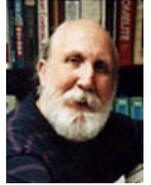




## Shop Tech Talk April 2011



### 12 Lead, Dual Voltage and Single Voltage, Wye-Delta Connections

#### Background:

Before VFD drives and electronic soft starts we used wye / delta, part winding and autotransformer reduced voltage starters . These types of starters allowed us to soft start a motor load without putting too much strain on the power supply or the motor's connected load. With the advent of relatively inexpensive soft starts these types of electromechanical soft starts are less favored today but still exist and do a good job at what they were designed to do.

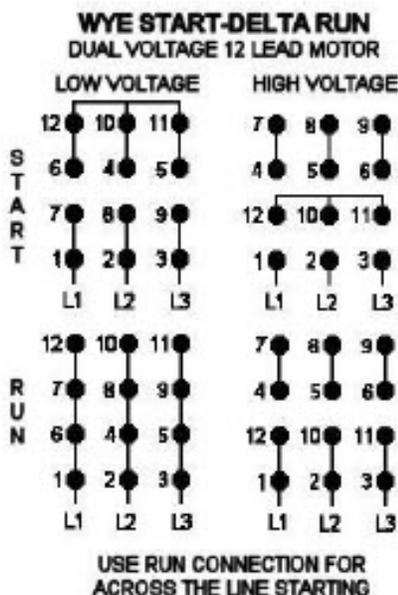
Wye / Delta starters are 2 step starters and have to be connected to motors that are wired in a WYE configuration for the START step and then through a system of switching contactors and timer the motor is reconnected in DELTA for the RUN step. We call this starter a reduced voltage starter but this term can be misleading. Let us say we have a 200 HP Wye / Delta motor and starter that will be operating on a 480v , 3 phase power supply. This same 480v will be applied to the motor both in the START step and the RUN step, in other words the incoming voltage will not be reduced. The motor is designed to run continuously on 480v when connected in DELTA but on START the motor is connected in WYE. Effectively then we have a motor that is designed to run continuously @ 480v connected in DELTA operating at 480v line voltage connected in WYE. Now for this WYE connected motor to run continuously at name plate rating it would need to have a much larger voltage applied to it, in fact it would need  $480 \times \sqrt{3} = 480 \times 1.732 = 831 \text{ v}$ . So we have a motor designed to have 831v on it and we have it being connected to a 480v supply. So with a little more than half voltage applied to it the motor is weak and slow to start thus giving us a soft start , then after a few seconds the motor is connected in DELTA with the same 480v applied and it is then running normally across the line.

This explanation may be a little bit long winded for most of you but I thought I would emphasize the point for the new electricians among you.

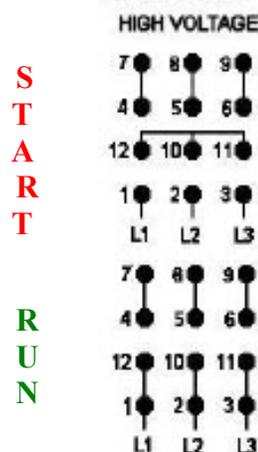
#### 12 Lead, Dual Voltage 230/460v, Wye / Delta Motor:

This motor could be connected DELTA for a RUN voltage of 230v (Low Voltage) or it can be connected DELTA for a RUN voltage of 460v (High Voltage)

If our supply voltage is 480v then our motor has to be connected for 460v (High Voltage) for the RUN condition.



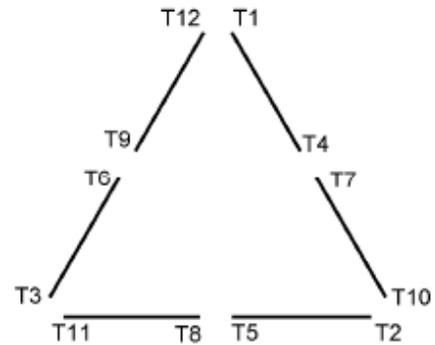
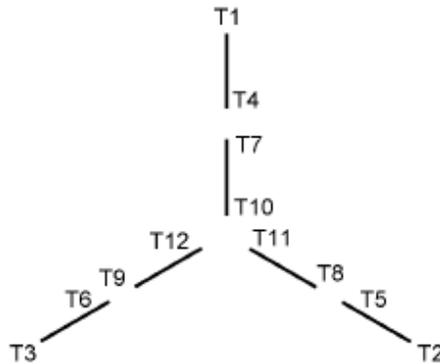
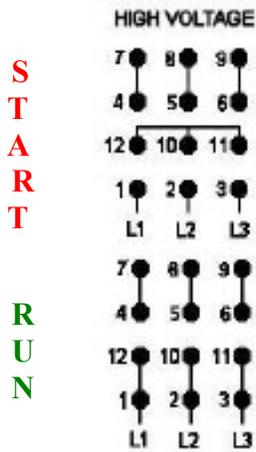
Because our supply voltage is 480v we use the HIGH VOLTAGE side. So:



Continued...

**START IN WYE**

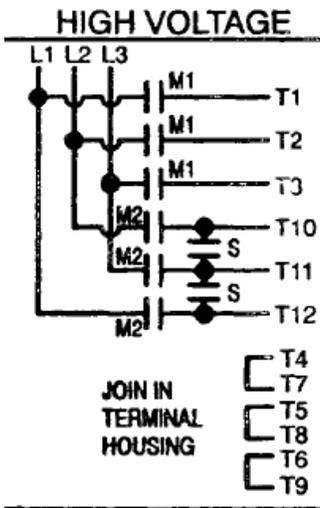
**RUN IN DELTA**



Notes:

1. This **dual** voltage, 12 lead motor is suitable for Part Winding Start on **LOW** voltage only.

Typical Starter Connection



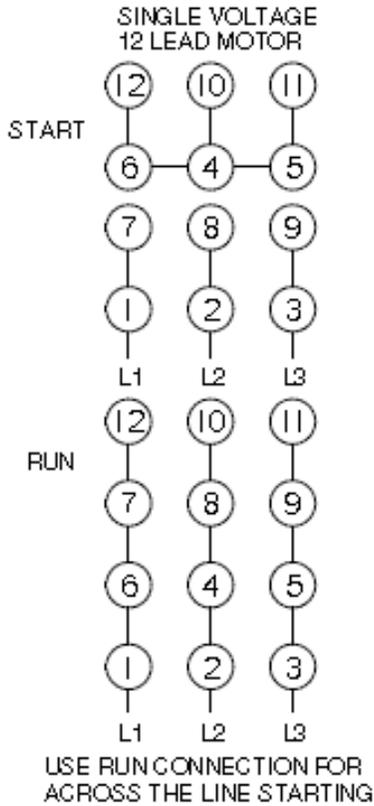
|    | START | RUN   |
|----|-------|-------|
| M1 | CLOSE | CLOSE |
| M2 | OPEN  | CLOSE |
| S  | CLOSE | OPEN  |

So on the **START** connection M1 and S contactor close.  
On the **RUN** connection M1 and M2 are closed and S opens.

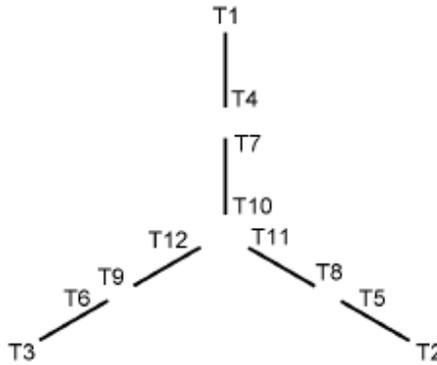
If motor is metric with u,v and w notation then use the table for comparison.

|     |    |
|-----|----|
| T1  | U1 |
| T2  | V1 |
| T3  | W1 |
| T4  | U2 |
| T5  | V2 |
| T6  | W2 |
| T7  | U5 |
| T8  | V5 |
| T9  | W5 |
| T10 | U6 |
| T11 | V6 |
| T12 | W6 |

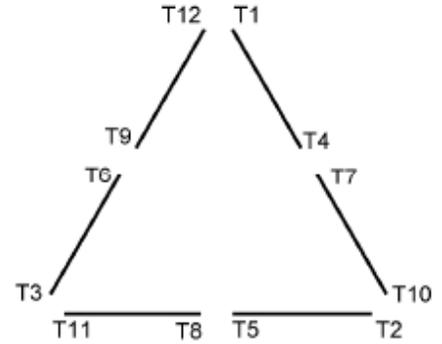
**12 Lead, Single Voltage , Wye / Delta Motor**



**START IN WYE**



**RUN IN DELTA**

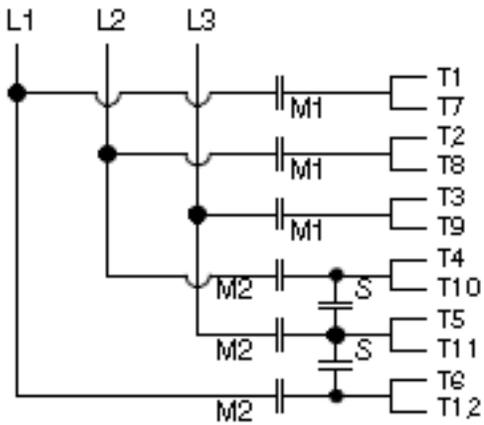


**Notes:**

1. This **single voltage** 12 lead motor is suitable **at its voltage** for Part Winding Start.

2. Be careful **NOT** to confuse this connection with the one on the preceding page. This connection is the one to use whenever the motor is **single voltage 230v, single voltage 460v or single voltage 575v** or whatever **single voltage** may be used.

**Typical Starter Connection**



|    | START | RUN   |
|----|-------|-------|
| M1 | CLOSE | CLOSE |
| M2 | OPEN  | CLOSE |
| S  | CLOSE | OPEN  |

So on the START connection M1 and S contactor close, M2 open.

On the RUN connection M1 and M2 are closed and S opens.

Holland Industrial, 518 West Montgomery Street, Henderson, NC., 27536  
 Tel: 1-800-232-7541, Fax 1-252-492-2444, E-Mail: sales @ hollandindustrial.com