

COMMANDER VHF-1200/2000

LINEAR AMPLIFIERS

6 METERS - 50 - 54 MHz.
MADE IN THE U.S.A. BY HAMS FOR HAMS

COMMAND TECHNOLOGIES, Inc.

**15719 CR 2.50
P.O. Box 326
EDON, OHIO 43518
419 459 4689
800-736-0443**

THE COMMAND TECHNOLOGIES PHILOSOPHY

The company was founded upon the guiding principal of providing amateur radio operators with better equipment at a lower cost.

That principal is evident in the company's products which have become known throughout the world for their superior value.

Value is defined by the company as a ratio of quality plus performance over cost. The higher the quality and/or performance or the lower the cost, the better the value.

Obviously, the limits of each parameter of the equation are subjective. For the company, quality limits are those which provide longevity and unquestioned performance benefits to the user without unnecessary cost burden. Performance is partly defined by governmental regulations and partly by the company's integrity of specifications. For example, power for Command Technologies linear amplifiers is specified by continuous carrier ratings - solid, meaningful figures which can be translated into benefits in the real world of amateur radio.

State-of-the-art technology has come to be a trite phrase, meaning different things to different people. To the company, it means today's proven technology, not gimmicks, which offer a facade with little of worth, or need, behind it. We may push the leading edge of technology in various ways, but it will be founded upon its value to the user in terms of performance and cost.

We appreciate your purchase of a Command Technologies product and assure you of continued factory support of your investment at all times.

Sincerely,

Patrick J. Stein
N8BRA

SPECIFICATIONS

COMMANDER VHF 1200

LINEAR POWER AMPLIFIER

FREQUENCY RANGE - 50 - 54 MHz.

MODES - USB,LSB,RTTY,FM,CW

POWER REQUIREMENTS -117/ 200/234VAC 50/60 Hz.

RF DRIVE POWER - 15 - 25 WATTS NOMINAL - 35-40 WATTS MAX. FOR FULL OUTPUT (1.2 KW SSB)

RF OUTPUT-+15DB GAIN OR OVER 750 WATTS
600 WATTS MAX. FM OR RTTY

INPUT IMPEDANCE - 50 OHMS UNBALANCED
REAR PANEL ADJUSTABLE

OUT PUT IMPEDANCE - 50 OHMS NOMINAL

ANTENNA LOAD -(VSWR) - 2 : 1 MAX.

HARMONIC SUPPRESSION - BETTER THAN
- 60 DB DOWN @ RATED OUTPUT

INTERMODULATION DISTORTION- BETTER THAN
- 35 DB DOWN @ RATED OUTPUT

WEIGHT - 75 LBS

CABINET SIZE 18 X 16 X 7.75 in.

TUBE COMPLIMENT - ONE 3CPX800A7 CERAMIC
METAL TRIODE

PRESSURIZED CHASSIS FORCED AIR COOLING

SPECIFICATIONS

COMMANDER VHF 2000

LINEAR POWER AMPLIFIER

FREQUENCY RANGE - 50 - 54 MHz.

MODES - USB,LSB,RTTY,FM,CW

POWER REQUIREMENTS - 200/234VAC 50/60 Hz.

RF DRIVE POWER - 15 - 25 WATTS NOMINAL - 35-50 WATTS MAX. FOR FULL OUTPUT (1.5 KW SSB)

RF OUTPUT- +15DB GAIN OR 1500 WATTS
1200 WATTS MAX. FM OR RTTY

INPUT IMPEDANCE - 50 OHMS UNBALANCED
REAR PANEL ADJUSTABLE

OUT PUT IMPEDANCE - 50 OHMS NOMINAL

ANTENNA LOAD -(VSWR) - 2 : 1 MAX.

HARMONIC SUPPRESSION - BETTER THAN
- 60 DB DOWN @ RATED OUTPUT

INTERMODULATION DISTORTION- BETTER THAN
- 35 DB DOWN @ RATED OUTPUT

WEIGHT - 75 LBS

CABINET SIZE 18 X 16 X 7.75 in.

TUBE COMPLIMENT - TWO 3CPX800A7 CERAMIC
METAL TRIODES

PRESSURIZED CHASSIS FORCED AIR COOLING

UNPACKING INSTRUCTIONS

Carefully remove your Commander Amplifier from its shipping carton making sure there is no damage evident from shipping. If there is any damage, notify the delivering shipper immediately, fully describing the damage.

Do not destroy the packing material, since it may be reusable later, should you require factory service, or need to transport the Amplifier for any other reason.

!! WARNING !!
CONTACT WITH VOLTAGES
IN THIS AMPLIFIER CAN BE
!!! FATAL !!!

CAUTIONS

Do not attempt any type of service or repair on this Amplifier without first removing the AC power and allowing at **LEAST 60 MINUTES FOR THE HIGH VOLTAGE CAPACITORS TO BLEED OFF !**

Make no attempt to put this Amplifier in service with the top or bottom covers removed. **CONTACT WITH VOLTAGES IN THE CABINET CAN BE FATAL !**

Never attempt operation without first connecting an appropriate antenna (2.0:1 VSWR Max) or a 50 ohm load with sufficient rating or **SERIOUS DAMAGE TO THE AMPLIFIER MAY RESULT.**

Never operate unit with more drive than required to produce the rated output for the operating mode used.

Do not place the Commander VHF-Amp. in Repeater operation. Extensive modification would be required for this type of service.

Never operate any Amplifier using an extension cord.

Never cover the top of the Amplifier cabinet with books, papers or other equipment as **OVERHEATING MAY RESULT.**

**IF ANY PROBLEM OCCURS NOT EASILY CORRECTED,
PLEASE CONTACT MANUFACTURER FOR
ASSISTANCE.**

800-736-0443 419-459-4689

INTRODUCTION

The Commander VHF-1200/2000 are Grounded Grid class Ab2 Linear Power Amplifiers that operate on the Amateur 6 meter band.

Over-Drive and Over-Grid current protection is provided by an Auto-Reset circuit that places the amplifier in Stand-By if a preset limit is exceeded.

Genuine Eimac 3CPX800A7 External Anode Triode(s) with forced air cooling and modern circuitry, insure efficient and conservative operation.

Reduced ratio (6 to 1) vernier drives on all tuning controls allow smooth and easy tune-up.

Rear panel input tuning control allows a higher input circuit "Q" for excellent linearity and a low input VSWR to exciter all across the 6 meter band.

An automatic delay circuit, for proper cathode conditioning before RF drive can be applied, extends tube life. A 50 ohm resistor in the plate supply positive lead and a 200 ohm resistor in the negative lead protect the tube in the event of an arc.

The Commander VHF-1200\2000 feature a full compliment of control and metering functions for easy on the air operation.

A Dual Primary Power Transformer allows 117 / 234 VAC operation. Additional primary taps are provided for 200 VAC operation. Operation of the VHF-2000 on 117 VAC is not recommended.

INSTALLATION PREPARATION

Location of your Commander VHF-1200/2000 requires that no equipment be placed directly above it, as air expelled from the tube exhaust can become quite hot. Allow at least 3 inches clearance on either side of the unit between other equipment.

To switch from transmit to receive the Commander VHF-1200/2000 requires a contact closure or keying circuit capable of sinking 55 ma. of positive voltage (12 VDC. open circuit) to ground. This connection is made to the RCA jack on the rear panel marked relay. Read the manual that came with your Transceiver to find the proper external connections. On some Transceivers, this is not provided, and an alternate circuit will be required. You can key the unit manually by placing a shorted RCA plug in the relay jack and using the standby / operate switch on the front panel. Always use shielded cable for these connections.

The 12 VDC jack on the rear panel is an accessory for powering low current 12 VDC devices (less than 100 mA.). Do not connect an external voltage source to the jack.

Connect a good quality Thru-line Wattmeter between the Amplifier output jack and the Antenna or Dummy Load using RG8 or better coax.

Connect the Exciter RF output to the Amplifier input using 50 ohm coax.

Connect as short a ground lead as possible from Earth Ground to the units rear panel ground terminal.

TRANSFORMER INSTALLATION

(Hypersil VHF-1200/2000)

When mounting the hypersil transformer, place the VHF-1200/2000 so the front panel faces your body. The wire leads coming out of the transformer should be to the rear and the connector to the right. Place the transformer in the unit aligning the transformer's mounting holes to the mounting holes on the bottom of the chassis. Place the 1/4 - 20 screws thru the mounting holes and chassis and secure with the 1/4 - 20 nuts and washers. Connect the male-female "mate & lock" connector. Push hard to insure that the two halves are locked together. The transformer should now be installed ready for use.

TUBE INSTALLATION

Carefully remove the 3CPX800A7 tube(s) from the shipping carton. This carton was located in the area where the transformer was installed. Place the tubes in the tube socket with the proper pin alignment. If you have maintained the proper pin alignment, the tubes should go into their sockets easily. If you have to use undue pressure to insert the tubes, you may have the wrong pin alignment or one of the pins may be bent. If necessary straighten pins with needle nose pliers and reinstall. Install the parasitic chokes on the tube caps and replace the top and bottom covers. The unit is now ready for operation.

117/200/234 VAC Operation

The Commander VHF-2000 comes factory wired for 234 VAC operation. For best operation, you should use a dedicated 234 VAC main capable of supplying 20 Amps of peak AC current. Unless for Export or user specified all VHF-1200 Amps. are wired for 117 VAC.

All Commander Amplifiers manufactured for export are wired for 234 vac or 200 vac depending on the final destination.

To convert the VHF-1200 to 234 VAC operation, remove the rear panel connector cover located on the top left hand corner. **CAUTION.... BE SURE YOU HAVE REMOVED THE LINE CORD PLUG FROM YOUR WALL SOCKET. IF YOU FAIL TO UNPLUG YOUR AMPLIFIER, YOU WILL EXPOSE YOURSELF TO LETHAL VOLTAGES.** After the cover has been removed, do the following steps:

1. Loosen the screws and remove the jumper wire going from the terminal block position 1 to 3. See illustration.
2. Unscrew and remove jumper connection at terminal block position 5 and place it at terminal block position 3. Secure all screws. See illustration.
3. Replace rear panel connector cover
4. Remove the 117 volt plug and replace with an appropriate 3 prong 234 VAC 20Amp plug.

Connection Diagram

Connect the RF output of your transceiver to the RF IN connector on the rear of the VHF-1200/2000 with 50 ohm coax. Connect the existing station antenna system to the RF OUT connector on the VHF-1200/2000 with RG-8 type coax. Connect the RELAY phono jack on the rear of the VHF-1200/2000 to the normally open terminal of the RELAY jack on your transceiver. The RELAY jack on the VHF-1200/2000 have positive 12 VDC open circuit and requires the sinking of 55 MA of current when pulled to ground. Connect as short a ground lead as possible from a good earth ground to the GROUND post on the rear panel. The 12 VDC phono jack on the VHF-2000 rear panel provides 12 VDC at 100 MA maximum to operate external accessories or dial lamps. Connect the ALC phono jack to the ALC connection on your transceiver using a shielded type cable. Consult your transceiver manual for proper ALC connection details.

OPERATING PROCEDURE

After reading this manual and completing the Installation / Preparation Instructions. Position the Commander VHF-1200/2000 front panel controls as follows.

ON / OFF - OFF

OPERATE / STANDBY - STANDBY

METER SWITCH - VP (PLATE VOLTAGE)

LOAD - 50 - MIDDLE OF RANGE

TUNE - MINIMUM CAPACITANCE (POINTER TO LEFT)

After presetting these controls, switch the ON / OFF switch to the ON position . At this time you will hear the blower running and an indication of Plate Voltage on the meter. (APPROX. 2650 VDC)

The 3CPX800A7(s) used in this Amplifier requires a warm up period before RF drive can be applied. This is accomplished with the 555 timer IC and expiration is indicated when the Green Power LED on the front panel comes on. This will take about 2 minutes.

When the Green Power light comes on the unit is ready for operation.

Switch the meter switch to the IP (plate current) position.

Switch the OPERATE / STANDBY switch to the operate and key the exciter with no RF drive applied. The Red transmit light should come on, along with an indication of plate idling current on the meter (approx.. 100 - 160 mA VHF-2000 80 - 100 mA VHF-1200)

Apply a low amount of RF drive (5 watts or less) and adjust the LOAD and then the TUNE control for maximum output as indicated on an external Wattmeter. Complete this adjustment as quickly as possible.

Again Key the exciter and while increasing the RF drive, adjust the LOAD control counter-clockwise to obtain a peak in output power while keeping the grid current below 60mA. Readjust the TUNE control clock-wise for maximum output. Repeat this procedure until the desired output is obtained. When increasing power output, the TUNE capacitance will increase (clock-wise on the dial) and the LOAD capacitance will decrease (counter-clockwise on the dial) When properly tuned, the grid current will be peaked at the TUNE setting, and turning the LOAD counter-clockwise will decrease grid current and power output. If the grid current rises keep turning counter-clockwise until it does. Do not exceed 1000mA. (600mA VHF-1200 of plate current on key down. (see chart typical operating conditions.) If you exceed 100mA. (70mA VHF-1200) of grid current the amplifier will dropout to Standby, to reset you will have to unkey the transmitter and reduce RF drive.

OPERATING PROCEDURE CONTINUED

With the meter switch in the Ip position and while monitoring grid current the Commander VHF-1200/2000 is ready for on the air operation. Normal SSB operation is indicated by plate and grid current meter readings on voice peaks of approximately $\frac{1}{3}$ to $\frac{1}{2}$ of the CW keydown value.

For FM or other high duty cycle modes limit output to 1000 watts (600 watts VHF-1200) maximum.

If your planned operation is on SSB, you should adjust the load control slight counter-clockwise, reducing the output slightly about 30 to 50 watts. This adjustment is necessary to insure that the amplifier is sufficiently loaded to handle the plate current peaks caused by the complex voice patterns during SSB operation. Nominal plate and grid current readings during SSB operation will be about 30 to 40% of the key down CW readings.

CAUTION: THE TUNE AND LOAD AIR VARIABLE CAPACITORS MAY ARC IF MAXIMUM DRIVE IS APPLIED BEFORE THE AMPLIFIER IS PROPERLY TUNED. ALWAYS FOLLOW THE DESCRIBED TUNE UP PROCEDURE TO AVOID CAPACITOR ARCING. ARCING MAY ALSO OCCUR IF YOU ATTEMPT TO TUNE INTO AN ANTENNA WITH A VSWR GREATER THAN 2:1.

If you should need any further assistance tuning this amplifier, feel free to call us at 1-800-736-0443 and our staff will be happy to help you.

If you are outside the United States we are available at 419-459-4689

TYPICAL OPERATING CONDITIONS

VHF-1200

DRIVE	-- GRID CURENT	-- PLATE CURENT	-- POWER OUTPUT
12.5	20mA	400mA	450 Watts
18.5	30mA	500mA	650 Watts
30	50mA	600mA	1000 Watts

VHF-2000

DRIVE	-- GRID CURENT	-- PLATE CURENT	-- POWER OUTPUT
25	30mA	700 mA	1000 Watts
40	45mA	1000mA	1500 Watts

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Theory Of Operation

The Commander VHF-1200/2000 use Genuine Eimac 3CPX800A7 ceramic/metal triode(s) in a class AB2 grounded grid configuration. Nominal drive power of 35 to 50 watts will deliver full rating of clean RF output power.

Metering Functions

The Commander VHF-1200/2000 have two illuminated panel meters. The Grid Current meter provides a continuous reading of the 3CX800-A7s grid current. The meter scale is 2 mA per division and the range is 0 to 100 MA. **DO NOT EXCEED 60 mA OF GRID CURRENT ON THE VHF-1200. DAMAGE TO YOUR TUBES COULD RESULT.** Under typical operating conditions the grid current will be 20-45 mA . Plate voltage and Plate current are shown on the second meter. A function switch on the front panel switches the meter from plate voltage (VP) to plate current (IP). Plate current is shown on the top scale. Each division is 20 mA, and full scale is 1500 mA. (1000 mA VHF-1200) The typical plate current under nominal rated output should range from 900 to 1100 mA. (500 to 600 on VHF-1200) with an absolute maximum of 1200 Ma. for SSB. (600 VHF-1200) Plate voltage is indicated on the bottom scale with each division reflecting .06 KV. The scale has a range from 0-3.0 KV. The nominal no-load plate voltage should read approximately 2,600 volts. Plate voltage under nominal full load should read approximately 2,300 volts.

AUTOMATIC DRIVE LIMITING CONTROL

An adjustable automatic level control (ALC) circuit limits the peak output power. When properly set, this circuit insures that the amplifier can not be over driven. Rear panel access allows for easy manual adjustment . A sample of the RF input derives the ALC voltage. Additionally this amplifier has an RF negative feedback resistance in the cathode circuit to help cancel excessive RF drive without reducing the amplifier's gain.

A.L.C. ADJUSTMENTS

Your transceiver's internal ALC will maintain linearity. The amplifier's ALC will prevent over driving the amplifier. The VHF-1200/2000 ALC circuit was designed for negative going ALC voltage. Proper adjustment is as follows:

1. Use an insulated tool when making these adjustments.
2. Tune the amplifier for operation on the desired frequency for full 1500 watts output. (1200 watts on the VHF-1200)
3. With your transceiver set for SSB operation, set the transceiver's microphone gain for normal operation as specified in its owners manual.
4. While speaking louder than normal into the microphone, adjust the ALC control on the rear panel thru the access hole. Adjust for 1500 watts (1200 on VHF-1200) maximum output as indicated on an external peak reading wattmeter. If an average reading wattmeter is used, adjust for approximately 600 watts output on voice peaks. (400 on VHF-1200)

TUNED INPUT CIRCUITS

The tuned input circuits utilize an L-C-L or "T" impedance matching circuit with a high "Q" design. These circuits employ RF phase compensating inductors to reduce intermodulation products. The use of mica trimmer type capacitors allows adjustments to precisely match the transceiver to the amplifier. The rear panel provides easy access to these trimmer capacitors.

Tuned Input Adjustments

Your Commander amplifier has a mica trimmer capacitor which is easily accessed thru the rear panel. The tuned input circuits are factory tuned and should not require any readjustment. You can easily make adjustments for any change in your preference for operating frequency range. Also, slight adjustments may be necessary because of slight variances in impedances between your transceiver and the tuned input circuitry of the amplifier.

1. Install a SWR meter between the transceiver and the amplifier.
2. Make sure the Operate/Standby switch is in the operate position and Your amplifier should also be properly tuned and loaded.
3. Apply drive and observe the SWR, and adjust the trimmer capacitor for minimum SWR. Be careful not to overdrive the amplifier.

OUTPUT FILTER CIRCUIT

The PI variable network filter transforms the plate load impedance from approximately 1600 ohms down to 200 ohms, Two air variable capacitors and an associated inductor accomplish this transformation. A design "Q" of 14 allows for good harmonic attenuation all across the band. The utilization of a special reactance tuned powdered iron core 4 to 1 Transmission line transformer transforms the nominal 50 ohm antenna impedance up to the 200 ohm output of the PI circuit. This also achieves further harmonic attenuation of the output in the same manor as an "L" coil in a Pi - L network. Additional harmonic attenuation is accomplished with a bandpass filter on the output.

HIGH VOLTAGE SUPPLY

The high voltage supply operates from 117/200/234 Vac 20\30 ampere line. The primary of the high voltage transformer is switched on/off with solid state relays that during power up, only conduct when the phase angle of the AC power line is at the 0 to +30 degree crossover point. This minimizes line surge and inrush current while the high voltage filter capacitors charge. The front panel on/off switch activates the solid state relays with 2ma AC to turn the unit on. Approximately 900 volts AC is fed to a full wave voltage doubler rectifier circuit. This supplies approx. 2600 volts DC to the 3CPX800A7's anodes. Metering of the tubes anode and grid current is accomplished by shunt resistors located in the negative return of the 3CPX800A7's cathodes. Plate voltage metering is accomplished by a resistor multiplier network in the B+ line of the high voltage circuit.

Limited Warranty

Command Technologies, Inc. warrants to the original purchaser, that our Commander Amplifiers shall be free from defects in material, except Eimac 3CPX800A7 tubes, or workmanship for five (5) years from the date of original purchase. Tubes are covered by warranty granted from their manufacturer.

During the warranty period, Command Technologies, Inc. will correct defects in material and workmanship. Original purchaser will pay all shipping charges. Command Technologies, Inc. provides warranty parts and services according to the following schedule:

1st year.....	100% parts and labor
2nd year.....	50% parts and labor
3rd,4th and 5th year.....	25% parts and labor

to obtain such warranty service, the purchaser must:

1. Notify Command Technologies as soon as possible after the discovery of possible defect of:
 - a. The model number and serial number
 - b. Approximate date of purchase
 - c. A detailed description of the problem
2. Deliver the product to Command Technologies service facility, or ship the same in its original container or equivalent, fully insured and shipping charges prepaid.

Correct maintenance, repair, and use are important to obtain proper performance from this product. Therefore, carefully read the Instruction Manual. This warranty does not apply to any defect that Command Technologies, Inc. determines is due to :

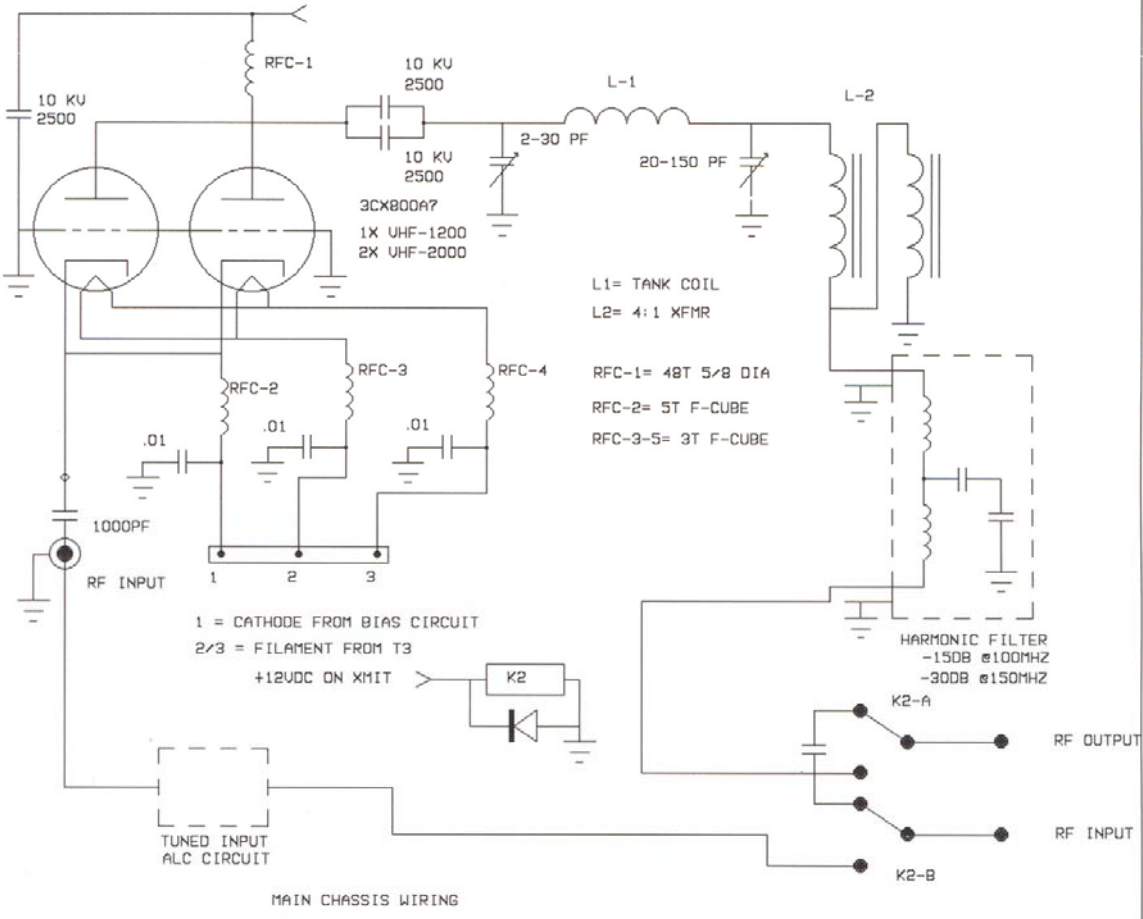
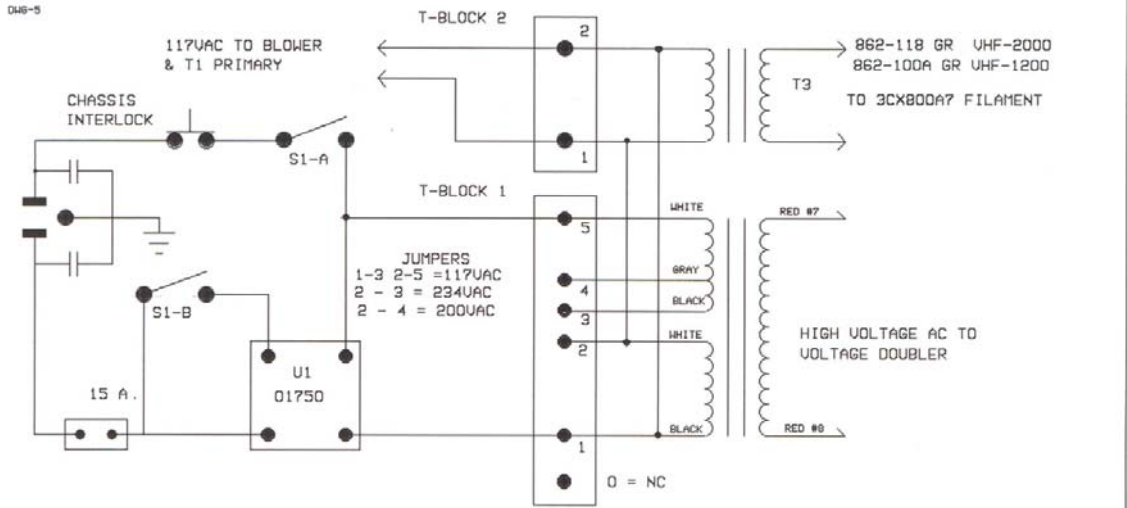
1. Improper maintenance or repair including the installation of parts or accessories that do not conform to the quality and specifications of the original parts.
2. Misuse, abuse, neglect or improper installation.
3. Accidental or intentional damage.

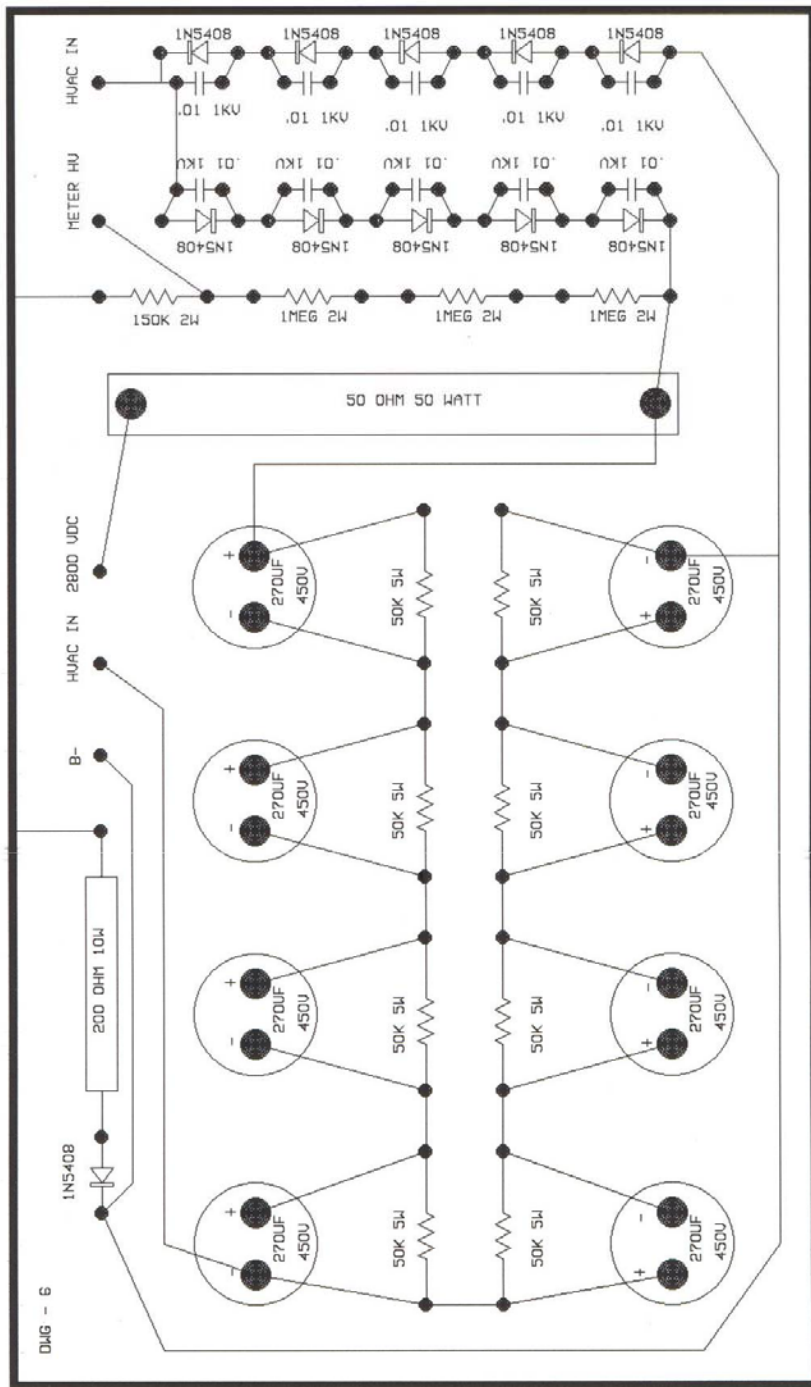
All implied warranties, if any, terminate five years form the date of the original purchase.

The foregoing constitutes Command Technologies entire obligation with respect to the product, and the original purchaser and any user or owner shall have no other remedy and no claim for incidental or consequential damages. Some states do not allow limitations on how long an implied warranty lasts or do not allow the exclusion or limitation of incidental or consequential damage, so the above limitation and exclusion may not apply to you.

This warranty gives specific legal rights, and you may also have other rights which vary from state to state.

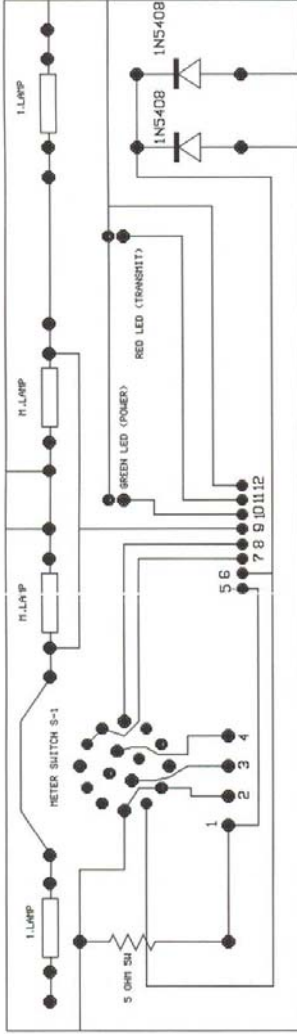
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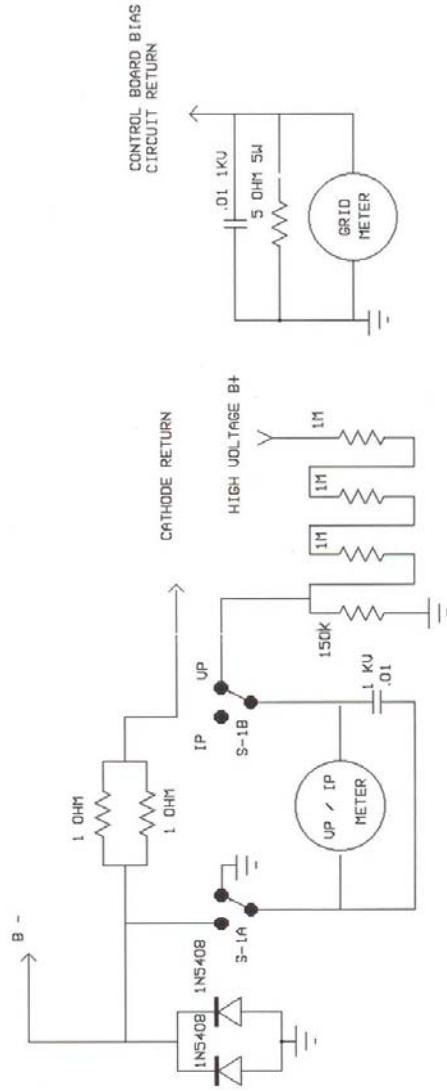
HIGH VOLTAGE CIRCUIT
DETAIL 6 - 1995

DWG - 6

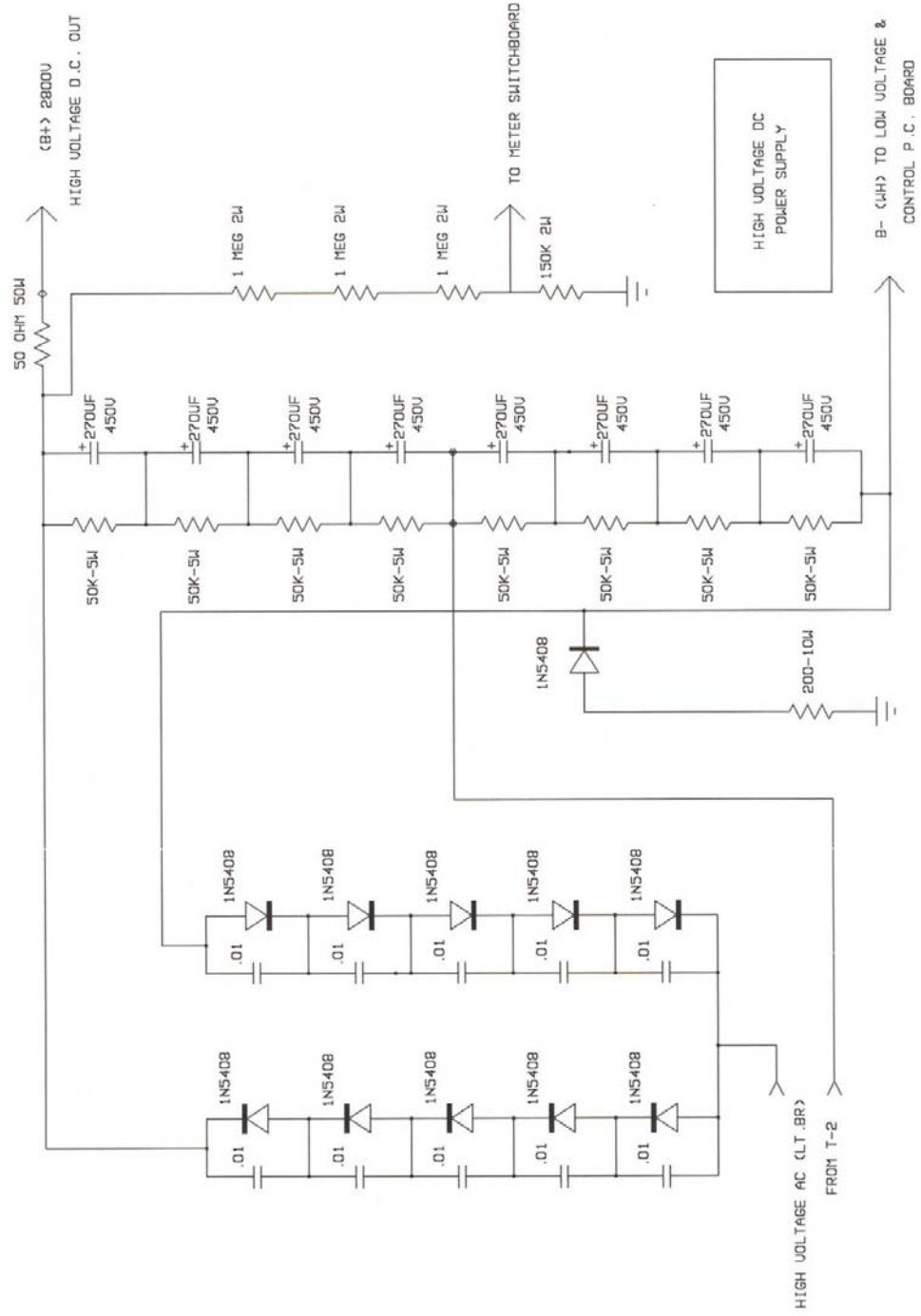


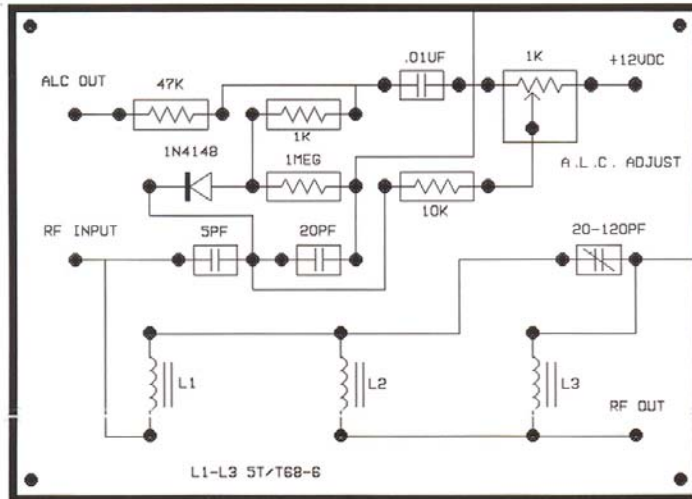
SWITCH BOARD DETAIL

- 1 - ORANGE GRID METER +
 - 2 - YELLOW GRID METER -
 - 3 - UP/IP METER -
 - 4 - UP/IP METER +
 - 5 - YELLOW GRID FROM CONTROL BOARD
 - 6 - WHITE B- FROM CONTROL BOARD
 - 7 - BROWN PLATE CURRENT SHUNT
 - 8 - YELLOW HV MULTIPLIER
 - 9 - ORANGE +12 VDC
 - 10 - BLUE POWER LED
 - 11 - PURPLE TRANSMIT LED
 - 12 - GREEN GROUND
- S1=81F1018 (01965)

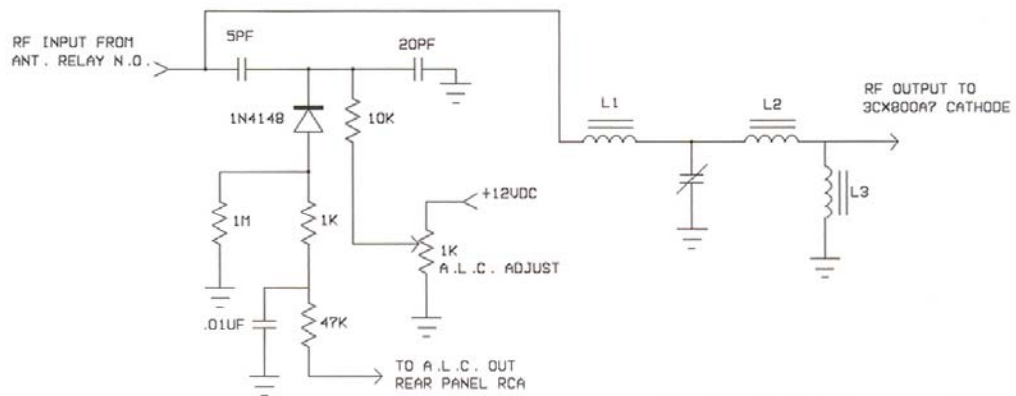


METER CIRCUIT DETAIL 6/16/95





TUNED INPUT & A.L.C.
CIRCUIT BOARD DETAIL



TUNED INPUT & A.L.C.
CIRCUIT DETAIL

