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# Buck - Boost Transformer Terms & Definitions

Buck-Boost transformers are single phase, four winding transformers designed for two purposes. The first purpose is as a low voltage isolation transformer for use on 12, 16, 24, 32, or 48 volt circuits. When used as low voltage transformers, Buck-Boost transformers have capacities of .050 kVA to 5.0 kVA. Their second, and more important use, is as a Buck-Boost transformer. Buck-Boost means that these transformers are used to buck (lower) or boost (increase) line voltage to match required load voltage.

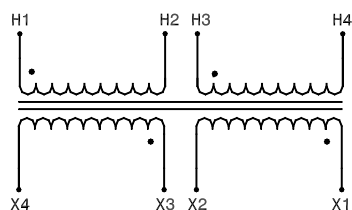
Buck-Boost transformers are used to correct consistently low or high voltage conditions, where the voltage difference ranges from approximately 5% to 27%. Variation of the input voltage is passed through to the output side of the transformer in the same percentage. This concept is important because the question is frequently asked if Buck-Boost transformers will stabilize variable voltages. They will not!

Low voltage conditions may be found at the end of long wire runs where a line voltage drop has occurred due to resistance in the wire. While high voltage supply lines are less frequent, they may be found close to voltage distribution points. Buck-Boost transformers offer a simple, economical solution to these common voltage problems and mitigate the harmful heating effects of low or high voltage.

Buck-Boost transformers are typically four winding isolation transformers as they leave the factory. Connected as an isolation transformer, these products may be used for many low voltage applications such as low voltage control panels or indoor/outdoor low voltage lighting. Low voltage connection charts may be found on Page 66. Type M, Type Y, and Type LM transformers connected per these charts are isolating type transformers.

**When connected as a Buck Boost transformer, these transformers, with dual primaries of 120 x 240, or 240 x 480, and dual secondaries of 12 / 24, 16 / 32, or 24 / 48 volts, have literally hundreds of voltage matching applications.**

Buck-Boost connections result when a lead(s) from the primary winding is interconnected to a lead(s) from the secondary winding. This interconnection modifies the transformer from an isolation transformer into an autotransformer because the primary and secondary windings are no longer electrically isolated from each other. This distinction is depicted



Isolation Transformer Connections

in the diagrams below.

When used in this fashion, the Buck-Boost transformer's kVA capacity is substantially greater than when connected as a low voltage, isolation transformer, as a portion of the line current flows directly through to the connected load.

Buck-Boost transformers are simple and straight forward to specify, size and connect. Buck-Boost connections are achieved by interconnecting the 8 copper lead wires supplied with each transformer in accordance with the charts contained in this section. In addition, each transformer shipped from the factory is equipped with a similar chart to assure ease of use at the installation site.

## Applications:

The most common applications for these transformers are boosting 208 volt lines to 230 or 240 volts, and vice-versa. These applications include both single and three phase lines and are particularly common in HVAC applications for air-conditioning appliances. A chart is specifically provided for convenient sizing of these applications on page 52.

Additionally, Buck-Boost transformers are very well suited to motor loads, boosting 240 to 277 for lighting loads and many applications where nominal voltage is above or below 120 volts. Their use should be considered where supply line voltage is found to be consistently above or below desired nominal values of load voltage.

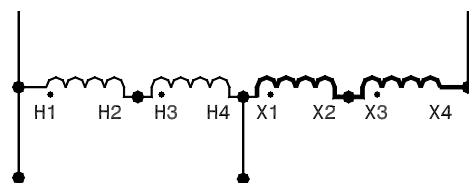
## Single Phase Applications:

Single phase applications require the purchase of one transformer. Charts are provided on Pages 53 - 55 for sizing and specifying single phase applications.

## Three Phase Applications:

Three phase applications require banking either 2 or 3 Buck-Boost transformers. Charts are provided on Pages 56 - 58 for sizing and specifying three phase applications.

Series ODY Autotransformers provide an economical, factory preconnected installation for transforming three phase lines from 208 to 240, or 240 to 208. This series banks 2 Buck-Boost transformers into one assembly for mounting and one assembly for connecting. Simply bring in three wires on the line side and take out three wires on the load side.



Autotransformer Connections

# Buck - Boost Transformer Terms & Definitions

## Connection/Configurations to Avoid:

Some line/load distribution system combinations are to be avoided. For instance, closed delta connections are not recommended because they may cause phase shifting to occur on the load side of the bank. In addition, they require larger transformers to accomplish similar results and are, therefore, less efficient and more expensive. Also, a three phase, 4 wire wye supply line should be connected to a wye configuration, 3 transformer bank. This configuration will assure sufficient current carrying capacity in the neutral of the wye circuit.

The chart below indicates distribution system restrictions.

Input (Supply System)	Desired Output Connection	
WYE 4 wire	WYE 3 or 4 wire	OK
WYE 3 or 4 wire	OPEN DELTA 3 wire	OK
CLOSED DELTA 3 Wire	OPEN DELTA 3 wire	OK
DELTA 3 Wire	WYE 3 or 4 wire	DO NOT USE
OPEN DELTA 3 wire	WYE 3 or 4 wire	DO NOT USE
WYE 3 or 4 wire	CLOSED DELTA 3 Wire	DO NOT USE

## Fusing Buck-Boost Transformers:

Buck-Boost kVA capacity is significantly higher than the low voltage isolation capacity listed on the nameplate of the transformer. Frequently, this disparity leads to questions of how to fuse the transformer. The Buck-Boost sizing charts on the following pages conveniently provide a fuse size for each transformer application.

In addition, paragraph 450-4 of the National Electric Code® provides more detailed information:

### 450-4. Autotransformers 600 Volts, Nominal, or Less.

- (a) Overcurrent Protection. Each autotransformer 600 volts, nominal, or less, shall be protected by an individual overcurrent device installed in series with each ungrounded input conductor. Such overcurrent device shall be rated or set at not more than 125 percent of the rated full-load input current of the autotransformer. An overcurrent device shall not be installed in series with

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the shunt winding (the winding common to both the input and the output circuits) of the autotransformer between Points A and B as shown in Figure 450-4.

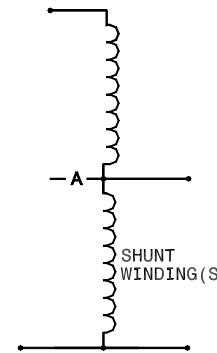
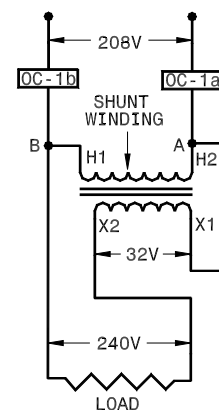


Figure 450-4

Exception: Where the rated input current of an autotransformer is 9 amperes or more and 125 percent of this current does not correspond to a standard rating of a fuse or nonadjustable circuit breaker, the next higher standard rating described in Section 240-6 (NEC) shall be permitted. Where the rated input current is less than 9 amperes, an overcurrent device rated or set at not more than 167 percent of the input current shall be permitted.



The drawing above indicates proper overcurrent placement in a typical Buck-Boost application.

- (b) Transformer Field-Connected as an Autotransformer. A transformer field-connected as an autotransformer shall be identified for use at elevated voltage.

## Sizing Buck-Boost Transformers:

Please turn to the next page for the proper questions to ask when sizing these installations. Sizing will be self evident when the examples are followed.

# Buck - Boost Transformer Sizing

Determine the information below in order to select the correct buck- boost transformer for your application. Reference tables, sizing formulae, kVA, amps, and motor horsepower are provided on the follow-

ing page. Any questions on sizing may be handled by your Dongan® Representative or by contacting Dongan® Customer Service at ( 800 ) 428-2626.

Required Data	Explanation	Examples	
		Single Phase	Three Phase
<b>Phase Requirements</b>	Determine load phase requirements <ul style="list-style-type: none"> <li>• Single phase</li> <li>• Three phase</li> </ul>	<b>1 Phase</b>	<b>3 Phase</b>
<b>Line Voltage</b>	Determine the supply or line voltage at the installation site where the transformer will be connected. This is best accomplished by measuring the voltage with a suitable voltmeter.	<b>106 volts</b>	<b>208 volts</b>
<b>Load Voltage</b>	Determine the voltage you require to operate the load to be connected to the transformer. If you are unsure of the correct voltage, check the nameplate of the devices intended for operation.	<b>120 volts</b>	<b>240 volts</b>
<b>Frequency</b>	Be certain the supply line frequency and the load frequency required are the same. Remember: a transformer is not capable of changing frequency.	<b>60 Hz</b>	<b>60 Hz</b>
<b>Load Amps or kVA</b>	Determine either load kVA or load amps by adding all loads to be supplied by the transformer. This is best accomplished by again referring to the equipment nameplates.	<b>4 kVA</b>	<b>15 kVA</b>
<b>Select Correct Catalog No. from Charts</b>	Now turn to the appropriate single or three phase buck - boost chart. Select the column closest to the line/load voltage combination for your application. Move down the column until values of load kVA or load amps meet or exceed your load amps or load kVA required. Never size smaller than your requirements demand. Then read across the row to select the correct catalog number for your application.	<b>Cat No. 85-Y030</b>	<b>Cat No. 85-Y040</b>
<b>Connect Transformer per Supplied Diagrams</b>	Remember, three phase applications require banks of two or three transformers, while single phase applications require only one unit. The charts note the correct combination of units required at the bottom of the columns. Be sure to specify and order the correct number of units for your three phase applications.	<b>or 35-Y030</b>	<b>or 80-Y040</b>
	The transformer may now be connected per the diagram indicated at the bottom of the column from which you selected your line/load combination. A connection diagram is packaged with each Buck-Boost transformer for your convenience.	<b>1 Unit Required</b>	<b>2 Units Required</b>
		<b>Diagram SP-11</b>	<b>Diagram TP-5</b>

## How to Determine Transformer kVA Ratings

### Transformer Load expressed in amperes:

Select the appropriate kVA size from the selection charts listed on this page or by using the single phase or three phase sizing formula listed below. Be sure to select a transformer kVA rating equal to or greater than the anticipated connected load.

$$\text{Single Phase kVA} = \frac{\text{Load Voltage} \times \text{Load Amps}}{1000} \quad \text{kVA} = \frac{\text{Volt Amperes}}{1000}$$

$$\text{Three Phase kVA} = \frac{\text{Load Voltage} \times \text{Load Amps} \times 1.73}{1000} \quad \text{VA} = \text{kVA} \times 1000$$

### Transformer Load expressed in kVA:

Select the appropriate size from the selection charts. Be sure to select a transformer kVA rating equal to or greater than the anticipated connected load.

### Transformer Load expressed in wattage:

Convert wattage into a kVA rating by using the formula listed below. Or you may refer to the equipment nameplate to obtain the ampere requirements of the connected load. Be sure to select a transformer kVA rating equal to or greater than the anticipated connected load.

$$\text{kVA} = \frac{\text{Wattage}}{(1000 \times \text{Power Factor of the Load})}$$

### Transformer Load expressed in motor horsepower:

Select the appropriate size kVA rating from the motor horsepower charts on this page. Be sure to select a transformer kVA rating equal to or greater than the anticipated load requirements.

#### Note:

**High Ambient Temperature Applications:** Derate the transformer nameplate kVA 8% for each 10°C above 40°C up to 60°C. Consult factory for ambients above 60°C.

**High Altitude Applications:** To allow for reduced cooling at higher elevations derate the transformer nameplate kVA by .3% for each 330 feet over 3300 feet above sea level.

kVA / Ampacity Ratings for Three Phase AC Voltages								
kVA	200V	208V	240V	380V	415V	480V	575V	600V
3	8.6	8.3	7.2	4.5	4.1	3.6	3.0	2.8
6	17.3	16.6	14.4	9.1	8.3	7.2	6.0	5.7
9	26.0	25.0	21.6	13.6	12.5	10.8	9.0	8.6
15	43.3	41.6	36.1	22.8	20.8	18.0	15.0	14.4
25	72	69	60	38.0	34.8	30.1	25.1	24.0
30	86	83	72	45.6	41.7	36.1	30.1	28.9
45	130	125	108	68	62	54	45.2	43.3
75	216	208	180	114	104	90	75	72
112.5	325	312	270	171	156	135	113	108
150	433	416	361	228	208	180	150	144

Full Load Amperes - Single Phase AC Motor Voltages						
HP	115V	200V	208V	230V	Minimum Transformer kVA	Std. Dongan® Size
1/6	4.4	2.5	2.4	2.2	.53	.750
1/4	5.8	3.3	3.2	2.9	.70	.750
1/3	7.2	4.1	4.0	3.6	.87	1
1/2	9.8	5.6	5.4	4.9	1.18	1.5
3/4	13.8	7.9	7.6	6.9	1.68	2
1	16	9.2	8.8	8	1.92	2
1 1/2	20	11.5	11	10	2.40	3
2	24	13.8	13.2	12	2.88	3
3	34	19.6	18.7	17	4.10	5
5	56	32.2	30.8	28	6.72	7.5
7 1/2	80	46	44	40	9.60	10
10	100	57.5	55	50	12.0	15

kVA / Ampacity Ratings for Single Phase AC Voltages													
kVA	12V	16V	24V	32V	48V	120V	208V	240V	277V	380V	415V	480V	600V
.050	4.2	3.1	2.1	1.6	1.0	.42	.24	.21	.18	.13	.12	.10	.08
.100	8.3	6.2	4.2	3.3	2.0	.83	.48	.42	.36	.26	.24	.21	.17
.150	12.5	9.4	6.3	4.6	3.1	1.3	.72	.63	.54	.39	.36	.31	.25
.250	20.8	15.6	10.4	7.8	5.2	2.1	1.2	1.0	.90	.66	.60	.52	.42
.500	41.7	31.2	20.8	15.6	10.4	4.2	2.4	2.1	1.8	1.3	1.2	1.0	.83
.750	62	47	31.3	23.4	16.6	6.3	3.6	3.1	2.7	2.0	1.8	1.6	1.3
1	83	62	41.7	31.2	20.8	8.3	4.8	4.2	3.6	2.6	2.4	2.1	1.7
1.5	125	94	62	47	31.2	12.5	7.2	6.3	5.4	3.9	3.6	3.1	2.5
2	166	125	83	62.5	41.6	16.7	9.6	8.3	7.2	5.3	4.8	4.2	3.3
3	250	188	125	94	62	25.0	14.4	12.5	10.8	7.9	7.2	6.3	5.0
5	416	312	208	156	104	41.7	24.0	20.8	18.1	13.2	12.0	10.4	8.3
7.5						62	36.1	31.3	27.1	19.7	18.1	15.6	12.5
10						83	48.1	41.7	36.1	26.3	24.1	20.8	16.7
15						125	72	62	54	39.5	36.1	31.3	25.0
25						208	120	104	90	65	60	52	41.7
37.5						312	180	156	135	98	90	78	62
50						416	240	208	180	131	120	104	83
75						625	360	312	270	197	180	156	125
100						833	480	416	361	263	240	208	166

#### Note:

Increase transformer kVA by 20% when motors are started more than once per hour. Multiply motor ampacity by 1.1 and 1.25 respectively for 90% and 80% power factors.

Full Load Amperes - Three Phase AC Motor Voltages						
HP	208V	230V	460V	575V	Min. Transformer kVA	Std. Dongan® Size
1/2	2.4	2.2	1.1	.9	0.9	3
3/4	3.5	3.2	1.6	1.3	1.2	3
1	4.6	4.2	2.1	1.7	1.5	3
1 1/2	6.6	6.0	3.0	2.4	2.1	3
2	7.5	6.8	3.4	2.7	2.7	3
3	10.6	9.6	4.8	3.9	3.8	6
5	16.7	15.2	7.6	6.1	6.3	9
7 1/2	24.2	22	11	9	9.2	15
10	30.8	28	14	11	11.2	15
15	46.2	42	21	17	16.6	25
20	59.4	54	27	22	21.6	25
25	74.8	68	34	27	26.6	30
30	88	80	40	32	32.4	45
40	114	104	52	41	43.2	45
50	143	130	65	52	52	75
60	169	154	77	62	64	75
75	211	192	96	77	80	112.5
100	273	248	124	99	103	112.5
125	343	312	156	125	130	150
150	396	360	180	144	150	150

# Quick Reference Chart - 208, 230, 240 Volts Single & Three Phase Buck - Boost

The most common buck - boost transformer uses are those involving line/load combinations of 208, 230 and 240 volts, in both single and three phase installations. These applications include air conditioning loads, motor loads, and machinery loads of all kinds.

The charts below provide simple solutions to these common applications with easy access data for kVA, line, and load amps information.

Three phase installations are easily accomplished with the use of Series ODY factory pre-connected three phase buck boost transformers. The ODY Series allows you to install and connect on pre-connected transformer for your three phase applications.

Other voltage combinations may be found on the following pages.

Single Phase Type M - 1 Unit			Single Phase Type Y - 1 Unit		
Catalog Number	230 208		Catalog Number	240 208	
35-M005 .45 kVA	Max Amps at 230 V.	1.9	35-Y005 .37 kVA	Max Amps at 240 V.	1.5
	Max Amps at 208 V.	2.1		Max Amps at 208 V.	1.8
	208V Fuse	5		208V Fuse	5
35-M010 .90 kVA	Max Amps at 230 V.	3.9	35-Y010 .75 kVA	Max Amps at 240 V.	3.1
	Max Amps at 208 V.	4.3		Max Amps at 208 V.	3.6
	208V Fuse	8		208V Fuse	5
35-M015 1.36kVA	Max Amps at 230 V.	5.9	35-Y015 1.12 kVA	Max Amps at 240 V.	4.6
	Max Amps at 208 V.	6.5		Max Amps at 208 V.	5.4
	208V Fuse	12		208V Fuse	8
85-M020 2.2 kVA	Max Amps at 230 V.	9.8	85-Y020 1.8 kVA	Max Amps at 240 V.	7.5
	Max Amps at 208 V.	10.8		Max Amps at 208 V.	9.0
	208V Fuse	15		208V Fuse	15
85-M025 4.5 kVA	Max Amps at 230 V.	19.7	85-Y025 3.7 kVA	Max Amps at 240 V.	15.4
	Max Amps at 208 V.	21.7		Max Amps at 208 V.	18.0
	208V Fuse	30		208V Fuse	25
85-M030 6.7 kVA	Max Amps at 230 V.	29.5	85-Y030 5.6 kVA	Max Amps at 240 V.	23.3
	Max Amps at 208 V.	32.6		Max Amps at 208 V.	27.0
	208V Fuse	45		208V Fuse	30
85-M035 9.0 kVA	Max Amps at 230 V.	39.4	85-Y035 7.5 kVA	Max Amps at 240 V.	31.2
	Max Amps at 208 V.	43.5		Max Amps at 208 V.	36.0
	208V Fuse	60		208V Fuse	40
85-M040 13.5 kVA	Max Amps at 230 V.	59.1	85-Y040 11.2 kVA	Max Amps at 240 V.	46.6
	Max Amps at 208 V.	64.9		Max Amps at 208 V.	54.0
	208V Fuse	90		208V Fuse	60
85-M045 18.1 kVA	Max Amps at 230 V.	78.8	85-Y045 15.0 kVA	Max Amps at 240 V.	62.5
	Max Amps at 208 V.	87.0		Max Amps at 208 V.	72.1
	208V Fuse	125		208V Fuse	80
85-M050 27.1 kVA	Max Amps at 230 V.	118.2	85-Y050 22.5 kVA	Max Amps at 240 V.	93.7
	Max Amps at 208 V.	130.2		Max Amps at 208 V.	108.0
	208V Fuse	175		208V Fuse	125
85-M055 45.3 kVA	Max Amps at 230 V.	197.0	85-Y055 37.5 kVA	Max Amps at 240 V.	156.2
	Max Amps at 208 V.	217.7		Max Amps at 208 V.	180.2
	208V Fuse	300		208V Fuse	200
Qty. Required Connection Dia. Page	1 SP- 14 60		Qty. Required Connection Dia. Page	1 SP- 15 60	

Three Phase Type ODY - 1 Unit			Three Phase Type Y - 2 Units		
Catalog Number	240 208	Max Amps	Catalog Number	240 208	Max Amps
34-280-ODY 2.8 kVA	Max Amps at 240 V.	6.7	85-Y020 2.8 kVA	Max Amps at 240 V.	6.7
	Max Amps at 208 V.	7.8		Max Amps at 208 V.	7.8
	Fuse Size	15		Fuse Size	15
34-560-ODY 5.6 kVA	Max Amps at 240 V.	13.5	85-Y025 5.6 kVA	Max Amps at 240 V.	13.5
	Max Amps at 208 V.	15.6		Max Amps at 208 V.	15.6
	Fuse Size	25		Fuse Size	25
34-840-ODY 8.4 kVA	Max Amps at 240 V.	20.2	85-Y030 8.4 kVA	Max Amps at 240 V.	20.2
	Max Amps at 208 V.	23.4		Max Amps at 208 V.	23.4
	Fuse Size	30		Fuse Size	30
84-1120-ODY 11.2 kVA	Max Amps at 240 V.	27.0	85-Y035 11.2 kVA	Max Amps at 240 V.	27.0
	Max Amps at 208 V.	31.2		Max Amps at 208 V.	31.2
	Fuse Size	45		Fuse Size	45
84-1690-ODY 16.9 kVA	Max Amps at 240 V.	40.5	85-Y040 16.9 kVA	Max Amps at 240 V.	40.5
	Max Amps at 208 V.	46.8		Max Amps at 208 V.	46.8
	Fuse Size	60		Fuse Size	60
84-2250-ODY 22.5 kVA	Max Amps at 240 V.	54.1	85-Y045 22.5 kVA	Max Amps at 240 V.	54.1
	Max Amps at 208 V.	62.4		Max Amps at 208 V.	62.4
	Fuse Size	80		Fuse Size	80
84-3300-ODY 33.7 kVA	Max Amps at 240 V.	81.1	85-Y050 33.7 kVA	Max Amps at 240 V.	81.1
	Max Amps at 208 V.	93.6		Max Amps at 208 V.	93.6
	Fuse Size	125		Fuse Size	125
84-5600-ODY 56.2 kVA	Max Amps at 240 V.	135.3	85-Y055 56.2 kVA	Max Amps at 240 V.	135.3
	Max Amps at 208 V.	156.1		Max Amps at 208 V.	156.1
	Fuse Size	200		Fuse Size	200
Qty. Required Connection Dia. Page	1 TP-25 63		Qty. Required Connection Dia. Page	2 TP-26 63	

# Single Phase Buck - Boost Sizing Tables

## Single Phase Buck - Boost Table, Type M

Type M		Single Phase / Single Unit - Type M												
		Boost - Increase Voltage								Buck - Decrease Voltage				
Catalog Number	Load Line	120	120	120	120	240	240	240	230	120	120	208	240	240
		96	100	108	109	216	218	228	208	132	144	230	252	264
35-M005	Load Amps	2.0	2.0	3.7	4.1	2.0	2.0	4.1	1.9	4.5	2.5	2.1	4.3	2.2
	kVA	<b>0.25</b>	<b>0.25</b>	<b>0.45</b>	<b>0.49</b>	<b>0.50</b>	<b>0.49</b>	<b>1.00</b>	<b>0.45</b>	<b>0.55</b>	<b>0.30</b>	<b>0.45</b>	<b>1.05</b>	<b>0.55</b>
	Line Fuse	5	5	8	8	5	5	7	5	7	5	5	7	5
35-M010	Load Amps	4.1	4.1	7.5	8.2	4.1	4.1	8.3	3.9	9.1	5.0	4.3	8.7	4.5
	kVA	<b>0.50</b>	<b>0.50</b>	<b>0.90</b>	<b>0.99</b>	<b>1.00</b>	<b>0.99</b>	<b>2.00</b>	<b>0.90</b>	<b>1.10</b>	<b>0.60</b>	<b>0.91</b>	<b>2.10</b>	<b>1.10</b>
	Line Fuse	10	10	15	15	8	8	15	8	15	7	7	15	7
35-M015	Load Amps	6.2	6.2	11.2	12.3	6.2	6.1	12.5	5.9	13.7	7.5	6.5	13.1	6.8
	kVA	<b>0.75</b>	<b>0.75</b>	<b>1.35</b>	<b>1.48</b>	<b>1.50</b>	<b>1.48</b>	<b>3.00</b>	<b>1.36</b>	<b>1.65</b>	<b>0.90</b>	<b>1.36</b>	<b>3.15</b>	<b>1.65</b>
	Line Fuse	15	15	20	20	12	12	20	12	20	12	10	20	12
85-M020	Load Amps	10.4	10.4	18.7	20.6	10.4	10.3	20.8	9.8	22.9	12.5	10.9	21.8	11.4
	kVA	<b>1.25</b>	<b>1.25</b>	<b>2.25</b>	<b>2.47</b>	<b>2.50</b>	<b>2.47</b>	<b>5.00</b>	<b>2.26</b>	<b>2.75</b>	<b>1.50</b>	<b>2.27</b>	<b>5.25</b>	<b>2.75</b>
	Line Fuse	20	20	30	30	15	15	30	15	30	15	15	30	15
85-M025	Load Amps	20.8	20.8	37.5	41.2	20.8	20.6	41.6	19.7	45.8	25.0	21.8	43.7	22.9
	kVA	<b>2.50</b>	<b>2.50</b>	<b>4.50</b>	<b>4.95</b>	<b>5.00</b>	<b>4.95</b>	<b>10.00</b>	<b>4.53</b>	<b>5.50</b>	<b>3.00</b>	<b>4.55</b>	<b>10.50</b>	<b>5.50</b>
	Line Fuse	35	35	60	60	30	30	60	30	60	30	30	60	30
85-M030	Load Amps	31.2	31.2	56.2	61.9	31.2	30.9	62.5	29.5	68.7	37.5	32.8	65.6	34.3
	kVA	<b>3.75</b>	<b>3.75</b>	<b>6.75</b>	<b>7.43</b>	<b>7.50</b>	<b>7.43</b>	<b>15.00</b>	<b>6.79</b>	<b>8.25</b>	<b>4.50</b>	<b>6.83</b>	<b>15.75</b>	<b>8.25</b>
	Line Fuse	50	50	80	90	45	45	80	45	80	40	40	80	40
85-M035	Load Amps	41.6	41.6	75.0	82.5	41.6	41.2	83.3	39.4	91.6	50.0	43.7	87.5	45.8
	kVA	<b>5.00</b>	<b>5.00</b>	<b>9.00</b>	<b>9.90</b>	<b>10.00</b>	<b>9.90</b>	<b>20.00</b>	<b>9.06</b>	<b>11.00</b>	<b>6.00</b>	<b>9.10</b>	<b>21.00</b>	<b>11.00</b>
	Line Fuse	70	70	125	125	60	60	110	60	110	60	60	110	60
85-M040	Load Amps	62.5	62.5	112.5	123.8	62.5	61.9	125.0	59.1	137.5	75.0	65.6	131.2	68.7
	kVA	<b>7.5</b>	<b>7.5</b>	<b>13.5</b>	<b>14.8</b>	<b>15.0</b>	<b>14.8</b>	<b>30.0</b>	<b>13.5</b>	<b>16.5</b>	<b>9.0</b>	<b>13.6</b>	<b>31.5</b>	<b>16.5</b>
	Line Fuse	100	100	175	175	80	80	175	90	175	80	80	175	80
85-M045	Load Amps	83.3	83.3	150.0	165.1	83.3	82.5	166.6	78.8	183.3	100.0	87.5	175.0	91.6
	kVA	<b>10.0</b>	<b>10.0</b>	<b>18.0</b>	<b>19.8</b>	<b>20.0</b>	<b>19.8</b>	<b>40.0</b>	<b>18.1</b>	<b>22.0</b>	<b>12.0</b>	<b>18.2</b>	<b>42.0</b>	<b>22.0</b>
	Line Fuse	150	150	250	250	125	125	225	125	225	110	110	225	110
85-M050	Load Amps	125.0	125.0	225.0	247.7	125.0	123.8	250.0	118.2	275.0	150.0	131.3	262.5	137.5
	kVA	<b>15.0</b>	<b>15.0</b>	<b>27.0</b>	<b>29.7</b>	<b>30.0</b>	<b>29.7</b>	<b>60.0</b>	<b>27.1</b>	<b>33.0</b>	<b>18.0</b>	<b>27.3</b>	<b>63.0</b>	<b>33.0</b>
	Line Fuse	200	200	350	350	175	175	350	175	350	175	150	350	175
85-M055	Load Amps	208.3	208.3	375.0	412.8	208.3	206.4	416.6	197.0	458.3	250.0	218.9	437.5	229.1
	kVA	<b>25.0</b>	<b>25.0</b>	<b>45.0</b>	<b>49.5</b>	<b>50.0</b>	<b>49.5</b>	<b>100.0</b>	<b>45.3</b>	<b>55.0</b>	<b>30.0</b>	<b>45.5</b>	<b>105.0</b>	<b>55.0</b>
	Line Fuse	350	350	600	600	300	300	600	300	600	300	250	600	300
Qty. Required		1	1	1	1	1	1	1	1	1	1	1	1	1
Connection Dia. Page		SP - 8 59	SP - 12 60	SP - 7 59	SP - 11 60	SP - 6 59	SP - 10 60	SP - 5 59	SP - 10 60	SP - 3 59	SP - 4 59	SP - 2 59	SP - 1 59	SP - 2 59

Connection diagrams may be found on Pgs. 59 - 60.

Connections found on this Page require ordering  
1 Buck - Boost Transformer

The appropriate size 35 or 80 Series Transformer may be substituted for the 85 Series where desired.

# Single Phase Buck - Boost Sizing Tables

## Single Phase Buck - Boost Table, Type Y

Type Y		Single Phase / Single Unit - Type Y												
		Boost - Increase Voltage								Buck - Decrease Voltage				
Catalog Number	Load Line	120	120	120	120	240	240	240	240	120	120	240	240	208
		88	95	104	106	212	224	225	208	136	152	256	272	240
35-Y005	Load Amps	1.5	1.9	3.1	3.1	1.5	3.1	3.1	1.5	3.5	1.9	3.3	1.7	1.8
	kVA	0.18	0.23	0.37	0.37	0.37	0.75	0.75	0.37	0.42	0.23	0.80	0.42	0.37
	Line Fuse	5	5	5	5	5	5	5	5	5	5	5	5	5
35-Y010	Load Amps	3.1	3.9	6.2	6.3	3.1	6.2	6.2	3.1	7.0	3.9	6.6	3.5	3.6
	kVA	0.37	0.47	0.75	0.75	0.75	1.50	1.50	0.75	0.85	0.47	1.60	0.85	0.75
	Line Fuse	7	8	12	12	6	10	10	6	10	5	10	5	5
35-Y015	Load Amps	4.6	5.9	9.3	9.4	4.7	9.3	9.3	4.6	10.6	5.9	10.0	5.3	5.4
	kVA	0.56	0.71	1.12	1.13	1.13	2.25	2.25	1.12	1.27	0.71	2.40	1.27	1.12
	Line Fuse	10	15	15	15	9	15	15	9	15	8	15	8	8
85-Y020	Load Amps	7.8	9.8	15.6	15.7	7.8	15.6	15.6	7.8	17.7	9.8	16.6	8.8	9.0
	kVA	0.93	1.18	1.87	1.89	1.89	3.75	3.75	1.87	2.12	1.18	4.00	2.12	1.87
	Line Fuse	15	25	25	25	15	25	25	15	20	15	20	15	15
85-Y025	Load Amps	15.6	19.7	31.2	31.5	15.7	31.2	31.2	15.6	35.4	19.7	33.3	17.7	18.0
	kVA	1.87	2.37	3.75	3.78	3.78	7.50	7.50	3.75	4.25	2.37	8.00	4.25	3.75
	Line Fuse	3.0	35	45	45	25	45	45	25	4	25	40	25	25
85-Y030	Load Amps	23.4	29.6	46.8	47.3	23.6	46.8	46.8	23.4	53.1	29.6	50.0	26.5	27.0
	kVA	2.81	3.56	5.62	5.67	5.67	11.25	11.25	5.62	6.37	3.56	12.00	6.37	5.62
	Line Fuse	40	50	70	70	35	70	70	35	60	30	60	35	30
85-Y035	Load Amps	31.2	39.5	62.5	63.0	31.5	62.5	62.5	31.2	70.8	39.5	66.6	35.4	36.0
	kVA	3.75	4.75	7.50	7.57	7.57	15.00	15.00	7.50	8.50	4.75	16.00	8.50	7.50
	Line Fuse	60	70	90	90	45	90	90	50	80	40	80	45	40
85-Y040	Load Amps	46.8	59.3	93.7	94.6	47.3	93.7	93.7	46.8	106.2	59.3	100.0	53.1	54.0
	kVA	5.6	7.1	11.2	11.3	11.3	22.5	22.5	11.2	12.7	7.1	24.0	12.7	11.2
	Line Fuse	80	100	150	150	70	125	125	70	125	60	125	70	60
85-Y045	Load Amps	62.5	79.1	125.0	126.1	63.0	125.0	125.0	62.5	141.6	79.1	133.3	70.8	72.1
	kVA	7.5	9.5	15.0	15.1	15.1	30.0	30.0	15.0	17.0	9.5	32.0	17.0	15.0
	Line Fuse	110	125	200	200	90	175	175	100	175	80	150	90	80
85-Y050	Load Amps	93.7	118.7	187.5	189.2	94.6	187.5	187.5	93.7	212.5	118.7	200.0	106.2	108.1
	kVA	11.2	14.2	22.5	22.7	22.7	45.0	45.0	22.5	25.5	14.2	48.0	25.5	22.5
	Line Fuse	175	200	300	300	150	300	300	150	250	125	225	150	125
85-Y055	Load Amps	156.2	197.9	312.5	315.4	157.7	312.5	312.5	156.2	354.1	197.9	333.3	177.0	180.2
	kVA	18.7	23.7	37.5	37.8	37.8	75.0	75.0	37.5	42.5	23.7	80.0	42.5	37.5
	Line Fuse	300	350	500	450	250	450	450	250	400	200	400	250	200
Qty. Required		1	1	1	1	1	1	1	1	1	1	1	1	1
Connection Dia. Page		SP - 8 59	SP - 12 60	SP - 7 59	SP - 11 60	SP - 10 60	SP - 5 59	SP - 9 60	SP - 6 59	SP - 3 59	SP - 4 59	SP - 1 59	SP - 2 59	SP - 13 60

Connection diagrams may be found on Pgs. 59 - 60.

Connections found on this Page require ordering  
1 Buck - Boost Transformers

The appropriate size 35 or 80 Series Transformer may be  
substituted for the 85 Series where desired.



# Single Phase Buck - Boost Sizing Tables

## Single Phase Buck - Boost Table, Type LM

Type LM		Single Phase / Single Unit - Type LM													
		Boost - Increase Voltage								Buck - Decrease Voltage					
Catalog Number	Load Line	240	240	240	240	480	480	480	480	230	230	240	240	480	480
		192	200	216	218	432	437	456	457	253	277	264	288	504	528
35-LM010	Load Amps	2.0	2.0	4.1	4.1	2.0	2.1	4.1	4.1	4.5	2.4	4.5	2.5	4.3	2.2
	kVA	0.50	0.50	1.00	1.00	1.00	1.01	2.00	1.98	1.05	0.56	1.10	0.60	2.10	1.10
	Line Fuse	5	5	8	7	5	5	7	7	7	5	7	7	5	7
35-LM015	Load Amps	3.1	3.1	6.2	6.2	3.1	3.1	6.2	6.2	6.8	3.6	6.8	3.7	6.5	3.4
	kVA	0.75	0.75	1.50	1.50	1.50	1.52	3.00	2.98	1.58	0.84	1.65	0.90	3.15	1.65
	Line Fuse	7	7	10	12	6	6	10	10	10	5	10	5	10	5
85-LM020	Load Amps	5.2	5.2	10.4	10.4	5.2	5.2	10.4	10.3	11.4	6.1	11.4	6.2	10.9	5.7
	kVA	1.25	1.25	2.50	2.50	2.50	2.54	5.00	4.96	2.63	1.41	2.75	1.50	5.25	2.75
	Line Fuse	10	10	15	15	10	10	15	15	15	9	15	9	15	9
85-LM025	Load Amps	10.4	10.4	20.8	20.8	10.4	10.5	20.8	20.6	22.9	12.2	22.9	12.5	21.8	11.4
	kVA	2.50	2.50	5.00	5.00	5.00	5.08	10.00	9.93	5.27	2.82	5.50	3.00	10.50	5.50
	Line Fuse	20	20	30	30	15	15	30	30	30	15	30	15	30	15
85-LM030	Load Amps	15.6	15.6	31.2	31.2	15.6	15.8	31.2	31.0	34.3	18.4	34.3	18.7	32.8	17.1
	kVA	3.75	3.75	7.50	7.50	7.50	7.62	15.00	14.90	7.90	4.23	8.25	4.50	15.75	8.25
	Line Fuse	25	25	45	45	25	25	45	45	40	20	20	20	40	20
85-LM035	Load Amps	20.8	20.8	41.6	41.6	20.8	21.1	41.6	41.3	45.8	24.5	45.8	25.0	43.7	22.9
	kVA	5.00	5.00	10.00	10.00	10.00	10.16	20.00	19.87	10.54	5.64	11.00	6.00	21.00	11.00
	Line Fuse	35	35	60	60	30	30	60	60	60	30	60	30	60	30
85-LM040	Load Amps	31.2	31.2	62.5	62.5	31.2	31.7	62.5	62.0	68.7	36.8	68.7	37.5	65.6	34.3
	kVA	7.50	7.50	15.00	15.00	15.00	15.24	30.00	29.80	15.81	8.47	16.50	9.00	31.50	16.50
	Line Fuse	50	50	90	90	45	45	90	90	80	40	80	40	80	40
85-LM045	Load Amps	41.6	41.6	83.3	83.3	41.6	42.3	83.3	82.7	91.6	49.1	91.6	50.0	87.5	45.8
	kVA	10.0	10.0	20.0	20.0	20.0	20.3	40.0	39.7	21.0	11.2	22.0	12.0	42.0	22.0
	Line Fuse	70	70	125	125	60	60	110	110	110	60	110	60	110	60
85-LM050	Load Amps	62.5	62.5	125.0	124.9	62.5	63.5	125.0	124.1	137.5	73.6	137.5	75.0	131.2	68.7
	kVA	15.0	15.0	30.0	30.0	30.0	30.4	60.0	59.6	31.6	16.9	33.0	18.0	63.0	33.0
	Line Fuse	100	100	175	175	90	90	175	175	175	80	175	80	175	80
85-LM055	Load Amps	104.1	104.1	208.3	208.3	104.1	105.8	208.3	206.9	229.1	122.7	229.1	125.0	218.7	114.5
	kVA	25.0	25.0	50.0	50.0	50.0	50.8	100.0	99.3	52.7	28.2	55.0	30.0	105.0	55.0
	Line Fuse	175	175	300	300	150	150	300	300	300	150	300	150	300	150
Qty. Required		1	1	1	1	1	1	1	1	1	1	1	1	1	1
Connection Dia. Page		SP - 8 59	SP - 12 60	SP - 7 59	SP - 11 60	SP - 6 59	SP - 10 60	SP - 5 59	SP - 9 60	SP - 3 59	SP - 4 59	SP - 3 59	SP - 4 59	SP - 1 59	SP - 2 59

$$\text{Single Phase kVA} = \frac{\text{Load Voltage} \times \text{Load Amps}}{1000}$$

$$\text{kVA} = \frac{\text{Volt Amperes}}{1000}$$

$$\text{Three Phase kVA} = \frac{\text{Load Voltage} \times \text{Load Amps} \times 1.73}{1000}$$

$$\text{VA} = \text{kVA} \times 1000$$

Connection diagrams may be found on Pgs. 61 - 63.

Connections found on this Page require ordering  
1 Buck - Boost Transformer

The appropriate size 35 or 80 Series Transformer may be  
substituted for the 85 Series where desired.

# Three Phase Buck - Boost Sizing Tables

## Three Phase Buck - Boost Table, Type M

Type M		Three Phase / Two or Three Units - Type M															
		Boost - Increase Voltage										Buck - Decrease Voltage					
Catalog Number	Load Line	208	208	208	230	240	240	416	416	416	416	208	208	240	240	416	416
		166	173	187	208	216	228	374	377	395	397	230	249	252	264	437	457
35-M005	Load Amps	1.6	2.0	3.6	4.1	1.8	3.9	1.8	2.0	3.9	4.1	4.5	2.4	4.3	2.2	4.3	2.2
	kVA	0.60	0.75	1.30	1.64	0.77	1.64	1.34	1.50	2.85	3.95	1.64	0.90	1.82	0.95	3.12	1.65
	Line Fuse	5	5	7	8	5	7	5	5	7	7	7	5	7	5	7	5
35-M010	Load Amps	3.3	4.1	7.2	8.2	3.7	7.8	3.7	4.1	7.9	8.3	9.1	4.9	8.7	4.5	8.6	4.5
	kVA	1.20	1.49	2.60	3.29	1.55	3.28	2.69	3.00	5.70	5.99	3.29	1.80	3.64	1.90	6.24	3.30
	Line Fuse	7	8	15	12	7	15	7	7.5	15	15	15	7	15	7	15	7
35-M015	Load Amps	4.9	6.2	10.8	12.4	5.5	11.8	5.6	6.2	11.8	12.4	13.7	7.4	13.1	6.8	12.9	6.8
	kVA	1.80	2.24	3.90	4.94	2.32	4.92	4.04	4.50	8.55	8.99	4.94	2.70	5.46	2.86	9.36	4.95
	Line Fuse	10	12	20	20	10	20	12	10	20	20	20	10	20	10	20	10
85-M020	Load Amps	8.3	10.4	18.0	20.6	9.3	19.7	9.3	10.4	19.7	20.8	22.8	12.4	21.9	11.4	21.6	11.4
	kVA	3.00	3.74	6.50	8.23	3.87	8.20	6.74	7.50	14.26	14.99	8.23	4.50	9.10	4.76	15.60	8.25
	Line Fuse	15	20	30	30	15	30	15	15	30	30	30	15	30	15	30	15
85-M025	Load Amps	16.6	20.8	36.0	41.3	18.6	39.4	18.7	20.8	39.5	41.6	45.7	24.9	43.8	22.9	43.3	22.9
	kVA	6.00	7.49	13.00	16.46	7.75	16.40	13.49	15.00	28.52	29.98	16.46	9.00	18.20	9.53	31.21	16.50
	Line Fuse	30	35	60	60	30	60	30	30	60	60	60	30	60	30	60	30
85-M030	Load Amps	24.9	31.2	54.1	62.0	27.9	59.1	28.0	31.2	59.3	62.42	68.5	37.4	65.7	34.4	64.9	34.3
	kVA	9.00	11.24	19.50	24.69	11.62	24.60	20.23	22.50	42.78	44.97	24.69	13.50	27.31	14.30	46.82	24.75
	Line Fuse	45	50	80	90	45	80	45	45	80	90	80	45	80	45	80	45
85-M035	Load Amps	33.3	41.6	72.1	82.6	37.2	78.9	37.4	41.6	79.1	83.2	91.4	49.9	87.6	45.8	86.6	45.8
	kVA	12.00	14.99	26.00	32.93	15.50	32.80	26.98	30.00	57.05	59.97	32.93	18.00	36.41	19.07	62.49	33.00
	Line Fuse	60	70	110	125	60	110	60	60	110	110	110	60	110	60	110	60
85-M040	Load Amps	49.9	62.4	108.2	124.0	55.9	118.3	56.17	62.45	118.7	124.8	137.1	74.9	131.4	68.8	129.9	68.7
	kVA	18.00	22.49	39.00	49.39	23.25	49.20	40.47	45.00	85.57	89.95	49.39	27.00	54.62	28.61	93.64	49.50
	Line Fuse	80	100	175	175	80	175	80	90	175	175	175	80	175	80	175	80
85-M045	Load Amps	66.6	83.2	144.3	165.3	74.5	157.8	74.8	83.2	158.3	166.4	182.8	99.9	175.2	91.7	173.2	91.6
	kVA	24.0	29.9	52.0	65.8	31.1	65.6	53.9	60.0	114.1	119.9	65.8	36.0	72.8	38.1	124.8	66.0
	Line Fuse	110	150	225	250	110	250	110	125	250	250	225	110	225	110	225	110
85-M050	Load Amps	99.9	124.8	216.5	248.0	111.8	236.7	112.3	124.9	237.5	249.6	274.2	149.9	262.8	137.6	259.9	137.4
	kVA	36.0	44.9	78.8	98.7	46.5	98.4	80.9	90.00	171.1	179.9	98.7	54.0	109.2	57.2	187.2	99.0
	Line Fuse	175	200	350	400	175	250	175	175	350	350	350	175	350	175	350	175
85-M055	Load Amps	166.6	208.1	360.8	413.3	186.4	394.5	187.2	208.1	395.9	416.1	457.0	249.8	438.0	229.4	433.2	229.0
	kVA	60.0	74.9	130.0	164.6	77.5	164.0	134.9	150.0	285.2	299.8	164.6	90.0	182.0	95.3	312.1	165.0
	Line Fuse	300	350	600	600	300	600	200	300	600	600	600	300	600	300	600	300
Qty. Required		3	3	3	3	2	2	3	3	3	3	3	3	2	2	3	3
Connection Dia. Page		TP-18 62	TP-22 63	TP-17 62	TP-21 63	TP-5 61	TP-6 61	TP-20 63	TP-24 63	TP-19 63	TP-23 63	TP-13 62	TP-14 62	TP-10 62	TP-9 61	TP-15 62	TP-16 62

$$\text{Single Phase kVA} = \frac{\text{Load Voltage} \times \text{Load Amps}}{1000}$$

$$\text{kVA} = \frac{\text{Volt Amperes}}{1000}$$

$$\text{Three Phase kVA} = \frac{\text{Load Voltage} \times \text{Load Amps} \times 1.73}{1000}$$

$$\text{VA} = \text{kVA} \times 1000$$

Connection diagrams may be found on Pgs. 61 - 63.

Connections found on this Page require ordering  
2 or 3 Buck - Boost Transformers

The appropriate size 35 or 80 Series Transformer may be substituted for the 85 Series where desired.

# Three Phase Buck - Boost Sizing Tables

## Three Phase Buck - Boost Table, Type Y

Type Y		Three Phase / Two and Three Units - Type Y															
		Boost - Increase Voltage									Buck - Decrease Voltage						
Catalog Number	Load Line	208	208	208	235	240	240	240	416	416	471	208	208	208	240	240	416
		152	164	180	208	208	212	224	360	388	416	263	235	240	256	272	390
35-Y005	Load Amps	1.5	1.5	2.6	3.1	1.3	1.5	2.9	1.3	2.9	1.5	1.9	3.5	1.5	3.3	1.77	3.1
	kVA	0.55	0.55	0.96	1.27	0.56	0.64	1.21	0.96	2.09	1.25	0.69	1.27	0.56	1.38	.73	2.25
	Line Fuse	5	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5.6
35-Y010	Load Amps	3.0	3.1	5.3	6.2	2.7	3.0	5.8	2.6	5.8	3.0	3.8	7.0	3.1	6.6	3.5	6.2
	kVA	1.11	1.11	1.93	2.54	1.12	1.28	2.42	1.93	4.19	2.50	1.39	2.54	1.12	2.77	1.47	4.50
	Line Fuse	5	7	10	12	5	5	10	5	12	6	5	10	5	10	5	7
35-Y015	Load Amps	4.6	4.6	8.0	9.3	4.0	4.6	8.7	4.0	8.7	4.6	5.8	10.6	4.6	10.0	5.3	9.3
	kVA	1.67	1.67	2.89	3.81	1.68	1.92	3.63	2.89	6.28	3.75	2.09	3.81	1.68	4.16	2.21	6.75
	Line Fuse	8	10	12	15	8	9	15	7.5	15	9	8	15	7	15	9	15
85-Y020	Load Amps	7.7	7.7	13.4	15.6	6.7	7.7	14.5	6.7	14.5	7.6	9.7	17.6	7.8	16.6	8.8	15.6
	kVA	2.78	2.79	4.83	6.36	2.81	3.21	6.05	4.83	10.47	6.26	3.49	6.36	2.81	6.93	3.68	11.25
	Line Fuse	12	15	25	30	15	15	25	15	25	15	15	25	10	25	15	25
85-Y025	Load Amps	15.4	15.5	26.8	31.2	13.5	15.4	29.1	13.4	29.0	15.3	19.4	35.3	15.6	33.3	17.7	31.2
	kVA	5.57	5.58	9.66	12.72	5.62	6.42	12.10	9.66	20.94	12.52	6.99	12.72	5.62	13.87	7.37	22.51
	Line Fuse	25	25	45	45	25	25	45	25	45	25	25	45	25	45	25	45
85-Y030	Load Amps	23.1	23.2	40.2	46.9	20.2	23.1	43.6	20.1	43.6	23.0	29.1	53.0	23.4	50.0	26.5	46.8
	kVA	8.35	8.38	14.49	19.09	8.43	9.64	18.15	14.49	31.42	18.78	10.49	19.09	8.43	20.80	11.05	33.76
	Line Fuse	35	45	60	70	35	35	60	35	60	35	30	60	30	60	30	70
85-Y035	Load Amps	30.9	31.0	53.6	62.5	27.0	30.9	58.2	26.8	58.1	30.7	38.8	70.6	31.2	66.7	35.4	62.4
	kVA	11.14	11.17	19.32	25.45	11.25	12.85	24.21	19.32	41.89	25.04	13.98	25.45	11.25	27.74	14.73	45.02
	Line Fuse	45	50	80	90	45	45	80	45	80	45	45	80	40	80	40	90
85-Y040	Load Amps	46.3	46.5	80.4	93.8	40.5	46.3	87.3	40.2	87.2	46.0	58.2	106.0	46.8	100.1	53.1	93.7
	kVA	16.7	16.7	28.9	38.1	16.8	19.2	36.3	28.9	62.8	37.5	20.9	38.1	16.8	41.6	22.1	67.5
	Line Fuse	60	80	125	150	60	70	125	60	125	70	60	125	60	125	70	125
85-Y045	Load Amps	61.8	62.0	107.2	125.0	54.1	61.8	116.4	53.6	116.2	61.4	77.6	141.3	62.4	133.4	70.9	124.9
	kVA	22.2	22.3	38.6	50.9	22.5	25.7	48.4	38.6	83.7	50.0	27.9	50.9	22.5	55.4	29.4	90.0
	Line Fuse	80	100	175	200	80	90	175	80	175	125	80	175	70	175	80	175
85-Y050	Load Amps	92.7	93.0	160.9	187.6	81.1	92.7	174.7	80.4	174.4	92.1	116.4	212.0	93.6	200.2	106.3	187.4
	kVA	33.4	33.5	57.9	76.3	33.7	38.5	72.6	57.9	125.6	75.1	41.9	76.3	33.7	83.2	44.2	135.0
	Line Fuse	125	175	250	300	125	150	250	150	250	150	125	250	125	250	150	250
85-Y055	Load Amps	154.6	155.1	268.1	312.7	135.3	154.6	291.2	134.0	290.7	153.5	194.1	353.3	156.1	333.7	177.2	312.4
	kVA	55.7	55.8	96.6	127.2	56.2	64.2	121.0	96.6	209.4	125.2	69.9	127.2	56.2	138.7	73.6	225.1
	Line Fuse	200	250	400	450	200	225	400	200	400	250	250	400	175	400	200	450
Qty. Required		3	3	3	3	2	2	2	3	3	3	3	3	2	2	2	3
Connection Dia. Page		TP-18 62	TP-22 63	TP-17 62	TP-21 63	TP-5 61	TP-1 61	TP-6 61	TP-20 63	TP-19 63	TP-24 63	TP-14 62	TP-13 62	TP-2 61	TP-10 62	TP-9 61	TP-23 63

$$\text{Single Phase kVA} = \frac{\text{Load Voltage} \times \text{Load Amps}}{1000} \quad \text{kVA} = \frac{\text{Volt Amperes}}{1000}$$

$$\text{Three Phase kVA} = \frac{\text{Load Voltage} \times \text{Load Amps} \times 1.73}{1000} \quad \text{VA} = \text{kVA} \times 1000$$

Connection diagrams may be found on Pgs. 61 - 63.

Connections found on this Page require ordering  
2 or 3 Buck - Boost Transformers

The appropriate size 35 or 80 Series Transformer may be substituted for the 85 Series where desired.

# Three Phase Buck - Boost Sizing Tables

## Three Phase Buck - Boost Table, Type LM

Type LM		Three Phase / Two or Three Units - Type LM																	
		Boost - Increase Voltage									Buck - Decrease Voltage								
Catalog Number	Load Line	240	240	240	416	416	440	480	480	480	200	216	230	230	240	240	416	480	480
		192	200	216	332	346	400	400	432	456	240	240	253	276	264	288	500	504	528
35-LM010	Load Amps	1.6	2.0	3.7	1.6	2.0	4.1	2.1	1.8	3.9	2.4	4.1	4.5	2.4	4.5	2.5	2.5	4.3	2.2
	kVA	0.68	0.86	1.54	1.20	1.50	3.13	1.80	1.54	3.28	0.86	1.54	1.80	0.98	1.90	1.04	1.80	3.64	1.90
	Line Fuse	5	5	7	5	5	7	5	5	7	5	6	7	5	7	5	5	7	5
35-LM015	Load Amps	2.4	3.1	5.5	2.5	3.1	6.1	3.2	2.7	5.9	3.7	6.1	6.7	3.7	6.8	3.7	3.7	6.5	3.4
	kVA	1.02	1.29	2.31	1.80	2.26	4.70	2.70	2.31	4.92	1.29	2.31	2.70	1.47	2.86	1.56	2.70	5.46	2.86
	Line Fuse	5	6	10	5	6	10	6	5	10	5	9	10	5	10	5	5	10	5
85-LM020	Load Amps	4.0	5.1	9.2	4.1	5.2	10.2	5.4	4.6	9.8	6.2	10.2	11.3	6.1	11.4	6.2	6.2	10.9	5.7
	kVA	1.70	2.15	3.85	3.00	3.76	7.83	4.50	3.85	8.20	2.15	3.85	4.51	2.46	4.76	2.60	4.50	9.10	4.76
	Line Fuse	8	10	15	9	10	15	10	8	15	8	15	15	8	15	9	9	15	9
85-LM025	Load Amps	8.1	10.3	18.5	8.3	10.4	20.5	10.8	9.2	19.7	12.4	20.8	22.6	12.3	12.9	12.5	12.5	21.9	11.4
	kVA	3.40	4.30	7.70	6.01	7.53	15.67	9.00	7.70	16.40	4.30	7.70	9.02	4.92	9.53	5.20	9.01	18.20	9.53
	Line Fuse	15	20	30	15	20	30	20	15	30	15	25	30	15	30	15	15	30	15
85-LM030	Load Amps	12.2	15.5	27.7	12.5	15.6	30.8	16.2	13.8	29.5	18.6	30.8	33.9	18.5	34.4	18.7	18.7	32.8	17.2
	kVA	5.10	6.46	11.55	9.02	11.29	23.51	13.50	11.55	24.60	6.46	11.55	13.5	7.38	14.30	7.80	13.52	27.31	14.30
	Line Fuse	25	25	45	25	25	45	25	25	45	25	45	45	25	45	25	25	45	25
85-LM035	Load Amps	16.3	20.7	37.0	16.7	20.9	41.1	21.6	18.5	39.4	24.8	41.1	45.2	24.7	45.8	25.0	25.0	43.8	22.9
	kVA	6.80	8.61	15.40	12.03	15.06	31.35	18.00	15.40	32.80	8.61	15.40	18.04	9.84	19.07	10.40	18.03	36.41	19.07
	Line Fuse	30	35	60	30	35	60	35	30	60	30	50	60	30	60	30	30	60	30
85-LM040	Load Amps	24.5	31.0	55.5	25.0	31.3	61.7	32.4	27.7	59.1	37.3	61.7	67.9	37.0	68.8	37.5	37.5	65.7	34.4
	kVA	10.2	12.9	23.1	18.0	22.5	47.0	27.0	23.1	49.2	12.9	23.1	27.0	14.7	28.6	15.6	27.0	54.6	28.6
	Line Fuse	45	50	80	45	50	90	50	45	80	45	80	80	45	80	45	45	80	45
85-LM045	Load Amps	32.7	41.4	74.0	33.4	41.8	82.2	43.3	37.0	78.9	49.7	82.3	90.5	49.4	91.7	50.0	50.0	87.6	45.8
	kVA	13.6	17.2	30.8	24.0	30.1	62.7	36.0	30.8	65.6	17.2	30.8	36.0	19.6	38.1	20.8	36.0	72.8	38.1
	Line Fuse	60	60	110	60	70	125	70	60	110	60	100	110	60	110	60	60	110	60
85-LM050	Load Amps	49.0	62.1	111.1	50.1	62.7	123.4	64.9	55.5	118.3	74.6	123.4	135.8	74.1	137.6	75.0	75.0	131.4	68.8
	kVA	20.4	25.8	46.2	36.1	45.1	94.0	54.0	46.2	98.4	25.8	46.2	54.1	29.5	57.2	31.2	54.1	109.2	57.2
	Line Fuse	80	100	175	80	100	175	100	80	175	80	150	175	80	175	80	80	175	80
85-LM055	Load Amps	81.7	103.6	185.2	83.5	104.5	205.6	108.2	92.6	197.2	124.3	205.8	226.4	123.5	229.4	125.1	125.1	219.0	114.7
	kVA	34.0	43.0	77.0	60.1	75.3	156.7	90.0	77.6	164.0	43.0	77.0	90.2	49.2	95.3	52.0	90.1	182.0	95.3
	Line Fuse	150	175	300	150	175	300	175	150	300	150	250	300	150	300	150	150	300	150
Qty. Required		2	2	2	3	3	3	3	2	2	2	2	2	2	2	3	2	2	
Connection Dia. Page		TP-7 61	TP-3 61	TP-4 61	TP-18 62	TP-22 63	TP-21 63	TP-2263	TP-5 61	TP-6 61	TP-11 62	TP-8 61	TP-12 62	TP-11 62	TP-12 62	TP-11 62	TP-14 62	TP-10 62	TP-9 61

$$\text{Single Phase kVA} = \frac{\text{Load Voltage} \times \text{Load Amps}}{1000} \quad \text{kVA} = \frac{\text{Volt Amperes}}{1000}$$

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Connection diagrams may be found on Pgs. 61 - 63.

Connections found on this Page require ordering 2 or 3 Buck - Boost Transformer

The appropriate size 35 or 80 Series Transformer may be substituted for the 85 Series where desired.

# Buck - Boost Connection Diagrams

## Single Phase Connection Diagrams

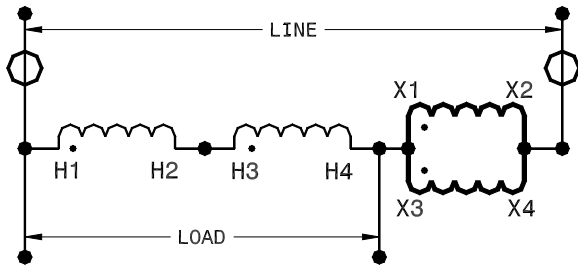


Diagram SP - 1

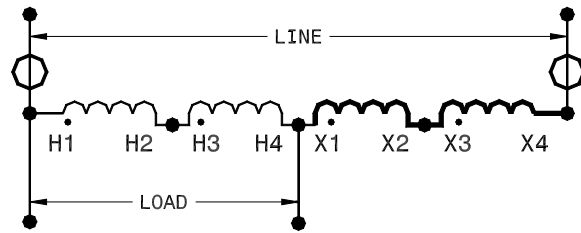


Diagram SP - 2

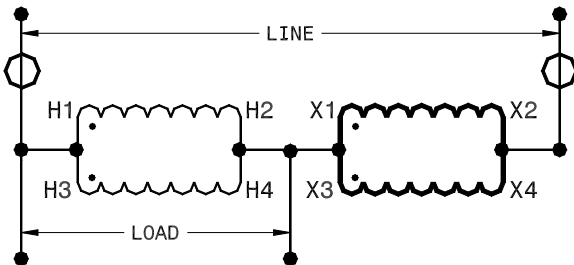


Diagram SP - 3

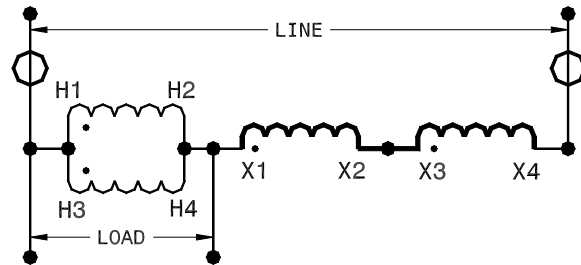


Diagram SP - 4

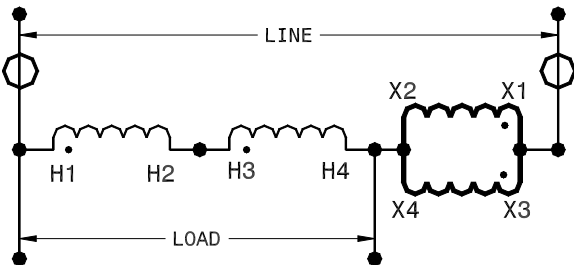


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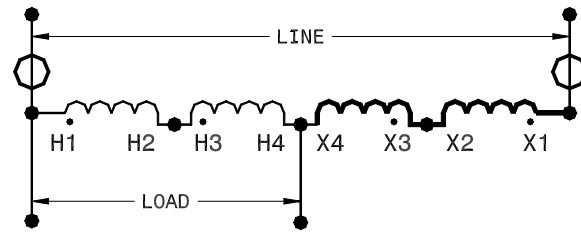


Diagram SP - 6

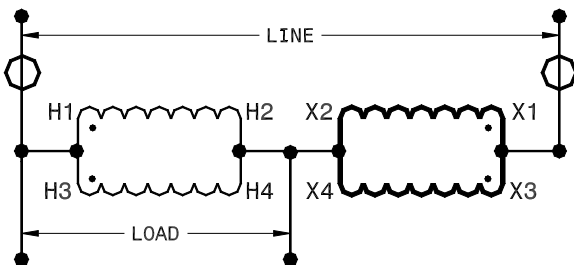


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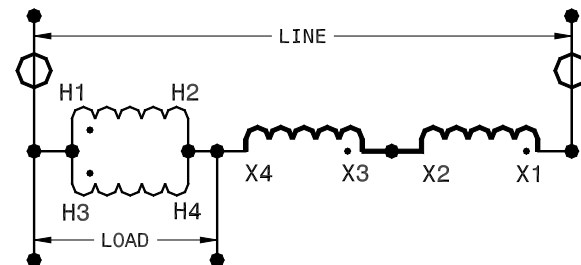


Diagram SP - 8

# Buck - Boost Connection Diagrams

## Single Phase Connection Diagrams

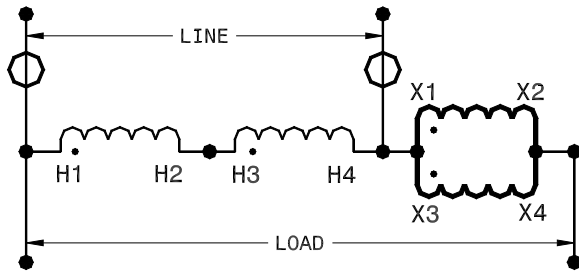


Diagram SP - 9

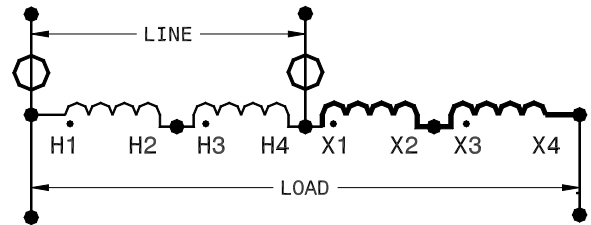


Diagram SP - 10

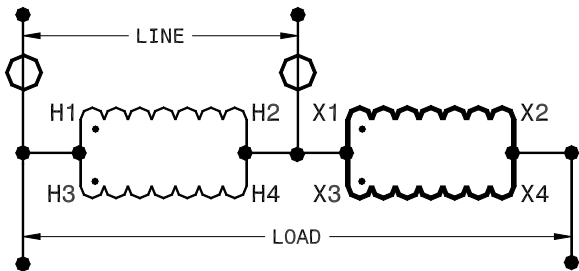


Diagram SP - 11

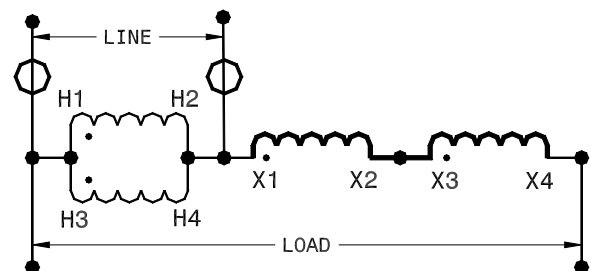


Diagram SP - 12

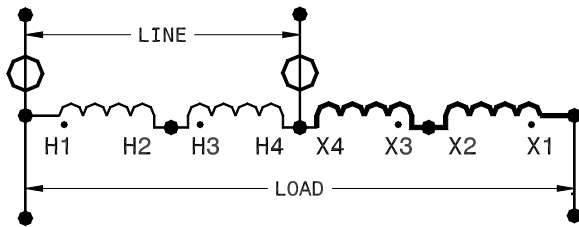


Diagram SP - 13

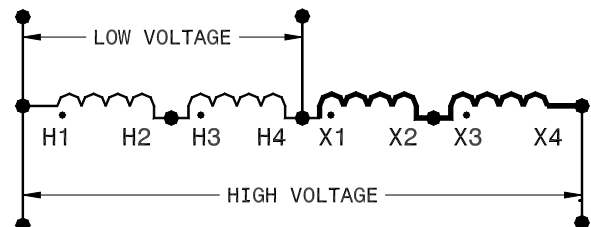


Diagram SP - 14

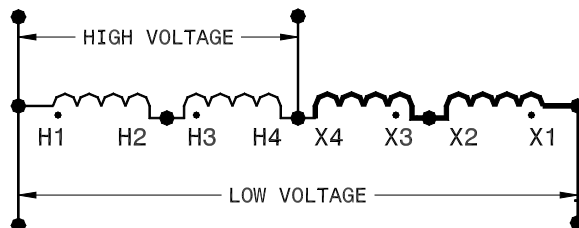


Diagram SP - 15

### Symbol Key

○ - Indicates Overcurrent Protection

Note: If present, do not fuse grounded conductor

# Buck - Boost Connection Diagrams

## Three Phase Connection Diagrams

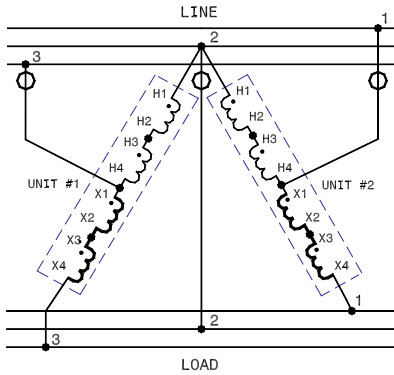


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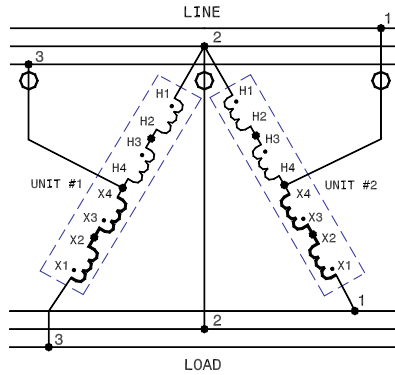


Diagram TP - 2

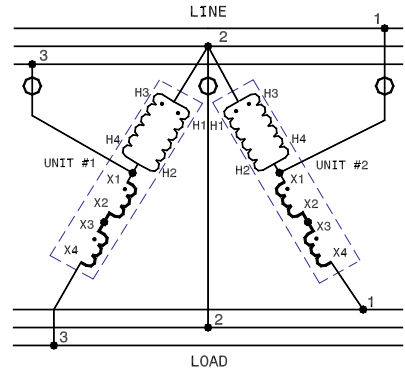


Diagram TP - 3

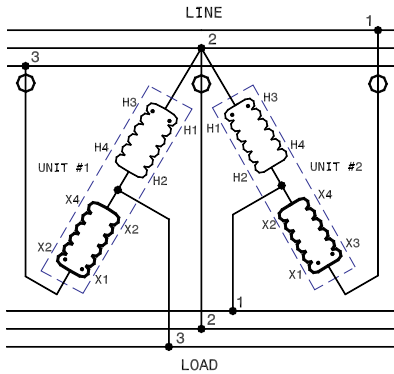


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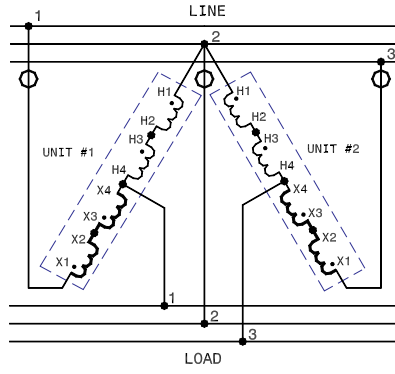


Diagram TP - 5

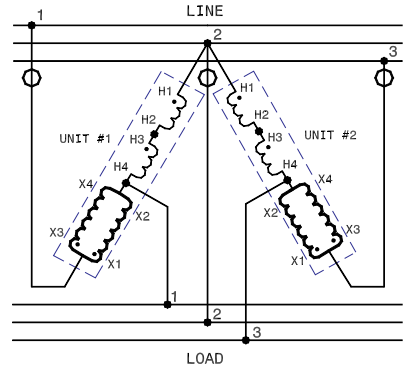


Diagram TP - 6

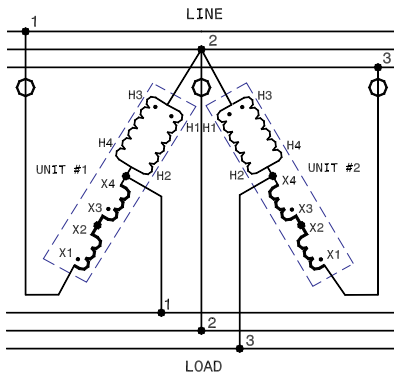


Diagram TP - 7

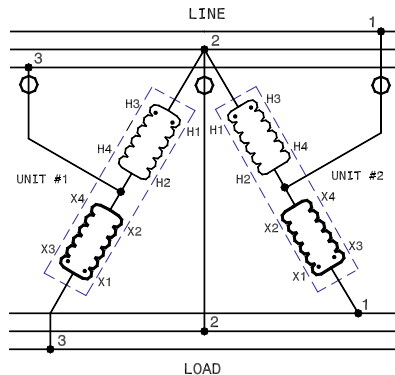


Diagram TP - 8

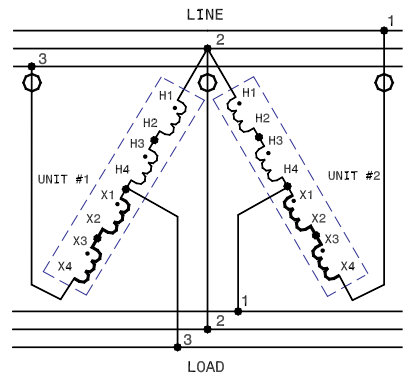


Diagram TP - 9

# Buck - Boost Connection Diagrams

## Three Phase Connection Diagrams

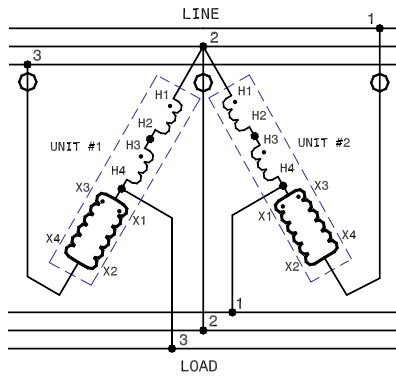


Diagram TP - 10

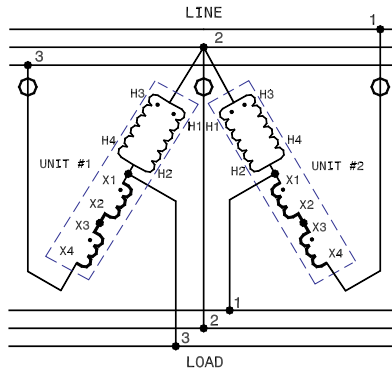


Diagram TP - 11

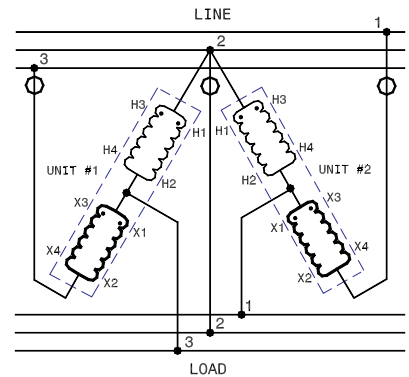


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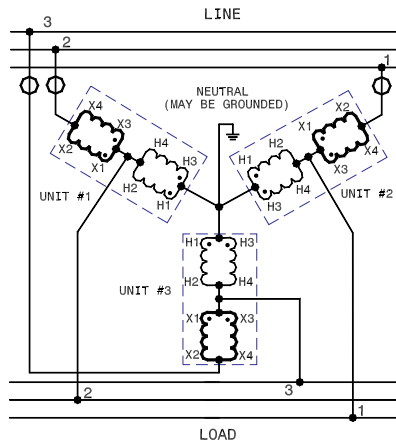


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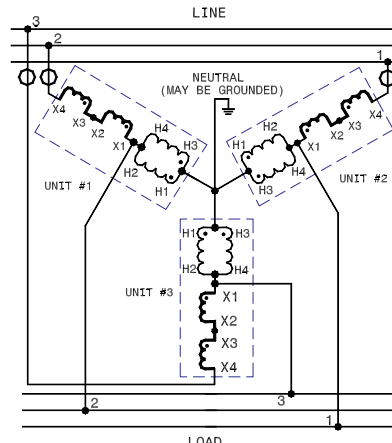


Diagram TP - 14

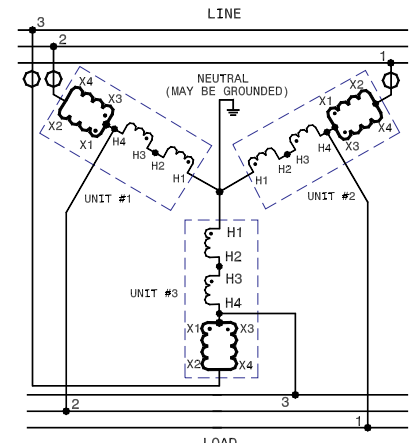


Diagram TP - 15

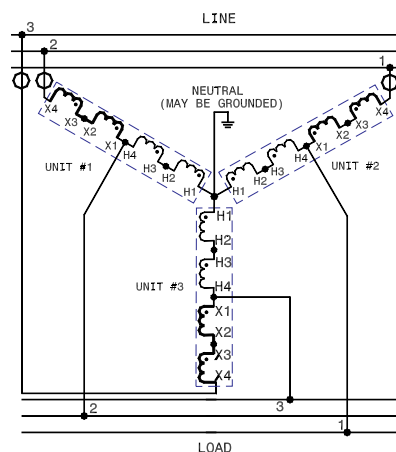


Diagram TP - 16

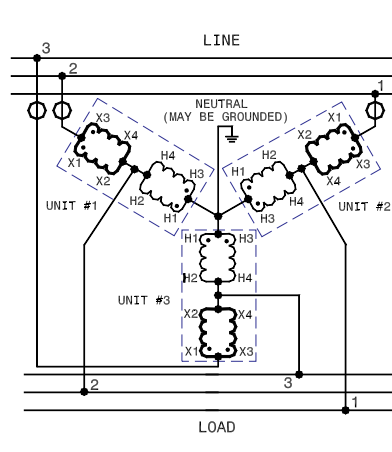


Diagram TP - 17

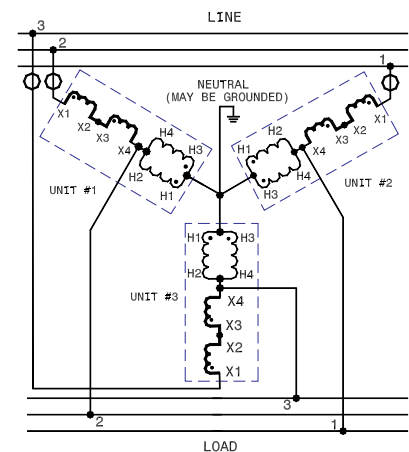


Diagram TP - 18



# Buck - Boost Connection Diagrams

## Three Phase Connection Diagrams

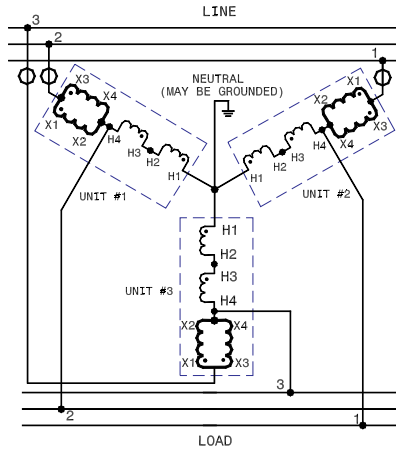


Diagram TP - 19

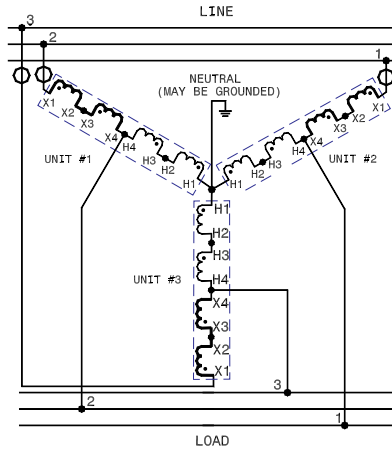


Diagram TP - 20

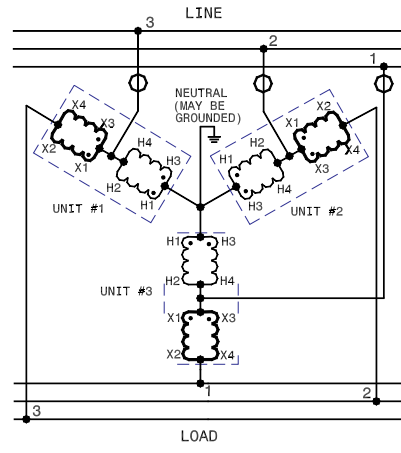


Diagram TP - 21

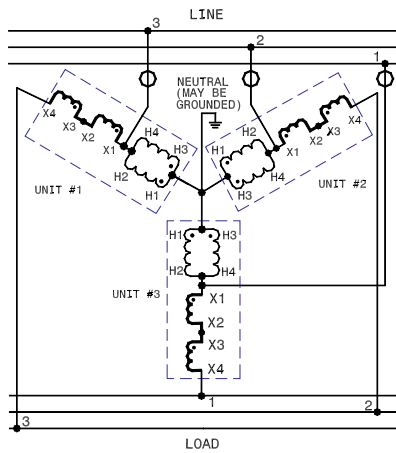


Diagram TP - 22

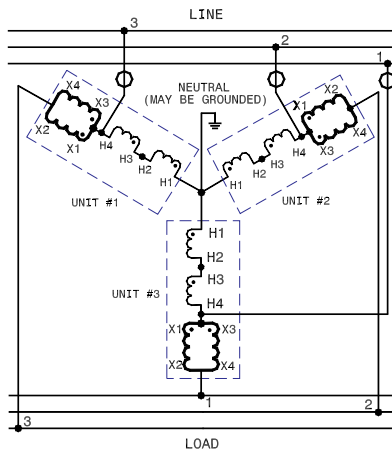


Diagram TP - 23

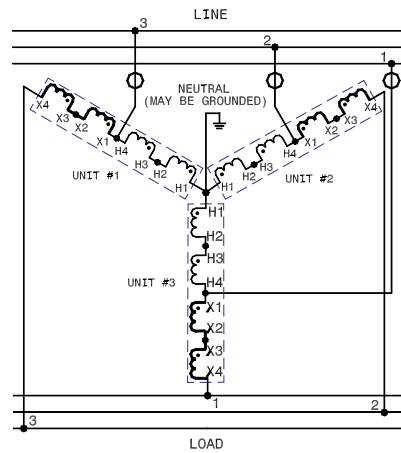


Diagram TP - 24

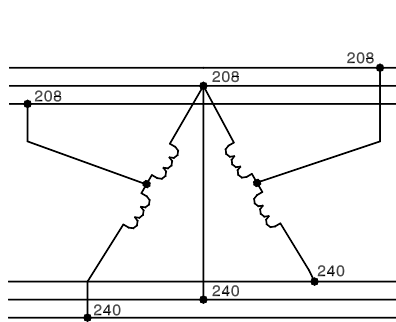


Diagram TP - 25

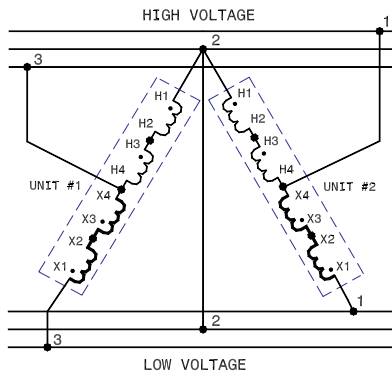


Diagram TP - 26

### Symbol Key

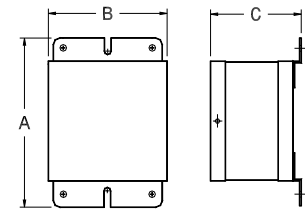
○ - Indicates Overcurrent Protection

Note: If present, do not fuse grounded conductor

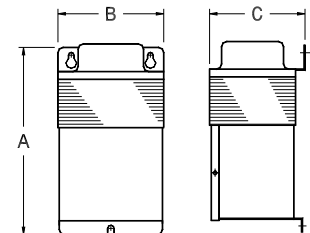
# Encapsulated Buck - Boost Transformers

## Primary Volts 120 X 240, Secondary Volts 12 / 24

General Information				Winding Specifications				Dimensions			
kVA Cap.	Catalog Number	Hz.	Wgt. Lbs	Taps	Maximum Amps		Conn Dia. Pg. 66	Height A	Width B	Depth C	Outline Dwg.
					Pri.	Sec.					
.050	35-M005*	50/60	4	0	.4 / .2	4.1 / 2.0	18	6.37	3.75	3.37	1
.100	35-M010*	50/60	5	0	.8 / .4	8.3 / 4.1	18	6.37	3.75	3.37	1
.150	35-M015*	50/60	7	0	1.2 / .6	12.5 / 6.2	18	7.00	4.00	3.63	2
.250	85-M020	50/60	15	0	2.0 / 1.0	20.8 / 10.4	18	12.00	4.87	5.25	3
.500	85-M025	50/60	19	0	4.1 / 2.0	41.6 / 20.8	18	12.00	4.87	5.25	3
.750	85-M030	50/60	23	0	6.2 / 3.1	62.5 / 31.2	18	12.00	4.87	5.25	3
1.0	85-M035	60	28	0	8 / 4	83 / 41	18	15.25	5.75	5.87	3
1.5	85-M040	60	39	0	12 / 6	125 / 62	18	15.25	5.75	5.87	3
2.0	85-M045	60	43	0	16 / 8	166 / 83	18	15.25	5.75	5.87	3
3.0	85-M050	60	69	0	25 / 12	250 / 125	18	15.25	8.25	7.87	3
5.0	85-M055	60	89	0	41 / 20	416 / 208	18	15.25	8.25	7.87	3



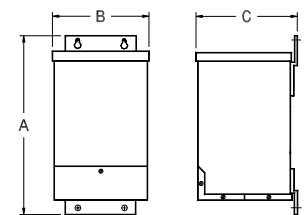
**Outline Drawing 1**  
Wall Mount - Ventilated - NEMA Type 1



**Outline Drawing 2**  
Wall Mount - Ventilated - NEMA Type 3R

## Primary Volts 120 X 240, Secondary Volts 16 / 32

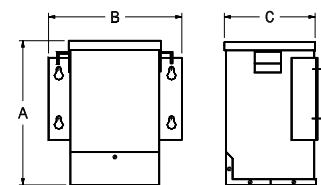
General Information				Winding Specifications				Dimensions			
kVA Cap.	Catalog Number	Hz.	Wgt. Lbs	Taps	Maximum Amps		Conn Dia. Pg. 66	Height A	Width B	Depth C	Outline Dwg.
					Pri.	Sec.					
.050	35-Y005*	50/60	4	0	.4 / .2	3.1 / 1.5	19	6.37	3.75	3.37	1
.100	35-Y010*	50/60	5	0	.8 / .4	6.2 / 3.1	19	6.37	3.75	3.37	1
.150	35-Y015*	50/60	7	0	1.2 / .6	9.3 / 4.6	19	7.00	4.00	3.63	2
.250	85-Y020	50/60	15	0	2.0 / 1.0	15.6 / 7.8	19	12.00	4.87	5.25	3
.500	85-Y025	50/60	19	0	4.1 / 2.0	31.2 / 15.6	19	12.00	4.87	5.25	3
.750	85-Y030	50/60	23	0	6.2 / 3.1	46.8 / 23.4	19	12.00	4.87	5.25	3
1.0	85-Y035	60	28	0	8 / 4	62 / 31	19	15.25	5.75	5.87	3
1.5	85-Y040	60	39	0	12 / 6	93 / 46	19	15.25	5.75	5.87	3
2.0	85-Y045	60	43	0	16 / 8	125 / 62	19	15.25	5.75	5.87	3
3.0	85-Y050	60	69	0	25 / 12	187 / 93	19	15.25	8.25	7.87	3
5.0	85-Y055	60	89	0	41 / 20	312 / 156	19	15.25	8.25	7.87	3



**Outline Drawing 3**  
Wall Mount - Encapsulated - NEMA Type 3R Note: 3 kVA & 5kVA 85 Series are also available in Outline Drawing 4 Configuration

## Primary Volts 240 X 480, Secondary Volts 24 / 48

General Information				Winding Specifications				Dimensions			
kVA Cap.	Catalog Number	Hz.	Wgt. Lbs	Taps	Maximum Amps		Conn Dia. Pg. 66	Height A	Width B	Depth C	Outline Dwg.
					Pri.	Sec.					
.100	35-LM010*	50/60	5	0	.4 / .2	4.1 / 2.0	20	6.37	3.75	3.37	1
.150	35-LM015*	50/60	7	0	.6 / .3	6.2 / 3.1	20	7.00	4.00	3.63	2
.250	85-LM020	50/60	15	0	1.0 / .52	10.4 / 5.2	20	12.00	4.87	5.25	3
.500	85-LM025	50/60	19	0	2.0 / 1.0	20.8 / 10.4	20	12.00	4.87	5.25	3
.750	85-LM030	50/60	23	0	3.1 / 1.6	31.2 / 15.6	20	12.00	4.87	5.25	3
1.0	85-LM035	60	28	0	4 / 2	41 / 20	20	15.25	5.75	5.87	3
1.5	85-LM040	60	39	0	6 / 3	62 / 31	20	15.25	5.75	5.87	3
2.0	85-LM045	60	43	0	8 / 4	83 / 41	20	15.25	5.75	5.87	3
3.0	85-LM050	60	69	0	12 / 6	125 / 62	20	15.25	8.25	7.87	3
5.0	85-LM055	60	89	0	20 / 10	208 / 104	20	15.25	8.25	7.87	3



**Outline Drawing 4**  
Wall Mount - Encapsulated - NEMA Type 3R

Dimensions & weights may change. Consult factory for certified drawings.

kVA capacity, primary amps, and secondary amps are shown with values when used as a low voltage, isolation transformer.

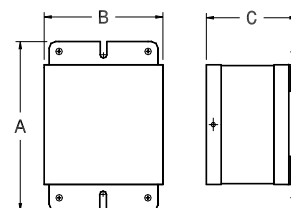
Buck - Boost capacities are found on the charts on pages 52 - 58.

\*Series 35 are ventilated units.

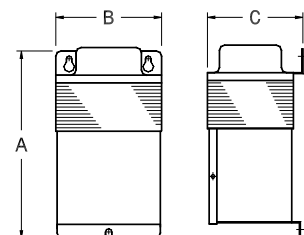
# Ventilated Buck - Boost Transformers

## Primary Volts 120 X 240, Secondary Volts 12 / 24

General Information				Winding Specifications				Dimensions			
kVA Cap.	Catalog Number	Hz.	Wgt. Lbs	Taps	Maximum Amps		Conn Dia. Pg. 66	Height A	Width B	Depth C	Outline Dwg.
					Pri.	Sec.					
.050	35-M005	50/60	5	0	.4 / .2	4.1 / 2.0	18	6.37	3.75	3.37	1
.100	35-M010	50/60	8	0	.8 / .4	8.3 / 4.1	18	6.37	3.75	3.37	1
.150	35-M015	50/60	8	0	1.2 / .6	12.5 / 6.2	18	7.00	4.00	3.63	2
.250	35-M020	50/60	11	0	2.0 / 1.0	20.8 / 10.4	18	7.50	4.63	4.00	2
.500	35-M025	50/60	20	0	4.1 / 2.0	41.6 / 20.8	18	9.28	5.50	4.75	2
.750	35-M030	50/60	28	0	6.2 / 3.1	62.5 / 31.2	18	10.88	5.50	4.75	2
1.0	80-M035	50/60	29	0	8 / 4	83 / 41	18	10.88	5.50	4.75	2
1.5	80-M040	50/60	37	0	12 / 6	125 / 62	18	10.63	6.63	5.88	2
2.0	80-M045	60	42	0	16 / 8	166 / 83	18	11.00	6.63	5.88	2
3.0	80-M050	60	58	0	25 / 12	250 / 125	18	16.38	7.69	6.88	2
5.0	80-M055	60	82	0	41 / 20	416 / 208	18	18.50	7.69	6.88	2



Outline Drawing 1  
Wall Mount - Ventilated - NEMA Type 1



Outline Drawing 2  
Wall Mount - Ventilated - NEMA Type 3R

## Primary Volts 120 X 240, Secondary Volts 16 / 32

General Information				Winding Specifications				Dimensions			
kVA Cap.	Catalog Number	Hz.	Wgt. Lbs	Taps	Maximum Amps		Conn Dia. Pg. 66	Height A	Width B	Depth C	Outline Dwg.
					Pri.	Sec.					
.050	35-Y005	50/60	5	0	.4 / .2	3.1 / 1.5	19	6.37	3.75	3.37	1
.100	35-Y010	50/60	8	0	.8 / .4	6.2 / 3.1	19	6.37	3.75	3.37	1
.150	35-Y015	50/60	8	0	1.2 / .6	9.3 / 4.6	19	7.00	4.00	3.63	2
.250	35-Y020	50/60	11	0	2.0 / 1.0	15.6 / 7.8	19	7.50	4.63	4.00	2
.500	35-Y025	50/60	20	0	4.1 / 2.0	31.2 / 15.6	19	9.25	5.50	4.75	2
.750	35-Y030	50/60	28	0	6.2 / 3.1	46.8 / 23.4	19	10.88	5.50	4.75	2
1.0	80-Y035	50/60	29	0	8 / 4	62 / 31	19	10.88	5.50	4.75	2
1.5	80-Y040	50/60	37	0	12 / 6	93 / 46	19	10.63	6.63	5.88	2
2.0	80-Y045	60	42	0	16 / 8	125 / 62	19	11.00	6.63	5.88	2
3.0	80-Y050	60	58	0	25 / 12	187 / 93	19	16.38	7.69	6.88	2
5.0	80-Y055	60	82	0	41 / 20	312 / 156	19	18.50	7.69	6.88	2

## Primary Volts 240 X 480, Secondary Volts 24 / 48

General Information				Windings Specifications				Dimensions			
kVA Cap.	Catalog Number	Hz.	Wgt. Lbs.	Taps	Maximum Amps		Conn Dia. Pg. 66	Height A	Width B	Depth C	Outline Dwg.
					Pri.	Sec.					
.100	35-LM010	50/60	8	0	.4 / .2	4.1 / 2.0	20	6.37	3.75	3.37	1
.150	35-LM015	50/60	8	0	.6 / .3	6.2 / 3.1	20	7.00	4.00	3.63	2
.250	35-LM020	50/60	11	0	1.0 / .52	10.4 / 5.2	20	7.50	4.63	4.00	2
.500	35-LM025	50/60	20	0	2.0 / 1.0	20.8 / 10.4	20	9.25	5.50	4.75	2
.750	35-LM030	50/60	28	0	3.1 / 1.6	31.2 / 15.6	20	10.88	5.50	4.75	2
1.0	35-LM035	50/60	29	0	4 / 2	41 / 20	20	10.88	5.50	4.75	2
1.5	35-LM040	50/60	37	0	6 / 3	62 / 31	20	10.63	6.63	5.88	2
2.0	35-LM045	60	42	0	8 / 4	83 / 41	20	11.00	6.63	5.88	2
3.0	35-LM050	60	58	0	12 / 6	125 / 62	20	16.38	7.69	6.88	2
5.0	35-LM055	60	82	0	20 / 10.	208 / 104	20	18.50	7.69	6.88	2

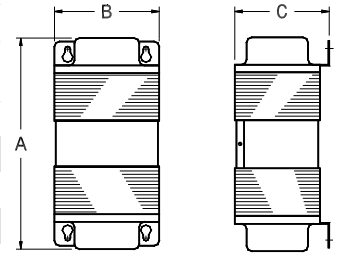
Dimensions & weights may change. Consult factory for certified drawings.

kVA capacity, primary amps, and secondary amps are shown with values when used as a low voltage, isolation transformer. Buck - Boost capacities are found on the charts on pages 52 - 58.

# Buck - Boost Transformers

## Series ODY Dimensions

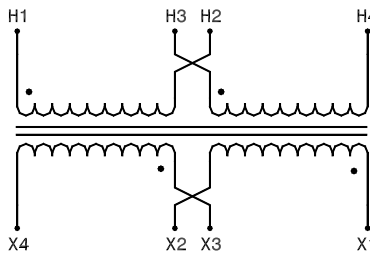
General Information				Winding Specifications				Dimensions		
kVA Cap.	Catalog Number	Hz.	Wgt. Lbs	Taps	Maximum Amps		Conn Dia.	Height A	Width B	Depth C
					208	240				
2.8	34-280-ODY	60	21	0	7.8	6.7	ODY	10.75	4.50	4.06
5.6	34-560-ODY	60	37	0	15.6	13.5	ODY	12.25	5.31	4.75
8.4	34-840-ODY	60	54	0	23.4	20.2	ODY	15.50	5.31	4.75
11.2	84-1120-ODY	60	55	0	31.2	27.0	ODY	15.50	5.31	4.75
16.9	84-1690-ODY	60	65	0	46.8	40.5	ODY	16.13	7.19	5.81
22.5	84-2250-ODY	60	74	0	62.4	54.1	ODY	17.13	7.19	5.81
33.0	84-3300-ODY	60	127	0	93.6	81.1	ODY	20.50	7.69	6.75
56.0	84-5600-ODY	60	158	0	156.1	135.3	ODY	24.88	7.69	6.75



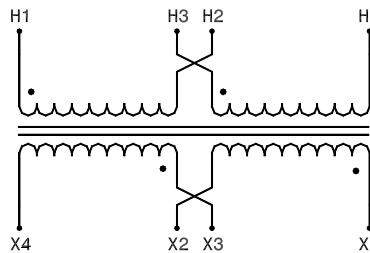
**Series ODY**  
Wall Mount - Ventilated - NEMA Type 3R

## Low Voltage Connection Diagrams

Dia. 18	Catalog Series 35-M0XX & 80-M0XX 85-M0XX		
	Tap Arrangement	No Taps	
% High Voltage	High Voltage 120 X 240	Inter-Connect	Connect High Voltage Lines To
100	120	H1 To H3 H2 To H4	H1H3 & H2H4
100	240	H2 To H3	H1 & H4
% Low Voltage	Low Voltage 12 / 24	Inter-Connect	Connect Low Voltage Lines To
100	12	X1 To X3 X2 To X4	X1X3 & X2X4
100	12 / 24	X2 To X3	X1 & X2X3 & X4
100	24	X2 To X3	X1 & X4



Dia. 19	Catalog Series 35-Y0XX & 80-Y0XX 85-Y0XX		
	Tap Arrangement	No Taps	
% High Voltage	High Voltage 120 X 240	Inter-Connect	Connect High Voltage Lines To
100	120	H1 To H3 H2 To H4	H1H3 & H2H4
100	240	H2 To H3	H1 & H4
% Low Voltage	Low Voltage 16 / 32	Inter-Connect	Connect Low Voltage Lines To
100	16	X1 To X3 X2 To X4	X1X3 & X2X4
100	16 / 32	X2 To X3	X1 & X2X3 & X4
100	32	X2 To X3	X1 & X4



Dia. 20	Catalog Series 35-LM0XX & 80-LM0XX 85-LM0XX		
	Tap Arrangement	No Taps	
% High Voltage	High Voltage 240 X 480	Inter-Connect	Connect High Voltage Lines To
100	240	H1 To H3 H2 To H4	H1H3 & H2H4
100	480	H2 To H3	H1 & H4
% Low Voltage	Low Voltage 24 / 48	Inter-Connect	Connect Low Voltage Lines To
100	24	X1 To X3 X2 To X4	X1X3 & X2X4
100	24 / 48	X2 To X3	X1 & X2X3 & X4
100	48	X2 To X3	X1 & X4

