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DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL

DS AND GS MAINTENANCE MANUAL

WELDING SET, ARC

INERT GAS SHIELDED, AIR COOLED

METAL LINED GUN FOR 3/64 IN. WIRE

(WESTINGHOUSE MODEL SA-136)

FSN 3431-121-5878

This copy is a reprint which includes current pages from Change 1.

HEADQUARTERS, DEPARTMENT OF THE ARMY

6 AUGUST 1969

SAFETY PRECAUTIONS

BEFORE OPERATION

Remove dirt, grease and any combustible material from the pieces to be welded as well as the area where the welding operation is to take place.

Wear approved protective clothing and eye protection.

Insure the welding area is adequately ventilated.

Argon gas cylinders must not be grounded, but should be secured to prevent damage to valves resulting from tanks being toppled.

Wipe all surfaces to be welded clear of solvents before welding.

DURING OPERATION

Wear approved protective clothing and eye protection.

Insure the welding area is adequately ventilated.

Argon gas cylinders must not be grounded, but should be secured to prevent damage to valves resulting from tanks being toppled.

Operate welding set with power source on "REVERSE POLARITY" only to avoid “burn back.”

AFTER OPERATION

Argon gas cylinders must not be grounded, but should be secured to prevent damage to valves resulting from tanks being toppled.

Change No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., *27 June 1973*

Operator's, Organizational, Direct Support, and General Support Maintenance Manual
WELDING SET, ARC, INERT GAS SHIELDED, AIR COOLED, METAL LINED GUN FOR 3/64 IN. WIRE (WESTINGHOUSE MODEL JA-136)
FSN 3431-121-5878

TM 5-3431-227-14, 6 August 1969, is changed as follows:
Page A-1. Appendix A is superseded as follows:

APPENDIX A
BASIC ISSUE-ITEMS-LIST-AND ITEMS TROOP INSTALLED OR AUTHORIZED LIST

Section I. INTRODUCTION

A-1. Scope

This appendix lists items required by the operator for operation of the arc welding set.

A-2. General

This list is divided into the following sections:

a. Basic Issue Items List - Section II. Not applicable.

b. Items Troop Installed or Authorized List - Section III. A list of items in alphabetical sequence, which at the discretion of the unit commander may accompany the arc welding set. These items are NOT SUBJECT TO TURN-IN with the arc welding set when evacuated.

A-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items List, Section II, and Items Troop Installed or Authorized List, Section III.

a. Source, Maintenance and Recoverability Code(s) (SMR): (Not applicable).

b. Federal Stock Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the Federal item name and any additional description of the item required.

d. Unit of Measure (U/M). A two character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft. ea, pr, etc.

e. Quantity Furnished with Equipment (BIIL). (Not applicable).

f. Quantity Authorized (Items Troop Installed or Authorized). This column indicates the quantity of the item authorized to be used with the equipment.

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) SMR code	(2) Federal stock number	(3) Description: Ref. No & Mfr code	(3) Description: Usable on code	(4) Unit of meas	(5) Qty auth
	7520-559-9618	Case, Maintenance and Operational Manuals		EA	1

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:
VERNE L. BOWERS
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The Adjutant General

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HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C. 6 August 1969

Operator, Organizational, Direct Support And General Support Maintenance

WELDING SET, ARC, INERT GAS SHIELDED, AIR COOLED, METAL LINED GUN FOR 3/64 IN. WIRE (WESTINGHOUSE MODEL JA-136) FSN 3431-121-5878

INTRODUCTION

The Arc Welding Set, Model SA-136 is designed for consumable electrode inert-gas shielding welding. It incorporates a well-balanced handgun and a control with a built-in contactor. The system is designed for semi-automatic welding of aluminum with aluminum wire sizes from .030 to 3/64 inch diameters. It is rated 200 amperes continuous duty and is air-cooled. (Numbers in parentheses indicate item numbers on referenced drawings.)

DESCRIPTION

Control Monitor

The Control Monitor as shown on Figure 1. is light weight, fully insulated, and compact.

The Control Monitor operates from a 115 volt A.C. or D.C. power supply which is necessary for the operation of the control and inching circuits. The power for the gear-head drive motor during the welding operation is supplied by the welding machine. The motor armature is said to be "across the arc". This is accomplished by attaching the terminal of the ground cable (4) to the negative lug of the welder and the terminal of the current cable (12) to the positive lug of the welder.

A rheostat (1) in series with the motor armature is adjusted to control the wire feed speed and the arc length. The rheostat setting will vary with different welding machines and is dependent on the current setting of the welder. The fact that the wire feed drive operates from the arc voltage is important, because it insures good steady feeding consistent with constant arc length. It is based on the following principle of operation: If the arc length increases, the voltage across the arc becomes higher, and as a result the motor speed increases thereby feeding more wire and shortening the arc length. If the arc length shortens, the voltage across it is lower and the motor speed decreases thereby increasing the arc length. The rheostat type control will permit approximately a 2 to 1 speed adjustment.

An "On-Off" switch (2) energizes the control monitor while renewable fuses (6) protect the line. The power supply cord (3) is a 16 foot cable terminated in a three-prong plug with a three to two wire plug adaptor. A replaceable fuse (7) in series with the wire drive motor protects the armature from damage due to high current. This is a one ampere fuse and should not be replaced with a larger fuse. The use of a larger than recommended fuse automatically voids the warranty on this equipment. The line fuses (6) should be 2 ampere fuses.

The Control Monitor has a current relay which permits touch starts. The minimum current required to operate the relay is approximately 45 amperes. A 200 ampere D.C. contactor (9) is mounted in the control enclosure and is controlled from the control panel (8).

Type SP-4B Welding Gun

The Type SP-4B welding gun is shown on Figure 2. Good balance and ease of handling have been accomplished by careful distribution of weight and by directing the control cable, power cable, and gas hose downward from the body of the gun. The weight of the gun including a one-pound spool of welding wire is less than four pounds.

A spring return weld trigger (16) and recessed inch button (17) are located in the handle of the gun. All electrical connections from the gun to the control monitor, except for welding current connections are made through the control cable (12) which plugs into a matching socket on the control monitor. Figure 3, showing internal wiring of the gun, is included with this booklet.

Welding current is brought to the gun by a 50 foot insulated copper cable (25) that plugs into the control monitor by means of an insulated plug. A 60 foot gas hose (1) is used to carry the shielding gas from the gas regulator at the shielding gas supply. All cables and hoses to the gun are tied together into one assembly.

The gun is equipped with a gear head wire drive motor (11) mounted in the handle. Wire driving force is developed by squeezing the welding wire between a knurled feed roll (2) mounted on the end of the gear head motor shaft and an idler roll (19) mounted on the swing arm (15). Squeezing force on the wire is obtained by turning the wire pressure screw (18) which exerts pressure on the swing arm through a compression spring (20).

A four inch diameter spool of wire (13) is mounted on the wire spool shaft (23). An adjustable spool brake (26) provides a controlled amount of friction to prevent uncoiling of the wire. The wire spool is covered by a transparent high impact plastic shield (9) attached to the spool shaft by means of a captive thumb screw. This shield protects the wire from spatter, yet, because of its transparency, allows the operator to determine the amount of wire on the spool. The spool shaft is mounted on an electrically insulated aluminum protective shield (28).

The guide tube (5) is an expendable copper tube which conducts welding current to the welding wire as the wire slides through it. Position of the guide tube relative to the end of the gas nozzle (8) can be changed by releasing the insulated set screw knob (14). For 3/64 and .040 diameter welding wires, the end of the guide tube should be about 1/8 to 1/4 of an inch behind the front end of the nozzle. For smaller wires, the tip of the guide tube should be even with or slightly ahead of the nozzle. Always use the guide tube specified for the particular welding wire.

The gas nozzle (8) is specifically designed to completely exclude air from the weld zone by proper direction of the shielding gas. For optimum gas flow, the internal surface of the nozzle should be kept reasonably clear of weld spatter by periodic cleaning. This nozzle may require occasional replacement and is easily removable.

The nozzle holder (29) is made of stainless steel and has a finger type holding arrangement to permit easy removal of the nozzle yet provide positive holding pressure.

The REGULATOR-VICTROMETER combination provides a compact unit assembly for accurate regulation and measurement of gas flow. They are especially suited for applications such as laboratory work, gas shielded arc welding, and a variety of industrial applications.

TWO-STAGE REGULATION. The Victor HVTS 2325, Two-Stage Regulator provides constant delivery pressure to the VICTROMETER and readjustment of the VICTROMETER is not required, from full to almost empty cylinder contents.

INSTALLATION

Receiving

Immediately upon receipt of the equipment, make a careful examination for evidence of damage encountered in transit.

Do not discard any packing material without first checking it for small accessory items.

The gas hose, electrical control cable, and welding power cable are connetted to the gun. A guide tube and nylon guides for 3/64 diameter wire are included in the gun. Uncoil the cables and hose in preparation for connecting them to the control.

Location

The control monitor should be installed so that all parts of the work piece to be welded can be reached with a minimum of effort. Approximately 50 feet of cable and hose are supplied with the gun. The control unit should be located so no sharp kinks or bends are made in the gas hose. Care should be taken to avoid dragging the cable or hose over hot work.

The distance from the welding machine to the control is not critical and is limited only if the voltage drop due to the length and size of the cable prevents stable welding conditions. The 115 volt supply cable may be extended as required, within reasonable limits.

It is usually best if the control is placed as close to the work piece as is practical, therefore making it easy for the operator to make adjustments in the wire feed speed as required.

Connections

Refer to Figure 4. Numbers on drawing refer to the paragraph number in the following installation instructions:

1. Attach the Regulator and Flowmeter to a cylinder of pure argon by threading nut on regulator-flowmeter to matching threads on cylinder. Tighten nut to prevent gas leaks. Gas cylinder is not part of welding set.

2. Attach nut on gas hose from welding gun to the matching threads on the outlet side of regulator-flowmeter and tighten to prevent gas leaks.

3. Insert plug on the end of the current cable from welding gun into the matching receptacle on the control monitor. This plug is keyed and must be rotated to the proper position before inserting. After inserting plug, turn plug 1/4 turn clockwise to lock in place.

4. Insert plug on end of control cable from welding gun in matching receptacle on the control monitor. This plug is also keyed and must be rotated to the proper position before inserting. After the plug is lined up properly with receptacle, gently work plug into socket and tighten retaining ring.

5. Attach current cable from control monitor to the positive (+) output terminal of the welding power supply. This cable includes a large terminal for connection to the positive (+) output terminal. Since this welding set may be used with various types of welding power supplies, some adaption to make this connection may be required. However, a tight connection is required. On welding power supplies which include a polarity switch, this cable should be attached to the terminal marked electrode and the polarity switch should be placed in the “Reverse Polarity” position.

   CAUTION: Operate the welding set with the welding power source set on “Reverse Polarity” only. If set on "Straight Polarity”, the flow of current will reverse, the wire feed motor will run in reverse, pulling the wire back into the gun, and a very severe “burn back” will result.

6. Attach one end of ground cable and the ground cord from the control monitor to the negative terminal of the welding power supply. This must be a tight connection. On welding power supplies with a polarity switch, these leads are connected to the “Work” terminal. Connections should be tight.

7. Connect the other end of the ground cable to the workpiece or material to be welded. This must be a tight connection.

8. Connect the line cord to a 110 to 125 volt AC or DC supply. This cord is equipped with a standard 3-prong plug. For connection to a 2-prong supply, an adaptor is provided. Where used, the screw on the side of the adaptor should be connected to the frame of the welding machine with a short piece of wire.

Wire Threading (Figure 2.)

Place a spool of welding wire on the spool shaft (23) so the free end will pay-off from the top into the rear nylon bushing (4). Loosen the wire pressure thumb screw (18) and open the swing arm (15). Push the free end of the wire through the rear nylon bushing (4), through the front nylon bushing (3), and into the guide tube (5). With the welding set connected according to the "Connection" instruction above and the line cord connected to a 115 V AC or DC supply, turn the system on by throwing the "ON-OFF" switch (2 of Figure 1).

Close the swing arm (15) and tighten the adjusting screw (18) until there is just sufficient pressure to prevent the wire from slipping when the inch switch (17) is pushed. Too much pressure on the adjusting screw will overload the motor and cause erratic welding action. Too little pressure will allow slippage and cause "burn-backs" while actually welding. If the wire is threaded properly and the adjusting nut is adjusted for the right pressure, the wire should feed freely from the guide tube. Now replace the plastic spool cover (9) over the spool.

A "burn-back" is a condition where the electrode fuses or melts into the front end of the guide tube. It is the result of improper adjustment of the welding set, such as improper current adjustment at the power supply, improper swing arm pressure, improper adjustment of the rheostat on the control monitor, loose connections, welding power source, set on Straight Polarity, etc.

Welding

1. Adjust the current control on the welder to the required output current.
2. To adjust the gas flow, first turn on the gas supply by turning on the main valve at the top of the gas cylinder. Being careful not to touch the wire to the workpiece, pull the weld trigger and hold; at the same time adjust the gas regulator by turning the flow adjustment shown on Figure 4 to the required gas flow. As a starting point adjust the flow to 35 cubic feet/hour. This is indicated when the top of the ball in the flowmeter reaches the calibration marked 35. An increase or decrease may be required after welding conditions are established.
3. Adjust the position of the wire to protrude 1/2 to 3/4 of an inch beyond the end of the nozzle by pressing the inch button.
4. Turn the rheostat knob (1) on the control monitor to maximum.
5. With the wire near the work, but not touching, lower the head shield, pull the weld trigger and bring the wire into contact with the workpiece. An arc will form and the wire will begin to feed.
6. With the wire feed speed knob on the control monitor adjusted near maximum as described in paragraph 4, the arc will probably be too short and the wire will stub, causing considerable spatter. Decrease the setting of the wire feed control until the proper arc length is accomplished. This is usually

the point where the crackling sound of the arc just disappears. With this welding control system, the dial setting affects arc length by changing electrode wire feed speed at a given welding power supply current setting. Increasing the setting of the dial will shorten the arc.

7. To stop the weld, release the trigger. Do not whip the gun away from the work before releasing the trigger to break the arc as this will cause excessive wire stick-out. CAUTION: Breaking the arc manually (by whipping the gun away from the work with the trigger depressed) will cause a current surge to the wire feed motor. Repeated practice will result in a blown motor fuse (1 Amp) and can cause motor burn out.

Wire Current Ranges

The following is a table of approximate current and voltage ranges of various types and sizes of wire for spray transfer operation:

Wire	Alloy	Diameter	Welding Current Range	Arc Voltage Range
Aluminum	AL-1100 & 4043	3/64	130-225	19-23
Aluminum	AL-11OO & 4043	.040	120-210	18-23
Aluminum	AL-5154, 5254 & 5356	3/64	130-225	19-23

Welding Techniques

After the operator has found the desired current and arc length settings for a particular joint, it is still necessary that he observes some elementary principles of technique.

1. Nozzle Spacing

   In general, the gas nozzle should be kept as close to the work as is practical. In most cases, a distance of 3/8 - 5/8 of an inch is correct. If the nozzle is too close a burn-back may result. With the nozzle too far away, a poor weld results.

2. Gun Angle

   Best cleaning action of the weld area is obtained and porosity-free welds made by using a forehand technique. For example, a horizontal fillet between two plates at a 90° angle is best made by holding the gun at an angle of 40° to 50° with the horizontal and 20° to 25° forehand angle. A right-handed welder will then weld from right to left on a horizontal fillet weld with the nozzle pointed slightly toward the direction of travel.

3. Travel speed will determine, to a great extent, the size of the bead deposited. The work piece thickness, in turn, will determine the rate of travel, bead size, and the current required to make the weld. Too high a current will melt through the plate.

4. Cleanliness of Material

   It is essential that aluminum be welded only when clean. To insure porosity-free welds, a cleaning operation should immediately precede the welding operation. Several organic solvents are now on the market for this purpose, or the work may be brushed with a stainless steel brush.

5. Wire Cleanliness

   Wire should be clean and free from oxide, grease, and other foreign material. Do not try to use wire that is not clean. Wire which is not in use should be kept in a container which will protect it from all forms of foreign material.

High Frequency Precautions

The control monitor should never be connected to a welder at the same time the welder is being used on high frequency as the motor will burn-out instantly. Neither the ground clamp nor the electrode lead should ever connect to a welder which is supplying welding current and high frequency to a tungsten arc torch or any other process requiring high frequency. Evidence of failure due to high frequency automatically voids the warranty on this equipment.

MAINTENANCE

Operating Maintenance

Gun

As the gun is used, some spatter will collect on the end of the guide tube and inside the nozzle. This can easily be removed by a screwdriver, knife, or other similar instrument. Spatter which may collect inside the gun barrel should be removed occasionally to prevent a short between the nozzle and guide tube. Shorts as described above are apt to cause the nozzle to burn up when accidentally touched to the work piece.

If the guide tube should become bent, replace with a new guide tube. Should a burn-back occur, do not try to inch the wire, since this may blow the fuse in the motor circuit. In the event of a burn-back, loosen the knurled knob which holds the guide tube and press the inch switch to push the guide tube and wire out of the gun. Cut off the wire about an eighth of an inch from

the rear of the guide tube. Hold the guide tube perpendicular to a steel plate or other hard, flat object and strike the end of the wire on the plate. If this does not free the wire, cut off the melted section of the guide tube, to free the wire. Remove the burr and put the tube back into the gun, maintaining the proper distance from the nozzle to the end of the guide tube. A tube may be trimmed about 3/8 of an inch before it becomes too short and must be discarded.

The gas holes in the gun barrel may become clogged with a white residue, which will eventually obstruct the gas flow. It is a good idea to dismantle the gun every 100 hours and blow out these gas holes with a high pressure air hose.

Care should be taken to see that the front nylon guide bushing (3) does not become damaged to the extent that the shielding gas is wasted by excessive leakage back into the drive roll cavity of the main casting.

Control

The control monitor, under normal operating conditions, needs no maintenance. The control door can be opened by twisting the screw latch.

Preventive Maintenance

Daily

1. Regulator and Flowmeter - Inspect for leaks and improper operation.

2. Welding Gun - Inspect for leaks and improper operation. Clean spatter from nozzle. Replace nozzle if damaged in such a way that gas flow from nozzle is changed. Inspect guide tube for damage such as burrs or melted weld metal adhering to end. Replace guide tube if beyond repair.

   Inspect front nylon bushing for excessive wear and replace if necessary.

Quarterly

1. Argon Gas Regulator - Inspect for cracks, leaks, and improper operation.

2. Hose and Cable Assemblies - Inspect for worn, frayed, and other damaged conditions. Inspect for loose connections on the hose and electrical cables.

3. Contactor - Inspect for defective wiring. Test the contactor for improper operation.

4. Solenoid Valve - Inspect for leaks and loose electrical connections. Test for improper operation.

5. Welding Gun - Inspect for cracks, leaks, loose hose, and electrical connections; the nozzle, adapter, guide tube, gun tube, and gun barrel for weld spatter, and obstructions.

6. Fuse and Fuse Holders - Inspect for damaged holders, loose electrical connections, and for defective or missing fuses.

7. Controls - Inspect the controls for damage. With the unit operating, inspect for improper operation.

TROUBLE SHOOTING

	Malfunction	Possible Cause	Corrective Action
1.	Frequent “Burn-back” (The term is described in the section on “Operation”)	Electrode wire speed through gun too slow.	Increase dial setting on control monitor.
2.	Same as 1 above.	Welding power supply current setting too high.	Reduce current setting on Welding power supply. Repair or replace guide tube as described under Operating Maintenance.
3.	Same as 1 above.	Poor cable connection.	Check all cable connections for tightness.
4.	Same as 1 above.	Ground cord from control monitor to negative terminal of welding power supply not connected or broken(possibly internally especially at terminal.)	Connect ground cord as shown in section on Connections or check for breaks. Repair or replace guide tube as as described under Operating Maintenance.
5.	Same as 1 above.	1 Amp Fuse in control monitor blown.	Replace fuse.
6.	Same as 1 above.	Electrode wire feed through welding gun obstructed.	Check for burrs in guide tube, make sure swing arm spring pressure is adjusted properly. Check for excessive breaking on electrode wire spool. Repair or replace guide tube as described under Operating Maintenance.

	Malfunction	Possible Cause	Corrective Action
7.	Extremely black deposits on weld and lack of fusion to base metal.	Inadequate shielding gas coverage or moisture in weld area or dirty electrode wire.	Check to make sure gas is turned on, properly adjusted. Can be caused by moisture in gas. Try another gas cylinder. Check hoses and welding gun for moisture. Check electrode wire for moisture and dirt.
8.	1 Amp Fuse blows.	Burn-back at guide tube in gun or electrode wire obstruction.	Check guide tube for burn-back. Check above for cause of burn-back. Check for wire obstructions.
9.	2 Amp Fuse blows as soon as line switch is closed.	Rectifier 1REC or capacitor 5CAP shorted.	With control monitor disconnected from 115 volt supply, check rectifier and capacitor for shorts.
10.	Inching speed too slow.	Resistor 2RES improperly adjusted or electrode wire feed obstruction.	Adjust slides on 2RES toward right end of resistor. Check for electrode wire obstructions.

SAFETY PRECAUTIONS

Inert-gas metal-arc welding processes produce intense visible and ultraviolet radiation and require certain precautions to protect the operator from injury.

For eye protection, welding helmets should have a #10 or #12 shade welding plate. In addition, the operator should wear #2 shade flash goggles with wide side shields under the helmet.

The skin should be completely covered. Leather gloves are recommended for hand protection. Heavy, dark-colored clothing should be worn to prevent radiation from penetrating to the skin or from reflecting onto the neck under the hood. Light weight leather protective clothing is also recommended because of its durability and resistance to deterioration from the radiation. It should be noted that cotton clothing is subject to rather rapid deterioration.

Adequate ventilation should be provided to remove fumes produced by the process, as set forth in American Standard Z-49.1 on safety in welding.

Inasmuch as vapors from halogenated solvents such as trichloroethylene are decomposed by ultra- violet light to form highly toxic gases, it is recommended that degreasers or other sources of such vapors be so located that the vapors will not reach the welding operation.

Detailed safety practices are given in the publication A6.1-55T on "Recommended Safe Practices for Inert-Gas Metal-Arc Welding", published by The American Welding Society.

Caution to be exercised by operator when adjusting gas pressure regulator and flowmeter:

Do not stand directly in front while adjusting gas flow.

Argon gas cylinder should never be grounded whether it be intentionally or accidentally. Extreme caution should be exercised against accidental grounding against metal tables, steel beams, etc.

The argon gas cylinder should always be tied to a vertical structure or otherwise supported so that it cannot fall over. If the cylinder should fall and break off the top of the cylinder, the cylinder can become a gas propelled projectile due to the gas pressure in the cylinder.

WARNING: The accidental striking of the welding electrode against the compressed gas cylinder could result in a burn-thru of the tank creating a safety hazard.

DIMENSIONS IN INCHES

AC-DC CONTROL - *MONITOR*
OUTLINE

① RHEOSTAT
② ON-OFF SWITCH
③ *POWER SUPPLY*
④ *GROUND CORD*
⑤ RECEPTACLE
⑥ LINE FUSES
⑦ MOTOR FUSE
⑧ CONTROL PANEL
⑨ CONTACTOR
⑩ TERMINAL STRIP
⑪ RESISTOR (2 RES)
⑫ CURRENT CABLE
⑬ *CONTROL CABLE RECEPTACLE*

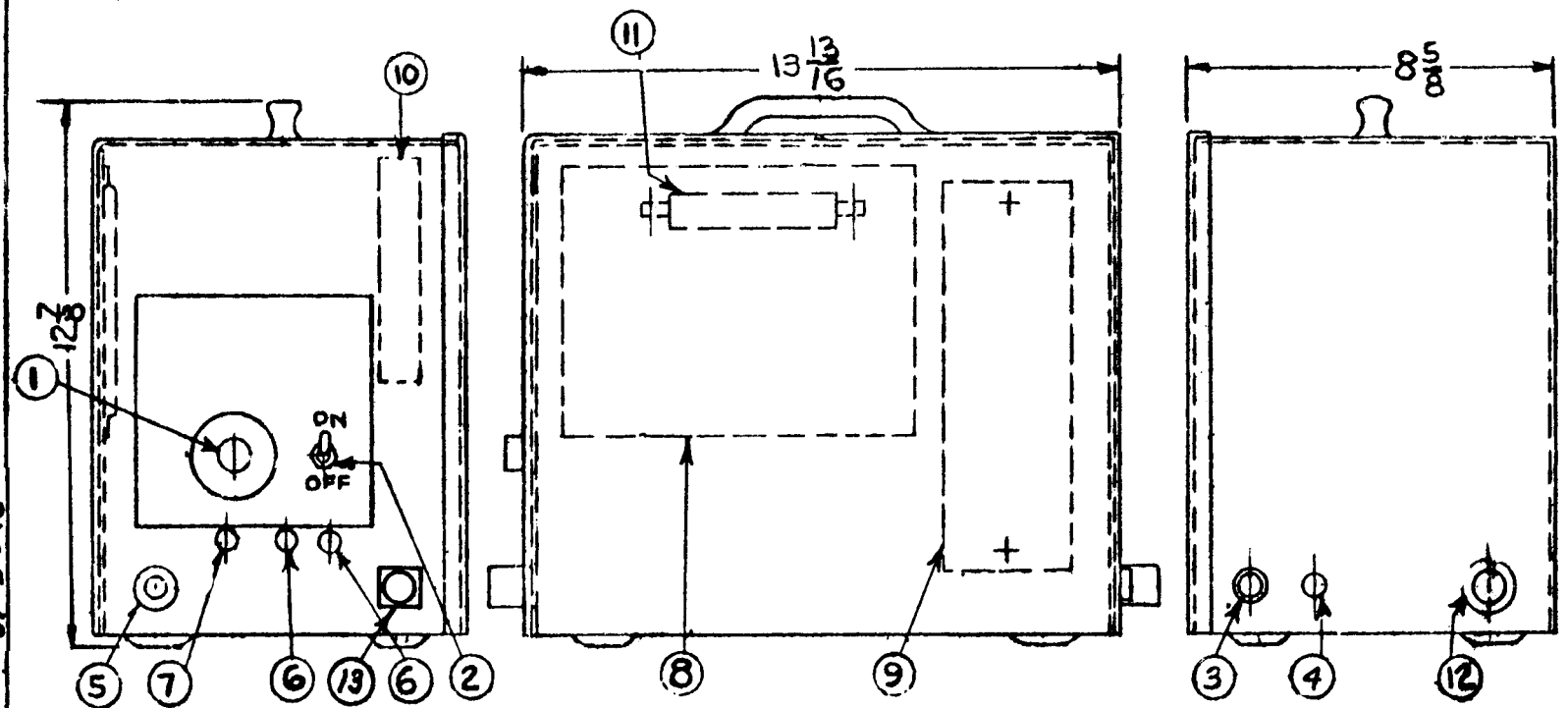

Figure 1. AC-DC Control Monitor Outline.

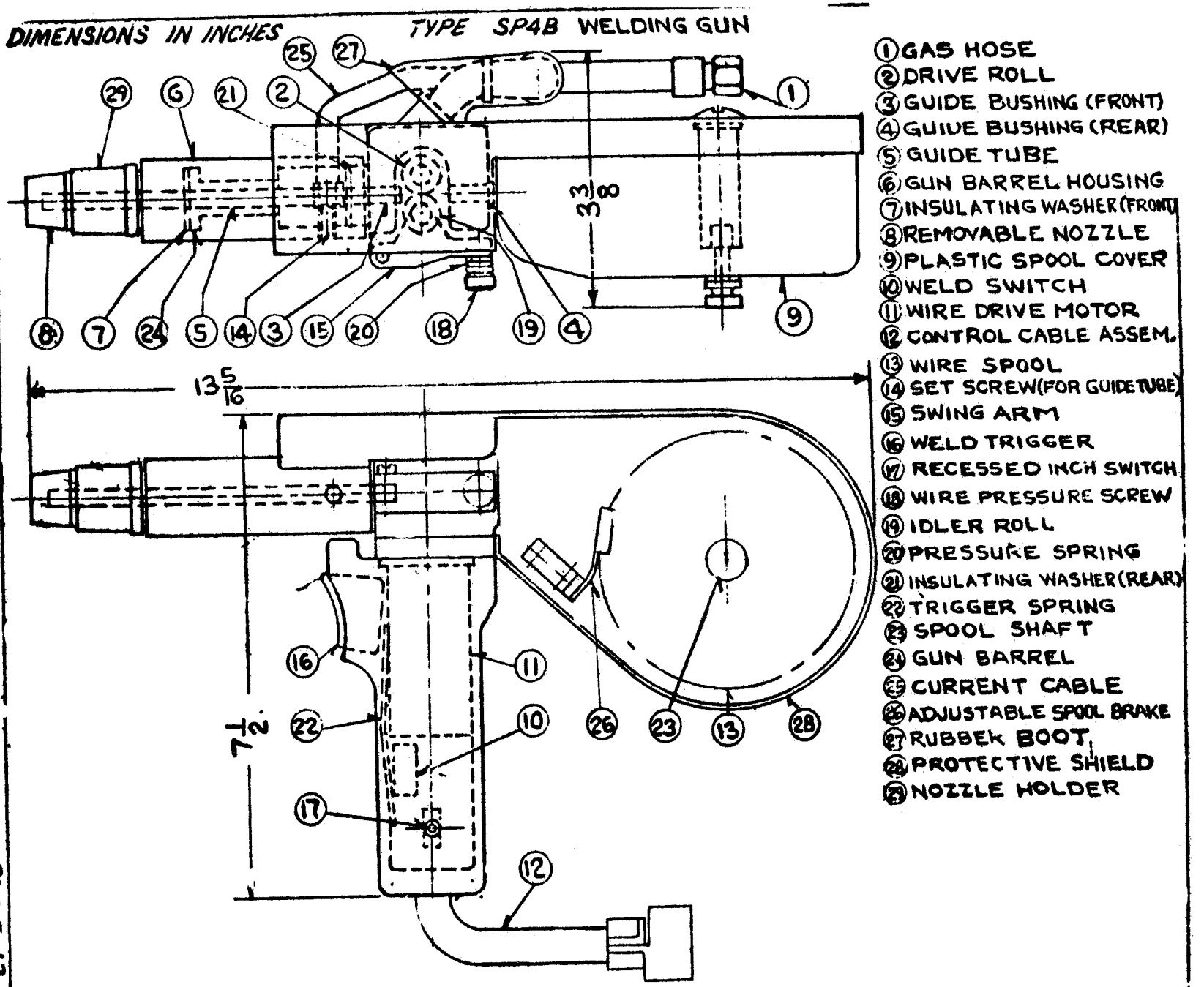

Figure 2. Welding Gun, TYPE SP4B.

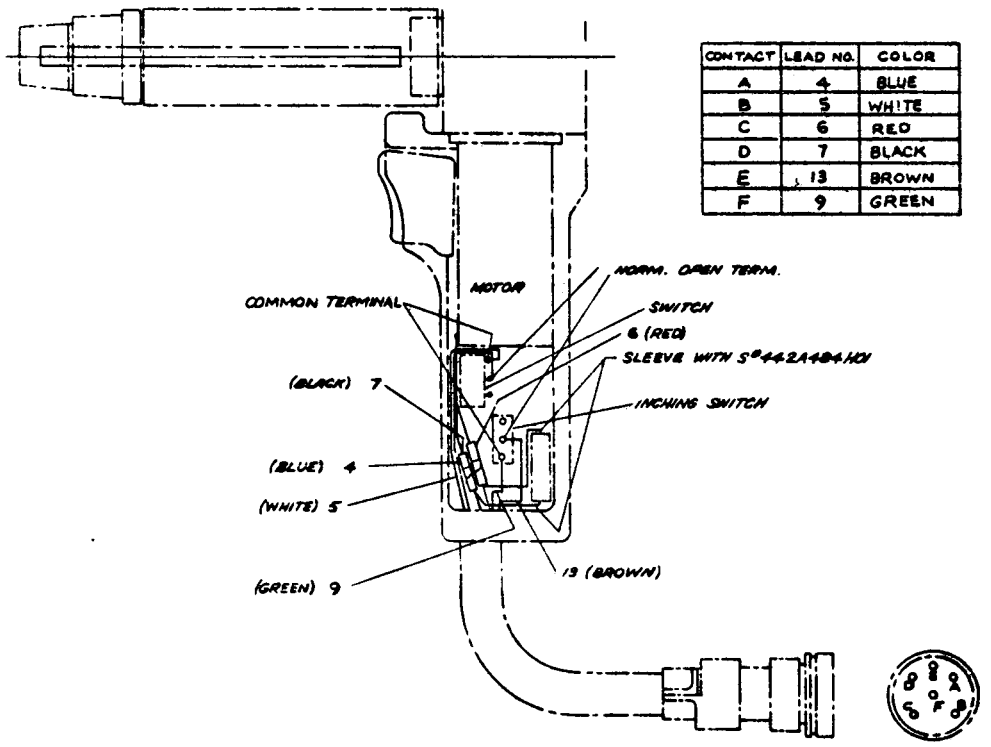

Figure 3. Wiring Diagram for Type SP4B Welding Gun.

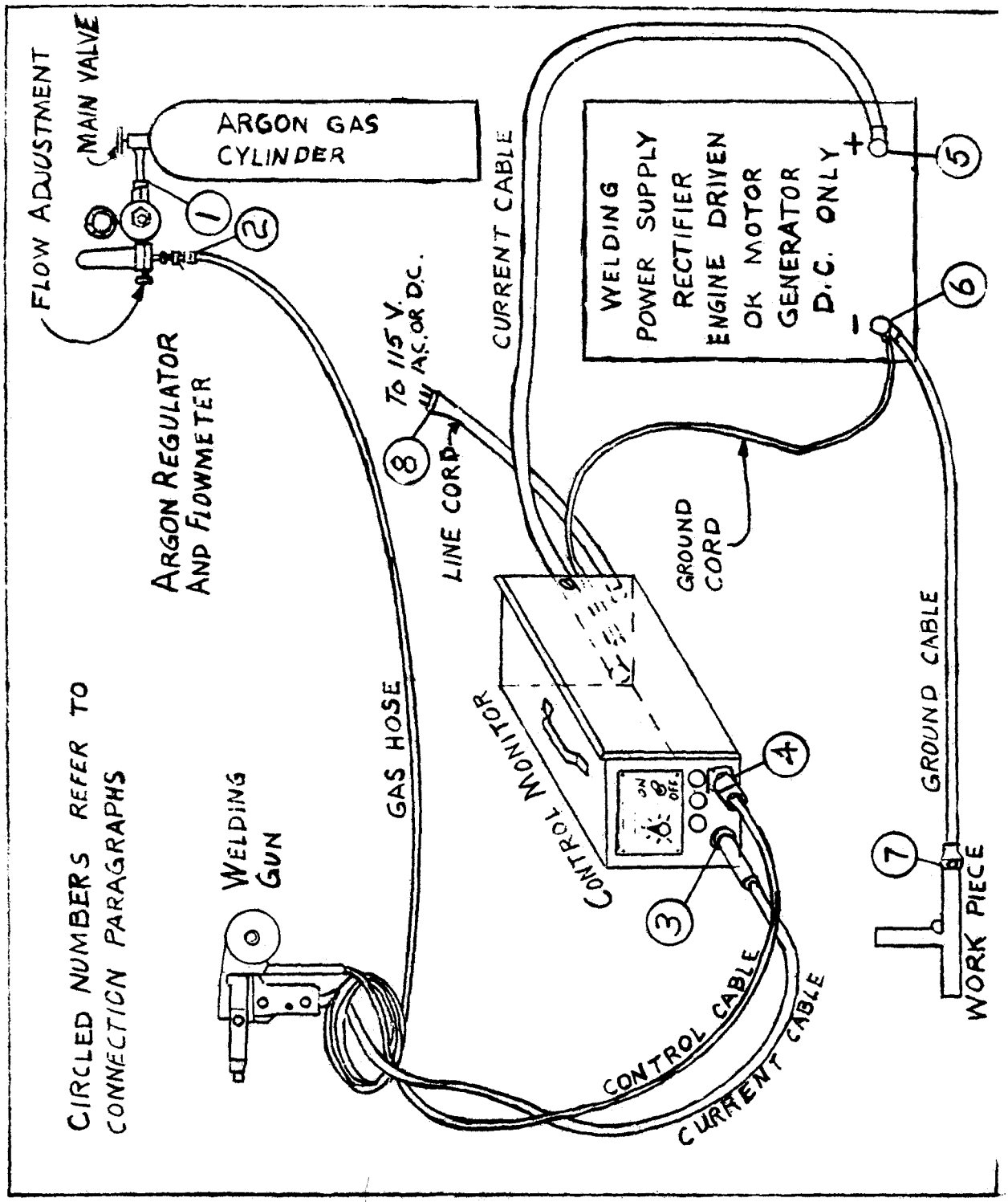

Figure 4. Welding System Set Up.

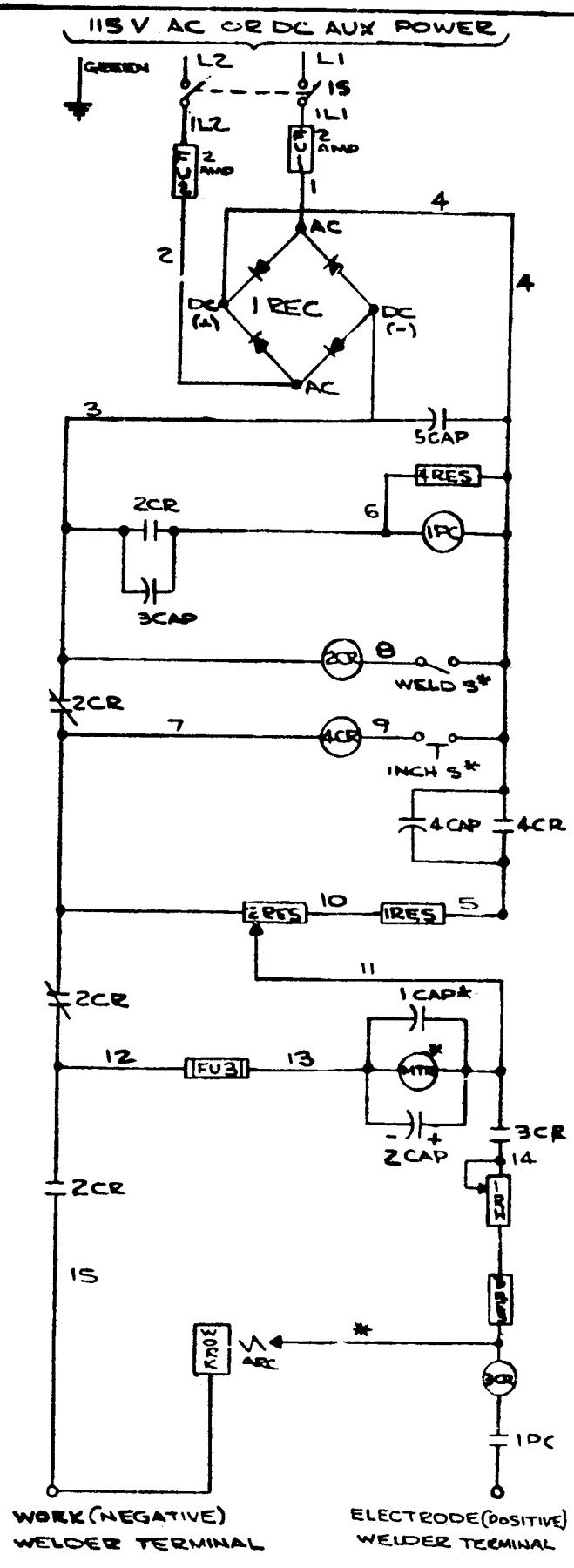

Figure 5. CCD-2 Control Schematic

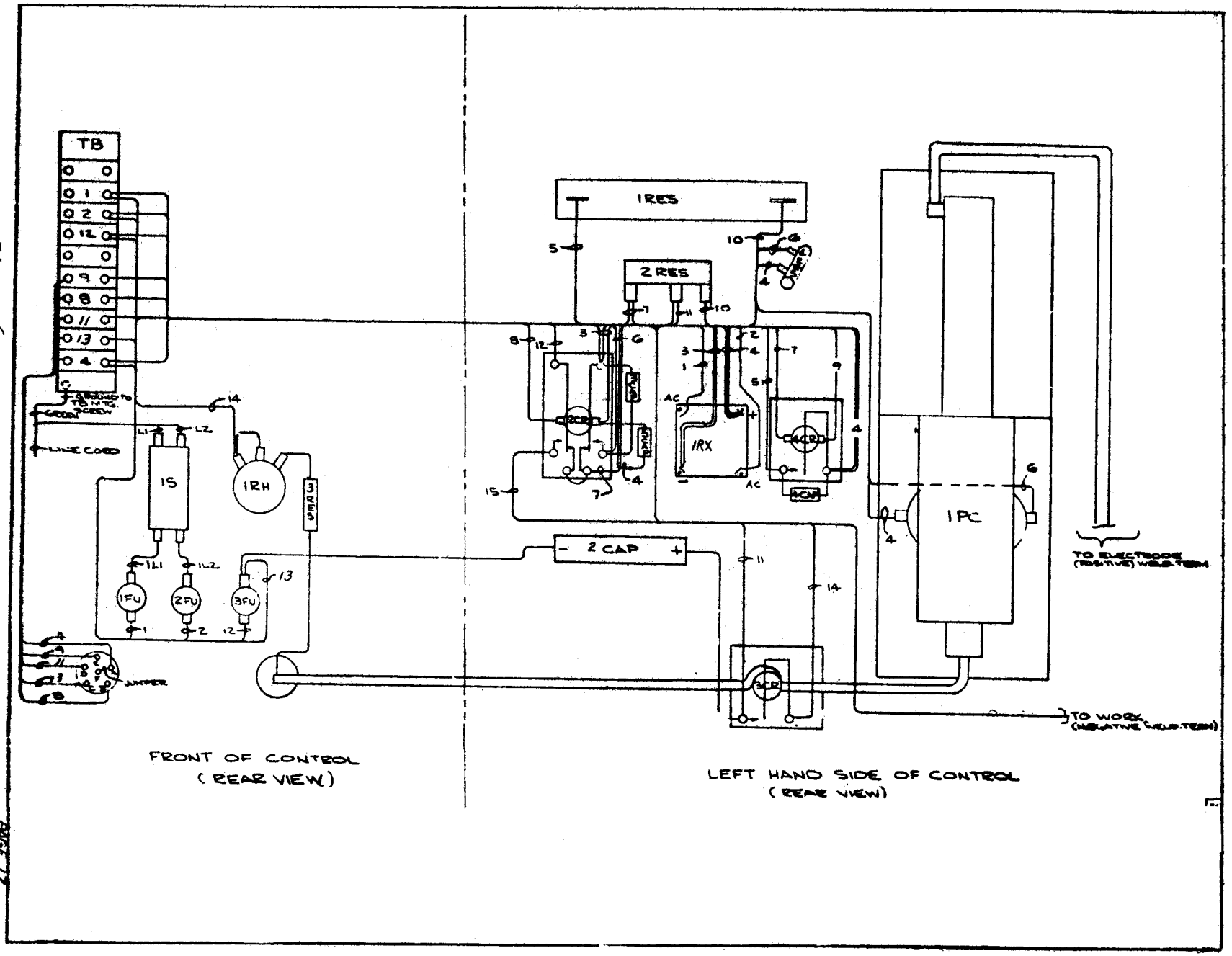

Figure 6. CCD-2 Control Wiring Diagram.

APPENDIX A

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

A-1. Scope.

This appendix lists items which accompany the Arc Welding Set or are required for installation, operation, or operator's maintenance.

A-2. General.

This Basic Issue Items List is divided into the following sections:

a. Basic Issue Items - Section II. A list of items which accompany the Arc Welding Set and are required by the operator/crew for installation, operation, or maintenance.

b. Maintenance and Operating Supplies - Section III. A listing of maintenance and operating supplies required for initial operation.

A-3. Explanation of Columns.

The following provides an explanation of columns in the tabular list of Basic Issue Items, Section II.

a. Source, Maintenance, and Recoverability Codes (SMR).

(1) Source code, indicates the selection status and source for the listed item. Source sodes are:

Code	Explanation
P	Repair parts which are stocked in or supplied from the GSA/DSA, or Army supply system and authorized for use at indicated maintenance categories.
P2	Repair parts which are procured and stocked for insurance purposes because the combat or military essentiality of the end item dictated that a minimum quantity be available in the supply system.
M	Repair parts which are not procured or stocked, but are to be manufactured in indicated maintenance levels.

A	Assemblies which are not procured or stocked as such, but are made up of two or more units. Such component units carry individual stock numbers and descriptions, are procured and stocked separately and can be assembled to form the required assembly at indicated maintenance categories.
X	Parts and assemblies which are not procured or stocked and the mortality of which normally is below that of the applicable end item or component. The failure of such part or assembly should result in retirement of the end item from the supply system.
X1	Repair parts which are not procured or stocked. The requirement of such items will be filled by use of the next higher assembly or component.
X2	Repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain them through cannibalization. Where such repair parts are not obtainable through cannibalization, requirements will be requisitioned, with accompanying justification, through normal supply channels.
G	Major assemblies that are procured with PEMA funds for initial issue only as exchange assemblies at DSU and GSU level. These assemblies will not be stocked above GS and DS level or returned to depot supply levels.

(2) Maintenance code, indicates the lowest category of maintenance authorized to install the listed item. The maintenance level code is:

Code	Explanation
C	Operator/crew

(3) Recoverability code, indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are:

Code	Explanation
R	Applied to repair parts (assemblies and components) which are considered economically repairable at direct and general support maintenance levels. When the maintenance capability to repair these items does not exist, they are normally disposed of at the GS level. When supply considerations dictate,

some of these repair parts may be listed for automatic return to supply for depot level repair as set forth in AR 710-50. When so listed, they will be replaced by supply on an exchange basis.

S Repair parts and assembIies which are economically reparable at DSU and GSU activities and which normally are furnished by supply on an exchange basis. When items are determined by a GSU to be uneconomically reparable they will be evacuated to a depot for evaluation and analysis before final disposition.

T High dollar value recoverable repair parts which are subject to speciaI handling and are issued on an exchange basis. Such repair parts are normally repaired or overhauled at depot maintenance activities.

U Repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, or high dollar value reusable casings or castings.

b. FederaI Stock Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the Federal item name and any additional description of the item required. The abbreviation "w/e", when used as a part of the nomenclature, indicates the Federal stock number includes all armament, equipment, accessories, and repair parts issued with the item. A part number or other reference number is followed by the applicable five-digit Federal suppIy code for manufacturers in parenthesis. Repair parts quantities included in kits, sets, and assemblies are shown in front of the repair part name.

d. Unit of Measure (U/M). A 2 character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Incorporated in Unit. This column indicates the quantity of the item used in the assembly group. A "V" appearing in this column in lieu of a quantity indicates that a definite quantity cannot be indicated (e.g., shims, spacers, etc.).

f. Quantity Furnished With Equipment. This column indicates the quantity of an item furnished with the equipment.

g. IIlustration. This column is divided as follows:

(1) Figure Number. indicates the figure number of the illustration in which the item is shown.

(2) Item Number. Indicates the callout number used to reference the item in the illustration.

A-4. Explanation of Columns in the Tabular List of Maintenance and Operating Supplies - Section III.

a. Component Application. This column identifies the component application of each maintenance or operating supply item.

b. Federal Stock Number, This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the item name and brief description.

d. Quantity Required for Initial Operation. This column indicates the quantity of each maintenance or operating supply item required for initial operation of the equipment.

e. Quantity Required for 8 Hours Operation. This column indicates the estimated quantities required for an average 8 hours of operation.

f. Notes. This column indicates informative notes keyed to data appearing in a preceding column.

SECTION II. BASIC ISSUE ITEMS

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION REF NO. & MFR CODE / USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) QTY FURN WITH EQUIP	(7) ILLUSTRATION (A) FIG NO.	(7) ILLUSTRATION (B) ITEM NO.
		GROUP 31 - BASIC ISSUE ITEMS, MANUFACTURER INSTALLED					
		3100 - Basic Issue Items, Manufacturer or Depot Installed					
PC		Department of the Army, Organizational, Direct and General Support and Depot Maintenance Manual TM 5-3431-227-15	EA	1	1		
PC	7520-559-9618	Case, Maintenance and Operational Manuals: Cotton duck, water repellent, mildew resistant	EA		1		

SECTION III. MAINTENANCE AND OPERATING SUPPLIES

(1) COMPONENT APPLICATION	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) QUANTITY REQUIRED F/ INITIAL OPERATION	(5) QUANTITY REQUIRED F/8 HRS OPERATION	(6) NOTES
Gun, Welding	6830-290-4291	ARGON, TECHNICAL: 243 cu. ft., w/o cylinder	1	as required	

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. General.

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the special tools and test equipment required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance function.

B-2. Explanation of Columns in Section II.

a. Group Number. The assembly group is a numerical group assigned to each assembly in a top down breakdown sequence. The applicable assembly groups are listed on the MAC in disassembly sequence beginning with the first assembly removed in a top down disassembly sequence.

b. Assembly Group. This column contains a brief description of the components of each assembly group.

c. Maintenance Functions. This column lists the various maintenance functions (A through K) and indicates the lowest maintenance category authorized to perform these functions. The symbol designations for the various maintenance categories are as follows:

C - Operator or crew
O - Organizational maintenance
F - Direct support maintenance
H - General support maintenance
D - Depot maintenance

The maintenance functions are defined as follows:

A - INSPECT. To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

B - TEST. To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

c - SERVICE. To clean, to preserve, to charge, to paint and to add fuel, lubricants, cooling agents, and air.

D - ADJUST. To rectify to the extent necessary to bring into proper operating range.

E - ALIGN. To adjust specified variable elements of an item to bring to optimum performance.

F - CALIBRATE. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

G - INSTALL. To set up for use in operational environment such as an emplacement, site, or vehicle.

H - REPLACE. To replace unserviceable items with serviceable assemblies, subassemblies, or parts.

I - REPAIR. To restore an item to serviceable condition. This includes, but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, riveting and strengthening.

J - OVERHAUL. To restore an item to a completely serviceable condition as prescribed by maintenance serviceability standards using the Inspect and Repair Only as Necessary (IROAN) technique.

K - REBUILD. To restore an item to a standard as nearly as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements (items) using original manufacturing tolerances and specifications, and subsequent reassembly of the item.

d. Tools and Equipment. This column is provided for referencing by code the special tools and test equipment, (Section III) required to perform the maintenance functions (Section II).

e. Remarks. This column is provided for referencing by code the remarks (Section IV) pertinent to the maintenance functions.

B-3. Explanation of Columns in Section III.

a. Reference Code. This column consists of a number and a letter separated by a dash. The number references the T & TE requirements column

on the MAC. The letter represents the specific maintenance function the item is to be used with. The letter is representative of columns A through K on the MAC.

b. Maintenance Category. This column shows the lowest level of Maintenance authorized to use the special tool or test equipment.

c. Nomenclature. This column lists the name or identification of the tool or test equipment.

d. Tool Number. This column lists the manufacturer's code and part number, or Federal Stock Number of tools and test equipment.

B-4. Explanation of Columns in Section IV.

a. Reference Code. This column consists of two letters separated by a dash, both of which are references to Section II. The first letter references column 5 and the second letter references a maintenance function, column 3, A through K.

b. Remarks. This column lists information pertinent to the maintenance function being performed, as indicated on the MAC, Section II.

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
01	Control Monitor:	0	F	0	0				0	0	F			A-C
	Contactor		0						0	F				
	Capacitor		0						0					
	Receptacles		0						0					
	Resistors, fixed		0						0					
	Resistors, adjustable		0		C				0					
	Rheostat		0		C				0					
	Rectifier		0						0					
	Relays		0						0					
	Switch, line		0						0					
02														
02	Welding Gun:		0	C					0	0	F			
	Motor								F	F				
	Cable assembly, control	C	0						F					
	Cable assembly, current	C	0						0					
	Hose assembly, gas								0	0				B-I
	Nozzle & adapter	C		C					C					C-C
	Barrel assembly	C		0					0					D-C
	Capacitor		F						F					
	Swing arm assembly				C				0					
	Tube, guide	C		C	C				C					E-C
	Drive roll	C		C					0					F-C
03	Gas Regulator and Flow Meter				C				C					
04	Miscellaneous Components													
	Cable assembly	C							0	0				G-I
	Hose assembly	C							0	0				H-I

SECTION III

SPECIAL TOOL AND SPECIAL TEST EQUIPMENT REQUIREMENTS

REFERENCE CODE	MAINTENANCE LEVEL	NOMENCLATURE	TOOL NUMBER
No special tools or test equipment required.			

SECTION IV REMARKS

REFERENCE CODE	REMARKS
A - C	Remove dust and dirt with clean, dry air stream.
B - I	Fabricate.
C - C	Remove weld spatter and obstructions with pen knife or similar instrument.
D - C	Remove white residue from gas holes by direct spray of high pressure air stream.
E - C	Remove burns and obstructions.
F - C	Clean serrated surface with stiff bristle brush.
G - I	Fabricate.
H - I	Fabricate.

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

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