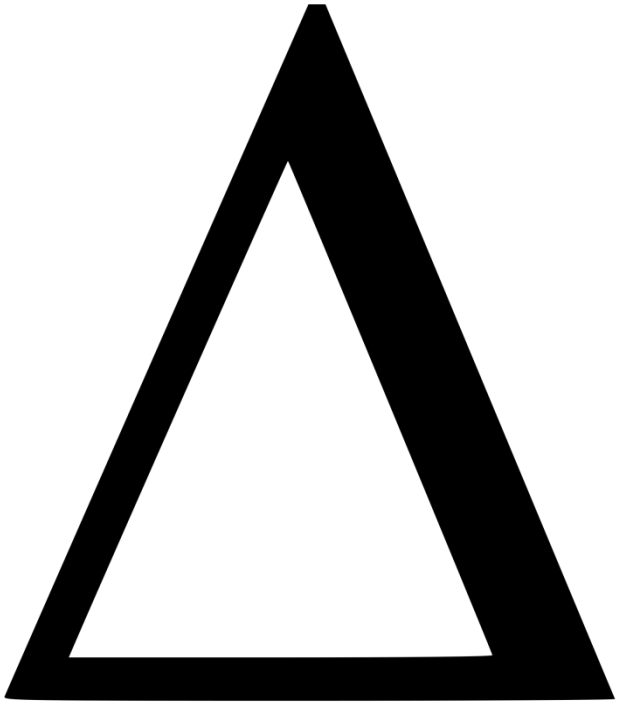
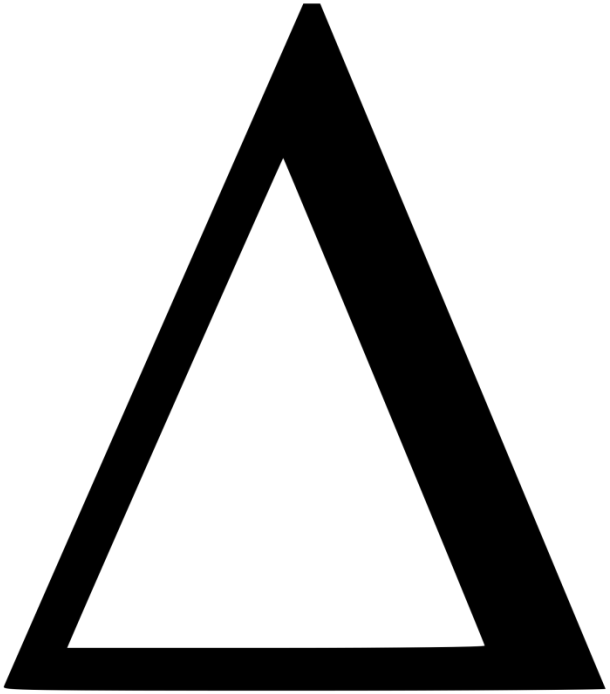
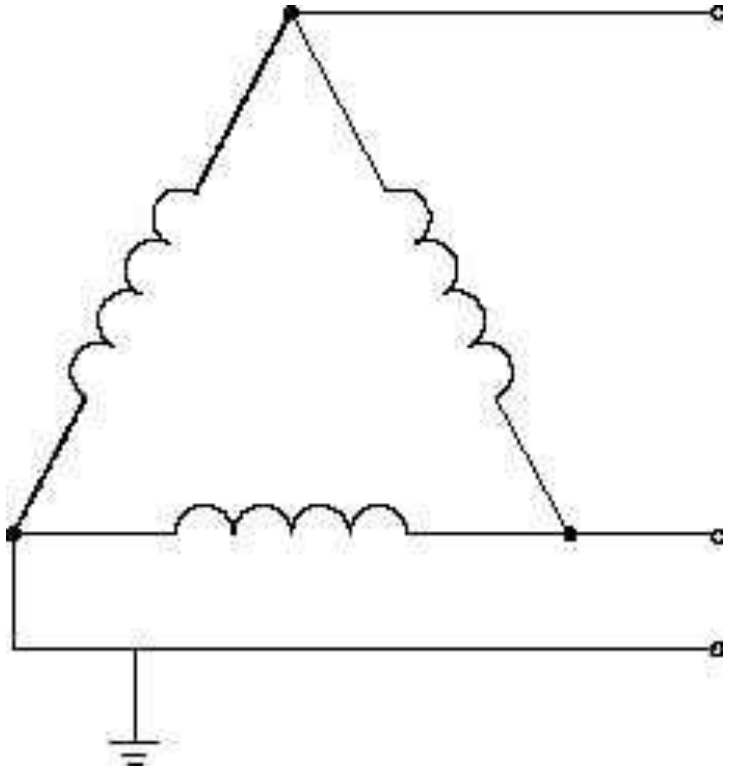


Delta Metering

Matt Heath– BrightRidge

Delta is the 4th letter of the Greek alphabet





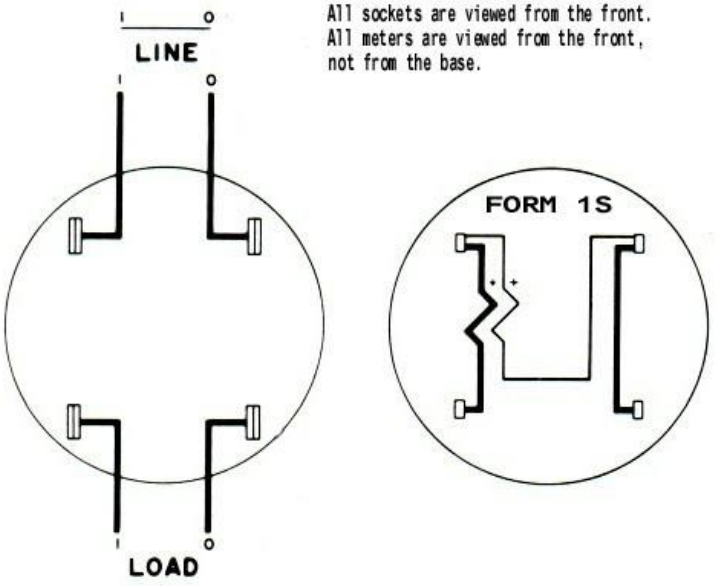
Transformers banked together look like the Greek letter Delta when viewed from above

Remember Blondel's Theorem

- In simple terms, Blondel's theorem states that the total power in a system of (N) conductors can be properly measured by using (N-1) stators or watt-measuring elements.
- The elements are placed such that one current coil is in each of the conductors and one potential coil is connected between each of the conductors and some common point. This is a stator.
- Therefore, the total power is correctly measured by the remaining (N – 1) elements.
- In application, this means that to accurately measure the power in a four-wire three-phase circuit (N = 4), the meter must contain (N – 1) or three measuring elements. Likewise, for a three-wire three-phase circuit (N = 3), the meter must contain two measuring elements.

A Simple One Stator Meter

Form 1S Meter – Used to Meter 2 Wire Service



FORM 1S
1ø, 2 W CIRCUIT
1 Stator, 2 W Meter, Self-Contained

BCM
Bay City Metering
P: 212-575-0785

In Other Words…

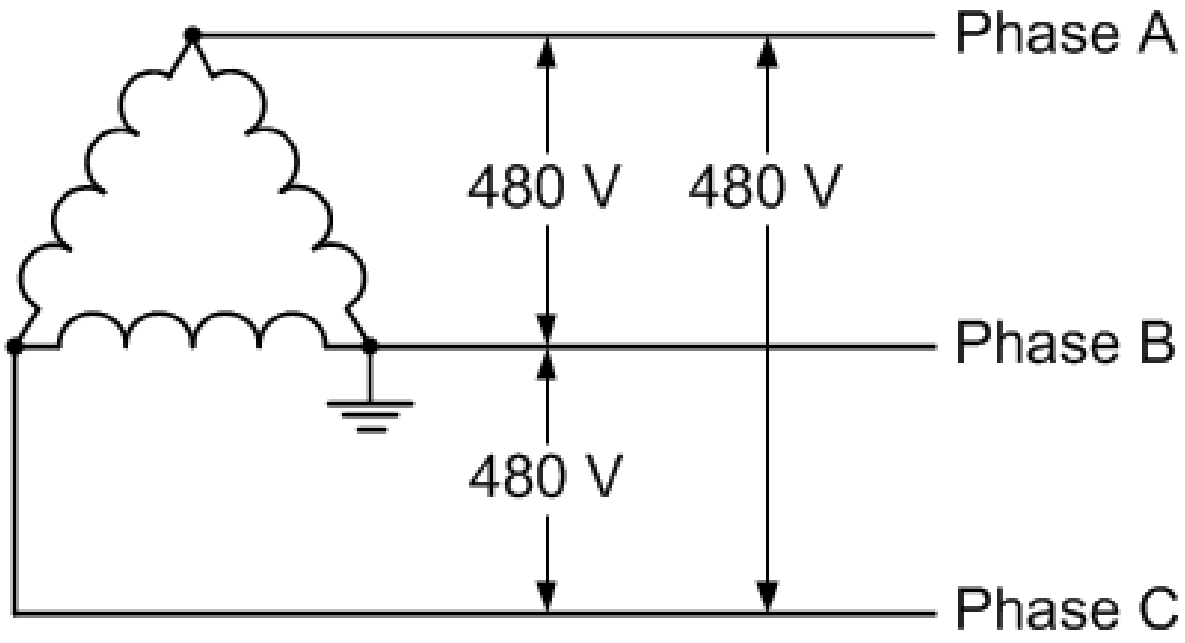
We need to choose a metering system that measures voltage and current referenced to a common point on 1 less than the number of phases we are metering.

One Voltage Coil and One Current Coil = One Stator

- For a 3 Wire service we need a 2 stator meter
- For a 4 Wire service we need a 3 stator meter

Remember – our common point is NOT necessary grounded!

Typical 3 Wire Delta Connection Diagram

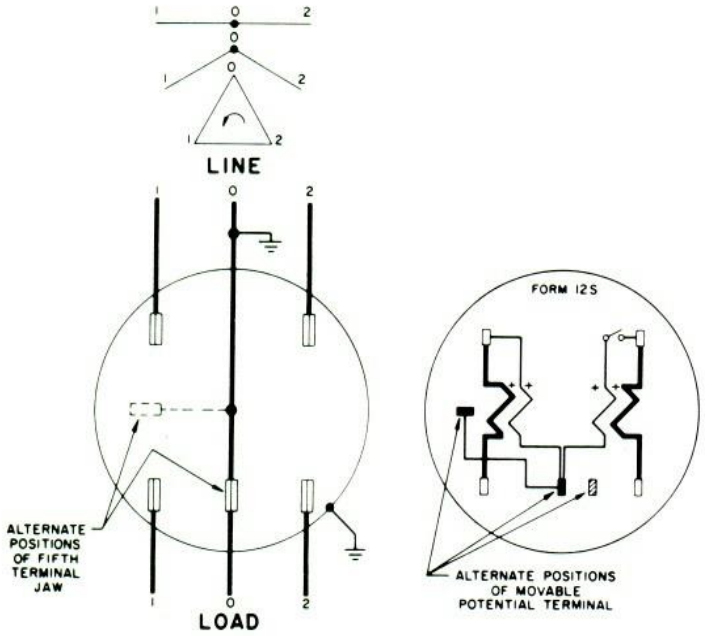


NOTE - Voltage may be 240, 480 or even 600

May be Corner Grounded or NOT

How To Meter 3 Wire Delta

Self Contained-12S



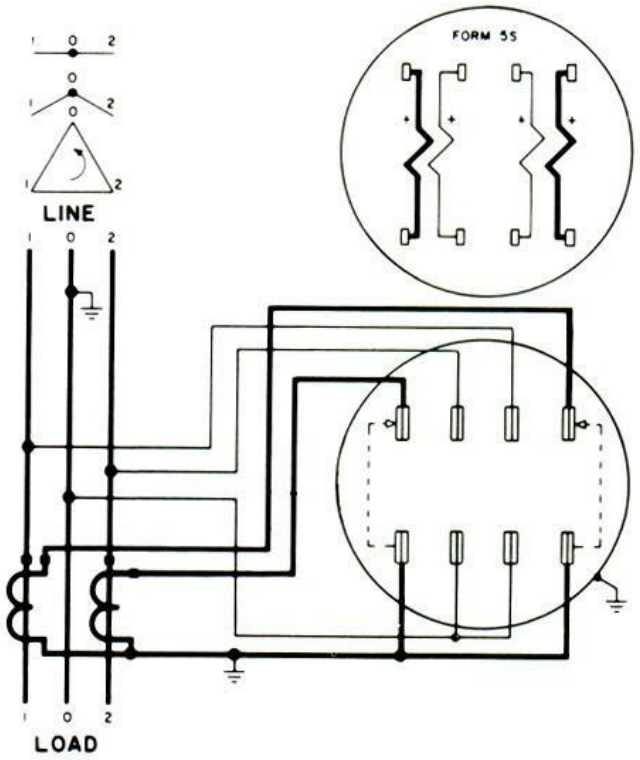
On 3-phase, 3-wire circuits, a ground is optional. Where a 3-phase circuit is grounded, the neutral connector in the socket should be grounded. Where a 3-phase circuit is ungrounded, the neutral connector in the socket should be insulated.

2 Stator, 3ø, 3 W (Network) Meter, Self-Contained

BCM
Bay City Metering
P: 212-575-0785

How To Meter 3 Wire Delta

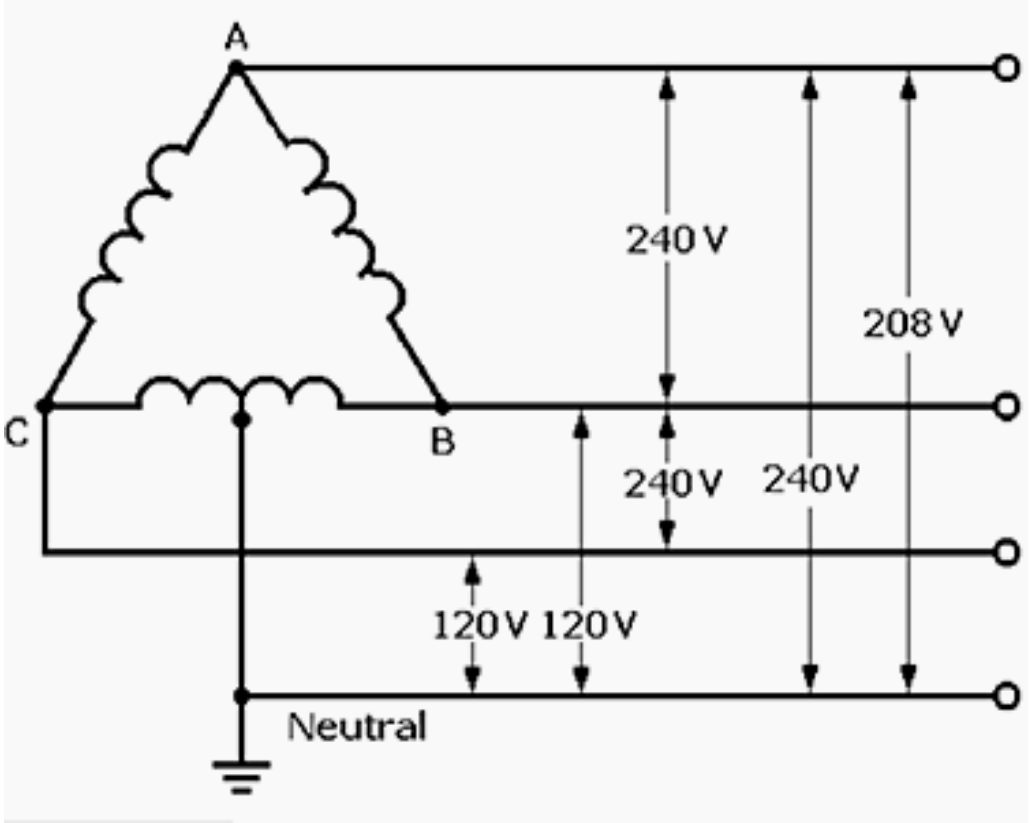
CT Rated - 5S



3ø, 3 W OR ANY OTHER 3 W CIRCUIT
2 Stator, 3ø, 3 W Meter with 2-2 W CT's

BCM
Bay City Metering
P: 212-575-0785

Typical 4 Wire Delta Connection Diagram



NOTE – Phase A to Neutral is 208V. This is the “High Leg”, “Power Leg” or “Wild Leg” and must always be metered on Phase C of our meter base

Typical 4 Wire Delta Transformer Bank

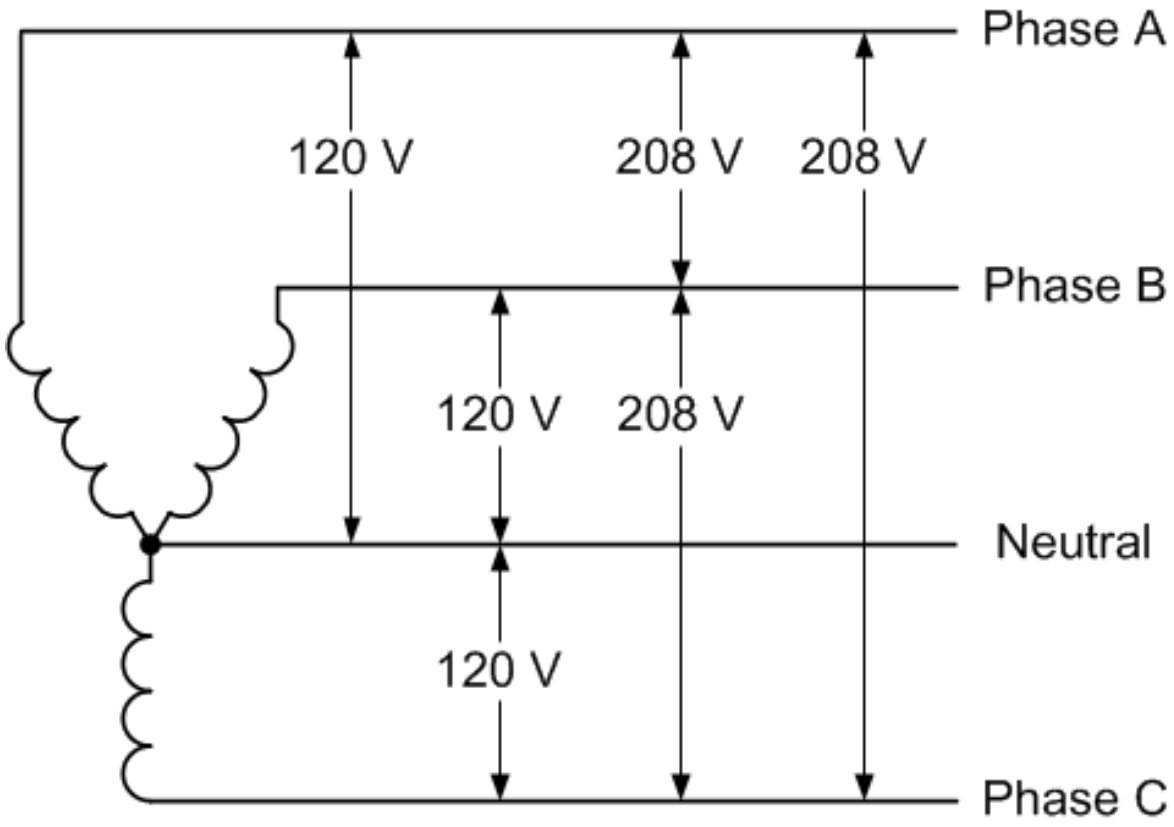
Notice how the phases are tied together – the center transformer is center tap grounded

How is a 4 Wire Wye Bank Wired Differently???

Look at how the transformers are tied together

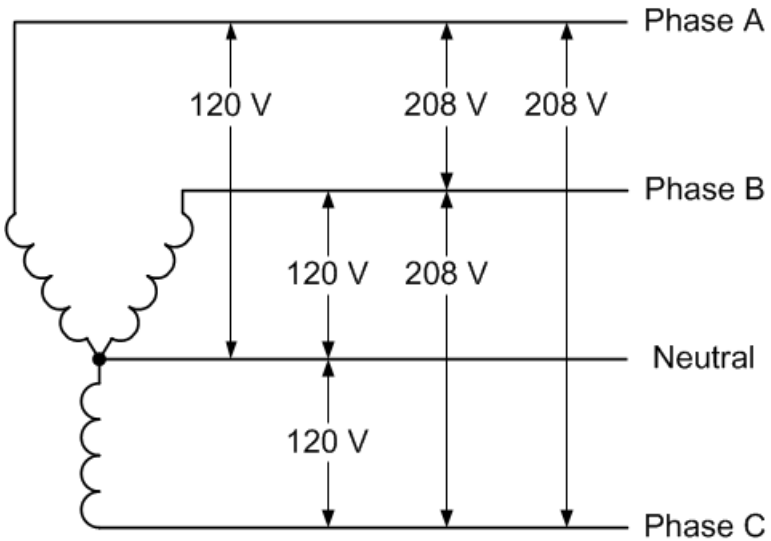
Notice how the outer secondary lugs are tied together – this is the Neutral wire

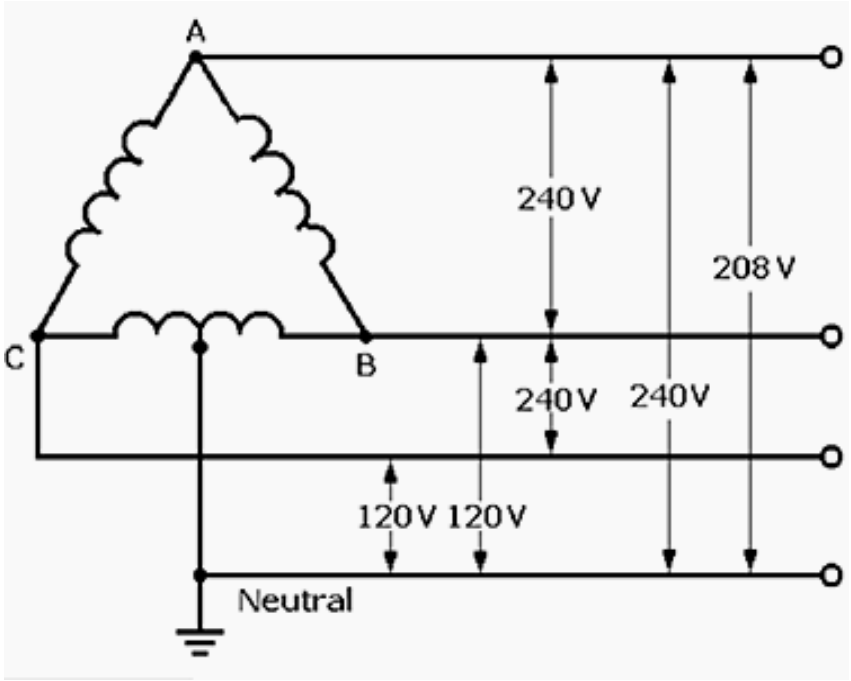
Typical 4 Wire Wye Connection Diagram



NOTE – Phase to Neutral is 120V OR 277V. Phase to Phase Voltage will be Phase to Neutral Voltage multiplied by √3(square root of 3, or 1.732)

Wye VS Delta

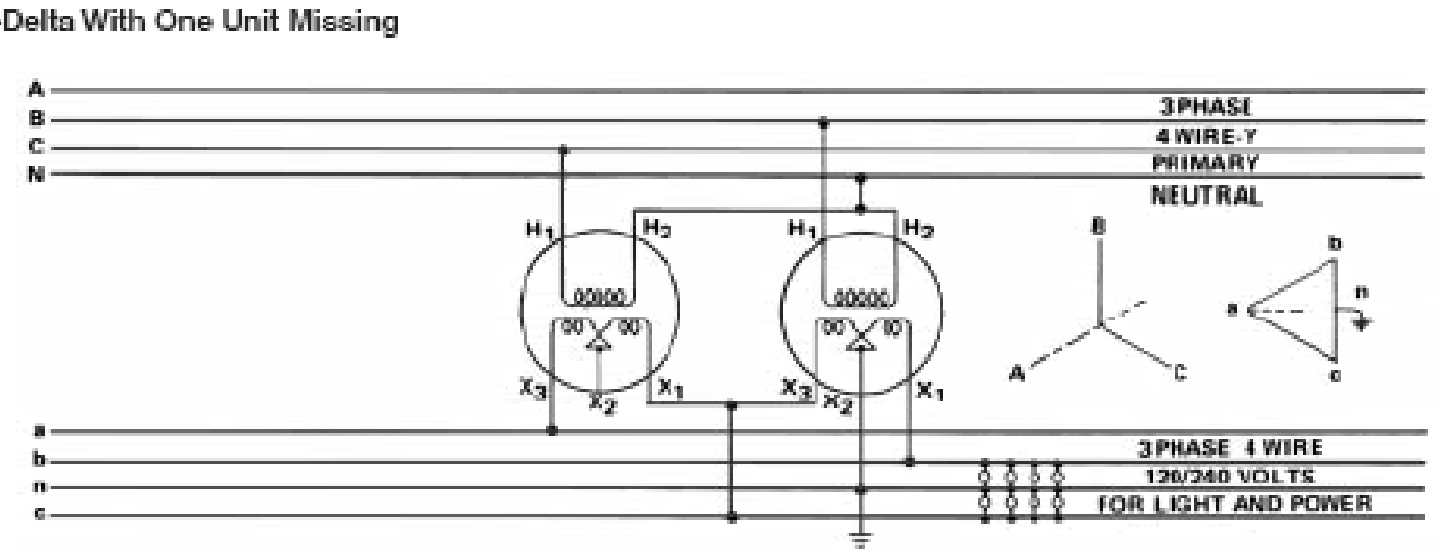

Phase A
120 V
208 V
208 V
Phase B
120 V
208 V
Neutral
120 V
Phase C


A
240 V
208 V
C
B
240 V
240V
120 V
120 V
Neutral

2 Pot Delta Bank (Cheater Bank)

4 Wire Delta Service (120/240) from 2 Transformers and 2 Primary Lines

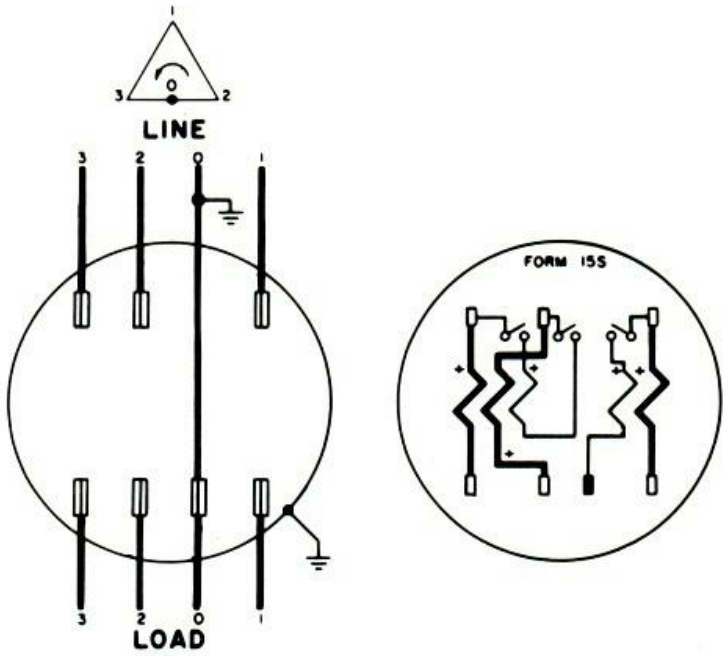
2 Pot Cheater Connection Diagram



The voltage in a typical 4 wire Delta service will be 120V Phase A and B to Neutral, 208V Phase C to Neutral and 240V Phase to any other Phase.
NOTE – voltage may be doubled (240, 416, 480V) on some services

How To Meter 4 Wire Delta

Self Contained–FM15S

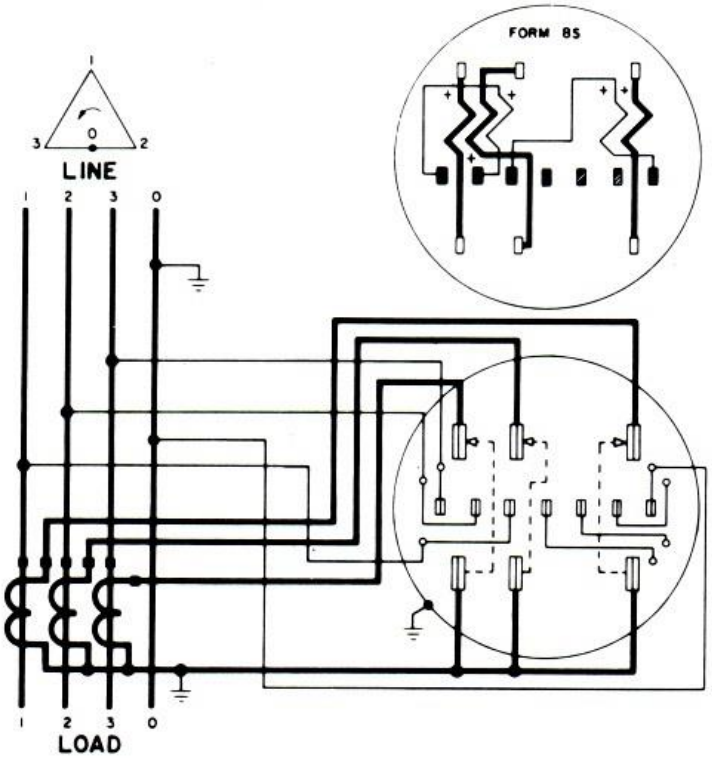


3ø, 4 W, Δ CIRCUIT
2 Stator, 3ø, 4 W, Δ Meter, Self-Contained

BCM
Bay City Metering
P: 212-575-0785

How To Meter 4 Wire Delta

CT Rated – 8S



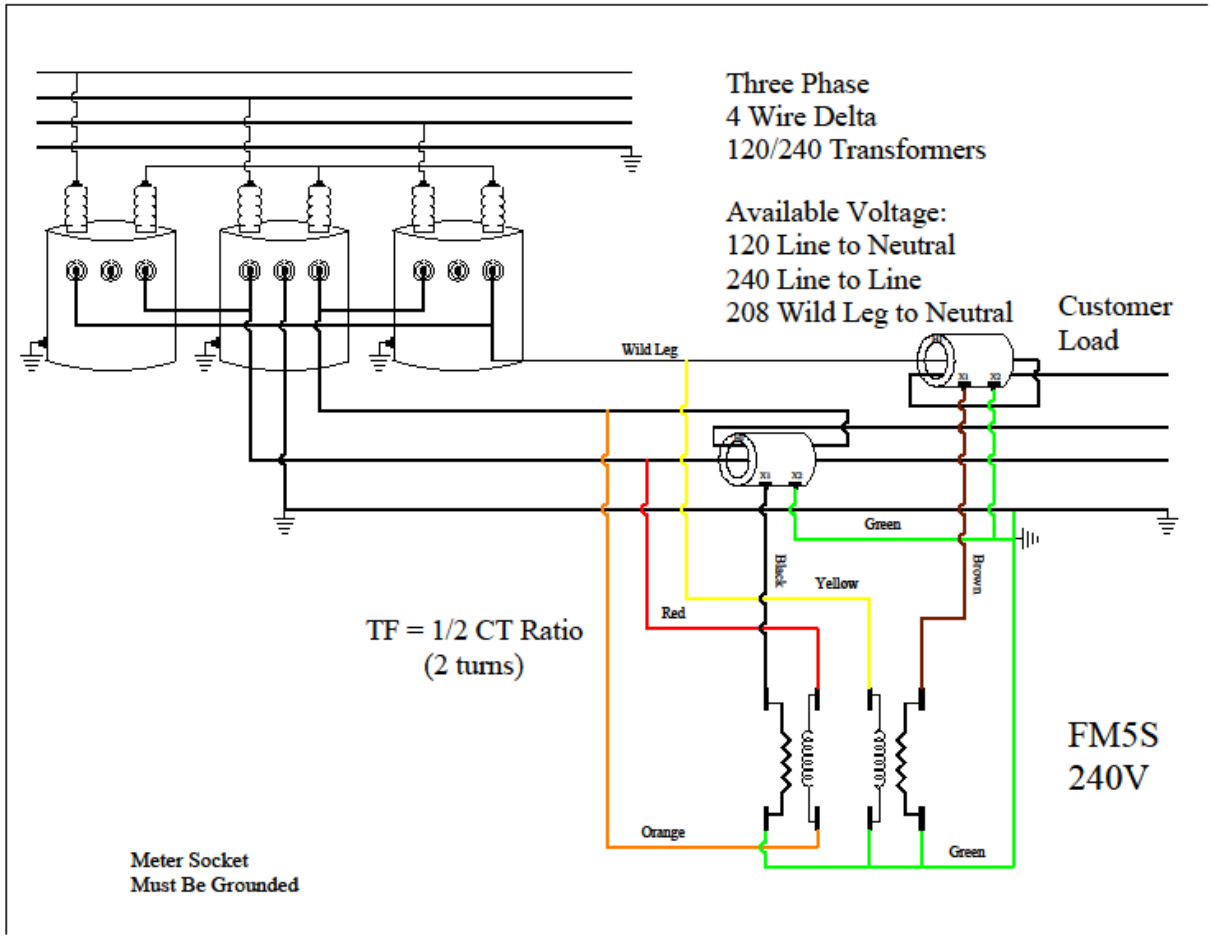
3ø, 4 W, Δ CIRCUIT

2 Stator, 3ø, 4 W, Δ Meter with 3-2 W CT's

BCM
Bay City Metering
P: 212-575-0785

How To Meter 4 Wire Delta

CT Rated – 5S



NOTE – Phase B Runs thru CT "backward" and Phase C is looped thru CT twice

Delta Metering Concerns

- NEVER assume that the unmetered or “common” phase is grounded!
- Always make sure to meter the “High Leg” in any 4 wire Delta service on ‘C’ phase in the meter base!
- When in doubt, always check the voltage!

Questions or Comments???

Please Contact
Matt Heath
AMI Dept. Manager – BrightRidge

Cell (423)791-2590
Email – mheath@brightridge.com