

## IX. Trouble/Fault Diagnosis (after successful installation)

The ZENA mobile welding system has been designed to be very simple to use. In addition, no expense has been spared to insure that it is also an extremely reliable and long lasting product.

However, should you have any problems with your system, the information below will help you to use built-in fault diagnosis tools to isolate and (often) to solve the problem that you are having.

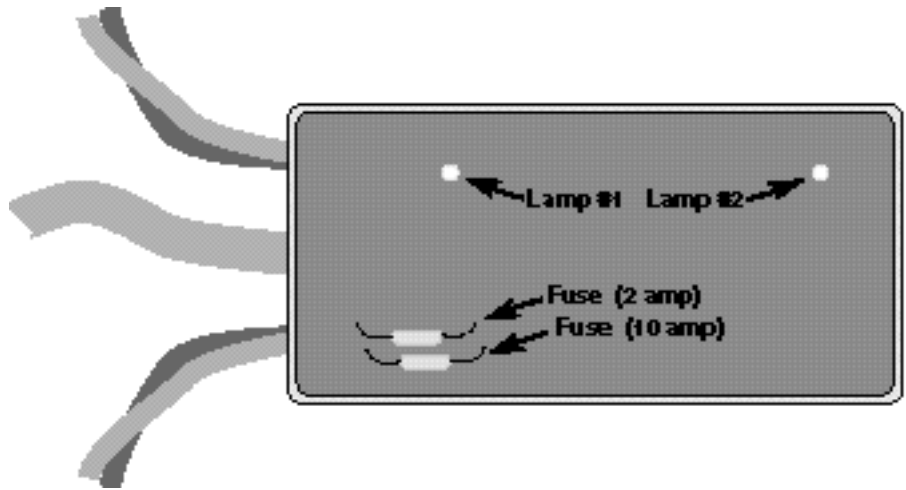
Please note that the following procedure assumes that a successful installation of the equipment has occurred and that the equipment was working properly after the installation was completed.

### A. Welding Control Module

#### 1. Control Models WC.12 & WC.24 -- Location of Internal Indicators and Fuses

By removing 4 screws, the cover of the Control Module that is mounted on the Welding Power Generator can be removed.

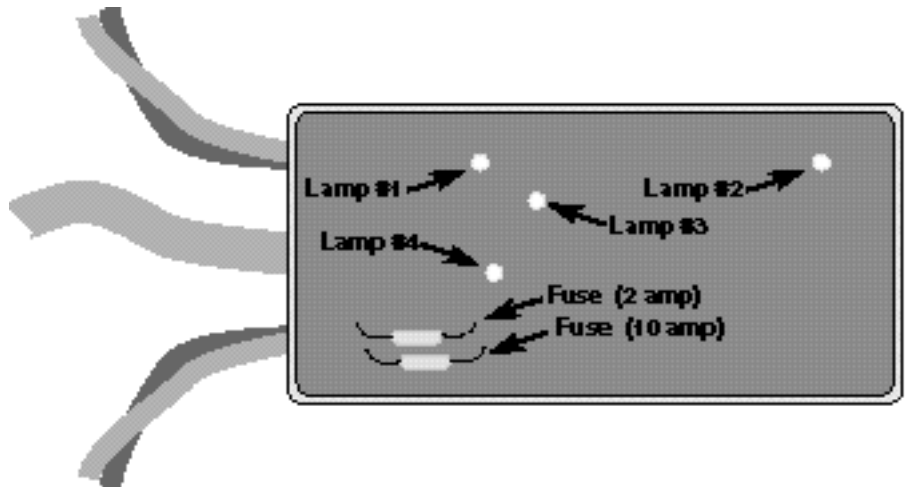
Once the cover has been removed, you will see the objects shown in the drawing to the right. The two indicators which are labeled Lamp #1 and Lamp #2 will be used in the system fault diagnosis steps that follow



#### 2. Control Models WC.12RO & WC.24RO -- Location of Internal Indicators and Fuses

By removing 4 screws, the cover of the Control Module that is mounted on the Welding Power Generator can be removed.

With the cover removed, you will see the objects shown in the drawing to the right. The four indicators which are labeled Lamp #1 through Lamp #4 will be used in the fault diagnosis steps that follow.



## B. Welding Power Problems

### 1. Welding Power is ADJUSTABLE but power output is LOW<sup>15</sup> OR power output drops off immediately after striking an arc.

- 1.1 Insure that your drive V-belt is the right size, undamaged, properly tightened, and is not slipping. A slipping belt is sometimes hard to detect, but it will **always** cause the belt **and** the pulley to become very hot. Belt slipping will often occur just after an arc is struck, **or** when welding power is increased to higher settings.

Test for belt slip by using a wrench on the power generator's pulley bolt to try to rotate the power generator in a CW direction. It should be quite difficult to turn using moderate to strong hand pressure. Often a small engine will "turn over" before any belt slip will be noted. If any slippage is noted, the point of failure will be easy to determine.

If a problem is found, correct the problem<sup>16</sup> and re-test the system. If no problem is found, go on to the next step.

- 1.2 Make sure that you are using the correct engine speed for welding. During welder installation and set-up, the proper engine speed for welding should have been determined and the welder tested for proper power output at this speed.

If the speed is too slow you will have low (or no) power. If the speed is much too high, belt slipping may occur -- resulting, also, in a low (or no) output.

Check and re-adjust engine speed if necessary -- see "Determining Proper Operating Speed" in Section VII. (Installation Notes).

If a problem is found, correct the problem, and re-test the system. If no problem is found, go on to Part 2, "Welding Power is NOT Available", below.

### 2. Welding Power is NOT Available

- 2.1 Insure that drive belt is correctly installed and that it is properly tightened. If a problem is found, correct the problem and re-test the system. If no problem is found, go on to the next step in this section.
- 2.2 With the engine OFF, open the Control Module and Observe Lamp #1 (shade from direct sunlight). If Lamp #1 is NOT illuminated, go on to the next step. If Lamp #1 IS illuminated, go to step 2.6
- 2.3 Check the connection of the red and black wires that provide power to the Module. The red wire should be connected to a source of 12 volt (or 24 volt) power. Check that power is present, and that no external fuse is blown" using a meter or test light. The black wire should be connected to the vehicle's chassis ground. Use your meter to insure that a proper electrical connection to chassis ground exists. If power and ground connections are OK, but Lamp #1 is still not illuminated, go on to the next step. If you found and corrected an improper connection, and if Lamp #1 is now illuminated, go to step 2.8

<sup>15</sup> Proper power output can be checked by making a test weld on a 1/4" thick piece of clean scrap material, using a type 7018, 6011, or 6013 1/8" welding rod. The arc should start easily as the electrode is "scratched" along the surface, and an acceptable welding bead with good penetration should be made with a Power Control setting of 2/3 to 3/4 of maximum.

<sup>16</sup> If belt is undamaged, tighten. If belt has become glazed, or if belt is delaminating, or if belt shows physical damage, the belt should be replaced. In extreme cases, the surface of the power generator's drive pulley may become glazed, or other wise damaged. In this case, drive pulley should also be replace.

- 2.4 The Module's internal solder-in fuses are covered with a silicone adhesive/sealant. Carefully remove the silicone to expose the fuse leads. Then, using a test lamp or a volt meter **with a sharp test probe end**, check for the presence of power at the end of the 2 amp. fuse which is closest to the point where wires enter/exit the Control Module. The 2 amp. fuse (one of two fuses in the Control Module) is the "top" or upper fuse when viewing the Control Module from above, with the wires going to and from the Control Module on the viewer's left. (SEE CONTROL MODULE DIAGRAM ON PREVIOUS PAGE) If you do not have a test lamp or meter, go to step 2.9.
- If power is **not** present at the end of the 2 amp. fuse, power is not getting to the Control Module. In this case, it is likely that a problem exists at the point of connection between the red wire extending from the Control Module and the red wire which is connected to the vehicle's electrical system. Check wiring.
- If the wiring is OK, the internal wiring of the Control Module may be at fault. Check for continuity between the red wire extending from the Module and the end of the 2 amp. fuse closest to the point where wires enter/exit the Module, with your meter. If the circuit is "open", the Module will need to be returned for repair or replacement. Go to step 2.9. If the circuit is "closed" ("0" ohms), a fault in the supply wiring exists -- carefully recheck wiring (red/supply wire) and all connections.
- If you found and corrected an improper connection, and if Lamp #1 is now illuminated, or if you measure +12V (or +24) at the fuse, continue.
- If power **is** present at the end of the 2 amp. fuse (the end **closest** to the point at which the connection wires leave the Control Module), check for power at the other end of the 2 amp. fuse (the end **furthest** from the point at which the connection wires enter/leave the Control Module). If power is NOT present, go on to the next step. If power **IS** present, go to step 2.6.
- 2.5 You have a "blown" 2 amp. fuse.
- This usually indicates a failure in the Control Module itself, OR that an improper input voltage (too high) has been present, OR that the red and black leads may have been misconnected (reversed).
- If you are able to solder, and if you have access to soldering equipment, you may choose to replace the fuse yourself, OR you can return the Control Module to us for repair. (Replacement fuses are available free of charge through our technical support department.) Go to step 2.9.
- 2.6 While observing Lamp #2 in the Control Module (and Lamp #3 -- if you have a WC.12RO or a WC.24RO Module), depress the Power Button on the Control Handle. Lamp #2 (and Lamp #3 for a "RO" type Module) should light and remain lit for as long as the Power Button is held down. You should also hear a very faint "clicking" sound coming from the Control Module. If Lamp #2 (and Lamp #3) is working properly, and if you are hearing the faint clicking sound, go on to the next step.
- If Lamp #2 **is not** working properly, AND if you **are** hearing the faint clicking sound, the Control Module is malfunctioning. Go to step 2.9.
- If you have a type "RO" Module, and if Lamp #2 **is not** working properly BUT Lamp #3 **is** working properly, AND if you **are** hearing the faint clicking sound

you have a “blown” 10A fuse -- and/or a defective Control Module. Go to Step 2.10.

If Lamp #2 **is not** working properly, AND if you **are not** hearing the clicking sound, go to step 2.10.

If you have a type “RO” Module, and if Lamp #2 **is not** working properly BUT Lamp #3 **is** working properly, AND if you **are not** hearing the faint clicking sound, go to Step 2.10.

- 2.7 Check to insure that the Gray wires which connect the Power Control Module to the Welding Power Generator are properly connected to the Power Generator, that the connectors at the ends of the Gray wires are secure, and that the gray wires have not been damaged. Also insure that the Yellow wire (not used in most basic welder installations) is not short circuiting to chassis ground or to any other component. Also check and insure that the Yellow wire is not connected to anything other than to another Yellow wire from either a ZENA WC.12S Slave Control Module or a ZENA WC.VR Universal Voltage/Current Regulator. If any wires were not properly connected, correct the problem and go to step 2.8. If the wires were properly connected, it is likely that you have a defective Power Generator, go to step 2.9.
- 2.8 Congratulations, it is likely that you have successfully corrected your problem. Fully re-test your welding system to make sure.
- 2.9 You have a problem which requires the assistance of our tech support department (877-ZENA INC or 615-897-2011).
- 2.10 It is possible that an internal fuse has been “blown”.

The Control Module’s internal solder-in fuses are covered with a silicone adhesive/sealant. Carefully remove the silicone to expose the fuse leads.

Using a test lamp or a volt meter with a sharp test probe, check for the presence of power (12 volts or 24 volts) at the end of the 10 amp. fuse which is **farthest** from the point where wires enter/exit the Control Module. The 10 amp. fuse (one of two internal fuses in the Control Module) is the “bottom” or lower fuse when viewing the Control Module from above, with the wires from the Control Module on the viewer’s left. (SEE CONTROL MODULE DIAGRAM ON PREVIOUS PAGE) If you do not have a test lamp or meter, go to step 2.9.

If power **is** present at the end of the fuse, it is likely that the Power Control Module is defective. Go to step 2.9.

If power **is not** present at the end of the 10 amp. fuse, you have a “blown” fuse. A 10A fuse failure may indicate a possible failure in the Control Module itself, but more likely it is pointing to a component failure in the Power Generator, OR that the gray wires connecting the Control Module to the Power Generator may have been accidentally shorted to ground while connecting or disconnecting these leads with power “on” to the Control Module, OR that a voltage higher than 14.5VDC (or 29VDC in 24V systems) has been accidentally applied to the Control Module.

You can easily check for a component failure in the Power Generator by disconnecting the two Gray wires which are used to connect the Control Module to the Power Generator’s control terminals, and check in the electrical resistance between these control terminals with an ohm meter. A normal reading is between 1.4 and 2.4 ohms. If your meter shows a resistance of **less**

**than 1.4 ohms**, your Power Generator has a component failure, and must be returned for repair. Go to Step 2.9.

If the electrical resistance measured between the control terminals is **higher than the “normal” range of 1.4 to 2.4 ohms** (for example, 20 ohms or 30 ohms) it is an indication of grease or some similar material which has caused “fouling” coating of the brushes and or internal slip-rings. Cleaning can be accomplished in the field, if necessary, but is best done under factory conditions. Such cleaning, will be performed free of any labor charge, with charges only for return freight cost. Go to Step 2.9.

If your electrical resistance between the control terminals is correct, you should also measure the electrical resistance between either of the terminal and the case of the Power Generator. A normal reading is an “open” circuit (an infinite resistance). If your meter shows any measurable resistance, your Power Generator has a component failure, and must be returned for repair. Go to Step 2.9.

If all resistance readings at the control terminals are correct simply replacing the fuse in the Control Module will likely solve the problem.

If you are able to solder, and if you have access to soldering equipment, you may choose to replace the 10 amp. Control Module fuse yourself (replacement fuses are available free of charge through our technical support department), OR you may (providing you insure that 7.5 to 8A external fuse is installed and functioning in the supply circuit to protect the Control Module) solder a suitably sized wire across the 10A fuse leads (shorting the 10A fuse so that power may be transmitted across it), OR you can return the Control Module to us for 10A fuse replacement. (In this case, it may also be advisable to return the Power Generator along with the suspect Control Module for inspection and/or repair.) If you choose to return the Module, go to step 2.9.

If the fuse is replaced, AND if the fuse “blows” again -- AND if you are sure that the gray wires connecting the Control Module to the Power Generator have not been accidentally shorted to ground while connecting or disconnecting these leads (with power “on” to the Control Module), AND/OR that a voltage higher than 14.5VDC (or 29VDC in 24V systems) has not been accidentally applied to the Control Module, go to step 2.9.

### **3. Welding Power is Available BUT is Not Adjustable -- Control Models WC.12 & WC.24**

- 3.1 It is likely that either your Control Handle/Control Cable Assembly or your Power Control Module is defective.

**NOTE:** If you are using a cable extension, or a quick disconnect system, of any sort, with your welder, remove it temporarily to insure that the problem noted is not caused by a wiring fault in the cable extension.

You have a problem which requires the assistance of our tech support department (877-ZENA INC or 615-897-2011).

### **3a. Welding Power is Available BUT is Not Adjustable -- Control Models WC.12RO & WC.24RO**

- 3a.1 With the engine OFF, open the Control Module and observe Lamp #2 and Lamp #3 while holding the Control Handle Power Button “down” and rotating the Control Dial on the Control Handle.

If Lamp #3 changes in intensity while Lamp #2 does not, your Control Module is malfunctioning.

If both Lamp #2 and Lamp #3 maintain a constant light intensity, the Control Handle Assembly is malfunctioning.

**NOTE:** If you are using a cable extension, or a quick disconnect system, of any sort, with your welder, remove it temporarily to insure that the problem noted is not caused by a wiring fault in the cable extension.

You have a problem which requires the assistance of our tech support department (877-ZENA INC or 615-897-2011).

**4. Welding Power Boost is Not Working and All Other Welding Functions are OK**

4.1 It is likely that your Control Handle is defective.

You have a problem which requires the assistance of our tech support department (877-ZENA INC or 615-897-2011).

**5. Welding Power is on CONTINUOUSLY -- Control Models WC.12 & WC.24**

5.1 Temporarily disconnect the plug that is used to connect the Control Handle/Control Cable Assembly to the Power Control Module. If welding power is no longer available, go on to the next step.

If welding power is still continuously available, go to step 5.3.

**NOTE:** If you are using a cable extension, or a quick disconnect system, of any sort, with your welder, remove it temporarily to insure that the problem noted is not caused by a wiring fault in the cable extension.

5.2 It is likely that either your Control Module or your Control Handle/Cable Assembly is defective.

You have a problem which requires the assistance of our tech support department (877-ZENA INC or 615-897-2011).

5.3 It is likely that your Control Module is defective.

You have a problem which requires the assistance of our tech support department (877-ZENA INC or 615-897-2011).

**5a. Welding Power is on CONTINUOUSLY -- Control Models WC.12RO & WC.24RO**

5a.1 Temporarily disconnect the plug that is used to connect the Control Handle/Control Cable Assembly to the Power Control Module. If welding power is no longer available, go on to the next step.

If welding power is still continuously available, go to step 5.3.

**NOTE:** If you are using a cable extension, or a quick disconnect system, of any sort, with your welder, remove it temporarily to insure that the problem noted is not caused by a wiring fault in the cable extension.

5a.2 Reconnect the plug used to connect the Control Handle/Control Cable Assembly to the Power Control Module.

With the engine OFF, open the Control Module cover, rotate the Power Control Dial on the Control Handle/Control Cable Assembly to its full counter clock wise position (CCW), turn on power to the Control Module and observe Lamp #2 and Lamp #3.

If Lamp #2 is illuminated and Lamp #3 is not, go to step 5a.3.

If BOTH Lamp #2 AND Lamp #3 are illuminated, go to step 5a.4.

5a.3 It is likely that your Control Module is malfunctioning.

You have a problem which requires the assistance of our tech support department (877-ZENA INC or 615-897-2011).

5a.4 It is likely that your Control Handle/Control Cable Assembly is malfunctioning.

You have a problem which requires the assistance of our tech support department (877-ZENA INC or 615-897-2011).

**6. Automatic Speed Control Stays at High Idle Constantly When Welder Power is ON -- Welder Operates Normally -- Control Models WC.12 & WC.24**

6.1 With the engine ON, temporarily disconnect the green wire that is used to connect Power Control Module to the Speed Control Vacuum Switch, turn on power to the Control Module, and observe throttle control actuator.

If engine speed stays at high idle it is likely that the Vacuum Switch is malfunctioning. Go to Step 6.2.

If engine speed returns to low/normal idle it is likely that the Control Module is malfunctioning. Go to Step 6.2.

6.2 You have a problem which requires the assistance of our tech support department (877-ZENA INC or 615-897-2011).

**7. Automatic Speed Control Will NOT Increase Engine Speed -- Welder Operates Normally -- Control Models WC.12 & WC.24**

7.1 With the engine ON, disconnect the green wire that is used to connect Power Control Module to the Speed Control Vacuum Switch, turn on power to the Control Module, and observe throttle control actuator while temporarily grounding the green wire which goes to the Vacuum Switch.

If engine speed stays at low/normal idle it is likely that the Vacuum Switch is malfunctioning. Go to Step 7.2.

If engine speed goes to high idle it is likely that the Control Module is malfunctioning. Go to Step 7.2.

7.2 You have a problem which requires the assistance of our tech support department (877-ZENA INC or 615-897-2011).

**C. Mechanical Problems**

Symptom	Likely Problem
V-belt squealing	Belt loose OR worn out
V-belt and/or pulley attached to the Welding Power Generator gets very hot	Belt mis-aligned OR too tight OR too loose
Mechanical noise is heard continuously	Mounting bracket loose or misaligned
Mechanical noise is heard only when welding	Mounting bracket loose or misaligned or defective Welding Power Generator
When the engine is running, excessive vibration is felt at (or in) the Welding Power Generator.	Mounting bracket loose or misaligned
Excessive vibration is felt at Welding Power Generator ONLY when welding power is being generated	Mounting bracket loose or misaligned or defective Welding Power Generator



## **X. If You Need Help/Support**

We want you to get the most from your new welding equipment. To this end, we are committed to providing you with whatever support you may need (starting with this manual) to insure that when you are done with your installation your new equipment will be perfectly installed and ready to provide you with the best welding experience of your life.

A number of different support avenues are available to you:

### **A. The Internet -- [www.zena.net](http://www.zena.net)**

Our web site is available 24 hours a day and contains our most up-to-date product information, photos and descriptions of typical installations, and other technical information that may be of assistance to you. If you have access to the web, log on to our site and browse before you begin your installation. A good starting point is our web site map:

**<http://www.zena.net/htdocs/Map.shtml>**

### **B. E-Mail -- [support@zena.net](mailto:support@zena.net)**

Feel free to send us e-mail at any time. We make every effort to answer all e-mail within 24 hours.

### **C. Fax -- 615-897-2023**

Feel free to send us a fax at any time (include pictures and/or diagrams if possible). We make every effort to answer all correspondence within 24 hours.

### **D. Mail**

ZENA, Incorporated  
Technical Support  
330 Club Springs Road  
Elmwood, Tennessee 38560  
U.S.A.

### **E. Telephone Support**

When all else fails, we can also provide you with help via telephone support. Telephone support is available during our normal business hours: 9:00 AM to 5:00 PM CST

Toll Free in U.S.A. --> 877-ZENA INC (877-936-2462)

Outside U.S.A. --> 615-897-2011

**NOTE:** We **do not** use inexperienced people who attempt to provide support by simply reading from a computer screen or a prepared script (our web site, and this manual, already contain everything that would be included in such a script). Instead, **all** of our support personnel are welders who have hands-on installation experience with our products.

However, depending on the time of day that you call, you may have to interact with our simple voice mail system, and wait for a call back, while we page the right person to help you. Should this occur, please accept our apologies.