

INSTRUCTION BOOK

for

Model 7000

Instant-Output

HIGH POWER

RF SOURCE

Fig. 1. Photo of Model 7000

Model 7000  
Instant - Output  
HIGH POWER RF SOURCE

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## HIGH POWER RF SOURCE

## SUMMARY SPECIFICATIONS

## AVAILABLE POWER OUTPUTS

25-30 MHz  
 30-110 MHz  
 170-300 MHz  
 300-600 MHz  
 750-1000 MHz

## RF WATTS MINIMUM

150 }  
 100 } Coarse and Fine Level  
 150 } Power Control - For  
 100 } all Values over 1/4 Watt.  
 50 }

Rated powers above available  
 into loads of up to 1.5:1 VSWR.  
 Slightly derated for conditions  
 as high as 2:1 VSWR.

Nominal Impedance

50 Ohms coaxial

Output Connector

Female N

RF Power Metering -  
Forward or reflected±15% of full scale over  
entire freq. range

Frequency Calibration

Direct reading ±2% actual

RF Power Sampler

35 to 45 dB below main output

Sampler Connector

Female BNC

Modulation

Not provided (CW only)

Line Power Supply

115V, 60Hz, 6.5 amp.

Dimensions

24 W x 24 D x 61 High

Weight

Approx. 450 lbs.

## Model 7000 Summary - Major Equipment

Source #	Model	Tubes
Source #1	T-464/ALT-7 Modified (CW)	(2) 4X150A
Source #2	T-465/ALT-7 Modified (CW)	(2) 6161
Source #3	T-85/APT-5 Modified (CW)	(1) 6161

## Power Supply -

Beckman - F-6003-AV - Modified  
Cedar Grove, New Jersey

Filters - (6) Low Pass	dB	VSWR
1 - 50 MHz Cut off	65+	1.2
1 - 100	65+	1.3
<u>Lab Models</u> 1 - 200	65+	1.2
1 - 300	65+	1.4
1 - 500	65+	1.4
1 - 1000 Model 5196	60+	1.2

## RF Coupler Details

3-Port Line Section, designed Special for Model 7000  
2 Ports 150W - Forward and Reverse, each  
1 RF Port 40 dB non-directional

Has M/F Type N RF Connectors

## Selector Switches (4)

- (2) Source Selectors - Bird Model 7441, single pole, three-position coaxial switches
- (2) Filter Selectors - Bird Model 74, single pole, six-position coaxial switches.

# MODEL 7000 - INSTANT-OUTPUT HIGH POWER RF SOURCE

## Section I

### General Description

#### General

This equipment is designed to provide continuous wave radio frequency power (up to 150W) over almost all of the range from 25 to 1000 MHz. See Summary Page -A- for more parameters of band limits and available power.

The whole equipment is housed in a simple vertical cabinet, on easy-rolling casters, with a hinged and latched rear door and readily removable panels on the other sides and top. The installed material is divided into three main divisions: The respective Oscillator (3) Sources on the two top shelves; the Selector and RF Monitor equipment just below; and a self-contained Power Supply and Control unit underneath.

#### Oscillators

The three oscillators supplied in the Source section are essentially stripped units, simple to tune and easy to detach. They generate a continuous wave signal only, there is no provision for sweep signal or any modulation form. The outputs of these units may be quickly interchanged during use, furnishing rapid conversions at any time, with only momentary interruption of signal. The B+ supply for each oscillator is switched in only as the selected unit is used, even though the (cathode) heaters and cooling blowers of all Sources are always on when the Model 7000 is operating.

### Power Supply

The common Power Supply Unit (on lowest level) furnishes 3000V max. B+ for all oscillators and also contains the overall control and safety items: Master switch, pilot, and fuses; door interlock relay; the overload circuit-break (with current adjustment) and reset; and the Powerstats for coarse and fine control of power level. The Power Unit also contains the accurate voltmeter and ammeter displays for essential use in close monitoring of B+ current (see Operating Section) and for simple determination of oscillator input power.

### Selector-Monitor

The intermediate portion of the panel contains the selector switches for Sources and Filters, and the output Metering equipment. One of the six installed low-pass Filters is selectively cut into the RF line - assuring at least a 50dB reduction of any harmonic output. The Meter (on a directionally coupled Element) indicates directly the RF power in the output line, both forward and reverse, by use of a two-throw switch. Also included is a non-directional coupler providing a -40dB sampler. The sampler connection, a BNC Jack, may be attached to make measurements for exact frequency, to monitor the signal on an oscilloscope, or to check the output on a spectrum analyzer.

### Summation

Combining this mobile RF Power Source with a Bird Model 4340 THRULINE RF Standard Wattmeter, and a Bird Model 8135 Load makes a highly useful instant RF Test Station. The entire equipment is intended for simplicity of use, for safety, and ease of access.

## Section II

### Installation and Operation

#### Installation

Place the equipment in a position convenient for operation where sufficient ventilation is available, particularly at the back of the cabinet. Allow several inches of clear access behind the unit - especially to permit unimpeded air entry to the oscillator blower intakes.

Power for the unit is supplied by a 10 ft. long power cord attached to the lower right-hand side of the cabinet. The current requirement for the Model 7000 equipment is 115V, 60 $\omega$ , 6.5 Amps. Be certain that the outlet receptacle used has its grounding pin contact properly wired to ground.

Turn the main power control counter-clockwise (Powerstat knob just below the center of the panel) down to zero. Then flip up the lower bat switch (on the right hand side) to "on", energizing the entire Power Source equipment. The red pilot lamp for "power on" will be illuminated. Check that the "Reset" switch just above the power switch is positioned "off". Before using the equipment allow at least five minutes for warmup and stabilization.

#### Operation

Determine the output frequency desired. For frequency selection, four switches on a horizontal row across the center are provided. The two (three-position) switches at the left are for Oscillator Source selection; the two (six-position) switches at the right of this row are for Filter selection. All are oper-



ated by "pull-turn-push". Select the appropriate Source and Filter, as described above, from the switch position markings. For your reference, the following schedule shows the frequency ranges covered and applicable pole positions:-

Selector Schedule

Oper.Freq's - MHz	Source No.	Filter Positions
25-110	1	{ 25-50 (1) 50-100 (2) 100-200 (3)
170-300	2	{ 100-200 (3) 200-300 (4)
300-600	3	{ 300-500 (5) 500-1000 (6)
750-1000	3	500-1000 (6)

Connect load to Female N output jack on front panel. Use a load of adequate power absorption capability for the generated power. Attach with good cabling and connectors of sufficient electrical rating, and fasten all connections tightly. Check that the blowers are going for the three individual oscillators of the equipment. Push the high voltage reset switch to "on", turn up the powerstat to the desired output level. Check the powerstat position against actual DC power produced; take the usual product of the readings on the voltmeter (on the right) and the ammeter readings.

Note: In turning up power supply on the equipment, some care must be observed in resulting outputs; at higher power levels the values of B+ (displayed on the panel voltmeter) might at times exceed the manual allowances for the tube(s) involved. This condition should not necessarily be cause for concern as tube capability for potential is generally quite superior to the stated voltage ratings. However, the

output milliammeter must be monitored carefully. Caution:  
 For protection of this equipment, see that these ratings are  
 not exceeded:

<u>Sources</u>	<u>mA output max.</u>
Oscillator #1	500
" #2	600
" #3	300

On Source #3, especially, note the 300 milliamper output maximum. Do not exceed this value except for very short lapses - that could be allowed up to 315 mA only. On any of the above three Source values, output tube burnouts can occur if they are exceeded. Be careful, tube replacements are quite costly and may occur at times of considerable inconvenience. Watch the monitor carefully, particularly on Source #3.

Remember also, for the safety of the output tubes, always connect adequate transmission (antenna) facilities or a dummy load (such as Bird TERMALINE Model 8135) before turning up the output power. Any system employed should have a VSWR at the connection of less than 1.5 to 1.

Detail Tuning Procedures

For tuning Source #1 (25-110 MHz) and Source #2 (170-300 MHz) procedures are relatively simple; as printed on Panel Instructions: Set desired frequency on dial by means of adjacent crank, then adjust coupling for maximum output. If frequency value is correctly set, no further tuning is needed. Turn up Powerstat to requisite power level. For Source #3 more detailed directions are needed and are included herein:

Source #3 (300-1000 MHz). Using the frequency chart on the oscillator panel, determine the counter numbers for the plate and cathode positions at desired frequency and set the respective counters accordingly. The frequency figures, being given generally at 100 MHz intervals, may be mathematically interpolated for intermediate points to determine the appropriate plate and cathode settings. Bear in mind that all the listed points are individually checked for each equipment and are unique to it. Do not use any reference material other than the chart attached to the panel of your unit. Then turn up main Powerstat to get a small indication of power output and then adjust the antenna coupling and the bias coupling for maximum power output.

Special Note: When working at 750 MHz, it will be necessary to readjust the coupling shift for max. output. Required only for this range and generally can be omitted at other frequencies.

Now readjust the cathode counter very carefully, moving only slightly to obtain maximum output readings, and again adjust the antenna and bias couplings. Caution: Be very careful of too much deviation on this cathode counter - if moved too far you can throw the oscillator into another mode, and output would be at three times the indicated counter frequency (300 MHz is a likely critical point). After coupling readjustments, move the Powerstat up to final power level. Just above

the large (lower) Control dial is a small Powerstat knob. This operates a vernier to provide very close output control where more precise settings may be desired.

As a general precaution for the next operation of the equipment, and as good procedure, always turn the main Powerstat back to zero before shutting off the AC power switch.

### Section III MAINTENANCE

#### General

The Model 7000 Equipment is generally rugged and simple. The main items in its care are certain operating precautions (See Sec. II, pp. 4, 5) and cleanliness. The outside surface should be wiped free of dirt and dust when required, particularly the front panel and rear door. Keep surroundings normally clean. Intrusion of dust into the oscillator blower systems could be harmful to tube life.

Keep the RF connectors (Female N output and BNC sampler) clean. If dirty, wipe the mating parts (metallic) and exposed insulator surfaces with Inhibisol or trichlorethylene on a cotton swab stick. This same care should also be applied to any coaxial or electrical junctions within the power source equipment. When disconnections of components are made (as in paragraphs below) the connectors should be checked and cleaned if necessary before re-attaching. If required, oscillator control shafts may be lubricated with Dow Corning DC-4 Compound (or a high-quality, non-gumming grease). Ordinarily, this would be done at times when the unit(s) are detached from front panel.

#### Oscillator Units

The most common concern with the operating of this equipment is the possibility of burnout of the oscillator tubes. Excessive current supply is the most likely cause, or to a lesser degree, improper output termination - resulting in too much re-turn RF power. As a preventive measure, always observe the Operating Instructions.

Also to be considered (as a safeguard for these tubes and for their filament supply circuits) is the fusing of the individual blower/filament AC lines. Note from the equipment Block Diagram, Fig. 2, that the respective blower/oscillator sets each have a common fuse on the AC line (mounted on the back of the oscillator case). A short circuit in the tube filaments or overloading of the blower-motor windings (thru a short circuit or stalling) would cause a burnout of the individual fuse. This wiring, of course, serves to protect the filament transformers in the respective oscillator units and to make any disruptions in the blower/filament supply system more discernible to the operator.

Special Caution: In case of stoppage of any on of the blowers, B+ power should be immediately removed from that unit by switching Source Selector Switch #1 (if energized). The Model 7000 equipment should be subsequently shut down, and the cause thereof determined and remedied per servicing of individual oscillator units described in paragraphs below.

#### Access

This equipment is mounted in the cabinet such that all major components can be rather easily reached and may be removed essentially thru the back door opening alone. The methods for this are described below; it is generally not necessary to remove side panels of the cabinet.

#### Special Safety Warning

Even though the safety interlock cuts off the high voltage supply whenever the door is open, always turn OFF the main switch and disconnect the power cord before attempting any work inside the Power Source cabinet.

The four major components - 3 Oscillators and the Power Supply are intended for removal from the equipment as units. Mounted across the lower portion of the main panel is the control center comprising the RF selector switches, the small RF meter with its directional switch and coupling section, and two RF (output) connectors. The bank of six RF output filters is independently shelf mounted. Access from the rear permits service of these control components, when needed, with a minimum of dismantling.

All radio frequency and high voltage cabling is double shielded, teflon dielectric, 50-ohm coaxial (Type RG-87A/U or - 225/U) fitted with Male Plugs, N or UHF, as required. If replaced, use only cable of equivalent characteristics.

#### Oscillators - Service of 3 RF Sources

Source #1 is located by itself on top shelf.

- a) To disassemble from equipment, see Fig. 3, page 11.
1. Release the blower hose clamp on the (center) air duct (1) at the back of the case by loosening the draw screw (2) and pull the hose (3) off.\*
  2. Reach in unscrew four #10-32 wing nuts from studs at four corners of the base flange of the Oscillator.
  3. Remove wiring and cable connections (two AC leads on terminal block (4) at the back, the blower plug from socket (5) and two UHF coaxial plugs). The UHF connections attach to the B+ choke adjacent on the same shelf. The screen input (J6) is at far back, and plate in center, joining equivalent positions on choke output.
  4. Remove controls from front panel - Pull out the coupling knob directly and loosen the two Allen #8-32 set screws on the frequency control knob with a 5/64 hex socket wrench.

\*( ) These numbers are, as applicable, for reference on the respective Figure callouts.

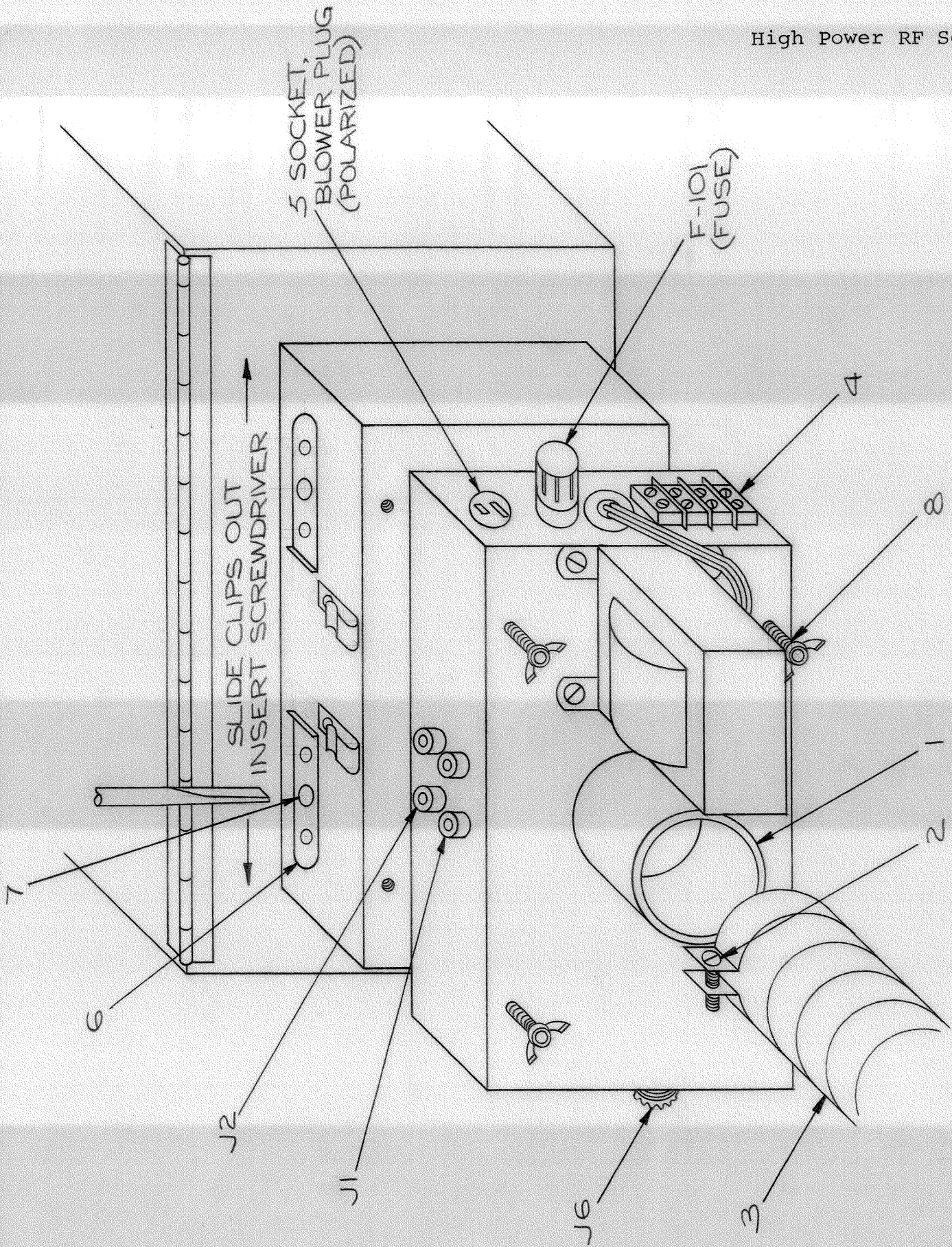


Fig. 3 - Tube Removal, Source#1



5. The oscillator may now be gently lifted off the stud ends and taken out of the cabinet. With care, this can be done without raising the top panel of the cabinet.
- b) To change the two 7034/4X150A output tubes (V101/102) in Source #1, per Fig. 3, proceed as follows:
1. Slide outward each of the two clips (6) on top side of the inner (stationary) box on the rear of the oscillator case, exposing small screw-driver holes (7).
  2. Insert a narrow-tip screwdriver (short if the oscillator remains in the cabinet) for about 1-1/2 inches straight down into these holes, then turn the engaged screws counter-clockwise several turns to release the anode clamping bands.
  3. Loosen the four wing-head captive screws (8) at the corners of the rear face of the tube box, twisting just a few turns to disengage only, and remove the box.
  4. The box holds the two (2) 4X150A tubes, which may be pulled up directly from their sockets.

Note: With care, these tubes can be changed without removing the oscillator from the cabinet as just described.

- c) Reverse above procedure in full to re-assemble the oscillator.
1. When re-installing vacuum tubes, check that the alignment nub on tube center-post is correctly positioned, and that all base pins engage properly.

Source #2 - at right side of second shelf (from the rear).

- a) This oscillator must be removed from the cabinet for service of the 6161 tubes (V201/202).
1. On the shelf above the oscillator, use a Phillips head screwdriver on the four screws in the four corners of its up-side end flanges.
  2. When loosened, raise shelf slightly.
  3. The oscillator case stands on four sleeve mounts fixed to its base shelf. Reach in on underside of this shelf and twist loose the four wing screws to release the case.
  4. Remove the control knobs as in Source #1, above.

5. Retract the oscillator from the cabinet - the RF cable is fixed, and the B+ will be detached when the case is far enough out for plug to be reached.
  6. Remove RF Cable from the Selector Switch jack - note correct N receptacle.
- b) To change the 6161 tubes, (V201/202) in Source #2, see Figs. 4a and b, V page 14, and proceed as follows:-

Loosen four slotted screws from corner of 3 x 4 dust cover on top of oscillator at the back and remove cover (1). A teflong adapter plate (holding the anode clamp) is fastened with four slotted machine screws thru hold-down bushings (2) in the corners. Loosen these four screws. On back face of unit, raise flat closure spring (8) to expose small screwdriver hole. Use a screwdriver (3) thru this hole to loosen anode clamp, screw (4), and carefully lift off the teflon anode-clamp plate (5), Fig. 4a. Rotate the antenna coupling plate to extreme "out" position to facilitate. Remove three slotted screws (6) from bezel ring holding the tube (7) and lift off the bezel, Fig. 4B. Tube may now be pulled out.

c) Turn the oscillator over to opposite side and repeat this same procedure to service the other tube.

d) Reverse steps given above the replace V201/202 tubes.

Source #3: The 6161 tube V301 on this oscillator may easily be replaced without removal from the cabinet.

- a) At the rear end of the oscillator, open the two spring clamps at the sides of cylindrical housing. This releases the adapter disc (with the blower hose attachment). Pull off the disc. Inside is an insulating yoke for the anode fastened by two screws at its ends. Loosen these and lift off the yoke. The tube may now be pulled out. Reverse above to replace. With this 6161 type tube, as on Source #2 also, radial positioning of the tube is not a concern, but care should be taken that tubes are pushed down to their proper seat. Source #3 is relatively easy to remove from the cabinet if required.

- b) Remove all control knobs with Allen wrench as in Source #1 above, and take out two wing screws projecting up from under the shelf into the oscillator base, towards the back of the unit. After releasing these screws, lift up the rear end of the oscillator carefully, and remove the RF output cable. This connector is on the underside of the unit near the back (on the right looking into cabinet) and faces forward. (This is the only oscillator having detachable RF cable). Remove other connections in usual manner to free.

#### DC Power Supply - 3KV

This equipment, adapted from a Beckman 6003-AV HDPS, is entirely self-contained and can be removed from the cabinet as a unit. Remove the top and bottom bezel strips, held by three screws each, across the top and bottom edges of the face panel of power supply. Remove four fastening screws down each side of panel. Detach wiring: AC input to fuse block; terminal strip leads to oscillator filaments; the door interlock leads, and the coaxial high voltage (B+) connection to UHF jack located on the right hand side of chassis about center position. The power supply is now ready to remove.

Caution - be very careful about this move. Have dolly or table of comparable height prepared to receive it. The unit weighs over 250 lbs.

The supply slides out the front of the cabinet. Do not attempt this move without adequate handling arrangements.

Location of Jacks on Source Oscillators

Source #1

- J1 Grid (Black) - Top rear of transmitter.
- J2 Grid (Red) - Top rear of transmitter.
- J3 Grid (Black) - Top rear of transmitter.
- J4 Grid (Red) - Top rear of transmitter.
- J5 Hi-Voltage (Plate) - Left rear of transmitter.
- J6 Hi-Voltage (Screen) - Left rear of transmitter.
- J7 RF Output - Right front of transmitter.

Source #2

- J1 Grid - Right side of transmitter.
- J2 Grid - Right side of transmitter.
- J6 Hi-Voltage - Right side front of transmitter.
- J7 RF Output - Right side of rear of transmitter.

Source #3

- J6 Hi-Voltage - Right side of rear of transmitter.
- J7 RF Output - Bottom of transmitter.

Note: For Jack number (J1, etc.) references see Schematics of respective Source Oscillators on ensuing pages.

Oscillators - (3) Sources  
Schedule of Circuit Components

## Source #1

C101/102 - IC, n/r\*  
C103 - 100 pf, 5000V  
C104/105 - .01 mf, 2500V  
C106 - 100 pf, 5000V  
  
F101 - 3AG Fuse, 2A (1/4 x 1-1/4 lg.)  
  
R101/105 - 2.2K, 2W  
R102/106 - 2.7K, 2W  
R103/107 - 2.7K, 2W  
R104/108 - 2.7K, 2W  
R109/110 - 12K, 10W  
R111 - 10K, 20W  
  
T101 - 6.3V @ 6A  
  
V101/102 - Type 4X150A Tubes

## Source #2

C201/202 - IC, n/r  
C203/204 - 1000 pf  
C205/209 - IC, n/r  
C206/207 - 1500 pf  
C208 - .01 uf  
  
F201 - 3AG Fuse, 2A (1/4 x 1-1/4 lg.)  
  
L201/203 - 7 uH  
L202/204 - Nominal - lg. of wire  
L205 - 7 uH  
L206 - 7 mH  
L207 - 7 uH  
  
R201/202 - 5K, 10W  
R203/204 - 25 ohm, 10W  
  
T201 - 6.3V @ 8A  
  
V201/202 - Type 6161

## Source #3

C301 - IC, n/r  
C302 - IC, n/r  
  
F301 - 3AG Fuse, 2A (1/4 x 1-1/4 lg.)

R301 - 1000 ohm, 50W potentiometer

T301 - 6.3V @ 4A

V301 - Type 6161 Tube

\*IC, n/r - Integral construction of the  
Oscillator Assy., not replace-  
able as an individual component.

## DC Power Supply - Model 7000

Beckman F6003-AV HDPS

## Schedule of Circuit Components

	$T_1$ - Superior Powerstat - High Power
$C_1$ - 8 $\mu$ f = (2 x 4 $\mu$ f's)	$T_2$ - Transformer Step-Up-3KV-600mA
$D_1$ - (60) AA 600 Diode network	$T_3$ - Superior Powerstat - Type 10B
$F_1$ - 30A-1/2" OT30	$T_4$ - Stancor P-3024 - 2.5 VCT @ 10 amps
$K_1$ - Coil-Solenoid	Blowers (3) on Oscillators Dayton - 100 CFM Shaded Pole 115V 60 $\nu$
$K_2$ - Coil-Solenoid	Type 2C781
$LT_1$ SE-6 or SE-7 Pilot Lamp	
$M_1$ 3KV Dials	{ Simpson Model 29, 4-1/2" Rectangular Model 7820 Volt'r, 5220 Amm'r; (100 ua)
$M_2$ 500 mA	
$R_2$ 29.9 Megohms (2)	
$R_3$ 500 ohm, 200 W	
$R_4$ 50 ohm - 25W Potentiometer	
$R_5$ 50 ohm, 25 W	
$R_6$ 75K	
$S_1$ DPST (SW) On-Off Switch	
$S_3$ SPST (SW) Momentary - N.O.	