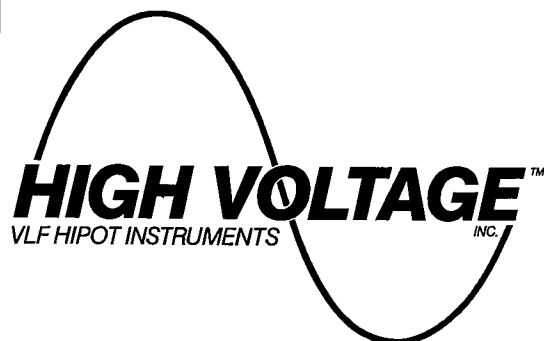
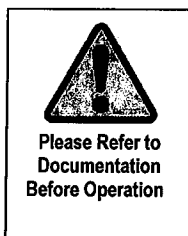




VLF-28CM

Safety, Operation, and Procedure Instructions for the VLF Series of AC Hipots

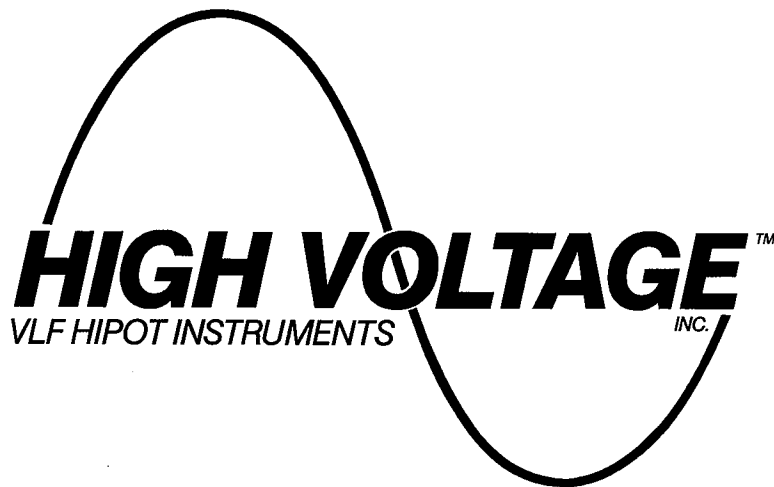


Danger- Lethal Voltages:

Equipment to be used by trained personnel only

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.**

VLF Operator Manual



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About the Operator Manual

Important

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

This Operator Manual is organized to provide information on the **VLF Series** in steps that familiarize the new operator with the entire scope of operation of this test set.

Section 1: Specifications and Controls.

Section 2: Setup and Operation.

Section 3: Performing Special Operations.

The Functions, Features, and Specifications of the VLF Series of AC Hipots are also discussed in the VLF Brochure available from High Voltage, Inc.

General Information

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

VLF-28CM Mini AC Hipot manufactured by **HIGH VOLTAGE, INC.**

Features and Specifications

The VLF-28CM hipot test set provides true sine wave AC output voltage for the test of 15 kV Class high voltage cables (0.4 uF (up to 4000 ft.)) and other capacitive loads.

Standard features of the VLF-28CM AC Hipot

- Sine wave output, 0.1Hz frequency standard.
- Continuously adjustable output voltage
- Continuous duty rating
- Fixed thermal circuit breaker overload
- "Zero Start" and External Interlock provision
- Single-range voltmeter
- Single -range Current meter
- One piece portable design
- Transit protected meter prevents damage between test sites
- Internal output limit resistor
- 10 ft. input line cord
- 20 ft. RG58/U output cable
- Alligator clip type output connector

WARNING

DO NOT OPERATE THE VLF HIPOT SET IF THE UNIT IS 15° OR MORE FROM LEVEL.

IF THE UNIT IS OPERATED OUT OF LEVEL, OVERHEATING AND INTERNAL ARCING MAY OCCUR.

DO NOT STORE OR TRANSPORT VLF UNIT

ON IT'S SIDE

Operating Environment

Indoor/Outdoor-fair weather

Altitude: 100% of rating; Sea-level, up to 5000ft.(approx.1500M). The output power is de-rated 10% above 5000 ft. altitude, 20% above 12,000 ft.(approx. 3600M), and 30% above 15,000 ft.(approx. 4500M)

Storage Temperature: -20°C to 70°C(-4°F to 158°F)

Operating Temperature: -5°C to 45°C(22°F to 113°F) Output power is de-rated linearly by 15% from 30 to 45°C ambient.

Maximum Relative Humidity: 80% up to 31°C(88°F), decreasing linearly to 50% at 40°C(104°F)

Mains supply fluctuation: +/-10% of rated voltage

Installation: Category II

Pollution: Degree 2

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ON IT'S SIDE

Safety Symbol Identification



Warning! Please refer to documentation before operation



Protective Earth Terminal



Warning: Hazardous Voltage

OPERATOR MANUAL

MODEL VLF-28CM AC HIPOT SPECIFICATIONS

	VLF-28CM(F) (28 kV,0.4 μ F) Part No. VLF-1436S(120V) Part No. VLF-1437S(230V)
Input	120 V, 50/60 Hz, 7A 230 V, 50/60 Hz, 3A
Output	Sinusoidal 0-28 kVac peak, 0.1Hz frequency
Duty	Continuous
Test Capacitance (Ins. Res. < 10G Ω)	0.4 μ F @ .1 Hz <u>Minimum capacitance to achieve full output- .005μF</u>
Kilovoltmeter	3.5 in. , -30/0/+30 PEAK KILOVOLTS 2% FS Accuracy
Current/uF Meter	3.5 in. 0-50 PEAK MILLIAMPS 2% FS Accuracy
Control Case Size	14.25w x 11.25d x 21.75 high
High Voltage Tank size	Included in Control
Weight	85 lbs. (39kg) Accessory Bag 8 lbs. (3.6kg)
Output cable length	RG8/U 20 ft.

Table 1 VLF-28CM Specifications.

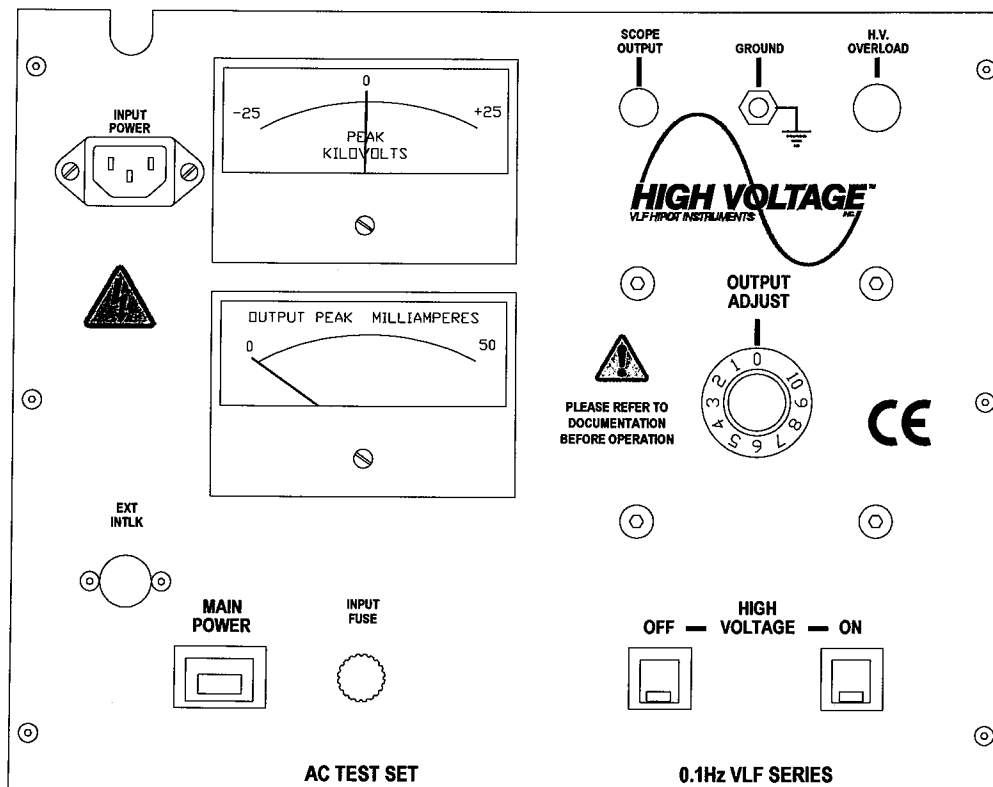


Figure 1 VLF-28CM front panel controls.

MAIN POWER

The **MAIN POWER** pushbutton switch provides the power to the control and power circuits. The neon lamp in the switch will light when the power is on and voltage is available through input line cord. The **INPUT FUSE** located electrically before the **MAIN POWER** switch provides input line protection for the unit.

EXT. INTLK (EXTERNAL INTERLOCK)

The **Ext. Intlk.** connector is provided to allow for a normally open safety interlock switch to control the energizing of the high voltage output.

HV OVERLOAD

OPERATOR MANUAL

The **HV OVERLOAD** circuit breaker protects the variable transformer output control brush. Its thermal characteristics allow for the short term overload of the variable transformer while still providing proper protection.

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 CONTROL

The **OUTPUT** control variable transformer adjusts the output voltage. The 0-10 markings(0-100 on CM units) on the knob indicate the low to high 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 , allow the unit to cycle for 60 seconds to assure full discharge of the load.

VOLTMETER

The **KILOVOLT METER** allows for 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. The center null meter indicates the polarity and amplitude of the output simultaneously for convenience of operation.

CURRENT METER

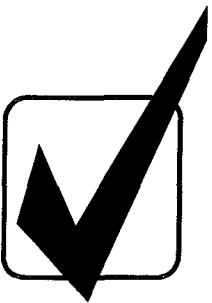
The **CURRENT** meter provides for accurate output current monitoring. The **CURRENT** portion of this circuit is for observing the charge and discharge currents in the cable load. 1% resistors minimize the need for re-calibration due to aging shift.

Note: The current meter on the VLF Series of AC hipot is for reference readings of current draw. The current reading is affected by both frequency and cable length and as such is not appropriate for use in trending or leakage measurements.

SCOPE OUTPUT

The **SCOPE OUTPUT** allows for accurate output voltage monitoring. This connector can be fed into an oscilloscope for the looking at the actual output wave shape. The peak to peak voltage representing 28 kVac is 5 volts peak/peak.

List of included components with the VLF-28CM Hipot



Ext. Intlk. jumper plug

20 ft. long output cable RG58/U

6 ft. BNC to BNC scope to panel interconnect coax cable

(1) 20 ft. 2AWG clear jacketed ground lead

OPERATOR MANUAL

SETTING UP THE EQUIPMENT

The setup of this equipment has been minimized by careful consideration of the operator during design. The **VLF-28CM** single-piece construction and light weight lends itself to convenient portability for AC testing in the field.

Select a location for the unit that will allow easy viewing of the control panel at a safe distance from the test object (within 20 ft.) on a level area. The meters should horizontal during use. A maximum angle for correct operation is 15°. Blocking the unit to a near level condition is acceptable.

1. **Be sure that all the controls are off**, in their de-energized or fully counterclockwise position.
2. **Secure a ground test lead to the panel.** The Ground post on the front panel should be used for that purpose.

Note: A second black test lead is provided for the 'live' load return ground, which will also connect to the GROUND stud on the front panel.

3. **Connect the safety ground stick to a solid earth ground.**
4. **Remove the coaxial output cable in the top lid storage and stretch out for later connection to the test cable or load.**
5. **Insert the EXT INTLK plug into the socket on the panel.** The plug may also be wired to a normally open contact of a safety switch for added protection.

The setup of the VLF AC Test Set does not address the need for proper safety grounding of the load (test sample or cable). The grounding requirements vary for different types of tests. Please consult the local codes where applicable or reference the guidelines for grounding found under OPERATING THE EQUIPMENT.

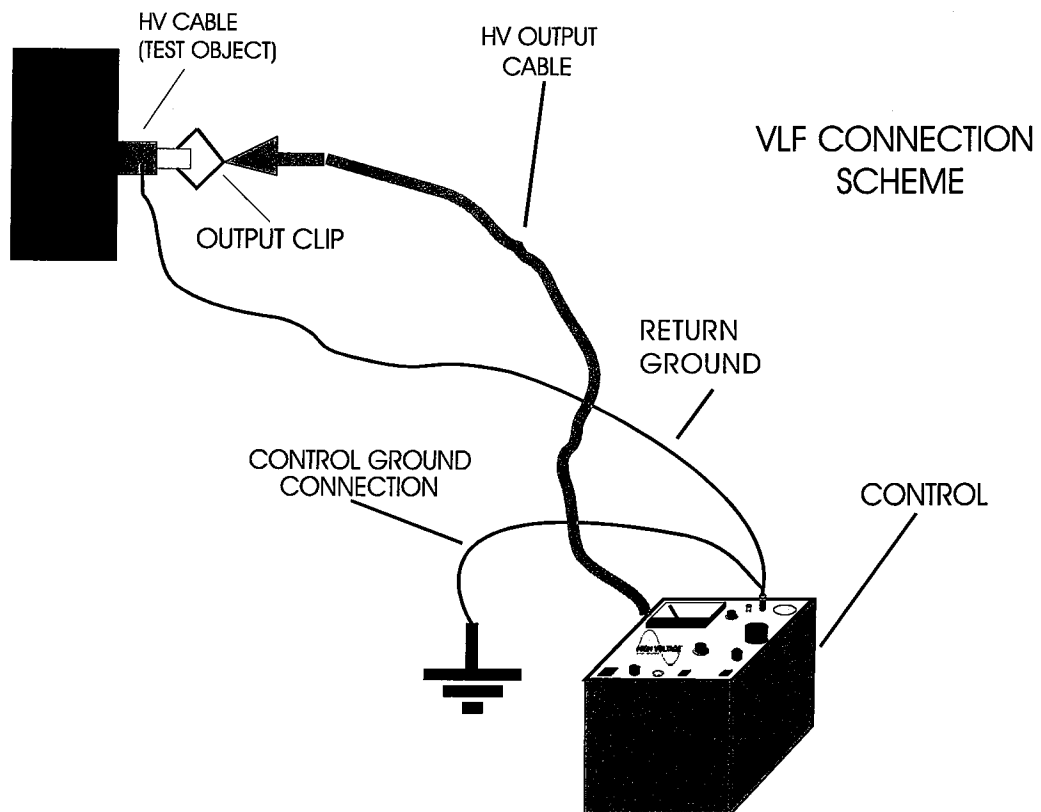
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DO NOT STORE OR TRANSPORT VLF UNIT

ON IT'S SIDE



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. ***Only trained personnel should attempt to operate this equipment.***

Dangerous voltages and currents are produced during the testing of cables, only trained individuals should operate this type of equipment and access to the test area must be restricted during testing to avoid endangering others.

When testing cables, either single or three phase, there are certain extra steps that must be observed to ensure safe operation.

It should be noted that the VLF series test sets are not intended to be used on vacuum bottles or switchgear without cables connected. The VLF-28CM requires a minimum of .005uF load capacitance to achieve full output. If the capacitance of the load is too low, the kilovolt meter will not read the actual peak output and damage to the unit (and/or load) may result.

AC Testing of High Voltage Cables

1. Ensure that all the steps listed in Setting Up the Equipment have been accomplished. Take special note to ground the test set to a solid earth ground.

Caution!!

Before making any cable connections, ensure that the cable being tested has been properly identified, de-energized, and grounded!

2. Make sure that all insulators, stress cones, and pot heads are clean and free of moisture. This will prevent flashover and minimize leakage.

Note: Be aware that any lightning arrestor or transient suppressing device must be disconnected if the clamping voltage is below the test voltage being performed. Failure to clear these devices from the cable may result in inappropriate failure indication of the test cable.

3. Isolate the far end of the conductors under test for the test voltage; that may mean separating some of the conductors in a multi-conductor cable from each other *and* their shields.

The shields of all cables must be securely tied to ground at the nearest end of the cable.

4. Any conductors or wires in the cable or the vicinity not being tested must be grounded to avoid a buildup of charge and possible shock hazard.
5. Voltage must be applied according to specifications from the cable manufacturer or any other applicable test standards
6. Prior to connecting anything to the test sample, be sure the test sample is identified, de-energized and grounded until ready to test.
7. Connect the input power terminal block to a grounded, 50/60 Hz source as noted in Table 1 Specifications. A generator is an acceptable power source.
8. Turn on the MAIN POWER switch. The MAIN POWER light will illuminate..



A minimum load capacitance of 0.005 μ F is required to achieve full output of the VLF-2804 unit.

It should be noted that the VLF series test sets are not intended to be used on vacuum bottles or switchgear without cables connected. The VLF-28CM requires a minimum of .005 μ F load capacitance to achieve full output. If the capacitance of the load is too low, the kilovolt meter will not read the actual peak output and damage to the unit (and/or load) may result.

9. An oscilloscope (**optional**) can be connected to the **SCOPE OUTPUT** on the control for wave shape monitoring. The oscilloscope should be properly grounded and the input should be set to 1 volt/ division, the time base should be 5 seconds/division and the trigger should be set to roll display to view the wave shape. An oscilloscope with signal memory display is best used for this application. A BNC to BNC shielded jumper should be used for connection between the **SCOPE OUTPUT** and the oscilloscope. A digital meter can be used to monitor this connector. The voltage feedback calibration for this connector is 1 volt for 10 kV of output.

*** CAUTION ***

POTENTIALLY LETHAL VOLTAGES MAY BE PRESENT

STORED ENERGY LEVELS IN THE CABLE GREATLY INCREASE THE RISK OF FATAL INJURY IF CONTACT IS MADE WITH THE LOAD WHILE AT ANY VOLTAGE.

10. Connect the output lead to the test sample. On the VLF-28CM, the limit resistor is internal to the high voltage section unlike the larger models where the resistor is external. 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.
11. Be sure to clear the test area of unauthorized personnel and use safety barricades to warn others of potential danger during the high voltage test .

Note: The current meter on the VLF Series of AC hipot is for reference readings of current draw. The current reading is affected by both frequency and cable length and as such is not appropriate for use in trending or leakage measurements.



12. With the **OUTPUT** control at zero (zero start interlock engaged), depress the **HV ON** pushbutton. The **HV ON** light will glow. Increase the output by operating the **OUTPUT** control slowly clockwise until the desired output voltage is reached. Raising the output too fast with large capacitive loads may trip the output overload. Observe the **Kilovolt** meter to set voltage. Please recognize that the output cycle is 10 seconds for a full sine wave @ .1 Hz. . To set the output voltage you may need more than one cycle to read the output accurately. **A minimum load capacitance of 0.005 μ F is required to achieve full output of the VLF-28CM unit.**
13. Maintain the output voltage for the test time specified in your standard procedures.

Note: Full scale current readings at the polarity reversal (zero crossing) of the output sine wave indicates an excessive load. Reduce the cable capacitance by isolating the test section from other branches. Observe the next cycle and repeat cable load reduction if necessary

The limiting factor in the VLF unit is the wave shaping discharge resistors. An excessive capacitance will not fully discharge before the next half cycle starts and causes a discharge at zero crossing through the high voltage circuit.

Excessive loads can damage the VLF test set.

14. After the test is complete, rotate the **OUTPUT** control to zero, allowing the load to return to zero and the unit to cycle for about 60 more seconds prior to depressing the **HV OFF** pushbutton. Allowing the unit to cycle for some time allows for the complete discharge of the load and avoiding the normal self re-charge that capacitive loads will exhibit.
15. If the test sample fails during the test, the overload circuit will de-energize the high voltage. Should an overload occur, the normal sine wave cycle is interrupted and the load may bleed down much more slowly than when the unit is cycling normally.

From time to time, the input fuse may blow during a fault on the cable load, be sure to replace the fuse with a slo-blo (TYPE T/time delay) fuse of the proper amperage.

The thermal overload may not trip below 20% of full output. Due to thermal characteristics and high voltage circuit impedance, the current peaks are not enough to trip the overload. Above 20%, the overload reliably trips at the peak of the output wave.



16. Prior to removing the output cable from the load, observe that the output voltmeter is at zero, and then use a SAFETY GROUND STICK to positively ground the test sample.

Note: Cables exhibiting high failure rates (greater than 4 times in 18 months) should be investigated further to determine the age and likelihood of continuing problems. Replacement may be indicated.

WARNING

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DO NOT STORE OR TRANSPORT VLF UNIT

ON IT'S SIDE

It should be noted that the VLF series test sets are not intended to be used on vacuum bottles or switchgear without cables connected. The VLF-28CM requires a minimum of .005uF load capacitance to achieve full output. If the capacitance of the load is too low, the kilovolt meter will not read the actual peak output and damage to the unit (and/or load) may result.

OPERATOR MANUAL
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PERFORMING SPECIAL OPERATIONS

The following section contains information on the care and upkeep of your new VLF-28CM AC Hipot. 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 VLF-28CM AC hipot uses precision metal film resistors for measurement and calibration of the voltmeter. The use of these resistors in both the high voltage tank and the metering circuits has minimized circuit drift due to aging and temperature. But, a potentiometer (R4) on the voltmeter PCB can be used to correct for movement changes from the aging of the meter.

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

Voltmeter Re-calibration

1. Remove the entire chassis assembly from the case. There are six screws securing the chassis. Two under each lifting handle, and two screws through the base of the case.
2. Once removed from the case, locate the unit in a position that will allow easy reading of the meters.

It is necessary to stop the VLF action of the output for calibration. To do this, first isolate the output cable from ground. Second, energize the output and raise the output control to '2' on the dial. When the output reaches a peak reading, turn off the **MAIN POWER** switch. Lastly, remove the yellow/black lead from the variac motor where it plugs onto the variac. This disables the heart cam drive and allows a dc calibration to take place. Continue with the calibration at this time.

OPERATOR MANUAL

3. Remove the panel screws and slide the panel out from chassis(one set of holes) to gain access to the calibration pot on the back of the voltmeter.
4. Zero the meter movement 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 front panel to a solid earth ground using the supplied black ground test lead prior to connecting the unit to input power.
6. Connect the output cable to a calibrated reference meter with ability to read to the full output voltage of the unit. Be sure to ground the low side of the meter.
7. Raise the output to one half scale on the unit meter. Adjust R4 as required.
8. Check calibration at both half and full scale. If the customer facility calibration certification requires more points of reference, follow those procedures instead of these.
9. Change the polarity by manually operating the latching relay on the heart cam assembly and check the other polarity.

Miscellaneous

Note: During normal operation, the control panel will heat due to the variable transformer output control. The heat exhibited is normal and does not affect the operation of the test set at all.

Replacing the Output Cable

The output cable can easily be replaced if it becomes damaged. The tank connection is a dry well fitting. To replace the cable:

- 1) Locate a suitable work surface that allows the control panel to be accessed.
- 2) With input power removed, remove the six (6) screws securing the control panel.
- 3) Remove the strain relief holding the cable in the panel. Lift the panel towards a vertical position to access the top of the high voltage tank.
- 4) Disconnect the output cable at the tank and feed the cable backwards through the panel.
- 5) Install a replacement cable by reversing the steps above.

Oil Insulated High Voltage Tanks

The oil-filled tanks in all the VLF SERIES of hipots are field serviceable. The only requirement is that the tank must be oil filled under vacuum at re-assembly. The parts to service the tank are available from HIGH VOLTAGE, INC. at the address noted on the inside front cover of this manual.

The oil level in the tank should be .50 - .75 inches from the lid when the oil temperature is 20°C.

Weekly Maintenance Schedule

Weekly maintenance must be developed for each individual customer and their particular needs. The typical regular maintenance items are:

- 1) Keep output cable insulation clean. Use a clean cloth and mild solvent oil (like WD40) to remove dirt and carbon marking from use.

Yearly Maintenance Schedule

Yearly Maintenance schedules must be developed for each individual customer and their particular needs. The typical required yearly maintenance items are:

- 1) Calibration verification.
- 2) Replace the thermal overload on the panel if the set has been used to burn or condition cables for fault locating.
- 4) Applying new lithium grease to the latching relay slug on the 'heart cam' assembly.

OPERATOR MANUAL
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:

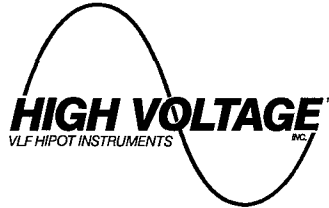
MODEL:
SERIAL NO:
PART NO:
REASON FOR RETURN:
SUSPECTED DEFECT:
CAUSE OF DEFECT:

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.



LIMITED WARRANTY; LIMITED RESPONSIBILITY FOR DAMAGES

High Voltage, Inc. ("High Voltage") warrants to the original purchaser of any new product, purchased from High Voltage, that the product is free from defects in material and workmanship under normal use and service for a period of one year from the date of shipment to the original purchaser by High Voltage.

This warranty is valid only for normal use of the product. Any use outside High Voltage's written operation instructions will void this warranty. In addition, any one of the following events will void this warranty: (a) any defects due to negligence, alteration, modification, accidental or intended physical abuse, faulty installation, and/or misuse; (b) attempted or actual dismantling, service or repair by any person or firm not authorized in writing by High Voltage; (c) defects caused due to handling or transit, either by carrier or purchaser.

This warranty only covers those parts deemed defective by High Voltage. The liability of High Voltage is limited to only the repair, replacement with new or reconditioned parts, or issuance of credit for those parts deemed defective within the scope of this warranty. Any additional costs incurred by the purchaser for labor and/or materials incidental to the inspection, repair, replacement or issuance of credit for product or materials under warranty is the sole responsibility of the purchaser. This warranty applies solely to products manufactured by High Voltage. It does not apply to parts, accessories, or materials not manufactured by High Voltage, or to consumables. If purchaser's claim relates to materials manufactured by a supplier to High Voltage, High Voltage reserves the right to disclaim responsibility and liability and may require the purchaser to deal directly with the other manufacturer of the defective part. High Voltage may elect to assist the purchaser in settling such claim against such other manufacturer without prejudicing High Voltage's position as to its own liability.

WARRANTY CLAIM PROCEDURE

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

- a) Purchaser must notify High Voltage as soon as is reasonably possible of any alleged defect in material, workmanship, or operation of any product covered under this warranty, provided that any notification must be received by High Voltage within twelve months after the shipment date of the product in question. Such notice must describe in detail the defect, any and all defective parts, and the alleged cause of the defect.
- b) At the exclusive option of High Voltage, purchaser may be directed to dismantle the product at the purchaser's cost and expense and ship the product prepaid to High Voltage. Refer to the Returned Material section for instructions regarding the return of any material to High Voltage. If High Voltage elects to inspect the product at the purchaser's site, and possibly repair, replace, or ship the defective product to High Voltage's factory, purchaser, at its own cost and expense, shall provide suitable facilities for such work as needed to inspect and evaluate and possibly repair/replace subject product. If inspection discloses that the defect is not one for which High Voltage is liable, that is, is outside the stated terms of this warranty provided by High Voltage, then the purchaser agrees to reimburse High Voltage for all expenses incurred.
- c) Upon receipt of the defective material or product, or following access to the same, High Voltage shall inspect and evaluate the material or product and determine the validity of the purchaser's claim.

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

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED ON THE PART OF HIGH VOLTAGE, INCLUDING THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR USE, AND NON-INFRINGEMENT ARISING FROM ANY BREACH THEREOF AND HIGH VOLTAGE NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON, FIRM, OR CORPORATION TO ASSUME ANY LIABILITY OR OBLIGATION IN CONNECTION WITH THIS WARRANTY ON ITS BEHALF AND PURCHASER ACKNOWLEDGES THAT NO REPRESENTATIONS EXCEPT THOSE MADE HEREIN HAVE BEEN MADE TO PURCHASER. THIS WARRANTY SHALL BE GOVERNED AND CONSTRUED ACCORDING TO THE INTERNAL LAWS OF THE STATE OF NEW YORK. 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 UNDER ANY CONTRACT, NEGLIGENCE, STRICT LIABILITY OR OTHER LEGAL OR EQUITABLE THEORY FOR (A) ANY AMOUNTS IN EXCESS IN THE AMOUNT PAID TO HIGH VOLTAGE FOR THE PARTICULAR PRODUCT OR PART THEREOF WHICH GAVE RISE TO THE APPLICABLE CAUSE OF ACTION, OR CLAIM, OR (B) ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOST PROFITS OR LOST DATA, OR (C) COST OF PROCUREMENT OF SUBSTITUTE GOODS, TECHNOLOGY OR SERVICES. HIGH VOLTAGE SHALL HAVE NO LIABILITY FOR ANY FAILURE OR DELAY DUE TO MATTERS BEYOND ITS REASONABLE CONTROL.

Parts List VLF-28CM (120V)
SCHEMATIC # VLF-1451S-CONTROL , VLF-1453S-TANK

<u>REF.</u>	<u>QTY</u>	<u>HVI #</u>	<u>DESCRIPTION</u>
CAB	1	32-031	CABINET, PORTABLE TRANSIT ENCLOSURE. HVI #CSE-0056D
CB1	1	06-095	CIRCUIT BREAKER, THERMAL, 2A , 250Vac , P&B # W58XB1A4A-2
D1,2	2	04-025	DIODE, 1N4007A
F1	1	06-036	FUSE, 7A, SLO-BLO, 250V, MDA-7
	1	06-015	FUSE HOLDER, LITTELFUSE # 342004A
J2	1	07-440	CONNECTOR, BULKHEAD, 2 SOCKET, CINCH # S302AB
J4	1	07-206	CONNECTOR, BNC, AMPHENOL # UG-1094A/U
J5	1	07-313	CONNECTOR, BULKHEAD, 7 SOCKET, AMP #211398-1
	6	07-304	CONNECTOR SOCKET, AMP# 1-66105-6
K1	1	11-150	CONTACTOR, 3PDT , 15A, 120 Vac COIL, MAGNECRAFT # W389ACX-14
M1	1	13-091	METER, ANALOG, 100/100 μ A MOVEMENT, SCALED -30/0/+30 PEAK KILOVOLTS
M2	1	13-291	METER, ANALOG, 100 μ A MOVEMENT, SCALED 0-50 PEAK MILLIAMPERES
MOV1,2	2	06-216	METAL OXIDE VARISTOR, # V275LA40B
NE1	1	15-114	NEON LAMP, # NE2
P1	1	22-504	INPUT POWER CABLE, 18-3, 7' 6" L.
P2	1	07-442	CONNECTOR, CABLE, 2 CIRCUIT, CINCH# P302CCT
P3	1	07-054	CONNECTOR, CABLE, CIRCULAR, 14 PIN, AMPHENOL # 97-3108B-20-27S
PCB-001-V2	1	82-4501	PRINTED CIRCUIT BOARD ASSEMBLY, VOLTMETER
PCB-001-C2	1	82-451	PRINTED CIRCUIT BOARD ASSEMBLY, CURRENT METER
PCB-007A	1	82-452	PRINTED CIRCUIT BOARD ASSEMBLY, CB OVERLOAD DETECTOR
R1	1	01-054	RESISTOR, METAL FILM, 0.25W, 750 Ω , 1%
REG ASM	1		SINE WAVE REGULATOR ASSEMBLY, w/ 21
S1	1	10-214	SWITCH, PB, MAINT'D, 250 Vac, 10A, DPST, NO , NEON LAMP, MICROSWITCH #AML32FBB4AD
	1	10-250	SWITCH, PB COVER, BLACK, MICROSWITCH # AML52-N10K
S2	1	10-222	SWITCH, PB, MOM., 125 Vac, 15A, SPDT, GRN LED, MICROSWITCH # AML22CBS2AA
S3	1	10-218	SWITCH, PB, MOM., 125 Vac, 15A, SPDT, RED LED, MICROSWITCH # AML22CBC2AA
	2	10-252	SWITCH, PB COVER, BLACK, MICROSWITCH # AML52-C10K
S4	1	10-106	SWITCH, SNAP ACTION, SHORT ARM, OMRON #A-20GV22-B7-K
T1	1	25-104	TRANSFORMER, VARIABLE, 120V, 5A, SUPERIOR TYPE 21
HV TNK	1	84-490	TANK ASSEMBLY, HIGH VOLTAGE 28 kVac peak , HVI # VLF-28CM TNK
PCB-001-V2		82-4501	VOLT METER PCB
C1	1	03-070	CAPACITOR, ELECTROLYTIC, RADIAL LEADS, 1000 μ F, 50 Vdc, MOUSER # 140-XRL50V1000
D1	1	04-025	DIODE, 1N4007A
D2	1	04-415	DIODE, FULL WAVE BRIDGE, 1.5A, 1kVdc, MOUSER # 583-RB157
J1	1	07-136	CONNECTOR, HEADER, 8 PIN, .1" SPACING, MOLEX # 22-23-2081
P1	1	07-120	CONNECTOR, CABLE, 8 PIN, .1" SPACING, MOLEX # 22-01-2087
	8	07-104	CONNECTOR PINS, .1" SPACING, MOLEX # 08-50-0114
PCB	1	14-001	PRINTED CIRCUIT BOARD, HVI #PCB-001
R1	1	01-096	RESISTOR, METAL FILM, 0.25W, 7.5K, 1%
R2	1	01-156	RESISTOR, METAL FILM, 0.25W, 249K, 1%
R3	1	01-090	RESISTOR, METAL FILM, 0.25W, 4.99K, 1%
R4	1	02-016	RESISTOR, POTENTIOMETER, 0.25W, 5K, MOUSER # 569-25PR-5K

R5,6	2	01-310	RESISTOR, CARBON FILM, 1W, 1K, 5%
RY1	1	11-110	RELAY, PCB MOUNT, SPDT, 24 Vdc COIL, P&B # T7NS5D1-24
PCB-001-C2			
		82-451	CURRENT METER PCB
C1	1	03-070	CAPACITOR, ELECTROLYTIC, RADIAL LEADS, 1000µF, 50 Vdc, MOUSER # 140-XRL50V1000
D1	1	04-025	DIODE, 1N4007A
D2	1	04-415	DIODE, FULL WAVE BRIDGE, 1.5A, 1kVdc, MOUSER # 583-RB157
J1	1	07-136	CONNECTOR, HEADER, 8 PIN, .1" SPACING, MOLEX # 22-23-2081
P1	1	07-120	CONNECTOR, CABLE, 8 PIN, .1" SPACING, MOLEX # 22-01-2087
	8	07-104	CONNECTOR PINS, .1" SPACING, MOLEX # 08-50-0114
PCB	1	14-001	PRINTED CIRCUIT BOARD, HVI #PCB-001
R1x	1	01-154	RESISTOR, METAL FILM, 0.25W, 200K, 1%
R2,3	-		NOT USED
R4	1	02-120	RESISTOR, POTENTIOMETER, 0.50 W, 1M, 20T, MOUSER # 72-T93YB-1M
RY1	1	11-110	RELAY, PCB MOUNT, SPDT, 24 Vdc COIL, P&B # T7NS5D1-24
PCB-007A			
		82-452	CB OVERLOAD PCB
D1	1	04-025	DIODE, 1N4007A
J1	1	07-130	CONNECTOR, PCB HEADER, 5 PIN, .1" SPACING, MOLEX # 22-23-2051
P1	1	07-114	CONNECTOR, CABLE, 5 PIN, .1" SPACING, MOLEX # 22-01-2057
	5	07-104	CONNECTOR PINS, .1" SPACING, MOLEX # 08-50-0114
PCB	1	14-007	PRINTED CIRCUIT BOARD, HVI #PCB-007A
RY1	1	11-013	RELAY, PCB MOUNT, SPDT, 12 Vdc COIL, P&B # T7NS5D1-12
H. C. ASM			
		82-455	HEART CAM ASSEMBLY
B1	1	24-217	MOTOR, SYNCHRONOUS, 12 RPM, 115Vac, 60Hz, GLEASON-AVERY #Z12-2520-A1506T-640
C1	1	03-070	CAPACITOR, ELECTROLYTIC, RADIAL LEADS, 1000µF, 50Vdc, MOUSER # 140-XRL50V1000
D1	1	04-415	DIODE, FULL WAVE BRIDGE, 1.5A, 1kVdc, MOUSER # 583-RB157
D2	1	04-025	DIODE, 1N4007A
	1	40-1051	FACE CAM, HEART PATTERN, HVI # VLF-1022D REV A
	1		SWITCH PLATE, HVI # VLF-1219D
	1		BASE PLATE, HVI # VLF-1220D
	1	40-422	BEARING/HUB, HVI # VLF-1027D
K1	1	11-114	CONTACTOR, LATCHING, DPDT, 24 Vdc COIL, P&B # S89R11DBD1-24
RY1-3	3	11-112	RELAY, DPDT, 24 Vdc COIL, MIDTEX # 25862C200
SI-3	3	10-321	SWITCH, MAGNETIC REED SENSOR, HAMLIN #59025-010
T1	1	25-104	TRANSFORMER, VARIABLE, SUPERIOR TYPE 21
T2	1	25-306	TRANSFORMER, STEP-DOWN, 115/24V C.T. @ 1 AMP, 50/60 Hz, STANCOR # TGC25-24
TB	1	08-893	TERMINAL BLOCK, CINCH # 141-10
xB	1	08-904	TERMINAL BLOCK SHORTING STRAP
TS1,2	2	08-886	TERMINAL STRIP, 8 POSITION, 2 GND, CINCH # 56A
TS3	1	08-880	TERMINAL STRIP, 3 POSITION, 1 GND, CINCH #52A
	1	23-253	GROMMET, PLASTIC, .250 HOLE SIZE
HV TANK			
		84-490	VLF-25/28CM HIGH VOLTAGE TANK, SCHEMATIC # VLF-1453S, REV 0
CR1,2	2	04-220	DIODE, HIGH VOLTAGE X-RAY STRING, 75 kVdc, 220 mA, EDAL # B1553
J1	1	07-050	CONNECTOR, BULKHEAD, CIRCULAR, 14 PIN AMPHENOL # 97-3102E-20-27P
R1	1	01-378	RESISTOR, METAL FILM, 12.5W, 2.5M, 10%, EBG # SSX52-2.5M
R2	1	01-436	RESISTOR, METAL FILM, 12.5W, 1M, 10%, EBG # SSP52-1M
R3	1	01-434	RESISTOR, METAL FILM, 12.5W, 750K, 10%, EBG # SSP52-750K
R4	2	01-478	RESISTOR, METAL FILM, 20W, 100K, 10%, DALE #HLW20-A1Z-100K
R5-7	3	01-378	RESISTOR, METAL FILM, 12.5W, 2.5M, 10%, EBG # SSX52-2.5M
R8	1	01-402	RESISTOR, WIREWOUND, 1K, 10W
SI(SOL1,2)	2	12-210	SOLENOID, GUARDIAN # 11HD-C-24D
SOL3,4	2	12-210	SOLENOID, GUARDIAN # 11HD-C-24D
	12	12-310	SOLENOID CONTACT, HVI# PTS-1022D
	4	36-426	GUIDE BLOCK, HVI# HVS-0218D
T1	1	T280C	TRANSFORMER, HIGH VOLTAGE, HVI # T280C
WB1	1	81-506	WELL BUSHING, 40kV VLF
	1		TANK/HEADER DETAIL, HVI #TNK-0094D

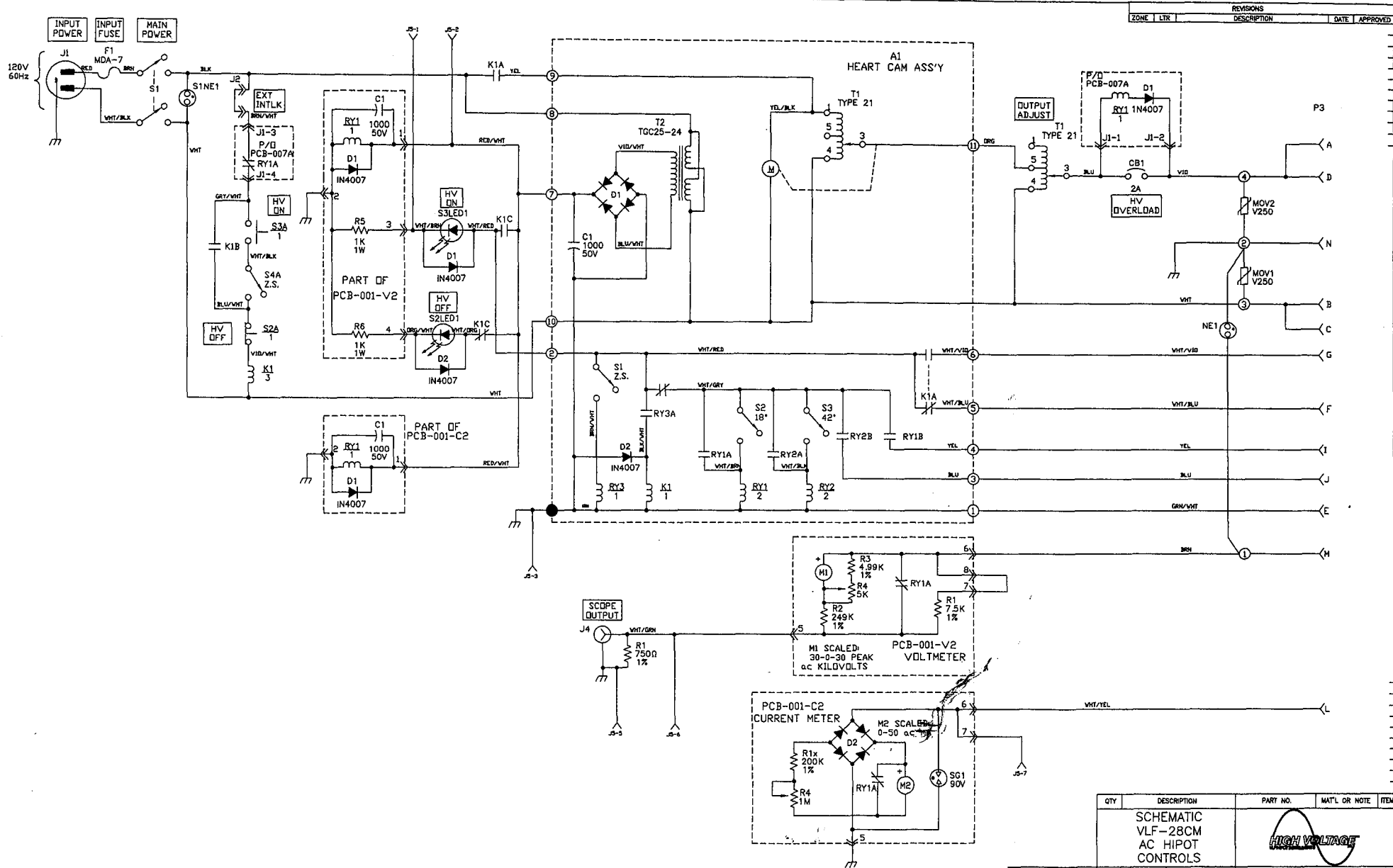
MISC.

1	23-109	KNOB, SKIRTED, 0-10 MARKING, EAGLE 45KN021
1	88-506	VLF 28 OUTPUT CABLE ASSEMBLY, SHIELDED RG8/U COAX, 20 FT. LONG WITH FITTINGS.
1	34-218	CHASSIS, U-WRAP, HVI # VLF-1363D Rev A
1	08-888	TERMINAL BLOCK, #4-140
1	35-408	BRACKET, HVI # BKT-1059D
1	34-123	PANEL, CONTROL, HV # VLF-1210D REV H

Parts List VLF-28CMF (230V)
SCHEMATIC # VLF-1452S-CONTROL , VLF-1453S-TANK

REF.	QTY	HVI #	DESCRIPTION
CAB	1	32-031	CABINET, PORTABLE TRANSIT ENCLOSURE. HVI #CSE-0056D
CB1	1	06-095	CIRCUIT BREAKER, THERMAL, 2A , 250Vac , P&B # W58XB1A4A-2
D1,2	2	04-025	DIODE, 1N4007A
F1	1	06-032	FUSE, 5A, SLO-BLO, 250V, MDA-5
	1	06-015	FUSE HOLDER, LITTELFUSE # 342004A
J2	1	07-440	CONNECTOR, BULKHEAD, 2 SOCKET, CINCH # S302AB
J4	1	07-206	CONNECTOR, BNC, AMPHENOL # UG-1094A/U
J5	1	07-313	CONNECTOR, BULKHEAD, 7 SOCKET, AMP #211398-1
	6	07-304	CONNECTOR SOCKET, AMP# 1-66105-6
K1	1	11-150	CONTACTOR, 3PDT , 15A, 120 Vac COIL, MAGNECRAFT # W389ACX-14
M1	1	13-091	METER, ANALOG, 100/100 μ A MOVEMENT, SCALED -30/0/+30 PEAK KILOVOLTS
M2	1	13-291	METER, ANALOG, 100 μ A MOVEMENT, SCALED 0-50 PEAK MILLIAMPERES
MOV1,2	2	06-216	METAL OXIDE VARISTOR, # V275LA40B
NE1	1	15-114	NEON LAMP, # NE2
P1	1	22-504	INPUT POWER CABLE, 18-3, 7' 6" L.
P2	1	07-442	CONNECTOR, CABLE, 2 CIRCUIT, CINCH# P302CCT
P3	1	07-054	CONNECTOR, CABLE, CIRCULAR, 14 PIN, AMPHENOL # 97-3108B-20-27S
PCB-001-V2	1	82-4501	PRINTED CIRCUIT BOARD ASSEMBLY, VOLTMETER
PCB-001-C2	1	82-451	PRINTED CIRCUIT BOARD ASSEMBLY, CURRENT METER
PCB-007A	1	82-452	PRINTED CIRCUIT BOARD ASSEMBLY, CB OVERLOAD DETECTOR
R1	1	01-054	RESISTOR, METAL FILM, 0.25W, 750 Ω , 1%
REG ASM	1		SINE WAVE REGULATOR ASSEMBLY, w/ 21
S1	1	10-214	SWITCH, PB, MAINT'D, 250 Vac, 10A, DPST, NO , NEON LAMP, MICROSWITCH #AML32FBB4AD
	1	10-250	SWITCH, PB COVER, BLACK, MICROSWITCH # AML52-N10K
S2	1	10-222	SWITCH, PB, MOM., 125 Vac, 15A, SPDT, GRN LED, MICROSWITCH # AML22CBS2AA
S3	1	10-218	SWITCH, PB, MOM., 125 Vac, 15A, SPDT, RED LED, MICROSWITCH # AML22CBC2AA
	2	10-252	SWITCH, PB COVER, BLACK, MICROSWITCH # AML52-C10K
S4	1	10-106	SWITCH, SNAP ACTION, SHORT ARM, OMRON #A-20GV22-B7-K
T1	1	25-104	TRANSFORMER, VARIABLE, 120V, 5A, SUPERIOR TYPE 21
T2	1	T145	TRANSFORMER, AUTO STEP-DOWN, 230/115, 50/60 Hz, HVI #T-145
HV TNK	1	84-490	TANK ASSEMBLY, HIGH VOLTAGE 28 kVac peak , HVI # VLF-28CM TNK
PCB-001-V2		82-4501	VOLT METER PCB
C1	1	03-070	CAPACITOR, ELECTROLYTIC, RADIAL LEADS, 1000 μ F, 50 Vdc, MOUSER # 140-XRL50V1000
D1	1	04-025	DIODE, 1N4007A
D2	1	04-415	DIODE, FULL WAVE BRIDGE, 1.5A, 1kVdc, MOUSER # 583-RB157
J1	1	07-136	CONNECTOR, HEADER, 8 PIN, .1" SPACING, MOLEX # 22-23-2081
P1	1	07-120	CONNECTOR, CABLE, 8 PIN, .1" SPACING, MOLEX # 22-01-2087
	8	07-104	CONNECTOR PINS, .1" SPACING, MOLEX # 08-50-0114
PCB	1	14-001	PRINTED CIRCUIT BOARD, HVI #PCB-001
R1	1	01-096	RESISTOR, METAL FILM, 0.25W, 7.5K, 1%
R2	1	01-156	RESISTOR, METAL FILM, 0.25W, 249K, 1%
R3	1	01-090	RESISTOR, METAL FILM, 0.25W, 4.99K, 1%
R4	1	02-016	RESISTOR, POTENTIOMETER, 0.25W, 5K, MOUSER # 569-25PR-5K

R5,6	2	01-310	RESISTOR, CARBON FILM, 1W, 1K, 5%
RY1	1	11-110	RELAY, PCB MOUNT, SPDT, 24 Vdc COIL, P&B # T7NS5D1-24
PCB-001-C2			
		82-451	CURRENT METER PCB
C1	1	03-070	CAPACITOR, ELECTROLYTIC, RADIAL LEADS, 1000µF, 50 Vdc, MOUSER # 140-XRL50V1000
D1	1	04-025	DIODE, 1N4007A
D2	1	04-415	DIODE, FULL WAVE BRIDGE, 1.5A, 1kVdc, MOUSER # 583-RB157
J1	1	07-136	CONNECTOR, HEADER, 8 PIN, .1" SPACING, MOLEX # 22-23-2081
P1	1	07-120	CONNECTOR, CABLE, 8 PIN, .1" SPACING, MOLEX # 22-01-2087
	8	07-104	CONNECTOR PINS, .1" SPACING, MOLEX # 08-50-0114
PCB	1	14-001	PRINTED CIRCUIT BOARD, HVI #PCB-001
R1x	1	01-154	RESISTOR, METAL FILM, 0.25W, 200K, 1%
R2,3	-		NOT USED
R4	1	02-120	RESISTOR, POTENTIOMETER, 0.50 W, 1M, 20T, MOUSER # 72-T93YB-1M
RY1	1	11-110	RELAY, PCB MOUNT, SPDT, 24 Vdc COIL, P&B # T7NS5D1-24
PCB-007A			
		82-452	CB OVERLOAD PCB
D1	1	04-025	DIODE, 1N4007A
J1	1	07-130	CONNECTOR, PCB HEADER, 5 PIN, .1" SPACING, MOLEX # 22-23-2051
P1	1	07-114	CONNECTOR, CABLE, 5 PIN, .1" SPACING, MOLEX # 22-01-2057
	5	07-104	CONNECTOR PINS, .1" SPACING, MOLEX # 08-50-0114
PCB	1	14-007	PRINTED CIRCUIT BOARD, HVI #PCB-007A
RY1	1	11-013	RELAY, PCB MOUNT, SPDT, 12 Vdc COIL, P&B # T7NS5D1-12
H. C. ASM			
		82-455	HEART CAM ASSEMBLY
B1	1	24-217	MOTOR, SYNCHRONOUS, 12 RPM, 115Vac, 60Hz, GLEASON-AVERY #Z12-2520-A1506T-640
C1	1	03-070	CAPACITOR, ELECTROLYTIC, RADIAL LEADS, 1000µF, 50Vdc, MOUSER # 140-XRL50V1000
D1	1	04-415	DIODE, FULL WAVE BRIDGE, 1.5A, 1kVdc, MOUSER # 583-RB157
D2	1	04-025	DIODE, 1N4007A
	1	40-1051	FACE CAM, HEART PATTERN, HVI # VLF-1022D REV A
	1		SWITCH PLATE, HVI # VLF-1219D
	1		BASE PLATE, HVI # VLF-1220D
	1	40-422	BEARING/HUB, HVI # VLF-1027D
K1	1	11-114	CONTACTOR, LATCHING, DPDT, 24 Vdc COIL, P&B # S89R11DBD1-24
RY1-3	3	11-112	RELAY, DPDT, 24 Vdc COIL, MIDTEX # 25862C200
S1-3	3	10-321	SWITCH, MAGNETIC REED SENSOR, HAMLIN #59025-010
T1	1	25-104	TRANSFORMER, VARIABLE, SUPERIOR TYPE 21
T2	1	25-306	TRANSFORMER, STEP-DOWN, 115/24V C.T. @ 1 AMP, 50/60 Hz, STANCOR # TGC25-24
TB	1	08-893	TERMINAL BLOCK, CINCH # 141-10
xB	1	08-904	TERMINAL BLOCK SHORTING STRAP
TS1,2	2	08-886	TERMINAL STRIP, 8 POSITION, 2 GND, CINCH # 56A
TS3	1	08-880	TERMINAL STRIP, 3 POSITION, 1 GND, CINCH #52A
	1	23-253	GROMMET, PLASTIC, .250 HOLE SIZE
HV TANK			
		84-490	VLF-25/28CM HIGH VOLTAGE TANK, SCHEMATIC # VLF-1453S, REV 0
CR1,2	2	04-220	DIODE, HIGH VOLTAGE X-RAY STRING, 75 kVdc, 220 mA, EDAL # B1553
J1	1	07-050	CONNECTOR, BULKHEAD, CIRCULAR, 14 PIN AMPHENOL # 97-3102E-20-27P
R1	1	01-378	RESISTOR, METAL FILM, 12.5W, 2.5M, 10%, EBG # SSX52-2.5M
R2	1	01-436	RESISTOR, METAL FILM, 12.5W, 1M, 10%, EBG # SSP52-1M
R3	1	01-434	RESISTOR, METAL FILM, 12.5W, 750K, 10%, EBG # SSP52-750K
R4	2	01-478	RESISTOR, METAL FILM, 20W, 100K, 10%, DALE #HLW20-A1Z-100K
R5-7	3	01-378	RESISTOR, METAL FILM, 12.5W, 2.5M, 10%, EBG # SSX52-2.5M
R8	1	01-402	RESISTOR, WIREWOUND, 1K, 10W
S1(SOL1,2)	2	12-210	SOLENOID, GUARDIAN # 11HD-C-24D
SOL3,4	2	12-210	SOLENOID, GUARDIAN # 11HD-C-24D
	12	12-310	SOLENOID CONTACT, HVI# PTS-1022D
	4	36-426	GUIDE BLOCK, HVI# HVS-0218D
T1	1	T280C	TRANSFORMER, HIGH VOLTAGE, HVI # T280C
WB1	1	81-506	WELL BUSHING, 40kV VLF
	1		TANK/HEADER DETAIL, HVI #TNK-0094D



REVISIONS		DATE	APPROVED
ZONE	LTR		

QTY	DESCRIPTION	PART NO.	MAT'L OR NOTE	ITEM
	SCHMATIC			
	VLF-28CM			
	AC HIPOT			
	CONTROLS			
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES DO NOT SCALE DIMS TOLERANCES FRACTIONS DECIMALS ANGLES				
MAT'L		VLF-28CM	DWG NO.	REV.
FINISH		JHW 04/07	VLF-1451S	
		JHW 04/07	SCALE	SHT 1 OF 1

