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COMBINATION REPAIR UNITS

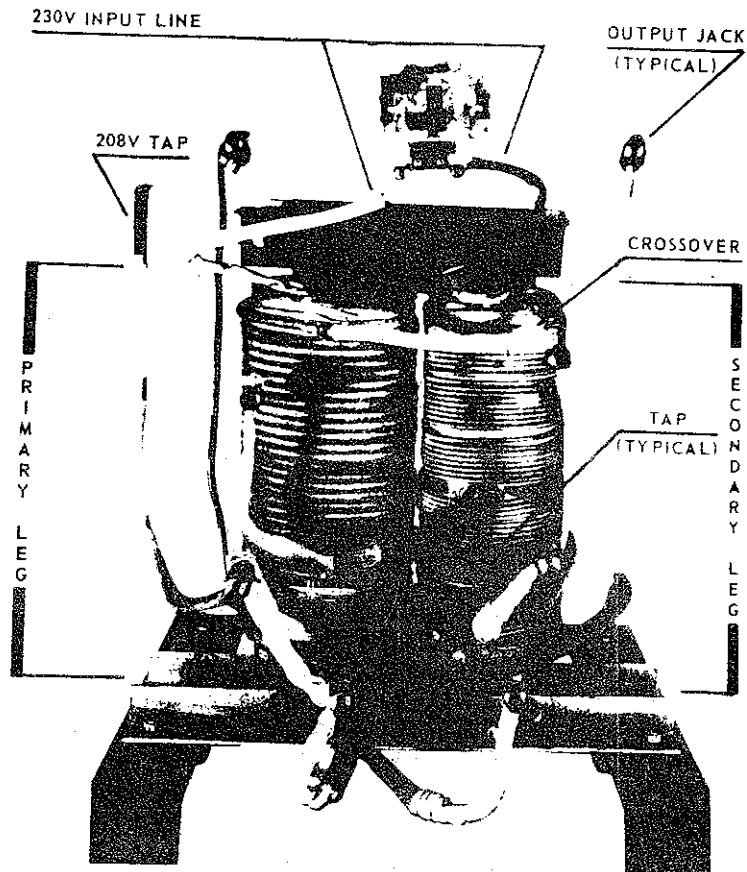
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BATTERY CHARGING ACCESSORY UNITS

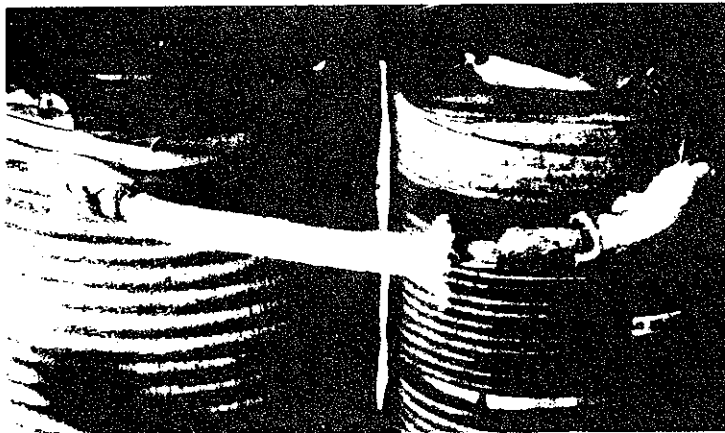
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In order to properly describe the procedure necessary to identify some of the problems encountered in servicing the Forney welder, the following information describing our manufacturing procedure is required.

The transformer in the Forney Combination Repair Unit is a limited input, tapped secondary unit. The windings are located and designed so as to furnish various rated outputs with maximum possible voltage. The transformer is wound in two sections commonly referred to as the "Primary Leg" and the "Secondary Leg." The primary leg contains the primary or 230 Volt input winding plus a portion of the secondary or output winding - referred to as "Overwind." Output connections which are called "Taps", are made at various places in the secondary winding and these taps are brought out and connected to the output jacks on the front of the machine. The secondary leg contains most of the winding which is tapped. When the transformer is assembled or welded together, additional connections - "Crossovers" - between the two legs are required.



Except for the high ground and the lowest amperage taps, a welded or brazed connection is required at each tap and crossover. The brazed tap connections are located within 3 or 4 inches of the transformer windings and are covered with a varnish impregnated cotton insulating sleeve. The crossover, which makes the electrical link between the primary and secondary leg, is located at the top of the transformer and is also covered with a varnish impregnated cotton insulating sleeve.



Typical tap with insulation slit and folded back to show brazed connection.



Typical crossover with insulation removed to show brazed connection.

Occasionally one of these brazed connections will break or separate due to over-heating, vibration, etc., and cause a malfunction of one or several of the output jacks.

Following is a table which should assist you in trouble shooting all Forney model welders.

TROUBLE SHOOTING FORNEY COMBINA'

PROBLEM	PROBABLE CAUSE	TEST PROCEDURE
Transformer hums but no welding current on some taps	Suggest broken tap connection	Follow "Transformer Circuit Testing" procedure for sp to locate break (See Index for Circuit Testing Section)
Transformer hums but no welding current on any combination of grounds and output jacks	Suggests open secondary between low ground and high tap caused by broken crossover.	Disconnect welder - from 230V wall receptacle power check continuity with ohmmeter from low ground jack to output jack.
Transformer hums and welder will operate for a few seconds, then cut off. After a few seconds of cooling, welder will function again for a short time and then cut off again.	Faulty crossover connection which breaks contact as the winding heats and expands during use.	
Operates on higher heat taps but will not operate on low heat taps (occurs primarily on "C" model welders in which the low heat taps are supplied by a choke which is connected to one of the medium heat taps)	Choke feeder wire disconnected or broken (refer to appropriate wiring diagram to determine which heat tap supplies the choke)	All taps connected to the choke inoperative.
	Broken braze at one of the connections between sections of the secondary winding.	
Arcing occurs if electrode holder or electrode in holder touches case.	Output jack retaining knob has loosened allowing a jack to move and make contact with case.	Check for loose retaining knob.
Plug on end of electrode holder and/or ground cable becomes extremely hot.	Poor connection where cable is crimped into plug.	
	Loose connection at rear of jack where transformer lead is connected.	
Mild electrical shock experienced when holding electrode holder or inserting electrode into holder.	Generally due to the normal open circuit voltage of the unit which may be from 50 to 82 volts and is not considered dangerous. Likely to occur most often in damp or wet weather.	
Extreme electrical shock experienced when touching electrode holder although welder continues to function properly in all other respects. This is EXTREMELY HAZARDOUS - DISCONNECT WELDER IMMEDIATELY	Primary to secondary transformer short.	Test with a hi-pot of approximately 1500 to 1700 vo to DISCONNECT Battery Charger in "BT" models BE test.
Extreme electrical shock experienced when touching the welder case. EXTREMELY HAZARDOUS - DISCONNECT WELDER IMMEDIATELY - DO NOT OPERATE.	Unit improperly connected to a three phase power source.	
	Safety ground wire not properly connected at receptacle and unit is internally shorted.	
	Foreign metal object or material may have fallen into top of transformer windings.	
Explosion like sound followed by a puddle of oil on floor under welder or unit may have caught fire internally (occurs on "C" models only)	Blown capacitor	Visually check to see if capacitor case has ruptured.
Low output regardless of amperage setting (VS-300 models only)	Diodes are defective (open)	
	Control Potentiometer may be open or burned	
	Diodes may have shorted blowing connecting fuse links	
Unit seems to be under full load - no welding current. (VS-300 AC-DC, F-260 AC/DC and F-275 AC-DC models only)	One or more rectifiers shorted in the DC section	
Low out put regardless of amperage setting (SR-200 models only)	Diodes are defective (open)	
	Control Potentiometer may be open or burned	
	Diodes may have shorted blowing connecting fuse links	
Replacement of Transformer	Field replacement of transformer is permissible if an exact replacement is available. If a substitution must be made, factory replacement is recommended since exact connections and special test equipment are required to assure satisfactory operation. Model, serial number and specification number of welder must accompany order to assure exact replacement.	
Replace of Choke	Normally may be made in the field with no difficulty. As in replacement of transformer, model, serial number and specification number of unit must accompany order to assure exact replacement.	

DISCONNECT WELDER FROM POWER SUPPLY BEFORE ATTEMPTING ANY REPAIR

Circuit testing of the F-225, F-230, F-230BT, F-260, F-275, F-260BT, F-275BT, F-260 AC/DC and F-275 AC/DC Model transformers to locate the occasional malfunction caused by broken or separated connections may be done by either one of two ways, use of an ohmmeter or actual welding with the machine. Either of these methods of testing must be performed in sequence as detailed in the following information to isolate the problem, therefore read these instructions carefully and completely before attempting any test or repair.

4. Begin testing IN SEQUENCE by conn terminals as outlined for the model beir

If the ohmmeter:

1. Shows full deflection the circuit and c correct. Go to the next test step.
2. Does not deflect. Look for probably broi indicated by letter in that test step and

TO TEST BY OHMMETER:

1. DISCONNECT WELDER FROM POWER SUPPLY by removing lead-in cable plug from wall receptacle. This is important as any voltages present in the machine can damage or destroy the meter.
2. Turn welder switch to "ON" position.
3. Touch ohmmeter leads together to verify a "O" or full scale deflection thereby eliminating the possibility of a defective meter.

TO TEST BY WELDING:

1. Connect welder to its power supply.
2. Turn welder switch "ON". A faint hum s unit is receiving power and primary is c
3. Begin testing IN SEQUENCE by plugg holder cables into jacks as outlined for
4. Using a piece of scrap metal, attempt to

overlaps with 3 B

FORNEY COMBINATION REPAIR UNITS

TEST PROCEDURE	REPAIR PROCEDURE	REPLACEMENT PART NUMBER
former Circuit Testing" procedure for specific model k (See Index for Circuit Testing Section)	Remove insulation and splice the two wires with a pressure type connector.	All Models 54600-0
elder - from 230V wall receptacle power supply; and ity with ohmmeter from low ground jack to high amp	Remove crossover insulation and splice the two wires with a pressure type connector.	All Models 54600-0
	Remove insulation and splice the break with a pressure type connector.	All Models 54600-0
ected to the choke inoperable.	Remove insulation and splice the break with a pressure type connector.	All Models 54600-0
se retaining knob	Center brass output jack in panel hole and re-tighten retaining knob or replace knob and Jack if they have been damaged.	57501-0 Black knob 57503-0 Green knob 57500-0 Repair plug
	Replace plug at end of cable.	All Models 57901-0
	Tighten set-screw connection on end of jack or replace jack if damaged.	57500-0
50 to 82 volts and is not considered	Wear welding gloves at all times when unit is in operation.	55200-0 55201-0
hi-pot of approximately 1500 to 1700 volts. Be sure LECT Battery Charger in "BT" models BEFORE hi-pot	*Replace transformer.	*Order by model, serial number, and specification number.
	Connect properly to single phase. Use external groundwire to ground welder to earth ground.	
	*Replace transformer	*Order by model, serial number, and specification number.
	Remove foreign material - test with 1500-1700 volt hi-pot.	
k to see if capacitor case has ruptured.	Disconnect and replace capacitor - no polarity need be observed when installing, either wire may be connected to either terminal. NOTE: Welder may be used without the capacitor, if necessary, until it is replaced. To do so, simply disconnect the two wires from the capacitor and TAPE EACH SEPARATELY.	C Models 54101-0 (Not used on F models)
	Replace control diode assembly.	58545
	Replace Potentiometer	59325
	Replace Control Diode Assembly	58545
	Replace Rectifiers (This is relatively easy, however the rectifier mounting nuts should be torqued to 250 to 300 inch pounds as excessive tightening can damage the Rectifiers.) NOTE: These units may continue to be used for AC welding if the DC section is disconnected.	
	Replace Diode Assembly	58545
	Replace Potentiometer.	59325
	Replace Diode Assembly.	58545
ble. If a substitution must be made, quipment are required to assure satis- ust accompany order to assure exact		
nsformer, model, serial number and		

ANY REPAIR OR REPLACEMENT

N SEQUENCE by connecting meter leads across
ifined for the model being checked.

lection the circuit and connection being tested is
the next test step.

it. Look for probably broken connection of location
iter in that test step and on the schematic.

IG:

r to its power supply.

itch "ON". A faint hum should be heard indicating
g power and primary is operating.

N SEQUENCE by plugging ground and electrode
nto jacks as outlined for the model being checked.

of scrap metal, attempt to strike an arc.

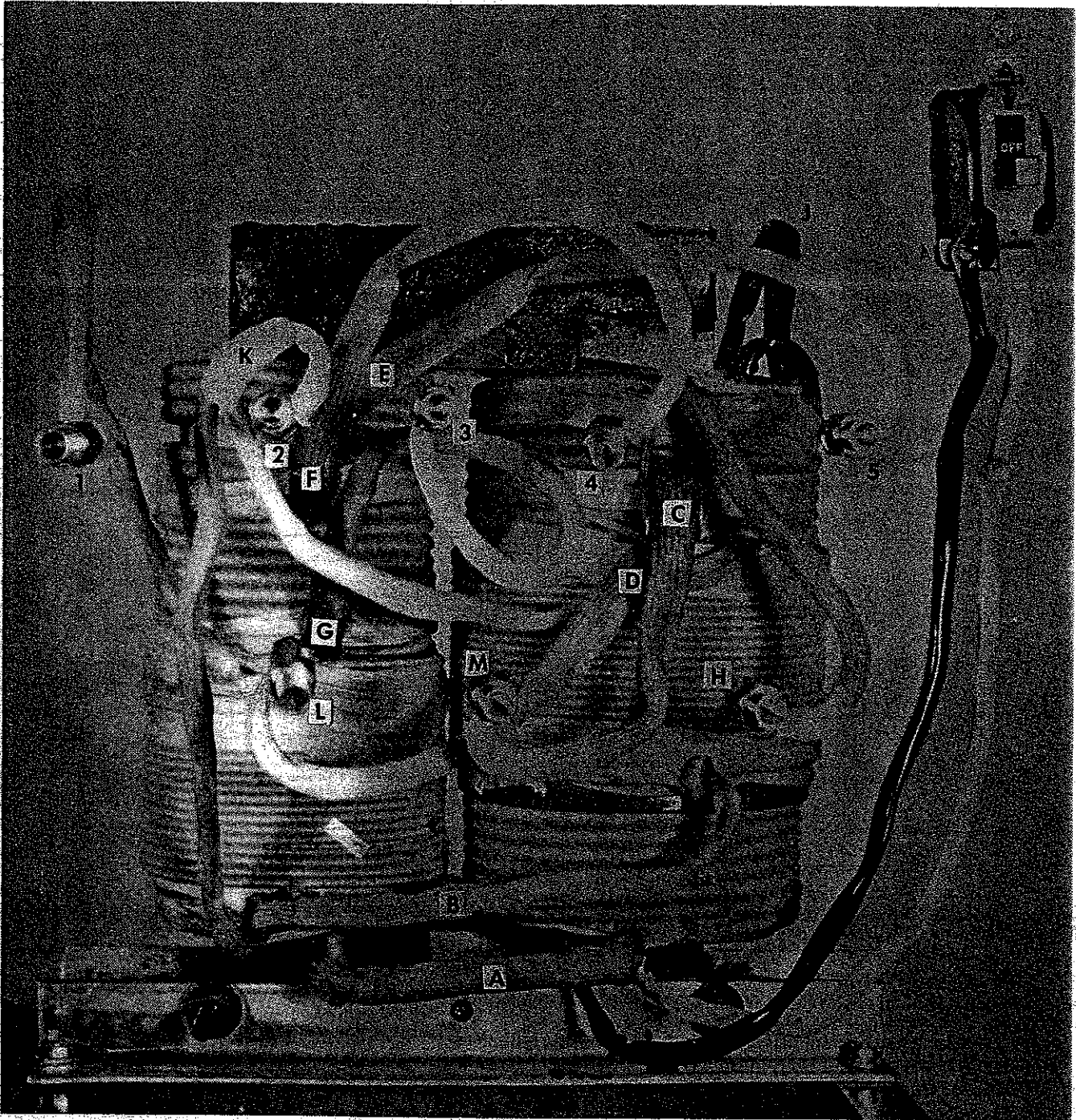
TRANSFORMER CIRCUIT TESTING - F SERIES

If an arc:

1. Is struck the circuit and connection being tested is correct. Go to the next test step.
2. Can not be struck look for probable broken connection at location indicated by letter in that test step and on the schematic.

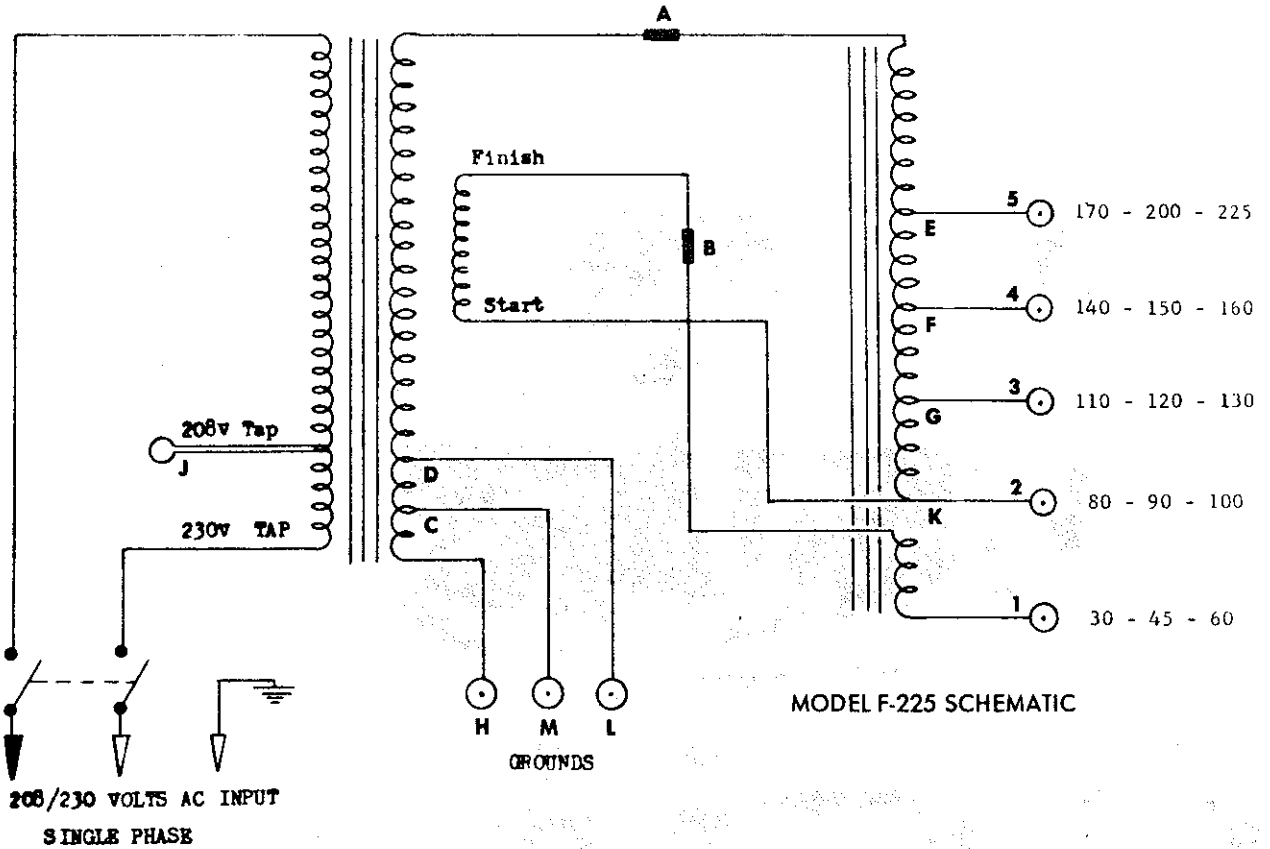
Note: In some instances, an arc will perform properly for a short time, then stop and after a short time can be re-started on the same heat setting. This indicates that the brazed connection is separating as the wire heats due to the heavy welding current, and again making contact when it cools.

The accompanying drawings show the electrical locations of the transformer connections. Each of these connections is identified by a letter which will be referred to in the testing procedure.



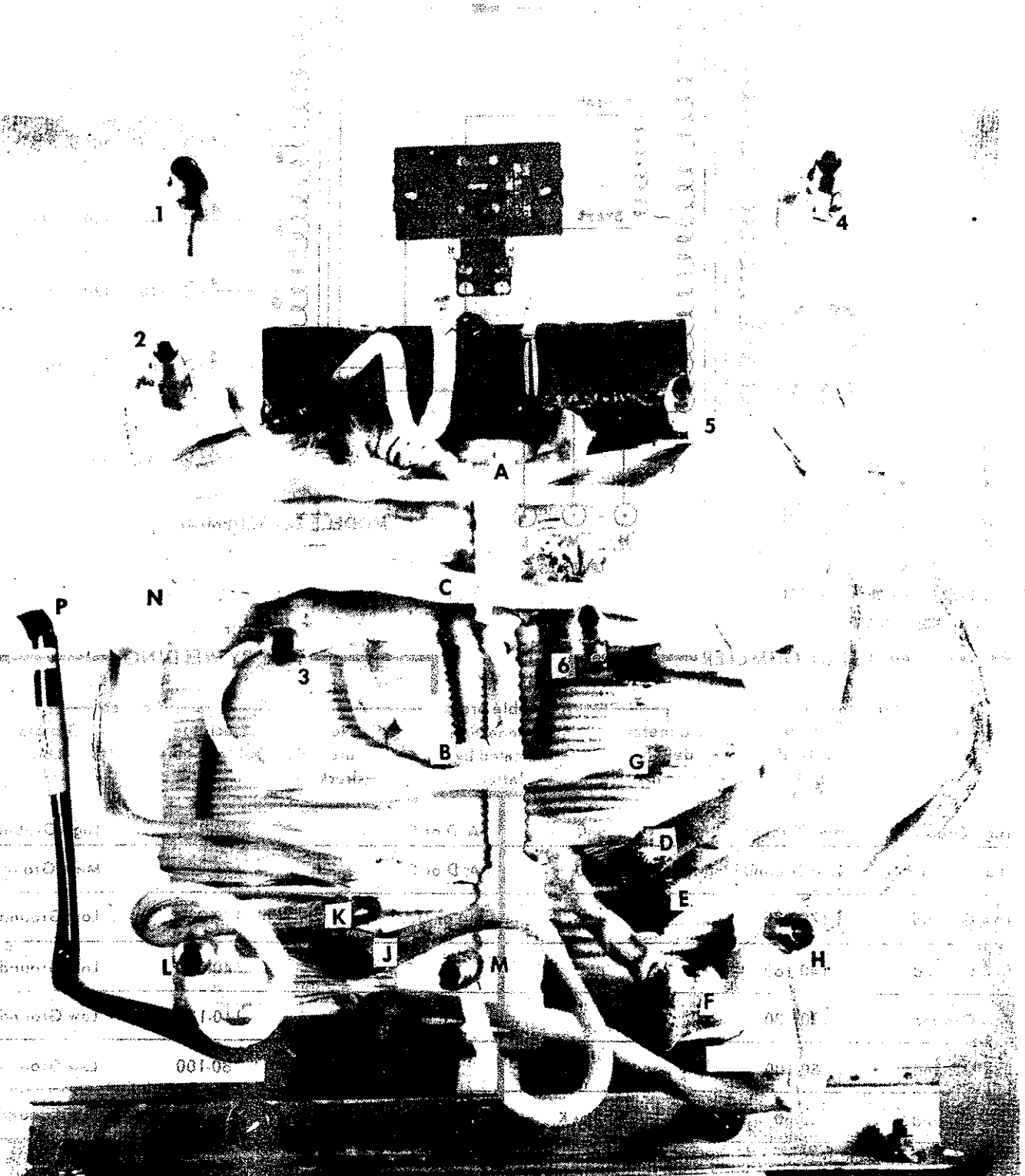
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TRANSFORMER CIRCUIT TESTING - F-225 MODELS



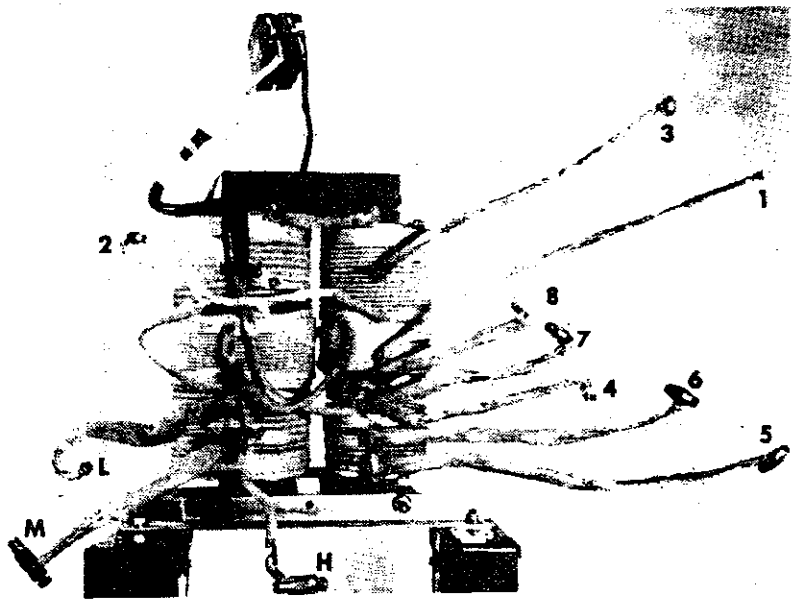
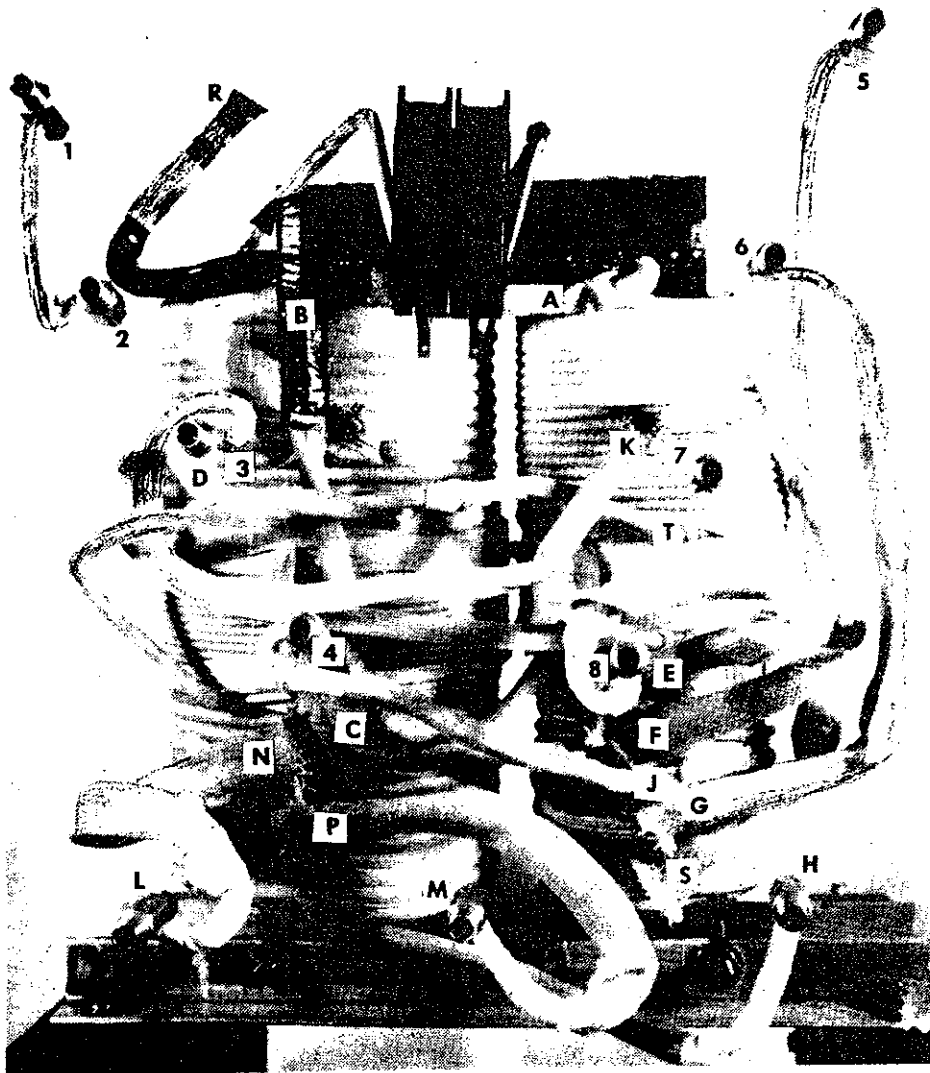
TEST BY OHMMETER			TEST BY WELDING			
Connect Meter lead to I	Connect Meter lead to I	Probable break at connection indicated by letter	Connect Electrode holder to I	Connect Ground cable to I	No meter deflection	No arc struck
High Ground	Med. Ground	C	170-225	High Ground	No meter deflection	Arc struck
High Ground	Low Ground	D	170-225	Med. Ground	No meter deflection	Arc struck
Low Ground	170-225	A	170-225	Low Ground	Deflection	No arc struck
Low Ground	140-160	E	140-160	Low Ground	Deflection	No arc struck
Low Ground	110-130	F	110-130	Low Ground	Deflection	No arc struck
Low Ground	80-100	G	80-100	Low Ground	Deflection	No arc struck
Low Ground	30-60	B or K	30-60	Low Ground	Deflection	No arc struck
Across LOWER Switch Terminals		J or Open Primary				
Across UPPER Switch Terminals		Defective Switch				
Across 230V Terminals of Lead-in Cable's Plug		Defective Lead-in Cable				

NOTE: If cooling fan is installed in machine, it must be disconnected prior to performing last three steps (Check of primary circuit).



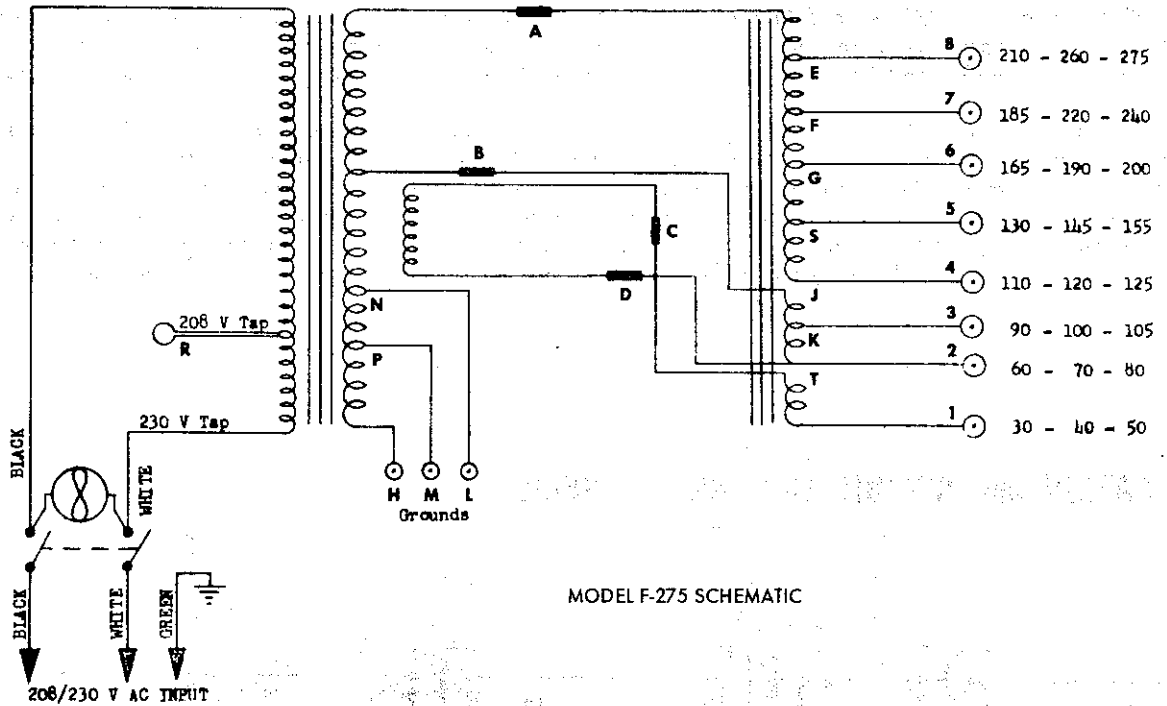
NOTE: If cooling fan is installed
 the diverter switch is to be removed from the
 system. Check the name plate of the fan.

Transformer
 Cooling System
 Diagram



No P.7

TRANSFORMER CIRCUIT TESTING - F-275 MODELS



MODEL F-275 SCHEMATIC

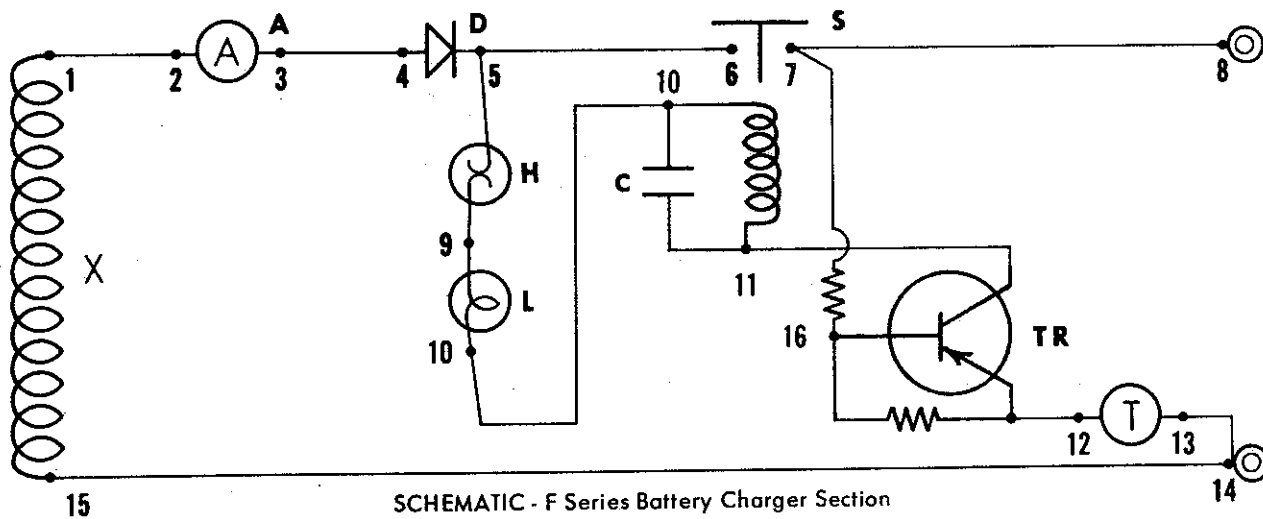
TEST BY OHMMETER			TEST BY WELDING			
Connect Meter lead to	Connect Meter lead to	No meter deflec- tion	Probable break at connection indicated by letter	No arc struck	Connect Electrode holder Cable to	Connect Ground cable to
High Ground	Med. Ground		P		210-275	High Ground
High Ground	Low Ground		N		210-275	Low Ground
Low Ground	210-275		A or B		210-275	Low Ground
Low Ground	185-240		E		185-240	Low Ground
Low Ground	165-200		F		165-200	Low Ground
Low Ground	130-155		G		130-155	Low Ground
Low Ground	110-125		S		110-125	Low Ground
Low Ground	90-105		B or K		90-105	Low Ground
Low Ground	60-80		T		60-80	Low Ground
Low Ground	30-50		C, D or T		30-50	Low Ground
Across LOWER Switch Terminals			R or Open Primary		NOTE: If cooling fan is installed in machine, it must be disconnected prior to performing last three steps. (Check of Primary Circuit)	
Across UPPER Switch Terminals			Defective Switch			
Across 230V Terminals of Lead-in Cable's Plug			Defective Lead-in Cable			

BATTERY CHARGER CIRCUIT TESTING

In 1958 a Combination Welder and Battery Charger Model was added to the C-5 Series of standard model welders which were then in production. The manufacture of these Welder/Battery Charger combination repair units, in addition to the standard welder models, has been continued with each new series of welders developed and produced since.

These combination repair units are denoted as "B" or "BT" models within any given series. The "B" designation identifies a model with a built-in battery charger and the "BT" designation identifies a model with a built-in battery charger with a timer. These combination repair units utilize the same transformers as the standard welders in the series. Since the transformers in the "B" or "BT" models are the same as in the standard models they may be trouble shot, tested and repaired as outlined in the first section of this manual, however additional problems may arise in the battery charger sections therefore the following material will describe there circuitry, testing and repair.

OPERATION and CIRCUIT TRACING - F SERIES



With a battery connected properly to the output (charge) jacks of the charger, the battery causes a small current to flow from emitter to base (14) of the transistor when the timer (T) is turned on.

The current path is as follows: 8-7-16-12-13-14. When the welder switch is turned "on", the transformer is energized. This causes a current to flow through the path: 1-2-3-4-5-9-10-11-12-13-14-15.

Current flows through the transistor collector-to-emitter because current is already flowing through the transistor base-to-emitter due to the battery being connected. (Ref P 1, transistor operation.)

Since current is flowing through the solenoid coil 10-11, the solenoid is energized and closes its internal switch contacts which allow the heavy charging current to flow through the solenoid contacts (6-7) to the negative jack and to the battery.

The control current is now flowing through path 1-2-3-4-5-9-10-11-12-13-14.

The charging current is now flowing through path 1-2-3-4-5-6-7-8.

- A AMMETER - Indicates amount of current flowing to battery.
- C CAPACITOR - Prevents solenoid bounce (chatter) when charger is initially turned on.
- D RECTIFIER - Converts alternating current (AC) to direct current (DC).
- H HEAT SENSOR - Thermostatic switch which shuts off charger if rectifier overheats.
- L BALLAST LAMP - Limits voltage applied to solenoid (series resistor) to prevent overheating of solenoid coil.
- S SOLENOID - Switches heavy charging current on or off.
- T TIMER - A clockwork operated switch that determines length of time charger will operate. Automatically turns charger off at a pre-set time.
- TR TRANSISTOR ASSEMBLY - Provides polarity protection when charging battery. If voltages applied to transistor are wrong polarity, transistor will not "turn on". This means that no current will flow from emitter to collector to switch on charging current.

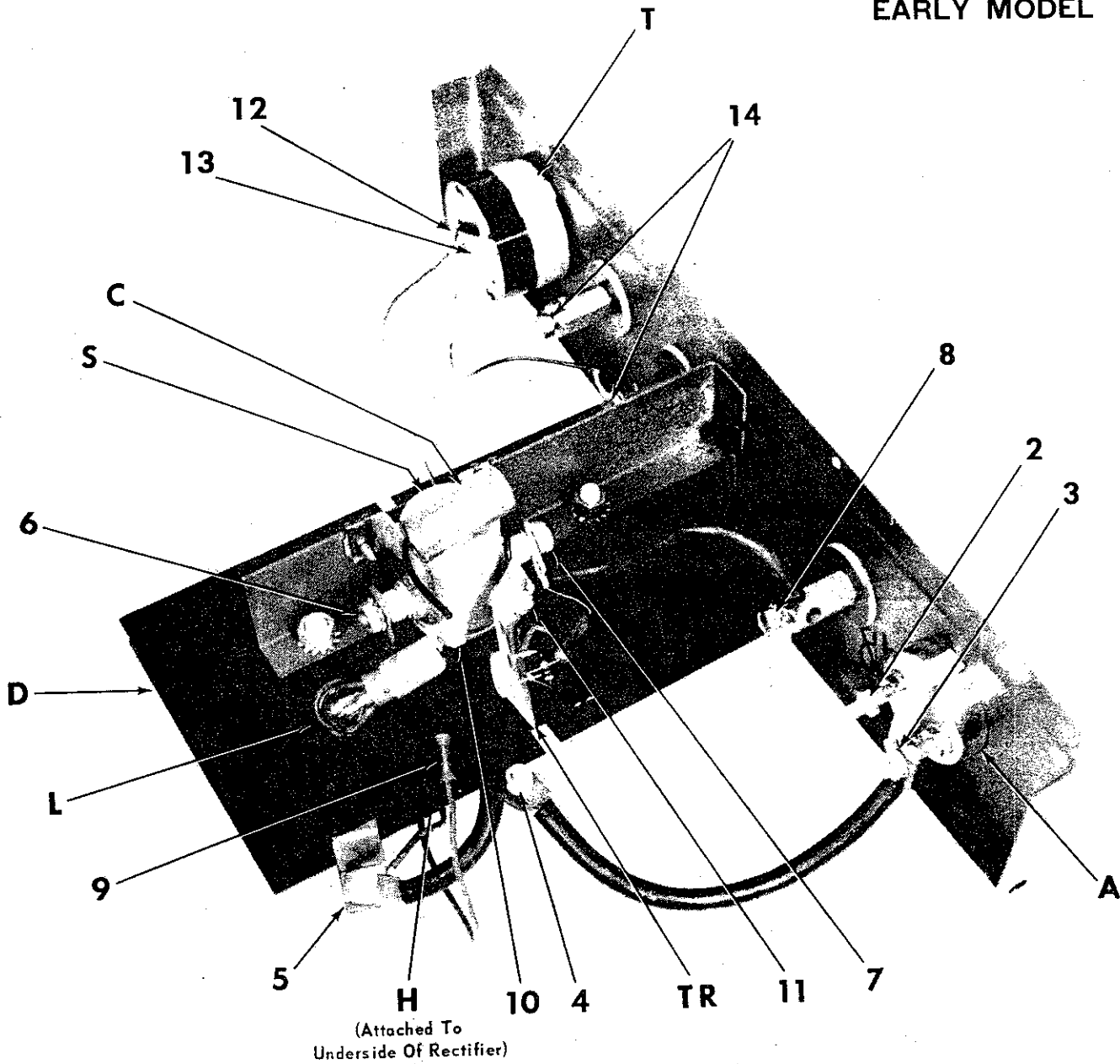
- 1 Connection to transformer lead
- 2 Terminal stud of rear of ammeter.
- 3 Terminal stud of rear of ammeter.
- 4 Terminal on rectifier-center (single tab on later units).
- 5 Terminal on rectifier-end (double tab on later units).
- 6 Large terminal stud on side of solenoid.
- 7 Large terminal stud on side of solenoid.
- 8 Negative output jack on panel.
- 9 Splice in wire from heat sensor to lamp socket.
- 10 Mounting tab terminal on lamp (also solenoid coil terminal-small stud on front of solenoid)
- 11 Aluminum plate on which transistor assembly is mounted (also small stud on front of solenoid)
- 12 Timer switch terminal.
- 13 Timer switch terminal.
- 14 Positive output jack on front of panel (slow charge jack on F-275BT, high charge jack on F-230BT).
- 15 Connection to transformer lead.
- 16 (Reference only) Base terminal of transistor.

TROUBLE SHOOTING F SERIES BATTERY CHARGER SECTIONS

PROBLEM	PROBABLE CAUSE	*	REPAIR PROCEDURE	REPLACEMENT PART NUMBER
Charger buzzes or rattles	Defective transistor assembly	2	Replace transistor assembly	F230BT, F275BT 59316
	Shorted rectifier		Replace rectifier	F230BT, F275BT 58542
	Capacitor defective or disconnected		Replace or reconnect capacitor	All Models 59310
No output - charger seems completely inoperable	Loose or broken battery post			
	Defective transistor assembly	2	Replace transistor assembly	F230BT, F275BT 59316
	Defective timer	3	Replace timer	All Models 59401
	Ballast lamp burned out	1	Replace lamp	Single contact 59313 Double contact 59317
	Defective solenoid	4	Replace solenoid	Replace with 59312
	Charger not connected to battery		Connect battery	
	Connections reversed		Reconnect - observe polarity	
	Loose or corroded battery connection		Clean terminals and reconnect	
	Completely dead battery		Jumper to charged battery for a few seconds	
Excessive hum - acrid odor emanates from welder, needle vibrates on ammeter rapidly Intermittent output	Shorted rectifier		Replace rectifier	All models replace with 58542
	Charge rate too high		Reduce charge rate	
	Defective heat sensor	1	Replace heat sensor	All Models 59308
Ballast lamp burns out in very short time	Defective solenoid	4	Replace solenoid	All models replace with 59312
	Connected to 24 volt battery			
Excessive arcing	Shorted transistor	2	Replace transistor assembly	F230BT, F275BT 59316
Charges battery regardless of position of clamps	Shorted transistor	2	Replace transistor assembly	F230BT F275BT 59316
No output - charger seems to be working, solenoid clicks, etc.	Defective solenoid	4	Replace solenoid	All models replace with 59312

* SEE TEST PROCEDURE STEPS ON FOLLOWING PAGES

EARLY MODEL



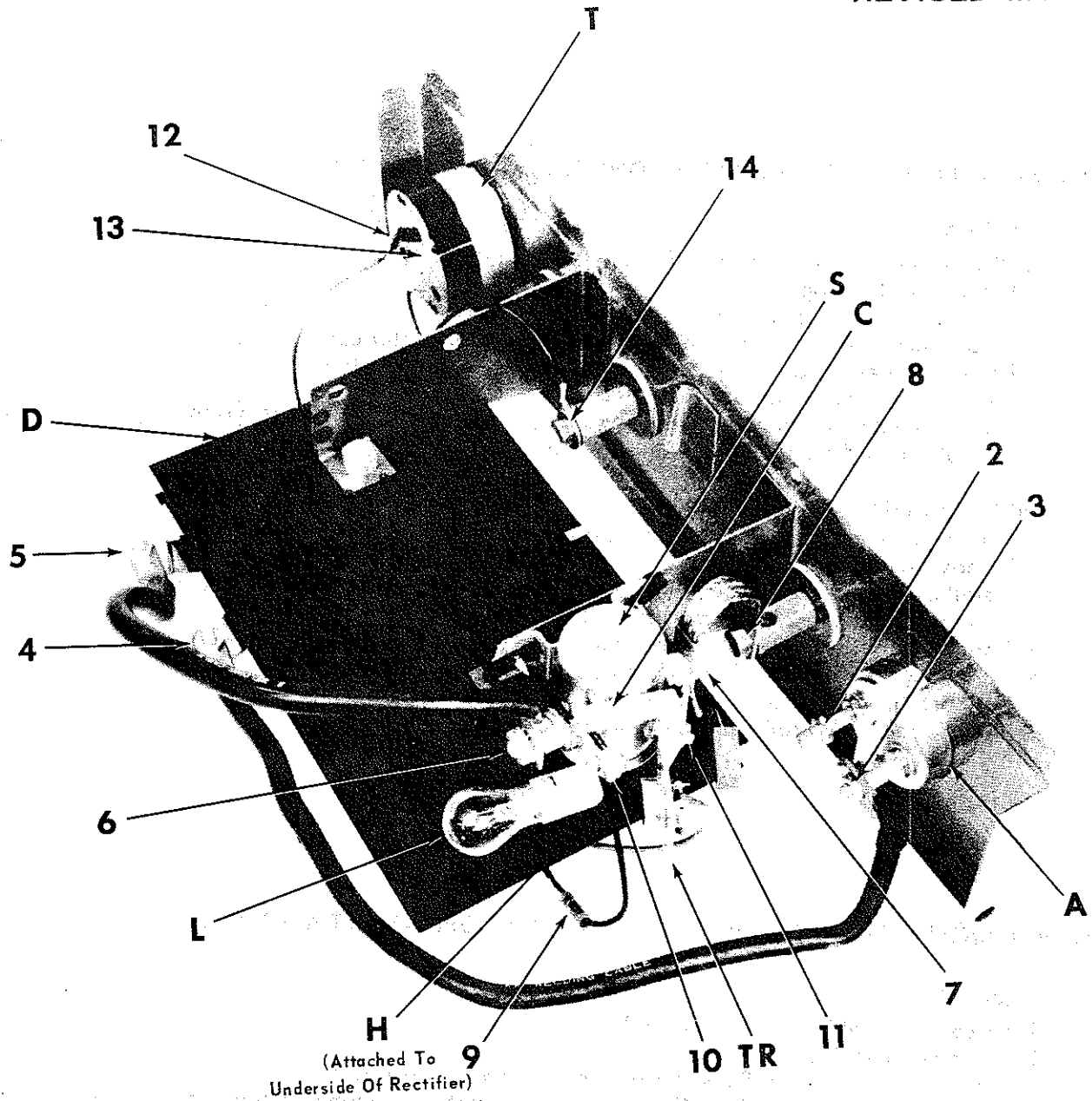
TEST PROCEDURE

CAUTION: The following tests are made with the charger on. Extreme caution should be used since 230 volts are present and may cause severe shock or injury. Keep hand, wires, tools, etc. clear of on-off switch connections.

To determine which part is defective: (Reference photo)
(No Output with charger "on" and battery connected.)

1. Connect jumper wire from (5) to (10). This by-passes the heat sensor and ballast lamp. If charger operates, probably the ballast lamp is burned out. If ballast lamp is OK, problem is connection or heat sensor needs replacement.

REVISED MODEL



2. Connect jumper wire from (11) to (12). This by-passes transistor assembly. If charger operates, transistor assembly needs to be replaced.
3. Connect jumper across timer terminals (12) & (13). If unit operates, timer is defective and needs to be replaced.
4. Connect heavy jumper (#6 or larger) from (6) to (7). This by-passes switch contacts in solenoid. If charger operates, solenoid should be replaced.

BATTERY CHARGER SECTION REPLACEMENT

REMOVAL AND INSTALLATION INSTRUCTIONS FOR MODEL F-230 BT WELDER

REMOVAL

1. Disconnect welder input cable from power outlet.
2. Remove welder top.
3. Disconnect wires from Slow and Fast charge jacks.
4. Disconnect wire from ammeter to transformer at ammeter connection.
5. Remove sheet metal screws holding charger section in position.
6. Remove charger section.

NOTE: If welder is to be used with charger section removed, **BE SURE** to tape bare ends of wires disconnected in Steps 3 and 4.

INSTALLATION

1. Disconnect welder input cable from power outlet.
2. Remove welder top.
3. Install charger section using sheet metal screws removed in above procedure.
4. Connect wire from 25/45 amp jack to Slow charge jack.
5. Connect wire from special charger tap (loop) to Fast charge jack.
6. Connect wire from 165/205 jack to open ammeter terminal.
7. Connect timer wire to Fast charge jack.
8. Replace top and reconnect welder to power outlet.

REMOVAL AND INSTALLATION INSTRUCTIONS FOR MODEL F-275 BT WELDER

REMOVAL

1. Disconnect welder from power outlet.
 2. Remove welder top.
 3. Disconnect wires from Slow charge jack and Fast charge jack.
 4. Disconnect wire from 210/275 amp jack to ammeter at ammeter terminal.
 5. Remove sheet metal screws holding charger section in place and remove charger section.
- NOTE: If welder is to be used with charger section removed, **BE SURE** to tape bare ends of wires disconnected in Steps 3 and 4.

INSTALLATION

1. Disconnect welder from power outlet.
2. Remove welder top.
3. Install charger section using sheet metal screws removed in Step 5 of removal instructions.
4. Connect wire from 60/80 amp jack to Slow charge jack.
5. Connect wire from 110/125 amp jack to Fast charge jack.
6. Connect wire from 210/275 amp jack to open terminal on ammeter.
7. Connect timer wire to Slow charge jack.
8. Replace top and reconnect welder to power outlet.

BATTERY CHARGER SECTION INSTALLATION

To Install a Battery Charger Section in an F Series Model Welder not originally equipped with charger:

1. Disconnect welder from Power Source.
2. Remove welder top.
3. Remove 4½" upper section of front panel.

MODEL F-230 only

1. Connect 10" wire to 25/45 amp jack.
2. Locate special charger tap which is a loop, generally formed or bent around the rear of the transformer. Bend this loop around to the approximate position of the fast charge jack on the charger panel. Remove tape from end of loop and form loop to fit 5/16 bolt.
NOTE: The charger tap emerges from the leg (winding) on the right side, facing the front. **DO NOT** attempt to connect the 208 volt tap which emerges from the leg on the left side, facing the unit and is identified by a black plastic sleeve and an adhesive tag marked "208 volt tap."
3. Install charger panel, using screws removed when removing blank panel.
4. Connect 10" wire from 25/45 amp jack to slow charge jack. Tighten connection.
5. Connect loop to fast charge jack. Do not tighten connection at this time.
6. Connect 5" timer wire from timer to fast charge jack. Tighten connection at jack.
7. Connect wire from ammeter to 165/205 jack.

MODEL F-275 only

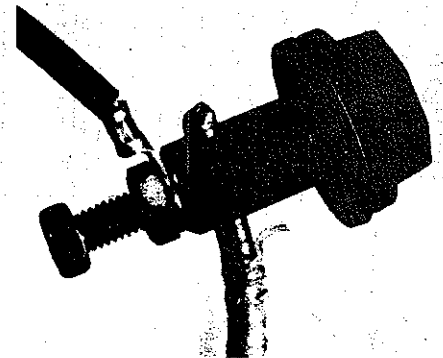
1. Connect 10" wire to 60/80 amp jack.
2. Connect 17" wire to 110/125 amp jack.
3. Install charger panel, using screws removed when removing blank panel.
4. Connect wire from ammeter to 210/275 amp jack.
5. Connect 10" wire from 60/80 amp jack to slow charge jack. Do not tighten.
6. Connect 5" timer wire to slow charge jack. Tighten connection.
7. Connect 17" wire from 110/125 amp jack to fast charge jack.

TO CONNECT CHARGER WIRE TO JACK:

1. Remove and discard existing 5/16 x 18 x 1/2" bolt.
2. Thread nut on 1" bolt, insert bolt through lug of charger wire and thread into rear of jack. Tighten bolt securely to assure good contact between jack and existing transformer wire.
3. Tighten jam-nut on lug to assure tight connection.

PARTS included in adapter kit:

- One #6 wire, lugged, 17" long.
- One #6 wire, lugged, 10" long.
- Three 5/16 x 18 x 1" brass bolts with nuts.



NOTE: If existing wires are bent or pushed aside to provide more working space when connecting charger wires to jacks, be sure to re-form these wires so as to provide clearance between all wires and jacks or other wires. This will prevent possible short circuits and subsequent burn-out of the transformer.

TROUBLE SHOOTING C SERIES BATTERY CHARGER SECTIONS

REPAIR PROCEDURE

* PROBABLE CAUSE

PROBLEM

PROBLEM	* PROBABLE CAUSE	REPAIR PROCEDURE	REPLACEMENT PART NUMBER
Charger buzzes or rattles	Defective transistor assembly	Replace transistor assembly	C6BT,CBBT 59315
	Shorted rectifier	Replace rectifier	C6BT,CBBT 58542
No output - charger seems completely inoperable	Capacitor defective or disconnected	Replace or reconnect capacitor	All Models 59310
	Loose or broken battery post		
	Defective transistor assembly	Replace transistor assembly	C6BT,CBBT 59315
	Defective timer	Replace timer	All Models 59401
Excessive hum - acrid odor emanates from welder, needle vibrates on ammeter rapidly intermittent output	Ballast lamp burned out	Replace lamp	Single contact 59313 Double contact 59317
	Defective solenoid	Replace solenoid	Before s/n 346500 unless unit has been transistorized replace with 59307 After s/n 346500 'All Models Replace with 59312
	Charger not connected to battery	Connect battery	
	Connections reversed	Reconnect - observe polarity	
Ballast lamp burns out in very short time	Loose or corroded battery connection	Clean terminals and reconnect	
	Completely dead battery	Jumper to charged battery for a few seconds	
	Shorted rectifier on units without polarity protector	Replace rectifier	C5B,C5BT 58542 CBBT (before s/n 276221) replace with 58542
	Charge rate too high	Reduce charge rate	
Excessive arcing	Defective heat sensor	Replace heat sensor	All Models 59308 Before s/n 346500 unless unit has been transistorized replace with 59307
	Defective solenoid	Replace solenoid	After s/n 346500 replace with 59312
	Connected to 24 volt battery	Replace transistor assembly	C6BT,CBBT 59315
	Shorted transistor	Replace transistor assembly	C6BT,CBBT 59315
Charges battery regardless of position of clamps Battery overheats excessively	Shorted transistor	Replace transistor assembly	
	Excessive charge rate	Reduce charge rate	C5B,C5BT 58542 CBBT (before s/n 276221) replace with 58542
	Shorted rectifier (on units without polarity protector circuit)	Replace rectifier	Before s/n 346500 (unless unit has been transistorized) replace with 59307 After s/n 346500 replace with 59312
	Defective solenoid	Replace solenoid	

* SEE TEST PROCEDURE STEPS ON FOLLOWING PAGES

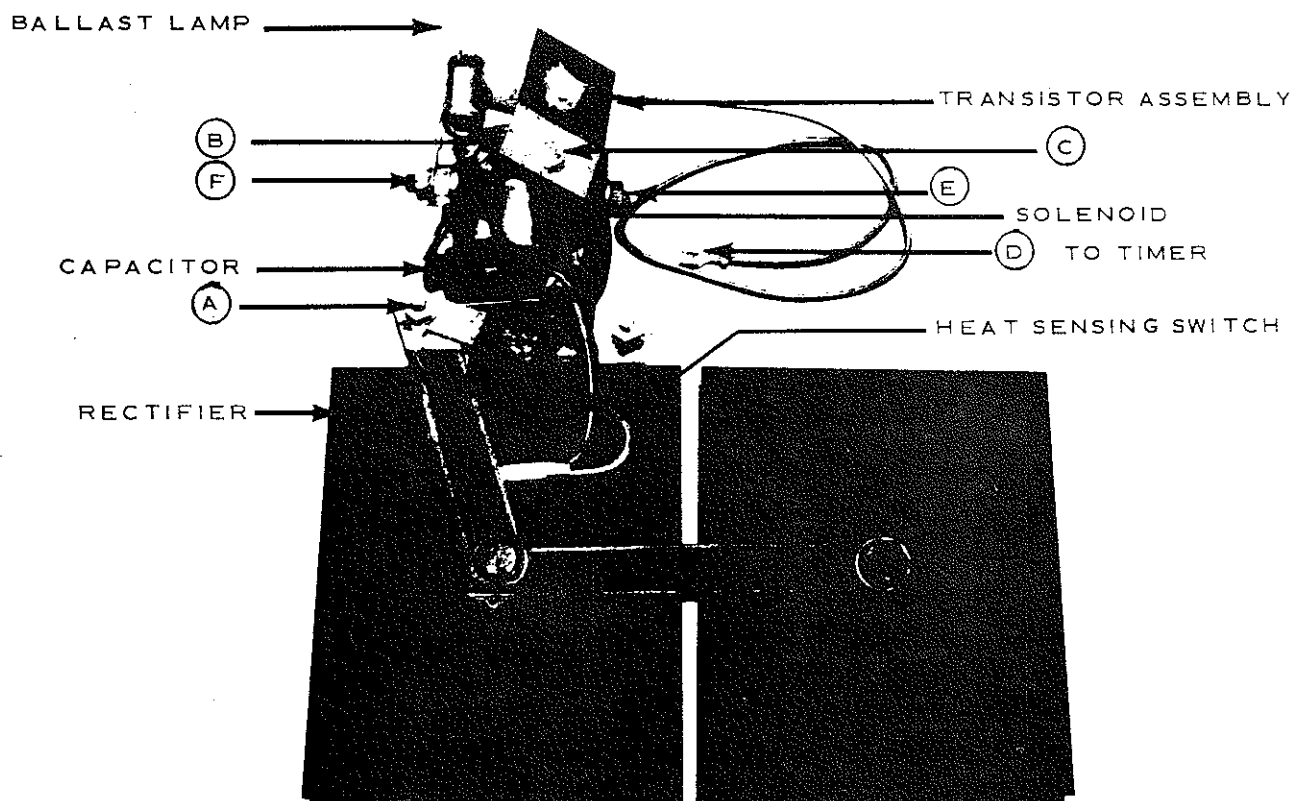
TEST PROCEDURE

MODELS C6BT AND CBBT

CAUTION: The following tests are made with the charger on. Extreme caution should be used since 230 volts are present and may cause severe shock or injury. Keep hand, wires, tools, etc. clear of on-off switch connections.

To determine which part is defective: (Reference drawing)
(No Output with charger "on" and battery connected.)

1. Connect jumper wire from (A) to (B). This by-passes the heat sensor and ballast lamp. If charger operates, probably the ballast lamp is burned out. If ballast lamp is OK, problem is connection or heat sensor needs replacement.
2. Connect jumper wire from (C) to (D). This by-passes transistor assembly. If charger operates, transistor assembly needs to be replaced.
3. Connect jumper across timer terminals. If unit operates, timer is defective and needs to be replaced.
4. Connect heavy jumper (#6 or larger) from (E) to (F). This by-passes switch contacts in solenoid. If charger operates, solenoid should be replaced.



OPERATION and CIRCUIT TESTING - C5 SERIES

The charger circuit of the Forney Model C5B consists of a half-wave rectifier, ammeter and a circuit breaker. The circuit of the Model C5BT is the same, but includes a three hour timer for automatic turn-off of the unit. (Note: The timer switches 230 VAC to turn the welder transformer on or off.)

In operation, the three positive connections (charge rate - slow, medium, fast) are supplied power by taps on the welding transformer. Another tap on the transformer is connected to the ammeter, then to the circuit breaker (KLIXON), then to the rectifier. The output of the rectifier is connected to the negative charge jack.

Standard color code on rectifiers is as follows:

Yellow dot-----AC connection (transformer)
Red dot -----Positive DC connection
Black dot-----Negative DC connection

In the Model C5B and C5BT circuits, proper hookup would be:

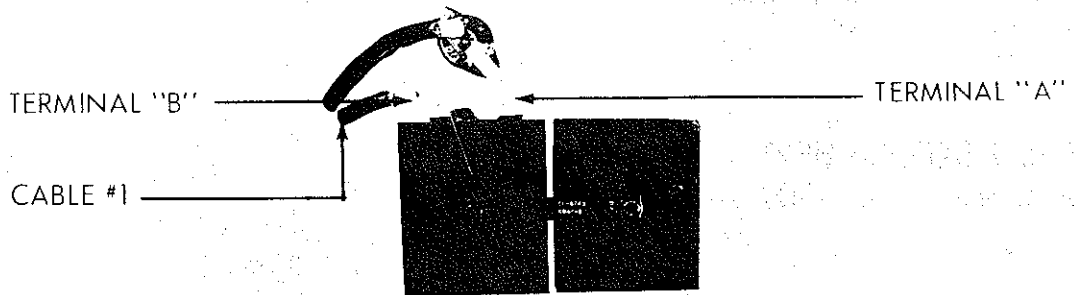
1. The wire from the circuit breaker (Klixon) connects to the red dot terminal.
2. The wire or strap from the negative charger jack connects to the yellow dot terminal.

These connections give a negative output from the rectifier. If reversed, the output of the rectifier will be positive and, when connected to a battery will cause the battery to discharge back through the charger circuit.

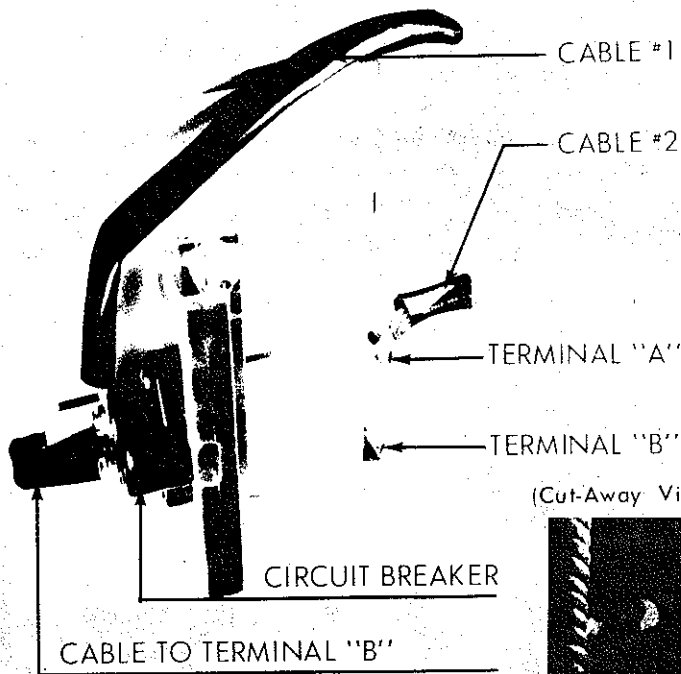
RECTIFIER REPLACEMENT

MODELS CBBT—Spec 16, C5B & C5BT—Spec 24 & 26

NOTE: Be sure that cable (1) is connected to negative battery charger jack on front of welder.

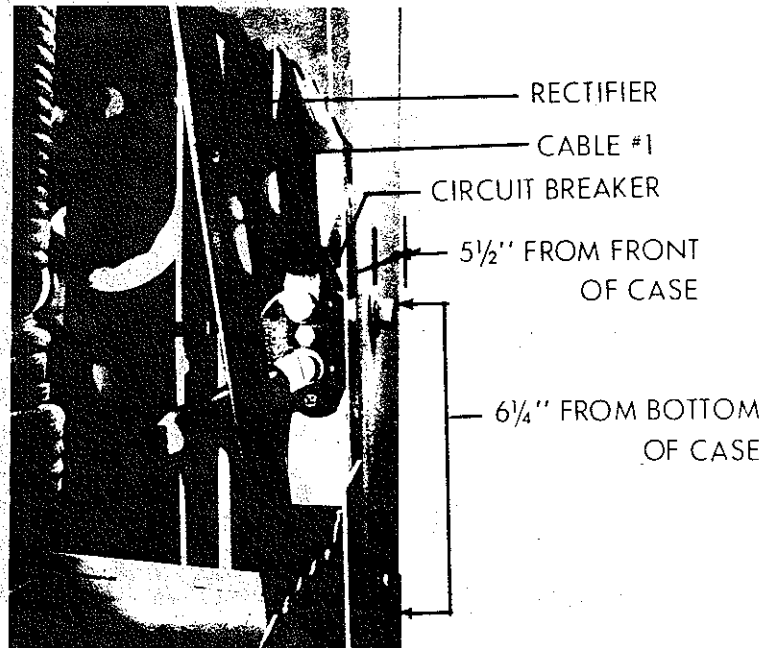


MODELS C5B & C5BT Spec 21



1. Disconnect cables from rectifier assembly and remove assembly.
2. Remove circuit breaker and mount on rear side of "U" bracket as shown.
3. Mount new rectifier to "U" bracket as shown.
4. Insulate 9 inch strap with black plastic sleeving and connect from circuit breaker to terminal "B" of rectifier.

(Cut-Away View Of Mounted Rectifier From Back of Welder)



5. Connect cable #1 (from negative jack on front of welder) to circuit breaker.
6. Connect cable #2 to terminal "A" of rectifier.
7. Locate and drill 3/8" diameter hole as shown. Bolt rectifier assembly in place.

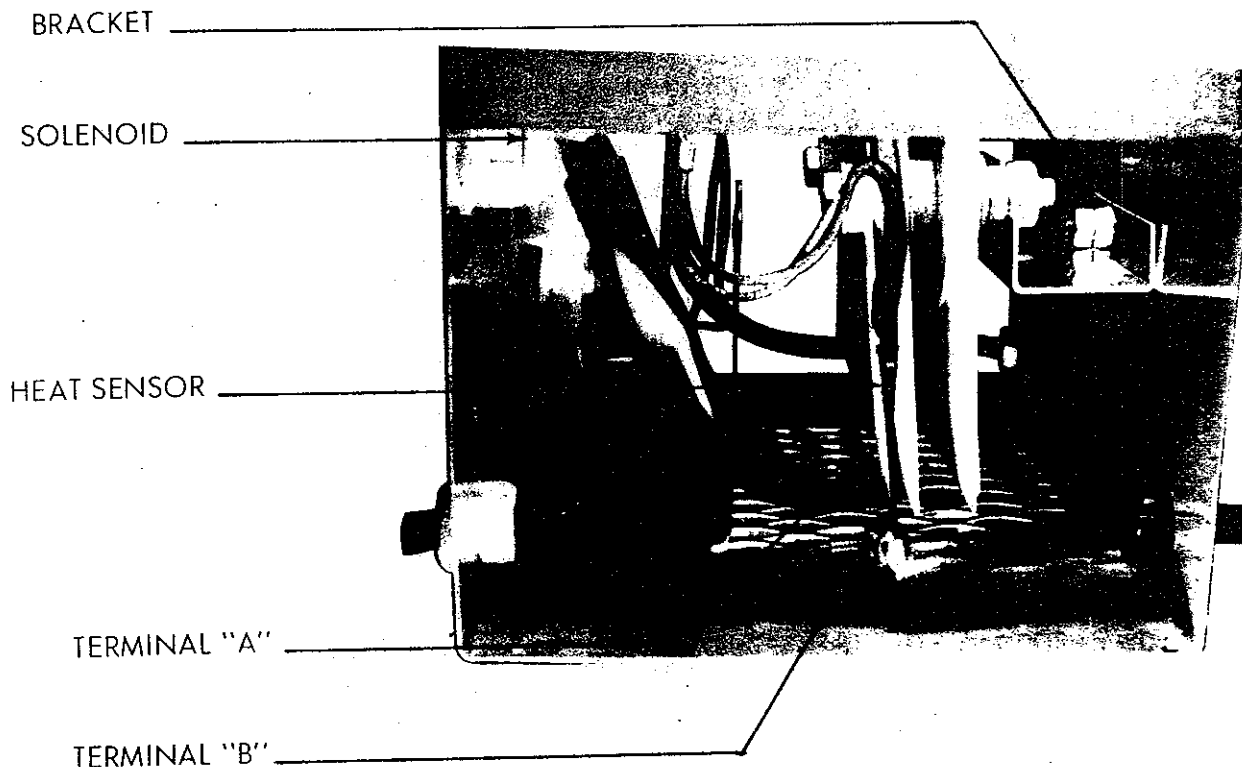
BATTERY CHARGING ACCESSORY UNITS

Battery charging capability with a standard model Forney welder has been made possible by the design and production of an accessory battery charging unit. These charger accessory units work as a companion with the welder, utilizing the welders transformer for charging current, when properly connected depending upon the models being used. The charging circuitry is all self-contained in these units and requires only plug-in external connection to the welder to make them operative.

RECTIFIER REPLACEMENT

MODEL 303 (With diode type polarity protector circuit)

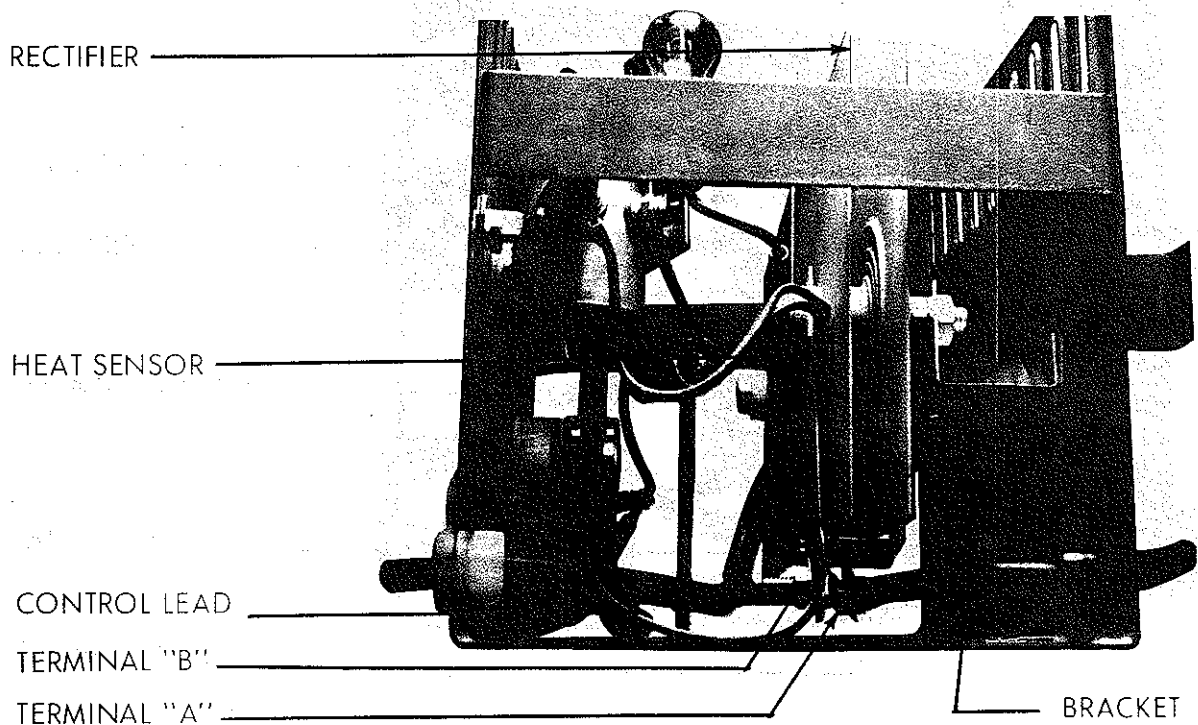
1. Remove cover.
2. Disconnect cables from rectifier.
3. Remove heat sensor from plastic sleeve.
4. Remove rectifier.
5. Mount rectifier on bracket (terminals down).
6. Connect input (AC) lead to terminal "B".
7. Connect output lead (to solenoid) to terminal "A".
8. Bolt rectifier assembly to rear of case.
9. Insert heat sensor in plastic sleeve. Make certain that the metallic part of the sensor does not make contact with rectifier.
10. Insert between rectifier plate & connector strap.
11. Replace cover.



RECTIFIER REPLACEMENT

MODEL 303 (Transistorized)

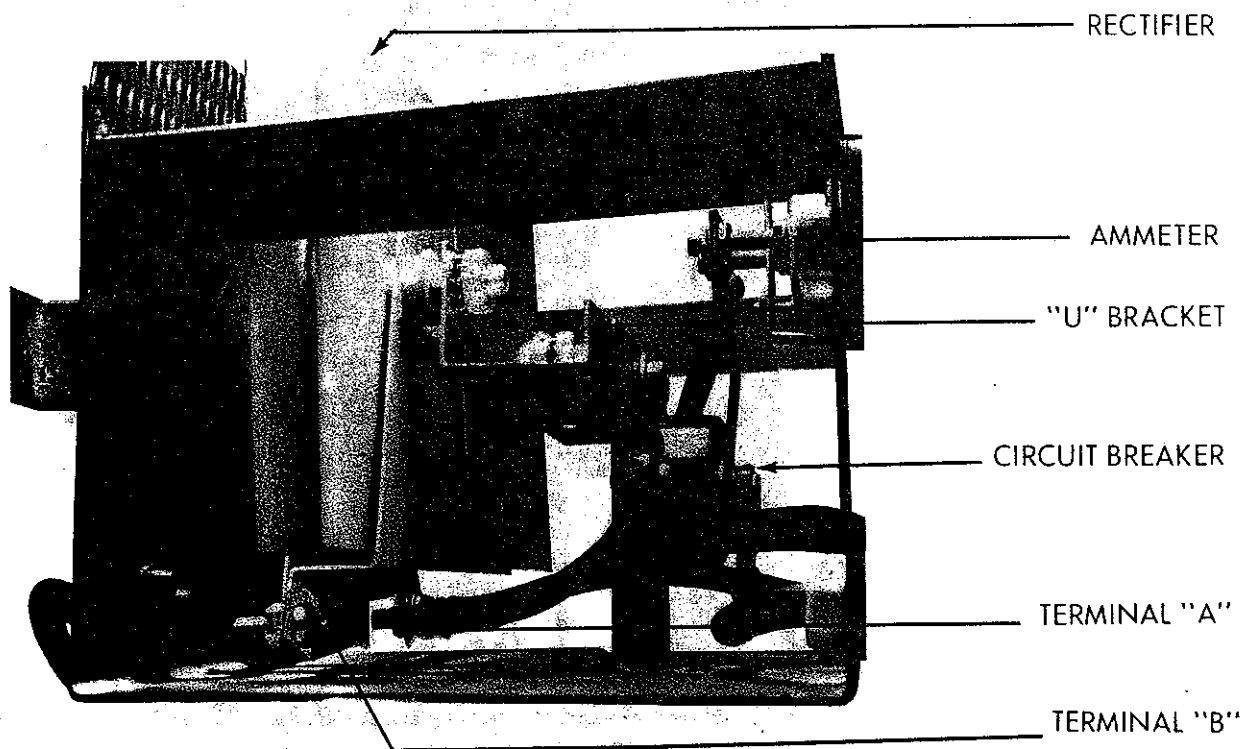
1. Remove cover.
2. Disconnect AC input lead from lower rectifier terminal.
3. Disconnect output (+) lead and control lead from upper rectifier terminal.
4. Remove heat sensor from plastic sleeve.
5. Remove rectifier.
6. Mount replacement rectifier on bracket (terminals down).
7. Connect output and control lead (Refer step 3) to terminal "A" of rectifier.
8. Connect AC input lead to terminal "B".
9. Insert heat sensor in plastic sleeve and insert between rectifier plate and connector strap. Make certain that the metallic part of the sensor does not make contact with the rectifier.
10. Bolt bracket and rectifier assembly to rear of case, center rectifier between end braces of case.
11. Replace cover.



RECTIFIER REPLACEMENT

MODEL 302

1. Remove four (4) screws holding cover to case and remove cover.
2. Disconnect copper strap from rectifier to ammeter and battery positive output cable from lower rectifier terminal. Remove rectifier.
3. If clearance between ends of replacement rectifier and case braces is less than $\frac{1}{2}$ inch, place one or two layers of electrical tape on braces to prevent accidental shorting of rectifier plates to case.
4. Mount new rectifier to "U" bracket.
5. Insulate 9 inch copper strap with black plastic sleeving and connect to terminal "A" of rectifier.
6. Bolt rectifier and bracket assembly to case brackets (Not to rear of case). Center rectifier between end braces of case and tighten bolt.
7. Connect free end of 9 inch copper strap to ammeter terminal.
8. Connect battery cable (Refer step #2) to terminal "B" to rectifier.
9. Replace cover.



RECTIFIER REPLACEMENT

MODEL 301 (With rectifier mounted on cover)

1. Remove cover.
2. Disconnect ammeter—circuit breaker cable at circuit breaker.
3. Disconnect input cable (AC lead to welder) from rectifier.
4. Remove rectifier assembly from cover.
5. Remove circuit breaker and mount on front side of new bracket.
6. Mount rectifier (terminals up) to new bracket and mount assembly on cover.
7. Connect 3 inch strap from terminal "A" of rectifier to circuit breaker. Insulate with black plastic sleeving.
8. Connect input (AC) cable (removed in step 3) to terminal "B" of rectifier.
9. Connect 9 inch strap from ammeter to circuit breaker. Insulate with black plastic sleeving.
10. Replace cover.

MODEL 301 (With square type rectifier mounted to rear of case)

1. Remove cover.
2. Disconnect copper straps from rectifier to ammeter and ammeter to circuit breaker at ammeter.
3. Lift out rectifier and circuit breaker assembly. Disconnect Positive battery cable from circuit breaker and disconnect input (AC) cable from rectifier.
4. Connect Positive battery cable to (-) ammeter terminal.
5. Follow steps 5 thru 10 above for 301, top mounted rectifier replacement.

NEW BRACKET

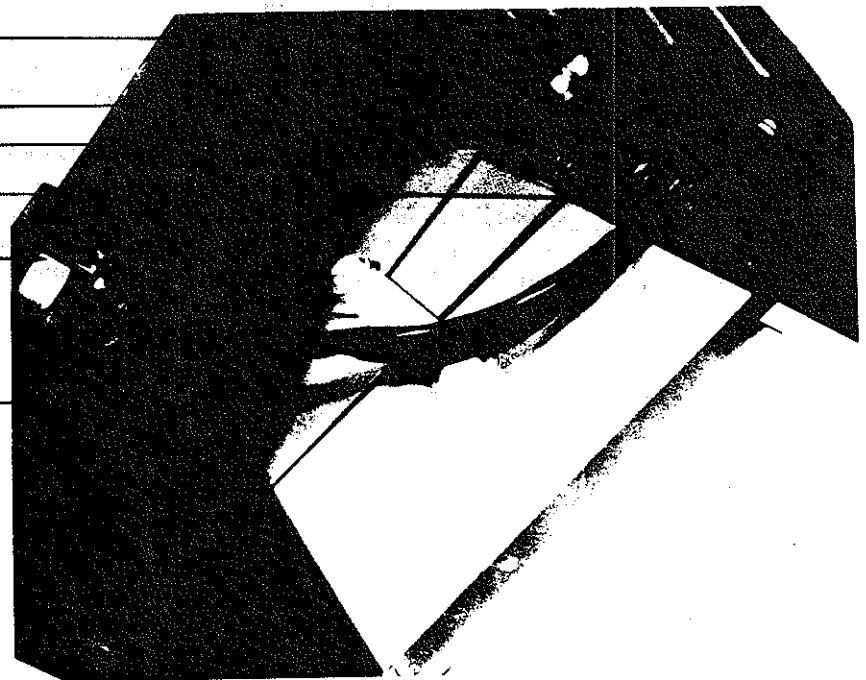
TERMINAL "B"

TERMINAL "A"

CIRCUIT BREAKER

AMMETER

RECTIFIER



USE OF F-225 AS TEST FIXTURE FOR CHARGERS

1.0 General

- 1.1 The Forney model F-225 welder can be used as a convenient power supply for testing all built-in charger sections of the Forney Combination Repair Unit and all Forney charger attachments.

Voltages and load characteristics of the welding tap combinations specified in the procedure section of this bulletin are sufficient for testing either complete charger sections or charger attachments and also half-wave or full wave bridge rectifiers used in battery charger service. Rectifiers used in full wave center-tapped circuits may be checked by testing each individual half of the rectifier as a half wave rectifier.

- 1.2 All rectifiers used in all Forney charger circuits (except the Add-a-Charge attachment) are rated at 60 amps maximum, convection cooled.
 - 1.2.1 The Add-a-Charge attachment has a rated maximum output of 15 amps.
- 1.3 Charger sections and attachments are those units which are not self-contained; they are used with the Forney welder transformer.
- 1.4 The rectifier of all built-in charger sections (C5B, C5BT, C6BT, CBBT, F-230BT and F-275BT) and charger attachments models 303, 304 and Add-a-Charger is wired for negative output. The rectifier of charger attachments 300, 301 and 302 is wired for positive output.
- 1.5 Test of all transistorized charger assemblies and attachments requires a residual battery voltage of at least 1.0 to 1.5 volts to "turn on" the transistor. If battery is completely discharged, charger will not operate.

2.0 Charger Test Setup

2.1 Equipment required

- 2.1.1 Forney model F-225 welder

- 2.1.2 Test cables (4)

2.1.2.1 NOTE: Three cables should be #8 or larger. One is #20 or larger.

- 2.1.3 Battery (12 volt recommended)

- 2.1.4 Volt-ohmmeter (optional)

2.2 Connections for testing the built-in charger section (all except C5B and C5BT)

- 2.2.1 Connect one cable from 30 amp jack on welder to Positive terminal on battery.

- 2.2.2 Connect one cable from 140 amp jack on welder to Positive rectifier terminal. (Ref Photo Page 4, #4) (p17, open terminal)

- 2.2.3 Connect one cable from output terminal of solenoid (Ref. photo Page 4, #7) (P17.F) to negative battery terminal.

- 2.2.4 Connect a wire (#20 or larger) from 30 amp jack (or positive battery terminal) to emitter wire on transistor assembly. (Ref. photo Page 4, #12) (Page 17, D)

- 2.2.5 Turn welder "ON". Charger should operate normally.

2.2.5.1 Verification of charge rate can be made with a 0-60 ammeter in series with either battery cable.

2.2.5.2 If charger does not operate, follow elimination procedure, (See pages 12,17.).

2.3 Testing the Add-a-Charge unit.

- 2.3.1 Connect one cable from 30 amp jack on welder to positive battery terminal.

- 2.3.2 Connect one cable from 170 amp jack on welder to circuit breaker terminal.

- 2.3.3 Connect one cable from Negative jack of Add-a-Charge unit to Negative battery terminal.

- 2.3.4 NOTE: Circuit breaker is rated 17½ amps and can be damaged by excessive charge rate, generally when charging 6 volt batteries. Unit is recommended for 12 volt batteries only.