

SVM 3057
Rev.00 03-2016

SPEEDTEC® 215C

For use with machines having code numbers: 50314



SERVICE MANUAL



LINCOLN ELECTRIC EUROPE
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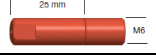
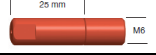
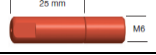
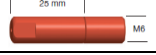
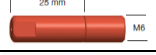






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TECHNICAL SPECIFICATIONS

NAME		INDEX			
SPEEDTEC 215C		K14146-1			
INPUT					
Input Voltage U_1		230 Vac \pm 10%, 1-phase		115 Vac \pm 10%, 1-phase	
Frequency		50/60 Hz			
Input Amperes I_{1max}		27A		23A	
Input Power at Rated Cycle (40°C)		6,2kVA @ 25% Duty Cycle		2,6kVA @ 40% Duty Cycle	
$\cos \varphi$		0,99		0,99	
EMC Group / Class		II / A			
RATED OUTPUT					
		Open Circuit Voltage	Duty Cycle 40°C (based on a 10 min. period)	Output Current	Output Voltage
230Vac	GMAW	57 Vdc	100	110A	19,5 Vdc
			25	200A	24 Vdc
	FCAW-SS	57 Vdc	100	110A	19,5 Vdc
			25	200A	24 Vdc
	SMAW	57 Vdc	100	100A	24 Vdc
			30	160A	26,4 Vdc
GTAW	57 Vdc	100	100A	14 Vdc	
		40	160A	16,4 Vdc	
115Vac	GMAW	57 Vdc	100	75A	17,7 Vdc
			40	100A	19 Vdc
	FCAW-SS	57 Vdc	100	75A	17,7 Vdc
			40	100A	19 Vdc
	SMAW	57 Vdc	100	60A	22,4 Vdc
			40	80A	23,2 Vdc
	GTAW	57 Vdc	100	90A	13,6 Vdc
			40	125A	15 Vdc
WELDING CURRENT RANGE					
	GMAW	FCAW-SS	SMAW	GTAW	
230Vac	20A – 200A	20A – 200A	20 – 160A	20A – 160A	
115Vac	20A – 100A	20A – 100A	20 – 80A	20A – 125A	
RECOMMENDED INPUT CABLE AND FUSE SIZES					
Fuse or Circuit Breaker Size			Power Lead		
Type B, 25A			3 Conductor, 2,5mm ²		
DIMENSION					
Weight		Height		Width	
42 kg		780 mm		400 mm	
				Length	
				750 mm	
WIRE DIAMETER / WIRE FEED SPEED RANGE					
WFS Range		Solid wires		Aluminum wires	
1.5 ÷ 15 m/min		0.6 ÷ 1.0		1.0	
				Cored wires	
				0.9 ÷ 1.1	
Protection Rating		Operating Humidity (t=20°C)		Operating Temperature	
IP23		≤ 95%		from -10°C to +40°C	
				Storage Temperature	
				from -25°C to 55°C	

Accessories

	K10413-15-3M	The gas-cooled gun LG150 to GMAW process - 3m.
	KP10461-1	Gas nozzle conical Ø12mm.
	KP10440-06	Contact Tip M6x25mm ECu 0.6mm
	KP10440-08	Contact Tip M6x25mm ECu 0.8mm
	KP10440-09	Contact Tip M6x25mm ECu 0.9mm
	KP10440-10	Contact Tip M6x25mm ECu 1.0mm
	KP10440-10A	Contact Tip M6x25mm Al 1.0mm
	KP10468	Protection cap to FCAW-SS process.
	K10513-17-4V	GTAW torch - 4m.
	E/H-200A-25-3M	Welding cable with electrode holder to SMAW process - 3m.
	K14010-1	Work Lead -3m.
	KIT-200A-25-3M	Lead's KIT to SMAW process: <ul style="list-style-type: none"> • The electrode holder with lead to SMAW process - 3m. • Work lead - 3m.
	R-0010-450-1R	Protective screen.

Drive rolls to 2 driven rolls

KP14016-0.8 KP14016-1.0	Solid wires: V0.6 / V0.8 V0.8 / V1.0
KP14016-1.2A	Aluminum wires: U1.0 / U1.2
KP14016-1.1R	Cored wires: VK0.9 / VK1.1

SAFETY







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 Equipment (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>
	<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.</p>
	<p>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.</p>
	<p>SAFETY MARK: This equipment is suitable for supplying power for welding operations carried out in an environment with increased hazard of electric shock.</p>

The manufacturer reserves the right to make changes and/or improvements in design without upgrade at the same time the operator's manual.

Introduction

General Description

The welding machines **SPEEDTEC 215C** enables welding:

- GMAW (MIG/MAG)
- FCAW-SS
- SMAW (MMA)
- GTAW (arc ignition using lift TIG)

The following equipment has been added to **SPEEDTEC 215C**:

- Work lead – 3m
- Gas hose – 2m
- Driving roll V0.8/V1.0 for solid wire (mounted in the wire feeder).

For GMAW and FCAW-SS process, the technical specification describes:

- Type of welding wire
- Wire diameter

Recommended equipment, which can be bought by user, was mentioned in the chapter "Accessories".

Installation and Operator Instructions

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

Location and Environment

This machine will operate in harsh environments. However, it is important that simple preventative measures are followed to assure long life and reliable operation.

- Do not place or operate this machine on a surface with an incline greater than 15° from horizontal.
- Do not use this machine for pipe thawing.
- This machine must be located where there is free circulation of clean air without restrictions for air movement to and from the air vents. Do not cover the machine with paper, cloth or rags when switched on.
- Dirt and dust that can be drawn into the machine should be kept to a minimum.

- This machine has a protection rating of IP23. Keep it dry when possible and do not place it on wet ground or in puddles.
- Locate the machine away from radio controlled machinery. Normal operation may adversely affect the operation of nearby radio controlled machinery, which may result in injury or equipment damage. Read the section on electromagnetic compatibility in this manual.
- Do not operate in areas with an ambient temperature greater than 40°C.

Input Supply Connection

WARNING

Only a qualified electrician can connect the welding machine to the supply network. Installation had to be made in accordance with the appropriate National Electrical Code and local regulations.

Check the input voltage, phase and frequency supplied to this machine before turning it on. Verify the connection of ground wires from the machine to the input source. The welding machine **SPEEDTEC 215C** must be connected to a correctly installed plug-in socket with an earth pin. Input voltage is 115Vac 50/60Hz or 230Vac 50/60Hz. For more information about input supply refer to the technical specification section of this manual and to the rating plate of the machine.

Make sure that the amount of mains power available from the input supply is adequate for normal operation of the machine. The necessary delayed fuse (or circuit breaker with "B" characteristic) and cable sizes are indicated in the technical specification section of this manual.

! WARNING

The welding machine can be supplied from a power generator of output power at least 30% larger than input power of the welding machine.

! WARNING

When powering welder from a generator be sure to turn off welder first, before generator is shut down, in order to prevent damage to welder!

Output Connections

Refer to points [4], [5] and [6] of the Figures below.

Controls and Operational Features

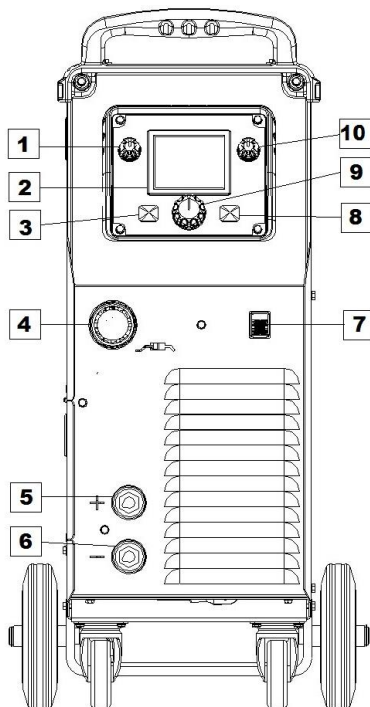


Figure 1.

1. **Left Knob:** The value of parameter in the upper left side of display [2] is adjusted.
2. **Display:** Parameters of welding process are shown.

3. **User Button (left):** Button function could be set:
 - **Advanced menu:**
 - Recalls advanced menu (default)
 - Recalls user memory.
 - Inductance.
 - Run-in WFS.
 - Burn-back.
 - **Basic menu –** changes basic menu for advanced menu.

4. **EURO Socket:** For connecting a welding gun (for GMAW / FCAW-SS process).

5. **Positive Output Socket for the Welding Circuit:** For connecting an electrode holder with lead / work lead.



6. **Negative Output Socket for the Welding Circuit:** For connecting an electrode holder with lead / work lead.



7. **Power Switch ON/OFF (I/O):** Controls the input power to the machine. Be sure the power source is connected to the mains supply before turning power on ("I"). After input power is connected and the power switch is turned on, the indicator will light up to indicate the machine is ready to weld.

8. **Escape Button (right):**
 - Cancels an action / exit menu.
 - Locks and unlocks knobs and buttons on the panel (press and hold button for 4 seconds).

9. **Set Knob:** Type of welding procedure and welding settings is changed by this knob.

10. **Right Knob:** The value of parameter in the upper right side of display [2] is adjusted.

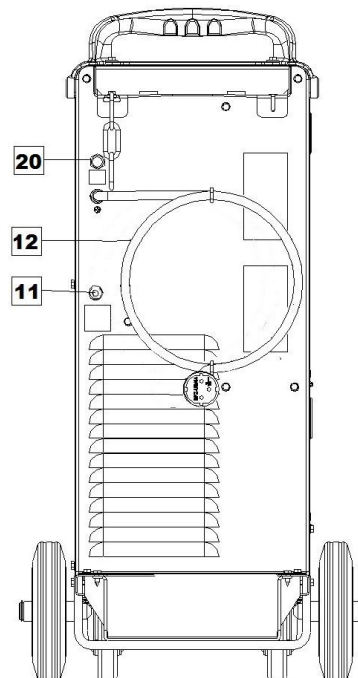


Figure 2.

11. **Gas Connector:** Connection for gas line



12. **Power Lead with Plug (3m):** Power lead with plug is

a standard equipment. Connect the power lead with plug to the main supply before turning power on.

20. **Thermal Circuit Breaker (25A):** The power source features a resettable 25A thermal breaker. If the current conducted through the breaker exceeds 25A for an extended period of time, the breaker will open and require manual reset

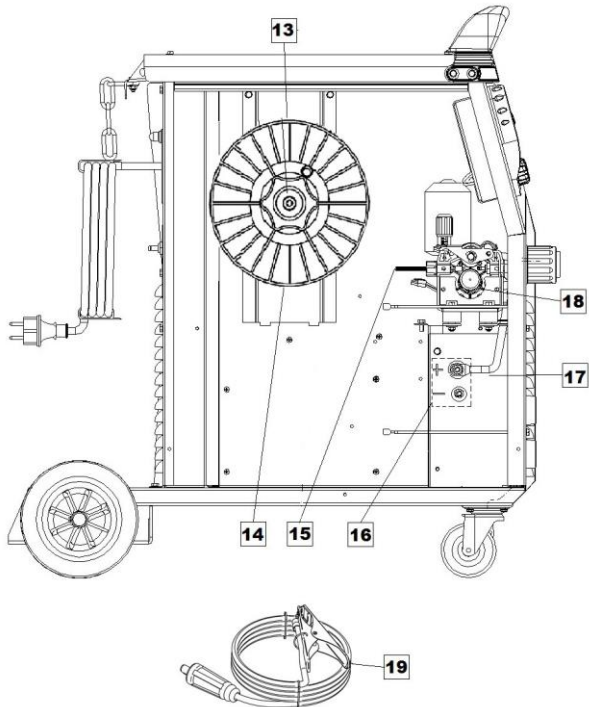


Figure 3

13. **Wire Spool Support:** Maximum 15kg spools. Accepts plastic, steel and fiber spools onto 51mm spindle.
14. **Spoiled Wire (for GMAW / FCAW-SS):** The machine does not include a spoiled wire.
15. **Welding Wire (for GMAW / FCAW-SS).**
16. **Terminal Block of Changing Polarity (for GMAW / FCAW-SS process):** This terminal block enables to set the welding polarity (+ ; -), which will be given at the welding holder.
17. **Shield of Changing Polarity.**
18. **Wire Drive (for GMAW, FCAW-SS process):** 2-Roll wire drive.
19. **Work Lead.**

! WARNING

Positive (+) polarity is set at the factory.

! WARNING

Before welding check the polarity for using electrodes and wires.

If the welding polarity has to be changed, user should:

- Switch off the machine.
- Determine the wire polarity for the wire to be used. Consult the electrode data for this information.

- Take off the terminal block's shield [17].
- The tip of the wire on the terminal block [16] and work lead fix as is shown in the Table 1 or the Table 2.
- Put on the terminal block's shield.

! WARNING

The machine must be used with the door completely closed during welding.

! WARNING

Not use handle to move the machine during work.

Table 1

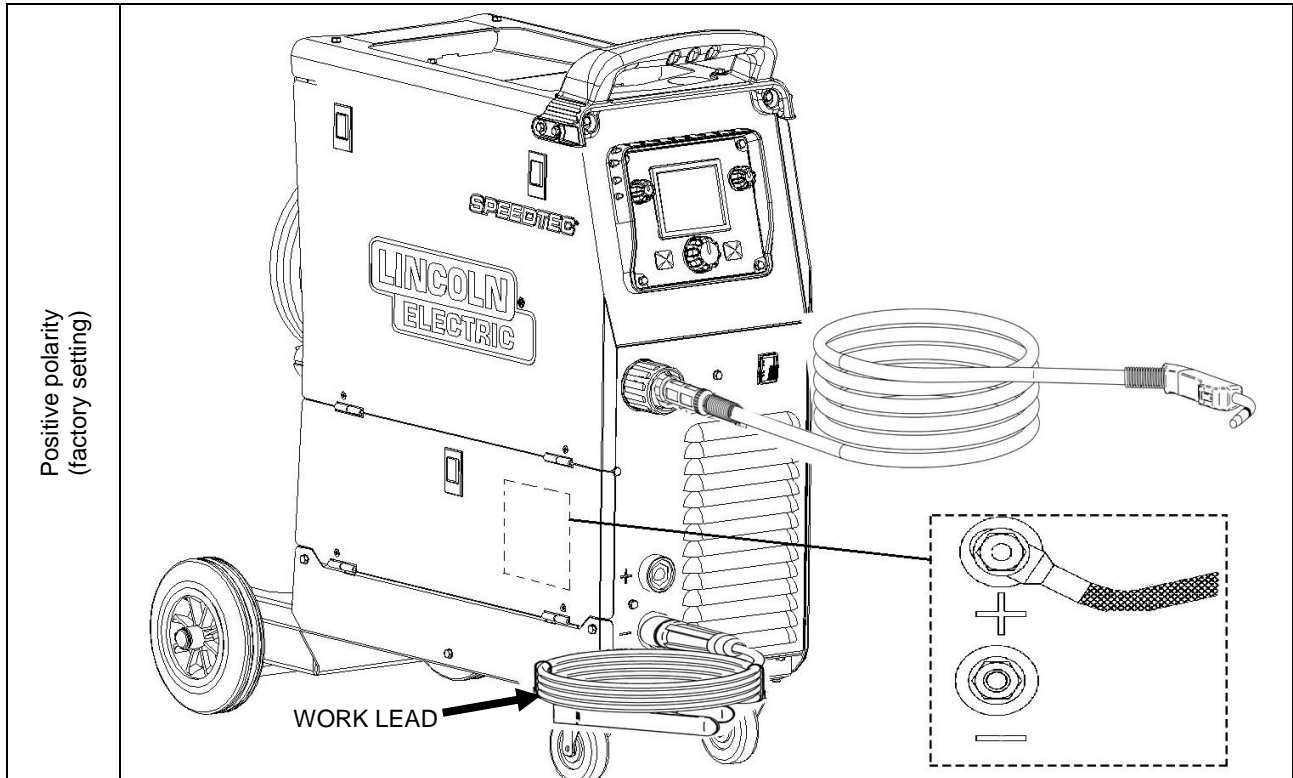
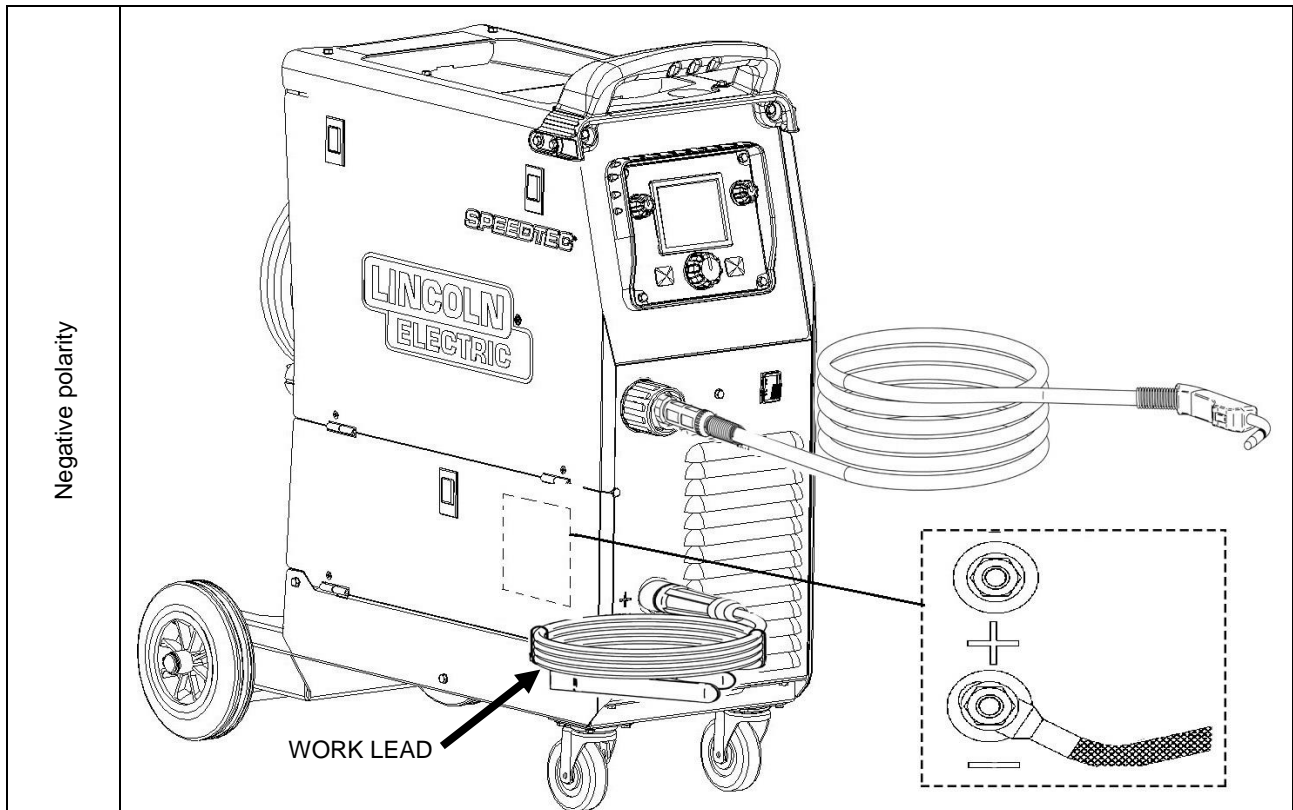


Table 2



Loading the Electrode Wire

- Turn the machine off.
- Open the side cover of the machine.
- Unscrew the locking nut of the sleeve.
- Load the spool with the wire [14] on the sleeve such

that the spool turns anticlockwise when the wire [15] is fed into the wire feeder.

- Make sure that the spool locating pin goes into the fitting hole on the spool.
- Screw in the fastening cap of the sleeve.
- Put on the wire roll using the correct groove corresponding to the wire diameter.

- Free the end of the wire and cut off the bent end making sure it has no burr.

! WARNING

Sharp end of the wire can hurt.

- Rotate the wire spool anticlockwise and thread the end of the wire into the wire feeder as far as the Euro socket.
- Adjust force of pressure roll of the wire feeder properly.

Adjustments of Brake Torque of Sleeve

To avoid spontaneous unrolling of the welding wire the sleeve is fitted with a brake.

Adjustment is carried by rotation of its Allen screw M8, which is placed inside of the sleeve frame after unscrewing the fastening cap of the sleeve.

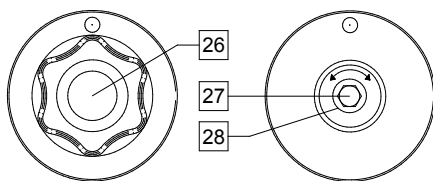


Figure 5

- 26. Fastening cap.
- 27. Adjusting Allen screw M8.
- 28. Pressing spring.

Turning the Allen screw M8 clockwise increases the spring tension and you can increase the brake torque

Turning the Allen screw M8 anticlockwise decreases the spring tension and you can decrease the brake torque.

After finishing of adjustment, you should screw in the fastening cap again.

Adjusting of Force of Pressure Roll Force

The pressure arm controls the amount of force the drive rolls exert on the wire.

Pressure force is adjusted by turning the adjustment nut clockwise to increase force, counterclockwise to decrease force. Proper adjustment of pressure arm gives the best welding performance.

! WARNING

If the roll pressure is too low the roll will slide on the wire. If the roll pressure is set too high the wire may be deformed, which will cause feeding problems in the welding gun. The pressure force should be set properly. Decrease the pressure force slowly until the wire just begins to slide on the drive roll and then increase the force slightly by turning of the adjustment nut by one turn.

Inserting Electrode Wire into Welding Torch

- Turn the welding machine off.
- Depending on welding process, connect the proper gun to the euro socket, the rated parameters of the

gun and of the welding machine should be matched.

- Remote the nozzle from the gun and contact tip or protection cap and contact tip. Next, straighten the gun out flat.
- Turn the welding machine on.
- Depress the gun trigger to feed the wire through the gun liner until the wire comes out of the threaded end.
- When trigger is released spool of wire should not unwind.
- Adjust wire spool brake accordingly.
- Turn the welding machine off.
- Install a proper contact tip.
- Depending on the welding process and the type of the gun, install the nozzle (GMAW process) or protection cap (FCAW-SS process).

! WARNING

Take precaution to keep eyes and hands away from the end of the gun while the wire is being come out of the threated end.

Changing Driving Rolls

! WARNING

Turn the input power off of the welding power source before installation or changing drive rolls.

SPEEDTEC 215C is equipped with drive roll V0.8/V1.0 for steel wire. For others wire sizes, is available the proper drive rolls kit (see "Accessories" chapter) and follow instructions:

- Turn the welding machine off.
- Release the pressure roll lever [30].
- Unscrew the fastening cap [29].
- Change the drive rolls [31] with the compatible ones corresponding to the used wire.

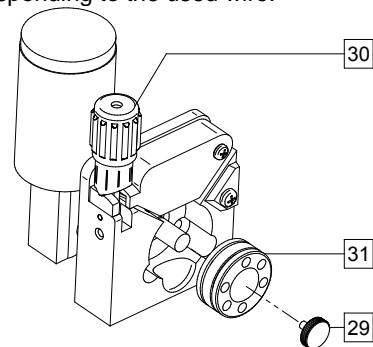


Figure 6

- Screw fastening cap [29].

Gas Connection

A gas cylinder must be installed with a proper flow regulator. Once a gas cylinder with a flow regulator has been securely installed, connect the gas hose from the regulator to the machine gas inlet connector. Refer to point [11] of the Figure 2.

! WARNING

The welding machine supports all suitable shielding gases including carbon dioxide, argon and helium at a maximum pressure of 5,0 bars.

Welding GMAW, FCAW-SS Process

SPEEDTEC 215C can be used to welding GMAW and FCAW-SS process. It has been provided with synergic GMAW process.

SPEEDTEC 215C packaging does not include the gun necessary for GMAW or FCAW-SS welding. Depending on the welding process can be purchased separately (see "Accessories" chapter).

Preparation the Machine for Welding GMAW and FCAW-SS Process.

Procedure of begin welding of GMAW or FCAW-SS process:

- Determine the wire polarity for the wire to be used. Consult the wire data for this information.
- Connect output the gas-cooled gun to GMAW / FCAW-SS process to Euro Socket [7].
- Depending on the using wire, connect the work lead [19] to output socket [8] or [9]. See [25] point – terminal block of changing polarity.
- Connect the work lead to the welding piece with the work clamp.
- Install the proper wire.
- Install the proper drive roll.
- Make a sure, if it is needed (GMAW process), that the gas shield has been connected.
- Turn the machine on.
- Push the gun trigger to feed the wire through the gun liner until the wire comes out of the threaded end.
- Install a proper contact tip.
- Depending on the welding process and the type of the gun, install the nozzle (GMAW process) or protection cap (FCAW-SS process).
- Close the left side panel.
- The welding machine is now ready to weld.
- By applying the principle of occupational health and safety at welding, welding can be begun.

Welding GMAW, FCAW-SS Process in Manual Mode

In manual mode can be set:

Basic menu	Advanced menu
<ul style="list-style-type: none"> • The welding load voltage • WFS • 2-Step / 4-Step 	<ul style="list-style-type: none"> • The welding load voltage • WFS • Burnback • Run-in WFS • Spot Time • Preflow Time/ Pastflow Time • 2-Step/4-Step • Inductance

The 2-Step - 4-Step changes the function of the gun's trigger.

- 2 Step trigger operation turns welding on and off in direct response to the trigger. Welding process is performed when the gun's trigger is pulled.
- 4-Step mode allows to continue welding, when the gun's trigger is released. To stop welding, the gun's trigger is pulled again. 4-step mode facilitates to making long welds.



WARNING

4-Step does not work during Spot Welding.

The Burn-back Time is the amount of time that the weld output continues after the wire stops feeding. It prevents the wire from sticking in the puddle and prepares the end of the wire for the next arc start.

Run-in WFS sets the wire feed speed from the time the trigger is pulled until an arc is established.

Spot Timer adjusts the time welding will continue even if the trigger is still pulled. This option has no effect in 4-Step Trigger Mode.



WARNING

Spot Timer has no effect in 4-Step Trigger Mode.

Pre-flow Time adjusts the time that shielding gas flows after the trigger is pulled and prior to feeding.

Post-flow Time adjusts the time that shielding gas flows after the welding output turns off.

Welding GMAW in Synergic Mode

In synergic mode, the welding load voltage is not set by user. The correct welding load voltage will set by the machine's software. This value was recalled on the basis of data (input data) had been loaded:

Basic menu	Advanced menu
<ul style="list-style-type: none"> Wire type (material) Wire diameter Gas 	<ul style="list-style-type: none"> Wire type (material) Wire diameter Gas

The welding load voltage can be changed depend on the value of parameters are set by operators:

Basic menu	Advanced menu
<ul style="list-style-type: none"> WFS Welding current Material thickness 	<ul style="list-style-type: none"> WFS Welding current Material thickness

If it is needed, the welding load voltage can be adjusted $\pm 2V$ by the right knob [10]. Additionally, user can manually set:

Basic menu	Advanced menu
No possibilities	<ul style="list-style-type: none"> Burn-back Run-in WFS Spot Timer Pre-flow Time / Post-flow Time 2-STEP/4-STEP Inductance

The 2-Step - 4-Step changes the function of the gun's trigger.

- 2 Step trigger operation turns welding on and off in direct response to the trigger. Welding process is performed when the gun's trigger is pulled.
- 4-Step mode allows to continue welding, when the gun's trigger is released. To stop welding, the gun's trigger is pulled again. 4-step mode facilitates to making long welds.



WARNING

4-Step does not work during Spot Welding.

The Burn-back Time is the amount of time that the weld output continues after the wire stops feeding. It prevents the wire from sticking in the puddle and prepares the end of the wire for the next arc start.

Run-in WFS sets the wire feed speed from the time the trigger is pulled until an arc is established.

Spot Timer adjusts the time welding will continue even if the trigger is still pulled. This option has no effect in 4-Step Trigger Mode. Adjusting range:



WARNING

Spot Timer has no effect in 4-Step Trigger Mode.

Pre-flow Time adjusts the time that shielding gas flows after the trigger is pulled and prior to feeding.

Post-flow Time adjusts the time that shielding gas flows after the welding output turns off.





Welding SMAW (MMA) Process

SPEEDTEC 215C does not include the electrode holder with lead necessary for SMAW welding, but the one can be purchased separately.

Procedure of begin welding of SMAW process:

- First turn the machine off.
- Determine the electrode polarity for the electrode to be used. Consult the electrode data for this information.
- Depending on the polarity of using electrode, connect the work lead [19] and the electrode holder with lead to output socket [8] or [9] and lock them. See the Table 3.

Table 3

		Output socket	
POLARITY	DC (+)	The electrode holder with lead to SMAW	[5] 
		Work lead	[6] 
	DC (-)	The electrode holder with lead to SMAW	[6] 
		Work lead	[5] 

- Connect the work lead to the welding piece with the work clamp.
- Install the proper electrode in the electrode holder.
- Turn the welding machine on.
- Set the welding parameters.
- The welding machine is now ready to weld.
- By applying the principle of occupational health and safety at welding, welding can be begun.

The user can set functions:

Basic menu	Advanced menu
<ul style="list-style-type: none"> The welding current Switch on / switch off the output voltage on the output lead 	<ul style="list-style-type: none"> The welding current Switch on / switch off the output voltage on the output lead HOT START ARC FORCE

Welding GTAW Process

SPEEDTEC 215C can be used to GTAW process with DC (-). Arc ignition can be achieved only by lift TIG method (contact ignition and lift ignition).

SPEEDTEC 215C does not include the torch to GTAW welding, but the one can be purchased separately. See "Accessories" chapter.

Procedure of begin welding of GTAW process:

- First turn the machine off.
- Connect GTAW torch to [9] output socket.
- Connect the work lead to [8] output socket.
- Connect the work lead to the welding piece with the work clamp.
- Install the proper tungsten electrode in the GTAW torch.
- Turn the machine on.
- Set the welding parameters.
- The welding machine is now ready to weld.
- By applying the principle of occupational health and safety at welding, welding can be begun.

During welding GTAW process, the user can set function:

Basic menu	Advanced menu
<ul style="list-style-type: none"> • The welding current • Switch on / switch off the output voltage on the output lead 	<ul style="list-style-type: none"> • The welding current • Switch on / switch off the output voltage on the output lead

Memory – Save, Recall, Delete

SPEEDTEC 215C enables saving, recalling and deleting the parameter's settings. 9 memories can be used by user.

Saving, recalling and deleting process settings is accessible in advanced menu of **SPEEDTEC 215C**.

Error's Message



Figure 7

This image indicates that:

- the machine is overloaded or that the cooling is not sufficient.
- When the wire drive motor is blocked
- When the output is shorted for more than 5s.

The image is shown by the display [2].

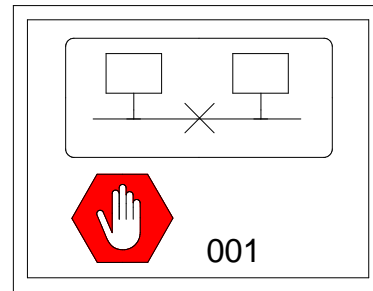


Figure 8.

Contact with the Technical Service Center or Lincoln Electric, when a machine's display of **SPEEDTEC 215C** will show a message of the Figure 8 or similar.

Sleep Mode

When the machine is turned on but not in use for longer than 10 minutes, to save power, sleep mode is activated. During Sleep Mode Logo "Lincoln Electric" moves into the Display [2].

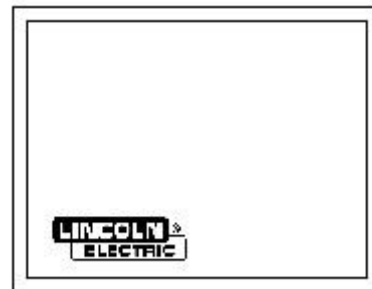



Figure 9

Restart the machine by pressing a button on MIG torch or by pressing the right button [8] on front panel.

Guide's Marking Interface SPEEDTEC 215C

Description of the user interface in "Quick Guide" chapter

	Select Welding Process		SMAW (MMA) Welding		Basic menu
	Burn-back		GMAW (MIG/MAG) Manual Welding		Brightness Level
	Run-in WFS		FCAW- Self shielded Manual Welding		View Software and Hardware Version Information
	Pre-flow Time		GMAW (MIG/MAG) Synergic Welding		User Button
	Post-flow Time		Select Process by Number		Cancel an Action
	Inductance		Select Gas		Switch On Output Voltage (TIG/MMA only)
	Spot Welding Setting		Select Wire Type (material)		Switch Off Output Voltage (TIG/MMA only)
	Spot Timer		Select Wire Size (diameter)		Unlock panel
	Switch off Spot Welding		Select Function of Gun Trigger (2-Step / 4-Step)		Unlock Panel by Code
	2-Step		Configuration and Set-up		Hot Start
	4-Step		Lock / Unlock Panel		Arc Force
	Memory		Lock Panel		Adjust Voltage
	Save a Memory		Lock Panel by Code		Welding Material Thickness
	Recall a Memory (user memory)		Recall Factory Setting		Welding current
	Clear a Memory		Select Menu (basic / advanced)		Wire Feeder Speed (WFS)
	GTAW (TIG) Welding		Advanced Menu		Sleep mode

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 may be potential difficulties in ensuring electromagnetic compatibility in those locations, due to conducted as well as radiated disturbances.

WARNING

While a high electromagnetic field occurs, a welding current can fluctuate.

WARNING

This equipment complies with IEC 61000-3-12.

MAINTENANCE

WARNING

For any repair operations, modifications or maintenances, it is recommended to contact the nearest Technical Service Center or Lincoln Electric. Repairs and modifications performed by unauthorized service or personnel will cause, that the manufacturer's warranty will become null and void.

Any noticeable damage should be reported immediately and repaired.

Routine maintenance (everyday)

- Check condition of insulation and connections of the work leads and insulation of power lead. If any insulation damage exists replace the lead immediately.
- Remove the spatters from the welding gun nozzle. Spatters could interfere with the shielding gas flow to the arc.
- Check the welding gun condition: replace it, if necessary.
- Check condition and operation of the cooling fan. Keep clean its airflow slots.

Periodic maintenance (every 200 working hours but at list once every year)

Perform the routine maintenance and, in addition:

- Keep the machine clean. Using a dry (and low pressure) airflow, remove the dust from the external case and from the cabinet inside.
- If it is required, clean and tighten all weld terminals.

The frequency of the maintenance operations may vary in accordance with the working environment where the machine is placed.

WARNING

Do not touch electrically live parts.

WARNING

Before the case of welding machine will be removed, the welding machine had to be turned off and the power lead had to be disconnected from mains socket.

WARNING

Mains supply network must be disconnected from the machine before each maintenance and service. After each repair, perform proper tests to ensure safety.

MAINTENANCE

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
Prior to performing preventive maintenance, perform the following capacitor discharge procedure to avoid electric shock.

INPUT FILTER CAPACITOR DISCHARGE PROCEDURE

1. Remove main input power to the SPEEDTEC® 215C.
2. Remove the cover following the case removal procedure available in this Service manual.
3. The capacitors are discharged by discharge resistors integrated into the main board in about 2 (two) minutes.
4. Access to the terminals **DC+** and **DC -** of the Main Board to check if capacitors are discharged is not possible without removing the board from the machine. **For this reason ALL operations to remove the Main Board have to be done in a safety way using electrically insulate gloves and insulate tools (pliers, screwdrivers, etc..)**
5. Remove the Main Board from the machine following the removal and replacement procedure available in this manual.
6. Once the Main Board has been removed connect your multi-meter positive probe to **DC+** point and your negative probe to **DC -** and check the voltage across filter capacitors. **See Figure 1**
7. In case of presence of residual voltage follow the next steps
8. Obtain a high resistance and high wattage resistor (500-1000 ohms and 25 watts minimum). This resistor is NOT supplied with the machine. NEVER USE A SHORTING STRAP FOR THIS PROCEDURE.
9. Use electrically insulate gloves and insulated pliers. Hold the body of the resistor and connect the resistor leads across the two points DC+ and DC -. **See Figure 1**. Hold the resistor in place for 10 seconds. DO NOT TOUCH CAPACITOR TERMINALS WITH YOUR BARE HANDS.
10. Check again the voltage across the two terminals. Voltage should be zero. If any voltage remains, repeat this procedure.

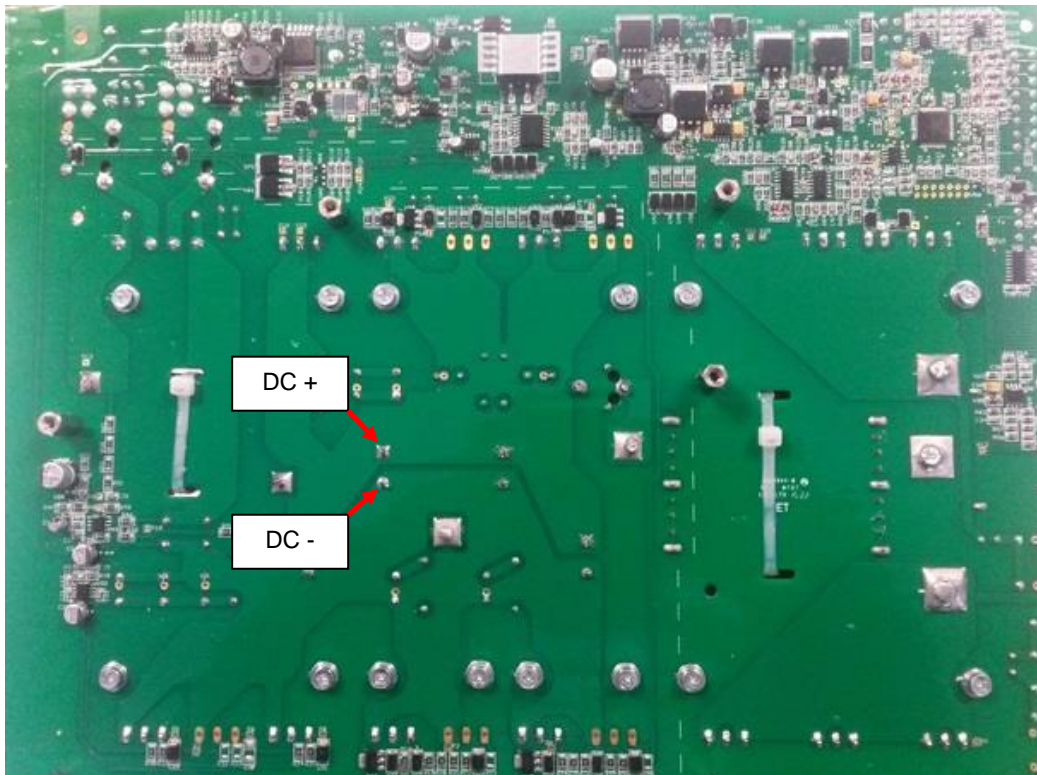


Figure 1

THERMAL PROTECTION

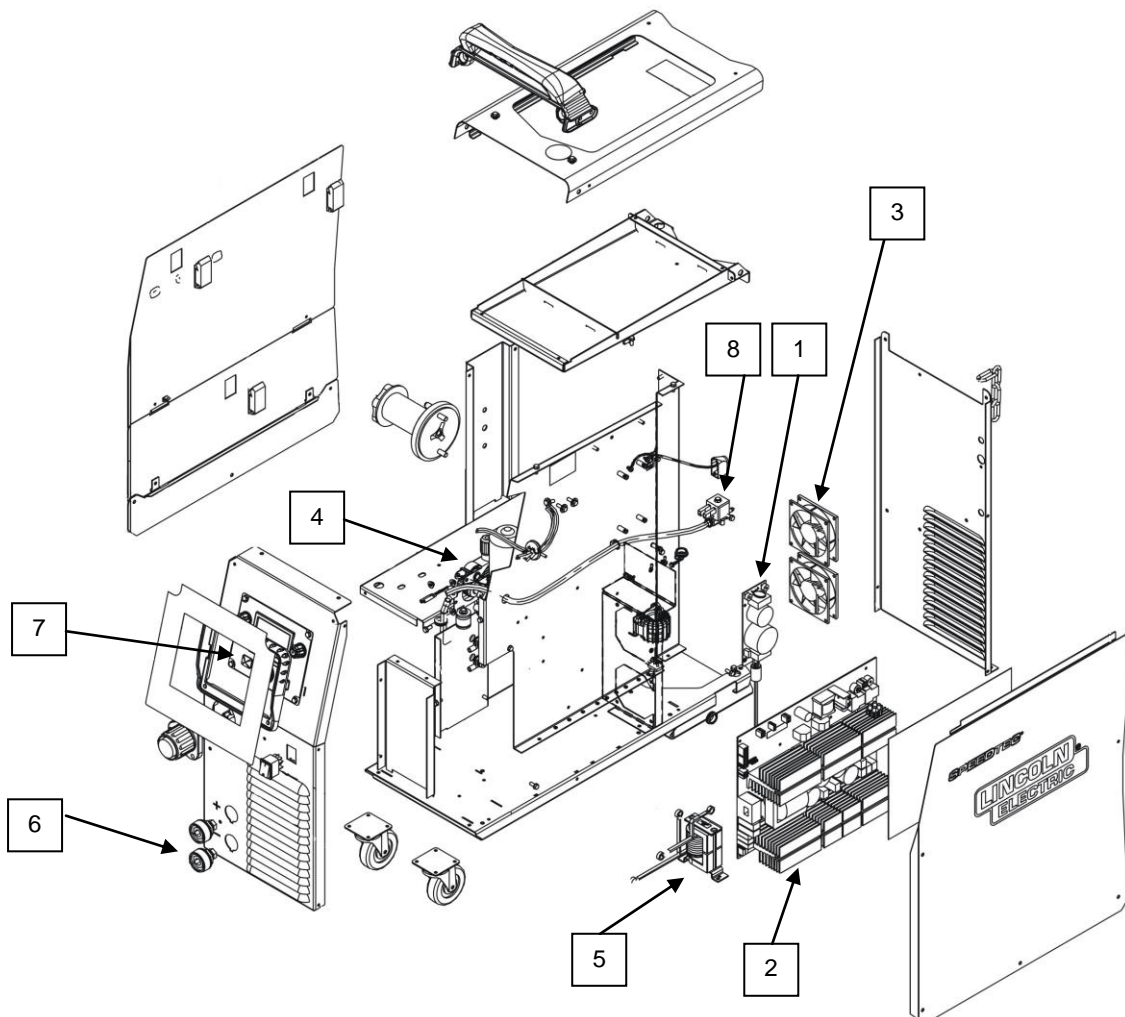
Thermal detection device protect the machine from excessive operating temperatures. Excessive temperatures may be caused by a lack of cooling air or operating the machine beyond the duty cycle and output rating. If excessive operating temperatures should occur, the yellow LED will light and the detection device will prevent output voltage or current.

These detection device are self-resetting once the machine cools sufficiently. If the thermostat shutdown was caused by excessive output or duty cycle and the fan is operating normally, the power switch may be left on and the reset should occur within a 15 minute period. If the fan is not turning or the air intake louvers were obstructed, then the power must be switched off and the fan problem or air obstruction must be corrected.

MAJOR COMPONENTS LOCATION

SPEEDTEC 215C

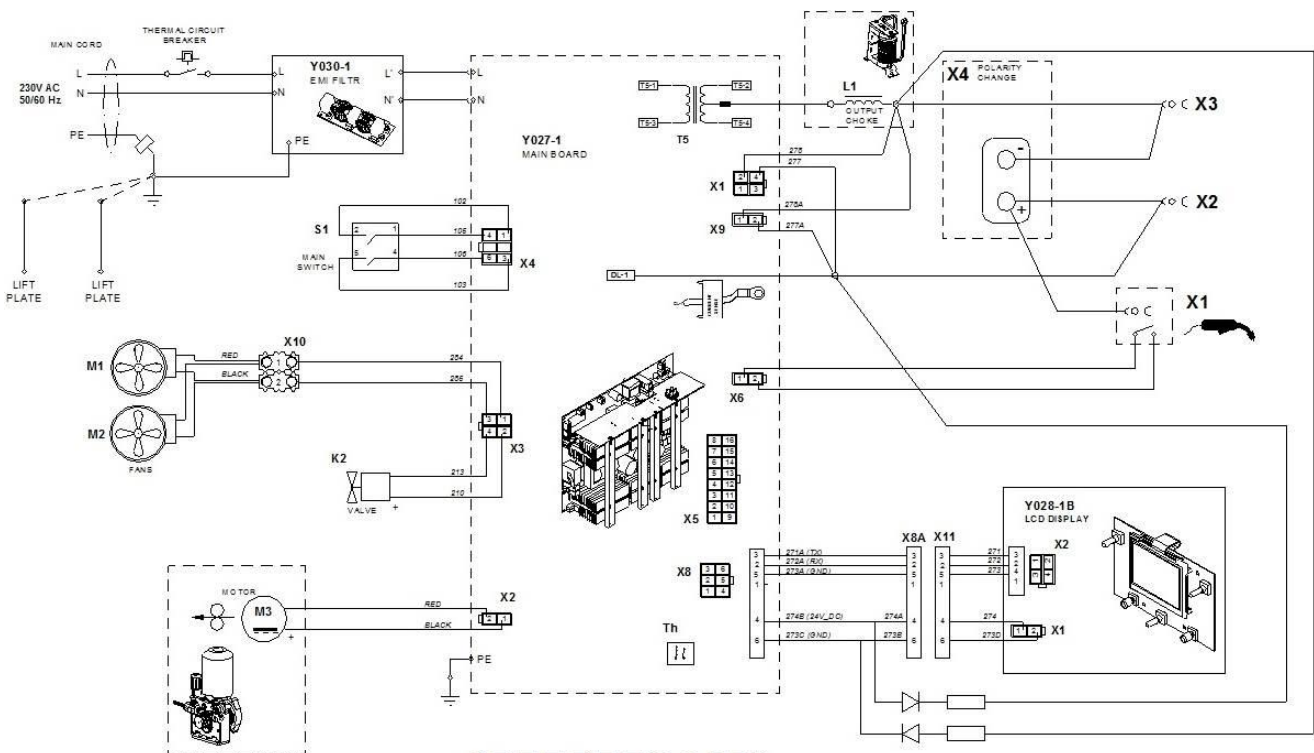
1. EMI Filter
2. Main Board
3. Fans
4. Drive Motor
5. Output Choke
6. Output Studs
7. User Interface (UI)
8. Gas solenoid



THEORY OF OPERATION

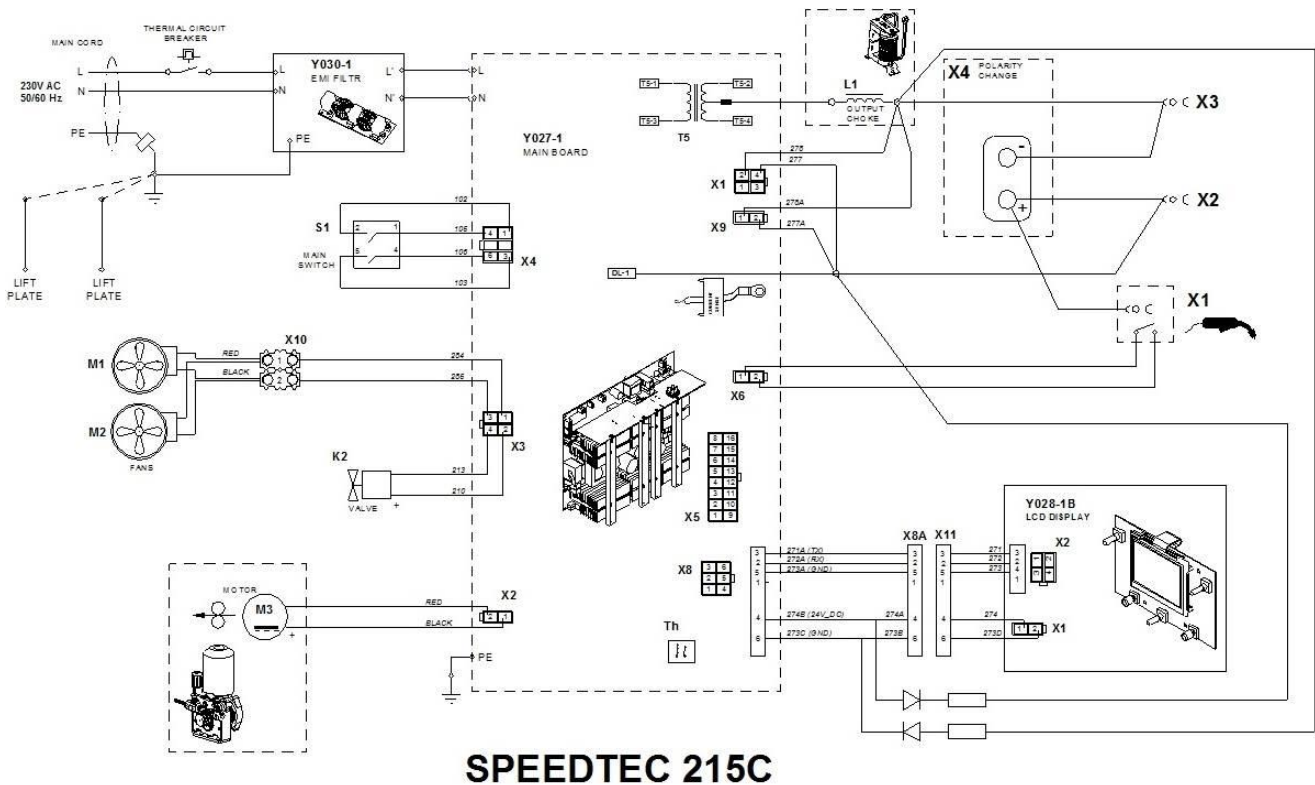
- General description
- Main Board
- Output choke – Polarity change – User Interface
- Protection Circuits
- IGBT operation

BLOCK DIAGRAM



SPEEDTEC 215C

GENERAL DESCRIPTION



GENERAL DESCRIPTION

The SPEEDTEC® 215C are industrial arc welding power sources which utilizes single phase input power, to produce constant voltage or constant current output. The welding response of these units has been optimized for GMAW, FCAW-SS, SMAW and GTAW-lift TIG. The units are ideal for industrial applications where portability is important.

The SPEEDTEC® 215C, when connected to the input voltage of 230Vac, produce a welding output from 20 to 200 amperes in GMAW-FCAW-SS and 20 to 160A in SMAW and GTAW. They operate on

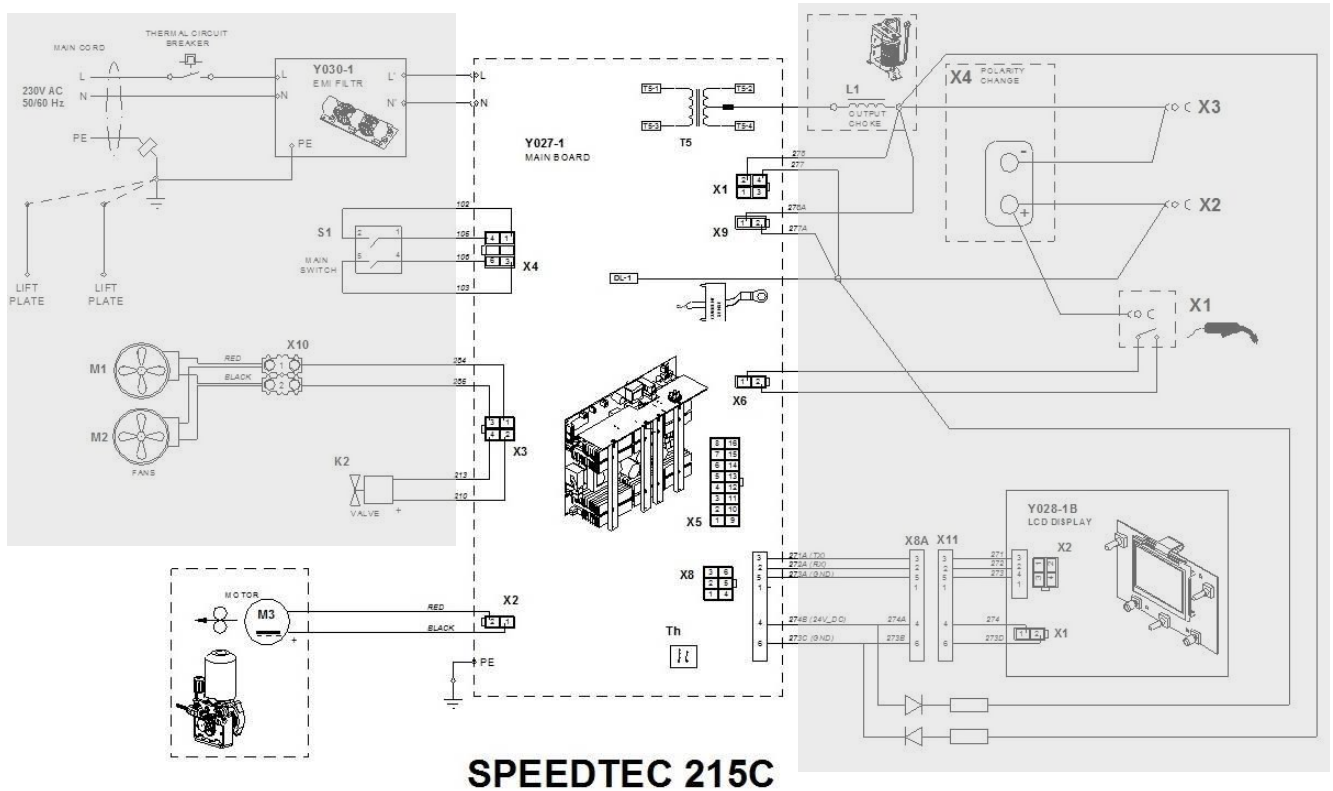
single phase input power 115Vac or 230Vac. It is environmentally hardened to an IP23 rating for operating in difficult environments.

EMI FILTER

EMI filter circuit, prevents noise from the machine from being transmitted along the main power line and vice versa, necessary to be in accordance with all relevant directives and standards.

MAIN BOARD

(PFC CIRCUIT - INVERTER CIRCUIT – OUTPUT CIRCUIT – WIRE DRIVE MOTOR)



MAIN BOARD (PFC CIRCUIT, INVERTER CIRCUIT, OUTPUT CIRCUIT, WIRE DRIVE CIRCUIT)

The SPEEDTEC® 215C can be connected to a 115Vac or 230Vac +/- 10% single phase input voltage.

This unit can be also connect to engine driven generators but it must follow the below conditions:

- Vac peak voltage: below 410V.
- Vac frequency: in the range of 50 and 60 Hertz.
- RMS voltage of the AC waveform: 115Vac or 230Vac ± 10%.
- Power generator output power at least 30% larger than input power of the welding machine

When the machine ON/OFF switch is closed the AC input is applied to the auxiliary voltages circuit that supply the circuitry of the unit, including fans and gas solenoid. Input voltage is verified and if correct (+/- 10%) micro controller gives command

to K2 relay to close and the soft-start process starts using a 25 ohms PTC to pre-charge the BUS capacitors. The 25 ohm PTC will be "shorted out" by the relay K1 contacts. Command to K1 is coming from main board microprocessor.

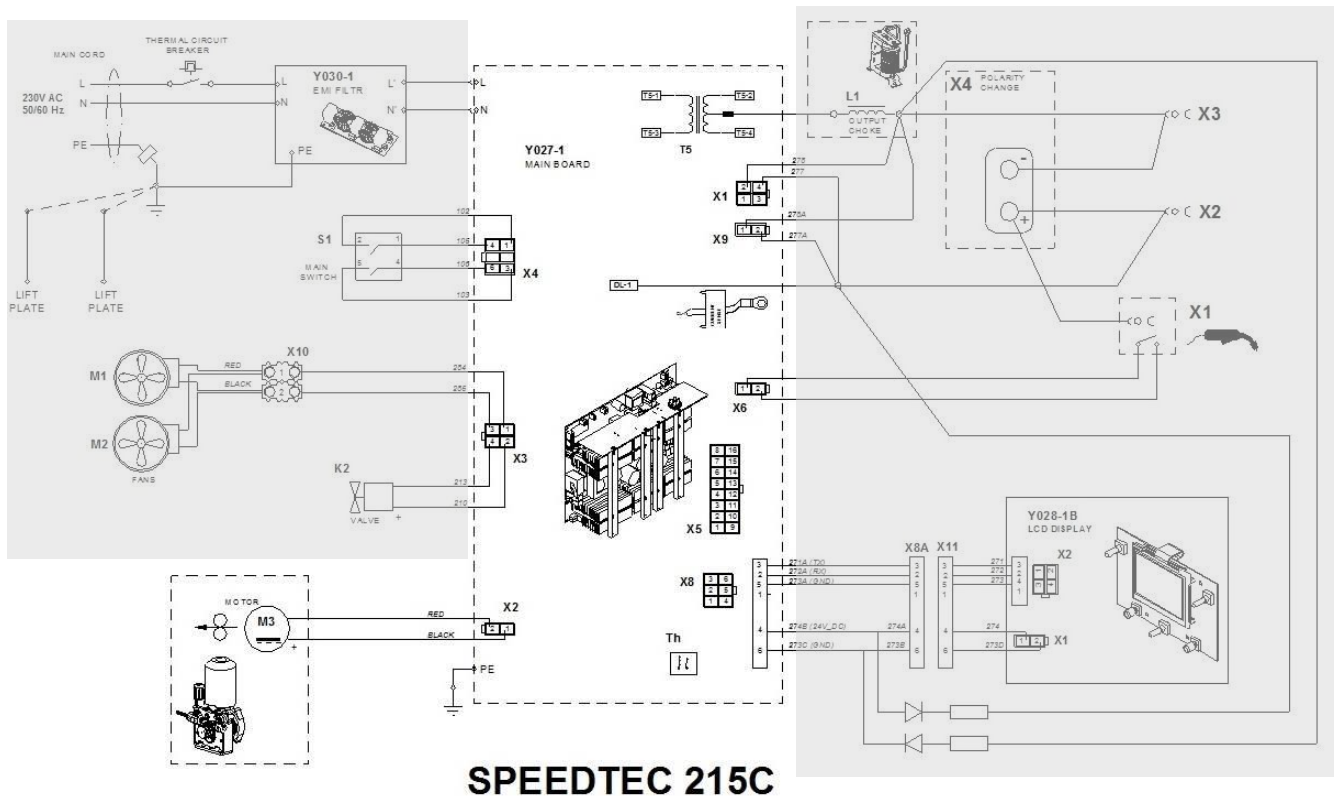
The output of the Boost circuit is filtered and applied to the IGBT controlled full wave bridge inverter.

The IGBTs supply the main transformer winding with 40KHz current flow. The IGBTs act as a switch assembly. This assembly feeds the primary winding of the main transformer. When current is pulsed through this primary winding, a resultant current is produced on a secondary winding of the main transformer. Current transducer located on the inverter board monitor the primary current. If the primary current become abnormally high, the inverter control circuit will shut off the IGBTs, thus disabling the machine's output.

MAIN BOARD

(PFC CIRCUIT - INVERTER CIRCUIT – OUTPUT CIRCUIT – WIRE DRIVE CIRCUIT)

(continued)



SPEEDTEC 215C

MAIN BOARD (PFC CIRCUIT, INVERTER CIRCUIT, OUTPUT CIRCUIT, WIRE DRIVE CIRCUIT)

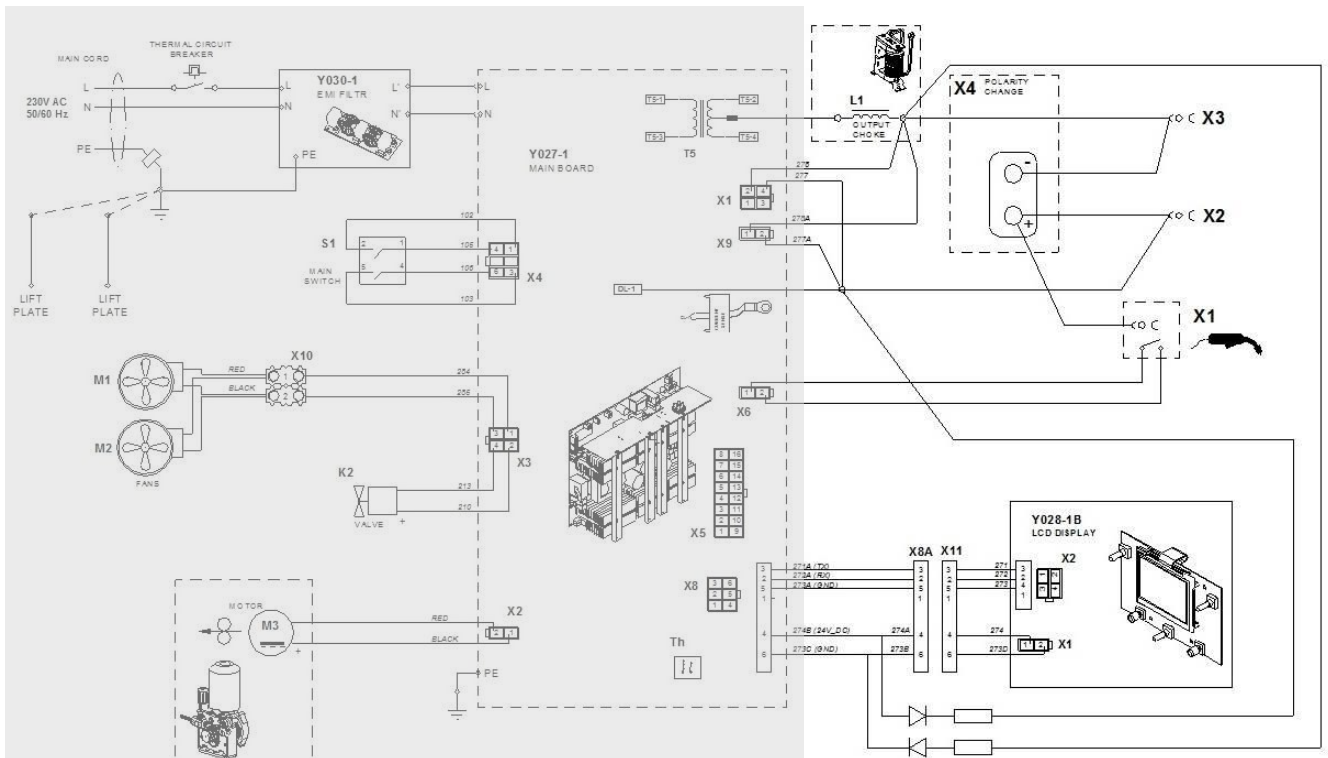
The output transformer, located on the main board, insulates the primary circuit from the secondary circuit.

The output circuit is also part of the main board and the rectifier diodes receive the high frequency AC output from the main transformer secondary winding and rectifies it to a DC voltage level. A filtered DC output is applied to the machine's output terminals.

An output hall current probe reads the output current and sends the signal to the analog control loop that manages the output current.

The wire drive motor is controlled by the main board microcontroller using PWM signals. The microcontroller receives signals directly from the User Interface and then it sends the correct PWM signal to the motor.

OUTPUT CHOKE – POLARITY CHANGE – USER INTERFACE



SPEEDTEC 215C

OUTPUT CHOKE, POLARITY CHANGE, USER INTERFACE

The DC output is applied through an output choke coil. The choke provides current filtering for the welding output.

Polarity Change terminal block enables to set the welding polarity (+ ; -), which will be given at the welding Euro connector holder. Main board output voltage feedbacks are connected to this block.

The User Interface is complex. It uses an LCD display; the user, from a basic or advanced menu, can set all the desired welding parameters. All information are send directly to the main board control circuitry via serial communication protocol.

OVERLOAD PROTECTION

SPEEDTEC® 215C are electrically protected from producing higher than normal output currents. An electronic protection circuit limits the current to within the capabilities of the machine.

THERMAL PROTECTION

There is one thermal device located on the output diodes heat-sink; it protects the machine from excessive operating temperature. Excessive temperature may be caused by a lack of cooling air or by operating the machine beyond

the duty cycle and output rating. If excessive operating temperature should occur, the Thermal LED indicator on the control board, will turn ON and the thermostat will prevent output current.

The thermal protection devices are self-resetting once the machine cools sufficiently. If the shutdown was caused by excessive output or duty cycle and the fan is operating normally, the power switch may be left on and the reset should occur within about 8 minutes period. If the fan is not turning or the air intake louvers are obstructed, the input power must be removed and the fan problem or air obstruction must be corrected.

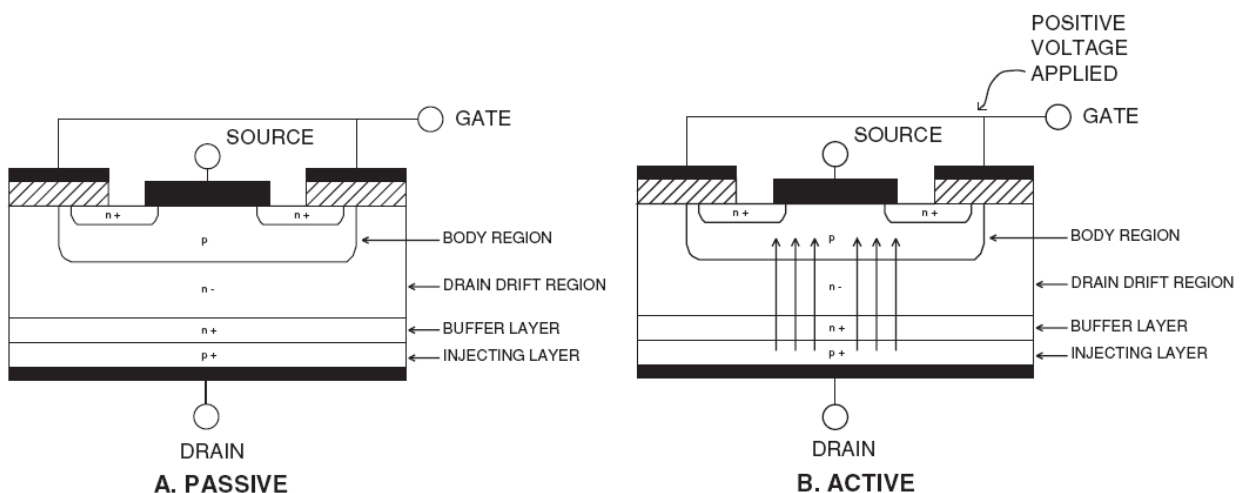
INSULATED GATE BIPOLAR TRANSISTOR (IGBT) OPERATION

An IGBT is a type of transistor. IGBTs are semiconductors well suited for high frequency switching and high current applications. Drawing A shows an IGBT in a passive mode. There is no gate signal, zero volts relative to the source, and therefore, no current flow. The drain terminal of the IGBT may be connected to a voltage supply; but since there is no conduction the circuit will not supply current to components connected to the source. The circuit is turned off

like a light switch in the OFF position.

Drawing B shows the IGBT in an active mode. When the gate signal, a positive DC voltage relative to the source, is applied to the gate terminal of the IGBT, it is capable of conducting current. A voltage supply connected to the drain terminal will allow the IGBT to conduct and supply current to circuit components coupled to the source. Current will flow through the conducting IGBT to downstream components as long as the positive gate signal is present. This is similar to turning ON a light switch.

IGBT



TROUBLESHOOTING AND REPAIR SECTION

- How to use troubleshooting Guide
- Troubleshooting Guide
- Case cover removal and capacitor discharge procedure

HOW TO USE TROUBLESHOOTING GUIDE

Service and repair should be performed by only 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 "PROBLEMS". 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 three main categories: Output Problems, Function Problems, and LED Function Problems.

Step 2. PERFORM EXTERNAL TESTS. The second column, labeled "CHECKS", 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. PERFORM COMPONENT TESTS. 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 referred to test points, components, terminal strips, etc., can be found on the referenced electrical wiring diagrams and schematics. Refer to the Wiring Diagrams Section Table of Contents to locate the appropriate diagram.

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
- Prior to performing preventive maintenance, perform the following capacitor discharge procedure to avoid electric shock

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.

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

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.
 - 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.
 - 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.

TROUBLESHOOTING

!! WARNING !! BEFORE CONNECT POWER SUPPLY, MAKE A CAREFUL VISUAL INSPECTION INSIDE THE MACHINE , CHECK ALL THE BOARDS AND HARNESES.

PROBLEMS / SYMPTOMS	POSSIBLE AREAS OF MISADJUSTMENT(S)	CHECKS	RECOMMENDED COURSE OF ACTION
THE LINE CIRCUIT BREAKER TRIPS WHEN POWER SWITCH IS " ON"	<ul style="list-style-type: none"> INPUT POWER BRIDGE IS IN SHORT CIRCUIT ELECTROLYTIC CAPACITORS FAILURE PFC IGBTs SHORT CIRCUITED 	<ul style="list-style-type: none"> PERFORM THE MAIN BOARD RESISTANCE TEST 	<ul style="list-style-type: none"> REPLACE THE MAIN BOARD
THE MACHINE IS DEAD, NO OUTPUT	<ul style="list-style-type: none"> THERE IS NO POWER SUPPLY ON LINE THE POWER SUPPLY CABLE IS INTERRUPTED THE EMI FILTER IS DAMAGED LINE SWITCH FAILURE THE MAIN BOARD IS DAMAGED 	<ul style="list-style-type: none"> CHECK THE PHASE INPUT VOLTAGE ON THE MACHINE CHECK THE POWER SUPPLY CABLE PERFORM THE EMI FILTER BOARD RESISTANCE AND VOLTAGE TEST CHECK THE LINE SWITCH PERFORM THE MAIN RESISTANCE AND VOLTAGE TEST 	<ul style="list-style-type: none"> RECONNECT THE POWER SUPPLY REPLACE THE INPUT POWER CABLE REPLACE THE EMI FILTER BOARD REPLACE THE LINE SWITCH REPLACE THE MAIN BOARD
ERROR 00X ON LCD DISPLAY	<ul style="list-style-type: none"> NO COMMUNICATION BETWEEN DISPLAY AND POWER BOARD. NUMBER INDICATE COMMAND THAT HAS COMMUNICATION PROBLEM. ERROR 003 AT MACHINE START MEANS NO COMMUNICATION AT ALL BETWEEN THE TWO BOARDS 	<ul style="list-style-type: none"> CHECK HARNESS BETWEEN CONTROL AND POWER BOARD CHECK X2 SOCKET ON LCD BOARD 	<ul style="list-style-type: none"> REPLACE THE HARNESS REPLACE THE CONTROL BOARD REPLACE THE MAIN BOARD
THERMO ICON ON LCD DISPLAY	<ul style="list-style-type: none"> THERMAL PROTECTION HAS TRIPPED. 	<ul style="list-style-type: none"> WAIT THE MACHINE TO COOL, THE RESET SHOULD OCCUR WITHIN ABOUT 10-15 MINUTES CHECK FANS AND THERMAL PROTECTION CIRCUIT 	<ul style="list-style-type: none"> REPLACE THE DEFECTIVE FAN REPLACE THE MAIN BOARD
THERE IS NO WIRE FEED WHEN THE TRIGGER IS ACTIVATED. OPEN CIRCUIT VOLTAGE IS PRESENT AND GAS SOLENOID WORKS PROPERLY	<ul style="list-style-type: none"> IF THE DRIVE ROLL IS TURNING A MECCANICAL RESTRICTION IN THE WIRE FEED PATH CAN BE THE CAUSE THE GUN LINER MAY BE CLOGGED THE DRIVE ROLL IS NOT TURNING 	<ul style="list-style-type: none"> CHECK THE WIRE FEED PATH FOR MECCANICAL RESTRICTION/PROBLEMS CHECK THE GUN LINER CHECK THE DRIVE ROLL PRESSURE PERFORM THE MAIN BOARD VOLTAGE TEST 	<ul style="list-style-type: none"> REMOVE ANY POSSIBLE RESTRICTION REPLACE THE GUN LINER SET THE CORRECT DRIVE ROLL PRESSURE (BELOW 3) FOLLOWING THE TABLE AVAILABLE IN THIS SERVICE MANUAL REPLACE THE WIRE DRIVE MOTOR OR MAIN BOARD
THE ARC IS UNSTABLE	<ul style="list-style-type: none"> THE CONTACT TIP MAY BE WORN BAD OR LOOSE CONNECTIONS ON THE WORK OR GUN CABLE WELDING POLARITY MAY IS NOT CORRECT FOR THE PROCESS BEING USED WELDING WIRE MAY BE RUSTED OR DIRTY 	<ul style="list-style-type: none"> CHECK THE STATUS OF THE CONTACT TIP CHECK THE STATUS OF THE WORK AND GUN CABLE CHECK THE WELDING POLARITY CHECK THE CONDITION OF THE WELDING WIRE 	<ul style="list-style-type: none"> REPLACE THE CONTACT TIP IF WORN REPLACE THE WORK CABLE OR TORCH CHANGE THE POLARITY ACCORDINGLY TO THE USED PROCESS REPLACE THE WELDING WIRE IF DIRTY OR RUSTED
POROSITY ARE PRESENT ON WELD BEAD	<ul style="list-style-type: none"> WELDING POLARITY MAY IS NOT CORRECT FOR THE PROCESS BEING USED SHIELDING GAS OR FLOW MAY IS NOT CORRECT THE WELDING JOINT IS CONTAMINATED 	<ul style="list-style-type: none"> CHECK THE WELDING POLARITY CHECK THE SHIELDING GAS OR THE GAS FLOW CHECK THE WELDING JOINT, FOR OIL, RUST OR ANY OTHER CONTAMINATIONS 	<ul style="list-style-type: none"> CHANGE THE POLARITY ACCORDINGLY TO THE USED PROCESS CHANGE THE GAS TYPE OR FLOW RATE CHECK THE GAS CIRCUIT FOR LOOSEN CONNECTIONS OR BROKEN TUBE CLEAN THE JOINT

CASE COVER REMOVAL AND DC LINK CAPACITOR DISCHARGE PROCEDURE

WARNING

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

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact your Local Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed.

.....

DESCRIPTION

This procedure will aid the technician in the removal and replacement of the case sheet metal cover and discharging the DC link capacitor making it safe for the technician to work on the machine.

MATERIALS NEEDED

8mm Nut driver

SPEEDTEC® 215C – SIDE CASE COVER REMOVAL

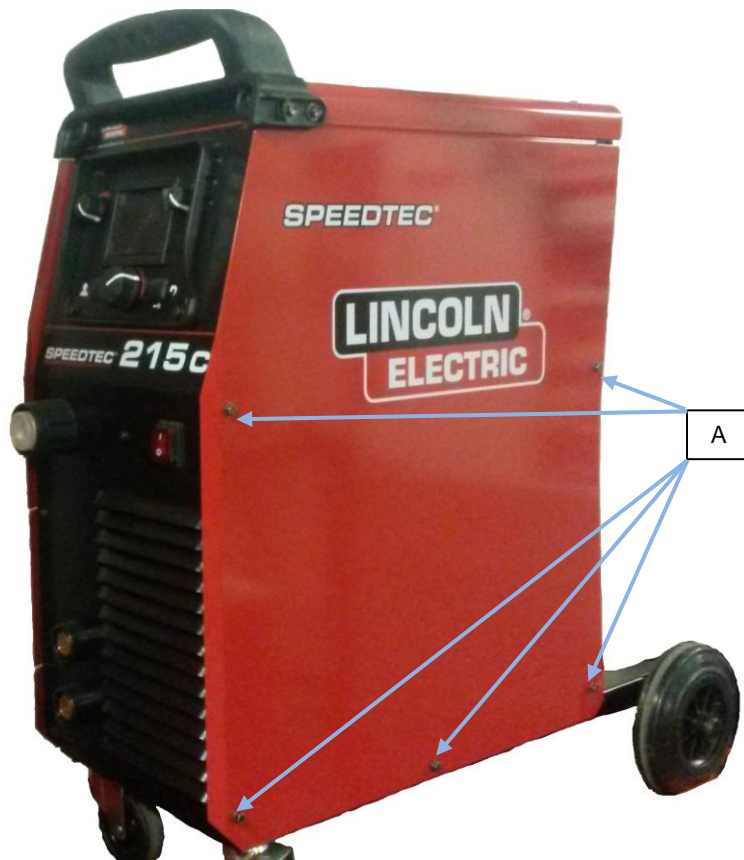


Figure 1

Necessary tool:

- 8 mm Nut driver

Procedure:

1. Turn on/off switch to off position.
2. Disconnect Input Power from the machine !
3. Remove the 5 screws (A) from the right panel. **See Figure1**
4. Remove the right panel
5. Follow the next session to **perform the discharge procedure**

DISCHARGE PROCEDURE

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
Prior to performing preventive maintenance, perform the following capacitor discharge procedure to avoid electric shock.

INPUT FILTER CAPACITOR DISCHARGE PROCEDURE

1. Remove main input power to the SPEEDTEC® 215C.
2. Remove the cover following the case removal procedure available in this Service manual.
3. The capacitors are discharged by discharge resistors integrated into the main board in about 2 (two) minutes.
4. Access to the terminals **DC+** and **DC -** of the Main Board to check if capacitors are discharged is not possible without removing the board from the machine. **For this reason ALL operations to remove the Main Board have to be done in a safety way using electrically insulate gloves and insulate tools (pliers, screwdrivers, etc..)**
5. Remove the Main Board from the machine following the removal and replacement procedure available in this manual.
6. Once the Main Board has been removed connect your multi-meter positive probe to **DC+** point and your negative probe to **DC -** and check the voltage across filter capacitors. **See Figure 1**
7. In case of presence of residual voltage follow the next steps
8. Obtain a high resistance and high wattage resistor (500-1000 ohms and 25 watts minimum). This resistor is NOT supplied with the machine. NEVER USE A SHORTING STRAP FOR THIS PROCEDURE.
9. Use electrically insulate gloves and insulated pliers. Hold the body of the resistor and connect the resistor leads across the two points **DC+** and **DC -**. **See Figure 1**. Hold the resistor in place for 10 seconds. **DO NOT TOUCH CAPACITOR TERMINALS WITH YOUR BARE HANDS.**
10. Check again the voltage across the two terminals. Voltage should be zero. If any voltage remains, repeat this procedure.

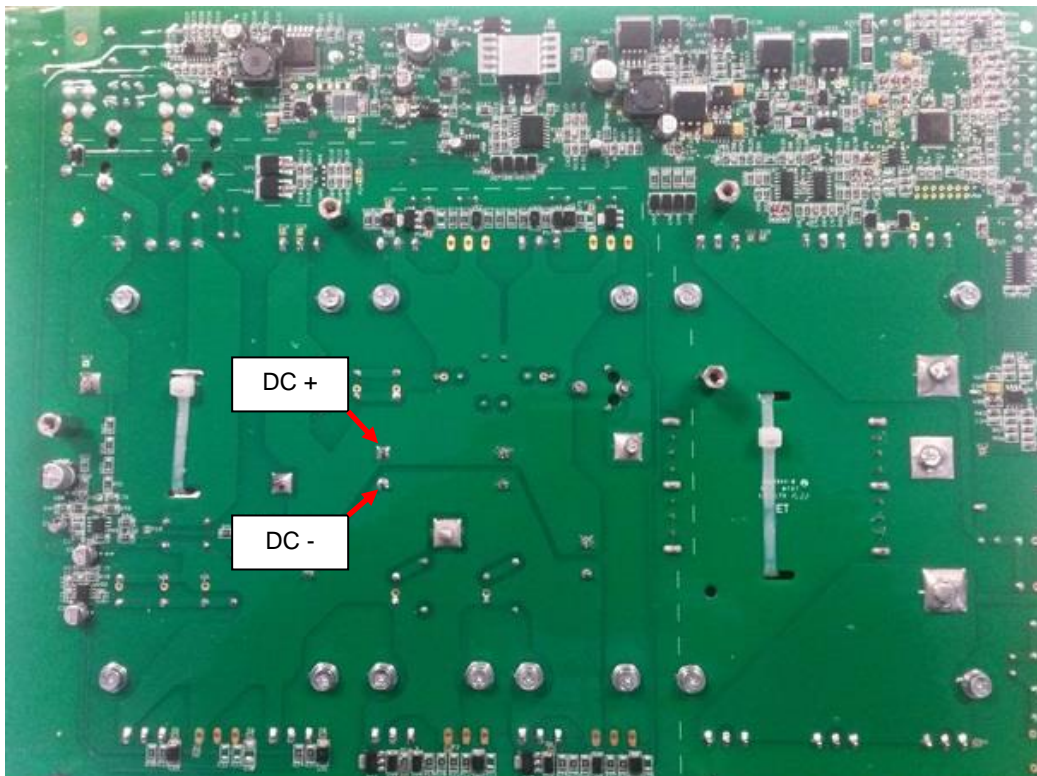


Figure 1

EMI FILTER BOARD RESISTANCE TEST

WARNING

Service and repair should be performed by only 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 your Local Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed.

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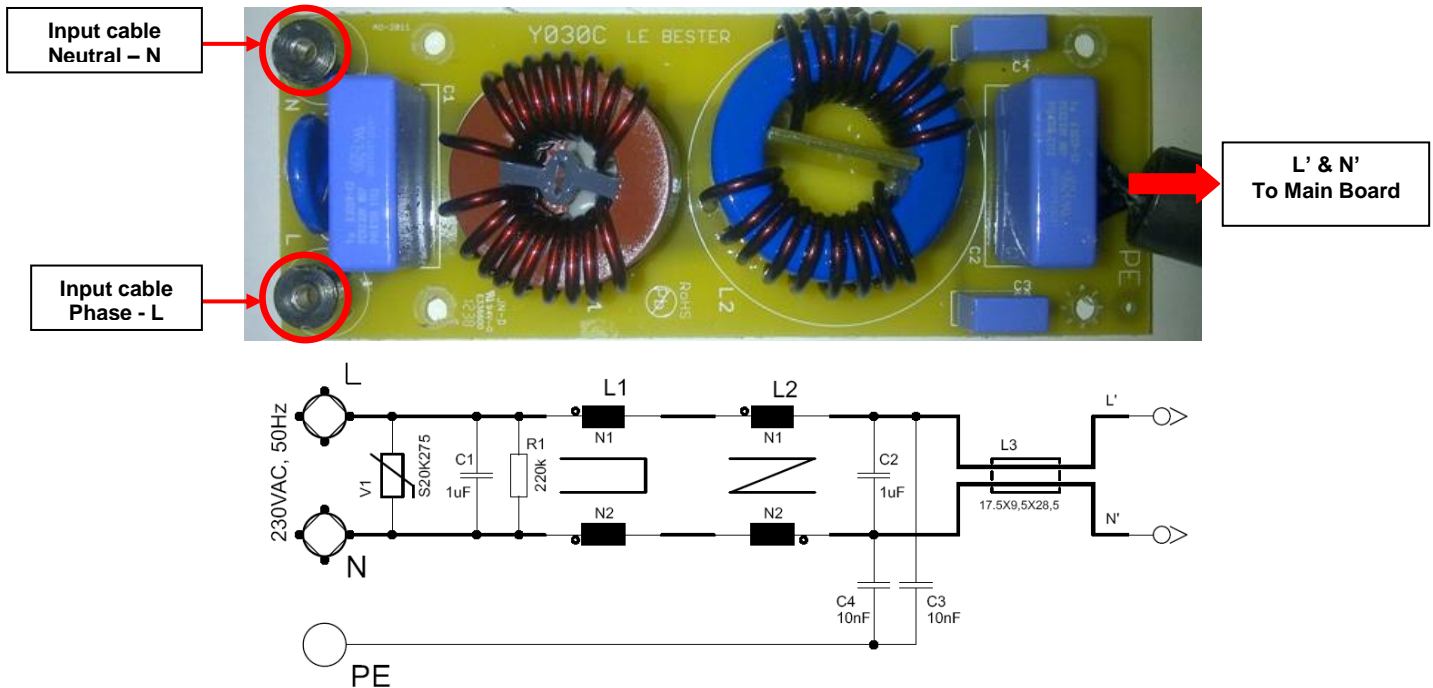
TEST DESCRIPTION

This test will determine if the EMI Filter Board is good or defect.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram Y030C

EMI FILTER BOARD RESISTANCE TEST (continued)



TEST PROCEDURE

1. Remove main input power to the SPEEDTEC® 215C
2. **WARNING !** EMI filter is directly connected to the main line, be sure to have the plug removed from the mains !
3. Follow the EMI Filter disassembly operations available in this Service Manual.
4. Visually check for burned or damaged components. If any components are physically damaged the board should be replaced.
5. Using the Volt-Ohmmeter (ohm mode) perform the tests following the below table test:

EMI Filter Board - Table tests 1

Positive Probe (RED)	Negative Probe (BLACK)	Value
L	L'	<i>0 ohm</i>
N	N'	<i>0 ohm</i>
L	N	<i>220K ohms+/- 10%</i>

MAIN BOARD RESISTANCE TEST

WARNING

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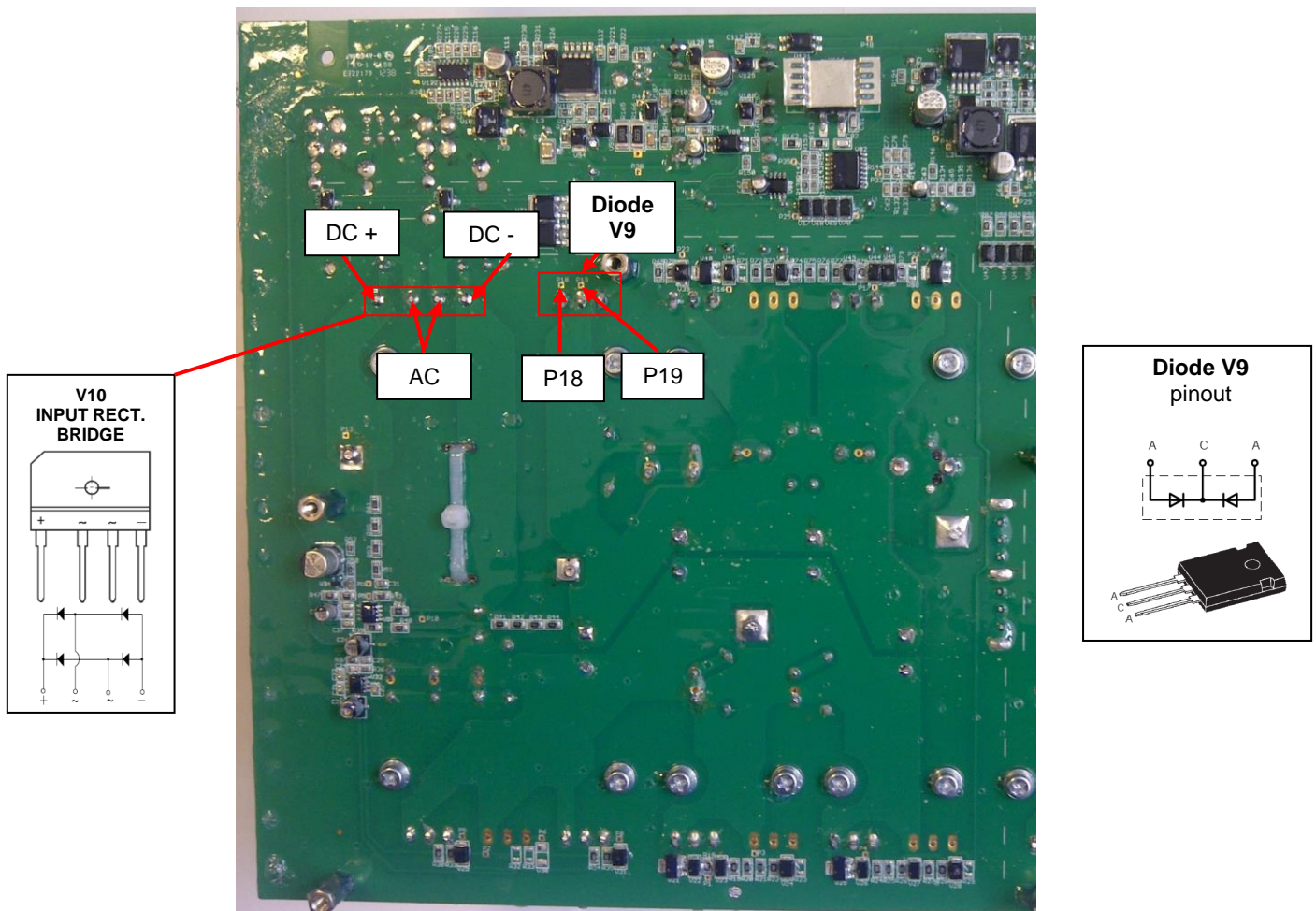
TEST DESCRIPTION

This test will determine if the main board has any “shorted” or “open” components.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram Y027E

MAIN BOARD RESISTANCE TEST (continued)



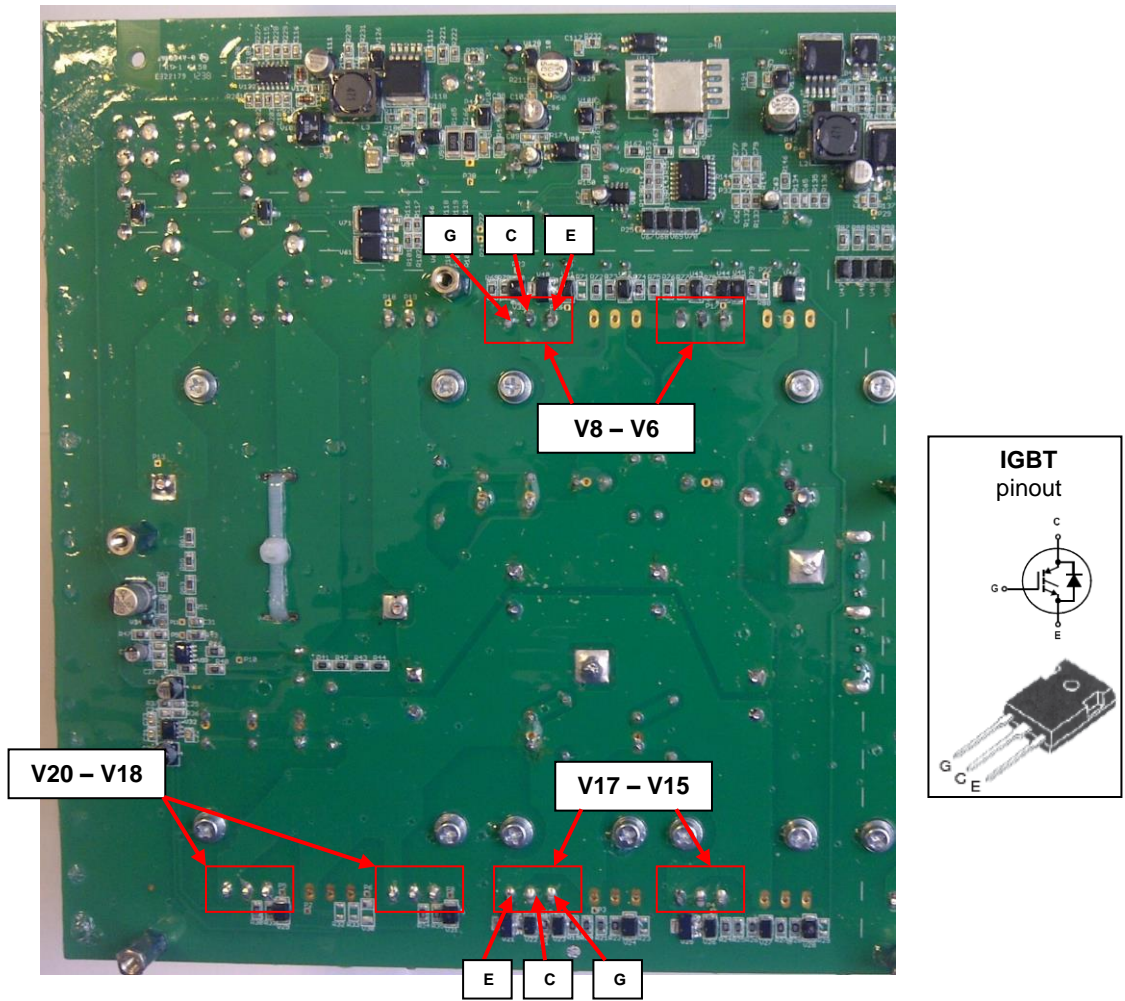
TEST PROCEDURE

1. Remove main input power to the SPEEDTEC® 215C
2. Perform the **Discharge procedure**
3. Follow the Main board disassembly operations available in this Service Manual.
4. Visually check for burned or damaged components. If any components are physically damaged the main board should be replaced
5. Using the Volt-Ohmmeter (diode test mode) check the Input Rectifier **V10** (see **Table tests 1**)
6. Using the Volt-Ohmmeter (diode test mode) check diode **V9** between test points P18 and P19. Positive probe to P18 and Negative probe to P19 value must be between 0,3 and 0,7.

Input Bridge V10 - Table tests 1

Positive Probe (RED)	Negative Probe (BLACK)	Value
ACa	+	0.3V - 0.7V
ACb	+	0.3V - 0.7V
+	ACa	Capacitors charge
+	ACb	Capacitors charge
-	ACa	0.3V - 0.7V
-	ACb	0.3V - 0.7V
ACa	-	Capacitors charge
ACb	-	Capacitors charge

MAIN BOARD RESISTANCE TEST (continued)



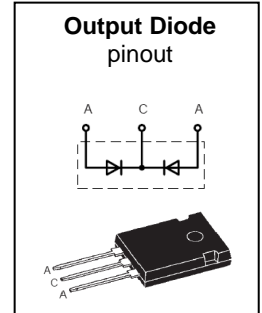
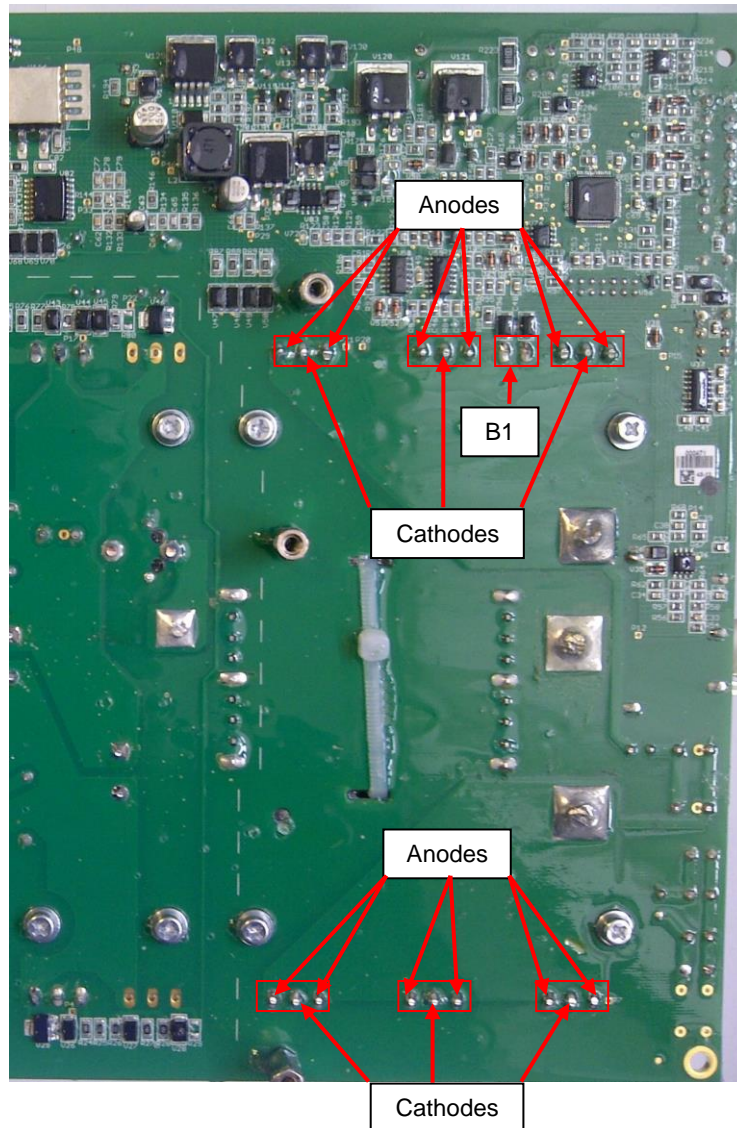
TEST PROCEDURE

7. Check PFC IGBT **V18** and **V20**, using the Volt-Ohmmeter (diode test mode), following the **Table tests 2**
8. Check Inverter IGBT **V6-V8** and **V15-V17**, using the Volt-Ohmmeter (diode test mode), following the **Table tests 2**

IGBT V6-V8-V15-V16-V18-V20 - Table tests 2

Positive Probe (RED)	Negative Probe (BLACK)	Value
Emitter (E)	Collector (C)	0.3V - 0.7V
Collector (C)	Emitter (E)	Capacitors charge
Emitter (E)	Gate (G)	0.15V - 0.2V

MAIN BOARD RESISTANCE TEST (continued)



TEST PROCEDURE

9. Check the output diodes V2,V3,V4,V11,V12,V13 with multi meter in diode test mode, for short, following the **Table tests 3**
10. Using the Volt-Ohmmeter (ohm mode) check thermal sensor **B1** (Output Diodes heat sink) value, shall be 0 Ohms.

Diode V2,V3,V4,V11,V12,V13 – Table tests 3

Positive Probe (RED)	Negative Probe (BLACK)	Value
anode	cathode	0.28V - 0.7V
cathode	anode	OPEN

EMI FILTER BOARD VOLTAGE TEST

WARNING

Service and repair should be performed by only 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 your Local Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed.

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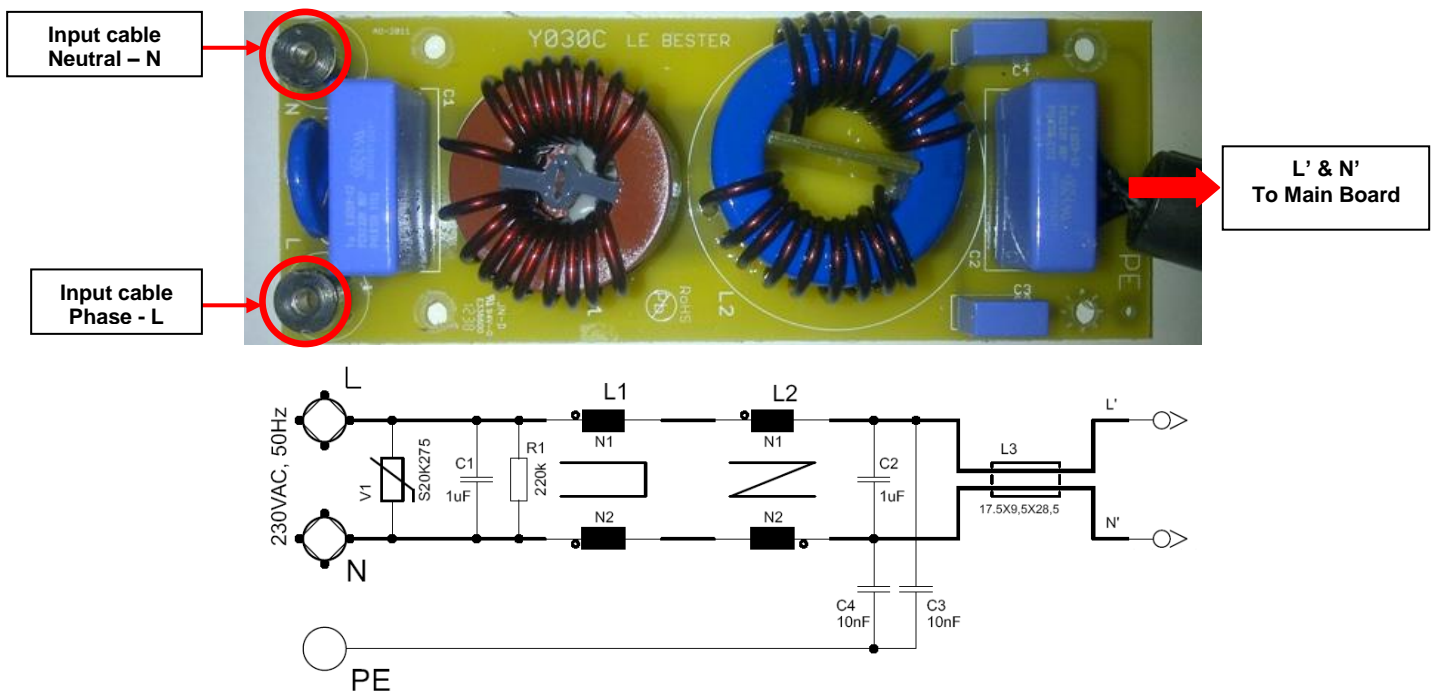
TEST DESCRIPTION

This test will help to determine if the input voltage applied to the EMI filter is passing through it and arrive correctly to the main board.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram Y030C

EMI FILTER BOARD VOLTAGE TEST (continued)



TEST PROCEDURE

⚠ **Use always electrically insulate gloves during this test procedure**

1. Remove main input power to the SPEEDTEC[®] 215C
2. Follow the case removal procedure available in this Service Manual
3. Apply 115 Vac or 230Vac +/- 10% to the SPEEDTEC[®] 215C
4. **WARNING!** EMI filter is connected before the machine ON/OFF switch !
5. Check between **L** and **N** points for 115Vac or 230Vac +/- 10%
6. Check between **L'** and **N'** for 115Vac or 230Vac +/- 10%
7. If 115Vac or 230Vac is not present between **L** and **N** points may be the input cable or the plug are damaged
8. If 115Vac or 230Vac is present between **L** and **N** points but it is not present between **L'** and **N'**, the EMI filter is damaged and needs to be replaced.

MAIN BOARD VOLTAGE TEST

WARNING

Service and repair should be performed by only 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 your Local Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed.

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TEST DESCRIPTION

This test will help to determine if the correct input voltage is being applied to the main board and also if the correct regulated voltages are being processed on the main board.

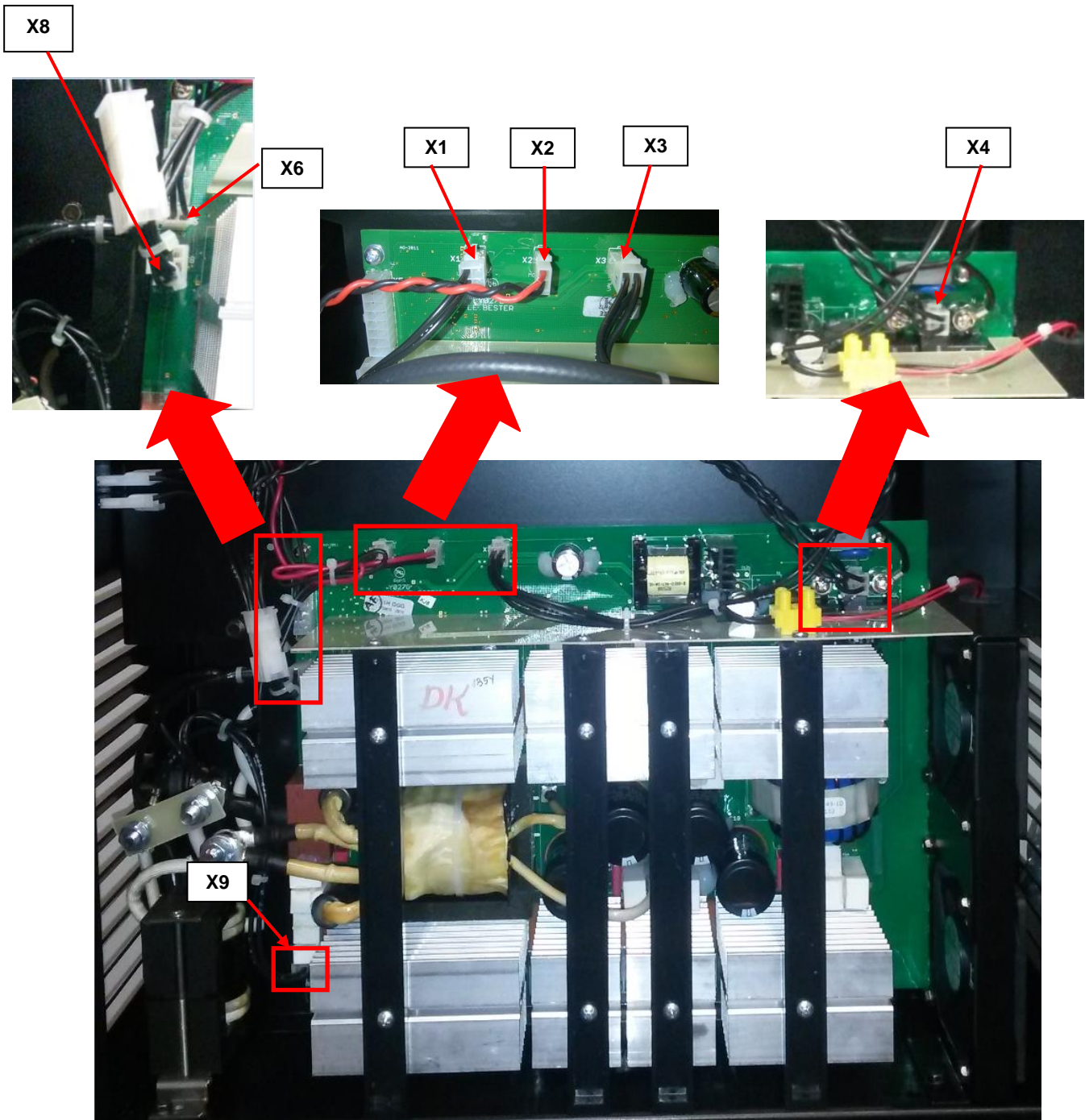
MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram Y027E

MAIN BOARD VOLTAGE TEST (continued)

⚠ WARNING

DO NOT CONNECT THE SAME SCOPE GROUND BETWEEN HIGH SIDE AND LOW SIDE



TEST PROCEDURE

⚠ Use always electrically insulate gloves during this test procedure

1. Remove main input power to the SPEEDTEC® 215C
2. Follow the case removal procedure available in this Service Manual
3. Apply 115Vac or 230Vac +/- 10% to the SPEEDTEC® 215C
4. Turn the machine mains switch to ON position
5. Follow the below tables tests:

MAIN BOARD VOLTAGE TEST (continued)

⚠ WARNING

DO NOT CONNECT THE SAME SCOPE GROUND BETWEEN HIGH SIDE AND LOW SIDE

X8: Main Board to Control Board connector

Pin #	Description	Value	Notes
1	Not used		
2	RX	4,5 – 5,5 V (typical value)	Serial communication between UI and Power Board
3	TX	4,5 – 5,5 V (typical value)	
4	+ 24Vdc	+ 24Vdc +/-10%	Control board power supply
5	GND	GND	
6	GND	GND	

X2: Main Board to Wire Drive Motor

Pin #	Description	Value	Notes
1	Wire drive motor supply	+2,5Vdc +/- 10% = 1,5m/min	In MIG mode with trigger pressed
2		+20Vdc +/- 10% = 15 m/min	

X3: Main Board to Fans and Gas solenoid

Pin #	Description	Value	Notes
1	Fan supply	+24Vdc +/-10%	Always when machine is ON
3			
2	Gas solenoid supply	+24Vdc +/-10%	In MIG mode with trigger pressed
4			

X4: Main Board to Main ON/OFF switch

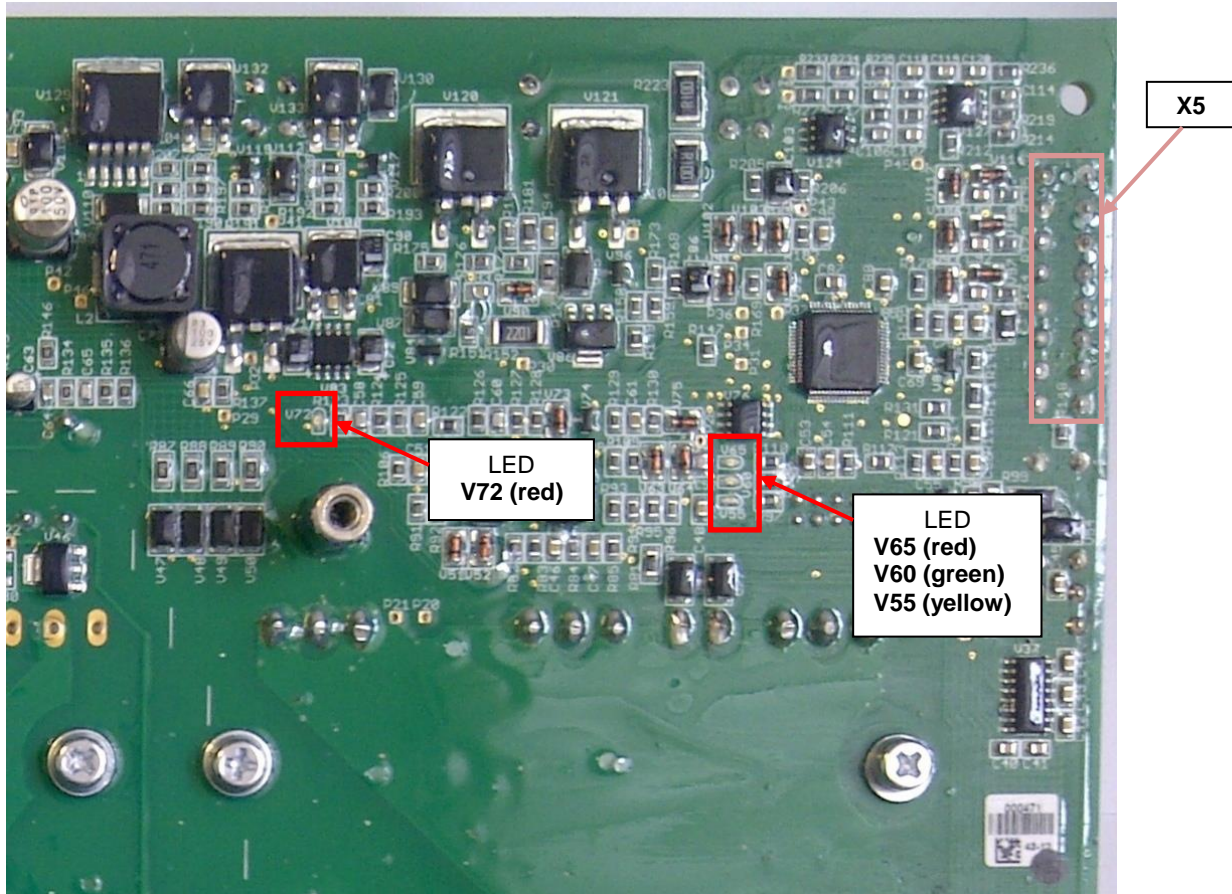
Pin #	Description	Value	Notes
1	Main Board Power Supply	115Vac or 230Vdc +/- 10%	Always when machine plug connected to the mains
3			
2	Main Board Power Supply	115Vac or 230Vdc +/- 10%	Only when ON/OFF switch to ON position
4			

X6: Main Board to Torch Trigger

Pin #	Description	Value (use pin X8/5 or X8/6 as GND ref.)	Notes
1	Mig gun trigger	+7,2Vdc +/-10%	When trigger pressed
		0Vdc	When trigger released

- Connector **X1** between pin 2 and 4 = output voltage feedback (from polarity change block)
- Connector **X9** between pin 1 and 2 = output voltage feedback (from polarity change block)

MAIN BOARD VOLTAGE TEST (continued)



LED INFORMATION:

- **V72 (red)** = + 15Vdc auxiliary supply present
- **V65 (red)** = lit when inverter is working, it means when voltage is present on output studs
- **V60 (green)** = lit during PCB programming process (factory only). During PCB programming process all 3 LEDs V65, V55, V60 are lit.
- **V55 (yellow)** = is blinking every 2 seconds to check if timers, used on the board, are working correctly and the adc (analog to digital converter) is working correctly.

CONTROL BOARD TEST

WARNING

Service and repair should be performed by only 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 your Local Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed.

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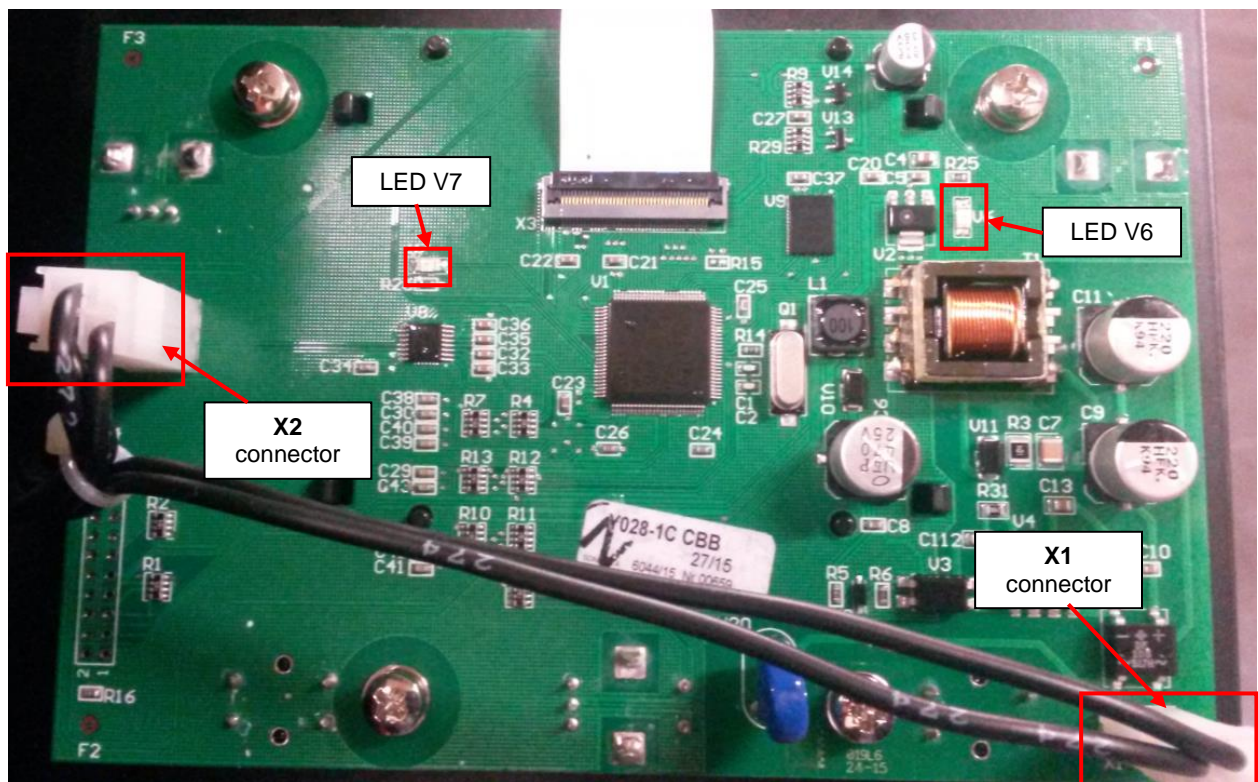
TEST DESCRIPTION

This test will help to determine if the correct input voltage is being applied to the control board and if it may be faulty.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram Y028-1B

CONTROL BOARD TEST (continued)



TEST PROCEDURE

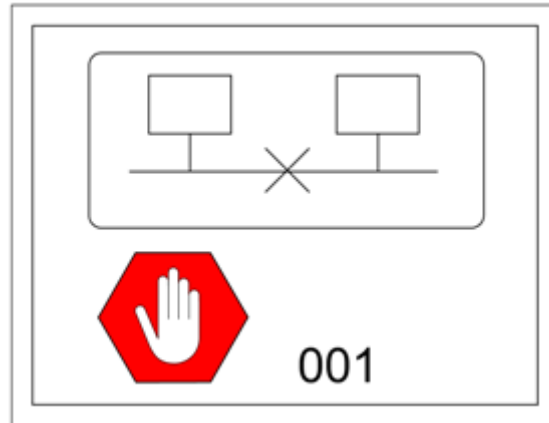
⚠ **Use always electrically insulate gloves during this test procedure**

1. Remove main input power to the SPEEDTEC® 215C
2. Follow the control board removal procedure
3. Apply 115Vac or 230Vac +/- 10% to the SPEEDTEC® 215C
4. Turn the machine mains switch to ON position
5. Check between X1 pin 1 and 2(GND) for +24Vdc +/- 10%
6. Check LED V6, it must be lit. When lit it means that the regulated 3,3Vdc is correctly generated by the power supply circuit on the control board.
7. LED V7 must be OFF (it is lit only during PCB programming process, when lit means that the RS port is open and ready for programming)
8. On connector X2 check between wire 273 (GND) and wire 271(TX) for 4,5 - 5,5Vdc. If present means that serial communication is active.
9. On connector X2 check between wire 273 (GND) and wire 272(RX) for 4,5V - 5,5dc. If present means that serial communication is active.

ERROR CODES

Communication Error:

Display board can't communicate with power board. Problem could be wiring between display and power board or socket on display board doesn't have good connection. Number on display shows number of command which display board can not send to power board or cannot receive respond from power board. If 003 number appears it means that there is absolutely no connection between display and power board.



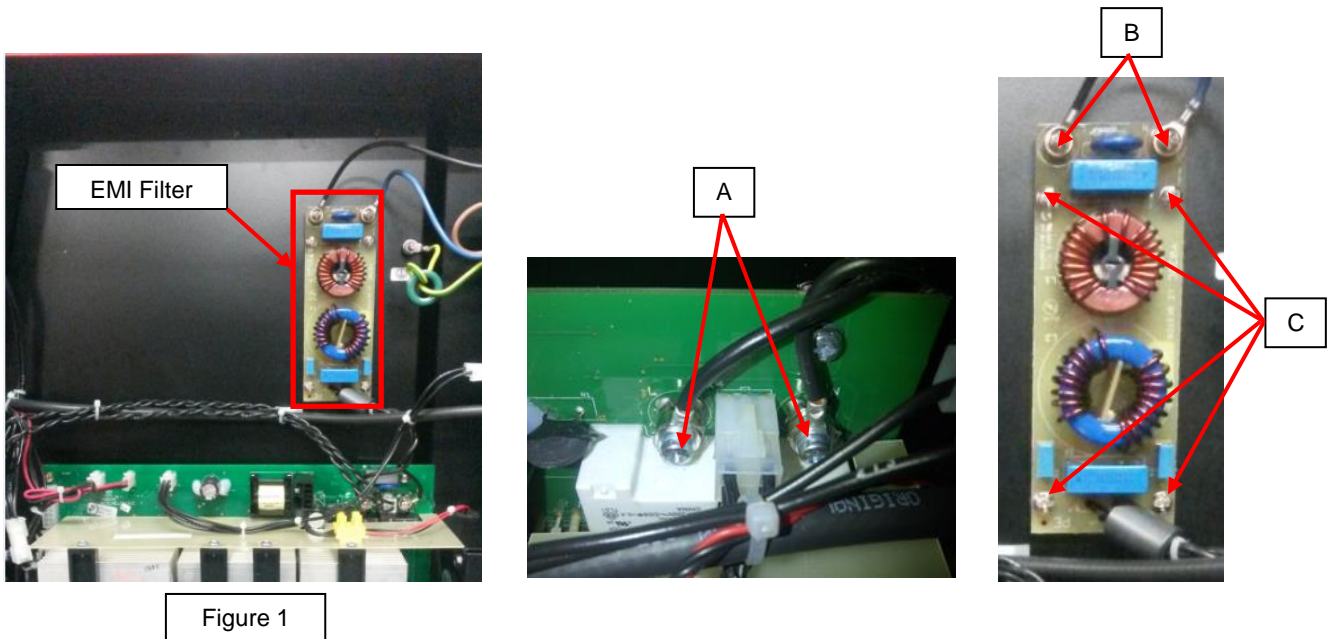
Thermal Overload Error:

This error code means thermal overload condition or insufficient cooling



DISASSEMBLY OPERATIONS

EMI FILTER BOARD REMOVAL AND REPLACEMENT PROCEDURE



REMOVAL PROCEDURE

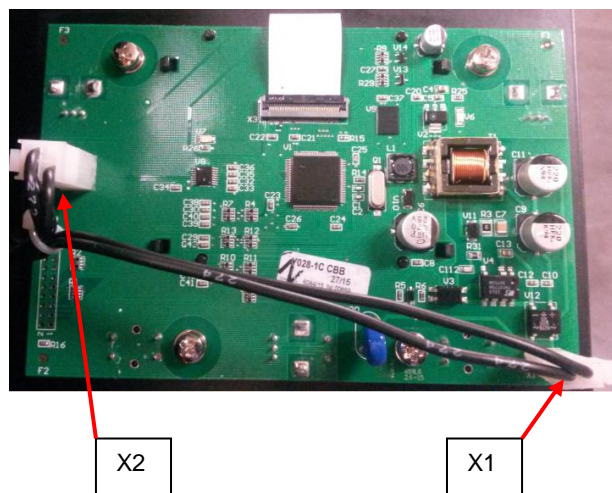
Necessary tool:

- 8 mm Nut Driver
- Phillips screwdriver PH02

1. Remove main input power to the SPEEDTEC® 215C
2. Open the right side panel of the machine following the case cover removal procedure.
3. **WARNING!** EMI filter is connected before the machine ON/OFF switch! Be sure to have disconnected the machine plug from the power supply.
4. Locate the EMI filter. See **Figure 1**
5. Using a Phillips screwdriver remove the 2 screws (**A**) on the main board points L and N
6. Using a Phillips screwdriver remove the 2 screws (**B**) that fix the input cable wires to the EMI filter
7. Using a Phillips screwdriver remove the 4 screws (**C**) that fix the EMI filter board to the central frame panel and remove the EMI filter from the machine.
8. **For the EMI Filter re-assembly operations,** make the previous steps in the reverse order.

DISASSEMBLY OPERATIONS

USER INTERFACE BOARD REMOVAL AND REPLACEMENT PROCEDURE



REMOVAL PROCEDURE

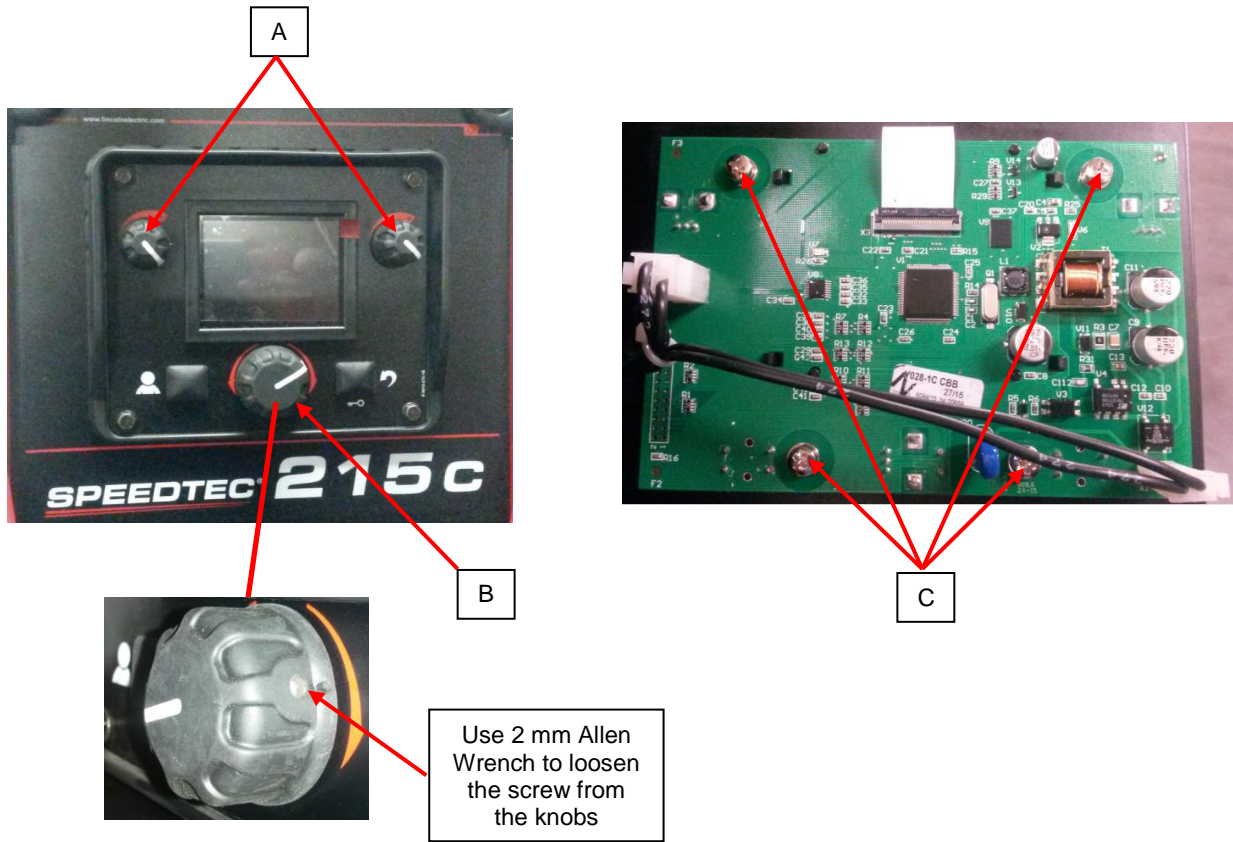
Necessary tool:

- 8 mm Nut Driver
- Phillips screwdriver PH02
- 2mm Allen wrench
- Small flat screwdriver

1. Remove main input power to the SPEEDTEC® 215C
2. Using the 8 mm nut driver remove the 4 screws (**A**) that fix the SPEEDTEC® 215C User Interface panel to the front panel of the machine.
3. Pull away a little the User Interface panel and disconnect the UI board harness from connector **X1** and **X2**
4. Follow the next procedure to remove the control board from the control board panel

DISASSEMBLY OPERATIONS

USER INTERFACE BOARD REMOVAL AND REPLACEMENT PROCEDURE



5. Using a small flat screwdriver lift the two small knobs (A) and remove them.
6. Using a 2 mm Allen Wrench loosen the Allen screw until you'll be able to remove the bigger knob (B)
7. Using the PH02 Phillips screwdriver remove the 4 screws (C) that are fixing the UI board to the control board panel
8. Remove the UI board from the panel.
9. **For the control board re-assembly operations**, make the previous steps in the reverse order.

DISASSEMBLY OPERATIONS

WIRE DRIVE ASSEMBLY REMOVAL AND REPLACEMENT PROCEDURE

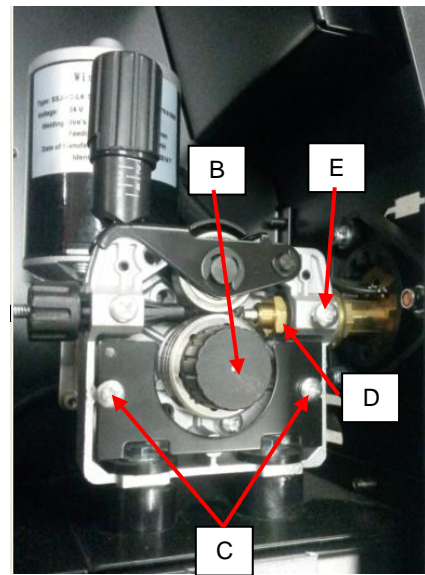
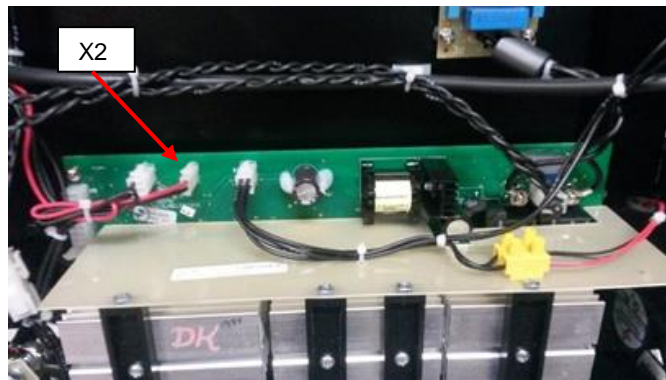


Figure 1



REMOVAL PROCEDURE

Necessary tool:

- 8 mm Nut Driver
- Phillips screwdriver PH02
- 14mm wrench
- 8 mm wrench

1. Remove main input power to the SPEEDTEC® 215C
2. Remove the 3 screws (A) and remove the tool box panel from the machine
3. Open the left side upper panel to have access to the wire drive assembly as shown in Fig. 1
4. Remove the fixing cap screw (B) that lock the drive roll and remove the drive roll and drive roll support
5. Using the Phillips screwdriver remove the two screws (C)
6. Using a 14 mm wrench remove the nut (D) and washer
7. Using the Phillips screwdriver remove the screw (E)
8. Disconnect, from the main board, the wire drive motor power supply harness connector X2

DISASSEMBLY OPERATIONS

WIRE DRIVE ASSEMBLY REMOVAL AND REPLACEMENT PROCEDURE



REMOVAL PROCEDURE

9. Locate the polarity change panel inside the tool box (F)
10. Using the 8mm nut driver remove the 3 screws (G+H) that are fixing the change polarity panel
11. Pull the change polarity panel to have access to the bolts (I)
12. Using the 8mm wrench remove the two nuts (I) and after that remove the two bolts (L) that are fixing the wire drive to the machine
13. Remove carefully the wire drive assembly, sliding it on the left, taking care of the plastic insulators that insulate the wire drive plate from the bottom panel.
14. **For the drive motor re-assembly operations**, make the previous steps in the reverse order.

DISASSEMBLY OPERATIONS

FANS REMOVAL AND REPLACEMENT PROCEDURE

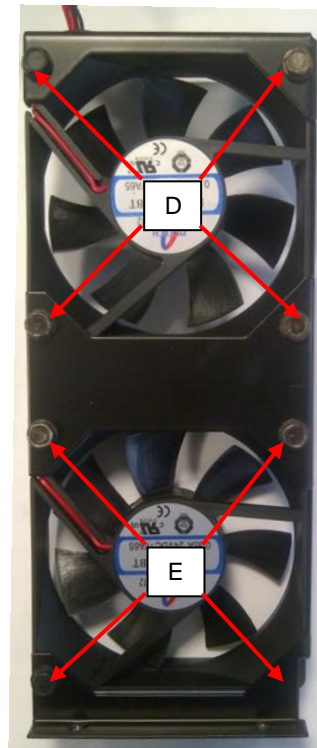
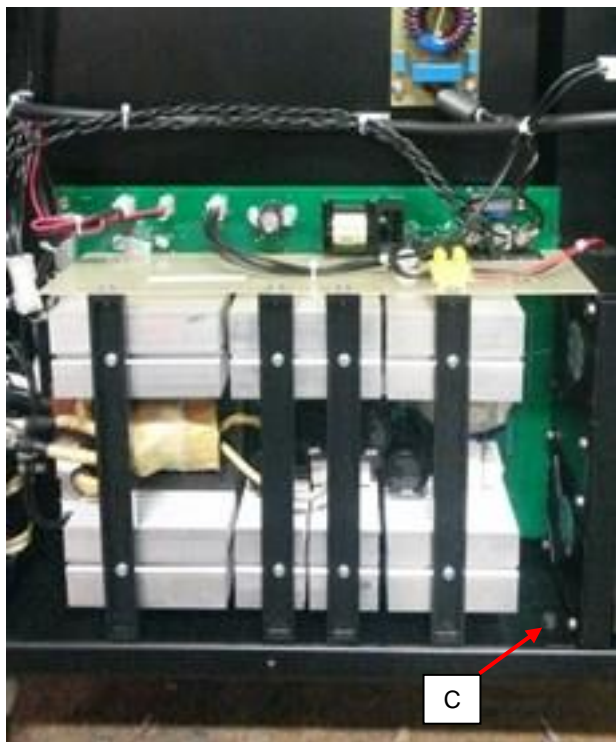
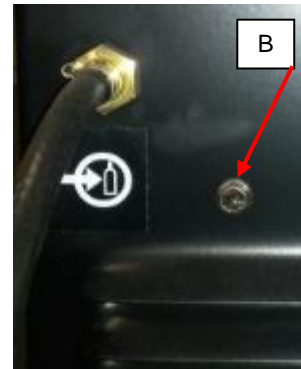
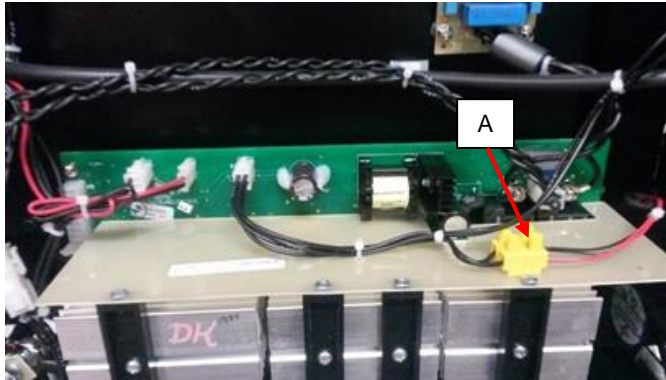


Figure 1

REMOVAL PROCEDURE

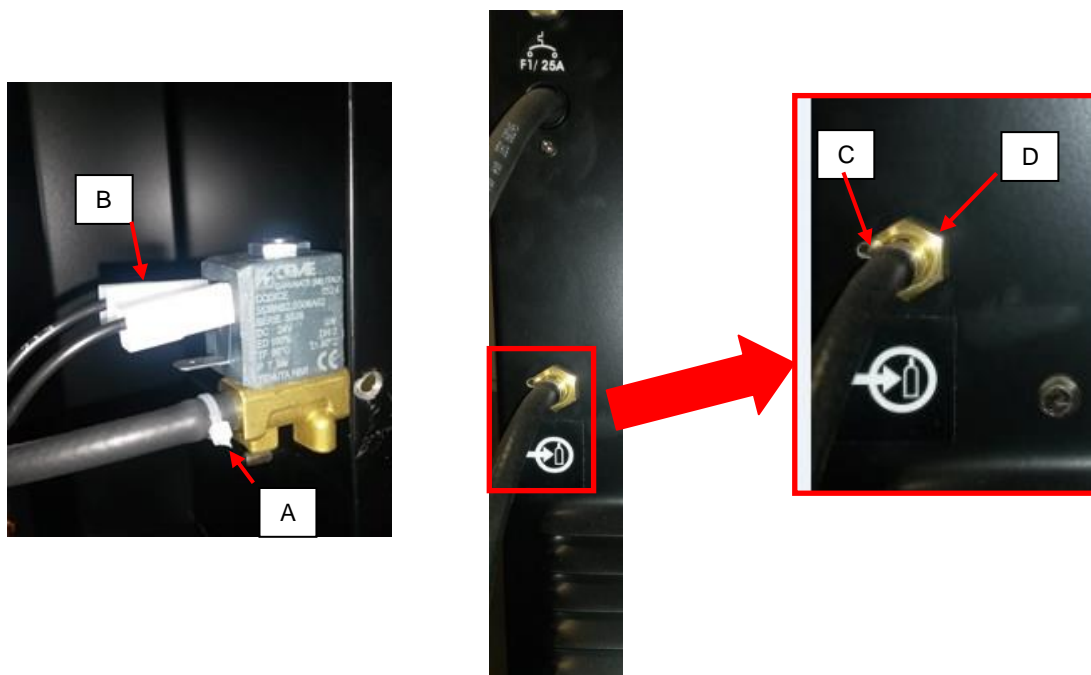
Necessary tool:

- 8 mm Nut Driver
- Small flathead screwdriver

1. Remove main input power to the SPEEDTEC® 215C
2. Follow the side case removal procedure available in this Service Manual
3. Using a small flathead screwdrivers remove the red and black fan supply cables from connector (A)
4. Using a 8mm Nut driver remove the screw (B) located on the rear panel of the unit and the screw (C) located on the bottom panel of the unit.
5. Remove the fans assembly from the machine (Figure 1)
6. Remove the 4 screws (D) or 4 screws (E) to remove the faulty fan.
7. **For the fans re-assembly operations**, make the previous steps in the reverse order.

DISASSEMBLY OPERATIONS

GAS SOLENOID REMOVAL AND REPLACEMENT PROCEDURE



REMOVAL PROCEDURE

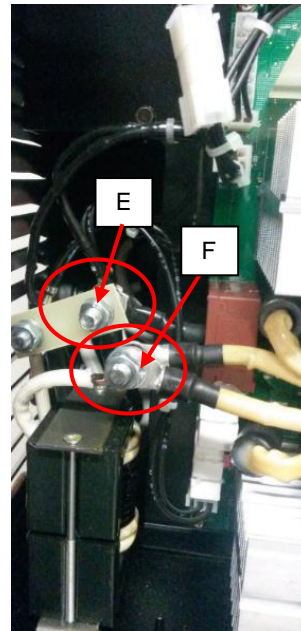
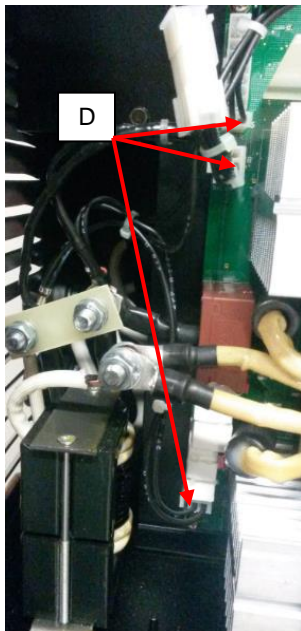
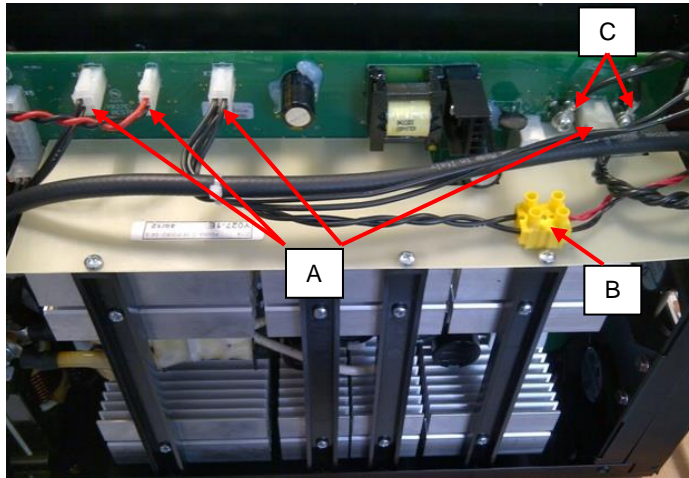
Necessary tool:

- 17mm wrench
- nippers

1. Remove main input power to the SPEEDTEC® 215C
2. Follow the side case removal procedure available in this Service Manual
3. Remove the plastic tie (A) and disconnect the gas pipe from the gas solenoid
4. Remove the two supply cables (B) from the gas solenoid.
5. Remove the metal tie (C) and disconnect the gas pipe from the inlet of the gas solenoid
6. Using a 17 mm wrench remove the nut (D) that fix the gas solenoid to the rear panel of the machine.
7. **For the gas solenoid re-assembly operations**, make the previous steps in the reverse order.

DISASSEMBLY OPERATIONS

MAIN BOARD REMOVAL AND REPLACEMENT PROCEDURE



REMOVAL PROCEDURE

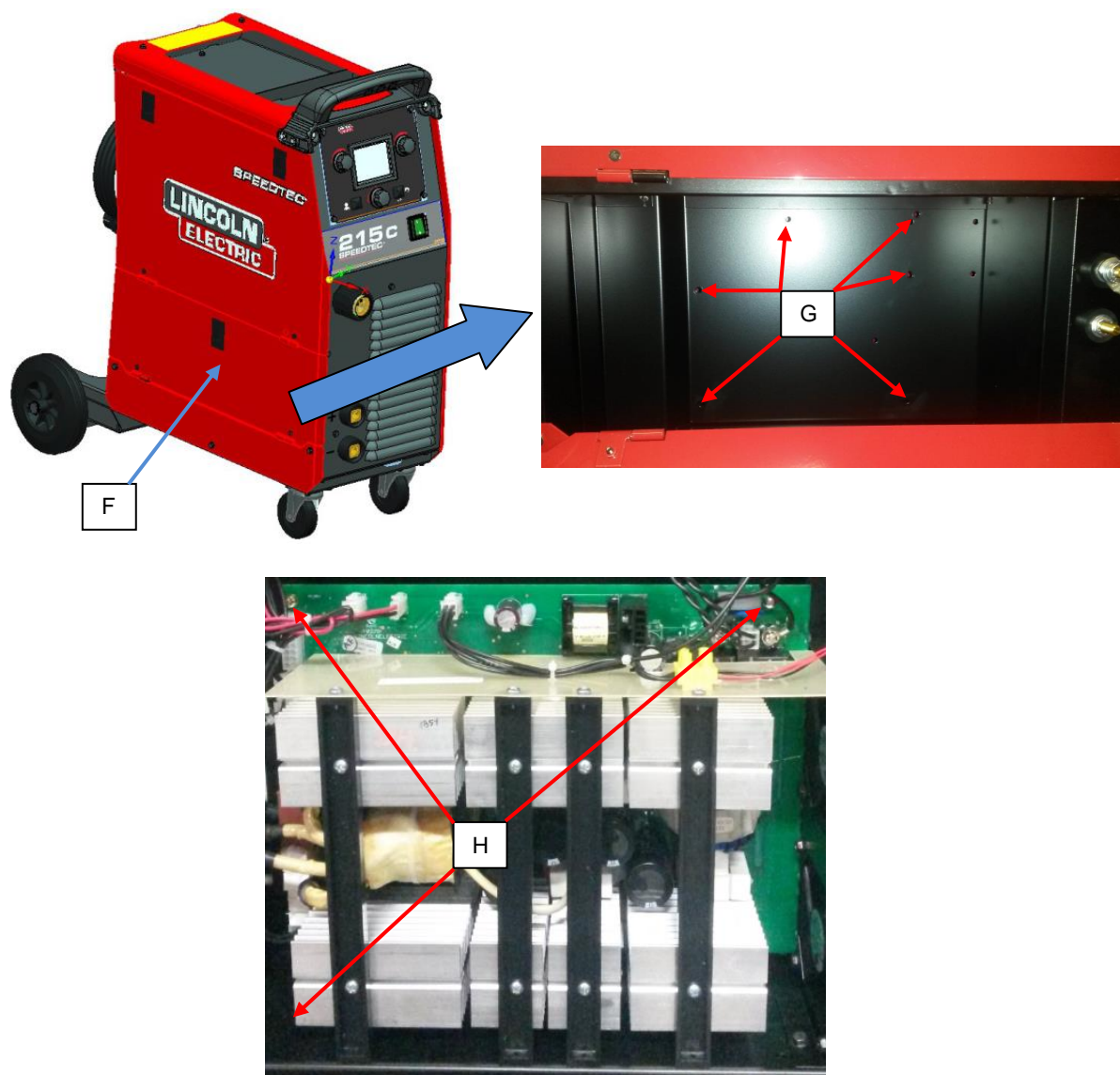
Necessary tool:

- Phillips screwdriver PH02
- Small flathead screwdriver
- 2 x 13 mm wrench

1. Remove main input power to the SPEEDTEC® 215C
2. Follow the side case removal procedure available in this Service Manual
3. Disconnect from the main board all connectors **X1, X2, X3, X4, X6, X8** and **X9** see reference **(A)** and **(D)**
4. Using the Phillips screwdriver remove the two input supply cables **(C)**
5. Using a small flathead screwdriver remove the 2 red and 2 black wires from connector **(B)**
6. Using the two 13 mm wrench disconnect the cable junction **(E)** and **(F)**

DISASSEMBLY OPERATIONS

MAIN BOARD REMOVAL AND REPLACEMENT PROCEDURE (continued)



REMOVAL PROCEDURE (continued)

7. Open the tool box door (F) on the left bottom side of the unit to have access to the main board fixing screws that have to be removed.
8. Using the Phillips screwdriver remove the 6 screws (G)
9. Using the Phillips screwdriver remove the last 3 screws (H) that are fixing the main board to the machine frame.
10. Carefully remove the main board
11. **For the main board re-assembly operations**, make the previous steps in the reverse order, taking care that on connector (B) the two red fan wires must be connected with the wire n° 254 and the black fan wires with the wire n° 255.

RETEST AFTER REPAIR

Should a machine under test be rejected for any reason requiring the removal of any mechanical part that could affect the machine's electrical characteristics, or if any electrical components are repaired or replaced, the machine must be retested.

Machine input and output

Input Voltage	Input Current	Rated Output
115Vac/1ph/50Hz	23A max	100A@40%
230Vac/1ph/50Hz	27A max	200A@25%

With Input Voltage 115Vac

Output current range GMAW - FCAW	20 – 100 Amps
Output current range SMAW	20 – 80 Amps
Output current range GTAW	20 – 125 Amps

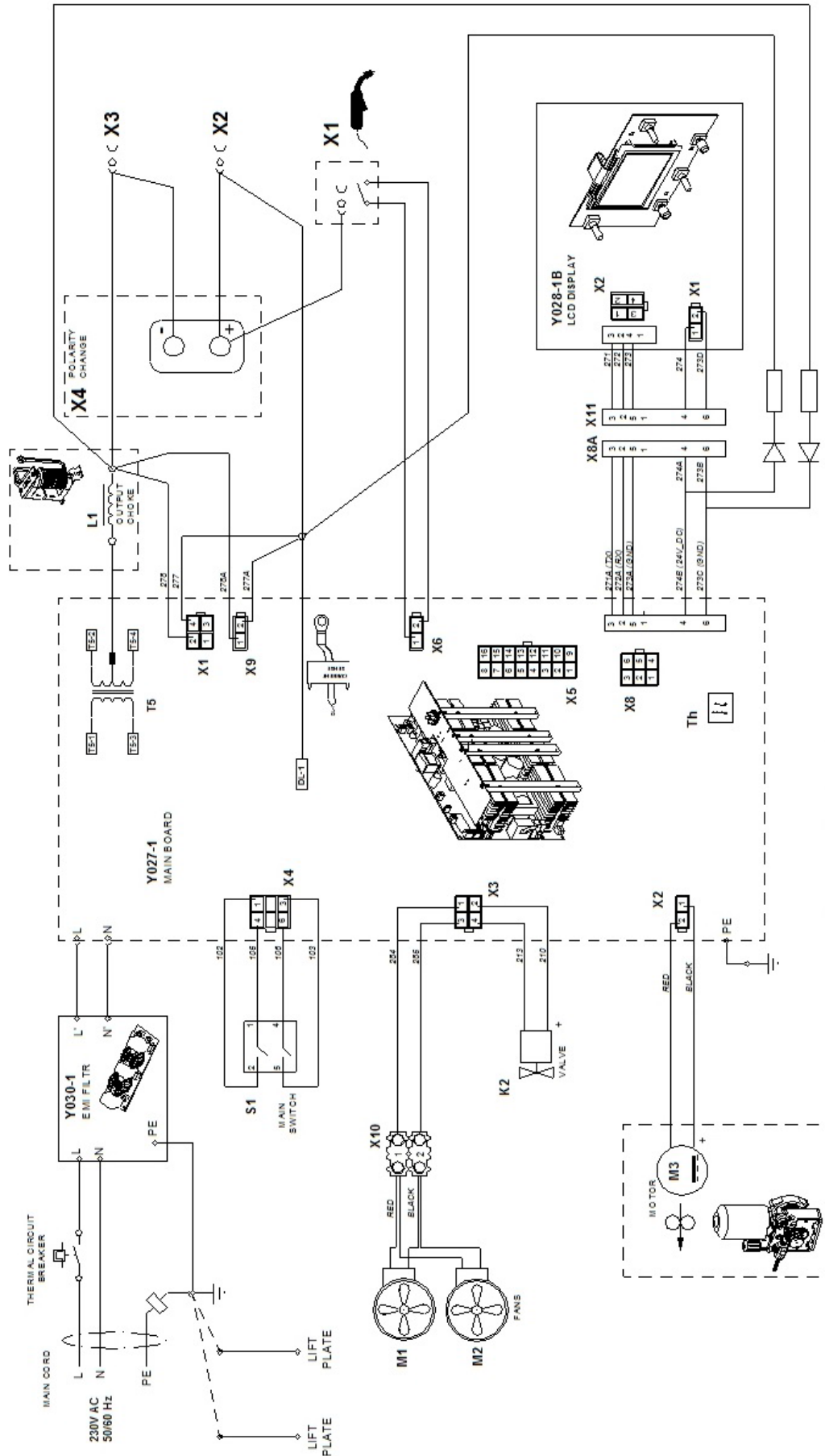
With Input Voltage 230Vac

Output current range GMAW - FCAW	20 – 200 Amps
Output current range SMAW – GTAW	20 – 160 Amps

Maximum Open Circuit Voltage	57 Vdc
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ELECTRICAL SCHEMATICS

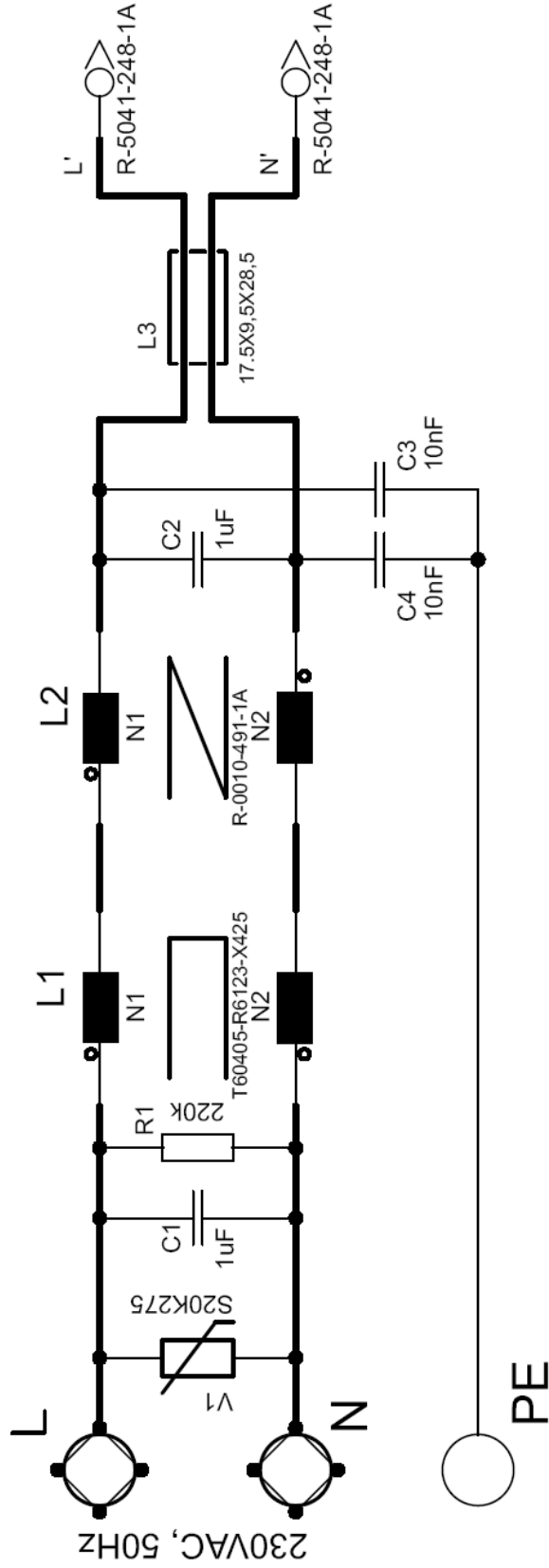
Block Diagram : SPEEDTEC® 215C



SPEEDTEC 215C

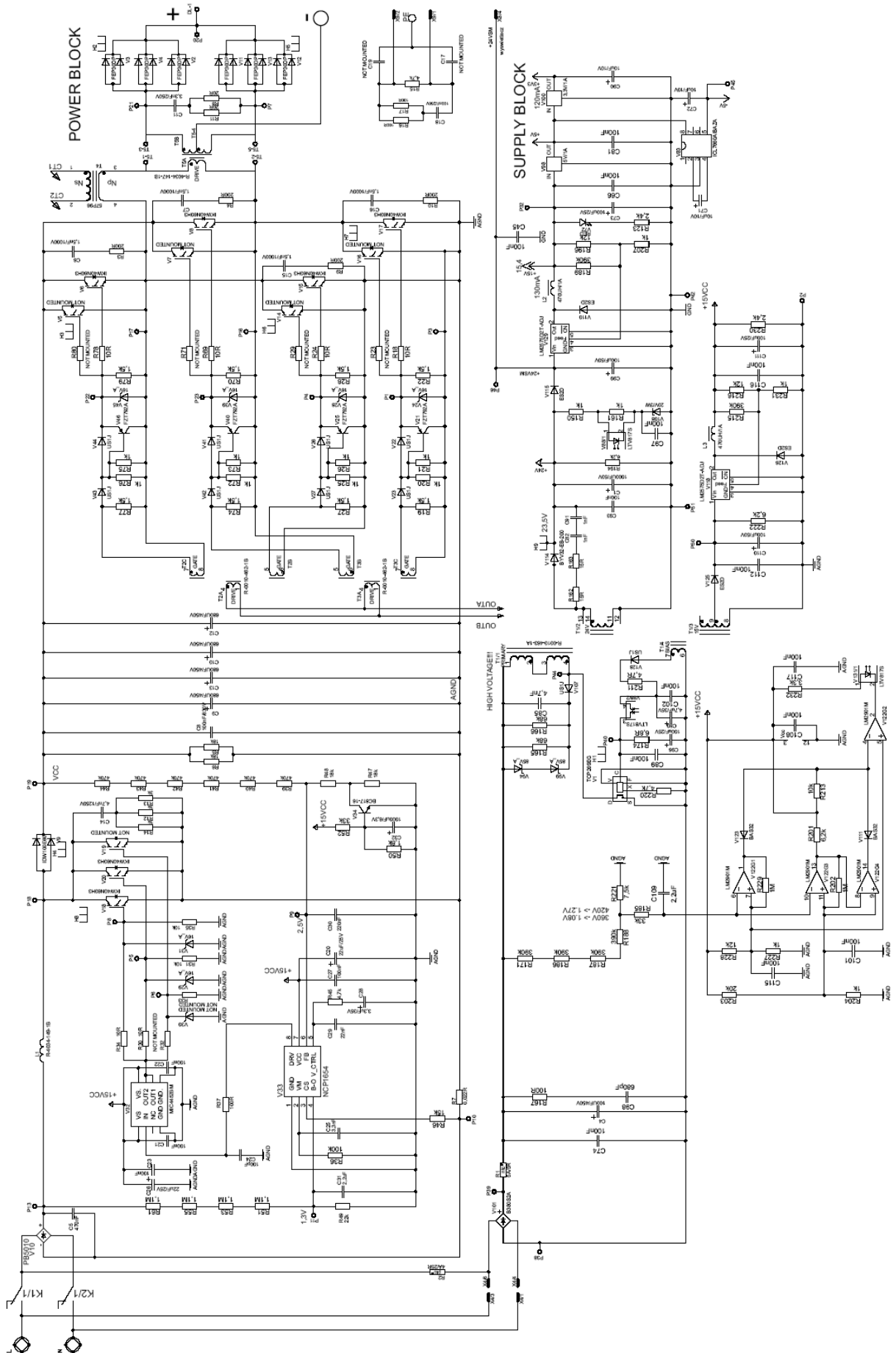
ELECTRICAL SCHEMATICS

EMI Filter Schematic Y030-1



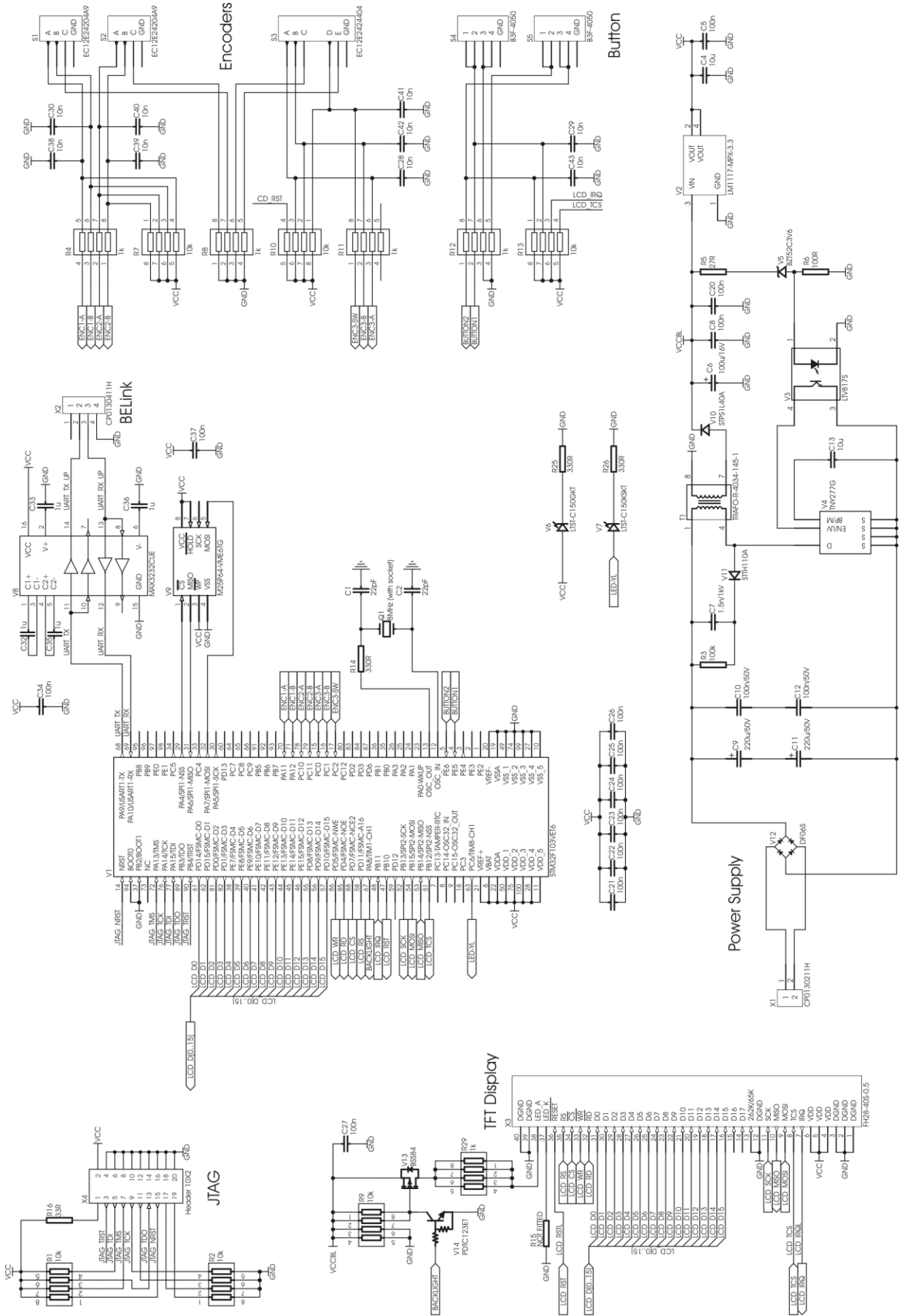
ELECTRICAL SCHEMATICS

Main Board Schematic Y027. Page 2/2



ELECTRICAL SCHEMATICS

Control Board Schematic - Y028-1



NOTE
