LINCOLN ELECTRIC

GENUINE LINCOLN PARTS™

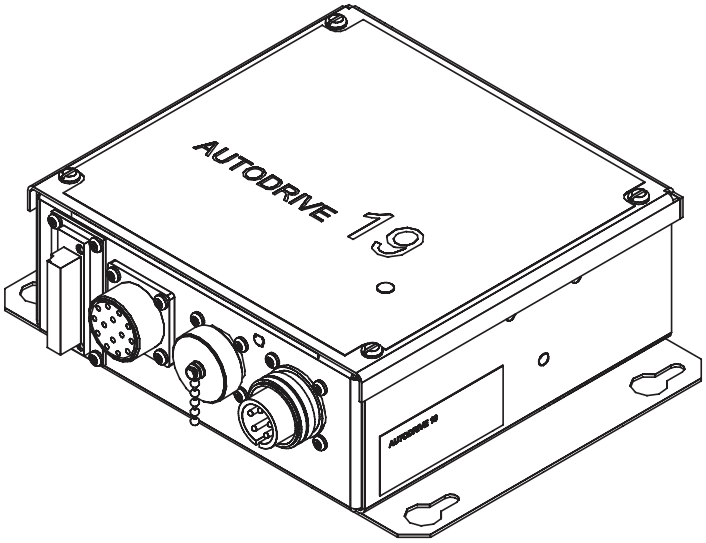
NOTE: This manual will cover most of the troubleshooting and repair procedures for the code numbers listed. Some variances may exist when troubleshooting/repairing later code numbers.

AutoDrive® 19 CONTROLLER

For use with machines having Code Numbers:

11730, 12446

SERVICE MANUAL



SVM234-A | Issue Date 13-Jul

THE LINCOLN ELECTRIC COMPANY
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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.

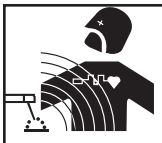
1.d. Keep all equipment safety guards, covers and devices in position and in good repair.Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

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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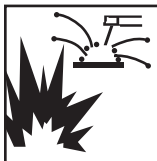

WELDING and CUTTING SPARKS can cause fire or explosion.

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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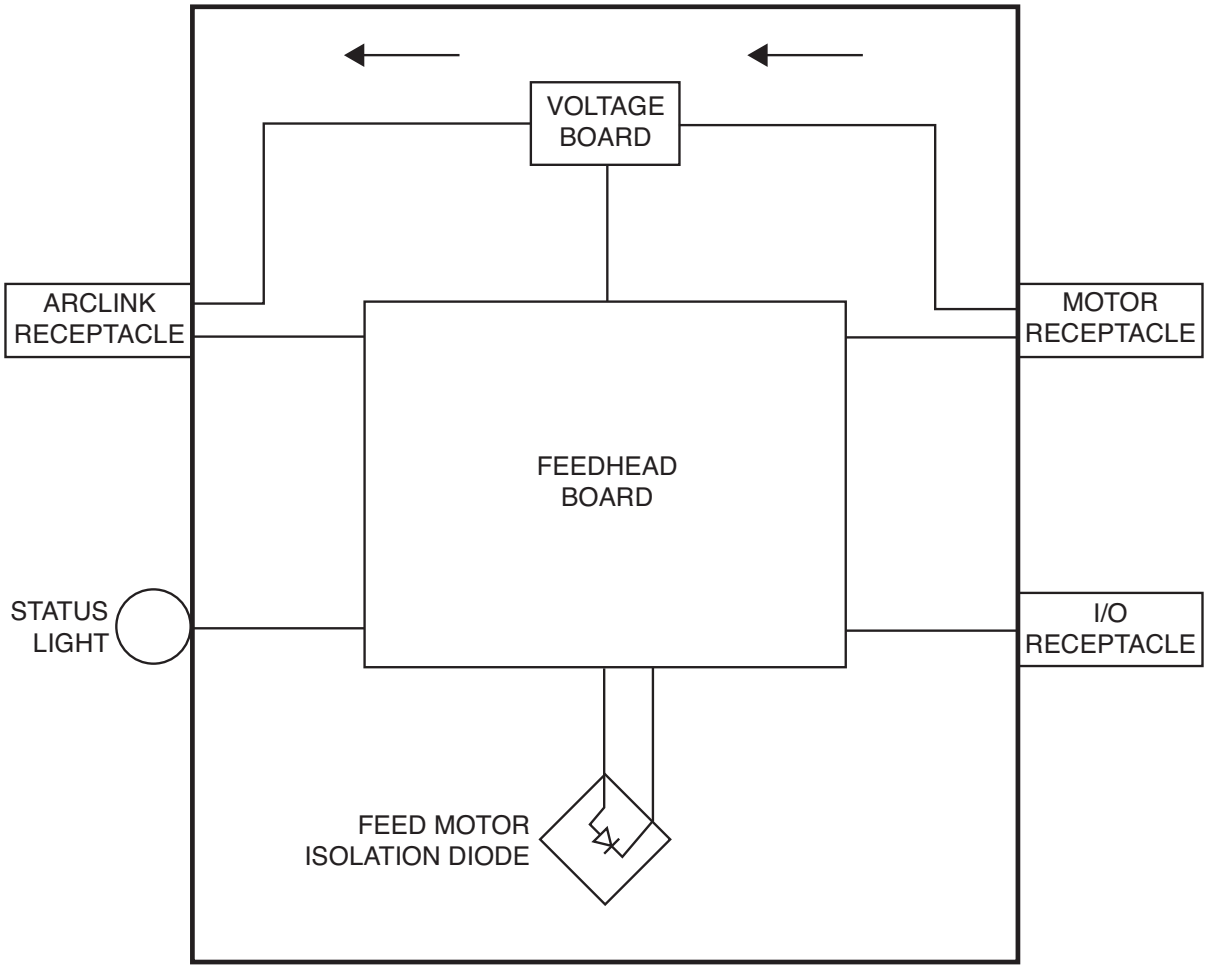
FIGURE E.1 BLOCK LOGIC DIAGRAM (CODE 11730)



AutoDrive® 19 CONTROLLER

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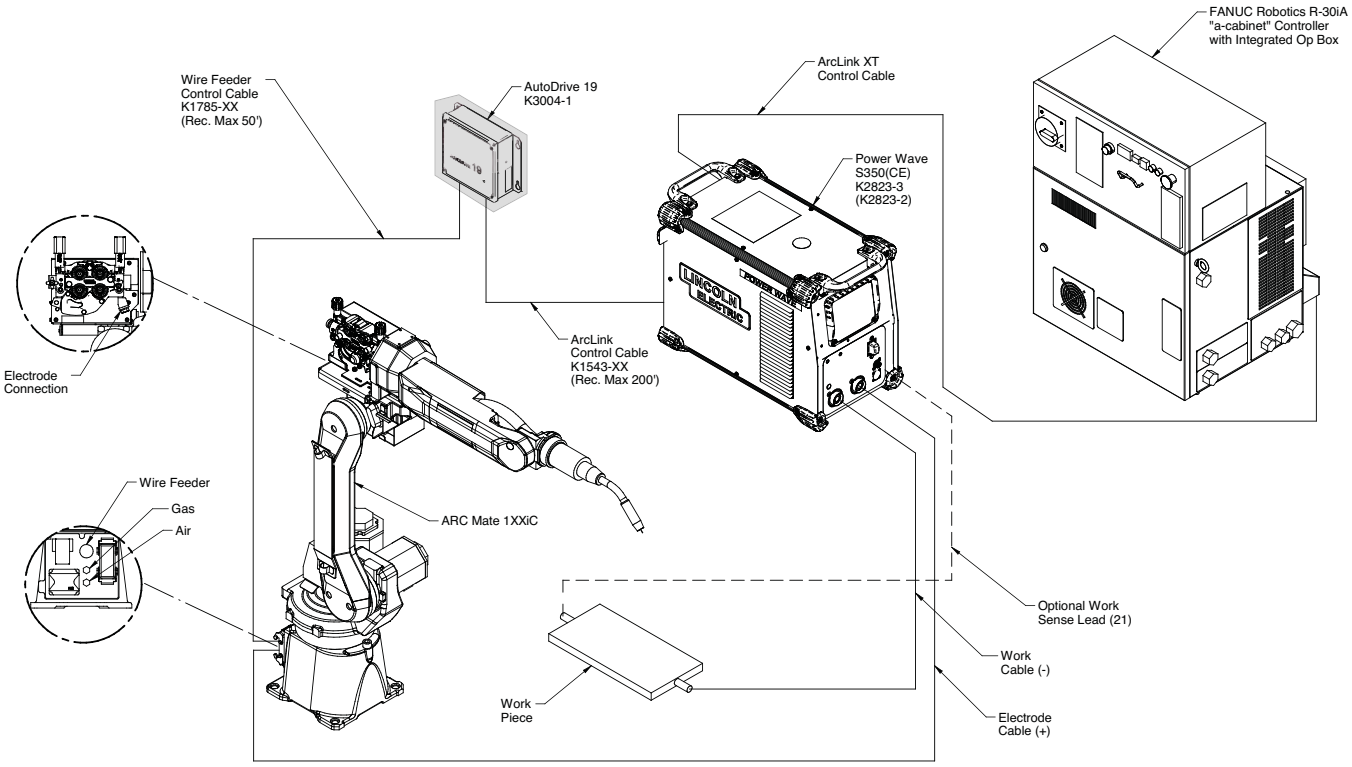
FIGURE E.2 - GENERAL DESCRIPTION



GENERAL DESCRIPTION

The AutoDrive® 19 CONTROLLER is a wire drive controller designed to operate in the Power Wave S Series system and AutoDrive Series feeders. It is responsible for relaying wire feeder commands to an AutoDrive 4R90, 4R100, 4R220 or PF10R (via a 14 pin feeder cable) and to the power source (via 5 pin arclink cable). The AutoDrive® 19 CONTROLLER is required for hard automation or robotic installations. A green terminal strip provides the customer with the following controls: trigger, 2/4 step, dual procedure, gas purge, cold inch forward, cold inch reverse and two shutdown inputs.

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

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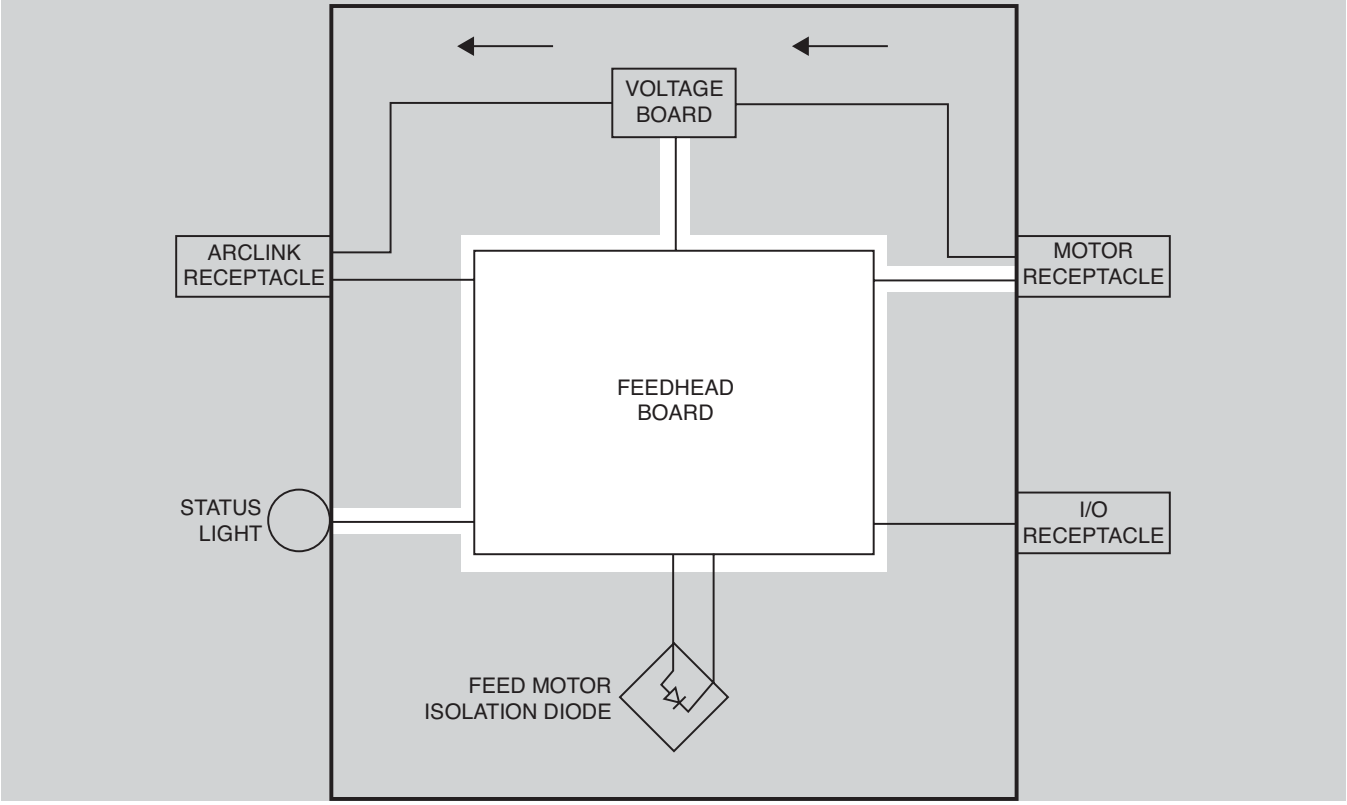
FIGURE E.3 - FEEDHEAD BOARD FUNCTION



FEEDHEAD BOARD FUNCTION

The feedhead board in the AutoDrive® 19 CONTROLLER is a board that is used in all of the Power Feed type feeders. The AutoDrive® 19 CONTROLLER has software dedicated to the board that will only work in this AutoDrive® 19 CONTROLLER product. By utilizing the tach feedback information from the feeder tach device located in the feeder head, the feedhead board controls the armature voltage (speed) to the wire drive motor. The feedhead board also provides the gas solenoid control signal. The feedhead board also controls the voltage sense board and processes I/O information through its receptacle back to the powerwave. Error status lights control and communicates all information back to the Powerwave.

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

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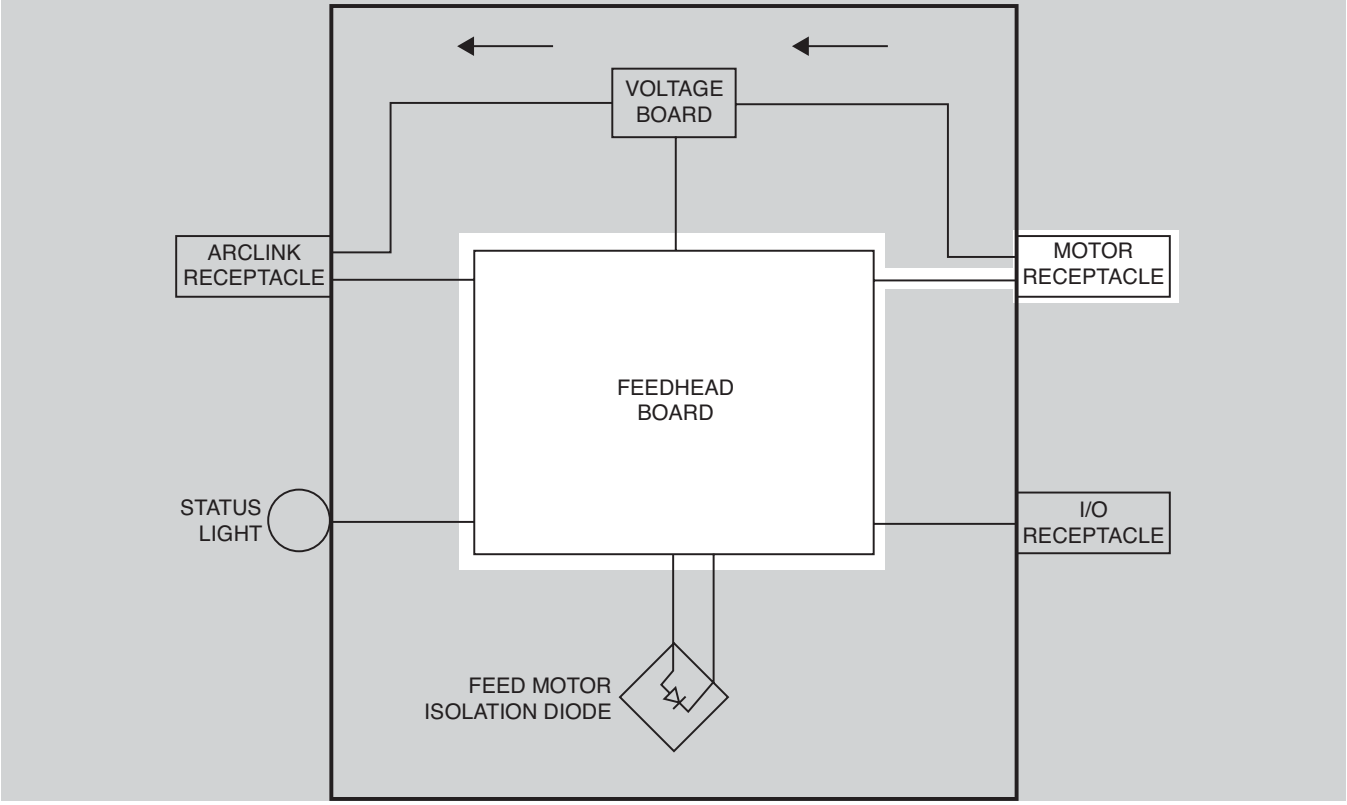
FIGURE E.4 - MOTOR RECEPTACLE FUNCTION



MOTOR RECEPTACLE FUNCTION

The 14 pin motor cable is the communication interface between the wire feeder and the AutoDrive® 19 Controller. This 14 pin cable transmits the motor armature supply and the +15VDC tach supply. The tach feedback signal and the electrode voltage sense are also transmitted through this cable.

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

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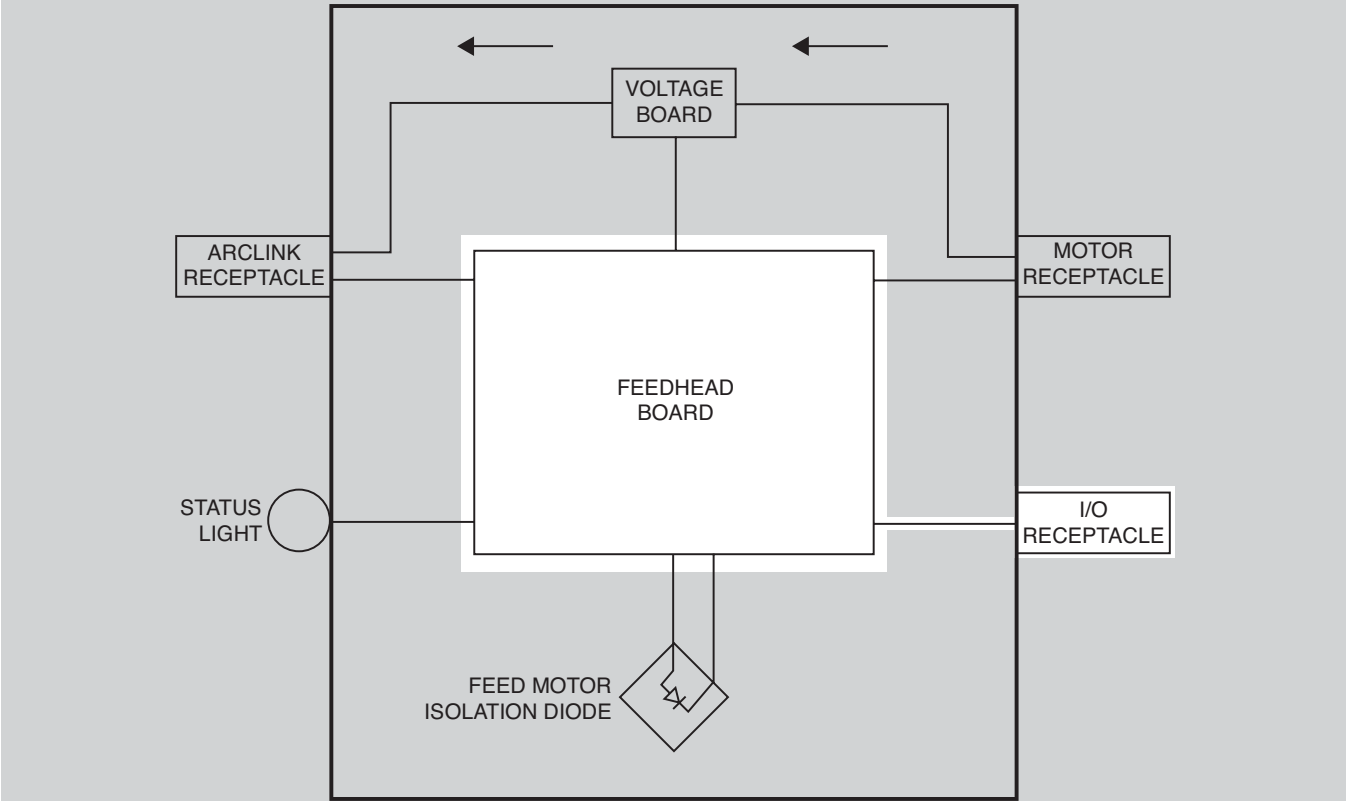
FIGURE E.5 - I/O RECEPTACLE FUNCTION



I/O RECEPTACLE FUNCTION

The AutoDrive® 19 CONTROLLER has a green terminal strip (I/O receptacle) that has several functions. There are two shut down functions (inputs), an inch up and down command as well as start and stop commands. (See ***Wiring Diagram*** for details).

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

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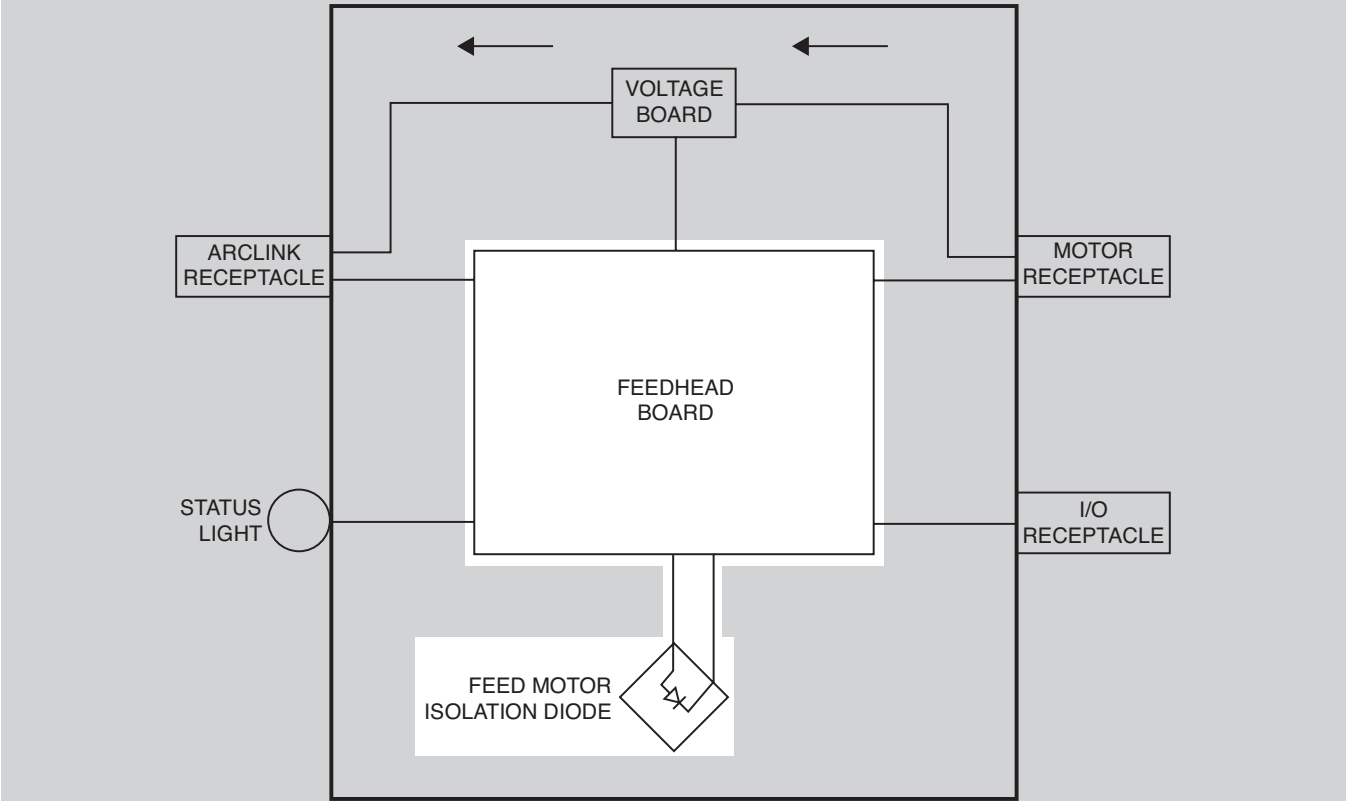
FIGURE E.6 - FEED MOTOR ISOLATION DIODE FUNCTION



FEED MOTOR ISOLATION DIODE FUNCTION

The feeder control board in the AutoDrive® 19 requires an isolation diode package to keep wire feeder motor voltage spikes from entering back into the 40 volt power supply. This helps protect the electronic circuits found on this board.

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

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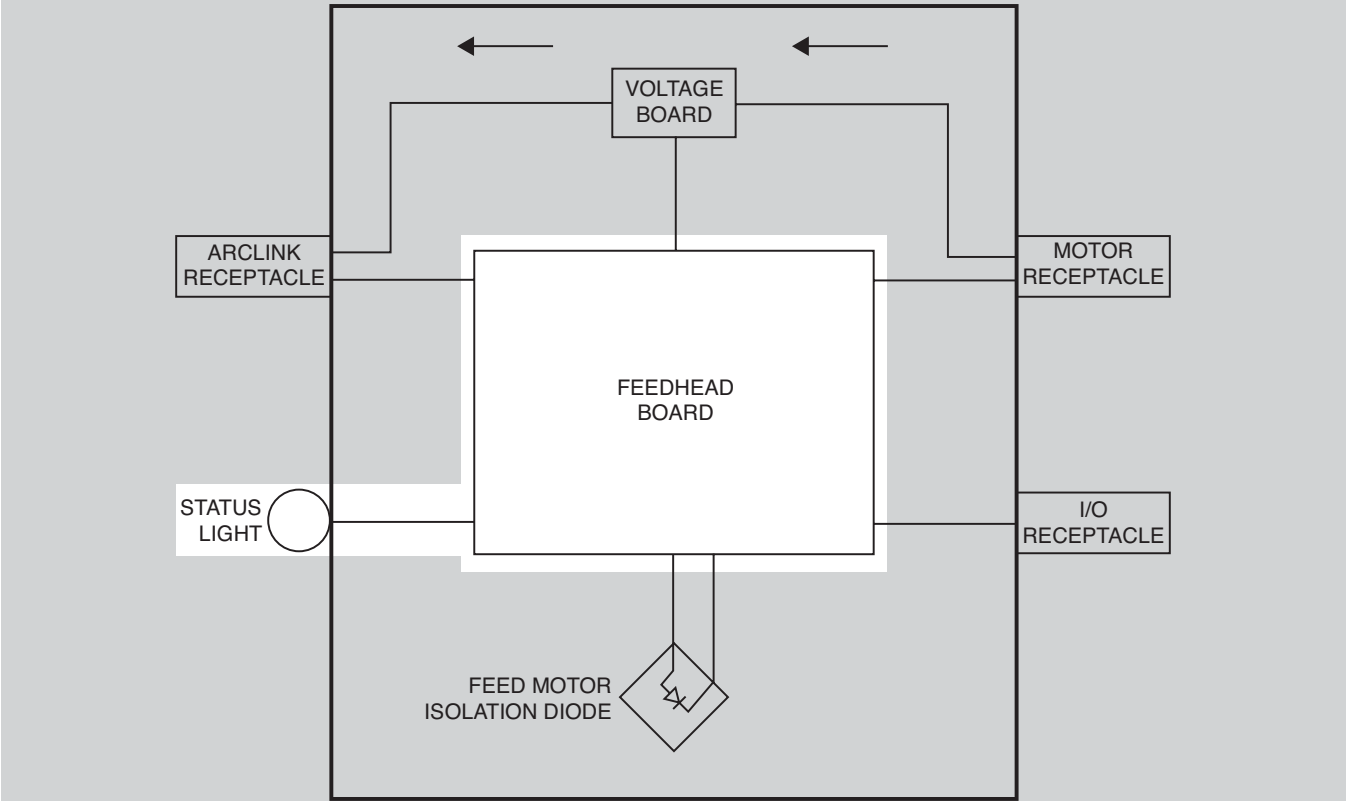
FIGURE E.7 - STATUS LIGHT FUNCTION

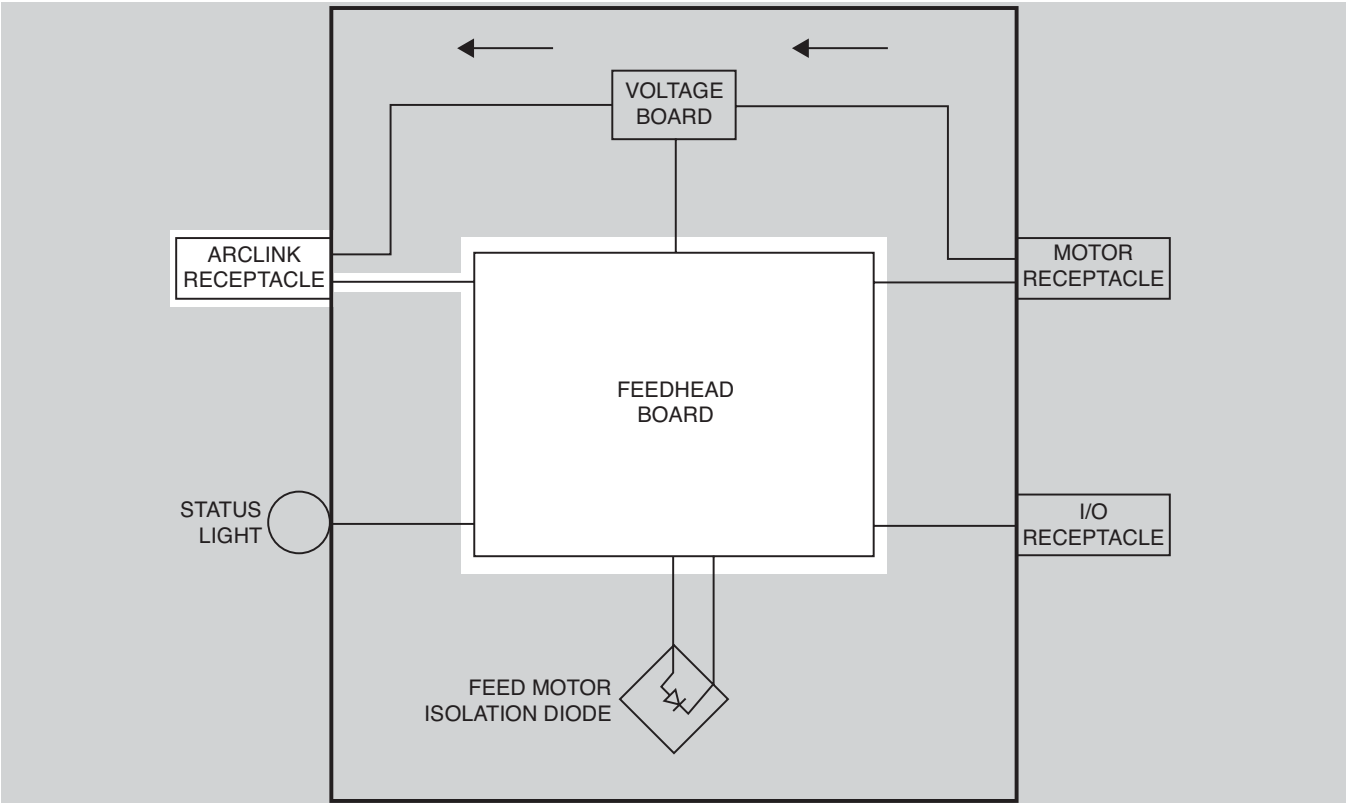


STATUS LIGHT FUNCTION

The AutoDrive® 19 has a bi-colored GREEN / RED LED on the outside of the AutoDrive® 19 controller. When all conditions are GOOD the status light is a steady GREEN. In the event of a problem the status light communicates an error code in RED flashes. A list of the error codes can be found in the ***Troubleshooting*** section of this manual, the Power Wave® Manager Diagnostic software section or at: ***www.PowerWaveSoftware.com***

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

FIGURE E.8 - ARCLINK RECEPTACLE FUNCTION

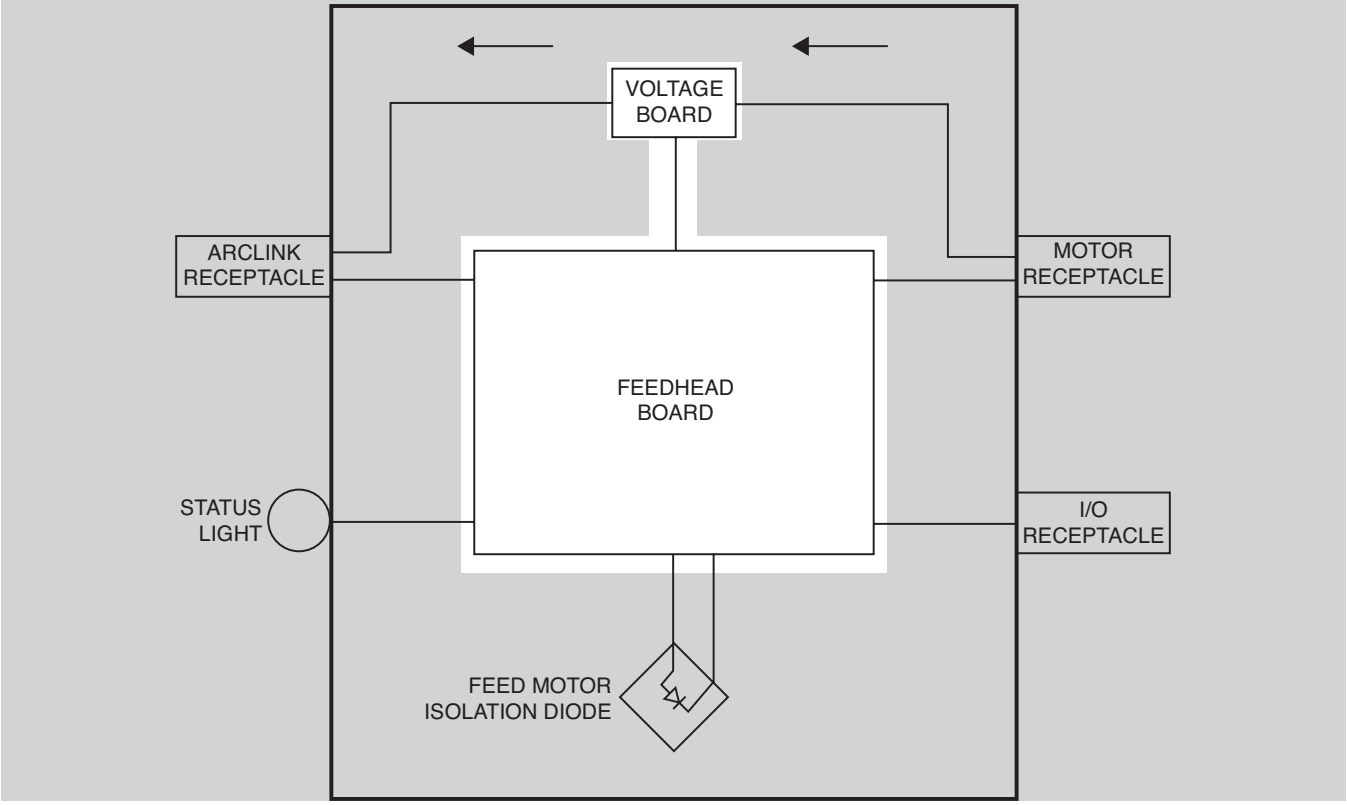


ARCLINK RECEPTACLE FUNCTION

The AutoDrive® 19 CONTROLLER communicates with the Power Wave welder via ArcLink that is a digital communication protocol. The 40 volts DC supply that powers up the AutoDrive® 19 CONTROLLER and the wire drive unit is also supplied through this cable. The electrode sense lead is incorporated in this cable.

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

FIGURE E.9 - VOLTAGE SENSE BOARD FUNCTION



VOLTAGE SENSE BOARD FUNCTION

The AutoDrive® 19 CONTROLLER has a voltage sense board that is required to turn on when the welders output is on. It supplies electrode voltage feedback to the PowerWave welder. The PowerWave needs this for the control of output welding voltage. The voltage sense board isolates the electrode voltage from the welder when the welder its not turned on.

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

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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: Arclink system error code and output 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.

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Observe all Safety Guidelines detailed throughout this manual

USING THE STATUS LED TO TROUBLESHOOT SYSTEM PROBLEMS

The AutoDrive® 19 CONTROLLER is equipped with a Status Light. If a problem occurs, it is important to note the condition of the status lights. **Therefore, prior to cycling power to the system, check the power source status light for error sequences as noted below.**

Included in this section is information about the power source and Wire Drive Module Status LEDs and some basic troubleshooting charts for both machine and weld performance.

The STATUS LIGHTS are dual-color LEDs that indicate system errors. Normal operation for each is steady GREEN. Error conditions are indicated in the following Table F.1.

TABLE F.1 – STATUS LIGHTS

Light Condition	Meaning
Steady Green	System OK. Power source is operational and is communicating normally with all healthy peripheral equipment connected to its ArcLink network.
Blinking Green	Occurs during power up or a system reset and indicates the POWER WAVE® is mapping (identifying) each component in the system. Normal for first 1-10 seconds after power is turned on or if the system configuration is changed during operation.
Fast Blinking Green	Under normal conditions indicates Auto-mapping has failed. Also used by the Weld Manager Utility (included on the POWER WAVE® Submerged Arc Utilities and Service Navigator CDs or available at www.PowerWaveSoftware.com) to identify the selected machine when connecting to a specific IP address.
Alternating Green and Red	Non-recoverable system fault. If the Status lights are flashing any combination of RED and GREEN, errors are present. **Read the error code(s) before the machine is turned off.** Error Code interpretation through the Status light is detailed in the Service Manual. Individual code digits are flashed in RED with a long pause between digits. If more than one code is present, the codes will be separated by a GREEN light. Only active error conditions will be accessible through the Status Light. Error codes can also be retrieved with the Weld Manager Utility (included on the POWER WAVE® Submerged Arc Utilities and Service Navigator CDs or available at www.PowerWaveSoftware.com). This is the preferred method, since it can access historical information contained in the error log. To clear the active error(s), turn power source off and back on to reset.
Steady Red	Not applicable.
Blinking Red	Not applicable.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your **Local Lincoln Authorized Field Service Facility** for technical troubleshooting assistance before you proceed.

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)		POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
ARCLINK SYSTEM ERROR CODES			
Err 81	Motor Overload (long term)	1. The wire drive motor has overheated. Check that the electrode slides easily through feed system. 2. Remove tight bends from the feed conduit. 3. Check that the wire reel brake is not too tight. 4. Verify a high quality electrode is being used. 5. Wait for the error to reset and the motor to cool (approximately 1 minute). 6. Long term average motor current limit has been exceeded. Typically indicates mechanical overload of system. If problem continues consider higher torque gear ratio (lower speed range).	
Err 82	Motor overload (short term).	1. The wire drive motor current draw has exceeded limits, usually because the motor is in a locked rotor state. Check that the motor can turn freely when idle arm is open. 2. Verify that the gears are free of debris and dirt. 3. Check items listed for long term overload (Err 81).	Perform the ***Wire Feed Motor Test***. If it does not pass, perform the ***Drive Motor and Tach Feedback Test***. These will be found in the AutoDrive 4R90 service manual. See ***SVM 213-TS***.
Err 83	Shutdown #1 is open.	1. This refers to the 'GREEN' I/O connector on the bottom of the AutoDrive® 19 CONTROLLER. If not being externally accessed, verify the integrity of the connector and jumper. If accessed through a remote circuit, verify the integrity of that circuit.	

⚠ 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 CAUSE	RECOMMENDED COURSE OF ACTION
ARCLINK SYSTEM ERROR CODES			
Err 84	Shutdown #2 is open.	1. This refers to the 'GREEN' I/O connector on the bottom of the controller. 2. If not being externally accessed, verify the integrity of the connector and jumper. 3. If accessed through a remote circuit, verify the integrity of that circuit.	
Err 6311	Unstable or "noisy" wire feed speed (WFS) feedback signal.	1. Check the cables and connections to the Wire Drive. 2. Check the Wire Drive control cable routing see ***Control Cable Connection-General Guidelines***. 3. Check the Tachometer Interface Board.	Perform the ***Tachometer / Wire Feed Speed Feedback Test***. If it does not pass the test, Perform the ***Wire Feed Motor Test*** and ***Tachometer Test***. These will be found in the AutoDrive 4R90 service manual. See ***SVM 213-TS***.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your **Local Lincoln Authorized Field Service Facility** for technical troubleshooting assistance before you proceed.

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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 feeder does power up but there is no wire feed.	1. The control cable may be loose or damaged. Tighten, repair or replace the control cable. 2. Check for the proper command information from the customer supplied user interface.	1. Perform the ***Wire Feed Motor Test***. 2. Check the isolation diode bridge for an open or shorted diode.
Inconsistent wire feeding or wire not feeding but drive rolls turning.	1. The electrode is rusty or dirty. Use only clean electrode. Use quality electrode, like L-50 or L-56 from Lincoln Electric. 2. The contact tip is partially melted or has spatter. Replace the contact tip. 3. Improper tip, drive rolls and/or inner wire guide. Verify the proper parts are installed. 4. Incorrect tension arm pressure on the drive rolls. Adjust the tension arm per the instruction manual. Most electrodes feed well at a tension arm setting of “3”. 5. Worn drive roll. Replace the drive rolls if worn or filled with dirt.	1. Contact the Lincoln Electric Service Department for technical troubleshooting at 1-888-935-38777.
Weld wire burns back to the welding tip every time the arc is struck. No control of the weld voltage, welder is at max weld voltage.	1. Make sure that the 67 lead positive voltage feed back is in tacked, not broken. Also for the work sense lead to the welder.	1. Perform the ***Voltage Sense Board Test***. 2. Enter into the diagnostic utility and sense positive and negative voltage feed back at the welders output studs. This tests for broken or disconnected sense leads if welding is improved.

⚠ 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		
Wire feed speed consistently operates at the wrong value.	1. The wire feeder gear setting is not properly set. Verify that the software setting matches the gear mounted. See ***Selecting A Wire Drive and Gear Ratio***.	1. Perform the ***Tachometer / Wire Feed Speed Feedback Test***. If this does not pass test, it may be necessary to perform a ***Tachometer Feedback Test*** for the feeder. These will be found in the AutoDrive 4R90 service manual. See ***SVM 213-TS***.
Variable or "hunting" arc.	1. Wrong size, worn and/or melted contact tip. Replace the contact tip. 2. Worn work cable or poor work connection. Verify all work and electrode connections are tight and that the cables are in good condition. Clean/replace as necessary. 3. Wrong polarity. Adjust polarity to the recommended procedure. Verify DIP switch #7 setting matches the electrode polarity.	
Gas solenoid problems. Porosity in the weld, or the weld has a dark sooty appearance.	1. Verify the gas supply is turned on and not empty. 2. Check the gas hose for cuts. Make sure it is not crushed or kinked. 3. Verify the shielding gas hose is connected to the gun bushing or weld gun.	1. Perform the ***Gas Solenoid Test***. 2. The gas solenoid is in the AutoDrive 4R90, 4R100 or 4R220 feeder.

⚠ 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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TACHOMETER / WIRE-FEED SPEED FEEDBACK TEST

⚠ 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

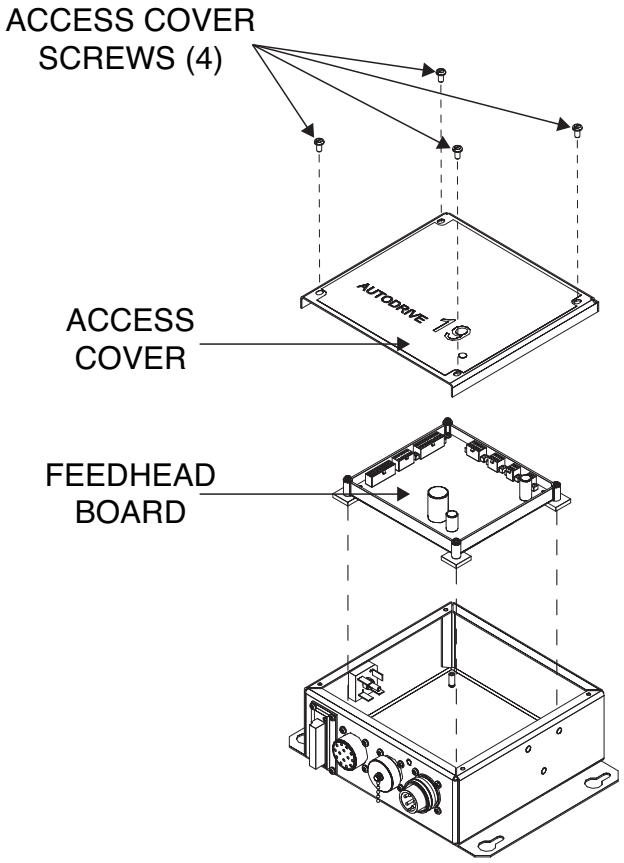
This test will help determine if the tach sensing is functioning correctly.

MATERIALS NEEDED

Phillips Screwdriver
Volt/Ohmmeter
Wiring Diagram
A Known Good AutoDrive 4R90, 4R100 or 4R220 or PF10R Wire Drive.
A Known Good Power Wave® S350 or i400
Possible use of AutoDrive 4R90 Service Manual SVM213-TS may be required for testing.

TACHOMETER / WIRE-FEED SPEED FEEDBACK TEST (continued)

FIGURE F.1 – FEEDHEAD BOARD LOCATION



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Do not touch electrically live parts or electrodes with your skin or wet clothing.**
- **Insulate yourself from the work and ground.**
- **Always wear dry insulating gloves.**

---

1. Remove the input power.
2. Using the phillips screwdriver, remove the four screws from the AutoDrive® 19 CONTROLLER access cover. See Figure F.1.
3. Open the access cover and locate the feedhead board in the AutoDrive® 19 CONTROLLER. See Figure F.1.

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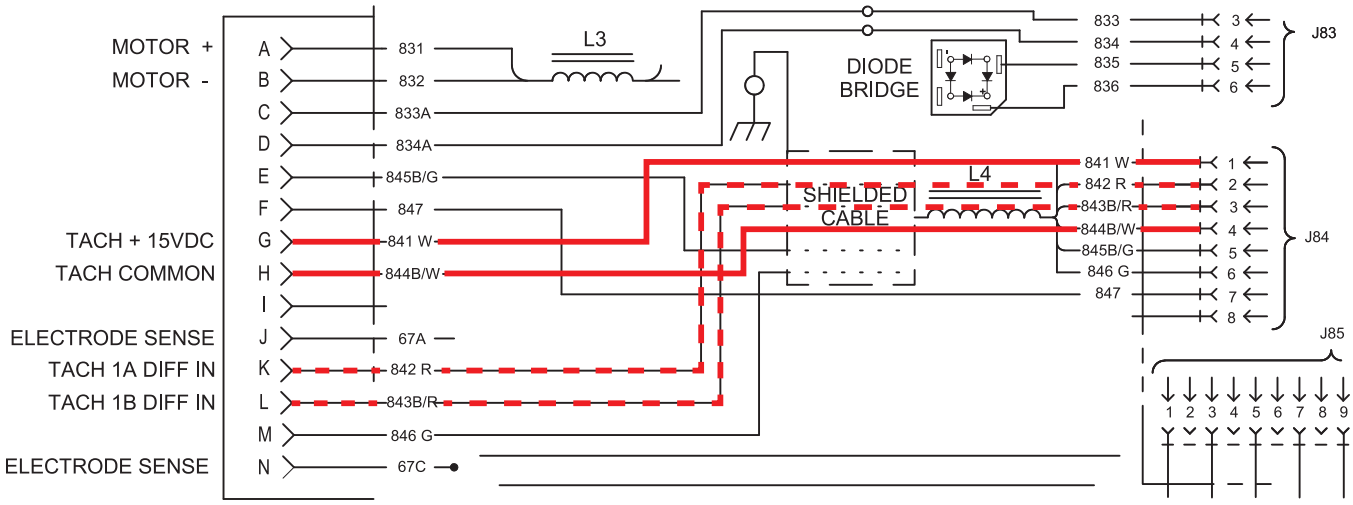
TACHOMETER / WIRE-FEED SPEED FEEDBACK TEST (continued)

FIGURE F.2 – LEAD LOCATIONS



4. Measure for 15VDC at leads 841(+) and 844(-) for the supply to the feedhead P.C. board. See Figure F.2 and ***Figure F.3***.
5. If voltage is present, check for frequency at leads 842 and 843 for different wire feed speeds by using the inch speed from the Power Wave® interface device. See Figure F.2 for diagram circuits highlighted in solid and dashed lines for reference. See ***Figure F.3***.

Frequency measurements for inches per minute.

IPM: 10 = 99 hz

100 = 973 hz

200 = 1945 hz

If these measurements cannot be obtained, there may be a possibility that the feedhead P.C. board or tach pick up is defective in the provided wire drive. Further tests for wire drive can be found in the ***Power Wave® 100SD SVM 205***. Do not rule out that the 14 pin control cable to the feeder could be defective. Test for opens or shorts.

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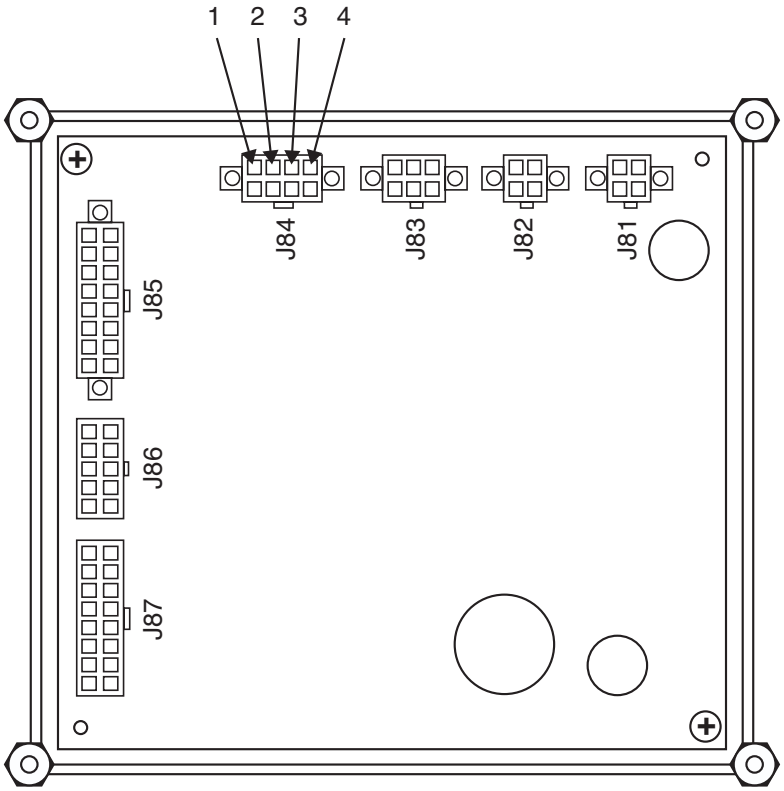
TACHOMETER / WIRE-FEED SPEED FEEDBACK TEST (continued)

FIGURE F.3 – PLUG J84 LEAD LOCATIONS



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WIRE FEED MOTOR TEST

⚠ 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

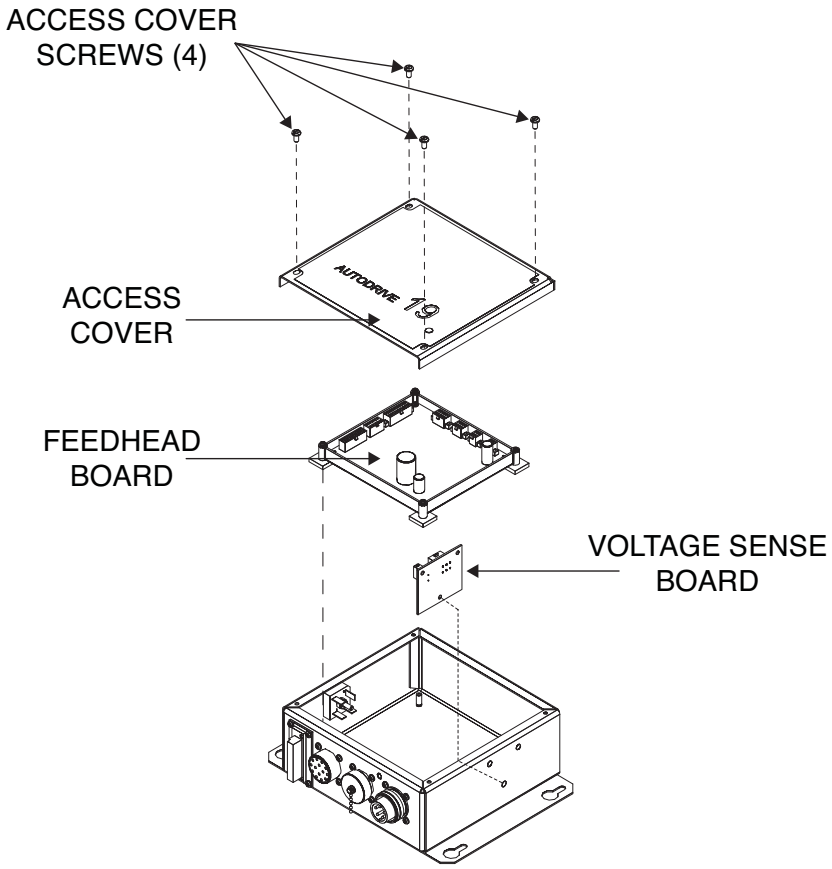
This test will help determine if the Wire Feed Motor is working properly and if it is receiving the correct voltages from the Feedhead Board in the AutoDrive® 19 CONTROLLER.

MATERIALS NEEDED

Phillips Screwdriver
Volt/Ohmmeter
Variable External 32VDC Supply
Wiring Diagram
A Known Good AutoDrive 4R90, 4R100 or 4R220 or PF10R Wire Drive.
A Known Good Power Wave® S350 or i400
Possible use of AutoDrive 4R90 Service Manual SVM213-TS may be required for testing.

WIRE FEED MOTOR TEST (continued)

FIGURE F.4 – VOLTAGE SENSE BOARD LOCATION



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

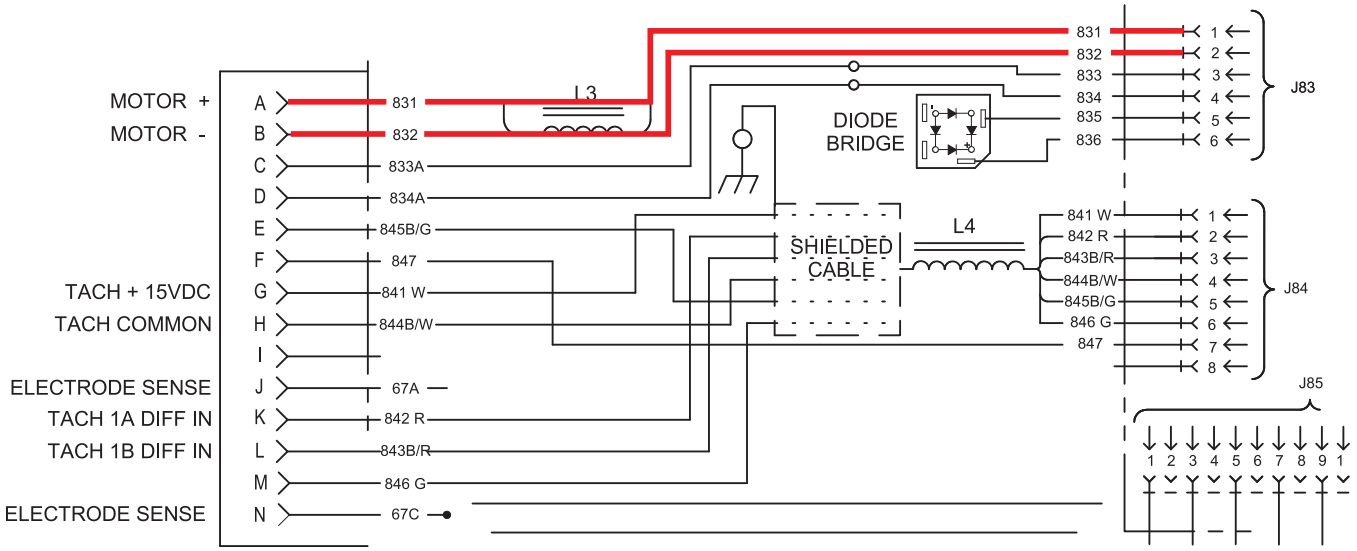
- **Do not touch electrically live parts or electrodes with your skin or wet clothing.**
- **Insulate yourself from the work and ground.**
- **Always wear dry insulating gloves.**

---

1. Remove the input power to the Power Wave®.
2. Using the phillips screwdriver, remove the four screws from the AutoDrive® 19 CONTROLLER access cover. See Figure F.4.
3. Open the access cover and locate the voltage sense board in the AutoDrive® 19 CONTROLLER. Figure F.4.
4. Locate and remove plug J83 on the control board. See ***Figure F.5*** and ***Figure F.6***.

WIRE FEED MOTOR TEST (continued)

FIGURE F.5 – LEAD LOCATIONS



5. Check the motor armature resistance from pin 1 (lead 831) to pin 2 (lead 832). The normal armature resistance is approximately 0.7 ohms. See Figure F.5 and ***Figure F.6***.
6. Check the resistance from either armature lead to the motor case. The acceptable resistance should be greater than 1 million ohms.
7. Place Plug 83 into the control board.
8. Apply the correct input power to the Power Wave® and turn on the machine. Make sure the AutoDrive® 19 CONTROLLER and the wire drive are connected properly to the Power Wave® machine.
9. Check the armature voltage being applied to the motor at Plug J83 pin 1 (lead 831) to pin 2 (lead 832). See Figure F.5 and ***Figure F.6***. The voltage should range from 2.0VDC to 31.5VDC depending upon the motor speed setting. The armature voltage can be varied by changing the inching speed. If this voltage is not present the feedhead board may be faulty or the 40V isolation diode maybe shorted or open.
10. If the armature voltage is present, variable and linear and the motor speed is erratic, check for worn brushes or signs of arcing on the commutator. This may indicate a shorted or grounded armature tested previously in **step 5 & 6**.
11. To further check the functionality of the motor, remove plug J83 from the control board and apply the external variable 32VDC supply to leads #831 to #832. As the external supply is varied from low to high voltage, the motor speed should increase accordingly. See Figure F.5 and ***Figure F.6***.

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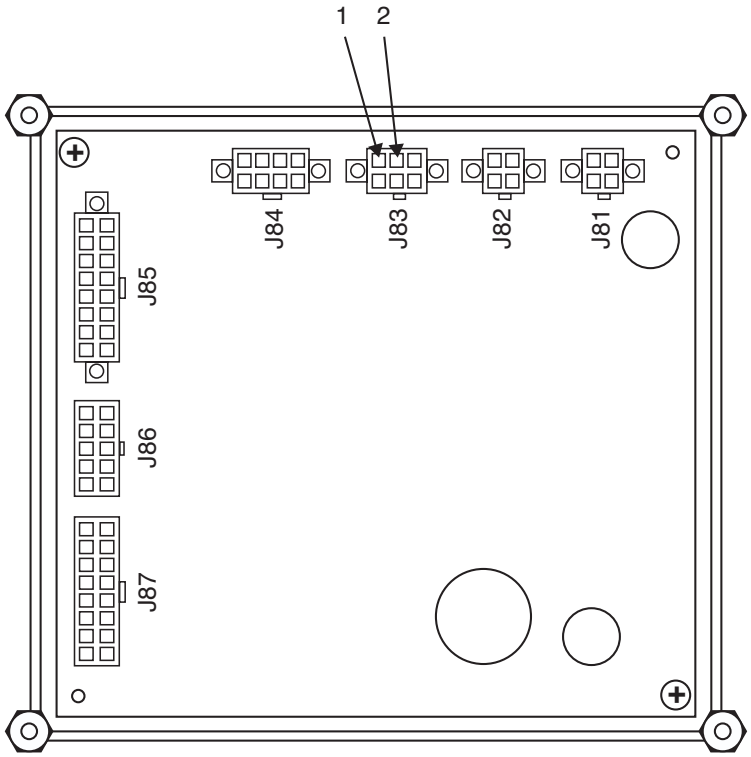
WIRE FEED MOTOR TEST (continued)

FIGURE F.6– PLUG J83 LEAD LOCATIONS



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VOLTAGE SENSE BOARD TEST

⚠ 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

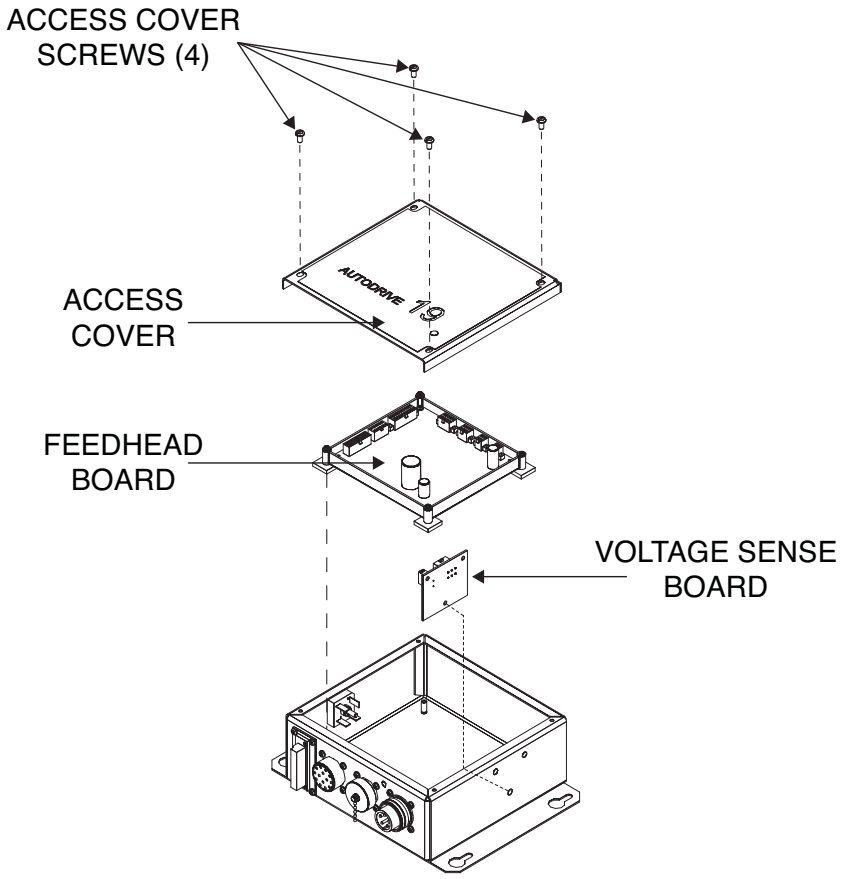
This test will help determine if the Voltage Sense Board is functioning correctly.

MATERIALS NEEDED

Phillips Screwdriver
Volt/Ohmmeter
Wiring Diagram
A Known Good AutoDrive 4R90, 4R100 or 4R220 or PF10R Wire Drive.
A Known Good Power Wave® S350 or i400
Possible use of AutoDrive 4R90 Service Manual SVM213-TS may be required for testing.

VOLTAGE SENSE BOARD TEST (continued)

FIGURE F.7 – VOLTAGE SENSE BOARD LOCATION



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Do not touch electrically live parts or electrodes with your skin or wet clothing.**
- **Insulate yourself from the work and ground.**
- **Always wear dry insulating gloves.**

---

1. Remove input power from the AutoDrive® 19 CONTROLLER .
2. Using the phillips screwdriver, remove the four screws from the AutoDrive® 19 CONTROLLER access cover. See Figure F.7.
3. Locate the voltage sense board and plugs J1 and J2. Do not remove the plugs from the voltage sense board. See Figure F.7.
4. Apply the correct input power from the Power Wave®. With the output activated, check for approximately 12 VDC at plug J1 pin 1 (+) to pin 4 (-). If the 12 VDC is NOT present, the feedhead board may be faulty. Also check for trigger closure at J85 pins 13 & 14 on the feedhead board. Check for loose or faulty wires and connections between the feedhead board, (plug J85 and plug J1) on the voltage sense board. This voltage is polarity sensitive. See ***Figure F.8***. See ***Wiring Diagram***.
5. With the output activated and arc voltage present at the 4R100 or 4R220 conductor block, check for arc voltage from plug J1 pin 3 (lead 67) to the workpiece. If actual arc voltage is NOT present, check the continuity of lead 67 from the conductor block to plug J1 pin 3 on the voltage sense board. See ***Figure F.8***. See ***Wiring Diagram***.

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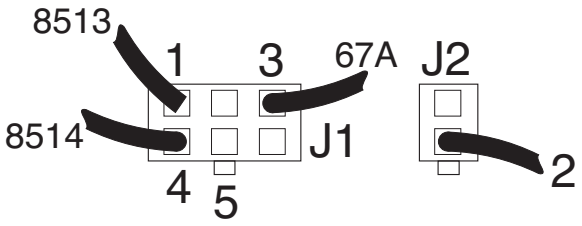
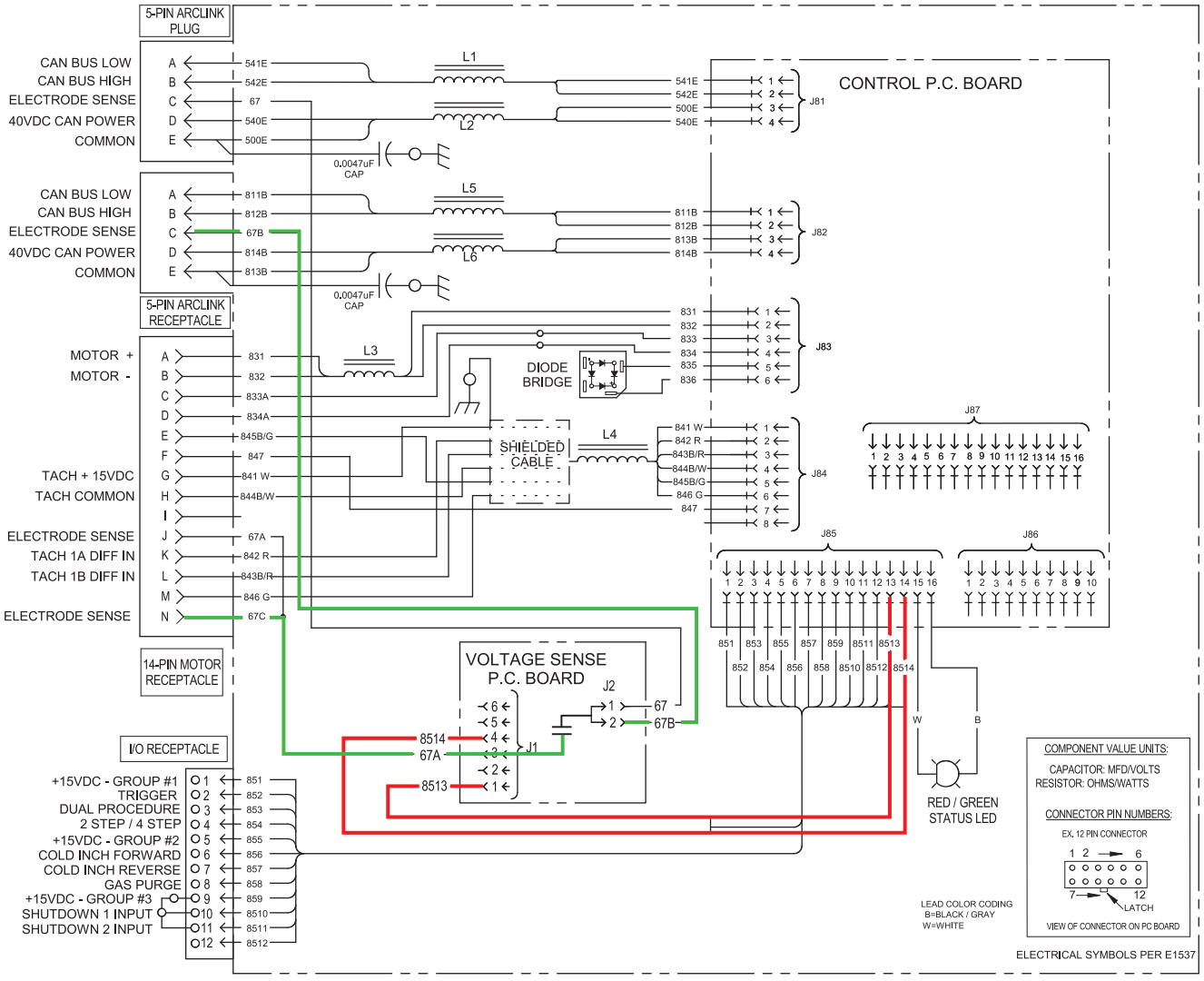
VOLTAGE SENSE BOARD TEST (continued)

FIGURE F.8 – LEAD LOCATIONS



NOTE: Inspect the molex plug connector pins on the Voltage Sense Board. If any of them are gold plated the P.C. board should be replaced.



6. If the actual arc voltage "IS" present at plug J1 pin 3 (lead 67), then check for arc voltage from plug J2 pin 2 (lead 67B) to the workpiece. See Figure F.8. 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 67A), the voltage sense PC board may be faulty. See Figure F.8. See Wiring Diagram.
8. Remove all input power from the wire feeder unit.
9. Using the phillips screwdriver, install the wire feeder cover.

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NOTES

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GAS SOLENOID TEST

⚠ 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

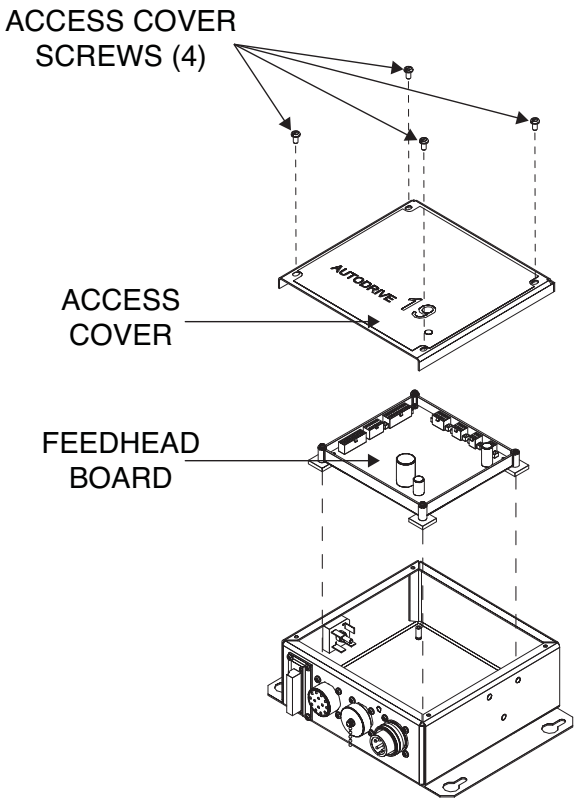
This test will determine if the Gas Solenoid is faulty.

MATERIALS NEEDED

Digital Volt/Ohmmeter
A Known Good AutoDrive 4R90, 4R100 or 4R220 or PF10R Wire Drive.
A Known Good Power Wave® S350 or i400
Possible use of AutoDrive 4R90 Service Manual SVM213-TS may be required for testing.

GAS SOLENOID TEST (continued)

FIGURE F.9 – FEEDHEAD BOARD LOCATION



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Do not touch electrically live parts or electrodes with your skin or wet clothing.**
- **Insulate yourself from the work and ground.**
- **Always wear dry insulating gloves.**

---

1. Using the phillips screwdriver, remove the four screws from the AutoDrive® 19 CONTROLLER access cover. See Figure F.9.
2. Locate and measure voltage across the two wires in the J83 molex connector on the feedhead board highlighted diagram. J83 pins 3 & 4 leads 833 & 834. The normal reading on an operative solenoid (located in the 4R100 or 4R220 feeder) is 4VDC. If 8 VDC is present but the solenoid does not activate, the solenoid may be defective. See ***Figure F.10*** and ***Figure F.11***.
3. If the 4 VDC is missing or low, check the leads from the amphenol connector to the 4R100 or 4R220 or PF10R.
4. Normal coil resistance of the solenoid should read about 19 ohms.
5. The solenoid can be further checked by applying a 12 VDC supply directly to the terminals at the solenoid. If the solenoid does not activate, the solenoid is faulty.
6. If a high voltage is present (approx. 32 VDC), the solenoid coil is open and needs replaced.

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GAS SOLENOID TEST (continued)

FIGURE F.10 – LEAD LOCATION

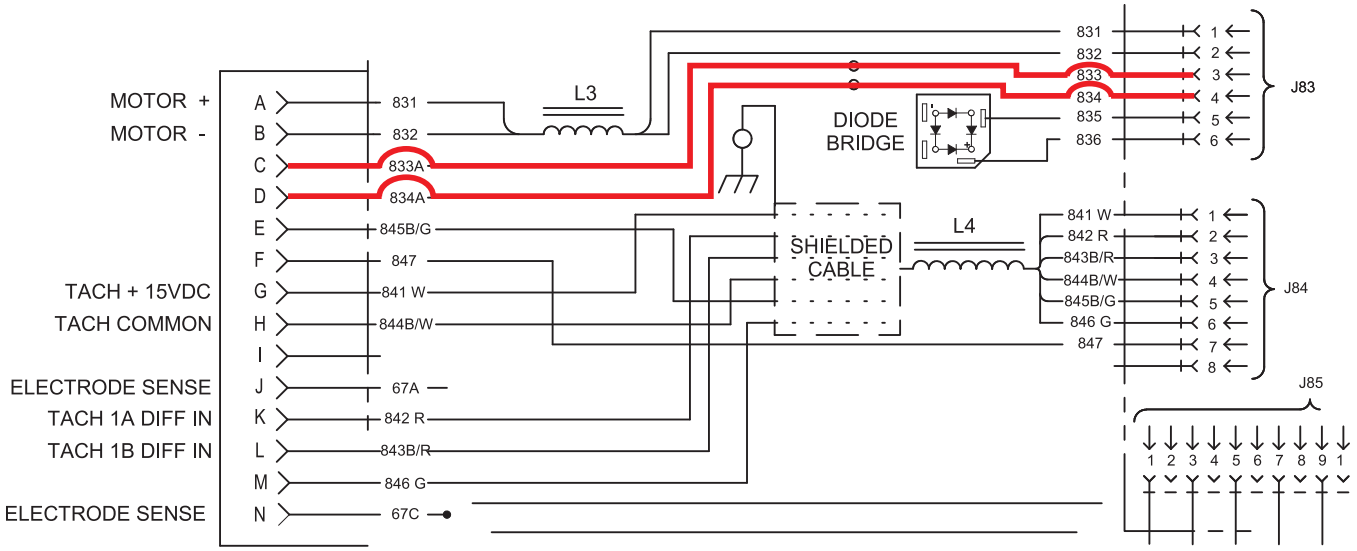
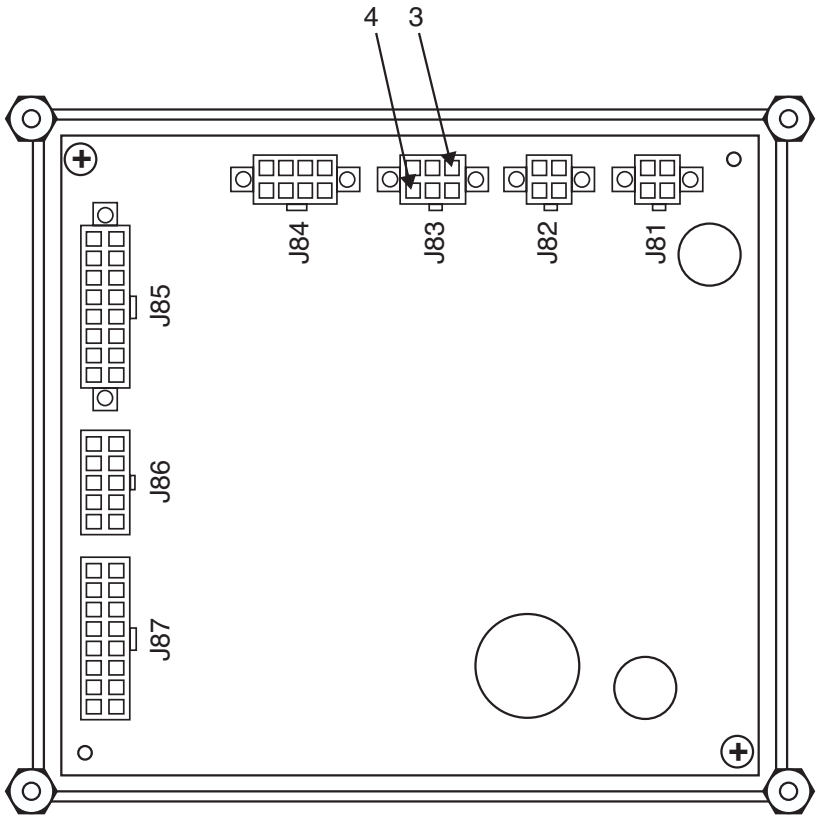


FIGURE F.11 – PLUG J83 LEAD LOCATIONS



RETEST AFTER REPAIR

Test the repaired controller in a known good Power Wave® set up. Operate the motor by inching the wire or running a test weld (gas purge if applicable) to check the solenoid. The Power Wave® Manager software can also be used to accomplish this.

If this is not possible, perform the component test associated with the component that has been replaced.

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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 no longer provided.

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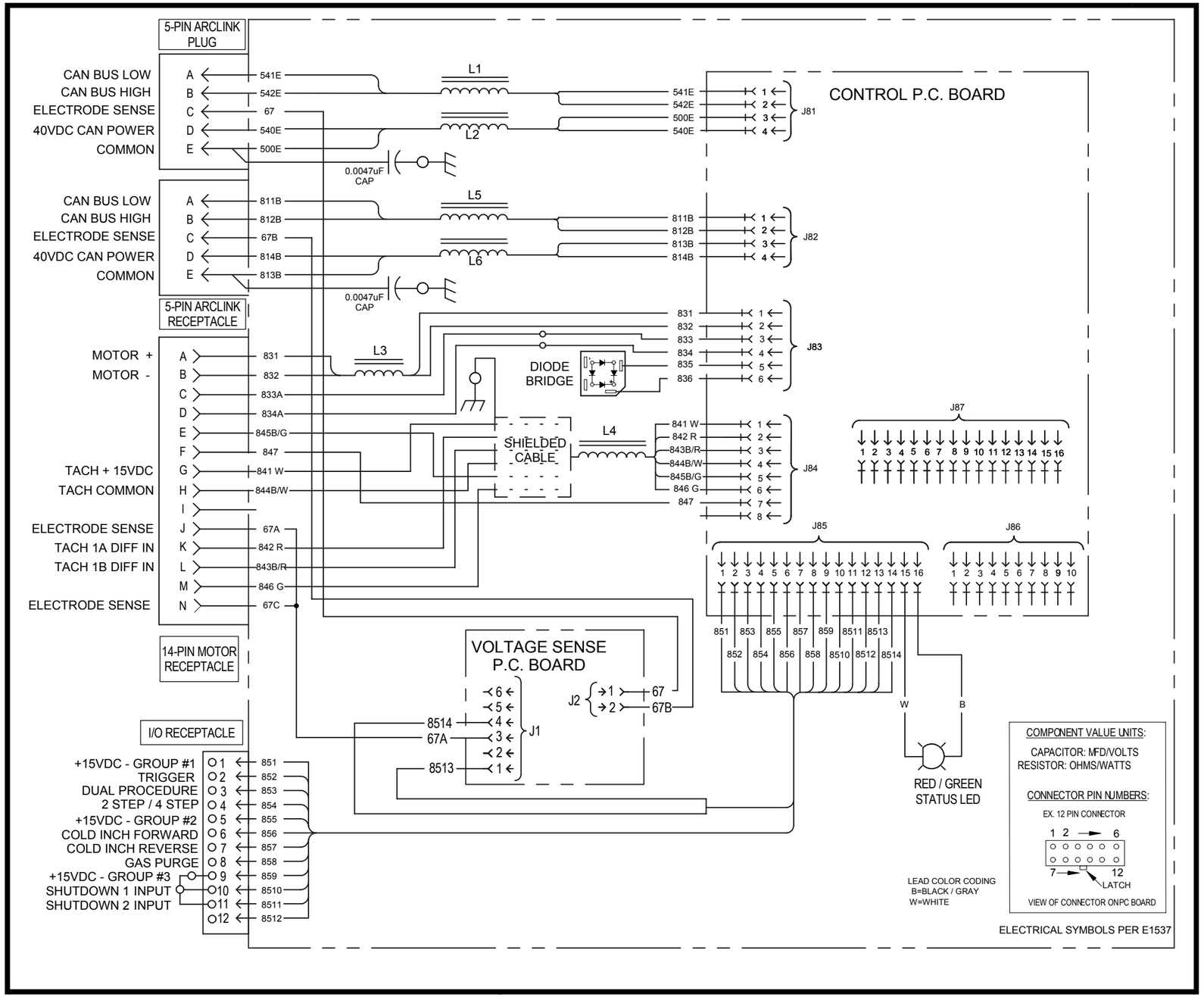
WIRING DIAGRAM - AutoDrive® 19 CONTROLLER - (G5190-1)

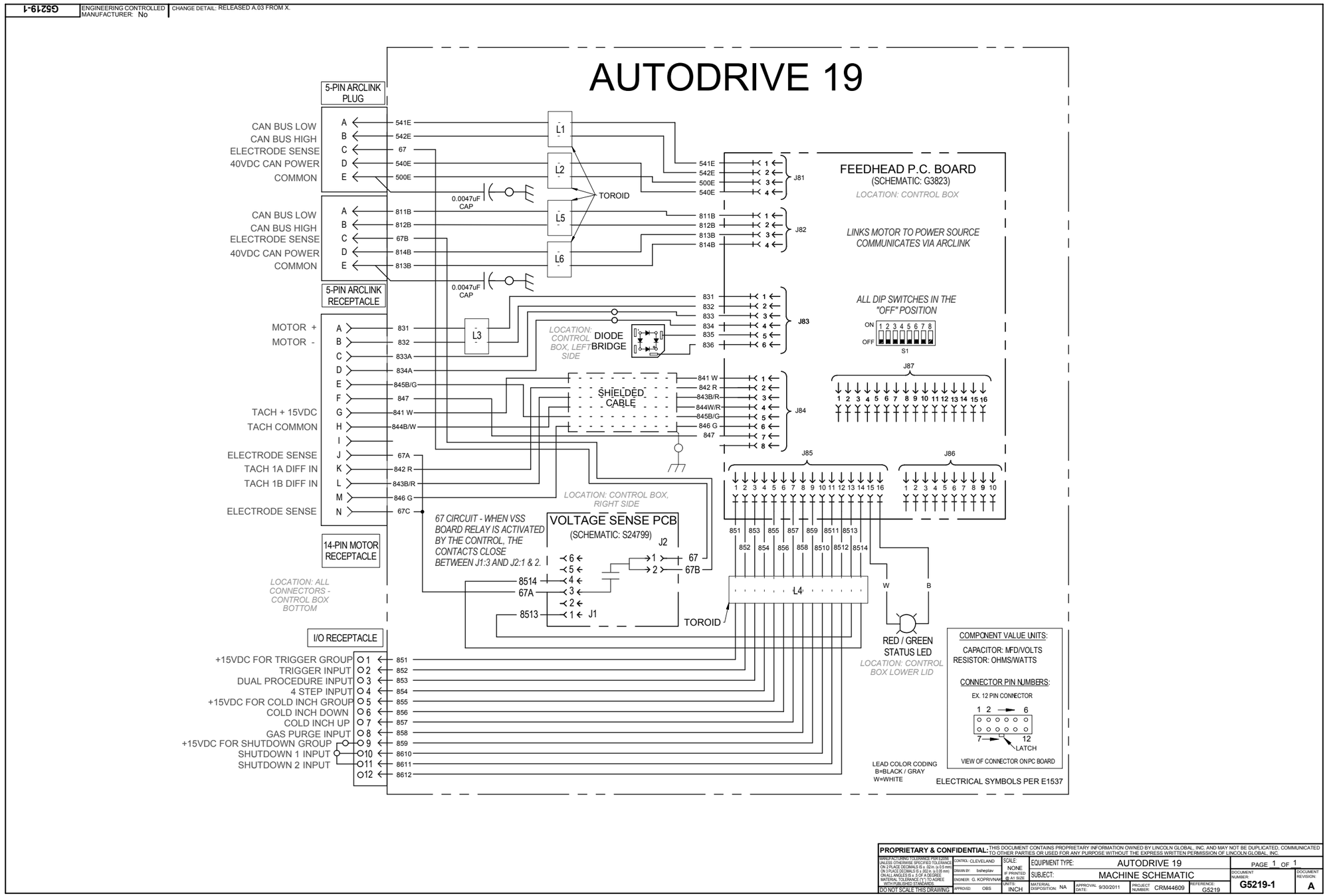
AUTODRIVE 19 WIRING DIAGRAM



G5190-1 A

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.

SCHEMATIC - AutoDrive® 19 CONTROLLER - COMPLETE MACHINE - (G5219-1)



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

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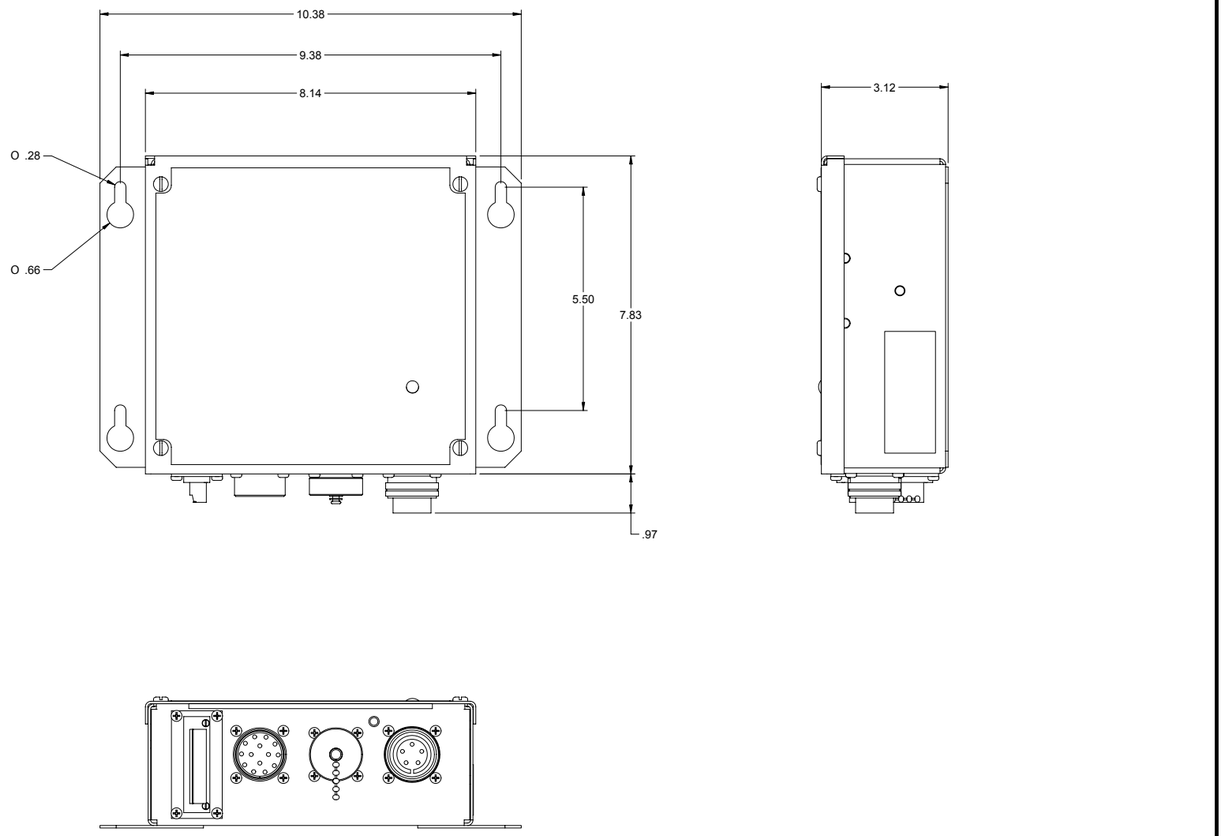
DIMENSION PRINT - AUTODRIVE 19 CONTROLLER



L13500 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.