Model JR-2
Current Interrupter

Operating Manual

(Revised August 19, 2011)

MC MILLER Co.

Catalog # 12830

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Warranty

M.C. Miller Co., Inc. warranties each new instrument manufactured and sold to be free from defects in material, workmanship, and construction except for batteries, which may be contained therein. When used in accordance with this Operating Manual the unit will perform to applicable specifications for a period of one year after shipment.

If examination by M.C. Miller Co., Inc. discloses that the product is defective, then its obligation is limited to the repair or replacement of the defective unit or its components at the option of M.C. Miller Co., Inc.

M.C. Miller Co., Inc. is not responsible for products, which have been subject to misuse, alteration, accident, or for repairs not performed by M.C. Miller Co., Inc.

Instruments must be returned properly packed with the transportation charge prepaid to:

M.C. Miller Co., Inc.

11640 US Hwy 1

Sebastian, Florida 32958

Return transportation charges will be F.O.B. factory. No parts shall be returned without prior authorization, which shall be furnished upon request.

The foregoing warranty constitutes M.C. Miller Co., Inc.'s sole liability and is in lieu of any other warranty of merchantability or fitness. M.C. Miller Co., Inc. shall not be responsible for any incidental or consequential damages arising from any breach of warranty.

General

The MCM Model JR-2 is a microprocessor controlled, high current interrupter featuring a high stability, temperature compensated time base. The JR-2 was specifically designed for the interruption of multiple rectifier cathodic protection systems in order to conduct synchronized instant off testing for extended periods.

Capabilities

The JR-2's capabilities include DC interruption in excess of 5 KW loads and AC interruption in excess of l0 KW loads (Reactive). Also, multiple unit synchronous operation is guaranteed for a normal five-day workweek. The JR-2 is sync and program compatible with all other models of the Model JR family of current interrupters.

Features

- Synchronization with any number of Model JR current interrupters;
- Five functions - programmable from the front panel keypad;
- Night latch - automatically stops relay in closed position when the **STOP SET** is programmed. The operation resumes when the **START SET** time is reached;
- Relay Condition - Displayed as **ON** or **OFF** along with a count down of time remaining in that condition;
- Start Condition - Switch is Closed now and re-defined To include **STOP SET** or **Night Latch;**
- Self Diagnostic - Automatically performs a system test at start up and displays **Pass** if the JR-2 is ready to proceed;
- An examination of the programmed parameters may

be done at any time by pressing the appropriate function key;

- Memory – The last entry made for each function is Remembered by the JR-2 . There is no need to re-program for each start up;
- Synchronization - Multiple units may be synchronized before or during operation;
- Re-synchronization – The JR-2 calculates when the relay should be switching, based on start time; This allows the re-synchronization of an existing unit or insertion of additional units during a test in progress;
- Charging System - A unique three-step system provides faster recharging, longer battery life, and temperature compensation. This allows for indefinite float charging during storage;
- State-of-Charge Indicator - This indicator changes from **RED** to **GREEN** when 100% capacity is reached;

Specifications

DISPLAY: 5-1/2-digit liquid crystal with battery and relay condition annunciators. Character height: .5 in. Operating temperature: -20 to +195 degrees F. (-30 to +90 C degrees.)

TIME BASE: 2 MHz Temperature Compensated Crystal Oscillator, 0.5 Sec. per 24 Hr.

KEYBOARD: Sealed, Tactile feedback, 16 key Arrangement: 5 function keys Time Set, Start Set, Stop Set (6) On cycle, Off cycle, 10 digit keys: 0- 9, 1 Enter Key: ENTER

CYCLE RANGE: .1 to 999.9 seconds, On Cycle and Off Cycle.

AUTO START: Start Set: Programmable delayed Start from 1 minute to 24 hours, in one-minute increments.

AUTO STOP: Stop Set (6). Programmable Stop from 1 minute to 24 hours, in one-minute increments
NOTE: Always stops with respect to "Start Relay" switch Position. *(Open or Closed)*

SYNCHRONIZATION: Multiple Unit capability, compatible with all JR versions.

ACCURACY: Typically less than +/- .5 sec. over 24 hours

RELAY: Normally Closed Mercury Plunger

MAXIMUM RATINGS: CURRENT -
100 A @ 48 VDC 100 A @ 120 VAC

MAXIMUM RATINGS: VOLTAGE -
30 A @ 240 VDC 40 A @ 600 VAC

BATTERY: Sealed, rechargeable, 12 Volt, 7 A.Hr

BATTERY LIFE: Is dependent on the interruption duty cycle. Examples:

4 sec On/1 sec Off: Lifetime = 50 hours

1 sec On/4 sec Off: Lifetime = 15 hours

Since power is required to hold the relay open in the case of the JR2, battery lifetimes will be shorter for longer Off time duty cycles.

SIZE: Exterior Dim. 10-5/8" x 9-11/16" x 6-7/8"

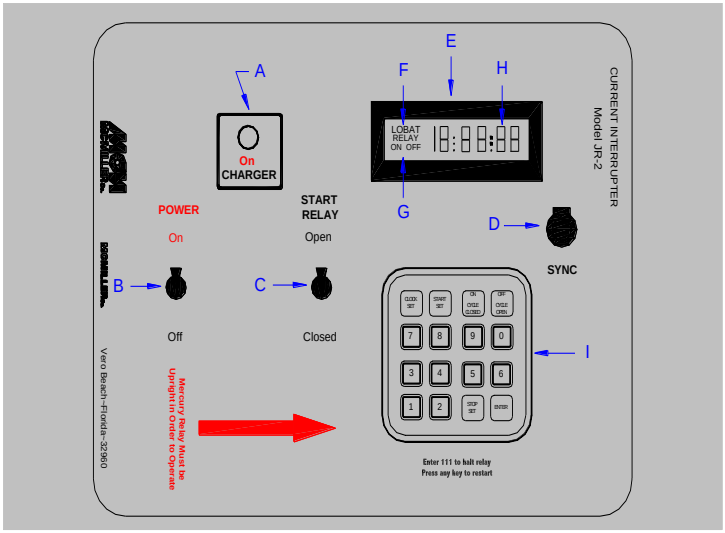
Metric Dim. 269.875 x 246.050 x 174.625 mm

WEIGHT: 14bs. Net weight. (6.4 Kg.)

NOTE: The JR-2 needs to be put in an **Upright Position** in order for the unit to Work. The Mercury Relay will not work if it is lying on its side. Once the JR-2 is programmed to the proper setting you wish to set, at that time you may set the JR in an Upright Position and press start set so it may operate correctly. The level should be at the TOP of the case.

Panel Controls

A. Battery Charging Indicator Light;
B. Power Switch;
C. Relay Starting Position Switch
D. Synchronizing Receptacle;
E. LCD Display Window;
F. Low Battery Indicator;
G. Rectifier Condition Indicator;
H. Display Area for Clock Time, Starting Time, Countdown Timing and Settings for ON Cycle and OFF Cycle;
I. Keyboard for Setting Times, ON Cycle, OFF Cycle and Activating Clock.



Operations Overview

A. Turn Power Switch "ON";
B. Select Start Relay is Closed (Also applies to Stop or Night Latch, i.e., Start Closed -Stop Closed;
C. Enter operating time requirements under the five function keys;
D. Synchronize all units to be used, to each other;
E. Install units in system to be tested to include: Observing polarity if DC is to be interrupted.

The JR-2 contains an EEPROM, which retains the last entry made under the five function keys. Factory testing will leave an existing program, which will be overwritten by the next entries.

The uses for the JR-2 are too numerous to list. The following examples will serve as both a set up (programming) and typical use guide. These examples assume instant-off testing of multiple rectifier cathodic protection on a structure.

Note: ALWAYS USE THE MILITARY TIME FORMAT WHEN ENTERING TIME DATA.

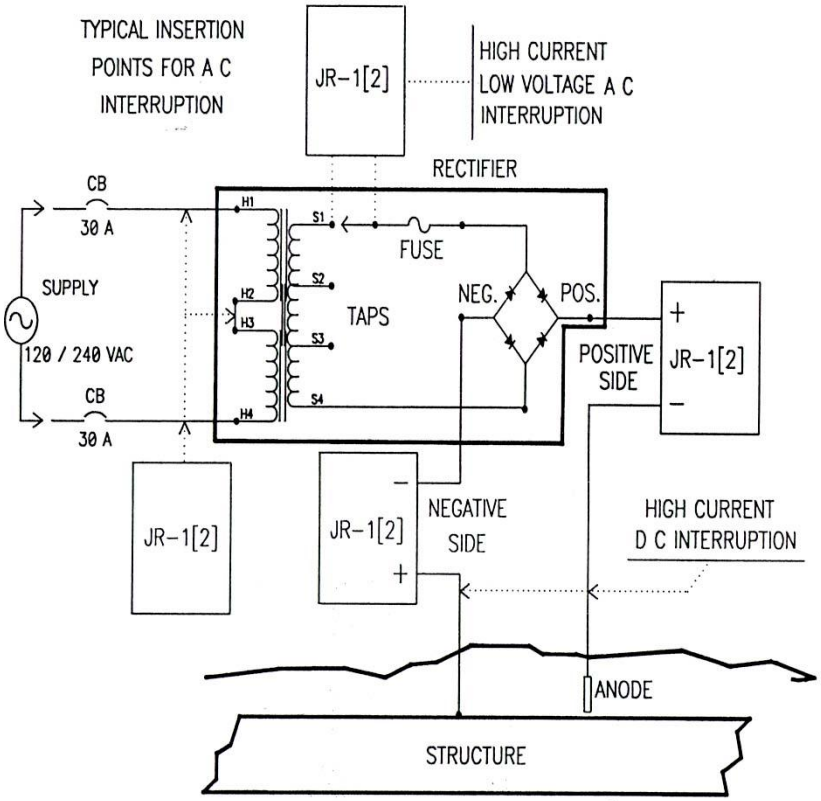
FOR EXAMPLE: 18:00 INSTEAD OF 6:00 PM

Installation of the Interrupter in the Rectifier

In general, it is physically easier to interrupt across the taps of the rectifier. In addition the tap location is best because breaking AC causes less wear on the relay. This is due to the AC crossing zero volts and extinguishing the arc, whereas DC depends on the distance of the gap to extinguish the arc. The next best location to interrupt is the AC power supply. The DC side may also be interrupted at the anode or structure leads (**+**) or (**-**) output of the rectifier.

When using the JR-2 to interrupt on the DC side, the indicated polarities should be observed to reduce wear of the plating on the plunger of the mercury relay.

Warning: Always observe the proper safety procedures when working on electrical equipment. Turn off all live wires before inserting the current interrupter.



Typical connections for MCM Model JR current interrupters.

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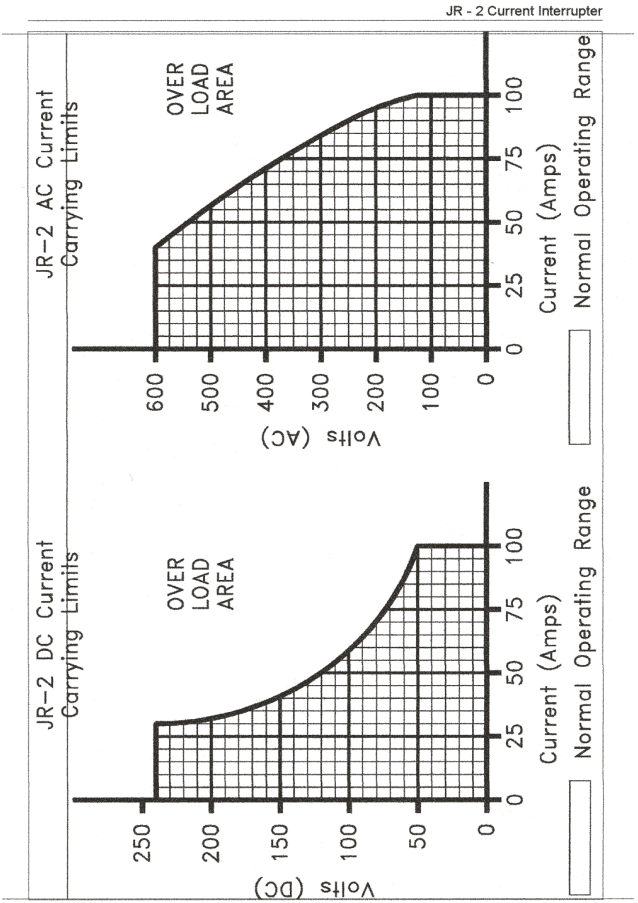
Instruments and Equipment for the Corrosion Engineer

AC/DC Current Carrying Limits



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Example 1: Delayed Start – Interruption Begins Later

The units will be put in place before the interruption cycle begins. In other words, the units will be synched *before* the **Start** cycle time has occurred

It is 7:00 in the morning and the JR-2's are in one location ready to be synched. They will be installed in the rectifiers before 8:00 am. At 8:00AM, the JR-2's will start their On / Off cycle and remain cycling until 5:00PM the same evening. At this time, the JR-2's will shut the relay and wait until 8:00AM the next morning before resuming interruption.

Test Requirements: On Cycle -2 seconds; Off Cycle -.5 seconds.

Work Schedule: Start at 8:00 A.M., Stop at 5:00 P.M., and repeat for XXX days, as necessary.

The present time is 7 :00AM

Procedure - All Units	**Display Reading**
1. Power Switch ON	PASS
2. Start Relay-Closed	PASS
3. Press START SET, 8,0,0, ENTER (8AM)	8:00
4. Press STOP SET (6),1,7,0,0 ENTER (5PM)	17:00
5. Press ON CYCLE, 2,0, ENTER (2 SEC.)	2.00
6. Press OFF CYCLE, 5, ENTER (0.5 sec)	.50

7. Interconnect "SYNC" jacks on all units, daisy chain fashion.

8. Press CLOCK SET, 7, 0,2 ENTER 7:02

9. When present time (your wrist watch) reads 7:02

   Press 'ENTER' once on one unit only 7:02

10. At 7:02, all units will begin running as evidenced by a flashing colon (:).

The sync cables may now be removed and the JR-2's distributed to their various locations for installation. Testing may begin at 8:00 A.M.

Example 2: Immediate Start – Cycle Begins Now

The JR-2's will be put in place after interruption cycle begins. In other words, the units will be synched after the **Start** cycle time has occurred.

It is 2:30 in the afternoon and the JR-2's are in one location ready to be synched. They will be installed in the rectifiers later. The JR-2's will start their On/Off cycle immediately and remain cycling until 5:00PM in the evening. At that time, they will shut the relay and wait until 8:00AM the next morning before resuming interruption.

Test Requirements: On Cycle -2 sec.; Off Cycle -.5 sec.

Work Schedule: Start 8:00AM, Stop 5:00PM, and repeat for XXX days, as necessary.

The present time is 2:30 PM

Procedure -All Units	Display Reading
1. Power Switch ON	PASS
2. Start Relay-Closed	PASS
3. Press START SET, 8,0,0, ENTER (8AM)	8:00
4. Press STOP SET (6), 1,7,0,0, ENTER (5PM)	17:00
5. Press ON CYCLE, 2,0, ENTER (2 sec.)	2.00
6. Press OFF CYCLE, 5, ENTER (0.5 sec)	.50
7. Interconnect "SYNC" jacks on all units, daisy chain fashion.	
8. Press CLOCK SET, 1,4,3,2. (2:32PM) (press ENTER)	14:32
9. When present time (your wrist watch) reads 2:32 Press 'ENTER' once on one unit only	14:32
10. At 14:32, all units will display	LOCh #

This is a countdown operation to show that the units are performing a calculation. When the calculation is complete, all the units will immediately commence cycling. Since the relays are now in operation, try to maintain them in an upright position during transport and installation.

Example 3: Extended Delayed Start (Next Day)

Test Requirements: Same as Example I.

Work Schedule: Testing to begin 8:00AM the next morning.

Present Time: 1:30PM

Procedure: With the following exceptions, follow Example 1.

	Display Reading
1. Press START SET, 3, 2, 0, 0, ENTER	32:00

In short, add 24:00 to desired start time, eg,

31 :00 would be 7:00 A.M. plus 24 hours = 31 :00

Miscellaneous Features:

If STOP SET is not desired, (continuous cycling), program STOP SET to an illegal time, eg, 24:01.

To create a '"MASTER" unit which never starts cycling, program "STOP SET' to equal "START SET'

Correcting Keypad Entry Errors:

Press "The letter **O** until display reads 00:00, then enter the correct numeric sequence.

EXAMPLE: 1,3,0 was entered for 1:30PM. Press the letter **O** four times, and then press 1,3,3,0 Enter. The correct entry reads 13:30.

Synchronizing a Model JR-2

Suppose there are five JR-2's in the field and one is accidentally turned off and needs to be restarted and resynchronized. All the units could be brought back to a single location, daisy chained together, and started as in example 2. This procedure will work, but is rather inefficient. Therefore, the JR-2's are constructed so that any one of the operating units may be used as a master to restart the failed slave unit. Simply take the slave unit to the working master location and follow the procedure below. The JR-2's automatically output a trigger pulse to the SYNC receptacle once a minute when running.

Procedure:

1. Turn the slave unit to be resynched OFF, and then ON.

2. Check or set the functions on the slave to the same as those on the master. Press the function key on both the master and the slave to display their settings.

    a. START SET;

    b. ON CYCLE;

    c. OFF CYCLE;

    d. STOP SET;

    e. START RELAY SWITCH CLOSED.

3. Press "CLOCK SET' on the slave and enter a time which is a minute or two ahead of the MASTER.

4. Press "ENTER" and then connect the SYNC cable when less than one minute remains between "CLOCK SET' and the time shown on Master Unit. Display the master time by pressing clock set on the master.

5. Remove SYNC cable when the display shows some activity, such as a flashing colon, or LOCh #.

6. The slave is now resynched and may be returned to service.

NOTE: The above method may be used to synch the JR-2's one at a time as needed. For example, there were 6 JR-2's to be installed over a long distance by one individual. One JR-2 could be started and kept in the truck as a master. At each location, a single JR-2 could be started and installed using the above method.

Maintenance

A few routine maintenance steps will insure the maximum life for your JR-2.

A. Maintain the battery in as near a fully charged state as possible;

B. Never operate the relay in a less than vertical position;

C. Observe polarity when interrupting DC;

D. Provide adequate ventilation when interrupting currents in excess of 20-25 AMPS.

Repairs

With the exception of the battery and the relay, there are no field replaceable parts in the JR-2. No one other than qualified electronic technicians should attempt servicing the JR-2. Contact the M. C. Miller Co., Inc. if a problem arises.

Low Battery Indication

When the battery has discharged to a factory-set level, a **LO BAT** indication will display in the upper left portion of the display window. Approximately two hours of operating time remains when the indicator displays.

Supply Voltage Selection (for charging and/or powering the unit)

For the JR2 model with the 3-pin socket mounted on the front of the unit (case handle side):

The input voltage (supply voltage) setting is established via the fuse selector by the customer. A small bag with the fuse and the fuse holder is attached on the outside of the case with instructions provided on how to position the fuse in order to establish a particular voltage setting.

For the JR2 model with the 3-pin socket mounted on the back of the unit:

Please see Appendix 1 below (pages 20-27) [How to change the voltage setting on the JR2's power entry module to match the supply voltage, and, how to replace the fuses]

Charging the Battery

A sealed lead acid gel-cell battery furnishes power for the JR-2.

The front panel indicator, displaying state-of-charge, will be RED during the charging stage. When the battery is fully-charged, the charging indicator will turn GREEN and remain GREEN through the float stage. Charging may take place during operation or storage, periodically, or on a continuous basis. If continuous charging during storage is performed, the circuit will automatically maintain a full charge, regardless of the temperature.

The battery charging time will depend on the status of the battery prior to beginning the charging process. Typical charging times (for GREEN light observation) are as follows:

Fully-discharged battery: approx. 11 hours

40% discharged battery: approx. 5 hours

As an example, the battery in a unit that has been run for a total of 16 hours in a 0.7sec ON/0.3sec OFF switching mode will be approximately 40% depleted and will require approx. 5 hours to re-charge to full capacity.

Replacement Parts

Battery 12 Volt, 7A.Hr	Part # BATOO8
Sync Cable Assembly	Part # SUBO26
3-Conductor Line Cord	Part # CONO14
Power cable Assembly	Part # SUB577

Appendix 1

How to change the voltage setting on the JR2's power entry module to match the supply voltage, and, how to replace the fuses

WARNING: Disconnect the external AC power supply before changing the input voltage setting or replacing the fuses

Changing the voltage setting to match the supply voltage:

Your JR2 current interrupter will have been shipped to you with an input voltage setting appropriate for your country. However, since it is extremely important that the input voltage setting match the AC supply voltage applied to the unit, for charging and/or powering purposes, it is critical that you check to make sure that the setting is correct for your application.

To do so, examine the panel directly above the 3-pronged socket. The input voltage setting will be indicated by whichever hole is occupied by the plastic indicator (100V, 120V, 230V or 240V).

If the input voltage setting is not appropriate for the voltage you will be supplying to the unit, please follow the instructions below to change to the correct setting:

Example: Changing from a 120VAC setting to a 240VAC setting.

The 120VAC setting is indicated in Figure 1.

Step 1: Gently pry open the panel door using a small flat

head screwdriver, as indicated in Figure 2. Insert the screwdriver into both slots in turn until the panel door pops open. The panel door can then be fully-opened, as indicated in Figure 3, by lifting the door at the far end (end furthest away from the 3-pin socket) and allowing the door to hinge as shown.

Step 2: Use pointed pliers to remove the printed circuit board (PCB) as shown in Figures 4 and 5.
In the current example, the clear plastic guide attached to the PCB points down to the 120V label on the PCB, as shown in Figure 6.

Step 3: Rotate the clear plastic guide, as shown in Figure 7, until the guide points down to the 240V label, as shown in Figure 8

Step 4: Re-install the PCB, as shown in Figure 9, making sure that the lettering on the PCB faces into the housing and the PCB is firmly seated.

In this example, once the panel door is firmly closed, the plastic indicator should now occupy the 240V setting hole, as shown in Figure 10.

Replacing the fuses:

Step 1: Gently pry open the panel door using a small flat head screwdriver, as indicated in Figure 11. Insert the screwdriver into both slots in turn until the panel door pops open. The panel door can then be fully-opened by lifting the door at the far end (end furthest away from the 3-pin socket) and allowing the door to hinge.

Step 2: Using the same small flat head screwdriver, remove

the fuse holder from the power entry module by inserting the screwdriver into one of the two rectangular holes in the fuse holder, as shown in Figure 12, and lifting out the fuse holder with an upward movement of the screwdriver.

Step 3: Turn the fuse holder upside down to reveal the set of two fuses, as shown in Figure 13, and replace the fuses as necessary (be careful not to break the retaining posts).

The fuses are 5mmx20mm, 250V/2A, fast-acting fuses, and these fuses protect the unit regardless of the input voltage setting (120V or 230V)

Note: Replacement fuses must have these same specifications.

Step 4: After replacing the fuses, re-install the fuse holder. *Note:* Make sure that the fuses are downward positioned so that the contact pins located at the bottom of the housing make contact with the fuse terminals – **the fuses should not be visible after re-installation of the fuse holder**.

Step 5: Close the hinged panel door and make sure that the door is firmly seated.

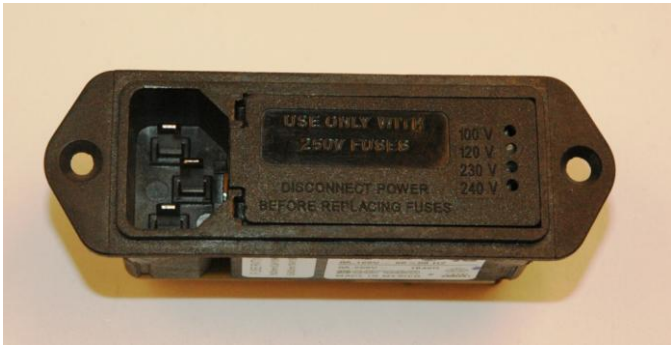

Figure 1

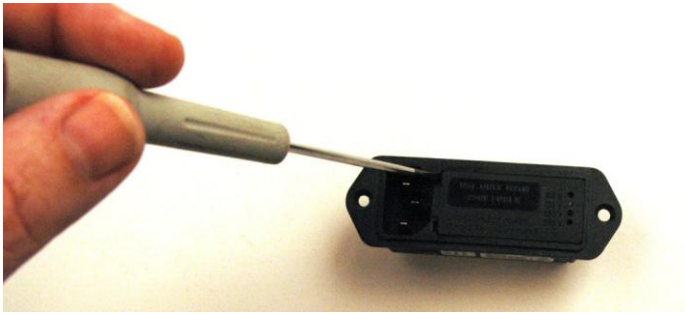

Figure 2

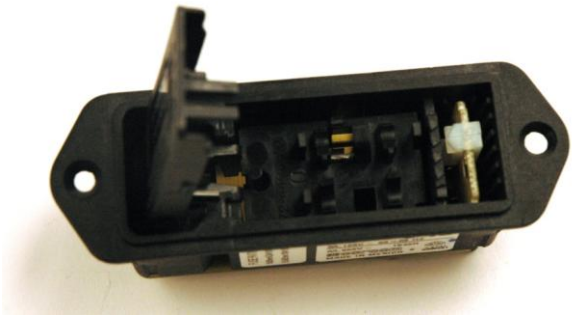

Figure 3

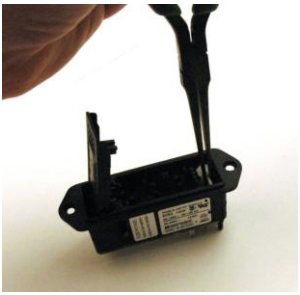

Figure 4

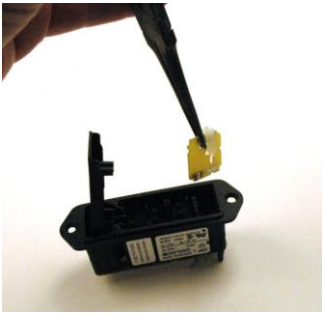

Figure 5

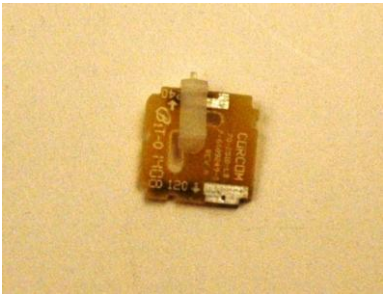

Figure 6

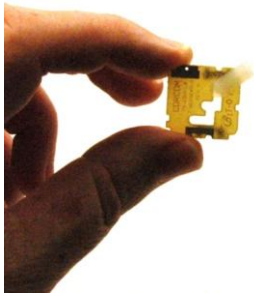

Figure 7

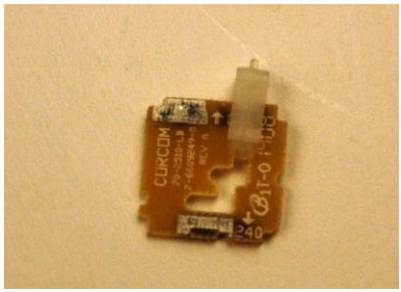

Figure 8

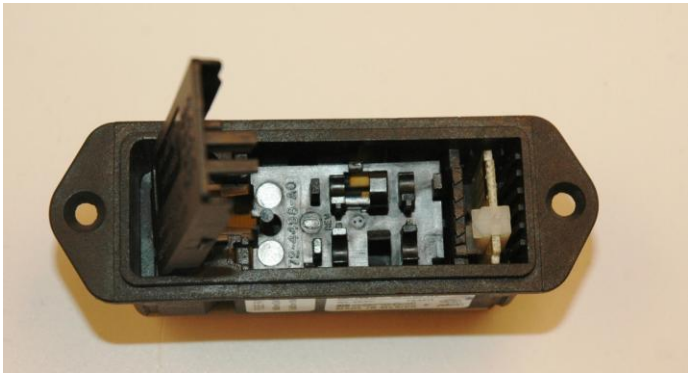

Figure 9

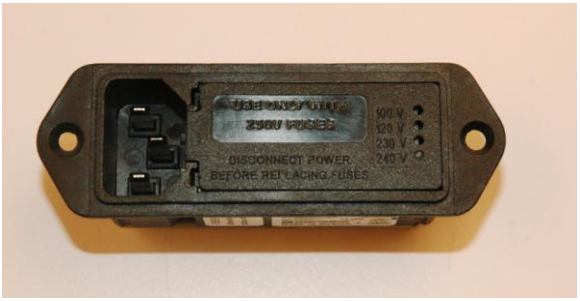

Figure 10

Replacing the Fuses:

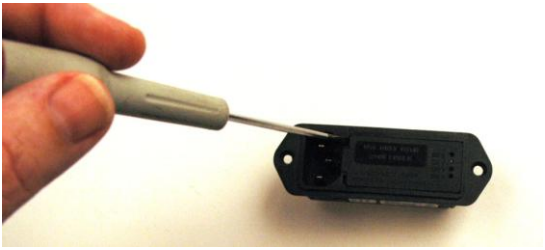

Figure 11

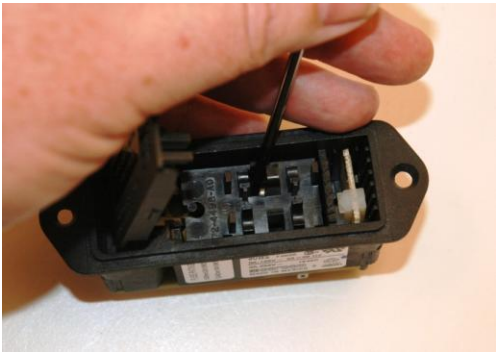

Figure 12

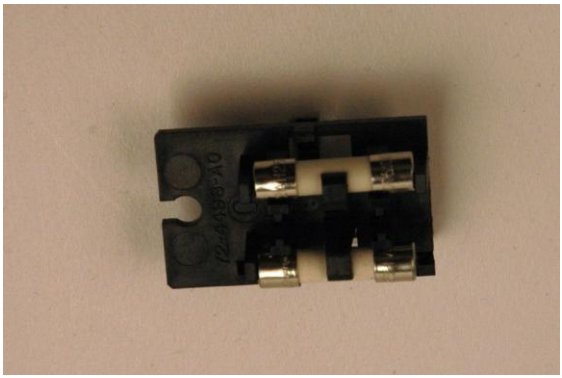

Figure 13