Three-Phase Power Unbalance

A full three-phase supply is recommended for all three-phase motors, consisting of three individual transformers or one three-phase transformer. So-called "open" Delta or Wye connections using only two transformers can be used, but are more likely to cause problems, such as poor performance, overload tripping or early motor failure due to current unbalance.

Transformer rating should be no smaller than listed in Table 4 for supply power to the motor alone.

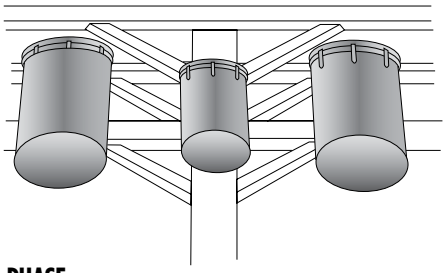


FIG. 7
FULL THREE-PHASE

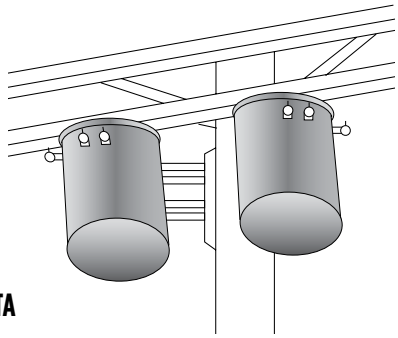


FIG. 8
OPEN DELTA

Checking and Correcting Rotation and Current Unbalance

1. Establish correct motor rotation by running the motor in both directions. Normal rotation is CCW viewing the shaft end. Rotation can be changed by interchanging any two of the three motor leads. The rotation that gives the most water flow is typically the correct rotation.
2. After correct rotation has been established, check the current in each of the three motor leads and calculate the current unbalance as explained in 3 below.

   If the current unbalance is 2% or less, leave the leads as connected.

   If the current unbalance is more than 2%, current readings should be checked on each leg using each of three possible hook-ups. Roll the motor leads across the starter in the same direction to prevent motor reversal.
3. To calculate percent of current unbalance:
   - A. Add the three line amps values together
   - B. Divide the sum by three, yielding average current
   - C. Pick the amp value which is furthest from the average current (either high or low)
   - D. Determine the difference between this amp value (furthest from average) and the average
   - E. Divide the difference by the average. Multiply the result by 100 to determine percent of unbalance
4. Current unbalance should not exceed 5% at max amp load or 10% at rated input load. If the unbalance cannot be corrected by rolling leads, the source of the unbalance must be located and corrected. If, on the three possible hookups, the leg farthest from the average stays on the same power lead, most of the unbalance is coming from the "power side" of the system. If the reading farthest from average moves with the same motor lead, the primary source of unbalance is on the "motor side" of the starter. In this instance, consider a damaged cable, leaking splice, poor connection, or faulty motor winding.

Phase designation of leads for CCW rotation viewing shaft end.

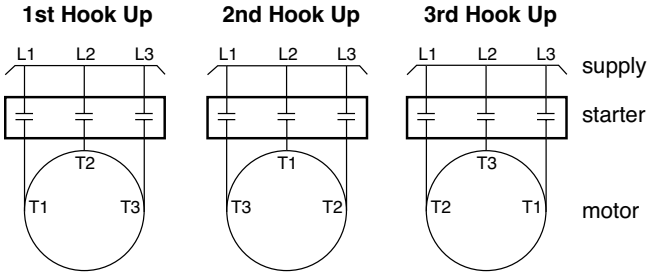
To reverse rotation, interchange any two leads.

Phase 1 or "A" - Black, T1, or U1

Phase 2 or "B" - Yellow, T2, or V1

Phase 3 or "C" - Red, T3, or W1

NOTICE: Phase 1, 2, and 3 may not be L1, L2, and L3.



EXAMPLE:

T1 = 51 amps	T3 = 50 amps	T2 = 50 amps T2 = 46
amps	T1 = 49 amps	T3 = 48 amps T3 = 53
+ amps	+ T2 = 51 amps	+ T1 = 52 amps
Total = 150 amps	Total = 150 amps	Total = 150 amps
$\frac{150}{3}$ = 50 amps	$\frac{150}{3}$ = 50 amps	$\frac{150}{3}$ = 50 amps
50 - 46 = 4 amps	50 - 49 = 1 amp	50 - 48 = 2 amps
$\frac{4}{50}$ = 0.08 or 8%	$\frac{1}{50}$ = 0.02 or 2%	$\frac{2}{50}$ = 0.04 or 4%