Lincoln Electric® Australasia

REDI-MIG® Plus 215C, 255C, 255S Operator's Manual

This manual applies to

Part No.	Description	Volts
K32061-11	REDI-MIG® Plus 215C	240
K32062-11	REDI-MIG® Plus 255C	240
K32062-2- AUP	REDI-MIG® Plus 255S	240

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.

Warranty Registration

www.mylincolnwarranty.com.au

IM6016
May 2010

LINCOLN® ELECTRIC
THE WELDING EXPERTS®

INDEX

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

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 refer to AS 1674 .1 & .2 (latest editions).
   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. Earth 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.

For more detailed information it is strongly recommended that you review copies of "Safety in Welding and Allied processes - AS 1674.1 & .2" and WTIA Technical Note 7 – TN07. Australian Standards are available from SAI Global – www.saiglobal.com and WTIA publications are available from the Welding Technology Institute of Australia – www.wtia.com.au.

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 ones 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 pacemakers 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'.

Thank You

for selecting a **QUALITY** product by Lincoln Electric. We want you to take pride in operating this Lincoln Electric Company product - as much pride as we have in bringing this product to you!

Please record your equipment identification information below for future reference. This information can be found on your machine nameplate.

Model Name & Number _____

Code & Serial Number _____

Date of Purchase _____

Whenever you request replacement parts or information on this equipment, always supply the information you have recorded above.

Read this Operator's Manual completely before attempting to use this equipment. Save this manual and keep it handy for quick reference. Pay particular attention to the Safety Instructions we have provided for your protection. The level of seriousness to be applied to each is explained below:

WARNING

This statement appears where the information must be followed exactly to avoid serious personal injury or loss of life.

CAUTION

This statement appears where the information must be followed to avoid minor personal injury or damage to this equipment.

PRODUCT DESCRIPTION

The REDI-MIG® Plus family is the latest development in step controlled MIG welding machines designed and built by Lincoln Electric. Lincoln Electric's new REDI-MIG® Plus family comprises of three models in both compact and separate wire feeder. The REDI-MIG® Plus 215C, 255C and 255S are for 240 volt supply. Excellent arc characteristics are provided for gas shielded and self shielded welding within the respective machine's current ranges.

Specifications	215C	255C	250S	PWF4-S
Part No.	K32061-11	K32062-11	k32062-2-AUP	K32066-1
Maximum Open Circuit Voltage	35V	38V	38V	
Output Current Range	30-220A	30-255A	30-255A	
Duty Cycle	220A/25V @ 15% 130A/20.5V @ 60% 100A/19V @ 100%	255A/26.8V @ 20% 150A/21.5V @ 60% 120A/20V @ 100%	255A/26.8V @ 20% 150A/21.5V @ 60% 120A/20V @ 100%	
Rated Input AS60974.1	240V 1 phase 50/60Hz 15 amp	240V 1 phase 50/60Hz 25 amp	240V 1 phase 50/60Hz 25 amp	42V AC 5 amp
Wire Speed Range	1-20 m/min	1-20 m/min	1-20 m/min	1-20 m/min
H x W x L (mm) Over handle	765 x 427 x 850	765x427x850	765x427x850*	490x350x420
Operating Temperature	-20°C to 40°C	-20°C to 40°C	-20°C to 40°C	-20°C to 40°C
IP Rating	IP23	IP23	IP23	IP23
Weight (complete with u/c)	87kg	87kg	108kg*	15kg

* Weights and dimensions for the 255S do not include the PWF4S wire feeder. These need to be added for total package

Section 1 - INSTALLATION

WARNING

HIGH VOLTAGE can kill

- **Turn the input power off at the disconnect switch before installing or servicing this machine.**
- **Do not touch electrically "hot" parts such as output terminals or internal wiring.**
- **Connect earthing screw (⏚) to a good earth ground.**
- **Do not operate with covers removed.**
- **Turn power switch "off" before connecting or disconnecting cables or other equipment.**

Only qualified personnel should install or service this equipment.

Machine Installation

1.1 Location

Place the welder where clean cooling air can freely circulate in through the back louvers and out through the front louvres. Dirt, dust or any foreign material that can be drawn into the welder should be kept at a minimum. Failure to observe these precautions can result in excessive operating temperatures and nuisance thermostat trips.

1.2 Connection to Mains Supply

Before connecting the machine to the mains supply check that the voltage and current capacity correspond to the machine voltage and rated input current. Use a fuse or C/B per AS3000 or local wiring rules.

The machine is supplied with an input lead fitted.

Have a qualified electrician fit a suitable input plug.

The REDI-MIG® Plus 215C, 255C and 255 are supplied with factory fitted 240 volt 15 amp plug.

Never connect the green/yellow conductor to any of the active supply lines from the mains. This conductor is to earth the machine as required by Electrical Regulations. Once the above has been followed the machine can be plugged into the mains outlet.

1.3 Shielding Gas Supply (For the Gas Metal Arc Welding Process)

Obtain cylinder of appropriate type shielding gas for the process being used.

WARNING

Refer to "Safety in Welding and Cutting" - ANSI Standard Z49-1 and WTIA Technical Note 7 available from the Welding Technology Institute of Australia.

Please also refer to "Safety in Welding and Allied processes - AS 1674.1 & .2" and WTIA Technical Note 7 – TN07. Australian Standards are available from SAI Global – www.saiglobal.com and WTIA publications are available from the Welding Technology Institute of Australia – www.wtia.com.au".

CYLINDER may explode if damaged

1. Set gas cylinder on rear platform of the machine. Hook chain in place to secure cylinder to rear of welder.
2. Remove the cylinder cap. Inspect the cylinder valve for damaged threads, dirt and dust. For cylinders having an external thread fitting, remove any dust and dirt from the threads with a clean cloth.

   DO NOT ATTACH THE REGULATOR/FLOWMETER IF OIL, GREASE OR CYLINDER VALVE DAMAGE IS PRESENT. OIL OR GREASE IN THE PRESENCE OF HIGH PRESSURE OXYGEN IS EXPLOSIVE! Inform your gas supplier of this condition.
3. Stand to one side away from the outlet and open the cylinder valve for an instant. This blows away any dust or dirt which may have accumulated in the valve outlet.
4. Inspect the regulator/flowmeter for damaged threads and seals, dirt and dust. Remove dust and dirt with a clean cloth.

   DO NOT USE THE REGULATOR/FLOWMETER IF DAMAGE IS PRESENT! Have an authorised repair station repair any damage.

WARNING

Gas under pressure is explosive. Always keep gas cylinders in an upright position and always keep chained to undercarriage or stationary support. Refer "Safety in Welding and Cutting" - ANSI Standard Z49-1 and WTIA Technical Note 7 available from the Welding Technology Institute of Australia.

5. Attach the regulator/flowmeter to the cylinder valve and tighten the union nut(s) securely with a spanner.
6. Attach the machines inlet gas hose to the outlet fitting of the regulator/flowmeter, and tighten the union nut securely with a spanner.
7. Before opening the cylinder valve, turn the regulator adjusting knob counter-clockwise until the adjusting spring pressure is released.

Never stand directly in front of or behind the regulator/ flowmeter when opening the cylinder valve. Always stand to one side.

8. Open the cylinder valve slowly a fraction of a turn. When the cylinder pressure gauge pointer stops moving, open the valve fully.
9. The regulator/flowmeter is adjustable. Set it for the flow rate recommended for the procedure and process being used before starting to weld.

1.4 Gun and Cable Installation

WARNING

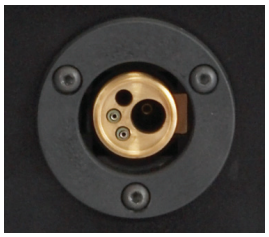
Turn the welder power switch off before installing gun and cable.

LINC Gun® 240G / 360G MIG gun (as supplied)

1. Lay the cable out straight.
2. Make sure all pins on the gun cable connector are aligned with the proper mating sockets on the front panel gun connector and then join the connectors and tighten the hand nut on the gun cable connector.

Note: If a gun and cable other than the supplied gun is to be used, it must conform to standard European-style connector specifications. See Picture.

The gun trigger switch must be capable of switching 10 milliamps at 60 volts DC—resistive.



CAUTION

The gun trigger switch connected to the gun trigger control cable must be a normally open, momentary switch. The terminals of the switch must be insulated from the welding circuit. Improper operation of, or damage to, the machine might result if this switch is common to an electrical circuit other than the machine trigger circuit.

Turn the welder power switch off before changing polarity.

1.5 Output Polarity Connection 215C and 255C only

The electrode cable is located between output terminals.

The electrode cable is connected to the required output terminal on the front of the REDI-MIG® Plus 215C and 255C.

The gun polarity can be changed by placing the electrode cable to the required output terminal, eg. for electrode (-)ve, connect the electrode cable to the (-)ve output stud. Connect the work lead to the other output terminal.

Output Polarity Connection 255S

The PWF4S wire feeder is connected to the REDI-MIG® Plus 255S separate power source via a control/electrode/gas cable assembly. The electrode cable is connected to the required output terminal on the front of the REDI-MIG® Plus 255S separate power source.

The control cable connects to the plug on the front of the REDI-MIG® Plus 255S separate power source, between the output terminals.

The gun polarity can be changed by placing the electrode cable to the required output terminal on the front of the REDI-MIG® Plus 255S, eg. for electrode (-)ve, connect the electrode cable to the (-)ve output terminal. Connect the work lead to the other output terminal.

WARNING	
 **ELECTRIC SHOCK can kill**	• Do not touch electrically live parts or electrode with skin or wet clothing. • Insulate yourself from work and ground. • Always wear dry insulating gloves.
 **FUMES AND GASES can be dangerous**	• Keep your head out of fumes. • Use ventilation or exhaust to remove fumes from breathing zone.
 **WELDING SPARKS can cause fire or explosion**	• Keep flammable material away. • Do not weld upon containers which have held combustibles.
 **ARC RAYS can burn**	• Wear eye, ear and body protection.

IMPORTANT SAFETY NOTE: In 2T mode {refer point 10 below}, this DC Constant Voltage wire welder provides "COLD" electrode when the gun trigger is not operated. Conversely, the output terminals are "LIVE" when the gun trigger is "activated" when pressed in 2T mode, or triggered on in 4T mode.

Welding voltage values for REDI-MIG® Plus 215C, 255C, 255S

	REDI-MIG® Plus 215C	REDI-MIG® Plus 255C	REDI-MIG® Plus 255S
Position	Volts	Volts	Volts
1	15.5V	16V	16V
2	16V	16.5V	16.5V
3	17.1V	17.5V	17.5V
4	18.1V	18.6V	18.6V
5	19.1V	19.6V	19.6V
6	20.1V	21.6V	21.6V
7	21.1V	22.2V	22.2V
8	22.3V	23.2V	23.2V
9	23.2V	24.7V	24.7V
10	25V	26.8V	26.8V
11	25.5V	27.8V	27.8V
12	26.1V	29V	29V

1. POWER SWITCH – Turns power on and off with built-in indicator light.

2. OVER TEMPERATURE LIGHT – Indicates when exceeding duty cycle i.e. based on 10 minute time period for 60% duty cycle, if actual welding time exceeds 6 minutes the light will come on. The input power remains on keeping the cooling fan operative.

3. WIRE FEED SPEED CONTROL (WFS) – Use this control to adjust the speed at which the wire feeds when welding. This is in effect a current control as the power source will deliver the current necessary to melt the wire. The higher the speed, the more current will be required. Wire feed speed range is approximately 1 to 20 m/min.

Operation of the gun trigger switches the wire feed motor on and off. The wire feed motor is dynamically braked to minimise wire over run after welding has ceased.

4. TORCH CONNECTION – Euro torch connection

5. ARC VOLTAGE CONTROL – The output voltage is controlled by rotary switch. This is located on the separate wire feeder of the REDI-MIG 255S.

The approximate weld voltages for the rotary switch postions for the 215C, 255C and 255S are above.

6. AMPERAGE AND VOLTAGE METER - Digital meter displays welding voltage. Supplied as standard on REDI-MIG® Plus 255S. Available as a field fit option for other REDI-MIG® Plus models.

Please note - 9 not shown

7. Spool Gun Connection - Connection for the optional spool gun on the 215C and 255C.

8. GAS PURGE/WIRE INCH – A two position toggle switch located on the REDI-MIG® Plus 4s Use the gas purge momentary toggle switch to operate the gas solenoid to purge air from the gas supply after connecting a new gas cylinder. Gas purge will only operate while the toggle switch is held upwards. Use the same toggle switch to operate the wire feed motor and "cold" inch the wire, by pushing the toggle switch downwards.

9. 2 STEP/4 STEP TRIGGER OPERATION – A two position toggle switch located inside the wire feeder door of the REDI-MIG® 215 C and 255C. This provides two modes of operation of the gun trigger. In 2 step mode, the gun trigger is pressed to start welding and released to stop.

In the 4 step mode, pressing the gun trigger only operates the gas solenoid, allowing shielding gas to flow. Releasing the gun trigger activates the contactor which starts the wire feed motor and connects welding current to the wire so that welding may commence. To stop welding, the trigger must again be operated; pressing it stops the wire feed, activates the burn back time delay and opens the contactor after the pre-set burn back time. Releasing the trigger stops the gas flow.

To recommence welding, the above cycle must be repeated.

10. Output Terminals – Dinse connection used to connect electrode cable and work return lead.

FOR OUT POLARITY CONNECTION REFER TO SECTION 1.5

11. CONTROL CABLE OUTPUT CONNECTION - The control cable connects to the output connection plug on the front of the REDI-MIG® Plus 255S power source above the output terminals. The control cable is used to connect the wire feeder to the power source.

BURNBACK CONTROL – This control is located in the wire feed bay. The burnback control adjusts the time period from when the drive motor stops until the power source and gas solenoid are switched off (approximately 0.1 seconds when fully anti-clockwise to 1.1 seconds when adjusted fully clockwise).

The purpose of the burnback control is to prevent the electrode wire sticking in the weld crater at the finish of the weld.

Section 3 - SETTING UP FOR WELDING

The following items are required:

1) A reel of wire of suitable size and type.

2) A suitable gun and cable assembly with a “Euro” connector and the correct tip and, if necessary gas nozzle for the consumable being used. (LINC Gun MIG gun is supplied).

3) Correct drive rolls for the wire size and type to be used. The REDI-MIG® Plus 215C and 255C are supplied with a 0.8 - 0.9mm drive roller. The REDI-MIG® Plus 255S are supplied with a 0.9 - 1.2mm drive roller. Drive rolls for other types and sizes are available as spare parts. (See table on page 16).

4) A work return cable and clamp. (Supplied)

5) Normal welding accessories including helmet or hand shield with suitable lens, gloves etc.

6) If a gas shielded process is to be used, a cylinder of appropriate shielding gas is required. (Regulator/flowmeter and hose are supplied.) If gas shielding is required, connect the gas hose.

Remember that gas cylinders may explode if damaged, so ensure that all gas cylinders are securely mounted. Ensure that the correct type and size wire feed rolls are fitted. In replacing wire feed rolls, ensure that the key and keyway are correctly positioned and tighten the knurled locking screw securely.

Fit a spool of appropriate wire onto the spool so that it turns clockwise as the wire is fed.

Carefully release the end of the wire from the spool ensuring that the released end is held to stop the wire from unravelling. Cut off the end kink to give a smooth straight end of wire.

Obtain a gap between the wire feed roll and the pressure roll by lifting the cam latch. Feed the wire end into the guide tube, between the drive rolls, and into the “Euro” connector guide until it protrudes about 20mm out of the front of the “Euro” connector.

Close the drive rolls by lowering the cam latch ensuring the rolls firmly hold the wire. Adjust the tension so that wire feeds smoothly. **Do not over tighten.**

Fit the gun and cable assembly onto the “Euro” connector by slipping the end of wire into the cable wire hole.

Tighten the “Euro” connector lock ring.

Activate the power source; set the wire feed speed to 4 on the dial and press the gun trigger or wire inch push button (if fitted). The wire feed roll should turn, feeding the wire further up the gun and cable assembly. Ensure there are no kinks or sharp bends in the gun cable and hold the gun trigger or wire inch button until the wire emerges from the gun. It is good practice to remove the tip when first feeding a new coil of wire, then refitting over the wire and tightening. Cut off the end of the wire leaving 10mm to 15mm stick-out. Select required polarity. See Section 1.5

.024 in. 0.60 mm
.030 in. 0.80 mm
.036 in. 1.0 mm
.048 in. 1.2 mm
.060 in. 1.6 mm
.075 in. 2.0 mm
.105 in. 2.5 mm
.135 in. 3.5 mm
3/16 in. 5.0 mm
1/4 in. 6.0 mm
5/16 in. 8.0 mm

Suggested settings for welding with the REDI-MIG® PLUS 215C & 255C

		STEEL						ALUMINIUM	
		DC-		DC+				DC+	
		Innershield® - FCAW		UltraMag® S6 / EasyMIG™S6				SuperGlaze® 4043, 5356	
		NR-211 MP	NR212						
		No Gas Required		77% Argon 23% CO_2 *		100% CO_2 *		100% Argon *	
		Wire Diameter							
		0.9mm	1.2mm	0.8mm	0.9mm	0.8mm	0.9mm	0.9mm	1.2mm
		V / ○○	V / ○○	V / ○○	V / ○○	V / ○○	V / ○○	V / ○○	V / ○○
0.9mm	REDI-MIG PLUS 215C			2 2	2 2	2 2	2 2	N/A N/A	N/A N/A
1.6mm		3 2	3 2.5	3 3.25	3 2	3 2.25	3 2.5	4 7	4 5.5
4.0mm		6 2.5	6 3	6 4	6 3.5	6 3.25	5 2.5	6 6.75	6 5.5
8.0mm		8 3.5	8 3.5	8 4	8 4.5	8 4	7 3.5	7 7	9 5.25
12.0mm			11 5	12 5	11 3	12 5.25	11 4	N/R N/R	N/R N/R

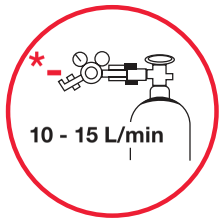
		Innershield® - FCAW		UltraMag® S6 / EasyMIG™S6				SuperGlaze® 5356	
		NR-211 MP	NR212						
		No Gas Required		77% Argon 23% CO_2 *		100% CO_2 *		100% Argon *	
		Wire Diameter							
		0.9mm	1.2mm	0.9mm	1.2mm	0.9mm	1.2mm	0.9mm	1.2mm
		V / ○○	V / ○○	V / ○○	V / ○○	V / ○○	V / ○○	V / ○○	V / ○○
0.9mm	REDI-MIG PLUS 255C	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A
1.6mm		3 2	3 2	2 4.25	4 2	4 3	6 2	N/A N/A	N/A N/A
4.0mm		6 3.5	6 2.5	3 4.25	6 3	6 3.5	6 2.5	6 6	N/R N/R
8.0mm		9 4	9 3	4 5.5	8 3	9 3.25	8 2.25	7 7	7 5
11.0mm		N/R N/R	N/R N/R	6 6	11 3	11 3.5	12 3.25	N/R N/R	9 5.5

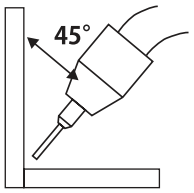
CONSUMABLE PARTS

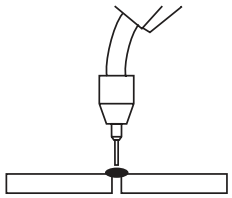
LINC Gun® LG240G (REDI-MIG PLUS 215C & 255C)		
Contact Tip M6 0.6mm	LG240G	KP10440-06
Contact Tip M6 0.8mm	LG240G	KP10440-08
Contact Tip M6 0.9mm	LG240G	KP10440-09
Contact Tip M6 1.2mm	LG240G	KP10440-12
Contact Tip M6 0.9mm Alum	LG240G	KP10441-09A
Contact Tip M6 1.0mm Alum	LG240G	KP10441-10A
Contact Tip M6 1.2mm Alum	LG240G	KP10441-12A
Nozzle 12mm	LG240G	KP10461-4
Tip Holder M6	LG240G	KP10455-1
Gas Diffuser	LG240G	KP10404-WT
Liner 0.8-1.0mm 4m	LG240G	KP10413-4M
Liner 1.0-1.2mm 4m	LG240G	KP10414-4M
Liner 1.2-1.6mm 4m	LG240G	KP10415-4M
Liner 0.8-1.0mm 4m Teflon	LG240G	KP10422-4M
Liner 1.0-1.2mm 4m Teflon	LG240G	KP10418-4M
DRIVE ROLLERS		
Drive Roll Kit 0.6/0.8mm		KP61015-08
Drive Roll Kit 0.8/0.9mm		KP61015-09
Drive Roll Kit 0.9/1.2mm		KP61015-0912
Drive Roll Kit 0.9/1.2mm Alum		KP61015-0912A
Driver Roll Kit 1.0/1.2mm		KP61015-12
Drive Roll Kit 0.9/1.2mm FCW		KP61015-0912R
Driver Roll Kit 1.2/1.6mm FCW		KP61015-16R

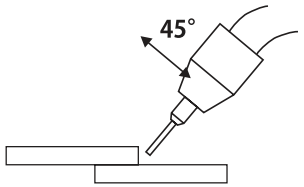
N/A = Not applicable
N/R = Not Recommended

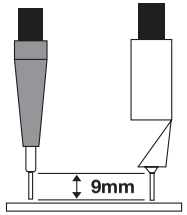
AC1400











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.024 in. 0.60 mm
.030 in. 0.80 mm
.036 in. 1.0 mm
.048 in. 1.2 mm
.060 in. 1.6 mm
.075 in. 2.0 mm
.105 in. 2.5 mm
.135 in. 3.5 mm
3/16 in. 5.0 mm
1/4 in. 6.0 mm
5/16 in. 8.0 mm

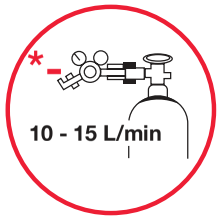
Suggested setting for welding with the REDI-MIG PLUS 255S

		STEEL													
		DC-		DC+				DC+							
		Innershield - FCAW													
		NR-211 MP		NR212		UltraMag S6 / EasyMIG S6						SuperGlaze 5356			
		No Gas Required		77% Argon 23% CO_2*				100% CO_2 *				100% Argon *			
		Wire Diameter													
		0.9mm		1.2mm		0.9mm		1.2mm		0.9mm		1.2mm		0.9mm		1.2mm	
0.9mm	REDI-MIG PLUS 255S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1.6mm		3	2.5	4	2.5	4	3	4	3	4	3	5	2.5	3	5.5	N/R	N/R
4.0mm		6	3.5	6	3	6	4	6	3.5	6	3.5	6	3	6	7.25	5	4.5
8.0mm		9	5.5	9	3	8	5	8	4	8	4.5	8	3.25	8	7.5	8	6
12.0mm		N/R	N/R	N/A	N/A	N/R	N/R	11	5	6	6	12	5.5	N/A	N/A	10	7

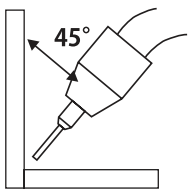
CONSUMABLE PARTS

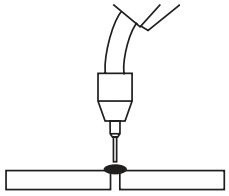
LINC GUN LG240G (REDI-MIG PLUS 255S)		
Contact Tip M6 0.6mm	LG240G	KP10440-06
Contact Tip M6 0.8mm	LG240G	KP10440-08
Contact Tip M6 0.9mm	LG240G	KP10440-09
Contact Tip M6 1.2mm	LG240G	KP10440-12
Contact Tip M6 0.9mm Alum	LG240G	KP10441-09A
Contact Tip M6 1.0mm Alum	LG240G	KP10441-10A
Contact Tip M6 1.2mm Alum	LG240G	KP10441-12A
Nozzle 12mm	LG240G	KP10461-4
Tip Holder M6	LG240G	KP10455-1
Gas Diffuser	LG240G	KP10404-WT
Liner 0.8-1.0mm 4m	LG240G	KP10413-4M
Liner 1.0-1.2mm 4m	LG240G	KP10414-4M
Liner 1.2-1.6mm 4m	LG240G	KP10415-4M
Liner 0.8-1.0mm 4m Teflon	LG240G	KP10422-4M
Liner 1.0-1.2mm 4m Teflon	LG240G	KP10418-4M
DRIVE ROLLERS		
Drive Roll Kit 0.6/0.8mm		KP61240-12S
Drive Roll Kit 0.9/1.2mm		KP61240-1S
Drive Roll Kit 1.2/1.6mm		KP61240-16
Drive Roll Kit 1.6/2.0mm		KP61240-20
Drive Roll Kit 1.0/1.2mm Alum		KP61240-1A
Drive Roll Kit 0.9/1.2mm FCW		KP61240-12R
Drive Roll Kit 1.2/1.6mm FCW		KP61240-16R
Drive Roll Kit 1.6/2.0mm FCW		KP61240-20R

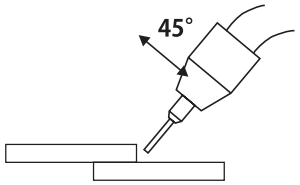
N/A = Not applicable
N/R = Not Recommended

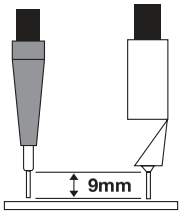


All welds done in downhand position using recommended gas flow settings









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Section 4 - WELDING

WARNING

When the gun trigger is pressed (2T mode on REDI-MIG 4s) or pressed and released the first time (4T mode on REDI-MIG 4s), the wire is at welding voltage. The wire should never touch the case of the wire feeder. If it does, it is possible for the wire to arc to the case.

Any wire overrun should be avoided.

REDI-MIG 4s – Put into 2T Step trigger mode

Select the output voltage required to suit the job by setting the rotary voltage switches. (Refer to REDI-MIG® Welding Guide for suggested settings).

Before beginning welding, ensure the wire protrudes from the gun tip by approximately 10-15mm. Ensure gas is turned on for gas shielded processes. Ensure welding shield and other protective clothing are in place. Present the protruding electrode just off the work. Maintain a steady grip on the gun, protect your eyes with a welding shield, then press and hold the gun trigger to create the arc.

If it is necessary to adjust the weld voltage, stop welding before changing the rotary voltage switches.

Adjust the wire feed speed as necessary to suit the job. At the completion of the weld, release the gun trigger and hold the gun over the weld pool to stop the arc.

4T Step trigger mode should only be used for long welds by experienced operators.

4.1 Changing Electrode Size and Type

When changing the electrode size or type, ensure the wire feed drive roll is the correct size and type for the electrode. Wire feed drive rolls have two grooves each of different sizes. Ensure the roll is located by the key.

When changing to aluminium welding a new drive roll, cable liner and contact tip should be used.

When changing to cored wire welding, a new drive roll should be used.

Also check electrode polarity, as different processes may require different polarities.

Note: Ensure that the correct gun liner and contact tip are used for different wire sizes and processes. Change gun liner as necessary. See Section 6.5 Liner Removal, Installation and Trimming Instructions for LINC Gun® 240 & 360 MIG guns.

Available Drive Rolls

Material No.	Size (mm)	Used With	For Use With
KP61015-08	0.6/0.8	Solid	Redimig® Plus 215/255C
KP61015-09	0.8/0.9	Solid	Redimig® Plus 215/255C
KP61015-0912	0.9/1.2	Solid	Redimig® Plus 215/255C
KP61015-0912A	0.9/1.2	Aluminium	Redimig® Plus 215/255C
KP61015-12	1.0/1.2	Solid	Redimig® Plus 215/255C
KP61015-0912R	0.9/1.2	Cored	Redimig® Plus 215/255C
KP61015-16R	1.2/1.6	Cored	Redimig® Plus 215/255C
KP61240-08	0.6/0.8	Solid	Redimig® Plus 255S
KP61240-0912	0.9/1.2	Solid	Redimig® Plus 255S
KP61240-16	1.2/1.6	Solid	Redimig® Plus 255S
KP61240-0912A	0.9/1.2	Aluminium	Redimig® Plus 255S
KP61240-12A	1.0/1.2	Aluminium	Redimig® Plus 255S
KP61240-0912R	0.9/1.2	Cored	Redimig® Plus 255S
KP61240-16R	1.2/1.6	Cored	Redimig® Plus 255S

4.2 Adjusting Spool Tension

The spool should stop rotating when the wire feed roll stops. Overrun of the spool can cause the coil of wire to unravel. The spool hub should be tensioned so that it neither drags nor overruns. The tension can be set by adjusting the large nut inside the hub with a tube spanner.

Section 5 - LEARNING TO WELD

No one can learn to weld simply by reading about it. Skill comes only with practice. The following pages will help the inexperienced operator to understand welding and develop this skill.

5.1 The Arc-Welding Circuit

The operators knowledge of arc welding must go beyond the arc itself. The operator must know how to control the arc, and this requires a knowledge of the welding circuit and the equipment that provides the electric current used in the arc. The circuit begins where the gun cable is attached to the welding machine. Current flows through the gun cable, gun, and contact tip, to the wire and across the arc. On the work side of the arc, current flows through the base metal to the work cable and back to the welding machine. This circuit must be complete for the current to flow.

This machine's welding circuit has a voltage output of 45 volts DC maximum. This voltage is quite low and is only present when the gun trigger is depressed.

To weld, the work clamp must be tightly connected to clean base metal. Remove paint, rust, dirt or oil as necessary and connect the work clamp as close as possible to the area you wish to weld. This helps prevent current from going through an unwanted path. Avoid allowing the welding circuit to pass through hinges, bearings, electronic components, or similar devices that can be damaged. Always disconnect electrical devices before welding upon them.

FUMES AND GASES can be dangerous

Fumes and slag generated from electrodes recommended for use with this welding machine can be toxic.

- **Avoid contact with eyes and skin.**
- **Do not take internally.**
- **Keep out of reach of children.**
- **Follow all safety precautions found in this operating manual.**

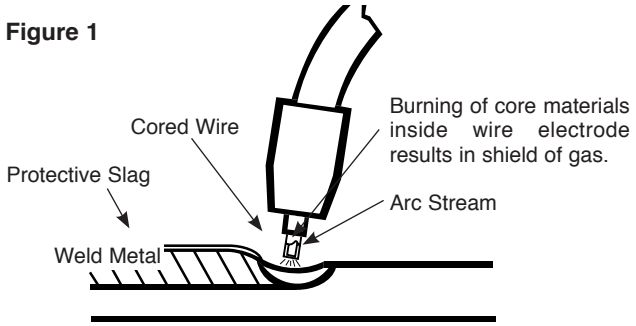
The gun and cable assembly is held by the operator who guides the automatically fed wire along the joint, maintaining a contact tip to work distance of about 10 - 12 mm This is called electrical stickout. This electrical stickout (ESO) must be properly maintained by the operator. The electric arc is made in the gap between the work and the tip end of a small diameter wire. When the power source is properly set, the arc gap is maintained automatically.

Arc welding is a manual skill requiring a steady hand, good physical condition, and good eyesight. The operator controls the welding arc, and, therefore, the quality of the weld made.

5.2 The Self-Shielded (Gasless) FCAW Welding Arc (DC-)

Figure 1 illustrates the action taking place in the self shielded gasless FCAW welding arc. It closely resembles what is actually seen while welding.

Figure 1



The “arc stream” is seen in the middle of the picture. This is the electric arc created by the electric current flowing through the space between the end of the wire electrode and the base metal. The temperature of this arc is about 3300°C, which is more than enough to melt metal.

The arc is very bright, as well as hot, and cannot be looked at with the naked eye without risking painful injury. The very dark lens, specifically designed for arc welding must be used with the hand or face shield whenever viewing the arc.

The arc melts the base metal and actually digs into it much as water through a nozzle on a garden hose digs into the earth. The molten metal forms a molten pool or crater and tends to flow away from the arc. As it moves away from the arc, it cools and solidifies.

The function of the cored wire electrode is much more than simply to carry current to the arc. The wire core is composed of fluxes and/or alloying ingredients around which a steel sheath has been formed. It is simply a stick electrode turned inside out in a continuous wire form.

The cored wire melts in the arc and tiny droplets of molten metal shoot across the arc into the molten pool. The wire sheath provides additional filler metal for the joint to fill the groove or gap between the two pieces of base metal.

The core materials also melt or burn in the arc and perform several functions. They make the arc steadier, provide a shield of smoke-like gas around the arc to keep oxygen and nitrogen in the air away from the molten metal, and provide a flux for the molten pool. The flux picks up impurities and forms the protective slag on top of the weld during cooling.

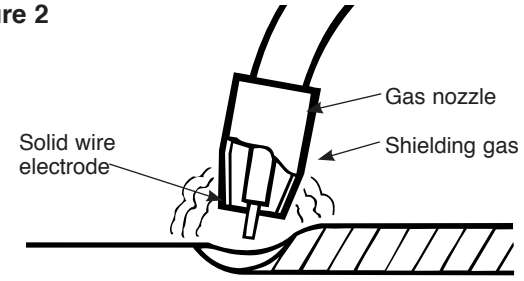
After running a weld bead, the slag may be removed with a chipping hammer and wire brush. This improves appearance and allows for inspection of the finished weld.

Machine size and output characteristics limit the size and type of wire electrode which can be used.

5.3 The GMAW (MIG) Welding Arc (DC+)

Figure 2 illustrates the GMAW (MIG) welding arc. Solid wire does not contain fluxes or ingredients to form its own shielding and no slag forms to protect the molten weld metal. For this reason, a continuous even flow of shielding gas is needed to protect the molten weld metal from atmospheric contaminants such as oxygen and nitrogen. Shielding gas is supplied through the gun and cable assembly, through the gas nozzle and into the welding zone.

Figure 2



When comparing the GMAW and FCAW processes, you can see that the principal difference between the two lies in the type of shielding used. GMAW uses gas for shielding, thus we have Gas Metal Arc Welding. FCAW uses the melting or burning of the core ingredients for shielding, and is thus termed Self-Shielded Flux Cored Arc Welding.

Gas Metal Arc Welding (MIG) is capable of welding a wide range of mild steels in all positions, however, more skill is required for out-of-position welding with the GMAW process.

5.4 Process Selection

By gaining knowledge of the differences between the two processes, you will be able to select the best process for the job you have at hand. In selecting a process, you should consider:

For GMAW (MIG) Process

1. Can I afford the extra expense, space, and lack of portability required for gas cylinders and gas supply?
2. Do I require clean, finished-looking welds?

If you have answered yes to all the above questions GMAW may be the process for you. If you have answered no to any of the above questions, then you should consider using the FCAW process.

For FCAW (Innershield) Process

1. Do I want simplicity and portability?
2. Will welding be performed outdoors or under windy conditions?
3. Do I require good all position welding capability?

5.5 Common Metals

Most metals found around the farm, small shop or home are low carbon steel, sometimes referred to as mild steel. Typical items made with this type of steel include most sheet metal, plate, pipe and rolled shapes such as channels and angle irons. This type of steel can usually be easily welded without special precautions. Some steels, however, contain higher carbon levels or other alloys and are more difficult to weld. Basically, if a magnet sticks to the metal and you can easily cut the metal with a file, chances are good that the metal is mild steel and that you will be able to weld the material. In addition, aluminum and stainless steel can be welded using the an aluminum welding kit. For further information on identifying various types of steels and other metals, and for proper procedures for welding them, we suggest you purchase a copy of “New Lessons in Arc Welding”.

Regardless of the type of metal being welded, in order to get a quality weld, it is important that the metal is free of oil, paint, rust or other contaminants.

5.6 Machine Set up for the Self-Shielded (Gasless) FCAW Process

1. Ensure the machine has the correct drive roll and parts.
2. See the Welding Procedure Guide on the inside of wire feed section door for information on setting the controls.
3. Set the “Voltage” and “Wire Speed” controls to the settings suggested on the Welding Procedure Guide for the welding wire and base metal thickness being used.
4. Check that the polarity is correct for the welding wire being used. See Section 1.5 for instructions on changing polarity.
5. Connect work clamp to metal to be welded. Work clamp must make good electrical contact to the work piece. The work piece must also be grounded as stated in the “Arc Welding Safety Precautions” at the beginning of this manual.

5.7 Welding Techniques For The Self-Shielded (Gasless) FCAW Process

Four simple manipulations are of prime importance when welding. With complete mastery of the four, welding will be easy. They are as follows:

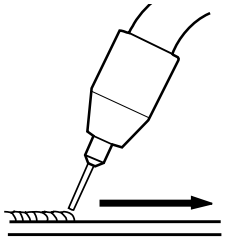
1. The Correct Welding Position

Figure 3 illustrates the correct welding position for right handed people. (For left handed people, it is the opposite.)

Hold the gun (of the gun and cable assembly) in your right hand and hold the shield with your left hand. (Left handers simply do the opposite.)

When using the FCAW Process, weld from left to right (if you are right handed). This enables you to clearly see what you are doing. (Left handers do the opposite.) Tilt the gun toward the direction of travel holding the electrode at an angle as shown in Figure 3.

Figure 3



ARC RAYS can burn eyes and skin

When using an open arc process, it is necessary to use correct eye, head and body protection.

Protect yourself and others, read "ARC RAYS can burn" at the front of this manual.

2. The Correct Way To Strike An Arc

1. Be sure the work clamp makes good electrical contact to the work.
2. Position gun over joint. End of wire may be lightly touching the work.
3. Position face shield to protect face and eyes, close gun trigger, and begin welding. Hold the gun so that the contact tip to work distance is about 10 - 12 mm.
4. To stop welding, release the gun trigger and pull the gun away from the work after the arc goes out.
5. A ball may form at the tip end of the wire after welding. For easier restrikes the ball may be removed by feeding out a few inches of wire and simply bending the wire back and forth until it breaks off.
6. When no more welding is to be done, turn off the machine.

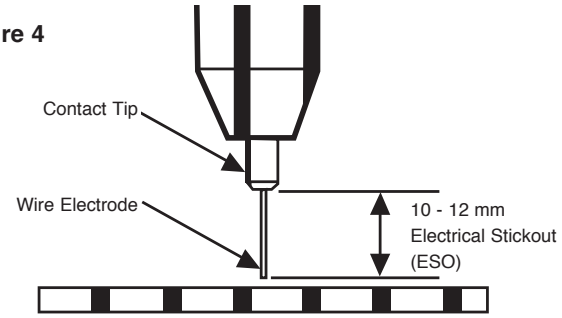
3. The Correct Electrical Stickout (ESO)

The electrical stickout (ESO) is the distance from the end of the contact tip to the end of the wire.

See Figure 4.

Once the arc has been established, maintaining the correct ESO becomes extremely important. The ESO should be approximately 10 - 12 mm long.

Figure 4



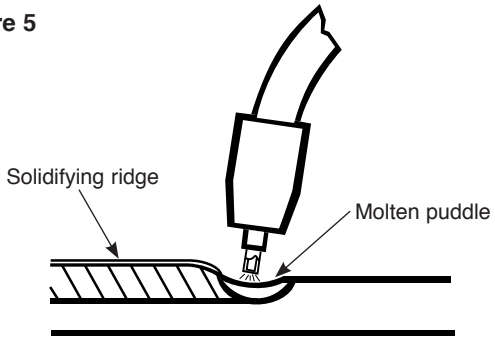
The easiest way to tell whether the ESO is the correct length is by listening to its sound. The correct ESO has a distinctive "crackling" sound, very much like eggs frying in a pan. A long ESO has a hollow, blowing or hissing sound. If the ESO is too short, you may stick the contact tip or nozzle to the weld puddle and/or fuse the wire to the contact tip.

4. The Correct Welding Speed

The important thing to watch while welding is the puddle of molten metal right behind the arc. See Figure 5. Do not watch the arc itself. It is the appearance of the puddle and the ridge where the molten puddle solidifies that indicates correct welding speed. The ridge should be approximately 10 mm behind the wire electrode.

Most beginners tend to weld too fast, resulting in a thin uneven, "wormy" looking bead. They are not watching the molten metal.

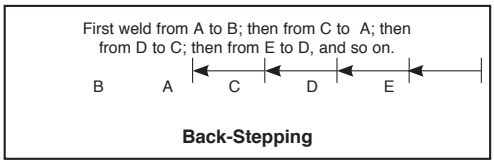
Figure 5



Helpful Hints

1. For general welding, it is not necessary to weave the arc, neither forward or backward nor sideways. Weld along at a steady pace. You will find it easier.
2. When welding on thin plate, you will find that you will have to increase the welding speed, whereas when welding on heavy plate, it is necessary to go more slowly in order to get good penetration.
3. When welding sheet metal 1.6 mm and lighter, heat buildup may cause part warpage and burn through. One way to eliminate these problems is to use the back-stepping method illustrated in Figure 6.

Figure 6



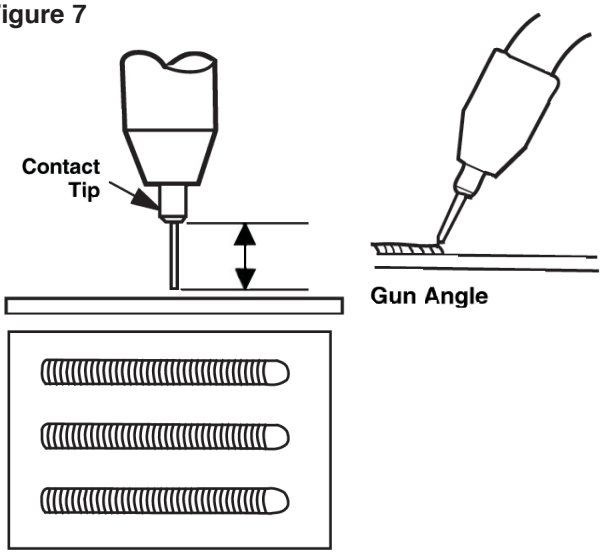
Back-Stepping

Practice

The best way of getting practice in the four skills that enable you to maintain:

1. Correct welding position
2. Correct way to strike an arc
3. Correct electrical stickout
4. Correct welding speed is to perform the following exercise.

Figure 7



For the REDI-MIG® Plus 255C use the following:

Mild Steel Plate	4.0mm
Wire Size and type	0.9mm Innershield 211 MP
Voltage Setting	6
Wire Feed Speed	3.5

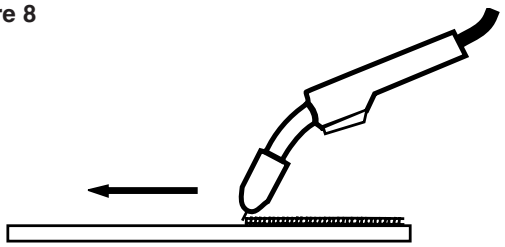
Refer to Figure 7.

1. Learn to strike an arc by positioning the gun over the joint and touching the wire to the work.
2. Position face shield to protect face and eyes.
3. Depress gun trigger, hold gun so contact tip to work distance is about 10 to 12 mm and the gun is at proper angle.
4. After you strike the arc, practice the correct electrical stickout. Learn to distinguish it by its sound.
5. When you are sure that you can hold the correct electrical stickout, with a smooth “crackling” arc start moving. Look at the molten puddle constantly, and look at the “ridge” where the metal solidifies.
6. Run beads on a flat plate. Run them parallel to the top edge (the edge farthest away from you). This gives you practice in running straight welds, and also gives you an easy way to check your progress. The 10th weld will look considerably better than the first weld. By constantly checking on your mistakes and your progress, welding will soon be a matter of routine.

5.8 Machine Set Up for the GMAW (MIG) Process and Gas Shielded GCAW Processes

1. The REDI-MIG® Plus comes ready for welding using the MIG process.
2. See the Procedure Welding Guide on the inside of wire feed section door for information on setting the controls.
3. Set the “Voltage” and “Wire Speed” controls to the settings suggested on the Procedure Welding Guide for the welding wire and base metal thickness being used. ’
4. Check that the polarity is correct for the welding wire being used. Set the polarity for DC(+) when welding with the GMAW (MIG) process. See Section 1.5 for instructions for changing polarity.
5. Check that the gas nozzle and proper size liner and contact tip are being used and that the gas supply is turned on. Set for 7 to 10 L/min. under normal conditions, increase to as high as 17 L/min. under drafty (slightly windy) conditions.
6. Connect work clamp to metal to be welded. Work clamp must make good electrical contact to the work piece. The work piece must also be grounded as stated in the “Arc Welding Safety Precautions” at the beginning of this manual.

Figure 8



5.9 Welding Techniques for the GMAW (MIG) Process

Four simple manipulations are of prime importance when welding. With complete mastery of the four, welding will be easy. They are as follows:

1. The Correct Welding Position

Figure 8 illustrates the correct welding position for right handed people. (For left handed people, it is the opposite.)

When GMAW (MIG) welding on sheet metal, it is important to use the “forehand” push technique.

Hold the gun (of the gun and cable assembly) in your right hand and hold the shield with your left hand. (Left handers simply do the opposite.) Weld from right to left (if you are right handed). This results in a colder weld and has less tendency for burn through.

ARC RAYS can burn eyes and skin

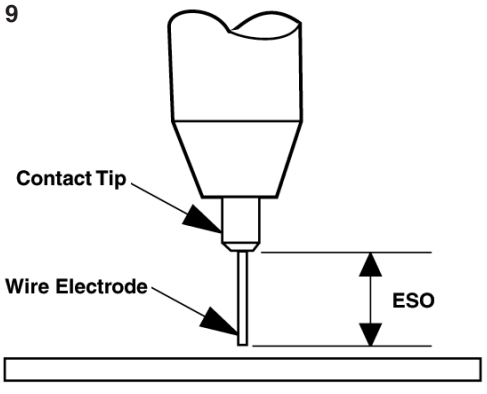
When using an open arc process, it Is necessary to use correct eye, head and body protection.

Protect yourself and others, read “ARC RAYS can burn” at the front of this manual.

2. The Correct Way To Strike An Arc

1. Be sure the work clamp makes good electrical contact to the work.
2. Position gun over joint. End of wire may be lightly touching the work.
3. Position face shield to protect face and eyes, close gun trigger, and begin welding. Hold the gun so that the contact tip to work distance is about 10 - 12 mm.
4. To stop welding, release the gun trigger and pull the gun away from the work after the arc goes out.
5. A ball may form at the tip end of the wire after welding. For easier restrikes, the ball may be removed by feeding out a few inches of wire and cutting off the end of the wire with wire cutters.
6. When no more welding is to be done, close the valve on the gas cylinder, momentarily operate the gun trigger to release gas pressure, then turn off the machine.

Figure 9



3. The Correct Electrical Stickout (ESO)

The electrical stickout (ESO) is the distance from the end of the contact tip to the end of the wire. See Figure 9.

Once the arc has been established, maintaining the correct ESO becomes extremely important. The ESO should be approximately 10 to 12 mm long.

The easiest way to tell whether the ESO is the correct length is by listening to its sound. The correct ESO has a distinctive "crackling" sound, very much like eggs frying in a pan. A long ESO has a hollow, blowing or hissing sound. If the ESO is too short, you may stick the contact tip or nozzle to the weld puddle and/or fuse the wire to the contact tip.

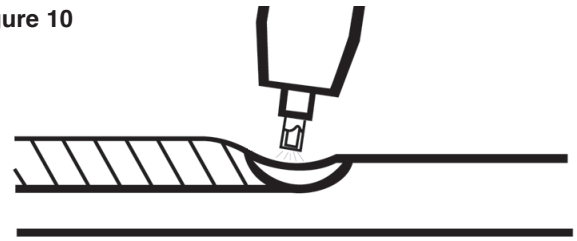
4. The Correct Welding Speed

The important thing to watch while welding is the puddle of molten metal right behind the arc. See Figure 10. Do not watch the arc itself. It is the appearance of the puddle and the ridge where the molten puddle solidifies that indicates correct welding speed. The ridge should be approximately 10 mm behind the wire electrode.

Most beginners tend to weld too fast, resulting in a thin, uneven, "wormy" looking bead. They are not watching the molten metal.

Helpful Hints

Figure 10



1. For general welding, it is not necessary to weave the arc, neither forward or backward nor sideways. Weld along at a steady pace. You will find it easier.
2. When welding on thin plate, you will find that you will have to increase the welding speed, whereas when welding on heavy plate, it is necessary to go more slowly in order to get good penetration.
3. When welding sheet metal 1.6mm and lighter, heat buildup may cause part warpage and burn through. One way to eliminate these problems is to use the back-stepping method illustrated in Figure 6.

Practice

The best way of getting practice in the four skills that enable you to maintain:

1. Correct welding position
2. Correct way to strike an arc
3. Correct electrical stickout
4. Correct welding speed

is to perform the following exercise.

Refer to Figure 4.

Refer to Figure 7.

For the REDI-MIG® Plus 255C, use the following:

Mild Steel Sheet	(1.6 mm)
Wire size and type	0.9mm Ultramag S6 Argon/CO_2 Blend
Voltage Setting	4
Wire Feed Speed	3

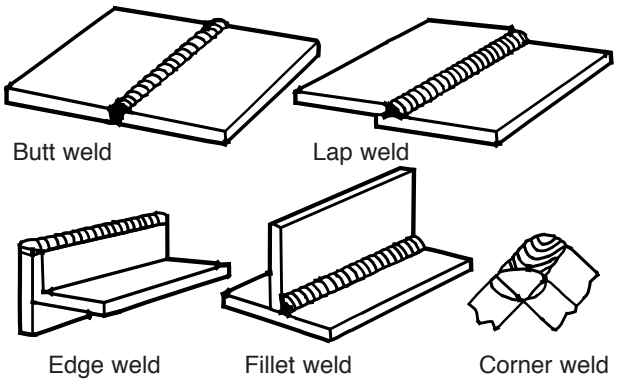
1. Learn to strike an arc by positioning the gun over the joint and touching the wire to the work.
2. Position face shield to protect face and eyes.
3. Depress gun trigger, hold gun so contact tip to work distance Is about 10-12 mm and the gun is at proper angle.

4. After you strike the arc, practice the correct electrical stickout. Learn to distinguish it by its sound.
5. When you are sure that you can hold the correct electrical stickout, with a smooth "crackling" arc, start moving. Look at the molten puddle constantly,
6. Run beads on a flat plate. Run them parallel to the top edge (the edge farthest away from you). This gives you practice in running straight welds, and also gives you an easy way to check your progress. The 10th weld will look considerably better than the first weld. By constantly checking on your mistakes and your progress, welding will soon be a matter of routine.

5.10 Joint Types and Positions

Five types of welding joints are: Butt Welds, Fillet Welds, Lap Welds, Edge Welds and Corner Welds. See Figure 10.

Figure 10



Of these, the Butt Weld and Fillet Weld are the two most common welds.

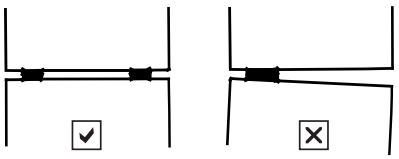
5.11 Butt Welds

Place two plates side by side, leaving a space approximately one half the thickness of the metal between them in order to get deeper penetration.

Securely clamp or tack weld the plates at both ends, otherwise the heat will cause the plates to move apart. See Figure 11.

Now weld the two plates together. Weld from left to right (if right handed and using self-shielded FCAW process). Point the wire electrode down in the crack between the two plates, keeping the gun slightly tilted in the direction of travel.

Figure 11



Watch the molten metal to be sure it distributes itself evenly on both edges and in between the plates.

5.12 Penetration

Unless a butt weld penetrates close to 100% of the metal thickness, a butt weld will be weaker than the material welded together. In the example shown in Figure 12, the total weld is only half the thickness of the material thus the weld is only approximately half as strong as the metal.

In the example shown in Figure 13, the joint has been welded so that 100% penetration could be achieved. The weld, if properly made, is as strong as or stronger than the original metal.

Figure 12

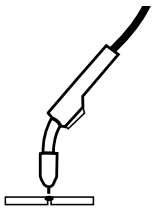
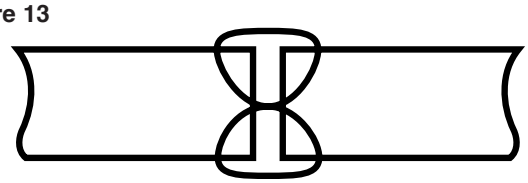


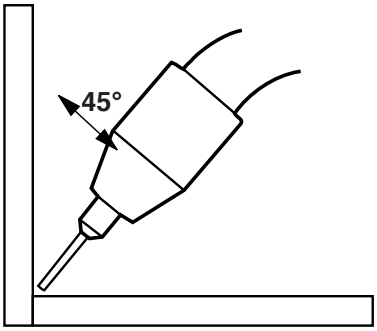
Figure 13



5.13 Fillet Welds

When welding fillet welds, it is very important to hold the wire electrode at a 45° angle between the two sides or the metal will not distribute itself evenly. The gun nozzle is generally formed at an angle to facilitate this. See Figure 14.

Figure 14



5.14 Welding In The Vertical Position

Welding in the vertical position can be done either vertical-up or vertical-down. Vertical-up is used whenever a larger, stronger weld is desired. Vertical-down is used primarily on sheet metal 4.0mm and under for fast, low penetrating welds.

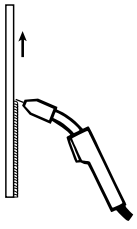
5.15 Vertical-up And Overhead Welding

The problem, when welding vertical-up, is to put the molten metal where it is wanted and make it stay there. If too much molten metal is deposited, gravity will pull it downwards and make it “drip”. Therefore, a certain technique has to be followed.

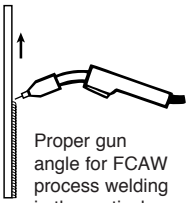
When welding out-of-position, run stringer beads. Don’t whip, break the arc, move out of the puddle, or move too fast in any direction. Use Wire Feed Speed (WFS) in the low portion of the range. The general technique and proper gun angle are illustrated in Figure 15.

Generally, keep the electrode nearly perpendicular to the joint as illustrated. The maximum angle above perpendicular may be required if porosity becomes a problem.

Figure 15



Proper gun angle for GMAW process welding in the vertical up position.



Proper gun angle for FCAW process welding in the vertical up position.

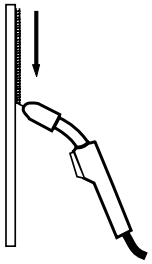
5.16 Vertical-down Welding

Refer to Figure 16 Vertical-down welds are applied at a fast pace. These welds are therefore shallow and narrow and, as such, are excellent for sheet metal. Vertical-down welds may be applied to 4.0 mm and lighter material.

Use stringer beads and tip the gun in the direction of travel so the arc force helps hold the molten metal in the joint. Move as fast as possible consistent with desired bead shape.

The important thing is to continue lowering the entire arm as the weld is made so the angle of the gun does not change. Move the electrode wire fast enough that the slag does not catch up with the arc. Vertical-down welding gives thin, shallow welds. It should not be used on heavy material where large welds are required.

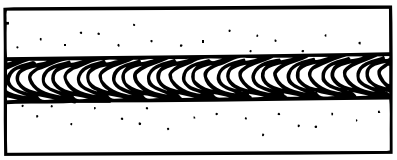
Figure 16



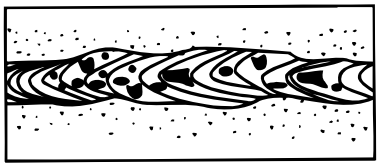
WARNING

Use of this unit on thicker materials than recommended may result in poor welds. The welds may “look” good, but may just be “sitting” on top, of the plate. This is called “Cold Lapping” and will result in weld failure.

5.17 Troubleshooting Welds



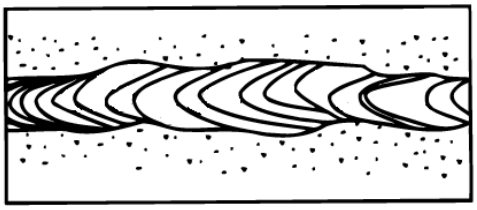
Good welds have excellent appearance.



To Eliminate Porosity (in order of importance):

1. Turn on gas supply, if used
2. Decrease voltage.
3. Increase stickout.
4. Increase WFS (wire feed speed).
5. Decrease torch angle.
6. Decrease travel speed.

Note: Always be sure the joint is free from moisture, oil,



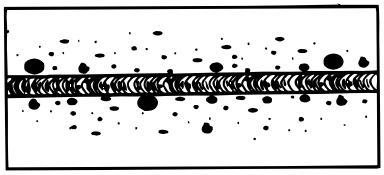
rust, paint or other contaminants.

To Eliminate a Ropy Convex Bead

(in order of importance):

1. Increase voltage
2. Decrease stickout.
3. Decrease WFS (wire feed speed).
4. Decrease travel speed.
5. Decrease torch angle.
6. Check for correct gas, if used

To Reduce Spatter (in order of importance):



1. Increase voltage.
2. Increase torch angle.
3. Decrease stickout.
4. Increase WFS (wire feed speed).
5. Decrease travel speed.
6. Check for correct gas, if used.

To Correct Poor Penetration (in order of importance):

1. Decrease stickout.
2. Increase WFS (wire feed speed).
3. Increase voltage.
4. Decrease speed.
5. Decrease torch angle.
6. Check for correct gas, if used.

If Arc Blow Occurs (in order of importance):

Note: Try different ground connection locations before adjusting procedures.

1. Decrease torch angle.
2. Increase stickout.
3. Decrease voltage.
4. Decrease WFS (wire feed speed.
5. Decrease travel speed.

To Eliminate Stubbing* (in order of importance):

1. Increase voltage
2. Decrease WFS (wire feed speed)
3. Decrease stickout
4. Increase torch angle

* Stubbing occurs when the electrode drives through the molten puddle and hits the bottom plate tending to push the gun up.

Proper Gun Handling

Most feeding problems are caused by improper handling of the gun cable or electrodes.

1. Do not kink or pull the gun around sharp corners
2. Keep the gun cable as straight as practical when welding.
3. Do not allow dolly wheels or trucks to run over the cables.
4. Keep the cable clean.
5. Use only clean, rust-free electrode. Lincoln electrodes have proper surface lubrication.
6. Replace contact tip when it becomes worn or the end is fused or deformed.

Section 6 - MAINTENANCE

WARNING

ELECTRIC SHOCK can kill

- **Have an electrician install and service this equipment.**
- **Turn the input power off at the fuse box, or unplug input lead before working on equipment.**
- **Do not touch electrically hot parts.**

6.1 Routine Maintenance

General

In extremely dusty locations, dirt may clog the air passages and cause the welder to run hot. Blow dirt out of the welder with low-pressure air at regular intervals to eliminate excessive dirt and dust build-up on internal parts.

The fan motor has sealed ball bearings which require no service.

Welding Thermal Overload Protection

The REDI-MIG® Plus and Powerplus units have built-in protective thermostats that respond to excessive temperature. They open the wire feed and welder output circuits if the machine exceeds the maximum safe operating temperature because of a frequent overload, or high ambient temperature plus overload. The over temperature light on the control panel glows if thermostats open. The thermostats automatically reset when the temperature reaches a safe operating level. The fan will stay on when the machines welding and feeding are disabled during thermostatic over temperature protection.

6.2 Gun and Cable Maintenance

Cable Cleaning

Clean cable liner after using approximately 150kg of electrode. Remove the cable from the wire feeder and lay it out straight on the floor. Remove the contact tip from the gun. Using an air hose and approx. 350 kPa (50psi) pressure, gently blow out the cable liner from the gas diffuser end.

Flex the cable over its entire length and again blow out the cable. Repeat this procedure until no further dirt comes out.

CAUTION

Excessive pressure at the start may cause dirt to form a plug.

6.3 Gun Tips and Nozzles

The gun tip should be replaced when worn. Replace with the correct size for the wire type and diameter. Too large a tip for the electrode wire will cause arcing within the gun cable and possible jamming of the wire within the cable .

Remove spatter from inside of gas nozzle and from tip after each 10 minutes of arc time or as required.

Drive Rolls and Guide Tubes

After every coil of wire, inspect the wire drive mechanism. Clean it as necessary by blowing with low pressure compressed air. Do not use solvents for cleaning the idle roll because this may wash the lubricant out of the bearing. All drive rolls are stamped with the wire sizes they will feed. If a wire size other than that stamped on the roll is to be used, the drive roll must be changed.

Avoiding Wire Feeding Problems

Wire feeding problems can be avoided by observing the following gun handling procedures:-

1. Do not kink or pull gun cable around sharp corners.
2. Keep the gun cable as straight as possible when welding or feeding electrode through cable.
3. Keep gun cable clean by following maintenance instructions.
4. Use only clean, rust-free electrode. Lincoln Electric electrode has proper surface lubrication.
5. Replace contact tip when the arc starts to become unstable or the contact tip end is fused or deformed.

6.4 Input Lead

If the supply cord is damaged, it must be replaced with a special cord. Refer spare part list.

6.5 Liner Removal, Installation and Trimming Instructions for LINC Gun® 240 & 360 Torch

Note: The variation in cable lengths prevents the inter-changeability of liners between guns. Once a liner has been cut for a particular gun, it should not be installed in another gun unless it can meet the liner cutoff length requirement.

1. Remove the gas nozzle and gas diffuser, (if used), to locate the set screw in the gas diffuser which is used to hold the old liner in place. Loosen the set screw with an Allen key.
2. Remove the contact tip holder from the gun tube.
3. Lay the gun and cable out straight on a flat surface. Loosen the liner nut cap located in the brass connector at the feeder end of the cable and pull the liner out of the cable.
4. Insert a new untrimmed liner into the connector end of the cable.
5. Fully seat the liner bushing into the Euro connector. Tighten the liner nut cap on the brass cable connector. The contact tip holder, at this time, should not be installed onto the end of the gun tube.
6. With the contact tip holder still removed from the gun tube, be sure the cable is straight, and then trim the liner to length. Remove any burrs from the end of the liner.
7. Screw the contact tip holder onto the end of the gun tube and securely tighten. Be sure the contact tip holder is correct for the tips being used.
8. Tighten the set screw in the side of the gas diffuser against the cable liner using an Allen key. **Do not overtighten.**

Section 7 - ACCESSORIES

° Drive Rolls for mild steel, stainless steel and aluminium for solid wires as well as for flux cored wires. See your nearest Lincoln distributor for details.

Section 8 - GROUND TEST PROCEDURE
These procedures refer to the REDI-MIG® 250s, 325c & 325s

⚠ WARNING

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

ELECTRIC SHOCK can kill

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 Lincoln Field Service Shop.

The insulation resistance values listed below are from Australian Standard AS60974-.1.

1) Disconnect input cable from power outlet.
2) Disconnect all output cables (control & weld).
3) Remove the roof panel.
4) Jumper the three (3) AC terminals and the (+) & (-) terminals of the three phase bridge rectifier (A total of five (5) places).
5) Jumper the four (4) meter terminals together.
6) Switch the fine control rotary switch to position '1' & switch the coarse control rotary switch to position '1'.
7) **Primary test:** Connect one lead of the mega tester to the frame of the machine and the other lead to each of the three (3) input conductors and to the main transformer primary leads L1A, L2A & L3A. Apply the test(s).
8) **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. (Min resistance 5.0MΩ).
9) **Welding circuit to primary test:** Connect one lead of the mega tester to the positive output stud and the other lead to each of the three (3) input conductors and to the main transformer primary leads L1A, L2A & L3A. Apply the test. (Min resistance 2.5MΩ).
10) **Transformer thermostat 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.(Min resistance 1MΩ).
11) Remove all jumper leads.
12) Refit the roof panel.

Procedure for Replacing PC Boards

Before replacing a PC board suspected of being defective, visually inspect the PC board in question for any visible damage to any of its components and conductors on the back of the board.

1. If there is no visible damage to the PC board, install a new one and see if this remedies the problem. If the problem is remedied, reinstall the original PC board to see if the problem still exists. If the problem no longer exists with the old PC board:
   a. Check the PC board harness connector pins for corrosion, contamination, or looseness.
   b. Check leads in the plug harness for loose or intermittent connection.
2. If PC board is visibly damaged, before possibly subjecting the new PC board to the same cause of failure, check for possible shorts, opens or grounds caused by:
   a. Damaged lead insulation.
   b. Poor lead termination, such as a poor contact or a short to adjacent connection or surface.
   c. Shorted or open motor leads, or other external leads.
   d. Foreign matter or interference behind the PC board.
3. If PC board is visibly damaged, inspect for cause, then remedy before installing a replacement PC board.

Changing Settings for Motor Acceleration

If Motor Acceleration needs to be altered from factory setting, because of the welding procedure being used, locate the PCB in the REDI-MIG® 325c or REDI-MIG® 4s Remote Wire Feeder.

On the PCB there is a trimmer labelled 'Rampa', this trimmer controls the acceleration rate of the drive motor from stationary to the set wire feed speed. Maximum acceleration when fully counter-clockwise to minimum acceleration when fully clockwise. This is particularly important when welding aluminium wire. The factory setting is fully clockwise.

Section 8 - GROUND TEST PROCEDURE
The following procedures refer to the REDI-MIG® 210c & 250c

WARNING

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

ELECTRIC SHOCK can kill

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 Electric Field Service Shop.

The insulation resistance values listed below are from Australian Standard AS60974.1.

1) Disconnect input cable from power supply.
2) Disconnect gun assembly and work cable.
3) Remove the side panel from power source.
4) Jumper the two (2) AC terminals and both output terminals of the bridge rectifier, (a total of three (4) places).
5) Disconnect the PCB plug.
6) Switch the control rotary switch to position 'one' (1) and switch the on/off switch to on.
7) **Primary Test:** Connect one lead of the mega tester to the frame of the machine and the other lead to the Active terminal of the input plug. Apply the test. (Min. resistance 2.5MΩ)
8) **Welding circuit test:** Connect one lead of the mega tester to the frame of the machine and the other lead to the (+)ve output stud. Apply the test. (Min. resistance 2.5MΩ)
9) **Welding circuit to primary test:** Connect one lead of the mega tester to the (+)ve output stud and the other lead to the Active terminal of the input plug. Apply the test. (Min. resistance 5MΩ)
10) **Transformer thermostat test:** Connect one lead of the mega to the frame of the machine and the other lead to the rectifier thermostat terminals. Apply the test. (Min. resistance 2.5MΩ)
11) Remove all jumpers and reconnect all leads and plugs.
12) Refit all panel work previously removed.

Procedure for Replacing PC Boards

Before replacing a PC board suspected of being defective, visually inspect the PC board in question for any visible damage to any of its components and conductors on the back of the board.

1. If there is no visible damage to the PC board, install a new one and see if this remedies the problem. If the problem is remedied, reinstall the original PC board to see if the problem still exists. If the problem no longer exists with the old PC board:
   a. Check the PC board harness connector pins for corrosion, contamination, or looseness.
   b. Check leads in the machine harness for loose or intermittent connection.
2. If PC board is visibly damaged, before possibly subjecting the new PC board to the same cause of failure, check for possible shorts, opens or grounds caused by:
   a. Damaged lead insulation.
   b. Poor lead termination, such as a poor contact or a short to adjacent connection or surface.
   c. Shorted or open motor leads, or other external leads.
   d. Foreign matter or interference behind the PC board.
3. If PC board is visibly damaged, inspect for cause, then remedy before installing a replacement PC board.

Section 9 - TROUBLESHOOTING

WARNING

ELECTRIC SHOCK can kill

- Have an electrician install and service this equipment.
- Turn the input power off at the fuse box and unplug the machine before working on equipment.
- Do not touch electrically hot parts.

Problem	Possible Cause	What To Do
Rough wire feeding or wire not feeding but drive rolls turning.	Gun cable kinked and/or twisted.	Inspect gun cable and replace if necessary.
	Wire jammed in gun and cable.	Remove wire from gun and cable - feed in new wire. Note any obstructions in gun and cable. Replace gun and cable if necessary.
	Incorrectly fitted drive roll.	See Wire Drive Roll Section in this manual for proper installation of drive roll.
	Drive roll loose.	Remove, clean, install and tighten.
	Gun cable dirty.	Clean cable or replace liner.
	Worn drive roll.	Replace.
	Electrode rusty and/or dirty.	Replace.
	Worn nozzle or cable liner.	Replace.
	Partially flashed or melted contact tip.	Replace contact tip.
	Incorrect idle roll pressure.	Set idle roll pressure.
Variable or "hunting" arc.	Wrong size, worn and/or melted contact tip.	Replace tip - remove any spatter on end of tip.
	Worn work cable or poor work connection.	Inspect - repair or replace as necessary.
	Loose electrode connections.	Be sure electrode lead is tight, gun cable tight in wire feeder contact block, gun nozzle and gun tip tight. All work lead connections must be tight.
	Wrong polarity.	Check connection at output studs for polarity required by welding process.
Poor arc striking with sticking or "blast offs", weld porosity, narrow and ropey looking bead, or electrode stubbing into plate while welding.	Improper procedures or techniques.	See "Gas Metal Arc Welding Guide" (GS100).
	Improper gas shielding	Clean gas nozzle. Make certain that gas diffuser is not restricted. Make certain that gas cylinder is not empty or turned off. Make certain gas solenoid valve is operating and gas flow rate is correct. Remove gun liner and check rubber seal for any sign of deterioration or damage. Be sure set screw in brass connector is in place and tightened against the liner bushing.
Tip seizes in diffuser.	Tip overheating due to prolonged or excessive high current and/or duty cycle welding.	Do not exceed current and duty cycle rating of gun. A light application of high temperature antiseize lubricant may be applied to tip threads.

TROUBLESHOOTING

Problem	Possible Cause	What To Do
No wire feed, although arc voltage is present.	Defective wire feed motor or wire drive control PC board.	Measure the voltage between the motor leads (54) and (53) when the Gas Purge/Wire Inch toggle switch is pressed downwards. If this voltage is over 10V DC, replace the wire feed motor. If no voltage is registered, replace the wire drive PCB. (Refer PCB replacement procedure on page 19).
No control of wire feed.	Defective wire drive control PC board.	Replace PCB. (Refer PCB replacement procedure on page 19).
No wire feed and no arc voltage. Pilot light indicates input power to machine.	Overtemperature protection circuit actuated due to overload or short. (Overtemperature light should be illuminated).	Allow machine to cool down and reduce on time and/or wire feed speed.
	Faulty gun trigger switch or damaged control cable connected to gun trigger.	Repair.
	Defective control PC board.	Refer Procedure for Replacing PC Boards, if no fault is detected in trigger-thermostat circuit.
	Defective contactor	Replace defective contactor
Poor welding characteristics and/or cannot obtain full rated output as per nameplate.	Improper settings for wire feed speed and volts.	Set controls correctly.
	Faulty switch either coarse control (on/off) or fine control.	Replace switch.
	Faulty pilot transformer.	Replace.
	Faulty main transformer.	Replace.
	Faulty rectifier.	Replace
	Faulty choke.	Replace.
	One phase disconnected.	Check fuses, check input connection.

LIMITED WARRANTY

IM6016 (1/06)

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 Magnetron 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:

a) The cost of replacing the goods;
b) The cost of obtaining equivalent goods; or
c) 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:

a) 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;

b) 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.

LINCOLN® ELECTRIC

THE WELDING EXPERTS℠

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Print 50 3/06