BEHLMAN

Basic AC Power Source Configurations

" Single Phase" 2 or 3 wire configuration

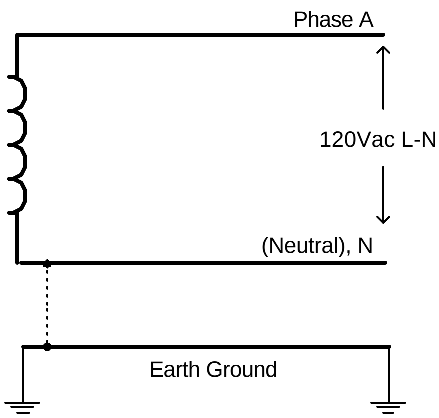

Fig 1

Figure 1 is a typical 120Vac (115Vac) 15A or 20A branch that feeds the common wall outlet and lighting circuits.

Also known as 110, 115 or 120Vac. The reason for the differences comes down to the local power authority and the nominal voltage they supply. The transformer on the pole and it's feed are responsible for the absolute value as well.

A 2 wire configuration refers to a installation that only has the hot leg (represented in Fig 1 by Phase A) and a neutral. A 3 wire configuration has the safety ground as the 3rd wire.

The 3 wire configuration is the most common.

The Neutral is usually tied to the Ground in the circuit breaker box.

" Single Phase 240 " also known as " Split Single Phase ", 3 or 4 wire

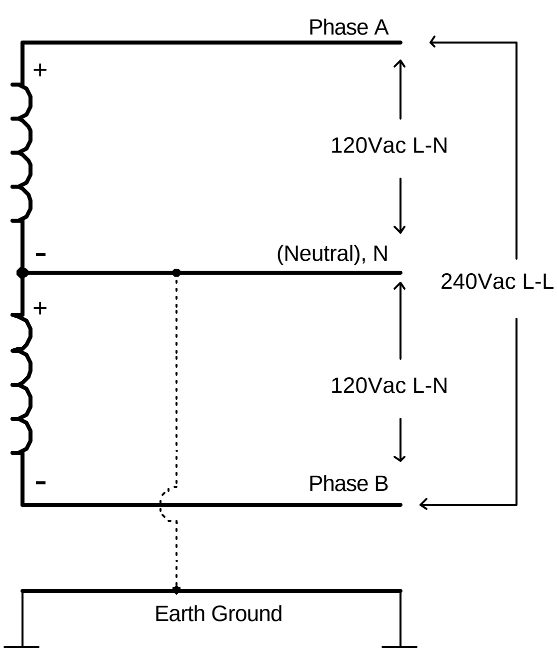

Fig 2

The two Legs, represented by Phase A and Phase B, are 180 degrees apart. Since they are 180 degrees apart, wiring them together with their relative polarities as shown will result in:

L-NVac x 2.00 = L-LVac

120Vac x 2.00 = 240Vac.

Just like stacking batteries in a flashlight.

The "center tap" is brought out as an artificial Neutral. This allows for the use of the two 120Vac branches.

This is the common residential configuration.

Typically known in the US as 110/220 or 115/230 or 120/240. As described above, the nominal is a regional anomaly.

The Neutral is usually tied to the Ground in the circuit breaker box.

For industrial applications, this configuration is limited to 200kVA max.

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3 Phase WYE 4 wire and 5 wire configuration

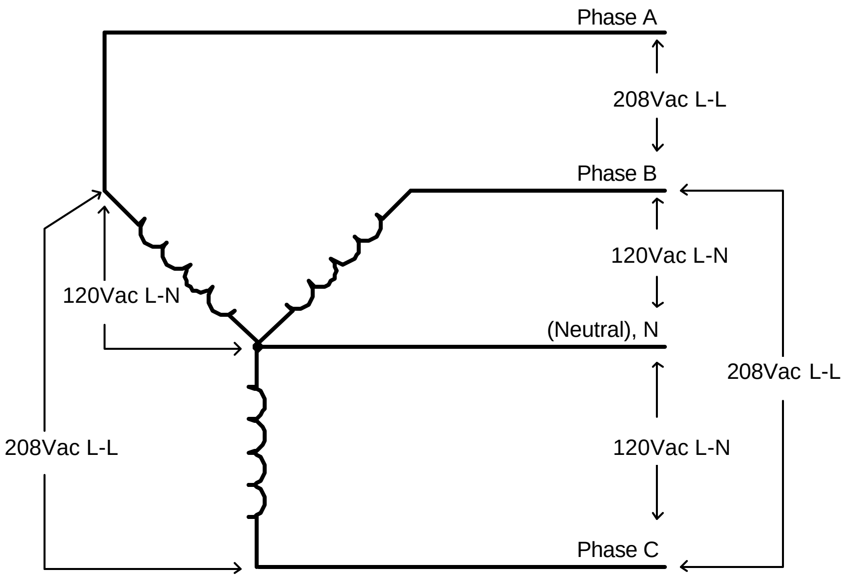

Fig 5

The 3 Phase WYE is commonly used in installations other than residential.

In the US, the most common is 120/208Vac. This voltage is used where power requirements are not greater than 750kVA.

277/480Vac is used for larger loads and commonly has a maximum capability of 2500kVA.

Of course equipment design and its power requirements will dictate what service the owner of the equipment will require.

Since each Leg is 120 degrees (phase angle) from each other, their voltages don't sum as nicely as batteries stacked in a flashlight.
Based on their phase angle, the sum of their voltages are calculated as follows:

$$\text{L-N Vac} \times \sqrt{3} = \text{L-L Vac}$$

$$120\text{Vac} \times 1.7\overline{333} = 208 \text{ Vac}$$

Figure 5 depicts the 3 Phase WYE 4 wire configuration.

Figure 6 below, depicts the 3 Phase WYE 5 wire configuration. Ground is distributed with the legs and neutral. Ground is usually connected to the neutral at the circuit breaker panel. In many facilities where metal conduit is used, a green ground wire may not be present in the conduit, since the metal conduit itself is used as the safety ground.

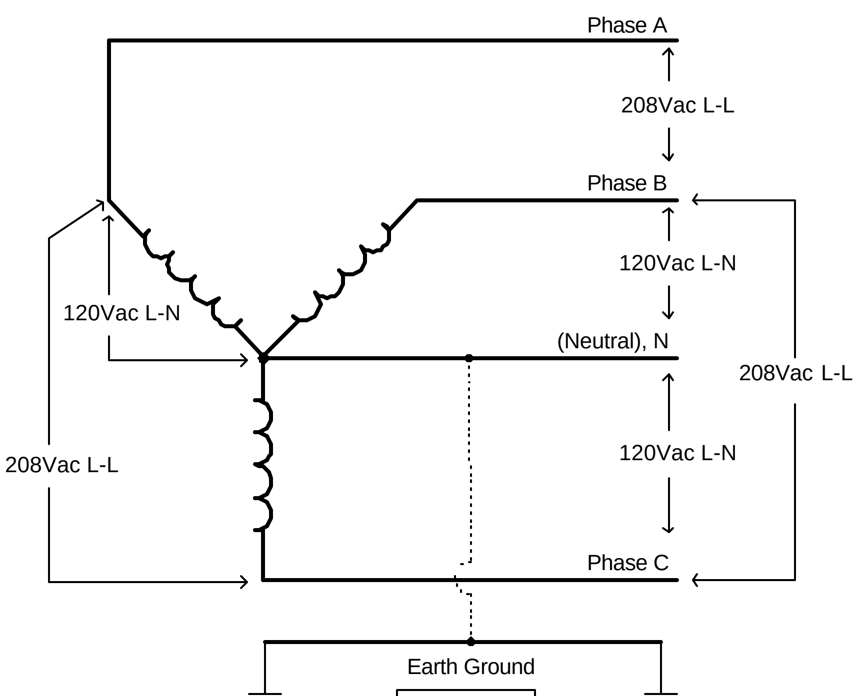

Fig 6

On a three phase application, to determine power requirements and select the proper power Behlman AC power source, we need to normalize the requirement to the L-N Vac and the current required for each phase. So if they say they will draw 20 amps per phase from a 3 phase 208 outlet this is how to find the total power:

$$(\text{L-LVac} \div \sqrt{3} = \text{L-N Vac})$$

$$208\text{Vac} \div 1.7\overline{333} = 120 \text{ Vac}$$

(L-NVac x Amps/phase = VA per phase)
120Vac x 20A = 2400VA per phase

(Qty of phase x VA per phase = VA Total)
3 x 2400VA = 7200 VA Total

So either based on total power or Amps per phase one would select a BL10000.

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" Delta " 3 phase, 3 wire or 4 wire configuration

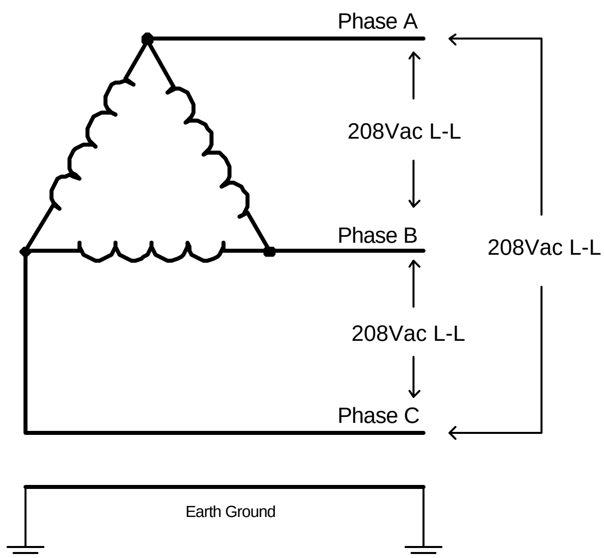

Fig 3

Delta is an older configuration that is still found in many industrial installations. Many power companies will only supply the Delta under special request. The WYE configuration, shown in this discussion, is the preferred standard.

3 wire: Phase A, B, C
4 wire: same as 3 wire, but safety ground is distributed.
Notice the absence of a Neutral. In rare instances one of the corners will be grounded to form a "Corner Ground" configuration.

To calculate power and select a Behlman supply, imagine that there is a neutral, and calculate the L-N Vac based on the L-LVac. Since the phase angle between phases is 120degrees , the $\sqrt{3}$ is used.

$$\text{L-L Vac} \div \sqrt{3} = \text{L-N Vac}$$

$$208\text{Vac} \div 1.7\overline{333} = 120\ \text{Vac}$$

L-N x Amps = VA per phase x 3 = total VA

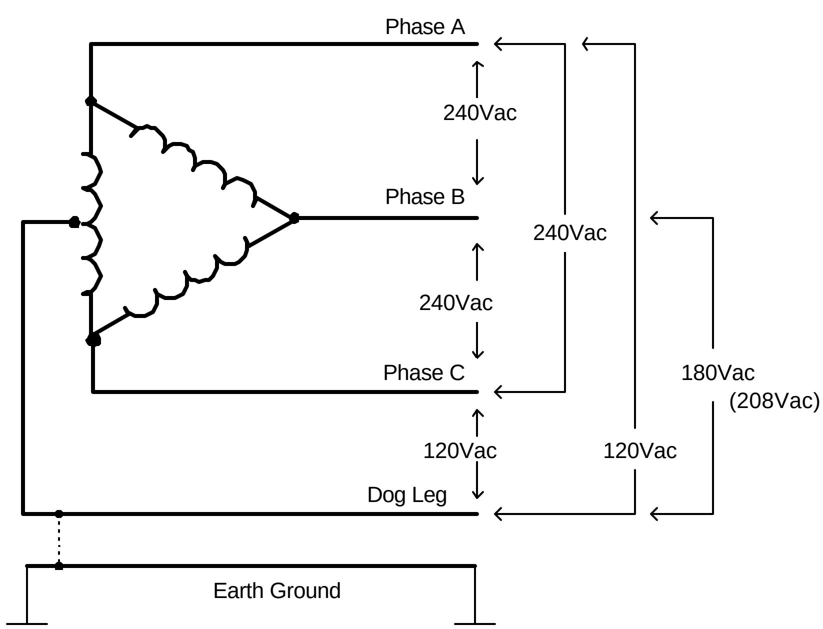

Fig 4

240V Split Phase Delta

Figure 4 represents another old configuration for the Delta. It uses a "Dog Leg" or "Stinger Leg" that is a tap on one of the 240Vac sources to produce a pair of 120Vac circuits.

One writing provides a potential of 180Vac between the Phase B node and the Dog Leg. Another guide points out that if the calculations are carried out, it can be as high as 208Vac. For this discussion, it's just a matter of providing information. We'll not try to prove one source wrong or right. We would like you just to be aware that such an issue is present.

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