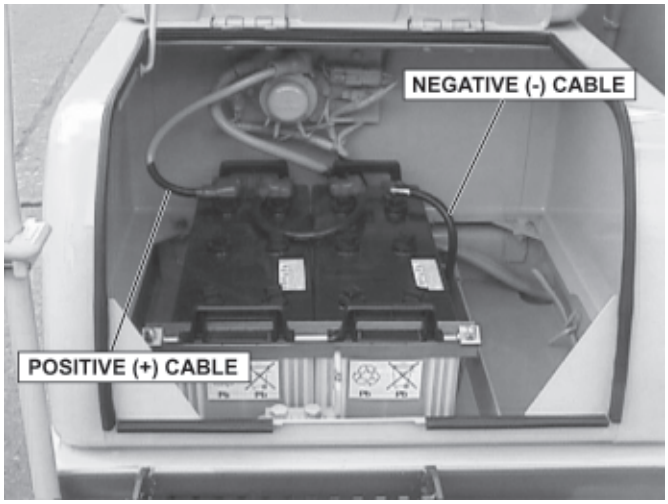
Wear proper safety equipment when working with batteries.

If using another machine or vehicle to boost batteries, make certain the machine or vehicle DOES NOT touch the disabled machine.

Make certain of the positive (+) and negative (–) terminals on the booster battery and the disabled machine before connecting booster cables.

Connect the positive (+) cable first,then connect negative (–).

When disconnecting,disconnect the negative (–) cable first, then disconnect the positive (+) cable. Refer to BASIC MACHINE OPERATION Section of this manual for proper procedures for use of booster cables.



MAKE CERTAIN OF THE POSITIVE (+) AND NEGATIVE (–) TERMINALS

⚠ WARNING

Improper booster cable connections can cause an explosion resulting in personal injury.

Connect booster cables using following procedure.

1. **Connect booster cable to positive (+) battery terminal of discharge battery. Connect other end of booster cable to positive battery ter minal of normal battery.**
2. **Connect other booster cable to negative (-) battery terminal of normal battery. Connect other end of booster cable to upper frame of troubled machine.**
3. **Start engine and remove booster cables on reverse order.**

https://truckmanualshub.com/

1.7 WARNING LABELS & DECALS

Warning labels and decals are affixed to the machine to remind operators and personnel specific safety precautions in certain areas of the machine. The following are illustrated examples of all warning labels and decals along with their locations.

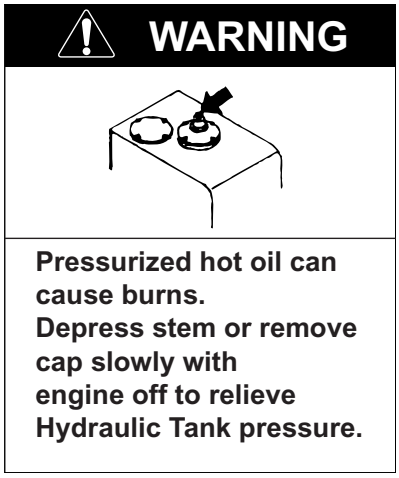
1. SWING–DANGER

Located on each side of the rear counterweight.
Part Number – YN20T01003P2 (2REQ'D)



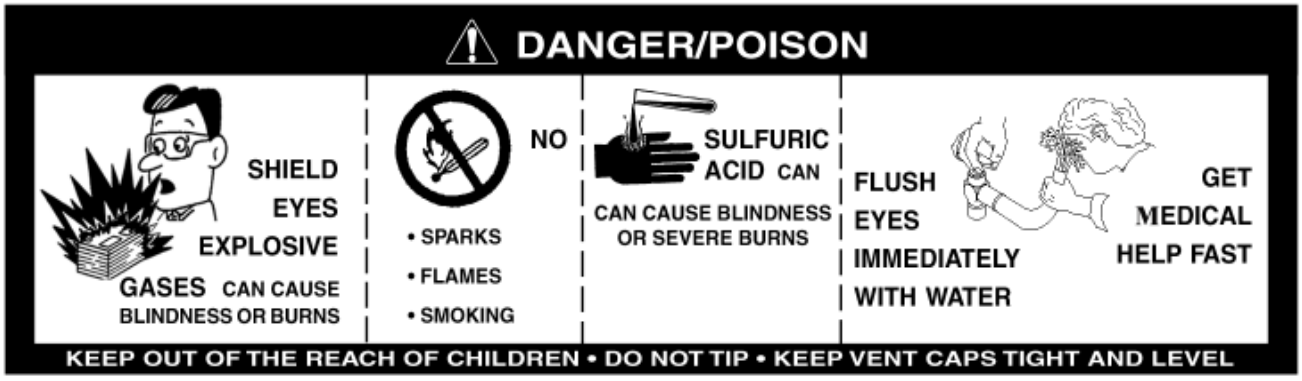
2. PRESSURIZED HOT OIL – WARNING

Located on top of Hydraulic Tank.
Part Number – YN20T01289P1



3. BATTERY – DANGER /POISON

Located on Battery



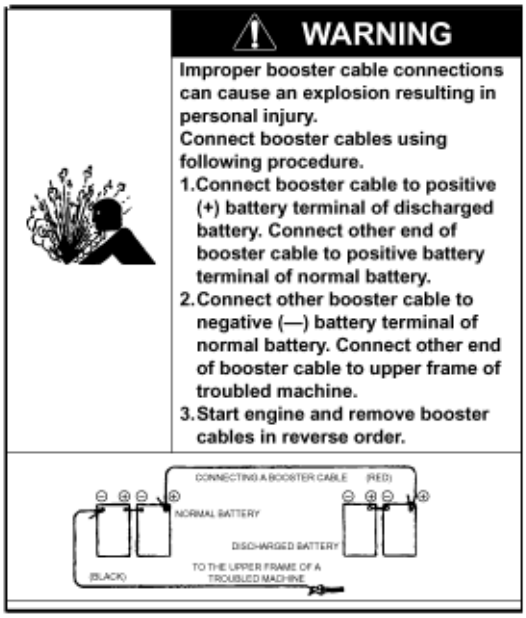
4. STOP ENGINE– WARNING

Located on top of engine fan shroud.
Part Number– YN20T01009P1



5. BOOSTER CABLE– WARNING

Located on battery box compartment.
Part Number– YN20T01015P2



https://truckmanualshub.com/

6. ACCUMULATOR CONTAINS PRESSURIZED GAS– WARNING
Located on side of nitrogen accumulator
Part Number– YN20T01216P1

WARNING

ACCUMULATOR CONTAINS PRESSURIZED GAS.

- **Do not disassemble.**
- **Do not remove plug in service.**
- **Do not dispose without relieving gas loosening plug.**

YN20T01216P1

7. BOOSTER CABLE – WARNING
Located on battery box access compartment.
Part Number – YN20T01338P1

WARNING



Electric hazard may cause injury when mishandling the cable. Read operator manual for safe and proper handling.

8. POWER BOOST SWITCH– WARNING
Located inside cab on R.H. Window.
Part Number– YN20T01004P1



WARNING

Releasing power boost switch while lifting a load can cause unexpected lowering of load, resulting severe injury of death. Never use power boost switch of lifting a load.

9. HEAVY LIFT SWITCH– WARNING
Located inside cab on R.H. Window.
Part Number– YN20T01340P1



WARNING

Turning off heavy lift switch while lifting a load can cause unexpected lowering of load, resulting in severe injury or death.

Never turn off heavy lift switch while lifting a load.

YN20T01340P1

10. ELECTRICAL POWER LINES– WARNING
Located inside cab on R.H. Panel.
Part Number– YN20T01006P1



WARNING

Contact with electrical power lines will result in severe injury or death.

Keep machine and attachment a safe distance from electrical power lines as per following instruction.

VOLTAGE (Volts)	SAFETY DISTANCE
50K OR LESS	3.0M (10FT)
50K TO 200K	4.5M (15FT)
200K TO 350K	6.0M (20FT)
350K TO 500K	7.5M (25FT)
500K TO 750K	10.5M (35FT)
750K OR OVER	13.5M (45FT)

YN20T01006P1

11. DO NOT LIFT MACHINE THROUGH COUNTERWEIGHT LIFTING EYES - DANGER
Located on top of counterweight. (2 Required)
Part Number– YN20T01221P1

DANGER

Do not use counterweight lifting eyes to lift whole machine.
Lifting eyes can fall under this load resulting in personal injury.

Refer to operators manual for proper way of lifting machine.

YN20T01221P1

12. DO NOT STEP ON – WARNING
Located on top of engine cover.
Part Number– 2432P3055



https://truckmanualshub.com/

13. HOT COOLANT – WARNING
Located on top of engine fan shroud.
Part Number– YN20T01010P1

⚠ WARNING

Steam of hot coolant can cause injury or blindness.
Never loosen or open radiator cap when coolant is hot and under pressure.
Before opening radiator cap:
- **Cool Down engine completely.**
- **Cover radiator with cloth rag.**
- **Loosen cap slowly to reliever pressure.**

YN20T01010P1

14. HOT PARTS – CAUTION
Located on top of engine cover.
Part Number– YN20T01220P1

⚠ CAUTION



Engine may be hot which could cause burns.
Do not touch engine until it cools down.

YN20T01220P1

15. ROTATING PARTS - CAUTION
Located on top of engine cover
Part Number– YN20T01012P1

⚠ CAUTION

Rotating engine fan, hot engine parts and drive belt can cause severe injury.
Do not open engine cover with engine running.

YN20T01012P1

16. USE DIESEL FUEL
Located on side of fuel tank opening.
Part Number– YN20T01213P1



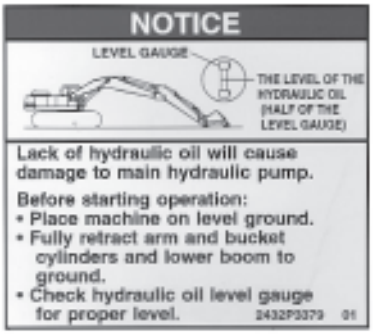
17. GREASE SWING BEARING
Located on upper frame lower right corner - Below cab. Part Number– 2432P2689



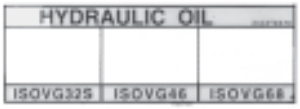
18. ANTIFREEZE SOLUTION
Located on back side of radiator compartment door.
Part Number– YN20T01097P1



19. HYDRAULIC OIL CHECK POSITION
Located on back side of pump compartment door.
Part Number– 2432P3379



20. HYDRAULIC OIL USED
Located on the back side of hydraulic tank.
Part Number– 2432T6573



21. SERIAL NUMBER PLATE
Located on upper frame lower right corner - Below cab. Part Number– 2432T5613



https://truckmanualshub.com/

22. KPSS &SWING BRAKE RELEASE – CAUTION
Located inside cab rear panel cover.
Part Number –YN20T01237P1

CAUTION

The KPSS work mode releases switch and swing parking brake release switch are installed on the rear side this cover.

Swing parking brake release switch	KPSS work mode release switch
• While operating swing action when the parking brake can not be released set the toggle switch to "RELEASE " position, and the parking brake si released. Usually, this toggle switch should be sent to norma position and contact our service department immediately.	• When the CPU error is displayed on the multidisplay, set the toggle swith to "RELEASE " position and contact our service department immediately.

YN20T01010P1

23. LIFTING FUEL TANK – WARNING
Located on top of fuel tank.
Part Number –YN20T01028P1

WARNING

Lift eyes or tank can fail when lifting tank containing fluids and cause possible personal injury.

Drain all fluids from tank before lifting.

YN20T01028P1

24. KEEP SURFACE CLEAN – WARNING
Located on top of fuel tank (front left corner).
Part Number – 2432T6111

WARNING



When servicing or repairing machine, keep surfaces free of oil, water, grease, tools, etc. to avoid possible slipping and / or falling from machine, which can cause personal injury.

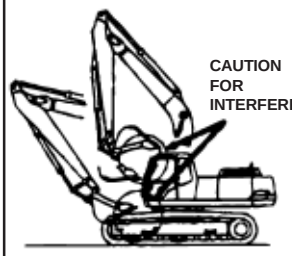
2432T6111

25. BREAK GLASS IN CASE OF EMERGENCY
Located inside cab,on back window glass.
Part Number –YN20T01178P1



26. BUCKET CAB INTERFERENCE -CAUTION
Located inside cab,on right indow glass lower corner.
Part Number – 2432P3380

CAUTION



Bucket can contact and damage cab when machine equipped with some attachments.

Check clearance between bucket and cab before operation. Exercise care when operation a bucket near cab.

YN20T01012P1

27. READ OPERATOR MANUAL -WARNING
Located inside cab,on right indow glass lower corner.
Part Number –YN20T01016P1

WARNING

Read and understand the operators manual before operating or performing maintenance on this machine.
Failure to follow or pay attention to instructions in operators manual can result in injury or death.
It is your responsibility to be aware of and follow all local laws and regulations.
Before starting machine, make sure hydraulic control lever is in lockout position and all control levers are in neutral.
Sound horn to alert people.
Ensure bystanders and obstacles are clear of machine before moving machine or its attachments.
Do not carry riders or machine.
Before leaving operators compartment, park on level ground, lower attachments to ground, make sure hydraulic control lever is in lockout position and stop engine.

YN20T01016P1

28. DO NOT INSTALL ANY OBJECT ON THE HAND-RAIL - WARNING
Located inside cab,on right window glass lower corner.Part Number – 2432T6109

⚠ WARNING

DO NOT INSTALL ANY OBJECT ON THE HANDRAIL

This can cause the welds that fasten the handrail to the operator's cab to fatigue and crack to excessive vibration during machine operation.

Injury to the operator may result if he falls to ground because of the unexpected brakage of the welds.

2432T6109

29. NIBBLER &BREAKER OPERATION - CAUTION
Located on Left Hand operator console.(OPT)
Part Number –YT20T01054P1

⚠ CAUTION

Do not set this switch to nibbler combined flow operation position when using breaker.

YY20T01039P1

30. NIBBLER &BREAKER SELECTOR VALVE – CAUTION
Located inside cab,on right window glass lower corner (OPT).
Part Number –YY20T01039P1

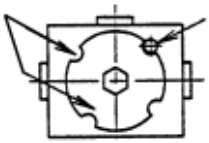
⚠ CAUTION

Procedure to change selector valve:

MARK	SELECTION
N	Nibbler
B	Breaker
E	Extra

Please adjust suitable notch to capscrew. (Some mark may not be indicated)

Marks Capscrew



MAINTENANCE
(When using nibbler or breaker)

Contamination and deterioration of hydraulic oil may develop malfunctioning of control valves, early wear, and seizure of hydraulic pumps, and consequential damage of entire hydraulic circuit.
Replace filters and hydraulic oil, referring to the following table:

1.- Hydraulic oil change: every 600 hours.

2.- Hydraulic return filter change:
First: 50 hours
Second: 250 hours
Regular: Every 250 hours

YY20T01039P1

31. SAFETY LOCK LEVER – WARNING
Located on right side of operator's right console.
Part Number – PY20T01073P1

⚠ WARNING

Machine may move suddenly and cause serious personal injury if a control lever is accidentally touched be sure the safety lever is disengaged and in the locked position before exiting the cab.

PY20T01073P1

32. DO NOT PINCH YOUR HAND(S)– CAUTION
Located left side of left console and on floor -left side of left console.
Part Number –YN20T01339P1 (2Req'd)

⚠ CAUTION



Be careful not to pinch your hand(s) when operating the lever.

YN20T01339P1

33. KEEP CLEAR OF MACHINE – DANGER
Located on both sides of the arm
Part Number –YN20T01337P1 (2 required)



34. FALLING FRONT WINDOW -CAUTION
Located on upper frame of front window
Part Number – LE20T01019P1

⚠ CAUTION

Falling front window can cause injury.
Always lock securely in place with lock pins on both sides.

LE20T01019P1

35. TWO SPEED TRAVEL -WARNING
Located inside cab,on right window glass lower corner Part Number – LE20T01019P1

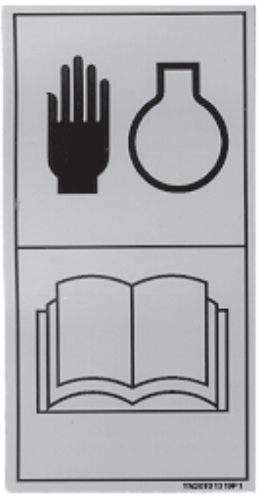
WARNING

Automatic two speed travel system changes travel speed automatically and can adversely affect machine control when descending a slope and loading or unloading on a trailer.
Personal injury can occur from sudden change in machine control.
Put travel speed select switch in low speed position when descending a slope and loading or unloading on a trailer.

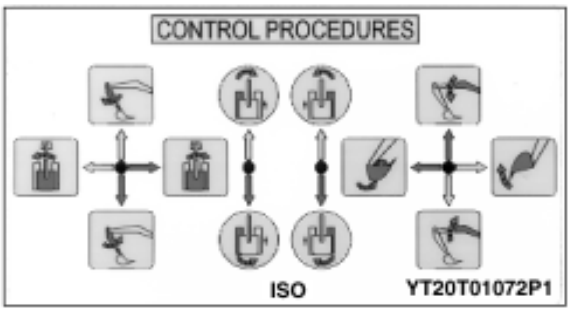
LE20T01019P1

36. STOP AND READ OPERATORS MANUAL BEFORE USING -WARNING
Located inside cab,on right side wall,behind the right control console (For manual throttle control).
Part Number –YN20T01319P1

(23) YN20T01319P1



37. OPERATOR'S CONTROL PATTERN
Located inside of cab door
Part Number –YT20T01072P1



38. HYDRAULIC WARM UP -CAUTION
Located inside cab right window glass.
Part Number –YN20T01263P1

CAUTION

Slow or unexpected movement of the hydraulic functions may result when the hydraulic oil is cold.

Always perform the hydraulic oil warm up procedure before attempting normal machine operations.

Always keep personnel away from the area around the machine during the warm up procedure.

YN20T012663P1

38. HYDRAULIC WARM UP -CAUTION
Located inside cab right window glass.
Part Number –YN20T01263P1

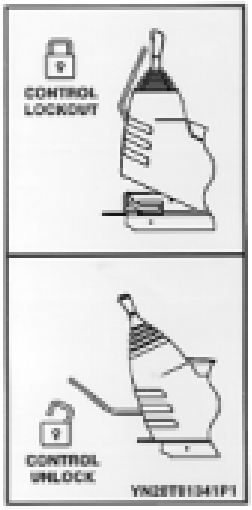
NOTICE

Stopping engine without allowing it to cool can result in overheatting and a shortened engine life.
Before stopping engine, run at low idle for at least 5 minutes to allow engine and turbo charger to gradally cool down.

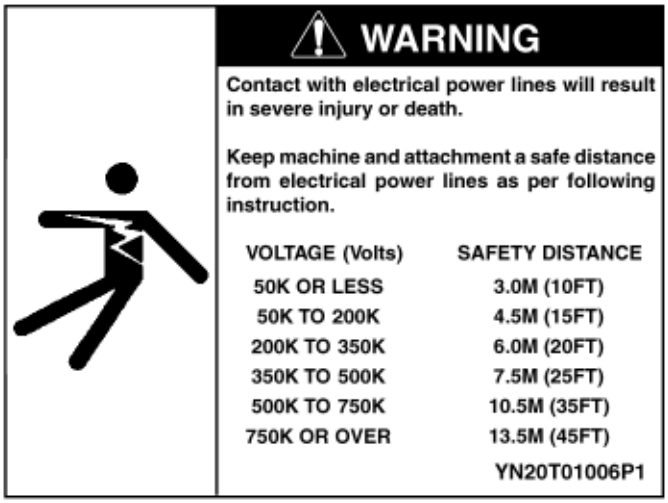
YN20T01007P1

https://truckmanualshub.com/

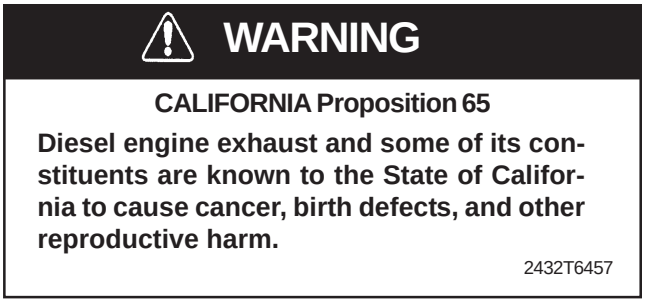
39. CONTROL LEVER LOCK AND UNLOCK
Located inside cab on left control console.
Part Number –YN20T01341P1



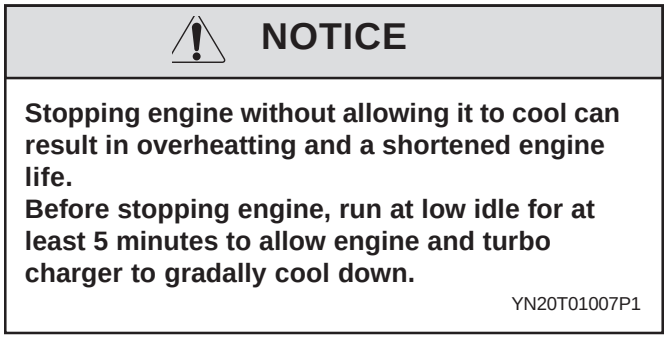
40. ELECTRICAL POWER LINES – WARNING
Located inside cab right window glass.
Part Number –YN20T01007P1



41.CALIFORNIA PROPOSITION 65 – WARNING
Located inside cab,on right window glass.
Part Number – 2432T6457



42.NOTICE FOR STOPPING ENGINE – NOTICE
Located inside cab,on right window glass.
Part Number – YN20T01007P1



https://truckmanualshub.com/

42. HANDLING PILOT HOSES WARNING –CAUTION

Located on front panel inside the air cleaner compartment.
Part Number –YN20T01290P1

⚠ CAUTION

PILOT VALVE SIDE **CONTROL VALVE SIDE**



1	1.BUCKET (H)
2	2.BUCKET (R)
3	3.BOOM (H)
4	4.BOOM (R)
5	5.SWING (LH)
6	6.SWING (RH)
7	7.ARM (H)
8	8.ARM (R)

- **HYDRAULIC OIL CAN BE HOT AFTER MACHINE PERATION. ALLOW OIL TO COOL BEFORE STARTING MAINTENANCE WORK.**
- **BEFORE DISCONNECTING THE HYDRAULIC HOSES..LOOSEN THE AIR BREATHER ON THE HYDRAULIC OIL TANK AND BLEED OFF THE REMAINING PRESSURE LEFT IN THE HY DRAULIC SYSTEM.**
- **CONTROL PATTERN FUNCTIONS MUST CORRESPOND TO BLACK AND WHITE DECAL LOCATED ON THE CONTROL CONSOLE.**

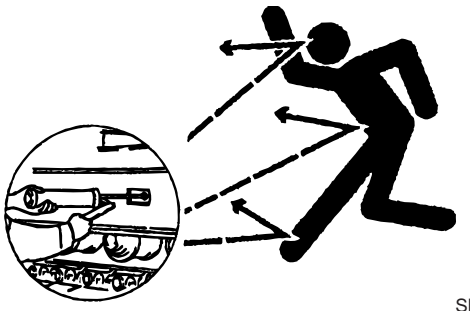
YN20T01290P1

WARNING

GREASE IN TRACK TENSIONING MECHANISM IS UNDER EXTREME PRESSURE AND CAN PENETRATE SKIN CAUSING SEVERE INJURY. KEEP FACE AND BODY AWAY FROM GREASE FITTING AREA. NEVER LOOSEN GREASE FITTING MORE THAN ONE (1) COMPLETE TURN. IF GREASE DOES NOT RELEASE AFTER ONE TURN OF THE FITTING, CALL AN AUTHORIZED KOBELCO SERVICE DEALER FOR ASSISTANCE.

USE CAUTION WHEN ADJUSTING TRACKS

TORQUE GREASE FITTING TO 6 kgf-m (45 lbs-ft)

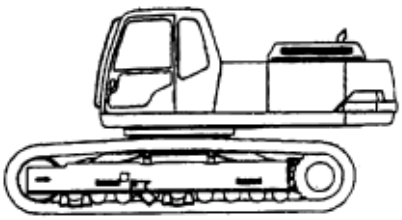


SK32001034

43. ADJUSTING TRACK TENSION – WARNING

Located inside cab,on right window glass lower corner. Part Number – 2432T6110

⚠ WARNING

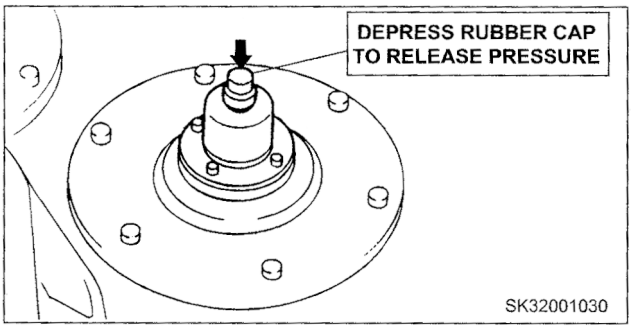


Extreme high pressure in track adjustment cylinder can cause personal injury when adjusting crawler tension. Loosen grease nipple with care to relieve pressure gradually.

2432T6110

44. RELEASE HYD.TANK PRESSURE – CAUTION

Located on hydraulic reservoir air breather valve.
Part Number –YN57V00002S007



SK32001030

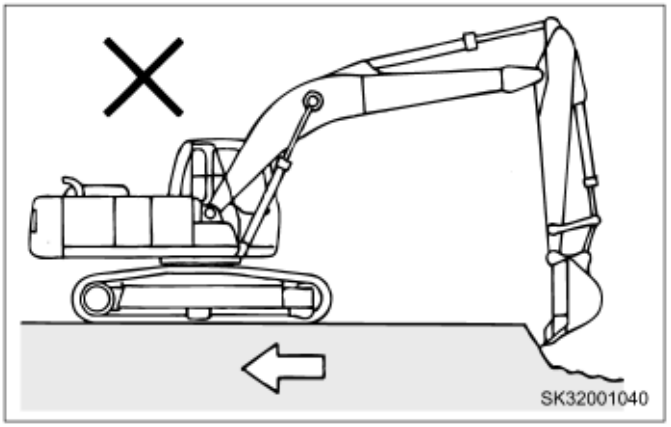
https://truckmanualshub.com/

PROHIBITED MACHINE OPERATION

The following examples of machine abuse and misuse should never be attempted by even the most experienced operator. Such abuse and misuse of this machine and its attachments can result in serious bodily injury, death, severe equipment damage and shortened service life of the machine. Under no circumstance should any of these operations be attempted. Use common sense and follow proper operation procedures found in this Operators Manual while operating this equipment.

A. DO NOT USE TRACTIVE FORCE OF THE MACHINE FOR LOADING THE BUCKET ATTACHMENT.

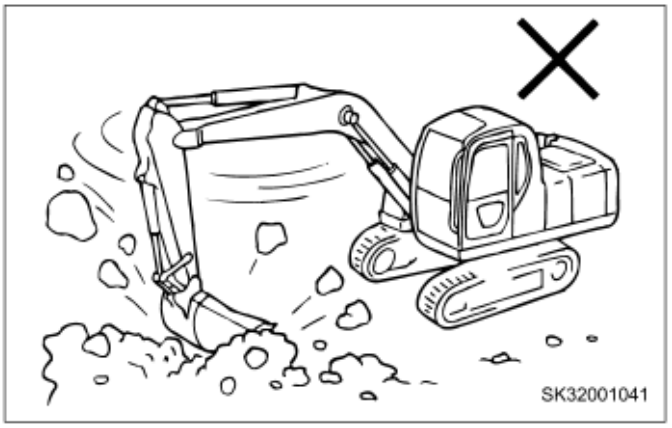
Doing so will exert excessive force on the machine structure, front end attachments and could cause severe equipment damage. Use tracks for normal travel operations only.



DO NOT USE TRACTIVE FORCE

B. DO NOT USE SWINGING FORCE OF THE MACHINE FOR OPERATIONS.

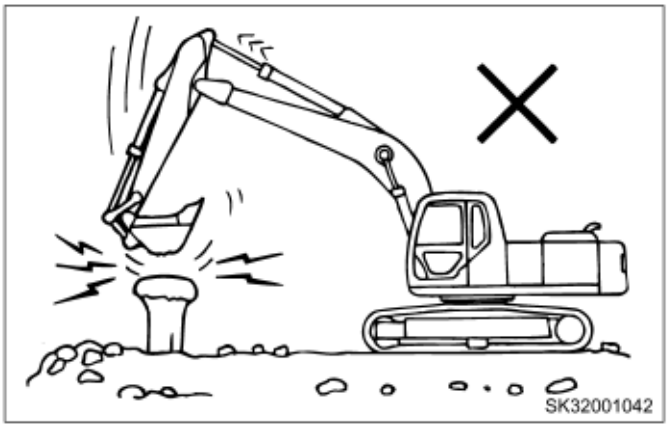
Doing so will exert excessive force to the machine structure, front end attachments and shorten life of the swinging system of the machine. Also, serious injury or death could result from such operations.



DO NOT USE SWINGING FORCE

C. DO NOT PERFORM "HAMMERING" OPERATIONS WITH THE BUCKET.

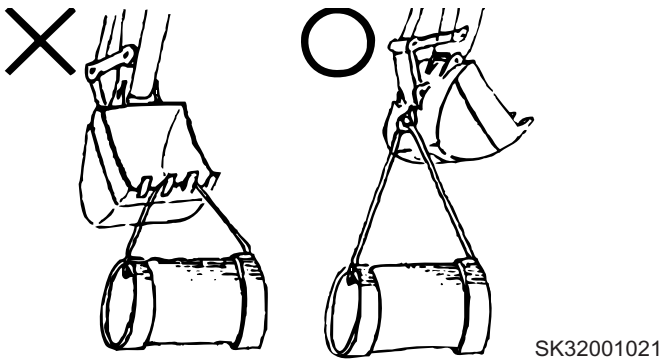
Performing operations such as hammering and piling will cause extensive damage to the machine and its components. These types of operations can also result in serious injury or death.



DO NOT HAMMER WITH ATTACHMENT

D. DO NOT USE THIS MACHINE FOR ANYTHING OTHER THAN ITS IN TENDED PURPOSE.

This machine is designed and manufacture used for digging and loading operations only. Any other use can exert excessive force to the machine, its components, its systems and result in serious bodily injury or death to the operators and other personnel working in the vicinity of or with the machine.



USE ONLY FOR INTENDED PURPOSE

https://truckmanualshub.com/

E. DO NOT OPERATE BUCKET AND ARM CYLINDERS TO STROKE END REPEATEDLY.

Extending the bucket and arm cylinders to stroke end to clean debris from the bucket, will cause impact to the bucket cylinder causing cylinder damage. Use high pressure water or manually remove stubborn material from the bucket.

F. DO NOT OVER EXERT THE MACHINE'S CAPACITIES.

Know the limitations of the machine and its attachments and operate the machine within those specifications. Do not exceed lift charts. Never tip or raise the machine to obtain power to move material.This could cause extensive damage to the machine and its components as well as result in serious bodily injury or death.

END OF WORK SHIFT SAFETY

Perform all of the following procedures af ter each shift is complete to insure the ma chine is in optimal operating condition for the next shift or job site.

A. Move the machine to a firm, level sur face.

B. Lower attachment to the ground.

C. Refill fuel tank to full mark to reduce air volume and condensation (moisture). This will decrease the possibility of freezing in the fuel tank, rusting due to moisture and other problems associ ated with start up and operation.

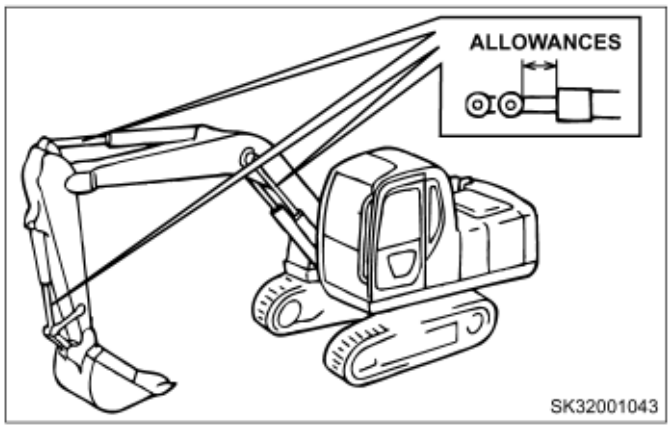
D. Close and secure all windows in placeto prevent water or moisture reaching the electrical components of the machine.

E. Thoroughly clean and inspect the machine. Perform lubrication mainte nance and repair or replace any problem areas found before restarting the machine.

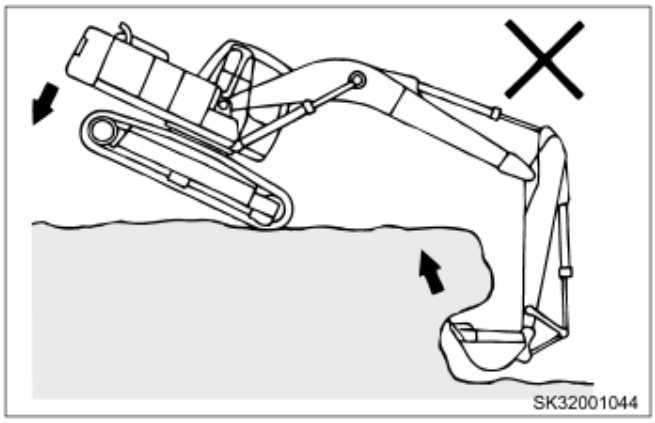
F. If operating the machine in cold climates, it may be necessary to remove the batteries from the machine and store in a warm well ventilated area.Install the batteries in the machine before next start up. This will help prevent premature battery deterioration.

G. Remove key from key switch and lock all doors and access panels.

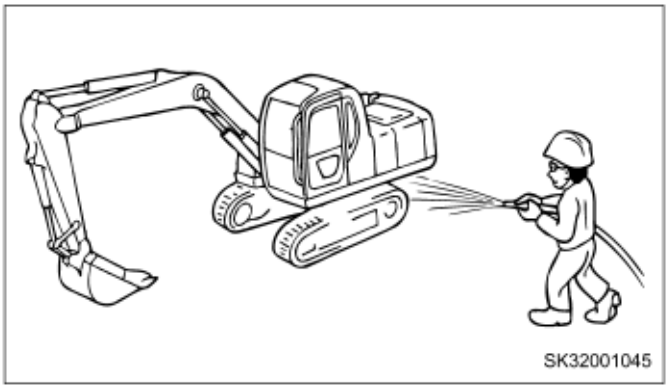
H. Install vandalism guards if necessary.



DO NOT OPERATE CYLINDER TO STROKE END



DO NOT OVER EXERT THE MACHINE

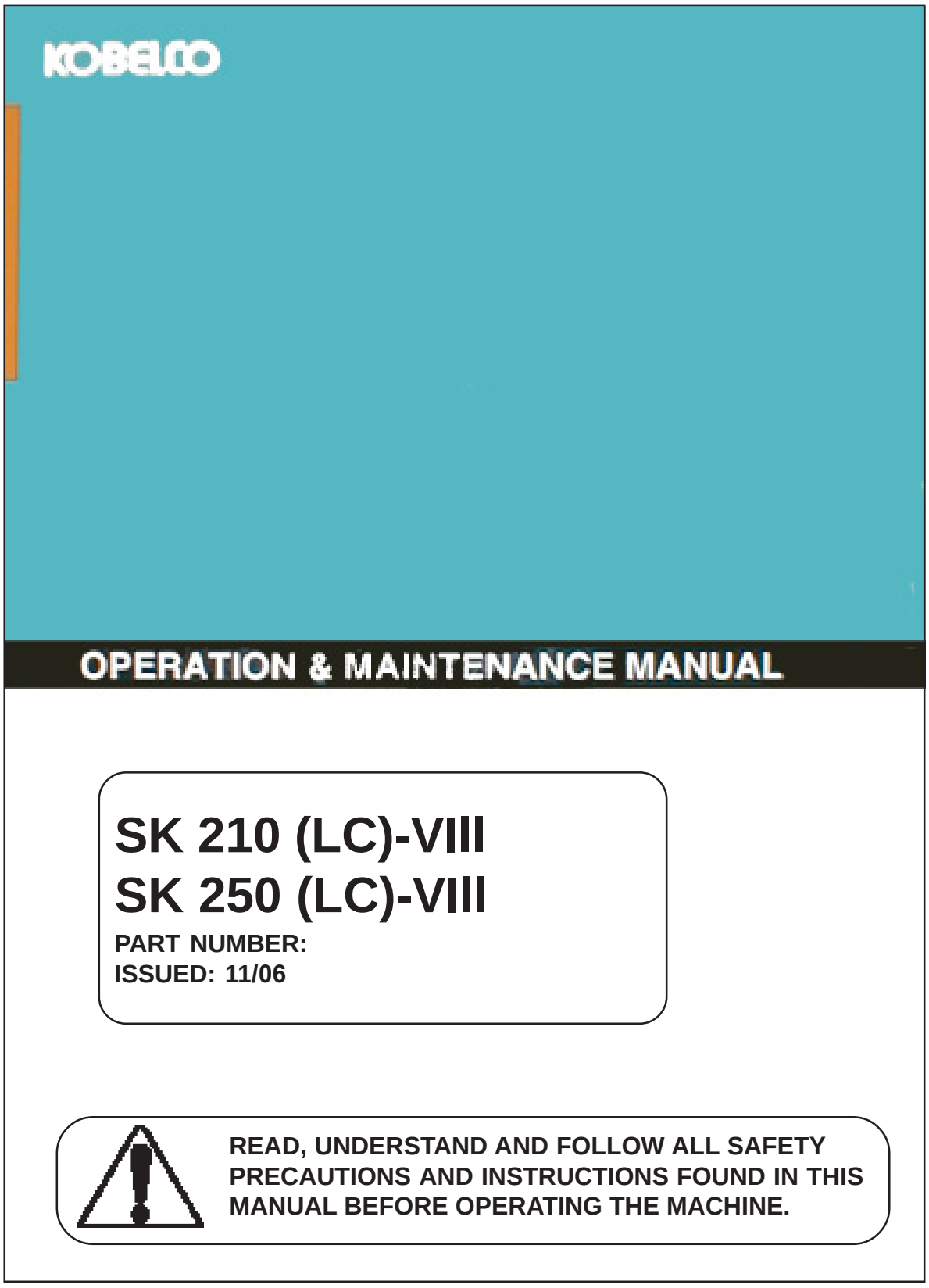


END OF WORK SHIFT SAFETY

https://truckmanualshub.com/

Always read your operators manual carefully before operating or repairing the excavator.

***** Important safety & operation information can be found in this Manual. *****



SK 210 (LC)-VIII
SK 250 (LC)-VIII

PART NUMBER:
ISSUED: 11/06

READ, UNDERSTAND AND FOLLOW ALL SAFETY PRECAUTIONS AND INSTRUCTIONS FOUND IN THIS MANUAL BEFORE OPERATING THE MACHINE.

https://truckmanualshub.com/

CHAPTER 03



MACHINE FAMILIARIZATION

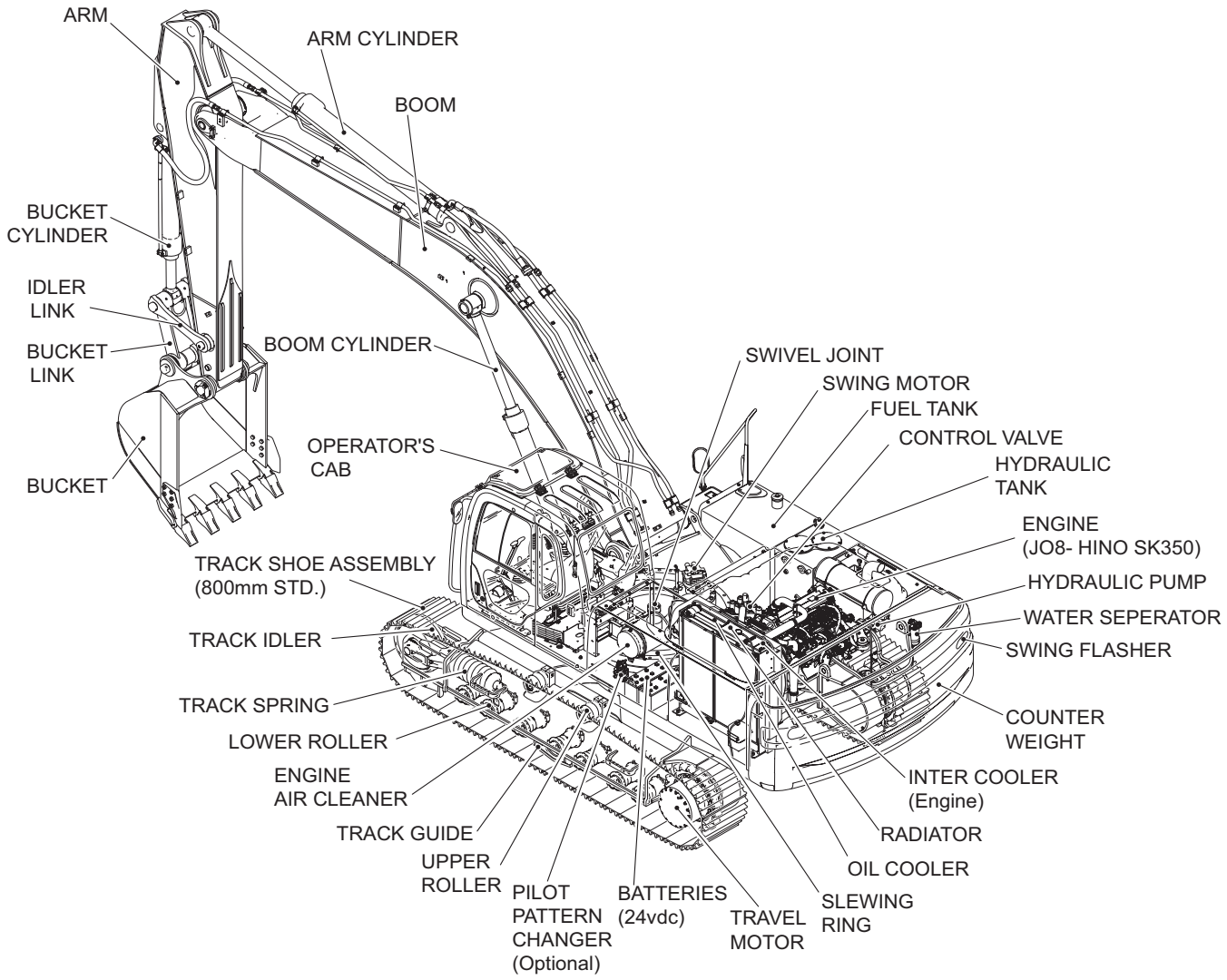
KOBELCO Construction Machinery LLC®
A Brand of CNH

FAMILIARIZATION

All operators,service mechanics and personnel responsible for operation,inspection and maintenance of the machine should become thoroughly familiar with the controls and components and their functions before working with or on this equipment.
Study the information in this section to become familiar With the controls and components of this machine.

GENERAL MACHINE NOMENCLATURE

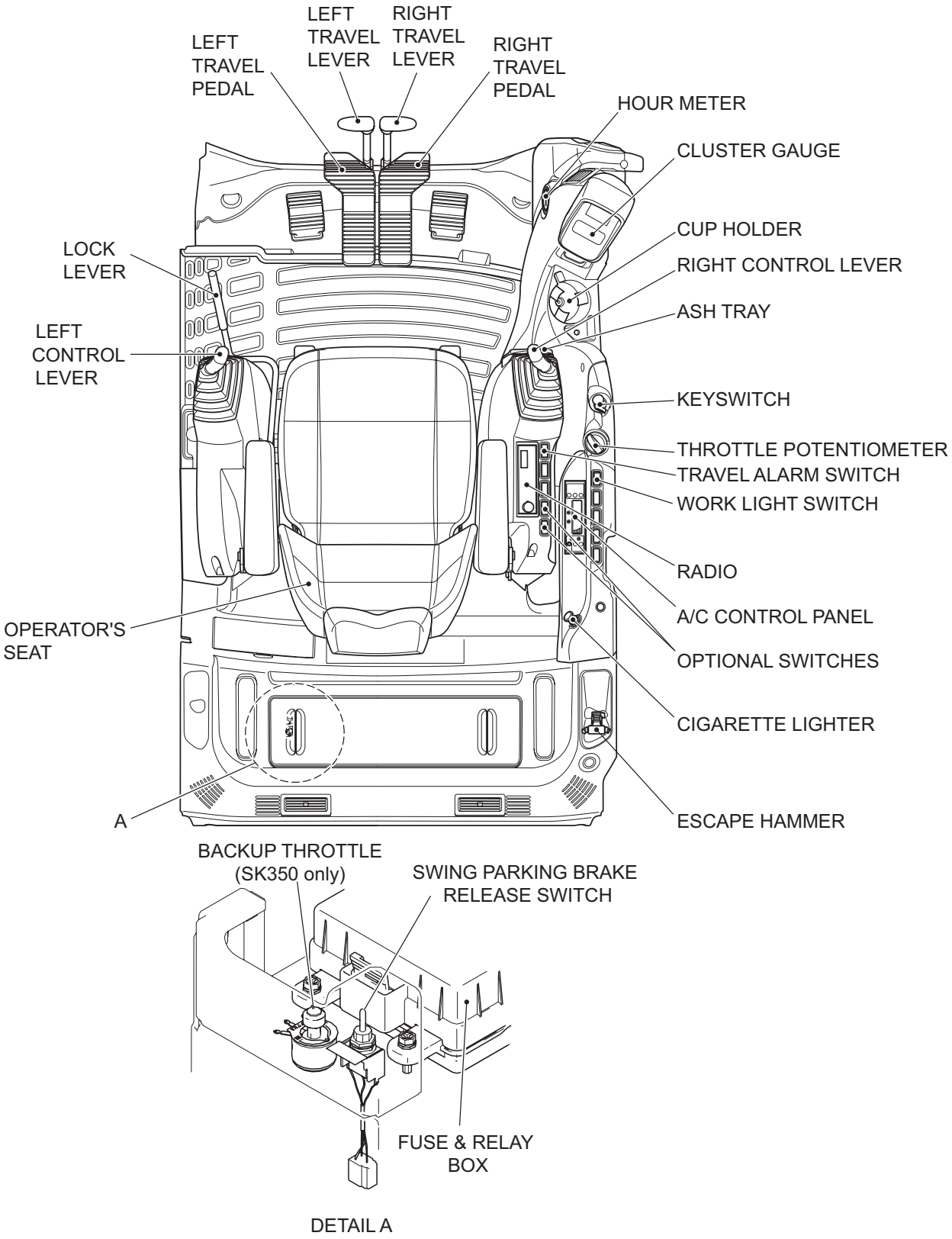
The Nomenclature drawing below (FIGURE 3.12),points out locations of major components of the new series Hydraulic Excavator.
Study these areas and locate these components on the machine.Specific information regarding these components are explained on the following pages of this section.



https://truckmanualshub.com/

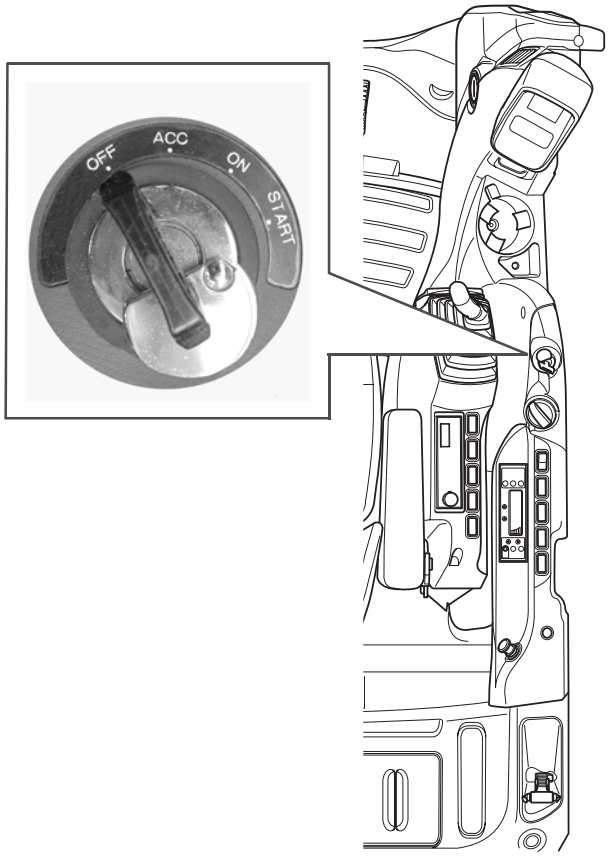
OPERATOR CAB NOMENCLATURE

The operator cab nomenclature, see Figure below, points out locations of operator controls of the hydraulic excavator operator cab. Study these areas and locate these components on the machine. Specific information regarding these components are explained on the following pages of this section.



COMPONENT & CONTROLS NOMENCLATURE

The following information provides a brief description and function of the components and controls of the KOBELCO Mark 8 Hydraulic Excavators. All personnel associated with these machines should read and understand this information BEFORE beginning any work with or on this equipment.



RIGHT HAND OPERATOR CONSOLE

1. Key Switch – FIGURE 3.14.a

The Key Switch is located on the right hand operator console and has 5 operating functions.

a. "OFF "–When Key is turned to this position, the engine stops and electrical power to the machine's electrical systems is stopped after approximately 4 seconds.

c. "ACC "–With key in the "ACC "position only the cigarette lighter, tuner and horn will have power.

d. "ON"– When Key is in the ON position, electrical power is supplied to all the machine 's electrical systems.

e. "START "–When key is turned to this position electrical power is supplied to the starter solenoid causing the starter to start the engine. After engine starts key should be released to go back to the "ON " position.



Note: Engine pre heat during cold climate conditions is controlled by the engine computer automatically, so no heat position is present on the Key Switch.

https://truckmanualshub.com/

2. Throttle Potentiometer

The throttle potentiometer item # 2 is located on the right hand cab wall and controls engine RPM.

When the throttle potentiometer is rotated to any position it increases or decreases engine rpm unless auto accel is engage and maintains engine at the programed RPM for that particular position on the dial.

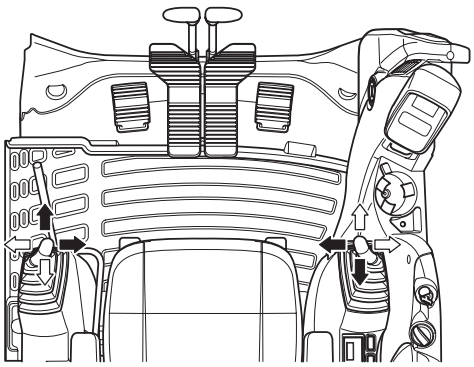
- **LO (Low idling) :**
  The engine speed reduces to the minimum at the position turned to the leftmost.
- **HI (High idling) :**
  The engine speed rises to the maximum at the position turned to the rightmost.

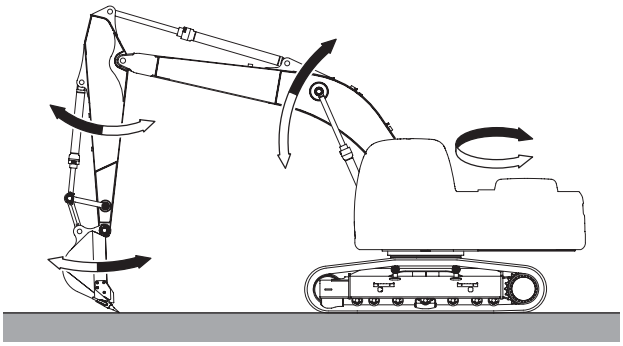


Proportional auto acceleration function:

1. In operation, when the pilot pressure from the hand and/or travel pedal control levers are not used for 1 sec., and if the position of the throttle potentiometer is higher than 1050 rpm, the auto accel actuates automatically and engine speed will return to 1050 rpm. When control lever movement is detected rpm will increase in direct proportion to lever movement amount or throttle position.

2. When the throttle potentiometer is positioned lower than the auto accel speed, the throttle potentiometer has priority over level control rpm demand so the engine speed is maintained to the throttle potentiometer's position.





AUTO ACCEL SWITCH

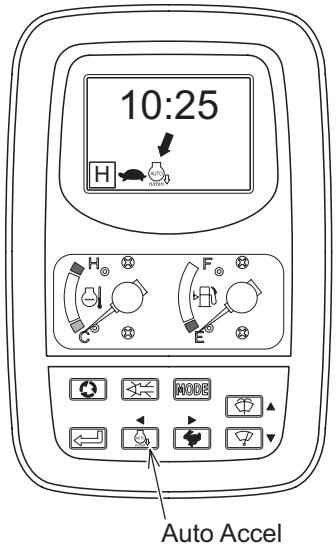
When this switch is activated (ON) the auto-accel system activates.

The auto-accel reduces the engine speed to the idle level reducing fuel consumption and noise under the following conditions:

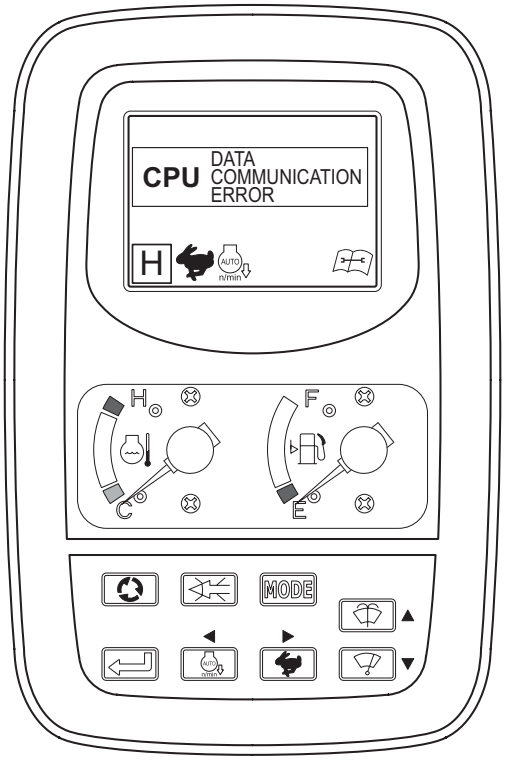
1. The accel dial position is set above the idle position.
2. The control levers and/or travel pedals are not operated for 1 seconds or more.

When the control lever and/or pedal are operated, the engine speed rises to the throttle potentiometer set level gradually, according to the respective amount of operating pilot valve stroke. Anytime this switch is deactivated (OFF) the engine speed rises to the throttle potentiometer set level, independently of respective amount of operating pilot valve stroke.

Notice: When loading or unloading machine on trailer, turn the auto accel switch off. If auto accel is left operational sudden engine speed changes could result in a accident or damage.



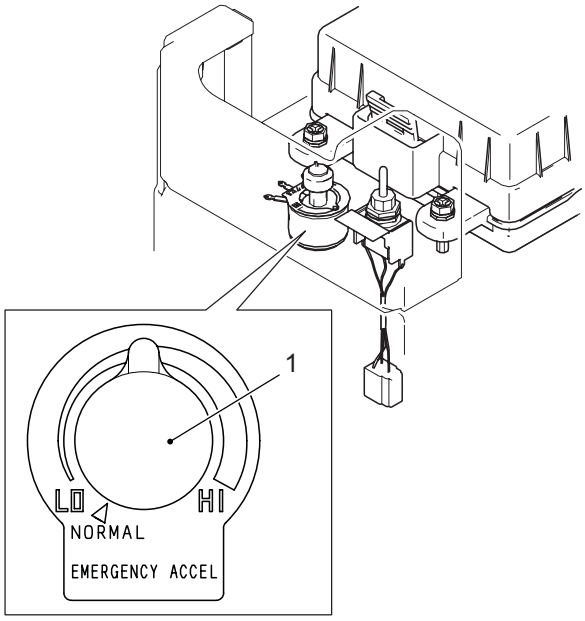
Potentiometer for Backup Throttle Mode - (SK350 Only)



This machine is equipped with both an electronic engine controller which is used to control engine speed and an mechatronics machine controller which is used to control excavator functions.
When the machine's mechatronics controller is in an inoperable abnormal condition, the warning shown in the right hand figure is displayed on the multi-display.
In this case,normal engine speed can't be controlled by the main throttle potentiometer,in this case the engine speed can be controlled by operating the backup throttle potentiometer accel dial located on the rear panel behind the operator seat, enabling the work to be continued temporarily. But contact our dealer/distributor for proper system diagnostic checkout and service immediately.
Follow the procedure shown below or the backup throttle potentiometer accel dial will not actuate properly.

Procedure

1. Turn the emergency accel dial (1) to "NORMAL" position.
2. Start engine.
3. Turn the emergency accel dial (1) to "HI" side and adjust the engine speed to required rotation.
4. To stop engine, at first return the emergency accel dial (1) to "NORMAL" position.



Notice : It is dangerous to abruptly increase the engine speed immediately after the engine is started. Follow proper warm-up procedures to avoid possible engine damage or castrophic engine failure. If the above procedure is not followed, the engine speed might be increased rapidly.
Once repaired and/or normal conditions return to the mechatronics controller or when the machine is not operated, return backup throttle potentiometer accel dial to the "NORMAL" position.

https://truckmanualshub.com/

2. KPSS Mode Switch – FIGURE 3.14.b

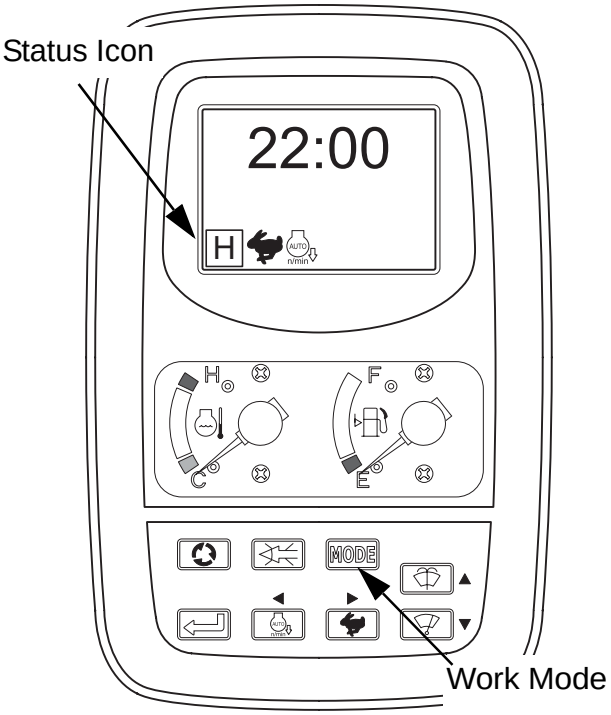
The KPSS Mode Switch SK210~SK350 is located on the cluster gauge and has 4 operational function modes. After starting the engine, the mode defaults to the **H** for maximum power. The operator can select an effective work mode complying with the working conditions and working target from the 4 modes. Each time the work mode switch is pressed, the work mode indicator in the cluster gauge is switched from **H,** to **B,**to A then to **S** in that order

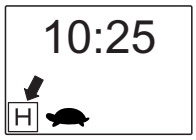
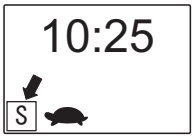
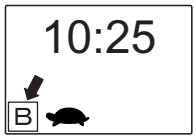
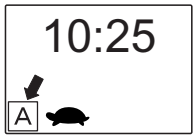
H : H mode (for heavy duty work)

S : S mode (for standard work and loading operations)

A : A mode (for crusher [nibbler]

B : B mode (for breaker)



Work mode	Display	Contents
H mode		**"H mode"**is suitable for heavy duty digging work which gives priority to the workload at the high speed.
S mode		**"S mode"**is suitable for standard digging and loading works and is in fuel saving and is maintained well-balanced relations with workload.
B mode		For the work with breaker, select "B mode" without fail.
A mode		For the work with crusher (nibbler), select "A mode".

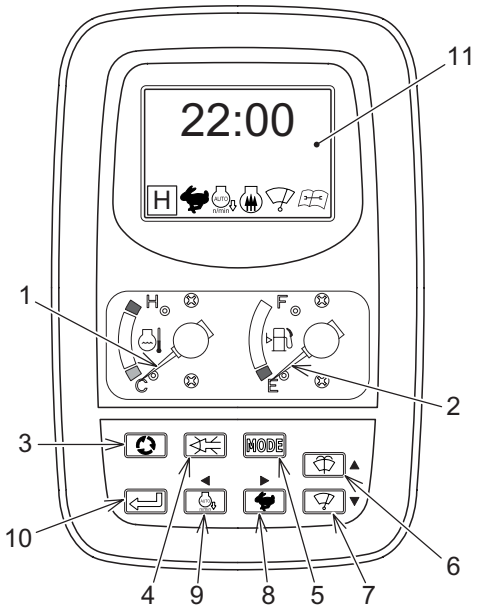
CLUSTER GAUGE & SWITCH NOMENCLATURE

The following information provides a brief description and function of the components and controls of the cluster gauge of the excavator.

GAUGE CLUSTER

The gauge cluster is made up of analog gauges (fuel level, engine coolant temperature), various switches and an L.C.D multi-display.

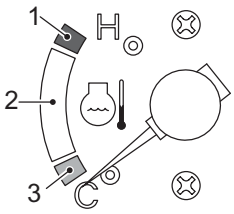
- When warning icons appear on the multi-display, stop work immediately if nessary and check and service point or problem.
- The display on the multi-display does not entirely assure the condition of machine.
- For the maintenance and inspection of machine, visual checking should be carried out daily without completely depending on the display on the multi-display.



GROUP	No.	NAME
A Meters	1	Engine Coolant Temperature Meter
	2	Fuel Level Meter
B Switches	3	Screen Change Switch
	4	Buzzer Stop Switch
	5	KPSS Mode Select Switch
	6	Washer Switch
	7	Wiper Switch
	8	Travel Speed Select Switch
	9	Auto Accel Switch
	10	Select Switch
C Display	11	L.C.D Display

Group A.METERS

1. COOLANT TEMPERATURE METER

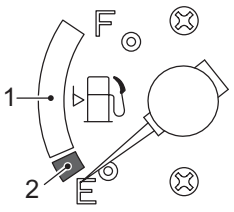


This indicates the temperature of the engine coolant, and operates when the key switch is turned to the "ON" position. The temperature is normal in the white range. If the indicator enters the red range, Decrease work load on the engine until the coolant temperature cool down and the indicator moves back into the normal range.

1. RED: Over heat zone
2. WHITE: Normal operating condition
3. BLUE: Cold condition, warm up engine and hydraulic system

https://truckmanualshub.com/

2. FUEL METER



This indicates the amount of fuel in the tank.

This gauge indicates the remaining volume of fuel in the fuel tank. Refuel when the indicator is approaching to the "E" point. Refill the fuel tank with diesel fuel only.
For fuel in use, see page 4-10.

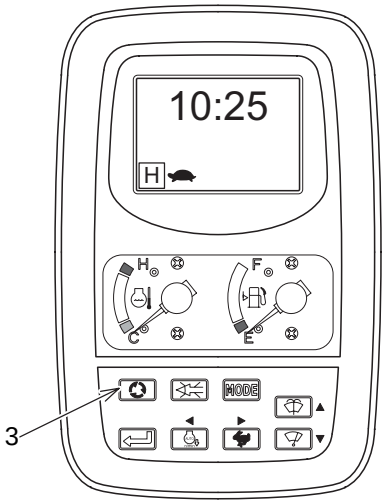
F : Tank is Full tank

1. WHITE: Operating zone
2. RED: Refill

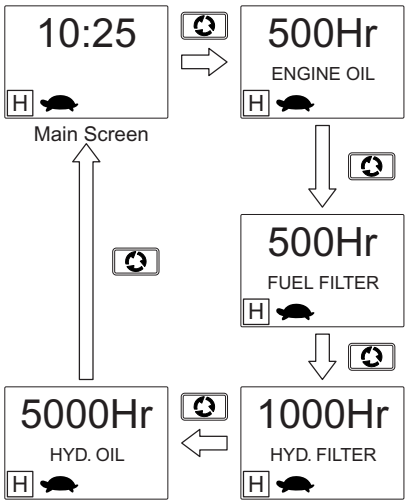
E : Empty - Refueling is required

Group B.SWITCH PANELS

The following switches are used to engage different functions on the machine. Please familiarize yourself with the proper use of the switch before operation of the excavator to prevent possiable misuse or accidents



3. SCREEN CHANGE SWITCH



After turning starter key switch ON or starting engine, the screen is changed in order of **"Time for engine oil change"** →**"Time for fuel filter replacement"** →**"Time for hydraulic oil filter change"** →**"Time for hydraulic oil change"** →**"Main screen"** each time the screen change switch (3) is pressed.
With this menu, the time range to the recommended change time for the filter and oil in use can be identified.

If the screen change switch is not operated for 30 seconds keeping the maintenance screen displayed, the screen automatically returns to the main status screen.

C.3 Display for maintenance

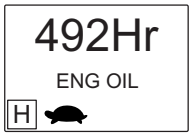
This screen displays the remaining time to the end of recommended replacement interval specified for filter/oil. After reaching to the end of replacement interval, check and serve them following to section "Maintenance".
The recommended replacement interval is the accumulated time which is counted by controller when the engine is running.
This menu is available for confirmation of the following items.
The maintenance screen changes each time the screen change switch is pressed.

Replacement Interval

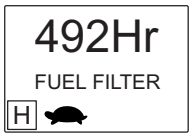
ITEM	DEFAULT
Engine Oil	500 Hr
Fuel Filter	500 Hr
Hydraulic Filter	1000 Hr
Hydraulic Oil	5,000 Hr *

* NOTE: Hydraulic oil interval of 5000 Hrs is only allowed with use of proper CNH Brand ISO VG 46 oil from CNH.

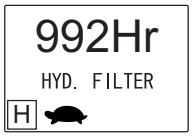
1. Remaining time display to the engine oil change
   This display shows the remaining time to the coming engine oil change.



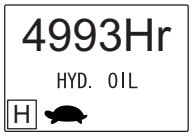
2. Remaining time display to the coming fuel filter replacement
   This display shows the remaining time to the coming engine fuel filter replacement.



3. Remaining time display to the coming hydraulic oil filter replacement
   This display shows the remaining time to the coming hydraulic oil filter replacement.



4. Remaining time display to the coming hydraulic oil change
   This display shows the remaining time to the coming hydraulic oil change.

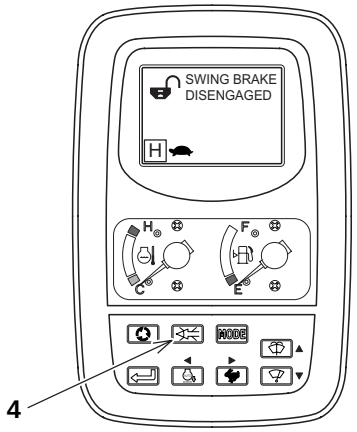


- The display automatically changes to the main screen, if switch is not operated for 30 seconds.
- For the setting procedure of maintenance time to be performed to the coming oil change in each type and filter replacement, see Page 1-26.

https://truckmanualshub.com/

4. BUZZER STOP SWITCH

In case where warning is displayed on the multi-display (LCD), press buzzer stop switch (4) and buzzer shown below stops sounding.



The level shown in the table is based on the following contents.

1. This warning shows the condition of personal injury or machine function.
2. This warning shows the change of work mode.
3. This might lead to the failure of machine. Check and service it immediately.

Priority of group	Level	L.C.D. display	Machine condition	Buzzer sounds				
				Auto stop	Manual stop	Type	Only starter key ON	Engine running
A	1	CPU DATA COMMUNICATION ERROR	Data from the mechatro controller is not received.	—	O	3	O	O
	1	SWING BRAKE DISENGAGED	The swing parking brake switch is turned ON.	O (5 sec.)	O	2	O	O
	1	STOP ENGINE STOP	Engine is stopped after Engine Oil pressure is in low.	O (5 sec.)	—	1	O	—
B	1	SELECTOR VALVE FAILURE	The selector valve (OPT.) malfunction.	—	O	2	—	O
	2	WARM FINISH WARM-UP	After finishing warming up.	O (5 sec.)	—	2	—	O
	3	LOW ENG OIL PRESS.	Low engine oil pressure disconnection.	—	O	2	—	O
	3	HIGH ENG WATER TEMP.	The engine coolant is more than 105°C.	—	O	3	O	O
	3	LOW ENG WATER LEVEL	Coolant level is low.	—	O	3	O	O
	3	DRAIN WATER SEPA	Water level is high in wat6er separator.	—	O	3	O	O
	3	CLOGGED AIR FLTR	The air filter is clogged.	—	O	3	O	O
	3	10:25 B013 H	Self diagnosis (sensor, valve etc.).	—	O	3	O	O

Sound of buzzer Type 1:continuation, Type2: Beep ON 0.2 sec, OFF 0.3 sec., Type 3: Beep ON 0.5 sec, OFF 0.5 sec.

Group C. WARNING ICON DISPLAY

The warning icon is displayed in order of priority, and when many icons occurred at the same time, for levels 1 and 2 in order of priority (A) level 1 is displayed in priority to level 2.

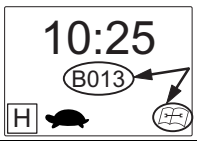
When these warning are displayed, there is a possibility of serious trouble. Therefore stop the operation immediately, investigate the causes and take a proper measure.

1. WARNING CLASSIFICATION (PRIORITY A)

Displays	Level	Warning Contents	Remedy
CPU DATA COMMUNICATION ERROR	1	Displayed when the mechatro-controller does not send data.	Contact our dealer/distributor for checking and service.
SWING BRAKE DISENGAGED	1	Displayed when the swing parking brake is switched.	
STOP ENGINE STOP	1	Displayed at the time of emergency engine stop due to low engine oil pressure.	

2.WARNING CLASSIFICATION (PRIORITY B)

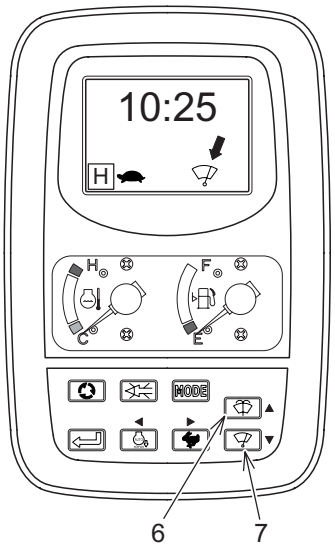
Displays	Level	Warning Contents	Remedy
SELECTOR VALVE FAILURE	1	Displayed when the selector valve malfunctions.	The attachment attached on the machine in specification of nibbler and breaker does not correspond to the selected work mode. Select proper work mode with the work mode select switch. B mode: In use of breaker A mode: In use of nibbler When the select error does not cancelled even though the proper work mode is selected, contact our dealer/distributor for checking and service.
POWER BOOST ON	2	Displayed when the attachment boost switch is on.	In this case, do not use the long arm.
WARM FINISH WARM-UP	2	Displayed when auto warming up was completed.	The warming up of engine and hydraulic oil is finished. Start engine by usual procedure referring to the instruction in page 3-12.
LOW ENG OIL PRESS.	2	• Displayed when the output saving control is in operation because the engine oil pressure is lowered to the specified pressure or less. • Displayed when the wiring is disconnected.	• Stop engine immediately and check oil level for shortage and on the disconnected wiring, and if shorted make up the shortage of specified engine oil referring to the "LUBRICANT, FUEL & COOLANT SPECIFICATIONS" page 4-10 or change it. • Where this warning is displayed and then when the engine does not rotate, there is a possibility of the trouble of disconnection of wiring etc. Contact our dealer/ distributor for repair.

Displays	Level	Warning Contents	Remedy
	3	Displayed when coolant temperature is raised to the specified temperature or higher.	Stop engine, lower the coolant temperature at low idling of engine speed, and cool down the engine. When the warning does not cancelled after an elapse of several minutes, stop engine and check the coolant level for shortage, fan belt tension for slack and radiator for clogging.
	3	Sk350 -Displayed when coolant level of radiator upper tank is lowered. (SK210/160 located in overflow tank)	Stop engine, and after the coolant temperature lowers, open radiator cap and make up the shortage of coolant. Check the radiator sub tank for the shortage, and if short make up the shortage of coolant.
	3	Displayed when the level of water separator (fuel filter) is raised to the specified level or higher.	Drain water from water separator.
	3	Displayed when engine output is lowered due to clogging of intake air filter.	Check on filter and clean it, and if necessary replace it with new one.
	3	Error code is displayed when trouble occurred on the pressure sensor, proportional valve, etc.	Contact our dealer/distributor for repair.
	4	Battery error. (High voltage/low voltage/poor charge) After engine starts, when the warning does not go out for a while and the warning is given during engine running, it may be caused by poor battery charge.	Inspect the condition where electric equipment is used and check on charging circuit.
	4	Fuel level is the specified level or lower.	Make up the shortage of fuel.
	5	Displayed when auto warming up is operating.	It is in auto warming up operation. Wait until the warming up is completed.
	5	The remaining time to the specified engine oil change is zero (0).	Supply the specified quantity of specified new engine oil.

6. WASHER SWITCH

Press washer switch and washer fluid is sprayed through the nozzle of front window while the switch is being pressed. The washer tank is located on the rear side of cab.

Make certain the washer reservoir has washer fluid before operating washer.



WASHER RESERVOIR

Press washer switch and washer fluid is sprayed through the nozzle of front window while the switch is being pressed. The washer tank is located on the rear side of cab.

Make certain the washer reservoir has washer fluid before operating washer.



7. WIPER SWITCH

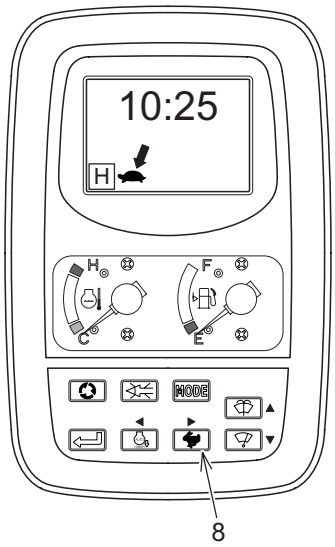
When the wiper switch is operated, the indication of "Intermittent" or "Continuous" appears on the lower part of multi-display.

a. Press it once : Wiper moves intermittently
b. Press it again : Wiper moves continuously
c. Press it once more : Wiper stops moving

8. TRAVEL SPEED SELECT SWITCH

Slow speed traveling is necessity to load and unload the machine on to a trailer. During loading or unloading, do not change the travel speed.

The travel speed select switch is located on the gauge cluster switch panel. Each time engine is started, travel speed is automatically set to LOW 1st () speed. Press the travel speed () switch on the gauge cluster, and the speed is changed to the HIGH 2nd and the () is indicated on the multidisplay.



LOW (1st) speed
Set to LOW when moving the machine on a rough or soft road, slope, or in a narrow place, or when powerful tractive force is required.

HIGH (2nd) speed
Set to HIGH when moving the machine on flat, hard ground.

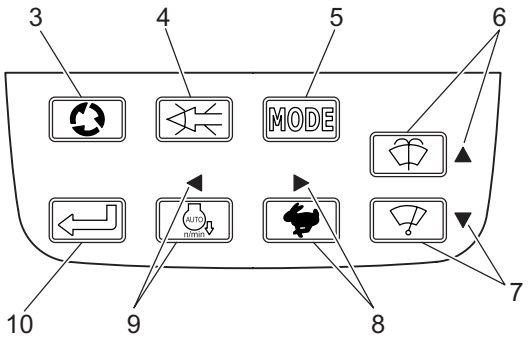
10. SELECT SWITCH

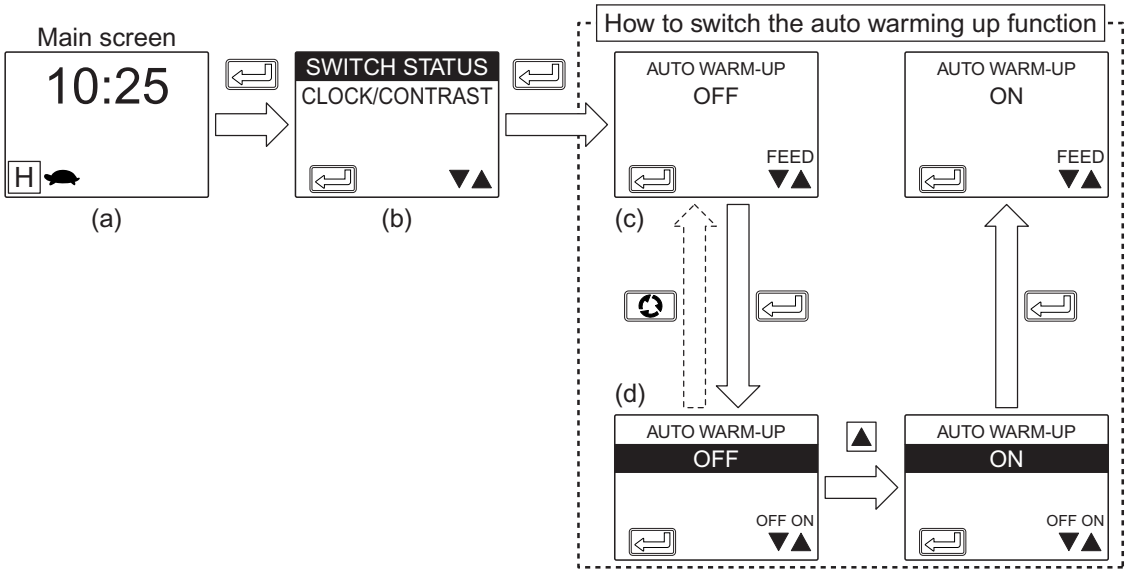
The Select switch is used to enter sub menu functions, this switch (8) is also available for adjustment of auto warming up, auto idling stop, clock setting, contrast adjustment, and flow rate setting of attachment/breaker mode.
For the uses of the select switch, see pages 3-17 to 3-22.

Note: Pressing the screen change switch (3) during the above adjustment and setting operations and the screen returns to the previous screen.

A. Auto Warming Up Function

No.	Switches
3	Screen Change Switch
4	Buzzer Stop Switch
5	KPSS Work Mode Select Switch
6	(Screen Up Button) -Washer Switch
7	(Screen Down Button) -Wiper Switch
8	(Screen Right Button) -Travel Speed Select Switch
9	(Screen Left Botton) -Auto Accel Switch
10	Select Switch





The procedure in order of No.1 to No.3 shows the initial setting. Once it is set to "Auto warming up", the resetting is unnecessary thereafter.

Warming up engine and hydraulic oil

1. Turn starter key switch on, display main screen (a) press select switch (10) and "CLOCK/CONTRAST" adjustment screen (b) is displayed.
2. Press select switch (10) and the "AUTO WARM-UP OFF" adjustment screen (c) is displayed.
3. Press select switch (10) again, and the color of "OFF" portion reverses and the "AUTO WARM-UP OFF" screen (d) is displayed.
4. After switching from "OFF" to "ON" in operation of Washer switch ▲(6), enter the new setting by pressing the select switch (10) again.

https://truckmanualshub.com/

5. Now return the key switch to the off position and the next time the excavator is started the auto warming up setting memorize.

   When the engine is started and the temperature is low (below 32 °f / 0°c), the automatic warming up operation starts.

   Pull up the safety lock lever to lock it.
6. In warming the engine oil and hydraulic oil, the "AUTO WARM-UP" is displayed on the multi-display.
7. After warming up, the "FINISH WARM = UP" is displayed on the multi-display, the buzzer sounds for about 5 seconds and the warming up is completed.

Note • The warm up mode operation can be turned of by going into the adjustment and selecting the function to the “off” position. See Chapter 10 adjustments for additional information.

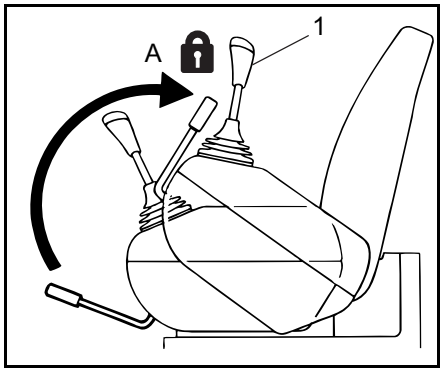
- In warm up mode, the warm-up operation is interrupted tentatively, if control lever is operated. Then the warm-up operation will start again, if the control levers condition continues for about 10 seconds.

! CAUTION !

Auto warm-up should be utilized anytime machine is started in climate temperatures below 32°f (0°c) to stabilize machine control response. Cold oil can cause erratic machine operation.

B. Auto Idling Stop Function - Optional for USA - (SK350 Only)

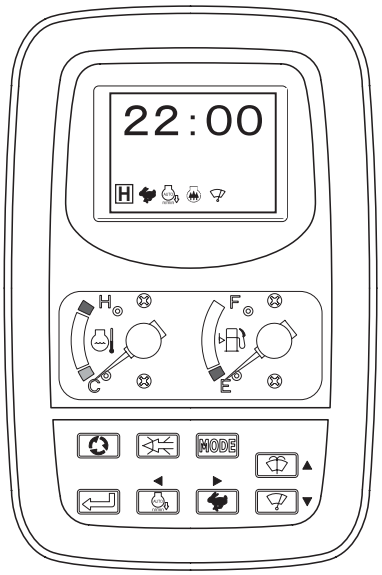
This switch is usually set to "OFF". When the auto idling stop function is selected, the engine stops automatically after an elapse of the specified time with the safety lock lever (1) set to "LOCKED" position (A) during engine operation. This function is effective in saving of fuel and in restraint of noise by setting the engine to auto idling stop function.



1. After setting safety lock lever to "LOCKED" position (A), the engine changes to "DECEL" speed about 4 seconds later.
2. Buzzer sounds for 5 seconds before engine stops.

- **Restart the engine after the engine is stopped by "Auto idling stop function"**
  1. Make sure that the buzzer stops sounding.
  2. Set the accel potentiometer to low idling position.
  3. Return the starter key switch to "ACC" or "OFF" once and restart the engine.

When transporting loads with the excavator, there is a possibility of dropping a load due to stoppage of the engine, make sure to turn the auto idling stop switch to OFF. before carrying out such tasks



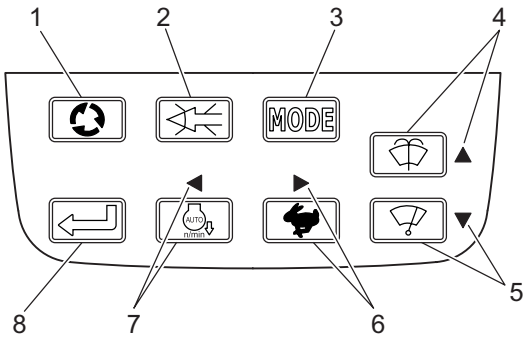
- When you start the engine again after an auto idling stop, start after first returning a key switch to ACC or OFF and also return the throttle potentiometer to Lo position. The engine cannot starts until the buzzer stops soounding, after auto idling engine stop.
- When you leave the machine for extended periods, place key switch in the off position to prevent accidentental engine starts.
- Turn the auto idling stop switch off when the following functions are employed. As the safety lock lever is set to "LOCKED" position (A),
  - When desired is to warm up the engine,
  - When desired is to idle engine and use air-con,
  - When desired is to low idle for light work continuously,
- The auto idling stop switch will not function regardless of the auto idling stop switch position in the following cases.
  - When an alarm for "HIGH ENG WATER TEMP" or "LOW ENGINE WATER LEVEL" is displayed.
  - When auto warming up is operated.

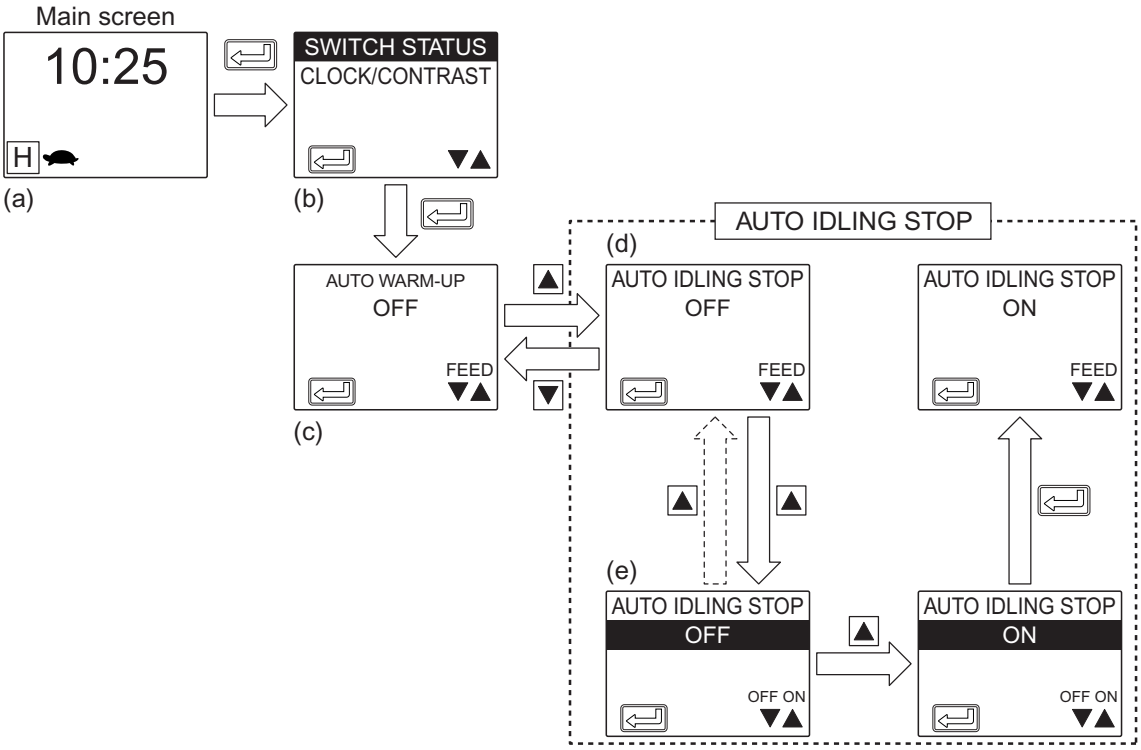


auto idling stop icon

Enabling/Disabling - Auto Idling Stop

No.	Switches
1	Screen Change Switch
2	Buzzer Stop Switch
3	KPSS Work Mode Select Switch
4	Washer Switch
5	Wiper Switch
6	Travel Speed Select Switch
7	Auto Accel Switch
8	Select Switch



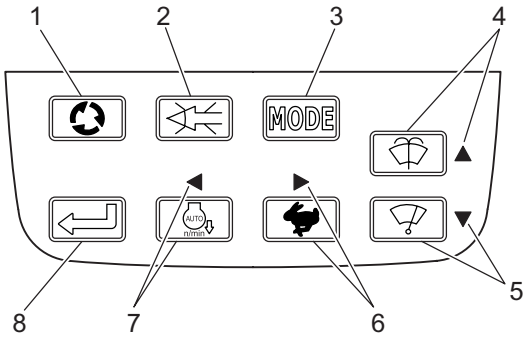


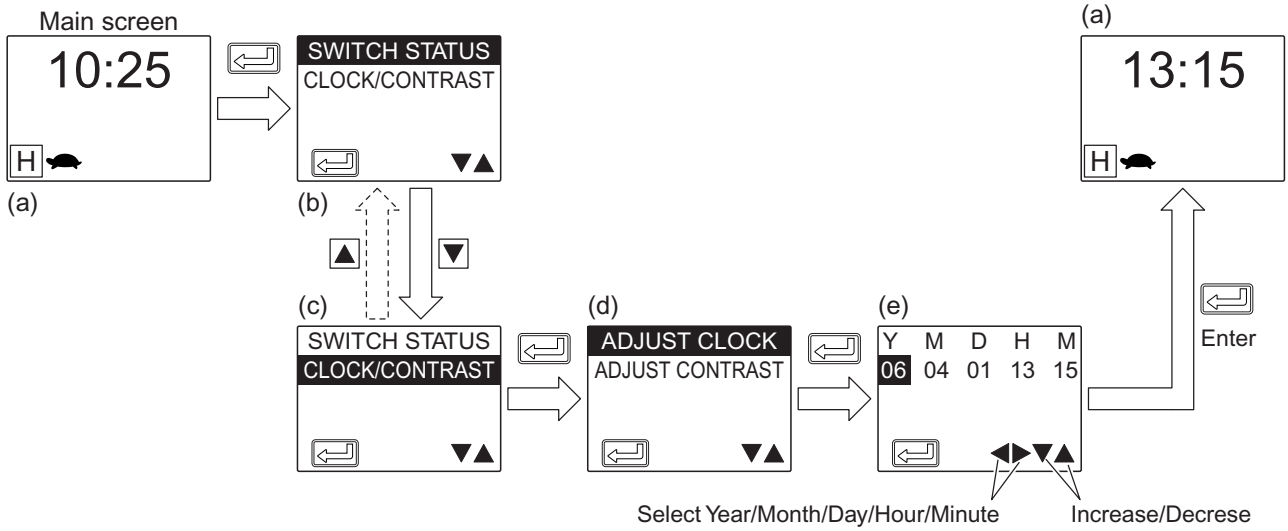
1. Press select switch (8) in main screen (a) for operator and display "SWITCH STATUS CLOCK/CONTRAST" select screen (b).
2. Press select switch (8) again and display "AUTO WARM-UP OFF" screen (c).
3. In operation of FEED ▲ (4), the "AUTO IDLING STOP OFF" screen (d) is displayed.
4. In operation of FEED ▲ (4), the color of "OFF" portion reverses and the "AUTO IDLING STOP OFF" screen (e) is displayed.
5. Switch from "OFF" to "ON" in operation of FEED ▲ (4) and set it by pressing selector switch (8).
6. When auto idling is functioning, the "AUTO IDLING STOP" is displayed on the multi-display.
7. Turn starter key switch off once and store the auto idling stop setting as a memory

Auto Idling Stop Function - continued from previous page

8.3 Clock Adjustment Switches

No.	Switches
1	Screen Change Switch
2	Buzzer Stop Switch
3	KPSS Work Mode Select Switch
4	Washer Switch
5	Wiper Switch
6	Travel Speed Select Switch
7	Auto Accel Switch
8	Select Switch



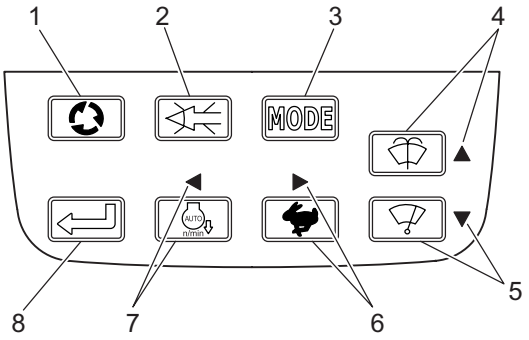


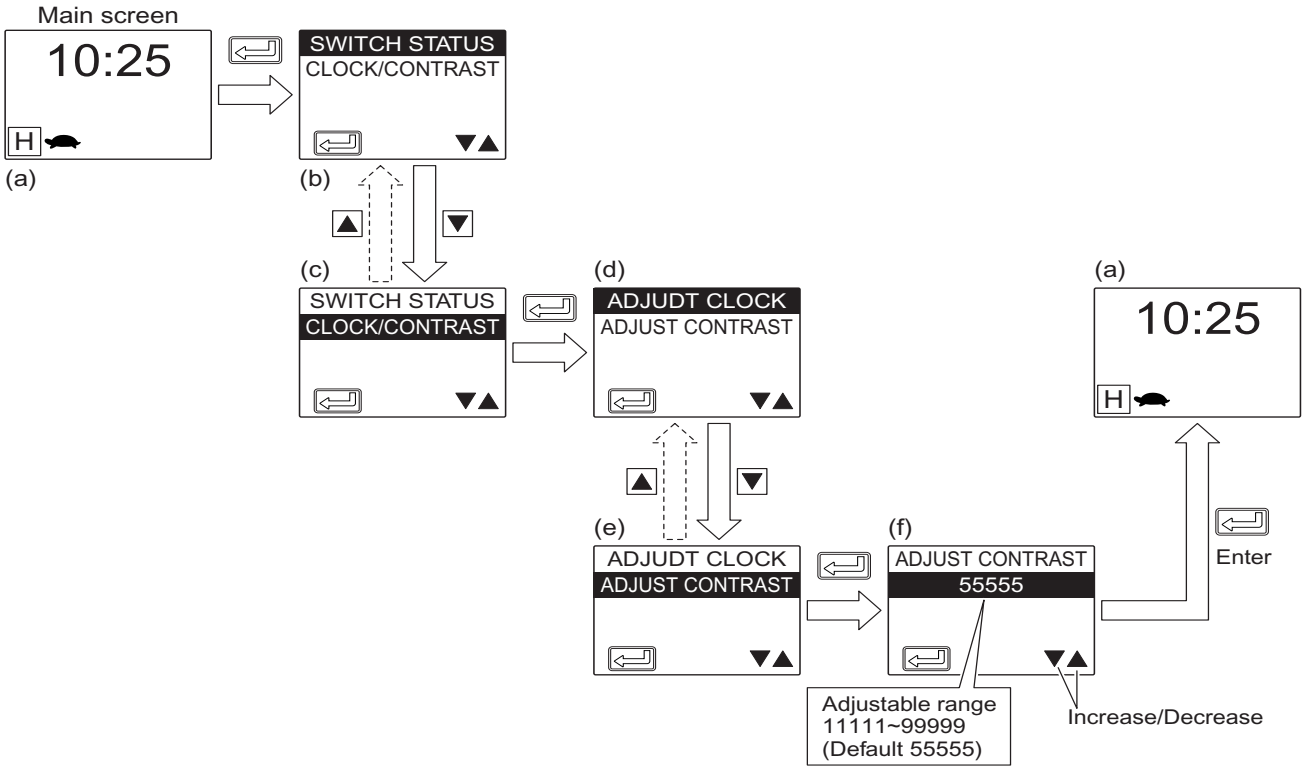
1. Turn starter key switch on and display main screen (a) for operator, and then press select switch (8) and display "SWITCH STATUS CLOCK/CONTRAST" select screen (b).
2. In operations of FEED ▲ (4) and FEED ▼ (5), move cursor to "CLOCK/CONTRAST" screen (c) and then press select switch (8) and the "ADJUST CLOCK ADJUST CONTRAST" screen (d) is displayed.
3. In operations of FEED ▲ (4) and FEED ▼ (5), move cursor to "ADJUST CLOCK" and then press select switch (8) and the "ADJUST CLOCK" screen (e) is displayed.
4. Select any of "Y•M•D•H•M" in operation of FEED ◀ (4) and FEED ▶ (5) and vary the values in operations of FEED ▲ (4) and FEED ▼ (5).
5. After adjustment, press select switch (8) and the adjusted values are stored as memory and time setting is completed, and then the screen returns to main screen (a).

C. CLOCK ADJUSTMENT

8.4 Contrast Adjustment Switches

No.	Switches
1	Screen Change Switch
2	Buzzer Stop Switch
3	KPSS Work Mode Select Switch
4	Washer Switch
5	Wiper Switch
6	Travel Speed Select Switch
7	Auto Accel Switch
8	Select Switch



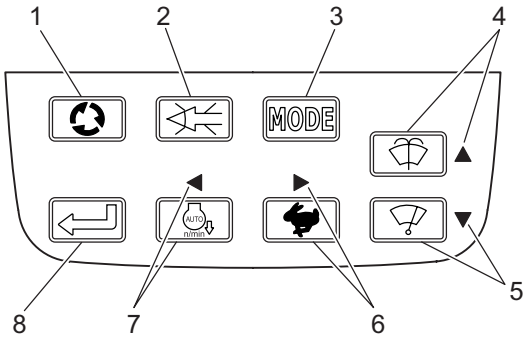


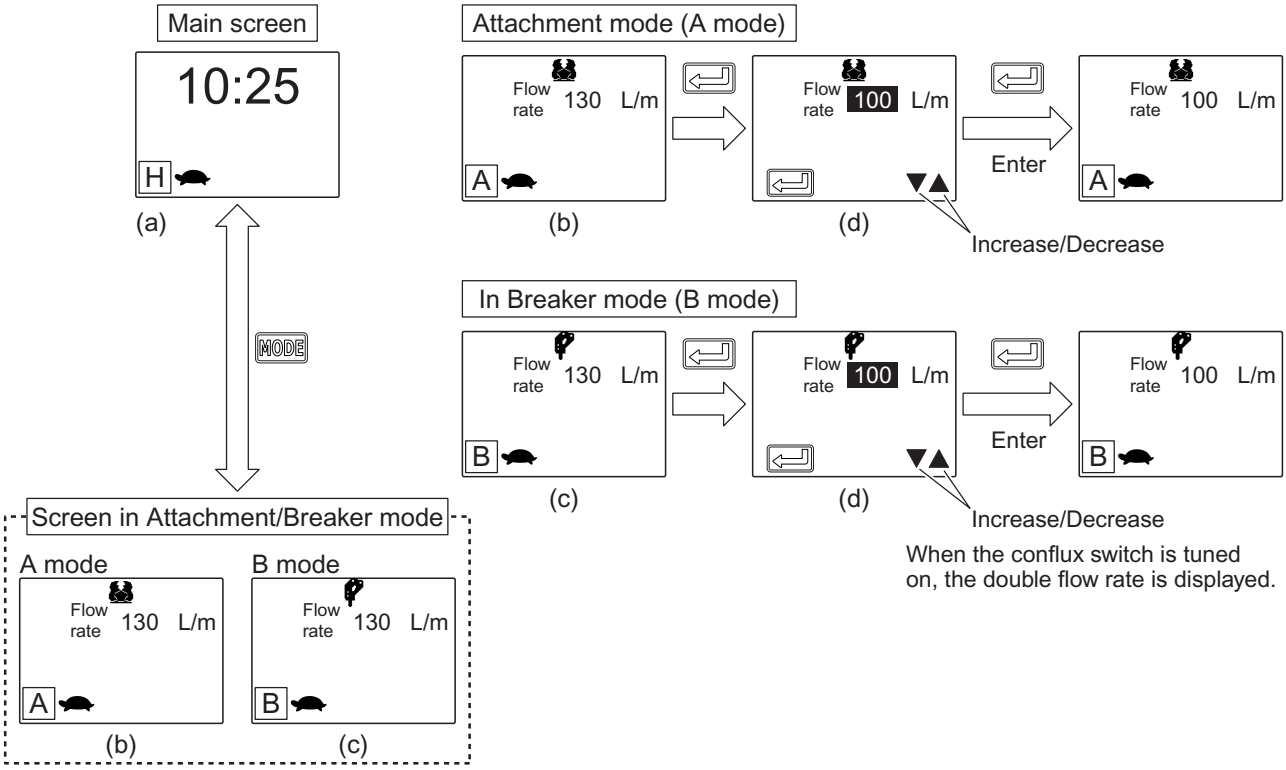
1. Turn starter key switch on and display main screen (a), and press select switch (8) and display "SWITCH STATUS CLOCK CONTRAST" select screen (b).
2. In operations of FEED ▲(4) and FEED ▼(5), move cursor to "SWITCH STATUS CLOCK CONTRAST" screen (c) and then press select switch (8) and the "ADJUST CLOCK ADJUST CONTRAST" screen (d) is displayed.
3. In operations of FEED ▲(4) and FEED ▼(5), move cursor to "ADJUST CLOCK ADJUST CONTRAST" and then press select switch (8) and the "ADJUST CLOCK ADJUST CONTRAST" screen (e) is displayed.
4. Press select switch (8) and the "ADJUST CONTRAST 55555" screen (f) is displayed.
5. Vary the values by pressing the desired figure in operations of FEED ▲(4) and FEED ▼(5).
   The available setting range is in 9 steps from "11111" to "99999".
   [Example] 11111 (faint) →99999 (clear) * The initial set value is 55555.
6. Press select switch (8) and the adjusted values are stored as a memory and the contrast adjustment is completed, and then the screen returns to main screen (a).

Pump Flow Rate Adjustment in (A mode/ B mode)

Different types of attachments require the ability to change the flow rate of the auxaliary circuit. Change the flow rate in accordance withmanufactor's specifications and by the procedure mentioned below.
In this example, last set flow rate has been restored and the initial flow rate is 210L/min. The adjustment (increase or decrease) of flow rate is changeable by 10L/min steps.

No.	Switches
1	Screen Change Switch
2	Buzzer Stop Switch
3	KPSS Work Mode Select Switch
4	Washer Switch
5	Wiper Switch
6	Travel Speed Select Switch
7	Auto Accel Switch
8	Select Switch





1. Turn starter key switch on and display main screen (a).
2. The display on the left lower corner of screen is changed in order of **"H"** →**"B"** →**"A"** →**"S"** each time the **"MODE"**Åh switch (3) is pressed under the condition where main screen (a) is displayed.
3. Select **"A** and A mode screen is displayed, and select **"B** and B mode screen is displayed.
4. Press select switch (8) in A/B mode display screens (b)/(c) and the value of flow rate reverses in black and the screen (d) is displayed. In this condition, press FEED ▲ (4)/FEED ▼ (5) and the flow rate value increases or decreases.
5. Select the desired setting value and then press select switch (8) and the flow rate is set to the desired value.

Language Adjustment Procedure

1) Make sure the safety lever is in the up (Locked position).

2) Display the “Service Diagnosis Screen” by pressing and continuing to hold the Buzzer Stop ( ) switch while turning the key switch to the “ON” position.

3) Once the “Service Diagnosis Screen” is displayed on the cluster gauge enter into the Language adjust screen by pressing and continuing to hold the Buzzer Stop ( ) switch and then press the Select ( ) switch 3 times

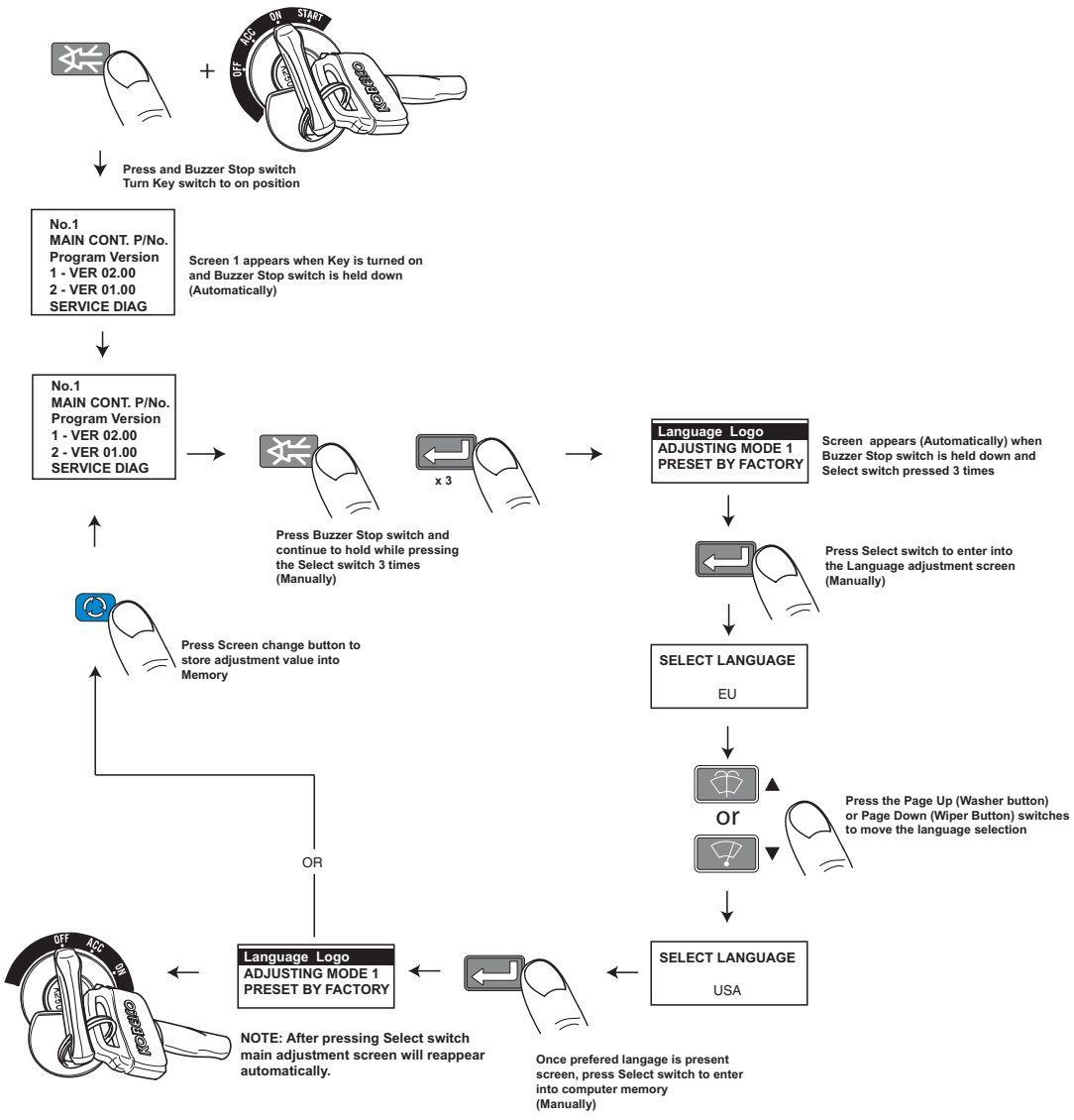
4) Confirm the screen has changed to adjustment screen (Figure 1) the default screen selector bar should be positioned on “Language Logo ”. If not use the select up / select down arrow buttons on the cluster gauge to move the select bar to language Logo.

5) With the select bar on “Language logo” press the Select button once to enter into the language adjustment.

6) Use the select up / select down arrow buttons on the cluster gauge to move the selector bar thru the different languages till your regional language is displayed.,

7) Once your regional language is highlighted in the selector bar press the Select ( ) switch to enter the new language into the computer’s memory.

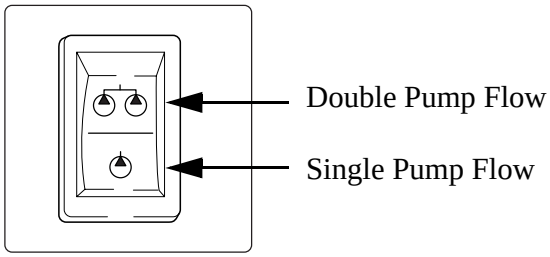
8) Press the Screen Change ( ) switch to return to the main screen return the key switch to the “OFF” position.



Conflux/Single Flow Change Switch - SW-15

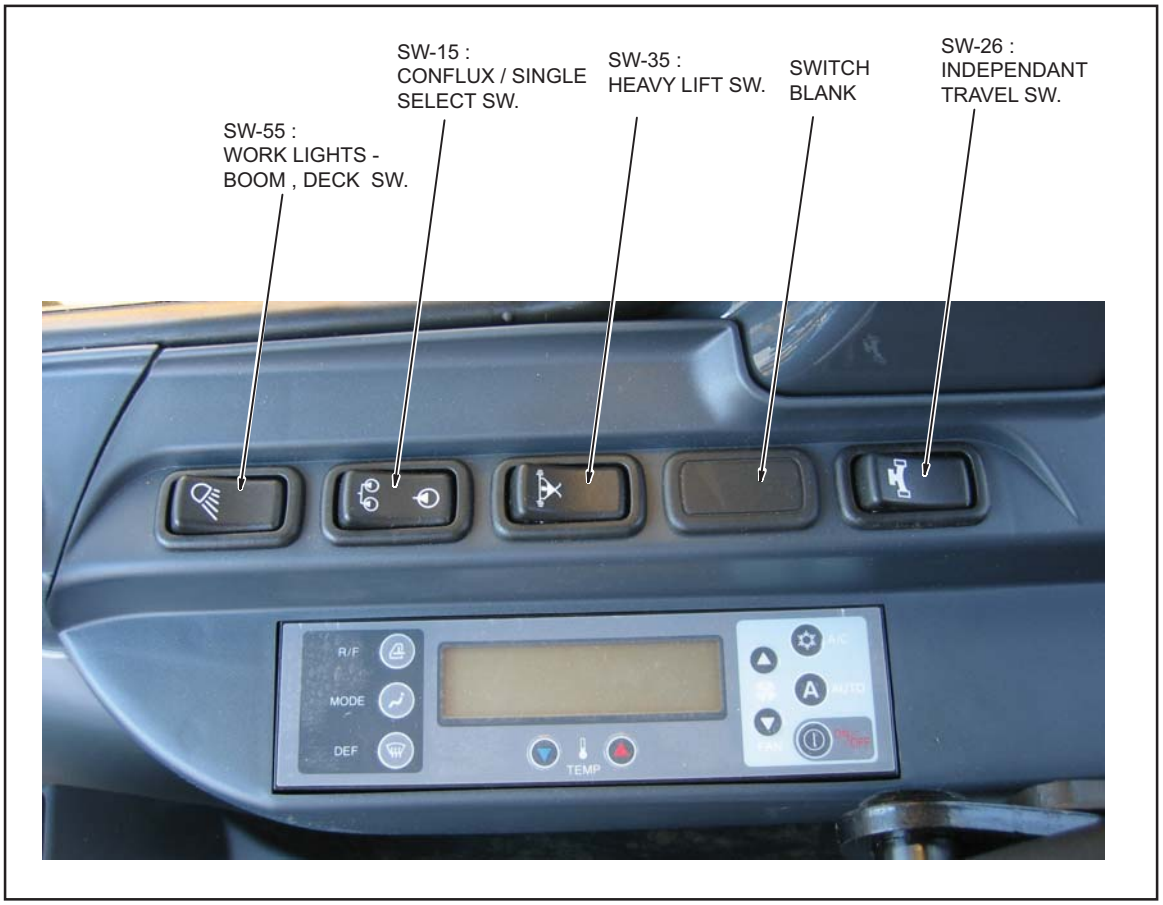
(ONLY PRESENT WITH N&B AUXILIARY CIRCUIT)

This switch is used to switch the single flow and conflux hydraulic circuit during “A” mode operation.



- **Double Pump symbol mark (two marks side) :**
  With this portion of the rocker switch selected to this side auxiliary hydraulics will work with double pump flow. Example: (When carrying out the demolition work with the nibbler which requires the conflux flow).
- **Single Pump symbol mark (one mark side) :**
  With this portion of the rocker switch selected to this side auxiliary hydraulics will work with single pump flow. Example: (Select this side when the reduced flow rate of auxiliary hydraulics is required for the work with a breaker, etc.

NOTE: Do not set this switch to nibbler confluxed flow operation position when using a breaker or damage to the breaker could occur.



C. LCD MULTI-DISPLAY

When the warning is displayed on the multi-display, stop the work immediately and check failure cause and service the trouble.

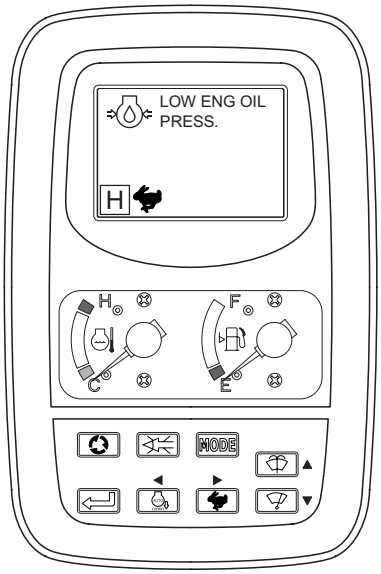
The gauge cluster processes signals received from various sensors and switches and outputs the signals to LCD display and lamp display, and makes the buzzer sound.

The everyday check should be carried out according to not only the display on the multi-display but also the instructions in section "Maintenance".

LCD display function is roughly divided into the following 5 types.

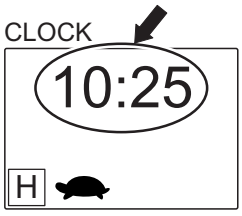
LCD (Liquid Crystal Display)

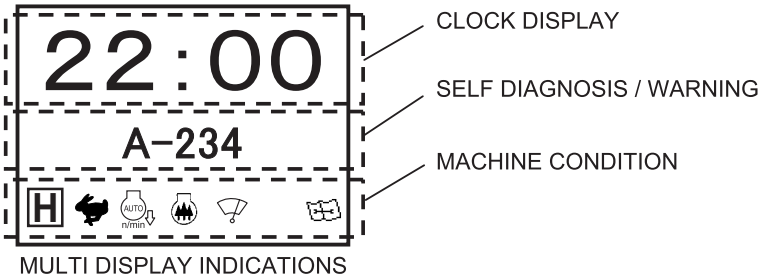
1. Main Screen Display for Operator
2. Display of status of Switch Operation
3. Warning Displays
4. Display for Maintenance



C.1 MAIN SCREEN

After starting engine, clock is usually is displayed.





https://truckmanualshub.com/

C.2 STATUS DISPLAY WITH SWITCH OPERATION

When using selector switches on the switch panel portion of the gauge cluster, the selected functional mode is displayed on the LCD portion of multi-display.

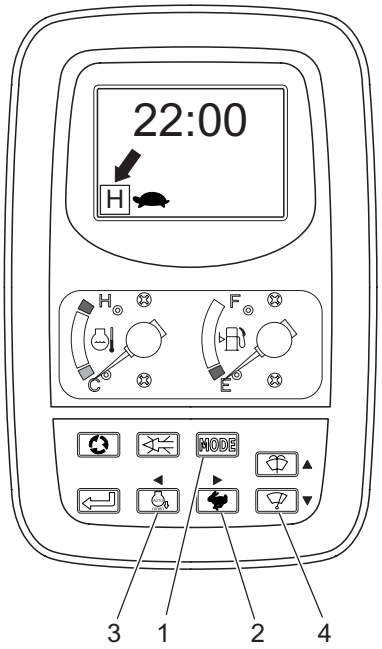
1. KPSS work mode display
   The mode changes in order of **"H"** →**"B"** →**"A"** →**"S"** each time the work mode switch (1) is pressed and the selected mode is displayed on the lower corner of multi-display.

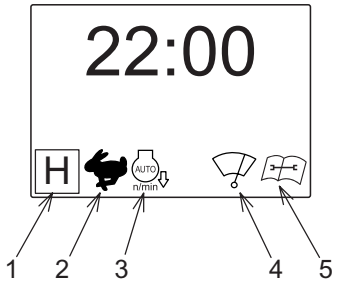
2. Travel low speed and high speed display
   The display is changed in icons →→ in order each time the travel low and high speed change switch is pressed and the selected mode is displayed.

3. Auto accel display
   Press auto accel switch (3) and the icon "" is displayed to inform that auto accel is functioning.

4. Wiper display screen
   Press wiper switch (5) and the icon "" is displayed when the wiper motor is running for front window intermittent wiping, and icon "" is displayed when the motor is running for continuous wiping.

5. Diagnostic Code Screen displayed when trouble occures
   For details, contact dealer/distributor.





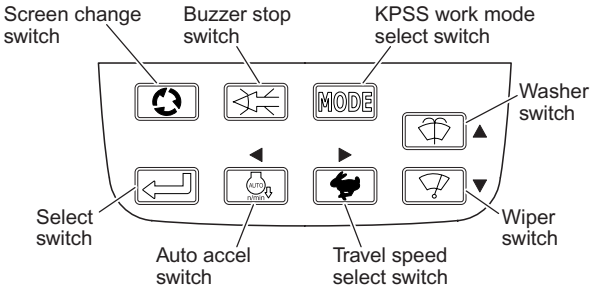
1	KPSS Work Mode Displays (H, B, A, S)
2	Travel Speed Displays (,)
3	Auto Accel Display
4	Wiper Displays (Intermittent/Continuation)
5	Failure Displays

MAINTENANCE INTERVAL SCHEDULE SET PROCEDURE

This machine is equipped with a multi-display which allows confirmation of remaining time before replacement/ change time of engine oil, fuel filter, hydraulic oil filter and hydraulic oil. When the remaining time reaches to Zero (0), replace or change indicated item and the perform the reset setting in the following order.

Interval of replacement of parts is mentioned below.

- Engine oil : 500 Hr
- Fuel filter : 500 Hr
- Hydraulic filter : 1,000 Hr
- Hydraulic oil : 5,000 Hr**



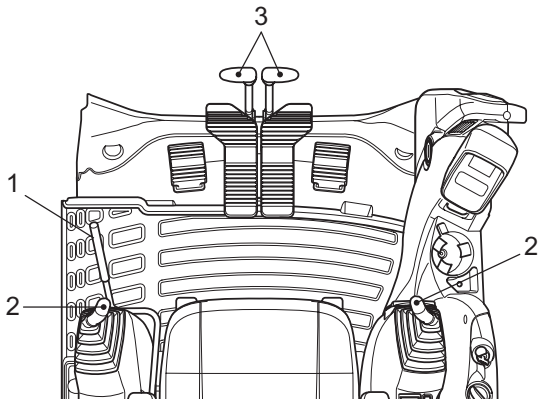
Procedure	Operating Procedure	Display on Multidisplay
1	Turn starter key switch on.	KOBELCO → After several seconds, display is changed to clock autmatically. → 10:25 H
2	Press " " switch press once display change switch on the switch panel once. And the clock display changes to the display of remaining time for coming engine oil change.	10:25 H → Press screen change switch once more. → 250 Hr ENGINE OIL H
3	Press " " switch press once select switch once and the display for the engine oil change reverses.	250 Hr ENGINE OIL H → Press select switch once more. → 250 Hr ENGINE OIL ▼▲
4	When required to adjust the interval to the coming change time by 10 hours, press " ▲" switch and the time to the coming engine oil change is added. Press " ▼" switch and the time to the coming engine oil change is reduced.	250 Hr ENGINE OIL ▼▲ → Replacing interval is changed with each pressing of switch. → 500 Hr ENGINE OIL ▼▲
5	When desired to return to the initial set time, press " " buzzer stop switch once. Press " " select switch once and the set time is stored.	500 Hr ENGINE OIL ▼▲ → To set the desired interval, press the select switch → 500 Hr ENGINE OIL H

1. After entering into the display for maintance setting by pressing the display change switch, set the respective maintenance time for fuel filter, hydraulic oil filter and hydraulic oil by repeating the procedure steps 2 thru 5.
2. The engine oil change time is displayed on the multi-display by 500 hours as a warning, but the buzzer does not sound.

** NOTE: Hydraulic oil interval of 5000 Hrs is only allowed with proper CNH Brand ISO VG 46 oil from CNH.

LEVERS AND PEDALS

1. Safety Lock Lever
2. Control lever (ISO Control Pattern)
3. Travel lever



1. Safety Lock Lever

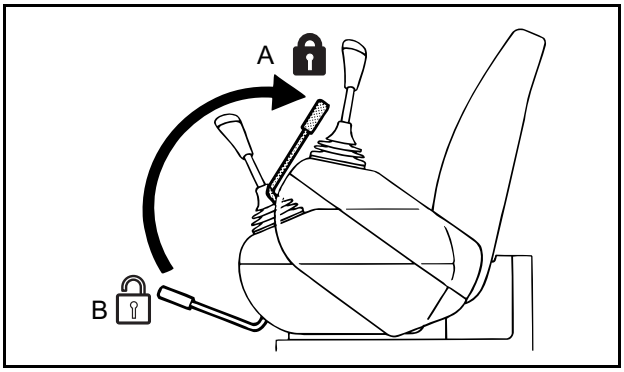
The safety lock lever is provided to prevent any unexpected operation due to the unexpected movement of the control levers.

- **Do not stand up and/or move during operation of machine or there is a possibility of sudden movement by unexpectedly touching and shifting the control lever unknowly.**
- **Raise the safety lock lever to the "lock position" securely before entering or exiting the cab. Make sure that the safety lock lever is placed in the locked position shown in the figure.**
- **When unlocking, do not touch any of the control levers unintentionally. If touched unintentionally, this may cause unexpected movement or danger due to malfunction of machine.**
- **After completion of work or during transportation, place the safety lock lever to the "locked position".**

Locking Hydraulic System (A)



When the safety lock lever is set in the "LOCKED (UP) Position" the hydraulic system is disabled.

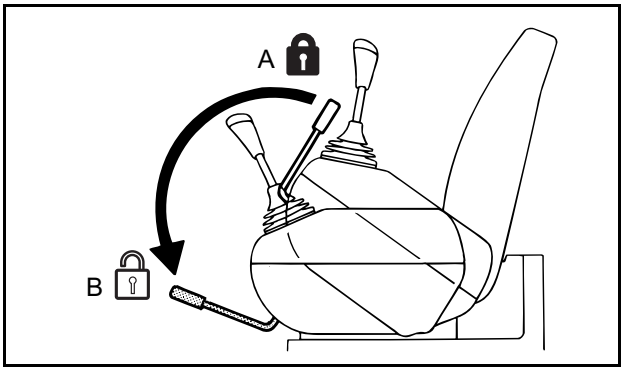


LOCKED (UP) POSITION

Unlocking Hydraulic System (B)



When the safety lever is set to the "UNLOCKED (DOWN) Position" all hydraulic functions are active.



UNLOCKED (DOWN) POSITION

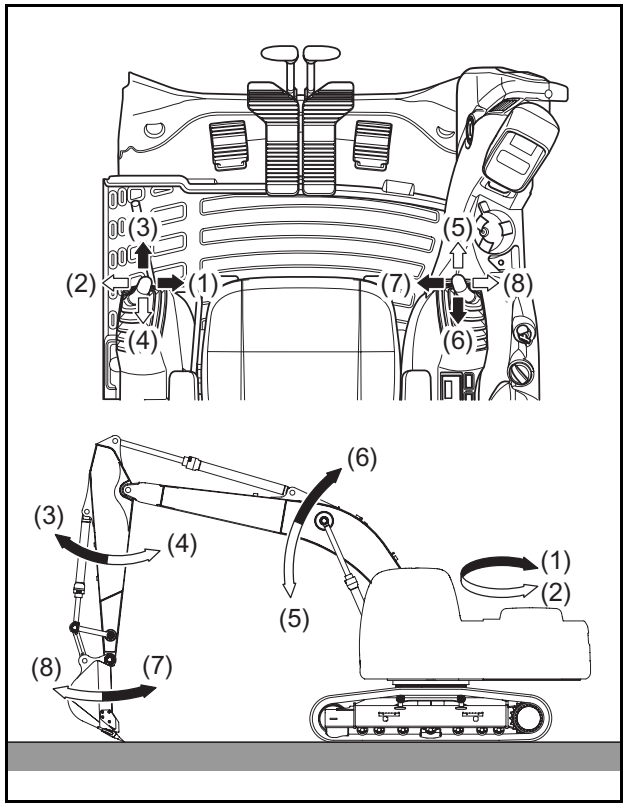
2. Operating Levers (ISO Operating Pattern)

These two levers activate each operation as illustrated iin the figure at the right.

- **Confirm safety around the work area. Also ensure that each lever operation is in accordance with the operating pattern indicated on the labels.**
- **If labels do not match the operator's control pattern, replace labels immediately to avoid accidents and/or injury.**

Releasing the hand off the lever returns it to the neutral position, and then the attachment stops moving. It is possible to perform various operations at the same time.

- **Left Control Lever**
  (1) Swing Right
  (2) Swing Left
  (3) Arm Out
  (4) Arm In
  N (Neutral): Upper structure and arm are held in the position where those are.
- **Right Control Lever**
  (5) Boom Down
  (6) Boom UP
  (7) Bucket Digging
  (8) Bucket Dumping
  N (Neutral): Boom and bucket are held in their relative position where those are.

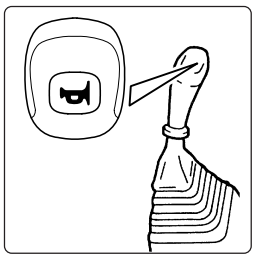


Notice: All excavators manufactored at our USA plant come standard with ISO pattern controls. Modification of the pattern control must be in accordance with manufacture's guidelines and all decals **MUST** be changed to reflect the proper operating pattern.

Horn Switch

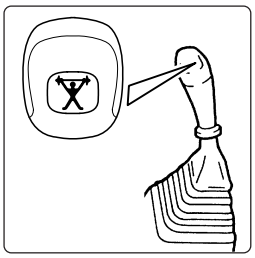
Located on the left control lever,Always sound horn before starting engine to alert personnel that the machine is going to be operated.

The horn switch is a momentary push grey button located on the operator's left control lever.



Power Boost Switch

Located on the right control lever, this switch should only be used for increased break out force during digging.



NOTICE:

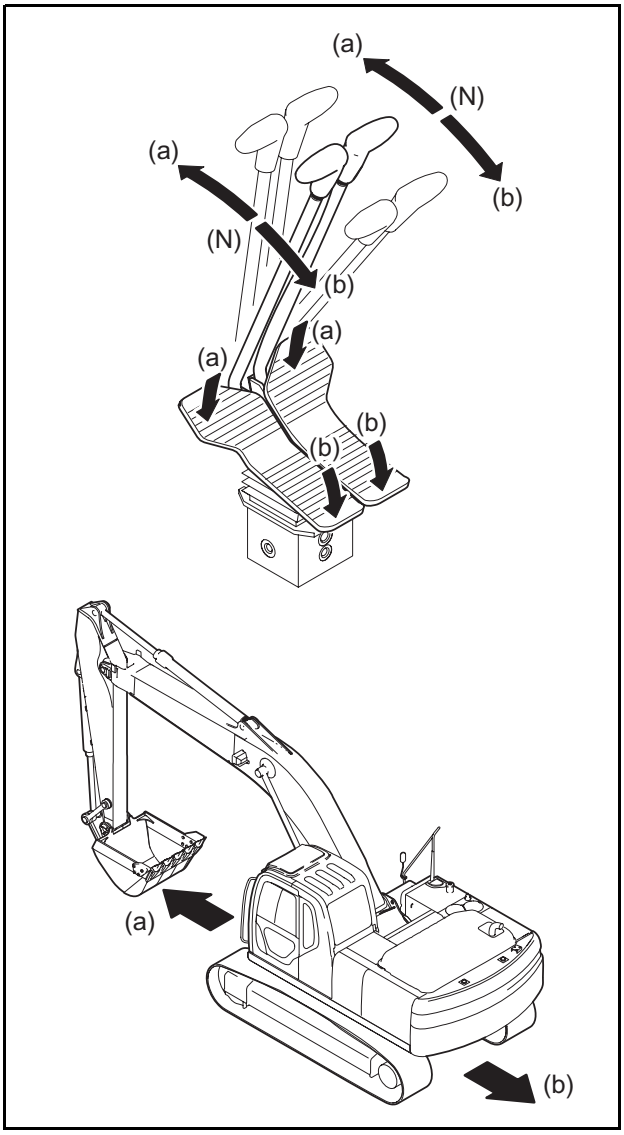
Use of Power Boost is prohibited where an arm longer than the standard is installed.

https://truckmanualshub.com/

3. Left and Right Travel Levers & Pedals

The travel lever & pedal are located in front of operator seat. They are used to move the left or right track of the machine either forward or backward.

- **Take precaution with the control lever in travel operation. There is a possibility of accident because the attachment is suddenly swung and moved by the unexpectedly touching and shifting the control lever.**
- **When operating the control lever, make sure the crawler frame direction. When the travel motor is located on the front side, the travel lever functions of the travel levers will be opposite.**
- **Do not perform the work while putting foot on the pedal. There is a possibility of serious accident resulting in injury and death because the machine starts abruptly by unexpectedly depressing the pedal.**
  Do not put foot on the pedal but of driving with foot on the pedal and changing the direction.
- **Pay attention when driving and operating with pedal.**
- (a) "Forward"
  Variable speed forward track movement.
- (b) "Backward"
  Variable speed reverse track movement.
- (N) "Center"
  Neutral position



.

WARNING

If travel alarm is disabled it is the operator's responsibility to ensure a safe work zone before moving or operating the machine.

FUSES & RELAY BOX

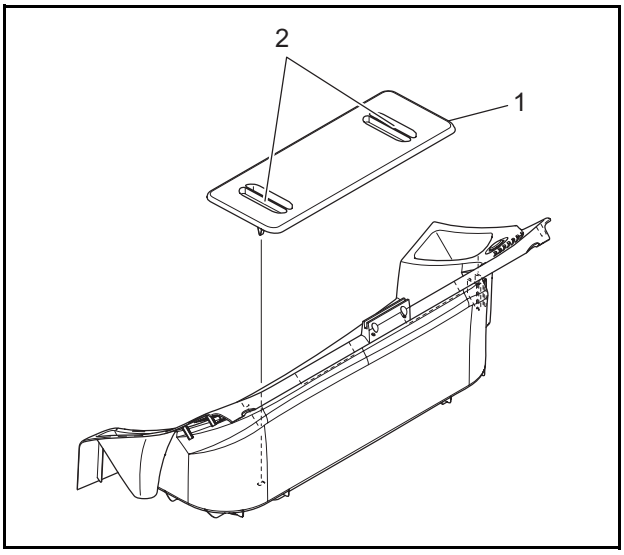
Make sure the starter key switch is in the "OFF" position when replacing fuses.

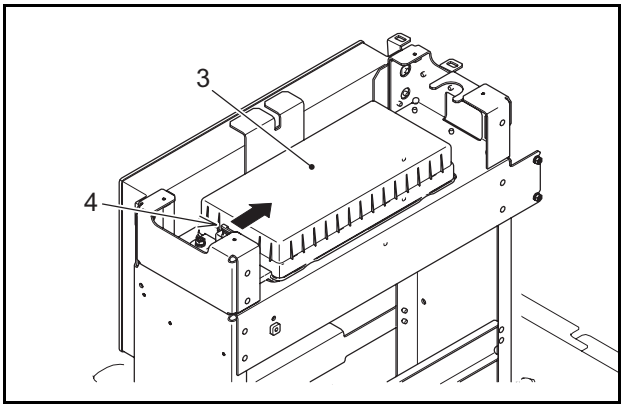
The fuses protect the electrical system from excess current. If operation is not normal, a fuse may be blown. Replace blown or faulty fuses with the spare fuses as follows.
Replace any fuse generating white powder on it or in case that some looseness exists between the fuse and fuse holder.

- When replacing a fuse, replace it with one of the same capacity.
- The spare fuses are stored in the back side of fuse box cover.

Replacing Procedure

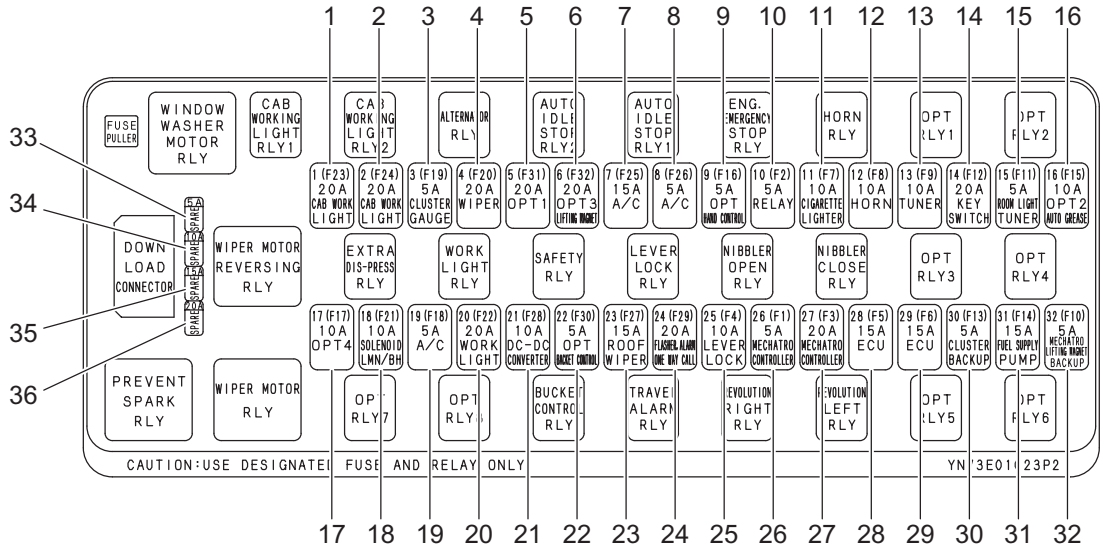
1. Hold grip (2) of cover (1) located on the rear side of operator seat and pull up and take out the cover (1).
2. To remove the cover of fuse box, press lock (4) of cover (3) inward to unlock and then lift it up.
3. When replacing the fuse, remove the fuse from the fuse box with fuse remover.
4. After replacement of fuse, attach the cover securely.





Fuses

Follow the procedures below to replace "



No.	AMPS	FUNCTION	No.	AMPS	FUNCTION
1	20A	Cab Work Light	21	10A	DC-DC Coinverter
2	20A	Cab Work Light	22	5A	Option (Bucket Control)
3	5A	Gauge Cluster	23	15A	Option (Roof Wiper)
4	20A	Wiper, Washer	24	20A	Flasher, Alarm, One Way Call
5	20A	Option 1	25	10A	Safety Lever Lock
6	20A	Option 3	26	5A	Mechatro Controller
7	15A	Air Conditioner	27	20A	Mechatro Controller
8	5A	Air Conditioner	28	15A	Engine Controller (ECU)
9	5A	Option (Hand Control)	29	15A	Engine Controller (ECU)
10	5A	Relay, Hour Meter	30	5A	Gauge Cluster (Back Up)
11	10A	Cigarette Lighter	31	15A	Fuel Supply Pump
12	10A	Horn, Horn Relay	32	5A	Mechatro Controller (Back Up) Lifting Magnet (Back Up)
13	10A	Tuner			
14	20A	Starter Key Switch	33	5A	Spare
15	5A	Room Lamp, Tuner	34	10A	Spare
16	10A	Option 2 (Auto Grease)	35	15A	Spare
17	10A	Option 4	36	20A	Spare
18	10A	Solenoid Valve			
19	5A	Air Conditioner			
20	20A	Work Light			

FUSIBLE LINK (FOR STARTER) SK350

In case power does not come when the starter key switch is turned "ON", a disconnection of the fusible link is suspected.
Inspect and replace the fusible link.

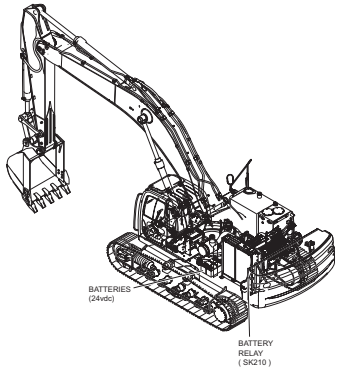
The fusible link is of a fuse wiring of big size provided in the electric wiring

Checking and replacing procedure

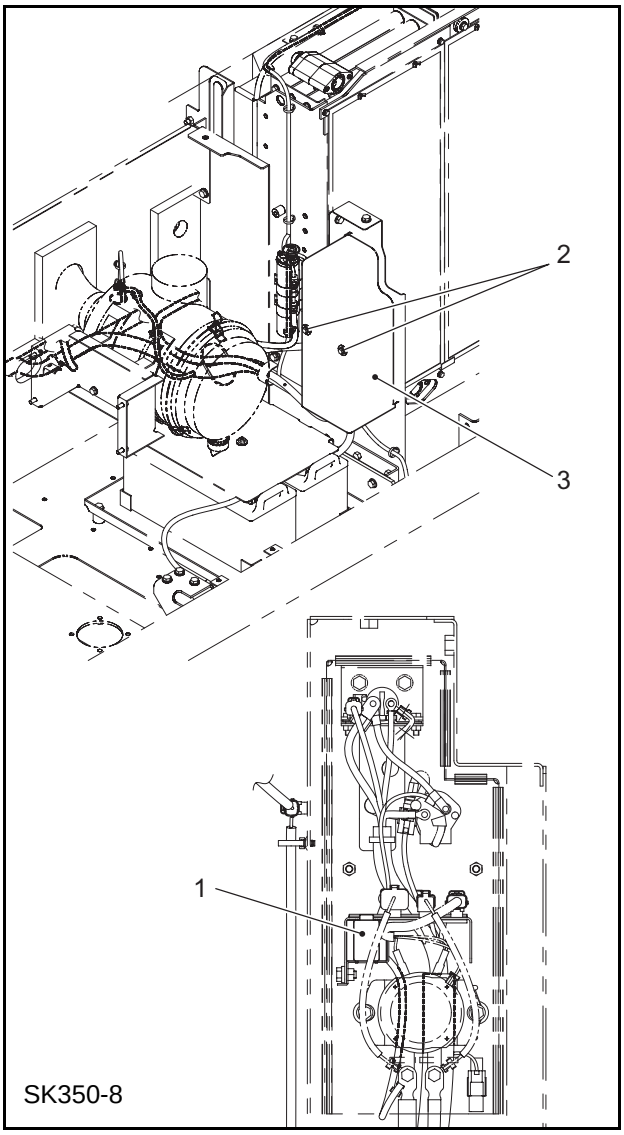
1. Remove two attaching screws (2) for the fuse and relay box and remove cover (3).
2. Remove fusible link (1) and check or replace it with new one.
3. After checking or replacement, close the side door on the left rear side of machine with starter key.

Note: Location of SK210 Mark 8 fusible link is located in bese of radiator on the side of guard assembly

See figure below for details



SK210-8

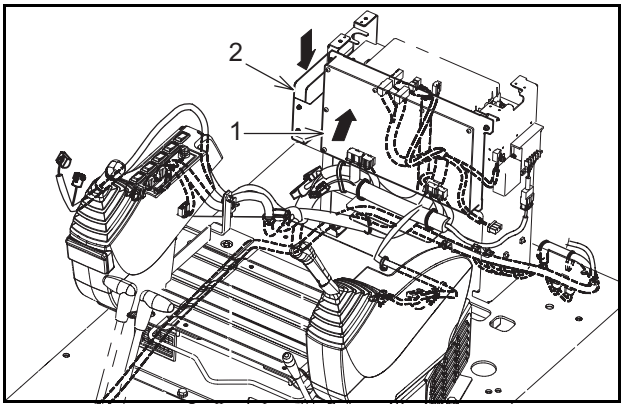


SK350-8

MECHATRO-CONTROLLER (CPU)SK210-8~SK350-8, ENGINE CONTROLLER (ECU) SK350-8 only

Mechatro-controller on all machines and engine controller SK260/350-8 are positioned at the rear of the cab behind the rear side of operator seat.

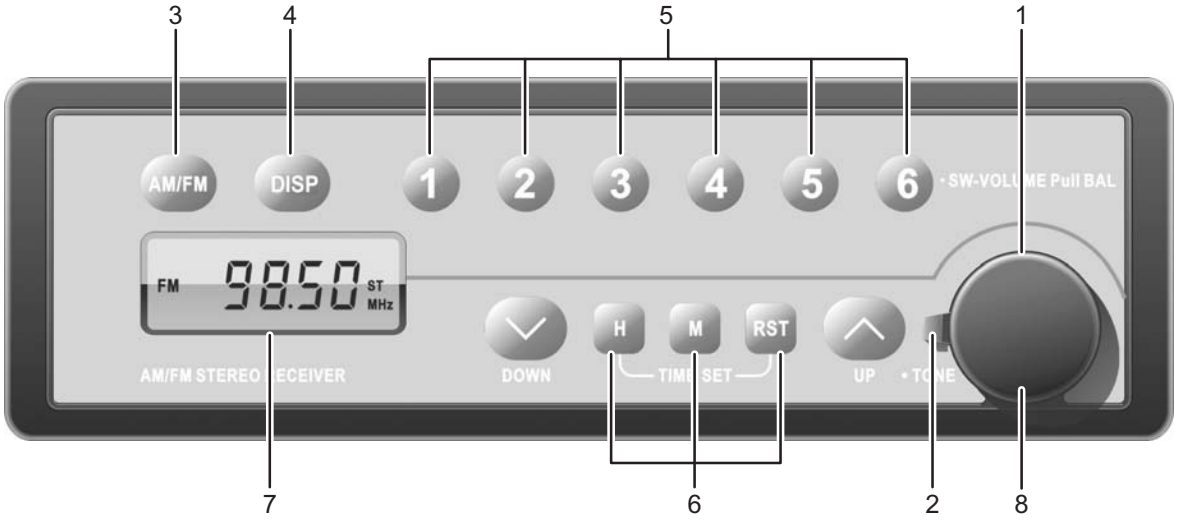
1. Mechatro Controller (CPU) - **ALL MODELS**
2. Engine Controller (ECU) **SK260~350-8 ONLY**



- Do not allow water, mud or soft drinks to come in contact with the controllers as damage will occur.
- When cleaning the cab interrior do not use water, vacumn or compressed air should be used to clean the interrior. Water can damage main electrical connections and computer components.

RADIO (24Vdc AM/FM Unit)

A. EXPLANATION OF FUNCTIONS

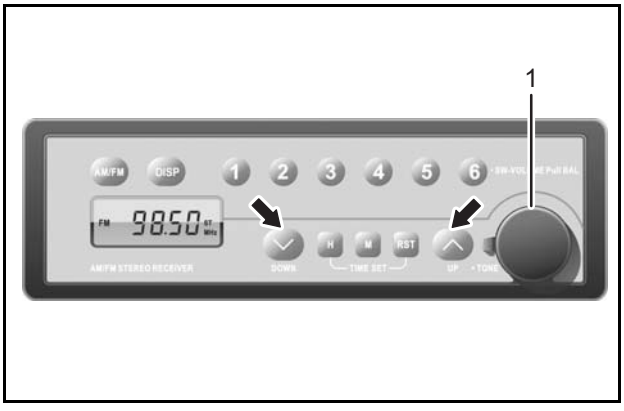


1. Control Name and Use of Each control
   1. Power Switch - Push ON/OFF
   2. Tone Control
   3. AM/FM selector button
   4. DISP (display change) (Time/frequency) button
   5. Preset stations buttons
   6. Time set key
   7. Display (Time/frequency)
   8. Volume control
2. How to Select Station
   This radio can select the station by the following three methods.
   - Manual tuning
   - Auto select station
   - Preset memory

   Each selecting method is explained below.

2.1 Manual tuning method

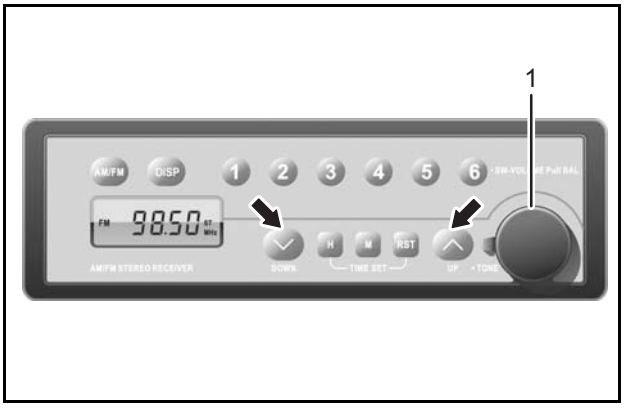
1. Turn power switch (1) on.
2. Manually tune the radio to the desired station by pressing "UP"/"DOWN" key once for 0.5 seconds or less.
3. Step up and down by pressing "UP"/"DOWN" key for 0.5 seconds or less.
   1 step: AM 9kHz
   1 step: FM 50kHz
4. When tuned with a certain frequency, step up and down with the same frequency.



5. The frequency reaches to the upper limit or lower limit by stepping up or down and the frequency is shifted from the upper limit to the lower limit or from the lower limit to the upper limit.

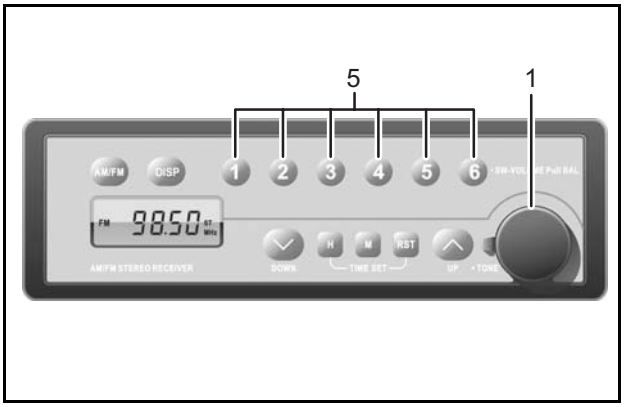
2.2 Auto select station

1. Turn power switch (1) on.
2. The radio is automatically tuned to the desired station by pressing each key once for 0.5 seconds or less.
3. When received radio waves during auto tuning or pressed the "UP" or "DOWN" key, the auto tuning is interrupted while maintaining the frequency.
4. When pressed "UP" or "DOWN" key in the course of auto tuning for less than 0.5 seconds, the manual tuning is applicable and pressed for 0.5 seconds or more, auto tuning is applicable.
5. The items 4. and 5. for the manual tuning are applicable at the time of auto tuning.
6. When once the band is switched during auto tuning and then is returned to the former band, and when once the power is turned off and then turned on, the frequency returns to the same frequency as that before auto tuning.



2.3 Preset memory

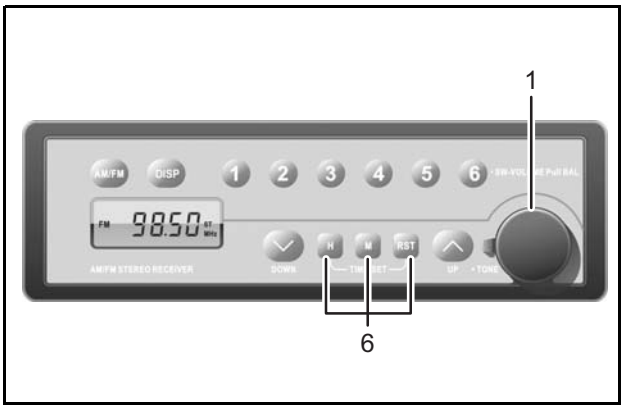
1. Turn power switch (1) on, and use keys "1" to "6" in the preset key (5) provided on the panel.
2. The six stations can be entered as a memory for every band of AM/FM1/FM2.
3. To read the memory, press any key of "1" to "6" for lower than 1 second and the frequency in memory and the preset number corresponding to the pressed key are displayed.
4. To write the memory, press any key of "1" to "6" for 1 second or more and the displayed frequency is stored as a memory and the preset number corresponding to the pressed key is displayed.
5. The reading has a priority even though it is in auto tuning operation.
6. The initial values of each preset memory are as shown in the table.



Key	AM (kHz)	FM1 (MHz)	FM2 (MHz)
1	522	76.0	76.0
2	603	76.4	76.0
3	954	85.6	76.0
4	1386	76.0	76.0
5	522	76.0	76.0
6	522	76.0	76.0

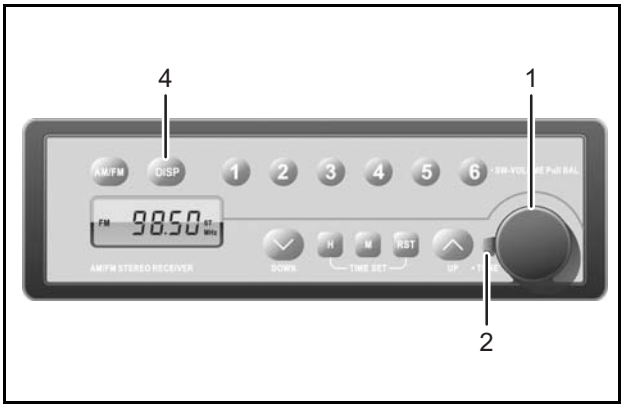
https://truckmanualshub.com/

3. Time setting



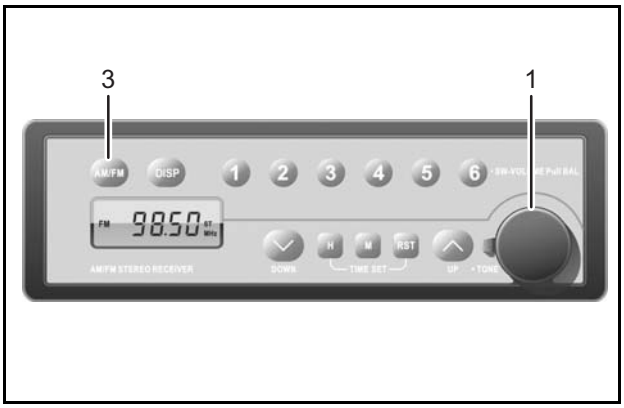
1. Use time setting keys "H", "M", "RST" only when the power switch (1) is on and the time is displayed.
2. Press "RST" key for 1 second of more and the time display flickers and changes in the time setting mode.
3. Set "Hour" by "H" key and "Minute" by "M" key.
4. The values of hour and minute increase each time the "H" and "M" key are pressed, and when the keys are pressed continuously, the values of hour and minute increase automatically.
5. When the "Hour" display is "12", press "H" key and the value returns to "1", and when the "Minute" display is "59", press "M" key and the value returns to "0". But in this case, the display of "Hour" is not carried.
6. After the setting was finished, when the "RST" key was pressed for 1 second or more again or the power was turned off, the time setting is completed and the time display is switched from flickering to illuminating.

4. Display switching



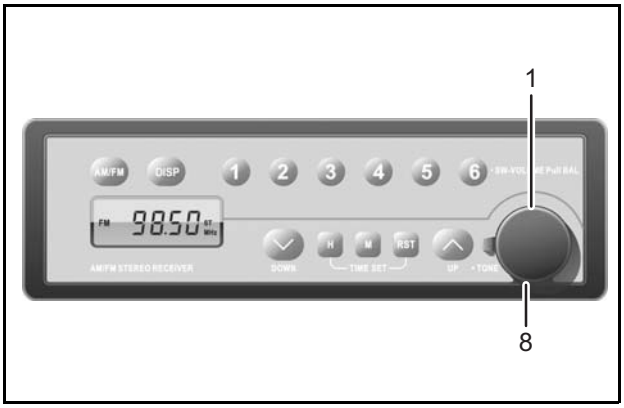
1. When the power switch is on, use "DISP" key for switching.
2. Press "DISP" key and the display switches from/to the frequency display to/from the time display.
3. Even in auto selection the time display can be switched, and even if the time is displayed, the operation is not cancelled during auto tuning until the stop signal is given.

5. AM/FM Switching

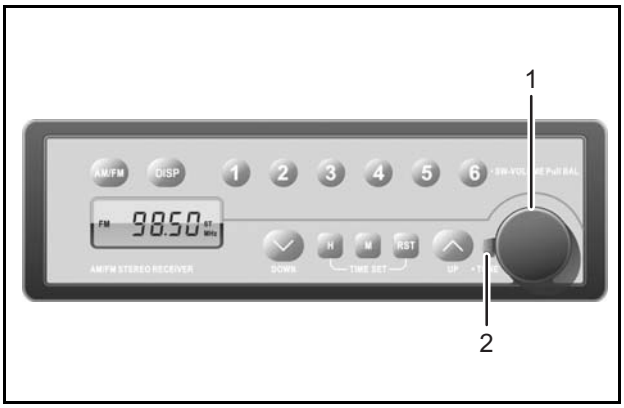


1. Turn power switch (1) on.
2. Press ÅgFM/AMÅh key (3) and the band and display are switched to FM1→FM2→AM in order.
3. Press "FM/AM" key again in the condition of AM display and the band and display are switched to FM1 again.
4. For the band switching, the station received immediately before switching is selected.

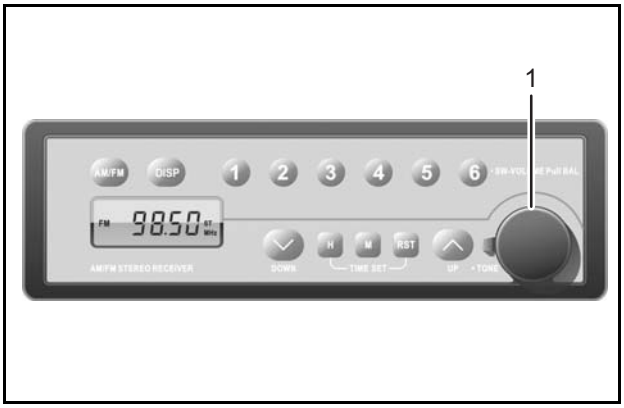
6. Volume control
   1. Use volume control (8) on the power switch (1).
   2. The volume control is in rotary type and the rotating angle is in the range of 300±10°.
   3. Turn the volume control in clockwise and the volume turns up, and in counterclockwise the volume turns down.



7. Tone control
   1. Use tone control (2) on the power switch (1).
   2. The tone control is in rotary type and the rotating angle is in the range of 300±10°.
   3. Turn the tone quality control in clockwise and the treble is emphasized, and turn in counterclockwise and the low bass is emphasized.

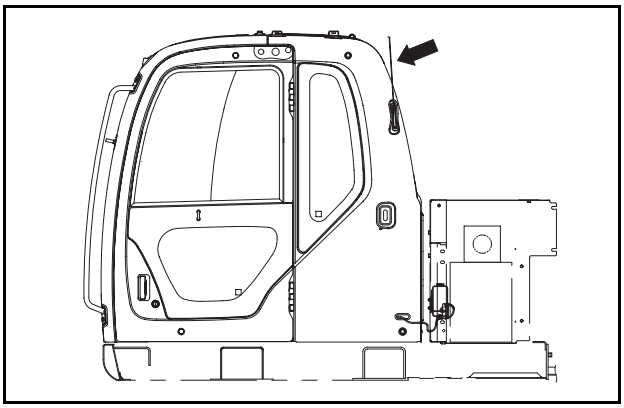


8. Power control
   1. Use power switch (1).
   2. Press the power switch and the power is switched from/to ON to/from OFF.



B. ANTENNA

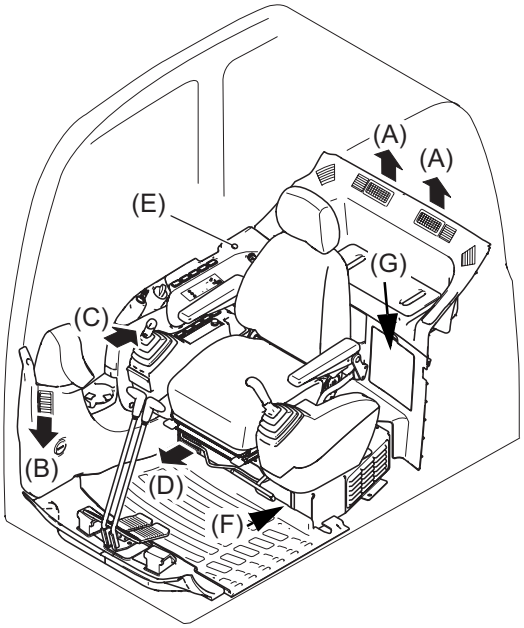
To prevent interference, retract the antenna in before transportation and storing.



AIR CONDITIONER

The air conditioner provides the comfortable indoor atmosphere and freely controls the room temperature and also removes the moisture to prevent of fogging on the cab glasses.
The air conditioner is located under the operator seat pedestal and sends out warm air and cool air in the cab.

Therefore no water should be introduced into the cab area as damage will occur to the air conditioner system, only compressed air or vacuum should be use to clean the interior of the cab.



Grille (Air outlet)
Select air stream in preferable direction by hand.
(A), (B), (C), (D): Air outlet
(E): Solar sensor

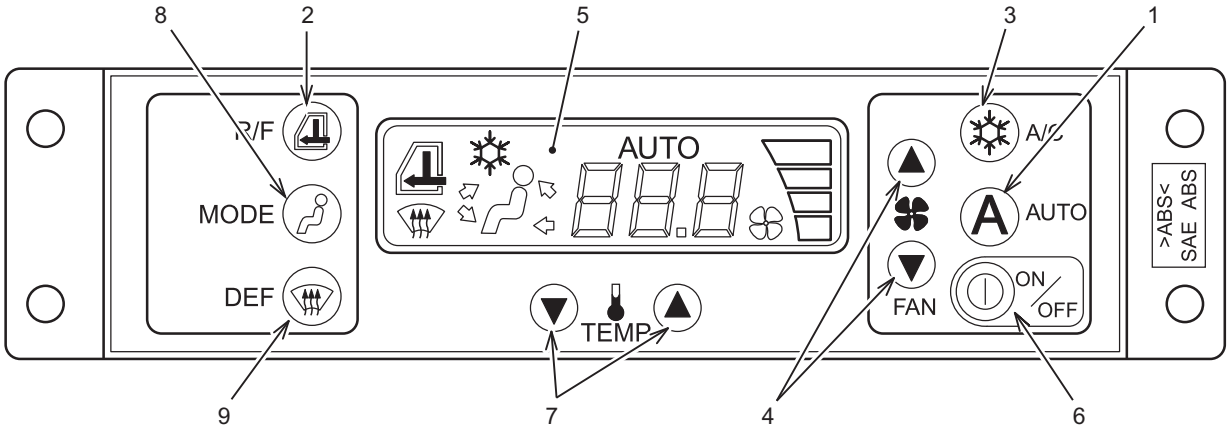
(F) Recirculation filter

(G) Fresh air intake filter

Precaution in Use of Air Conditioner

- When the air conditioner is running-in, start the engine at slow speed. Do not start the air conditioner at high speed. This might cause premature failure of air conditioner compressor.
- Pay attention to the control panel and solar sensor (E) so as not to splash water on them. The entry of water in the control panel and solar sensor might cause unexpected failure. And do not operate air conditioner around burn piles or fires, as embers might get drawn into the system and cause damage or possiable cab fires.
- Keep the solar sensor clean to allow proper auto function of air conditioner . And do not place the things which may interrupt the function of sensor on or in the surrounding area of the sensor.

Control Panel Description

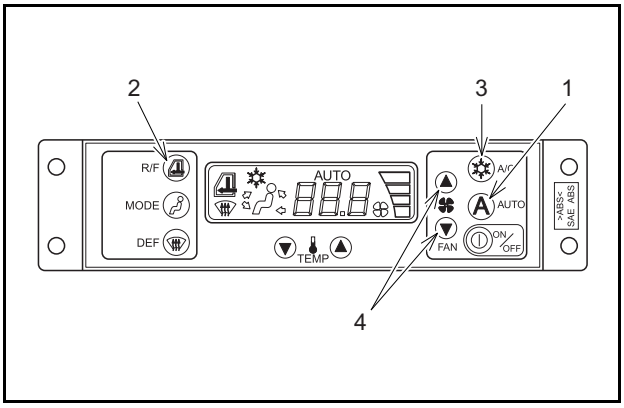


No.	NAME	No.	NAME
1	Auto Control Switch	6	Power Switch
2	Fresh and Recirculate Air Selector Switch	7	Temperature Setting Switch (°C ⟷°F Selector Switch)
3	Compressor Switch		
4	Fan Speed Selector Switch	8	Air Outlet Mode Selector Switch
5	LCD Display	9	Defroster Switch

- The LCD display indicates temperature, air outlet mode, compressor ON - OFF, AUTO, recirculate and fresh air and fan speed.
- Each switch, FAN mark of blower, and TEMP mark are illuminated green at night.

A. FUNDAMENTAL USE

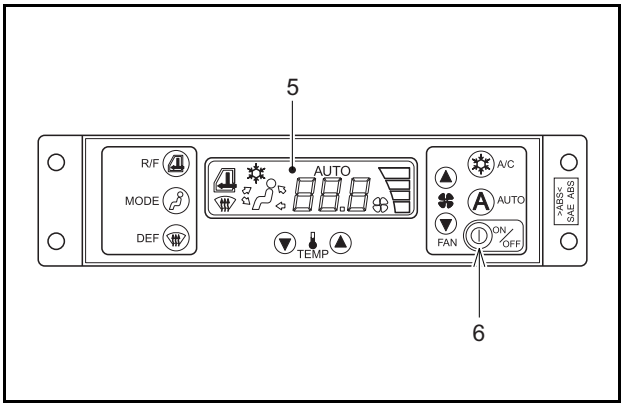
Before turning air-condition on, close doors of cab and windows to achieve the best performance.



1. Press control switch "AUTO" (1) to control air capacity and blower outlet automatically, and set the temperature in the range from 18.5 °C (65.3 °F) to 31.5 °C (88.7 °F).
   The outlet temperature, outlet opening and fan speed are adjusted automatically so that indoor temperature of cab comes closer to the set temperature.
2. Select proper mode manually through recirculate and fresh air capacity selector switch (2) and compressor switch (3) ON - OFF.
3. Select preferable fan speed manually through fan speed selector switch (4) when fan speed, selected through auto control, is not preferable.
   The indicator lamp of "AUTO" in LCD display goes out. Press "AUTO" switch to retune to automatic climate control.

B. CONTROL PANEL FUNCTIONS

1. Main Power Switch and Display



a. LCD display is illuminated (5) when the climate control-AC is operating.
   When the climate control-AC is stopped, LCD will be tuned off.
b. Press main power switch (6), and all functions for the climate control-AC switch ON or OFF.
   Each time when this switch is pressed, the function switches ON and OFF. When switched ON, the climate control-AC starts operating at the point set before switching OFF (when it is set to "AUTO", in auto mode; if NORMAL is selected, then in normal mode).

The key switch will switch air-conditioner OFF, but the operating condition just before switching off may not be restored when the key switch is turned ON again.

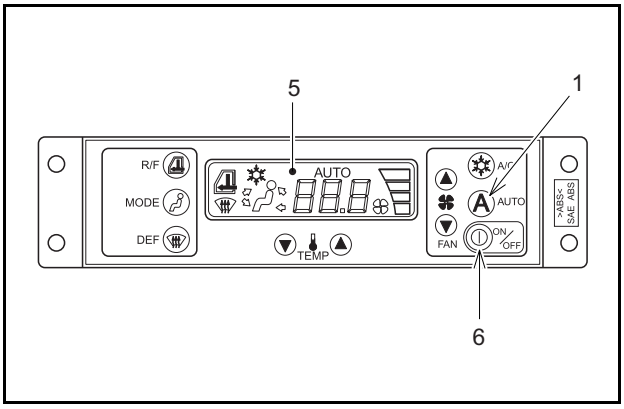
https://truckmanualshub.com/

Auto Control Switch and Display

a. Press the main power switch (6) to activate the climate control-AC and the LCD display (5) will illuminate.

b. Press control switch AUTO (1), and fan speed and air outlet are automatically controlled, and "AUTO" indicator lamp on LCD display is illuminated.

c. When the main power switch (6) is OFF, the system will retain the previous setting in memory. Therefor, when the main power switch is pressed again, the climate control AC will come on in the auto control mode. In the auto mode, the fan speed and air outlet openings are operated automatically.



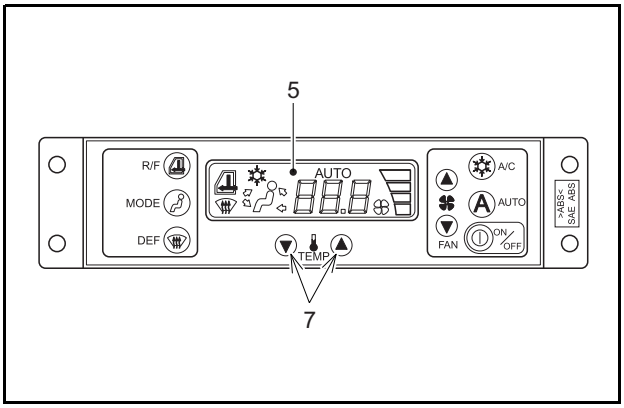
Temperature Setting Switch and Display

a. The set temperature is indicated in digits on LCD display (5). Temperatuer set range is 18.5°C (65.3°F) to 31.5°C (88.7°F).

b. Press the two temperature set switches (7) simultaneously for 5 seconds to change the display from Centigrade (°C) to Fahrenheit (°F) or viceversa in the LCD display.
(Eg.) 25°C →77°F or 77°F →25°C

c. Press temperature set switch DOWN or UP to change the set temperature.
The temperature goes up or down by 0.5°C (0.9°F) in graduation.
The set temperature may be raised or lowered by continued pressing of the switch.

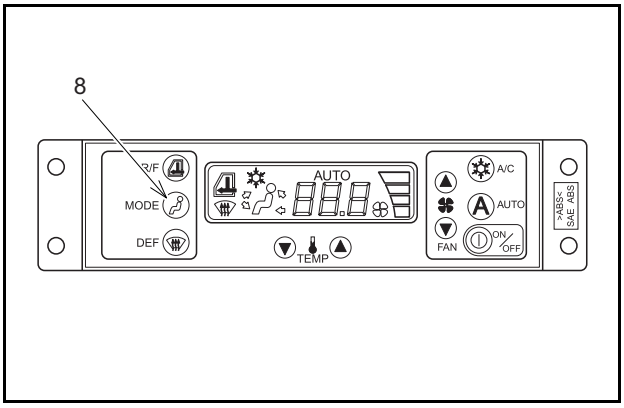
d. The set temperature 18.5°C (65.3°F) is the lowest cooling temperature, and 31.5°C (88.7°F) is the highest heating temperature.
Control beyond either of these limits is not possible.



Air Outlet Mode Selector Switch and Display

(1) Air outlet position is indicated by the arrow on LCD display.

(2) Press air outlet mode switch (8) in the condition where auto display light is on, and the display mode is fixed, "AUTO" indicator lamp on LCD display goes out, and "AUTO" control of air outlet opening is released.
Press it again, and the level is changed to
VENT →BI LEVEL →FOOT →FACE



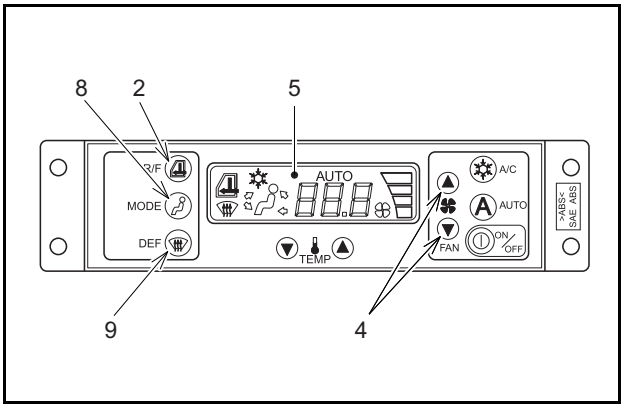
LCD Display				
Air Outlet Opening	Vent	Bi-level	Foot	Face
Air Outlet Direction	Upper half of body	Upper half of body, foot	Foot, front glass	Upper half of body (Front)

Defroster Switch and Display

a. Press defroster switch (9), defroster indicator lamp will be displayed (5).

b. Press aire outlet mode selector switch (8), and it returns to air outlet mode just before pressing defroster switch.

c. Press defroster switch (9) in the condition where AUTO display is lighting up, "AUTO" indicator lamp on LCD display (5) goes out and the auto control of air outlet opening is released.



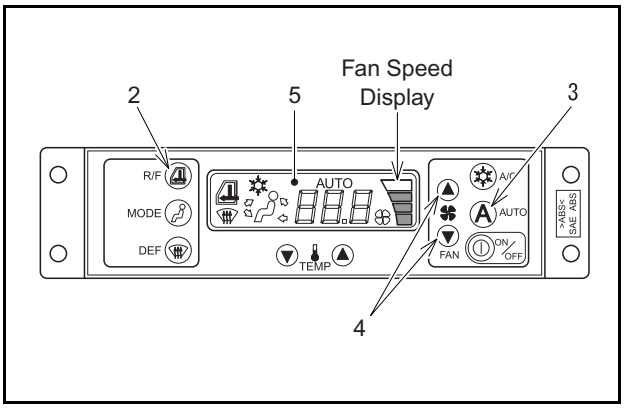
Recirculate and Fresh Air Selector Switch and Display

a. Suction (fresh air intake) mode is indicated on LCD display (5).

b. Each time recirculate and fresh air capacity selector switch (2) is pressed, the mode is switched to air recirculate or fresh air intake.

: Air Recirculation

: Fresh Air Intake



Compressor Switch and Display

Press compressor switch (3) in the condition where mark on LCD display is unlit, compressor starts operating and indicator lamp of mark on LCD display (5) goes on.
Press it again, and compressor turns off, and indicator lamp of mark on LCD display (5) goes out.

Fan Speed Selector Switch and Display

When it is set to MANUAL mode, fan speed on LCD display is as follows.

DISPLAY	FAN SPEED
LCD 1 lamp is lit up.	Low
LCD 2 lamps are lit up.	Mediun
LCD 3 lamps are lit up.	High
LCD 4 lamps are lit up.	Max

Press UP or DOWN of fan speed selector switch, and auto control of fan speed is released, and "AUTO" indicator lamp on LCD display (5) goes out.

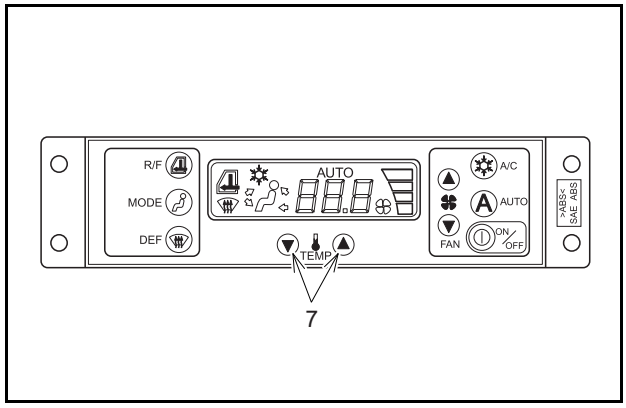
LCD Display				
Fan Speed	Low	Mediun	High	Max.

Setting Temperature Display Switching Function from/to °F to/from °C

The setting temperature display can be switched from/ to °F to/from °C.

While the fan is operating, press "▼" and "▲" switches (7) simultaneously for 5 seconds or more, and the display is switched form/to Fahrenheit to/from Celsius. (But the unit is not displayed.)

	LC (Liquid crystal) display
Celsius (℃)	18.0~32.0
Fahrenheit (°F)	63~91



Treatment of Season In and Off

(1) Season in
Contact our dealer/distributor for checking and service of air conditioner before air-cooling season (season in) so that the air conditioner is used in good condition for a long time.

(2) Season off
Operate air conditioner for several minutes once a week in the period of out of season (season off). The operation maintains the air conditioner in good condition preventing short of oil in each part of compressor.

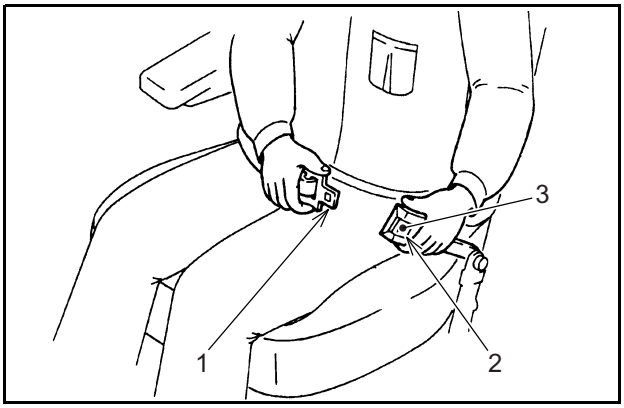
USAGE OF SEAT BELT

Install the seat belt properly or the fundamental performance may not be achieved.

- **Make sure that there is no abnormality on the belt attaching bracket and bolts before fastening the belt.**
- **Check attaching bolts which are used to secure the belt to the seat for loosening and tighten loose bolts again.**
- **Do not fail to fasten the belt during operation.**

How to Fasten Seat Belt

1. Since this seat belt is equipped with take-up motion, the adjustment of length is unnecessary.
2. Check that the seat belt (1) is not twisted, and pull the seat belt out.
3. When fastening seat belt, pull it out a little longer than the required length and insert it into buckle until clicking sound is heard.
   Release hand, and the length is automatically adjusted and the buckle is locked.



How to Unfasten Seat Belt

1. Press the red button (3) of the buckle (2), and the belt (1) is unfastened.

https://truckmanualshub.com/

OPERATOR SEAT

The operator seat incorporates several adjustment mechanisms to insure operator comfort, ease of operation and operator safety. The adjustment areas are as follows.

When adjusting the operator seat, pay attention to hands in order not to be caught between handle and seat.

A. Operator Weight Adjustment

Rotate the adjustment knob (1) until weight close to the operator's weight is at the top end of the dial. (Not equipped in Asia.)

B. Seat Height Adjustment

1. Pull height adjustment lever (2) up to raise or lower rear of seat.
2. Push height adjustment lever (2) down to raise or lower front of seat.

C. Seat Reclining Adjustment

1. Pull reclining adjustment lever (3) up to set desired reclining angle.
2. Release reclining adjustment lever to lock seat in position.

D. Seat Front to Back Adjustment

Pull up on seat adjustment bail (4) and move seat forward or backward to desired position

E. Arm Rest Adjustment

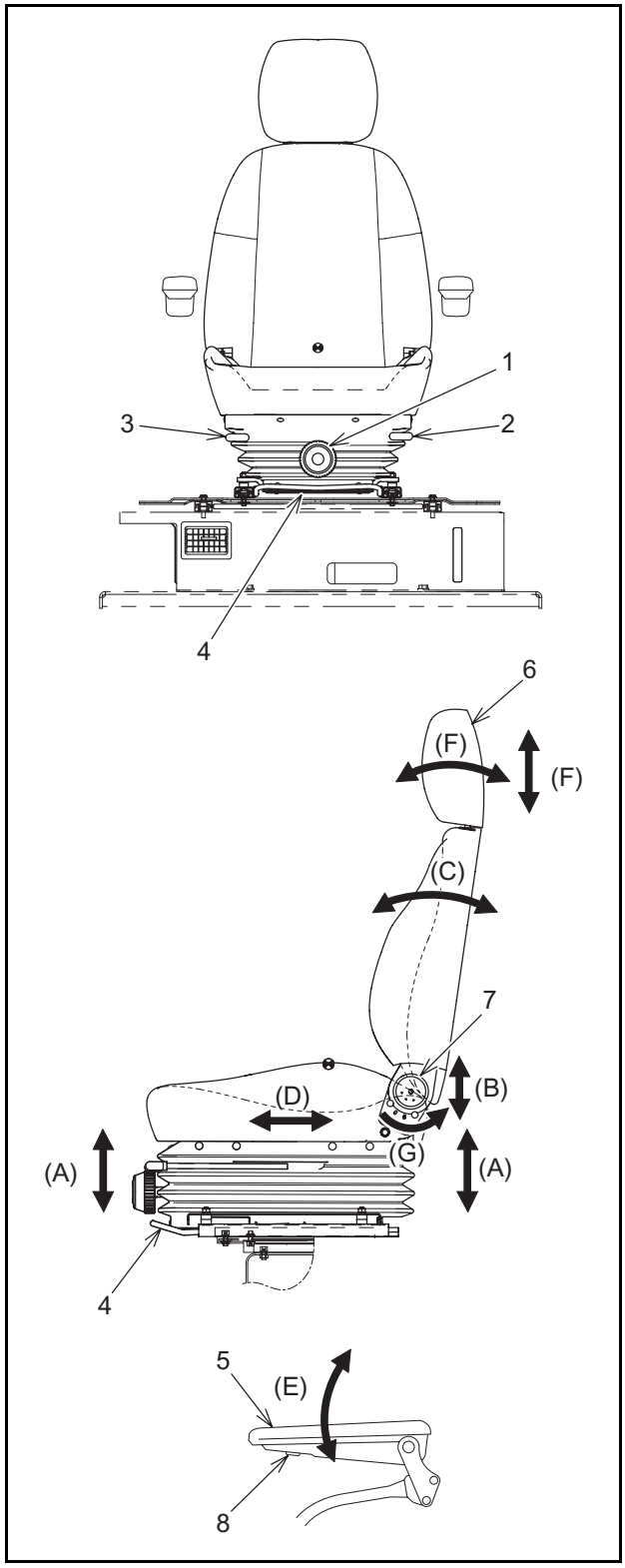
Lower arm rest (5) and with finger, turn adjustment wheel until arm rest is in desired position.
To fine-adjust the angle of arm rest, turn control dial (8).

F. Head Rest Adjustment

1. Move head rest (6) forward or backward to desired reclining angle.

G. Lumber Support (7)

It is possible to adjust the force which is supporting the lumber in 5 steps by turning the knob in counterclockwise. With turning the knob in counterclockwise the supporting force is raised and returns to the condition before adjustment at 6th step.



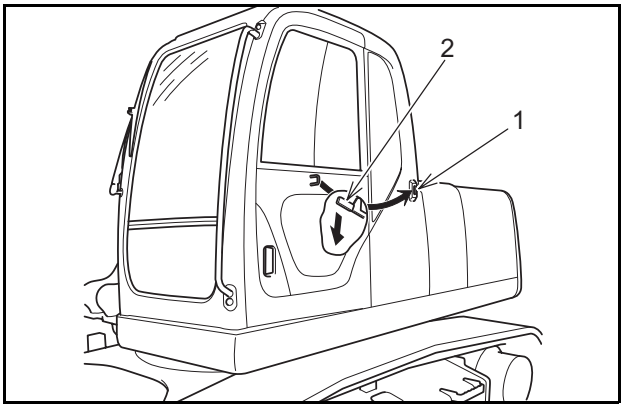
OPERATOR CAB

When necessary to leave from the operator seat, lock the safety lock lever.
After the control lever is unexpectedly touched without the safety lock lever locked, this may cause serious accident resulting in injury and death.

A. Cab Door Lock

This is used to fix door in the condition where the door is open.

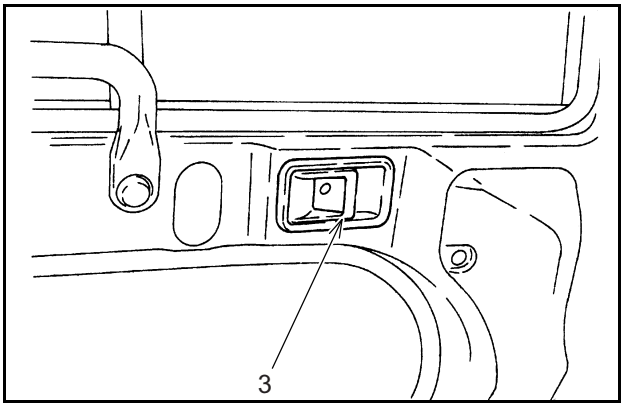
1. Push door against catch (1) and door is fixed.
2. When necessary to open the door, push down lever (2) on the left side of operator seat and the catch is released.
3. When necessary to fix the door, fix door to the catch securely.



In operation, lock the door securely even if it is on either open side or close side. When not locked, the door may be open unexpectedly and this might cause the injury. And also it may cause the failure of machine.

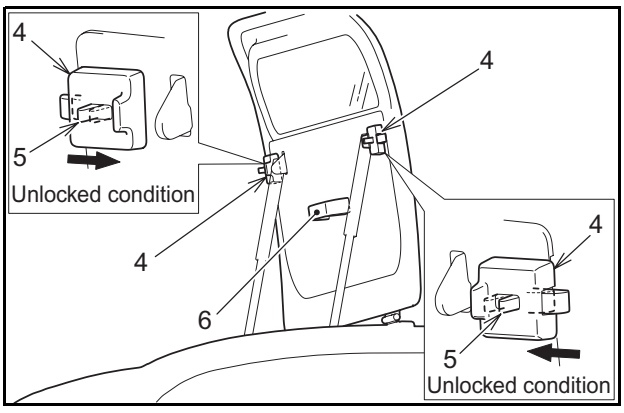
B. Releasing Door Lock from Inside of Cab

When necessary to open the door from the inside of cab, pull lever (3) by hand and the door opens.



C. Opening and Closing Sunroof

- **When being open**
  Pull the levers (5) of the right and left locks (4) inward and the roof is opened or closed. Push up handle (6) and the roof opens by the power of gas damper.
- **When closing**
  When necessary to close, pull in handle (6) and move levers (5) on the right and left locks outward.



https://truckmanualshub.com/

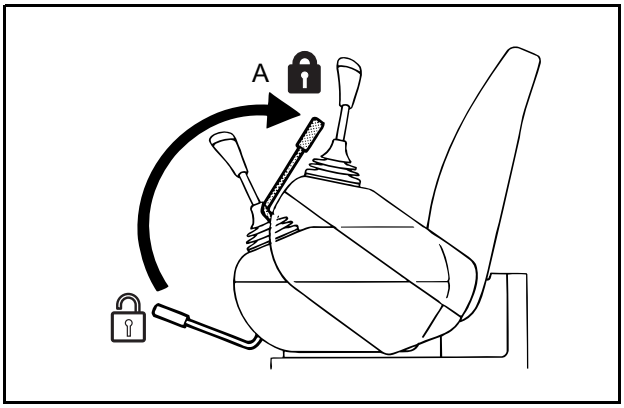
Opening and Closing Front Window

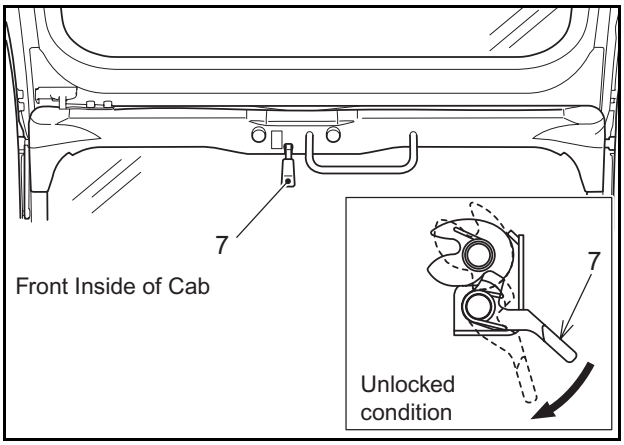
- **The front window should be opened and closed in the condition where the machine is parked in level and locked securely. If the lock is released in the forward tilting position of machine there is a possibility of falling of the front window.**
- **When closing the front window, the closing speed increases due to the weight of front window. Hold and close it by both hands securely.**
- **When storing the front window in, pull up the safety lock lever to the "LOCKED" position and stop the engine.**

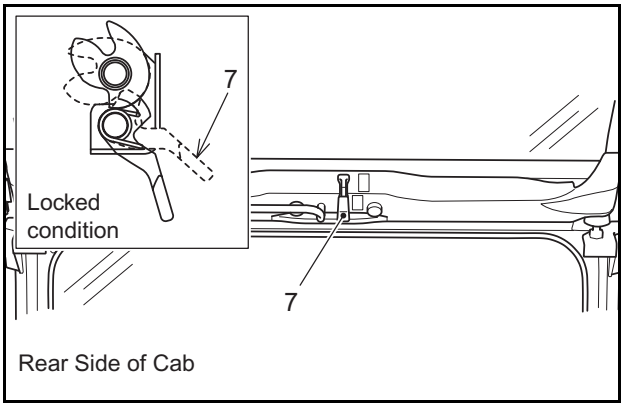
1. Park the machine on the level ground, put the bucket on the ground, pull up the safety lock lever to the locked position and stop the engine.
2. Push lock lever (7) on the upper center part of window (upper) forward and release the lock.
3. Hold and push up the handle on the upper and lower parts of the front upper window. After the front upper window reached to the end on the rear side of roof, it is locked automatically. And then make sure that it is locked securely.
4. When closing the front upper window, close it by the reverse procedure of that in above items 2.to 3.

To prevent from catching your hand between windows, open and close the front window slowly. The work in no locking and incomplete locking conditions might cause injury.

5. When closing the front window, push the right and left sides of front window forward, pull lock lever (7) near side and lock it securely.

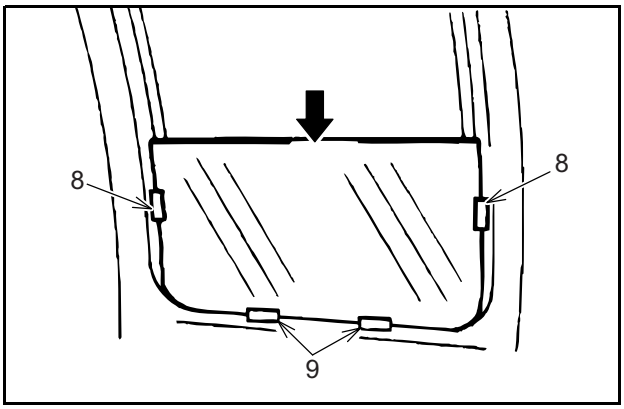






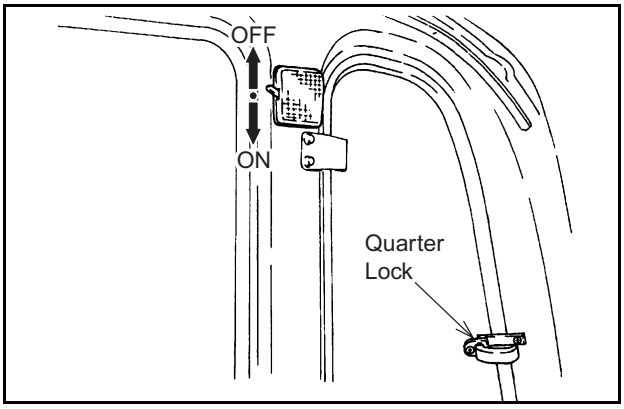
E. Removing & Storing Lower Front Window

1. After placing upper front window in ceiling, hold lower front window by hands and remove it from window frame.
2. Store the removed lower front window in holder (8), (9) on the rear side of cab securely.



Opening and Closing Glass Window on the Right Rear Side

Release the quarter lock and the glass window opens slightly.



G. Cab Room Lamp

a. Turn cab room lamp "ON" by pushing the lamp switch downward.

b. The lamp goes out at the neutral position.

c. Turn "OFF" by pushing switch all the way up.

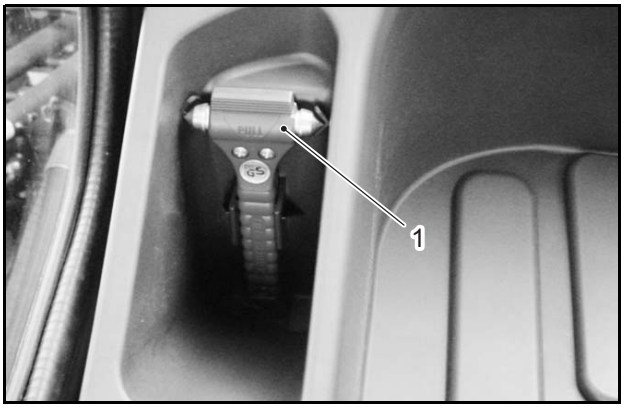
EMERGENCY ESCAPE FROM CAB

If it is impossible to open the cab door in an emergency, escape from the cab by the following way.

1. Open the front window and escape through the front window.

For how to open the front window, see item "Opening and closing front upper window".

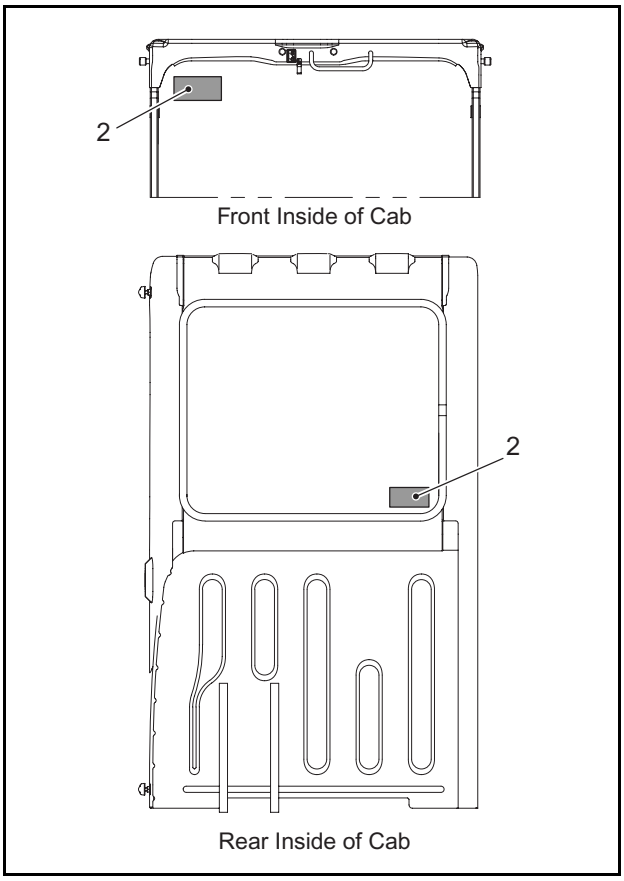
2. If it is impossible to open the front window, break the front window glass by using life hammer (1) provided on the right rear side of cab.
3. If the front window is unavailable to escape, break the rear window glass by using life hammer (1).



Pay attention to the broken pieces so as not to be injured when breaking the window glass.

Labels (2) indicating the emergency exit are affixed on the front and rear windows.

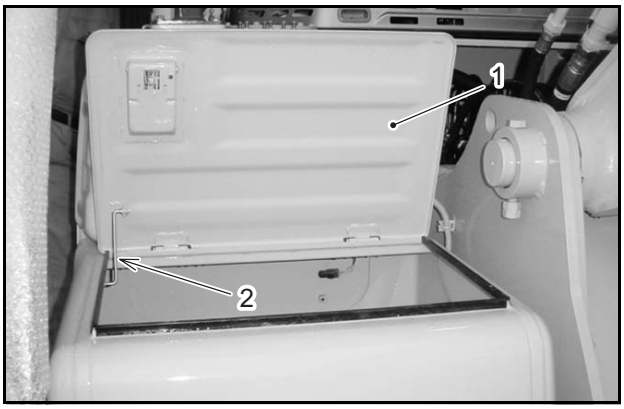
4. If it is impossible to use both front and rear windows for escape, open and escape from the skylight.



OTHER EQUIPMENT (ACCESSORY)

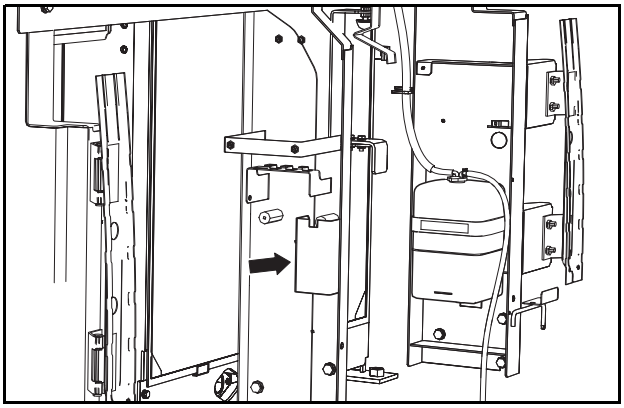
A Tool Box

Use this box for tools and accessory.
This box is located on the right front side of machine.
Release lock (1) of the cover with starter key and support it with stay (2).
After using tools, release the stay and close the cover, and then lock it with starter key.



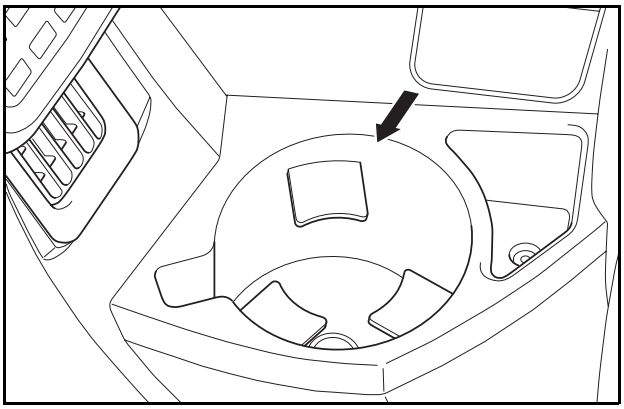
B Grease Gun Holder

This is provided on the inside of cover on the left rear side of machine. When the gun is not used, put it on this holder.



C Cup Holder

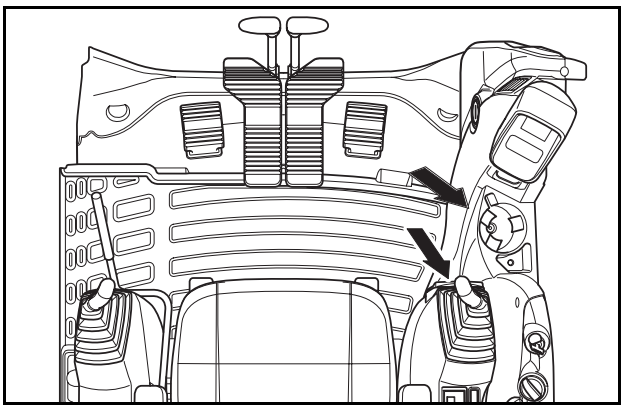
This is provided on the right side console in the cab.
This is used to put drinks, etc. in.



D Ash Tray

When desired to use ash tray, open the cover by hand.

Put out of fire of cigarette completely, and put the cigarette in ash tray. And close the cover of ash tray securely.

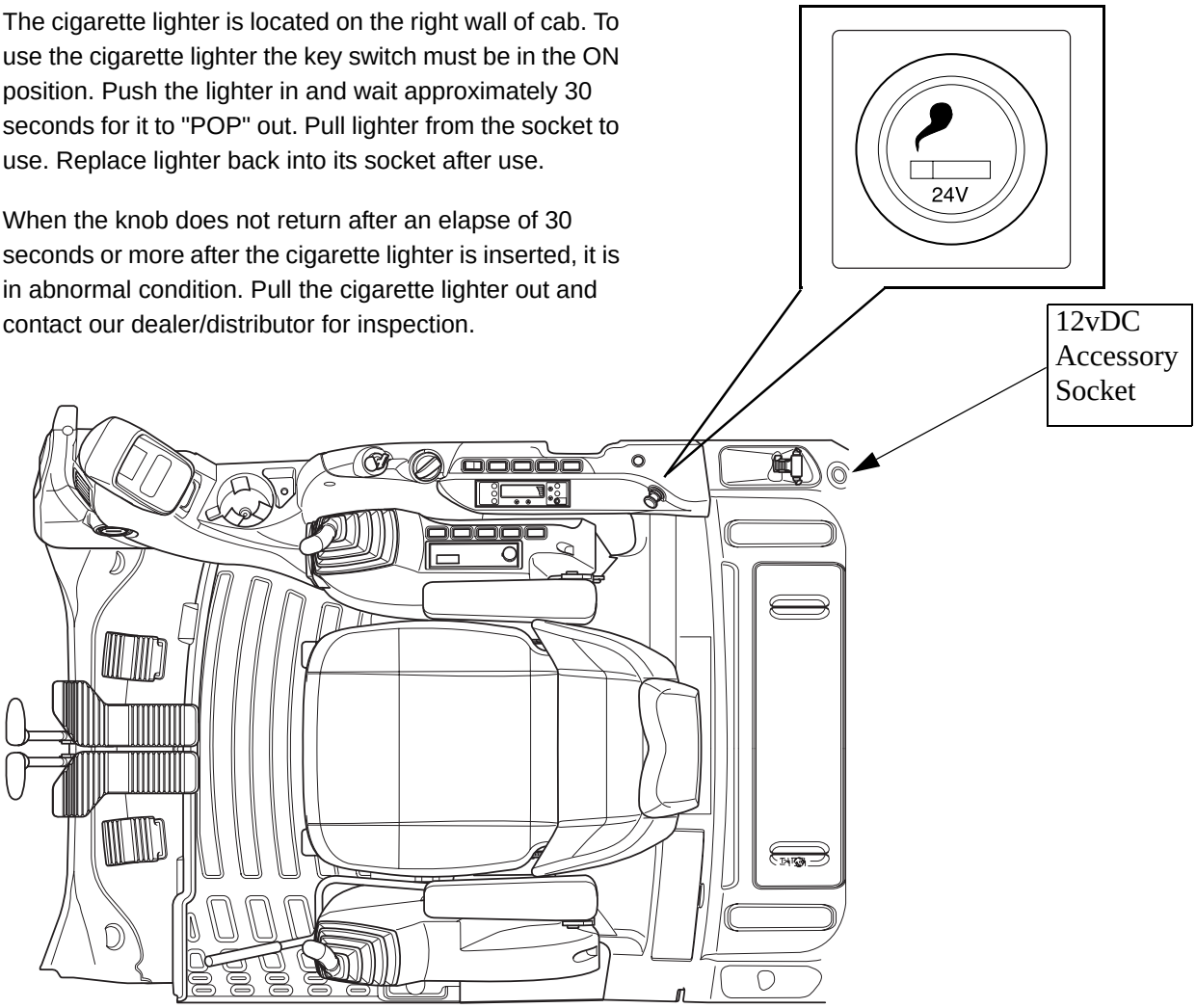


https://truckmanualshub.com/

24 Volt Cigaratte Lighter & 12 Volt Accessory Socket

The cigarette lighter is located on the right wall of cab. To use the cigarette lighter the key switch must be in the ON position. Push the lighter in and wait approximately 30 seconds for it to "POP" out. Pull lighter from the socket to use. Replace lighter back into its socket after use.

When the knob does not return after an elapse of 30 seconds or more after the cigarette lighter is inserted, it is in abnormal condition. Pull the cigarette lighter out and contact our dealer/distributor for inspection.



https://truckmanualshub.com/

KOBELCO

MARK 8



Maintenance Standards
&
Test Procedures

KOBELCO

Kobelco Construction Machinery America LLC

https://truckmanualshub.com/

TABLE OF CONTENTS

CYLINDER CYCLE TIME TESTS .....**4 ~ 8**
A. Tools & Equipment.....4
B.Machine Settings & Site Condition 4
C. Boom Cylinder 4
D. Arm Cylinder 5
E. Bucket Cylinder.....6

CYLINDER DRIFT 7
A. Tools & Equipment 7
B. Machine Settings & Site Condition 7
C. Test Procedure 7

SWING SPEED 8
A. Tools & Equipment 8
B. Machine Settings & Site Condition 8
C. Test Procedure 8
SWING STOPPING 9
A. Tools & Equipment 9
B. Machine Settings & Site Condition 9
C. Test Procedure 9
SWING DRIFT 10
A. Tools&Equipment.....10

B. Machine Settings & Site Condition 10
C. Test Procedure 10

SWING BEARING UP-DOWN (VERTICAL) MOVEMENT 11
A. Tools & Equipment 11
B. Machine Settings & Site Condition 11
C. Test Procedure 11
SWING BEARING SIDE TO SIDE (HORIZONTAL) MOVEMENT 12
A. Tools & Equipment 12
B. Machine Settings & Site Condition 12
C. Test Procedure 12

SWING MOTOR OIL CASE DRAIN .....13 ~ 15
A. Tools & Equipment 13
B. Machine Settings & Site Condition 13
C. Test Procedure .....13 ~ 14
TRAVEL MOTOR OIL CASE DRAIN .....15 ~ 16
A. Tools & Equipment 15
B. Machine Settings & Site Condition 15
C. Test Procedure .....15 ~ 16

TRAVEL PERFORMANCE .....17 ~19
A. Tools & Equipment 17
B. Machine Settings & Site Condition 17
C. Test Procedure 17

TRAVEL SPEED 18
TRAVEL DEVIATION 19

https://truckmanualshub.com/

Pre-cycle time considerations

BUCKET SELECTION GUIDE

Bucket selection is extremely important to a machine's productivity, durability and stability.

Choosing an excessively large bucket can reduce productivity due to slower than normal cycle times.

Using an oversized or overly wide bucket, in severe conditions, such as mining, will lead to durability problems for both the machine and bucket involved.

Stability will be adversely affected using a bucket that is unnecessarily large.

The Bucket Selection Charts listed in the Specification's Section (6) are to be used as general guidelines.

If the buckets used locally vary in weight from these sample buckets, it will be necessary to adjust the bucket capacity accordingly. A heavier bucket must correspond to a reduced capacity.

If the material density (weight) exceeds guideline specifications then the bucket capacity must be reduced.

If the machine is to continuously dig rock, wasted shale, river cobbel or other severe applications the narrowest bucket possible should be utilized. This will allow the greatest possible penetration and minimal twisting of the attachment (boom and stick). Bucket capacity is not to be the prime consideration for severe applications.

If a machine is to exclusively load trucks at close radius then the bucket loads can be adjusted up 5% to 7 % from the Lift Chart values listed in the Specification's Section, due to a close in dump radius.

If a machine is to be utilized exclusively to spoil pile, which causes a large radius dump cycle, applicable loads may have to be adjusted down by 5% from the Lift Chart Values (Section VI) or stability complaints may occur.

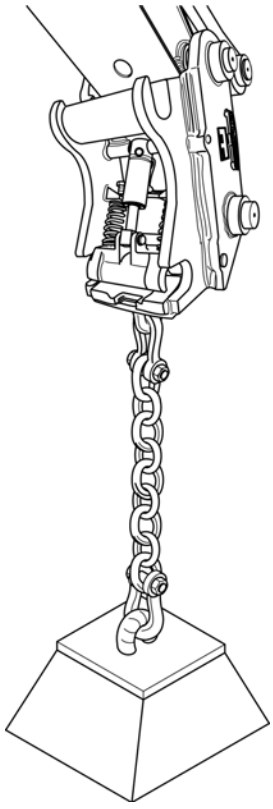
See the Specification's Section - "Bucket Selection Charts" to select the appropiate bucket size



USE OF OPTIONAL ATTACHMENTS

If a machine is equipped with optional attachments such as a bucket quick coupler, and/or thumbs, (either hydraulic or mechanical) applicable bucket sizes and suspended loads must be reduced in direct porportion to the weight or combined weight of these attachments. Failure to consider the added weight of such attachments will cause stability complaints. Additionally these weights of such attachments must be considered when the lift chart is referred to before lifting a load. The additional weight of heavy buckets, couplers, and thumbs, must be deducted from allowable lift capacities. See Lift Charts - Section VI.

Use of quick couplers for bucket interchangeability will reduce effective arm digging force and particularly bucket breakout force due to an increase of tooth tip radius. Example: Some couplers can increase tooth tip radius up to 12 inches. If this is used with a 48" tooth tip radius, effective bucket breakout force can be reduced 25%, a 5% reduction in effective arm force, a reduction in lift capacities of up to 1000 lbs (for SK480).



To obtain the proper lifting capacity when a quick coupler is used, proceed as follows: deduct the weight of the standard bucket from the lifting chart, add the weight of the quick coupler plus the weight of the attachment to be coupled. Consideration of the Center of Gravity of the new attachment + coupler may be necessary.

https://truckmanualshub.com/

CYLINDER CYCLE TIME TEST

NOTE

The measuring time of the cylinder cycle does not include the cushion stroke times. Only measure time up to the beginning of the cushion

A.Tools & Equipment

The following tools and equipment will be required to perform the cylinder cycle time test:

1.Stopwatch.

2.Thermometer or heat gun to read Hydraulic Oil Temperature. Cycle attachment a few times to warm up hydraulic system.

B.Machine Settings & Site Conditions

1.Disable Auto Accel by pressing Accel button then move any lever safey 1 full stroke.

2.Place machine throttle in "High" idle position. A/C unit should be turned “OFF”.

3.Hydraulic oil temperature at 55°C to 65°C (131°F to 149°F).

4.Firm, level testing site.Check all Fluid levels before testing.

5.Verify that engine RPM's are correct to specifications.

C.Boom Cylinder Cycle Time Test

1.Place the machine throttle control to "HIGH" idle and the KPSS Work Mode Switch to "H " Mode. See Figure 3.1

2.Fully extend the Bucket Cylinder and fully retract the Arm Cylinder. See Figure 3.2.

3.Lower Boom until bucket rests on the ground level with bottom of tracks.

4.Raise Boom (extending the cylinders) at full stroke of the control and measure the time for the boom cylinder to reach the cushion stroke. Record the time. See Figure 3.3.

5.Lower the boom (retracting cylinders) at full stroke and measure the time for the bucket to reach ground level. Record the time. See Figure 3.3.

6.Repeat steps 5 and 6 two more times and record the stopwatch readings. Average the readings and compare the average to the Boom Cylinder Cycle Time Specification Chart.

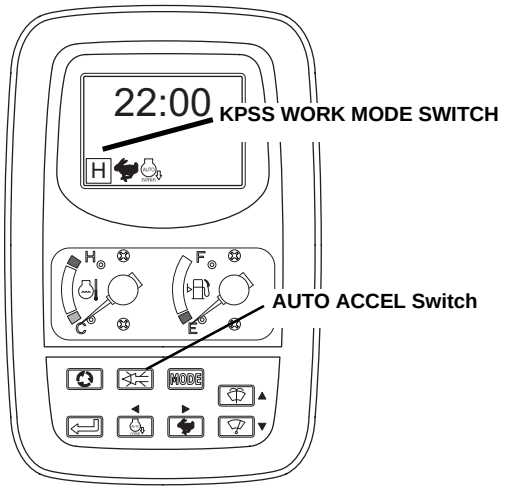
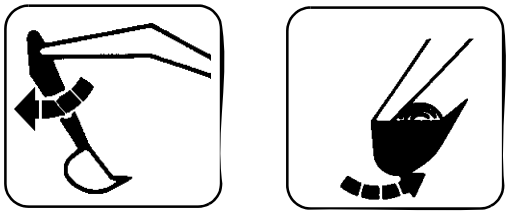


FIGURE 3.1



ARM OUT CYLINDER RETRACTED

BUCKET IN CYLINDER EXTENDED

FIGURE 3.2

DO NOT TIME CUSHION STROKE OF CYLINDER DURING TEST

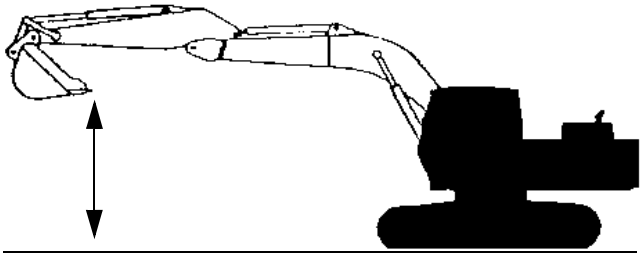


FIGURE 3.3

BOOM CYLINDER CYCLE TIME SPECIFICATIONS

MODEL	CYLINDER POSITION	H-MODE
*SK170-8	EXTENSION	2.7 - 3.3
*SK170-8	RETRACTION	2.2 - 2.8
SK210-8	EXTENSION	2.7 - 3.3
SK210-8	RETRACTION	2.3 - 2.9
SK260-8	EXTENSION	2.8 - 3.4
SK260-8	RETRACTION	2.3 - 2.9
SK290	EXTENSION	0.0 - 0.0
SK290	RETRACTION	0.0 - 0.0
SK350	EXTENSION	2.9 - 3.5
SK350	RETRACTION	2.4 - 3.0
SK480	EXTENSION	0.0 - 0.0
SK480	RETRACTION	0.0 - 0.0

*SK170 and ED190 same

Unit: Seconds

https://truckmanualshub.com/

CAUTION

THIS TEST IS DESIGNED FOR STANDARD BOOM, ARM AND BUCKET. IF THE MACHINE BEING TESTED HAS ANY OPTIONAL EQUIPMENT, CHECK TO MAKE CERTAIN THERE WILL BE NO INTERFERENCE WITH THE CAB BEFORE PERFORM-

D. Arm Cylinder Cycle Time Test

NOTE:

The measuring time of the cylinder cycle does not include the cushion stroke times. Only measure time up to the beginning of the cushion stroke. Cycle attachment a few times to warm up

1. Move the machine to a firm, level testing area.Check all Fluid levels before testing.
2. Place the machine throttle control to "HIGH" idle and The KPSS Work Mode Switch to "H" Mode. See Figure 3.4.
3. Fully extend Boom Cylinder. See Figure 3.5.
4. Fully retract Bucket Cylinder. See Figure 3.5.
5. Fully extend the Arm (retracting cylinder).
6. At full stroke of the control, bring the arm all the way in (extending cylinder) and measure the time it takes for the arm cylinder to reach the cushion stroke. Record the time. See Figure 3.6.
7. At full stroke of the control, fully extend the arm (retracting cylinder) and measure the time it takes until the cylinder reaches the cushion stroke. Record the time. See Figure 3.6.
8. Repeat steps 6 and 7 two more times. Average the recorded times and compare the average to the Arm Cylinder Cycle Time Specification Chart.

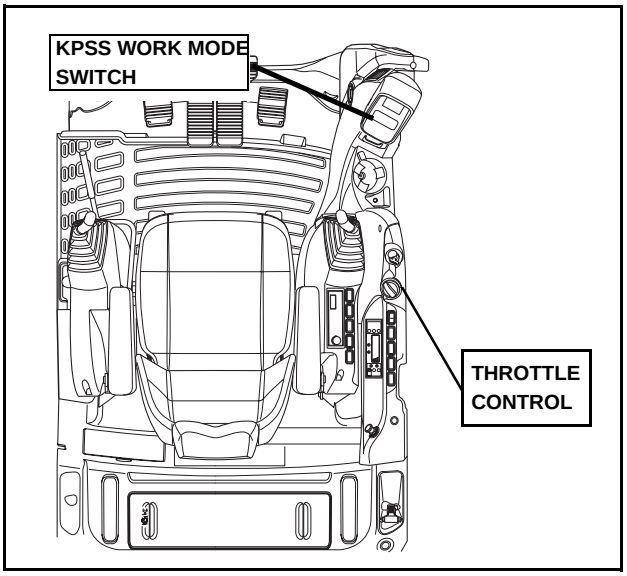
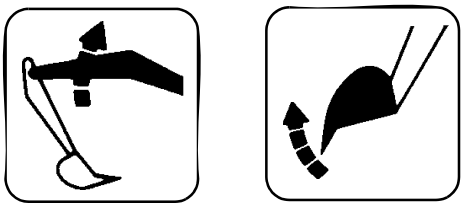


FIGURE 3.4



BOOM UP CYLINDER EXTENDED | **BUCKET OUT CYLINDER RETRACTED**

FIGURE 3.5

DO NOT TIME CUSHION STROKE OF CYLINDER DURING TEST

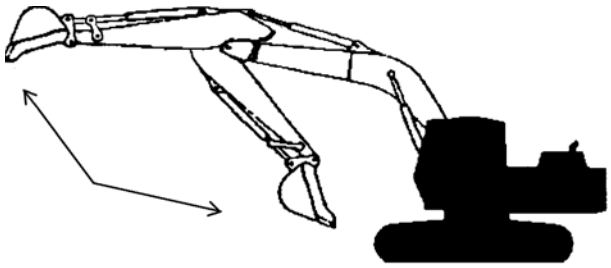


FIGURE 3.6

ARM CYLINDER CYCLE TIME SPECIFICATIONS

MODEL	CYLINDER POSITION	H-MODE
*SK170-8	EXTENSION	3.1 - 3.7
*SK170-8	RETRACTION	2.5 - 3.1
SK210-8	EXTENSION	3.0 - 3.6
SK210-8	RETRACTION	2.4 - 3.0
SK260-8	EXTENSION	3.2 - 3.8
SK260-8	RETRACTION	2.6 - 3.2
SK290	EXTENSION	0.0 - 0.0
SK290	RETRACTION	0.0 - 0.0
SK350-8	EXTENSION	3.4 - 4.0
SK350-8	RETRACTION	3.1 - 3.7
SK480	EXTENSION	0.0 - 0.0
SK480	RETRACTION	0.0 - 0.0

*SK170 and ED190 same

Unit: Seconds

https://truckmanualshub.com/

E. Bucket Cylinder Cycle Time Test

NOTE

The measuring time of the cylinder cycle does not include the cushion stroke times. Only measure time up to the beginning of the cushion stroke. Cycle attachment a few times to warm

1. Move the machine to a firm, level testing area.Check all Fluid levels before testing.

2. Place the machine throttle control to "HIGH" idle and The KPSS Work Mode Switch to "H" Mode. See Figure 3.7.

3. Raise Boom to full height using "Boom Up" control.

4. Adjust the arm until the arm is at 90° to arm cylinder. See Figure 3.8.

5. Lower boom until the arm tip is parallel with the boom foot. See Figure 3.8.

6. Bring bucket all the way in.

7. Operate bucket out (retracting cylinder) at full stroke of control and measure the time it takes for the bucket cylinder to reach the cushion stroke (if equipped). Record the time. See figure 3.9.

8. Operate the bucket in (extending cylinder) at full stroke of control and measure the time it takes for the bucket cylinder to reach the cushion stroke (if equipped). Record the time. See Figure 3.9.

9. Repeat steps 7 and 8 two more times. Average the readings and compare to the Bucket Cylinder Cycle Time Specification Chart.

BUCKET CYLINDER CYCLE TIME SPECIFICATIONS

MODEL	CYLINDER POSITION	H - MODE
*SK170-8	EXTENSION	2.4 - 3.0
*SK170-8	RETRACTION	1.9 - 2.5
SK210-8	EXTENSION	2.3 - 2.9
SK210-8	RETRACTION	1.8 - 2.4
SK260-8	EXTENSION	2.5 - 3.1
SK260-8	RETRACTION	2.0 - 2.6
SK290	EXTENSION	0.0 - 0.0
SK290	RETRACTION	0.0 - 0.0
SK350-8	EXTENSION	2.8 - 3.4
SK350-8	RETRACTION	2.0 - 2.6
SK480	EXTENSION	0.0 - 0.0
SK480	RETRACTION	0.0 - 0.0

*SK170 and ED190 same

Unit: Seconds

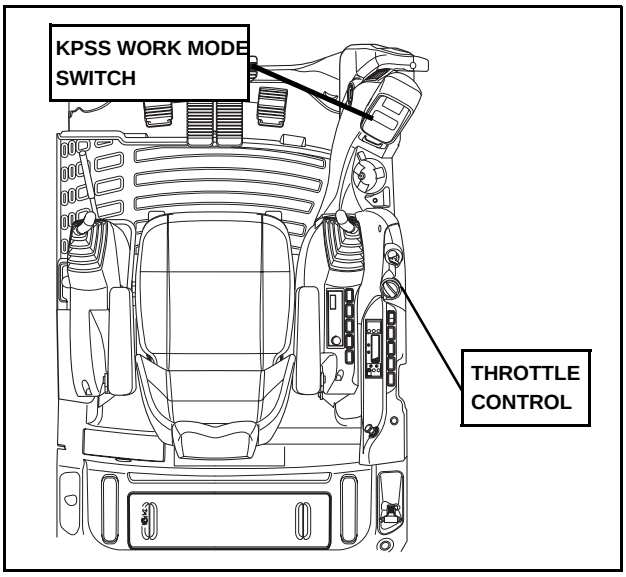


FIGURE 3.7

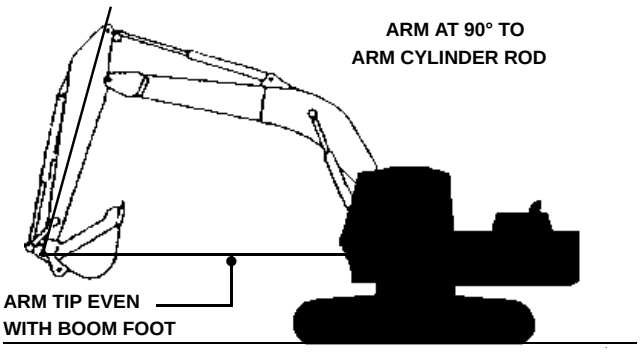


FIGURE 3.8

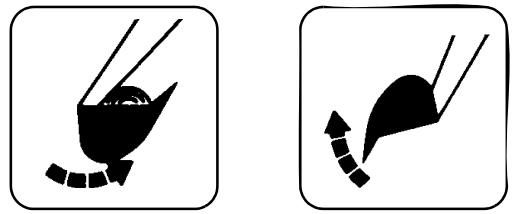


FIGURE 3.9

https://truckmanualshub.com/

CYLINDER DRIFT

A. Tools & Equipment

The following tools and equipment will be required to perform the cylinder drift test:

1.Measuring tape.
2.Stopwatch.
3.Device for marking starting points.
4.Thermometer or heat gun to read Hydraulic Oil Temperature.

B. Machine Settings & Site Conditions

1.Machine engine "OFF".
2.Hydraulic oil temperature at 55°C to 65°C (131°F to 149°F).
3.Firm, level testing site.Check all Fluid levels before testing.

C. Cylinder Drift Test

1.Move the machine to a firm, level test site and allow the hydraulic oil temperature to reach 55°C to 65°C (131°F to 149°F).
2.Operate the arm out control until arm is completely out (retract cylinder completely). Mark cylinder with grease pencil next to dust to establish starting point reference line.
3.Operate the bucket in control until bucket is completely in (extend cylinder completely). Mark cylinder with grease pencil about 6” from dust to establish starting point reference line.
4.Adjust the boom up or down with control until bucket is 1.5m (4'-11") from ground level to tip of teeth. Mark cylinder with grease pencil about 6” from dust seal to establish starting point reference line. See Figure 3.11.
5. Turn engine "OFF" and allow machine to sit for <u>five minutes</u>.
6. Subtract the movement amount from the starting point measurement, this is the total movement dimension.
7. Repeat steps 4 through 6 two more times and average the measurements. Compare the average to the Cylinder Drift Specification Chart.

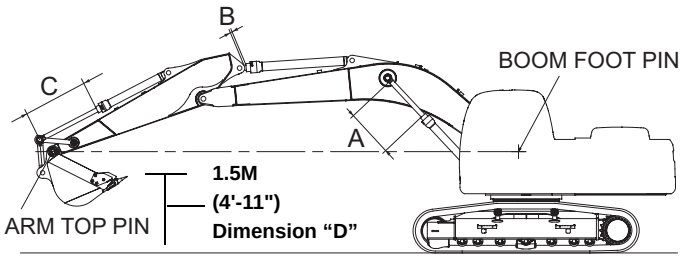


FIGURE 3.11

CYLINDER DRIFT SPECIFICATION CHART

MODEL	BOOM “A” (RETRACT)	ARM “B” (EXTEND)	BUCKET “C” (EXTEND)	BUCKET “D” (TOP END)
*SK170	MAXIMUM	MAXIMUM	MAXIMUM	MAXIMUM
*SK170	14mm(0.55")	12mm(0.47")	15mm(0.6")	300mm(12")
SK210-8	MAXIMUM	MAXIMUM	MAXIMUM	MAX./10MIN
SK210-8	14mm(0.55")	12mm(0.47")	15mm(0.6")	300mm(12")
SK250-8	MAXIMUM	MAXIMUM	MAXIMUM	MAX./10MIN
SK250-8	14mm(0.55")	12mm(0.47")	15mm(0.6")	300mm(12")
SK290	MAXIMUM	MAXIMUM	MAXIMUM	MAX/10MIN
SK290	14mm(0.55")	12mm(0.47")	15mm(0.6")	300mm(12")
SK350-8	MAXIMUM	MAXIMUM	MAXIMUM	MAX/10MIN
SK350-8	14mm(0.55")	12mm(0.47")	15mm(0.6")	300mm(12")
SK480	MAXIMUM	MAXIMUM	MAXIMUM	MAX/10MIN
SK480	14mm(0.55")	12mm(0.47")	15mm(0.6")	300mm(12")

Unit: mm (inches)

***SK170 and ED190 same**

https://truckmanualshub.com/

SWING SPEED

A. Tools & Equipment.

1.Stopwatch
2.Device for Marking Starting Point
3.Measuring Tape

B. Machine Settings & Site Condition

1.Machine throttle in "High" Idle position.
2.Hydraulic oil temperature at 55°C to 65°C (131°F to 149°F).
3.Firm, level testing site.
4.Verify that engine RPM's are to correct specification.

C. Swing Speed Test

WARNING

• MAKE CERTAIN THE TEST AREA WILL ALLOW SAFE 360° SWING OF THE MACHINE.
• MAKE CERTAIN NO PERSONS OR OTHER EQUIPMENT ARE WITHIN 50 FEET OF THE SWING AREA. PLACE CONES OR SPOTTER IF NEEDED FOR SAFETY.

2. Move throttle to High Idle and place KPSS switch in "H" mode.
3. Operate the Arm Out Control until arm is completely out (retracting cylinder). See Figure 4.2.
4. Operate the Bucket Out Control until bucket is completely out (retracting cylinder). See Figure 4.1.
5.Adjust boom up or down until bucket teeth are

CAUTION

*Turn on Swing Flasher and sound horn **BEFORE** starting swing motion. See Figure 4.3.*

6.After sounding horn and with swing flashers on, operate swing control at full stroke for two complete rotations clockwise. Time the last rotation and record the reading. Bring swing to a complete stop.
7.Repeat steps 3 through 5 two more times and average the readings. Compare the average to the Swing Speed Specification Chart.
8.Repeat steps 2 through 7 swinging counterclockwise.

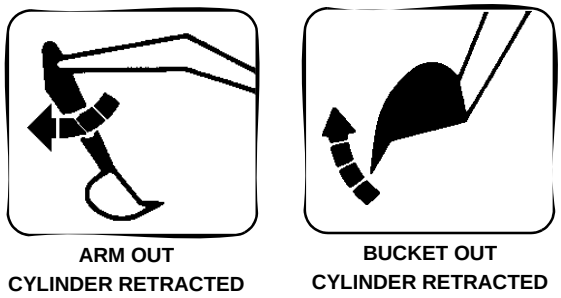


FIGURE 4.1

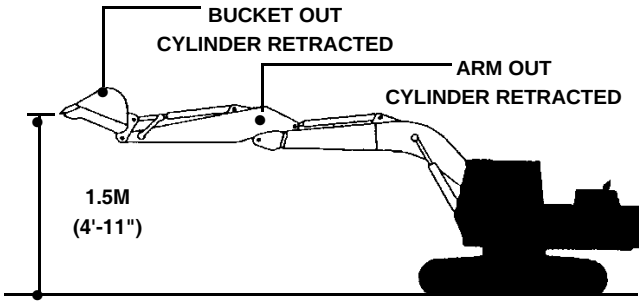


FIGURE 4.2

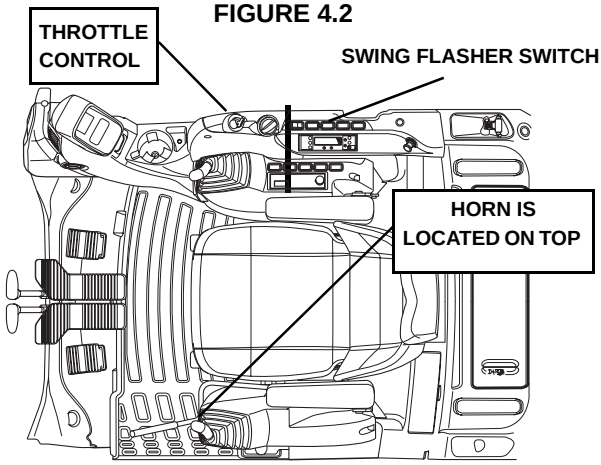


FIGURE 4.3

SWING SPEED SPECIFICATIONS

MODEL	CLOCKWISE / COUNTERCLOCKWISE
*SK170-8	4.2 - 5.4
*SK170-8	4.2 - 5.4
SK210-8	4.2 - 5.4
SK210-8	4.2 - 5.4
SK260-8	5.0 ~ 6.2
SK260-8	5.0 ~ 6.2
SK290	0.0 - 0.0
SK290	0.0 - 0.0
SK350-8	5.6 - 6.3
SK350-8	5.6 - 6.3
SK480	0.0 - 0.0
SK480	0.0 - 0.0

*SK170 and ED190 same **Unit: Seconds per Revolution**

https://truckmanualshub.com/

SWING STOPPING

A. Tools & Equipment.

1.Device for Marking Starting Point

B. Machine Settings & Site Condition

1.Machine throttle in "High" Idle position.

2.Hydraulic oil temperature at 55°C to 65°C (131°F to 149°F).

3.Firm, level testing site.

C. Swing Stopping Test

WARNING

• MAKE CERTAIN THE TEST AREA WILL ALLOW SAFE 360° SWING OF THE MACHINE.
• MAKE CERTAIN NO PERSONS OR OTHER EQUIPMENT ARE WITHIN 50 FEET OF THE SWING AREA. PLACE CONES OR SPOTTER IF NEEDED FOR SAFETY.

2.Move throttle to High Idle and place KPSS switch in "H" mode.

3.Operate the Arm Out Control until arm is completely out (retracting cylinder). See Figure 4.4.

4. Operate the Bucket In Control until bucket is completely in (extending cylinder). See Figure 4.4.

5. Adjust boom up or down until bucket teeth

CAUTION

*Turn on Swing Flasher and sound horn **BEFORE** starting swing motion. See Figure 4.6.*

6. After sounding horn and with swing flashers on, operate swing control at full stroke for one complete rotation clockwise. When bucket reaches starting point, release the swing control and allow rotation to completely stop.

7.Measure the degree of angle from the starting point to the stopping point of the bucket. Record the angle degree. Repeat step 6 two more times and average the readings. Compare to Swing Stop Specification Chart. See Figure 4.7.

8.Repeat steps 2 ~ 7 swinging counterclockwise.

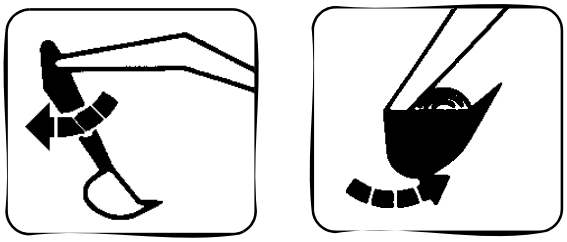


FIGURE 4.4

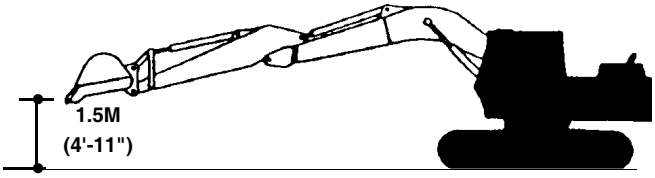


FIGURE 4.5

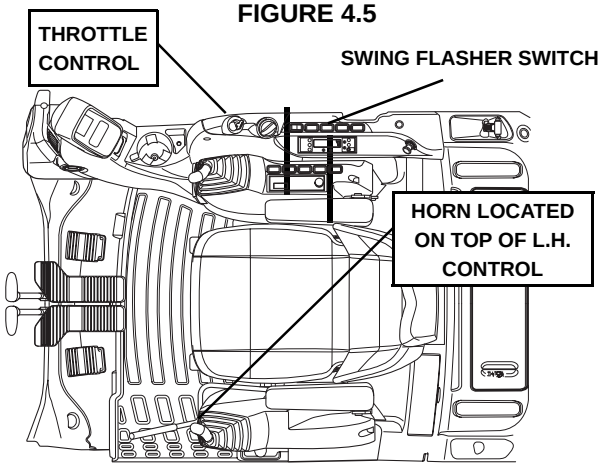


FIGURE 4.6

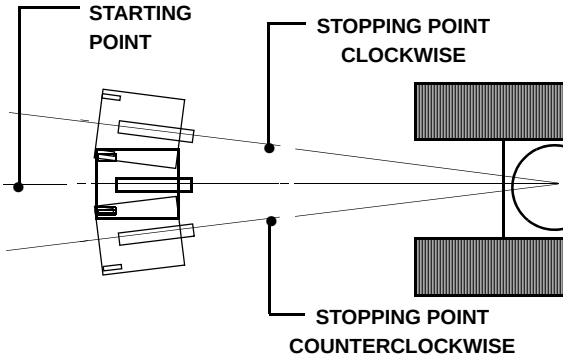


FIGURE 4.7

SWING STOPPING SPECIFICATIONS

MODEL	CLOCKWISE / COUNTERCLOCKWISE
*SK160	0°-0°
SK210-8	75°- 90°
SK260-8	75°- 90°
SK290	0°-0°
SK350-8	53°- 93°
SK480	0°-0°

***SK160 and ED190 same**

Unit: degree of angle

https://truckmanualshub.com/

SWING DRIFT

A. Tools & Equipment.

1.Device for Marking Starting Point

2. Stopwatch

B. Machine Settings & Site Condition

1.Hydraulic oil temperature at 55°C to 65°C (131°F to 149°F).

2.Firm testing area with 10° slope.

C. Swing Drift Test

1.Move the machine to a firm testing area with 10° slope as shown in Figure 4.8.

2.Operate the Bucket In Control until bucket is completely in (extending cylinder). See Figure 4.9.

3.Operate the Arm Out Control until the arm is completely out (retracting cylinder). See Figure 4.9.

4.Adjust the boom up or down until bucket teeth are 1.5m (4'-11") from ground level. See Figure 4.10.

5.Stop engine and allow the machine to sit for 20 seconds.

6.Measure the distance the swing drifted, down grade, while sitting. Record the distance. See Figure 4.11.

7.Repeat steps 2 through 6 two more times. Average the distances and compare average to the Swing Drift Specification Chart.

8.Start engine and swing machine 180°. Repeat steps 2 through 7.

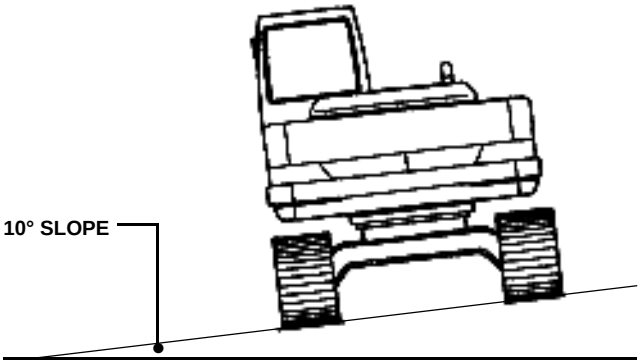


FIGURE 4.8

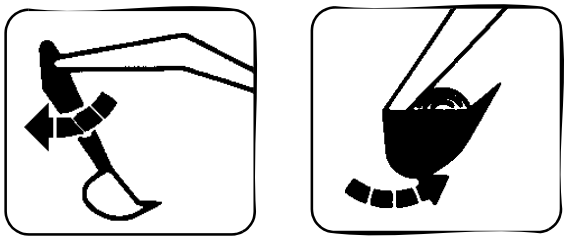


FIGURE 4.9

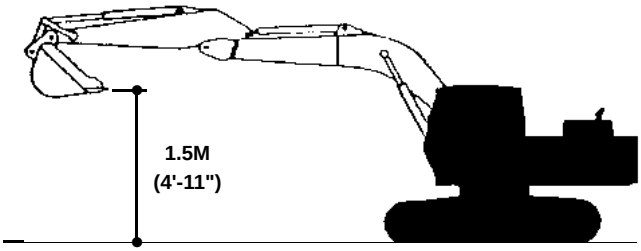


FIGURE 4.10

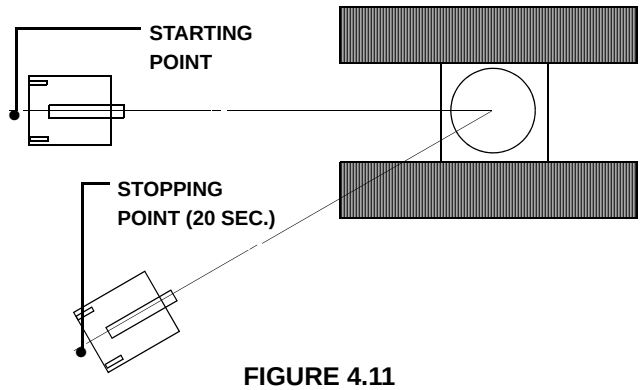


FIGURE 4.11

SWING DRIFT SPECIFICATIONS

MODEL	SPECIFICATION
SK170 ~ SK350-8	10mm (0.393") / 20 Seconds

https://truckmanualshub.com/

SWING BEARING UP-DOWN (VERTICAL) MOVEMENT

A. Tools & Equipment.

1.Dial Indicator

2.Magnetic Base Assembly

B. Machine Settings & Site Condition

1.Hydraulic oil temperature at 55°C to 65°C (131°F to 149°F).

2.Grease bearing at 4 rotation points according to operator's manual.

WARNING

• BE EXTREMELY CAUTIOUS WHILE TAKING READINGS FROM DIAL INDICATOR.

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

C. Swing Bearing Up-Down (Vertical) Movement Test

1.Move the machine to a firm, level testing area.

2.Attach the Dial indicator to the mounting area of the swing bearing at the location of a swing bearing mouning bolt. See Figure 4.12.

3.Operate the Arm Control until the arm is approximately at 90° with boom. See Figure 4.13.

4.Operate the Bucket Control until bottom of bucket is even with ground level. See Figure 4.13.

5.With Boom Control, raise the machine until tracks are 450mm (17.75") off the ground. See Figure 4.13.

6.Set Dial Indicator to "0".

7.Operate Boom Up and Arm Out Controls until arm is completely out. See Figure 4.14.

8.Operate Bucket Control until bucket is completely out and operate boom until bucket teeth are 450mm (17.75") from ground. See Figure 4.14.

9. Record reading from dial indicator and repeat steps 3 through 9 two more times. Compare reading to Up-Down Movement Specification Chart.

10. Swing Machine 180° and repeat steps 2 through 9.

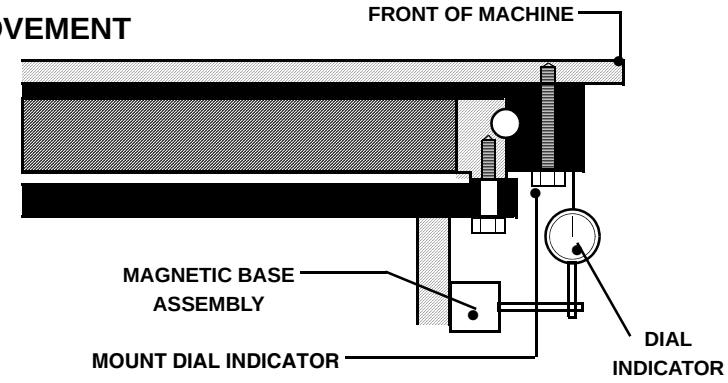


FIGURE 4.12

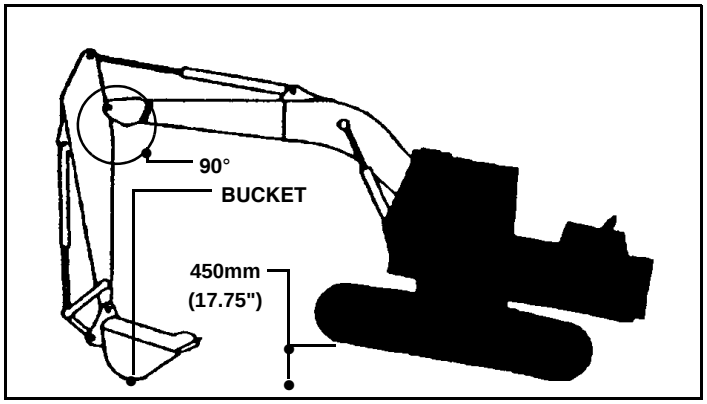


FIGURE 4.13

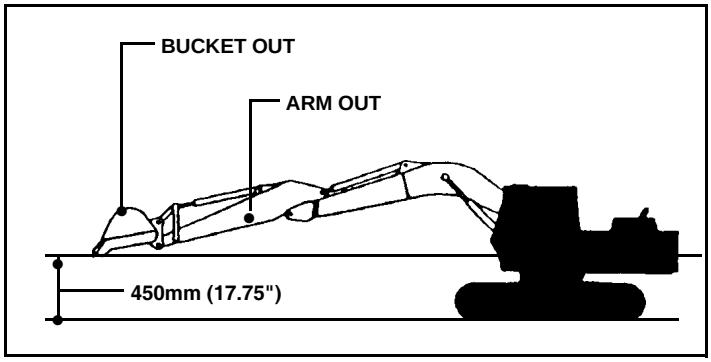


FIGURE 4.14

SWING BEARING UP-DOWN MOVEMENT SPECIFICATIONS

MODEL	STANDARD	MAX. MOVEMENT
*SK170	0.0 ~ 0.0 (.000~.000)	0.0 (.000)
SK210-8	0.8 ~ 1.8 (.030~.070)	3.6 (.140)
SK260-8	0.8 ~ 1.8 (.030~.070)	3.6 (.140)
SK290	0.0 ~ 0.0 (.000~.000)	0.0 (.000)
SK350-8	0.8 ~ 1.8 (.030~.070)	3.6 (.140)
SK480	0.0 ~ 0.0 (.000~.000)	0.0 (.000)

*SK170 and ED190 same

Unit: mm (inches)

https://truckmanualshub.com/

SWING BEARING HORIZONTAL MOVEMENT

SWING BEARING SIDE TO SIDE (HORIZONTAL) MOVEMENT

A. Tools & Equipment.

1.Measuring Tape

2.Device for marking starting point.

B. Machine Settings & Site Condition

1.Hydraulic oil temperature at 55°C to 65°C (131°F to 149°F).

WARNING

• BE EXTREMELY CAUTIOUS WHILE MOVING THE BUCKET FROM SIDE TO SIDE.

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

C. Swing Bearing Side To Side (Horizontal) Movement Test

1.Move the machine to a firm testing area.

2.Operate the Bucket Control until bucket is completely out (retracting cylinder). See Figure 4.15.

3. Operate the Arm Control until arm is completely out (retracting cylinder). See Figure 4.15.

4.Operate boom up or down until bucket teeth are 10mm (0.04") from ground level. See Figure 4.16.

5.Mark center of bucket with marking device.

6.Make a mark on ground in line with mark on bucket. See Figure 4.17.

7.Manually move bucket to the left and record distance the center of bucket moved to the left of the mark on ground. See Figure 4.17.

8.Move bucket to the right and record the distance the center of the bucket moved to the right of mark on ground.

9.Repeat steps 7 and 8 two more times.

10. Average the readings and compare to the Side To Side (Horizontal) Movement Specification Chart.

11. Swing Machine 180° and repeat steps 1 through 10.

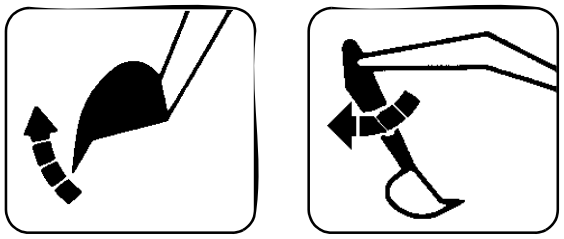


FIGURE 4.15

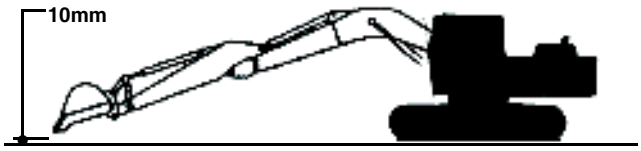


FIGURE 4.16

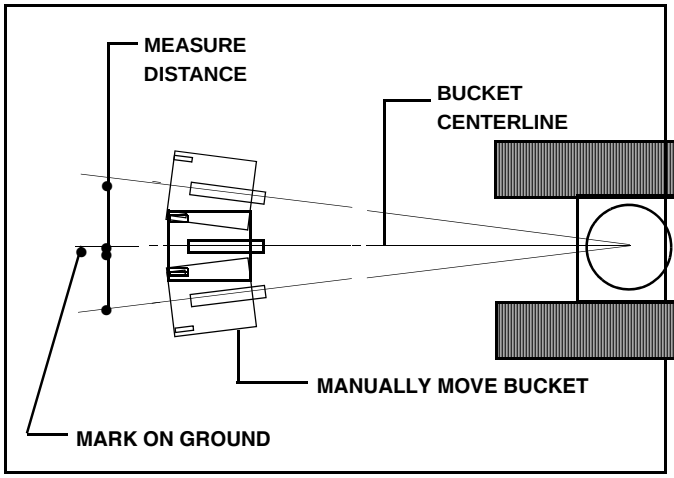


FIGURE 4.17

SWING BEARING SIDE TO SIDE (HORIZONTAL) MOVEMENT SPECIFICATIONS

MODEL	STANDARD	MAX. MOVEMENT
*SK170	00 (0.00)	000 (0.00)
SK210-8	30 ~50 (1.18 ~ 1.97)	120 (4.72)
SK260-8	30 ~50 (1.18 ~ 1.97)	120 (4.72)
SK290	00 (0.00)	000 (0.00)
SK350	60 (2.36)	120 (4.72)
SK480	00 (0.00)	000 (0.00)

*SK170 and ED190 same

Unit: mm (inches)

https://truckmanualshub.com/

SWING MOTOR OIL CASE DRAIN

A. Tools & Equipment

1. 38 Liter (10 U.S. Gal.) graduated bucket.
2. Hydraulic line wrenches
3. Hydraulic line plugs
4. Hydraulic fitting caps
5. Stopwatch
6. Thermometer/Heat Gun

B. Machine Settings & Site Condition

1. Machine throttle in "High" idle position.
2. Hydraulic oil temperature at 55°C to 65°C (131°F to 149°F).
3. Firm, level testing area.
4. Verify that engine RPM's are at correct specification

C. Swing Motor Oil Case Drain Test

1. Move machine to a firm, level testing area.
2. Allow the hydraulic oil to reach a temperature of 45°C to 55°C (113°F to 131°F).
3. Operate the Arm Out Control until the arm is completely out. See Figure 5.1.
4. Operate the Bucket Out Control until bucket teeth are positioned to go into ground See Figure 5.1.
5. Lower the boom until bucket teeth are in ground. See Figure 5.2.
6. Operate Swing Control in both directions to make certain bucket teeth are in the ground deep enough to stall swing. It May be necessary to set bucket teeth deeper to stall swing.
7. Turn engine "OFF".
8. Release hydraulic tank pressure by removing cap from pressure relief valve and depressing relief valve stem. See Figure 5.3.
9. After cleaning away all dirt and debris, remove hydraulic line routed from "Tee" on top of swing motor to center port on Swivel Joint at swing motor "Tee". See Figure 5.4.

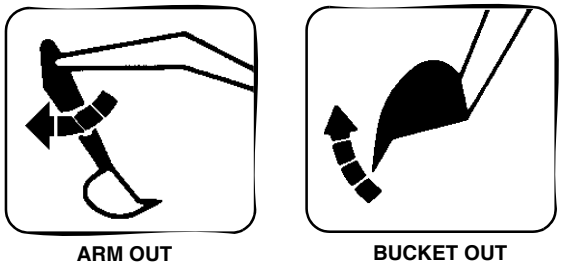


FIGURE 5.1

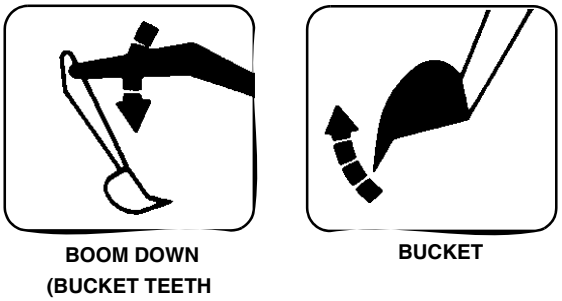


FIGURE 5.2

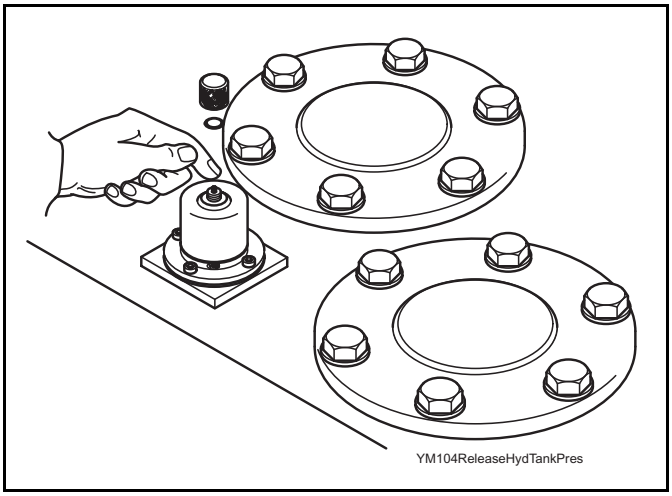


FIGURE 5.3

WARNING

• BE EXTREMELY CAUTIOUS WHILE RELEASING HYDRAULIC TANK PRESSURE. VAPORS MAY BE EXTREMELY HOT.
• WEAR APPROVED SAFETY CLOTHES, SHOES, GLOVES AND HARD HAT WHEN PERFORMING ANY MAINTENANCE OR TEST PROCEDURES.

https://truckmanualshub.com/

SWING MOTOR TEST CONTINUED

CAUTION

• Thoroughly clean all hydraulic lines and fittings before removal. Do not allow any dirt or debris to enter the open lines or fittings.
• Thoroughly clean the bucket that the oil is to be drained into.

10. Install one hydraulic line plug into line and one hydraulic fitting cap onto "Tee". See Figure 5.4. Torque to proper value.

11. Remove line routed between "Tee" on top of swing motor to hydraulic tank at the hydraulic tank. See Figure 5.5.

12. Install one hydraulic fitting cap onto fitting at Hydraulic Tank and torque. See Figure 5.5.

13. Place loose end of line into a clean 38 liter (10gal.) capacity bucket.

14. Start engine and place throttle control in the "High" idle position.

Do not operate Travel!!

15. Operate the Swing Control to the ***LEFT***, stalling swing for one minute. Record amount of oil in bucket.

16. Operate Swing Control to the ***RIGHT***, stalling swing for one minute. Record the amount of oil in bucket.

NOTE

If oil flow seems excessively high, perform the test for 15 seconds and multiply amount of oil by 4 to compare to chart.

EXAMPLE: 19liters(5 U.S. Gal) X 4= 76liters(20 Gal)

17. Compare readings to Swing Motor Oil Case Drain Specification Chart.

18. If readings are greater than values in chart, refer to Shop Manual for additional instrucs.

19. Remove hydraulic fitting caps and plugs. Install hydraulic lines back to their original fittings and torque to the proper value.

20. Check hydraulic oil level. Refer to Operators Manual for hydraulic oil level check procedures.

CAUTION

•Fill Hydraulic tank to proper level using only approved new hydraulic oil as listed in the List of Oils, Greases, Filters and Elements operator's manual.

SK160 ILLUSTRATED

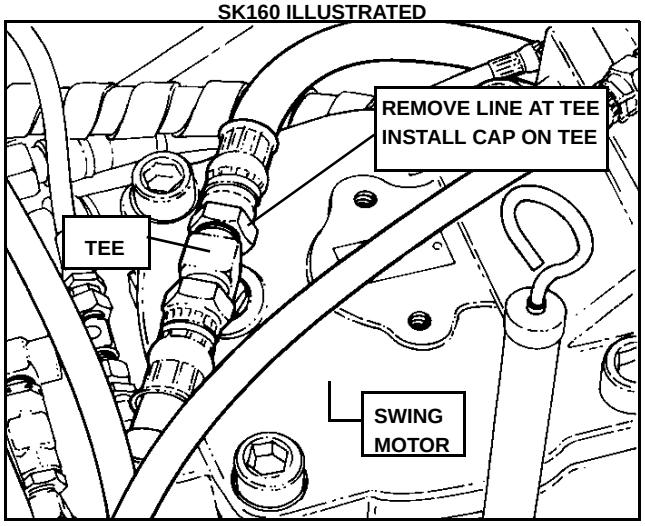


FIGURE 5.4

SK160 ILLUSTRATED

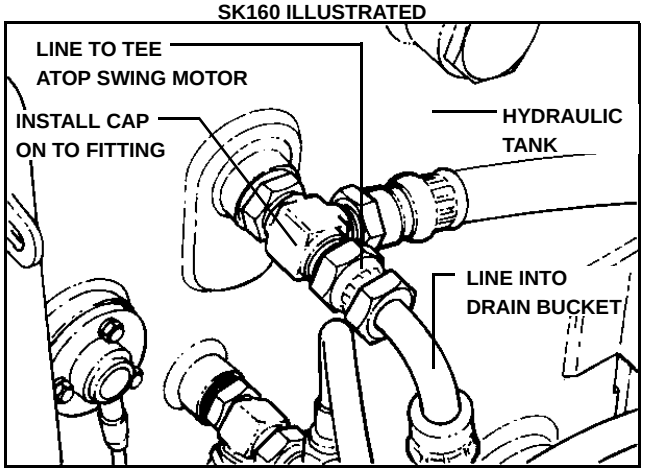


FIGURE 5.5

SWING MOTOR OIL CASE DRAIN SPECIFICATIONS

MODEL	LEFT/RIGHT SWING
*SK160	STANDARD- 0 (0.0)
*SK160	MAXIMUM- 0 (0.0)
SK210-8	STANDARD- 2.1 (0.55)
SK210-8	MAXIMUM- 5.2 (1.4)
SK250-8	STANDARD- 1.5 (0.4)
SK250-8	MAXIMUM- 4.2 (1.1)
SK290	STANDARD- 0 (0.0)
SK290	MAXIMUM- 0 (0.0)
SK350-8	STANDARD- 5.2 (1.4)
SK350-8	MAXIMUM- 6.2 (1.6)
SK480	STANDARD - 0 (0.0)
SK480	MAXIMUM - 0 (0.0)

*SK160 and ED190 same

Unit: Liter per Minute (Gallon per Minute)

https://truckmanualshub.com/

TRAVEL MOTOR OIL CASE DRAIN

A. Tools & Equipment

1.38 Liter (10 U.S. Gal.) graduated bucket.
2.Hydraulic line wrenches and line fitting caps.
3.Stopwatch
4.Thermometer/Heat Gun
5.Special Tool to Lock Sprockets (2-Required)

B. Machine Settings & Site Condition

1.Machine throttle in "High" idle position.
2.Hydraulic oil temperature at 55°C to 65°C (131°F to 149°F).
3.Firm, level testing area.

C. Travel Motor Oil Case Drain Test

1.Move machine to a firm, level testing area.
2.Allow the hydraulic oil to reach a temperature of 55°C to 65°C (131°F to 149°F).
3.Install Special Tool into each Sprocket. See Figure 5.6.

CAUTION

*• When placing Special Tool into sprockets, have machine in **"LOW IDLE"** and operate travel controls cautiously until tool is in position*

4.Operate Travel Controls in forward until machine tracks stall.

NOTE

Use the Sprocket Special Tool that fits the sprocket of the particular machine being tested.

5.Operate the Arm In Control until the arm is completely in. See Figure 5.8.
6.Operate the Bucket In Control until bucket is completely in. See Figure 5.8.
7.Operate the Boom Down Control until boom is completely down. See Figure 5.8.
8.Turn engine "OFF".
9.Release hydraulic tank pressure by remoing cap from pressure relief valve and depressing relief valve stem. See Figure 5.9.
10. After cleaning away all dirt and debris, remove hydraulic line routed from "Tee" on top of Swing Motor to center port on Swivel Joint at swing motor "Tee". See Figure 5.10.

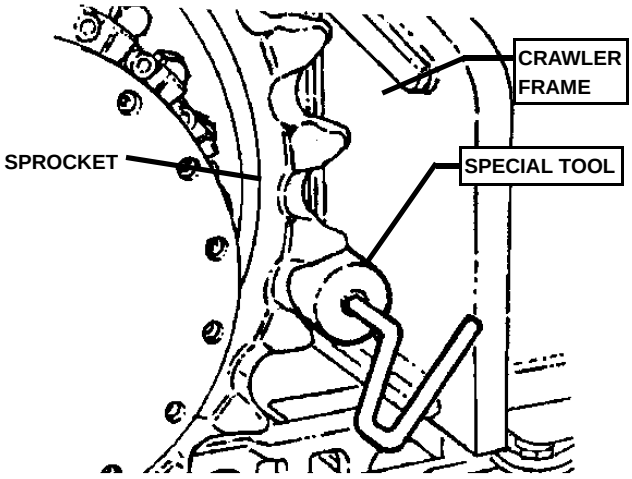
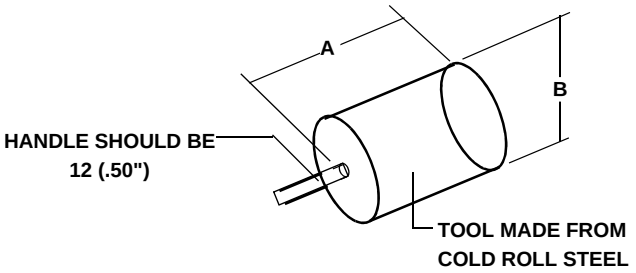


FIGURE 5.6



MODEL	A (LENGTH)	B (DIAMETER)
SK210~SK260-8	150 (5.91")	80 (3.15")
SK350-8	150 (5.91")	90 (3.54")
SK480	150 (5.91)	90 (3.54")

Unit: mm (inches)

FIGURE 5.7



FIGURE 5.8

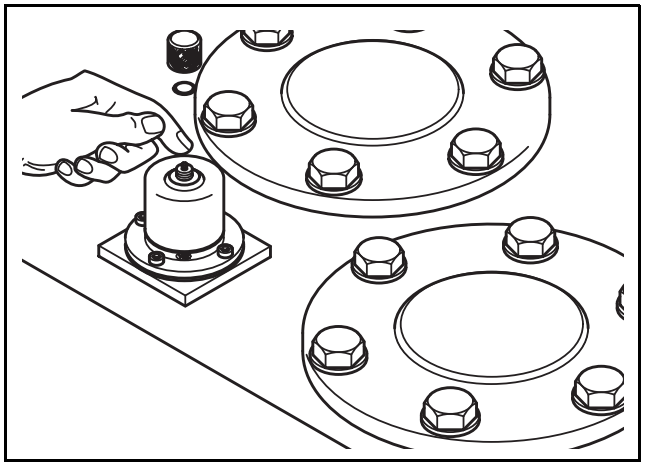


FIGURE 5.9

https://truckmanualshub.com/

CAUTION

• Thoroughly clean all hydraulic lines and fittings before removal. Do not allow any dirt or debris to enter the open lines or fittings.

• Thoroughly clean the bucket that the oil is to be drained into.

11. Install one hydraulic fitting cap onto "Tee". See Figure 5.10. Torque to proper value.

12. Place loose end of line into a clean 38 liter (10 gal.) capacity bucket.

13. Start engine, raise boom a little and place throttle control in the "High" idle position.

14. With special tool installed in each travel motor sprocket, operate the left travel control at full stroke forward for one minute. Measure the amount of oil in bucket and record.

NOTE

If flow of oil will be high, perform the test for 15 seconds and multiply amount of oil by 4 to compare to chart.

EXAMPLE: 19 liters (5 U.S. Gal) X 4 = 76 liters (20 Gal)

15. Repeat step 14 with right control at full stroke forward for one minute. Record amount of oil in bucket.

16. Remove special tool and place into sprocket to stall reverse movement. See Figure 5.11.

17. Repeat steps 14 and 15 with control to reverse movement.

18. Compare readings for each travel motor to Travel Motor Oil Case Drain Specification Chart.

19. If readings are greater than values in chart, refer to shop manual for additional instructions.

20. Remove hydraulic fitting cap. Install hydraulic lines back to the original fitting and torque to the proper value.

21. Check Hydraulic Oil level. Refer to Operators Manual for hydraulic oil level check procedures.

CAUTION

• Fill Hydraulic tank to proper level using only approved new hydraulic oil as listed in the List of Oils, Greases, Filters and Elements Chart in Operators Manual.

SK160 ILLUSTRATED

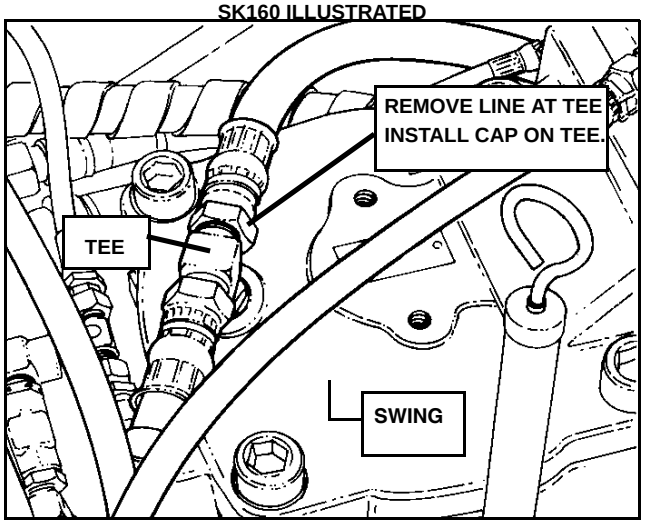


FIGURE 5.10

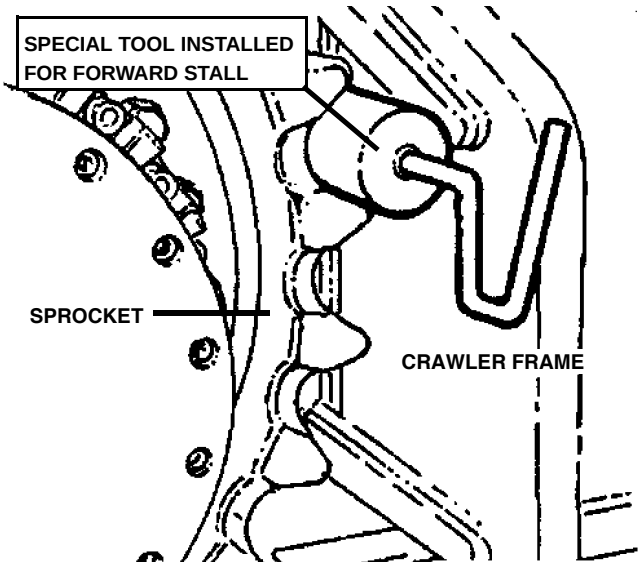


FIGURE 5.11

TRAVEL MOTOR OIL CASE DRAIN SPECIFICATIONS

MODEL	FORWARD/REVERSE TRAVEL
*SK160	STANDARD - 0 (0.0)
*SK160	MAXIMUM - 00 (0.0)
SK210-8	STANDARD - 9 (2.4)
SK210-8	MAXIMUM - 16 (4.2)
SK260-8	STANDARD - 7 (1.8)
SK260-8	MAXIMUM - 14 (3.7)
SK290	STANDARD - 0 (0.0)
SK290	MAXIMUM - 00 (0.0)
SK350-8	STANDARD - 7.0 (1.8)
SK350-8	MAXIMUM - 21.0 (5.5)
SK480	STANDARD - 0 (0.0)
SK480	MAXIMUM - 0.0 (0.0)

*SK160 and ED190 same

Unit: Liters per Minute (Gallons per Minute)

https://truckmanualshub.com/

TRAVEL SPEED

A. Tools & Equipment

1.Stopwatch

2.Device to mark starting point of tracks.

B. Machine Settings & Site Condition

1.Machine throttle in "High" idle position.

2.Test will be performed with KPSS Mode Switch in "H".

3.Hydraulic oil temperature at 55°C to 65°C (131°F to 149°F).

4.Firm, level testing area.

5.Verify that engine RPM's are at correct specification.

C. Travel Speed Test

1.Move machine to a firm, level testing area.

2.Allow the hydraulic oil to reach a te perature of 45°C to 55°C (113°F to 131°F).

3.Operate Swing Right Control until mchine is sitting across (perpendicular) tracks.

4.Operate the Boom, Arm and Bucket Controls until bucket is on ground. See Figure 7.4.

5. Operate Boom Control until bottom of right track is approximately 300mm (12") off ground. See Figure 7.4. Make reference mark on track.

6.Place Throttle Control in "HI-IDLE" position and KPSS Switch in "H" Mode. See Figure 7.5.

7.Place Travel Speed Select Switch in 1st( ) Speed. See Figure 7.6.

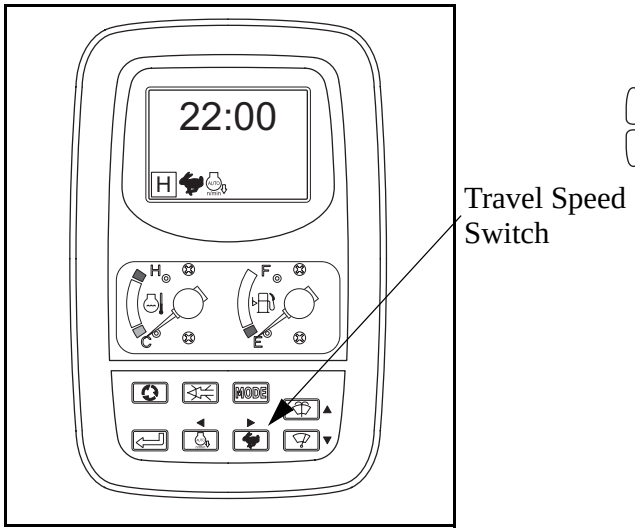


Figure 7.6

8.Operate the Right Travel Control full forward and measure the time it takes for track to make three complete revolutions. Record the time.

9.Repeat Step 7 ands 8 two more times. Average the readings and compare to Travel Speed Specification Chart.

10. Place Travel Speed Select Switch in 2( ) speed and repeat steps 8 and 9.

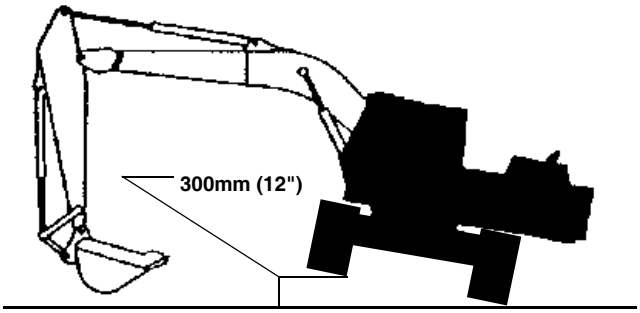


FIGURE 7.4
SK210 ~ SK480 ILLUSTRATED

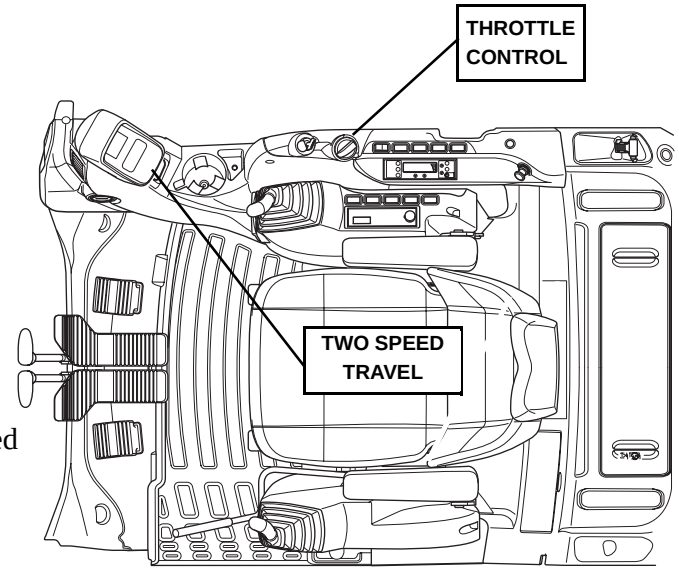


Figure 7.5

https://truckmanualshub.com/

TRAVEL SPEED SPECIFICATION CHART

MODEL	MODE	DIRECTION	SPEED	STANDARD 3 REV
SK170-8	H	FORWARD	1ST	27.6 ~ 30.5
	H	REVERSE	2ND	16.2 ~ 17.9
ED190	H	FORWARD	1ST	0.0 ~ 0.0
	H	REVERSE	2ND	0.0 ~ 0.0
SK210-8	H	FORWARD	1ST	27.5 ~ 30.5
	H	REVERSE	2ND	16.3 ~ 17.9
SK260-8	H	FORWARD	1ST	29.5 ~ 32.7
	H	REVERSE	2ND	19.9 ~ 20.9
SK290	H	FORWARD	1ST	0.0 ~ 0.0
	H	REVERSE	2ND	0.0 ~ 0.0
SK350-8	H	FORWARD	1ST	33.2 ~ 36.4
	H	REVERSE	2ND	19.7~ 21.7
SK480	H	FORWARD	1ST	0.0 ~ 0.0
	H	REVERSE	2ND	0.0 ~ 0.0

Revised 08 / 2007

Units: Seconds

Speed Selection **1ST** ()

2ND ()

https://truckmanualshub.com/

TRAVEL DEVIATION

A. Tools & Equipment

1.Measuring Tape 30M (100') Capacity
2.Line Parallel to Machine in soil

B. Machine Settings & Site Condition

1.Machine throttle in "High" idle position.
2.KPSS Mode Switch in "H" Mode Position.
3.Hydraulic oil temperature at 55°C to 65°C (131°F to 149°F).
4.Firm, level testing area.
5.Verify that engine RPM's are at correct specification.

C. Travel Deviation Test

1.Move machine to a firm, level testing area.

2.Allow the hydraulic oil to reach a temperature of 45°C to 55°C (113°F to 131°F).

3.Operate the Boom, Arm and Bucket Controls until attachment is in a transport position. See Figure 7.1.

4.Scribe (draw) a line parallel to machine in the soil for a distance of 20M (65'-7") from front of machine tracks. See Figure 7.2.

5.Move Throttle Control to "HI-IDLE" Position and place KPSS Switch in "M" Mode. See Figure 7.3.

6. Operate both travel controls together at full forward speed for the 20M (65'-7") Distance. See Figure 7.2.

7.Measure and record dimension "A". See Figure 7.2.

8.Repeat steps 6 and 7 two more times. Average the readings and compare to Travel Deviation Specification Chart.

9.Repeat steps 1 through 8 with undercarriage turned 180°.

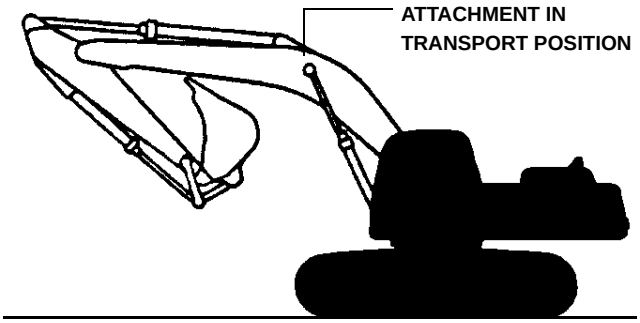


FIGURE 7.1

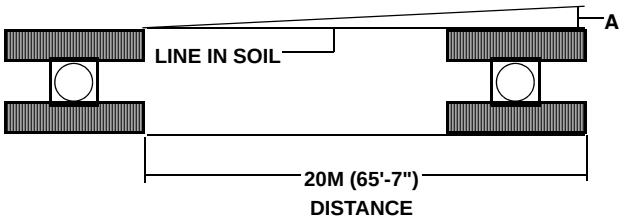


FIGURE 7.2

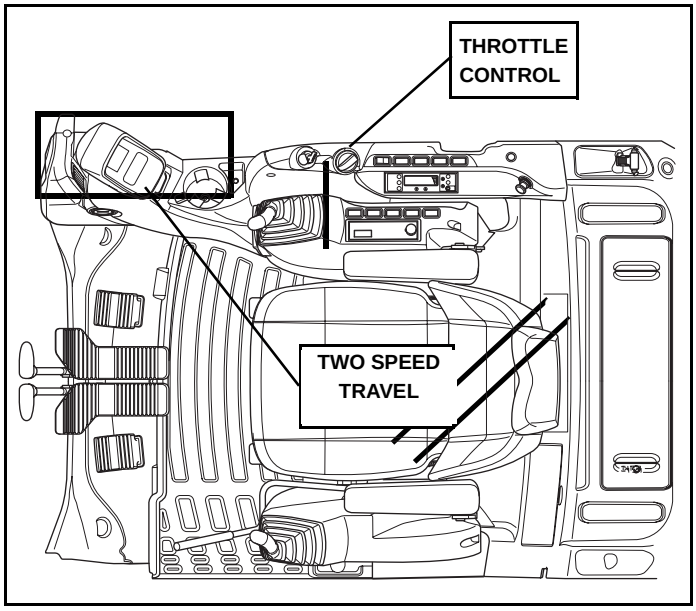


FIGURE 7.3

TRAVEL DEVIATION SPECIFICATION CHART

MODEL	STANDARD "A"
SK170 ~ 350	0mm to 720mm (28.4”)

Unit: mm (Inches)

https://truckmanualshub.com/

NOTES

MARK 8

https://truckmanualshub.com/

Chapter 05.
MAIN HYDRAULIC COMPONENTS

TABLE OF CONTENTS

5.1 HYDRAULIC COMPONENTS 5-3
5.1.1 HYDRAULIC PUMP • REGULATOR 5-12
5.1.2 CONTROL VALVE 5-21
5.1.3 PILOT VALVE (ATT) 5-41
5.1.4 PILOT VALVE (TRAVEL) 5-45
5.1.5 SWING MOTOR UNIT 5-47
5.1.6 SWIVEL JOINT 5-49
5.1.7 Multi- Solenoid Manifold Block 5-89



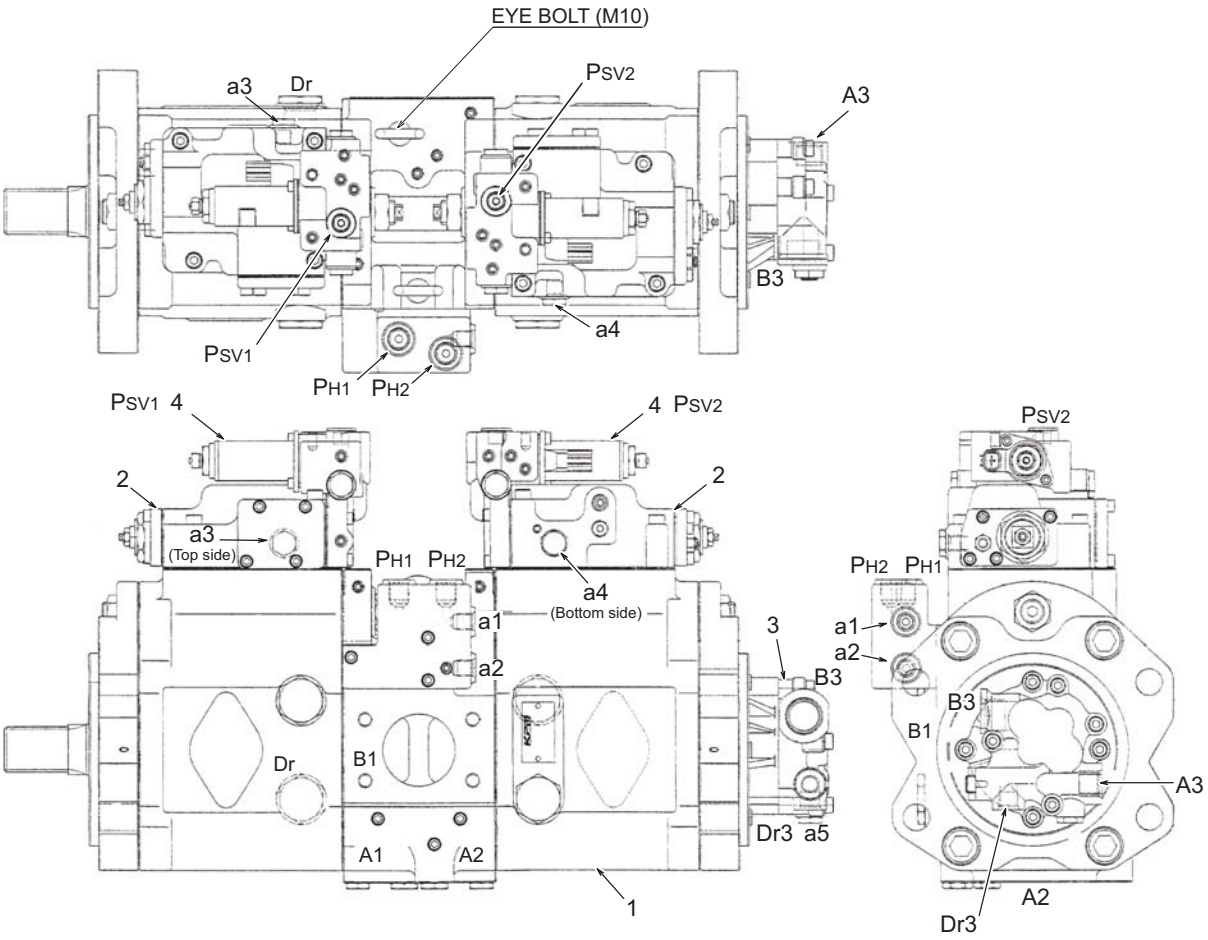
Issue	Date of Issue	Applicable Machines	Remarks
second edition	Aug. 2007	SK330–8 : LC10-07001~ SK350LC–8 : YC10-03501~	S5LC2411E01 K (ASIA, OCE)

HYDRAULIC COMPONENTS

HYDRAULIC PUMP • REGULATORS

OVERVIEW

(1) Outside view and Hydraulic port



No.	Parts	Q'TY
1	Main pump assy	1
2	Regulator assy	2
3	Gear pump assy(for pilot)	1
4	Solenoid proportional reducing valve	2

Hydraulic ports

Code	Ports name	Size
A1,2	Delivery port	SAE 6000psi 1"
B1	Suction port	SAE 2500psi 2 1/2"
Dr	Drain port	PF3/4-20
PSV1,2	Servo assist port	PF1/4-13
PH1,2	Pressure sensor port	PF3/8-17
a1~a4	Gauge port	PF1/4-15
a5	Gauge port	PF1/4-14
A3	Delivery port of gear pump	PF1/2-19
B3	Suction port of gear pump	PF3/4-20.5
Dr3	Drain port of gear pump	PF3/8-15

Fig. 24-1 Hydraulic pump • regulator

(2) Hydraulic Pump - cont.

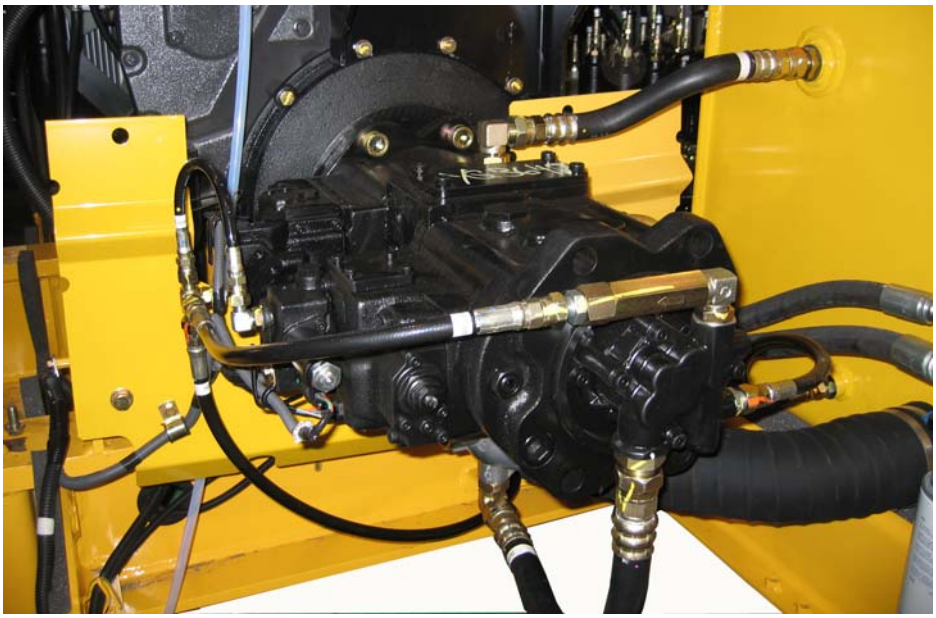


Fig. 24-2 Hydraulic pump SK210 Mark 8

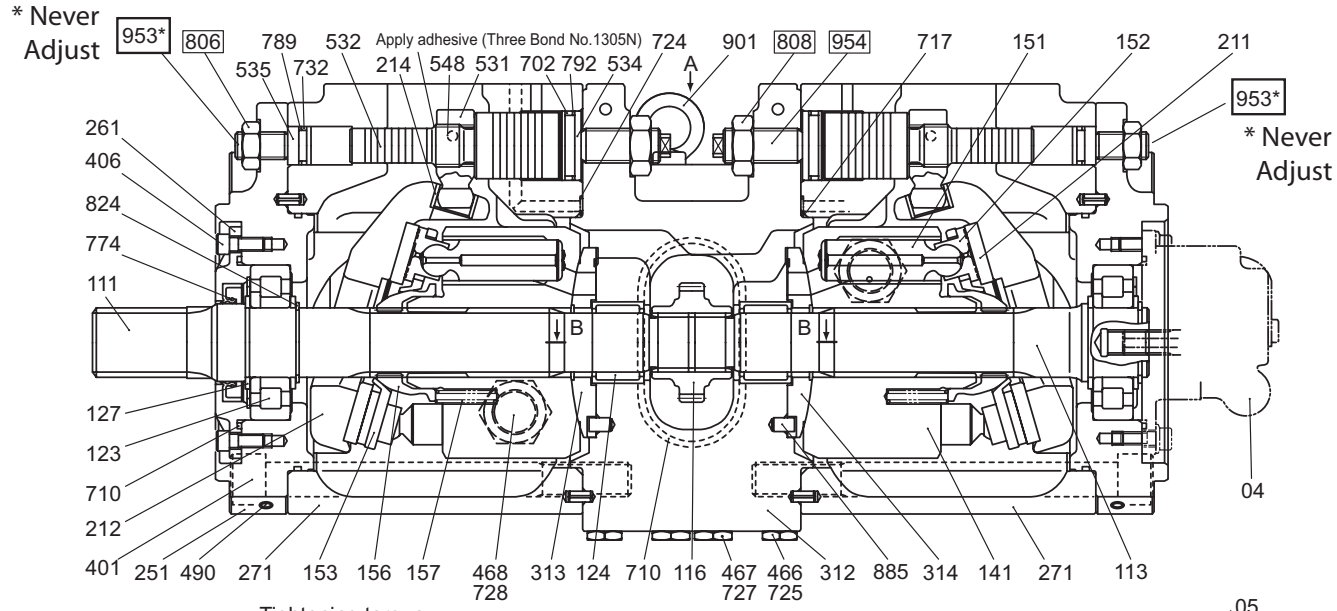
(3) Specifications

Item			Main pump	Gear pump
Pump model				
Max.displacement capacity		cm^3	140 X 2	10
Revolution	Rated	min^{-1}(Clockwise seen from shaft end)	2100	←
Pressure	Rated	MPa (psi)	34.3 (4980)	5.0 (725)
	ATT boost pressure		37.8 (5480)	
Max. flow		L/min (gal/min)	294 (78) X 2 at 7.8MPa (1130 psi)	21 (5.5)
Max. input horse power		kW (PS)	195 (265)	3.4 (4.6)
Max. input torque		N·m (lbf·ft)	886 (653)	14.7 (10.8)
Regulator		Part No.	LC10V01005F1	
		Model	KR3S-YTOK-HV	
		Control function	Electric flow control, positive flow control, total power control at emergency mode and power shift control	
		Others	With solenoid proportional reducing valve (KDRDE5K-31/30C50)	
Weight		kg (lb)	141 (310)	143 (315)

24.1.1.2 HYDRAULIC PUMP

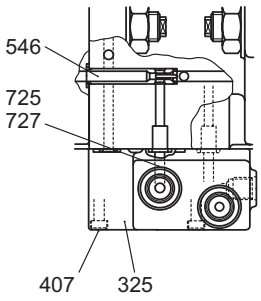
24.1.1.2.1 CONSTRUCTION

(1) Main pump

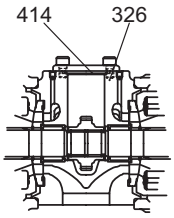


Tightening torque

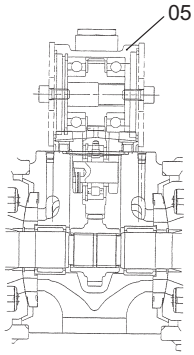
Item number	Thread size	Tightening torque N·m (lbf·ft)
401	M20	430 (317)
406	M8	29 (21)
407	M6	12 (8.9)
414	M10	57 (42)
466	PF 1/4	36 (27)
467	PF 3/8	74 (55)
468	PF 3/4	170 (125)
490	NPTF1/16	8.8 (6.5)
531,532	M24X2	240 (177)
806	M16	130 (96)
808	M20	240 (177)



VIEW A



SECTION B-B
SE.Asia

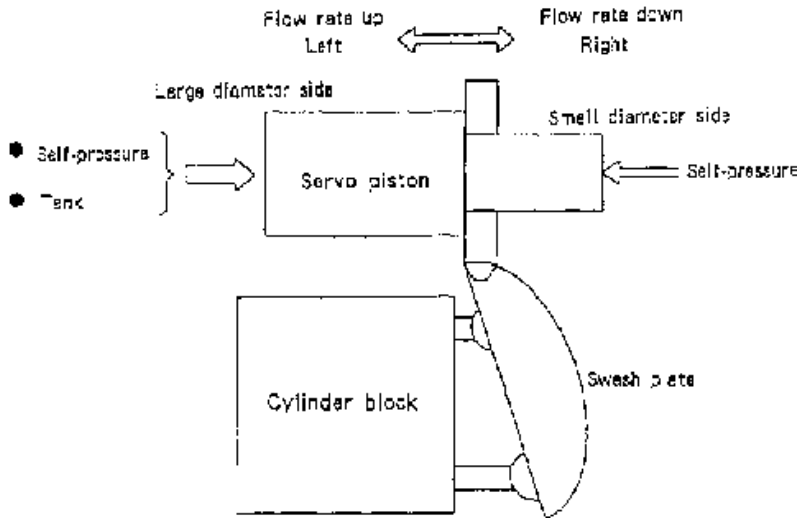


SECTION B-B
Oceania

No.	Parts	Q'ty	No.	Parts	Q'ty	No.	Parts	Q'ty
111	Drive shaft (F)	1	314	Valve plate (L)	1	724	O-ring ; 1B P8	16
113	Drive shaft (R)	1	325	Sensor block	1	725	O-ring ; 1B P11	9
116	Gear #1	1	326	Cover	1	727	O-ring ; 1B P14	3
123	Roller bearing	2	401	Socket bolt ; M20X210	8	728	O-ring ; 1B P24	4
124	Needle bearing	2	406	Socket bolt ; M8X20	4	732	O-ring ; 1B P18	2
127	Bearing spacer	3	407	Socket bolt ; M6X55	3	774	Oil seal	1
141	Cylinder block	2	414	Socket bolt ; M10X20	4	789	Back up ring ; P18	2
151	Piston	18	466	VP plug ; PF1/4	2	792	Back up ring ; G35	2
152	Shoe	18	467	VP plug ; PF3/8	2	806	Nut ; M16	2
153	Retainer plate	2	468	VP plug ; PF3/4	4	808	Nut ; M20	2
156	Spherical bushing	2	490	Plug ; NPTF1/16	4	824	Snap ring	2
157	Cylinder spring	18	531	Tilting pin ; M24X2	32	885	Valve plate pin	2
211	Shoe plate	2	532	Servo piston ; M24X2	2	886	Spring pin	4
212	Swash plate	2	534	Stopper(L)	2	901	Eye bolt ; M10	2
214	Tilting bushing	2	535	Stopper(S)	2	953	Socket screw ; M16X35	2
251	Swash plate support	2	546	Spacer	2	954	Set screw ; M20	2
261	Seal cover (F)	1	548	Feed back pin	2	04	Gear pump	1
271	Pump casing	2	702	O-ring ; 1B G35	2	05	PTO unit	1
312	Valve block	1	710	O-ring ; 1B G95	2			
313	Valve plate (R)	1	717	O-ring ; 1B G145	4			

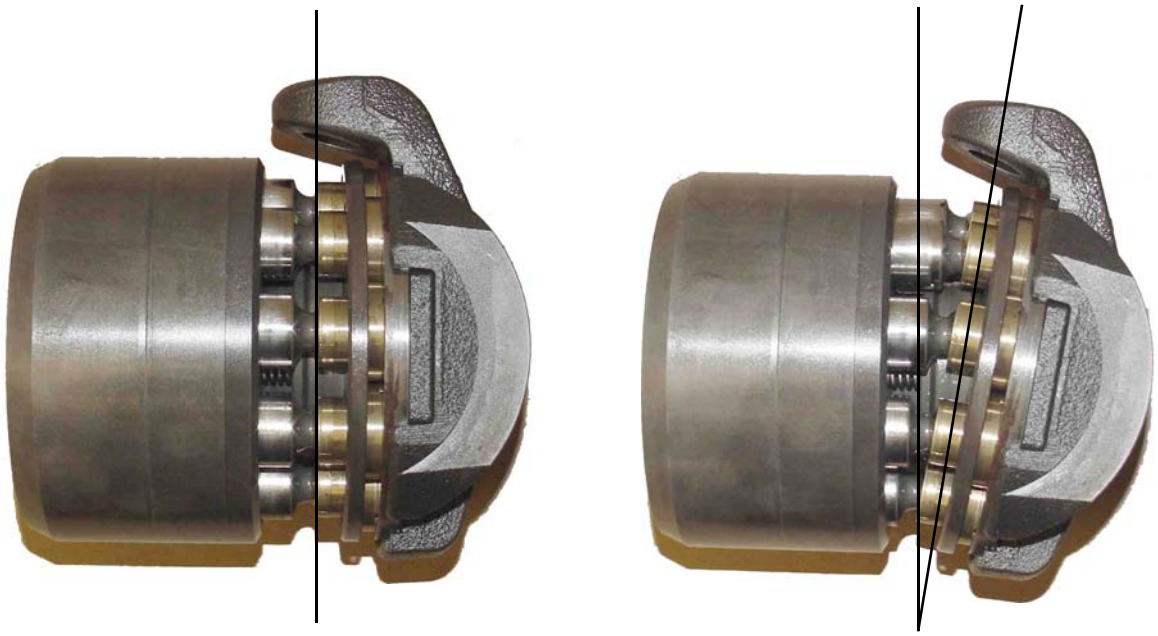
The codes in a rectangle represent Factory adjustment points. Do not tamper with the adjust screws as DAMAGE may occur.

Fig. 24-3



Minumn Angle

Maximum Angle

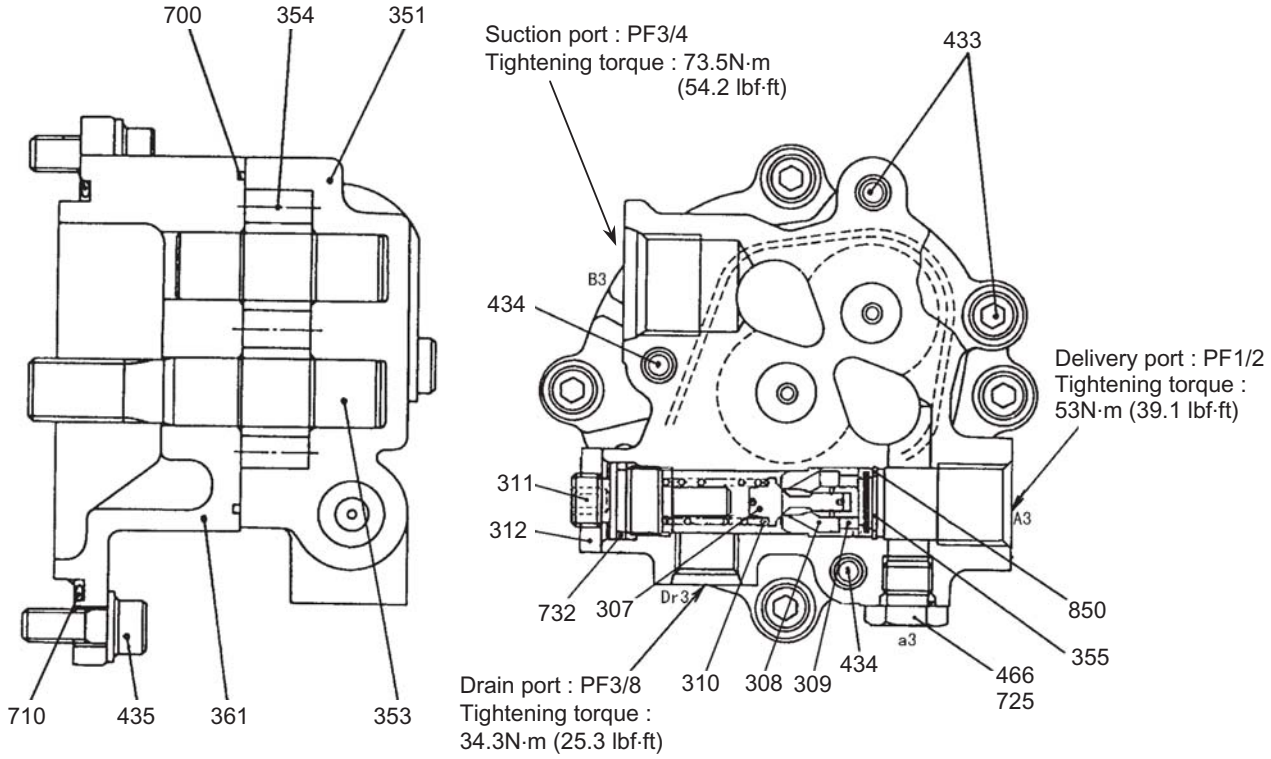


Internal Pump Control:

Internal pressure is applied on the small side of the Servo piston to maintain position when the pump flow rate is increased this is accomplished by two things.

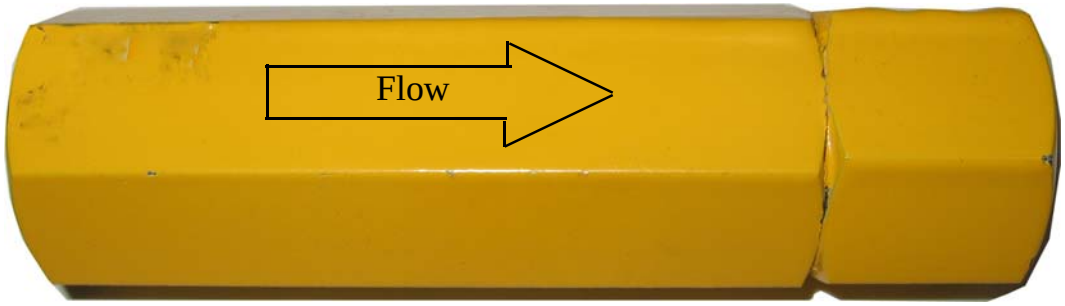
1. Pilot pressure enters the regulator on the large side of the servo piston to position the pump swash plate angle to minumn.
2. The PSV pressure is increased on the compensation spool side of the regulator to servo piston which allows pressure on the large piston side of the servo piston to be redirect control oil to tank allowing the pump to come on stroke and increase the pump flow.

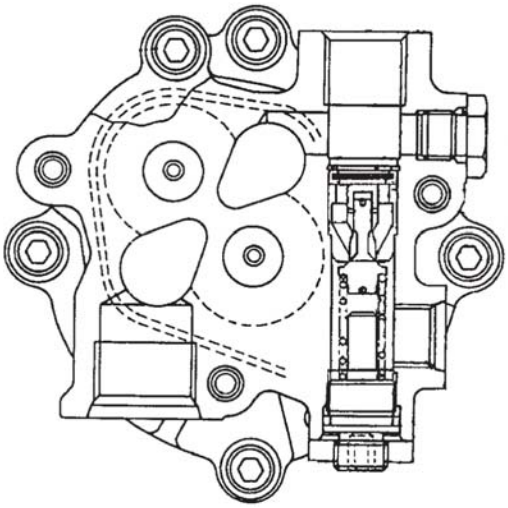
(2) Gear pump (For pilot)

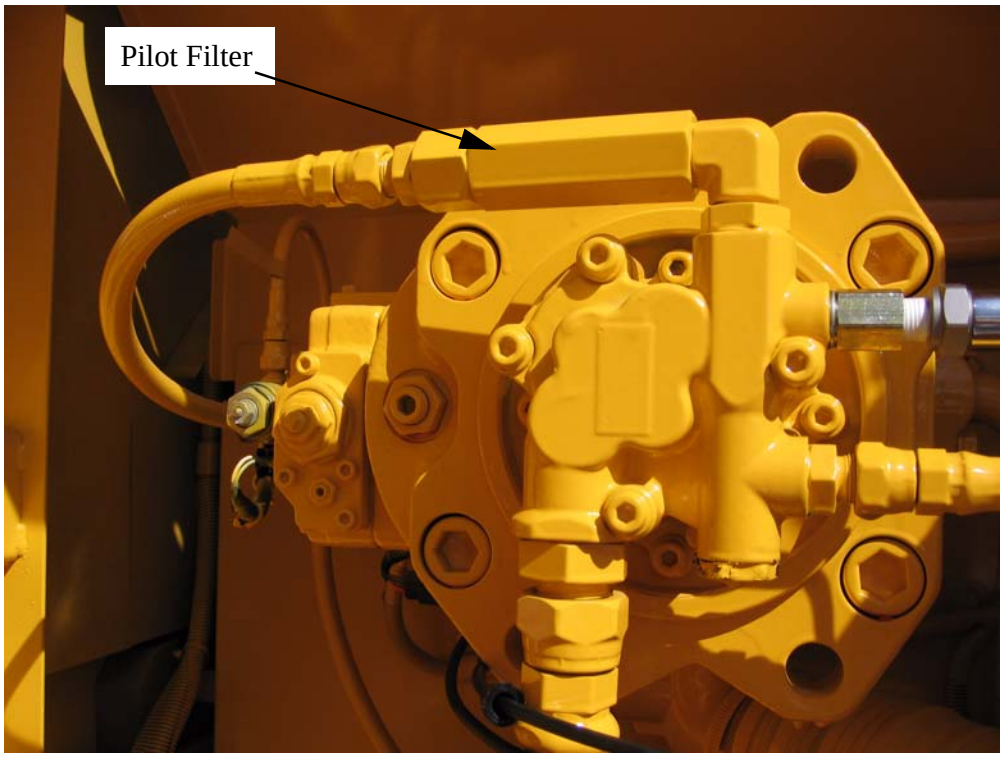


No.	Parts	Q'ty	No.	Parts	Q'ty
307	Poppet	1	361	Front case	1
308	Seat	1	433	Flange socket; M8×40	2
309	Ring	1	434	Flange socket; M8×55	2
310	Spring	1	435	Flange socket; M8×20	4
311	Adjust screw	1	466	VP plug ; PF1/4	1
312	Lock nut ; M14×1.5	1	700	Ring	1
351	Gear case	1	710	O-ring ; 1B G95	1
353	Drive gear	1	725	O-ring ; 1B P11	1
354	Driven gear	1	732	O-ring ; 1B P16	1
355	Filter	1	850	Locking ring	1

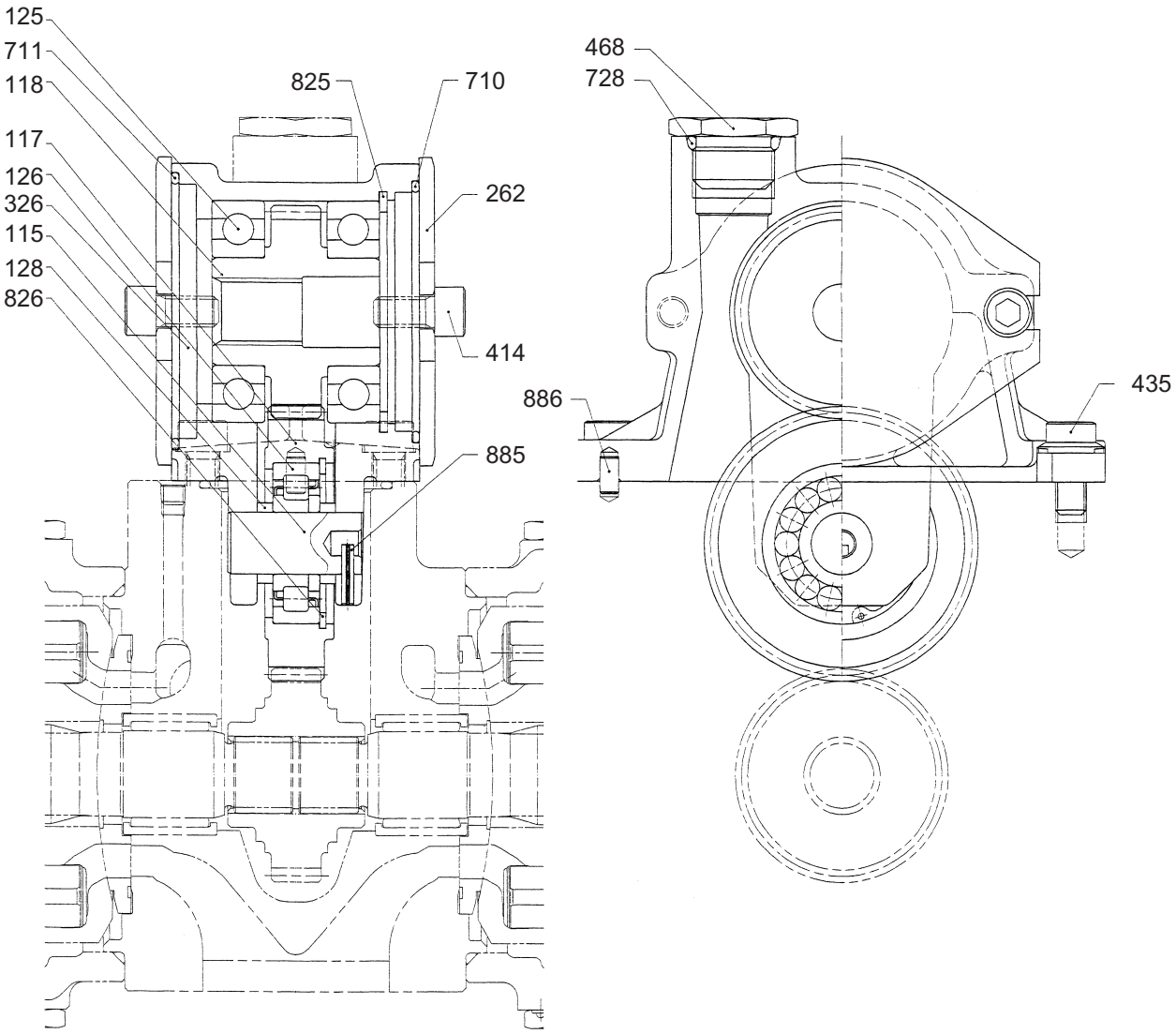
Pilot Filter







(3) PTO gear case (Optional for USA spec.)



No.	Parts	Q'ty	No.	Parts	Q'ty
115	Idle shaft	1	435	Flange socket ; M10×20	4
117	2nd gear	1	468	VP plug ; PF3/4	1
118	3rd gear	1	710	O-ring ; 1B G80	1
125	Ball bearing	2	711	O-ring ; 1B G85	1
126	Roller bearing	1	728	O-ring ; 1B P24	1
128	Bearing spacer	2	825	Snap ring	1
262	Cover	2	826	Snap ring	1
326	Gear case	1	885	Sprig pin	1
414	Capscrew ; M10×20	4	886	Pin	2

24.1.1.2.2 OPERATION

The pump assy is equipped with two pumps arranged on the same axis that are connected with gear (116) and distribute the rotating power to the gear trains on a different axis. Thus the engine rotation is transmitted to front shaft (111) that drives the two pumps and, at the same time, drives the auxiliary pump (OPT) arranged on another shaft. The pump assy consists largely of the rotary group, the main part of the pump that makes rotary on; the swash plate group that changes the delivery rate; the valve block group that selects between oil suction and delivery ; and the PTO group (OPT) that transmits the drive power to the auxiliary pump.

(1) Rotary group

The rotary group consists of shaft(111), cylinder block (141), piston (151), shoe (152), plate (153), spherical bushing (156), and cylinder spring (157). The shaft is supported by bearings (123) and (124) at its both ends. The shoe, which is caulked to the piston, forms a spherical joint and relieves it of thrust force that is generated by load pressure. Further, the piston is provided with a pocket so it moves lightly on shoe plate (211), taking hydraulic balance.

The sub group of the piston-shoe is pressed against the shoe plate by the cylinder spring, via the retainer plate and the spherical bushing, so that it moves smoothly over the shoe plate. The cylinder block (141) is also pressed against valve plate (313) by the action of cylinder spring (157).

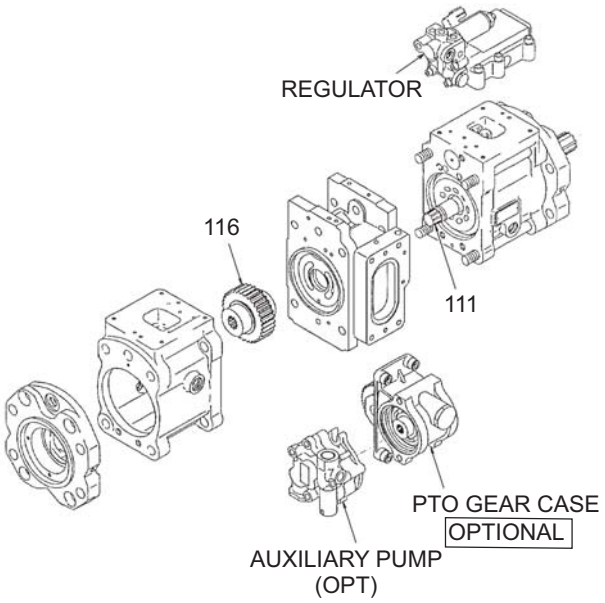


Fig. 24-4 Construction of hydraulic pump

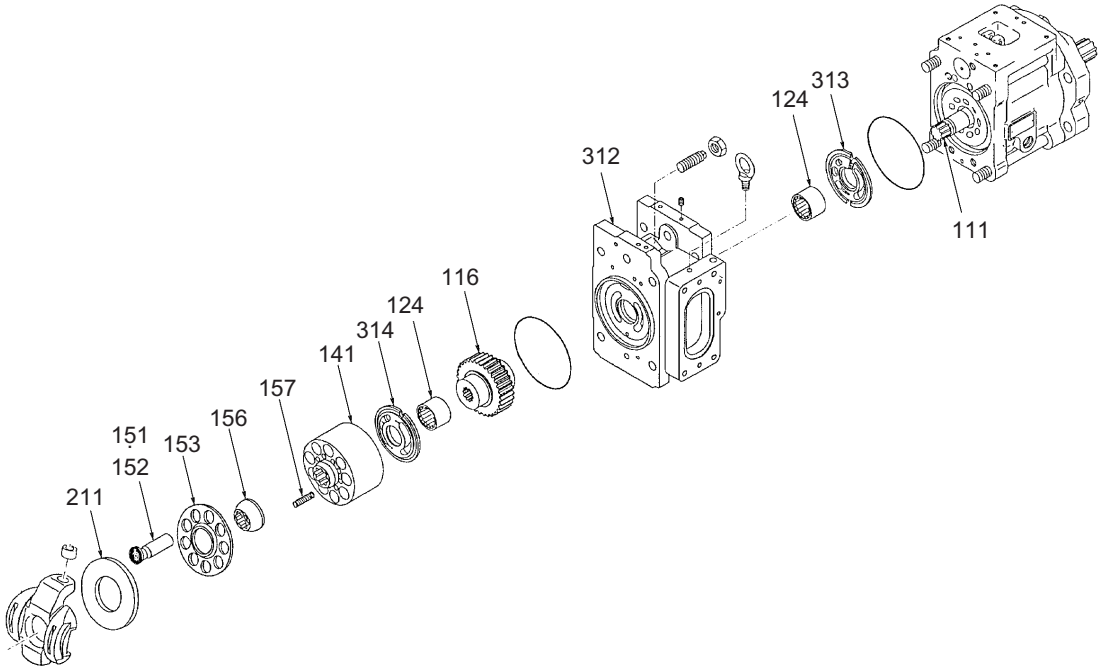


Fig. 24-5 Rotary group

(1) Swash plate group

The swash plate group consists of swash plate (212), shoe plate (211), swash plate support (251), tilting bushing (214), tilting pin (531), and servo piston (532). The swash plate is the cylindrical part that is formed on the opposite side of the shoe sliding surface and is supported by the swash plate support.

The hydraulic force controlled by the regulator flows into the hydraulic chamber that is provided on both sides of the servo piston. This moves the servo piston to the right and left. The result is that the swash plate swings on the swash plate support via the spherical part of the tilting pin and changes the tilting angle (a).

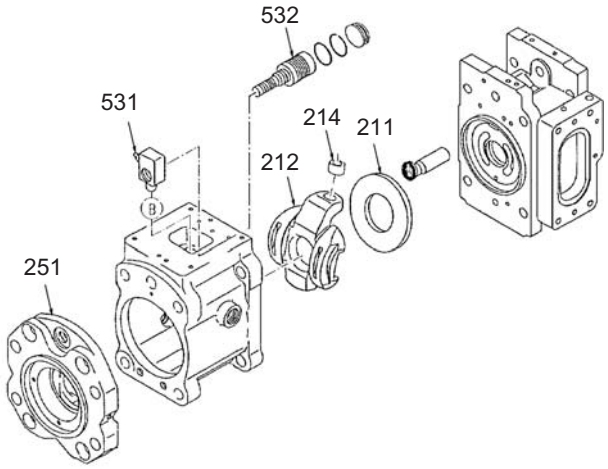


Fig. 24-6 Swash plate group

(2) Valve block group

The valve block group consists of valve block (312), valve plates (313 or 314), and valve plate pin (885). The valve plates having two crescent-shaped ports are installed to valve block (312) to feed oil and recycle it from cylinder block (141). The oil switched over by the valve plate is connected with the external pipe by way of the valve block.

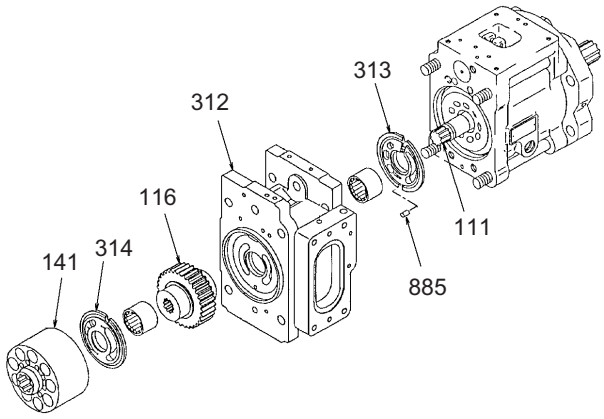


Fig. 24-7 Valve block group

(3) PTO group (For Oceania)

The PTO group is composed of 1st gear (116), 2nd gear (117) and 3rd gear (118). The 2nd and the 3rd gear are supported by bearings (125) and (126) respectively and installed to the valve block.

Now, if the shaft is driven by the engine, the cylinder block rotates together by the spline linkage. If the swash plate is inclined, the pistons arranged in the cylinder block make reciprocating motion with respect to the cylinder while rotating with the cylinder block. If we keep an eye on a single piston, it makes a motion away from the valve plate (oil suction process) in the first 180° and a motion toward the valve plate (oil delivery process) in the remaining 180°. If the swash plate is not inclined (zero tilting angle), the piston does not stroke i.e. delivers no oil.

The shaft rotation is taken up by the 1st gear (116) and transmitted to the 2nd gear (117) and the 3rd gear (118), in that order, to drive the gear pump that is linked to the 3rd gear.

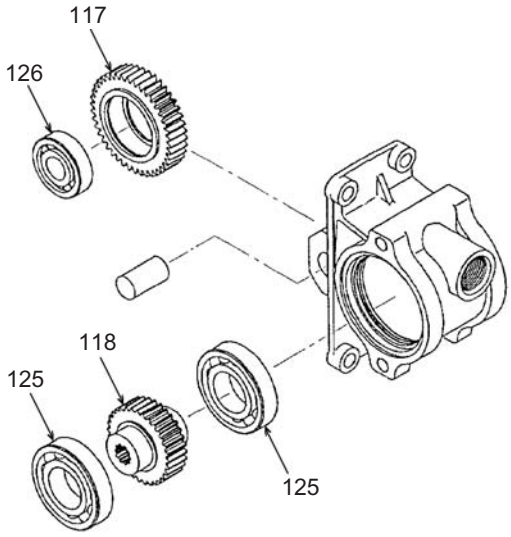
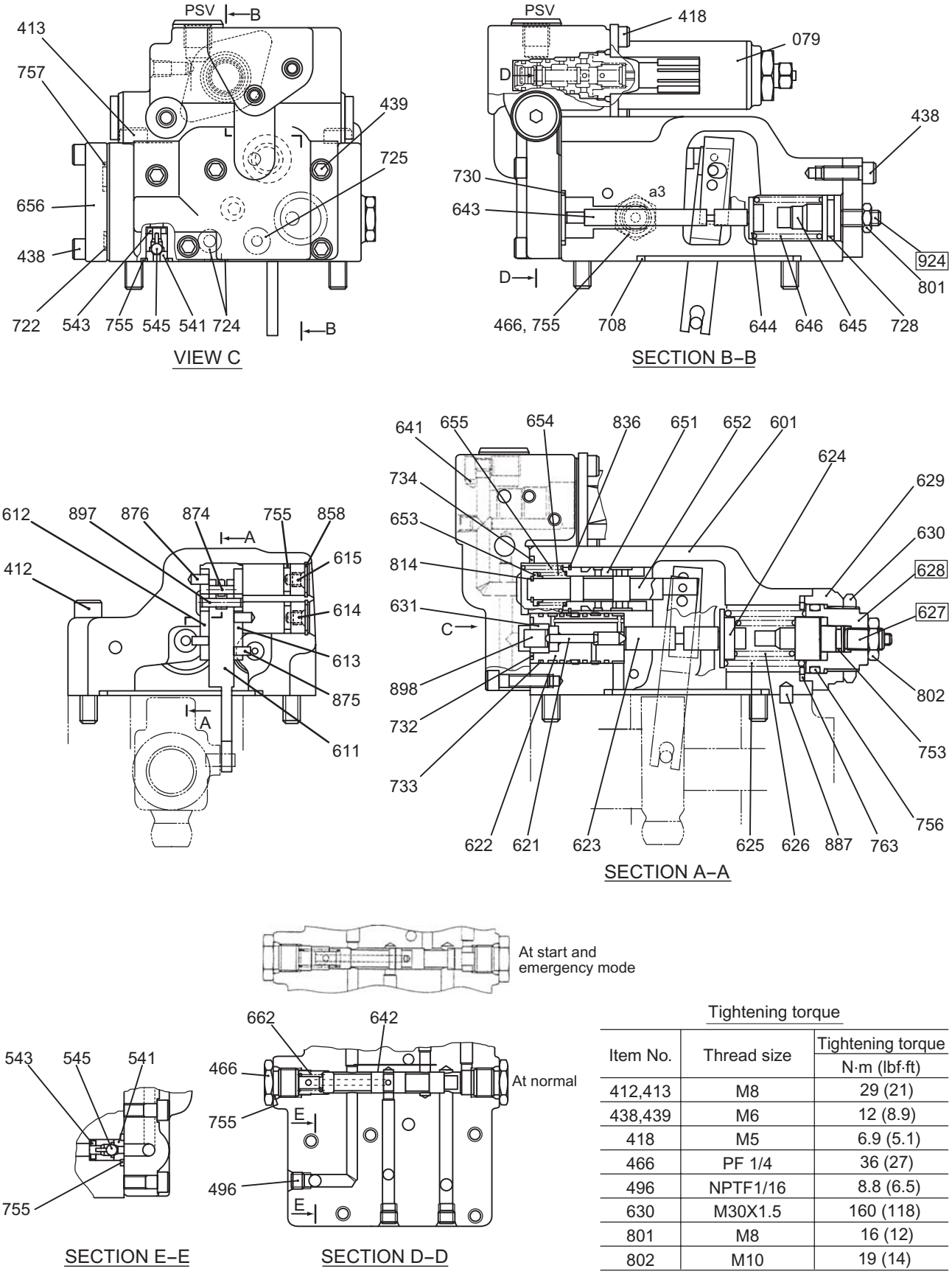


Fig. 24-8 PTO group

24.1.1.3 REGULATOR

24.1.1.3.1 CONSTRUCTION



Tightening torque

Item No.	Thread size	Tightening torque N·m (lbf·ft)
412,413	M8	29 (21)
438,439	M6	12 (8.9)
418	M5	6.9 (5.1)
466	PF 1/4	36 (27)
496	NPTF1/16	8.8 (6.5)
630	M30X1.5	160 (118)
801	M8	16 (12)
802	M10	19 (14)

Fig. 24-9

No.	Parts	Q'ty	No.	Parts	Q'ty	No.	Parts	Q'ty
412	Socket bolt ; M8X50	2	628	Adjusting screw (C)	1	732	O-ring ; 1B P16	1
413	Socket bolt ; M8X70	2	629	Cover (C)	1	733	O-ring	1
418	Socket bolt ; M5X12	2	630	Lock nut ; M30X1.5	1	734	O-ring ; 1B G25	1
438	Socket bolt ; M6X20	8	631	Sleeve (For PF)	1	753	O-ring ; 1B P9	1
439	Socket bolt ; M6X25	5	641	Pilot cover	1	755	O-ring ; 1B P11	7
466	VP plug ; PF1/4	3	642	Spool	1	756	O-ring ; 1B P26	1
496	Plug ; NPTF1/16	18	643	Pilot piston	1	757	O-ring ; 1B P12.5	1
541	Seat	2	644	Spring seat (Q)	1	763	O-ring ; 1B G35	1
543	Stopper 1	2	645	Adjusting stem (Q)	1	801	Nut ; M8	1
545	Ball	2	646	Pilot spring	1	802	Nut ; M10	1
601	Casing	1	651	Sleeve	1	814	Snap ring	1
611	Feed back lever	1	652	Spool	1	836	Snap ring	1
612	Lever (1)	1	653	Spring seat	1	858	Snap ring	2
613	Lever (2)	1	654	Return spring	1	874	Pin ; ø 4X11.7L	1
614	Fulcrum plug	1	655	Set spring	1	875	Pin ; ø 4X8L	2
615	Adjusting plug	1	656	Block cover	1	876	Pin ; ø 5X8L	2
621	Compensating piston	1	662	Spring	1	887	Pin	1
622	Piston case	1	708	O-ring ; 1B G75	1	897	Pin ; ø 5X19L	1
623	Compensating rod	1	722	O-ring ; 1B P6	3	898	Pin ; ø 7.5X11L	1
624	Spring seat (C)	1	724	O-ring ; 1B P8	8	924	Socket screw ; M8X20	1
625	Outer spring	1	725	O-ring ; 1B P10	1	041	Sub-check valve	2
626	Inner spring	1	728	O-ring ; 1B P18	1	079	Solenoid proportional reducing valve	1
627	Adjusting stem (C)	1	730	O-ring ; 1B P22	1			

☐ The codes in a rectangle represent FACTORY adjust points.
Do not tamper with the adjustment screws as much as DAMAGE may occur.

24.1.1.3.2 OPERATION

(1) Control function

Control function …… Electric flow control.
- •Positive flow control.
- •Total horsepower control.

Emergency mode control.
- •Hydraulic positive control.
- •Hydraulic total horsepower control

(2) Summary

The regulator KR3S-YTOK for the in-line type axial piston pump K5V series is composed of the control mechanism as mentioned below:

1) Electric flow control and positive flow control

The tilting angle of the pump (delivery rate) is controlled by controlling the current command value of the solenoid proportional reducing valve attached to the regulator. The regulator makes positive flow control (positive control) that increases the delivery rate as the secondary pressure of the solenoid proportional reducing valve rises. Since this function permits the output power of the pump to be varied, it is possible to attain optimum power according to the operating condition. Also, since the pump delivers only the necessary oil flow, the machine does not consume excessive power.

2) Constant power control at emergency mode

When the electromagnetic proportional pressure-reducing valve cannot output the secondary pressure due to the trouble, the spool for emergency mode is switched automatically, and the control is switched from electric control to hydraulic control (emergency mode).

In emergency mode, the power shift command pressure Pf shifts the power set value. The power shift pressure (secondary pressure of electromagnetic proportional pressure-reducing valve) is led to power control section of regulator on each pump through pump inside passage and shifts respective control to the same power set value.

In the power shifted condition, as self pump delivery pressure Pd1 rises, the pump tilt angle (delivery rate) is automatically reduced; consequently the input torque is controlled to the constant value or less. (When the speed is constant, the input power is also constant.)

This pump is controlled by Pd1 only regardless of another delivery pressure. Condition where the power is controlled, the regulator of each pump is controlled to the different tilt angle (delivery rate). Consequently in the condition where the power is controlled, the overloading of engine is automatically prevented regardless of the loading of pump 2. And in normal condition, because the power shift pressure is 0MPa, the power control is not worked.

With this mechanism, it is possible to obtain proper power for the working condition.

This regulator is made up of the above two kinds of control system, but when both controls are actuated together, the low tilt angle (low delivery rate) command precede on mechanical operation described later.

(3) Explanation of operation

1) Flow rate electrical control

The pump delivery rate is controlled according to the command current value corresponding to the movement of control devices. This relation is shown in right figure.

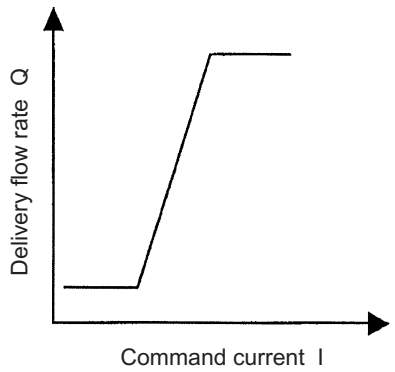


Fig. 24-10

a. Flow rate increase (See Fig. 24-11)
As the command current value I rises, the secondary pressure P2 of electromagnetic proportional pressure-reducing valve rises, and by pressing pilot piston (643) in (A) direction it stops at the position the secondary pressure P2 balances the pilot spring force (646). The movement of pilot piston is transferred to lever 2 (613) through pin (875), and rotates at (B) fulcrum in arrow direction. Furthermore the lever 2 movement is transferred to feedback lever (611) through pin (897) and rotates at (C) fulcrum in the same arrow direction as (B). Consequently the spool (652) connected to feedback lever moves towards (D). When the spool moves towards (D), the port CL connected to tank port is open and the pressure in servo piston large bore diameter chamber is released, consequently the servo piston (532) moves towards (E) according to delivery pressure Pd1 in small bore diameter piston chamber, resulting in the rise of flow rate. Since the feed back lever is connected to the servo piston and spool, the feed back lever rotates at (F) fulcrums with the movement of the servo piston towards (E), consequently the spool is returned to the original position. With this movement, the opening of spool sleeve gradually closes, and the servo piston stops at the position the opening closes completely.

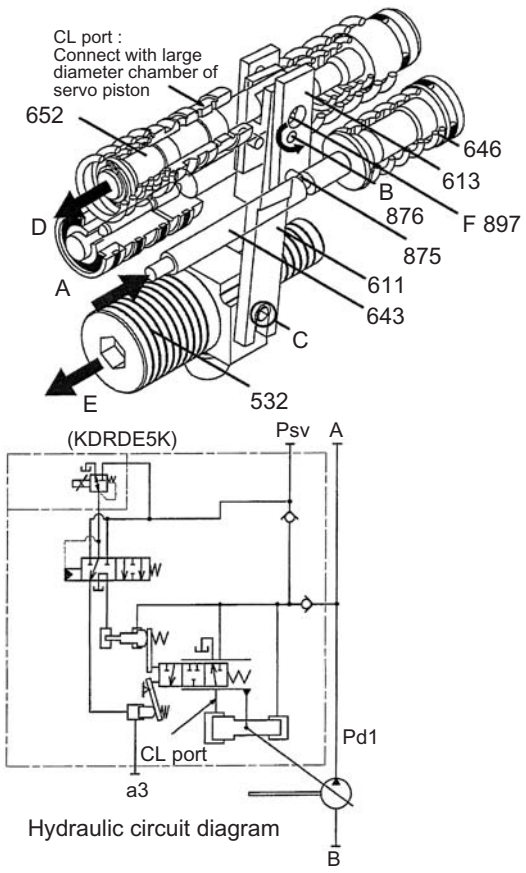


Fig. 24-11

b. Flow rate decrease (See Fig. 24-12)
As the command current value I is reduced, the secondary pressure P2 of electromagnetic proportional pressure-reducing valve is reduced, and by pressing pilot piston (643) in (G) direction it stops at the position the pilot spring force (646) balances the secondary pressure P2. The movement of pilot piston is transferred to lever 2 (613) through pin (875), and rotates at (H) fulcrum in arrow direction. Furthermore the lever 2 movement is transferred to feedback lever (611) through pin (897) and rotates at (I) fulcrum in the same arrow direction as (H). Consequently the spool (652) connected to the feedback lever moves towards (J). When the spool moves towards (J), the delivery pressure Pd1 is led in servo piston large bore diameter chamber through spool and port CL. The servo piston small bore diameter chamber constantly receives delivery the pressure Pd1, consequently the servo piston moves towards (K) according to the difference of area resulting in the reduction of tilt angle, and finally the flow rate is reduced. Since the feed back lever is connected to servo piston and spool, the feed back lever rotates at (L) fulcrum with the movement of servo piston towards (K), consequently the spool is returned to the original position. With this movement, the opening of spool sleeve gradually closes, and the servo piston stops at the position the opening closes completely.

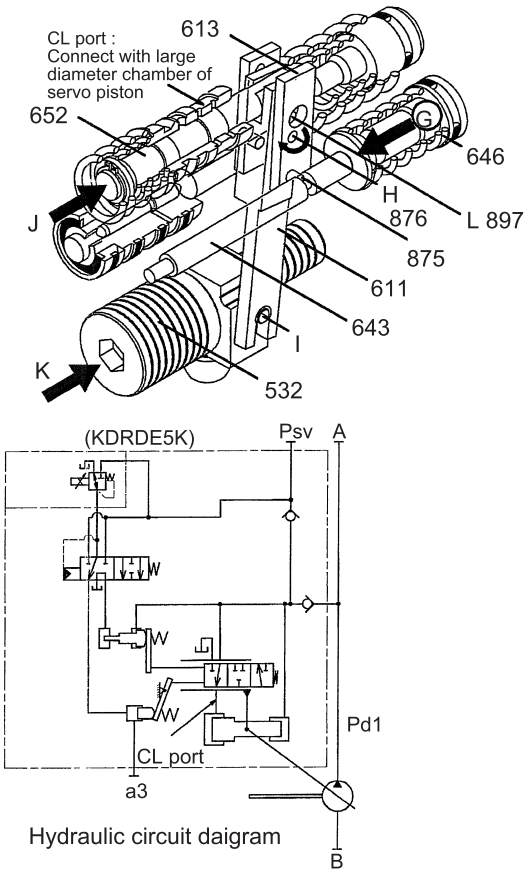


Fig. 24-12

2) Power control (In emergency mode)
When the load pressure rises, the pump tilt angle is reduced preventing the overloading of engine as shown in Fig. 24-13.
The operation of power control is the same as the flow rate control, and is explained below.

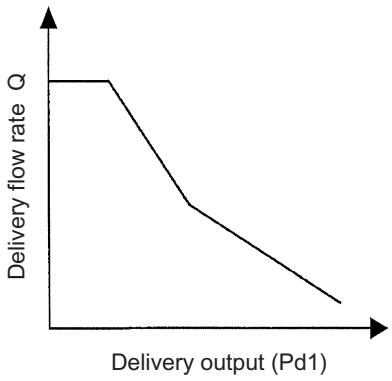


Fig. 24-13

a. Overload prevention operation (See Fig. 24-14)
Because the delivery pressure Pd1 acts on the compensating rod stepped section with the rise of self pump delivery pressure Pd1 the compensating rod (623) is pushed towards (M), and moves to the position the delivery pressure Pd1 balances the spring force of outer spring (625) and inner spring (626). The movement of compensating rod is transferred to lever 1 (612) through pin (875), and rotates at (N) fulcrum in arrow direction. Furthermore the lever 1 (612) movement is transferred to feedback lever (611) through pin (897) and rotates at (O) fulcrum in the same arrow direction as (N). Consequently the spool (652) connected with feedback lever moves towards (P). When the spool moves towards (P), the delivery pressure Pd1 is led in servo piston large bore diameter chamber through spool and CL port. Since the delivery pressure Pd1 is constantly led to servo piston large bore diameter chamber, the servo piston moves towards (Q) according to the difference of area, resulting in the reduction of tilt angle, consequently the flow rate is also reduced. Since the feed back lever is connected with servo piston and spool, the feed back lever rotates at (R) fulcrum with the movement of the servo piston towards (Q), consequently the spool is returned to the original position. With this movement, the opening of spool sleeve gradually closes, and the servo piston stops at the position the opening closes completely.

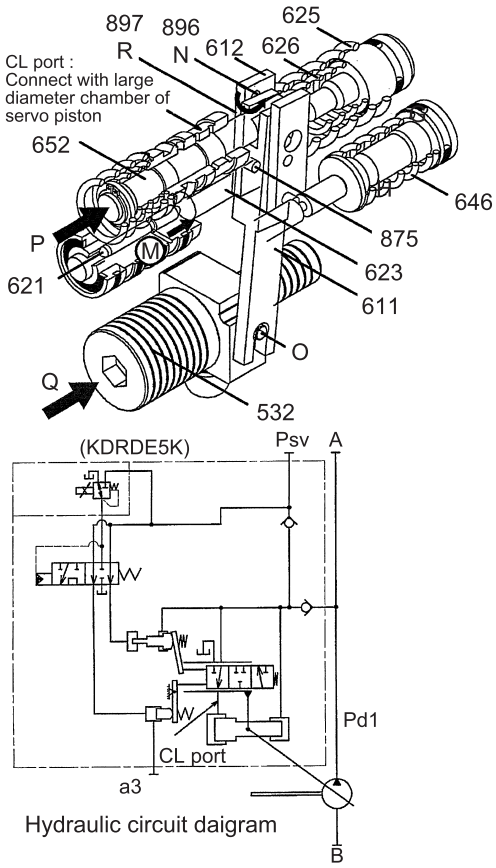


Fig. 24-14

b. Flow rate recovery operation (See Fig. 24-15)
Because the compensating rod (623) is pushed towards (S) with the force of outer spring (625) and inner spring (626) with reduction of self pump delivery pressure Pd1, and moves to the position the spring force of outer spring (625) and inner spring (626) balances the delivery pressure Pd1. The movement of compensating rod is transferred to lever 1 (612) through pin (875), and rotates at (T) fulcrum in arrow direction.
Furthermore the lever 1 (612) movement is transferred to feedback lever (611) through pin (897) and rotates at (T) fulcrum in the same arrow direction as (N). Consequently the spool (652) connected to feedback lever moves towards (V).
As the spool moves towards (V), CL port is open and connected to tank port, the pressure of servo piston large bore diameter chamber is released and the servo piston (532) moves towards (W) with delivery pressure Pd1 in small bore diameter chamber, and consequently the flow rate is raised. Since the feed back lever is connected to servo piston and spool, the feed back lever rotates at (X) fulcrum with the movement of the servo piston towards (W), consequently the spool is returned to the original position.
With this movement, the opening of spool sleeve gradually closes, and the servo piston stops at the position the opening closes completely.

3) Priority mechanism of low tilt angle (low flow rate) command
As the said explanation, the tilting commands of flow rate control and power control are transferred to feedback lever (611) and spool (652) through the large bore section of lever 1 (612) and lever 2 (613), but because the pin (dia 5) is extruded in large bore (dia 9), pin (897) on the side where making tilt angle smaller contacts with it, consequently the bore (dia 9) of lever on the side where larger tilt angle command is given is free without contact with pin (897). In this mechanical selecting manner, the command on the side of low tilt angle of the flow rate control and power control has a priority.

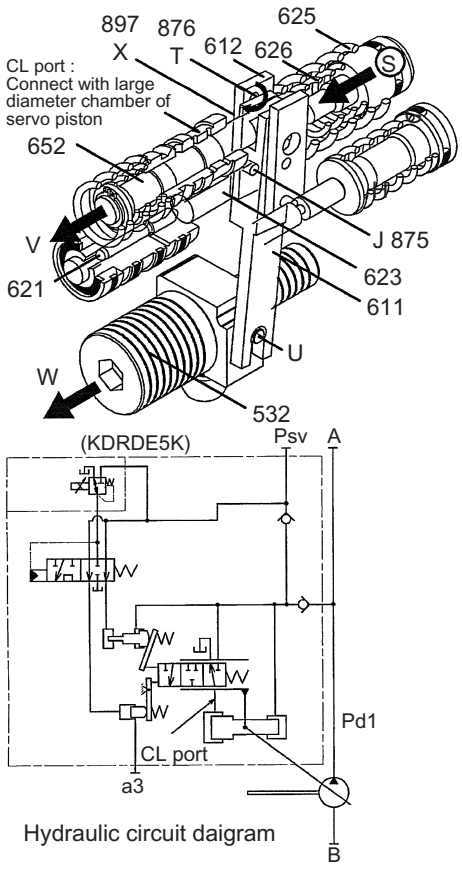


Fig. 24-15

4) Power shift control

As shown in Fig. 24-16, the pump set power is controlled according to the movement of control by power shift pressure Pf.

As power pressure Pf rises, the compensating rod (623) moves rightward through pin (898) and compensating piston (621). Consequently like the overloading prevention operation of power control, the pump tilt angle becomes smaller and the power setting value is reduced. Conversely, if the power shift pressure Pf is reduced, the power set value is raised.

The power shift pressure Pf of this pump is ordinary set to 0MPa, but in emergency mode, the power shift pressure Pf is raised to 4.9MPa. (710 psi)

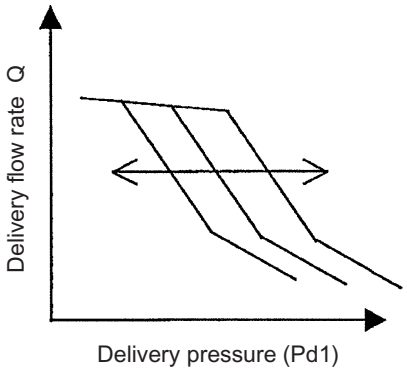


Fig. 24-16

24.1.1.3.3 ADJUSTING THE REGULATOR

The regulator may be adjusted in terms of maximum flow, minimum flow, horsepower (at emergency mode control) control characteristics, flow control characteristics using the adjust screw.

(1) Adjusting the maximum flow (See Fig. 24-3)

Adjust the maximum flow by loosening nut (808) and by tightening set screw (954) (or loosening it). Tightening set screw (954) decreases the delivery rate, as indicated in Fig. 24-17.

Only the maximum flow varies, but other control characteristics remain unchanged.

Adjust screw no.	954
No. of turns for tightening	1/4
Pilot pressure Pi (Input current I)	No change
Min. increase in delivery flow L/min (gal/min)	5.8 (1.5)

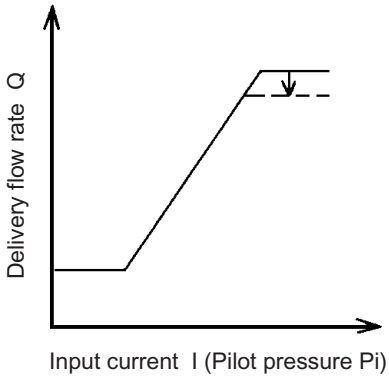


Fig. 24-17 Adjusting the max. delivery flow

(2) Adjusting the minimum flow (See Fig. 24-3)

Adjust the minimum flow by loosening nut (806) and by tightening socket screw (953) (or loosening it). Tightening socket screw increases the delivery rate, as indicated in Fig. 24-18.

Other control characteristics remain unchanged in the same way as maximum flow adjustment, care should be used of the fact that overtightening may increase a required power at the maximum delivery pressure (at relieving action).

Adjust screw no.	953
No. of turns for tightening	1/4
Pilot pressure Pi (Input current I)	No change
Min. increase in delivery flow L/min (gal/min)	4.6 (1.2)

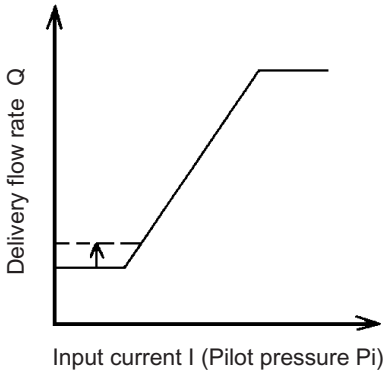


Fig. 24-18 Adjusting the min. delivery flow

(3) Adjusting the input horsepower
(At emergency mode)
Since the regulator is of total horsepower control type, turn the adjust screws of both the front (No.1) and rear (No.2) pumps when changing horsepower set values. Adjust the horsepower settings of both pumps to a same level. The pressure change values by adjustment are based on two pumps pressurized at the same time, and the values will by halved when only one pump is loaded.

1) Adjusting the Outer Spring (See Fig. 24-9)
(At emergency mode)
Adjust it by loosening lock nut (630) and by tightening adjust screw (628) (or loosening it). Tightening the adjust screw shifts the control chart to the right and increases the input horsepower, as indicated in Fig. 24-19.
Since turning the adjust screw C (628) by N turns changes the setting of the inner spring (626), return the adjust screw C (627) by NX1.48 turns at first.

Adjust screw no.	628
No. of turns for tightening	1/4
Increase delivery pressure MPa (psi)	2.06 (299)
Increase in input torque N·m (lbf·ft)	50 (36.9)

2) Adjusting the Inner Spring (See Fig. 24-9)
(At emergency mode)
Adjust it by loosening nut (802) and by adjust screw (C) (627) (or loosening it). Tightening the adjust screw increases the flow and then the input horsepower, as indicated in Fig. 24-20. And the input torque raises.

Adjust screw no.	627
No. of turns for tightening	1/4
Increase inflow L/min (gal/min)	12 (3.2)
Increase in input torque N·m (lbf·ft)	58.7 (43.3)

(4) Adjusting the flow control characteristics (See Fig. 24-9)
Adjust them by loosening nut (801) and socket bolt (924) (or loosening it). Socket bolt causes the control chart to move to the right as shown in Fig. 24-21.

Adjust screw no.	924
No. of turns for tightening	1/4
Increase Pilot pressure MPa (psi)	0.18 (26)
Decrease in delivery flow L/min (gal/min)	18.5 (4.9)

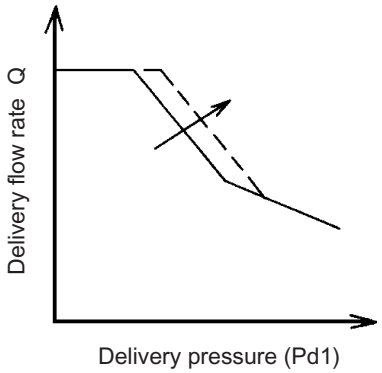


Fig. 24-19 Adjusting the input horsepower (1)

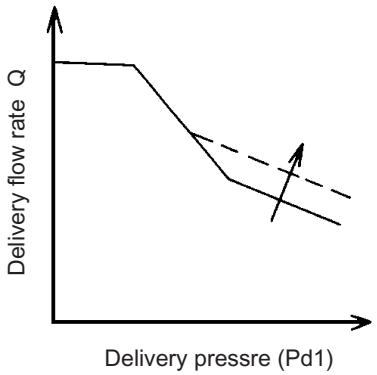


Fig. 24-20 Adjusting the input horsepower (2)

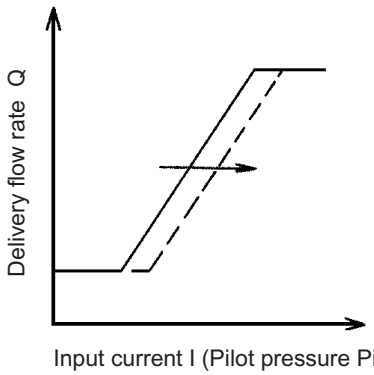


Fig. 24-21 Adjusting the flow control characteristics

24.1.1.3.4 CAUSES OF FAULT RESULTING FROM REGULATOR

When trouble due to this regulator occurs, disassemble and inspect it referring to "Chapter LC33-II"

(1) When the engine is overloaded,
Load every unit of pump, and check on pumps on the right and left sides for possible damages. When pumps on both sides are failed, check on them for the following failures 1), 2). When pump on the one side is failed, start checking from para. 3).

1) Check that the power shift command current I is normal.

2) The power shift pressure is low.

- Check the dither of amp.
- Replace solenoid proportional reducing valve.

3) Stick of compensating piston (621) and compensating rod (623)

- Disassemble and clean it.

4) Stick of pin (898)

- Disassemble and clean it.

(2) The max. flow rate is not delivered.

1) Check that pilot differential pressure Pi is normal.

2) Stick of pilot piston (643)

- Disassemble and clean it.

3) Stick of spool (652)

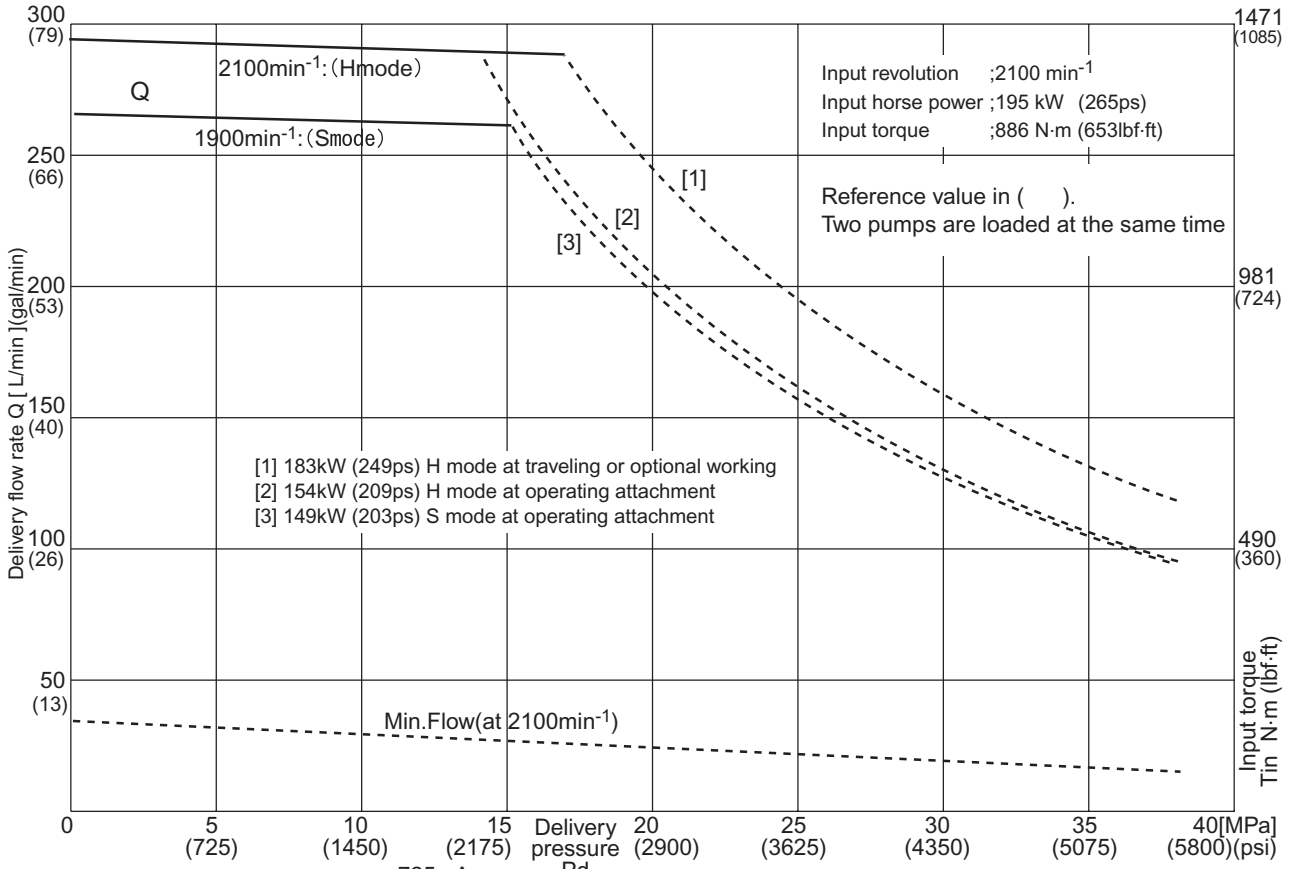
- Disassemble and clean it.

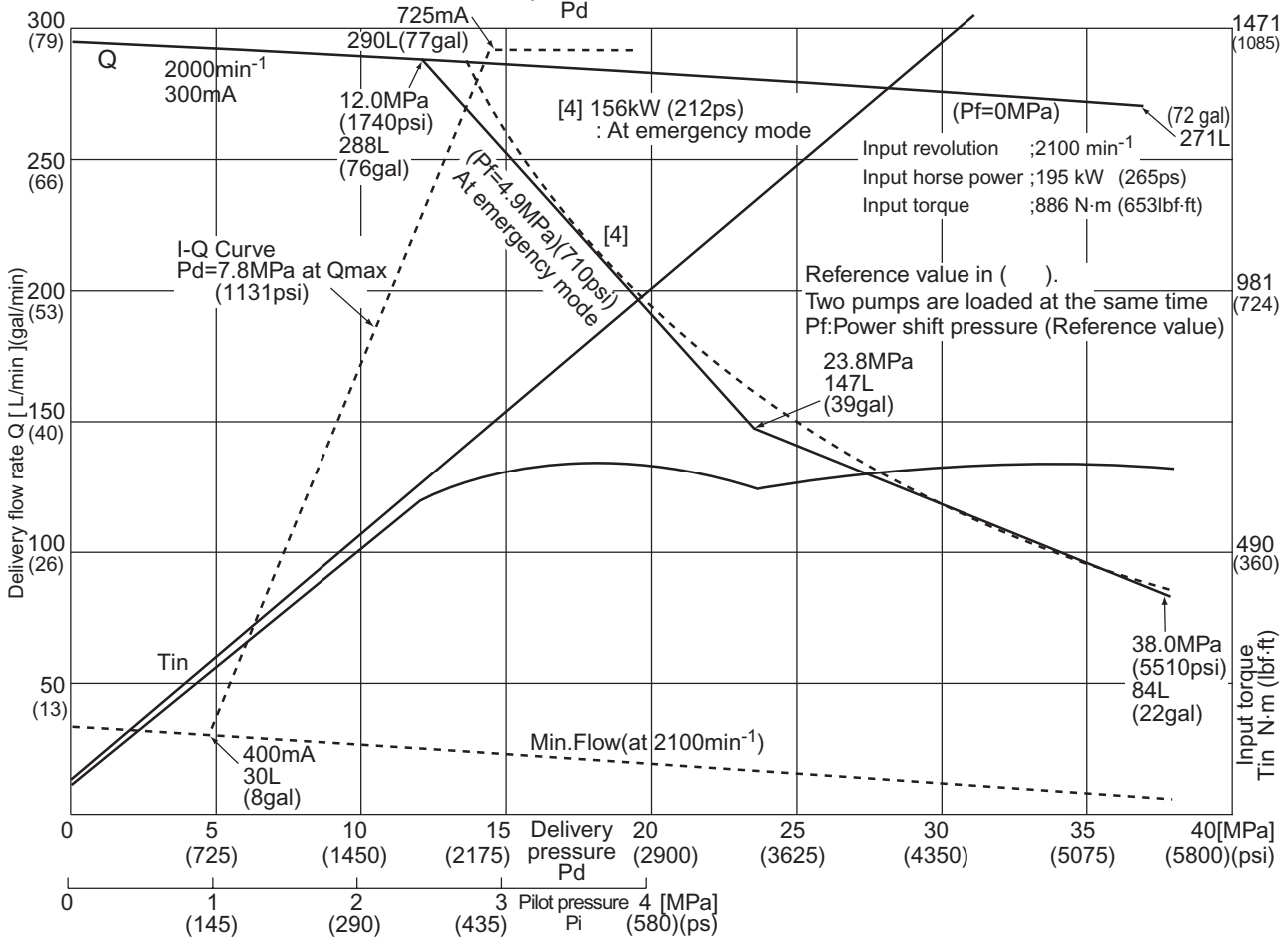
4) Stick of pin (898)

- Disassemble and clean it.

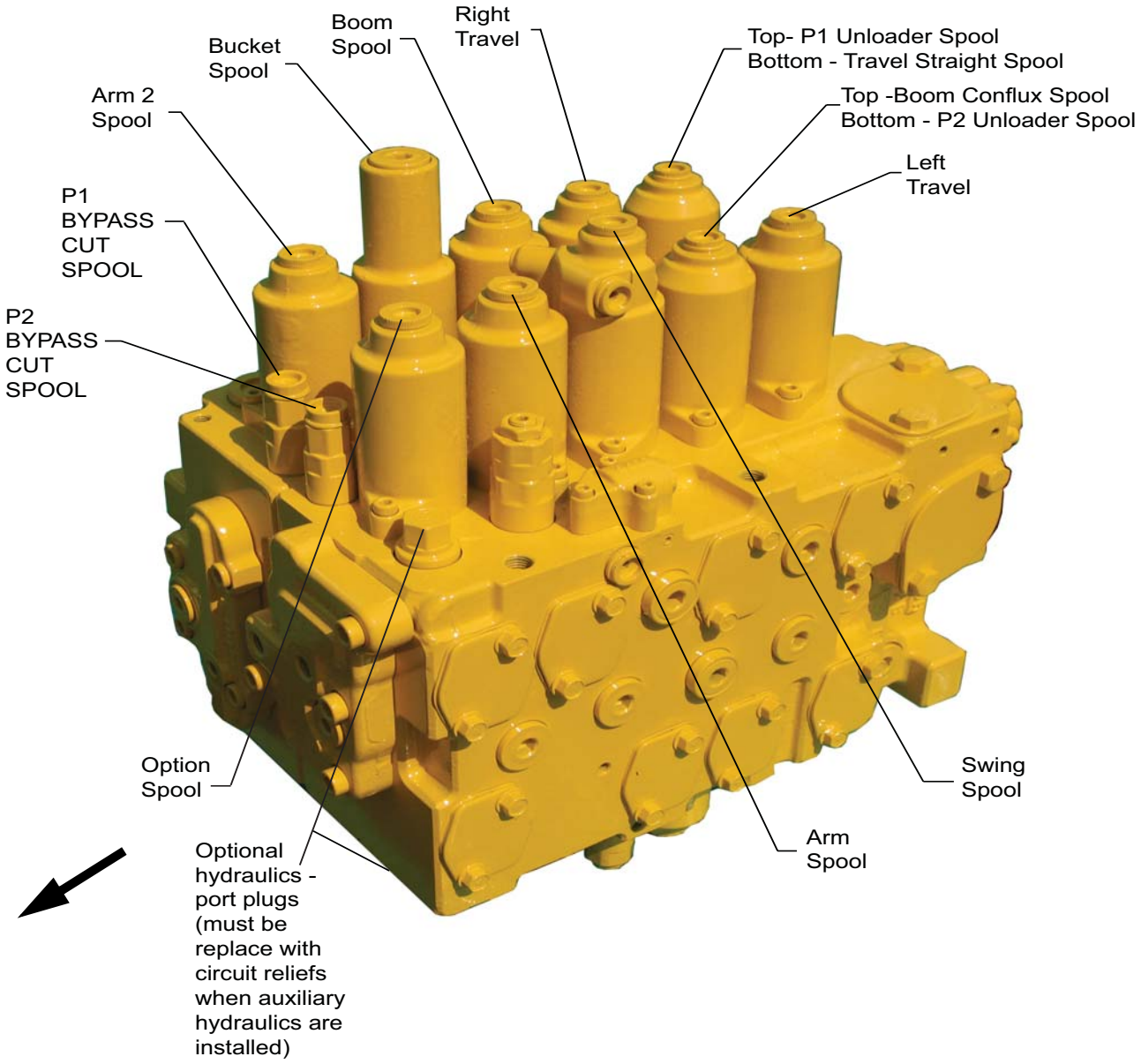
Note : When the damage of part is severe, replace the part with new one.

24.1.1.4 P/Q - CONTROL CURVE OF PUMP (SK350-8)

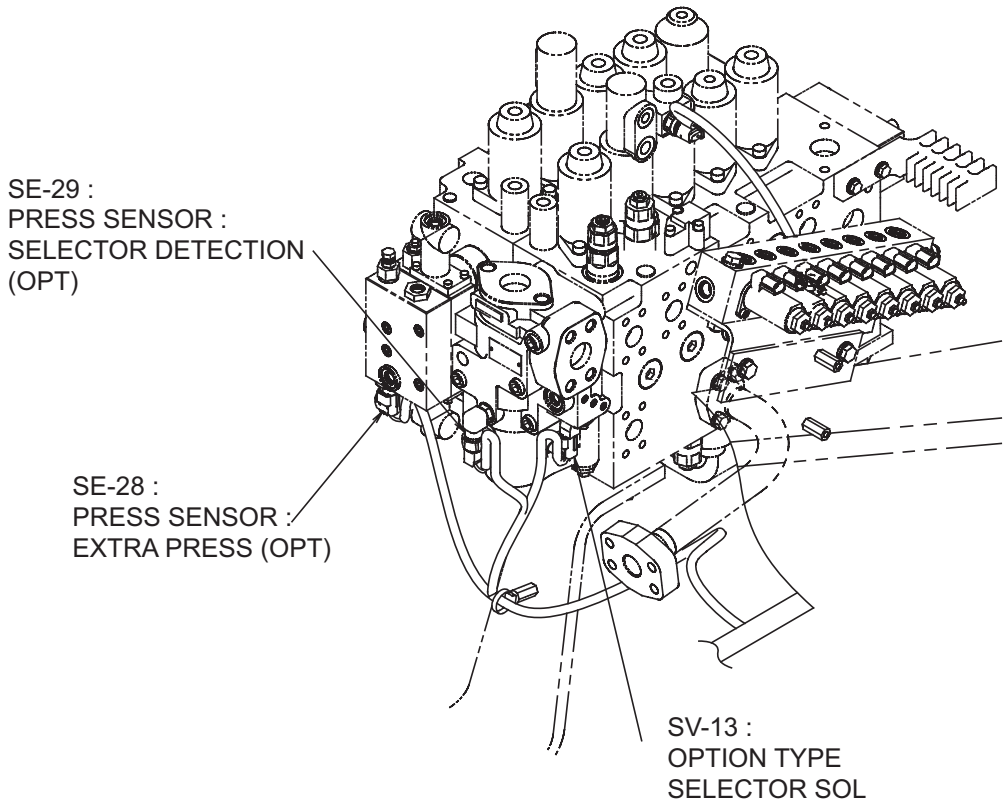




Main Control Valve SK350-8

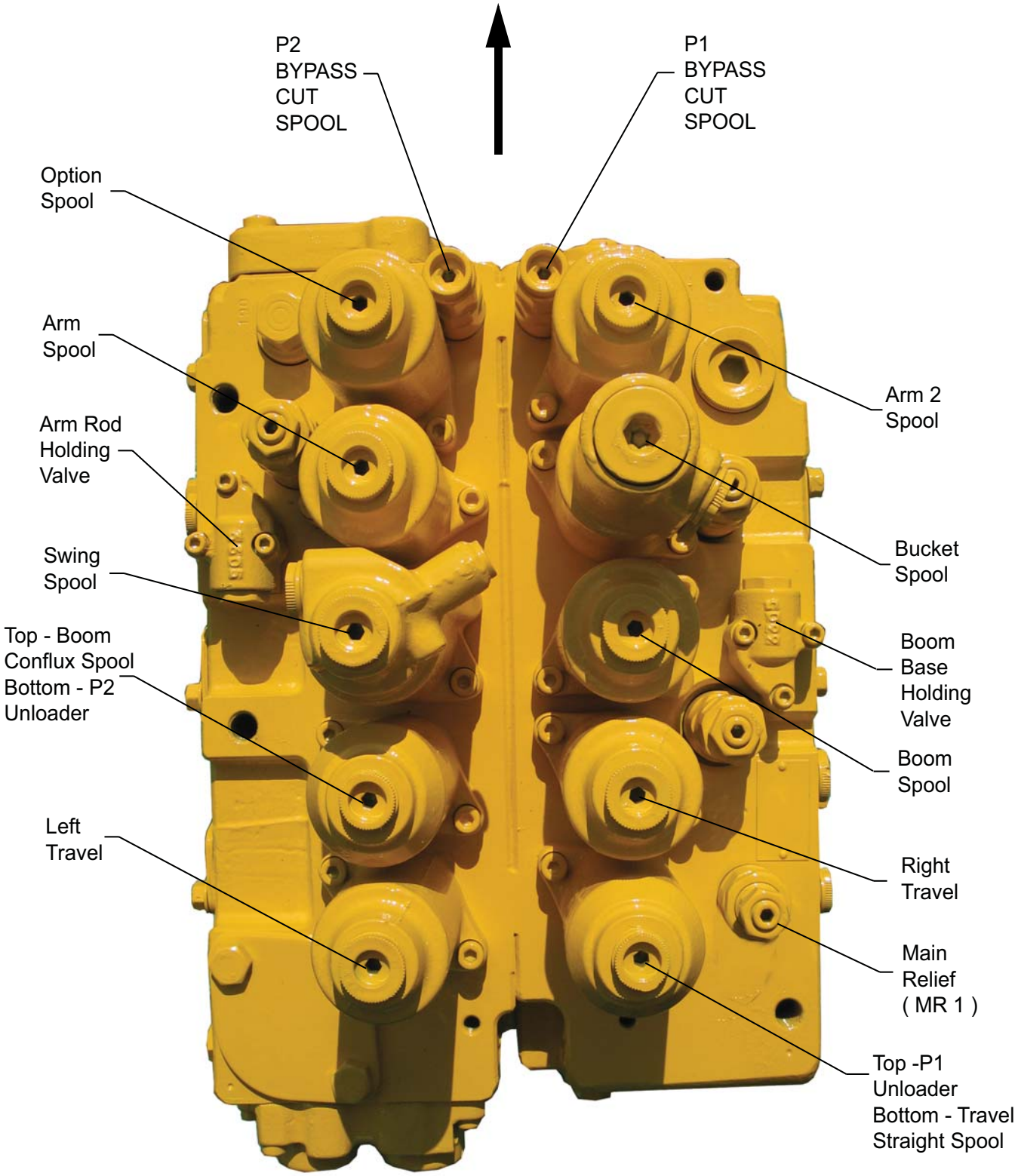


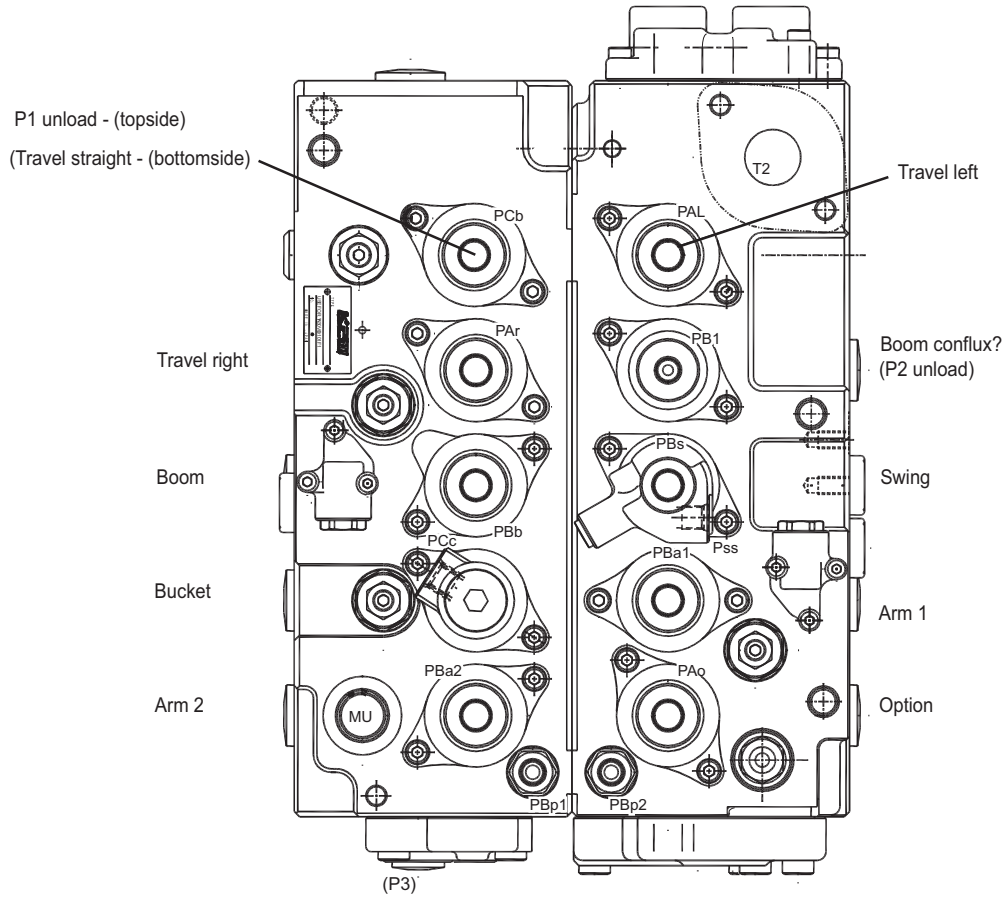
Main Control Valve - SK350
(with Optional Auxaliary Hydraulics)



SK350 Main Control Valve
(Spool Locations)

Front of Machine




P1 unload - (topside)
(Travel straight - (bottomside)
Travel right
Boom
Bucket
Arm 2
Travel left
Boom conflux?
(P2 unload)
Swing
Arm 1
Option
PCb
PAr
PCc
PBb
PBa2
MU
PBp1
(P3)
T2
PAL
PB1
PBs
Pss
PBa1
PAo
PBp2

24.1.2 CONTROL VALVE

24.1.2.1 SPECIFICATIONS

24.1.2.1.1 OUTSIDE VIEW

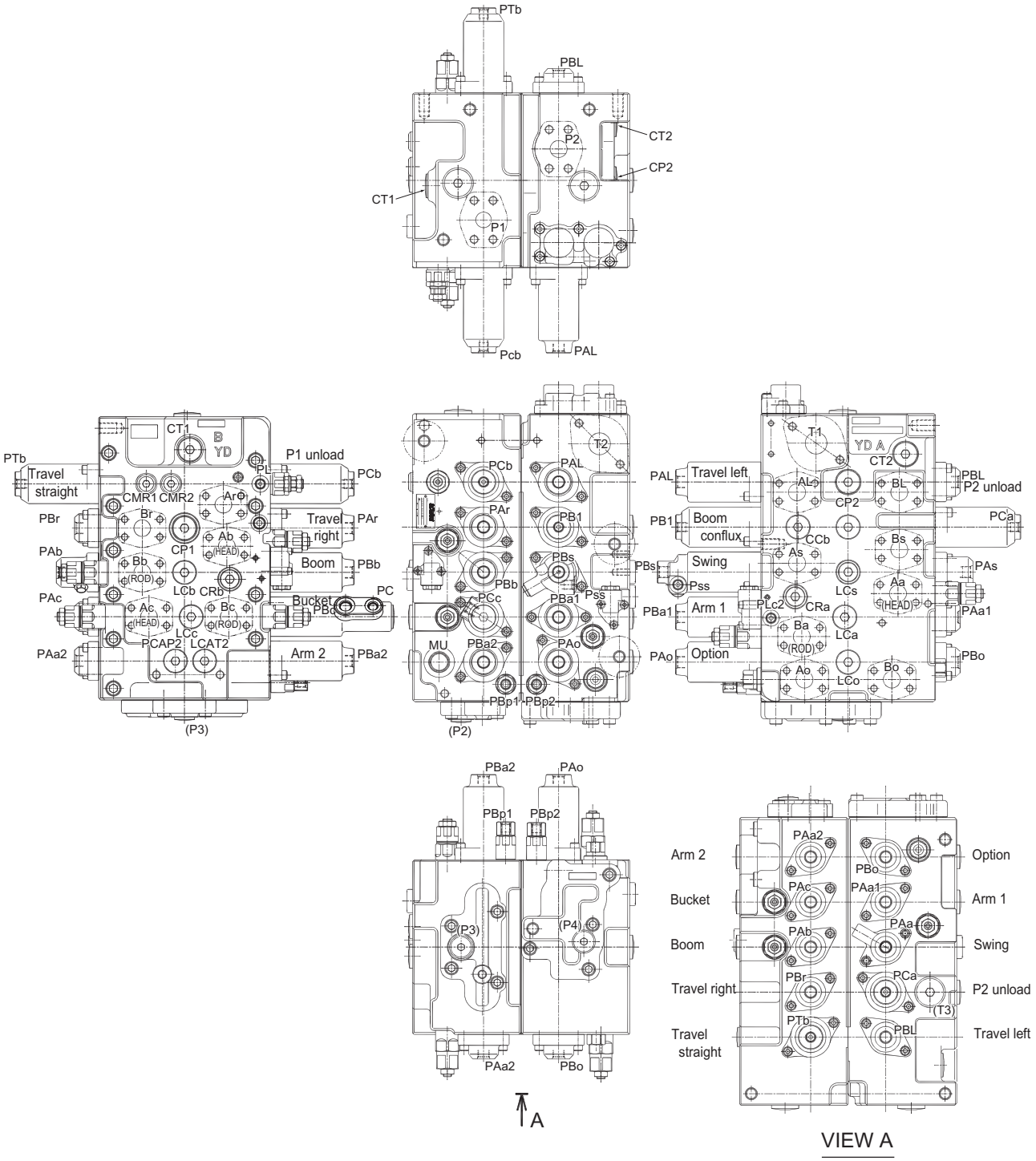


Fig. 24-22 Outside view

24.1.2.1.2 PORTS

Port size	Tightening torque	Ports	Description
PF3/4	150~180 N•m	MU	
	(111~133 lbf•ft)	(T3)	Pluged
PF1/2	98~120 N•m	(P3)	Pluged
	(72~89 lbf•ft)	(P4)	Pluged
PF3/8	69~78 N•m	PAa1	Arm 1 (in) pilot port
	(51~58 lbf•ft)	PBa1	Arm 1 (out) pilot port
		PAb	Boom (up) pilot port
		PBb	Boom (down) pilot port
		PAc	Bucket (digging) pilot port
		PBc	Bucket (dump) pilot port
		PAL	Travel left (forward) pilot port
		PBL	Travel left (reverse) pilot port
		PAr	Travel right (forward) pilot port
		PBr	Travel right (reverse) pilot port
		PAs	Swing (right) pilot port
		PBs	Swing (left) pilot port
		PAa2	Arm 2 (in) pilot port
		PBa2	Arm 2 (out) pilot port
		PAo	Option pilot port
		PBo	Option pilot port
		DR	Drain port
PF1/4	34~39 N•m	Pss	Swing pilot high pressure select port
	(25~29 lbf•ft)	PLc2	Lock valve select pilot port
		PBp1	Bypass cut valve (P1 side) pilot port
		PBp2	Bypass cut valve (P2 side) pilot port
		PL	Attachment boost port
		PB1	Boom (up) conflux pilot port
		PTb	Travel straight pilot port
		PCa	Unload valve (P2 side) pilot port
		PCb	Unload valve (P1 side) pilot port
		PCc	Bucket (digging) stroke limiter pilot port
M12	83~110N•m	P1	Pump port (P1 side)
	(61~81 lbf•ft)	P2	Pump port (P2 side)
		T1	Tank port 1
		T2	Tank port 2
M10	49~65 N•m	Ar	Right travel motor port (forward)
	(36~48 lbf•ft)	Br	Right travel motor port (reverse)
		AL	Left travel motor port (forward)
		BL	Left travel motor port (reverse)
		As	Swing motor port (right)
		Bs	Swing motor port (left)
		Ab	Boom cylinder head side port (up)
		Bb	Boom cylinder rod side port (down)
		Aa	Arm cylinder head side port (in)
		Ba	Arm cylinder rod side port (out)
		Ac	Bucket cylinder head side port (digging)
		Bc	Bucket cylinder rod side port (dump)

Port size	Tightening torque	Ports	Description
		Ao	Optional pilot port
		Bo	Optional pilot port

24.1.2.2 CONSTRUCTION AND OPERATION

24.1.2.2.1 CONSTRUCTION

(1) Control valve

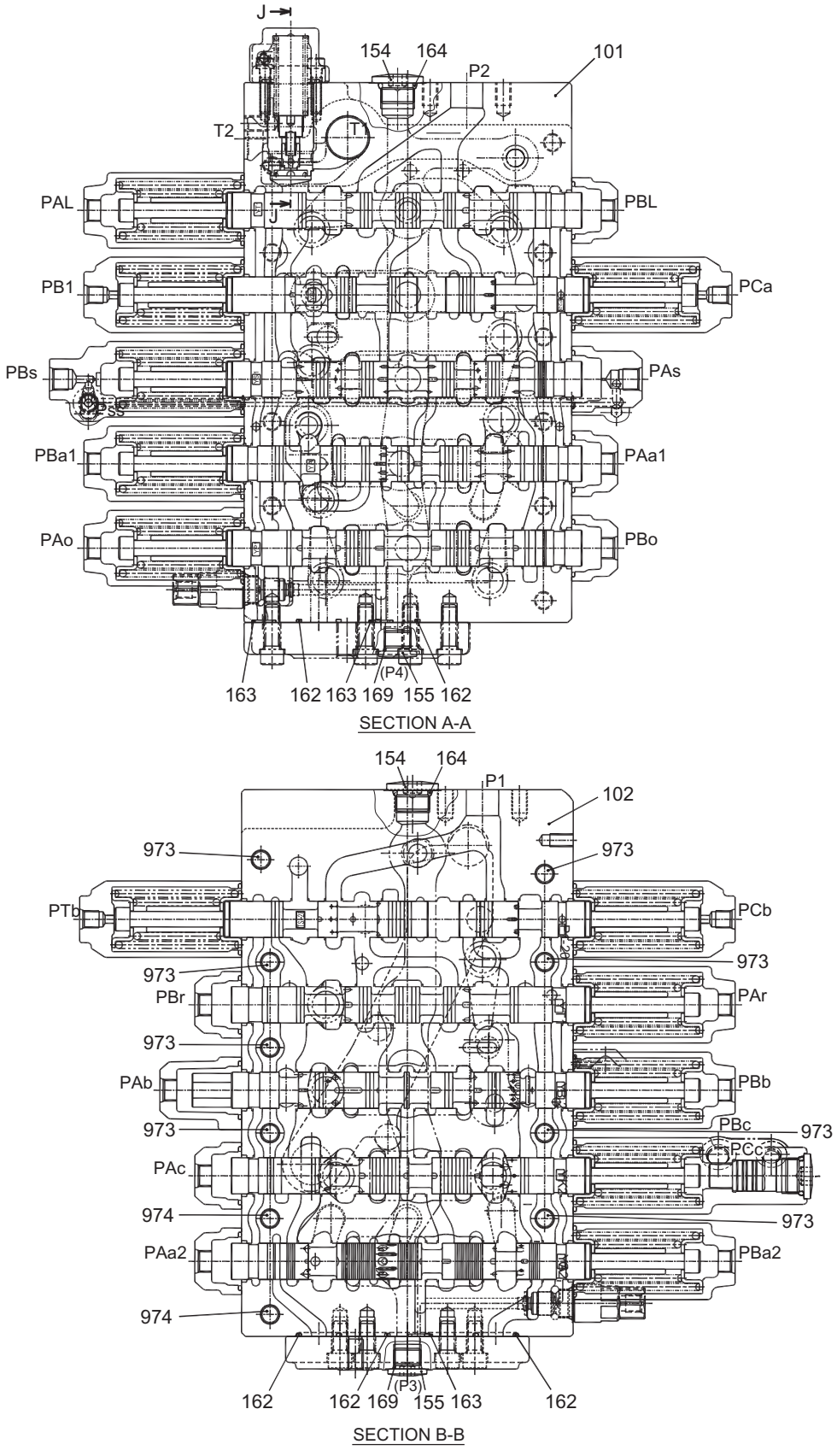


Fig. 24-23 Section (1/6)

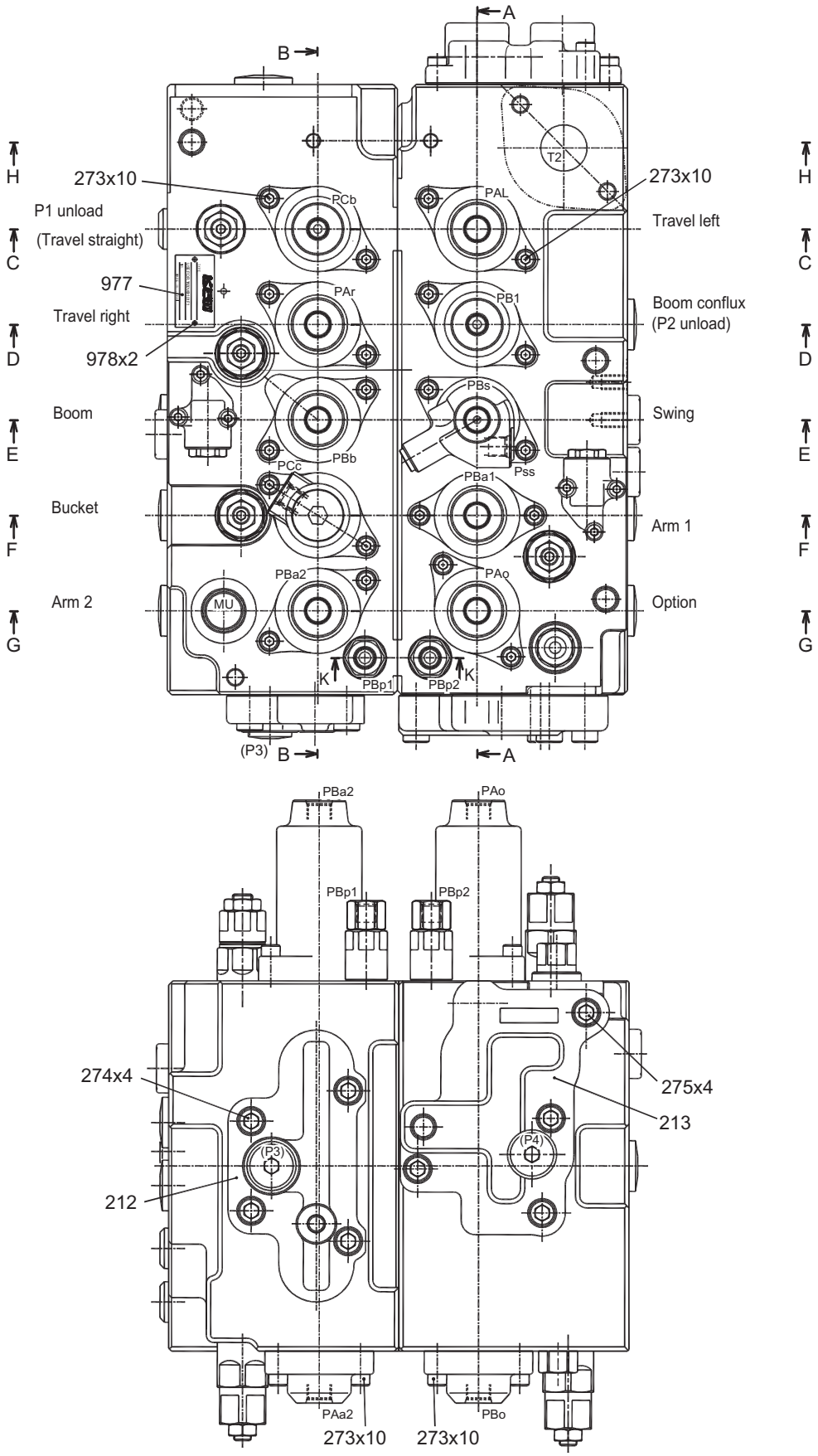


Fig. 24-24 Section (2/6)

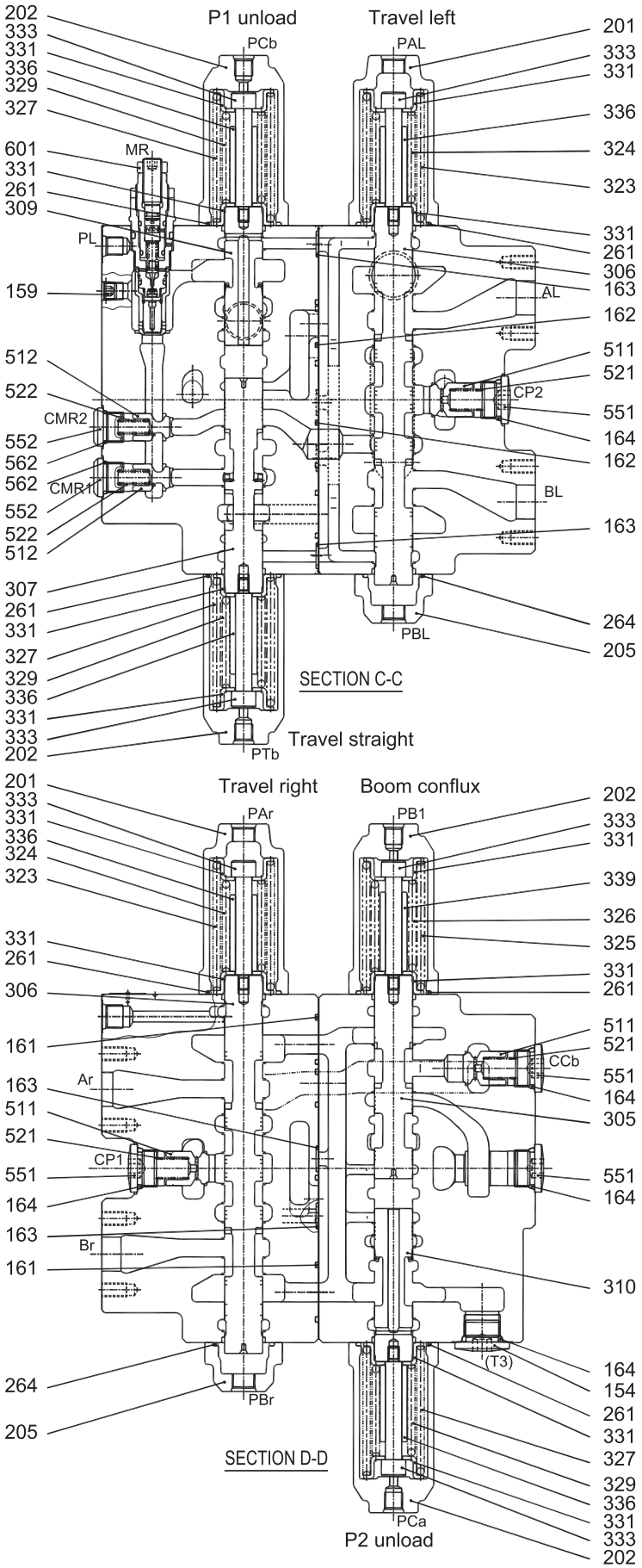


Fig. 24-25 Section (3/6)

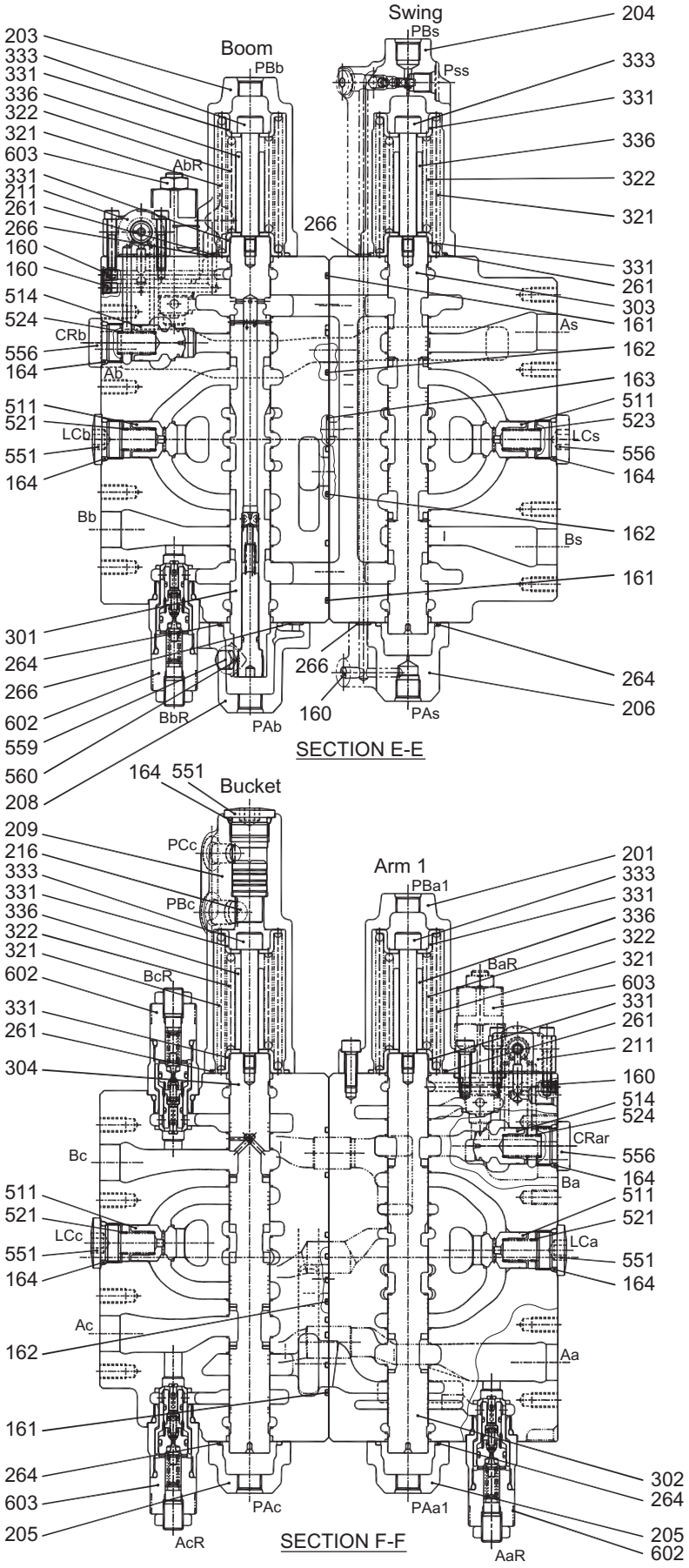
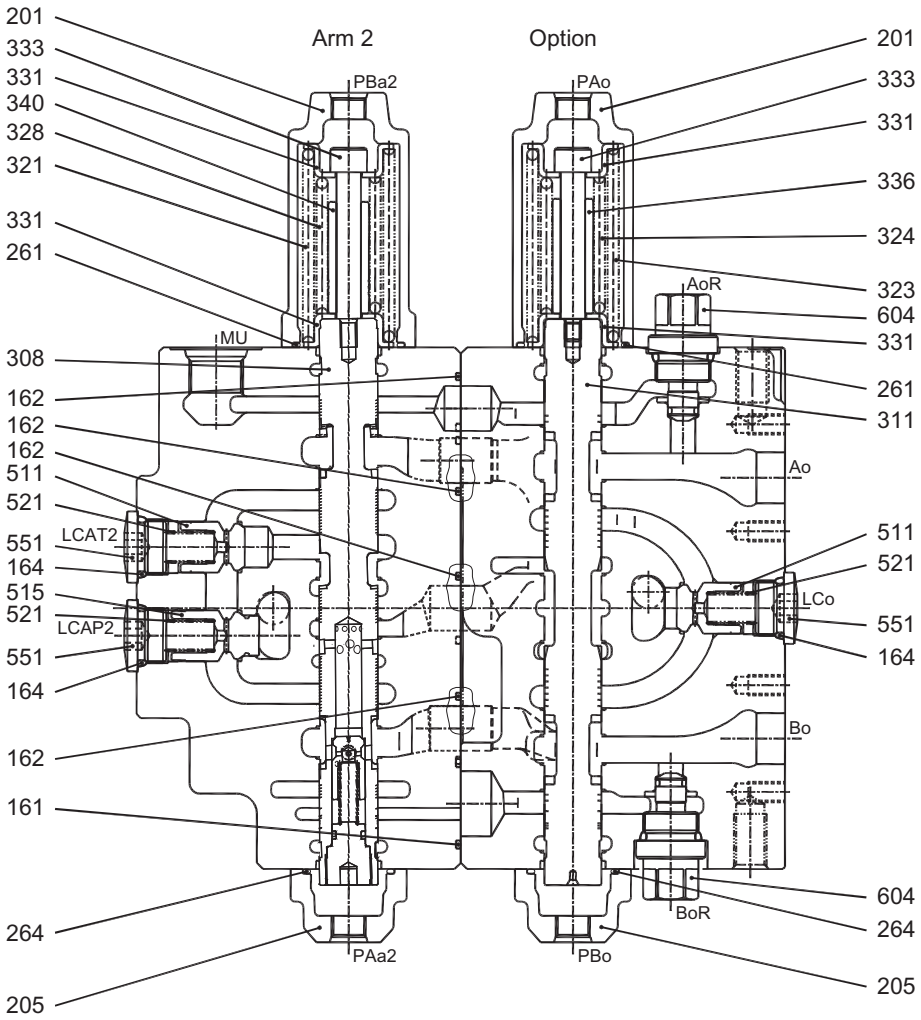
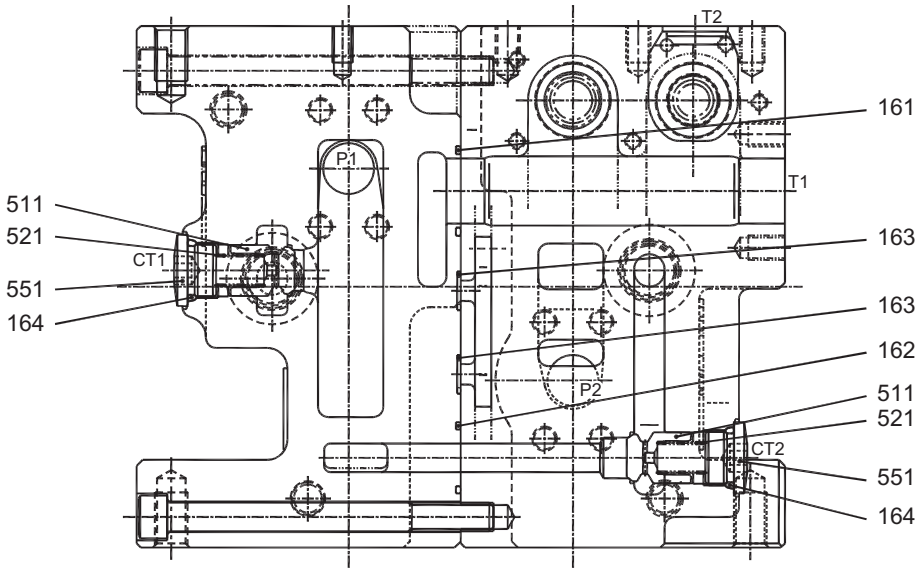


Fig. 24-26 Section (4/6)



SECTION G-G



SECTION H-H

Fig. 24-27 Section (5/6)

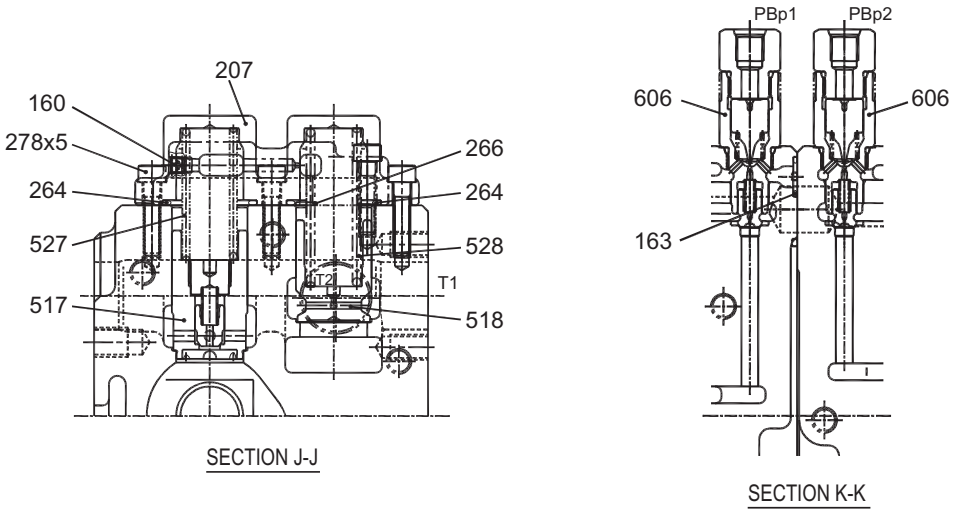


Fig. 24-28 Section (6/6)

Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty	Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty
	101	Casing A	1		321	Spring	5
	102	Casing B	1		322	Spring	4
220~250 (162~184)	154	Plug PF3/4	3		323	Spring	3
110~130 (81~96)	155	Plug PF1/2	2		324	Spring	3
20~24 (15~18)	159	Plug PT1/4 MEC (Pre-coat bolt)	1		325	Spring	1
7.8~9.8 (5.8~7.2)	160	Plug PT1/16 MEC (Pre-coat bolt)	5		326	Spring	1
	161	O-ring	7		327	Spring	3
	162	O-ring	15		328	Spring	1
	163	O-ring	11		329	Spring	3
	164	O-ring	19		331	Spring seat	24
	169	O-ring	2	16~18 (12~13) Loctite #262	333	Spacer bolt	12
	201	Cover	5		336	Stopper	10
	202	Cover	4		339	Stopper	1
	203	Cover	1		340	Stopper	1
	204	Sub cover	1		511	Poppet	11
	205	Cover	6		512	Poppet	2
	206	Cover	1		514	Poppet	2
	207	Back pressure check valve cover	1		515	Poppet	1
	208	Cover	1		517	Poppet	1
	209	Cover	1		518	Poppet	1
9.8~14 (7.2~10.3)	211	Lock valve selector sub	2		521	Spring	11
	212	Plate	1		522	Spring	2
	213	Plate	1		523	Spring	1
	216	Piston	1		524	Spring	2
	261	O-ring ; 1B G50	12		527	Spring	1
	264	O-ring ; 1B G40	10		528	Spring	1
	266	O-ring ; 1B P7	5	230~260 (170~192)	551	Plug	13
25~34 (18~25)	273	Socket bolt ; M8×25	40	130~150 (96~111)	552	Plug	2
98~120 (72~89)	274	Socket bolt ; M12×25	4	230~260 (170~192)	556	Plug	3
98~120 (72~89)	275	Socket bolt ; M12×35	4		559	Plug	1
25~34 (18~25)	278	Socket bolt ; M8×35	5		560	O-ring	1
	301	Boom spool sub	1		562	O-ring ; 1B P20	2
	302	Arm 1 spool	1	69~78 (51~58)	601	Main relief valve	1
	303	Swing spool	1	69~78 (51~58)	602	Port relief valve	3
	304	Bucket spool	1	69~78 (51~58)	603	Port relief valve	3
	305	Boom conflux spool	1	69~78 (51~58)	604	Relief valve plug assy	2
	306	Travel spool	2	98~120 (72~89)	606	Bypass cut valve	2
	307	Travel straight spool	1	140~180 (103~133)	973	Socket bolt ; M14×160	8
	308	Arm 2 spool sub	1	140~180 (103~133)	974	Socket bolt ; M14×140	2
	309	P1 unload spool	1		977	Name plate	1
	310	P2 unload spool	1		978	Rivet	2
	311	Option spool	1				

(2) Main relief valve (Two stage relief) (601)

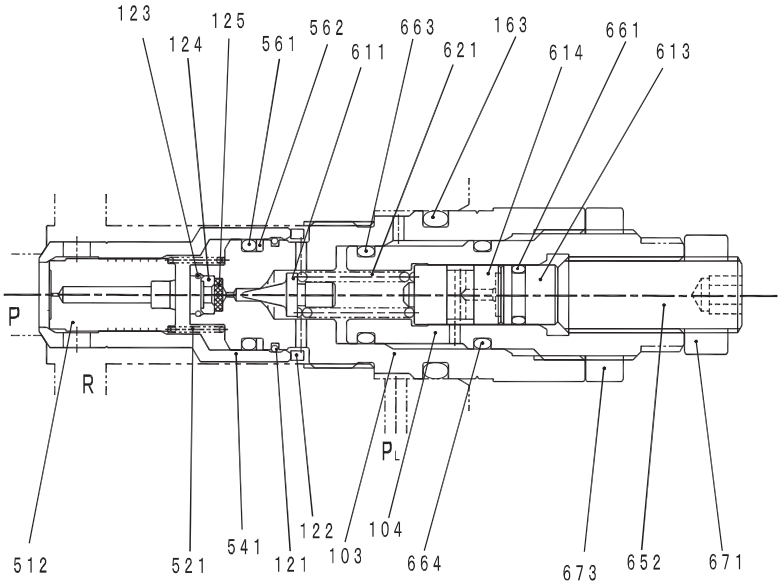


Fig. 24-29 Main relief valve (Two step relief)

Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty	Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty
69~78 (51~58)	103	Plug ; M27	1		562	Back up ring	1
	104	Adjust screw	1		611	Poppet	1
	121	C-ring	1		613	Stopper	1
	122	Spacer	1		614	Piston	1
	123	C-ring	1		621	Spring	1
	124	Filter stopper	1		652	Adjust screw	1
	125	Filter	1		661	O-ring	1
	163	O-ring	1		663	O-ring	1
	512	Plunger	1		664	O-ring	1
	521	Spring	1	28~31 (21~23)	671	Lock nut ; M14	1
	541	Seat	1	46~52 (34~38)	673	Lock nut ; M24	1
	561	O-ring	1				1

(3) Over load relief valve- Circuit relief (602,603)

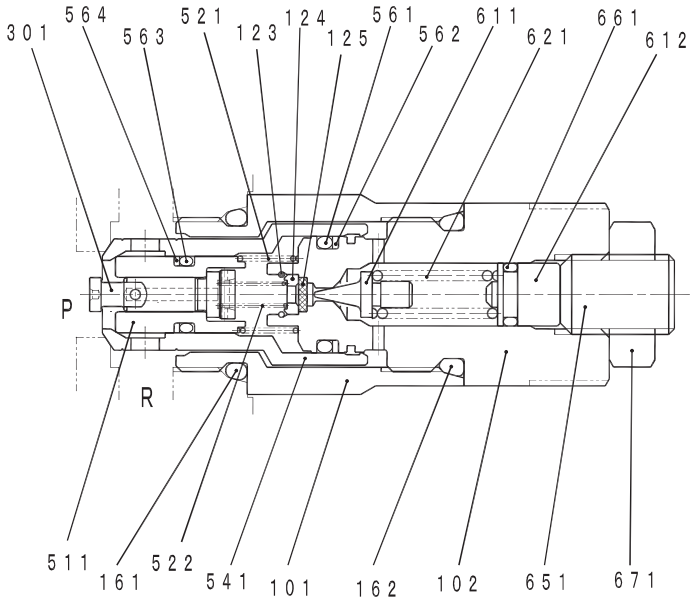


Fig. 24-30 Over load relief valve

Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty	Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty
69~78 (51~58)	101	Body ; M27	1		541	Seat	1
69~78 (51~58)	102	Plug ; M27	1		561	O-ring	1
	161	O-ring	1		562	Backup ring	1
	162	O-ring	1		563	O-ring	1
	123	C-ring	1		564	Backup ring	1
	124	Filter stopper	1		611	Poppet	1
	125	Filter	1		612	Spring seat	1
	301	Piston	1		621	Spring	1
	511	Plunger	1		651	Adjust screw	1
	521	Spring	1		661	O-ring	1
	522	Spring	1	28~31 (21~23)	671	Lock nut ; M14	1

(4) Arm 2 spool (308)

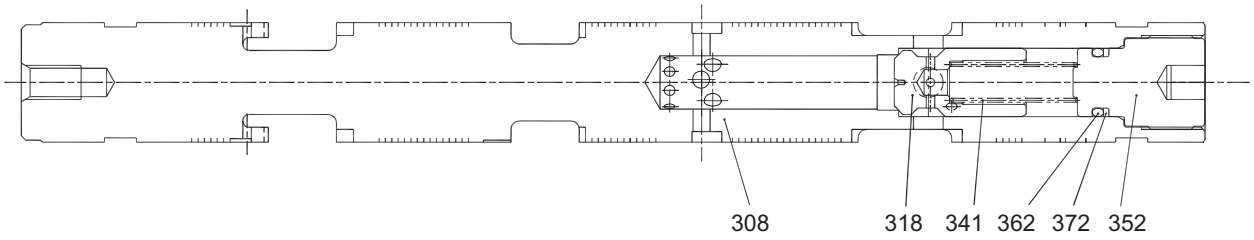


Fig. 24-31 Arm 2 spool

Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty	Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty
	308	Spool	1	33~35 (24~26) Loctite #638	352	Plug	1
	318	Plunger	1		362	O-ring	1
	341	Spring	1		372	Buckup ring	1

(5) Boom spool (301)

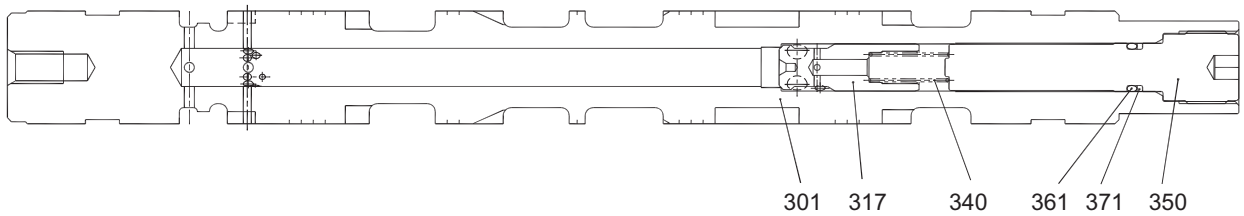


Fig. 24-32 Boom spool

Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty	Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty
	301	Spool	1	16~18 (12~13) Loctite #638	350	Plug	1
	317	Plunger	1		361	O-ring	1
	340	Spring	1		371	Buckup ring	1

(6) Travel straight spool (307)

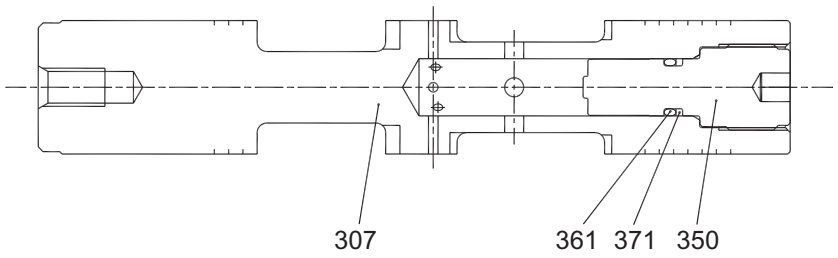


Fig. 24-33 Travel straight spool

Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty	Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty
	307	Spool	1		361	O-ring	1
16~18 (12~13) Loctite #638	350	Plug	1		371	Backup ring	1

(7) Lock valve selector (211)

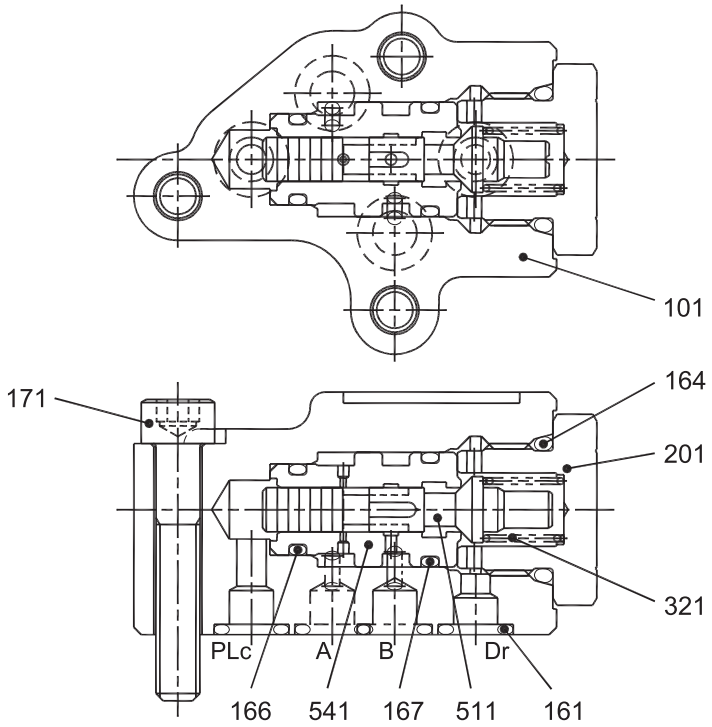


Fig. 24-34 Lock valve selector

Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty	Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty
	101	Casing	1	10~14 (7.4~10.3)	171	Socket bolt	3
	161	O-ring	4	49~59 (36~44)	201	Plug	1
	164	O-ring	1		321	Spring	1
	166	O-ring	1		511	Spool	1
	167	O-ring	1		541	Sleeve	1

(8) Bypass cut valve (606)

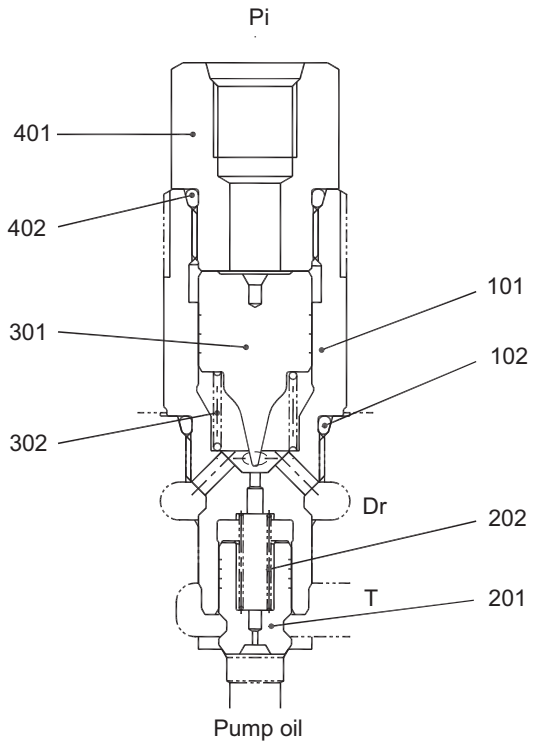


Fig. 24-35 Bypass cut valve

Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty	Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty
98~120 (72~89)	101	Plug	1		301	Plunger	1
	102	O-ring	1		302	Spring	1
	201	Poppet	1	69~78 (51~58)	401	Plug	1
	202	Spring	1		402	O-ring	1

(9) Swing shuttle valve cover (204)

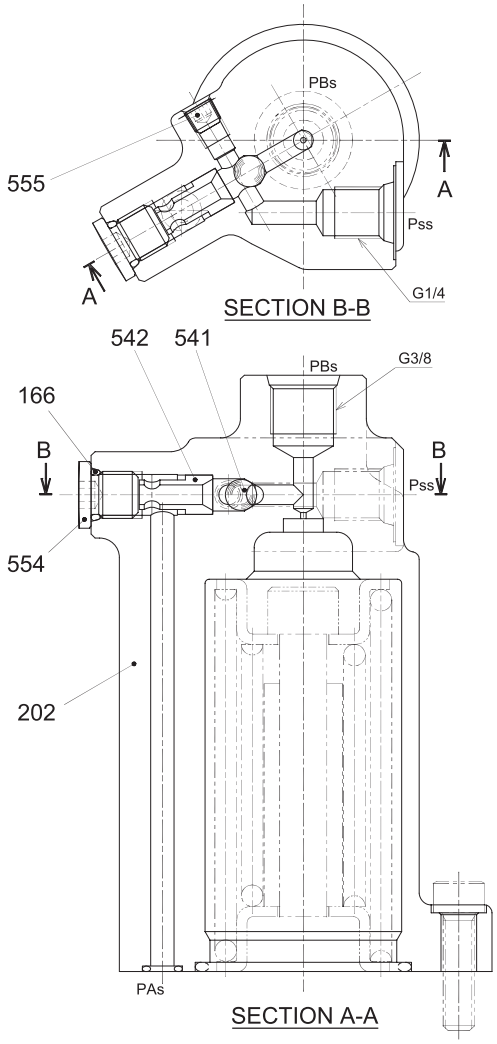


Fig. 24-36 Swing shuttle valve cover

Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty	Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty
	166	O-ring	1		542	Seat	1
	202	Cover	1	25~29 (18~21)	554	Plug	1
	541	Steel ball	1	7.9~9.8 (5.9~7.2)	555	Plug	1

(10)Boost check valve (517)

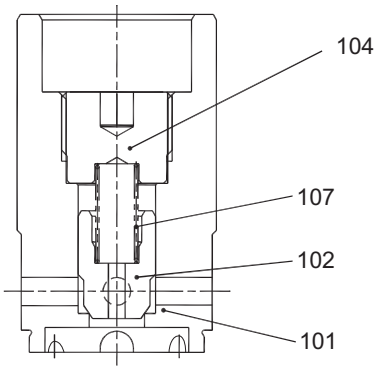


Fig. 24-37 Boost check valve

Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty	Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty
	101	Poppet	1	20~29 (15~21) Loctite #262	104	Plug	1
	102	Poppet	1		107	Spring	1

(10)Boost check valve, By-pass check valve

1) Boost check valve

The boost check valve is located between low pressure passage (D) and tank port T1 and generates boost pressure necessary for the low pressure passage.

a. In normal operation

The hydraulic oil from low pressure passage (D) moves the boost check valve (517) upward against the force of spring (527), and returns to the hydraulic tank through tank port T1. At this time, the pressure generated by spring (527) is used as the boost pressure for the low pressure passage.

But the return oil used for the arm out and bucket dumping operation does not pass through boost check valve (517), but returns from low pressure passage (D') to hydraulic tank through tank port T1.

b. In make up operation

When supplying to make up the flow rate through low pressure passage (D) after the swing operation is suspended, if the hydraulic oil quantity in low pressure passage (D) is not enough, the deficient hydraulic oil is made up from hydraulic tank into low pressure passage (D).

When the deficient hydraulic oil in low pressure passage (D) is not sufficient, the pressure of low pressure passage (D) is lowered. If the pressure of low pressure passage (D) is lowered to the pressure at tank port T1, poppet (102) housed in boost check valve (517) receives the pressure at tank port T1 on the receiving section in ring type which is made up of guide diameter and seat diameter of poppet (102), and is pushed upward and opens, and the hydraulic oil flows from the hydraulic tank to low pressure passage (D) to make up the deficient flow rate.

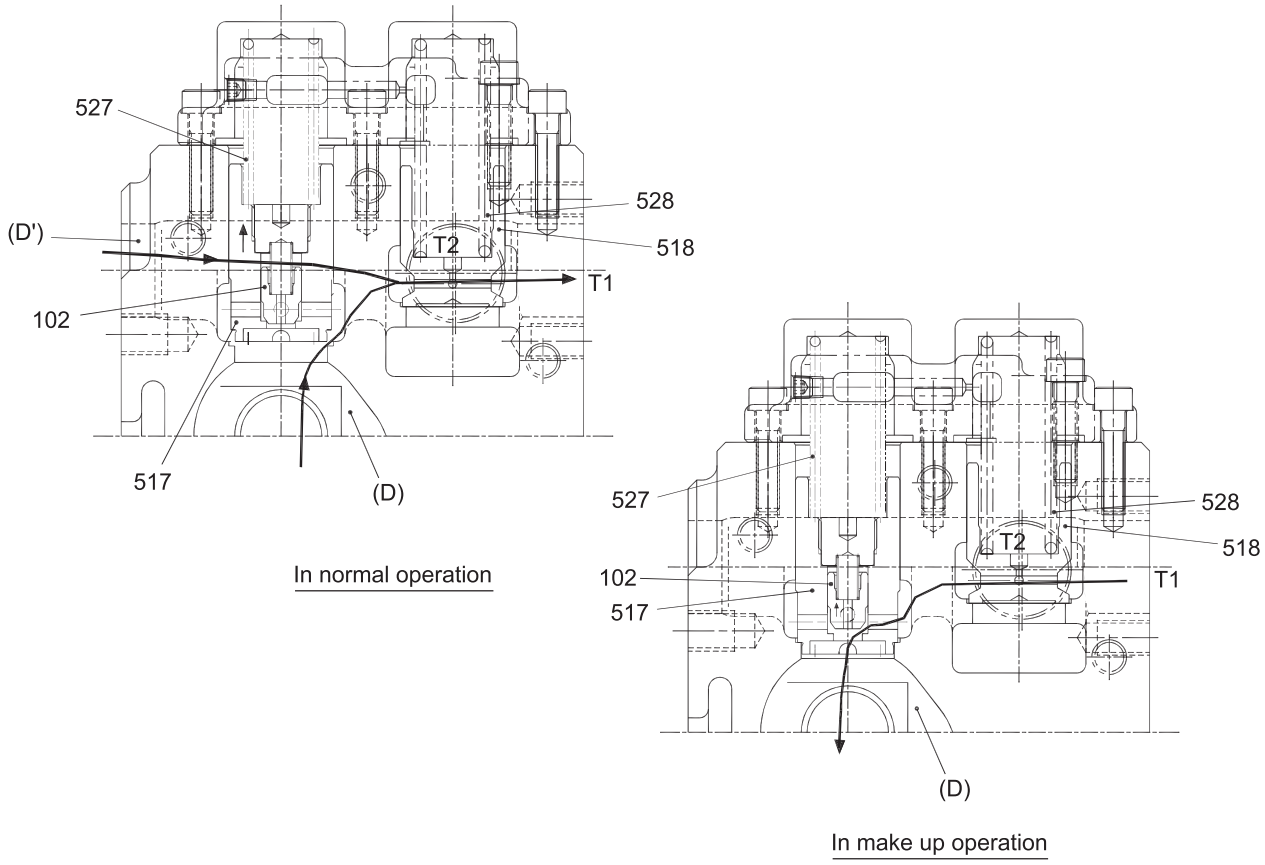


Fig. 24-56 Boost check valve operation

2) By-pass check valve

Even if the pressure at tank port T1 goes up due to the sudden change of return flow rate, the by-pass check valve actuates and prevents the pressure at tank port T1 from going up higher than the specified pressure, and consequently the oil cooler and filter located between tank port T1 and the hydraulic tank are protected from possible damage.

When the pressure at tank port T1 goes up to the pressure added by spring (528), by-pass check valve (518) is pushed and opens against the force of spring (528), and the hydraulic oil in tank port T1 directly returns to the hydraulic tank through tank port T2.

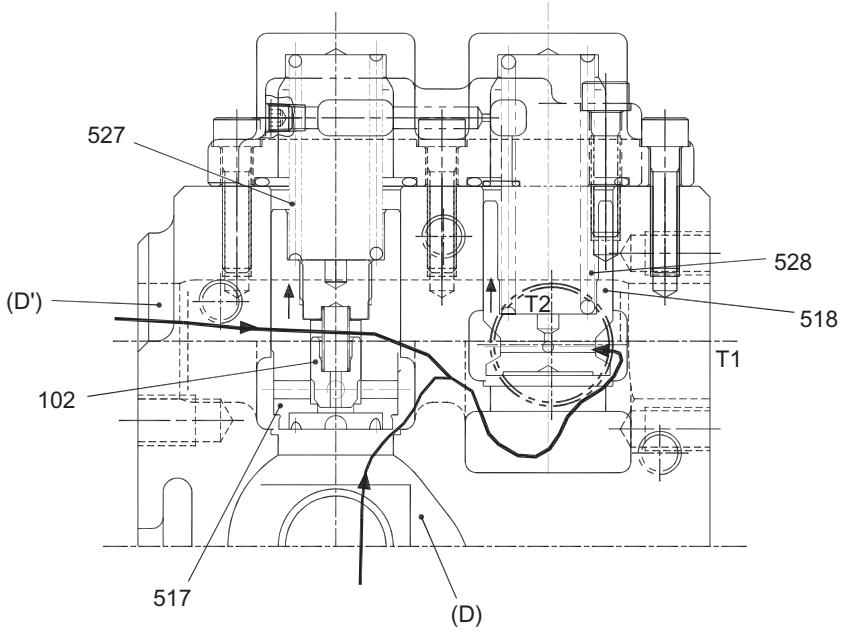
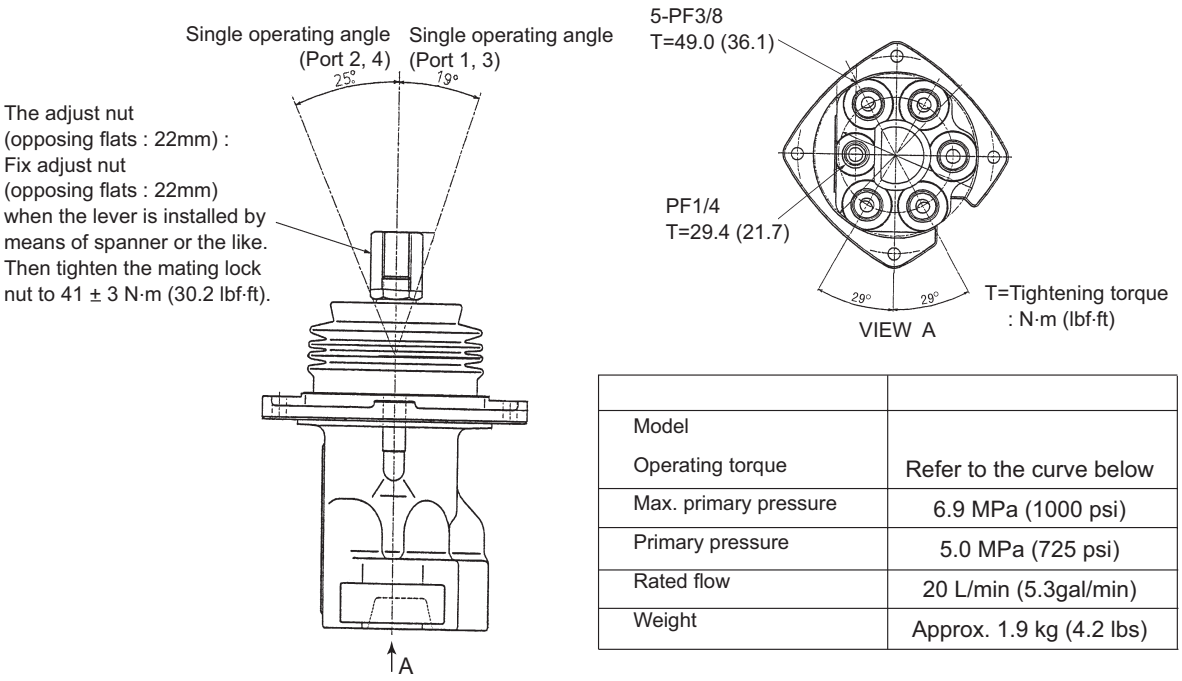


Fig. 24-57 By-pass check valve operation

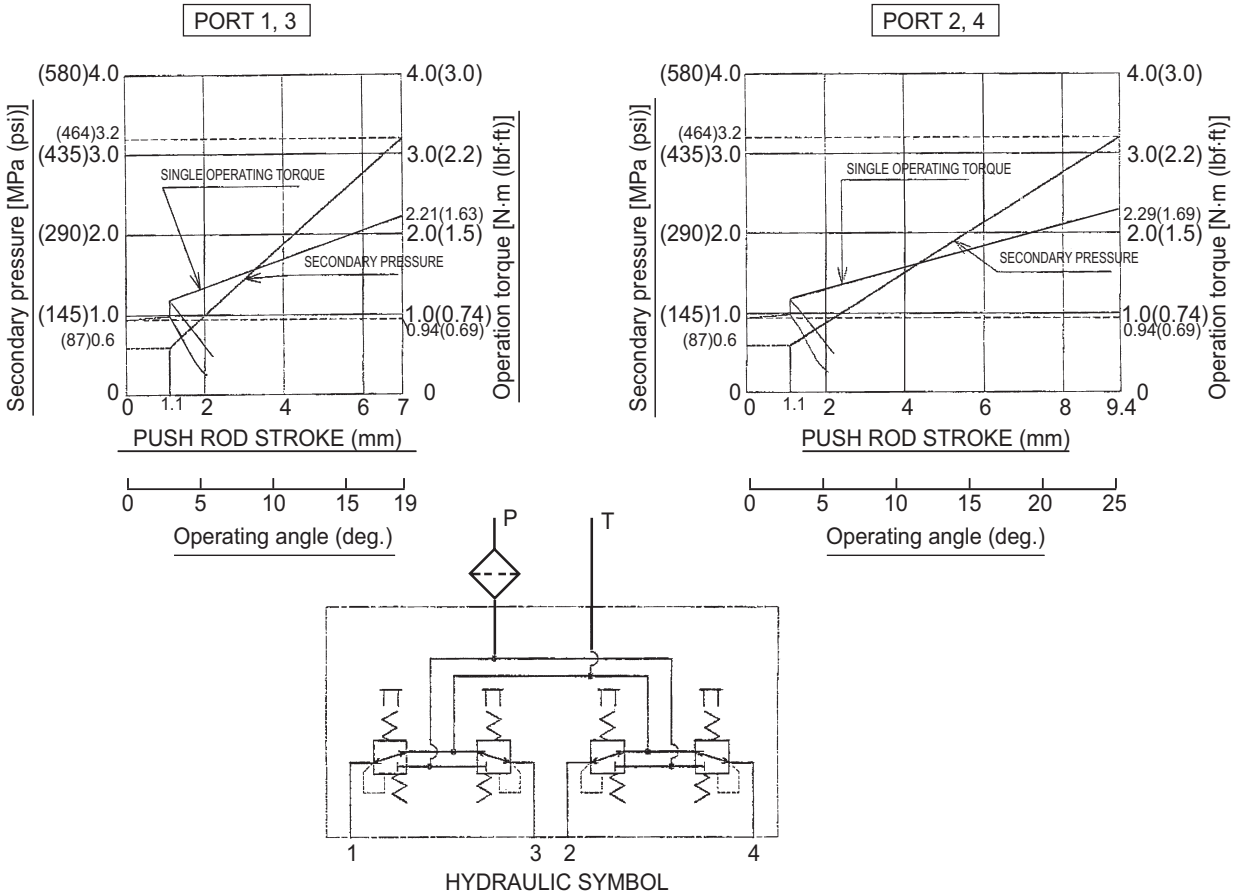
24.1.3 PILOT VALVE (ATT)

24.1.3.1 OUTLINE

(1) Outside view



Model	
Operating torque	Refer to the curve below
Max. primary pressure	6.9 MPa (1000 psi)
Primary pressure	5.0 MPa (725 psi)
Rated flow	20 L/min (5.3gal/min)
Weight	Approx. 1.9 kg (4.2 lbs)



24.1.3.2 CONSTRUCTION

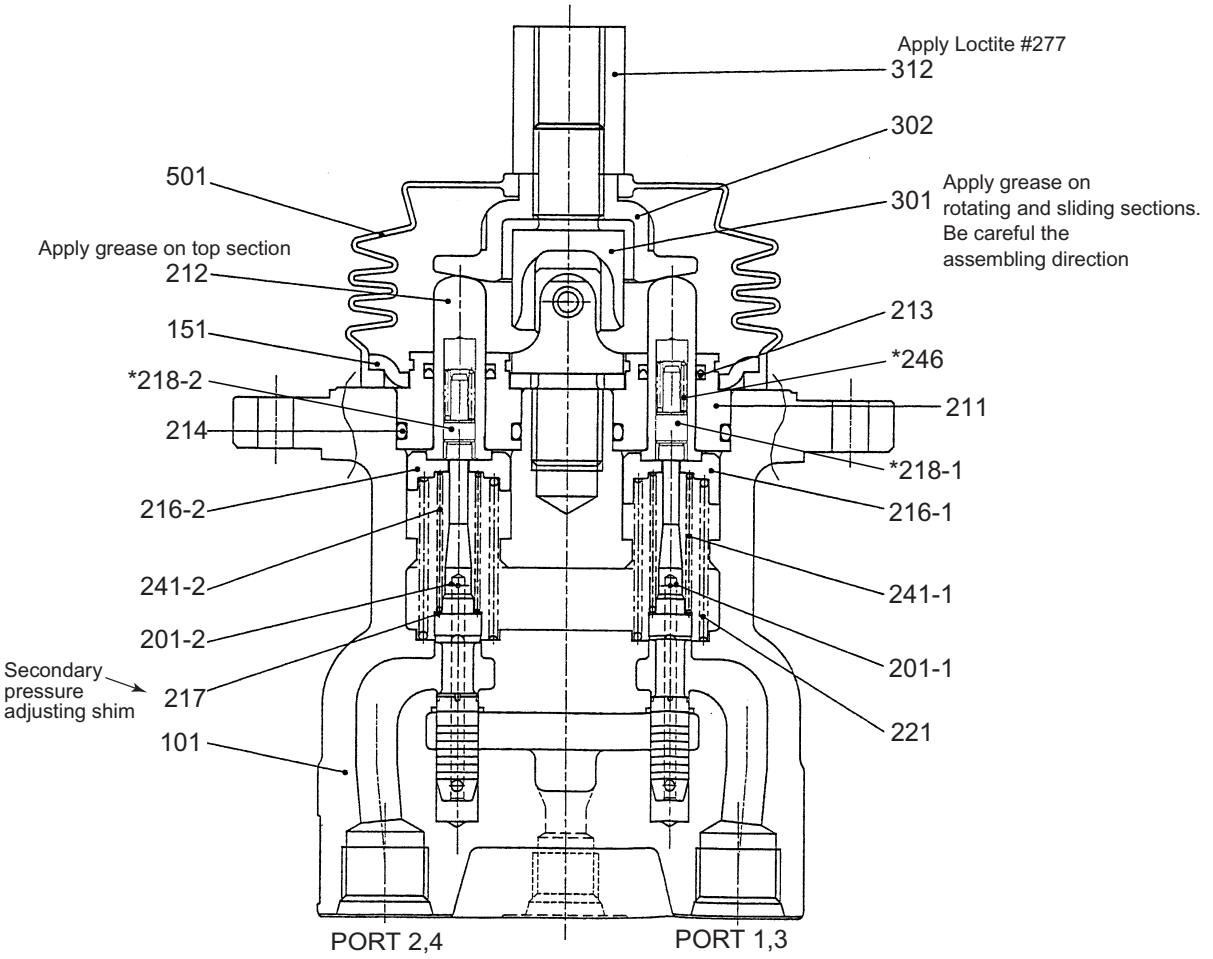


Fig. 24-58 Pilot valve (ATT)

Tightening torque N•m (lbf•ft)	No.	Name	Q'ty	Tightening torque N•m (lbf•ft)	No.	Name	Q'ty
	101	Casing	1		*218-1	Seat	2
	151	Plate	1		*218-2	Seat	2
	201-1	Spool	2		221	Spring	4
	201-2	Spool	2		241-1	Spring	2
	211	Plug	4		241-2	Spring	2
	212	Push rod	4		*246	Spring	4
	213	Seal	4	47.1 (34.7)	301	Joint : M14	1
	214	O-ring : 1B P20	4		302	Circular plate	1
	216-1	Spring seat	2	68.6 (50.6)	312	Adjust nut : M14	1
	216-2	Spring seat	2		501	Boots	1
	217	Washer 2 (Shim)	4				

Note) The parts marked * may not be equipped depending on valve type.

24.1.3.3 OPERATION

(1) Lever in neutral (See Fig. 24-59)
The action of spring (509) (for secondary pressure setting) that determines the output pressure of the pilot valve does not act upon spool (201). Therefore, spool (201) (for return) is pushed up by spring (221) [spring seat (216)]. The output ports (2,4) connect with the T port. The result is that the output pressure is equal to the tank pressure.

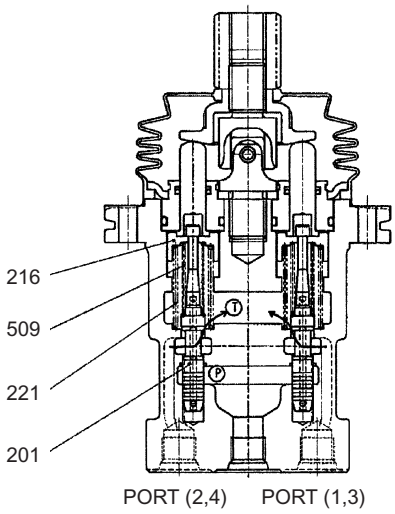


Fig. 24-59 Lever in neutral

(2) When the pilot lever is tilted (See Fig. 24-60)
When the lever is tilted and the push rod (511) strokes, the spool (201) [spring seat (216)] moves downward to make the port P to connect with the port 2, 4, with the result that the oil of the pilot pump flows to the port 2 ,4 to produce a pressure.

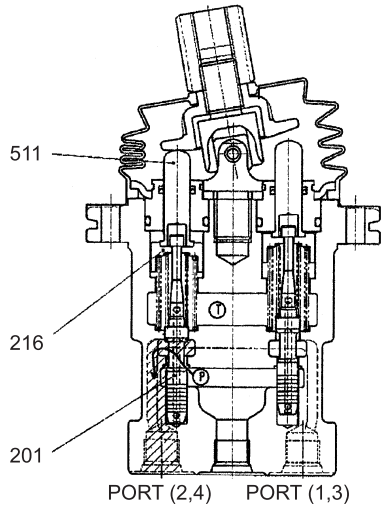


Fig. 24-60 When the lever is tilted

(3) Lever held (See Fig. 24-61)
When the pressure at ports (2,4) rises to a level equivalent to the action of spring (509) that is set by tilting the lever, the hydraulic pressure balances the spring action. When the pressure of ports (2,4) rises above a set value, ports (2,4) and the P port close while ports (2,4) and the T port open. When the pressure at ports (2,4) falls below a set value, ports (2,4) and the P port open while ports (2,4) and the T port close. Thus the secondary pressure is kept constant.

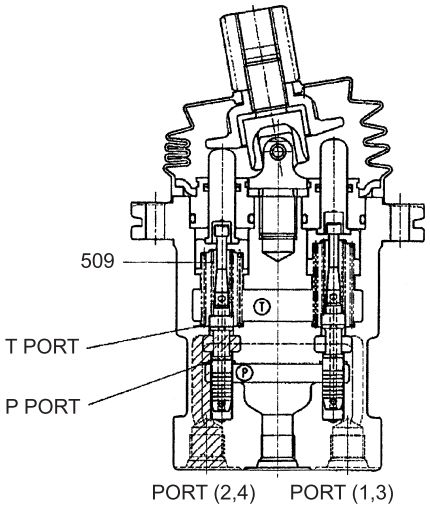


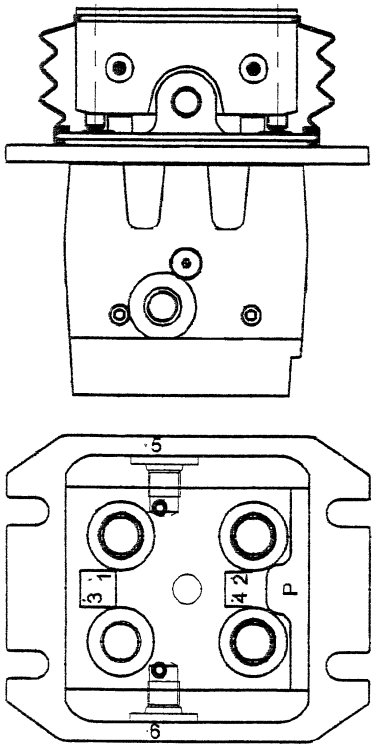
Fig. 24-61 When the lever is held

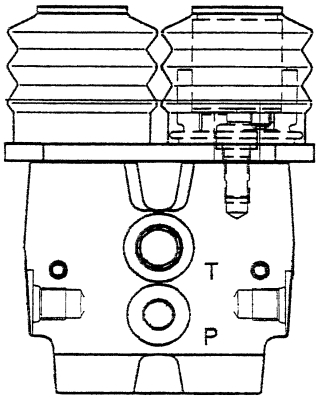
(4) Operation in the area where the tilting angle of the lever is large.
(varies with the model)
If the lever is inclined beyond a certain angle on certain models, the top end of the spool contacts the bottom of the bore of the push rod. This keeps the output pressure connected with the P port pressure.
Furthermore, on a model in which a spring seat and a spring are built in the push rod, the bottom of the bore of the push rod contacts the spring if the lever is turned beyond a certain angle. This causes the secondary pressure gradient to change by the spring action. Thereafter, the bottom of the bore of the push rod contacts the top end of the spring seat, keeping the output pressure connected with the P port.

24.1.4 PILOT VALVE (TRAVEL)

24.1.4.1 OUTLINE

(1) Outside view

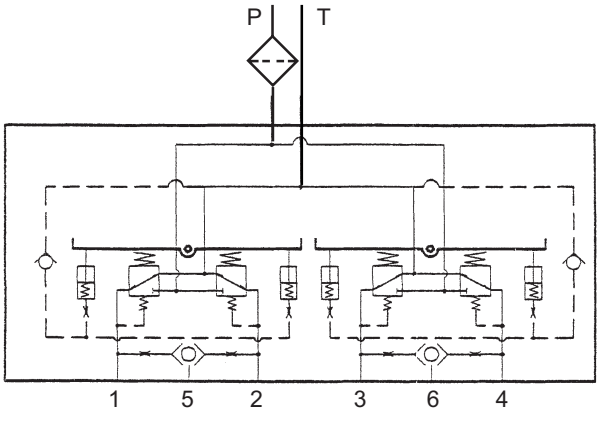




Port size	Tightening torque N·m (lbf·ft)	Port name	Function
PF3/8	30 (22)	1	LH travel forward port
		2	LH travel reverse port
		3	RH travel forward port
		4	RH travel reverse port
		T	Tank port
PF1/4	16.7 (12.3)	5	LH travel pressure sensor port
		6	RH travel pressure sensor port
		P	Pilot primary pressure port

(2) Specifications

Item	Specifications
Part No.	YN30V00105F1
Type	6TH6NRZ
Primary pressure	4.9MPa (711psi)
Secondary pressure	0.54~2.35MPa (78~341 psi)
Rated flow	25 L/min (6.6 gal/min)
Weight	Approx. 8kg (18 lbs)

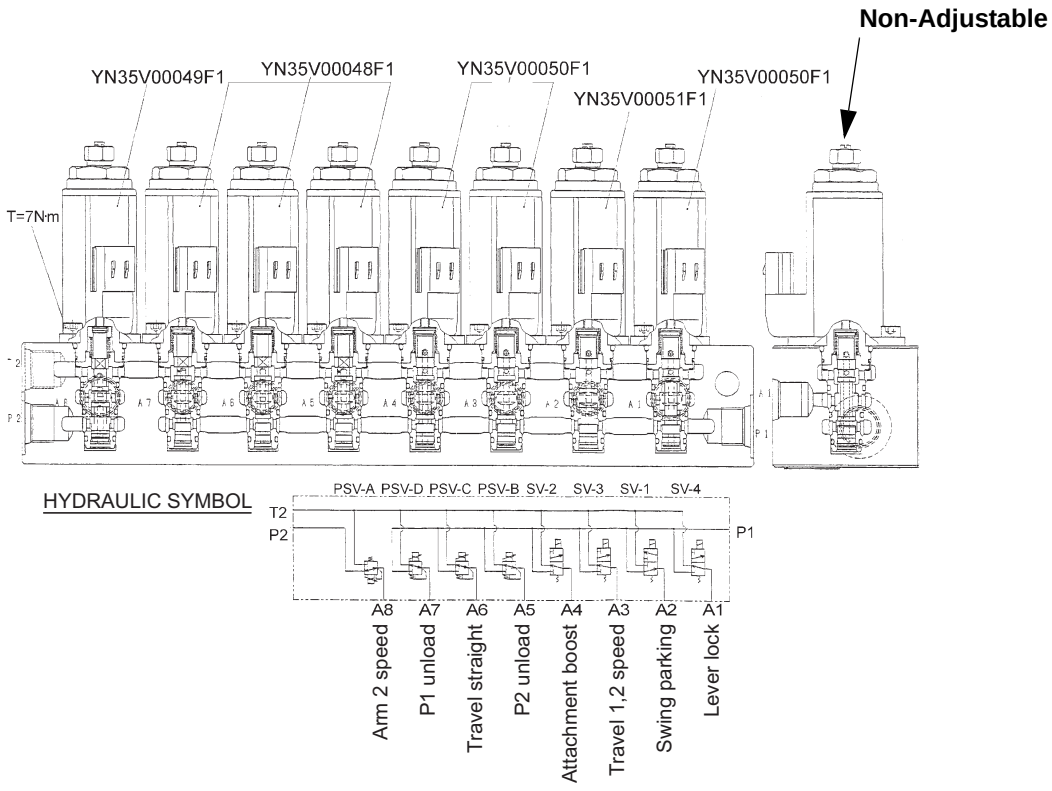


Hydraulic symbol

Multi Solenoid Manifold Block

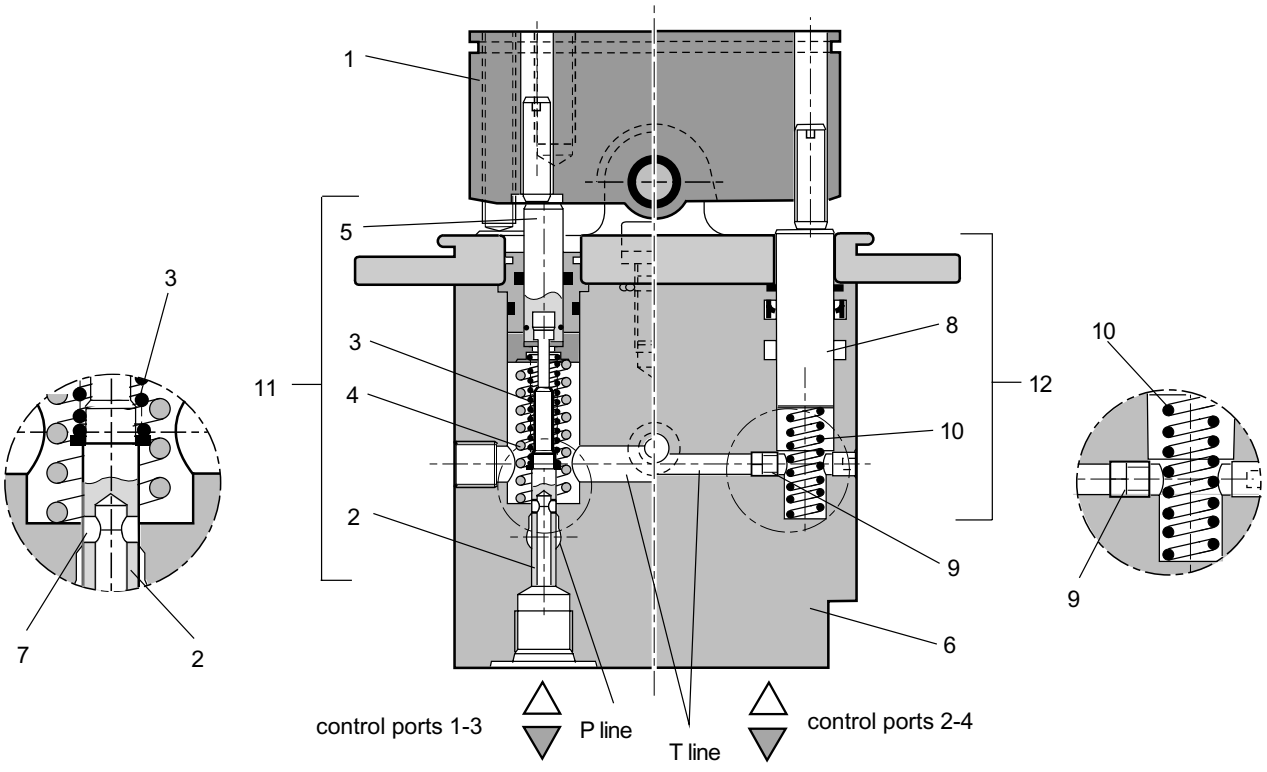


Item	Specifications	
Solenoid Valve (On/Off Type)	Rated Voltage	20.4 ~30 Vdc
	Coil Resistance	34 ~ 40 Ω
Proportional Solenoid Valve (Variable Type)	Rated Voltage	20.4 ~30 Vdc
	Coil Resistance	17 ~ 25 Ω



24.1.4.2 Construction and operation

The hydraulic remote control valve in TH6NR type is operated with directly-operated pressure-reducing valve.
The pilot control equipment TH6NR in double foot pedal type is made up of the actuating section which is equipped with 2 foot supports (1), 4 pressure-reducing valves (11), 4 damper system (12) and body (6).
Every pressure-reducing valve is made up of control spool (2), control spring (3), return spring (4) and plunger (5).
The dumper system is made up of plunger (8), orifice (9) and return spring (10).
In stationary condition, the pedal is held in neutral position by return spring (10).
In operation, the foot pedal pushes the plunger (5) used for pressure-reducing valve and plunger (8) used for dumper system.
The hydraulic oil fed into damper chamber is restricted in the orifice (9) by the pressure corresponding to the operating speed. [Similarly, when the foot pedal returns to the neutral position with the return spring, the hydraulic oil trapped in the damper chamber is forced out. Consequently the return speed is controlled by the flow rate of hydraulic oil led through orifice (9).]
Simultaneously, the plunger (5) is pushed against return spring (4) and control spring (3). The control spring (3) first moves the control spool (2) downwards, and then closes the passage between control port and the return pipe to tank port (T). At the same time, the control port is connected to passage (7). When the control spool reaches to the position the force of control spring (3) balances the pressure of control port (1 or 2), it starts retaining the condition.
The pressure of control port is proportional to the stroke of plunger (5) and the position of pedal (1) according to the mutual relations between the control spool (2) and control spring (3).
The closed circuit pressure control makes proportional control of selector valve and high responsibility of hydraulic pump and motor possible in relation with the characteristics of foot pedal (1) position and control spring (3).



24.1.7 SWIVEL JOINT

24.1.7.1 GENERAL VIEW

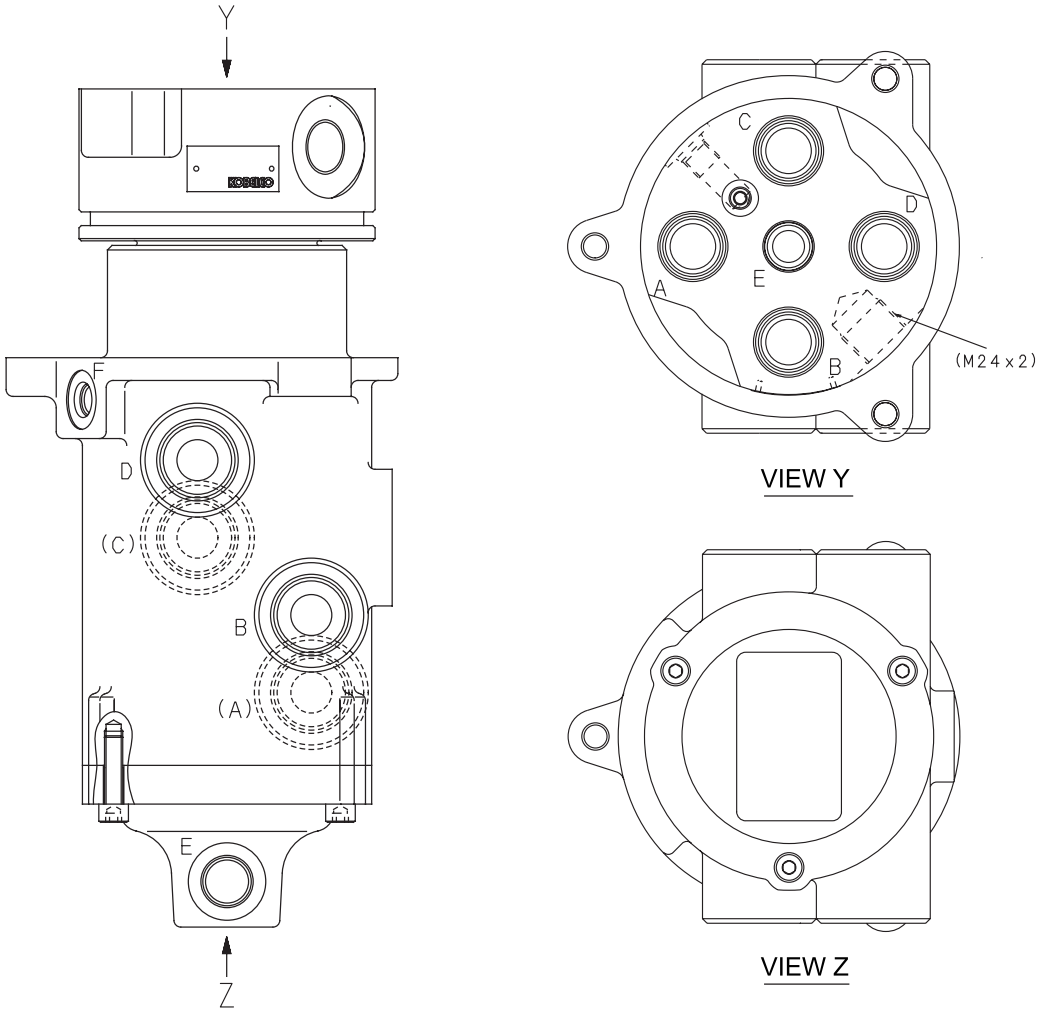


Fig. 24-92 General view of swivel joint

24.1.7.2 SPECIFICATIONS

Item		Specifications
Assy parts No.		YN55V00053F1
High pressure ports A, B, C, D	Working pressure Max. impact pressure Rated flow	34.3 MPa (4970 psi) 51.5 MPa (7470 psi) 255 L/min (67 gal/min)
Low pressure ports E	Working pressure Rated flow	0.5 MPa (73 psi) 50 L/min (13 gal/min)
Low pressure ports F	Working pressure Rated flow	5 MPa (725 psi) 30 L/min (8 gal/min)
Revolution speed		15 min^{-1} (15 rpm)
Ports size	A, B, C, D (Body) A, B, C, D (Stem) E F	PF1 PF3/4 PF1/2 PF1/4
Length : L		368 mm (14.5")
Weight		25 kg (245 lbs)

24.1.7.3 CONSTRUCTION

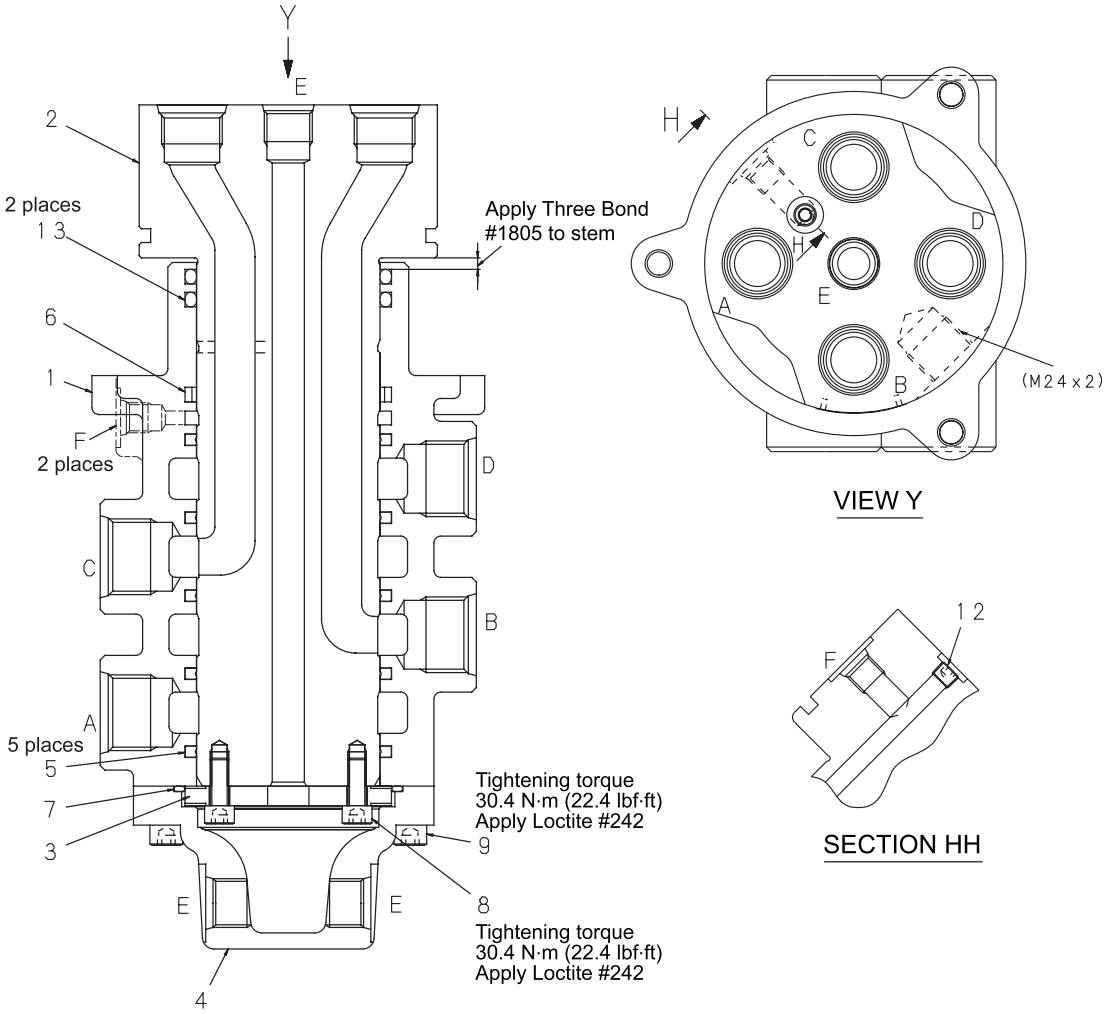


Fig. 24-93 Construction

No.	Name	Q'ty	No.	Name	Q'ty
1	Body	1	7	O-ring(G95 1A)	1
2	Stem	1	8	Capscrew (M8×20)	2
3	Thrust plate	1	9	Capscrew (M8×30)	3
4	Cover	1	12	Plug	1
5	Seal	5	13	O-ring	1
6	Seal	1			

24.1.7.4 OPERATION

The swivel joint consists mainly of body (1) and stem (2) that rotate mutually, thrust plate (3) preventing both components from falling off, cover (4) closing one side of body (1), seal (5) that partitions off the circuits and seal assy (6) and O-ring (7) that prevent external leaks.

Four ports for the travel main circuits are provided on body (1) and stem (2). Further, four oil passing grooves are arranged in the inner surface of body (1), with seal (5) fixed above and below the circumferential groove.

The body (1) and the stem (2) rotate mutually. The oil flowing in from body (1) or stem (2) keeps on flowing to stem (2) or body (1) past the circumferential groove between body (1) and stem (2) ; the oil flow is never shut off because of rotation. Further, an oil groove for lubrication that connects with the drain port is provided, in order to prevent the body (1) from seizure with the stem (2).

This construction keeps on connecting the circuits between the swing bodies by means of a swivel joint.

24.1.8 CYLINDER

24.1.8.1 SPECIFICATIONS

(1) General view

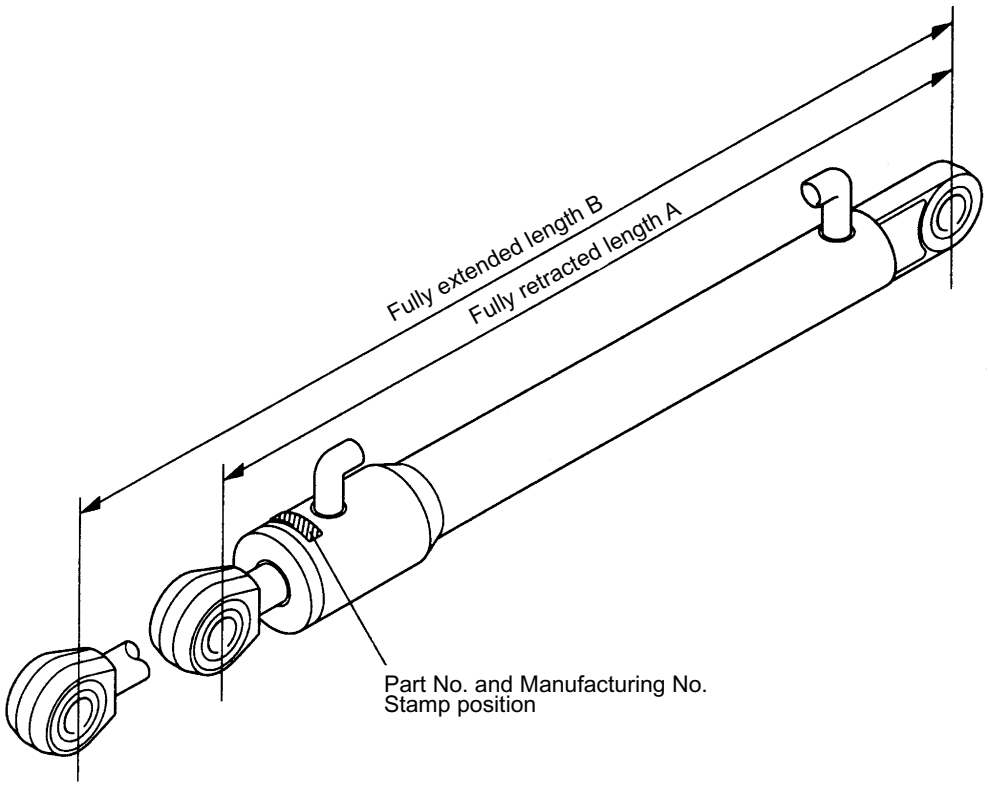


Fig. 24-94 General view of cylinder

(2) Specifications

Unit : mm (ft-in)

Use		Part No. of cylinder assy	Cylinder bore / Rod Dia.	Stroke	Center distance of pins Full extend B / Full retract A	Cushion	Dry weight kg (lbs)
Boom		LC01V00044F1	ø140 / ø100 (5.51" / 3.94")	1,550 (5'1")	3,651 / 2,101 (11'12" / 6'11")	With cushion on rod side	269 (593)
Arm	SE.Asia	LC01V00054F2	ø170 / ø120 (6.69" / 4.72")	1,788 (5'10")	4,281/ 2493 (14'1" / 8'2")	With cushion on both sides	504 (1,111)
	Oceania	LC01V00054F1					
Bucket	SE.Asia	LC01V00055F2	ø150 / ø100 (5.91" / 3.94")	1,193 (3'11")	3,005 / 1,812 (9'10" / 5'11")	With cushion on rod side	265 (584)
	Oceania	LC01V00055F1					

24.1.8.2 CONSTRUCTION AND FUNCTION

24.1.8.2.1 CONSTRUCTION

(1) Boom cylinder - Mono cushion

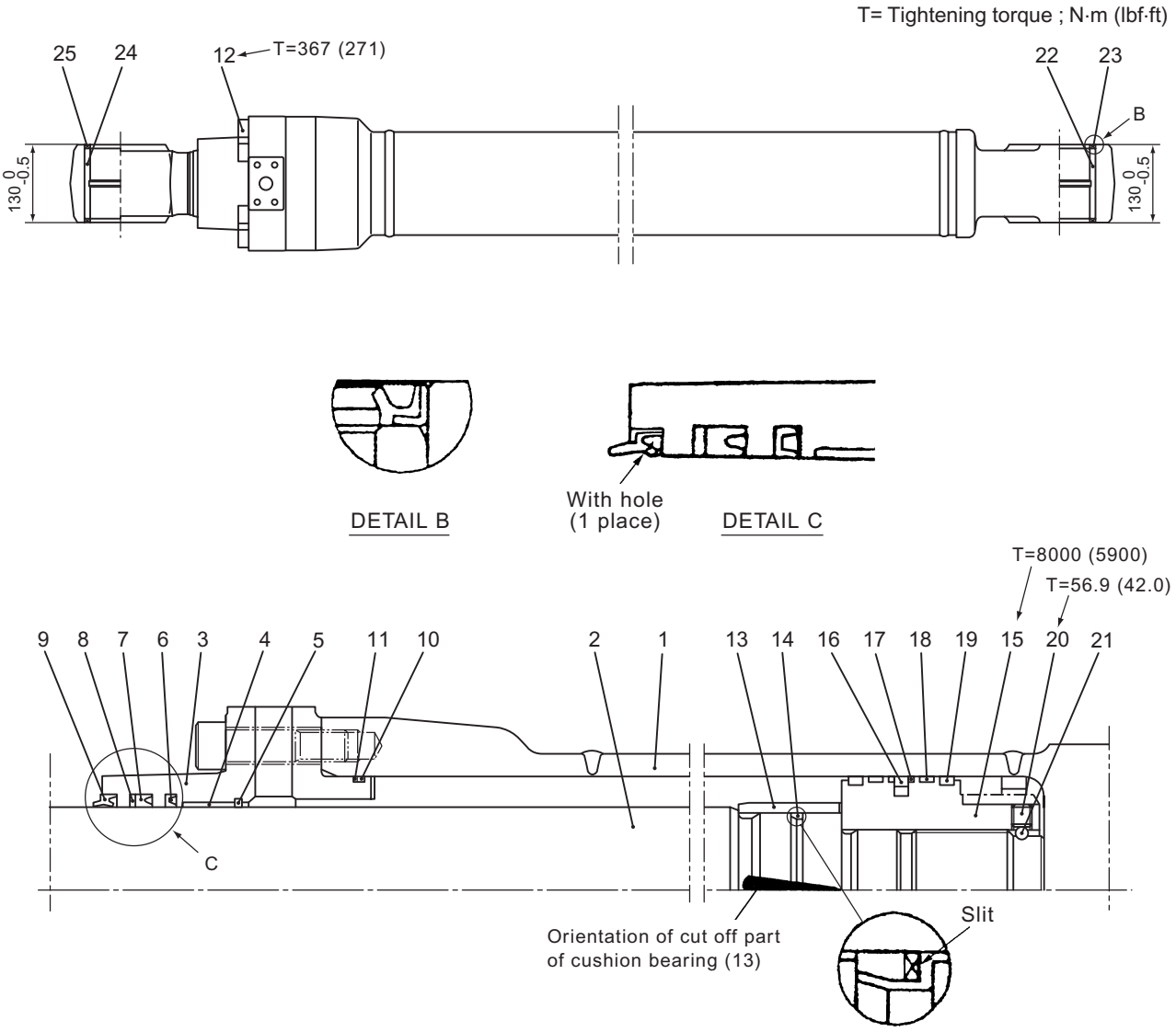


Fig. 24-95 Construction of boom cylinder

P/No	LC01V00044F1							
No.	Parts	Q'ty	No.	Parts	Q'ty	No.	Parts	Q'ty
1	Cylinder tube	1	10	O-ring	1	19	Slide ring	2
2	Piston rod	1	11	Buckup ring	1	20	Set screw; M14	1
3	Rod cover	1	12	Socket bolt; M18×80	12	21	Steel ball	1
4	Bushing	1	13	Cushion bearing	1	22	Pin bushing	1
5	Snap ring	1	14	Cushion seal	1	23	Wiper ring	2
6	Buffer ring	1	15	Piston	1	24	Pin bushing	1
7	U-ring	1	16	Seal ring	1	25	Wiper ring	2
8	Buckup ring	1	17	Buckup ring	2			
9	Wiper ring	1	18	Slide ring	2			

(2) Arm cylinder- Dual cushion

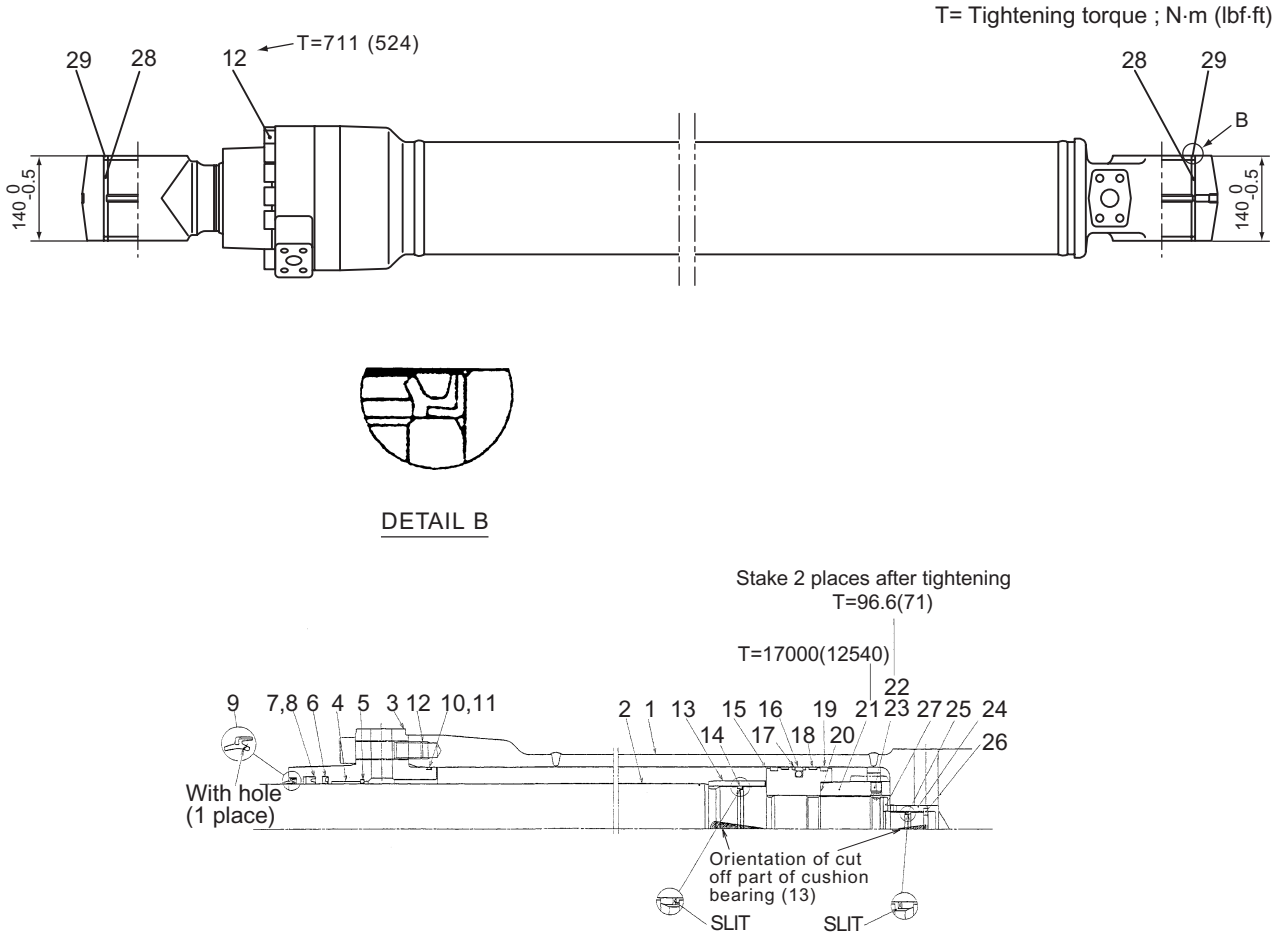


Fig. 24-96 Construction of arm cylinder

P/No	LC01V00054F2	SE.Asia
	LC01V00054F1	Oceania

No.	Parts	Q'ty	No.	Parts	Q'ty	No.	Parts	Q'ty
1	Cylinder tube	1	11	Buckup ring	1	21	Piston nut	1
2	Piston rod	1	12	Socket bolt; M22×95	12	22	Set screw; M16	1
3	Rod cover	1	13	Cushion bearing	1	23	Steel ball	1
4	Bushing	1	14	Cushion seal	1	24	Cushion bearing	1
5	Snap ring	1	15	Piston	1	25	Cushion seal	1
6	Buffer ring	1	16	Seal ring	1	26	Stopper	2
7	U-ring	1	17	Buckup ring	2	27	Snap ring	1
8	Buckup ring	1	18	Slide ring	2	28	Pin bushing	2
9	Wiper ring	1	19	Slide ring	2	29	Wiper ring	4
10	O-ring	1	20	Shim	1			

(3) Bucket cylinder - Mono cushion

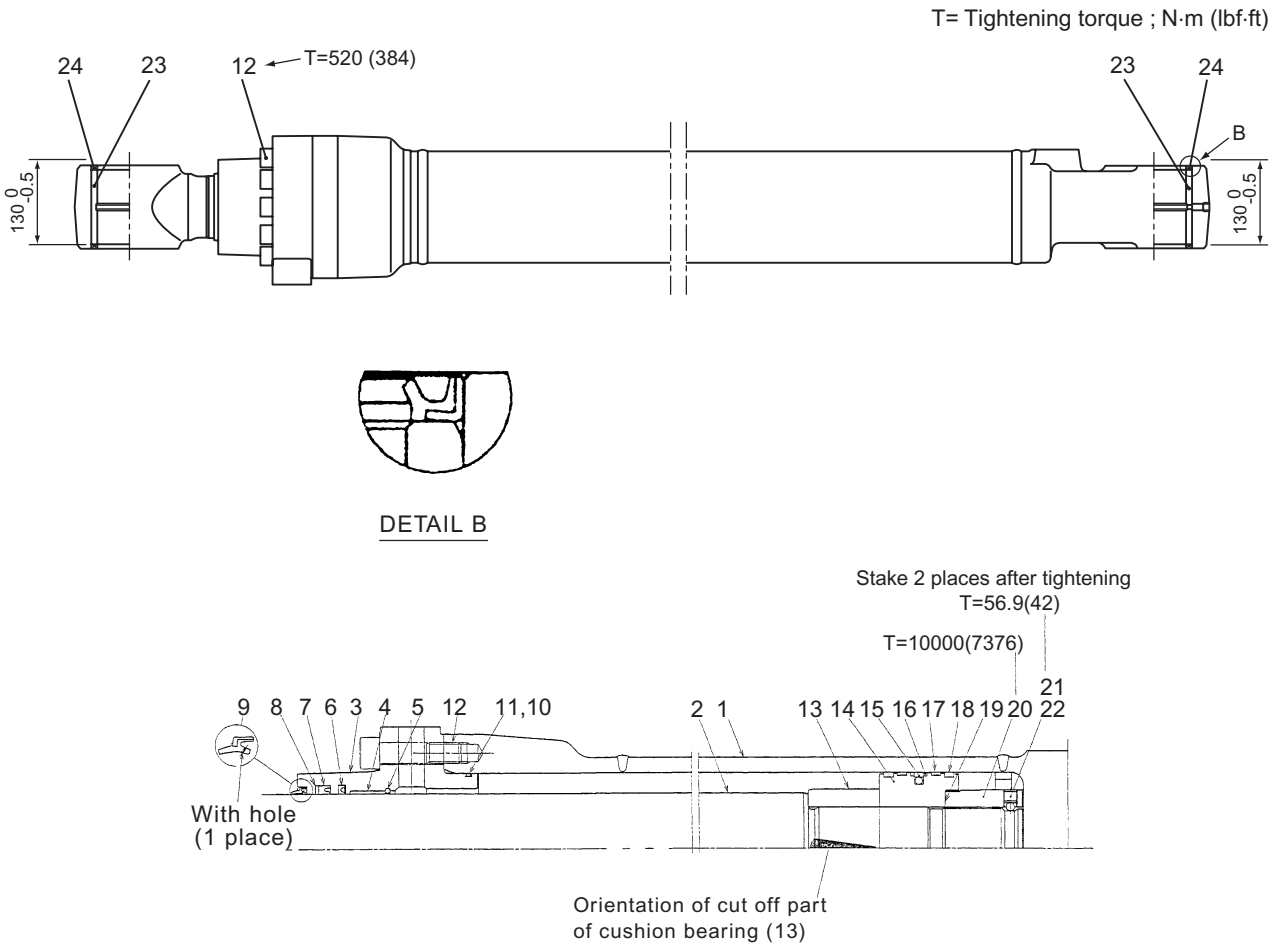


Fig. 24-97 Construction of bucket cylinder

P/No	LC01V00055F2	SE.Asia
	LC01V00055F1	Oceania

No.	Parts	Q'ty	No.	Parts	Q'ty	No.	Parts	Q'ty
1	Cylinder tube	1	9	Wiper ring	1	17	Slide ring	2
2	Piston rod	1	10	O-ring	1	18	Slide ring	2
3	Rod cover	1	11	Buckup ring	1	19	Shim	1
4	Bushing	1	12	Socket bolt; M20×95	12	20	Piston nut	1
5	Snap ring	1	13	Cushion bearing	1	21	Set screw; M14×2	1
6	Buffer ring	1	14	Piston	1	22	Steel ball	1
7	U-ring	1	15	Seal ring	1	23	Pin bushing	4
8	Buckup ring	1	16	Buckup ring	2	24	Wiper ring	4

HYDRAULIC CYLINDER CONSTRUCTION (See Fig. 24-95)
By construction the hydraulic cylinder consists mainly of cylinder tube assy (1), piston rod assy (2) that takes out the motion of pistons reciprocating in the cylinder tube assy, and cylinder head (3) that serves as both a lid and a guide. Cylinder tube assy (1) is equipped with a pin mount (clevis) that connects piston rod assy (2) with other parts.
In addition to these main components, seal ring (16) and back-up ring (17) are located between cylinder tube assy (1) and piston rod assy (2); buffer ring (6), U-ring (7) back-up ring (8) and wiper ring (9) are located between piston rod assy (2) and cylinder head (3); and an O-ring (10) and a back-up ring (11) are placed between cylinder tube assy (1) and cylinder head (3)

24.1.8.2.2 OPERATION

If pressurized oil is fed alternatively to the oil inlet and outlet provided in the cylinder, force acts on the piston which in turn causes the piston rod (2) to extend and retract.

(1) Operation of cylinder with cushion

1) Cushion on rod side
The cushion mechanism is provided to prevent the generation of shock when the moving speed of piston (15) is not reduced and strikes cylinder head (3).
An oil in chamber "A" returns to the tank by passing through passage "B" at a fixed flow rate in a intermediate stroke state (Fig. 24-98) of pressing head side. Next, in a state of just before stroke end (Fig. 24-99), cushion ring (13) plunges into passage "B".
At this time, an oil in chamber "A" passes clearance "D" and mouth gap "C", an oil flow volume returning to tank suddenly drops and the piston part movement slows down.

2) Cushion on head side (See Fig. 24-100)
This construction is similar to the one of cushion on rod side. In a state of intermediate stroke pressing rod side, an oil in chamber "A" returns to tank by passing through passage "B" at a fixed flow rate.
Next, in a state of just before stroke end, cushion bearing (22) plunges into passage "B". At this time, the oil in chamber "A" flows only through clearance "D" and mouth gap "C" of cushion seal (23). So the returning oil volume drops suddenly and the piston movement slows down.

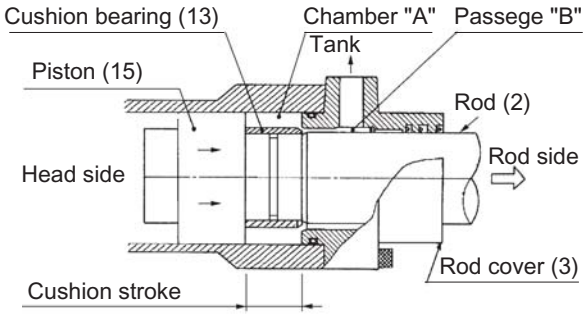


Fig. 24-98 Cushion mechanism on the rod side

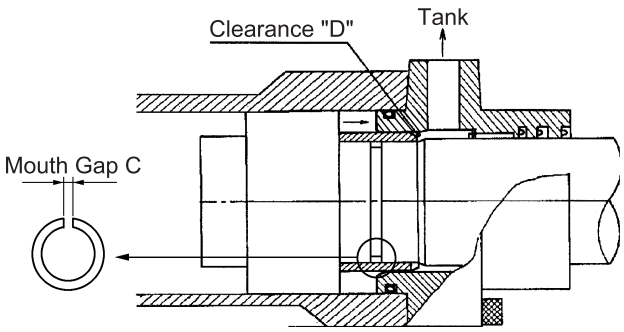


Fig. 24-99 Cushioning action on the rod side

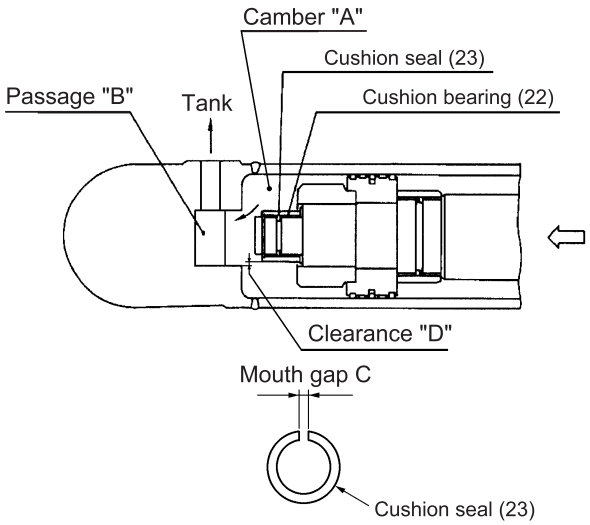


Fig. 24-100 Cushion mechanism on the head side

Notes

https://truckmanualshub.com/

KOBELCO

Mark 8

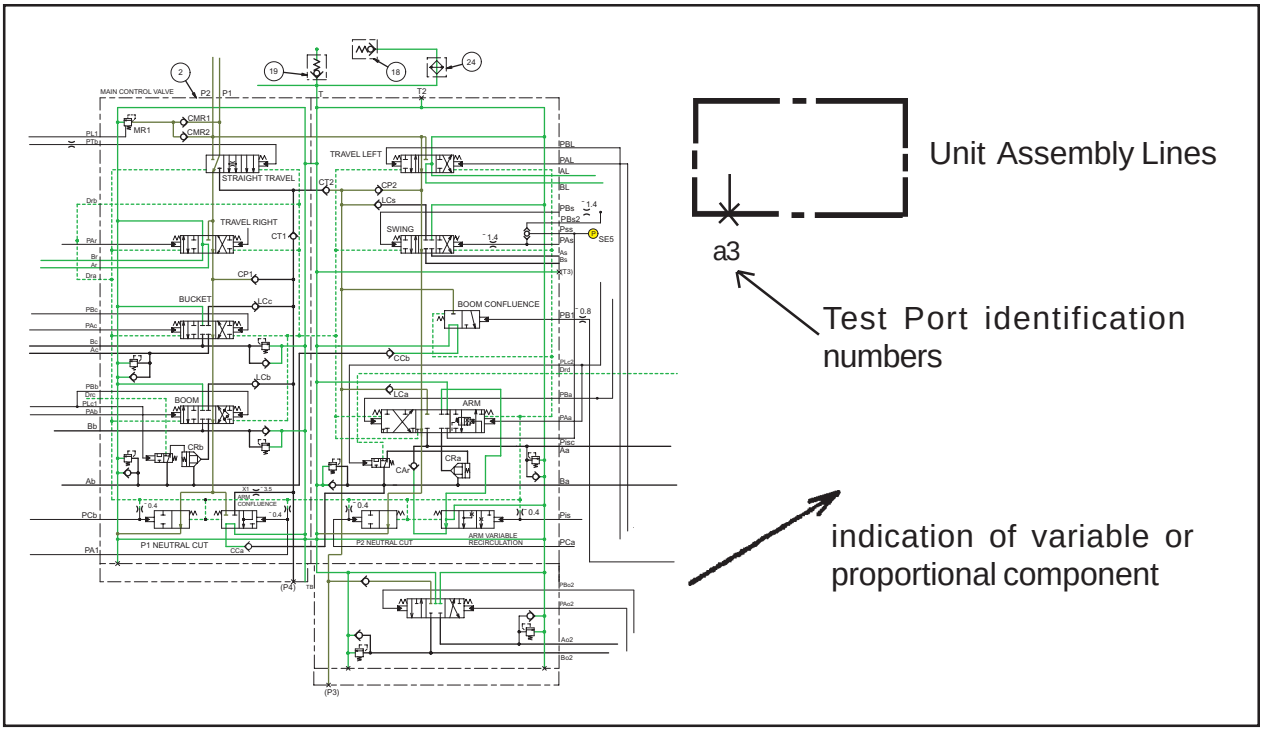


Hydraulic Schematics

KOBELCO

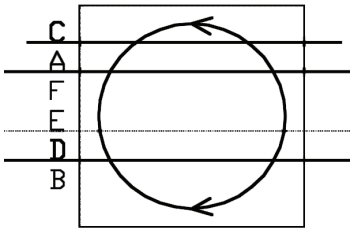
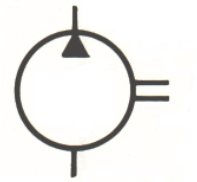
Kobelco Construction
Machinery America LLC

https://truckmanualshub.com/

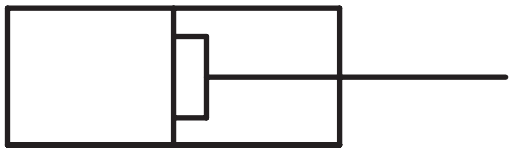
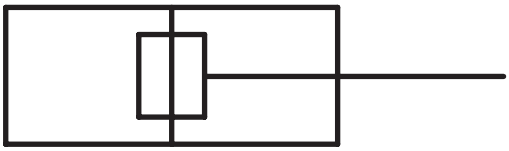
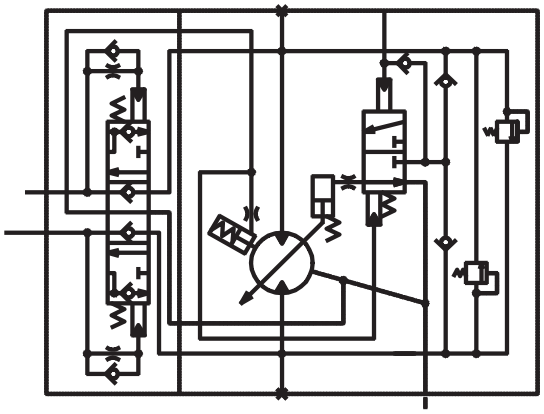


Name	Symbols	Remarks
Main line		The main line is the suction line, pressure line and return line.
Pilot line		Used for all pilot circuits.
Drain line		Short dashed lines
Connection of line		Dot represents connection
Tank (Drain) Symbol		Hydraulic oil Returning to the Hydraulic Tank
Line intersecting		Without connection point.

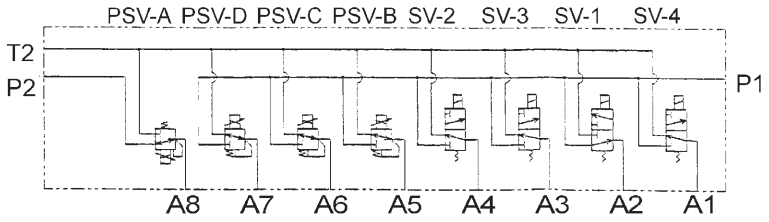
https://truckmanualshub.com/

Name	Symbol	Remarks
One way check valve		
Swivel Joint		Example: swivel for excavators
Fixed displacement hydraulic pump		Example: hydraulic gear pump for pilot system
Variable displacement hydraulic pump		Example: main hydraulic pump

https://truckmanualshub.com/

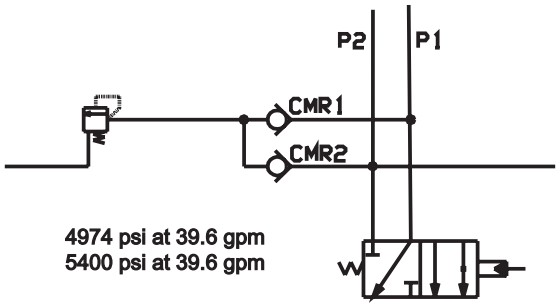
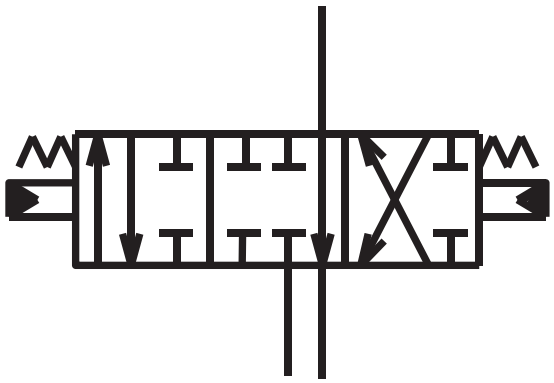
Name	Symbol	Remarks
Single cushioned cylinder		Cushion cylinders helps prevent damage to circuits and cylinder.
Double cushioned cylinder		Cushion cylinders helps prevent damage to circuits and cylinder.
Bi-directional motor (Variable speed)		Typical of the travel motors used on the excavators

Electromagnetic Solenoids



Normally Open: Swing P/B
Normally closed: Lever Lock, Att boost, 1/2 speed travel
Proportional: P2 Unload, Travel priority, P1 Unload

https://truckmanualshub.com/

Name	Symbol	Remarks
Two stage main relief with check valves		Compound main relief Potential two stage relief when pilot oil is added to spring to increase pressure. Used on excavators with power boost heavy lift.
Pilot operated, open center work spool	 Springs drawn on each end of the spool assembly will return the spool to the drawn position in the circuit, when not activated by pilot oil. Triangles drawn on the end of the spool and filled (colored) indicate pilot oil will shift the spool.	The number of the continuous squares (rectangle) will indicate the numbers of the valve selecting position. As a general rule, the SPOOL will be shown in the neutral position. Neutral is described as the following the hydraulic pump is producing flow and the operator has not activated a function. The arrow entered in each of the squares (rectangle) will indicate flow direction at one of the selecting position.

https://truckmanualshub.com/

MARK 8 SERIAL NUMBER RANGE

SK160LC	YM~ N/A at press time
ED190LC	YL~ N/A at press time
SK210LC	YQ09U3301 ~ Positive Control
SK260LC	LL10U1501 ~ Positive Control
SK290LC	LB0 ~ N/A at press time
SK350LC	YC08U1601 ~ Positive Control
SK480LC	YS0~ N/A at press time

Positive control system: Proportional solenoid valves (PSV) use pilot pump oil (P3) thru the PSV to control the servo piston of the pump by placing force on the compensating spool in the pump regulator it forces the compensating spool to allow pressure only to the small diameter end of the servo piston to push the pump on stroke. This pressure is at a minium range(80~100psi) at neutral. PSV pressure is increased to allow the stroke angle of the pump's rotating group to change from a low flow state to a high flow state based on system working pressure and electronic control of the PSV-1 and PSV-2 by the main C-1 computer. Thus sense the pressure is added (addition) or increased this is where the term positive control derives from.

https://truckmanualshub.com/

Insert 11x17 pages of main hydraulic schematic here

https://truckmanualshub.com/

Chapter 06

HYDRAULIC SCHEMATICS - SK350

TABLE OF CONTENTS

06

Paste here

Book Code No. KSTM-08-07-Rev03

Issue	Date of Issue	Applicable Machines	Remarks
First edition	Oct, 2006	SK330–8 : LC10-07001~ SK350LC–8 : YC10-03501~	
Second edition	Feb, 2007	YQ08U03301 ~	S5LC2211E01 K

22.1 SUMMARY

The hydraulic circuits are built up with the following functions and features in order to achieve easy operability, safety, mass volume handling and low fuel consumption.

Table22-1

Perfor-mance	Device	Function	Features
Easy operability and safety	Travel	● Travel straight	● Travel straight at combined operation
		● Travel 2-speed change & Auto 1st (low) speed return	● 1-2 travel speed change and low speed / high torque at heavy duty
		● Auto parking brake	● Automatic braking when parking
		● Motor overrun protection	● Prevents overrunning of travel motor on the down hill slope.
		● Travel pilot operation	● Prevents hunting by the built in travel shockless mechanism
	Swing	● Reverse rotation protective function	● Easy positioning to protect it from swinging back when stops swinging.
		● Swing priority circuit (simultaneous operation of arm in and swing motions)	● Easy operation of stable swing speed, arm slanted leveling, swing press digging
		● Automatic swing parking brake	● Swing parking brake when operating at on a slope
	Attachment	● Hydraulic pilot control system	● Light action with operating lever
		● Pilot safety lock system	● Cut out of pilot circuit by safety lock lever.
		● Lock valve (boom / arm)	● Protect boom and arm from unexpected drop (Natural fall).
		● Multi control valve (Oceania)	● Changeable to 4 operating pattern with only 1 lever.
	Others	● Pressurized hydraulic oil tank	● To prevent hydraulic oil from entering dust and to promote self suction ability of pump
		● Suction strainer	● Remove dust on suction side.
		● Line filter ; pilot circuit	● To prevent pilot operating circuit from malfunctioning
		● Return circuit	● To prevent hydraulic oil from contamination
		● Cooling hydraulic oil by oil cooler	● To prevent hydraulic oil from being deteriorated.
		● Pressure draining circuit	● To release the main circuit pressure for piping repair work.
		● Main control valve with optional valve	● Optional piping and additional work are easy
		● Switching of return line for N&B machine in the cab (Option)	● Switching of return line for N&B machine is able to change with a switch in the cab
Mass handling capability	Pump	● Electric flow controlled variable displacement pump	● Pump delivery rate control by a current command to the solenoid proportional valve of the variable displacement pump
		● Positive flow rate control	● Flow control by positive pilot control pressure
		● Hydraulics backup control	● Backup control by hydraulic when the electric flow controlled variable displacement pump fails.
	Attachment	● Boom up conflux circuit	● Speed up of boom up operation
		● Arm conflux circuit	● Speed up of arm operation
		● Bucket conflux circuit	● For speed-up of bucket operation (digging & dump)
		● Optimum operation by work mode select (H,S,A,B)	● Efficient operation in all work modes
Low fuel consumption	Micro computer	● Auto accel	● Reduce fuel consumption and noise by lowering engine speed when control lever is in neutral position.

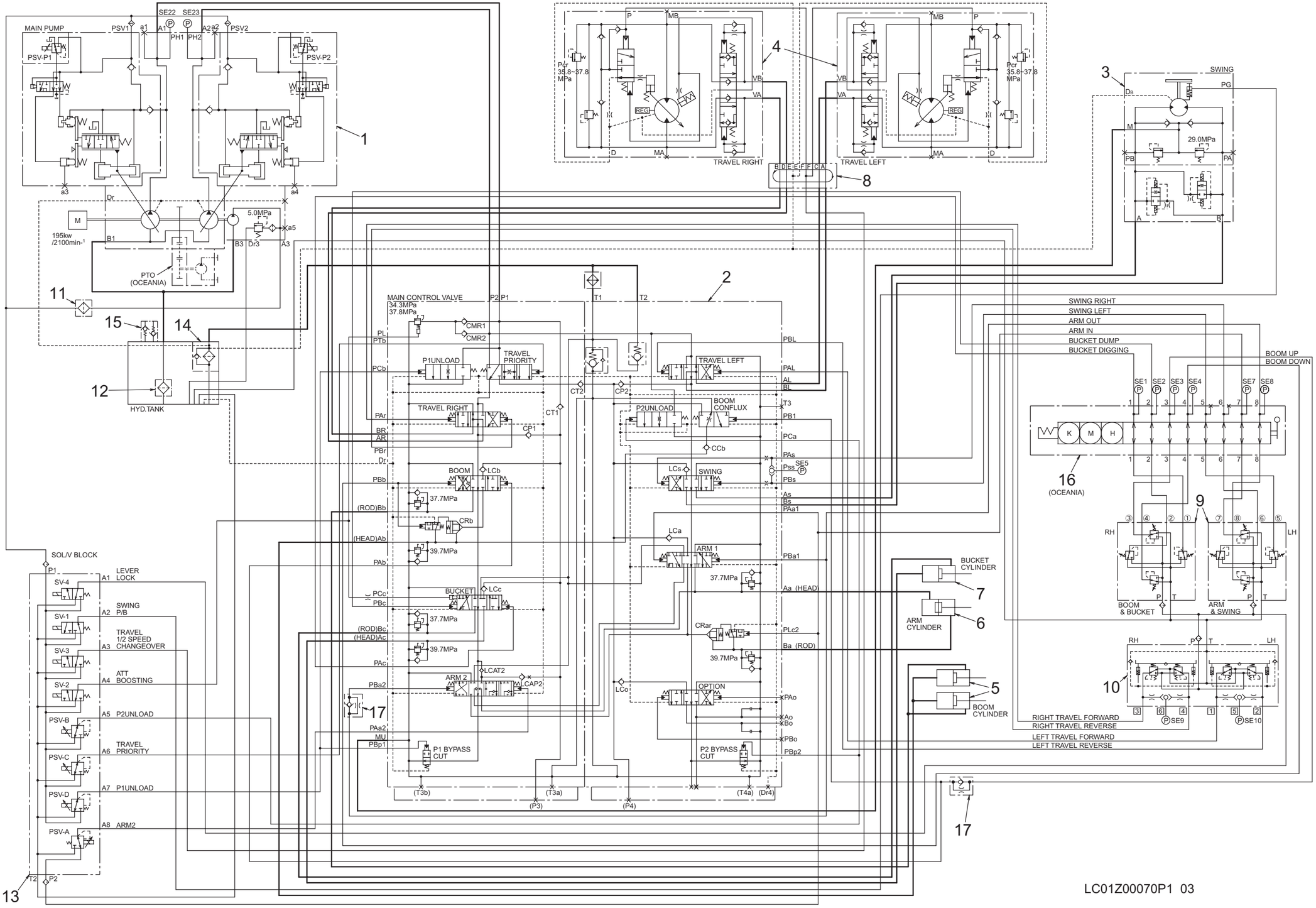
22.2 HYDRAULIC CIRCUITS AND COMPONENTS

STD. SCHEMATIC HYD. LINES		LC01Z00072P1 (SE, ASIA) / LC01Z00070P1 (OCEANIA)	
Item #	Component name	Part No.	Model No.
1	Hyd. pump assy	LC10V00014F1	K5V140DTP (SE. Asia : without PTO.)
		LC10V00015F1	K5V140DTP (Oceania : with PTO.)
2	Control valve (main)	LC30V00028F1	KMX15YD
3	Swing motor unit	LC15V00022F1	M5X180-CHB
4	Travel motor unit	LC15V00023F1	M4V290 / 170F-RG6.5F
5	Boom cylinder (RH & LH)	LC01V00044F1	ø100×ø140×1550
6	Arm cylinder	LC01V00054F2	ø120×ø170×1788 (SE. ASIA)
		LC01V00054F1	ø120×ø170×1788 (Oceania)
7	Bucket cylinder	LC01V00055F2	ø100×ø150×1193 (SE. ASIA)
		LC01V00055F1	ø100×ø150×1193 (Oceania)
8	Swivel joint	YN55V00053F1	
9	Pilot valve (ATT)	YN30V00111F1	PV48K2
10	Pilot valve (travel)	YN30V00105F1	6TH6 NRZ
11	Inline filter	YN50V00020F1	Y-457400
12	Suction strainer	LC50V00004F1	BS281J0A007A
13	Solenoid valve assy	YN35V00047F1	8KWE5A-30
14	Return filter	LC52V01001F1	FZ1F180A001A
15	Air breather	YN57V00004F1	AB0210GA008A
16	Multi control valve (lever less)	YN30V00113F1	Australia : STD
	Multi control valve (with lever)	YN30V00117F1	New zealand : STD
17	Restrictor	YN21V00005F1	07381-00000

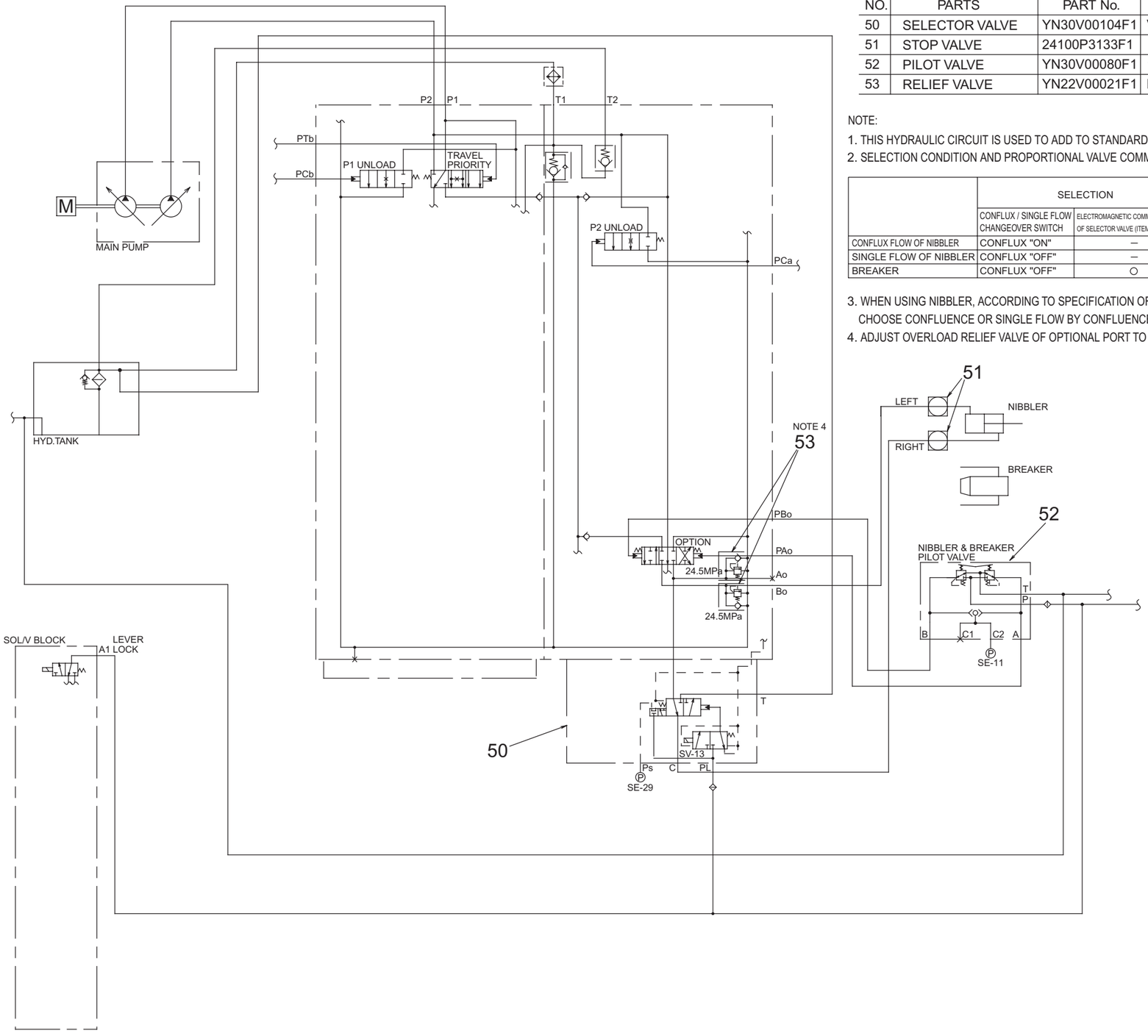
Note

The part numbers may be changed due to modification, so use only the numbers for references.

22.2.1 STANDARD



22.2.2 N&B SPECIFICATION (OPTION)



	N&B specification	YN01Z00162P1	
NO.	PARTS	PART No.	MODEL No.
50	SELECTOR VALVE	YN30V00104F1	VBY-174B
51	STOP VALVE	24100P3133F1	
52	PILOT VALVE	YN30V00080F1	16030-00000
53	RELIEF VALVE	YN22V00021F1	KRX16EK22

NOTE:

1. THIS HYDRAULIC CIRCUIT IS USED TO ADD TO STANDARD CIRCUIT.
2. SELECTION CONDITION AND PROPORTIONAL VALVE COMMAND WHEN ANY OF NIBBLER SINGLE & CONFLUX FLOW OR BREAKER IN SERVICE.

	SELECTION		COMMAND SIGNAL OF SOLENOID PROPORTIONAL VALVE (W: ○, W/O: –)				
	CONFLUX / SINGLE FLOW CHANGEOVER SWITCH	ELECTROMAGNETIC COMMAND SIGNAL OF SELECTOR VALVE (ITEM 50)(W:○,W/O:-)	P1 PUMP	P2 PUMP	TRAVEL STRAIGHT	P1 UNLOAD	P2 UNLOAD
CONFLUX FLOW OF NIBBLER	CONFLUX "ON"	–	○	○	○	○	○
SINGLE FLOW OF NIBBLER	CONFLUX "OFF"	–	–	○	–	–	○
BREAKER	CONFLUX "OFF"	○	–	○	–	–	○

3. WHEN USING NIBBLER, ACCORDING TO SPECIFICATION OF NIBBLER INSTALLED, CHOOSE CONFLUENCE OR SINGLE FLOW BY CONFLUENCE FLOW CHANGEOVER SWITCH.
4. ADJUST OVERLOAD RELIEF VALVE OF OPTIONAL PORT TO CUSTOMIZE SPECIFICATION ORDINARY SET PRESSURE.

YN01Z00162P1 01

This page is blank for editing convenience.

22.3 COLOR CODING STANDARD FOR HYDRAULIC CIRCUITS

Blue
Feed, drain circuit
less than 0.44 MPa (64 psi)
Green
Return, make up circuit,
0.44~0.59 MPa (64~86 psi)
Purple
Secondary pilot pressure,
(including proportional vlave)
0.59~5 MPa (86~725 psi)
Red
Primary pilot pressure,
(including proportional vlave)
5 MPa (725 psi)
Orange
Main pump drive pressure,
5~34.3 MPa (725~4970 psi)
Blue tone
At valve operation
Red valve
When solenoid proportional valve (reducing)
is operating
Red solenoid
In active and exciting
Displaying the flow circuit and standby circuit when operating.
Regarding the electrical symbols in this manual, refer to the electric circuit diagram.

22.4 NEUTRAL CIRCUIT

This section describes the following.

(1) Bypass cut valve and unload valve control
(2) Safety lock lever and pilot circuit
(3) Pump positive flow control
(4) Pump P-Q (Pressure-Quantity) curve control

22.4.1 OPERATION OF BY-PASS CUT VALVE AND UNLOADING VALVE HOUSED IN CONTROL VALVE

(1) By-pass cut valve
On starting engine, P1 and P2 unloading proportional valves (PSV-D, PSV-B) output secondary pressure according to the command output by mechatro controller, and this pressure exerts on PBp1 and PBp2 ports, and consequently the by-pass cut spool is switched to CLOSE side.
The by-pass cut spool is usually held on CLOSE side after the engine started. And it is switched to OPEN side only when failure occurred on pump proportional valve and mechatro controller.

(2) Unloading valve
On starting engine, like by-pass cut valve, the secondary pressures output by P1 and P2 unloading proportional valves (PSV-D, PSV-B) exert on PCb and PCa ports, consequently the P1 and P2 unloading valves are switched to OPEN side.

22.4.2 SAFETY LOCK LEVER AND PILOT CIRCUIT

(1) Purpose :
To protect attachment from unexpected movement for safety.

(2) Principle :
Cut pressure source of pilot valve for operation.

(3) Operation :
If the safety lock lever (red) is pushed forward after the engine starts, the limit switch (SW-11) is turned on. The timer relay is actuated one second later which causes the solenoid (SV-4) of the solenoid valve block (13) to be energized and makes the pilot operating circuit to stand by.

22.4.3 PUMP POSITIVE FLOW CONTROL

(1) Type :
Electric flow controlled variable displacement pump.

(2) Principle :
The current command I to the pump's solenoid proportional valve controls the delivery rate of the pump.

(3) Operation :

1) Flow rate rise operation (Eg. P1 pump)
By operating any of control levers, the operating secondary pressure of pilot valve rises, and the rising pressure is transformed to the rise of output voltage corresponding to the pressure input by the low pressure sensor.
Mechatro controller signal-processes this change of voltage, resulting in rise of command current value I to the pump proportional solenoid valve and consequently the pump flow rate rises. This is called "Positive Control System".
As the pump command current value rises, the secondary pressure of proportional solenoid valve also rises. On the regulator attached on the pump, the spool (652) through piston (643) is pushed leftward, and stops at the position where being in proportion to the force of pilot spring (646).
The tank port connected to the large bore of servo piston (532) opens, and the piston moves leftward by delivery pressure P1 of the small bore resulting in the increase of tilt angle (α).
The servo piston and spool (652) are connected to feedback lever (611). Therefore when servo piston moves leftward, the spool (652) also moves rightward by means of feedback lever. With this movement, the opening of spool sleeve closes gradually, and the servo piston stops at the position the opening closed completely.

2) Flow rate reduction operation
As the current value I of mechtro controller reduces, the secondary pressure of solenoid proportional valve reduces, and spool (652) is moved rightward by the force of pilot spring (646). With the movement of spool, the delivery pressure P1 usually flows into the large bore of piston through the spool.
The delivery pressure P1 flows in the small bore of servo piston, but the servo piston moves rightward due to the difference of area, resulting in the reduction of tilt angle. Similarly, when the servo piston moves rightward, the spool (652) is moved leftward by the feedback lever.
The operation is maintained until the opening of spool sleeve is closed.

22.4.4 PUMP P-Q CURVE CONTROL OPERATION

(1) Type :
Electrical flow control type variable pump

(2) Principle :
Perform an operation of the value from pump high pressure sensor to P-Q curve control value, and send a command to the pump solenoid proportional valve.

(3) Operation :
The pump high pressure sensor converts the pressure to the output voltage corresponding to the pump delivery pressure.
The mechatro controller converts the voltage output by the high pressure sensor to the P-Q curve control value. On the other hand, select the pump positive control command current value from the low pressure sensor in lower order, and the values are output to respective pump proportional valve as a command current.
With this operation, the pump power is controlled so as not to be exceed the engine power, therefore engine dose not stall.

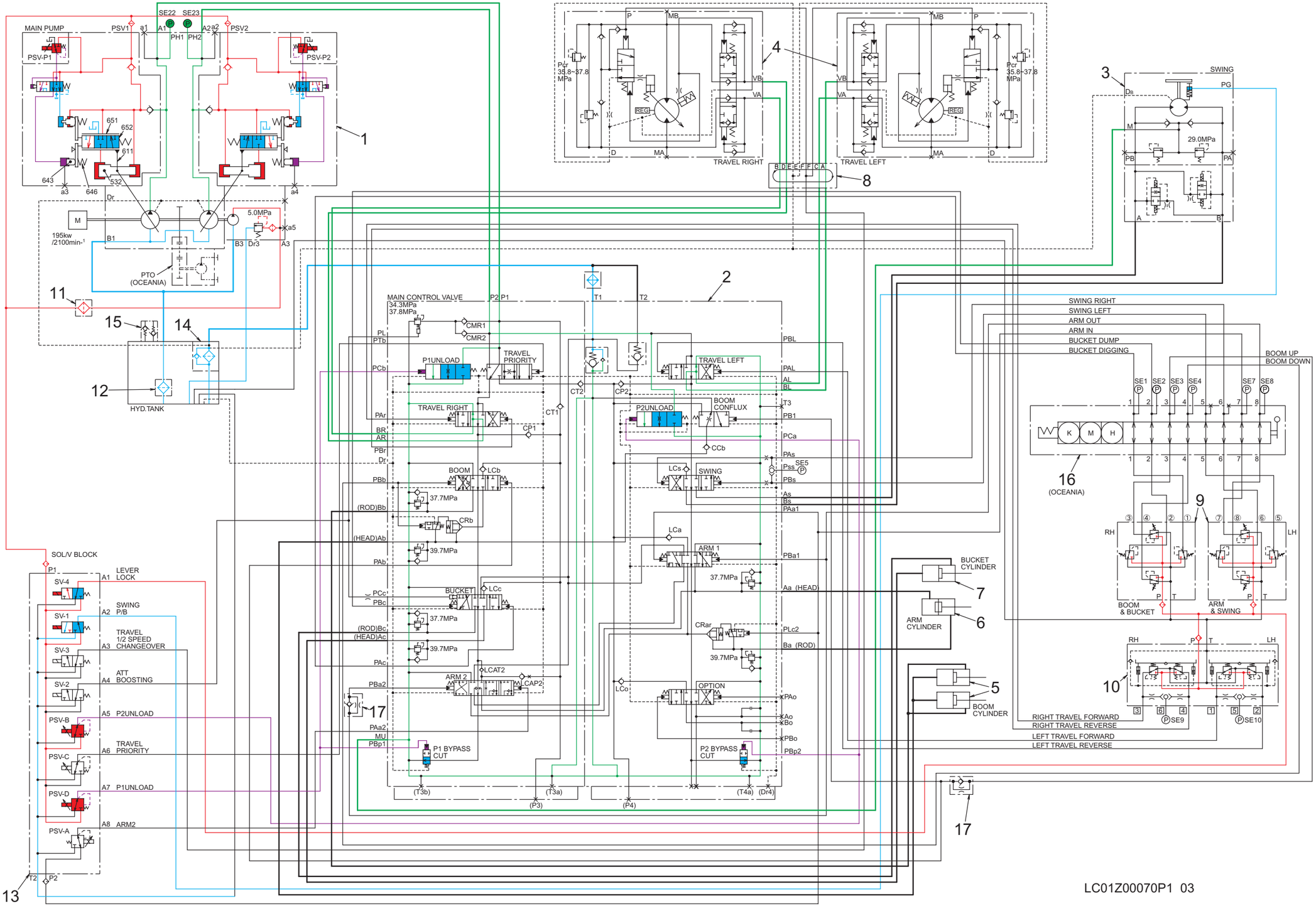


Fig. 22-1 NEUTRAL CIRCUIT : Positive control function at safety lock lever down (unlocked position)

https://truckmanualshub.com/

22.5 TRAVEL CIRCUIT

This section describes the following.

(1) Travel forward pilot simultaneous operation circuit

(2) 2 speed travel solenoid command circuit and auto 1-speed return function

(3) Travel main circuit

(4) Travel motor function

22.5.1 TRAVEL FORWARD PILOT SIMULTANEOUS OPERATION CIRCUIT

(1) Purpose :
Light operating force and shockless operation

(2) Mechatronics :

1) If the travel lever with damping mechanism is operated for travel right, left and forward motions, the secondary pilot proportional pressure comes out of the 3, 1 ports of P/V (10). The higher of the pressures is selected, comes out of the 6, 5 ports and acts upon the low pressure sensors (SE9) (SE-10).

2) The pilot secondary pressure flows to PAr and PAL ports of the control valve (2), moves the travel spool, and switches the main circuit.

3) The low pressure sensor output voltage is input into mechatro controller. The mechatro controller performs signal processing and outputs current corresponding to the increase of flow rate to P1 pump proportional valve (PSV-P1) and P2 pump proportional valve (PSV-P2), and at the same time the command current is output to P1 unloading valve (PSV-D) and P2 unloading valve (PSV-B).

4) The secondary pressures output by P1 pump proportional valve (PSV-P1) and P2 pump proportional valve (PSV-P2) exert on pump regulator, actuating the pump on the delivery flow rate increase side.

5) The secondary pressure delivered in P1 unloading valve (PSV-D) and P2 unloading valve (PSV-B) is fed to PBp1, Pcb, PBp2 and PCa ports provided in control valve (2).
The secondary pressure from proportional valve which has exerted on PBp1 and PBp2 ports holds the by-pass cut spool on CLOSE side, like the operation in the lever neutral position.
The secondary pressure from proportional valve which has exerted on PCb and PCa ports switches the unloading spool in CLOSE side.

22.5.2 2-SPEED TRAVEL SOLENOID COMMAND CIRCUIT AND AUTO 1st SPEED RETURN FUNCTION

(1) Purpose :
Change travel motor speed with switch.

(2) Principle :
If the switch is turned, an electric signal is issued. It excites the 2-speed travel solenoid which in turn converts the primary pilot pressure and the self pressure to a tilting angle of the variable displacement motor.

(3) Operation :
If the rabbit marked switch on the gauge cluster is pressed, the solenoid (SV-3) of the proportional valve block (13) is excited and changes the proportional valve. Then the solenoid command pressure is issued from port A3, enters the P port of the travel motor (4), opens the oil passage to the 2nd speed select piston, and causes the motor to run in the 2nd speed tilting mode by its self pressure. However, when the main circuit pressure rises above 28 MPa (4060 psi), the motor's self pressure pushes the 2nd speed select piston back to the 1st speed.

22.5.3 TRAVEL MAIN CIRCUIT

(1) Operation :
The delivery oil from Pump A1 and A2 ports by changing the travel spool with the operation of travel pilot flows in each VA port on the left side of travel motor (4) through C,D ports of swivel joint (8) from AL, AR ports of C/V, and rotates the travel motor.

22.5.4 TRAVEL MOTOR FUNCTION

(1) Function :

1) Prevents the motor from over running on a slope.

2) Check valve that prevents cavitation of the hydraulic motor.

3) Shockless relief valve and anti cavitation valve when inertia force stops.

4) High/Low 2 step speed change mechanism and auto 1st speed return at high load.

5) Travel parking brake.

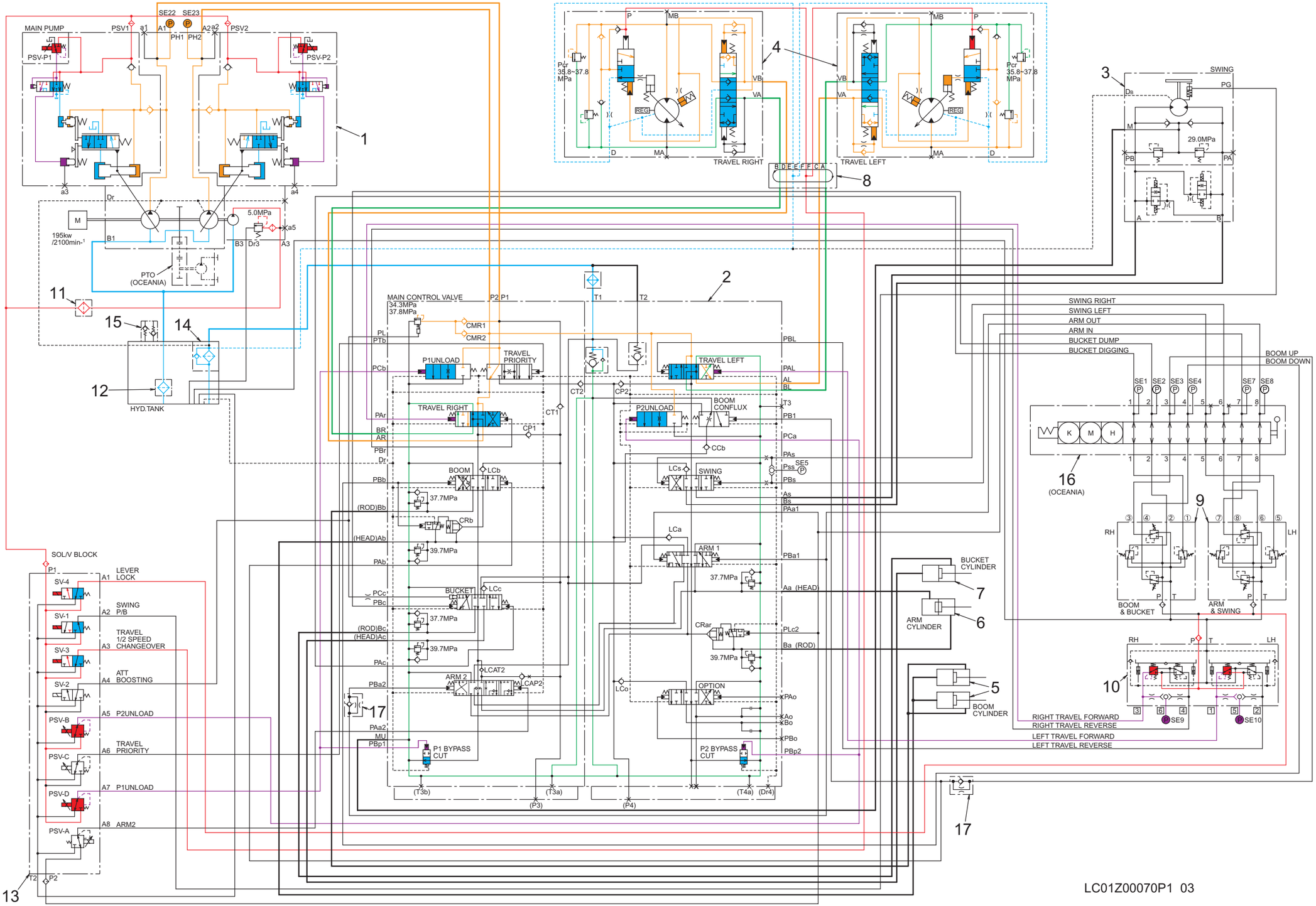


Fig. 22-2 TRAVEL CIRCUIT : Travel 2nd speed, RH & LH simultaneous operation.

22.6 BUCKET CIRCUIT

This section describes the following.

(1) Bucket digging pilot circuit

(2) Auto accel operation

(3) Flow control in the work mode

(4) Bucket digging travel straight main circuit

(5) Bucket spool stroke limiter

22.6.1 PILOT CIRCUIT FOR BUCKET DIGGING

(1) Mechatronics :

1) When the operation for bucket digging is performed, the pilot proportional secondary pressure is delivered through port 1 of the right pilot V (9), flows to PAc port, and acts on the low pressure sensor (SE-1), and at the same time the bucket spool is switched.

2) The voltage output by low pressure sensor inputs in mechatro controller. The mechatro controller performs signal processing and outputs current corresponding to the increase of pump flow rate to pump proportional valves (PSV-P1) and (PSV-P2) on the P1 and P2 pump sides, and at the same time the command current is output to P1 unloading valve (PSV-D), P2 unloading valve (PSV-B) and travel straight proportional valve (PSV-C).
In the following pages, the relation of operation of low pressure sensor to both the increase of pump flow rate and unloading proportional valve is the same. Therefore the explanation is omitted.

3) The secondary pressure output by P1 pump proportional valve (PSV-P1) and P2 pump proportional valve (PSV-P2) exerts on pump regulator, actuating the pump onto the delivery flow increase side.

4) The secondary pressure delivered in P1 unloading valve (PSV-D) and P2 unloading valve (PSV-B) is led to PBp1, PCb, PBp2 and PCa ports provided in control valve (2).
The secondary pressure from proportional valve which has exerted on PBp1 and PBp2 ports holds the by-pass cut spool on CLOSE side, like the operation in the lever neutral position.
The secondary pressure from proportional valve which has exerted on PCb and PCa ports switches the unloading spool in CLOSE side.

5) The secondary pressure delivered in travel straight proportional valve (PSV-C) is led to PTb port provided in control valve (2) and shifts the travel straight valve one stage.

22.6.2 AUTO ACCELERATION OPERATION

(1) Principle :
Auto acceleration actuates according to signals from low pressure sensor.

(2) Operation :
<When lever is set to neutral position>
In the event where the sensor does not receive signal for 4 seconds or more even though the acceleration dial is set to MAX position, the engine speed should be raised to 1000rpm.
<When lever is operated>
When the pressure 0.6MPa (87psi) is input to low pressure sensor in STD specification (travel, bucket, swing, arm), proportional voltage from low pressure sensor inputs in mechatro controller, and then the engine speed returns to the dial set position corresponding to the lever operation.

22.6.3 STAND-BY CURRENT CONSTANT CONTROL

(1) Principle :
When the engine speed is intermediate speed or lower, command current value to have the pump delivery rate constant is output.

(2) Operation :
Even if the engine speed specified by acceleration potentiometer is low speed, as the delivery rate corresponds to the intermediate speed, the actuator moves earlier than the movement equivalent to the control lever angle rate in light load operation.

22.6.4 BUCKET DIGGING AND TRAVEL STRAIGHT CONFLUENCE (CONFLUX) MAIN CIRCUIT

(1) Operation :

1) The oil delivered through A1 port of P1 pump goes into P1 port of C/V (2), opens load check valve LCc through parallel circuit and enters in bucket spool.

2) On the other hand, the oil delivered through P2 port of P2 pump goes into P2 port of C/V (2), confluences with oil from P1 pump through travel straight valve, and goes into bucket spool. (Confluence of oil from 2 pumps)

3) With the function of pilot circuit, the oil flow is switched from bucket spool, and is fed into bucket cylinder head side through AC port of C/V (2). On the other hand, the return oil from cylinder rod (R) side is throttled by bucket spool and returns to tank circuit from BC port of C/V (2).

References :

- In bucket dumping operation, the travel straight valve also switches like digging operation, resulting in confluence with travel straight.
- When the bucket operation and other operation are simultaneously performed, the travel straight valve does not actuate, resulting in single flow of bucket circuit.

22.6.5 BUCKET SPOOL STROKE LIMITER

(1) Purpose :
To secure simultaneous operability of boom and arm on boosting up attachment pressure (Pump flow rate decreases.) and to prevent cavitations at low engine speed

(2) Operation :
On boosting up attachment pressure, pilot primary pressure exerts on PCc port of C/V(2) through attachment booster solenoid valve, operates stroke limiter of bucket spool, and throttle oil path of spool. As a result, P1 pump pressure increases, making the simultaneous operation of boom up and bucket digging possible.
Even though the engine speed is low, similarly the cavitations can be prevented by actuating the stroke limiter.

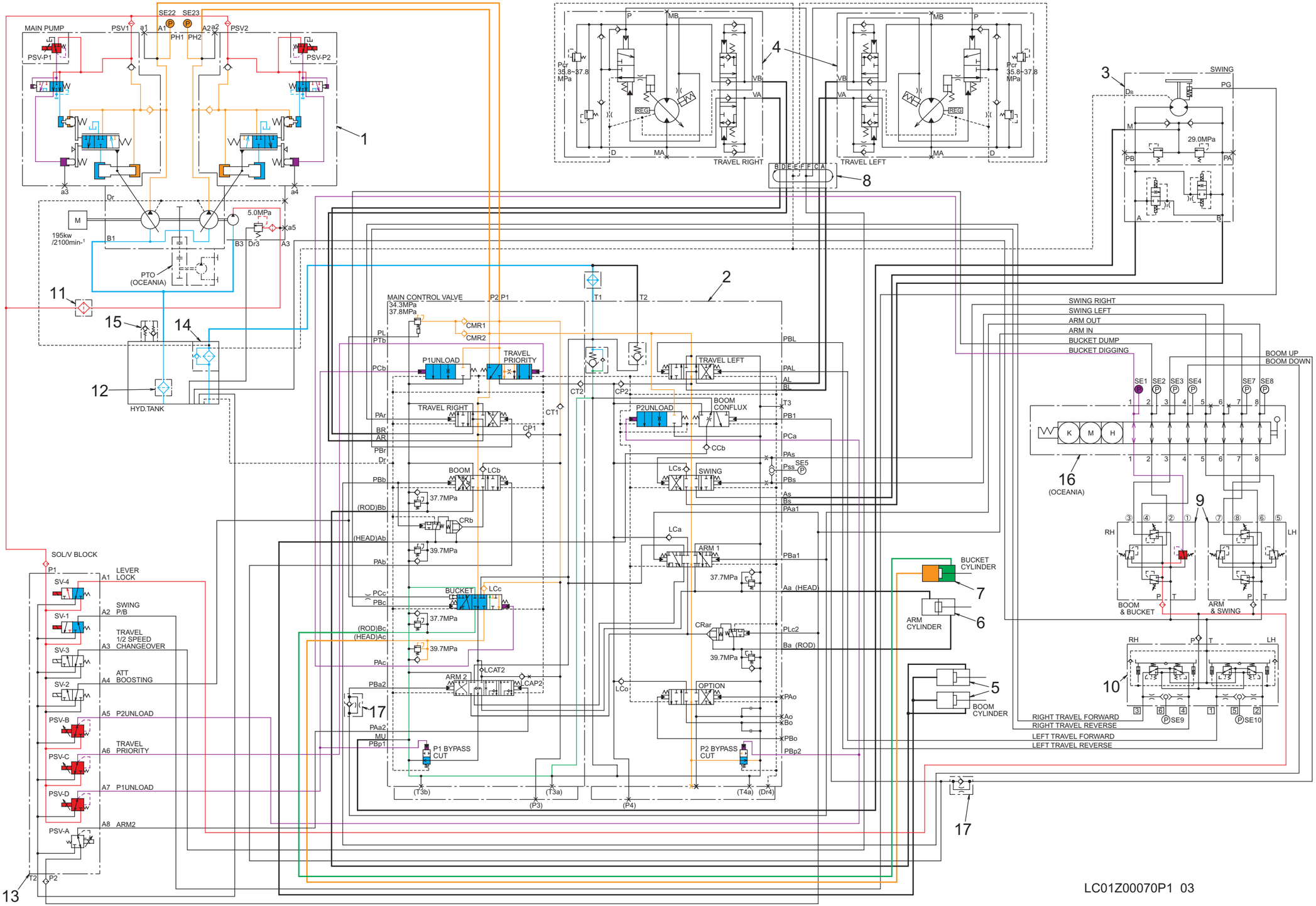


Fig. 22-3 BUCKET CIRCUIT : Bucket digging (Travel straight conflux), Auto-accelation and Standby flow rate constant control

22.7 BOOM CIRCUIT

This section describes the boom raise conflux operation.

(1) Boom up pilot circuit

(2) Boom up 2 pumps conflux main circuit in C/V

22.7.1 BOOM RAISE PILOT CIRCUIT

(1) Operation :

1) If boom up operation is performed, the secondary pilot proportional pressure from the right pilot valve (10) gets out of port 3 and acts upon the low pressure sensor (SE3). At the same time, the pressure acts upon the PAb and PB1 ports.

2) The secondary pressure which enters the PAb port of C/V (2) shifts the boom spool. The secondary pressure which enters the PB1 port shifts the boom conflux spool.

22.7.2 BOOM UP 2 PUMPS CONFLUX MAIN CIRCUIT IN C/V

(1) Purpose :
Boom up speed up

(2) Principle :
Confluxing oil from 2 pumps

(3) Operation :

1) The oil delivered through A1 port of P1 pump flows into C/V (2) P1 port, and branches into bypass circuit and parallel circuit. Since P1 unloading valve is closed, the boom spool is moved and bypass circuit is closed, the oil opens load check valve LCb through parallel circuit and flows into boom spool.

2) Then the oil passes through boom spool, opens lock valve of boom lock valve CRb, and is led into H side of boom cylinder through C/V (2) Ab port.

3) Meanwhile, the oil delivered from the A2 port of the P2 pump enters the P2 port of C/V (2) and due to shut off the P2 unloading valve, the oil then passes through the parallel circuit and via the restrictor on the circumference of the boom conflux spool, pushes the load check valve CCb open from the boom conflux circuit, and combines the oil delivered by the P1 pump internally.

4) The return oil from boom cylinder R side flows into tank circuit through boom spool from C/V (2) Bb port.

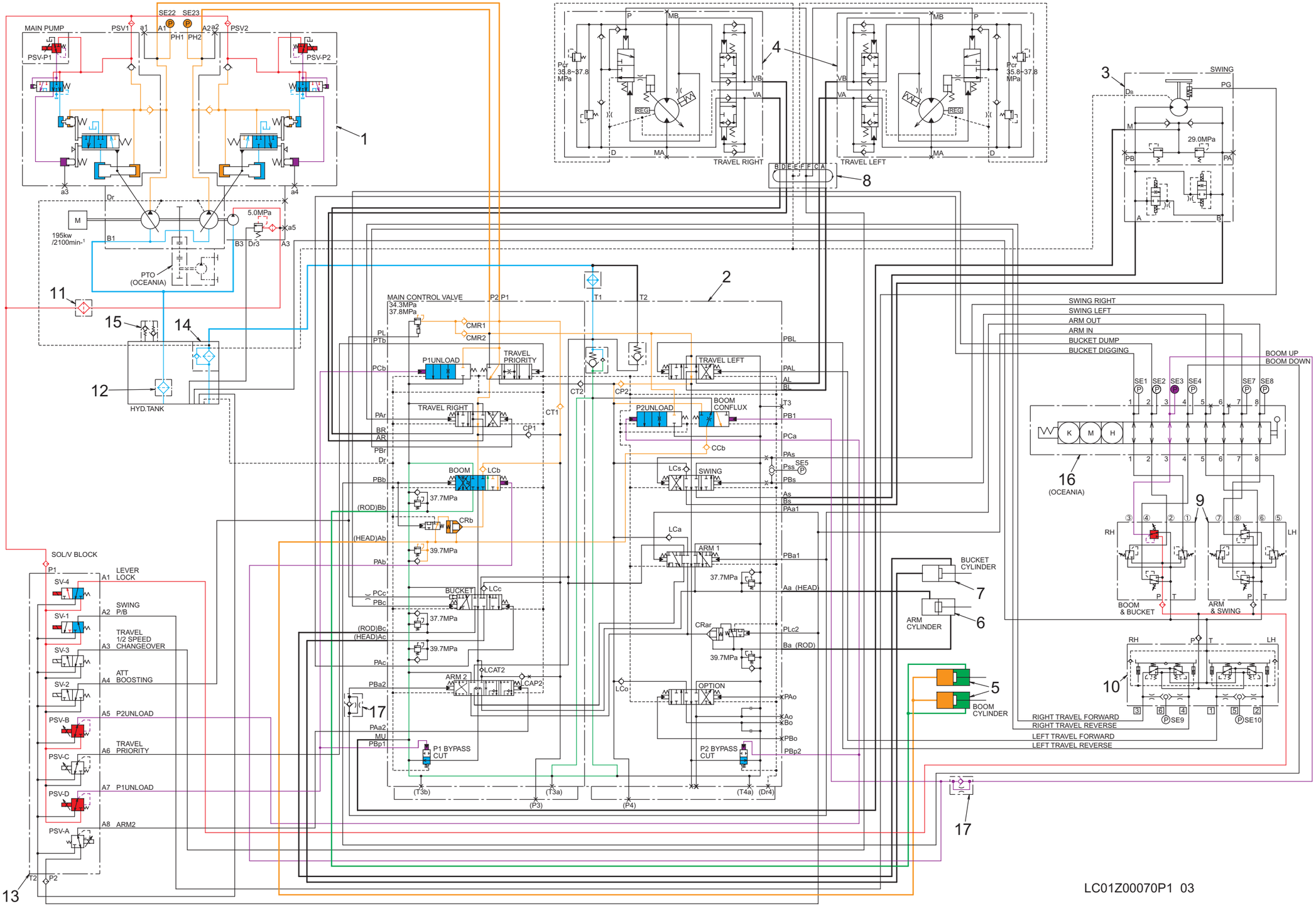


Fig. 22-4 BOOM CIRCUIT : Boom up operation, Confluence function.

https://truckmanualshub.com/

This section describes boom lower operation.

(1) Boom down pilot circuit

(2) Prevention of natural fall by lock valve and actuation at lowering

(3) Constant recirculation function of boom down main circuit

22.7.3 BOOM DOWN PILOT CIRCUIT

(1) Operation :

1) If the boom down operation is performed, the secondary pilot proportional pressure comes out of portáC of the right pilot valve (9) and acts upon the low pressure sensor (SE-4).
At the same time, the pressure acts upon the PBb port of C/V (2).

2) The voltage output of the low pressure sensor (SE-4) enters the mechatro controller and processed in it.

3) Then, the proportionl secondary pressure fed into C/V (2) PBb port and branches off in two lines and switches boom spool and releases boom lock valve.

22.7.4 PREVENTION OF NATURAL FALL BY LOCK VALVE AND ACTUATION AT LOWERING

(1) Purpose :
Prevention of natural fall when the lever is neutral

(2) Principle :
The oil is prevented from returning to the boom spool by the poppet seat of the boom lock valve.

(3) Operation :
In the boom down action, the selector valve is changed over by the secondary proportional pressure of PBb port. Then the poppet spring chamber of the lock valve CRb gets through the drain line (Dr) and makes the lock valve poppet open.
When the boom lever is at neutral, the drain line on the lock valve CRb poppet spring chamber is closed which causes the poppet closed.
The result is that the oil returning from the boom cylinder head (H) to the boom spool is held and makes the leak from the boom spool zero.
Thus the boom cylinder is prevented from making a natural fall.

22.7.5 CONSTANT RECIRCULATION FUNCTION OF BOOM DOWN MAIN CIRCUIT

(1) Purpose :
Prevention of cavitation during boom lowering motion.

(2) Principle :
The oil returning from the boom cylinder head (H) is recirculated to the rod (R).

(3) Operation :
When the oil is supplied to the boom cylinder rod (R) side during boom down operation, the boom moves faster than it should do in some cases by the self weight of the attachment.
On that occasion, the circuit pressure on the rod (R) side is on the negative side.
The oil supplied to the boom cylinder rod (R) flows into the A1 port of the P1 pump and the P1 port of C/V. The oil then passes through the boom spool and goes out of the Bb port.
On that occasion, the oil returning from the head (H) goes through the recirculation path in the boom spool, pushes the check valve in the spool open, is recirculated to the Bb port and is supplied to the rod (R). When the (R) pressure is larger than the head (H) pressure, the check valve in spool closes.
Thereupon, the recirculation is stopped.

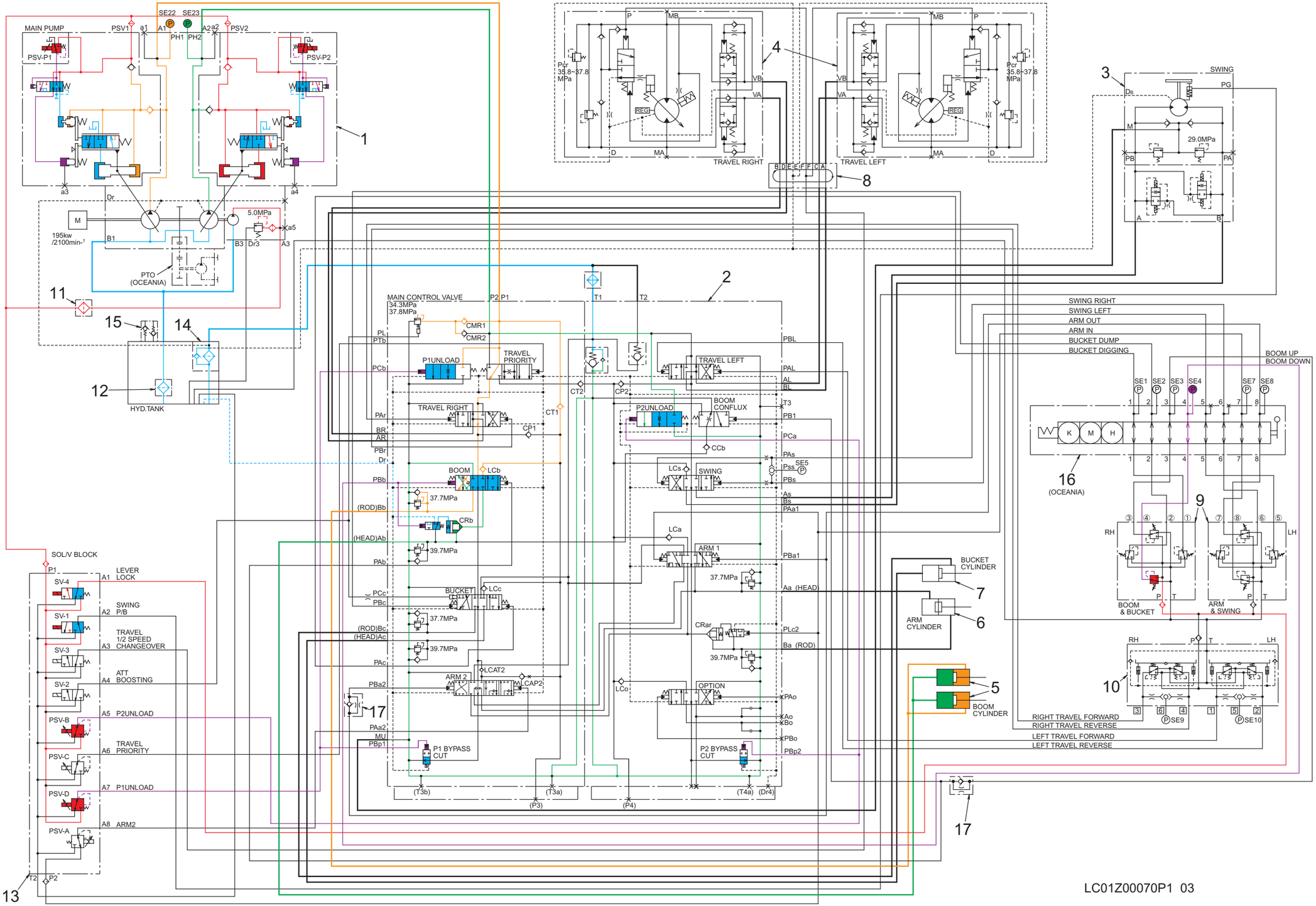


Fig. 22-5 BOOM CIRCUIT : Boom down operation & Prevention of natural boom falling.

22.8 SWING CIRCUIT

This section describes the following operations.

(1) Swing left pilot circuit

(2) Swing auto parking brake

(3) Swing main circuit

(4) Swing motor circuit

22.8.1 PILOT CIRCUIT FOR LEFT SWING

(1) Operation :

1) When the left swing operation is performed, the pilot proportional secondary pressure is delivered through port (5) of left pilot V (9), and the secondary pressure acts on PBs port of C/V (2), and simultaneously flows out from Pss port of C/V and acts on low pressure sensor (SE-5).

2) The voltage output by the low pressure sensor is input in the mechatro controller, and is signal-processed.

3) Then, the secondary pressure led into PBs port of C/V (2) switches the swing spool.

22.8.2 SWING AUTO PARKING BRAKE

(1) Purpose :
Swing lock in neutral position and parking

(2) Principle :
Release mechanical brake only when required to operate swing and arm in.

(3) Operation :

1) The swing parking system excites the swing parking SOL (SV-1) usually if the key switch is turned on and works by the action of the mechanical brake.

2) The mechanical brake is released if the swing parking solenoid is de-excited only when the secondary operating pressure in the swing and arm in actions acts upon any of the low pressure sensors (SE-5, 7).

3) The swing parking solenoid (SV-1) is excited five seconds after the pressure of the swing low pressure sensors (SE-5) is reduced to zero. In the case of arm in operation, the swing parking solenoid (SV-1) is excited the moment the pressure of the arm in low pressure sensor (SE-7) is reduced to zero. This causes the mechanical brake to operate.

22.8.3 SWING MAIN CIRCUIT

(1) Operation :
The oil delivered from the A2 port of the P2 pump enters the P2 port of C/V (2) and is branched off into the bypass line and the parallel circuit. However, since the bypass line is closed as the swing spool is shifted, the oil pushes the load check valve LCs open through the parallel circuit, enters the B port of the swing motor via the Bs port of C/V (2), and rotates the swing motor counterclockwise.

22.8.4 SWING MOTOR CIRCUIT

(1) Anti cavitation circuit at swing deceleration

(2) Shockless relief valve that prevents the swing motor from being reversed.

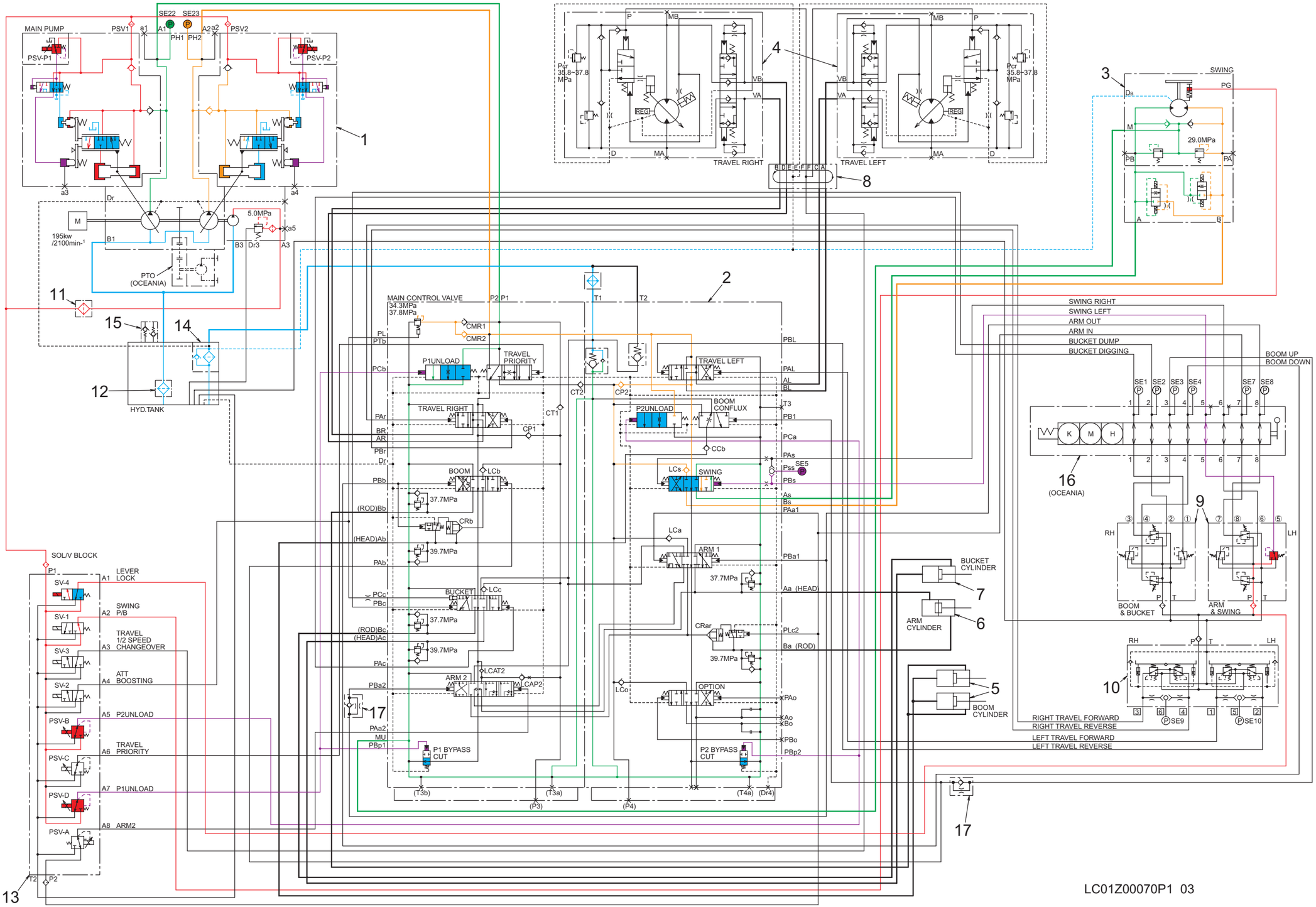


Fig. 22-6 SWING CIRCUIT : Swing operation (LH)

22.9 ARM CIRCUIT

This section describes the following operations.

(1) Arm in, light-load operating pilot circuit

(2) Arm in, light-load variable normal recirculation main circuit / internal conflux main circuit

22.9.1 ARM IN, LIGHT-LOAD OPERATING PILOT CIRCUIT

(1) Purpose :
Speed-up and Anticavitation when the arm is at light loaded.

(2) Principle :
The oil returning from the arm cylinder rod (R) is recirculated variably to the head (H) at arm 2 spool in C/V.

(3) Operation :

1) When the arm in operation is performed, the secondary pilot proportional pressure gets out of port 7 of the left pilot valve (9) and acts upon the low pressure sensor (SE-7).
At the same time, the pressure is branched off in two flows, acts upon the Paa1 port and the PLc2 port, changes over the arm spool and the arm lock valve CRar. releases.

2) The output voltage by the low pressure sensor is input into mechatro controller, and is pilot signal-processed, and is output to P1, P2 pump proportional valve (PSV-P1), (PSV-P2) and arm 2 inverse proportional valve (PSV-A).

3) The secondary pressure from pilot proportional valve, which is reduced by arm 2 inverse proportional valve (PSV-A) switches arm 2 spool.

22.9.2 ARM-IN, LIGHT-LOAD VARIABLE NORMAL RECIRCULATION, INTERNAL CONFLUX MAIN CIRCUIT

(1) Operation :

1) The P2 pump delivery oil flows in travel left section through P2 port of C/V (2) and is branched off in by-pass circuit and parallel circuit, but because arm 1 spool is switched, the delivery oil which goes through parallel circuit opens load check valve LCa and is flowed into arm 1 spool.

2) On the other hand, P1 pump delivery oil flows in P1 port of C/V (2), and the flows in travel straight section and travel right tandem path. Then because arm 2 spool was switched, the delivery oil opens load check valve LCAT2, goes through arm 2 spool, and confluences with P2 pump delivery oil in the valve section, and then is flowed into arm cylinder head (H) side through Aa port of C/V (2).

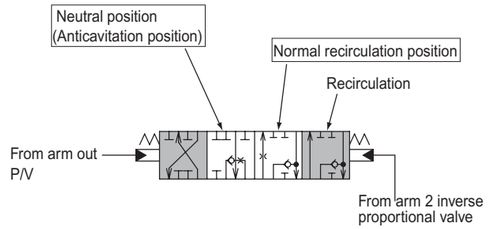
3) The return oil from arm cylinder (R) side flows in Ba port of C/V (2) and passes through the Ba port because the arm lock valve CRar is open, and is flowed into arm 2 spool through arm 1 spool.

4) Because arm 2 spool is switched to normal recirculation position, causing restriction of passage to tank, the return oil from arm cylinder (R) side flows into arm cylinder (H) side.

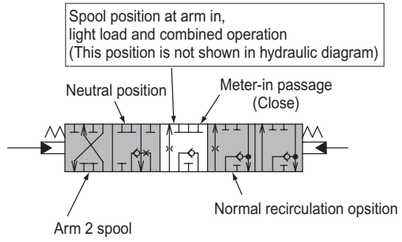
- Because, at light load, the pressure in cylinder rod (R) side is higher than that in the head (H) side, it opens the check valve housed-in arm 2 spool and is recirculated in the head (H) side, resulting in the speed up of arm-in operation at light load.

5) Cavitations prevention control in arm-in operation
Command current is output to arm 2 solenoid proportional valve by signal processing of E/G speed and arm-in pilot pressure, accordingly the arm 2 spool is switched to neutral (cavitations prevention) position, resulting in cavitations prevention.

Position of arm 2 spool



Reference :
In light-load arm-in operation (normal recirculation, conflux), when the attachment to which the circuit in P1 pump side is applied is operated, the meter-in path of arm 2 spool is closed, resulting in single flow operation.



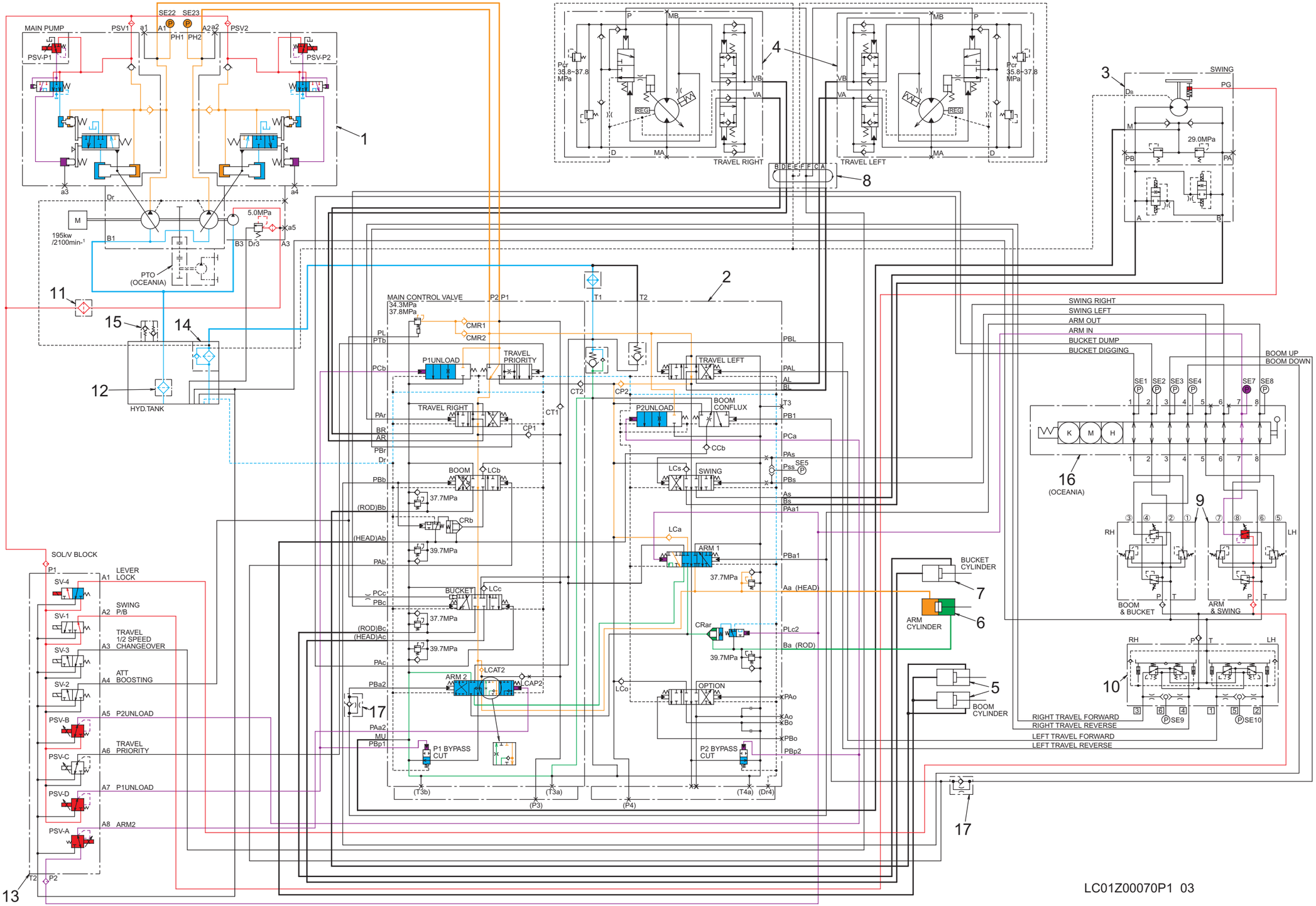


Fig. 22-7 ARM CIRCUIT : Arm in (Light load) operation, Arm variable recirculation & Anti cavitation function

https://truckmanualshub.com/

This section describes the following operations.

(3) Arm in, heavy load operating pilot circuit (recirculation cut)

(4) Arm in, heavy load operating sequence confluxed main circuit

22.9.3 ARM IN, HEAVY LOAD OPERATING PILOT CIRCUIT

(1) Operation :

1) In arm-in operation, when the heavy loading is applied to arm and the P2 pump pressure increases to the set pressure, the voltage output by P2 pump pressure sensor (SE-23) is converted to signal (signal processing) by mechatro controller, consequently the current of arm 2 solenoid proportional valve is controlled according to the load pressure and the arm variable recirculation is cut.
When the recirculation is cut, internal confluence is held similarly to that in light load operation.

2) Left pilot valve actuation due to arm-in operation is equivalent to that at light load operation.

22.9.4 ARM IN, HEAVY LOAD OPERATING RECIRCULATION CUT MAIN CIRCUIT

(1) Purpose :
Speed up for arm in operation

(2) Principle :
Cut the recirculation and reduce rod pressure.

(3) Operation :

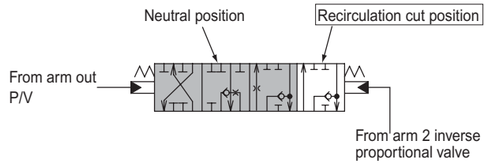
1) P2 pump delivery oil flows in the travel left section through P2 port of C/V (2) and branched off in by-pass circuit and parallel circuit. Consequently the arm spool is switched and pushes and opens load check valve LCa through parallel circuit, and flows in the arm spool.

2) On the other hand, P1 pump delivery oil flows in P1 port of C/V (2), and flow in travel right tandem passage through travel straight section. Then because arm 2 spool was switched, the delivery oil opens load check valve LCAT2, and confluences with P2 pump delivery oil in the valve section, and is flowed into arm cylinder head (H) side through Aa port of C/V(2).

3) The return oil from arm cylinder (R) side flows in Ba port of C/V(2) and is flowed to arm lock valve CRar, but because the arm lock valve CRar is open, the return oil goes through arm lock valve CRar and flows in arm 2 spool.

4) The return oil returns directly into tank circuit because arm 2 spool is switched to recirculation cut position.

Position of arm 2 spool



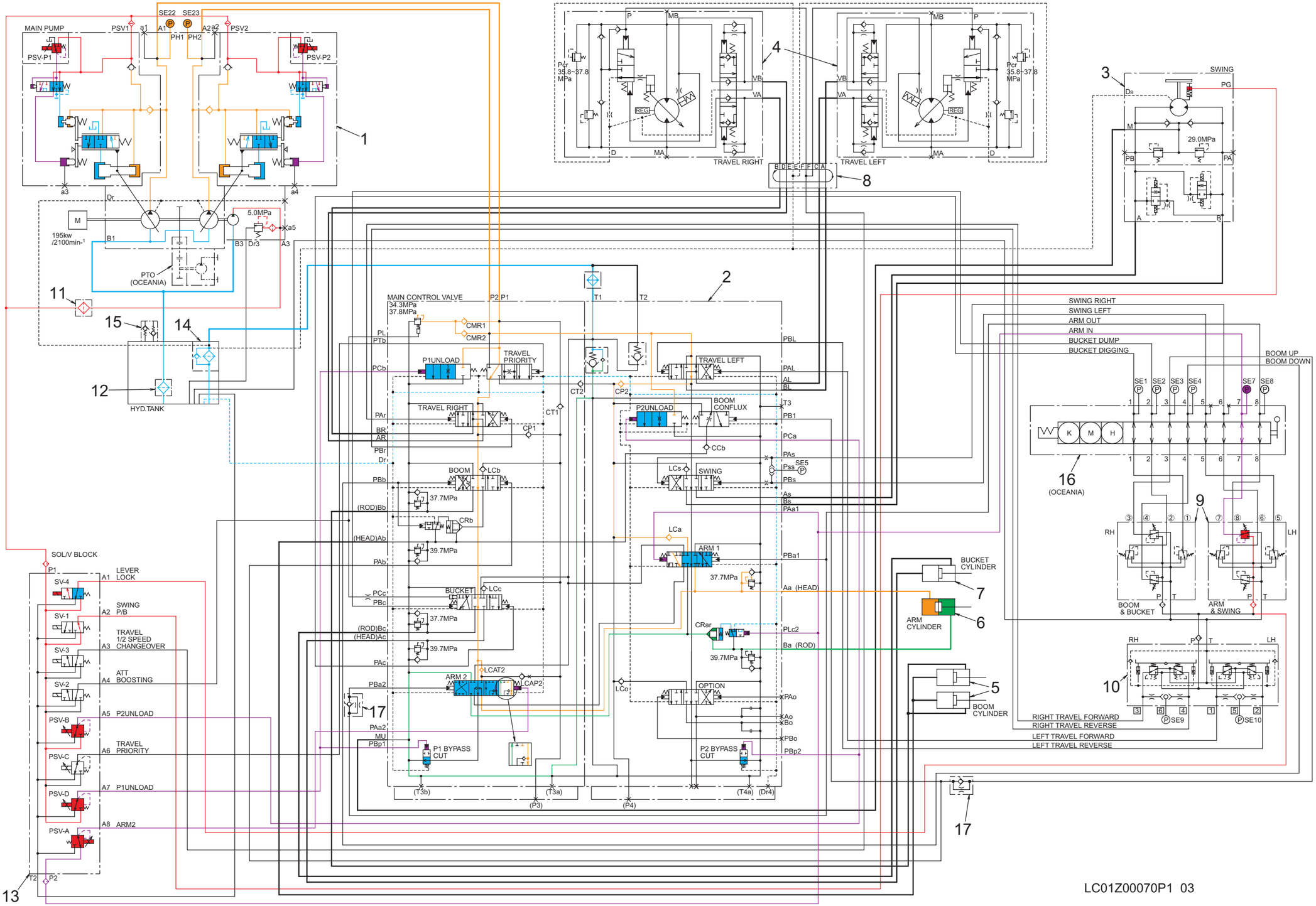


Fig. 22-8 ARM CIRCUIT : Arm in (Heavy load) operation, Arm confluence & recirculation cut function

This section describes the following operations.

(5) Arm out pilot circuit

(6) Arm out 2 pumps conflux main circuit

(7) Natural fall protection with arm lock valve

22.9.5 ARM OUT PILOT CIRCUIT

(1) Operation :

1) When the arm out operation is performed, the secondary pilot proportional pressure gets out of port 8 of the left pilot valve (9), and acts upon the low pressure sensor (SE-8). At the same time, the oil is branched off in two flows and act upon the PBa1 and Pba2 ports of C/V (2).

2) The operating proportional secondary pressure flowed in Pba1 port of C/V (2) switches the arm 1 spool.

3) Then, the operating secondary pressure flowed in PBa2 port of C/V (2) switches the arm 2 spool valve.

22.9.6 ARM OUT 2 PUMPS CONFLUX MAIN CIRCUIT

(1) Purpose :
Arm out operation speed up.

(2) Principle :
The oil delivered by the P1 pump is confluxed with that delivered by the P2 pump in C/V (2).

(3) Operation :

1) P1 pump delivery oil opens load check valve (LCAT2) by switching arm 2 spool and confluxes with P2 pump delivery oil just short of the arm lock valve.

2) And, P2 pump delivery oil flows through arm 1 spool and confluences with P1 delivery oil, opens lock valve of arm lock valve CRar with free flow and is flowed into arm cylinder rod (R) side through Ba port of C/V(2).

3) On the other hand, the return oil from arm cylinder (H) side flows in Aa port, and returns into tank circuit through arm 1 spool and arm 2 spool.
The return line which does not pass through boost check valve is used for this return circuit to reduce the pressure loss.

22.9.7 NATURAL FALL PROTECTION WITH ARM LOCK VALVE

(1) Purpose :
To prevent the arm from falling naturally by the weight of the arm & bucket.

(2) Principle :
Complete seat of the return circuit against the arm spool of the arm cylinder (R) side circuit.

(3) Operation :

1) When the secondary pressure for arm operation disappears and the arm cylinder stops, the pressure on the rod (R) side passes through the selector of the lock valve from the Ba port of C/V, acts the back pressure on the lock valve CRar and seats the lock valve.

2) Since the oil flow into the arm spool from the lock valve is shut off completely, natural fall of the arm due to oil leaks through the arm spool is prevented.

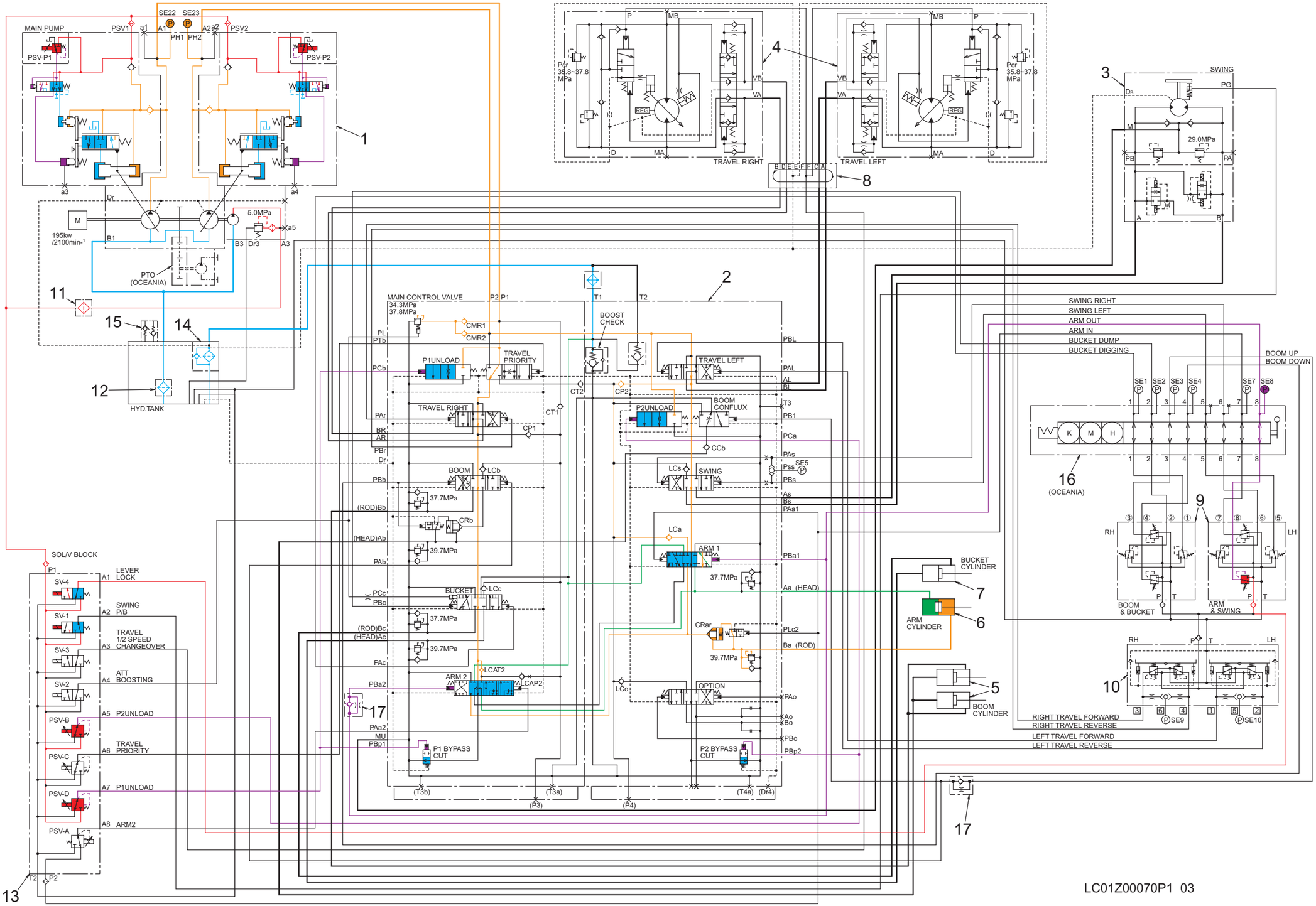


Fig. 22-9 ARM CIRCUIT : Arm out operation, Confluence function

https://truckmanualshub.com/

22.10 COMBINED CIRCUIT

This section describes only the difference in combined operation.

(1) Boom up / travel, pilot circuit

(2) Boom up / travel, main circit

22.10.1 BOOM UP / TRAVEL, PILOT CIRCUIT

(1) Operation :
<Operation: Different point of pilot circuit from independent operation >

1) The mechatro controller outputs command current to travel straight solenoid proportional valve after signal processing, and the solenoid valve outputs secondary pressure and acts on PTb port of C/V (2).

2) Then the pressure of PTb port switches the travel straight valve one step.

22.10.2 BOOM UP / TRAVEL, MAIN CIRCUIT

(1) Purpose :
To insure straight travel movement during travel operation even if the attachment is operated.

(2) Principle :
The travel action and the attachment action are actuated by separate pumps.

(3) Operation :

1) P1 pump delivery oil flows through P1 port of C/V(2) and branches off in P1 parallel circuit and travel straight spool.
P2 pump delivery oil flows through P2 port of C/V(2) and branches off in P2 tandem circuit and travel straight spool.

2) The delivery oil flowed into P1 parallel circuit of P1 pump opens check valve CT1 and LCb and flows in boom spool, which exerts on boom up operation.
The delivery oil flowed into travel straight spool of P1 pump opens check valve CT2 because the travel straight spool is shifted, and flows in boom conflux spool and exerts on boom up operation with the internal oil conflux.
(In travel straight operation, P1 pump delivery oil exerts on swing operation of attachment.)

3) The delivery oil flowed into P2 tandem circuit of P2 pump flows in left travel spool to travel leftward.
The delivery oil flowed into travel straight spool of P2 pump flows in right travel spool because the travel straight spool is shifted and exerts on the right travel operation.
(In travel straight operation, P2 pump delivery oil exerts on travel operation.)

4) However, a portion of the flow is led to the travel straight spool notch restriction. The speed of attachments like travel, boom, etc. is adjusted by the circuit of restriction.

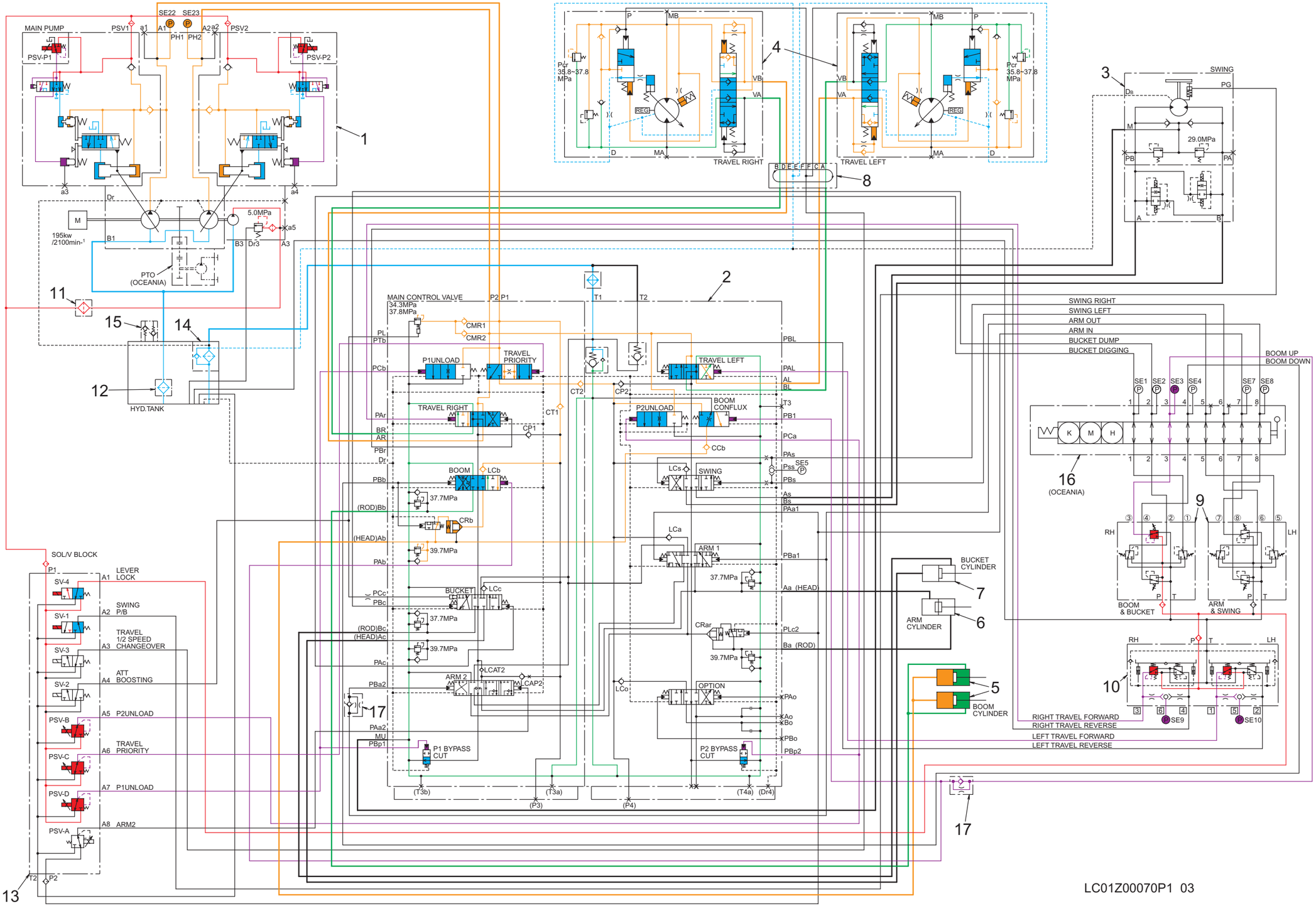


Fig. 22-10 COMBINED CIRCUIT : Boom up & Travel forward 1st speed operation, Travel straight function.

In this section, the independent operation is omitted and describes difference in combined operation.

(3) Swing / Arm in light load, pilot circuit

(4) Swing / Arm in, swing priority main circuit

22.10.3 SWING / ARM IN LIGHT LOAD, PILOT CIRCUIT

(1) Operation :

1) On operating swing (left) and arm in motions simultaneously, mechatro controller outputs command current to travel straight solenoid proportional valve (PSV-C) and arm 2 solenoid inverse proportional valve according to signal processing, and this proportional valve outputs secondary pressure, which acts on PTb port and PAa2 port of C/V(2).

2) PTb port pressure switches the travel straight spool 2 steps, and the PAa2 port pressure switches the arm 2 spool to the forced recirculation position.

22.10.4 SWING / ARM IN, SWING PRIORITY MAIN CIRCUIT

(1) Purpose :
Stable swing speed.

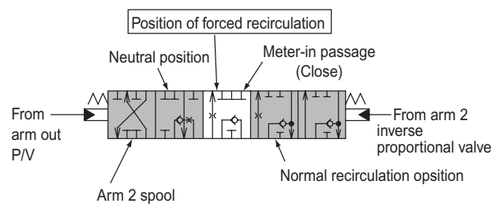
(2) Principle :
Raise the oil pressure flowing to arm cylinder, and give a priority of the delivery of P2 pump to swing operation.

(3) Operation :

1) The swing main circuit operates with P2 pump flow. But on P2 pump circuit side, the flow goes to the swing circuit and arm circuit simultaneously because the swing circuit and arm circuit are parallel. Then since the return oil from arm cylinder rod (R) side is restricted in the arm 2 spool because the arm 2 spool is switched to forced recirculation position, the pressure of return oil is raised, causing the rise of circuit pressure on the arm cylinder head (H) side.

2) At the same time meter-in of arm 2 spool closes and arm in conflux is therefore cancelled, and delivery oil from P2 pump and P1 pump are combined in the parallel circuit on P2 pump side because the travel straight spool was switched. The conflux oil of P1 and P2 delivery oil in high pressure flows in swing side taking priority over all others.
This operation is called "Swing Priority Circuit".

Position of arm 2 spool



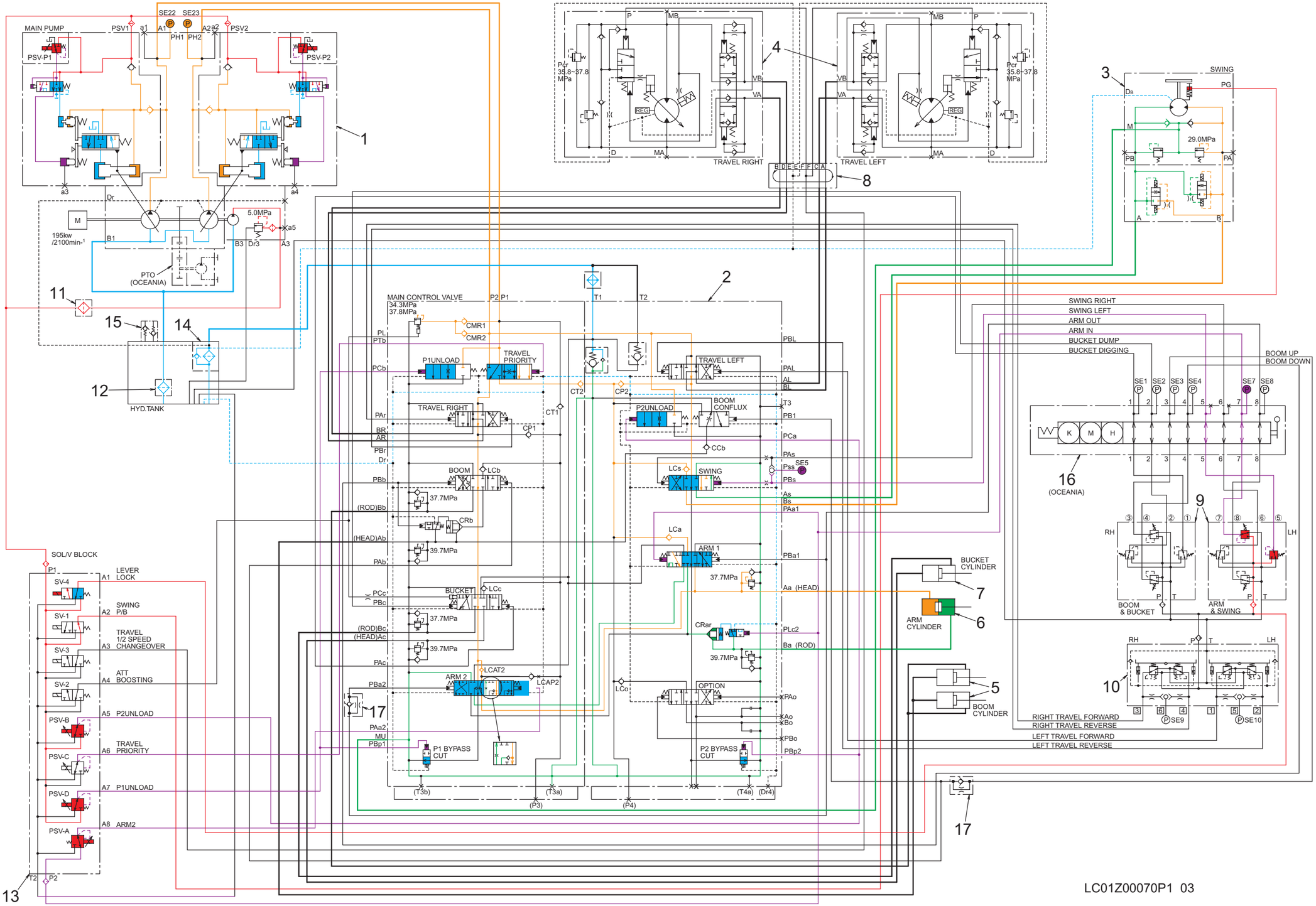


Fig. 22-11 COMBINED CIRCUIT : Swing / Arm in operation, swing priority function

22.11 PRESSURE DRAINING (RELEASING) CIRCUIT

This section describes the following operations.

(1) Pressure drain (releasing) pilot circuit

(2) Pressure drain (releasing) main circuit

22.11.1 PRESSURE RELIEVING PILOT CIRCUIT

(1) Purpose :
To release the pressure in main circuit for piping repair works.

(2) Principle :
After the mode is switched to "Pressure Relief Mode" with switch on gauge cluster, mechatro controller outputs the following commands.

1) Minimum tilting command value to pump proportional valve (PSV-P1, PSV-P2).

2) Output "Pressure relief control speed command value" at ECU. (Electric system)

3) Stand-by command value to P1, P2 unloading proportional valves

How to switch to "Pressure relief mode"

1) Press selector switch (↵) on gauge cluster, and "SWITCH" screen is displayed. After checking the letter "SWITCH" is reversed in black and white, press the selector switch again.

2) The adjustment mode screen is displayed, then press (▼) switch or (▲) switch, and "DRAIN HYD. OFF" screen appears.

3) Press selector switch, the screen changes in "DRAIN HYD. ON" screen. After checking the letter "SWITCH" is reversed in black and white, press the selector switch again.

(3) Operation :

1) Pump proportional valve reduces the pump flow rate to the minimum.

2) Unloading proportional valves (PSV-D, PSV-B) output secondary pressure and the secondary pressure flows in PCb, PCa ports of C/V(2) and switches the P1, P2 unloading valves to OPEN position.

22.11.2 PRESSURE RELEASE MAIN CIRCUIT

(1) Operation :
When the operating lever is shifted to neutral during engine running, "DRAINING HYD. PRESS." is displayed on the gauge cluster while the mode switch is changed to pressure relieving mode. In this time the intermittent buzzer sounds continuously. When right and left operating levers are operated 4 or 5 times to their full stroke, pressure is relieved.
After draining pressure is completed, turn off the starter key and buzzer sound stops. If the pump pressure is determined to be more than 1 MPa (145 psi) by the output value of the high pressure sensor or the high pressure sensors (SE-22,23) are broken, "FAIL DRAIN HYD. PRESS" is displayed and the buzzer sounds continuously. In that case, also the buzzer is not stopped unless the engine key is turned to OFF. Repeat the pressure releasing procedure once again.

(2) Hydraulics :
If the travel straight valve is turned to the pressure release position, the oil delivered by each pump is unloaded to the tank passage. If the spools are switched by pilot operation, the remaining pressure from the actuators may be relieved to the tank circuit, i.e. the main circuit pressure may be released.

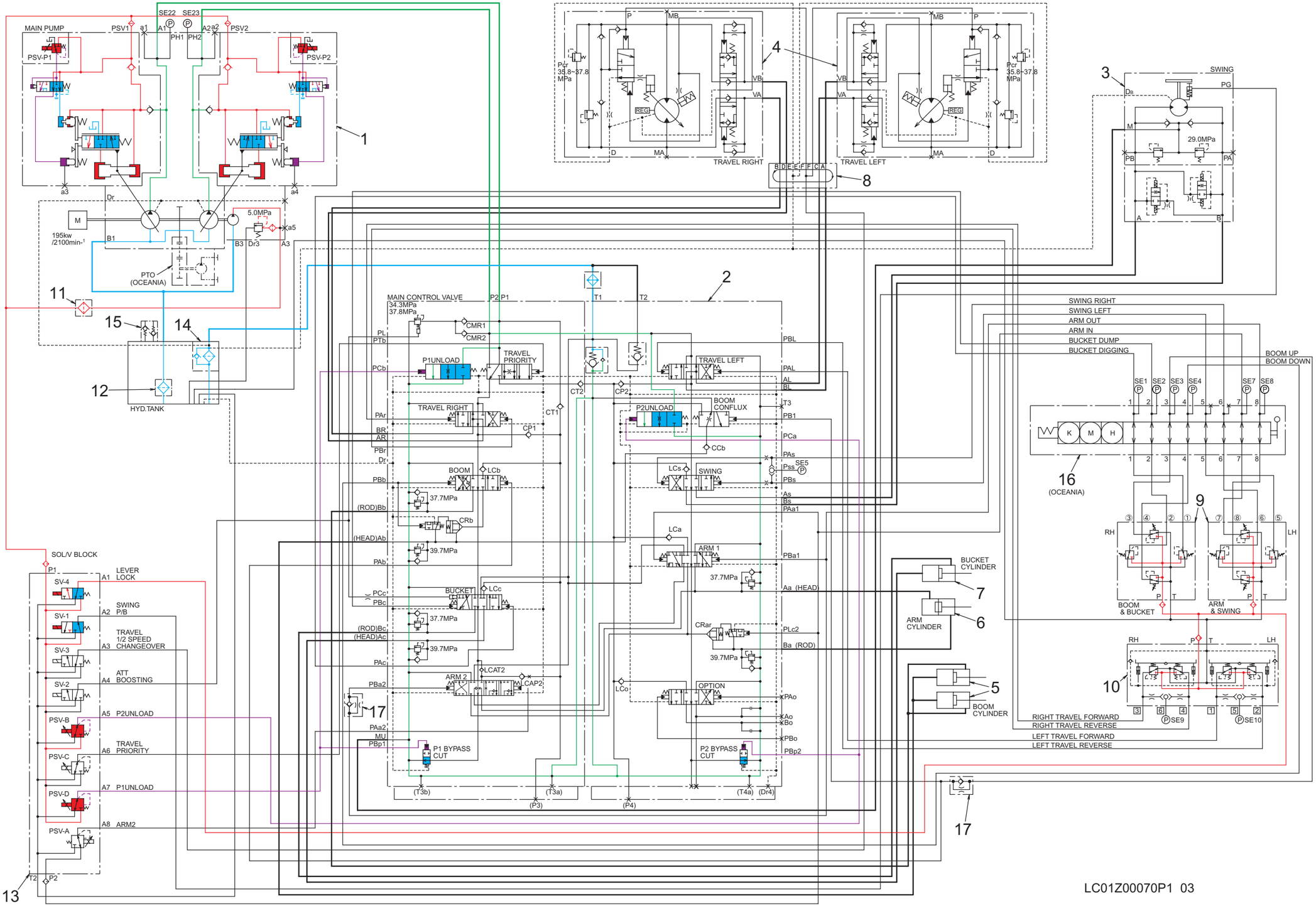


Fig. 22-12 PRESSURE DRAIN (RELEASE) CIRCUIT : At pressure release mode.

[MEMO]

https://truckmanualshub.com/

CHAPTER 07
SK350-8
HYDRAULIC MOTOR COMPONENTS
(Swing & Travel Systems)

TABLE OF CONTENTS

7.1 HYDRAULIC COMPONENTS 07-3
7.1.1 HYDRAULIC PUMP • REGULATOR 7-3
7.1.2 CONTROL VALVE 7-21
7.1.3 PILOT VALVE (ATT) 7-59
7.1.4 PILOT VALVE (TRAVEL) 7-63
7.1.5 SWING MOTOR UNIT 7-65
7.1.6 TRAVEL MOTOR 7-75
7.1.7 SWIVEL JOINT 7-89
7.1.8 CYLINDER 7-91
7.2 ELECTRIC EQUIPMENT 7-97
7.2.1 ELECTRIC EQUIPMENT LIST 7-97
7.2.2 SPECIFICATION OF ELECTRIC EQIUPMENTS 7-100

Book Code No. **S5LC2411E01**

https://truckmanualshub.com/

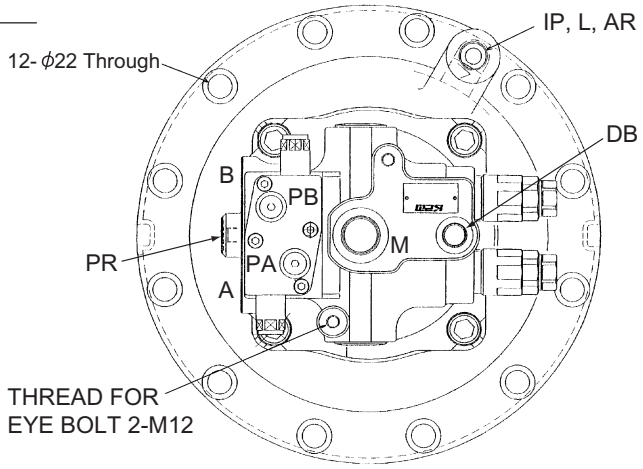
Issue	Date of Issue	Applicable Machines	Remarks
First edition	July, 2006	SK330–8 : LC10-07001~ SK350LC–8 : YC10-03501~	S5LC2411E01 (ASIA, OCE) SC

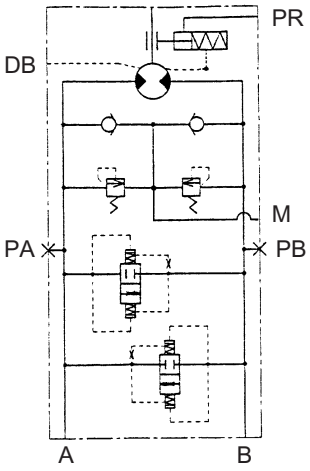
24.1.5 SWING MOTOR UNIT

24.1.5.1 SPECIFICATION

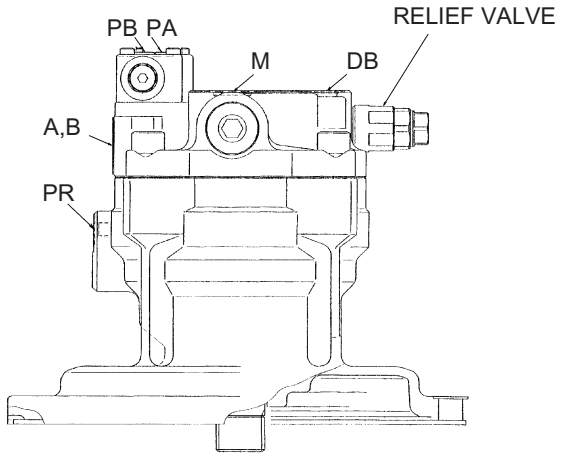
(1) General view

Symbol	Port name	Port size	Tightening torque N·m (lbf·ft)
A,B	Main port	SAE 3/4"	—
DB	Drain port	PF1/2	108 (80)
M	Make-up port	PF1	216 (159)
PA,PB	Pressure measuring port	2-PF1/4	36 (27)
PR	Parking brake release port	PF1/4	36 (27)
IP,L,AR	Gear oil level gauge or Air breather port or Gear oil filling port	PT3/4	98 (72)





Hydraulic diagram

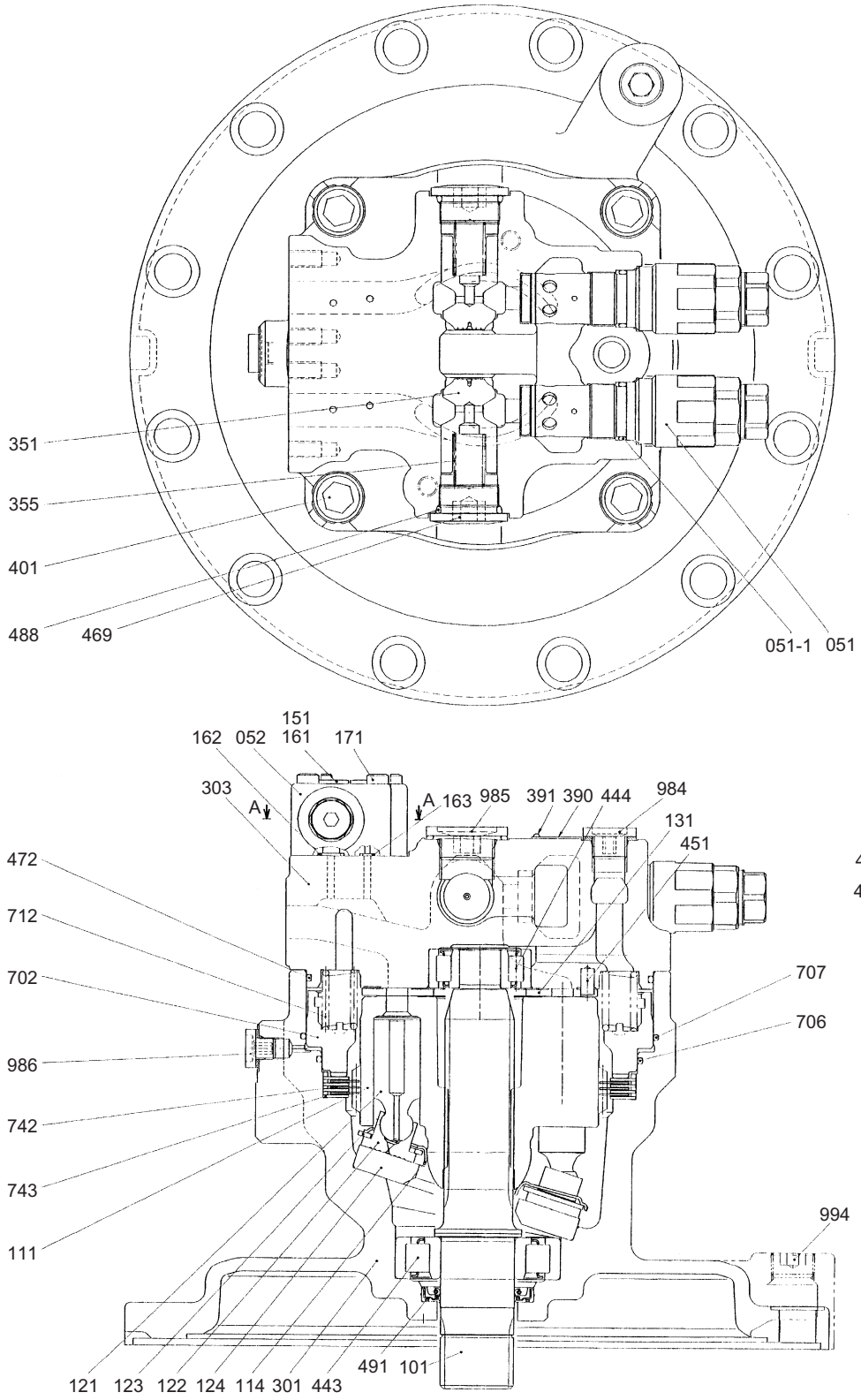


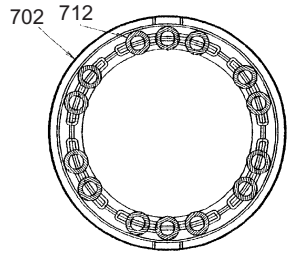
(2) Specifications

Swing motor unit part No.				LC15V00025F1
Hydraulic motor	Part No.			LC15V00022F1
	Type			M5X180CHB-10A-60B/295
	Displacement		cm^3 (in^3)	180.1 (11.0)
	Working pressure		MPa (psi)	32.4 (4700)
	Max. pressure		MPa (psi)	39.2 (5680)
	Working flow		L/min (gal/min)	294 (77.7)
	Braking torque		N•m (lbf•ft)	860~1121 (634~827)
	Brake release pressure		MPa (psi)	2.4~5.0 (348~725)
	Relief set pressure		MPa (psi)	29.0 (4205)
	Weight		kg (lbs)	72.5 (160)
	Anti-reaction valve block	Part No.		YN22V00014F4
		Type		2KAR6P72/240-712
		Weight	kg (lbs)	2.5 (5.5)
	Hydraulic motor assy weight		kg (lbs)	75 (165)
Reduction unit	Part No.			LC32W00007F1
	Speed reduction type			Planetary 2-stage
	Reduction ratio			27.143
	Lubicate oil			Gear oil SAE90 (API class GL-4 grade)
	Lubicate oil volume			7.4 L (1.96 gal)
	Grease			Extreme pressure lithum base #2 grease
	Grease volume		kg (lbs)	Approx. 1.7 (3.7)
	Weight		kg (lbs)	371 (818)
Total weight			kg (lbs)	446 (983)

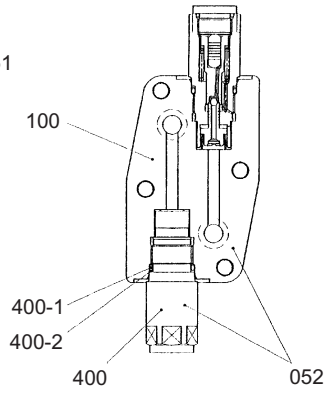
24.1.5.2 CONSTRUCTION

(1) Swing motor





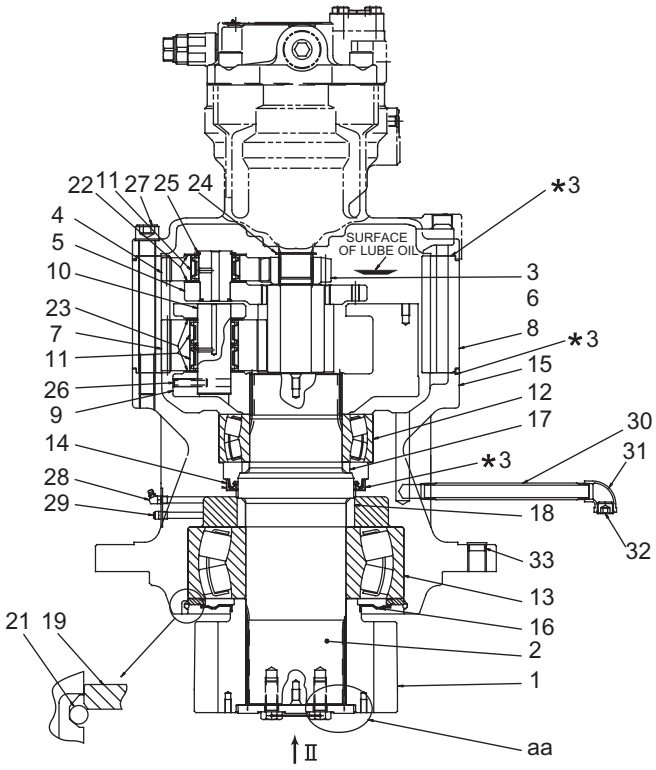
ARRENGEMENT OF BRAKE SPRING

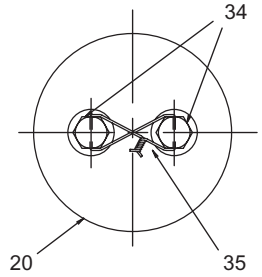


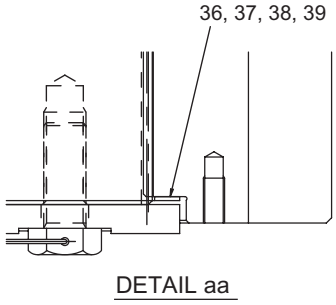
SECTION A-A

Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty	Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty
177 (130)	051	Relief valve ; M33-P1.5	2	69 (51)	400	Anti-reaction valve ; M22-P1.5	2
	051-1	O-ring ; 1B G30	2		400-1	O-ring ; 1B P20	2
	052	Anti-reaction valve sub	1		400-2	Backup ring	2
	100	Casing for anti-reaction valve	1	431 (318)	401	Socket bolt ; M20×45	4
	101	Drive shaft	1		443	Roller bearing	1
	111	Cylinder	1		444	Roller bearing	1
	114	Spring plate	1		451	Pin	2
	121	Piston	9	539 (398)	469	ROMH plug; M36-P1.5	2
	122	Shoe	9		472	O-ring ; W1516,WG44	1
	123	Set plate	1		488	O-ring ; 1B P34	2
	124	Shoe plate	1		491	Oil seal	1
	131	Valve plate	1		702	Brake piston	1
36 (27)	151	Plug ; PF1/4	2		706	O-ring ; W1516,WG42	1
	161	O-ring ; 1B P11	2		707	O-ring ; W1516,WG45	1
	162	O-ring ; 1B P12	2		712	Brake spring	14
	163	O-ring ; 1B P6	2		742	Friction plate	3
29 (21)	171	Socket bolt ; M8×55	4		743	Separator plate	4
	301	Casing	1	2.7 (2.0)	984	Plug ; PF1/2	1
	303	Valve casing	1	5.6 (4.1)	985	Plug ; PF1	1
	351	Plunger	2	0.9 (0.66)	986	Plug ; PF1/4	1
	355	Spring	2	98 (72)	994	Plug ; PT3/4	1
	390	Name plate	1				
	391	Rivet	2				

(2) Swing reduction unit







Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty	Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty
	1	Pinion	1		21	Ring	1
	2	Shaft	1		22	Thrust washer	6
	3	#1 Sungear	1		23	Thrust washer	8
	4	#1 Planetary pinion	3		24	Snapring	1
	5	#1 Spider assy	1		25	Snapring	3
	6	#2 Sungear	1		26	Spring pin	4
	7	#2 Planetary pinion	4	539±54 (398±40)*1	27	Capscrew ; M20×200	12
	8	Ring gear	1		28	Grease fitting	1
	9	#2 Spider assy	1		29	Relief fitting	1
	10	Shaft	4	69.1±4.4 (51±3)*2	30	Tube	1
	11	Needle bearing	11	69.1±4.4 (51±3)*2	31	Elbow	1
	12	Roller bearing	1	69.1±4.4 (51±3)*2	32	Plug	1
	13	Roller bearing	1		33	Cap	2
	14	Oil seal	1	279±30 (206±22)*1	34	Capscrew	2
	15	Housing	1		35	Wire ø1.6×250	1
	16	Oil seal	1		36	Shim ; t=0.1	1
	17	Sleeve	1		37	Shim ; t=0.2	1
	18	Sleeve	1		38	Shim ; t=0.3	1
	19	Plate	1		39	Shim ; t=0.5	1
	20	Plate	1				

*1 : Apply Three Bond #1360K.

*2 : Apply seal tape or Loctite #577.

*3 : Apply Loctite #515.

https://truckmanualshub.com/

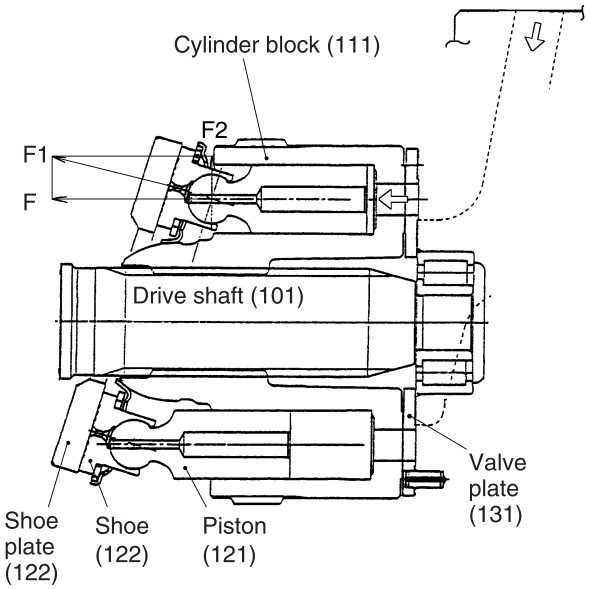
24.1.5.3 OPERATION

24.1.5.3.1 OPERATION OF HYDRAULIC MOTOR

If the high pressure oil flows into the cylinder through the inlet port (a) of valve plate (131), as shown on the figure on the right, the hydraulic pressure acts upon piston (121) and creates force F in the axial direction.
The force F may be divided into force F1 vertical to shoe plate (124) via shoe (122) and force F2 at right angles with the shaft.
The force F2 is transmitted to cylinder block (111) via pistons (121) and causes drive shaft to turn so as to produce a rotating moment.
The cylinder block (111) has nine pistons equally arranged. Rotating torque is transmitted to drive shaft by turns by pistons connected to inlet port of high pressure oil.
If the oil supply and discharge directions are reversed, the drive shaft rotates in the opposite direction.
Theoretical output torque T can be given by the following equation.

$$T = \frac{P \times q}{2 \times \pi}$$

P ; Effective differential pressure MPa
q ; Displacement per revolution cc/rev



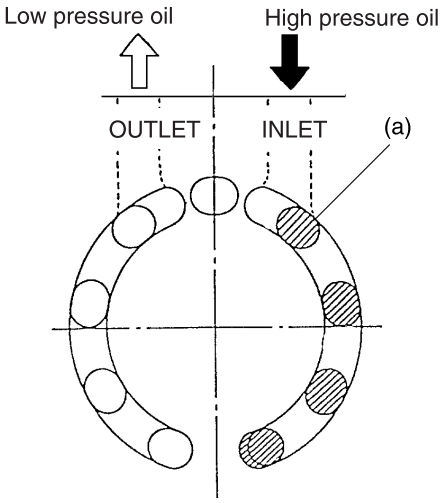


Fig. 24-62 Operation of hydraulic motor

24.1.5.3.2 VALVE CASING SECTION

(1) (1)Operation of anti-cavitation check plunger
Since the system using this type of motor is not equipped with a valve having a counterbalance function, the motor is rotated beyond the oil feed rate in some cases.
The system has check plunger(351) and sucks in deficient oil, in order to prevent cavitation from occurring due to oil deficiency.

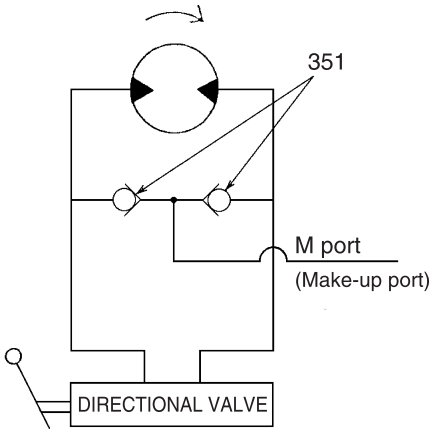


Fig. 24-63 Operation of anti-cavitation check plunger

(2) Operation of relief valve

1) Consider where the relief valve is pressurized.

The pressure at the P, R ports is equal to the tank pressure at the beginning, as shown in Fig. 24-64.

The relief valve begins to operates when the hydraulic pressure that is determined by the product of the pressure-receiving area A1 of plunger(301) and the pressure P balances the hydraulic pressure that is determined by the product of the pressure-receiving area A2 of the plunger(301) and the pressure Pg of chamber g. Thereafter, the pressure of chamber g rises and the piston 1 (302) begins to stroke. The load to spring (321) increases by this movement of the piston.

As the result, the relief pressure P is raised and controlled in the pressure boost time t1 from P1 till Ps.

This process is explained in the following in the relationships between the movements of the components shown in (2) to (4) of Fig. 24-65~Fig. 24-67and the relief pressure :

a. Condition shown in Fig. 24-65.

If the P port of the relief valve is pressurized, pressure is built up in chamber g via the restrictor m of plunger (301).

The hydraulic pressure acting on plunger (301) increases and when it balances the load Fsp of spring (321), the relief valve performs relieving action by the pressure P1.

This relationship is expressed as :

$P1 \times A1 = FSP1 + Pg1 \times A2$

where FSP1 :

primary set load value of spring (321)

b. Condition shown in Fig. 24-66.

The pressure of chamber g acts upon the pressure-receiving area A3-A4 of piston 1 (302). When the hydraulic pressure rises above the load of spring (321), the piston 1 begins to move to the left.

On that occasion, since the machine turns to the left while discharging the oil of chamber h arranged between piston 1 and adjust plug (401) into chamber g via orifice n provided in piston 1 (302), chamber h serves as a dumping chamber.

The load of the spring increases slowly till piston 1 reaches the end of the adjust plug. The relief pressure P rises smoothly.

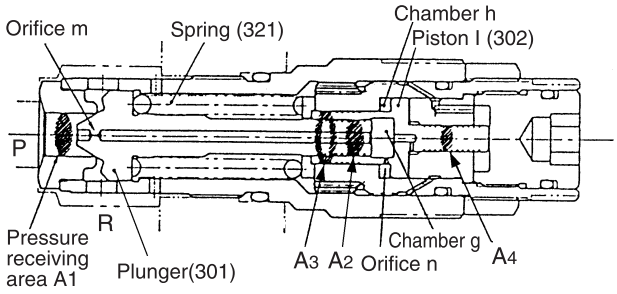


Fig. 24-64 Functional explanation of relief valve (1)

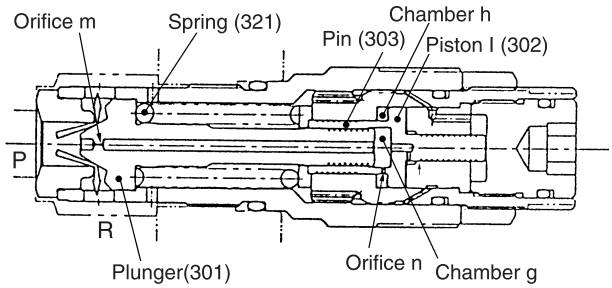


Fig. 24-65 Functional explanation of relief valve (2)

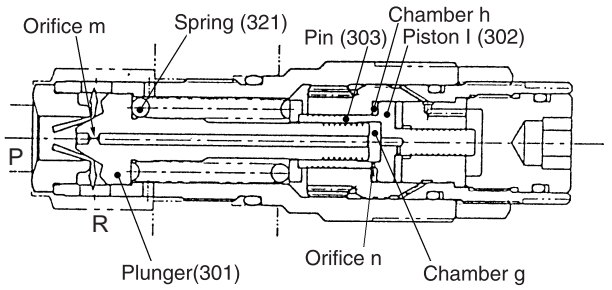


Fig. 24-66 Functional explanation of relief valve (3)

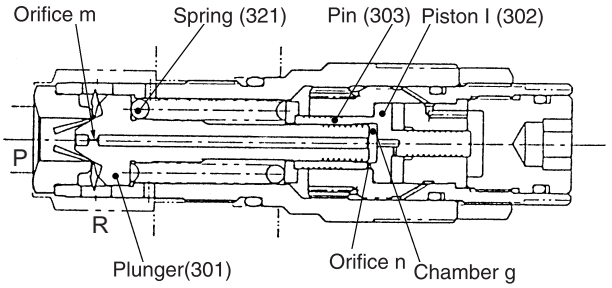


Fig. 24-67 Functional explanation of relief valve (4)

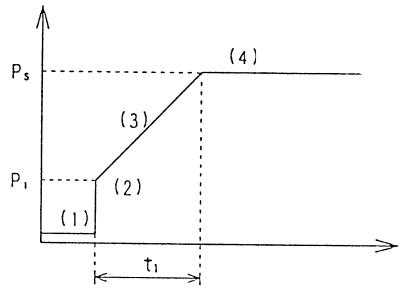


Fig. 24-68 Pressure boost characteristics

https://truckmanualshub.com/

c. Condition shown in Fig. 24-67.
The machine does not travel to the left further when piston 1 (302) arrives at the end of adjust plug (401). Therefore, the relief valve keeps its normal relieving action whereby the relief pressure is held at P2.
In the processes 1 to 3 above, the relief pressure changes as shown in Fig. 24-68.

2) Function when the relief valve pressure is reduced
Let us consider the pressure of the P port is reduced.
When the pressure at port P is reduced to zero, the pressure of chamber g falls to the tank pressure level. The result is that the plunger (301) which is now open moves to the left and is seated on seat (341). At the same time, the piston 1 (302) moves to the right by the action of spring (321) and returns to the condition of Fig. 24-64.

(3) Operation of anti-reaction valve

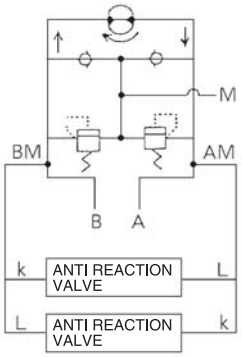


Fig. 24-69 Hydraulic circuit diagram for anti-reaction valve.

1) Neutral condition :
Fig. 24-69 illustrates the relationship between the neutral condition of the anti-reaction valve and the hydraulic circuits. Now, let us consider a braking condition in which brake pressure generates on the AM port side.

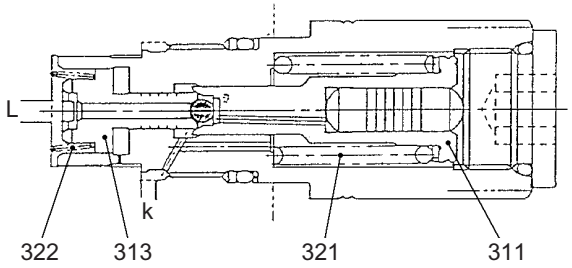


Fig. 24-70 Neutral condition

2) When brake pressure occurs :
If pressure (P) generates at the AM port, it passes through the passage L, the hole on the shaft of seat (313) and the passage m of plunger (311) and is led to the n chamber.
When the pressure P rises above a value (Ps) set by spring (321), plunger (311) compresses spring (321) and shifts it to the left.
Seat (313) compresses weak spring (322) as pushed by plunger (311) and moves to the left.

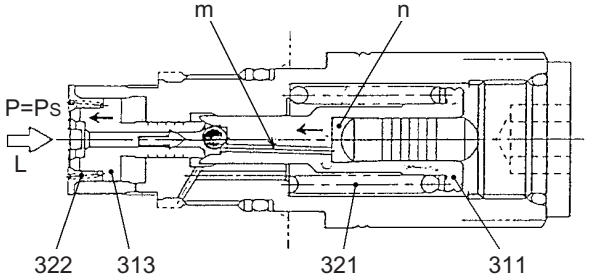


Fig. 24-71 When brake pressure occurs

3) At anti-reaction action

When inertia load stops moving (point Y Fig. 24-73), brake pressure (P) tries to fall.

When P<Ps, plunger (311) moves toward the right return side by the action of spring (321).

Seat (313) tries to move to the right by the action of spring (322), but since chamber p provides damping action by orifice g, the return of the seat makes a time delay with regard to the return of the plunger.

Consequently, seat t opens. This makes a passage connecting the AM port and BM ports or both ports of the hydraulic motor by way of ~~t → p → k~~. The result is that the pressures at the AM and BM ports become equal (Pb), falling into the condition at point Z in Fig. 24-73.

This prevents the hydraulic motor from swing shock by the closing pressure of the AM port.

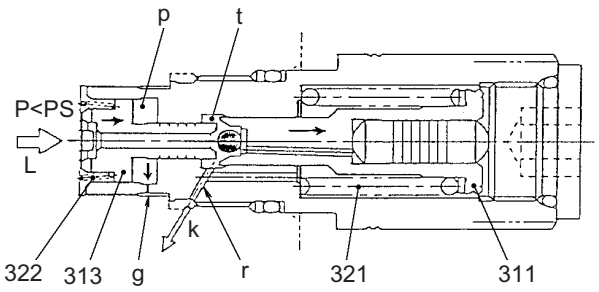


Fig. 24-72 At anti-reaction action

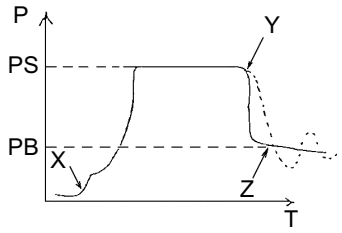


Fig. 24-73 Pressure change diagram of anti-reaction operation

24.1.5.3.3 OPERATION OF BRAKE SECTION

The cylinder (111) is jointed by drive shaft (101) and a spline. Separator plate (743) is fixed in its circumferential direction by circular grooves provided in casing (301).

Now, if the friction plate (742) splined to the outer circumference of the cylinder is pressed against casing (301) via separator plate (743) and brake piston (702) by the action of brake spring (712), frictional force is created between friction plate (742) and casing (301) and between separator plate (743) and brake piston (702). The frictional force bounds the drive shaft to brake the motor.

In the meantime, when brake release pressure applied to the oil chamber formed between brake piston (702) and casing (301) overcomes the spring force, the brake is released as brake piston (702) moves till friction plate (742) is separated from casing (301).

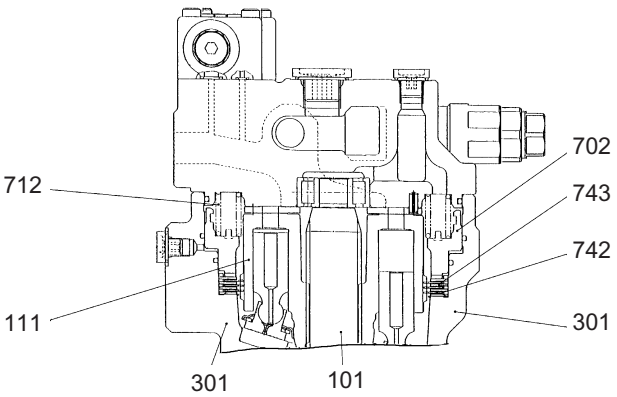


Fig. 24-74 Operation of swing brake

https://truckmanualshub.com/

24.1.5.3.4 SWING REDUCTION UNIT

The swing reduction unit is used to reduce the rotating speed which is transmitted by the hydraulic motor and to convert it to the strong turning force (torque).
This swing speed reduction unit is equipped with planetary speed reducing mechanism.
The planetary mechanism is made up of sun gear, planetary pinion, planetary shaft, spider and ring gear, as shown in Fig. 24-75.

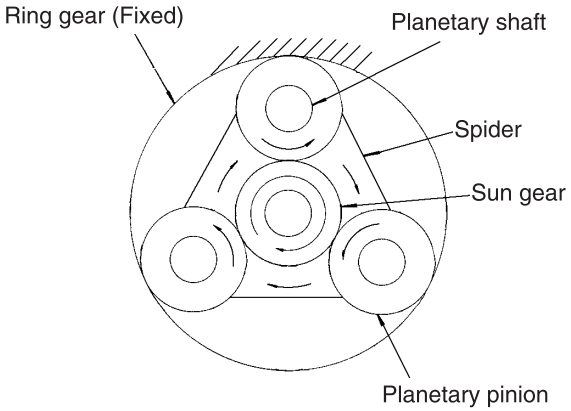


Fig. 24-75 Planetary mechanism

For the operation of the 1st stage planetary, the hydraulic motor rotates #1 sun gear (3). Sun gear (3) is engaged with planetary pinion (4) and rotates, but since ring gear (8) is fixed, planetary pinion (4) revolves about sun gear (3) with the planetary shaft and spider (5).

The role of spider is to hold the planetary pinion and planetary shaft and transmits the power from the planetary pinion to the spider through the planetary shaft.
The #1 spider (5) is linked with #2 sun gear (6) by the involute spline, and transmits the power to the 2nd stage planetary mechanism.
For the operation of the 2nd stage planetary, the power is transmitted to #2 sun gear (6)→#2 planetary pinion (7)→#2 spider (9) similarly to the 1st stage. The #2 spider (9) is linked with pinion shaft (2) by the involute spline, and pinion (1) is engaged with the swing gear fixed on the undercarriage (lower frame) and rotates.

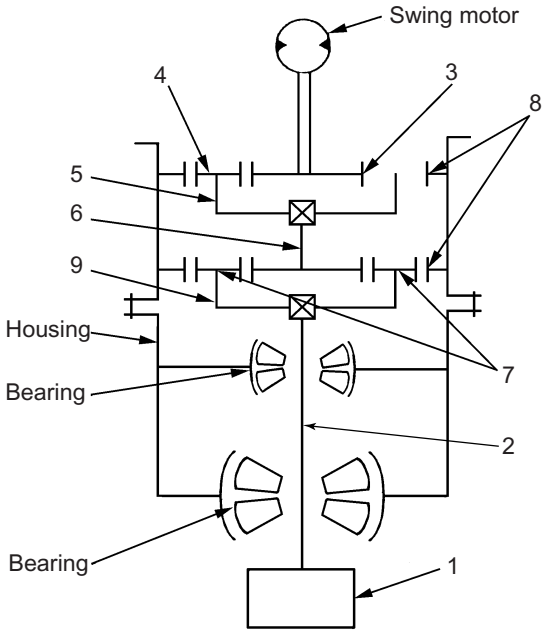


Fig. 24-76 Function of reduction unit

24.1.6 TRAVEL MOTOR

24.1.6.1 SPECIFICATION

(1) Appearance

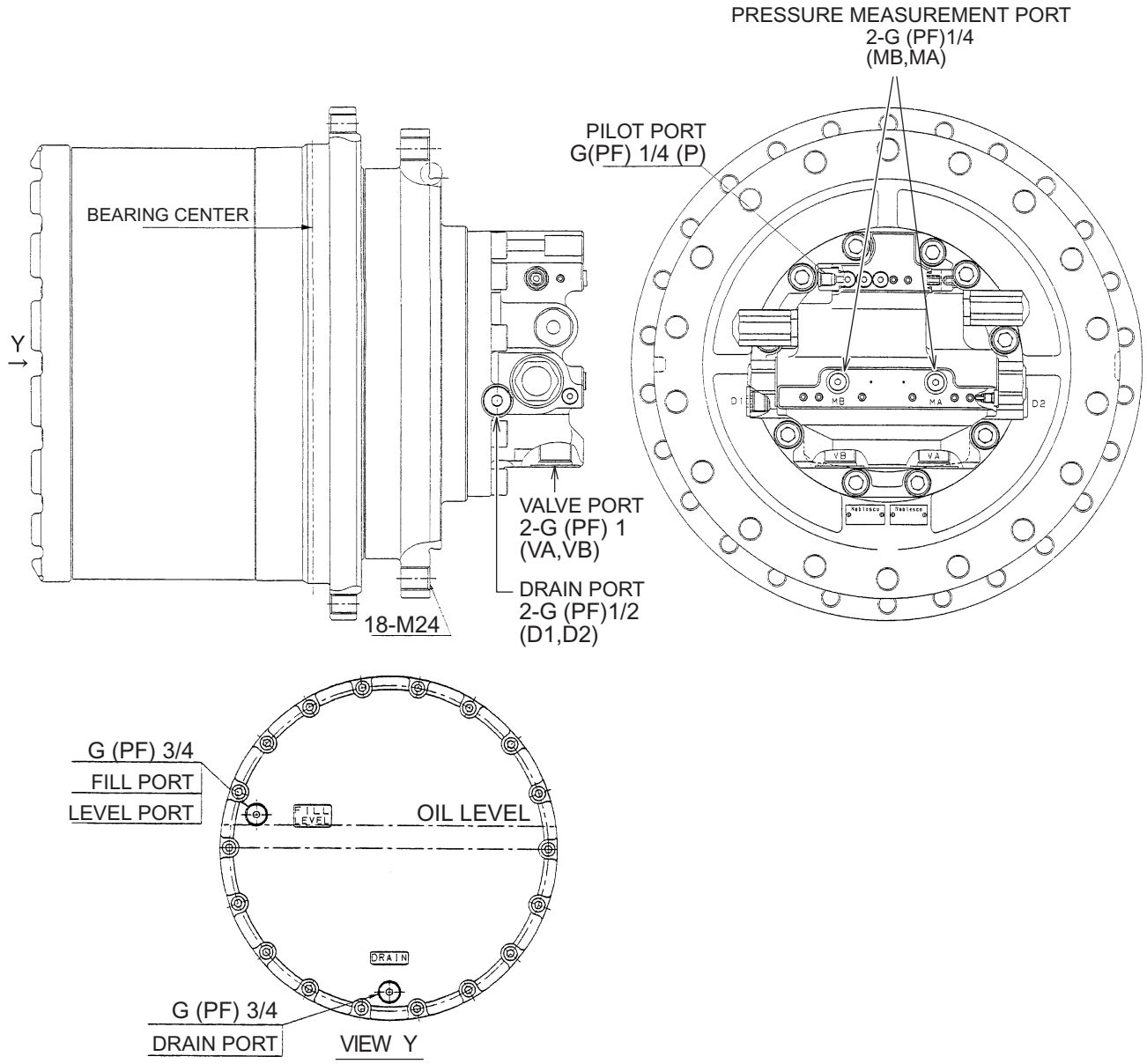


Fig. 24-77 Travel motor

Rotation direction

Oil inlet port	Oil outlet port	Rotation direction (Viewed from valve port side)
VA	VB	Right (Clockwise)
VB	VA	Left (counter clockwise)

Port name	Port size	Tightening torque N•m (lbf•ft)	Function
P	PF1/4	36 (26.6)	Pilot (2 speed changeover) port
D1, D2	PF1/2	98.1 (72.4)	Drain port
VA, VB	PF1	255 (188)	Motor drive port
MA, MB	PF1/4	29.4 (21.7)	Pressure measurement

https://truckmanualshub.com/

(2) SPECIFICATIONS

TRAVEL MOTOR UNIT		Part No.		LC15V00023F1
		Type		M4V290 / 170F-RG6.5F
Reduction unit	Part No.			—
	Type			—
	Reduction ratio			40.467
	Number of reduction stages			2
	Lube oil capacity	L (gal)		9.5 (2.5)
	Lube oil capacity specification			Gear oil SAE90API GL4 or GL5
	Weight	kg (lbs)		—
Travel motor	Part No.			LC15V00026F1
	Type			M4V290 / 170F
	Max. displacement	cc/rev (cu•in/rev)		290.7 (17.7)
	Min. displacement	cc/rev (cu•in/rev)		170.1 (10.4)
	Relief valve set pressure	MPa (psi)		35.0 (5075)
	2 peed changeover pilot pressure	MPa (psi)		5.0 (725)
	Parking brake torque	N•m (lbf•ft)		902 or more (665)
	Parking brake release pressure	MPa (psi)		Less than 1.54 (223)
	Allowable drain pressure	MPa (psi)	Working	0.2 (29)
			Surge	0.98 (142)
	Weight	kg (lb)		—
Unit weight (with oil)		kg (lb)		399 (880)

24.1.6.2 CONSTRUCTION

24.1.6.2.1 TRAVEL MOTOR

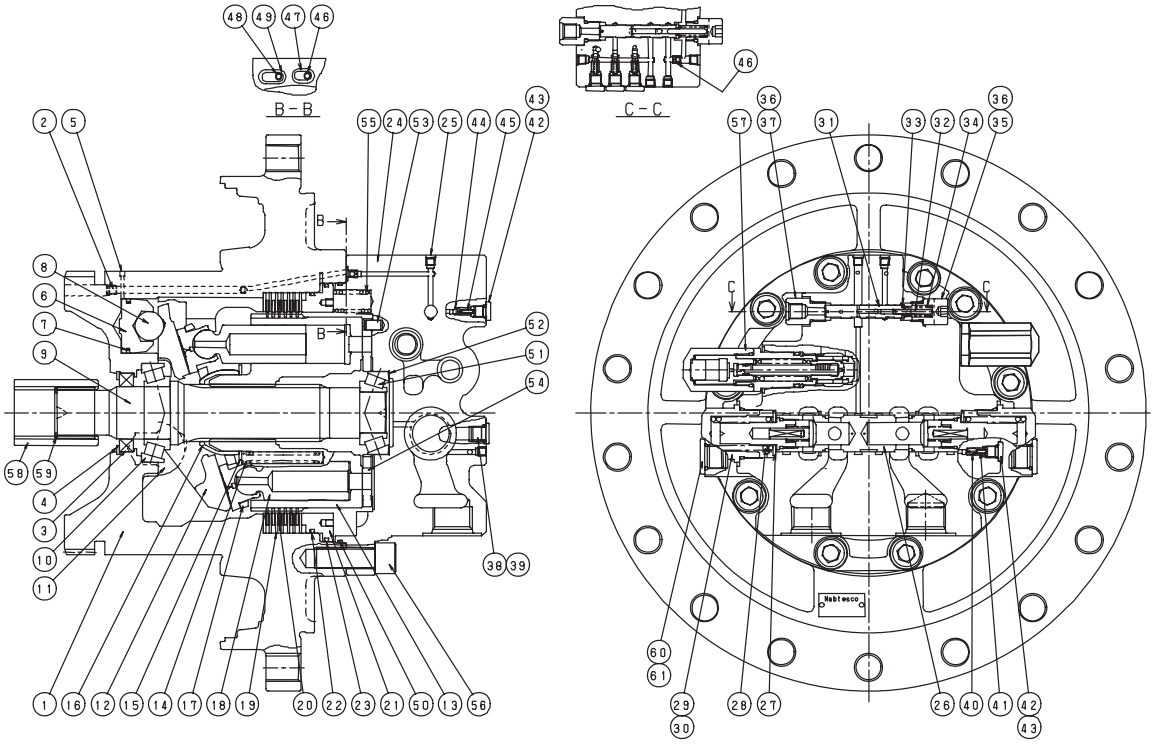


Fig. 24-78 Travel motor

No.	NAME	No.	NAME	No.	NAME
1	Casing	21	Breake piston	41	Restrictor spring (brake valve)
2	NPT 1/16 plug	22	D-ring (small dia.)	42	G1/8 plug
3	Oil seal	23	D-ring (big dia.)	43	O-ring 1B P8
4	Retaining ring IRTW68	24	Rear cover	44	Check valve
5	Expander plug MB800-040	25	NPT 1/16 plug (MEC)	45	Check valve spring
6	Shifter piston	26	Spool assy (M4V RBV)	46	M6 restrictor (0.6)
7	Piston seal	27	Spring holder (M4V RBV)	47	O-ring 1B P12.5
8	Steel ball 25	28	Spring (M4V150RBV)	48	M8 restrictor (0.8)
9	Shaft	29	M42 plug (4V RBV)	49	O-ring 1B P15
10	Bearing HR32209J	30	O-ring 1B G40	50	O-ring 215.57×2.62
11	Pivot	31	Pilot valve spool dia. ø10 (M4V290)	51	Bearing HR32207C
12	Swash plate	32	Pin (MRC03)	52	Shim
13	Cylinder block	33	Spring holder (MRC03)	53	Parallel pin M68×12
14	Cylinder spring	34	Spring (MRC03)	54	Valve plate
15	Spring holder	35	G3/8 pilot valve plug	55	Brake spring
16	Ball joint	36	O-ring 1B P14	56	HEX. socket head bolt M18×50
17	Shoe retainer	37	Connector (MRC03)	57	Overload relief valve ORV-240L
18	Piston assy	38	G1/4 plug	58	Coupling
19	Separating plate	39	O-ring 1B P11	59	Retaining ring C-type 40
20	Friction plate	40	Restrictor (brake valve)	60	G1/2 plug
				61	O-ring 1B P18

https://truckmanualshub.com/

24.1.6.2.2 REDUCTION UNIT

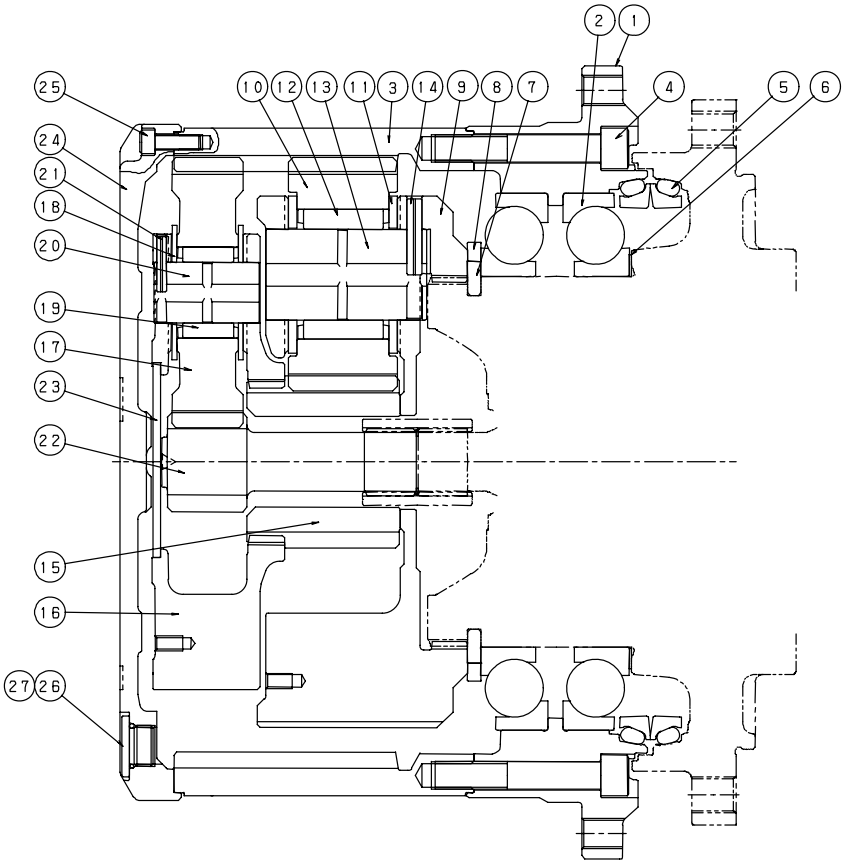


Fig. 24-79 Reduction unit

No.	NAME	No.	NAME	No.	NAME
1	Housing	11	Thrust washer 2	21	Spring pin 6×36
2	Bearing 245BA35S1GS	12	Needle bearing FBNP-608660	22	Sun gear 1
3	Ring gear	13	Carrier pin 2	23	Thrust plate
4	HEX. socket head bolt M18×110	14	Spring pin 10×50	24	Cover
5	Floating seal 368	15	Sun gear 2	25	HEX. socket head bolt M10×30
6	Shim	16	Carrier 1	26	Plug G3/4
7	Lock washer	17	Planetary gear 1	27	O-ring 1B P24
8	Support ring	18	Thrust washer 1		
9	Carrier 2	19	Needle bearing FBNP-406040		
10	Planetary gear 2	20	Carrier pin 1		

24.1.6.3 MAKEUP OF TRAVEL MOTOR

The travel motor consists mainly of the rotary group that generates rotating power, the parking brake that prevents the machine from moving by itself while it is parked, the variable displacement mechanism that switches over the motor capacity to the large or small mode, the overload relief valve that is built in the rear cover, and the brake valve (counterbalance valve) that controls the hydraulic circuits.

(1) Rotary group

Cylinder block (13) is inserted in the gear tooth grooves of the spline of shaft (9) that is supported by bearings (10, 51) at it both ends. The cylinder block (13) is pressed against rear cover (24) with valve plate (54) by the action of spring (14).

9 piston assy (18) slide over shoe plate (12), while stroking in cylinder block (13).

A bearing retainer is arranged at the end face of piston assy (18) to reduce the sliding resistance. The action of spring (14) is transmitted to spring retainer (15), ball joint (16), and shoe retainer (17) and presses the end face of piston assy (18) against shoe plate (12) so the piston assy moves close to the surface of shoe plate (12).

(2) Parking brake

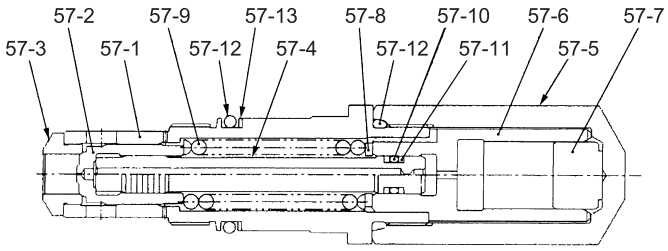
Seven separator plates (19) and six friction plates (20) are inserted by turns in the spline grooves in the outer surface of cylinder block (13) and are pressed against casing (1) by the action of 14 springs (55) via brake piston (21).

(3) Variable displacement mechanism

The variable displacement mechanism consists of pivot (11) supporting shoe plate (12) that is put in two semispherical concaves provided in shoe plate tilting piston (6) that tilts shoe plate on pivot (11) tilting stopper (H) supporting the piston at a certain position; the pilot valve that admits the pressurised oil to the tilting piston (6) by an external command; and three check valves (44) that take out the highest of the external command activated pilot pressure, the motor inlet pressure and the motor outlet pressure and that sends it to the pilot valve.

(4) Overload relief valve

The overload relief valve consists of socket (57-1) that has valve seat (57-3) metallically seating rear cover (24) of the motor and screwed up in rear cover (24) valve (57-2) engaged with socket (57-1) that is tangential in contact with valve seat (57-3) by the action of adjust spring (57-9) connecting piston (57-4) that is inserted in valve (57-2) and serves also as an oil path to pilot body (57-6) piston (57-7) that is put in pilot body (57-6) and pressed against plug (57-5) and shim (57-8).



No.	NAME	No.	NAME
57-1	SOCKET	57-8	SHIM
57-2	VALVE	57-9	SPRING
57-3	VALVE SEAT	57-10	O RING ; 1B P7
57-4	CONNECTING PISTON	57-11	BACKUP RING
57-5	PLUG	57-12	O RING ; 1B G25
57-6	PILOT BODY	57-13	BACKUP RING
57-7	PISTON		

Fig. 24-80 Construction of overload relief valve

https://truckmanualshub.com/

(5) Brake valve portion

1) Spool
By shifting the spool (26), the discharged oil from hydraulic motor is automatically shut off or restricted according to the condition and give the effect of holding, accelerating, stopping and counterbalance operations.

2) Check valve (built in the spool)
This valve is located in the oil supplying passage to hydraulic motor, and at the same time functions to lock oil displacement. Therefore, this valve serves as not only a suction valve but also a holding valve for hydraulic motor.

Spool control pressure : 0.59~0.95 MPa (86~138 psi)
Check valve cracking pressure : 0.015 MPa (2.2 psi)

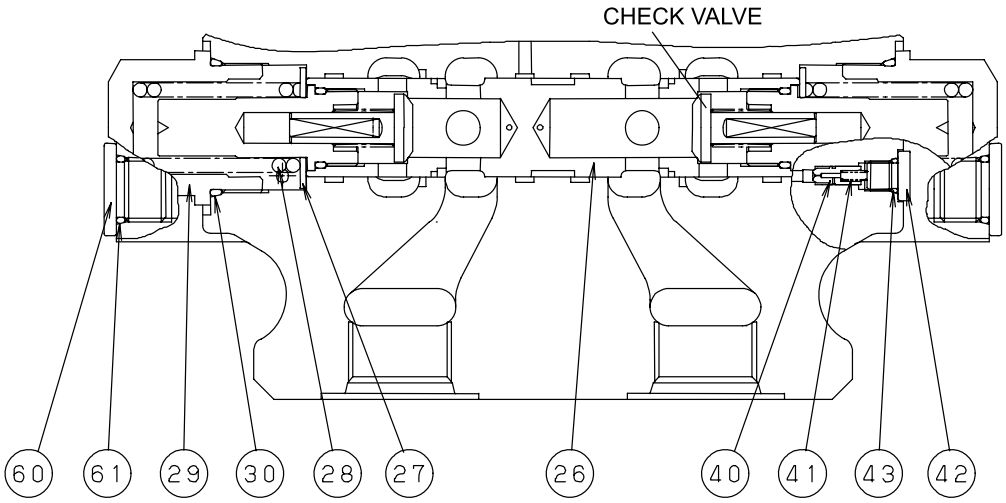


Fig. 24-81 Brake valve portion

24.1.6.4 FUNCTIONS OF TRAVEL MOTOR

(1) Motor

High pressure oil delivered from hydraulic pump is led to inlet port that is provided in the brake valve portion and, through the rear cover (24) and valve plate (54), led to cylinder block (13).

As shown in Fig. 24-82 (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.

F1=P× A (P : pressure, A : area of piston section)

The swash plate (12) with inclined angle of α divides this force F1 into thrust force F2 and radial force F31-F34 (or F35). (Fig. 24-82 (b)) This radial force is applied to axis Y-Y as turning force and generate drive torque of T.

T=r1•F31+r2•F32+r3•F33+r4•F34

(In case high pressure oil is applied to five pieces of pistons, r5 F35 should be added.)

This drive torque is transmitted via cylinder block (13) to driving shaft (9).

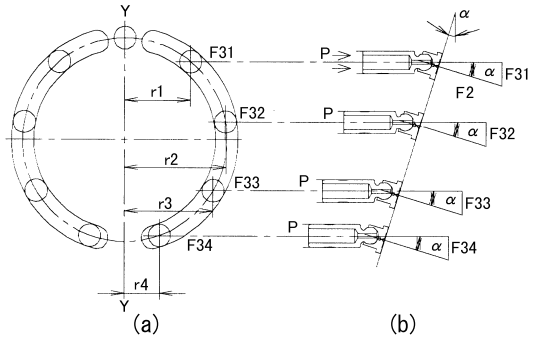


Fig. 24-82

(2) Parking Brake

Parking brake is released when high pressure oil, selected by the brake valve portion that is connected directly to the rear cover (24), is applied to the brake piston (21). Otherwise the braking torque is always applied.

This braking torque is generated by the friction between the separating plates (19), inserted into the casing (1), and friction plates (20), coupled to cylinder block (13) by the outer splines.

When no pressure is activated on the brake piston (21), it is pushed by the brake springs (55) and it pushes friction plates (20) and separating plates (19) towards casing (1) and generates the friction force which brakes the rotation of cylinder block (13) and hence the shaft (9).

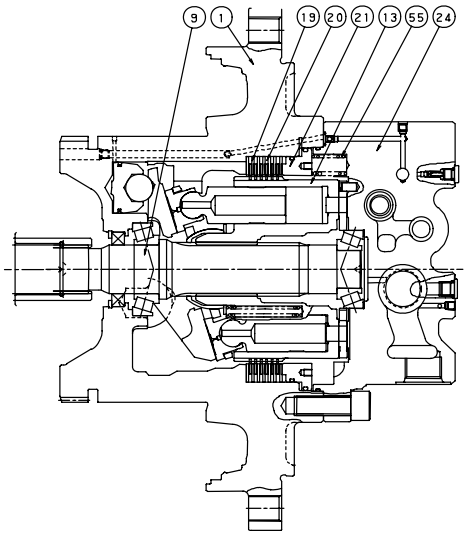


Fig. 24-83 Parking brake portion

https://truckmanualshub.com/

(3) Capacity Control Mechanism

Fig. 24-84 typically shows the capacity control mechanism.

When high speed pilot line is charged with the pressure PA that overcome the spring (34), the spring (34) is compressed and spool (31) shifts to the right to connect the port P and port C.

Then, the highest pressure is selected by the check valve (44) from inlet and outlet pressure of the motor and high speed pilot line pressure and pushes shifter piston (6). As a result, swash plate (12) turns around the line L which connect the two pivots (11) as shown by dotted lines. The turn stops at the stopper (1-1) of casing and swash plate (12) keeps the position.

In this case, the piston stroke become shorter and motor capacity become smaller and motor rotates faster, around 1.71 times, by the same volume of oil.

When no pressure is in the high speed pilot line PA, spool (31) is pushed back by the spring (34) and pressure that pressed the shifter piston (6) is released to the hydraulic tank through restrictor (46).

Here, nine pistons are there and they equally spaced on the swash plate (12). The force that summed up those of pistons comes to almost the center of the swash plate (12) as shown. Since the pivots (11) are off-set by S from the center, the rotating force of product S and the force moves swash plate (12) 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 mode, the system step down to the low speed automatically. The mechanism is that: pump pressure is led to the port PB (Fig. 24-84) and this pressure activate on pin (32). When the pressure at PB exceeds predetermined value, spool (31) returns to the left by the counter-pressure against pin (32) and the pressure on the shifter piston (6) through port C is released to the tank and the motor comes to low speed.

When PB goes down, the spool (31) moves to the right and the speed become high.

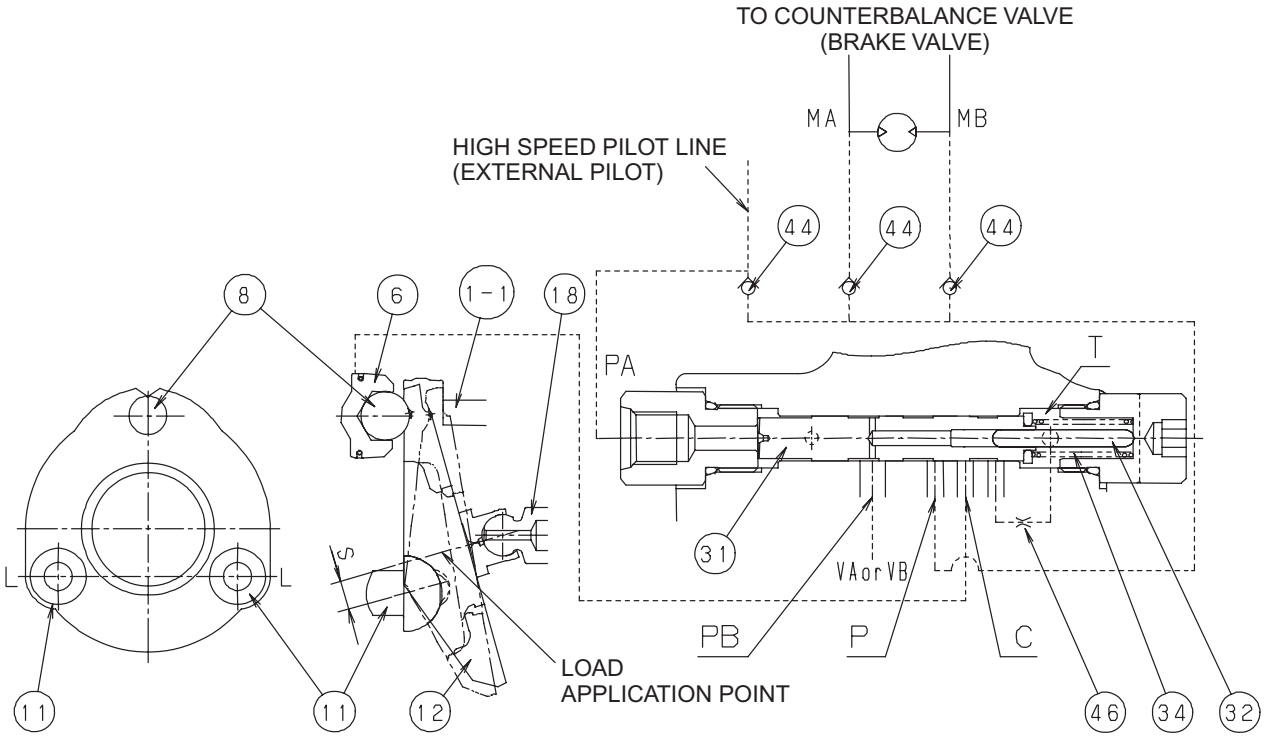


Fig. 24-84 Capacity control Mechanism

(4) Function of overload relief 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 sharply while starting, and to mitigate the braking shock while stopping. For these purposes, the developed pressure is kept comparatively low for a short period, 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 (57-2) which seats on the valve seat (57-3) and, at the same time, is delivered, via small hole, to the connecting piston (57-4) located inside the valve (57-2) and the piston bore pressure increases up to "A" port pressure. The valve (57-2) opposes to adjusting spring (57-9) 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 (57-7) is at the left position by the driving pressure, and when "A" port pressure increases, the pressure is applied also to the piston (57-7) through the small hole in the valve (57-2) and piston (57-7) moves rightward until it touches the cap (57-5). In this while, the valve (57-2) maintains "A" port pressure at comparatively low against the adjusting spring (57-9) force and exhaust oil to "B" port side. After the piston reached to the plug, the valve acts the same as at starting.

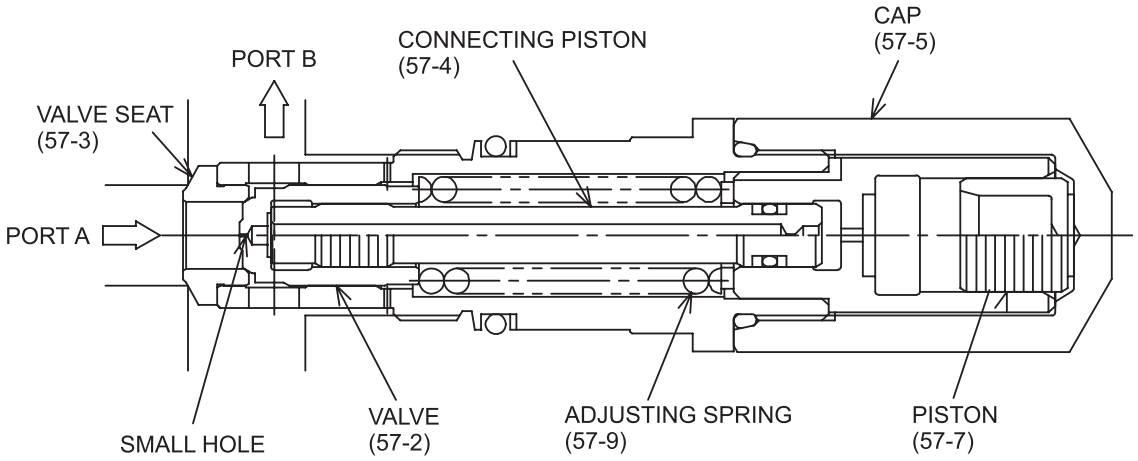


Fig. 24-85 Function of overload relief valve

https://truckmanualshub.com/

(5) Function of brake valve

1) Holding operation (see Fig. 24-86)

When the control valve is at neutral position, VA and VB ports are connected to the tank, and the spring (28) located on both spool ends holds the spool (26) at central position. Therefore, the passages from VA to MA and VB to MB are closed, which result in closing MA and MB ports connected to hydraulic motor.

Since the passage to parking brake is connected to the tank line, the brake cylinder pressure is equal to the tank pressure and the brake is applied by the springs. Thus, the rotation of the motor is mechanically prevented. If external torque is exerted on the motor shaft, the motor would not rotate as usual by this parking brake.

In case the brake should be released for some reason, pressure is built on MA or MB port. But, due to oil leakage inside hydraulic motor or so, high-pressure oil escapes from the closed circuit and motor rotates a bit. So, the cavitation tends to occur in the lower pressure side of the closed circuit. Then, the check valve, built in the spool (26), operates to avoid the cavitation and opens the passage from VA to MA or from VB to MB. Then the oil equivalent to the leakage is sucked from the tank line to the closed circuit.

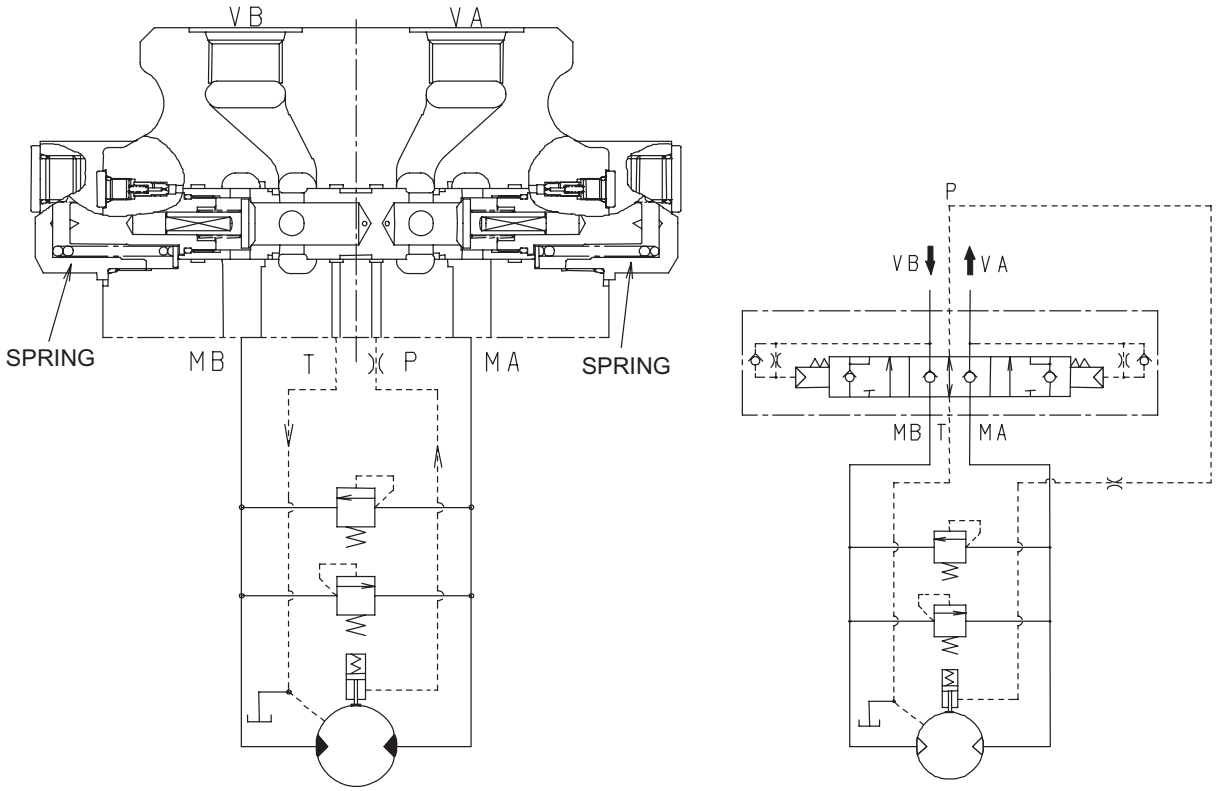


Fig. 24-86 Holding Operation

2) Accelerating operation (see Fig. 24-87)
When VA and VB ports are connected respectively to pump and tank by operating the control valve, hydraulic oil from pump is forwarded through VA port to push open the check valve provided inside spool (26), and oil flows to motor via MA port to rotate the motor.
Therefore, the pressure increases and negative brake is released by the pressure supplied from pump. At the same time, the pressure of pilot chamber increases to push and move the spool (26) leftwards, overcoming the spring (28) force. Thus, the return line from MB to VB opens to rotate the motor.
In case inertia load is too big to start rotation, accelerating pressure reaches the set pressure of relief valve and high pressure oil is being relieved while the motor gains the rotational speed. As the rotational speed goes up, the relieved volume decreases, and finally the motor rotates at a fixed speed.

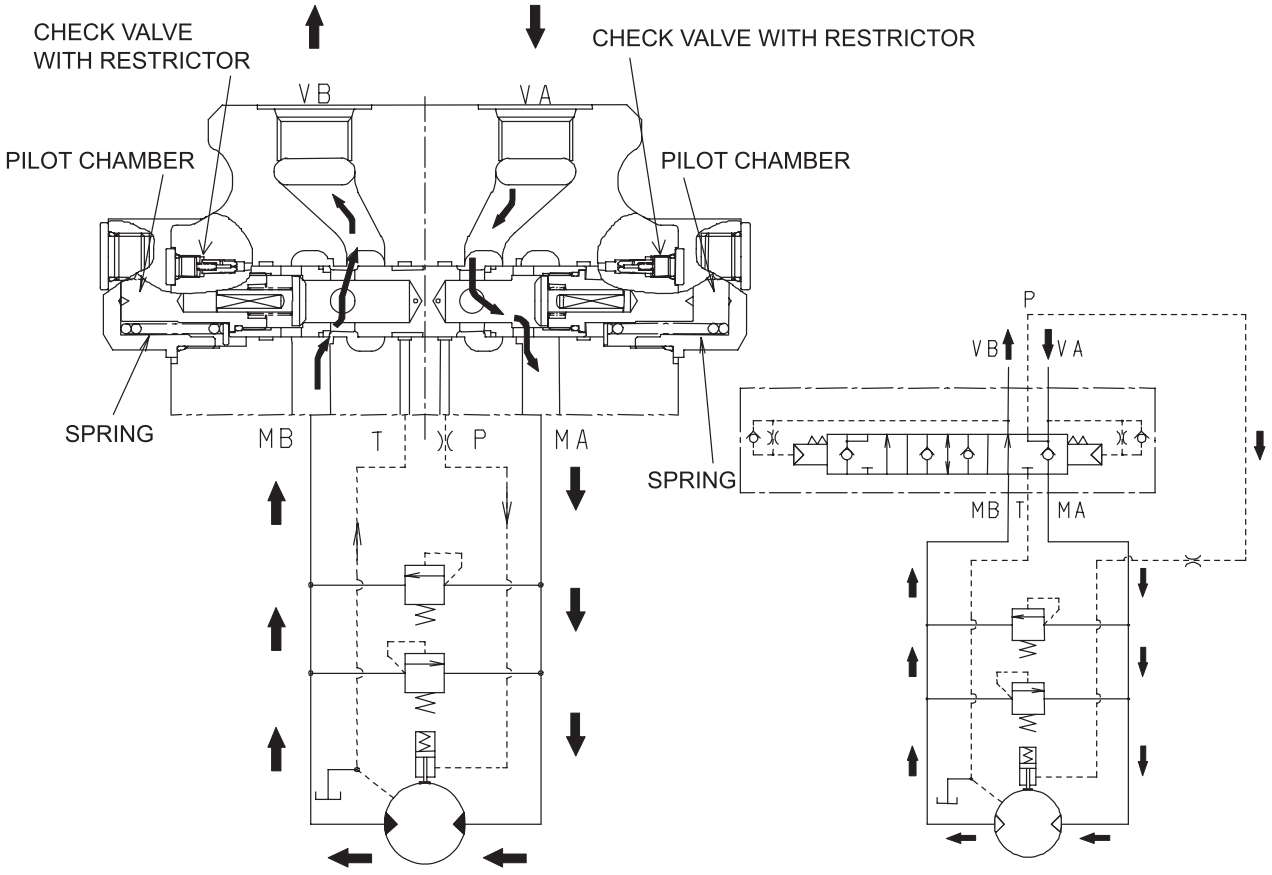


Fig. 24-87 Accelerating Operation

https://truckmanualshub.com/

3) Stopping operation (see Fig. 24-88)
Returning the control valve to neutral position while running the motor, the oil supply is cut off and VA and VB ports are connected to the tank line. Then the pressure of the pilot chamber located on both spool ends become equal, and the spool (26) returns to the neutral position by spring (28) force. Thus, the passage from MA to VA is closed.
Owing to the inertia force of the load, the hydraulic motor tends to continue the rotation. Here, the motor functions as a pump and forwards the oil to MB port but the passage is blocked and MB port pressure increases. Then the relief valve opens to relieve the pressure and rotational speed decelerates and at last the motor stops.
Negative brake release pressure is gradually lowered due to the restrictor and finally the brake works and the motor is mechanically stopped.

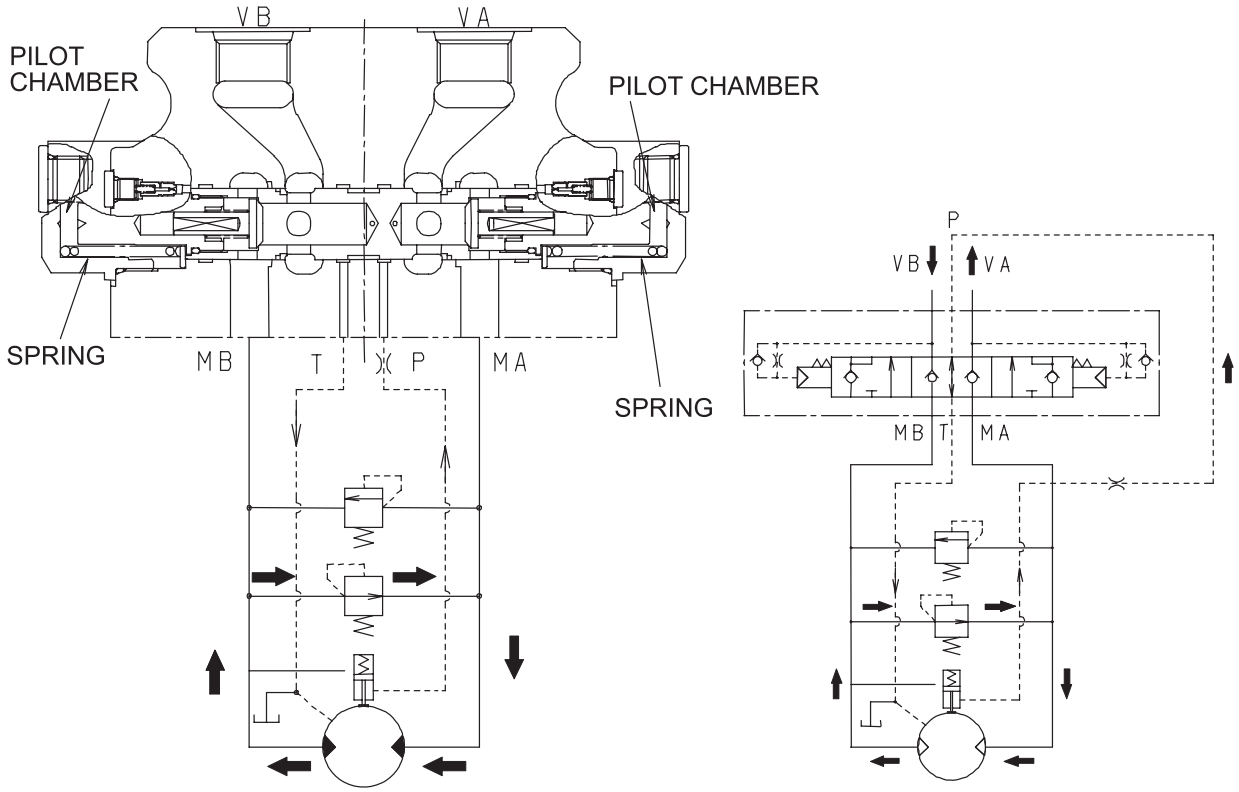


Fig. 24-88 Stopping operation

4) Counterbalance operation (see Fig. 24-89)
Counterbalance operation is required to decelerate slowly the hydraulic motor while absorbing inertia force. In case the hydraulic oil is gradually decreased from pump to VB port, the drive shaft of hydraulic motor tends to rotate faster than that matched to the volume of oil supply. Consequently, the pilot chamber pressure on MB to VB side decreases and the spring (28) force moves the spool (26) leftwards towards neutral position. Therefore, the area of passage from MA to VA becomes smaller and the pressure on MA side rises due to increased resistance in the passage and the motor receives hydraulic braking effect.
If the motor rotates slower than that matched to the volume of supplied oil, the pilot chamber pressure on VB port increases, and spool (26) moves rightwards to enlarge the area of passage from MA to VA. Therefore the braking effect becomes smaller and the rotational speed of motor is controlled to correspond to the volume of supplied oil. In order to give stable counterbalance operation, the restrictors (40) are set in the pilot chamber to damp the spool (26) movement.
The parking brake is released during pressure adjusting action of the spool (26).

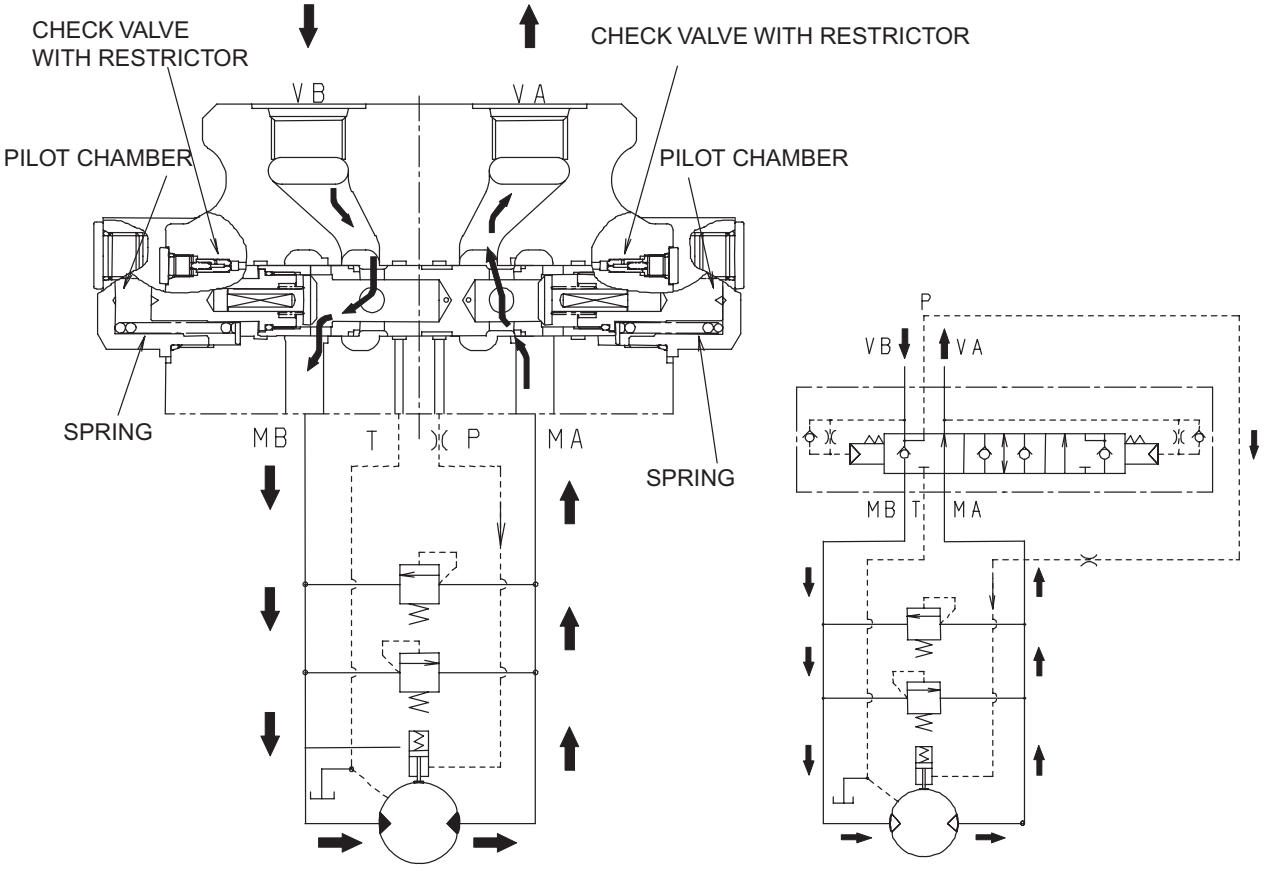


Fig. 24-89 Counterbalance operation

https://truckmanualshub.com/

24.1.6.5 FUNCTION OF REDUCTION GEAR

Reduction unit slows down the rotating speed of motor and converts motor torque to strong rotating force.
This reduction unit utilizes two stages, 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.

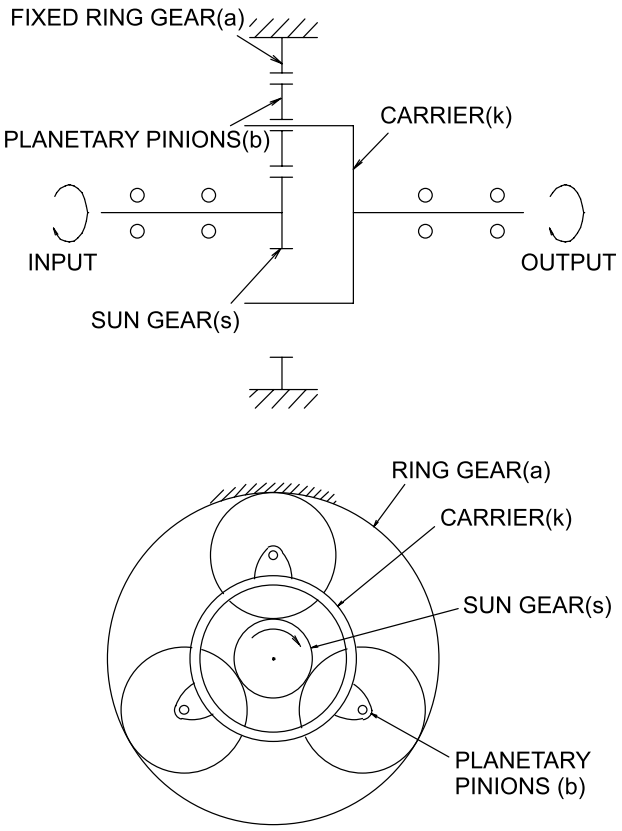


Fig. 24-90 Planetary gear mechanism

See Fig. 24-91 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.

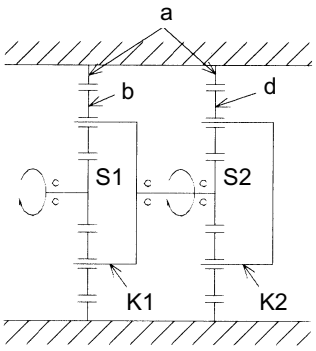


Fig. 24-91 Two stages reduction gear

[MEMO]

https://truckmanualshub.com/

https://truckmanualshub.com/

Chapter 08
TOOLS

TABLE OF CONTENTS

13.1 TIGHTENING TORQUES FOR CAPSCREWS AND NUTS 13-3
13.2 SCREW SIZE 13-5
13.2.1 CAPSCREW (BOLT) 13-5
13.2.2 CAPSCREW (SOCKET BOLT) 13-5
13.2.3 SOCKET SET SCREW 13-5
13.3 TIGHTENING TORQUE FOR HOSE AND FITTING 13-6
13.3.1 JOINT (O-RING TYPE) 13-6
13.3.2 HYDRAULIC HOSE (30° FLARE TYPE) 13-6
13.3.3 JOINT (ORS TYPE) 13-6
13.3.4 SPLIT FLANGE 13-6
13.4 TIGHTENING TORQUES FOR NUTS AND SLEEVES 13-7
13.5 PLUG 13-8
13.5.1 PLUG FOR HYDRAULIC PIPE JOINT 13-8
13.5.2 PLUG FOR HYDRAULIC EQUIPMENT 13-9
13.6 SPECIAL SPANNER FOR TUBE 13-11
13.7 SPECIAL TOOLS 13-12
13.8 APPLICATION OF SCREW LOCKING COMPOUND AND SEALING COMPOUND 13-14
13.9 SUCTION STOPPER 13-15
13.9.1 COMPONENTS 13-15
13.9.2 DIMENSION 13-15
13.9.3 APPLICABLE MODEL 13-15
13.10 COUNTER WEIGHT LIFTING JIG 13-16
13.11 UPPER FRAME LIFTING JIG 13-17
13.12 ENGINE MOUNTING PEDESTAL 13-18
13.13 TRACK SPRING SET JIG 13-19

Issue	Date of Issue	Applicable Machines	Remarks
First edition	July, 2006	SK200–8 : YN11-45001~ SK210LC–8 : YQ11-06001~	S5YN1118E01 Reference Chapter 11 JPN

11.1 TIGHTENING TORQUES FOR CAPSCREWS AND NUTS

Tables Table11-1 and Table11-2 indicate tightening torques applicable to cases where no special note is given.
Overtightening of bolts may result in a twist-off and a fracture under load.
Insufficient tightening may lead to a loosening or loss of bolts. Always tighten bolts to proper torques.

Table11-1 Tightening torque for metric coarse threads (not plated)

Unit : N•m (lbf•ft)

Classification		4.8T		7T		10.9T	
Nominal size		No lubrication	Oil lubrication	No lubrication	Oil lubrication	No lubrication	Oil lubrication
M6	P=1	4.4±0.5 (3.2±0.4)	3.7±0.4 (2.7±0.3)	9.6±1.0 (7.1±0.7)	8.1±0.8 (6.0±0.6)	17.4±1.8 (12.8±1.3)	14.7±1.5 (10.8±1.1)
M8	P=1.25	10.7±1.1 (7.9±0.8)	9.0±0.9 (6.6±0.7)	23.5±2.0 (17.3±1.5)	19.6±2.0 (14.5±1.5)	42.2±3.9 (31.1±2.9)	35.3±3.9 (26.0±2.9)
M10	P=1.5	21.6±2.0 (15.9±1.4)	17.9±1.8 (13.2±1.3)	46.1±4.9 (34.0±3.6)	39.2±3.9 (28.9±2.9)	83.4±8.8 (61.5±6.5)	70.6±6.9 (52.1±5.1)
M12	P=1.75	36.3±3.9 (26.8±2.9)	31.4±2.9 (23.2±2.1)	79.4±7.8 (58.6±5.8)	66.7±6.9 (49.2±5.1)	143±15 (105±11)	121±12 (89.2±8.9)
M14	P=2	57.9±5.9 (42.7±4.4)	49.0±4.9 (36.1±3.6)	126±13 (92.9±9.6)	106±10 (78.2±7.4)	226±20 (167±15)	191±19 (141±14)
M16	P=2	88.3±8.8 (65.1±6.5)	74.5±6.9 (55.0±5.1)	191±20 (141±15)	161±16 (119±12)	343±39 (253±29)	284±29 (209±21)
M18	P=2.5	122±12 (90.0±8.9)	103±10 (75.8±7.2)	265±29 (195±21)	226±20 (167±15)	481±49 (355±36)	402±39 (297±29)
M20	P=2.5	172±17 (127±13)	144±14 (106±10)	373±39 (275±29)	314±29 (232±21)	667±69 (492±51)	559±59 (412±44)
M22	P=2.5	226±20 (167±15)	192±20 (142±15)	500±49 (369±36)	422±39 (311±29)	902±88 (665±65)	755±78 (557±58)
M24	P=3	294±29 (217±21)	235±29 (173±21)	637±69 (470±51)	520±49 (383±36)	1160±118 (856±87)	941±98 (694±72)
M27	P=3	431±39 (318±29)	353±39 (260±29)	941±98 (694±72)	765±78 (564±58)	1700±167 (1250±123)	1370±137 (1010±101)
M30	P=3.5	588±59 (434±44)	490±49 (361±36)	1285±127 (948±94)	1079±108 (796±80)	2300±235 (1700±173)	1940±196 (1430±145)
M33	P=3.5	794±78 (586±58)	667±69 (492±51)	1726±177 (1270±131)	1451±147 (1070±108)	3110±314 (2290±232)	2610±265 (1930±195)
M36	P=4	1030±98 (760±72)	863±88 (637±65)	2226±226 (1640±167)	1863±186 (1370±137)	4010±402 (2960±297)	3360±333 (2480±246)

Table11-2 Tightening torques for metric fine threads (not plated)

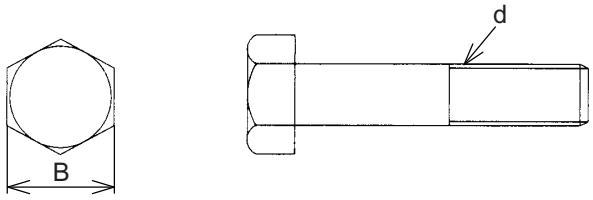
Torque value Unit : N•m (lbf•ft)

Classification		4.8T		7T		10.9T	
Nominal size		No lubrication	Oil lubrication	No lubrication	Oil lubrication	No lubrication	Oil lubrication
M8	P=1.0	11.3±1.1 (8.3±0.8)	9.5±1.0 (7.0±0.7)	24.5±2.0 (18.1±1.5)	20.6±2.0 (15.2±1.5)	44.1±3.9 (32.5±2.9)	37.3±3.9 (27.5±2.9)
M10	P=1.25	22.6±2.0 (16.7±1.5)	18.7±1.9 (13.8±1.4)	48.1±4.9 (35.5±3.6)	41.2±3.9 (30.3±2.9)	87.3±8.8 (64.4±6.5)	73.5±6.9 (54.2±5.1)
M12	P=1.25	39.2±3.9 (28.9±2.9)	33.3±2.9 (24.6±2.1)	85.3±8.8 (62.9±6.5)	71.6±6.9 (52.8±5.1)	154±16 (114±12)	129±13 (95.2±9.6)
M16	P=1.5	92.2±8.8 (68.0±6.5)	77.5±7.8 (57.2±5.8)	196±20 (145±15)	169±17 (125±13)	363±39 (268±29)	304±29 (224±21)
M20	P=1.5	186±19 (137±14)	155±16 (114±12)	402±39 (297±29)	333±29 (246±21)	726±69 (535±51)	608±59 (448±44)
M24	P=2	314±29 (232±21)	265±29 (195±21)	686±69 (506±51)	569±59 (420±44)	1240±118 (915±87)	1030±98 (760±72)
M30	P=2	637±59 (470±44)	530±49 (391±36)	1390±137 (1030±101)	1157±118 (853±87)	2500±255 (1840±188)	2080±206 (1530±152)
M33	P=2	853±88 (629±65)	706±70 (521±52)	1860±186 (1370±137)	1550±155 (1140±114)	3350±334 (2470±246)	2790±275 (2060±203)
M36	P=3	1070±108 (789±80)	892±88 (658±65)	2330±226 (1720±167)	1940±196 (1430±145)	4200±422 (3100±311)	3500±353 (2580±260)

11.2 SCREW SIZE

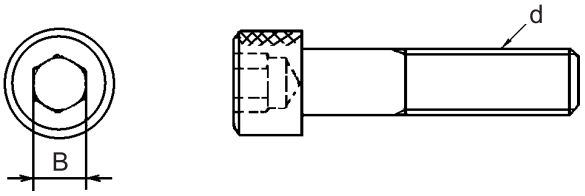
11.2.1 CAPSCREW (BOLT)

Nominal screw size (d)	B mm Tool size	Nominal screw size (d)	B mm Tool size
M6	10	M36	55
M8	13	M42	65
M10	17	M45	70
M12	19	M48	75
(M14)	22	M56	85
M16	27	(M60)	90
(M18)	27	M64	95
M20	30	(M68)	100
(M22)	32	M72	105
M24	36	M76	110
(M27)	41	M80	115
M30	46		



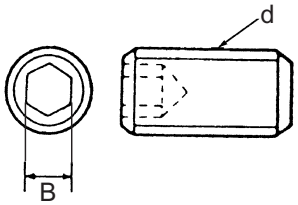
11.2.2 CAPSCREW (SOCKET BOLT)

Nominal screw size (d)	B mm Tool size	Nominal screw size (d)	B mm Tool size
(M3)	2.5	M20	17
(M4)	3	(M22)	17
(M5)	5	M24	19
M6	5	(M27)	19
M8	6	M30	22
M10	8	M36	27
M12	10	M42	32
M14	12	(M45)	32
M16	14	M48	36
(M18)	14	M52	36



11.2.3 SOCKET SET SCREW

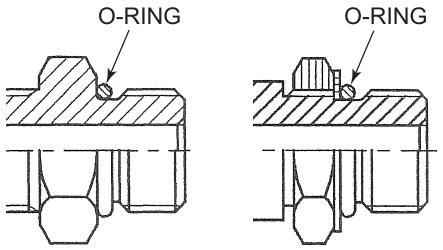
Nominal screw size (d)	B mm Tool size	Nominal screw size (d)	B mm Tool size
M2.5	1.27	M8	4
M3	1.5	M10	5
M4	2	M12	6
M5	2.5	M16	8
M6	3	M20	10



11.3 TIGHTENING TORQUE FOR HOSE AND FITTING

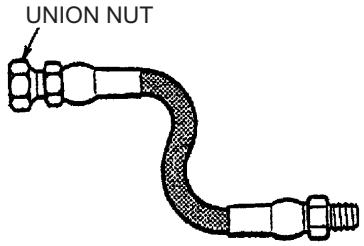
11.3.1 JOINT (O-RING TYPE)

Size (PF)	Wrench (mm)	Tightening torque N•m (lbf•ft)
1 / 8	14	17±2 (13±1.5)
1 / 4	19	36±2 (27±1.5)
3 / 8	22	74±5 (55±4)
1 / 2	27	108±9.8 (80.0±7)
3 / 4	36	162±9.8 (119±7)
1	41	255±9.8 (188±7)



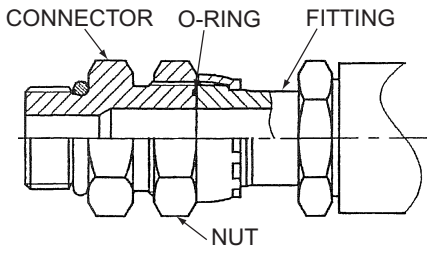
11.3.2 HYDRAULIC HOSE (30° FLARE TYPE)

Size (PF)	Wrench(mm)	Tightening torque N•m (lbf•ft)
1 / 8	17	15±2.0 (11±1.5)
1 / 4	19	29±4.9 (21±3.6)
3 / 8	22	49±4.9 (36±3.6)
1 / 2	27	78±4.9 (58±3.6)
3 / 4	36	118±9.8 (87±7.2)
1	41	137±15 (101±11)



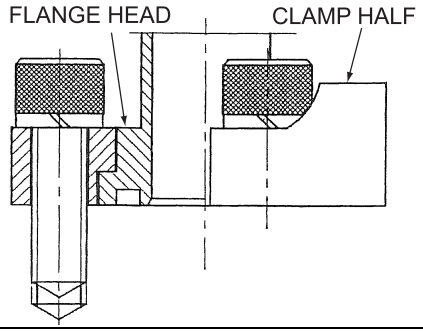
11.3.3 JOINT (ORS TYPE)

Unified screw size	Opposing flats	Tightening Torque N•m (lbf•ft)
1-14 UNS	30, 32	137±14 (101±10)
1 3 / 16-12 UN	36	177±18 (131±13)
	41	206±26 (152±15)
1 7/ 16-12 UN	41	206±26 (152±15)
	46	206±26 (152±15)



11.3.4 SPLIT FLANGE

Size	Tightening torque N•m (lbf•ft)			
	Standard pressure series 20.6 MPa	Bolt size	Hi pressure series 41.2 MPa	Bolt size
3 / 4	33.9±5.6 (25±4)	M10	39.5±5.6 (29±4)	M10
1	42.4±5.6 (31±4)	M10	62.2±5.6 (46±4)	M12
1 1 / 4	55.1±7.1 (41±5)	M10	93.3±8.4 (69±6)	M14
1 1 / 2	70.6±8.4 (52±6)	M12	169±11 (125±8)	M16
2	81.9±8.4 (60±6)	M12	282±11 (208±8)	M20



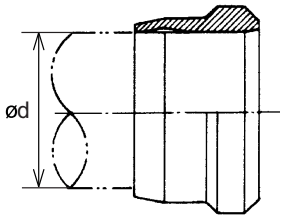
11.4 TIGHTENING TORQUES FOR NUTS AND SLEEVES

Table11-3 indicates standard tightening torques applicable to cases where no particular note is given.
Overtightening or undertightening of nuts and sleeves in FLARELESS JOINT may develop oil leaks through pipe connections.
Always tighten nuts and sleeves to proper torques.

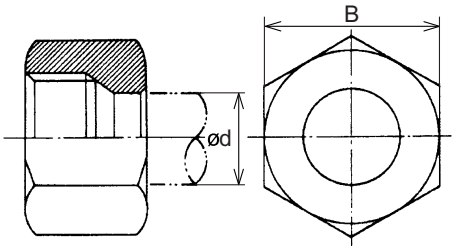
Table11-3

Manufacturer's name	Working pressure MPa (psi)	Tube size OD × thickness mm (in)	Opposing flats (HEX) mm	Tightening torque N•m (lbf•ft)
Nippon A.M.C.	29.4 (4270)	ø10×1.5 (0.394×0.059)	19	49.0±9.8 (36±7.2)
		ø15×2.0 (0.591×0.079)	27	118±12 (87±8.7)
		ø18×2.5 (0.709×0.098)	32	147±15 (110±11)
		ø22×3.0 (0.866×0.118)	36	216±22 (160±16)
		ø28×4.0 (1.10×0.157)	41	275±27 (200±20)
Ihara Koatu	29.4 (4270)	ø35×5.0 (1.38×0.197)	55	441±44 (330±33)

SLEEVE



NUT

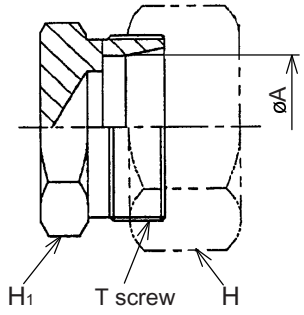


Tube size ød	Parts No.		Tube size ød	Opposing flats (HEX) mm	Parts No.	
	Ihara Koatu	Nippon A.M.C.			Ihara Koatu	Nippon A.M.C.
6	ZF93S06000	—	6	14	ZF93N06000	—
8	ZF93S08000	—	8	17	ZF93N08000	—
10	ZF93S10000	ZA93S10000	10	19	ZF93N10000	ZA93N10000
12	ZF93S12000	—	12	22	ZF93N12000	—
15	ZF93S15000	ZA93S15000	15	27	ZF93N15000	ZA93N15000
18	ZF93S18000	ZA93S18000	18	32	ZF93N18000	ZA93N18000
22	ZF93S22000	ZA93S22000	22	36	ZF93N22000	ZA93N22000
28	ZF93S28000	ZA93S28000	28	41	ZF93N28000	ZA93N28000
32	ZF93S32000	—	32	50	ZF93N32000	—
35	ZF93S35000	ZA93S35000	35	55	ZF93N35000	ZA93N35000
38	ZF93S38000	—	38	60	ZF93N38000	—

11.5 PLUG

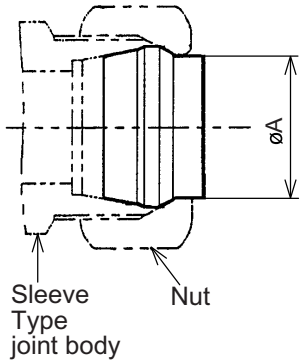
11.5.1 PLUG FOR HYDRAULIC PIPE JOINT

(1) Cap nut (Joint plug)



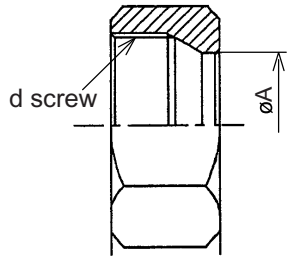
Applicable tube O. D : A	Cap nut parts No.	T screw	Opposing flats	
			H_1	H
6	ZF83H06000	M12 × 1.5	14	14
8	ZF83H08000	M14 × 1.5	17	17
10	ZF83H10000	M16 × 1.5	17	19
12	ZF83H12000	M18 × 1.5	19	22
15	ZF83H15000	M22 × 1.5	24	27
18	ZF83H18000	M26 × 1.5	27	32
22	ZF83H22000	M30 × 1.5	32	36
28	ZF83H28000	M36 × 1.5	38	41

(2) Plug (Tube plug)



Applicable tube O. D : A	Plug parts No.
6	ZF83P06000
8	ZF83P08000
10	ZF83P10000
12	ZF83P12000
15	ZF83P15000
18	ZF83P18000
22	ZF83P22000
28	ZF83P28000

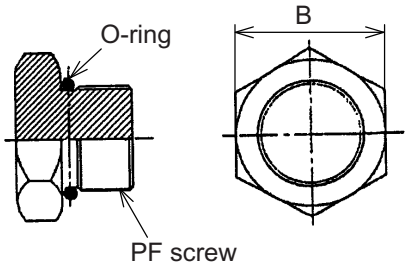
(3) Nut



Applicable tube O. D : A	Nut parts No.	d screw	Opposing flats
6	ZF93N06000	M12 × 1.5	14
8	ZF93N08000	M14 × 1.5	17
10	ZF93N10000	M16 × 1.5	19
12	ZF93N12000	M18 × 1.5	22
15	ZF93N15000	M22 × 1.5	27
18	ZF93N18000	M26 × 1.5	32
22	ZF93N22000	M30 × 1.5	36
28	ZF93N28000	M36 × 1.5	41
32	ZF93N32000	M42 × 1.5	50
35	ZF93N35000	M45 × 1.5	55
38	ZF93N38000	M48 × 1.5	60

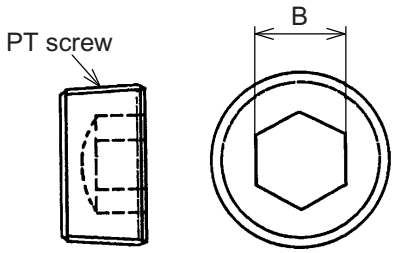
11.5.2 PLUG FOR HYDRAULIC EQUIPMENT

(1) PF screw



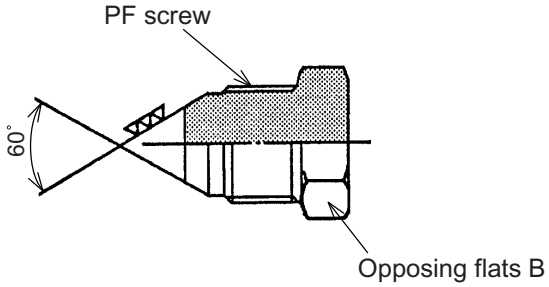
PF screw	Plug parts No.	B mm	O-ring parts No.	Nominal O-ring
PF1/4	ZE72X04000	19	ZD12P01100	1B P11
PF3/8	ZE72X06000	22	ZD12P01400	1B P14
PF1/2	ZE72X08000	27	ZD12P01800	1B P18
PF3/4	ZE72X12000	36	ZD12P02400	1B P24
PF1	ZE72X16000	41	ZD12P02900	1B P29

(2) PT screw

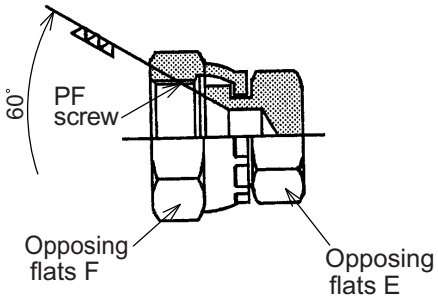


PT screw	Plug parts No.	B mm
PT1/8	ZE82T02000	5
PT1/4	ZE82T04000	6
PT3/8	ZE82T06000	8
PT1/2	ZE82T08000	10
PT3/4	ZE82T12000	14
PT1	ZE82T16000	17
PT1 1/4	ZE82T20000	22
PT1 1/2	ZE82T24000	22

(3) Plug for (F) flare hose



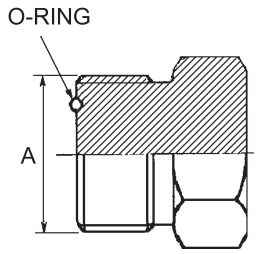
PF screw	Plug parts No.	B mm
PF1/4	2444Z2728D1	14
PF3/8	2444Z2728D2	17
PF1/2	2444Z2728D3	22
PF3/4	2444Z2728D4	27
PF1	2444Z2728D5	36



PF screw	Plug parts No.	E mm	F mm
PF1/4	2444Z2729D1	14	19
PF3/8	2444Z2729D2	17	22
PF1/2	2444Z2729D3	23	27
PF3/4	2444Z2729D4	27	36
PF1	2444Z2729D5	36	41
PF1 1/4	2444Z2729D6	40	50

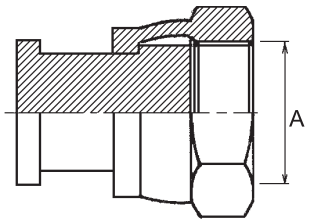
(4) Plug for ORS joints

Male



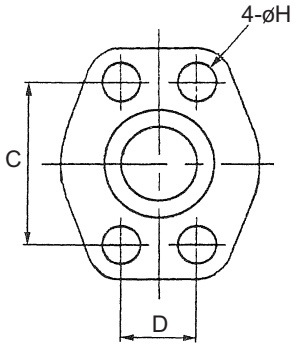
Screw size A	Applicable hose O.D	Plug parts No.	Opposing flats (HEX)	O-ring parts No.	Nominal O-ring
1-14UNS	ø21.7	YN01H01001P1	27	ZD12A01600	1B A16
1 3/16-12UN	ø27.2	YN01H01002P1	36	ZD12A01800	1B A18
1 7/16-12UN	ø34.0	YN01H01003P1	41	ZD12A02100	1B A21

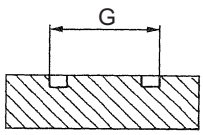
Female



Screw size A	Applicable tube O.D	Plug parts No.	Opposing flats (HEX)
1-14UNS	ø21.7	YN01H01004P1	32
1 3/16-12UN	ø27.2	YN01H01005P1	36
1 7/16-12UN	ø34.0	YN01H01006P1	41

(5) Plug for half clamp





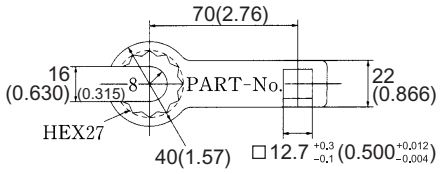
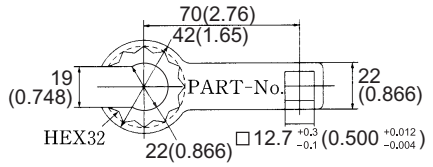
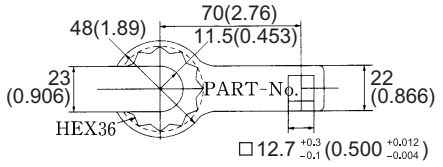
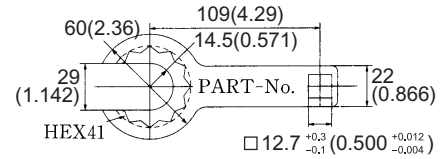
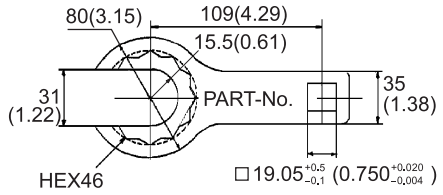
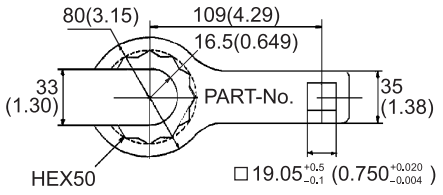
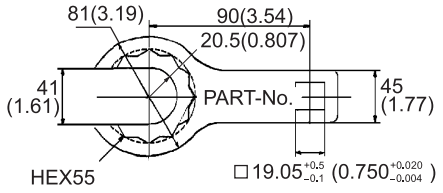
For standard pressure : 20.6 MPa (2990 psi)

Size	Plug part No.	C mm	D mm	G mm	H mm	O-ring part No.
1/2	ZE12Q08000	38.10	17.48	25.53~ 25.40	9	45Z91D2
3/4	ZE12Q12000	47.63	22.23	31.88~ 31.75	11	ZD12P02600
1	ZE12Q16000	52.37	26.19	39.75~ 39.62	11	ZD12P03400
1 1/4	ZE12Q20000	58.72	30.18	44.58~ 44.45	11	ZD12P03800

For high pressure : 41.2 MPa (5970 psi)

Size	Plug part No.	C mm	D mm	G mm	H mm	O-ring part No.
1/2	ZE13Q08000	40.49	18.24	25.53~ 25.40	9	2445Z831D1
3/4	ZE13Q12000	50.80	23.80	31.88~ 31.75	11	ZD12P02600
1	ZE13Q16000	57.15	27.76	39.75~ 39.62	13	ZD12P03400
1 1/4	ZE13Q20000	66.68	31.75	44.58~ 44.45	15	ZD12P03800

11.6 SPECIAL SPANNER FOR TUBE

Applicable tube diameter mm (in)	Part No.	HEX (mm)	Drawing of a special spanner mm (in)
15 (0.591)	2421T160	27	
18 (0.709)	2421T138	32	
22 (0.866)	2421T130	36	
28 (1.10)	2421T115	41	
28 (1.10)	2421T231	46	
32 (1.26)	2421T232	50	
35 (1.38)	2421T314	55	

11.7 SPECIAL TOOLS

Table11-4

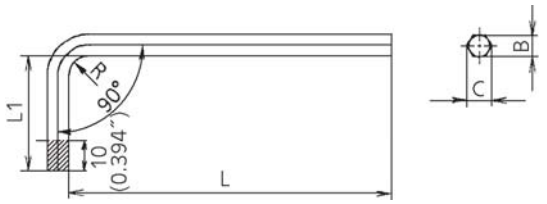
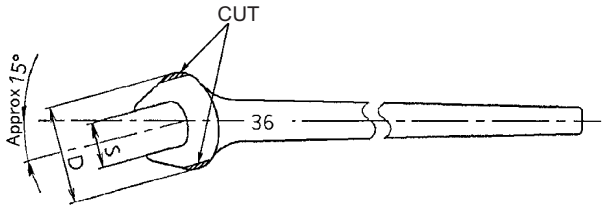
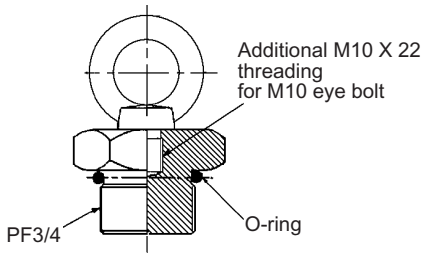
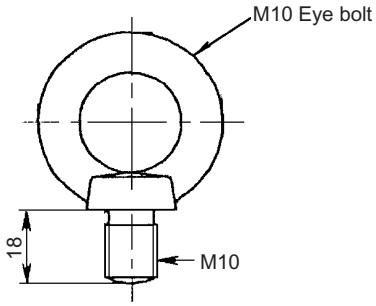
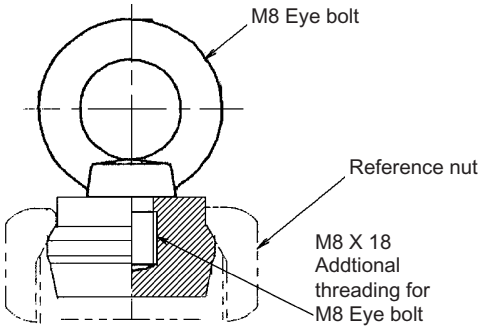
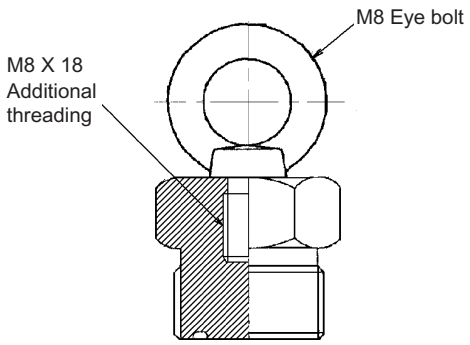
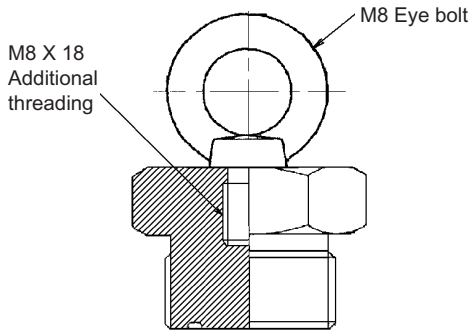
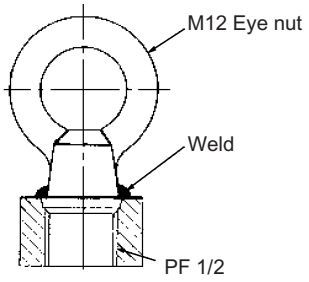
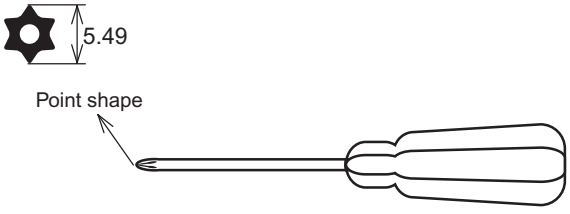
No.	Tools name	Tools No.	Shape	Applicable
1	Allen wrench Nominal B : 10, C : 11.3	ZT22A10000	 Commercial tool length (L1) - cut length = Required length 40 (1.57") - 10 (0.39") = 30 (1.18")	Pump suction
2	Spanner or socket Nominal B : 17		General tools	Pump install
3	Spanner Nominal S : 36	ZT12A36000	 Commercial tool outer width (D) - cut length = Required length 81 (3.19") - 16 (0.63") = 65 (2.56")	Swing motor A,B port
4	Plug PF3/4	ZE72X12000		For slinging the swing motor
5	Eye bolt M10×18	ZS91C01000 or commercial equivalent		For slinging the swing motor & Flare hose
6	Plug (Nominal tube dia. 22) Reference Eye bolt Nut	ZF83P22000 ZS91C00800 ZF93N22000		Flare hose

Table11-4

7	Plug Nominal 1-14UNS Eye bolt	YN01H01001P1 ZS91C00800		Flare hose
8	Plug Nominal 1 3/16-12UN Eye bolt	YN01H01002P1 ZS91C00800		Flare hose
9	Plug PF1/2	ZE25F08000 Coupling half		For slinging the swivel joint
10	TORX driver (with tamper proof) T30 (For M6)	—		For instrument panel cover (RH)

11.8 APPLICATION OF SCREW LOCKING COMPOUND AND SEALING COMPOUND

(1) For general use

Service	Manufacturer		Features
	Loctite	Three-Bond	
Screw locking compound	#242	1360K	Low strength
	#262	1374	Middle strength
	#271	1305	High strength
Sealing compound	#515	1215	Sealing

(2) For specific location

No.	Use	Manufacturer	Name	Equivalent	Applicable
1	Sealing compound & adhesive	Three-Bond	# 1901	(Manufacturer ; Loctite) Anti-seizure	Cylinder
			# 1215 gray	# 5699	Swing motor
			# 1211 white	# 5301J	Swing motor
			# 1303B	# 211	Main pump
		Loctite	# 222	(Manufacturer ; Three-Bond) # 1344N	Main pump
			# 277	# 1307N	Pilot valve
		Loctite	Parmatex 98D	(Manufacturer ; Three-Bond) # 1121	Hydraulic oil tank :
		Sumitomo Chemical Co., Ltd.	Cyano Bond PO-1		Hose
		Shell petroleum	Shell Alvania EP2	New Molyknock Grease 2	Swing bearing grease bath

11.9 SUCTION STOPPER

11.9.1 COMPONENTS

No.	NAME	PARTS No.	Q'TY
	SUCTION STOPPER ASSY	24100P978F2	
1	ROD	2420T4660D1	1
2	NUT	ZN16C08007	1
3	COVER	2414T2123D2	1
4	O-RING	45Z91D6	1

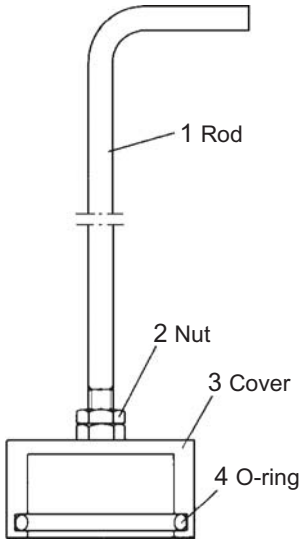


Fig. 11-1 Components of suction stopper

11.9.2 DIMENSION

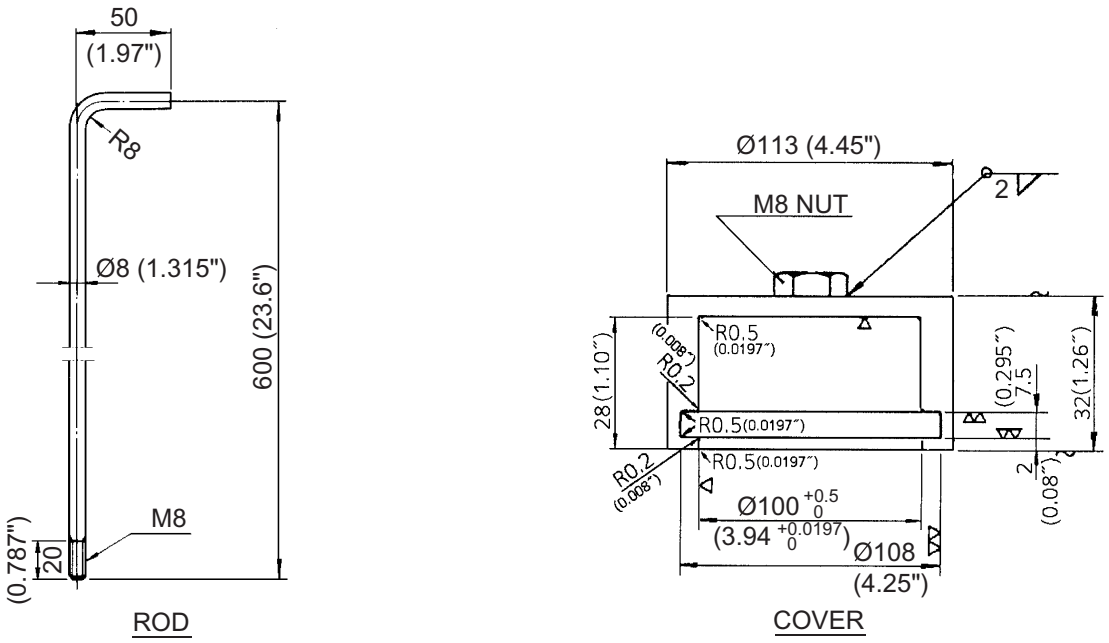


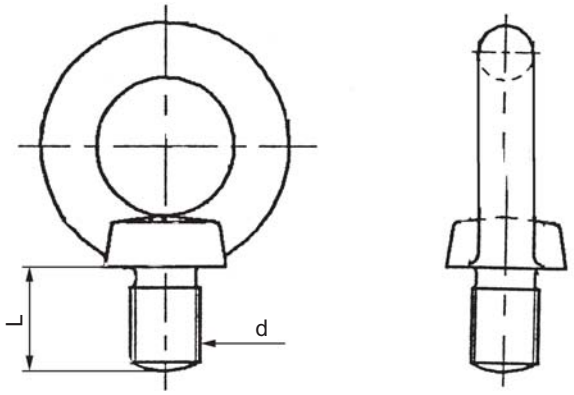
Fig. 11-2 Dimension of suction stopper

11.9.3 APPLICABLE MODEL

Applicable model / Part No.	SK100	SK120	SK100-2	SK120-2	SK100-3	SK120-3	SK115SR	SK135SR	SK235SR	SK200-6	SK200-6E	SK200-6ES	SK200-8
24100P978F2	○	○	○	○	○	○	○	○	○	○	○	○	○

11.10 COUNTER WEIGHT LIFTING JIG

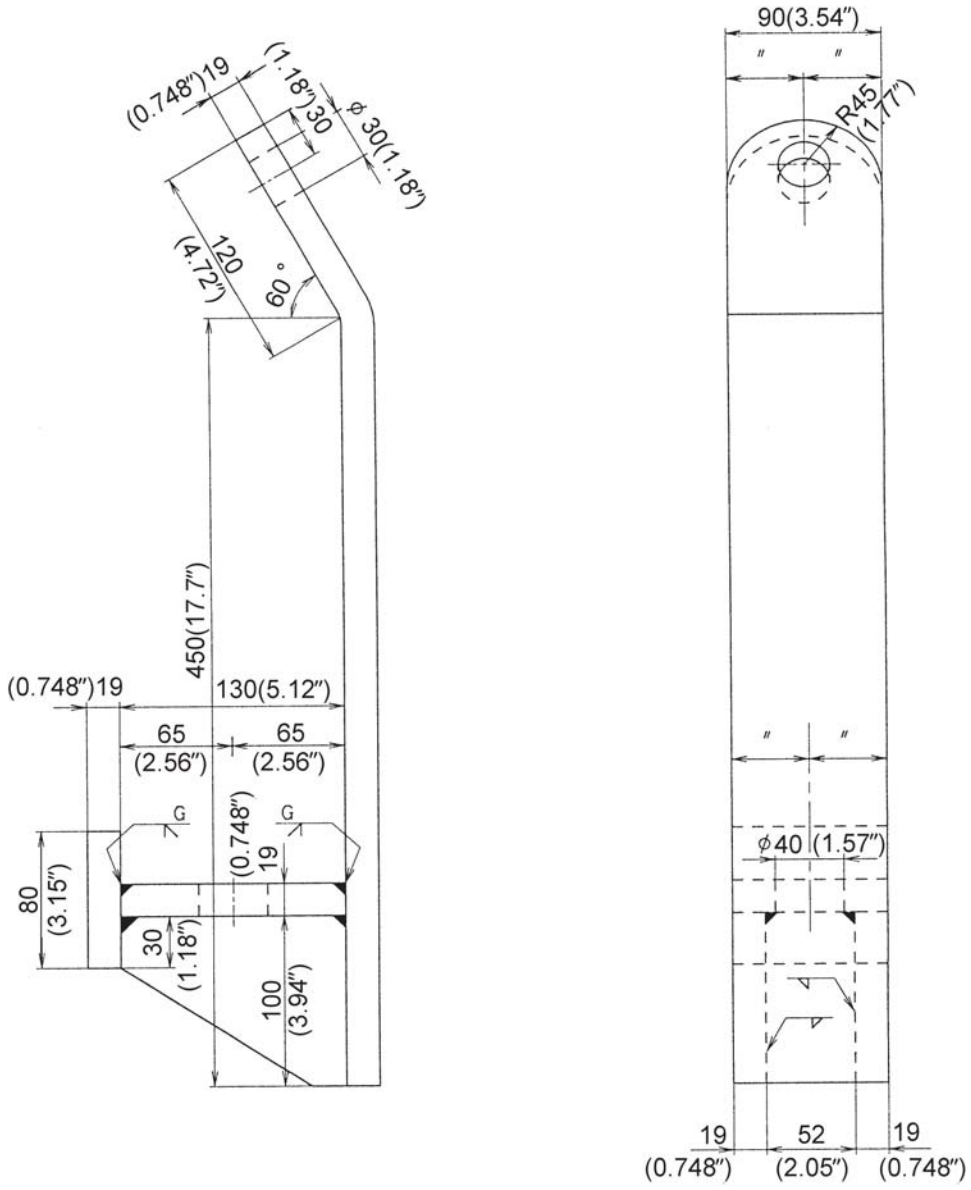
(1) Standard eye bolt



Size		Part No.	Vertical lifting load kg (lbs)
d	L		
M8	15	ZS91C00800	80 (176)
M10	18	ZS91C01000	150 (331)
M12	22	ZS91C01200	220 (485)
M16	27	ZS91C01600	450 (992)
M20	30	ZS91C02000	630 (1390)
M24	38	ZS91C02400	950 (2090)
M30	45	ZS91C03000	1500 (3310)
M36	55	ZS91C03600	2300 (5070)
M42	65	ZS91C04200	3400 (7490)
M48	70	ZS91C04800	4500 (9920)

Fig. 11-3 Eye bolt

11.11 UPPER FRAME LIFTING JIG



Q'ty : 2 sets

Material : Mild steel

Fig. 11-4 Upper frame lifting jig

11.12 ENGINE MOUNTING PEDESTAL

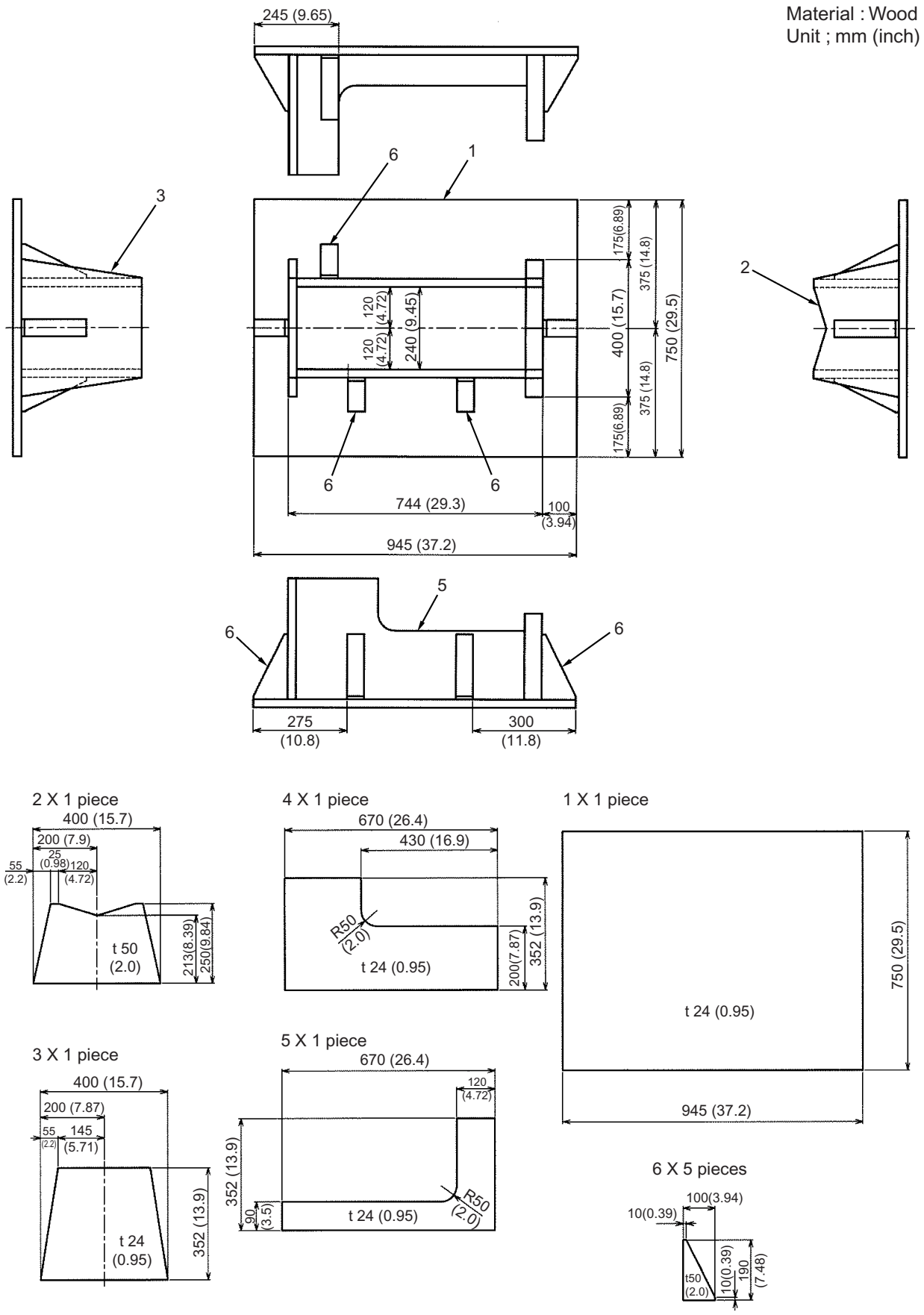


Fig. 11-5 Engine stand

11.13 TRACK SPRING SET JIG

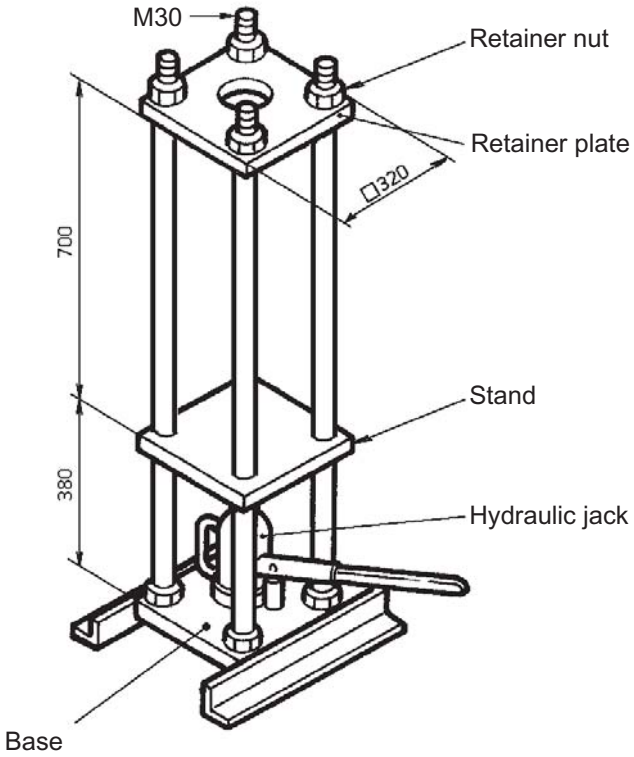


Fig. 11-6 Track spring set jig

[MEMO]

https://truckmanualshub.com/

KOBELCO

MARK 8



Kobelco Construction Machinery America LLC
Pressure Adjustments
SK350-8

KOBELCO
Kobelco Construction
Machinery America LLC

https://truckmanualshub.com/

TABLE OF CONTENTS

1. VERIFICATION OF ENGINE RPM 3
A. Machine Preparation Procedures 3

2. ENGINE SPEED MEASURED WITH SERVICE DIAGNOSTICS (28 ITEM CHECK) 3

3. HYDRAULIC OIL CAUTIONS 4
A. Checking the Main Relief Setting Using Service Diagnostics (28 Item Check) 4
B. Tools & Equipment Required for Checking and Adjusting of Pilot and Main Relief Valves 4

4. PILOT CIRCUIT 5
A. Machine Preparation Procedures 5
B. Pilot Relief Valve Pressure Measurement Procedures 5
C. Pilot Relief Valve Adjustment Procedures 5

5. MAIN RELIEF PRESSURE ADJUSTMENT 6
A. Machine Preparation Procedures 6
B. Measurement of Attachment Main Relief Valve “HEAVY LIFT SWITCH ON” 6

6. ADJUSTMENT 2nd STAGE MAIN RELIEF WITH “HEAVY LIFT SWITCH ON” 7
A. Machine Preparation Procedures 7
B. 2nd Stage Main Relief Valve Adjustment 7

7. ADJUSTMENT MAIN RELIEF WITH “HEAVY LIFT SWITCH OFF” 8
A. Machine Preparation Procedures 8
B. Main Relief Valve Adjustment 8
8. SWING CIRCUIT 9
A. Machine Preparation Procedures 9
B. Swing Port Relief Valve Pressure Measurement 9
C. Swing Port Relief Valve Procedures 10
9. OVER LOAD RELIEF VALVES 11
A. Machine Preparation Procedures 11
B. Tools & Equipment Required for Checking and Adjusting of Over Load Relief Valves 11
C. Over Load Relief Pressure Measurement 11
D. OR3 Boom Up Over Load Relief 12
E. OR4 Boom Down Over Load Relief 12
F. OR1 Bucket In (Dig) Over Load 12
G. OR2 Bucket Out Over Load 13
H. OR7 Arm In (Dig) Over Load 13
I. OR8 Arm Out Over Load 13
J. Travel Motor Port Reliefs 14
10. MEASUREMENT OF ADDITIONAL CIRCUIT PRESSURE PORTS 15
PERFORMANCE INSPECTION SPECIFICATION CHARTS ..... 16 ~ 19
A. SK160 16
B. ED190 17
C. SK210 18
D. SK250 19
E. SK290 20
F. SK330 21
G. SK480 22

https://truckmanualshub.com/

1. VERIFICATION OF ENGINE RPM

A. Machine Preparation Procedures

1. Place front attachment to hydraulic oil check position. Verify proper hydraulic oil level and all other lubricant levels. See Figure 5.1.
2. Place throttle potentiometer to low idle position; start engine, allow engine to achieve normal operating temperature113~145 ^{O}F (45~55 ^{O}C)
3. Check the gauge cluster and confirm that the machine is in the default “H” mode. See Figure 5.3.
4. Check that engine is at low idle allow engine to idle for two minutes to cool turbo then turn key switch the off position to shut off engine.

B. ENGINE SPEED MEASURED WITH SERVICE DIAGNOSTICS SCREEN

1. With safety lock in the lock (up) position. See Figure 5.1. machine turned off, depress and hold the buzzer stop switch while turning the key switch to the on position. Start Engine at low idle.
2. Check the gauge cluster and confirm that the machine is in the default “H” mode. allow engine to achieve normal operating temperature113~145 ^{O}F (45~55 ^{O}C) See Figure 5.4.
3. Press auto accel disable switch to disable auto accel. See Figure 5.2,5.3
4. Press the windshield washer(^) switch once, diagnostic check screen will now be at screen No. 2. (See Below).

```
NO. 2 ENG
G-3 SPEED SET    2205
                 MEAS 1 2201

G-5   ENG OIL PRS.   LIVE
      WATER TEMP.    114°F

      MODE           H
H-1   ACCEL. VOLT.   4.2V
      POS            100%
      ECU OUTPUT     0.5V
```

5. Place Throttle Potentiometer at High idle position, check engine rpms.Compare to **Specifications** in back of this chapter.
6. Press Mode switch and check rpms in all modes as well as low idle and auto accel mode.
7. Screen will stay in diagnostic mode until key switch is turned off.

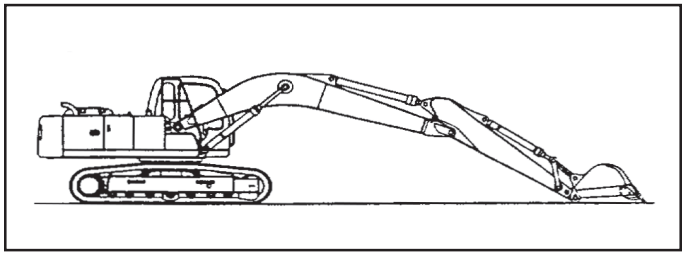


FIGURE 5.1

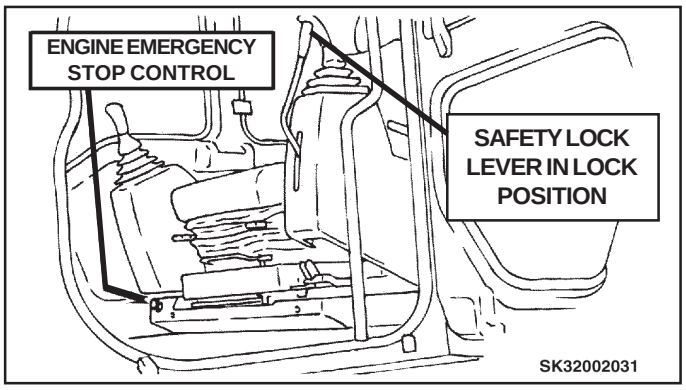


FIGURE 5.2

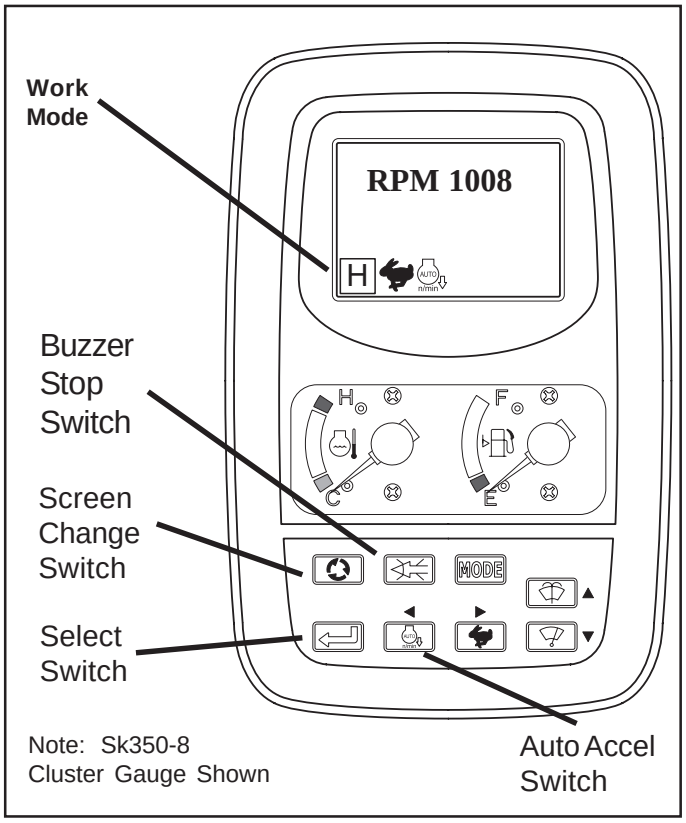


FIGURE 5.3

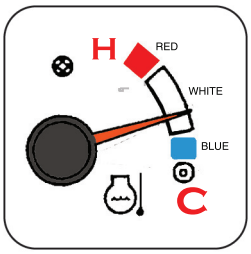


FIGURE 5.4

https://truckmanualshub.com/

3. PILOT CIRCUIT

A. Machine Preparation Procedures

1. **Note:** Verify Engine RPM before proceeding.
2. Confirm that the machine's front attachment is in the oil check position. Verify Hyd. oil level. See Figure 7.1.
3. Release hydraulic tank pressure by depressing relief valve stem item ① on the pressure relief valve. See Figure 7.2.
4. Open Main Pump Access Door and remove the PF1/4 test Port Plug (a5) from Output Port on Pilot System Gear Pump and install 105kg/cm² (1,000 psi) Pressure Gauge. See Figure 7.3.

B. Tools & Equipment Required for Checking and Adjusting of Pilot Main Relief Valve.

1. One 70kg/cm² (1,000 psi) Gauge.
2. One Quick couple P/N 100-42-001
3.  24mm spaner wrench
   6 mm allen wrench
4. General hand or power tools to remove and replace hydraulic fittings and components.
5. Thermometer or heat gun to read hydraulic oil temperature.

Note: To Change kg/cm² to PSI multiply kg/cm² pressure x 14.223 = Psi

---

B. Pilot Relief Valve Pressure Measurement Procedures

1. With safety lock lever in the locked (up) position. Start engine and place throttle control in Hi Idle position after engine warms up properly.
2. Press auto accel switch on the cluster gauge and move a lever full stroke to release auto accel. Return lever to neutral.
3. If not already in "H" mode, Press the Mode switch and place in "H" Mode.
4. Confirm that the hydraulic oil is approximately 113~145°F (45~55°C). Engine water temperature is approximately 104~212 °F (40~100 °C).

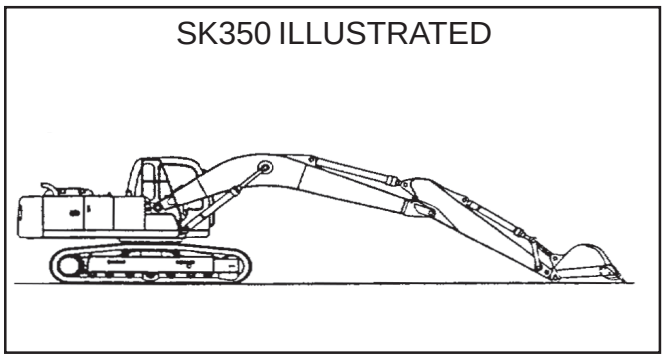


FIGURE 7.1

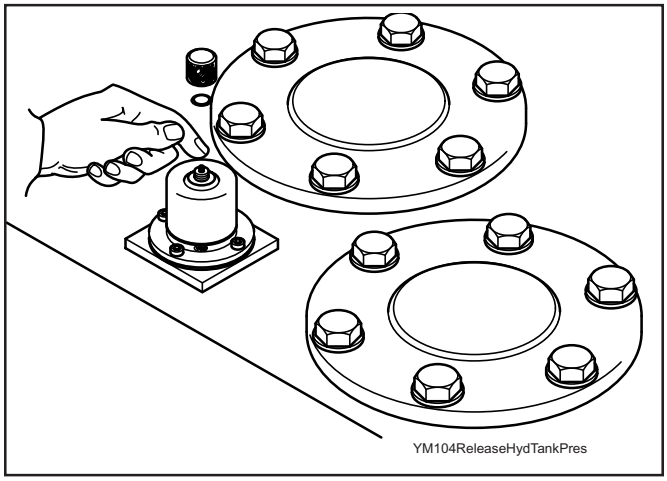


FIGURE 7.2

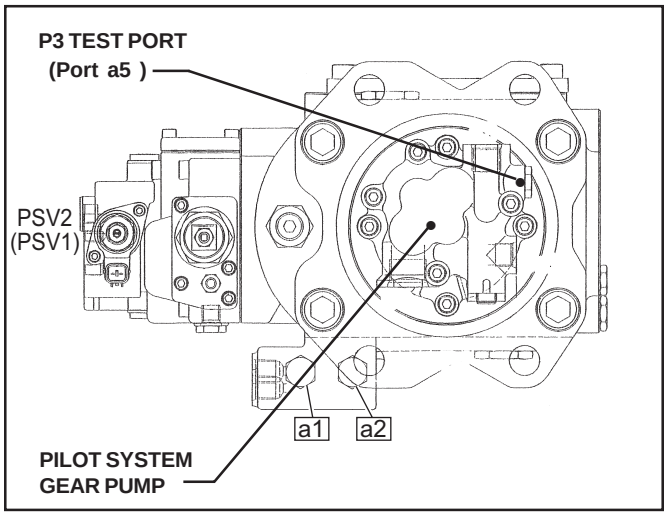


FIGURE 7.3

Note: All test ports on pump are PF1/4 BSPP (Never install test port that are NPT, or pump damage will occur.



https://truckmanualshub.com/

5. Place all pilot controls in neutral, read and record the 70kgf/cm^2 (1000 psi) pressure gauge at the P3 pump, a7 pressure test port. See Figure 7.3. Compare to chart for specific model being tested.

C. Pilot Relief Valve Adjustment Procedures

1. With safety lock lever in the locked (up) position. Locate the Pilot Relief Valve mounted on the bottom of the P3 Pilot Pump Assembly. See Figure 7.4.
2. Loosen the adjusting screw locknut with a 24mm spanner. See Figure 7.4.
3. Adjust using a 6mm allen until specified pressure according to proper chart for specific machine being adjusted is achieved.
4. After correct pressure is obtained, tighten adjusting screw locknut, tightening torque 3.0 kgfm^2 (22ft.lb). See Figure 7.4.
5. Verify pressure after tightening locknut.

D. Pilot Relief Pressure Check at low Idle

1. With safety lock lever in the locked (up) position. Locate and place throttle potentiometer in low Idle position with engine still idling.
2. Place all pilot controls in neutral, read and record off the 70kgf/cm^2 (1000 psi) pressure gauge at the P3 pump, a7 pressure test port.
3. Pilot Pressure should not drop below 500 psi (35kgf/cm^2)if pilot pressure drops below pressure level pilot pump or pilot relief valve is damage or worn, replace or repair to correct problem.

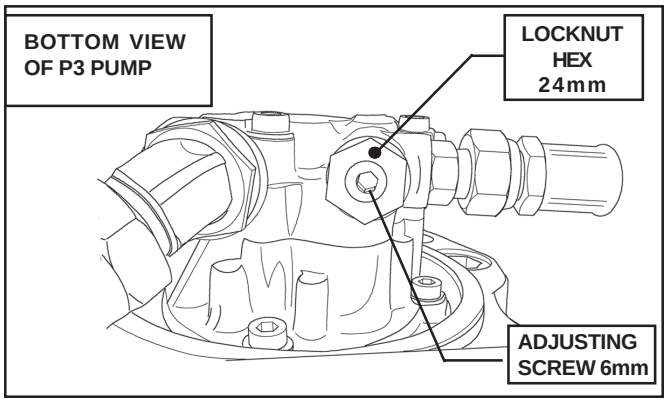


FIGURE 7.4

Conversions Notes: Kg/cm ^{2} x 14.224 = **PSI**
Mpa x 145.0377 = **PSI**

Tools for checking and testing pressure on Kobelco excavators

Kobelco Pressure Test Kit - HTK-1000-01
Service Bulletin HE-59c

or

Individual parts:

Qty: Description
2 - 10,000 PSI Gauge KSP9000-10M
1 - 1,000 PSI Gauge KSP9000-1.0M
3 - H.P. Gauge Hose 200-16-400
3 - Gauge to Hose Connector 300-42-000
3 - Quick Coupler 100-42-001

https://truckmanualshub.com/

4. HYDRAULIC CAUTIONS

Kobelco Excavators are set to ISO pilot controls at the factory. It is up to you to read and understand the Operators & Maintenance Manual before attempting any service or maintenance procedures.

WARNING

• BE EXTREMELY CAUTIOUS WHILE RELEASING HYDRAULIC TANK PRESSURE OR REMOVING LINES AND FITTINGS, VAPORS AND OIL MAY BE EXTREMELY HOT.

• WEAR APPROVED SAFETY CLOTHES, SHOES, GLOVES AND HARD HAT WHEN PERFORMING ANY MAINTENANCE OR TEST PROCEDURES.

1. Checking the Main Relief Value Using Service Diagnostic Screens

a. With key in OFF position, gauge cluster blank, press and hold buzzer stop switch.

b. Turn key switch to on position. Release buzzer stop switch. See Figure 6.1.

c. Move key switch to start position, start engine and release key switch.

d. Now by pressing the “UP” arrow button the service diagnostics is advanced forward. See Figure 6.2.

e. By pressing the “DOWN” arrow button the screen is returned to the previous screen.

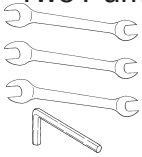
f. Advance the service diagnostics to screen No.7. See Figure 6.3.

g. Screen No.7 will display the voltage of high pressure sensor, and the computer sensed oil pressure at P1 and P2 pump. Use this for checking pump and machine performance. See Figure 6.3.

2. Tools Required for Check and Adjusting of Main Relief Valve

a. Two 700kg/cm^2 (10,000psi) Gauges.

b. Two Pump test ports P/N 100-42-001.

c. 
32 mm spaner wrench
22 mm spaner wrench
19 mm spaner wrench
6 mm allen wrench

d. General hand or power tools to remove and replace hydraulic fittings and components.

e. Thermometer or heat gun to read hydraulic oil temperature.

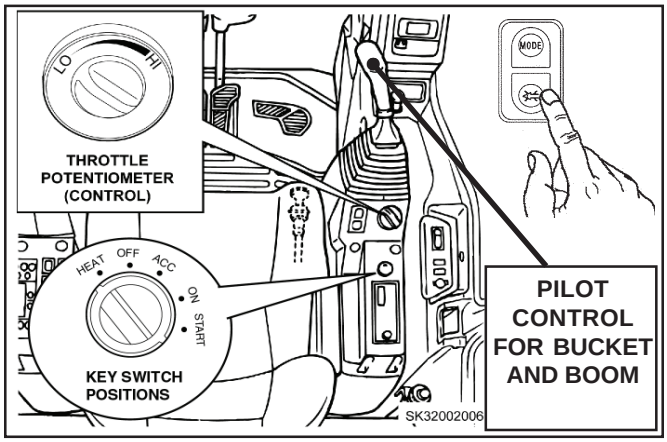


FIGURE 6.1

Note: To Change MPa to PSI multiply MPa pressure x 145.0377 = Psi

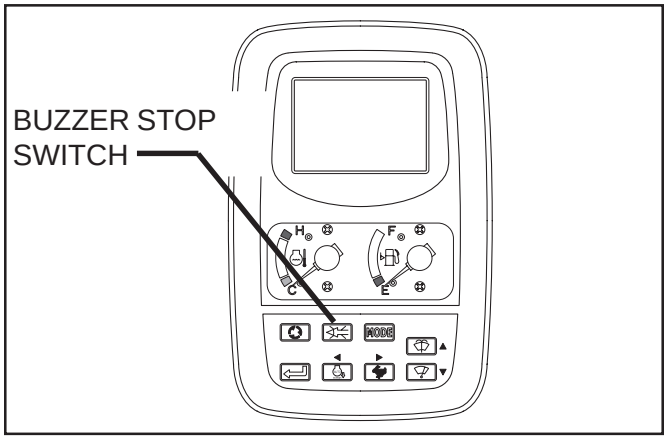


FIGURE6.2

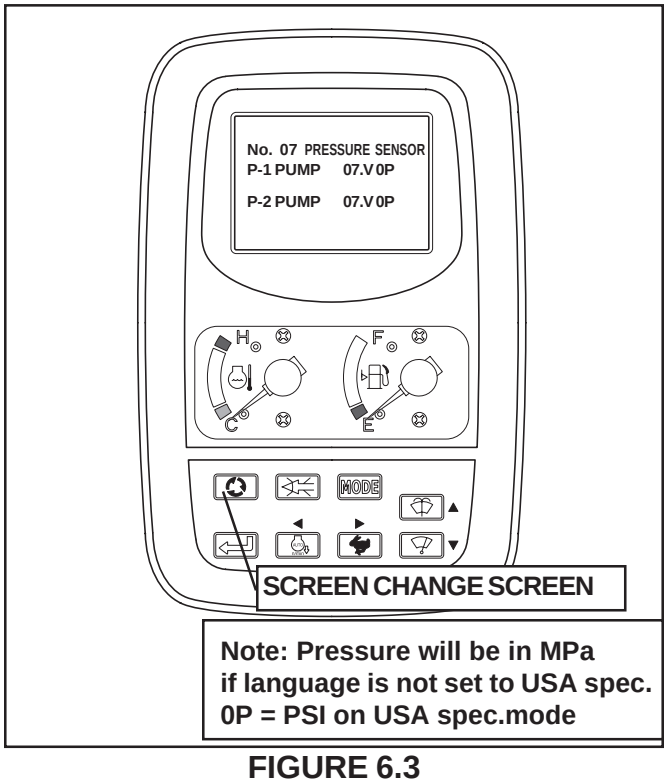


FIGURE 6.3

https://truckmanualshub.com/

MAIN RELIEF PRESSURE ADJUSTMENT

WARNING

• MAKE CERTAIN THERE ARE NO OBJECTS IN THE PATH OF THE BOOM

GAUGE INSTALLATION FOR MAIN RELIEF PRESSURE ADJUSTMENT

3. Machine Preparation Procedures

1. **Note:** Refer to Verification of Engine RPM before proceeding.
2. Confirm that the machine front attachment is in the oil check position. See Figure 8.1.
3. Release hydraulic tank pressure by depressing relief valve stem item ① on the pressure relief valve. See Figure 8.2.
4. Open Main Pump Access Door and remove two (2) PF1/4 test Port Plugs (a1) P1 pump and (a2) Pump install 700kg/cm² (10,000 psi) Pressure Gauges. See Figure 8.3.

4. Measurement of Attachment Heavy Lift.

1. Perform machine preparation procedures as described in MACHINE PREPARATION PROCEDURES.
2. Place "Heavy Lift" Switch in the "**ON**" position. See Figure 8.4.
3. Place KPSS Mode Switch in "H" Mode.
4. Start engine and place throttle control in Low Idle position.
5. Confirm that the hydraulic oil is approximately 113~145°F (45~55°C). Engine water temperature is approximately °C 40~100 (°F104~212).
6. Move throttle control to "HI-IDLE".
7. Operate Boom Raise control until boom is completely up, then hold over relief.
8. Record readings from 700kg/cm² (10,000 psi) Pressure Gauges at a1 port on P1 Main Pump and a2 port at P2 pump.
9. If pressure gauge readings are within specifications for the particular machine being tested, it is not necessary to adjust Relief Valve Pressure. Refer to chart for machine and model being tested.

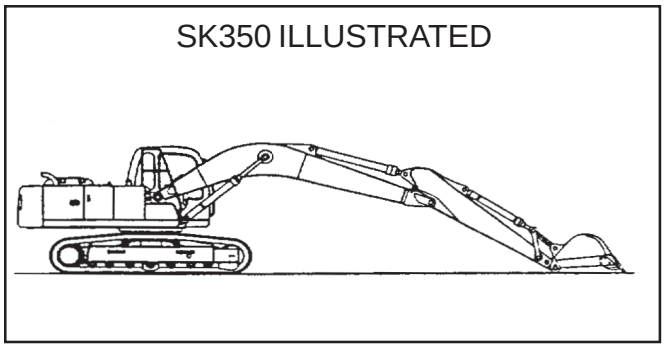


FIGURE 8.1

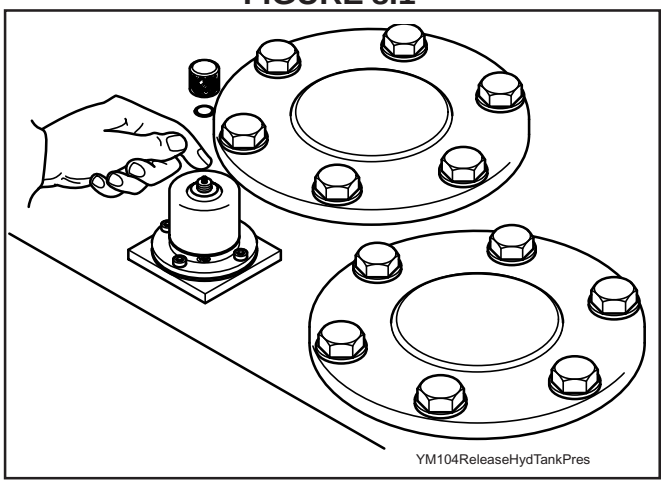


FIGURE 8.2

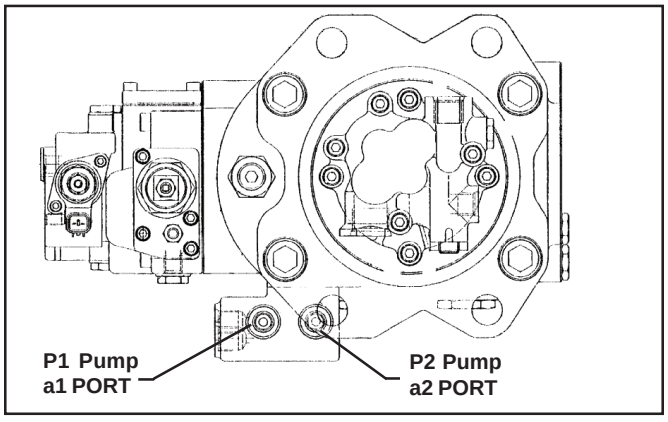


FIGURE 8.3

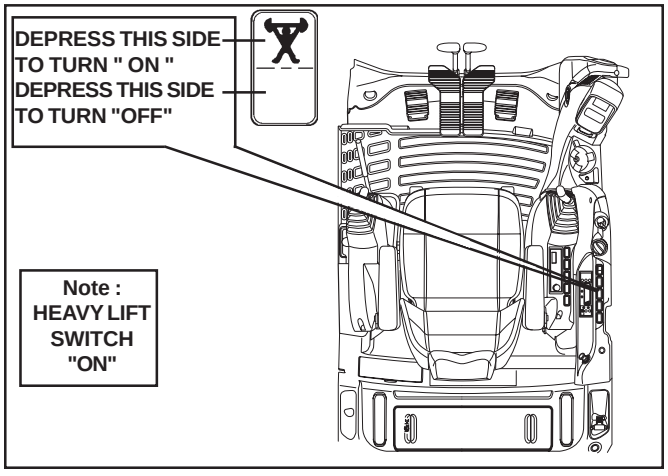


FIGURE 8.4

https://truckmanualshub.com/

ADJUSTMENT 2nd STAGE OF MAIN RELIEF "HEAVY LIFT PRESSURE"

WARNING

• MAKE CERTAIN THERE ARE NO OBJECTS IN THE PATH OF THE BOOM

5. ADJUSTMENT 2nd STAGE of MAIN RE LIEF WITH "HEAVY LIFT SWITCH ON"

A. Machine Preparation Procedures

1. Confirm that the following is proper before proceeding to step 2.
   a. KPSS is in “H” mode. See Figure 9.1.
   b. Heavy lift switch on. See Figure 9.2
   c. Hydraulic oil is approximately 113~145°F (45~55°C).
   d. Engine water temperature is approximately °C 40~100 (°F104~212).
   e. Disable auto accel by pressing auto accel button on cluster gauge.
   f. High Idle RPM is proper per machine being tested.

B. HEAVY LIFT 2nd Stage Main Relief Valve Adjustment

1. Locate Main Relief Valve (MR1) on the main control valve. See Figure 9.3.
2. Loosen second stage locknut with 32mm wrench See Figure 9.4.
3. With engine at full RPM, raise boom up and over relief. Adjust heavy lift, power boost screw with 19mm wrench, until proper pressure is achieved at pump P1 a1 test port, and pump P2 a2 test port with 700kg/cm² (10,000 psi) pressure gauges.
4. After correct pressure is obtained tighten adjusting screw locknut to 2.8 ~3.2 kgfm² (20~30 ft.lb). Verify pressure after tightening locknut.

NOTE

Turning Heavy lift Power Boost Adjusting Screw Clockwise One turn
Increases Pressure Approximately
108 kgf/cm² 180 (2560 psi)

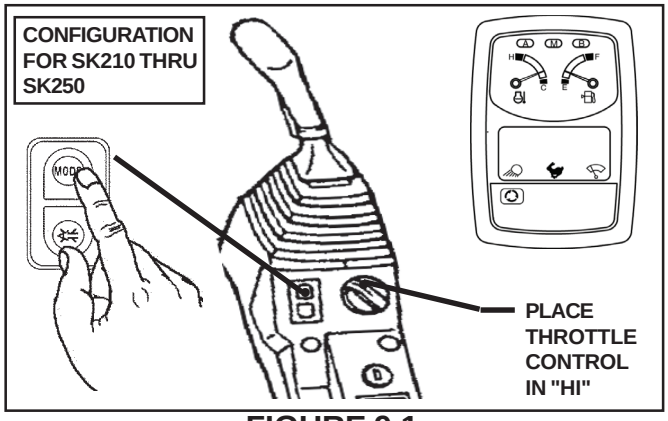


FIGURE 9.1

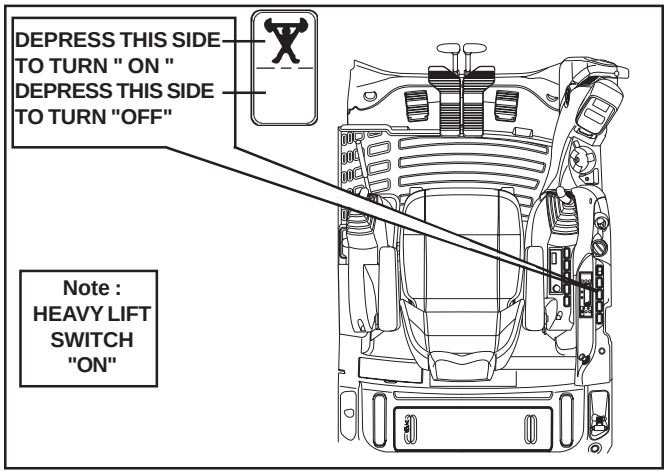


FIGURE 9.2

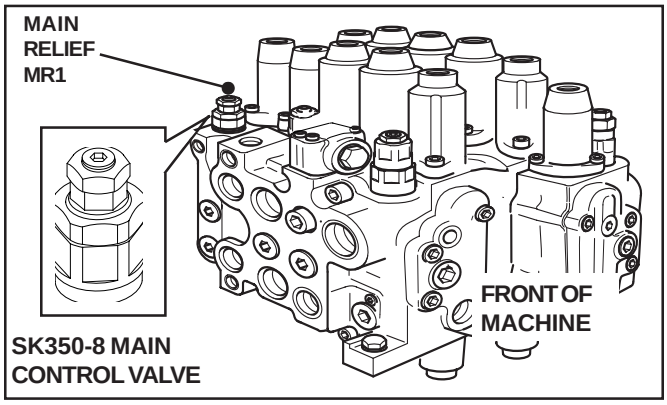


FIGURE 9.3

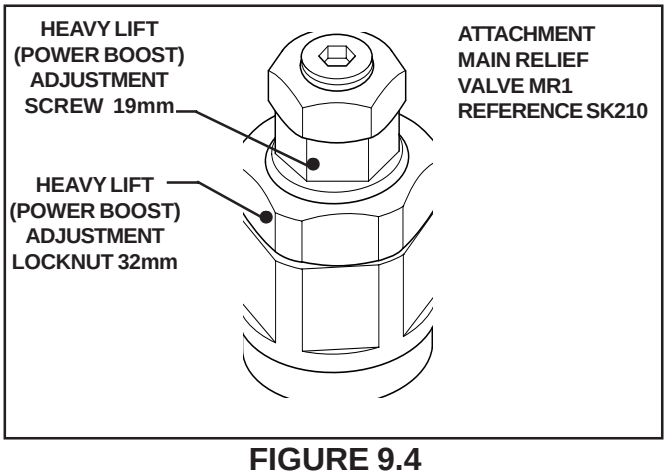


FIGURE 9.4

https://truckmanualshub.com/

ADJUSTMENT MAIN RELIEF STANDARD PRESSURE

WARNING

• MAKE CERTAIN THERE ARE NO OBJECTS IN THE PATH OF THE BOOM

6. ADJUSTMENT OF MAIN RELIEF Normal Opertional Pressure

A. Machine Preparation Procedures

1. Confirm that the following is proper before proceeding to step 2.
   a. KPSS is in “H” mode. See Figure 10.1.
   b. Heavy lift switch off. See Figure 10.2.
   c. Hydraulic oil is approximately 113~145^{O}F (45~55^{O}C).
   d. Engine water temperature is approximately 104~212^{O}F (40~100^{O}C).
   e. Disable auto accel by pressing auto accel button on cluster gauge.
   f. High Idle RPM is proper per machine being tested.

B. Main Relief Valve Adjustment

1. Locate Main Relief Valve (MR1) on the main control valve. See Figure 10.3.
2. Loosen locknut with 22mm wrench See Figure 10.4.
3. With engine at full RPM, raise boom up and over relief. Adjust screw with 6mm allen wrench, until proper pressure is achieved at pump P1 a1 test port, and pump P2 a2 test port with 700kg/cm² (10,000 psi) pressure gauges.
4. After correct pressure is obtained tighten adjusting screw locknut to ; 2.8 ~3.2 kgfm^{2} (20~30 ft.lb). Verify pressure after tightening locknut.

NOTE

Turning Normal Adjusting Screw Clockwise One turn

Increases Pressure Approximately 108 kgf/cm^{2} 180 (2560 psi)

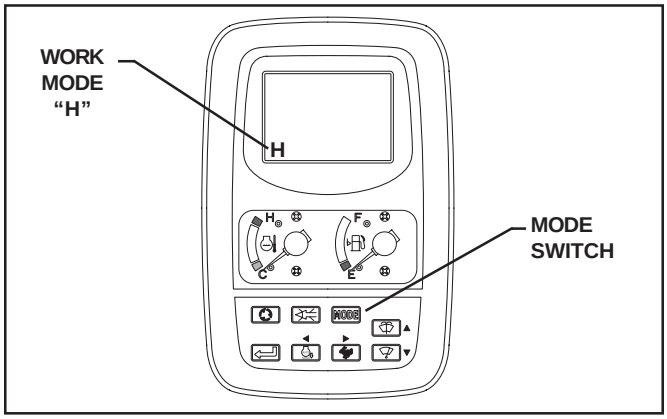


FIGURE 10.1

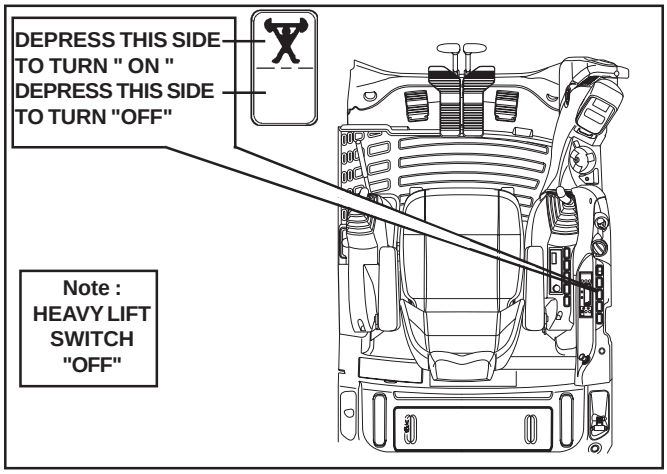


FIGURE 10.2

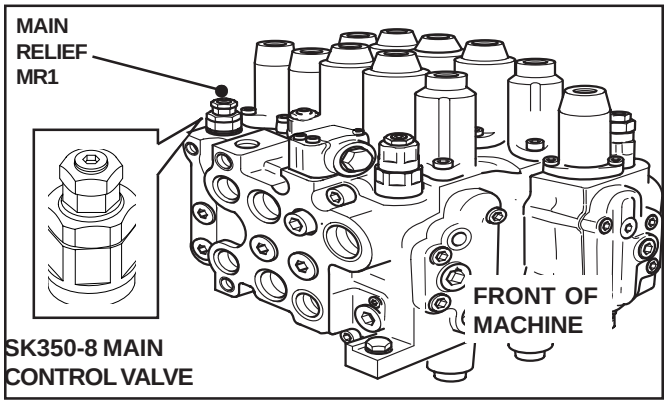


FIGURE 10.3

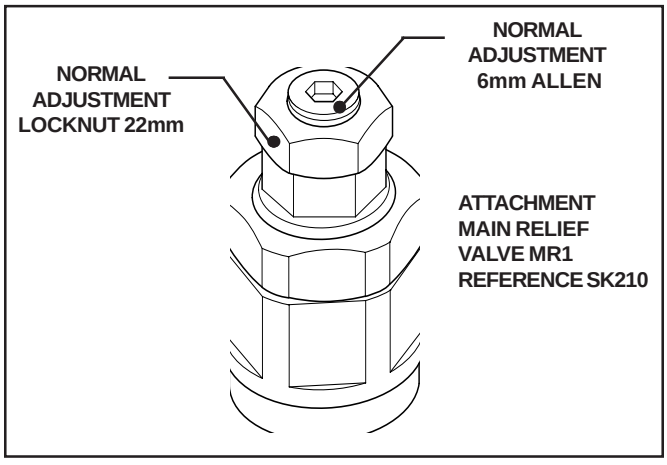


FIGURE10.4

https://truckmanualshub.com/

7. SWING CIRCUIT

NOTE

The following procedures are provided for reference only. Attachment Port Relief Valves are factory preset and should not be field adjusted.

A. Machine Preparation Procedures

1. **Note:** Refer to Verification of Engine RPM before proceeding.
2. Confirm that the machine front attachment is in the oil check position. See Figure 11.1.
3. Release hydraulic tank pressure by depressing relief valve stem item ① on the pressure relief valve.
4. Open Main Pump Access Door and remove the PF1/4 test Port Plug (a7) from Output Port on Pilot System Gear Pump and install 105kg/cm² (1,000 psi) Pressure Gauge. See Figure 11.2.

B. Swing Over Load Relief Valve Pressure Measurement

1. Perform machine preparation procedures as described in MACHINE PREPARATION PROCEDURES.
2. Move throttle control to "HI-IDLE," place KPSS Mode Switch in "H" Mode.
3. Operate boom down control until bucket teeth penetrate soil approximately 305mm (12"). See Figure 11.3.
4. Operate swing control to the left and hold, stalling swing. Record reading from 700kg/cm² (10,000 psi) Pressure Gauge installed to test port a2 on P2 Main Pump. See Figure 11.2.
   Or compare reading in Diagnostic Check No.14. See Figure 11.4.
5. Operate swing control to the right and hold, stalling swing. Record reading from 700kg/cm² (10,000 psi) Pressure Gauge installed to test port a2 on P2 Main Pump.
   Or compare reading in Diagnostic Check No.14. See Figure 11.4.

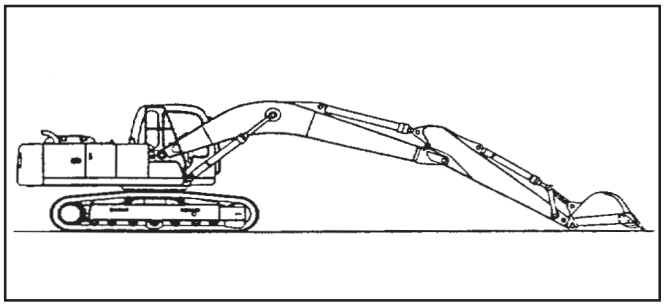


FIGURE 11.1

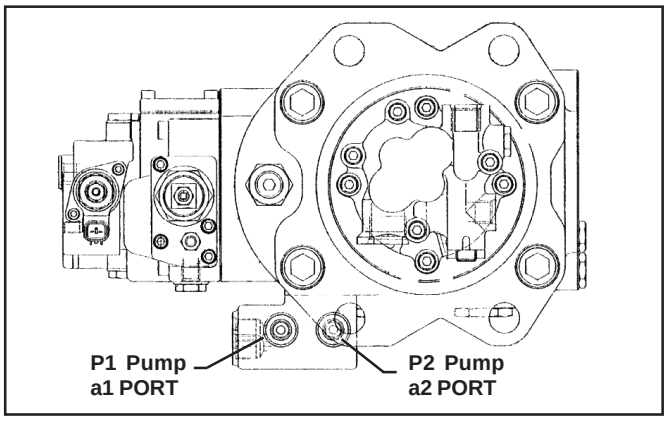


FIGURE 11.2

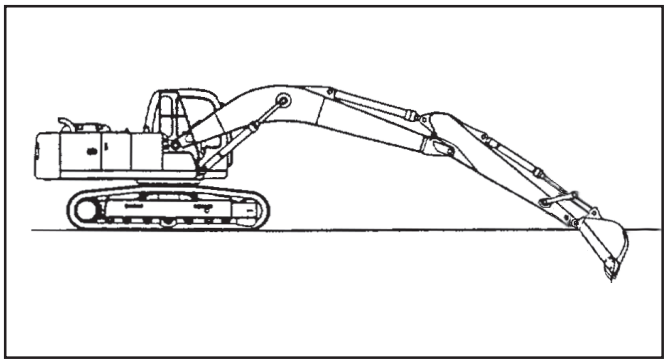


FIGURE 11.3

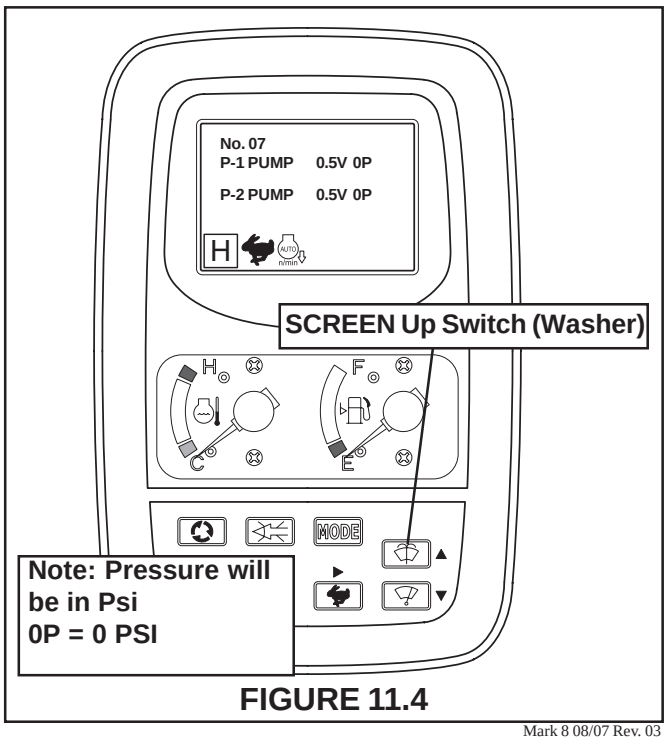


FIGURE 11.4

https://truckmanualshub.com/

WARNING

• PRECISE ADJUSTMENT OF THE MACHINE'S ATTACHMENT PORT RELIEF VALVES IS *NOT POSSIBLE ON THE MACHINE*.
• SHOULD A PROBLEM BE FOUND WITH THE ATTACHMENT PORT RELIEF VALVES, IT IS RECOMMENDED TO REPLACE FAULTY ATTACHMENT PORT RELIEF VALVES.
SUCH ADJUSTMENT COULD VOID WARRANTY.

C. Swing Over Load Relief Valve Pressure Adjustment

Machine Preparation Procedures

1. Confirm that the following is proper before proceeding to step 2.
   a. KPSS is in “H” mode
   b. Heavy lift switch off.
   c. Hydraulic oil is approximately ^{O}C 45~55 (^{O}F113~145).
   d. Engine water temperature is approximately ^{O}C 40~100 (^{O}F104~212).
   e. Maintenance connector is in the release position.
   f. High Idle RPM is proper per machine being tested.
   g. Bucket teeth penetrate soil approximately 305mm (12"). Figure 12.1.
2. Locate Swing Left overload relief OR5, loosen 24mm locknut.See Figure12.2
3. Operate swing control to the left and hold, stalling swing. Adjust pressure to specific machine using 700kg/cm^2 (10,000 psi) Pressure Gauge installed to test port a2 on P2 Main Pump. See Figure 12.3
4. After correct pressure is obtained tighten adjusting screw locknut to ; 2.8 ~3.2 kgfm^2 (20~30 ft.lb). Verify pressure after tightening locknut.
5. Locate Swing Right overload relief OR6, loosen 24mm locknut. Operate swing control to the right and hold, stalling swing. Adjust pressure to specific machine using 700kg/cm^2 (10,000 psi) Pressure Gauge installed to test port a2 on P2 Main Pump.
6. After correct pressure is obtained tighten adjusting screw locknut to ; 2.8 ~3.2 kgfm^2 (20~30 ft.lb). Verify pressure after tightening locknut.

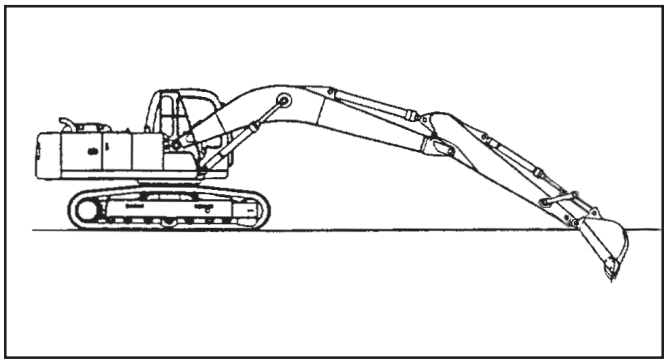


FIGURE 12.1

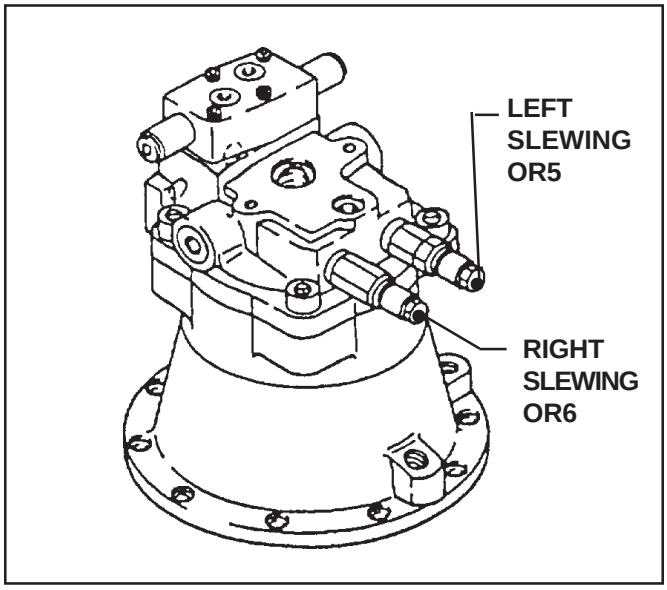


FIGURE 12.2

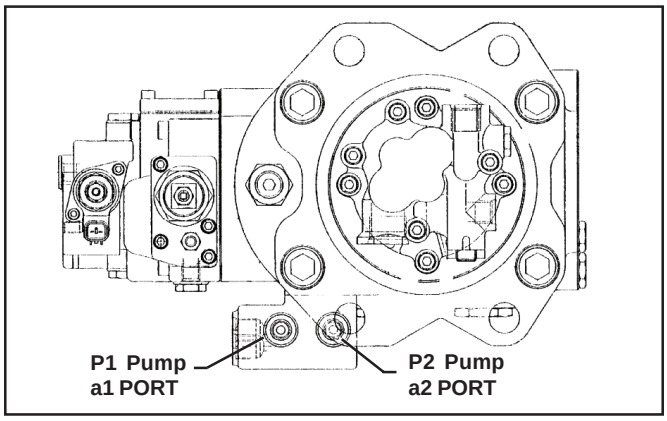


FIGURE 12.3

NOTE

Turning Normal Adjusting Screw Clockwise One turn
Increases Pressure Approximately
108 kgf/cm^2 21 (300 psi)

https://truckmanualshub.com/

10. MEASUREMENT OF ADDITIONAL CIRCUIT PRESSURE PORTS

1. High pressure sensor circuit
   Remove a1, a2 port plugs PF 1/4 of main pump and attach pressure gauge of 700 kgf/cm² (10,000 psi).
2. Pump proportional valve secondary pressure circuit Remove a3, a4 port plugs PF 1/4 of main pump and attach pressure gauge of 70 kgf/cm² (1000 psi).
3. Pilot pump circuit
   Remove a5 port plug PF 1/4 of gear pump and attach pressure gauge of 70 kgf/cm² (1000 psi).

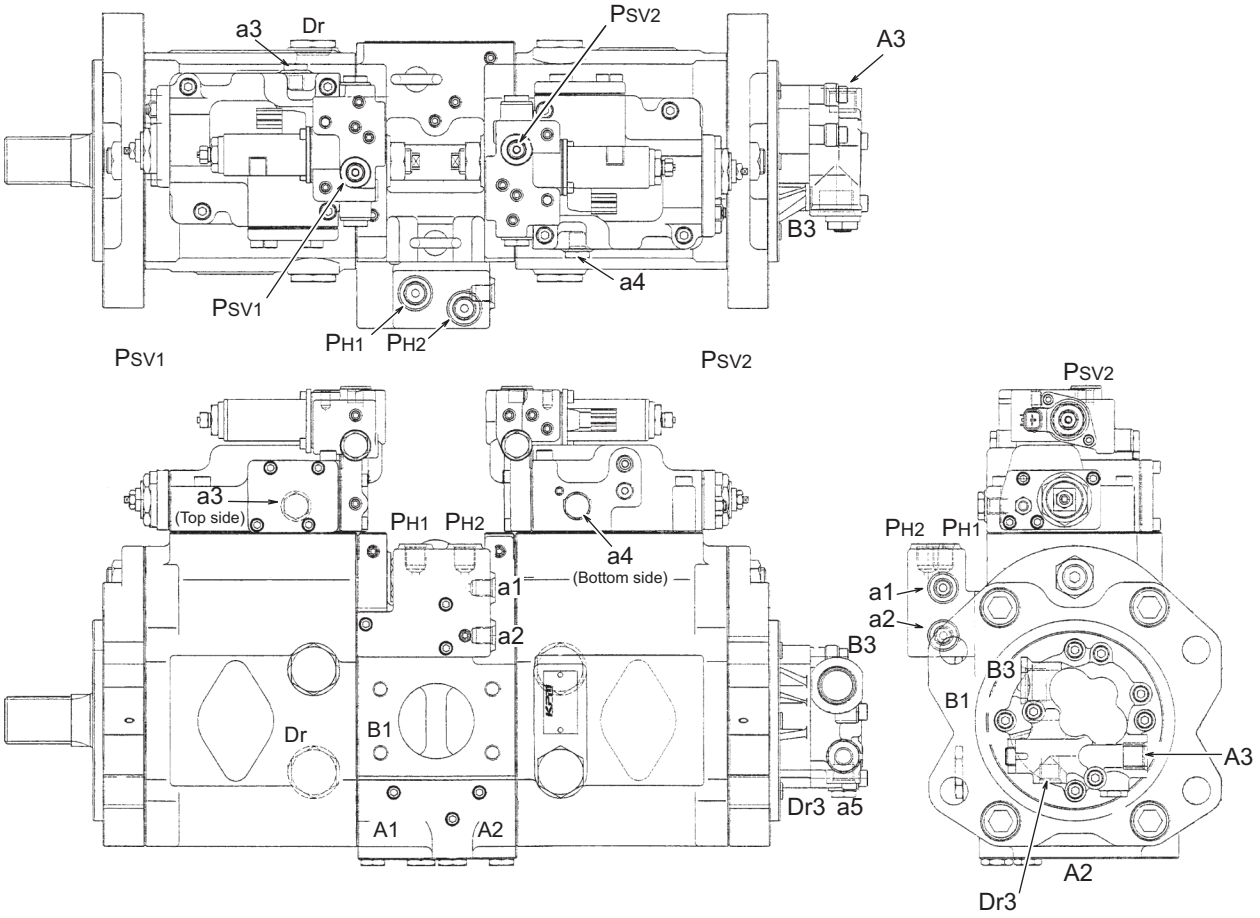


Fig. 09-13

Typical of SK350

https://truckmanualshub.com/

MEASURING & ADJUSTING PRESSURES SK350

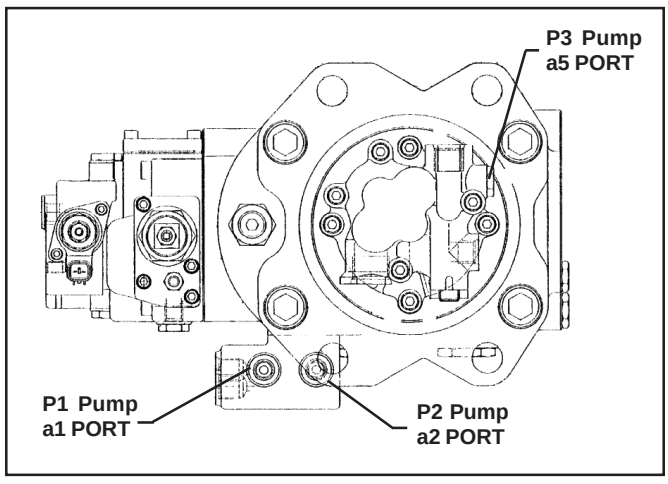
YC08U1601~

INSPECTION ITEM			PRESSURE READING FROM		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		45~55°C	113~145°F	N/A	Ambient Temperature -10°C ~ 50°C (14°F ~ 122°F)
	Engine Coolant Temperature		Radiator Surface		60~90°C	140~194°F	N/A	
	ENGINE RPM	Low Idle	Display change switch on gauge cluster		975~1025 RPM		Service Connector Installed	Throttle @ "LO"- Idle
		H - Mode			2030~2130 RPM			Throttle @ "HI"- Idle
		S - Mode			1830~1930			Throttle @ "HI"- Idle
		A - Mode			2030~2130			Throttle @ "HI"- Idle
		B- Mode			2030~2130			
		Auto - Accel			1025~1075			

SYSTEM	COMPONENT		GAUGE @	SIZE	PORT	MPa	PSI	Adj point	Measuring Condition
PILOT CIRCUIT	PRIMARY PRESSURE		Gear Pump		a5	5~5.5	725~800	P3	Engine - Hi Idle, H mode
MAIN RELIEF	HEAVY LIFT		Main Pump		a1	37.3~38.8	5400~5627	MR1	Boom Raise held over relief
					a2				
	ATTACHMENT		Main Pump		a1	33.8~35	4900~5076	MR1	Boom Raise held over relief
					a2				
NOTE:	Port relief valves are set at a precise flow rate and cannot be adjusted on the machine. Port relief valves can be checked for excessive leakage by increasing the value of main relief valve. (turn main relief clockwise one complete turn). Check at low idle, heavy lift on (if Applicable). Refer to chart below for port relief valve.								
PORT RELIEFS	BOOM (DO NOT ADJUST)	ROD	Main Pump	PF 1/4	a1	33.8~37.8	4902~5480	OR4	Boom Down
		HEAD			a2	33.8~39.7	4902~5760	OR3	Boom Up
	ARM (DO NOT ADJUST)	ROD	Main Pump		a1	33.8~39.7	4902~5760	OR8	Arm Out (Cylinder In)
		HEAD			a2	33.8~37.8	4977~5474	OR7	Arm In (Cylinder Out)
	BUCKET (DO NOT ADJUST)	ROD	Main Pump		a1	33.8~37.8	4902~5480	OR1	Bucket Out
		HEAD			a2	33.8~39.7	4902~5760	OR2	Bucket In
	SWING	Left	Main Pump		a2	29.0~35	4622~5050	OR5	Bucket Lock, Stall Swing
		Right			a2	29.0~35	4622~5050	OR6	Bucket Lock, Stall Swing
	AUXILIARY */**	All	Main Pump		a1a2	33.8~37.8	4902~5480		Auxiliary Attachment Stalled
	TRAVEL (DO NOT ADJUST)	RH F	Main Pump		a1	33.8~35.8	4902~5192		"H"-Mode, Engine at Hi Idle. Simultaneous LH/RH Travel Engaged
		RH R			a1	33.8~35.8	4902~5192		
		LH F			a2	33.8~35.8	4902~5192		"H"-Mode, Engine at Hi Idle. Simultaneous LH/RH Travel Engaged
		LH R			a2	33.8~35.8	4900~5192		

SYSTEM	COMPONENT		GAUGE @	SCREEN #		MPa	mA	Adj point	Measuring Condition
Pump Regulation	P1 pump proportional valve	a3	Gauge Cluster	Service Diag.	No.07	0.2~0.5	330~360	Neutral	Boom up or Bucket dig
						2.0~3.0	630~770	activated	
	P2 pump proportional valve	a4			No.07	0.2~0.5	330~360	Neutral	Armin/out or Swing stall
						2.0~3.0	630~770	activated	

Test Port Locations



NOTE :
Take Measurements
H-Mode Engine at "HI" Idle.
Levers in neutral for neutral reading,
then activate circuit to take activated readings

Power Shift:
*** ...All controls in neutral 0~10 mA
** ....Front attachment stalled 0~10 mA
Auxiliary */** ....Both travel motors stalled 10~30 mA

Auxilary port relief are as follows:
Swing priority, Breaker, Nibler Breaker

https://truckmanualshub.com/

CHAPTER 10
MECHATRONICS SYSTEM

TABLE OF CONTENTS

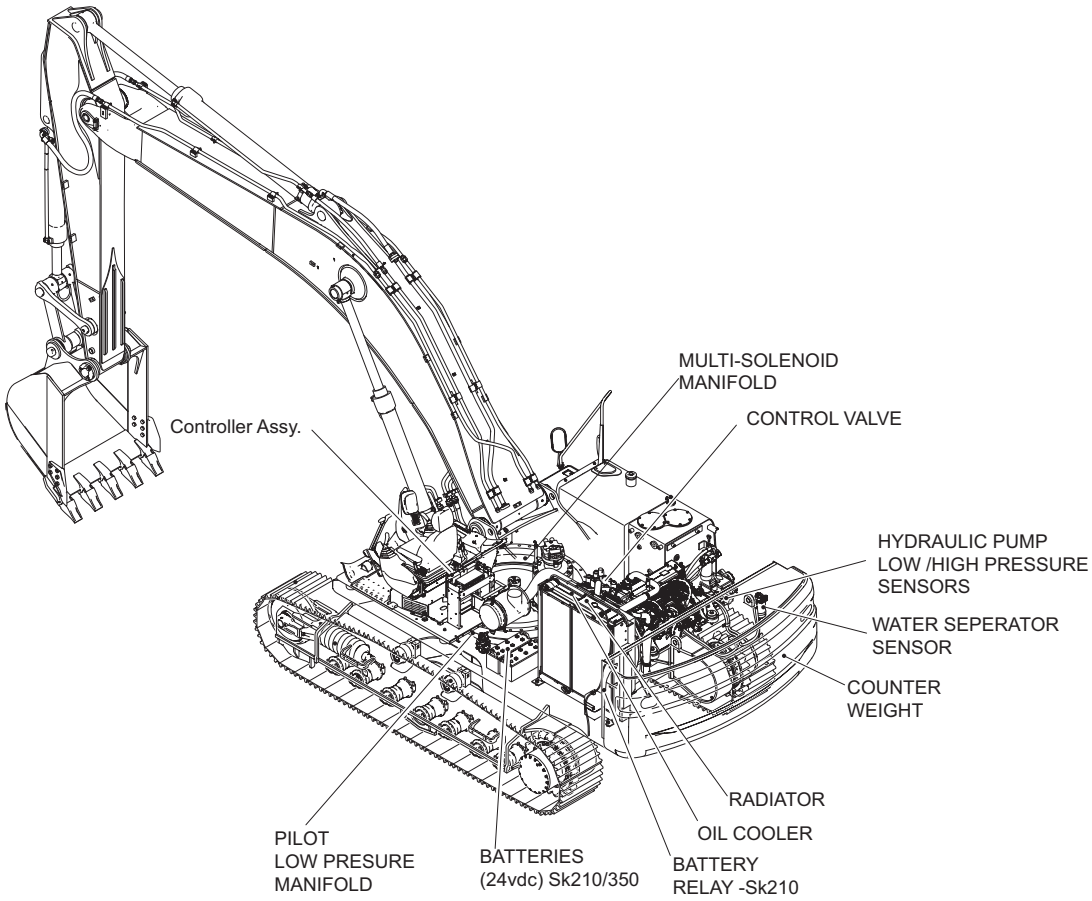
21.10.0 SUMMARY OF MECHATRO CONTROL SYSTEM 10-4
21.1.1 MECHATRO CONTROL SYSTEM IN GENERAL 10-4
21.1.2 UNLOAD VALVE CONTROL 10-6
21.1.3 POSITIVE CONTROL & P-Q CONTROL 10-7
21.1.4 BOOM UP CONFLUX CONTROL 10-9
21.1.5 ARM IN RECIRCULATION & CONFLUX CONTROL 10-10
21.1.6 ARM-IN ANTI-CAVITATION CONTROL 10-12
21.1.7 ARM-OUT CONFLUX CONTROL 10-13
21.1.8 BUCKET DIGGING (DUMP) CONFLUX CONTROL 10-14
21.1.9 BUCKET DIGGING ANTI-CAVITATION CONTROL 10-15
21.1.10 SWING PRIORITY CONTROL 10-17
21.1.11 TRAVEL STRAIGHT CONTROL 10-18
21.1.12 PRESSURE RELEASE CONTROL 10-20
21.1.13 N&B SWITCH CONTROL (OPTION) 10-21
21.1.14 OPTION CONFLUX CONTROL (OPTION) 10-22
21.2.0 MECHATRO CONTROLLER 10-23
21.2.1 SUMMARY OF MULTI DISPLAY 10-23
21.2.2 SELF DIAGNOSIS DISPLAY 10-28
21.2.3 SERVICE DIAGNOSIS DISPLAY FUNCTION 10-30
21.2.4 TROUBLE HISTORY DIAGNOSIS 10-40
21.2.5 TROUBLE DIAGNOSIS MODE 10-41
21.2.6 SET PROCEDURE OF MAINTENANCE SCHEDULE 10-42
21.2.7 ADJUSTING PROCEDURE A,B,C SK210-8 10-45
21.2.8 ADJUSTING PROCEDURE A,B,C SK350-8 10-47

https://truckmanualshub.com/

Issue	Date of Issue	Applicable Machines	Remarks
First edition Second Edition	Sept. 30, 2006 Aug 01,2007	SK330–8 : LC10-07001~ SK350LC–8 : YC10-03501~	S5LC2111E01 Shop-manual Refer Section 21 SC

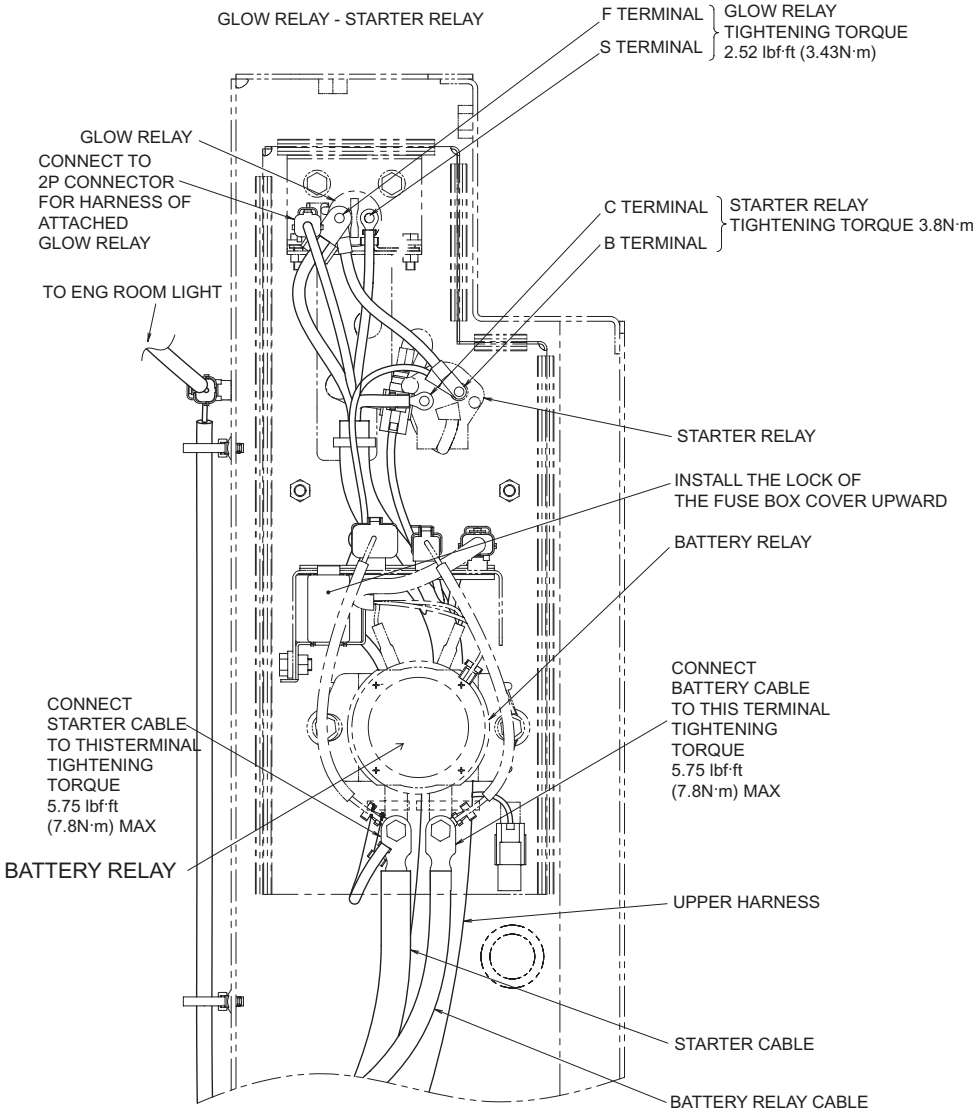
https://truckmanualshub.com/

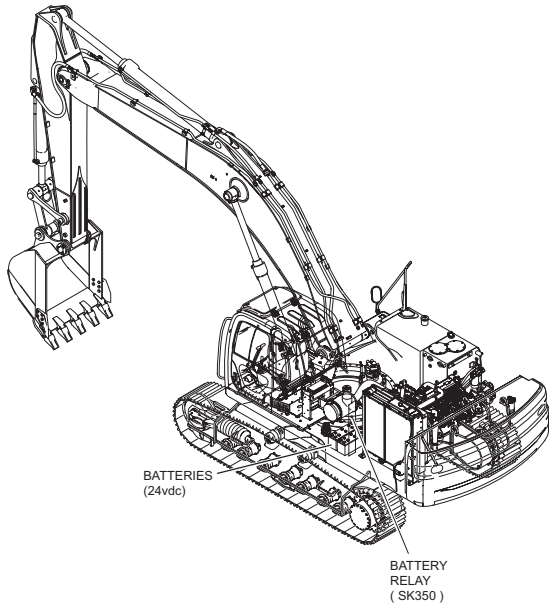
Electrical Component locations



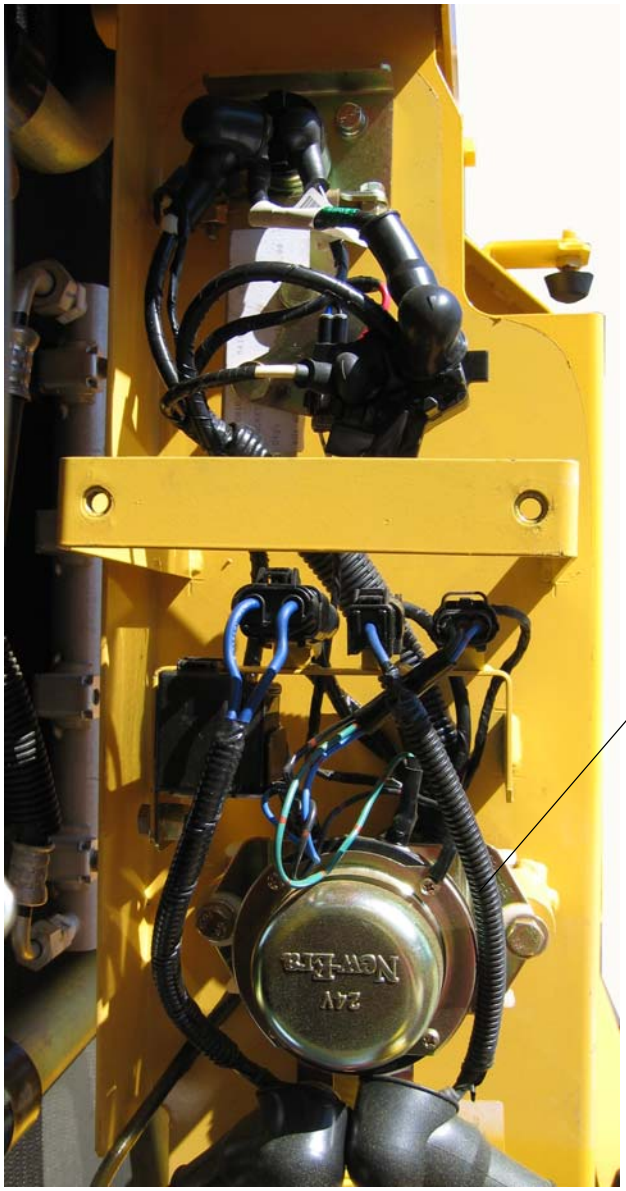
https://truckmanualshub.com/

Battery Relay



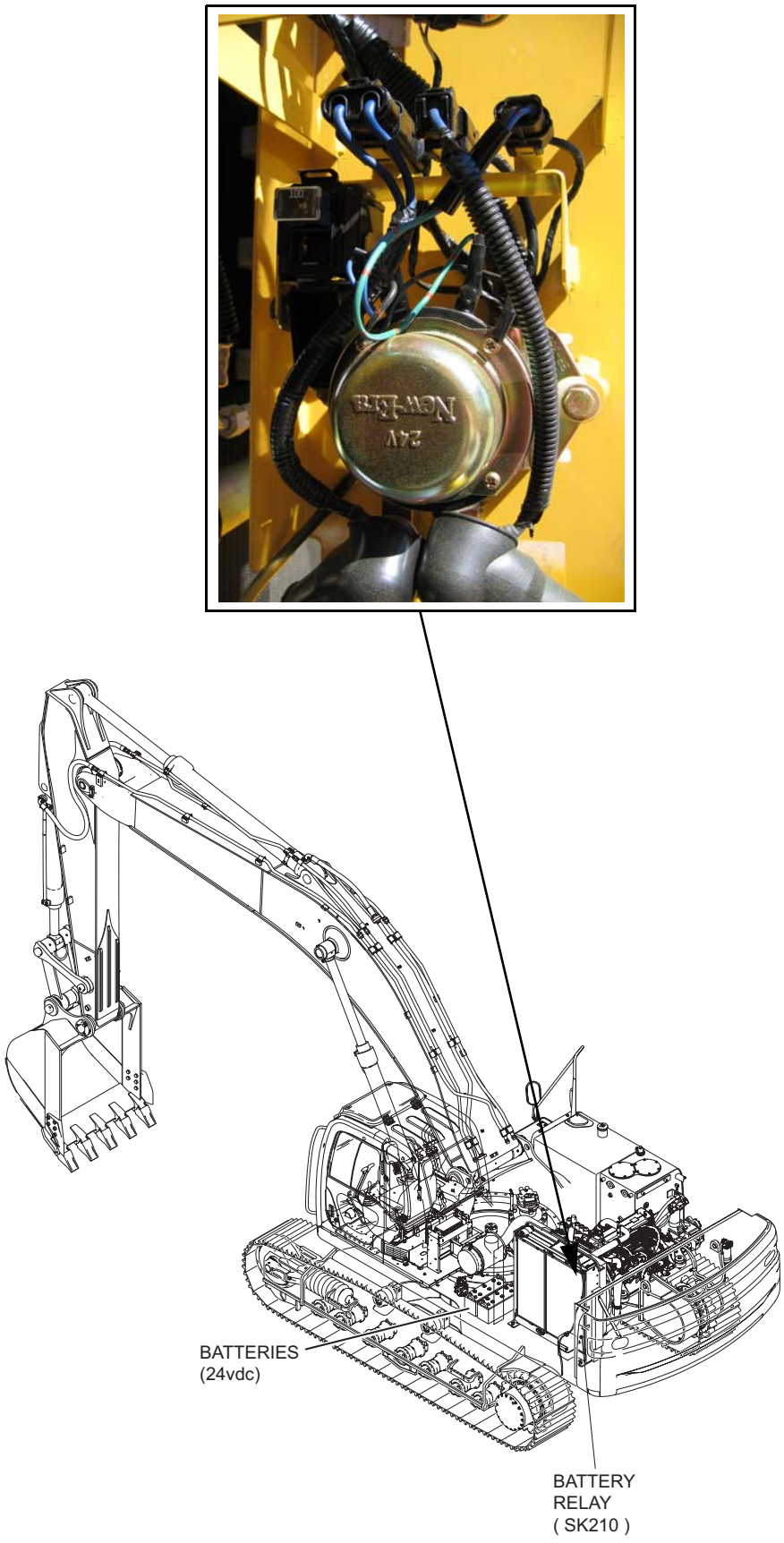


SK 350 Battery Relay Details

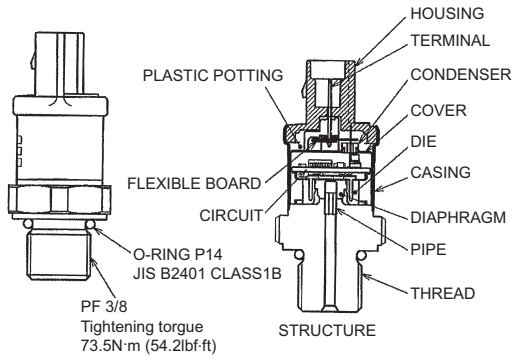


https://truckmanualshub.com/

SK210-8 Battery Relay Location

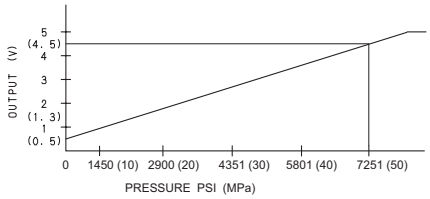


(4) High pressure sensor : YN52S00048P1

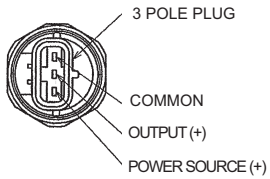


SPECIFICATION :
PRESSURE RANGE : 0 ~ 7252 psi (0 ~ 50 MPa)
POWER SOURCE VOLTAGE : 5.0 ± 0.5V DC
OUTPUT : 1/10Vs-9/10Vs
(Vs=5V DC 0.5〜4.5V DC)
INSURANCE RESISTANCE : 100MΩ OR MORE
(BETWEEN CASING AND ALL IN/OUT
TERMINALS AT 50V DC MEGGER)

OUTPUT CHARACTERISTIC

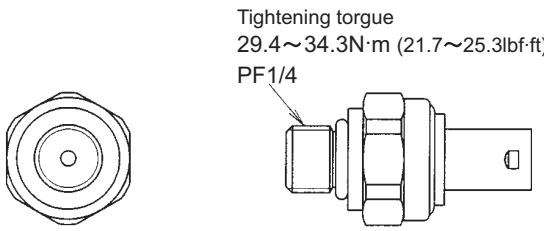


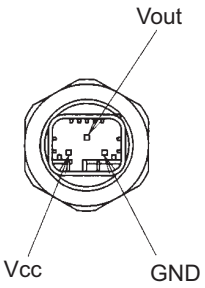
ELECTRIC CONNECTION DETAILS:



10

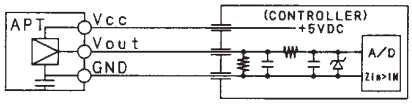
(5) Low pressure sensor : YX52S00013P1





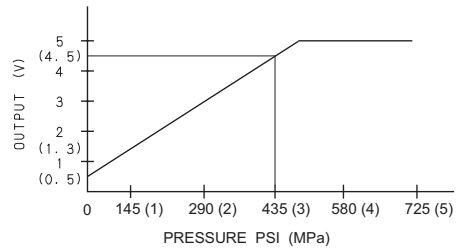
ELECTRIC CONNECTING DIAGRAM

(Ex. Construction of internal controller)



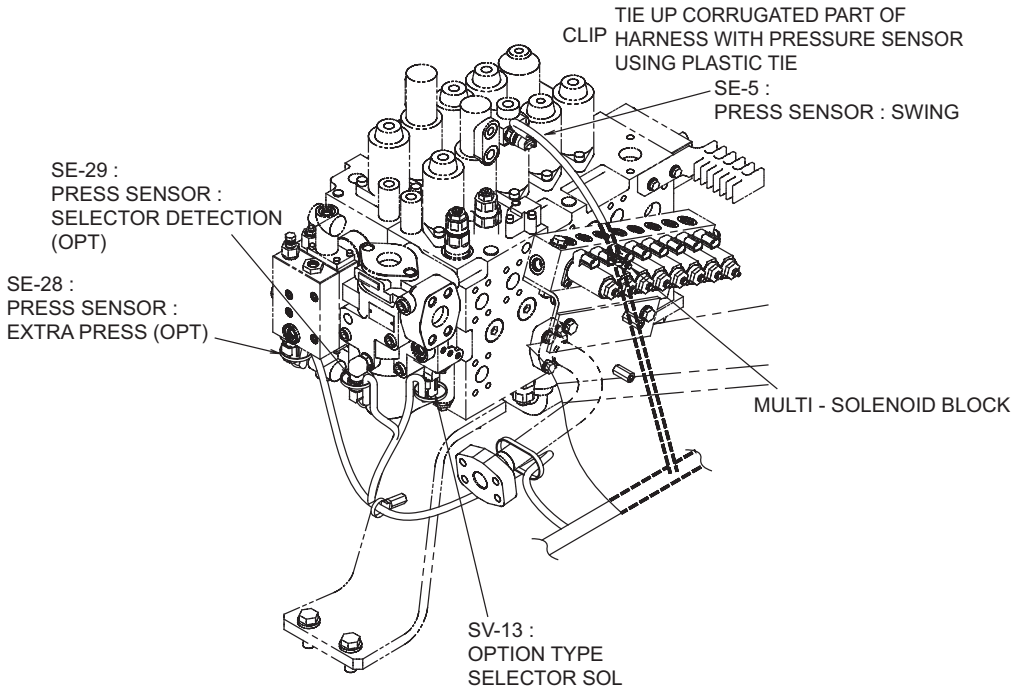
SPECIFICATION :
PRESSURE RANGE : 0〜3.0 MPa
RATED VOLTAGE : 5.0+0.5V DC
INSURANCE RESISTANCE : 50MΩ OR MORE
(BETWEEN BODY AND EACH TERMINAL AT
50V DC MEGGER)

OUTPUT CHARACTERISTIC

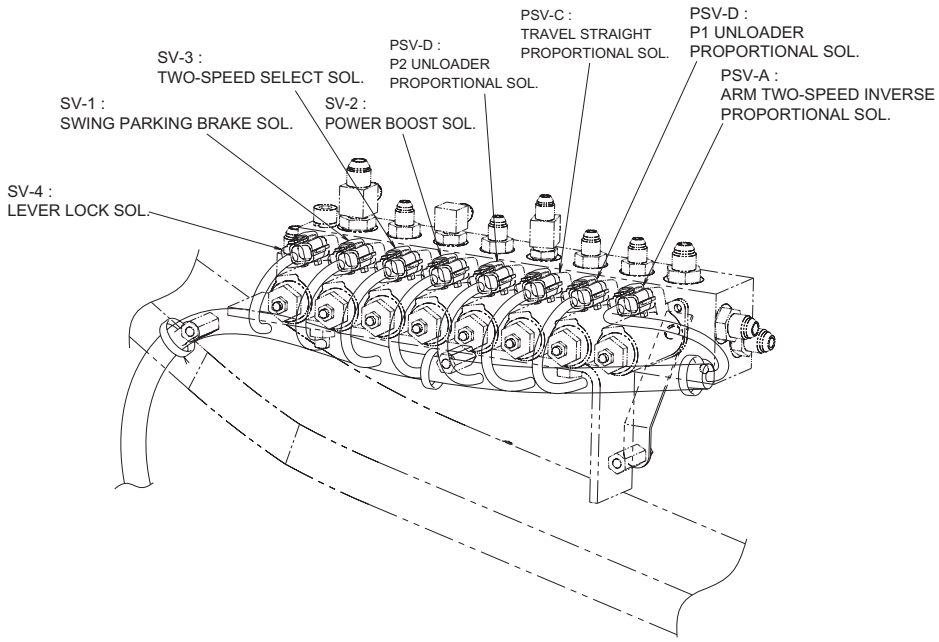


https://truckmanualshub.com/

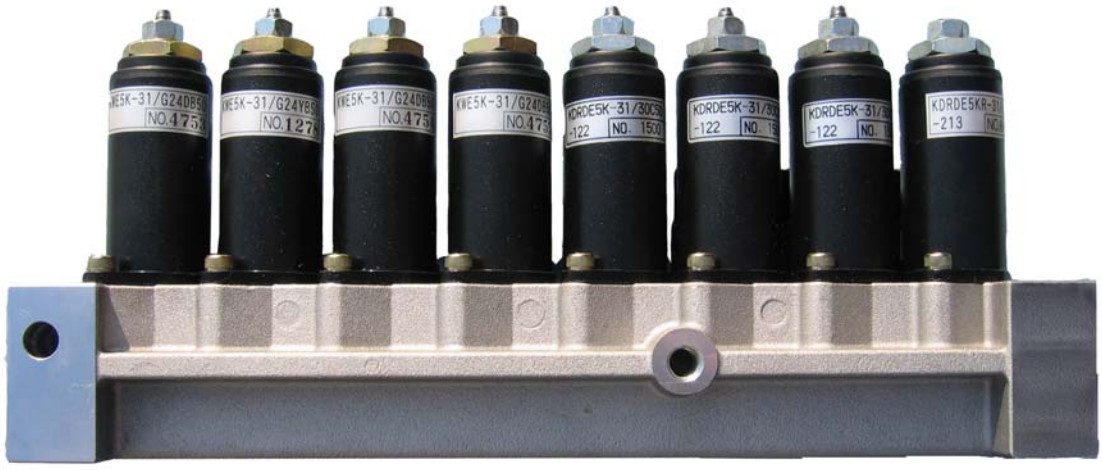
Solenoids & Pressure Sensor Locations



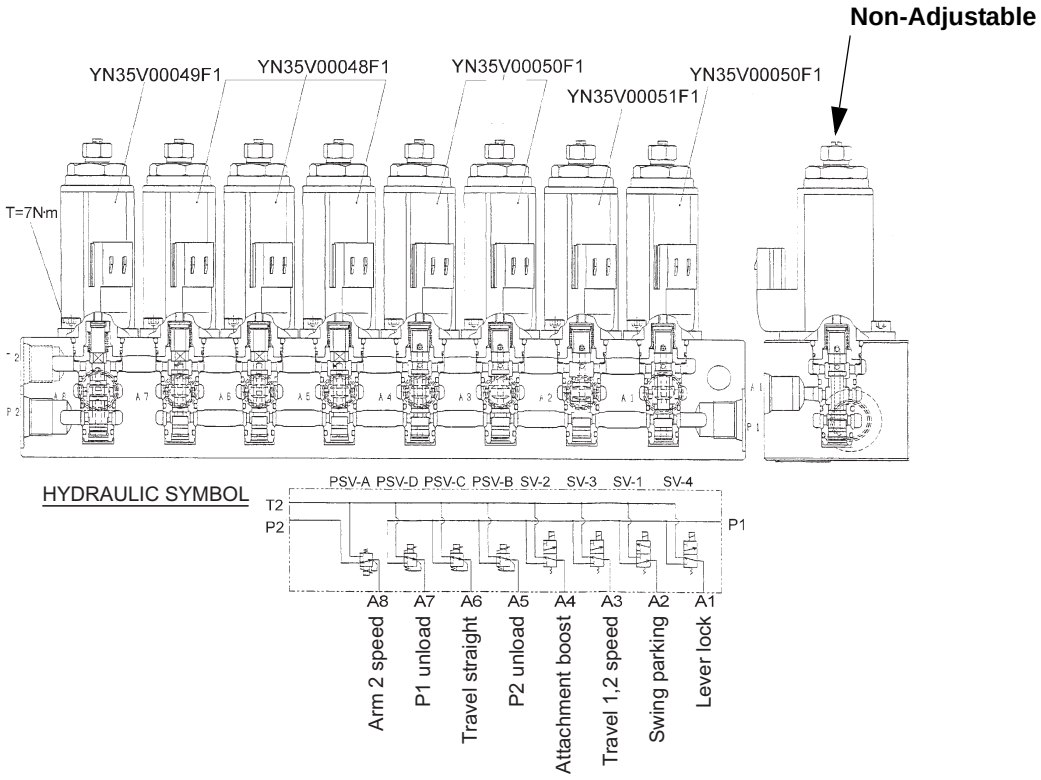




Multi-solenoid Manifold Block

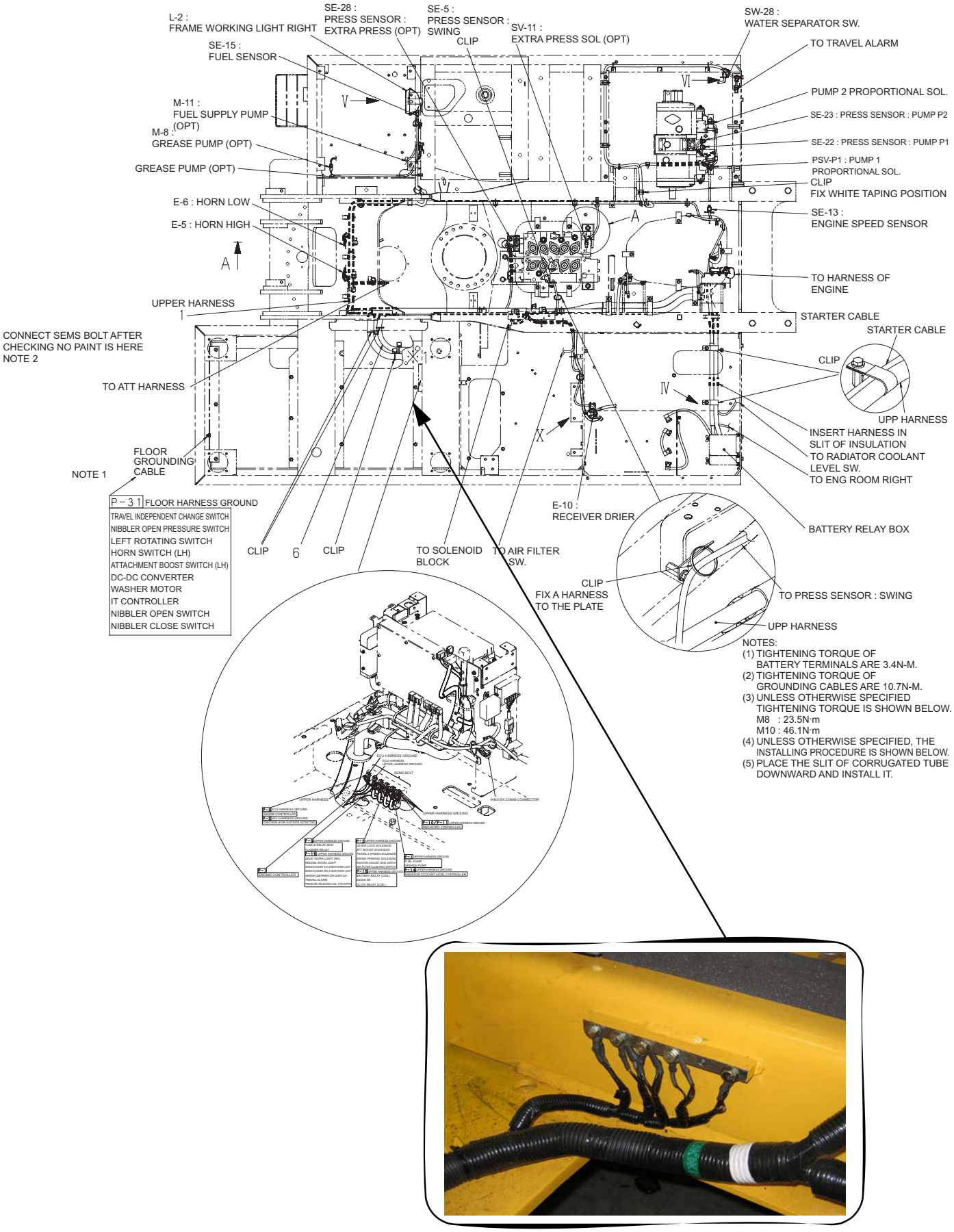


Item	Specifications	
Solenoid Valve (On/Off Type)	Rated Voltage	20.4 ~30 Vdc
	Coil Resistance	34 ~ 40 Ω
Proportional Solenoid Valve (Variable Type)	Rated Voltage	20.4 ~30 Vdc
	Coil Resistance	17 ~ 25 Ω

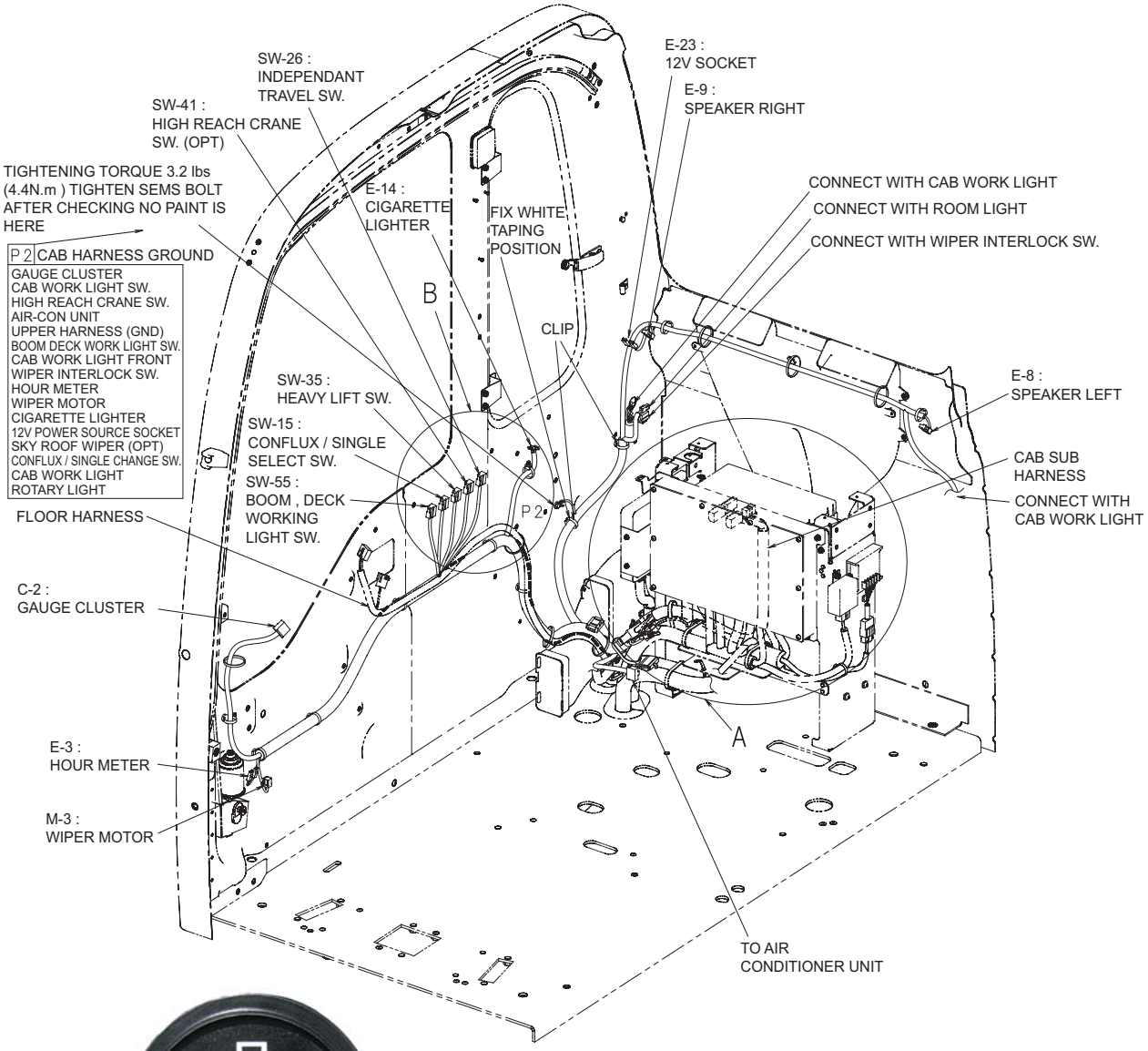


https://truckmanualshub.com/

FRAME GROUND LOCATIONS

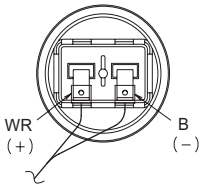


https://truckmanualshub.com/





E-3 :
HOUR METER

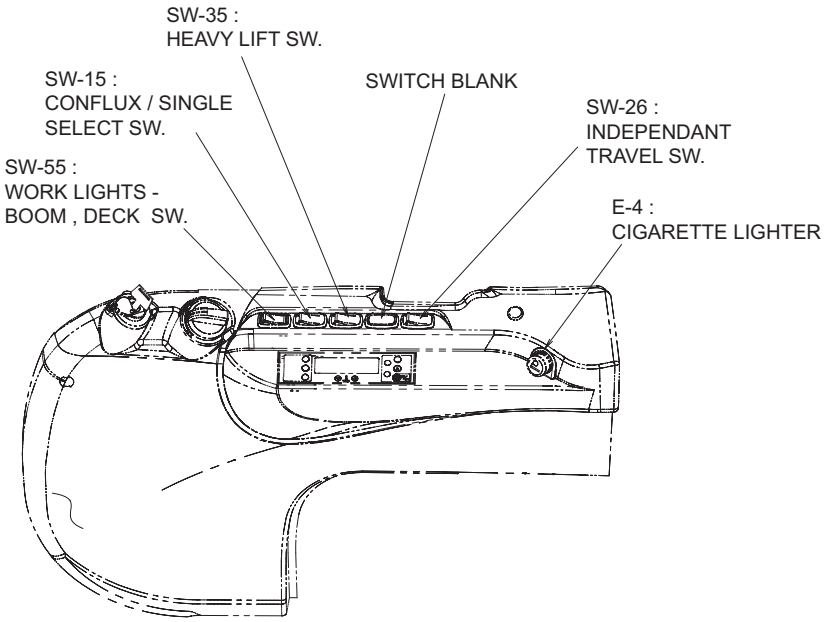


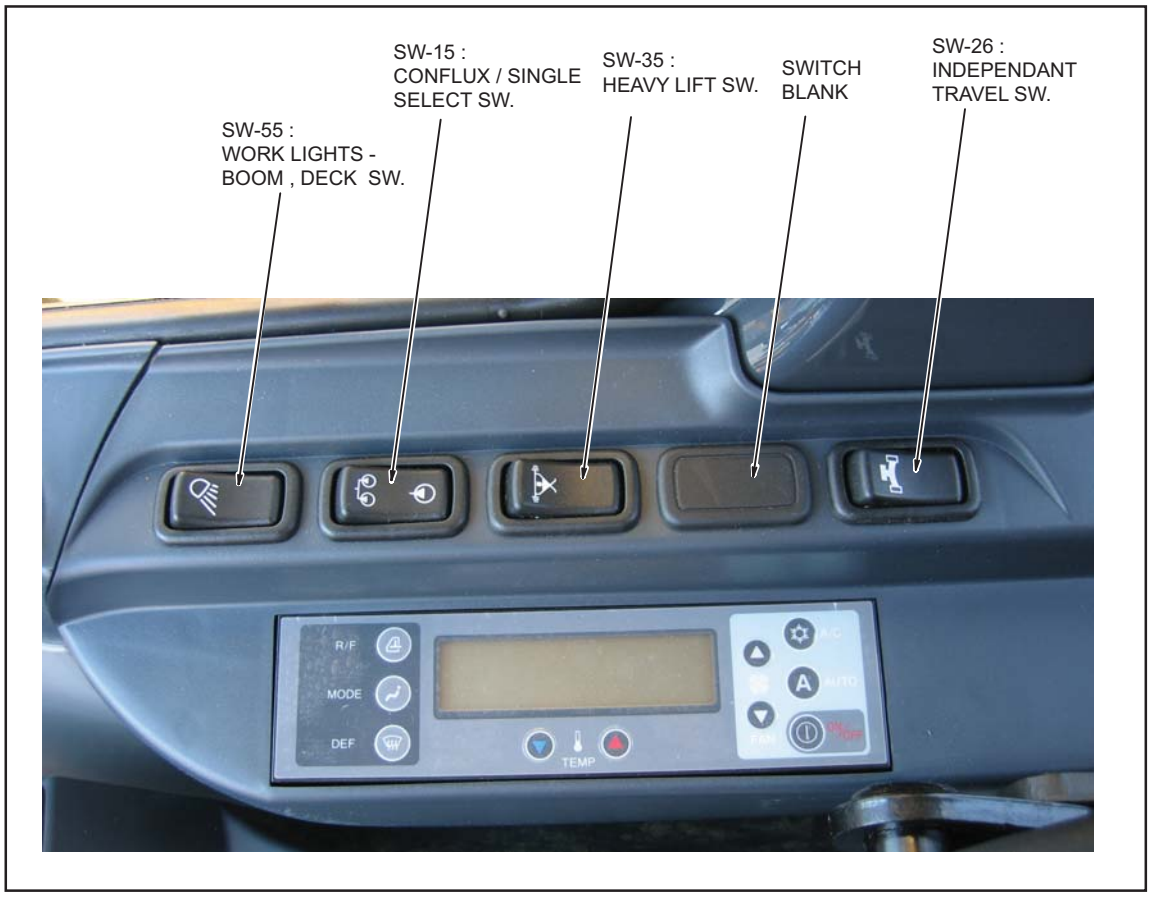
DETAIL OF E-3
HOUR METER

Ref: YLCOO230028E01-B128SM

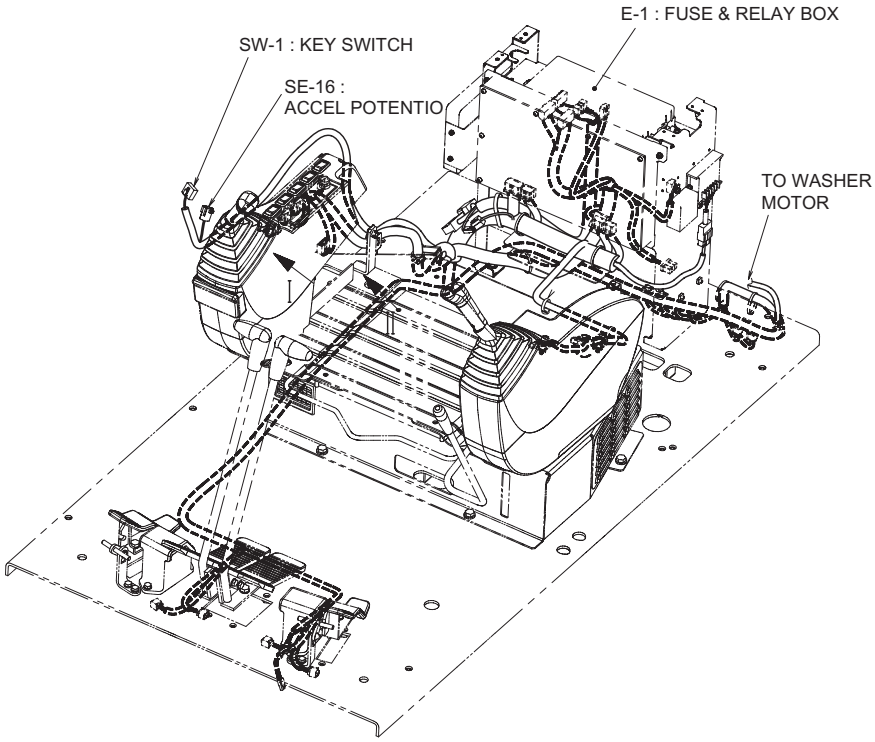
https://truckmanualshub.com/

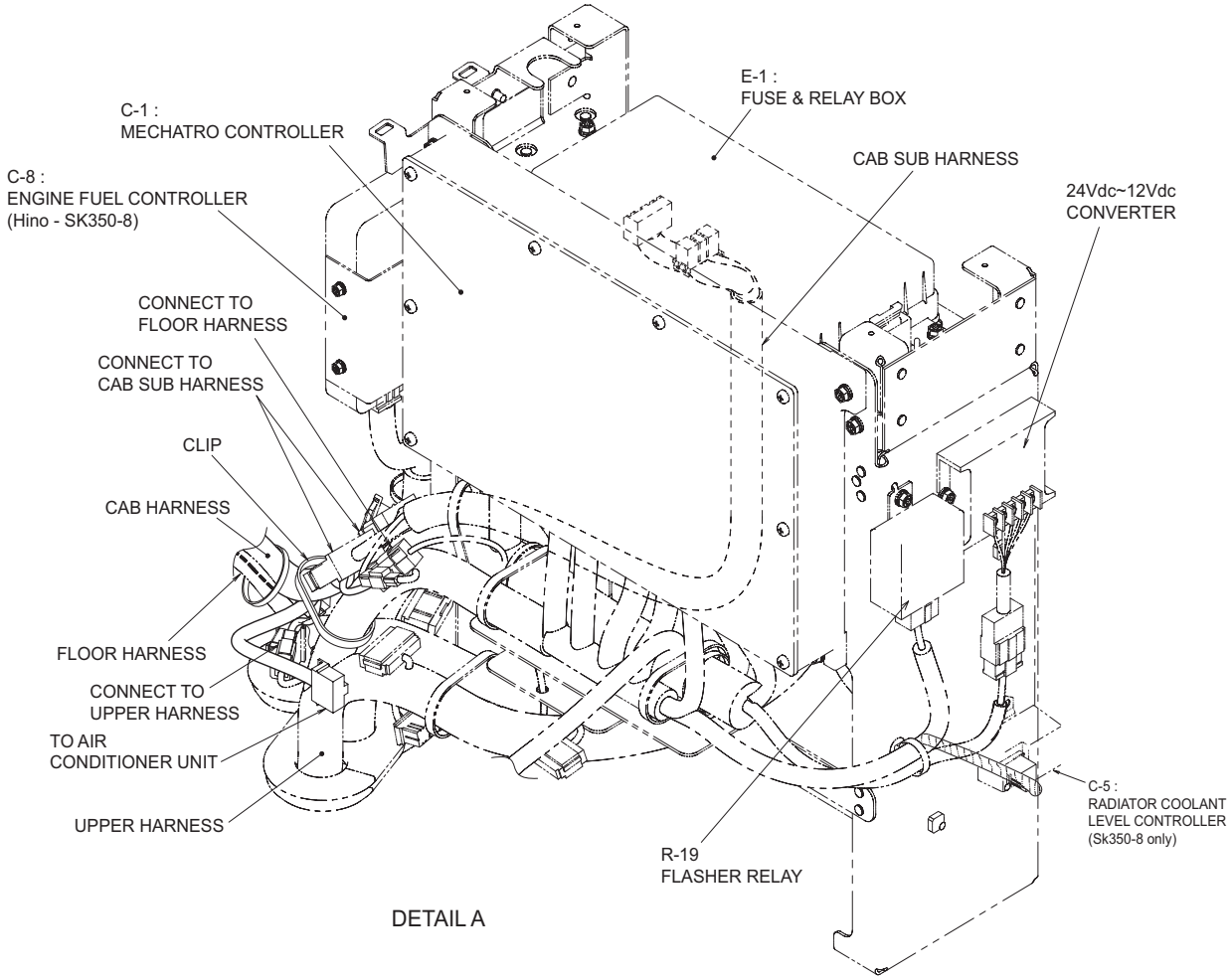
Right Hand Cab Wall Switch Locations





https://truckmanualshub.com/

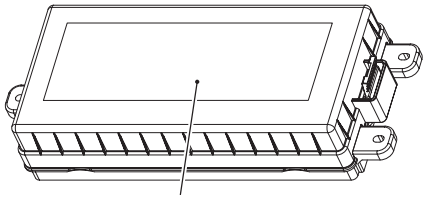




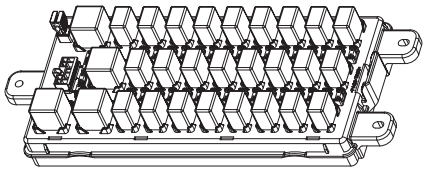
DETAIL A

(3) Relay & fuse box (symbol E-1)

1) General view

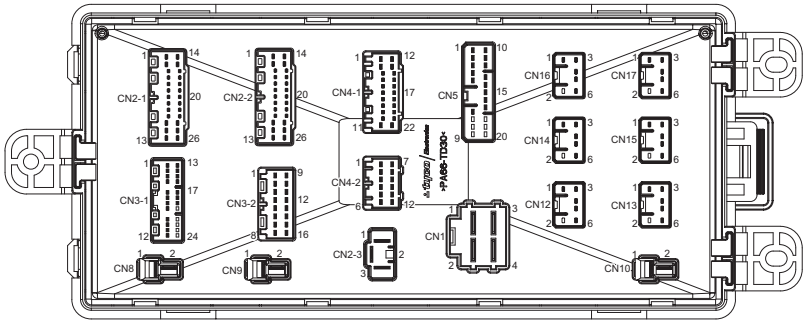


LABEL

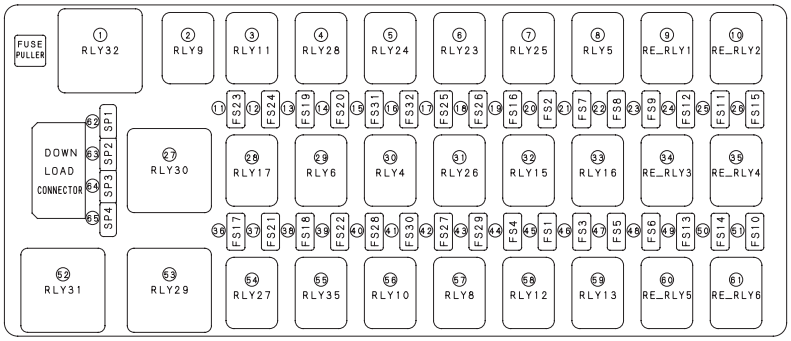


(Overhead view of box)

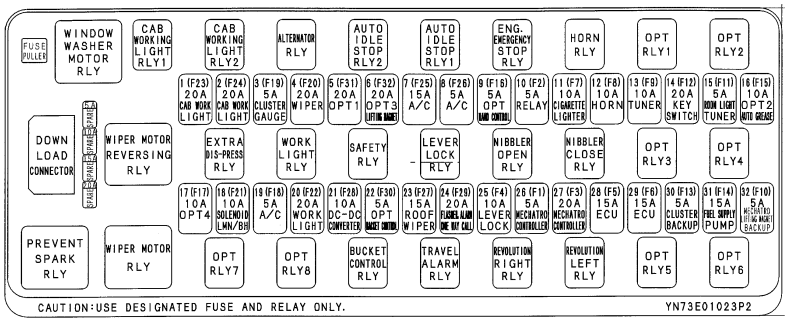
INSIDE



LOCATION OF CONNECTORS (Seen from backside)



LOCATION OF RELAY & FUSE



LABEL OF RELAY & FUSE BOX

Note) These circles indicate the parts which are used in standard specification

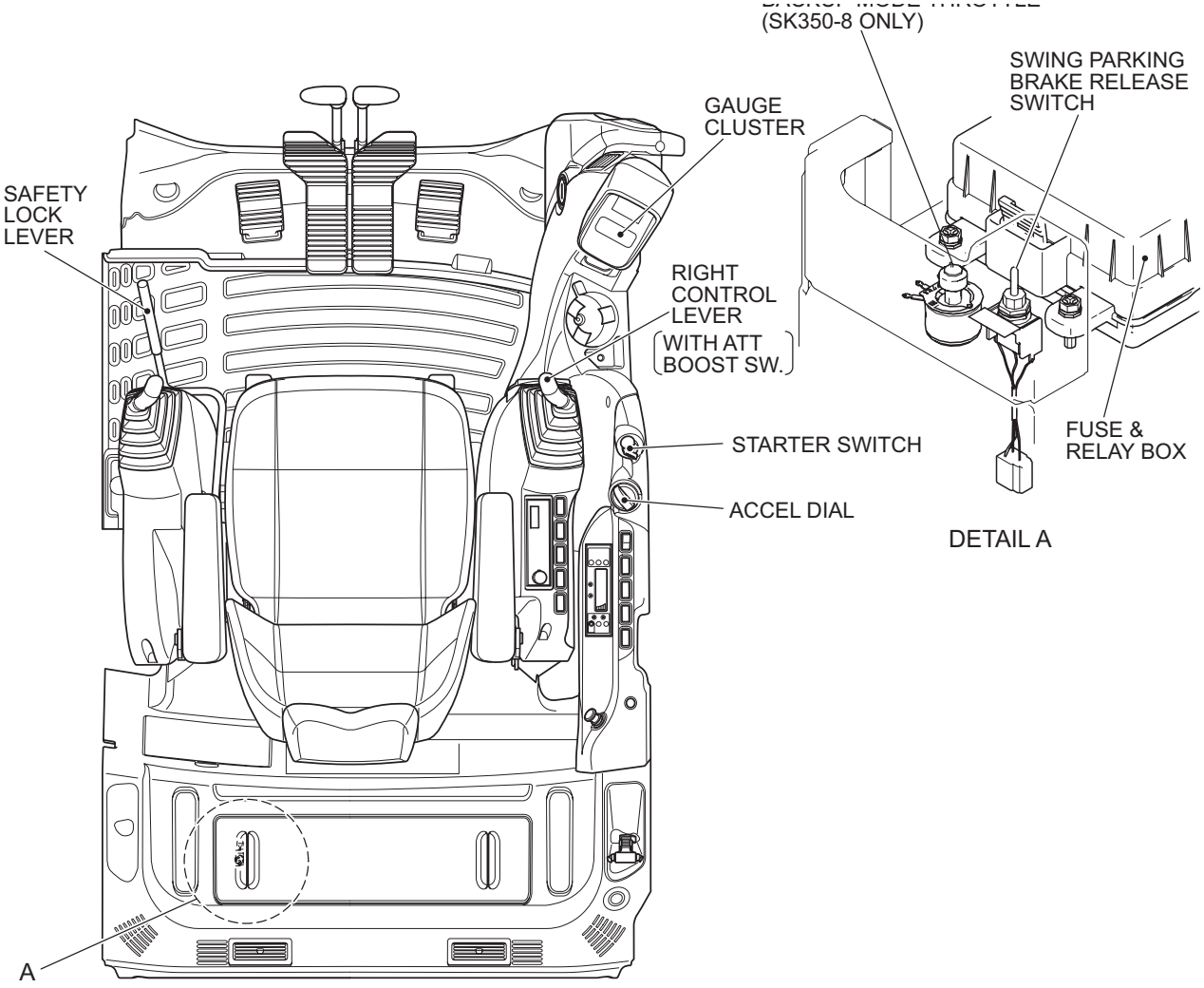
No.	CODE IN CIRCUIT	PARTS NAME	
65	SP4	MINI FUSE (20A)	○
64	SP3	MINI FUSE (15A)	○
63	SP2	MINI FUSE (10A)	○
62	SP1	MINI FUSE (5A)	○
61	RE_RLY6	MICRO RELAY (V23074A2002A403)	
60	RE_RLY5	MICRO RELAY (V23074A2002A403)	
59	RLY13	MICRO RELAY (V23074A2002A403)	
58	RLY12	MICRO RELAY (V23074A2002A403)	
57	RLY8	MICRO RELAY (V23074A2002A403)	
56	RLY10	MICRO RELAY (V23074A2002A403)	
55	RLY35	MICRO RELAY (V23074A2002A403)	
54	RLY27	MICRO RELAY (V23074A2002A403)	
53	RLY29	MINI RELAY (VF4-15H11)	○
52	RLY31	MINI RELAY (VF4-15H11)	○
51	FS10	MINI FUSE (5A)	○
50	FS14	MINI FUSE (15A)	○
49	FS13	MINI FUSE (5A)	○
48	FS6	MINI FUSE (15A)	○
47	FS5	MINI FUSE (15A)	○
46	FS3	MINI FUSE (20A)	○
45	FS1	MINI FUSE (5A)	○
44	FS4	MINI FUSE (10A)	○
43	FS29	MINI FUSE (20A)	○
42	FS27	MINI FUSE (15A)	○
41	FS30	MINI FUSE (5A)	○
40	FS28	MINI FUSE (10A)	○
39	FS22	MINI FUSE (20A)	○
38	FS18	MINI FUSE (5A)	○
37	FS21	MINI FUSE (10A)	○
36	FS17	MINI FUSE (10A)	○
35	RE_RLY4	MICRO RELAY (V23074A2002A403)	
34	RE_RLY3	MICRO RELAY (V23074A2002A403)	
33	RLY16	MICRO RELAY (V23074A2002A403)	
32	RLY15	MICRO RELAY (V23074A2002A403)	
31	RLY26	MICRO RELAY (V23074A2002A403)	○
30	RLY4	MICRO RELAY (V23074A2002A403)	○
29	RLY6	MICRO RELAY (V23074A2002A403)	○
28	RLY17	MICRO RELAY (V23074A2002A403)	
27	RLY30	MINI RELAY (VF4-15H11)	○
26	FS15	MINI FUSE (10A)	○
25	FS11	MINI FUSE (5A)	○
24	FS12	MINI FUSE (20A)	○
23	FS9	MINI FUSE (10A)	○
22	FS8	MINI FUSE (10A)	○
21	FS7	MINI FUSE (10A)	○
20	FS2	MINI FUSE (5A)	○
19	FS16	MINI FUSE (5A)	○
18	FS26	MINI FUSE (5A)	○
17	FS25	MINI FUSE (15A)	○
16	FS32	MINI FUSE (20A)	○
15	FS31	MINI FUSE (20A)	○
14	FS20	MINI FUSE (20A)	○
13	FS19	MINI FUSE (5A)	○
12	FS24	MINI FUSE (20A)	○
11	FS23	MINI FUSE (20A)	○
10	RE_RLY2	MICRO RELAY (V23074A2002A403)	
9	RE_RLY1	MICRO RELAY (V23074A2002A403)	
8	RLY5	MICRO RELAY (V23074A2002A403)	○
7	RLY25	MICRO RELAY (V23074A2002A403)	○
6	RLY23	MICRO RELAY (V23074A2002A403)	○
5	RLY24	MICRO RELAY (V23074A2002A403)	○
4	RLY28	MICRO RELAY (V23074A2002A403)	○
3	RLY11	MICRO RELAY (V23074A2002A403)	
2	RLY9	MICRO RELAY (V23074A2002A403)	
1	RLY32	MINI RELAY (VF4-15H11)	○

21.2 MECHATRO CONTROLLER

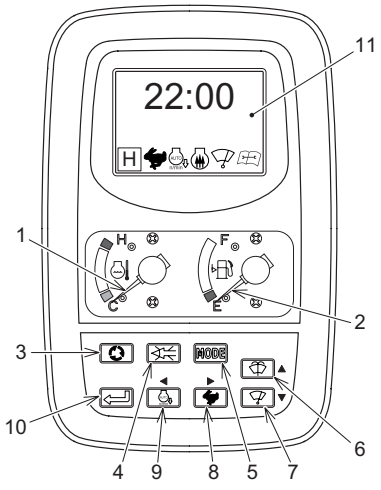
21.2.1 SUMMARY OF MULTI DISPLAY

Electro-hydraulic conversion information is displayed on the multi display of the gauge cluster.

(1) Controls



(2) Gauge cluster

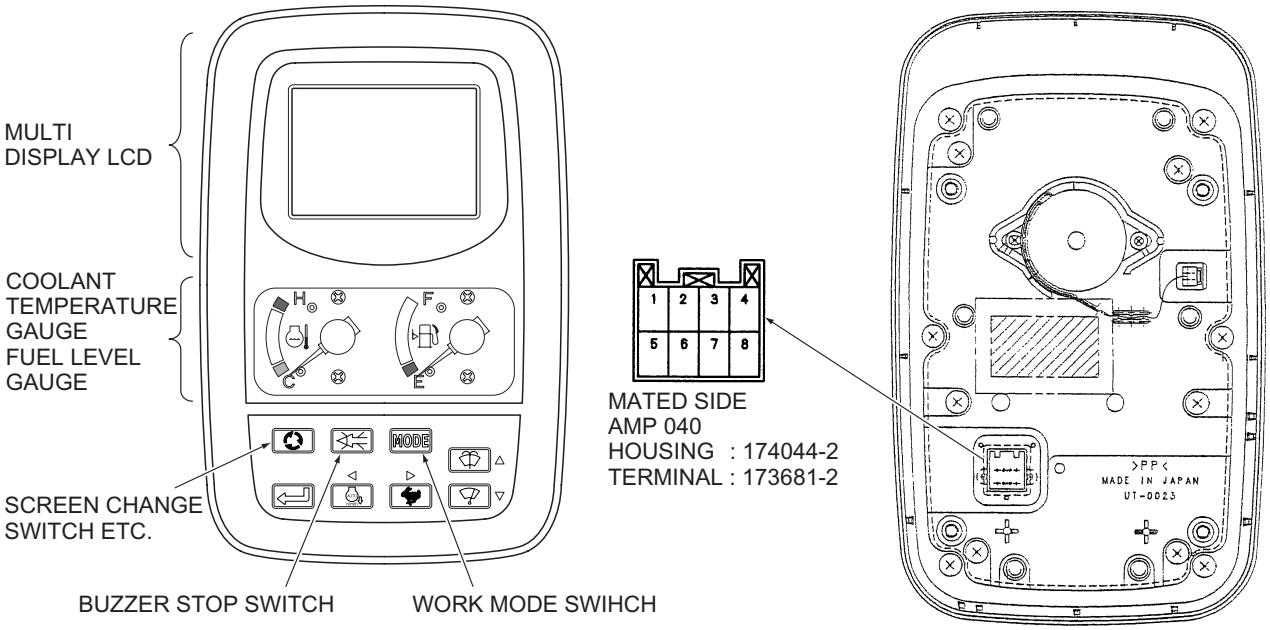


No.	Name
1	Engine coolant temperature gauge
2	Fuel level gauge
3	Screen change switch
4	Buzzer stop switch
5	Work mode select switch
6	Washer switch
7	Wiper switch
8	Travel high speed, low speed select switch
9	Auto accel switch
10	Select switch
11	Multi display (LCD)

https://truckmanualshub.com/

(2) Gauge cluster (symbol C-2)

1) General view



2) Connector CN-600 (Harness side)

No.	Item name	Wire color	No.	Item name	Wire color
1	Gauge cluster →Mechatro controller (RS232C communication)	White	5	GND source (+24V Battery direct connection)	Yellow / Black
2	Mechatro controller →Gauge cluster (RS232C communication)	Red	6	GND	Black
3	Reserved	—	7	Source (+24V starter switch ON)	White
4	Reserved	—	8	GND (RS232C communication)	Black

3) Function

a. It processes signals by communication between the gauge cluster and the mechatro controller, displays them in lamps, displays them in LCDs and actuates the buzzer.

b. It outputs coolant temperature signals, fuel level signals and panel switch signals to the mechatro controller through the communication port.

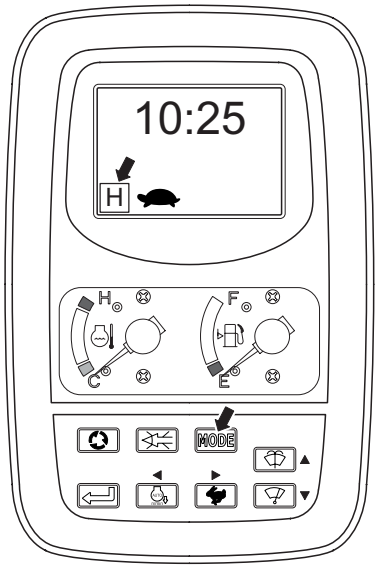
4) Summary of display and drive item

No.	Item	Remarks
1	Monitar display	LCD dot 120×168
2	Gauge display (Coolant temp., Fuel level)	Stepping motor
3	—	
4	Buzzer	Piezo-electricity type
5	Screen change switch	
6	Buzzer stop switch	
7	Work mode select switch	
8	Back light	LED

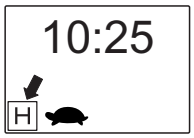
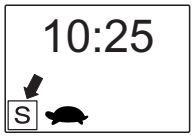
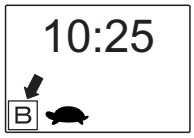
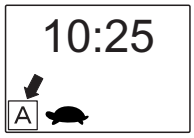
(3) Screen selection by work mode select switch
After starting engine, "S" mode is usually set.

The work modes **"H"**,**"S"**,**"B"** and **"A"** are selected in order every time (MODE) is pressed.
Select efficient work mode according to the working condition and the purpose from the following table.
The selected mode is displayed on the left lower corner on multi display.

- H mode: For heavy duty digging work
- S mode: For standard digging work
- B mode: For works with breaker
- A mode: For works with crusher (nibbler)



10

Work mode	Display	Contents
H mode		**"H mode"**is suitable for heavy duty digging work which gives priority to the workload at the high speed
S mode		**"S mode"**is suitable for standard digging and loading works and is in fuel saving and is maintained well-balanced relations with workload
B mode		For the work with breaker, select "B mode" without fail.
A mode		For the work with a crusher (nibbler), select "A mode".

1) Pump flow rate adjustment (A mode /B mode)

No.	Switches
1	Screen change switch
2	Buzzer stop switch
3	KPSS work mode select switch
4	Washer switch
5	Wiper switch
6	Travel speed select switch
7	Auto accel switch
8	Select switch

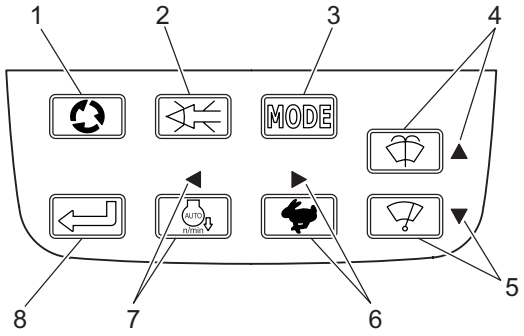
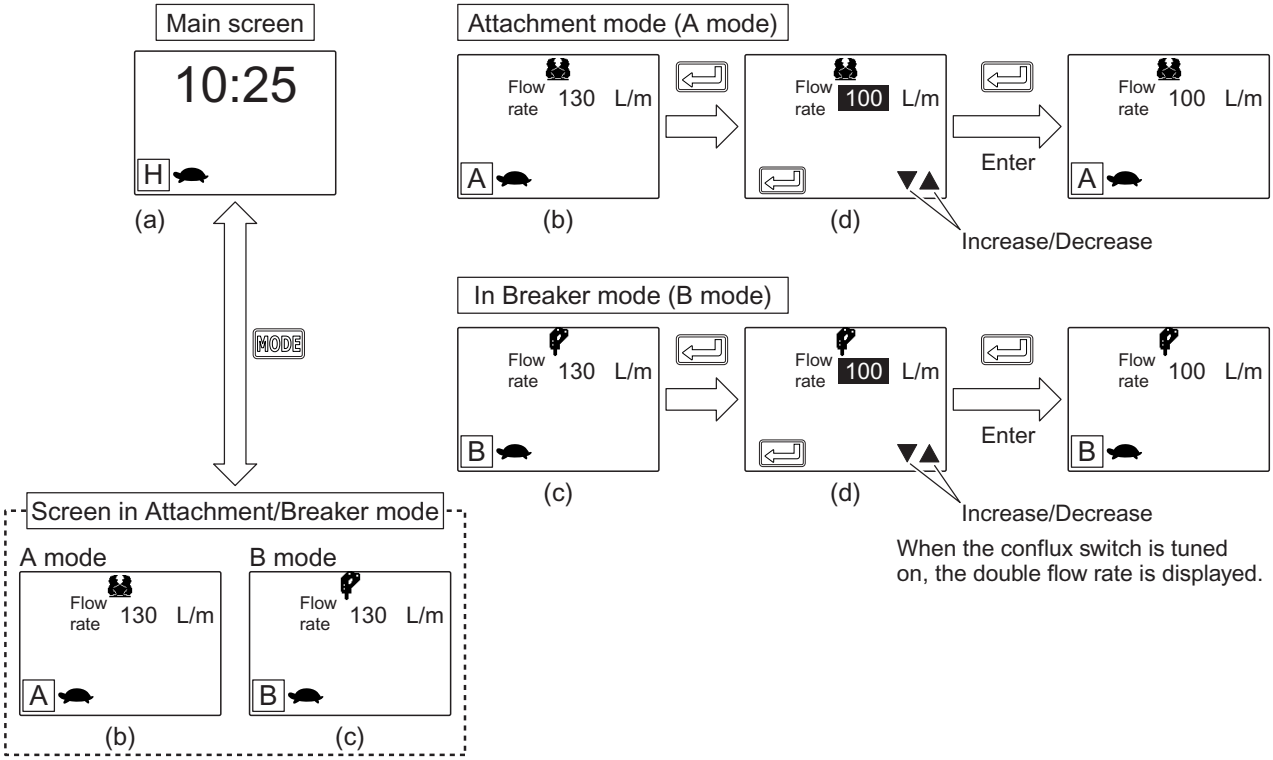


Fig. 21-1

According to some kind of attachment, it is required to change the flow rate for service circuit. Change the flow rate in accordance with the procedure mentioned below.
In this machine, last set flow rate has been stored and the initial flow rate is 210L/min. The adjustment (increase or decrease) of flow rate is changeable by 10L/min step.



1. Turn starter key switch on and display main screen (a).
2. The display on the left lower corner of screen is changed in order of **"H"** →**"S"** →**"B"** →**"A"** each time the **"MODE"** switch (3) is pressed under the condition where main screen (a) is displayed.
3. Select **"A"** and A mode screen is displayed, and select **"B"** and B mode screen is displayed.
4. Press select switch (8) in A/B mode display screens (b)/(c) and the value of flow rate reverses in black and the screen (d) is displayed. In this condition, press FEED ▲ (4)/▼(5) and the flow rate value increases or decreases.
5. Select the desired setting value and then press select switch (8) and the flow rate is set to the desired value.

(4) MAINTENANCE SCREEN DISPLAYS

This screen displays the remaining time to the end of recommended replacement/change interval specified for filter/oil.
For the initial set value of recommenced replacement/change time, see the following table.

Replacement interval

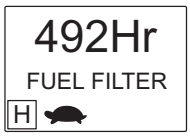
Item		Default
Engine oil		500 Hr
Fuel filter		500 Hr
Hydraulic oil filter		1,000 Hr
Hydraulic oil	ASIA	2,000 Hr
	OCEANIA	5,000 Hr

This menu is available for confirmation of the following items.
The maintenance screen changes each time the screen change switch is pressed.

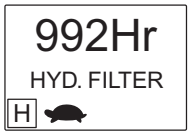
1. Remaining time display to the engine oil change
   This display shows the remaining time to the coming engine oil change.



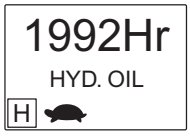
2. Remaining time display to the coming fuel filter replacement
   This display shows the remaining time to the coming engine fuel filter replacement.



3. Remaining time display to the coming hydraulic oil filter replacement
   This display shows the remaining time to the coming hydraulic oil filter replacement.



4. Remaining time display to the coming hydraulic oil change
   This display shows the remaining time to the coming hydraulic oil change.



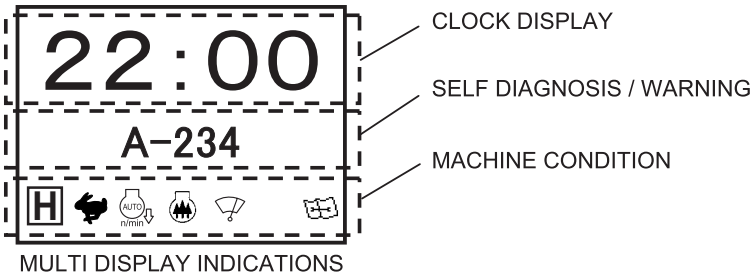
Notice

- The display automatically changes to the main screen, if switch is not operated for 30 seconds.
- For the setting procedure of maintenance time to be performed to the coming oil change in each type and filter replacement, see the 21.2.6 SET PROCEDURE OF MAINTENANCE SCHEDULE.

https://truckmanualshub.com/

(5) Gauge cluster display

After key is switched on and logo mark display disappears, screen for operator is displayed on multi screen. The display functions of multi display are explained below.



MULTI DISPLAY INDICATIONS

1) Display function for operator ..... Screen usually displayed during operation

1.1 Clock display function ..... Current time is displayed.

1.2 Self-diagnosis display ..... When abnormality is detected on mechatro system like sensor, proportional valve, etc., this displays error code.

1.3 Warning display ..... When machine was thrown into dangerous state, or was failed, displays warning contents with the symbol and statement. (For warning contents, see items shown below.)

1.4 Machine condition display ..... Displays machine operating condition.

2) Display function for maintenance ..... Displays remaining time up to replacement/change of following items.
(1) Engine oil (2) Fuel filter (3) Hydraulic oil filter (4) Hydraulic oil

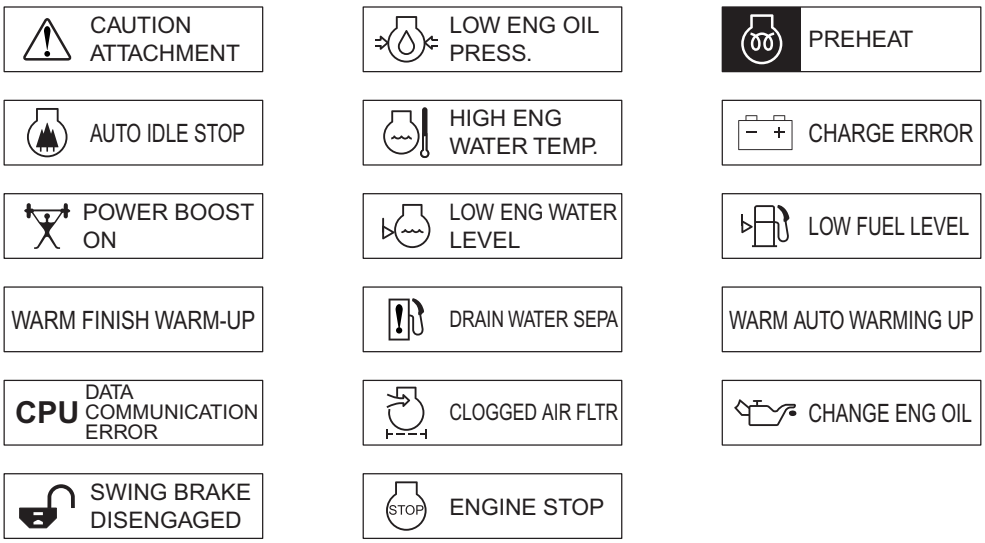
3) Failure history display function ..... Stores abnormality occurred on mechatro system in the past and displays in order of recent occurrence.

4) Mechatro adjustment display ..... Displays procedure for adjustment of mechatro system like output adjustment and unload adjustment, etc.

5) Service diagnosis display ..... Displays information like pressure sensor sensed value, proportional valve command, etc. output by mechatro controller

6) Failure diagnosis mode display function ..... Specifies failed section automatically for failures which are not detected by self diagnosis and displays the results.

- Warning Icons

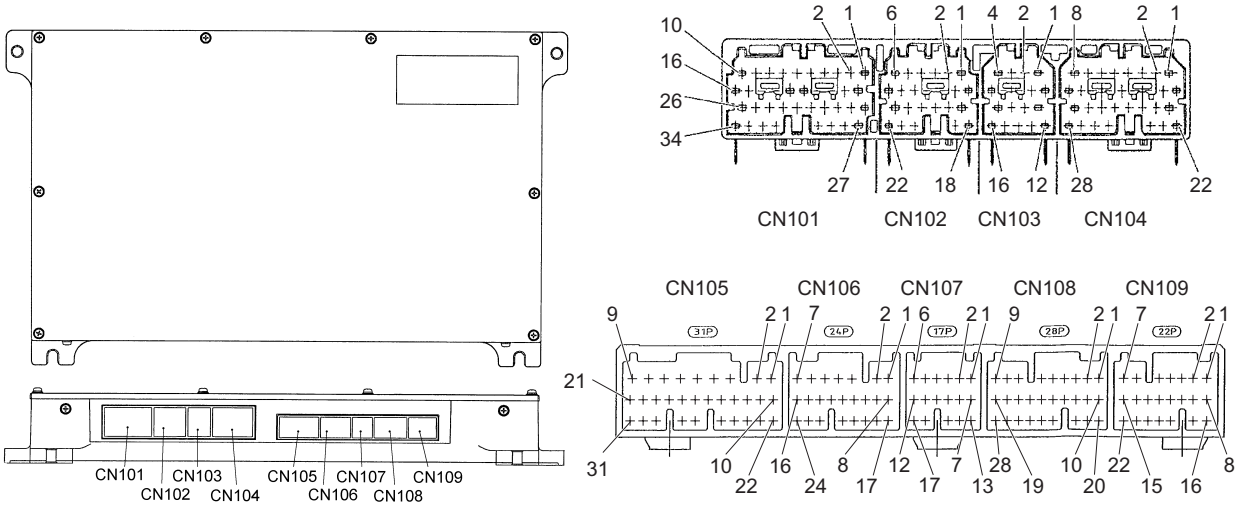


https://truckmanualshub.com/

21.2.8 MECHATRO CONTROL EQUIPMENT

(1) C-1 Mechatro controller (Sk350-8

1) Outside view



2) List of connectors

Connector No.	Pin No.	Port name	Function	Input/putput	Signal level
CN101	1	GA	Boom up	Input	0V
	2	A1			0.5~4.5V
	3	+5VA			Power output 5V
	4	+5VA	Boom down	Input	Power output 5V
	5	A2			0.5~4.5V
	6	GA			0V
	7	GA	Arm in	Input	0V
	8	A3			0.5~4.5V
	9	+5VA			Power output 5V
	10	+5VA	Arm out	Input	Power output 5V
	11	A4			0.5~4.5V
	12	GA			0V
	13	GA	Bucket digging	Input	0V
	14	A5			0.5~4.5V
	15	+5VA			Power output 5V
	16	+5VA	Bucket dump	Input	Power output 5V
	17	A6			0.5~4.5V
	18	GA			0V
	19	TXD1	Gauge cluster	Transmission	RS232C communication
	20	RXD1		Reception	RS232C communication
	21	GP			0V
	22	SHG1			Shield GND
	23	TXD3	Down load	Transmission	RS232C communication
	24	RXD3		Reception	RS232C communication
	25	DL			EARTH / OPEN(5V)
	26	GP			0V
	27	CANH1	E/G ECU		CAN communication
	28	CANL1	E/G ECU		CAN communication
	29	DO 20	Spare	Output	EARTH/OPEN
	30	DO 21	Safety relay	Output	EARTH/OPEN
	31	DO 22	Spare	Output	EARTH/OPEN
	32	DO 23	Rotary light (yellow)	Output	EARTH/OPEN
	33	DO 24	Rotary light (green)	Output	EARTH/OPEN
	34	DI 36	Heavy lift	Input	EARTH/OPEN

https://truckmanualshub.com/

Connector No.	Pin No.	Port name	Function	Input/putput	Signal level
CN102	1	GA	Travel right	Input	0V
	2	A8			0.5~4.5V
	3	+5VA			Power output 5V
	4	+5VA	Travel left	Input	Power output 5V
	5	A9			0.5~4.5V
	6	GA			0V
	7	GA	Accelation	Input	0V
	8	A10			0.5~4.5V
	9	+5VA			Power output 5V
	10	+5VA	P1 option	Input	Power output 5V
	11	A13			0.5~4.5V
	12	GA			0V
	13	GA	P2 option	Input	0V
	14	A14			0.5~4.5V
	15	+5VA			Power output 5V
	16	+5VA	Spare	Input	Power output 5V
	17	A27			0.5~4.5V
	18	GA			0V
	19	GA	Spare	Input	0V
	20	A28			0.5~4.5V
	21	+5VA			Power output 5V
	22	D1 37	Spare	Input	GND / OPEN

Connector No.	Pin No.	Port name	Function	Input/putput	Signal level
CN103	1	GA	Swing	Input	0V
	2	A			0.5~4.5V
	3	+5VA			Power output 5V
	4	+5VA	P1 pump	Input	Power output 5V
	5	A11			0.5~4.5V
	6	GA			0V
	7	GA	P2 pump	Input	0V
	8	A12			0.5~4.5V
	9	+5VA			Power output 5V
	10	+5VA	Boom angle	Input	Power output 5V
	11	A15			0.5~4.5V
	12	GA			0V
	13	GA	Arm angle	Input	0V
	14	A16			0.5~4.5V
	15	+5VA			Power output 5V
	16		Reserved		

Connector No.	Pin No.	Port name	Function	Input/putput	Signal level
CN104	1	GA	Boom head	Input	0V
	2	A17			0.5~4.5V
	3	+5VA			Power output 5V
	4	+5VA	Boom rod	Input	Power output 5V
	5	A18			0.5～4.5V
	6	GA			0V
	7	GA	Extra pressure source	Input	0V
	8	A19			0.5~4.5V
	9	+5VA			Power output 5V
	10	+5VA	Spare	Input	Power output 5V
	11	A20			0.5~4.5V
	12	GA			0V
	13	A21	Spare	Input	0.5~4.5V
	14	GA			0V
	15	A22	Fuel level	Input	0.5~4.5V
	16	GP			0V
	17	A23	Spare	Input	0.5~4.5V
	18	GA			0V
	19	GA	Selector detection	Input	0V
	20	A24			0.5~4.5V
	21	+5VA			Power output 5V
	22	+5VA	Spare	Input	Power output 5V
	23	A25			0.5~4.5V
	24	GA			0V
	25	GA	Spare	Input	0V
	26	A26			0.5~4.5V
	27	+5VA			Power output 5V
	28	DI 1	Cab slow up and down	Input	GND / OPEN

Connector No.	Pin No.	Port name	Function	Input/putput	Signal level
CN105	1	+24V	Battery relay output side		20~32V
	2	+24V	Battery relay output side (sensor analog output)		20~32V
	3	+24V	Battery relay output side		20~32V
	4	DO 7	Travel 1,2 speed select valve	Output	24V/OPEN
	5	DO 8	Swing P/B select valve	Output	24V/OPEN
	6	DO 9	Travel 1,2 speed select valve	Output	24V/OPEN
	7	DO 11	Attachment boost select valve	Output	24V/OPEN
	8	GND	Battery (-)		0V
	9	GND	Battery (-)		0V
	10	D10+	OPT changeable relief 1	Output	+0~800mA
	11	D1+	P1 unload	Output	+0~800mA
	12	D1-			-0~800mA
	13	D2+	P2 unload	Output	+0~800mA
	14	D2-			-0~800mA
	15	D3+	Travel straight	Output	+0~800mA
	16	D3-			-0~800mA
	17	D4+	Arm in	Output	+0~800mA
	18	D4-			-0~800mA
	19	D5+	P1 pump	Output	+0~800mA
	20	D5-			-0~800mA
	21	GND	Battery (-)		0V
	22	D10-	OPT changeable relief 1	Output	-0~800mA
	23	D6+	P2 pump	Output	+0~800mA
	24	D6-			-0~800mA
	25	D7+	Cab slow stop valve	Output	+0~800mA
	26	D7-			-0~800mA
	27	D8+	Boom cushion	Output	+0~800mA
	28	D8-			-0~800mA
	29	D9+	Arm cushion	Output	-0~800mA
	30	D9-			+0~800mA
	31	+24V	Battery direct connection		20~32V

https://truckmanualshub.com/

Connector No.	Pin No.	Port name	Function	Input/putput	Signal level
CN106	1	+24V	Battery relay secondary side	0	20~32V
	2	SHGF			Shield GND
	3	F1+	Accel motor A phase (spare)	Output	+24V 1.5A
	4	F1-	Accel motor A phase (spare)	Output	+24V 1.5A
	5	F2+	Accel motor B phase (spare)	Output	+24V 1.5A
	6	F2-	Accel motor B phase (spare)	Output	+24V 1.5A
	7	OIL	Oil level (spare)	0	
	8	OILG			
	9	D11+	OPT changeable relief 2	Output	+0~800mA
	10	D11-			-0~800mA
	11	D12+	Spare	Output	+0~800mA
	12	D12-			-0~800mA
	13	D13+	Spare	Output	+0~800mA
	14	D13-			-0~800mA
	15	D14+	Spare	Output	+0~800mA
	16	D14-			-0~800mA
	17	GND	Battery (-)		0V
	18	D12+	Spare	Output	+0~800mA
	19	D12-			-0~800mA
	20	E1+	E/G speed sensor	Input	XX~XXVp-p
	21	E1-			0V
	22	SHG3			Shiled GND
	23	CANH2	Proportional vlave expand unit		CAN communication
	24	CANL2			CAN communication

Connector No.	Pin No.	Port name	Function	Input/putput	Signal level
CN107	1	DI 3	Key switch (GLOW)	Input	+24V/OPEN
	2	DI 8	Water separetor	Input	EARTH / OPEN
	3	DI 9	E/G oil pressure	Input	EARTH / OPEN
	4	DI 10	Air filter	Input	EARTH / OPEN
	5	DI 11	Stroke end check	Input	EARTH / OPEN
	6	DI 12	Spare	Input	EARTH / OPEN
	7	DI 13	E/G coolant level	Input	EARTH / OPEN
	8	DI 14	Spare	Input	EARTH / OPEN
	9	DI 15	Spare	Input	EARTH / OPEN
	10	DI 20	ECU main relay	Input	EARTH / OPEN
	11	DI 28	Spare	Input	EARTH / OPEN
	12	DI 32	Hand control nibbler	Input	EARTH / OPEN
	13	DI 38	Quick coupler	Input	EARTH / OPEN
	14	DI 39	Extra pressure	Input	EARTH / OPEN
	15	DI 40	Spare	Input	EARTH / OPEN
	16	DI 41	Spare	Input	EARTH / OPEN
	17		Reserved		

https://truckmanualshub.com/

Connector No.	Pin No.	Port name	Function	Input/putput	Signal level
CN108	1	DI 2	Key switch (ON)	Input	+24V / OPEN
	2	DI 4	Spare	Input	+24V / OPEN
	3	DI 5	Swing P/B release	Input	GND / OPEN
	4	DI 6	E/G start	Input	+24V / OPEN
	5	DI 7	High reach (hoisting at fixed position)	Input	GND / OPEN
	6	DI 16	Wiper rise up	Input	GND / OPEN
	7	DI 17	Wiper reverse	Input	GND / OPEN
	8	DI 18	ATT boost	Input	GND / OPEN
	9	DI 19	Nibbler open check SW	Input	GND / OPEN
	10	DI 21	Elevator cab up check	Input	+24V / OPEN
	11	DI 22	Spare	Input	+24V / OPEN
	12	DI 23	Lever lock	Input	+24V / OPEN
	13	DI 24	Hand control rotation / clamp open or close	Input	GND / OPEN
	14	DI 25	Front window open or close	Input	GND / OPEN
	15	DI 26	Hand control breaker	Input	GND / OPEN
	16	DI 27	Conflux/single select	Input	GND / OPEN
	17	DI 29	Overload select	Input	GND / OPEN
	18	DI 30	High reach (hoist at travel)	Input	GND / OPEN
	19		Reserved		
	20	GP			
	21	DI 33	Charge	Input	~12V / 12V~
	22	DI 34	Spare	Input	+24V / OPEN
	23	DI 35	Spare	Input	+24V / OPEN
	24		Reserved	Reserved	
	25	H1+	Accel signal 1		0~5V
	26	H2-			0V
	27	H2+	Accel signal 2		0~5V
	28	H2-			0V

Connector No.	Pin No.	Port name	Function	Input/putput	Signal level
CN109	1	DO 1	Wiper arc prevention	Output	GND / OPEN
	2	DO 2	Wiper normal moving	Output	GND / OPEN
	3	DO 3	Wiper reserve moving	Output	GND / OPEN
	4	DO 4	Washer motor	Output	GND / OPEN
	5	DO 5	Bucket move limitation	Output	GND / OPEN
	6	DO 6	Reserved	Output	GND / OPEN
	7	DO 12	Rotary light (RH)	Output	GND / OPEN
	8	DO 13	Swing flasher (RH)	Output	GND / OPEN
	9	DO 14	Swing flasher (LH)	Output	GND / OPEN
	10	DO 15	Travel alarm	Output	GND / OPEN
	11	DO 16	Auto idle stop relay	Output	GND / OPEN
	12	DO 17	Engine stop	Output	GND / OPEN
	13	DO 18	Lever lock	Output	GND / OPEN
	14	DO 19	Extra pressure release	Output	GND / OPEN
	15		Reserved		
	16	GP	IT controller		0V
	17	TXD2		Tranmission	RS232C communication
	18	RXD2		Reception	RS232C communication
	19	RTS	Spare		RS232C communication
	20	CTS	Spare		RS232C communication
	21	SHG2			Shiled GND
	22	DO 10	Cab up and down switching valve	SV	24V/OPEN

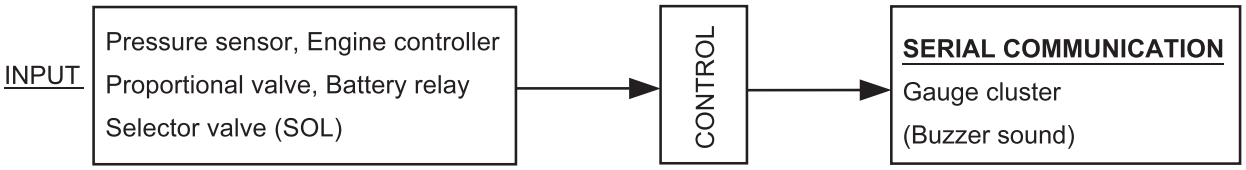
https://truckmanualshub.com/

SELF DIAGNOSIS DISPLAY

(1) Outline

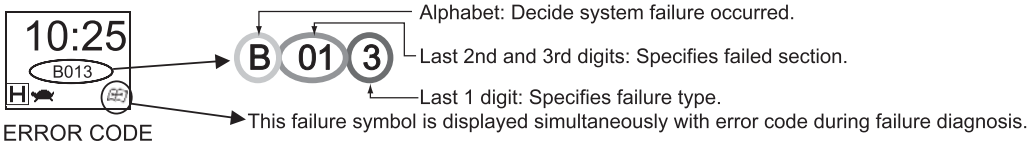
This function identifies abnormality of control I/O signal like pressure, proportional valve, etc. during machine operation through self diagnosis. The failed items are displayed on multi display of gauge cluster. For connector No. and pin No., refer to the section "C-1 Mechatro controller" explained later. Electric circuit diagram or harness is available to identify wire No. and wire color.

(2) I/O configuration



(3) Self diagnosis display items

As-displayed clock (Usually main screen). When error occurred, specifies failed section and the failure type with the aid of error code.



	A	B	C	D	E	F	G	H	I	K	P	R
Last 2,3 digits	Controller memory	Low pressure sensor	High pressure sensor	Proportional valve for valves	Proportional valve for pumps	Solenoid valve	Speed sensor	Potentiometer etc	Communication	Battery relay	Engine ECU	Relay output
01	Engine adjust data	Boom up	P1 pump	P1 unload	P1 pump	ATT boost		Acceleration		Battery relay		Wiper ark prevention relay
02	Torque adjust data	Boom down	P2 pump	P2 unload	P2 pump	Swing parking		Boom angle				Wiper ark forward rotation relay
03	Unload adjust data	Arm out	Boom head	Travel straight		Travel 1,2 speed	Angle sensor for shovel	Arm angle				Wiper ark reverse rotation relay
04	Boom up adjust data	Arm in	Boom rod			Option selector	Angle sensors for shovel & ECU					Washer motor
05	Arm in adjust data	Bucket digging										Bucket stroke limit
06	Arm out adjust data	Bucket dump		Arm 2 spool for arm in								
07		Swing										
08												
09		Travel right						Fuel sensor				
10		Travel left										
11		Selector position detection							CAN communication			
12												
13												Swing flasher right relay
14												Swing flasher left relay
15												Travel alarm relay
16		P1 side option										AIS relay 2
17		P2 side option										Engine stop relay
18												Safety lock lever relay
19												
21	Adjustment data sector 1											Safety relay
22	Adjustment data sector 2											
23	Hourmeter sector 1											
24	Hourmeter sector 2											
25	Proportional valve adjust data											
31									Cluster communication			

Refer to next page (Engine)

0		Larger than normal range	Larger than normal range									
1	–					Transistor OFF failure / Grounding short circuit			CAN error			
2	–	Wrong output	Wrong output	Transistor ON failure	Transistor ON failure		Over run					
3	–	Disconnection	Disconnection	Disconnection	Disconnection	Transistor ON failure / Disconnection	Disconnection	Disconnection	Time is over			
4	–	Power source short circuit	Power source short circuit					Power source short circuit		Contact point is melted and adhered		Power source short circuit
5												

Refer to next page (Engine)

SK350-8 ENGINE ERROR CODES

	ERROR CODE	POSSIBLE CAUSE	PROBLEM
SENSOR SYSTEM	P2228	Atmospheric pressure sensor malfunction (LOW)	Insufficient engine power
	P2229	Atmospheric pressure sensor malfunction (HI)	Insufficient engine power
	P0192	Common rail pressure sensor malfunction (LOW)	Insufficient engine power
	P0193	Common rail pressure sensor malfunction (HI)	Insufficient engine power
	P0191	Common rail pressure sensor malfunction	Insufficient engine power
	P0237	Boost pressure sensor malfunction (LOW)	Insufficient engine power
	P0108	Boost pressure sensor malfunction (HI)	Insufficient engine power
	P0117	Coolant temperature sensor malfunction (LOW)	Insufficient engine power
	P0118	Coolant temperature sensor malfunction (HI)	Insufficient engine power
	P0182	Fuel temperature sensor malfunction (LOW)	-
	P0183	Fuel temperature sensor malfunction (HI)	-
	P0335	Engine speed main sensor circuit malfunction	Engine does not start / Engine stopped.
	P0340	Engine speed sub sensor circuit malfunction	-
	P2120	Accelerator sensor 1 and 2 malfunction	Insufficient engine power (Low idle 800rpm fixing)
	P2122	Accelerator sensor 1 malfunction (LOW)	-
	P2123	Accelerator sensor 1 malfunction (HI)	-
	P2127	Accelerator sensor 2 malfunction (LOW)	-
	P2128	Accelerator sensor 2 malfunction (HI)	-
SWITCH, RELAY SYSTEM	P0540	Preheat circuit malfunction (Open / GND short circuit)	Difficult to start engine.
	P0540	Preheat circuit malfunction (+B short circuit)	Difficult to start engine.
	P0617	Starter signal malfunction	-
	P0686	Main relay malfunction	-
SUPPLY PUMP SYSTEM	P0629	Supply pump SCV malfunction (Power source line short)	Engine does not start / Engine stopped.
	P0628	Supply pump SCV malfunction (Full discharge mode)	Low output
	P2635	Supply pump abnormal pressure record	-
	P2635	Supply pump SCV sticking	Low output
	P0088	Excessive common rail pressure	Low output
INJECTOR SYSTEM	P1211	Injector common 1 ground short	Low output
	P1214	Injector common 2 ground short	Low output
	P1212	Injector common 1 open circuit	Low output
	P1215	Injector common 2 open circuit	Low output
	P1601	Injector correction data conformily error	-
	P0201	Injector circuit malfunction-cylinder 1	Low output
	P0202	Injector circuit malfunction-cylinder 2	Low output
	P0203	Injector circuit malfunction-cylinder 3	Low output
	P0204	Injector circuit malfunction-cylinder 4	Low output
	P0205	Injector circuit malfunction-cylinder 5	Low output
	P0206	Injector circuit malfunction-cylinder 6	Low output
	P0263	Cylinder 1 contribution / balance fault	-
	P0266	Cylinder 2 contribution / balance fault	-
	P0269	Cylinder 3 contribution / balance fault	-
	P0272	Cylinder 4 contribution / balance fault	-
	P0275	Cylinder 5 contribution / balance fault	-
	P0278	Cylinder 6 contribution / balance fault	-
EGR SYSTEM	P0489	EGR solenoid 1 malfunction (Open circuit, ground line short)	Other problem
	P0490	EGR solenoid 1 malfunction (Power source line short)	Other problem
	P0404	EGR valve 1 stick	Other problem
	P0405	EGR lift sensor 1 circuit low input	Other problem
	P0406	EGR lift sensor 1 circuit high input	Other problem
	P0407	EGR lift sensor 2 circuit low input	-
	P0408	EGR lift sensor 2 circuit high input	-
	P1401	EGR valve 2 stick	-
	P1402	EGR solenoid 2 malfunction (Open / ground short-circuit)	-
	P1403	EGR solenoid 2 malfunction (VB short-circuit)	-
TURBO CHARGER SYSTEM	P0234	Turbo charger over boost	Low output
ENGINE CONDITION	P0217	Engine over heat	Low output
	P0219	Engine over run	-
COMMUNICATION	U1001	Interruption of CAN communication (Machine)	-
ECU SYSTEM	P0611	ECU charge circuit low input	Low output
	P0200	ECU charge circuit high input	Low output
	P0605	Flash ROM error	Low output
	P0606	CPU malfunction (Hard detection)	Engine does not start / Engine stopped.
	P0607	Monitoring IC malfunction in CPU	Low output
INJECTOR SYSTEM	P1601	Injector correction data conformity error	Low output
			-
SUPPLY PUMP SYSTEM	P0088	Excessive common rail pressure, supply pump excess forced feed	Low output
SUPPLY PUMP SYSTEM	P2635	Supply pump malfunction	Low output

Note) The numbers in the column of "page for reference" show the related page in Chapter 51 Engine.

https://truckmanualshub.com/

ERROR HISTORY

Errors detected by mechatro controller self diagnosis function are stored in mechatro controller in history.
And the errors are able to be viewed on the cluster gauge display.

(1) How to display

1) Turn Key switch to on position.
2) Press buzzer stop switch 5 times within 10 seconds and the error history screen is displayed.

(Examples)

No errors

Error detected in the past	10530Hr F023 8500Hr G033 3000Hr P1211 1500Hr C013

3) Error history data (One or many) and hour meter data is displayed on the cluster gauge.
   - Hour meter and 4 failure data are displayed on screen.
   - In case of more than 4 failure data, 4 data is displayed at a time for 10 seconds by turns.
4) Paging (Up and down)
   - Press washer switch (▲), and the item moves upward.
   - Press wiper switch (▼), and the item moves downward.
5) Turn starter switch off, and the display is disappeared.

(2) How to delete contents of Error history

1) Display error history screen back on cluster gauge by procedure #1 & #2 from above.
2) Press work mode change switch and buzzer stop switch simultaneously for 10 seconds or more.
3) When "NO ERROR" is displayed, the deletion is completed.
4) Turn starter switch off.

Note

When all the stored items are erased. It is impossible to retrieve erased data.

https://truckmanualshub.com/

SERVICE DIAGNOSIS DISPLAY FUNCTION

The current service diagnosis is displayed on multi display based on the data received from mechatro controller. This section explains the operating procedure and examples of each screen. The values in display changes according to the conditions like engine speed, attachment position, etc.

(1) Service diagnosis display screen operating procedure

1) Turn starter switch ON keeping buzzer stop switch pressed.
2) After logo mark is displayed, the screen changes in service diagnosis mode.
   The service diagnosis screen "Mode No.1", "Screen No.1" is displayed first.
   The service diagnosis is classified into three modes, 1, 2, and 3, and the present mode is displayed in "Screen No.1".
   The screen number each mode can display differs. The screen number displayed by each mode is as follows.
   - Mode No.1 : Screen No.1~No.30
   - Mode No.2 : Screen No.1, Screen No.31~No.40
   - Mode No.3 : Screen No.1, Screen No.41~No.50
3) The screen changes each time each switch is pressed from now on.
   Washer switch: Screen gains by 1 in order. (No.2→No.3→No.4→..)
   Wiper switch: Screen loses by 1 in order. (No.24→No.23→No.22→..)
   Auto idling switch: Service diagnosis number advances from No.1 to No.3, and then returns to No.1. (No.1→No.2→No.3→No.1→..)
   Travel 1, 2 speed switch: Service diagnosis number advances from No.3 to No.1, and then returns to No.3. (No.3→No.2→No.1→No.3→..)
4) Turn key switch OFF and the display of service diagnosis mode is closed.

https://truckmanualshub.com/

(1) Service Diagnosis Screens - MODE 1 (Example)

The service diagnosis display screen list is shown below. The conditions for display are H mode, engine low speed and lever to neutral position.)

1) Service diagnosis mode No.1

No.	Displays	Contents	No.	Displays	Contents
1	NO.1 MAIN CONT. P/N YN22E00001F1 PROGRAM VERSION 1-VER 11.11 2-VER 00.00 SERVICE DIAG 1	 P/No. indication Program version indication MERIT controller program version Service diagnosis mode	4	NO.4 RELAY K-1 AIS RELAY 2 OFF K-2 SAFETY RLY OFF K-3 ENG STOP OFF KEY SWITCH OFF START SWITCH OFF CHARGE LIVE K-4 LOCK LEVER OFF SWITCH OFF	 Indicated value Indicated value Indicated value Key switch Starter switch Alternator Indicated value Switch
2	NO.2 ENG G-3 SPEED SET 2205 MEAS1 2201 G-5 ENG PRS. LIVE WATER TEMP 100 OFF MODE H H-1 ACCEL VOLT. 4.2V POS. 100%	 No load setting rpm Actual rpm 1 Engine oil pressure Coolant temperaturre sensor Work mode Potentiometer voltage Voltage % indication Accel output voltage to engine controller	5	NO.5 PRESS.SENSOR B-1 BOOM RAISE 3.5V 2.6M B-2 BOOM LOWER 3.5V 2.6M B-3 ARM OUT 3.5V 2.6M B-4 ARM IN 3.5V 2.6M B-5 BUCKET DIG 3.5V 2.6M B-6 BUCKET DUMP 3.5V 2.6M	 Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value
3	NO.3 SOL.VALVE F-1 POWER BOOST COMP. OFF MEAS. OFF SWITCH OFF F-2 SWING-BRAKE COMP. OFF MEAS. OFF RELEASE SW OFF F-3 1/2-TRAVEL COMP. OFF MEAS. OFF SWITCH OFF	 Set value in computer Measured value Switch Set value in computer Measured value Switch Set value in computer Measured value Switch	6	NO.6 PRESS.SENSOR B-7 SWING 3.5V 2.6M B-9 TRAVEL(R) 3.5V 2.6M B-10 TRAVEL(L) 3.5V 2.6M B-16 P1 OPT. 3.5V 2.6M B-17 P2 OPT. 3.5V 2.6M B-18 DOZER 1 3.5V 2.6M B-19 DOZER 2 3.5V 2.6M	 Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value

https://truckmanualshub.com/

Service Diagnosis Screens - MODE 1 - continued

No.	Displays	Contents	No.	Displays	Contents
7	NO.7 P.SENSOR PROPO-V C-1 PUMP P1 3.5V 32.6M C-2 PUMP P2 3.5V 32.6M C-3 BOOM-HEAD 3.5V 32.6M C-4 BOOM-ROD 3.5V 32.6M PROPO-VALVE E-3 OPT RELIEF 1 COMP. 600mA 14.5M MEAS. 600mA 14.5M E-4 OPT RELIEF 2 COMP. 600mA 14.5M	 Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value Set value in computer / Converted value from pressure Measured value / Converted value from pressure Set value in computer / Converted value from pressure Measured value / Converted value from pressure	16	NO.16 PRESS.SENSOR B-11 3.5V 12.6M B-12 3.5V 12.6M B-13 3.5V 12.6M B-14 3.5V 12.6M B-15 3.5V 12.6M B-20 3.5V 12.6M	 Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value
8	NO.8 PROPO-VALVE D-1 P1 UN-LOAD(BP-CUT) COMP. 600mA 4.5M MEAS. 600mA 4.5M D-2 P2 UN-LOAD(BP-CUT) COMP. 600mA 4.5M MEAS. 600mA 4.5M D-3 S-TRAVEL COMP. 600mA 4.5M MEAS. 600mA 4.5M D-6 ARM IN-2-SPEED COMP. 600mA 4.5M MEAS. 600mA 4.5M	 Set value in computer / Converted value from pressure Measured value / Converted value from pressure Set value in computer / Converted value from pressure Measured value / Converted value from pressure Set value in computer / Converted value from pressure Measured value / Converted value from pressure Set value in computer / Converted value from pressure Measured value / Converted value from pressure	18	NO.18 DIGITAL INPUT DI1 OFF DI2 OFF DI3 OFF DI4 OFF DI5 OFF DI6 OFF DI7 OFF DI8 OFF DI9 OFF DI10 OFF DI11 OFF DI12 OFF DI13 OFF DI14 OFF	 ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication See Mechatro controller connector
9	NO.9 PROPO-VALVE E-1 P1 PUMP COMP. 600mA 4.5M MEAS. 600mA 4.5M POWER SHIFT 100mA FLOW RATE 100L E-2 P2 PUMP COMP. 600mA 4.5M MEAS. 600mA 4.5M POWER SHIFT 100mA FLOW RATE 100L	 Set value in computer / Converted value from pressure Measured value / Converted value from pressure Power shift Flow rate of pump P1 Set value in computer / Converted value from pressure Measured value / Converted value from pressure Power shift Flow rate of pump P2	19	NO.19 DIGITAL INPUT DI15 OFF DI16 OFF DI17 OFF DI18 OFF DI19 OFF DI20 OFF DI21 OFF DI22 OFF DI23 OFF DI24 OFF DI25 OFF DI26 OFF DI27 OFF DI28 OFF	 ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication
10	NO.10 SENSOR,SWITCH H-9 FUEL LEVEL 4.5V 90 H-10 HYD.OIL TEMP 4.5V 30℃ GLOW OFF AIR FILTER LIVE WATER SEPA. LIVE ENG OIL FILTER LIVE FRONT WINDOW OFF DOUBLE FLOW ON KPSS SW OFF HEATER OFF ENG OIL LEVEL LIVE COOLANT LEVEL LIVE	 Fuel level Hydraulic oil temperature Glow switch Air filter clogging Water separator clogging Engine oil filter clogging Front window open/close switch Conflux/Single flow select switch KPSS switch Command from air heater Engine oil level Coolant level	20	NO.20 DIGITAL INPUT DI29 OFF DI30 OFF DI31 OFF DI32 OFF DI33 OFF DI34 OFF DI35 OFF DI36 OFF DI37 OFF DI38 OFF DI39 OFF DI40 OFF DI41 OFF DI42 OFF	 ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication ON/OFF indication
11	NO.11 SOL.VALVE F-4 OPT SELECT COMP. OFF MEAS. OFF SPOOL POS. NIB SELECT SWITCH NIB F-5 FAN PUMP COMP. OFF MEAS. OFF F-6 COMP. OFF MEAS. OFF	 Set value in computer Measured value (Feed back value) Spool position Mode of selector valve Set value in computer Measured value Set value in computer Measured value	21	NO.21 DIGITAL OUTPUT DO1 COMP. OFF MEAS. OFF DO2 COMP. OFF MEAS. OFF DO3 COMP. OFF MEAS. OFF DO4 COMP. OFF MEAS. OFF DO5 COMP. OFF MEAS. OFF DO6 COMP. OFF MEAS. OFF DO7 COMP. OFF MEAS. OFF	 Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value
12	NO.12 POTENTIO. H-2 BOOM 3.5V 137 H-3 ARM 3.5V 137	 Sent value from sensor / Converted value from angle Sent value from sensor / Converted value from angle	22	NO.22 DIGITAL OUTPUT DO8 COMP. OFF MEAS. OFF DO9 COMP. OFF MEAS. OFF DO10 COMP. OFF MEAS. OFF DO11 COMP. OFF MEAS. OFF DO12 COMP. OFF MEAS. OFF	 Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value

10

https://truckmanualshub.com/

Service Diagnosis Screens - MODE 1 - continued

No.	Displays	Contents
23	NO.23 DIGITAL OUTPUT DO15 COMP. OFF MEAS. OFF DO16 COMP. OFF MEAS. OFF DO17 COMP. OFF MEAS. OFF DO18 COMP. OFF MEAS. OFF DO19 COMP. OFF MEAS. OFF DO20 COMP. OFF MEAS. OFF DO21 COMP. OFF MEAS. OFF	 Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value
24	NO.24 DIGITAL OUTPUT DO22 COMP. OFF MEAS. OFF DO23 COMP. OFF MEAS. OFF DO24 COMP. OFF MEAS. OFF DO25 COMP. OFF MEAS. OFF DO26 COMP. OFF MEAS. OFF DO27 COMP. OFF MEAS. OFF DO28 COMP. OFF MEAS. OFF	 Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value
25	NO.25 WIPER SYSTEM WIPER SW OFF RISEUP SW OFF REVERSE SW OFF PREVENT ARC OFF CW MOTOR RLY OFF CCW MOTOR RLY OFF WASHER SW OFF MOTOR RELAY OFF	 Wiper switch Wiper rise-up switch Wiper reverse rotation switch Wiper motor ark prevention relay Wiper normal rotation relay Wiper reverse rotation relay Washer switch Washer motor relay

No.	Displays	Contents
27	NO.27 MERIT SYSTEM COMMUNICATION OFF 4 0412051200	Status of communication in MERIT controller
28	NO.28 ENG CONT. TRANS.COUNT. 100 RECEIVE COUNT. 100 DIAG STATUS 9 NUMBER OF DIAG 100 BOOST PRESS. 100 BOOST TEMP. -100 BAROMETRIC P. 100 FUEL TEMP. -100 FUEL CONS. 200 INTAKE TEMP. -100 ENG PRESS. 300 GLOW OFF ENG STOP OFF TORQUE 1000	 Counted number of transmission error Counted number of reception error Diagnosis status Numbers of error Boost pressure Boost temperature Atmospheric pressure Fuel temperature Fuel consumption Intake air temperature Engine oil pressure Glow output from ECU Engine stop command from ECU Calculated torque of ECU

Service Diagnosis Screens - **MODE 2** (Example)

No.	Displays	Contents	No.	Displays	Contents
1	NO.1 MAIN CONT. P/N YN22E00001F1 PROGRAM VERSION 1-VER 11.11 2-VER 00.00 SERVICE DIAG 2	 P/No. indication Program version indication MERIT controller program version Service diagnosis mode	33	NO.33 BUCKET C-1 P1-PRES 13.9M C-2 P2-PRES 13.9M E-1 P1-PSV 600mA E-2 P2-PSV 600mA D-1 P1-UL(BPC) 600mA D-2 P2-UL(BPC) 600mA D-3 S-TRAVEL 600mA B-5 BUCKET DIG 1.9M B-6 BUCKET DUMP 1.9M G-3 ENG SPEED 2205 POWER SHIFT 100mA	 Pump pressure sensor Pump pressure sensor Command current Command current Command current Command current Command current Bucket digging pressure sensor Bucket dump pressure sensor Engine actual speed Power shift current
31	NO.31 BOOM C-1 P1-PRES 13.9M C-2 P2-PRES 13.9M E-1 P1-PSV 600mA E-2 P2-PSV 600mA D-1 P1-UL(BPC) 600mA D-2 P2-UL(BPC) 600mA B-1 BOOM RAISE 1.9M B-2 BOOM LOWER 1.9M G-3 ENG SPEED 2205 POWER SHIFT 100mA	 Pump pressure sensor Pump pressure sensor Command current Command current Command current Command current Boom up pressure sensor Boom down pressure sensor Engine actual speed Power shift current	34	NO.34 TRAVEL C-1 P1-PRES 13.9M C-2 P2-PRES 13.9M E-1 P1-PSV 600mA E-2 P2-PSV 600mA D-1 P1-UL(BPC) 600mA D-2 P2-UL(BPC) 600mA D-3 S-TRAVEL 600mA B-9 TRAVEL(R) 13.9M B-10 TRAVEL(L) 13.9M Pi-P1 13.9M Pi-P2 13.9M G-3 ENG SPEED 2205 POWER SHIFT 100mA	 Pump pressure sensor Pump pressure sensor Command current Command current Command current Command current Command current Travel right pressure sensor Travel left pressure sensor Pilot pressure at travel straight (P1 side) Pilot pressure at travel straight (P2 side) Engine actual rpm Power shift current
32	NO.32 ARM,SWING C-1 P1-PRES 13.9M C-2 P2-PRES 13.9M E-1 P1-PSV 600mA E-2 P2-PSV 600mA D-1 P1-UL(BPC) 600mA D-2 P2-UL(BPC) 600mA D-3 S-TRAVEL 600mA D-6 ARM-IN-2 600mA B-3 ARM OUT 13.9M B-4 ARM IN 13.9M B-1 BOOM RAISE 13.9M B-7 SWING 13.9M G-3 ENG SPEED 2205 POWER SHIFT 100mA	 Pump pressure sensor Pump pressure sensor Command current Command current Command current Command current Command current Command current Arm out pressure sensor Arm in pressure sensor Boom up pressure sensor Swing pressure sensor Engine actual speed Power shift current	35	NO.35 OPT C-1 P1-PRES 13.9M C-2 P2-PRES 13.9M E-1 P1-PSV 600mA E-2 P2-PSV 600mA D-1 P1-UL(BPC) 600mA D-2 P2-UL(BPC) 600mA D-3 S-TRAVEL 600mA E-3 OPT RELIEF 600mA B-16 P1 OPT 1.9M B-17 P2 OPT 1.9M F-4 OPT SELECT NIB DOUBLE FLOW SW NIB G-3 ENG SPEED 2205 POWER SHIFT 100mA	 Pump pressure sensor Pump pressure sensor Command current Command current Command current Command current Command current Command current P1 side option pressure sensor P2 side option pressure sensor Optional selector SOL (Nibbler line) Conflux/ Single selector switch Engine actual rpm Power shift current

https://truckmanualshub.com/

3)Service Diagnosis Screens - **MODE 3** (Example)

No.	Displays	Contents	No.	Displays	Contents
1	NO.1 MAIN CONT. P/N YN22E00001F1 PROGRAM VERSION 1-VER 11.11 2-VER 00.00 SERVICE DIAG 3	 P/No. indication Program version indication MERIT controller program version Service diagnosis mode	43	NO.43 MACHINE-INFORM. HOUR METER 3550 TRIP METER 3500 OPERATION 3300 TRAVEL 300 SWING 3000 HAMMER 100 CRANE 100 STARTER 1200	 Hour meter of controller Trip meter of controller All accumulated operating time All accumulated traveling time All accumulated swing time All accumulated breaker operating time All accumulated high-reach crane operating time All accumulated starter operating time
41	NO.41 ADJUSTMENT 1 ENG HI-IDLE 2205 PUMP ACT I 515mA △ 15mA PUMP P 35.0M ESS N 2040 UN-LOAD P1 600mA P2 600mA BOOM 137° 137° ARM 137° 137° OFFSET 137° 137° INTER-B 137° 137°	 Engine speed high idle Current at pump adjustment Current correction at pump adjustment Pressure at pump adjustment Engine speed sensor rpm P1 unload corrective current P2 unload corrective current Angle adjustment Angle adjustment Angle adjustment Angle adjustment	44	NO.44 MACHINE-INFORM. PUMP PRESS. TOTAL 10Hr LEVEL1 24% 22% LEVEL2 50% 50% LEVEL3 25% 25% LEVEL4 1 % 3% WATER TEMP. TOTAL 10Hr LEVEL1 24% 22% LEVEL2 50% 50% LEVEL3 25% 25% LEVEL4 1 % 3%	 Pump pressure distribution (%) Total / In the last 10 hours Total / In the last 10 hours Total / In the last 10 hours Total / In the last 10 hours Coolant temperature distribution (%) Total / In the last 10 hours Total / In the last 10 hours Total / In the last 10 hours Total / In the last 10 hours

(4) Service Diagnosis Testing (**Data list - SK210-8**)

Preface and precaution

The following is the data decided as normal status after service diagnosis for every operation. Use these data to decide normal/abnormal status.

- The values in following display are reference values with standard attachment attached machine.
- The value of pressure sensor is calculated taking variation into accounts. When compared to performance check reference criteria, measure it with the aid of calibrated measuring instrument.
- The current of proportional valve is not the measured value, but command value. The measured value should be confirmed by the value in the displayed value for each proportional valve.
- The current value of pump proportional valve is reference value because it varies according to pump pressure and adjusted torque value.
- The value in display during operation shows the value in steady state, rather than, at start of operation.
- Check on machine after sufficiently warming up machine.
- The value in display may differ according to software version. Contact our dealer/distributor.

Operation No.1 : No operation
H mode Hi idle

No.32 ARM, SWING		
C-1	P1-PRES	0.2~2.0 M
C-2	P2-PRES	0.2~2.0 M
E-1	P1-PSV	350 mA
E-2	P2-PSV	350 mA
D-1	P1-UL(BPC)	750 mA
D-2	P2-UL(BPC)	750 mA
D-3	S-TRAVEL	350 mA
D-6	ARM-IN-2	750 mA
B-3	ARM OUT	0.0 M
B-4	ARM IN	0.0 M
B-1	BOOM RAISE	0.0 M
B-7	SWING	0.0 M
G-3	ENG SPEED	1970~2030
	POWER SHIFT	0 mA

Operation No.2 : No operation
S mode Hi idle

No.32 ARM, SWING		
C-1	P1-PRES	0.2~2.0 M
C-2	P2-PRES	0.2~2.0 M
E-1	P1-PSV	350 mA
E-2	P2-PSV	350 mA
D-1	P1-UL(BPC)	750 mA
D-2	P2-UL(BPC)	750 mA
D-3	S-TRAVEL	350 mA
D-6	ARM-IN-2	750 mA
B-3	ARM OUT	0.0 M
B-4	ARM IN	0.0 M
B-1	BOOM RAISE	0.0 M
B-7	SWING	0.0 M
G-3	ENG SPEED	1770~1830
	POWER SHIFT	0 mA

Operation No.3 : Boom up in full lever operation & relief
H mode Hi idle

No.31 BOOM		
C-1	P1-PRES	33.0~35.8 M
C-2	P2-PRES	33.0~35.8 M
E-1	P1-PSV	470~585 mA
E-2	P2-PSV	470~585 mA
D-1	P1-UL(BPC)	360 mA
D-2	P2-UL(BPC)	360 mA
B-1	BOOM RAISE	3.0 M
B-2	BOOM LOWER	0.0 M
G-3	ENG SPEED	1970~2030
	POWER SHIFT	0 mA

Operation No.4 : Boom up in full lever operation & in operation
H mode Hi idle

No.31 BOOM		
C-1	P1-PRES	13.0~18.0 M
C-2	P2-PRES	13.0~18.0 M
E-1	P1-PSV	630~770 mA
E-2	P2-PSV	630~725 mA
D-1	P1-UL(BPC)	360 mA
D-2	P2-UL(BPC)	360 mA
B-1	BOOM RAISE	3.0 M
B-2	BOOM LOWER	0.0 M
G-3	ENG SPEED	1970~2030
	POWER SHIFT	0 mA

https://truckmanualshub.com/

Operation No.5 : Boom down in full lever operation & in operation
H mode Hi idle

No.31 BOOM

C-1	P1-PRES	5.0~9.0 M
C-2	P2-PRES	0.2~2.0 M
E-1	P1-PSV	600~620 mA
E-2	P2-PSV	350 mA
D-1	P1-UL(BPC)	427~477 mA
D-2	P2-UL(BPC)	750 mA
B-1	BOOM RAISE	0.0 M
B-2	BOOM LOWER	3.0 M
G-3	ENG SPEED	1970~2030
	POWER SHIFT	0 mA

Operation No.6 : Arm-in in full lever operation & relief
H mode Hi idle

No.32 ARM, SWING

C-1	P1-PRES	33.0~35.8 M
C-2	P2-PRES	33.0~35.8 M
E-1	P1-PSV	470~585 mA
E-2	P2-PSV	470~585 mA
D-1	P1-UL(BPC)	360 mA
D-2	P2-UL(BPC)	360 mA
D-3	S-TRAVEL	350 mA
D-6	ARM-IN-2	200 mA
B-3	ARM OUT	0.0 M
B-4	ARM IN	3.0 M
B-1	BOOM RAISE	0.0 M
B-7	SWING	0.0 M
G-3	ENG SPEED	1970~2030
	POWER SHIFT	0 mA

Operation No.7 : Arm-in in full lever operation & in operation
H mode Hi idle

No.32 ARM, SWING

C-1	P1-PRES	9.0~13.0 M
C-2	P2-PRES	9.0~13.0 M
E-1	P1-PSV	750~770 mA
E-2	P2-PSV	750~770 mA
D-1	P1-UL(BPC)	360 mA
D-2	P2-UL(BPC)	360 mA
D-3	S-TRAVEL	350 mA
D-6	ARM-IN-2	395 mA
B-3	ARM OUT	0.0 M
B-4	ARM IN	3.0 M
B-1	BOOM RAISE	0.0 M
B-7	SWING	0.0 M
G-3	ENG SPEED	1970~2030
	POWER SHIFT	0 mA

Operation No.8 :
Arm-out in full lever operation & relief
H mode Hi idle

No.32 ARM, SWING

C-1	P1-PRES	33.0~35.8 M
C-2	P2-PRES	33.0~35.8 M
E-1	P1-PSV	470~585 mA
E-2	P2-PSV	470~585 mA
D-1	P1-UL(BPC)	360 mA
D-2	P2-UL(BPC)	360 mA
D-3	S-TRAVEL	350 mA
D-6	ARM-IN-2	750 mA
B-3	ARM OUT	3.0 M
B-4	ARM IN	0.0 M
B-1	BOOM RAISE	0.0 M
B-7	SWING	0.0 M
G-3	ENG SPEED	1970~2030
	POWER SHIFT	0 mA

* Measure the values after a lapse of 5 minutes or after release of low temperature mode

Operation No.9 :
Arm-out in full lever operation & in operation
H mode Hi idle

No.32 ARM, SWING

C-1	P1-PRES	15.0~22.0 M
C-2	P2-PRES	15.0~22.0 M
E-1	P1-PSV	570~680 mA
E-2	P2-PSV	570~680 mA
D-1	P1-UL(BPC)	360 mA
D-2	P2-UL(BPC)	360 mA
D-3	S-TRAVEL	350 mA
D-6	ARM-IN-2	750 mA
B-3	ARM OUT	3.0 M
B-4	ARM IN	0.0 M
B-1	BOOM RAISE	0.0 M
B-7	SWING	0.0 M
G-3	ENG SPEED	1970~2030
	POWER SHIFT	0 mA

* Measure the values after a lapse of 5 minutes or after release of low temperature mode

Operation No.10 :
Swing in full lever operation & relief
H mode Hi idle

No.32 ARM, SWING

C-1	P1-PRES	0.2~2.0 M
C-2	P2-PRES	28.0~35.8 M
E-1	P1-PSV	350 mA
E-2	P2-PSV	615~770 mA
D-1	P1-UL(BPC)	750 mA
D-2	P2-UL(BPC)	360 mA
D-3	S-TRAVEL	350 mA
D-6	ARM-IN-2	750 mA
B-3	ARM OUT	0.0 M
B-4	ARM IN	0.0 M
B-1	BOOM RAISE	0.0 M
B-7	SWING	3.0 M
G-3	ENG SPEED	1970~2030
	POWER SHIFT	0 mA

Operation No.11 :
Swing in full lever operation & in operation
H mode Hi idle

No.32 ARM, SWING

C-1	P1-PRES	0.2~2.0 M
C-2	P2-PRES	10.0~15.0 M
E-1	P1-PSV	350 mA
E-2	P2-PSV	770 mA
D-1	P1-UL(BPC)	750 mA
D-2	P2-UL(BPC)	360 mA
D-3	S-TRAVEL	350 mA
D-6	ARM-IN-2	750 mA
B-3	ARM OUT	0.0 M
B-4	ARM IN	0.0 M
B-1	BOOM RAISE	0.0 M
B-7	SWING	3.0 M
G-3	ENG SPEED	1970~2030
	POWER SHIFT	0 mA

https://truckmanualshub.com/

Operation No.12 :
Bucket digging in full lever operation & relief
H mode Hi idle

No.33 BUCKET

C-1	P1-PRES	33.0~35.8 M
C-2	P2-PRES	33.0~35.8 M
E-1	P1-PSV	470~585 mA
E-2	P2-PSV	470~585 mA
D-1	P1-UL(BPC)	360 mA
D-2	P2-UL(BPC)	360 mA
D-3	S-TRAVEL	720 mA
B-5	BUCKET DIG	3.0 M
B-6	BUCKET DUMP	0.0 M
G-3	ENG SPEED	1970~2030
	POWER SHIFT	0 mA

Operation No.13 :
Bucket digging in full lever operation & in operation
H mode Hi idle

No.33 BUCKET

C-1	P1-PRES	7.0~11.0 M
C-2	P2-PRES	7.0~11.0 M
E-1	P1-PSV	670~770 mA
E-2	P2-PSV	600~620 mA
D-1	P1-UL(BPC)	360 mA
D-2	P2-UL(BPC)	360 mA
D-3	S-TRAVEL	720 mA
B-5	BUCKET DIG	3.0 M
B-6	BUCKET DUMP	0.0 M
G-3	ENG SPEED	1970~2030
	POWER SHIFT	0 mA

Operation No.14 :
Bucket dump in full lever operation & relief
H mode Hi idle

No.33 BUCKET

C-1	P1-PRES	33.0~35.8 M
C-2	P2-PRES	33.0~35.8 M
E-1	P1-PSV	470~585 mA
E-2	P2-PSV	470~585 mA
D-1	P1-UL(BPC)	360 mA
D-2	P2-UL(BPC)	360 mA
D-3	S-TRAVEL	720 mA
B-5	BUCKET DIG	0.0 M
B-6	BUCKET DUMP	3.0 M
G-3	ENG SPEED	1970~2030
	POWER SHIFT	0 mA

Operation No.15 :
Bucket dump in full lever operation & in operation
H mode Hi idle

No.33 BUCKET

C-1	P1-PRES	15.0~24.0 M
C-2	P2-PRES	15.0~24.0 M
E-1	P1-PSV	550~770 mA
E-2	P2-PSV	550~770 mA
D-1	P1-UL(BPC)	360 mA
D-2	P2-UL(BPC)	360 mA
D-3	S-TRAVEL	720 mA
B-5	BUCKET DIG	0.0 M
B-6	BUCKET DUMP	3.0 M
G-3	ENG SPEED	1970~2030
	POWER SHIFT	0 mA

Operation No.16 :
P2 side option in full lever operation & relief
A mode Hi idle

No.35 OPT

C-1	P1-PRES	22.5~26.0 M
C-2	P2-PRES	22.5~26.0 M
E-1	P1-PSV	530~665 mA
E-2	P2-PSV	530~665 mA
D-1	P1-UL(BPC)	360 mA
D-2	P2-UL(BPC)	360 mA
D-3	S-TRAVEL	720 mA
E-3	OPT RELIEF	0 mA
B-16	P1 OPT	0.0 M
B-17	P2 OPT	2.0~2.6 M
F-4	OPT SELECT	NIB
	DOUBLE FLOW SW.	ON
G-3	ENG SPEED	1970~2030
	POWER SHIFT	0 mA

* Conflux switch is ON. Relief set pressure is value of shipping.

Operation No.17 :
P2 side option in full lever operation & relief
B mode Hi idle

No.35 OPT

C-1	P1-PRES	0.2~2.0 M
C-2	P2-PRES	22.5~26.0 M
E-1	P1-PSV	350 mA
E-2	P2-PSV	770 mA
D-1	P1-UL(BPC)	750 mA
D-2	P2-UL(BPC)	360 mA
D-3	S-TRAVEL	350 mA
E-3	OPT RELIEF	0 mA
B-16	P1 OPT	0.0 M
B-17	P2 OPT	2.0~2.6 M
F-4	OPT SELECT	BRK
	DOUBLE FLOW SW.	OFF
G-3	ENG SPEED	1970~2030
	POWER SHIFT	0 mA

* Conflux switch is OFF. Relief set pressure is value of shipping.

Operation No.18 :
Travel right in full lever operation & travel idling
H mode Hi idle

No.34 TRAVEL

C-1	P1-PRES	7.0~13.0 M
C-2	P2-PRES	0.2~2.0 M
E-1	P1-PSV	770 mA
E-2	P2-PSV	350 mA
D-1	P1-UL(BPC)	360 mA
D-2	P2-UL(BPC)	750 mA
D-3	S-TRAVEL	350 mA
B-9	TRAVEL(R)	2.0~2.5 M
B-10	TRAVEL(L)	0.0 M
	Pi-P1	0.0 M
	Pi-P2	0.0 M
G-3	ENG SPEED	1970~2030
	POWER SHIFT	0 mA

Operation No.19 :
Travel left in full lever operation & travel idling
H mode Hi idle

No.34 TRAVLE

C-1	P1-PRES	0.2~2.0 M
C-2	P2-PRES	7.0~13.0 M
E-1	P1-PSV	350 mA
E-2	P2-PSV	770 mA
D-1	P1-UL(BPC)	750 mA
D-2	P2-UL(BPC)	360 mA
D-3	S-TRAVEL	350 mA
B-9	TRAVEL(R)	0.0 M
B-10	TRAVEL(L)	2.0~2.5 M
	Pi-P1	0.0 M
	Pi-P2	0.0 M
G-3	ENG SPEED	1970~2030
	POWER SHIFT	0 mA

https://truckmanualshub.com/

AUTOMATIC COMPUTER CONTROLLER FAILURE TROUBLE DIAGNOSIS MODES 1 & MODE 2

The recent control system includes many electrical systems and it makes troubleshooting very difficult.
The failure trouble diagnosis modes are used to automatically specify the failed sections for the failures which can not be detected through the use of self diagnosis function (the failure can be specified through the use of error code) like disconnection and abnormal output. This is useful to save time for troubleshooting by a technician.

(1) Function
There are two types of failure trouble diagnosis modes.

1) Trouble diagnosis mode 1: Used to diagnose unload system, pump system, travel straight system and engine system.
2) Trouble diagnosis mode 2: Used to diagnose pilot system.
In any mode, with the attachment not moved, both directional valve and proportional valve are automatically actuated, the sensor detects the machine status and the mechatro controller identifies the normal condition or failed condition of the system.

For details of how to use, refer to "TROUBLE DIAGNOSIS MODE" page 10-47
later in this manual Manual.

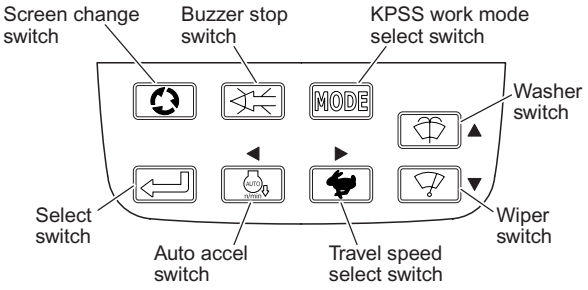
21.2.6 PROCEDURE TO SET MAINTENANCE SCHEDULE

This machine is equipped with multi-display which allows confirmation of remaining time to the coming replacement/ change time of engine oil, fuel filter, hydraulic oil filter and hydraulic oil, therefore when the remaining time reaches to Zero (0), replace or change engine oil, fuel filter, hydraulic filter, hydraulic oil, etc. and perform the initial setting by the following order.

Notice

Interval of replacement of parts is mentioned below.

- Engine oil : 500 Hr
- Fuel filter : 500 Hr
- Hydraulic filter : 1,000 Hr
- Hydraulic oil : 2,000 Hr (ASIA)
  5,000 Hr (OCEANIA)



10

Procedure	Operating Procedure	Display on Multidisplay
1	Turn starter key switch on.	KOBELCO → After several seconds, display is changed to clock autmatically. → 10:25 H
2	Press " " switch press once display change switch on the switch panel once. And the clock display changes to the display of remaining time for coming engine oil change.	10:25 H → Press screen change switch once more. → 250 Hr ENGINE OIL H
3	Press " " switch press once select switch once and the display for the engine oil change reverses.	250 Hr ENGINE OIL H → Press select switch once more. → 250 Hr ENGINE OIL ▼▲
4	When required to adjust the interval to the coming change time by 10 hours, press " ▲" switch and the time to the coming engine oil change is added. Press " ▼" switch and the time to the coming engine oil change is reduced.	250 Hr ENGINE OIL ▼▲ → Replacing interval is changed with each pressing of switch. → 500 Hr ENGINE OIL ▼▲
5	When desired to return to the initial set time, press " " buzzer stop switch once. Press " " select switch once and the set time is stored.	500 Hr ENGINE OIL ▼▲ → To set the desired interval, press the select switch → 500 Hr ENGINE OIL H

Notice

1. After displaying the display for setting by pressing the display change switch, set the respective maintenance time for fuel filter, hydraulic oil filter and hydraulic oil while repeating the procedure 2 to 5.
2. he engine oil change time is displayed on the multi-display by 500 hours as a warning, but the buzzer does not sound.

https://truckmanualshub.com/

21.2.7 ADJUSTING PROCEDURE OF DISPLAY

(1) For operator

Adjustment of Auto idling stop Procedure

No.	Switchs
1	Screen change switch
2	Buzzer stop switch
3	KPSS work mode select switch
4	Washer switch
5	Wiper switch
6	Travel speed select switch
7	Auto accel switch
8	Select switch

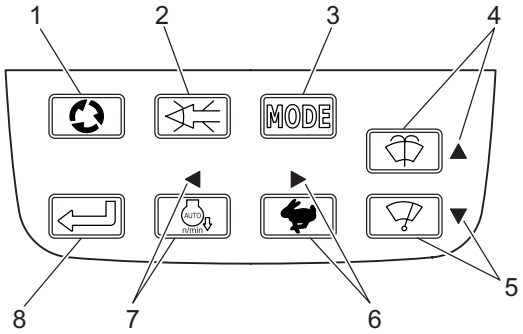
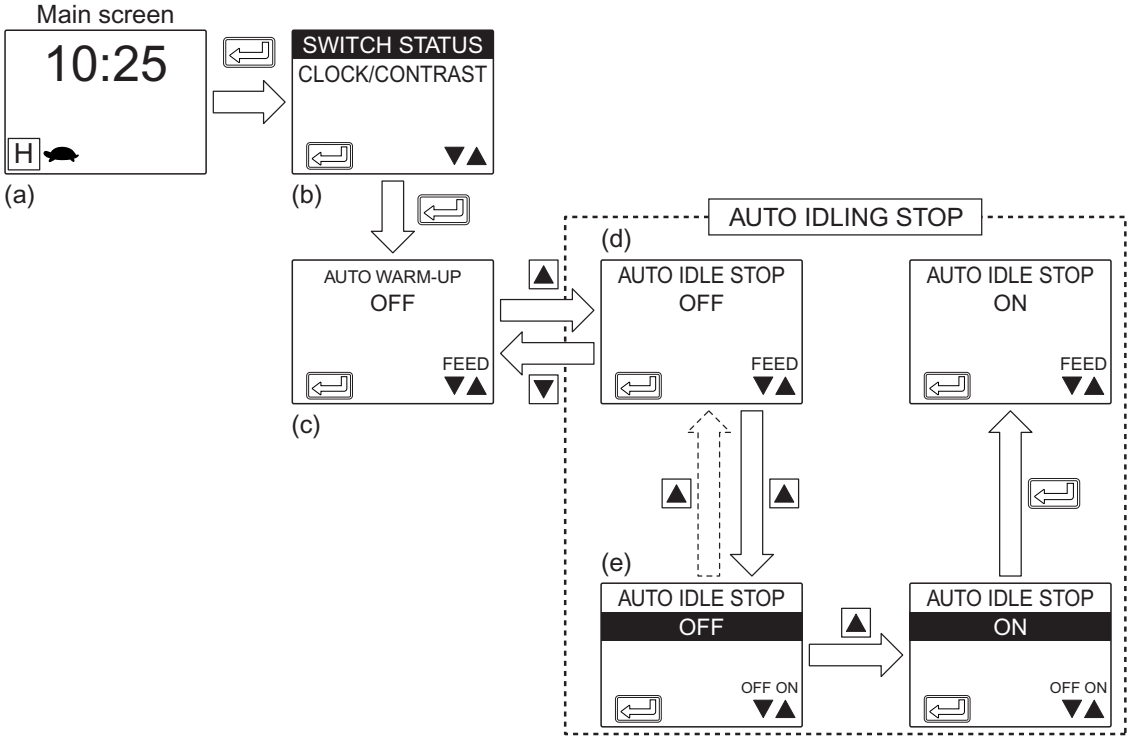


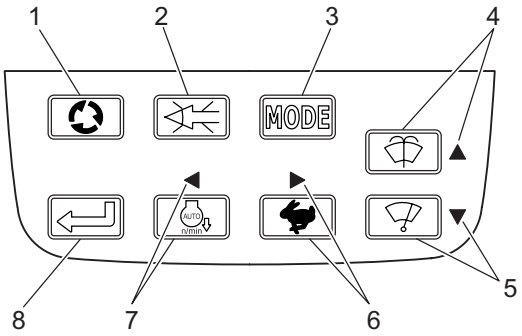
Fig. 21-2

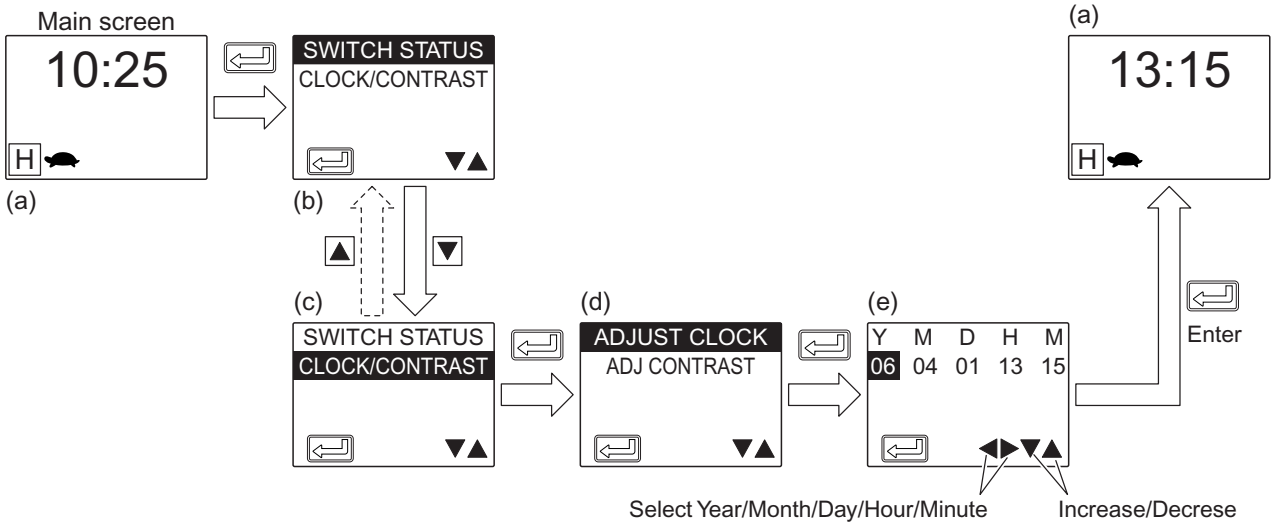


1. Press select switch (8) in main screen (a) for operator and display "SWITCH STATUS CLOCK/CONTRAST" select screen (b).
2. Press select switch (8) again and display "AUTO WARM-UP OFF" screen (c).
3. In operation of FEED ▲ (4), the "AUTO IDLE STOP OFF" screen (d) is displayed.
4. In operation of FEED ▲ (4), the color of "OFF" portion reverses and the "AUTO IDLE STOP OFF" screen (e) is displayed.
5. Switch from "OFF" to "ON" in operation of FEED ▲ (4) and set it by pressing selector switch (8).
6. When auto idling is functioning, the "AUTO IDLE STOP" is displayed on the multi-display.
7. Turn starter key switch off once and store the auto idling stop setting as a memory.

2) Clock Adjustment Procedure

No.	Switches
1	Screen Change Switch
2	Buzzer Stop Switch
3	KPSS Work Mode Select Switch
4	Washer Switch
5	Wiper Switch
6	Travel Speed Select Switch
7	Auto Accel Switch
8	Select Switch



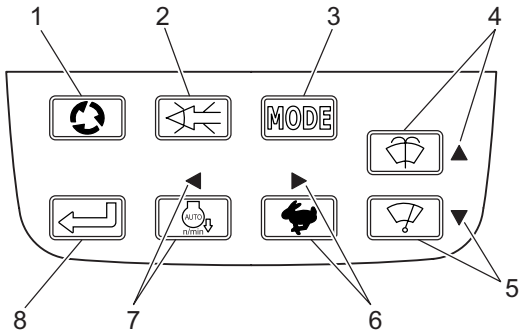


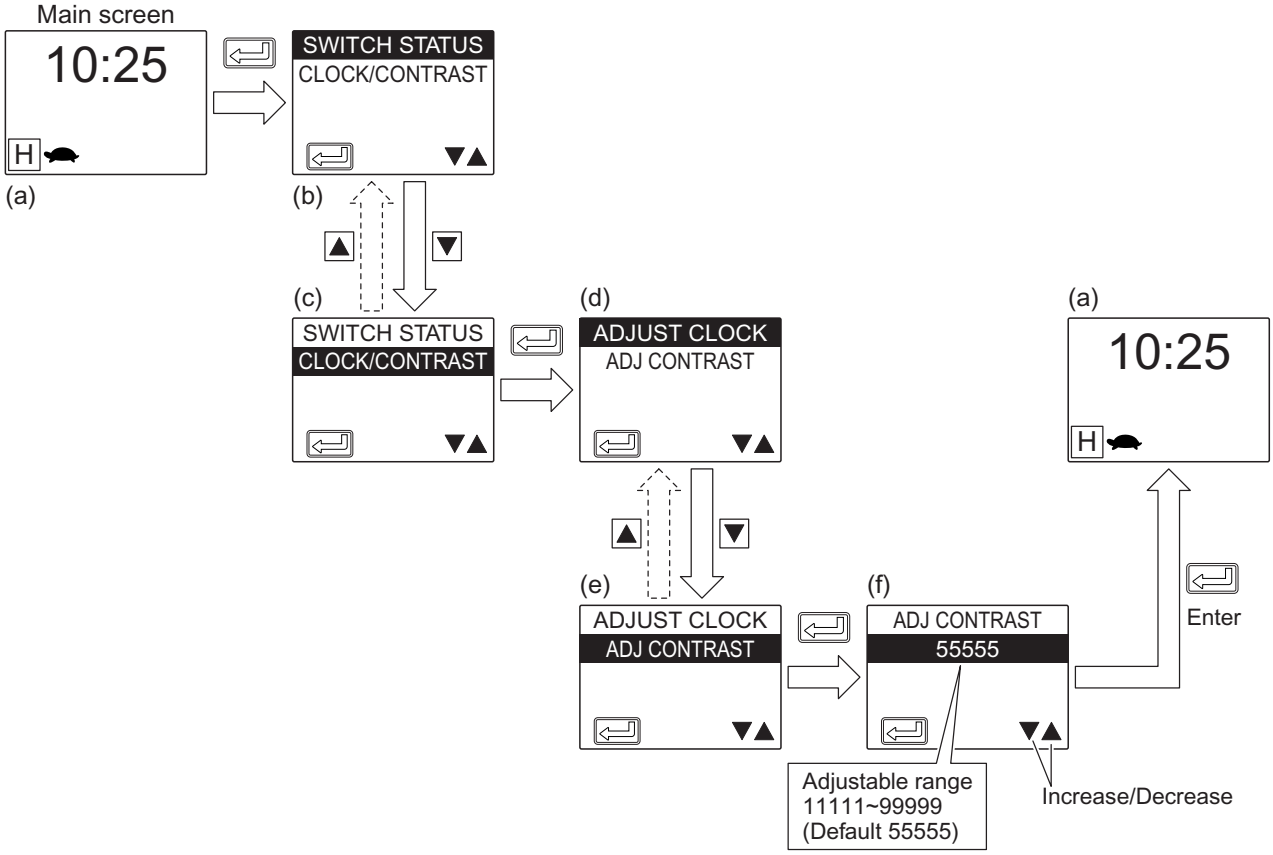
1. Turn starter key switch on and display main screen (a) for operator, and then press select switch (8) and display "SWITCH STATUS CLOCK/CONTRAST" select screen (b).
2. In operations of FEED ▲ (4) and FEED ▼ (5), move cursor to "CLOCK/CONTRAST" screen (c) and then press select switch (8) and the "ADJUST CLOCK ADJ CONTRAST" screen (d) is displayed.
3. In operations of FEED ▲ (4) and FEED ▼ (5), move cursor to "ADJUST CLOCK" and then press select switch (8) and the "ADJUST CLOCK" screen (e) is displayed.
4. Select any of "Y•M•D•H•M" in operation of FEED ▲ (4) and FEED ▼ (5) and vary the values in operations of FEED ▲ (4) and FEED ▼ (5).
5. After adjustment, press select switch (8) and the adjusted values are stored as memory and time setting is completed, and then the screen returns to main screen (a).

https://truckmanualshub.com/

3) Contrast Adjustment Procedure

No.	Switches
1	Screen Change Switch
2	Buzzer Stop Switch
3	KPSS Work Mode Select Switch
4	Washer Switch
5	Wiper Switch
6	Travel Speed Select Switch
7	Auto Accel Switch
8	Select Switch





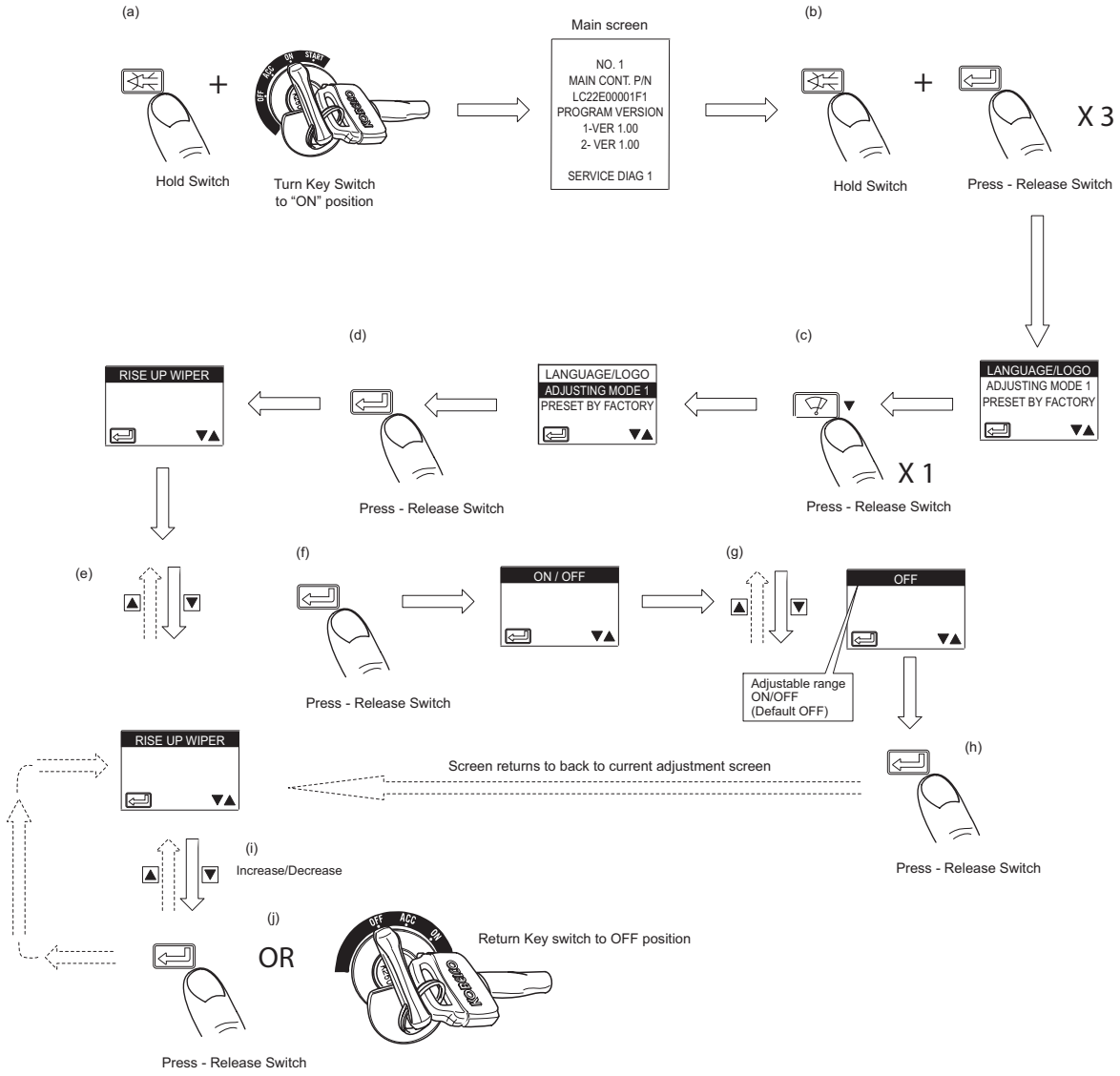
1. Turn starter key switch on and display main screen (a), and press select switch (8) and display "SWITCH STATUS CLOCK CONTRAST" select screen (b).
2. In operations of FEED ▲ (4) and FEED ▼ (5), move cursor to "SWITCH STATUS CLOCK CONTRAST" screen (c) and then press select switch (8) and the "ADJUST CLOCK ADJ CONTRAST" screen (d) is displayed.
3. In operations of FEED ▲ (4) and FEED ▼ (5), move cursor to "ADJUST CLOCK ADJ CONTRAST" and then press select switch (8) and the "ADJUST CLOCK ADJ CONTRAST" screen (e) is displayed.
4. Press select switch (8) and the "ADJ CONTRAST 55555" screen (f) is displayed.
5. Vary the values by pressing the desired figure in operations of FEED ▲ (4) and FEED ▼ (5).
   The available setting range is in 9 steps from "11111" to "99999".
   [Example] 11111 (faint) →99999 (clear) * The initial set value is 55555.
6. Press select switch (8) and the adjusted values are stored as a memory and the contrast adjustment is completed, and then the screen returns to main screen (a).

https://truckmanualshub.com/

ADJUSTMENT OF STATUS FUNCTIONS (**MODE 1**)

Following items are provided for adjustment of machine status service function. - BY SERVICE TECHNICAN ONLY

Item	CONTENTS
Language	Language selection
Rise-up wiper	Wiper control change (When cab is changed)
Auto Idle stop	ON/OFF of auto idle stop (ON/OFF of adjustment for user) and time adjust
P1 option pressure sensor	ON/OFF of self diagnosis for P1 option pressure sensor
P2 option pressure sensor	ON/OFF of self diagnosis for P2 option pressure sensor
Swing alarm	ON/OFF of swing alarm (ON/OFF of adjustment for user)
Left pedal for rotation of option attachment	Does left rotation pedal use? (Unload valve does not actuate because P4 pump is equipped in EU.)
Setting of optional equipment	Optional flow rate limitation, relief pressure limitation, combination of return selector adjustment)
Engine speed Display (RPM)	ON/OFF of engine rpm display
Auto acceleration	Adjustment the type of the engine speed of auto deceleration runs up abruptly.
Change of Startup Mode	Change of the Default mode machine start in
Cancellation of Low temperature	Low temperature mode release
E/G Cylinder injector calibration	calibration of Injection system of engine
Hydraulic Drain Pressure release	For pressure release of hydraulic system

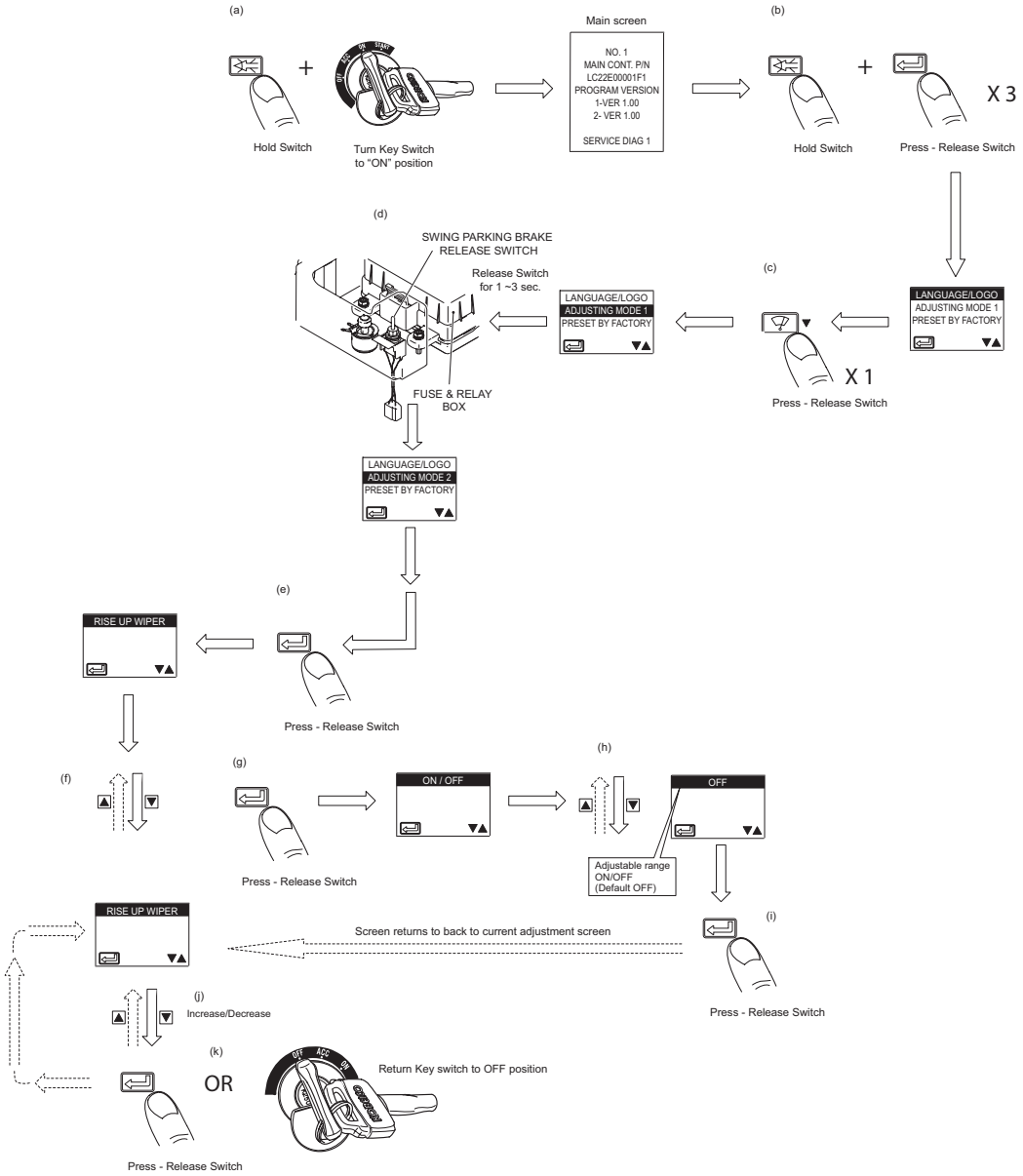


https://truckmanualshub.com/

ADJUSTMENT OF STATUS FUNCTIONS (**MODE 2**)

Following items are provided for adjustment of machine statusservice function.Ref. from Yamakoshi slide #29 pp

Item	CONTENTS
OPT.MAX. PRESS	Adjusting Upper Pressure Limit of Auxaliary Hydraulic circuit
OPT.MAX. FLOW RATE	Adjusting Max Flow Rate Limit of Auxaliary Hydraulic circuit
P1 OPT. MAX. FLOW	Adjusting Max Flow Rate Limit of P1 Auxaliary Hydraulic circuit
ADJ POWER ESS	Adjusting Max ESS Limit
ADJ % POWER ESS	Adjusting Max ESS response rate limit
Travel-Straight PCSV	Adjusting Travel-Straight PSV response rate limit
Boom (inching)	Adjusting boom PSV response rate limit
Arm (inching)	Adjusting arm PSV response rate limit
Swing Priority	Adjusting swing priority response rate limit
Boom UP & Swing	Adjusting Boom-up & swing response feeling rate limit
Arm 2 speed	Adjusting arm 2 speed power set response rate limit
Bucket Conflux	Adjusting bucket conflux response rate
Trip Meter	Adjusting of secondary hour meter
Starter Motor	Reset of counter of starter motor usage



AUTOMATIC COMPUTER CONTROLLER FAILURE TROUBLE DIAGNOSIS MODES 1 & MODE 2

The recent control system includes many electrical systems and it makes troubleshooting very difficult.
The failure trouble diagnosis modes are used to automatically specify the failed sections for the failures which can not be detected through the use of self diagnosis function (the failure can be specified through the use of error code) like disconnection and abnormal output. This is useful to save time for troubleshooting by a technician.

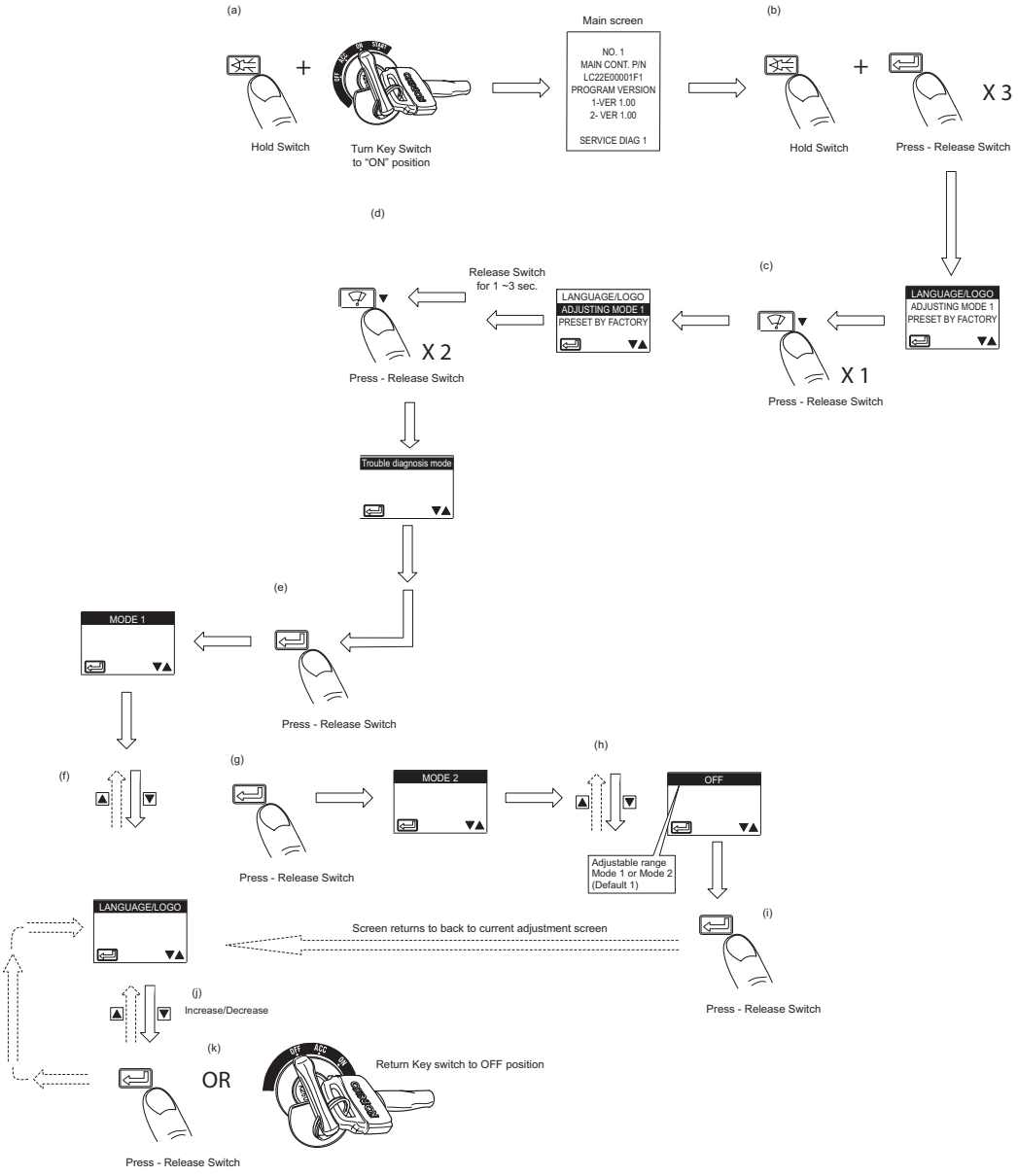
(1) Function

There are two types of failure trouble diagnosis modes.

1) Trouble diagnosis mode 1: Used to diagnose unload system, pump system, travel straight system and engine system.
2) Trouble diagnosis mode 2: Used to diagnose pilot system.
   In any mode, with the attachment not moved, both directional valve and proportional valve are automatically actuated, the sensor detects the machine status and the mechatro controller identifies the normal condition or failed condition of the system.

For details of how to use, refer to "Chapter 46 TROUBLESHOOTING TROUBLE DIAGNOSIS MODE" in Service Shop Manual.

10



MECHATRONICS CONTROLLER Adjustment A-B-C {SK210-8}

ENGINE CONTROL INPUT / OUTPUT

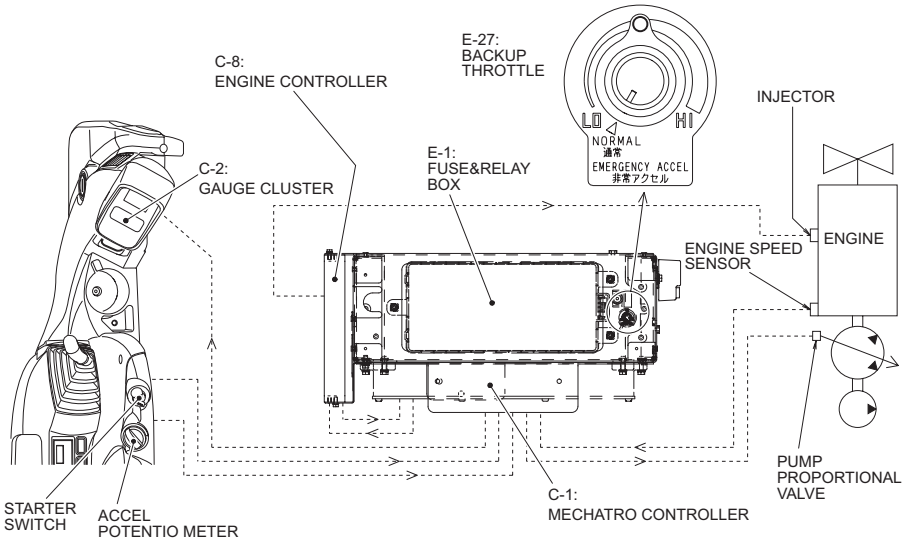


Fig. 13-36 INPUT / OUTPUT

ADJUSTMENTS OF MECHATRONICS CONTROLLER OUTPUT (A-B-C ADJUSTMENTS)

PURPOSE OF THE ADJUSTMENTS

There are 3 kinds of adjustment of mechatronics controller as shown below; every adjustment is an essential function to ensure proper performance of machine.

(1) "A" adjustment - Adjustment of engine
This adjustment is performed to set the relation between the acceleration command voltage output from mechatronic controller to engine controller and the engine speed.

(2) "B" adjustment - Adjustment of pump
This adjustment is performed to correct the output variation by coordinating the output hydraulic pressure with engine rated output.

(3) "C" adjustment - Adjustment of unloading valves
This adjustment is performed to correct the open variation of unloading valves to improve operability further.

CONDITIONS WHERE ADJUSTMENT OF MECHATRONICS CONTROLLER IS REQUIRED:

When the following parts are replaced or repaired, carry out the adjustment.

(1) Mechatronics controller

(2) Engine or fuel rack

(3) Hydraulic pump or hydraulic pump proportional valve

(4) Unloading proportional valve, spool of unloading valve

(5) Down load of mechatronics software

Tools & Equipment Required for Adjustment “A”

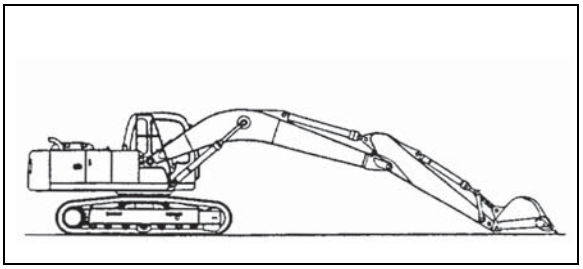

12 & 13 mm spaner wrenches


17 mm spaner wrenches X 2


10 mm spaner wrench

0.1mm (.004“) Feeler gauge
1- Metric or Inch Tape Measure to measure linkage
1- Heat Gun or Thermometer to read proper hydraulic oil temperature on tank surface.
General hand tools to remove and replace stepping motor linkage and components.

MACHINE PREPARATION



(1) Place machine in the hydraulic oil check position, check for proper hydraulic oil level, engine oil level, coolant level and if necessary replace fuel filter and air filter.

(2) Raise the hydraulic oil temperature to 113~135°F (45~57°C) by use of hydraulic system.

(3) Place the a/c in the “OFF” position.

(4) Place the key switch “OFF” to stop the engine.

Notice:

When the mechatronic controller has been replaced, the following error codes are displayed because the adjustment data is not entered into the computer’s memory yet. Code: A215, A225, A015, A025, A035
If other error codes other than those shown above are shown, it may suggest failures of other machine components, repair the machine according to other Error Code listings.

4) **Removal of Rod linkage and Lever from Stepping Motor.**

a. Move to the engine compartment and locate the injection pump and stepping motor assembly. See Figure 10.32 A.

b. With a 17 and 14 mm spanner wrench loosen the ball joint end jam nuts on the rod linkage of the stepping motor, be sure to use a holding wrench on the opposite side of the nut to avoid linkage damage.

NOTE : Threads are R.H and LH on opposite ends.

c. Using a 10 spanner wrench remove the splined lever from stepping motor shaft. Note the position of the lever on the stepping motor shaft so the lever can be reinstalled closely to the same position as when removed. See Figure 10.32 B.

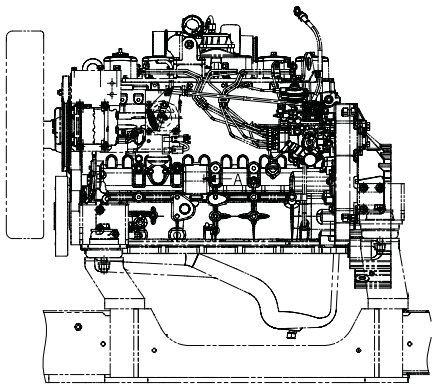


Figure 10.32 A.

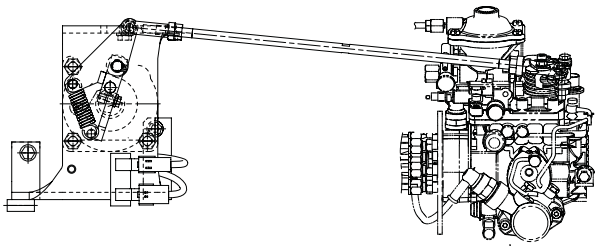


Figure 10.32 B.

NOTE :
Not all machines classes have the lever positioned on the stepping motor at the same degree, be sure remember the direction of the lever before removal and reinstall in the same direction.

d. Place a holding wrench on the shoulder side of the ball joint. Loosen nut and remove it and lock washer from the ball joint end connected to the Fuel Rack lever. This allows the complete linkage to be removed now. See Figure 10.32 C.

e. Loosen the left and right hand thread jam nuts on rod linkage and inspect the heads of linkage for excessive wear. Adjust both ball joint end all the way down on the threads of the tie rod linkage for full thread engagement. See Figure 10.32 C.

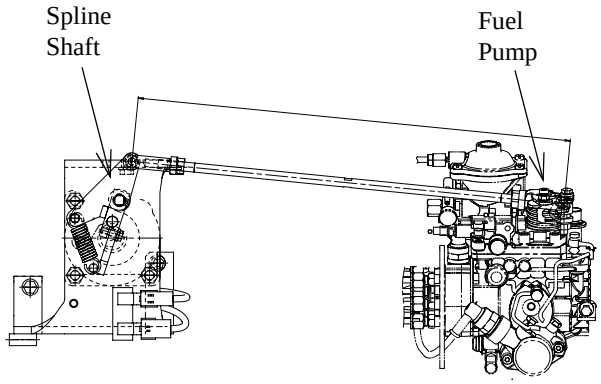


Figure 10.32 C.

https://truckmanualshub.com/

f. While anchoring both ball joint ends so as not to turn them, turn tie rod intermediate rod to set the correct rod length to the specific dimension per machine model number listed below. See Figure 10.33 G.

"B" Dimension

SK 210-8 18.22"~ 19.48" (463~495mm)

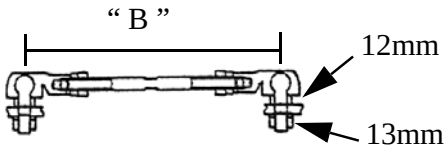


Figure 10.33 G.

NOTE

Dimension B is the starting dimension of fuel injection rod assembly. Final dimension of rod will be determined when rod and lever is installed on engine and engine stop gap is set.

g. Once "B" dimension has been adjusted temporarily lay linkage aside, engine fuel rack must be verified before reinstallation of stepping motor linkage.

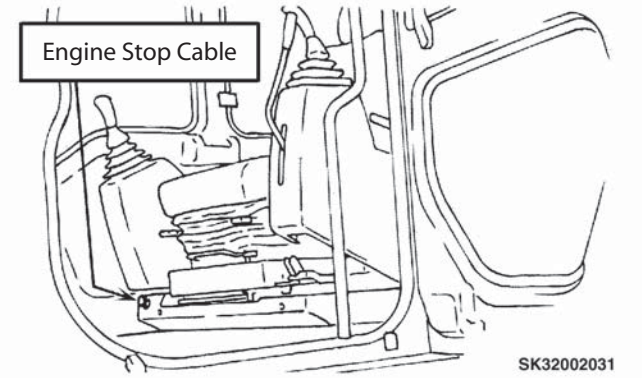


Figure 10.33 H.

Verification of Fuel Rack Capabilities:

V1.Return to cab and :

a. Place Safety lock lever in the lock (UP) position.See Figure 10.33 H.

b. Place throttle potentiometer to LOW idle position. See Figure 10.33 I.

c. Turn key switch to start position and start engine. See Figure10.33 I.

d. Locate the screen change switch, depress the switch once to select RPM. See Figure 10.33 I.

V2.Return to engine compartment and carefully manually move Fuel Rack lever over to the High Idle Stop Bolt. See Figure 10.33 J.

V3.Verify on the Cluster Gauge or with a external photo tach what the max.achievable high engine rpm against the high 10.56I.

V4.Verify High Stop bolt rpms against Machine Performance specs in this training manual. If rpms are within tolerance continue with this procedure, if not stop and repair engine or fuel rack to allow proper engine rpm.

V5.Return to cab and allow engine/turbo to cool at idle,shut engine off and return keyswitch to the off position.

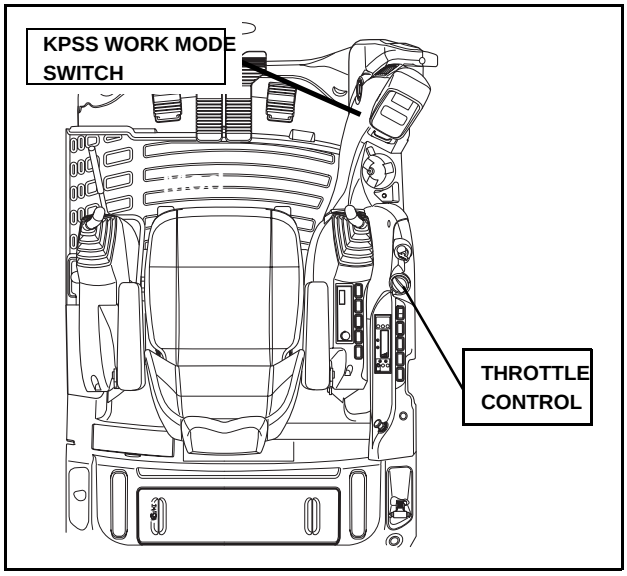


Figure 10.33 I.

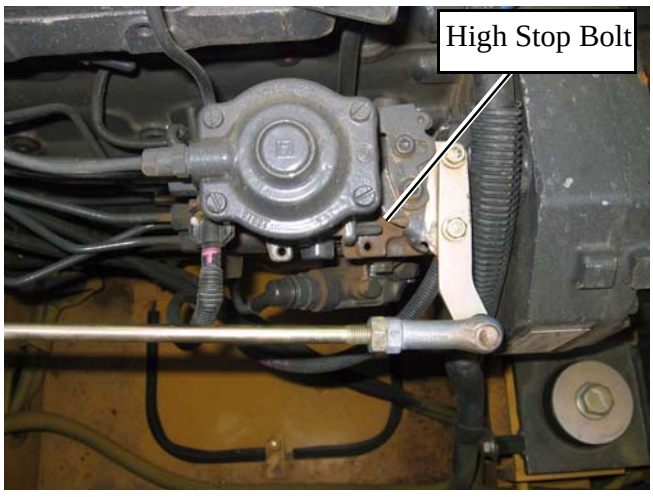


Figure 10.33 J.

ADJUSTMENT PROCEDURES A,B,C

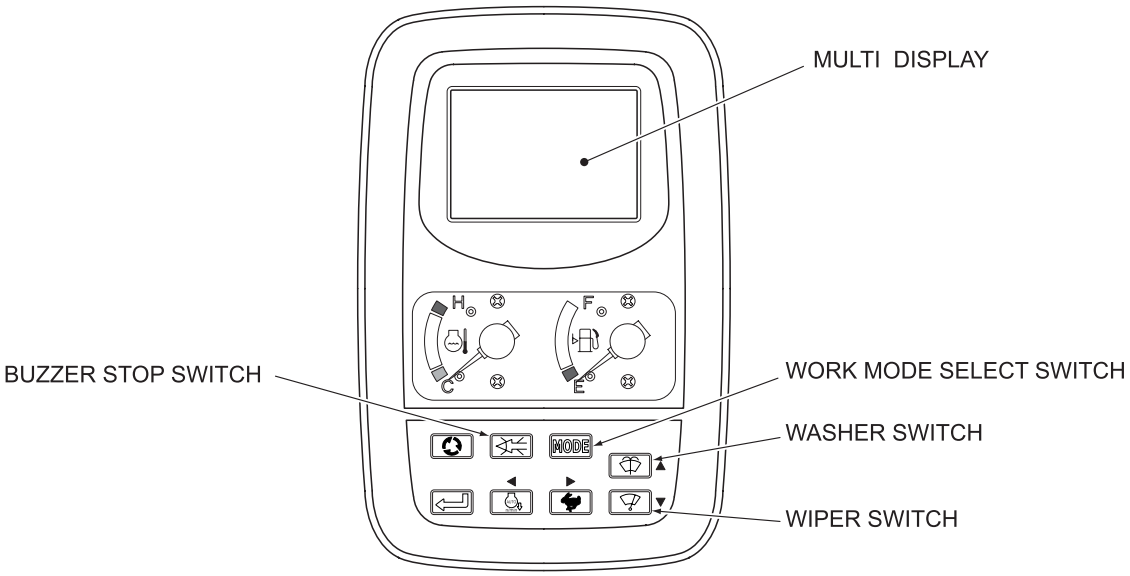


Fig. 10.50 A Cluster Gauge

(1) **Adjustment of engine ("A" adjustment) Procedure**

1) Locate and depress the Mode Switch MODE then turn key switch to the “ON” position while continuing to keep the mode switch on the cluster gauge pressed. Continue to hold for 5~10 seconds, and then release switch. (If the engine is started, the following indication can’t be displayed. Therefore do not start the engine.)

   See Figure 10.50 A.

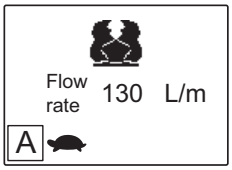


Figure 10.50 B

2) Locate and depress the buzzer stop switch on cluster gauge, hold for 5~10 seconds and release switch. The screen for selecting adjustment will now display. {Note: When adjustment data is not entered in mechatronics controller, "READY" is indicated. If the adjustment operation is once performed, "FIN" is indicated}. For Safety the lever lock solenoid is automatically released and disables all operator controls while in adjustment mode. See Figure 10.50 B.

Note: If a new CPU is installed Screen A. will be displayed, if the CPU is just being reprogramed Screem B. will be displayed.

A.



OR

B.



Figure 10.50 C

3. Locate and depress the selection switch on cluster gauge, the cluster gauge will now display the Adjust Gap screen. See Figure 10.50 D.

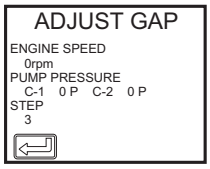


Figure 10.50 D

4) **Reinstallation of Rod linkage and Lever on the Stepping Motor.**

a. Move to the engine compartment and locate the injection pump and stepping motor assembly. See Figure 10.32 E.

b. Obtain Stepping motor linkage that was previously adjusted to the proper B dimention in step # 4 of removeal procedure. Verify fuel rack lever is at the low stop bolt position. While holding the fuel rack lever against the low stop bolt reinstall the linkage assembly between the stepping motor and injection pump. Do not over tighten max. torque is 13.27 ft•lbs, (1.84 kgf•m). See Figure 10.60 A and 10.60 B.

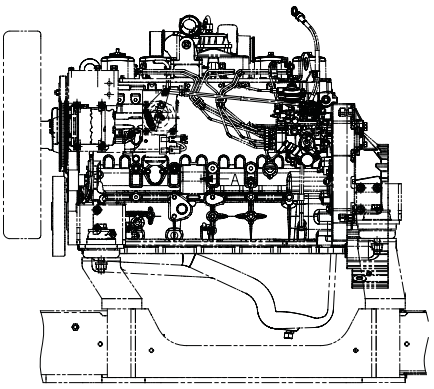


Figure 10.60 A.

NOTE :
Threads are R.H and LH on opposite ends.

Note: If the splined shaft lever will not align while other ball joint end is inserted into the fuel lever remove that end from the fuel rack, retain position move splined lever one spline forward or backward on the stepper motor shaft to allow splines to align. Then adjust the intermediate rod so the ball joint end can be installed on the fuel lever side.

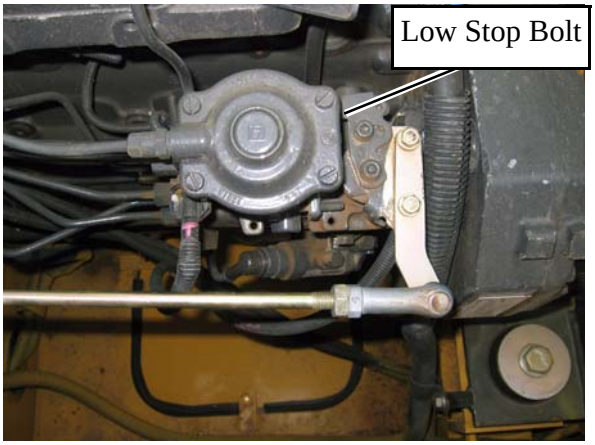
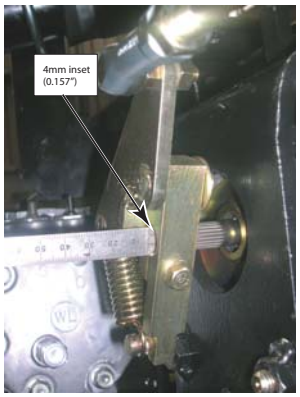


Figure 10.60 B.

c. Confirm that the spline on the stepping motor is protruding in approximately 4mm (0.157”) past the lever assembly. Secure the lever to stepping motor with the 10mm spanner wrench. See Figure 10.60 C.



d. With a 12 and 13 mm spanner wrench loosen the ball joint end jam nuts on the rod linkage of the stepping motor, with a feeler gauge inserted between the fuel shut off stop bolt and the fuel injection pump lever adjust the rod linkage clearance to 0.1mm (.004”).

e. Once clearance has been reached with only slight resistance on the feeler gauge tighten both rod linkage jam nuts with 13 and 14 mm wrenches. Do not over tighten max. torque is 1.84 kgf•m, (13.27 ft•lbs)

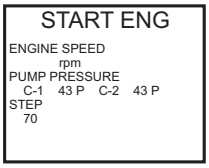
f. Recheck all linkage fastners and make sure everything is tight. also make sure ball joint linkage ends are equally aligned and not twisted. Afterwards return to the operator’s cab for the next step.



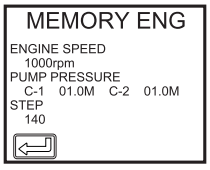
Note: Remove all tools and wrenches in and around engine compartment to prepare for the starting of the engine in the next process.

g. Press selector switch once on gauge cluster to display "START ENG".
"Engine SPEED", P1, P2 "PUMP PRESSURE" and "STEP" (acceleration command voltage) are indicated.

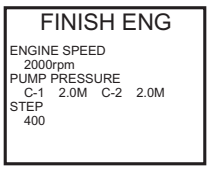
Turn keyswitch to the “START” position and release after engine starts. You will notice that the controller will move the stepping motor to a position normal RPM starting range.



h. After starting engine, press selector switch on gauge cluster, and "MEMORY ENG" is displayed, the engine speed is automatically increased, and the adjustment of engine is performed.

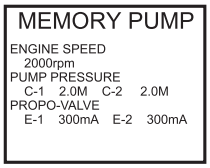


i. When normal HIGH idling speed is detected, the adjustment is completed. And "FINISH ENG" is displayed. **Do not shut off Keyswitch or press any buttons on gauge cluster** as the final two procedure (Adjustment “B”, Adjustment “C”) must be performed before the procedure is complete.

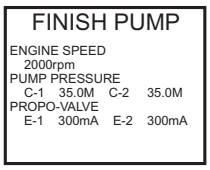


"B" adjustment - Adjustment of pump Procedure

1) The adjustment automatically shifts from engine to pump, the speed shifts from LOW idling to HIGH idling. And "MEMORY PUMP" is displayed. And the unloading proportional valve and pump proportional valve actuate, accordingly the loading of pump is increased.
The "ENGINE SPEED", P1, P2 "PUMP PRESSURE" and P1, P2 pump "PROPO-VALVE" current (command value) are indicated.

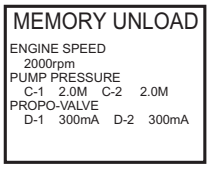


2) After detection of the engine rated speed, the adjustment of pump is automatically completed. And "FINISH PUMP" is displayed.
(**Do not shut off Keyswitch or press any buttons on gauge cluster** as the final procedure (Adjustment “C) must be performed before the procedure is complete.

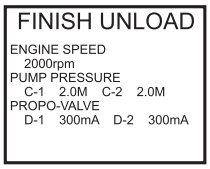


(3) **"C" adjustment** - Adjustment of unloading valve Procedure

1) The adjustment shifts from pump to unloading, and the unloading valve actuates, accordingly the pump pressure is detected. And "MEMORY UNLOAD" is displayed.
The "ENGINE SPEED", P1, P2 "PUMP PRESSURE" and P1, P2 "PROPO-VALVE" voltage (command value) are indicated.

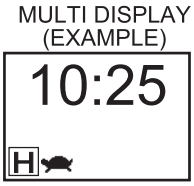


2) When the unloading valve operates to the specified value, the adjustment of unloading proportional valve is automatically terminated. And "FINISH UNLOAD" is displayed.
The speed is shifted to the speed corresponding to acceleration potentiometer.
The adjusting current value is indicated on the display of current of P1, P2 unloading proportional valves. The adjusting range is usually 520~635mA.



3) Normal status screen will reappear procedure is complete.

Normal Status Screen



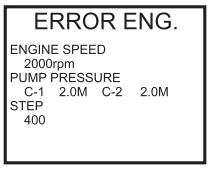
4) Reconfirm normal status screen is displayed on cluster gauge then return key switch to the “OFF” position and allow the engine to shut down. (The adjusted data is automatically stored.)

(**A-B-C TROUBLE SHOOTING**

Corrective actions taken when the adjustments can not be performed;

A ADJUSTMENT:

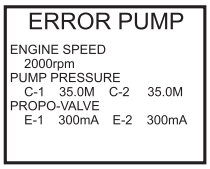
1) In cases where the adjustment of engine can not be performed; And ERROR ENG" is displayed.
Judging condition: The read engine speed is 50rpm lower than the last value.



It is conceived that the error is caused by the speed read error, pump load applied to the engine and unusual acceleration command voltage applied to the engine controller in the course of adjustment.

a. Checking speed sensor: Check that it is free from wrong reading of speed due to engine vibration.
b. Checking load applied to pump: Check that it is free from abnormal increase of pump pressure during adjustment of engine through adjustment screen.
c. Checking acceleration command voltage: Measure the acceleration command voltage output from mechatronics controller to engine controller. Check that signal is regularly input to the engine controller by actual measurement of voltage or with failure diagnosis tool of engine controller.

B Adjustment trouble shooting



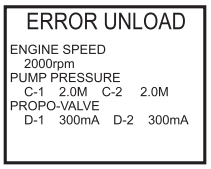
2) In cases where the adjustment of pump can not be performed; And "ERROR PUMP" is displayed.
Judging condition 1:
P1 and P2 average pump pressure at the time when the adjustment is completed is 25MPa or less.
Judging condition 2:
The adjustment does not complete although the pump proportional valve current reaches to the specified value.

The P1 and P2 pump pressures usually increase to 33~38MPa.
When the pressure does not increase;

a. Identify the reason why the pressure does not increase,
   - Check that the relief valve operates normally.
   - Check that the hydraulic circuit is free from leak of pressure.
   - Check that the pressure sensor functions normally.
     And so on.

b. Identify the reason why the actual flow rate does not increase,
   - Check that the pump proportional valve operates normally.
   - Check that the pump regulator operates normally.
     And so on.

C Adjustment Trouble shooting



3) In cases where unloading valve can not be performed; And "ERROR UNLOAD" is displayed.
Judging condition 1:
The pump pressure does not increase up to the pressure in the range of the specified adjustment. Or the increased pressure is held as it is.
Judging condition 2:
Pressure sensor of either P1 pump or P2 pump is failed.

Normally the pump pressures of P1 and p2 pumps gradually increase to 10~25MPa.
(It may be affected by operating oil temperature.)

When the pump pressure does not increase;

a. Identify the reason why the pressure does not increase,
   - Check that the relief valve operates normally.
   - Check that the hydraulic circuit is free from leak of pressure.
   - Check that the pressure sensor functions normally.
     And so on.

(5) Other precautions:

1) In the event of a failure, there is case where the adjustment may not be performed normally.
First serve the machine, and perform the adjustment work.

2) In the condition where large load is constantly applied to engine, the adjustment could not be performed normally.

Note

For machines equipped with lifting magnet, turn the generator OFF.

13.9.3 OPERATIONS IN THE EVENT OF A FAILURE OF EQUIPMENT OF mechatronics CONTROLLER

(1) Engine emergency mode

When the trouble occurs and the control of engine is impossible, the engine speed can be controlled by operating emergency acceleration (E-27) provided on the seat rear side. (See Fig. 13-36)

Operating procedure:

1) Set the emergency acceleration to NORMAL position.
2) Start engine.
3) Turn the emergency acceleration to HI side and control the engine speed.
4) When stopping the engine, set the emergency acceleration to NORMAL position before stopping.

Never increase the engine speed immediately after starting engine. It is dangerous.
To avoid this danger, repeat the above procedure, or the engine speed does not increase.
When the machine does not operate, set the emergency acceleration to NORMAL position.

(2) Pump emergency mode

In the event where a failure of P1 or P2 pump proportional valve represented in items of self diagnosis is indicated on multi display provided on the gauge cluster, the full power control of pump and positive control through mechatronics controller are unavailable. Then the P1 and P2 pumps are automatically switched to emergency mode, making the operation with the power shift control of pump and the constant power control by means of self-pressure possible. But be careful that, at emergency mode, the accuracy of inching becomes poor, the frequency of engine down is increased, and the engine stalls in LOW speed condition.

CAUTION

The emergency mode should be firmly used in case of emergency. We recommend that the defective section is repaired through troubleshooting as early as possible.

MECHATRO CONTROLLER ADJUSTMENT A-B-C {SK350-8 ONLY}

ENGINE CONTROL INPUT / OUTPUT

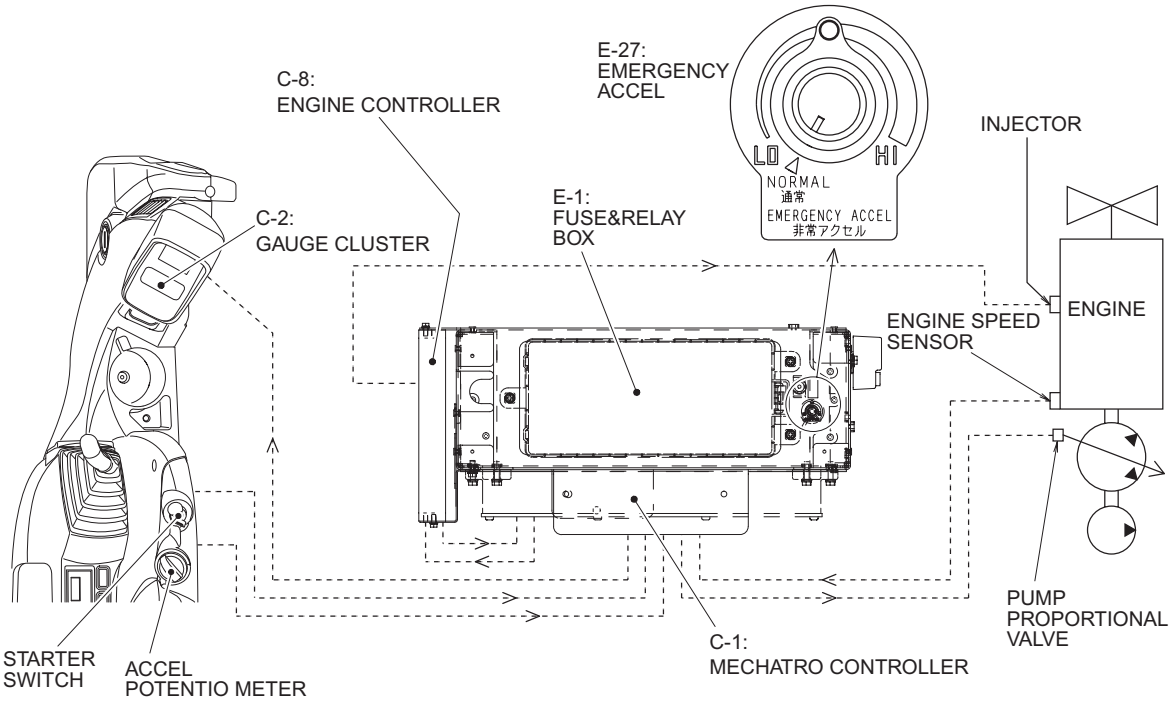


Fig. 13-34 INPUT / OUTPUT

ADJUSTMENT OF MECHATRONICS CONTROLLER A-B-C ADJUSTMENT - SK350 ONLY

PURPOSE OF THE ADJUSTMENT

There are 3 kinds of adjustments of the mechatronics controller as shown below; every adjustment is an essential function to ensure performance of machine.

(1) **A adjustment** - Adjustment of engine
This adjustment is performed to set the relation between the acceleration command voltage output from mechatro controller to engine controller and the engine speed.

(2) **B adjustment** - Adjustment of pump
This adjustment is performed to correct the output variation by coordinating the output hydraulic pressure with engine rated output.

(3) **C adjustment** - Adjustment of unloading valve
This adjustment is performed to correct the manufacturing variation of unloading valves to improve the operability further.

CONDITIONS WHERE ADJUSTMENT OF MECHATRONICS CONTROLLER IS REQUIRED:

When the following parts are replaced or repaired, adjustment must be carried out without failure.

(1) Mechatronics controller
(2) Engine or engine controller
(3) Hydraulic pump or hydraulic pump proportional valve
(4) Unloading proportional valve, spool of unloading valve
(5) Engine High Pressure fuel pump (HP pump) and/or Suction Control Valve (SCV valve)
(6) Down load of Mechatronic or Engine controller software.

MACHINE PREPARATION

(1) Raise the oil temperature to about 50°C (122°F) to warm up the engine.

(2) Place the air-con system to the “OFF” position.

(3) Turn the starter key switch OFF to stop the engine.

Notice:

When the main mechatronic controller C-1 was replaced, the following error codes are displayed because the adjustment data has never been entered into the controller memory.

Error Codes Displayed - **A215, A225, A015, A025, A035**

Note: If any other error codes other than those shown above appear on cluster gauge this may suggest failures of other systems on the machine, repair the machine proper operating condition according to Error Code List.

ADJUSTMENT PROCEDURE "A" - SK350 ONLY

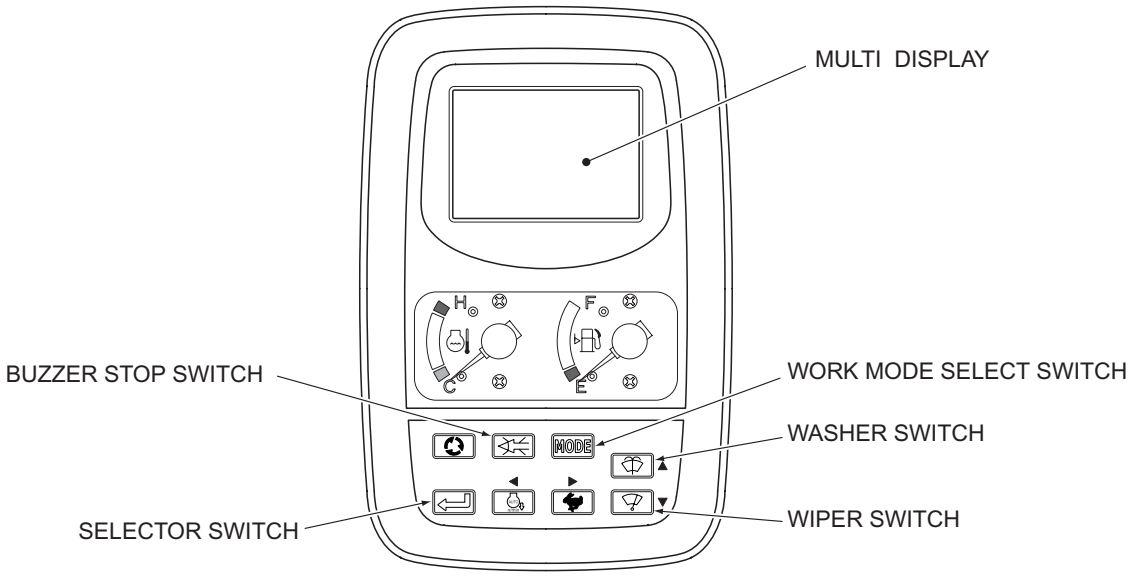
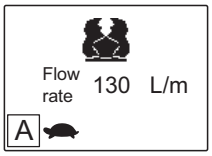


Fig. 13-35 Gauge cluster

(1) Adjustment of engine ("A" adjustment)

Procedure

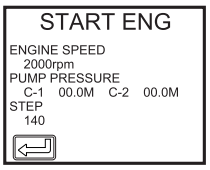
1) Turn starter key switch ON keeping the work mode selector switch on the gauge cluster pressed, and hold it for 5~10 seconds, and then release it. (If the engine is started, the following indication is not displayed. Therefore do not start the engine.)



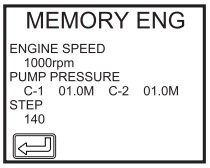
2) Keep buzzer stop switch on gauge cluster pressed for 5 seconds and release it and the screen for selecting adjustment is displayed. When adjustment data is not entered in mechatro controller, "READY" is indicated. If the adjustment operation is once performed, "FIN" is indicated.
And the lever lock solenoid is automatically released, disabling all operations.



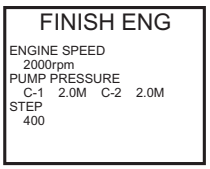
3) Press selector switch on gauge cluster to display "START ENG".
"Engine SPEED", P1, P2 "PUMP PRESSURE" and "STEP" (acceleration command voltage) are indicated.



4) After starting engine, press selector switch on gauge cluster, and "MEMORY ENG" is displayed, the engine speed is automatically increased, and the adjustment of engine is performed.



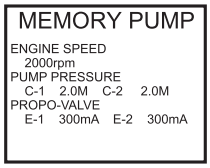
5) When normal HIGH idling speed is detected, the adjustment is completed. And "FINISH ENG" is displayed.
Do not shut off Keyswitch or press any buttons on gauge cluster as the final two procedure (Adjustment "B", Adjustment "C") must be performed before the procedure is complete.



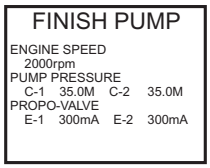
ADJUSTMENT PROCEDURE “B” - SK350 <u>ONLY</u>

Procedure

1) The adjustment automatically shifts from engine to pump, the speed shifts from LOW idling to HIGH idling. And "MEMORY PUMP" is displayed. And the unloading proportional valve and pump proportional valve actuate, accordingly the loading of pump is increased.
   The "ENGINE SPEED", P1, P2 "PUMP PRESSURE" and P1, P2 pump "PROPO-VALVE" current (command value) are indicated.



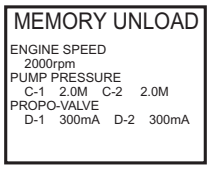
2) After detection of the engine rated speed, the adjustment of pump is automatically completed. And "FINISH PUMP" is displayed.
   Do not shut off Keyswitch or press any buttons on gauge cluster as the final procedure (Adjustment “C”) must be performed before the procedure is complete.



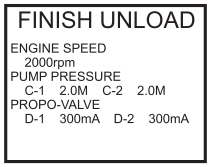
ADJUSTMENT PROCEDURE “C” - SK350 <u>ONLY</u>

Procedure

1) The adjustment shifts from pump to unloading, and the unloading valve actuates, accordingly the pump pressure is detected. And "MEMORY UNLOAD" is displayed.
   The "ENGINE SPEED", P1, P2 "PUMP PRESSURE" and P1, P2 "PROPO-VALVE" voltage (command value) are indicated.



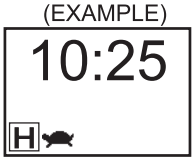
2) When the unloading valve operates to the specified value, the adjustment of unloading proportional valve is automatically terminated. And "FINISH UNLOAD" is displayed.
   The speed is shifted to the speed corresponding to acceleration potentiometer. The adjusting current value is indicated on the display of current of P1, P2 unloading proportional valves. The adjusting range is usually 520~635mA.



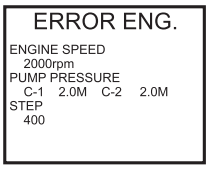
3) Once normal status screen appears on the cluster gauge the procedure is complete. Place the key switch in the “OFF” position and allow engine to shut off and electrical system and battery relay to power down.

   (The adjusted data is automatically stored.)

MULTI DISPLAY
(EXAMPLE)



Trouble Shooting Failed Procedure A-B-C - SK350 ONLY

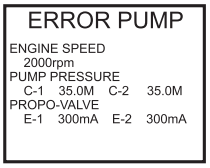


Corrective actions to when the adjustment can not be performed;

1) In cases where the adjustment of engine " **A** " can not be performed; And ERROR ENG" is displayed.
   Judging condition: The read engine speed is 50rpm lower than the last value.

   It is conceived that the error is caused by the speed read error, pump load applied to the engine and unusual acceleration command voltage applied to the engine controller in the course of adjustment.

   a. Checking speed sensor: Check that it is free from wrong reading of speed due to engine vibration.
   b. Checking load applied to pump: Check that it is free from abnormal increase of pump pressure during adjustment of engine through adjustment screen.
   c. Checking acceleration command voltage: Measure the acceleration command voltage output from mechatro controller to engine controller. Check that signal is regularly input to the engine controller by actual measurement of voltage or with failure diagnosis tool of engine controller.

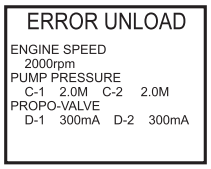


2) In cases where the adjustment of pump " **B** " can not be performed; And "ERROR PUMP" is displayed.
   Judging condition 1:
   P1 and P2 average pump pressure at the time when the adjustment is completed is 25MPa or less.
   Judging condition 2:
   The adjustment does not complete although the pump proportional valve current reaches to the specified value.

   The P1 and P2 pump pressures usually increase to 33~38MPa (4785~5510psi).
   When the pressure does not increase;

   a. Identify the reason why the pressure does not increase,
      - Check that the relief valve operates normally.
      - Check that the hydraulic circuit is free from leak of pressure.
      - Check that the pressure sensor functions normally.
        And so on.
   b. Identify the reason why the actual flow rate does not increase,
      - Check that the pump proportional valve operates normally.
      - Check that the pump regulator operates normally.
        And so on.

3) In cases where unloading valve " **C** "can not be performed; And "ERROR UNLOAD" is displayed.
Judging condition 1:
The pump pressure does not increase up to the pressure in the range of the specified adjustment. Or the increased pressure is held as it is.
Judging condition 2:
Pressure sensor of either P1 pump or P2 pump is failed.



Normally the pump pressures of P1 and p2 pumps gradually increase to 10~25MPa (1450~3625psi).
(It may be affected by operating oil temperature.)

When the pump pressure does not increase;

a. Identify the reason why the pressure does not increase,
   - Check that the relief valve operates normally.
   - Check that the hydraulic circuit is free from leak of pressure.
   - Check that the pressure sensor functions normally.
     And so on.

(5) Other precautions:

1) In the event of a failure, there is case where the adjustment may not be performed normally.
First serve the machine, and perform the adjustment work.

2) In the condition where large load is constantly applied to engine, the adjustment could not be performed normally.

Note

For machines equipped with lifting magnet, turn the generator OFF.

13.9.3 OPERATIONS IN THE EVENT OF A FAILURE OF EQUIPMENT OF MECHATRO CONTROLLER

(1) Engine emergency mode

When the trouble occurs and the control of engine is impossible, the engine speed can be controlled by operating emergency acceleration (E-27) provided on the seat rear side. (See Fig. 13-34)

Operating procedure:

1) Set the emergency acceleration to NORMAL position.
2) Start engine.
3) Turn the emergency acceleration to HI side and control the engine speed.
4) When stopping the engine, set the emergency acceleration to NORMAL position before stopping.

Never increase the engine speed immediately after starting engine. It is dangerous.
To avoid this danger, repeat the above procedure, or the engine speed does not increase.
When the machine does not operate, set the emergency acceleration to NORMAL position.

(2) Pump emergency mode

In the event where a failure of P1 or P2 pump proportional valve represented in items of self diagnosis is indicated on multi display provided on the gauge cluster, the full power control of pump and positive control through mechatro controller are unavailable. Then the P1 and P2 pumps are automatically switched to emergency mode, making the operation with the power shift control of pump and the constant power control by means of self-pressure possible. But be careful that, at emergency mode, the accuracy of inching becomes poor, the frequency of excessive engine pull down is increased, and the engine can be stalled at LOW speed conditions.

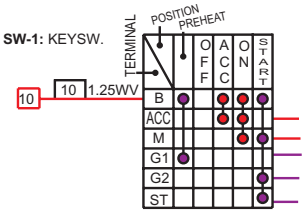
CAUTION

The emergency mode should be used in case of emergency. We recommend that the defective section of the machine be investigated and repaired through troubleshooting as early as possible.

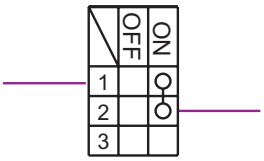
[MEMO]

https://truckmanualshub.com/

ELECTRICAL SCHEMATIC SYMBOLS



Key Switch -
The Keyswitch is a 5 position key activated switch



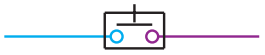
Two Position Rocker Switch
Example : Swing Parking Brake Switch



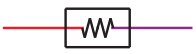
Normally Open Switch
Example : Air cleaner



Normally Closed Switch
Example : Oil Pressure



Momentary Push Switch
Example : Horn Button



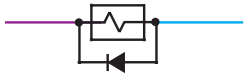
Resistor
commonly show with a value



Diode
commonly show with id number above or below



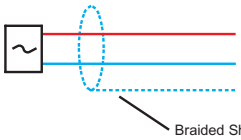
Ground Source



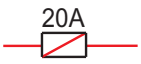
Solenoid Valve
On/Off Type



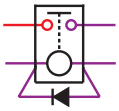
Solenoid Valve
Proportional type



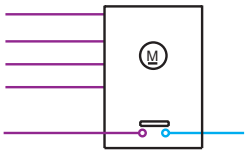
Sensor
Example : RPM Sensor



Fuse
Amp rating above symbol



Relay
Example : Starter Relay



Stepping Motor
Example : M-2 Governor Motor



Potentiometer
Example : Throttle Potentiometer



Fuseable Link
with Amp rating to the side



Sensor
Example : Pilot Low Pressure Sensor



Fuse Number
Location of fuse in fuse box
Note: Number in box is not amp rating



Circuit In - id arrow
Will house the number in a circuit and give info for the component it receives source from



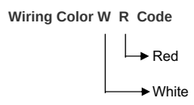
Circuit out - id arrow
Will house the number in a circuit and give info for the component it sends source to

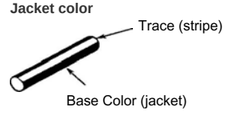
https://truckmanualshub.com/

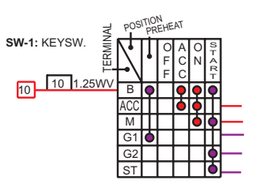
Chapter 10 - ELECTRIC SCHEMATICS

SK350

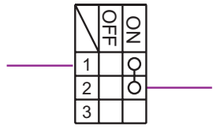
Wire color list							
Symbol	Color	Symbol	Color	Symbol	Color	Symbol	Color
B	Black	W	White	Br	Brown	V	Violet
G	Green	Y	Yellow	Lg	Light Green		
L	Blue	P	Pink	Gr	Gray		
R	Red	O	Orange	Sb	Sky Blue		







Key Switch -
The Keyswitch is a 5 position key activated switch



Two Position Rocker Switch
Example : Swing Parking Brake Switch



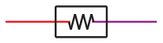
Normally Open Switch
Example : Air cleaner



Normally Closed Switch
Example : Oil Pressure



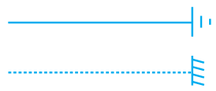
Momentary Push Switch
Example : Horn Button



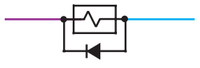
Resistor
commonly show with a value



Diode
commonly show with id number above or below



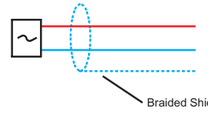
Ground Source



Solenoid Valve
On/Off Type



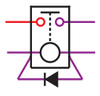
Solenoid Valve
Proportional type



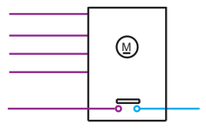
Sensor
Example : RPM Sensor



Fuse
Amp rating above symbol



Relay
Example : Starter Relay



Stepping Motor
Example : M-2 Governor Motor



Potentiometer
Example : Throttle Potentiometer



Fuseable Link
with Amp rating to the side



Sensor
Example : Pilot Low Pressure Sensor



Fuse Number
Location of fuse in fuse box
Note: Number in box is not amp rating



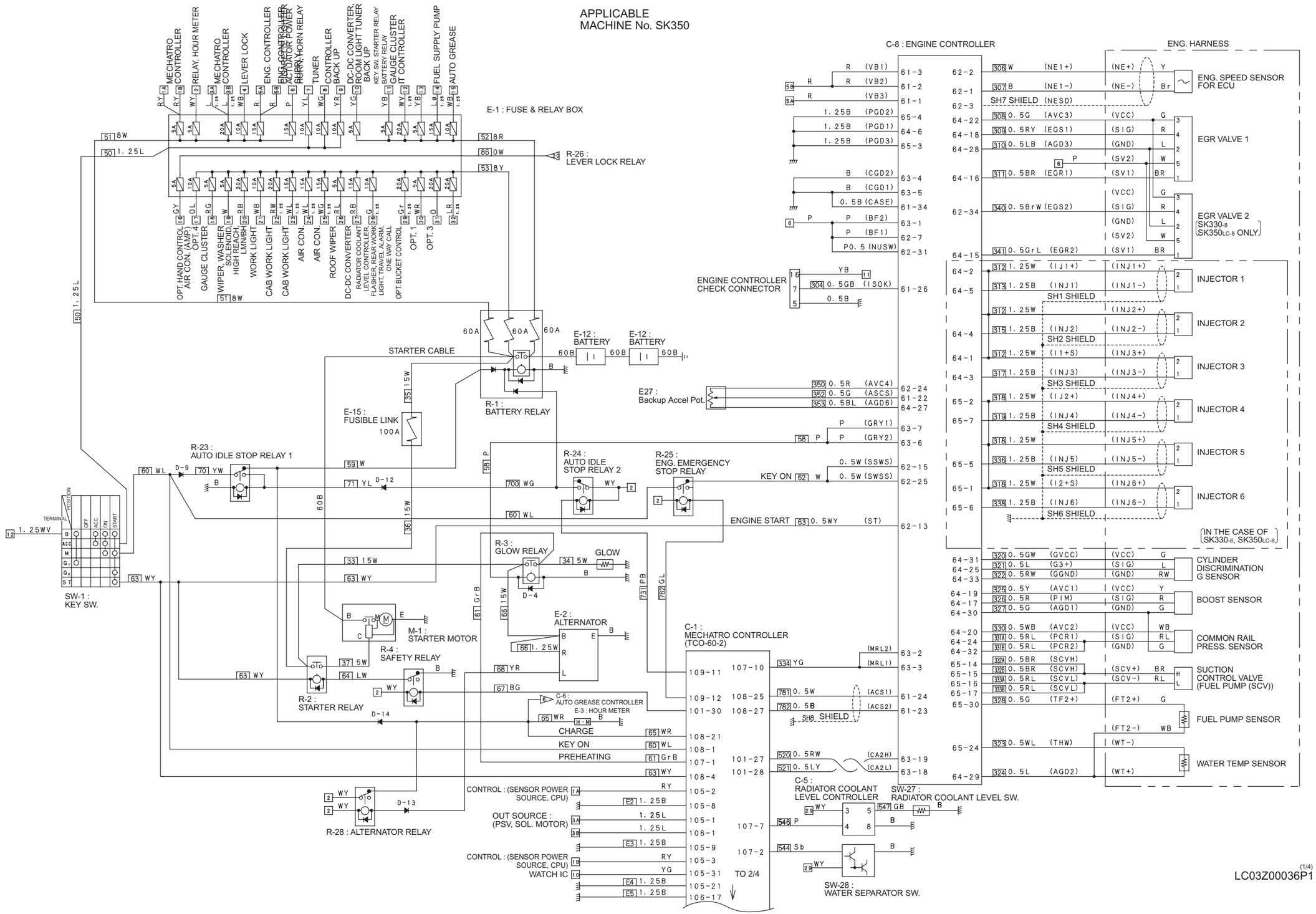
Circuit In - id arrow
Will house the number in a circuit and give info for the component it receives source from



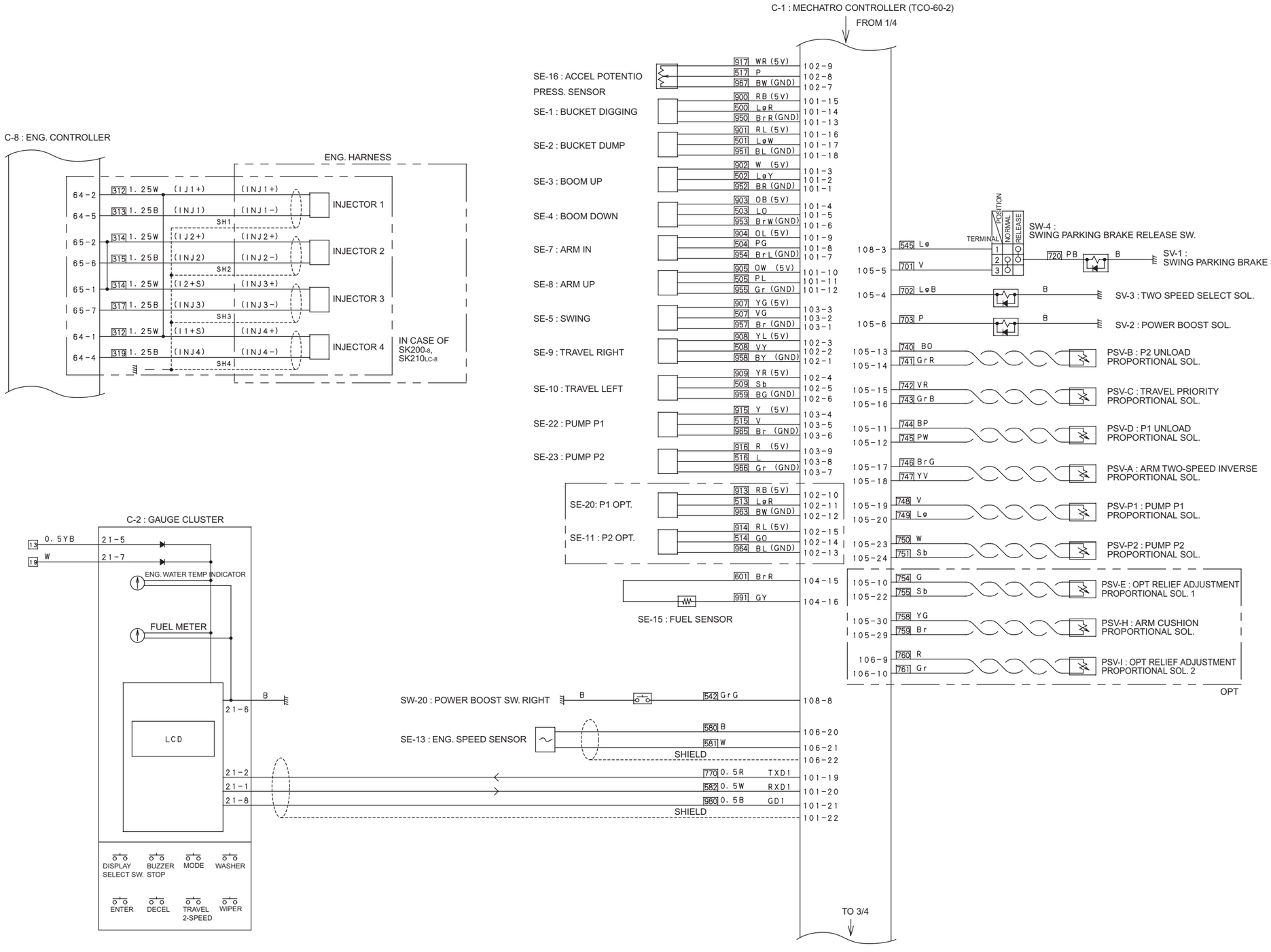
Circuit out - id arrow
Will house the number in a circuit and give info for the component it sends source to

Issue	Date of Issue	Applicable Machines	Remarks
First edition	July, 2006	SK330–8 : LC10-07001~ SK350LC–8 : YC10-03501~	S5LC2311E01 SC

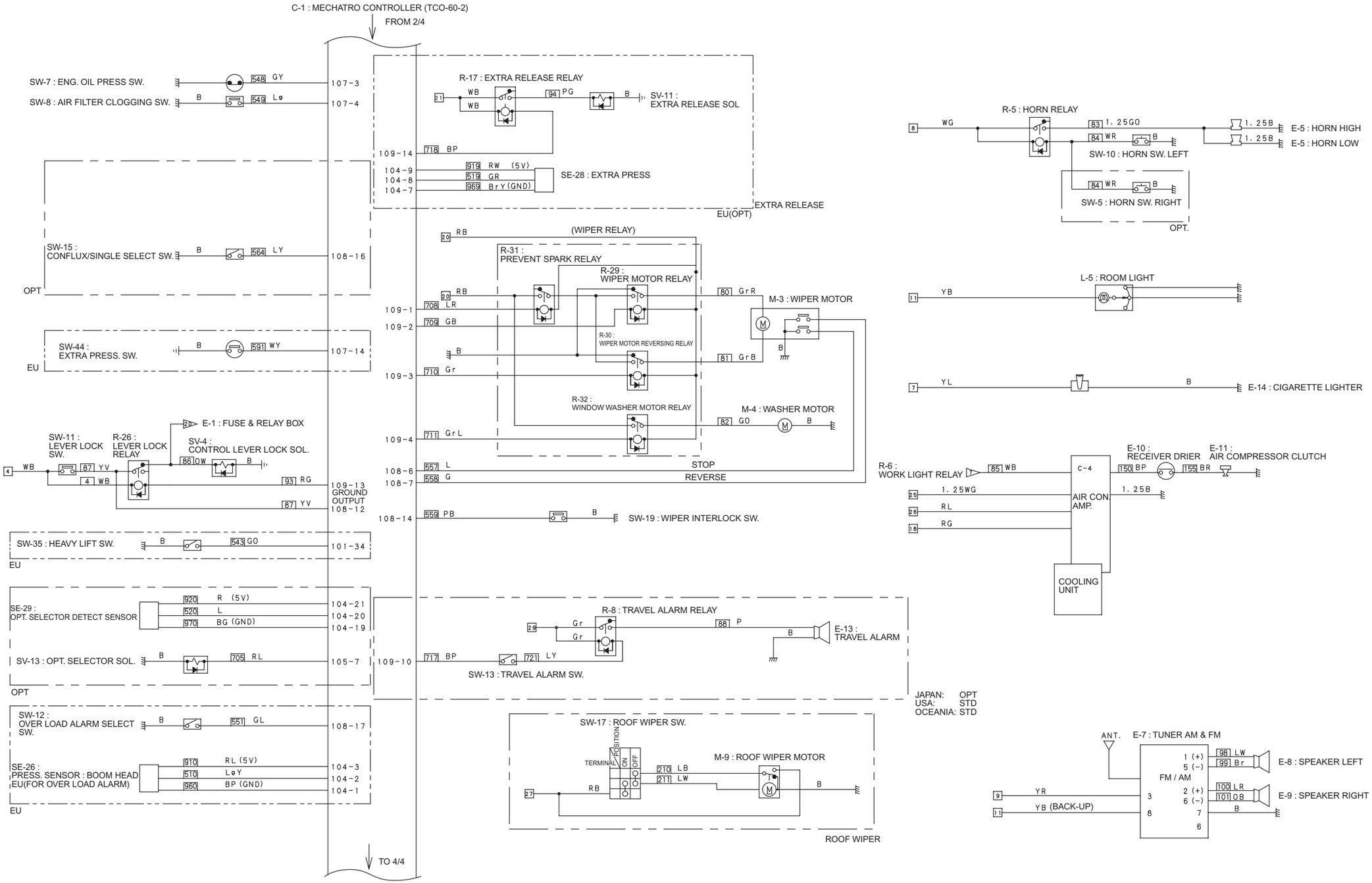
23.1 ELECTRIC CIRCUIT DIAGRAM

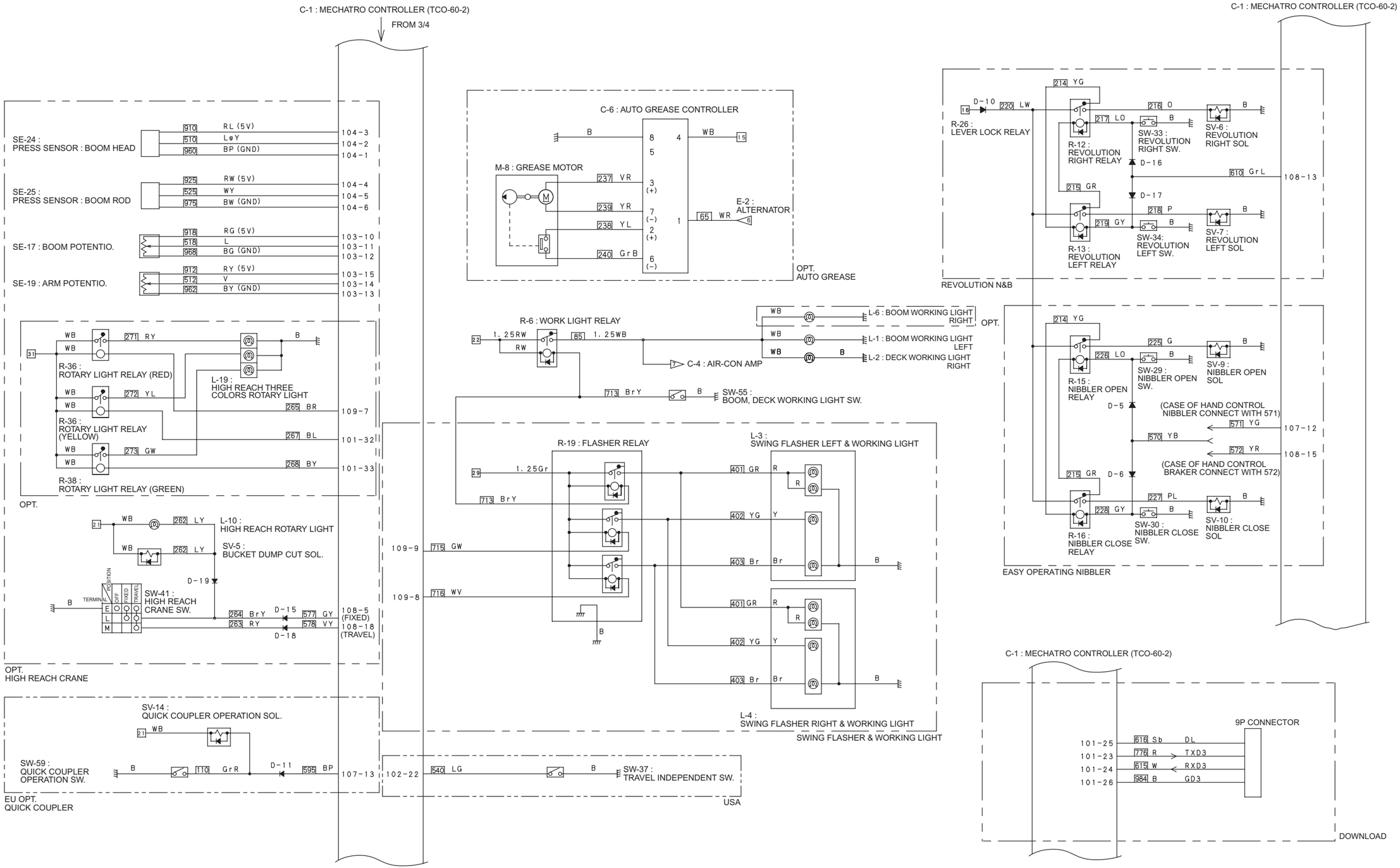


LC03Z00036P1 (1/4) 02



(2/4)
LC03Z00036P1 02


C-1 : MECHATRO CONTROLLER (TCO-60-2)
FROM 2/4
SW-7 : ENG. OIL PRESS SW.
548 GY
107-3
SW-8 : AIR FILTER CLOGGING SW.
B
549 Lg
107-4
R-17 : EXTRA RELEASE RELAY
21
WB
WB
94 PG
B
SV-11 :
EXTRA RELEASE SOL
109-14
718 BP
104-9
919 RW (5V)
104-8
519 GR
104-7
969 BrY(GND)
SE-28 : EXTRA PRESS
EXTRA RELEASE
EU(OPT)
SW-15 :
CONFLUX/SINGLE SELECT SW.
B
564 LY
108-16
OPT
(WIPER RELAY)
20 RB
R-31 :
PREVENT SPARK RELAY
R-29 :
WIPER MOTOR RELAY
20 RB
708 LR
109-1
709 GB
109-2
80 GrR
M-3 : WIPER MOTOR
R-30 :
WIPER MOTOR REVERSING RELAY
B
710 Gr
109-3
81 GrB
R-32 :
WINDOW WASHER MOTOR RELAY
M-4 : WASHER MOTOR
82 GO
B
711 GrL
109-4
SW-44 :
EXTRA PRESS. SW.
B
591 WY
107-14
EU
E-1 : FUSE & RELAY BOX
SW-11 :
LEVER LOCK
SW.
R-26 :
LEVER LOCK
RELAY
SV-4 :
CONTROL LEVER LOCK SOL.
4 WB
87 YV
86 OW
B
4 WB
93 RG
109-13
GROUND
OUTPUT
87 YV
108-12
557 L
108-6
558 G
108-7
STOP
REVERSE
559 PB
108-14
B
SW-19 : WIPER INTERLOCK SW.
SW-35 : HEAVY LIFT SW.
B
543 GO
101-34
EU
SE-29 :
OPT. SELECTOR DETECT SENSOR
920 R (5V)
104-21
520 L
104-20
970 BG (GND)
104-19
SV-13 : OPT. SELECTOR SOL.
B
705 RL
105-7
OPT
R-8 : TRAVEL ALARM RELAY
29 Gr
Gr
88 P
B
E-13 :
TRAVEL ALARM
109-10
717 BP
721 LY
SW-13 : TRAVEL ALARM SW.
JAPAN: OPT
USA: STD
OCEANIA: STD
SW-12 :
OVER LOAD ALARM SELECT
SW.
B
551 GL
108-17
SW-17 : ROOF WIPER SW.
POSITION
TERMINAL
ON
OFF
210 LB
211 LW
M-9 : ROOF WIPER MOTOR
27 RB
B
ROOF WIPER
SE-26 :
PRESS. SENSOR : BOOM HEAD
EU(FOR OVER LOAD ALARM)
910 RL (5V)
104-3
510 LgY
104-2
960 BP (GND)
104-1
EU
TO 4/4
R-5 : HORN RELAY
8 WG
83 1.25GO
84 WR
B
1.25B
E-5 : HORN HIGH
1.25B
E-5 : HORN LOW
SW-10 : HORN SW. LEFT
84 WR
B
SW-5 : HORN SW. RIGHT
OPT.
L-5 : ROOM LIGHT
11 YB
7 YL
B
E-14 : CIGARETTE LIGHTER
R-6 :
WORK LIGHT RELAY
7
85 WB
25 1.25WG
26 RL
18 RG
C-4
AIR CON.
AMP.
1.25B
E-10 :
RECEIVER DRIER
E-11 :
AIR COMPRESSOR CLUTCH
150 BP
155 BR
COOLING
UNIT
ANT.
E-7 : TUNER AM & FM
1 (+)
5 (-)
FM / AM
2 (+)
6 (-)
3
8
7
6
98 LW
99 Br
E-8 : SPEAKER LEFT
100 LR
101 OB
E-9 : SPEAKER RIGHT
B
9 YR
11 YB (BACK-UP)



(4/4)
LC03Z00036P1 02

23.2 ELECTRICAL EQUIPMENT LIST

GROUP	CODE	NAME	PARTS No.
(C) CONTROLLER	C-1	MECHATRO CONTROLLER (TCO-60-2)	YN22E00214F1 (HARD)
	C-2	GAUGE CLUSTER	YN59S00021F1
	C-4	AIR-CON CONTROLLER (INCLUDING PANEL)	YN20M01468P1
	C-5	ENGINE COOLANT LEVEL CONTROLLER	VHS834701230B
	C-8	ENGINE CONTROLLER	VH89661E0010
(D) DIODE	D-4	DIODE	HARNESS ACCESSORY
	D-5	DIODE	ACCESSORY OF RELAY BOX
	D-6	DIODE	↑
	D-9	DIODE	↑
	D-10	DIODE	↑
	D-12	DIODE	↑
	D-13	DIODE	↑
	D-14	DIODE	↑
	D-15	DIODE	↑
	D-16	DIODE	↑
	D-17	DIODE	↑
(E) ELECTRIC FITTINGS	E-1	FUSE AND RELAY BOX	YN24E00016F1
	E-2	ALTERNATOR	VHS270402500
	E-3	HOUR METER	YT58S00006P1
	E-5	HORN HIGH	LC53S00001D1
	E-6	HORN LOW	LC53S00001D2
	E-7	TUNER AM/FM (For Oceania)	YN54S00046P1
	E-8	SPEAKER LEFT (For Oceania)	YN54S00006P1
	E-9	SPEAKER RIGHT (For Oceania)	↑
	E-10	RECEIVER DRYER	YN54S00041P1
	E-11	AIR-CON COMPRESSOR	YX91V00001F1
	E-12	BATTERY	YN72S00014P1
	E-13	TRAVEL ALARM (For Australia)	YN53S00004F1
	E-14	CIGARETTE LIGHTER	YN81S00003P1
	E-15	FUSIBLE LINK	LC13E01175S002
	E-27	RESISTER FOR EMERGENCY (POTENTIO METER)	YN52S00052P1

GROUP	CODE	NAME		PARTS No.
(L) LIGHT	L-1	BOOM WORK LIGHT (LH)		YW80S00001F1
	L-2	DECK WORK LIGHT (RH)		YT80S00002F2
	L-3	SWING FLASHER (LH) & REAR WORK LIGHT		YM80S00001F1
	L-4	SWING FLASHER (RH) & REAR WORK LIGHT		YM80S00001F2
	L-5	ROOM LIGHT		YT80S00001P1
	L-6	BOOM WORK LIGHT (RH)		YW80S00001F1
	L-7	CAB WORK LIGHT FRONT (For SE.Asia)		YT80S00002F2
(M) MOTOR	M-1	STARTER MOTOR		VHS281002894A
	M-3	WIPER MOTOR		YN53C00012F2
	M-4	WASHER MOTOR		YN54C00001F1
	M-9	ROOF WIPER MOTOR		YN76S00005P1
(P) PROPORTIONAL SOLENOID VALVE	PSV-A	ARM 2 SPEED INVERSE PROPO.VALVE	(YN35V00047F1) SOLENOID VALVE ASSY	YN35V00049F1
	PSV-B	P2 UNLOAD PROPO.VALVE		YN35V00048F1
	PSV-C	TRAVEL STRAIGHT PROPO.VALVE		↑
	PSV-D	P1 UNLOAD PROPO.VALVE		↑
	PSV-P1	P1 PUMP PROPO.VALVE	(LC10V00014F1) PUMP	YN35V00052F1
	PSV-P2	P2 PUMP PROPO.VALVE		↑
(R) RELAY	R-1	BATTERY RELAY		YN24S00008F1
	R-2	STARTER RELAY		VHS283001271A
	R-3	GLOW RELAY		VHS286201420A
	R-4	SAFETY RELAY		YN24S00010P1
	R-5	HORN RELAY		↑
	R-6	WORKING LIGHT RELAY		↑
	R-8	TRAVEL ALARM RELAY (For Australia)		↑
	R-10	CAB WORK LIGHT RELAY (For SE.Asia)		↑
	R-19	FLASHER RELAY		YY24S00001F1
	R-23	AUTO IDLE STOP RELAY 1		YN24S00010P1
	R-24	AUTO IDLE STOP RELAY 2		↑
	R-25	ENGINE EMERGENCY STOP RELAY		↑
	R-26	LEVER LOCK RELAY		↑
	R-28	ALTERNATOR RELAY		↑
	R-29	WIPER MOTOR RELAY (NORMAL ROTATION)		↑
	R-30	WIPER MOTOR RELAY (REVERSE ROTATION)		↑
	R-31	WIPER MOTOR RELAY (ARC PREVENTION)		↑
	R-32	WASHER MOTOR RELAY		↑

GROUP	CODE	NAME		PARTS No.
(SE) SENSOR	SE-1	PRESSURE SENSOR : BUCKET DIGGING		YX52S00013P1
	SE-2	PRESSURE SENSOR : BUCKET DUMP		↑
	SE-3	PRESSURE SENSOR : BOOM UP		↑
	SE-4	PRESSURE SENSOR : BOOM DOWN		↑
	SE-5	PRESSURE SENSOR : SWING		↑
	SE-7	PRESSURE SENSOR : ARM IN		↑
	SE-8	PRESSURE SENSOR : ARM OUT		↑
	SE-9	PRESSURE SENSOR : TRAVEL RH		↑
	SE-10	PRESSURE SENSOR : TRAVEL LH		↑
	SE-11	(PRESSURE SENSOR : P2 OPT.)		↑
	SE-13	E/G SPEED SENSOR		VHS894101290A
	SE-15	FUEL SENSOR		YN52S00045F1
	SE-16	ACCEL POTENTIOMETER		YN52S00032P1
	SE-20	(PRESSURE SENSOR : P1 OPT.)		YX52S00013P1
	SE-22	PRESSURE SENSOR : PUMP P1		YN52S00048P1
	SE-23	PRESSURE SENSOR : PUMP P2		↑
(SV) SOLENOID	SV-1	SWING PARKING BRAKE SOL.	(YN35V00047F1) SOLENOID VALVE ASSY	YN35V00051F1
	SV-2	POWER BOOST SOL		YN35V00050F1
	SV-3	TWO SPEED SELECT SOL		↑
	SV-4	SAFETY LOCK LEVER SOL		↑
(SW) SWITCH	SW-1	KEY SWITCH		YN50S00026F1
	SW-4	SWING PARKING BRAKE RELEASE SWITCH		YT50E00001F1
	SW-5	HORN SWITCH (RH)		YN50E00017P1
	SW-7	E/G OIL PRESSURE SWITCH		VHS835301471D
	SW-8	AIR FILTER CLOGGING SWITCH		YR11P00008S005
	SW-10	HORN SWITCH (LH)		YN50E00017P1
	SW-11	SAFETY LOCK LEVER SWITCH		YN50S00041F1
	SW-13	TRAVEL ALARM SWITCH (For Australia)		YN50S00040DF
	SW-15	(CONFLUX/SINGLE SELECT SWITCH)		YN50S00040DD
	SW-17	(SKYLIGHT WIPER SWITCH)		YN50S00040D9
	SW-19	WIPER INTERLOCK SWITCH		YT50S00004P1
	SW-20	POWER BOOST SWITCH (RH)		YN50E00017P1
	SW-21	POWER BOOST SWITCH (LH)		↑
	SW-27	COOLANT LEVEL SWITCH		VHS834601510A
	SW-28	WATER SEPARATOR SWITCH		VHS233002800A
	SW-55	BOOM WORK LIGHT SWITCH		YN50S00040D1

NOTE : The parts number may be changed due to the improvement of machine, so use the number for reference only.

23.3 HARNESS

23.3.1 HARNESS LIST

INDEX No.		EQUIPMENT			HARNESS				REMARKS
GROUP	ITEM	NAME	ASSY No.		ITEM	NAME	PART No.		
			SE. ASIA	OCEANIA			SE. ASIA	OCEANIA	
UPPER FRAME	3.2	INSTRUMENT PANEL ASSY	YN17M00053F1	YN17M00054F1					
	3.3	CONTROLLER INSTALL (ENGINE)	YN22E00220F1	←					
		CONTROLLER INSTALL	YN22E00219F1	←					
	3.4	RADIO INSTALL	YN54E00008F1	YN54E00017F1					
	3.5	UPPER ELECTRIC ASSY	LC03E00008F1	←					
	3.6	UPPER HARNESS ASSY	LC13E00031F1	←	1	HARNESS	LC13E01184P2	←	UPPER
					2	CABLE	LC13E01145P2	←	BATTERY ~ BATTERY
					3	CABLE	LC13E01176P2	←	BATTERY ~ RELAY
					4	CABLE	LC13E01245P1	←	BATTERY ~ GROUND
					5	CABLE	LC13E01175P2	←	STARTER
					6	HARNESS	LC13E01185P2	←	ECU HARNESS
					48	CABLE	LE13E01006P1	←	FLOOR GROUND
					51	CABLE	LC13E01177P1	←	ENGINE GROUND
					54	CABLE	LC13E01180P2	←	GLOW RELAY ~ STARTER RELAY
	3.7	ENGINE HARNESS ASSY	LC16E00010F1	←	1	HARNESS	LC16E01029P2	←	ENGINE SUB
					20	HARNESS	LC16E01028P1	←	AIR CONDITIONER SUB
	3.8	UPPER HARNESS ASSY (FLOOR PLATE)	LC13E00032F1	←	1	HARNESS	YN13E01449P3	←	FLOOR
					4	HARNESS	LC13E01186P1	←	CAB SUB
					9	CABLE	LE13E01005P1	←	FLOOR GROUND
CAB	3.9	CAB HARNESS	LC14E00023F1	←	1	HARNESS	YN14E01102P3	←	CAB
BOOM	3.10	BOOM HARNESS ASSY	LC15E00008F1	←	1	HARNESS	2479Z3130D1	←	BOOM
LIGHT	3.11	BOOM LIGHT INSTALL	LC80E00004F1	←					
	3.12	DECK LIGHT INSTALL	YN80E00049F1	←					
	3.13	CAB LIGHT INSTALL	YN80E00058F1	—	6	HARNESS	YN02C01760P1	—	CAB LIGHT
	3.14	FLASHER LAMP INSTALL	LC80E00011F1	←					
ALARM	3.15	ALARM ASSY	—	YN53E00015F1					

Note

The parts number may be changed due to the improvement of machine, so use the number for reference only.

https://truckmanualshub.com/

Chapter 12
TROUBLE SHOOTING (BY ERROR CODES)

TABLE OF CONTENTS

JUDGMENT OF ACTUAL THING AT SITE 12-3
CLASSIFICATION OF FAILURE AND TROUBLESHOOTING 12-4
THE BLOWN FUSE OF MECHATRO CONTROLLER 12-4
TROUBLESHOOTING BY ERROR CODE 12-4

https://truckmanualshub.com/

Issue	Date of Issue	Applicable Machines	Remarks
First edition	July, 2006	SK330–8 : LC10-07001~ SK350LC–8 : YC10-03501~	S5YN4618E01 (ASIA, OCE) K
↑	August, 2006	SK200–8 : YN11-45001~ SK210LC–8 : YQ11-06001~	↑ K

46.2 CLASSIFICATION OF FAILURE AND TROUBLESHOOTING

Classify failures into the following 3 types and carry out the troubleshooting.

No.	Classes of failure	Troubleshooting
A	When error code after self-diagnosis is displayed on gauge cluster	Carry out troubleshooting according to the error code.
B	When no failure is detected currently but error code after self diagnosis is remained in trouble history	When it is hard to recreate the failure situation, cancel the data in the history and reproduce the failed situation or suppose the cause according to the troubleshooting by error code, and then repair it.
C	When error code after self diagnosis is not displayed or is not remained in the history	• Carry out troubleshooting according to instructions in Chapter 47 "TROUBLESHOOTING BY TROUBLE". • Carry out troubleshooting according to instructions in Chapter 48 "TROUBLE DIAGNOSIS MODE".

46.3 THE BLOWN FUSE OF MECHATRO CONTROLLER

If the fuse of mechatro controller has blown, the following display appears on the gauge cluster.

(1) The blown fuse of mechatro controller

a. Blown fuse 5A of mechatro controller :
"DATA COMMUNICATION ERROR" is displayed on the gauge cluster in the condition where the controller program is not executed.

b. Blown fuse 20A of mechatro controller
The controller functions normally but the power supply applied when the controller drives the solenoid, etc. stops.
Many error codes are displayed on the gauge cluster.
D013, D023, D033, D063,
E013, E023, F021

46.4 TROUBLESHOOTING BY ERROR CODE

When error code was displayed on the gauge cluster with the aid of self-diagnosis display function, carry out the troubleshooting referring to applicable page in the contents of error codes.

Error Code	Trouble	Described page
A015	Engine adjustment (A adjustment) is not adjusted yet or is failed.	46-6
A025	Pump propo. valve adjustment (B adjustment) is not adjusted yet or is failed.	46-6
A035	Unload valve adjustment (C adjustment) is not adjusted yet or is failed.	46-7
A215	Written data of ROM adjustment data is incorrect.	46-7
A225	Writing of ROM adjustment data is incorrect.	46-8
A235	Written data of ROM hour meter data is incorrect.	46-8
A245	Writing of ROM hour meter data is incorrect.	46-9
A255	Writing of proportional valve adjustment data is incorrect.	46-9
B012	Incorrect output of boom up pressure sensor	46-10
B013	Disconnection of boom up pressure sensor	46-10
B014	Short-circuit of boom up pressure sensor	46-11
B022	Incorrect output of boom down pressure sensor	46-11
B023	Disconnection of boom down pressure sensor	46-12
B024	Short-circuit of boom down pressure sensor	46-12

Error Code	Trouble	Described page
B032	Incorrect output of arm out pressure sensor	46-13
B033	Disconnection of arm out pressure sensor	46-13
B034	Short-circuit of arm out pressure sensor	46-14
B042	Incorrect output of arm in pressure sensor	46-14
B043	Disconnection of arm in pressure sensor	46-15
B044	Short-circuit of arm in pressure sensor	46-15
B052	Incorrect output of bucket digging pressure sensor	46-16
B053	Disconnection of bucket digging pressure sensor	46-16
B054	Short-circuit of bucket digging pressure sensor	46-17
B062	Incorrect output of bucket dump pressure sensor	46-17
B063	Disconnection of bucket dump pressure sensor	46-18
B064	Short-circuit of bucket dump pressure sensor	46-18
B072	Incorrect output of swing pressure sensor	46-19
B073	Disconnection of swing pressure sensor	46-19
B074	Short-circuit of swing pressure sensor	46-20
B092	Incorrect output of travel right pressure sensor	46-20
B093	Disconnection of travel right pressure sensor	46-21
B094	Short-circuit of travel right pressure sensor	46-21
B102	Incorrect output of travel left pressure sensor	46-22
B103	Disconnection of travel left pressure sensor	46-22
B104	Short-circuit of travel left pressure sensor	46-23
B113	Disconnection of pressure sensor of optional selector positioning	46-23
B114	Short-circuit of pressure sensor of optional selector positioning	46-24
B162	Incorrect output of P1 optional side pressure sensor	46-24
B163	Disconnection of P1 side optional pressure sensor	46-25
B164	Short-circuit of P1 side optional pressure sensor	46-25
B172	Incorrect output of P2 optional side pressure sensor	46-26
B173	Disconnection of P2 side optional pressure sensor	46-26
B174	Short-circuit of P2 side optional pressure sensor	46-27
C012	Incorrect output of P1 pump pressure sensor	46-27
C013	Disconnection of P1 pump pressure sensor	46-28
C014	Short-circuit of P1 pump pressure sensor	46-28
C022	Incorrect output of P2 pump pressure sensor	46-29
C023	Disconnection of P2 pump pressure sensor	46-29
C024	Short-circuit of P2 pump pressure sensor	46-30
C033	Disconnection of boom head pressure sensor	46-30
C034	Short-circuit of boom head pressure sensor	46-31
C043	Disconnection of boom rod pressure sensor	46-31
C044	Short-circuit of boom rod pressure sensor	46-32
D012	Failure of output transistor ON at P1 unload proportional valve	46-32
D013	Disconnection of P1 unload proportional valve	46-33
D022	Failure of output transistor ON at P2 unload proportional valve	46-33
D023	Disconnection of P2 unload proportional valve	46-34
D032	Failure of output transistor ON at travel straight proportional valve	46-34
D033	Disconnection of travel straight proportional valve	46-35
D062	Failure of output transistor ON at arm in high speed proportional valve	46-35
D063	Disconnection of arm in high speed proportional valve	46-36
E012	Failure of output transistor ON at P1 pump proportional valve	46-36

Error Code	Trouble	Described page
E013	Disconnection of P1pump proportional valve	46-37
E022	Failure of output transistor ON at P2 pump proportional valve	46-37
E023	Disconnection of P2 pump proportional valve	46-38
F011	Failure of output transistor OFF and GND short of attachment boost SOL valve	46-38
F013	Failure of output transistor ON and disconnection of attachment boost SOL valve	46-39
F021	Failure of output transistor OFF and GND short of swing parking SOL valve	46-39
F023	Failure of output transistor ON and disconnection of swing parking SOL valve	46-40
F031	Failure of output transistor OFF and GND short of travel 1-2 speed SOL valve	46-40
F033	Failure of output transistor ON and disconnection of travel 1-2 speed SOL valve	46-41
F041	Failure of output transistor OFF and GND short of optional selector SOL valve	46-41
F043	Failure of output transistor ON and disconnection of optional selector SOL valve	46-42
G032	Overrun of speed sensor of direct input Mechatro-controller	46-42
G033	Disconnection of speed sensor of direct input Mechatro-controller	46-43
G042	Overrun of speed sensor of direct input Mechatro-controller and received data from E/G controller.	46-43
G043	Disconnection of speed sensor of direct input Mechatro-controller and received data from E/G controller.	46-44
H013	Disconnection of acceleration potentio	46-44
H014	Power short-circuit of acceleration potentio	46-45
H023	Disconnection of boom angle potentio	46-45
H024	Power short-circuit of boom angle potentio	46-46
H033	Disconnection of arm angle potentio	46-46
H034	Power short-circuit of arm angle potentio	46-47
H091	Failure of GND short-circuit of fuel sensor	46-47
H093	Disconnection of fuel sensor	46-48
I111	Received error of CAN1 communication (passive error)	46-48
I113	Received error of CAN1 communication (time-out)	46-49
I313	Received error of cluster communication (time-out error)	46-49
K014	Adhesion of battery relay terminal	46-50
R014	Failure of arc prevention relay of wiper motor	46-51
R024	Failure of normal rotation relay of wiper motor	46-52
R034	Failure of reverse rotation relay of wiper motor	46-53
R044	Failure of washer motor relay	46-54
R134	Failure of swing flasher relay	46-54
R144	Failure of swing flasher relay	46-55
R154	Failure of travel alarm relay	46-55
R164	Failure of auto idling stop relay 2	46-56
R174	Failure of engine forcible stop relay	46-57
R184	Failure of lever lock relay	46-58
R214	Failure of safety relay	46-58

Table46-1

Error code		A015		
Trouble		Not yet adjusted engine or failed adjustment of engine (A adjustment)		
Judging condition		Engine adjustment is missed. Or it is impossible to set the adjusting value within the adjusting range.		
Symptom		Deviated from the reqired value, but no problem in normal operations.		
Control in the event of failure		Rotate with the default engine		
Returned in normal condition		The engine adjustment is completed normally.		
Service diagnosis checking screen		Screen No.	2	G-3 SPEED SET
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	•Checking			Carry out engine adjustment (A adjustment). When "ERROR ENG" was displayed during adjustment, refer to the section "Adjustment procedure - Measures to be taken with the adjustment failed"
2	• Mechatro controller			Check that the error is corrected after replacement of controller.
3				

Table46-2

Error code		A025		
Trouble		Not yet adjusted engine or failed adjustment of pump proportional valve (B adjustment)		
Judging condition		Pump proportional valve adjustment is missed. Or it is impossible to set the adjusting value within the adjusting range.		
Symptom		Deviated from the rated output, but no problem in normal operation		
Control in the event of failure		Workable with the default proportional valve output.		
Returned in normal condition		The pump proportional valve adjustment is completed normally.		
Service diagnosis checking screen		Screen No.	9	E-1 P1 PUMP
		Screen No.	9	E-2 P2 PUMP
		Screen No.		
Checking object				Checking contents and remedy
1	•Checking			Carry out pump adjustment (B adjustment). When"ERROR PUMP" was displayed during adjustment, refer to the section "Adjustment procedure - Measures to be taken with the adjustment failed"
2	• Mechatro controller			Check that the error is corrected after replacement of controller.
3				

Table46-3

Error code	A035		
Trouble	Not yet adjusted unload valve or failed adjustment of unload valve (C adjustment)		
Judging condition	The adjustment of unload valve is missed. Or the adjusting value can not be set in the adjusting range.		
Symptom	It is not normal output, but no problem in normal operation		
Control in the event of failure	Work with the aid of output by default proportional valve.		
Returned in normal condition	The adjustment of unload valve is completed normally.		
Service diagnosis checking screen	Screen No.	8	D-1 P1 UN-LOAD (BP-CUT)
	Screen No.	8	D-2 P2 UN-LOAD (BP-CUT)
	Screen No.		
Checking object			Checking contents and remedy
1	•Checking		Carry out adjustment of unload valve (C adjustment). When"ERROR PUMP" was displayed during adjustment, refer to the section "Adjustment procedure - Measures to be taken with the adjustment failed"
2	• Mechatro controller		Check that the error is corrected after replacement of controller.
3			

Table46-4

Error code	A215		
Trouble	The data of ROM adjustment is written incorrectly.		
Judging condition	Check adjustment data, and judge the content of memory is correct or not. (Trouble history only)		
Symptom	No affect.		
Control in the event of failure	Control at side of correct memory data.		
Returned in normal condition	It does not regain. Replace controller.		
Service diagnosis checking screen	Screen No.		
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	Mechatro controller		Check that the error is corrected after replacement of controller.
2			
3			

Table46-5

Error code	A225		
Trouble	The data of ROM adjustment is written incorrectly.		
Judging condition	Check adjustment data, and judge the data is correct or not.		
Symptom	It is not normal output, but no problem in normal operation		
Control in the event of failure	Control can be done by default value.		
Returned in normal condition	It does not regain. Replace controller.		
Service diagnosis checking screen	Screen No.		
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	Mechatro controller		Check that the error is corrected after replacement of controller.
2			
3			

Table46-6

Error code	A235		
Trouble	The data of ROM hourmeter is written incorrectly.		
Judging condition	Check hourmeter memory, and judge the data is correct or not. (Trouble history only)		
Symptom	No affect.		
Control in the event of failure	Control at side of correct memory data.		
Returned in normal condition	It does not regain. Replace controller.		
Service diagnosis checking screen	Screen No.		
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	Mechatro controller		Check that the error is corrected after replacement of controller.
2			
3			

Table46-7

Error code	A245		
Trouble	The data of ROM hourmeter is written incorrectly.		
Judging condition	Check hourmeter memory, and judge the data is incorrect.		
Symptom	The hour meter data which was judged as error is taken as 0 Hr. No problem in normal operation		
Control in the event of failure	Normal control is available.		
Returned in normal condition	It does not regain. Replace controller.		
Service diagnosis checking screen	Screen No.		
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	Mechatro controller		Check that the error is corrected after replacement of controller.
2			
3			

Table46-8

Error code	A255		
Trouble	The data of proportional valve adjustment is written incorrectly.		
Judging condition	Check proportional valve adjustment data, and judge the data is incorrect.		
Symptom	It is not normal output, but no problem in normal operation		
Control in the event of failure	Using fixed value of proportional valve correction data, usual control is done.		
Returned in normal condition	It does not regain. Replace controller.		
Service diagnosis checking screen	Screen No.		
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	Mechatro controller		Check that the error is corrected after replacement of controller.
2			
3			

Table46-9

Error code	B012		
Trouble	Boom up pressure sensor outputs error		
Judging condition	After starter switch ON and engine does not start yet. And the input voltage from the sensor after starter switch ON is in the range of 1.4V or more to less than 4.7V.		
Symptom	The boom up operability becomes poor.		
Control in the event of failure	Normal control		
Returned in normal condition	Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen	Screen No.	5	B-1 BOOM RAISE
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Boom up pressure sensor SE-3		When B012 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between boom up pressure sensor and controller CN-126F CN-101F		When B012 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-10

Error code	B013		
Trouble	Boom up pressure sensor’s wiring disconnects.		
Judging condition	The input voltage from boom up pressure sensor is less than 0.1V.		
Symptom	The boom up speed slows down.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P1 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	5	B-1 BOOM RAISE
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Boom up pressure sensor SE-3		When B013 is cancelled and other error occurs after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between boom up pressure sensor and controller CN-126F CN-101F		When B013 is displayed after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-11

Error code	B014		
Trouble	Boom up pressure sensor's power source is shortcut.		
Judging condition	The input voltage from boom up pressure sensor is 4.7V or more.		
Symptom	The boom up speed slows down.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P1 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	5	B-1 BOOM RAISE
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Boom up pressure sensor SE-3		When B014 is cancelled and other error occurs after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between boom up pressure sensor and controller CN-126F CN-101F		When B014 is displayed after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-12

Error code	B022		
Trouble	Boom down pressure sensor outputs error		
Judging condition	After starter switch ON and engine does not start yet. And the input voltage from the sensor after starter switch ON is in the range of 1.4V or more to less than 4.7V.		
Symptom	The boom down operability becomes poor.		
Control in the event of failure	Normal control		
Returned in normal condition	Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen	Screen No.	5	B-2 BOOM LOWER
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Boom down pressure sensor SE-4		When B022 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between boom down pressure sensor and controller CN-127F CN-101F		When B022 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-13

Error code	B023		
Trouble	Boom down pressure sensor’s wiring is disconnecting.		
Judging condition	The input voltage from boom down pressure sensor is 0.1V or less.		
Symptom	The boom down operability becomes poor.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P1 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	5	B-2 BOOM LOWER
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Boom down pressure sensor SE-4		When B023 is cancelled and other error occurs after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between boom down pressure sensor and controller CN-127F CN-101F		When B023 is displayed after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-14

Error code	B024		
Trouble	Boom down pressure sensor’s power source is shortcut.		
Judging condition	The input voltage from boom down pressure sensor is 4.7V or more.		
Symptom	The boom down operability becomes poor.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P1 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	5	B-2 BOOM LOWER
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Boom down pressure sensor SE-4		When B024 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between boom down pressure sensor and controller CN-127F CN-101F		When B024 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-15

Error code	B032		
Trouble	Arm-in pressure sensor outputs error		
Judging condition	After starter switch ON and engine does not start yet. And the input voltage from the sensor after starter switch ON is in the range of 1.4V or more to less than 4.7V.		
Symptom	The arm-out operability becomes poor.		
Control in the event of failure	Normal control		
Returned in normal condition	Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen	Screen No.	5	B-3 ARM OUT
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Arm-out pressure sensor SE-8	When B032 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between arm-out pressure sensor and controller CN-131F CN-101F	When B032 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-16

Error code	B033		
Trouble	Arm-out pressure sensor’s wiring is disconnecting.		
Judging condition	The input voltage from arm-out pressure sensor is 0.1V or less.		
Symptom	Shock at stopping of arm-out is great.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P1 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	5	B-3 ARM OUT
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Arm-out pressure sensor SE-8	When B033 is cancelled and other error occurs after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between arm-out pressure sensor and controller CN-131F CN-101F	When B033 is displayed after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-17

Error code	B034		
Trouble	Arm-out pressure sensor’s power source is shortcut.		
Judging condition	The input voltage from arm-out pressure sensor is 4.7V or more.		
Symptom	Shock at stopping of arm-out is great.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P1, P2 unload proportional valves to 0mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	5	B-3 ARM OUT
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Arm-out pressure sensor SE-8		When B034 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between arm-out pressure sensor and controller CN-131F CN-101F		When B034 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-18

Error code	B042		
Trouble	Arm-in pressure sensor outputs error		
Judging condition	After starter switch ON and engine does not start yet. And the input voltage from the arm-in pressure sensor after starter switch ON is in the range of 1.4V or more to less than 4.7V.		
Symptom	The arm-in operability becomes poor.		
Control in the event of failure	Normal control		
Returned in normal condition	Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen	Screen No.	5	B-4 ARM IN
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Arm-in pressure sensor SE-7		When B042 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between arm-in pressure sensor and controller CN-130F CN-101F		When B042 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-19

Error code	B043		
Trouble	Arm-in pressure sensor's wiring is disconnecting.		
Judging condition	The input voltage from arm-in pressure sensor is 0.1V or less.		
Symptom	Cavitation occurs at independent work of arm-in. Arm horizontal arm pulling can be barely done but if attachment is pulled in the air, arm falls first. Bucket can drag under the condition that the bucket bottom put on the ground.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P1 and P2 unload proportional valve to 0mA. (Valve emergency mode) Set output of arm 2 arm-in proportional valve to 200mA.		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	5	B-4 ARM IN
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Arm-in pressure sensor SE-7	When B043 is cancelled and other error occurs after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between arm-in pressure sensor and controller CN-130F CN-101F	When B043 is displayed after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-20

Error code	B044		
Trouble	Arm-in pressure sensor's power source is shortcut.		
Judging condition	The input voltage from arm-in pressure sensor is 4.7V or more.		
Symptom	Cavitation occurs at independent work of arm-in. Arm horizontal arm pulling can be barely done but if attachment is pulled in the air, arm falls first. Bucket can drag under the condition that the bucket bottom put on the ground.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P1, P2 unload proportional valves to 0mA. (Valve emergency mode) Set output of arm 2 arm-in proportional valve to 200mA.		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	5	B-4 ARM IN
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Arm-in pressure sensor SE-7	When B044 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between arm-in pressure sensor and controller CN-130F CN-101F	When B044 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-21

Error code	B052		
Trouble	Bucket digging pressure sensor outputs error		
Judging condition	After starter switch ON and engine does not start yet. And the input voltage from the bucket digging pressure sensor after starter switch ON is in the range of 1.4V or more to less than 4.7V.		
Symptom	The bucket digging operability becomes poor.		
Control in the event of failure	Normal control		
Returned in normal condition	Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen	Screen No.	5	B-5 BUCKET DIG
	Screen No.		
	Screen No.		

Checking object		Checking contents and remedy
1	• Bucket digging pressure sensor SE-1	When B052 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between bucket digging pressure sensor and controller CN-124F CN-101F	When B052 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-22

Error code	B053		
Trouble	Bucket digging pressure sensor’s wiring is disconnected.		
Judging condition	The input voltage from bucket digging pressure sensor is 0.1V or less.		
Symptom	The bucket digging speed slows down a little.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P1 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	5	B-5 BUCKET DIG
	Screen No.		
	Screen No.		

Checking object		Checking contents and remedy
1	• Bucket digging pressure sensor SE-1	When B053 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between bucket digging pressure sensor and controller CN-124F CN-101F	When B053 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-23

Error code	B054		
Trouble	Bucket digging pressure sensor's power source is shortcut.		
Judging condition	The input voltage from bucket digging pressure sensor is 4.7V or more.		
Symptom	The bucket digging speed slows down a little.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P1 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	5	B-5 BUCKET DIG
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Bucket digging pressure sensor SE-1		When B054 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between bucket digging pressure sensor and controller CN-124F CN-101F		When B054 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-24

Error code	B062		
Trouble	Bucket dump pressure sensor outputs error		
Judging condition	After starter switch ON and engine does not start yet. And the input voltage from the bucket dump pressure sensor after starter switch ON is in the range of 1.4V or more to less than 4.7V.		
Symptom	The bucket dump operability becomes poor.		
Control in the event of failure	Normal control		
Returned in normal condition	Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen	Screen No.	5	B-6 BUCKET DUMP
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Bucket digging pressure sensor SE-2		When B062 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between bucket digging pressure sensor and controller CN-125F CN-101F		When B062 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-25

Error code	B063		
Trouble	Bucket dump pressure sensor’s wiring is disconnected.		
Judging condition	The input voltage from bucket dump pressure sensor is 0.1V or less.		
Symptom	The bucket dump speed slows down a little.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P1 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	5	B-6 BUCKET DUMP
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Bucket digging pressure sensor SE-2		When B063 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between bucket digging pressure sensor and controller CN-125F CN-101F		When B063 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-26

Error code	B064		
Trouble	Bucket dump pressure sensor’s power source is shortcut.		
Judging condition	The input voltage from bucket dump pressure sensor is 4.7V or more.		
Symptom	The bucket dump speed slows down a little.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P1 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	5	B-6 BUCKET DUMP
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Bucket digging pressure sensor SE-2		When B064 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between bucket digging pressure sensor and controller CN-125F CN-101F		When B064 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-27

Error code	B072		
Trouble	Swing pressure sensor outputs error		
Judging condition	After starter switch ON and engine does not start yet. And the input voltage from the swing pressure sensor after starter switch ON is in the range of 1.4V or more to less than 4.7V.		
Symptom	The swing operability becomes poor.		
Control in the event of failure	Normal control		
Returned in normal condition	Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen	Screen No.	6	B-7 SWING
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Swing pressure sensor SE-5		When B072 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between swing pressure sensor and controller CN-169F CN-103F		When B072 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-28

Error code	B073		
Trouble	Swing pressure sensor’s wiring is disconnected.		
Judging condition	The input voltage from swing pressure sensor is 0.1V or less.		
Symptom	The swing operability becomes poor.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P2 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	6	B-7 SWING
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Swing pressure sensor SE-5		When B073 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between swing pressure sensor and controller CN-169F CN-103F		When B073 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-29

Error code	B074		
Trouble	Swing pressure sensor's power source is shortcut.		
Judging condition	The input voltage from swing pressure sensor is 4.7V or more.		
Symptom	The swing operability becomes poor.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P2 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	6	B-7 SWING
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Swing pressure sensor SE-5		When B074 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between swing pressure sensor and controller CN-169F CN-103F		When B074 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-30

Error code	B092		
Trouble	Travel right pressure sensor outputs error		
Judging condition	After starter switch ON and engine does not start yet. And the input voltage from the travel right pressure sensor after starter switch ON is in the range of 1.4V or more to less than 4.7V.		
Symptom	The travel right operability becomes poor.		
Control in the event of failure	Normal control		
Returned in normal condition	Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen	Screen No.	6	B-9 TRAVEL (R)
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Travel right pressure sensor SE-9		When B092 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between travel right pressure sensor and controller CN-301F CN-102F		When B092 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-31

Error code	B093		
Trouble	Travel right pressure sensor's wiring is disconnected.		
Judging condition	The input voltage from Travel right pressure sensor is 0.1V or less.		
Symptom	The Travel right operability becomes poor.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) P1, Set output of P2 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	6	B-9 TRAVEL (R)
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Travel right pressure sensor SE-9		When B093 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between travel right pressure sensor and controller CN-301F CN-102F		When B093 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-32

Error code	B094		
Trouble	Travel right pressure sensor's power source is shortcut.		
Judging condition	The input voltage from Travel right pressure sensor is 4.7V or more.		
Symptom	The Travel right operability becomes poor.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) P1, Set output of P2 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	6	B-9 TRAVEL (R)
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Travel right pressure sensor SE-9		When B094 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between travel right pressure sensor and controller CN-301F CN-102F		When B094 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-33

Error code	B102		
Trouble	Travel left pressure sensor outputs error		
Judging condition	After starter switch ON and engine does not start yet. And the input voltage from the travel left pressure sensor after starter switch ON is in the range of 1.4V or more to less than 4.7V.		
Symptom	The travel left operability becomes poor.		
Control in the event of failure	Normal control		
Returned in normal condition	Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen	Screen No.	6	B-10 TRAVEL (L)
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Travel left pressure sensor SE-10		When B102 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between travel left pressure sensor and controller CN-302F CN-102F		When B102 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-34

Error code	B103		
Trouble	Travel left pressure sensor’s wiring is disconnected.		
Judging condition	The input voltage from Travel left pressure sensor is 0.1V or less.		
Symptom	The Travel left operability becomes poor.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) P1, Set output of P2 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	6	B-10 TRAVEL (L)
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Travel left pressure sensor SE-10		When B103 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between travel left pressure sensor and controller CN-302F CN-102F		When B103 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-35

Error code	B104		
Trouble	Travel left pressure sensor's power source is shortcut.		
Judging condition	The input voltage from Travel left pressure sensor is 4.7V or more.		
Symptom	The Travel left operability becomes poor.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) P1, Set output of P2 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	6	B-10 TRAVEL (L)
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Travel left pressure sensor SE-10		When B104 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between travel left pressure sensor and controller CN-302F CN-102F		When B104 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-36

Error code	B113		
Trouble	Option selector position detect pressure sensor's wiring is disconnected.		
Judging condition	The input voltage from option selector position detect pressure sensor is 0.1V or less.		
Symptom	When B mode is selected, option selector valve error is indicated.		
Control in the event of failure	Normal control		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	16	B-11
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Option selector position detect pressure sensor SE-29		When B113 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between option selector position detect pressure sensor and controller CN-162F CN-104F		When B113 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-37

Error code	B114		
Trouble	Option selector position detect pressure sensor's wiring is disconnected.		
Judging condition	The input voltage from selector position detect pressure sensor is 4.7V or more.		
Symptom	When B mode is selected, option selector valve error is indicated.		
Control in the event of failure	Normal control		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	16	B-11
	Screen No.		
	Screen No.		

Checking object		Checking contents and remedy
1	• Option selector position detect pressure sensor SE-29	When B114 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between option selector position detect pressure sensor and controller CN-162F CN-104F	When B114 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-38

Error code	B162		
Trouble	P1 side option pressure sensor outputs error		
Judging condition	After starter switch ON and engine does not start yet. And the input voltage from the P1 side option pressure sensor after starter switch ON is in the range of 1.4V or more to less than 4.7V.		
Symptom	The P1 side option operability becomes poor.		
Control in the event of failure	Normal control		
Returned in normal condition	Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen	Screen No.	6	B-16 P1 OPT.
	Screen No.		
	Screen No.		

Checking object		Checking contents and remedy
1	• P1 side option pressure sensor SE-20	When B162 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between P1 side option pressure sensor and controller CN-304F CN-102F	When B162 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-39

Error code		B163		
Trouble		P1 side option pressure sensor's wiring is disconnected.		
Judging condition		The input voltage from P1 side option pressure sensor is 0.1V or less.		
Symptom		The P1 side option does not work.		
Control in the event of failure		Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P1 unload proportional valve to 0mA. (Valve emergency mode) But normal control is done when the left control pedal selection is ON.		
Returned in normal condition		It returns automatically in normal condition.		
Service diagnosis checking screen		Screen No.	6	B-16 P1 OPT.
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• P1 side option pressure sensor SE-20			When B163 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between P1 side option pressure sensor and controller CN-304F CN-102F			When B163 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table46-40

Error code		B164		
Trouble		P1 side option pressure sensor's wiring is disconnected.		
Judging condition		The input voltage from P1 side option pressure sensor is 4.7V or more.		
Symptom		The P1 side option does not work.		
Control in the event of failure		Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P1 unload proportional valve to 0mA. (Valve emergency mode) But normal control is done when the left control pedal selection is ON.		
Returned in normal condition		It returns automatically in normal condition.		
Service diagnosis checking screen		Screen No.	6	B-16 P1 OPT.
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• P1 side option pressure sensor SE-20			When B164 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between P1 side option pressure sensor and controller CN-304F CN-102F			When B164 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table46-41

Error code		B172		
Trouble		P2 side option pressure sensor outputs error		
Judging condition		After starter switch ON and engine does not start yet. And the input voltage from the P2 side option pressure sensor after starter switch ON is in the range of 1.4V or more to less than 4.7V.		
Symptom		The P2 side option operability becomes poor.		
Control in the event of failure		Normal control		
Returned in normal condition		Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen		Screen No.	6	B-17 P2 OPT.
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• P2 side option pressure sensor SE-11			When B172 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between P2 side option pressure sensor and controller CN-303F CN-102F			When B172 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table46-42

Error code		B173		
Trouble		P2 side option pressure sensor’s wiring is disconnected.		
Judging condition		The input voltage from P2 side option pressure sensor is 0.1V or less.		
Symptom		The selection of conflux does not work.		
Control in the event of failure		Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P2 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition		It returns automatically in normal condition.		
Service diagnosis checking screen		Screen No.	6	B-17 P2 OPT.
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• P2 side option pressure sensor SE-11			When B173 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between P2 side option pressure sensor and controller CN-303F CN-102F			When B173 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table46-43

Error code	B174		
Trouble	P2 side option pressure sensor's wiring is disconnected.		
Judging condition	The input voltage from P2 side option pressure sensor is 4.7V or more.		
Symptom	The selection of conflux does not work.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P2 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	6	B-17 P2 OPT.
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• P2 side option pressure sensor SE-11		When B174 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between P2 side option pressure sensor and controller CN-303F CN-102F		When B174 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-44

Error code	C012		
Trouble	P1 pump pressure sensor outputs error		
Judging condition	After starter switch ON and engine does not start yet. And the input voltage from the P1 pump pressure sensor after starter switch ON is in the range of 1.4V or more to less than 4.7V.		
Symptom	The P1 pump operability becomes poor.		
Control in the event of failure	Normal control		
Returned in normal condition	Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen	Screen No.	7	C-1 PUMP P1
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• P1 pump pressure sensor SE-22		When C012 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between P1 pump pressure sensor and controller CN-139F CN-103F		When C012 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-45

Error code		C013		
Trouble		P1 pump pressure sensor’s wiring is disconnected.		
Judging condition		The input voltage from P1 pump pressure sensor is 0.1V or less.		
Symptom		The delicate operability of P1 pump related attachment becomes poor.		
Control in the event of failure		Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode)		
Returned in normal condition		It returns automatically in normal condition.		
Service diagnosis checking screen		Screen No.	7	C-1 PUMP P1
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• P1 pump pressure sensor SE-22			When C013 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between P1 pump pressure sensor and controller CN-139F CN-103F			When C013 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table46-46

Error code		C014		
Trouble		P1 pump pressure sensor’s power source is shortcut.		
Judging condition		The input voltage from P1 pump pressure sensor is 4.7V or more.		
Symptom		The delicate operability of P1 pump related attachment becomes poor.		
Control in the event of failure		Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode)		
Returned in normal condition		It returns automatically in normal condition.		
Service diagnosis checking screen		Screen No.	7	C-1 PUMP P1
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• P1 pump pressure sensor SE-22			When C014 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between P1 pump pressure sensor and controller CN-139F CN-103F			When C014 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table46-47

Error code	C022		
Trouble	P2 pump pressure sensor outputs error.		
Judging condition	After starter switch ON and engine does not start yet. And the input voltage from the P2 pump pressure sensor after starter switch ON is in the range of 1.4V or more to less than 4.7V.		
Symptom	The P2 pump operability becomes poor.		
Control in the event of failure	Normal control		
Returned in normal condition	Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen	Screen No.	7	C-2 PUMP P2
	Screen No.		
	Screen No.		

Checking object		Checking contents and remedy
1	• P2 pump pressure sensor SE-23	When C022 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between P2 pump pressure sensor and controller CN-140F CN-103F	When C022 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-48

Error code	C023		
Trouble	P2 pump pressure sensor's wiring is disconnected.		
Judging condition	The input voltage from P2 pump pressure sensor is 0.1V or less.		
Symptom	The delicate operability of P2 pump related attachment becomes poor.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	7	C-2 PUMP P2
	Screen No.		
	Screen No.		

Checking object		Checking contents and remedy
1	• P2 pump pressure sensor SE-23	When C023 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between P2 pump pressure sensor and controller CN-140F CN-103F	When C023 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-49

Error code	C024		
Trouble	P2 pump pressure sensor’s power source is shortcut.		
Judging condition	The input voltage from P2 pump pressure sensor is 4.7V or more.		
Symptom	The delicate operability of P2 pump related attachment becomes poor.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	7	C-2 PUMP P2
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• P2 pump pressure sensor SE-23	When C024 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between P2 pump pressure sensor and controller CN-140F CN-103F	When C024 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-50

Error code	C033		
Trouble	Boom head pressure sensor’s wiring is disconnected.		
Judging condition	The input voltage from boom head pressure sensor is 0.1V or less.		
Symptom	Indication load value of High-reach crane becomes abnormal.		
Control in the event of failure	Normal control		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	7	C-3 BOOM-HEAD
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Boom head pressure sensor SE-24	When C033 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between boom head pressure sensor and controller CN-706F CN-104F	When C033 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-51

Error code	C034		
Trouble	Boom head pressure sensor's power source is shortcut.		
Judging condition	The input voltage from boom head pressure sensor is 4.7V or more.		
Symptom	Indication load value of High-reach crane becomes abnormal.		
Control in the event of failure	Normal control		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	7	C-3 BOOM-HEAD
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Boom head pressure sensor SE-24		When C034 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between boom head pressure sensor and controller CN-706F CN-104F		When C034 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-52

Error code	C043		
Trouble	Boom rod pressure sensor's wiring is disconnected.		
Judging condition	The input voltage from boom rod pressure sensor is 0.1V or less.		
Symptom	Indication load value of High-reach crane becomes abnormal.		
Control in the event of failure	Normal control		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	7	C-4 BOOM-ROD
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Boom rod pressure sensor SE-25		When C043 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between boom rod pressure sensor and controller CN-705F CN-104F		When C043 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-53

Error code		C044		
Trouble		Boom rod pressure sensor's power source is shortcut.		
Judging condition		The input voltage from boom rod pressure sensor is 4.7V or more.		
Symptom		Indication load value of High-reach crane becomes abnormal.		
Control in the event of failure		Normal control		
Returned in normal condition		It returns automatically in normal condition.		
Service diagnosis checking screen		Screen No.	7	C-4 BOOM-ROD
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• Boom rod pressure sensor SE-25			When C044 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between boom rod pressure sensor and controller CN-705F CN-104F			When C044 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table46-54

Error code		D012		
Trouble		P1 unload proportional valve and output transistor ON are failure.		
Judging condition		The feed-back value from proportional valve is 1000mA or more.		
Symptom		Option conflux can not be done.		
Control in the event of failure		Set output of P1 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition		It returns automatically in normal condition.		
Service diagnosis checking screen		Screen No.	8	D-1 P1 UN-LOAD (BP-CUT)
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• P1 unload proportional valve PSV-D			When D012 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between P1 unload proportional valve and controller CN-120F CN-105F			When D012 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table46-55

Error code	D013		
Trouble	P1 unload proportional valve's wiring is disconnected.		
Judging condition	The feed-back value from proportional valve is 100mA or less. (If output is 100mA or less, judging is not done.)		
Symptom	Option conflux can not be done.		
Control in the event of failure	Set output of P1 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	8	D-1 P1 UN-LOAD (BP-CUT)
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• P1 unload proportional valve PSV-D	When D013 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between P1 unload proportional valve and controller CN-120F CN-105F	When D013 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-56

Error code	D022		
Trouble	P2 unload proportional valve and output transistor ON are failure.		
Judging condition	The feed-back value from proportional valve is 1000mA or more.		
Symptom	Independent operations of boom up and of bucket digging/dump become slow.		
Control in the event of failure	Set output of P2 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	8	D-2 P2 UN-LOAD (BP-CUT)
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• P2 unload proportional valve PSV-B	When D022 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between P2 unload proportional valve and controller CN-118F CN-105F	When D022 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-57

Error code		D023		
Trouble		P2 unload proportional valve's wiring is disconnected.		
Judging condition		The feed-back value from proportional valve is 100mA or less. (If output is 100mA or less, judging is not done.)		
Symptom		Independent operations of boom up and of bucket digging/dump become slow.		
Control in the event of failure		Set output of P2 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition		It returns automatically in normal condition.		
Service diagnosis checking screen		Screen No.	8	D-2 P2 UN-LOAD (BP-CUT)
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• P2 unload proportional valve PSV-B			When D023 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between P2 unload proportional valve and controller CN-118F CN-105F			When D023 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table46-58

Error code		D032		
Trouble		Travel straight proportional valve and output transistor ON are failure.		
Judging condition		The feed-back value from proportional valve is 1000mA or more.		
Symptom		Travel deviation occurs by combined operation of travel and attachment.		
Control in the event of failure		Set Travel straight proportional valve output to 0mA.		
Returned in normal condition		It returns automatically in normal condition.		
Service diagnosis checking screen		Screen No.	8	D-3 S-TRAVEL
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• Travel straight proportional valve PSV-C			When D032 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between Travel straight proportional valve and controller CN-119F CN-105F			When D032 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table46-59

Error code	D033		
Trouble	Travel straight proportional valve's wiring is disconnected.		
Judging condition	The feed-back value from proportional valve is 100mA or less. (If output is 100mA or less, judging is not done.)		
Symptom	Travel deviation occurs by combined operation of travel and attachment.		
Control in the event of failure	Set Travel straight proportional valve output to 0mA.		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	8	D-3 S-TRAVEL
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Travel straight proportional valve PSV-C	When D033 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between Travel straight proportional valve and controller CN-119F CN-105F	When D033 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-60

Error code	D062		
Trouble	Arm-in spool 2 proportional valve and output transistor ON are failure.		
Judging condition	The feed-back value from proportional valve is 1000mA or more.		
Symptom	Operability of combined operation with arm-in becomes poor.		
Control in the event of failure	Set Arm-in spool 2 proportional valve output to 0mA.		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	8	D-4 ARM IN-2-SPEED
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Arm-in spool 2 proportional valve PSV-A	When D062 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between Arm-in spool 2 proportional valve and controller CN-121F CN-105F	When D062 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-61

Error code		D063		
Trouble		Arm-in spool 2 proportional valve's wiring is disconnected.		
Judging condition		The feed-back value from proportional valve is 100mA or less. (If output is 100mA or less, judging is not done.)		
Symptom		Operability of combined operation with arm-in becomes poor.		
Control in the event of failure		Set Arm-in spool 2 proportional valve output to 0mA.		
Returned in normal condition		It returns automatically in normal condition.		
Service diagnosis checking screen		Screen No.	8	D-4 ARM IN-2-SPEED
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• Arm-in spool 2 proportional valve PSV-A			When D063 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	• Wiring between Arm-in spool 2 proportional valve and controller CN-121F CN-105F			When D063 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table46-62

Error code		E012		
Trouble		P1 pump proportional valve and output transistor ON are failure.		
Judging condition		The feed-back value from proportional valve is 1000mA or more.		
Symptom		The delicate operability of P2 pump related attachment becomes poor.		
Control in the event of failure		Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode)		
Returned in normal condition		Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen		Screen No.	9	E-1 PUMP P1
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• P1 pump proportional valve PSV-P1			When E012 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it. When replacing of connector is executed, turn off power source once.
2	• Wiring between P1 pump proportional valve and controller CN-141F CN-105F			When E012 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary. When replacing of connector is executed, turn off power source once.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table46-63

Error code	E013		
Trouble	P1 pump proportional valve's wiring is disconnected.		
Judging condition	The feed-back value from proportional valve is 100mA or less. (If output is 100mA or less, judging is not done.)		
Symptom	The delicate operability of P2 pump related attachment becomes poor.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode)		
Returned in normal condition	Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen	Screen No.	9	E-1 PUMP P1
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• P1 pump proportional valve PSV-P1		When E013 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it. When replacing of connector is executed, turn off power source once.
2	• Wiring between P1 pump proportional valve and controller CN-141F CN-105F		When E013 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary. When replacing of connector is executed, turn off power source once.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-64

Error code	E022		
Trouble	P2 pump proportional valve and output transistor ON are failure.		
Judging condition	The feed-back value from proportional valve is 1000mA or more.		
Symptom	The delicate operability of P2 pump related attachment becomes poor.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode)		
Returned in normal condition	Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen	Screen No.	9	E-2 PUMP P2
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• P2 pump proportional valve PSV-P2		When E022 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it. When replacing of connector is executed, turn off power source once.
2	• Wiring between P2 pump proportional valve and controller CN-142F CN-105F		When E022 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary. When replacing of connector is executed, turn off power source once.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-65

Error code		E023		
Trouble		P2 pump proportional valve's wiring is disconnected.		
Judging condition		The feed-back value from proportional valve is 100mA or less. (If output is 100mA or less, judging is not done.)		
Symptom		The delicate operability of P2 pump related attachment becomes poor.		
Control in the event of failure		Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode)		
Returned in normal condition		Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen		Screen No.	9	E-2 PUMP P2
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• P2 pump proportional valve PSV-P2			When E023 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it. When replacing of connector is executed, turn off power source once.
2	• Wiring between P2 pump proportional valve and controller CN-142F CN-105F			When E023 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary. When replacing of connector is executed, turn off power source once.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table46-66

Error code		F011		
Trouble		ATT boost solenoid valve and output transistor OFF are failure, and grounding is short-circuit.		
Judging condition		The feed-back signal is grounding level while exciting command is output.		
Symptom		ATT boost is not available.		
Control in the event of failure		Normal control		
Returned in normal condition		The feed-back signal is 24V level while exciting command is output.		
Service diagnosis checking screen		Screen No.	3	F-1 POWER BOOST
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• ATT boost solenoid valve SV-2			When F011 is cancelled and other error occurs by exchanging the connector for other solenoid valve. Check solenoid valve unit for possible failure. If failure found, replace it.
2	• Wiring between ATT boost solenoid valve and controller CN-117F CN-105F			When F011 is displayed after the connector is exchanged with other solenoid valve. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table46-67

Error code	F013		
Trouble	ATT boost solenoid valve and output transistor ON are failure, and disconnection.		
Judging condition	The feed-back signal is 24V level while exciting command is not output.		
Symptom	ATT boost is not available or is leaving available.		
Control in the event of failure	Normal control		
Returned in normal condition	The feed-back signal is grounding level while exciting command is not output.		
Service diagnosis checking screen	Screen No.	3	F-1 POWER BOOST
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• ATT boost solenoid valve SV-2		When F013 is cancelled and other error occurs by exchanging the connector for other solenoid valve. Check solenoid valve unit for possible failure. If failure found, replace it.
2	• Wiring between ATT boost solenoid valve and controller CN-117F CN-105F		When F013 is displayed after the connector is exchanged with other solenoid valve. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-68

Error code	F021		
Trouble	Swing parking solenoid valve and output transistor OFF are failure, and grounding is short-circuit.		
Judging condition	The feed-back signal is grounding level while exciting command is output.		
Symptom	Swing parking is not available.		
Control in the event of failure	Normal control		
Returned in normal condition	The feed-back signal is 24V level while exciting command is output.		
Service diagnosis checking screen	Screen No.	3	F-2 SWING-BRAKE
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Swing parking solenoid valve SV-1		When F021 is cancelled and other error occurs by exchanging the connector for other solenoid valve. Check solenoid valve unit for possible failure. If failure found, replace it. Check solenoid valve unit for possible failure. If failure found, replace it.
2	• Wiring between swing parking solenoid valve and controller CN-123F CN-105F		When F021 is displayed after the connector is exchanged with other solenoid valve. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-69

Error code		F023		
Trouble		Swing parking solenoid valve and output transistor ON are failure, and disconnection.		
Judging condition		The feed-back signal is 24V level while exciting command is not output.		
Symptom		Swing parking is not available or is leaving available.		
Control in the event of failure		Normal control		
Returned in normal condition		The feed-back signal is grounding level while exciting command is output.		
Service diagnosis checking screen		Screen No.	3	F-1 POWER BOOST
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• Swing parking solenoid valve SV-1			When F023 is cancelled and other error occurs by exchanging the connector for other solenoid valve. Check solenoid valve unit for possible failure. If failure found, replace it.
2	• Wiring between swing parking solenoid valve and controller CN-123F CN-105F			When F023 is displayed after the connector is exchanged with other solenoid valve. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table46-70

Error code		F031		
Trouble		Travel 1, 2 speed solenoid valve and output transistor OFF are failure, and grounding is short-circuit.		
Judging condition		The feed-back signal is grounding level while exciting command is output.		
Symptom		Travel 2 speed is not obtainable.		
Control in the event of failure		Normal control		
Returned in normal condition		The feed-back signal is 24V level while exciting command is output.		
Service diagnosis checking screen		Screen No.	3	F-3 1/2-TRAVEL
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• Travel 1, 2speed solenoid valve SV-3			When F031 is cancelled and other error occurs by exchanging the connector for other solenoid valve. Check solenoid valve unit for possible failure. If failure found, replace it.
2	• Wiring between travel 1, 2speed solenoid valve and controller CN-122F CN-105F			When F031 is displayed after the connector is exchanged with other solenoid valve. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table46-71

Error code	F033		
Trouble	Travel 1, 2 speed solenoid valve and output transistor ON are failure, and disconnection.		
Judging condition	The feed-back signal is 24V level while exciting command is not output.		
Symptom	Travel 2 speed is not obtainable or is keeping 1 speed.		
Control in the event of failure	Normal control		
Returned in normal condition	The feed-back signal is grounding level while exciting command is not output.		
Service diagnosis checking screen	Screen No.	3	F-3 1/2-TRAVEL
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Travel 1, 2speed solenoid valve SV-3	When F033 is cancelled and other error occurs by exchanging the connector for other solenoid valve. Check solenoid valve unit for possible failure. If failure found, replace it.
2	• Wiring between travel 1, 2speed solenoid valve and controller CN-122F CN-105F	When F033 is displayed after the connector is exchanged with other solenoid valve. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-72

Error code	F041		
Trouble	Option selector solenoid valve and output transistor OFF are failure, and grounding is short-circuit.		
Judging condition	The feed-back signal is grounding level while exciting command is output.		
Symptom	Option selector valve does not change to breaker side.		
Control in the event of failure	Normal control		
Returned in normal condition	The feed-back signal is ground level while exciting command is output.		
Service diagnosis checking screen	Screen No.	11	F-4 OPT SELECT
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Option selector solenoid valve SV-13	When F041 is cancelled and other error occurs by exchanging the connector for other solenoid valve. Check solenoid valve unit for possible failure. If failure found, replace it.
2	• Wiring between option selector solenoid valve and controller CN-251F CN-105F	When F041 is displayed after the connector is exchanged with other solenoid valve. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-73

Error code	F043		
Trouble	Option selector solenoid valve and output transistor ON are failure, and disconnection.		
Judging condition	The feed-back signal is 24V level while exciting command is not output.		
Symptom	Option selector valve does not change to breaker side or it does not change from breaker to nibbler.		
Control in the event of failure	Normal control		
Returned in normal condition	The feed-back signal is ground level while exciting command is not output.		
Service diagnosis checking screen	Screen No.	11	F-4 OPT SELECT
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Option selector solenoid valve SV-13	When F043 is cancelled and other error occurs by exchanging the connector for other solenoid valve. Check solenoid valve unit for possible failure. If failure found, replace it.
2	• Wiring between option selector solenoid valve and controller CN-251F CN-105F	When F043 is displayed after the connector is exchanged with other solenoid valve. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-74

Error code	G032		
Trouble	Mechatro controller direct input speed sensor is overrun.		
Judging condition	Engine rpm input is 3000rpm or more. (Only trouble history)		
Symptom	Operate without problem.		
Control in the event of failure	Receive rpm from engine controller and control the rpm.		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	2	G-3 MEAS 1 (for mechatro controller)
	Screen No.	2	G-3 MEAS 2 (receive from engine controller)
	Screen No.		

	Checking object	Checking contents and remedy
1	• Engine speed sensor SE-13	Measure the resistance between terminals of speed sensor. Normal value: 1.6~2.0k Ω
2	• Wiring between engine speed sensor and controller CN-136F CN-106F	Check wiring for possible failure according to the wiring checking procedure and repair it if necessary. Especially check wiring for false disconnection and noise included.
3	• Mechatro controller	Check that the error is corrected after replacement of controller. (Controller is broken by only applying power to grounding of signal.)

Table46-75

Error code	G033		
Trouble	Mechatro controller direct input speed sensor, Disconnection		
Judging condition	Voltage of alternator is 12V or more, and speed sensor indicates excess low engine rpm.		
Symptom	Operate without problem.		
Control in the event of failure	Receive rpm from engine controller and control the rpm.		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	2	G-3 MEAS 1 (for mechatro controller)
	Screen No.	2	G-3 MEAS 2 (receive from engine controller)
	Screen No.		

	Checking object	Checking contents and remedy
1	• Engine speed sensor SE-13	Measure the resistance between terminals of speed sensor. Normal value: 1.6~2.0k Ω
2	• Wiring between engine speed sensor and controller CN-136F CN-106F	Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller. (Controller is broken by only applying power to grounding of signal.)

Table46-76

Error code	G042		
Trouble	Mechatro controller direct input speed sensor and received data from engine controller are overrun.		
Judging condition	Engine rpm input is 3000rpm or more. (Only trouble history)		
Symptom	Operate without problem.		
Control in the event of failure	Normal control		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	2	G-3 MEAS 1 (for mechatro controller)
	Screen No.	2	G-3 MEAS 2 (receive from engine controller)
	Screen No.		

	Checking object	Checking contents and remedy
1	• Engine speed sensor SE-13	Measure the resistance between terminals of speed sensor. Normal value: 1.6~2.0k Ω
2	• Wiring between engine speed sensor and controller CN-136F CN-106F	Check wiring for possible failure according to the wiring checking procedure and repair it if necessary. Especially check wiring for false disconnection and noise included.
3	• Wiring between ECU engine speed sensor and controller pressure sensor and controller	Check wiring for possible failure according to the wiring checking procedure and repair it if necessary. Especially check wiring for false disconnection and noise included.
4	• Mechatro controller	Check that the error is corrected after replacement of controller. (Controller is broken by only applying power to grounding of signal.)
5	• Engine controller	Check that the error is corrected after replacement of controller.

Table46-77

Error code		G043		
Trouble		Mechatro controller direct input speed sensor and received data from engine controller are disconnected.		
Judging condition		Voltage of alternator is 12V or more, and speed sensor and receipt data from engine controller indicate excess low engine rpm.		
Symptom		Engine speed down may cause extension by abrupt loading.		
Control in the event of failure		Enter 0 rpm for engine speed. Enter 0 for ESS power shift command.		
Returned in normal condition		It returns automatically in normal condition.		
Service diagnosis checking screen		Screen No.	2	G-3 MEAS 1 (for mechatro controller)
		Screen No.	2	G-3 MEAS 2 (receive from engine controller)
		Screen No.		
Checking object				Checking contents and remedy
1	• Engine speed sensor SE-13			Measure the resistance between terminals of speed sensor. Normal value: 1.6~2.0k Ω
2	• Wiring between engine speed sensor and controller CN-136F CN-106F			Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Wiring between ECU engine speed sensor and controller pressure sensor and controller			Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
4	• Mechatro controller			Check that the error is corrected after replacement of controller. (Controller is broken by only applying power to grounding of signal.)
5	• Engine controller			Check that the error is corrected after replacement of controller.

Table46-78

Error code		H013		
Trouble		Accel potentiometer is disconnected.		
Judging condition		The input voltage from accel potentiometer is 0.1V or less.		
Symptom		LOW idling is fixed.		
Control in the event of failure		LOW idling is fixed.		
Returned in normal condition		It returns automatically in normal condition.		
Service diagnosis checking screen		Screen No.	2	H-1 ACCEL VOLT.
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• Accel potentiometer SE-16			Measure the resistance between terminals of speed sensor. 1.6~2.4k Ω Turn the potentiometer and measure resistance between signal and GND.
2	• Wiring between accel potentiometer and controller CN-402F CN-102F			Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table46-79

Error code	H014		
Trouble	Accel potentiometer's power source is shortcut.		
Judging condition	The input voltage from accel potentiometer is 4.7V or more.		
Symptom	LOW idling is fixed.		
Control in the event of failure	LOW idling is fixed.		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	2	H-1 ACCEL VOLT.
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Accel potentiometer SE-16	Measure the resistance between terminals of accel potentiometer. 1.6~2.4k Ω Turn the potentiometer and measure resistance between signal and GND.
2	• Wiring between accel potentiometer and controller CN-402F CN-102F	Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-80

Error code	H023		
Trouble	Boom angle potentiometer's wiring is disconnected.		
Judging condition	The input voltage from boom angle potentiometer is 0.1V or less.		
Symptom	Indications of rating load and working radius of High-reach crane become abnormal.		
Control in the event of failure	Normal control		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	12	H-2 BOOM
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Boom angle potentiometer SE-17	Measure the resistance between terminals of boom angle potentiometer. 4.0~6.0k Ω Turn the potentiometer and measure resistance between signal and GND. Normal value: 0 to all resistance (4.0~6.0)k Ω
2	• Wiring between boom angle potentiometer and controller CN-702F CN-103F	Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-81

Error code	H024		
Trouble	Boom angle potentiometer's power source is shortcut.		
Judging condition	The input voltage from boom angle potentiometer is 0.1V or less.		
Symptom	Indications of rating load and working radius of High-reach crane become abnormal.		
Control in the event of failure	Normal control		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	12	H-2 BOOM
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Boom angle potentiometer SE-17		Measure the resistance between terminals of boom angle potentiometer. 4.0~6.0k Ω Turn the potentiometer and measure resistance between signal and GND. Normal value: 0 to all resistance (4.0~6.0)k Ω
2	• Wiring between boom angle potentiometer and controller CN-702F CN-103F		Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-82

Error code	H033		
Trouble	Arm angle potentiometer's wiring is disconnected.		
Judging condition	The input voltage from arm angle potentiometer is 0.1V or less.		
Symptom	Indications of rating load and working radius of High-reach crane become abnormal.		
Control in the event of failure	Normal control		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	12	H-3 ARM
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Arm angle potentiometer SE-19		Measure the resistance between terminals of arm angle potentiometer. 4.0~6.0k Ω Turn the potentiometer and measure resistance between signal and GND. Normal value: 0 to all resistance (4.0~6.0)k Ω
2	• Wiring between arm angle potentiometer and controller CN-703F CN-103F		Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-83

Error code	H034		
Trouble	Arm angle potentiometer's power source is shortcut.		
Judging condition	The input voltage from arm angle potentiometer is 0.1V or less.		
Symptom	Indications of rating load and working radius of High-reach crane become abnormal.		
Control in the event of failure	Normal control		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	12	H-3 ARM
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Arm angle potentiometer SE-19		Measure the resistance between terminals of arm angle potentiometer. 4.0~6.0k Ω Turn the potentiometer and measure resistance between signal and GND. Normal value: 0 to all resistance (4.0~6.0)k Ω
2	• Wiring between arm angle potentiometer and controller CN-703F CN-103F		Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-84

Error code	H091		
Trouble	Fuel sensor grounding is short-circuited.		
Judging condition	The input voltage from fuel sensor is 0.1V or less.		
Symptom	Warning for low fuel level is indicated.		
Control in the event of failure	Fuel level becomes 0%.		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	10	H-9 FUEL LEVEL
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Fuel sensor potentiometer SE-15		Move fuel sensor and measure the resistance between terminals of fuel sensor. EMPTY 95 Ω ~ FULL 5 Ω
2	• Wiring between fuel sensor and controller CN-152F CN-104F		Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-85

Error code	H093		
Trouble	Fuel sensor's wiring is disconnection.		
Judging condition	The input voltage from fuel sensor is 4.7V or more.		
Symptom	Warning for low fuel level is indicated.		
Control in the event of failure	Fuel level becomes 0%.		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	10	H-9 FUEL LEVEL
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Fuel sensor potentiometer SE-15		Move fuel sensor and measure the resistance between terminals of fuel sensor. EMPTY 95 Ω ~ FULL 5 Ω
2	• Wiring between fuel sensor and controller CN-152F CN-104F		Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-86

Error code	I111		
Trouble	Reception of CAN1 communication is abnormal. (Passive error)		
Judging condition	Reception from engine controller can not receive correctly.		
Symptom	It has been affected little.		
Control in the event of failure	Keep the last receiving condition.		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.		
	Screen No.		
	Screen No.		
Checking object			Checking contents and remedy
1	• Wiring between ECU and controller CN-3F CN-101F		Check wiring for possible failure according to the wiring checking procedure and repair it if necessary. (There is a possibility of false disconnection.)
2	• Mechatro controller		Check that the error is corrected after replacement of controller.

Table46-87

Error code	I113		
Trouble	Reception of cluster communication is abnormal. (Time-out error)		
Judging condition	Reception from gauge cluster can not receive correctly. It has been affected little.		
Symptom	It has been affected little.		
Control in the event of failure	It can be operated in condition that coolant temperature is 20°C.		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	2	G-5 WATER TEMP
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Wiring between ECU and controller CN-3F CN-101F	Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
2	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-88

Error code	I313		
Trouble	Reception of cluster communication is abnormal. (Time-out error)		
Judging condition	Reception from gauge cluster can not receive correctly.		
Symptom	Switch operation of gauge cluster can not be done.		
Control in the event of failure	Keep the condition after immediately key-on is operated.		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.		
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Wiring between gauge cluster and controller CN-600F CN-101F	Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
2	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-89

Error code	K014		
Trouble	Battery relay contact welded		
Judging condition	The power 24V is continuously supplied to controller for 40 seconds or more while the key switch ON signal turned OFF		
Symptom	The power on the battery relay secondary side does not turn OFF even if the key switch is turned OFF.		
Control in the event of failure	Normal control with key switch OFF		
Returned in normal condition	Turn key switch ON. Or when the power supply 24V to mechatro controller is stopped		
Service diagnosis checking screen	Screen No.	4	K-1 AIS RELAY 2
	Screen No.	4	K-3 KEY SWITCH OFF
	Screen No.		

	Checking object	Checking contents and remedy
1	• Battery relay R-1 CN-256F	Turn key switch off and disconnect the connector (CN-256F) on the battery relay coil. If 24V power lives on battery relay secondary side, check on battery relay for failure and replace it if failed.
2	• Auto idle stop relay 2 R-24 • Alternator relay R-28	Turn off the key switch, and remove the connector (CN-256F) on the battery relay coil side. If power of battery relay on secondary side falls, remove either auto idling stop relay 2 or alternator relay. The failure may be occurred in case where the power falls after the relay was removed, and therefore check on the relay unit and replace it with new one if failed.
3	• Wiring between auto idle stop relay/alternator relay and controller CN-109F, CN2-1 • Fuse& relay box E-1	When K014 is left displayed with the relay removed Check that no power 24V is produced on relay (-) line according to the wiring checking procedure and replace it if necessary. When no failure found after checking on wiring and K014 is left displayed Replace fuse/relay box.
4	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-90

Error code	R014		
Trouble	Wiper motor arc prevention relay error		
Judging condition	The mechatro controller output line to wiper motor arc prevention relay is short-circuited with the power source.		
Symptom	Wiper does not move.		
Control in the event of failure	Relay output is stopped.		
Returned in normal condition	When the power is OFF		
Service diagnosis checking screen	Screen No.	25	PREVENT ARC
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Wiper motor arc prevention relay R-31	When error is cancelled after removing wiper motor arc prevention relay, check relay unit for failure, replace it with new one if failed. When resistance between relays (1) and (2) is 0 Ω, it is in abnormal condition. 
2	• Wiring between wiper motor arc prevention relay and controller CN-109F, CN2-1 • Fuse & relay box E-1	When R014 is left displayed with the relay removed Check that no power 24V is produced on relay (-) line according to the wiring checking procedure and replace it if necessary. When no failure found after checking on wiring and R014 is left displayed Replace fuse/relay box.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-91

Error code	R024		
Trouble	Wiper motor forward rotation relay error		
Judging condition	The mechatro controller output line to wiper motor forward rotation relay is short-circuited with the power source.		
Symptom	Wiper does not move.		
Control in the event of failure	Relay output is stopped.		
Returned in normal condition	When the power is OFF		
Service diagnosis checking screen	Screen No.	25	CW MOTOR RLY
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Wiper motor forward rotation relay R-29	When error is cancelled after removing wiper motor forward rotation relay, check relay unit for failure, replace it with new one if failed. When resistance between relays (1) and (2) is 0 Ω, it is in abnormal condition. 
2	• Wiring between wiper motor forward rotation relay and controller CN-109F, CN2-1 •Fuse & relay box E-1	When R024 is left displayed with the relay removed Check that no power 24V is produced on relay (-) line according to the wiring checking procedure and replace it if necessary. When no failure found after checking on wiring and R024 is left displayed Replace fuse/relay box.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-92

Error code	R034		
Trouble	Wiper motor reverse rotation relay error		
Judging condition	The mechatro controller output line to wiper motor reverse rotation relay is short-circuited with the power source.		
Symptom	Wiper does not move after forward rotation.		
Control in the event of failure	Relay output is stopped.		
Returned in normal condition	When the power is OFF		
Service diagnosis checking screen	Screen No.	25	CCW MOTOR RLY
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Wiper motor reverse rotation relay R-30	When error is cancelled after removing wiper motor reverse rotation relay, check relay unit for failure, replace it with new one if failed. When resistance between relays (1) and (2) is 0 Ω, it is in abnormal condition. 
2	• Wiring between wiper motor forward rotation relay and controller CN-109F, CN2-1 •Fuse & relay box E-1	When R034 is left displayed with the relay removed Check that no power 24V is produced on relay (-) line according to the wiring checking procedure and replace it if necessary. When no failure found after checking on wiring and R034 is left displayed Replace fuse/relay box.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-93

Error code		R044		
Trouble		Washer motor relay error		
Judging condition		The mechatro controller output line to washer motor relay is short-circuited with the power source.		
Symptom		Washer motor does not move.		
Control in the event of failure		Relay output is stopped.		
Returned in normal condition		When the power is OFF		
Service diagnosis checking screen		Screen No.	25	MOTOR RELAY
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• Washer motor relay R-32			When error is cancelled after removing washer motor relay, check relay unit for failure, replace it with new one if failed. When resistance between relays (1) and (2) is 0 Ω, it is in abnormal condition. 
2	• Wiring between washer motor relay and controller CN-112F, CN2-1 •Fuse & relay box E-1			When R044 is left displayed with the relay removed Check that no power 24V is produced on relay (-) line according to the wiring checking procedure and replace it if necessary. When no failure found after checking on wiring and R044 is left displayed Replace fuse/relay box.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table46-94

Error code		R134		
Trouble		Swing flasher relay error		
Judging condition		The mechatro controller output line to swing flasher relay is short-circuited with the power source.		
Symptom		Right swing flasher does not light.		
Control in the event of failure		Relay output is stopped.		
Returned in normal condition		When the power is OFF		
Service diagnosis checking screen		Screen No.	22	D13
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	• Swing flasher relay R-19			When error is cancelled after removing connector (CN-74F) of swing flasher relay, check relay unit for failure, replace it with new one if failed. When resistance between relays (HB) and (HC) is 0 Ω, it is in abnormal condition. 
2	• Wiring between swing flasher relay and controller CN-74F, CN-109F			When R134 is left displayed with the relay removed Check that no power 24V is produced on relay (-) line (as shown right upper figure C) according to the wiring checking procedure and replace it if necessary.
3	• Mechatro controller			Check that the error is corrected after replacement of controller.

Table46-95

Error code	R144		
Trouble	Swing flasher relay error		
Judging condition	The mechatro controller output line to swing flasher relay is short-circuited with the power source.		
Symptom	Left swing flasher does not light.		
Control in the event of failure	Relay output is stopped.		
Returned in normal condition	When the power is OFF		
Service diagnosis checking screen	Screen No.	22	D14
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Swing flasher relay R-19	When error is cancelled after removing connector (CN-74F) of swing flasher relay, check relay unit for failure, replace it with new one if failed. When resistance between relays (HB) and (HC) is 0 Ω, it is in abnormal condition. 
2	• Wiring between swing flasher relay and controller CN-74F, CN-109F	When R144 is left displayed with the relay removed Check that no power 24V is produced on relay (-) line (as shown right upper figure B) according to the wiring checking procedure and replace it if necessary.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-96

Error code	R154		
Trouble	Travel alarm relay error		
Judging condition	The mechatro controller output line to travel alarm relay is short-circuited with the power source.		
Symptom	Travel alarm does not actuate.		
Control in the event of failure	Relay output is stopped.		
Returned in normal condition	When the power is OFF		
Service diagnosis checking screen	Screen No.	23	D15
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Travel alarm relay R-8	When error is cancelled after removing of travel alarm relay, check relay unit for failure, replace it with new one if failed. When resistance between relays (1) and (2) is 0 Ω, it is in abnormal condition. 
2	• Wiring between travel alarm relay and controller CN-109F, CN2-2 •Fuse & relay box E-1	When R154 is left displayed with the relay removed Check that no power 24V is produced on relay (-) line according to the wiring checking procedure and replace it if necessary. When no failure found after checking on wiring and R154 is left displayed. Replace fuse/relay box.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-97

Error code	R164		
Trouble	Auto idle stop relay 2 relay error		
Judging condition	The mechatro controller output line to auto idle stop relay 2 is short-circuited with the power source.		
Symptom	Power source for mechatro controller often turns off. Auto idle stop relay 2 does not actuate.		
Control in the event of failure	Relay output is stopped.		
Returned in normal condition	When the power is OFF		
Service diagnosis checking screen	Screen No.	4	K-1 AIS RELAY 2
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Auto idle stop relay 2 relay R-24	When error is cancelled after removing of auto idle stop relay 2, check relay unit for failure, replace it with new one if failed. When resistance between relays (1) and (2) is 0 Ω, it is in abnormal condition. 
2	• Wiring between auto idle stop relay 2 and controller CN-109F, CN2-2 •Fuse & relay box E-1	When R164 is left displayed with the relay removed Check that no power 24V is produced on relay (-) line according to the wiring checking procedure and replace it if necessary. When no failure found after checking on wiring and R164 is left displayed. Replace fuse/relay box.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-98

Error code	R174		
Trouble	Engine forcibly stop relay error		
Judging condition	The mechatro controller output line to engine forcibly stop is short-circuited with the power source.		
Symptom	When key switch is turned off but engine does not stop. Engine auto idle stop function does not actuate.		
Control in the event of failure	Relay output is stopped.		
Returned in normal condition	When the power is OFF		
Service diagnosis checking screen	Screen No.	4	K-3 ENG STOP
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	• Engine forcibly stop relay R-25	When error is cancelled after removing of engine forcibly stop relay, check relay unit for failure, replace it with new one if failed. When resistance between relays (1) and (2) is 0 Ω, it is in abnormal condition. 
2	• Wiring between engine forcibly stop relay and controller CN-109F, CN2-2 • Fuse & relay box E-1	When R174 is left displayed with the relay removed Check that no power 24V is produced on relay (-) line according to the wiring checking procedure and replace it if necessary. When no failure found after checking on wiring and R174 is left displayed. Replace fuse/relay box.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-99

Error code	R184		
Trouble	Safety lock lever relay error		
Judging condition	The mechatro controller output line to safety lock lever relay is short-circuited with the power source.		
Symptom	Safety lock lever timer does not actuate.		
Control in the event of failure	Relay output is stopped.		
Returned in normal condition	When the power is OFF		
Service diagnosis checking screen	Screen No.	4	K-4 LOCK LEVER
	Screen No.		
	Screen No.		

Checking object		Checking contents and remedy
1	• Safety lock lever relay R-26	When error R184 is cancelled after removing of safety lock lever relay, check relay unit for failure, replace it with new one if failed. When resistance between relays (1) and (2) is 0 Ω, it is in abnormal condition. 
2	• Wiring between safety lock lever relay and controller CN-109F, CN2-2 • Fuse & relay box E-1	When R184 is left displayed with the relay removed Check that no power 24V is produced on relay (-) line according to the wiring checking procedure and replace it if necessary. When no failure found after checking on wiring and R184 is left displayed. Replace fuse/relay box.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

Table46-100

Error code	R214		
Trouble	Safety relay error		
Judging condition	The mechatro controller output line to safety relay is short-circuited with the power source.		
Symptom	Safety relay does not actuate.		
Control in the event of failure	Relay output is stopped.		
Returned in normal condition	When the power is OFF		
Service diagnosis checking screen	Screen No.	4	K-2 SAFETY RLY
	Screen No.		
	Screen No.		

Checking object		Checking contents and remedy
1	• Safety lock lever relay R-26	When error R214 is cancelled after removing of safety relay, check relay unit for failure, replace it with new one if failed. When resistance between relays (1) and (2) is 0 Ω, it is in abnormal condition. 
2	• Wiring between safety lock lever relay and controller CN-109F, CN2-2 • Fuse & relay box E-1	When R214 is left displayed with the relay removed Check that no power 24V is produced on relay (-) line according to the wiring checking procedure and replace it if necessary. When no failure found after checking on wiring and R214 is left displayed. Replace fuse/relay box.
3	• Mechatro controller	Check that the error is corrected after replacement of controller.

[MEMO]