



SECTION 6

CLEAN POWER PRODUCTS

Computer Regulators, Line Voltage Conditioners and Super Isolation Transformers

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Clean Power

WHY IS CLEAN POWER SO CRITICAL?

Your computer is a delicate electronic instrument. When you use the keyboard, your sending a series of tiny electronic impulses through the computers circuits. The computer 'reads' these electronic impulses and makes calculations or performs tasks according to your programmed instructions.

If the electrical power feeding your computer is smooth and clean, your computer will behave normally.

However, if the power fed into your computer is "dirty", you could be in for many unpleasant surprises.

WHAT IS DIRTY POWER?

Dirty power is caused by a number of things. Simply put, dirty power is what causes your radio or telephone to 'crackle' during an electrical storm; or what causes 'snow' on your TV when someone is using a power tool, sewing machine or other appliances in your house.

This dirty power, or **electrical noise**, is a nuisance when it appears on your radio, TV or telephone. When it gets into your computer, it can cause serious errors; improper readouts, printing problems, or even damage your computers circuit.

HOW DOES THIS HAPPEN?

Your computer operates by reading electronic impulses. Dirty power contains a great number of random pulses riding on the normally smooth surface of a power wave. As these random pulses enter the circuits, your computer 'reads' them as data. This can cause a whole range of problems. You may suddenly get garbled numbers or letters in a readout or printout. You could loose files, skip program steps, have trouble loading programs or have connection problems while on the internet.

HOW BAD CAN IT GET?

One form of dirty power usually called a surge can burn out computer, audio, video or nay other electronic circuitry in seconds. A surge is a high voltage pulse riding the normal power wave. Surges will commonly measure 600 to 2500 volts. Even though they occur for only milli-seconds, that is enough time to melt down circuits.

WHAT ARE THE MOST COMMON POWER PROBLEMS?

Research conducted by both IBM and Bell indicates that most line disturbances to sensitive equipment are **line noise** and **voltage fluctuations**.

VOLTAGE FLUCTUATIONS

Under voltages and over voltages are caused by faults on power lines, and the subsequent actions of fault clearing devices. Also, by heavy loads, such as machinery start-up and by the slow reaction of power company regulating equipment.

Since computer equipment is designed to operate close to nominal voltages, the effects of these voltage variations can cause serious problems. Voltages can drop as much as 20% of nominal. This can result in expensive and time consuming errors, loss of information, downtime, recovery and rerun costs and possible equipment damage.

NOISE

Noise is a very broad term that can be applied to a number of AC power line disturbances. Lightening surges or any other sudden changes in load, such as switching motor loads or power factor correcting capacitors can produce voltage spikes and ringing. Phase controlled rectifier loads and arcing devices produce continuous noise unless adequately filtered.

Noise sources are either common mode which appears between both sides of a power line and ground or of transverse mode which appears from line to line. Hammond Clean Power products, such as our Computer Regulators remove these noise sources.



Pinpointing The Problem

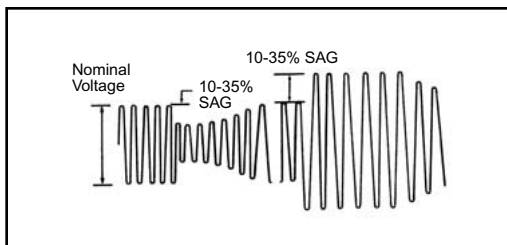
HOW DO YOU CHOOSE THE CORRECT, MOST COST-EFFECTIVE SOLUTION?

Not everyone has the same power problem. Finding the most cost-effective solution requires some analysis of your equipment, the power system and the available solutions in the market.

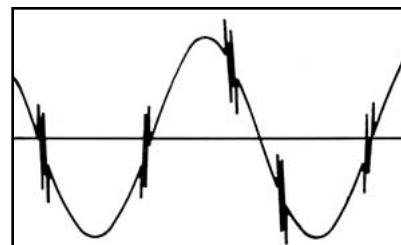
The table below lists causes and effects of many common power problems. You, or your electrician can determine the most likely cause of power problems based on knowledge of your location, the kinds of equipment you operate in that location, and the kind of power distribution system in your building.

The following page lists the types of Clean Power products available from Hammond to solve your power problems.

POWER DISTURBANCE TYPE	CAUSED BY	CONDITION CREATED	EFFECTS
Voltage Fluctuations Fluctuations exceeding +/-5% of nominal. These can occur from milliseconds to several seconds.	<ul style="list-style-type: none"> • Heavy loads being added to or removed from the power source including: utility switching equipment, lightning suppression apparatus, heavy motor start-up loads such as elevators, generators, furnaces and compressors. • Lighting loads • Power line faults and fault clearing devices. • Brownouts 	<ul style="list-style-type: none"> • Low voltage to equipment up to 20% below normal. 	<ul style="list-style-type: none"> • Loss of Data • Down Time • Rerun costs • Equipment damage
Line Noise Fluctuations, transients, spikes, dips or bursts of high frequency energy which can range from 10 to 100 times the line voltage.	<ul style="list-style-type: none"> • Lightning • Static discharge • Power line faults • Utility switch gear • Office equipment • Disk drives • Heavy office cleaning equipment • Programmable controllers • printers and plotters • Radio transmitters • Other computers • Fluorescent lights and dimmers • Heater controls • Motors and motor controls • Power tools and appliances • Unshielded automobile ignition cables 	<ul style="list-style-type: none"> • Spikes or surges 600 to 6,000 volts from one tenth to 100 millionths of a second duration. • Electromagnetic Interference (EMI) or Radio Frequency Interference (RFI). 	<ul style="list-style-type: none"> • Output errors • Character changes • Skipped program steps • System crash • Memory loss • File loss • Misregistration • Circuit damage • 'Snow' on video equipment and audible noise in audio equipment.
Other Disturbances	<ul style="list-style-type: none"> • Ground not dedicated or isolated • Shock Hazards 	<ul style="list-style-type: none"> • Electrical safety hazard 	<ul style="list-style-type: none"> • Personal safety hazard • Possible equipment damage.



Voltage sags and surges can cause incorrect data memory loss and damage hardware components.



Noise on a typical sine wave can cause memory loss, program errors and in some cases equipment damage.



Solutions

WHAT'S THE SOLUTION TO DIRTY POWER?

The solutions are as wide ranging as the problems. So are the prices. We have summarized some solutions and their price ranges in the table below.

SOLUTION	COVERAGE	PRICE RANGE	GENERAL USAGE
Unfiltered Surge Fuses	Protect against major surges only.	\$15.00 and up	• Basic protection against lightning strike surges - do not provide clean power
Filtered Surge Suppressors	Spikes, EMI/RFI Surges	\$60.00 to \$300.00	• Small business, home business, home computers, audio and video
Computer Regulators and Line Voltage Conditioners	Spikes, surges, brownouts EMI/RFI	\$300.00 and up	• Office computers, business applications, dedicated lines, labs test facilities
Isolation Transformers	Spikes, surges EMI/RFI	\$300.00 and up	• Business applications, dedicated services, labs, test equipment
U.P.S. (Uninterruptable Power Supply)	All Power problems	\$750.00 and up	• Large main frame computers and networks.

Unfiltered Surge Fuses are very inexpensive, and may provide damage protection from lightning strikes or other surges, but they do not filter out adverse noise.

Filtered Surge Suppressors are inexpensive solutions to noise suppression and surge protection. The better units inhibit surges above 5000 volts, 200 amps. They should also provide noise filtration of 10dB or more to cover average power disturbances.

Computer Regulators or Line Voltage Conditioners protect equipment from both noise and voltage fluctuations. They are an inexpensive solution, available in both portable or hard-wired models. They provide ideal protection in high noise areas where voltage fluctuations exceed the regulating range of the computers power supply.

Super Isolation Transformers provide inexpensive protection against frequency variation or noise related disturbances. This is adequate where voltage fluctuations are not a serious problem. Most high-end computers have built-in voltage regulation, but still require protection from line noise.

U.P.S. Systems are in effect self-contained power centers. They provide backup power for a period of time when utility power is interrupted. Most U.P.S. systems also provide noise filtration and surge suppression.



SECTION 6



COMPUTER REGULATORS

FEATURES

Portable Computer Regulators are easily moved from place to place and attractively finished to adapt to any workplace. They provide ideal protection in high noise areas where voltage fluctuations exceed the regulating range of the equipment/system power supply. Epoxy potted windings are impervious to moisture from accidental spills. This makes them ideal for use between any wall outlet and your equipment.

- Protects equipment from both noise and voltage fluctuations
- Windings impervious to moisture
- Rejects Noise
- Controls voltage fluctuations
- UL and CSA Listed
- Attractively finished in brown and beige.

CONSTRUCTION FEATURES

The computer regulator is a ferroresonant transformer type regulator with a simple circuit configuration and has no moving components. This provides fast response, automatic output current limiting and high reliability.



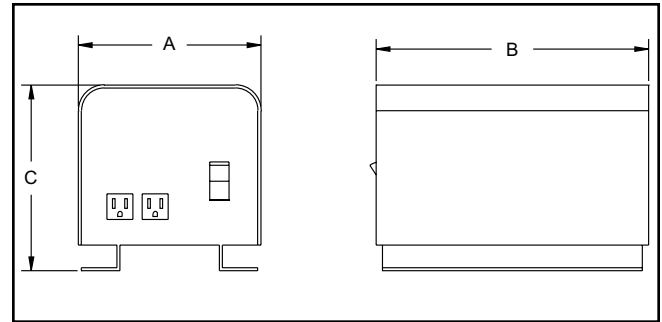
APPLICATIONS

- Instrumentation
- Data terminals
- Micro processors
- Instrumentation
- CAD/CAM systems
- Security systems
- Test equipment
- Navigation equipment
- Electronic cash registers
- Communications equipment
- Medical Diagnostics equip.
- Photographic equipment
- Programmable controllers
- Scientific research equip.
- Mini/micro computers

PERFORMANCE CHARACTERISTICS

Input voltage range	+/- 15%
Output regulation/response time	+/- 3%/1.5 cycles
Frequency input range	59-61 Hz/49-51 Hz*
Harmonic Distortion	3%
Common mode rejection	120 dB
Normal mode rejection	60 dB
Audible noise	43 dBa
Efficiency	85%
Holdup time	3 ms.

* = 50 Hz Models



120V OUTPUT

60 Hz

Power Rating VA	Input Range VAC	Catalog Number	Approx. Dimensions (inches)			Approx. Weight (Lbs.)
			Width A	Depth B	Height C	
70	95-1330	CV70AFP	5.13	8.63	5.38	23.0
140	95-1330	CV140AFP	5.13	8.63	5.38	23.0
250	95-1330	CV250AFP	7.13	10.63	7.25	45.0
500	95-1330	CV500AFP	7.13	10.63	7.25	55.0
750	95-1330	CV750AFP	9.25	12.63	9.75	95.0
1000	95-1330	CV1000AFP	9.25	12.63	9.75	100.0
1500	95-1330	CV1500AFP	11.5	15.0	9.0	120.0
2000	95-1330	CV2000AFP	11.5	17.0	10.25	140.0

Note: For 220V/50 Hz models, please contact our quotations department for specifications and delivery.



LINE VOLTAGE CONDITIONERS

FEATURES

Hard Wired Line Voltage Conditioners are designed to be installed directly to the utility power source to provide dedicated clean power to one or more outlets (depending on the unit size), for a variety of equipment. They provide ideal protection in high “noise” areas where voltage fluctuations exceed the regulating range of the equipment/system power supply. Epoxy potted windings protect against moisture, dust and other airborne contaminants and are ideal for office or plant locations. Voltage conditioners main features;

- Protects equipment from both noise and voltage fluctuations
- Windings impervious to moisture
- Rejects Noise
- Controls voltage fluctuations
- CSA Certified
- Finished in recoatable ANSI 61 Grey

APPLICATIONS

- Mini/micro computers
- Data terminals
- Micro processors
- Electronic cash registers
- Instrumentation
- Communications equipment
- Medical Diagnostics equipment
- Photographic equipment
- CAD systems
- CAM systems
- Security systems
- Test equipment
- Navigation equipment
- Programmable controllers
- Scientific research equipment

*** Not intended for “Highly Inductive Loads”**

CONSTRUCTION FEATURES

The Line Voltage Conditioner is a ferroresonant transformer type regulator with a simple circuit configuration and without moving components. This provides fast, responsive voltage regulation.



PERFORMANCE CHARACTERISTICS

Input voltage range	+/- 15%
Output regulation/response time	+/- 3%/1.5 cycles
Frequency input range - (60 Hz models)	59-61 Hz
Harmonic Distortion	3%
Common mode rejection	120 dB
Normal mode rejection	60 dB
Audible noise	55 dBa
Efficiency	85%
Holdup time	3 ms.

SELECTION TABLE

120/240V OUTPUT

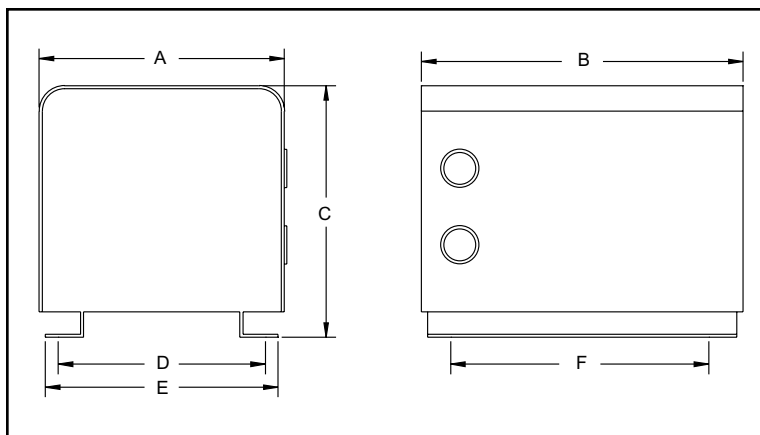
60 Hz

Power Rating VA	Input Range VAC	Catalog Number	Case Style (Pages 194-197)	Approx. Dimensions (Inches)			Approx. Weight (Lbs.)
				Width	Depth	Height	
250	120/208/240	CVHW250C	L6	6.75	4.75	14.30	32
250	240/480	CVHW250D	L6	6.75	4.75	14.30	32
250	600	CVHW250E	L6	6.75	4.75	14.30	32
500	120/208/240	CVHW500C	L7	6.75	6.25	14.30	43
500	240/480	CVHW500D	L7	6.75	6.25	14.30	43
500	600	CVHW500E	L7	6.75	6.25	14.30	43
750	120/208/240	CVHW750C	L8	9.00	7.25	17.25	80
750	240/480	CVHW750D	L8	9.00	7.25	17.25	80
750	600	CVHW750E	L8	9.00	7.25	17.25	80
1000	120/208/240	CVHW1000C	L9	9.00	8.50	18.25	95
1000	240/480	CVHW1000D	L9	9.00	8.50	18.25	95
1000	600	CVHW1000E	L9	9.00	8.50	18.25	95
1500	120/208/240	CVHW1500C	L10	11.50	7.50	20.75	130
1500	240/480	CVHW1500D	L10	11.50	7.50	20.75	130
1500	600	CVHW1500E	L10	11.50	7.50	20.75	130
2000	120/208/240	CVHW2000C	L11	11.50	9.00	20.75	158
2000	240/480	CVHW2000D	L11	11.50	9.00	20.75	158
2000	600	CVHW2000E	L11	11.50	9.00	20.75	158
3000	120/208/240	CVHW3000C	L12	13.00	12.00	20.50	225
3000	240/480	CVHW3000D	L12	13.00	12.00	20.50	225
3000	600	CVHW3000E	L12	13.00	12.00	20.50	225
5000	120/208/240	CVHW5000C	L13	15.00	12.00	25.00	325
5000	240/480	CVHW5000D	L13	15.00	12.00	25.00	325
5000	600	CVHW5000E	L13	15.00	12.00	25.00	325

SECTION 6



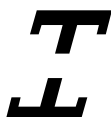
SINGLE PHASE, SUPER ISOLATION TRANSFORMER SPECIFICATIONS



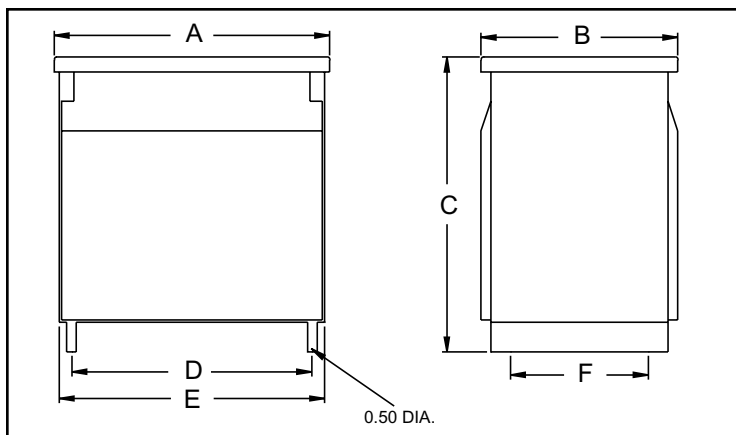
SINGLE PHASE SELECTION TABLE

kVA Rating	Catalog Number	Frequency Hz	Input VAC	Output VAC	Overall Dimensions (inches)						Weight Lbs.
					A	B	C	D	E	F	
0.12	US10121	50/60	120/240	120/240	5.13	7.63	6.13	3.66	4.66	5.13	12
0.12	UT10121	60	120/240	120/240	5.13	7.63	6.13	3.66	4.66	5.13	10
0.25	US10251	50/60	120/240	120/240	5.13	9.63	6.13	3.66	4.66	7.13	18
0.25	UT10251	60	120/240	120/240	5.13	9.63	6.13	3.66	4.66	7.13	16
0.5	US10501	50/60	120/240	120/240	6.63	8.13	7.13	5.11	6.11	5.63	27
0.5	UT10501	60	120/240	120/240	6.63	8.13	7.13	5.11	6.11	5.63	23
1	US11001	50/60	120/240	120/240	6.63	9.63	7.13	5.11	6.11	7.13	44
1	UT11001	60	120/240	120/240	6.63	9.63	7.13	5.11	6.11	7.13	38
2.5	US12501	50/60	120/240	120/240	6.63	13.63	7.13	5.11	6.11	11.13	86
2.5	UT12501	60	120/240	120/240	6.63	13.63	7.13	5.11	6.11	11.13	75
5	US15001	50/60	120/240	120/240	9.63	12.63	9.88	8.11	9.11	10.13	138
5	UT15001	60	120/240	120/240	9.63	12.63	9.88	8.11	9.11	10.13	120
5	US15004	50/60	240/480	120/240	9.63	12.63	9.88	8.11	9.11	10.13	138
5	UT15006	60	600	120/240	9.63	12.63	9.88	8.11	9.11	10.13	120
10	US110001	50/60	120/240	120/240	9.63	19.13	9.88	8.11	9.11	16.63	225
10	UT110001	60	120/240	120/240	9.63	19.13	9.88	8.11	9.11	16.63	225
10	US110004	50/60	240/480	120/240	9.63	19.13	9.88	8.11	9.11	16.63	225
10	UT110006	60	600	120/240	9.63	19.13	9.88	8.11	9.11	16.63	225
15	US115001	50/60	120/240	120/240	13.25	21.56	12.38	11.73	12.73	19.06	325
15	UT115001	60	120/240	120/240	13.25	21.56	12.38	11.73	12.73	19.06	280
15	US115004	50/60	240/480	120/240	13.25	21.56	12.38	11.73	12.73	19.06	325
15	UT115006	60	600	120/240	13.25	21.56	12.38	11.73	12.73	19.06	280
20	US120001	50/60	120/240	208Y120	13.25	21.56	12.38	11.73	12.73	19.06	375
20	UT120001	60	120/240	208Y120	13.25	21.56	12.38	11.73	12.73	19.06	325
20	US120004	50/60	240/480	208Y120	13.25	21.56	12.38	11.73	12.73	19.06	375
20	UT120006	60	600	208Y120	13.25	21.56	12.38	11.73	12.73	19.06	325

SECTION 6



THREE PHASE, SUPER ISOLATION TRANSFORMER SPECIFICATIONS



THREE PHASE SELECTION TABLE

kVA Rating	Catalog Number	Frequency Hz	Input VAC	Output VAC	Overall Dimensions (inches)						Weight Lbs.
					A	B	C	D	E	F	
3	US3031	50/60	208	208Y120	25	19	27	21.5	24	13.5	190
3	UT3031	60	208	208Y120	25	19	27	21.5	24	13.5	170
3	US3034	50/60	240/480	208Y120	25	19	27	21.5	24	13.5	190
3	UT3036	60	600	208Y120	25	19	27	21.5	24	13.5	170
7.5	US3071	50/60	208	208Y120	25	19	27	21.5	24	13.5	265
7.5	UT3071	60	208	208Y120	25	19	27	21.5	24	13.5	240
7.5	US3074	50/60	240/480	208Y120	25	19	27	21.5	24	13.5	265
7.5	UT3076	60	600	208Y120	25	19	27	21.5	24	13.5	240
15	US3151	50/60	208	208Y120	28	20	30	24.5	27	14.5	355
15	UT3151	60	208	208Y120	28	20	30	24.5	27	14.5	320
15	US3154	50/60	240/480	208Y120	28	20	30	24.5	27	14.5	355
15	UT3156	60	600	208Y120	28	20	30	24.5	27	14.5	320
22.5	UT3221	60	208	208Y120	28	20	30	24.5	27	14.5	470
22.5	UT3224	60	240/480	208Y120	28	20	30	24.5	27	14.5	470
22.5	UT3226	60	600	208Y120	28	20	30	24.5	27	14.5	470
30	UT3301	60	208	208Y120	28	20	30	24.5	27	14.5	530
30	UT3304	60	240/480	208Y120	28	20	30	24.5	27	14.5	530
30	UT3306	60	600	208Y120	28	20	30	24.5	27	14.5	530
45	UT3451	60	208	208Y120	37	28	38	33.5	36	22.5	800
45	UT3454	60	240/480	208Y120	37	28	38	33.5	36	22.5	800
45	UT3456	60	600	208Y120	37	28	38	33.5	36	22.5	800
75	UT3751	60	208	208Y120	37	28	38	33.5	36	22.5	1500
75	UT3754	60	240/480	208Y120	37	28	38	33.5	36	22.5	1500
75	UT3756	60	600	208Y120	37	28	38	33.5	36	22.5	1500

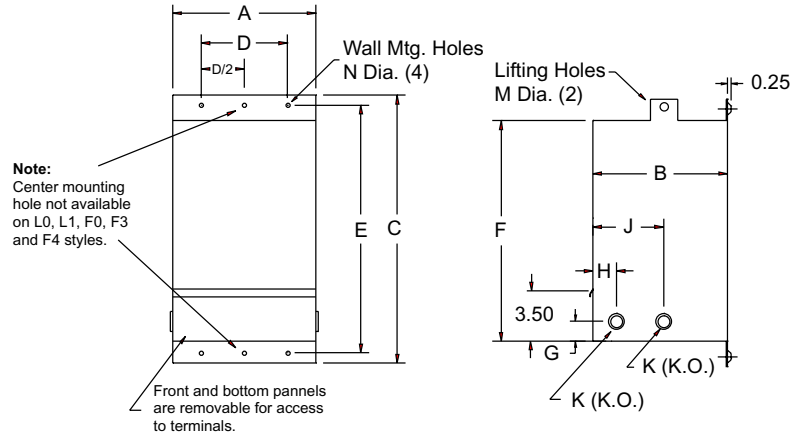
SECTION 6



GENERAL INFORMATION

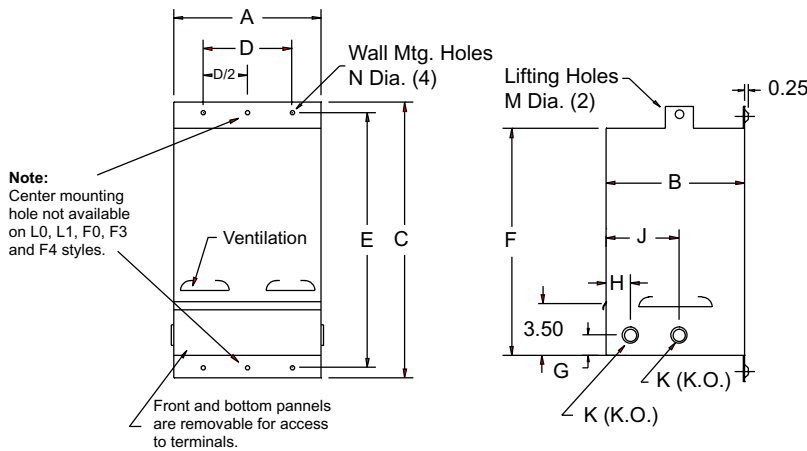
DIMENSIONAL DRAWINGS

'F' & 'L' SERIES ENCLOSURES



Case Style	Dimensions in Inches											
	A	B	C	D	E	F	G	H	J	K	M	N
L0	7.00	7.00	14.75	4.50	13.00	11.13	1.50	2.50	-	.50 X .75	0.75	0.265
L1	9.00	8.50	17.50	5.50	15.75	13.88	2.00	1.50	7.00	.75 X 1.0	0.75	0.265
L2	12.50	8.00	23.00	9.00	21.25	19.38	2.00	1.50	6.88	.75 X 1.0	0.75	0.265
L3	12.50	6.00	16.50	9.00	14.75	12.88	2.00	1.50	4.50	.75 X 1.0	0.75	0.265
L4	16.50	6.00	19.00	13.00	17.25	15.38	1.50	2.00	4.50	1.0 X 1.25	0.75	0.265
L5	7.50	7.75	15.94	5.50	14.20	12.80	1.50	2.50	-	0.5 X 0.75	0.75	0.265
F0	8.00	7.50	15.00	5.50	14.20	12.50	1.50	2.75	-	.75 X 1.0	0.75	0.312
F1	8.75	9.00	15.50	5.75	14.68	13.13	2.00	3.50	-	.75 X 1.0	0.75	0.312
F2	10.75	8.50	16.50	7.50	15.68	14.13	2.00	3.50	-	.75 X 1.0	0.75	0.312
F3	11.75	8.13	19.50	8.75	18.68	17.13	2.00	3.50	-	1.0 X 2.0	0.75	0.375
F4	13.50	9.44	21.75	10.50	21.00	19.38	2.00	4.00	-	1.0 X 2.0	0.75	0.437

'L6 to L13' SERIES ENCLOSURES



Case Style	Dimensions in Inches											
	A	B	C	D	E	F	G	H	J	K	M	N
L6	6.75	4.75	14.38	4.00	13.63	12.00	1.38	1.50	-	0.5 X 0.75	0.75	0.312
L7	6.75	6.25	14.38	4.00	13.63	12.00	1.38	1.50	-	0.5 X 0.75	0.75	0.312
L8	9.00	7.25	17.25	6.25	16.50	15.00	2.38	1.25	-	0.5 X 0.75	0.75	0.312
L9	9.00	8.50	18.25	6.25	17.50	16.00	2.75	2.25	-	0.5 X 0.75	0.75	0.312
L10	11.50	7.50	20.75	8.75	20.00	18.44	-	-	-	-	0.75	0.312
L11	11.50	9.00	20.75	8.75	20.00	18.44	-	-	-	-	0.75	0.312
L12	13.00	12.00	20.50	10.28	19.44	17.44	-	-	-	-	0.75	0.406
L13	15.00	12.00	25.00	12.50	23.94	21.92	-	-	-	-	0.75	0.406

GENERAL INFORMATION