

OPERATING MANUAL

SHIELD-ARC[®] 400AS-50

WITH 12 VOLT ELECTRICS - KA1352



SAFETY DEPENDS ON YOU

Lincoln Electric welders are designed and built with safety in mind. However, your overall safety can be increased by proper installation and thoughtful operation on your part. Read and observe the general safety precautions on page 2 and follow specific installation and operating instructions included in this manual.

Most importantly, think before you act and be careful.

**THE LINCOLN ELECTRIC COMPANY
(AUSTRALIA) PTY. LTD. A.B.N. 36 000 040 308
SYDNEY, AUSTRALIA**

A Subsidiary of

THE LINCOLN ELECTRIC CO. U.S.A.

Associated Subsidiaries in Australasia, Asia, Canada, Europe, North and South America.

THE WORLD'S LEADER IN WELDING AND CUTTING PRODUCTS

PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. READ AND UNDERSTAND BOTH THE SPECIFIC INFORMATION GIVEN IN THE OPERATING MANUAL FOR THE WELDER AND/OR OTHER EQUIPMENT TO BE USED AS WELL AS THE FOLLOWING GENERAL INFORMATION.

ARC WELDING SAFETY PRECAUTIONS



ELECTRIC SHOCK can kill

1. a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Do not touch these "hot" parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
- b. In semi-automatic and automatic wire welding, the electrode, electrode reel, welding head and nozzle or semi-automatic welding gun are also electrically "hot".
- c. Insulate yourself from work and ground using dry insulation. When welding in damp locations, on metal framework such as floors, gratings or scaffolds, and when in positions such as sitting or Lying, make certain the insulation is large enough to cover your full area of physical contact with work and ground.
- d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.
- e. Ground the work or metal to be welded to a good electrical (earth) ground.
- f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.
- g. Never dip the electrode holder in water for cooling.
- h. Never simultaneously touch electrically "hot" parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.
- i. When working above floor level, protect yourself from a fall should you get a shock.
- j. Also see items 4c and 6.



FUMES AND GASES can be dangerous

2. a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. When welding on galvanised, lead or cadmium plated steel and other metals which produce toxic fumes, even greater care must be taken.
- b. Do not weld in locations near chlorinated hydrocarbon vapours coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapours to form phosgene, a highly toxic gas, and other irritating products.
- c. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to ensure breathing air is safe.
- d. Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer's safety practices.
- e. Also see Item 7b.



ARC RAYS can burn

3. a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to AS 1674.2-1990 standards.
- b. Use suitable clothing made from durable flame resistant material to protect your skin and that of your helpers from the arc rays.
- c. Protect other nearby personnel with suitable non flammable screening and/or warn them not to watch the arc or expose themselves to the arc rays or to hot spatter or metal.



WELDING SPARKS can cause fire or explosion

4. a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Have a fire extinguisher readily available.
- b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to AS1674 Parts 1 & 2 "Safety in Welding and Allied Processes", WTIA Technical Note 7 "Health and Safety in Welding" and the operating information for the equipment being used.
- c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.
- d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapours from substances inside. These can cause an explosion even though the vessel has been "cleaned". For information purchase AS 1674-1990.
- e. Vent hollow castings or containers before heating, cutting or welding. They may explode.
- f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.
- g. Connect the work cable to the work as close to the welding area as possible. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.
- h. Also see Item 7c.



CYLINDER may explode if damaged

5.
 - a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators, designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.
 - b. Always keep cylinders in an upright position and securely chained to an undercarriage or fixed support.
 - c. Cylinders should be located :
 - Away from areas where they may be struck or subjected to physical damage.
 - A safe distance from arc welding or cutting operations and any other source of heat, sparks or flame.
 - d. Never allow the electrode, electrode holder, or any other electrically "hot" parts to touch a cylinder.
 - e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.
 - f. Valve protection caps should always be in place and hand-tight except when the cylinder is in use or connected for use.
 - g. Read and follow the instructions on compressed gas cylinders and associated equipment, and AS 2030 Parts 1 & 2.



FOR ELECTRICALLY powered equipment

6.
 - a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.
 - b. Install equipment in accordance with the SAA Wiring Rules, all local codes and the manufacturer's recommendations.
 - c. Ground the equipment in accordance with the SAA Wiring Rules and the manufacturer's recommendations.



FOR ENGINE powered equipment

7.
 - a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.



- b. Operate engines in open, well ventilated areas or vent the engine exhaust fumes outdoors.



- c. Do not add fuel near an open flame, welding arc or when the engine is running. Stop the engine and allow it to cool before refuelling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.



- d. Keep all equipment, safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.
- e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

- f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.

- g. To prevent accidentally starting petrol engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.



- h. To avoid scalding do not remove the radiator pressure cap when the engine is hot.

HAVE ALL INSTALLATIONS, OPERATION, MAINTENANCE AND REPAIR WORK PERFORMED BY QUALIFIED PEOPLE

For more detailed information it is strongly recommended that you purchase a copy of "Safety in Welding and Cutting - ANSI Standard Z 49.1" and WTIA Technical Note 7. All WTIA publications and ANSI/AWS Standards are available from the Welding Technology Institute of Australia, P.O. Box 6165, Silverwater NSW 2128. For copies of various Australian Standards contact your local S.A.A. office.

HOW TO ORDER REPLACEMENT PARTS

To ensure that you receive the correct replacement part the following procedure should be followed:

1. Quote Serial Number and Code Number.
2. Quote the Description, Item Number and Parts List Number of the desired part. When ordering parts for items carrying brand names of other companies, such as fan motors, drive shafts, etc., be sure to include the other company's name and part number and other relevant information.
3. Should the primary cord be damaged, a special cord is required, and is available from Lincoln Electric.
4. Parts should be ordered from Lincoln, its offices or the nearest Authorised Field Service Shop. (The "Lincoln Service Directory" listing these shops geographically is available on request.)

Note: "Hardware" in the Lincoln Parts Lists are not Lincoln stock items but can be obtained via the Field Service Shop network.

Component parts of assemblies such as stator coils or armature coils, etc., which require electrical testing or locating fixtures are not considered replaceable items. This is to ensure that the customer receives parts which will keep the welder in the best operating condition.

BUY ONLY GENUINE REPAIR PARTS

WELDING, EMF & PACEMAKERS

All welders should follow safe practices that minimise their exposure to electric and magnetic fields (EMF).

For welders wearing implanted pacemakers, safe welding practices are particularly important and additional procedures should be followed by those who have decided to continue to weld. (Hopefully in keeping with a doctor's advice).

The following procedures will not eliminate exposure to EMF or the possibility of arc welding having an effect on a pacemaker, however if followed, they will significantly reduce exposure to electric and magnetic fields. Electric and magnetic fields are created any time electric current flows through a conductor, however it is not clear whether such exposure affects one's health.

Some researchers have reported that exposure to EMF may cause leukemia or other illnesses. These claims originally arose in relation to high voltage electric power lines and are very much in dispute in the medical and scientific arena, however the best advice is to minimise your exposure to EMF to protect your health should doctors eventually decide there is a risk.

There are four fundamental facts about EMF:

- With direct current (DC), the field strength is relatively constant and does not change.
- With alternating current (AC), the field strength constantly changes.
- The greater the current flow, i.e. the higher the amps, the stronger the field created by the current
- The closer the conductor or electrical device is to the body, the greater the exposure to the field.

Minimising exposure

All welders should use the following procedures to minimise EMF exposure.

- Route electrode or gun and work cables together. Secure them with tape if possible.
- Never coil the electrode lead around your body.
- Do not place your body between the electrode and work cables. If your electrode cable is on your right side the work cable should also be on your right side.
- Connect the work cable to the work piece as close as possible to the area being welded. (This is also a good practice to eliminate a common problem on welding - a poor work connection.
- Do not work next to the welding power source.

Welders with pacemakers

There is no question that the fields in arc welding can interfere with a pacemaker's function. Generally the interference does not permanently damage the pacemaker. Once the wearer leaves the arc welding environment or stops welding, the pacemaker returns to normal functioning. The welding arc has little or no effect on the operation of some pacemakers, especially designs that are bi-polar or designed to filter out such interference.

For a welder or anyone working around electrical equipment the selection of a pacemaker is very important. Get a doctor's advice about which pacemaker is the least sensitive to interference from welding while still being medically suitable.

In addition to the normal safety precautions, the following additional procedures should be adopted by welders with pacemakers.

- Use gas welding when the application is suitable.
- Use the lowest current setting appropriate for the application. Do not exceed 400 amps. Low current (75-200 amps) direct current (DC) welding should be used if arc welding is necessary. Do not TIG weld with high frequency.
- Do not use repeated, short welds. Wait about ten seconds between stopping one weld and starting the next. When having difficulty starting an electrode, do not re-strike the rod repeatedly.
- If you feel light headed, dizzy or faint, immediately stop welding. Lay the electrode holder down so that it does not contact the work and move away from any welding being performed. Arrange your work in advance so that, if you become dizzy and drop the electrode holder, the electrode holder will not fall on your body or strike the work.
- Do not work on a ladder or other elevated position or in a cramped, confined place.
- Do not work alone. Work only in the presence of an individual who understands these precautions and the possible effect welding may have on your pacemaker.
- Do not work near spot welding equipment.
- If you have a pacemaker and wish to continue arc welding, discuss this and any other questions you may have with your physician and follow his or her advice. The doctor may wish to contact the pacemaker manufacturer for a recommendation. As mentioned before, the design of the pacemaker significantly affects the degree to which it is subject to interference from a welding circuit. Do not rely on the fact that you know another welder with a pacemaker who has welded for years without experiencing a problem. That welder and his or her pacemaker may be quite different from you and your pacemaker.

INSTRUCTIONS FOR ELECTROMAGNETIC COMPATIBILITY



WARNING

This welding machine must be used by trained operators only. Read this manual carefully before attempting to use the welding machine.

Conformance

Products displaying the C-Tick mark are in conformity with Australian/New Zealand requirements for Electromagnetic Compatibility (EMC). They are:

- manufactured in conformity with Australian/New Zealand Standard (Emission):- AS/NZS 3652 'Electromagnetic Compatibility - Arc Welding Equipment' (Identical to and reproduced from British Standard EN 50199)
- for using with other Lincoln Electric/LiquidArc equipment.
- designed for industrial and professional use.

Introduction

All electrical equipment generates small amounts of electromagnetic emission. Electrical emission may be transmitted through power lines or radiated through space, similar to a radio transmitter. When emissions are received by other equipment, electrical interference may result. Electrical emissions may effect many kinds of electrical equipment: other nearby welding equipment, radio and TV transmitters and receivers, numerical controlled machines, telephone systems, computers, etc. Be aware that interference may result and extra precautions may be required when a welding power source is used in a domestic establishment.

Installation and Use

The purchaser/user is responsible for installing and using the welding equipment according to the manufacturer's instructions. If electromagnetic disturbances are detected then it shall be the responsibility of the purchaser/user of the welding equipment to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing (grounding) the welding circuit (see note below). In other cases it could involve constructing an electromagnetic screen enclosing the power source and the work complete with associated input filters. In all cases electromagnetic disturbances must be reduced to the point where they are no longer troublesome.

Note: The welding circuit may or may not be earthed for safety reasons according to national codes. Changing the earthing arrangements should only be authorised by a person who is competent to assess whether the changes increase the risk of injury, eg. by allowing parallel welding current return paths which may damage the earth circuits of other equipment.

Assessment of Area

Before installing welding equipment the purchaser/user shall make an assessment of potential problems in the surrounding area.

The following shall be taken into account:

- a. Other supply cables, control cables, signalling and telephone cables above, below and adjacent to the welding equipment;
- b. Radio and television transmitters and receivers;
- c. Computer and other control equipment;
- d. Safety critical safety equipment, eg. guarding of industrial equipment;
- e. The health of people around, eg. the use of pacemakers and hearing aids;;
- f. Equipment used for calibration or measurement;

- g. The immunity of other equipment in the environment. The purchaser/user shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures;
- h. The time of the day that welding or other activities are to be carried out.

The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

Methods of Reducing Emissions

Mains Supply

Welding equipment should be connected to the mains supply according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering the mains supply. Consideration should be given to shielding the supply cable of permanently installed welding equipment in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the welding power source so that good electrical contact is maintained between the conduit and the welding power source enclosure.

Maintenance of the Welding Equipment

The welding equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the welding equipment is in operation. The welding equipment should not be modified in any way except for those changes and adjustment covered in the manufacturer's instructions. In particular, the spark gaps of arc initiation and stabilising devices should be adjusted and maintained according to the manufacturer's recommendations.

Welding Cables

The welding cables should be kept as short as possible and should be positioned close together, running at or close to the floor level.

Equipotential Bonding

Bonding of all metallic components in the welding installation and adjacent to it should be considered. However, metallic components bonded to the work piece will increase the risk that the operator could receive a shock by touching these metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

Earthing of the workpiece

Where the workpiece is not bonded to earth for electrical safety, nor connected to earth because of its size and position, eg. ship's hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of work pieces increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

Screening and Shielding

Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire welding installation may be considered for special applications.*

* Portions of the preceding text are contained in AS/NZS3652: 'Electromagnetic Compatibility - Arc Welding Equipment'.

OPERATING INSTRUCTIONS

IMPORTANT NOTE ABOUT “RUNNING IN” YOUR DIESEL ENGINE

All diesel engines require some additional care for about the first 50 hours operation. While maximum load can be applied to a new engine as soon as it is put into service and the coolant temperature has reached at least 60°C, care should be taken that the engine is not run at very light loads (say less than 2.4 kVA, or a 10 amp radiator) for extended periods, as this can lead to glazing of the cylinder bores. Do not operate at high speeds without a load, and do not overload the engine. Cylinder glazing can lead to excessive oil consumption and smoky exhaust, while overloading during the first few hours can lead to excessive wear and shorten the life of the engine.

Engine Operation

On receipt of 400 AS-50, remove “Gold Seal” or “Carecard” label from engine, add ownership details, and mail to nearest Perkins Distributor. The Distributor will return a plastic Carecard which must be retained and presented should warranty service be required. Note that the Carecard is accepted world-wide.

Before attempting to start the engine, the following should be carried out:

1. Ensure the crankcase oil level is at the “Full” mark on the dipstick. Use only the grade oil recommended by the engine manufacturer in accompanying Engine Manual.

N.B.: Many oil companies market a product which meets the recommended MIL-L-46152 (SE CC) and the heavy duty and turbocharged engine specification MIL-L-2104C (SE CD). These oils are not recommended for use in this welder, particularly in the initial 50 hours of operation.

2. Fill the fuel tank (always use clean fuel).
3. Fill the radiator. Be sure to add Alfoc 2000 or equivalent to radiator as per container instructions. This is required for corrosion resistance. A water/glycol mixture is recommended for use in cold temperature conditions.
4. In the case of a new engine or an engine which has been standing idle for any length of time, it is important to bleed the fuel system. Always use the manual primer on the lift pump to circulate fuel in the system. Extensive use of the electric starter for this purpose may lead to electrical component damage. Refer to the engine instruction manual for the correct procedure.
5. Fill the dry charged battery. See page 6.



**FOR ENGINE
powered equipment**

Before Starting the Engine



CAUTION

Operate internal combustion engine in open, well ventilated areas or vent the exhaust fumes outdoors. Whenever starting the engine, be sure any welding loads are removed and any A.C. auxiliary loads are either turned off or the plugs pulled. If the load is left connected it may prevent the generator from building up to full voltage.

To Start the Welder

Turn the start switch to the “H” position for 15-20 seconds, then turn further in the clockwise direction to the “start” position. If the engine does not start after 30 seconds, return the switch to the “H” position for 10 seconds and then return to the “start” position. Then engage the starter motor again for a maximum period of 30 seconds. If the engine still does not start, allow at least 10 minutes for the starter motor and other electrical components to cool before repeating the starting procedure. As soon as the engine starts, the start switch should be released and allowed to return to the “on” position. If the engine is warm and has only been stopped for a short period, restart by turning switch directly on to the “start” position and releasing when the engine starts.

Note: The “H” position is midway between the “on” position and the “start” position. A definite spring loaded location can be felt at the “H” position.



WARNING

Failure to return the key switch to “on” position, or turning to “start” position while engine is running will cause electrical component damage.

If the oil pressure gauge does not show normal oil pressure (200/420kPa) 10 seconds after starting, stop the engine and consult the engine instruction manual.

The engine speed has been pre-set in the factory for optimum welder performance and the fuel pump and governor then sealed. This setting should not be altered, to do so will void the warranty.

For normal running, lubricating and maintenance instructions, consult the engine instruction manual. For correct cooling air flow, the welder should be operated with the doors closed.

TO STOP THE ENGINE

Turn the key switch to “off” position.

FOR OPTIONAL ENGINE WATCHER OPERATION:

When an engine watcher option is fitted to a 400AS-12V, two (2) warning lights are mounted on the control panel. These are located in the area of the key switch.

The light beside the key switch is the battery charge alternator light. If this light glows after the engine has reached operating speed there is a fault in the battery charge alternator and the battery is not being charged.

The second light, mounted above the battery charge alternator light, is the engine watcher operation light. This light glows to indicate that the engine watcher is functioning correctly.

WELDER OPERATION



ELECTRIC SHOCK can kill

General

Connect the electrode and ground cables to the studs marked on the welder output panel. The studs are marked "Positive" and "Negative". Some types of electrode require electrode positive and others negative. Therefore consult the instructions for the particular electrode being used to determine which lead is to be attached to the "Positive" and which to the "Negative" stud.

When welding at a considerable distance from the machine, care should be taken that ample size welding cables are used. Small size cables for long distances reduce output at the point of welding.

Setting the Controls

The welder is equipped with Dual Continuous Control of the welding output. To meet the varied requirements of present day welding it is highly desirable to be able to vary the voltage and current separately. Dual Continuous Control means that it is possible to get the proper welding current throughout the range to the machine in two or more ways.

There are two controls which determine the output of the generator:

1. Continuous Current Control – to vary the welding amperage
2. Job Selector – to vary the open circuit voltage of the generator.

Job Selector

The Job Selector is both the fine current adjustment and the voltage control of the welder. With this control it is possible to obtain the exact current necessary. Also by means of this control the open circuit voltage can be varied to suit different welding applications.

The Job Selector dial is divided into four sections. The section marked "Large Electrodes" provides a high open circuit voltage. The section marked "Normal Welding Range" gives medium high open circuit voltage. The section marked "Overhead and Vertical" gives a medium low open circuit voltage. The section marked "Special Applications" provides a low open circuit voltage and is used with a minimum setting on the Continuous Current Control.

Continuous Current Control

The Current Control provides the major adjustment of welding current to suit any particular application. The dial reads continuously in a clockwise direction from maximum to minimum and has three graduated concentric dials corresponding to the respective sections of the Job Selector dial. When the Job Selector is set on the "Overhead and Vertical" section of its dial,

the approximate welding current is indicated by the "Overhead and Vertical" scale on the Current Control dial.

Do not change the Current Control setting while welding.

How to Set the Controls

Assume you want to make a vertical up weld using a 4.0mm electrode at about 135 amps. A snappy digging arc (medium low open circuit voltage) is required to give the best control of the arc in the whipping technique that must be used.

1. Set the Job Selector to the section of the dial marked "Overhead and Vertical".
2. Set the Current Control to read 135 amps on the scale marked "Overhead and Vertical".
3. Strike the arc.
4. If the arc is too weak, move the Job Selector counter-clockwise to increase the current. If a still higher current is desired, turn up the Current Control 10 or 20 amps. In the final adjustment, be certain the Job Selector is still set in the same range to get the snappy arc recommended for vertical welding.



FOR ELECTRICALLY powered equipment

Auxiliary Power

These machines are fitted with two standard 3 pin 240 volt 15 amp auxiliary power outlets and two 3 pin 115 volt auxiliary power outlets. Auxiliary power is available while welding - refer Table below for relative loadings. Both 240 volt and 115 volt supplies can be used simultaneously, provided the total current drawn does not exceed the current in the Table. The outlets are located on the control panel of the 400AS-50. Total power available is

Welder Output (Amps)	Maximum permissible Auxiliary Power Load (Amps)
300 or less	20
300-350	15
350-400	10
400-450	5

5,000 watts, 240 volt, 50 Hz. A.C. at 100% duty cycle or 2,500 watts, 115 volt, 50 Hz. A.C. at 100% duty cycle.

Important: The 400AS-50 auxiliary power circuits are not connected to the welder frame, and earth leakage protection is not required (refer AS2790-1989, Clause 6.1.9.(a) and Comment 1), however connected equipment should be double insulated, or fitted with an effective earth wire.



WARNING

Notwithstanding the above, should a Residual Current Device (RCD) be fitted to this machine, it is imperative that the frame of the machine be earthed in accordance with AS3000, Clause 5.6. An effective earth is essential for the safe operation of machines fitted with RCD devices.

USE OF WELDERS AS STAND-BY POWER UNITS



FOR ELECTRICALLY powered equipment

Welders with 240 volt, 50 Hz. auxiliary A.C. outlets can be used as stand-by power units.

To avoid the possibility of electric shock and/or damage to the welding machine, connections and alterations must be made by a licensed electrician, who can determine how the machine can be adapted to the particular installation and comply with the local Supply Authority regulations.

It is also important that an adequately rated isolation switch is used to ensure that the stand-by power unit and the Authorities' Supply are not connected on parallel.

MAINTENANCE AND LUBRICATION



FOR ENGINE powered equipment

For instructions on lubrication and maintenance of the engine, refer to the engine instruction manual.

Cylinder head nuts must be pulled down after 25 hours operation and no later - see Engine Manual.

All internal and external connections should also be checked to make certain they are tight.

Running In

It is not necessary to gradually run in a new or factory rebuilt engine and any prolonged light load running during the early life of the engine can prove harmful to the bedding in of piston rings and liners.

SEE "IMPORTANT NOTE ABOUT "RUNNING IN" YOUR DIESEL ENGINE" ON PAGE 4.

WELDER

General

It is good practice to blow out the welder with compressed air and check all internal and external connections for tightness every 2-3 months. This welder is equipped with a double-seal ball bearing having sufficient grease to last the life of the bearing.

Communicator and Brushes

The commutator and brushes are inspected by opening the doors and removing generator covers.

The brushes on the generator and alternator are properly adjusted before the machine leaves the factory. No particular attention is required to keep the brushes in good condition, however as the brushes wear out they must be replaced with new ones. One complete set of brushes should always be kept on hand.

Before fitting replacement brushes, twist the brush pig tail at its entrance to the brush until the strands are tightly packed and no part of the pig tail protrudes beyond the brush surface in the pig tail slot. When the brush is placed in the holder, clear the pig tail from the side of the holder to allow free radial movement of the brush.

New brushes must be bedded in before they can be used on the machine. This is accomplished by placing the new brush in position in the holder with a piece of medium sandpaper (never use emery cloth) placed under the brush. A second person should hold the brush in its normal position by a slight pressure of the fingers. The sandpaper then should be drawn in the direction of generator rotation under the brush with the back of the sandpaper held closely in contact with the commutator or slip ring. This will wear the end of the brush down to the proper curve. When the end of the brush has the proper curve, the operation is complete. Care should be taken to blow all carbon dust away from the commutator or slip rings.

The commutator and slip rings require very little attention. They should be cleaned from time to time with a clean rag or, while running, with a piece of fine sandpaper. Never use emery cloth or paper or organic solvents for this purpose.

GROUND TEST PROCEDURE



WARNING

This procedure is only suitable for applications using DC mega testers up to 500V.

Note: This procedure is for 'machines as built' many modifications could have taken place over the life of a particular machine, so details of this procedure may need to be 'adjusted' to suit these modifications.

For prompt service contact your local authorised Lincoln field service shop.

The insulation resistance values listed below are from Australian Standard AS1966.2.

1. Ensure engine is stopped.
2. Remove welding leads and disconnect any auxiliary equipment cables.
3. Disconnect the leads from the battery charge alternator (mounted on the engine).
4. Disconnect the negative and positive battery leads.
5. Jumper together the positive, negative and both AC terminals of the two bridge rectifiers (one mounted on the rear of the control panel and the other is on the brush holder bracket).
6. Place the key switch in the 'RUN' position and the aux switch to the 'ON' position.
7. Remove the thermostart lead from terminal No 5 on the key switch.
8. Remove the earth leads from:
 - The bridge rectifier (mounted on the brush holder bracket).

The water temperature gauge and sender.

The voltmeter.

The stop solenoid (mounted in the engine fuel injector pump)

The hour meter and engine watcher warning light (if fitted).

9. Auxiliary Circuit Test: Connect one lead of the mega tester to the frame of the machine and the other lead to the 'active' terminal of one of the 240V aux. outlets. Apply the test. (Minimum resistance 1M Ω)
10. Welding Circuit Test: Connect one lead of the mega tester to the frame of the machine and the other lead to the positive output stud. Apply the test. (Minimum resistance 1M Ω)
11. Field Circuit Test: Connect one lead of the mega tester to the frame of the machine and the other lead to the positive output stud. Apply the test. (Minimum resistance 1M Ω)
12. Aux. to Weld Circuit Test: Connect one lead of the mega tester to the 'active' terminal of one of the 240V aux. outlets and the other to the positive output stud. Apply the test. (Minimum resistance 10M Ω)
13. Aux. to Field Circuit Test: Connect one lead of the mega tester to the 'active' terminal of one of the 240V aux. outlets and the other to one of the slip ring brush pig tails. Apply the test. (Minimum resistance 1M Ω)
14. Weld to Field Circuit Test: Connect one lead of the mega tester to the positive output stud and the other lead to one of the slip ring pig tails. Apply the test. (Minimum resistance 1M Ω)
15. Remove all jumper leads. Reconnect all leads disconnected during this procedure.

IF ANY PROBLEMS ARE ENCOUNTERED REFER TO YOUR NEAREST AUTHORISED LINCOLN FIELD SERVICE SHOP

TROUBLESHOOTING

12V Starter - Read in conjunction with Wiring Diagram AM3062-E1, in this Manual. See page 18
Numbers in brackets key in to items on diagram.

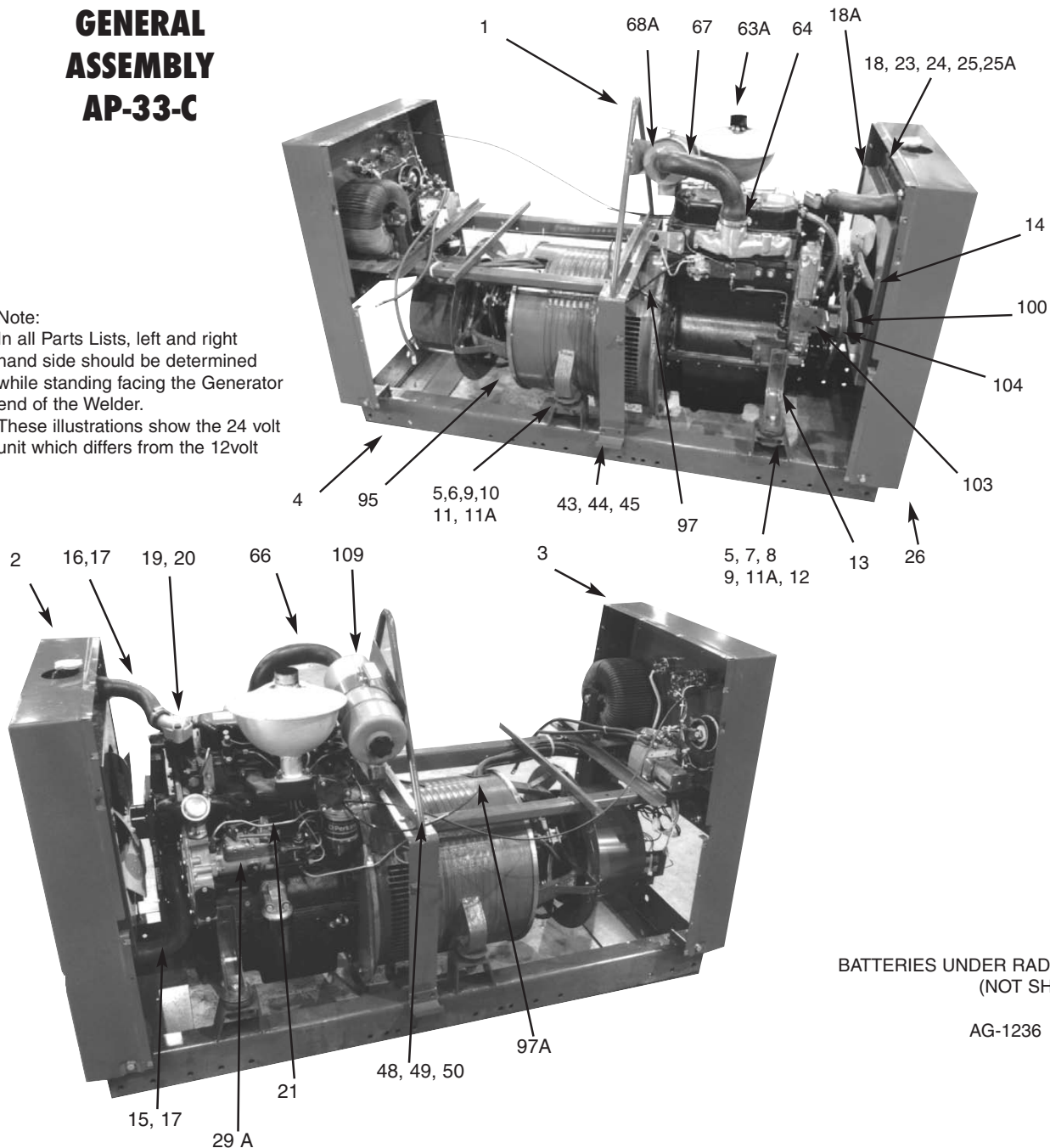
TROUBLE	CAUSE	WHAT TO DO
Machine fails to start	Check for: Flat battery and/or faulty terminal connections. Key switch (4) faulty connection and/or loose wires. Starter motor faulty (21).	Charge battery and/or clean terminals Repair or replace Repair or replace
Machine starts, but has the following faults:		
Voltage at AC outlet, but no voltage or reduced voltage at welder output studs.	Check DC voltage across bridge rectifier (8). If there is no voltage or half voltage, bridge rectifier may have open circuit in one or two diodes only.	Replace
	If the above is ok, then check: Rheostat (9) for open circuit. Shunt coil (9A) for open circuit. Bad connections.	Replace Repair or replace Repair
There is no output from either the AC outlet or the welder output studs	Check fuse F4. If F4 is blown also check bridge rectifier (8).	Replace
	If the above are ok., then check flashing circuit for faults.	
	Check there is battery voltage across rotor brushes (12A) with key switch (4) turned midway between Run and Start position. If not, check for: Flashing diode (10) open circuit. Blocking diode (11) open circuit. Key Switch (4) faulty. Poor connections.	Replace Replace Replace Repair
	If the above are ok., then check for: Bridge rectifier (8) open or short circuit. Rotor (12) open or short circuit. (Rotor resistance approx. 11 ohm.) Capacitors (13) faulty. Stator field windings (17) open or short circuit. Alternator brushes (12A) sticking or excessively worn. Dirty slip rings (12A). Poor connections.	Replace Repair or replace Replace Repair or replace Free or replace Clean Repair
Machine has low welding output or fails to hold welding current constant.	Rectifier bridge (8) may be open circuited on one or two diodes only.	Replace bridge
	Main brushes excessively worn (7). Faulty capacitors (13). Rotor (12) or brushes (12A) may have a ground.	Replace brushes Replace capacitors Locate and remove ground
	Electrode lead or work lead connections may be poor Brush springs may be broken (7). Main brushholder rocker (7) moved position.	Tighten all connections Replace brush springs Realign drilled marker points
	Commutator may be dirty (7A). 2 segments on commutator burnt (7A) (open in that coil).	Refer maintenance section page 6 Repair or replace

TROUBLESHOOTING (Cont)

TROUBLE	CAUSE	WHAT TO DO
Machine starts, but has the following faults: <i>continued:</i>	Short circuit in armature (7A). (2 segments burnt in 4 locations 90° apart).	Locate fault using growler and repair or replace
	Field rheostat may be making poor contact and overheating (9).	Inspect rheostat. Clean out and if necessary increase finger tension on contact arm by bending arm.
	Field circuit may have variable resistance connections or intermittent open circuit, due to loose connections or broken wires (17), (8), (9) or (9A).	Check field current with ammeter to discover varying current. This applies to both the main generator and alternator.
	Current control brushholder support stud and mating contact surfaces may be dirty or pitted and burned (5A).	If brushholder internal contact surface is pitted and burned, replace the brushholder and support stud. If the contact surface is dirty, clean off the brushholder stud and internal contact surface. Apply mixture of three parts silicone grease and one part zinc powder (by weight) to stud.
	Current control brushholder contact springs may be worn out or missing. Contact surface may be dirty, rough or pitted (5A).	Inspect. Replace needed parts. Clean internal contact surface of control device. Do not lubricate. Smooth up roughened surface.
	Current-adjusting mechanism may not be operating properly (5A).	Check for loose or missing set screw in control handles.
	Engine speed low.	Check nameplate for desired speed and reset. (Refer engine instruction manual.)
Welding is loud and spatters excessively	Wrong grade of brushes may have been installed on generator (7).	Fit correct Lincoln brushes
	Series field (5) and armature circuit may be open circuited (7A). Current setting may be too high.	Check circuit with voltmeter
	Polarity may be wrong.	Check setting and current output with ammeter Check polarity. Try reversing polarity or try an electrode of the opposite polarity
Maximum welding output all the time	Open in series coil (5).	Repair or replace
Battery not charging	Faulty battery charge alternator (22) Faulty meter (14) Battery may be fully charged.	Repair or replace Repair or replace meter
Battery over-charging	Faulty battery charge alternator (22).	Repair or replace
Auxiliary power fails under load	Capacitors faulty (13).	Replace capacitors
Welding current too great or too small compared to indication on dial.	Current control shaft and handle (5) may have turned slightly in the insulated bushing of the current control brushholder, caused by turning handle too hard against one of the stops.	With current control against the minimum stop, set the pointer to within 3mm of last scale division.
	Alternator low causing low output compared to dial indication.	Check for faulty rotor circuits
	Current control set to minimum and welder output so great that the engine stalls when arc is struck.	Check to see that the series field is properly connected & not shorted.
	Engine running at incorrect speed.	Set welder controls for maximum output and weld. Then, while welding, check engine R.P.M. The engine should be running at full load speed. If indicator shows a significant difference, consult your engine instruction manual.
Welding output ok., but no auxiliary output.	Aux power circuit breaker tripped. Broken wires. Open circuit in auxiliary power (18) windings	Reset Repair or replace Repair or replace stator

GENERAL ASSEMBLY AP-33-C

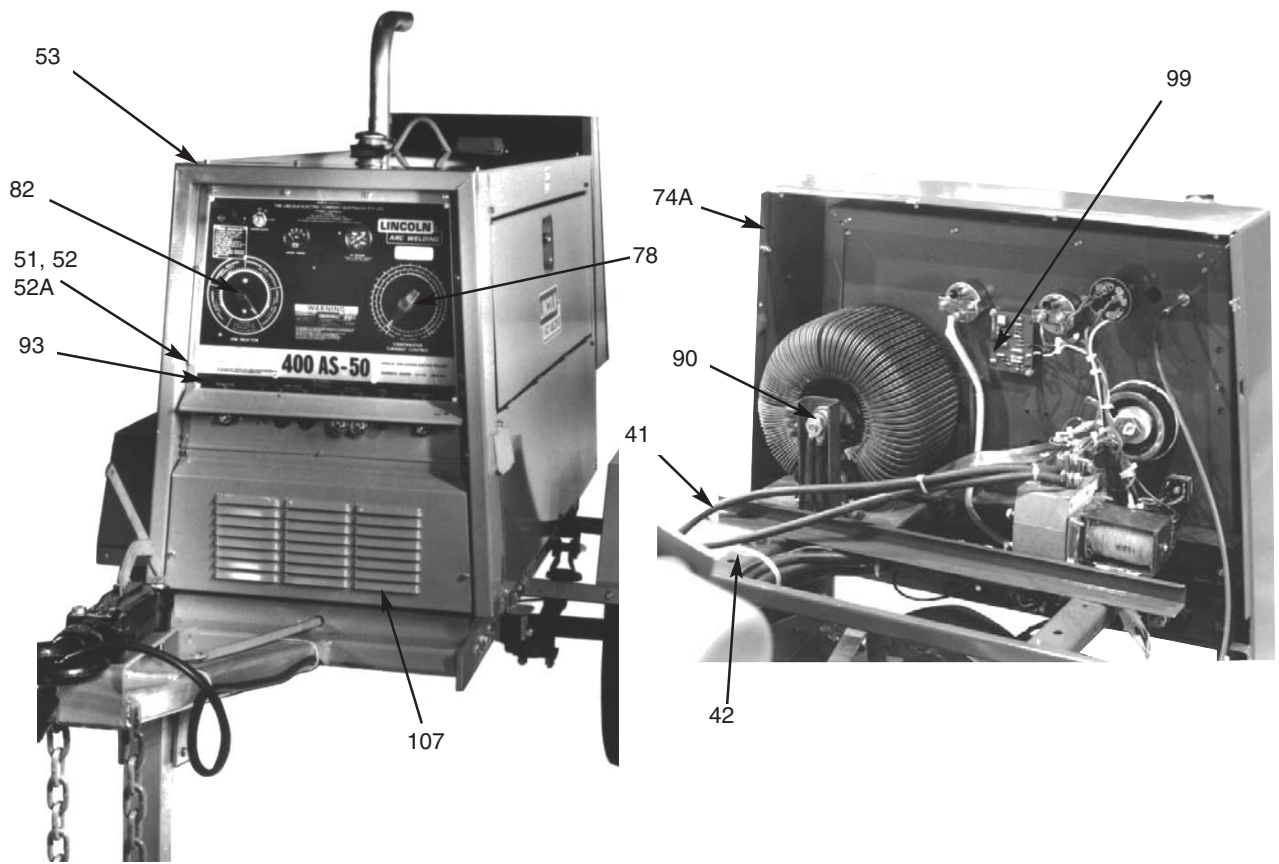
Note:
In all Parts Lists, left and right hand side should be determined while standing facing the Generator end of the Welder.
These illustrations show the 24 volt unit which differs from the 12volt



Quote AP-33-C plus Machine Code No. and Serial No.

Item	Part Name and Description	No. Req
1	Lift Bale Assembly	1
2	Rear End Frame Assembly	1
3	Front End Frame Assembly	1
4	Chassis Assembly	1
5	Hex. Head Bolt (1/2" UNC x 3 1/4")	4
6	Washer	2
7	Rubber Mount - Engine	2
8	Rubber Mount - Engine (Top)	2
9	Nyloc Nut (1/2" UNC)	4
10	Rubber Mount - Generator	2
11	Rubber Mount - Generator (Top)	2
11A	Washer (9/16" I.D. x 3 3/8" O.D.)	12
12	Engine Mounting Spacer	4
13	Engine Foot	2
14	Engine Fan (Perkins Parts)	1
15	Bottom Radiator Hose	1
16	Top Radiator Hose	1
17	Radiator Hose Clamp	4
18	Radiator	1
18A	Radiator Shroud	1
19	Water Outlet	1
20	Flat Washer	2

Item	Part Name and Description	No. Req
21	Governor Adjust Pad Assembly	1
23	Hex. Head Screw (5/16" Whit. x 3/4")	4
24	Hex. Head Nut (5/16" Whit.)	4
25	Flat Washer (5/16" dia.)	4
25A	Lockwasher (5/16" dia.)	4
26	Rear Lower Panel Assembly	1
34	Transfer (Not Shown)	1
40	Battery (Not Shown)	1
41	Positive Lead (Not Shown)	1
42	Negative Lead (Not Shown)	1
43	Hex. Head Bolt (1/2" UNC x 1 1/4")	4
44	Lockwasher (1/2" dia.)	4
45	Hex. Nut (1/2" UNC)	4
48	Hex. Head Screw (5/16" Whit. x 3/4")	2
49	Hex. Nut (5/16" Whit.)	2
50	Lockwasher (5/16" dia.)	2
51	Hex. Head Screw (5/16" x 3/4")	4
52	Lockwasher (5/16" dia.)	4
53	Self Tapping Screw	16



Quote AP-33-C plus Item No, Description, Machine Code No. and Serial No.

Item	Part Name and Description	No. Req
57	Self Tapping Screw (Not Shown) (Lower Door Panel to Machine)	16
58	Heat Shrink Tubing (1/2" x 1/2")(Not Shown)	2
59	Cable Tie (Oil Gauge Line)(Not Shown)	8
60	Fuel Tank Union (Male Adaptor)(Not Shown)	2
	Perkins Nut #33533112	1
60B	Sleeve Syco	2
61	Radiator Cap Cover Assy. (Not Shown)	1
61A	Radiator Cap (Not Shown)	1
62	Self Tapping Screw (Not Shown) (Radiator Cap Hinge to Rear End Frame)	2
63	Exhaust Pipe Assembly (Not Shown)	1
63A	Exhaust Pipe Clamp	1
64	Hose Clamp – Air Cleaner (Hose to Manifold)	1
66	Air Cleaner Clamp Assy. includes:	1
	Air Cleaner Support	1
	Air Cleaner Clamp	1
	Self Tapping Screws	2
67	Air Cleaner Hose	1
68A	Air Cleaner Hose Clamp	1
69	Door Handle (Not Shown)	2
69A	Door Handle Latch Assy. (Not Shown)	2
70	Split Pin 1/8" x 3/4" (Not Shown)	2
70A	Countersunk Screw (3/16" x 1/2") (Not Shown)	4
71	Lockwasher – 3/16" (Not Shown)	4
71A	Hex. Nut (Not Shown)	4
72	Rubber Seal (Lift Bale)(Not Shown)	1
73	Canopy* (Not Shown)	1
73A	Canopy Support Plate (Not Shown)	1
74	Thread Forming Screw (Not Shown)	12
74A	Spire "J" Nuts	12

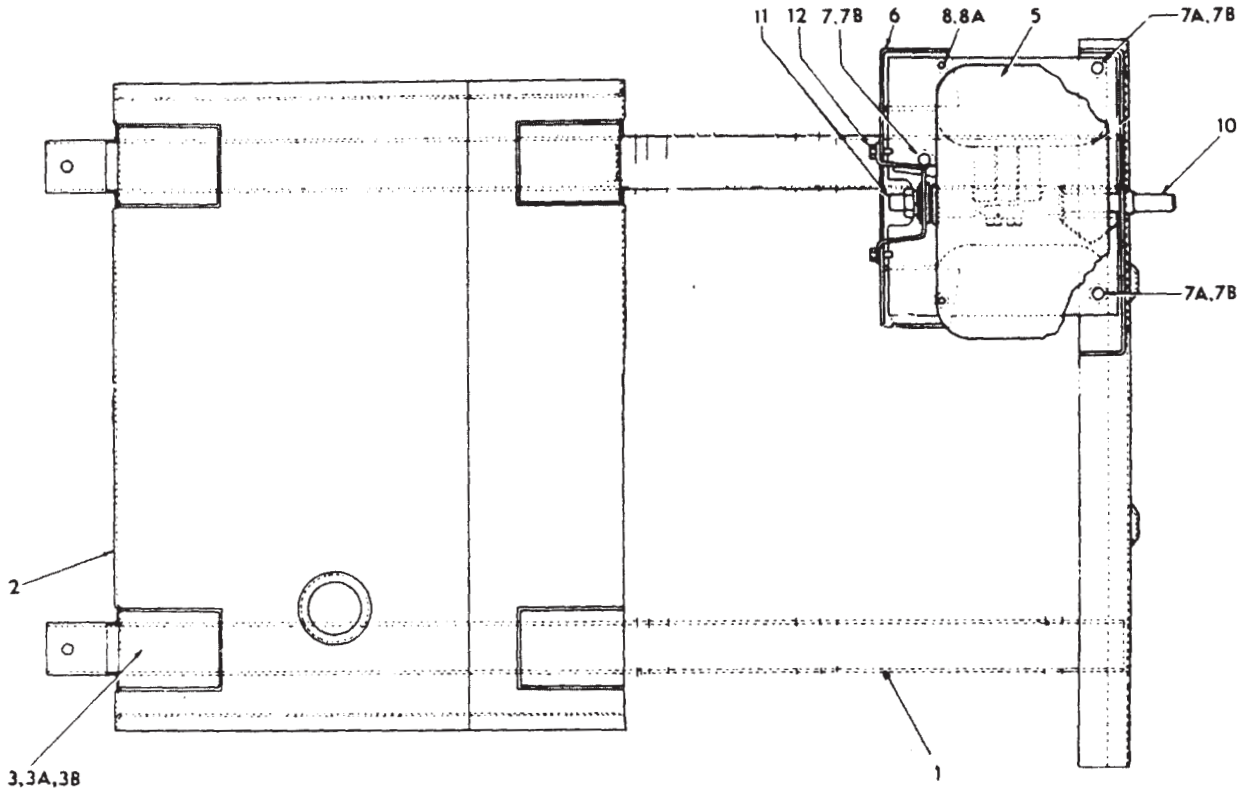
Item	Part Name and Description	No. Req
76	Hex. Head Bolt (1/4" x 2 3/4")(Not Shown)	2
	Spire "J" Nuts	2
	Lockwasher	2
76A	Hex. Head Screw (1/4" x 3/4") (Not Shown)	2
	Hex. Nut (1/4") (Not Shown)	2
	Lockwasher (1/4") (Not Shown)	2
78	Reactor Handle	1
79	Half Dog Point Socket Set Screw	1
80	R.H. Door & Lower Panel Assy. (Not Shown)	1
81	L.H. Door & Lower Panel Assy. (Not Shown)	1
82	Rheostat Handle	1
85	Lock Rod Assembly (Not Shown)	2
86	Rubber Gasket (Not Shown) (Fuel Tank Neck to Air Cleaner)	1
88	Filler Pipe Cap (Not Shown)	1
89	Logo – Doors (Not Shown)	2
90	Hex. Nut (lead to Reactor)	1
91	Hex. Nut (Not Shown)	2
92	Hex. Head Bolt (1/2" UNCx1-1/4")(Not Shown)	2
93	Control Panel Assy. (See AP-33-D)	1
94	Fuel Tank, Reactor & Air Cleaner Assy. (See AP-33-E)	1
95	Alternator Assy. (See AP-33-G)	1
97	Fuel Line (Lift Pump to Tank)	1
97A	Fuel Line (Tank Return)	1
99	Oil Pressure Line	1
100	Pulley Fan Belt	1
106	Rain Cap Assy. (Not Shown)	1
107	Front Louvre Panel	1
109	Air Cleaner	1
110	Brass Rod (3/16" x 9/16")(Not Shown)	4
	Support Plate (Oil Line) (Not Shown)	1
	Saddles (Mounts Fuel lines) (Not Shown)	5
	Supports Oil Pressure Line on Fuel Tank Rail	
111	Main Generator Cover (220mm wide) (N/S)	1

Nut, bolt and washer sizes are given so that they may be procured locally.

*Specify if Sound Reduced

FRAME, FUEL, TANK AND REACTOR AP-33-E

(plan view)



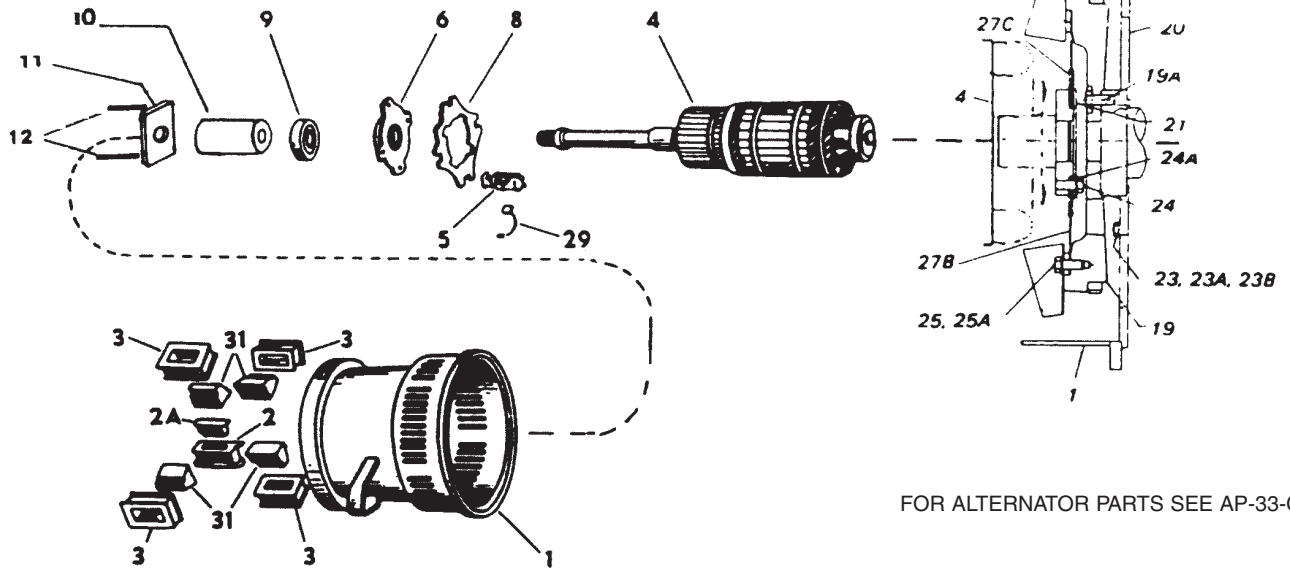
Quote AP-33-E plus Machine Code No. and Serial No.

Item	Part Name and Description	No. Req
1	Frame Assembly	1
2	Fuel Tank Assembly	1
3	Hex. Hd. Screw	4
3A	Hex. Nut	4
3B	Lockwasher	4
	} Fuel Tank to Rails Not Shown	
5	Reactor Assembly	1
6	Rear Reactor Support (Not Used)	1
7	Hex. Hd. Screw	1
7A	Hex. Hd. Screw	2
7B	Lockwasher	3
	} Reactor Base to Frame	
8	Hex. Hd. Screw	2
8A	Lockwasher	2
	} Reactor Base to Rear Reactor Support	
10	Reactor Brush Holder Assembly, includes	1
	Brush Holder	1
	Spring	3
	Contact Spring	3
	Rd. Hd. Screw	3
	Lockwasher	3
	Shaft	1
	Tube	1
	Hex. Hd. Screw	2
	Washer	1
	Spring Clip	1
	Spring	1

Item	Part Name and Description	No. Req
11	Stud Assembly, includes	1
	Brush Holder Stud	1
	Reactor Brush Holder Bracket Assembly	1
	Insulation Bush	1
	Insulation Washer	2
	Brass Jam Nut	1
	Washer	1
	Lockwasher	1
12	S/T Screw (Mounting Stud Assembly)	2
14	Air Cleaner Clamp Band*	1
15	S/T Screws (Clamp Band to Frame)*	2
	*Air Cleaner is mounted on Lift Bale under Canopy	

Nut, bolt and washer sizes are given so that they may be procured locally.

WELDING GENERATOR AND COUPLING AP-27-F



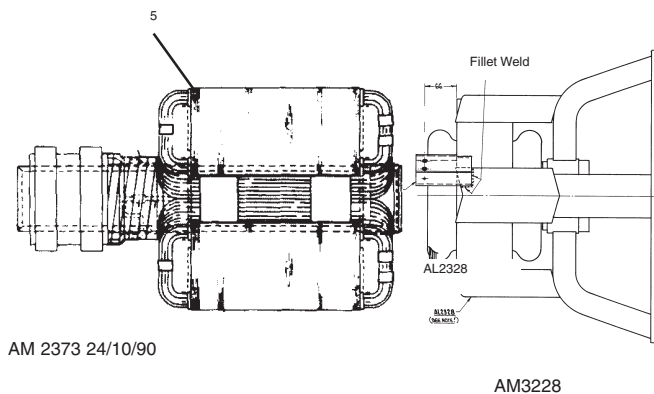
Quote AP-27-F plus Machine Code No. and Serial No.

Item	Part Name and Description	No. Req
1	D.C. Frame	1
2	Interpole Coil Assembly	4
2A	Interpole Pole Pieces	4
3	Series Coil	2
	Shunt Coil	2
4	Armature Assembly	1
5	Generator Brush Holder Assembly (See AP-9-G for parts)	4
6	Inner Dust Cap	1
8	Rocker	1
9	Bearing	1
10	Bearing Spacer	1
10A	'O' Ring (Not Shown) (between bearing and spacer)	1
11	Outer Dust Cap	1
12	H/H Bolt Dust Cap (5/16"-18 x 3 1/2)	2
19	Flywheel	1
19A	H/H Screw H/T (1/2" UNF x 1") (Flywheel to Crankshaft)	6
20	Backplate	1
21	Coupling Disc (Small - Engine side)	1

Item	Part Name and Description	No. Req
22	Hex. Head Screw H/T (1/2" UNC x 1") (Backplate to Frame)	5
22A	Springwasher (Backplate to Frame)	5
23	Hex. Head Screw (3/8" - 24 UNF x 1") (Backplate to Engine)	10
23B	Starwasher (3/8") (Backplate to Engine)	10
24	Blower Kit Assembly, includes: H/H H/T Screw (7/16" UNC x 1 1/2) (Coupling to Armature)	1 8
24A	Coupling Lock Tab	4
25	H/H H/T Screw (7/16" UNC x 1") (Coupling to Flywheel)	8
25A	Spring Washer (7/16")	8
26	Dowel (Not Shown)	2
27	Blower Segments	4
27B	Coupling Disc (Large - Stainless Steel)	1
27C	Backing Disc (7 1/2" dia. Armature side)	1
29	Generator Brush	8
31	Main Pole	4

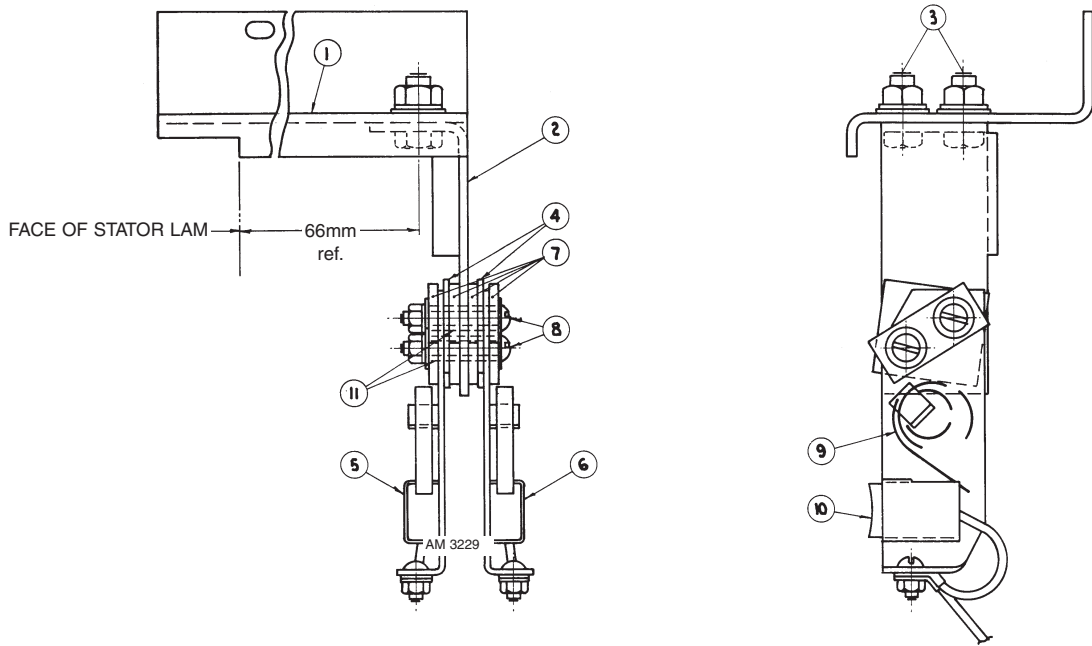
ALTERNATOR ASSEMBLY AP-33-G

Quote AP-33-G plus Machine Code No. and Serial No.



Item	Part Name and Description	No. Req
1	Stator and Baffle Assembly	1
2	Alternator Bracket	1
3	Hex Head Screw, High Tensile (1/2"-20 UNF x 1 3/4")	4
	Spring Washer 1/2"	4
4	Stator Cover (Not Shown)	1
5	Rotor Assembly	1
6	Rotor Locating Collar (Not Shown)	1
7	Rotor Locknut Washer (Not Shown)	1
8	Rotor Locknut (Not Shown)	1
9	Rotor Brush Holder Assembly (Not Shown) (See AP -1-D)	1
10	Capacitor Assembly, includes: (Not Shown) (See AP -1-D)	1
	Slip Ring Brush Holder	2
	Support Bracket	2
	Capacitors (200 MFD)	2
11	Bridge Rectifier (fitted on S/ring B/hold Bkt)	1

SLIP RING BRUSH HOLDER ASSEMBLY AP-1-D



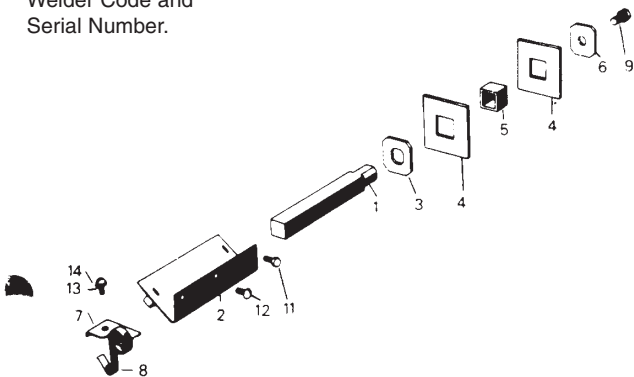
Quote AP-1-D.2 plus Machine Code No. & Serial No.

Item	Part Name and Description	No. Req
	Slip Ring Brush Holder Assembly (Less Item 10)	1
1	Mounting Bracket	1
2	Brushholder Bracket	1
3	5/16" Whit. x 3/4" Hex. Hd. Bolt etc.	2
4	Insulation	2
5	Left Hand Brush Holder	1
6	Right Hand Brush Holder	1
7	Insulating Washer	2

Item	Part Name and Description	No. Req
8	3/16" Z/P Flat Washer	4
	3/16" Z/P Lock Washer	2
	3/16" Z/P Hex. Nut	2
	3/16" x 1 1/4" Z/P Rd. Hd. Screw	2
9	Spring	2
10	Brush	2
11	Insulating Tube	2

GENERATOR BRUSH HOLDER AP-9-G

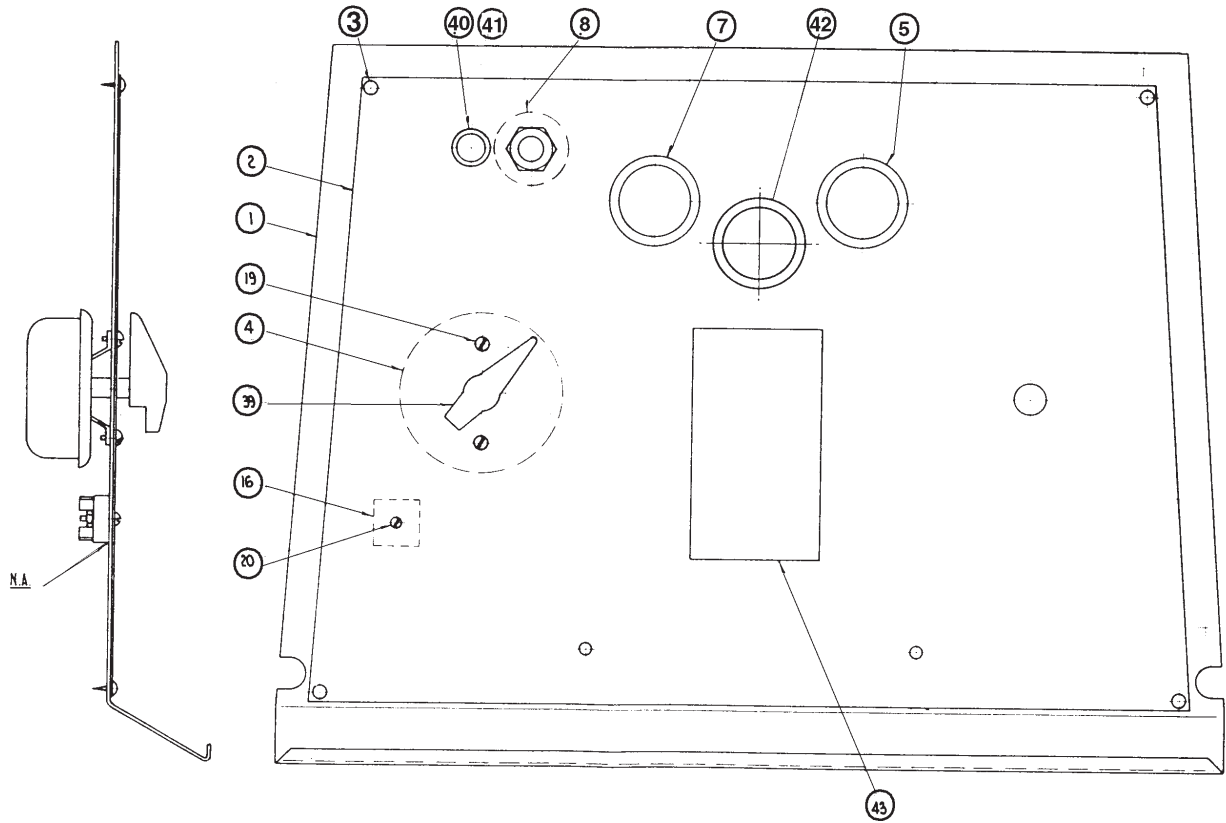
Note: When ordering give No. Part Name, Parts List No. Welder Code and Serial Number.



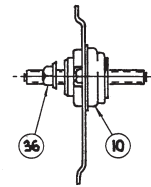
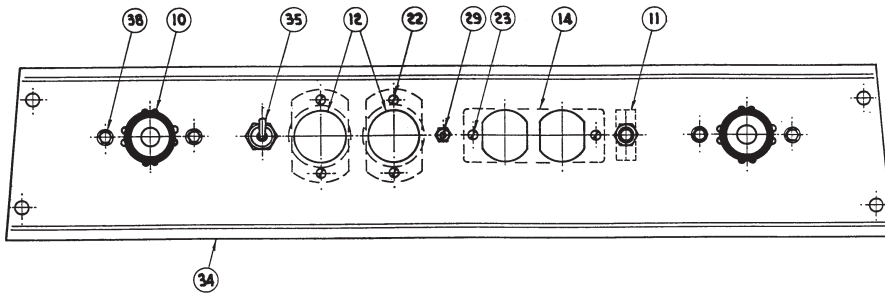
Parts List AP-9 AP-9-G

Item	Part Name and Description	No. Req
	Brushholder Assy, includes	4
1	Brushholder Stud	1
2	Retainer Assembly	1
3	Washer	1
4	Insulating Washer	2
5	Insulating Tube	1
6	Washer	1
7	Spring Clip	2
8	Spring	2
9	Lockwasher	1
10	Hex. Head Bolt	1
11	Hex. Head Bolt	1
12	Round Head Screw	1
13	Round Head Screw	2
14	Lockwasher	2

CONTROL PANEL AP-33-D



AL2398
A1.6.94M



AM3034-2
A29-3-95M

Quote AP-33-D plus Machine Code No. and Serial No.

Item	Part Name and Description	No. Req
1	Control Panel	1
2	Nameplate	1
3	Fastener Button	4
4	Rheostat	1
5	Oil Pressure Gauge	1
7	Voltmeter	1
8	Key Switch	1
10	Moulded Output Stud	2
12	3 Pin Plug Receptacle - 240V	2
13	Cork Gasket	2
14	3 Pin Plug Receptacle - 115V	1
16	Bridge Rectifier	1
19	Lockwasher	2
	Truss Head Screw	2
20	Hex Nut	1
	Starwasher	1
	Rd Head Screw	1
22	Hex Nut	4
	Springwasher	4
	Round Head Screw	4

Quote AP-33-D plus Machine Code No. and Serial No.

Item	Part Name and Description	No. Req
23	Hex Nut	2
	Springwasher	2
	Round Head Screw	2
29	Hex Nut	2
	Starwasher	2
	Round Head Screw	1
31	Aux Switch Decal	1
32	Code & Serial Number Decal (N/S)	1
33	Hex Nut (Mounts Leads to Rheostat) (N/S)	3
	Starwasher (Mounts Leads to Rheostat) (N/S)	3
	Rd Hd Screw (Mts Leads to Rheostat) (N/S)	2
34	Outlet Panel	1
35	Switch	1
36	Flange Nut	2
37	Connector - 3 Pin	1
38	Self Tapping Screw	4
39	Handle	1
40	Red Indicator	1
41	Lamp	1
42	Temperature Gauge	1
43	Warning Decal	1

400AS-50 OPTIONAL PARTS

Quote AP-33-J plus Machine Code No. and Serial No.

Item	Part Name and Description	No. Req
A	SOUND REDUCTION OPTION	
9	Door Assembly	2
10	Canopy	1
11	Bolt Kit	1
12	End Frame (Low Fan – Radiator)	1
12	End Frame (Front End – Muffler)	1
13	Door Handle (Locking Type)	2
14	Radiator Shroud Assembly	1
15	Base Plate	1
16	Hex. Hd. Bolt & Lock Washer (1/2" UNC 1")	4
17	Nyloc Nut (Base Plate) (1/2" UNC)	4
19	Muffler (Dome Shaped – 3 Hole Flange)	1
20	Muffler Pipe	1
21	Pipe Clamps	2
B	HOUR METER OPTION	
1	Hour Meter	1
2	Diode & Lead Assembly	1
C	REMOTE CONTROL OPTION	
	Remote Field Control Packs, includes:	1
1	Plug (3 Pin)	1
2	Plug Base (3 Pin)	1
3	Clamp	1
4	Rheostat (64 ohm)	1
5	Rheostat Handle	1
6	Remote Control Box	1
7	Nameplate	1
8	Mounting Plate (2 1/2" x 2 5/8")	1

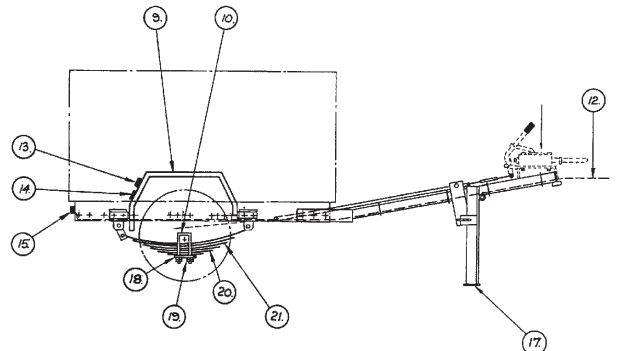
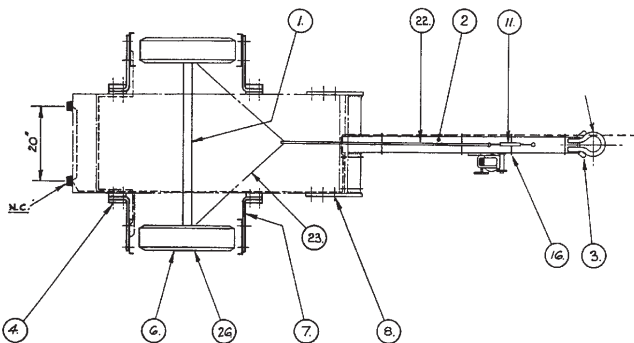
Nut, bolt and washer sizes are given so that you may procure locally.

ENGINE WATCHER

Quote AP-43-B plus Machine Code No. and Serial No.

Item	Part Name and Description	No. Req
10	Oil Pressure Switch	1
11	Female Tee	1
12	Hex Nipple	1
13A	Engine Temperature Sensor Assembly	1
14	Engine Temperature Sensor Plug only	1
15	Engine Temperature Sensor Switch only	1
17A	Stop Button Switch	1
18	Red Indicator Light	1
20	Instruction Decal	1
22	Assembly Instructions	1

UNDERCARRIAGE (2-wheel type)



Item	Part Name and Description	No. Req
1	Assembly (Unsprung), Includes:	1
	Axle Assembly (Sprung), Includes:	1
	Axle	1
	Grease Cup	2
	Axle Cup	2
	Small Cone (Bearing)	2
	Seal	2
	Large Cone	2
	Large Cup	2
	Small Cup	2
	Hub and Stud Assy. (AS-2959)	2
	each assembly includes:	
	Stud (7/16" UNF-2A x 1 7/8" LG)	5
2	Drawbar (Standard)	1
	Drawbar (Sprung Trailers with Brakes)	1
3	Chain (3/8" - 18") Registration only	2
4	Nyloc Nuts (1/2")	8
6	Wheel and Tyre, Includes:	2
	Wheel (14")	2
7	Mudguard Supports	4
8	Nyloc Nuts (1/2")	6
9	Mudguard	2
10	"U" Bolts	4
11	Turnbuckle (5/16")	1
	(Hooks each and Tail Lamp to Trafficator)	

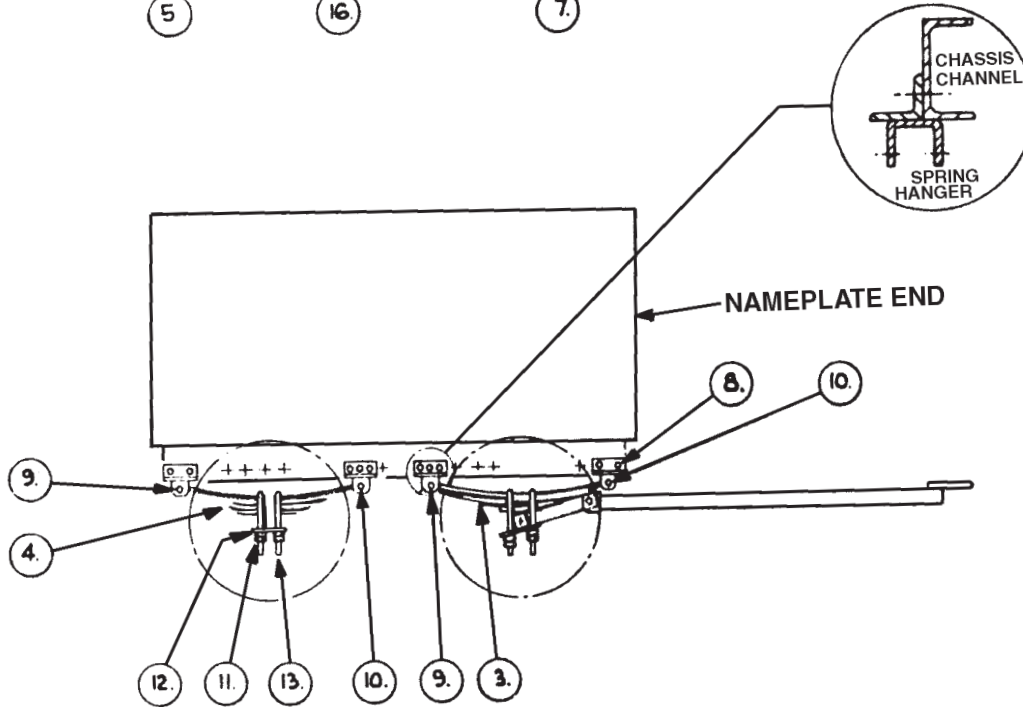
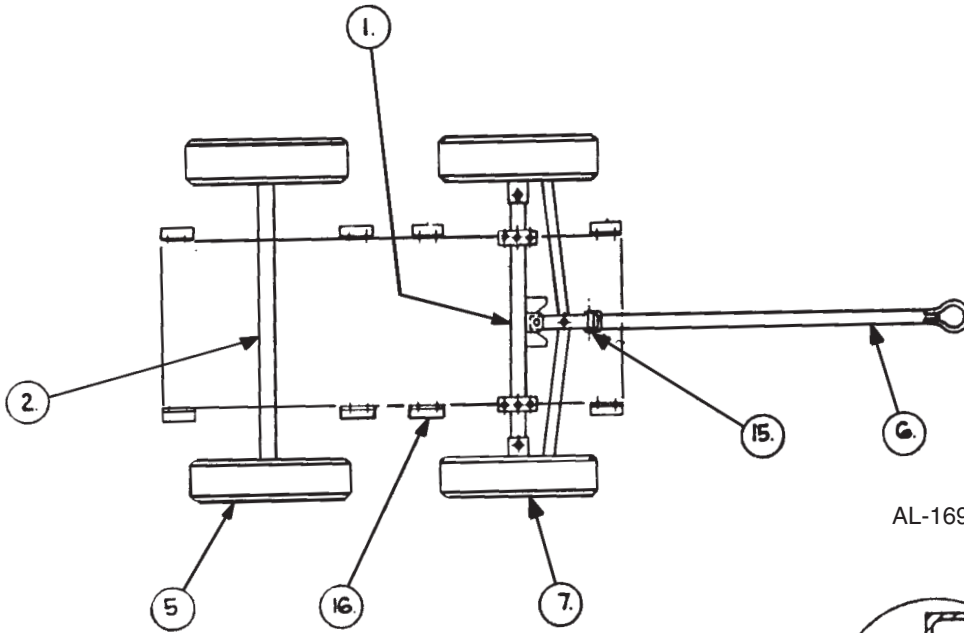
Nut, bolt and washer sizes are given so that you may procure locally.

Item	Part Name and Description	No. Req
16	Cable Tie	6
17	Drawbar Stand, includes	1
	Handle and Shaft	1
	Spring	1
17	Jockey Wheel Assy. (optional) includes:	
	Wheel	1
	Spring	1
18	Hanger Plate	1
19	Hex. Nuts 12mm ("U" Bolt)	16
20*	Left Hand Spring Assy.	1
21*	Right Hand Spring Assy.	1
22	Brake Cable Connector	1
23	Brake Cable	1
26	Wheel Nuts (7/16" UNF)	10
27	Wheel Studs (7/16" UNF-2A x 1 5/8")	10
30	Override Brake Assembly (not shown)	1

Notes:

- * Each Spring Assembly includes the following parts.
 - 2 Shackle Assemblies
 - 4 Shackle Bolts
 - 2 Shackle Bolts with grease hole
 - 6 Nyloc Nuts

UNDERCARRIAGE (4-wheel type)



Quote AP-22-B plus Machine Code No. and Serial No.

Item	Part Name and Description	No. Req
1	Front Axle	1
2	Rear Axle	1
3	Front Spring – 3 leaf	2
4	Rear Spring – 4 leaf	2
5	Wheel and Tyre	4
6	Drawbar	1
7	Wheel Nut – 60°	20
8	Hex. Screw, Washer and Nyloc Nut (2" x 1/2" UNC)	16 sets
9	Hex. Bolt, Flatwasher and Nyloc Nut (3 1/4" x 1/2" UNC)	4 sets
10	Shackle Bolts and Nuts	4 sets
11	Hex Nuts (U-Bolt)	32
12	Hanger Plate	4
13	U-Bolt	8
14	Grease Nipple (Not Shown)	1
15	Shackle Bolt and Nut	1 set
16	Shackle	8

RECOMMENDED SPARE PARTS

1.10.97 (revised 22.9.98)

If working at remote sites, the highlighted items should be carried to support one 400AS machine for a period of one year. Other items are optional and could assist in minimising potential down time and delay.

Lincoln Shield-Arc 400AS-50 (KA1352)

For codes 1297 & up

Part No.	Description	Qty.
AG1165-1	Radiator	1
AL1834	Bottom radiator hose	1
AL1835	Top radiator hose	1
AL2224A1	Bottom series coil	1
AL2224A2	Top series coil	1
AM2338	Blower segment assy	1
AM2373-1E	Rotor assy	1
AM2464-1	Moulded output stud	2
AM2548	Muffler assy	1
AM3229	Brush holder assy	1
AS3289-3	Capacitor & lead assy	1
AS4302	Temperature gauge	1
AT2996-2	Red light assy	1
AT3002-1	Oil pressure gauge	1
AT3024	Fuel tank cap	2
AT3061-6	Hose clamp	2
AT3081	Carbon brush	4
AT3639	Volt meter	1
AT3919	Switch	1
L1741-14B	Bottom coil assy	1
L1741-15B	Top coil assy	1
L2036CA2	Reactor assy	1
L2667-21C	Armature assy	1
M5090C	Rheostat	1
M6277A1Z	Reactor brush holder assy	1
M6964-10X	Brush holder assy	1
M9300-22	Bearing	1
P26510192	Air cleaner element	4
P2654403	Oil filter	4
P26561117	Fuel filter	4
P28461230	Key start switch	1
S10745-1	Mail pole lamination	1
S12261-12	Interpole coil assy	4
S16664-4	Rheostat handle	1
S5960	Rocker	1
T10728-8A	Fuse 15A 250V 3GA	4
T12564	Carbon brush	8
T13637	Diode 35A 1000V	2
T14129-1	Temperature sender unit	1
AS2654-2	Engine foot	2
AT2226-1	Engine foot spacer	4
AT3443	Engine & generator mounting kit	1
M6730	Coupling disk	1
AS 3021	Backing disk	2

NOTES

NOTES

STATEMENT OF LIMITED WARRANTY

The Lincoln Electric Company (Australia) Pty Limited ("Lincoln") warrants all new machinery and equipment ("goods") manufactured by Lincoln against defects in workmanship and material subject to certain limitations hereinafter provided.

This warranty is void if Lincoln or its Authorised Service Facility finds that the equipment has been subjected to improper installation, improper care or abnormal operations.

PERIOD OF WARRANTY "LINCOLN BRANDED GOODS"

The period from the commencement of the warranty in respect of goods covered by this warranty shall be as follows:

Three Years

All Lincoln welding machines, wire feeders and plasma cutting machines unless listed below.

Two Years

All Weldanpowers, Rangers and Italian Invertec welders.

One Year

Italian Plasmas.

- All water coolers (internal and external).
- Arc welding and cutting robots and robotic controllers.
- All stick electrodes, welding wires and fluxes.
- All Environmental Systems equipment, including portable units, central units and accessories. (Does not include consumable items listed under 30-day warranty).
- All welding and cutting accessories including wire feed modules, undercarriages, field installed options that are sold separately, unattached options, welding supplies, standard accessory sets, replacement parts. (Does not include expendable parts and guns/torches listed under 90 and 30 day warranties)
- All "Pro Torch" TIG torches.

90 Days

- All Gun and Cable Assemblies (manufactured by Lincoln) and Spool guns.
- All MIG, TIG and Plasma Torches

30 Days

- All consumable items that may be used with the environmental systems described above. This includes hoses, filters, belts and hose adapters.
- Expendable Parts - Lincoln is not responsible for the replacement of any expendable part that is required due to normal wear.

ENGINE WARRANTY

To the extent permitted by law Lincoln shall be entitled to in its absolute discretion repair all engines and engine accessories however Lincoln shall not be held responsible for any such repair which shall be the sole responsibility of the engine manufacturer which provides for warranties for the period and subject to any limitations provided for by those manufacturers of the respective engines and engine accessories.

Three Years*

Deutz 912 Engine and Accessories
(Warranty service can only be carried out an authorised Deutz service dealer)

*Subject to conditions imposed by Deutz.

Cummins B3.3 Engine and Accessories
(Warranty service can only be carried out an authorised Cummins service dealer)

*Subject to conditions imposed by Cummins

Two Years

Perkins Engines and Accessories
(The Perkins Distributor Organisation provides all warranty service (accessories included) for the Perkins Engines powering goods manufactured by Lincoln.

*Subject to conditions imposed by Perkins

Briggs & Stratton Vanguard Engines and Accessories. (Warranty service can only be carried out by an authorised Briggs & Stratton service dealer).

*The Magneton ignition system is warranted by Briggs & Stratton for 5 years.

Kubota Engines and Accessories
(Warranty service can only be carried out an authorised Kubota service dealer)

*Subject to conditions imposed by Kubota.

One Year*

Ruggerini Engines and Accessories
(Warranty service can only be carried out by authorised Lincoln Field Service Shop or the engine distributors authorised by the Lincoln branch office).

BATTERY WARRANTY

Lincoln supplies certain batteries in connection with its supply of goods and the purchaser acknowledges that any such battery is warranted by its manufacturer and any claim in respect of such a battery whether as to a defect in the battery or as to damage consequential upon a defect in a battery shall be made by the purchaser to the manufacturer of the battery and the purchaser shall not hold Lincoln in any way liable for the operation, non-operation or malfunction of any such battery.

CONDITION OF WARRANTY**TO OBTAIN WARRANTY COVERAGE:**

The purchaser must contact Lincoln or Lincoln's Authorised Service Facility about any defect claimed under Lincoln's warranty.

Determination of warranty on welding and cutting equipment will be made by Lincoln or Lincoln's Authorised Service Facility.

WARRANTY REPAIR

If Lincoln or Lincoln's Authorised Service Facility confirms the existence of a defect covered by this warranty, the defect will be corrected by repair or replacement at Lincoln's option.

At Lincoln's request, the purchaser must return, to Lincoln or its Authorised Service Facility, any "Goods" claimed defective under Lincoln's warranty.

FREIGHT COSTS

The purchaser is responsible for shipment to and from the Lincoln Authorised Service Facility.

WARRANTY LIMITATIONS

Certain conditions warranties and obligations are implied by law (for example under the Trade Practices Act 1974) and cannot be excluded or modified ("the statutory warranties").

Where the statutory warranties do apply then any express warranties given by Lincoln (the "express warranties") are given in addition and without derogation from the statutory warranties. Apart from the express warranties and (in cases where they apply by law but not otherwise) the statutory warranties Lincoln gives no warranties whether express or implied by operation of law or otherwise in respect of any goods manufactured or supplied by Lincoln or by its authorised distributor.

Any warranty whether express or statutory and the term of any such warranty as set out herein commences on the date Lincoln or Lincoln's authorised distributorship forwards the goods from the premises of Lincoln or Lincoln's authorised distributor to the purchaser.

In respect of any claim under the warranty herein provided a purchaser must furnish Lincoln with written notice of any claim under the warranty within the time period of the warranty as further specified herein.

The extent of Lincoln's warranty whether express or statutory is limited to a liability to repair, replace or pay to the purchaser an amount equal to:

- The cost of replacing the goods;
- The cost of obtaining equivalent goods; or
- The cost of having the goods repaired whichever remedy in its absolute discretion Lincoln chooses.

Upon request by Lincoln the purchaser must permit Lincoln to inspect the goods the subject of any claim under this warranty and Lincoln may at its absolute discretion repair or replace the goods F.O.B. at its own premises or at such other premises as Lincoln may designate provided that all freight charges to and from Lincoln's premises or such other premises as Lincoln may designate shall be paid by the purchaser.

Subject to the express and statutory warranties hereinbefore provided Lincoln provides no other warranties in respect of the manufacture or sale of goods and in particular Lincoln shall have no responsibility or liability in respect of:

- Repairs done to Lincoln's goods and undertaken by the purchaser outside Lincoln's premises without written authority from Lincoln obtained prior to any such repair;
- Any damage or failure of the goods as a result of normal wear and tear or the neglect misuse abuse or failure to properly service goods by any purchaser.

The liability of Lincoln is limited as hereinbefore provided and Lincoln shall not be liable for any incidental special or consequential damage suffered by a purchaser whether or not arising out of circumstances known or foreseeable known by Lincoln and in particular arising out of the supply of goods to a purchaser or the use of goods by a purchaser whether based on breach of contract negligence or tort.

CUSTOMER ASSISTANCE POLICY

The business of The Lincoln Electric Company is manufacturing and selling high quality welding equipment, consumables, and cutting equipment. Our challenge is to meet the needs of our customers and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric for advice or information about their use of our products. We respond to our customers based on the best information in our possession at that time. Lincoln Electric is not in a position to warrant or guarantee such advice and assumes no liability, with respect to such information or advice. We expressly disclaim any warranty of any kind, including any warranty of fitness for any customer's particular purpose, with respect to such information or advice. As a matter of practical consideration, we also cannot assume any responsibility for updating or correcting any such information or advice once it has been given, nor does the provision of information or advice create, expand or alter any warranty with respect to the sale of our products.

Lincoln Electric is a responsive manufacturer, but the selection and use of specific products sold by Lincoln Electric is solely within the control of, and remains the sole responsibility of the customer. Many variables beyond the control of Lincoln Electric affect the results obtained in applying this type of fabrication methods and service requirements.

In Australia, Lincoln Technical Sales Representatives are located in, Mackay, Brisbane, Newcastle, Sydney, Melbourne, Adelaide and Perth. To contact your local Lincoln Technical Sales Representative, call **1300 728 720** (for the cost of a local call). Lincoln products are sold primarily through its distributors. Our Regional Office locations are:

Northern Region: Unit 1/15 Westgate St, Wacol, QLD, 4076 (07) 3271 3000

Central Region: 35 Bryant Street, Padstow, NSW, 2211 (02) 9772 7222

Southern Region: 52b Winterton Road, Clayton, VIC, 3168 (03) 9543 9399

Western Region: 25 Barker Street, Belmont, WA, 6104 (08) 9277 8744

New Zealand: 7B/761 Great South Road, Penrose, Auckland (9) 580 4008

Singapore: 11 Pandan Crescent, Singapore (65) 6773 6689



THE WELDING EXPERTSSM

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THE LINCOLN ELECTRIC CO.

Cleveland, Ohio, U.S.A. - Subsidiary companies established in Australasia, Asia, Canada, Europe, North and South America.