

Theory Of Operation For The Beta Mig 170 Spec. 500105-001

Instructions

Follow along with the schematic (204546) starting at the left and proceeding right towards the output. This theory will describe what happens when the unit is plugged in, turned on and what happens when the gun switch is closed.

Input

The Beta Mig 170 has two different hook up capabilities. One is for 200 VAC single phase and the other is for 230 VAC single phase. These are made for a 50 or 60 Hz cycle.

Plugged In

When the unit is plugged in, 200 / 230 VAC is supplied through a three pronged plug. The Black wire is considered Hot. The White wire is considered Neutral. Green is frame ground. The green wire is naturally connected to the frame immediately upon entering the machine. The Black wire is connected to one side of S1. The White wire is connected to the other side of S1. There is now voltage present and waiting at the power switch S1.

Turned On (Power Switch Closed)

Primary of T1

Once the power switch (S1) is closed the AC voltage will continue on to the T1 transformer. Because there can be two different hook ups there is a connector (J9) supplied that is to be used for the "floating" Primary Transformer wire (s). In other words, when the machine comes from the factory the #3 wire will be connected to S1 and the two #2 "floating" wires will be connected to J9 on top of the transformer to isolate them from the rest of the unit. If the unit needs to be change then simply reverse the #2 wires with the #3 wire.

Secondary of T1

Immediately after closing the power switch, the incoming AC voltage will be stepped down through the Main Transformer (T1). There are three different sections or voltages that are supplied from the secondary.

Fan Circuit

The first section is the Fan circuit. The simply uses a 115 VAC supply from T1 to operate the Fan. The Fan should come on as soon as the S1 power switch is closed.

Output Circuit

The second section is the main power circuit. This section supplies approximately 25 VAC to the Anodes of CR1 and CR2. This section also supplies the 25 VAC to the PC Board.

This voltage serves two purposes on the PC Board:

- 1) It's the voltage supply for the board. Used for : powering the IC chips, wire feed speed, voltage control, gate signal, and the motor supply voltage.
- 2) It's also used as the clocking signals. The clocking signals help the board determine when to fire the SCR's.

The AC voltage is rectified to DC voltage after going through the power diodes (CR1 & 2). Following the diodes is CR3 which is an SCR (Silicon Controlled Rectifier). This means that the DC current will not flow until the SCR's gate lead receives a DC signal from the 204419A PC Board. C1, C2, & C3 are suppression capacitors which help eliminate (block), damaging, reverse current from going back through the diodes and the SCR.

After the SCR receives the signal it will conduct to allow the current to flow through the output choke and return through R2 and the center tap E1/S2 of T1. L1 will provide filtering for a smooth DC output. Working with the choke are a bank of capacitors (C4,C5, & C6). These capacitors provide additional filtering. C7 is another suppression cap. used to block the DC current from going through the capacitors in the wrong direction. R1 is the bleeding / preload resistor. This resistor will allow the capacitor bank to discharge (about 10 sec's) after the current stops (Gun Switch is opened). This resistor also provides a path for current to flow when the machine is not under load (welding). This is the Open Circuit Voltage, 28V DC, that can be checked from the (+) to (-) terminals when the Gun Switch is closed.

A shunt resistor (R2) is in series with the output circuit. This device is used to provide a voltage drop which is supplied to the PC board. This voltage drop is in the millivolt range. On the PC Bd. this voltage will be compared to the preset value supplied by R3 (voltage control pot.). The PC board will then fire the SCR at a different time in order to increase or decrease the output voltage level.

Output Circuit - Cont'd

The small voltage drop is also used to limit the current output of the machine to about 180-190 amps. This is done through a summing amplifier on the PC Bd. If VR3 gets too high the board will stop firing the SCRs. This will help if the machine's output is put under a dead short to save the transformer from burning up.

Gun Switch Circuit

The third section is a 24 VAC supply that is used for the Gun Switch. When the G.S. (J7) is closed the 24V circuit will do a couple of things.

The 24 VAC will go across L1 (gas valve) to energize it and allow the gas to flow.

This voltage is also used on the PC Bd. It's applied to J3-1 & 2. K1 relay on the board will close when the G.S. is closed. This will send the appropriate signals for the PC Bd. to start the firing signals & wire feed motor.

Wire Feed Motor Circuit

This circuit will not function until the Gun Switch is closed and the K1 relay (on the board) closes. Once these requirements are met, the PC Bd. will take the WFS control circuit voltage, which is adjustable through R4, and send it out to the motor (B1). The WFS voltage is translated by a modulation device to take a small voltage to turn it into a higher voltage in order to run the motor.

In series with the WFS motor is a 4 amp circuit breaker - CB1 (resettable push-button) that will trip when excessive current is drawn across the motor due to the motor locking up, or something similar.

Options

There is an optional spot and / or burnback timer available with this unit.

If it is not installed then there is a jumper wire that connects J8-4 to J8-5. This wire will allow the G.S. circuit to function. If the jumper is not installed, or is cut, the unit will not operate without the timer board.

If the timer board is installed the jumper wire must be cut. This will allow the timer board to operate correctly.