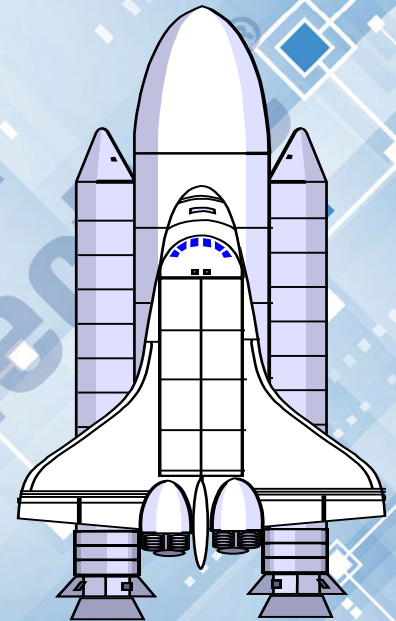
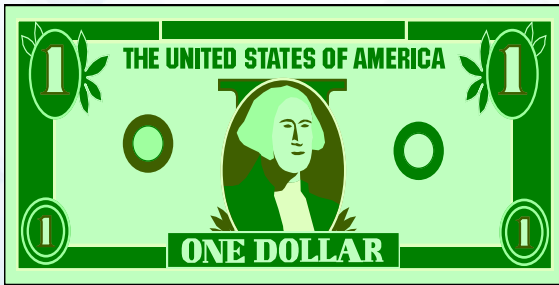


# Transformer Seminar

## Buck-Boost Applications



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# What Are Buck-Boost Transformers?

BUCK-BOOST TRANSFORMERS START OUT AS ISOLATION TRANSFORMERS WITH OUTPUTS FROM 12 TO 48 VOLTS, WHICH GET FIELD CONNECTED AS “AUTO” TRANSFORMERS TO INCREASE OR DECREASE VOLTAGE WITHIN A RANGE OF 5 TO 20 PERCENT. (ie, 208 TO 230 V)

THEY DO NOT PROVIDE ISOLATION FROM THE SUPPLY BECAUSE THEY ARE “AUTO” CONNECTED DURING INSTALLATION!



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# Industry Standard Buck-Boost Groups

Group 1 Primary 120 x 240 and Secondary 12/24

Group 2 Primary 120 x 240 and Secondary 16/32

Group 3 Primary 240 x 480 and Secondary 24/48

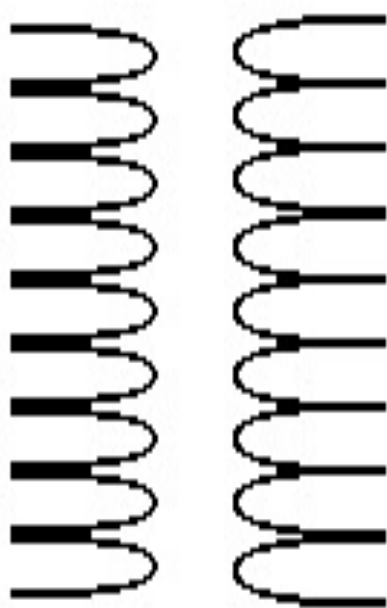


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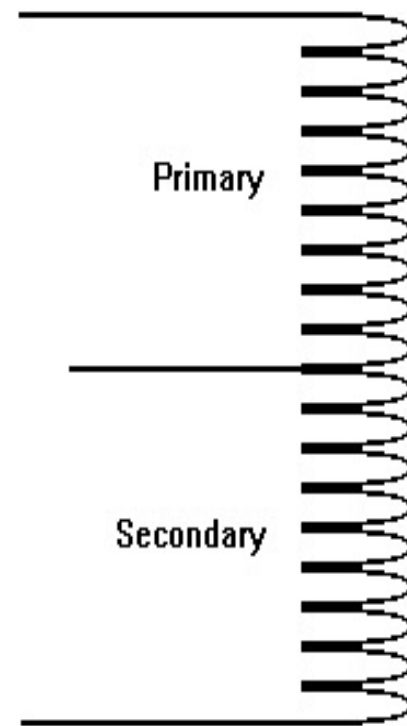
# Isolation vs “Auto”

PRIMARY



SECONDARY

ISOLATION



Primary

Secondary

AUTO

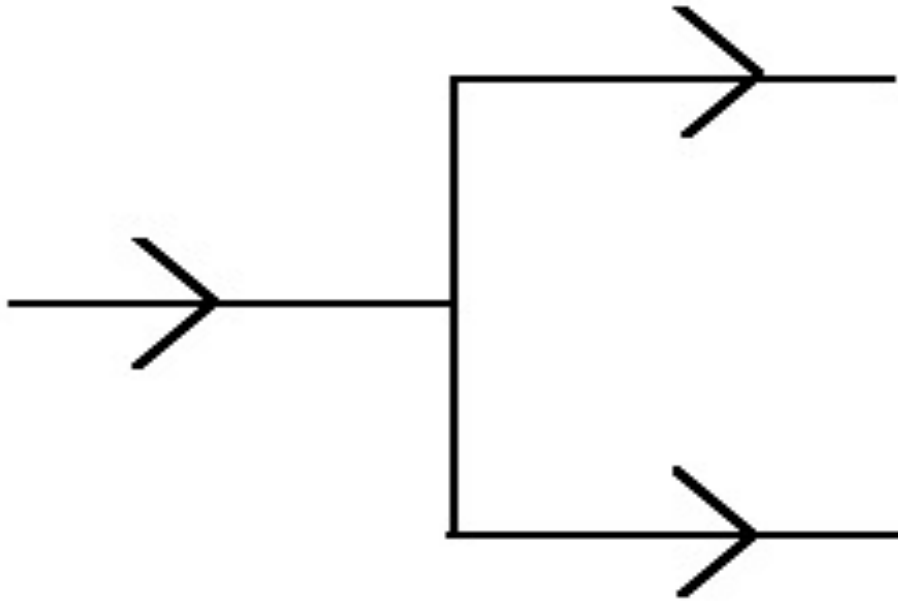


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# Basic Principle

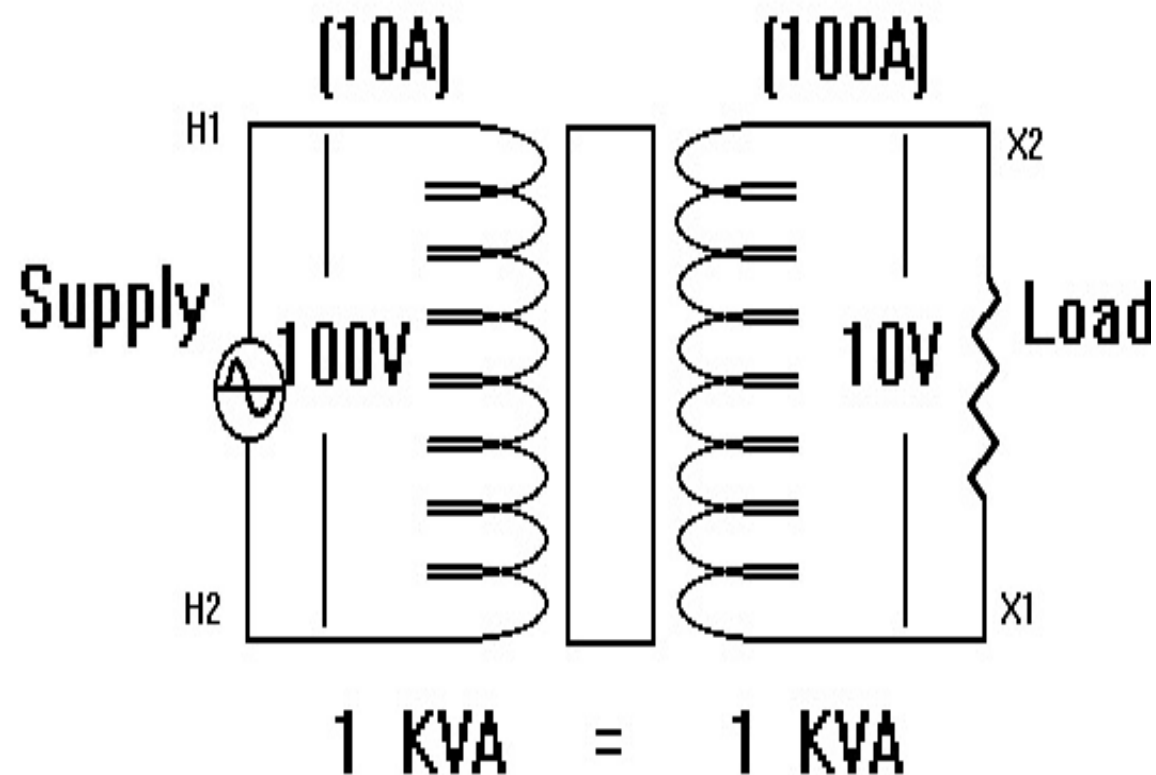
**CURRENT WILL FOLLOW PATH OF LEAST RESISTANCE**



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# Primary and Secondary Have Same Capacity

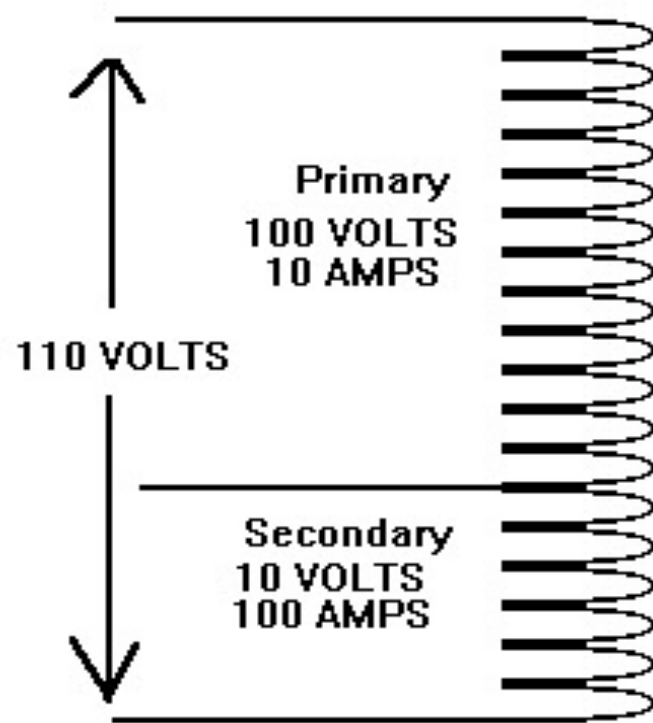


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# Boosting Connection Coil Voltages Add



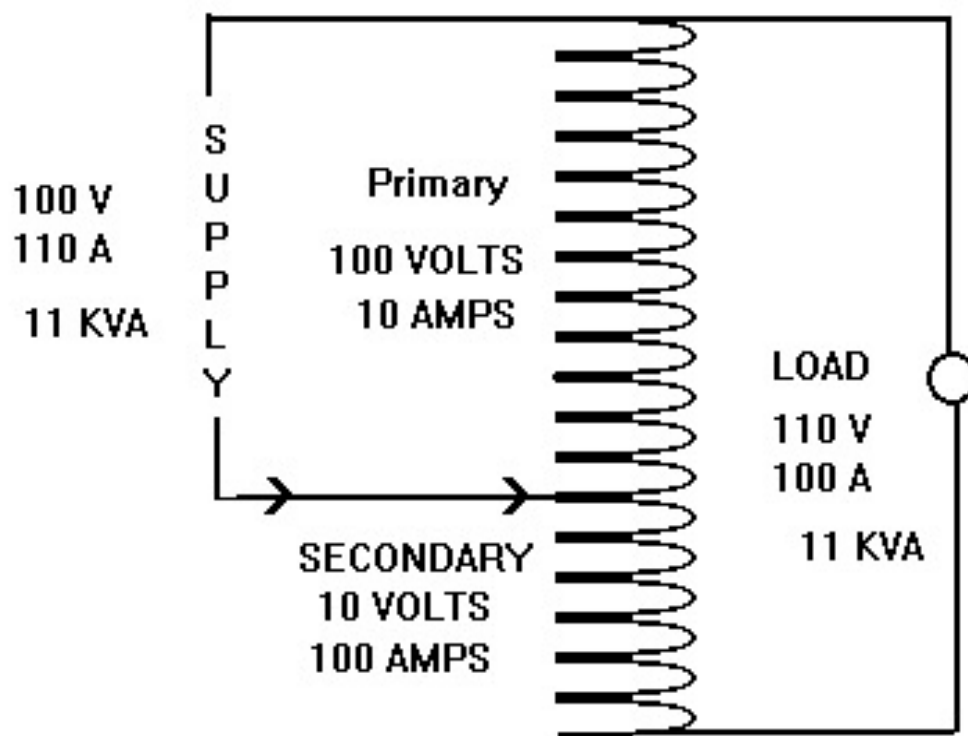
Autotransformer



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# Auto Connection Increases kVA Capacity



Autotransformer



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# Data Needed to Select Buck-Boost Transformer

1. SYSTEM PHASE
2. SYSTEM FREQUENCY
3. LINE VOLTAGE
4. LOAD VOLTAGE
5. LOAD KVA, AMPS, OR HORSEPOWER

(Available line voltage should be measured whenever possible)



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## Selection Example #1

1. 1-PHASE
2. 60 HZ
3. LINE - 189 VOLTS
4. LOAD - 208 VOLTS
5. LOAD - 4 KVA



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# 1-Phase Group I Chart

REFER TO 1-PHASE GROUP I SELECTION CHART ON PAGE 127  
IN SECTION 8 OF 2017 ACME CATALOG.

Catalog number T181051 is selected from chart.

Nameplate data for this unit is:

Primary 120 x 240 and Secondary is 12/24.

Nameplate kva is 0.5kva

(500va divided by 24v = 20.8 amps load capacity)

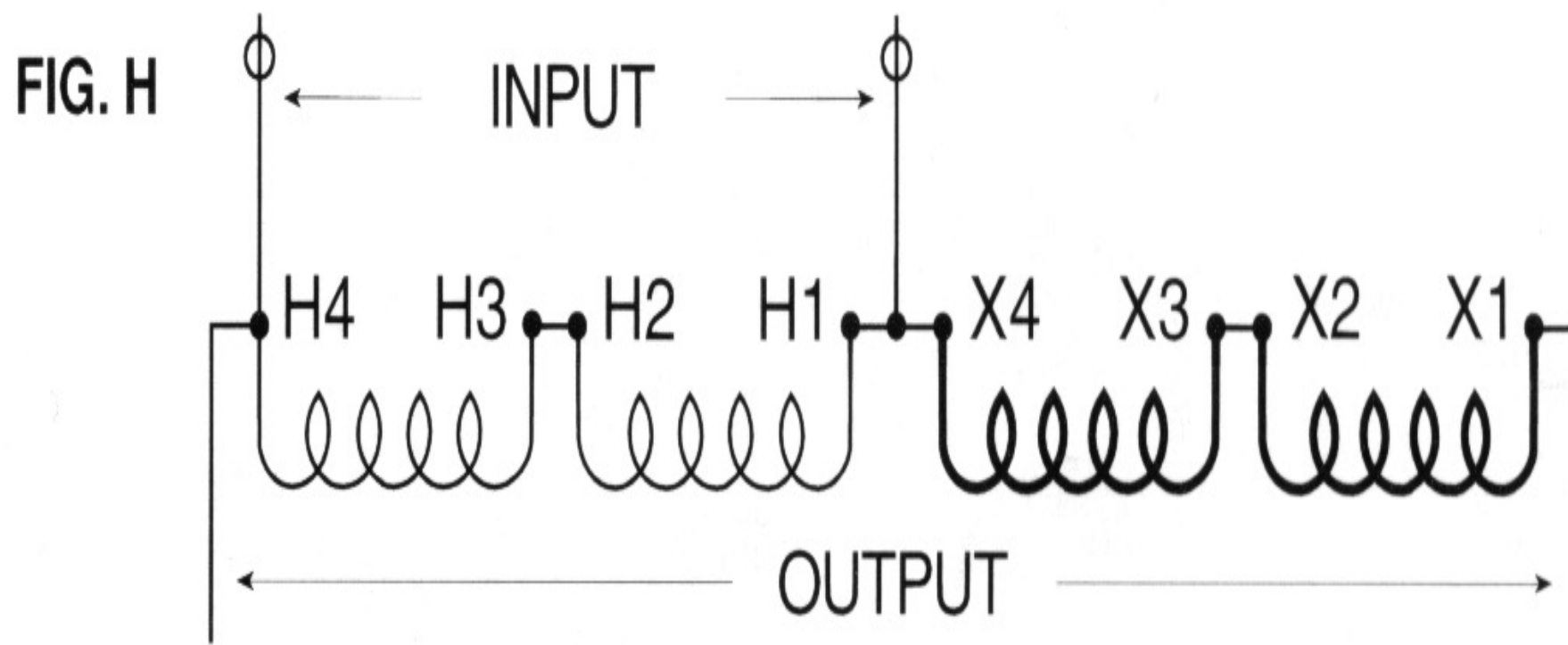
(Load volts 208 times load amps 20.8 = 4.33kva  
when boosting 189v to 208v and wired, per figure H.



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# Connection Diagram



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## Selection Example 2

1. 1 - PHASE
2. 60 HZ
3. LINE - 208 VOLTS
4. LOAD - 240 VOLTS
5. LOAD - 60 AMPS



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# 1-Phase Group II Chart

REFER TO 1-PHASE GROUP II SELECTION CHART ON PAGE 128  
OF SECTION 8 OF 2017 ACME CATALOG.

Chart says use T113075 wired, per figure H.

Nameplate says 2kva and 120 x 240 to 16/32.

(2000va divided by 32v = 62.5 amps)

Load volts 240v times 62.5 amps = 15kva when boosting  
208v to 240v wired, per figure H.

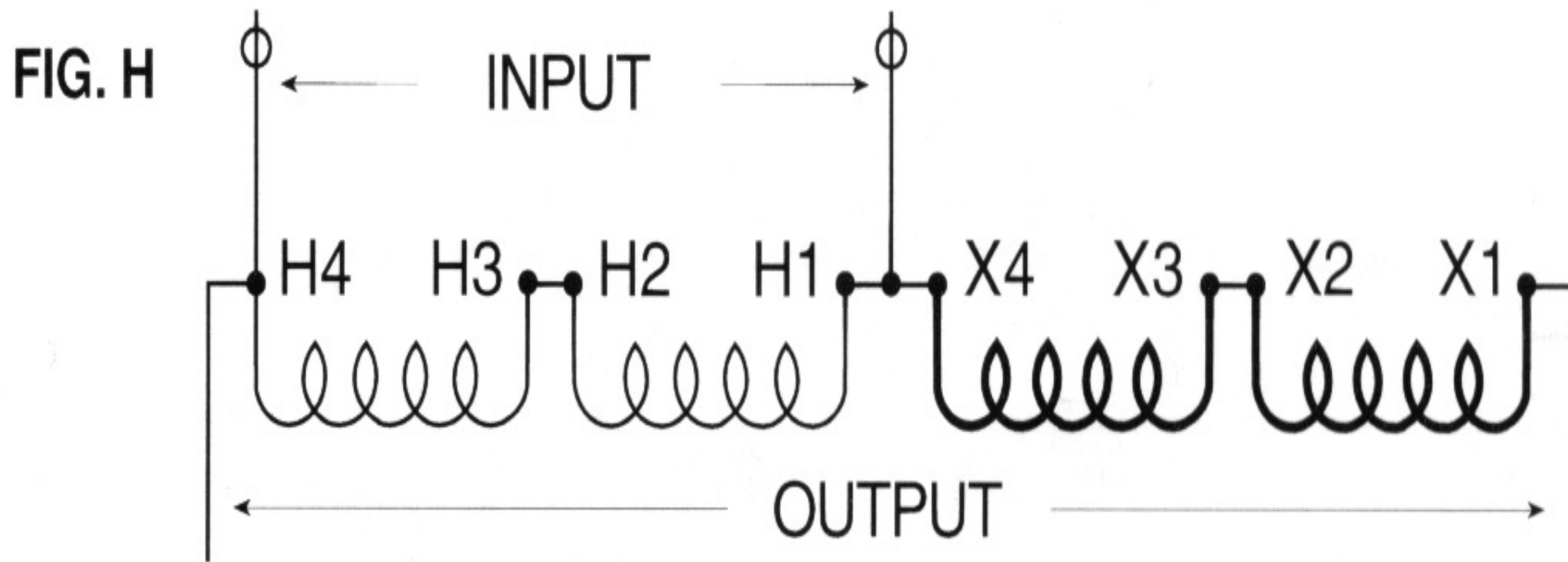


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# Connection Diagram



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## Selection Example 3

1. 1 - PHASE
2. 60 HZ
3. LINE - 240 VOLTS
4. LOAD - 208 VOLTS
5. LOAD - 14 KVA



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# 1-Phase Group II Chart

REFER TO 1-PHASE GROUP II SELECTION CHART  
IN SECTION 8 OF 2017 ACME CATALOG.

Note that this becomes a reverse connection  
of the previous application we just did.  
(wiring diagram I is a reverse connection of figure H)



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# Connection Diagram

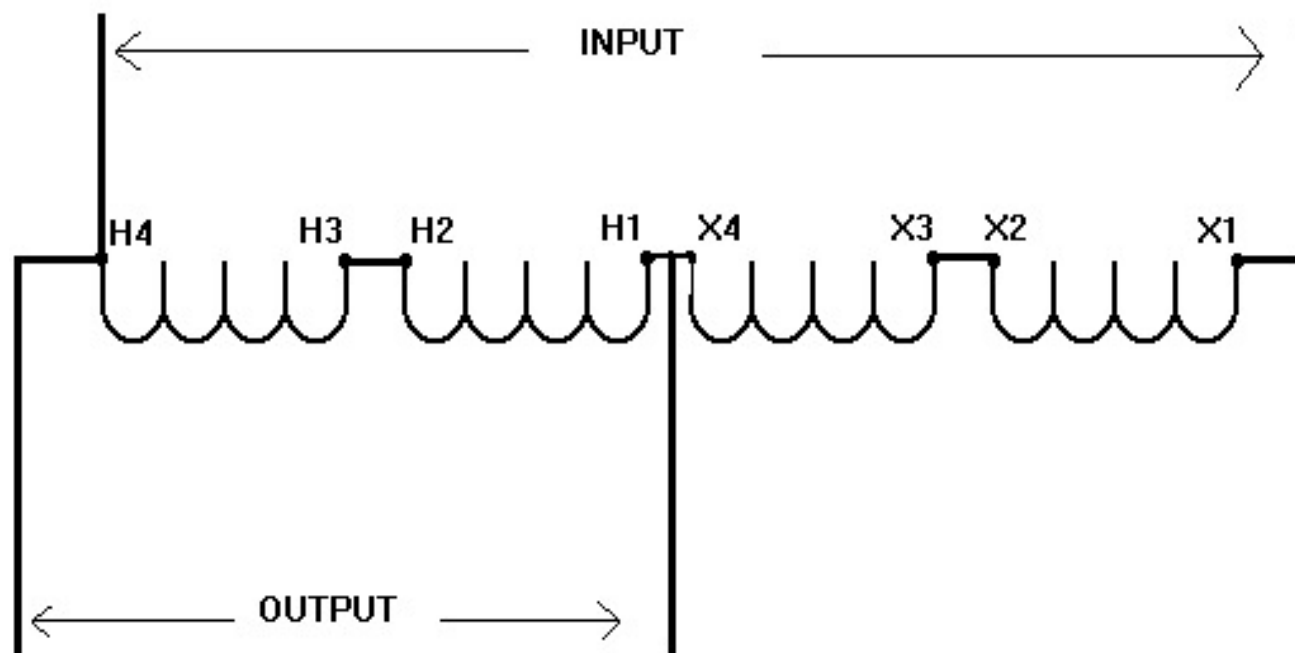


Fig. 1



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## Selection Example 4

1. 3 - PHASE
2. 60 HZ
3. LINE - 208 VOLTS
4. LOAD - 230 VOLTS
5. LOAD - 80 KVA



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# 3-Phase Group I Chart

REFER TO 3-PHASE GROUP I SELECTION CHART  
IN SECTION 8 OF ACME 2017 CATALOG.

Chart says use two pieces of T111687 wired  
per figure B-B.

We can also use the new 3 Phase unit (quantity 1)  
to do this application. Catalog number A3112K0310B.  
(See slides 22 and 23)



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# Connection Diagram B-B

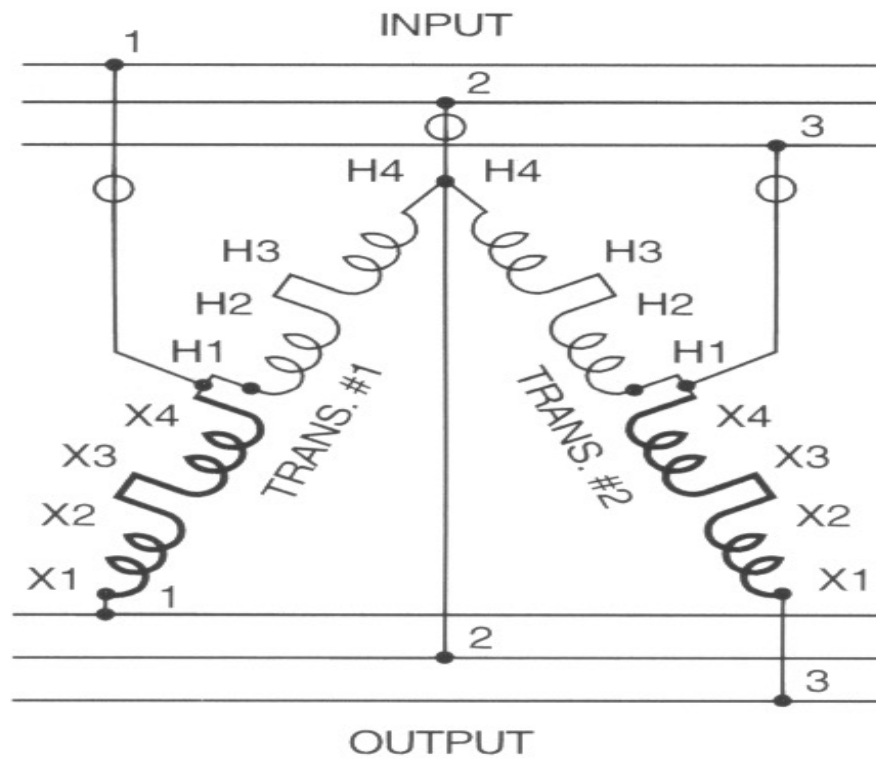


FIG. BB

OPEN DELTA



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# Three Phase Buck-Boost

## 240 PRIMARY VOLTS — 208 SECONDARY VOLTS

kVA	Catalog Number	Height (Inches)(Cm.)	Width (Inches)(Cm.)	Depth (Inches)(Cm.)	Weight (Lbs.)(Kg.)	Dimensional Drawing
3	A3003K0310B	15.19(38.6)	13.50(34.3)	10.84(27.5)	120(54.0)	D
6	A3006K0310B	15.19(38.6)	13.50(34.3)	10.84(27.5)	120(54.0)	D
9	A3009K0310B	15.19(38.6)	13.50(34.3)	10.84(27.5)	130(58.5)	D
15	A3015K0310B	15.19(38.6)	13.50(34.3)	10.84(27.5)	130(58.5)	D
30	A3030K0310B	18.86(47.9)	20.30(51.6)	9.03(22.9)	250(112.5)	I
45	A3045K0310B	18.86(47.9)	20.30(51.6)	9.03(22.9)	270(121.5)	I
75	A3075K0310B	24.81(63.0)	27.13(68.9)	11.14(28.3)	400(180.0)	I
112.5	A3112K0310B	24.81(63.0)	27.13(68.9)	11.14(28.3)	600(270.0)	I
150	A3150K0310B	24.81(63.0)	27.13(68.9)	11.14(28.3)	650(292.5)	I

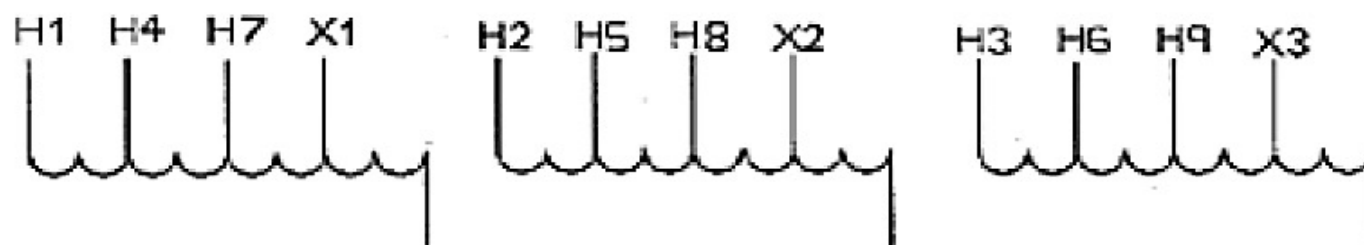


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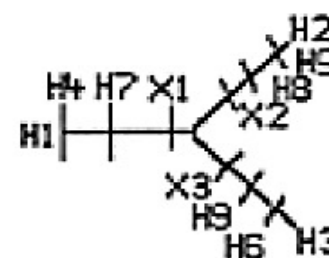


# Three Phase Buck-Boost Wiring Diagram

## CONNECTION DIAGRAM



PRIMARY VOLTS	%	CONNECT LEADS TO TAP NO.
252	105	H1-H2-H3
240	100	H4-H5-H6
228	95	H7-H8-H9
SECONDARY LINES TO X1-X2-X3		



0° ANGULAR DISPLACEMENT



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# Typical Applications for Buck-Boost Transformers

1. AIR CONDITIONERS
2. AC MOTORS
3. PUMPS
4. TANNING BEDS (No. 1 application)
5. CONTROL CIRCUITS



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# General Application Comparison

## STANDARD ISOLATION TRANSFORMER

- Handle large increases or decreases in voltage
- Provide electrical isolation and shielding if required

## BUCK-BOOST TRANSFORMERS

- Handle small increases or decreases in voltage (+/- 5 to 20%)
- Do not provide electrical isolation (because they get “auto” connected)



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# Effect of Low Voltage on Motor Operation

<u>VOLTAGE</u>	<u>CURRENT</u>	<u>TEMPERATURE</u>
- 5 %	+ 5 %	+ 11 %
- 10 %	+ 11 %	+ 23 %
- 15 %	+ 17 %	+ 38 %



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# Other Effects of Low Voltage on Motors

DETERIORATE INSULATION

NUISANCE TRIPPING OF BREAKERS

INSUFFICIENT MOTOR TORQUE

WASTED ENERGY AND MONEY



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# Effects of Low Voltage on Motor Torque

<u>% RATED VOLTS</u>	<u>% RATED TORQUE</u>
100%	100%
90%	81%
80%	64%



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# Causes of Voltage Mismatch

SERVICE VOLTAGE CHANGED AFTER EQUIPMENT INSTALLED

VOLTAGE DROP IN POWER LINE

ERRORS IN ORDERING EQUIPMENT

UTILITY CUTBACK IN SOURCE VOLTAGE



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# General Size Comparison

## STANDARD ISOLATION TRANSFORMER

16"H X 14"W X 11"D

125 LBS

10 KVA RATING

## BUCK-BOOST TRANSFORMER

10"H X 6"W X 5"D

24 LBS

1 KVA RATING



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# Acme Buck-Boost Features

- UL LISTED/CSA CERTIFIED
- UL 3R ENCLOSURES
- ALLOWABLE UNDER NEC
- EPOXY ENCAPSULATED  
(EXCEPT 50, 100, 150 VA)
- BROAD RANGE OF VOLTAGES
- TEN YEAR WARRANTY

***New Three Phase Version Available***



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# Questions or Comments

Tech Service contact number:  
800-334-5214 option 1



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