TM 5-3431-225-15

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE MANUAL

WELDING MACHINE, ARC: GENERAL AND INERT GAS SHIELDED TRANSFORMER; 300 AMP; 5 TO 460 AMP AC: 5 TO 350 AMP DC (MILLER MODEL 330A/B/SP) FSN 3431-620-0858

HEADQUARTERS, DEPARTMENT OF THE ARMY

MARCH 1969

SAFETY PRECAUTIONS

BEFORE OPERATION

See that the ground terminal lug is connected through the input cable or by separate conductor to the power system ground. An ungrounded machine can cause death by electrocution to personnel coming in contact with it.

Do not reposition the voltage bars while power source is connected to the machine. To do so could cause a serious electrical shock and possible death.

DURING OPERATION

Do not make or break any connections or perform any maintenance while the welding machine is in operation. The high voltage created by this math ine can cause death by electrocution.

Do not come in contact with the electrode while the machine is in operation. The high voltage generated by the machine can cause death by electrocution.

Be very careful when the unit or surrounding area is wet or damp. Coming in contact with a wet or damp unit can cause a serious electrical shock and possible death.

When malfunction of the selenium occurs, thoroughly ventilate the area to prevent inhalation of poisonous fumes. Do not handle the damaged rectifier while it is warm so as not to absorb poisonous selenium oxide compound through the skin. Failure to observe this warning can result in serious injury or possible death.

AFTER OPERATION

When making a test on the high-frequency transformer, make sure that the transformer is on an insulated bench. Do not touch an activated transformer or the wires leading from it. To do so may cause a serious electrical shock or possible death to personnel performing the test.

Short the capacitor connections to ground before removal. Failure to do this may result in a serious electrical shock.

Change
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D. C., *20 June 1973*

Operator, Organizational, Direct and General Support and Depot Maintenance Manual WELDING MACHINE, ARC: GENERAL AND INERT GAS SHIELDED TRANSFORMER; 300 AMP 5 to 460 AMP AC; 5 to 350 AMP DC (MILLER MODEL 330 A/B/SP) FSN 3431-620-0858

TM 5-3431-225-15, 7 March 1969, is changed as follows:
Page B-1. APPENDIX B is superseded as follows:

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

Section I. INTRODUCTION

B-1. Scope

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

B-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 welding machine. These items are NOT SUBJECT TO TURN-IN with the welding machine when evacuated.

B-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	Usable on code	(4) Unit of mesa	(5) Qty auth
	7520-559-9618	Case, Manual		E A	1
	4210-555-8837	Extinguisher, Fire		E A	1
	5975-878-3791	Rod Assy, Ground		E A	1

By Order of the Secretary of the Army:

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

Official:
VERNE L. BOWERS
Major General, United States Amy
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-25A (qty rqr block No. 182) organizational maintenance requirements for Welding.

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TECHNICAL MANUAL
No. 5–3431–225–15

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *7 MARCH 1969*

Operator, Organizational, Direct and General Support

and Depot Maintenance Manual

WELDING MACHINE, ARC: GENERAL AND INERT GAS SHIELDED TRANSFORMER; 300 AMP; 5 TO 460 AMP AC; 5 TO 350 AMP DC (MILLER MODEL 330A/B/SP) FSN 3431-620-0858

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope

a. These instructions are published for the use of the personnel to whom the Miller Model 330A/B/SP Welding Machine is issued. Chapters 1 through 3 provide information on the operation, daily preventive maintenance services, and organizational maintenance of the equipment, accessories, components, and attachments. Chapter 4 provides information for direct and general support and depot maintenance. This manual also provides descriptions of the main units and their functions in relationship to other components.

b. Appendix A contains a list of publications applicable to this manual. Appendix B contains the list of basic issue items authorized for the initial operation. Appendix C contains the maintenance allocation chart. The organizational, direct and general support and depot maintenance repair parts lists are listed in TM-5-3431-225-25P (when published).

c. Numbers in parentheses on illustrations indicate quantity,

d. DA Form 2028 (Recommended Changes to DA Publication) will be used for reporting discrepancies and recommendations for improving this equipment manual. This form will be completed by the individual using the manual and forwarded direct to Commanding General, U.S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Blvd., St. Louis, Mo. 63120.

e. Report all equipment improvement recommendations as prescribed by TM 38-750 (Army Equipment Record Procedures).

1-2. Record and Report Forms

a. DA Form 2258 (Depreservation Guide for Vehicles and Equipment).

b. DA Form 1397 (Processing and Reprocessing Record for Shipment, Storage, and Issue of Vehicle and Spare Engines).

c. For other record and report forms applicable to the operator and organizational maintenance, refer to TM 38-750.

Note. Applicable forms shall be kept in a canvas bag mounted on the equipment, excluding Standard Form 46 (States Government Motor Vehicles Operator's Identification Card) which is carried by the operator.

Section II. DESCRIPTION AND DATA

1-3. Description

The Miller Model 330A/B/SP AC/DC general and inert gas shielded welding machine (fig. 1-1 and 1-2) is operated from an external power source of either 208, 230 or 460 volt, alternating current, and by single phase or three phase connections. This welder provides an electrically controlled current output for use in either shielded inert gas welding or metallic arc welding. The entire control section is located on a front panel at the top of the welding machine.

1-4. Identification and Tabulated Data

a. Identification. The welding machine has two identification plates, which are the Corps of Engineers' plate, and the manufacturer's identification and data plate. The Corps of Engineers' plate is located on the upper right side of the housing near the front of the welding machine. It specifies the nomenclature, make, model, serial number, and contract number. The manufacturer's identification and data plate is located on the upper front panel. It specifies the nomenclature, manufacturer, mode], serial number, secondary rated output amperage, load voltage, duty cycle percent, open circuit voltage, primary input voltage, input amperage, rated kilo-volt amperage, power factor percent, and cycles.

b. Tabulated Data.

(1) *U.S. Army identification plate.*

Nomenclature ---------- Welding Machine: ARC; AC-DC, 300 amp (amperes)
Make . . . . . Miller Electric Mfg. Co.
Model 330/A/B/SP
Serial Number . . . . . .
Contract Number DSA-700-68-C-9860
FSN 3431-620-5999

(2) *Manufacturer's identification and data plate.*

Manufacturer . . . . . Miller Electric Mfg. Co.
Model . . . . . 330A/B/SP AC-DC inert gas welding machine
Serial Number . . . . . .

Secondary	AC	DC
Volts	32	32
Amps(amperes)	300	300
Duty cycle	60%	60%
Maximum open circuit volts	80	80
Maximum amps at 35 volts	375	
Maximum amps at 32 volts		300
Duty cycle at maximum amps.	35%	60%
Welding range inert gas	5 to 460	
NEMA rating		

Primary

Volts 208/230/460
Amps (amperes) 115/104/52
KW (kilowatts) 17.9
KVA (kilovolt amperes) 23.9
Frequency . . . . . .60 cycle
Single phase . . . . . .

(3) *Solenoid valve.*

Manufacturer . . . . . .Controls Co. of America
Model 291AF
Device number 70291-069
Orifice 1/8-inch
Pipe size. 1/4-inch
Voltage . . . . . .115 v (volts) 50/60 cycle
Pressure 100
Watts. 10

(4) *Contactor, primary.*

Manufacturer . . . . . Allen-Bradley
Catalog number . . . . . .702-DODX196 Series K
Bulletin 702
Size 1
Continuous current rating . . .27 amp
Voltage . . . . . .600 volts AC maximum

(5) *Contactor, relay.*

Manufacturer . . . . . Fumes Electric Co.
Catalog number 42DC103973F

(6) *Timer, post flow.*

Manufacturer . . . . . .Industrial Timer Corporation

(7) *Timer, spot weld.*

Manufacturer . . . . . .Industrial Timer Corporation
Series . . . . . .TDAFGS
Volts 115
Cycles 60
Watts 1000

(8) *Dimensions and weight.*

Height 47-3/8-inches
Width 22-1/8-inches
Length 33-1/8-inches
Weight . . . . . 845 pounds

(9) *Adjustments.*

Spark gap adjuster . . . . . .008 inches

(10) *Base plan.* Refer to figure 1-3.

(11) *Wiring diagram.* Refer to figure 1-4.

1-5. Difference in Models

This manual covers only the Miller Model 330A/B/SP welding machine. No known unit differences exist for the model covered by this manual.

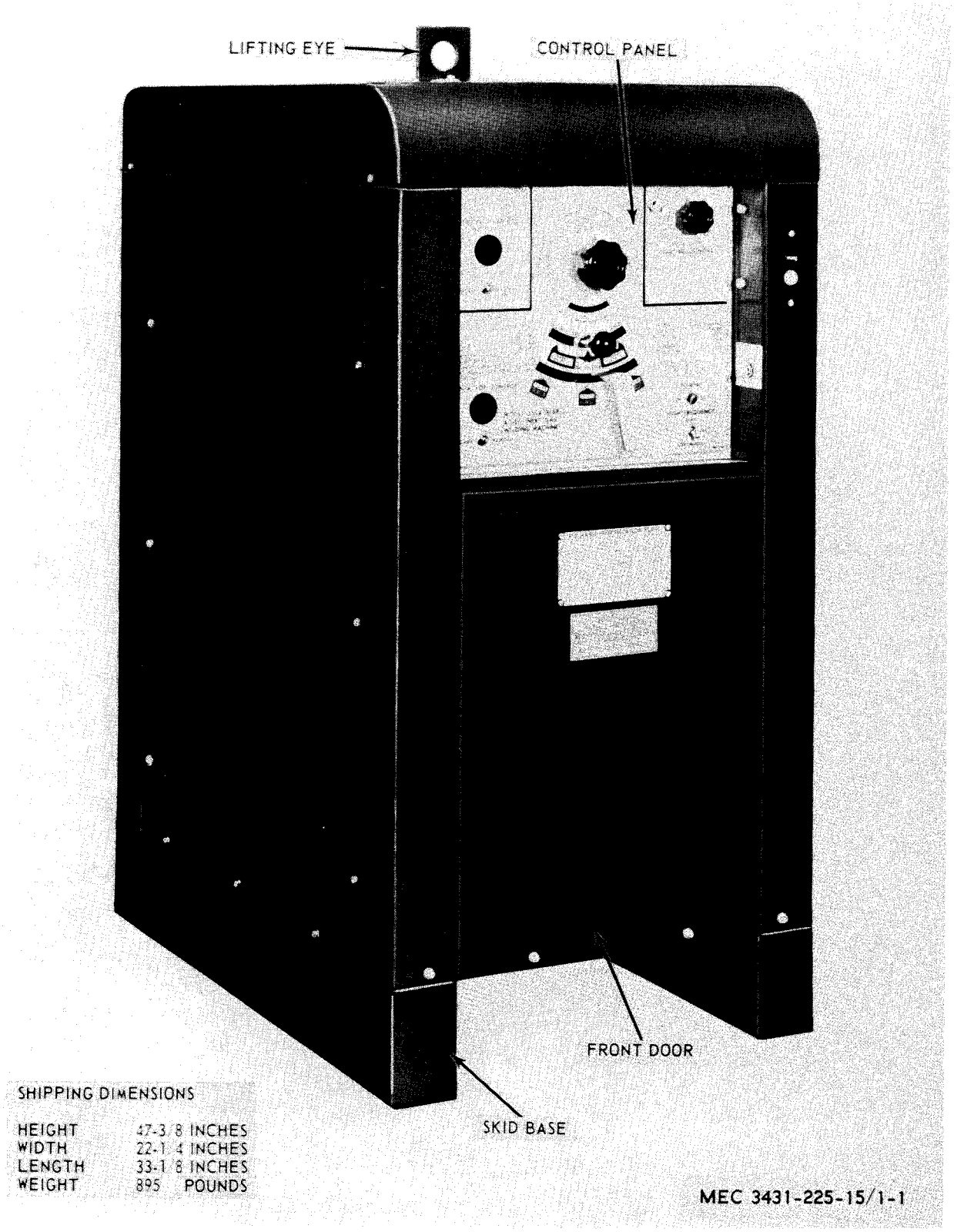


Figure 1–1. Welding machine, right front, three-quarter view shipping dimensions.

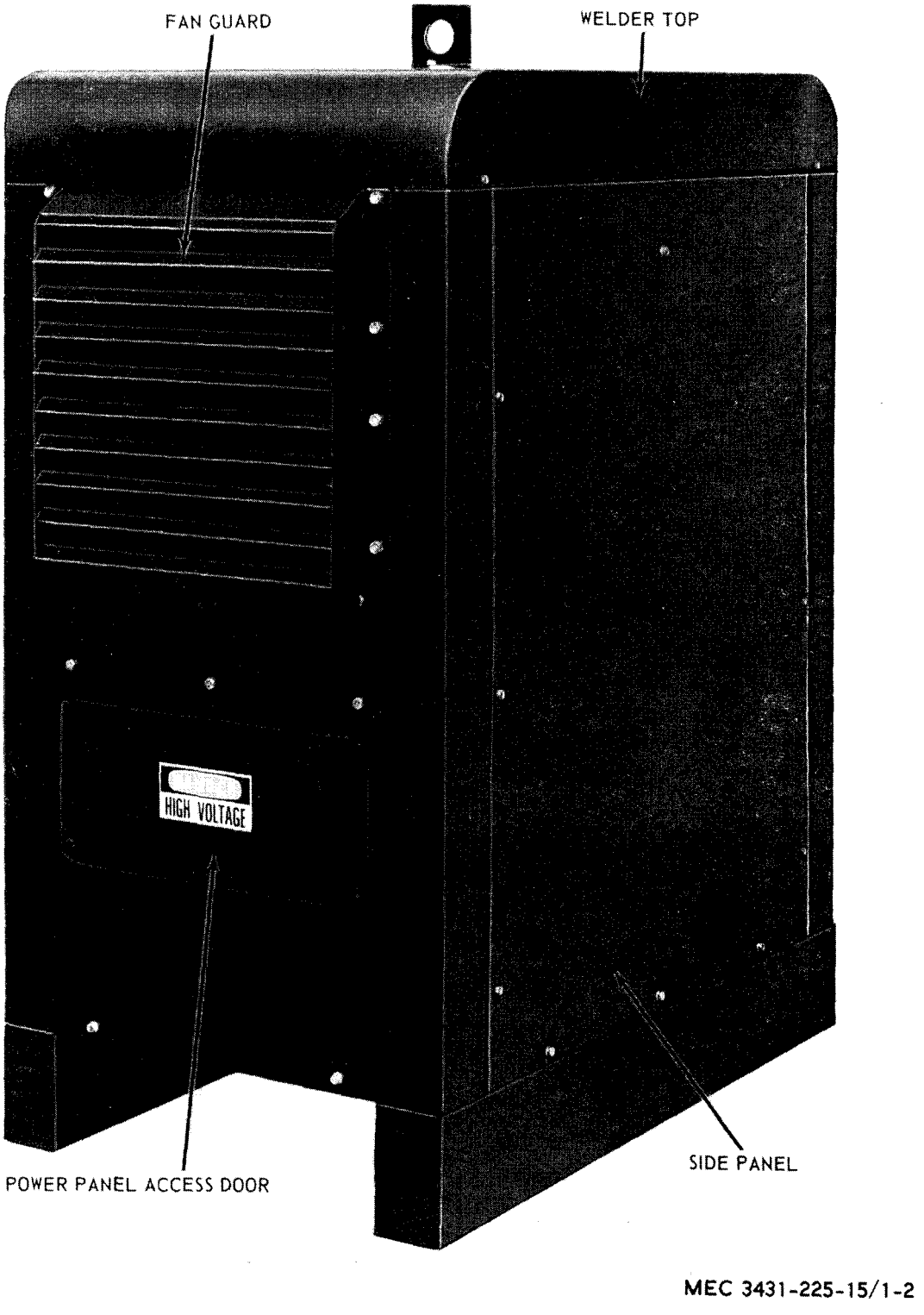


Figure 1-2. Welding machine, left rear three-quarter view.

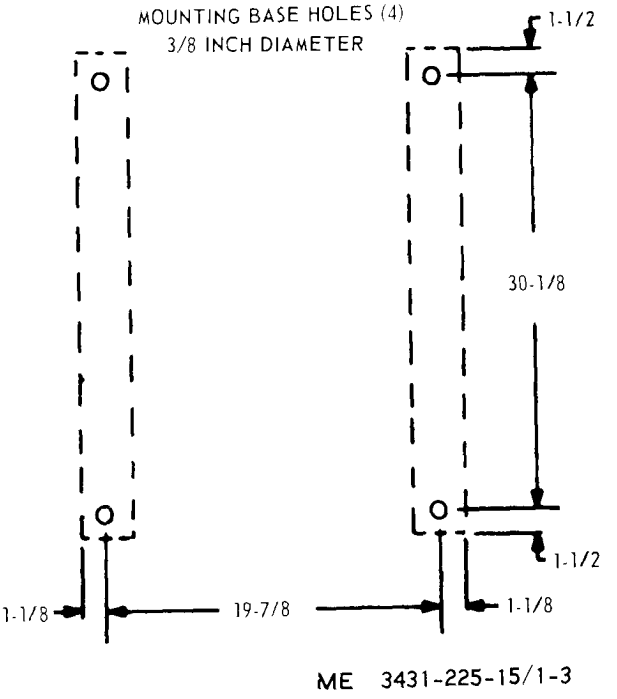


Figure 1-3. Base plan.

Figure 1-4. Practical wiring diagram.

(Located in back of manual)

CHAPTER 2

INSTALLATION AND OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

2-1. Unloading the Equipment

a. Shipment by Tractor. When the welding machine is received by tractor, remove all securing devices and, with a forklift or other suitable lifting device, remove it from the truck.

***Warning:* When using a lifting device to move the welding machine, make sure it has a lifting capacity of no less than 1,000 pounds. Do not allow the welding machine to swing or sway while suspended. Failure to observe this warning may result in damage to the equipment or serious injury to personnel.**

b. Shipment by Rail. When the welding machine is received by rail, remove all securing devices and with a forklift or other suitable lifting device, remove it from the freight car.

2-2. Unpacking the Equipment

a. Unpacking. The welding machine has heavy paper or cardboard around it to protect it from damage. This is packed in a wooden box.

(1) Remove all metal banding with a suitable tool.

(2) Remove the wooden box with a claw hammer, pry bar, nail puller, or other suitable tools.

Note. Be careful not to damage the welding machine while removing the wooden box.

b. Depreservation. Prepare the welding machine for inspection and operation as outlined on DA Form 2258, attached on or near the control panel.

2-3. Inspecting and Servicing Equipment

a. Cheek packing list for missing parts.

b. Inspect for damaged parts. Check welding machine for dents, scratches, and damaged housing.

c. inspect for damaged or broken controls and switches.

d. Inspect for loose and missing hardware, lifting eyes, panels, and fittings,

e. Perform the daily preventive maintenance services (para 3-5).

2-4. Installation or Setting-Up Instructions

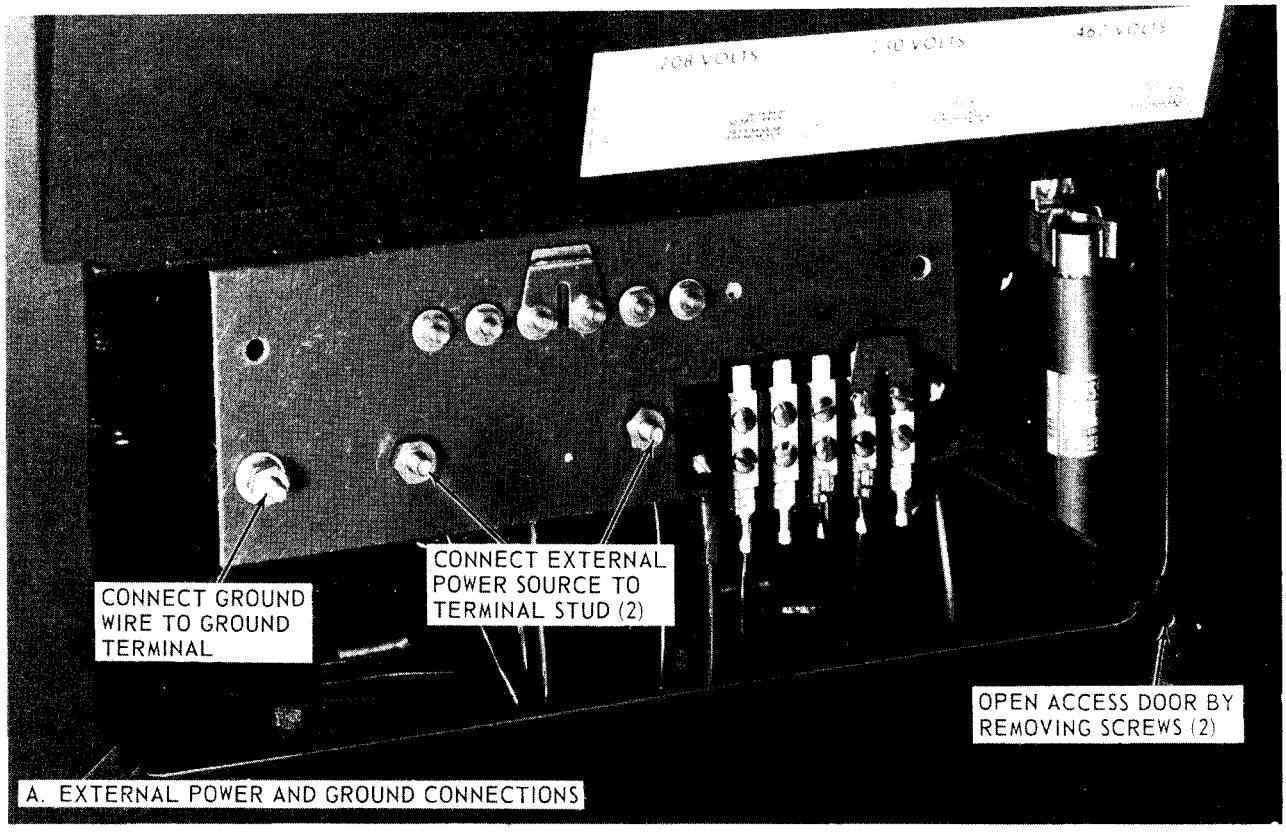
a. Ground and Electrode Cable Connections. Refer to figure 2-1B and connect the work cables to the ground terminal stud and electrode terminal stud located on the front of the welder. It is recommended the welding leads be kept as short as possible to prevent high frequency dissipation and erratic operation.

b. External Power and Ground Connections. Connect the external power source as shown in figure 2-2F. Use the wire size and fuse size recommended below. The welding machine must be grounded prior to operation. The ground can be, in order of preference, an underground metallic water piping system, a driven metal rod, or a buried metal plate. The ground rod must have a minimum diameter of 5/8-inch if solid, or 3/4-inch if pipe, and must be driven to a minimum depth of 8 feet. A ground plate must have a minimum area of 9 square feet and be buried to a minimum depth of 4 feet. The ground lead must be a No. 6 AWG (American Wire Gage) copper wire or larger, and be bolted or clamped to the rod, plate, or piping system. Refer to figure 2-1A and connect the external power and ground wire.

RECOMMENDED LINE VOLTAGE WIRE AND FUSE SIZES

Line voltage wiring size-AWG			Line voltage fuse size in AMPS		
208V	230V	460V	208V	230V	460V
#2	#1	#6	175	150	80V

***Warning:* Before operating the unit, see that the ground terminal lug is properly connected by one of the methods referenced in paragraph 2-4b. An ungrounded machine can cause death by electrocution of personnel coming in contact with it. If the welding machine is to be connected to one phase of a three phase line, DO NOT connect the third wire from a three phase line to the stud labeled "GRD" as this may result in a "hot" welding machine.**



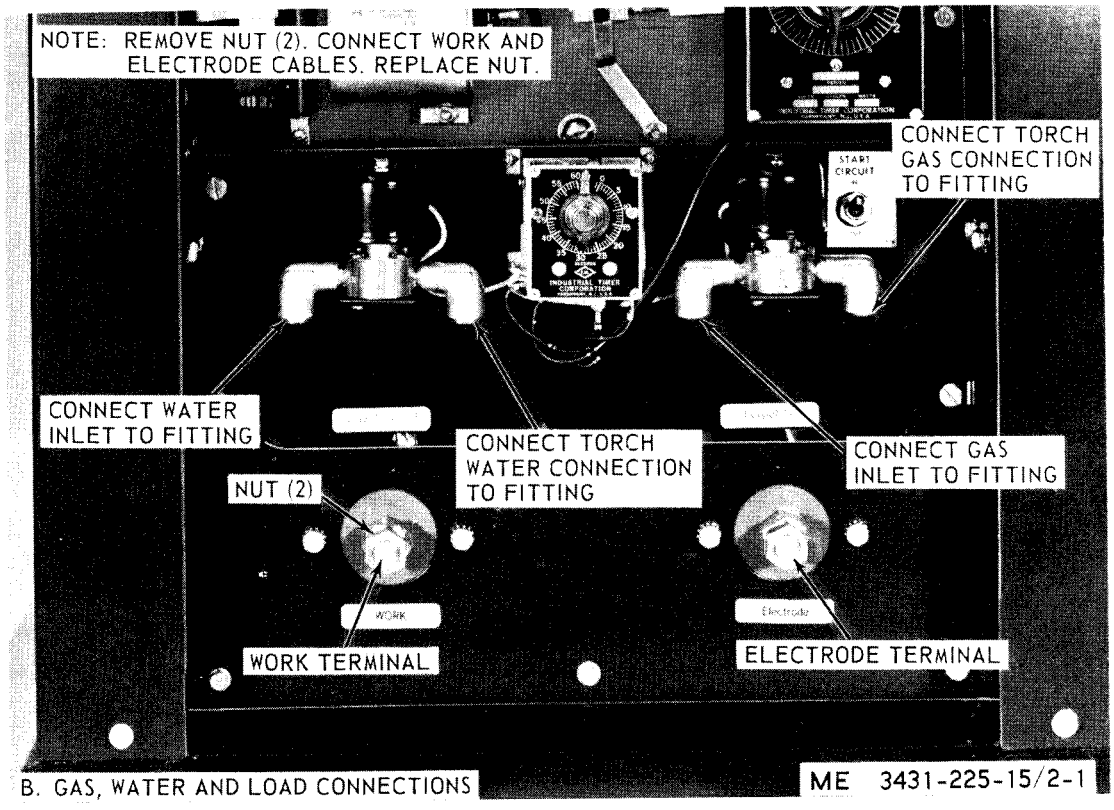


Figure 2-1. Load, ground, external power source, gas, and water connections.

c. Water Connections. Refer to figure 2-1B and connect suitable pipe and fittings to the welding machine. If a portable water coolant system is used, connections should be made directly to the electrode holder water connections, by-passing the welding machines water valve.

d. Gas Connections. Refer to figure 2-1B and connect suitable pipe and fittings to the welding machine.

Note. When installing the welding machine, allow at least 18-inches clearance on all sides for proper ventilation.

e. Radio Interference.

(1) The following information is necessary to make a proper installation of the high frequeney arc welding equipment described in this manual. The manufacturer of the equipment covered herein has conducted approved field tests and certifies that the radiation can reasonably be expected to be within the legal limits if the correct installation procedures, as outlined, are followed. The importance of a correct installation cannot be over-emphasized since case histories of interference due to high frequency stabilized arc welding machines have shown that invariably all inadequate installation was at fault.

(2) In a high frequency stabilized arc welding machine installation, interfering radiation can escape in four distinct ways as outlined below:

(a) Direct radiation from the welding machine. This is radiation that escapes directly from the welding machine case. This is very pronounced if access doors are left open and unfastened and if the welding machine case is not properly grounded. Any opening in the metal welding machine case will allow some radiation to escape, The high frequency unit of this certified equipment is adequately shielded to prevent direct radiation of any consequences if proper grounding is carried out.

(b) Direct feedback to the power line. High frequency energy may get on the power line by direct coupling inside the equipment or the high frequency unit, the power line then serving as a radiating antenna. By proper shielding and filtering, direct coupling is prevented in this certified equipment.

(c) Direct radiation from welding leads. Direct radiation from the welding leads, although very pronounced, decreases rapidly with distance from the welding leads. By keeping the welding leads as short as possible, the operator can do a great deal to minimize interference from the source. The intensity and frequency of the radiation can be altered over wide limits by changing the location and relative position of the welding leads and work. If possible, loops and suspended sections should be avoided.

(d) Pick-up and reradiation from power lines. Even though welding lead radiation falls off rapidly with distance, the field strength in the immediate vicinity of the welding area may be extremely high. Unshielded wiring and ungrounded metallic objects in this strong field may pick up the direct radiation, conduct the energy for some distance, and produce a strong interference field in another area. This is usually the most troublesome source of interference, but careful adherences to proper installation procedure as outlined in this booklet will minimize this type of interference.

(3) The specific installation instructions for making the proper primary connections to the equipment as outlined in the manual furnished with the equipment, should be followed carefully. Only solid metallic conduit or conduit of “equivalent electrical shielding ability” should be used to enclose the primary power service leads. Solid metallic shielding shall enclose the primary power service to the equipment from a point 50 feet from the equipment in an unbroken run. This shielding shall be grounded at the farthest point from the equipment and should make good electrical contact with the casing of the equipment. The ground should be in accordance with the specifications outlined in para *2-4a* and *b* and as shown in figure 2-2. Care should be taken that paint or corrosion at the junction of conduit and case do not interfere with good electrical contact. There shall be no gap in this shielding run. This simply means that within 50 feet of the equipment, no portion of the power wires serving the equipment shall be unshielded. If there is any question about the electrical efficiency of the joints between individual conduit sections, outlet boxes and the equipment case, bonding should be carried out by soldering a copper strap or wire across the joint as shown in figure 2-2B.

(4) The location of the equipment should be chosen with respect to nearness to a suitable ground connection. The equipment case, firmly bonded to the power conduit, should be grounded to the work terminal of the equipment with a copper cable or braid with rated current carrying equal to or greater than that of the power service wires. The “work” output terminal of the equipment should then be grounded to a “good elec-

trical ground" with a short length of welding cable of the same capacity as the "work lead" (fig. 2-2C). While the equipment is in operation, all access and service doors shall be closed and properly fastened. Spark gap settings shall be maintained at the minimum separation consistent with satisfactory welding results (fig. 3-16).

(5) In order to minimize direct weld lead radiation, the welding leads (electrode lead and work lead) must be kept as short as possible. Certification tests on this machine have been made with leads 25 feet long. Considerable improvement in radiation minimization can be had by shortening the leads as much as possible. Keeping the electrode lead and ground or work lead as close as possible and on the floor serves to reduce the radiation (fig. 2-2D).

(6) The most serious source of interference is reradiation from wires that are located near the welding area. Any ungrounded electrical conductor in the strong "directly radiated" field, produced by the welding leads, serves as a pick-up device and may conduct the interference for some distance and reradiate strongly at another location. For purpose of simplification and standardization, the space all around the weld zone at a distance of 50 feet in all directions is referred to as the high field intensity (H.F.I.) zone. (fig. 2-2E.) To minimize radiation of this type, all wiring in the H.F.I. zone shall be in rigid metallic conduit, lead covered cable, copper braid or material of equivalent shielding efficiency. Ordinary flexible helically wrapped metallic conduit, commonly referred to as "B. X." is not satisfactory for shielding, and should not be used. The shield on all wiring should be grounded at intervals of 50 feet and good electrical bonding between sections shall be maintained. This shielding requirement applies to all wiring, including telephone, inter-communication, signal and control and incidental service. Extreme precaution should be taken to make sure that the location of the zone is chosen so that none of the conditions are voided by unshielded wires off the premises but still within the radial dimensions of the H.F.I. zone. This 50 foot H.F.I. zone is a minimum that is imposed on the installation. Certification tests by the manufacturer are based on this limit. Keeping unshielded wires farther than 50 feet from the weld zone will materially aid in minimizing interference. If it is impossible to relocate unshielded wires, that section within the H.F.I. zone, should be placed in conduit and each end of the conduit section grounded.

(7) Frequent reference is made to a "good ground" in previous sections. Although there is considerable leeway in the interpretation of this term, for the purpose covered in this manual the following specifications apply: A "ground" connection should be made to a driven rod at least 8 feet long and driven into moist soil. A cold water pipe can be used in place of the ground rod provided it enters the ground within 10 feet of the equipment to be grounded. All leads connecting the point to be grounded to the ground rod or pipe should be as short as possible since the ground lead itself can become an effective radiating antenna. The effectiveness of a ground in reducing interference depends upon the ground conductivity. In certain locations it may become necessary to improve the ground conductivity by treating soil around the ground rod with a salt solution.

(8) It is frequently thought that operation of high frequency stabilized arc welding equipment in metallic buildings will completely eliminate troublesome radiation. This, however, is a false assumption. A metallic building structure, if properly grounded, may serve to reduce direct radiation from the weld zone but will have no effect on conducted interference and reradiation. As a result, all installation requirements mentioned above must be complied with. If the metallic building is not properly grounded, bonding to several good electrical grounds placed around the periphery of the building will give reasonable assurance that the building itself is not contributing to the radiation.

f. Check List of High Frequency Stabilized Arc Welding Equipment Installation.

(1) Has the equipment been located so that ground leads can be kept short?

(2) Are the power leads serving the unit in conduit?

(3) Is there good electrical contact between power conduit and case?

(4) Do the conduit couplings make good electrical contact? (If in doubt, use bonding.)

(5) Is there good electrical contact between conduit and switch on service boxes?

(6) If rigid metallic conduit is not used, is the shielding used of equivalent shielding efficiency? (Copper sleeving, lead covered cable, etc., is satisfactory. Spirally wound flexible metallic conduit is not suitable.)

(7) Is the conduit system grounded at a point at least 50 feet from the equipment?

(8) Is the conduit run complete (without any gap) in the H.F.I. zone?

(9) Is the equipment case connected to the work terminal of the secondary?

(10) Is the wire used for this connection of sufficient size ?

(11) Is the work terminal connected to a good electrical ground ?

(12) Is the cable or copper braid used for this connection equal to or greater in current carrying capacity than the welding lead ?

(13) Is this cable as short as possible?

(14) Are the spark gaps set at .008 inches or less ?

(15) Are all service and access doors closed and bolted ?

(16) Are the welding leads less than 25 feet long ?

(17) Are they as short as possible?

(18) Are the welding leads on the floor or placed on a suitable board?

(19) Are the welding leads approximately 3/4 inch to 1 inch apart?

(20) Have you visualized the H.F.I. zone, a sphere with 50 feet radius centered on the weld zone ?

(21) Have the unshielded power and light wires originally in this H.F.I. zone been placed in grounded shields or been relocated outside the zone ?

(22) Have all large metallic objects and any long guy or supporting wires in the H.F.I.. zone been grounded ?

(23) Have you checked so that no external power or telephone lines off the premises are within the zone ?

(24) Are the grounds driven ground rods ?

(25) Is a cold water pipe used as ground?

(26) If so, does it enter the ground 10 feet or less from the connection ?

(27) Are the connections to the ground clean and tight ?

(28) If operated within a metal building, is the building properly grounded ?

If the answers to the above questions are affirmative, the equipment may reasonably be expected to meet the radiation limits set by the Federal Communications Commission.

2-5. Equipment Conversion

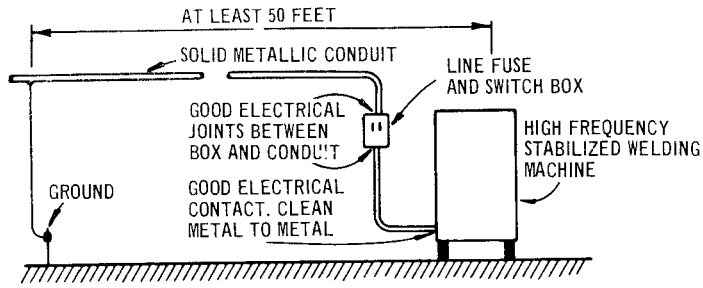
a. General. The welding machine can operate on either 208, 230 or 460 volts by the correct positioning of the voltage change bars.

b. Voltage Change Bar Positioning.

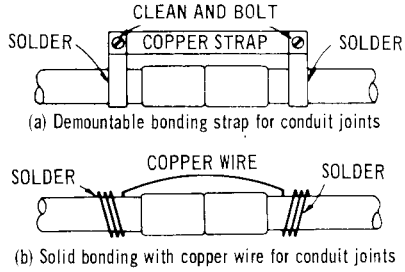
(1) Remove the screws on the voltage change bar access panel and open door.

(2) Refer to figure 2-2G and place the voltage change bars in the desired position.

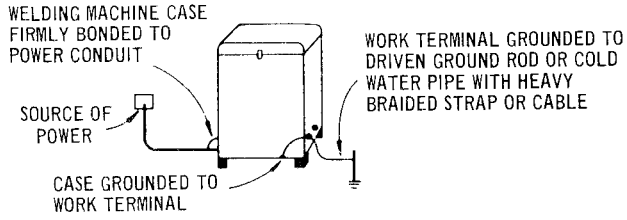
Warning: **Do not reposition voltage change bars while power source is connected to the machine. To do so could cause a serious electrical shock and possible death.**



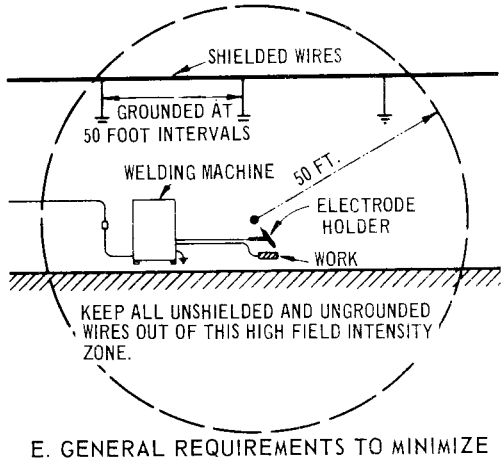
A. POWER SERVICE INSTALLATION



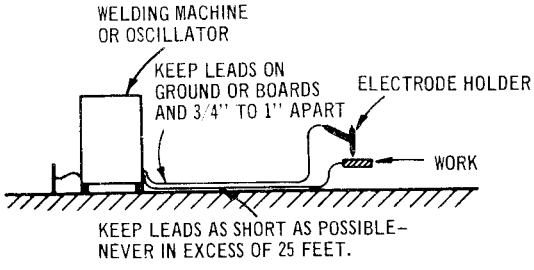
B. RECOMMENDED METHODS FOR ELECTRICAL BONDING



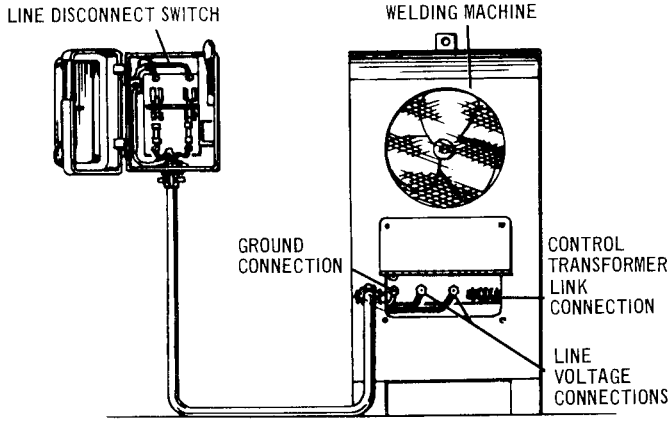
C. GROUND CONNECTIONS AT WELDING MACHINE



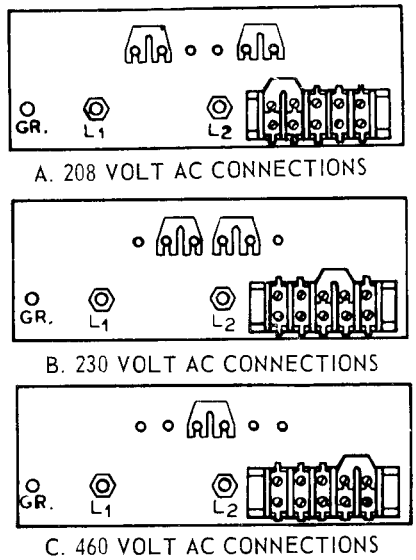
E. GENERAL REQUIREMENTS TO MINIMIZE RERADIATION PICK-UP



D. GENERAL RULES FOR WELDING LEADS



F. PRIMARY LINE VOLTAGE CONNECTIONS



A. 208 VOLT AC CONNECTIONS

B. 230 VOLT AC CONNECTIONS

C. 460 VOLT AC CONNECTIONS

G. VOLTAGE CHANGE BAR CONNECTIONS.

MEC 3431-225-15/2-2

Figure 2–2. Welding machine installation.

Section II. MOVEMENT TO A NEW WORKSITE

2-6. Dismantling for Movement

a. Disconnect cables from load connection, external power source ground connections, and hoses and/or piping from gas and water connections (para 2-4).

b. If the welding machine is to be moved within a building, it can be skidded or moved with a forklift. If the welding machine is to be moved other than a short distance, cover the water and gas connection fittings and load it on a truck or other suitable carrier with a suitable lifting device.

Warning: **When using a lifting device to lift the welding machine, make sure it has a safe lifting capacity of at least 1,000 pounds. Do not allow the welding machine to swing freely when being lifted, Failure to observe this warning may cause damage to the equipment** or serious injury to personnel.

2-7. Reinstallation After Movement

Refer to paragraph 2-4 for reinstallation instructions after movement to a new worksite.

Section III. CONTROLS AND INSTRUMENTS

2-8. General

This section describes, locates, illustrates and furnishes the operator, crew, or organizational maintenance personnel sufficient information about the various controls and instruments for proper operation of the welding machine.

2-9. Controls and Instruments

Refer to figure 2-3 for the purpose, use, and normal position of the controls and instruments.

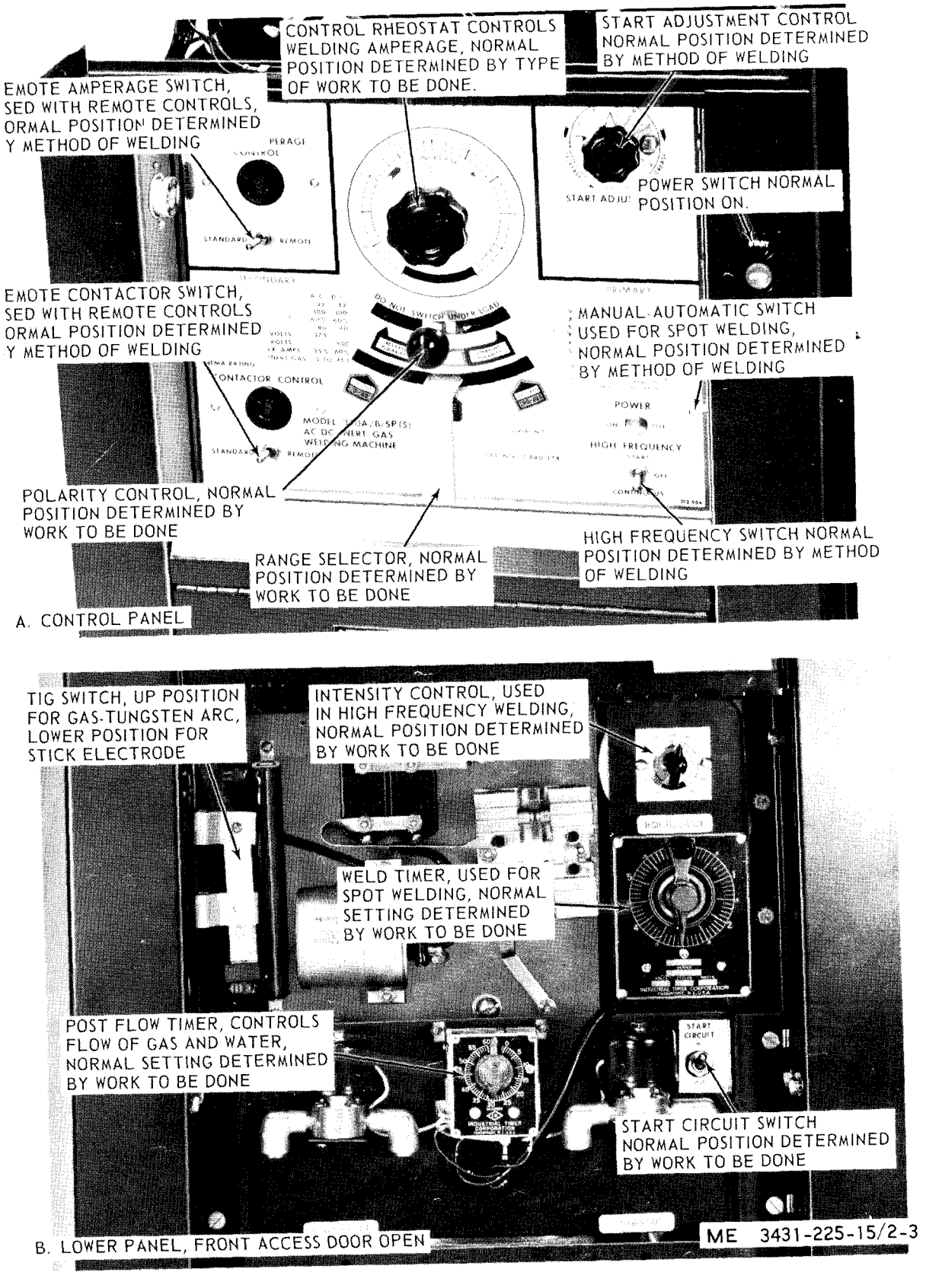


Figure 2-3. Controls and instruments.

Section IV. OPERATION OF EQUIPMENT

2-10. General

a. The instructions in this section are published for the information and guidance of the personnel responsible for the operation of the welding machine.

b. The operator must know how to perform every operation of which the welding machine is capable. This section gives instructions on starting and stopping the welding machine, and various settings of controls to enable the welding machine to perform different types of welding for which it is designed. Since nearly every job presents a different problem, the operator may have to vary given procedures to fit the individual job.

***Caution:* When using the machine for high frequency welding, high frequency emission may result in communication interference if the machine is not properly grounded.**

2-11. Starting

a. Preparation for Starting.

(1) Perform the daily preventive maintenance services (para 3-5).

(2) Clean area on item to be welded to insure a good connection.

(3) Connect the ground clamp of the load (work) cable to the work table or item to be welded.

b. Stating. Refer to figure 2-4 for starting instructions.

2-12. Stopping

a. Refer to figure 2-5 for stopping instructions.

b. Remove the ground clamp from the item being welded.

2-13. Welding Machine Operation

a. Start the welding machine (para 2-11).

b. Refer to table 2-1 and select the proper electrode for inert gas welding.

***Caution:* Do not operate the Current Range Switch or the AC/DC Selector and Polarity Switch under load. Arcing caused by opening the switch carrying high current will severely burn the contact surfaces of the switch. This burning of the contact surfaces will decrease the maximum current carrying capacity of the switch and possibly cause the switch to become inoperative.**

Table 2-1. Electrode Size for Applied Current

Tungsten Electrode size (diameter)	Welding current (amp)
0.040 in.	40–60
3/32 in.	50–100
1/16 in.	100–160
1/8 in.	150–210
5/32 in.	200–275
3/16 in.	250–350
1/4 in.	325–475

Note. Refer to TM 9–237 for metallic arc welding theory and application.

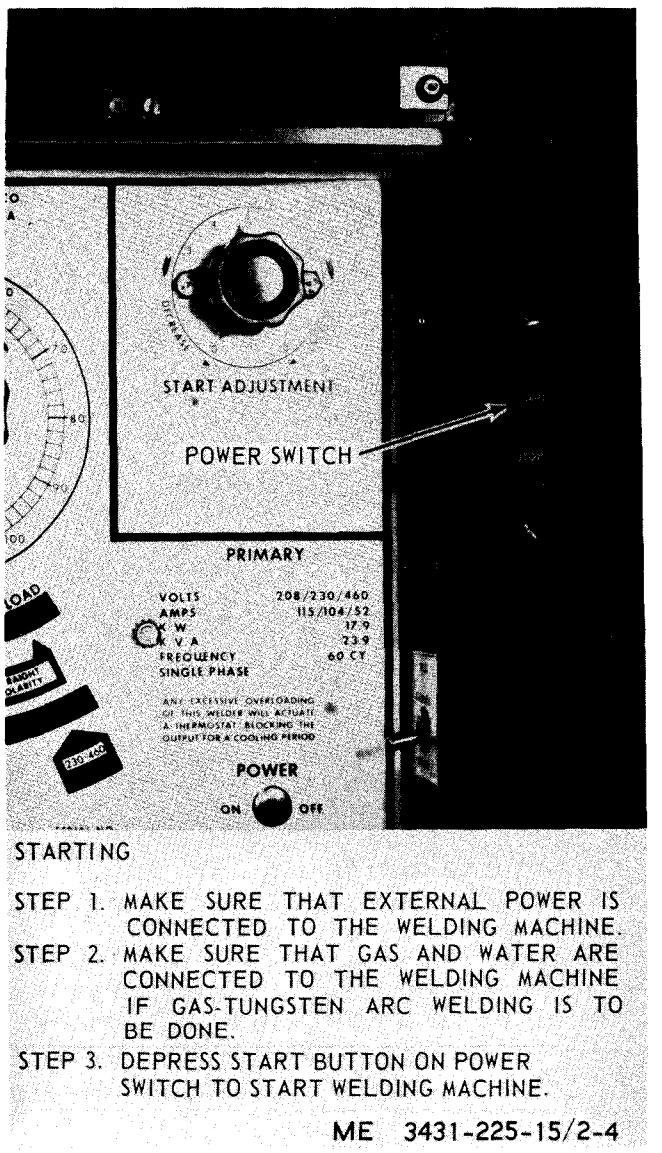


Figure 2–4. Starting the welding machine.

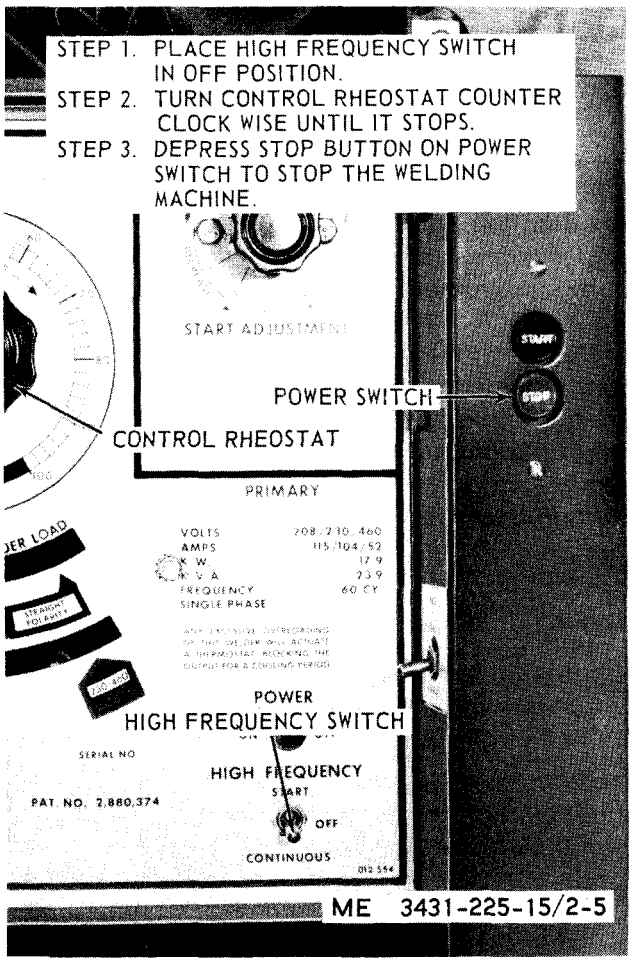


Figure 2-5. Stopping the welding machine.

c. Use a sample piece of metal, like the metal to be welded and adjust the welding amperage to produce the correct arc necessary for the welding to be done.

Warning: **Do not come in contact with the electrode while the welding machine is operating. The high voltage generated by the machine can cause death by electrocution.**

d. The connections on the terminal blocks located on the relay panel on the left side of the machine (fig. 4-10) must be properly positioned for the type of welding to be done. These three connections are known as Panel "A" used for automatic welding, Panel "B" used for manual welding, and Panel "S" used for spot welding, Proper connections for each panel are shown in figure 2-6 (1) A. Operation of the welding machine in each panel is as follows:

(1) *"A" panel.* This type of operation is used for automatic welding. The contactor control switch must be in the "remote" position. A normally open maintained contact switch must be connected to the contactor control receptacle. With this switch engaged, the contactor in the welding machine is energized, starting gas and water flow. Full open circuit voltage (when no arc is established) and high frequency is present (with the switch in either "Start" or "Continuous" position) and the start adjustment control circuit is energized. When welding is begun, the high frequency will shut off (with the switch in the "Start" position only), and the start adjustment control will change to the main welding control. Welding can continue as long as the remote control switch is maintained in the closed position, To stop welding, the control switch must be opened; this drops out the contactor and breaks the arc. The post flow gas timer will start to time out.

Note. If the arc is broken manually, gas and water will continue to flow, full open circuit voltage is present, high frequency is present (if switch is in "Continuous" position) and the start adjustment control circuit is energized. The maintained contact witch must be opened to deenergize the welding circuit.

(2) *"B" panel.* This type of operation is used for manual welding. The contactor control switch must be in the remote position. A momentary contact switch must be connected to the contactor control receptacle. With this switch engaged the contactor in the welding machine is energized, starting gas and water flow. Full open circuit voltage (when no arc is established) and high frequency is present (with the switch in either "Start" or "Continuous" position) and the start adjustment circuit is energized. When welding is begun, the remote contactor control switch can be released, the high frequeney will shut off (with the switch in the "Start" position only) and the start adjustment control will change to the main welding control. To stop welding, break the arc by withdrawing the electrode holder from the work. The contactor will open and gas and water will start to time out automatically.

(3) *"S" panel.* This type of operation is used for spot welding. When using the "S" panel control, it will be necessary to position the "Automatic-Manual" switch as required. With the "Automatic-Manual" switch in the "Manual" position, "A" control operation is possible. With the switch in the "Automatic" position, "S" control operation is possible. When using the "S" control for gas tungsten-arc spot welding, it will be necessary to place the contactor control switch in the "Remote" position. The weld timer, lo-

cated behind front access door, is provided for automatic control of weld current time.

e. Refer to figure 2-6 and operate the welding machine.

Warning: Before operating the welding machine, see that the ground terminal lug is connected through the input cable or by separate conductor to the power system ground. An ungrounded welding machine can cause death by electrocution to personnel coming in contact with it.

Note. The welding machine is equipped with a remote receptacle and can be operated by remote control. When using the remote control, the contactor and amperage switches must be in the remote position. When the remote amperage control is used, the maximum current available will be limited by the setting of the panel rheostat. If full range is necessary, the panel rheostat control must be set wide open.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

2-14. Operation in Extreme Cold (Below 0° F)

a. Frequently inspect for frozen water pipes or lines.

b. If freezing is evident, disconnect the water system from the welding machine and use only for regular arc welding,

2-15. Operation in Extreme Heat

Make sure the welding machine has adequate ventilation.

2-16. Operation in Dusty or Sandy Areas

a. Keep dust and sand cleaned from welding machine as much as possible.

b. Keep welding machine covered when not in use.

2-17. Operation Under Rainy or Humid Conditions

a. provide as much protection as possible to keep rain from welding machine.

b. Keep the welding machine covered when not in use.

c. If water comes in contact with the high frequency panel, remove the panel and dry throughly before installing it in the welding machine.

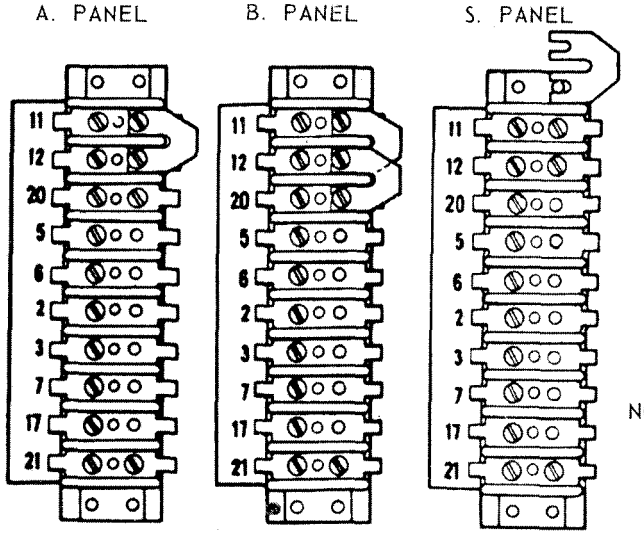
Warning: **Be extremely careful when the unit or surrounding area is damp or wet. Coming in contact with a wet or damp unit can cause a serious electrical shock or death.**

2-18. Operation in Salt Water Areas

a. Keep the welding machine protected as much as possible but do not block ventilation.

b. Inspect all connections, terminals, and fittings for corrosion.

c. Keep welding machine covered when not in use.



NOTE: SET UP WELDER FOR TYPE OF WELDING TO BE DONE.
AUTOMATICALLY CONTROLLED WELDING
CONNECT JUMPERS ON RELAY PANEL FOR "A" PANEL.
MANUALLY CONTROLLED WELDING
CONNECT JUMPERS ON RELAY PANEL FOR "A" PANEL.
SPOT WELDING
CONNECT JUMPERS ON RELAY PANEL FOR "S" PANEL.

NOTE: REMOVE RIGHT SIDE PANEL OF WELDING MACHINE FOR ACCESS TO PANEL CONNECTIONS.

A. PANEL CONNECTIONS

SHEILDED METAL-ARC WELDING

STEP 1. PLACE CONTACTOR CONTROL SWITCH IN STANDARD POSITION.
STEP 2. IF START CONTROL IS DESIRED, PLACE START CONTROL TO IN POSITION.
STEP 3. TURN START ADJUSTMENT CONTROL TO MAXIMUM C.W. POSITION EXCEPT FOR LIGHT GAUGE METAL.
STEP 4. DETERMINE WELDING RANGE BY SIZE OF WORK TO BE DONE AND SELECT PROPER ELECTRODE SIZE. ADJUST RANGE CONTROL TO PROPER POSITION.
STEP 5. PLACE POLARITY SWITCH IN POSITION TO SUIT WELDING APPLICATION.
STEP 6. PLACE REMOTE AMPERAGE CONTROL SWITCH IN STANDARD POSITION. (IF REMOTE CONTROL IS USED, PLUG INTO REMOTE AMPERAGE RECEPTACLE, AND PLACE SWITCH IN REMOTE POSITION.)
STEP 7. ADJUST CONTROL RHEOSTAT FOR PROPER WELDING CURRENT.
STEP 8. DEPRESS POWER SWITCH ON BUTTON. COMMENCE WELDING. ADJUST RANGE SWITCH AND CONTROL RHEOSTAT IF NECESSARY.

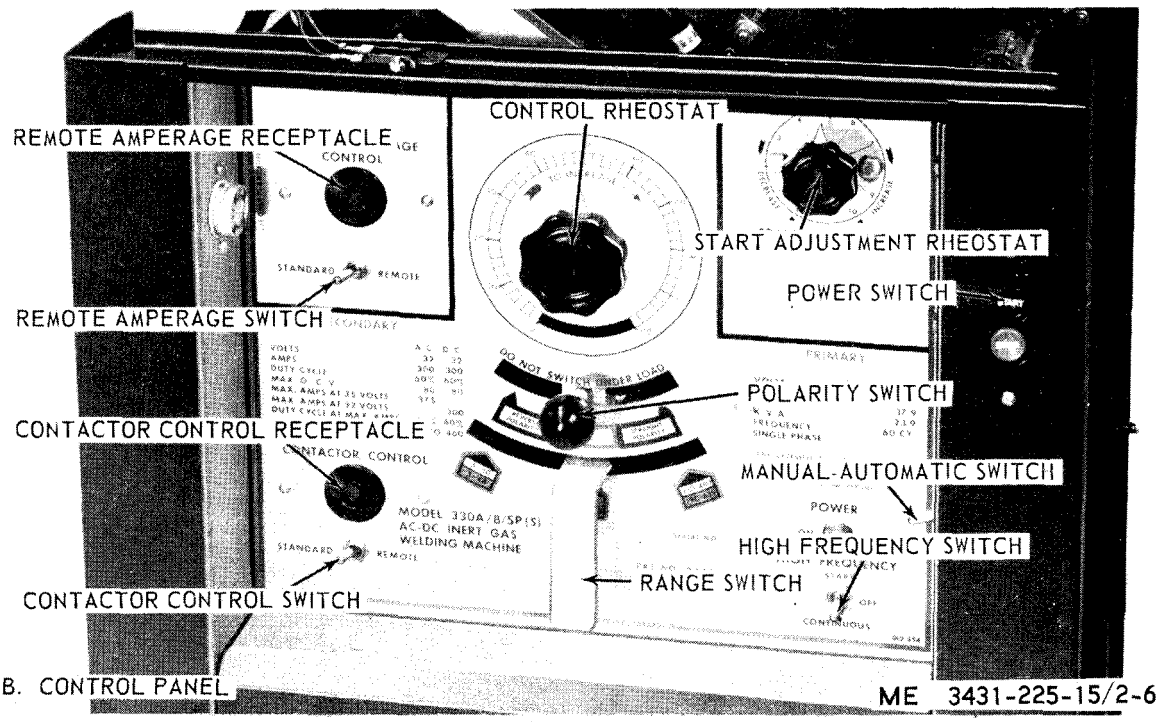
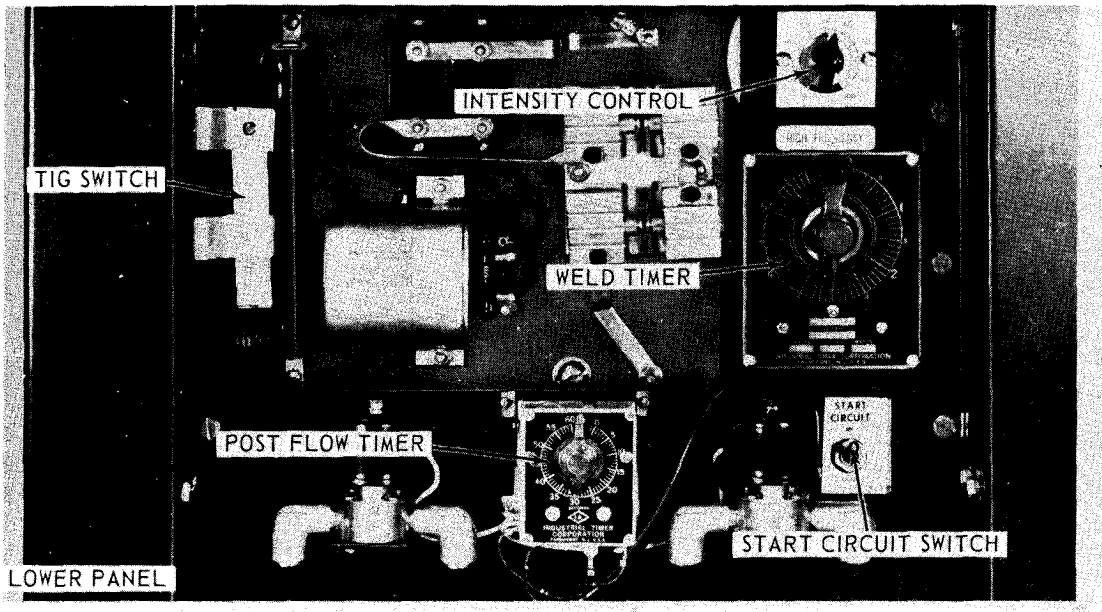


Figure 2-6. Welding machine operation (sheet 1 of 2).



C. LOWER PANEL

GAS TUNGSTEN-ARC WELDING

STEP 1. TURN ON SOURCES OF GAS AND WATER.
STEP 2. PLACE CONTACTOR CONTROL SWITCH IN REMOTE POSITION. CONNECT SUITABLE CONTACTOR CONTROL TO CONTACTOR CONTROL RECEPTACLE.
STEP 3. PLACE REMOTE AMPERAGE SWITCH IN STANDARD POSITION (IF REMOTE CONTROL IS USED, PLUG INTO REMOTE AMPERAGE RECEPTACLE AND PLACE SWITCH IN REMOTE POSITION.)
STEP 4. DETERMINE WELDING RANGE BY SIZE OF WORK TO BE DONE AND SET RANGE IN POSITION TO SUIT WELDING CURRENT.
STEP 5. PLACE POLARITY SWITCH IN POSITION TO SUIT WELDING APPLICATION.
STEP 6. ADJUST CONTROL RHEOSTAT FOR PROPER WELDING CURRENT.
STEP 7. IF START CONTROL IS DESIRED, PLACE START CONTROL SWITCH IN THE IN POSITION. SET START CONTROL RHEOSTAT TO SAME POSITION AS CONTROL RHEOSTAT.
STEP 8. PLACE HIGH FREQUENCY SWITCH IN THE START POSITION FOR D.C. WELDING OR IN THE CONTINUOUS POSITION FOR A.C. WELDING.
STEP 9. PLACE TIG SWITCH IN TIG (UPPER) POSITION.
STEP 10. ADJUST POST FLOW TIMER FOR 10 SECONDS FOR EACH 100 AMPERES OF WELDING CURRENT.
STEP 11. SET INTENSITY CONTROL TO 60. RE-ADJUST AS NECESSARY.
STEP 12. DEPRESS POWER SWITCH ON BUTTON. COMMENCE WELDING. RE-ADJUST CONTROLS AS NECESSARY UNTIL PROPER WELDING OPERATION IS OBTAINED.

SPOT WELDING

STEP 1. CONNECT SPOT GUN TO GAS, WATER AND ELECTRODE TERMINALS. TURN ON GAS AND WATER SOURCES.
STEP 2. PLACE CONTACTOR CONTROL SWITCH IN REMOTE POSITION. CONNECT CONTACTOR CONTROL TO CONTACTOR CONTROL RECEPTACLE.
STEP 3. PLACE REMOTE AMPERAGE CONTROL IN STANDARD POSITION (IF REMOTE CONTROL IS USED, PLUG INTO REMOTE AMPERAGE RECEPTACLE AND PLACE SWITCH IN REMOTE POSITION.)
STEP 4. DETERMINE WELDING RANGE BY SIZE OF WORK TO BE DONE AND SET RANGE SWITCH.
STEP 5, PLACE POLARITY SWITCH IN STRAIGHT POLARITY POSITION.
STEP 6. ADJUST CONTROL RHEOSTAT FOR PROPER WELDING CURRENT.
STEP 7. IF START CONTROL IS DESIRED, PLACE START CONTROL SWITCH IN THE IN POSITION. SET START CONTROL RHEOSTAT IN UPPER HALF OF ITS RANGE.
STEP 8. PLACE HIGH FREQUENCY SWITCH IN CONTINUOUS OR START POSITION DEPENDING ON APPLICATION.
STEP 9. PLACE AUTOMATIC-MANUAL SWITCH IN AUTOMATIC POSITION. SET WELD TIMER TO DESIRED WELD TIME.
STEP 10. PLACE TIG SWITCH IN TIG (UPPER) POSITION.
STEP 11. SET INTENSITY CONTROL TO 60. RE-ADJUST AS NECESSARY.
STEP 12. DEPRESS POWER SWITCH ON BUTTON. COMMENCE WELDING. RE-ADJUST CONTROLS AS NECESSARY UNTIL PROPER WELDING OPERATION IS OBTAINED.

ME 3431-225-15/2-6(2)

Figure 2–6. Welding machine operation (sheet 2 of 2).

CHAPTER 3

OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. OPERATOR AND ORGANIZATIONAL MAINTENANCE TOOLS AND EQUIPMENT

3-1. Special Tools and Equipment

No special tools or equipment are required by the operator or organizational maintenance personnel for the maintenance of the welding machine.

3-2. Basic Issue Tools and Equipment

Tools and repair parts issued with or authorized for the welding machine are listed in the basic issue items list, Appendix B of this manual.

Section II. LUBRICATION

3-3. General Lubrication Information

No lubrication is required for the welding machine.

Section III. PREVENTIVE MAINTENANCE SERVICES

3-4. General

To insure that the welding machine is ready for operation at all times, it must be inspected systematically, so that defects may be discovered and corrected before they result in serious damage and failure. The necessary preventive maintenance services to be performed are listed and described in paragraphs 3-5 and 3-6. The item numbers indicate the sequence of minimum inspect ion requirements. Defects discovered during operation of the unit shall be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation which would damage the equipment if operation were continued. All deficiencies and shortcomings will be recorded, together with the corrective action taken, on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) at the earliest possible opportunity.

3-5. Daily Preventive Maintenance Services

This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by the operator. The item numbers are listed consecutively and indicate the sequence of minimum inspection requirements. Refer to figure 3-1 for the daily preventive maintenance services.

3-6. Quarterly Preventive Maintenance Services

a. This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by organizational maintenance personnel at quarterly intervals. A quarterly interval is equal to 3 calendar months or 250 hours of operation, whichever occurs first.

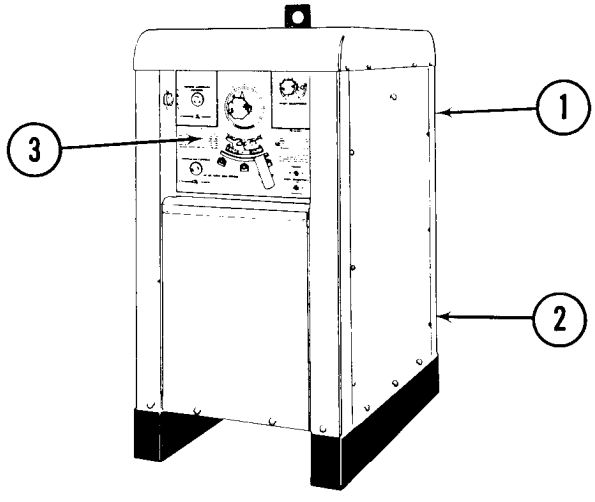
b. The item numbers are listed consecutively and indicate the sequence of minimum inspection requirements. Refer to figure 3-2 for the quarterly preventive maintenance services.

PREVENTIVE MAINTENANCE SERVICES

DAILY

TM-3431-225-15 WELDING MACHINE

(MILLER MODEL 330A/B/SP(S)



ITEM		PAR REF
1	SCREEN. Clean a dirty screen	51
2	GROUND TERMINAL. Check for proper ground. A proper ground will consist of a 3/4 inch-dia. hollow rod or 5/8-inch-dia. solid rod, 9 feet long. The cable will be No. 6 AWG copper wire, bolted or clamped to the rod and attached to the ground terminal of the welder set.	
3	CONTROLS. Inspect for damage and loose mounting. With unit operating, check for proper operation. Turn from Min. to Max. and back each day.	11
	NOTE 1. OPERATION. During operation observe for any unusual noise or vibration.	

ME 3431-225-15/3-1

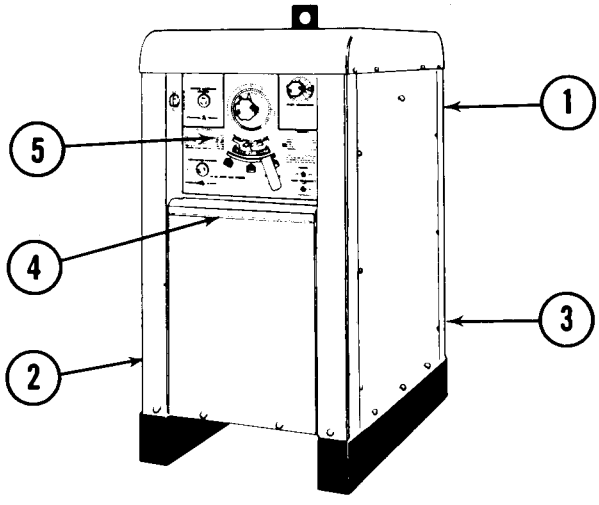
Figure 3-1. Daily preventive maintenance services.

PREVENTIVE MAINTENANCE SERVICES

QUARTERLY

TM5-3431-225-15 WELDING MACHINE

(MILLER MODEL 330A/B/SP(S)



ITEM		PAR REF
1	FAN MOTOR, FAN AND SCREEN. Clean a dirty screen. Tighten loose motor and fan mounting and electrical connections. Reploce defective fon motor or fen.	51 thru 54
2	CONTACTOR. Tighten loose mounting and electrical connections. Replace defective contactor.	39,40
3	GROUND TERMINAL. Check for proper ground. A proper ground will consist of a 3/4 inch-dia. hollow rod or 5/8-inch-dia. solid rod 9 feet long. The cable will be No. 6 AWG capper wire, baited or clamped to the rad and ottoched to the ground terminal of the welding set.	
4	SOLENOID VALVES AND FITTINGS. Tighten loose mounting and electrical connections. Reploce defective valves ond fittings.	48 49
5	CONTROLS. Replace domoged controls. Tighten loose mounting. With the unit opcrating, check far proper operation.	29 thru 33
	NOTE 1 CLEANING. Blow out machine with oir hose (Min. 40 lbs. Max. 75 lbs.). NOTE 2. OPERATIONAL TEST. During operation observe for any unusual noise or vibration. NOTE 3. ADJUSTMENTS. Make all necessory adjustments during operatianal test.	

ME 3431-225-15/3-2

Figure 3-2. Quarterly preventive maintenance services.

Section IV. OPERATOR'S MAINTENANCE

3-7. General

The instructions in this section are published for the information and guidance of personnel responsible for the operator's maintenance of the welding machine and are in addition to those listed in paragraph 3-5.

3-8. Controls

Turn the welding machine OFF, Rotate the controls clockwise to the stop, then counterclockwise to the stop each day to prevent corrosion and keep contacts clean.

3-9. Cartridge Fuses

Refer to figure 3-3 and remove and install the cartridge fuses.

3-10. Plug Fuse

Refer to figure 3-3 and remove and install the plug fuse.

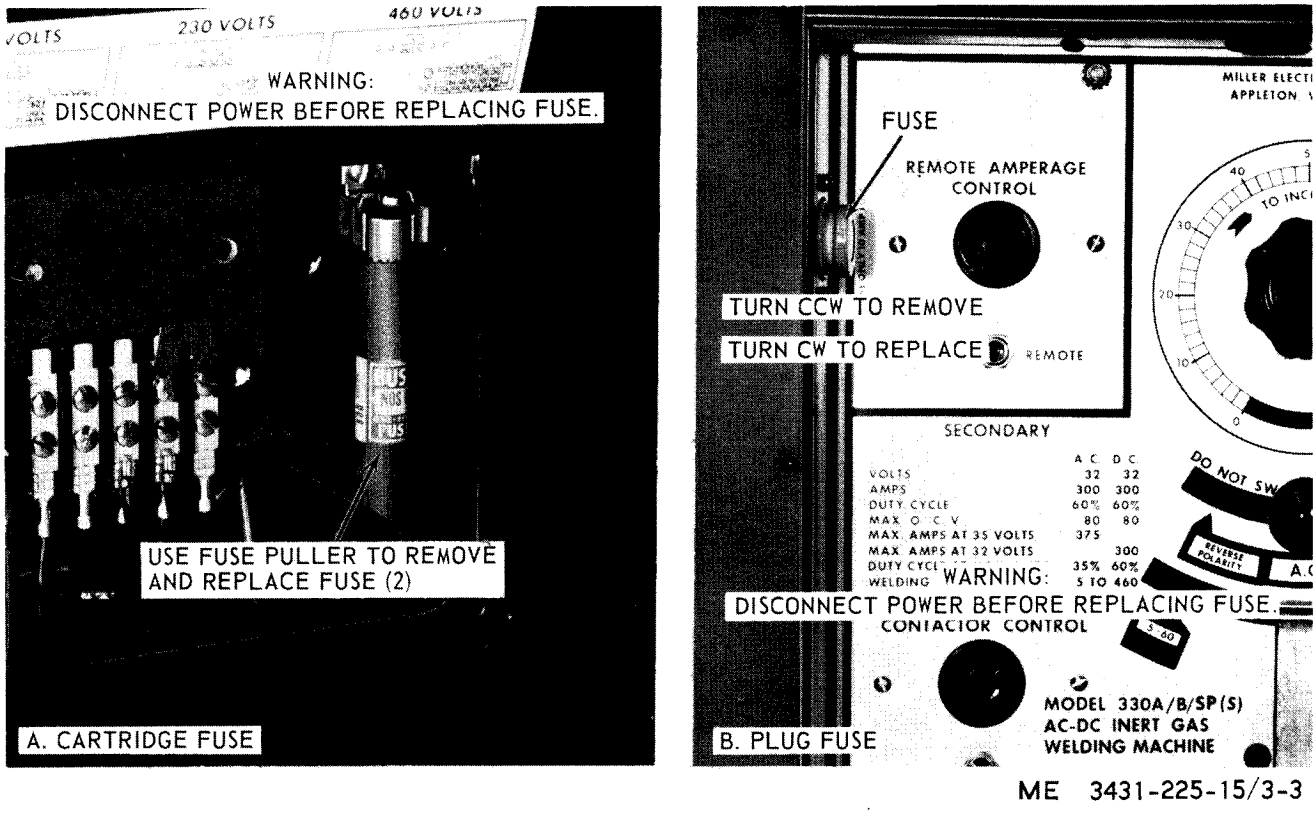


Figure 3-3. Fuses, removal and installation.

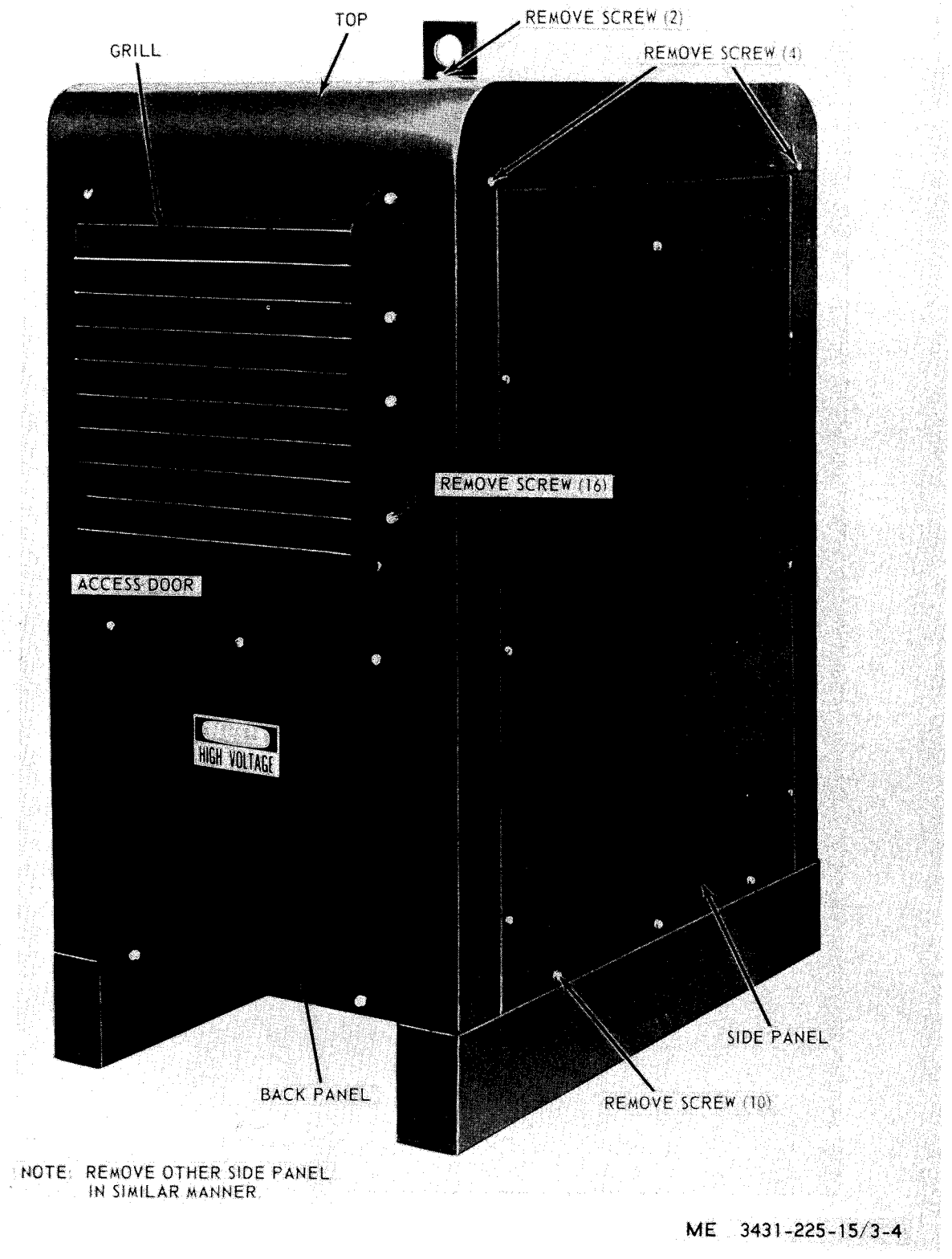


Figure 3–4. Welding machine top and housing, removal and installation.

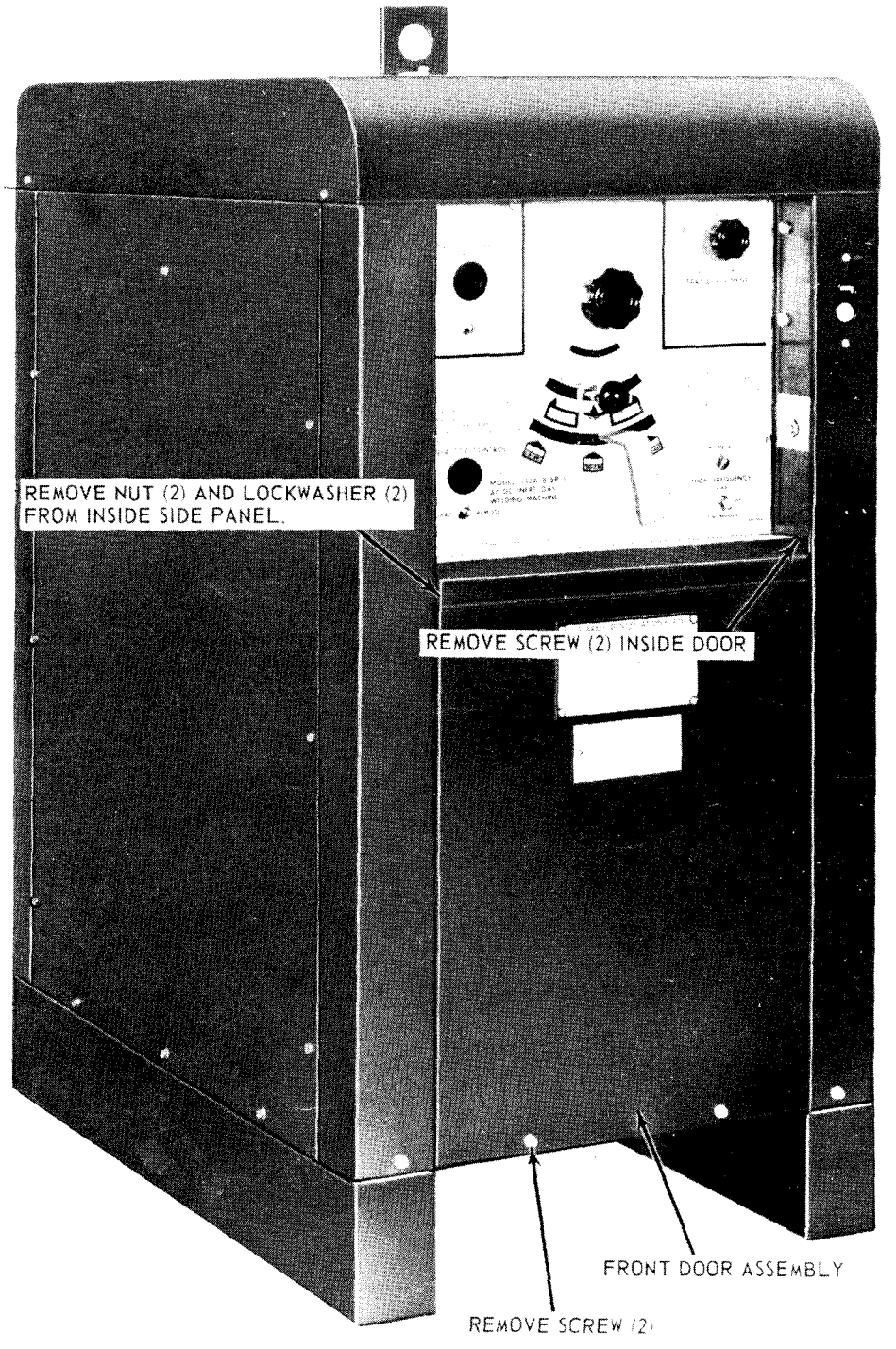


Figure 3–5. Front door assembly, removal and installation.

Section V. TROUBLESHOOTING

3-11. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the welding machine and its components, Each trouble symptom stated is followed by a list of probable causes of the trouble. The possible remedy recommended is described opposite the probable cause. Any trouble beyond the scope of organizational maintenance shall be reported to direct support maintenance.

3-12. Welding Machine Fails to Start

Probable Cause	Possible Remedy
Contactors open	Reset contactors.
Power switch defective	Replace switch (para 3-29).
Control transformer fuse open	Replace fuse (para 3-10).

3-13. Cooling Fan Does Not Operate

Probable Cause	Possible Remedy
Lead broken or terminal loose	Repair or tighten terminal (para 4–34).
Fan motor defective	Replace motor (para 3-52).
Fuse F2 open	Replace fuse (para 3-9).

3-14. Fan Assembly Noisy

Probable Cause	Possible Remedy
Mounting hardware loose	Tighten hardware (para 3–51).
Fan blade loose	Tighten fan blade setscrew (para 3-53).

3-15. Gas Insufficient

Probable Cause	Possible Remedy
Lines or fittings obstructed	Clean lines and 'or fittings (para 3–48).
Solenoid defective	Replace solenoid (para 3-48).

3-16. Water Insufficient

Probable Cause	Possible Remedy
Lines or fittings obstructed	Clean lines and/or fittings (para 3-49).
Solenoid defective	Replace solenoid (para 3-49).

3-17. Welding Machine Operates Erratically

Probable Cause	Possible Remedy
Spark gap improperly adjusted	Clean adjusting screws and adjust spark gap (para 3-44).
Contactor CR–1 or CR–4 defective	Repair or replace contactor CR–1 or CR–4 (para 3–39 and 3–40).

3-18. Remote Control Does Not Function Properly

Probable Cause	Possible Remedy
Wires loose at receptacle	Tighten wires (para 3-38).
Receptacle defective	Replace receptacle (para 3-38).
Remote contactor switch defective	Replace switch (para 3-30).
Remote amperage switch defective	Replace switch (para 3-30).

3-19. Contactor Breaks Circuit

Probable Cause	Possible Remedy
Thermostatic switch defective	Replace switch (para 3-41 and 3-42).

3-20. High Frequency Inoperative

Probable Cause	Possible Remedy
Defective fuse F3	Replace fuse (para 3-9).
Spark gap improperly adjusted	Clean and adjust spark gap (para 3-44).
Defective contactor	Repair or replace contactor (para 3-39 and 3-40).

Section VI. FIELD EXPEDIENT REPAIR

3-21. General

operator and organizational maintenance troubles may occur while the welding machine is operating in the field where supplies and repair parts are not available and normal corrective action cannot be performed. When this condition exists, the following expedient repairs may be used in emergencies, upon the decision of the unit commander. Equipment so repaired must be removed from operation as soon as possible and properly repaired before being placed in operation again.

3-22. Loss of Water

Trouble	Expedient Remedy
Pipe or fitting cracked	Tape cracked pipe or fitting until defective pipe or fittings can be replaced.

3-23. Reduction of High Frequency Output

Trouble	Expedient Remedy
Failure of one high voltage capacitor evidenced by the appearance of melted sealing material or oil leakage	Reduce spark gap point setting to .004 inches until the defective capacitor can be replaced.

3-24. Power Failure

Trouble	Expedient Remedy
Contactor broken or defective	Provide jumper wire around contactor until it can be replaced (para 3-39).

Section VII. WELDING MACHINE TOP, HOUSING, DOORS, AND PANELS

3-25. General

The welding machine housing is constructed of a heavy metal top, sides, back housing and front housing. This section contains information on the maintenance of these components.

Caution: **Never, under any circumstances, operate the welding machine with the top and/or housing removed. In addition to the safety hazard, improper cooling may result in damage to the power transformer and welding machine components.**

3-26. Welding Machine Top and Housing

a. Removal.

(1) Refer to figure 3-4 and remove the welding machine top.

(2) Refer to figure 3-4 and remove the welding machine sides.

(3) Remove the fan, motor, and guard assembly (para 3-51).

(4) Refer to figure 3-4 and remove the rear housing.

b. Installation.

(1) Refer to figure 3-4 and install the rear housing.

(2) Install the fan, motor, and guard assembly (para 3-51).

(3) Refer to figure 3-4 and install the welding machine sides.

(4) Refer to figure 3-4 and install the welding machine top.

3-27. Front Door Assembly

a. Removal.

(1) Refer to figure 3-4 and remove the welding machine top.

(2) Refer to figure 3-4 and remove the welding machine sides.

(3) Refer to figure 3-5 and remove the front door assembly.

b. Installation.

(1) Refer to figure 3-5 and install the front door panel,

(2) Refer to figure 3-4 and install the welding machine sides.

(3) Refer to figure 3-4 and install the welding machine top.

Section VIII. FUSES, SWITCHES, TIMERS AND REMOTE RECEPTACLES

3-28. General

a. The ON-OFF push buttons control the power to the welding machine.

b. The High Frequency Switch has three positions: "START," "CONTINUOUS," and "OFF." In the "START" position, high frequency will be introduced into the welding circuit only when starting to weld. This position is usually used for Gas Tungsten de arc welding. In the "Continuous" position, usually used for Gas Tungsten ac arc welding, high frequency will be introduced into the welding circuit during the entire welding operation. The High Frequency Switch should be placed in the "OFF" position when using the metallic arc (stick electrode) welding process.

c. The Automatic-Manual Switch is set to "Automatic" for Gas Tungsten Arc Spot Welding.

d. The Weld Timer is used to control the spot weld time interval desired-adjustments of from zero (0) to three (3) seconds are obtainable.

e. The post flow gas and water valves timer controls the length of time the gas and water will

continue to flow after the arc has been broken. This timer should be set so that the gas flow continues for a sufficient length of time to allow the tungsten to cool to a point where it will no longer be contaminated when exposed to the air. This time setting is usually ten (10) seconds for each 100 amperes of welding current being used.

f. The Start Circuit Switch is a two position switch provided for starting current control and is located behind the lower front access door. The switch is labeled Start Circuit In-Out and provides the operator with a selection of connecting the starting current control circuit either in or out of the welding circuit. Placing the switch in the "IN" position connects the starting current control in the welding circuit. Placing the switch to the "OUT" position removes the starting current from the welding control circuit. The Start Adjustment Control is labeled "Increase-Decrease" and is used to control the welding arc when starting to weld. The start circuit consists of time delay components which allows preset starting current to flow for approximately 35 to 40 cycles (2/3 of a second). After the time delay, current will automatically change to the current setting of the Weld Current Adjustment Control. To avoid burn-through on light gage metals, the start-Adjustment Control should be set in the counterclockwise direction at a lower setting than the Weld Current Control. If the Weld Current Control is near the zero setting of its range, it may be well to change the Range Switch to the next lowest range setting, if a lower range is available. For heavy gage metals, a full clockwise setting or higher than the Weld Current Control setting is recommended as a higher starting current is required to preheat the metal at the beginning of the weld.

Caution: **Do not operate the welding machine wit h the "Standard-Remote" Switch in the "Remote" position unless a Remote Control is plugged into the receptacle. Failure to heed the caution stated above may result in damage to the switch and/or dc control coil. Removing the Remote Control plug from the Remote Amperage Control Receptacle, with the welding machine in operation, and with the switch in the "Remote" position will have the same adverse effect.**

3-29. Power Switch

a. Removal.

(1) Remove the top and right side panels from welding machine (para 3-26).

(2) Refer to figure 3-6 and remove the power switch.

b. Installation.

(1) Refer to figure 3-6 and install the power switch.

(2) Install the top and side panels on the welding machine (para 3-26).

3-30. Standard-Remote Switches

a. Removal.

(1) Remove the top and side panels from the welding machine (para 3-26).

(2) Refer to figure 3-7 and remove the standard-remote switch.

b. Installation.

(1) Refer to figure 3-7 and install the standard-remote switch.

(2) Install the top and side panels on the welding machine (para 3-26).

3-31. High Frequency Switch

a. Removal.

(1) Remove the top and side panels from the welding machine (para 3-26).

(2) Refer to figure 3-7 and remove the high frequency switch.

b. Installation.

(1) Refer to figure 3-7 and install the high frequency switch.

(2) Install the top and side panels on the welding machine (para 3-26).

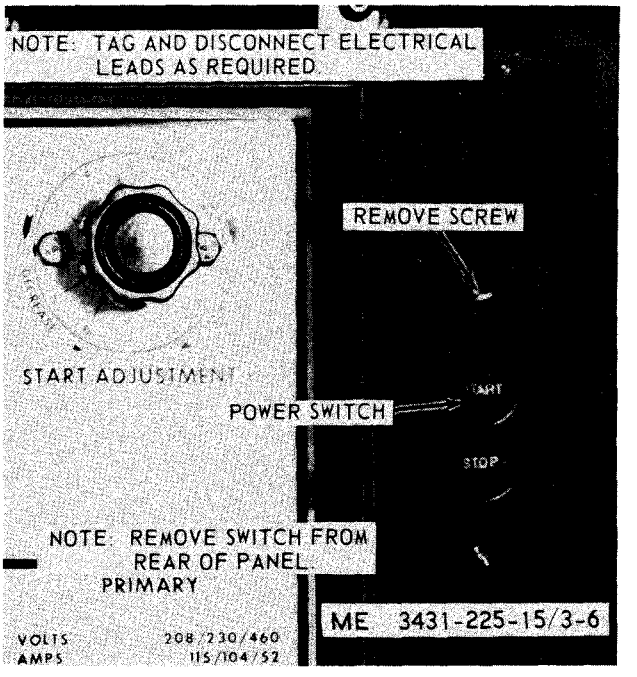


Figure 3-6. Power switch, removal and installation.

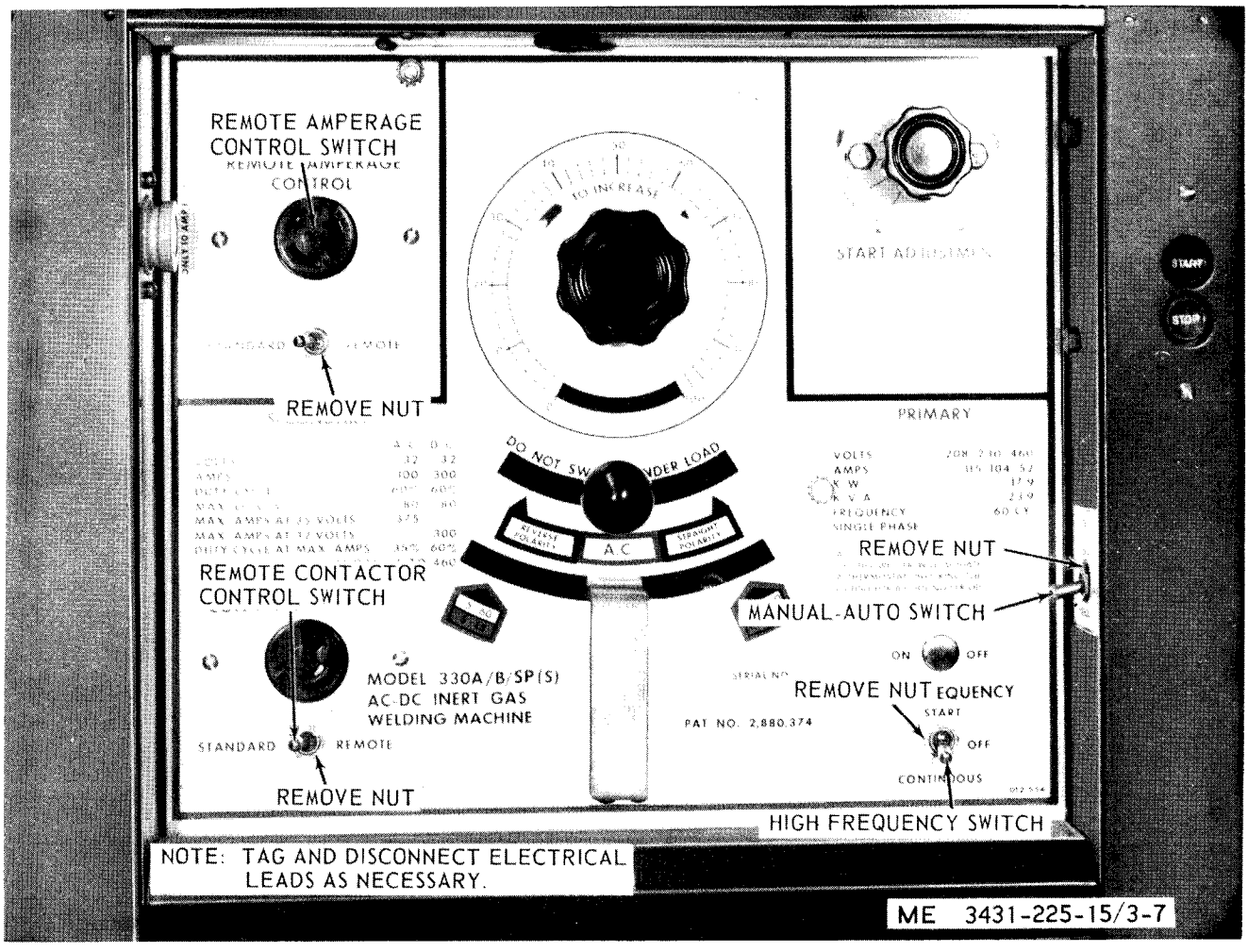


Figure 3–7. Standard-remote, high frequency, manual-auto switches, removal and installation.

3-32. Manual-Auto Switch

a. Removal.

(1) Remove the top and side panels from the welding machine (para 3-26).

(2) Refer to figure 3-7 and remove the manual-auto switch.

b. Installation.

(1) Refer to figure 3-7 and install the manual-auto switch.

(2) Install the top and side panels on the welding machine (para 3-26).

3-33. Start Circuit Switch

a. Removal.

(1) Remove the top and side panels from the welding machine (para 3-26).

(2) Refer to figure 3-8 and remove the start circuit switch.

(1) Refer to figure 3-8 and install the start circuit switch.

(2) install the top and side panels on the welding machine (para 3-26).

3-34. Fuse Receptacles

a. Removal.

(1) Remove the top and side panels from the welding machine (para 3-26).

(2) Refer to figure 3-9 and remove the fuse receptacle.

b. Installation.

(1) Refer to figure 3-9 and install the fuse receptacle.

(2) Install the top and side panels on the welding machine (para 3-26).

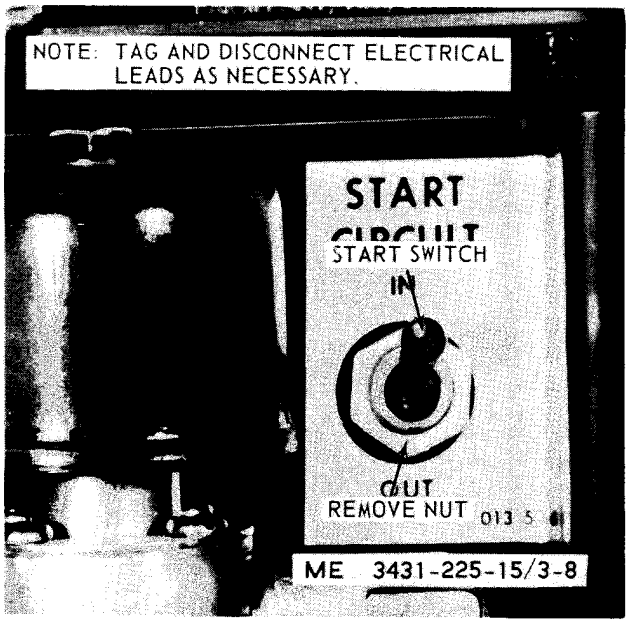


Figure 3–8. Start circuit switch, removal and installation.

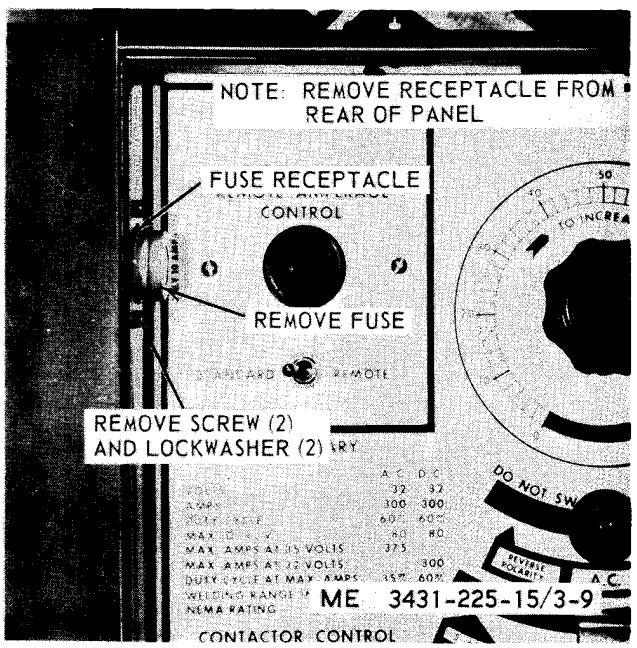


Figure 3–9. Fuse receptacle, removal and installation.

3-35. Spot Weld Timer

a. Removal.

(1) Remove the top and side panels from the welding machine (para 3-26).

(2) Refer to figure 3-10 and remove the high frequency timer.

b. Installation.

(1) Refer to figure 3-10 and install the high frequency timer.

(2) Install the top and side panels on the welding machine (para 3-26).

3-36. Gas and Water Timer

a. Removal.

(1) Remove the top and side panels from the welding machine (para 3-26).

(2) Refer to figure 3-10 and remove the gas and water timer.

b. Installation.

(1) Refer to figure 3-10 and install the gas and water timer.

(2) Install the top and side panels on the welding machine (para 3-26).

3-37. Contactor Control Receptacle

a. Removal.

(1) Remove the top and side panels. from the welding machine (para 3-26).

(2) Refer to figure 3-11 and remove the contactor control receptacle.

b. Installation.

(1) Refer to figure 3-11 and install the contactor control receptacle.

(2) Install the top and side panels on the welding machine (para 3-26).

3-38. Remote Amperage Control Receptacle

a. Removal.

(1) Remove the top and side panels from the welding machine (para 3-26).

(2) Refer to figure 3-11 and remove the remote amperage control receptacle.

b. Installation.

(1) Refer to figure 3-11 and install the remote amperage control receptacle.

(2) Install the top and side panels on the welding machine (para 3-26).

3-39. Main Contactor

a. Removal.

(1) Remove the top and side panels from the welding machine (para 3-26).

(2) Refer to figure 3-12 and remove the main contactor.

b. Installation.

(1) Refer to figure 3-12 and install the main contactor.

(2) Install the top and side panels on the welding machine (para 3-26).

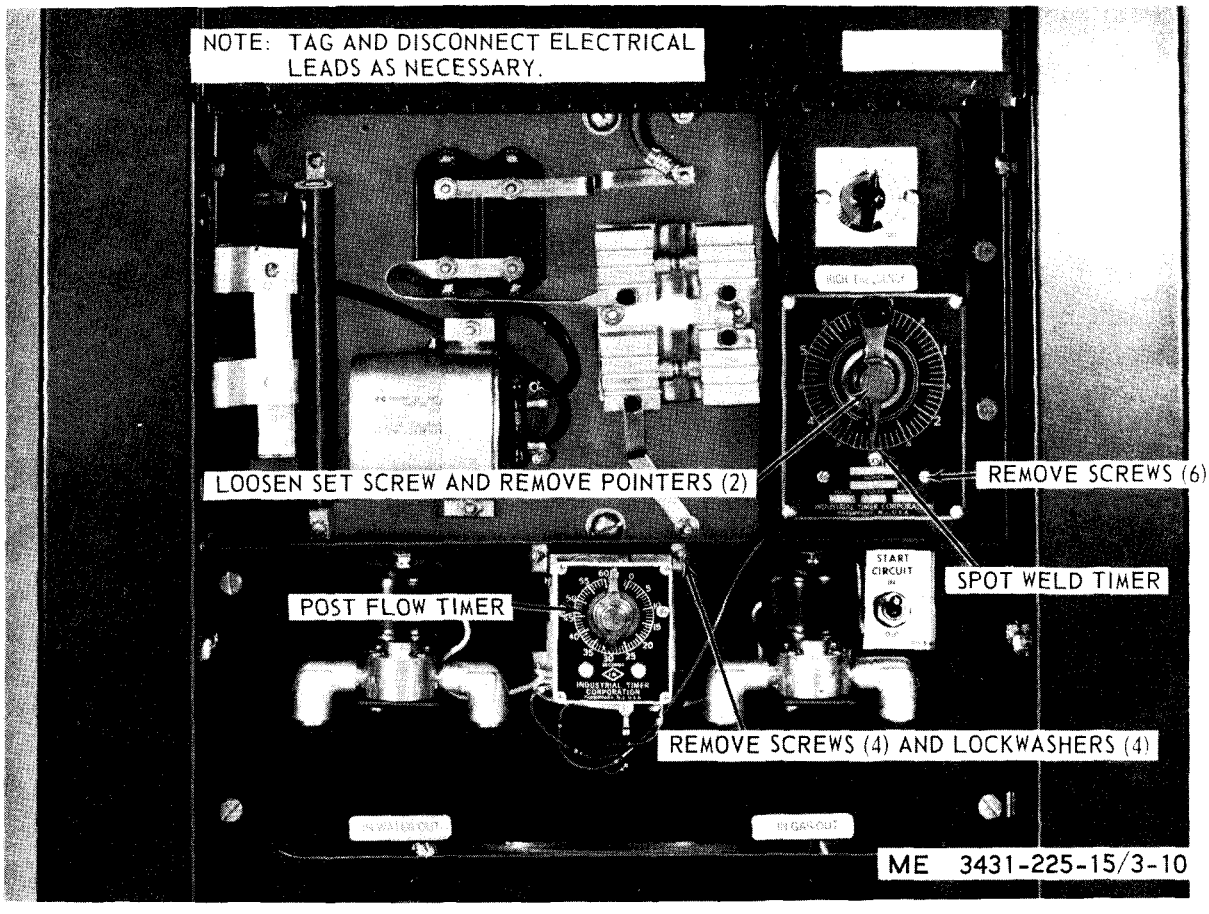


Figure 3-10. Timers, removal and installation.

3-40. Relay Contactor

a. Removal.

(1) Remove the top panel from the welding machine (para 3-26).

(2) Refer to figure 3-13 and remove the relay contactor.

b. Installation.

(1) Refer to figure 3-13 and install the relay contactor.

(2) Install the top on the welding machine (para 3-26).

3-41. Transformer Thermostatic Switch

a. Removal.

(1) Remove the top and side panels from the welding machine (para 3-26).

(2) Refer to figure 3-14 and remove the thermostatic switch.

b. Installation.

(1) Refer to figure 3-14 and install the thermostatic switch.

(2) Install the top and side panels on the welding machine (para 3-26).

3-42. Rectifier Thermostatic Switch

a. Removal.

(1) Remove the top panel from the welding machine (para 3-26).

(2) Refer to figure 3-15 and remove the thermostatic switch from the rectifier.

b. Installation.

(1) Refer to figure 3-15 and install the thermostatic switch on the rectifier.

(2) Install the top panel on the welding machine (para 3-26).

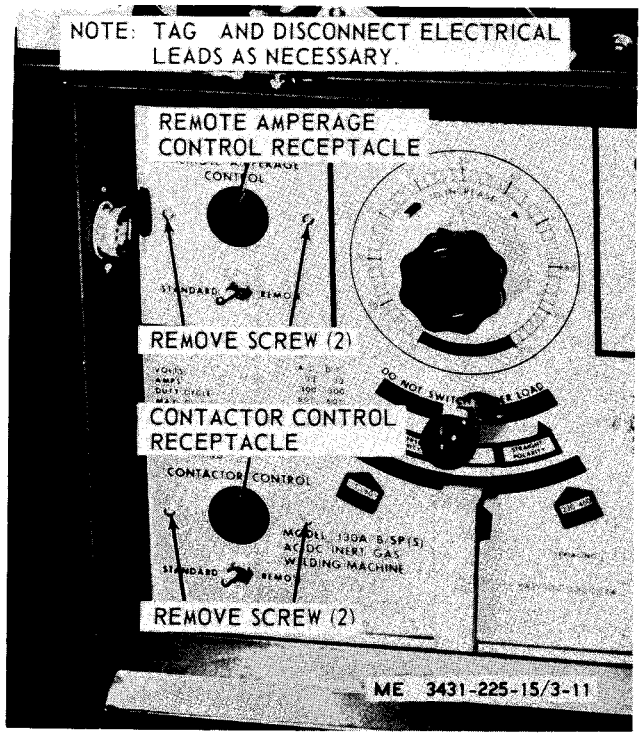


Figure 3-11. Contactor control and remote amperage control receptacles, removal and installation.

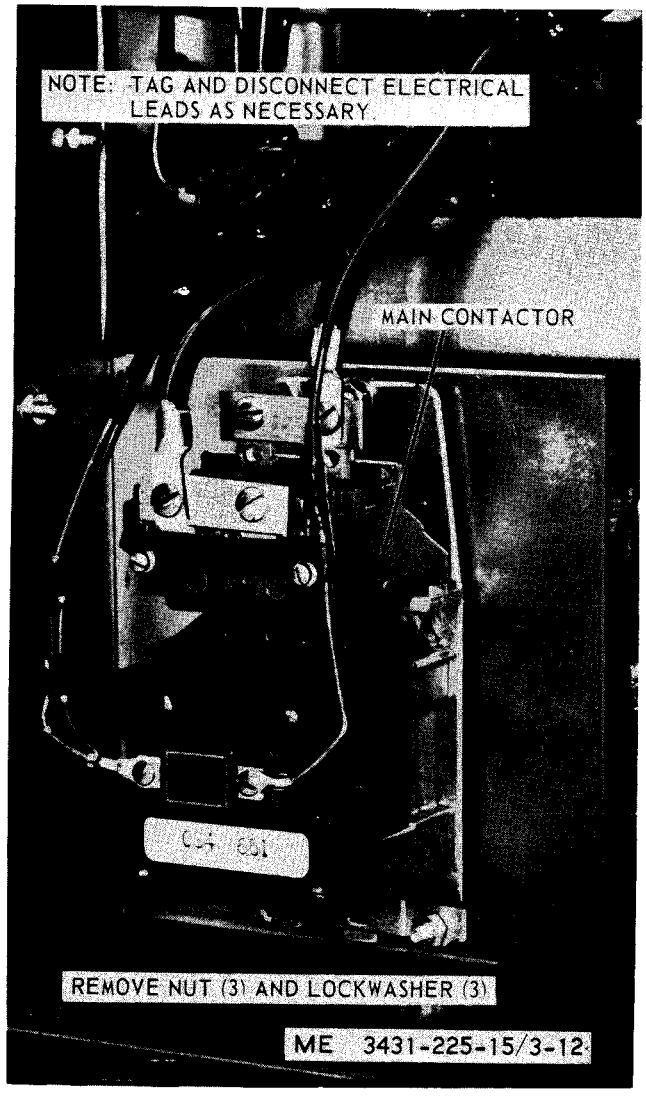


Figure 3-12. Main contactor, removal and installation.

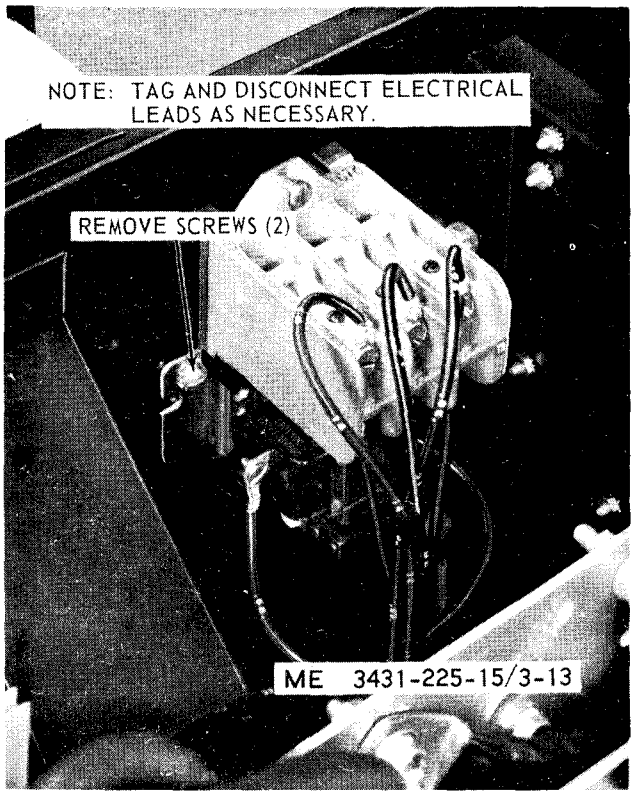


Figure 3-13. Relay contactor, removal and installation.

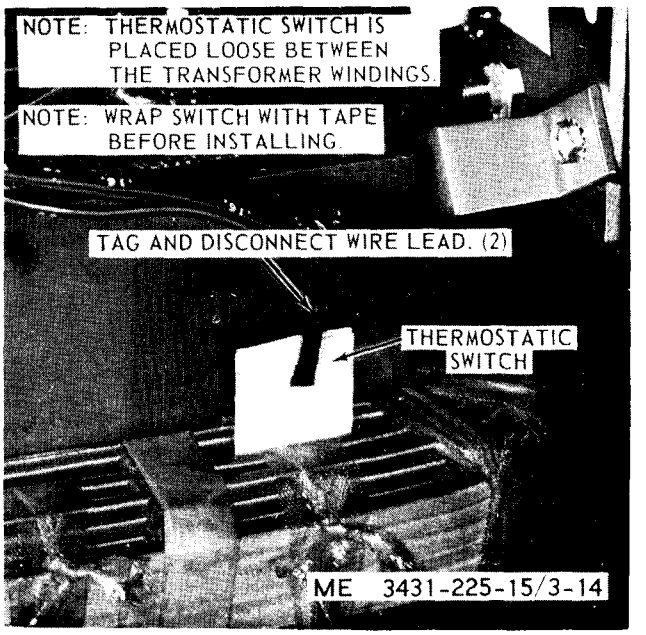


Figure 3-14. Transformer thermostatic switch, removal and installation.

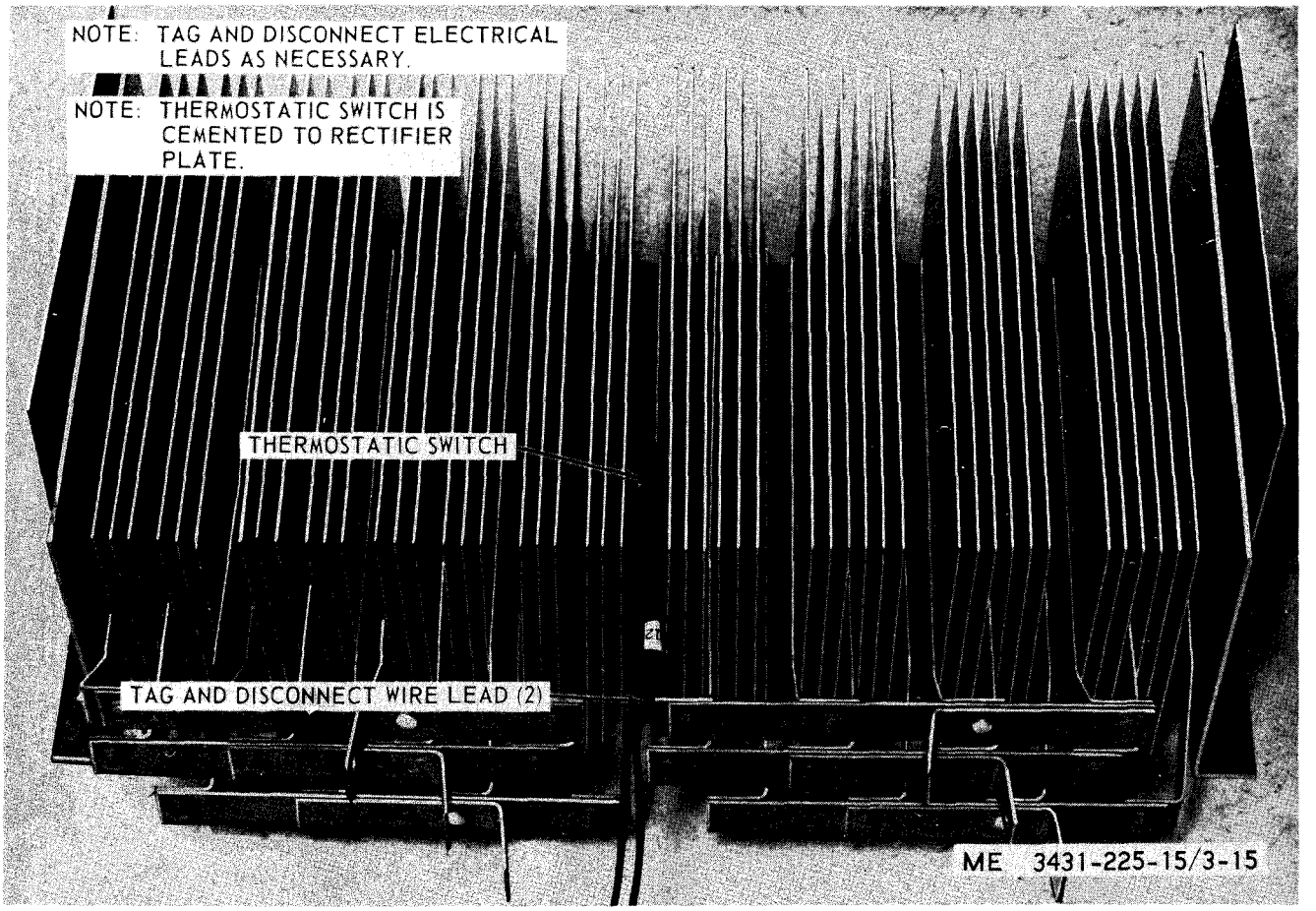


Figure 3–15. Rectifier thermostatic switch, removal and installation.

Section IX. SPARK GAP ASSEMBLY, VOLTAGE CHANGE BARS, AND GROUND AND ELECTRODE TERMINAL BOARD

3-43. General

The primary purpose of the spark gap assembly is to control the stability of the high frequency are. The purpose of tile voltage change bars is to allow the welding machine to operate from 208, 230 or 460 volts by the correct changing of the bars. The ground and electrode cable terminal lugs are connected by brass nuts to the studs on the ground and electrode terminal board.

3-44. Spark Gap Assembly

a. Removal. Refer to figure 3-16 and remove the spark gap assembly.

b. Installation. Refer to figure 3-16 and install the spark gap assembly.

c. Adjustment. Refer to figure 3-16 and adjust the spark gap.

3-45. Voltage Change Bars

a. Removal.

(1) Remove the two securing screws and raise the voltage change bar access door on the rear of the welding machine.

(2) Refer to figure 3-17 and remove the voltage change bars.

b. Installation.

(1) Refer to figure 3-17 and install the voltage change bars.

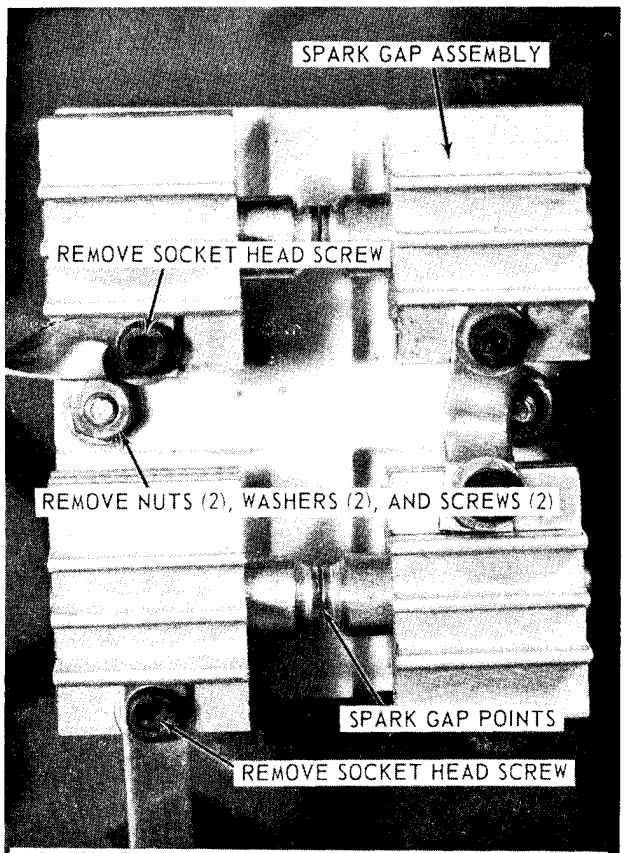
(2) Close the access door and replace the two securing screws.

3-46. Ground and Electrode Terminal Boards

a. Removal.

(1) Remove the top and side panels from the welding machine (para 3-26).

(2) Refer to figure 3-18 and remove the ground or electrode terminal board.



ADJUSTMENT

STEP 1. LOOSEN SOCKET HEAD SCREW.
STEP 2. INSERT A 0.008-IN. FEELER GAGE BETWEEN SPARK GAP POINTS.
STEP 3. PUSH POINTS SNUG AGAINST GAGE TO ADJUST GAP.
STEP 4. TIGHTEN SOCKET HEAD SCREW. GAP IS SET CORRECTLY WHEN FEELER GAGE DRAGS SLIGHTLY WHEN PASSED BETWEEN POINTS.

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Figure 3–16. Spark gap assembly, removal, installation, and adjustment.

b. Installation.

(1) Refer to figure 3-18 and install the ground or electrode terminal board.

(2) Install the top and side panels on the welding machine (para 3-26).

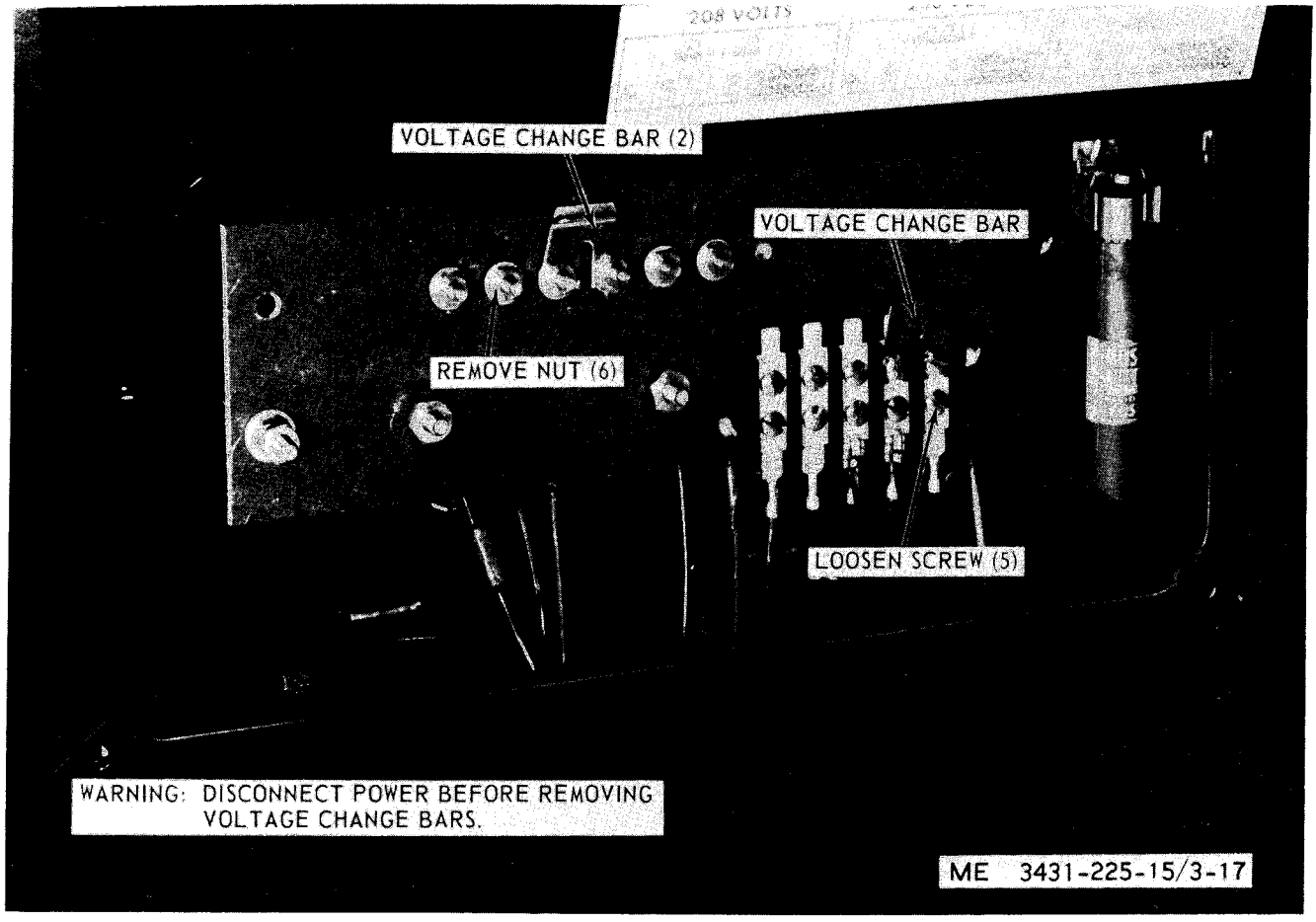

Figure 3-17. Voltage change bars, removal and installation.

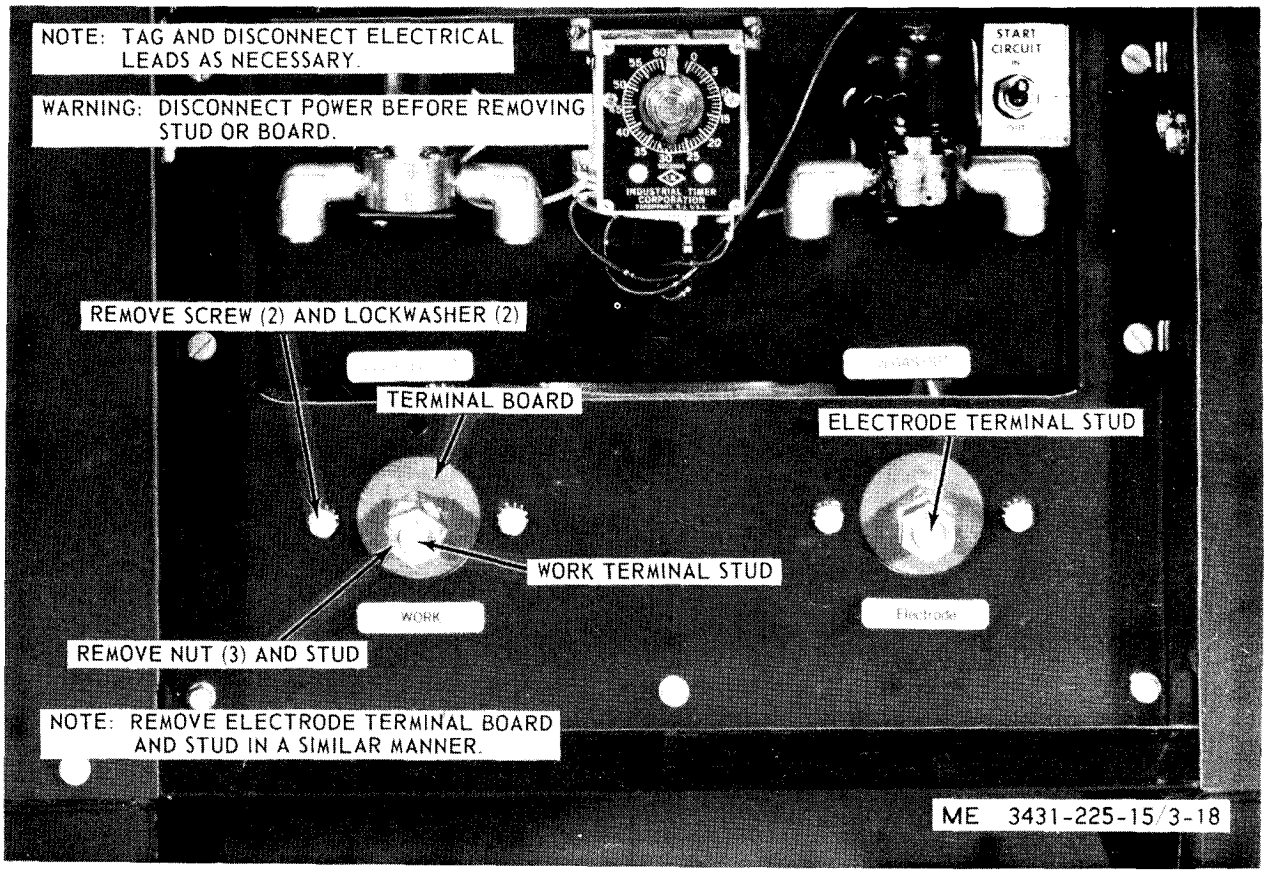

Figure 3–18. Ground and electrode terminal boards, removal and installation.

Section X. GAS AND WATER SOLENOID VALVES

3-47. General

The gas solenoid valve is used when the operator is performing inert gas welding. The solenoid valve is operated electrically through the timer control. The water solenoid valve is used when a water-cooled torch is used. The water solenoid valve is operated electrically through the timer control.

3-48. Gas Solenoid Valve

Refer to figure 3-19 and remove and install the gas solenoid valve.

3-49. Water Solenoid Valve

Refer to figure 3-19 and remove and install the water solenoid valve.

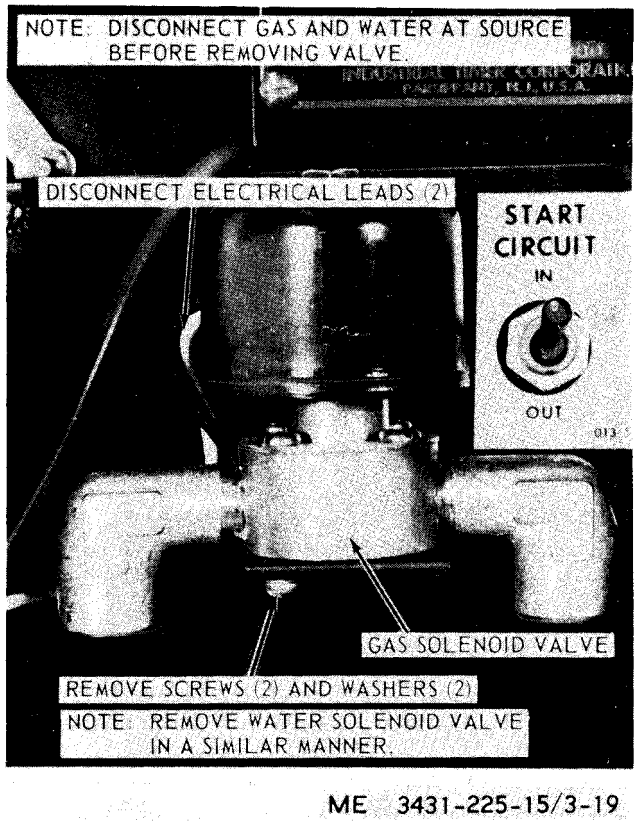

Figure 3-19. Gas and water solenoid valves, removal and installation.

Section XI. VENTILATING COOLING SYSTEM

3-50. General

The welding machine is cooled by a fan motor assembly which operates from a tap on the primaly of the control transformer. It has three blades which pull the air through the welder and out the back. The ballast resistors are mounted on the fan guard so they can be cooled by the air as it passes through them. To make any repairs on the fan motor blade or guard, the complete assembly must be removed.

3-51. Fan, Motor, and Guard Assembly

a. Removal.

(1) Remove the top and side panels from the welding machine (para 3-26).

(2) Refer to figure 3-20 and remove the fan, motor, and guard as a complete unit.

b. Disassembly and Reassembly. Refer to figure 3-21 and disassemble and reassemble the fan, motor, and guard assembly.

c. Installation.

(1) Refer to figure 3-20 and install the fan, motor, and guard assembly.

(2) Install the welder top and side panels (para 3-26).

3-52. Motor

a. Removal.

(1) Remove the fan, motor, and guard assembly (para 3-51).

(2) Refer to figure 3-21 and remove the fan motor.

b. Installation.

(1) Refer to figure 3-21 and install the fan motor.

(2) Install tile fan, motor, and guard assembly (para 3-51).

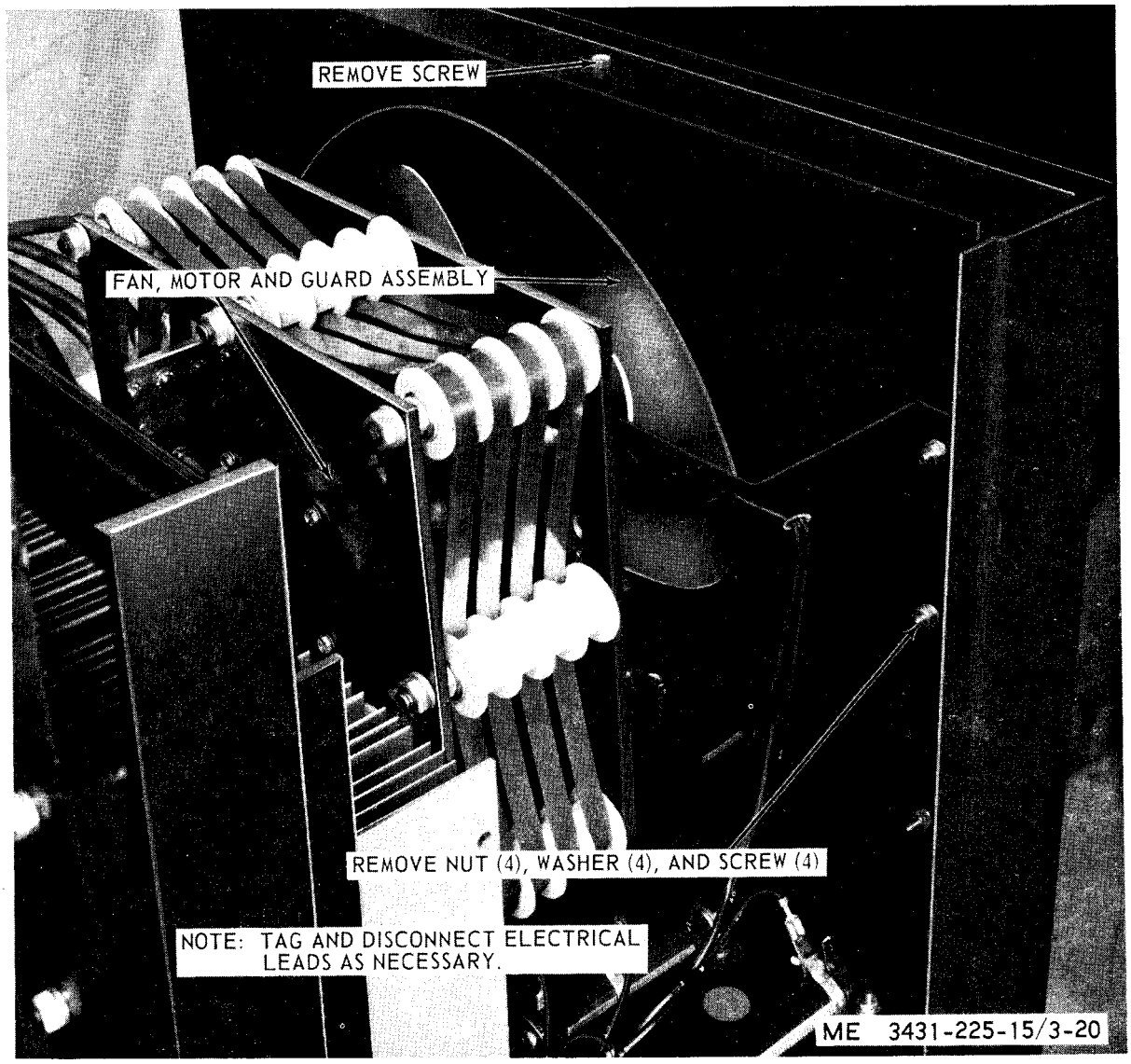

Figure 3–20. Fan, motor, and guard assembly, removal and installation.

3-53. Fan

e. Removal.

(1) Remove the fan, motor, and guard assembly (para 3-51).

(2) Refer to figure 3-21 and remove the fan.

b. Installation.

(1) Refer to figure 3-21 and install the fan.

(2) Install the fan, motor, and guard assembly (para 3-51).

3-54. Fan Guard

a. Removal.

(1) Remove the fan, motor, and guard assembly (para 3-51).

(2) Refer to figure 3-21 and remove the fan guard.

b. Installation.

(1) Refer to figure 3-21 and install the fan guard.

(2) Install the fan, motor, and guard assembly (para 3-51).

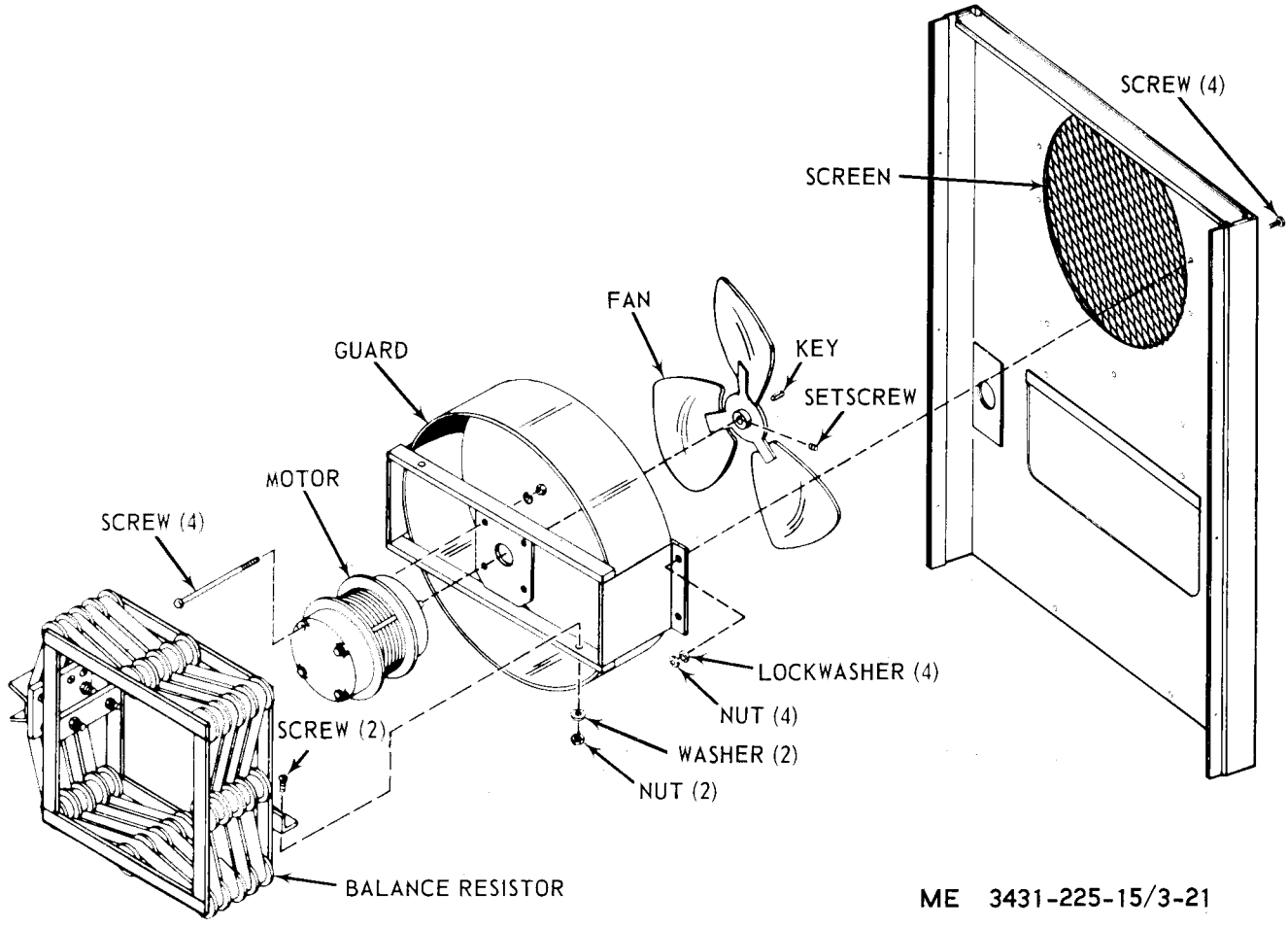

Figure 3–21. Fan, motor, and guard assembly, disassembly, and reassembly.

CHAPTER 4

DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE INSTRUCTIONS

Section I. GENERAL

4-1. Scope

a. The following instructions are for direct and general support and depot maintenance personnel, They contain information on equipment maintenance that is beyond the scope of the tools, equipment, personnel, or supplies normally available to organizational maintenance.

b. Appendix A includes the list of publications applicable to direct and general support and depot maintenance. Appendix B contains the basic issue items list. Appendix C contains the maintenance allocation chart.

4-2. Record and Report Forms

For record and report forms applicable to direct and general support and depot maintenance, refer to TM 38-750.

Note. Applicable forms, excluding Standard Form 46 (United States Government Motor Vehicles Operator's Identification Card) which is carried by the operator, shall be kept in a canvas bag mounted on the equipment.

Section II. DESCRIPTION AND DATA

4-3. Description

For a complete description of the welding machine, refer to paragraph 1-3.

4-4. Tabulated Data

a. General. This paragraph contains all the overhaul data pertinent to direct and general support and depot maintenance personnel.

b. Time Standards. Table 4-1 lists the number of man-hours required under normal conditions to perform the indicated maintenance and repair for the welding machine. Under adverse conditions, the operations will take longer; but under ideal conditions, with highly skilled mechanics, most of the operations can be accomplished in considerably less time.

Table 4-1. Time Standards

Remove and replace	Man-hours
22 ACCESSORY ITEMS	
2210 Data Plates Instruction Holders	
Plates, instruction	0.3
44 WELDING EQUIPMENT	
4400 Arc Welder	
Welder, arc	0.5
4405 Frame Support and Housing	
Cover, top	0.3
Door rear terminal	0.3
Front cover	0.4
4406 Ventilating, Cooling System	
Blade, fan	1.0
Guard, fan (includes R & I of motor and fan)	1.4
Motor, fan (includes removal and installation of the top cover and fan guard)	2.0
4408 Connecting Devices Receptacle	
Remote control	0.6
Panel	0.3
Stud, terminal	0.6
Remote control	0.7
4409 Protective Devices	
Fuse	0.2
Switch, thermostatic	0.6
Receptacle, fuse	0.5
4410 Switching and Timing Speed	
Switch, control	0.6
Timer	0.4
Relay, timer	0.4
Spark gap points	0.5
Contactor	0.6
Valve, solenoid	0.4
Switch, range and polarity	4.0
Capacitor	0.5

Table 4-1. Time Standards—Continued

Table 4-1. Time Standards—Continued

Remove and replace	Man-hours
4411 Resistor Components	
Resistor	0.6
Rheostat (includes R & I of top cover)	0.8
4412 Transformer Components	
Transformer, main (includes complete disassembly of unit)	3.5
Capacitor, power (includes R & I of top cover and housing)	0.5
Amplifier, magnetic (includes R & I top cover and housing)	6.0
Stabilizer (includes R & I of top cover and housing)	8.0
Transformer, high frequency (includes removal and installation of top cover and housing)	4.0
Transformer, control	2.6
4413 Rectifier Components	
Rectifier, main (includes R & I of top cover and housing)	2.0
Rectifier, control	0.5

Section III. SPECIAL TOOLS AND EQUIPMENT

4-5. Special Tools and Equipment

No special tools or equipment are required by direct and general support and depot maintenance of the welding machine.

4-6. Direct and General Support and Depot Maintenance Repair Parts

Direct and general support and depot maintenance repair parts are listed and illustrated in TM 5-3431-225-25P (when published).

4-7. Specially Designed Tools and Equipment

No specially designed tools and equipment are required by direct and general support and depot maintenance for the maintenance of the welding machine.

Section IV. TROUBLESHOOTING

4-8. General

This section plovides information useful in diagnosing and correcting unsatisfactory operation or failure of the welding machine or any of its components. Each trouble symptom stated is followed by a list of probable causes of the trouble. The possible remedy recommended is described opposite the probable cause.

4-9. Welding Machine Smokes

Probable Cause	Possible Remedy
Main transformer defective	Replace transformer (para 4-31).
Accessory transformer defective	Replace transformer (para 4-31).
Main rectifier defective	Replace rectifier (para 4-22).

4-10. Polarity Cannot be Selected

Probable Cause	Possible Remedy
Polarity switch defective	Replace switch (para 4-17).

4–11. Range Cannot be Selected

Probable Cause	Possible Remedy
Range and polarity switch defective	Replace switch (para 4-17).

4-12. Welding Machine has Internal Arcing

Probable Cause	Possible Remedy
Connections loose	Tighten connections (para 4-35).
Shorted coils	Replace coils (para 4-31, 32, 33).

4-13. Welding Machine Fails to Start

Probable Cause	Possible Remedy
Main transformer defective	Replace transformer (para 4-31).
Wiring defective	Repair or replace wiring (para 4-34).

4-14. Welding Machine Operates Erratically

Probable Cause	Possible Remedy
Rectifier defective	Replace rectifier (para 4-22).
Control rheostat defective	Replace rheostat (para 4-18).
Range and polarity switch contacts dirty, greasy, or bent	Clean or straighten contacts or replace switch (para 4-17).

4-15. Contactor Breaks Circuit

Probable Cause	Possible Remedy
Wiring shorted	Repair or replace wiring (para 4-35).
Defective thermostatic switch	Replace thermostatic switch (para 3-41, 3-42).
Main transformer shorted	Replace transformer (para 4-31).

Section V. CONTROL PANEL

4-16. Control Panel

a. Removal.

(1) Remove the welder top and sides (para 3-26) .

(2) Remove the power switch (para 3-29).

(3) Remove the standard-remote switch (para 3-30).

(4) Remove the high frequeney switch (para 3-31).

(5) Remove the manual-auto switch (para 3-32).

(6) Remove the fuse receptacle (para 3-34).

(7) Remove the start adjustment rheostat (para 4-20).

(8) Remove the control rheostat (para 4-18).

(9) Remove the range and polarity switch assembly (para 4-17).

(10) Remove the front door assembly (para 3-27) .

(11) Remove the TIG-metallic switch (para 4-21).

(12) Remove the ground-electrode terminals (para 3-46).

(13) Refer to figure 4-1 and remove the control panel.

b. Installation.

(1) Refer to figure 4-1 and install the control panel.

(2) Install the ground-electrode terminals (para 3-46).

(3) Install the TIG-metallic switch (para 4-21).

(4) Install the front door assembly (para 3-27).

(5) Install the range and polarity switch (para 4-17).

(6) Install the control rheostat (para 4-18).

(7) Install the start adjustment rheostat (para 4-20).

(8) Install the fuse receptacle (para 3-34).

(9) Install the manual-auto switch (para 3-32) .

(10) Install the high frequency switch (para 3-31).

(11) Install the standard-remote switches (para 3-30).

(12) Install the power switch (para 3-29).

(13) Install the top and sides on the welding machine (para 3-26).

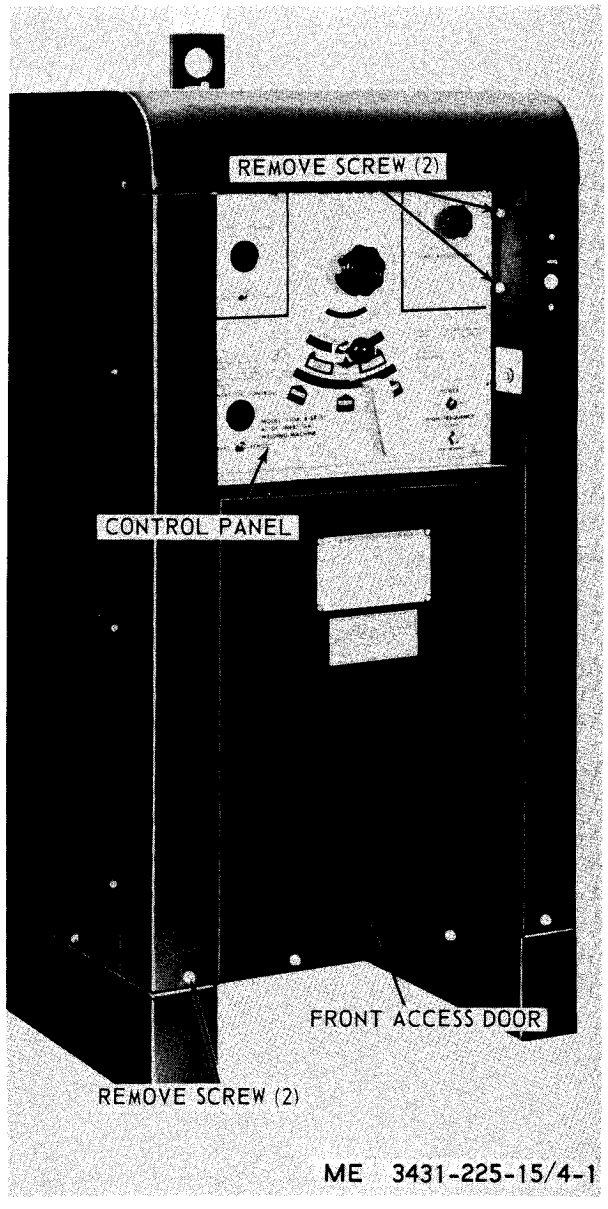

Figure 4-1. Control panel, removal and installation.

Section VI. RANGE AND POLARITY SWITCH, CONTROL RHEOSTAT, INTENSITY SELECTOR RHEOSTAT, START ADJUSTMENT RHEOSTAT, AND TIG-METALLIC SWITCH

4-17. Range and Polarity Switch Assembly

a. Removal.

(1) Remove the welding machine top and housing (para 3-26).

(2) Remove the two control rectifiers mounted to the polarity and range switch bracket (para 4-23).

(3) Remove the control rheostat (para 4-18).

(4) Refer to figure 4-2 and remove the range and polarity switch assembly.

b. Installation.

(1) Refer to figure 4-2 and install the range and polarity switch assembly.

(2) Install the control rheostat (para 4-18).

(3) Install the two control rectifiers to the bracket of the range and polarity switch assembly (para 4-23).

(4) Install the top and sides on the welding machine (para 3-26).

4-18. Control Rheostat

a. Removal.

(1) Remove the top and sides from the welding machine (para 3-26).

(2) Refer to figure 4-3 and remove the control rheostat.

b. Testing.

(1) Connect an ohmmeter to the two outer terminals of the rheostat and set the meter on RX1 scale. The reading should be 15 ohms. If the reading is more or less than 15 ohms, replace the rheostat.

(2) Connect an ohmmeter to the center terminal and either outside terminal of the rheostat. Set the meter on the RX1 scale. Turn the rheostat in either direction until it stops, then turn it in the opposite direction slowly and evenly until it stops again. The indicator on the meter should increase or decrease evenly according to the speed in which the rheostat is turned. If the meter indicator does not function as described, replace the rheostat.

Note. Make sure the ohmmeter used for the above test is in proper working condition.

c. Installation.

(1) Refer to figure 4-3 and install the control rheostat.

(2) Install the top and sides on the welding machine (para 3-26).

4-19. Intensity Rheostat

a. Removal.

(1) Remove the top and sides from the welding machine (para 3-26).

(2) Refer to figure 4-4 and remove the intensity rheostat.

b. Testing.

(1) Connect an ohmmeter to the two outer terminals of the rheostat and set the meter on RX1 scale. The reading should be 10,000 ohms. If the reading is more or less than 10,000 ohms, replace the rheostat.

(2) Connect an ohmmeter to the center terminal and either outside terminal of the rheostat. Set the meter on the RX1 scale. Turn the rheostat in either direction until it stops, then turn it in the opposite direction slowly and evenly until it stops again. The indicator on the meter should increase or decrease evenly according to the speed in which the rheostat is turned. If the meter indicator does not function as described, replace the rheostat.

Note. Make sure the ohmmeter used for the above tests is in proper working condition.

c. Installation.

(1) Refer to figure 4-4 and install the intensity rheostat.

(2) Install the top and sides on the welding machine (para 3-26).

4-20. Start Adjustment Rheostat

a. Removal.

(1) Remove the top from the welding machine (para 3-26).

(2) Refer to figure 4-5 and remove the start adjustment rheostat.

b. Testing.

(1) Connect an ohmmeter to the two outer terminals of the rheostat and set the meter on RX1 scale. The reading should be 15 ohms. If the reading is more or less than 15 ohms, replace the rheostat.

(2) Connect an ohmmeter to the center terminal and either outside terminal of the rheostat. Set the meter on the RX1 scale. Turn the rheostat

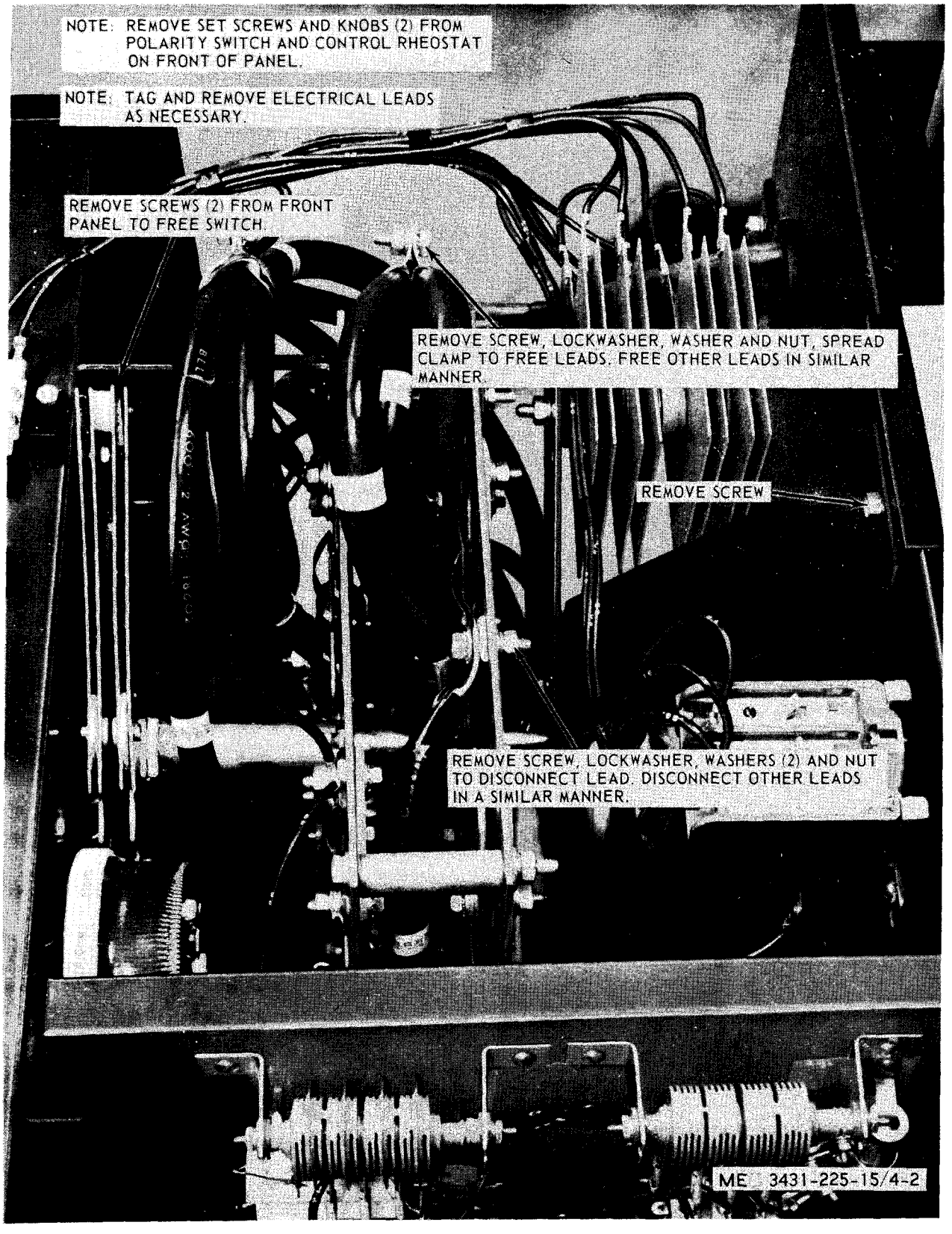

Figure 4-2. Range and polarity switch assembly, removal and installation.

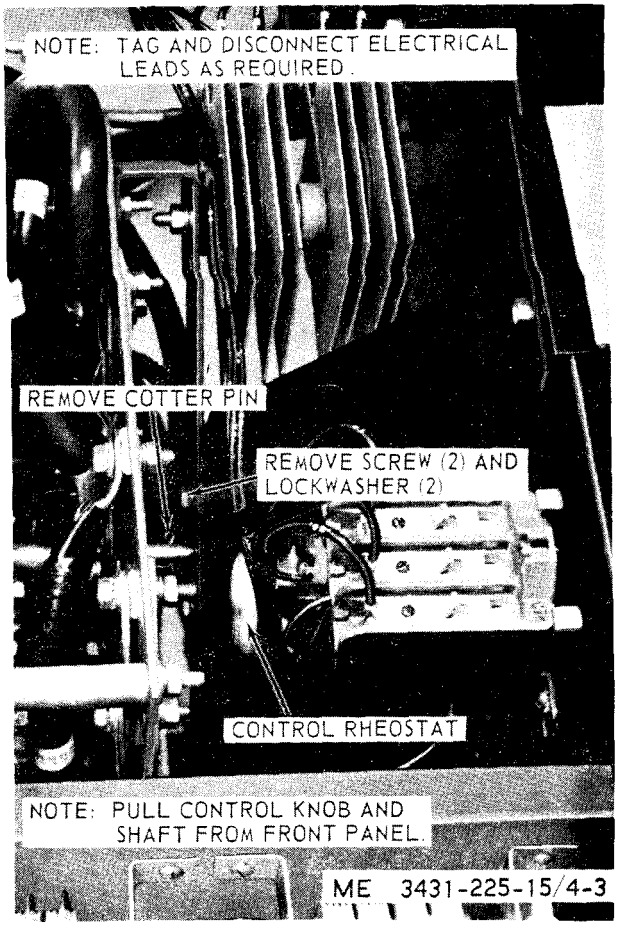

Figure 4–3. Control rheostat, removal and installation.

in either direction until it stops, then turn it in the opposite direction slowly and evenly until it stops again. The indicator on the meter should increase or decrease evenly according to the speed in which the rheostat is turned. If the meter indicator does not function as described, replace the rheostat.

Note. Make sure the ohmeter used for the above tests is in proper working condition.

c. Installation.

(1) Refer to figure 4–5 and install the start adjustment rheostat.

(2) Install the top on the welding machine (para 3–26).

4-21. TIG-Metallic Switch

a. Removal.

(1) Remove the top and sides from the welding machine (para 3–26).

(2) Refer to figure 4–4 and remove the TIG-metallic switch.

b. Installation.

(1) Refer to figure 4–4 and install the TIG-metallic switch.

(2) Install the top and sides on the welding machine (para 3–26).

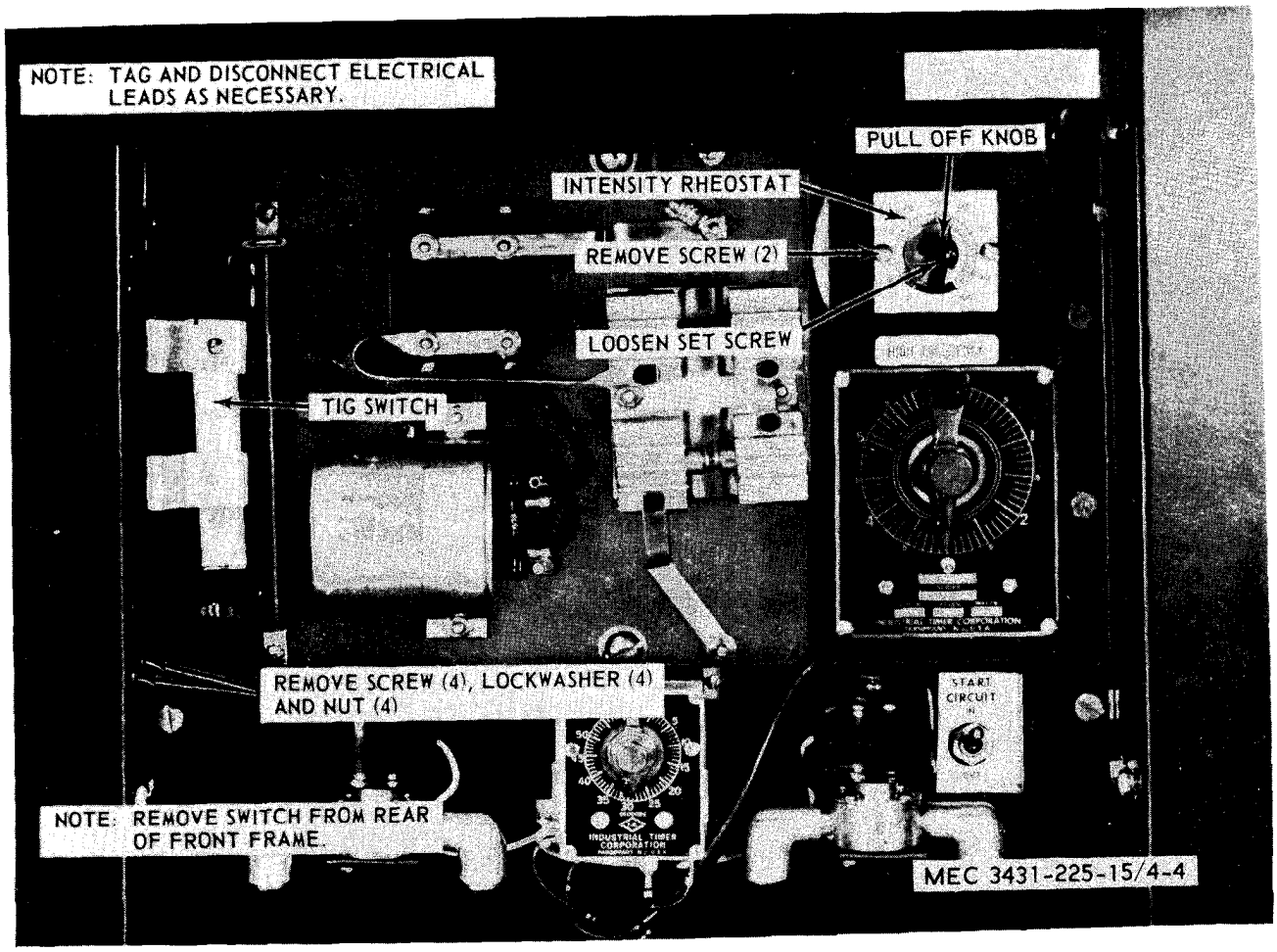

Figure 4–4. Intensity rheostat and TIG switch, removal and installation.

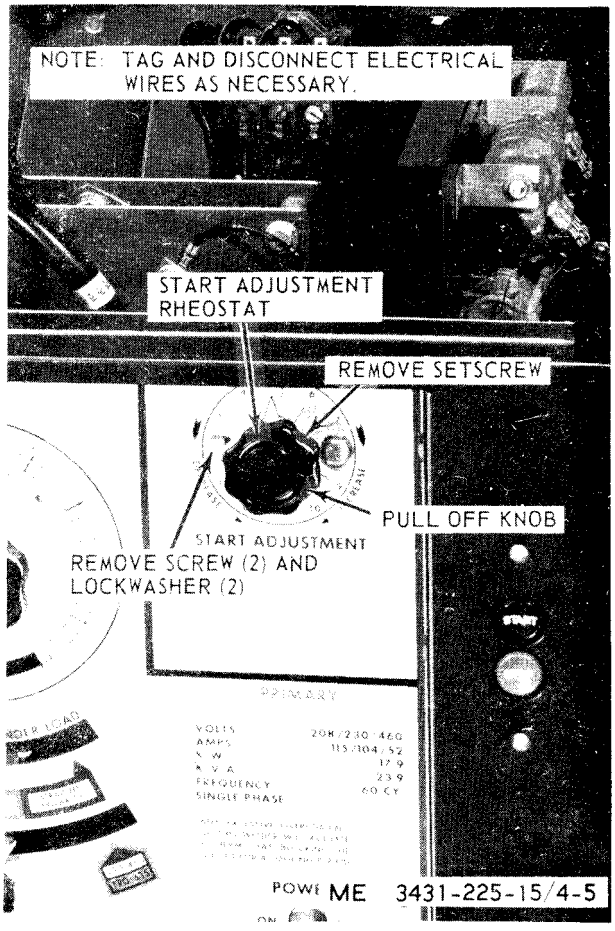

Figure 4-5. Start adjustment rheostat, removal and installation.

Section VII. RECTIFIER ASSEMBLY, CONTROL RECTIFIER, CAPACITORS, AND RESISTORS

4-22. Rectifier Assembly

a. Removeal.

(1) Remove the top and sides from the welding machine (para 3-26).

(2) Remove the fan, motor, and guard (para 3-51).

(3) Remove the rectifier thermostatic switch (para 3-42).

(1) Refer to figure 4-6 and remove the rectifier assembly.

b. Installation.

(1) Refer to figure 4-6 and install the rectifier assembly.

(2) Install the rectifier thermostatic switch (para 3-42).

(3) Install the fan, motor, and guard assembly (para 3-51).

(4) Install the top and sides on the welding machine (para 3-26).

Warning: **When malfunction of the selenium rectifier occurs, thoroughly ventilate the area to prevent the inhalation of poisonous fumes. Do not handle the damaged rectifier while it is warm to avoid absorption of the poisonous selenium oxide compound through the skin. Failure to observe this warning can result in serious injury or death.**

4-23. Control Rectifiers

a. Removal.

(1) Remove the top and sides from the welding machine (para 3-26).

(2) Refer to figure 4-7 and remove the control recifiers.

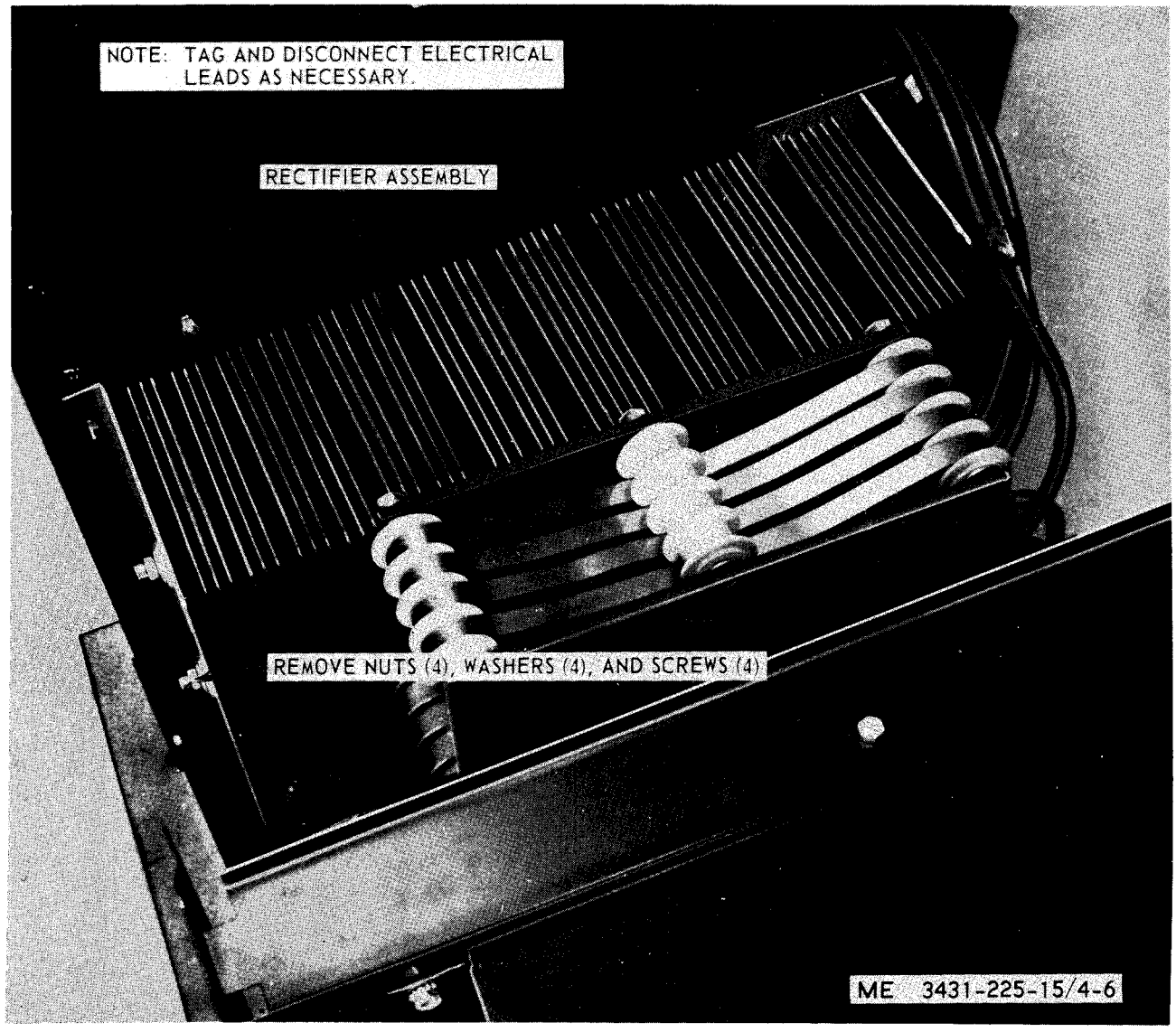

Figure 4-6. Rectifier assembly, removal and installation.

b. Installation.

(1) Refer to figure 4-7 and install the control rectifiers.

(2) Install the top and sides on the welding machine (para 3-26).

4-24. Capacitors

a. Removal.

(1) Remove the top and sides from the welding machine (para 3-26).

(2) Refer to figure 4-8 and remove the capacitors.

b. Testing. Connect a suitable capacitor tester to the wire leads and check the Capacitors for open or short circuit.

c. Installation.

(1) Refer to figure 4-8 and install the capacitors.

(2) Install the top and sides on the welding machine (para 3-26).

4-25. Resistors

a. Removal.

(1) Remove the top and sides from the welding machine (para 3-26).

(2) Refer to figure 4-9 and remove the resistors.

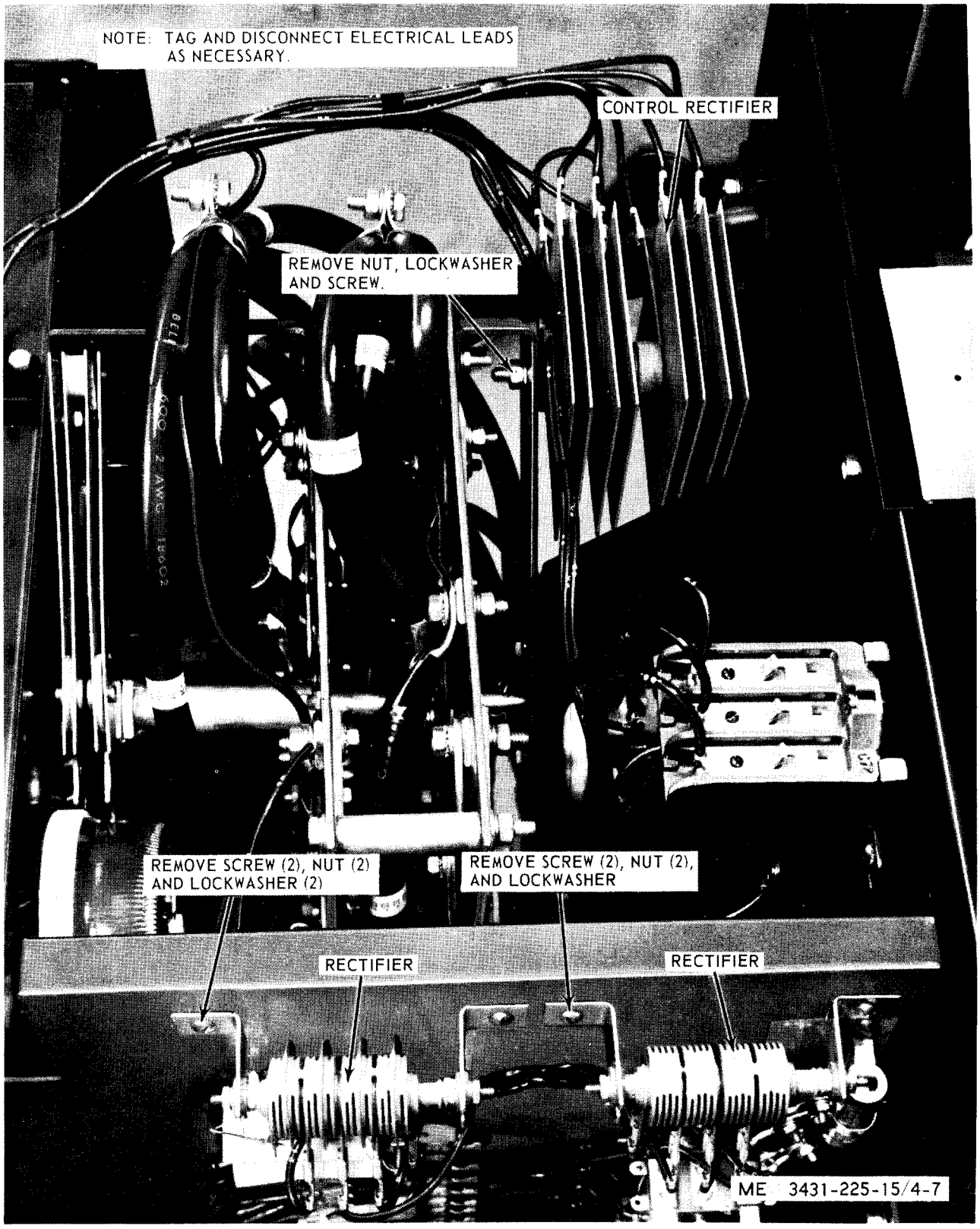

Figure 4-7. Control rectifiers, removal and installation.

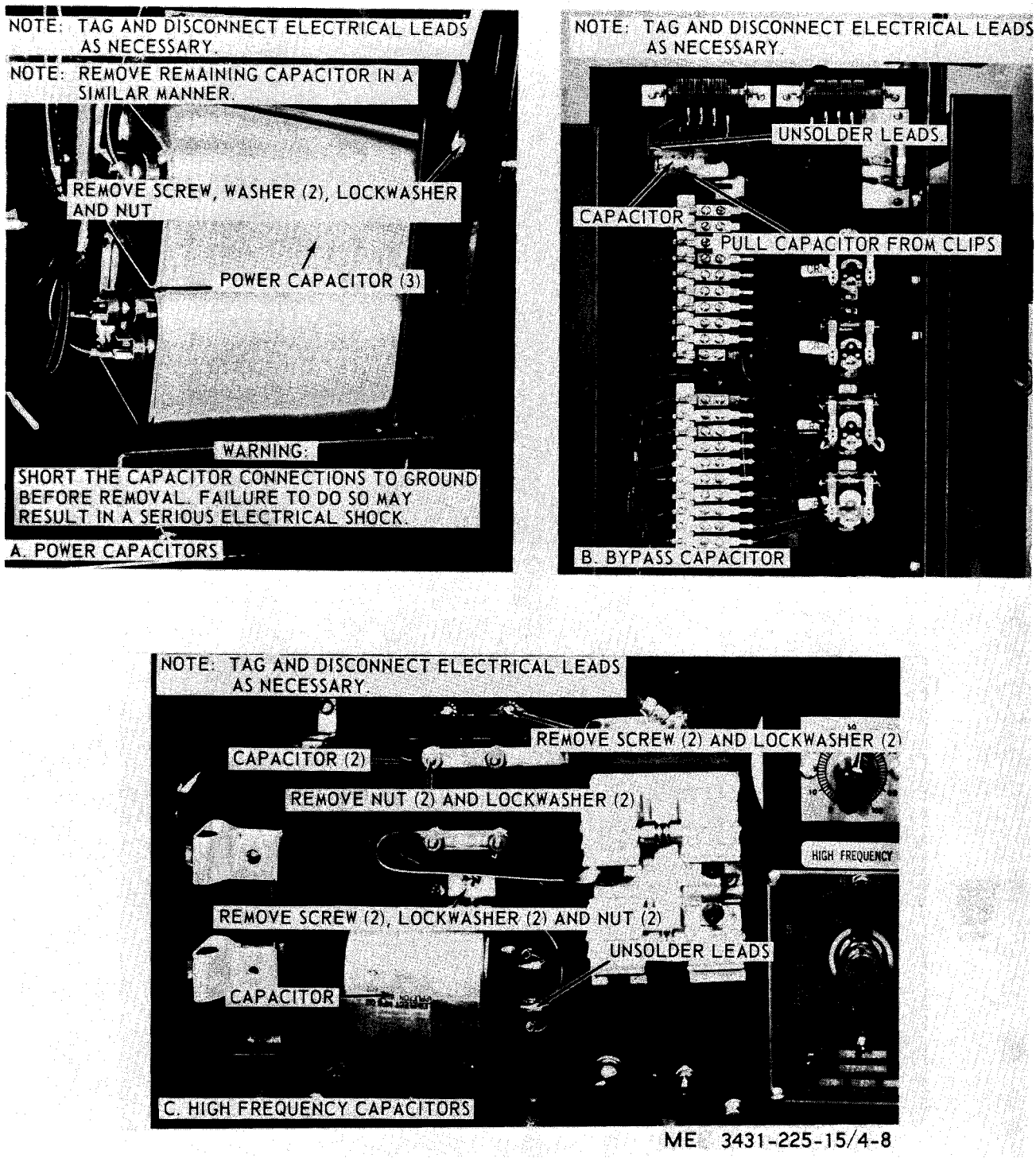

Figure 4-8. Capacitors, removal and installation.

b. Testing. Connect an ohmmeter to the resistor leads and check the resistance. The meter leading must conform with the resistor values shown on the schematic diagram (fig. 1-4).

c. Installation.

(1) Refer to figure 4-9 and install the resistors.

(2) Install the top and sides on the welding machine (para 3-26).

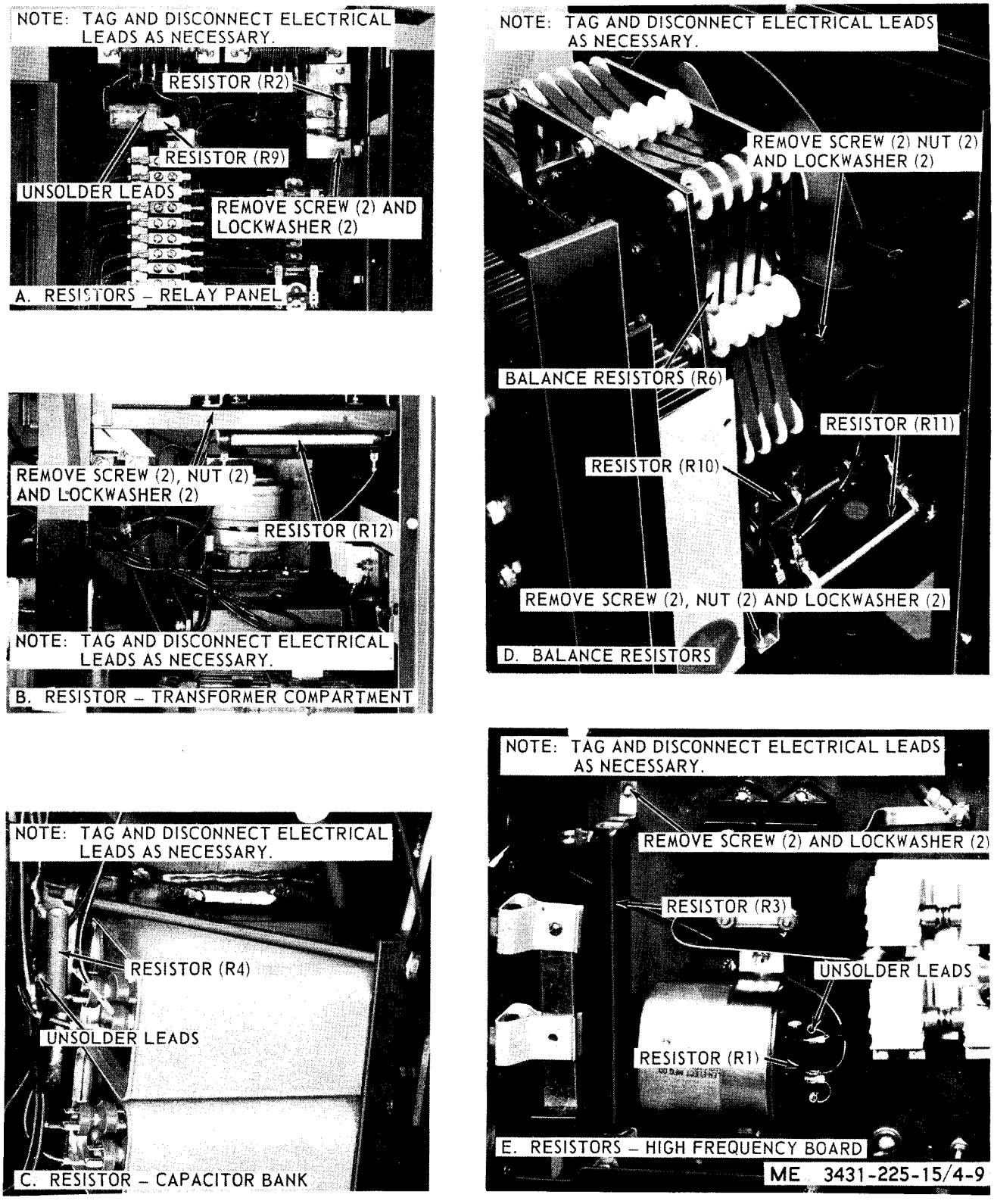

Figure 4–9. Resistors, removal and installation.

Section XIII. RELAYS, HIGH FREQUENCY PANEL, HIGH FREQUENCY TRANSFORMER, CONTROL TRANSFORMER, MAIN TRANSFORMER, MAGNETIC AMPLIFIER, AND STABILIZER

4-26. Relays

a. Removal.

(1) Remove the top and sides from the welding machine (para 3-26).

(2) Remove two screws and remove the housing from the relay compartment,

(3) Refer to figure 4-10 and remove the relays.

b. Installation.

(1) Refer to figure 4-10 and install the relays.

(2) Replace the cover on the relay housing and secure with two screws.

(3) Install the top and sides on the welding machine (para 3-26).

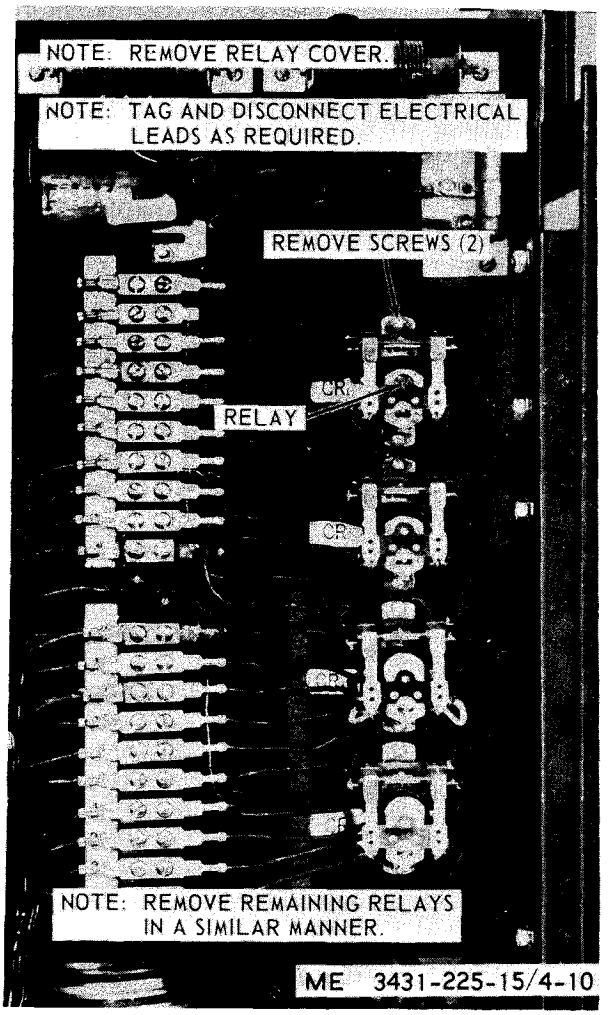

Figure 4–10. Relays, removal and installation.

4-27. High Frequency Panel

a. Removal.

(1) Remove the top and sides from the welding machine (para 3-26).

(2) Refer to figure 4-11 and remove the high frequency panel.

b. Installation.

(1) Refer to figure 4-11 and install the high frequency panel.

(2) Install the top and sides on the welding machine (para 3-26).

4-28. High Frequency Transformer

a. Removal.

(1) Remove the high frequency panel (para 4-27).

(2) Refer to figure 4-12 and remove the high frequency transformer.

b. Testing.

(1) Connect an ohmmeter to the primary leads and check the resistance. The meter should read 230 ohms.

(2) Connect an ohmmeter to the secondary leads and check the resistance. The meter should read 3600 ohms.

(3) Connect a megohmeter to both primary and secondary and test the insulation breakdown.

c. Installation.

(1) Refer to figure 4-12 and install the high frequency transformer.

(2) Install the' high frequency panel (para 4-27).

4-29. Air Coupling Coil

a. Removal.

(1) Remove the high frequency panel (para 4-27).

(2) Refer to figure 4-12 and remove the air coupling coil.

b. Testing.

(1) Connect a multimeter to the coil leads and test for continuity.

(2) If there is no reading on the multimeter, replace the coil.

(3) Connect a megohmmeter to the coil and test the insulation breakdown.

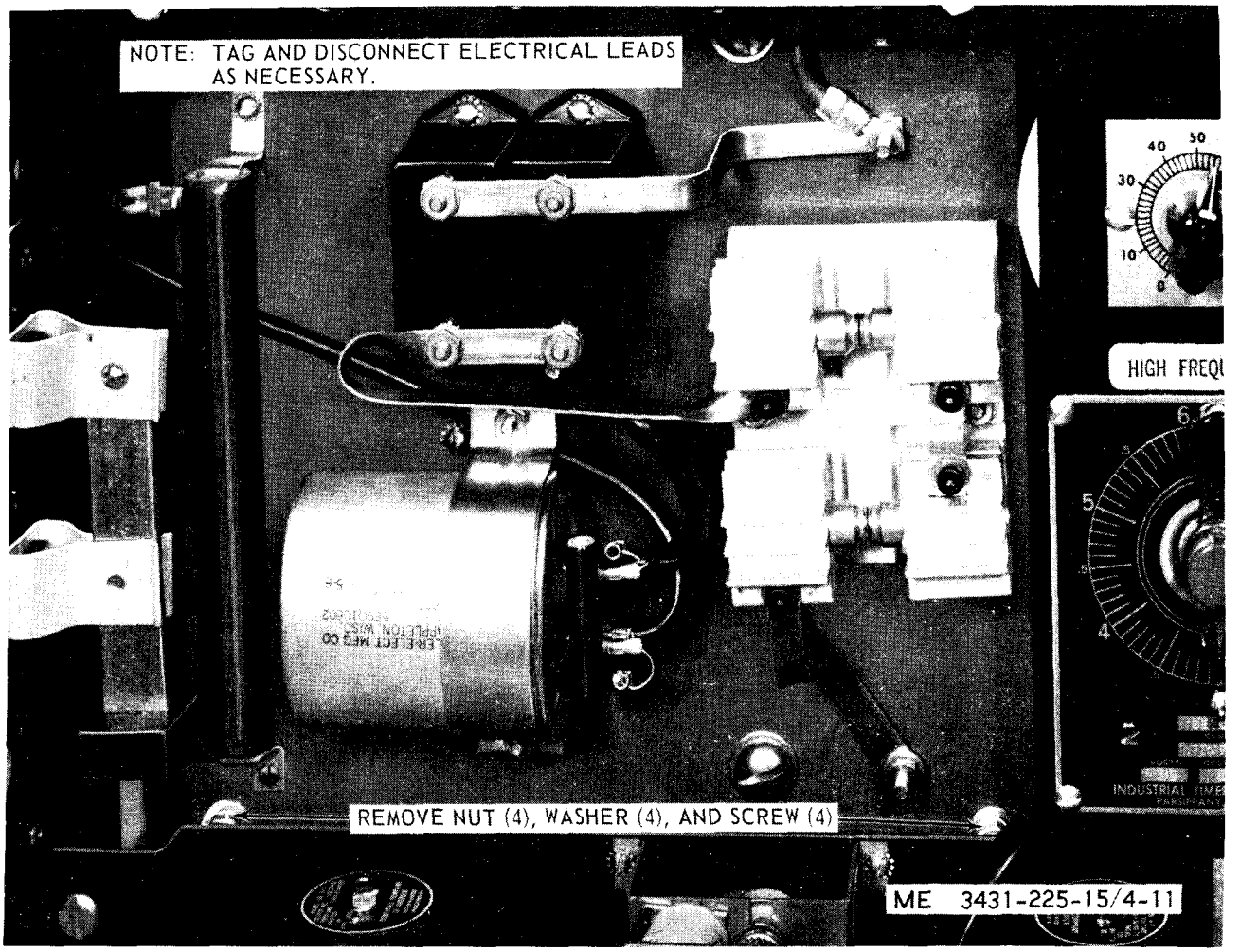

Figure 4-11. High frequency panel, removal and installation.

c. Installation.

(1) Refer to figure 4-12 and replace the air coupling coil.

(2) Install the high frequency panel (para 4-27).

4-30. Control Transformer

a. Removal.

(1) Remove the top and sides from the welding machine (para 3-26).

(2) Refer to figure 4-13 and remove the Control transformer.

b. Testing.

(1) Connect the 230 volt power source to the input lead No. 16 and the center tap lead No. 40.

(2) Connect the voltmeter to the secondary leads (numbers 1 and 4). The meter reading should be 115 volts.

(3) Connect a voltrneter to the secondary leads (numbers 31 and 32). The meter should read 30 volts.

(4) Connect a voltmeter to the secondary leads (numbers 41 and 42). The meter should read 15 volts.

(5) If the meter reading is other than that specified above, the transformer must be replaced.

c. Installation.

(1) Refer to figure 4-13 and install the control transformer.

(2) Install the top and sides on the welding machine (para 3-26).

4-31. Main Transformer

a. Removal.

(1) Remove the top and sides from the welding machine (para 3-26).

(2) Remove the range and polarity switch assembly (para 4-17).

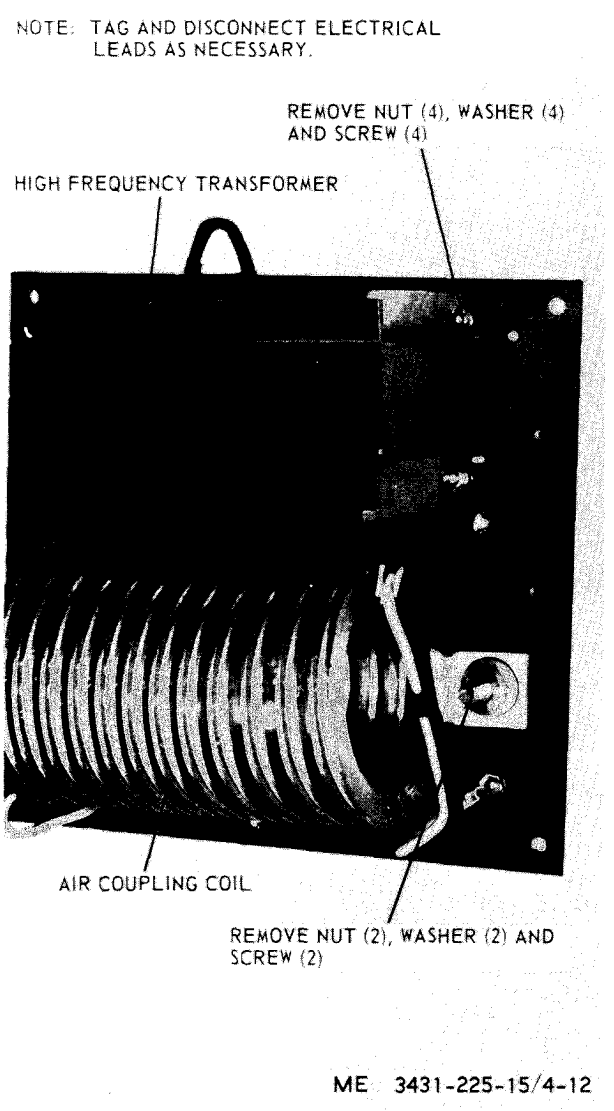

Figure 4-12. High frequency transformer and air coupling coil, removal and installation.

(3) Remove the rectifier assembly (para 4-22).

(4) Remove the control transformer (para 4-30).

(5) Refer to figure 4-14 and remove the main transformer.

b. Installation.

(1) Refer to figure 4-14 and install the main transformer.

(2) Install the control transformer (para 4-30).

(3) Install the rectifier assembly (para 4-22).

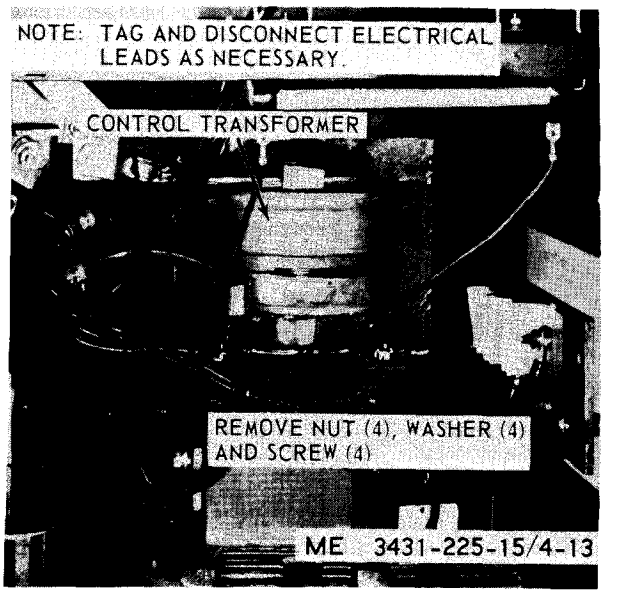

Figure 4-13. Control transformer, removal and installation.

(4) Install the range and polarity switch assembly (para 4-17).

(5) Install the top and sides on the welding machine (para 3-26).

4-32. Magnetic Amplifier

a. Removal.

(1) Remove the top and sides from the welding machine (para 3-26).

(2) Remove the range and polarity switch assembly (para 4-17).

(3) Remove the rectifier assembly (para 4-22).

(4) Refer to figure 4-14 and remove the magnetic amplifier.

b. Installation.

(1) Refer to figure 4-14 and install the magnetic amplifier.

(2) Install the rectifier assembly (para 4-22).

(3) Install the range and polarity switch (para 4-17).

(4) Install the top and sides on the welding machine (para 3-26).

4-33. Stabilizer

a. Removal.

(1) Remove the top and sides from the welding machine (para 3-26).

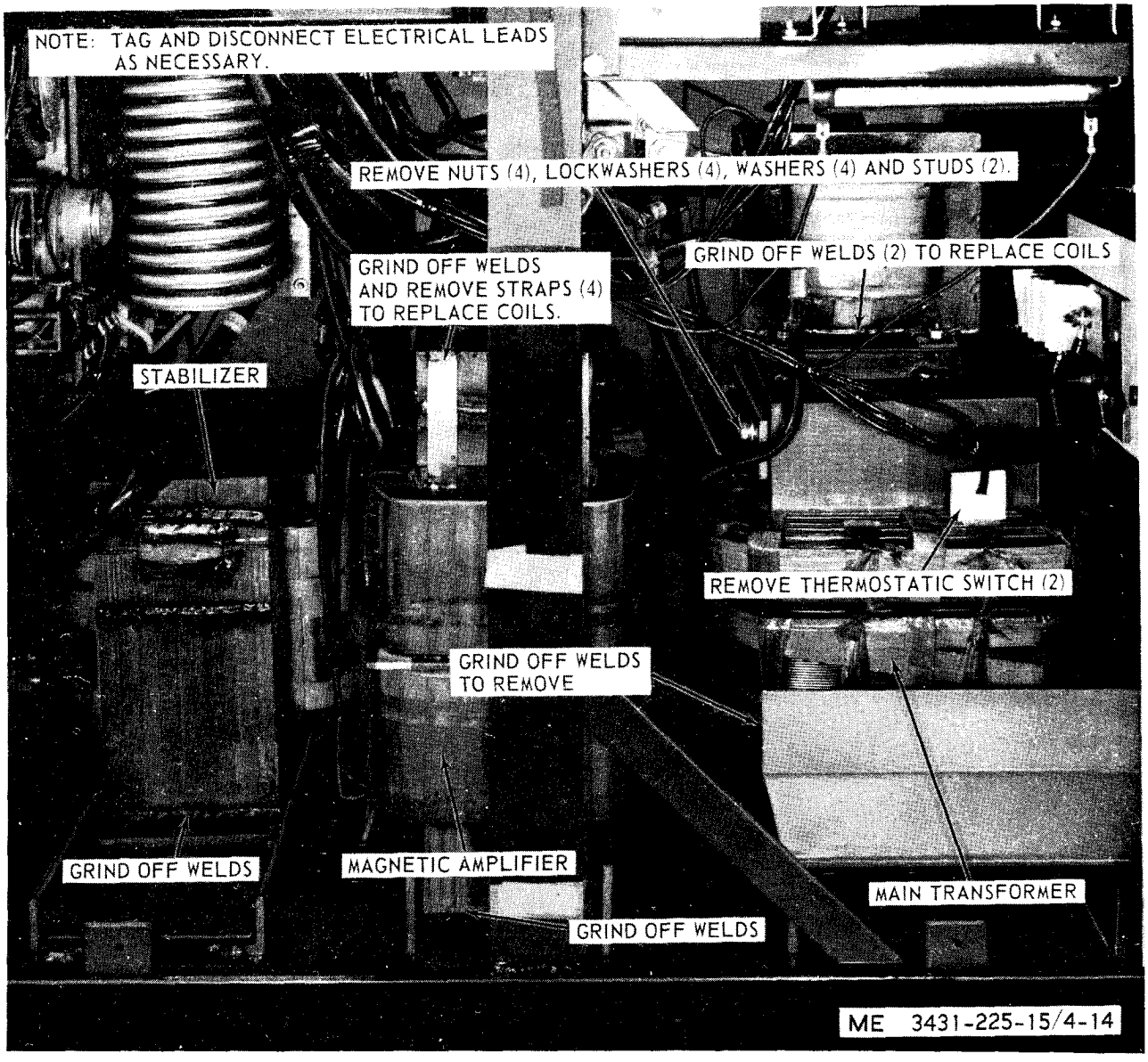

Figure 4-14. Main transformer, magnetic amplifier, and stabilizer, removal and installation.

(2) Refer to figure 4-14 and remove the stabilizer.

b. Testing. Connect a multimeter to the coil leads and set the meter on ohms. If the indicator gives no reading, the coil has an open circuit and must be replaced.

c. Installation.

(1) Refer to figure 4-14 and install the stabilizer.

(2) Install the top and side of the welding machine (para 3-26).

Section IX. WIRING ASSEMBLY

4-34. General

The welding machine has no wiring' harness which is replaced as a complete unit. The wiring is made up of individual wires connected point to point and taped together to form tables.

4-35. Wiring

a. Removal.

(1) Remove the top and sides of the welding machine (para 3-26).

(2) Cut the tape and remove the wire from the cable assembly.

(3) Disconnect the wire from the equipment at each end.

b. Testing. To test the wire for continuity, disconnect each end of the wire from the component or components to which it is connected. Touch the test poles of a multimeter to each end of the wire. If continuity is not indicated, the wire is defective and must be repaired or replaced.

c. Replace. Shave the insulation on the wire to expose 1/2-inch of bare wire at both ends of the break. Twist the bare wire together and solder the connection. Cover the repair break with electrical tape. Do not leave any bare wire exposed. If a terminal lug is damaged or breaks off a wire, replace it using an exact duplicate terminal lug.

d. Replacememt. Replace a wire by disconnecting from the component or components to which it is connected and remove the wire. Install a new wire and connect it to the component or components. If a broken wire is part of a cable assembly, disconnect the wire at both ends. Cut. the tape and remove it from the cable assembly. Install a new wire and attach it to the cable assembly and retape.

e. Installation.

(1) Repair or replace the wire as in paragraphs *c* and *d* above.

(2) Install the welding machine top and sides (para 3-26).

Section X. FRAME AND MAIN TRANSFORMER SUPPORT ASSEMBLY

4-36. General

The welding machine frame and main transformer support assembly is of welded construction and constructed of heavy metal. It has two skids which make up the bottom and are designed for bolting the welding machine to the floor. The skids also hold the welding machine approximately 4-inches above the floor to allow for circulation of air through the welding machine for cooling. The main transformer magnetic amplifier and stabilizer units are welded and bolted to the frame.

4-37. Frame and Main Transformer Support Assembly

a. Removal.

(1) Remove the main transformer (para 4-31).

(2) Remove the magnetic amplifier (para 4-32).

(3) Remove the stabilizer (para 4-33).

(4) After the three components above are removed, the frame and transformer support assembly is free.

b. Installation.

(1) Install the stabilizer (para 4-33).

(2) Install the magnetic amplifier (para 4-32).

(3) Install the main transformer (para 4-31).

CHAPTER 5

DEMOLITION, SHIPMENT AND LIMITED STORAGE

Section I. DEMOLITION OF THE WELDING MACHINE TO PREVENT ENEMY USE

5–1. General

When capture or abandonment of the welding machine to an enemy is imminent, the responsible unit commander must make the decision either to destroy the equipment or to render it inoperative. Based On this decision, orders are issued which cover the desired extent of destruction. Whatever method of demolition is employed, it is essential to destroy the same vital parts of all welding machines and all corresponding repair parts.

5-2. Demolition to Render the Welding Machine Inoperative

Use sledge hammers, crowbars, picks, axes, or any other heavy tools which may be available to destroy the following:

a. All controls and instruments.

b. Ground the electrode terminals.

c. Gas and water inlet and outlet fittings.

d. Contactor.

Note. The above procedures are minimum requirements for this method.

e. Fan motor.

f. Reactors, rectifiers, and transformers.

g. Cut all electrical wires and leads

5-3. Demolition by Explosives or Weapons Fire

a. Explosives. Place as many of the following charges (fig. 5-1) as the situation permits and (detonate them simultaneously with detonating cord or a suitable detonator. Place one 1/2 pound charge on control panel and place one 1/2 pound charge on voltage changeover board.

b. Weapons Fire. Fire on the welding machine with the heaviest practical weapons available.

5-4. Other Demolition Methods

a. Scattering and Concealment. Remove all easily accessible parts such as the rectifiers, reactors, and transformers. Scatter them through dense foliage, bury them in dirt or sand, or throw them in a lake, steam, or other body of water.

b. Burning. Pack rags, paper, or other combustible material around and in the main transformer. Saturate this packing with gasoline, oil, or diesel fuel and ignite.

c. Submersion. Totally submerge the welding machine in a body of water to provide water damage and concealment. Salt water will damage metal parts more than fresh water.

5-5. Training

All operators should receive thorough training in the destruction of the welding machine. Refer to Fill 5-25. Simulated destruction, using all of the methods listed above, should be included in the operator training program. It must be emphasized in training that demolition operations are usually necessitated by critical situations when time available for carrying out destruction is limited. For this reason, it is necessary that operators be thoroughly familiar with all methods of destruction of equipment and be able to carry out demolition instructions without reference to this or any other manual.

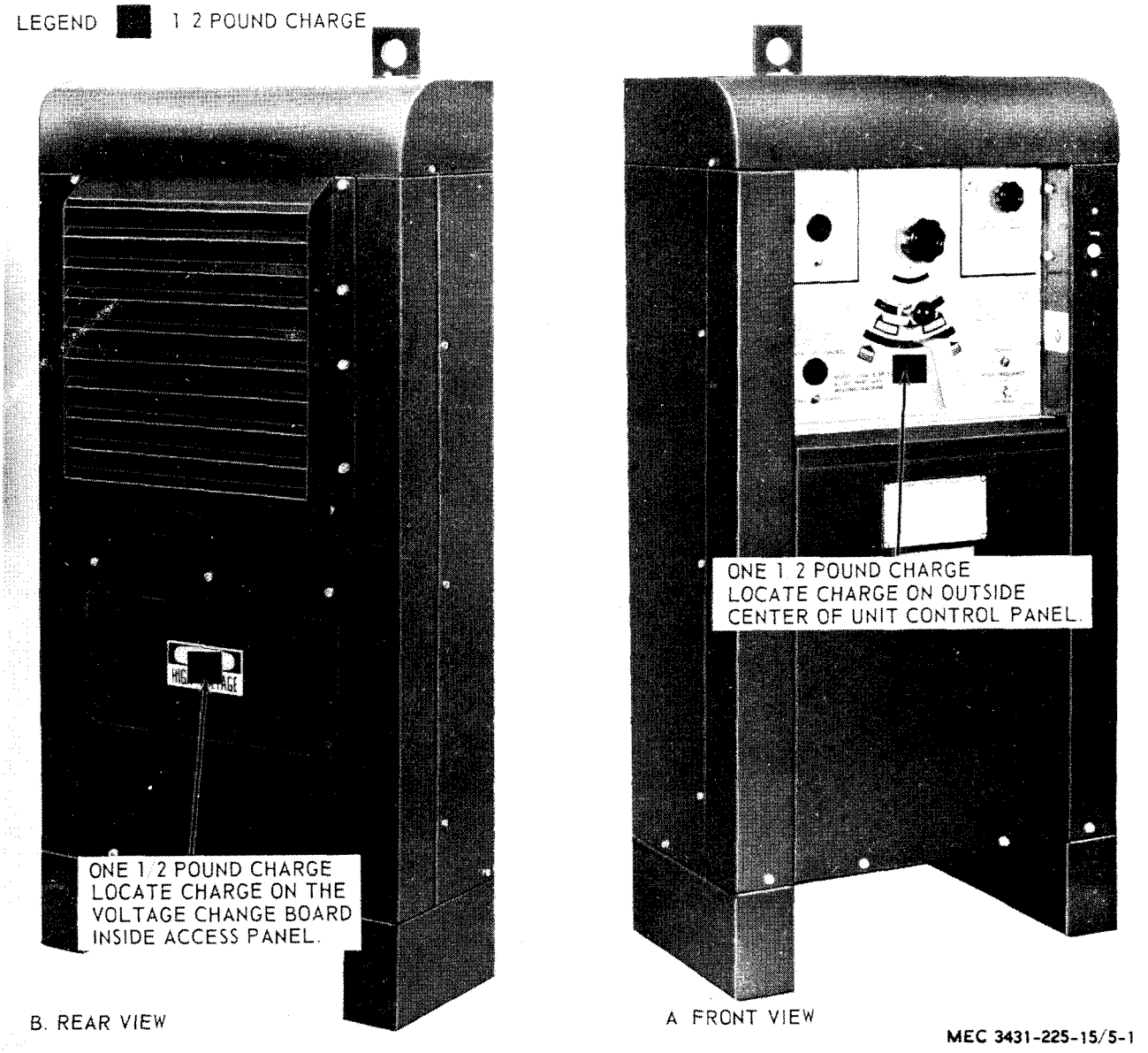

Figure 5–1. Placement of charges.

Section II. SHIPMENT AND LIMITED STORAGE

5-6. Preparation of Equipment for Shipment

a. General. Detailed instructions for the preparation of engineer equipment for domestic shipment are outlined below. Preservation will be accomplished in sequence that will not require the operation of previously preserved components.

b. Inspection. The welding machine will be inspected for any unusual conditions such as damage, rusting, accumulation of water, and pilferage. Inspection of the individual components and assemblies will be as outlined on the "Preventive Maintenance Service, Quarterly" in this manual.

c. Cleaning and Drying. Clean all surfaces with an approved cleaning solvent and dry thoroughly. Refer to TM 38-230 for choice and application of cleaning method.

d. Painting. Paint all surfaces on which the paint has been removed or damaged, Refer to

tions.

e. Depreservation Guide. DA Form 2258 Depreservation Guide of Engineer Equipment.

(1) A properly annotated depreservation guide will be completed concurrently with preservation for each item of mechanical equipment with all peculiar requirements outlined in the remarks column. The completed depreservation guide will be placed with the equipment in a waterproof envelope, marked "Depreservation Guide," and fastened in a conspicuous location on or near the operator's controls.

(2) Prior to placing equipment in operation or to the extent necessary for inspection, depreservation of the item will be performed as outlined on the depreservation guide.

f. Sealing of Opening. The fan guard opening located in the back panel of the welding machine will be covered with waterproof paper and sealed with type III, class I, pressure sensitive tape conforming to Specification PPP-T-60.

g. Marking. Will conform to MIL-STD-129.

h. Disassembly, Disassembled Parts, and Basic Issue Items.

(1) Disassembly will be limited to the removal of parts and projecting components that tend to increase the overall profile of the equipment and that which is subject to pilferage.

(2) Disassembled items will be packed with the publications in the toolbox if possible. Otherwise, items will be packed in a suitable container and secured to the equipment to prevent loss or pilferage.

Note. If packaging is required to provide adequate protection against damage during shipment, refer to TM 38-230 for guidance in crate fabrication.

5-7. Loading Equipment for Shipment

a. Loading.

(1) Be sure the packing crate remains right side up when removing the welding machine to the loading site.

(2) The welding machine can be loaded with either a forklift or crane.

Warning: **When using a lifting device to move the welding machine, make sure that it has a safe lifting capacity of at least 1,000 pounds. Do not allow the welding machine to swing freely when being lifted. Failure to observe this warning may cause damage to the equipment or serious injury to personnel.**

b. Shipping. Block or tie welding machine right side up to the bed of the carrier to prevent shifting while being transported.

5-8. Preparation of Equipment for Storage

a. Detailed instuctions for preparation of the welding machine for limited storage are provided in paragraph 5-6. Limited storage is defined as storage not to exceed six (6) months, Refer to TM 740-90-1 (Administrative Storage of Equipment).

b. Every effort should be made to provide covered storage for the welding machine. If this is impossible, select a firm, level, well-drained storage location, protected from prevailing winds. Position the welding machine on heavy planking. Cover the welding machine with a tarpaulin or other suitable waterproof covering and secure in a manner that will provide the welding machine maximum protection from the elements.

5-9. Inspection and Maintenance of Equipment in Storage

a. Inspection. When the welding machine has been placed in storage, all scheduled preventive maintenance services, including inspection, will be suspended and preventive maintenance inspection will be performed as specified herein.

b. Worksheet and Preventive Maintenance. DA Form 2404 will be executed on the welding machine when the equipment is initially placed in limited storage, and every 30 days thereafter. Required maintenance will be performed promptly to insure that the welding machine is mechanically sound and ready for immediate use.

APPENDIX A

REFERENCES

A-1. Fire Protection

TB 5-4200-200-10	Hand Portable, Fire Extinguishers for Army Users.

A-2. Painting

TM 9-213	Painting Instructions for Field Use.

A-3. Radio Interference Suppression

TM 11-483	Radio Interference Suppression.

A-4. Maintenance

TM 38-750	Army Equipment Record Procedures.
TM 5-3431-225-25P	organizational, DS, GS and Depot Maintenance Repair Parts
TM 5-3431-223-15	Operator, Organizational, DS, GS and Depot Maintenance Repair Parts

A-5. Shipment and Limited Storage

TM 38-230	Preservation of USAMEC Mechanical Equipment for Shipment and Storage
TB 740-93-2	Preservation, Packaging and Packing of Military Supplies and Equipment
TM 740-90-1	Administrate Storage of Equipment

APPENDIX B

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

B-1. Scope

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

B-2. General

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

a. Basic lssue Items-Section II. A list of items which accompany the Welding Machine 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 (Not applicable).

B-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), Column (1):

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

Code	Explanation
P	Applied to repair parts which are stocked in or supplied from GSA/DSA or Army supply system, and authorized for use at indicated maintenance categories.
P 2	Repair parts which are procured and stocked for insurance purposes because the combat or military essentiality of the end item dictates that a minimum quantity be available in the supply system.
M	Applied to repair parts which are not procured or stocked but are to be manufactured at indicated maintenance levels.
A	Applied to assemblies which are not procured or stocked as such, but are made up of two or more units, each of which carry individual stock numbers and descriptions and are procured and stocked separately and can be assembled by units at indicated maintenance categories.
X	Applied to parts and assemblies which are not procured or stocked, the mortality of which is normally below that of the applicable end item or component, and the failure of which should result in retirement of the end item or component, and the failure of which should result in retirement of the end item from the supply system.
X1	Applied to repair parts which are not procured or stocked, the requirement for which will be filled by use of the next higher assembly or component.
X2	Applied to repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain them through cannibalization; if not obtainable through cannibalization, such repair parts will be requisitioned with supporting justification through normal supply channels.
C	Applied to repair parts authorized for local procurement. If not obtainable from local procurement, such repair parts will be requisitioned through normal supply channels with a supporting statement of nonavailability from local procurement.
G	Applied to major assemblies that are procured with PEMA (Procurement Equipment Missile Army) funds for initial issue only to be used as exchange assemblies at DSU and GSU level. These assemblies will not be stocked above DS or GS level or returned to depot supply level.

(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 and assemblies which are economically repairable at DSU and GSU activities and are normally furnished by supply on an exchange basis.

Code	Explanation
S	Applied to repair parts and assemblies which are economically repairable 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 repairable, they will be evacuated to a depot for evaluation and analysis before final disposition.
T	Applied to high dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts are normally repaired or overhauled at depot maintenance activities.
U	Applied to 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. Federal Stock Number, Column (2). This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description, Column (3). 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 supply code for manufacturers in parenthesis. The physical security elassification of the item is indicated by the parenthetical entry. Repair parts quantities included in kits, sets, and assemblies are shown in front of the repair part name.

d. Unit of Measure (u/m), Column (4). A 2-character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ca, pr, etc.

e. Quanity Incorporated in Unit, Column (5). This column indicates the quantity of the item used in the functional group or 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, Column (6). This column indicates the quantity of an item furnished with the equipment.

g. *Illustration, Column (7).* This column is divided as follows:

(1) *Figure Number, Column (7) (a).* Indicates the figure number of the illustration in which the item is shown.

(2) *Item, Number, Column (7) (b).* Indicates the callout number used to reference the item in the illustration.

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 ISSUEITEMS, MANUFACTURER INSTALLED 3100—Basic Issue Items, Manufacturer or Depot Installed					
PC	7510–889–3494	Binder, Log Book	EA		1		
PC	7520–559–9618	CASE, MAINTENANCE AND OPERATIONAL MANUALS: cotton duck, water repellent mildew resistant	EA		1		
PC		Department of the Army, Operator, Organizational, Direct and General Support, and Depot Maintenance Manual TM 5–3431–225–15	EA		1		
		GROUP 32-BASIC ISSUEITEMS, TROOP INSTALLED 3200—Basic Issue Items, Troop Installed or Authorized					
PCI	4210–555–8837	Extinguisher, Fire, Monobromotrifluoromethane	EA		*		
PC	5975–878–3791	ROD ASSEMBLY, GROUND: 3 Sect.; 9 ft, lg.; 5/8 in. dia.; copper coated; cone point; separable clamp; w/6 ft. wire and one terminal end	EA				

APPENDIX C

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

C-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.

C-2. Explanation of Columns in Section II

a. Group Number Column (1). The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes (obtained from TB 750-93-1, Functional Grouping Codes) are listed on the Maintenance Allocation Chart in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. Funcitonal Group, Column (2). This column contains a brief description of the components of each functional group.

c. Maintenance Functions, Column (3). 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	Aline: 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, Column (4). This column is provided for referencing by code the special tools and test equipment, (sec. III) required to perform the maintenance functions (sec. II).

e. *Remarks, Column (5).* This column is provided for referencing by code the remarks (sec. IV) pertinent to the maintenance functions.

C-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.

C-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.

Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Functional group	(3) Maintenance functions A Inspect	B Test	C Service	D Adjust	E Aline	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	(4) Tools and equipment	(5) Remarks
22	ACCESSORY ITEMS													
2210	Data Plates and Instruction Holders:													
	Plates, data	--	--	--	--	--	--	--	F					
	Plates, instruction	--	--	--	--	--	--	--	O					
44	WELDING EQUIPMENT													
4400	Welding Machine, Arc	--	F	C	--	--	--	--	--	O	H			
4405	Frame Support, Housing:													
	Lifting eye, cover top; housing panels	--	--	--	--	--	--	--	O					
	Base assembly	--	--	--	--	--	--	--	H					
4406	Ventilating, Cooling System:													
	Motor, fan and guard assembly	--	--	O	--	--	--	--	O	--	--	--	----	A
4407	Control Panels, Housing:													
	Panels: control and high frequency	--	--	--	--	--	--	--	F					
	Wiring assembly	--	--	--	--	--	--	--	F	F	--	--	----	B
4408	Connecting Devices:													
	Change bars, voltage	--	--	--	O	--	--	--	O	--	--	--	----	C
	Receptacles: remote control and contactor control	--	--	--	--	--	--	--	O					
	Terminal board, ground and electrode	--	--	--	--	--	--	--	O					
4409	Protective Devices:													
	Switches, thermostatic	--	--	--	--	--	--	--	O					
	Fuses and holders	--	--	--	--	--	--	--	O					
4410	Switching, Timing and Speed Speed Control													
	Switches: power; standard-remote; manual-auto; start circuit; high frequency	--	--	--	--	--	--	--	O					
	Switches; range and polarity; tig-metallic	--	--	--	--	--	--	--	F	F				
	Switch and cable assembly, remote control	--	--	--	--	--	--	--	O	F				

Group No.	(2) Functional group	(3) Maintenance functions A Inspect	B Test	C Service	D Adjust	E Aline	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	(4) Tools and equipment	(5) Remarks
	Timers: high frequency gas and water	--			--	--		--	O					
	Relay, timer	--	--	--		--	--	--	F					
	Spark gap assembly	O	--	O	O	--	--	--	O	O	--		----	D
	Contactors: main and remote	--	--	--		--	--	--	O					
	Valves, solenoid: gas and water	--		--	--	--	--	--	O					
	Capacitors	--	F	--		--	--		F					
4411	Resistor Components:													
	Resistors	--	F	--	--	--	--	--	F					
	Rheostats: control; intensity and start adjustment	--	F	--	--	--	--	--	F					
4412	Transformer Components:													
	Transformer, main	--	H	O	--	--	--	--	H	H	--		----	E
	Magnetic amplifier	--	--	--	--	--	--	--	F	H				
	Transformers: control and high frequency	--	F	O	--	--	--	--	F	H				
	Coil, air coupling	--	F	--	--	--	--	--	F					
	Stabilizer	--	F	--	--	--	--	--	F					
4413	Rectifier Components:													
	Rectifier, main	--	--	O	--	--	--	--	F	F	--		----	F
	Rectifier, control	--	--	O	--	--	--	--	F	--	--		----	F

Section III. SPECIAL TOOL AND SPECIAL TEST EQUIPMENT REQUIREMENTS

Reference code	Maintenance category	Nomenclature	Tool number
		No special tools or test equipment required.	

Section IV. REMARKS

Reference code	Remarks
A - C	Clean screen with compressed air.
B - I	Fabricate.
C - D	Change voltage to conform with available power source.
D - D	Set gapat .008 inches.
E - C	Remove dust and dirt with clean, dry, air stream.
F - C	Clean periodically by blowing out with compressed air. Blow through and not across the rectifier plates.

INDEX

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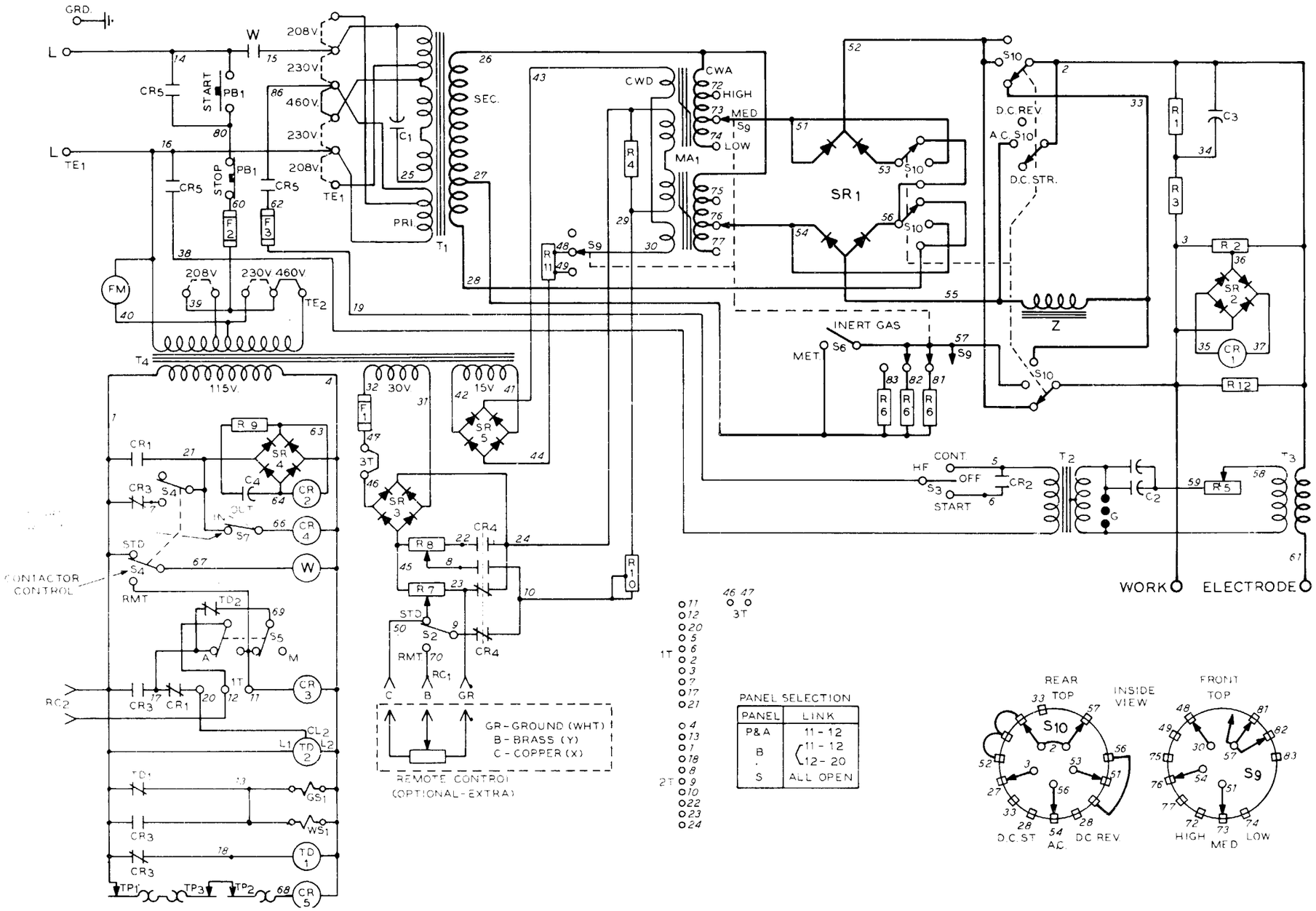

C1	CAPACITOR, 30 mfd. 440 VDC
C2	CAPACITOR, .002 mfd. 5000 VDC
C3	CAPACITOR, 10 mfd. 600 VDC
C4	CAPACITOR, 40 mfd. 250 VDC
CR1	RELAY
CR2	RELAY
CR3	RELAY
CR4	RELAY
CR5	CONTACTOR
F1	FUSE, PLUG, 10 ampere
F2	FUSE, CARTRIDGE, 6 ampere
F3	FUSE, CARTRIDGE, 6 ampere
FM	FAN MOTOR
G	SPARK GAP
GS1	SOLENOID VALVE, GAS
MA1	MAGNETIC AMPLIFIER
PB1	PUSHBUTTON, ON-OFF
R1	RESISTOR, 10,000 ohm, 10 watt
R2	RESISTOR, 1,000 ohm, 25 watt
R3	RESISTOR, 10 ohm, 100 watt
R4	RESISTOR, 10,000 ohm, 10 watt
R5	RHEOSTAT, 10,000 ohm, 10 watt
R6	RIBBON RESISTOR
R7	RHEOSTAT, 15 ohm, 150 watt
R8	RHEOSTAT, 15 ohm, 150 watt
R9	RESISTOR, 100 ohm, 2 watt
R10	RESISTOR, 4 ohm, 50 watt
R11	RESISTOR, 5 ohm, 100 watt
R12	RESISTOR, 100 ohm, 100 watt
RC1	RECEPTACLE, REMOTE AMPERAGE
RC2	RECEPTACLE, CONTACTOR CONTROL
S2	SWITCH, AMPERAGE CONTROL
S3	SWITCH, HIGH FREQUENCY
S4	SWITCH, STANDARD-REMOTE
S6	SWITCH, TIG
S7	SWITCH, START CONTROL
S9	SWITCH, RANGE
S10	SWITCH, POLARITY
SR1	MAIN RECTIFIER
SR2	RECTIFIER
SR3	RECTIFIER
SR4	CONTROL RECTIFIER
SR5	RECTIFIER
T1	TRANSFORMER, MAIN
T2	TRANSFORMER, HIGH FREQUENCY
T3	COIL, HIGH FREQUENCY
T4	TRANSFORMER, CONTROL
TP1	THERMOSTAT SWITCH
TP2	THERMOSTAT SWITCH
TP3	THERMOSTAT SWITCH
W	CONTACTOR, PRIMARY
WS1	SOLENOID VALVE, WATER
Z	STABILIZER

ME 3431-225-15/1-4

Figure 1–4. Practical wiring diagram.

TM 5-3431-225-15 WELDING MACHINE, ARC—1969