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05/2016
REV01

POWER WAVE STT module CE

OPERATOR'S MANUAL



ENGLISH

LINCOLN[®]
ELECTRIC

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THE LINCOLN ELECTRIC COMPANY

EC DECLARATION OF CONFORMITY



Manufacturer and technical documentation holder: The Lincoln Electric Company

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Hereby declare that welding equipment: STT Module

Sales code: K2921, code may also contain prefixes and suffixes

Is in conformity with Council Directives and amendments: Electromagnetic Compatibility (EMC) Directive 2014/30/EU
Low Voltage Directive (LVD) 2014/35/EU

Standards: EN 60974-1:2012, Arc Welding Equipment – Part 1: Welding Power Sources:
EN 60974-10: 2007 Arc Welding Equipment – Part 10: Electromagnetic compatibility (EMC) requirements;

Samir Farah, Manufacturer
Compliance Engineering Manager
16 May 2016

Dario Gatti, European Community Representative
European Engineering Director Machines
19 May 2016

MCD481b



THANKS! For having chosen the QUALITY of the Lincoln Electric products.

- Please Examine Package and Equipment for Damage. Claims for material damaged in shipment must be notified immediately to the dealer.
 - For future reference record in the table below your equipment identification information. Model Name, Code & Serial Number can be found on the machine rating plate.

Model Name:	
Code & Serial number:	
Date & Where Purchased:	

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WARNING

This equipment must be used by qualified personnel. Be sure that all installation, operation, maintenance and repair procedures are performed only by qualified person. Read and understand this manual before operating this equipment. Failure to follow the instructions in this manual could cause serious personal injury, loss of life, or damage to this equipment. Read and understand the following explanations of the warning symbols. Lincoln Electric is not responsible for damages caused by improper installation, improper care or abnormal operation.

	<p>WARNING: This symbol indicates that instructions must be followed to avoid serious personal injury, loss of life, or damage to this equipment. Protect yourself and others from possible serious injury or death.</p>
	<p>READ AND UNDERSTAND INSTRUCTIONS: Read and understand this manual before operating this equipment. Arc welding can be hazardous. Failure to follow the instructions in this manual could cause serious personal injury, loss of life, or damage to this equipment.</p>
	<p>ELECTRIC SHOCK CAN KILL: Welding equipment generates high voltages. Do not touch the electrode, work clamp, or connected work pieces when this equipment is on. Insulate yourself from the electrode, work clamp, and connected work pieces.</p>
	<p>ELECTRICALLY POWERED EQUIPMENT: Turn off input power using the disconnect switch at the fuse box before working on this equipment. Ground this equipment in accordance with local electrical regulations.</p>
	<p>ELECTRICALLY POWERED EQUIPMENT: Regularly inspect the input, electrode, and work clamp cables. If any insulation damage exists replace the cable immediately. Do not place the electrode holder directly on the welding table or any other surface in contact with the work clamp to avoid the risk of accidental arc ignition.</p>
	<p>ELECTRIC AND MAGNETIC FIELDS MAY BE DANGEROUS: Electric current flowing through any conductor creates electric and magnetic fields (EMF). EMF fields may interfere with some pacemakers, and welders having a pacemaker shall consult their physician before operating this equipment.</p>
	<p>CE COMPLIANCE: This equipment complies with the European Community Directives.</p>
	<p>ARTIFICIAL OPTICAL RADIATION: According with the requirements in 2006/25/EC Directive and EN 12198 Standard, the equipment is a category 2. It makes mandatory the adoption of Personal Protective Equipments (PPE) having filter with a protection degree up to a maximum of 15, as required by EN169 Standard.</p>
	<p>FUMES AND GASES CAN BE DANGEROUS: Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. To avoid these dangers the operator must use enough ventilation or exhaust to keep fumes and gases away from the breathing zone.</p>
	<p>ARC RAYS CAN BURN: 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. Use suitable clothing made from durable flame-resistant material to protect you skin and that of your helpers. Protect other nearby personnel with suitable, non-flammable screening and warn them not to watch the arc nor expose themselves to the arc.</p>
	<p>WELDING SPARKS CAN CAUSE FIRE OR EXPLOSION: Remove fire hazards from the welding area and have a fire extinguisher readily available. Welding sparks and hot materials from the welding process can easily go through small cracks and openings to adjacent areas. Do not weld on any tanks, drums, containers, or material until the proper steps have been taken to insure that no flammable or toxic vapors will be present. Never operate this equipment when flammable gases, vapors or liquid combustibles are present.</p>

	WELDED MATERIALS CAN BURN: Welding generates a large amount of heat. Hot surfaces and materials in work area can cause serious burns. Use gloves and pliers when touching or moving materials in the work area.
	SAFETY MARK: This equipment is suitable for supplying power for welding operations carried out in an environment with increased hazard of electric shock.
	CYLINDER MAY EXPLODE IF DAMAGED: 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. Always keep cylinders in an upright position securely chained to a fixed support. Do not move or transport gas cylinders with the protection cap removed. Do not allow the electrode, electrode holder, work clamp or any other electrically live part to touch a gas cylinder. Gas cylinders must be located away from areas where they may be subjected to physical damage or the welding process including sparks and heat sources.
	NOISE APPEARES DURING WELDING CAN BE HARMFUL: Welding arc can cause noise with high level of 85dB for 8-hour week day. Welders operating welding machines are obligated to wear the proper ear protectors /appendix No. 2 for the Decree of the Secretary of Labor and Social Policy from 17.06 1998 – Dz.U. No. 79 pos. 513/. According to the Decree the Secretary of Health and Social Welfare from 09.07.1996 /Dz.U. No. 68 pos. 194/, employers are obligated to carry examinations and measurements of health harmful factors.
	MOVING PARTS ARE DANGEROUS: There are moving mechanical parts in this machine, which can cause serious injury. Keep your hands, body and clothing away from those parts during machine starting, operating and servicing.

Installation and Operator Instructions

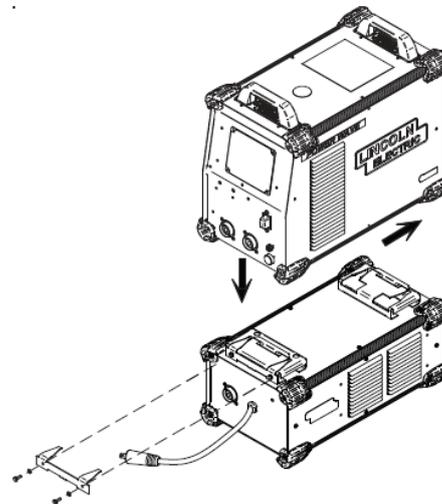
Read this entire section before installation or operation of the machine.

Location and Environment

Mount the STT Module directly to the bottom of a compatible Power Wave “S” series power source utilizing the quick lock mechanism as shown. The STT Module will operate in harsh environments and can be used outdoors. Even so, it is important that simple preventative measures are followed in order to assure long life and reliable operation.

- The machine must be located where there is free circulation of clean air such that movement into and out of the louvers will not be restricted.
- Dirt and dust that can be drawn into the machine should be kept to a minimum. The use of air filters on the air intake is not recommended because normal air flow may be restricted. Failure to observe these precautions can result in excessive operating temperatures and nuisance shutdown.
- Keep the machine dry. Shelter from rain and snow. Do not place on wet ground or in puddles.
- Do not mount the Power Wave “S” series power source and STT Module combination over combustible surfaces.

Figure A.1



Control Cable Connections

General guidelines

Genuine Lincoln control cables should be used at all times (except where noted otherwise). Lincoln cables are specifically designed for the communication and power needs of the Power Wave systems. Most are designed to be connected end to end for ease of extension. Generally, it is recommended that the total length not exceed 30,5m. The use of nonstandard cables, especially in lengths greater than 7,6m, can lead to communication problems (system shutdowns), poor motor acceleration (poor arc starting), and low wire driving force (wire feeding problems). Always use the shortest length of control cable possible, and DO NOT coil excess cable.

⚠ WARNING

Regarding cable placement, best results will be obtained when control cables are routed separate 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. These recommendations apply to all communication cables including ArcLink® connections.

Connection between Power Source and STT® module (ArcLink® and differential I/O pigtailed)

The pigtail connections on the STT® Module include all signal and power lines required for proper operation. With the STT® Module securely fastened to the power source, connect the pigtails to their respective receptacles on the back of the power source per the connection diagram located in the “Installation Section”.

Special Instructions: K2921-1

A special ArcLink® and Differential I/O receptacle kit is provided with the STT® Module for installation into the host power source. Follow the instructions provided with the kit. (reference instruction sheet M22499-1).

Electrode and work connections

Connect the electrode and work cables per the connection diagrams included in this document. Size and route the cables per the following:

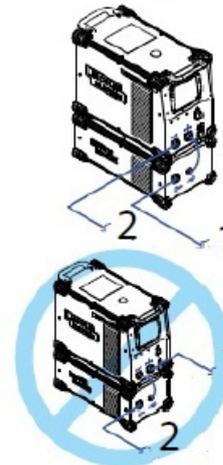
- **Positive electrode Polarity:** Most welding applications run with the electrode being positive (+). For those applications, connect the electrode cable between the wire drive feed plate and the output stud on the STT Module. Connect a work lead from the negative (-) power source output stud to the work piece per the Connection Diagram. (See Figure a.5)
- **Negative electrode Polarity:** The STT process CANNOT be run using negative electrode polarity. However, for processes other than STT requiring negative polarity, such as some Innershield applications, the electrode and work connections should be reversed at the load, NOT at the input to the STT Module. Connect the electrode cable to the negative (-) stud of the power source, and work cable to the output stud of the STT Module per the Negative Polarity Connection Diagram. (See Figure a.2)

⚠ WARNING

Never reverse the polarity at the input of the STT module (Do not connect the negative stud of the power source to input stud of the STT module). This may result in damage to the STT module!

NEGATIVE POLARITY CONNECTION (not to be used for STT process)

Figure A.2

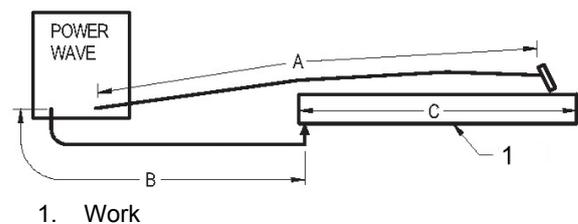


1. To work;
2. To electrode (feeder).

CABLE INDUCTANCE AND ITS EFFECTS ON WELDING

Excessive cable inductance will cause the welding performance to degrade. There are several factors that contribute to the overall inductance of the cabling system including cable size, and loop area. The loop area is defined by the separation distance between the electrode and work cables, and the overall welding loop length. The welding loop length is defined as the total of length of the electrode cable (A) + work cable (B) + work path (C) (see Figure A.3 below). To minimize inductance always use the appropriate size cables, and whenever possible, run the electrode and work cables in close proximity to one another to minimize the loop area. Since the most significant factor in cable inductance is the welding loop length, avoid excessive lengths and do not coil excess cable. For long work piece lengths, a sliding ground should be considered to keep the total welding loop length as short as possible.

Figure A.3



Remote Sense Lead Connections

Voltage Sensing overview

The STT[®] welding process requires the use of remote voltage sense leads to more accurately monitor the conditions of the arc. These leads originate in the power source, and are connected and configured external to the STT[®] Module. Consult the power source instruction manual for detailed information.

Note:

Other processes run through the STT[®] Module do not necessarily require sense leads, but will benefit from their use. Consult the power source instruction manual for recommendations.

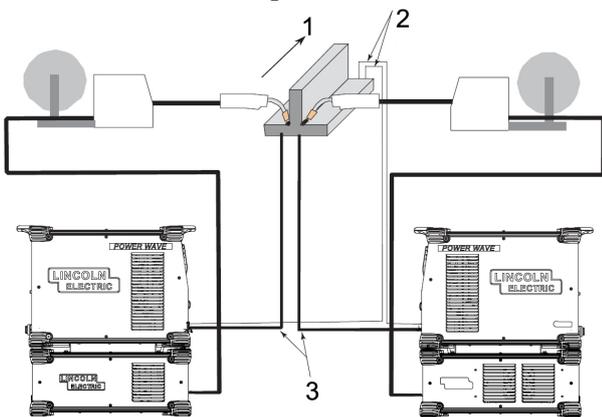
General Voltage Sensing Considerations for multiple arc Systems

Special care must be taken when more than one arc is welding simultaneously on a single part. The placement and configuration of remote work voltage sense leads is critical to the proper operation of multiple arc STT[®] applications.

RECOMMENDATIONS:

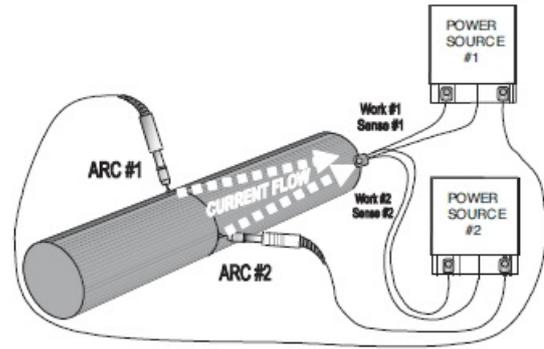
- **Position the sense leads out of the path of the weld current.** Especially any current paths common to adjacent arcs. Current from adjacent arcs can induce voltage into each others current paths that can be misinterpreted by the power sources, and result in arc interference.
- **For longitudinal applications,** connect all work leads at one end of the weldment, and all of the work voltage sense leads at the opposite end of the weldment. Perform welding in the direction away from the work leads and toward the sense leads. (See Figure a.4)

Figure A.4



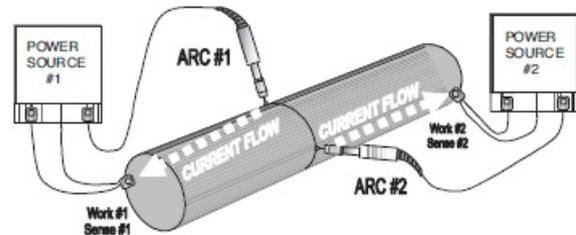
1. Direction of travel.
2. Connect all sense leads at the end of the weld.
3. Connect all work leads at the beginning of the weld.

Bad connection



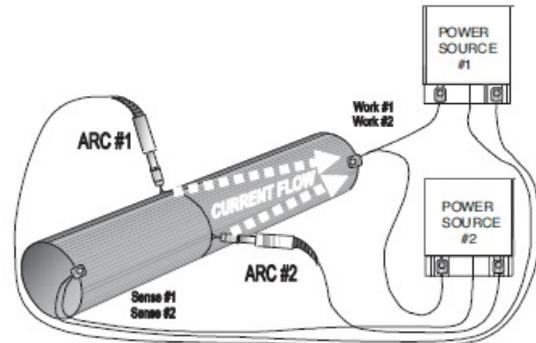
- Current flow from **Arc#1** affects **Sense lead #2**.
- Current flow from **Arc#2** affects **Sense lead #1**.
- Neither sense lead picks up the correct work voltage, causing starting and welding arc instability.

Better connection



- **Sense lead #1** is only affected by current flow from **Arc#1**.
- **Sense lead #2** is only affected by current flow from **Arc#2**.
- Due to voltage drops across workpiece, Arc voltage may be low, causing need for deviation from standard procedures.

Best connection



- Both **Sense** leads are out of the current paths.
- Both **Sense** leads detect arc voltage accurately.
- No voltage drop between **Arc** and **Sense** leads.
- Best start, best arcs, most reliable results.
- **For circumferential applications,** connect all work leads on one side of the weld joint, and all of the work voltage sense leads on the opposite side, such that they are out of the current path.

GENERAL DESCRIPTION

General Physical Description

The POWER WAVE® STT® MODULE (CE) is an accessory enabling compatible power sources to perform the STT® function without limiting the normal multi-process rating of the host machine. It is intended for use with medium range “S”- series Power Wave ® power sources such as the S350. The module itself is a low profile pedestal, designed to seamlessly integrate with compatible power sources and water coolers.

General Functional Description

The POWER WAVE® STT® MODULE (CE) is essentially a high speed, high capacity output switch, connected in series with the positive output of the power source. It communicates module status and identification information to the power source via the ArcLink® protocol, and receives a high speed synchronized switching command via a dedicated digital link.

DUTY CYCLE

The POWER WAVE® STT® MODULE (CE) is rated at 450 amps at a 100% duty cycle. It is further rated to support 500 amps at a 60% duty cycle and 550 amps at a 40% duty cycle. The duty cycle is based on a ten-minute period. A 60% duty cycle represents 6 minutes of welding and 4 minutes of idling in a ten-minute period.

Note:

The POWER WAVE® STT® MODULE (CE) is capable of withstanding a peak output current of 750 amps. The allowable maximum average output current is time dependant, and ultimately limited by the host power source.

COMMON WELDING PROCEDURES

MAKING A WELD

Choose the electrode material, electrode size, shielding gas, and process (GMAW, GMAW-P, GMAW STT etc.) appropriate for the material to be welded.

Select the weld mode that best matches the desired welding process. The standard weld set shipped with the host power source encompasses a wide range of common processes that will meet most needs. If the STT modes are not available, or if a special weld mode is desired, visit www.powerwavesoftware.com or contact the local Lincoln Electric sales representative.

The power source controls the POWER WAVE® STT® MODULE (CE) based on the selected weld mode.

For a more detailed description, and specific operating instructions, consult the power source Instruction Manual.

Steady green	System okay. The power source and wire feeder are communicating normally.
Blinking green	Occurs during a reset and indicates the power source is identifying each component in the system. This is normal for the first 60 seconds after power-up, or if the system configuration is changed during operation.
Alternating green and red	Non-recoverable system fault. If the power source or wire feeder status LED is flashing any combination of red and green, errors are present in the system. Read the error code before the machine is turned off.

RECOMMENDED PROCESSES AND EQUIPMENT

RECOMMENDED PROCESSES

The POWER WAVE® STT® MODULE (CE) is recommended for all process supported by the host power source including, but not limited to SMAW, GMAW, GMAW-P, GMAW-STT.

PROCESS LIMITATIONS

The POWER WAVE® STT® MODULE (CE) is unaffected by the voltage at the load, and therefore processes are only limited by the current and duty cycle ratings listed in the specifications for the product. The POWER WAVE® STT® MODULE (CE) is designed to protect itself from the excessive transient voltages associated with highly inductive weld circuits. These high inductance circuits may result in unsatisfactory performance, but will not damage the module.

Although the STT Module can be configured to support negative electrode polarity processes, such as Innershield, the STT process must be configured to use positive electrode polarity.

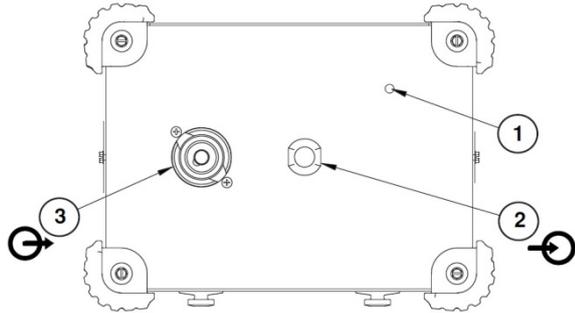
EQUIPMENT LIMITATIONS

The POWER WAVE® STT® MODULE (CE) is intended for use with compatible medium range “S” – series POWER WAVE® power sources such as the S350.

COMMON EQUIPMENT PACKAGES

Basic Package (CE)	
K2921-1	STT® Module (CE)
K2823-2	Power Wave® S350 (CE)
K14072-1	LF-45
K10349-PG(W)-XX	Interconnecting cable package
K3168-1	Power Wave S500 CE

STT® MODULE (CE) CASE FRONT



CASE FRONT DESCRIPTIONS

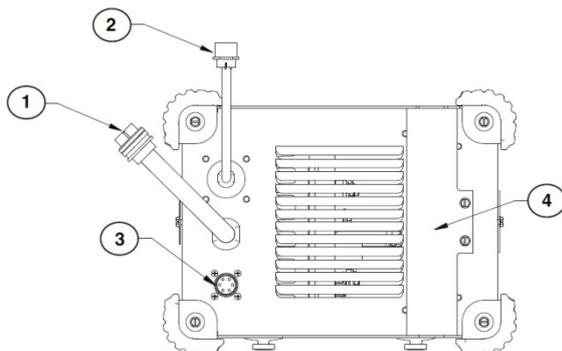
1. Status LED – Provides ArcLink® status of Power Wave STT Module.

Note: During normal power-up, the LED will flash green up to 60 seconds as the equipment performs self tests.

2. STT INPUT – Connects directly to the Positive output of the power source.

3. STT OUTPUT – Connects directly to the wire feeder, torch or electrode.

STT® MODULE (CE) CASE BACK



CASE BACK DESCRIPTIONS

1. ArcLink® Pigtail – Connects directly to the ArcLink® Out receptacle on the rear of the power source.

2. Differential I/O Pigtail – Connects directly to the Differential I/O output receptacle on the rear of the power source.

3. Differential I/O (Sync Tandem) Output – Supports Synchronized Tandem MIG Welding with other compatible power sources. Note: This feature is not compatible with the STT process, and is therefore disabled when using STT weld modes.

4. Watercooler Pass Through – CE model only. Provides a channel to conceal and protect the power and control leads for the optional integrally mounted CE watercooler.

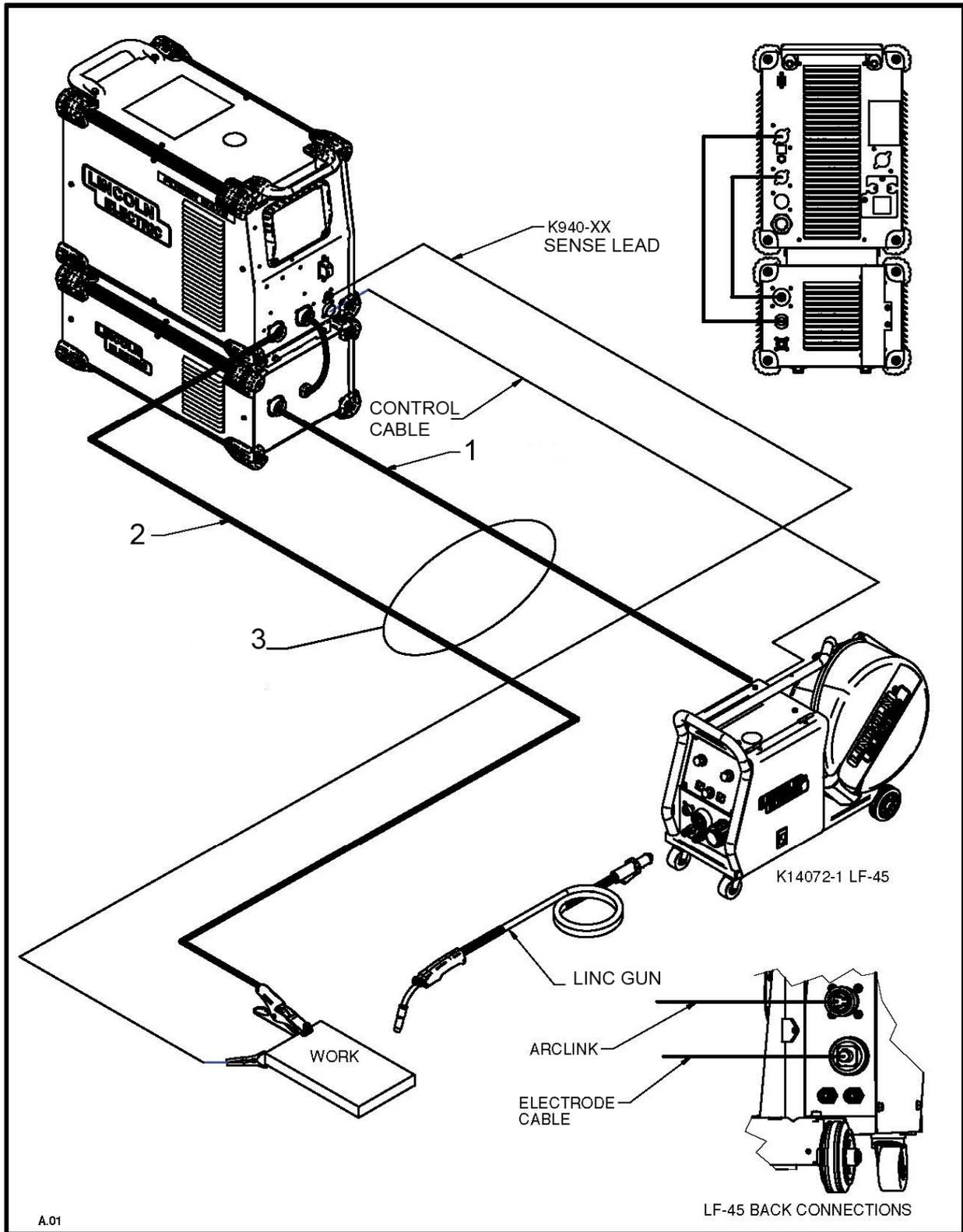
ROUTINE MAINTENANCE

Routine maintenance consists of periodically blowing out the machine, using a low-pressure air stream, to remove accumulated dust and dirt from the intake and outlet louvers, and the cooling channels in the machine.

Also verify the STT® Module fan is operational when the power source fan is activated.

**CONNECTION DIAGRAM SYSTEM
STT MODULE (CE) CONNECTION DIAGRAM**

Figure A.5



A.01

M22498

- 1. Ground cable
- 2. Electrode cable (to feeder)
- 3. Sense lead cable

Electromagnetic Compatibility (EMC)

11/04

This machine has been designed in accordance with all relevant directives and standards. However, it may still generate electromagnetic disturbances that can affect other systems like telecommunications (telephone, radio, and television) or other safety systems. These disturbances can cause safety problems in the affected systems. Read and understand this section to eliminate or reduce the amount of electromagnetic disturbance generated by this machine.



This machine has been designed to operate in an industrial area. To operate in a domestic area it is necessary to observe particular precautions to eliminate possible electromagnetic disturbances. The operator must install and operate this equipment as described in this manual. If any electromagnetic disturbances are detected the operator must put in place corrective actions to eliminate these disturbances with, if necessary, assistance from Lincoln Electric.

Before installing the machine, the operator must check the work area for any devices that may malfunction because of electromagnetic disturbances. Consider the following.

- Input and output cables, control cables, and telephone cables that are in or adjacent to the work area and the machine.
- Radio and/or television transmitters and receivers. Computers or computer controlled equipment.
- Safety and control equipment for industrial processes. Equipment for calibration and measurement.
- Personal medical devices like pacemakers and hearing aids.
- Check the electromagnetic immunity for equipment operating in or near the work area. The operator must be sure that all equipment in the area is compatible. This may require additional protection measures.
- The dimensions of the work area to consider will depend on the construction of the area and other activities that are taking place.

Consider the following guidelines to reduce electromagnetic emissions from the machine.

- Connect the machine to the input supply according to this manual. If disturbances occur it may be necessary to take additional precautions such as filtering the input supply.
- The output cables should be kept as short as possible and should be positioned together. If possible connect the work piece to ground in order to reduce the electromagnetic emissions. The operator must check that connecting the work piece to ground does not cause problems or unsafe operating conditions for personnel and equipment.
- Shielding of cables in the work area can reduce electromagnetic emissions. This may be necessary for special applications.

WARNING

The Class A equipment is not intended for use in residential locations where the electrical power is provided by the public low-voltage supply system. There can be potential difficulties in ensuring electromagnetic compatibility in those locations, due to conducted as well as radio-frequency disturbances.



Technical Specifications

POWER WAVE® STT® module CE

STT® Module - INPUT VOLTAGE AND CURRENT			
Voltage		Input Current	
40Vdc		0.5A	
STT® Module - *Output Current Capacity			
Duty Cycle	Amperes	Notes	
100%	450	750A Peak (Max)	
60%	500		
40%	550		
* Output Current Capacity: Defines capability of the output switch. the actual output current is supplied by host power source.			
PHYSICAL DIMENSIONS			
Height (mm)	Width (mm)	Depth (mm)	Weight (kg)
292	353	630	21.3
TEMPERATURE RANGES			
Operating Temperature Range (°C)		Storage Temperature Range (°C)	
-20 to +40		-40 to +85	

IP23 Insulation Class

WEEE

English	07/06
	<p>Do not dispose of electrical equipment together with normal waste!</p> <p>In observance of European Directive 2012/19/EC on Waste Electrical and Electronic Equipment (WEEE) and its implementation in accordance with national law, electrical equipment that has reached the end of its life must be collected separately and returned to an environmentally compatible recycling facility. As the owner of the equipment, you should get information on approved collection systems from our local representative.</p> <p>By applying this European Directive you will protect the environment and human health!</p>

Spare Parts

12/05
<p>Part List reading instructions</p> <ul style="list-style-type: none"> Do not use this part list for a machine if its code number is not listed. Contact the Lincoln Electric Service Department for any code number not listed. Use the illustration of assembly page and the table below to determine where the part is located for your particular code machine. Use only the parts marked "X" in the column under the heading number called for in the assembly page (# indicate a change in this printing).

First, read the Part List reading instructions above, then refer to the "Spare Part" manual supplied with the machine, that contains a picture-descriptive part number cross-reference.

Electrical Schematic

Refer to the "Spare Part" manual supplied with the machine.