



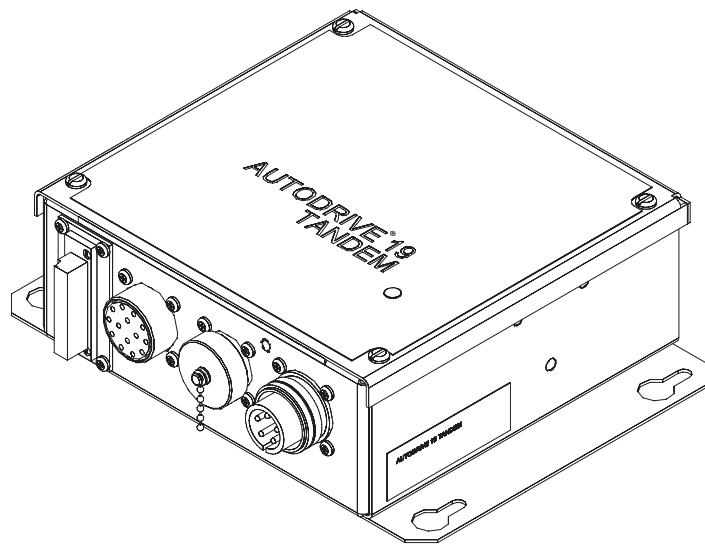
NOTE: This manual will cover most of the troubleshooting and repair procedures for the code numbers listed. Some variances may exist when troubleshooting/repairing later code numbers.

AutoDrive[®] ***TANDEM***

For use with machines having Code Numbers:

11885

SERVICE MANUAL



⚠ 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.

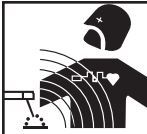


1.f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.

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.



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 Z87.1 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.**

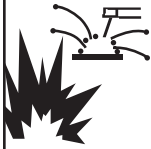
5.b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically 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.



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-1, "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.

PRÉCAUTIONS DE SÛRETÉ

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

Sûreté Pour Soudage A L'Arc

1. Protégez-vous contre la secousse électrique:
 - a. Les circuits à l'électrode et à la pièce 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 vêtements mouillés. Porter des gants secs et sans trous pour isoler les mains.
 - b. Faire très attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher métallique ou des grilles métalliques, 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 de fonctionnement.
 - 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 précautions pour le porte-électrode s'appliquent 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 où on reçoit 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 latéraux 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 un endroit isolé de la masse. Un court-circuit accidentel peut provoquer un échauffement et un risque d'incendie.
8. S'assurer que la masse est connectée le plus près 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 chaînes de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'échauffement des chaînes et des câbles jusqu'à ce qu'ils se rompent.
9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particulièrement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumées 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 phosgène (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 châssis du poste conformément au code de l'électricité et aux recommandations du fabricant. Le dispositif de montage ou la pièce 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 faire des travaux à l'intérieur de poste, la débrancher à l'interrupteur à la boîte de fusibles.
4. Garder tous les couvercles et dispositifs de sûreté à leur place.

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.

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 manufacturer's 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

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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Return to Master TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC

TECHNICAL SPECIFICATIONS: AutoDrive® 19 TANDEM

INPUT VOLTAGE & CURRENT			PHYSICAL SIZE			TEMPERATURE RATING		
Model	Voltage*	Input Amps*	Dimensions			Weight	Operating	Storage
			Height	Width	Depth			
K3171-1	40VDC	1.0	8.8 in. (224 mm)	10.38 in. (264 mm)	3.12 in. (80 mm)	7 Lbs. (3.2 Kg.)	14°F to 104°F (-10°C to 40°C)	-40°F to 185°F (-40°C to 85°C)

* When not driving a motor.

SAFETY PRECAUTIONS

⚠ WARNING



ELECTRIC SHOCK can kill.

- Only a qualified electrician should connect the AutoDrive® 19 TANDEM. Installation should be made in accordance with the appropriate National Electrical Code, the local codes and the information in this manual.
- Turn off the input power to the power source at the disconnect switch or fuse box before working on this equipment. Turn off the input power to any other equipment connected to the welding system at the disconnect switch or fuse box before working on this equipment.
- Do not touch electrically hot parts.

⚠ CAUTION



- 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.

MECHANICAL HAZARDS



- Welding fixture or wire feeder will move during welding or inching. Keep away from pinch points.
- Electrode reel and drive rolls turn during welding or inching. Keep gloved hands away from areas that may catch the glove.

WELDING VOLTAGE

Wire feed parts are electrically live while welding and while feeding wire (with Touch Sense feature selected). The electrically live parts are listed below:

Electrode	Electrode Reel
Wire Drive Motor	Drive Rolls
Gear Box	Cross-seam Adjuster
Wire Straightener	Welding Nozzle
Welding Cables	Welding Cable Terminal

LOCATION AND MOUNTING

The AutoDrive® 19 TANDEM is IP23 rated for use in an outdoor environment. The AutoDrive® 19 TANDEM should not be subjected to falling water during use nor should any parts of it be submerged in water. Doing so may cause improper operation as well as pose a safety hazard. The best practice is to keep the controller in a dry, sheltered area.

The AutoDrive® 19 TANDEM should be mounted in the vertical (upright) position and located where there is little risk of impacts to the controller.

HIGH FREQUENCY PROTECTION

Locate the AutoDrive® 19 TANDEM away from radio controlled machinery. The normal operation of the AutoDrive® 19 may adversely affect the operation of RF controlled equipment, which may result in bodily injury or damage to the equipment.

CONTROL CABLE CONNECTIONS

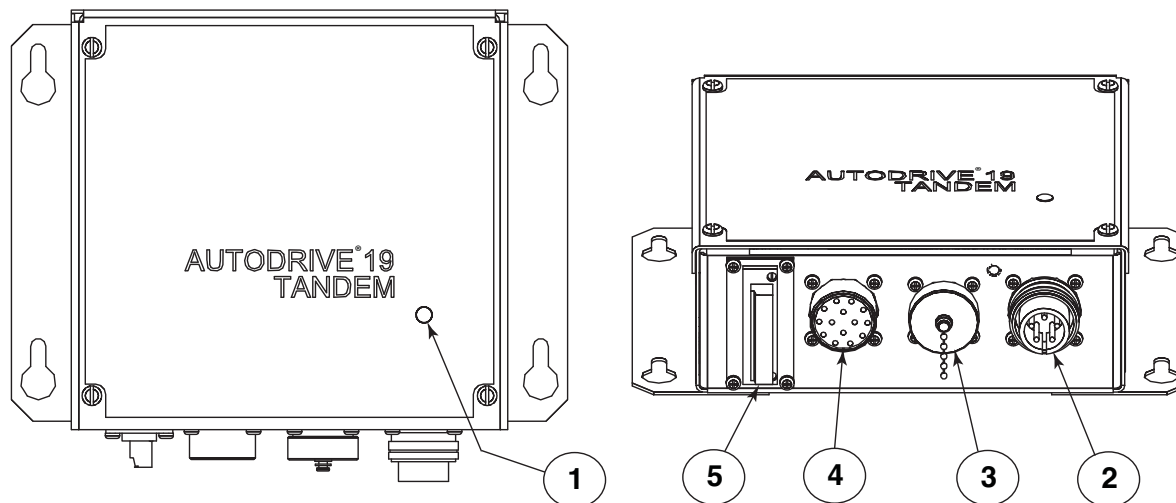
GENERAL GUIDELINES

These guidelines apply to all communications cables including optional DeviceNet and Ethernet connections.

- **Genuine Lincoln control cables should be used at all times (except as noted otherwise).** Lincoln cables are specifically designed for the communication and power needs of the Power Wave/ AutoDrive® systems. Most are designed to be connected end to end for ease of operation.
- **Always use the shortest cable lengths possible. DO NOT coil excess cable.** It is recommended that the total length of control cable does not exceed 100' (30.5M). The use of non-standard cables in excess of 25' (7.5M) can lead to communication problems (system shutdowns), poor motor acceleration (poor arc starting) and low wire driving force (wire feeding problems).
- **Best results will be obtained when the control cables are routed separately from the weld cables.** This minimizes the possibility of interference between the high currents flowing through the weld cables and the low level signals in the control cables.

COMPONENT DESCRIPTIONS

FIGURE A.1



1. Status LED:

The status light is a two color LED. Normal operation is steady GREEN. Flashing GREEN or RED/GREEN indicates a system error. See the **Troubleshooting** section.

NOTE: At power up of the Power Wave® system, the status light will flash GREEN for up to 60 seconds. This is normal and indicates that the system is performing a self test and mapping each component in the local ArcLink system. The status lights will also flash GREEN as a result of a system reset or configuration change during operation. When the status lights become steady GREEN, the system is ready for operation.

2. Arclink Input Connector (5 pin):

Receives power and communication from the power source.

3. Arclink Output Connector (5 pin):

Provides power and communication to the robotic controller.

4. 14 Pin Connector:

Provides motor power, tach feedback, solenoid drive and electrode sense (67) between the AutoDrive® 19 controller and the wire feeder.

5. External I/O Connector:

Terminal Strip for making simple input signal connections. See Figure A.2.

The terminal strip is divided into three groups:

Group #1 - TRIGGER

Group #2 - FEED FORWARD/REVERSE

Group #3 - SHUTDOWN INPUTS

When the Power Wave® power source is controlled via DeviceNet, the "TRIGGER" and "Feed" groups can interfere with the welding sequence and should not be used.

All inputs use "normally open" logic except the shutdown group. The shutdown inputs use "normally closed" logic and are always enabled. Unused shutdowns must be tied to the +15V supply for the shutdown group. Machines are shipped from the factory with jumpers installed on both shutdown inputs.

FIGURE A.2

Shutdown 2 Input	Shutdown 1 Input	+15VDC - Group #3	Gas Purge	Feed Reverse	Feed Forward	+15VDC - Group #2	2/4 Step	Dual Procedure	Trigger	+15VDC - Group #1	
12	11	10	9	8	7	6	5	4	3	2	1

SELECTING A WIRE DRIVE AND GEAR RATIO

The AutoDrive® 19 TANDEM can accommodate a number of wire drives including the AutoDrive® 4R100, AutoDrive® 4R220 and Power Feed® 10R. The feeder control system must be configured for both the wire drive and the gear ratio. This can be accomplished with the Power Wave® Manager Utility. This utility is available at www.powerwavesoftware.com.

POWER WAVE® i400 SYNCHRONIZED TANDEM INSTALLATION

OVERVIEW

The following hardware must be installed to convert two Power Wave® i400 power sources into a Synchronized Tandem welding system.

NOTE: The Synchronized Tandem and DeviceNet receptacles utilize the same control panel mounting hole. Therefore, if the Power Wave® i400 is equipped with a DeviceNet receptacle it must be removed prior to the installation of this kit.

⚠ WARNING



ELECTRIC SHOCK can kill.

- Disconnect input power before servicing.
 - Do not operate with covers removed.
 - Do not touch electrically live parts.
- Only qualified persons should install, use or service this equipment.

PARTS LIST

ITEM	PART NUMBER	DESCRIPTION	QTY.
1	M21927	Plug and Lead Assembly	1
2	M20979-1	Interconnect Cable Assembly	1
3	T13770-2	Cable Tie (Black)	1

MATERIALS NEEDED

- 3/8" Wrench or other suitable tool
- 3/8" Nutdriver or other suitable tool
- Slotted narrow screwdriver

INSTALLATION

1. Turn off input power to both power sources and any other equipment connected to the welding system at the disconnect switch or fuse box before working on the equipment.
2. Remove the weld cables from the output studs and disconnect all control cables including the Ethernet connection from the connect panel of each machine.

Repeat Steps 3 thru 8 for each power source:

3. Using a 3/8" nutdriver or other suitable tool, remove the outer end panel of the power source by removing the twelve screws fastening the panel to the power source. Keep the twelve screws removed for re-installation of panel. See **Figure A.3**.

⚠ CAUTION

- DO NOT remove both end panels simultaneously when the Power Wave® i400 is supporting the weight of a robot controller.
- DO NOT attempt to slide chassis out of the cabinet from the end of the machine. If complete removal is necessary see the "Chassis Removal Procedure" in the Power Wave® i400 Instruction Manual.

4. Using a 3/8" wrench, nutdriver or other suitable tool, remove the two nuts that hold the cover plate over the mounting hole from behind the Connect Panel. Keep the nuts for installation of the plug and lead assembly. See **Figure A.4**.
5. From the backside of the Connect Panel, slide the Plug and Lead Assembly over the studs and through the mounting hole. Make sure the keyway on the assembly is in the down position before re-installing the two nuts and tightening. See **Figure A.4 and A.5**.
6. Route the Plug and Lead Assembly down to the Control PC Board on the left side of the machine and plug the connector into J12 on the Control PC Board. See **Figure A.6**.
7. Loop the Plug and Lead Assembly downward and secure it to the existing harness using the cable tie provided. See **Figure A.6**.
8. Verify the Control Board dip switch settings. See **Figure A.7**.
9. Re-install the outer end panel of the power source using the twelve screws removed in **Step 1**.
10. Re-install any weld or control cables removed in **Step 2**.
11. To complete the installation, connect the Interconnect Cable Assembly between the two power sources.

FIGURE A.3

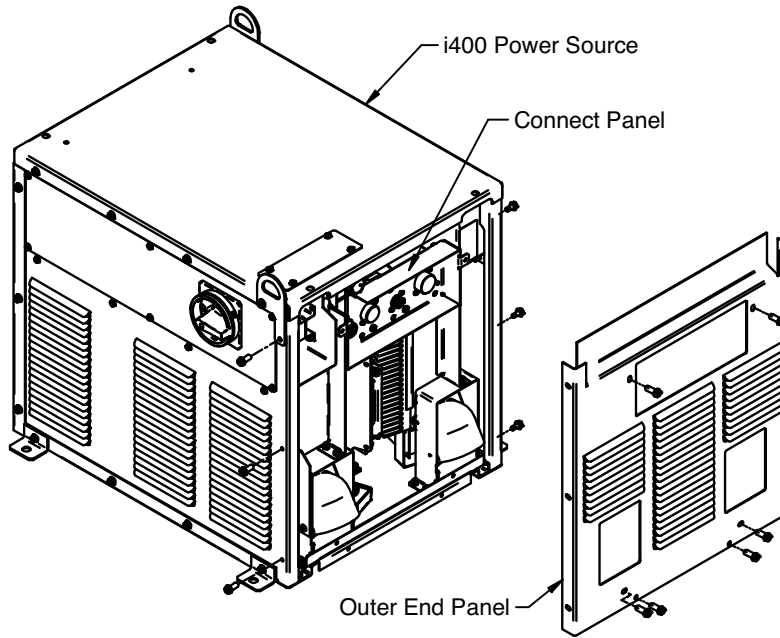
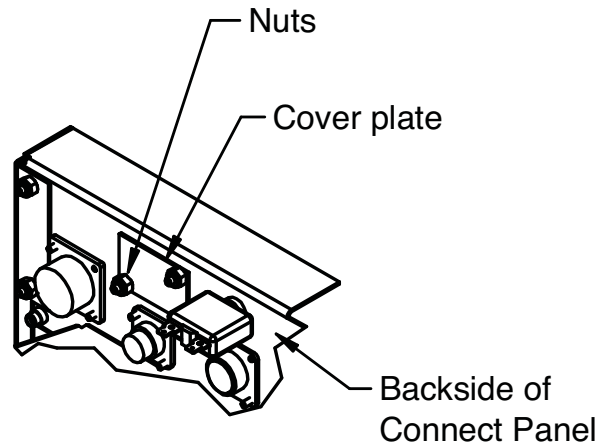


FIGURE A.4



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FIGURE A.5

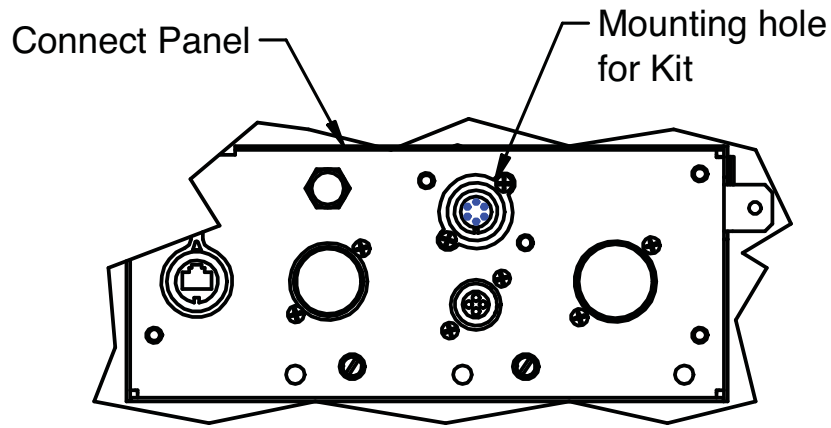


FIGURE A.6

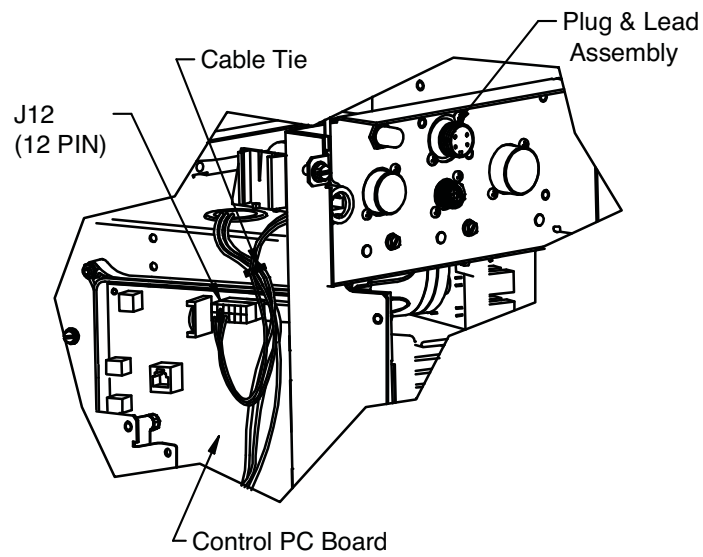
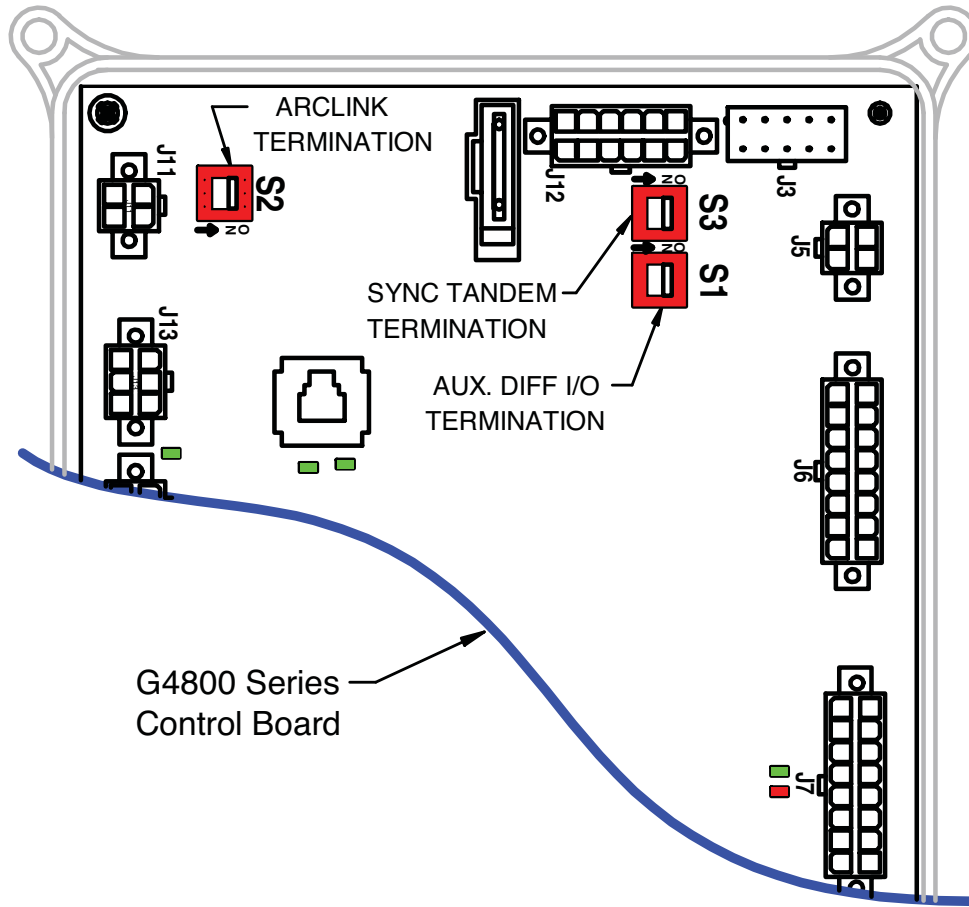


FIGURE A.7



DIP SWITCH	MACHINE 1	MACHINE 2
S1 SYNC TANDEM	ON (Default)	OFF
S2 (ARCLINK)	ON (Default)	ON (Default)
S3 (RESERVED)	ON (Default)	ON

NOTE: Earlier versions of G4800 (prior to “G4800-4K0”) were equipped with a single gang switch in place of S1 and S3. If the pc board has a single switch, set it per “S3” in the table above.

POWER WAVE® S-SERIES OR R-SERIES SYNCHRONIZED TANDEM INSTALLATION

OVERVIEW

The following hardware must be installed to convert two Power Wave® S-series or R-series power sources into a Synchronized Tandem welding system.

⚠ WARNING



ELECTRIC SHOCK can kill.

- Disconnect input power before servicing.
 - Do not operate with covers removed.
 - Do not touch electrically live parts.
- Only qualified persons should install, use or service this equipment.

MATERIALS NEEDED

- 7/16" Nutdriver or other suitable tool
- 5/16" Nutdriver or other suitable tool

INSTALLATION

1. Turn off input power to both power sources and any other equipment connected to the welding system at the disconnect switch or fuse box before working on the equipment.

Follow steps 2 thru 4 for each S350(CE) or R350 power source:

Follow steps 5 thru 9 for each S500(CE) or R500 power source:

2. Using a 5/16" nutdriver or other suitable tool, remove the top right rubber end caps as well as the right case side of the power source by removing the twelve screws fastening the end caps and case side to the power source. Keep the twelve screws removed for re-installation of the case side and rubber end caps. See *Figure A.8*.
3. Set the control board dip switch settings per the specified chart. See *Figure A.10*.

4. Using the twelve screws removed in **Step 2**, re-install the right case side and end caps of the power source. Skip down to **Step 10**.
5. Using a 7/16" nutdriver or other suitable tool, remove the handles from the power source by removing the eight screws fastening the handles to the power source. Keep the 8 screws removed for re-installation of the handles. See *Figure A.9*.
6. Using a 5/16" nutdriver or other suitable tool, remove the top four rubber end caps as well as the case top of the power source by removing the fourteen screws fastening the end caps and case top to the power source. Keep the twelve screws removed for re-installation of panel. See *Figure A.9*.
7. Set the Control Board dip switch settings per the specified chart. See *Figure A.10*.
8. Using the fourteen screws removed in **Step 6**, re-install the case top and end caps of the power source.
9. Using the eight screws removed in **Step 5**, reinstall the handles of the power source.
10. To complete the installation, connect the Interconnect Cable Assembly between the two power sources.

FIGURE A.8

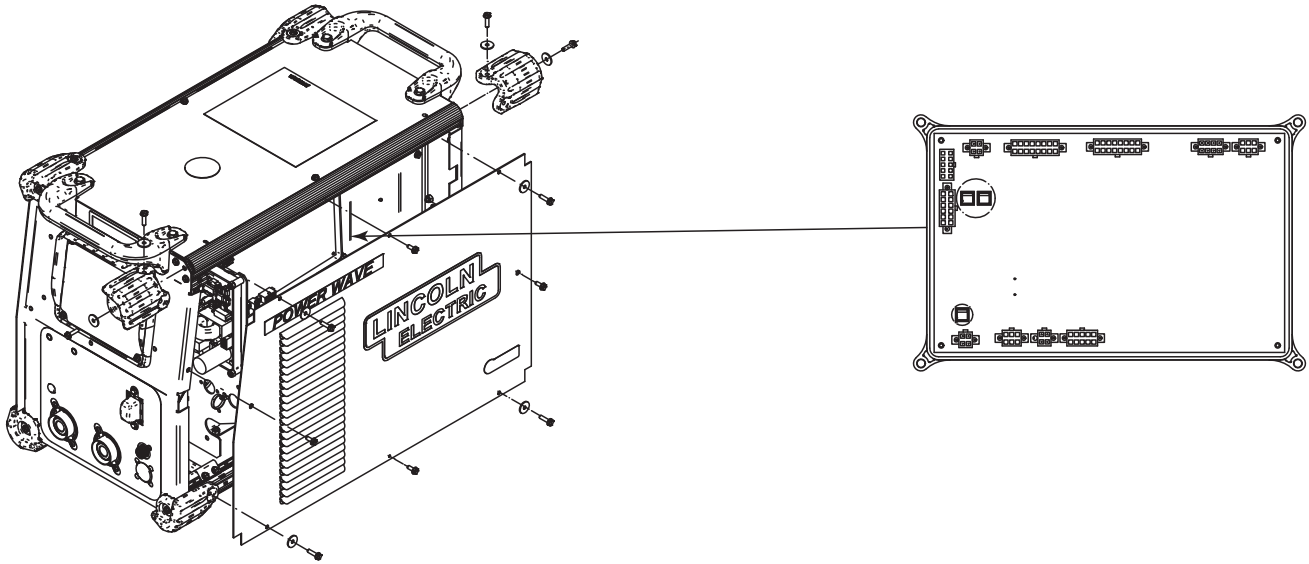
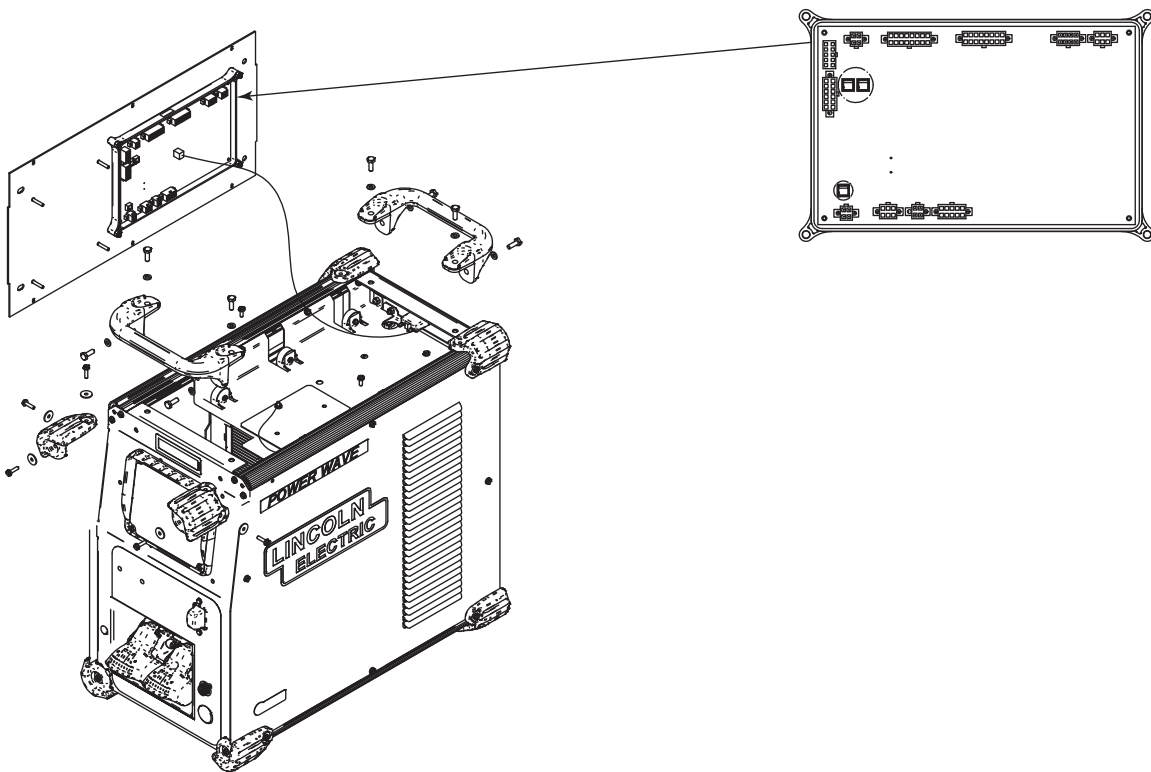


FIGURE A.9



AutoDrive® 19 TANDEM



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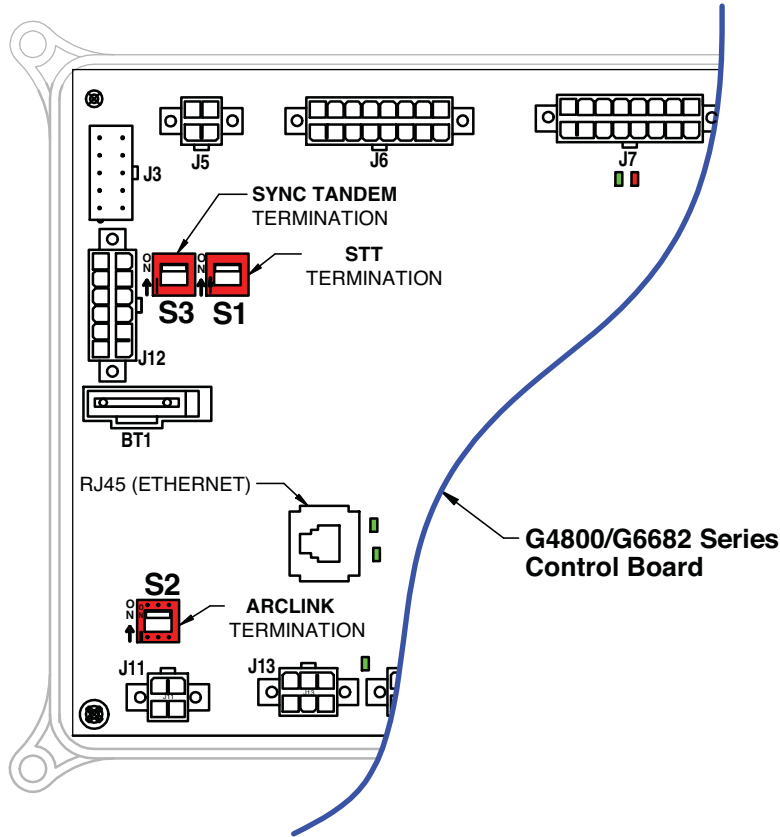
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FIGURE A.10

S-SERIES POWER WAVE® SET-UP INFORMATION

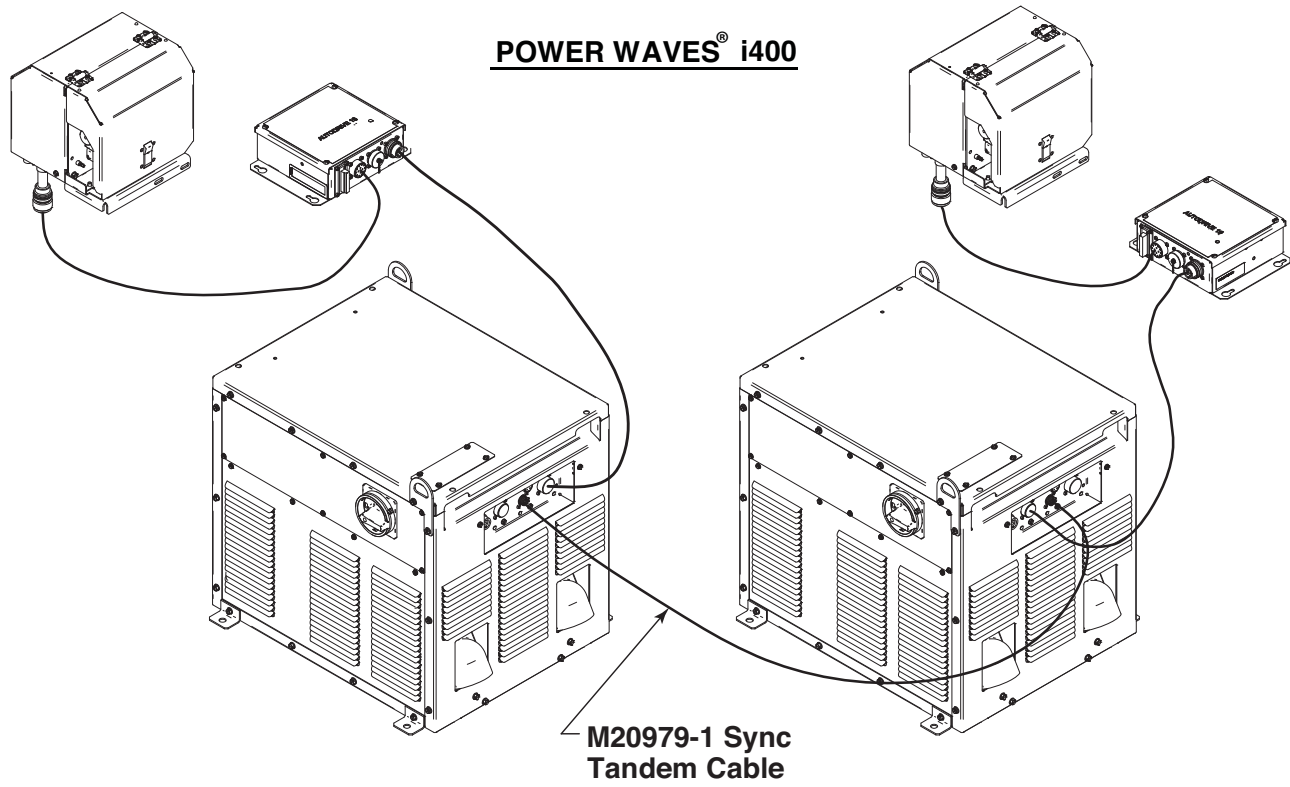
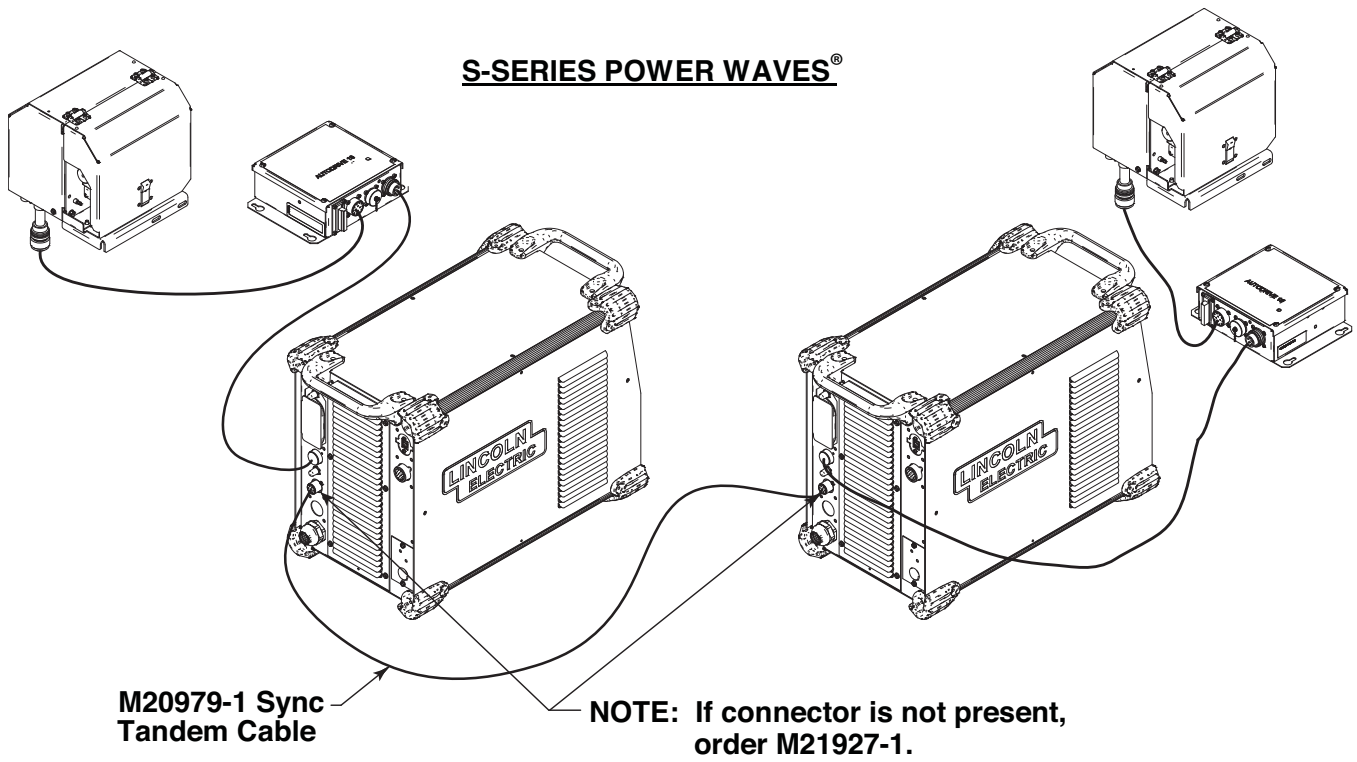


DIP SWITCH	MACHINE 1	MACHINE 2
S1 (STT / SYNC TANDEM)	ON (Default)	OFF
S2 (ARCLINK)	ON (Default)	ON (Default)
S3 (AC)	ON (Default)	ON (Default)

Notes:

- For proper operation, the control board dip switches **MUST** be configured per the chart.
- The STT Welding process **CANNOT** be run synchronously.

FIGURE A.11 - SYNCHRONIZED TANDEM CONNECTION DIAGRAM



Operation **B-1**

 Safety Precautions B-2

 Design Features B-2

 Common Welding Abbreviations B-2

 Graphic Symbols That Appear On This Machine or In This Manual B-2

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 Recommended Processes and Equipment B-3

 Common Basic Equipment Packages B-3

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SAFETY PRECAUTIONS

Read this entire section of operating instructions before operating the machine.

⚠ 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.
- Do not use AC welder if your clothing, gloves or work area is damp or if working on, under or inside work-piece.



- Use the following equipment:
- DC manual (stick) welder.
 - AC welder with reduced voltage control.
- Do not operate with panels removed.
 - Disconnect input power before servicing.

ONLY QUALIFIED PERSONS SHOULD INSTALL, USE OR SERVICE THIS EQUIPMENT. READ AND FOLLOW THE MANUFACTURER'S INSTRUCTIONS, EMPLOYER'S SAFETY PRACTICES AND MATERIAL SAFETY DATA SHEETS (MSDS) FOR CONSUMABLES.

READ THIS WARNING, PROTECT YOURSELF AND OTHERS.

FUMES AND GASES can be dangerous.



- Keep your head out of fumes.
- Use ventilation or exhaust at the arc or both, to keep fumes and gases from your breathing zone and general area.

WELDING SPARKS can cause fire or explosion.



- Do not weld near flammable material.
- Do not weld on containers which have held flammable materia

ARC RAYS can burn.



- Wear eye, ear and body protection.

DESIGN FEATURES

- Digital communications for accurate and reliable performance.
- PC Boards are potted for environmental protection.
- IP23 Environmental Rating for use in outdoor environments.
- Status light for indication of the system condition.
- External I/O Connector for simple input signal connections.

COMMON WELDING ABBREVIATIONS

GMAW

- Gas Metal Arc Welding

GMAW-P

- Pulse Gas Metal Arc Welding

FCAW

- Flux Core Arc Welding

GTAW

- Gas Tungsten Arc Welding

GRAPHIC SYMBOLS THAT APPEAR ON THIS MACHINE OR IN THIS MANUAL



WIRE FEEDER



MACHINE STATUS



ArcLink
INPUT CONNECTOR



ArcLink
OUTPUT CONNECTOR

PRODUCT DESCRIPTION

COMMON BASIC EQUIPMENT PACKAGES

GENERAL PHYSICAL DESCRIPTION

The AutoDrive® 19 TANDEM is a wire feeder controller designed to operate in a Power Wave® automated system and is responsible for relaying wire feed commands to an AutoDrive® series wire drive. It is connected to the Power Wave® power source by a K1543 or a K2683 ArcLink cable and to the wire drive by a K1785 14 pin control cable.

BASIC PACKAGE

- K2823-2 Power Wave® S350(CE)
- K2823-3 Power Wave® S350

RECOMMENDED PROCESSES AND EQUIPMENT

The AutoDrive® 19 TANDEM is intended for Tandem MIG welding, but will support MIG, Pulsed MIG, STT, Flux-Cored, Metal-Cored, TIG (lift start only) arc welding only with the Power Wave® S350(CE), Power Wave® i400 along with AutoDrive® series or Power Feed® 10R wire feeders.

- K3002-1 4R100 Wire Drive
- K2685-1 4R220 Wire Drive

The AutoDrive® 19 TANDEM is not designed for use in automated Power Wave® system that utilizes a Power Wave® R350 controller.

- K3171-1 AutoDrive® 19 TANDEM
- K1543-xx Control Cable (5 pin – 5 pin) - power source to AutoDrive 19.
- K1785-xx Control Cable (14 pin – 14 pin) - AutoDrive® 19 TANDEM to wire drive.

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AccessoriesC-1

There Are Currently No Accessories Available.

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Routine MaintenanceD-2

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Calibration SpecificationD-2

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SAFETY PRECAUTIONS

WARNING

ELECTRIC SHOCK can kill.



- Do not touch electrically live parts such as output terminals or internal wiring.
- When inching, electrode and drive mechanism are “hot” to work and ground and could remain energized several seconds after the inch button is released.

- Turn OFF input power at welding power source before installation or changing drive roll and/or guide tubes.
- Welding power source must be connected to system ground per the National Electrical Code or any applicable local codes.
- Only qualified personnel should perform maintenance work.

See additional warning information throughout this operator’s manual and the Engine manual as well.

ROUTINE MAINTENANCE

Check weld cables and control cables for cuts.

PERIODIC MAINTENANCE

N/A

CALIBRATION SPECIFICATION

All calibration is factory set on the AutoDrive® 19 TANDEM.

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 Motor Receptacle Function E-4

 I/O Receptacle Function E-5

 Feed Motor Isolation Diode Function E-6

 Status Light Function E-7

 ArcLink Receptacle Function E-8

 Voltage Sense Board Function E-9

FIGURE E.1 BLOCK LOGIC DIAGRAM

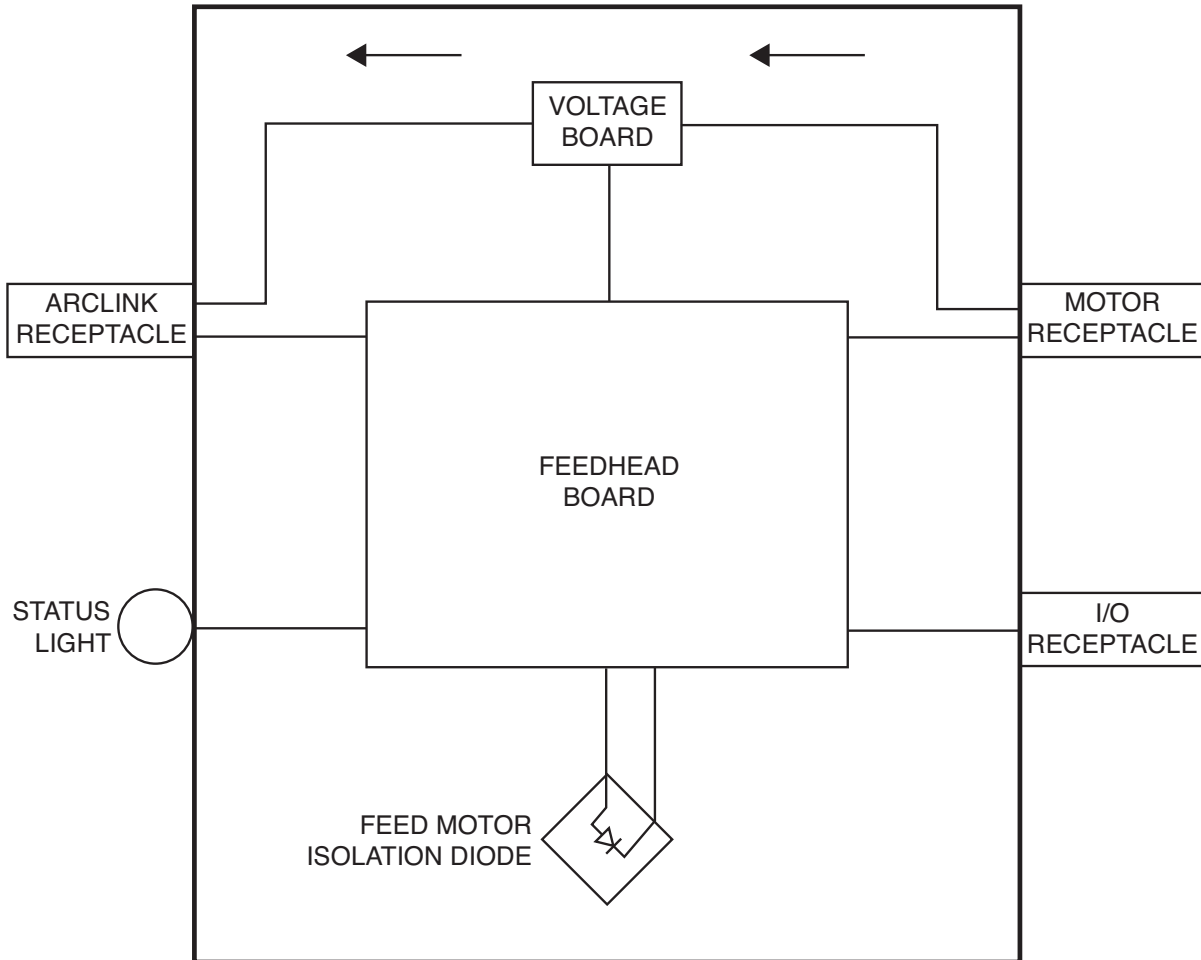
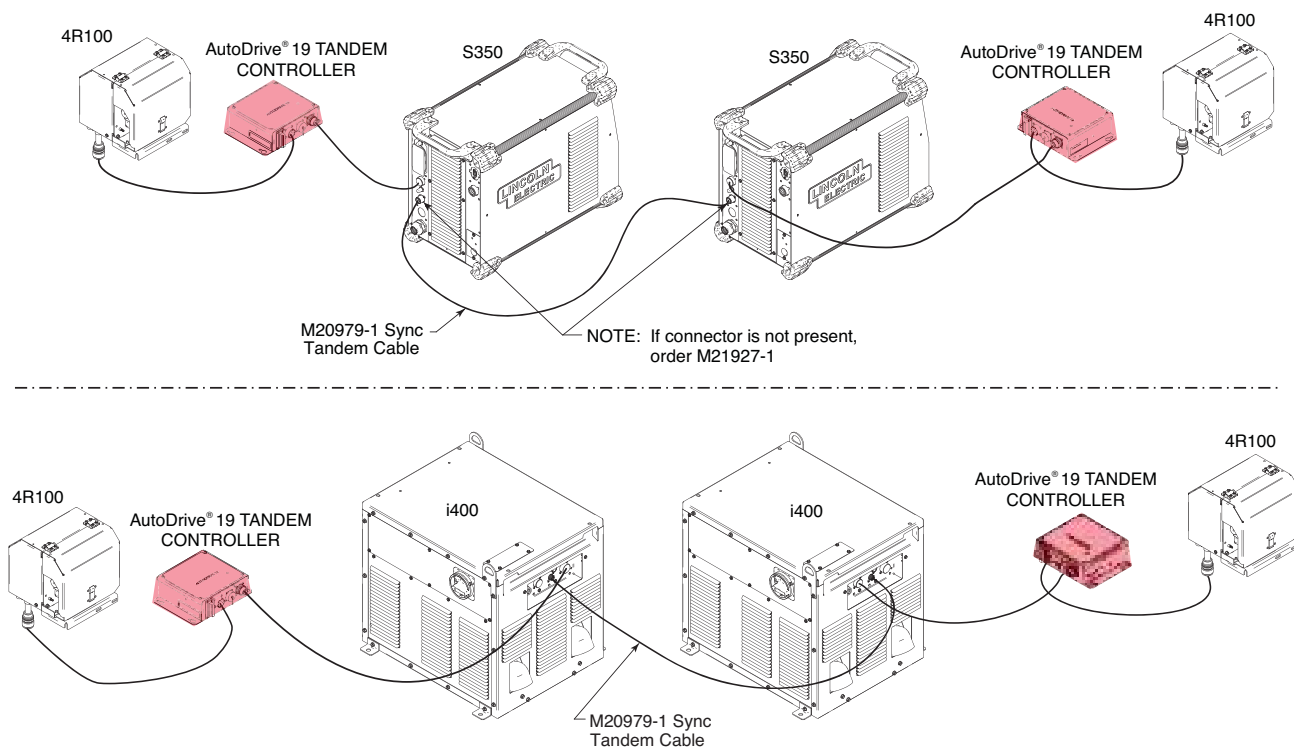


FIGURE E.2 - TYPICAL AutoDrive® 19 TANDEM SET UPS



GENERAL DESCRIPTION

The AutoDrive® 19 TANDEM is a wire drive controller (2 each) designed to operate only in a Synchronized Tandem system, with an i400 or S series Power Wave® and AutoDrive® series feeders. The presence of the AutoDrive® 19 TANDEM in the weld setup will allow the user to access specifically designed weld modes specifically designed for tandem MIG welding.

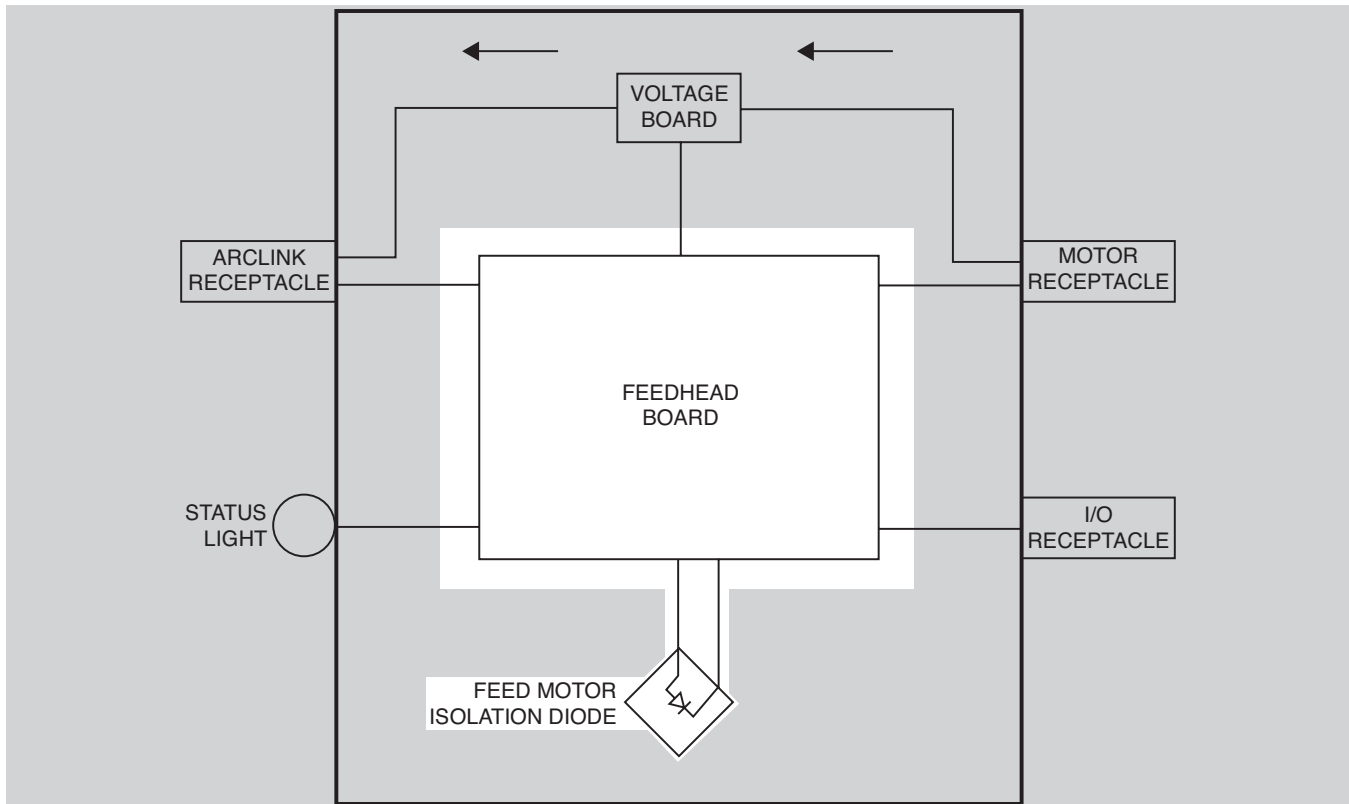
The AutoDrive® 19 TANDEM is responsible for relaying wire feeder commands to a AutoDrive 4R90, 4R100, 4R220 or PF10R (via 14 pin feeder cable) and to the power source (via 5 pin arclink cable). A green terminal strip provides the customer with the following controls: trigger, 2/4 step, dual procedure, gas purge, cold inch forward, cold inch reverse, as well as two shut-down inputs.

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

AutoDrive® 19 TANDEM



FIGURE E.3 - FEEDHEAD BOARD FUNCTION



FEEDHEAD BOARD FUNCTION

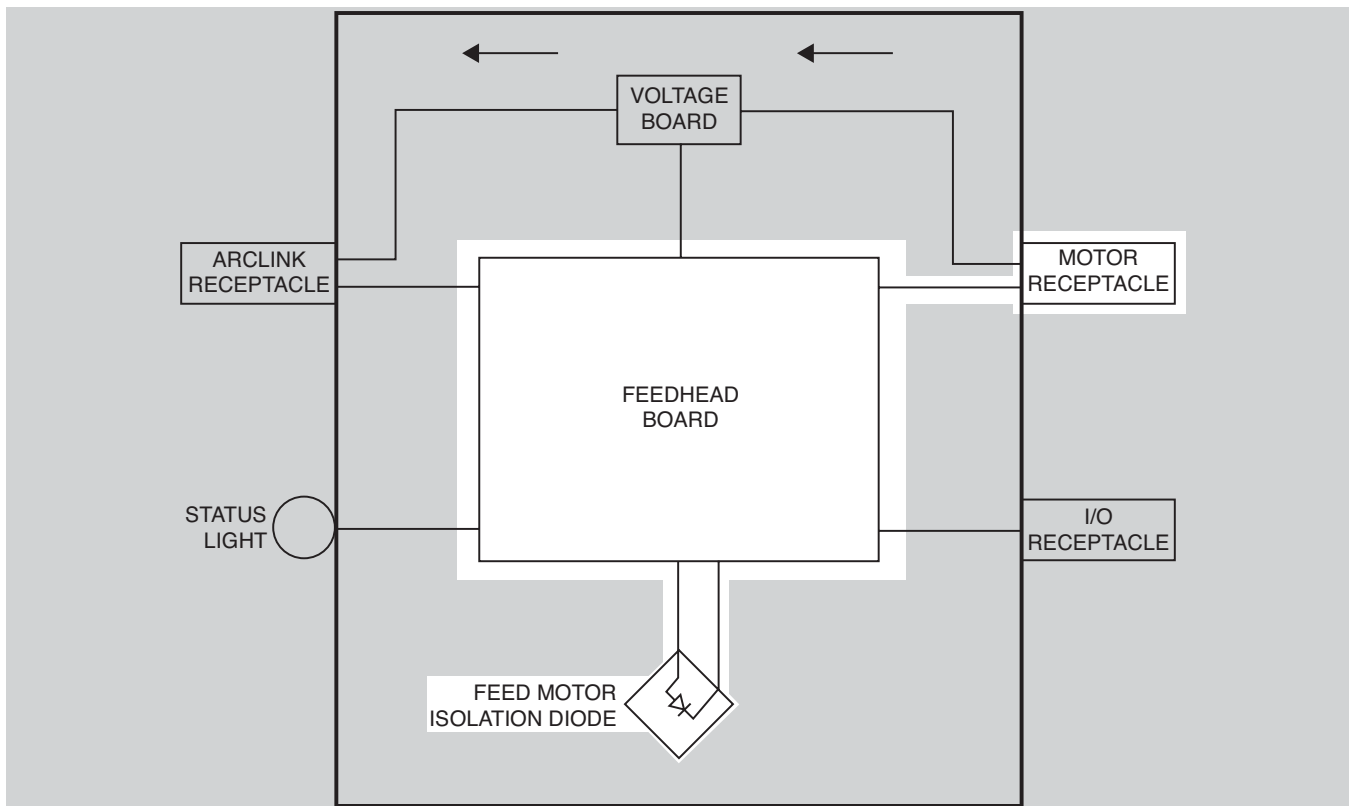
The feedhead board in the AutoDrive® 19 TANDEM is used in all of the Power Feed type feeders. The AutoDrive® 19 TANDEM has software that is dedicated to the board that will only work in the AutoDrive® 19 TANDEM. By utilizing the tach feedback information from the feeder tach device located in the feeder 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.

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

AutoDrive® 19 TANDEM



FIGURE E.4 - MOTOR RECEPTACLE FUNCTION



MOTOR RECEPTACLE FUNCTION

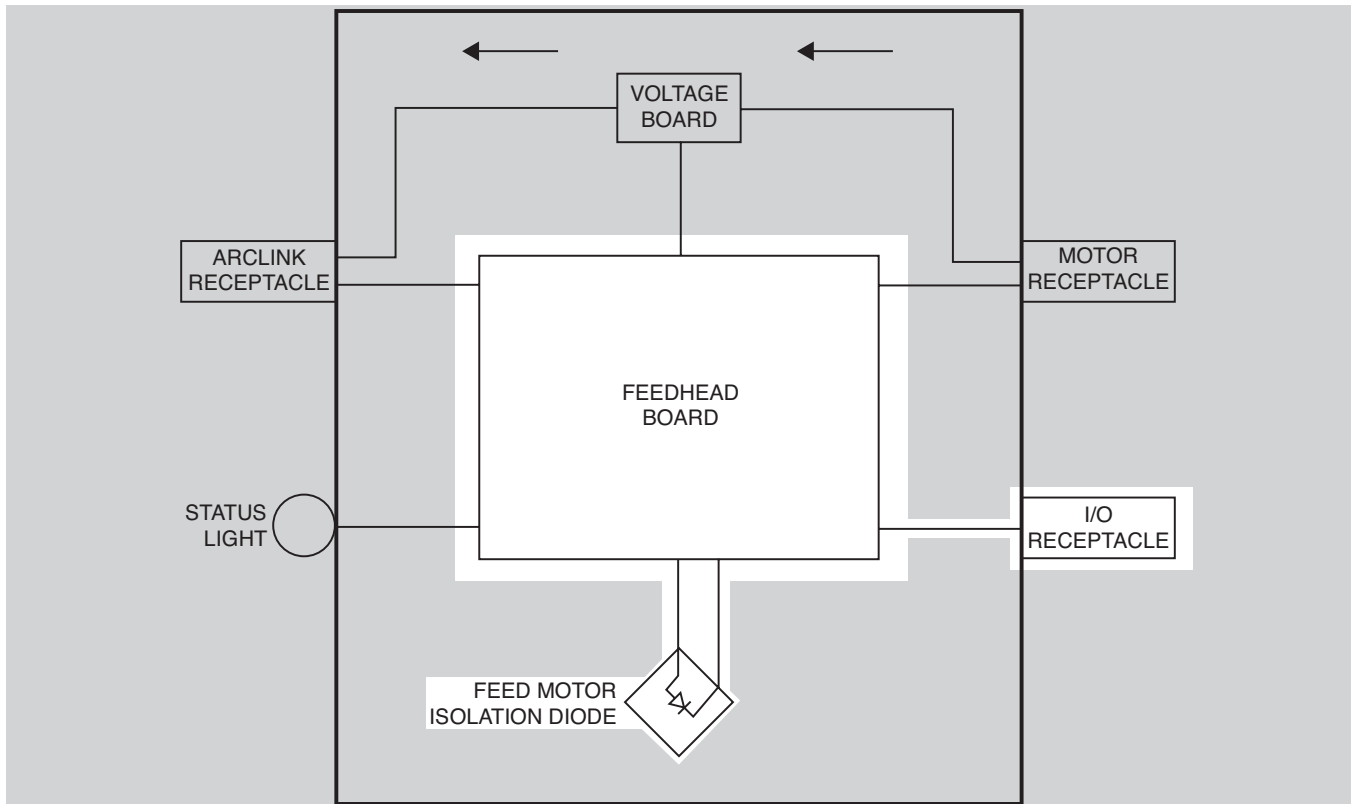
The 14 pin motor cable is the communication interface between the wire feeder and the AutoDrive® 19 TANDEM Controller. This 14 pin cable transmits the motor armature supply and the +15VDC tach supply. The tach feedback signal and the electrode voltage sense are also transmitted through this cable.

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

AutoDrive® 19 TANDEM



FIGURE E.5 - I/O RECEPTACLE FUNCTION



I/O RECEPTACLE FUNCTION

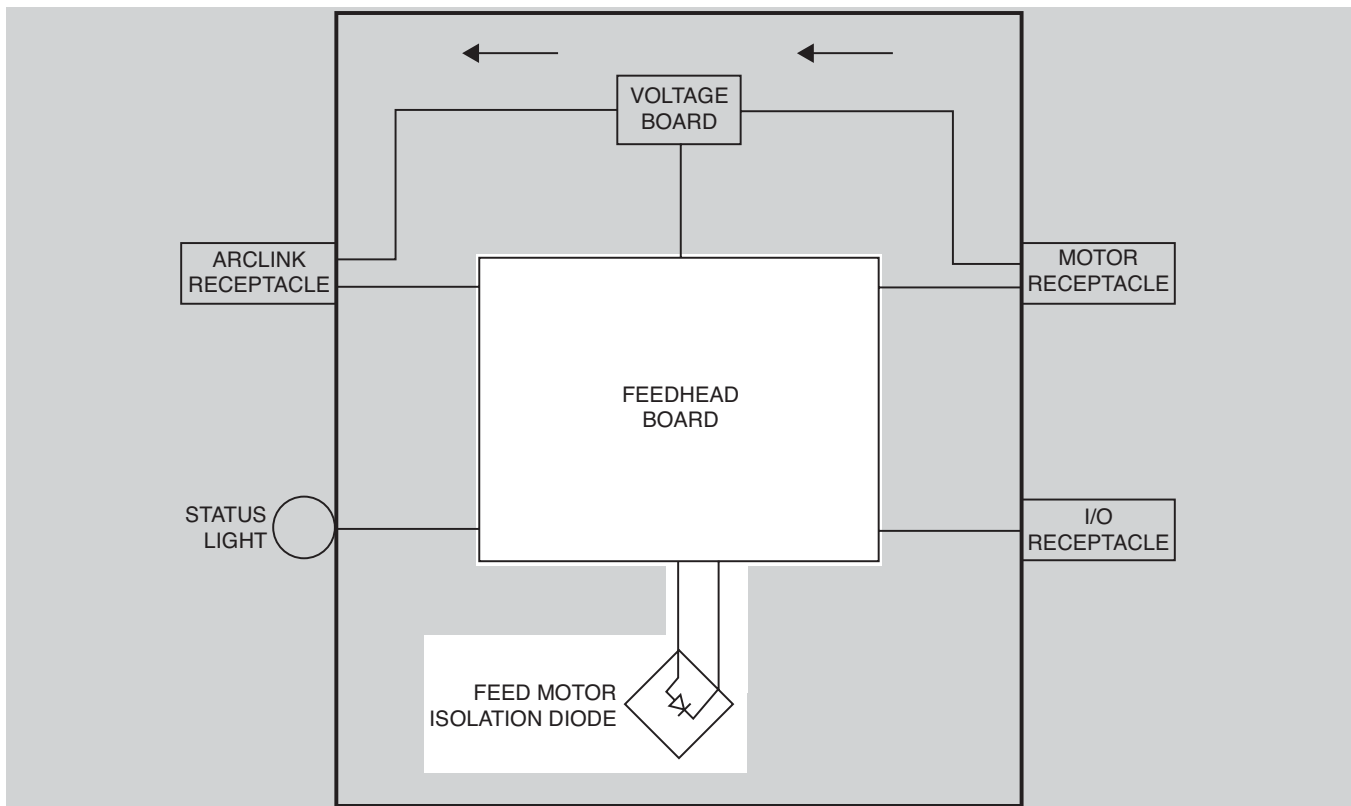
The AutoDrive® 19 TANDEM has a GREEN terminal strip (I/O receptacle) that makes several functions available. There are two shut down functions (inputs), “inch up” and “inch down” as well as Start and Stop commands. See Wiring Diagram for details.

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

AutoDrive® 19 TANDEM



FIGURE E.6 - FEED MOTOR ISOLATION DIODE FUNCTION



FEED MOTOR ISOLATION DIODE FUNCTION

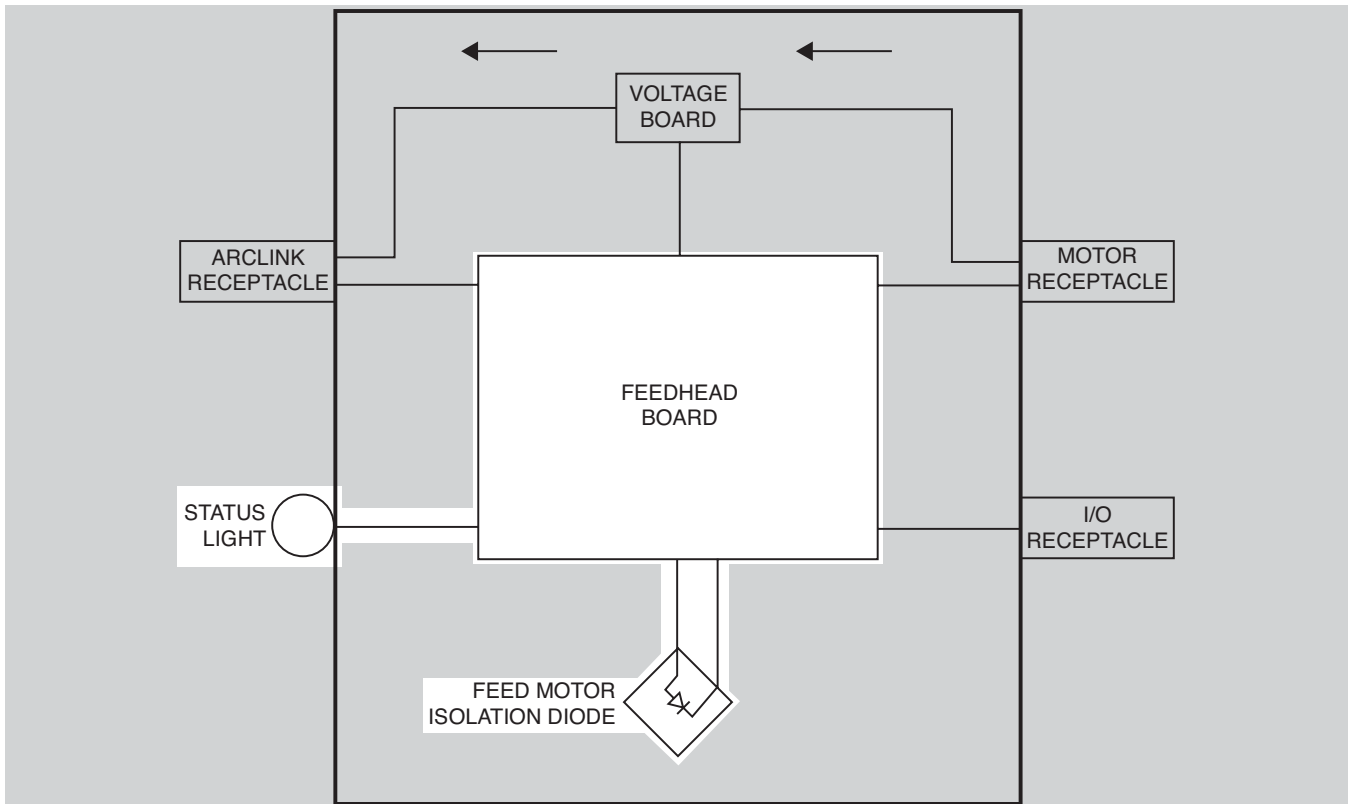
The feeder control board in the AutoDrive® 19 TANDEM requires an isolation diode package to keep wire feeder motor voltage spikes from entering back into the 40 volt power supply. This helps protect the electronic circuits found on this board.

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

AutoDrive® 19 TANDEM



FIGURE E.7 - STATUS LIGHT FUNCTION



STATUS LIGHT FUNCTION

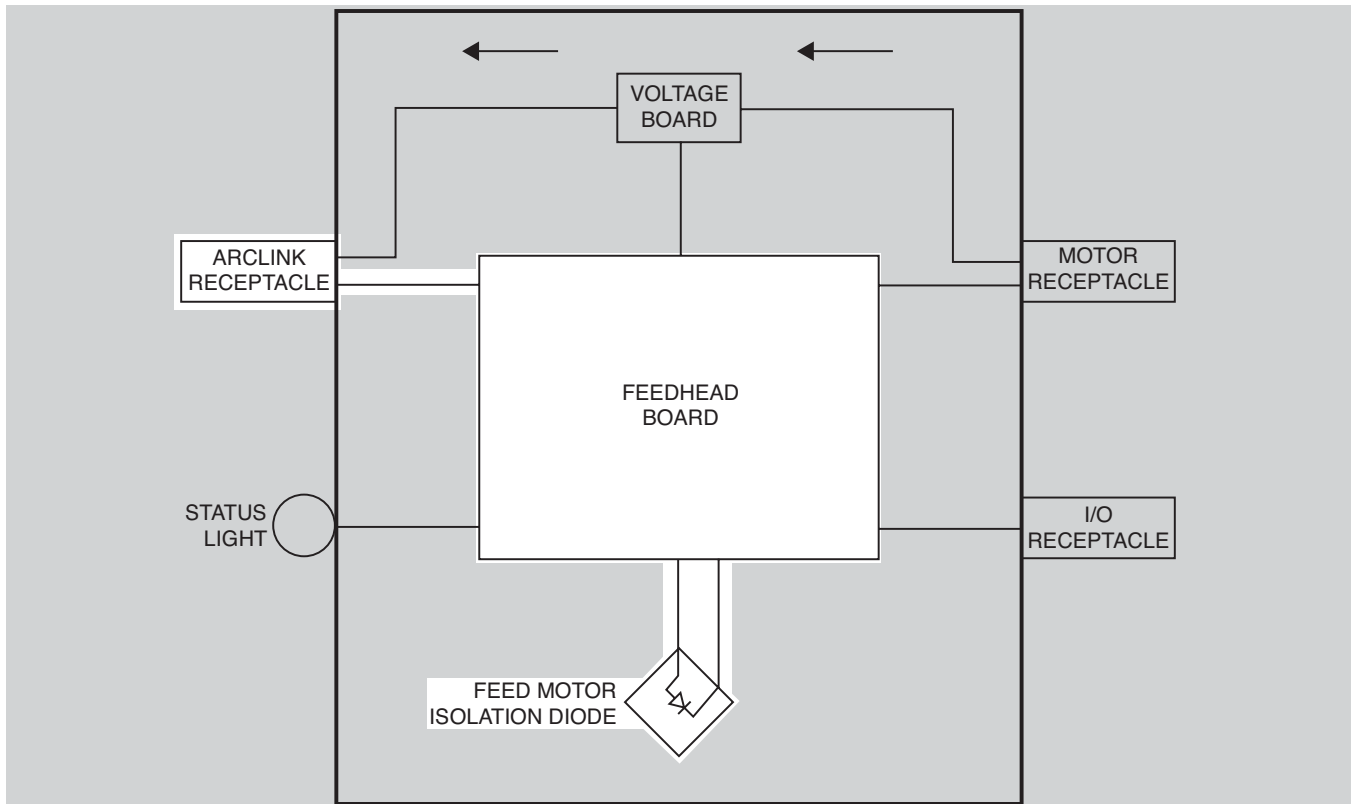
The AutoDrive® 19 TANDEM has a bi-colored GREEN / RED LED on the outside of the AutoDrive® 19 TANDEM control box. When all conditions are GOOD the status light is a steady GREEN. In the event of a problem the status light communicates an error code in RED flashes. A list of the error codes can be found 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

AutoDrive® 19 TANDEM



FIGURE E.8 - ARCLINK RECEPTACLE FUNCTION



ARCLINK RECEPTACLE FUNCTION

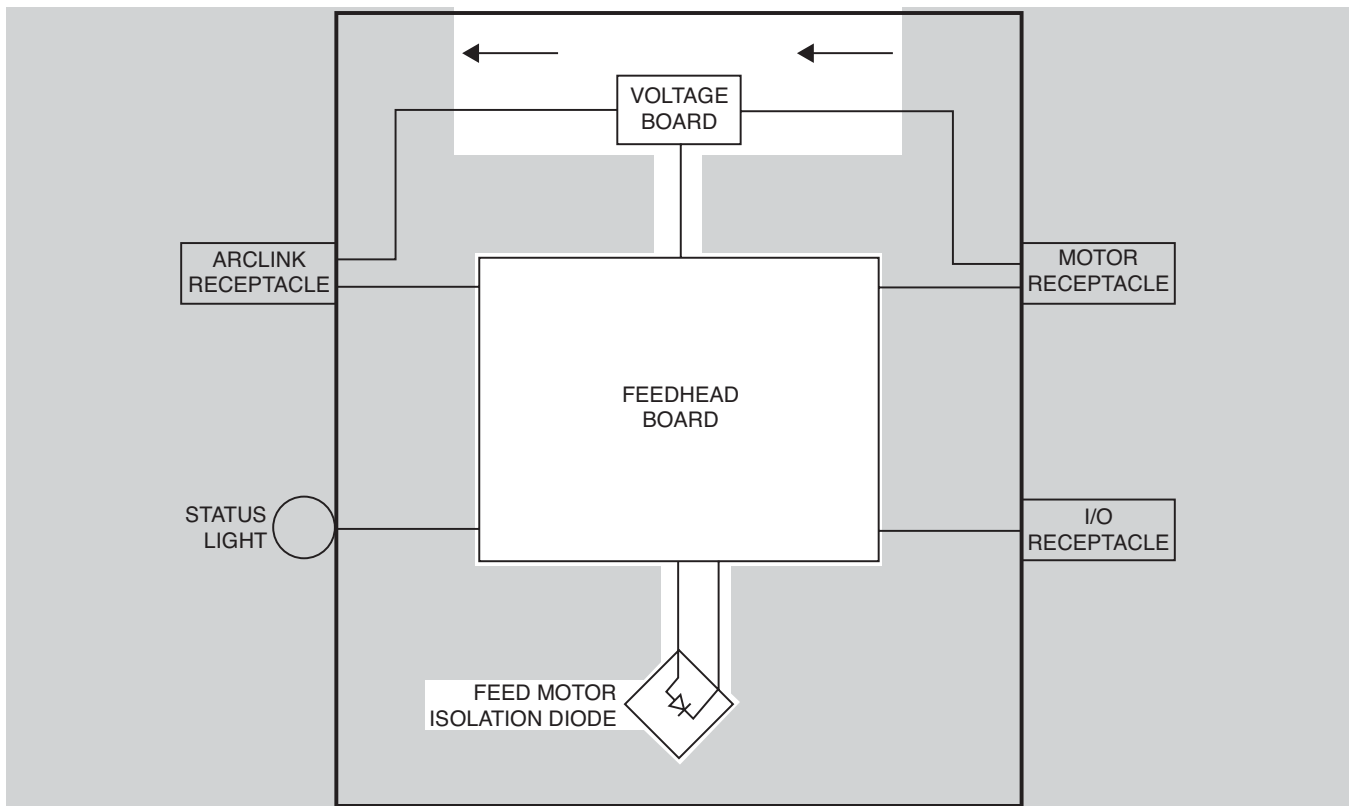
The AutoDrive® 19 TANDEM communicates with the Power Wave welder via ArcLink that is a digital communication protocol. The 40 volts DC supply that powers up the AutoDrive® 19 TANDEM and the wire drive unit is also supplied through this cable. The electrode sense lead is incorporated in this cable.

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

AutoDrive® 19 TANDEM



FIGURE E.9 - VOLTAGE SENSE BOARD FUNCTION



VOLTAGE SENSE BOARD FUNCTION

The voltage sense board is activated when the welder's arc voltage is initiated. It supplies electrode voltage feedback to the Power Wave® welder. The Power Wave® requires this feedback for the control of output weld voltage. The voltage sense board isolates the electrode voltage from the welder when the welder's output is not turned on.

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

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 Using The Status LED To Troubleshoot System Problems F-4

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 Tachometer / Wire-Feed Speed Feedback Test F-9

 Wire Feed Motor Test F-13

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 Gas Solenoid Test F-21

 Retest After Repair F-24

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 Error Codes 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.

- 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 all Safety Guidelines detailed throughout this manual

USING THE STATUS LED TO TROUBLESHOOT SYSTEM PROBLEMS

The AutoDrive® 19 TANDEM 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

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	<p>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.</p> <p>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.</p> <p>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.</p> <p>To clear the active error(s), turn power source off and back on to reset.</p>
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.

AutoDrive® 19 TANDEM



Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)		POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
ARCLINK SYSTEM ERROR CODES			
Err 81	Motor Overload (long term)	<ol style="list-style-type: none"> 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). 	<p>Perform the Feed Motor Test. If this does not pass test, it may be necessary to perform a Wire Feed Motor Test and Tachometer Test for the feeder. These will be found in the AutoDrive 4R90 service manual. See SVM 213 TS.</p>
Err 82	Motor overload (short term).	<ol style="list-style-type: none"> 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). 	
Err 83	Shutdown #1 is open.	<ol style="list-style-type: none"> 1. This refers to the 'GREEN' I/O connector on the bottom of the controller AutoDrive® 19 TANDEM. <p>If not being externally accessed, verify the integrity of the connector and jumper.</p> <p>If accessed through a remote circuit, verify the integrity of that circuit</p>	

⚠ 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.

AutoDrive® 19 TANDEM



Return to Section TOC
Return to Master TOC

Observe all Safety Guidelines detailed throughout this manual

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

⚠ 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.

AutoDrive® 19 TANDEM



Return to Section TOC
Return to Master TOC

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.	<ol style="list-style-type: none"> 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. 	<ol style="list-style-type: none"> 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.	<ol style="list-style-type: none"> 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. 	
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.	<ol style="list-style-type: none"> 1. Make certain that lead #67(+) and the work sense lead are in good condition and connected to their proper terminals. 	<ol style="list-style-type: none"> 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.

AutoDrive® 19 TANDEM



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.

AutoDrive® 19 TANDEM



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

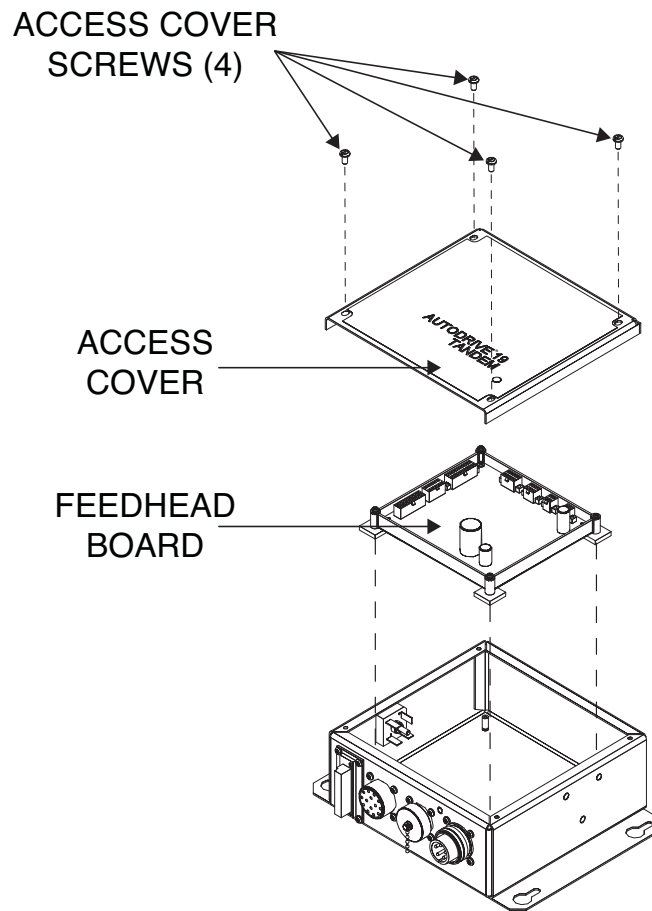
A Known Good AutoDrive 4R90, 4R100 or 4R220 or PF10R Wire Drive.

A Known Good Power Wave® S350 or i400

Possible use of AutoDrive 4R90 Service Manual SVM 213 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.**

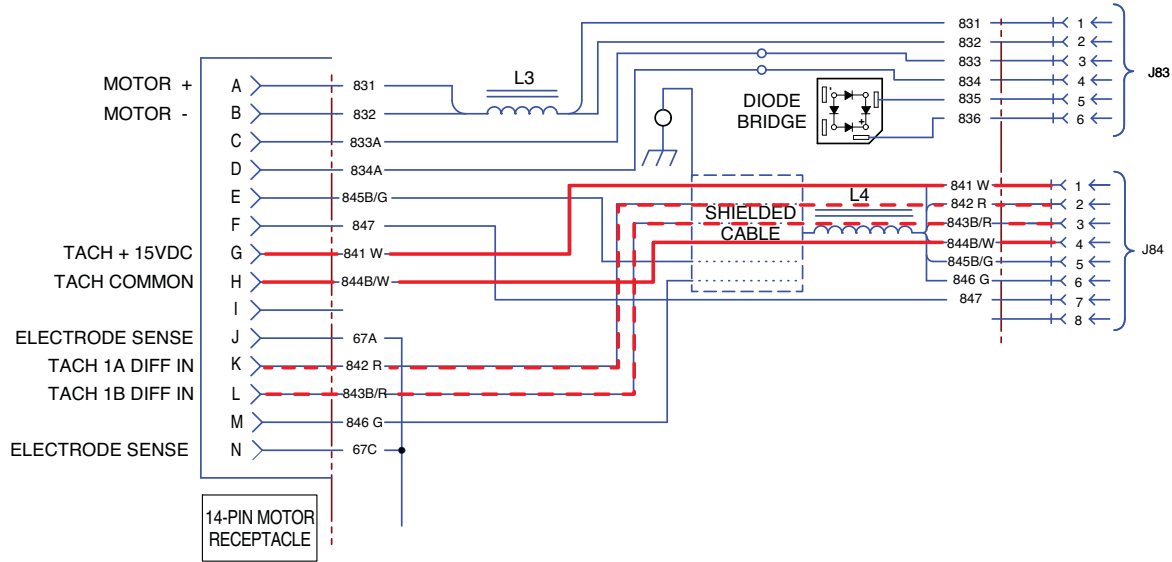
- Do not touch electrically live parts or electrodes with your skin or wet clothing.
- Insulate yourself from the work and ground.

- Always wear dry insulating gloves.

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

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 diagram circuits highlighted in solid and dashed lines for reference. See **Figure F.3**.

If these measurements can not 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.

Frequency measurements for inches per minute.

- IPM: 10 = 99 hz
- 100 = 973 hz
- 200 = 1945 hz

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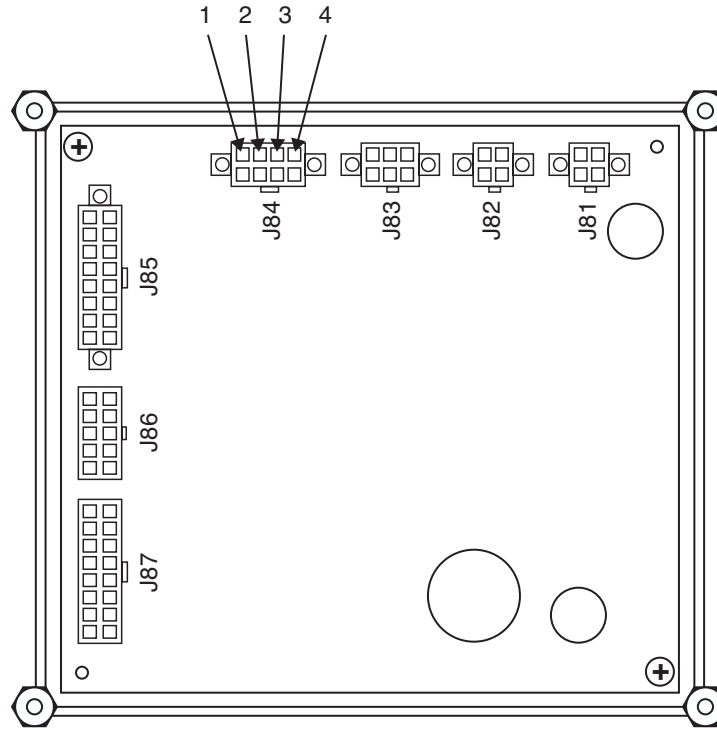
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TACHOMETER / WIRE-FEED SPEED FEEDBACK TEST (continued)

FIGURE F.3 – PLUG J84 LEAD LOCATIONS



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Return to Master TOC

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

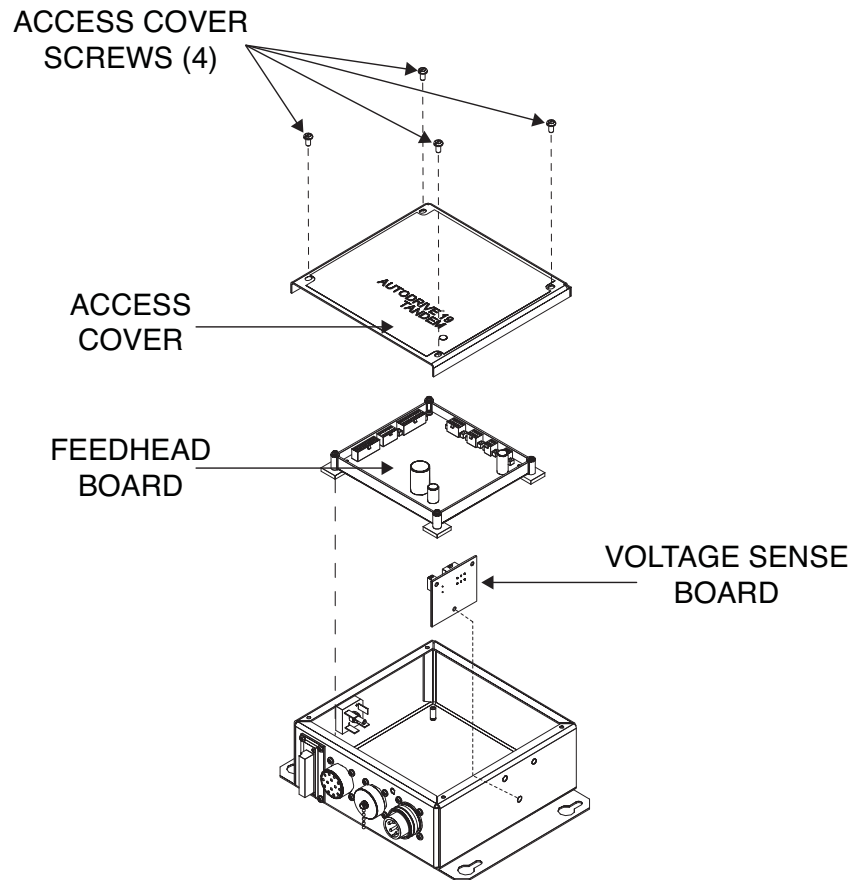
This test will help determine if the Wire Feed Motor is working properly and if it is receiving the correct voltages from the Feedhead Board in the AutoDrive 19® TANDEM.

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 SVM 213 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.

3. Open the access cover and locate the voltage sense board in the AutoDrive® 19 TANDEM Controller. Figure F.4.
4. Locate and remove plug J83 on the control board. See **Figure F.5** and **Figure F.6**.

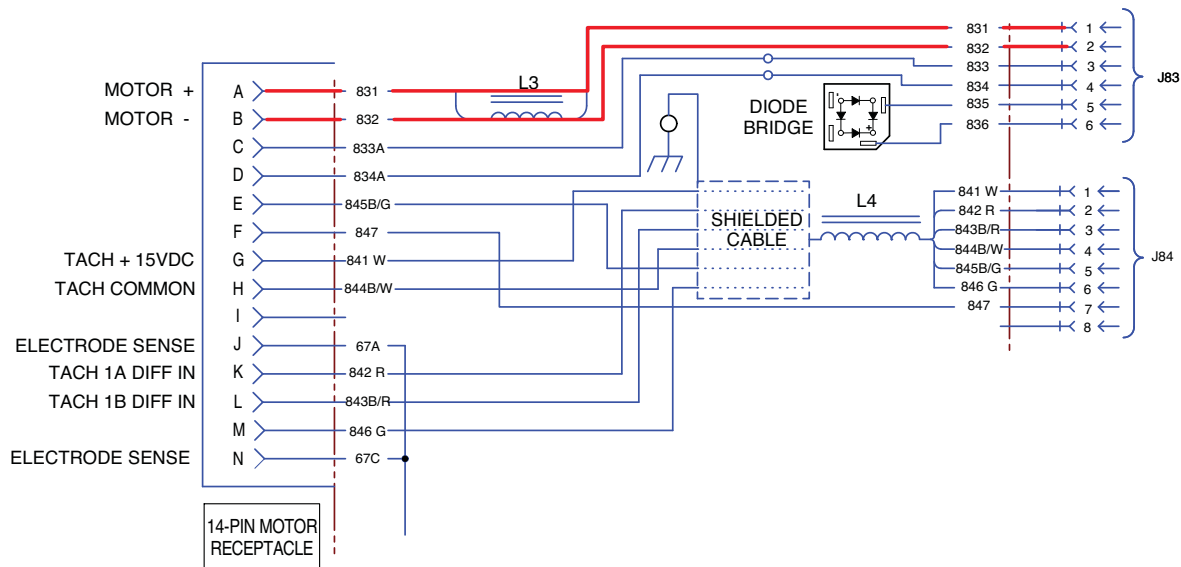
1. Remove the input power to the Power Wave®.
2. Using the phillips screwdriver, remove the four screws from the AutoDrive® 19 TANDEM access cover. See Figure F.4.

AutoDrive® 19 TANDEM



WIRE FEED MOTOR TEST (continued)

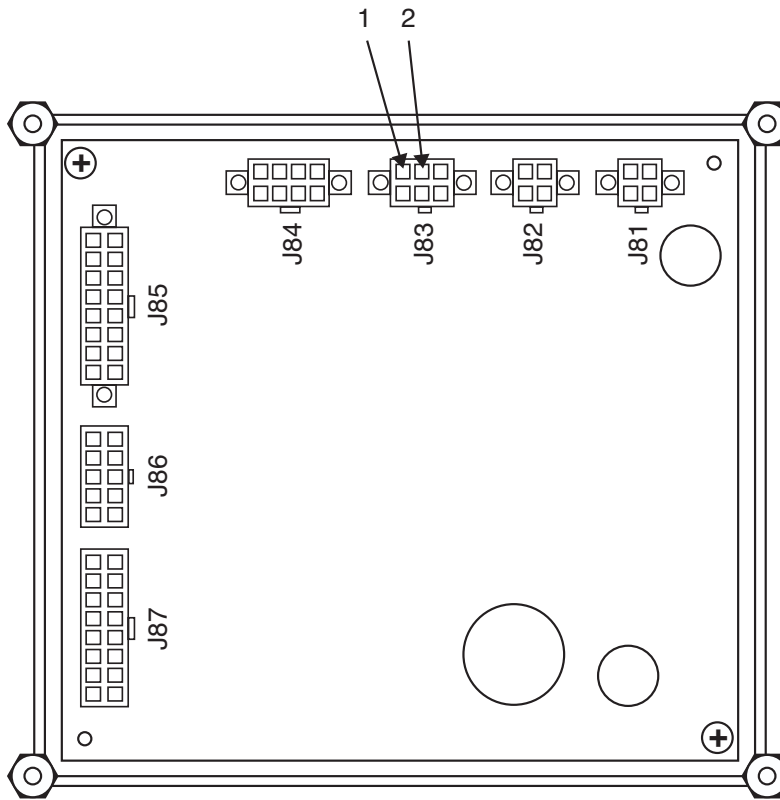
FIGURE F.5 – LEAD LOCATIONS



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. Replace 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 TANDEM 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**.

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.

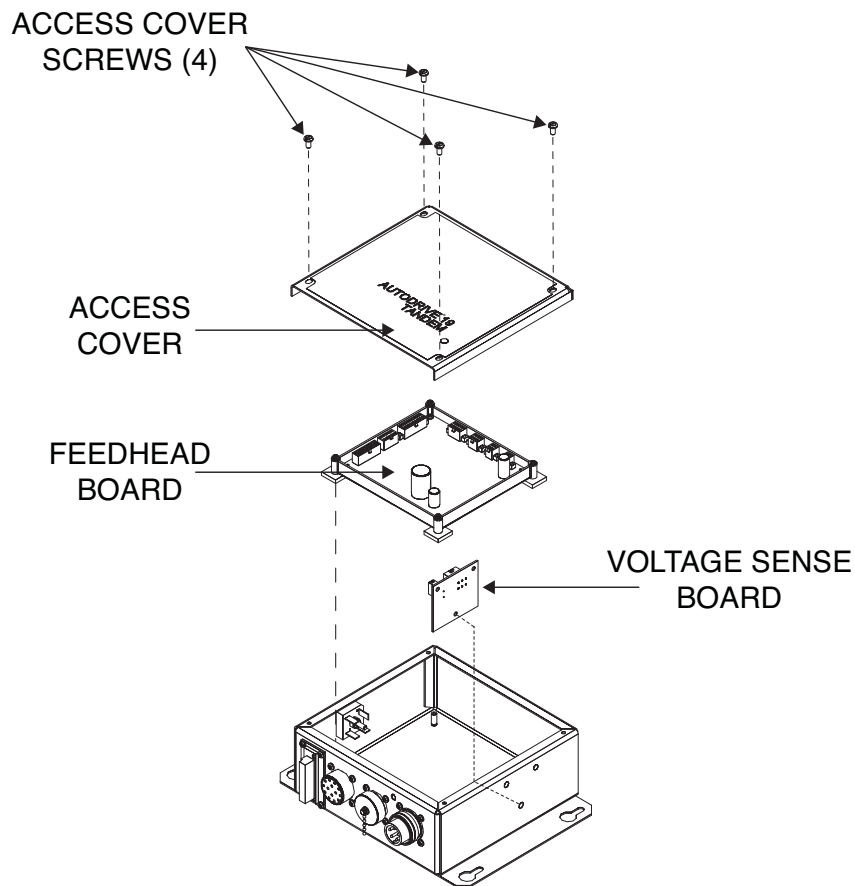
TEST DESCRIPTION

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 SVM 213 TS may be required for testing.

FIGURE F.7 – VOLTAGE SENSE BOARD LOCATION

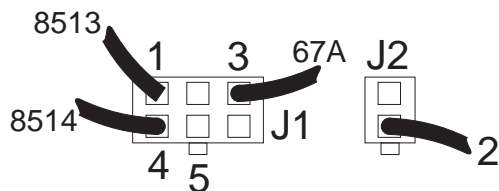


PROCEDURE

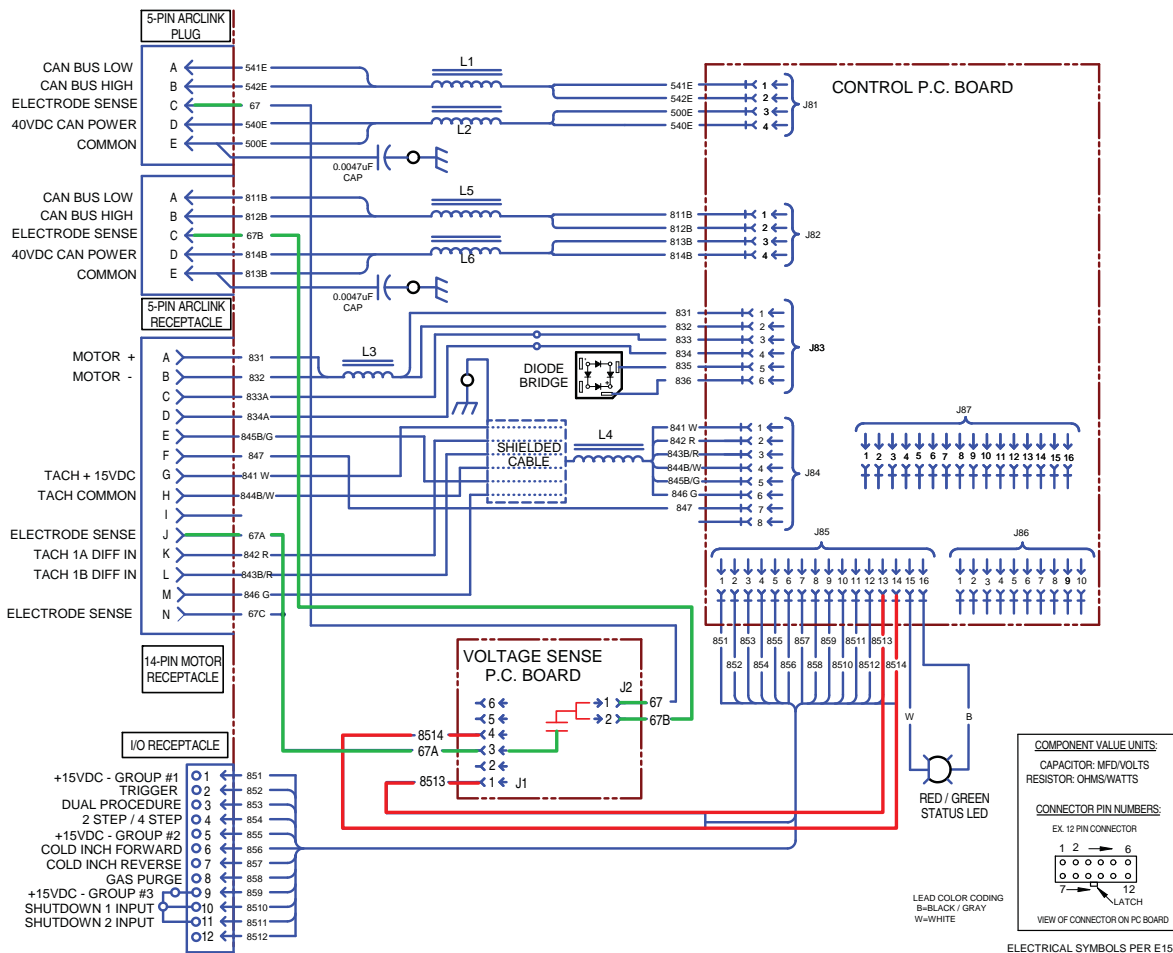
1. Remove input power from the AutoDrive® 19 TANDEM.
2. Using the phillips screwdriver, remove the four screws from the AutoDrive® 19 TANDEM access cover. See Figure F.7.
3. Locate the voltage sense board and plugs J1 and J2. Do not remove the plugs from the voltage sense board. See Figure F.7.
4. Apply 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.

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.



COMPONENT VALUE UNITS:
 CAPACITOR: MFD/VOLTS
 RESISTOR: OHMS/WATTS

CONNECTOR PIN NUMBERS:
 EX. 12 PIN CONNECTOR
 1 2 → 6
 ○ ○ ○ ○ ○ ○
 ○ ○ ○ ○ ○ ○
 7 → 12
 LATCH

VIEW OF CONNECTOR ON PC BOARD

LEAD COLOR CODING
 B=BLACK / GRAY
 W=WHITE

ELECTRICAL SYMBOLS PER E1537

- 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 Wiring Diagram. See Figure F.8. See Wiring Diagram.
- Remove all input power from the wire feeder unit.
- 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.
- Using the phillips screwdriver, install the wire feeder cover.

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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

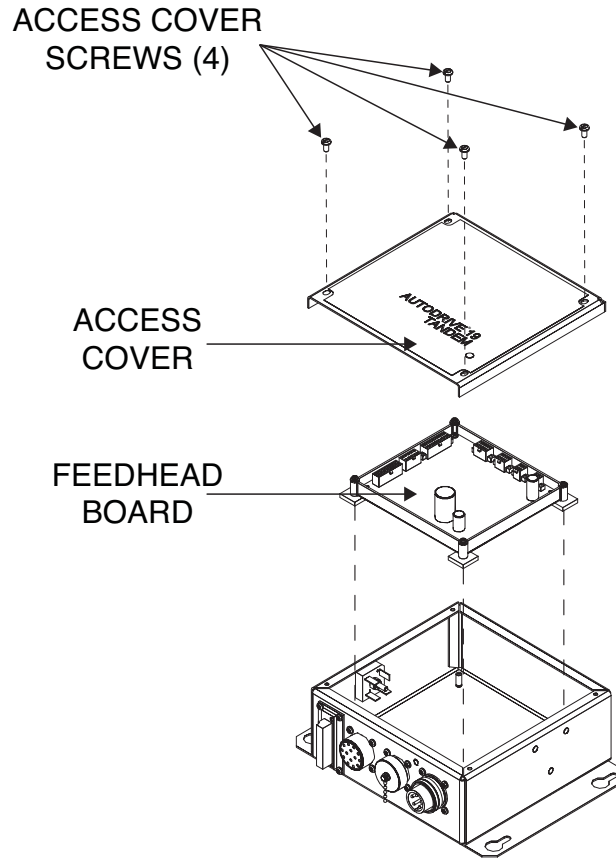
A Known Good AutoDrive 4R90, 4R100 or 4R220 or PF10R Wire Drive.

A Known Good Power Wave® S350 or i400

Possible use of AutoDrive 4R90 Service Manual SVM 213 TS may be required for testing.

GAS SOLENOID TEST (continued)

FIGURE F.9 – FEEDHEAD BOARD LOCATION



PROCEDURE

1. Using the phillips screwdriver, remove the four screws from the AutoDrive® 19 TANDEM 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.

GAS SOLENOID TEST (continued)

FIGURE F.10 – LEAD LOCATION

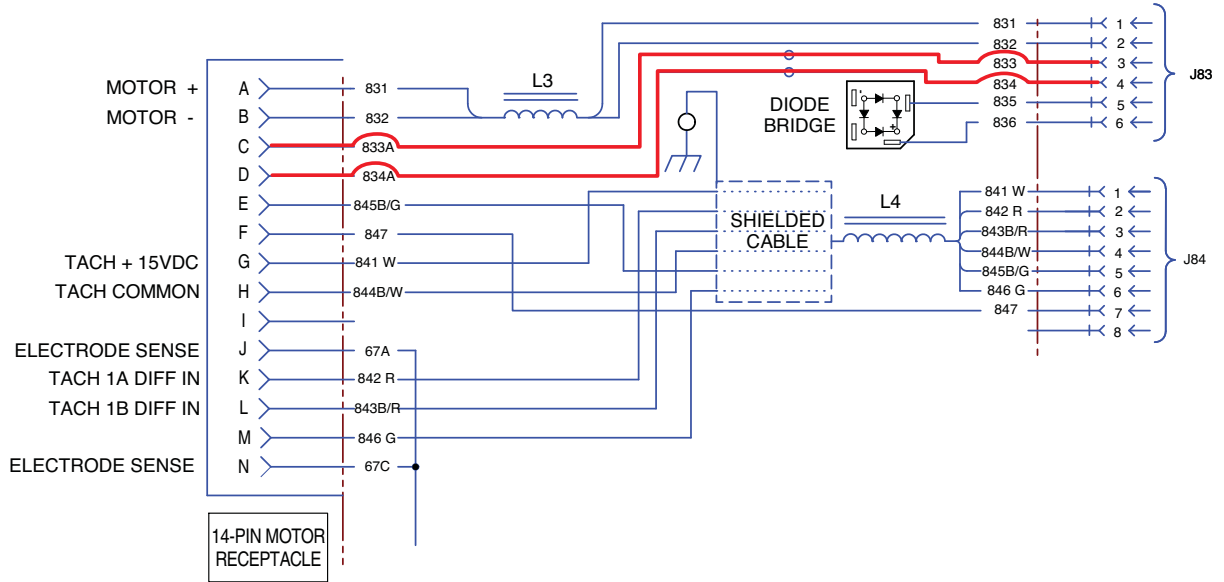
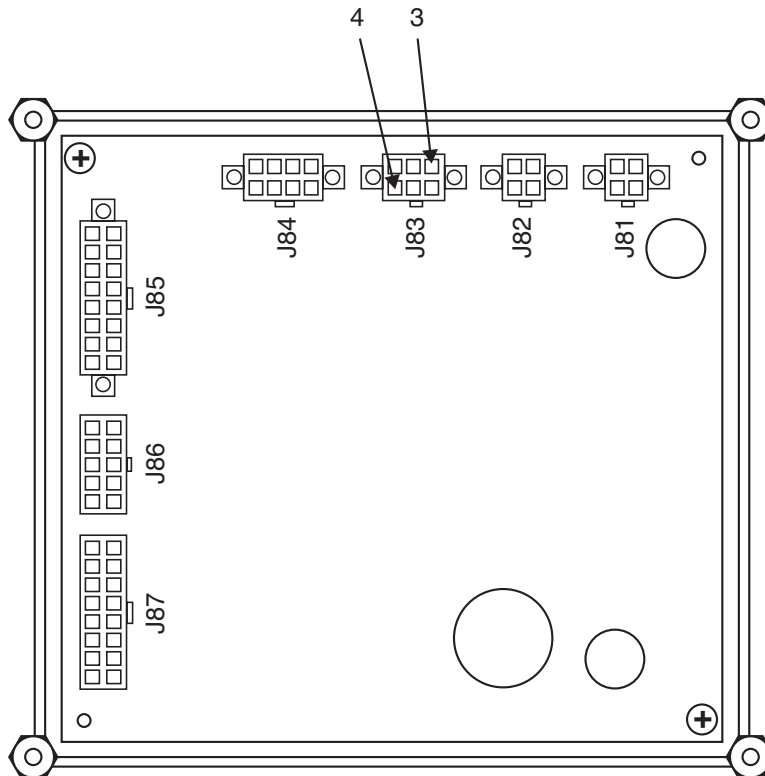


FIGURE F.11 – PLUG J83 LEAD LOCATIONS



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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 removal and replacement procedure performed.

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Electrical Diagrams **G-1**

 Wiring Diagram (G5190-1) G-2

 Schematic – Complete Machine (G5219-1) G-3

 Dimension Print – (L13500) G-4

*** 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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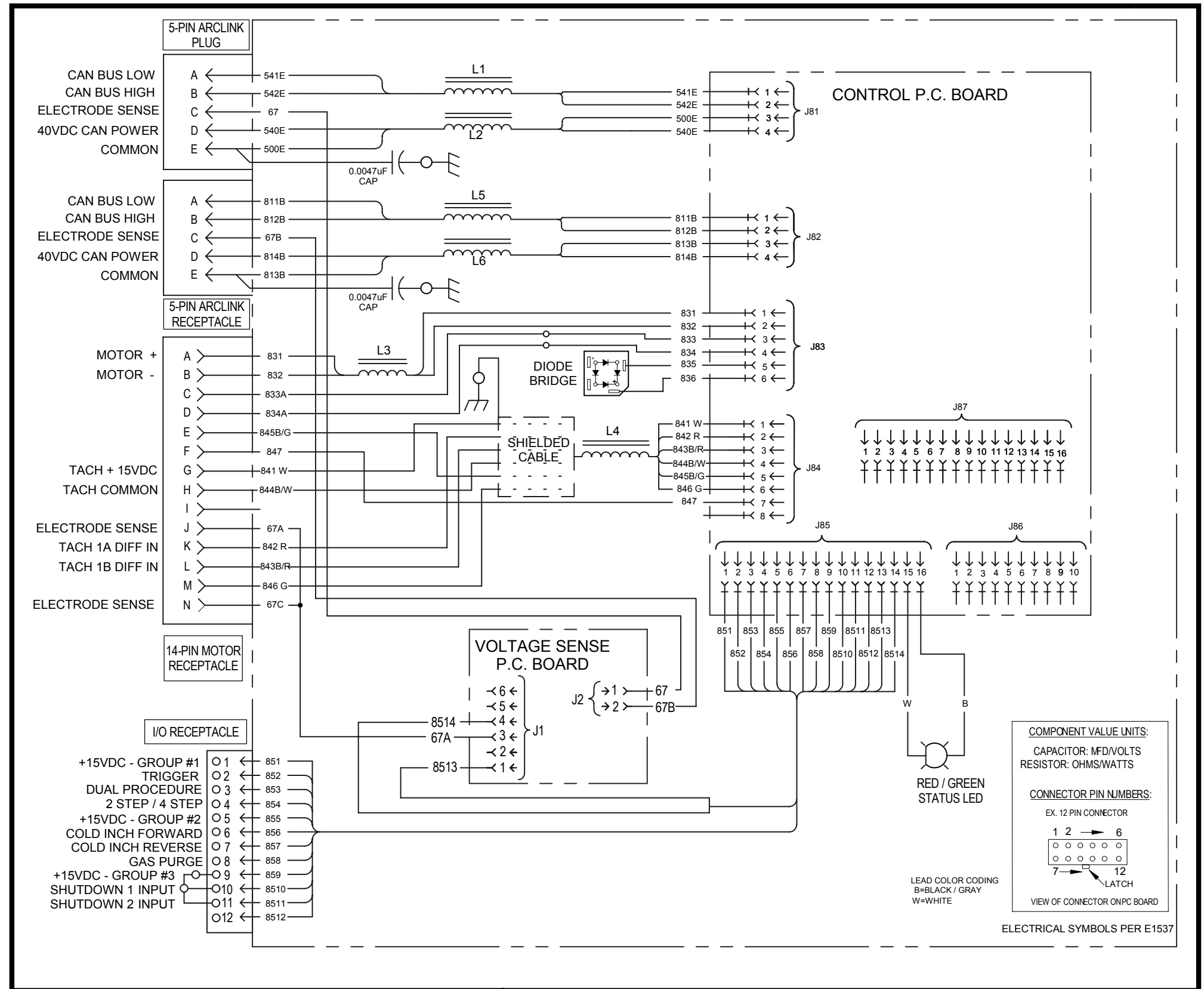
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WIRING DIAGRAM - (CODE 11885) (G5190-1)

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.

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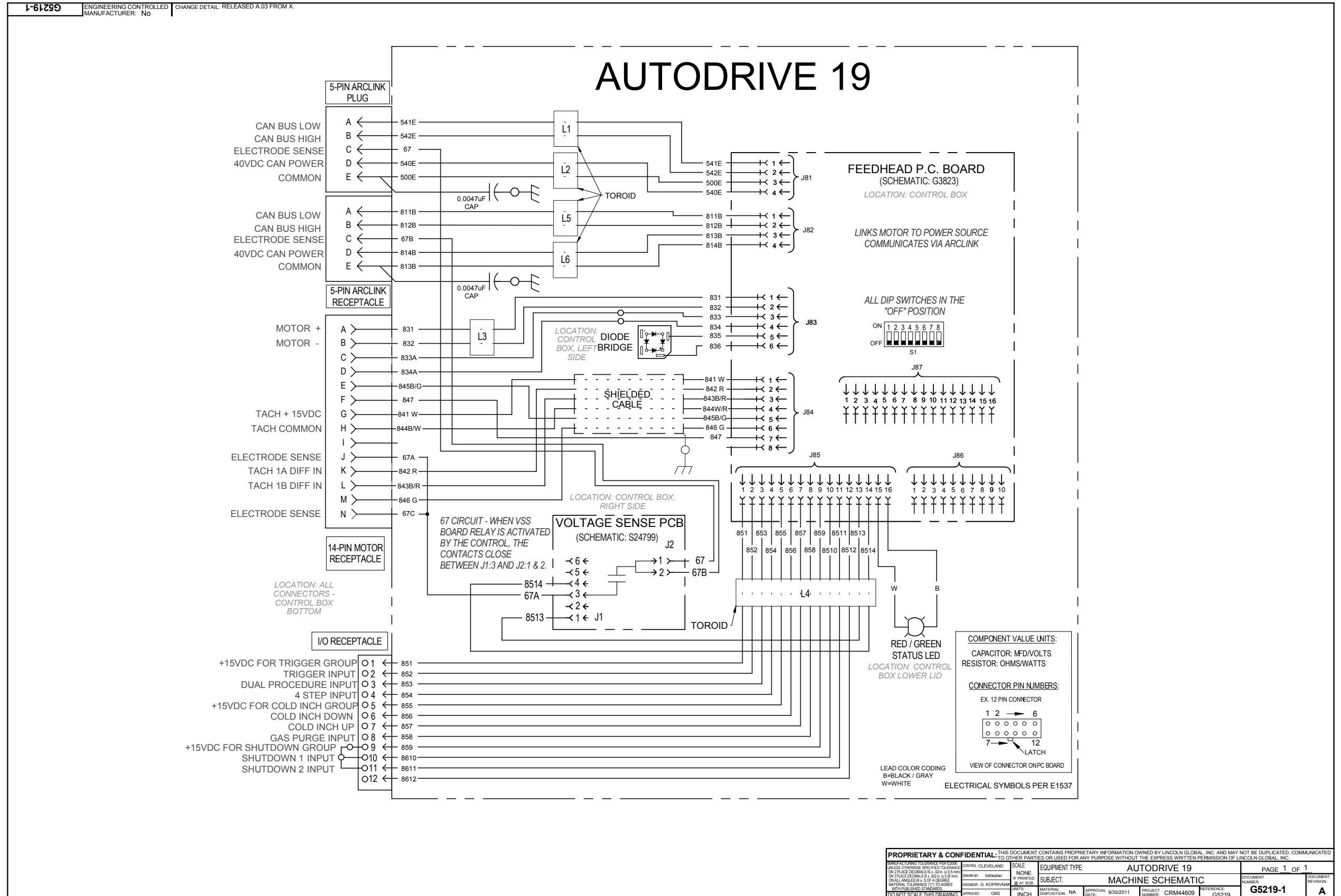
SCHEMATIC - FLEXTEC™ 650 - COMPLETE MACHINE - (CODE 11885) (G5219-1)

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

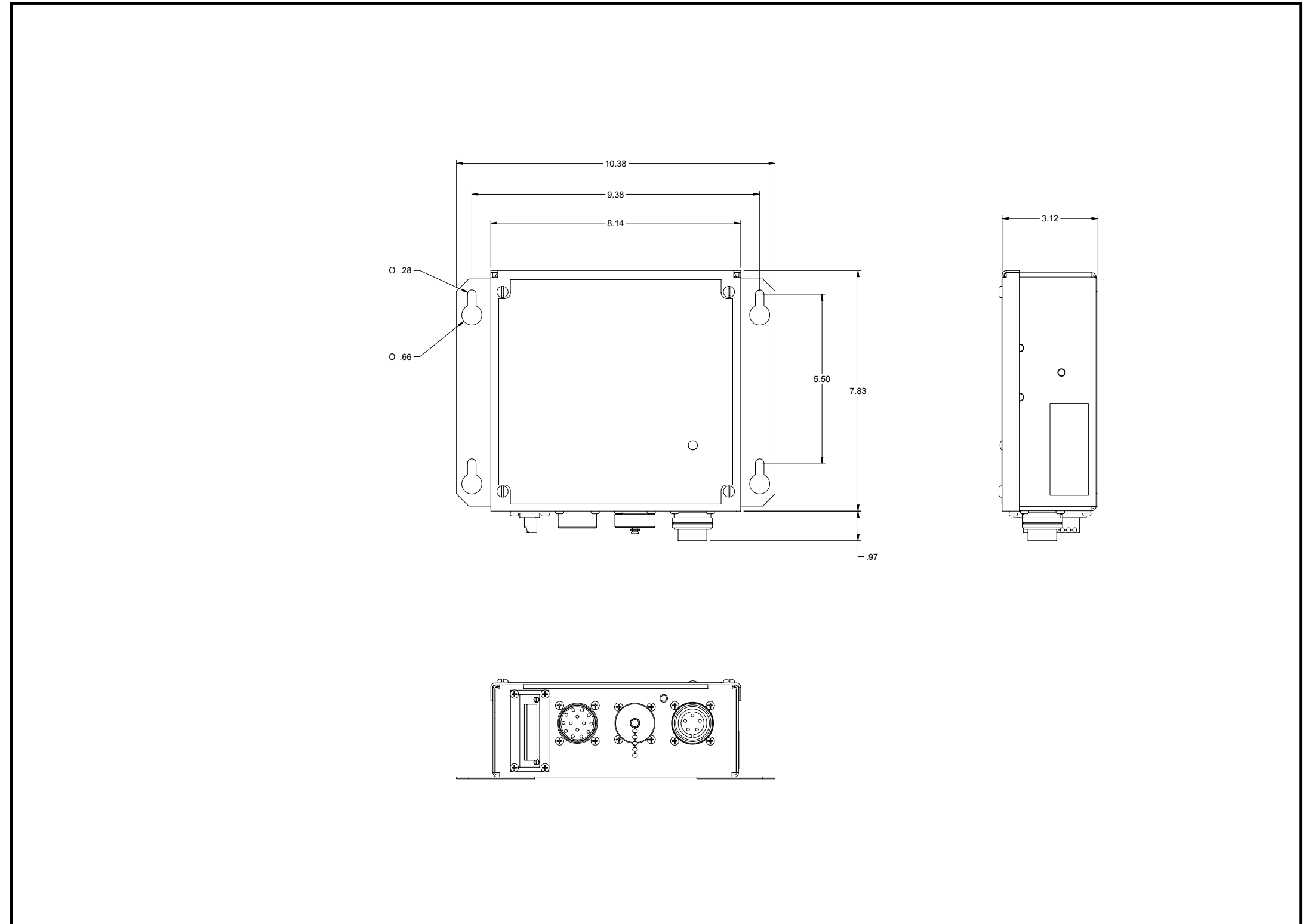
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DIMENSION PRINT - AUTODRIVE 19 TANDEM



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.