

## Unpacking the Commander

Examine the cardboard cartons and wooden crate for signs of visible damage before accepting the shipment. If there is visible damage, notify the truck driver to send the claim adjustor. Ask him to make notation on the bill that the shipment is damaged, and ask the driver to sign his name. Then you may accept the shipment with full protection. In case of hidden damage found after unpacking, immediately notify the trucking company that delivered the unit. The trucking company legally responsible for damage is the one delivering the merchandise to its final destination. All trucking companies are bonded and insured to cover damage in transit. If you so desire, you can claim reimbursement for the entire shipment if an integral part of the transmitter is damaged. If a tube is broken, of course you would claim the cost of replacement. Your damage claim should be to your entire satisfaction. Since you bought and paid for new equipment, you are entitled to it, and you do not have to settle for repaired damaged equipment. If necessary, go to an attorney to get prompt action.

We include this information as a help to those who may not be familiar with the law in such a situation. When we turn the merchandise over to the trucking company, they assume title, possession, and full legal and financial responsibility for it until it is delivered safely and undamaged to the customer.

Several components such as tubes, chimney, blower, etc. are shipped separately for added protection in shipment. If special installation instructions are required, they will be included below or packed with the component.

### INSTALLATION

1. Remove RF deck from cabinet by removing solder lug from top of doorknob capacitor on rear of chassis and pulling the plug from socket on back of chassis. Remove panel screws on meter panel and top panel, drop the meter panel forward and down. RF deck will then slip out through the front of the cabinet.
2. Attach blower to bottom of 4-1000A socket with two #10 machine screws. Make sure the blower fits snugly to the rubber ring around the bottom of the socket. Body of the blower goes toward center of chassis. Twist and solder the blower motor leads to pins 1 and 6 of the six prong socket.
3. Install the 4-1000A in the socket, place the chimney over the tube, careful of the springs. Attach the plate cap to the parasitic choke with plate cap set screw to the rear. Do not put plate cap on the tube until chassis is in place in the cabinet. The tube can be installed through top lid of the cabinet, if desired.
4. Remove packing strips from bleeder resistors on top back of cabinet.
5. Back door of the cabinet comes off by opening 90° and lifting up on the door. Do not try to operate plate voltage switch with the back door open or off, as the high voltage supply is shorted to ground through the interlock safety switch.
6. The fibreglass on the back door is to quiet the sound of the blower and transformers inside the cabinet. Further noise plus heat reduction can be obtained by piping the opening above the 4-1000A outside the operating room through

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5. Back door of the cabinet comes off by opening 90° and lifting up on the door. Do not try to operate plate voltage switch with the back door open or off, as the high voltage supply is shorted to ground through the interlock safety switch.
6. The fibreglass on the back door is to quiet the sound of the blower and transformers inside the cabinet. Further noise plus heat reduction can be obtained by piping the opening above the 4-1000A outside the operating room, through a cabinet flange fitting made to fit the opening. Do not use a pipe less than 4" in diameter.
7. Commander primary requirements are 220 volt 3 wire grounded neutral 30 amp service. #10 wire is satisfactory for runs of up to 30 feet from entrance box. Longer runs should use larger wire to reduce line voltage drop at input terminals of the Commander.

*J. Wilaver*

8. Connect output coax cable to connector on the back of chassis under copper tubing coil. Connect input coax cable to connector on back of chassis under the 4-1000A. Use 90° connectors on the end of the coax cables so that the back door of the cabinet will close.
9. Connect cut-off bias for the 4-1000A from the exciter to pin 6 on the octal plug at bottom rear of cabinet. 30 volts negative or more will provide complete plate current cut-off for the 4-1000A during the receive or standby period. The Commander will operate satisfactorily without cut-off bias; however the idling plate power is around 600 to 800 watts, depending on the individual 4-1000A characteristics. So if cut-off bias is not provided from the exciter, a small separate supply or battery can be used.
10. Make sure all components are in place and securely fastened, including the blower, tubes, and 4-1000A chimney. Check for loose bolts. Inspect fuses, 5 amp 3AG in filament circuit, 20 amp 3AB or 3AC in plate power circuit.
11. After a thorough examination of the entire unit, throw both power switches off and connect the 220 input cable.

#### OPERATING INSTRUCTIONS

1. Turn filament power on. 4-1000A filament voltage can be adjusted to exactly 7.5 with slider resistor on the RF chassis. At this point, blower should run, 4-1000A should light up, 866AXs should show a red color in the filament. Make sure all four 866AXs are lit up.
2. Allow 15 minutes warmup for 866AXs the first time before turning on plate power switch, 30 seconds thereafter. Always throw plate power switch to LOW position first, then to HIGH. This allows filter capacitor to charge in steps.
3. **LOADING:** for 4 KW P.E.P., 2 KW talk up sideband operation, load the 4-1000A for maximum output under the following conditions:  
 Plate power switch in LOW (3000V) position  
 Grid current (carrier input) 75 MA  
 Plate input power meter reading 2000 watts (meter reads twice actual input power when plate power switch is in LOW position.  
 Adjust loading control until maximum output is obtained with the above meter readings. **CAUTION:** Never turn the Coarse Loading switch or the Bandswitch with excitation on the final. Serious arcing will result. Throw plate power switch to HIGH, and the Commander is ready for 2 KW talk-up. With the plate power switch in LOW position, talk-up is 1 KW, 500 watts actual.
4. Typical Commander dial settings 4 KW P.E.P.:

Band	Fine	Coarse	Plate	Ø'clock Setting	Output power
80	5	2	7.2	2:30	Meter Calibrated
40	1	1	4.0	1:30	
20	3.5	1	2.0	11:30	
15	6.25	1	1.0	10:00	
10	8.00	1	1.0	7:00	

5. **Output Power Meter:** The meter circuit utilizes a conventional bridge arrangement to measure forward and reflected power. The actual power, as read on the meter scale is

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5. **Output Power Meter:** The meter circuit utilizes a conventional bridge arrangement to measure forward and reflected power. The actual power, as read on the meter scale is only relative, unless precisely calibrated. The meter calibrate control can be calibrated against a flat line or 52 ohm dummy load and an RF voltmeter, or RF ammeter, using  $E^2/R$  or  $I^2/R$  to arrive at the power figure. When calibrated at any power level over 100 watts, the meter will be quite accurate over the entire scale. The real value of the meter is as a tuning indicator and to indicate SWR, or reflected power, on the line. Care must be exercised

when tuning to avoid damage from overload in the meter circuit. It is good practice to back off the calibrate control when making preliminary tuning adjustments. Once the operator is familiar with the precise dial settings for each band, this will not be necessary. After a little practice, the operator will be able to change bands on the Commander in a few seconds.

6. DRIVE POWER: In some cases, difficulty may be experienced in obtaining sufficient drive on 10 and 15 meters, particularly with exciters using fixed impedance output. Experimenting with different coax lengths between the exciter and the Commander will generally cure the difficulty, provided the exciter has the drive available. In general use, the shortest possible connecting line. A small L network connected close to the Commander RF input connector will also do the job.
7. Under no conditions should the grid current be permitted to exceed 100 MA. To do so will shorten tube life.

#### AM Operation

Adjust loading for any desired operating level up to 1.5 KW carrier plate input. Do not exceed 50 MA grid current for AM operation under any conditions. Increase loading and decrease drive until output meter kicks up slightly with modulation. When properly adjusted at 1500 watts input, the 4-1000A is dissipating 1000 plate watts and putting out 500 watts of carrier and 2000 watts P.E.P. output on modulation peaks. At 1000 watts plate dissipation, the entire 4-1000A plate will be a dull orange color. The plate color can be used as a rough indication of proper loading at 1500 watts AM input.

#### LINEARITY CHECK, AM or SSB

Any linear amplifier is a variable efficiency device. The efficiency must be variable or the amplifier cannot be linear. The efficiency is highest at the peak of the driving voltage cycle and lowest with no driving voltage. For example, if we take a class B linear operating at 1 KW P.E.P. input (single tone or carrier), let us say the RF output is 700 watts P.E.P. If the amplifier is operating linear, the output power will drop to 1/4 the P.E.P. value or 175 watts, when the drive is reduced to where the input power to the linear is 1/2 or 500 watts.

The above is extremely important in understanding the functioning of a linear amplifier. The plate input and RF output meter on the Commander can be used to check linearity at any power level. For any given set of conditions, whether AM or SSB, the power output should drop to 1/4 the P.E.P. value when drive is reduced sufficiently to reduce the plate input power 1/2. The average power in the human voice is roughly 1/4 the peak value. So in order to maintain linearity in a class B amplifier using sideband, the average plate current input to the amplifier, as read on the meter, will be roughly 1/2 the peak value. Then the peak plate current will be twice the average value, and the peak power output will be 4 times the average value. It sounds very confusing, but time spent studying this phenomenon will clarify the whys and wherefores of P.E.P. vs average power in a sideband linear.

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In the case of AM operation, you may wonder about the efficiency situation. Here are the answers. Peak power under 100% modulation in the AM signal is 4 times the carrier power. Thus you might think that the plate power meter should kick upward with modulation. However, under 100% modulated conditions, the plate current in the final varies from zero to twice the average value; so that the average plate current with modulation is the same as with carrier alone. But if

the amplifier is linear, the output power is 4 times the carrier level power on modulation peaks, because we have already determined that when the plate input power is doubled in a class B linear, the output goes up 4 times.

A clear understanding of these few paragraphs regarding basic linear amplifier theory will do more to clarify the operation of the Commander than a large book of cut and dried instructions.

#### WARRANTY

The manufacturer warrants this equipment to be free of defects in material and workmanship under normal use and service as follows:

90 day warranty on all components and entire transmitter, with the exception of the 4-1000A tube and the four 866AXs. The tubes are covered by the tube manufacturer. All matters pertaining to tubes should be taken up directly with the tube manufacturer.

At any time during the warranty period, the manufacturer will, at his election, repair or replace without cost (except transportation) to the owner, any component or components (except tubes) found to be defective through normal use.

The above manufacturers warranty does not apply to any part of this transmitter which has been subject to misuse, neglect, alteration, or accident, to damage caused by fire, flood, or acts of God or any other casualty, or if the original serial numbers have been removed.

The foregoing manufacturers warranty shall apply only if this equipment is installed within the continental United States.

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ELECTRONIC ENGINEERING CO.  
WABASH, INDIANA U.S.A.