LINCOLN WELDERS

IM-239-A

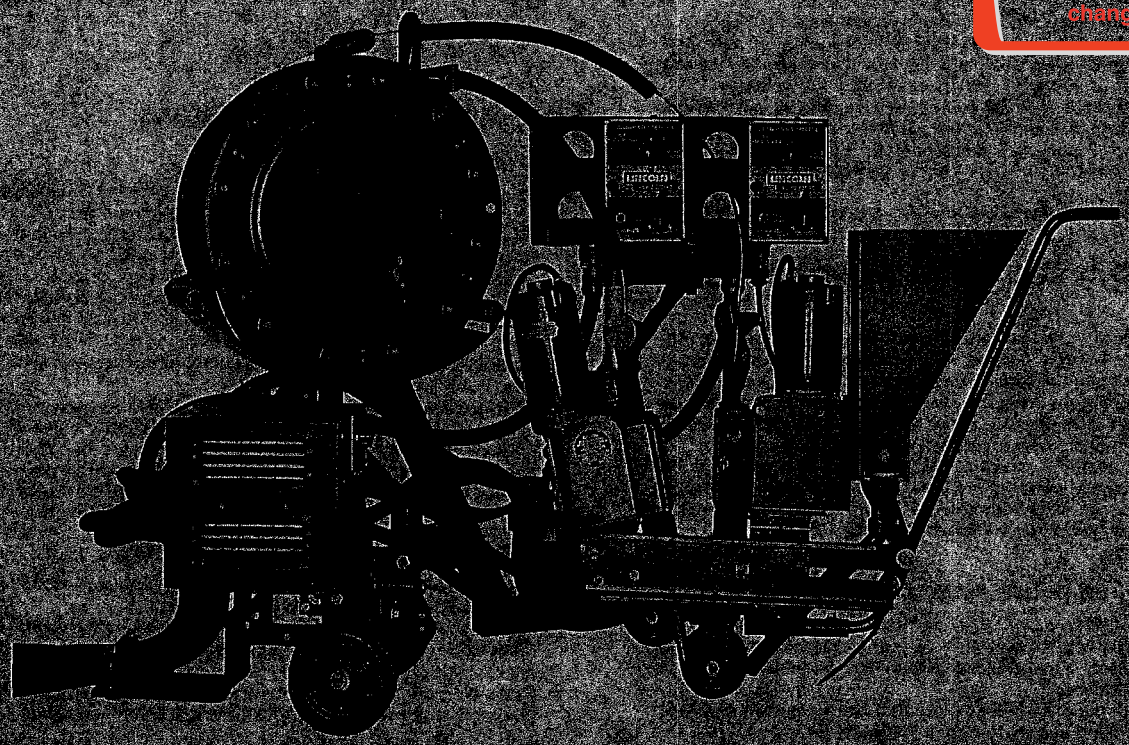
OPERATING MANUAL

"Lincolnweld"

Tractor Mounted Wire Feeder and Controls for Submerged Arc Welding

LT-3 DC WELDING
LT-4 AC WELDING
LT-34 TANDEM ARC WELDING

This manual covers equipment which is obsolete and no longer in production by The Lincoln Electric Co. Specifications and availability of optional features may have changed.



SAFETY DEPENDS ON YOU

Lincoln arc welding equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation ... and thoughtful operation on your part. DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS OPERATING MANUAL AND THE ARC WELDING SAFETY PRECAUTIONS ON THE INSIDE FRONT COVER. And, most importantly, think before you act and be careful.

For instructions on the LAF-3, 4, and 5 tractor mounted wire feeders and controls, see IM-198-B.

THE LINCOLN ELECTRIC COMPANY
World's Largest Manufacturer of Arc Welding Products
Manufacturer of Industrial Motors
Cleveland, Ohio 44117 U.S.A.

ARC WELDING SAFETY PRECAUTIONS

PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. READ AND UNDERSTAND BOTH THE SPECIFIC INFORMATION GIVEN IN THE OPERATING MANUAL FOR THE WELDER AND/OR OTHER EQUIPMENT TO BE USED AS WELL AS THE FOLLOWING GENERAL INFORMATION.

1. **HAVE ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR WORK performed only by qualified people**

2. **ELECTRIC SHOCK can kill.**

Protect yourself from possible dangerous electrical shock:

a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Never permit contact between "hot" parts of the circuits and bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
b. Always insulate yourself from the work and ground by using dry insulation.When welding in damp locations, on metal floors, gratings or scaffolds, and when in positions (such as sitting or lying), make certain the insulation is large enough to cover your full area of physical contact with work and ground.
c. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition.
d. Never dip the electrode holder in water for cooling.
e. Never simultaneously touch electrically "hot" parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.
f. If using the welder as a power source for mechanized welding, the above precautions also apply for the automatic electrode, electrode reel, welding head, nozzle or semiautomatic welding gun.
g. When working above floor level, protect yourself from a fall should you get a shock.
h. Ground the work or metal to be welded to a good electrical ground.
i. Also see Item 7.

3. **FUMES AND GASES can be dangerous to your health.**

a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. When welding on galvanized, lead or cadmium plated steel and other metals which produce toxic fumes, even greater care must be taken.
b. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.
c. Also see Item 8b.

4. **ARC RAYS can injure eyes and burn skin.**

a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87.1 standards.
b. Use suitable clothing made from durable, flame-resistant material to protect your skin and that of your helpers from the arc rays.
c. Protect other nearby personnel with suitable non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.

5. **FIRE OR EXPLOSION can cause death or property damage.**

a. Remove fire hazards well away from the area. If this is not possible cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Have fire extinguisher readily available.
b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to "Safety in Welding and Cutting" (ANSI Standard Z49.1) and the operating information for the equipment being used.
c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.
d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned." For information purchase "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", AWS F4.1-80 from the American Welding Society (see address below).
e. Vent hollow castings or containers before heating, cutting or welding. They may explode.
f. Also see Items 6c and 8c.

Additional Safety Precautions

6. **For Welding in General.**

a. Droplets of molten slag and metal are thrown or fall from the welding arc. Protect yourself with oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses when in a welding area. Use glasses with side shields when near slag chipping operations.
b. Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.
c. Be sure the work cable is connected to the work as close to the welding area as practical. Work cables connected to the building framework or other locations some distance from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

7. **For Electrically Powered Equipment.**

a. Turn off the input power using the disconnect switch at the fuse box before working on the equipment.
b. Make the electrical installation in accordance with the National Electrical Code, all local codes and the manufacturer's recommendations.
c. Properly ground the equipment in accordance with the National Electrical Code and the manufacturer's recommendations.

8. **For Engine Powered Equipment.**

a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.
b. Operate internal combustion engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.
c. Do not add the fuel near an open flame, welding arc or when the engine is running. Stop the engine and, if possible, allow it to cool to prevent spilled fuel from igniting on contact with hot engine parts or electrical sparks. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.
d. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.
e. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.

For more detailed information it is strongly recommended that you purchase a copy of "Safety in Welding & Cutting" — ANSI Standard Z49.1 from the American Welding Society, P.O. Box 351040 Miami, Florida 33135.

SEC. D2 ASSEMBLY AND INSTALLATION

SEC. D2.1 CONTENTS

August 1969

SEC. D2.3 STANDARD EQUIPMENT

Sec. D2.3.1

Damage Claims

When this equipment is shipped, title passes to the purchaser upon receipt by the carrier. Consequently, claims for material damaged in shipment must be made by the purchaser against the transportation company at the time the equipment is received.

October 1961

Sec. D2.3.2

Sequence of Installation

1. Uncrate and connect the power source to the input power — see the power source instruction manual.
   a. Install the field relay, if required — see Sec. 2.7.3.
2. Uncrate the LT-3 or LT-34 machine.
   a. Fill the tractor travel drive and wire feed gear boxes with oil — see Sec. D2.3.3.
3. Uncrate and mount the remote control boxes — see Sec. D2.3.3.
4. Uncrate the 35 volt MG control exciter(s).
5. Install the control and welding cables between the tractor, remote control boxes, power source and 35 volt control exciter(s) — see Sec. D2.3.4 for the LT-3 and Sec. D2.3.6 for the LT-34.
6. Install the ground cables between the power sources and work.
7. Unpack and install the desired accessories
8. Load the wire reel — see Sec. D.3.3.2.
9. Check the equipment for proper operation. See Sec. D3 for complete operating instructions. See Sec. D3.3.4 for sequenc of operation and test weld.

March 1973

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STANDARD EQUIPMENT – CONTINUED

Sec. D2.3.3
Tractor

a. Main Assembly

The LT-3 and LT-34 model tractors are shipped with the head and wire reel mounted to the tractor frame.

b. Wire Feed and Tractor Drive Gear Boxes

The wire feed and tractor drive gear boxes are drained of oil before leaving the factory. To add oil, unscrew the three screws in the motor base plate and remove the motor. Remove the screw at the oil level mark on the "Caution Plate" below the motor. Fill the gear case with the oil furnished (for operating at temperatures below 60°F, see Sec. 6.2.1) until it runs out the level screw hole. It will hold approximately 3/4 pint of oil.

Normally, the motor and gear boxes are operated in an upright position. If necessary, they can be rotated up to 45 degrees from the vertical. If operated in a position of more than 45 degrees from the vertical, the oil level must be carefully checked to make certain the oil cannot run into the motor and ruin the windings.

c. Remote Control Boxes

The AC and DC remote control boxes are shipped separately. Mount them on or near the AC or DC power source as appropriate.

March 1973

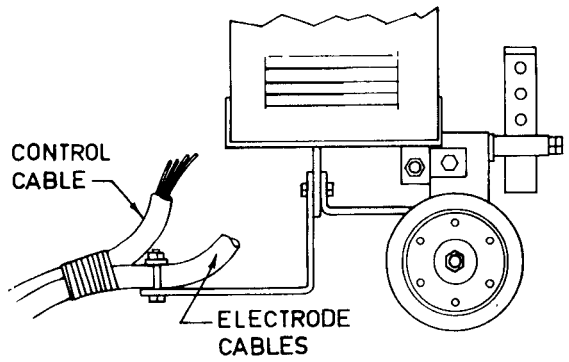
Sec D2.3.4
Wiring the LT-3

a. Control Cables

The standard K-74 input cable assembly consists of a multiconductor control cable and two 4/0 electrode cables.

The control cable has a polarized plug on one end and is lugged on the other end. Insert the polarized plug into the receptacle in the 'DC Arc Controls' box.

Connect the electrode leads to the shunt in the tractor drive control box. Run all the leads down on top of the cable strain relief platform. Clamp all of the electrode cables as shown. Do not clamp the multiconductor control cable. Tape all cables together just behind the platform.



Connect the lugged leads of the control cable to the 35 volt control exciter, the remote control box, and the terminal strips* on the power source. For wiring connections, see the diagram for the specific power source type to be used. These diagrams are listed on the index in Sec. D8.1 filed after the parts lists in this manual. Also see the LT-3 or LT-34 Control Circuit wiring diagram listed on the index in Sec. D8.1 for any wiring changes inside the control box required for the power source you are using.

35 volt DC power is required for the wire feed control circuit in the LT-3. In installations powered by a single power source, this control power is supplied by a separate 35 volt MG set.

The control exciter is supplied without a starter, therefore, it is usually connected to the motor side of the power source starter. To protect the control exciter, the connecting lines should be fused with a 4 amp lag type fuse for 220 volt operation and a 2 amp lag type fuse for 440 volt operation.

As indicated on the connection wiring diagram for some power sources, a field relay kit must be used.

To supply large amounts of current for heavy welds, two welders of the same model can be connected in parallel. When used in parallel, the welder starters must be interconnected to protect the equipment from accidental damage. See the appropriate starter paralleling diagrams listed on the index in Sec. D8.1 for instructions. Normally, one machine with a 125 volt exciter and one with a 35 volt exciter are used for parallel connections. This eliminates the need for a separate motor-generator exciter to supply the 35 volt wire feed circuit current. If two machines with 125 volt exciters or power sources not covered by wiring diagrams in this manual must be paralleled, write to the factory for instructions. Give the model name and code numbers of the power sources to be used.

A receptacle is provided in the tractor drive control box for a light extension cord if desired. On the LT-3 this receptacle provides 120 volt DC current with a capacity of 1.5 amps.

For best operation, the control cable length from the tractor to power source must not exceed 100 feet. The automatic head loses sensitivity as the control leads become longer. Consult the factory giving full details of

the installation and application before using cables over 100 feet long.

*Some power sources built before 1950 do not have terminal strips built into their control boxes. Write to the factory for diagram S-8576 for instructions to adapt these old SAE generators for LT-3 operation.

b. Welding Cables

Connect the two 4/0 electrode cables of the K-74 assembly and two 4/0 ground cables to their respective studs on the power source. Connect the other end of the ground cables to the work.

Two 4/0 cables are included in the K-74 assembly. For welding currents over 1200 amperes, add another 4/0 cable to the electrode cable assembly and to the ground cables.

March 1977

Sec. D2.3.5

Wiring the LT-4* of an LT-34

a. Control Cable

The standard K-76 input cable assembly consists of a multiconductor control cable and two 4/0 electrode cables. Run this cable assembly through the strain relief clamp located at the rear of the tractor control box (machines above code 4980 only).

The control cable has polarized plugs on both ends. Insert the right angle plug end of the cable into the receptacle on the remote control box. Insert the straight plug end into the receptacle on the 'AC Arc Controls' box on the tractor.

Connect the lugged leads from the multiconductor cable from the remote control box to the 35 volt control exciter and the terminal strips on the power source. For wiring connections see the wiring diagram for the specific power source to be used. These diagrams are listed on the index in Sec. D8.1 filed after the parts lists in this manual.

35 volt DC power is required for the wire feed control circuit in the LT-4. It is supplied by a separate 35 volt MG set. Connect the motor-generator to three phase power according to instructions on the motor name-plate. A starter is needed in this input line.

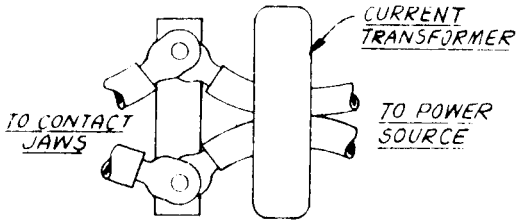
To supply large amounts of current for heavy welds, two welders of the same model can be connected in parallel. Connection diagrams for parallel operation are listed on the index in Sec. D8.1.

For best operation, the control cable length from the power source to the tractor must not exceed 100 feet. The automatic head loses sensitivity as the control leads become longer. Consult the factory giving full details of the installation and application before using cables over 100 feet long.

b. Welding Cables

Connect ground cables of the appropriate size and length between the work studs on the power source and the work.

Run the two 4/0 electrode cables of the K-76 assembly thru the current transformer located in the tractor drive control box as shown in the sketch below and connect them to the same studs to which the cables to the contact nozzle are connected.



Machines above code 6790 (built after August 1969) have another current transformer on the remote control box. Run the other end of the 4/0 electrode cables thru this transformer and connect them to the output stud on the power source.

Machines below code 6790 have no current transformer on the remote control box. Connect the electrode cables to the output stud on the power source.

March 1973

Sec. D2.3.6

Wiring the LT-34

The LT-34 consists of an LT-3 and an LT-4 head and controls on a single tractor frame. The LT-3 and LT-4 control and welding cables are connected between the DC power source and LT-3 and between the AC power source and the LT-4 as described in Sections D2.3.4 and D2.3.5 respectively.

On the LT-34 the light extension receptacle in the tractor drive control box provides 120 volt DC power with a capacity of 1.5 amps.

October 1961

* Separate LT-4 models were last manufactured in 1964.

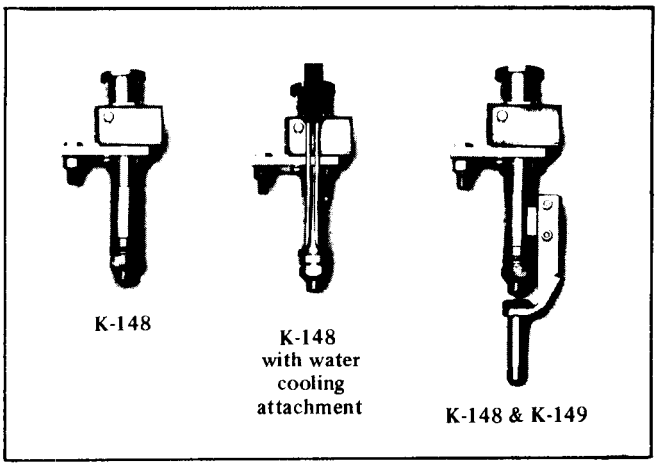
The Lincoln Electric Company
Cleveland, Ohio 44117

FOR SUBMERGED ARC AND INNERSHIELD® WELDING

K-148 Contact Nozzle and K-149 Linc-Fill™ Long Stickout Extension

File as Sec. L2.2.7 for IM-278
File as Sec. T2.2.7 for IM-305
File as Sec. M2.2.7 for IM-279
File as Sec. E3.3.4 for IM-245
File as Sec. 2.7.2 for IM-198 or IM-239

This nozzle can be used with the NA-1, NA-2, NA-3, NA-4, NA-5, LAF-3, LAF-4, LAF-5 and LT-3 wire feeders. K-148-A is designed for 3/32" and 1/8" wire sizes. K-148-B is designed for 5/32" and 3/16" wire. K-148-C is designed for .062 to 5/64" wire.



Current Ratings

A. Without Linc-Fill Attachment

Innershield welding:
600 amps, 100% duty, no water cooling
1100 amps, 100% duty, with water cooling

Submerged arc welding:
1100 amps, 100% duty, no water cooling

B. With K-149 Linc-Fill Attachment

Innershield or Submerged Arc
1100 amps, 100% duty, no water cooling

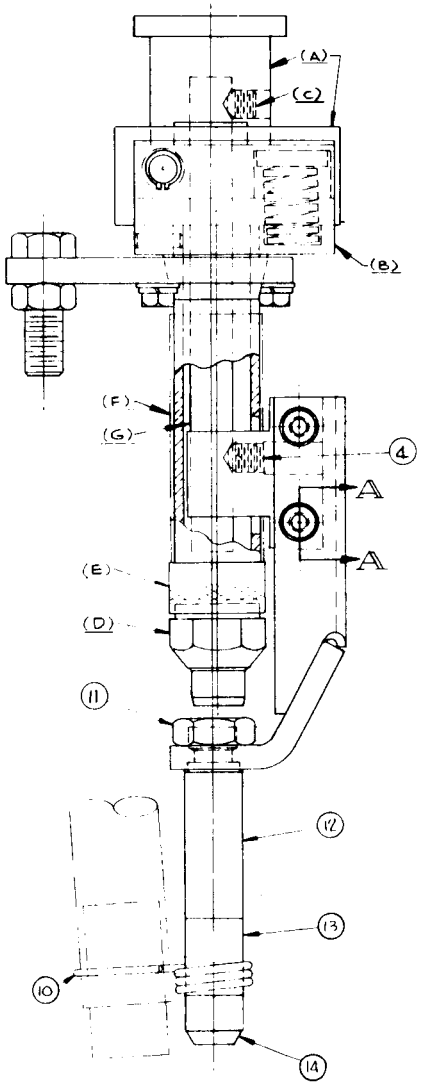
Water Cooling Attachment

When using currents over 600 amperes at high duty cycles water cooling always increases contact tip life. The cooling attachment is ordered as a separate item, Part No. T-12928. Installation instructions are included in the kit.

Connect the attachment to the water supply and the drain with rubber tubing obtained locally. Water flow should be between 1/2 and 1 gallon of tap water per minute.

K-149 Installation

1. Install the K-149 attachment before mounting the K-148 nozzle on the welder.
2. Place a small C-clamp on the spring supporting members (A) and (B) in such a manner that the spring can be compressed. Look up the hole in the end of contact tip and tighten the C-clamp until the backup tang lifts off the surface.
3. Remove the 3/8" set screw (C) in the body (A).
4. Remove the contact tip clamping nut (D) and the contact tip.
5. Remove the brass thread protecting collar (E).
6. Remove the window cover (F) from unit.
7. Slide the center guide (G) up out of the pivot body until the tang is above the window.
8. Place the Linc Fill guide assembly into the nozzle window, and then lower the center guide tube (G) back down to its original position.
9. Line up the spot at the top of the center guide tube (G) with the 3/8 tapped hole in the upper pivot block (A) and put the 3/8 set screw (C) back into the hole and tighten securely.



10. Line up the lower spot in the center guide tube (G) with the 3/8 set screw (Item 4) and tighten this securely.
11. Replace the brass thread protecting collar (E). It is important that this protecting collar be pulled up against its locating shoulder, otherwise the tip locking nut will not clamp the tip securely.
12. Replace the contact tip and its clamping nut (D) and tighten securely.
13. Assemble the proper combination of extension guides (Items 12, 13 and 14) with locking nut (Item 11) for the welding procedure to be used.
14. If Submerged Arc welding is being used, screw the flux hose clamp (Item 10) onto the extension housing.

K-148 Nozzle Installation

To install the nozzle on the head, insert the outgoing wire guide from the head into the nozzle assembly. Place the combined assembly in position on the bottom of the wire feed roll box. Clamp it in place using the two clamps supplied with the head.

Before pulling the clamps up tight the nozzle must be positioned relative to the travel direction as shown in Figure 1. This position is set so accidental contact between the work and the nozzle will not compress the contact pressure spring. If positioned otherwise, such accidental contact may cause arcing inside the contact tip.

After the nozzle is positioned in the proper relationship with the travel direction, the connector tab for the electrode cables can be moved to any of four positions 90° apart. To change the tab, remove the two 1/4-20 hex head screws. Tap the connector tab to loosen it from the tapered collar on the nozzle body. Turn the tab to the desired position. Replace and tighten the 1/4-20 screws.

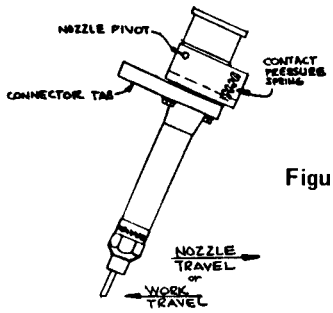


Figure 1

Operation

The same contact tip, S-13763, is used for 3/32 through 3/16" diameter electrodes. S-16388 is used for .062 and 5/64" electrode.

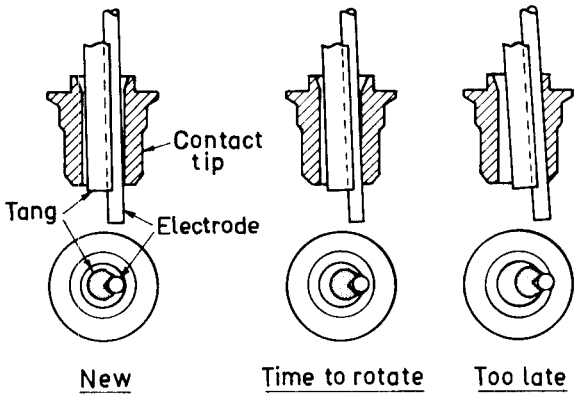
Loading of Wire

Straighten the start end of the coil for at least eight inches pass the end down through the appropriate wire straightener. Inch the wire through the wire feeder and the nozzle. When using .062 or 5/64 Innershield with a K-148-C nozzle, make sure that the wire is in the "vee" groove of the pressure tang. Idle roll pressure settings should be made per marks on the idle roll arm, except for the smaller diameter electrodes. For the .062 and 5/64" wire sizes, back off on the idle roll pressure so that there is little or no flattening of the wire.

Because the electrode is held against one point of the contact tip, it wears a groove at that point. When the groove is about one half the diameter of the electrode rotate the contact tip to a new position per the instructions below. Careful positioning of the contact tip will provide four to six wear spots depending upon the electrode size.

When welding with the small diameter electrodes, it will be necessary to change contact position more frequently since the amount of tip wear that can be tolerated is much less. The tang should never be allowed to touch the I.D. of the contact tip. To do so will allow welding current to go through the tang, causing electrical wear and overheating of the tang and contact tip.

If the groove is allowed to wear until the tang touches the ID of the contact tip, welding current passes through the tang. This causes electrical wear and overheating of the tang and contact tip.



To rotate the tip, clip the end of the electrode and inch it up until it is free of the contact tip. Loosen the locking nut about one-half turn and pull the nozzle body to relieve the pressure of the tang against the inside of the contact tip hole. At this moment rotate the tip the proper amount and then retighten the locking nut.

To install a new contact tip proceed as follows:

1. Clip the end of the electrode and inch it up until it is free of the tip.
2. Remove the contact tip locking nut.
3. Relieve the spring pressure of the contact tip against the steel tang in the hole of the contact tip. To do this, push the nozzle body so the steel tang is approximately centered in the 3/8" hole in the contact tip. Under these conditions the contact tip can be easily removed from the nozzle body.
4. a. Before installing the new tip, make sure the threads and the bottom surface of the nozzle are clean and bright. These surfaces are current carrying areas and must be clean.

The Lincoln Electric Company
Cleveland, Ohio 44117

File as Sec. L2.2.7 for IM-278
File as Sec. T2.2.7 for IM-305
File as Sec. M2.2.7 for IM-279
File as Sec. E3.3.4 for IM-245
File as Sec. 2.7.2 for IM-198 or IM-239
(Continued)

b. Push the nozzle body to one side and insert the new contact tip.

5. a. Check the locking ring threads making sure they are free of any foreign material. A small application of high temperature anti-sieze compound on these threads insure a longer thread life of the two mating parts. Suggested anti-sieze compounds are Graphite grease, "Go-go No-Lok" made by Gojer Corporation, Akron, Ohio, and "Anti-Sieze and Lub. Compound" made by Never Seez Compound Corporation, 2910 A. 18th Ave., Broadview, Illinois.
   b. Replace the locking ring and tighten securely.
6. Check the contact tip to be certain it is tight in the nozzle body. If the tip is not tight, arching will take place between the tip contact surface and the nozzle contact surface which will damage the nozzle body.

December 1984

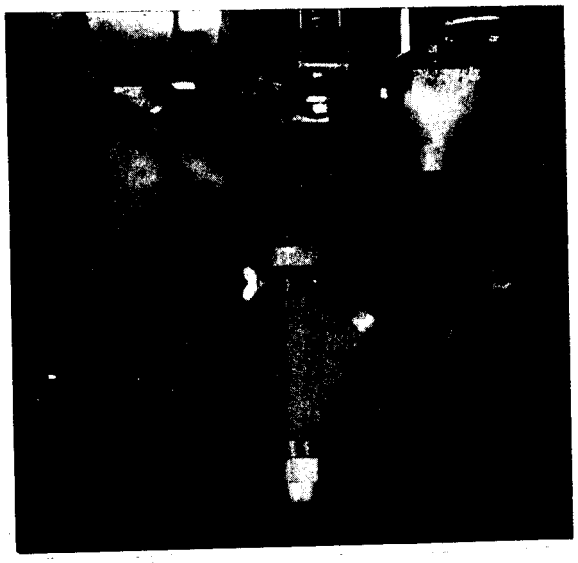
SUBMERGED ARC CONTACT ASSEMBLIES

(Also See Sec. T2.2.7 for the K-148 nozzle when using high currents or Linc-Fill long stickout procedures.)

Sec. T2.2.6
(File as Sec. L2.2.6 for IM-278)
(File as Sec. 2.7.1 for IM-198 and IM-239)

A. K-231 Contact Nozzle Assembly

(For all NA, LAF and LT models.)



For submerged arc welding using currents generally under 600 amps. Higher currents can be used but result in faster tip wear. The outer flux cone deposits flux right around the arc for full coverage with minimum flux consumption.

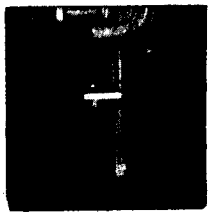
Contact tips for the electrode diameter specified on the order ($\frac{5}{64}$ thru $\frac{7}{32}$") are shipped with each nozzle. A different contact tip is required for each electrode size used. Nozzles ordered for $\frac{5}{64}$ and $\frac{3}{32}$" electrodes also include a contact tip adapter. Screw the adapter into the nozzle and the tip into the adapter.

Installation — Nozzles ordered for feeding $\frac{5}{64}$" and $\frac{3}{32}$" electrode diameters include a liner. Insert the liner as shown in the following photo. Do NOT use the liner when the I.D. of the outgoing tube is larger than .125". These larger I.D. guide tubes are shipped with some wire feeders built to feed $\frac{3}{32}$" and all wire feeders built to feed larger electrodes.

NOTE: Changing to a different diameter wire may necessitate changing drive rolls and the ingoing and outgoing guide tubes. See P-100-D for the correct parts.

To feed $\frac{5}{64}$" electrode with all LAF and LT models, purchase the necessary parts listed on P-50-D in IM-198-B and IM-239-A.

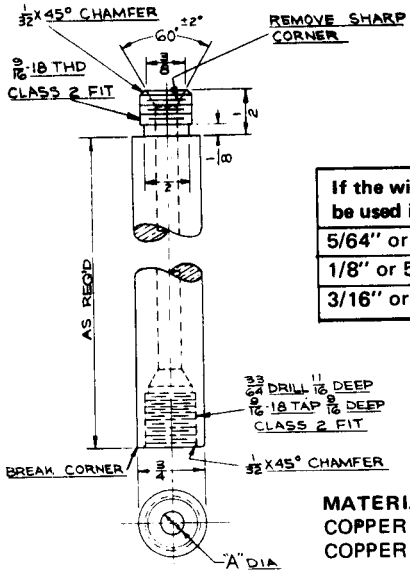
Slip one end of the rubber flux hose shipped with the nozzle onto the valve tube below the flux hopper. Fit the short metal tube in the other end of the hose into the hole in the nozzle body. Do not push the metal tube in far enough to touch the nozzle or the nozzle housing will be electrically hot.



Connect the electrode cable from the control box to the contact nozzle. Place one cable on top and one below the connection tab with the lugs flat against the tab and tighten the bolt and nut.

Operation — Do NOT completely straighten the electrode. A slight curvature is required in the electrode to insure good electrical contact inside the contact tip.

Extensions — When required the nozzle can be lengthened by making extensions per the following drawing. Screw the extensions into the nozzle body and screw the contact tip or small wire adapter into the extension. A flux tube of the appropriate length must be made for the installation.



If the wire to be used is	Make Dim. "A"
5/64" or 3/32"	1/8"
1/8" or 5/32"	3/16"
3/16" or 7/32"	1/4"

MATERIAL – HARD DRAWN COPPER or HEAT TREATABLE COPPER ALLOY

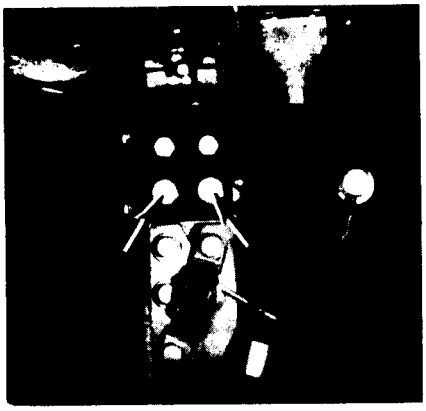
Maintenance — Replace the contact tip when it no longer provides accurate wire location or good electrical contact. Rusty and dirty wire or high currents increase tip wear. Always keep replacement tips in stock.

To replace the contact tip, first loosen the retaining wing screw and remove the flux cone. Then unscrew the tip and replace it.

The special socket head screw (Item 118 of P-101-M) holds the nozzle body to the insulator. If the nozzle body becomes loose, remove the nozzle from the head, tighten the screw and reassemble the nozzle.

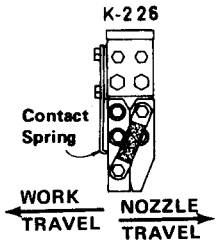
B. K-226 Contact Jaw Assembly

(For Models NA-2, NA-3, NA-4, NA-5, LAF-3, LAF-4, LAF-5 and LT-3)



For submerged arc welding generally at currents from 600 to 1000 amps. Model K-226-T with two tapered jaws feeds 3/32" and 1/8" electrodes. K-226-R with one tapered and one rectangular jaw feeds 1/8" thru 7/32" electrodes. The braided shunt is not included with the K-226-T.

Installation — Insert the outgoing wire guide from the wire feed mechanism into the top of the contact assembly body. Install the assembly in position on the bottom of the wire feed mechanism with the pressure spring as shown in the following sketch and lock it in position with the two screws provided with the assembly (**Note:** By removing the four screws which hold the body to the mounting block, the jaws can be rotated to the appropriate one of four positions 90° apart.)



Connect two electrode cables coming from the control box to the contact jaws by placing one under each of the 1/2-13 nuts on the assembly (see arrows in photograph) with the cable lugs flat against the copper and tightening the nuts.

Slip the rubber tube shipped with the contact assembly onto the valve below the flux hopper. (If installing other rubber tubing, be sure it is non-conductive.) Fit the copper tube in the other end through the clip on the jaw assembly.

Maintenance — Rusty or dirty wire and excessively high currents increase jaw wear. When arcing occurs in the jaws or the wire becomes loose in the jaws, remove the jaws and dress them down by filing. When an excessive amount of material is worn off, replace the jaws. Contact jaws manufactured after April, 1979 have replaceable contact inserts (refer to P-101-N).

The contact jaws must be kept in line with the wire guides. To align the contact jaws, loosen the stationary contact jaw (Item 25 of P-101-N). Release the tension on the movable contact jaw (Item 21) by loosening the screws holding the strap spring (Item 18). Place a straight 14" piece of bare 5/32" wire up through the wire guide and into the drive rolls. Adjust the stationary contact jaw so the electrode touches the jaw at the center of the groove for the entire length of the jaw. Tighten the screws. Remove the piece of bare wire. Apply the tension to the movable contact jaw by tightening the screws holding the strap spring. Be certain the movable contact jaw moves freely after these screws are tightened.

C. K-233 Small Wire Contact Nozzle

(For Models NA-2, NA-3, NA-4 and NA-5)

For submerged arc welding with .035" thru 3/32" diameter electrodes.

Unless a separate K-219 flux hopper kit was ordered, a T-10642-11 flux hose and an S-7748-35 hose tip must be purchased.

Installation — Depending upon the electrode size specified when the nozzle was ordered, either a liner for .035 thru .052" electrode or for 1/16" thru 3/32" electrode is shipped with the assembly. Insert the appropriate liner into the nozzle body with the adapter ring on top.

Insert the outgoing wire guide from the wire feed mechanism into the top of the nozzle body and place the nozzle in position on the bottom of the wire drive mechanism.

Operation — A pressure shoe and contact tips for the electrode diameter specified on the order are shipped with each assembly. A different contact tip is required for each electrode size used.

The electrode is automatically held against the nozzle contact tip with a preset pressure to assure good electrical contact. Because the electrode is held against the tip, it tends to wear a groove in the tip. When the groove becomes too deep to maintain good electrical contact, the tip must be replaced.

A groove is also worn in the contact pressure shoe. This shoe has two chamfered edges 90° apart. When a groove is worn in one direction, remove the shoe, turn it 90° and replace it so the second chamfered edge fits into the contact tip. This provides a new wearing surface. When both wearing surfaces are grooved, replace the shoe.

ACCESSORIES - CONT'D.

Sec. D2.7.6

Fillet-Lap Attachment: K-87

This fillet-lap attachment is designed to fit the LT-3 or the LT-4 single head models only.

This fillet-lap welding attachment is used for making horizontal fillet or lap welds on 3/16" and thicker material. Satisfactory lap welds can be made on material of this thickness by using the standard contact assembly with the head tilted about 15°. However, these welds have somewhat less throat section than welds of corresponding leg size made with the fillet-lap attachment.

Installation instructions are as follows:

1. Remove the electrode cable from the contact assembly.
2. Remove the flux tube and the pointer assembly.
3. Remove the electrode contact jaw or nozzle assembly by loosening the two clamps (M) which fasten it to the drive roll box.
4. Remove the lower guide tube from the standard contact assembly. Place it in the same position in the fillet-lap attachment (L).
5. Place the attachment (L) in position per Fig. D2.7.6-1. Clamp it with the same clamps (M) used to hold the standard contact assembly.
6. Connect the electrode cables to the copper lug on the fillet-lap attachment.
7. Clamp the metal flux tube (N) included with the kit to the bottom of the flux gate assembly. Turn the metal flux tube toward the weld. Slip one end of the rubber flux tube over the end of the metal flux tube. Adjust the position of the flux tubes so the flux will fall just ahead of the electrode.
8. The flux depth is controlled with the flux control arm included with the kit. Install this arm as follows: (See Fig. D2.7.6-1)
   a. Remove the 3/8" screw used to plug the hole on the front of the flux hopper. Replace the screw with the longer screw (P) and lockwasher included with the kit. Tighten this screw.
   b. Put the plain washer over this screw.
   c. Place the control arm assembly (Q) inside the hopper so the hole in the arm goes over this screw. The bent end of the arm must straddle the top edge of the flux hopper.
   d. Put the special pivot nut (R) on this screw so the shoulder on the nut goes through the hole in the arm. Tighten this nut against the washer used in (b).
9. Install the proper guide roll. Two types of guide rolls are included. The double roll is used for fillet welding. One wheel of the double roll rides against each member of the joint with enough room between to clear tack welds. The grooved roll is for lap welds. With this roll the groove rides on the corner of the top plate.

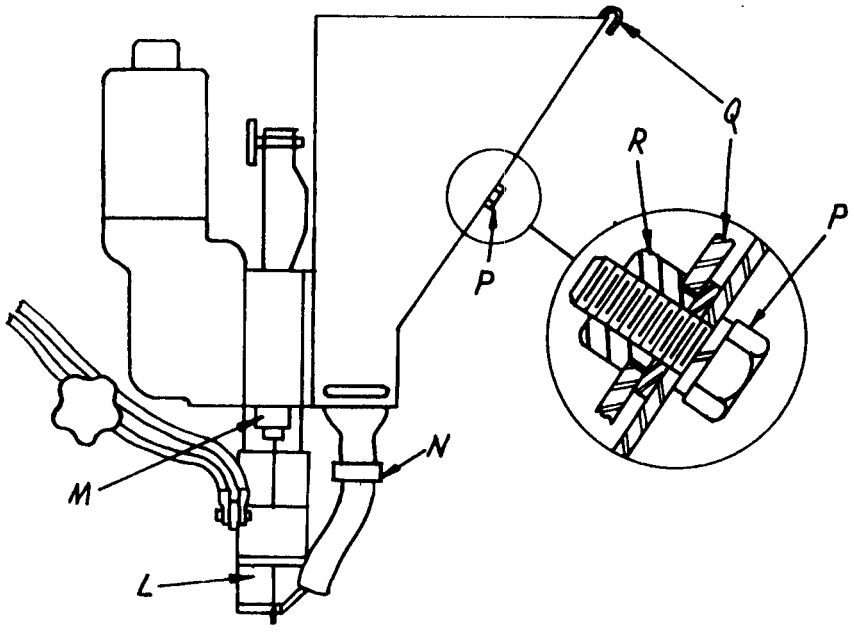


Fig. D2.7.6-1

Sec. D2.7.6 (Continued)

10. Set the tractor to frame position 2 and adjust for toe-in tracking as described in Sec. D3.2.6. Set the tractor on the work at the beginning of the joint.

    To position the electrode in the joint, adjust the set screw above the guide rolls. Do not allow flux to fall ahead of the rolls.

11. See Sec. D4 for procedures for each specific job.

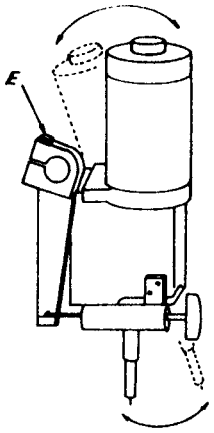


Fig. D2.7.6-2

ACCESSORIES - CONT'D.

Sec. D2.7.9

Flat Fillet Guide: K-82

The flat fillet guide is used with the LT-3, LT-4 and LT-34 for making flat or trough fillet welds. Its parts include nozzle extensions (A), the drive assembly idle wheel (B), and front guide wheel assemblies (C) for 30° and 45° fillets. Install this accessory as follows:

NOTE: This installation is most easily done when the machine is hung from a hoist.

1. If a vertical lift adjuster is being used, it must be mounted upside down so the crank handle is at the top (see Fig. D2.7.9-2). To do this:
   a) Remove the heads by loosening (D) in Fig. D2.7.9-1. Be sure the heads are kept upright. If they are laid down, oil from the gear box can run into the motor and damage the windings.

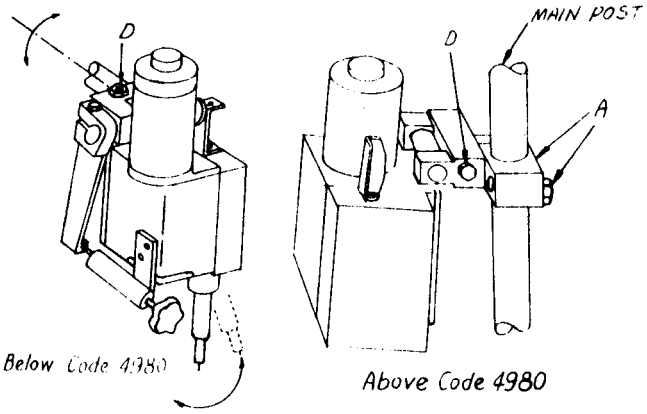
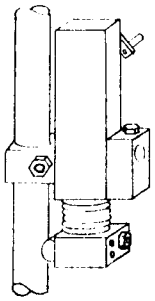


Fig. D2.7.9-1

   b) Remove the control box mounting bracket and the control boxes from the main post.
   c) If it is already installed, remove the vertical lift adjuster from the main post. Note: LT-34 machines below code 4980 which have not been converted to the new head mounting arrangement have two vertical lift adjusters (See Fig. D2.7.9-3).
   d) Turn the vertical lift adjuster over and remount it on the main post. The head mounting bracket (K) must also be turned 180° so the head mounting shaft points toward the front of the machine. When properly installed, the crank of the vertical lift adjuster is at the top.
   e) Remount the heads and the control boxes.
2. Remove the front idle wheel and mounting bracket.
3. Remove the front wheel, fork, and steering handle assembly.
4. Install the appropriate front guide wheel assembly (C). Two assemblies are provided - one for 30° fillets and one for 45° fillets. When shipped, the two guide wheels (E) are attached to the 45° fillet assembly. If needed, remove these wheels from the 45° assembly and reinstall them on the 30° assembly.
5. Lock the spring loaded plunger by tightening the locking screw.
6. Attach the drive assembly idle wheel (B) to the tractor drive assembly base plate. For a 45° fillet, position the mounting bolts about in the middle of the slot. For a 30° fillet, extend the idle wheel to maximum. Tighten the bolts.



BACK VIEW

Fig. D2.7.9-2

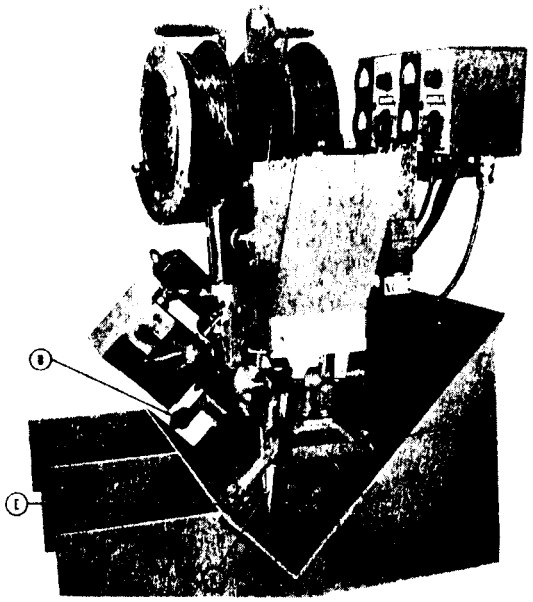


Fig. D2.7.9-3 45° Flat Fillet Guide Installed

Sec. 2.7.9 (Continued)

7. Reposition the tractor drive assembly so it rides on a plate 30° or 45° to the floor as appropriate, but with the heads vertical. To do this, remove the four hex head screws which hold the drive assembly to the pivot post. Turn the drive assembly 30° or 45° to the right as appropriate. Replace three of the screws in the holes provided.

8. Set the tractor frame position as specified in Sec. D3.2.7

9. Place the tractor in the joint to be welded.

10. Remove the nozzle tip from the contact nozzle installed on each head. Install the nozzle extensions included with the flat fillet guide. Install the proper size nozzle tip in the extensions depending upon the electrode size to be used.

11. Install the flux tube as follows: In all cases, slip the short copper tube into the output end of the rubber flux tube.
    (a) On the LT-3 or LT-4, the rubber flux tube should hang straight down from the flux hopper bottom. Cut the tube to length.
    (b) On the LT-34, set for 45° fillets, attach the rubber flux tube directly to the flux hopper bottom. Slip the tube through the support located on the front guide wheel assembly.
    (c) On the LT-34 set for 30° fillets, attach the metal flux tube extension to the bottom of the flux hopper. Attach one end of the rubber flux tube to this metal extension and the other end through the support located on the front guide wheel assembly.

ACCESSORIES - CONT'D.

Sec. D2.7.10

V-Butt Guide

The V-Butt Guide is designed to ride in a gap or groove of a butt joint so the weld is made without touching the steering mechanism. The K-15 guide for the LT-3 or LT-4 includes only the guide wheel assembly. The K-83 guide for the LT-34 includes the guide wheel assembly and an extension.

Installation instructions are as follows:

1. Lock the front wheel steering mechanism by tightening the locking screw on the plunger.

2. Remove the front wheel from the tractor.

3. On the LT-34, attach the front wheel extension to the front wheel fork using the two 1/2-13x3-1/4" bolts and nuts provided.

4. Attach the guide to the fork or the extension as appropriate. Using the washers provided on the guide wheel axle, adjust the guide wheel until it is in line with the electrode.

April 1972

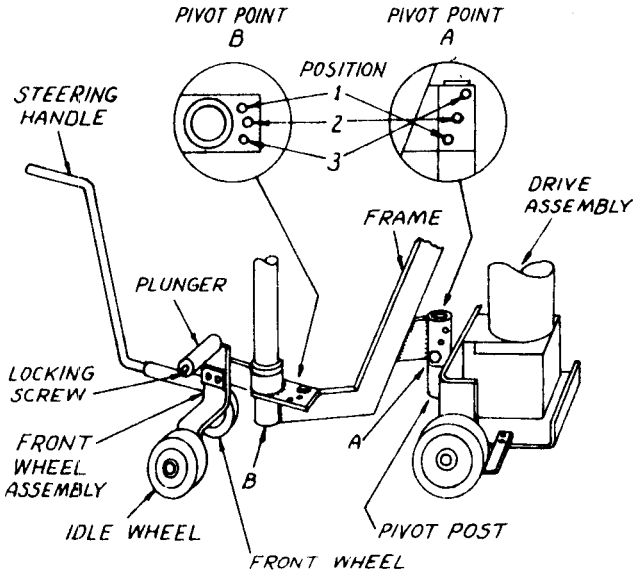


Fig. D2.7.10-1

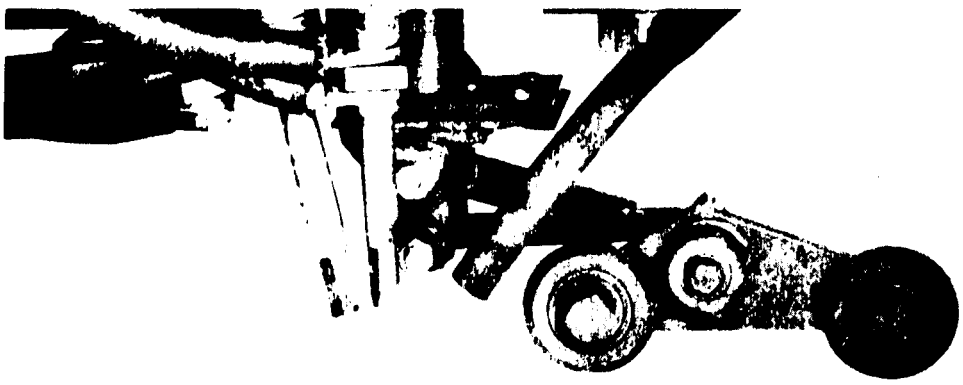


Fig. D2.7.10-2

ACCESSORIES - CONT'D.

Sec. D2.7.11

Vertical Lift Adjuster: K-92

The vertical lift adjuster provides a simple means of quickly raising and lowering the heads during set-up or while welding.

The K-92 assembly fits all LT-3 and LT-34 machines above code 4980 (built after Sept. 1962). It will also fit LT-34 machines below code 4980 if the head mounting is converted to the new arrangement (order conversion Kit L-4050).

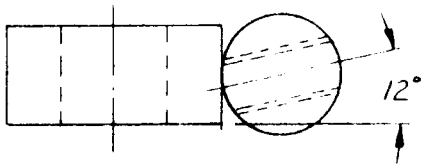
The K-92 also fits the obsolete LT-4 machines. Follow instructions for the LT-3.

REQUIRED PARTS

Check the carton for the following items:

Vertical lift adjuster (G)
Mounting Bracket (E)
One 5/8-11x1-1/4" hex head screw & lockwasher
Head mounting bracket for LT-34 (K-2)*
Head mounting bracket for LT-3 (K-1)*

* The tapped hole in the 1-1/2" diameter shaft of the K-2 bracket is at a 12° angle as shown here. The hole for the K-1 bracket is straight. K-2 is included in K-92-T. K-1 is included in K-92-S.



K-2

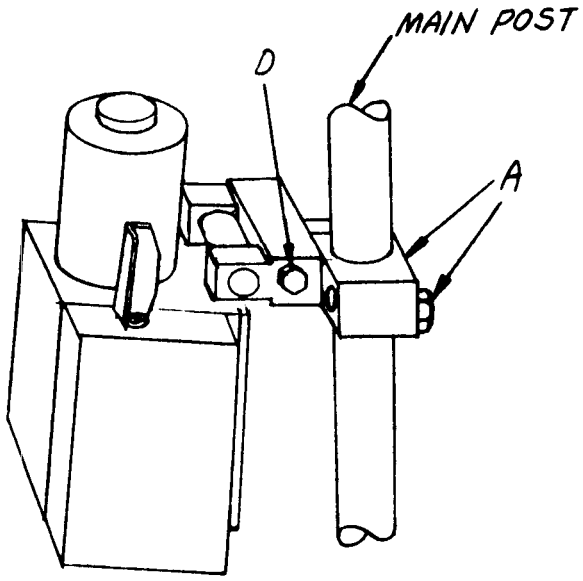
INSTALLATION

The instructions are the same for mounting the assembly on a single head LT-3 as for mounting it on a tandem head LT-34 as follows:

1. Remove the heads by removing screw (D). Be sure the heads are kept upright. If they are laid down on their side, oil from the gear box may run into the motor and damage the windings.
2. Remove the control box mounting bracket and the control boxes from the main post.
3. Remove the head mounting bracket (A) from the main post. This part is not remounted.
4. Mount the vertical list adjuster (G) to the mounting bracket (E) using the 5/8 - 11 x 1-1/4" screw and lockwasher.
5. Mount the assembled adjuster and mounting bracket to the main post.
6. Install the head mounting bracket on the vertical lift adjuster. Use (K-2) for the LT-34 or (K-1) for the LT-3. Tighten the set screw (not shown) into the groove. Tighten nut (M). Adjust the height of bracket (E) for proper electrode stickout.
7. Remount the head and the control boxes.

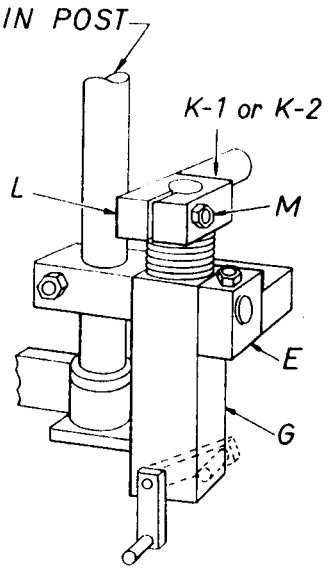
If a LT-3 or LT-34 is to be used with the Flat Fillet Guide, see Sec. D2.7.9.

November 1966



Above Code 4980

Fig. D2.7.11-1



BACK VIEW

Fig. D2.7.11-2

ACCESSORIES - CONT'D.

Sec. D2.7.12

Fillet-Lap Attachment: K-80

This attachment is designed for making 5/16" and smaller fillet and lap welds. It can be used with the LT-34 tandem machines only.

The following installation instructions are for LT-34 machines above code 4980 (built after Sept. 1962). They also apply to LT-34 machines below code 4980 if the head mounting is converted to the new arrangement. For installation instructions for unconverted machines below code 4980, write to the factory for Sec. D2.7.7.

GUIDE TUBE ASSEMBLY

1. Remove the electrode cables from the contact nozzle assembly mounted to each head.
2. Remove the rubber flux tube.
3. Remove the pointer assembly.
4. Remove the contact nozzle assembly from each head. Do this by removing the two clamps which hold the contact assembly to the bottom of the wire feed box.
5. Remove the lower wire guides from both of these contact assemblies. Insert these guides into the proper locations in the top of the K-80 guide tube assembly.
6. Position the heads as shown in Fig. D2.7.12-1. To do this the head mounting must be raised. This is most easily done if the heads are removed from the mounting bracket.

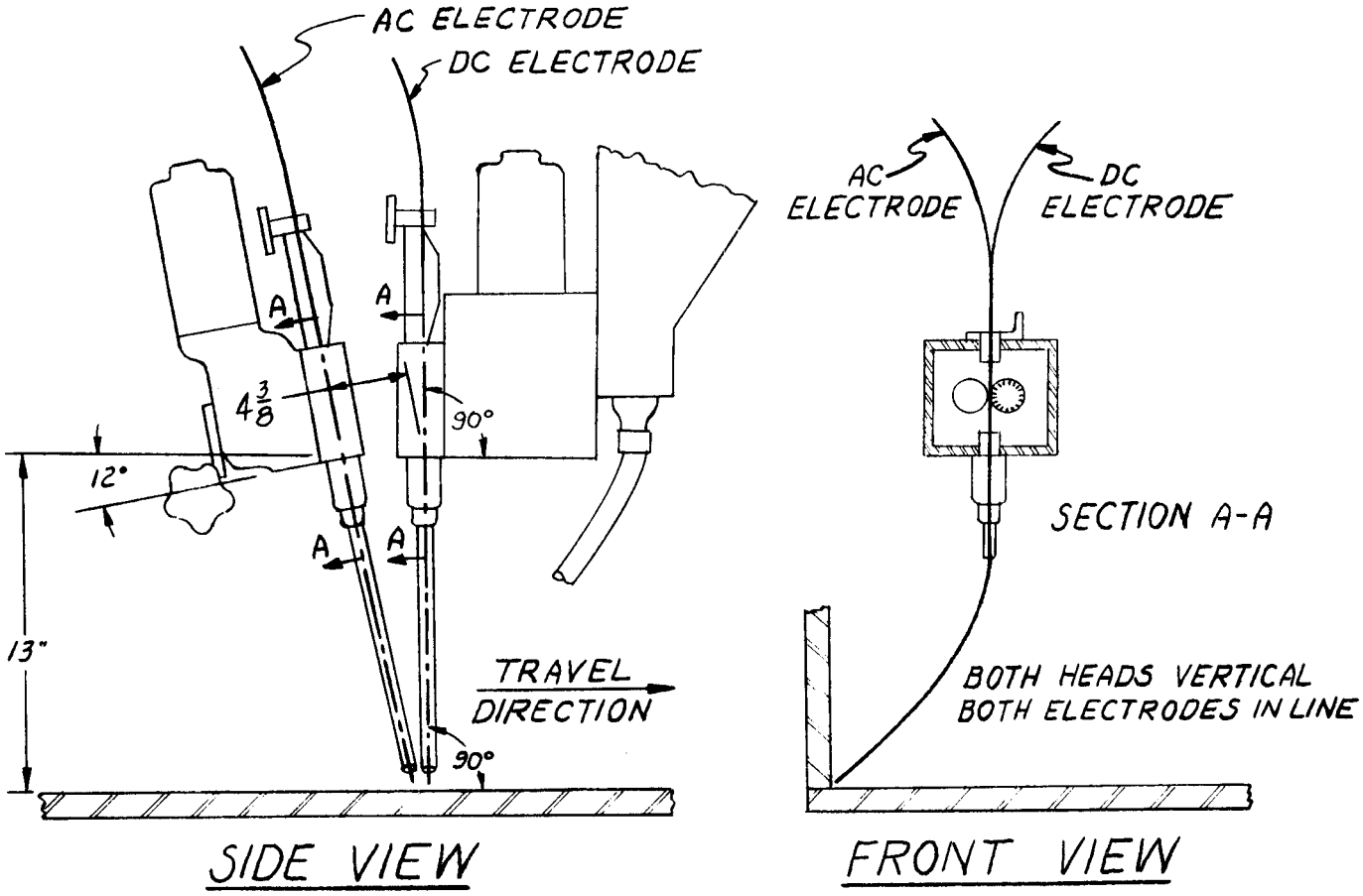


Fig. D2.7.12-1

Sec. D2.7.12 (Continued)

7. Remove the clamp bracket (K) from the guide tube assembly. Be sure the straight tubes (L) are screwed up tight in the curved tubes (M). Use a pipe wrench if necessary.

8. Attach the guide tubes to the bottom of the wire feed boxes in position as shown in Fig. D2.7.12-1. Use the same clamps which were used to hold the standard contact nozzles. Tighten the clamps to the DC head. Leave those to the AC head loose.

9. Replace the clamp bracket (K).

10. Install the proper size nozzle tip in the end of each guide tube depending upon the electrode size to be used.

11. Adjust the clamp bracket up or down for the proper electrode stickout. Tighten this clamp and the clamps holding the guide tube to the AC head.

12. Turn the metal flux tube (N) toward the weld. Slip one end of the rubber flux tube over the metal flux tube and the other end through the loop on the guide tubes clamp.

13. For some applications, the electrodes will follow the seam better if the heads are allowed to float free. Do this by loosening nut (E).

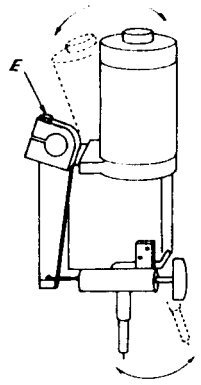


Fig. D2.7.12-2

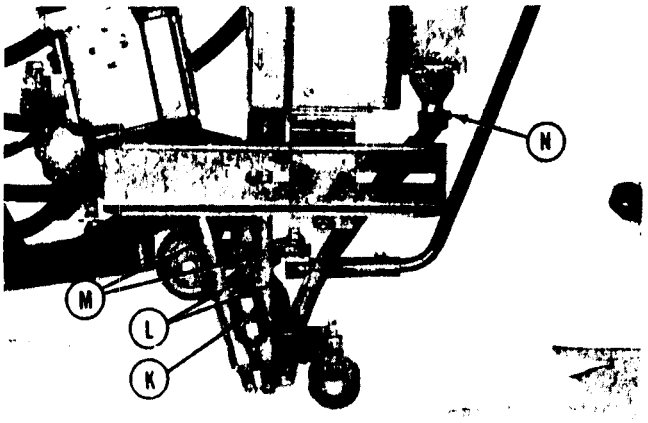


Fig. D2.7.12-3

GUIDE ROLLS

Install the proper guide roll. Two types of guide rolls are included. The double roll is used for fillet welding. One wheel of the double roll rides against each member of the joint with enough room between to clear tack welds. The grooved roll is for lap welds. With this roll the groove rides on the corner of the top plate. This roll is good for jobs where the top plate is up to 1/2" thick. Plates 5/8" to 1 1/4" require relocation of the pivot point.

To position the electrodes in the joint, adjust the set screw above these rolls. Do not allow flux to fall ahead of the rolls.

OPERATION

For instructions on the adjustment and operation of the tractor with the fillet-lap attachment, see Sec. D3.2.7 and the appropriate procedure in Sec. D4.

ACCESSORIES - CONT'D.

Sec. D2.7.13

Fillet-Lap Attachment: K-93

This attachment is designed to make 3/8" to 1/2" fillet and lap welds. 1/2" fillets may have some undercut on the vertical leg. This can be eliminated by positioning the weldment about 10° from the horizontal.

This attachment can be used with the LT-34 tandem tractor only. The K-92 vertical lift adjuster must be installed to use this accessory.

This assembly fits the LT-34 machines above code 4980 (built after September 1962). It will also fit LT-34 machines below code 4980 if the head mounting has been converted to the new arrangement.

INSTALLATION

1. (a) If the vertical plate of the piece to be welded is less than 18" high, set the tractor frame to frame position 1 (see Sec. D3.2.6). Install the shorter of two rear guide wheel assemblies (X) included with this attachment. Bolt this guide wheel assembly to the underside of the tractor drive assembly base using the slot in the guide wheel mounting bar and the two tapped holes in the base. If a greater offset is required for more positive guiding, locate the roll at a greater distance from the frame using the slot in the guide wheel mounting bar.

   (b) If the vertical plate of the piece to be welded is over 18" high, set the tractor frame to frame position 2 (see Sec. D3.2.6). Install and adjust the longer to the two rear guide wheel assemblies (X) as outlined for the shorter guide wheel in (a) above.

2. The long steering handle is attached by two screws. Remove these screws and slide the handle out away from the flux hopper and reattach it using only one screw and the outer hole.

3. Loosen nut (E). Rotate the heads to the nozzles from a 50° angle with the horizontal plate as shown in Fig. D2.7.13-3. Tighten nut (E) until the following adjustments are made.

4. Install the nozzle extensions (V) to both heads. Install the appropriate nozzle tip depending upon the size electrode to be used.

5. Remove the flux hopper from its mounting bracket by removing the four 1/4 - 20 screws. Remove the flux hopper mounting bracket (Z) by removing the two 3/8 - 16 screws. Flip the mounting bracket over and remount it so the flange sticks out from the gear box as shown in Fig. D2.7.13-1. Remount the flux hopper so it is vertical using only three of the 1/4 - 20 screws and the three holes provided.

6. Loosen nut (P). Lower the vertical lift adjuster until its mounting bracket rests on the collar on the main post. Retighten nut (P).

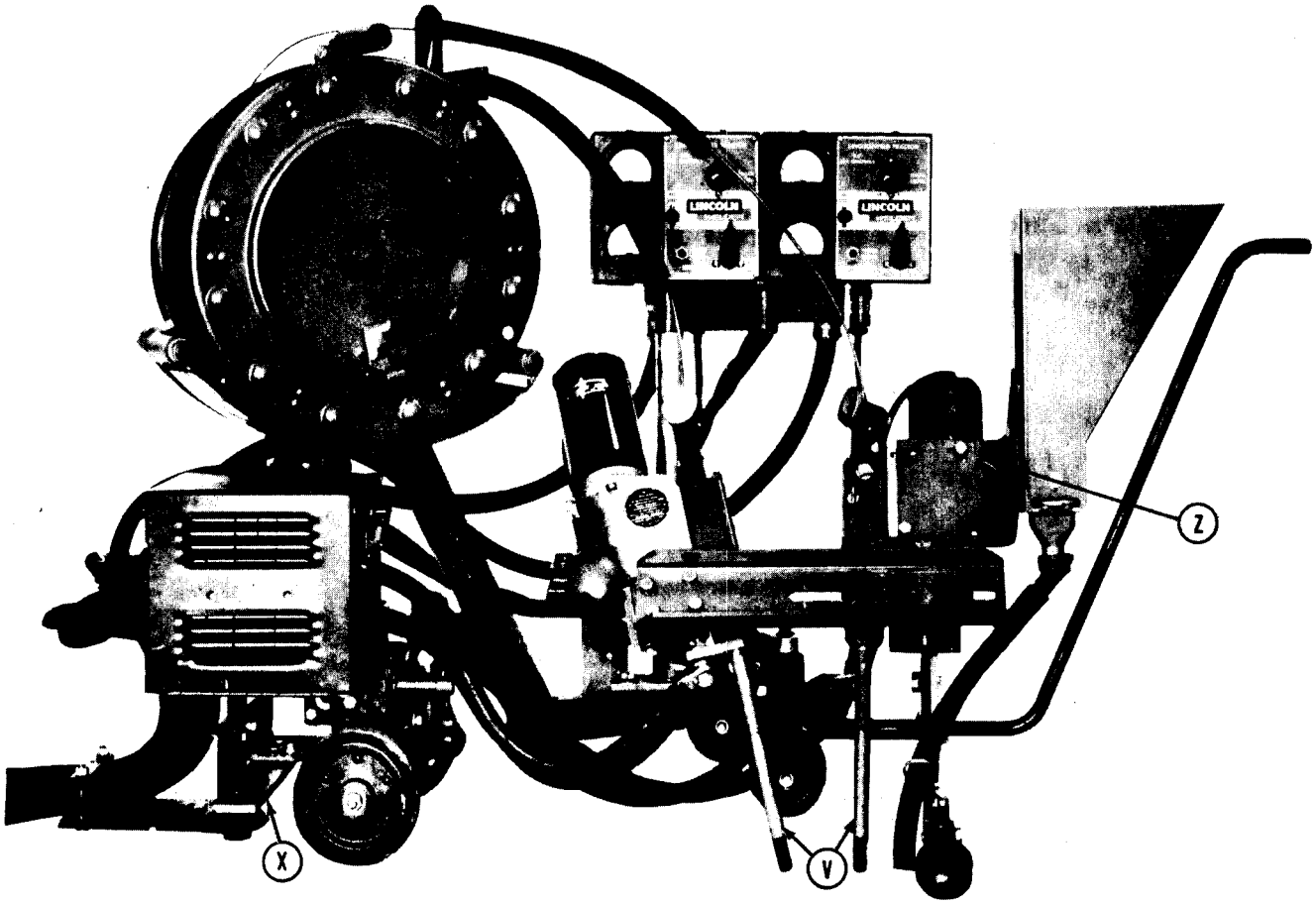


Fig. D2.7.13-1

Sec. D2.7.13 (Continued)

7. Loosen the nut holding the head mounting bracket (K) to the vertical lift adjuster. Rotate the entire head mounting assembly until yoke (D) touches the main post. Retighten the nut holding (K).

8. Set the vertical lift adjuster 3" from the horizontal plate by loosening nut (P). Retighten nut (P).

9. Attach the front guide wheel assembly to the DC (front) head using the two screws (R).

10. Place the tractor in the joint to be welded. Loosen screw (E) so the heads float free.

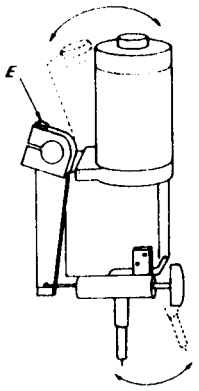


Fig. D2.7.13-2

ADJUSTMENTS

1. For the recommended distance between electrodes and the electrode angles, see the appropriate procedures in Sec. D4.

2. To adjust the distance between electrodes, loosen (N) and slide the DC head in the slots.

3. Set the angle of the DC electrode and the stickout with the vertical lift adjuster and the guide roll adjustment (S). Moving the heads up increases the electrode angle. Moving the guide roll adjustment (S) down decreases the electrode angle and increases stickout.

4. To position the AC electrode relative to the DC electrode, loosen bolt (U). Make the adjustment with bolt (W). Then retighten (U).

5. Before moving the tractor with overhead handling equipment, tighten screw (E) to hold the set-up of the heads.

6. If additional capacity is added to the flux hopper, adjust the idle wheel (M) so it touches the vertical plate.

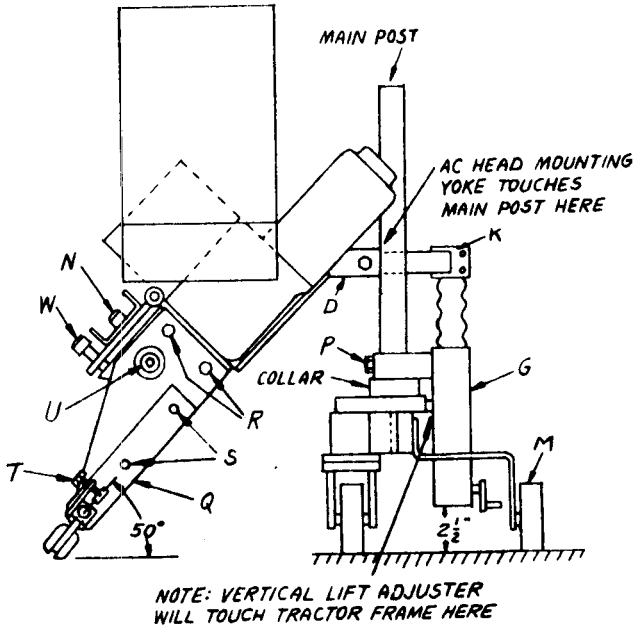


Fig. D2.7.13-3

SEC. D3 OPERATING INSTRUCITONS

Sec. D3.1 Contents

Lincoln arc welding equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation . . . and thoughtful operation on your part. DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WIHTOUT READING THIS OPERATING MANUAL AND THE ARC WELDING SAFETY PRECAUTIONS ON THE INSIDE FRONT COVER. And, most importantly, think before you act and be careful.

March 1984

SEC. D3.2 CONTROLS AND ADJUSTMENTS

Sec. D3.2.1

ADJUSTMENT OF CURRENT AND VOLTAGE

When using an LT-3, LT-4 or LT-34 tractor set the controls on the power source to the values given in Sec. D3.3.4. Welding current and voltage is then adjusted for specific applications from the controls in the 'Arc Controls' boxes on the tractor.

A major change in either the current or voltage will have an effect on both. Therefore, both the current and voltage controls must be adjusted whenever a change is made.

October 1961

Sec. D3.2.2

CHANGING POLARITY

On certain applications, negative polarity is used to deposit electrode faster while producing less penetration of the base metal. This is an advantage on build-up applications, certain types of fillets, grooved butts where there is insufficient base metal thickness, and on some other applications.

Negative polarity requires 3 to 5 volts higher arc voltage than positive polarity. Therefore, negative polarity is more sensitive to arc blow and pin holing.

Polarity is changed by operating the polarity switch on the DC power source. If the polarity is changed to negative, the meters must be rewired for proper operation. Open the top of the 'DC Arc Controls' box. Reverse the leads connected to each meter.

October 1961

Sec. D3.2.3.

TRAVEL CONTROLS

Turn the 'Travel Speed' control on the tractor drive control box to adjust the speed of travel. The dial indicates the approximate speed in inches per minute. Speed range is 6 to 96 in/min.

The tractor travel is controlled by the 'Travel Control' switch on the tractor drive control box. This switch has three positions. When set on 'Hand' the travel mechanism operates but the welding circuit is off. This position is used to time the travel for exact speeds or for positioning the tractor on the work. When set on 'Auto', the travel circuit is controlled by the relays in the welding controls. The travel will not operate with the 'Travel Control' set on 'Off'.

The tractor is driven in one direction only. To move it in the other direction, disengage the clutch by pulling the clutch lever up and roll the tractor to position. Push the clutch lever down to engage the travel mechanism.

October 1961

The Lincoln Electric Company
Cleveland 17, Ohio

Sec. D3.2.4

FLUX VALVE OPERATION

These tractors have a manual flux valve. Pull the handle out to open or push it in to close the valve.

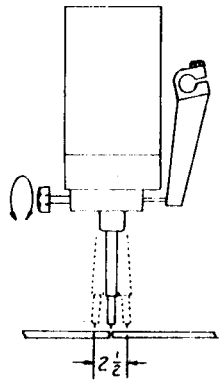
October, 1961

CONTROLS AND ADJUSTMENTS - CONT'D.

Sec. D3.2.5

Head Mounting Adjustments

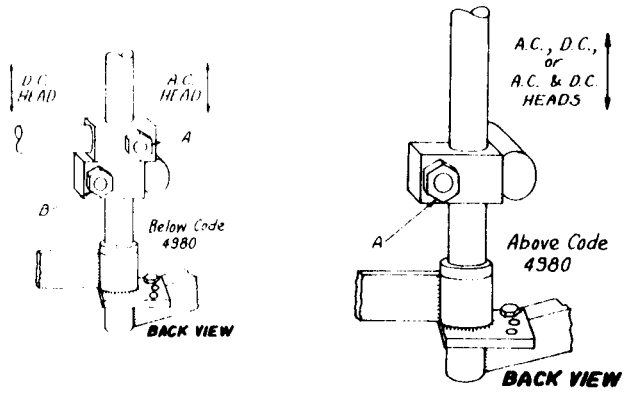
1. CROSS SEAM FINE ADJUSTMENT



Operation of the hand screw of the cross adjustment assembly permits a 2-1/2" cross seam adjustment. This adjustment can be used when welding.

Fig. D3.2.5-1

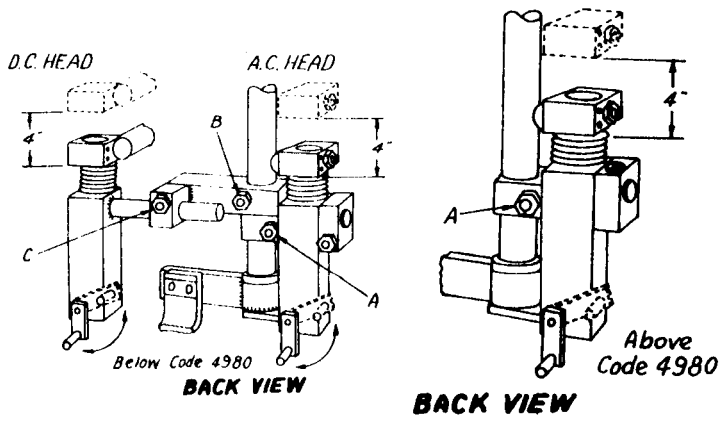
2. VERTICAL HEAD ADJUSTMENT



The heads can be raised and lowered on the tractor head mounting post by loosening nuts A and B in Fig. D3.2.5-2 and Fig. D3.2.5-3. This adjustment is used during setup to position the nozzle or jaws close to the joint.

Fig. D3.2.5-2

3. VERTICAL HEAD LIFT ASSEMBLY (Optional)



The heads can be raised 4 inches vertically by turning the hand crank of the vertical head lift assembly. This adjustment can be used during setup or when welding.

Fig. D3.2.5-3

Sec. D3.2.5.4 (Continued)

4. FORWARD AND BACK ADJUSTMENT: LT-34 Only

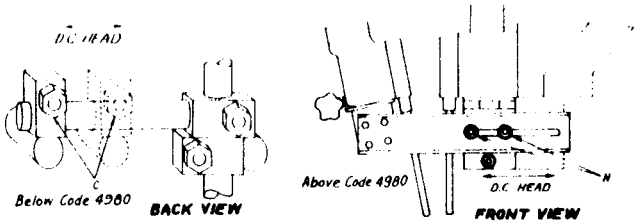


Fig. D3.2.5-4

Above Code 4980
The DC (front) head can be moved forward and back along its mounting plate. This adjustment is used during setup to adjust the distance between the two electrodes. Just loosen screws (N) in Fig. D3.2.5-4.

Below Code 4980
The DC (front) head can be moved forward and back along its mounting bar. This adjustment is used during setup to adjust the distance between the two electrodes. Just loosen nut C in Fig. D3.2.5-4 and Fig. D3.2.5-3.

5. ELECTRODE ANGLE ADJUSTMENT: LT-34 Only

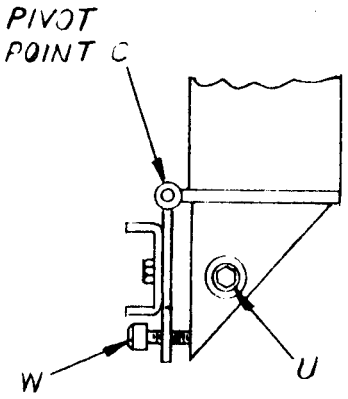


Fig. D3.2.5-5

Above Code 4980 Only
The DC head rotates about Pivot Point (C) to align the DC electrode relative to the AC electrode. The two electrodes are normally lined up for most applications. They are offset from each other when making 3/8-1/2" fillet welds. To make the adjustment, loosen socket screw (U) and adjust with socket screw (W).

6. CROSS SEAM COARSE POSITIONING

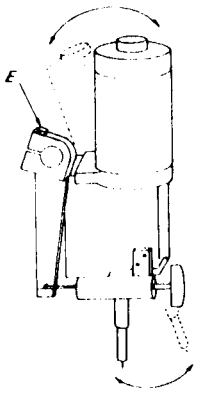


Fig. D3.2.5-6

The heads can be swung across the seam for coarse positioning. Just loosen the hex head bolt holding the cross adjustment arm clamp - E in Fig. D3.2.5-6. This adjustment is used only during setup. It is most often needed when setting the LT-34 for welding fillets over 3/8".

7. ELECTRODE POSITIONING FOR 3 O'CLOCK

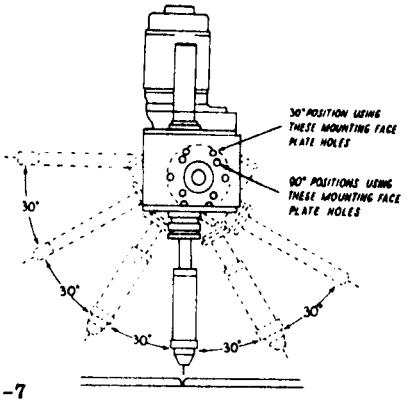


Fig. D3.2.5-7

The wire feed box and wire straightener swing 360° in 30° increments relative to the stationary gear box. This adjustment is made only during setup. It is rarely needed in tractor applications.

CONTROL AND ADJUSTMENTS - CONT'D.

Sec. D3.2.6

Tractor Adjustments

WELDING POSITION ADJUSTMENTS

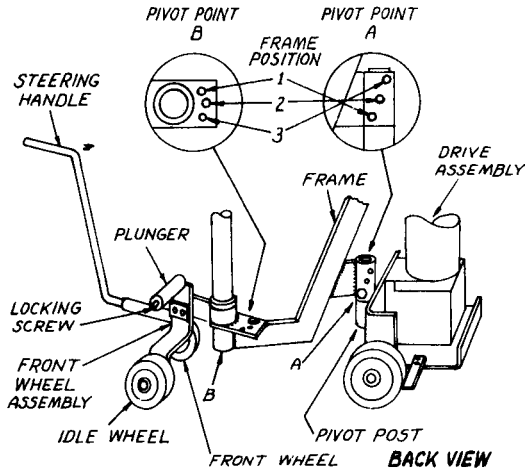


Fig. D3.2.6-1

Using the two pivot points A and B, the tractor frame is set in one of three positions for welding. The recommended position for welding each type of joint is specified in Sec. D3.2.7. When one pivot point is changed the other must also be changed to the corresponding position otherwise, the tractor will not track in a straight line.

To change the setting of pivot point A, remove the two hex head screws. Turn the tractor frame relative to the drive assembly until the desired position holes line up with the tapped hole in the pivot post. Replace the screws.

To change the setting of pivot point B, remove the hex head screw. Turn the front wheel assembly relative to the frame until the desired position hole lines up with the tapped hole in the tractor frame. Replace the screw.

TRACKING ADJUSTMENTS

The tractor must be adjusted so it tracks in either a straight line or with some toe-in. The setting recommended for each type of joint is listed in Sec. D3.2.7.

a. During Setup (above code 4980 only)

Tighten the screws at pivot point A. Then tracking adjustments are made using pivot point B. The screw at pivot point B fits in oversize holes.

To set for straight line tracking, set the screw at pivot point B at about the center of the appropriate frame position hole. Tighten this screw only hand tight. Run the tractor and turn the front wheel in the proper direction to keep the tractor running in a straight line. This adjusts the setting of pivot point B. When no further adjustment is necessary, stop the tractor. Tighten the screw at pivot point B.

To set for toe-in tracking, set the screw at pivot point B at about the center of the appropriate frame position hole. Tighten this screw only hand tight. Run the tractor and turn the front wheel so the tractor turns right or into the joint. When the tractor runs with the needed gentle right turn, stop the tractor. Tighten the screw at pivot point B.

Pivot point B should provide sufficient toe-in for most fillet and lap welds. In cases where the joint is wavy, additional toe-in may be required. To get more toe-in, loosen the front wheel axle. Twist the wheel so all the play is in one direction - so the wheel tends to turn right. Tighten the axle. CAUTION; Too much toe-in causes the front wheel or fillet-lap attachment wheel to chatter.

b. During Setup (Below code 4980 only)

This tracking adjustment is made using the same two pivot points, A and B, used to set the welding positions. The screws in both pivot points fit in oversize holes.

To set the tractor for tracking in a straight line, set the screw at pivot point B at about the center of the appropriate frame position hole. Tighten this screw. Tighten the screws at pivot point A only hand tight. Run the tractor and turn the front wheel in the proper direction to keep the tractor running in a straight line. This adjusts the setting of pivot point A. When no further adjustment is necessary, stop the tractor. Tighten the screws at pivot point A.

To set toe-in, set the screw at pivot point B at about the center of the appropriate frame position hole. Tighten this screw. Tighten the screws at pivot point A only hand tight. Run the tractor and turn the front wheel so the tractor turns right or into the joint. When the tractor runs with a constant gentle right turn, stop the tractor. Tighten the screws at pivot point A.

These instructions should provide sufficient toe-in for most fillet or lap welds. In cases where the joint is wavy, additional toe-in may be required. To get more toe-in, loosen the front wheel axle. Twist the wheel so all the play is in one direction - so the wheel tends to turn right. Tighten the axle. CAUTION: Too much toe-in can cause the front wheel or fillet-lap attachment wheel to chatter.

c. When Welding

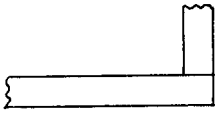
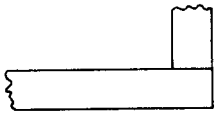
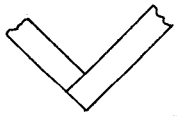
When welding set the idle wheel so it rides about 1/8" above the plate.

The front wheel assembly steers the tractor. The front wheel turns about a vertical shaft when the steering handle is turned. When the front wheel is turned, a cam depresses a spring loaded plunger. When the steering handle is released, this plunger returns the front wheel to its original position so the machine still tracks on a straight line or with the same toe-in. Use this turning mechanism during setup to adjust the tracking direction or when welding to follow the joint.

The spring loaded plunger can be locked in position with the locking screw. This holds the front wheel in center position.

Sec. D3.2.7

Recommended Setups For Different Types of Weld

Type of Joint	Accessory	Frame Position See Fig. D3.2.6-1	Tracking
BUTT - No gap 	none	1 or 3 Note 1	Straight
BUTT - with groove or gap 	V-Butt Guide K-15 for LT-3 or LT-4 K-83 for LT-34	1 or 3 Note 1	Straight
FILLET - 5/16" and smaller 	Fillet-Lap Attachment K-87 for LT-3 or LT-4 K-80 for LT-34	2	Toe-in
FILLET - 3/8 - 1/2" 	Fillet-Lap Guide K-93 for LT-34 (Above code 4980 only) K-81 for LT-34 (Below code 4980 only)	1 or 2 1	Toe-in Toe-in
LAP 	Fillet-Lap Guide K-87 for LT-3 or LT-4 K-80 for LT-34	2	Toe-in
FLAT FILLET 	Flat Fillet Guide K-82 for 45° fillets for 30° fillets	2 3	Straight Straight

NOTE 1: Use Position 1 on Butt welds when there is sufficient room on both sides of the joint. Where room on one side of the joint is limited use position 3. See dimension drawings M-10136 for the space required for the LT-3 or LT-4 and dimension drawing M-10135 for the space required for the LT-34.

SEQUENCE OF OPERATIONS

1. Install the required accessory. Installation instructions are given on the following pages:

   Fillet-Lap Attachment: K-87 . Sec. D2.7.6
   Fillet-Lap Attachment: K-80 . Sec. D2.7.12
   Fillet-Lap Attachment: K-93 . Sec. D2.7.13
   Flat Fillet Guide: K-82 . . . . . Sec. D2.7.9
   V-Butt Guide. . . . . Sec. D2.7.10

2. Set the recommended frame positions. See Sec. D3.2.6.

3. Set the tractor for straight line or toe-in tracking. See Sec. D3.2.6.

4. Adjust the heads as required by the appropriate procedure for the particular joint being welded. See Sec. D3.2.5 for instructions on how to make the head adjustments.

5. Position the tractor at the start of the joint. See Sec. D3.3.4 for the Sequence of operations for making the weld.

OPERATION OF STANDARD EQUIPMENT – CONT'D

Sec. D3.3.1

Starting the Arc

a. General Instructions

The AC head of LT-34's above code 6790 (built after August 1969) can be started either "hot" or "cold". "Hot" starting is usually recommended. "Hot" starting sequence is as follows:

1. Inch the DC wire down until it touches the work. Wire feed automatically stops when electrical contact is made.
2. Push the DC 'Arc Start' button. This starts the DC arc and the travel.
3. Quickly switch the AC 'Electrode Control' to 'Inch Down' and immediately push the AC 'Arc Start' button. Hold this 'Arc Start' button in until the AC arc is stabilized.
4. For good starting, the inch speed of the AC wire must be equal to or slower than the feed speed while welding. Adjust the 'Inch Speed' rheostat on the AC remote control box for good starting. The machine automatically switches to welding wire feed speed once the arc is stabilized.

The LT-34's below code 6790 and all LT-3 and LT-4 (obsolete) machines must be started "cold". The 'Cold' starting sequence is as follows:

1. Inch one or both electrodes as appropriate down until they touch the work. Wire feed automatically stops when electrical contact is made.
2. Push one or both 'Arc Start' buttons. This starts the arcs and travel. Always hold the AC 'Arc Start' button in until the arc is stabilized.

b. Clip the Electrode.

Since the electrode must make electrical contact with the work in starting, the end is usually cut off to provide a clean metal surface. With the following precautions, smooth starts can be made every time.

c. Head Mounting Must be Tight

Much of the trouble in striking the arc can be traced to loose mountings. Then the electrode, upon touching the work, lifts the head a fraction of an inch before making electrical contact. All head positioning adjustors should be locked securely after final positioning is made.

d. Work Mounting Must Be Rigid

For the same reason as above, there must be no possibility of up or down movement of the work when the electrode hits the work.

e. Prevent Electrode Buckling

There must be no possibility of the electrode buckling when it contacts the work from either too long stick-out from the end of the jaw or within an extension. If any extension is added to the normal head to bring the contact jaws farther away from the drive rolls, the electrode must be guided the entire length of this extension by an accurately machined guide tube just a little larger (about .030 greater diameter) than the electrode diameter.

f. Contact Assemblies

Two types of electrode contacts for the LT-3 are available: the spring-loaded contact jaw assembly and the nozzle assembly. The contact jaws are heavier, more rugged and maintain positive contact with the electrode for longer periods of time. The nozzles rely upon a snug hole and slight curvature in the electrode for contact with the electrode. To insure good contact, replace nozzle contact tips when worn and do not completely straighten the wire.

Nozzle assemblies must be used on the LT-34.

September 1969

Sec. D3.3.2

Wire Reel Loading

With the LT-34, use the left hand reel to feed the AC (rear) head. Right and left in this case means to the right or left side of the lift bail when in front of the tractor facing the flux hopper.

These instructions apply to the new reels (with the center spinner clamping nut) installed on machines assembled after February 1968. For older reels with the rim clamping lugs, follow the same basic instructions except ignore paragraphs 2a and 3.

1. Lay the reel flat on the floor and remove the cover plate.
2. For the LT-3, LT-4, or AC (rear) head of the LT-34, place a coil of electrode on the reel so it would unwind if the reel was rotated clockwise while it is lying on the floor. For the DC (front) head of the LT-34 place the coil so it would unwind if the reel was rotated counter-clockwise while it is lying on the floor.
   a. Be sure the coil is placed so the spring loaded arms will not interfere with the later removal of the coil tie wires.
3. Put the cover plate on the reel so the four arms on the cover straddle the spring loaded arms of the reel proper.
4. Tighten the cover as much as possible by hand. Do NOT hammer on the spinner nut arms. Put the loaded reels back on the shafts. Be sure there are washers on both sides of the reel.

Sec D.3.3.2 (Cont.)

5. Cut and remove the two tie wires that do not hold the end of the electrode. Rotate the reel so the wire feeds off the coil underneath the roller. Hold the end of the electrode and cut the third tie wire. While still holding the electrode end, cut off the bent end. While still holding the electrode end, straighten the first 12 inches of electrode and insert it through the wire straightener and into the wire feed box.

CAUTION: It is important to hold the end of the electrode until it is inserted into the wire feed rolls. Failure to do this results in the "back lashing" of the free end of the electrode. This may tangle the wire and prevent proper feeding.

6. LT-34 machines above code 4980 are equipped with two rubber tubes to insulate the electrodes between the reel and wire straightener. Machines below code 4980 were equipped with one loose rubber tube. This tube should be used for the DC electrode. One end of this tube should rest on the wire straightener when the welder is in operation. To add the two rubber insulating tube assembly to LT-34 machines below code 4980 order part no. SL-14748.

7. Turn the 'Electrode Control' on the appropriate 'Arc Controls' box to 'Inch Down' Push the electrode down until the feed rolls pick up the wire. Some pressure is required to start 7/32" electrode.

8. Adjust the wire straightener. If using a contact nozzle assembly, the electrode should not be completely straightened to insure good contact. If using a contact jaw assembly, the wire should be straight as it leaves the jaws.

OPERATION OF STANDARD EQUIPMENT — CONT'D

Sec. D3.3.4

Sequence Of Operation and Test Weld

Sec. D3.3.4-a

LT-3

1. With the 'Electrode Control' on the LT-3 'DC Arc Controls' box and the 'Travel Switch' on the tractor drive control box turned off, start the power source and the control exciter.
2. Fill the flux hopper with the appropriate type of flux.
3. Load the wire reel with the proper size wire.
4. Set the LT-3 'Current Control' and 'Voltage Control' and the power source for the required welding output When making a test weld, set the LT-3 'Voltage Control' to #5 position and the 'Current Control' near mid-range. Set the power source for maximum open circuit voltage and about 800 amperes when using electrode larger than 1/8" or 500 amperes for 1/8" or 3/32" electrode as follows:
   a. With SA or SAF power sources, set the 'Open Circuit Voltage' or 'Output Control' to maximum (#10). Use the appropriate output stud for the current desired. For best results normally use the stud with the lowest current range that still permits welding at the desired current.
   b. With SAE welders, set the 'Job Selector' to the 'Large Electrode' position. Turn 'Current Control' to the full counter-clockwise position when using electrode larger than 1/8" or to 500 amperes for 1/8" or 3/32" wire.
5. Set up and ground the work.
6. Turn the 'Travel' switch to 'Hand' and set the desired travel speed. Position the tractor at the start of the weld. Turn the 'Travel' switch to 'Auto'.
7. Switch the 'Electrode Control' to 'Inch Down'. When the electrode makes electrical contact with the work, the inching stops, and the voltmeter reading drops to zero.
8. Open the flux valve.
9. Press the 'Arc Start' button and proceed with the weld. Adjust the current, voltage and travel speed to obtain the desired weld. When welding, the meters indicate welding voltage and current. If the desired results are not obtained, see the Trouble Shooting section.
10. To stop the arc, flip the 'Electrode Control' to the 'Inch Up' position. This stops the arc, the travel, and feeds the wire up, pulling it away from the molten pool. After the wire has fed up approximately 1/2 inch, turn the 'Electrode Control' switch 'Off'. Clip the end of the electrode to a sharp point before welding again.

Sec. D3.3.4-b

LT-34

1. With both of the 'Electrode Control' switches and the 'Travel Switch' on the tractor turned off, start the power sources and control exciters.
2. Fill the flux hopper with the appropriate type of flux.
3. Load both wire reels with the appropriate size wire.
4. For good starting the 'Inch Speed' for the AC wire must be equal to or slower than the feed speed while welding. Adjust the LT-4 'Inch Speed' rheostat for good starting. The machine automatically switches to welding wire feed speed once the arc is started.
5. Set the DC output per step 4 in Sec. D3.3.4-a. Set the AC 'Current Control', and 'Voltage Control' for the required welding output. When making a test weld, turn the 'Voltage Control' to #5 position. The AC-1000 or AC-750 power source output is controlled directly by operation of the 'Current Control' toggle switch on the 'AC Arc Controls' box. Approximate output is indicated on the dial on the power source. Adjust the output for about 800 amperes when using electrode larger than 1/8" or about 500 amperes for 1/8" or 3/32" wire.
6. Set up and ground the work.
7. Turn the 'Travel Switch' to 'Hand' and set the desired travel speed. Position the tractor at the start of the weld. Turn the 'Travel Switch' to 'Auto'.
8. Switch the DC 'Electrode Control' to 'Inch Down'. When the electrode makes electrical contact with the work, the inching stops and the voltmeter reading drops to zero.
9. Open the flux valve.
10. Start the arcs per instructions in Sec. D3.3.1-a and proceed with the weld. Adjust the current, voltage, and travel speed to obtain the desired results. When welding, the meters indicate welding voltage and current.
11. To stop the arc, flip both 'Electrode Control' switches to 'Inch Up'. This stops the arc and travel and feeds the electrodes up, pulling them away from molten pool. After the wires have fed up about 1/2", turn both 'Electrode Control' switches to 'Off'. Clip the end of the electrode to a sharp point before welding again.

OPERATION OF STANDARD EQUIPMENT - CONT'D.

Sec. D3.3.6

Operator's Trouble Shooting Guide

NOTE: LT-3 Troubles also apply to the DC head of the LT-34.
LT-4 Troubles also apply to the AC head of the LT-34.

CONDITION	REMEDY
LT-3 & 4 1. You can't get the wire started into the feed rolls.	1. Wire must be straightened by hand for a distance of approximately 1 ft. from the end. Move the straightener guide to the non-straightening position and poke the electrode around until it starts.
LT-3 & 4 2. The wire doesn't stop when it hits the plate.	2. If the work is not grounded, the wire will feed down on the plate and continue to bend, forming a spring. The voltmeter should read zero if electrical contact has been made.
LT-4 3. The wire bumps the plate hard.	3. The inching speed is too fast. Slow down until the wire just makes contact with the plate. The head should not move up upon contact of the electrode to the plate.
LT-3 4. The wire won't inch up.	4. You have forgotten to turn on the control exciter.
LT-4 5. Electrode will not inch.	5. 'Inch Control' on AC remote current control box set on minimum. Advance the setting.
LT-3 6. Electrode will not inch in either direction, no voltmeter reading, no voltage at light receptacle or drive assembly, in other words no 110 volt DC.	6. If using SA-750 for power source, replace 15 amp fuse in SA-750 control box.
LT-3 7. After reversing the polarity of the electrode, the electrode will not inch down.	7. To correct this trouble, inch the electrode up a few inches. Turn the 'Electrode Control' switch to the 'Inch Down' position. Push the 'Arc Start' button and immediately turn the 'Electrode Control' switch 'Off'. The electrode should now inch down.
LT-3 & 4 8. The electrode sticks to the work and will not weld.	8. The 'Voltage Control' is set on minimum. For rough check set this rheostat in the center of its range.
LT-3 & 4 9. The weld takes off the side and will not weld at the bottom of the deep groove.	9. This is arc blow. The groove is too narrow. Weld manually until the groove bottom is 5/16" to 3/8" wide.
LT-3 & 4 10. You have porosity? What should you check for?	10. Rust is one of the worst offenders. Oily, greasy or wet surfaces will also cause trouble. Sometimes it is necessary to use pre-heating torch ahead of the arc.

Sec. D3.3.6 (Continued)

CONDITION	REMEDY
LT-3 11. You have porosity always at the same position on the weldment.	11. Usually, this denotes arc blow. Weld away from the ground, if possible. Change the ground to a different position. Keep the ground contact point as far away as possible from welding arc.
LT-3 & 4 12. You are welding, then wire suddenly dives and freezes the work.	12. This is usually due to a poor ground condition. Check ground connection.
LT-3 & 4 13. Porosity only when welding over tacks.	13. Wrong type of electrode has been used for tacking. Tacks may not have been cleaned.
LT-3 & 4 14. On fillets and laps the weld won't feather to the plate.	14. Travel speed too fast or not enough current to heat the plate.
LT-3 & 4 15. The bead is high and bumpy.	15. Travel speed too fast. Current or voltage may be too high.
LT-3 & 4 16. The bead is undercut at the edges.	16. These are the first signs of the travel speed being too fast. Reduce travel speed. Heavy scale can also cause undercut at the bead edges.
LT-3 & 4 17. The slag is unusually hard to remove.	17. Check your bead shape. Concave fillets cause locked slag. Smooth up the bead shape. This might require a change in current, voltage, or speed. See Bulletin 2220.1 in Section D5. Stagger beads from side to side on multiple pass deep groove work.
LT-4 18. Bad, bumpy starts.	18. Pushbutton not held down long enough. Wire end must be cut off to a sharp point. Start on steel wool.

SEC. D6 MAINTENANCE INSTRUCTIONS

Have qualified personnel do the maintenance and troubleshooting work. Turn the input power off at the power source before working inside the machine.

Sec. D6.1 Contents

SEC. 6.2 HEAD AND CONTROLS

Sec. 6.2.1
Gear Case Lubrication

The wire feed drive gear case oil should be changed about once a year. To do this remove the motor and the drain plug. Drain and flush the gear case thoroughly. Replace the drain plug and fill with oil to the proper level as marked on the caution plate. For operating at temperatures above 60°F use SAE-140 oil or the equivalent. For temperatures below 32°F use SAE-90 oil. Use either grade when operating at temperatures between 32°F and 60°F.

No other lubrication is necessary for proper maintenance of the welding head.

December 1959

Sec. 6.2.2
Wire Drive Mechanism

The electrode is driven by gripping the wire between knurled grooved driving rolls and a spring loaded idle roll. When operating properly the drive rolls make definite indentations in the electrode. To inspect the drive rolls, loosen the thumb screw behind the flux hopper. With this screw loose the flux hopper swings out on a hinge. The drive rolls have two sets of teeth so they can be reversed when the first set becomes worn.

December 1959

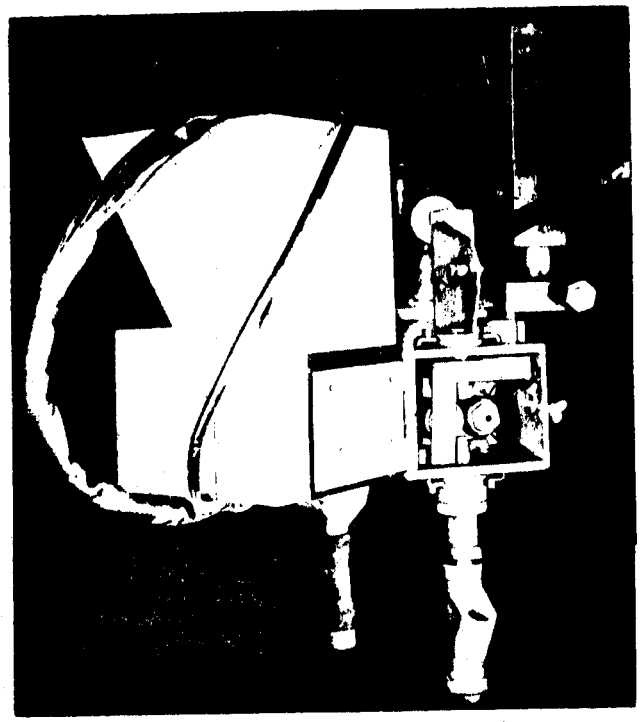


Fig. 2.6.4-1 – View of drive roll box with door open.

Sec. 6.2.3
Wire Straightener, LAF Only

The top slide bushing (item 28 in the parts list) and the incoming wire guide (item 4) should be inspected periodically for signs of wire milling. The slide bushing can be reversed. Remove the cross adjustment screw (item 25), turn the slide bushing over and reassemble the adjustment screw.

December 1959

Sec. 6.2.4
Controls

a. Control Box

Inspect and clean the control box every three months. No other regular maintenance of the control box is required.

b. LAF-3 Field Relay

The field relay is installed in the control box of power sources used with the LAF-3. *It is important to keep the relay free of dust. Be certain to replace the cover after cleaning.*

December 1959

Sec. 6.2.5
Spare Parts

We recommend that you keep the following spare parts on hand:

1 set of drive rolls S-10110
1 upper wire guide S-10168, LAF only
1 wire straightener bushing T-10584, LAF only
1 wire straightener, K-52 specify wire size, NA-1 only
1 set of motor brushes for each motor

When ordering motor brushes, give the code number of the head and the nameplate data on the motor.

December 1959

Sec. 6.2.6
Gear Box Disassembly

a. Disassembly

Should it become necessary to disassemble your wire feed or carriage drive gear box, follow these instructions. The numbers used refer to the item numbers used on the gear box parts lists.

1. Remove motor assembly (item 191). Drain the oil from the gear box cavity. Use care so as to avoid damage to gaskets. If damage does result, replace.

2. Remove dust cap (180).

Sec. 6.2.6 (Continued)

3. Remove the small bearing cage (184). To remove small bearing cage, push the cross shaft (199) by hand toward the small bearing cage, just far enough to be able to grip the outer diameter of the small bearing cage. Pull the small bearing cage off the bearing by hand. Since the bronze worm gears may be in contact with each other at this time, *do not force or pry this small bearing housing off*, otherwise the gear teeth may be damaged.

4. After the small bearing cage has been removed, push the cross shaft back through the gear box housing until the bearing on the dust cap end comes completely through the bearing housing. Leave the cross shaft suspended in this position until the output shaft is removed.

5. Remove the screws which hold the dust cap (176) and the output bearing cage (187).

6. Remove the dust cap. Push the output shaft assembly out of the gear box housing by hand.

7. Insert the cross shaft bearing back into its housing and then push the cross shaft, by hand, out of the housing.

8. All gears are keyed to their respective shafts, with the exception of the motor pinion which is pinned. All bearings are press fits to their respective shafts.

9. If the large bearing cage is removed from the output shaft, care must be taken to protect the grease seal (190) from being damaged when sliding it over the keyway slot. A layer of paper or cellophane tape will afford this protection.

b. Reassembly

1. Insert cross shaft (199) back into the housing. Push the shaft through until the bearing on the far end comes completely through the housing. Leave the shaft suspended in this position until the output shaft is installed.

2. Assemble these parts in the following order:
   a. Output shaft assembly.
   b. Large bearing cage gasket (180).
   c. Large bearing cage (188). Protect grease seal when cage is slipped over the shaft.
   d. Install the six screws (189) which hold large bearing cage.
   e. Install gaskets* (177 & 178), dust cap (176), and mounting screws. Check shaft for a small amount of end play (.001" to .005"). This is adjusted by adding or subtracting gaskets on the dust cap end.
   f. Push cross shaft back to its normal position.
   g. Install small bearing cage gasket (185), small bearing cage (184) and the four mounting screws).
   h. Install gaskets* (177 & 178), dust cap (180), caution nameplate (181) and the four mounting screws. Check cross shaft for a small amount of end play (.001" to .010").
   i. Fill gear box with T-8484 oil to the proper level.
   j. Install motor gasket (209), motor assembly (191) and the three motor mounting screws.

*Both .005 and .010 inch thick gaskets are used.

December 1959

Sec. 6.5.4

Spreadarc

Every six months: Add a small amount of light oil to the oil hole on the support block. Remove the Spreadarc gear box and apply a graphite grease to the gears.

February 1959

Sec. 6.5.5

Vertical Head Adjustment

Every month: Add a few drops of SAE-140 oil or equivalent to the oil cup on the back of the vertical lift housing. (SAE-140 is the same oil that is used in the gear box.)

Every year: Replace the grease in the top section (gear cavity) with a medium grease.

Should the unit be disassembled for cleaning, lubricate as follows: Apply a layer of medium grease to the screw threads of the head lift tube (item 2) and the head lift screw (8). Apply a thin layer of grease to the O.D. of the head lift tube and to the I.D. of the long hole in the head lift body (1). Slide the head lift tube into the head lift body. Screw in the head lift screw. Fill the upper section (gear cavity) 1/2 full of grease. Be sure the needle bearings are packed with grease.

February 1959

SEC. D6.3 TRACTOR

Sec. D6.3.1

Tractor Drive

Every six months:

1. Apply graphite grease to the tractor drive spur gears and the shaft on which the clutch gear slides.
2. Apply graphite grease to the inside of the clutch dog support tube.
3. Check drive motor brushes.

The tractor drive gear case requires the same maintenance as the wire feed gear case outlined in Sec. 6.2.1 instructions for disassembling the gear box are given in Sec. 6.2.6.

October 1961

Sec. D6.3.2

Fuses and Circuit Breakers

TRAVEL MOTOR CIRCUIT

Fuse (or Circuit Breaker)	If Blown (or Tripped)
1. 1/2 amp slo-blo fuse in line #1; located on travel mag-amp panel in remote DC control box.	a. No field on travel motor. b. No control voltage for mag-amp control circuit. c. Mag-amp circuit breaker will trip-out when travel circuit is energized because there is no field voltage.
2. 1/4 amp slo-blo fuse; located on tractor drive control box.	a. Travel motor will not run.
3. 2 amp circuit breaker; located on remote DC control box.	a. Travel Motor will not run.

AC REMOTE CONTROL BOX

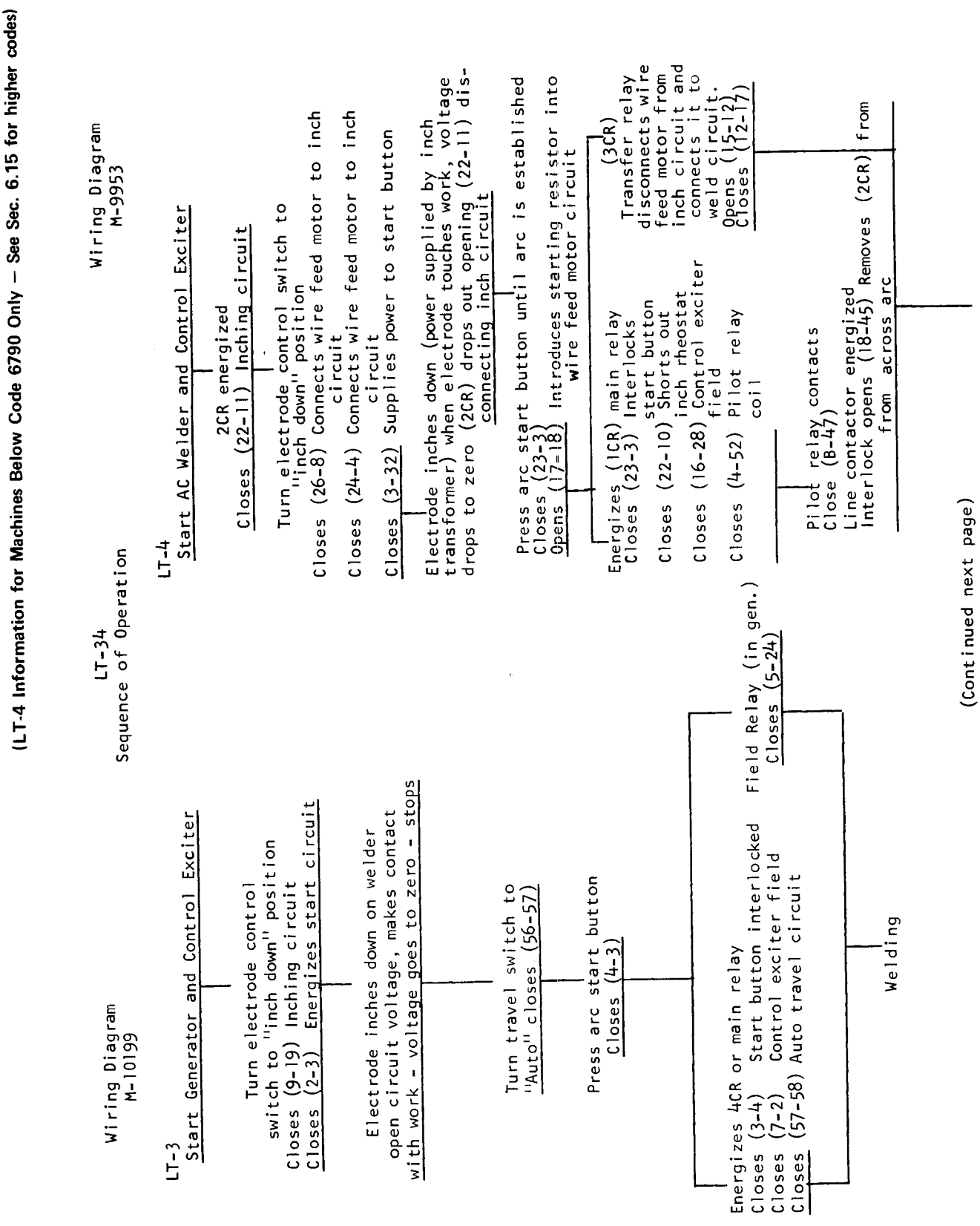
1. 2 amp slo-blo fuse; located on AC remote control box. Protects Automatic Stop Relay.	a. Wire will not stop when it touches the plate. Fuse will blow if DC head or wire touches AC head or wire.
2. 8 amp slo-blo fuse; located on AC remote control box. Protects wire feed motor armature and rectifier.	a. Wire will not inch up or down. Fuse blows when overloaded.

DC ARC CONTROL BOX

1. 8 amp slo-blo fuse; located on DC arc controls box. Protects wire feed motor armature and rectifier.	a. Wire will not inch up or down. Fuse blows when overloaded.

April 1972

SEC. D6.7 ELECTRICAL SEQUENCE OF OPERATIONS



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Sec. D6.7 (Continued)

SEC. 6.15 ELECTRICAL SEQUENCE OF OPERATION: LAF-4 & LT-4

(Above Code 6790 Only)

LAF-4 AUTOMATIC AND LT-4 SECTION OF THE LT-34 - SEQUENCE OF OPERATION

(Refer to schematic wiring diagrams M-11693 for LAF-4 or M-11696 for LT-4 which shows the circuits in a complete de-energized condition.)

Turn on welding power source and control exciter

2CR is energized

LT-4 22 to 11) closes - completing the inch down circuit
LAF-4 87 to 11)
LAF-4 only 20 to 31 opens - flux valve coil is de-energized

LAF-4 only - turn travel switch to "Auto" position (23 to 25 closes)

Turn the "Electrode Control Switch" to the "Down" position

32 to 3 closes - Energizes the start circuit
26 to 8 closes - Connects wire feed motor to the inch circuit
24 to 14 closes - Connects wire feed motor to the inch circuit

Electrode inches down and makes contact with the work

When the electrode touches the work the 2CR coil is shorted out thus de-energizing 2CR

On LAF-4 87-11 opens) Wire feed motor stops inching
On LT-4 22-11 opens)

LAF-4 only 20 to 31 closes - flux valve opens if its switch is in the "on" position thus depositing flux around electrode

Press the "Arc Start" button until arc is established

3 to 23 closes - Energizes ICR coil
17 to 18 opens - Introduces a starting resistance into wire feed motor circuit

ICR Closes

LAF-4 86 to 23 closes) - interlock for ICR
LT-4 3 to 23 closes)
LAF-4 only 31 to 20 closes - interlock for flux valve
22 to 11 closes - closes inch rheostat circuit
4 to 52 closes - energizes pilot relay coil
81 to 21 closes - completes circuit to 3CR

Contacts of Pilot Relay Close

Line contactors energized

(18 to 45 opens - removes 2CR coil from across-the-arc.)

(Electrode lead energized)

Arc established

Current flows in electrode lead

Current transformer supplies voltage to 3CR coil

3CR Current Relay closes

83-35 opens - disconnects 3CR from current transformer
85-35 closes - connects current transformer to ammeter
LAF-4 only 35-21 closes - shorts current transformer
LT-4 only 82-15 closes - interlocks 3CR and energizes 4CR coil
11-10 closes - shorts out inch rheostat

4CR Relay closes (Transfer Relay)

15-12 opens - disconnects wire feed motor from inch circuit
12-17 closes - connects wire feed motor to the weld circuit
28-16 closes - energizes control exciter field

Remove manual force from arc start button

3 to 23 opens - circuit still held closed due to interlock contacts on ICR

17 to 18 close - shorts out the starting resistor

WELDING

To stop turn "Electrode Control" switch through the "Off" position to the "Inch Up" position

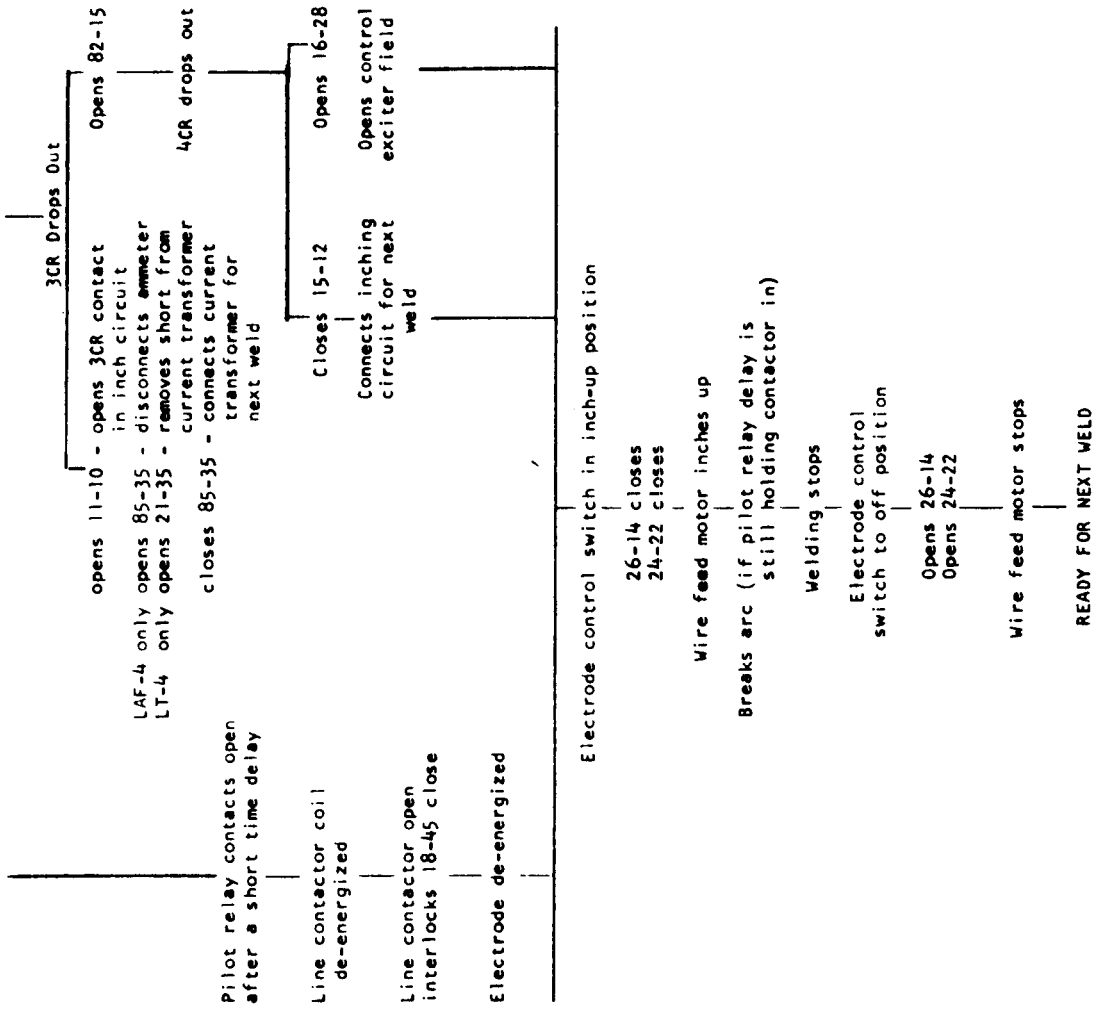
As the "Electrode Control Switch" goes through "Off"

14 to 24 opens) Disconnects wire feed motor
8 to 26 opens)
3 to 32 opens - ICR de-energized, travel stops (LAF-4 only)

22-11 opens - Opens ICR contact in inch rheostat circuit
LAF-4 only 20-31 opens - de-energizes flux valve coil
4-52 opens - de-energizes pilot relay coil
LAF-4 86-23 opens) - opens start circuit
LT-4 3-23 opens)

81-21 opens - de-energizes 3CR coil

(Continued on the back)


3CR Drops Out
opens 11-10 - opens 3CR contact in inch circuit
Opens 82-15
LAF-4 only opens 85-35 - disconnects ammeter
LT-4 only opens 21-35 - removes short from current transformer
4CR drops out
closes 85-35 - connects current transformer for next weld
Pilot relay contacts open after a short time delay
Closes 15-12
Opens 16-28
Line contactor coil de-energized
Connects inching circuit for next weld
Opens control exciter field
Line contactor open interlocks 18-45 close
Electrode de-energized
Electrode control switch in inch-up position
26-14 closes
24-22 closes
Wire feed motor inches up
Breaks arc (if pilot relay delay is still holding contactor in)
Welding stops
Electrode control switch to off position
Opens 26-14
Opens 24-22
Wire feed motor stops
READY FOR NEXT WELD

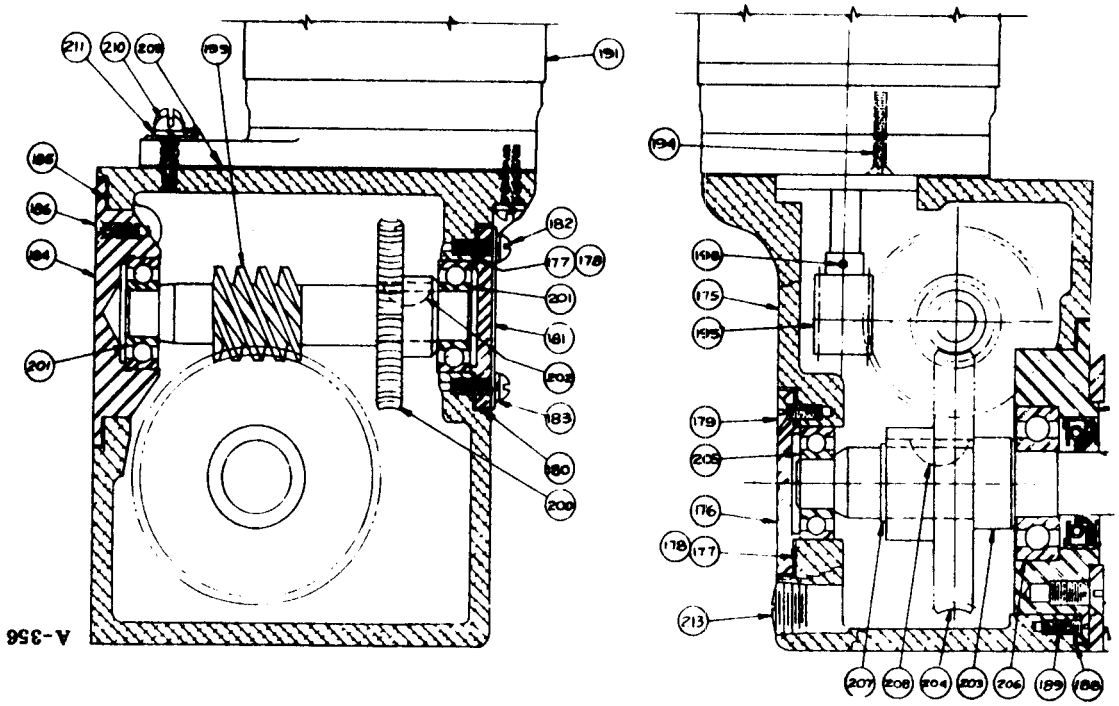
SEC. D7 PARTS LISTS

Sec. D7.1 Contents

April 1963

The Lincoln Electric Company
Cleveland, Ohio 44117

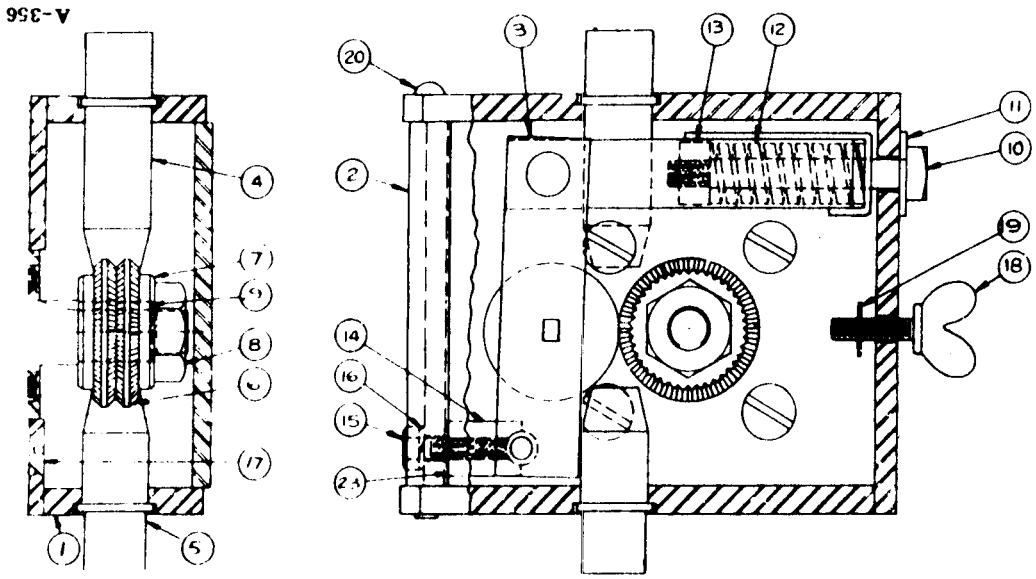
LAF-3, -4 & -5
LT-3, -4 & -34
WIRE DRIVE MOTOR AND GEAR CASE
and
LT-3, -4 & -34 TRACTOR DRIVE MOTOR AND GEAR CASE



March 1973

ITEM	PART NAME & DESCRIPTION	PART NO.	NO. REQ'D	1 2 3	4 5 6
A	LAF-3, Includes All Items Marked "X" in Column #1	L-3094-3*	1	x . .	. . .
A	LAF-4 and 5, Includes All Items Marked "X" in Column #2	L-3094-5*	1	. x .	. . .
A	LAF-3 With High Frequency Insulation, Includes All Items Marked "X" in Column #3	L-3094-10*	1	. . x	. . .
A	LT-3 and DC Head of LT-34, Includes All Items Marked "X" in Column #4	L-3094-13*	1	. . .	x . .
A	LT-4 and AC Head of LT-34, Includes All Items Marked "X" in Column #5	L-3094-14*	1	. . .	. x .
A	LT-3, 4 and 34 Tractor Travel Drive, Includes All Items Marked "X" in Column #6	L-3094-11*	1	. . .	. . x
175	Gear Case	G-1027	1	x x x	x x x
176	Dust Cap - For Output Shaft	T-10559	1	x x x	x x x
177	Dust Cap Gasket	T-10649-1	As Req'd	x x x	x x x
178	Dust Cap Gasket	T-10649-2	As Req'd	x x x	x x x
179	Flat Head Screw - Dust Cap to Gear Case	#10-24 x 1/2	4	x x x	x x x
180	Dust Cap - For Cross Shaft	T-10672	1	x x x	x x x
181	"Caution" Plate	S-10346	1	x x x	x x x
182	Round Head Screw - Dust Cap to Gear Case	#10-24 x 1/2	4	x x x	x x x
183	Lockwasher - Dust Cap to Gear Case	E-106-A-1	4	x x x	x x x
184	Small Bearing Cage	S-10077	1	x x x	x x x
185	Small Bearing Cage Gasket	S-10084	1	x x x	x x x
186	Flat Head Screw - Small Bearing Cage to Gear Case	#10-24 x 1/2	4	x x x	x x x
187	Large Bearing Cage	S-10079	1	x x x	x x x
188	Large Bearing Cage Gasket	S-10085	1	x x x	x x x
189	Flat Head Screw - Large Bearing Cage to Gear Case	#10-24 x 1/2	6	x x x	x x x
190	Oil Seal - Output Shaft	S-7611-5	1	x x x	x x x
	Motor Assembly, LAF-3, Includes Items 191 thru 198	M-7628-6	1	x . .	. . .
	Motor Assembly, LAF-4 and 5, Includes Items 191 thru 198:	M-8298-8	1	. x .	. . .
	Motor Assembly, LAF-3 With High Frequency Insulation Includes Items 191 thru 198:	S-11776	1	. . x	. . .
	Motor Assembly, LT-3, Includes Items 191 thru 198	M-8298-7	1	. . .	x . .
	Motor Assembly, LT-4, Includes Items 191 thru 198	M-8298-9	1	. . .	. x .
	Motor Assembly, LT Tractor Travel Drive, Includes Items 191 thru 197	M-9852-2	1	. . .	. . x
191	Motor	Not Sold Separately	1	x x x	x x x
	Base Insulation, Not Illustrated	S-11756	1	. . x	. . .
	Needle Bearing, Not Illustrated	S-9746-2	2	. . x	. . .
194	Flat Head Screw - Motor to Base	#8-32 x 1	4	x x x	x x x
	Roundhead Screw - Base to Insulation	#10-24 x 1	4	. . x	. . .
195	Input Worm	S-10088-3	1	x x x	x x .
195	Input Worm	S-10088-1	1	. . .	. . x
196	Roll Pin - Input Worm to Motor Shaft	T-9967-3	1	x x x	x x x
197	Motor Lead Receptacle	S-12022-5	1	. x .	. . .
197	Motor Lead Receptacle	S-12020-3	1	. . .	x . .
197	Motor Lead Receptacle	S-12020-6	1	. . .	. x .
197	Motor Lead Plug	T-10662	1	. . .	. . x
198	Motor Lead Connector	M-7582-3	1	x . x	. . .
198	Motor Lead Clamp	S-12024-1	1	. x .	x x .
	Cross Shaft Assembly, Includes Items 199 thru 202	S-10080-3	1	x x x	x x .
	Cross Shaft Assembly, Includes Items 199 thru 202	S-10080-8	1	. . .	. . x
199	Cross Shaft	S-10075-3	1	x x x	x x .
199	Cross Shaft	S-10075-2	1	. . .	. . x
200	Input Worm Gear	S-10087-3	1	x x x	x x .
200	Input Worm Gear	S-10087-1	1	. . .	. . x
201	Ball Bearing	M-9300-29	2	x x x	x x x
202	Woodruff Key	#405	1	x x x	x x x
	Output Shaft Assembly Includes Items 203 thru 208	S-10083-3	1	x x x	x x .
	Output Shaft Assembly Includes Items 203 thru 208	S-10083-2	1	. . .	. . x
203	Output Shaft	S-10078	1	x x x	x x x
204	Output Shaft Worm Gear	S-10076-3	1	x x x	x x .
204	Output Shaft Worm Gear	S-10076-2	1	. . .	. . x
205	Ball Bearing, Smaller	M-9300-27	1	x x x	x x x
206	Ball Bearing, Larger	M-9300-7	1	x x x	x x x
207	Snap Ring	S-9776-5	1	x x x	x x x
208	Woodruff Key	#606	1	x x x	x x x
209	Motor Base Gasket	T-8364	1	x x x	x x x
210	Round Head Screw - Motor Base to Gear Case	#10-24 x 3/4	3	x x x	x x x
211	Lockwasher - Motor Base to Gear Case	E-106-A-1	3	x x x	x x x
213	Slotted Pipe Plug	S-10780-5	1	x x x	x x x
	Gear Box Lubricant	T-8484	1	x x x	x x x
	* To order a gear box assembly without a motor, add "-w" to this assembly number.				

LAF-3, -4, -5, NA-1,
LT-3, -4 & -34
FACEPLATE AND WIRE DRIVE ROLLS



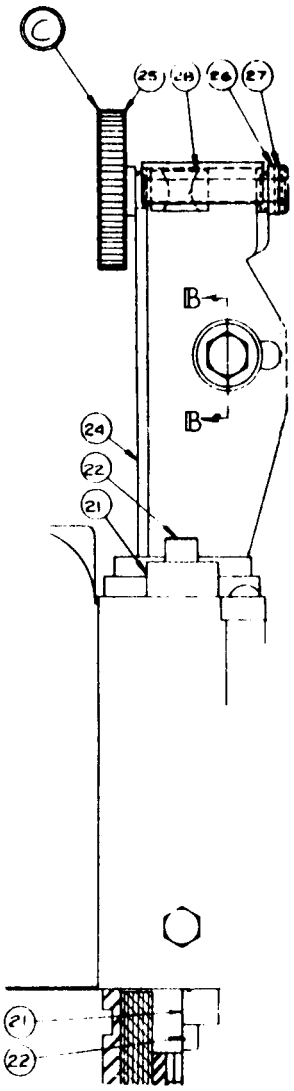
Note 1 To feed 5/64" electrode, purchase the following parts:

K 231 5/64" Contact Nozzle Assembly
1 10592 1 Wire Straightener Bearing (Item 29, P-50-E)
S 10168-3 Top Wire Guide (Item 4, P-50-D)
S 1277-3 3/32 Lower Wire Guide and Insert (Item 5, P-50-D)
S 7981 Drive Rolls 2 Req'd (Item 6, P-50-D)
S 13922 Instruction Sheet
S 12771 1 Outgoing Guide Tube Sleeve

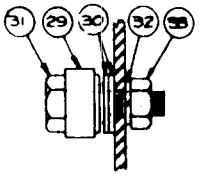
ITEM	PART NAME & DESCRIPTION	PART NO.	NO. REQ'D	1 2 3
1	Faceplate	L-3093	1	
2	Faceplate Door	M-8230	1	
3	Idle Roll Assembly	M-11007	1	
4	Topwire Guide (Except NA-1)	S-10168 Note 1	1	.
5	Lower Wire Guide	S-10170 Note 1	1	.
6	Drive Roll	S-10110 Note 1	2	.
7	Drive Roll Washer	S-9262-44	2	
8	Drive Roll Nut	T-10552	1	
9	Drive Roll Key	M-8776-5	1	
10	Idle Roll Tension Screw	T-10317-2	1	
11	Washer - Tension Screw	S-9262-4	1	
12	Spring - Tension Screw	T-10247-2	1	
13	Nut - Tension Screw	T-10318	1	
14	Support Pivot	T-10550	1	
15	Hex Head Bolt - Support Pivot to Faceplate	1/4-20 x 3/4	1	
16	Lockwasher - Support Pivot to Faceplate	E-106-A-2	1	
17	Flat Head Screw - Faceplate to Gear Case	5/16-18 x 5/8	4	
18	Thumb Screw - Faceplate Door to Faceplate	T-9078-5	1	
19	Screw Retainer - To Secure Thumb Screw to Door	S-10773-22	1	
20	Faceplate Door Hinge Pin	T-10548-1	1	
21	Mounting Clip - Nozzle and Wire Straightener to Faceplate	T-8400	4	
22	Socket Head Cap Screw - Mounting Clip to Faceplate	T-9447-12	4	
23	Idle Roll Shim	T-10828	As Required	

December 1975

The Lincoln Electric Company
Cleveland, Ohio 44117



LAF-3, -4, & -5
LT-3, -4 & -34
WIRE STRAIGHTENER

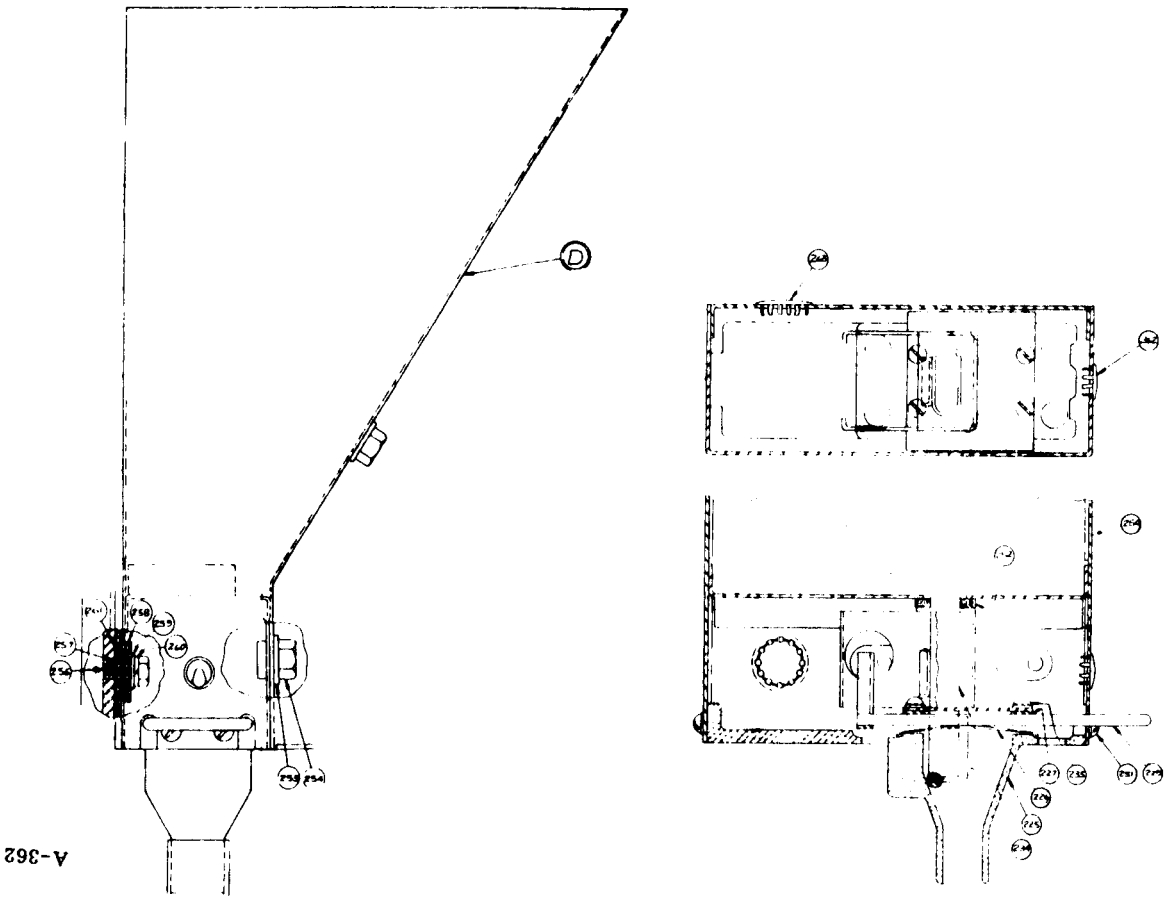


A-356

SECTION B B

ITEM	PART NAME AND DESCRIPTION	PART NO.	NO. REQ'D.	1 2 3
21	Mounting Clip - Nozzle and Wire Straightener to Faceplate	T-8400	4	
22	Socket Head Cap Screw - Mounting Clip to Faceplate	T-9447-12	4	
C	Single Arc Wire Straightener Assembly, Includes Items 24 Through 33	M-8269-1	1	
24	Body	M-8268	1	
25	Cross Slide Screw	S-10159	1	
26	Bushing - Locates Slide Screw in Body	T-10585	1	
27	Roll Pin - Bushing to Slide Screw	T-9967-5	1	
28	Slide Bushing	T-10584	1	
29	Ball Bearing	M-9300-26*	1	
30	Washer - Bearing to Body	S-9262-30	3	
31	Hex Head Bolt - Bearing to Body	5/16-18 x 1-1/4	1	
32	Lockwasher - Bearing to Body	E-106-A-3	1	
33	Hex Nut - Bearing to Body	5/16-18	1	
	* See Note 1 on P-50-D.			

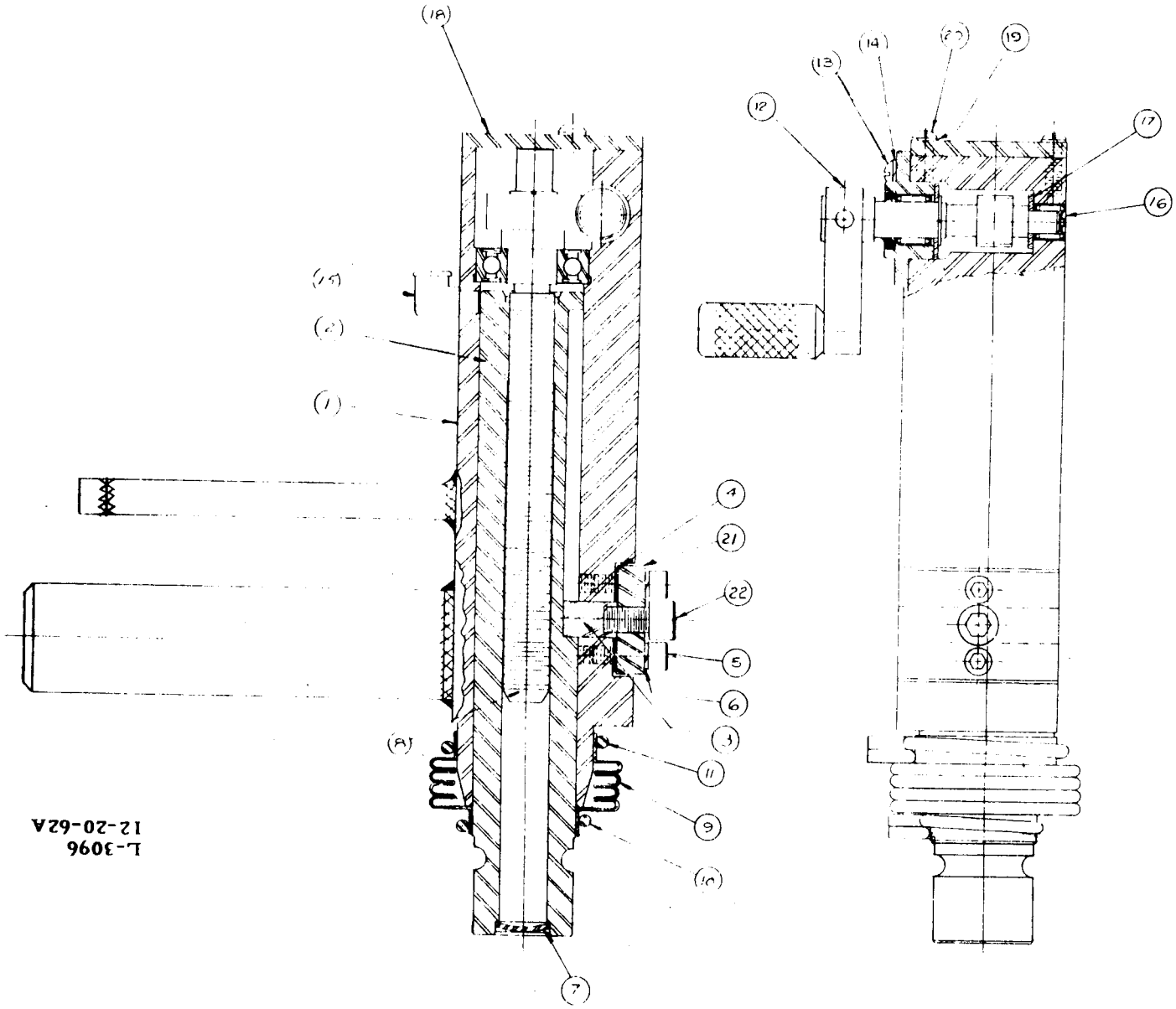
LAF-5 and LT-3, -4 & -34
FLUX HOPPER ASSEMBLY



ITEM	PART NAME AND DESCRIPTION	PART NO.	NO. REQ'D.
D	Flux Hopper Assembly, Includes Items 225 Thru 254 Plus 262 and 263	L-3194-F	1
	Flux Hopper Base Assembly, Includes Items 225 Thru 227, 229, 234 and 235	L-3194-E	1
225	Flux Hopper Base	L-3100	1
226	Flux Gate Spring	T-10573	2
227	Wear Plate	T-10600	2
229	Flux Gate Assembly	S-10131-2	1
234	Flux Tube Assembly	S-10130	1
235	Sems Screw - Flux Tube Assembly to Base	T-10082-4	4
250	Flux Hopper	M-8262	1
251	Sems Screw - Hopper to Base	T-10082-4	4
252	Gasket - Between Flux Tube Assembly and Hopper	T-10545	1
253	Washer - Mounts on Flux Hopper	S-9262-4	3
254	Hex Head Bolt - Mounts in Flux Hopper	3/8-16 x 3/8	3
262	Plug Button - Mounts in Flux Hopper	T-10397-3	1
263	Plug Button - Mounts in Flux Hopper	T-10397-4	1
256	Hex Head Bolt	1/4-20 x 5/8	4
257	Insulating Tube	T-7028-5	4
258	Insulating Washer	S-10773-11	4
259	Washer	S-9262-23	4
260	Lockwasher	E-106-A-2	4
261	Insulator	S-10143	1
	Flux Hopper Mounting Bracket, LT-3, 4 and 34 Only	M-9815	1

The Lincoln Electric Company
Cleveland, Ohio 44117

LAF-3, -4, -5 & NA-1
LT-3, -4 & -34
VERTICAL HEAD LIFT ASSEMBLY



LUBRICATION INFORMATION

1. APPLY A LAYER OF LG-1 GREASE TO THE INTERNAL SCREW THREADS ON ITEM NO 2. APPLY A THIN LAYER OF GREASE TO THE O.D. OF ITEM NO 2 AND THE I.D. OF LONG HOLE IN ITEM NO 1. SLIDE ITEM 2 INTO ITEM 1.
2. APPLY GREASE TO ENTIRE SCREW SURFACE ON ASSLY ITEM 8. SCREW ITEM 2 & 8 TOGETHER. FILL UPPER CHAMBER ½ FULL OF GREASE.
3. MAKE SURE NEEDLE BEARINGS ARE PACKED WITH GREASE BEFORE FINAL ASSLY

April 1963

ITEM	PART NAME & DESCRIPTION	PART NO.	NO. REQ'D	1 2 3	4 5 6
	Vertical Head Lift Assembly, LAF-3, 4 and 5 and NA-1 Includes all Items Marked "X" in Column 1	K-29	1	x . .	.
	Vertical Head Lift Assembly, DC (Front) Head of LT-34 BELOW CODE 4980 ONLY, Includes all Items Marked "X" in Column 2	K-79 (Order K-92-T and Kit L-4050)	1	. x .	.
	Vertical Head Lift Assembly, LT-3, 4 and AC (Rear) Head of LT-34, BELOW CODE 4980 ONLY, Includes all Items Marked "X" in Column 3	K-78 (Order K-92-S)	1	. . x	.
	Vertical Head Lift Assembly, LT-3, 4 and 34 Above Code 4980 Includes all Parts Marked "X" in Column 4	K-92-S (LT-3 & 4) K-92-T (LT-34)	1 1	. . . . . .	x x
	Head Lift Assembly - Includes Items 1 Through 20	L-3096	1	x . .	.
1	Head Lift Assembly - Includes Items 1 Through 20	L-3096-1	1	. x .	.
1	Head Lift Assembly - Includes Items 1 Through 20	L-3096-2	1	. . x	x
1	Head Lift Body	L-3092	1	x . .	.
1	Head Lift Body	L-3092-1	1	. x .	.
1	Head Lift Body	L-3092-2	1	. . x	x
2	Head Lift Tube	M-8228	1	x x x	x
3	Locating Key	T-12121	1	x x x	x
4	Shim	T-10601	As Req'd	x x x	x
5	Socket Head Screw - Locking Key to Body	T-9447-3	2	x x x	x
6	Lockwasher	E-106-A-2	2	x x x	x
7	Expansion Plug	T-10442-1	1	x x x	x
8	Lift Screw Assembly - Includes:	S-10114	1	x x x	x
	Head Lift Screw	-10094	1	x x x	x
	Ball Bearing	M-9300-6	1	x x x	x
	Snap Ring	S-9776-3	1	x x x	x
	Gear	S-10096-1	1	x x x	x
	Woodruff Key	#404	1	x x x	x
9	Boot	S-10442	1	x x x	x
10	Clamp	S-10888-11	1	x x x	x
11	Clamp	S-10888-10	1	x x x	x
12	Adjusting Shaft Assembly - Includes:	S-10097	1	x x x	x
	Crank Arm Assembly	T-10543	1	x x x	x
	Snap Ring	S-9776-3	1	x x x	x
	Thrust Washer	S-9262-38	1	x x x	x
	Drive Pin	T-8433	1	x x x	x
	Shaft	T-10544	1	x x x	x
	Bearing Retainer	S-10093	1	x x x	x
	Needle Bearing	S-7844	1	x x x	x
	Oil Seal	S-7611-13	1	x x x	x
13	Round Head Screw - Adjusting Shaft Assembly to Body	#10-24 x 1/2	2	x x x	x
14	Lockwasher - Adjusting Shaft Assembly to Body	E-106-A-1	2	x x x	x
15	Oil Cup	T-10643	1	x . .	.
15	Oil Cup	T-10397-8	1	. x x	x
16	Needle Bearing	S-10116	1	x x x	x
17	Thrust Washer	S-9262-37	1	x x x	x
18	Cover Plate	S-10089	1	x x x	x
19	Lockwasher	E-106-A-1	2	x x x	x
20	Round Head Screw	#10-24 x 1/2	2	x x x	x
21	Locking Plate	T-12120	1	x x x	x
22	Socket Head Screw	T-9447-34	1	x x x	x
	Following Parts Not Illustrated				
	Head Adjustment Stop	T-10602	2	x . .	.
	Washer - Use With Head Adjustment Stop	S-9262-4	2	x . .	.
	Hex Head Bolt - Use With Head Adjustment Stop	3/8-16 x 1	2	x . .	.
	Head Adjustment Lock	S-10086	1	x . .	.
	Hex Head Bolt - Use With Head Adjustment Lock	1/2-13 x 2-3/4	1	x . .	.
	Roll Pin - Use With Head Adjustment Lock	S-9976-13	1	x . .	.
	Extension Bracket, Lift Adjuster to Main Post	S-12000	1	. x x	.
	Extension Bracket, Lift Adjuster to Main Post	S-12355	1	. . .	x
	Head Mounting Bracket, Head to Lift Adjuster	S-12005	1	. x x	.
	Head Mounting Bracket, Head to Lift Adjuster	S-12005-1 (LT-34)	1	. . .	x
	Head Mounting Bracket, Head to Lift Adjuster	S-12005-2 (LT-3 & 4)	1	. . .	x
	Roll Pin, Mounting Bracket to Lift Adjuster	T-9967-7	1	. x x	.
	Draw Bolt	T-4893-2	2	. x x	.
	Hex Nut	3/4-10	2	. x x	.