No. D58443 01334

INSTRUCTION MANUAL

Soundproof Diesel Engine – Driven DC Welder

MODEL: DLW–400LSW

⚠ Caution : Do not operate this machine before you thoroughly read and understand this manual. Always keep this manual near the machine.

Denyo Co.,Ltd.

HEAD OFFICE
2-8-5 Nihonbashi-horidomecho, Chuo-ku, Tokyo, 103-8566 Japan
TEL +81 - 3 - 6861 - 1111
FAX +81 - 3 - 6861 - 1181

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CONTENTS

FOREWORD

- This " INSTRUCTION MANUAL " gives a detailed description of the operation, routine inspection, maintenance and trouble shooting of the diesel engine driven DC Welder, and other items required for proper operation.

- Please read this manual carefully, especially the items with the caution marks.
- While the machine is placed for operation, please keep the instruction manual near the machine.
- For the detailed operation and maintenance of the ENGINE, please refer to the "Engine Operation Manual" .

Your Machine ; Model No. : DLW-400LSW
Serial No. :

[NOTE] : There may be a difference between the specifications detailed in this manual and the actual performance of the machine due to modifications of the machine.

Symbol mark in this Manual

⚠ WARNING : This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.

⚠ CAUTION : This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.

[NOTE] : This symbol shows handling precautions for effective operation and many years of satisfactory operation.

1. SAFETY PRECAUTIONS

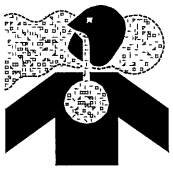
The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. Read and follow all Safety Standards. Only qualified persons should install, operate, maintain, and repair this machine. During operation, keep everybody, especially children, away.

⚠ WARNING :
ELECTRIC SHOCK CAN KILL.

Do not touch output terminals during operation. This is extremely dangerous when your hands are wet. Stop the machine before you touch the terminals for connection and other purposes.

⚠ WARNING :
DIESEL FUEL CAN CAUSE FIRE OR EXPLOSION.

Fuel and oil are inflammable. Never fail to keep in flammable material away from the machine, never smoke while refueling and never refuel during operation.



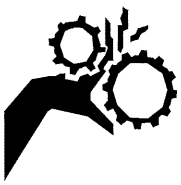
⚠ WARNING :
ENGINE EXHAUST GASES CAN KILL.

Exhaust from the engine contains substances harmful to the human body. Sufficient change of air is necessary when the machine is used in places with poor ventilation, such as in a tunnel or indoors. Do not direct exhaust to passers-by or houses.

⚠ CAUTION :
HOT PARTS CAN CAUSE SEVERE BURNS.

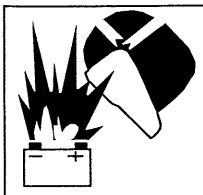
Do not touch, while operating the unit, the engine cooling fan and other places of high temperature like the exhaust pipe, engine and radiator.
Even when the machine is stopped, take care that the machine has cooled down enough before touching the engine and the like.

⚠ WARNING : NO CONNECTION TO HOUSE WIRING.
Connecting to house wiring is very dangerous because it may cause electric shocks and damage the machine.



⚠ CAUTION :
Do not touch moving parts inside the machine. Stop the engine when you do maintenance.

⚠ WARNING : CONFIRM CONNECTION.
Damaged cables and insufficient tightening of connection screws may cause damage to the machine and electric shocks. Repair damaged cables and ensure connections are tight.



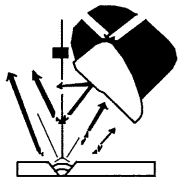
⚠ CAUTION :
BATTERY ECTROLYTE CAN CAUSE EXPLOSIONS OR BURNS.

Battery contains acid and generates explosive gases. Handle battery carefully. Stop engine before connecting or disconnecting battery cables, and confirm for correct polarity for connection on battery. Do not allow tools to cause short circuit accident due to contacting to terminals. Flush eyes, skin and clothes immediately with much water if battery acid is attached.

⚠ CAUTION :
In case the battery liquid (dilute sulfur acid) happens to come in contact with clothing or skin, you must immediately rinse it out by using a lot of water. If the battery liquid comes into contact with your eyes, wash it out with lot's of water and seek medical attention immediately.

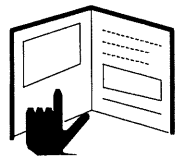
⚠ CAUTION :
HOT COOLANT CAN CAUSE SEVERE BURNS.

Do not open the radiator cap, cooling water drain plug, or engine oil drain plug while engine is still hot. Hot coolant or oil can burn face, eyes, and hand.



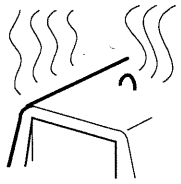
⚠ CAUTION :
ARC RAYS CAN BURN EYES AND SKIN

When welding or watching, use a hand shield or welding helmet fitted with proper shade of filter. Wear protective clothing and foot protection.



⚠ CAUTION :
Read the manual and use the machine safely and properly.

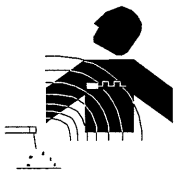
When you rent it to others or let others use it, explain the instruction manual in detail and advise users to read the manual in advance.



⚠ CAUTION :
Overloading shortens the life of the machine. Use the machine with appropriate AC and DC current and appropriate duty cycle.

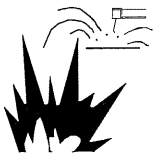
⚠ CAUTION :
FALLING EQUIPMENT CAN CAUSE DEATH ACCIDENT

Take caution in transporting the machine. Use a lifting equipment of enough capacity.



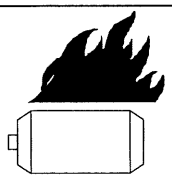
⚠ CAUTION :
HIGH CURRENT CAN AFFECT PACEMAKER

Pacemaker wearers should not go near arc welding operation before consulting their doctor



⚠ CAUTION :
WELDING CAN CAUSE FIRE OR EXPLOSION.

① Remove all flammables where flying sparks can strike. If this is not possible, tightly cover them with approved covers.
② Watch for fire, and keep a fire extinguisher nearby.



⚠ CAUTION :
Low voltage and frequency can damage electrical equipment such as Motors.

Take caution or disconnect AC loads when engine is starting or running with idle control switch in "ON".

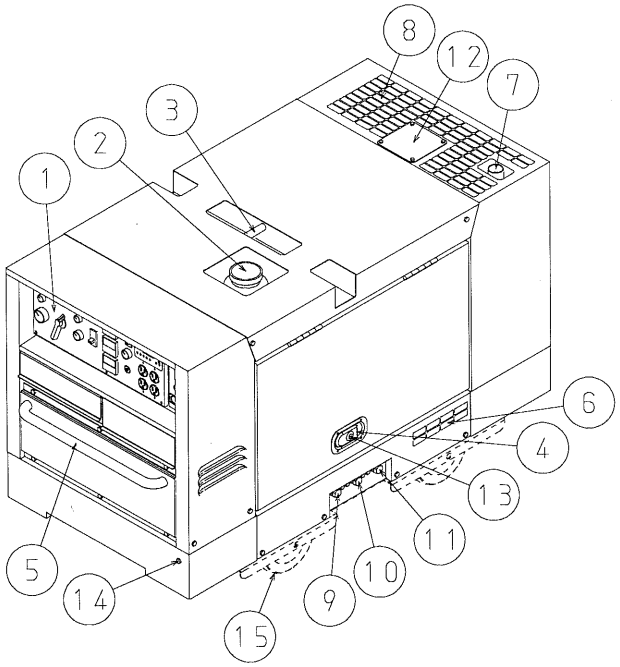
⚠ CAUTION :
FLYING PIECES OF METAL or DIRT can injure eyes.

Wear safety glasses with side shields or face shield

2. OUTLINE AND PART NAMES

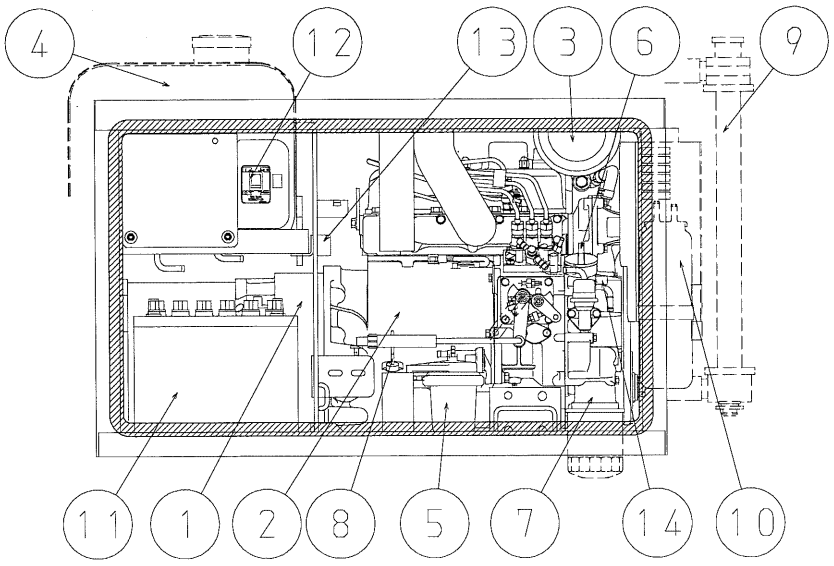
2-1 Outline Drawing and Name of Instrument

① Control panel
② Fuel tank inlet
③ Lifting hook
④ Door latch
⑤ Bar(for rope)
⑥ Air intake
⑦ Exhaust
⑧ Ventilation
⑨ Fuel drain
⑩ Water drain
⑪ Oil drain
⑫ Radiator inlet
⑬ Lock
⑭ Ground Terminal
⑮ Wheel(option)

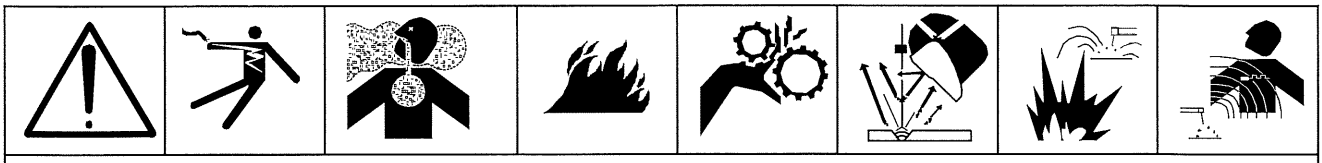


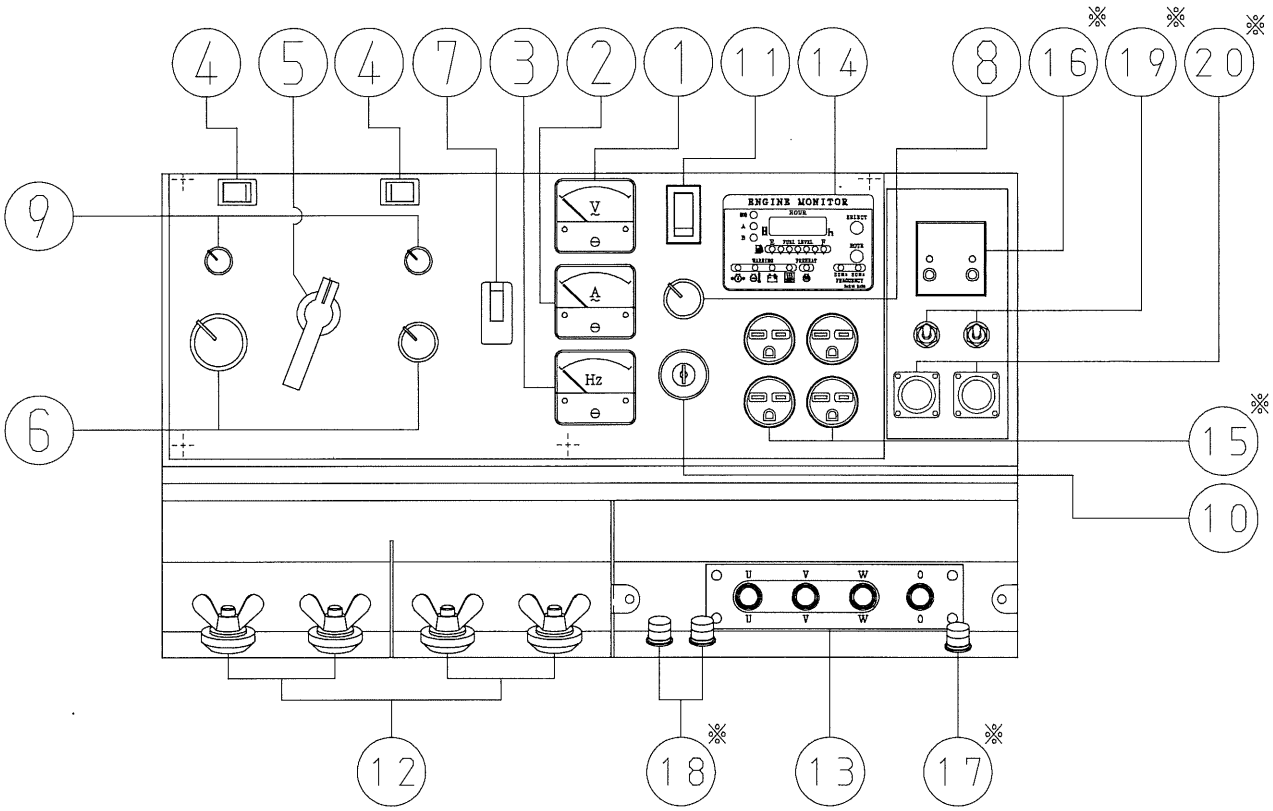
2-2 Name of Components

① Generator
② Diesel Engine
③ Air Cleaner
④ Fuel Tank
⑤ Fuel Filter
⑥ Oil Inlet
⑦ Oil Filter
⑧ Oil Level Gauge
⑨ Radiator
⑩ Reserve Tank
⑪ Battery
⑫ Voltage Reduction Switch
⑬ Fuse
⑭ Fuel Priming Lever



2-3 Control Panel





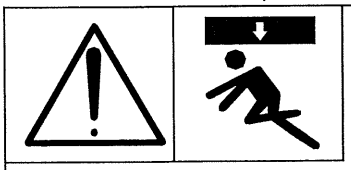
① AC Voltmeter
② AC Ammeter
③ Frequency Meter
④ Welding Mode Selector Switch
⑤ Single-Dual Selector Switch
⑥ Current Regulator
⑦ AC Circuit Breaker
⑧ Voltage Regulator
⑨ Arc Force Regulator
⑩ Starter Switch
⑪ e-Mode Selector Switch
(VARIABLE, LOW/HIGH, HIGH)
⑫ DC Welding Output Terminal (+,-)
⑬ 3-Phase AC output Terminal
⑭ Engine Monitor
Warning Lamp Unit
(Oil Press./Water Temp./Control Unit temp./Charging/Preheat)
Frequency Lamp
Hour Meter · Fuel Meter

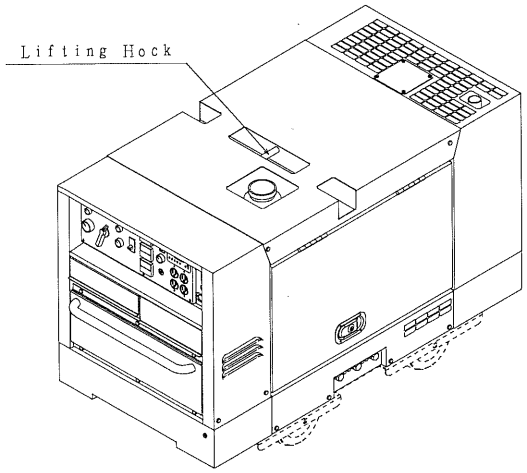
⑮ ※ 1-Phase AC output Receptacle
⑯ ※ Earth Leakage Relay
⑰ ※ Ground terminal(for ELR)
⑱ ※ 1-Phase AC output Terminal
⑲ ※ Remote Control Switch
⑳ ※ Remote Control Receptacle

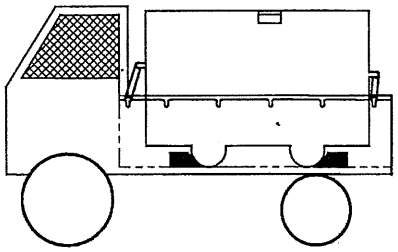
※ Option

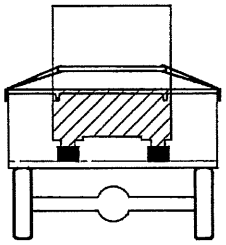
3. TRANSPORTATION AND INSTALLATION

3-1 Caution in Transporting Machine





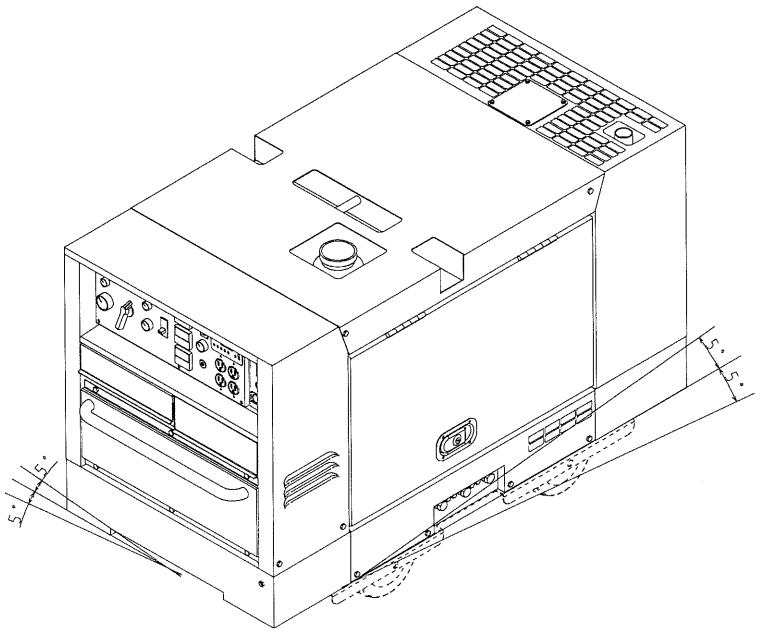




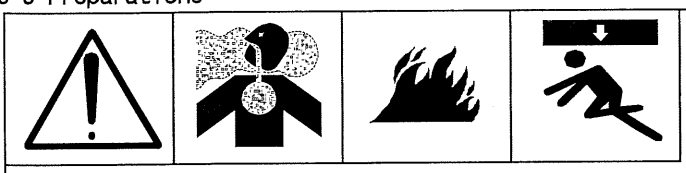
⚠ Caution : When transporting and lifting the machine, lift it at the lifting hook which is located at the center of gravity on the top panel.

3-2 Operating Angle

Make sure the machine is placed on level foundation or ground. Do not operate the machine on place with inclination of more than 5 degrees, or engine damage will occur.



3-3 Preparations



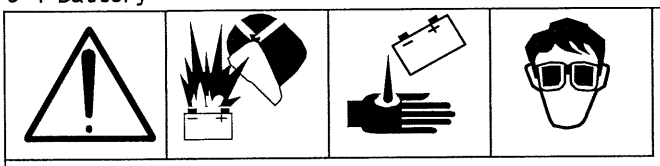
- This machine has undergone stringent factory tests and inspections to ensure the machine performs in accordance with its specifications, before been shipped to the end user.
- As with any piece of motorized machinery, excessive use of a brand new machine may shorten the life of the machine. Therefore, it is recommended for the initial 50 hours of machine usage, special care is required for this break-in period.
- Upon receipt of the machine, please perform a maintenance check of the machine BEFORE USE, so as to further ensure there are no major malfunctions or damage to the machine that occurred during transit.
- We recommend the machine be placed upon a level surface, where there is not excessive dust or moisture.

When using the machine in places where there is inadequate ventilation, make sure the following care is taken:

Notice for Installation.

[**NOTE**] : Avoid using the machine in places of high humidity.
[**NOTE**] : Avoid using the machine in places where the surrounding temperature is likely to rise over 40 degrees Celsius.
[**NOTE**] : Avoid using the machine in places where there is excessive dust, noxious gases and explosive gases.
[**NOTE**] : Provide adequate space for machine inspection and maintenance.
[**NOTE**] : Do not have any obstacles within a 1 meter from the machine. Failing to do so, may cause the machine to overheat.

3-4 Battery



Proper maintenance of the battery is extremely important to ensure smooth starting and long service life. Check the specific gravity, level of electrolyte and output voltage every 50 hours or once every month.

[**NOTE**] : The electrolyte must always cover the plates. If the plates are exposed to air for a long time, damage will result.

(1) Battery Check

◆ Always ensure the level of electrolyte is always maintained above the low level mark. If the electrolyte level is low, distilled water should be immediately supplied to the battery.

[**NOTE**] : Do not refill the battery over the upper level mark. Always remember to tighten the battery cap properly after refilling the battery.

◆ Measure the battery gravity if there is a suspicion that battery leakage has occurred especially where there have been instances where the machine would not start.

◆ The relationship between Battery Gravity and Battery Charging at 20 ℃.

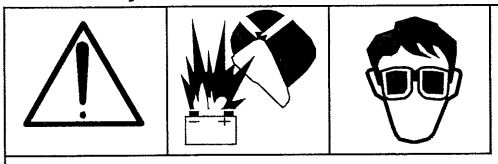
Battery Gravity	Battery Charging
over 1.28	over charged(need adjustment)
1.25 - 1.28	optimal charging
1.24 - 1.25	average
below 1.24	low charged(need adjustment)

[**NOTE**] : In determining the specific gravity at a temperature other than 20 ℃, use the following formula:

$$S20 = St + 0.0007\ (t-20)$$

Where S20 : is the calculated specific gravity at 20 ℃.
St : is the measured specific gravity
t : is the battery solution temperature reading.

3-5 Battery Cable Connection



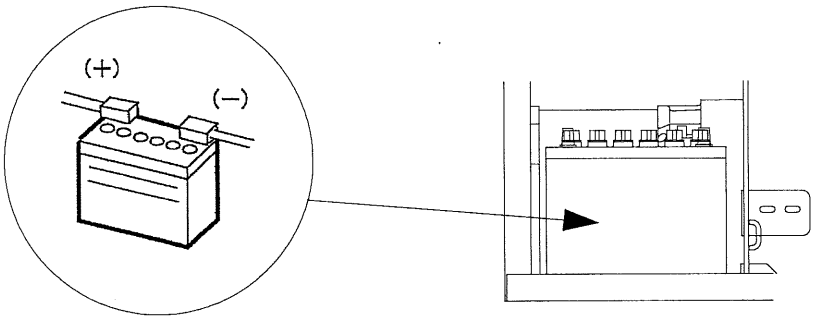
◆ Make sure the battery cables are properly connected to battery terminal (+) and (−).

[**NOTE**] : If the cable is connected incorrectly, damage to the electrical parts will result soon.

◆ See the starter switch is "OFF" before connecting the battery cables.

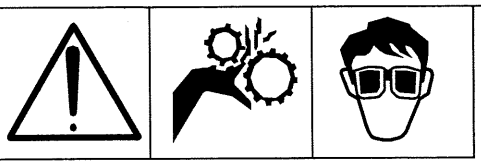
[**NOTE**] : Do not connect the cables to the battery terminal when the starter switch is "ON", because electric sparks will be produced. This may injure the operator and cause damage to the machine's electrical components.

[**NOTE**] : It is recommended that a thin film of grease be applied to the battery terminals to ensure a good connection and the prevention of corrosion of the battery terminals. An insufficient sufficient or poor connection may cause poor starting of the machine and other malfunctions to occur.



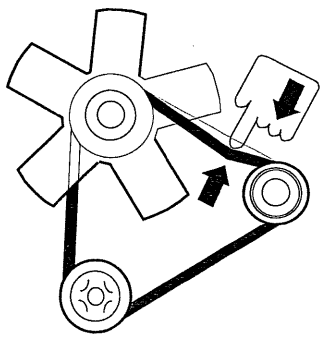
◆ Connect (−) Cable Last.

3-6 Fan Belt



Check the belt for tension and looseness and adjust them as required. Also, check that the belt has not been damaged and immediately replace it if any abnormality is noted on the belt.

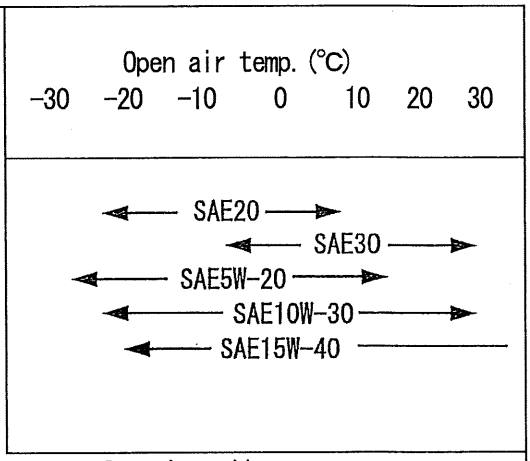
Perform the adjustment and replacement as directed in the "Instruction Manual" provided by the Engine Manufacturer.



Fan Belt : Parts No. Y 060 20 152 66

4. LUBRICATING OIL, COOLING WATER AND FUEL

4-1 Engine Oil



◆ The lubricating oil used influences engine performance, starting characteristic and ultimately the life of the engine.
We recommend that the appropriate, good quality, lubricating oil be used.

(1) We recommend that "CD class" lubricating oil be used (API service grade).

(2) We recommend the use of SAE10W-30 all season type of engine oil viscosity. The viscosity of the oil to be used is dependent on the external temperature. Refer to the table to select oil.

[**NOTE**] : Do not pour in different kinds of oil as it will change the oil quality which will have a detrimental effect on engine performance. If you want to add in a different type of oil, you must first drain the oil already in the engine completely.

(3) The total oil change capacity is 5.1 litters.

4-2 Engine Cooling Water

(1) Use only soft water for cooling water. For example, tap water that is of good quality can be used.

(2) If the machine is to be used in cold areas, especially where there is a risk of freezing, long-life, anti-freeze, coolant (LLC) should be used. (This machine when delivered ex-factory, the radiator cooling water contains 30 % long life coolant.)

[**NOTE**] : The recommended ratio of LLC to be used is between 30 % - 50 % range.

[**NOTE**] : The following is the recommended of LLC to be used for below mentioned temperature:

- 30 % : down to -10 °C
- 40 % : down to -20 °C
- 50 % : down to -30 °C

[**NOTE**] : The LLC should be changed at least every 2 years.

(3) The total cooling water capacity is 4.7 litters.
(This does not include the cooling water reserve tank.)

① For the proper use of LLC carefully follow the instructions given by the LLC manufacturer.

② During cold periods and LLC is not used, the cooling water should be drained, including the reserve tank cooling water before adding in the LLC at the appropriate ratio in relation to the prevailing temperature.

(1) Use ASTM No. 2 Diesel Fuel

[**NOTE**] : If other than the recommended type of fuel is used, it can bring about a undesirable result to engine for its output performance, length of life, etc.

(2) Use JIS special No. 3 diesel fuel.

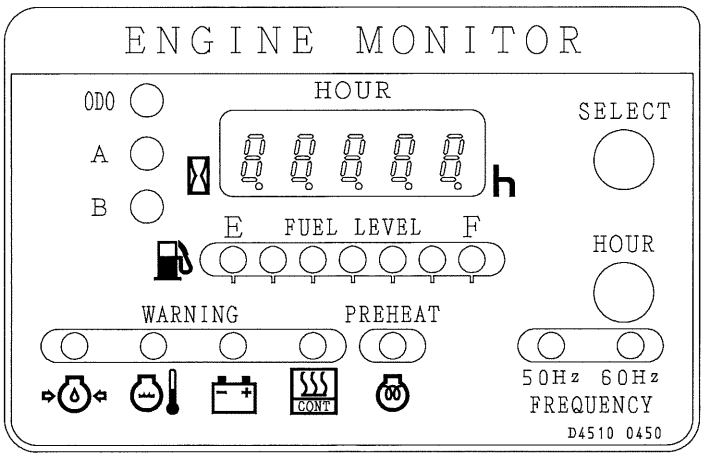
JIS No. 2 Diesel Fuel : down to - 5 ℃
JIS Special No. 3 Diesel Fuel : down to -25 ℃

(3) The Fuel tank capacity is 42 litters.

(1) Before starting the machine, check to see that fuel is sufficient by the engine monitor.

(2) While fuel is full in the installed tank, all of green lamps are on. Numbers of lamps decrease as remaining fuel amount decrease. Color of lamps also change from green to red following decrease of remaining fuel amount. Fill fuel when only one lighting lamp is left. A correlation between numbers of lighting lamps and remaining fuel amount is roughly like the below chart.

The number of lamp	Lamp color	Fuel residual quantity
7	Green	37~Full
6	Green	33~37
5	Green	28~33
4	Green	23~28
3	Green	18~23
2	Green	14~18
1	Green	9~14
1	Red	0~ 9



4-4 Fuel Consumption

(1) No Load

No Load	High		Low
	(3000min^{-1})	(3600min^{-1})	(2000min^{-1})
Fuel Consumption (L/h)	1.86	2.57	1.05

(2) Load

High[50Hz]

Amperes (A)	0	93	185	278	370	380
Fuel Consumption (L/h)	1.86	2.35	3.06	3.99	5.20	5.29

High[60Hz]

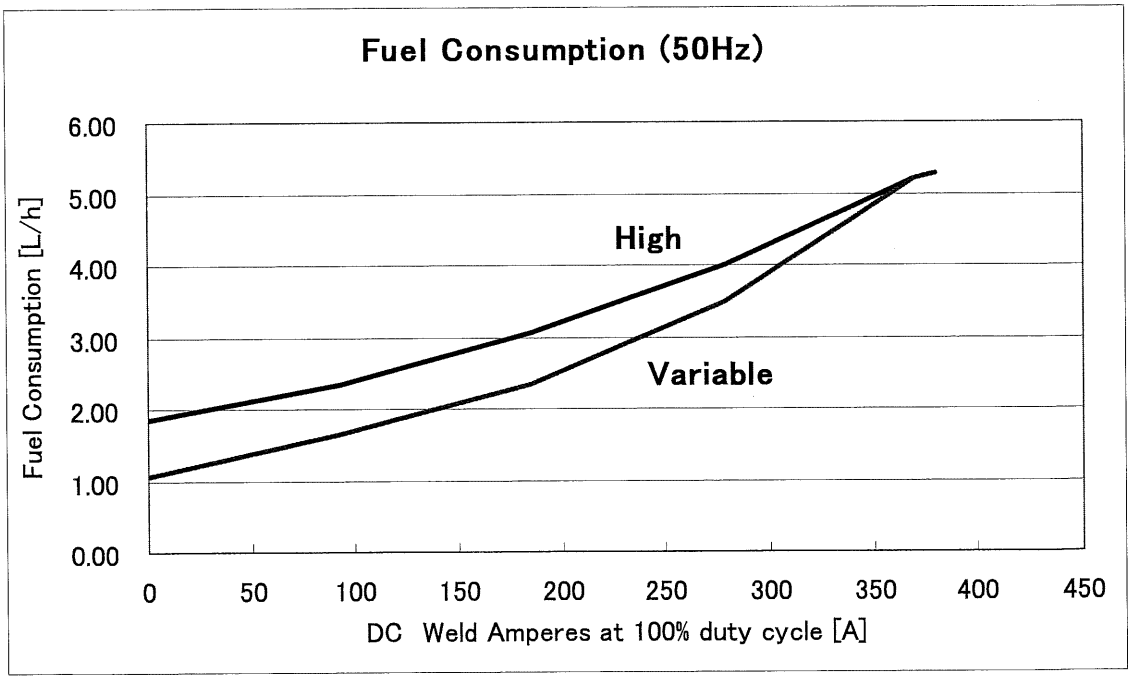
Amperes (A)	0	98	195	293	390	400
Fuel Consumption (L/h)	2.57	3.11	3.86	4.87	6.33	6.47

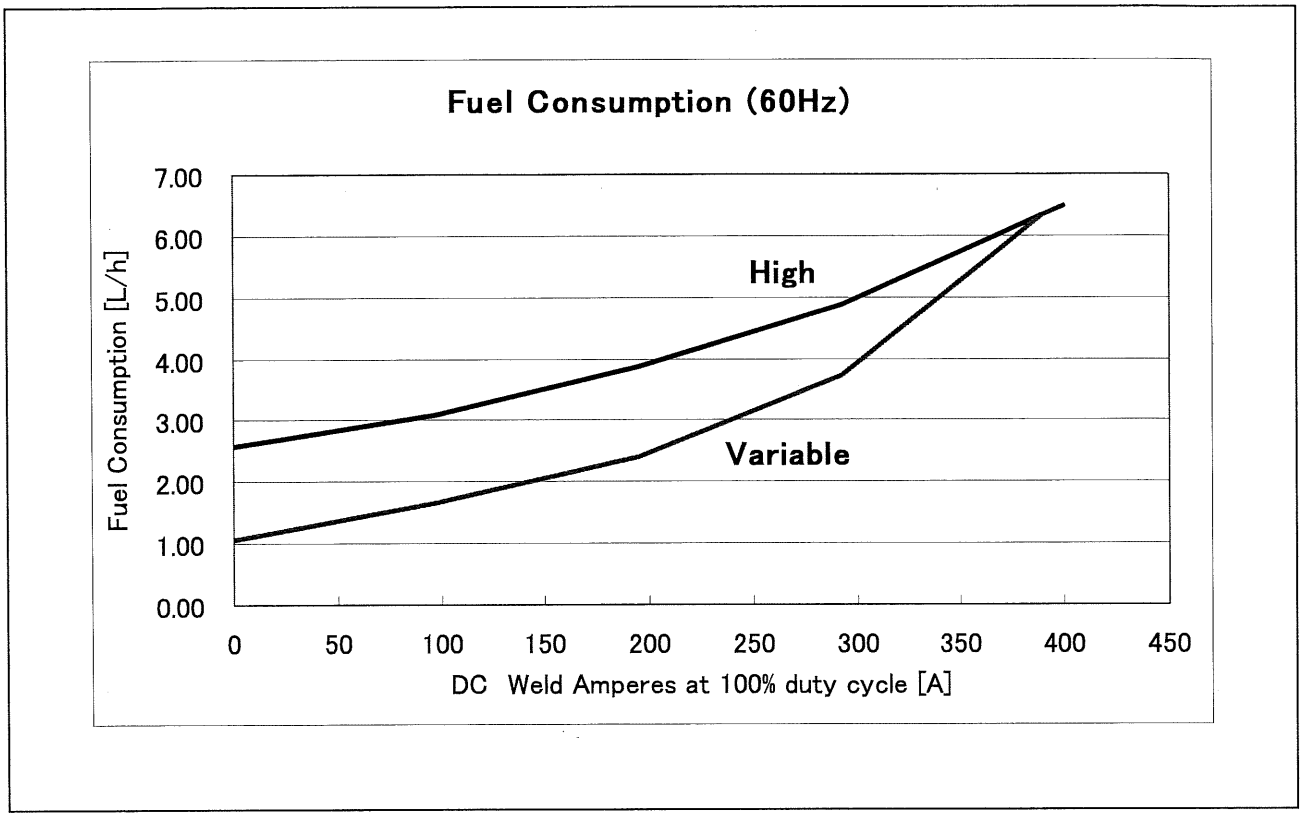
Variable[50Hz]

Amperes (A)	0	93	185	278	370	380
Fuel Consumption (L/h)	1.05	1.65	2.34	3.49	5.20	5.29

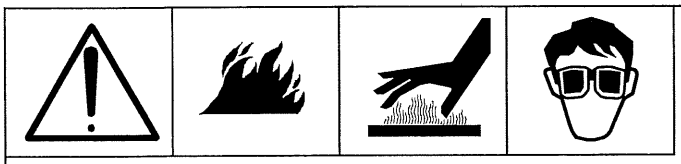
Variable[60Hz]

Amperes (A)	0	98	195	293	390	400
Fuel Consumption (L/h)	1.05	1.65	2.40	3.74	6.33	6.47

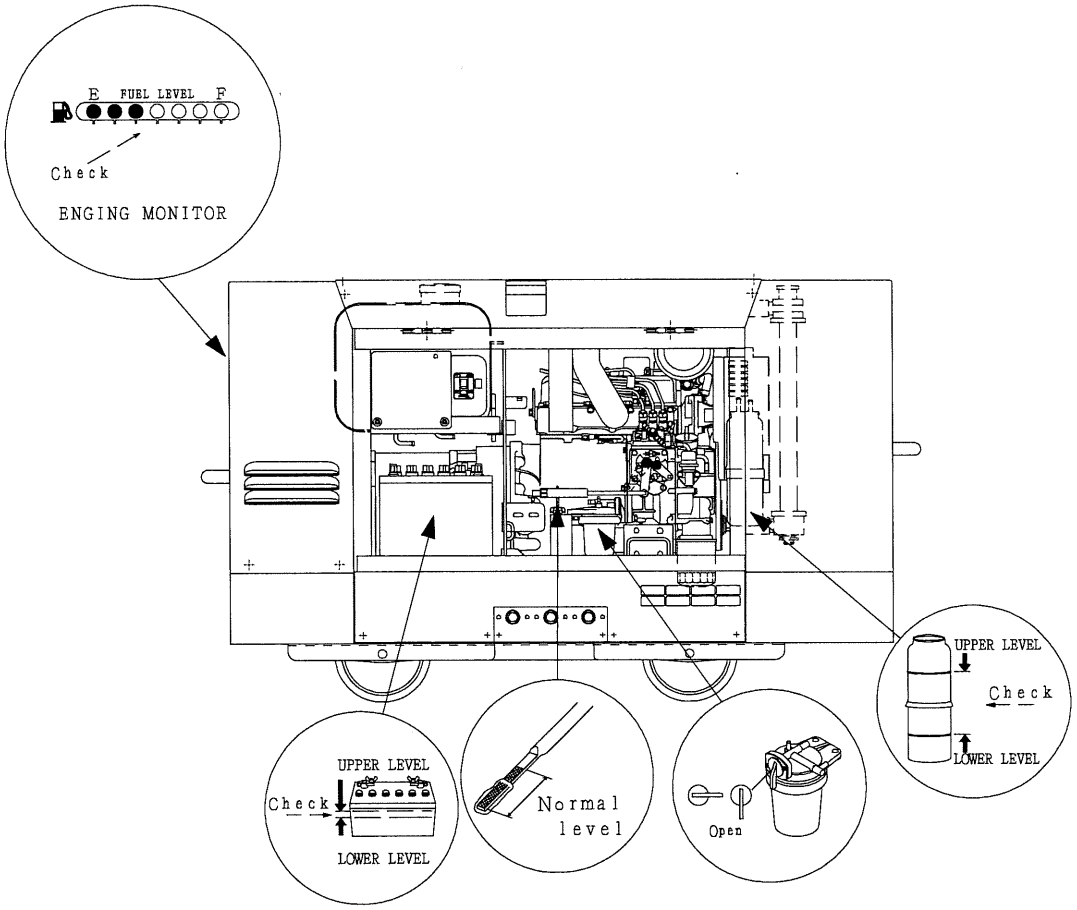


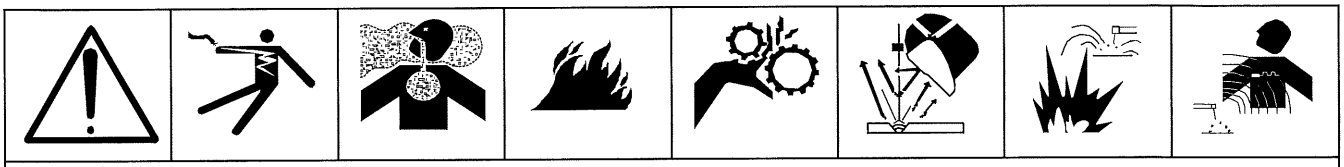

Fuel Consumption (60Hz)
Fuel Consumption [L/h]
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
High
Variable
0
50
100
150
200
250
300
350
400
450
DC Weld Amperes at 100% duty cycle [A]

5. ENGINE PRESTART CHECKS



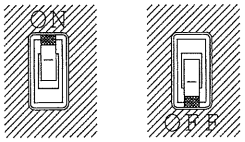
◆ Check the positions shown under before starting.





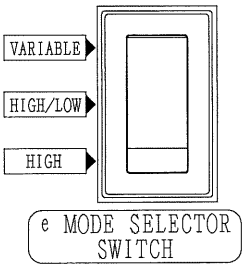
◆ Before starting the machine, the pre-starting safety checks must be completed. In addition, do a general survey of the area surrounding the machine making sure the area is safe, air vents of the machine are not blocked and the exhaust can freely be discharged.
The machine can be started, once the people surrounding the machine have been notified that the machine is going to be used.

[NOTE] : In cold operating conditions, use suitable cooling water and lubricating oil for improved starting and prevention of any troubles. The battery must always be maintained at full charging level.



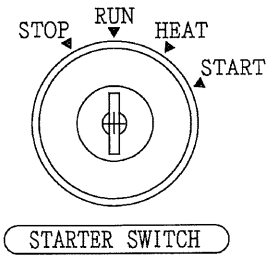
(1) Check whether the breaker is at the "OFF" position.

(2) Turn the "e Mode Selector Switch" to select VARIABLE or HIGH/LOW.



(3) Insert the key into the "Starter Switch" . When turn the key to the "RUN" position, the indicator lamp acts as a "Oil indicator" and "Charge indicator". If the indicator lamp don't come on, inspect the electric bulb of indicator lamp or the fuse.

(4) Turn the key to the "START" position to start the engine. As soon as the engine starts, release the key where by the key will automatically return to the "RUN" position.



[NOTE] : Key switch will automatically return to "RUN" position after the engine has started.
If the key switch did not return automatically, return it manually to prevent damage to the starter.

[NOTE] : During winter or when the surrounding air temperature is cold, in situations where a load start is required, turn the key to the "HEAT" position, you must wait until the engine indicator lamp goes off.

(5) In situations where the sounds of the engine turning over cannot be heard in trying to start the machine, repeat the starting procedure from the beginning in accordance with the Operation Manual, after about 30 seconds.
If the machine fails to start despite repeating the starting procedure, there is obviously some problem with the machine.
Therefore a thorough check is required (e.g. : Fuel has run out, forgetting to turn the fuel cock to the open position, excessive air in the fuel system and battery leakage)

(6) After the engine starts, let the machine idle 5~10 minutes to warm-up.
And the engine rotates high speed for a few seconds immediately after the engine starts, if the "e Mode Selector Switch" is in VARIABLE or HIGH/LOW.

[**NOTE**] : While the engine is operating, do not turn the starter switch on.

(7) Carefully check the engine for abnormal vibration (noise), oil leakage, fuel leakage, cooling water leakage and air leakage. If the machine is operating normally, set the "Circuit breaker" to the ON position in order to supply electricity to the load.

(8) Do not have any of the doors of the machine open while operating. The main problems with leaving the doors of the machine open during operating, are the effect on the internal cooling air-flow of the machine and alien substances (e.g. dust and dirt) will be drawn into the machine.

(9) After the engine in started, check to see that the oil pressure lamp and battery charging lamp are off. If one of these lamps are on, check the machine after the engine is turned off. (Refer to the Operation Manual for details)

(10) While the engine is operating, check the Hour Meter operating. When turn the key to the "Start" position, the Hour Meter operating.

7. STOPPING THE ENGINE

(1) Turn the load side's circuit breaker to the "OFF" position.

(2) Turn the circuit breaker on the machine to the "OFF" position and let the engine idle for five minutes, so as to allow the engine to cool down. After the five minutes idling period is over, turn the key to the "OFF" position.

(3) Remove the key out of the starter switch. Make sure the key, when the machine is not use, is kept in safe.

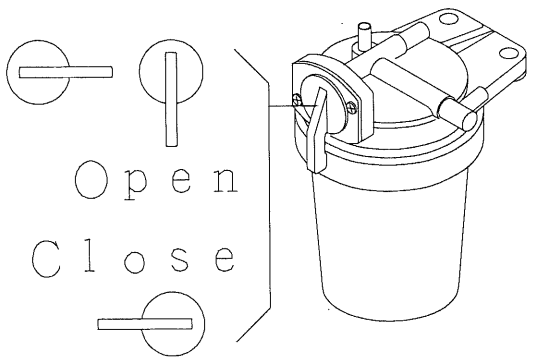
(4) Turn the fuel filter cock to the "Close" position.

(5) Disconnect the wiring and plug(s) from the AC Power connections.

(6) Make sure the machine is not exposed to moisture. It is important that the machine be kept dry when not in use.

(7) To keep the machine in good working order, do not leave the machine exposed to the elements and cover it using a sheet, when the machine is not been used.

[**NOTE**] : In the unlikely occurrence of the engine not stopping when the key is turned to the "OFF" position, there is a way of stopping the machine. Please refer to the following diagram and explanation.
Turn the fuel filter cock to the "Close" position.
Closing the fuel filter cock cuts the supply of fuel to the engine and the engine will take a few minutes to come to a stop.
This should only be done in case of an emergency.



(1) Always read the meters and lamps on the control panel.

◆ While the machine is running, periodically check the readings of the meters on the control panel. Specifically, check that these meters show the machine in running correctly or the warning lamps are not on.

[**NOTE**] : If any of the warning lamps illuminates or the meters show abnormal readings while operating the machine, immediately stop the engine. Proceed to check and inspect the source of the problem.

(2) Hour meter

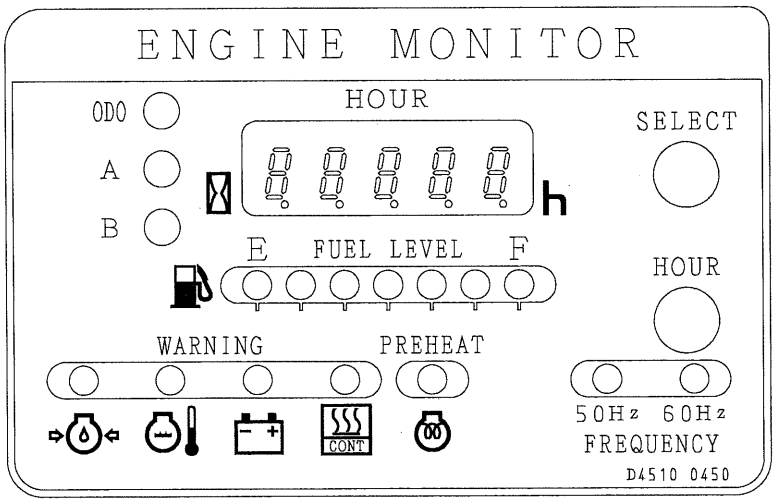
Normally, the hour meter indicates the integrating operation hours (ODO).
When the key to the "RUN" position, the meter will counts the time and the point next to the right end of the hour indication will be blinking. By pushing the ODO-A-B display change button, it is possible to count 2 types A and B of operation hours (trip meter function). Whenever the ODO-A-B display change button is pushed with the operation switch set to ON and with the residual fuel indicated, the indication and function will be changed over in the order of ODO → A → B. When the ODO-A-B display change button is continuously pressed during the trip indication for A or B, the trip time can be reset. This function can be used as a timer for regular inspection and maintenance to be made at the time of oil replacement.

(3) Residual fuel indicator

For the residual fuel indication, refer to "4-3 Fuel" in page 12.

(4) Keyless indications

Without using the operation switch key, the hour meter and the residual fuel quantity can be checked only by pushing the hour display button right bottom on the engine monitor. Those indications will be lighting while the hour display button is being pressed.



(5) Others

◆ While the machine is running, check the following:

[NOTE] : Make a periodic check of the exhaust discharge, which will make the operator aware of any abnormalities in the exhaust discharge.

[NOTE] : Check for leakage' s of lubricant oil, fuel, cooling water and exhaust gases.

[NOTE] : Be aware of the noise produced by the machine. If any strange noise/sounds are noticed, there may be a problem.

[NOTE] : If any abnormalities are noted, immediately stop the machine and investigate the cause of the abnormality.

7-2 After Stopping

(1) While the machine is not used, pull out the key from the Starter switch and keep it in a given place so that it is not lost.

(2) Set the cock of the fuel filter to the" Close" position.

(3) Disconnect the welding cable and the cable and plug from the AC power connector.

(4) After checking that the machine is cooled down, take it in storage by covering it with a sheet or in a roofed place free from moisture. Do not expose it to weathers.

7-3 How to Use the Automatic Air Bleeding Unit

When the engine is stopped due to fuel run-out, or when the fuel filter and piping are demounted, start the machine in the following steps:

(1) Replenish fuel and set the cock of the fuel filter to the" Open" position.

(2) Push the priming lever several time until the fuel filter cup becomes full.

(3) Turn the Starter switch to " Start" . After the cranking (idling) is repeated, the air in the fuel piping is automatically exhausted.

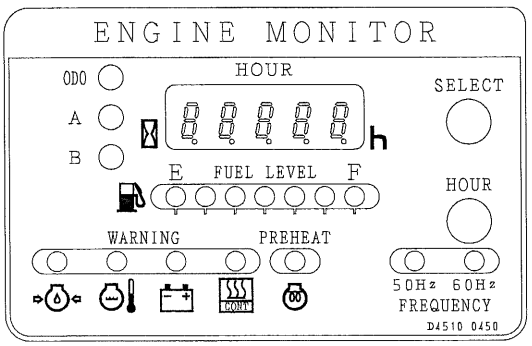
(4) If the air is completed exhausted by cranking, the engine will be started stably.

This machine is equipped with the protection devices to prevent the abnormal states during its operation as shown in the table below. If the protection devices operate, stop the operation promptly and inspect or repair the abnormal point, or consult with our marketing section or service plant.

Table of Main Protection Devices and Functions

Operation Item	Circuit Breaker	Engine	Welding Output	Engine Monitor Lamp Indication	Operating Conditions
Low lubricating oil pressure	—	Stop	Stop	○ (Alarm lamp)	The oil pressure in the engine is abnormally low. Parameter: 0.098 MPa or less
High jacket water temperature	—	Stop	Stop	○ (Alarm lamp)	The water temperature in the Engine is abnormally high. Parameter: 115℃ or more
Insufficient charge	—	Stop	Stop	○ (Alarm lamp)	The generated voltage of the charging generator is abnormally low.
Over rotation	—	Stop	Stop	○ (Alarm lamp)	The engine revolutions of 4140 min^{-1} or more are detected. ・「CONT」blinking
IGBT overheat	—	—	Stop (Self-recovery)	○ (Alarm lamp)	The semiconductor (IGBT) in the welding control device was overheated (due to operation with the side door opened or with the air breathing vent or exhaust vent closed). ・「CONT」ligthing
Residual fuel low	—	—	—	○ (Level lamp)	The residual fuel quantity is indicated. The residual fuel quantity when only one red lamp is lighting is 10L or less.
AC over current	Trip	—	—	—	AC overload or short-circuit
Fuse for engine wiring	—	—	—	—	Fused with the overcurrent due to short-circuit

[**NOTE**] : If a fuse is blown out, check on any wiring trouble and intrusion of any foreign object before fuse replacement.



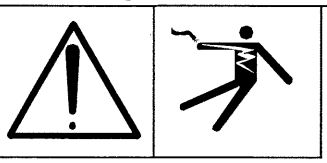
◆ FUSE

The engine wiring system has its own fuse. If this fuse has blown, check the wiring to determine if there are any problems.
If there are no apparent problems with the wiring, check to see if there are any alien substances in the wiring system.
Repair any problems found in accordance with the Engine Manufacturer's Operation Manual. After the problem is fixed, replace the blown fuse.

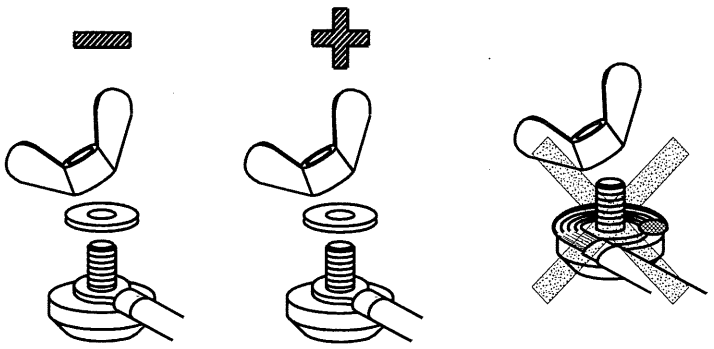
[**NOTE**] : If the engine does not stop despite a blown fuse or another malfunction(with the starter switch in the "OFF" position), turn the fuel filter cock to the close position and the engine will stop.
Or Keep pushing the stop lever of engine till engine stopped completely.

8. OPERATION OF THE WELDER

8-1 Welding Cable and Polarities



(1) Connect securely the cable to the output terminals fitted under the control panel. Never allow the cable terminals to touch the other terminal or body steel.



※ Follow this illustration to connect the terminals.
※ Fit a metal terminal at the cable's end.

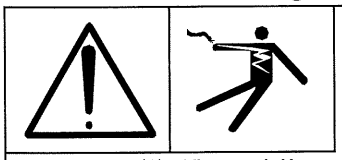
Connect the welding cables to the output terminals at the bottom of the control panel. The output terminals have (+) and (-) polarities. Select the appropriate polarities according to the application (see the table below).

Attach terminal connectors to each cable's end. Never connect exposed wires directly to the terminal. Exposed wiring may cause shocks or di-electric breakdown from poor contact.

Polarities and applications

	Welding method	Typical Applications
Straight polarity	(+)··grounding (base metal) (-)··welding holder	Arc welding for steel materials of general structures, and for thick plates Arc welding for copper alloy
Reverse polarity	(+)··welding holder (-)··grounding (base metal)	Build-up welding Air gouging Arc welding of thin plates Arc welding of stainless steel

8-2 Selection of Welding Cable



(1) The welding cable should be larger in size as it becomes longer or its current becomes higher. Prepare a cable having a suitable size by referring to the table below.

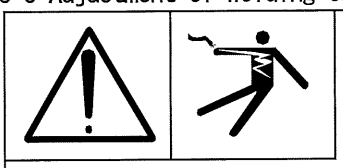
Calculation for the table is based on the voltage drop of maximum 4V.

Cable Selection

	Length (m)	20	30	40	50	60	80	100
Suitable cable size (mm²)	100 (A)	22	22	22	30	30	38	50
	150 (A)	22	22	30	38	50	60	80
	200 (A)	22	30	38	50	60	80	100
	250 (A)	30	38	50	60	80	100	125
	300 (A)	30	50	60	80	100	125	150
	350 (A)	38	60	80	100	125	150	200
	400 (A)	38	60	80	100	125	150	200

[**NOTE**] : The above table can also apply to the grounding cable.

8-3 Adjustment of Welding Current and Selection of Welding Mode

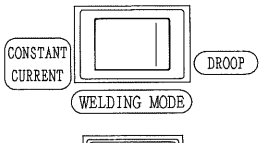


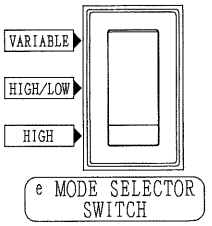
(1) Turn the "Welding Mode Selector Switch" to select CONSTANT CURRENT or DROOP.

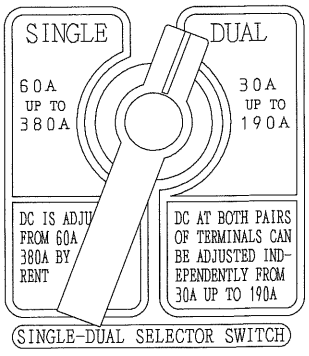
(2) Turn the "e Mode Selector Switch" to select VARIABLE, HIGH/LOW or HIGH.

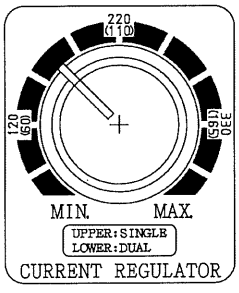
(3) Turn the "Single-Dual Selector Switch" to select Single or Dual.

(4) Adjust welding current with the Welding Current Regulator.









Current Range and Engine Speed

[50Hz]

E Mode Selector Switch	Single			Dual		
	Low (2000 min^{-1})	Variable (2200~3000 min^{-1})	High (3000 min^{-1})	Low (2000 min^{-1})	Variable (2200 min^{-1})	High (3000 min^{-1})
VARIABLE	N/L	60~380A	—	N/L	30~190A	—
HIGH/LOW	N/L	—	60~380A	N/L	—	30~190A
HIGH	—	—	N/L, 60~380A	—	—	N/L, 30~190A

[60Hz]

E Mode Selector Switch	Single			Dual		
	Low (2000 min^{-1})	Variable (2200~3600 min^{-1})	High (3600 min^{-1})	Low (2000 min^{-1})	Variable (2200 min^{-1})	High (3600 min^{-1})
VARIABLE	N/L	60~400A	—	N/L	30~200A	—
HIGH/LOW	N/L	—	60~400A	N/L	—	30~200A
HIGH	—	—	N/L, 60~400A	—	—	N/L, 30~200A

[NOTE] : If of connects by different polarity and the same work is simultaneously used by two sets of machine, the voltage between folders way receive an electric shock. That one operator has two folders absolutely should avoid.

[NOTE] : When you connect the polarity which is different in the same work with two sets of machine, please be sure to connect the ground cable by the side of work separately.
If a ground cable is shared by one, a ground may be caused to a machine.

[NOTE] : Don' t switch the Single-Dual Selector Switch during welding operation, otherwise the troubles such as contacting failure, burning, etc. can occur.

(5) Single use

In case of single operation, turn the "Single-Dual Selector Switch" left, and use Terminal A.
Regulate the current range of Terminal A by using "Current Regulator for Terminal A".

In this case you cannot use Terminal B.

(6) Dual use

In case of dual operation, turn the "Single-Dual Selector Switch" right.
You can use both the Terminal A and Terminal B.
Regulate the current range of Terminal A by using "Current Regulator for Terminal A" and the current range of Terminal B by using "Current Regulator for Terminal B".

Range selection by the current range and the electrode size

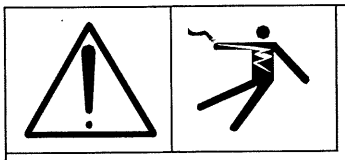
[50Hz]

	Single		Dual	
	Variable (2200～3000 min^{-1})	High (3000 min^{-1})	Variable (2200 min^{-1})	High (3000 min^{-1})
Current Range	60～380A	60～380A	30～190A	30～190A
Electrode Size	ϕ2.0～ϕ8.0	ϕ2.0～ϕ8.0	ϕ2.0～ϕ4.0	ϕ2.0～ϕ4.0

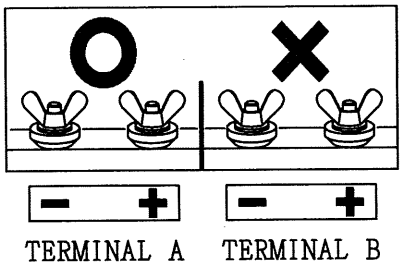
[60Hz]

	Single		Dual	
	Variable (2200～3600 min^{-1})	High (3600 min^{-1})	Variable (2200 min^{-1})	High (3600 min^{-1})
Current Range	60～400A	60～400A	30～200A	30～200A
Electrode Size	ϕ2.0～ϕ8.0	ϕ2.0～ϕ8.0	ϕ2.0～ϕ4.0	ϕ2.0～ϕ4.0

8-4 How to use Welding Terminals

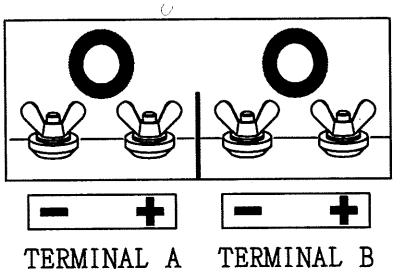


(1) "Single-Dual Selector Switch" when Single Operation
Use Terminal A". ("Terminal B" can not be used.)



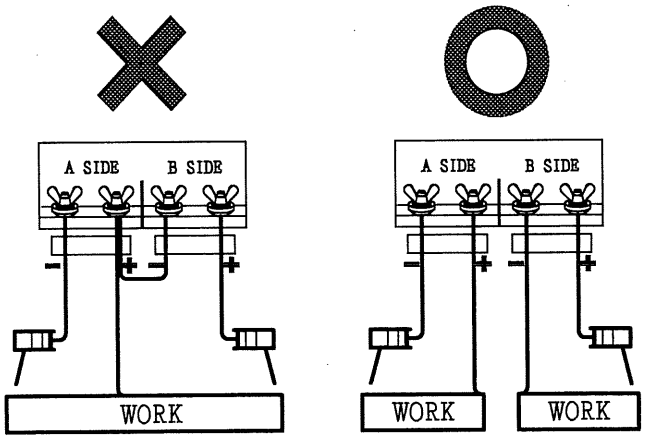
※ Only Terminal A can be used.

(2) "Single-Dual Selector Switch" when Dual Operation
Use both the Terminals A and B.

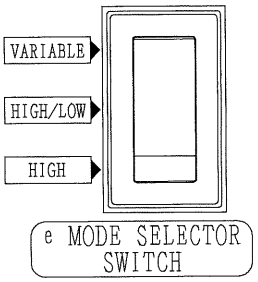


※ Both the Terminal A and B can be used.

[**NOTE**] : When Dual operation, don't use the same work by different polarity. Since a folder and the voltage between terminals may become twice the usual no load voltage and may receive an electric shock, that one worker has two folder absolutely should avoid.



(1) This function is capable of reducing noise, saving fuel and slashing CO_2 in operating the engine at a low speed with no load or with a low Welding load. The operations at the e-mode switch positions are as follows:



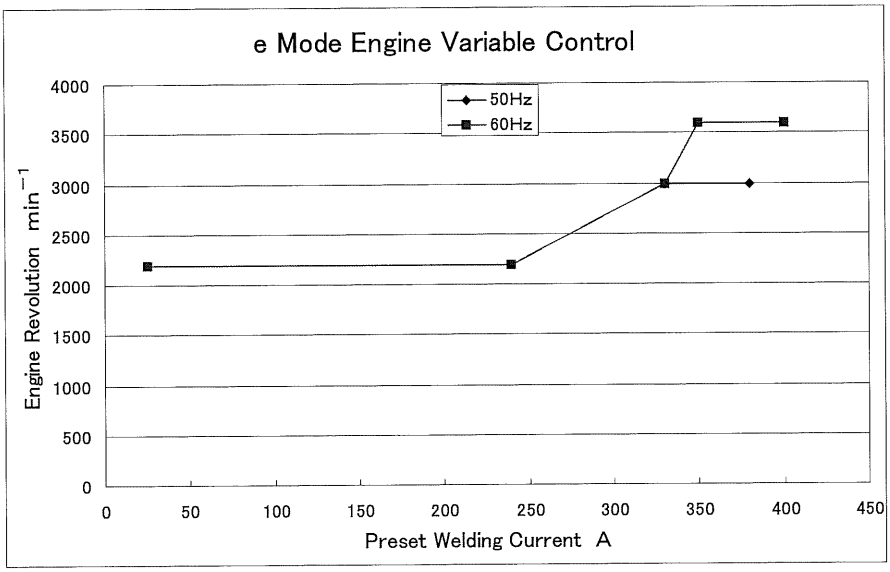
① "Variable" position
When the welding power and the AC welding power are not used, the Engine is always operated at the lowest revolutions (2000 min^{-1}).
During the welding work, the engine rotation is automatically controlled at a proper speed depending upon the welding output.
With an AC load of 100W or more, however, the engine will be operated at a high speed to respond to the preset AC frequency regardless of the welding work.

② "High/Low" position
With an AC load of 100W or more or when the welding work is started, the engine will be operated at a high speed to respond to the preset AC frequency.

③ "High" position
Regardless of having no load or a load, the engine is always operated at a high speed to respond to the preset AC frequency.

[**NOTE**] : Be careful that no overload is caused in the simultaneous use of welding power and AC power in referring to "8-10 AC Power Supply" in page 34.

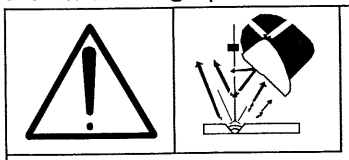
(2) If welding is started at the "Variable" position, the engine revolutions is controlled in no steps according to the preset welding current as shown in the diagram below.
The engine will be put into low-speed operation about 8 sec. after a pause of welding work.



(3) If the welding work using the current of 240A or less is done by one person, set the e-mode switch to the "High/Low" or "High" position, especially if you are careful about bead appearance and welding faults.

(4) Set the e-mode switch to the "High" position if the AC load is less than 100W or if an AC load with a magnet switch is used.

8-6 In Welding Operation



During arc welding or arc cutting operation, be sure to use a cover glass to protect your eyes. It is very dangerous to operate without a protector such as mask, safety goggles or hand shield.

- Reference - Numbers of bright degree of lens

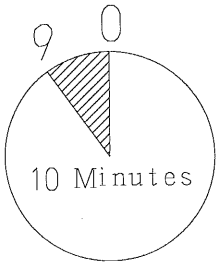
	Applied electrode size	color depth of filter glass
Shield arc welding	ϕ1.6 to ϕ4.0 mm (1/16 to 5/32 inches)	10
	ϕ5.0 to ϕ6.0 mm (3/16 to 1/ 4 inches)	12
	ϕ8.0 to ϕ9.5 mm (5/16 to 3/ 8 inches)	14

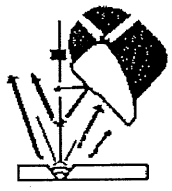
Quoted from OSHA (Occupational Safety and Health Standards)

8-7 Duty Cycle

Duty cycle is percentage of 10 minutes that the unit can weld at a certain current without overloading. For example, the duty cycle is 90% at the welding current of 380 / 400 amperes.

1 minutes resting.





9 minutes welding.

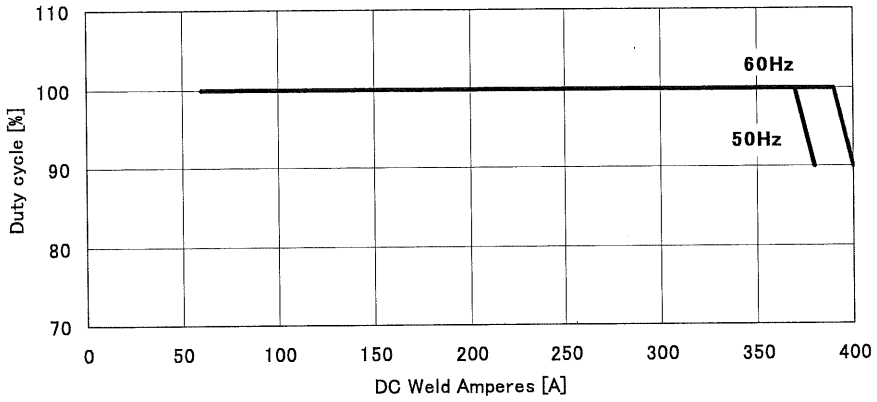
[Single]

Frequency	Duty cycle (%)	100 (%)	90 (%)
50Hz	Current	60~370A	380A
60Hz		60~390A	400A

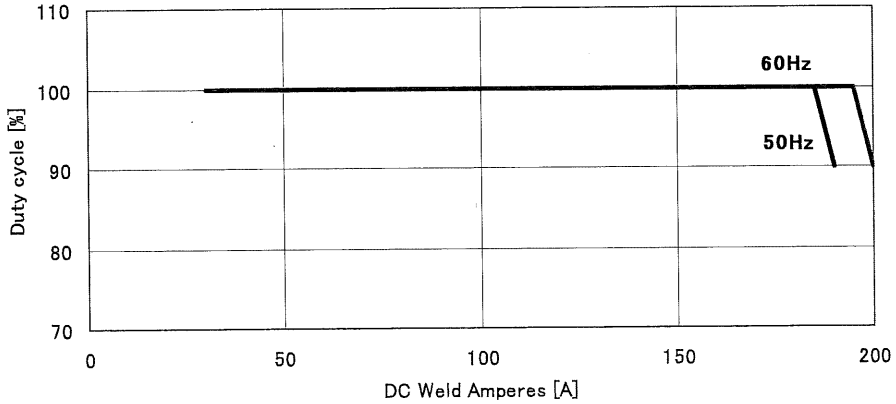
[Dual]

Frequency	Duty cycle (%)	100 (%)	90 (%)
50Hz	Current	30~185A	190A
60Hz		30~195A	200A

Duty cycle and welding current (Single)

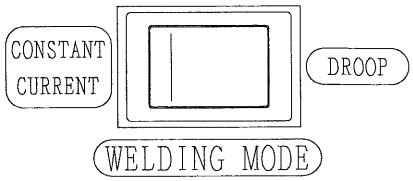


Duty cycle and welding current (Dual)



8-8 Welding Mode Selector Switch and Arc Force Regulator

Use the "Welding Mode Selector Switch" and the "Arc Force Regulator " to adjust welding characteristic according to the welding operation. This function is useful for peculiar welding operation.

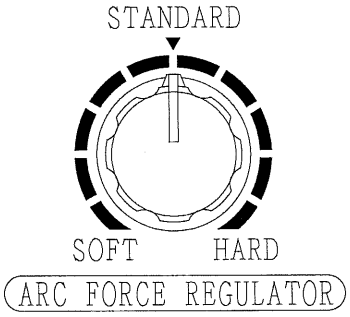


(1) CONSTANT CURRENT

Control the welding output current according to the current setting even if the arc length is longer or shorter and it is unaffected by welding cable thickness or length. If you set the mode to constant current, you can adjust the short circuit current using the Arc Force Regulator. Refer to characteristic graph in the next page for further explanation.

① SOFT

Its short circuit current is almost same as large as the welding current. The arc is stable in this mode by its stable current characteristic.



② STANDARD

Its short circuit current is about 1.7 times as large as the welding current. It' s easy to start arc and the stability of arc is superior in this mode. It' s suitable for many kinds of welding rods.

③ HARD

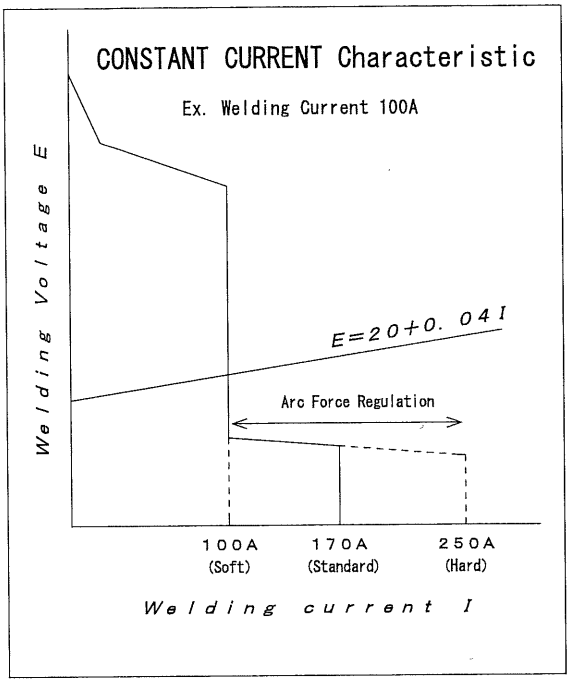
Its short circuit current is about 2.5 times as large as the welding current. It' s easy to start arc and the power of arc is strong in this mode. Particularly it' s suitable for welding with high cellulosic welding rod.

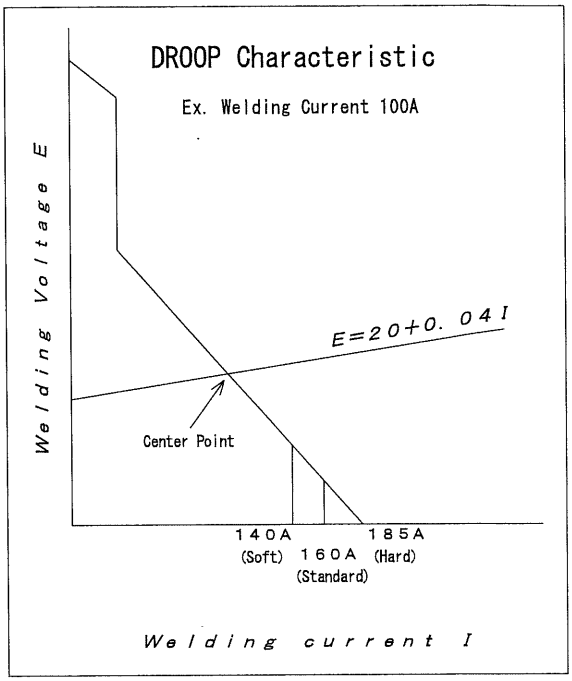
[NOTE] : To protect the IGBT circuit board, the short circuit current is equipped with the limiter. There will be no out put if the short circuit current is more than approximately 700/350A(Single/Dual).
To prevent overload to the engine, the output current will be automatically limited when the cable drop is too much during welding operation.

(2) DROOP

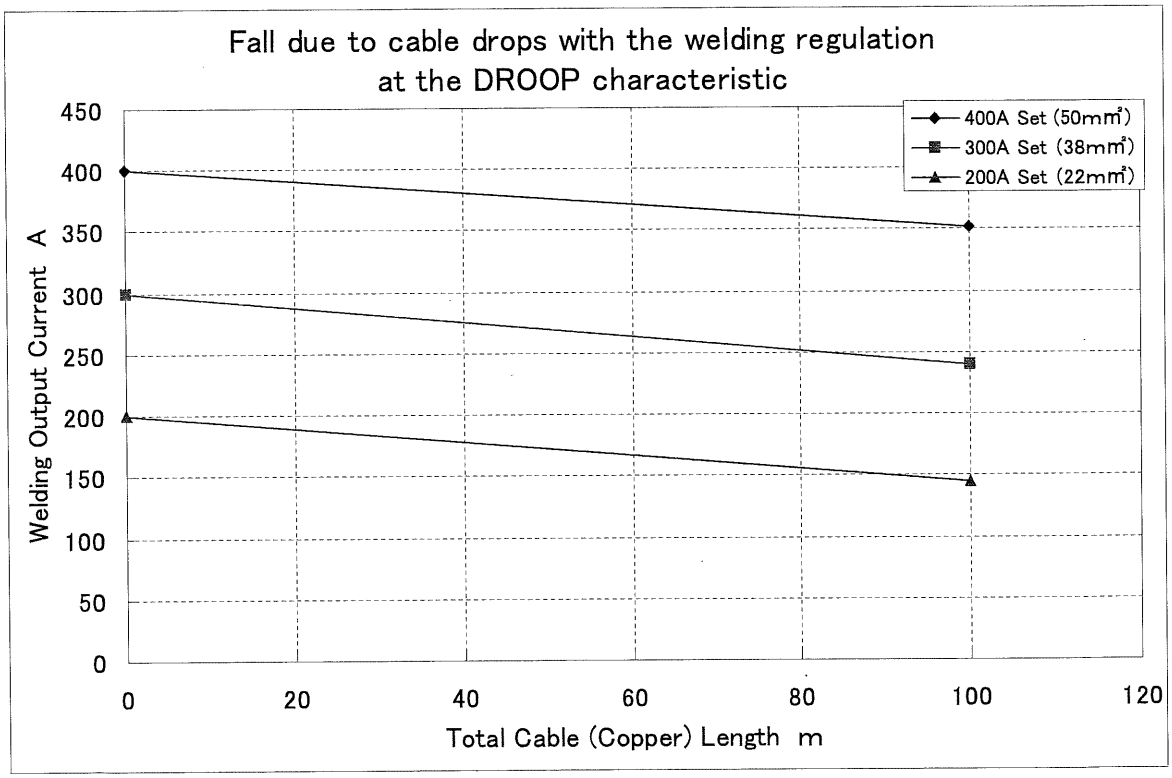
The heat input and the beat can be adjusted by moving the welding rod up and down. The welding rod up-down movements will cause the arc length to change and at the same time the welding current can be fluctuated. This is suitable for pipe welding operation. The welding cable drop will cause the welding output current to decline. Make sure to use the right cable thickness and length. Dropping distribution is not possible to adjust.

The short circuit current is limited to 0.75(soft)～1(hard) of the short circuit Current on the dropping line depending on the position of the Arc Force Regulator.



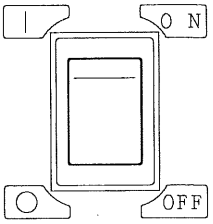


[Ref.] : graph below shows the calculation result for output current dropping rates in dropping characteristic.



8-9 VRD (Voltage Reduction Device)

This machine is equipped with the VRD function to prevent electric shock especially during operation performed in limited working space or in region with higher altitude or higher humidity.



VOLTAGE REDUCTION

The VRD function is activated when you turn the "Voltage Reduction Switch" to ON position, the unloaded voltage of the welding output terminal will be decrease for about 12V.
When the welding operation started, the normal welding control condition will be applies automatically and when the welding operation stopped (current level is 0A), the VRD function will be activated after 1 second.

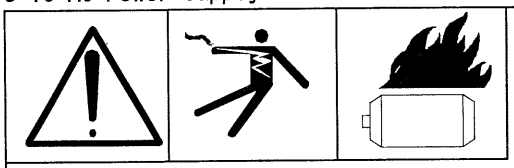
[NOTE] : When the Voltage Reduction Switch is on, you may have difficulties to start the arc.

Check the Voltage Reduction Device (VRD)

(1) If the machine is used when the Voltage Reduction Switch is "ON", function check is recommended for at least once in 6 months.

(2) For inspection, turn the e-mode switch to the HIGH position and measure the voltage between the welding output terminals using the direct current (DC) voltmeter (or any commercial electronic test equipment) with no load applied, make sure that when the Voltage Reduction Switch is "ON" the voltage must be lower than 30V, and if the Voltage Reduction Switch is "OFF" the voltage must be more than 50V.

8-10 AC Power Supply



AC power supply

This machine is provided with AC power supplies in addition to the welding power supply. Mount terminal to each tip (connection part) of the cable and cord without fail, and fasten the screw securely.

(1) Be sure to turn off the circuit breaker for AC power source before connecting AC loads. Connecting without turning off can cause a death accident due to electrical shock or give a electrical damage to the machine.

(2) Do not allow overloading when AC and DC are used simultaneously. The circuit breaker trips automatically when AC current exceeds the maximum output.

[**NOTE**] : Where high quality welding is required, do not use the AC power source simultaneously.

AC output Capacity for lamp at simultaneous use with DC output

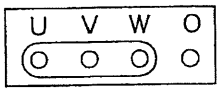
AC power supplies are used concurrently

welding rod	AC power source capacity allowable for simultaneous use
No using	Three-Phase 15.0 kVA or Single-Phase 6.0 kVA and Three-Phase 3.7 kVA
ϕ2.0 (50A)	Three-Phase 13.6 kVA or Single-Phase 6.0 kVA and Three-Phase 2.3 kVA
ϕ2.6 (80A)	Three-Phase 12.6 kVA or Single-Phase 6.0 kVA and Three-Phase 1.4 kVA
ϕ3.2 in use(130A)	Three-Phase 10.9 kVA or Single-Phase 6.0 kVA
ϕ4.0 in use(170A)	Three-Phase 9.3 kVA or Single-Phase 6.0 kVA
ϕ5.0 in use(220A)	Three-Phase 7.0 kVA or Single-Phase 5.6 kVA
ϕ6.0 in use(270A)	Three-Phase 4.6 kVA or Single-Phase 3.6 kVA
ϕ7.0 in use(340A)	0

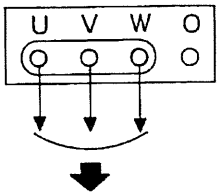
(3) Do not allow the AC output to connect to house wiring or commercial supply wiring.

(4) This welder/generator is equipped with four single-phase receptacles(option) and one single-phase output terminal(option) for auxiliary power, which have can be used for a particular auxiliary load with a maximum combined output of 3.0 kVA or 1.5 kVA per receptacle. When using both of these receptacles and output terminal at once, for the best results, it is recommended that each receptacle's output be balanced with each other.

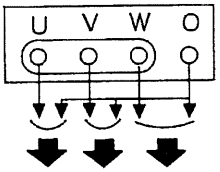
(5) The following diagrams illustrate how to connect Single-phase loads to the generator's output terminal.



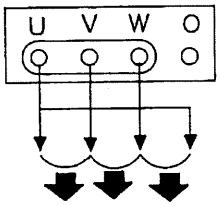
3-Phase 4-Wire Output Terminal



3-Phase Load
Use U, V, W for 200V/220V/380V/400V/415V/440V



Single Phase Load
Use O.U, O.V, O.W for 115V/127V/220V/230V/240V/254V



Single Phase Load
Use U.V, V.W, W.U for 200V/220V/380V/400V/415V/440V

(6) If the three-phase power supply and single-phase power supply are used concurrently.

Maximum power supply capacity of each single-phase output when 3-phase and single-phase power supplies are used concurrently

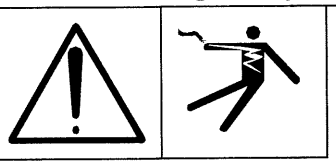
50Hz

3-phase	Single-phase		
	Output Terminal	CON1 (1.5kVA × 2)	CON2 (1.5kVA × 2)
15.0 kVA	0	0	0
12.5 kVA	0.65 kVA	0.65 kVA	0.65 kVA
10.0 kVA	1.30 kVA	1.30 kVA	1.30 kVA
7.5 kVA	2.00 kVA	2.00 kVA	2.00 kVA
5.0 kVA	2.65 kVA	2.65 kVA	2.65 kVA
0	TOTAL 9.0 kVA		

60Hz

3-phase	Single-phase		
	Output Terminal	CON1 (1.5kVA × 2)	CON2 (1.5kVA × 2)
15.0 kVA	0	0	0
12.5 kVA	0.65 kVA	0.65 kVA	0.65 kVA
10.0 kVA	1.30 kVA	1.30 kVA	1.30 kVA
7.5 kVA	2.00 kVA	2.00 kVA	2.00 kVA
5.0 kVA	2.65 kVA	2.65 kVA	2.65 kVA
0	TOTAL 9.9 kVA		

8-11 Earth Leakage Relay (Option)



(1) Generator Description

◆ The machine is equipped with an earth leakage relay which has a current sensitivity of 30mA. The purpose of this relay is to detect any current leakage due to insulation failure of the load for example, while the generator is running. When the earth leakage relay detects a current leakage, it will automatically trip the circuit breaker, thereby shutting down the output to the terminal, in order to guard against the occurrence of electric shock.

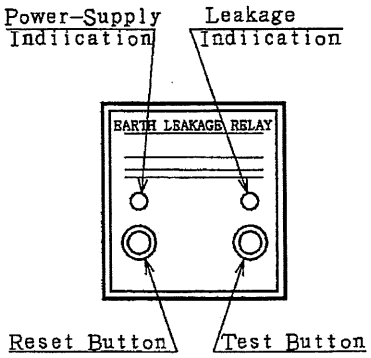
◆ It is more important to ensure that the load is properly connected to generator rather than being careless and risk the possibility of current leakage and other problems. We urge the users of this generator to read this Operation Manual throughout.

◆ When the earth leakage relay is activated, the operator should immediately locate the leakage area and repair it. Once the repairs are completed, you should press the reset button on the earth leakage relay or stop the engine and then turn the circuit breaker on again. We recommend that you should equip the earth leakage device with each load equipment for safety reasons.

(2) How to Use and Test the Earth Leakage Relay

◆ The following descriptions allow you to make sure the earth leakage relay is functioning correctly.

① Perform a periodic check on earth leakage relay to ensure it is operating correctly, in accordance with the following instructions:



◆ Start the engine and adjust the to high speed running. Note that the indicator lamp (green color) on the leakage relay is on.

◆ Turn the circuit breaker on.

◆ Press the "TEST" button(red) on the earth leakage relay. If this causes the leakage lamp to turn red, which activates the leakage relay and trips the circuit breaker, the leakage relay is confirmed to be operating correctly.

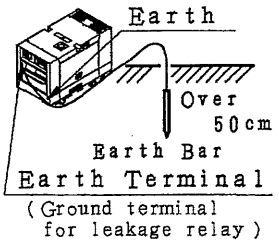
◆ Press the reset button on the earth leakage relay and return the circuit breaker to the off position temporarily. This allows the circuit breaker to be turned on again.

Notice : The leakage relay once activated will hold its activation state until the reset button is pressed or the starter switch is turned to the off position.

② Grounding the Generator

◆ To ground the generator, the grounding rod supplied with the generator should be connect to the grounding terminal on the control panel.
The grounding rod should be placed into the surface/ground.

[CAUTION] : If the generator set is not ground.
The earth leakage relay will not function.
The grounding resistance shall be less than 100 Ω, and the current sensitivity of the earth leakage relay is 30 mA.
The grounding of the generator should be done in accordance with the applicable electrical standards that are in force. In addition, ground the generator case by connecting a grounding conductor to the case grounding terminal provided on the control panel.



③ Grounding the Load Equipment.

◆ As with the generator, the load equipment should be grounded.

[CAUTION] : Installing the earth leakage relay on the generator should not be a justification for not grounding the load equipment.
The absence of any current leakage that may occur.
The absence of such grounding on the load side, requires any current leakage to be detected, the current must flow through the human body.
This is extremely dangerous because the sensitivity of the leakage relay provided with the generator is not sufficient to detect such a small current. In cases where the load-side with the earth leakage relay terminal grounding of the generator.

(3) Earth Terminal for Leakage Relay

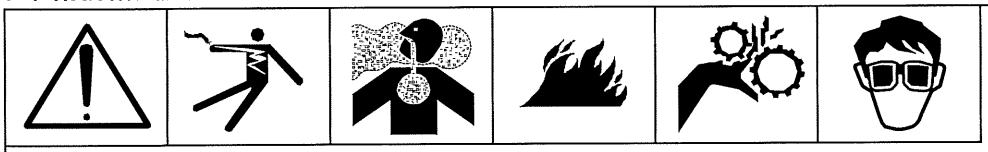
① This generator is equipped with a earth terminal for the leakage relay which can be found on the control panel. This earth terminal is connected to the neutral point of the three-phase AC wiring of the generator.

② For grounding of a leakage breaker to load-side, grounding work on the equipment must be carried out, even if this equipment is connected to the control panel in conjunction with the earth terminal for the generator's earth leakage relay. (It the grounding' is not done for both the generator and the load, the leakage breaker will not be activated.)
The load wire that is to be connected to the grounding rod, must be more than 5.5㎟ think for the ground. This wire's grounding resistance should be less than 100Ω.

Notice : It is prohibited to use the earth terminal of the leakage relay for single-phase AC output.

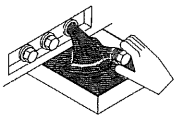
9. MAINTENANCE

9-1 Routine Maintenance

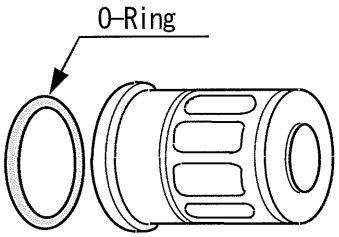


◆ Be sure to stop engine before servicing.
Remove dust and moisture from inside the machine and always keep it clean. Read the manual and give the machine correct inspection and maintenance.
Inspect or maintenance the machine periodically in the interval time shown below.

Initial 50 hours

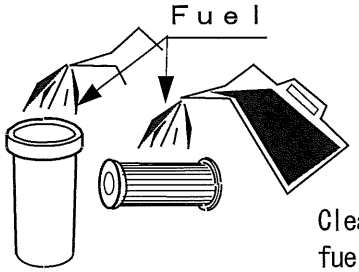


Change the engine oil.

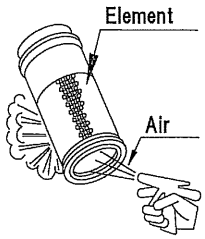


Change the oil filter.

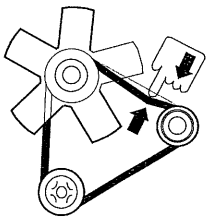
Every 100 hours



Clean the fuel filter element.

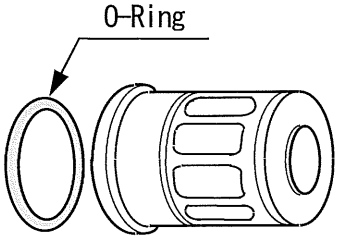


Clean the air cleaner element.



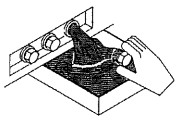
Check the tension of the fan belt.
(Change if necessary)

Every 200 hours



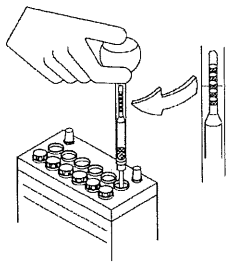
Change the oil filter.

Measurement of insulation resistance.

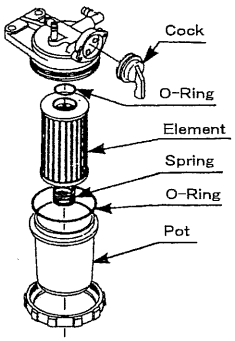


Change the engine oil.

Every 400 hours

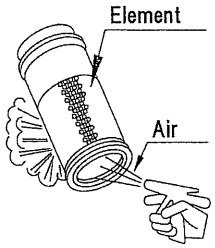


Check the gravity of Battery electrolyte.

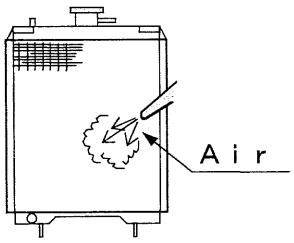


Change the fuel filter element.

Every 500 hours



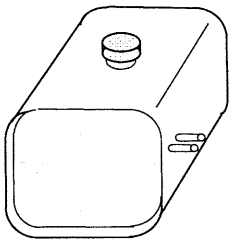
Change the air cleaner element.



Clean the radiator.

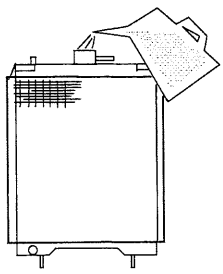
Adjust fuel injection nozzle.

Every 1000 hours



Clean the inside of the fuel tank.

Every 2000 hours



Change the water in the radiator.

Measure the engine compression pressure.
Check the valve clearance.

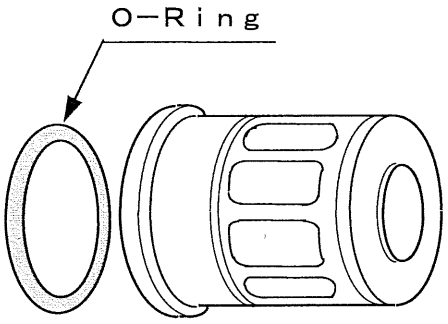
Other Inspection and Maintenance

- ◆ Change the nylon or rubber pipes every 2000 run hours or 3 years, or replace it if it becomes hard or deteriorated.
- ◆ Replace acoustic foam flat if it is extremely spoiled or damaged.

9-2 Engine Oil Filter

(1) Change the Engine Oil Filter

① Remove the cartridge (oil filter) using the Filter Wrench.
② Insert the new cartridge.
③ Screw in the cartridge by hand. Once the gasket comes into contact with the face of the seal, tighten the cartridge (1 turns) using the filter wrench.
④ Run the engine for a while and check to see if there are any oil leakage's. Stop the engine. After the engine has stopped for about 10-20 minutes, check the oil level gauge. If there is a shortage of oil, refill the oil.

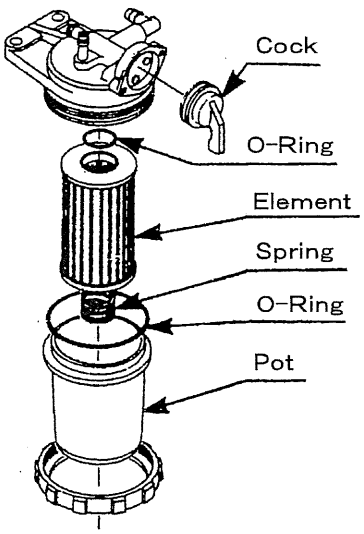


Cartridge : Parts No. Y 060 20 411 74

9-3 Fuel Filter Element

(1) Clean the Fuel Filter Element
① Turn the fuel filter cock to the close position. Remove the ring screw and take out the filter cup and element.
② Rinse the element using diesel fuel and also, clean the inside of the filter cup using diesel fuel.
③ After cleaning, fit the fuel filter back to its original position. Make sure when the fuel filter is being refitted that it is not overly dusty.

(2) Change the Fuel Filter Element and the O-Ring.
[NOTE] : Change the fuel filter element as per the description contained in 9-3 (1). The O-Ring to be changed that goes with the fuel filter element.



Fuel Filter Element : Parts No. Y 060 20 421 74

9-4 Air Cleaner Element

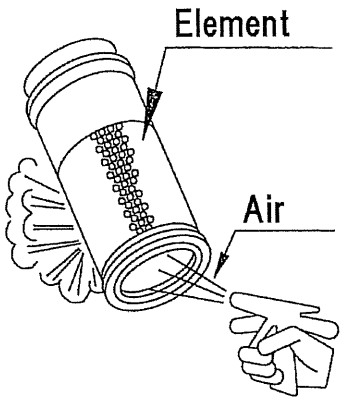
(1) Cleaning the Air Cleaner Element

< The air cleaner needs to be cleaned particularly if it has trapped a lot of dust and dirt >

① Take the air element out. Clean the air element by passing an air current through the air element.
If the air cleaner is full of carbon and oil, it is best to use some cleaner to get rid such contaminants.

② Make sure when refitting the air cleaner element to its proper position that you do so in a way that does not allow dust enter into the cleaner.

[**NOTE**] : After cleaning the air element, check to see whether there is any damage to the element. If there is any damage replace the damaged element with a new element.



Air Cleaner Element : Parts No. Y 060 20 463 35

(2) Change the Air Cleaner Element

In situations where the machine has not been operated for 500 Hours as a general rule, the air cleaner element will needs to be replaced after it has been cleaned 6 times.

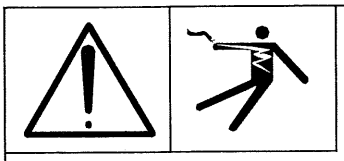
9-5 Condenser

To keep a stable performance of this machine, we recommend you to replace these condenser with new ones every five years due to degradation of condenser. Otherwise electrolytic capacitors might be damaged and in the worst case, the damaged capacitors may cause failure of the other parts.

[**NOTE**] : Do not touch the condenser within five minutes after stopping the engine. Otherwise you will have electric shock because capacitors can not fully discharge and voltage still remains in the condenser.

Condenser $C_{1,2}$: Parts No. Y 060 18 261 70

9-6 Measurement of insulation resistance



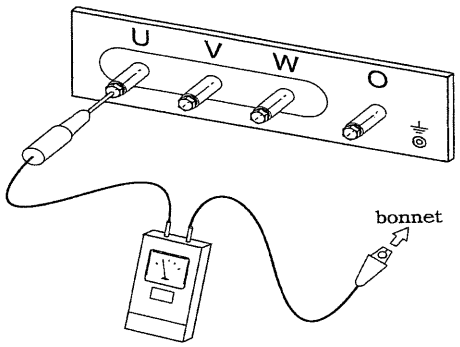
- Using a 500V insulation resistance tester, make a check once a month to ensure that the insulation resistance is more than 1MΩ.

In case of measuring with an insulation resistance tester over 500 VDC current, disconnect all connectors from the AVR and Control Unit before measuring.

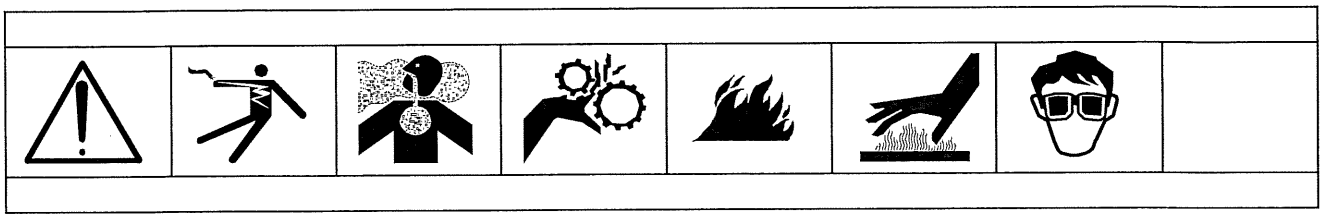
Measurement:

Disconnect the load side cable from the output terminal as shown at below.
Turn ON the circuit breaker and measure the insulation resistance between the output terminal bolt, welding output terminal bolt and the bonnet.

- If the measured resistance is less than 1MΩ, it may cause electric leakage or fire accident. Wipe off dirt and oil on the output terminals, circuit breakers and generator leads(cables) and dry them thoroughly.
If the insulation resistance is not recovered after cleaning, contact distributor or our office.



10. TROUBLESHOOTING



Trouble	Cause	Remedy
No arcing or weak arcing	Loose or disconnected wires	Visually check and repair
	Poor contacting at wire terminal	Pull the lead wire and check connection
	Generator	Replace
	Control device (FE-60)	Replace
	Transistor (IGBT)	Replace
	Rectifier (Re1)	Replace
	Current regulator (VR_1)	Replace
	DC reactor	Replace
	Condenser ($C_{1, 2}$)	Replace
	Inadequate length or thickness of welding cable	Replace
	Output terminals	Replace and Repair
No AC output	Loose or disconnected wires	Visually check and repair
	Poor contacting at wire terminal	Pull the lead wire and check connection
	Control device (AVR)	Replace
	Rotor	Replace
	Engine speed is too low	Adjustment and repair
	Circuit breaker	Replace
	Layer short-circuit in armature	Replace
Engine does not start	Loose or disconnected wires	Visually check and repair
	Poor contacting at wire terminal	Pull the lead wire and check connection
	No flow of fuel	Check fuel tank and fuel filter and remove foreign matter Change filter, if clogged inside
	Air or water in fuel system	Bleed air
	Fuel cock closed	Open fuel cock
	Over discharged battery	Charge or replace
	Starter switch	Replace
	Starter	Replace
	Broken pre-heat circuit	Repair
	Burned fuse (F3 5A, main fuse 65A)	Replace
	Emergency unit	Replace
	Safety relay	Replace

Trouble	Cause	Remedy
Low power sudden shutdown of engine	No fuel	Replenish
	Air cleaner clogged	Make clean element
	Faulty emergency shutdown switch.	Check for oil quantity
		Check for water quantity
		Check fan belt
		Check radiator for clogging
Abnormal color of emission	Fuel of bad quality	Change fuel
	Air cleaner, clogged	Make clean element
Abnormal noise	Engine, faulty	Repair
	Damaged rotor	Replace
	Loosened damaged bolts	Tighten
	Bonnet, damaged	Repair
Engine overheats	Low level of oil	Add oil to FULL mark on dipstick
	Over load	Reduce the load
	Poor ventilation	Check space around the machine Make sure there is at least 1 m clearance on all sides of the machine
	Cooling water is emptied or short	Check and replenish cooling water
Engine remains at high speed or slow speed	Loose or disconnected wires	Visually check and repair
	Poor contacting at wire terminal	Pull the lead wire and check connection
	Control panel	Replace
	e mode Selector switch (SW_1)	Replace
	Current Trans (CT-AC, DCCT)	Replace
	Control device (FE-60)	Replace
	Geared motor (GM)	Replace
	Burned fuse (F)	Replace
Battery becomes flat soon	Charging generator	Replace
	Regulator	Replace
	Starter switch	Replace
	Burned fuse (main fuse 65A)	Replace

11. STORAGE OF MACHINE

◆ When storing, carry out the prescribed procedures for maintenance and inspection to keep the machine's life and performance.

(1) Long Term Storage.
Disconnect the battery cable (-) from the battery.

(2) Battery Electrolyte Level.
Replenish distilled water where the acid level is low.

(3) Miscellaneous Checks.
Do routine checks for loose bolts, nuts and other fasteners. Always check for fuel, oil and cooling water leakage's.
For the complete routine engine checks, refer to the engine manual.

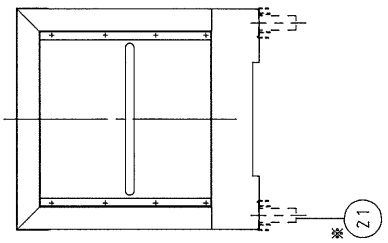
12. SPECIFICATIONS

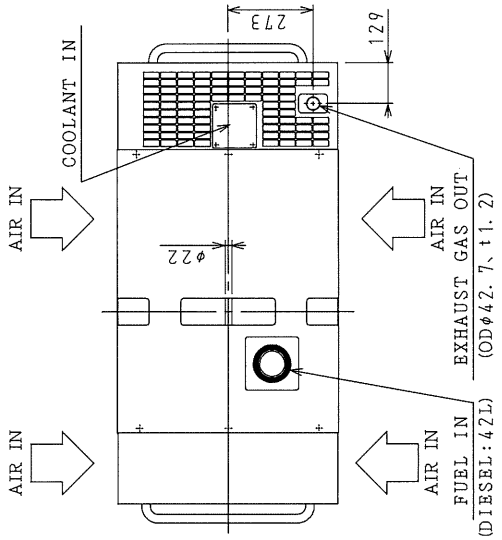
SPEC. / MODEL				DLW-400LSW					
Frequency			(Hz)	50			60		
DC WELDING OUTPUT	Rated Output		(kW)	12.9			13.9		
	Rated Current		(A)	370			390		
	Rated Voltage		(V)	34.8			35.6		
	Single	Current Range	(A)	60 ~ 380			60 ~ 400		
		Electrode	(mm)	φ2.0 ~ φ8.0					
	Dual	Current Range	(A)	30 ~ 190			30 ~ 200		
		Electrode	(mm)	φ2.0 ~ φ4.0					
	Rated Speed		(min^{-1})	3000			3600		
	Duty Cycle		(%)	100					
AC POWER OUTPUT	Three-Phase	Rated Output	(kVA)	15					
		Rated Voltage	(V)	200	220	380	400	415	440
		Rated Current		43.3	39.4	22.8	21.7	20.9	19.7
		No. Of Phase		3-Phase 4-wire					
		Power Factor		0.8(Lag)					
		Excitation		Brushless type (with AVR)					
		No. of poles		2					
		Insulation		Class F					
	Single-phase Aux. AC Power(Option)			Total 9.0/9.9 kVA [CON 1.5 kVA×4, Output Terminal 3kVA]					
ENGINE	Maker / Model			KUBOTA / D1105-K3B					
	Type			Water-cooled diesel engine					
	Number of cylinders			3					
	Bore × Stroke		(mm)	78 × 78.4					
	Total displacement		(L)	1.123					
	Rated output		(kW / min^{-1})	17.8 / 3000			20.7 / 3600		
	Battery			12V - 45Ah(55B24L)					
	Fuel			DIESEL FUEL ASTM NO.2 or eq.					
	Fuel tank capacity		(L)	42					
	Lubricanting capacity		(L)	5.1					
	Cooling water capacity		(L)	4.7					
SET	Length		(mm)	1520					
	Width		(mm)	700					
	Height		(mm)	770					
	Dry weight		(kg)	471					
	Total weight		(kg)	521					

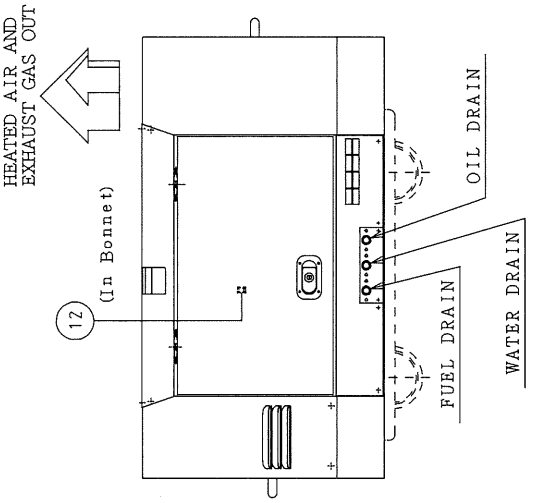
13. OUTLINE DRAWING

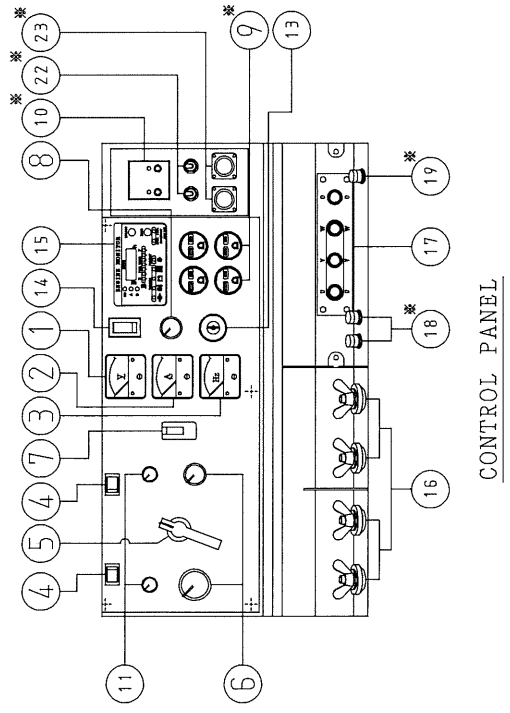
No	NAME
1	AC VOLTMETER
2	AC AMMETER
3	FREQUENCY METER
4	WELDING MODE SELECTOR SWITCH
5	SINGLE - DUAL SELECTOR SWITCH
6	CURRENT REGULATOR
7	AC CIRCUIT BREAKER
8	VOLTAGE REGULATOR
9	※1-PHASE AC OUTPUT RECEPTACLE
10	※EARTH LEAKAGE RELAY
11	ARC FORCE REGULATOR
12	VOLTAGE REDUCTION SWITCH
13	STARTER SWITCH
14	8-MODE SELECTOR SWITCH (VARIABLE/HIGH LOW/HIGH)
15	ENGINE MONITOR WARNING LAMP UNIT (OIL PRESS./WATER TEMP./CONTROL UNIT TEMP./ CHARGING/PREHEAT/PREHEAT LAMP) HOUR METER・FUEL METER
16	DC WELDING OUTPUT TERMINAL (+,-)
17	3-PHASE AC OUTPUT TERMINAL
18	※1-PHASE AC OUTPUT TERMINAL
19	※GROUND TERMINAL (for ELR)
20	GROUND TERMINAL (for Bonnet)
21	※4-TIRES (φ700)
22	※REMOTE CONTROL SWITCH
23	※REMOTE CONTROL RECEPTACLE

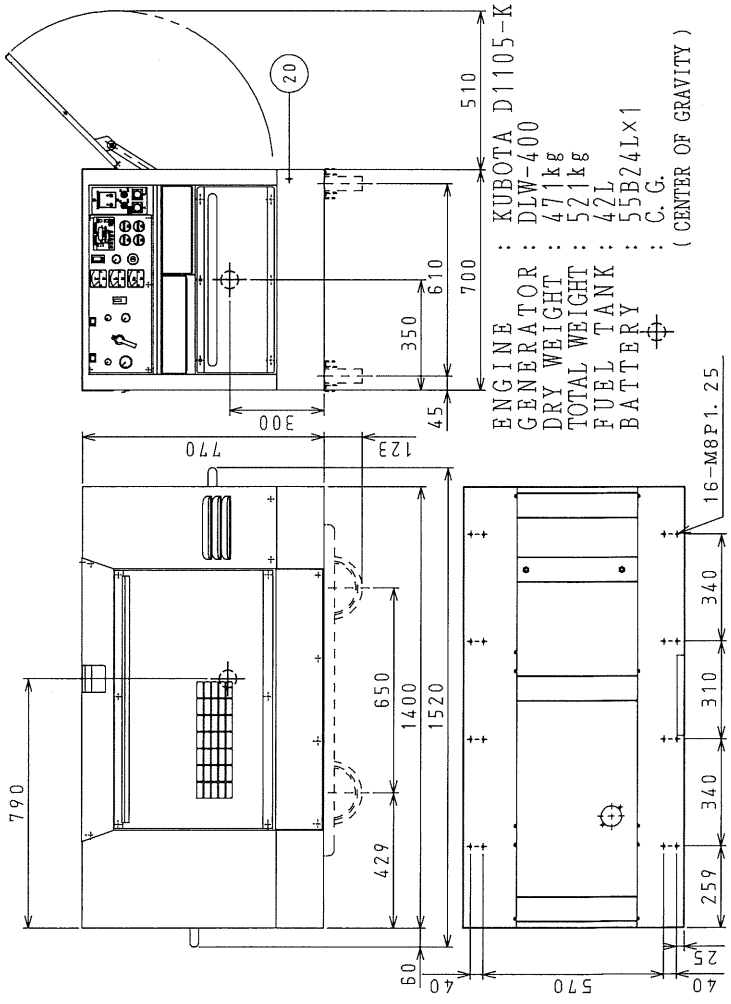
※ OPTION



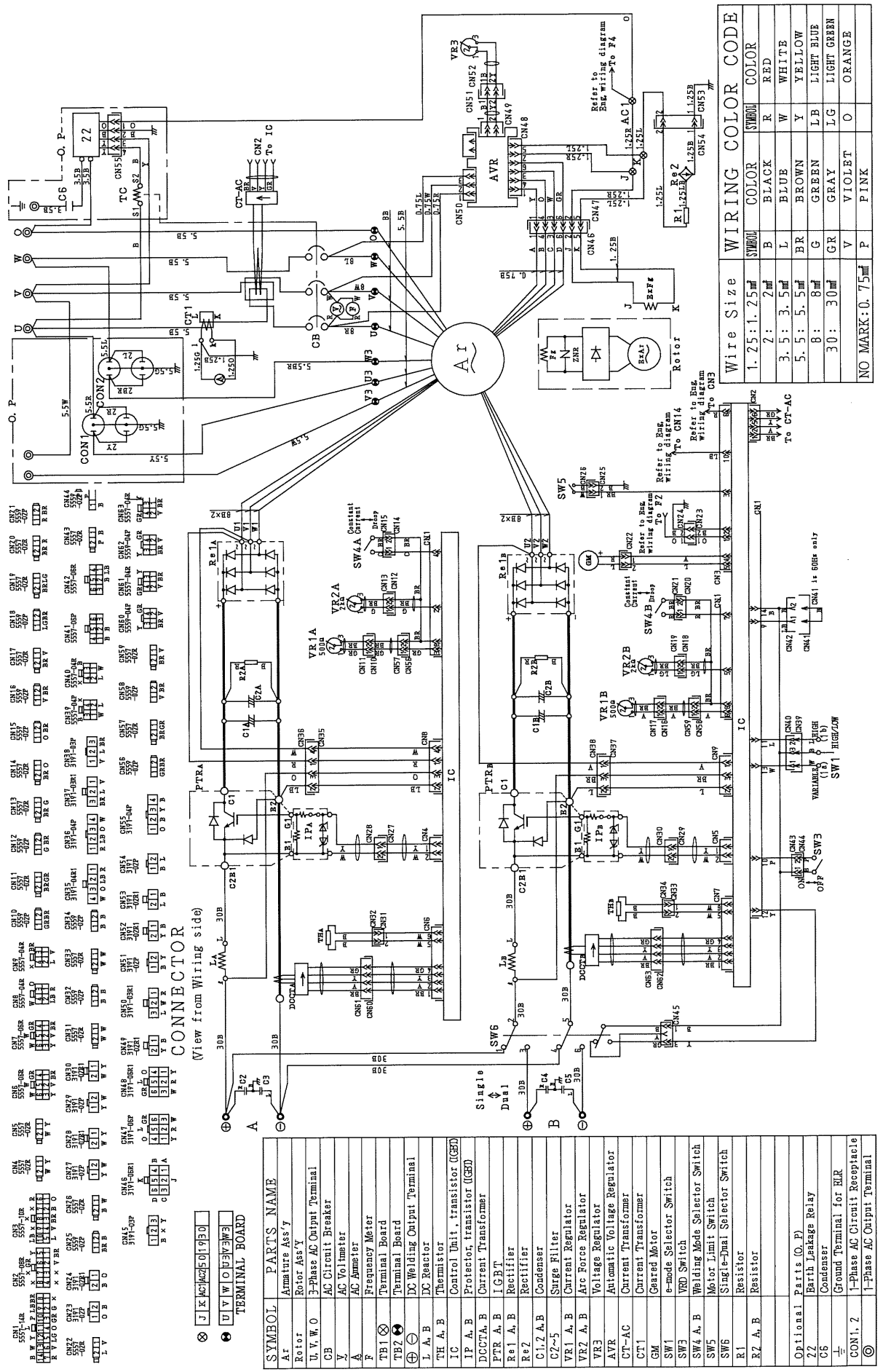




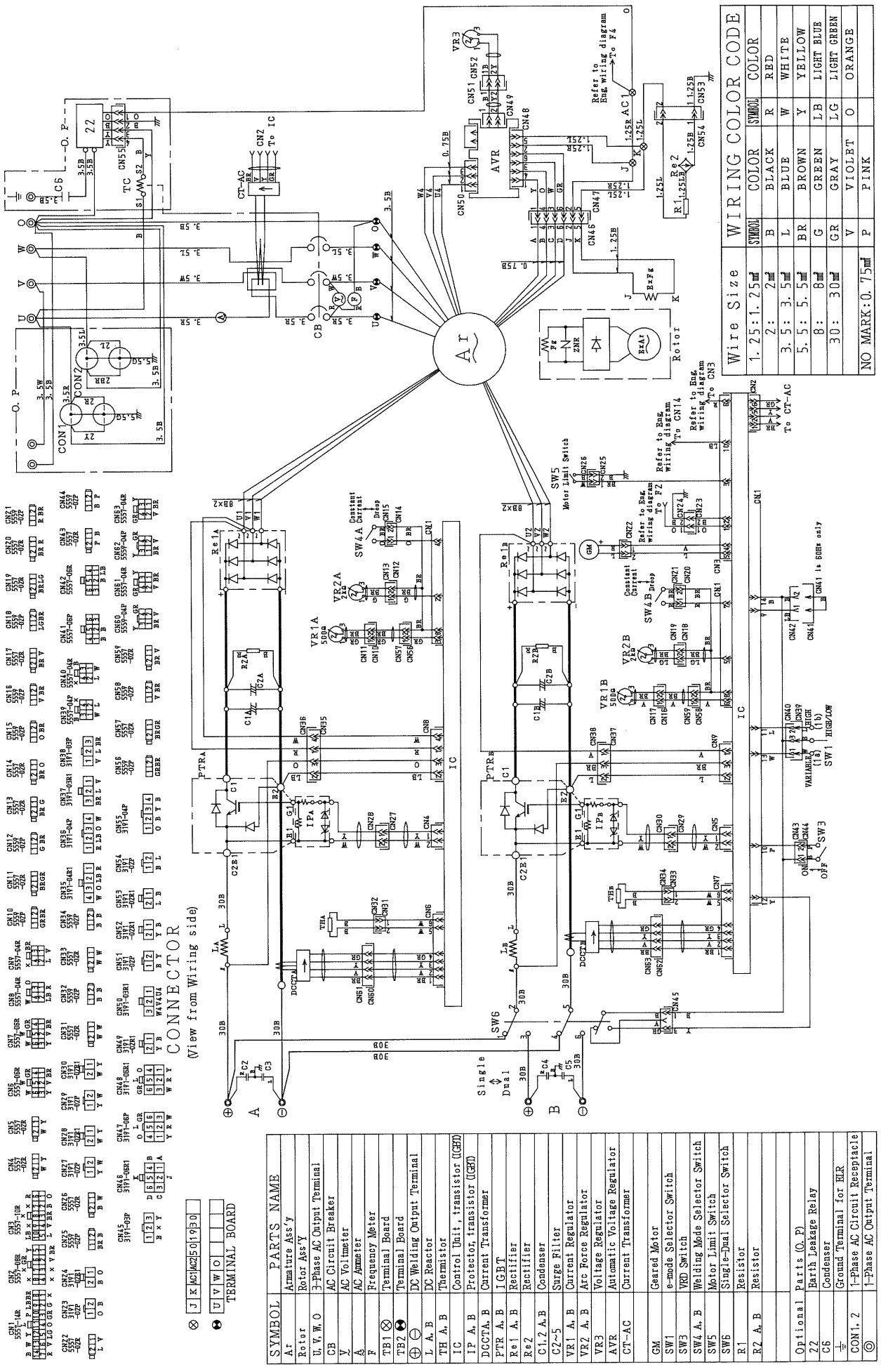




14. GENERATOR WIRING DIAGRAM
[200V CLASS]



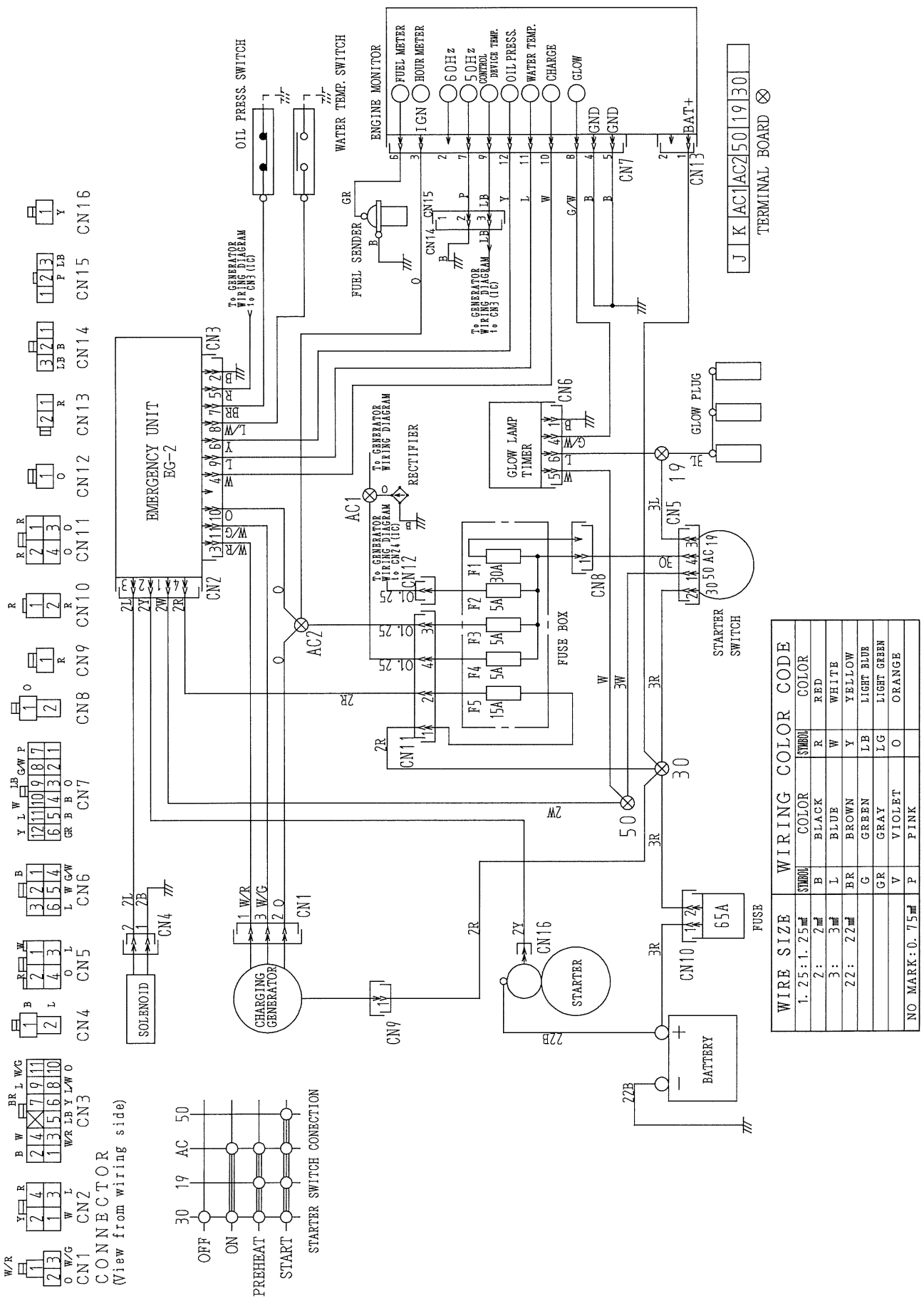
[400V CLASS]



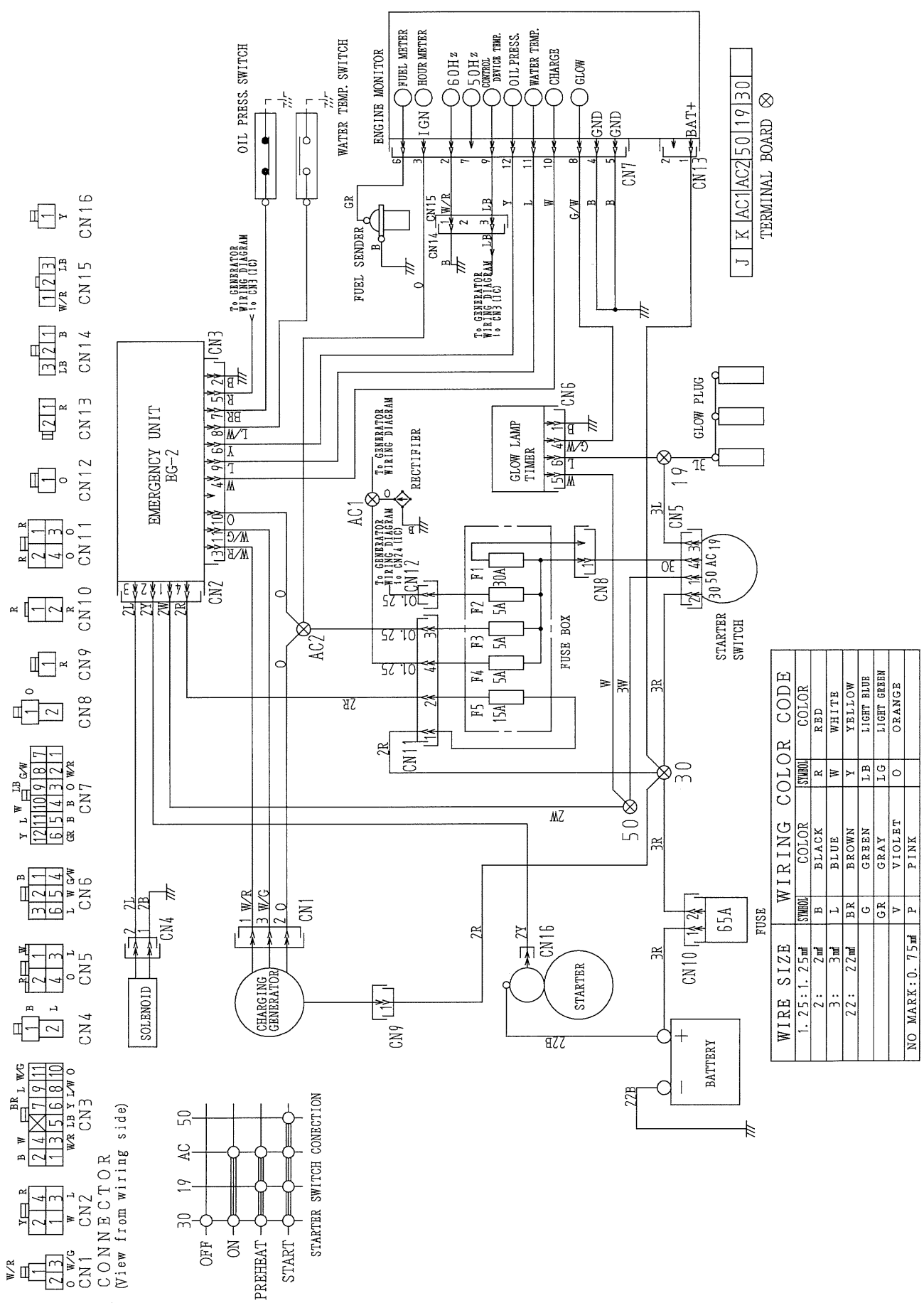
SYMBOL	PARTS NAME
Ar	Armature Ass'y
Rotor	Rotor Ass'y
U, V, W, O	3-Phase AC Output Terminal
CB	AC Circuit Breaker
V	AC Voltmeter
A	AC Ammeter
F	Frequency Meter
TB1 ⊗	Terminal Board
TB2 ⊕ ⊖	Terminal Board
L A, B	DC Welding Output Terminal
TH A, B	DC Reactor
IC	Thermistor
IP A, B	Control Unit, transistor (IGBT)
DCCTA, B	Protector, transistor (IGBT)
PTR A, B	Current Transformer
Re1 A, B	IGBT
Re2	Rectifier
C1, 2 A, B	Rectifier
C2~5	Condenser
VR1 A, B	Surge Filter
VR2 A, B	Current Regulator
VR3	Arc Force Regulator
AVR	Voltage Regulator
CT-AC	Automatic Voltage Regulator
	Current Transformer
CM	Geared Motor
SW1	e-mode Selector Switch
SW3	VRD Switch
SW4 A, B	Welding Mode Selector Switch
SW5	Motor Limit Switch
SW6	Single-Dual Selector Switch
R1	Resistor
R2 A, B	Resistor
Optional	Parts (O. P)
22	Earth Leakage Relay
C6	Condenser
⏚	Ground Terminal for ELR
CON1, 2	1-Phase AC Circuit Receptacle
◎	1-Phase AC Output Terminal

15. ENGINE WIRING DIAGRAM

[50Hz]

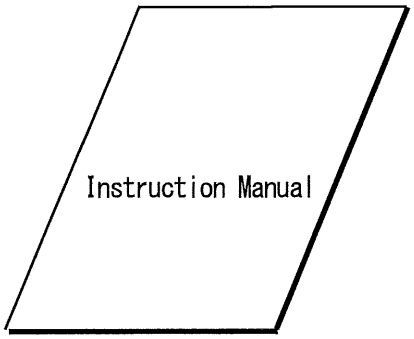


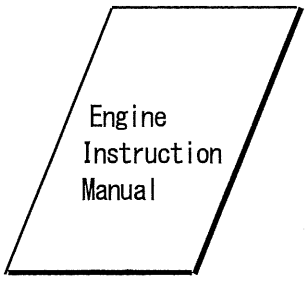
[60Hz]

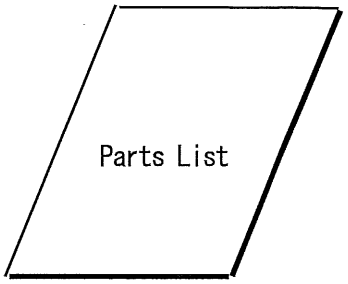


WIRE SIZE	WIRING COLOR CODE		
1.25:1.25㎟	COLOR	SYMBOL	COLOR
2: 2㎟	BLACK	R	RED
3: 3㎟	BLUE	W	WHITE
22: 22㎟	BROWN	Y	YELLOW
	GREEN	LB	LIGHT BLUE
	GRAY	LG	LIGHT GREEN
	VIOLET	O	ORANGE
NO MARK:0.75㎟	PINK		

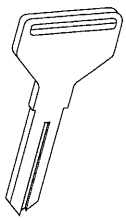
16. ATTACHMENT



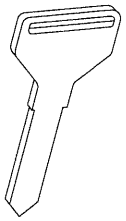




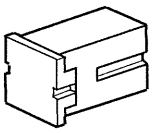
Starter Key



Door Key



Fuse



Earth Bar (option)