

INSTALLATION,  
OPERATION AND  
MAINTENANCE  
MANUAL



AccuVar ACV



Liebert

# LIEBERT ACCUVAR<sup>®</sup> ACV SERIES INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

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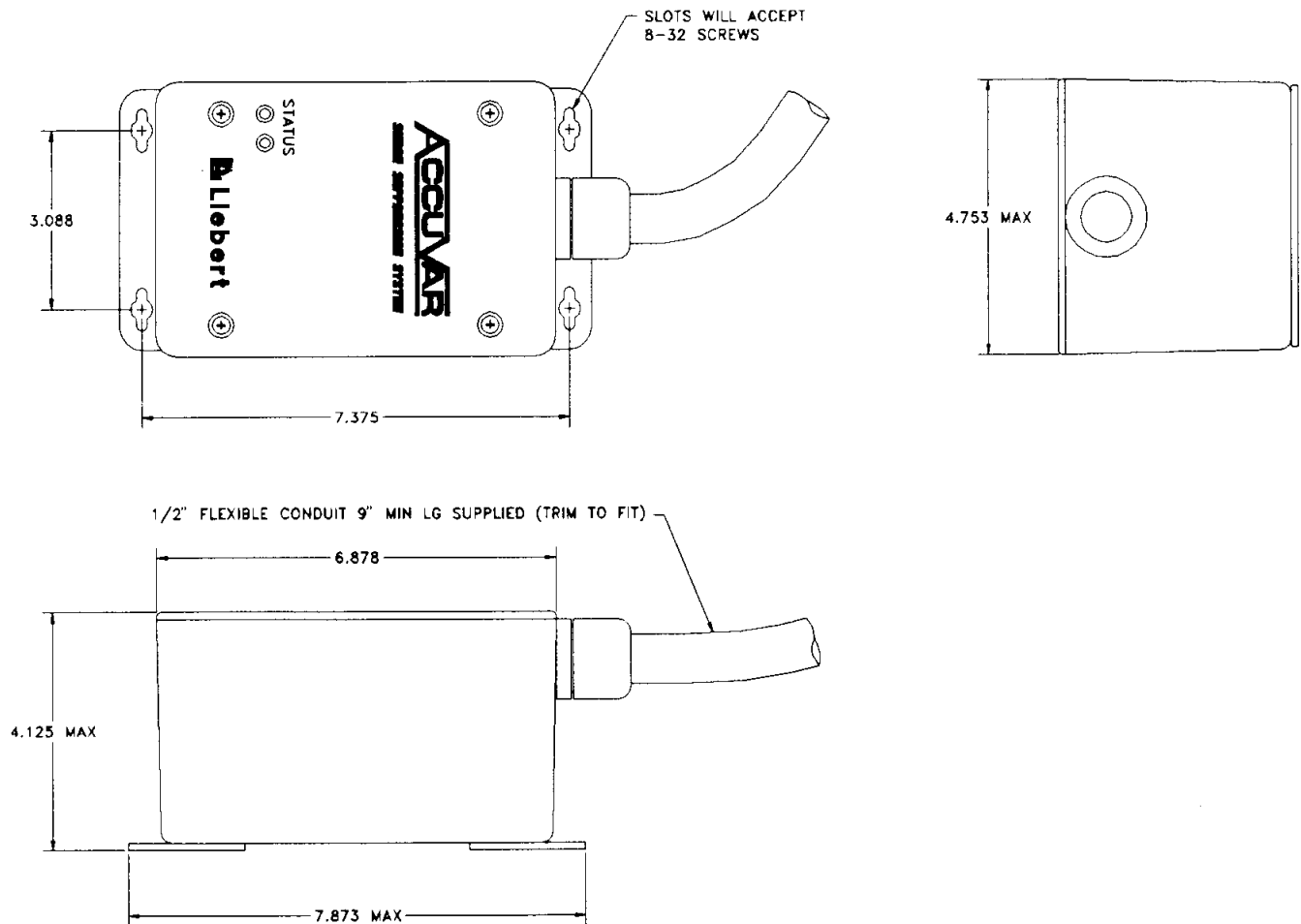
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## INSTALLATION INSTRUCTIONS FOR THE LIEBERT ACCUVAR® ACV SERIES SURGE PROTECTIVE DEVICE WITH OPTIONAL FILTERING

The Liebert AccuVar® ACV Series Surge Protective Device (SPD) is a high quality, high energy surge current diversion system designed to protect sensitive equipment from damaging transient surges and electrical line noise. Proper installation is required for maximum system performance.

The installer should perform the following steps to assure a quality installation. The entire installation manual should be read before starting installation. These instructions do not replace national or local electrical codes. Check applicable electrical codes to ensure compliance. Installation of the Liebert AccuVar ACV Series Surge Protective Device should only be performed by qualified personnel.



**Figure 1. AccuVar ACV Series Dimensions.**

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## UNPACKING AND INSTALLATION

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### Unpacking and Preliminary Inspection

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1. **Inspect the shipping crate(s)** for damage or signs of mishandling before unpacking the unit.
2. **If any damage as a result of shipping is observed**, immediately file a claim with the shipping agency and forward a copy to your local Liebert Sales Representative.

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### Storage

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The unit should be stored in a clean, dry environment. Storage temperature range is -55°C (-67°F) to +85°C (+185°F). Care should be taken to avoid condensation. All packing and shipping materials should be left intact until the unit is ready for final installation. If the unit has been stored for an extended period of time, the unit should be cleaned and carefully inspected before placing into service.

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### Location Considerations

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**Environment** – The unit is designed for operation indoors in ambient temperatures of -40°C (-40°F) to +50°C (+122°F) with a relative humidity of 0% to 95% (non-condensing).

The unit is provided in a NEMA 12, 4, and 4X rated industrial use enclosure, which is dust, drip, and water tight and should not be installed in areas with flammable materials or explosive atmospheres.

**Outdoor Use** – To assure water tightness for outdoor use, “O” rings must be used with screws to secure cover!

The cover screws and “O” rings are supplied inside of the unit in the small plastic bag that also contains the wiring ring terminals. To properly attach the cover to the enclosure the four “O” rings must be used with the four screws provided, prior to placing the screw in hole of cover. Screws should be torqued between 4 and 10 inch-pounds.

**Note: To maintain the integrity of the “O” rings, protection against direct sunlight is advised.**

**Equipment Performance** – For maximum system performance, the unit must be located as close to the protected circuit as practical to minimize interconnecting wiring length.

For optimum transient surge protection, coordinated surge suppression should be applied at the service entrance, at all other electrical connections to the building (telephone, CATV, etc.), and at known transient surge generating loads within the building (large motors, arc welders, switched capacitors, etc.). Electrical line noise protection should also be applied close to the point of usage for sensitive electronic loads (computers, electronic appliances, solid state motor drives, etc.). For interconnected electronic loads (such as by way of data cabling), communication line protectors may also be applied to the interconnect wiring.

**Mounting** – The unit is to be wall mounted. Refer to Figure 1 for mounting dimensions.

## ELECTRICAL CONNECTIONS

All electrical connections should be installed by a qualified (licensed) electrician only. All wiring must comply with the National Electrical Code (NEC) and applicable local codes.



**VERIFY THAT ALL POWER CIRCUITS ARE DE-ENERGIZED AND LOCKED OUT BEFORE MAKING ELECTRICAL CONNECTIONS.**

Terminals are provided inside the Liebert AccuVar SPD units for the line (phase), neutral (if used), and transient ground connections.

### Voltage Ratings & Power Source Configurations

Before making connections to the unit, verify that the unit model number and nameplate voltage rating are appropriate for connection to the intended power source. See Figure 2 for voltage rating applications with typical power source configurations and assure that system voltages do not exceed the maximum continuous operating voltage (MCOV) on the unit's data label.

**Surge Voltage Ratings** – To obtain the suppression voltage ratings (SVRs), as obtained by Underwriters Laboratories, Incorporated, in accordance with the *Standard for Safety, Surge protective devices, (SPD), Standard 1449, Second Edition, dated August 15, 1996*, marked on this product, #10 AWG wire must be utilized to connect the AccuVar® to your facilities' power grid. Connections made with other than #10 AWG conductors may result in different suppression voltage ratings.

**Circuit Ampacity Limitations** – Representative samples of this device have been investigated by Underwriters Laboratories, Incorporated to withstand, without exposing live circuits or components on power sources, with voltage of two times (2x) the device ratings, and fault currents of up to 300,000 AIC, as described in the *Standard for Safety, Surge protective devices, (SPD), Standard 1449, Second Edition, dated August 15, 1996*.

### Overcurrent Protection

The SPD unit conducts practically no current under normal operation and only conducts during very short duration transient conditions. The Liebert AccuVar ACV Series SPD units contain UL approved 300 kAIC internal system fusing to protect against device failure. This overcurrent protection, while not currently required by SPD safety agencies or installation codes (NEC Article 280), has proven to be prudent engineering practice.

External overcurrent protection is not specifically required, nor is it desired since it impedes the performance of the transient surge suppressor. If overcurrent protection of the conductors to the transient surge suppressor is desired, the suggested fuse sizes based on the unit's transient surge current capabilities and suggested wire sizes are shown in Table 1.

**Table 1. Terminal Wire Size Range and Suggested Wiring Overcurrent Protection (All Models).**

SUGGESTED WIRE SIZE (AWG)	SPECIAL NOTES	SUGGESTED FUSE / CIRCUIT BREAKER AMPACITY (IF USED)
10*	6-32 screw ring or spade terminal required. (Spare terminal screws enclosed)	30A
12		20A

\* Must be used for UL1449 performance.

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## **Connection**

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With the AccuVar's parallel connection, the length of wiring to the transient voltage surge suppression (SPD) unit must be minimized for best performance. Wire lengths longer than 10 feet must be avoided. Wiring connections may be made directly into circuit breakers.

To reduce the wiring impedance to surge currents, the phase, neutral (if required), and ground conductors are recommended to be twisted together and routed in the same raceway (conduit). Avoid any sharp bends in the conductors.

**Wire Sizing** - With parallel connection, the size of the wiring to the SPD unit is independent of the protected circuit's ampacity. Suggested wire sizes based on the unit's transient surge current capabilities are shown in Table 1.

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## **System Grounding & Bonding**

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The performance and safety of any SPD system is dependent on proper grounding. Grounding is required primarily for safety. Correct implementation also enhances equipment performance. Incorrect grounding can reduce or impede the SPD's operation.

All electrical circuits to or from the SPD must include an equipment grounding conductor as required by the NEC and local codes.

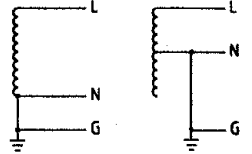
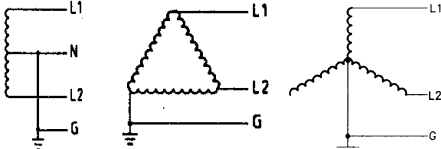
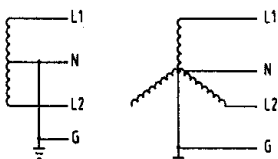
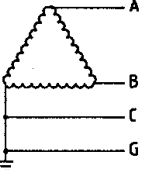
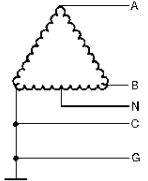
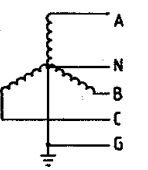
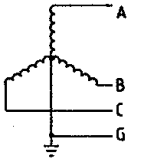
An insulated grounding conductor is recommended for the SPD. The grounding conductor should be the same wire size as the associated power conductors and should be connected in close proximity to the SPD.

**Grounding Electrode** – Contrary to popular belief, transient surge suppressors do not discharge all surges to ground (earth). Transient surge suppressors divert the surge current back to its source to complete the electrical circuit.

In the case of lightning, whose potential is developed with respect to the earth, the SPD diverts the surge current to the grounding electrode (earth connection). However, for most transient surges which are developed by switching loads, the SPD diverts the surge current back to its source without involving the grounding electrode.

For proper SPD performance, the service entrance grounding electrode system must comply with the NEC by having all available electrodes (building steel, metal water pipe, driven rods, concrete encased electrodes, etc.) properly bonded together and connected to the power system grounding.

**The use of a separate grounding electrode to ground the SPD defeats the effectiveness of the SPD, is a potential safety hazard, may cause equipment damage, is an NEC violation (reference NEC 250-51 and 250-54), and is not recommended.**

<b>VOLTAGE RATINGS &amp; POWER SOURCE CONFIGURATIONS</b>			
<b>Source Configurations</b>	<b>Nominal Operating Voltage</b>	<b>Maximum Continuous Operating Voltage</b>	<b>Model Voltage Code</b>
 <p>Single Phase L-N, 2 W + G</p>	100 110 120 230 277 347	130 L-N 130 L-N 150 L-N 275 L-N 320 L-N 420 L-N	100N 110N 120N 230N 277N 347N
 <p>Single Phase L-L, 2 W + G</p>	208 240 400 480 600	130 L-L 150 L-L 275 L-L 275 L-L 420 L-L	208L 240L 400L 480L 600L
 <p>Split Single Phase, 3 W + G</p>	120 / 208 or 120 / 240 277 / 480 347 / 600	150 L-N 320 L-N 420 L-N	120S 277S 347S
 <p>Three Phase Delta, 3 W + G</p>	208 240 380 415 480 600	250 L-L 320 L-L 420 L-L 580 L-L 580 L-L 680 L-L	208D 240D 380D 415D 480D 600D
 <p>Three Phase Delta Hi Leg, 4 W + G</p>	120 / 240 208 / 240	150 L-N 250 L-N	240H 240H
 <p>Three Phase Wye, 4 W + G</p>	120 / 208 220 / 380 240 / 415 277 / 480 347 / 600	150 L-N 320 L-N 320 L-N 320 L-N 420 L-N	120Y 220Y 240Y 277Y 347Y
 <p>Three Phase Wye, 3 W + G No Neutral</p>	120 230 277 347	130 L-L 275 L-L 320 L-L 420 L-L	120Y 230Y 277Y 347Y

**Table 2. Voltage Ratings and Power Source Configurations.**

For other voltages or source configurations, consult factory.

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## OPERATION

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**Liebert AccuVar ACV Series SPD Systems require little or no operator intervention after installation. The units are provided with status LED, which assist in determining when the unit needs service (see Troubleshooting/Repair/Maintenance Section).**

If the unit is energized and the green LED is off (and / or the red LED is on), the AccuVar is not fully functional and will require replacement.

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### Summary Alarm Contact Option

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Optional Form C ( 1 N.O. and 1 N.C.) relay contacts may be provided for remote indication of

phase loss, undervoltage (70% of line voltage, typical), power loss, and suppression failure. If the status of the contacts change (indicating a problem), one of these conditions exists.

The summary alarm contact terminals are located inside the unit. Contacts are rated for 5 amps at 125 VAC maximum.

Note: Wiring for the Form C contacts may be routed through the flexible conduit with the phase wiring. All wire must comply with the National Electrical Code (NEC) and applicable local codes.

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## TROUBLESHOOTING / MAINTENANCE / SERVICING

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### Inspection and Cleaning

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Periodic system inspections, cleaning, and connection checks are recommended to ensure reliable system performance and continued transient protection.

**(For any other problems not listed below, or if cause of the problem cannot be determined, please call Control Concepts at 800-288-6169 or 607-724-2484.)**

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### Troubleshooting

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If status failure indication occurs or Form C relay has changed states, a qualified electrician should first determine if the systems voltage and proper phasing exists.

If the AccuVar SPD remains in an alarm condition once the technician is satisfied that the electrical system and its connections are normal, the unit should be replaced.

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### Corrective Maintenance

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The Liebert AccuVar ACV Series SPD is designed for years of trouble-free operation. However, even the most reliable equipment may fail under abnormal conditions. Diagnostic indicators are

provided to indicate when the unit needs replacement (see operation section of this manual for details). To ensure continuity of surge protection, failed units should be replaced at the earliest convenient service opportunity.

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### Servicing

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**ONLY QUALIFIED PERSONNEL SHOULD PERFORM MAINTENANCE ON THE SYSTEM.**

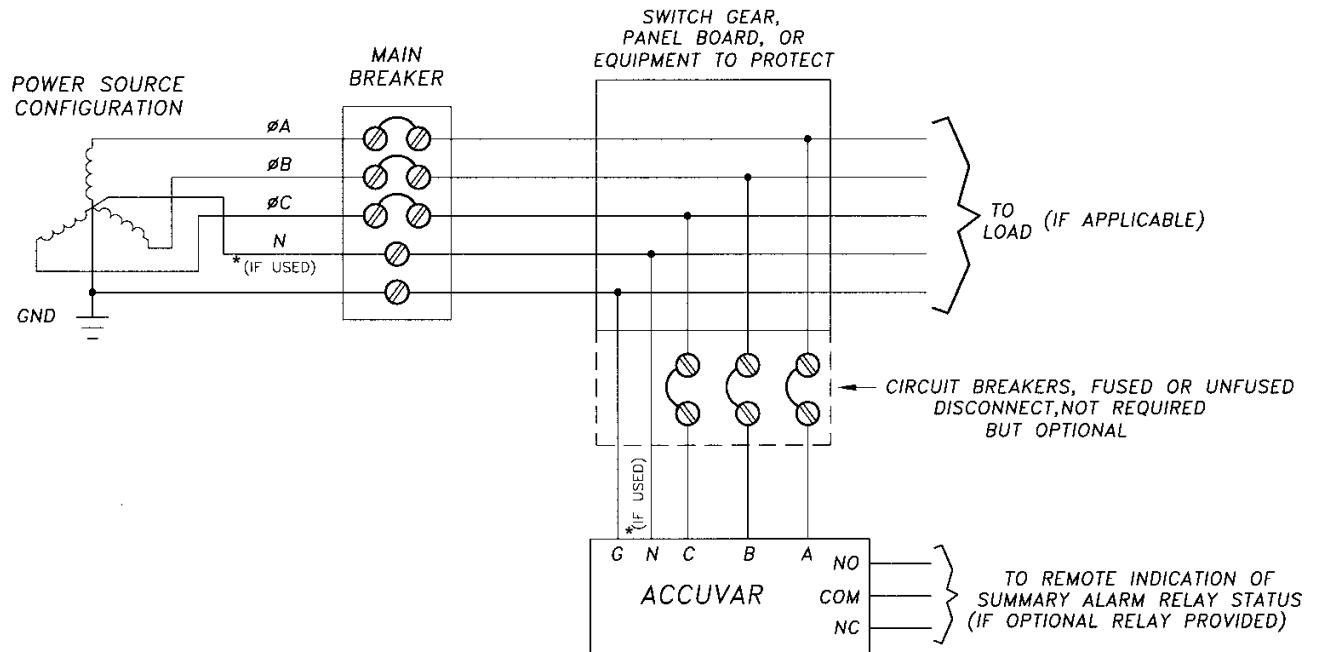
**HAZARDOUS VOLTAGES ARE PRESENT INSIDE THE UNIT DURING NORMAL OPERATIONS.**

**ELECTRICAL SAFETY PRECAUTIONS MUST BE FOLLOWED WHEN SERVICING THIS UNIT.**

**TO PREVENT RISK OF ELECTRICAL SHOCK, TURN OFF AND LOCK OUT ALL POWER SOURCES TO THE UNIT BEFORE SERVICING UNIT.**



THREE PHASE WYE ACCUVAR RECOMMENDED CONNECTIONS



**Figure 2. Installation Diagram.**

**\*If neutral is provided, a reliable neutral must be pulled to the AccuVar.**

### LIMITED WARRANTY

This Warranty is given **ONLY** to purchasers who buy for commercial or industrial use in the ordinary course of each purchaser's business.

#### General:

Control Concepts' products are in our opinion the finest available. We take pride in our products and are pleased that you have chosen them. Under certain circumstances, we offer with our products the following Ten-Year Warranty Against Defects in Material and Workmanship. Please read your Warranty carefully. This Warranty sets forth our responsibilities in the unlikely event of defect and tells you how to obtain performance under this Warranty.

### TEN YEAR LIMITED WARRANTY AGAINST DEFECTS IN MATERIAL AND WORKMANSHIP

**CONTROL CONCEPTS PRODUCTS COVERED:** AccuVar®.

#### Terms of Warranty:

As provided herein, the Control Concepts product is warranted to be free of defects in material and workmanship for a period of ten (10) years from the date of delivery of the product to User. The delivery date will be determined only from the Control Concepts bill of lading. If any of the Control Concepts products fail to conform to the warranty within the warranty period, Control Concepts, at its option, will furnish new or factory remanufactured parts for repair or replacement of that part.

#### Warranty Extends to First Purchaser for Use, Non-transferable:

This Warranty is extended to the first person, firm, association or corporation for whom the Control Concepts product specified herein is originally installed for use in the United States (the "User"). This Warranty is not transferable or assignable without the prior written permission of Control Concepts.

#### Assignment of Warranties:

Control Concepts assigns to User any warranties which are made by manufacturers and suppliers of components of the Control Concepts product and which are assignable, but Control Concepts makes **NO REPRESENTATIONS** as to the effectiveness or extent of such warranties, assumes **NO RESPONSIBILITY** for any matters which may be warranted by such manufacturers or suppliers and extends no coverage under this warranty to such components.

#### Descriptions:

Control Concepts warrants for the period and on the terms of the Warranty set forth herein that the Control Concepts product will conform to the descriptions contained in Control Concepts' final invoices, orders and Control Concepts' product brochures. Control Concepts does not control the installation and use of any Control Concepts product. Accordingly, it is understood that the Descriptions are **NOT WARRANTIES OF PERFORMANCE** and **NOT WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE**.

#### Obtaining Performance Under This Warranty:

Within a reasonable time, but in no case to exceed thirty (30) days, after User's discovery of a defect, User shall contact Control Concepts and request a return authorization number. User shall ship the product, with proof of purchase, to Control Concepts freight prepaid. Control Concepts products shipped to Control Concepts without a return authorization number will be refused and returned freight collect to User at User's expense. Control Concepts products shipped by User to Control Concepts which have incurred freight damage due to User's improper packaging of the product will not be covered by this Warranty and any repairs or replacement parts, components or products needed will be invoiced in the full current price amount and returned freight collect to User.

Subject to the limitations specified herein, Control Concepts will repair or replace, at its option, without charge for Control Concepts labor or materials, subsequent to its inspection and F.O.B. Control Concepts' facility, the Control Concepts product shipped to Control Concepts with a return authorization number and warranted hereunder which does not conform to the Warranty. Replacement parts, components or products shipped to User prior to Control Concepts' receipt and inspection of the product claimed to be defective, shall be invoiced in the full current price amount and shipped freight collect F.O.B. Control Concepts' facility. Warranty coverage will be extended only after Control Concepts' receipt of the claimed defective product within thirty (30) days of shipment of any replacement parts, components or products, if applicable, Control Concepts' inspection discloses the claimed defect and the returned product shows no signs of treatment or use which would void the coverage of this Warranty.

#### Items Not Covered By Warranty:

THIS WARRANTY DOES NOT COVER DAMAGE OR DEFECT CAUSED BY misuse, improper application, wrong or inadequate electrical current or connection, inadequate water or drain services, negligence, inappropriate on site operating conditions, corrosive atmosphere, repair by non-Control Concepts designated personnel, accident in transit, tampering, alterations, a change in location or operating use, exposure to the elements, Acts of God, theft or installation contrary to Control Concepts' recommendations or specifications, or in any event if the Control Concepts serial number has been altered, defaced or removed.

THIS WARRANTY DOES NOT COVER shipping costs, installation costs, circuit breaker resetting or maintenance or service items and further, except as provided herein, does NOT include labor costs or transportation charges arising from the replacement of the Control Concepts product or any part thereof or charges to remove same from any premises of the User.

THIS WARRANTY DOES NOT COVER DAMAGE OR DEFECT CAUSED BY use of the Control Concepts product in combination with any electrical or electronic components, circuits, systems, assemblies, or other materials not furnished by Control Concepts. Control Concepts does NOT warrant the suitability for use or the results of the Control Concepts product in combination with the products of others.

REPAIR OR REPLACEMENT OF A DEFECTIVE PRODUCT OR PART THEREOF DOES NOT EXTEND THE ORIGINAL WARRANTY PERIOD.

**Limitations:**

- THIS WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
- USER'S SOLE AND EXCLUSIVE REMEDY IS REPAIR OR REPLACEMENT OF THE CONTROL CONCEPTS PRODUCT AS SET FORTH HEREIN.
- IF USER'S REMEDY IS DEEMED TO FAIL OF ITS ESSENTIAL PURPOSE BY A COURT OF COMPETENT JURISDICTION, CONTROL CONCEPTS' RESPONSIBILITY FOR PROPERTY LOSS OR DAMAGE SHALL NOT EXCEED ONE TIMES THE NET PRODUCT PURCHASE PRICE.
- IN NO EVENT SHALL CONTROL CONCEPTS ASSUME ANY LIABILITY FOR INDIRECT, SPECIAL, INCIDENTAL, OR ECONOMIC CONSEQUENTIAL DAMAGES OF ANY KIND WHATSOEVER, INCLUDING WITHOUT LIMITATION, LOST PROFITS, BUSINESS INTERRUPTION OR LOSS OF DATA, WHETHER ANY CLAIM IS BASED UPON THEORIES OF CONTRACT, NEGLIGENCE, STRICT LIABILITY, TORT OR OTHERWISE.

**Miscellaneous:**

- NO SALESPERSON, EMPLOYEE OR AGENT OF CONTROL CONCEPTS IS AUTHORIZED TO ADD TO OR VARY THE TERMS OF THIS WARRANTY. Warranty terms may be modified, if at all, only in a writing signed by a Control Concepts' officer.
- This Warranty is effective as of the date of Control Concepts receipt of payment and supersedes all previous warranties. Control Concepts reserves the right to supplement or change the terms of this Warranty in any subsequent warranty offering to User or others.
- In the event that any provision of this Warranty should be or becomes invalid and/or unenforceable during the warranty period, the remaining terms and provisions shall continue in full force and effect.
- This Warranty is given in and is intended to be construed under the laws of the State of New York.
- This Warranty represents the entire agreement between Control Concepts and User with respect to the subject matter herein and supersedes all prior or contemporaneous oral or written communications, representations, understandings or agreements relating to this subject.

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**DECLARATION OF CONFORMITY**

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All models of the AccuVar Series are in compliance with the **EMC Directive 89/336/EEC**, conforming to EMC standard IEC 1000-4-4 and IEC 1000-4-5.

----- Office of the Vice-President of Engineering, Binghamton, NY USA, June 1996.

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