LINCOLN ELECTRIC

GENUINE LINCOLN PARTS™

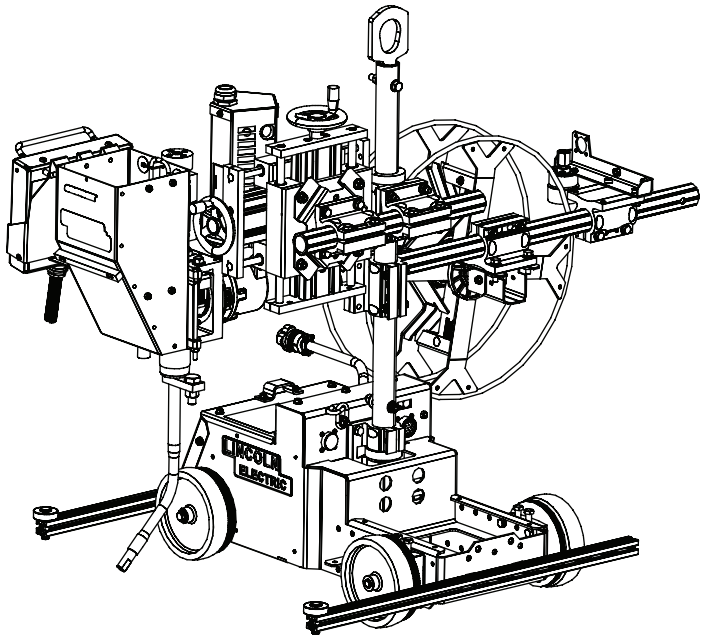
NOTE: This manual will cover most of the troubleshooting and repair procedures for the code numbers listed. Some variances may exist when troubleshooting/repairing later code numbers.

CRUISER™ & CRUISER TANDEM™ TRACTOR

For use with machines having Code Numbers:

11767, 11824, 11910,
12332, 12452

SERVICE MANUAL



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⚠ WARNING

⚠ CALIFORNIA PROPOSITION 65 WARNINGS ⚠

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

The Above For Diesel Engines

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

The Above For Gasoline Engines

ARC WELDING can be hazardous. PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING.

Read and understand the following safety highlights. For additional safety 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 or CSA Standard W117.2-1974. A Free copy of "Arc Welding Safety" booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.

FOR ENGINE powered equipment.

1.a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.

1.b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.

1.c. Do not add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.

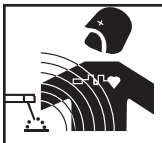
1.d. Keep all equipment safety guards, covers and devices in position and in good repair.Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

1.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

1.f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.

1.g. 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.

1.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.



ELECTRIC AND MAGNETIC FIELDS may be dangerous

2.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines

2.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.

2.c. Exposure to EMF fields in welding may have other health effects which are now not known.

2.d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

2.d.1. Route the electrode and work cables together - Secure them with tape when possible.

2.d.2. Never coil the electrode lead around your body.

2.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.

2.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.

2.d.5. Do not work next to welding power source.

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ELECTRIC SHOCK can kill.

3.a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Do not touch these "hot" parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.

3.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.

In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:

- **Semiautomatic DC Constant Voltage (Wire) Welder.**
- **DC Manual (Stick) Welder.**
- **AC Welder with Reduced Voltage Control.**

3.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically "hot".

3.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.

3.e. Ground the work or metal to be welded to a good electrical (earth) ground.

3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.

3.g. Never dip the electrode in water for cooling.

3.h. 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.

3.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.

3.j. Also see Items 6.c. and 8.

ARC RAYS can burn.

4.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. I standards.

4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.

4.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.

FUMES AND GASES can be dangerous.

5.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 with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and within applicable OSHA PEL and ACGIH TLV limits using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required. Additional precautions are also required when welding on galvanized steel.**

5.b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically thereafter to be certain it is within applicable OSHA PEL and ACGIH TLV limits.

5.c. 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.

5.d. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.

5.e. Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer's safety practices. MSDS forms are available from your welding distributor or from the manufacturer.

5.f. Also see item 1.b.

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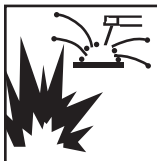

WELDING and CUTTING SPARKS can cause fire or explosion.

6.a. Remove fire hazards from the welding 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. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

6.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.

6.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.

6.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 from the American Welding Society (see address above).

6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.

6.f. Sparks and spatter are thrown from the welding arc. Wear 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 with side shields when in a welding area.

6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away 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.

6.h. Also see item 1.c.

6.I. Read and follow NFPA 51B " Standard for Fire Prevention During Welding, Cutting and Other Hot Work", available from NFPA, 1 Batterymarch Park,PO box 9101, Quincy, Ma 022690-9101.

6.j. Do not use a welding power source for pipe thawing.

CYLINDER may explode if damaged.

7.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.

7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.

7.c. Cylinders should be located:
- Away from areas where they may be struck or subjected to physical damage.
- A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.

7.d. Never allow the electrode, electrode holder or any other electrically "hot" parts to touch a cylinder.

7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.

7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-l, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.

FOR ELECTRICALLY powered equipment.

8.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.

8.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer's recommendations.

8.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer's recommendations.

Refer to **http://www.lincolnelectric.com/safety** for additional safety information.

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PRÉCAUTIONS DE SÛRETÉ

Pour votre propre protection lire et observer toutes les instructions et les précautions de sûreté specifiques qui parraissent dans ce manuel aussi bien que les précautions de sûreté générales suivantes:

Sûreté Pour Soudage A L'Arc

1. Protegez-vous contre la secousse électrique:

   a. Les circuits à l'électrode et à la piéce sont sous tension quand la machine à souder est en marche. Eviter toujours tout contact entre les parties sous tension et la peau nue ou les vétements mouillés. Porter des gants secs et sans trous pour isoler les mains.
   b. Faire trés attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher metallique ou des grilles metalliques, principalement dans les positions assis ou couché pour lesquelles une grande partie du corps peut être en contact avec la masse.
   c. Maintenir le porte-électrode, la pince de masse, le câble de soudage et la machine à souder en bon et sûr état defonctionnement.
   d. Ne jamais plonger le porte-électrode dans l'eau pour le refroidir.
   e. Ne jamais toucher simultanément les parties sous tension des porte-électrodes connectés à deux machines à souder parce que la tension entre les deux pinces peut être le total de la tension à vide des deux machines.
   f. Si on utilise la machine à souder comme une source de courant pour soudage semi-automatique, ces precautions pour le porte-électrode s'applicuent aussi au pistolet de soudage.

2. Dans le cas de travail au dessus du niveau du sol, se protéger contre les chutes dans le cas ou on recoit un choc. Ne jamais enrouler le câble-électrode autour de n'importe quelle partie du corps.

3. Un coup d'arc peut être plus sévère qu'un coup de soliel, donc:

   a. Utiliser un bon masque avec un verre filtrant approprié ainsi qu'un verre blanc afin de se protéger les yeux du rayonnement de l'arc et des projections quand on soude ou quand on regarde l'arc.
   b. Porter des vêtements convenables afin de protéger la peau de soudeur et des aides contre le rayonnement de l'arc.
   c. Protéger l'autre personnel travaillant à proximité au soudage à l'aide d'écrans appropriés et non-inflammables.

4. Des gouttes de laitier en fusion sont émises de l'arc de soudage. Se protéger avec des vêtements de protection libres de l'huile, tels que les gants en cuir, chemise épaisse, pantalons sans revers, et chaussures montantes.

5. Toujours porter des lunettes de sécurité dans la zone de soudage. Utiliser des lunettes avec écrans lateraux dans les zones où l'on pique le laitier.

6. Eloigner les matériaux inflammables ou les recouvrir afin de prévenir tout risque d'incendie dû aux étincelles.

7. Quand on ne soude pas, poser la pince à une endroit isolé de la masse. Un court-circuit accidental peut provoquer un échauffement et un risque d'incendie.

8. S'assurer que la masse est connectée le plus prés possible de la zone de travail qu'il est pratique de le faire. Si on place la masse sur la charpente de la construction ou d'autres endroits éloignés de la zone de travail, on augmente le risque de voir passer le courant de soudage par les chaines de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'echauffement des chaines et des câbles jusqu'à ce qu'ils se rompent.

9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particuliérement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumeés toxiques.

10. Ne pas souder en présence de vapeurs de chlore provenant d'opérations de dégraissage, nettoyage ou pistolage. La chaleur ou les rayons de l'arc peuvent réagir avec les vapeurs du solvant pour produire du phosgéne (gas fortement toxique) ou autres produits irritants.

11. Pour obtenir de plus amples renseignements sur la sûreté, voir le code "Code for safety in welding and cutting" CSA Standard W 117.2-1974.

PRÉCAUTIONS DE SÛRETÉ POUR LES MACHINES À SOUDER À TRANSFORMATEUR ET À REDRESSEUR

1. Relier à la terre le chassis du poste conformement au code de l'électricité et aux recommendations du fabricant. Le dispositif de montage ou la piece à souder doit être branché à une bonne mise à la terre.

2. Autant que possible, l'installation et l'entretien du poste seront effectués par un électricien qualifié.

3. Avant de faires des travaux à l'interieur de poste, la debrancher à l'interrupteur à la boite de fusibles.

4. Garder tous les couvercles et dispositifs de sûreté à leur place.

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Electromagnetic Compatibility (EMC)

Conformance
Products displaying the CE mark are in conformity with European Community Council Directive of 15 Dec 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility, 2004/108/EC. It was manufactured in conformity with a national standard that implements a harmonized standard: EN 60974-10 Electromagnetic Compatibility (EMC) Product Standard for Arc Welding Equipment. It is for use with other Lincoln Electric equipment. It is designed for industrial and professional use.

Introduction
All electrical equipment generates small amounts of electromagnetic emission. Electrical emission may be transmitted through power lines or radiated through space, similar to a radio transmitter. When emissions are received by other equipment, electrical interference may result. Electrical emissions may affect many kinds of electrical equipment; other nearby welding equipment, radio and TV reception, numerical controlled machines, telephone systems, computers, etc. Be aware that interference may result and extra precautions may be required when a welding power source is used in a domestic establishment.

Installation and Use
The user is responsible for installing and using the welding equipment according to the manufacturer's instructions. If electromagnetic disturbances are detected then it shall be the responsibility of the user of the welding equipment to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing (grounding) the welding circuit, see Note. In other cases it could involve construction of an electromagnetic screen enclosing the power source and the work complete with associated input filters. In all cases electromagnetic disturbances must be reduced to the point where they are no longer troublesome.

Note: The welding circuit may or may not be earthed for safety reasons according to national codes. Changing the earthing arrangements should only be authorized by a person who is competent to access whether the changes will increase the risk of injury, e.g., by allowing parallel welding current return paths which may damage the earth circuits of other equipment.

Assessment of Area
Before installing welding equipment the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account:

a) other supply cables, control cables, signaling and telephone cables; above, below and adjacent to the welding equipment;

b) radio and television transmitters and receivers;

c) computer and other control equipment;

d) safety critical equipment, e.g., guarding of industrial equipment;

e) the health of the people around, e.g., the use of pacemakers and hearing aids;

f) equipment used for calibration or measurement

g) the immunity of other equipment in the environment. The user shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures;

h) the time of day that welding or other activities are to be carried out.

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Electromagnetic Compatibility (EMC)

The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

Methods of Reducing Emissions

Mains Supply
Welding equipment should be connected to the mains supply according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the mains supply. Consideration should be given to shielding the supply cable of permanently installed welding equipment, in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the welding power source so that good electrical contact is maintained between the conduit and the welding power source enclosure.

Maintenance of the Welding Equipment
The welding equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the welding equipment is in operation. The welding equipment should not be modified in any way except for those changes and adjustments covered in the manufacturers instructions. In particular, the spark gaps of arc striking and stabilizing devices should be adjusted and maintained according to the manufacturer's recommendations.

Welding Cables
The welding cables should be kept as short as possible and should be positioned close together, running at or close to floor level.

Equipotential Bonding
Bonding of all metallic components in the welding installation and adjacent to it should be considered. However, metallic components bonded to the work piece will increase the risk that the operator could receive a shock by touching these metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

Earthing of the Workpiece
Where the workpiece is not bonded to earth for electrical safety, not connected to earth because of its size and position, e.g., ships hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by a direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

Screening and Shielding
Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire welding installation may be considered for special applications. [1]

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[1] Portions of the preceding text are contained in EN 60974-10: "Electromagnetic Compatibility (EMC) product standard for arc welding equipment."

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FIGURE E.1 BLOCK LOGIC DIAGRAM

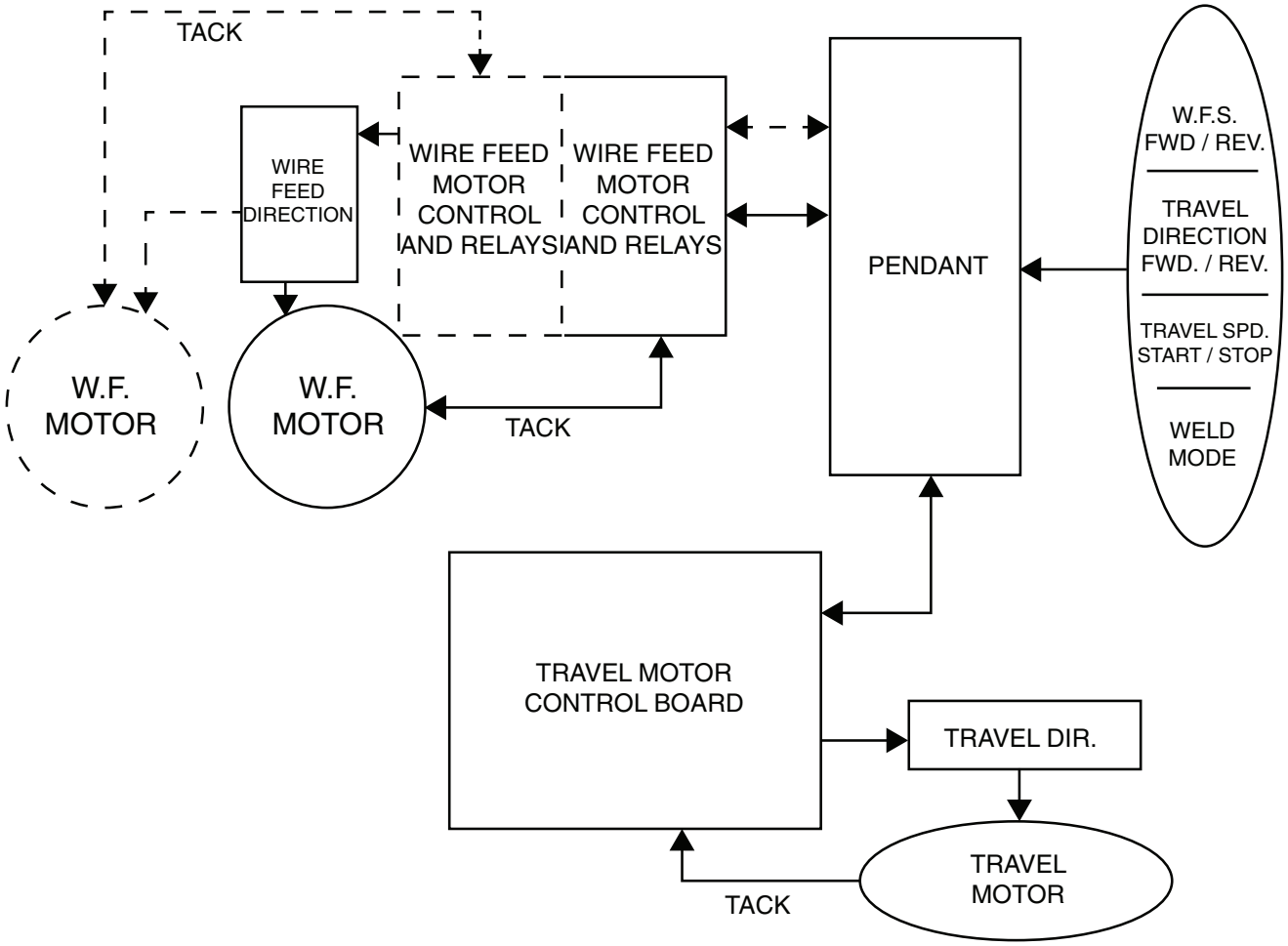
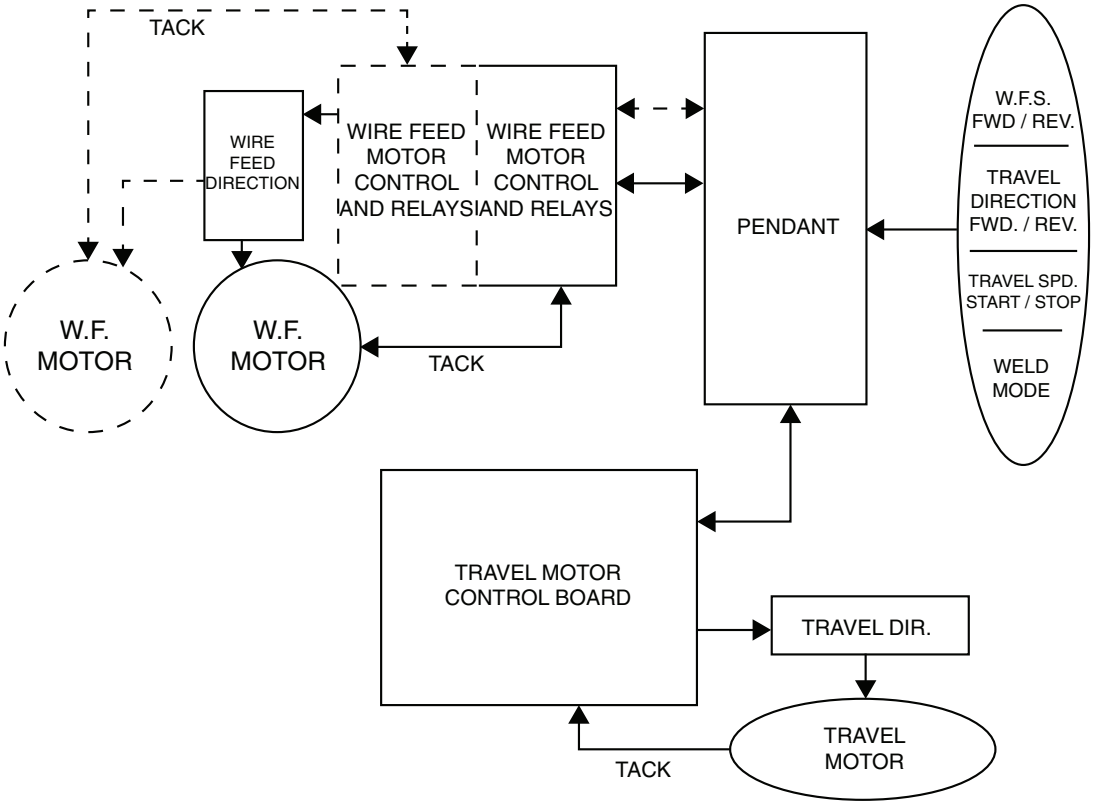


FIGURE E.2 - GENERAL DESCRIPTION



GENERAL DESCRIPTION

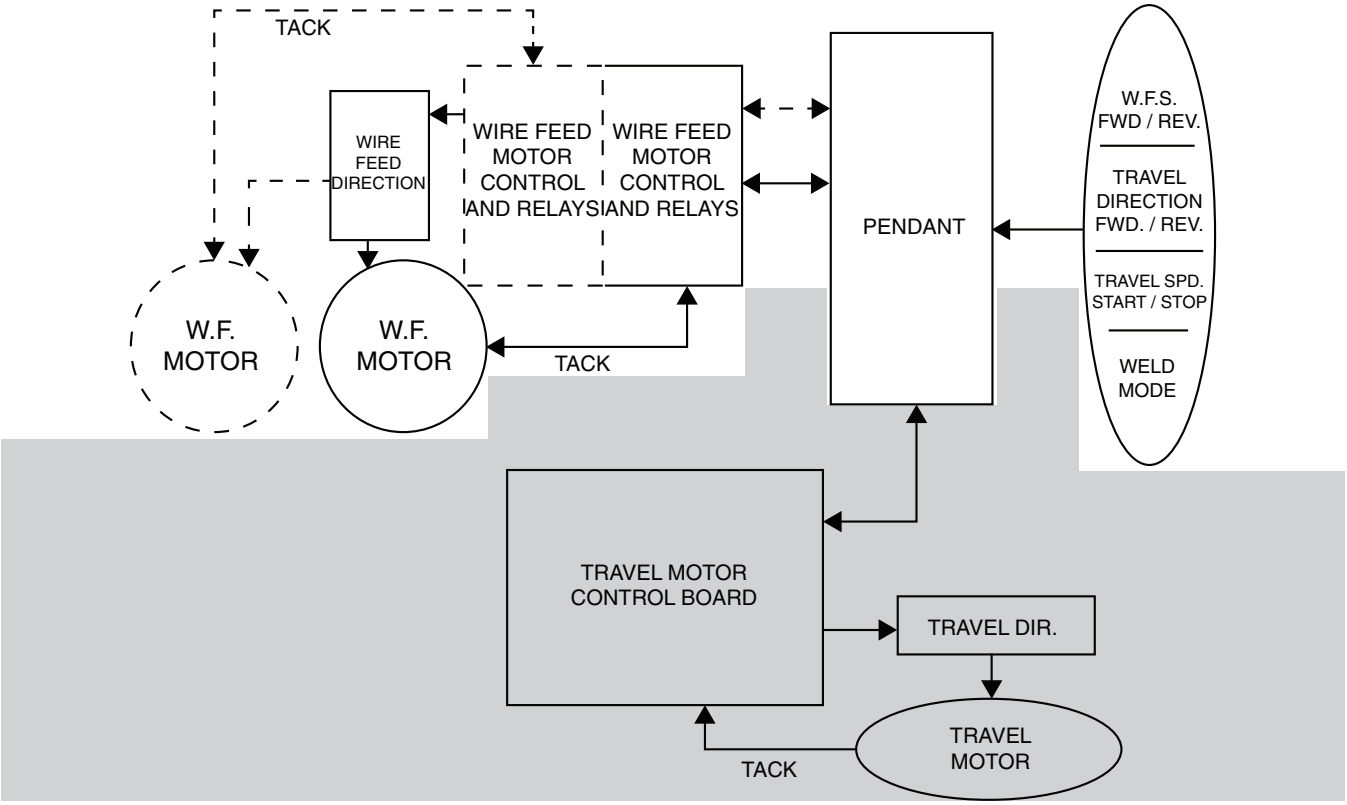
The Cruiser Tractor is a single arc or lead-trail in tandem, wire feeder tractor ideal for welding heavy plate on barges, ships, large tanks, bridge girders and offshore platforms. Deposition rates of up to 30 pounds per hour are possible. Rated 1000 amps at 100% duty cycle.

The Cruiser Tractor has versatile travel capabilities with three or four wheel configurations for use with or without a track.

The Cruiser Tractor is capable of operating with 0.035 to 7/32 inch (0.9 to 5.5 mm) wire, depending on gear box ratio, at speeds of 10 to 100 inches per minute, (254 to 2540 mm/minute).

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

FIGURE E.3 - WIRE FEED MOTOR CONTROL BOARD AND USER PENDANT

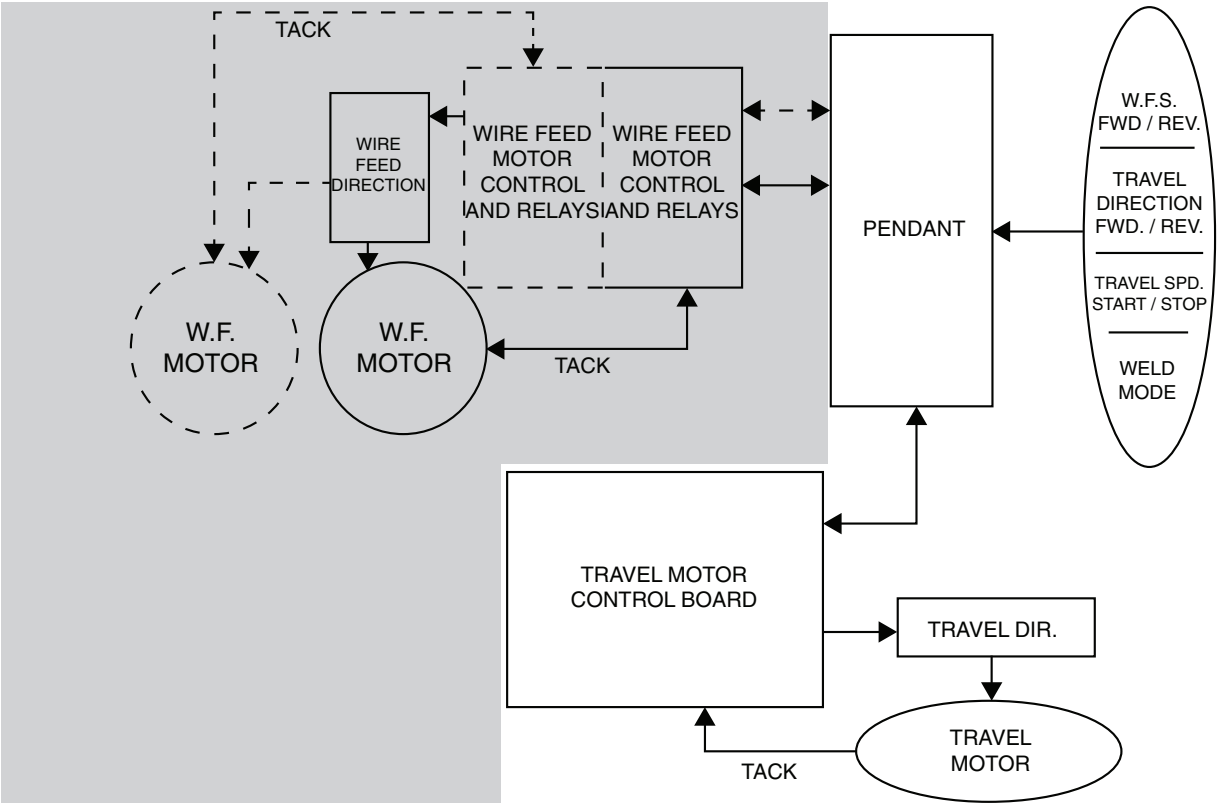


WIRE FEED MOTOR CONTROL BOARD AND USER PENDANT

The user pendant allows for input of wire feed speed, travel speed, direction and starting/stopping. Communication between the pendant and the wire feed control board enables the operator to make long subarc welds. The wire feed direction is determined by the wire feed direction relay, controlled by the wire feed control board based on the user pendant and weld mode requirements.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

FIGURE E.4 - TRAVEL MOTOR CONTROL BOARD



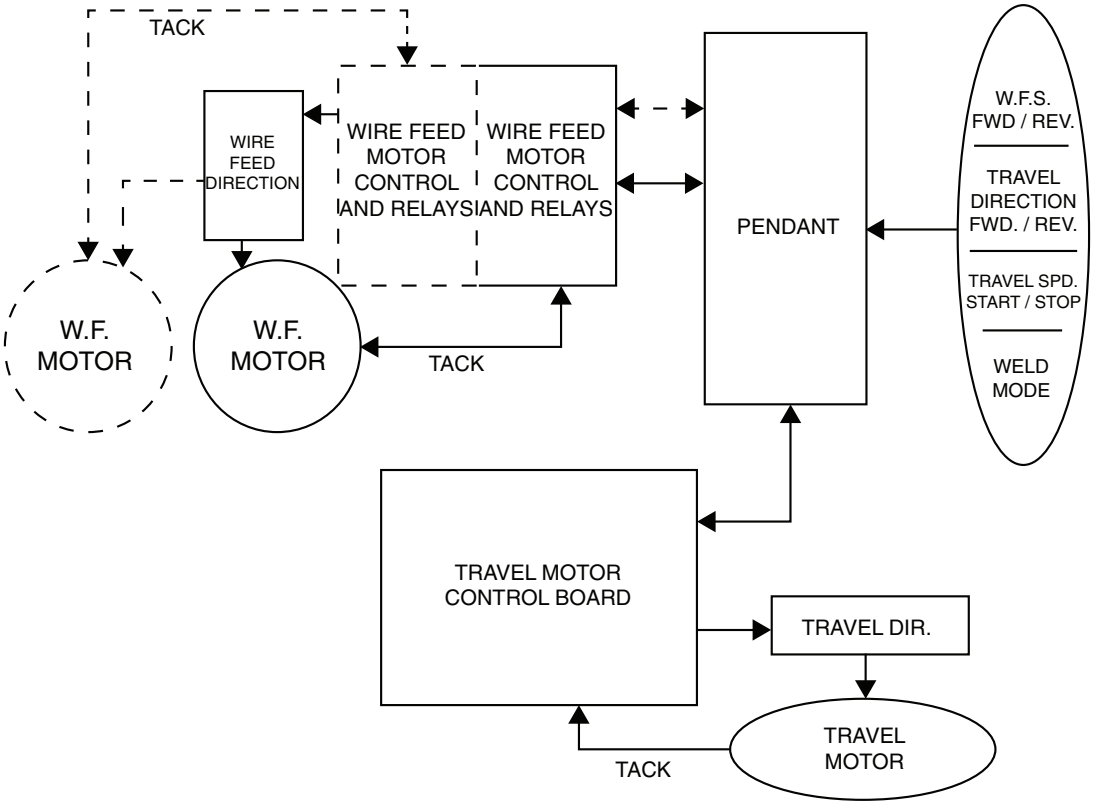
TRAVEL MOTOR CONTROL BOARD

The travel motor control board works with the power source and the user pendant to determine the speed of travel in which the tractor needs to move. The travel direction relay provides forward or reverse direction as determined by the user pendant.

Note: The travel motor and wire feed motor control boards are physically identical but are **NOT** interchangeable. Each board is software programmed to do a specific task.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

FIGURE E.5 - CRUISER POWER & COMMUNICATION



CRUISER POWER AND COMMUNICATION

40 VDC is supplied from the power source to the Cruiser Tractor. Communication to the tractor and power source is carried out through the communication link in the arc link cable. The arc voltage is communicated to the power source directly from the tractor.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

NOTES

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HOW TO USE TROUBLESHOOTING GUIDE

⚠ WARNING

Service and Repair should only be performed by Lincoln Electric Factory Trained Personnel. Unauthorized repairs performed on this equipment may result in danger to the technician and machine operator and will invalidate your factory warranty. For your safety and to avoid Electrical Shock, please observe all safety notes and precautions detailed throughout this manual.

This Troubleshooting Guide is provided to help you locate and repair possible machine malfunctions. Simply follow the three-step procedure listed below.

Step 1. LOCATE PROBLEM (SYMPTOM).
Look under the column labeled "PROBLEM (SYMPTOMS)". This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting. Symptoms are grouped into the following categories: wire feeding problems, function problems, output problems and travel problems.

Step 2. PERFORM EXTERNAL TESTS.
The second column labeled "POSSIBLE AREAS OF MISADJUSTMENT(S)" lists the obvious external possibilities that may contribute to the machine symptom. Perform these tests/checks in the order listed. In general, these tests can be conducted without removing the case wrap-around cover.

Step 3. RECOMMENDED COURSE OF ACTION
The last column labeled "Recommended Course of Action" lists the most likely components that may have failed in your machine. It also specifies the appropriate test procedure to verify that the subject component is either good or bad. If there are a number of possible components, check the components in the order listed to eliminate one possibility at a time until you locate the cause of your problem.

All of the referenced test procedures referred to in the Troubleshooting Guide are described in detail at the end of this chapter. Refer to the Troubleshooting and Repair Table of Contents to locate each specific Test Procedure. All of the specified test points, components, terminal strips, etc. can be found on the referenced electrical wiring diagrams and schematics. Refer to the Electrical Diagrams Section Table of Contents to locate the appropriate diagram.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

PC BOARD TROUBLESHOOTING PROCEDURES

⚠ WARNING

ELECTRIC SHOCK can kill.

- Have an electrician install and service this equipment. Turn the input power OFF at the fuse box before working on equipment. Do not touch electrically hot parts.

⚠ CAUTION

Sometimes machine failures appear to be due to PC board failures. These problems can sometimes be traced to poor electrical connections. To avoid problems when troubleshooting and replacing PC boards, please use the following procedure:

1. Determine to the best of your technical ability that the PC board is the most likely component causing the failure symptom.
2. Check for loose connections at the PC board to assure that the PC board is properly connected.
3. If the problem persists, replace the suspect PC board using standard practices to avoid static electrical damage and electrical shock. Read the warning inside the static resistant bag and perform the following procedures:

PC board can be damaged by static electricity.

ATTENTION Static-Sensitive Devices Handle only at Static-Safe Workstations

- Remove your body's static charge before opening the static-shielding bag. Wear an anti-static wrist strap. For safety, use a 1 Meg ohm resistive cord connected to a grounded part of the equipment frame.

- If you don't have a wrist strap, touch an un-painted, grounded, part of the equipment frame. Keep touching the frame to prevent static build-up. Be sure not to touch any electrically live parts at the same time.

- Tools which come in contact with the PC board must be either conductive, anti-static or static-dissipative.

- Remove the PC board from the static-shielding bag and place it directly into the equipment. Don't set the PC board on or near paper, plastic or cloth which could have a static charge. If the PC board can't be installed immediately, put it back in the static-shielding bag.

- If the PC board uses protective shorting jumpers, don't remove them until installation is complete.

- If you return a PC board to The Lincoln Electric Company for credit, it must be in the static-shielding bag. This will prevent further damage and allow proper failure analysis.

4. Test the machine to determine if the failure symptom has been corrected by the replacement PC board.

NOTE: It is desirable to have a spare (known good) PC board available for PC board troubleshooting.

NOTE: Allow the machine to heat up so that all electrical components can reach their operating temperature.

5. Remove the replacement PC board and substitute it with the original PC board to recreate the original problem.
   a. If the original problem does not reappear by substituting the original board, then the PC board was not the problem. Continue to look for bad connections in the control wiring harness, junction blocks, and terminal strips.
   b. If the original problem is recreated by the substitution of the original board, then the PC board was the problem. Reinstall the replacement PC board and test the machine.
6. Always indicate that this procedure was followed when warranty reports are to be submitted.

NOTE: Following this procedure and writing on the warranty report, "INSTALLED AND SWITCHED PC BOARDS TO VERIFY PROBLEM," will help avoid denial of legitimate PC board warranty claims.

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
WIRE FEEDING PROBLEMS		
The wire feeder does not feed wire, drive rolls do not spin and pendant is not lit.	1. Verify the power source is turned on. 2. Verify the circuit breaker for the wire feeder power on the power source has not tripped. 3. Verify power is being supplied to the tractor. 4. Verify the cable to the wire drive is connected to the base of the Cruiser™ tractor. 5. Verify that the cable is connected to the pendant.	1. Turn on the welding power source. Perform the ***Input Voltage Test***. 2. Perform the ***Pendant Test***.
The wire feeds erratically, or a motor overload error occurs.	1. Verify the correct drive rolls and guides are installed in the wire drive. 2. Check for sharp bends in the wire path. 3. Examine the contact tip for wear and proper size. 4. The pressure arm setting is too high. 5. Verify the coil of wire rotates with no more than moderate resistance. 6. Inspect the brushes on the wire drive motor.	1. Perform the ***Wire Feed Motor PC Board and Relay Test***. 2. Perform the ***Wire Feed Motor Tachometer Test***.
The wire drive feeds wire in the wrong direction.	1. P19 parameter is set wrong.	1. Change parameter P19 in the setup menu. See the ***Setup Features Menu*** in the Operations section.
The wire feed system is consistently wrong but not the maximum value. When the inch speed is adjusted, the wire feed system changes.	1. Verify that parameter P18 and gear ratio installed in the wire drive match. The Cruiser™ tractor ships with 142:1 gears.	1. Change P18 in the setup menu to match the gear ratio installed in the wire drive. See the ***Setup Features Menu*** in the operations section of this manual.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
WIRE FEEDING PROBLEMS		
The wire feed system runs at maximum.	1. Check the tachometer leads connecting the wire drive cable to the Cruiser Tractor base.	1. Repair the tachometer leads, or replace the tachometer. 2. Perform the ***Wire Feed Motor Tachometer Test***.
The wire feed system feeds in only one direction.	1. Check the wire drive relay.	1. Perform the ***Wire Feed Motor PC Board and Relay Test***. 2. Perform the ***Wire Feed PC Board Test***.
When the welding arc is activated, the drive rolls spin but no arc is present.	1. Check all electrode and work connections.	1. If all recommended possible areas of misadjustment have been checked and the problem persists, contact the Lincoln Electric Service Department at 1-888-935-3877.
The Cruiser™ welds for a short period, then the arc goes out, the wire stops, travel continues and no error codes are displayed on the pendant.	1. Check for loose or damaged work and electrode sense leads.	
The arc goes to full output. High output - No control.	1. Verify work sense lead is making a good connection and there is no damage to the lead. 2. Check the electrode sense lead at the Cruiser™ and make sure it is a good connection.	1. Perform the ***Voltage Sense Board Test***. 2. If all recommended possible areas of misadjustment have been checked and the problem persists, contact the Lincoln Electric Service Department at 1-888-935-3877.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
Frequency and balance do not appear on the display.	1. DC waveform has been selected.	1. Switch to square wave or sine wave mode. **Note:** No balance in sine wave mode.
Wire does not feed when inching up or down. Pendant is lit and travel motor works.	1. Check connections on reversing relay and at feed motor rectifier as well as feed motor PC Board. See Wiring Diagram.	1. Perform the ***Rectifier Test***. 2. Perform the ***Pendant Module Board Test***. 3. Perform the ***Wire Feed Motor P.C. Board And Relay Test***.
Wire "Burn Back" to contact tip.	1. Confirm 67 and 21 sense leads (electrode and work) are connected. 2. Confirm the weld mode number selected is correct for the size/type of welding you are using.	1. Perform the ***Voltage Sense PC Board Test.***

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
A wire drive motor overload occurs. (Error 81)	1. Examine the contact tip for wear and proper size. Replace as necessary. 2. Verify the correct drive rolls and inner wire guide are installed in the wire drive. 3. Do not use more idle roll pressure than necessary. Check for proper setting. 4. Verify that the wire pulls easily through the take-off arm bushing and conduit. 5. Check that the wire straightener is not exerting excessive load on the wire. 6. If using 57:1 gear ratio, switch to 95:1 or 142:1. 7. If using 95:1 gear ratio, switch to 142:1.	1. If all recommended possible areas of misadjustment have been checked and the problem persists, contact the Lincoln Electric Service Department at 1-888-935-3877.
A travel motor overload occurs. (Error 81)	1. Verify the Cruiser™ rolls freely when the clutch is disengaged. 2. Check for excessive loads caused by dragging long cables. 3. When using the outriggers to steer the Cruiser™, set the offset between the front and rear outriggers at 0.5” (12.7mm). 4. Verify the front wheels are perfectly straight.	
Error 215	1. Check that all of the DIP switches on travel drive board and the wire drive board are in the OFF position.	
Frequency and balance do not appear on the display.	1. Verify a AC square wave weld mode has been selected.	

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The wire feeder does not feed wire and the drive rolls do not spin.	1. Verify the power source is turned on. 2. Verify the circuit breaker for the wire feeder power. 3. Verify power is being supplied to the wire feeder. 4. Check that any equipment connected to the external shut-off inputs have not faulted.	1. If all recommended possible areas of misadjustment have been checked and the problem persists, contact the Lincoln Electric Service Department at 1-888-935-3877.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
TRAVEL PROBLEMS		
The Cruiser Tractor travels in only one direction.	1. Check the travel relay.	1. Perform the ***Travel Motor And Relay Test Procedure.***
The Cruiser Tractor does not travel.	1. Verify the clutch is engaged. 2. Verify the rear wheels are tightened to the axle. 3. Insure travel switch is set on AUTO. 4. Verify the worm on the travel motor spins. 5. Inspect the travel motor brushes.	1. Replace the travel motor brushes if necessary. 2. Perform the ***Travel Motor And Relay Test Procedure.***
The Cruiser Tractor travels only at a fast speed.	1. Verify the travel motor tachometer is operating correctly.	1. Perform the ***Travel Tachometer Test.***

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

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NOTES

INPUT VOLTAGE TEST PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

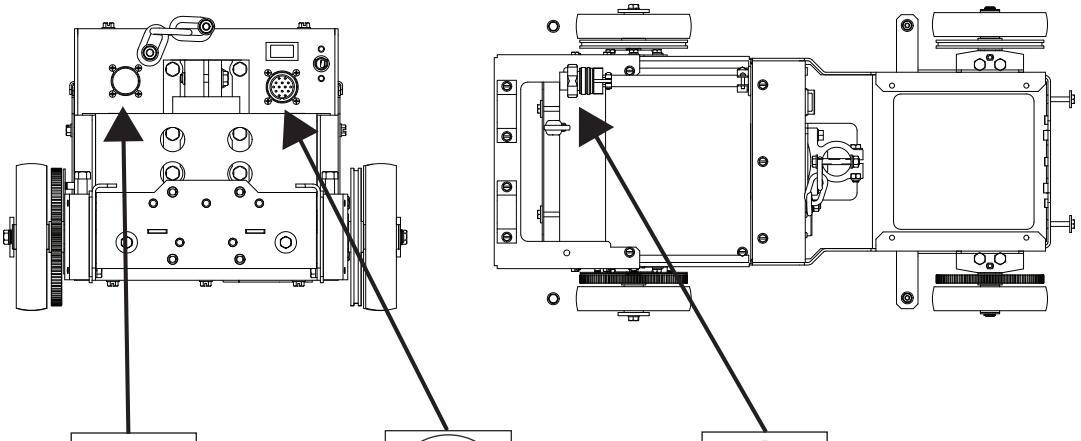
This procedure will aid the technician in determining that the path for input power, communication and voltage feedback is complete.

MATERIALS NEEDED

Digital Volt/Ohmmeter
Static Grounding Equipment (Wrist Strap)

INPUT VOLTAGE TEST PROCEDURE (continued)

FIGURE F.1 – CONNECTOR LOCATION



CONTROLLER CONNECTOR	
PIN	DEFINITION
A	ARC LINK CAN
B	ARC LINK CAN
C	67 ELECTRODE SENSE
D	+40 VDC
E	COMMON

P7

WIRE FEEDER	
PIN	FUNCTION
A	ARC LINK
B	ARC LINK
C	67 VOLTAGE SENSE
D	+40 VDC
E	COMMON

TRAIL WIRE FEEDER CONNECTOR (TANDEM ONLY)

POWER SOURCE CONNECTOR	
PIN	DEFINITION
A	ARC LINK CAN
B	ARC LINK CAN
C	67 ELECTRODE SENSE
D	+40 VDC
E	COMMON

J10

PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Have a qualified individual install and service this equipment.**
- **Turn the input supply power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**

---

1. Disconnect the pendant to tractor connector J7-P7 at the base roof.
2. Disconnect the control cable to tractor connector J10. See Figure F.1.

ATTENTION Static-Sensitive Devices Handle only at Static-Safe Workstations

PC board can be damaged by static electricity.

- Remove your body's static charge before opening the static-shielding bag. Wear an anti-static wrist strap. For safety, use a 1 Meg ohm resistive cord connected to a grounded part of the equipment frame.
- If you don't have a wrist strap, touch an un-painted, grounded, part of the equipment frame. Keep touching the frame to prevent static build-up. Be sure not to touch any electrically live parts at the same time.
- Tools which come in contact with the PC board must be either conductive, anti-static or static-dissipative.

INPUT VOLTAGE TEST PROCEDURE (continued)

3. Using a digital volt/ohmmeter and following all static electrical precautions, check for continuity (approximately zero ohms) from A-A, B-B, C-C, D-D and E-E on J10 to P7. See ***Figure F.1***.
4. If the continuity of the pins is good and the tractor does not power up with 40 volts present at pins D and E on the control cable, plug the pendant back into the controller connector (P7) and check that no two pins on the input connector (J10) are in electrical contact with one another.

NOTE: Low ohm readings that change or "count up" to higher values are okay. This test is looking for zero ohms short only.

5. If the tractor appears to be "dead", connect the input arc link cable to the tractor input connector and remove the pendant from the five pin connector located on the tractor roof.
6. Locate pins D and E on the pendant connector and attach voltmeter leads to these pins. See ***Figure F.1.***
7. Turn on the AC/DC 1000 power source or apply 40 volts DC from an external DC power source at the arclink input. Pins D and E (**D must be positive**).
8. If the voltmeter shows 40 VDC, then the supply is complete. Perform the ***Pendant Test Procedure.***
9. The ***Pendant Test Procedure*** will need to be repeated by applying power to the track portion of the TANDEM Cruiser™.

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PENDANT MODULE TEST PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

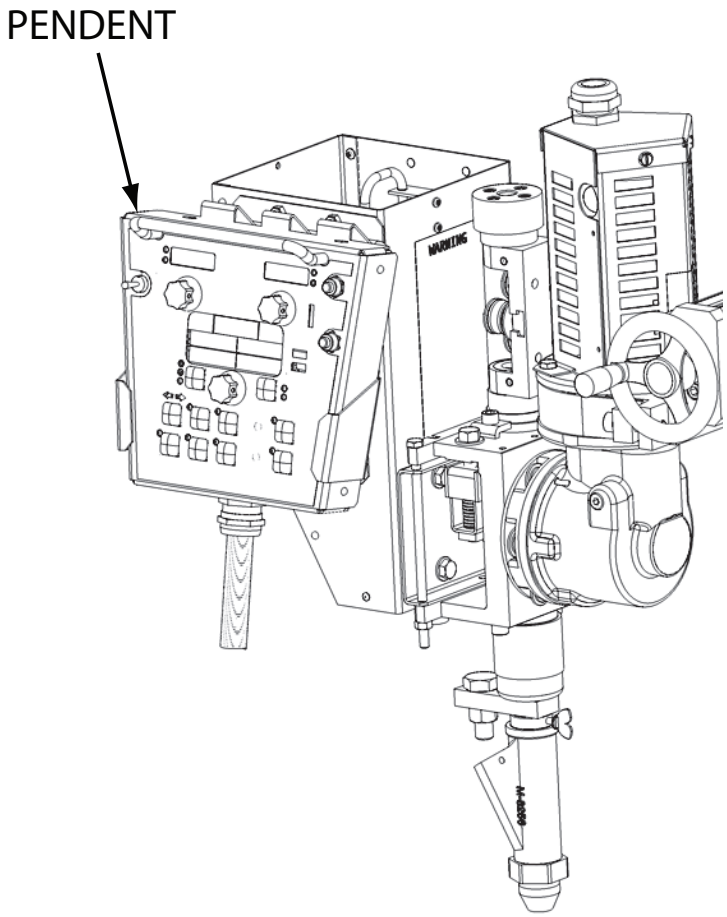
This procedure will aid the technician in the testing of the Operator Pendent.

MATERIALS NEEDED

1/2" Wrench
Digital Voltmeter/Ohmmeter With Frequency Measuring Capability
Cruiser Tractor and AC/DC 1000 Subarc Setup
Wiring Diagram

PENDANT MODULE TEST PROCEDURE (continued)

FIGURE F.2 – PENDENT LOCATION



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Have a qualified individual install and service this equipment.**
- **Turn the input supply power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**

1. Turn off AC/DC 1000 and open input power disconnect. Insure the power is OFF by attempting to turn ON the AC/DC 1000. Leave in the off position.
2. Carefully push each of the pendant push buttons and feel for the click of the switch under each protective pad. Rotate the three encoders, paying close attention to the feel of the shaft within the knobs. If a knob and shaft are loose or come off the pendent, the UI PC board must be replaced. If one or more switches covered with rubber protectors does not actuate, perform the ***UI PC Board Removal And Replacement Procedure***.
3. Using a 1/2" wrench, remove the six torx head machine screws securing the back cover of the pendent box and remove.
4. Turn on the AC / DC 1000. Check for any LED lights on the pendent. If no led's light, check for 40 VDC at pins 3 and 4 at J31 while the input cable to the pendent is plugged into J31. See Wiring Diagram.

PENDANT MODULE TEST PROCEDURE (continued)

5. Switch your meter to measure frequency and check for a frequency at J31 pins 1 and 2. See Wiring Diagram.

If 40 VDC is present and frequency is present, but no led's are lit on the pendent, the pendent PC board is faulty.

If 40 volts is present and all led's appear to function as intended, but nothing operates when required, locate the center tab of the travel switch S1. With power removed, use an ohmmeter and check for continuity from this center tab to the stop push button S2 (Lead #624). See Wiring Diagram.

If an open circuit is indicated, the stop switch is defective. If continuity is present, the stop switch is not faulty.

If 40 volts is **NOT** present, and/or no frequency is present, the pendent itself is not faulty. Check continuity of the five leads from J31 and ground to J82 at the wire drive motor PC board J82. See Wiring Diagram.

With power disconnected from the AC/DC 1000, check continuity from J31 in the pendent. Test pins one through four between the corresponding cavities one through four at the wire drive pc board (upper) in the tractor base. If continuity checks OK, the pendent and cable are not suspect. See the ***Wire Feed Motor PC Board Test.***

6. Perform the ***Retest After Repair Procedure***.

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WIRE FEED MOTOR TACHOMETER TEST PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

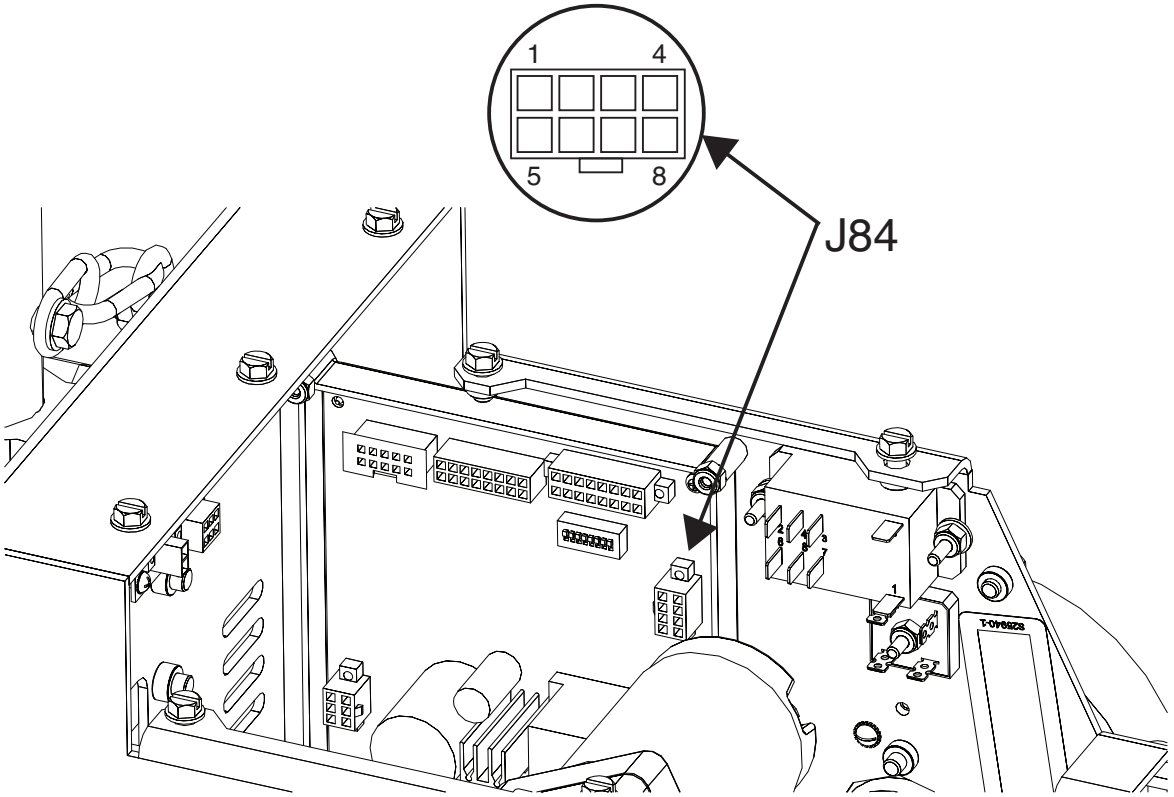
The following procedure will aid the technician in determining the condition of the Wire Feed Motor Tachometer.

MATERIALS NEEDED

Volt/Ohmmeter With Frequency Counting Ability
Access To An Operating AC/ DC 1000 With Software For The Cruiser Tractor
Miscellaneous Hand Tools
Wiring Diagram

WIRE FEED MOTOR TACHOMETER TEST PROCEDURE (continued)

FIGURE F.3 – PLUG J84 LOCATION



PROCEDURE

⚠ WARNING

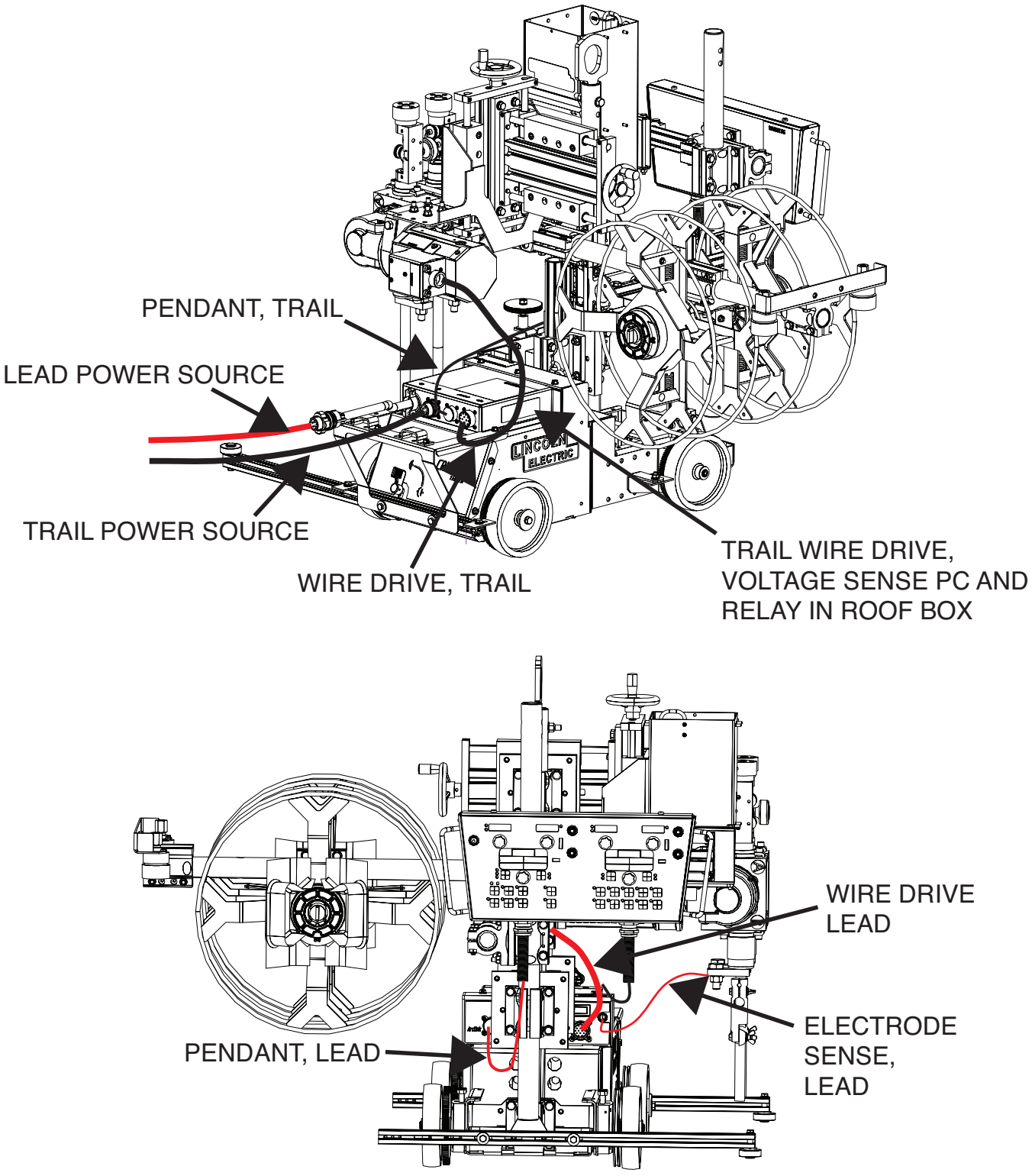
ELECTRIC SHOCK can kill.

- **Have a qualified individual install and service this equipment.**
- **Turn the input supply power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Locate the J84 connector on the wire drive motor PC board. See Figure F.3. See Wiring Diagram.
4. Locate pins one and four on J84. Connect a DC volt meter to the leads by inserting a suitable wire or probe while the connector is still plugged into the PC board. See Figure F.3.
5. Carefully connect the control cable and turn on the AC/DC 1000 power source. Check for 5VDC on the voltmeter. If 5 volts is not present, the wire drive motor PC board may be faulty. This 5VDC is the power supply for the tachometer circuit. The tachometer circuit may also be defective.
6. If 5 volts is present, move the feed switch on the pendent to start the wire feed motor.
7. Move the probe in J84 pin one to pin seven and switch the meter to read hertz. If no frequency is present, the tach or wiring from the tachometer is faulty. If the frequency is in the range of 1800 hertz for a wire speed of 200 inches per minute, the wire feed tachometer is functioning.
8. If the tachometer circuit is functioning correctly and wire speed is uncontrolled, perform the ***Wire Drive PC Board Removal And Replacement Procedure***.

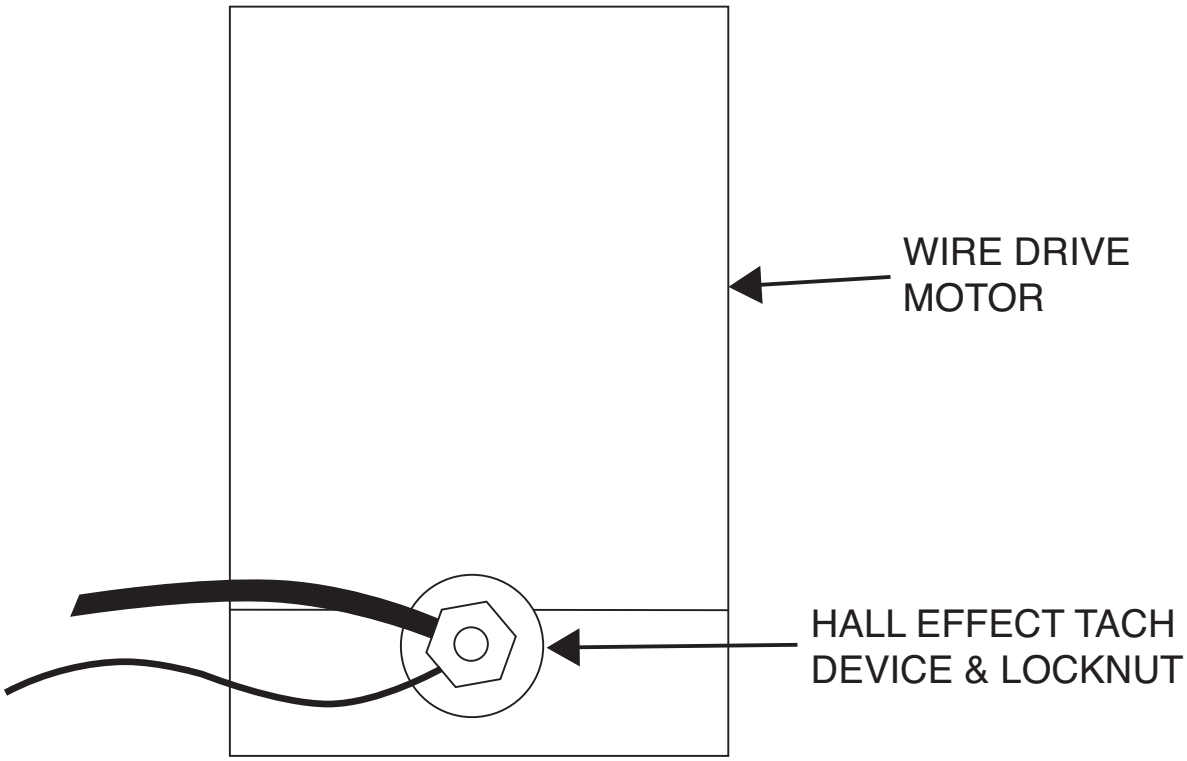
WIRE FEED MOTOR TACHOMETER TEST PROCEDURE (continued)

FIGURE F.4 – REAR AND FRONT VIEW CONNECTIONS



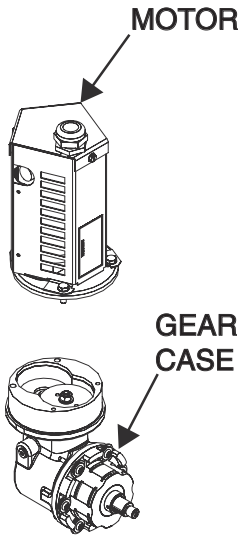
WIRE FEED MOTOR TACHOMETER TEST PROCEDURE (continued)

FIGURE F.5 – HALL EFFECT TACH DEVICE & LOCKNUT



The wire drive motor tachometer and wire drive motor can be removed from the tractor by removing the gearbox clamp socket head cap screw and 3/8" anchor bolt. The wire feed motor and gearbox can then be lifted out of the tractor base for service. See Figure F.6.

FIGURE F.6 – MOTOR REMOVAL



ADJUSTMENT OF WIRE DRIVE HALL EFFECT TACHOMETER

1. Loosen the lock nut that holds the hall effect device in the motor end bell. See Figure F.5.
2. Carefully turn the device clockwise until:
   A. If you are checking the position of a hall effect that was previously installed - it should "bottom out" in 1/4 turn.
   B. If you are replacing a hall effect, carefully screw the device into the housing until it "bottoms out".
3. Once you have felt the device strike the magnet in the motor, turn the hall device counter clockwise 1/4 turn and carefully lock it in place using the locknut.

NOTE: Be careful not to let the hall effect device turn in either direction when tightening.

4. Perform the ***Case Cover Replacement Procedure***.
5. Perform the ***Retest After repair Procedure***.

WIRE FEED MOTOR, PC BOARD AND RELAY TEST PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

The following procedure will aid the technician in determining if the Wire Feed Motor, Drive Motor PC Board or Relay is defective.

MATERIALS NEEDED

Wiring Diagram
Volt/Ohmmeter

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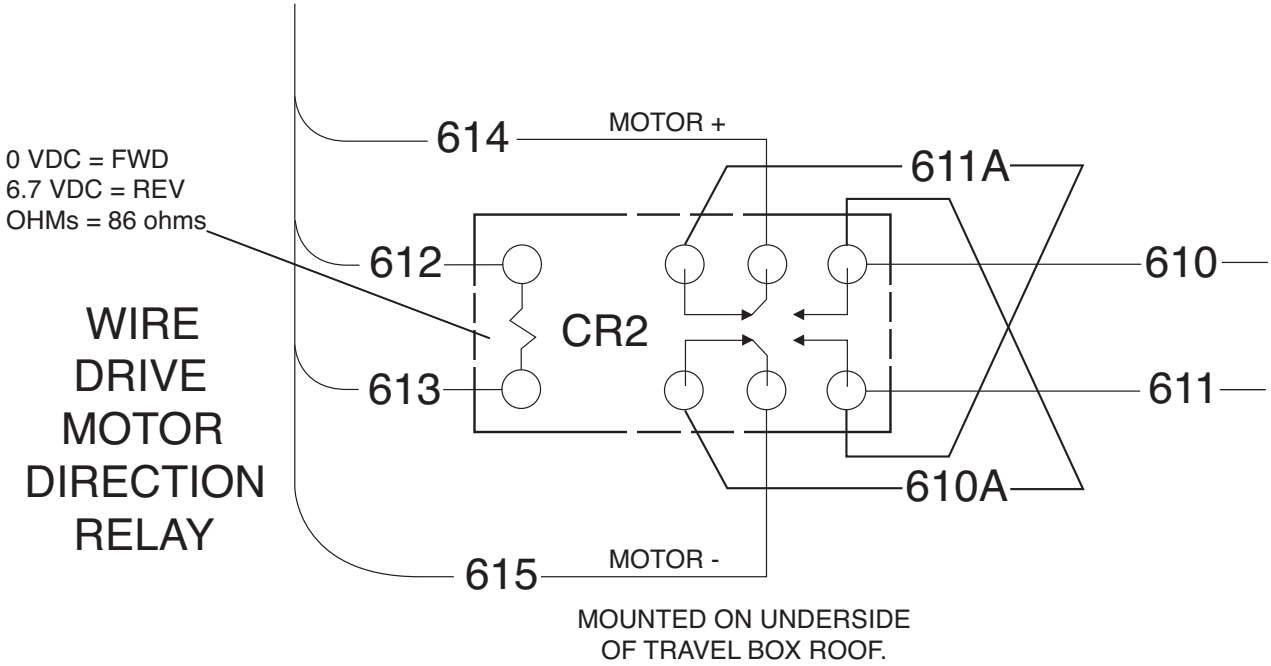
WIRE FEED MOTOR, PC BOARD AND RELAY TEST PROCEDURE (continued)

FIGURE F.7 – WIRE DRIVE MOTOR DIRECTION RELAY



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Have a qualified individual install and service this equipment.**
- **Turn the input supply power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**

---

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Locate the wire drive motor direction relay. Make certain all leads are securely fastened to the relay as indicated in drawing G6500 for CR2. See Wiring Diagram.
4. Remove one motor lead (610 or 611) from the wire drive motor direction relay and use a volt/ohmmeter set to ohms. Measure resistance from the loose lead to the other (610 to 611) at the wire drive motor direction relay. See Wiring Diagram. See Figure F.7.
5. If the resistance reading is open, carefully trace the leads back to the wire drive motor. Check the resistance until you find the open or until you arrive at the black and white leads of the motor. See the Wiring Diagram.

NOTE: If the resistance is approximately 0.5 ohms, the circuit is ok. Replace the motor lead previously removed on to the wire drive motor direction relay.

* Reconnect the control cable at J10 and turn on the AC/DC 1000SD.

WIRE FEED MOTOR, PC BOARD AND RELAY TEST PROCEDURE (continued)

6. Locate leads 614 and 615 on the wire drive motor direction relay. Connect the probes of a DC volt meter to the tabs of the relay. See ***Figure F.7***.
7. Using the pendent cold inch switch, attempt to move the wire up and down while watching for voltage on the meter.
8. If no voltage is present, check the wire feed rectifier as explained in the ***Rectifier Diode Module Test***. See the Wiring Diagram.
9. If the rectifier tests OK and no voltage is present on 614 and 615, perform the ***Wire Drive PC Board Removal And Replacement Procedure***. See ***Retest After Repair***.
10. Move the voltage probes to the tabs connected to leads 612 and 613. Attempt to select "feed up" and "feed down". The voltage on 612 and 613 should switch between 0 volts and 7 volts. If the voltage does not change, the pendent may be faulty. If the voltage changes, continue to next step.
11. Check resistance across 612 - 613 terminals of the wire drive motor direction relay, with one of the two leads disconnected from the wire drive motor direction relay.
12. If the resistance reads about 85 ohms, reconnect the lead. The coil resistance is ok.
13. Move the voltage probes to the tabs connected to leads 610 and 611. If voltage is present in only one direction of wire feed or not present at all, perform the ***Wire Drive Motor Direction Relay Removal And Replacement Procedure***. The polarity should change when feeding up and down.
14. If all the above steps have been followed and the motor still does not run, the motor/gearbox may be faulty and may need replaced.
15. Perform the ***Case Cover Replacement Procedure***.
16. Perform the ***Retest After Repair***.

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VOLTAGE SENSE PC BOARD TEST PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

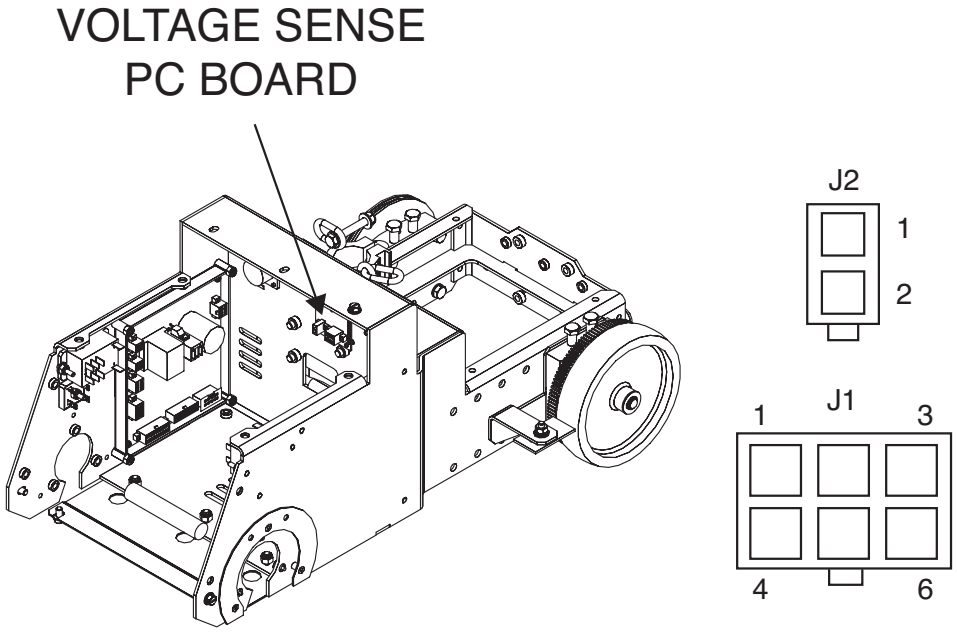
This test will determine if the Voltage Sense Board is functioning properly.

MATERIALS NEEDED

Digital Volt/Ohmmeter
18 Gauge 4 Inch Jumper Wire
Wiring Diagram

VOLTAGE SENSE PC BOARD TEST PROCEDURE (continued)

FIGURE F.8 – VOLTAGE SENSE BOARD LOCATION



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Have a qualified individual install and service this equipment.**
- **Turn the input supply power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**

---

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Locate the voltage sense PC board plugs J1 and J2. Do not remove the plugs from voltage sense PC board. The voltage sense PC board can be removed from its standoff mount and positioned above the sheet metal to be tested while still connected to the wiring harness. See Figure F.8.
4. Apply the correct input power (from the Power Wave 1000 control cable) to the cruiser. Using the pendant start button activate the welding output. Check for approximately 12 VDC at plug J1 pin 1(+) to pin 4(-). If the 12 VDC is NOT present, the wire drive board may be faulty. Also check for loose or faulty wires and connections between the wire drive board (plug J85 and plug J1) on the voltage sense PC board. See Wiring Diagram.

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VOLTAGE SENSE PC BOARD TEST PROCEDURE (continued)

5. With welding output activated and arc voltage present at the contact tip, check for arc voltage from plug J1 pin 3 (lead 67B) to the workpiece. If actual arc voltage is not present, check the continuity of lead 67B from the contact tip to plug J1 pin 3 on the voltage sense PC board. See ***Figure F.8***. See Wiring Diagram.
6. If the actual arc voltage is present at plug J1 pin 3 (lead 67B), then check for arc voltage from plug J2 pin 1 (lead 67E) to the workpiece. See ***Figure F.8***. See Wiring Diagram.
7. If the 12 VDC is present in step #4 and the arc voltage is present in step #5, but the arc voltage is not present in step #6 (lead 67E), the voltage sense PC board may be faulty.
8. If the voltage sense pc board is faulty, perform the ***Voltage Sense PC Board Removal And Replacement Procedure***.
9. Perform the ***Case Cover Replacement Procedure***.
10. Perform the ***Retest After Repair***.

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RECTIFIER DIODE MODULE TEST TRAVEL AND/OR FEEDING

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

The following procedure will aid the technician in determining if the Motor Blocking Diodes are faulty.

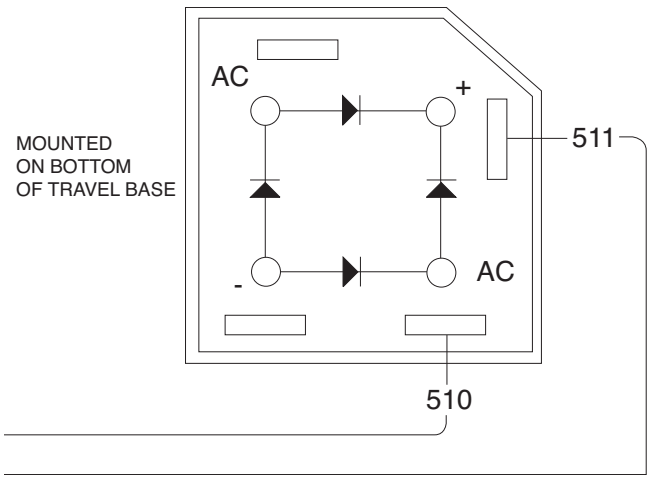
MATERIALS NEEDED

Volt/Ohmmeter With Diode Check
Wiring Diagram

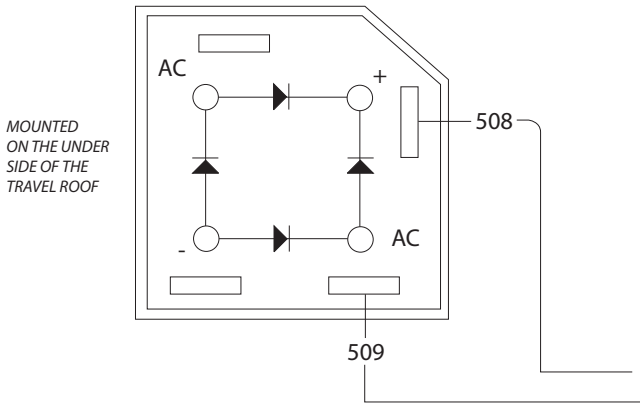
RECTIFIER DIODE MODULE TEST
TRAVEL AND/OR FEEDING (continued)

FIGURE F.9 - TRAVEL & WIRE DRIVE MOTOR RECTIFIERS

TRAVEL MOTOR RECTIFIER



WIRE DRIVE MOTOR RECTIFIER



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Have a qualified individual install and service this equipment.**
- **Turn the input supply power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**

---

1. As shown in the machine schematic, the Travel and Drive Motors each have an associated diode which is used to prevent motor generated voltage from reaching the circuit board when motor drive voltage is removed.
2. If you suspect a shorted diode, due to repeated drive board failure or at the time a drive board is replaced, checking the blocking diode is a good preventative practice. An open diode will result in no motor power.
3. Check the diode using a volt/ohmmeter. One corner of the module is beveled for identification. This is the positive end of the bridge diode. See Figure F.9. See Wiring Diagram.
4. If the diode checks OK, it is safe to replace the faulty PC board if necessary.
5. If the diode checks open or shorted, test the other diodes in the bridge. If they are ok you can utilize one of the good diodes by moving the leads. See Figure F.9. ALWAYS maintain the same diode polarity to the leads as shown in Figure F.9. Misconnection will result in no motor power and much frustration. See Wiring Diagram.

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TRAVEL MOTOR AND RELAY TEST PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

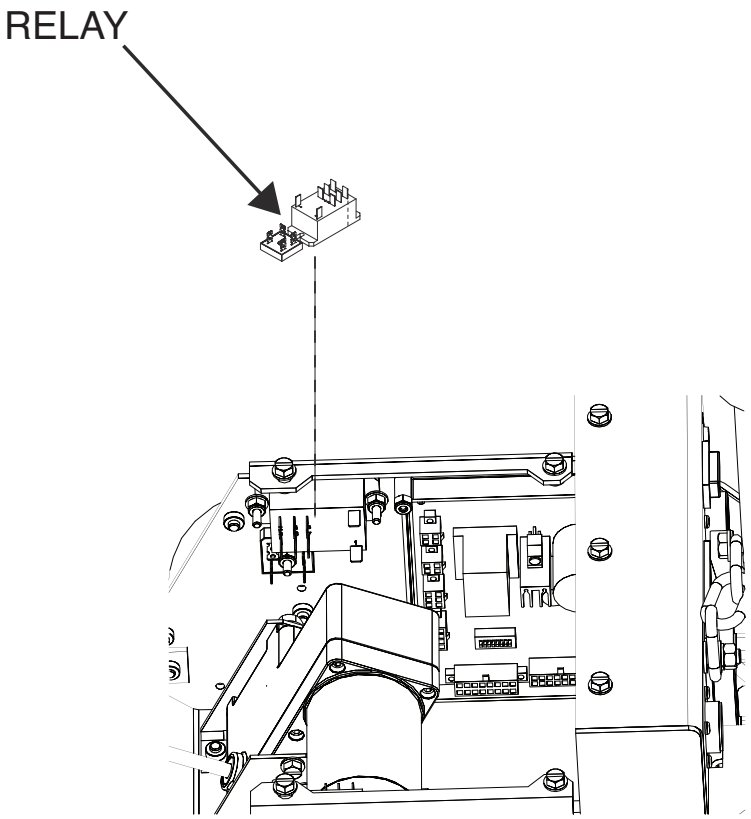
The following procedure will aid the technician in determining if the Travel Motor or the Travel Motor PC Board is defective.

MATERIALS NEEDED

Wiring Diagram
Volt/Ohmmeter
6VDC Lantern Battery

TRAVEL MOTOR AND RELAY TEST PROCEDURE (continued)

FIGURE F.10 - TRAVEL MOTOR RELAY LOCATION (BASE SUB ASSEMBLY)



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

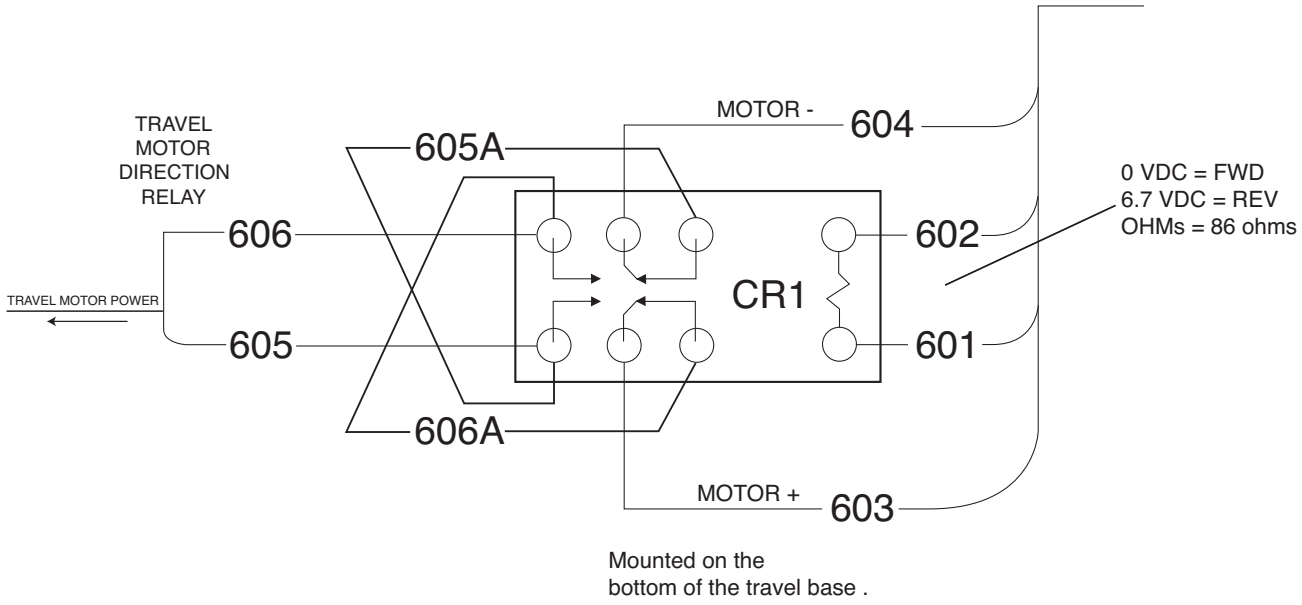
- **Have a qualified individual install and service this equipment.**
- **Turn the input supply power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**

---

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Locate the travel motor direction relay in the cruiser base. Make certain all leads are securely fastened to the relay as indicated in drawing G6500 for CR1. See Wiring Diagram. See Figure F.10. See ***Figure F.11***.
4. Remove one motor lead (605 or 606). Using a volt/ohmmeter, set to ohms and measure resistance from the loose lead to the other lead (605 or 606) at the travel motor direction relay. See ***Figure F.11***. See Wiring Diagram.
5. If the resistance is in the normal range of 1.5 ohms, replace the motor lead on the relay. If the reading is open or greater than 5 ohms, the motor needs additional testing. (See ***Travel Motor And Gear Box Removal And Replacement Procedure***). Also check for loose or faulty connections between the relay and the tractor motor. See Wiring Diagram.

TRAVEL MOTOR AND RELAY TEST PROCEDURE (continued)

FIGURE F.11 – TRAVEL MOTOR DIRECTION



6. If the motor resistance checks at approximately 1.5 ohms, locate leads 601 and 602 on the relay. Connect the probes of a DC volt meter to the tabs of the relay. See Figure F.11. See Wiring Diagram.
7. Using the pendent direction switch, attempt to move the tractor forward and backward while watching for voltage on the meter. If no voltage is present in reverse travel direction, the travel PC board or pendent may be faulty. Check resistance across 601-602 terminals of the travel direction relay with one of the two leads disconnected. See Figure F.11. See Wiring Diagram.
8. If the resistance reads about 85 ohms, reconnect the lead. 85 ohms is normal.
9. If voltage is present in step #7, move the probes to the 605 and 606 terminals. If voltage is present in only one direction and the motor travels only one way all the time, perform the ***Travel Motor Direction Relay Removal And Replacement Procedure***. If voltage is present and the motor does not run, perform the ***Travel Motor And Gear Box Removal Procedure***.

NOTE: When the travel direction is changed the voltage polarity should change on leads 605 and 606.

10. If voltage is not appearing, the travel PC board is faulty. As a final check, move the probes to the terminals with leads 603 and 604.
11. Attempt to move the tractor once again using the pendent. If no voltage appears in either forward or reverse direction, the travel PC board may be faulty. If voltage appears in only one direction, the direction switch on the pendent may be faulty.

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TRAVEL MOTOR AND RELAY TEST PROCEDURE (continued)

12. Perform the ***Travel Motor And Gear Box Removal Procedure***.
13. Test the travel motor by applying 5VDC with a 4 amp limit (a 6VDC lantern battery will do).

NOTE: The brushes and tachometer are the only serviceable parts of the motor.

14. The brushes should be free to move and at least 1/4" long. If the motor does not turn with a 5VDC supply, it must be replaced.
15. Test the motor and tachometer before reinstalling. See ***Travel Motor Tachometer Test***.
16. Always test the motor and relay before installing back into the tractor base.
17. Perform the ***Travel Motor And Gear Box Replacement Procedure***.

NOTE: When installing the motor, be sure to carefully secure all motor mounting bolts while paying close attention to the clutch mechanism. Doing so will insure that it operates freely upon installation.

18. Perform the ***Retest After Repair Procedure***.

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TRAVEL MOTOR TACHOMETER TEST PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

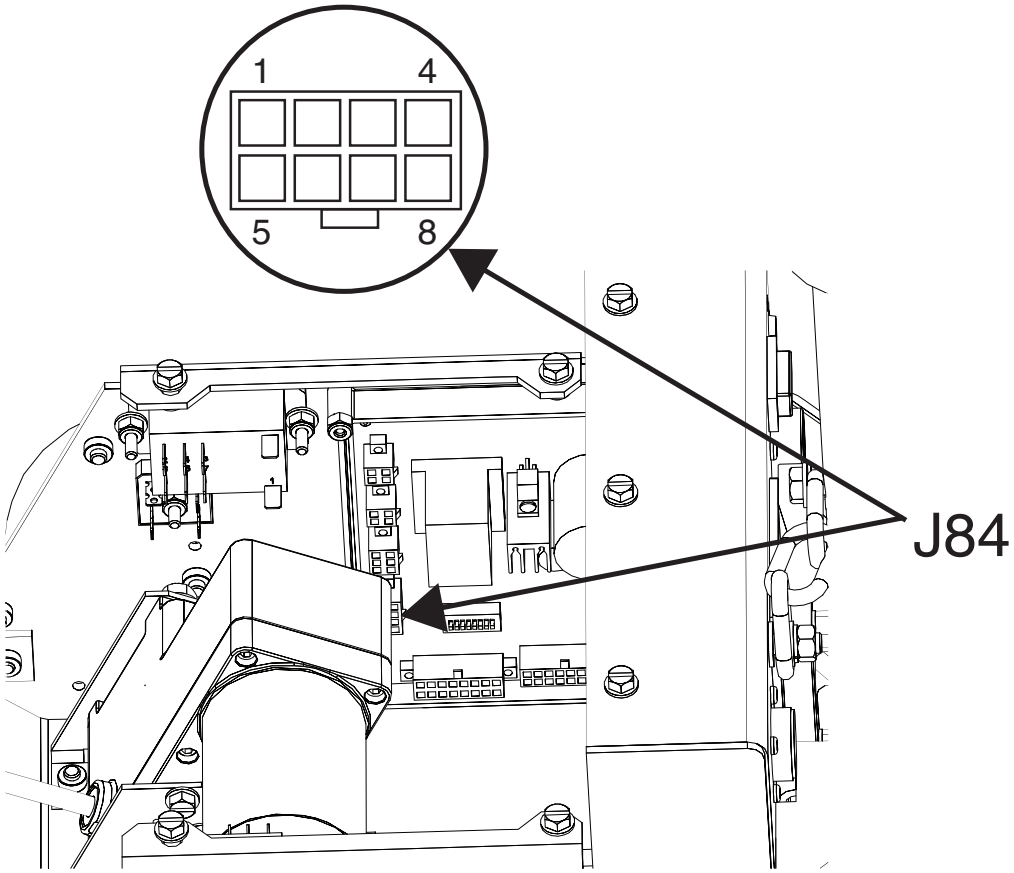
The following procedure will aid the technician in determining the cause of uncontrolled travel speed, as being the Tachometer or the Travel Feedhead PC Board.

MATERIALS NEEDED

7/16” Hex Head Wrench
Volt/Ohmmeter
Wiring Diagram

TRAVEL MOTOR TACHOMETER TEST PROCEDURE (continued)

FIGURE F.12 - PLUG J84 LOCATION



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

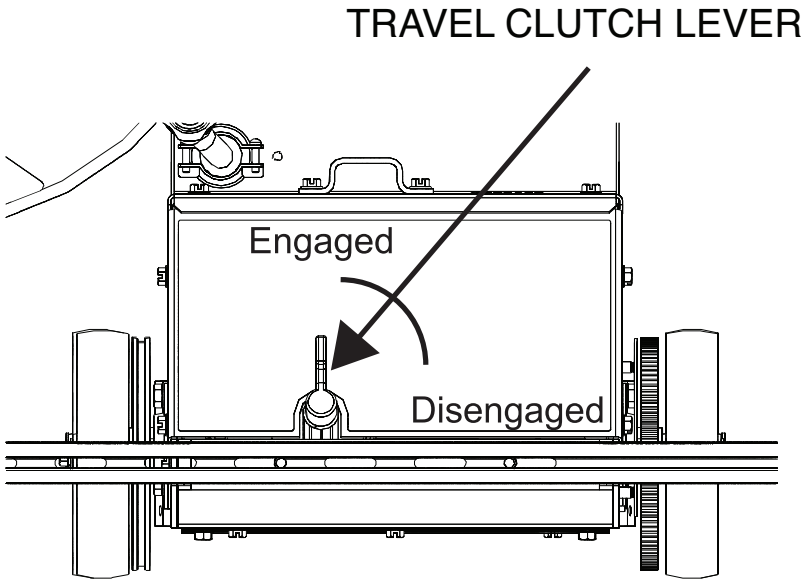
- **Have a qualified individual install and service this equipment.**
- **Turn the input supply power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**

---

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Locate the J84 connector plugged into the travel motor PC board on the bottom of the base assembly box. See Figure F.12. See Wiring Diagram.
4. Disengage the travel clutch lever making certain the unit does not start to roll in either direction. See ***Figure F.13***.
5. Locate pins one and four on J84 and connect a DC volt meter to the leads by inserting a suitable wire or probe. Leave plug J84 connected to the PC board. See Figure F.12. See Wiring Diagram.
6. Carefully connect the control cable and turn on the AC/DC 1000 power source. Check for 5 volts DC on the voltmeter. If 5 volts is not present, the travel motor PC board may be faulty or the tachometer circuit may be defective. See ***Figure F.14***. See Wiring Diagram. The 5VDC is the supply for the tachometer circuit.

TRAVEL MOTOR TACHOMETER TEST PROCEDURE (continued)

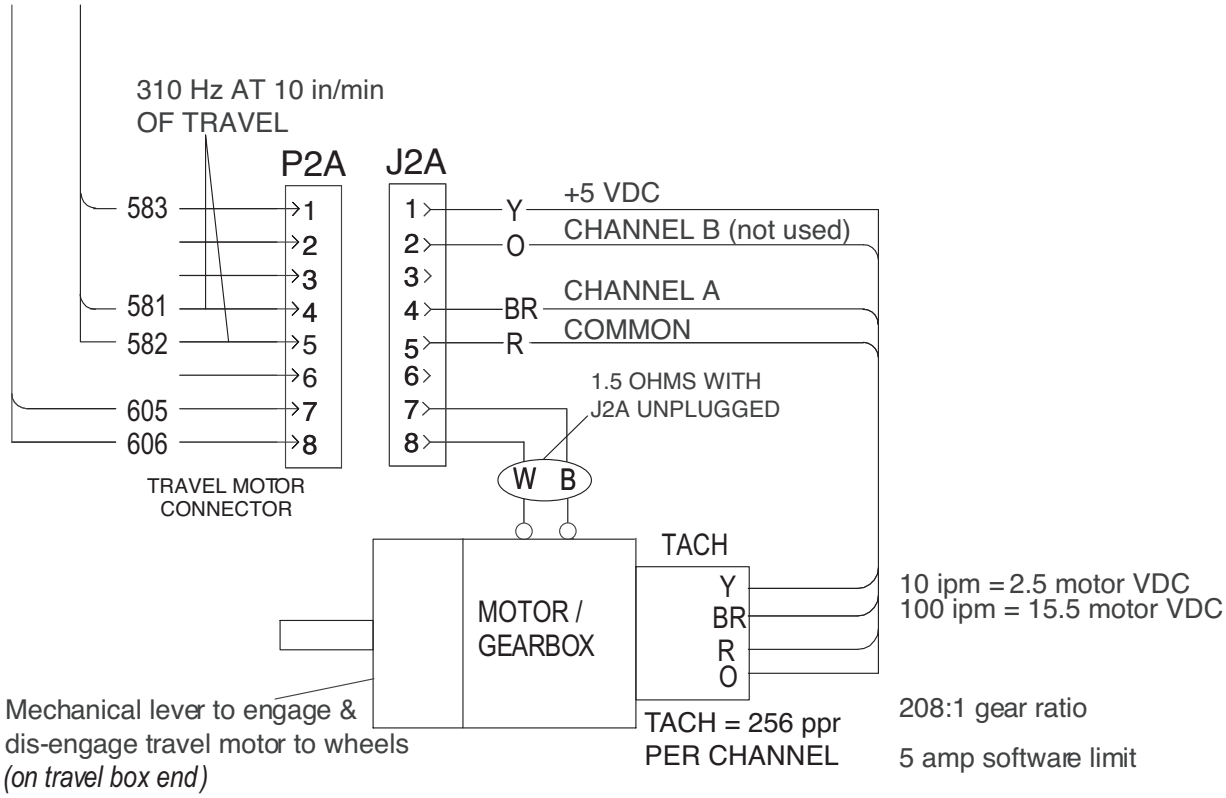
FIGURE F.13 – TRAVEL CLUTCH LEVER LOCATION



7. If 5 volts is present, move the travel switch on the pendent to manual to start the travel motor.
8. Move the probe in J84 pin one to pin seven and switch the meter to read hertz. If no frequency is present, the tach or wiring from the tach may be faulty. If the frequency is in the range of 310 Hertz, the travel motor PC board is faulty.
9. Perform the ***Case Cover Replacement Procedure***.
10. Perform the ***Retest After Repair Procedure***.

TRAVEL MOTOR TACHOMETER TEST PROCEDURE (continued)

FIGURE F.14 – TRAVEL MOTOR SCHEMATIC



CASE COVER REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

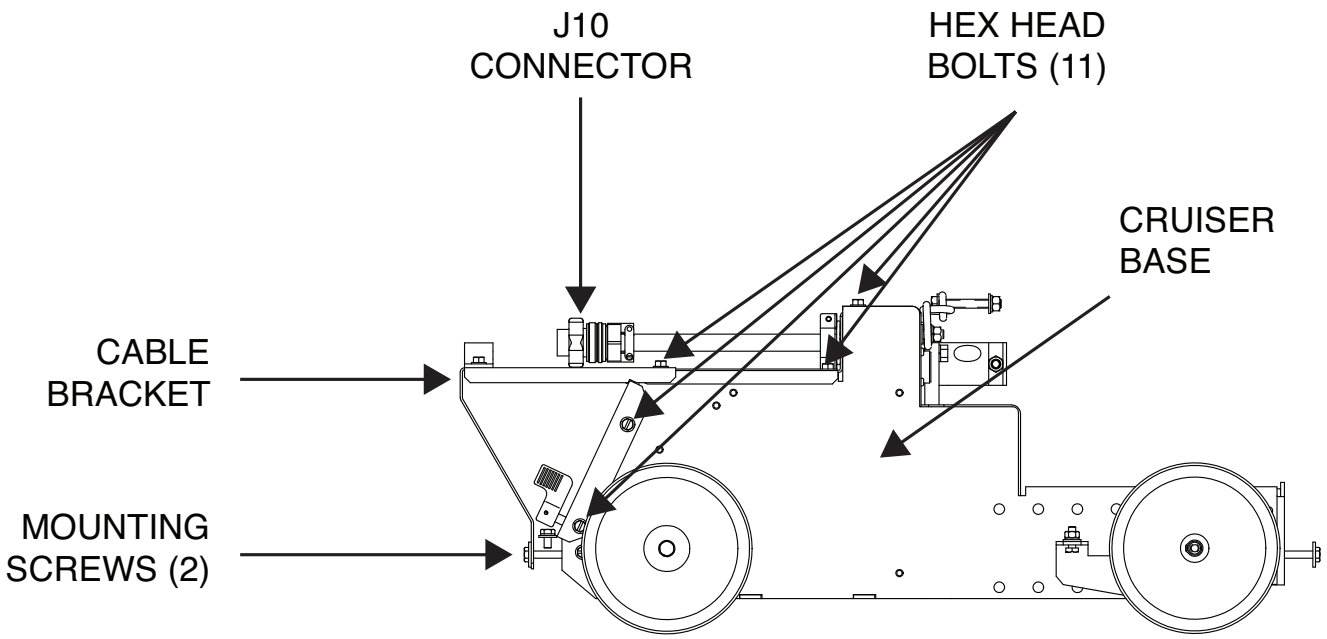
This procedure will aid the technician in the removal and replacement of the Case Covers.

MATERIALS NEEDED

3/8" Wrench
7/16" Nutdriver
Wiring Diagram

CASE COVER REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.15 – PLUG J10 AND HEX BOLT LOCATIONS



REMOVAL PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Have a qualified individual install and service this equipment.**
- **Turn the input supply power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**

---

1. Remove the control cable at J10 connector on the cruiser base roof to disconnect power to the tractor. See Figure F.15.
2. Using a 3/8” wrench, remove the eleven hex head bolts securing the roof. See Figure F.15.
3. Using a 7/16” nutdriver, remove the two screws and associated washers securing the cable bracket to the outrigger. See Figure F.15. Note washer placement for reassembly.
4. Label and disconnect plug J15 from the roof. See Wiring Diagram.
5. Remove roof and set aside.

NOTE: When performing test procedures, carefully lift the roof section up and away as far as the harness will allow. Position the roof on a piece of insulating material. Make certain the electrical components are insulated from any sheet metal.

CASE COVER REMOVAL AND REPLACEMENT PROCEDURE (continued)

REPLACEMENT PROCEDURE

1. Remove input power.
2. Connect previously removed plug J15. See Wiring Diagram.
3. Carefully position roof on to machine.
4. Using a 7/16” nutdriver, attach the two screws and associated washers previously removed securing the cable bracket to the outrigger.
5. Using a 3/8” wrench, attach the eleven hex head bolts previously removed securing the roof.
6. Attach the control cable at J10 connector on the cruiser base to connect power to the machine.

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UI PC BOARD
REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

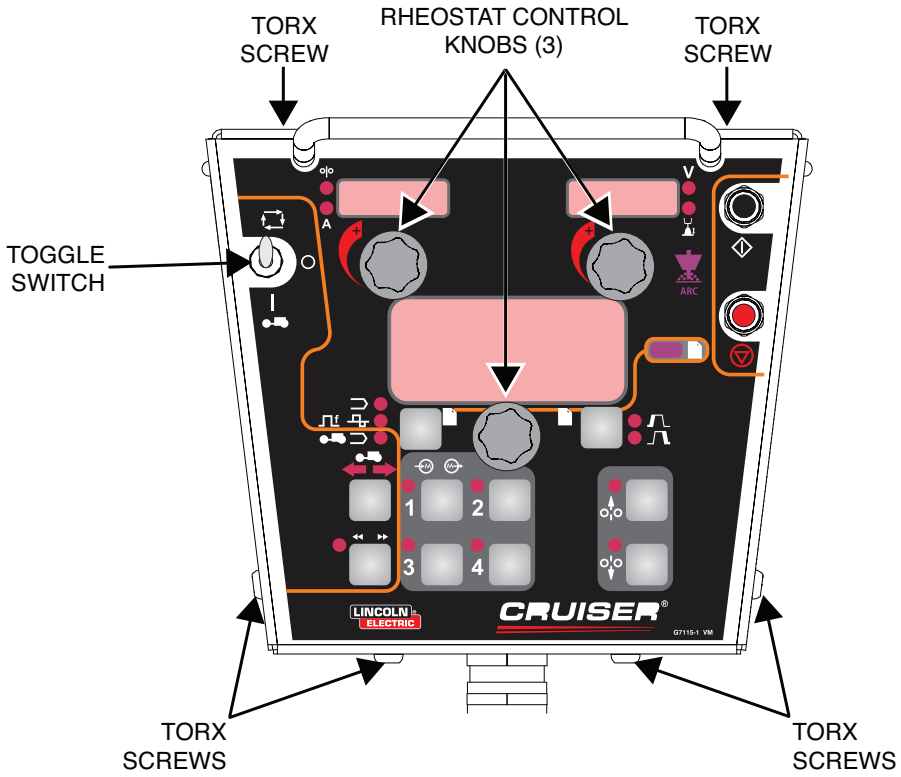
This procedure will aid the technician in the removal and replacement of the UI PC Board.

MATERIALS NEEDED

Small Slotted Screwdriver
9/16” Nutdriver
3/8” Nutdriver
Torx Wrench Set
Wiring Diagram

UI PC BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.16 – UI PC BOARD REMOVAL



REMOVAL PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

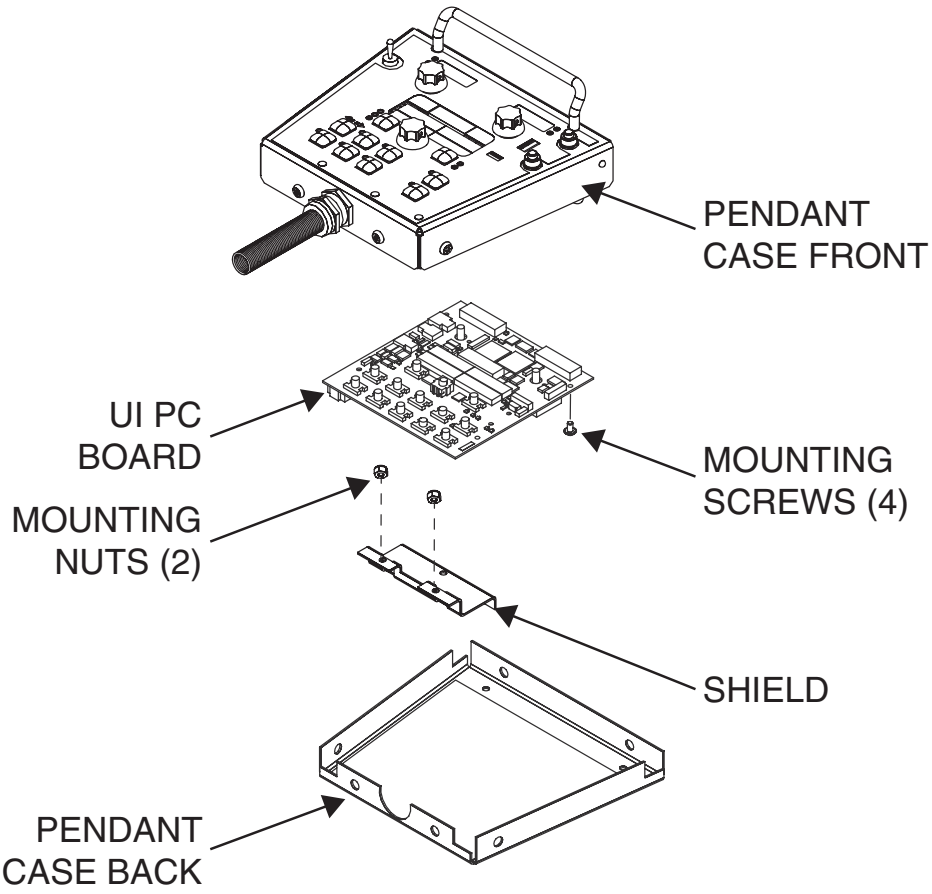
- **Have a qualified individual install and service this equipment.**
- **Turn the input supply power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**

---

1. Remove input power to the machine.
2. Using a small slotted screwdriver, loosen the set screws securing the three rheostat control knobs to the pendant and remove knobs. See Figure F.16. Note shaft seal and conductive foam washer placement for reassembly.
3. Using a Torx wrench, remove the six Torx button head screws securing the pendant case back and remove case back. See Figure F.16.
4. Label and disconnect plugs J31 and J32 from the UI PC board. See Wiring Diagram.
5. Using a 9/16” nutdriver, remove the nut securing the toggle switch to the pendant. See Figure F.16. Note rear washer placement for reassembly.
6. Using a 3/8” nutdriver, remove the nut and washer securing leads 67G and B1 to the pendant case front. See Wiring Diagram.
7. Using a 3/8” nutdriver, remove the two nuts securing the shield to the pendant case front. See ***Figure F.17***.
8. Using a phillips screwdriver, remove the four screws securing the UI PC board to the pendant case front. Note washer placement for reassembly. See ***Figure F.17***.
9. Gently lift up on shield to allow clearance for the UI PC Board to be removed.

UI PC BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.17 – UI PC BOARD MOUNTING SCREWS



REPLACEMENT PROCEDURE

1. Gently lift up on shield to allow clearance for the new UI PC Board to be placed into position.
2. Using a phillips screwdriver, attach the four screws securing the UI PC board to the pendant case front.
3. Using a 3/8” nutdriver, attach the two nuts securing the shield to the pendant case front.
4. Using a 3/8” nutdriver, attach the nut and washer securing leads 67G and B1 to the pendant case front. See Wiring Diagram.
5. Using a 9/16” nutdriver, attach the nut and washer securing the toggle switch to the pendant.
6. Connect previously removed plugs J31 and J32 to the UI PC board. See Wiring Diagram.
7. Attach the six Torx button head screws securing the pendant case back.
8. Using a small slotted screwdriver, attach the set screws securing the three rheostat control knobs, shaft seal and conductive foam washer.

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WIRE DRIVE PC BOARD REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

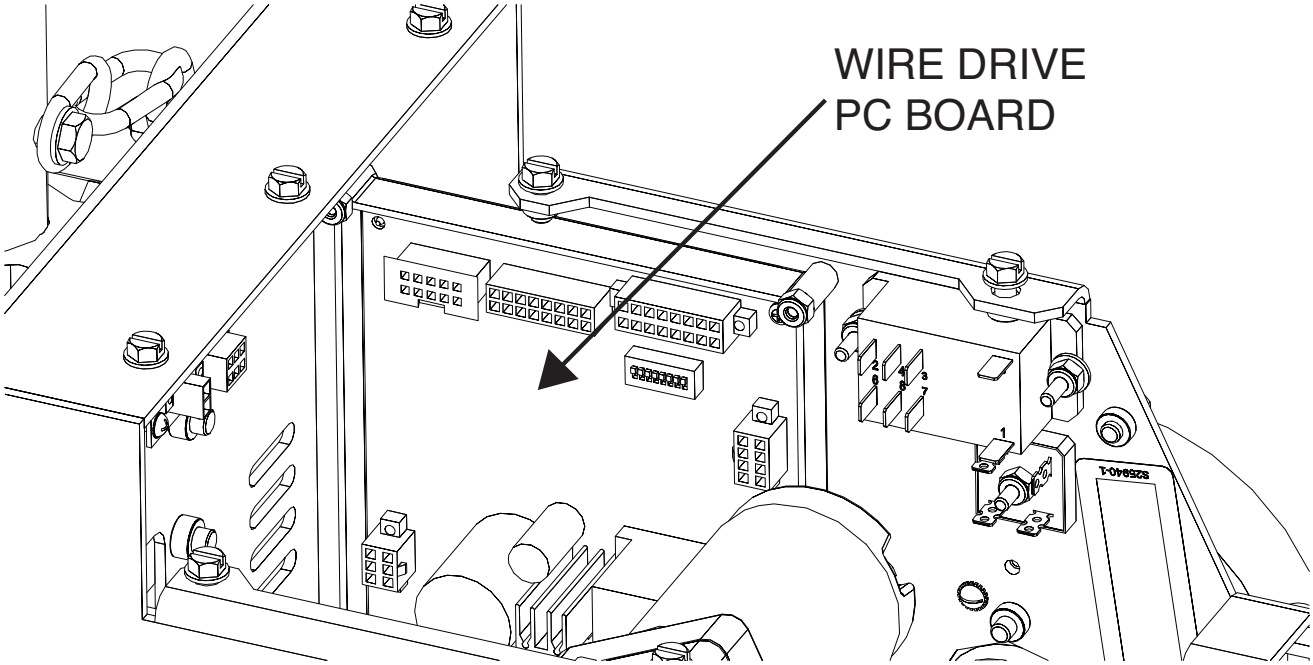
This procedure will aid the technician in the removal and replacement of the Wire Drive PC Board.

MATERIALS NEEDED

3/8" Nutdriver
Wiring Diagram

WIRE DRIVE PC BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.18 – WIRE DRIVE PC BOARD LOCATION



REMOVAL PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Have a qualified individual install and service this equipment.**
- **Turn the input supply power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**

---

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Locate wire drive pc board. See Figure F.18. See Wiring Diagram.
4. Label and disconnect plugs J81, J82, J83, J84, J85 and J86 from the wire drive pc board. See ***Figure F.19***. See Wiring Diagram.
5. Using a 3/8" nutdriver, remove the four nuts securing the wire drive pc board to the machine. See ***Figure F.19***.
6. The wire drive pc board can now be removed and replaced.

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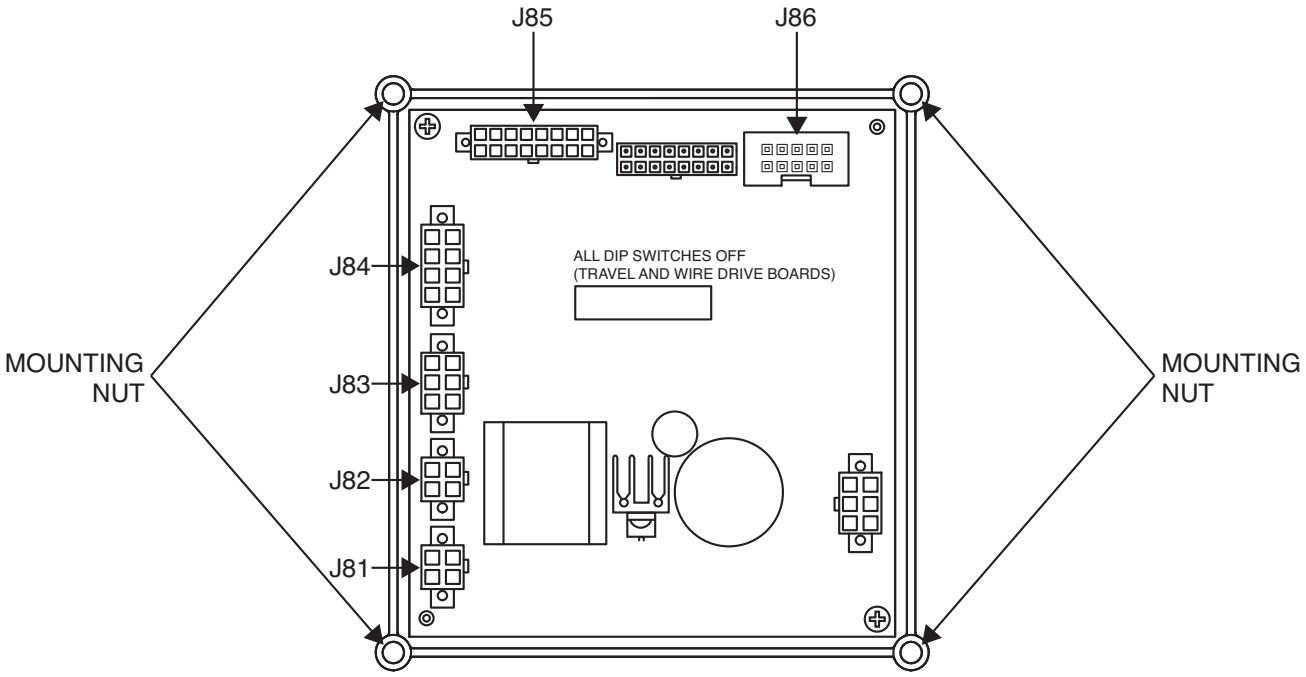
WIRE DRIVE PC BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.19 – WIRE DRIVE PC BOARD PLUG AND MOUNTING NUT LOCATIONS



REPLACEMENT PROCEDURE

1. Carefully position new wire drive pc board into the machine.
2. Using a 3/8” nutdriver, attach the four nuts securing the board to the machine.
3. Connect previously removed plugs J81, J82, J83, J84, J85 and J86 to the wire drive pc board. See Wiring Diagram.
4. Perform the ***Case Cover Replacement Procedure***.

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Return to Section TOC
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WIRE DRIVE MOTOR DIRECTION RELAY

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

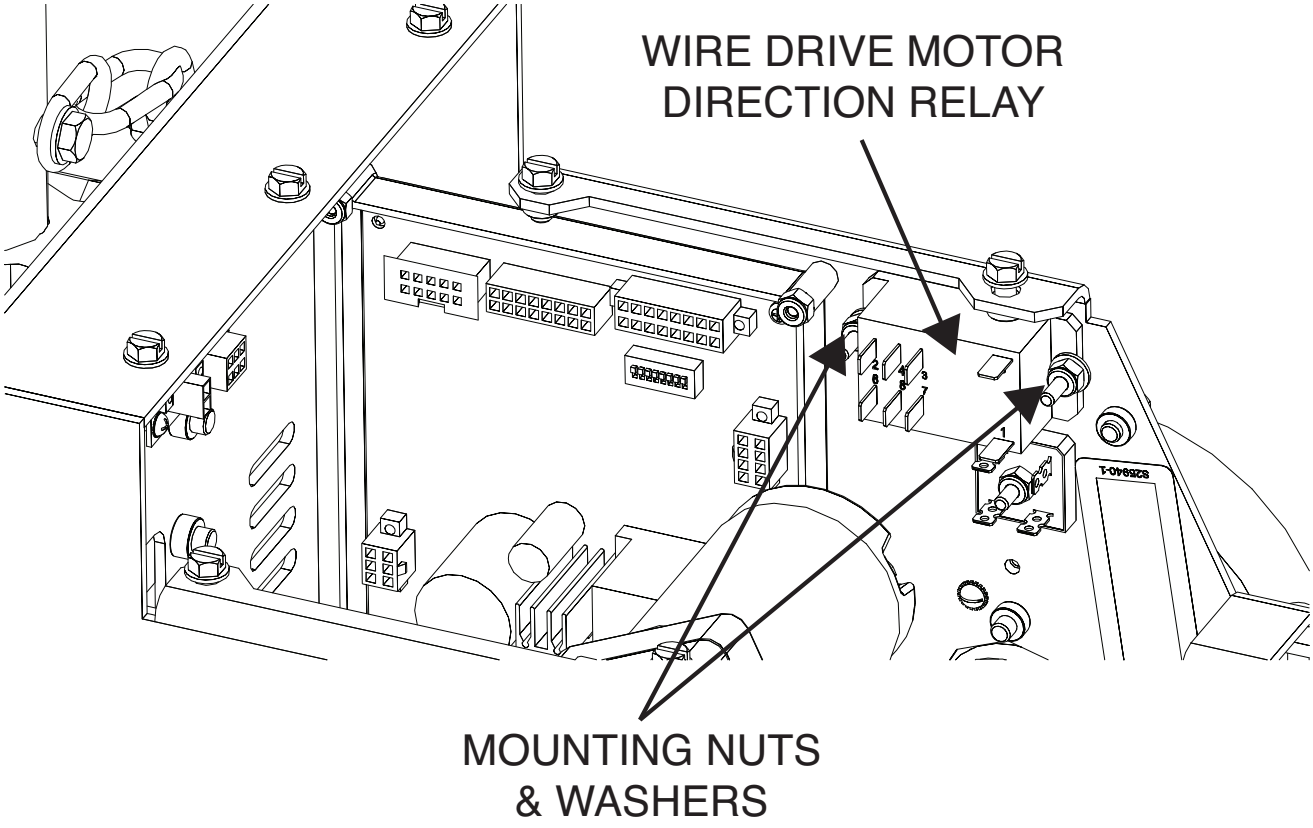
This procedure will aid the technician in the removal and replacement of the Wire Drive Motor Direction Relay.

MATERIALS NEEDED

3/8" Nutdriver
Wiring Diagram

WIRE DRIVE MOTOR DIRECTION RELAY REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.20 – WIRE DRIVE MOTOR DIRECTION RELAY LOCATION



REMOVAL PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

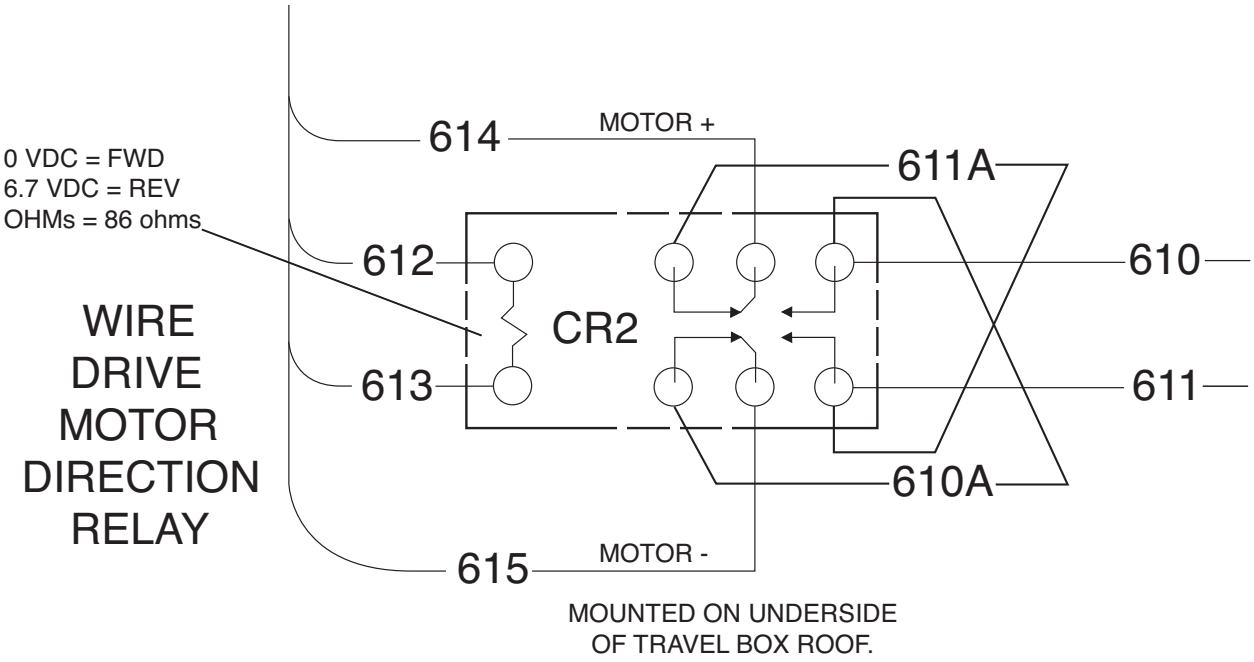
- **Have a qualified individual install and service this equipment.**
- **Turn the input supply power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**

---

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Locate wire drive motor direction relay. See Figure F.20.
4. Label and disconnect leads 610, 611, 612, 613, 614, 615, 610A and 611A from the wire drive motor direction relay. See ***Figure F.21***. See Wiring Diagram.
5. Using a 3/8" nutdriver, remove the two nuts and associated washers securing the wire drive motor direction relay to the machine. Note washer placement for reassembly. See Figure F.20.

WIRE DRIVE MOTOR DIRECTION RELAY REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.21 – WIRE DRIVE MOTOR DIRECTION RELAY LEAD LOCATIONS



REPLACEMENT PROCEDURE

1. Carefully position the new wire drive motor direction relay into the machine.
2. Using a 3/8” nutdriver, attach the two nuts and associated washers securing the wire drive motor direction relay to the machine.
3. Connect previously removed leads 610, 611, 612, 613, 614, 615, 610A and 611A to the wire drive motor direction relay. See Wiring Diagram.
4. Perform the ***Case Cover Replacement Procedure***.

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TRAVEL MOTOR DIRECTION RELAY REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Travel Motor Direction Relay.

MATERIALS NEEDED

3/8" Nutdriver
Wiring Diagram

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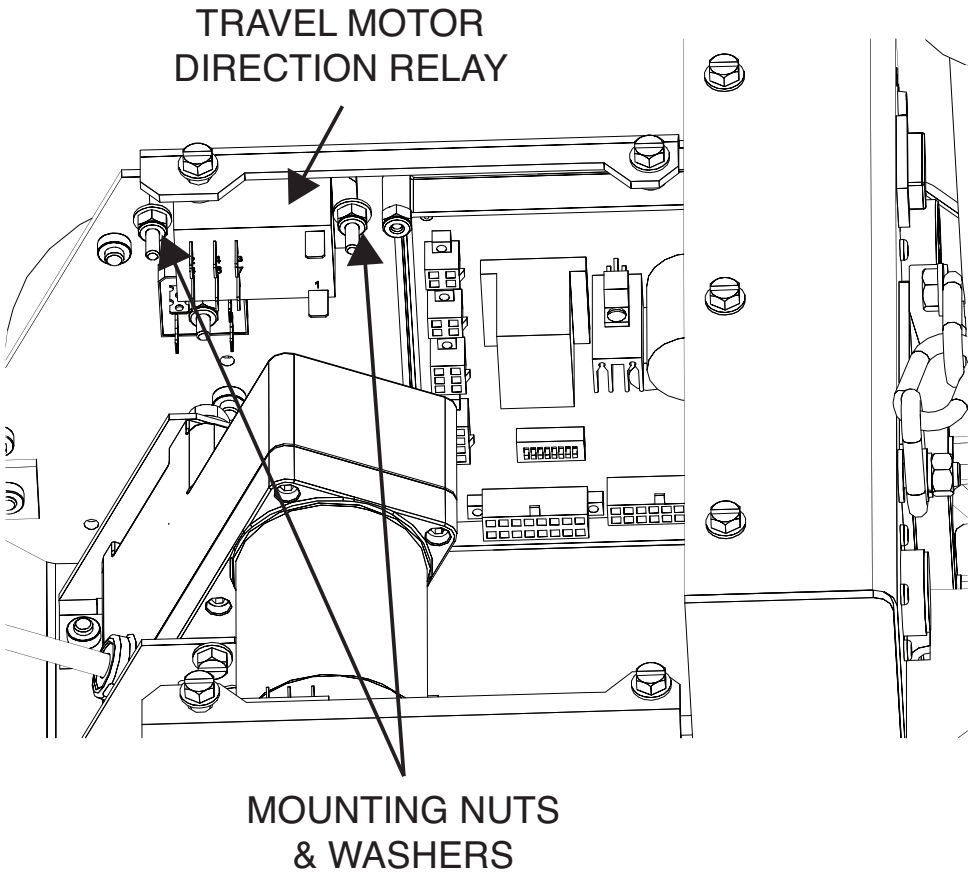
TRAVEL MOTOR DIRECTION RELAY REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.22 – TRAVEL MOTOR DIRECTION RELAY LOCATION



REMOVAL PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

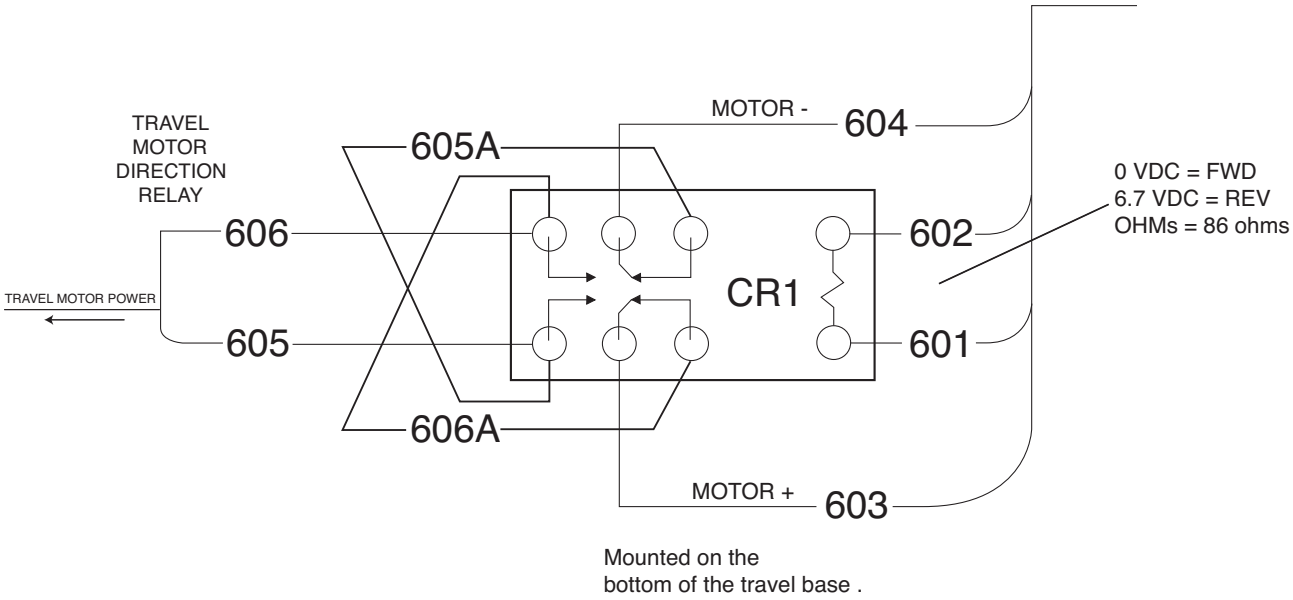
- **Have a qualified individual install and service this equipment.**
- **Turn the input supply power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**

---

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Locate travel motor direction relay. See Figure F.22.
4. Label and disconnect leads 601, 602, 603, 604, 605, 606, 605A and 606A from the travel motor direction relay. See ***Figure F.23***. See Wiring Diagram.
5. Using a 3/8” nutdriver, remove the two nuts and associated washers securing the travel motor direction relay to the machine. Note washer placement for reassembly. See Figure F.22.

TRAVEL MOTOR DIRECTION RELAY REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.23 – TRAVEL MOTOR DIRECTION RELAY LEAD LOCATIONS



REPLACEMENT PROCEDURE

1. Carefully position the new travel motor direction relay into the machine.
2. Using a 3/8” nutdriver, attach the two nuts and associated washers securing the travel motor direction relay to the machine.
3. Connect previously removed leads 601, 602, 603, 604, 605, 606, 605A and 606A to the travel motor direction relay. See Wiring Diagram.
4. Perform the ***Case Cover Replacement Procedure***.

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Return to Section TOC
Return to Master TOC

TRAVEL MOTOR AND GEAR BOX ASSEMBLY REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Travel Motor and Gear Box Assembly.

MATERIALS NEEDED

1/2” Nutdriver
Two Flathead Screwdrivers
7/16” Nutdriver
1/8” Allen Key
3/8” Nutdriver
Wiring Diagram

Return to Section TOC
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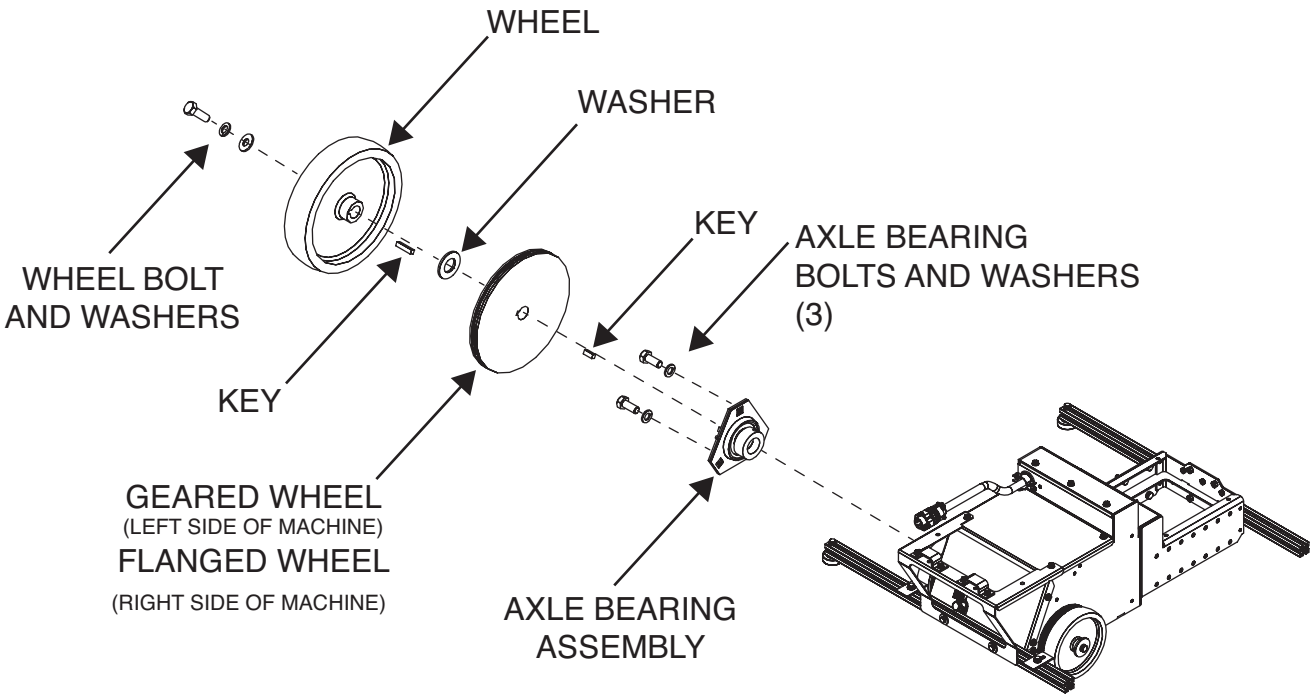
TRAVEL MOTOR AND GEAR BOX ASSEMBLY
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.24 – WHEEL REMOVAL



REMOVAL PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

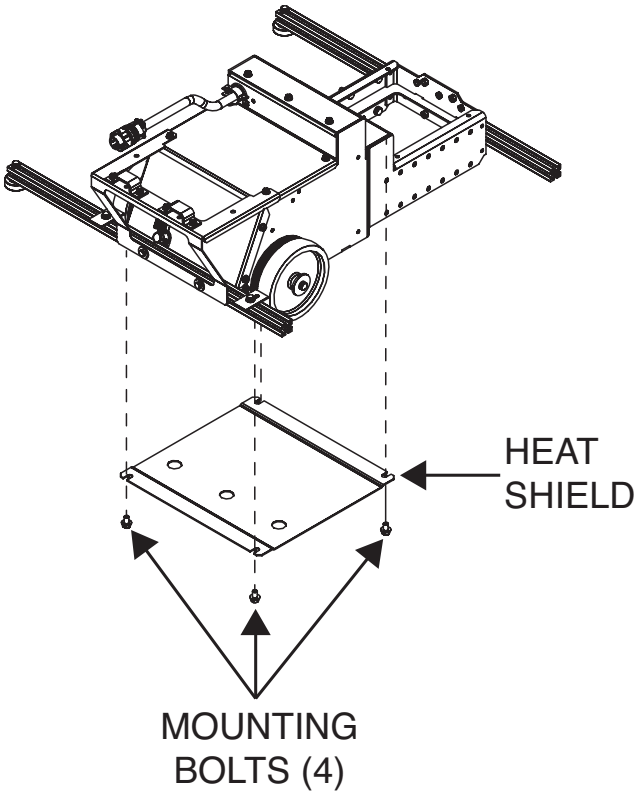
- **Have a qualified individual install and service this equipment.**
- **Turn the input supply power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**

---

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Place block beneath machine to raise rear wheels off of the ground. This will aid in the removal of components.
4. Using a 1/2" nutdriver, remove wheel bolt and associated washers securing the rear wheels. See Figure F.24. Note washer placement for reassembly.
5. Using two flat head screwdrivers, gently pry wheel off of machine. See Figure F.24. Note washer and key location for reassembly.
6. Using two flat head screwdrivers, gently pry geared wheel (left side) and flanged wheel (right side) off of machine. See Figure F.24.
7. Using a 7/16" nutdriver, remove the three bolts securing the axle bearings to the machine. Note washer placement for reassembly. See Figure F.24.
8. Using a 1/8" allen key, loosen the bushing allen key screw located on inside of left axle bearing.

TRAVEL MOTOR AND GEAR BOX ASSEMBLY REMOVAL AND REPLACEMENT PROCEDURE (continued)

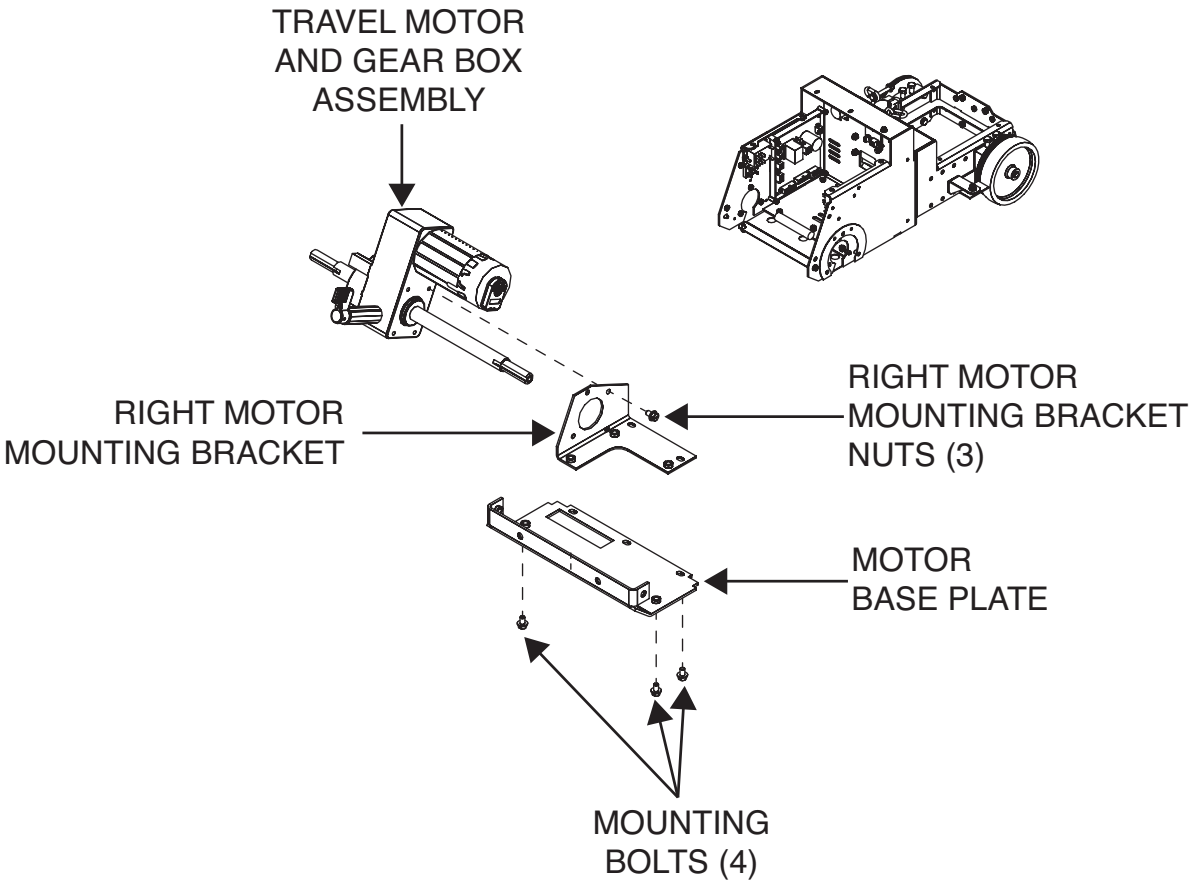
FIGURE F.25 – HEAT SHIELD REMOVAL



9. Using a 3/8” nutdriver, remove the four bolts securing the heat shield to the bottom of the machine. See Figure F.25.
10. Using a 3/8” nutdriver, remove the four bolts securing the motor base plate to the machine. See Figure F.26.
11. Label and disconnect plug J2A. See Wiring Diagram.
12. Using a 7/16” nutdriver, remove the three nuts securing the right motor mounting bracket to the machine. See Figure F.26.
13. Carefully rotate the motor and gear box assembly toward the rear of the machine and remove.

TRAVEL MOTOR AND GEAR BOX ASSEMBLY REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.26 – TRAVEL MOTOR AND GEAR BOX REMOVAL



REPLACEMENT PROCEDURE

1. Carefully position new motor and gear box assembly into the machine.
2. Using a 7/16” nutdriver, attach the three nuts securing the right motor bracket to the machine.
3. Connect previously removed plug J2. See Wiring Diagram.
4. Using a 3/8” nutdriver, attach the four bolts securing the motor base plate to the machine.
5. Using a 3/8” nutdriver, attach the four bolts securing the heat shield to the bottom of the machine.
6. Using a 1/8” allen key, tighten the bushing located on the left axle bearing.
7. Using a 7/16” nutdriver, attach the three bolts securing the axle bearings to the machine. Note washer placement.
8. Carefully place the geared wheel (left side) and flanged wheel (right side) onto the machine.
9. Carefully place the wheel, washer and key into position on the machine.
10. Using a 1/2” nutdriver, attach the wheel bolt and associated washers securing the rear wheels.
11. Carefully remove block from beneath the machine.
12. Perform the ***Case Cover Replacement Procedure***.

VOLTAGE SENSE PC BOARD REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Voltage Sense PC Board.

MATERIALS NEEDED

Small Phillips Screwdriver
Wiring Diagram

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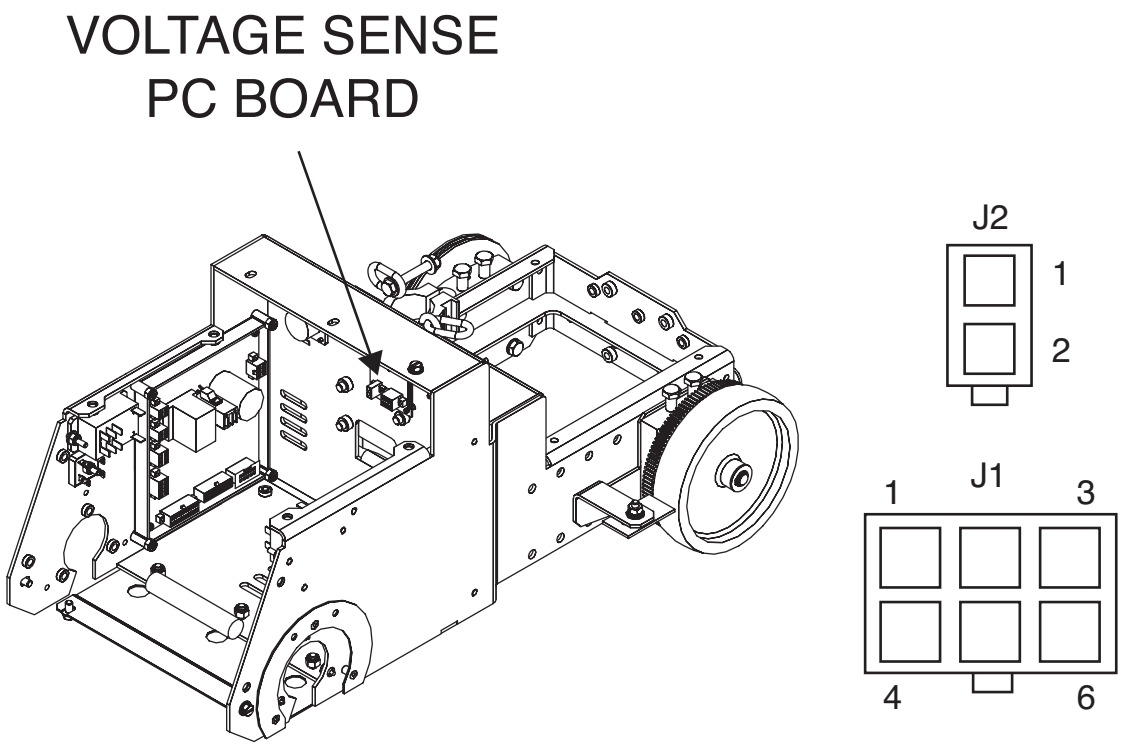
VOLTAGE SENSE PC BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.27 – VOLTAGE SENSE PC BOARD LOCATION



REMOVAL PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Have a qualified individual install and service this equipment.**
- **Turn the input supply power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**

---

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Locate voltage sense pc board. See Figure F.27. See Wiring Diagram.
4. Label and disconnect the two plugs (J1 and J2) connected to the board. See Figure F.27. See Wiring Diagram.
5. Using a small phillips screwdriver, remove the two screws securing the board to the machine.
6. The voltage sense pc board can now be removed and replaced.

Return to Section TOC
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VOLTAGE SENSE PC BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

REPLACEMENT PROCEDURE

1. Carefully position the new voltage sense pc board into the machine.
2. Using a small phillips screwdriver, attach the two screws securing the board to the machine.
3. Connect the two plugs (J1 and J2) to the board. See Wiring Diagram.
4. Perform the ***Case Cover Replacement Procedure***.

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TRAVEL MOTOR PC BOARD REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

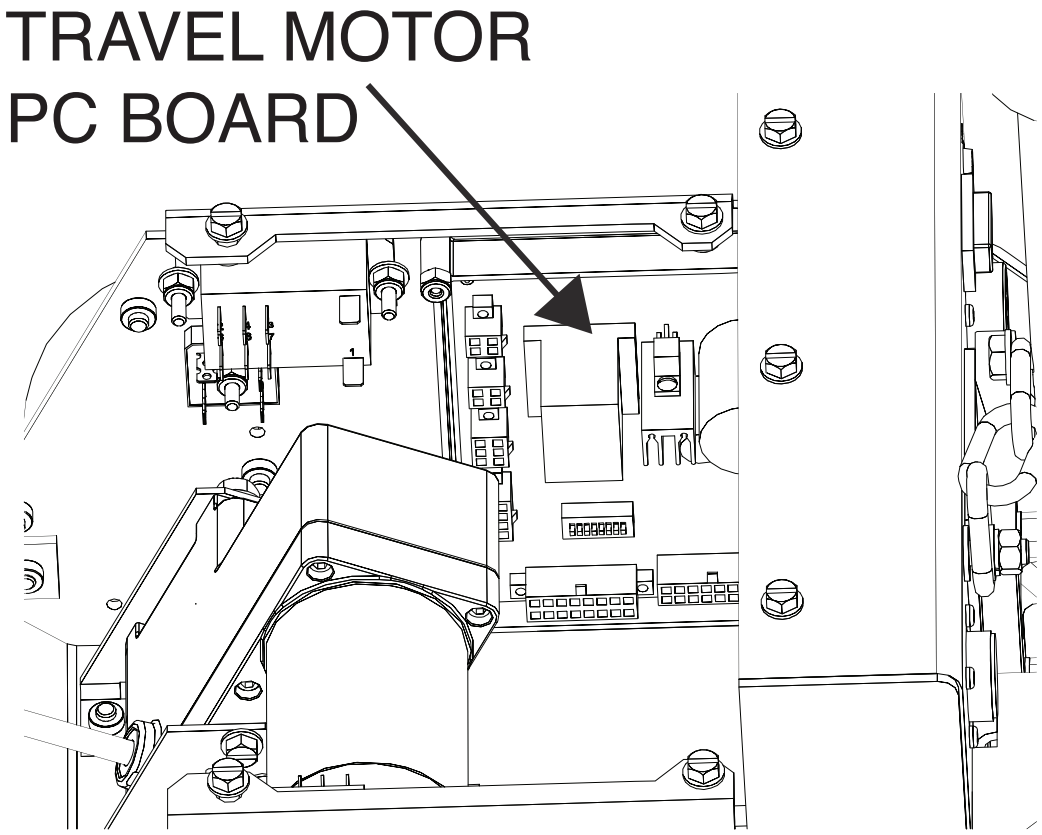
This procedure will aid the technician in the removal and replacement of the Travel Motor PC Board.

MATERIALS NEEDED

3/8" Nutdriver
Wiring Diagram

TRAVEL MOTOR PC BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.28 – TRAVEL MOTOR PC BOARD LOCATION



REMOVAL PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Have a qualified individual install and service this equipment.**
- **Turn the input supply power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**

---

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Locate the travel motor pc board. See Figure F.28.
4. Label and disconnect the plugs J81, J82, J83 and J84 at the travel motor pc board. See ***Figure F.29***. See Wiring Diagram.
5. Using a 3/8” nutdriver, remove the four nuts securing the travel motor pc board to the machine. See ***Figure F.29***.
6. The travel motor pc board can now be removed and replaced.

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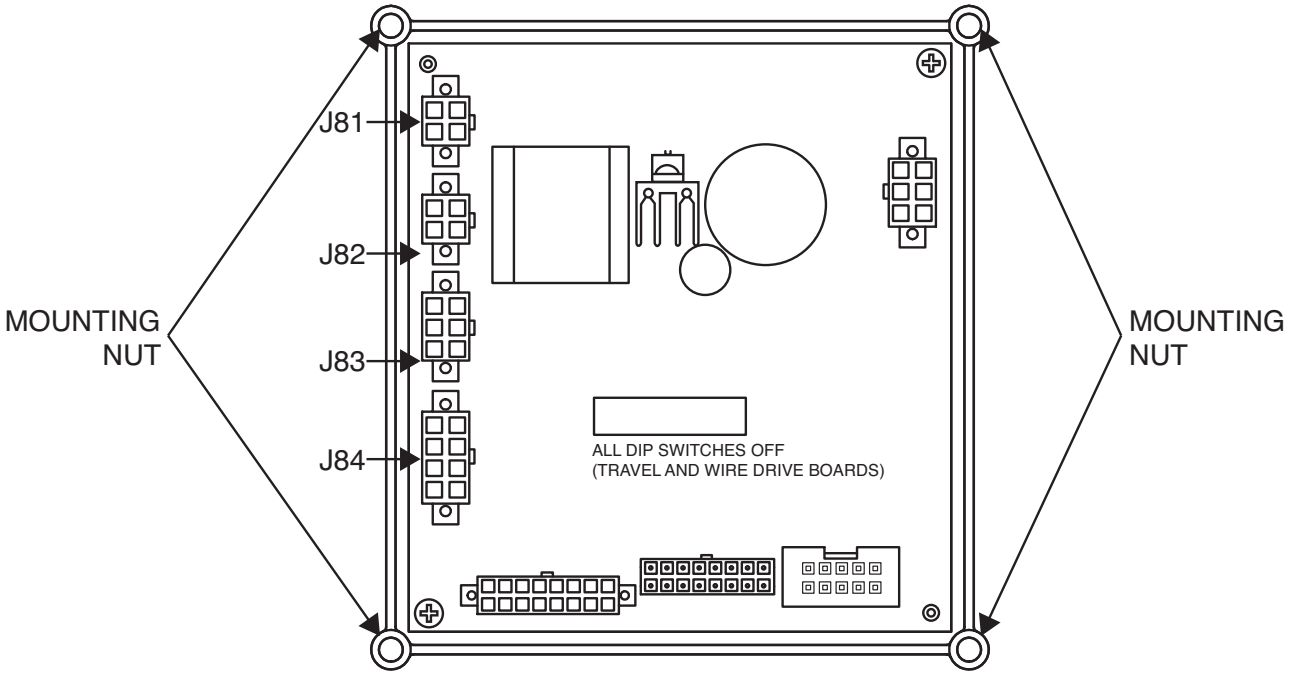
TRAVEL MOTOR PC BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.29 – TRAVEL MOTOR PC BOARD PLUG AND MOUNTING NUT LOCATIONS



REPLACEMENT PROCEDURE

1. Carefully position new travel motor pc board into the machine.
2. Using a 3/8” nutdriver, attach the four nuts securing the travel motor pc board to the machine.
3. Connect all previously removed plugs to the travel motor pc board. See Wiring Diagram.
4. Perform the ***Case Cover Replacement Procedure***.

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RETEST AFTER REPAIR

RETEST AFTER REPAIR PROCEDURE

Once the faulty component or wiring has been corrected, the machines operation needs to be verified.

Re-assemble the Cruiser Tractor and re-connect the arc link cable from the AC/DC 1000. Turn on the AC/DC 1000.

1. Inch the wire feed motor up or down, and ensure the wire feed speed can be controlled using the wire feed speed control.
2. Make certain the direction of the wire feed is controllable and matches the indication on the pendent.
   a. If the wire feed motor or gearbox was repaired, check the pendent setup menu to make certain the gearbox ratio matches the ratio of the gearbox.*
   b. Set the wire feed speed to 100 inches per minute and run out wire for 10 seconds. If the right gearbox / setup menu has been selected, 16.5” of wire will have been fed.
3. Make certain the direction of the travel motor is controllable and matches the indication on the pendent when the clutch is engaged.
   a. Make certain the travel speed is controllable from 10 to 100 inches per minute by actual measurement.

If based on the above tests, any part of the Cruiser Tractor does not function as expected, the problem should be easily diagnosed to:

1. The Wire Feed Speed Motor Tachometer.
2. The Wire Feed Motor Reversing Relay. Both one and two check the feed motor blocking diode module and wire feed motor PC board.
3. The Travel Motor, the Travel Motor Tachometer, the Reversing Relay and the Travel Motor PC Board and Diode Module.

Once these tests are complete, make certain all accessories are re-mounted and all fasteners are replaced. This completes the retest after repair.

* Repeat step 1 and 2 (2a) with trail and trail connected AC/DC 1000SD for TANDEM Cruiser™.

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*** NOTE:** Many PC Board Assemblies are now totally encapsulated, surface mounted and or multi-layered and are therefore considered to be unserviceable. Assembly drawings of these boards are provided for reference only.

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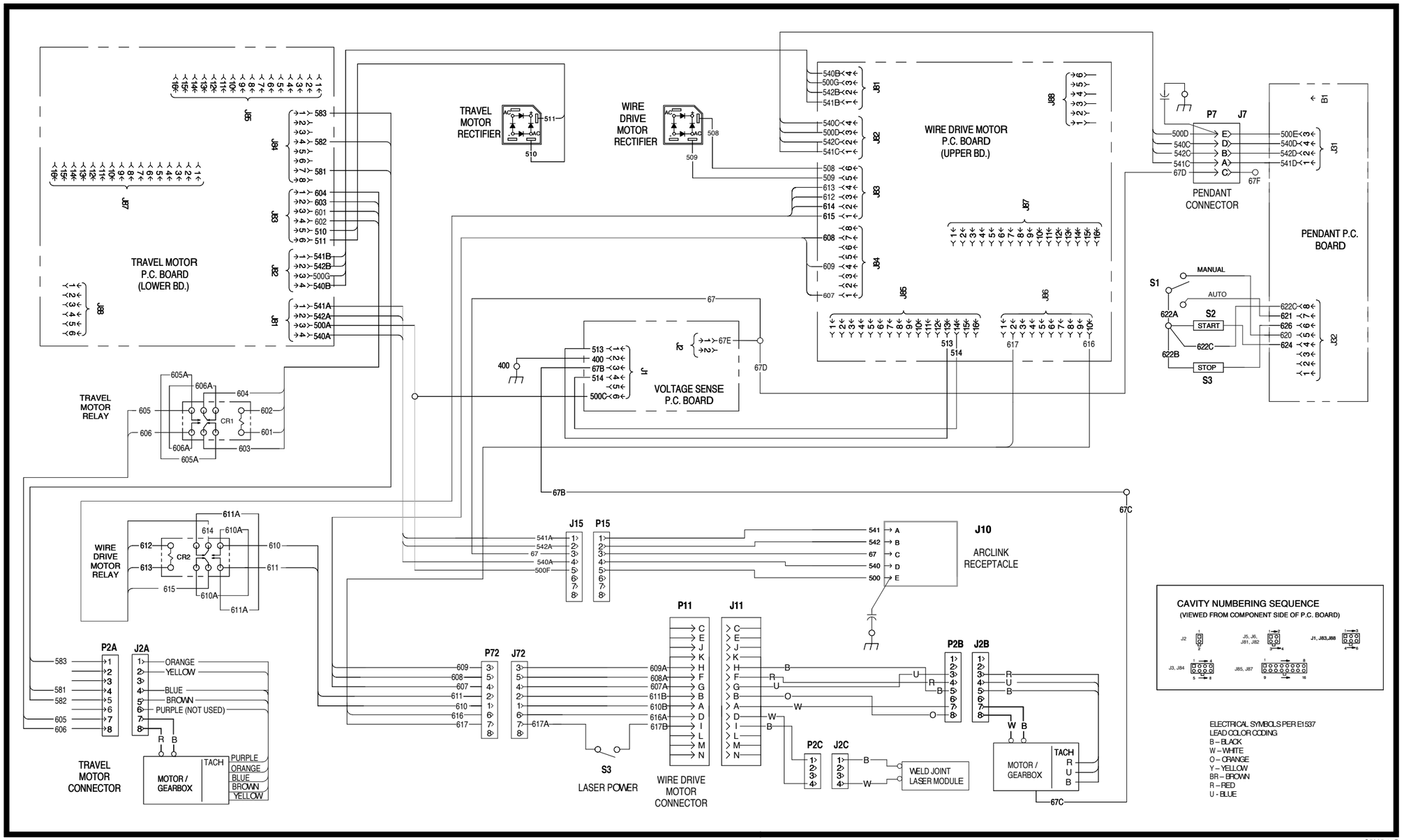
WIRING DIAGRAM - (CRUISER CODE 11767 & TANDEM CRUISER CODE 11824) - G5905-1

WIRING DIAGRAM - DIGITAL CRUISER



G5905-1 B

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The wiring diagram specific to your code is pasted inside one of the enclosure panels of your machine.

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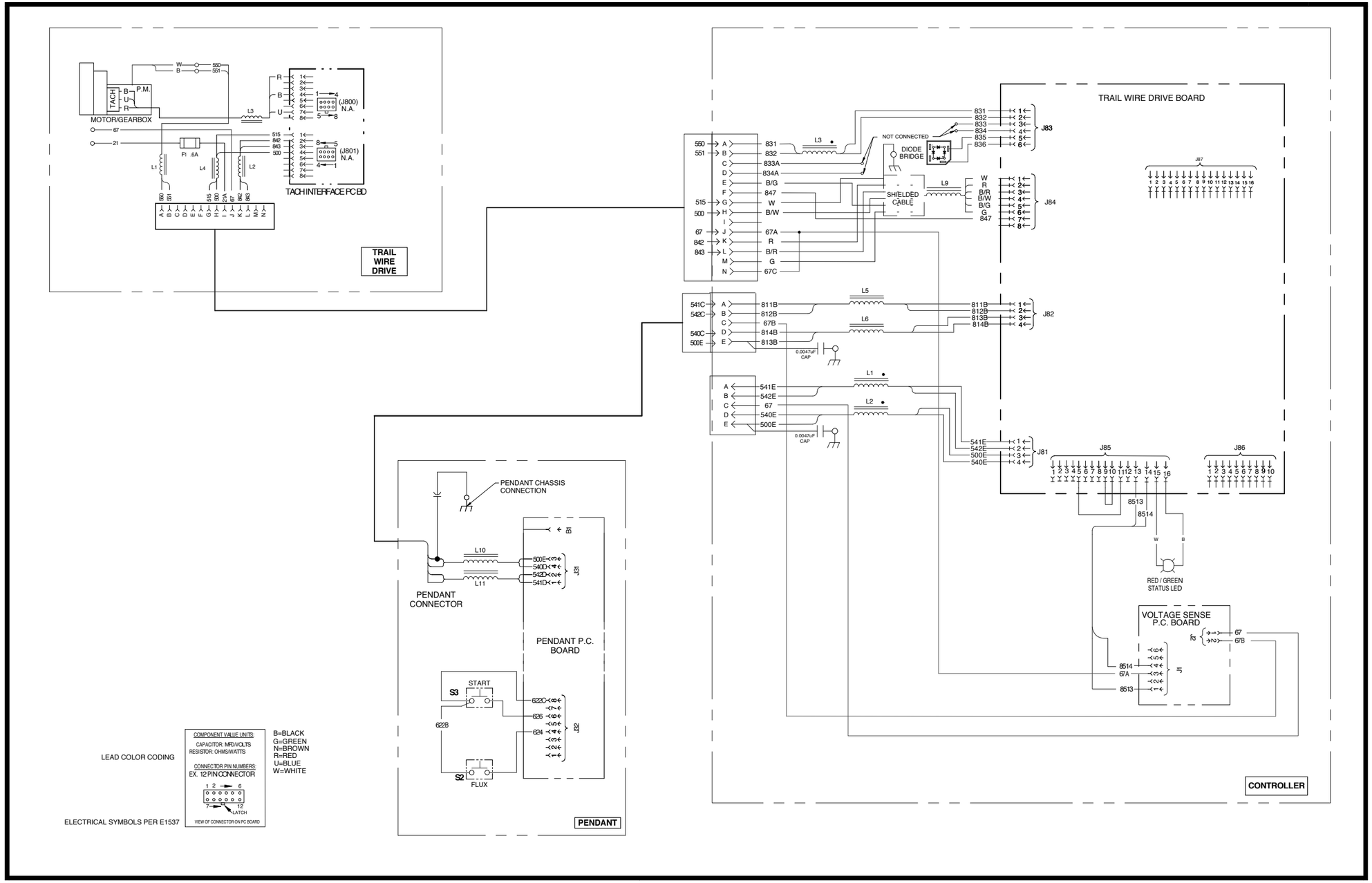
WIRING DIAGRAM - (TANDEM CRUISER CODE 11824) - G7249

TRAIL ARC WIRING DIAGRAM



G7249 **A**

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

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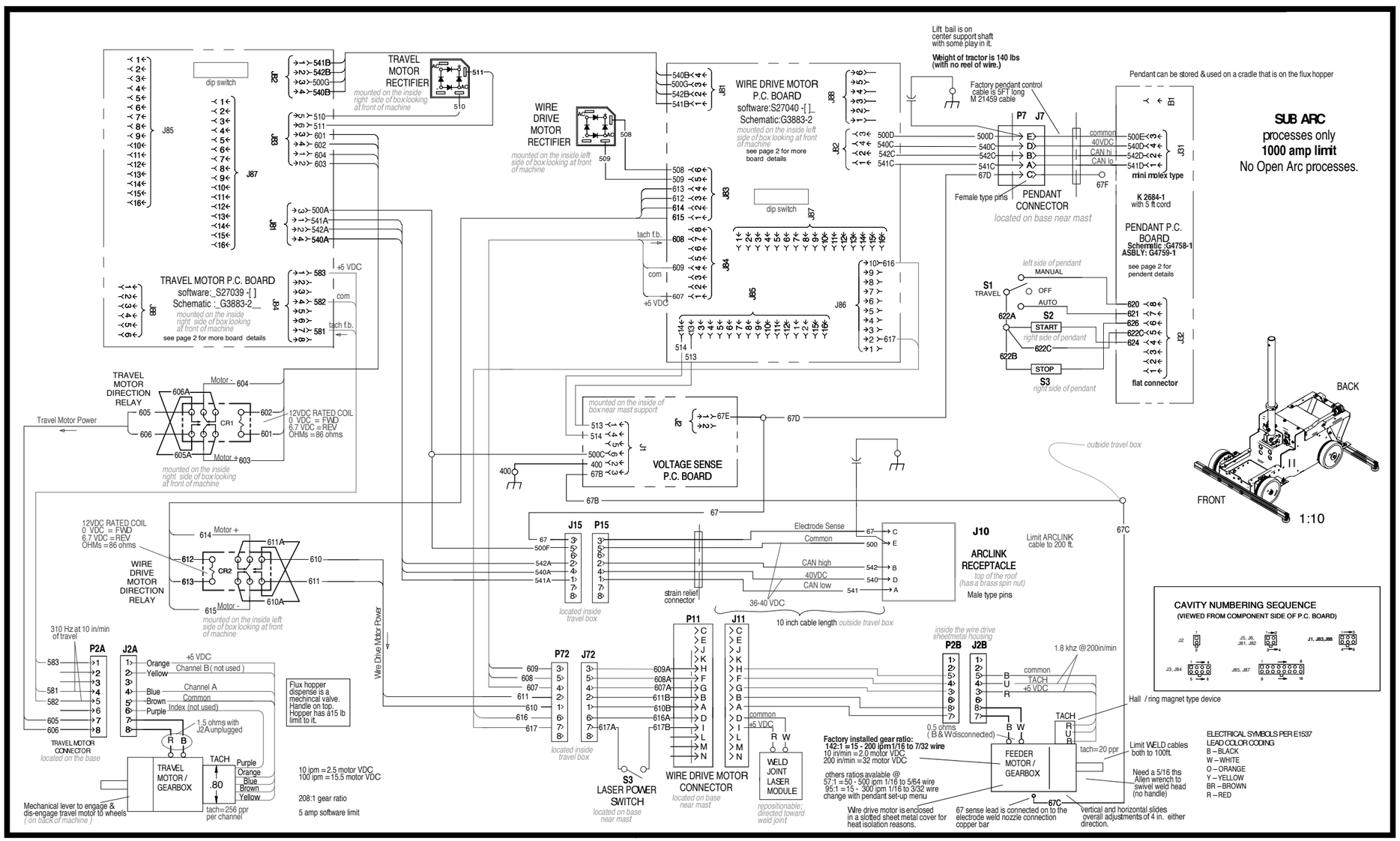
MACHINE SCHEMATIC - (CRUISER CODE 11767 & TANDEM CRUISER CODE 11824) - G6500-1 PG 1

G6500-1 | ENGINEERING CONTROLLED | MANUFACTURER: No | CHANGE DETAIL: REVISED MISC. LEAD NUMBERS AND COLORS.

MACHINE SCHEMATIC - CRUISER



UNLESS OTHERWISE SPECIFIED TOLERANCE: ON 2 PLACE DECIMALS ± .02 in. (±0.5 mm) ON 3 PLACE DECIMALS ± .005 in. (±0.15 mm) ON ALL ANGLES ± .5 OF A DEGREE. MATERIAL TOLERANCE (T) TO AGREE WITH PUBLISHED STANDARDS. DO NOT SCALE THIS DRAWING

CONTROL: CLEVELAND | DRAWN BY: tpearn | ENGINEER: E. ENYEDY | APPROVED: GWM

SCALE: NONE IF PRINTED @ A1 SIZE | UNITS: INCH

EQUIPMENT TYPE: CRUISER | SUBJECT: MACHINE SCHEMATIC | MATERIAL DISPOSITION: NA | APPROVAL DATE: 4/13/2012 | PROJECT NUMBER: CRM45820 | REFERENCE: G6500

PAGE 1 OF 2

DOCUMENT NUMBER: G6500-1 | DOCUMENT REVISION: B

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

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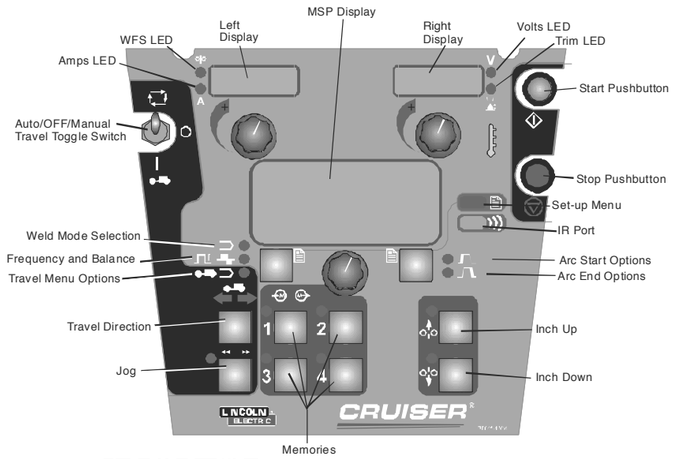
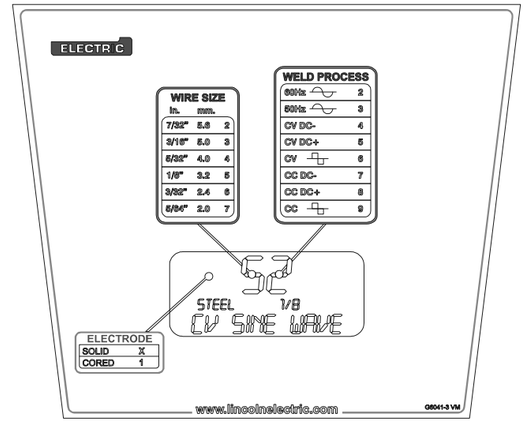
MACHINE SCHEMATIC - (CRUISER CODE 11767 & TANDEM CRUISER CODE 11824) - G6500-1 PG 2

G6500-1 | ENGINEERING CONTROLLED MANUFACTURER: No | CHANGE DETAIL: REVISED MISC. LEAD NUMBERS AND COLORS.



PENDANT FRONT

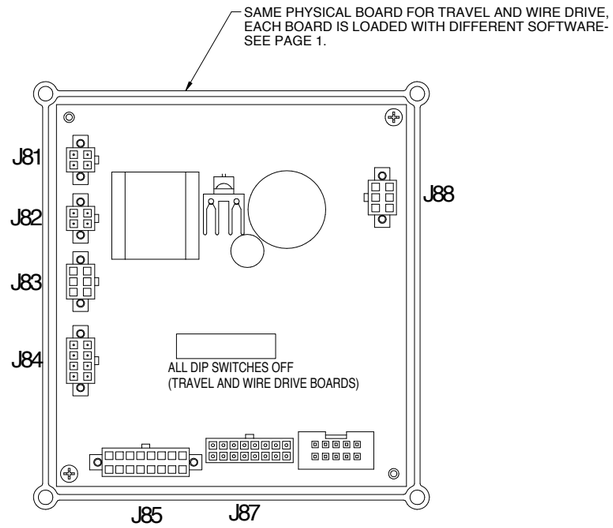


REAR OF PENDANT WITH PROCEDURE INFORMATION

ELECTRODE HOT PARTS:
- SPOOL AND WIRE
- WIRE DRIVE FEEDPLATE
- STRAIGHTENER ROLLS AND SCREWS
- NOZZLE AND TIP

COVER WIRE WITH PLASTIC CONDUIT FROM SPOOL TO WIRE DRIVE

WIRE DRIVE MOTOR IS INSULATED



MANUFACTURING TOLERANCE PER ES200
UNLESS OTHERWISE SPECIFIED TOLERANCE
ON 2 PLACE DECIMALS IS ± .02 in. (± 0.5 mm)
ON 3 PLACE DECIMALS IS ± .005 in. (± 0.13 mm)
ON ALL ANGLES IS ± 5 OF A DEGREE
MATERIAL TOLERANCE (T) TO AGREE WITH PUBLISHED STANDARDS.
DO NOT SCALE THIS DRAWING

CONTROL: CLEVELAND	SCALE: NONE IF PRINTED IS A1 SIZE	EQUIPMENT TYPE: CRUISER					PAGE 2 OF 2		
DRAWN BY: tpearn		SUBJECT: MACHINE SCHEMATIC					DOCUMENT NUMBER: G6500-1	DOCUMENT REVISION: B	
ENGINEER: E. ENYEDY	UNITS: INCH	MATERIAL DISPOSITION: NA	APPROVAL DATE: 4/13/2012	PROJECT NUMBER: CRM45820	REFERENCE: G6500				
APPROVED: GWM									

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

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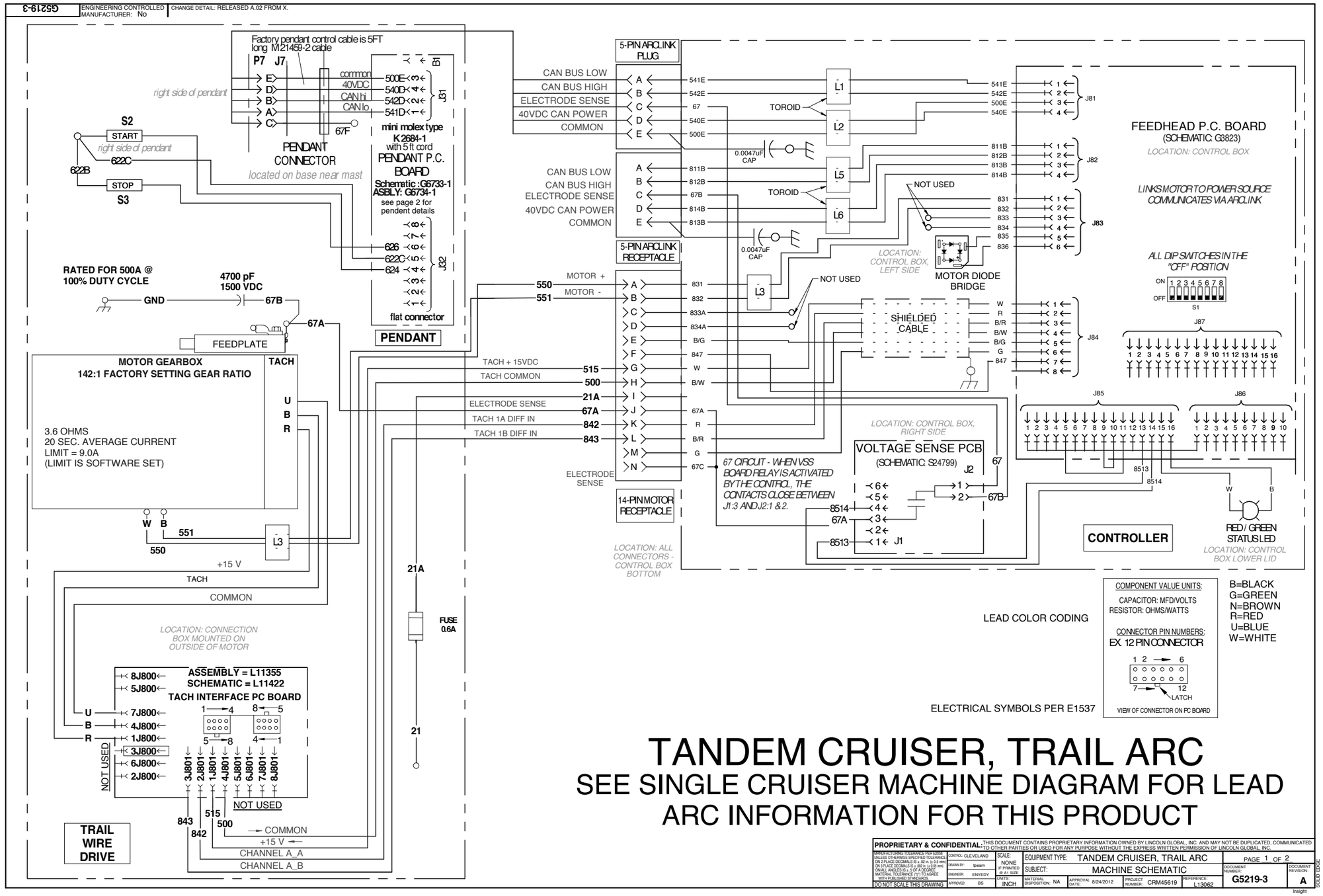
SCHEMATIC - (TANDEM CRUISER CODE 11824) - G5219-3 PG 1



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

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Return to Section TOC
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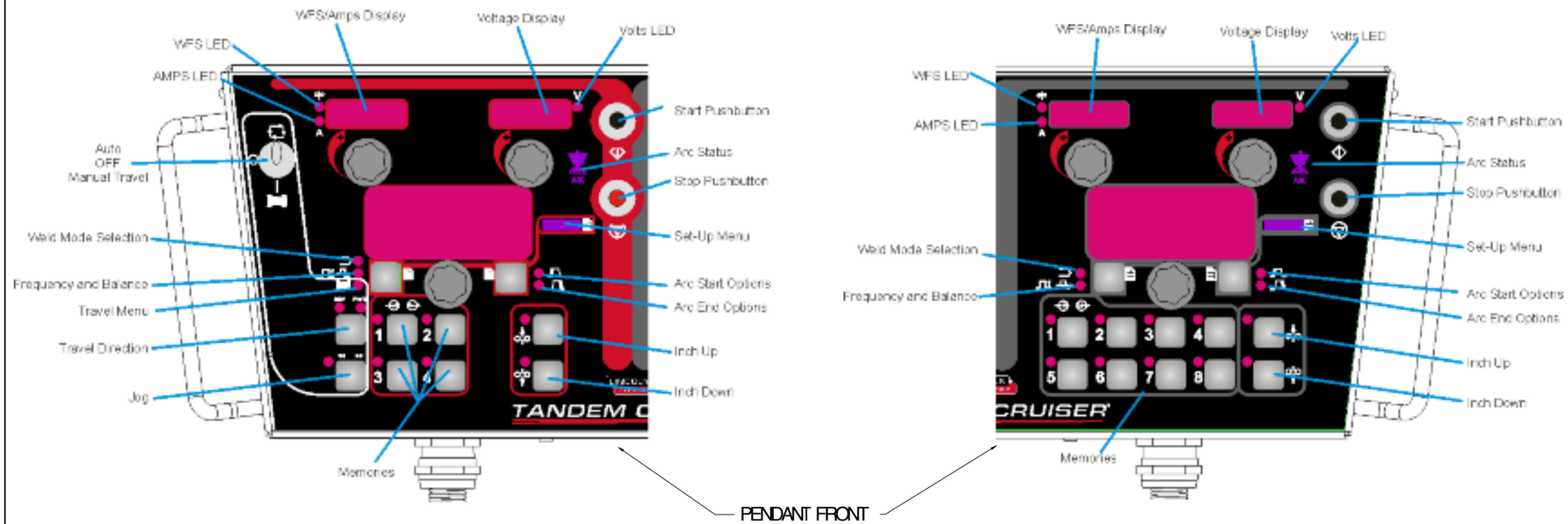
G5219-3 | ENGINEERING CONTROLLED | CHANGE DETAIL: RELEASED A.02 FROM X.
MANUFACTURER: No



ELECTRODE HOT PARTS:
- SPOOL AND WIRE
- WIRE DRIVE FEEDPLATE
- STRAIGHTENER ROLLS AND SCREWS
- NOZZLE AND TIP

COVER WIRE WITH PLASTIC CONDUIT FROM SPOOL TO WIRE DRIVE

WIRE DRIVE MOTOR IS INSULATED

MANUFACTURING TOLERANCE PER ES556 UNLESS OTHERWISE SPECIFIED TOLERANCE ON 2 PLACE DECIMALS IS ± .02 in. (± 0.5 mm) ON 3 PLACE DECIMALS IS ± .002 in. (± 0.05 mm) ON FRACTIONS IS ± 1/64 in. (± 0.4 mm) MATERIAL TOLERANCE 2° X TO AGREE WITH PUBLISHED STANDARDS.
DO NOT SCALE THIS DRAWING

CONTROL: CLEVELAND	SCALE: NONE IF PRINTED @ A1 SIZE	EQUIPMENT TYPE: TANDEM CRUISER, TRAIL ARC				PAGE 2 OF 2	
DRAWN BY: tpearn		SUBJECT: MACHINE SCHEMATIC				DOCUMENT NUMBER: G5219-3	DOCUMENT REVISION: A
ENGINEER: ENYEDY		MATERIAL DISPOSITION: NA	APPROVAL DATE: 8/24/2012	PROJECT NUMBER: CRM45619	REFERENCE: L13062		
APPROVED: BS	UNITS: INCH						

SOLID EDGE Insight

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.