BTU/H Calculations for Power Supplies

There is a growing need to understand and quantify the amount of heat generated by power supplies. This application note explains how to convert power in terms of Watts or HVAC, which is the terminology used in the Power Supply industry into BTU/H which is used by the Heating and AC industry.
Note: Many times BTU, which is a unit of energy is used interchangeably with BTU/H which is a unit of power. When such is the case the professionals generally understand it to mean the power need.

Power supplies support equipment in a broad array of applications. Security, IT, Access, CCTV and Fire are but a few examples of their use. The trend is to merge many of these applications in form and function. Much of this equipment is installed in environmentally controlled facility rooms along with other delicate computer based equipment. It is essential that temperatures be maintained in an acceptable operating range for best reliability. Temperature control systems such as HVAC are designed to provide these optimal conditions. Thus there is a need to know how to equate heat generated by Power Supplies into its meaningful equivalent of BTU/H for facility room environmental design.
Note: The power that generates heat in the Power Supply, is not its rated output power, but rather the power that is dissipated by the power supply. This is the total power at the input minus the delivered power to the output and can be described by its efficiency.

FORMULAS:

eff **= Power supply efficiency (%)**

PO **= Output power (Watts or VA)**

PD **= Power dissipated by the power supply in Watts or VA.**

1. POWER DISSIPATED:

$$P_D = P_O\ (100/eff - 1)$$

2. HEAT POWER

Since 1 Watt or 1 VA = 3.412 BTU/H.

To convert Power in Watts or VA into BTU/H use the following formula:

$$\text{Heat Power}_{(BTU/H)} = P_D \times 3.412$$

HELPFUL NUMBERS:

Typical efficiency (eff) for Altronix switching power supplies is better than 85% (100/85 -1 = .18)

PD = PO x (0.18)

Typical efficiency (**eff**) for Altronix CCTV AC power supplies is better than 90% (100/90 -1 = .11)

PD =PO x (0.11)

EXAMPLE:

A R2416300UL Rack Mounted CCTV Power Supply can supply a total output power of 300VA with efficiency of 90%.

Using formulas 1 & 2:

Heat power =300VA x 0.11 x 3.412 ~= 114 BTU/H