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OWNERS MANUAL

WELDMATIC 150S

MODEL NO. CP104-0, REV. E

11/2000

QUALITY WELDING PRODUCTS, SYSTEMS AND SERVICE

SAFETY

Before this equipment is put into operation, the SAFE PRACTICES section at the back of the manual must be read completely. This will help to avoid possible injury due to misuse or improper welding applications.

PLASTIC HANDLE

Please note that the handle fitted to the WELDMATIC 150S is intended for carrying the machine by hand only.

DO NOT use this handle for suspending or mounting the machine in any other manner.

CONTENTS

Sec.1 ..... Introduction P.3
Sec.2 ..... Receiving P.3
Sec.3 ..... Specifications P.4
Sec.4 ..... Power Source Controls P.5
Sec.5 ..... Welding Polarity Selection P.6
Sec.6 ..... Installation P.7
Sec.7 ..... Basic Welding Information P.8
Sec.8 ..... General Maintenance P.12
Sec.9 ..... Trouble Shooting P.12
Sec.10 ..... Service Information P.13
Sec.11 ..... Parts Lists P.16
Sec.12 ..... Safe Practices P.20

FIGURES

Fig.1 ..... Power Source Controls P.5
Fig.2 ..... Positive Wire Connection P.6
Fig.3 ..... Negative Wire Connection P.6
Fig.4 ..... 'Good' Weld P.8
Fig.5 ..... 'Bad' Weld P.8
Fig.6 ..... Weld setting Charts P.9
Fig.7 ..... Gun Position P.10
Fig.8 ..... Duty Cycle Chart P.11
Fig.9 ..... Wirefeed Control Board P.14
Fig.10 ..... Circuit Diagram P.15
Fig.11 ..... Power Source Assembly P.17
Fig.12 ..... Gun Cable Assembly P.18
Fig.13 ..... W26 Wire Drive Assembly P.19

The information contained in this manual is set out to enable you to properly maintain your new equipment and ensure that you obtain maximum operating efficiency.

Please ensure that this information is kept in a safe place for ready reference when required at any future time.

When requesting spare parts, please quote the model and serial number of the machine and part number of the item required. All relevant numbers are shown in lists contained in this manual. Failure to supply this information may result in unnecessary delays in supplying the correct parts.

1.INTRODUCTION

The WELDMATIC 150S is a Gas Metal Arc welding power source designed for use with gas shielded and "self shielding" flux-cored wires. The consumable wire is fed to the welding gun by motor driven drive rollers. The arc is struck between the work piece and the end of the wire, which melts to form the weld deposit.

With solid consumable wires, the arc occurs in an envelope of shielding gas supplied via the gun from a separate gas cylinder.

"Self-shielding" wires contain a core of flux which, during welding, generates gases to shield the arc and the weld pool. The flux also leaves a light protective slag over the cooling weld deposit. In this way a separate gas supply is not required.

The WELDMATIC 150S is intended for use with 0.6mm to 0.9mm solid wires, and 0.9mm and 1.2mm self shielding consumable wires. The smaller wire sizes are recommended for welding at lower currents such as for sheet-metal applications. Increasing the wire diameter permits higher welding currents to be obtained.

2. RECEIVING

Check the equipment received against the shipping invoice to make sure the shipment is complete and undamaged. If any damage has occurred in transit, please immediately notify your supplier.

The CP104-0 Package contains;

- WELDMATIC 150S Power source with in built wirefeeder,
- BERNARD 200 Amp Gun cable, Euro connector, 3 metres,
- Work Lead Assembly,
- Gas Regulator,
- (This) Owners Manual.

3. SPECIFICATIONS

This equipment is manufactured in accordance with Australian Standard AS1966.1.

PRIMARY VOLTAGE	240 Volts AC, Single Phase, 50 Hz.
RATED PRIMARY CURRENT	12 Amps.
MAX PRIMARY DEMAND	28 Amps.
MIN RECOMMENDED CIRCUIT BREAKER	16 Amps.
FITTED SUPPLY CABLE (Note 1)	30/0.25 Three Core, Heavy Duty PVC, 15 Amp plug. Type Y attachment
ELECTRODE WIRE SIZE RANGE	0.6mm - 1.2mm diameter.
OPEN CIRCUIT VOLTAGE	.18 - 37 Volts
COOLING	Fan cooled, air drawn in through rear fan grille.
OUTPUT RATING (Note 2)	135 Amps, 22 Volts, 25% Duty Cycle.
	67 Amps, 18 Volts, 100% Duty Cycle.
MINIMUM WELDING CURRENT	35 Amps
MAX. WELDING CURRENT	150 Amps, 20% Duty Cycle.
DIMENSIONS	L - 400mm, W - 245mm, H - 390mm including handle.
MASS	33Kg, without wire.

Note 1. For a type Y cable attachment, if the supply flexible cable is damaged, it must be replaced by the manufacturer or their service agent or similarly qualified person in order to avoid a hazard.

Note 2. Duty cycle is defined in Australian Standard AS1966.1 as the ratio of arcing time to 5 minutes in any 5 minute period, expressed as a percentage.)

4. POWER SOURCE CONTROLS

VOLTAGE CONTROL SWITCHES

The three voltage control switches together provide 8 steps of output welding voltage adjustment arranged as 4 steps in HIGH range and 4 steps in LOW range. Within each range, the COARSE switch produces the largest step change of voltage, and the FINE switch the smallest step change of voltage.

Minimum welding voltage is obtained in LOW range with COARSE 1 and FINE 1 selected. Maximum welding voltage is obtained in HIGH range with COARSE 2 and FINE 2 selected.

IMPORTANT: Do not operate the Voltage Control switches during welding.

WIRE SPEED CONTROL

This control is used to adjust the feeding rate of the consumable electrode wire. Rotating the dial clockwise increases the wirespeed, so increasing the welding current.

Refer to Section 7 of this manual for information with reference to the setting of these controls to obtain the intended welding current. A setting chart is also located inside the wire-spool enclosure cover.

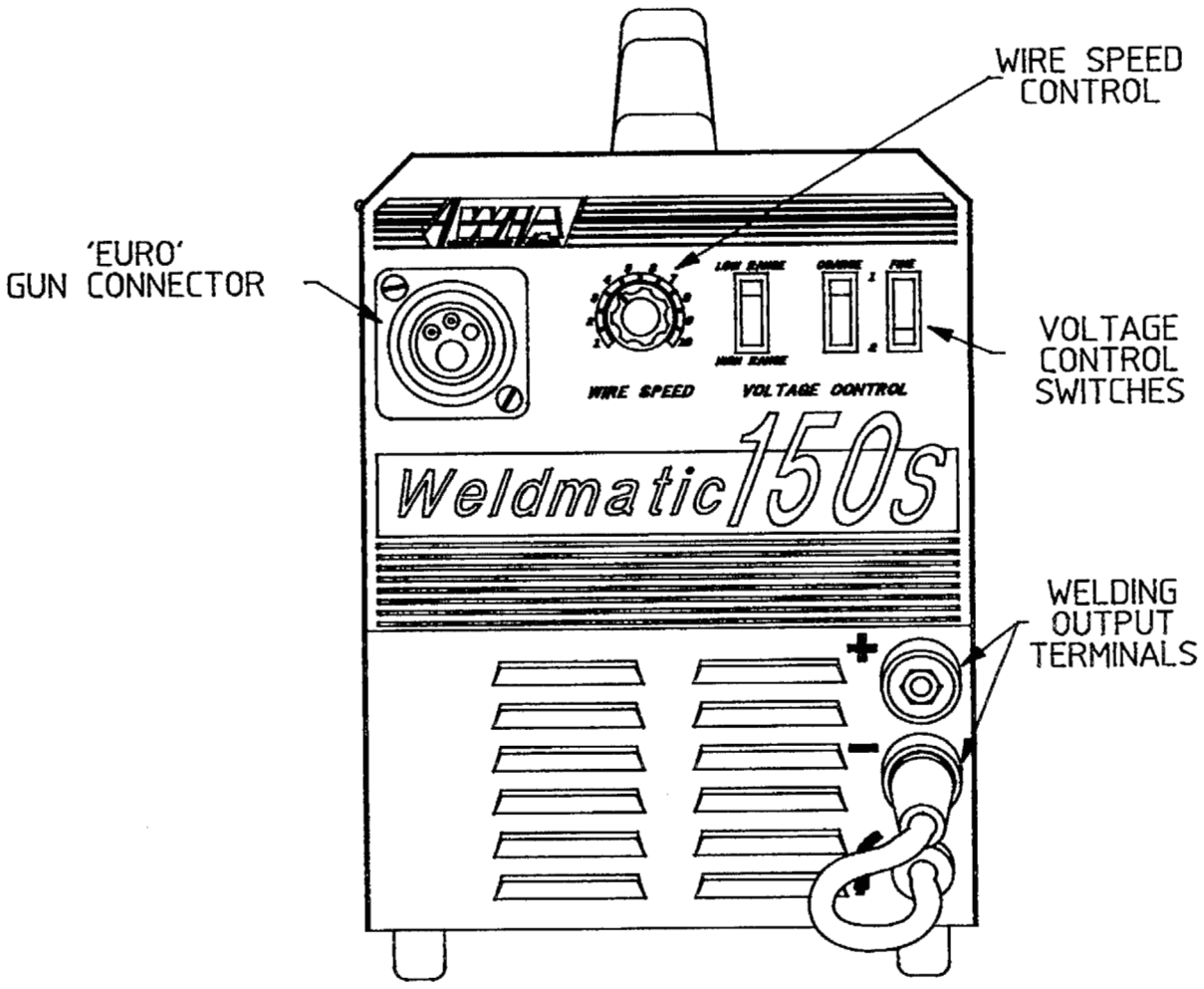

FIGURE 1. POWER SOURCE CONTROLS

5. WELDING POLARITY SELECTION

POSITIVE WIRE

Most gas shielded G.M.A.W. is carried out with the welding electrode Positive and the work piece Negative.

To set the machine for this condition, connect the 'GUN' lead to the (+) output terminal, and the 'WORK' lead to the (-) terminal, as in Figure 2. below.

NEGATIVE WIRE

Most "Self-Shielded" flux cored consumables are designed to be operated with the welding electrode Negative and the work piece Positive. Check the manufacturers data for the particular consumable to be used.

To set the machine for this condition, connect the 'GUN' lead to the (-) output terminal, and the 'WORK' lead to the (+) terminal, as in Figure 3. below.

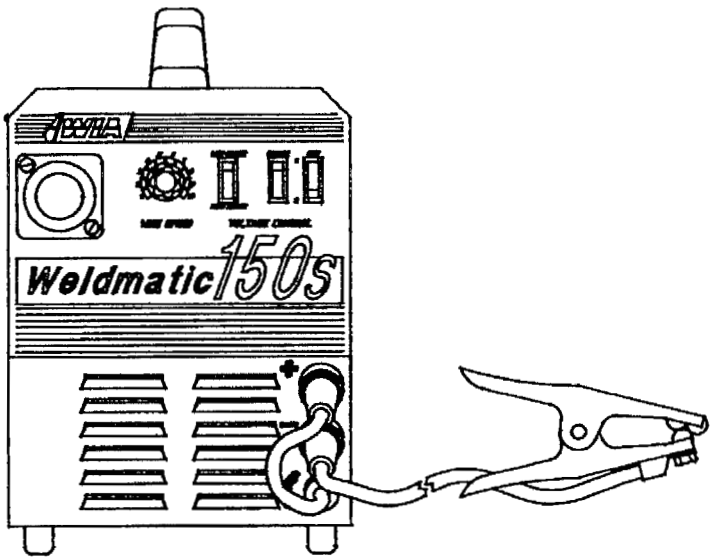

FIGURE 2. POSITIVE WIRE CONNECTION

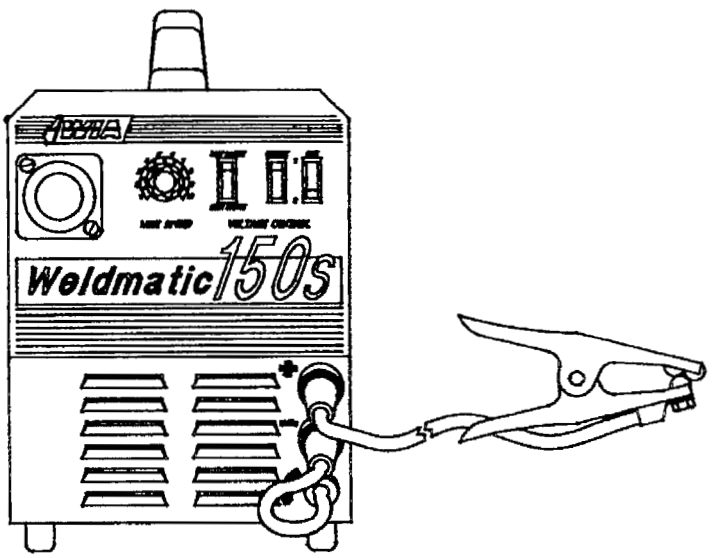

FIGURE 3. NEGATIVE WIRE CONNECTION

6. INSTALLATION

MAINS POWER SUPPLY

The WELDMATIC 150S is designed for a mains power supply of 240 Vac at 50 Hz. The minimum capacity of the mains wiring and power outlet supplying a welder is selected according to the *effective primary current* of the machine. The effective primary current for a Weldmatic 150S is 12 Amps and its maximum input current is 28 amps.

The minimum recommended circuit breaker rating for a Weldmatic 150S is 16 Amps. Note : The tripping time of a typical 16A circuit breaker can limit the duty cycle available from the Weldmatic 150S. A higher rated circuit breaker can be selected, but the mains wiring capacity must be increased to suit.

SHIELDING GAS SUPPLY

Fit the gas regulator to the gas cylinder. DO NOT apply oil or grease to these connections. Fit the gas connector supplied with the regulator to the gas hose of the welder, and secure it with the 'O' clip supplied.

Always ensure the gas regulator adjusting knob is fully released before opening the gas cylinder valve. Failure to observe this practice can result in damage to the regulator.

FITTING THE GUN CABLE

The gun cable is attached to the power source via a 'Euro' adaptor which incorporates all required connection points for welding current, shielding gas and gun switch control.

To fit the gun cable, engage the mating parts of the male and female Euro connectors, then rotate the locking ring clockwise to firmly secure the connection.

FITTING THE CONSUMABLE WIRE

In order to obtain the most satisfactory welding results from any G.M.A.W. equipment, the wirefeed must be smooth and constant. Dirty, rusty or kinked wire will not feed smoothly through the gun cable and will cause erratic welding. Deposits from the wire will clog the gun cable liner requiring it to be replaced prematurely. For best results use quality WIA consumable wires.

Place the spool of welding wire onto the spool holder. The location pin should mate with a hole provided on the wire spool body. Fit the spool retaining 'R' clip supplied.

FEEDING THE CONSUMABLE WIRE

Open the two roll drive mechanism by drawing the pressure spring outwards, allowing the upper roller assembly to be rotated away from the driven roller. The end of the welding wire can now be passed through the inlet guide, over the bottom driven roller, and into the gun cable assembly.

Check that the drive roller groove is correct for the wire in use. The appropriate size is stamped on the visible side of the installed roller. Part numbers for alternate size drive rollers are shown in Section 11.

Check also that the correct size contact tip is fitted to the gun. Gun part numbers are shown in section 11.

Return the top roller to the closed position and, with the machine energised, close the gun switch to feed wire through the gun cable. Adjust the compression screw to provide just sufficient clamping of the drive rolls drive to achieve constant wirefeed. Do not over tighten the compression screw, as the consumable wire can be crushed leading to erratic wirefeed.

7. BASIC WELDING INFORMATION

SHIELDING GAS

The choice of shielding gas is largely determined by the consumable wire to be used. Many proprietary shielding gas mixtures are available.

The recommended shielding gases for use with this equipment are :

- Mild Steel .....Argon + 5 to 25% Carbon Dioxide;
- Aluminium .....Argon;
- Stainless Steel .....Argon + 1 to 2% Oxygen.

Consult your gas supplier if more specific information is required.

SHIELDING GAS FLOW RATE

In G.M.A.W., one of the functions of the shielding gas is to protect the molten weld pool from the effects of oxygen in the atmosphere. Without this protection the weld deposit becomes 'honeycombed' in appearance, an effect which is described as weld porosity.

In draft-free conditions the gas flow rate required to give adequate protection is typically 10 litres/min. In situations where drafts cannot be avoided, it may be necessary to increase this rate and/or to provide screening of the work area.

Weld porosity can also be caused by air entering the gas stream through a damaged hose, loose gas connection, or from restriction in the nozzle, such as from excess build-up of spatter.

ESTABLISHING A WELD SETTING

The WELDMATIC 150S has been designed for use with a range of solid and flux cored electrode wires. The charts below can be used to preset the machine for an approximate welding current. For each of the eight combinations of voltage control switch settings, there is a range of valid wirespeed settings.

The wirefeed rate determines the welding current; increasing the feed rate increases the current, and decreasing it decreases current. The selected wirefeed rate must be matched with sufficient arc voltage; an increase of wirefeed rate requires an increase of arc voltage.

If the voltage is too low the wire will stub and stutter, and the arc will not be stable. If the voltage is too high, the arc will be long with metal transfer occurring as a series of large droplets.

The welding current should be chosen to suit the thickness of the metal to be welded. It is important to check that the deposited weld provides sufficient strength to suit the application.

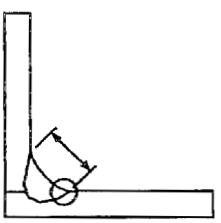

FIGURE 4. "GOOD" WELD.

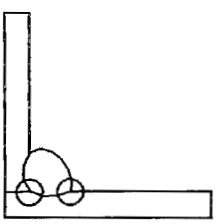

FIGURE 5. "BAD" WELD

A "good" weld will have the characteristics illustrated in Figure 4. The weld has penetrated into the parent metal, fusing the root of the joint where the two plates meet, and the weld blends smoothly into the side walls.

A "bad" weld is shown in Figure 5. The weld has not penetrated the joint root, and there is poor side wall fusion. This lack of fusion would normally be corrected by increasing the arc voltage, or by increasing both wirefeed rate and arc voltage to achieve a higher current weld setting.

IMPORTANT: Do not operate the Voltage Control switches during welding.

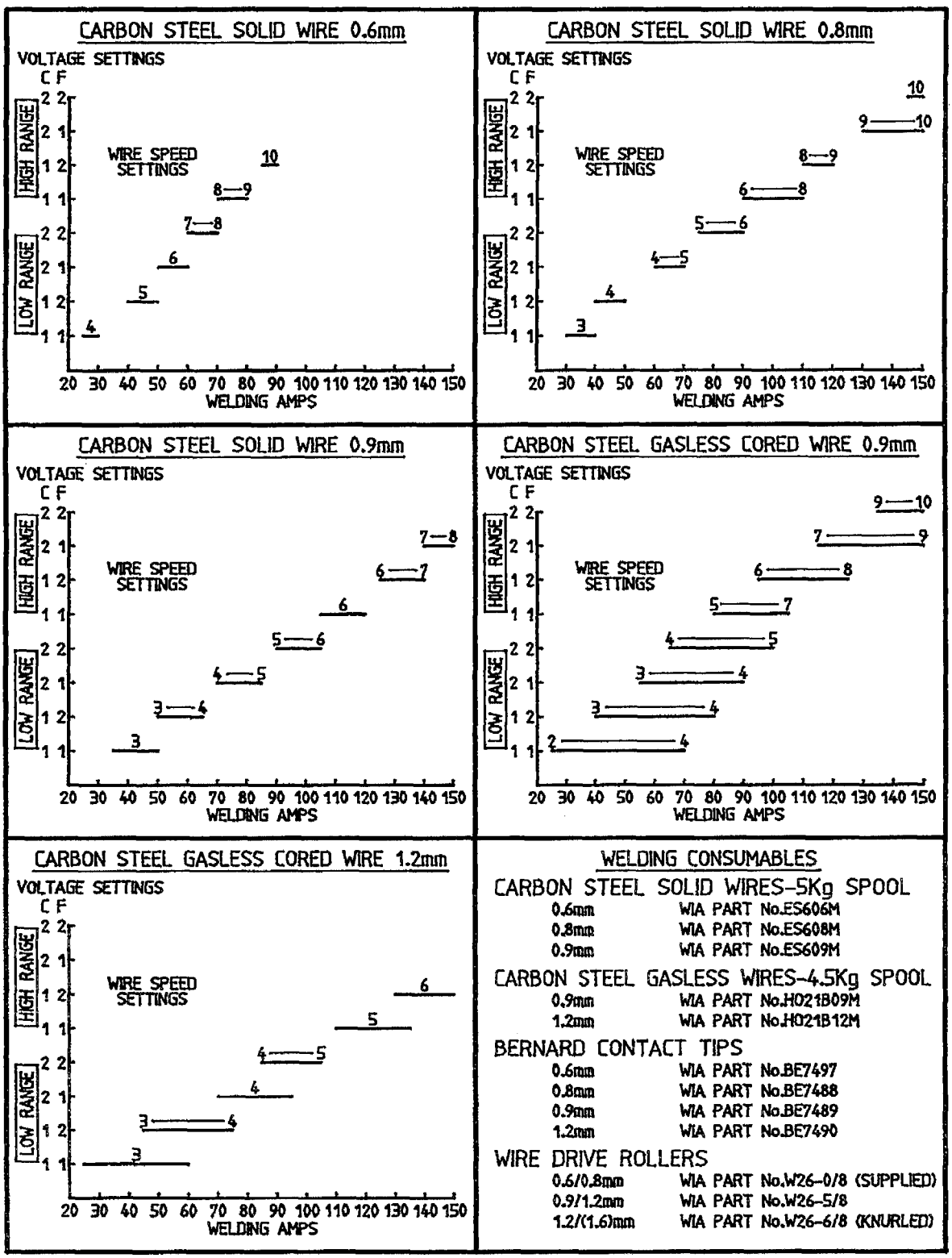

FIGURE 6. WELD SETTING CHARTS

GUN POSITION

For 'down hand' fillet welding with gas-shielded consumable wires, the gun is normally positioned as in the Figures below with the nozzle end pointing towards the direction of travel.

For 'down hand' fillet welding with self-shielded consumable wires, the gun is normally positioned as in the Figures below with the nozzle end pointing away from the direction of travel, referred to as 'dragging' the weld. Self shielding consumable wires should be operated with approximately 15mm of wire 'stick-out' from the welding contact tip.

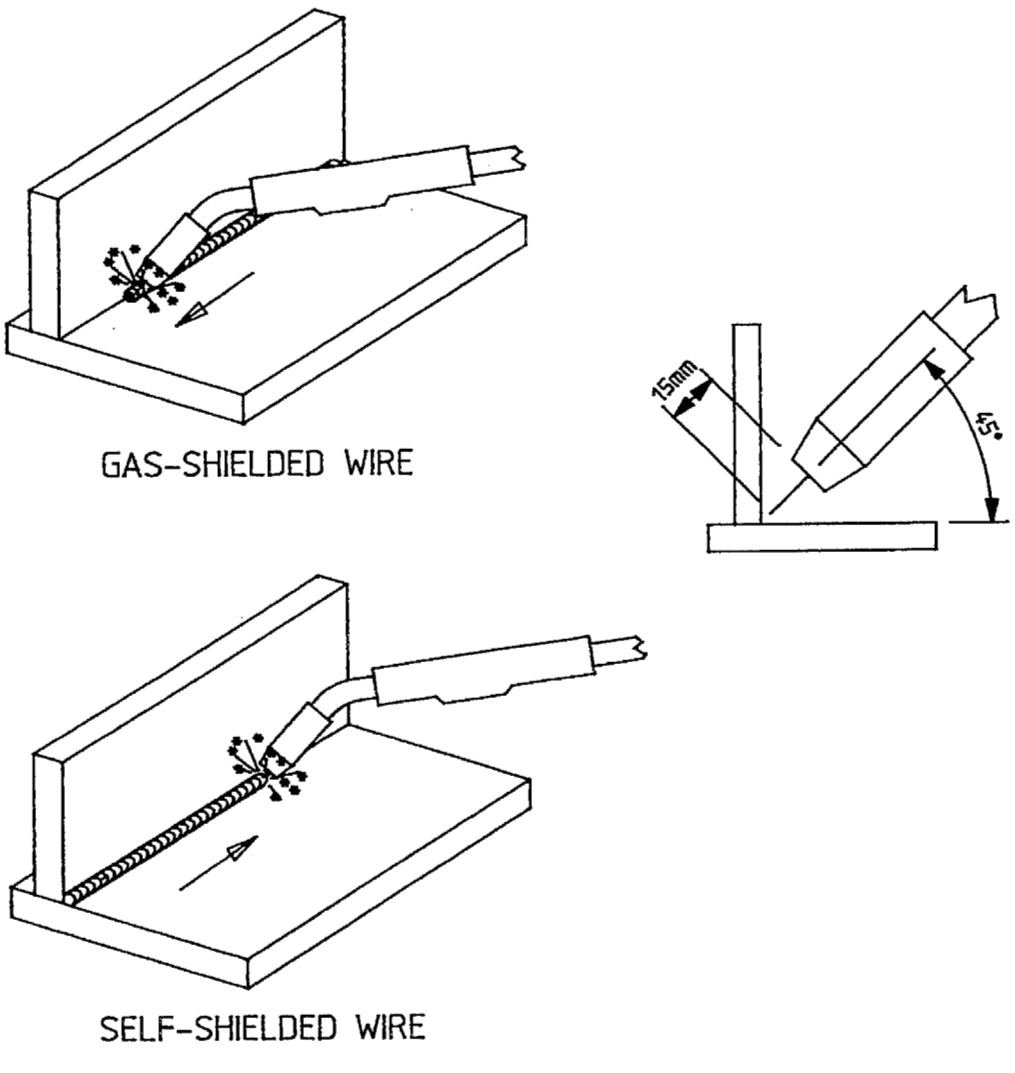

FIGURE 7. GUN POSITION

DUTY CYCLE

The term duty cycle indicates the percentage welding time available at the rated output current, for each 5 min period over 4 hours.

The WELDMATIC 150S is rated at 135 amps, 25% duty cycle. If the machine is operated at a reduced welding current, a higher duty cycle is available. The diagram below illustrates the appropriate duty cycle rating for the range of welding currents available from the 150S, and so allows the maximum welding time per 5 minute period to be determined.

The power source is protected by in built over temperature protection devices. These will operate if the machine is operated in excess of its current and duty cycle rating. If this occurs, the fan will continue to run, but the machine will not deliver welding current until the unit has cooled sufficiently.

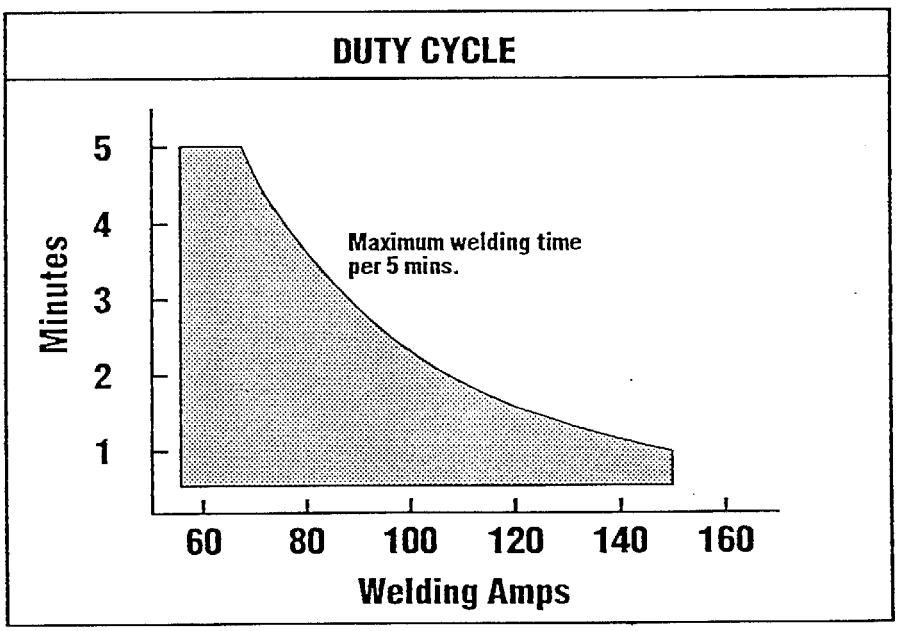

FIGURE 8. DUTY CYCLE RATING CHART

8. GENERAL MAINTENANCE

Before removing the machine cover, ENSURE that the unit is disconnected from the mains power supply. When the unit is energised LETHAL VOLTAGES are present on the electrical components enclosed.

DUST

Care should be taken to prevent excessive build-up of dust and dirt within the welding power source. It is recommended that at regular intervals, according to the prevailing conditions, the machine covers be removed and any accumulated dust be removed by the use of dry, low pressure compressed air, or a vacuum cleaner.

WIREFEED

In order to obtain the most satisfactory welding results, the wirefeed must be smooth and constant. It is therefore important to observe the following points;

- Keep the gun cable liner clear of dust and swarf build up. When liner replacement becomes necessary, fit only the genuine replacement part. The build up of dust in a cable liner can be minimised by regular purging of the liner with dry compressed air. This may be conveniently done each time the wire spool is replaced.
- Replace the welding tip as it becomes worn or damaged. Ensure the tip size is correct for the welding consumable wire in use. See Section 11 for gun part numbers.
- Keep the wire drive mechanism clean. Periodically check the drive roller for wear or clogging, and that the compression roller rotates freely.

9. TROUBLE SHOOTING

UNSATISFACTORY RESULTS

WIREFEED

- Erratic wirefeed is the MOST LIKELY cause of failure in all continuous electrode wire welding processes. It should therefore be the first point checked when problems occur. Refer to the section above.

WELDING CIRCUIT

- Ensure that the work clamp is securely tightened onto the work-piece so that good electrical contact is achieved.
- Surface contamination of the work piece by water, oil, grease, galvanising, paint, or oxide layers can severely disturb the welding arc resulting in a poor weld. Best results will be obtained if the surface is clean and dry.

WIREFEED / ARC VOLTAGE RELATIONSHIP

If the consumable wire is stubbing into the work piece and a steady arc cannot be obtained, it is likely that the wirespeed is set too high to suit the welding voltage. To correct this situation, decrease the wirespeed setting. If the arc length is too long, increase wirespeed setting.

NO WELDING CURRENT

Check the electrical continuity of the welding current circuit, i.e., work lead, work clamp and gun cable connections.

Check that mains supply voltage is available to the WELDMATIC 150S, i.e. that the fan is running and the contactor can be heard operating as the gun switch is closed.

If the thermal overload protection devices have been tripped, leave the machine energised with the fan running to achieve the maximum cooling rate.

If the forgoing checks have been made and have not revealed the fault condition, a QUALIFIED SERVICE PERSON should be consulted.

10. SERVICE INFORMATION.

NOTE that the following information is intended for use by Qualified Service Personnel. When the unit is energised LETHAL VOLTAGES are present on the electrical and electronic components. It is not intended that persons without suitable training and knowledge attempt to perform service tasks on the components of this Welder.

Before removing the machine cover, ENSURE that the unit is disconnected from the mains power supply. When the unit is energised LETHAL VOLTAGES are present on the electrical components enclosed. .

SUPPLY FLEXIBLE CABLE

The WELDMATIC 150S is fitted with a 3 metre, 3 core Heavy Duty PVC mains power supply cable and standard 15 Amp plug.

If it becomes necessary to replace the mains power supply cable, use only a cable with an equivalent or higher current rating.

Access to the machine supply terminals is gained by removing the power-source side panel opposite to the wire-spool enclosure.

WIREFEED CONTROL BOARD CP104-12

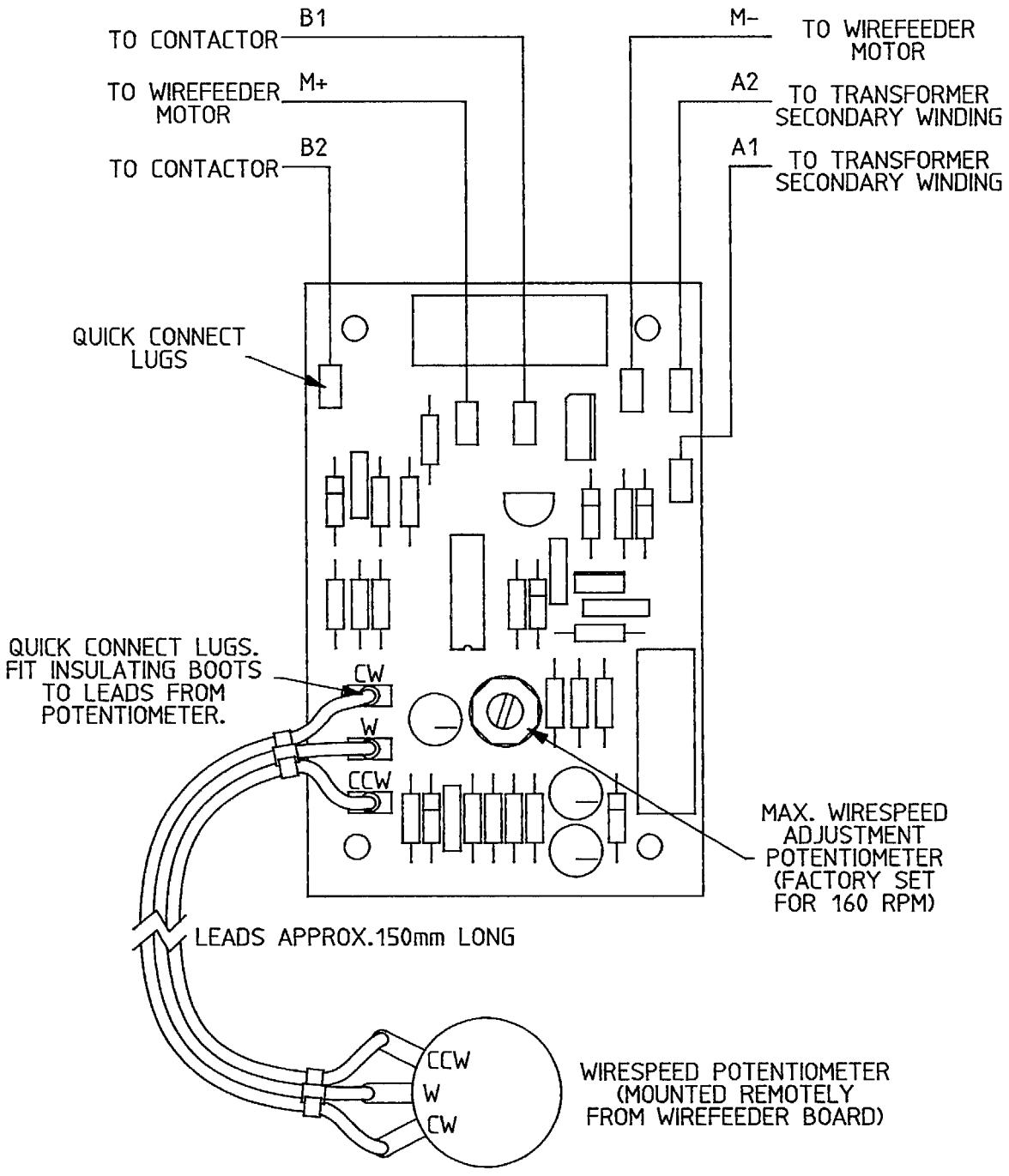

FIGURE 9. WIREFEED CONTROL BOARD

CIRCUIT DIAGRAM

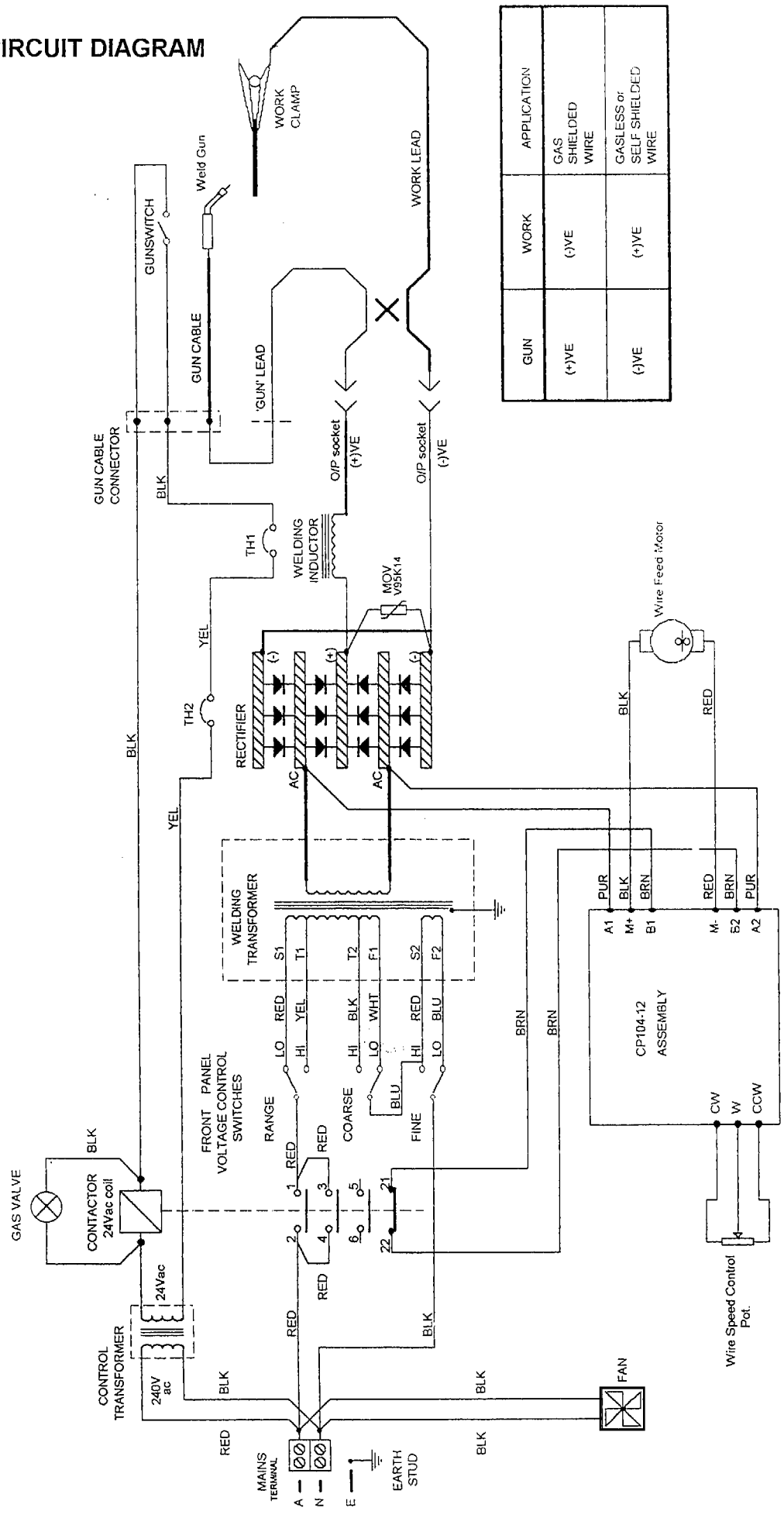

FIGURE 10. WELDMATIC 150S CIRCUIT DIAGRAM

11. PARTS LISTS

WELDMATIC 150S POWER SOURCE CP104-0

ITEM #	PART #	DESCRIPTION
1	CP104-12	Wirespeed PCB Assembly (Remote Pots.)
2	CP104-15	Transformer/Inductance Assembly
Includes		
2.1	CP104-16/2	Thermal Overload
3	CP104-20	Base Assembly
4	CP104-21	Side and Top Cover, Fixed
5	CP104-22	Side cover, Opening
6	CP104-23	Terminal Bracket
8	CP104-31	Support Plate
9	CP104-0/3	Butt Hinge
10	W29-1/20	Slam Catch
11	S140-0/1	Handle
12	CP103-28	Axle
13	CP103-29	Spool Adaptor
14	AM133-3	'R' Clip
15	AM133-2	Thrust Washer
16	CP27-0/15	Fan and Motor
17	CP101-0/17	Finger Guard
18	CP104-0/2	Rectifier
19	AM152-11/2	Control Transformer
20	CP103-0/3	Contactor 24V
21	MK6/2	Terminal Block
22	MC66-0/8	Flex and Plug, 15A
23	MC84-2/1	Cable Clamp
24	HF200-1/15	Mounting Foot
25	H285	Earth Tab
26	H774	Cup Terminal
27	H774W	Washer
28	CP103-0/4	Switch
29	K28	PCB Standoff Mount
30	W5-10/19	Potentiometer Knob
31	W26	Motor and Two Roll Drive
32	TC396-1/1	Plastic Moulding
33	TC396-1/2	Central Adaptor
34	TC396-7/1	Adaptor Stem
35	TC396-1/8	Power Clamp
36	TC396-7/2	Guide Tube
37	CP104-0/1	Gas Valve 24 V AC
38	W11-11/1	Hose Barb
39	HOS5R	Gas Hose
40	OCL13	'O' Clip 13mm
41	OCL8	'O' Clip 8mm
42	SA32-0/1	Twistlock Plug
43	SA140-0/2	Twistlock Socket
44	CABW10	Welding cable $10mm^2$
45	CLG300	Work Clamp
46	BEXT2-4E210AE	Gun and Cable Assembly
47	GW251190	Gas Regulator & Flow Gauge
48	CP104-26	Loom Assembly
49	CP101-0/20	Nut

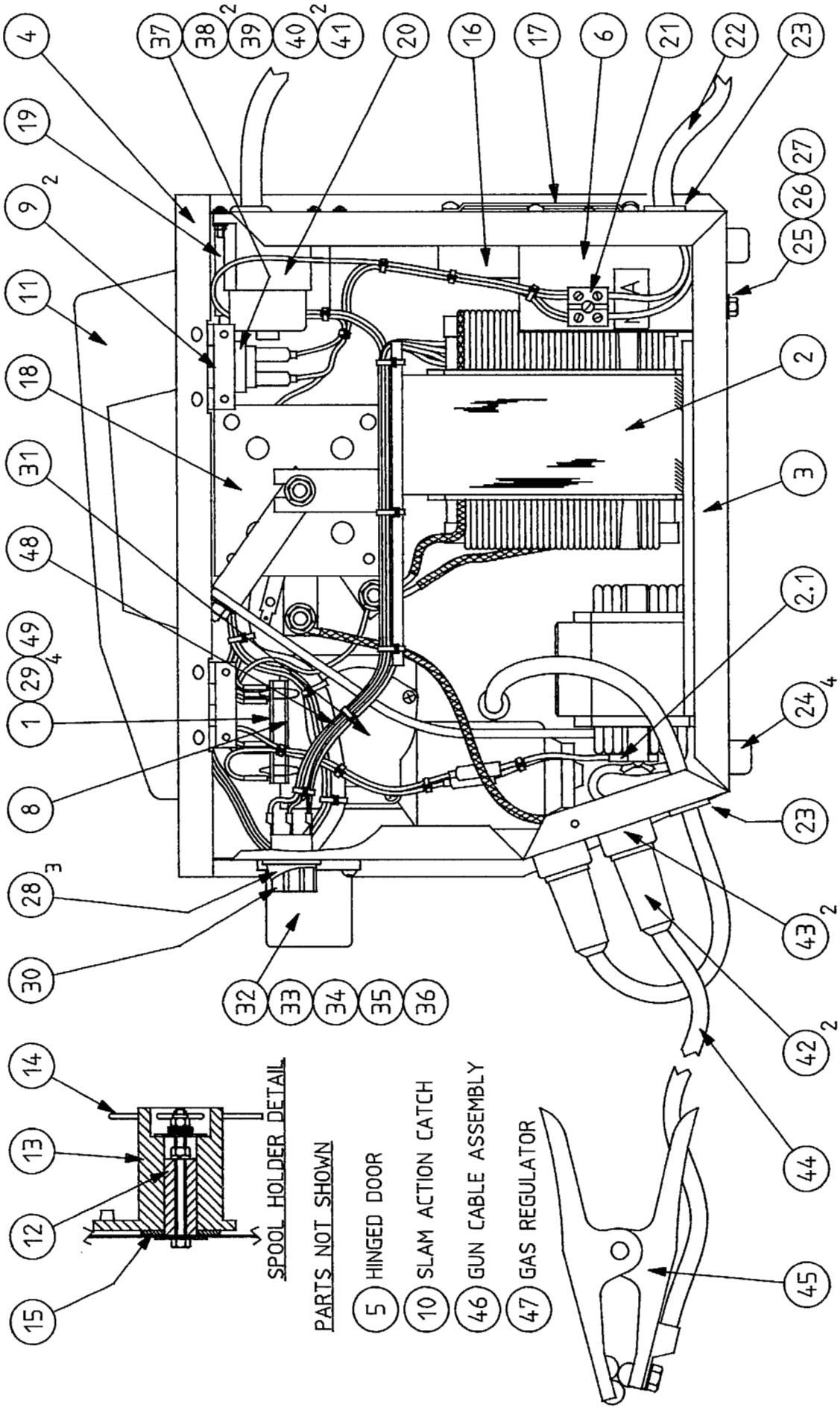

FIGURE 11. WELDMATIC 150S POWER SOURCE ASSEMBLY

BEXT2-4E210AE GUN ASSEMBLY

1	BE4392	Nozzle
2	BE7497	Contact tip 0.6mm
	BE7488	Contact tip 0.8mm
	BE7489	Contact tip 0.9mm
	BE7490	Contact tip 1.2mm
3	BE4335	Head
4	BE4323R	Cap
5	BE4780	Nut Insulator
6	BE1370117	Insulator
7	BE1370116	Body Tube
8	BE1780006	Handle Kit
9	BE5662	Trigger
10	BE1880004	Screw Kit
14	BE8681TE	Cable 3m.
15	BE4E213B	End Fitting
16	BE4305	Cone Nut
17	BE2660001	Terminal
18	BE1520008	Clamp
19	BE2520017	Strain Relief, flexible
20	BE1470007	Bushing
21	BE1880135	Strain Relief, rigid
22	BE2280002	Screw
23	BE4932	Butt Connector
24	BE4816	Nut
25	BE5060	Euro Block
26	BE4421	'O' Ring
27	BE43110	Liner 0.9 - 1.2mm

To replace liner: Disconnect gun cable assembly from the euro adaptor on the machine case, remove nozzle (1) and head (3). Withdraw old liner from the wire feeder end. Insert new liner and refit gun cable assembly to Euro adaptor on the machine case. At the gun end, compress the liner within the gun cable, then cut it one contact tip length past the end of the body tube (7). Refit head, tip and nozzle.

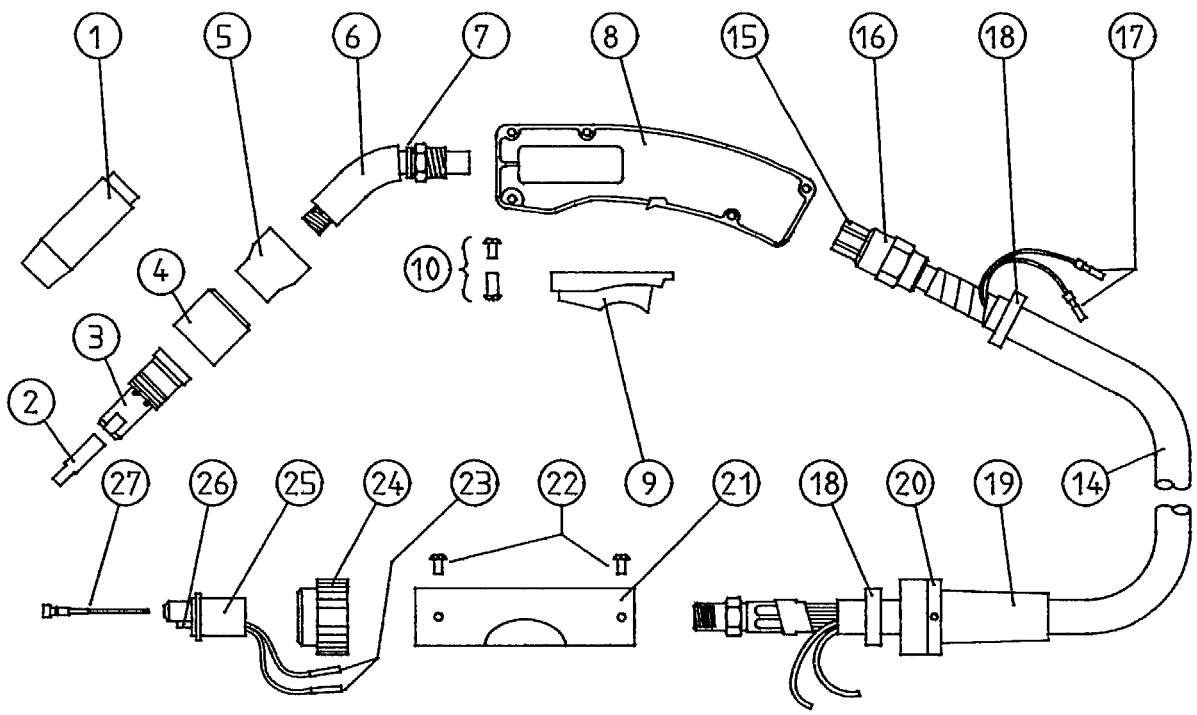

FIGURE 12. BEXT2-4E210AE GUN & CABLE ASSEMBLY

W26 MOTOR & TWO ROLL DRIVE ASSEMBLY

ITEM #	PART #	DESCRIPTION
1	W26-0/1	Motor and Gearbox
2	W26-0/3	Screw M6x12
3	W26-0/4	Key
4	W26-0/5	Nut M5
5	W26-0/6	Feed Plate
6	W26-0/7	Screw M5x10
7	W26-0/8	Feed Roll 0.6mm/0.8mm
Alternatives		
	W26-5/8	Feed roll 0.9mm/1.2mm
	W26-6/8	Feed Roll 1.2mm/(1.6)mm (knurled)
8	W26-0/9	Screw
9	W26-0/10	Axle Shoulder Screw
10	W26-0/11	Pressure Spring
11	W26-0/12	Washer
12	W26-0/13	Inlet Guide
13	W26-0/14	Pressure Screw
14	W26-0/15	Nut M5
15	W26-0/16	Retaining Ring
16	H1972	Quick Connect Lug
17	H1135	Insulating Boot

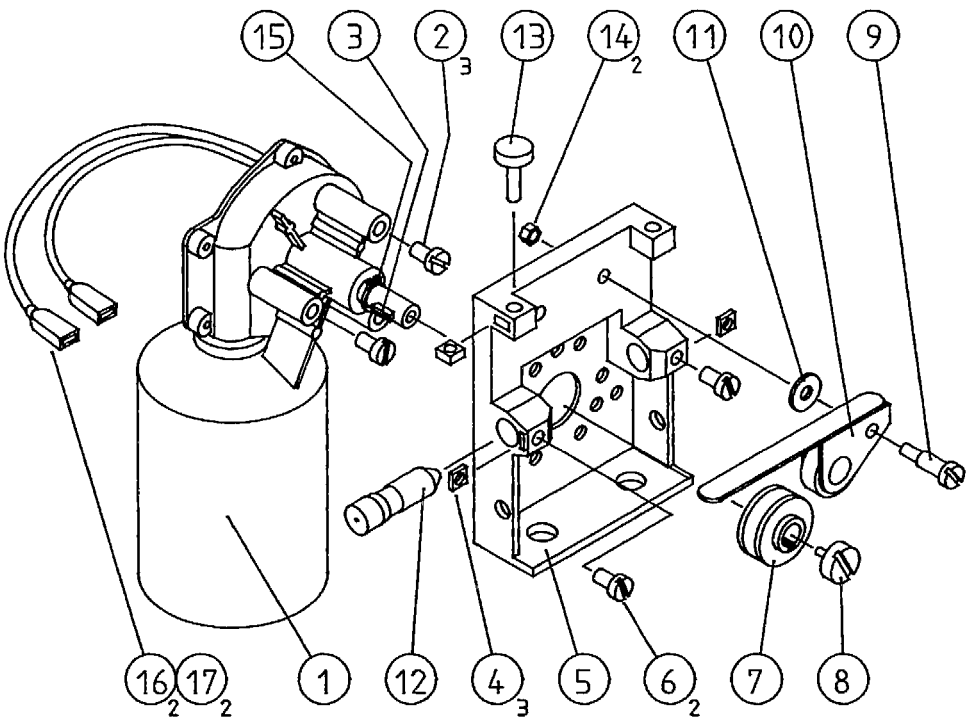

FIGURE 13. W26 TWO ROLL DRIVE ASSEMBLY

12. SAFE PRACTICES IN USING WELDING EQUIPMENT

These notes are provided in the interests of improving operator safety. They should be considered only as a basic guide to Safe Working Habits. A full list of Standards pertaining to industry is available from the Standards Association of Australia, also various State Electricity Authorities, Departments of Labour and Industry or Mines Department and other Local Health or Safety Inspection Authorities may have additional requirements. WTIA Technical Note TN7-98 also provides a comprehensive guide to safe practices in welding.

EYE PROTECTION

NEVER LOOK AT AN ARC WITHOUT PROTECTION. Wear a helmet with safety goggles or glasses with side shields underneath, with appropriate filter lenses protected by clear cover lens. This is a MUST for welding, cutting, and chipping to protect the eyes from radiant energy and flying metal. Replace the cover lens when broken, pitted, or spattered.

Recommended shade filter lens.

Amps	TIG	MMAW	MIG	Pulsed MIG
0-100	10	9	10	12-13
100-150	11	10	10	12-13
150-200	12	10-11	11-12	12-13
200-300	13	11	12-13	12-13
300-400	14	12	13	14
400-500	--	13	14	14
500 +	--	--	14	14

BURN PROTECTION.

The welding arc is intense and visibly bright. Its radiation can damage eyes, penetrate lightweight clothing, reflect from light-coloured surfaces, and burn the skin and eyes. Burns resulting from gas-shielded arcs resemble acute sunburn, but can be more severe and painful.

Wear protective clothing - leather or heat resistant gloves, hat, and safety-toe boots. Button shirt collar and pocket flaps, and wear cuffless trousers to avoid entry of sparks and slag.

Avoid oily or greasy clothing. A spark may ignite them. Hot metal such as electrode stubs and work pieces should never be handled without gloves.

Ear plugs should be worn when welding in overhead positions or in a confined space. A hard hat should be worn when others are working overhead.

Flammable hair preparations should not be used by persons intending to weld or cut.

TOXIC FUMES.

Adequate ventilation with air is essential. Severe discomfort, illness or death can result from fumes, vapours, heat, or oxygen depletion that welding or cutting may produce. NEVER ventilate with oxygen.

Lead, cadmium, zinc, mercury, and beryllium bearing and similar materials when welded or cut may produce harmful concentrations of toxic fumes. Adequate local exhaust ventilation must be used, or each person in the area as well as the operator must wear an air-supplied respirator. For beryllium, both must be used.

Metals coated with or containing materials that emit fumes should not be heated unless coating is removed from the work surface, the area is well ventilated, or the operator wears an air-supplied respirator.

Work in a confined space only while it is being ventilated and, if necessary, while wearing air-supplied respirator.

Vapours from chlorinated solvents can be decomposed by the heat of the arc (or flame) to form PHOSGENE, a highly toxic gas, and lung and eye irritating products. The ultra-violet (radiant) energy of the arc can also decompose trichlorethylene and perchlorethylene vapours to form phosgene. Do not weld or cut where solvent vapours can be drawn into the welding or cutting atmosphere or where the radiant energy can penetrate to atmospheres containing even minute amounts of trichlorethylene or percholorethylene.

FIRE AND EXPLOSION PREVENTION.

Be aware that flying sparks or falling slag can pass through cracks, along pipes, through windows or doors, and through wall or floor openings, out of sight of the operator. Sparks and slag can travel up to 10 metres from the arc.

Keep equipment clean and operable, free of oil, grease, and (in electrical parts) of metallic particles that can cause short circuits.

If combustibles are present in the work area, do NOT weld or cut. Move the work if practicable, to an area free of combustibles. Avoid paint spray rooms, dip tanks, storage areas, ventilators. If the work can not be moved, move combustibles at least 10 metres away out of reach of sparks and heat; or protect against ignition with suitable and snug-fitting fire-resistant covers or shields.

Walls touching combustibles on opposite sides should not be welded on or cut. Walls, ceilings, and floor near work should be protected by heat-resistant covers or shields.

A person acting as Fire Watcher must be standing by with suitable fire extinguishing equipment during and for some time after welding or cutting if;

- Combustibles (including building construction) are within 10 metres.
- Combustibles are further than 10 metres but can be ignited by sparks.
- Openings (concealed or visible) in floors or walls within 10 metres may expose combustibles to sparks.
- Combustibles adjacent to walls, ceilings, roofs, or metal partitions can be ignited by radiant or conducted heat.

After work is done, check that area is free of sparks, glowing embers, and flames.

A tank or drum which has contained combustibles can produce flammable vapours when heated. Such a container must never be welded on or cut, unless it has first been cleaned as described in AS.1674-1974, the S.A.A. Cutting and Welding Safety Code. This includes a thorough steam or caustic cleaning (or a solvent or water washing, depending on the combustible's solubility), followed by purging and inerting with nitrogen or carbon dioxide, and using protective equipment as recommended in AS.1674-1974. Water-filling just below working level may substitute for inerting.

Hollow castings or containers must be vented before welding or cutting. They can explode. Never weld or cut where the air may contain flammable dust, gas, or liquid vapours.

SHOCK PREVENTION.

Exposed conductors or other bare metal in the welding circuit, or ungrounded electrically alive equipment can fatally shock a person whose body becomes a conductor. Ensure that the machine is correctly connected and earthed. If unsure have machine installed by a qualified electrician. On mobile or portable equipment, regularly inspect condition of trailing power leads and connecting plugs. Repair or replace damaged leads.

Fully insulated electrode holders should be used. Do not use holders with protruding screws. Fully insulated lock-type connectors should be used to join welding cable lengths.

Terminals and other exposed parts of electrical units should have insulated knobs or covers secured before operation.