



Delta Wye Boost heat application

This white paper describes one method of performing a boost heater function.

This heating application utilizing three phase power where full heater power is required to achieve set point temperature quickly then reduce heater power to 1/3 to maintain and control set point temperature. This can be accomplished on three-phase power by wiring the heaters in Delta for quick heat during start up and switching to heaters wired in Wye for normal operation at setpoint. A solid-state power control provides the main heater switching function from the primary output of the control.

In this example, the heaters are connected to 240 volts in a Delta configuration, 240 volts is applied to each 240 volt, 5 kW heater. When the heaters are connected to the same supply but wired in a Wye configuration, 138.5 volts is applied across each 240-volt heater, the voltage will be 57.7% of the full line ratings and the heaters operate at 1/3 of their rated power. An additional benefit is longer heater life.

Controllers for this application:

SD6C-HCAE-AARG Temperature Control
SD6L-HJAA-AARG High Limit Control
2 – Instrument fuses for controllers

Power switching device for main heater switching:

DC21-24C0-0000
2 - Semiconductor fuses

Power switching device to consider for the power level transfer function:

2 - Three pole contactors with auxiliary NC contact. Allen Bradley makes contactors that can perform this function
Note: Normally Closed auxiliary contacts are used to prevent the contacts from both Delta and Wye being closed at the same time. If this were to happen, fuses will open.

Misc. components:

2 - Suppression Devices
1 – Limit Contactor

Theory of operation:

The temperature controller reads the sensor connected to input 1 while output 1 is configured for heat, which controls the heater utilizing the Din-a-mite.

Output 3 of the temperature controller is configured for a non-latching deviation alarm used to enable boost heat by placing the heaters in a Delta wired configuration.

The high limit controller prevents the system from overheating in the event of a system malfunction.



Setup menu

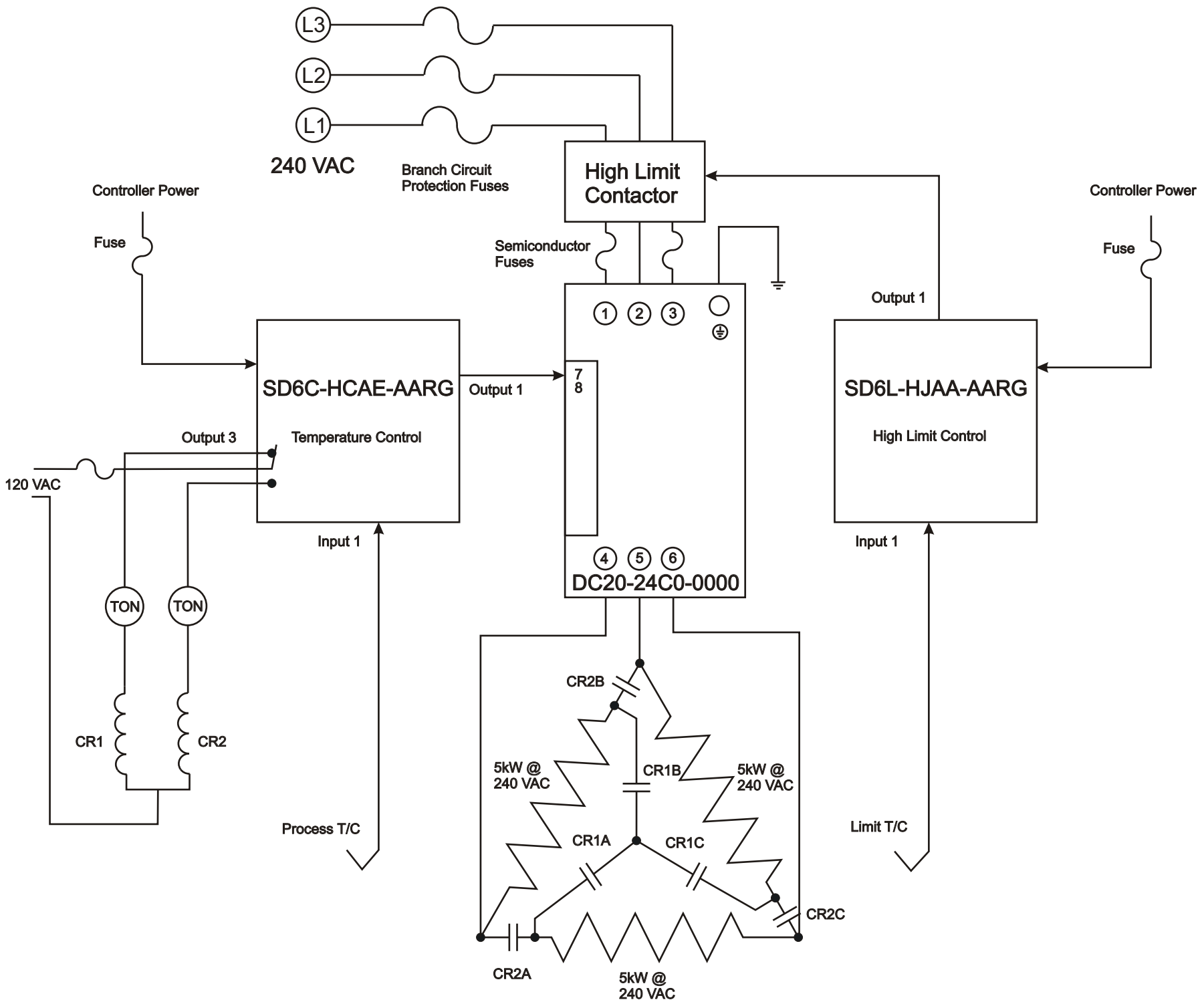
Sen = tc
Lin = K
C-F = F
S.dec = 0
IS.En = no
SP.Lo = 0
SP.Hi = 500
Ftr.E = 0.0
Ot 1 = hEAAt
Ctr1 = Vrtb
PL 1 = 100.0
PSL1 = 0
PSH1 = 100
nLF1 = OFF
Ot 3 = dE.AI
hyS3 = 1.000
Lgc3 = AL C
Lat3 = nLAt
Sil3 = OFF
DSP3 = OFF
ACLF = 60
Unit = US
I.Err = nLAt
FAIL = Off
dSP = nor
rP = OFF
LOC = 0

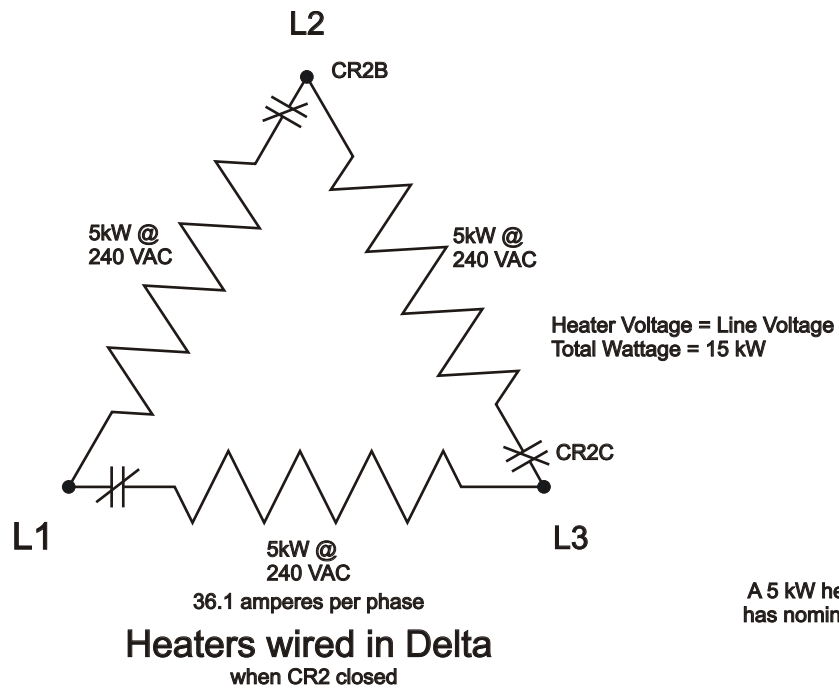
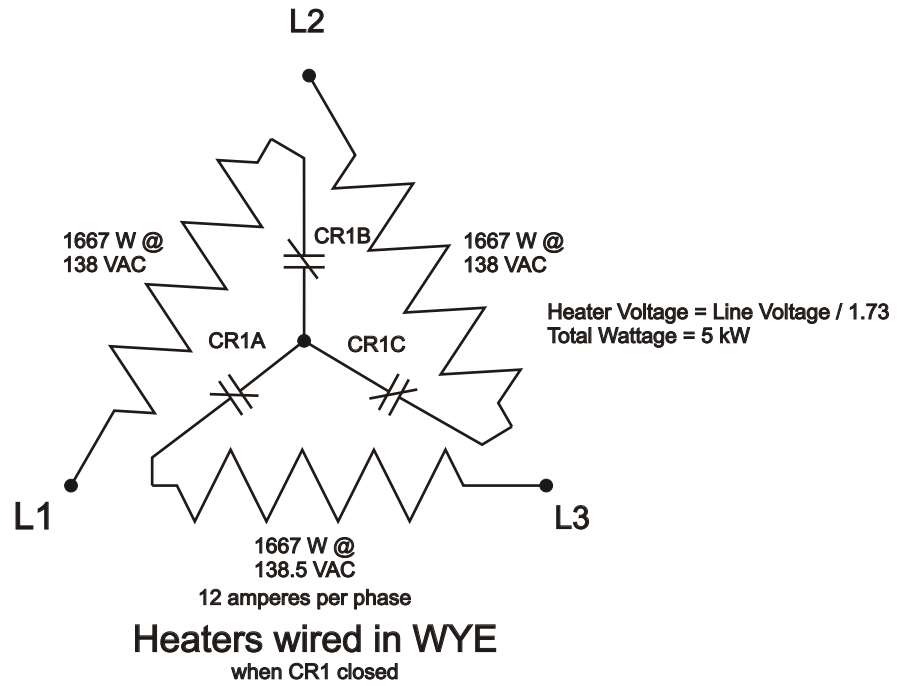
Operations menu

Po.ht = (displays PID calculated power output)
A-M = Auto
Aut = OFF (Except when auto-tuning)
Cal = 0
HT.M = PID
Pb.ht = tune to system
RE.ht = tune to system
RA.ht = tune to system
A3.hi = 999
A3.Lo = 25 (The alarm deviation low set point value is used to define the transition point where the boost heat is enabled. In this example, if the temperature is more than 25 degrees below set point, boost heat is enabled)

PID tuning

Make sure the boost heat function is disabled when auto-tuning or manual tuning to get the correct thermal response for the available heat energy.





A 5 kW heater rated for 240 VAC has nominal 11.52 ohms of resistance.