FSCURTIS®

INSTRUCTION MANUAL

PORTABLE
SCREW COMPRESSOR

FAC-110B
FAC-110BC

Please be sure to read this manual before using this machine.

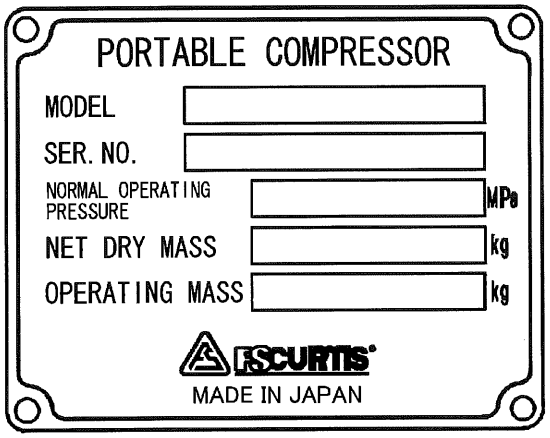
Preface

Thank you for having selected our "FSCURTIS" product.

- This manual explains about the proper operation and daily inspection and maintenance of this machine.
- In order to use a machine safely, people with sufficient knowledge and sufficient technology need to deal with it.
- Before operating the unit, read the manual carefully, fully understand its operation and maintenance requirement. Maintain "SAFETY OPERATION AND PROPER MAINTENANCE OF THE UNIT".

Be sure to follow safety warnings and cautions given in the manual. Unsafe operation could cause serious injury or death.

- For details of handling, maintenance and safety of the engine, see the Engine Operation Manual.
- Keep the manual available at all times for the operator or safety supervisor.
- If the manual is lost or damaged, place an order with your dealer for another copy.
- Be sure that the manual is included with the unit when it is handed over to another user.
- There may be some inconsistency in detail between the manual and the actual machine due to improvements of the machine. Ask your dealer if you have any questions or problems.
- If you have any questions about the unit, please inform us the model and serial number. A plate stamped with the model and serial number is attached to side of the unit.



A090188

- Each illustrated figure (Fig.) has a number (for instance, A090188) at the right bottom. This number is not a part number, but it is used only for our reference number.

Table of Contents

1.Safety

This manual explains and illustrates general requirements for safety.

Read all safety requirements carefully and fully understand the contents before starting the machine.

For your better recognition, according to the degree of potential danger, safety messages are classified into three hierarchical categories, namely, "DANGER", "WARNING" and "CAUTION" with a caution symbol ⚠-attached to each message.

When one of these messages is shown, please take preventive measures and carry out "SAFETY OPERATION AND PROPER MAINTENANCE OF THE MACHINE".

⚠ DANGER	DANGER indicates an imminently hazardous situation which, if not avoided by any user, will result in death or serious injury. This signal word is to be limited to the most extreme situations.
⚠ WARNING	WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to a user.
⚠ CAUTION	CAUTION indicates a potential hazardous situation which may possibly only cause a minor injury to a user and damages to property only.
IMPORTANT	IMPORTANT indicates important caution messages for the performance or durability of the machine.

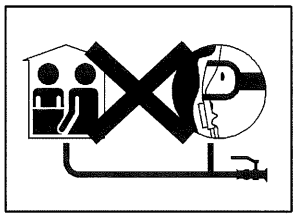
Follow warnings mentioned in this manual. This manual does not describe all safety items.
We, therefore, advise you to pay special attention to all items (even though they may not be described in the manual) for your safety.

1.Safety

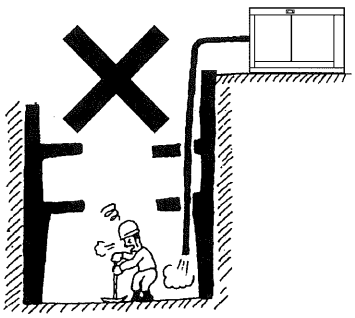
1.1 Caution before Operation

⚠ DANGER — ***Compressed air is prohibited to be used for human respiration***

- Compressed air by this machine contains poisonous materials. Absorption of the compressed air can cause serious injury. Never provide this compressed air for human respiration.
- This machine is not designed to be used for working chambers pressurized by compressed air such as respiratory air provided to persons working inside wells and tunnels such as pneumatic engineering method and pneumatic caisson method. Should this machine stop operation due to trouble, it can cause death and serous injury to the working persons. Refrain from using the compressed air for such pneumatic engineering method or pneumatic caisson method.



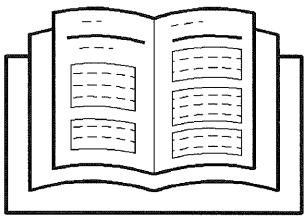
TR0201-1



A080001

⚠ WARNING — ***Follow the safety instructions***

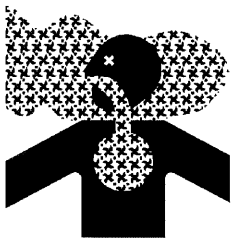
- Read each instruction plate which is displayed in the manual or on the machine carefully, understand its content and follow the indications thereof.
- Keep the Safety Warning labels clean. When they are damaged or missing, apply new ones.
- Do not modify the machine without prior approval. The safety may be compromised, functions may be deteriorated, or the machine life may be shortened.
- Never use the machine for the purpose of compression of gases other than air, or as a vacuum pump. Otherwise, serious accidents may occur.



TR0086

⚠ WARNING — ***Ventilation***

- Exhaust gas from the engine is poisonous, and could cause death when inhaled.
  Avoid using the machine in an insufficiently ventilated building or tunnel.



PC002

1.Safety

⚠ WARNING

Handling battery

- Keep flames away from battery.
- Battery may generate hydrogen gas and may explode.
- Battery electrolyte is dilute sulfuric acid.
  In case of mishandling, it could cause skin burning.
- When you deal with a battery, please be sure to wear protection implements, such as protection glasses and a glove.
- Dispose of battery, observing local regulations.

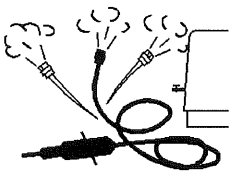
D004

TR0093

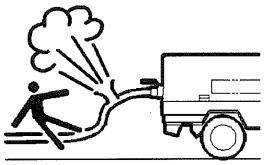
⚠ WARNING

Cautions of hose attachment and removal

- Piping or the hose from this machine service valve should use what can be borne enough for the discharge pressure of this machine.
- Please connect piping or a hose to this machine service valve firmly before operation and during operation. If the connection part is loosening, there is a possibility of piping or a hose separating and getting seriously injured.
- Please remove after closing a service valve and extracting pressure remained, in case piping or a hose is removed. If pressure remained should remain, a near thing blows away or there is a possibility of a hose whipping, causing a phenomenon and getting seriously injured.
- In order to use it safely, please read the handling of the work tools often used.



TR0088



TR0303A

⚠ WARNING

Safety outfit

- When handling the machine, do not wear;
- Loose clothes
- Clothes with unbuttoned sleeves
- Hanging tie or scarf
- Accessories such as dangling jewelry
  Such outfit could be caught in the machine or dragged in the rotating portion of the machine, and this could cause a serious injury.

TR0084

1.Safety

⚠ WARNING — ***Maintain both physicl and mental health***

- Do not operate the machine when you are tired or drunk or under the influence of drugs. Otherwise, a hasty conclusion or careless handling may cause unexpected injury or accident.
  Manage your physical and mental health and be cautious in handling the machine.

⚠ CAUTION — ***Protection equipments***

- Please wear protection implements, such as a helmet, protection glasses, earplugs, safety shoes, a glove, and a protection-against-dust mask, according to the contents of work for safety.

TR0085

⚠ CAUTION — ***Safety fittings***

- Have first-aid boxes and fire extinguishers near the machine ready for emergency situations such as injuries and a fire.
- It is advisable to have a list of phone numbers of doctors, ambulance and the fire department available in case of emergency.

TR0096

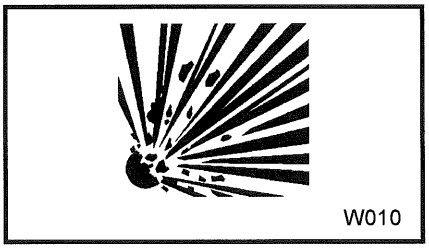
⚠ CAUTION — ***Safety around the machine***

- Such things as unnecessary equipment and tools, cables, hoods, covers and pieces of wood which are a hindrance to the job, have to be cleaned and removed. This is because operators and/or personnel nearby may stumble on them and may be injured.

1.2 Caution during Operation

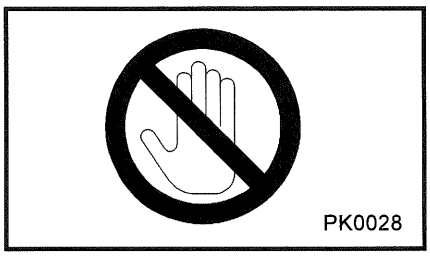
⚠ WARNING — ***Do not replenish compressor oil during operation***

- Do not, under any circumstance, open the oil filler cap of separator receiver tank while running or immediately after stopping operation.
  It is very dangerous because the oil filler cap could be blown off and high temperature compressed air and oil could jet out from the filler port, and cause serious injury.


W010

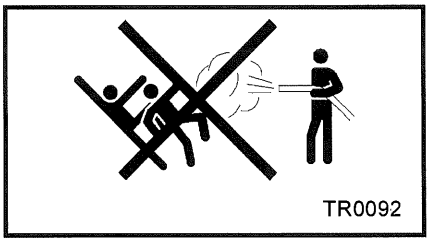
⚠ WARNING — ***Draining during operation prohibited***

- Do not, under any circumstance, open the portions below during operation:
- Separator receiver tank drain valve
- Coolant drain valve and plug
- Engine oil drain valve
- Oil cooler drain valve
- Fuel tank drain vale and plug


PK0028

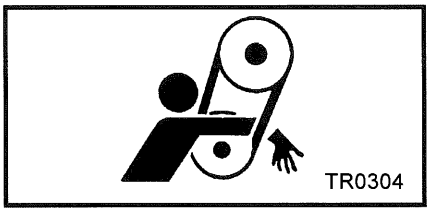
⚠ WARNING — ***Never direct the compressed air to people and foods***

- Never blow compressed air directly at people.
  Scattered impurities, dust, or foreign objects in the compressed air may cause skin and eyes to be seriously injured.
- Blowing compressed air on food is prohibited.


TR0092

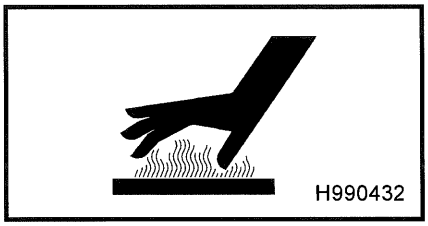
⚠ WARNING — ***Hands off from rotating parts and belts***

- Keep hands off from the rotating portion or belts while running.
  It could cause serious injuries if hands should be caught in.


TR0304

⚠ CAUTION — ***Do not remove radiator cap during operation***

- Do not, under any circumstance, open the radiator cap while running or immediately after stopping operation.
  Otherwise high temperature steam jets out and this could cause scalding.

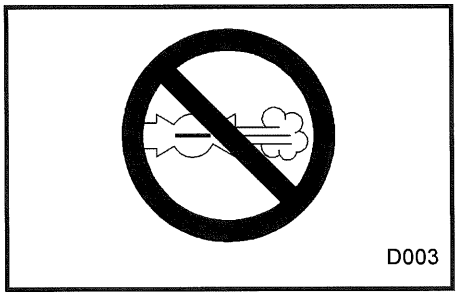

H990432

1.Safety

⚠ CAUTION

Operation with discharge port (compressed air supply port) opened is prohibited

- Do not operate the machine with service valves and relief valve open unless air hoses and/or pipes are connected. High-pressurized air blows out and its air pressure could cause injury to the people nearby.
- When the machine has to be unavoidably temporarily operated with its port open, be sure to mount a silencer to reduce noise and wear protective materials such as earplugs to prevent damage to hearing.

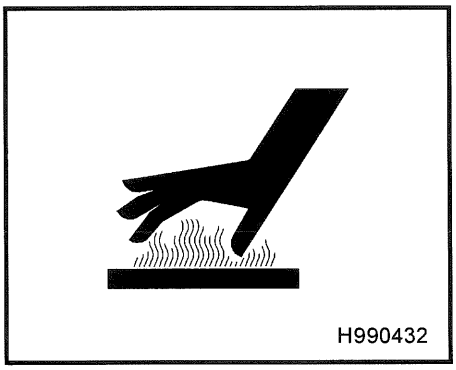


D003

⚠ CAUTION

Do not touch hot parts

- Never work nearby hot portions of the machine while it is running.
- Do not touch hot portions of the machine while inspecting the machine when running.
- Such parts as engine, exhaust manifold, exhaust pipe, muffler, radiator, oil cooler, air-end, pipe, separator receiver tank, and discharging pipe are especially hot, so never touch those parts, because it could cause serious burns.
- Compressor oil, coolant water, and engine oil are also very hot and dangerous to touch.
  Avoid checking or refilling them while the machine is running.



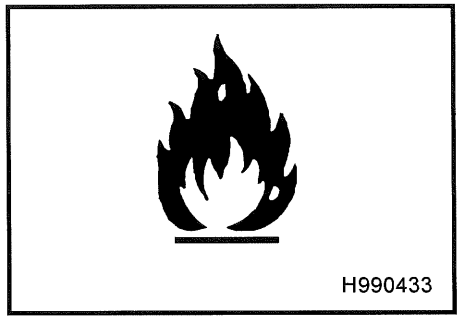
H990432

⚠ CAUTION

Fire prevention

- Do not, under any circumstance, bring lit cigarettes or matches near such oils as engine oil and compressor oil, etc. They are extremely flammable and dangerous, so be careful when handling.
- Refilling oils should be done in an outdoor well-ventilated place.
- Refuel after stopping the engine, and never leave the fuel nearby the machine. Do not spill. It may cause a fire. When it is spilt, wipe it up completely.
- **Do not fill fuel up to the filler level. When fuel tank is filled up to the filler level, fuel will be overfilled due to volume expansion caused by rise of ambient temperature. Further, fuel will be possibly spilled from fuel tank due to vibration caused during movement and/or transportation of the machine.**
- Such parts as muffler and exhaust pipe can be extremely hot. Remove twigs, dried leaves, dried grass and waste paper, etc. from the exhaust outlet of the muffler.
- Keep a fire extinguisher available by the machine in case of a fire.

D004

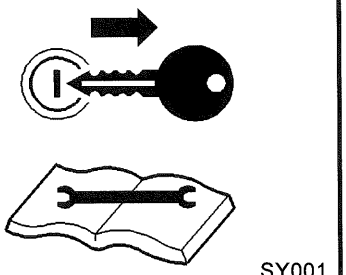


H990433

1.3 Caution during Inspection and Maintenance

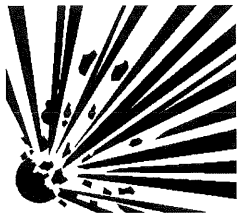
⚠ WARNING — ***Hang a "Now Checking and under Maintenance" tag***

- Remove the starter key from the starter switch before starting inspection, and hang up a "Now Checking and under Maintenance" tag where it can be easily seen. The checker must keep the key during checking and maintenance.
- Remove the negative (–) side cable from the battery. If the above procedure is neglected, and another person starts operating the machine during check or maintenance, it could cause serious injury.


SY001

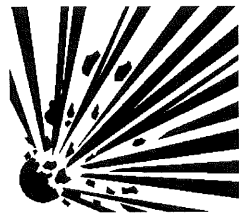
⚠ WARNING — ***Refilling of compressor oil***

- When you refill the separator receiver tank with compressor oil, stop the engine, and make sure that the pressure gauge indicates 0MPa and there is no residual pressure in it, and then gradually loosen the oil filler cap for refilling oil.
- Note residual pressure in the separator receiver tank could force both extremely hot compressed air and oil to jet out and you may be scalded or seriously injured.


W010

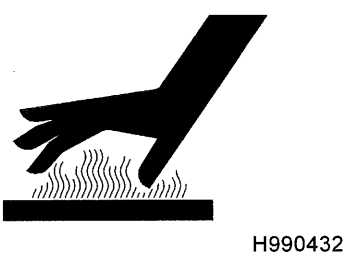
⚠ WARNING — ***Be careful of high-pressurized air blowout***

- After stopping the engine, make sure that pressure gauge indicates 0MPa. Even when the gauge shows 0MPa, open a service valve and further do not fail to make sure that there is no residual pressure in the air piping. Then start such a job as repair and maintenance.
- Residual air under pressure will blow off and severely injure operator.


W010

⚠ WARNING — ***Draining separator receiver tank***

- After stopping the engine, confirm that the pressure gauge indicates 0MPa and there is no residual pressure in it, then open the drain valve gradually to drain the compressor oil.
- Note residual pressure in the separator receiver tank could force both extremely hot compressed air and oil to jet out and you may be scalded or seriously injured.


H990432

1.Safety

⚠ WARNING

Adjusting tension of belt

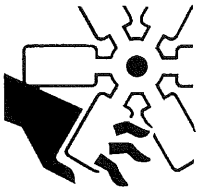
- Be sure to stop the engine and remove the starter key whenever the tension of the belt is to be adjusted.
- Remove the negative (–) side cable from the battery.
- If the machine is running, it might catch the operator's hand into the belts, and this could cause a serious injury.

TR0304

⚠ WARNING

Hands off from cooling fan

- Be sure to stop the engine and remove the starter key whenever check or maintenance work is carried out near the cooling fan.
- If the cooling fan is rotating, it may catch the operator or part of his body into the fan, and it could cause a serious injury.



W009

⚠ WARNING

Cleaning by air-blow

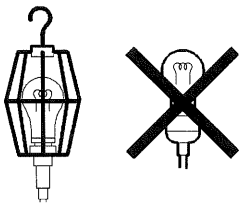
- When cleaning dust accumulated in such devices as the air-filter, by blowing compressed air, wear safety glasses, etc. to protect your eyes.

M003

⚠ CAUTION

Lighting apparatus

- It is recommended to use a lamp with safety guard fitted where the site is dark.
  Operating the machine gropingly or by relying on one's intuition could cause unexpected accidents.
- Any lamps without safety guard are not recommended since they can be broken and they could ignite flammables such as fuel, etc.



TR0206

⚠ CAUTION

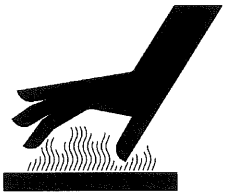
Opening coolant water drain valve cap

- Be sure to stop the engine, and let the coolant water sufficiently cool down before draining it.
- If the drain valve is opened before the coolant water is cooled enough, hot water could jet out, and it could cause scalding.

H990432

⚠ CAUTION — ***Refilling or draining of engine oil***

- After stopping the engine, wait for 10 to 20 minutes until the engine oil cools off. Then check the level of the engine oil, or refill or drain the oil.
- The engine oil is very hot during operation and just after it stops. Be careful because the hot oil also pressurized blows off and it can cause burning.



H990432

⚠ CAUTION — ***Fear of fire***

- Be sure to perform the periodical check of compressor oil and oil separator.
- Neglecting checks could cause overheat of the oil, resulting in a fire.

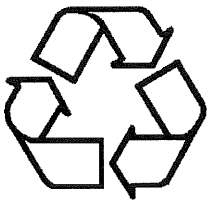
H990433

⚠ CAUTION — ***Handling of electrical equipment engine***

- The engine of this machine and electrical parts many electronic devices have been installed. If you do this please go airborne welding work, remove the connector of the electronic control equipment.
  Can cause equipment to malfunction due to electronic control of excessive current is applied.

⚠ CAUTION — ***Treatment of organic wastes***

- Waste liquid from the machine contains harmful material. Do not discharge it onto the ground or into the river, lake or sea. Such material will contaminate the environment.
- Be sure to use a container to hold the waste liquid from the machine.
- Be sure to follow the designated regulations when disposing of oil, fuel, coolant (antifreeze), filter, battery or other harmful materials.

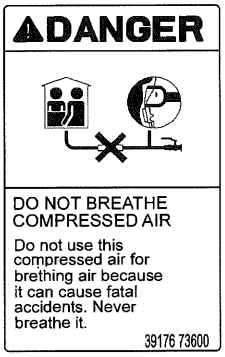


A100285

1.4 Safety Warning Labels

Following labels are attached to the machine.
Keep them clean all the time. When they are found damaged or peeled off, order them by the part number printed right under from our office nearby or distributor and attach them again.

1



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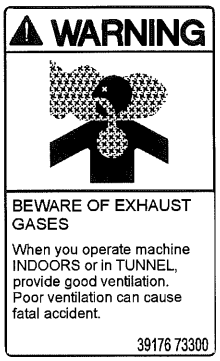

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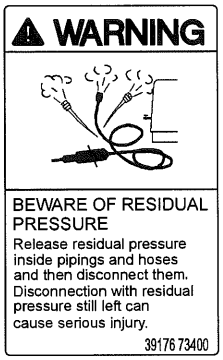

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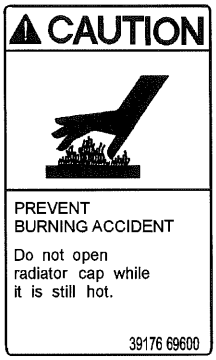

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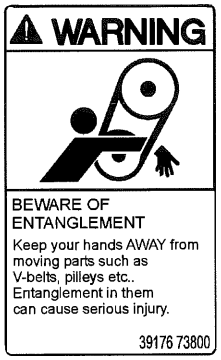

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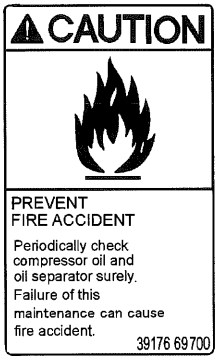

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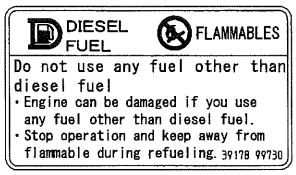

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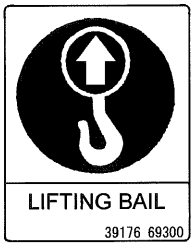
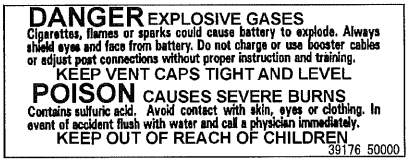
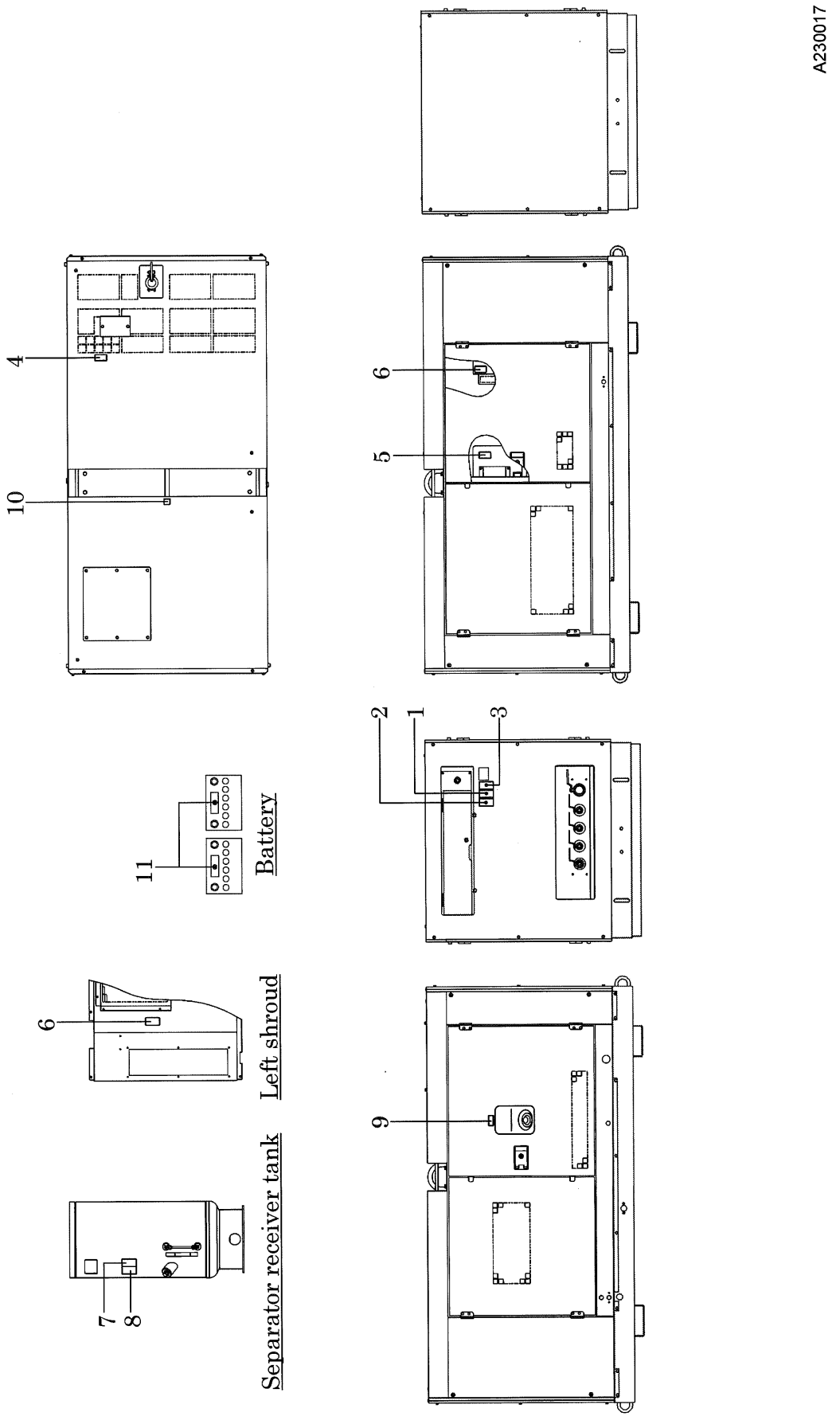


11



1.Safety

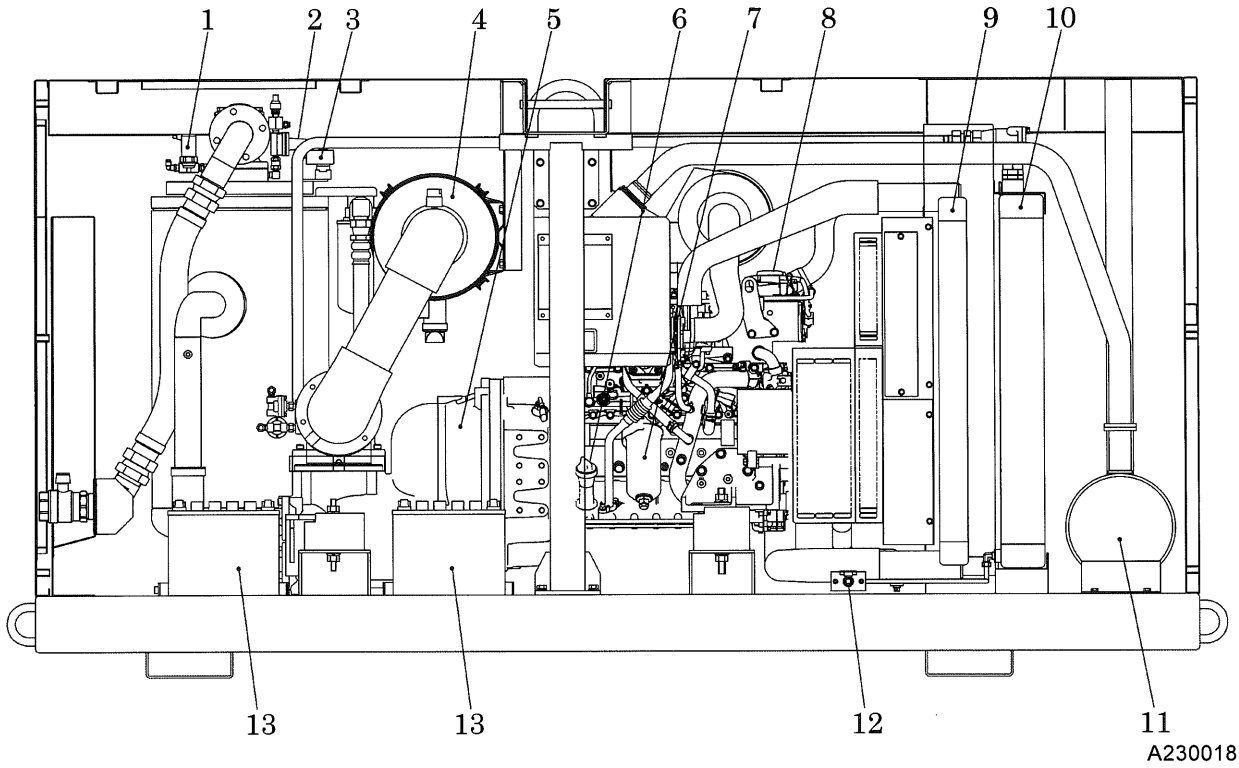
● The pasting position of safe warning label is as follows.



MEMO

2.Part Names

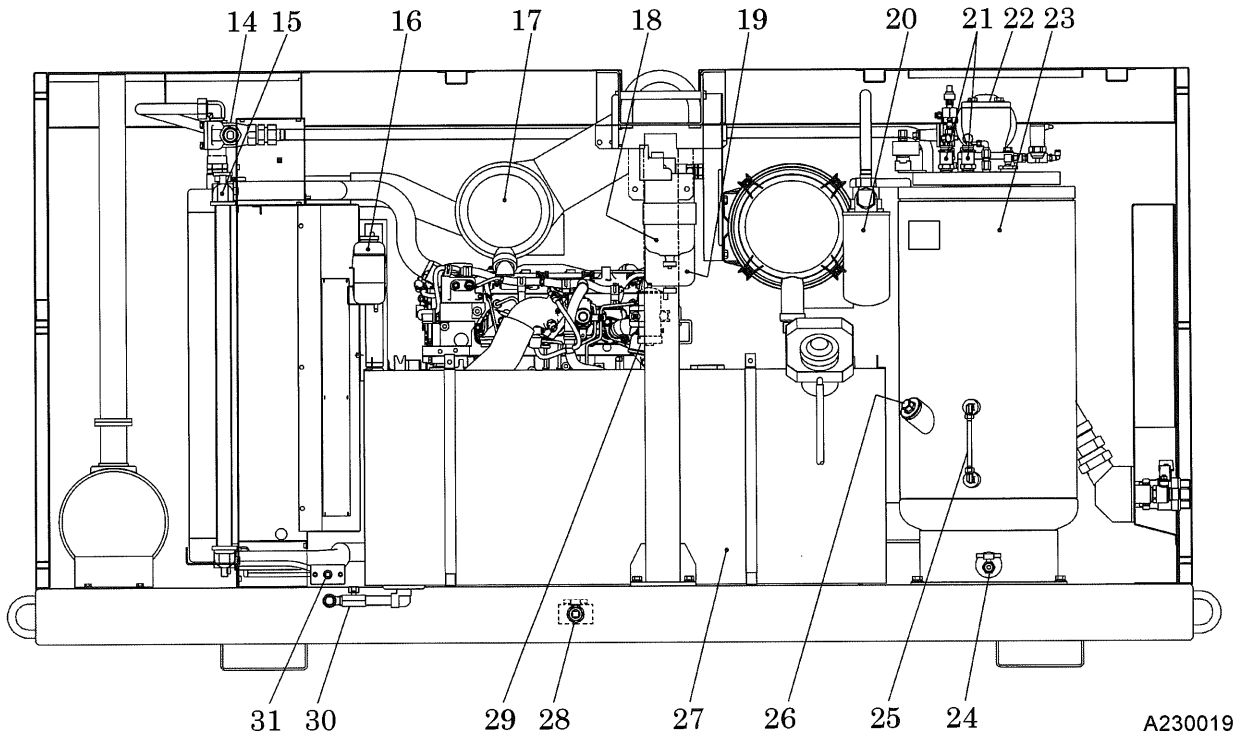
2.1 Internal Components and Part Names



FAC-110B

No.	Description	Function
1	Solenoid valve for starting unloader (SV1)	For reducing load at start-up.
2	Pressure regulator	For regulating the compressor pressure in the system.
3	Solenoid valve for starting unloader (SV2)	For reducing load at start-up.
4	Air filter (For compressor air-end)	For filtering the dust floating in the air in the system.
5	Air-end	For compressing air in the system.
6	Engine oil filler port (also used as oil level gauge)	For supplying or adding engine oil. (also used for checking engine oil level)
7	Engine oil filter	For filtering engine oil in the system.
8	Engine	For driving the compressor air-end in the system.
9	Inter cooler	For cooling the air compressed by engine supercharger in the system.
10	Oil cooler	For cooling compressor oil in the system.
11	Exhaust muffler	For silencing the noise caused before discharging the air.
12	Oil cooler drain valve	For draining compressor oil from oil cooler and oil line.
13	Battery	For electrically starting engine.

2.Part Names



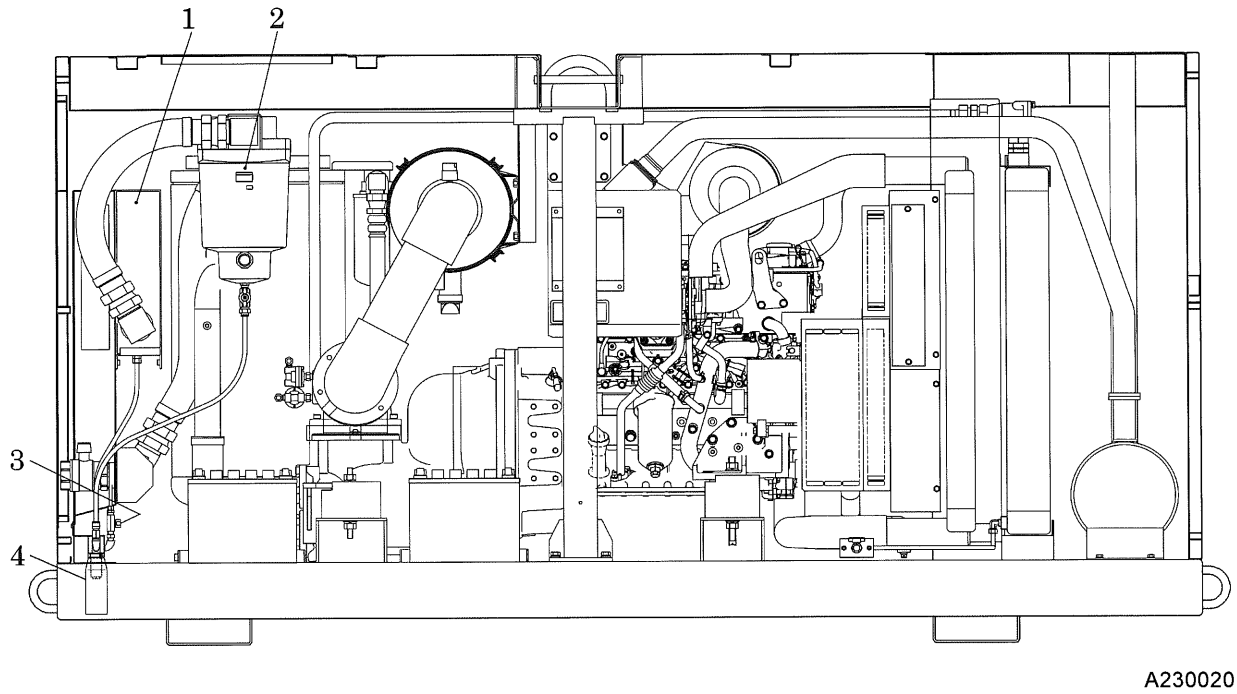
FAC-110B

No.	Description	Function
14	By-pass valve	For keeping compressor oil at optimum temperature in the system.
15	Radiator	For cooling the coolant for engine in the system.
16	Reserve tank	For checking coolant level and supplying it.
17	Air filter (For engine)	For filtering the dust floating in the air in the system.
18	Fuel filter	For filtering foreign matter and dust mixed in fuel.
19	Fuel pre-filter	For removing dust and water mixed in fuel.
20	Compressor oil filter	For filtering compressor oil in the system.
21	Safety valve	For releasing compressed air to the atmosphere when the pressure rises higher than the rated pressure in the system.
22	Pressure control valve	For keeping the pressure in receiver tank constantly higher than a certain level in the system.
23	Separator receiver tank	For separating oil from compressed air in the system.
24	Separator receiver tank drain valve	For draining condensed water from separator receiver tank.
25	Compressor oil level gauge	For checking compressor oil level.
26	Compressor oil filler port	For supplying or adding compressor oil.
27	Fuel tank	For storing fuel.
28	Engine oil drain valve	For draining engine oil.
29	Fuel air-bleeding electromagnetic pump	For automatically bleeding air from fuel pipes in the system.
30	Fuel tank drain valve	For draining condensates from fuel tank.
31	Radiator drain valve	For draining engine coolant.

2.Part Names

[After cooler type]

Only the special devices additionally or optionally attached to the standard machine are shown in the following figure. For the details of the other standard devices, refer to page 2-1,2-2.



FAC-110BC

No.	Description	Function
1	After cooler	For cooling compressed air in the system.
2	Drain separator	For separating water from compressed air cooled in after-cooler in the system.
3	Drain warming valve	For preventing air pipe outlet port from getting frozen.
4	Drain port of air pipe	Location for draining water separated by drain separator.

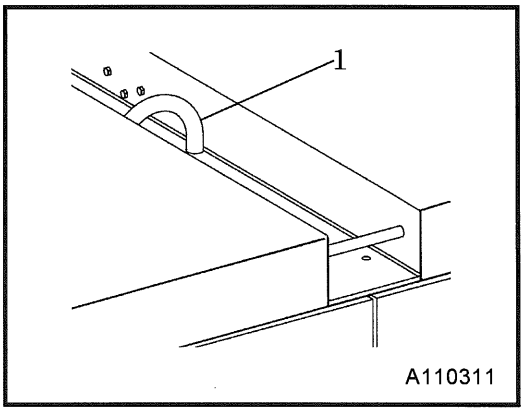
3.Installation

3.1 Transportation

⚠ WARNING

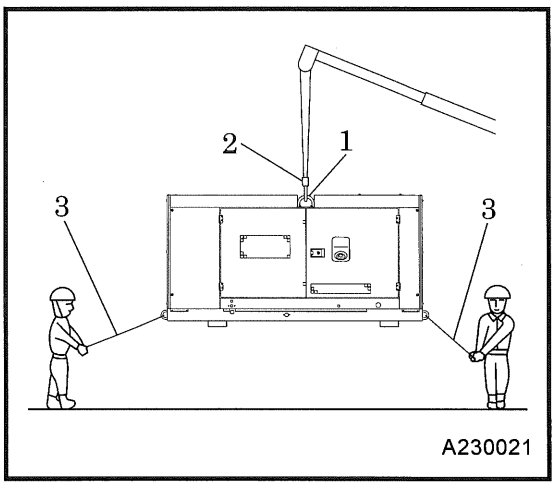
Transportation

- When loading and unloading machine, be sure to use the lifting bail "1" provided on the center of the machine top.
- Never get under the machine which is suspended, because it is very dangerous.
- Never lift machine which is still in operation, or it could cause critical damage to each component or lead to serious accident.



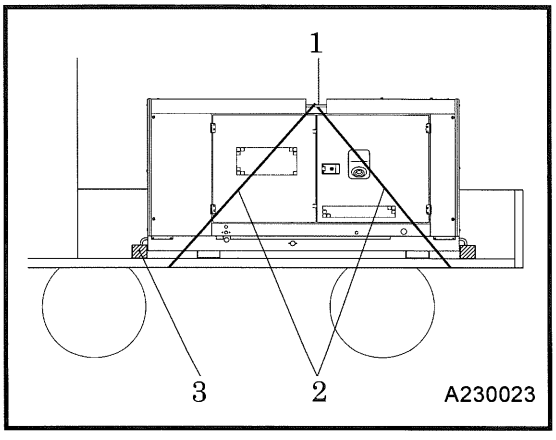
3.1.1 Lifting up

① Before lifting the machine up, make sure to check the lifting bail "1" for any crack and loosened bolts.
② Connect the hook "2" of the crane or shackle with lifting bail "1" fitted at the top center of the machine, and make sure that there is no person standing around the machine. Then perform hoisting operation.
③ Use auxiliary ropes "3" to prevent the machine from swinging and/or twisting, giving signs and signals each other.
④ Select a truck or a crane with capacity sufficient for weight and size of the machine by referring to the values shown in Chapter 8 "Specifications" of the manual.
⑤ Never lift the machine while it is running, or this could cause a serious accident.



3.1.2 Mounting the machine on the truck bed

- When moving the machine from working site, load it to truck, and fix it by the rope "2" with using the rope hooks "1" on both right and left side of bonnet, and be sure to place the block "3".



3.Installation

3.2 Location and Installation

⚠ DANGER

Ventilation

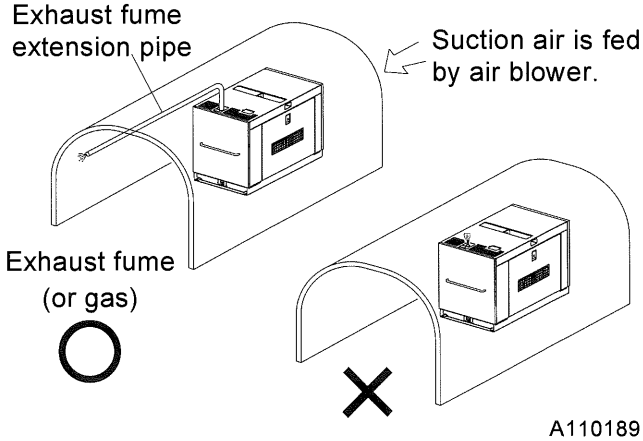
- Exhaust gas from the engine is poisonous, and could cause death when inhaled.
  Avoid using the machine in an insufficiently ventilated building or tunnel.
- Do not position the exhaust gas outlet in direction of a person or a house.

PC002

⚠ DANGER

Installing the machine such poorly-ventilated place

- In case that the machine is installed inside any tunnel, make sure to provide fresh air and ventilate it.
- In this case, make sure to extend the exhaust fume pipe outdoors, and also make sure to prevent any leak from any connection pipes.



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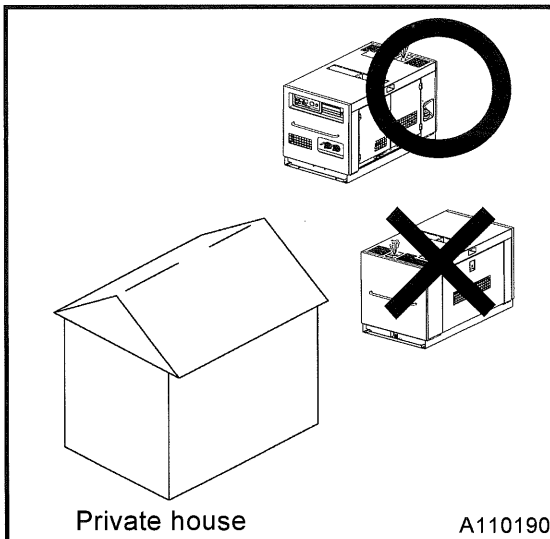
⚠ DANGER

How to locate the machine

- Never locate the machine with the exhaust muffler facing any private house:
- As the exhaust fume (gas) from the engine is poisonous, never direct it to any other persons passing by.



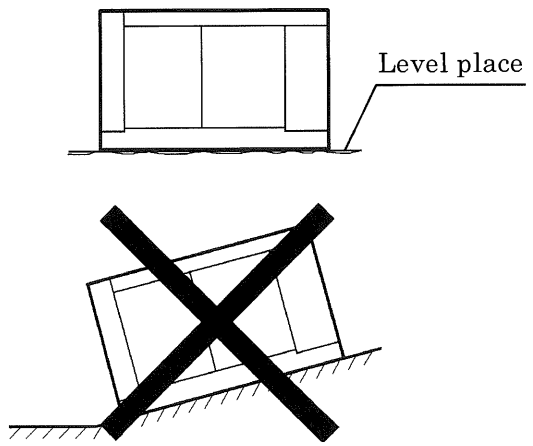
A110190

3.Installation

⚠ CAUTION

Installation

- The machine has to be parked horizontally on a level place.
- The machine should be installed within 5° degree inclination.
- When installing the machine at a sandy place, make sure that exhaust from the generator or radiator does not blow the sand up in the air, or into the machine.
- In case that the machine has to be installed inevitably on any rough and uneven ground; it is necessary to insert square wooden bars under the machine for levelling it.



- The machine should be operated in following conditions:
- **Ambient temperature ····· -15°C to 40°C**
- **Humidity ····· Less than 80%**
- **Altitude ····· Lower than 1,500 m above sea level**

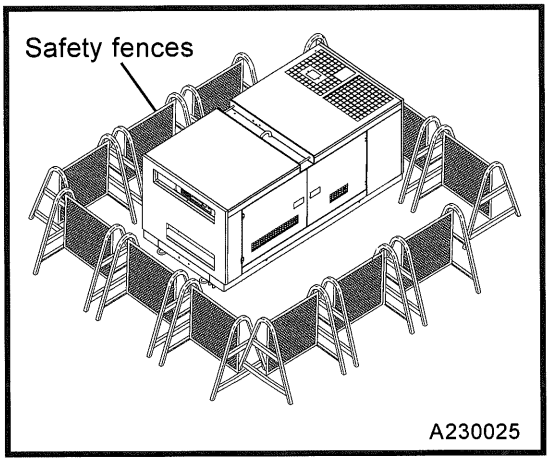
※ **If you use the machine not in the conditions stated above, it may causes serious breakdown.**

- Install the machine in a place with good ventilation, lower temperature and with surroundings as dry as possible.
- If more than two machines are placed parallel in operation, keep enough distance so that exhaust air from one machine does not affect the other one.
- Also, a machine has to be installed in the environment where fresh air is always available.
- Keep enough space around the machine for inspection and maintenance access.

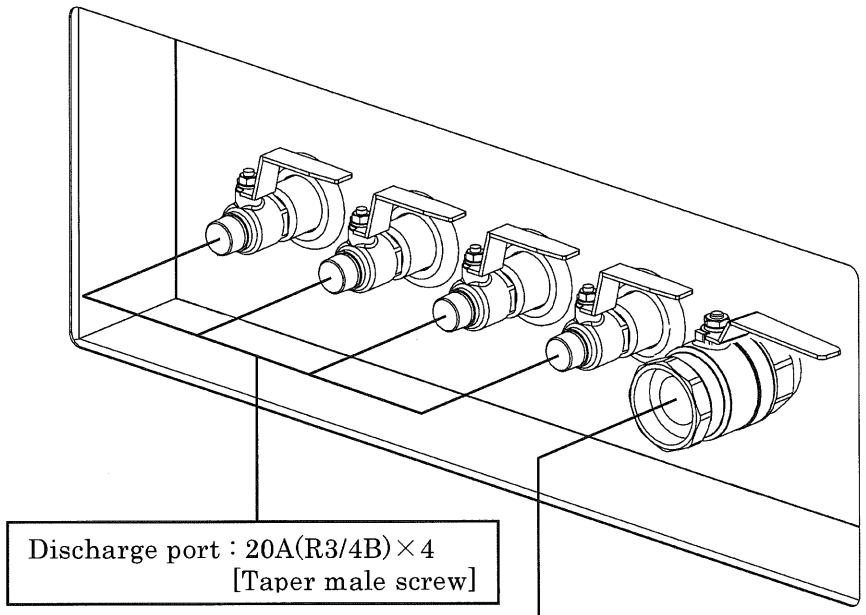
⚠ CAUTION

Preparation of safety fences

- In order to prevent from entering the jobsite or touching the equipment any other persons than the persons engaged in the job, please prepare for safety fences around the machine:



3.2.1 Service valve



4.Operation

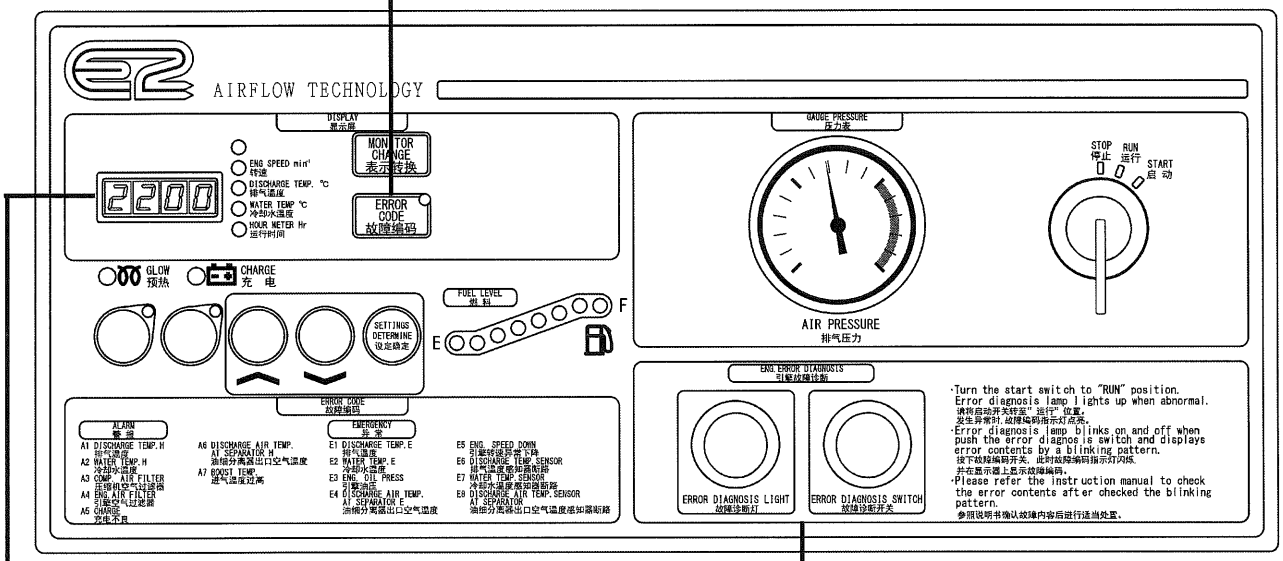
4.1 Instrument Panel

Each display of the operation panel is illustrated as follows.
Read and fully understand the explanations and be sure to operate safely:

Error code / Reset switch

When this switch is pushed on while lamp is blinking, it shows error code. When starter switch is placed to "STOP", displayed screen is reset.

※ Regarding the error, take a necessary measure referring to the clause 6.2.



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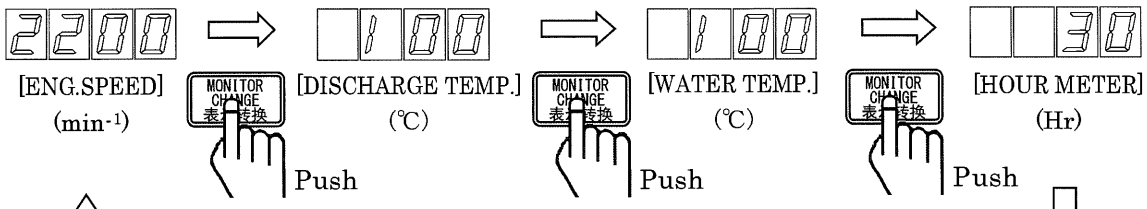
Engine trouble diagnosis

In case of any error or trouble, diagnosis lamp continues lighting. Pushing the diagnosis switch continuously makes the diagnosis lamp flash, and then it will indicate contents of error or troubles.

Digital monitor

When power is supplied, revolution speed (lamp lighting) is indicated.



Whenever indication selector switch is pushed every time, indication screen is changed by turns as shown above.

※In case that discharge air temperature is below 20℃, "———L" is indicated on screen.

4.Operation

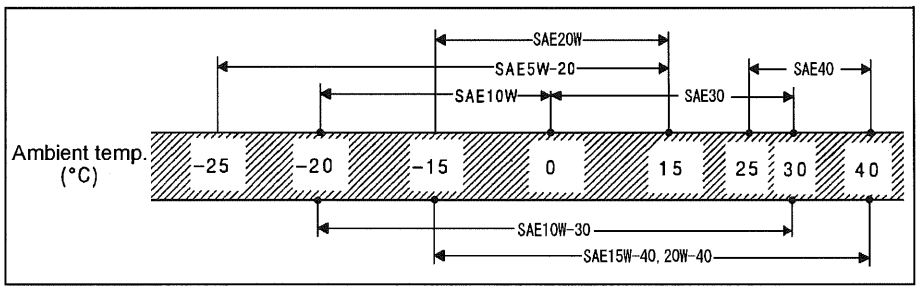
4.2 Lubricating oil · Coolant · Fuel

4.2.1 Engine oil

IMPORTANT

- Viscosity of engine oil greatly affects startability, performance, oil consumption of the engine, as well as wear of the moving parts.
- Choose appropriate oil based upon the table below according to the outside air temperature.

Ambient temperature range and oil viscosity (SAE)



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*** When the machine is delivered from factory, it is filled with the engine oil having the following specifications:**

Classification	API service classification CF class or higher
Viscosity	SAE10W-30

- When two or more different brands of oil are mixed, its performance can be deteriorated. Do not mix oils.
- Follow the designated regulations to dispose of engine oil.

4.2.2 Compressor oil

IMPORTANT ***Do not mix compressor oil***

- Be sure to use recommended oil listed below.

Maker and Brand of Recommended Oil

Maker	Brand
SHELL	SHELL CORENA S3R(VG32)
JX NIPPON OIL & ENERGY CORPORATION	FAIRCOL RA32

- Even continuous oil replenishment cannot improve its deteriorated condition. Be sure to change the oil completely at every scheduled interval.
- Do not mix it with other brand oil, or it will cause poor performance and shorten the life of the compressor oil. (But fresh compressor oil could accept a mixture of small amount of different brands.)
- Running the machine with old and deteriorated compressor oil will cause damage to bearings, or serious accident like ignition in a separator receiver tank. Be sure to change the oil completely at every scheduled interval.
- Follow the designated regulations to dispose of compressor oil.

4.2.3 Coolant

IMPORTANT — ***Quality of coolant and antifreeze***

- Use soft water of good quality such as tap water for coolant.
- When water with dirt, sand, and/or dust contained, or hard water such as well water (ground water) is used, this will cause deposits inside radiator or on cylinder head, and will cause engine overheat due to poor flow of coolant.
- When the machine is used in a cold region and possible freezing is expected, it is recommended to use LLC (Antifreeze) for the coolant.
- Adjust mixing ratio of LLC (Antifreeze) with water according to the temperature. **(When the machine is delivered from factory, it is filled with LLC (Antifreeze) of density 35%.) Use LLC (Antifreeze) within the range of its mixing ratio between 30 and 60%. (If LLC (Antifreeze) in the water exceeds more than 60%, it may decrease its antifreezing effect.)**
- Follow the designated regulations to dispose of LLC (Antifreeze).

4.2.4 Fuel

IMPORTANT — ***Choose appropriate***

- Be sure to use diesel fuel oil.
  (Using other oil will cause low power output or damage the engine.)
- Follow the designated regulations to dispose of diesel fuel oil.

- As for fuel, use diesel fuel oil (having higher than 45 cetane number).
- Use of diesel fuel oil having lower than 45 cetane number will cause inferior function to engine and, what is worse, it will cause serious accident to the engine.

4.Operation

4.3 Check before Starting Machine

⚠ CAUTION — ***Check before starting machine***

- Be sure to check the machine before operation.
  When any abnormality is found, be sure to repair it before restarting the machine.
- Be sure to make daily checks before operation. If the machine is operated without prior check and without noticing its abnormality, such operation could cause seizure of components or may even cause fire.

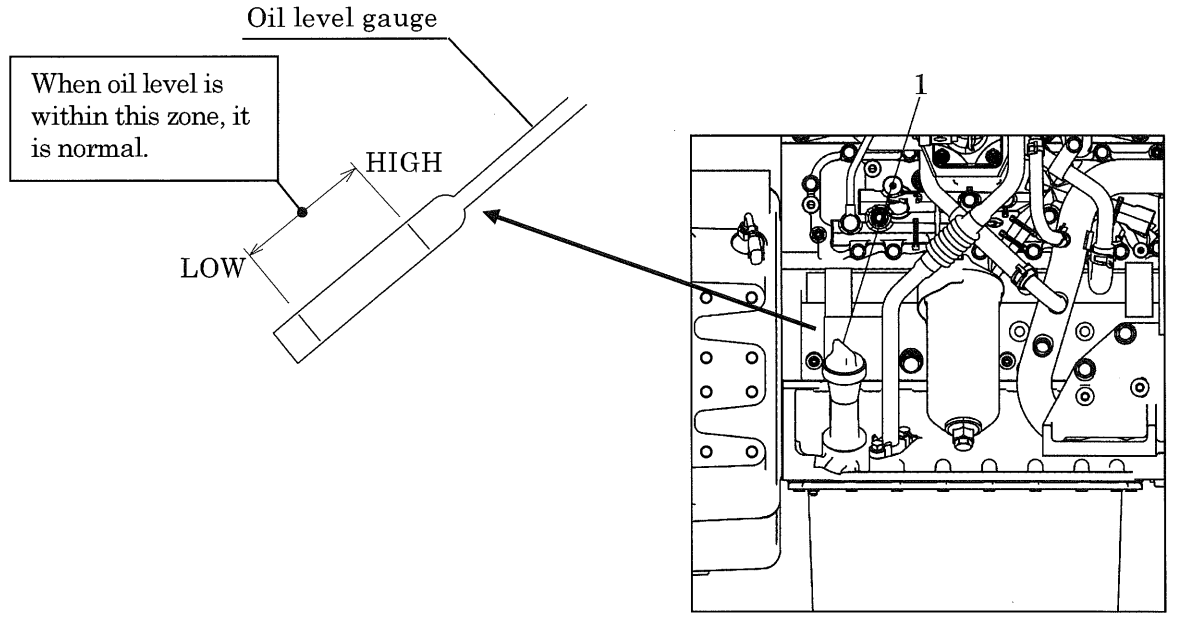
4.3.1 Check engine oil level

- Machine should be on level before checking oil level.
- When you check oil level after you have once started operation, wait 10 to 20 minutes after stopping engine, before checking the oil level.

<Procedure>

① Remove the oil level gauge, and wipe it with a clean cloth.
② Then, re-insert the oil level gauge fully and pull it out again.
If the oil level gauge shows the oil level between LOW and HIGH, it is normal.
③ When the oil level is below its LOW, add engine oil from engine oil filler port (used as oil level gauge) "1".

- While checking oil level, check also for contamination. If the oil is found dirty, contaminated or should it be changed according to the periodic inspection list, change the oil. (See 5.6.1)



4.3.2 Check coolant level

⚠ CAUTION

Taking off the radiator cap

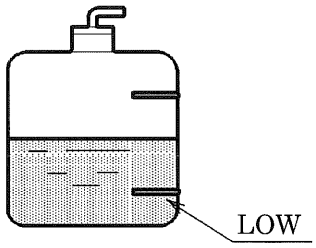
- Be sure to stop the machine and allow time to cool. Then loosen the radiator cap one notch. After the coolant water is sufficiently cooled and the inner pressure is released, take the cap off.
  If this procedure is neglected, the inner pressure can blow off the cap. Steam jetting out of the radiator could result in causing scalding. Follow this procedure under all circumstances.

H990432

IMPORTANT

- Do not continue operation at low coolant level.
  Air bubble is mixed into radiator, and it causes damage to the radiator.

- Check the coolant level in the reserve tank. If it is lower than the limit, open the cap and replenish the coolant. (Level must be kept above LOW mark.)
- In case that quite a little coolant is found in the reserve tank (lower than LOW mark), remove the radiator cap and replenish the coolant through it. (See 5.6.16)



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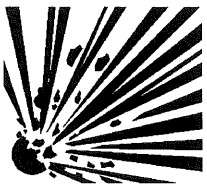
4.3.3 Check compressor oil level

⚠ WARNING

Refilling of compressor oil

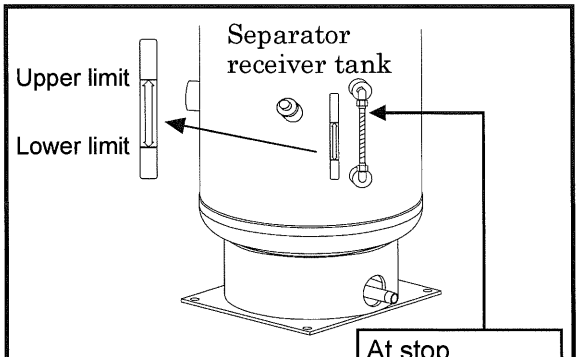
- When you refill the separator receiver tank with compressor oil, stop the engine, and make sure that the pressure gauge indicates 0MPa and there is no residual pressure in it, and then gradually loosen the oil filler cap for refilling oil.
- Should any residual pressure be left in the separator receiver tank, hot compressed air and hot compressor oil jetting out could cause burning or serious injury to persons nearby.



W010

- Place the machine on level ground when checking the oil level.
- After checking and confirming that the residual pressure in separator receiver tank is 0MPa, replenish the tank with compressor oil so that the oil level is kept higher than the upper limit of oil level gauge plate. (See 5.6.5)

※ Supply of excessive oil can cause deterioration of oil separation performance and the like. Never supply oil at a higher level than the "proper level" of oil level gauge when the machine is on standstill.



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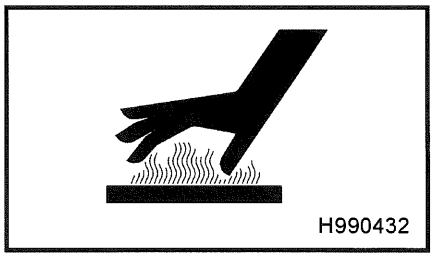
4.3.4 Drain separator receiver tank

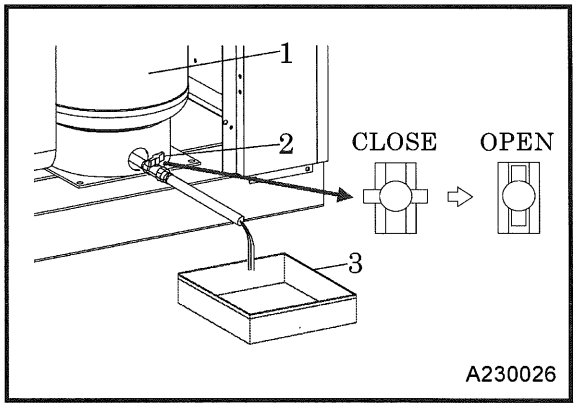
⚠ WARNING

Draining of Separator receiver tank

- After stopping the engine, confirm that the pressure gauge indicates 0MPa and there is no residual pressure in it, then open the drain valve gradually to drain the compressor oil.
- Note residual pressure in the receiver tank could force both extremely hot compressed air and oil to jet out and you may be scalded or seriously injured.
- A long-time operation with condensate accumulated could cause rust in the interior of compressor air-end, resulting in serious trouble.


H990432

- Gradually opening the drain valve "2" fitted under the separator receiver tank "1" as shown in the fig, drain the condensate.
- When the drain valve is fully opened, it will be drained together. Take care not to lose it.
- After draining the oil completely, close the drain valve "2" firmly.
- Drain the condensate in container "3", and then dispose of condensate according to the designated regulations.
- Touch the fluid and check its viscosity to determine whether it is condensate or compressor oil, and when it is difficult to distinguish between the two.



A230026

4.3.5 Check fuel

- Before starting operation, make sure to check the level of residual fuel so that fuel shortage during operation can be avoided.
- Drain condensate accumulated at the bottom of fuel tank whenever necessary.

⚠ CAUTION

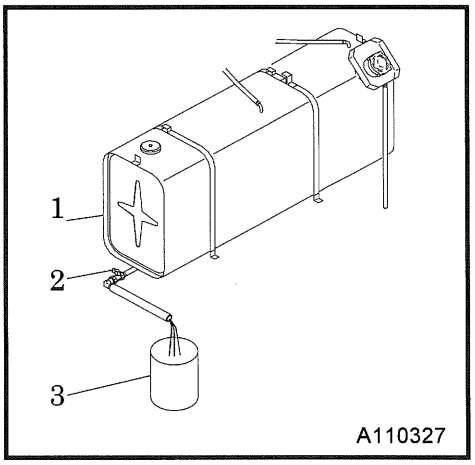
Fire prevention

- Do not, under any circumstance, bring lit cigarettes and/or matches to the fuel.
- The fuel is extremely flammable and dangerous.
  Be careful of fire because it is very likely to catch fire.
- Refuel only after stopping the engine, and never leave open fuel can near the machine. Do not spill. It could cause a fire. When it is spilt, wipe it up completely.
- Never use alcohol-base cleaning fluid. If it sticks to such parts made of plastic, it causes degradation of liquid surface visibility, and in worst case, it leads to crack and fuel leak due to crack caused.
- Refilling fuel tank should be done in an outdoor well-ventilated place.
- **Do not fill fuel up to the filler level. When fuel tank is filled up to the filler level, fuel will be overfilled due to volume expansion caused by rise of ambient temperature. Further, fuel will be possibly spilled from fuel tank due to vibration caused during movement and/or transportation of the machine.**


D004

4.3.6 Drain fuel tank

- Remove drain valve "2" provided under fuel tank "1" and open drain valve "2" for draining condensate accumulated in fuel tank.
- After condensate is completely drained out, make sure to close drain valve "2".
- Drain the condensate in container "3", and then dispose of condensate according to the designated regulations.



4.3.7 Check fuel pre-filter for condensate

⚠ CAUTION

- At time of inspection, never use alcohol-base cleaner. If it sticks to such parts made of plastic, it causes degradation of liquid surface visibility, and in worst case, it leads to crack and fuel leak due to crack caused.

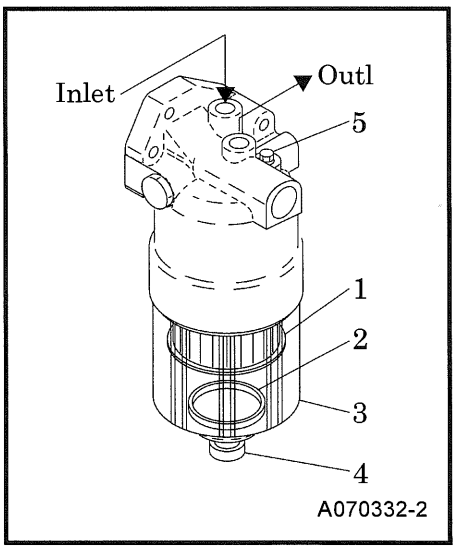
Check if the red float "2" in the pre-filter rises up to the water drain level "1", then drain water if it is near the drain level.

<Draining procedure>

① Drain condensed water accumulated inside, after loosening drain plug "4" and air bleeding plug "5".

② After draining the condensate, be sure to fasten the drain plug "4" and air bleeding plug "5".

- Never remove case "3" of fuel pre-filter because if removed fuel comes out. In case that it is necessary to remove it, do it after having clogged the inlet hose using a clip or like.
- Drain the condensate in container, and then dispose of condensate according to the designated regulations.



4.3.8 Check wiring of each part

Check each wiring for any loose connection, damage to insulating sheathed portion, disconnection, and short-circuit.

4.3.9 Check piping of each part

Check each piping for any loose connection and also check each hose and pipe for any tear and leaks.

4.3.10 Check belt tension

IMPORTANT

- Too tight belt tension could damage shaft and shorten bearing life. Too loose belt tension may result in damaging belt earlier and machine components due to overheat.

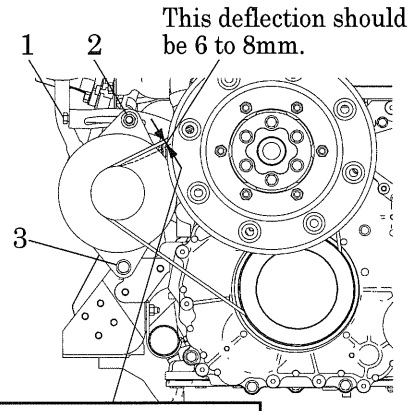
- Follow the procedure below to adjust tension of belt.
- Adjust the belt tension using the bolt "1" by loosening alternator fixing bolt "3" and the locknut "2".

<Procedure>

① Visually check if there are any cracks or tears in the belt.

② Adjust the belt by loosening the alternator fixing bolt "3" and the locknut "3" so that the deflection can be kept at 6 to 8 mm when the belt midway is pressed with about 98N·m (10kgf·m) force by a finger. After belt adjustment is completed, retighten the fixing bolt "3" and locknut "2" surely.

③ Be careful not to leave any grease or LLC on a belt while changing it. If any such material is left, wipe it off completely.

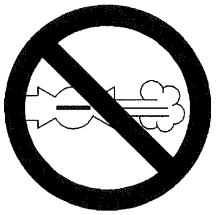


4.4 Operation

CAUTION

Operation with discharge port (compressed air supply port) opened is prohibited

- Do not operate the machine with service valves and relief valve open unless air hoses and/or pipes are connected. High-pressurized air blows out and its air pressure could cause injury to the people nearby.
- When the machine has to be unavoidably temporarily operated with its port open, be sure to mount a silencer to reduce noise and wear protective materials such as earplugs to prevent damage to hearing.



WARNING

- Keep the door closed and locked while running the machine.
- When the door has to be opened, be careful not to touch portions that are rotating or very hot. Careless touch may cause serious injury.
- Pull the handle forward to open the door.
- Be sure to close the door tightly so that its latch is firmly caught.

4.Operation

4.4.1 Procedure to start the machine

IMPORTANT — ***Be sure to warm-up***

- Be sure to let machine warm-up after starting for smooth operation of the engine and the compressor air-end. Do not operate the engine at full load immediately after it starts up. This will shorten the equipment life.
- During the warm-up operation, examine the different parts of the equipment for any looseness, leakage of water, oil, fuel, and other irregularities. Also, make sure that diagnosis lamps are off.

<Procedure>

① Check and confirm the indicator of discharge air pressure gauge "3" that it indicates 0MPa.

② Close fully service valve.

③ Turn the starter switch "1" to "RUN" position, and the glow lamp "2" goes on.

④ As soon as the glow lamp "2" has gone out, turn the starter switch "1" fully clockwise to start up the engine. After starting engine, starting unload operation automatically begins.

- The time of starting unloader operation changes according to the discharge air temperature as mentioned in the following table.

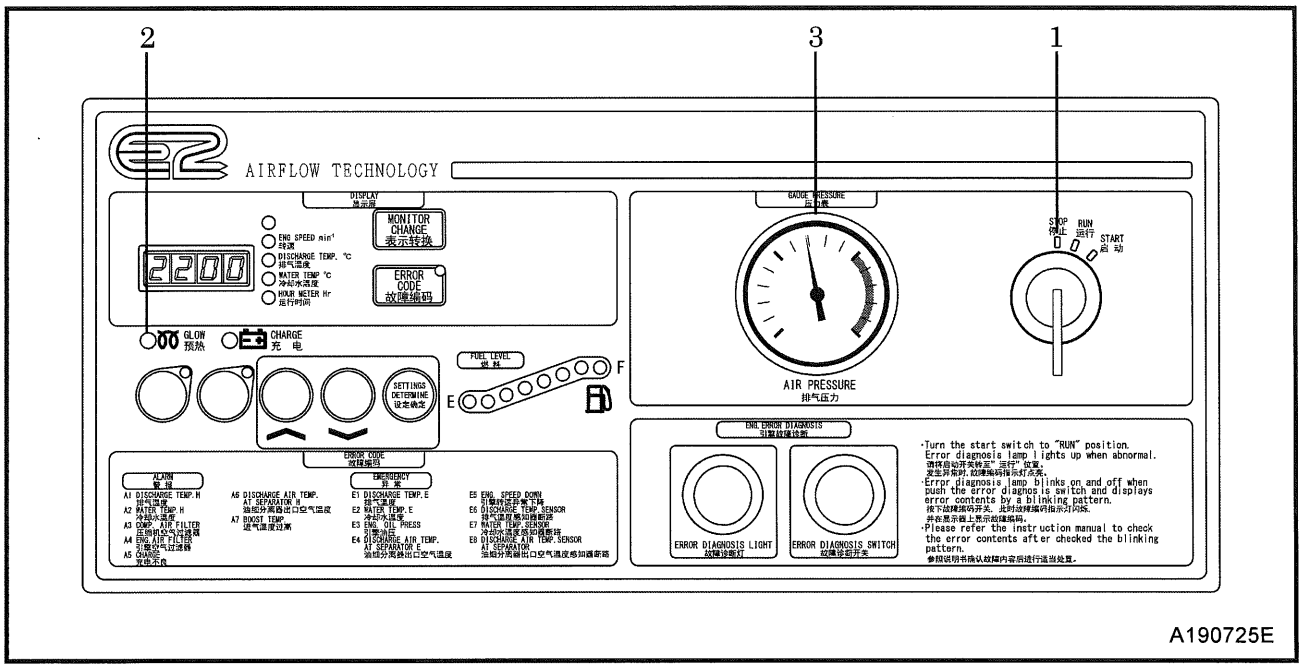
Discharge air temperature	Required time for starting unloader operation
Less than 10℃	The shorter one that exceeds 120 sec or 30 sec and the discharge air temperature reaches 10℃ or higher.
Higher than 10℃	30 sec

- Engine RPM speed changes according to the discharge air temperature as mentioned in the following table.

Discharge air temperature	Engine speed (rpm)
Less than 60℃	1,600 min^{-1}
Higher than 60℃	1,300 min^{-1}

⑤ Once the engine has started up, leave it running to warm-up for about 5 minutes.
The discharge air pressure gauge "3" in this condition ranges from 0.3 to 0.9MPa.

⑥ After finishing warming up operation, open the service valve provided at the outlet of compressed air and start service job.



4.4.2 Operating procedures when engine fails to start up on first attempt

- When the engine fails to start up even after performing the startup procedures ① to ④, do not keep the starter running, but set the starter switch back to "STOP" and wait about 30 seconds. Then, repeat the startup procedure once again.
- If the repeated procedure does not allow the engine to run, the following causes are suspected. Therefore, check the following:
- No fuel
- Clogging of fuel filter
- Discharge of battery (Low cranking speed)

4.4.3 How to start the machine at low temperature

IMPORTANT — ***Operation under Cold Weather Conditions below -5°C***

- Use SAE10W-30 (CF class) for the engine oil.
- Use LLC (antifreeze). Use correct amount to provide freeze protection, according to the ambient temperature.
- Battery should always be kept fully charged.

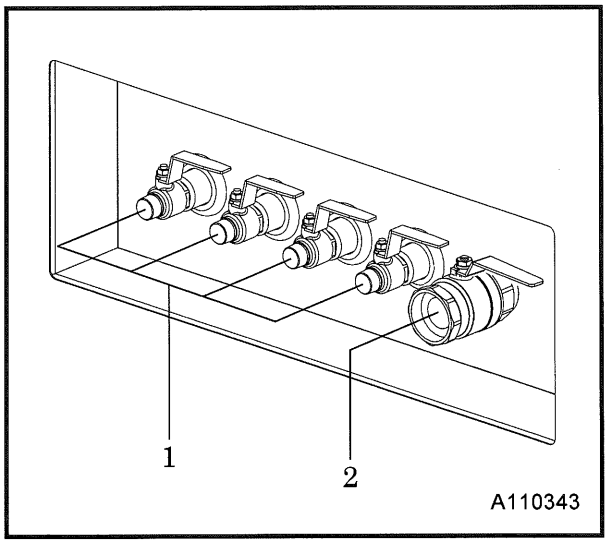
When it is difficult to start engine in cold weather, take the following measures.

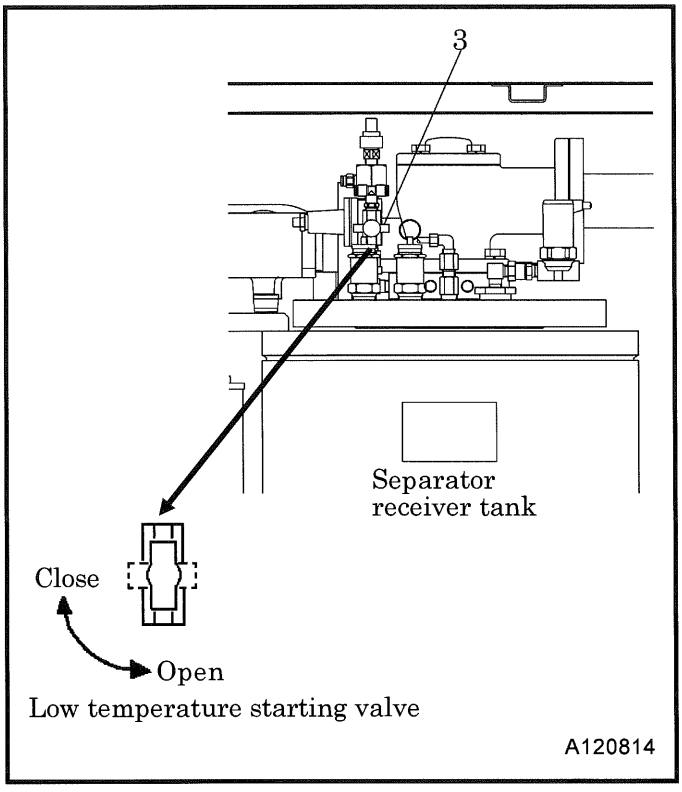
<Procedure>

① Fully close the service valve "1"and "2", and fully open the low temperature starting valve "3" which is provided at the top of separator receiver tank.

② Perform normal starting operation first and gradually close the low temperature starting valve "3", watching the rising engine speed.

[Caution]
The discharge pressure will not rise with low temperature starting valve "3" kept open.
Make sure to close the low temperature starting valve "3" before starting operation.





4.4.4 Indication of Instrument Gauge during Operation

IMPORTANT

- Minimum discharge air pressure is 0.40MPa during operation.
- Continuing equipment operation at a lower pressure than the above pressure may cause overheating, since it affects the separation of lubricating oil inside the oil separator and reduces the oil flow to the compressor air-end, resulting in temperature rise.

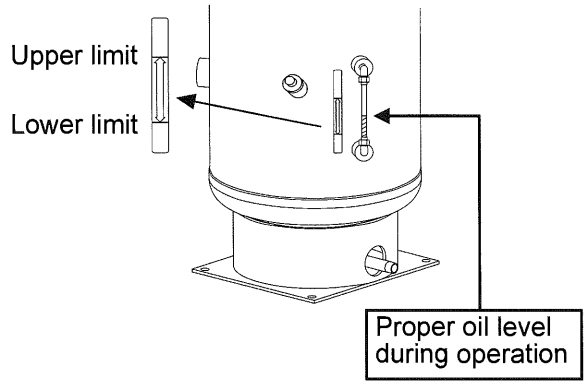
- Be sure to check at times to see if gauges or each component of the machine are properly working, or if there is any air-leak, oil-leak, water-leak or fuel-leak etc.
- During normal operation, each indication of instruments is shown in the table below. Refer to the table for daily checks.
- The above table gives standard values. They may vary slightly depending on the operating conditions and other factors.

Protection device		Indicator lamp	
		GLOW	CHARGE
Monitor			
Starting	Starter switch set to "RUN" position	● OFF ※	☼ ON
In operation		● OFF	

		Discharge pressure gauge
In operation	No load (Unload)	0.69 to 0.85MPa
	Full load	0.4 to 0.69MPa

※ This lamp will be OFF in 0 to 20 seconds, (varying upon ambient temperature.)

- During loaded operation, make sure to check and confirm that the oil level stays between upper limit and lower limit. If not, replenish compressor oil.



Amount of oil during operation

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4.5 Procedure to stop the machine

<Procedure>

① Close the service valve completely and operate the machine about 5 minutes, until it cools down.

② Turn the starter switch to "STOP" position to stop the engine.

③ Remove the key from the compressor every time when you stop the engine. Keep the key and be careful not to lose it.

4.6 Bleeding air in fuel system

Should the machine stop due to fuel shortage, perform air bleeding according to the following steps.

<Procedure>

① Place starter switch to "RUN" position to keep electromagnet pump functioning.

② Loosen "air bleeding plug" enough to move "Priming pump" (more than 20 times) till fuel comes out.

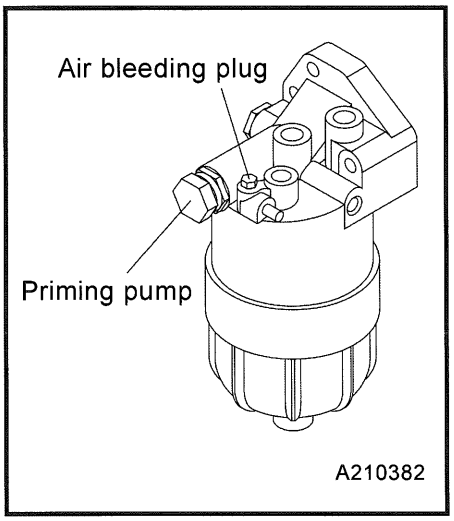
③ Tighten "Air bleeding plug" and move "Priming pump" (more than 10 times) till fuel is filled in fuel filter.

④ After waiting about 1 minute, loosen "Air bleeding plug" to bleed air from air filter.

⑤ Repeat the above procedures ②-④ till air does not come out from "Air bleeding plug".
(at least more often than 3 times).

⑥ Tighten "Air bleeding plug" for sure, set the starter switch to "STOP" position, and wipe out fuel around.
Air bleeding plug tightening torque:7.9~11.7N·m

● For details, refer to the engine operation manual.



⚠ CAUTION

● Tighten the air bleeding plug firmly to the specified torque. Loosening of the air bleeding plug may cause fuel leakage.

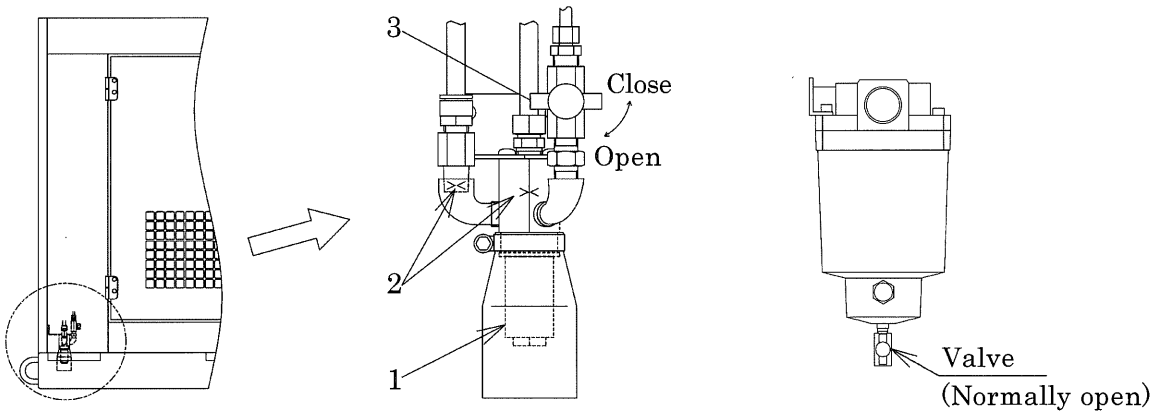
4.7 Operation of after-cooler type

4.7.1 Draining after cooler

- As an extremely small amount of an oil component is contained in the after cooler drain, please be careful in treating the drain.

[Check and clean drain outlet port of the aftercooler]

- Check if the drain is discharged from the drain outlet port of aftercooler during operation.
- If the drain is not discharged, clean the silencer "1" at the drain outlet port and the orifice "2". Replace these if severely contaminated.
- Continuing to operate without discharging the drain may cause mixing the drain into the discharged air or freeze the inside of the aftercooler in cold weather, resulting in damage.
- When cleaning or replacing it, contact directly us or distributor because it requires expert technical knowledge.



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4.7.2 Drain warmer valve

- This valve "3" is provided to prevent condensate water from getting frozen when draining water separated. Run the machine with the valve being "open" when ambient temperature is lower than 5℃.But when freezing is impossible, the machine can be operated more dfficently if the valve is "closed".

4.7.3 To prevent freezing when stopped

- In cold weather, before stopping the engine, open and close the service valve 2-3 times for about 5 seconds each time in order to remove the condensate accumulated inside the air piping such as the aftercooler. If the drainage is not sufficiently removed, the inside of the aftercooler may freeze and be damaged.

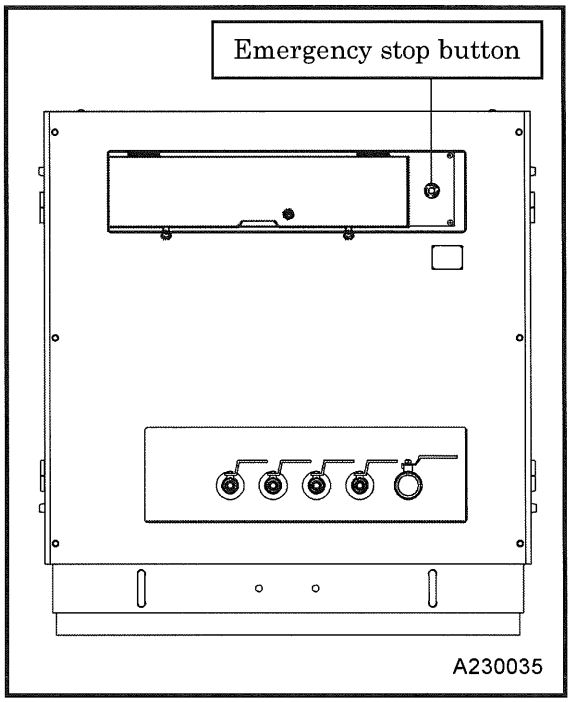
⚠ CAUTION

- When operating with purging the compressed air, install a silencer on the outlet (compressed air supply port) and wear protective gear such as earplugs to prevent hearing impairment.

4.8 Emergency Stop

4.8.1 Emergency stopping procedures

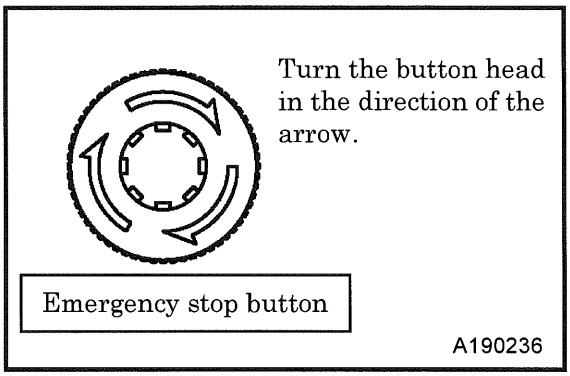
- If it is necessary to stop the machine for emergency, press the Emergency stop button.
  When shutting down with the emergency stop button, the machine will be stop immediately.
- When shutting down with the emergency stop button, the control power is "ON". After shutting down, turn the starter switch to "Stop" position immediately and remove the starter key. Do not look inside the machine and take inspection right after shutting down.



4.8.2 Cancellation of emergency stop button

- After emergency stopping, be sure to carry out an investigation of the problem which caused you to use the emergency stop and take appropriate countermeasures. Release emergency stop button after making sure the safety was confirmed.
  To reset the button, turn the button head in the direction of the arrow.

※ If it is not reset, the machine cannot restart operation.



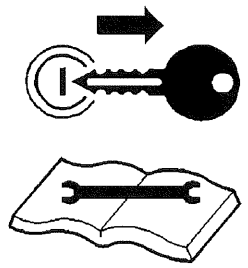
5.Periodic Inspection/Maintenance

5.1 Important Items at Periodic Inspection and Maintenance or after Maintenance

The following table shows the inspection and maintenance intervals under normal operation conditions. When used or operated under hard environmental conditions, it is impossible to warrant the machine even if the above conditions are performed according to the intervals listed in the above table.

⚠ WARNING — ***Hang a "Now Checking and under Maintenance" tag***

- Remove the starter key from the starter switch before starting inspection, and hang up a "Now Checking and under Maintenance" tag where it can be easily seen. The checker must keep the key during checking and maintenance.
- Remove the negative (–) side cable from the battery.
  If the above procedure is neglected, and another person starts operating the machine during check or maintenance, it could cause serious injury.
- Use tools appropriate for the inspection and maintenance. Any makeshift or improper tools could cause unexpectedly injury by their slippage.



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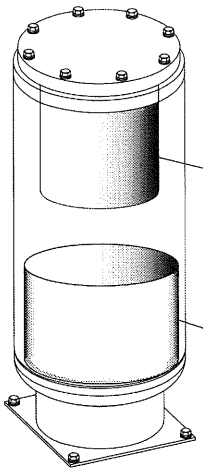
⚠ CAUTION — ***Prevention of oil separator from catching fire***

- Be sure to perform oil change basically according to the specified interval. But if such oil is found much more contaminated before the interval, change the oil even before the specified period comes. In doing so, replace the oil completely and use our recommended oil.
- Be sure to perform following periodic inspection and maintenance:
  1. Check and change compressor oil
  2. Change oil separator
- Never mix the oil of different brands, or the mixed oil may deteriorate the oil quality.



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5.Periodic Inspection/Maintenance

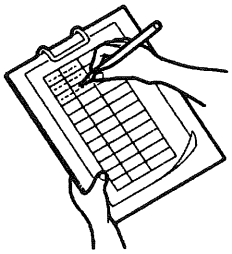
IMPORTANT ***Directions: Prohibition of any other jobs or works than directed herein***

- Be sure to use recommended fuel, oil, grease, and antifreeze.
- Do not disassemble or adjust engine, compressor air-end or part(s) for which inspection or maintenance is not referred to in this manual.
- Use genuine parts for replacement.
- Any breakdown, caused by using unapproved parts or by wrong handling, will be out of the scope of "WARRANTY".
- Keep the electrical components away from water or steam.
- Waste from machines contains harmful material. Do not dispose of such harmful fluids to the ground, rivers, lakes or ponds, and sea. It contaminates the environment.
- When draining waste fluid from machines, use leak proof containers to hold such fluids from machine.
- Be sure to follow the designated regulations when disposing of oil, fuel, coolant, filters, battery and other harmful things.

5.2 Daily Inspection and Operation Log

- Be sure to carry out daily inspection every morning before operation. See Chapter 4 "Operation" of the manual for the details of inspection.
- Pay attention to and carefully observe the following points during daily operation or inspection and maintenance work. If any trouble or abnormality is found, immediately investigate its cause and make repairs. If the cause is unknown or not traceable, or if the trouble involves a part or component not described in the manual, ask our office nearby or distributor for information.

(a)Controls and instruments function properly.
(b)Quantity and any leak of water, fuel, and oil or any contamination should be checked.
(c)Appearance, abnormal noise or excessive heat should be checked.
(d)Loose bolt or nut should be checked.
(e)Any damage, wear or shortage of machine components and parts should be checked.
(f)Performance of each part or component should be proper.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- Keep the operation log to record constant inspection of each component, so that trouble of the machine can be easily discovered and preventive measures can be taken.
  It is very useful to record information such as discharge pressure, oil level, as well as running hour, maintenance items and replenishment of lubricant on a daily maintenance log.

5.3 Inspection on Separator Receiver Tank

IMPORTANT ***Periodic inspection of separator receiver tank***

- Be sure to carry out the following cleaning and inspection of the separator receiver tank at least once every year.

<Procedure>
(1) Any damage found on the tank.
(2) Any excessive wear found to fastening bolts on the cover.
(3) Any damage found to pipes and valves etc.

5.Periodic Inspection/Maintenance

5.4 Periodic Inspection List

(Unit:Hour)

	Maintenance	Daily	Every 250	Every 300	Every 500	Every 1,000	Every 2,000	Every 3,000	Every 12,000	Page
Compressor	Check compressor oil level.	○								4-5
	Drain separator receiver tank.	○								4-6
	Check looseness in pipe connecting part, and wear and tear of pipe.	○								4-7
	Check oil, water, fuel and air leak.	○								4-11
	Check functions of all instruments and devices.	○								4-11
	Check and clean clogging of air filter element		○							5-8
	Change compressor oil.			○ First time	○					5-9
	Change compressor oil filter.			○ First time	○					5-10
	Clean strainer in the scavenging orifice.				○					5-10
	Change air filter element.				○					5-11
	Clean outside of oil cooler.					○				5-12
	Clean outside of after cooler. (After cooler type)					○				5-12
	Check and clean drain outlet port of air pipe. (After cooler type)					※1○				5-13
	Change oil separator.						☆●			5-15
	Change nylon tube.						☆●			5-16
	Clean and change drain separator. (After cooler type)						※1○			5-16
	Change pressure regulator.							●		5-16
	Change O-ring of unloader.							★●		5-17
	Check and change bushing of unloader.					※2○		★●		
	Check consumable part of auto-relief valve.							★●		5-17
	Check consumable part of vacuum relief valve.							★●		5-17
	Performance check of pressure control valve							★●		5-18
	Check and change of O-ring and piston of pressure control valve							★●		5-18
	Check rubber hose.							★●		5-18
	Check solenoid valve (Re-usable after check, if normal.)							●		
	Change rubber coupling.							● Every 3 years		
	Change oil seal and bearing.								●	

Such items marked ○ shall be carried out by customers.
For the following items or clauses marked ●, contact our office nearby or distributor because technical knowledge is required.

Regarding the item marked ※1:When water is found mixed in the discharged air, perform cleaning work even before the specified interval comes.
Regarding the item marked ※2,check the function of the unloader. In case the unloader malfunctions, change O-ring or bushing of unloader. This is because either of both parts may be worn out.

※ The items or parts marked ☆ should be replaced every two years even if they are not in disorder within their periodical maintenance interval because their materials will change or become degraded over the course of as time passes. Also for the same reason, the parts marked ★ should be replaced every three years.

※ The indicated replacement periods are rough estimates. Depending on the usage conditions or environment, inspection/maintenance should be conducted earlier.

※ The above intervals of inspection and maintenance are respectively based on 1,000 hours of use per year.

5.Periodic Inspection/Maintenance

◎**Refer to engine operation manual for inspection and maintenance of an engine.**
For the details, contact our office nearby or distributor.

(Unit:Hour)

	Maintenance	Daily	Every 50	Every 250	Every 500	Every 1,000	Every 2,000	Every 3,000	Every 6,000	Page
Engine	Check engine oil level.	○								4-4
	Check coolant level.	○								4-5
	Check fuel.	○								4-6
	Drain fuel tank	○								4-7
	Check fuel pre-filter for condensate	○								4-7
	Check looseness in pipe connectors, terminals and tear in wiring.	○								4-7
	Check belt tension.	○								4-8
	Change engine oil.		○ First time		○					5-6
	Change engine oil filter.		○ First time		○					5-7
	Check battery electrolyte.			○						5-7
	Check and clean clogging of air filter element.			○						5-8
	Change air filter element.				○					5-11
	Change of fuel filter and fuel pre-filter element.				○					5-11
	Check and clean of the supply pump strainer				○					5-12
	Clean filter inside the fuel air-bleeding electromagnetic pump				○					5-12
	Clean outside of radiator and inter cooler.					○				5-12
	Drain intercooler.					○				5-12
	Clean inside of radiator.					●				5-13
	Change coolant.					☆○				5-14
	Change inter cooler hose.						☆●			5-16
	Change fuel hose.						☆●			5-16
	Clean inside of fuel tank.						●			5-16
	Change radiator hoses.							☆●		5-18
	Change wiring harness.								●	

※ The items or parts marked ☆ should be replaced every two years even if they are not in disorder within their periodical maintenance interval because their materials will change or become degraded over the course of as time passes.

※ The indicated replacement periods are rough estimates. Depending on the usage conditions or environment, inspection/maintenance should be conducted earlier.

※ The above intervals of inspection and maintenance are respectively based on 1,000 hours of use per year.

5.Periodic Inspection/Maintenance

5.5 Periodic Replacement of Parts

- Part number changes upon modification.
  For replacement of parts, make sure whether the part number is correct or applicable.

Part Name		Part Number	Quantity
Element kit for engine oil filter		37438 08700 ISUZU 898018-8580	1
Air filter element	For compressor air-end	32143 12400 (Inner element)	1
		32143 12500 (Outer element)	1
	For engine	32143 12600 (Inner element)	1
		32143 12700 (Outer element)	1
Compressor oil filter		37438 05601	1
Element kit for fuel filter		43543 01000 ISUZU 898143-0410	1
Element kit for fuel pre-filter		43543 00900 ISUZU 898074-2880	1
Gasket for filter inside fuel air-bleeding electric pump		ISUZU 898071-4040	1
Unloader valve	O-ring "1"	21441 03800	1
	O-ring "2"	21441 03400	1
	Gasket "3"	22116 02400	1
	Gasket "4"	22112 08800	1
Oil separator	Separator "1"	34220 16500	1
	Gasket "2"	34235 06000	1
	Gasket "3"	34235 06100	1
Auto-relief valve & vacuum relief valve	O-ring "1"	03402 25021	2
	O-ring "2"	03402 25008	2
	O-ring "3"	21221 02100	2
Pressure control valve	Gasket "1"	03737 11203	1
	O-ring "2"	03402 25048	1
	Spring "3"	22144 09400	1
	Piston "4"	35303 05100	1
Pressure regulator		36400 19000	1
Engine supply pump strainer "1"		ISUZU 898074-9550	1
Gasket for engine supply pump strainer "2"		ISUZU 109630-0850	3
Copper packing for air bleeding plug of the EGR cooler		ISUZU 909571-4100	1
Solenoid valve	For starting unloader (SV1)	46811 27100	1
	For starting unloader (SV2)	46811 28700	1
Belt		ISUZU 898038-8560	1
Element for drain separator (FAC-110BC only)		34540 00800	1

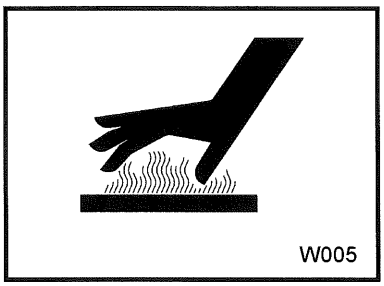
5.Periodic Inspection/Maintenance

5.6 Maintenance Items

5.6.1 Change engine oil
[At 50 hours for the first change and at every 500 hours thereafter]

⚠ CAUTION — ***Caution in filling or discharging engine oil***

- After stopping the engine, wait for 10 to 20 minutes until the engine oil cools off. Then check the level of the engine oil, or refill or drain the oil.
- Engine oil is very hot and highly pressurized during or just after the operation. Hot oil could blow out of the tank and can cause scalding.
- Never supply more engine oil than the proper level. Too much oil could cause white smoke out of the exhaust, and it can cause damage and accident to engine.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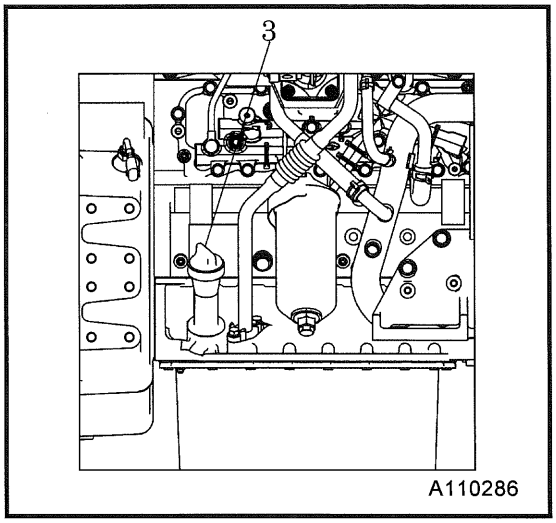
<Procedure>

① Remove the drain plug "1" attached outside the plane, open a drain valve "2" inside the plane, and discharge engine oil drain.

② After drainage of used engine oil has been completed, close drain plug "1" and drain valve "2" and supply new engine oil through the engine oil filler port (used as oil level gauge) "3" which is used as oil level gauge also.
[Quantity of oil : approx.15L]

③ After supplying oil, pull out the engine oil filler port (used as oil level gauge) "3" and wipe it out.

④ Then, re-insert the engine oil filler port (used as oil level gauge) "3" fully and pull it out again. If the dipstick shows the oil level between LOW and HIGH, it is normal.



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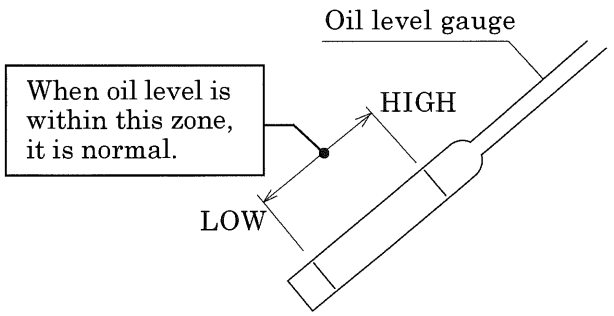

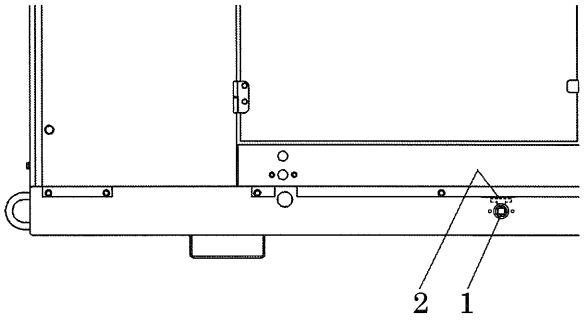

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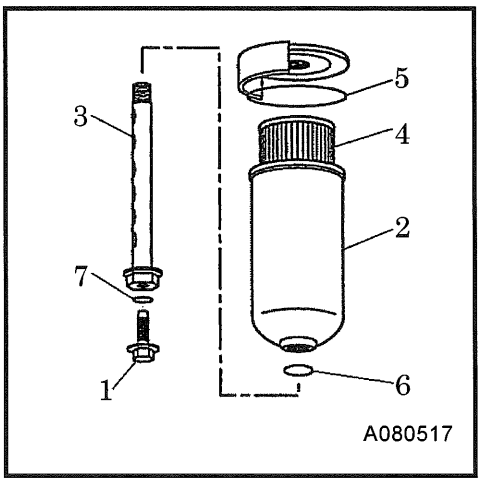
5.6.2 Change engine oil filter [At 50 hours for the first change and at every 500 hours thereafter]

<Procedure>

① Remove drain plug "1" and drain the oil condensed in filter case "2".
② Remove filter case "2" by loosening center bolt "3" and pull out element "4".
③ Wash the inside of filter case "2" with diesel oil.
④ Use oil filter element kit for element "4" and change O-ring "5", "6" and "7". (For part number, See 5.5)
⑤ Insert a new element "4" into the filter case "2" and fix it with center bolt "3".

- Drain the condensate in container, and then dispose of condensate according to the designated regulations.
- Both tightening torques for center bolt "3" and drain plug "1" are mentioned below.

Tightening torque for center bolt : 44.1N・m
Tightening torque for drain plug : 25.4N・m



5.6.3 Check battery electrolyte [Every 250 hours]

If there seems to be a problem in starting an engine due to a flat battery, carry out the checks by following the procedures below:

1. Ordinary type battery:

Check battery electrolyte level and if the level is not within the specified level, add distilled water.
Measure specific gravity of battery electrolyte, and if it shows below 1.24, recharge the battery immediately.
Refer to 6.1. for method of specific gravity measurement and recharging the battery.

2. Enclosed type battery:

Check the indicator on top surface of the battery.
If the indicator shows that charge is needed, recharge the battery immediately.

5.6.4 Check and clean clogging of air filter element [Every 250 hours]

IMPORTANT ***Cleaning of Air Filter Element should be perfectly performed***

- Clogged or cracked or pitted element could allow entrance of dust into engine and compressor air-end to cause earlier wear of moving parts. Periodical inspection and cleaning of element should be performed to maintain life of compressor air-end and engine long.

<Procedure>

① After removing the cap "1" by loosening its latch "2", clean its interior properly.

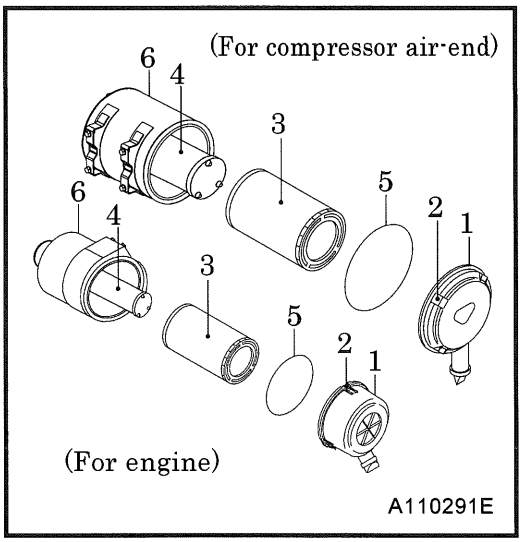
② Take out outer element "3" only, and clean it.
Be sure to never remove the inner element "4" at the same time because it is impossible to use twice the inner element "4" even if it clean.

③ Be sure to replace the inner element at once when replace the outer element. The inner element should be replaced once about every 4 times in replace the outer element.

④ It is impossible to use twice the inner element even if it clean. Be sure to prevent the dust go into the inside inner element when replace the inner element.

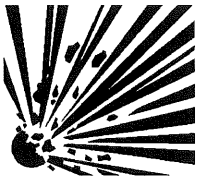
⑤ When installing cap "1" after cleaning it, hold O-ring "5" to the case "6" with a hand so that O-ring "5" may not come out, and then tighten it after confirming that the hook of cap "6" fixing latch "2" is engaged.

- Not limited to the above, be sure to replace an element new one in case of it became dirty extremely.
(For part number, See 5.5)



5.6.5 Change compressor oil
[At 300 hours for the first change and at every 500 hours thereafter]

⚠ WARNING — ***Refilling of compressor oil***



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- When you refill the separator receiver tank with compressor oil, stop the engine, and make sure that the pressure gauge indicates 0MPa and there is no residual pressure in it, and then gradually loosen the oil filler cap for refilling oil.
- Note residual pressure in the receiver tank could force both extremely hot compressed air and oil to jet out and you may be scalded or seriously injured.
- Even continuous oil replenishment cannot improve its deteriorated condition. Be sure to change the oil completely at every scheduled interval.
- Do not mix it with other brand oil, or it will cause poor performance and shorten the life of the compressor oil. (But fresh compressor oil could accept a mixture of small amount of different brands.)
- Running the machine with old and deteriorated compressor oil will cause damage to bearings, or serious accident like ignition in a separator receiver tank. Be sure to change the oil completely at every scheduled interval.
- Follow the designated regulations to dispose of compressor oil.

<Procedure>

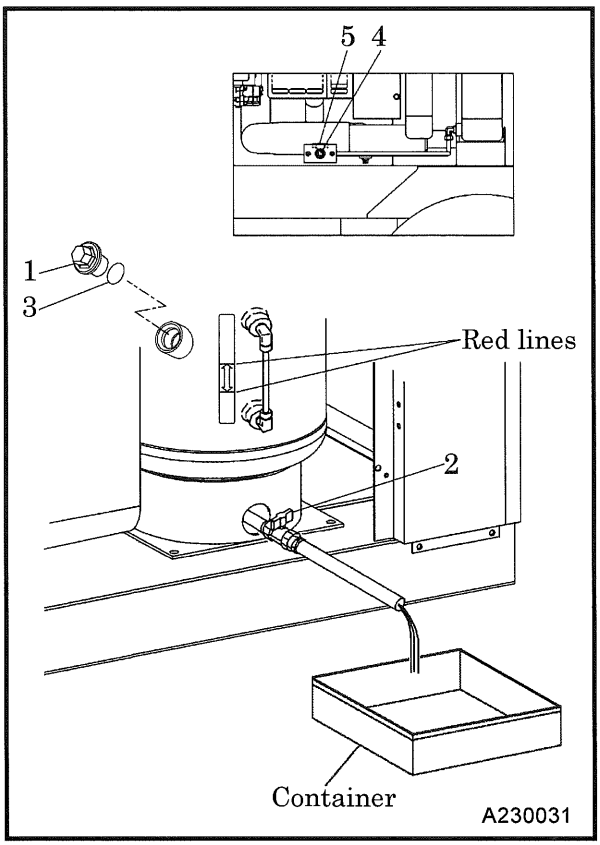
① After the machine has stopped and pressure inside the separator receiver tank has been completely released as much time passed, remove the oil filler cap "1" and open the drain valve "2" to drain the residual oil. Further, open the drain valve "5" after removing oil cooler drain plug "4" and drain the oil accumulated in the cooler.

② After compressor oil is completely drained out, close drain valve "2" and "4" for sure.

③ After filling new compressor oil up to the upper limit, retighten the oil filler cap "1". Check the O-ring "3" of the oil filler cap "1". If it is found hardened or damaged, replace it with a new one.

④ Start the machine. Then check and confirm that the oil level is between red lines at full load operation.

Oil level between red lines	Approx.10L
Oil quantity to be changed	Approx.50L



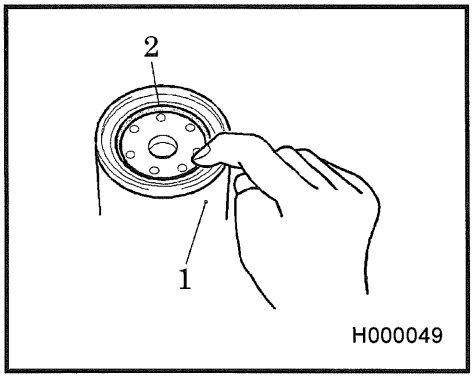
5.6.6 Change compressor oil filter
[At 300 hours for the first change and every 500 hours thereafter]

IMPORTANT — ***Use our genuine oil filter***

- Poor quality oil filters do not trap dust sufficiently and will cause damage to the bearings in a short period.

<Procedure>

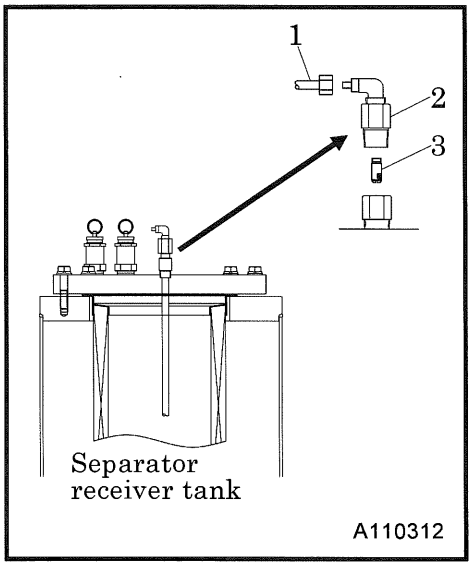
① Remove the cartridge "1", using a filter wrench.
② Screw in the new cartridge "1" with the packing "2" coated slightly with oil. (For part number, See 5.5)
③ After the packing "2" touches the sealing face, tighten another 1/2 to 3/4 turn with a filter wrench.
④ After installing the oil filter, check it for any leak during operation.



5.6.7 Clean strainer in the scavenging orifice
[Every 500 hours]

<Procedure>

① Remove the pipe "1", using a spanner.
② First remove the bushing "2".
③ Then remove the strainer "3".
④ Wash the removed strainer "3" in diesel oil and blow out "dust" by air blowing.
⑤ After finishing the cleaning, install the strainer "3" again in the reverse procedure.



5.6.8 Change air filter element [Every 500 hours]

IMPORTANT — ***Use our genuine part***

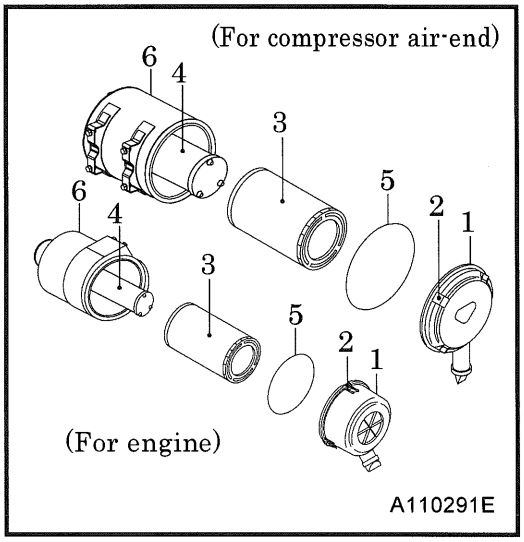
- Air filter is an important part which is crucial to machine's performance and life. Be sure to use genuine parts.

<Procedure>

① After removing the cap "1" by loosening its latch "2", clean its interior properly.

② Remove the element "3", "4" and then replace it with a new one. (For part number, See 5.5)

③ When installing cap "1" after replacing it, hold O-ring "5" to the case "6" with a hand so that O-ring "5" may not come out, and then tighten it after confirming that the hook of cap fixing latch "2" is engaged.



5.6.9 Change of fuel filter and fuel pre-filter element [Every 500 hours]

<Procedure>

① Loosen the drain plug "4" and the air bleeding plug "5" to drain out the fuel inside the fuel filter; After the drainage has been finished, retighten the drain plug "4" and the air bleeding plug "5" surely.

② Remove the filter case "1", using a filter wrench.

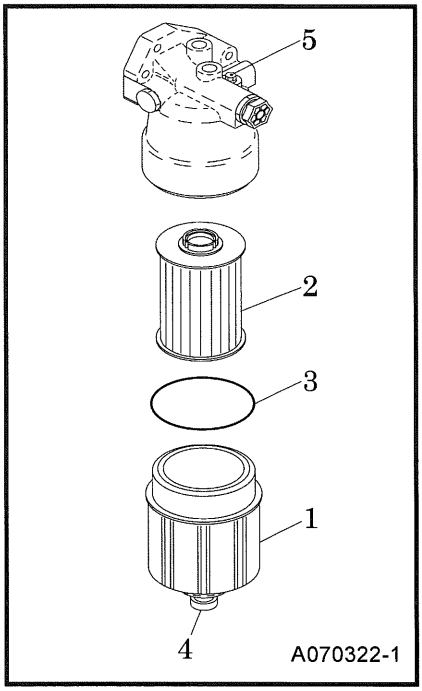
③ Screw in the new element "2" with the packing "3" coated slightly with oil. (For part number, See 5.5)

④ After the packing "3" touches the sealing face, further tighten it by turning it with the filter wrench.

⑤ Bleed air from fuel. (See 4.6)

⑥ After installing the element, check it for any leak during operation.

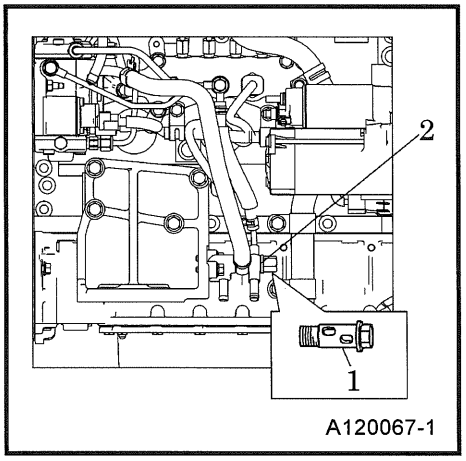
- For the details of replacement, refer to engine operation manual.



5.6.10 Check and clean of the supply pump strainer [Every 500 hours]

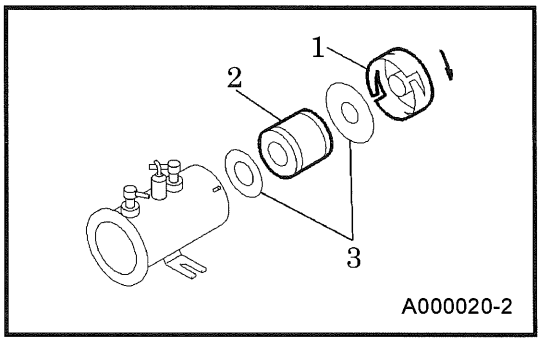
- Loosen the supply pump strainer "1" (joint bolt built-in type) and remove it. Then after washing it in diesel oil, blow dust and dirt off with high pressure air. Please be replaced whenever this gasket "2". (For part number, See 5.5)
- In case the conditions of lowered engine power and engine stop will not be improved even after the supply pump strainer (joint bolt built-in type) has been cleaned, it should be replaced. (For part number, See 5.5)

[NOTE] Supply pump strainer, not part of the decomposition please do not remove the strainer of internal order. (For more information, please refer to theinstruction manual of the engine.)



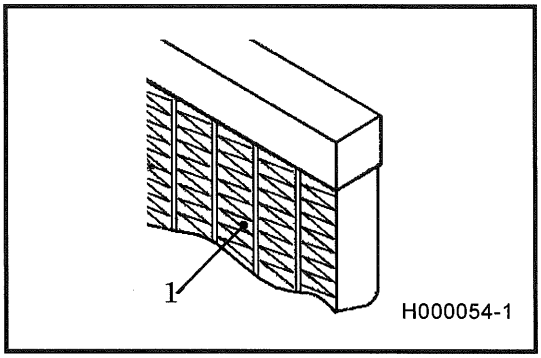
5.6.11 Clean filter inside the fuel air-bleeding electromagnetic pump [Every 500 hours]

- Turning the cap "1" counterclockwise to remove it, the filter "2" (steel mesh type) inside will come off. So, clean it.
  (For part number, See 5.5)
- Whenever the filter "2" is removed, the gaskets "3" should be replaced without fail.
- As the fuel inside spills out when it is removed, prepare a fuel receiver.



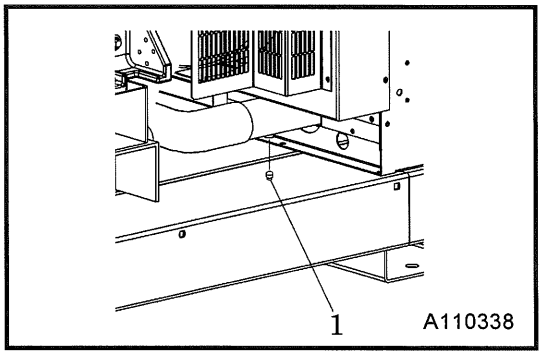
5.6.12 Clean outside of radiator, oil cooler, after-cooler and intercooler [Every 1,000 hours]

- When the fin tubes "1" of radiator, oil cooler, after-cooler and intercooler get clogged with dirt and dust heat, exchange effectiveness drops so much that temperature rise of coolant temperature and engine suction air is caused. It is necessary to clean them even prior to the regular interval according to the clogging state of them.
- Do not use a high pressure washer to protect fin tubes "1" from being damaged.



5.6.13 Drain intercooler [Every 1,000 hours]

- Remove drain plug "1" below intercooler to drain condensate.
- After finishing drainage, install drain plug "1".



5.6.14 Clean inside of radiator [Every 1,000 hours]

- When the inside of a radiator and water conduits of an engine are dirty with scale and rust, its cooling efficiency will be deteriorated. Clean the interiors of such components periodically.
- When cleaning it, contact our office nearby or distributor because technical knowledge is required.

5.6.15 Check and clean drain outlet port of air pipe (After cooler type) [Every 1,000 hours]

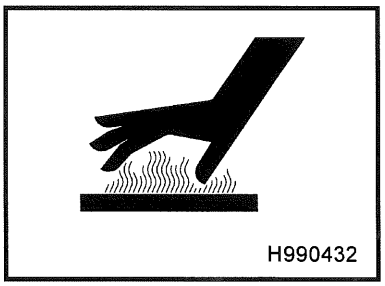
IMPORTANT — ***Cleaning it completely and keeping it cleaned***

- When any water is found mixed in discharged air, silencer and orifice and air pipe could be clogged. Periodically carry out inspection and cleaning of it.

- Regarding the details of the after-cooler, see 4.7.1 "Draining after-cooler".

5.6.16 Change coolant [1,000 hours or every 2 years]

⚠ CAUTION — ***Caution in filling or discharging engine oil***



- Be sure to stop the machine and allow time to cool. Then loosen the radiator cap one notch. After the coolant water is sufficiently cooled and the inner pressure is released, take the cap off. If this procedure is neglected, the inner pressure can blow off the cap. Steam jetting out of the radiator could result in causing scalding. Follow this procedure under all circumstances.
- LLC (Antifreeze) is a toxic material.
- If it should be swallowed by mistake, it is necessary to see a doctor immediately instead of being sent out enforcedly.
- When a person gets LLC (Antifreeze) in his eyes, wash the eyes with clean running water and make him see a doctor immediately.
- When LLC (Antifreeze) is stored, put it in a container with an indication saying "LLC (Antifreeze) inside" and seal it up, then keep it in a place away from children.
- Beware of flames.

<Procedure>

① To drain coolant, remove cap "1" of radiator top and open the drain plug "2" to drain it.

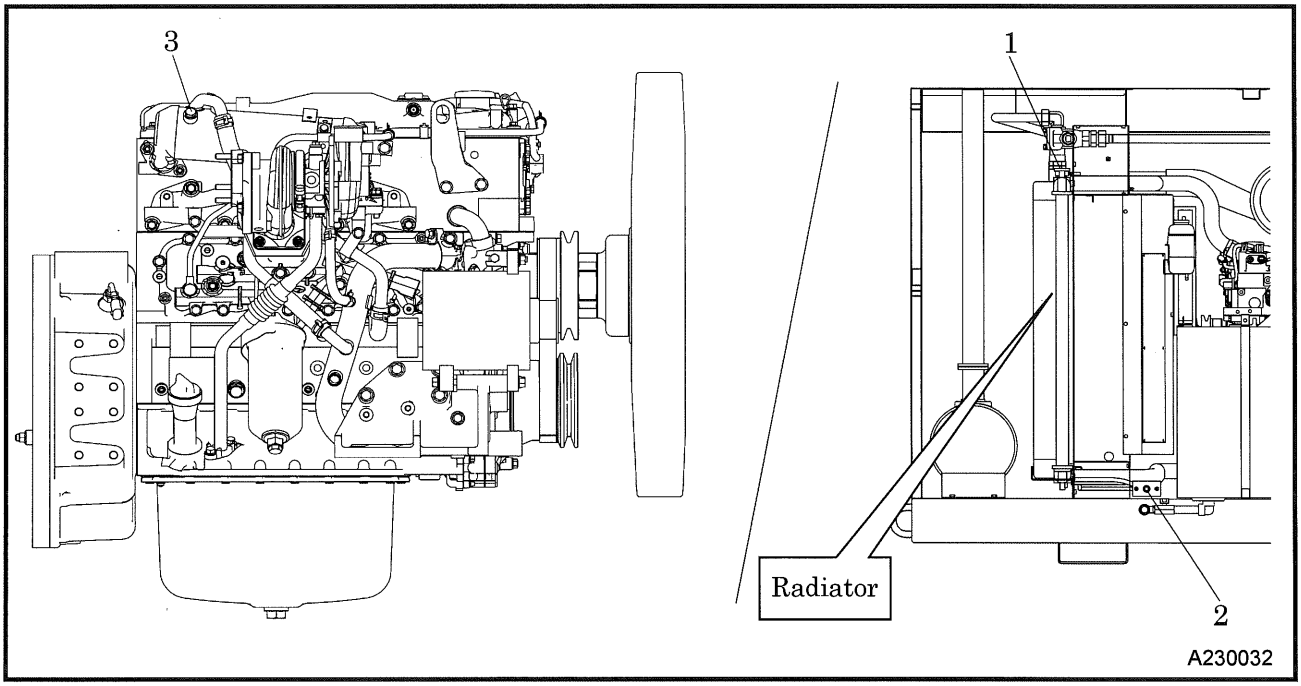
② After the drainage is completed, install drain plug "2" and then supply coolant through the filler port. **[Quantity of water : approx.11L]**

③ Loosen the EGR cooler air bleeding plug "3" and then bleed air from EGR cooler.

④ When coolant comes out from air bleeding plug "3", retighten the air bleeding plug "3" securely. When retightening the plug, the used packing should be replaced by a new copper packing to prevent the leakage. (For part number, See 5.5)

⑤ After changing coolant, operate the machine 2 to 3 minutes unloaded conditions and stop it. Again check and confirm the coolant level, and if short, additionally supply coolant.

- For the details of replacement, refer to engine operation manual.

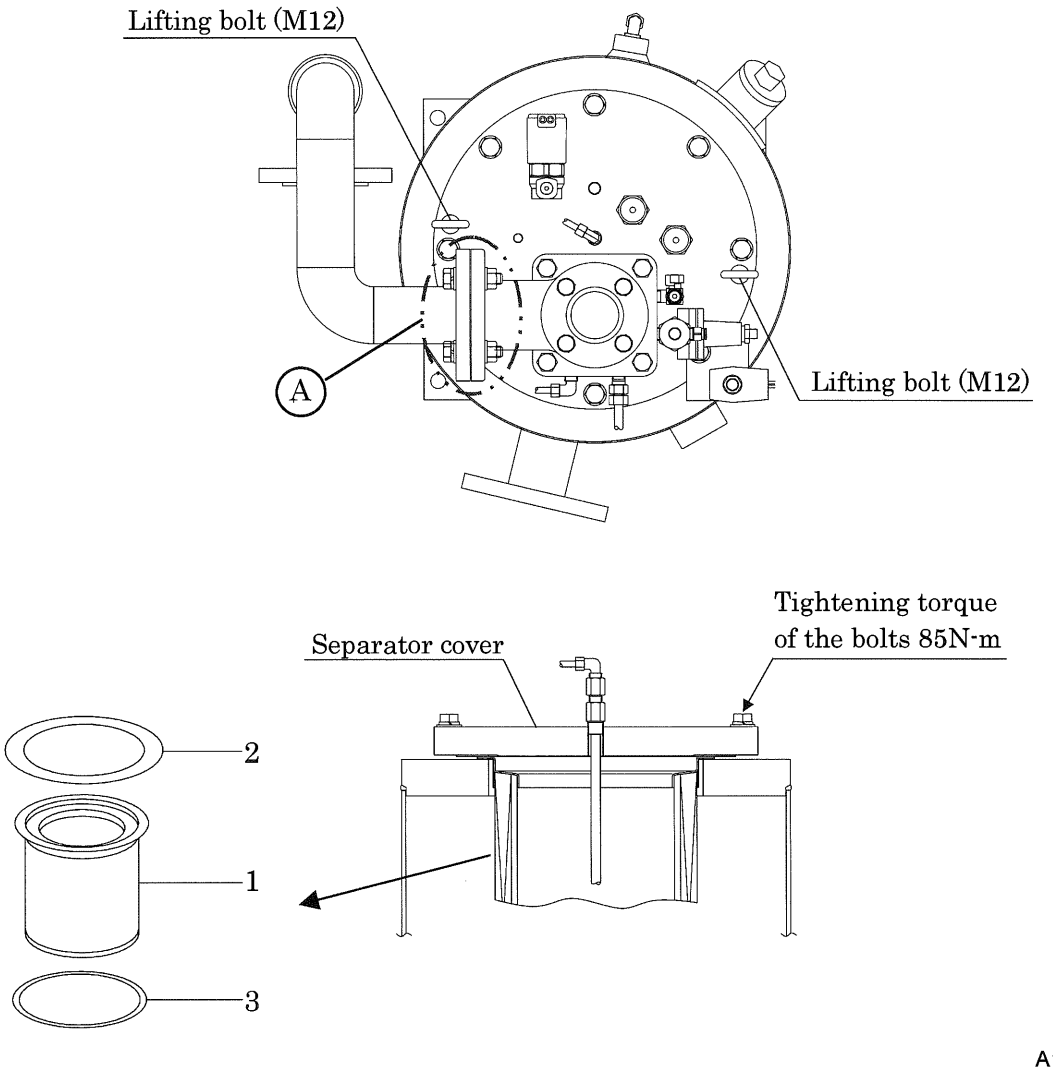


5.6.17 Change oil separator [2,000 hours or every 2 years]

<Procedures>

① In order to pull out the oil separator, unscrew the fixing bolts (6 pcs.) for top cover inspection cover provided on top of separator cover, using an impact wrench.
② Remove all the cables connected to the solenoid valve on the separator cover. Further, remove all the nylon tubes fixed on cable connecting parts using a spanner.
③ Remove the fixing bolt provided at Ⓐ flange of separator outlet.
④ Remove the fixing bolts (8pcs.) of separator cover, using an impact wrench etc.
⑤ Screw two lifting eyebolts (M12) for the 2 threaded holes provided on the separator cover.
⑥ Pass a rope or wire rope through the eyes of the lifting bolts and lift the separator up by a crane etc.

- Even before the scheduled periodic time, when compressor oil is so much consumed that so much oil is found mixed in discharged compressed air, replace oil separator.
- When consumption of the oil is still unusual even after cleaning strainer in the scavenging orifice (See5.6.7), change the oil separator "1" and gasket "2" "3" with a new one.
  (For part number, See 5.5)
- The oil separator "1" is made from electrically conducting material in order to be anti-static.
  Also gaskets "2"・"3" is treated for conduction by using staplers.
  Make sure to use our genuine parts for replacement.
- When replacing it, contact our office nearby or distributor because technical knowledge is required.

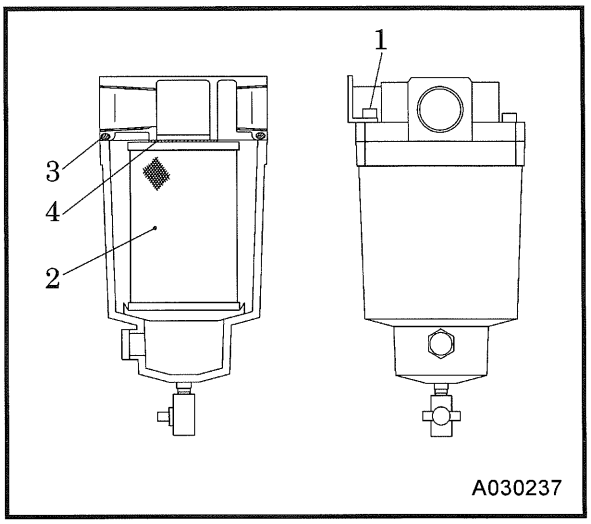


5.6.18 Change nylon tubes [2,000 hours or every 2 years]

- Replace nylon tubes used for the oil and air pipings.
- When replacing it, contact our office nearby or distributor because technical knowledge is required.

5.6.19 Clean and change drain separator [After cooler type] [Every 2,000 hours]

- In case that water is found mixed in the service air, remove the element "2" and dispose of dust etc., by loosening 4 pieces M12 hexagon bolts "1" at the top of separator.
  (If it is impossible to recover the conditions, perform cleaning job together with 4.7.1.)
- If it is difficult to recover the conditions, replace element "2" by a new one. At the same time, replace the o-ring "3" and gasket "4"fitted at the element assembly. (For part number, See 5.5)
- When water is found mixed in the discharge air, perform cleaning job even before the specified interval comes.



5.6.20 Change inter cooler hose [2,000 hours or every 2 years]

- When any crack or wear is found on the inter cooler hoses, replace it even before the scheduled time.
- When replacing it, contact our office nearby or distributor because technical knowledge is required.

5.6.21 Change fuel hose [2,000 hours or every 2 years]

- In case various rubber hoses for fuel system and engine lubrication system are hardened or deteriorated, replace them even before the specified replacement time.
- When replacing it, contact our office nearby or distributor because technical knowledge is required.

5.6.22 Clean inside of fuel tank [Every 2,000 hours]

- When cleaning it, contact our office nearby or distributor because technical knowledge is required.

5.5.23 Change pressure regulator [Every 3,000 hours]

- Remove pressure regulator and rebuild or replace with a new machine. (For part number, See 5.5)

5.6.24 Change o-ring of unloader [3,000 hours or every 3 years]

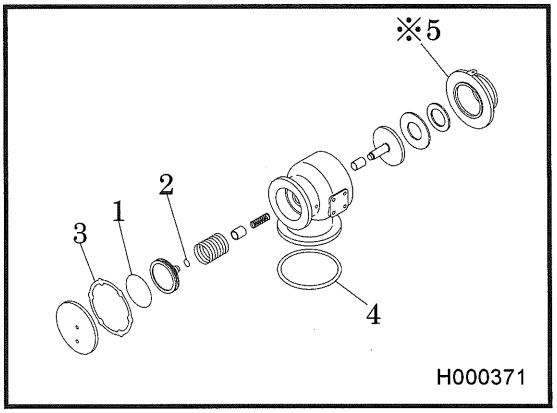
IMPORTANT

- When reassembling, apply sufficient grease to O-ring Slot/O-ring and sliding surface. Use CALTEX MULTIFAK EP1 grease or equivalent. Grease of poor quality will deteriorate the material.

Obey following procedure when reassembling.

<Procedure>
Liquid seal packing should be spread on the surface ※5.
Liquid seal packing: LOCTITE FMD-127

- Disassemble and clean the component, and check O-ring "1", "2" and gasket "3", "4". Then, replace O-ring "1"・"2" and gasket "3"・"4", if its rubber is hardened. (For part number, See 5.5)

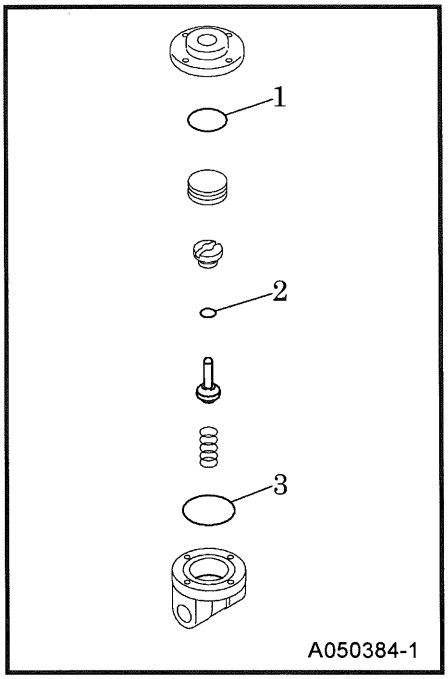


5.6.25 Check consumable part of auto-relief valve and vacuum relief valve [3,000 hours or every 3 years]

IMPORTANT

- When reassembling, apply sufficient grease to O-ring Slot/O-ring and sliding surface. Use CALTEX MULTIFAK EP1 grease or equivalent. Grease of poor quality will deteriorate the material.

- Disassemble and clean the component, and check O-ring "1" "2", "3". Then, replace O-ring "1", "2", "3" , if hardened. (For part number, See 5.5)



5.6.26 Performance check of pressure control valve [3,000 hours or every 3 years]

IMPORTANT

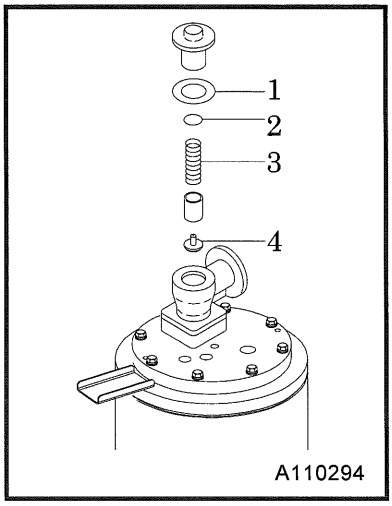
- When reassembling, apply sufficient grease to O-ring Slot/O-ring and sliding surface. Use CALTEX MULTIFAK EP1 grease or equivalent. Grease of poor quality will deteriorate the material.

<Procedure>

① When closing stop valve and fully opening service valve while the machine is running, make sure that the discharge pressure gauge shows the figure between 0.35 to 0.50MPa.

② When the pressure is lower than 0.35MPa, replace spring "3" with a new one. (For part number, See 5.5)

③ When the indicator shows excessively higher pressure, you will find that the piston does not move smoothly due to foreign material and rust stuck inside valve. In such a case, disassemble the component for checking and cleaning.



5.6.27 Check and change of O-ring and piston of pressure control valve

- After disassembling and cleaning pressure control valve, check Gasket "1", O-ring "2" and piston "4". When the rubber of these parts is found hardened, or damaged, replace them. (For part number, See 5.5)
- When replacing it, contact directly us or distributor because it requires expert technical knowledge.
- After replacement, run the machine to check its function (See 5.6.26), air-leak or any disorder.

5.6.28 Check rubber hose [3,000 hours or every 3 years]

- Check hoses used for oil piping for any crack or tear, and replace when an abnormality is found.
- When replacing it, contact our office nearby or distributor because technical knowledge is required.

5.6.29 Change radiator hoses [3,000 hours or every 2 years]

- When any crack or wear is found on the hoses, change it even before the scheduled time.
- When replacing it, contact our office nearby or distributor because technical knowledge is required.

6. Maintenance

6.1 Maintenance of Battery

⚠ WARNING

- Keep flames away from battery.
- Battery may generate hydrogen gas and may explode.
- Therefore, recharging should be done at a well-ventilated place.
- Do not spark near the battery nor light a match, nor bring lit cigarette and match close to the battery.
- Do not check the battery by short-circuiting the positive and negative terminals with a metallic piece.
- Never operate the machine nor charge the batteries with the battery liquid level being kept lower than the "LOWER" level. Continuing operation at this lower level will cause deterioration of such parts as pole plates etc., and also it may cause explosion as well as reduction of battery life. Add distilled water so that the liquid level may reach the middle level between the "UPPER" and "LOWER" level without any delay.
- Do not charge the frozen battery. Otherwise it may explode. If the battery is frozen, warm it up until the battery temperature becomes 16°C to 30°C.
- Battery electrolyte is dilute sulfuric acid.
  In case of mishandling, it could cause skin burning.
- When you deal with a battery, please be sure to wear protection implements, such as protection glasses and a glove.
- When such battery electrolyte contacts your clothes or skin, wash it away with large amount of water immediately.
- If the battery electrolyte gets into your eyes, wash it away immediately with plenty of water and see a doctor at once, because it is feared that eyesight might be lost.
- Dispose of battery, observing local regulations.

Handling battery

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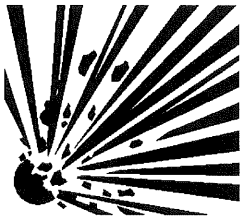

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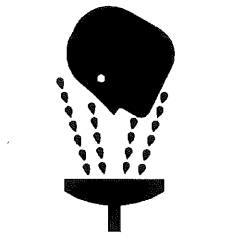

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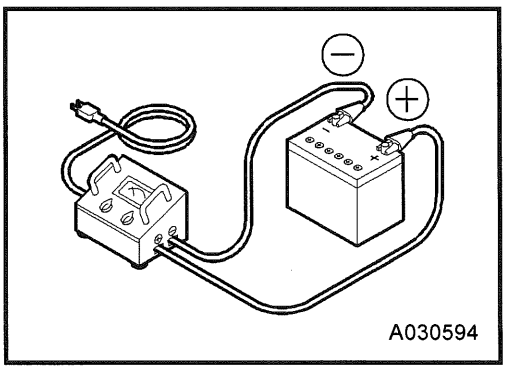
6. Maintenance

6.1.1 Charge battery

- Be sure to read the operation manual of the battery charger to know if it is applicable, before using it.
- Disconnect the cable between battery and the machine, and charge the battery with a 12V battery charger. Do not charge two batteries at the same time.
- Be sure not to connect (+) and (-) terminals backwards.



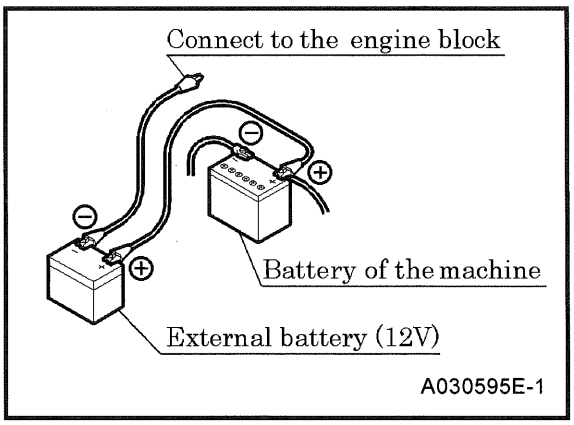
6.1.2 How to use booster cable

⚠ CAUTION — ***Do not reverse the cable connection***

- If a booster cable has to be used or when cables are connected at battery replacement, be careful not to connect (+) and (-) terminals backwards. Such a wrong-connection will cause spark and damage each component.

<Procedure for using a booster cable>

① Stop the engine.
② Connect one end of the (+) cable to the (+) terminal of the machine battery.
③ Connect the other end of the (+) cable to the (+) terminal of the external battery.
④ Connect one end of the (-) cable to the (-) terminal of the external battery.
⑤ Connect the other end of the (-) cable to the engine block of the machine.
⑥ Start up the engine.
⑦ Disconnect the booster cable by following the procedure back in the reverse order.



6. Maintenance

6.2 Indicator lamp and Warning / Emergency display

[Indicator lamp] Turn the starter switch to "RUN" position. Then the lamp goes on.

Item	Contents	Measures	Monitor
GLOW	Press starter switch "GLOW" and the lamp goes on and after preheating is finished, the lamp will be off.	—	
CHARGE	Lamp goes on when alternator is not charging.	Check wiring. Check alternator.	

[Warning Display] This displays such trouble of less importance when it occurs during operation, but the machine continues operating.
When any abnormality happens, a trouble code lamp flickers. In this time when trouble code switch is pressed, a failure code will be displayed.

Item	Failure code	Contents	Measures
DISCHARGE TEMP.H	A-1	Lamp displays when the discharge air temperature at the outlet of the air-end reaches 115℃.	See "Troubleshooting"
WATER TEMP.H	A-2	Lamp displays when coolant temperature reaches 100℃.	
COMP. AIR FILTER	A-3	Lamp displays when air filter gets clogged and suction resistance increases. [Actuating resistance is more than 6.2kPa.]	Clean Replace
ENG. AIR FILTER	A-4		
CHARGE	A-5	Belt loosened and/or cut Faulty generation of alternator	See "Troubleshooting"
DISCHARGE AIR TEMP. AT SEPARATOR H	A-6	Lamp displays when the air temperature at the outlet of the separator reaches 115℃.	
BOOST TEMP.	A-7	Lamp displays when the boost temperature reaches 85℃.	

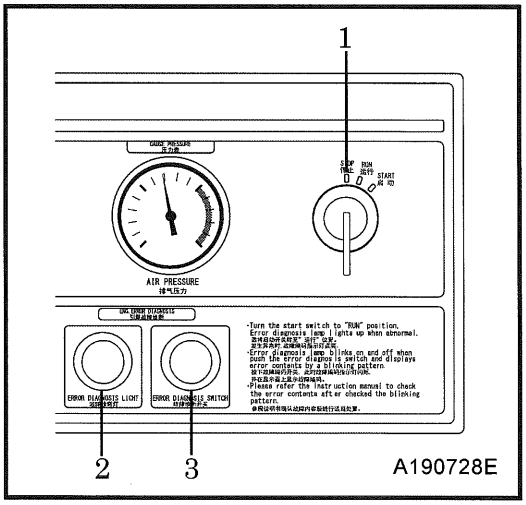
[Emergency Display] When any trouble takes place during operation, this displays and it stops as an emergency stop.
When any abnormality happens, a trouble code lamp flickers. In this time when trouble code switch is pressed, a failure code will be displayed.

Item	Failure code	Contents	Measures
DISCHARGE TEMP. E	E-1	Lamp displays when the discharge air temperature at the outlet of the air-end reaches 120℃.	See "Troubleshooting"
WATER TEMP.E	E-2	Lamp displays when coolant temperature of engine reaches 105℃.	
ENG. OIL PRESS.	E-3	Lamp displays when engine oil pressure drops. [The function pressure is below 0.1MPa.]	
DISCHARGE AIR TEMP. AT SEPARATOR E	E-4	Lamp displays when the air temperature at the outlet of the separator reaches 120℃.	
ENG. SPEED DOWN	E-5	Lamp displays when engine revolution speed drops. [Actuating speed is less than 1,200min^{-1}.]	
DISCHARGE TEMP.SENSOR	E-6	Lamp displays when discharge air temperature sensor at the outlet port of compressor air end is disconnected.	
WATER TEMP.SENSOR	E-7	Lamp displays when engine coolant temperature sensor is disconnected.	
DISCHARGE AIR TEMP. SENSOR AT SEPARATOR	E-8	Lamp displays when separator outlet air temperature sensor is disconnected.	

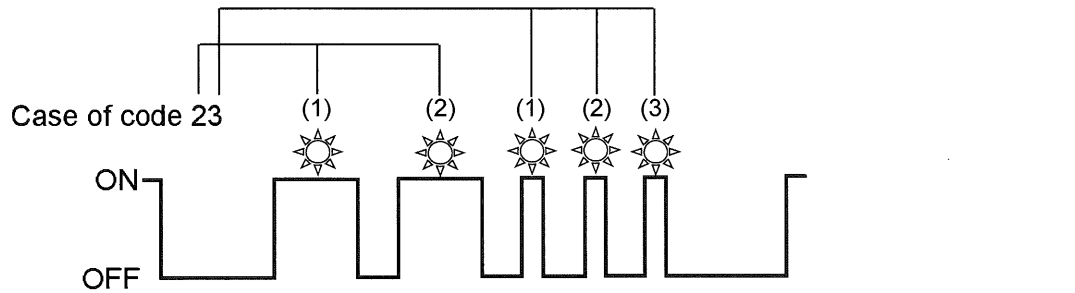
6.2.1 Engine trouble

- This is equipped with controller which memorizes engine troubles. In case that any abnormality occurs to engine, diagnosis lamp "2" continues to lighting. When the diagnosis switch "3" is continuously pressed, it displays trouble contents by flickering patterns.

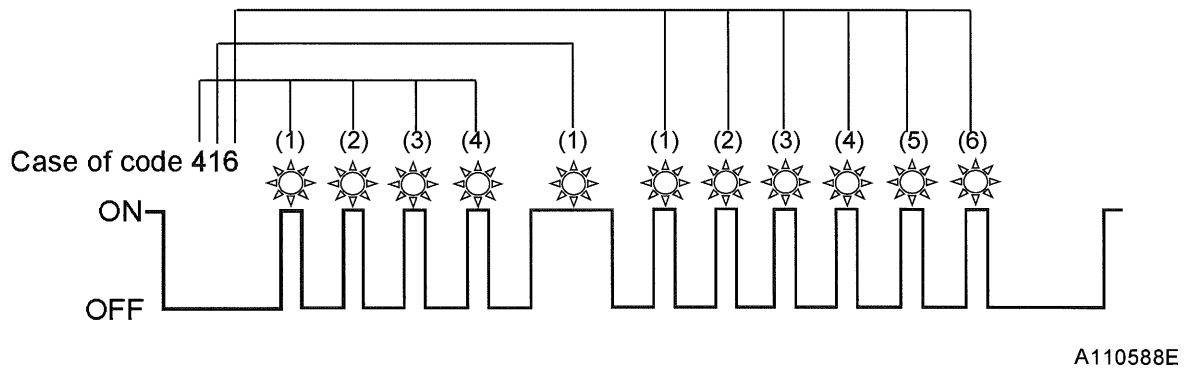
<Procedure>
① Turn the starter switch "1" to "START" position.
② In case that any abnormality or trouble occurs, the diagnosis lamp "2" continues to light.
③ When diagnosis switch "3" is continuously pressed, it displays the contents of the trouble by flickering patterns.
(When no trouble is found, diagnosis lamp "2" lights on 0.3 seconds and lights out 2.4 seconds continuously. This cycle is repeated.)



[Examples of reading and confirming diagnostic codes]



Long interval blinking 2 times and short interval blinking 3 times mean code 23.



Short interval blinking 4 times and long interval blinking 1 time and short interval blinking 6 times are code 416.

Long interval blinking : approx. 1.2 seconds
Short interval blinking : approx. 0.3 seconds

6. Maintenance

[List of diagnostic codes]

Some examples of diagnostic codes are mentioned in the following table.
Concerning the codes of trouble conditions, they are grouped into decades of the trouble kinds.
For the details and countermeasures, contact our office nearby or distributor because technical knowledge is required.

Code	Items to be detected	Details
14	Cam sensor failure	Disconnection of sensor and wiring.
15	Crank sensor failure	Disconnection of sensor and wiring.
22	Intake air temperature sensor failure	Disconnection / short circuit / degradation of intake air temperature sensor and harness.
23	Water temperature sensor failure	Disconnection / short circuit / degradation of water temperature sensor and harness.
24	Accelerator sensor failure	Disconnection / short circuit / degradation of sensor and harness.
32	Boost pressure sensor failure	Disconnection / short circuit / degradation of boost pressure sensor and harness.
34	Charge circuit failure	ECU charge circuit failure
44	EGR(Exhaust·gas·recirculation) position abnormal	Disconnection / short circuit / degradation of sensor and harness.
45	EGR(Exhaust·gas·recirculation) valve control abnormal	Driving motor trouble / disconnection / valve caught / stuck
51	CPU failure	CPU failed.
55	5V power supply voltage abnormal	Power supply cable to sensor short-circuited Power supply circuit in ECM (engine control module) damaged
71	Atmospheric pressure sensor failure	Disconnection / short circuit / degradation of atmospheric pressure sensor and harness.
118	Common rail pressure failure	Common rail pressure abnormally rises.
211	Fuel temperature sensor failure	Disconnection / short circuit / degradation of fuel temperature sensor and harness.
227	No fuel is pumped. (Fuel leakage)	Common rail pressure will not rise up to required range of pressure.
245	Common rail pressure sensor failure	Disconnection / short circuit / degradation of sensor and harness.
247	SCV(suction control valve) system disconnection / short-circuit	Disconnection / short circuit of SCV (suction control valve) harness.
271 ~274	Disconnection of injection nozzle driving system	Disconnection of wiring cable between injector cylinder #1 to cylinder #4 / short-circuited
294	Engine oil pressure sensor failure	Disconnection / short circuit / degradation of engine oil pressure sensor.
416	Main relay system failure	Disconnection of harness / short-circuit of GND / relay OFF stuck
542	Overheat	In overheating state
543	Overrun (Excessive RPM)	Engine abnormally high speed

6. Maintenance

6.3 Troubleshooting

- Should any trouble occur during operation, do not leave it.
  Investigate the cause and take appropriate measures.
- Read the manual carefully and fully understand what to do in case of trouble.
- The better you understand the construction and function of the machine, the faster you can find a problem and solution.
- This chapter describes the state, cause and countermeasures of important troubles in detail:

Symptom	Cause	Countermeasures
Low starter revolution speed.	(1) Battery malfunction.	Check battery→Charge Change
Starter rotates but engine does not start.	(1) Fuel filter clogging. (2) Fuel pre-filter clogging (3) Filter of fuel air-bleeding electric pump clogging (4) No diesel fuel oil (5) Air mixing in fuel piping	Disassemble, clean, and change Disassemble, clean, and change Change filter Replenish fuel Bleed air
Discharge air pressure will not rise.	(1) Pressure regulator insufficient adjustment. (2) Malfunction solenoid valve for starting unloader	Re-adjust (fasten) Change
Engine does not reach its maximum speed.	(1) Faulty engine controller. (2) Unloader orifice clogging. (3) Malfunction emergency controller. (4) Engine trouble. (5) Fuel filter clogging.	Call your nearest dealer Disassemble, clean Call your nearest dealer Call your nearest dealer Disassemble, change
While the discharge pressure will not rise up to the specified one, RPM will drop.	(1) Pressure regulator insufficient adjustment. (2) Trouble of pressure regulator. (3) Unloader orifice clogging.	Re-adjust (fasten) Change Disassemble, Check
Engine does not reach minimum revolution at unload.	(1) Faulty engine controller. (2) Malfunction emergency controller. (3) Faulty engine speed sensor.	Call your nearest dealer Call your nearest dealer Change
Safety valve relieves at unload.	(1) Pressure regulator insufficient adjustment. (2) Unloader valve damaged·Faulty seat (3) Faulty safety valve	Re-adjust (loosen) Disassemble, repair hange
Oil mixes in air. (poor oil separation)	(1) Scavenging orifice strainer clogging. (2) Excessive oil in separator receiver tank. (3) Low discharge pressure. (4) Oil separator element deteriorated.	Disassemble, Clean Drain to its proper level Disassemble and check of pressure control valve Check, Change
Water found mixed in air. (Condensate separation malfunctioned.) After cooler type	(1) Drain separator element clogging. (2) Silencer of after-cooler drain outlet clogging. (3) Inside of piping between after-cooler and silencer clogged with dust. (4) The valve fitted under drain separator is closed.	Disassemble, clean, change Disassemble, clean, change Disassemble, clean Open

Symptom	Cause	Countermeasures
Insufficient free air delivery.	(1) Air filter element clogging. (2) Unloader valve cannot fully open. (3) Engine does not reach rated speed.	Clean or change of element Call your nearest dealer Call your nearest dealer
It is indicated that engine oil pressure is abnormal, and engine stops.	(1) Engine oil shortage. (2) Engine oil filter clogging. (3) Faulty oil pressure sensor. (4) Loose wiring, connectors and disconnection.	Replenish oil Change Change Check, fasten
It is indicated that coolant temperature is abnormal, and engine stops.	(1) Radiator clogging. (2) Faulty thermostat. (3) Faulty coolant temp. sensor. (4) Low coolant level. (5) Slippage of belt. (6) Loose wiring, connectors and disconnection.	Clean Change Change Replenish Re-adjust tension Check, retighten
It is indicated that discharge air temperature sensor is disconnection, and engine stops.	(1) Coolant temp. sensor is disconnected.	Repair, change
It is indicated that discharge air temperature is abnormal, and engine stops.	(1) Oil cooler clogging. (2) Oil filter clogging. (3) Faulty discharged air temp. sensor. (4) Loose wiring, connectors and disconnection. (5) Slippage of belt. (6) Shortage of compressor oil. (7) Malfunction of by-pass valve. (8) Discharge air temp. sensor is disconnected.	Clean Change Disassemble, check Check, retighten Re-adjust tension Replenish oil Check, change Repair, replace
It is indicated that engine speed down is abnormal, and engine stops.	(1) Malfunction controller. (2) Loose wiring, connectors and disconnection. (3) Shortage of feeding fuel caused due to fuel filter and feed pump strainer clogging (4) Air mixed in fuel line system (5) Output reduction due to clogged engine air filter	Change Check, retighten Replace filter and/or clean the strainer Bleed the air Clean and replace air filter

- Contact our office nearby or distributor if you find it difficult to repair by yourselves.
- Refer to the engine operation manual for trouble concerning the engine.

7.Storage of the machine

7.1 Preparation for Long-term Storage

When the machine is left unused or not operated longer than half a year (6 months), store it at the dry place where no dust exists after the following treatments have been done to it.

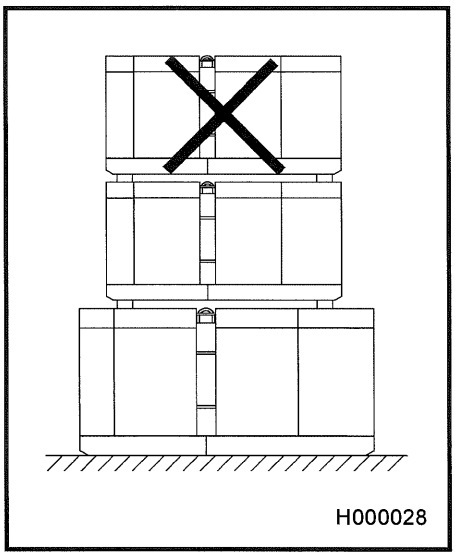
- Put the machine in a temporary cabin if it is stored outside.
  Avoid leaving the machine outside with a sheet cover directly on the paint for a long time, or this will cause rust to the machine.
- Perform the following treatments at least once every three months.

<Procedure>

① Drain existing lubricant from the engine oil pan. Pour new lubricant in the engine to clean its inside. After running it for a while, drain it again.
② Spread lubricant on moving parts like speed regulator and rod end, beforehand.
③ Completely charge the battery and disconnect grounding wires. Remove the battery from the machine, if possible, and store it in a dry place. (Charge the battery at least once every month.)
④ Drain coolant and fuel from the machine.
⑤ Seal the engine, air-intake port and other openings like the muffler with a vinyl sheet, packing tape, etc., to prevent moisture and dust from entering the machine.
⑥ Be sure to repair any breakdowns and maintain the machine so that it will be ready for the next operation.

⚠ CAUTION — ***Cautions on stacking up box type machines***

- When stacking up the machines for storage, only two machines stacking are acceptable. The mass of the lower machine should be larger than that of the upper one.
- Select a leveled floor with sufficient strength.
- Before stacking the machines up, check the machine for deformation of bonnet, looseness or missing of bolts, and other parts.
- When stacking them, be sure to securely fix them as shown in the figure so that the balanced weight is applied to each squared lumber "1" for preventing a sideslip or a collapse.
- Never operate the machines with stacking conditions. It is very dangerous.
- When stacking the machines for storage, enough safety precautions should be paid to the storage place, because earthquake can cause sideslip or collapse of the stacked machine.



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8. Specifications

8.1 Specifications

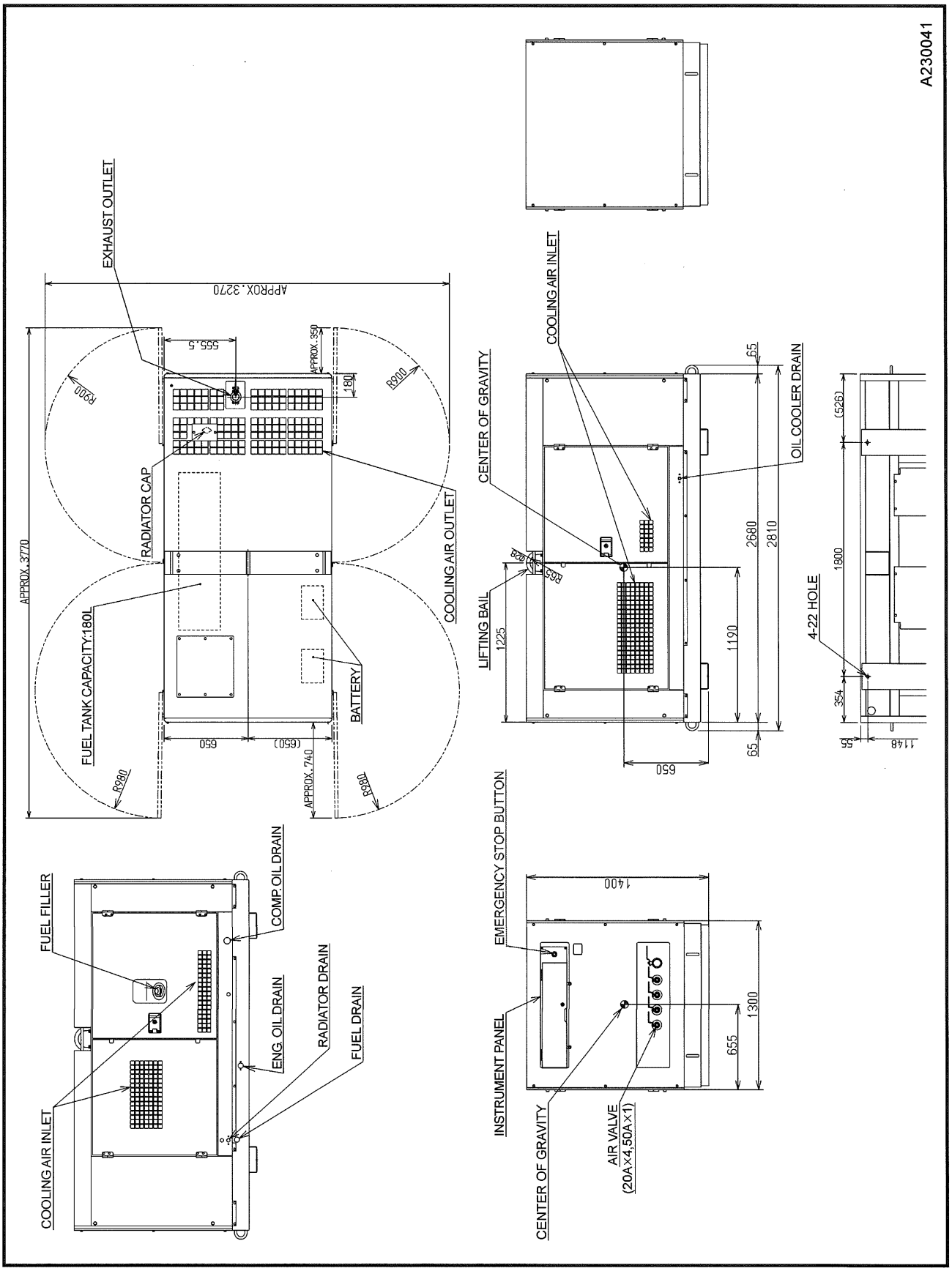
Model			FAC-110B <FAC-110BC>
Compressor air-end	Type		Single-stage oil cooled, screw type compressor
	Free air delivery	m^3/min	11.0
	Working pressure	MPa	0.69
	Lubricating system		Forced Lubrication by compressed pressure
	Driving system		Direct driving with rubber coupling
	Receiver tank capacity	m^3	0.098
	Lubricating oil capacity	L	50
Engine	Model		ISUZU CI-4JJ1X
	Type		4-cycle, water-cooled, direct injection type with turbo charged
	Number of cylinders, bore stroke	mm	4-95.4 mm×104.9 mm
	Total displacement	L	2.999
	Rated output	kW/min^{-1}	84.4/ 2,200
	Initial oil replenishment	L	15
	Coolant capacity (including radiator)	L	11
	Battery		85D26R×2 (24V) equivalent
	Fuel tank capacity	L	180
General Specifications	Overall length	mm	2,810
	Overall length (Bonnet only)	mm	2,680
	Overall width	mm	1,300
	Overall height	mm	1,400
	Net dry mass	kg	1,660 <1,700>
	Operating mass	kg	1,870 <1,910>

* The values in : < > shows those of the after-cooler type.

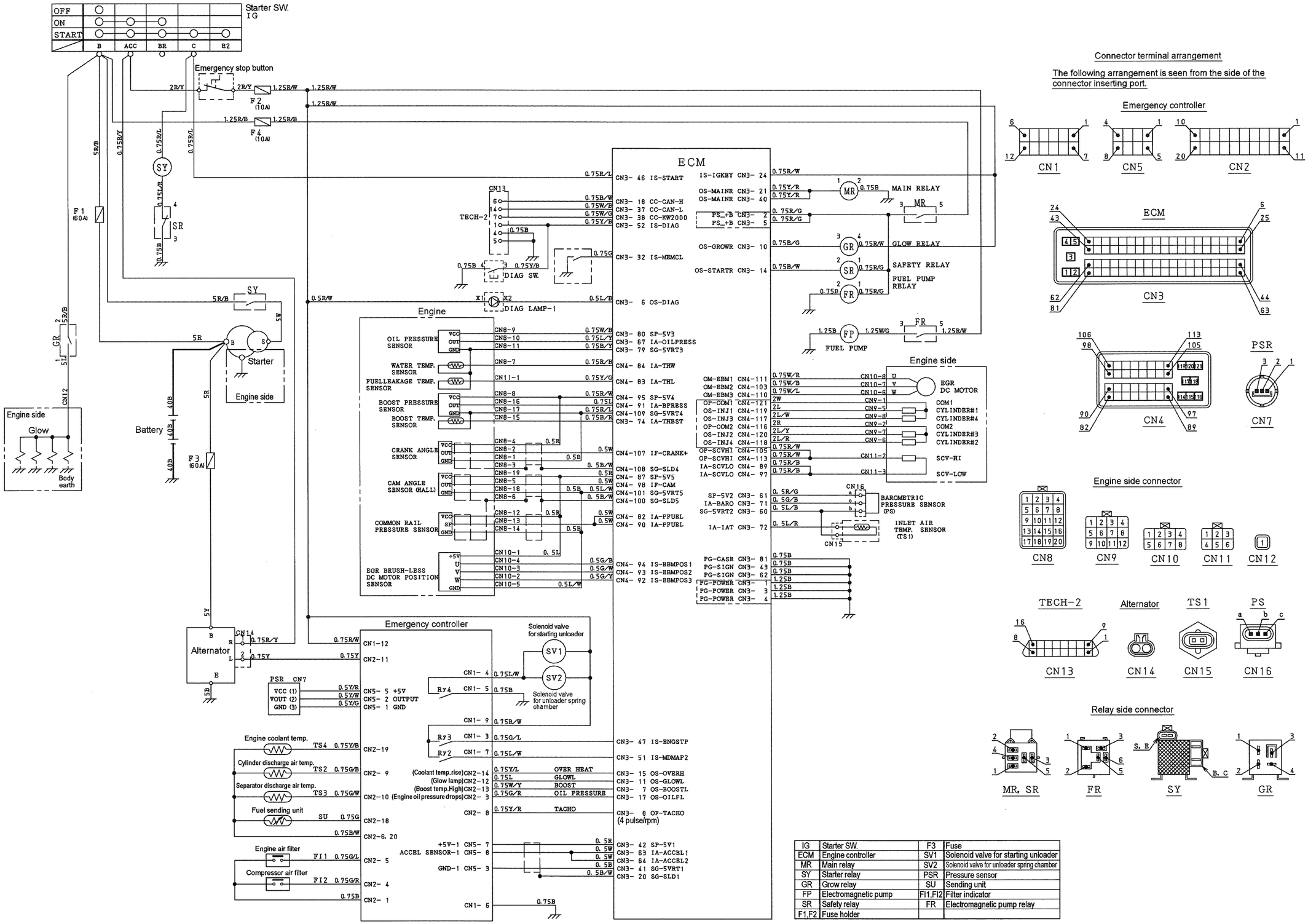
8. Specifications

8.2 Outline drawing

FAC-110B
FAC-110BC



9. Wiring Diagram



Connector terminal arrangement

The following arrangement is seen from the side of the connector inserting port.

Emergency controller

Engine side connector

Relay side connector

IG	Starter SW.	F3	Fuse
ECM	Engine controller	SV1	Solenoid valve for starting unloader
MR	Main relay	SV2	Solenoid valve for unloader spring chamber
SY	Starter relay	PSR	Pressure sensor
GR	Grow relay	SU	Sending unit
FP	Electromagnetic pump	FI1,FI2	Filter indicator
SR	Safety relay	FR	Electromagnetic pump relay
F1,F2	Fuse holder		

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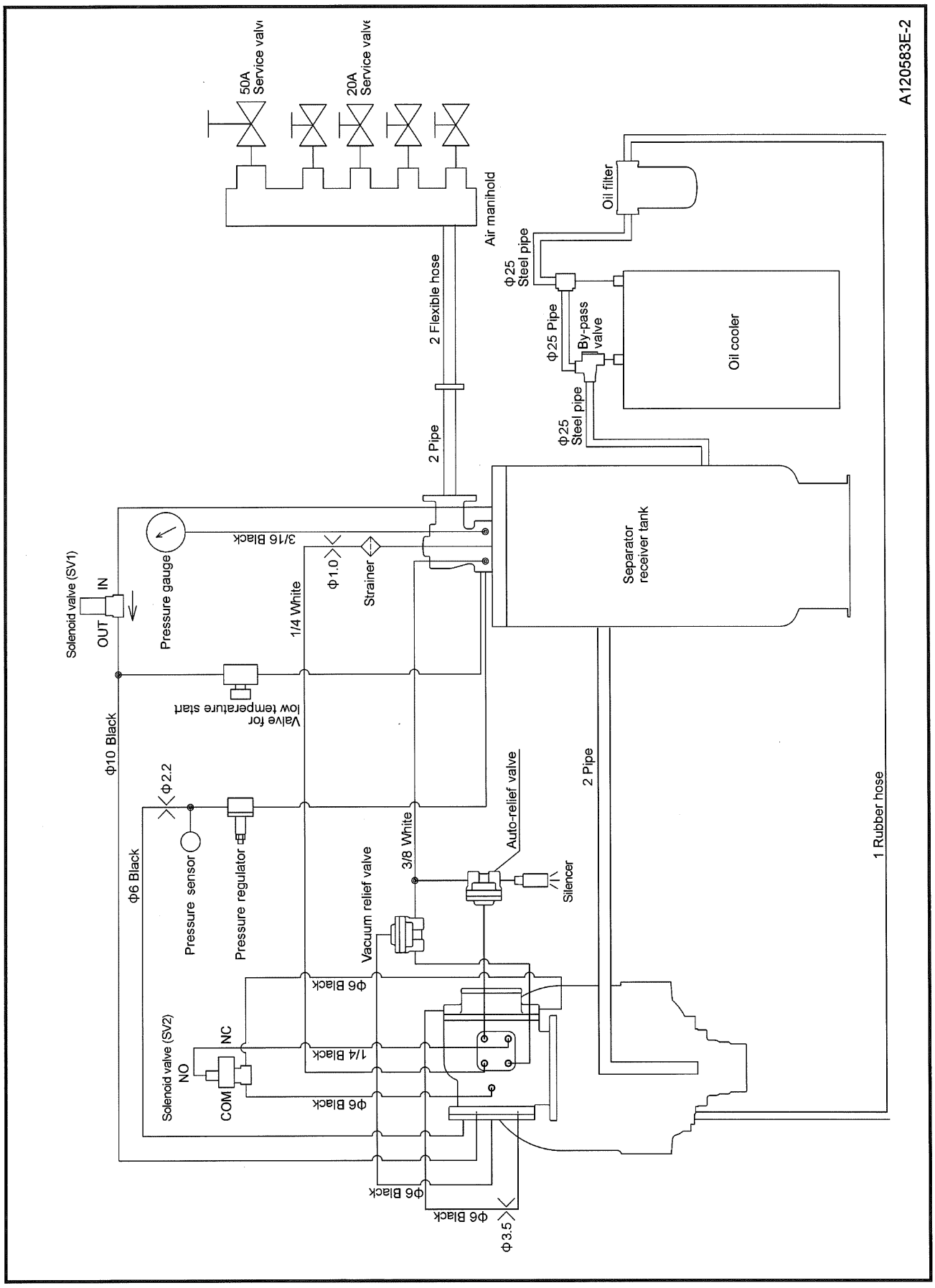
10. Piping Diagram

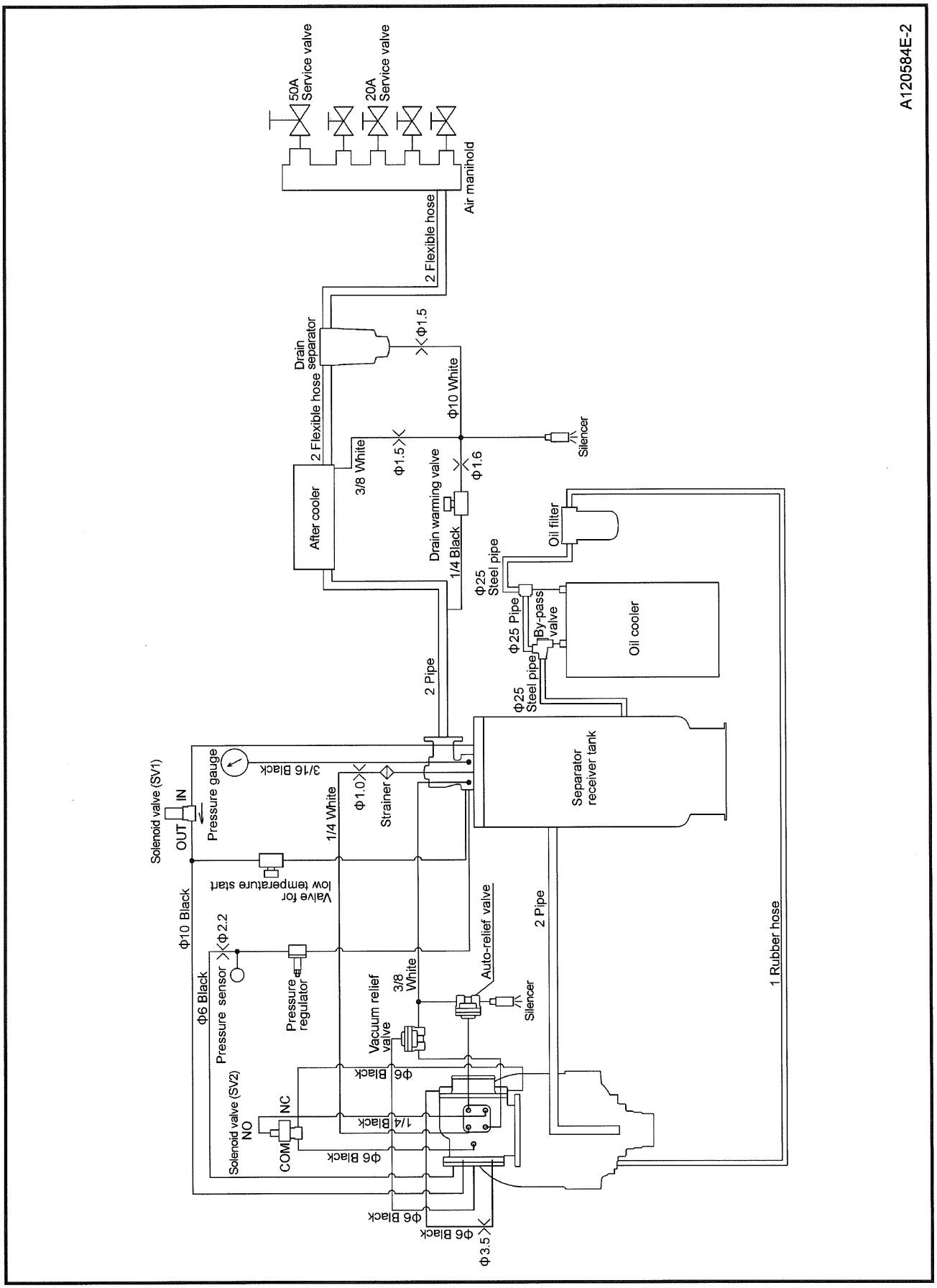
10.1 Air piping·Compressor oil piping

FAC-110B



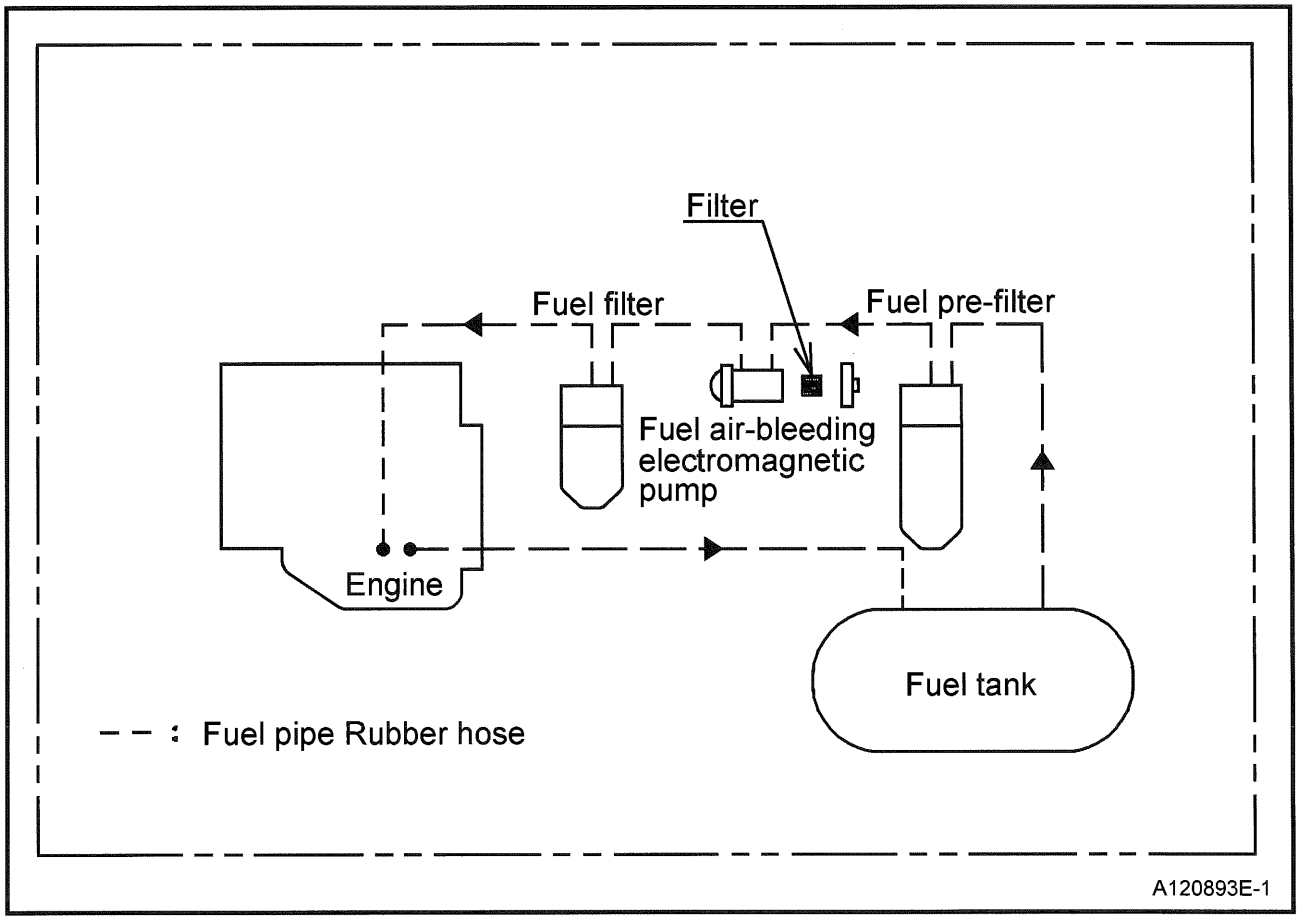
10. Piping Diagram

FAC-110BC (After cooler type)



10. Piping Diagram

10.2 Fuel piping



MEMO

OPERATION LOG

OPERATION DATE	OPERATION TIME		TOTAL OPERATION HOURS (h)	DISCHARGE AIR PRESS.(MPa)	AMBIENT TEMP.(°C)	DISCHARGE AIR TEMP. (°C)	COOLANT TEMP.(°C)	RATED RPM (rpm,min^{-1})	ENG.OIL REPLACEMENT HOUR (h)	COMP.OIL SUPPLY(L)	REMARKS (INSPECTION/PART CHANGE HISTORY ETC.)
	START TIME	STOP TIME									
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