



FPA-12/066F

Safety, Operation, and Procedure Instructions for the FPA-12/066F FIELD PORTABLE AC Hipot

***** Caution- High Voltage *****

This Operator Manual contains instructions for the operation of a High Voltage power source. The operator of this equipment must use good judgement and follow all safety precautions noted in this guide to ensure the protection of himself and others in close proximity to the test area. **Failure to follow the instructions could result in injury or death.** Proper grounding of the test set must be done prior to connecting this unit to a power source.

Operator Manual



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About the Operator Manual

Important

This Operator Manual describes the features and safe operation of a High Voltage Test Set. The instructions are intended to be clear and simple, but the operator must be trained and qualified according to established procedures for the use of this type of equipment.

This Operator Manual is organized to provide information on the **FPA-12/066F** in steps that familiarize the new operator with the operation of this test set.

Section 1: Specifications and Controls.

Section 2: Setup and Operation.

Section 3: Performing Special Operations.

General Information

This section familiarizes the operator with the features and specifications of the

FPA-12/066F FIELD PORTABLE AC Test Set manufactured by **HIGH VOLTAGE, INC.**

Features and Specifications

The FPA-12/066F Field Portable AC hipot test set provides continuously adjustable output voltage for testing up to 6 or 12kVac @ 6kVA.

Standard features of the FPA-12/066F

- Continuously adjustable output voltage
- Adjustable overload, 10-110% of rated output current
- Fixed 120% Primary overload
- "Zero Start" and External Interlock provision
- Keyed EMERGENCY OFF pushbutton
- Top Mounted Safety Lights indicating POWER ON and HIGH VOLTAGE ON conditions
- Secondary connected analog Kilovolt Meter, TWO range scale
- Triple range analog Current Meter
- Dual full KVA output 0-12kVac, 500 Milliamperes, and 0-6 kVac, 1000 Milliamperes
- Guard/Ground Return Mode Switch
- Burn Reactor with ON/OFF Switch
- 15 ft. shielded output cable precludes unnecessary insulated support of the cable

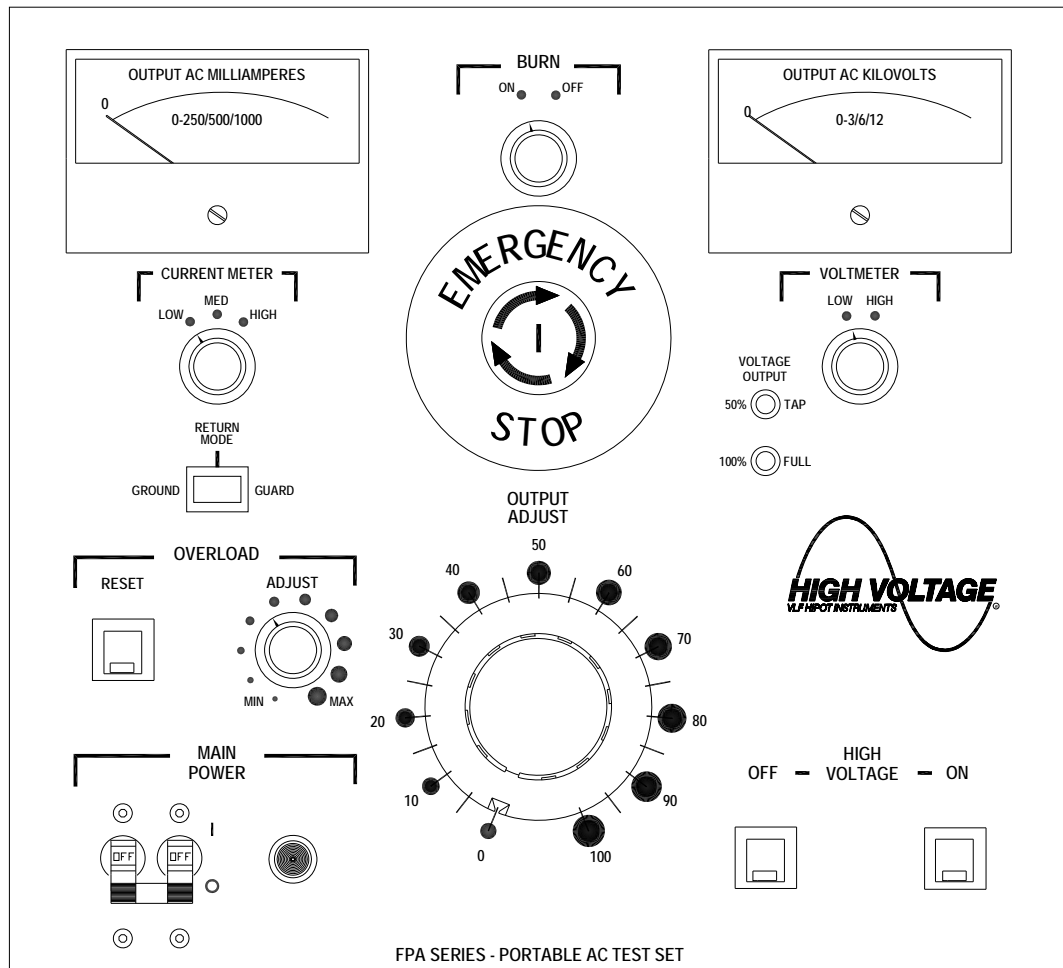
- One piece mobile design in heavy-duty hand truck type cabinet (215 lbs.)
- Transit protected meters prevent meter damage between test sites
- 15 ft. input line cord

FPA-12/066F MODEL SPECIFICATIONS

	FPA-012/066F Part No. FPA-12/066F(230v, 50/60 Hz)
Input	230 V, 50/60 Hz, 30amps, single phase
Output	0-6kVac, 6kVA resistive load (1000 mA) 0-12kVac, 6kVA resistive load (500 mA)
Output Termination	15 ft. long shielded cable
Duty	6KVA:1 hour ON, 1 hour OFF 5KVA: continuous
Distortion	<5%
Meter Accuracy	2% FS Accuracy
Kilovoltmeter	3.5 inch Scaled 0-3/6/12 kVac (RMS)
Current Meter	3.5 inch Scaled 0-250/500/1000 mA ac
Case Size	23w x 23.5d x 46 high
Weight	215 lbs. (98kg)

Table 1 *FPA-12/066F Specifications.*

Figure 1 *FPA-12/066F front panel controls.*



MAIN POWER

The **MAIN POWER** circuit breaker provides overload protection and power to the control and High Voltage circuits. The neon lamp will light when the power is on and voltage is available through the input line cord. The input power must be from a *grounded* source rated to match the input power specifications noted in Table 1.

HIGH VOLTAGE ON/OFF

The **HIGH VOLTAGE ON (OFF)** pushbuttons activate (de-activate) the high voltage power circuits. The LED indicators provide long life positive indication of the circuit status. The **RED (ON)** LED lights when high voltage is energized, the **GREEN (OFF)** LED lights when the high voltage is de-energized.

OUTPUT ADJUST

The **OUTPUT ADJUST** control variable transformer adjusts the output voltage. The 0-100% markings on the panel indicate the low to high output setting. The control must be at ZERO (0) to energize the high voltage circuits. The output control must always be returned to zero at the completion of testing, prior to de-energizing the output

VOLTMETER AND RANGE SWITCH

The **KILOVOLT METER** and associated range switch allows for more accurate output voltage readings. 1-% precision resistors minimize the need for re-calibration due to aging shift. See **Voltmeter Re-calibration** in Section 3 for details on calibration.

ACTIVE OUTPUT LED INDICATORS

The **ACTIVE OUTPUT** LEDs indicate which output well the output cable is connected to.

CURRENT METER AND RANGE SWITCH

The **CURRENT METER** and associated range switch allows for more accurate resolution on lower current readings. 1-% precision resistors minimize the need for re-calibration due to aging shift.

OVERLOAD ADJUSTMENT AND RESET SWITCH

The **OVERLOAD** trips from a secondary current in excess of the adjustment setpoint. Once tripped, the High Voltage is turned off and the **OVERLOAD** must be **RESET** to resume testing. To set the **OVERLOAD**, refer to **Section 2 in Operating The Equipment, Setting the Overload**.

RETURN MODE

The **RETURN MODE** switch allows for accurate secondary load current readings. In the **GUARD** position, all ground currents are shunted around the meter. The load must be isolated from ground to use in the **GUARD** position. In the **GROUND** position, the return point is grounded and all currents (load and ground losses) are metered.

BURN

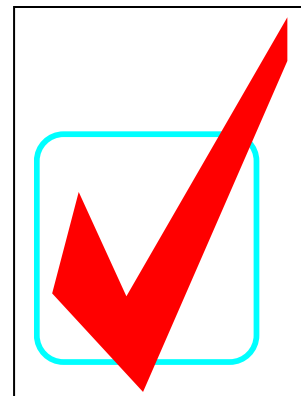
The **BURN** function is for the finding of faults in insulation by burning the fault until the resulting short can be traced by conventional methods. When in the **BURN** mode, the **OVERLOAD** is bypassed. Caution must be used when burning predominantly capacitive loads. The current limiting reactor may cause resonance with the load. If resonance occurs, the output voltage may rise above 12 kV. Watch the output voltmeter closely when testing in the **BURN** mode. It may be necessary to turn off the High Voltage manually should a resonant condition occur.

EMERGENCY STOP

The **EMERGENCY STOP** switch, when depressed, shuts off the high voltage output. To release, insert the key and turn clockwise.

List of included components

- ☐ Ext. Intlk. jumper plug (provided installed in panel)
- ☐ Attached 15 ft. X-Ray shielded output cable with clip
- ☐ 15 ft. input line cord



SETTING UP THE EQUIPMENT

The setup of this equipment has been minimized by careful consideration of the operator during design. The FPA-12/066F one-piece hand truck type construction augments portability.

1. **Select a location** for the unit that will allow easy viewing of the kilovolt meter at a safe distance from the test object.
2. **Be sure that all the controls are off**, in their de-energized or fully counterclockwise position.
3. **Secure a Customer Supplied ground lead to the rear of the cabinet.** *Do not rely solely on the input power ground for safety grounding of the cabinet.*
4. **Insert the EXT INTLK plug into the socket on the side of the cabinet.** The plug may also be wired to a normally open contact of a safety switch for added protection.
5. **Uncoil the input and output cables from the hook on the rear of the cabinet.**

Operating the Equipment

This section provides step-by-step instruction on various test methods. Many facilities have their own in-house test procedures, and this manual is not to supercede these. The purpose of this section is to explain the capabilities of this test set in real-world applications.

Setting the Overload

1. Ensure that all the steps listed in **Setting up the Equipment** have been accomplished. Take special note to ground the cabinet to a solid earth ground.
2. Choose the appropriate output connection (6 or 12kVac) and insert the output cable into the output well.
3. Short the output cable to the **GROUND** stud on the rear of the cabinet.
4. Place the **RETURN MODE** in the **GROUND** position.
5. Connect the input power cord to a grounded source (See the specification table for unit input requirements). Rotate the **OVERLOAD ADJUST** to the **MAX** setting.
6. Operate the **MAIN POWER** circuit breaker to energize the control circuits.

* * * C A U T I O N * * *

P O T E N T I A L L Y L E T H A L V O L T A G E S M A Y B E P R E S E N T

7. With the **OUTPUT** control at zero (zero start interlock engaged), depress the **HV ON** pushbutton. The **HV ON** light will glow.
8. Increase the output slowly by rotating the **OUTPUT** control clockwise until the desired output (overload) current is reached. Adjust the **OVERLOAD ADJUST** towards **MIN** until the **OVERLOAD** trips.
9. Re-energize High Voltage and raise the output current once more to verify the desired setting. At the completion of setting the overload go to the next section for testing instructions.

AC Insulation Testing

1. Ensure that all the steps listed in **Setting up the Equipment** have been accomplished. Take special note to ground the cabinet to a solid earth ground.
2. Select the desired **VOLTMETER RANGE** for the test voltage level expected. The voltmeter has 3 ranges but only a LOW/HIGH range choice. 0-3/6kVac for the 6kV output, and 0-6/12kVac for the 12kV output. Once the output cable is inserted into the appropriate output well, the ranges are automatically connected to the proper monitoring divider string.
3. If the **OVERLOAD** is to be used see the instructions for **Setting The Overload** if it is not yet done.
4. *Prior* to connecting the output cable to the test sample, be sure that the test sample is de-energized.
5. Connect the output lead to the test sample. *Be sure that there is enough clearance to grounded objects for the expected test voltage. The minimum clearance in air is 10 kV ac/inch.* Connect the low side of the load or test object to the **LOAD RETURN** connection using the supplied shielded coax cable.
6. Depending on your test requirements, choose the **GUARD or GROUND RETURN MODE** on the control panel. Refer to "Using the Guarded Return" explanation on Pages 9 and 10 in the manual.
7. Connect the input power cord to a grounded source (See the specification table for unit input requirements).
8. Operate the **MAIN POWER** circuit breaker to energize the control circuits.

* * * CAUTION * * *

POTENTIALLY LETHAL VOLTAGES MAY BE PRESENT

9. With the **OUTPUT** control at zero (zero start interlock engaged), depress the **HV ON** pushbutton. The **HV ON** light will glow.
10. Increase the output voltage by rotating the **OUTPUT** control slowly clockwise until the desired output voltage is reached.
11. Maintain the output voltage for the test time specified in your standard procedures.
12. After the test is complete, rotate the **OUTPUT** control to zero, prior to depressing the **HV OFF** pushbutton.

13.If the test sample fails during the test, the overload relay will de-energize the high voltage. The overload is set by following the procedure outlined in Setting The Overload.

14.Prior to removing the output cable from the load, assure that the load has no voltage, a safety ground stick or resistive discharge stick should be used.

Using the Burn Feature

When a fault occurs and the overload trips it may be necessary to 'Burn' the fault to locate it. The use of the **BURN** function facilitates the locating of faults and makes the repair process proceed quickly.

1. Once a fault has been observed, rotate the **BURN** switch to the **ON** position prior to energizing High Voltage.
2. Re-energize the High Voltage. Slowly raise the voltage until the fault arcs. The current limiting reactor will limit the output current below the unit rating. The burning of the fault should occur in a relatively short time.
3. Once the fault has been burned, turn off the High Voltage and return all controls to their **OFF** or fully counter-clockwise position.
- 4.Prior to removing the output cable from the load, assure that the load has no voltage, a safety ground stick or resistive discharge stick should be used.

Using the Guarded Return

The use of the GUARD/GROUND return feature of this test set provides for very accurate leakage current measurements if certain conditions exist allowing for the GUARD circuit to be employed. The following explanation will detail different test samples and methods that lend themselves to the use of this circuit. The same setup precautions such as proper grounding still apply to the test but the grounds will be manipulated to accomplish the test requirements.

1. **Grounded Return-** With the output return in the grounded mode, the current meter reads all current to ground, internal and external to the power supply. This current might include corona, surface tracking, and any shunt resistance. The typical diagram for grounded return operation is shown in **Figure 2** below.

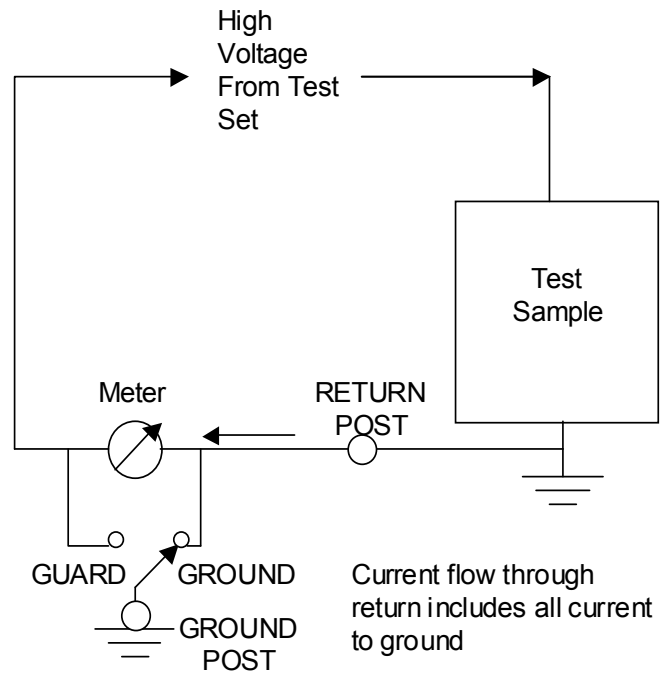


Figure 2, Grounded Return Diagram

2. **Guarded Return-** With the output return in the guarded mode, the current meter will only read currents through the test sample. The test sample must be isolated from ground on the low side as shown in **Figure 3** below.

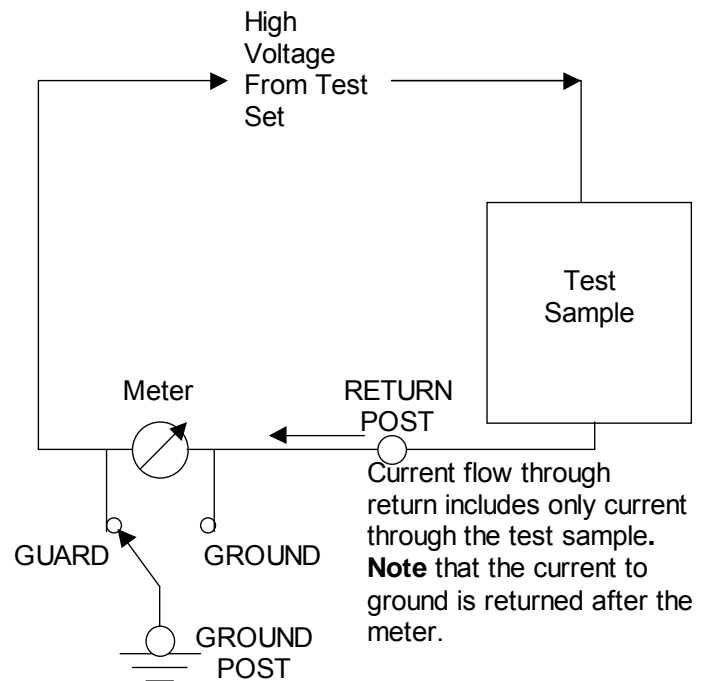


Figure 3, Guarded Return Diagram

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PERFORMING SPECIAL OPERATIONS

The following section contains information on the care and upkeep of your new HPA SERIES High Power AC Test Set. There are some notes on troubleshooting and service, which will save much time and money over the life of the unit.

Meter Re-calibration

The FPA-12/066F hipot uses precision metal film resistors for measurement and calibration of the voltmeter. The use of these resistors has minimized circuit drift due to aging and temperature. But, potentiometers on the voltmeter PCB can be used to correct for movement changes from the aging of the meters.

The certification of meters on a yearly basis is recommended to ensure accurate test results.

Voltmeter Re-calibration

1. Locate the unit in a position that will allow easy reading of the meters.
2. Remove the panel screws and support the panel horizontally to gain access to the calibration pot on the back of the voltmeter.
3. Both meters are independently calibrated. Follow instructions simultaneously for both.
4. Zero the meter movements using the zero adjustment below the scale window.
5. Perform the steps in **Setting up the Equipment** at the start of **SECTION 2**. Be sure to ground the cabinet to a solid earth ground prior to connecting the unit to input power.
6. Insert the output cable into the 6kV output well, and connect the output cable to a calibrated reference meter with ability to read to the full 6kV output voltage of this tap. Be sure to ground the low side of the meter.
7. Starting on the **LOW** range. Raise the output to one half scale on the unit meter. Adjust R4 as required.

8. Check calibration at full scale.
9. Verify the reading on the **HIGH** range and adjust R1C if necessary. The 1% precision range resistors should preclude the need for any adjustment, but it may be necessary to split variations between scales to keep within the ½ scale and Full scale range tolerances.
10. Next, insert the output cable in the 12kV output well and connect the working end to a calibrated reference with the ability to read the full 12 kV of this output. Verify the readings and adjust R4 (low) or R1C (high) to split (average) any possible variations.

If the customer facility calibration certification requires more points of reference, follow those procedures instead of these.

11. Calibration must then be verified with the panel in the operating position to check for any meter balance affect on the calibration.

Current Meter Re-calibration

1. Perform steps 1 thru 5 as noted in the Voltmeter Re-calibration Instructions.
2. Connect the output cable to a calibrated reference meter with ability to read to the full output current of the unit. Be sure to ground the low side of the meter.
3. Raise the output to one half scale on the unit meter. Adjust 100K pot next to the current meter on the rear of the control panel as required.
4. Check calibration at full scale.

If the customer facility calibration certification requires more points of reference, follow those procedures instead of these.

5. Calibration must then be verified with the panel in the operating position to check for any meter balance affect on the calibration.

RETURNED MATERIAL

If for any reason it becomes necessary to return any equipment or materials to High Voltage, Inc., the Service Department of High Voltage, Inc. must be notified, and authorization received, prior to the shipment of the equipment. When notified, the following information must be provided:

MODEL:

SERIAL NO:

PART NO:

REASON FOR RETURN:

SUSPECTED DEFECT:

CAUSE OF DEFECT:

With the above information provided, High Voltage, Inc. will determine if the return of the equipment is appropriate. If deemed appropriate, a Return Authorization Number will be issued. At that time, the Purchaser will be instructed how to mark and return the equipment.

The above procedure must be adhered to in order to ensure prompt service. No equipment should be returned without the prior knowledge and authorization of High Voltage, Inc.

REPLACEMENT PARTS ORDERING

To order replacement parts, first refer to the Parts List for the product in question. Every part is issued a part number. It will be necessary for this part number and the product model and serial number to be provided. When calling High Voltage, Inc. request the Service Department.

THESE TERMS AND CONDITIONS OF SALE AND LIMITED WARRANTY OF HIGH VOLTAGE, INC. ("High Voltage") SHALL BE GOVERNED BY AND CONSTRUED ACCORDING TO THE INTERNAL LAWS OF THE STATE OF NEW YORK, USA, WITHOUT GIVING EFFECT TO ITS CONFLICT OF LAWS PROVISIONS. THE RIGHTS AND OBLIGATIONS OF ALL PARTIES AND ALL PERSONS OR ENTITIES CLAIMING HEREUNDER SHALL NOT BE GOVERNED BY THE PROVISIONS OF THE 1980 U.N. CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS.

1. **ACCEPTANCE.** All orders become effective only when accepted by High Voltage's written order acknowledgment at Copake, New York, USA. Unless modified in writing by an authorized representative of High Voltage, or modified in High Voltage's Quotation or order Acknowledgment, these Terms and Conditions and Limited Warranty shall solely control Purchaser's order. High Voltage expressly rejects any additional or different provisions, terms or conditions proposed by Purchaser at any time.

2. **SCHEDULING.** High Voltage's shipping date specified in High Voltage's quotation or purchase order acknowledgment is approximate and High Voltage shall use reasonable commercial efforts to effect timely shipment. Furthermore, High Voltage shall not be liable for any delay in the performance of orders or contracts or in the delivery or shipment of goods or for any damages suffered by Purchaser by reason of such delay when such delay is, directly or indirectly, caused by, or in any manner arising from Purchaser's fault, fires, floods, accidents, riots, acts of God, war, governmental interference or, embargoes, strikes, labor difficulties, shortage of labor, fuel, power, materials or supplies, transportation delays, or any other cause or causes (whether or not similar in nature to any of these hereinbefore specified) beyond the control of High Voltage.

3. **CANCELLATIONS.** Prior to shipment, Purchaser may request cancellation or delayed delivery of an order or part thereof, but such shall be conditioned upon written consent of High Voltage and upon payment to High Voltage of cancellation or delayed delivery charges to be determined by High Voltage.

4. **SALE AND DELIVERY.** Unless otherwise agreed in writing, sale and delivery of the goods hereunder shall be made EXW or FCA (Incoterms® 2010) at High Voltage's option, High Voltage's dock at Copake, New York, USA, at which time all risk of loss or damage shall pass to Purchaser. All shipments and packaging shall be made in the manner determined by High Voltage, unless otherwise requested by Purchaser, in which case any resultant additional changes and expenses shall be paid by Purchaser.

5. **TAXES.** Any and all sales, use, excise and similar taxes, and duty and all other charges levied or imposed by governmental authority, foreign and domestic, upon any goods sold or contracted to be sold shall be paid by Purchaser and added to the purchase price unless appropriate tax exemption certificates are supplied to High Voltage in form satisfactory to High Voltage.

6. **PAYMENTS.**

a. All payments shall be in US Dollars without discount unless otherwise specified in High Voltage's order acknowledgment. Credit card payments are accepted only if specified in High Voltage's order acknowledgment.

b. Terms of payment are net thirty (30) days from date of invoice, unless otherwise agreed by High Voltage in its order acknowledgment. Delinquent payments are subject to a service charge on the unpaid balance from invoice date equal to the lower of 1-1/2% per month or the maximum rate permitted by law until all amounts are paid in full. If the financial responsibility of Purchaser becomes unsatisfactory to High Voltage for any reason, or if Purchaser has been in default to High Voltage under any order, High Voltage may require full payment in cash before shipment of goods.

c. If Purchaser so requests and makes arrangements prior to shipment

which meet High Voltage's full satisfaction, High Voltage in its discretion may accept irrevocable letters of credit in its favor issued by a United States bank which is satisfactory to High Voltage.

7. **INFRINGEMENT, ETC.** On goods manufactured to Purchaser's specifications, Purchaser shall and does indemnify and hold High Voltage harmless against any claims, damages, liabilities, costs and expenses (including attorneys' fees) arising out of or resulting from actual or alleged infringement of patent, copyright, trademark or other proprietary rights, or claim of unfair trade or unfair competition arising from or occasioned by the use, possession, sale or delivery of any such goods sold by High Voltage.

8. **REPRODUCTION RIGHTS.** Drawings, specifications, reports, photographs and other data relating to all orders and all proprietary rights and interests therein and the subject matter thereof shall be and remain the property of High Voltage. Purchaser agrees that it shall not use High Voltage's drawings, specifications or other materials covered by this order, or any similar article from any other source, or reproduce the same or otherwise appropriate them, without the prior written authorization of High Voltage.

9. **LIMITED WARRANTY.**

a. High Voltage warrants to the original Purchaser of any new goods that the goods are free from defects in material and workmanship under normal use and service for a period of one (1) year from the date of shipment by High Voltage. The obligation of High Voltage under this Limited Warranty is limited, in High Voltage's exclusive option, to repair, replace with new or reconditioned parts or issue credit for goods, parts or materials which prove to be defective. Costs incurred by Purchaser for labor or other expenses to repair or replace such goods, parts and/or materials shall be the sole responsibility of Purchaser. High Voltage shall not be responsible for any damage or lack of performance resulting from: (i) defects due to accident, negligence, alteration, modification, faulty installation, abuse or misuse, whether by Purchaser, Purchaser's agents or employees, or by others than High Voltage (ii) attempted or actual dismantling, disassembly, service or repair by any person, firm or corporation not specifically authorized in writing by High Voltage, or (iii) defects caused by or due to handling by carrier, or incurred during shipment, transshipment or other move.

b. High Voltage expressly disclaims any warranty whatsoever of (i) consumables, and of (ii) parts, components, software (including but not limited to object code and source code and software user instructions), accessories, and materials not prepared, compiled or manufactured by High Voltage, and Purchaser must deal directly with such other supplier. High Voltage may elect to assist Purchaser in settling such claim against such other supplier, but any such assistance shall not prejudice High Voltage's position as to its own liability.

c. Compliance with the following Limited Warranty Claim Procedure is a condition precedent to the obligation of High Voltage under this Limited Warranty:

i. Purchaser must notify High Voltage in writing as soon as is reasonably possible, but within the applicable warranty period, of any alleged defect in material, workmanship, or operation of any goods covered under this Limited Warranty. Such notice must describe in detail the defect, any and all defective parts, and the alleged cause of the defect. No goods may be returned to High Voltage without High Voltage's prior written permission, which permission may be withheld by High Voltage in its sole discretion.

ii. At the exclusive option of High Voltage, Purchaser may be directed in writing to dismantle the goods at the Purchaser's cost and expense and ship the goods prepaid to High Voltage (refer to "Returns" Section 10 for provisions regarding the return of any goods to High Voltage). If High Voltage elects to inspect the goods at Purchaser's site, and to repair, replace,

[Section 9.c.ii. continued on page 2]

or ship the defective goods to High Voltage's factory, Purchaser, at its own cost and expense, shall provide the facilities for such work as needed to inspect and evaluate and possibly repair/replace the goods. If inspection discloses that the defect is not one for which High Voltage is liable, then Purchaser shall promptly reimburse High Voltage for all expenses incurred.

iii. Upon receipt of the defective goods, or following access to the same, High Voltage shall inspect and evaluate the goods and determine the validity of Purchaser's claim.

iv. The validity of any warranty claim, Purchaser's compliance with the Limited Warranty and Limited Warranty Claim Procedure, and the obligation to replace, repair, or issue credit for any goods are solely and exclusively to be determined by High Voltage and any determination shall be final and binding.

d. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, STATUTORY OR EXPRESSED OR IMPLIED ON THE PART OF HIGH VOLTAGE, INCLUDING THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT; FURTHERMORE, HIGH VOLTAGE MAKES NO WARRANTY REGARDING NON-INTERRUPTION OF USE OR SOFTWARE FREEDOM FROM BUGS. HIGH VOLTAGE NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON, FIRM, OR CORPORATION TO ASSUME ANY LIABILITY OR OBLIGATION IN CONNECTION WITH THIS SALE OR LIMITED WARRANTY ON HIGH VOLTAGE'S BEHALF AND PURCHASER ACKNOWLEDGES THAT NO REPRESENTATION EXCEPT THOSE MADE HEREIN HAS BEEN MADE TO PURCHASER.

10. **RETURNS.** No goods may be returned to High Voltage without High Voltage's prior written permission, which permission may be withheld by High Voltage in its sole discretion. Any request for return authorization must be in writing and include, as applicable, model number, serial number, part number, reason for return, alleged defect, and apparent cause of alleged defect. Except as specifically provided in Section 9 Limited Warranty, if High Voltage consents to return of goods: (a) all return shipments are to be via prepaid freight and with all other charges prepaid, (b) if goods are returned to High Voltage within sixty (60) days from the date of original shipment for reasons other than an error by High Voltage in filling the Purchaser's order, Purchaser shall only be entitled to receive a credit in an amount equal to the payment received by High Voltage for the goods minus (i) handling charges, and (ii) a restocking fee determined solely by High Voltage which shall not exceed twenty five percent (25%) of the invoiced amount, and (c) if goods are returned to High Voltage after sixty (60) days from the date of original shipment for reasons other than an error by High Voltage in filling the Purchaser's order, Purchaser shall only be entitled to receive a credit in the amount equal to the payment received by High Voltage for the goods minus (x) a handling fee, and (y) a restocking fee in excess of twenty five percent (25%) which shall be determined by High Voltage.

11. **SECURITY INTEREST.** In order to induce High Voltage to ship goods without full payment, Purchaser grants a security interest to High Voltage in any and all of Purchaser's right, title and interest in the goods, and Purchaser agrees to comply with any reasonable request of High Voltage to perfect such security interest. Purchaser hereby further authorizes High Voltage to perfect High Voltage's security interest in said goods and consents to filing one or more financing statements without the signature of Purchaser.

12. **ARBITRATION.** Any controversy arising out of or relating to this document, or any breach thereof, including, without limitation, any claim that this document is voidable or void, shall be submitted to final and binding arbitration before, and in accordance with, the Commercial Rules of the American Arbitration Association then in effect, and judgment upon the award may be entered in any court have jurisdiction thereof; provided, however, that this clause shall not be construed to limit any rights which

High Voltage may have to apply to any court of competent jurisdiction for equitable, injunctive or provisional relief. This arbitration provision shall be deemed self-executing, and in the event that either party fails to appear at any properly noticed arbitration proceeding, an award may be entered against such party notwithstanding said failure to appear. Such arbitration shall be conducted before a single arbitrator under the aegis of the American Arbitration Association in Columbia County, State of New York. The arbitrator shall have the authority to award expenses to the successful party.

13. **LIMITATION OF LIABILITY.** TO THE MAXIMUM EXTENT PERMITTED UNDER APPLICABLE LAW, AND NOTWITHSTANDING ANYTHING ELSE IN THIS DOCUMENT OR OTHERWISE, INCLUDING THAT HIGH VOLTAGE WAS WARNED THAT DAMAGES WOULD OCCUR OR WERE LIKELY TO OCCUR, HIGH VOLTAGE SHALL NOT BE LIABLE WITH RESPECT TO ANY SUBJECT MATTER OF THIS DOCUMENT UNDER ANY CONTRACT, NEGLIGENCE, STRICT LIABILITY OR OTHER LEGAL OR EQUITABLE THEORY FOR (i) ANY AMOUNTS IN EXCESS IN THE AMOUNT PAID TO HIGH VOLTAGE FOR THE PARTICULAR GOODS OR PART THEREOF WHICH GAVE RISE TO THE APPLICABLE CAUSE OF ACTION OR CLAIM, OR (ii) ANY INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOST PROFITS OR LOST OR CORRUPTED DATA, OR (iii) COST OF PROCUREMENT OF SUBSTITUTE GOODS, SOFTWARE, TECHNOLOGY OR SERVICES. HIGH VOLTAGE SHALL HAVE NO LIABILITY FOR ANY FAILURE OR DELAY DUE TO MATTERS BEYOND ITS REASONABLE CONTROL.

14. **SEVERABILITY.** These Terms and Conditions and Limited Warranty are the entire understanding between Purchaser and High Voltage with respect to the subject matter hereof and supersede all prior agreements, dealings and negotiations. No modification, alteration or amendment shall be effective unless made in writing and signed by a duly authorized representative of High Voltage. No waiver of any breach hereof shall be held to be a waiver of any other or subsequent breach. Nothing contained in this document shall be construed as requiring the commission of any act contrary to law. Whenever there is any conflict between any provision of this document and any present or future statute, ordinance or regulation contrary to which the parties have no legal right to contract, the latter shall prevail, but in such event the provision of this document thus affected shall be curtailed and limited only to the extent necessary to bring it within the requirements of the law. In the event that any part, article, section, paragraph, sentence or clause of this document shall be held to be indefinite, invalid or otherwise unenforceable, the entire document shall not fail on account thereof, and the balance of the document shall continue in full force and effect. If any arbitration tribunal or court of competent jurisdiction deems any provision hereof (other than for the payment of money) unreasonable, said arbitration tribunal or court may declare a reasonable modification thereof, and this document shall be valid and enforceable, and the parties hereto agree to be bound by and perform the same as thus modified.

15. **BASIS OF BARGAIN.** Each party recognizes and agrees that the warranty disclaimers and liability and remedy limitations in this document are material, bargained for bases of their agreement and that they have been taken into account and reflected in determining the respective obligations of the parties.

[End]

