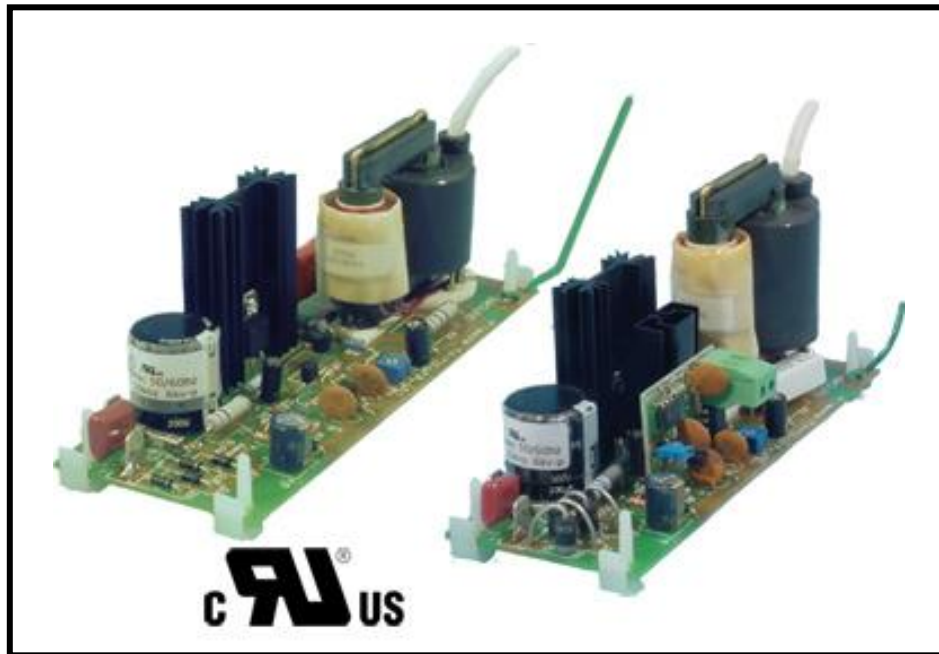


Plasma Technics Inc.

PTI

INSTALLATION & OPERATION MANUAL ET & ETI SERIES



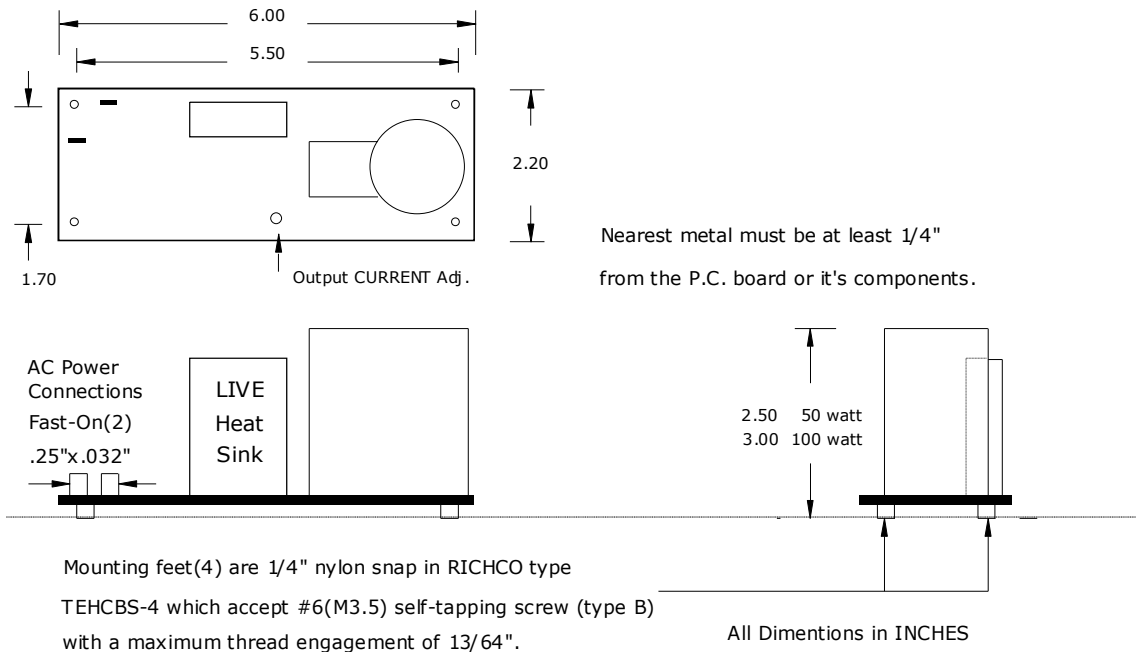


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APPNOTE ET11 v002
Electronic Transformer Application Notes
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ET & ETI Series Application Notes



Background

The ET series electronic transformers are capable of driving a wide range of loads. They can be used in applications such as: Corona Discharge Ozone Generation, Electrostatic Power Supplies, Static Eliminator Supplies, Corona Treatment Supplies, Eximer Lamp supplies, Oxygen Therapy and other Medical uses.

The ET's frequency is fixed at approximately 20khz. This frequency is affected only in a minor way by changing line voltage, current adjustment and load. The current adjustment has only a minor affect on output voltage, it sets output current and therefore power.

The ET series will automatically handle all variations of fault conditions from arcing caused by cell failure to shorted output and even an unloaded secondary. In the case of an output short the ET essentially reduces its input power to a few watts while testing the load several times per second. When the short is removed normal operation is immediately resumed automatically.

The ET series contains compensation circuits that will automatically compensate for line voltage changes such that an increase in line voltage will result in a linear increase in input power. A normal transformer under the same circumstances will generate a square law change in power with a linear increase in line voltage. Therefore the ET provides a less radical ozone output changes as line voltage changes.

Every output pulse has its current value controlled by the ET's current monitor.

ETI series with 4 - 20ma Interface for Remote and PLC Control

If remote control adjustment is desired, the ETI series option utilizes an OPTO coupler for maximum isolation and equipment protection. Simply connect the control loop to the screw terminals of the connection block. The input is polarity sensitive. Connect the **negative to the right terminal** and the **positive to the left terminal**. If a mistake is made the unit is polarity protected and will not operate. The interface is factory jumpered with 2 small computer type jumpers. When they are installed the ETI operates normally in that the control pot controls the output current and the interface is in operable.

With the **both jumpers removed** the **4-20ma interface is active**. 0 to 15vdc can also be used. Observe the marked polarity. **Note: at a current below 2ma (or about 3vdc) the ETI will be shut off by the interface.** When used with the interface active turn the adjustment pot located on the main printed circuit board **full clock-wise**. If desired this pot can also be used to set the maximum output.

1. To do so, adjust the 4-20ma current source (or voltage source if used) to the maximum expected value.
2. Adjust the control pot to achieve the desired maximum power line input current.

If the need to remote operate the pot involves simply front panel control the two options are available. PTI can install a pot with an extended shaft, either right angle or straight. The customer can remote wire a pot of equal value with wire lengths not exceeding 3".

It is also recommended that a minimum of 1/4" of space be provided around the edges of the circuit board as well as the transformer cores and heat sink. Any ferrous metal located near the transformer cores will absorb power from the ET by inducing energy into the metal. If space is available, best to use it near the transformer.

Load Sizing

The process of selecting and optimizing a generator cell can be simplified by following these few basic steps.

1. **Determine if ET output voltage is within range of ozone cell needs.** Use Variac fused to a value of 2 or 3 amps (fast). Measure the AC input current with an ammeter between the Variac and the black input spade terminal. Connect the white directly to the line white. **The green wire on the ET must be connected to service green and the ozone generator cell.**

Input current limits are:

50 watt ET106051 = .65a max.

100 watt ET106101 = 1.3a max.

Wattage can be either measured or estimated using the generally accepted premise for DC supply devices which is:

$$\text{Watts} \approx (\text{Volts} * \text{current}) * .65$$

$$\therefore (120\text{v} * .65\text{a}) * .65 = 50.7 \text{ watts}$$

Increase the Variac while observing input current so as to not exceed the current limits specified once full rated line voltage is reached (i.e. 120v), if the input current is less than the maximum then the current control potentiometer can be used to increase (or decrease) to a desired level.

Now reduce the Variac such that the input current falls off sharply. This will be the point the ozone cell is substantially dark. Now increase the Variac until the cell snaps back into operation. Note the line voltage. Generally this point should be in the range of 75-90 volts. ***A value less than 75 would indicate that the ET's high voltage output is too high for the cell.*** This situation will produce increasing and perhaps excessive heating of the transformer and power transistor (located on large heat sink). Be careful not to touch any circuit elements while the ET is operational as the circuit operates at line voltage potentials and a dangerous shock will result. The transformer can operate at fairly high temperature safely. Typically one can expect the free air core temp to be 130-150°F. The large power transistor heat sink should be much lower – in the range 100-120°F. A better voltage match can be accomplished in one of two ways; PTI provides an ET with lower output voltage or the ozone cell gap is increased.

If the line voltage is **above 95** then the ET's output voltage is too low for the cell and a greater high voltage level is required. This can be remedied in one of two ways; PTI provides an ET with greater secondary potential or the ozone cell gap can be reduced.

2. **Determine that cell loading is in a linear operating range for the ET.** Adjust the Variac to normal ET rated line voltage. Set the current control on the ET to the full CCW position (min) being careful not to touch any other components. Now increase the current control CW while observing the input current meter. The current should increase as the control is increased. If the current begins to decrease at a point while the control is being increased, the ET is seeing a cell load that is excessive.
3. **Determine if the cell capacitance is within range.** With the line voltage at rated and the current set to the desired level, sweep the Variac from 95-125v. Normally the corona produces a ‘hissing’ sound because the frequency of operation is above human hearing level. If the ET and cell begins to squeal then the unit is on the verge of shutting down due to an excessively capacitive load. This condition will not harm the ET but should be corrected by reducing the cell capacitance. Usually this means that the square inches of load surface is too large and should be reduced.
4. **Ozone Cell (Generator) Suggestions.** Given the inherent uniqueness of a particular cell design the following parameters are only suggestions. Air gap 0-.5mm, Dielectric .5-1mm, and cell surface area 4-6 sq inches. Effective operation at 20khz requires the cell to be properly cooled. It is also beneficial to use low dielectric loss tangent material.

UL Required Markings. UL requires a marking on the final product in the vicinity of the large black heat sink, the following: “CAUTION – Hazard of Electric Shock. Heat Sink is Live. Disconnect Power Supply Before Servicing.” Caution at least 1/8” high, remaining letters at least 1/16” high.

PTI Transformer Limited Warranty

The PTI Transformer is warranted by Plasma Technics, Inc., to the original purchaser to be free from defects in material and workmanship under normal use and service for a period of **One (1) year** from the date of purchase under the following terms and conditions:

The obligation of Plasma Technics, Inc. is expressly limited to repairing or replacing, at the option of Plasma Technics, Inc., any PTI Transformer returned to it during the warranty period, which is determined by PTI to be defective in material or workmanship.

Any improper use /operation or installation other than in accordance with the published application materials, instructions and specifications established by Plasma Technics, Inc. shall void this warranty.

The obligation of Plasma Technics, Inc. Shall not include any transportation charges, costs of removal or installation, labor charges or any direct, indirect, consequential or delay damages.

Attachment or use of components or accessories not compatible with the PTI Transformer shall void this warranty.

Any alteration not authorized by Plasma Technics, Inc. in writing, accident, misuse, abuse or damage to the PTI Transformer shall void this warranty.

The transformer subject to this warranty is not warranted as suitable for any particular purpose or use of the purchaser. The suitability of any PTI Transformer for any purpose particular to the purchaser is for the purchaser in the purchaser's sole judgment, to determine. Plasma Technics, Inc. assumes no responsibility for the selection or furnishing of a transformer suitable to the purchaser's needs or the purposes of any particular purchaser.

This warranty is in lieu of any other warranty express or implied, including specifically but without limitation warranties of merchantability or efficacy and of all other obligations or liabilities in connection with the sale or use of the PTI Transformer.