

**Knowledge Domain: Power Supply**  
**Unit: Regulator**  
**Skill: Adapting and Replacing Regulators**

**Tools and Parts Required:**

- 1) Digital multimeter (DMM)
- 2) Soldering iron
- 3) Desoldering braid (solder wick)
- 4) Desoldering bulb or solder sucker

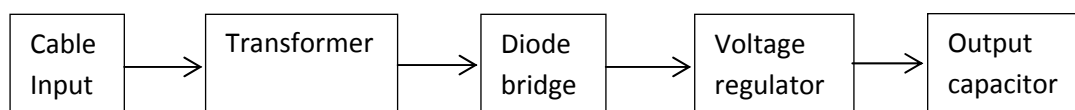
**Introduction**

A voltage regulator maintains a constant voltage level. Two common DC voltage regulators are linear regulators and switching regulators. Linear regulators continuously adjust to changes at the input to maintain a constant output voltage level. Switching regulators continuously switch the input voltage on and off to maintain a constant output voltage level. A third regulator is a shunt regulator. Shunt regulators begin conducting at a specified voltage and will conduct as much current as is required to maintain that specified voltage. This skill will discuss linear DC voltage regulators.

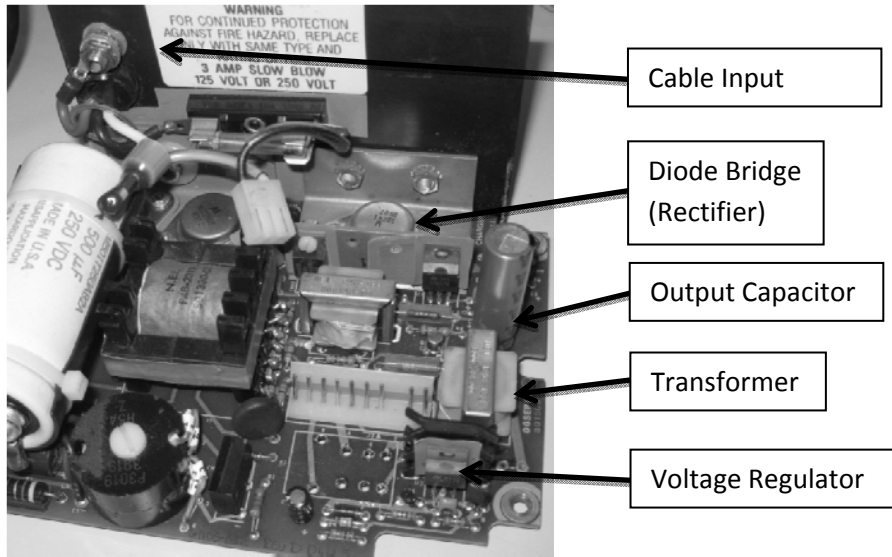
Linear DC voltage regulators are often attached to a heat sink. The heat sink absorbs heat generated by the voltage regulator. The absorbed heat is transferred to the air. A small sheet of mica may be inserted between the voltage regulator and the heat sink to provide electrical insulation. Remember to reinsert this mica sheet when replacing the voltage regulator. Heat-conducting paste may be used to improve the flow of heat from the voltage regulator to the heat sink.

**Example**

Linear voltage regulators are packaged as integrated circuits. Linear voltage regulators may be small and often resemble other parts. To find the voltage regulator, begin at the power input to the device. Follow the chart below to find the voltage regulator. There may be extra components along the path due to varying power supply designs.



Insure the part you see is a linear voltage regulator by looking up its part number (usually printed on the side of the part) on the internet.



## Identification and Diagnosis

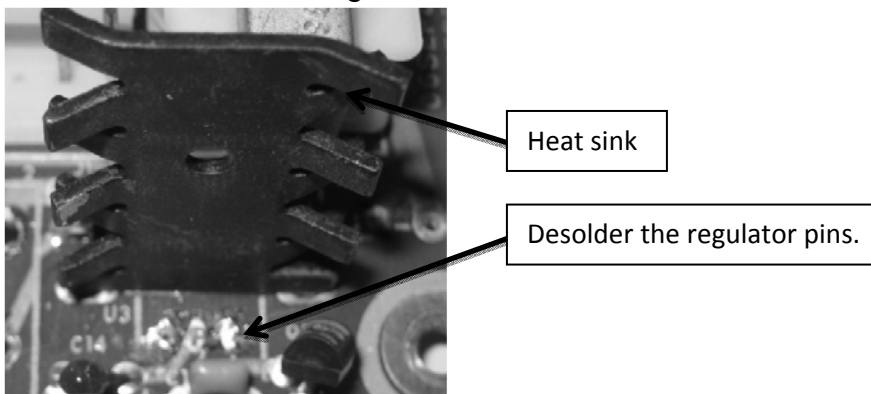
Identify a faulty voltage regulator as described in the BTA skill *PowerSupply-Regulator-Diagnosing*.

Replace a broken voltage regulator. The replacement regulator must be exactly the same part as the original regulator. Do not use a voltage regulator that has a different part number than the original regulator.

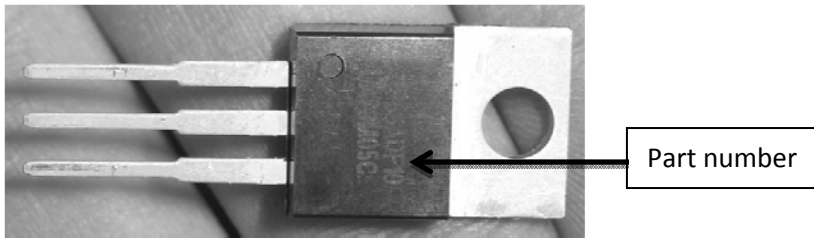
## Procedure

The following procedure can be used to replace a voltage regulator.

1. Free the regulator pins by desoldering them. See the BTA skill *Electrical-Connections-Desoldering* for instructions on how to do this.

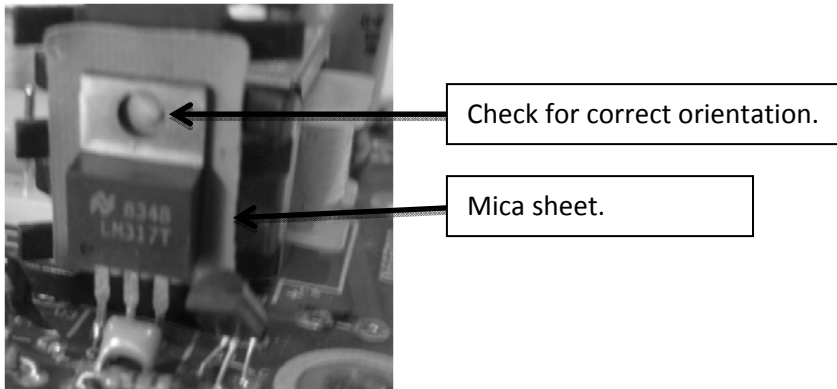


2. Remove the regulator and mica sheet from the board. Obtain a regulator with the same part number. The regulators must be the same size. Set the mica sheet aside.

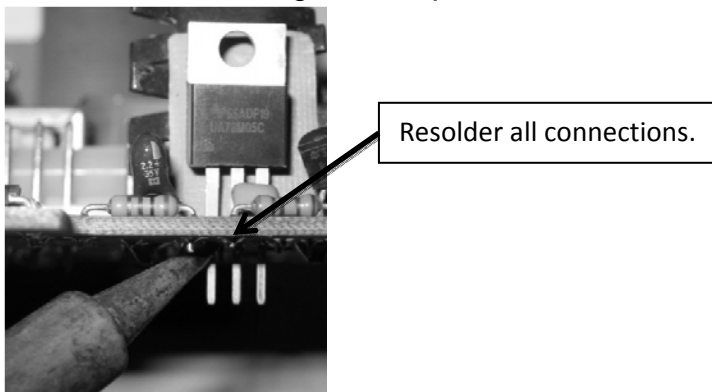


One example of a linear voltage regulator

3. Place the new regulator in the board. Insure that the orientation and placement of the new regulator is the same as the original regulator. Place the mica sheet back in the original position.



4. Resolder the new regulator in place. Restore all connections.



5. Test the device by turning it on. Verify that the device functions properly.

## Exercise

Obtain a device with power supply and a linear regulator. Remove the voltage regulator and re-solder it in place again. Verify that the device works after replacing the regulator. Your instructor must verify your work before you continue.

## Preventative Maintenance and Calibration

Always calibrate every medical device before returning it to use.