TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL: INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST BWO POWER SUPPLY,

PRD TYPE

816-S10

This copy is a reprint which includes current pages from Changes 1 and 2.

HEADQUARTERS, DEPARTMENT OF THE ARMY

NOVEMBER 1973

This manual is an authentication to the manufacturers commercial literature which, through usage, has been found to cover the data required to operate and maintain this equipment. Since the manual was not prepared in accordance with military specifications, the format has not been structured to consider level of maintenance nor to include a formal section on depot overhaul standards.

TECHNICAL MANUAL)
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No. 9-4931-459-14-1)

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 20 November 1973

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT,

AND GENERAL SUPPORT MAINTENANCE MANUAL,

INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST: BWO POWER SUPPLY, PRD TYPE 816-S10

ILLUSTRATIONS

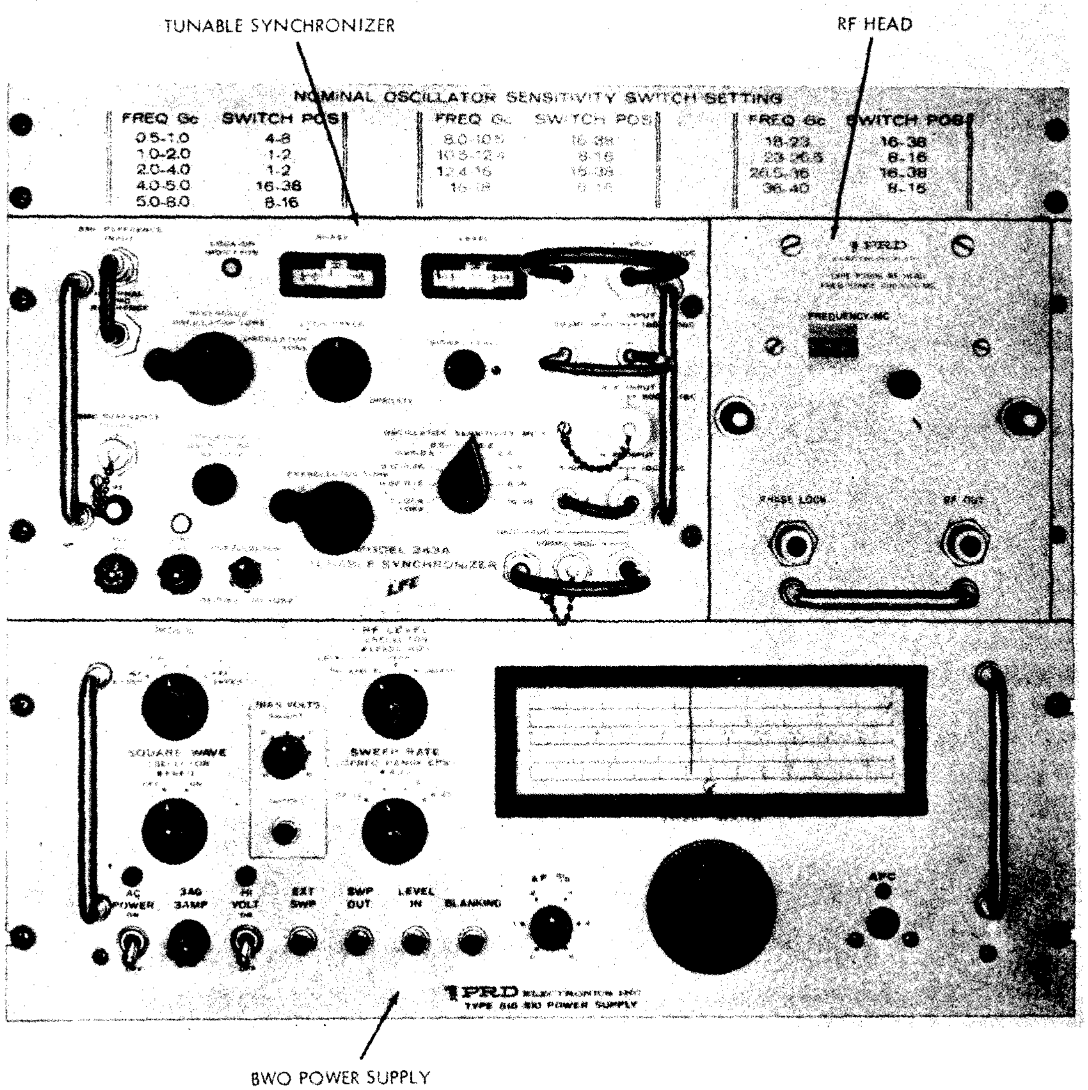


Figure 1. PRD 816-S10 BWO Power Supply Installed in Signal Source

SECTION O

GENERAL

Scope

This manual includes installation and operation instructions and covers organizational, direct support (DS), and general support (GS) maintenance. It describes the BWO Power Supply, PRD Type 816-S10.

Indexes of Publications

DA Pam 310-4. Refer to the latest issue of DA Pam 310-4 to determine if there are any new editions, changes, or additional publications pertaining to the equipment.

DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

Forms and Records

Reports of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions given in TM 38-750.

Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Report of Packaging and Handling Deficiencies) as prescribed in DOD 4140-34-M.

Discrepancy in Shipment Report. Fill out and forward Discrepancy in Shipment Report (DIS-REP) (SF 361) as prescribed in AR 55-38 (Army), NAVSUP Pub 459 (Navy), AFM 75-34 (Air Force), and MCO P4610.19 (Marine Corps).

Reporting of Equipment Publication Improvements. The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commander, US Army Missile Command, AMSMI-MFM, Redstone Arsenal, AL 35809.

SECTION I

INTRODUCTION

The PRD 816-S10 BWO Power Supply (figure 1) provides operating voltages for a Signal Source that consists of the Power Supply, an RF Head, and a Tunable Synchronizer. The Signal Source covers the frequency range of 500 mc to 40 gc in eight separate bands, the selection of which is obtained by interchanging the RF Head.

The RF Head provides a continuously variable frequency output within the selected band. This output is sampled by the Tunable Synchronizer which provides a drift-correction voltage for the rf output. The Tunable Synchronizer is manufactured by LFE Instruments, and is described in a separate manual. Coverage in this manual is limited to the Power Supply.

The operating voltages provided by the Power Supply comprise a helix source, variable from +100 to +2,500 volts; a collector source, fixed at +130 volts with respect to the helix; an anode supply, variable from 0 to +200 volts; and a regulated filament supply, fixed at 6.3 volts. In addition, the Power Supply contains a varactor bias source which is variable between 0 and -6 volts.

Various sweep and modulating modes may be selected through separate control circuits. These circuits consist of:

1. A square wave generator, which optionally modulates the rf power level by modulating the anode supply, adjustable from 800 to 1200 cps.

2. A leveler amplifier, which allows alternate leveled operation from either a crystal detector or a thermistor input. Alternatively, unleveled operation is also possible.

3. A ΔF source, which sweeps the helix over a range that corresponds to five percent of the frequency band.

4. An internal source, which sweeps the helix over any part of the frequency band at a rate adjustable from 0.03 to 25 cps.

5. Provisions to sweep the helix over any part of the frequency band at a rate and width determined by an external source.

The RF Heads contain backward wave oscillator (BWO) tubes which generate the rf frequency output. One of the RF Heads is a double unit that mounts two BWO tubes; each of the remaining heads mounts one BWO (see table 1). In addition, each RF Head contains the shaper, which is functionally part of the helix supply, and the anode current overload adjustment.

The Power Supply specifications are listed in table 2.

Table 1

RF HEADS

RF Head	Frequency Range	Power Output	BWO
PRD P7006	500 mc to 1 gc	20 mw	Stewart SE223-12
PRD L7006	1.0 gc to 2.0 gc	20 mw	Stewart SE214A-12
PRD S7006	2.0 gc to 4.0 gc	20 mw	Stewart SE215A-13
PRD CX7006*	4.0 gc to 8.0 gc	20 mw	Varian VA-160R
PRD CX7006*	8.0 gc to 12. 4 gc	20 mw	Varian VA-173R
PRD U7006	12.4 gc to 18.0 gc	20 mw	Varian VA-162R
PRD K7006	18.0 gc to 26.5 gc	10 mw	Varian VA-163R
PRD A7006	26.5 gc to 40.0 gc	5 mw	Varian VA-164R

* Indicates double RF Head mounting two tubes.

Table 2

POWER SUPPLY SPECIFICATIONS

(All voltages are referenced to ground.)

ITEM	VALUE
HELIX SUPPLY	
Voltage	100 to 2,500 volts, dc
Current	25 ma, maximum
Regulation	±0.05% for line variation of ±10% 0.1% for 0 to 25 ma load
Maximum Ripple and Noise	200 mv peak to peak
External Sweep	Can sweep all or any part of helix voltage.
Internal Sweep:	
Rate	4 variable ranges: 0.03 to 0.15 cps; 0.15 to 1 cps; 1 to 6 cps; 6 to 25 cps
Linearity	±2%
Sweep Width	5 ranges: 0 to 1 gc; 0 to 2 gc; 0 to 4.4 gc; 0 to 8.5 gc; 0 to 14 gc
Accuracy	±3% of full scale
ΔF Mode	Sweeps up to five percent of BWO frequency range. SWEEP OUT BNC connector provides synchronized signal for horizontal drive of oscilloscope. This rate is adjustable from 0.03 to 25 cps.
ANODE SUPPLY	
Voltage	0 to 200 volts, dc
Current	25 ma, maximum
Power Output	1 watt, minimum
Regulation	±0.05% for 10% line variation ±0.1% for 0 to 25 ma load

Table 2 (cont'd)

ITEM	VALUE
ANODE SUPPLY (cont'd)	
Ripple Plus Noise	100 mv peak to peak
Current Overload	Continuously adjustable from 1 ma to 10 ma
FILAMENT SUPPLY	
Voltage	6.3 volts dc ±5%
Current	2.0 amperes, maximum
Regulation	±2% for line variation of ±10%
Ripple Plus Noise	50 mv peak to peak
MODULATION	
Type	Square wave, internal
Frequency	800 cps to 1200 cps
Symmetry	±2%
Application	Clamps to anode voltage at a preset value
Rise and Fall Time	5 μsec, maximum
Amplitude	0 to 200 volts
LEVELER	
Input	Either crystal or thermistor detector
Input Impedance	5 kc at LEVEL XTAL position
Bandwidth	300 kc, minimum, at LEVEL XTAL position. 1 kc, minimum at LEVEL THERM position
Gain	60 db, minimum
COLLECTOR	
Voltage	+130 volts dc, referenced to helix supply
Current	25 ma, maximum

Table 2 (cont'd)

ITEM	VALUE
COLLECTOR (cont'd)	
Stability	±0.1%
OVERALL EQUIPMENT	
Input Power	115 volts rms, ±10%, 50 to 60 cps
Site	17 in. wide x 7 in. high x 15-1/2 in. deep
Weight	47 pounds, approximately

SECTION II

THEORY

A. INTRODUCTION

The theory of operation for the PRD 816-S10 BWO Power Supply is presented first or an overall block diagram level, followed by detailed block diagram discussions. The overall block diagram discussion covers the BWO voltage requirements and describes, at a system level, the helix supply. The detailed block diagram discussions cover the remaining power sources as well as the basic subdivisions of the helix supply. It is assumed that the reader is familiar with basic electronics; therefore, theory is not described below the block diagram level.

B. OVERALL BLOCK DIAGRAM DISCUSSION

1. BWO Voltage Requirements

The frequency of a BWO varies exponentially with reference to a linear helix voltage; conversely, the frequency of a BWO varies linearly with reference to an (inverse) exponential helix voltage. To provide a linear BWO frequency range, the helix voltage is varied exponentially from +100 volts to +2,500 volts.

The collector voltage exhibits the same characteristics as the helix voltage. The collector voltage is fixed at +130 volts with respect to the helix voltage.

The anode voltage is variable from 0 to +200 volts, and may be modulated at a nominal 1 kc rate. Since the BWO can burn out if the anode voltage exceeds the helix voltage, the anode voltage is limited to a level that does not exceed the helix level.

The filament voltage is fixed at 6.3 volts dc and is applied directly to the filaments of the BWO. High voltage application is delayed by approximately 90 seconds to ensure sufficient filament heat up.

2. System Description

The operating voltages required by the BWO are provided by the Power Supply (figure 2) which also generates the ancillary local, drive, and reference voltages that control equipment operation. These control voltages include regulated local supplies of ±22.5 volts, an unregulated drive source of -40 volts, and a regulated -36 volt reference which is developed by 12-kc oscillator Q704, Q705 and doubler CR711, CR712.

Primary power is applied to power transformer T701 and 90-second time delay relay K701 in series with AC POWER switch S101. The output of the transformer drives the ±22.5-volt local supplies, the -40-volt supply and the filament supply, the output of which is applied directly to the selected RF Head. Switch S701 interlocks the primary supply with the RF Head so that power is removed when the head is disconnected. The Tunable Synchronizer is connected across the Power Supply primary so that power to both units is controlled by the Power Supply AC POWER switch.

Approximately 90 seconds after power is applied, time delay relay K701 closes and source power is applied to HI VOLT switch S102. When this latter switch is closed, source power is simultaneously applied to control relay K702 and to the anode supply. This switching sequence energizes the anode and helix supplies simultaneously which avoids the possibility of a BWO burnout that might result if only the anode voltage were applied.

The anode output voltage is varied between 0 and +200 volts by RF LEVEL-LEVEL ADJ R102 which controls the power output of the BWO. When the SQUARE WAVE SELECTOR switch S105 is closed, an 800 to 1200 cps modulation, adjustable by SQUARE WAVE FREQ control R113, is added to the anode output, which modulates the power level of the BWO from the level established by the RF LEVEL - LEVEL ADJ control.

When control relay K702 energizes, a -40-volt drive is applied to the helix supply, the output level of which is determined by the setting of FREQUENCY -MC control R1502 (in RF Head). This preset value may be optionally modulated by an internal or external sweep or by a ΔF source.

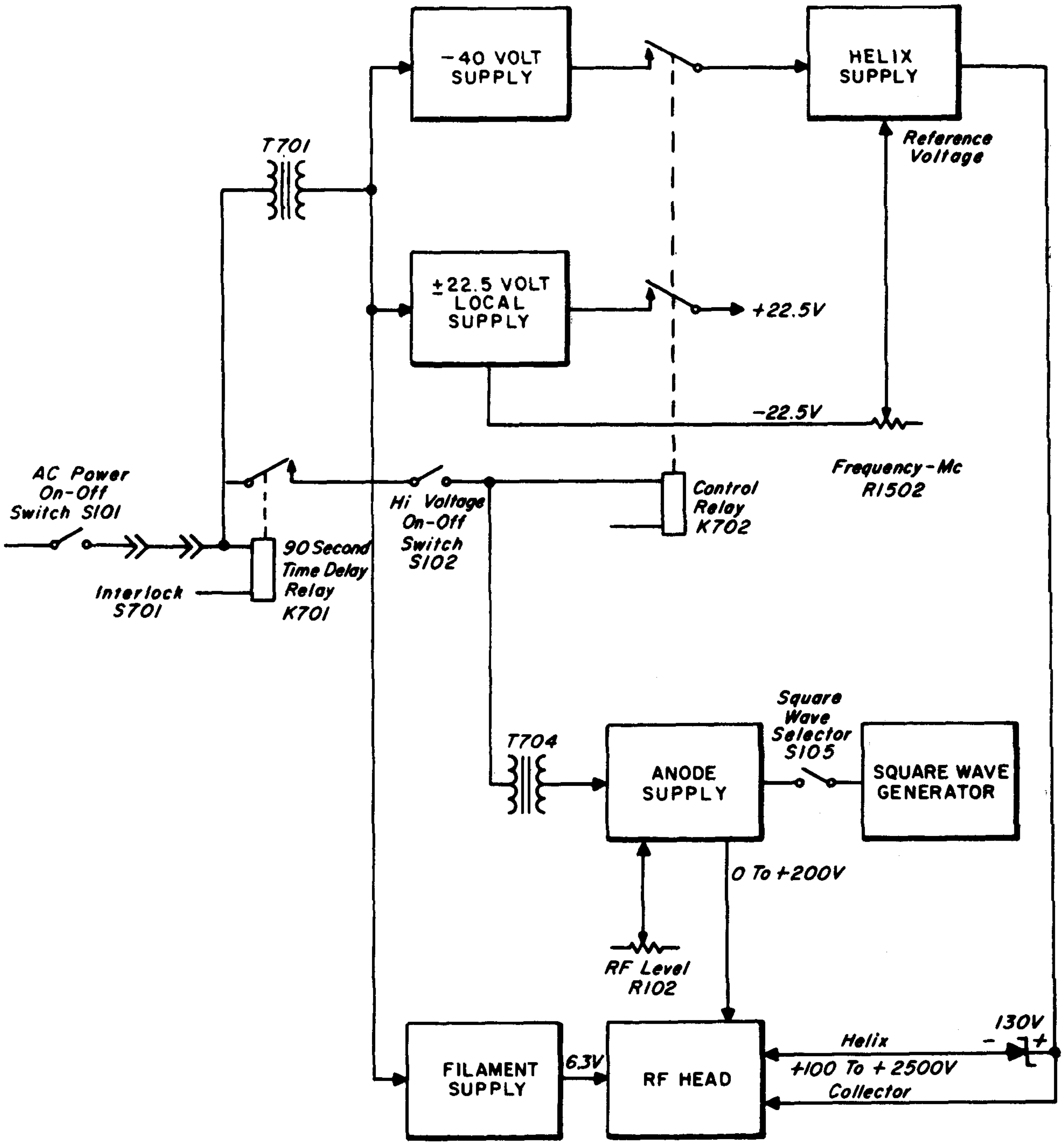


Figure 2. PRD 816-S10 Power Supply, Block Diagram

3. Helix Power Supply, Overall Description

The helix power supply (figure 3) is a high-gain, feedback loop which provides a high voltage output variable from +100 volts to +2,500 volts. The actual output level is preset by FREQUENCY -MC control R1502 (in RF Head). which provides a linear reference that corresponds to the full excursion of the BWO frequency range. A closed loop configuration is used so that any voltage variation from the preset level provides an error signal. This error, in turn. corrects the voltage variation by returning the helix output to the preset level. The helix output varies exponentially to provide a linear BWO tuning range.

The helix voltage source is provided by a high-voltage converter consisting of a 12-kc oscillator and a 12-kc chopper. The oscillator is a conventional dc to ac converter which uses a saturable core transformer to generate a square-wave output; this output drives the chopper which is, essentially, an electronic switch. As the chopper is turned on and off. it interrupts, at a 12-kc rate, the regulator output applied through the pre-regulator. The interrupted dc is induced at a 90 to 1 step-up ratio across high voltage transformer T703.

The chopper output varies between +100 volts and +2,500 volts, corresponding to the regulator output varying between -2 volts and -30 volts. The chopper output is rectified by bridge diodes CR705 through CR708 and filtered by a twin-tee filter.

The filter output is applied to the collector terminal of the BWO and, through two 65-volt zener diodes, to the Beta network. The Beta network is a voltage-dropping system, the output of which is a sample of the high voltage; this sample is applied to the shaper circuits located in the RF Head.

The shaper provides an exponential feedback signal that ensures BWO frequency linearity. It should be noted that a relation exists between the amplitude of the signal applied from the Beta network and the exponential feedback appearing at the output of the shaper. At low output voltages (corresponding to the -2 volt side of the regulator output), the attenuation of the feedback is correspondingly low, and the slope of the exponential output is not steep. As the output voltage increases, feedback attenuation is increased, and the exponential slope becomes steeper.

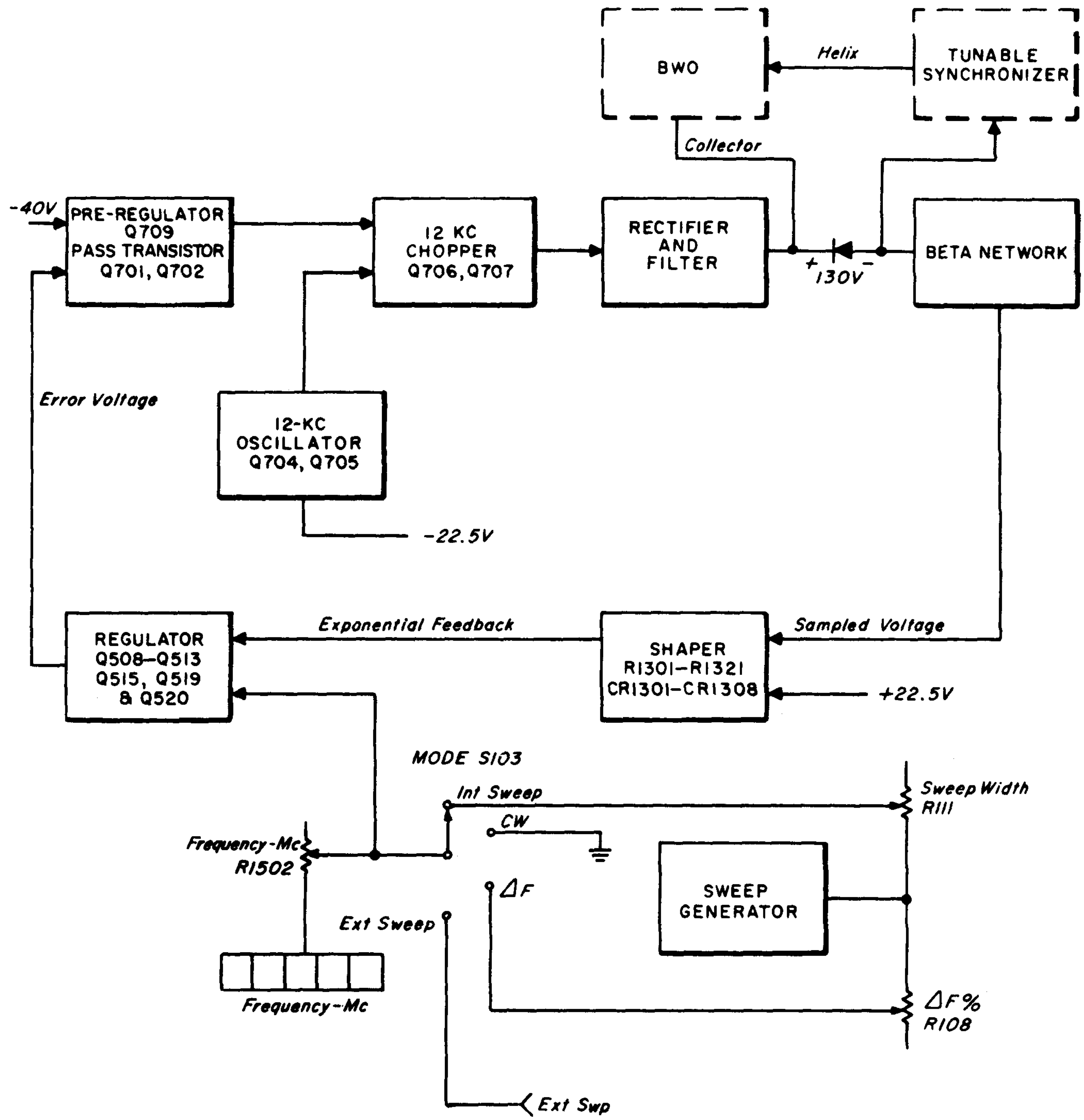


Figure 3. Helix Power Supply, Block Diagram

The regulator consists of difference amplifier and conventional amplifier circuits. These amplifiers generate error signals that correspond to the difference between the preset helix output and the actual helix output. When the output of the helix tends to vary from its preset value, the voltage sampled by the Beta network changes and an unbalance is created within the difference amplifier circuits of the regulator. The resulting dc error signal is proportional to the difference between the FREQUENCY MC voltage setting and the exponential feedback signal. This error is applied through the pre-regulator at the proper polarity to reduce the error to a null.

Because of its severe power requirements, the helix supply incorporates a pre-regulator. This circuit maintains a constant voltage drop of four volts across pass transistors Q701 and Q702 of the helix supply. The power dissipated across the pass transistors is thus limited to a safe value. For explanatory purposes, assume there was no pre-regulator, and the pass transistors were inserted directly between the regulator and the chopper. The regulator output (-2 to -30 volts) and the -40-volt helix drive are applied directly across the pass transistors. At the high end (-30 volts), the difference between the two applied voltages is relatively minor, and the subsequent power dissipation would not damage the pass transistors. However, at the low end (-2 volts), the potential difference is excessive; without the pre-regulator, 70 watts would be dissipated across the transistors which would burn them out.

Power dissipation across the pass transistors is limited by feeding back voltages from either side of the transistors to the pre-regulator. Thus, any change in voltage across the pass transistors is sensed by the pre-regulator. When this change in voltage drop tends to exceed four volts, the pre-regulator responds by proportionally lowering the level of the -40 volt helix drive.

The reference voltage for the helix supply is a combination of the voltage sampled by FREQUENCY -MC control R1502 in conjunction with the setting of MODE switch S103.

In the INT SWEEP position, a sawtooth waveform, generated within the Power Supply, sweeps the helix symmetrically around the voltage level preset by the FREQUENCY - MC control. The reference signal now applied to the regulator has a sawtooth component which is constantly corrected by the difference amplifier. SWEEP WIDTH control R111 adjusts the amplitude of the helix modulation which, in turn, controls the BWO frequency band. The SWEEP RATE controls vary the rate at which the helix is swept.

In the CW switch position, the helix voltage is fixed between the limits of +100 and +2,500 volts by the FREQUENCY -MC control. Since there is no helix modulation, the BWO output is at the frequency set by the FREQUENCY -MC control.

In the ΔF position, a sawtooth waveform similar to that generated for the INT SWEEP position is used to sweep the helix voltage. The sawtooth, which has a much smaller amplitude than the INT SWEEP sawtooth, is varied by the ΔF% control. The amplitude, which relates to the BWO frequency, provides a narrow range that is not more than five percent of the BWO frequency.

In EXT SWEEP, an external sweep signal is added to the preset helix voltage. Since a voltage excursion of approximately three volts corresponds to the complete helix voltage range, the supply may be swept over its entire range from an available external source. At this switch position the center frequency about which the sweep occurs is set by the FREQUENCY - MC control.

C. DETAILED BLOCK DIAGRAM DISCUSSION

The following paragraphs describe the operation of those blocks which make up the overall block diagram (figure 2), the helix block diagram (figure 3), and the remaining control and special circuitry.

1. Regulated Filament Supply

The regulated filament supply (figure 4) provides the BWO with a constant 63 volt output at a nominal current level of 1.5 amperes. The ac input, which is tapped from terminals 15 and 17 of power transformer T701, is rectified by bridge diodes CR1101 through CR1104 and filtered by capacitor C717. The filtered output is applied through power transistor Q1101 which is connected as an emitter follower.

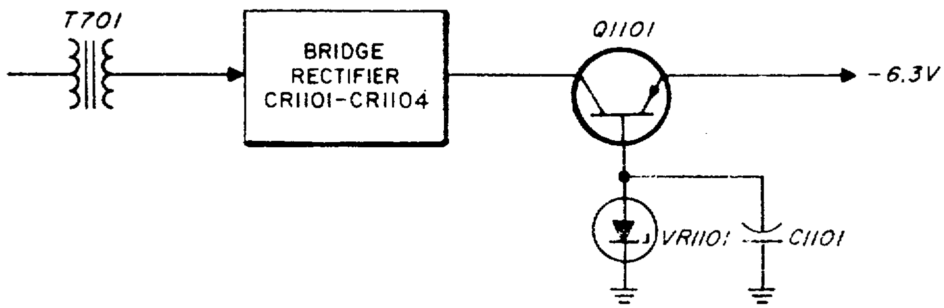


Figure 4. Regulated Filament Supply, Block Diagram

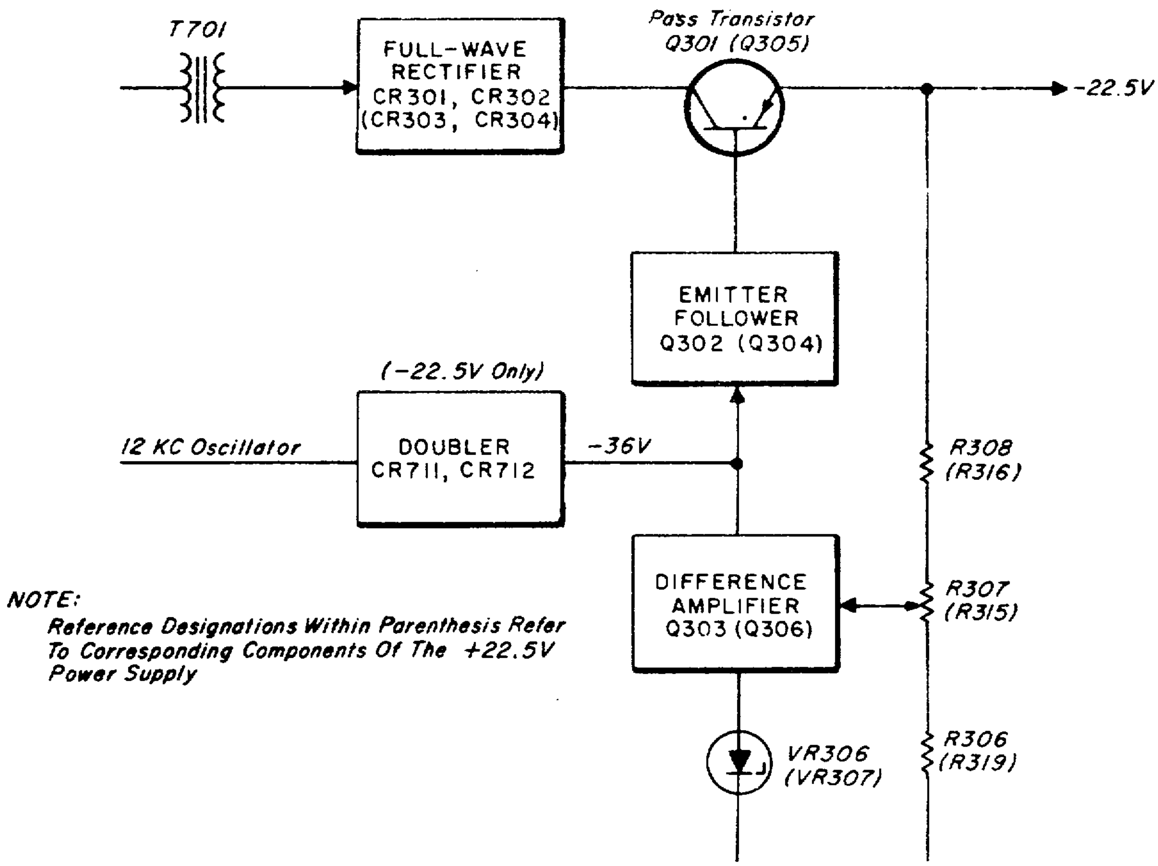


Figure 5. ±22.5 VDC Local Power Supplies, Block Diagram

The base of the transistor is maintained at a constant potential by zener diode VR1101 and filtered by capacitor C1101. The emitter output is, therefore, regulated and at a low impedance.

2. ±22.5 Volt DC Local Power Supplies

The local power supplies (figure 5) consist of two separate but almost identical 22.5 volt supplies: one provides a positive output and the other a negative output. Because of the similarity, only the -22.5 volt supply is described.

The ac output of transformer T701 is rectified by full-wave rectifiers CR301 and CR302, filtered by capacitor C301 and applied to pass transistor Q301. The transistor is connected as an emitter follower, the output of which appears across resistors R306, R307 and R308. The output is sampled by R307 and applied to the base of difference amplifier Q303. The difference amplifier generates an output voltage related to the difference of the base-applied voltage and the fixed voltage appearing at the anode of zener diode VR306. The output voltage is coupled through emitter follower Q302 to the base of the pass transistor. This feedback varies the collector-to-emitter resistance of Q301 and thus maintains the output constant.

3. Regulated Anode Supply

The regulated anode supply (figure 6) controls the power output of the BWO. This control of power may be exercised in any one of three possible modes; the sole difference between these modes is the method of obtaining feedback voltages. In either of the leveled positions of RF LEVEL SELECTOR S104 (XTAL and THERM), the feedback to-level signal is applied from an external crystal or thermistor. In the UNLEVELED position feedback is taken from the output of the anode supply.

Primary voltages are induced across transformer T704, rectified by bridge diodes CR204 through CR207, filtered by capacitor C205, and applied to pass transistor Q205.

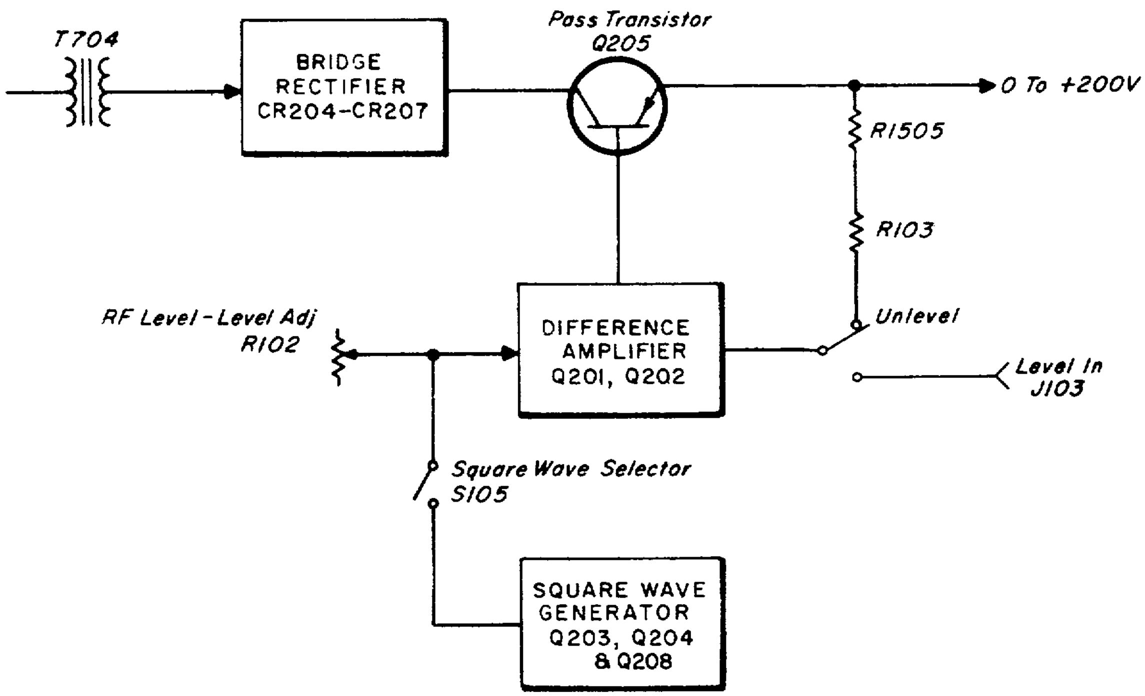


Figure 6. Anode Voltage Supply, Block Diagram

In the unleveled position of S104, the output at the emitter of Q205 is sampled by R103 in series with R1505 of the RF Head, and fed back to difference amplifier Q201 and Q202. The difference amplifier produces an error signal that is proportional to the difference between the anode voltage preset by RF LEVEL - LEVEL ADJ control R102 and the sampled signal. The error signal is applied through emitter follower Q207 and regulator amplifier Q206 to the base of Q205. This feedback varies the collector-to-emitter resistance of Q205 so that the output of the anode supply remains constant.

In the level positions, the difference amplifier output is proportional to the difference between the voltage setting of RF LEVEL - LEVEL ADJ control R102 and the input applied to LEVEL IN connector J103.

The anode voltage output may be modulated by an 800 to 1200 cps square wave that is added to the level preset by the RF LEVEL - LEVEL ADJ control. The square wave is generated by a conventional multivibrator, Q203, Q204, and Q208, the operation of which is controlled by SQUARE WAVE SELECTOR S105 and SQUARE WAVE FREQ control R113.

Resistor R1505, located in the RF Head, is used to limit excessive current through pass transistor Q205. When the voltage drop across this resistor exceeds the predetermined level set by zener diode VR202, a signal is passed through the diode that limits the transistor current.

4. Helix Power Supply

The regulated helix power supply consists of high-voltage circuits, a Beta network, shaper, regulator, pre-regulator and sweep generator. Each of these functional blocks is discussed in the following paragraphs; the interrelation between these blocks is shown in figure 3.

a. High-Voltage Circuits. The high-voltage circuits (figure 7) consist of a 12-kc oscillator, a chopper, a step-up transformer, a bridge rectifier network, a filter network, a Beta network and protective circuits consisting of a high voltage monitor and a constant current source. The 12-kc oscillator, consisting of Q704, Q705 and T702 generates a square

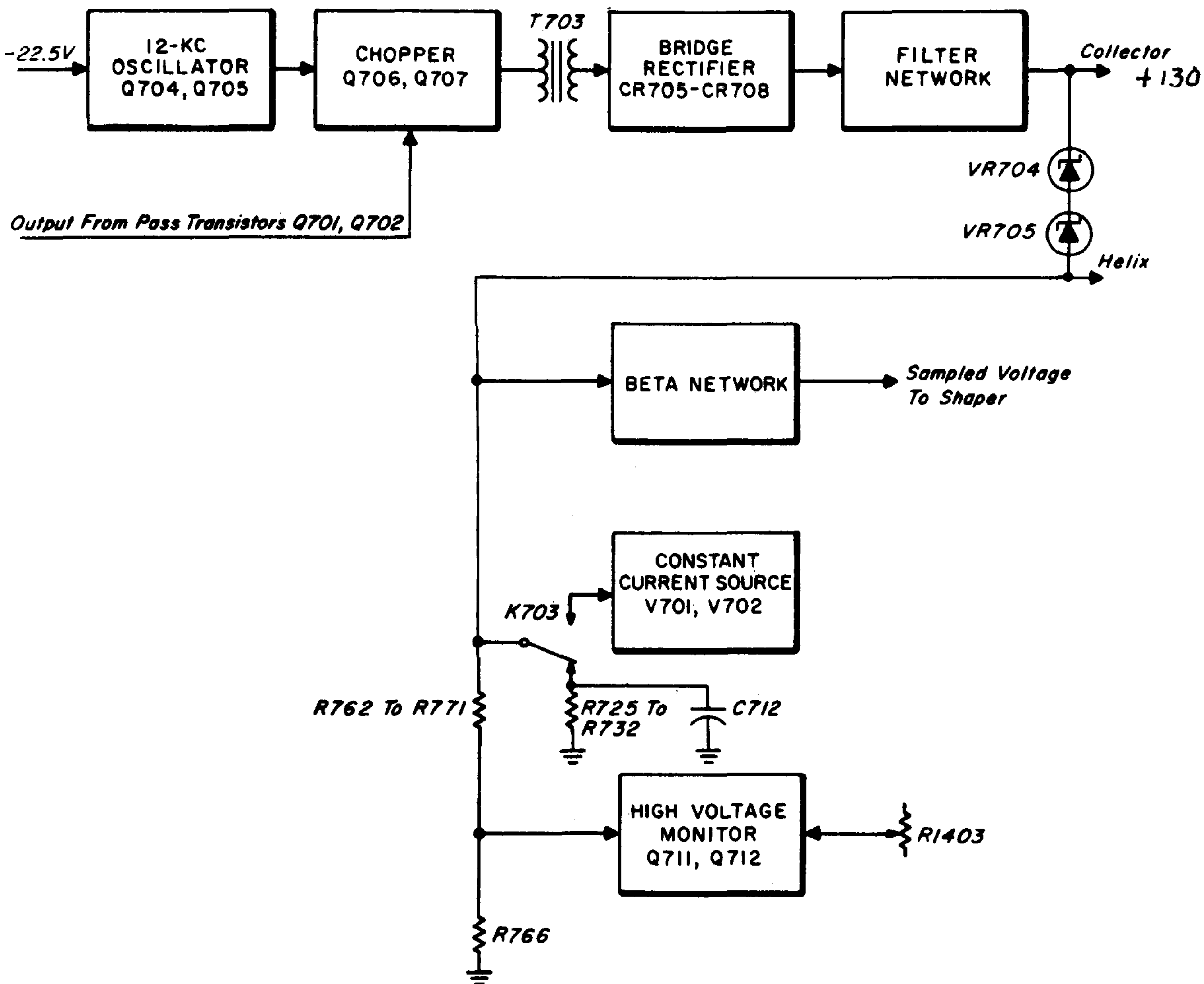


Figure 7. High-Voltage Circuits, Block Diagram

wave output from the -22.5 volt local supply. The square wave output is coupled to the bases of transistors Q706 and Q707. Since the inputs to these transistors are out of phase, one transistor is always switched on while the other is switched off. This electronic switching periodically interrupts the dc signal at the output of the pre-regulator. The chopped dc is coupled across step-up transformer T703, rectified by diodes CR705 through CR708, and applied through a twin-tee filter to the BWO. A sample of this output is applied to the Beta network as well as to the high-voltage monitor and to the constant current source.

The high-voltage monitor limits the upper level of the high voltage applied to the BWO. The circuit is a difference amplifier, the limiting level of which is preset by R1403 to a value equivalent to the upper-limit voltage of the BWO. When the high-voltage output tends to rise above this level, the comparator lowers the dc potential across R766, thus preventing an over-voltage application to the BWO.

V701 and V702 comprise a constant current source set at a nominal 10 ma. The function of these parallel tubes is to discharge the high voltage capacitors of the twin-tee filter. The circuit is operative in all the sweep positions of MODE selector S103. In the CW position, capacitor C712, in parallel with R725 - R732, is switched in and the constant current source is disconnected.

The Beta network samples the output of the high-voltage circuits so that any variations in the output voltage level can be detected. The sampling network consists of voltage-dropping resistors R1401 through R1410, the output of which is applied to the shaper in the RF Head.

Zener diodes VR704 and VR705 maintain the collector output at +130 volts with respect to the helix output. High-voltage diode CR1401, connected in the CW position of MODE selector S103, clamps the anode voltage to the helix voltage.

b. Shaper. The shaper (figure 8) adds an exponential component to the sampled high-voltage input from the Beta network. The shaper consists of a resistive network and shaping diodes CR1301 through CR1308. Bias for the shaping

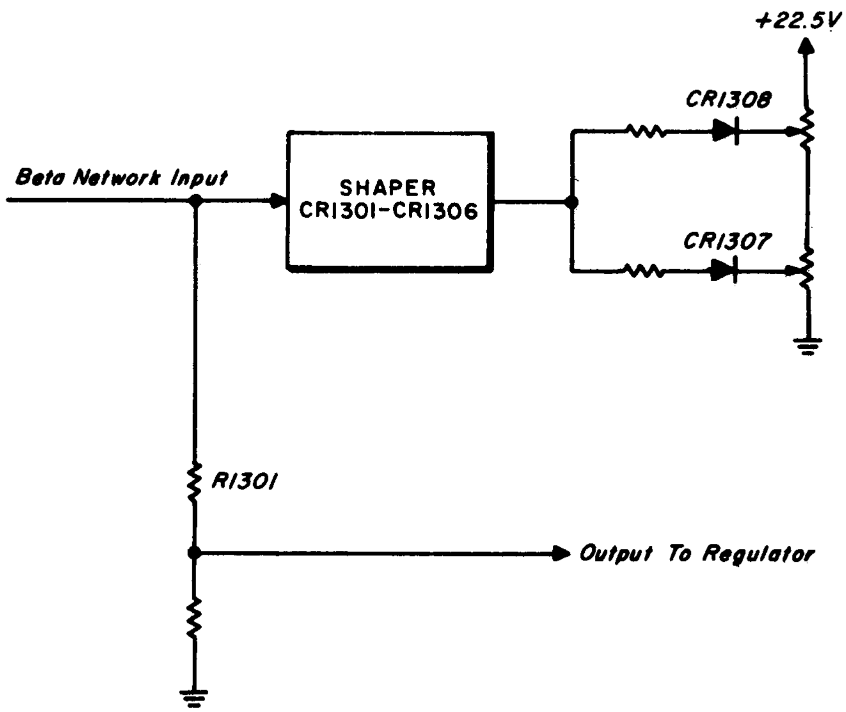


Figure 8. Shaper, Block Diagram

diodes is applied through resistors R1321 through R1311 from the +22.5-volt local supply. Since this bias is applied through a series network, bias for each of the diodes is progressively lower than the +22.5-volt input. The Beta input is applied to the shaping anodes through a parallel, resistive network. This means that all the anodes are at a constant level (for any Beta input), but the cathodes have a sequentially staggered bias. Thus, the number of diodes driven into conduction is a function of the Beta input.

At a low-level Beta input, the diodes are back biased and the Beta input appears across resistor R1301. Since the feedback attenuation is low, the change in slope of the Beta input is small. As the Beta amplitude increases, the number of diodes which conduct increases which tends to short out resistor R1301. Thus, as the Beta input amplitude increases, attenuation in the feedback circuit is proportionally increased, and the exponential slope becomes steeper.

c. Regulator. The regulator (figure 9) senses any difference that exists between the voltage level preset by the FREQUENCY - MC control and the actual high-voltage output level. A voltage is generated in response to this difference, and this voltage is applied as a corrective signal to pass transistors Q701 and Q702.

The exponential feedback from the shaper is added at the input of emitter follower Q515 to the reference voltage taken from the FREQUENCY - MC control. Since the inputs are of opposite polarity, a null indicates a balance of inputs. When one input exceeds the other, an output corresponding to these inputs is coupled through Q515 to amplifier Q512, Q513; the amplifier output, between -2 and -30 volts, is coupled through emitter follower Q511, dc amplifier Q509 and emitter Q508 to the pre-regulator. The BWO sweep signals are added at this point to the helix supply.

d. Pre-regulator. The pre-regulator (figure 10) maintains at a low level the voltage dropped across pass transistors Q701 and Q702. Thus, the power dissipated across these transistors is limited. At high-voltage levels, the power dissipated could burn out the transistors.

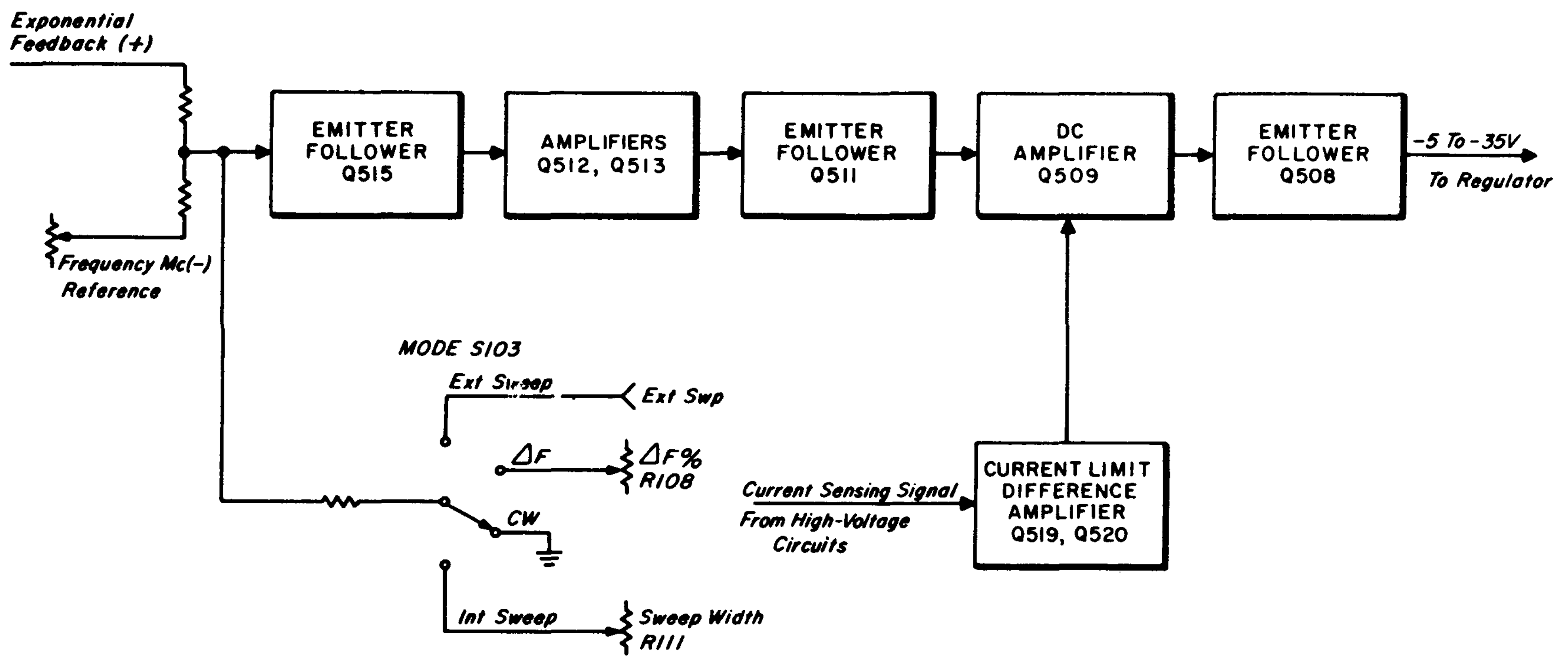


Figure 9. Regulator, Block Diagram

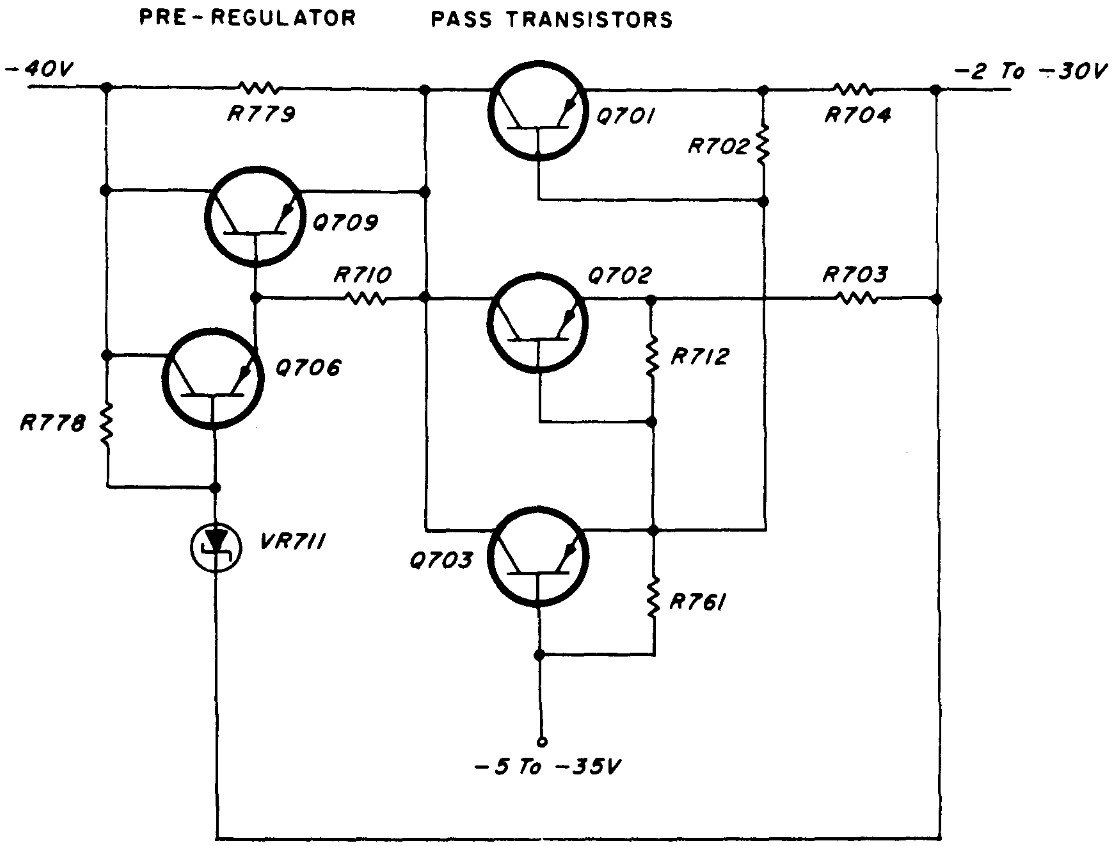


Figure 10. Pre-Regulator and Pass Transistors, Simplified Schematic

Since the base and emitter of Q709 are essentially at the same level (when the transistor acts as an emitter follower), zener diode VR711 is effectively across the collector and emitter of the pass transistors. The voltage dropped across these transistors, therefore, appears across the zener diode. Since the voltage dropped across the zener diode is 3.3 volts, the base and the emitter of the pre-regulator is held to a level 3.3 volts above that of the pass transistor output. This holds the collector-to-emitter voltage at 3.5 volts.

At the higher output voltage level, which corresponds to an approximate -30-volt error, the zener diode stops conducting and the Q709 base drops toward the -40-volt level. The transistor consequently saturates and the -40-volt input is applied directly to the collectors of the pass transistors. At the lower output voltage level, the zener diode conducts and Q709 acts like an emitter follower. Since there is a decrease in Q709 conduction, current is shunted through resistor R779.

The output voltage is controlled by the -5 to -35 volts applied from emitter follower Q508 of the regulator to the bases of the pass transistors. This output is filtered and applied to the high voltage converter circuits.

e. Sweep Generator. The sweep generator (figure 11) is a modified Miller integrator that provides the modulating signals to sweep the BWO around the preset FREQUENCY - MC setting. These modulating signals may either be the ΔF or the SWEEP WIDTH outputs which are, except for amplitude, identical.

The selected sweep rate capacitor is charged exponentially at a rate preset by SWEEP RATE ADJ control R114 to the level required to turn on comparator Q504. The comparator, in turn, fires multivibrator Q505, Q506 which discharges the selected SWEEP RATE capacitor and provides the blanking output.

The zener diode and the variable controls at the input to Q503 shift the dc level of the output sweeps.

5. Varactor Bias Supply

The varactor bias supply is a voltage divider consisting of VARACTOR BIAS ADJ R115 and resistor R117 connected across the -22.5-volt supply.

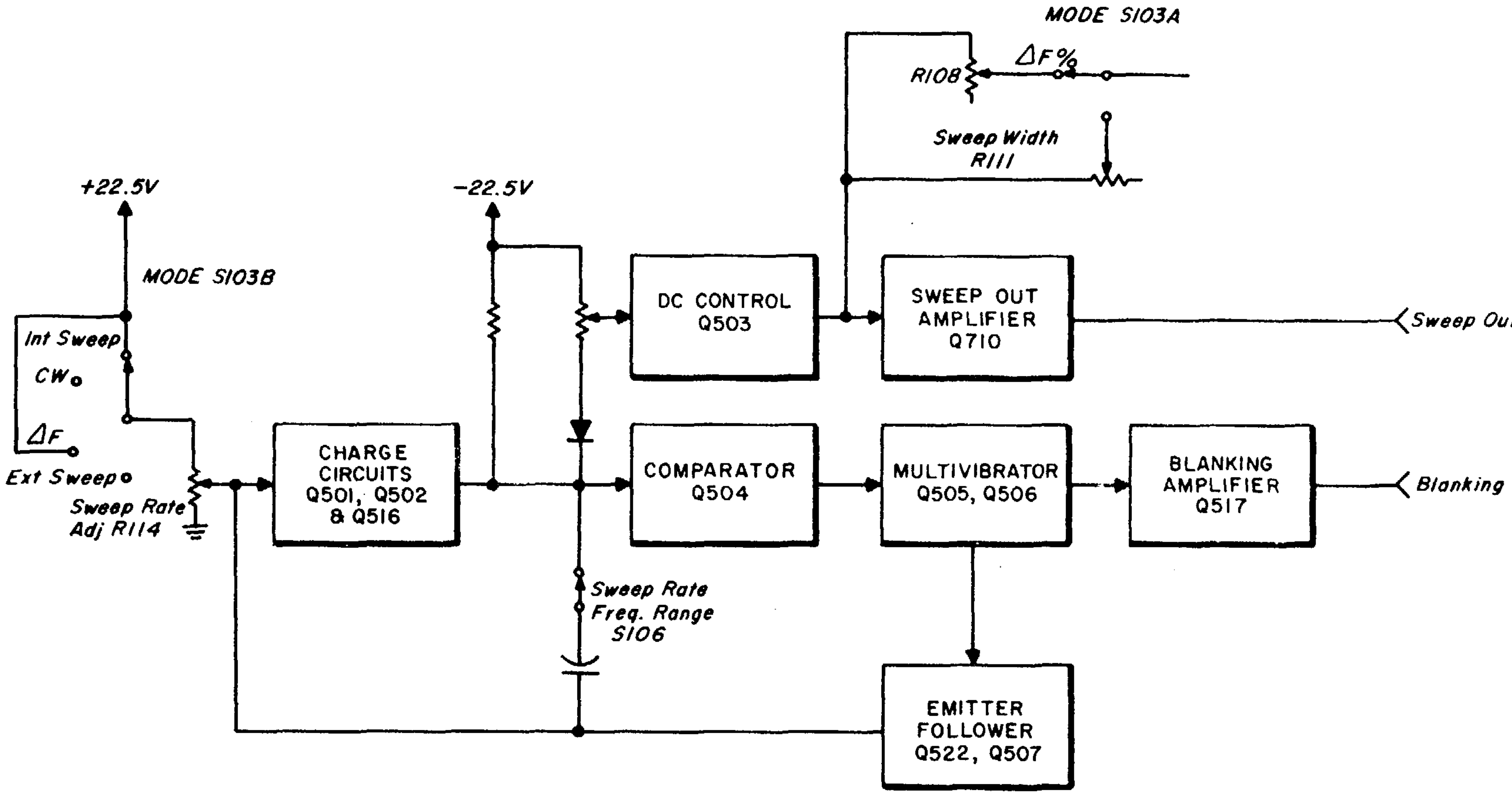


Figure 11. Sweep Generator, Block Diagram

SECTION III

OPERATION

A. PREPARATION FOR USE

Table 1 lists the frequency ranges covered by the RF Heads. Select the appropriate RF Head in accordance with the specific frequency requirements and plug it into the Signal Source.

B. OPERATING CONTROLS

All operating controls, indicators and connectors of the Signal Source are illustrated in figure 1. The operating controls of the Power Supply and of the RF Head are described in table 3.

Table 3

OPERATING CONTROLS, INDICATORS AND CONNECTORS

ITEM	FUNCTION
POWER SUPPLY	
AC POWER Switch	Controls application of primary power; in ON position, energizes power supply.
AC POWER Indicator	Lights when the AC POWER switch is set to ON.
3AG 3 AMP Fuse	Provides overload protection.
HI VOLT Switch	Controls operation of high-voltage supplies; in ON position, after a 90-second time delay, the helix and anode supplies are energized.
HI VOLT Indicator	Lights when high voltage supply is energized.

Table 3 (cont'd)

ITEM	FUNCTION
POWER SUPPLY (cont'd)	
MODE Selector	Selects the type of modulation for the RF Head. The selected modulation is added to the helix level preset by the RF Head FREQUENCY-MC control.
INT SWEEP	An internal-sweep signal is added to the preset helix voltage level. The BWO output is swept at a rate controlled by the SWEEP WIDTH and SWEEP RATE controls.
CW	The BWO output is a continuous wave.
∆ F	The helix voltage level is frequency modulated over a portion of its range. The amplitude of the helix swing about its preset value is controlled by the ∆ F% control.
EXT SWEEP	The helix may be swept over its entire range of 100 volts to 2,500 volts by means of an external sweep applied to the EXT SWEEP connector.
SWEEP WIDTH Control	Controls the BWO frequency sweep when MODE selector is at INT SWEEP.
SWEEP WIDTH Indicator	Indicates the frequency sweep of the BWO as controlled by the SWEEP WIDTH control.
SWEEP RATE FREQ RANGE-CPS Switch	Selects the rate at which the BWO is swept. It is used when the MODE selector is at INT SWEEP or ∆ F.
SWEEP RATE ADJ Control	Adjusts the BWO sweep rate within the range selected by the SWEEP RATE FREQ RANGE-CPS switch. It is used when the MODE selector is at INT SWEEP or ∆ F.
BLANKING Connector	Provides external blanking signal connection when the MODE selector is at INT SWEEP.
∆ F% Control	Is enabled by the MODE selector at ∆ F. When enabled, the control varies the amplitude of the helix modulation about its preset level. The amplitude of the swing corresponds to a percent of the BWO frequency continuously variable from 0 to 5%.

Table 3 (cont'd)

ITEM	FUNCTION
POWER SUPPLY (cont'd)	
SWP OUT Connector	Provides synch signal for external oscilloscope. It is used when the MODE Selector is in ΔF or INT SWEEP.
EXT SWP Connector	Provides connection for external sweep signal. It is used when the MODE Selector is at EXT SWEEP.
RF LEVEL SELECTOR Switch	Controls the rf power output of the BWO by selecting the leveling mode.
LEVEL XTAL	Selected when the rf detector is a crystal. The detector output, which is applied to the LEVEL IN connector, becomes progressively more positive as the rf power level increases.
LEVEL THERM	Selected when the rf detector is a thermistor. Functionally, this position is the same as the LEVEL XTAL position.
UNLEVEL	Selected for unleveled operation of signal source.
RF LEVEL - LEVEL ADJ Control	Controls the rf power output level.
LEVEL IN Connector	Used when the RF LEVEL SELECTOR switch is at LEVEL XTAL or at LEVEL THERM. The crystal rf detector or thermistor input is connected through this jack.
SQUARE WAVE SELECTOR Switch	Modulates BWO power about the level preset by the RF LEVEL - LEVEL ADJ control.
OFF	The anode supply is unmodulated.
ON	An 800 to 1200 cps square wave modulates the anode supply. The actual frequency is selected by the SQUARE WAVE FREQ control.
SQUARE WAVE FREQ Control	Provides modulating frequency adjustment between 800 cps and 1200 cps. Control is operative when SQUARE WAVE SELECTOR is set to ON.

Table 3 (cont'd)

ITEM	FUNCTION
POWER SUPPLY (cont'd)	
BIAS VOLTS ADJUST Control	Provides a preset bias of 0 to -6 volts for external varactor. The output to the varactor is taken at the BIAS VOLTS OUTPUT connector.
BIAS VOLTS OUTPUT Connector	Provides varactor bias output connection.
AFC Connector	Provides for AFC connection in series with the helix.
RF HEAD	
FREQUENCY - MC Counter	Provides a direct-reading indication of the BWO output frequency preset by the FREQUENCY - MC control.
FREQUENCY - MC Control	Controls the BWO output frequency.
RF OUT Connector	Provides connection for BWO rf output.
PHASE LOCK Connector	Provides connection for an rf output sample that is applied to the Tunable Synchronizer. The sample is used in the generation of a correction voltage that maintains the BWO frequency within close tolerances.

C. OPERATION

The operating procedures for the Power Supply consist of energizing the various supplies and setting the BWO frequency and power outputs. Certain precautions must be observed or damage to the equipment may result.

1. Preliminary Procedure

Perform the following procedures as a preliminary to operating the Power Supply:

a. Set the AC POWER switch, the HI VOLT switch and the SQUARE WAVE SELECTOR switch to their respective OFF positions; set the MODE selector to CW.

b. Connect the Power Supply to a 115 volt ac power source.

c. Plug in the appropriate RF Head. Select the RF Head from table 1.

d. Interconnect the RF Head and the Tunable Synchronizer as indicated in figure 12 or refer to the Tunable Synchronizer Instruction Manual.

e. Place the operating controls of the Tunable Synchronizer in the pre-operating positions. Refer to the Tunable Synchronizer Instruction Manual.

f. The signal source may be operated in an unleveled or in a leveled mode. For unleveled operation set the RF LEVEL SELECTOR switch to UNLEVEL and rotate the RF LEVEL - LEVEL ADJ control fully counterclockwise.

g. For leveled operation below 12.4 gc connect test setup shown in figure 13a. For operation above 12.4 gc connect test setup of figure 13b. Set the RF LEVEL SELECTOR switch to LEVEL XTAL or LEVEL THERM, as appropriate, and rotate the RF LEVEL - LEVEL ADJ control fully counterclockwise.

CAUTION

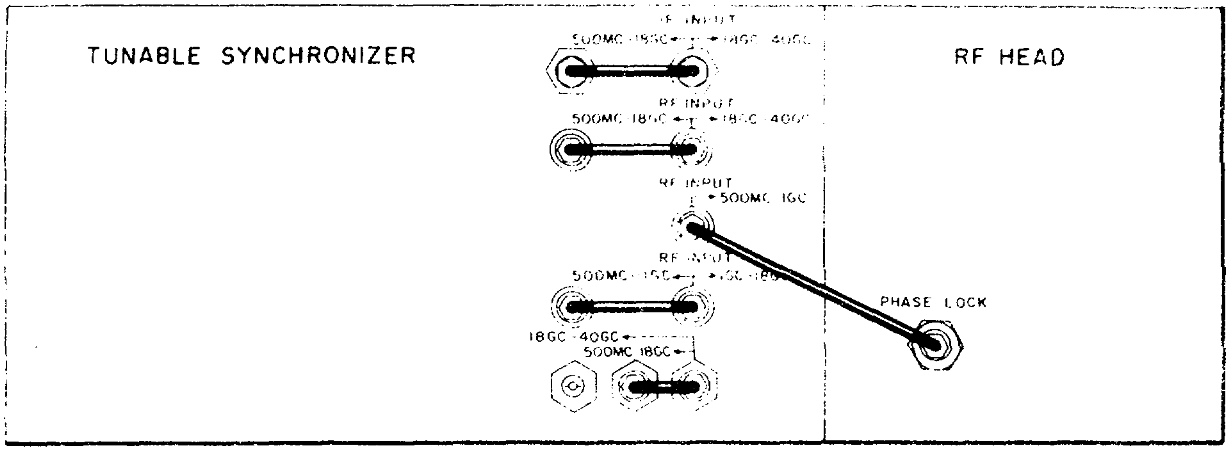
In order to prevent damage to any low-wattage device connected to the RF OUT connector, initially set the RF LEVEL - LEVEL ADJ control to the minimum power output level.

h. When using a varactor frequency multiplier in test setup, turn the BIAS VOLTS ADJUST control fully counterclockwise and connect BIAS VOLTS OUTPUT connector to varactor bias input.

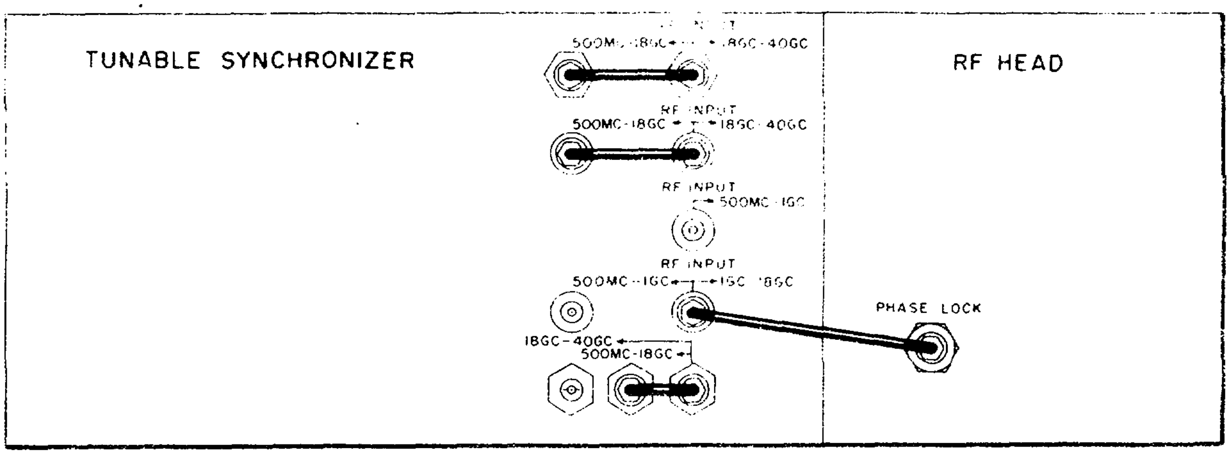
2. CW Operation

a. Set the AC POWER switch to ON. The AC POWER indicator on the Power Supply, as well as the LINE indicator on the Tunable Synchronizer should light.

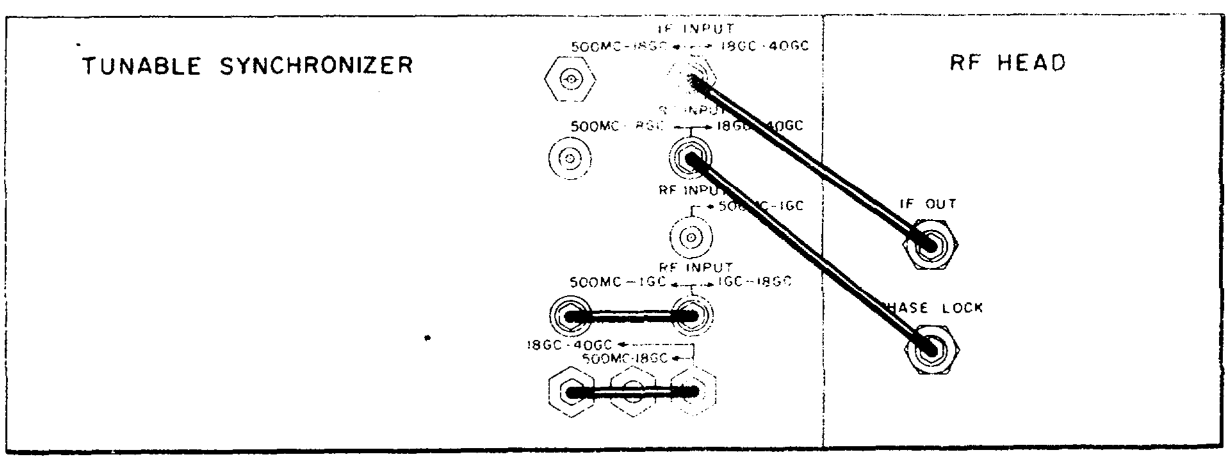
b. After approximately 90 seconds, set the HI VOLT switch to ON. The HI VOLT indicator should light.



A. INTERCONNECTION FOR 500 MC - 1 GC BAND OPERATION



B. INTERCONNECTION FOR 1 GC-18 GC BAND OPERATION



C. INTERCONNECTION FOR 18 GC-40 GC BAND OPERATION

Figure 12. Signal Source Interconnections

c. Rotate the FREQUENCY - MC control for the required BWO frequency indication on the FREQUENCY - MC counter.

d. Monitor the signal source with an appropriate power meter, as follows:

(1) For frequencies below 12.4 gc, substitute the power meter thermistor mount for the cable connector at the PHASE LOCK output of the RF Head, as shown in figure 13a.

(2) For frequencies above 12.4 gc, connect the power meter thermistor mount to the auxiliary arm of the second directional coupler, as shown in figure 13b.

e. To adjust the signal source output, rotate the RF LEVEL - LEVEL ADJ control clockwise to obtain the appropriate power output.

f. When applicable, advance the BIAS VOLTS ADJUST control for the required varactor bias.

3. <u>Δ F Operating Mode</u>

To operate the equipment in the Δ F mode, proceed as follows:

a. Perform all procedures given under CW operation, paragraph 4.

b. Set the MODE selector to Δ F. The BWO frequency will vary around a center frequency preset by the FREQUENCY - MC control.

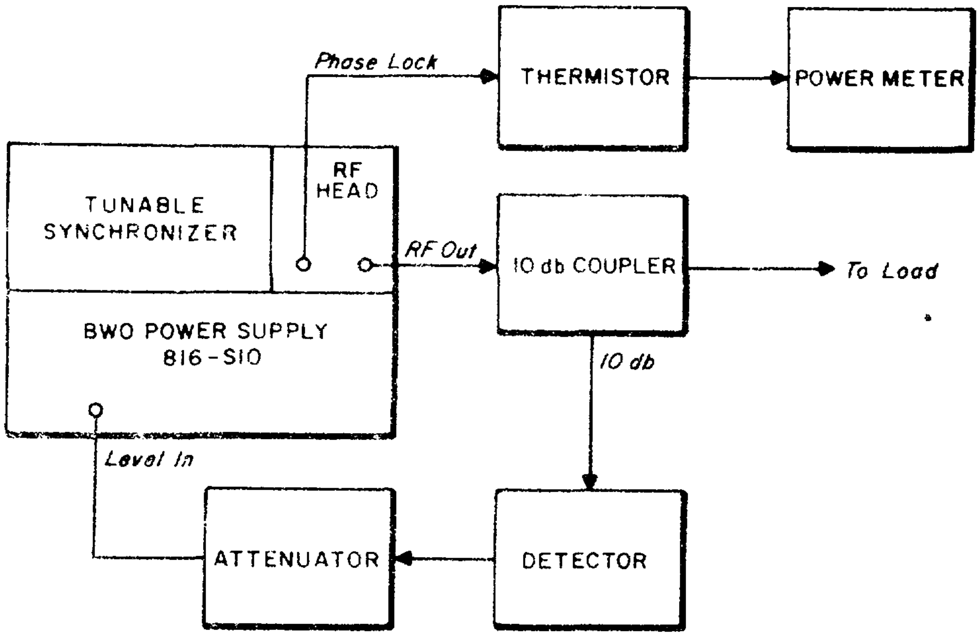
c. Rotate the Δ F% control for the desired frequency sweep between 0 and 5 percent.

d. If required, an external sweep signal for horizontal sweep circuits of an external oscilloscope can be obtained at the SWP OUT connector. Connect the jack to the appropriate terminals of an oscilloscope.

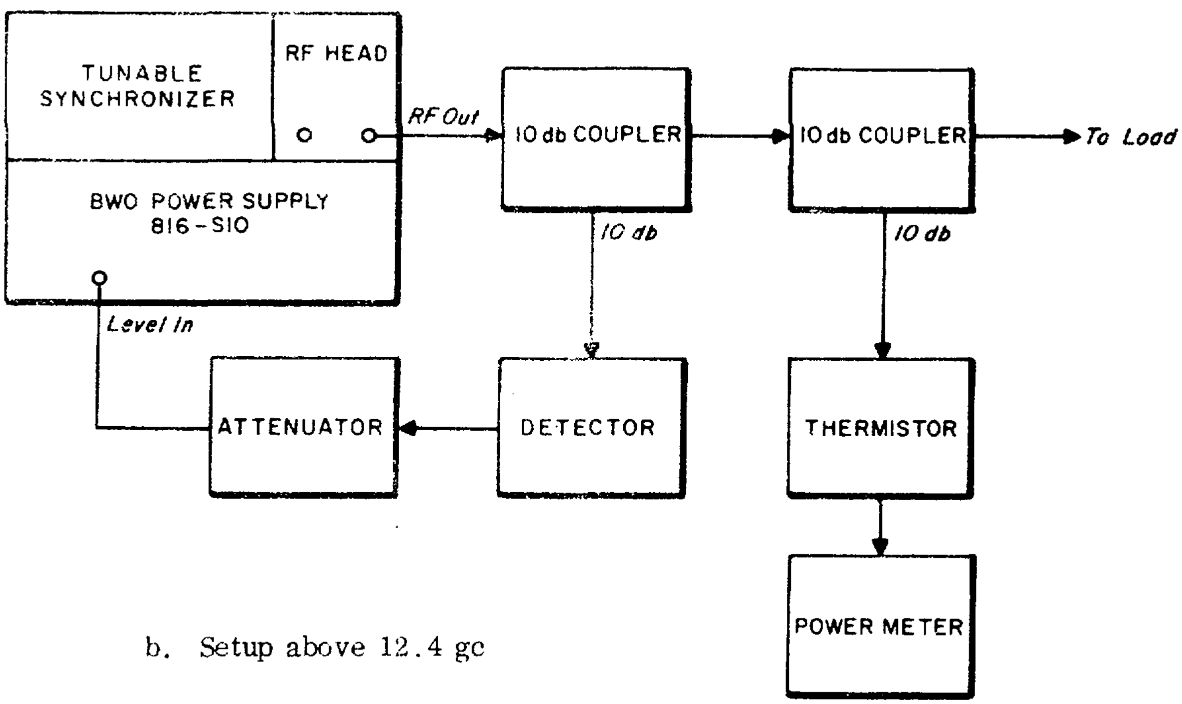
e. Set the SWEEP RATE control for the desired frequency.

NOTE

For the D F operating mode, set the Tunable Synchronizer OSCILLATOR SENSITIVITY control to LOCK OFF.



a. Setup below 12.4 gc



b. Setup above 12.4 gc

Figure 13. Signal Source, Test Setup for Leveled Operation

4. Internal Sweep Operating Mode

To operate the equipment in the internal sweep mode, proceed as follows:

a. Perform all procedures given under CW operation, paragraph 4.

b. Set the MODE selector to INT SWEEP.

c. Set the SWEEP WIDTH control for the desired frequency sweep.

d. Set the SWEEP RATE controls for the desired sweep rate.

e. If required, an external synch signal for horizontal sweep circuits of an oscilloscope can be obtained at the SWP OUT connector and a blanking signal can be obtained at the BLANKING connector. Connect the jacks to the appropriate terminals of an oscilloscope.

NOTE

For the internal sweep operating mode, set the Tunable Synchronizer OSCILLATOR SENSITIVITY control to LOCK OFF.

5. External Sweep Operating Mode

To operate the equipment in the external sweep operating mode, proceed as follows:

a. Perform all procedures given under CW operation, paragraph 4.

b. Set the MODE selector to EXT SWEEP.

c. Connect an external sweep source to the EXT SWP input connector. Set the output amplitude of the external sweep source as required either for a complete band sweep of the signal source or a portion of the band sweep.

NOTE

For the external sweep operating mode, set the Tunable Synchronizer OSCILLATOR SENSITIVITY control to LOCK OFF.

6. 800 to 1200 CPS Modulation Mode

To operate the equipment with a square wave modulation of 800 to 1200 cps, proceed as follows:

a. Perform all procedures given under paragraph 4, CW operation.

b. Set the SQUARE WAVE SELECTOR switch to ON and adjust the SQUARE WAVE FREQ control for the desired modulating frequency.

NOTE

For the 800 to 1200 cps modulation mode, set the Tunable Synchronizer OSCILLATOR SENSITIVITY control to LOCK OFF.

7. Shutdown Procedure

To shutdown the Power Supply, place the HI VOLT and AC POWER switches to their respective OFF positions.

SECTION IV

MAINTENANCE

A. PERIODIC MAINTENANCE

In addition to the normal cleaning and conventional inspection procedures performed on the PRD 816-S10 Power Supply and the associate RF Heads, the performance checks and adjustment procedures presented in this section should be performed periodically to ensure peak performance. After all the front panel controls have been operated to check the electrical and mechanical functioning of the equipment, perform a visual inspection of the internal components.

B. TEST EQUIPMENT REQUIRED FOR MAINTENANCE

The test equipment listed in table 4, or their equivalents, are required to perform the maintenance procedures described in this section.

Table 4

TEST EQUIPMENT REQUIRED FOR MAINTENANCE

EQUIPMENT	MANUFACTURER AND MODEL NUMBER
Differential Voltmeter	Fluke 801
Multimeter	Simpson 260
Oscilloscope	Tektronix RM561
Autotransformer, 5A	General Radio, variac
Insulated screwdriver	
Resistor, 20 Kohm, 2 watt	
Capacitor, 0.01 μf, 4 Kv	

C. PERFORMANCE CHECKS

The performance checks for the Power Supply are subdivided into an overall check, which ascertains the performance level of the entire equipment, and functional checks, which determine the operational status of each of the major blocks of the Power Supply.

1. Overall Check

A properly operating Power Supply is indicated by the adequate performance of the associated RF Head. The overall check consists of the verification of the BWO frequency limits, frequency spectrum, and rf power level.

a. Connect the equipment as indicated in figure 14.

b. Adjust the line voltage to 115 volts ac, by means of a variable power transformer.

c. Operate the equipment in the CW, unleveled operating mode.

d. Check the BWO frequency readout against the indication of the frequency meter. The BWO frequency and the meter indication must remain within a ± two percent tolerance over the complete frequency spectrum.

e. Rotate the RF LEVEL - LEVEL ADJ control clockwise until the power meter indicates the power output specified in table 1.

2. Functional Block Checks

The functional blocks to be checked are the anode, filament, helix, and local supplies, the square wave generator, and the RF Heads.

a. Power Supplies, Rated Output. Check the rated outputs of the various power supplies. It should be noted that the actual voltages depend on the RF Head in use. Voltage values are given in table 5.

(1) The anode supply should read from 0 to +200 volts. This indication is obtained in the unleveled mode as the RF LEVEL - LEVEL ADJ control is rotated throughout its range.

(2) The filament supply should read -6.3 volts ±5% at test point TP704.

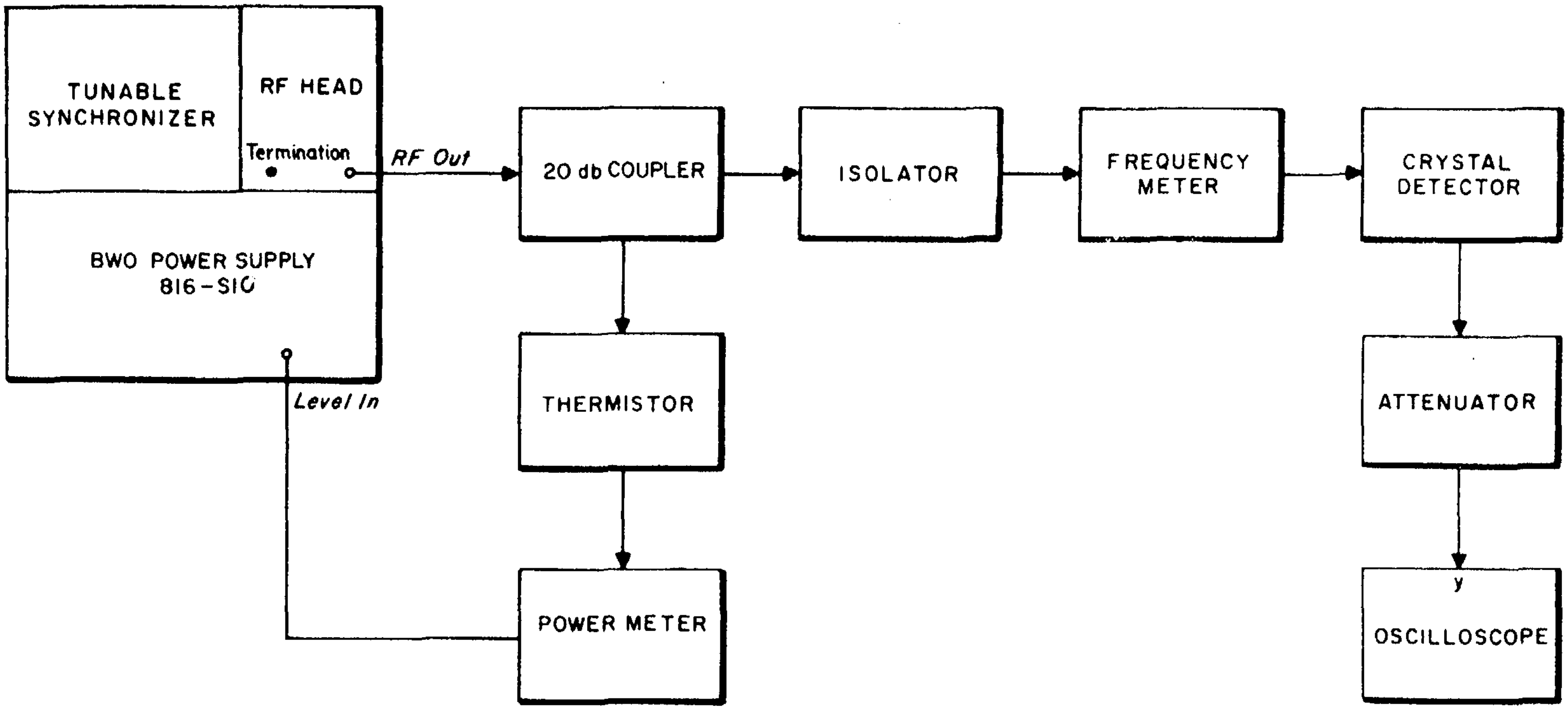


Figure 14. Test Setup for RF Head Alignment

Table 5

POWER SUPPLY VOLTAGE OUTPUTS

Power Supply	Output Voltage	Measured At
Anode	0 to +200 volts, as RF LEVEL - LEVEL ADJ control is rotated throughout its range.	J201, pins J and S
Filament	-6.3 volts ±5%	TP704
Helix	+100 to +2500 volts, as FREQUENCY - MC control is rotated throughout its range. Exact range depends on RF Head being used.	P701, pin 20
Collector	+130 volts above helix voltage. Measured with RF Head not plugged in.	P701, pin 23
Local	+22.5 volts ±50 mv -22.5 volts ±50 mv	J301, pins T and P J301, pins A and P

(3) The helix supply should read from +100 volts to +2500 volts. This indication is obtained as the FREQUENCY - MC control is rotated throughout its entire range.

(4) The collector supply should read +130 volts with respect to the helix voltage when the RF Head is not plugged in.

(5) The local supply should read -22.5 volts ±50 mv and +22.5 volts ±50 mv.

b. Power Supplies, Regulation. To check the regulation of the filament and local supplies, connect a variable power transformer between the primary power source and the ac power input of the Power Supply. Introduce a line voltage variation of ±10%. Monitor the filament supply at test point TP704, and the local supply between pins A and P, and T and P of J301. The voltages at each of the three test points should remain relatively constant: -6.3 volts ±2%, -22.5 volts ±0.1%, and +22.5 volts ±0.1%.

c. Square Wave Generator. Set the SQUARE WAVE SELECTOR to ON and monitor the square wave generator with an oscilloscope at pin W of J201. Check that a symmetrical square wave recurs between 800 and 1200 cps as the SQUARE WAVE FREQ control is rotated throughout its range.

d. RF Head. The simplest and most direct way to verify the operation of the RF Head is to replace the head and compare the operating characteristics. However, the previously described "Overall Check" should localize any trouble either in the BWO or the shaper circuits of the RF Head.

D. ADJUSTMENT PROCEDURES

Maintenance adjustments for the Power Supply are performed on the ±22.5 volt supplies, anode supply, square wave generator, sweep generator and regulator, the 12 kc oscillator, high-voltage filter, constant current source, and the RF Head. Plug in the appropriate RF Head, and set the line voltage to 115 volts ac by means of a variable power transformer. Internal views are given in figures 15 through 18 and schematic diagrams in figures 19 and 20.

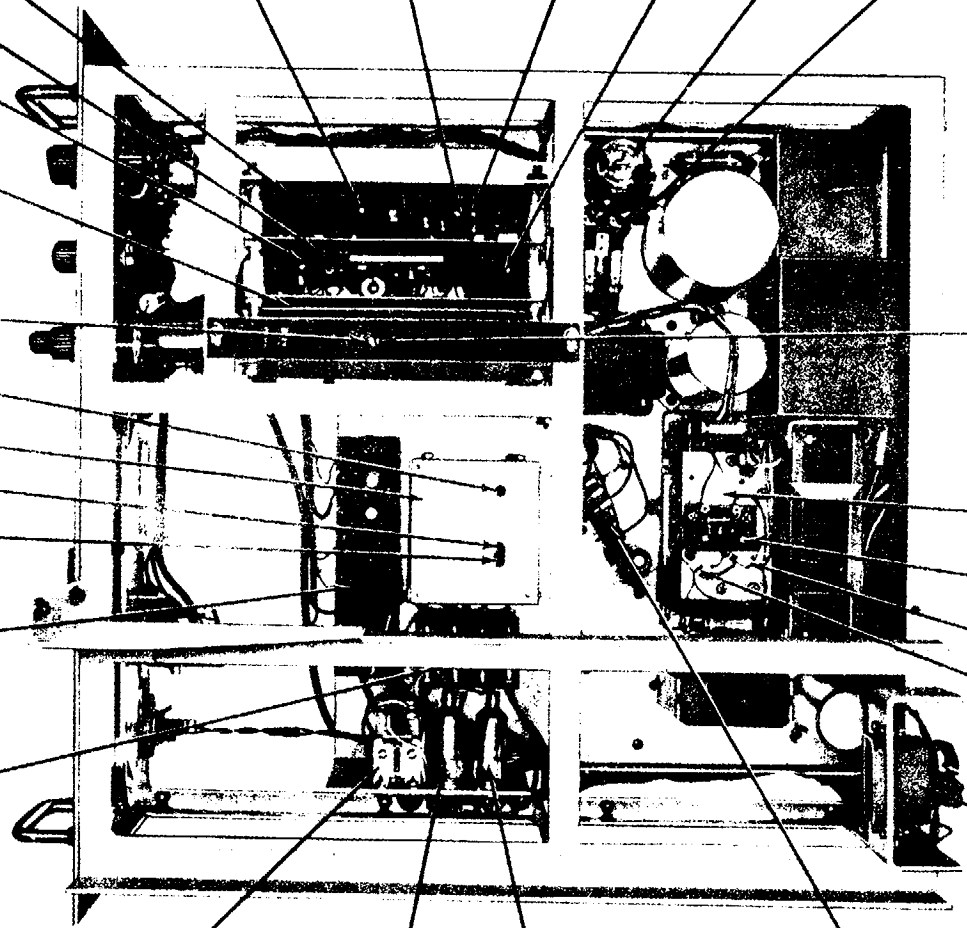


Figure 15. PRD 816-S10 Power Supply - Top View

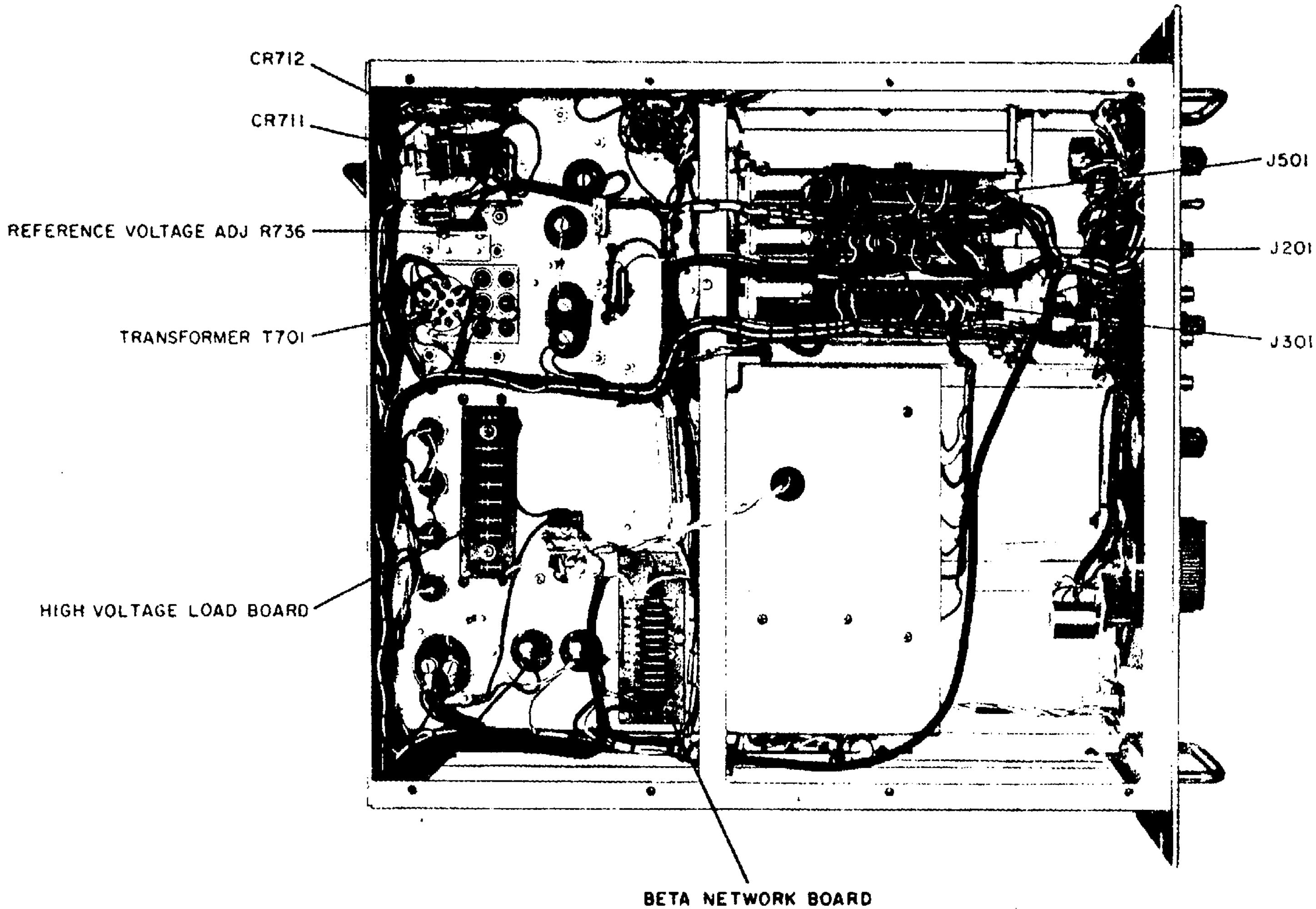


Figure 16. PRD 816-S10 Power Supply - Bottom View

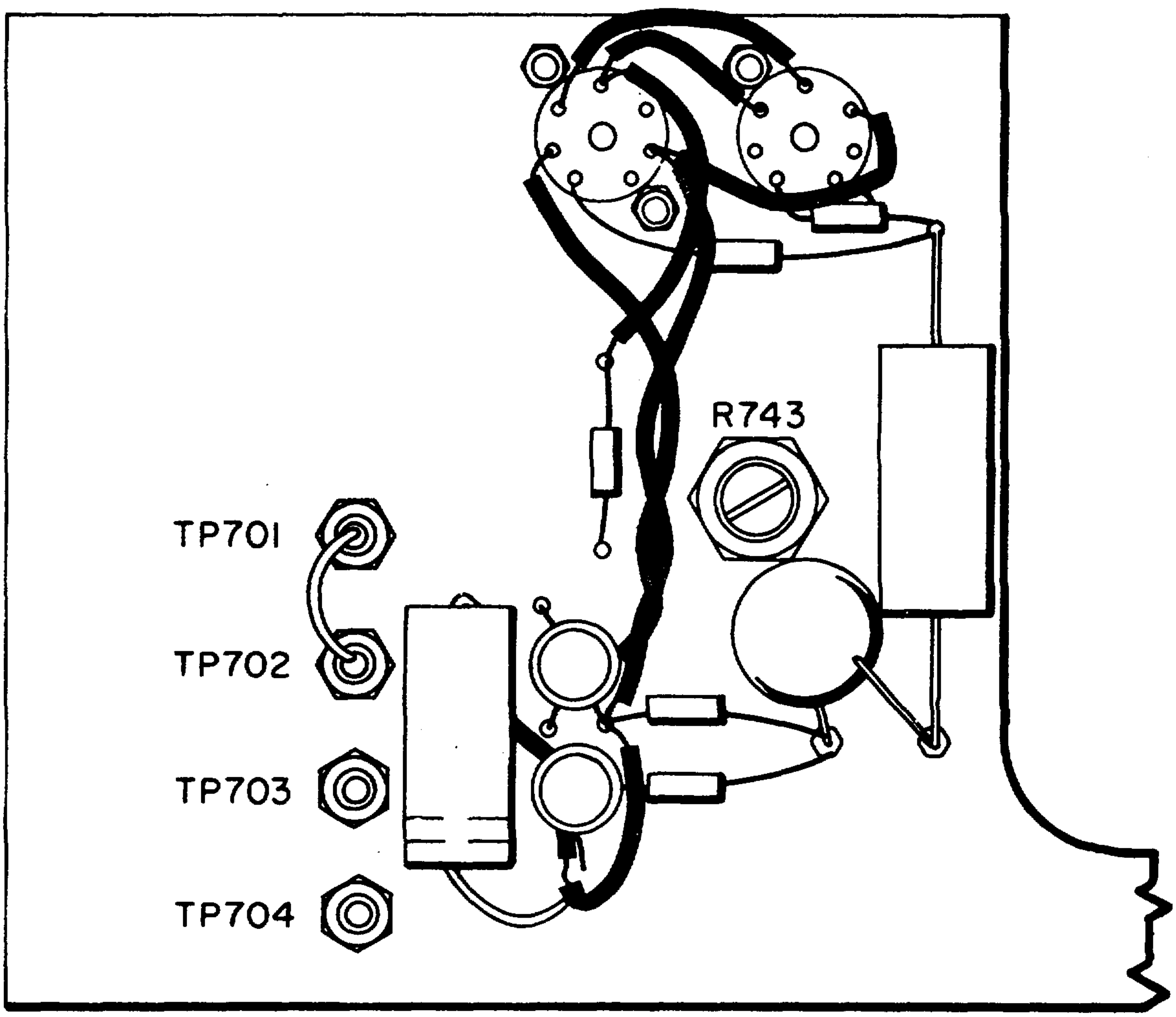


Figure 17. PRD 816-S10 Power Supply - Side View Showing Test Points

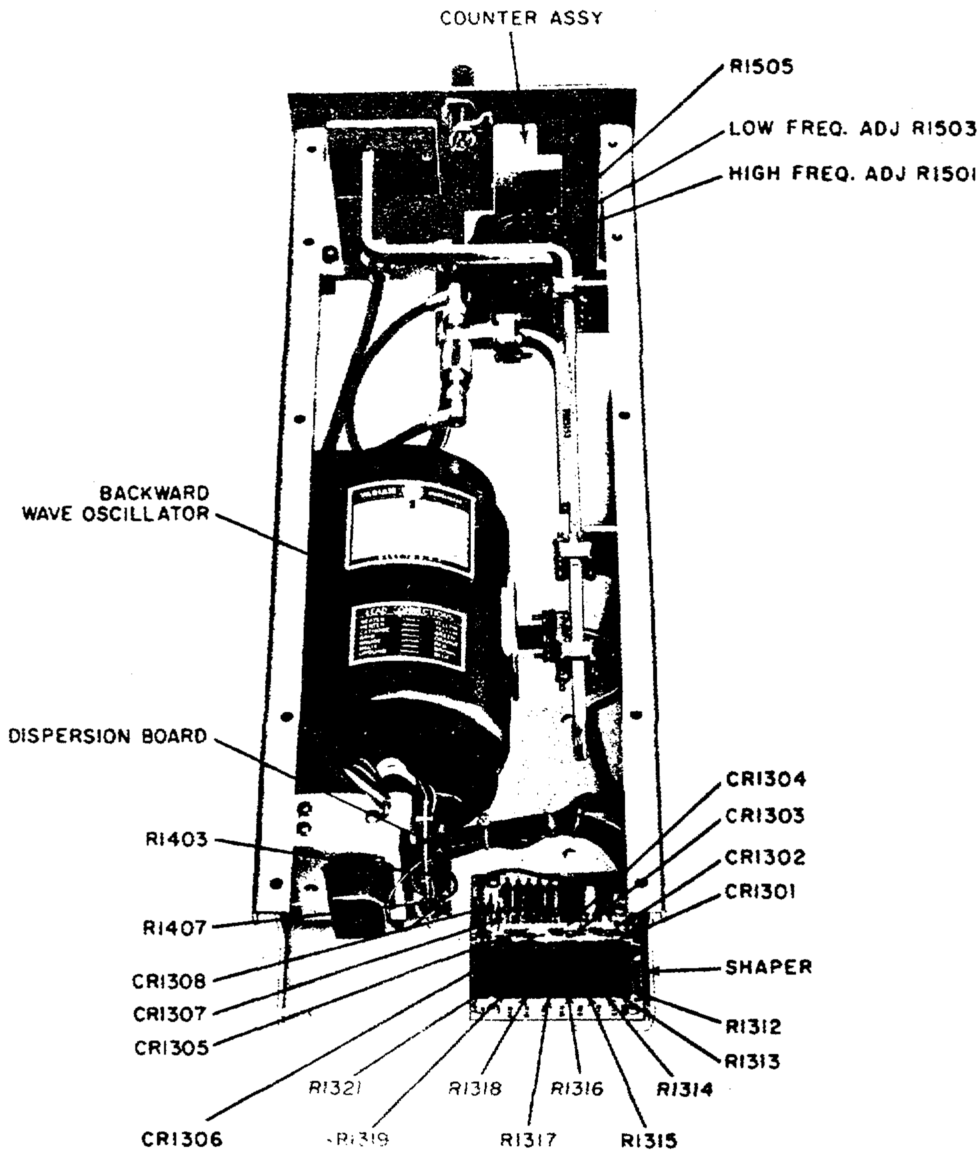


Figure 18. Typical RF Head - Internal View

1. Preliminary Procedure

   a. Remove the tunable synchronizer from the BWO power supply and connect together jacks E and J of the interconnecting cable. Insulate this connection.

   b. Remove the protective cover from the BWO power supply.

   c. Set the BWO switches and controls as follows:

      (1) AC power switch to OFF.

      (2) Hi voltage switch to OFF.

      (3) RF Level:

         Level Adj fully CCW.

         Selector unleveled.

      (4) SQUARE WAVE to OFF.

      (5) Sweep Rate:

         ADJ fully CCW.

         FREQ RANGE - CPS to 6-25.

   d. Install the BWO simulator.

   e. Connect the variable transformer between BWO power supply and maintain 115 volts ac.

2. ±2.5 Volt Supply Adjustment

Two separate adjustments are performed on the ±22.5-volt power supplies, one for the positive output and one for the negative output.

   a. Set the MODE selector to CW and set AC POWER switch to ON.

   b. Connect the digital voltmeter between pins A and P of J301.

   c. Adjust variable resistor R307 for a meter indication of -22.5 volts, ±50 millivolts.

d. Connect the voltmeter between pins T and P of J301.

e. Adjust variable resistor R315 for a meter indication of +22.5 volts, ±50 millivolts.

3. Filament Voltage Supply Measurement

a. Check that the FILAMENT VOLT meter on the BWO simulator indicates a voltage between 6.0 and 6.6 volts, as indicated on the digital voltmeter.

b. Place the BWO power supply AC POWER switch to the OFF position.

NOTE

Verify all BWO simulator readings with the digital voltmeter via test jacks on front panel of BWO simulator.

4. Sweep Regulator Board Adjustments

a. Remove the ANODE VOLTAGE SUPPLY board (figure 15) and connect the oscilloscope to pin A of J501 (figure 16).

b. Place the BWO power supply AC POWER switch to the ON position.

c. Set the BWO power supply MODE selector switch to INT SWEEP.

d. Adjust sweep zero adjust R508 and sweep amplitude R540 (figure 15) for a square-wave display of 8 volts peak-to-peak centered around zero volts.

e. Operate the SWEEP RATE controls and verify that the sweep range is from 0.03 to 25 cycles per second.

f. Connect the oscilloscope to BLANKING jack. The display should be a -20-volt rectangular wave coincident with the sweep output.

g. Set the SWEEP RATE controls on the BWO power supply for a sweep rate of 25 cycles per second.

h. Disconnect the oscilloscope and set the MODE selector switch on the BWO power supply to CW.

i. Connect the digital voltmeter to the REF and GROUND test points on the BWO simulator. Adjust R736 (figure 16) for a meter indication of -18.0, ±0.9 volts.

j. Connect the digital voltmeter to the HELIX CONTROL VOLT and GROUND test points on the BWO simulator. Adjust HELIX VOLT CONTROL on the BWO simulator for 0.450 volt ± .001 volt dc, if necessary, adjust R3, the HELIX LOW LIMIT ADJ potentiometer.

k. Set the HELIX LOAD control on the BWO simulator to HELIX ON and the HI VOLT switch on the BWO power supply to ON. The indications on the COLLECTOR VOLT meter should be 130 volts.

CAUTION

Before performing the following procedures, to avoid damaging the digital voltmeter, verify that the voltage at the HELIX VOLT test point on the BWO simulator is not excessively high.

l. Connect the digital voltmeter between the HELIX VOLT and GROUND test points on the BWO simulator. Adjust R548 (figure 15) for a meter indication of 35.0, ±1 volt.

m. Place the HI VOLT switch on the BWO power supply to OFF.

n. Disconnect the digital voltmeter and place the LOAD switch on the BWO simulator to NORM.

o. Place the HI VOLT switch on the BWO power supply to ON.

CAUTION

Use the high voltage probe provided with the digital voltmeter for the following check.

p. Using the HELIX VOLT CONTROL, check that the helix voltage may be adjusted up to 2,500 volts.

NOTE

If 2,500 volts cannot be obtained, adjust HELIX VOLT CONTROL and R121 on the rear of the BWO simulator for limiting at 2,500 volts.

q. Rotate the HELIX VOLT CONTROL fully counterclockwise. Place the HI VOLT and AC POWER switches on the BWO power supply to their respective OFF positions.

5. Anode Supply Balance Adjustments

a. Remove the key from J201, plug the extender board into J201, and plug the anode supply board into the extender board with its components side facing the right hand side of the BWO power supply.

b. Connect a jumper between pins B and C of P201. These points are accessible at R204 and R205. Refer to the power supply schematic (figure 19).

c. Place the BWO power supply MODE selector switch to CW, the RF LEVEL SELECTOR switch to UNLEVEL and rotate the RF LEVEL-LEVEL ADJ control fully counterclockwise.

d. Place the LOAD switch on the BWO simulator to the ANODE OFF position.

c. Set the AC POWER switch on the BWO power supply to ON. Allow sufficient time for the high voltage time delay relay to close, then set the HI VOLT switch to ON.

f. Connect the digital voltmeter across R203 (figure 15) on the anode supply board and adjust R203 for an indication of 0.0000 volt, ±0.2 millivolt.

g. Set the BWO power supply HI VOLT and AC POWER switches to OFF and disconnect the digital voltmeter leads and the short from the anode supply board.

h. Set the AC POWER switch on the BWO power supply to ON. Allow sufficient time for the high voltage time delay relay to close, then set the HI VOLT switch to ON.

i. Rotate the RF LEVEL-LEVEL ADJ control fully clockwise. The indication on the anode voltmeter should be between 200 and 211 volts.

j. Rotate the RF LEVEL-LEVEL ADJ control fully counterclockwise.

k. If the anode voltage is not within the values given in i above, set the-HI VOLTAGE and AC POWER switches to off and replace R228 (figure 19), with a decade box set to 432 ohms.

l. Set AC POWER switch to ON and allow sufficient time for the HI VOLTAGE time delay relay to close, then set HI VOLTAGE switch to ON.

m. Repeat i above and adjust decade box to the value of resistance required to obtain a maximum of 211 volts.

n. Repeat j above.

o. Set the BWO power supply HI VOLT and AC POWER switches to OFF and solder in a resistor having the value selected for R228.

p. Remove the anode supply board and extender from J201, replace the key in pin T of J201 and plug an anode board into J201.

q. Set the AC POWER switch on the BWO power supply to ON. Allow sufficient time for the high voltage time delay relay to close, then set the HI VOLT switch to ON.

r. Rotate the RF LEVEL-LEVEL ADJ control fully clockwise. The indication on the anode voltmeter should be between 200 and 211 volts.

s. Place the BWO power supply HI VOLT and AC POWER switches to their respective OFF positions.

6. <u>12-KC Oscillator Adjustment</u>

a. Connect the counter with 10X probe to the collector of Q705 (figure 15) on the converter chassis.

b. Place the BWO power supply AC POWER switch to ON.

c. Adjust R740 (figure 16) for a square-wave frequency of 12 kc ±125 cps.

d. If it was necessary to adjust R740 more than three turns, repeat 3 above, ±22.5 Volt Power Supply Adjustment.

7. <u>High-Voltage Filter Adjustment</u>

a. Connect the oscilloscope and 10X probe to the HELIX RIPPLE test point jack on the BWO simulator.

b. Place the BWO simulator LOAD switch in the NORM position.

CAUTION

Use the high voltage probe provided with the digital voltmeter for the following check.

c. Set the HI VOLT switch on the BWO power supply to ON. Adjust the HELIX VOLT CONTROL on the BWO simulator for an indication of 1,500 volts on the HELIX VOLT meter.

d. Adjust the oscilloscope time base so that the 12-k cps ripple voltage may be observed.

e. Adjust R601, R603, and R604 (figure 15) for minimum 12-k cps ripple. The ripple should be adjustable to less than 20 millivolts peak-to-peak.

f. Set the HI VOLT and AC POWER switches to OFF.

8. Constant Current Source Adjustment

a. Set the MODE selector to INT SWEEP.

b. Adjust the SWEEP RATE controls for one cycle.

c. With the HI VOLT switch turned OFF, remove the jumper between TP701 and TP702.

d. Connect a milliammeter (25 ma scale) between the test points.

e. Turn the HI VOLT switch to ON.

f. With an insulated screwdriver, adjust R743 for 10 ma.

g. Turn off the high voltage, remove the meter, and replace the jumper.

WARNING

The milliammeter floats at 1 to 2 kv during the constant current source adjustment procedure.

9. RF Head, Anode Current Limit Adjustment

a. Set up the Power Supply for CW unleveled operation.

b. Place a dc voltmeter to TP703.

c. Determine the anode voltage rating for the BWO in use from the label attached to the tube. Adjust trim pot R1505 so that the anode voltage cannot exceed the rated value.

10. RF Head, Helix Voltage Shaper Circuit Adjustment

The helix voltage is set by means of the FREQUENCY - MC control, a 10-turn pot geared to the linear frequency counter. The lower limit is adjusted by R1503 and the upper limit by R1501. The shaper circuit is adjusted to provide an exponential helix voltage which, in turn, will provide a linear frequency BWO output. The actual curve is reached by trial and error; a linear frequency output is the only indication of a proper adjustment. If the frequency of the RF Head signal output is not accurate to within ±2 percent over the frequency band of the BWO, perform the adjustments indicated below:

a. Connect equipment as indicated in figure 14.

b. Set up the Power Supply for CW, leveled operation. Make certain that the RF LEVEL - LEVEL ADJ control is set for the rated power output.

c. Set the FREQUENCY - MC control to the low end of the frequency band.

d. Measure the frequency of the RF Head output signal using the external frequency meter.

e. Adjust trim pot R1503 so that the measured frequency and the setting of the FREQUENCY - MC control correspond to within ±1 percent.

f. Set the FREQUENCY - MC control to the high end of the frequency band.

g. Measure the frequency of the RF Head output signal using the external frequency meter.

h. Adjust trim pot R1501 so that the measured frequency and the setting of the FREQUENCY - MC control correspond to within ±1 percent.

i. Since there is a degree of interaction between the two trim pots, repeat the procedures of steps c. through h. until the low and high ends of the frequency band are properly adjusted.

j. Divide the frequency band of the BWO into nine approximately equal intervals (ten test frequencies including the end points).

k. Set the FREQUENCY - MC control to the first test frequency above the low end of the frequency band.

l. Measure the frequency of the RF Head output signal using the external frequency meter.

m. Adjust trim pot R1312 so that the measured frequency and the setting of the FREQUENCY - MC control correspond to within ±1 percent.

n. Set the FREQUENCY - MC control to the next higher test frequency.

o. Measure the frequency of the RF Head output signal using the external frequency meter.

p. Adjust trim pot R1313 so that the measured frequency and the setting of the FREQUENCY - MC control correspond to within ±1 percent.

q. Repeat the procedures of steps k through p for trim pots R1314 through R1319, using the next higher test frequency for each trim pot.

r. Check the linearity of the BWO output from the minimum rated frequency to the maximum rated frequency. If the frequency readings are not linear, repeat the applicable steps of this procedure.

s. Repeat the procedure of step r. The BWO frequency output should be linear and within the rated frequency limits. If the entire frequency spectrum is more than ±2 percent beyond the rated frequency limits, adjust trim pot R1321, if the particular RF Head is so equipped.

11. RF Head, Dispersion Adjustment

a. Connect the equipment as indicated in figure 14. Operate the Power Supply in the CW, leveled mode.

b. Set MODE selector to INT SWEEP and the SWEEP WIDTH control for maximum bandwidth.

c. Set the FREQUENCY - MC control to the exact center frequency of the band.

d. Set the external frequency meter to the low end of the frequency band, and adjust R1407 until the marker appears at the start of the sweep.

e. Set the external frequency meter to the high end of the frequency band, and check that the marker appears at the end of the sweep. If necessary, readjust R1407.

12. RF Head, Helix Voltage Limit Adjustment

a. Retain test setup of figure 14. Operate the Power Supply in the CW, leveled mode.

b. Set MODE selector to INT SWEEP and the SWEEP WIDTH control for maximum bandwidth.

c. Set the FREQUENCY - MC control to the exact center frequency of the band.

d. Set the external frequency meter to the high end of the frequency band and adjust R1403 until the marker at the end of the sweep appears more than once.

e. Back off one complete turn on R1403.

SECTION V

REPLACEABLE PARTS

Table 7 of this section lists, by reference designation, all electrical parts contained within the PRD 816-S10 Power Supply, with a description of each part, the manufacturer's code number and the manufacturer's part number. The code number and name and address of each component manufacturer are given in table 6. See note on page 77.

TABLE 6

COMPONENT MANUFACTURERS

CODE	MANUFACTURER
00656	Aerovox Corp., New Bedford, Mass.
00853	Sangamo Electric Co., Pickens Division, Pickens, South Carolina
01121	Allen Bradley Co., Milwaukee, Wisconsin
01364	Allied Radio Corp., Chicago, Ill.
01963	Cherry Electrical Products Corp., Highland Park, Ill.
02660	Amphenol-Borg Electronics Corp., Maywood, Ill.
04713	Motorola Inc., Semi Conductor Products Div., Phoenix, Ariz.
09023	Cornell-Dubilier Electric Corp., Electrolytics and Paper Tubular Div., Sanford, North Carolina
09922	Burndy Corp., Norwalk, Conn.
12697	Clarostat Mfg. Co. Inc., Dover, New Hampshire
18726	Radio Corporation of America, Harrison, N.J.
37942	P.R. Mallory and Co., Inc., Indianapolis, Ind.
56289	Sprague Electric Company, North Adams, Mass.
63060	Victoreen Instrument Co., Inc., Cleveland, Ohio
70563	Amperite Co., Inc., Union City, N.J.
71450	CTS Corp., Elkhart, Indiana
71590	Centralab Division of Globe-Union Inc., Milwaukee, Wisc.
71785	Cinch Mfg. Co., and Howard B. Jones Div., Chicago, Ill.

TABLE 6 (Cont'd)

CODE	MANUFACTURER
72653	GC Electronic Mfg. Co., Rockford, Ill.
72765	Drake Mfg. Co., Chicago, Ill.
72825	Hugh H. Eby Co., Philadelphia, Pa.
72982	Erie Technological Products, Erie, Pennsylvania
73559	Carling Electric Inc., Hartford, Conn.
75042	International Resistance Co., Philadelphia, Pa.
75915	Littlefuse, Des Plaines, Ill.
77327	PRD Electronics, Inc., Westbury, N.Y.
80294	Bourns, Inc., Riverside, California
81312	Winchester Electronics Division, Litton Industries, Inc., Oakville, Conn.
82377	Rotron Mfg., Co., Inc., Woodstock, N.Y.
83330	Smith, Herman H., Inc., Brooklyn, N.Y.
83701	Electronic Devices, Yonkers, N.Y.
84171	Arco Electronics, Inc., Great Neck, N.Y.
84411	TRW Capacitor Division, Ogallala, Nebraska
91637	Dale Electronics, Inc., Columbus, Nebraska
99120	Plastic Capacitor, Inc., Chicago, Ill.
99378	Atlee Corp., Winchester, Mass.

TABLE 7

REPLACEABLE PARTS

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
B701	Fan	82877	Muffin Venture
C101	Capacitor, fixed, mylar, 0.1 mf, 400 Vdc	09023	WMF 4P1
C102	Capacitor, fixed, tantalum, 2.7 mf, 35 Vdc, ±10%	56289	150D275 X9035B2
C103	Capacitor, fixed, tantalum, 10 mf, 20 Vdc, ±10%	56289	150D106 X9020B2
C104	Capacitor, fixed, tantalum, 100 mf, 20 Vdc, ±10%	56289	150D107 X9020S2
C105	Capacitor, fixed, tantalum, 0.47 mf, 35 Vdc, ±10%	56289	150D474 X9035A2
C106	Capacitor, fixed, metallized paper, 1 mf, 200 Vdc	00656	P8292ZN13
C107	Capacitor, fixed, electrolytic, 1 mf, 10 Vdc	00656	PTT34
C201	Capacitor, fixed, electrolytic, 25 mf, 15 Vdc	00656	PTT69
C202	Capacitor, fixed, mylar, 0.03 mf, 100 Vdc, ±10%	84171	1DP-1-303
C203	Capacitor, fixed, mylar, 0.03 mf, 100 Vdc, ±10%	84171	1DP-1-303
C204	Capacitor, fixed, electrolytic, 1 mf, 50 Vdc	00656	PTT87
C205	Capacitor, fixed, electrolytic, 4 mf, 450 Vdc	09023	BR4-450
C206	Capacitor, fixed, mica, 50 mmf, 500 Vdc, ±5%	00853	D155E500
C207	Capacitor, fixed, electrolytic, 50 mf, 25 Vdc	00656	PTT85
C208	Capacitor, fixed, electrolytic, 50 mf, 25 Vdc	00656	PTT85

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
C209	Not Used		
C210	Capacitor, fixed, mica, 1200 mmf	09022	CM20B122M
C301	Capacitor, fixed, electrolytic, 500 mf, 50 Vdc	09023	BR500-50
C302	Capacitor, fixed, ceramic, 0.005 mf, 1000 Vdc ±20%	56289	5GA-D50
C303	Capacitor, fixed, electrolytic, 25 mf, 50 Vdc	00656	PTT95
C304	Capacitor, fixed, electrolytic, 100 mf, 50 Vdc	09023	BR100-50
C305	Capacitor, fixed, electrolytic, 100 mf, 50 Vdc	09023	BR100-50
C306	Capacitor, fixed, electrolytic, 250 mf, 50 Vdc	09023	BR250-50
C307	Capacitor, fixed, ceramic, 0.005 mf, 1000 Vdc, ±20%	56289	5GA-D50
C308	Capacitor, fixed, electrolytic, 25 mf, 50 Vdc	00656	PTT95
C309	Capacitor, fixed, electrolytic, 20 mf, 50 Vdc	00656	PTT94
C501	Capacitor, fixed, electrolytic, 10 mf, 50 Vdc	00656	PTT92
C502	Capacitor, fixed, electrolytic, 10 mf, 50 Vdc	00656	PTT92
C503	Not Used		
C504	Capacitor, fixed, ceramic, 0.03 mf, 50 Vdc	56289	TG-S30
C505	Capacitor, fixed, mylar, 0.22 mf, 100 Vdc, 10%	09023	WMF 1P22
C506	Not Used		
C507	Capacitor, fixed, electrolytic, 25 mf, 50 Vdc	00656	PTT95
C508	Capacitor, fixed, ceramic, 0.02 mf, 500 Vdc	56289	5HK-S20
C509	Not Used		
C510	Capacitor, fixed, electrolytic, 10 mf, 25 Vdc	56289	89D174

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
C511	Capacitor, fixed, electrolytic, 50 mf, 25 Vdc	00656	BCD25050
C512	Not Used		
C513	Capacitor, fixed, tantalum, 0.33 mf, 35 Vdc, ±10%	56289	150D334 X9035A2
C514	Not Used		
C515	Not Used		
C516	Capacitor, fixed, tantalum, 27 mf, 10 Vdc ±10%	56289	150D276 X9010B2
C517	Capacitor, fixed, ceramic, 0.02 mf, 500 Vdc	56289	5HK-S20
C518	Not Used		
C519	Not Used		
C520	Capacitor, fixed, mylar, 0.01 mf, 100 Vdc, ±10%	09023	WMF 1S1
C601	Capacitor, fixed, film, 0.005 mf, 4000 Vdc	99120	OF40-502
C602	Capacitor, fixed, film, 0.013 mf, 4000 Vdc	99120	OF40-133
C603	Capacitor, fixed, film, 0.026 mf, 4000 Vdc	99120	OF40-263
C604	Capacitor, fixed, film, 0.013 mf, 4000 Vdc	99120	OF40-133
C605	Capacitor, fixed, mica, 0.016 mf, 500 Vdc	00853	D305E163J03
C606	Capacitor, fixed, mica, 0.0012 mf, 500 Vdc	00853	D195E122J03
C607	Capacitor, fixed, film, 0.007 mf, 4000 Vdc	99120	OF40-702
C701	Capacitor, fixed, electrolytic, 4000 mf, 50 Vdc	00853	DCM539- 2741-01
C702	Capacitor, fixed, electrolytic, 10,000 mf, 50 Vdc	00853	DCM539- 2650-01

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER CODE	MANUFACTURER PART NO.
C703	Capacitor, fixed, electrolytic, 10 mf, 50 Vdc	00656	PTT92
C704	Capacitor, fixed, mylar, 0.22 mf, 100 Vdc	09023	WMF-1P22
C705	Capacitor, fixed, mylar, 0.22 mf, 100 Vdc	09023	WMF-1P22
C706	Capacitor, fixed, electrolytic, 250 mf, 50 Vdc	09023	BR250-50
C707	Capacitor, fixed, ceramic, 0.005 mf, 3000 Vdc ±20%	71590	DD30-502
C708	Capacitor, fixed, electrolytic, 10 mf, 50 Vdc	00656	PTT92
C709	Not Used		
C710	Not Used		
C711	Capacitor, fixed, mylar, 0.22 mf, 100 Vdc	09023	WMF-1P22
C712	Capacitor, fixed, film, 1 mf, 3000 Vdc,-10% +207%	99120	EP30-105A
C713	Not Used		
C714	Capacitor, fixed, electrolytic, 10 mf, 50 Vdc	00656	PTT
C715	Capacitor, fixed, electrolytic, 10 mf, 50 Vdc	00656	PTT
C716	Capacitor, fixed, electrolytic, 10 mf, 50 Vdc	00656	PTT
C717	Capacitor, fixed, electrolytic, 8000 mf, 15 Vdc	00853	DCM539-2534-01
C718	Not Used		
C719	Capacitor, fixed, ceramic, 0.004 mf, 4000 Vdc	72982	3828
C720	Capacitor, fixed, electrolytic, 4 mf, 250 Vdc	09023	BR4-250
C721	Capacitor, fixed, mylar, 0.1 mf, 100 Vdc, ±10%	84411	X663F1049 W1
C722	Capacitor, fixed, mylar, 1 mf, 200 Vdc, ±10%	84411	X663F1059 W2

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
C1101	Capacitor, fixed, electrolytic, 500 mf, 12 Vdc	09023	BR500-12
C1401	Capacitor, fixed, ceramic, 0.001 mf, 3000 Vdc, ±20	71590	DD30-102
C1402	Capacitor, fixed, ceramic, 68 mmf, 3000 Vdc, ±20%	00656	HVD-30
CR201	Diode		1N662
CR202	Not Used		
CR203	Not Used		
CR204	Diode, full wave bridge	37942	FW400
CR205	Diode, full wave bridge	37942	FW400
CR206	Diode, full wave bridge	37942	FW400
CR207	Diode, full wave bridge	37942	FW400
CR301	Diode, silicon rectifier		1N538
CR302	Diode, silicon rectifier		1N538
CR303	Diode, silicon rectifier		1N538
CR304	Diode, silicon rectifier		1N538
CR501	Not Used		
CR502	Diode, germanium		1N198
CR503	Diode, silicon		1N457
CR504	Diode, silicon		1N457
CR505	Not Used		
CR506	Diode, silicon		1N457
CR507	Not Used		
CR508	Diode, silicon		1N457

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
CR509	Diode, silicon		1N457
CR510	Diode, silicon		1N457
CR511	Diode, silicon		1N457
CR512	Diode, silicon		1N457
CR513	Diode, germanium		1N198
CR514	Diode, germanium		1N191
CR701	Diode, silicon	04713	1N3210
CR702	Diode, silicon	04713	1N3210
CR703	Diode, silicon	04713	1N3210
CR704	Diode, silicon	04713	1N3210
CR705	Diode, silicon	83701	EJ450
CR706	Diode, silicon	83701	EJ450
CR707	Diode, silicon	83701	EJ450
CR708	Diode, silicon	83701	EJ450
CR709	Not Used		
CR710	Not Used		
CR711	Diode, silicon rectifier		1N538
CR712	Diode, silicon rectifier		1N538
CR713	Diode, silicon rectifier		1N538
CR1101	Diode, silicon rectifier	04713	MR1030B
CR1102	Diode, silicon rectifier	04713	MR1030B
CR1103	Diode, silicon rectifier	04713	MR1030B

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER CODE	MANUFACTURER PART NO.
CR1104	Diode, silicon rectifier	04713	MR1030B
CR1401	Diode, silicon	83701	EH350
DS101	Pilot light, ac power	72765	HR116-604
DS102	Pilot light. H.V.	72765	14-116-604
F101	Fuse, 3 amp	75915	3AG
F701	Fuse, 3 amp, slow blow	75915	3AG
F702	Fuse, 1/100 amp, slow blow	75915	3AG
F703	Fuse, 1/32 amp, slow blow	75915	3AG
J101	Jack, phone	72653	33702-BU
J102	Connector, BNC		UG-625/U
J103	Connector, BNC		UG-625/U
J104	Connector, BNC		UG-625/U
J105	Connector, BNC		UG-625/U
J106	Connector, BNC		UG-625/U
J201	Connector, printed circuit, 22 pin polarized	02660	143-022-01
J301	Connector, printed circuit, 22 pin polarized	02660	143-022-01
J501	Connector, printed circuit, 44 pin polarized	71785	251-22-30-160
J701	Connector, rack and panel type, 43 pin polarized	09922	ME43R-2
K701	Relay, thermal, delay, 90 sec	70563	115N090

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
K702	Relay, 2 pole, 2 position, 115 Vac 60 cycle	73949	64OU-1C(4) 1C(1)
K703	Relay	77327	83574000
L601	Inductor, toroidal, miniature, 10 mh	00348	QKL10-F
L602	Inductor, toroidal, miniature, 10 mh	00348	QKL10-F
L603	Choke, RF, ferrite core, 10 mh	76493	6306
L701	Choke, filter, 0.046 mh, 2.58 amps, 0.72 ohms	09349	CA 87FL-19
L702	Choke, filter, 50 mh, 8 amps	04213	CD 6116-2
L703	Choke, filter, 20 mh, 8 amps	04213	CD 6116-1
L704	Choke, shielded, 47 mh	76493	9240-728
L705	Choke, RF, 150 mh, ±10%	76493	9350-12
L706	Not Used		
L707	Not Used		
Q201[1]	Transistor		2N1711
Q202[1]	Transistor		2N1711
Q203	Transistor		2N1711
Q204	Transistor		2N1711
Q205	Transistor	18726	2N3439
Q206	Transistor		2N3439
Q207	Transistor		2N1711
Q208	Transistor		2N1711

[1] To be matched within 5% for h_{fe} at 0.5 ma collector current.

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
Q301	Transistor, power, germanium		2N555
Q302	Transistor, germanium		2N1377
Q303	Transistor, germanium		2N1377
Q304	Transistor, germanium		2N1377
Q305	Transistor, germanium		2N1183
Q306	Transistor, germanium		2N1377
Q501	Transistor, silicon	18726	2N1711
Q502	Transistor, silicon	18726	2N1711
Q503	Transistor, germanium		2N3906
Q504	Transistor, germanium		2N1377
Q505	Transistor, germanium		2N1377
Q506	Transistor, germanium		2N1377
Q507	Transistor, germanium		2N1377
Q508	Transistor, germanium		2N1377
Q509	Transistor, germanium		2N1377
Q510	Transistor, silicon	18726	2N1711
Q511	Transistor, silicon	18726	2N1711
Q512	Transistor, silicon	18726	2N1711
Q513	Transistor, silicon	18726	2N1711
Q514	Not Used		
Q515	Transistor, silicon	18726	2N1711
Q516	Transistor, germanium		2N1308

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
Q517	Transistor, silicon		2N3906
Q518	Not Used		
Q519	Transistor, germanium		2N1377
Q520	Transistor, germanium		2N1377
Q521	Not Used		
Q522	Transistor, germanium		2N1377
Q701	Transistor, germanium	04713	2N1546
Q702	Transistor, germanium	04713	2N1546
Q703	Transistor, germanium		2N1184
Q704	Transistor, germanium		2N1183A
Q705	Transistor, germanium		2N1183A
Q706	Transistor, germanium		2N1907
Q707	Transistor, germanium		2N1907
Q708	Transistor, germanium		2N1377
Q709	Transistor, germanium	04713	2N1546
Q710	Transistor, germanium		2N3906
Q711	Transistor, silicon		2N1711
Q712	Transistor, silicon		2N1711
Q1101	Transistor		2N1546
R101	Resistor, fixed, film, 22,000 ohms ±2%, 1/2 w		RL20S223G
R102	Resistor, variable, part of switch S104, 1K	77327	83598400
R103	Resistor, fixed, film, 2 megohm, ±1%, 1/2 w		RN20X2004F

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
R104	Resistor, fixed, film, 22,000 ohms, ±2%, 1/2 w		RL20S223G
R105	Resistor, fixed, composition, 180,000 ohms, ±10%, 1/2 w		RC20GF184K
R106	Resistor, fixed, film, 100,000 ohms, ±2%, 1/2 w		RL20S104G
R107	Resistor, fixed, film, 1,000 ohms, ±2%, 1/2 w		RL20S102G
R108	Resistor, variable, wirewound, 500 ohms, ±10%, 2w	71450	252
R109	Resistor, fixed, film, 22,100 ohms, ±1%, 1/2 w		RN20X2212F
R110	Resistor, fixed, film, 22,100 ohms, ±1%, 1/2 w		RN20X2212F
R111	Resistor, variable, wirewound, 10 turns, 1000 ohms	80294	3500S-1-102
R112	Resistor, fixed, film, 120,000 ohms, ±2%, 1/2 w		RL20S124G
R113	Resistor, variable, part of switch S105, 10K	77327	83598900
R114	Resistor, variable, part of switch S106, 1K	77327	83598600
R115	Resistor, variable, wirewound, 5,000 ohms, ±10%, 2 w	71450	RA20NASD 502A
R116	Resistor, fixed, composition, 150 ohms, ±10%, 1/2 w		RC20GF151K
R117	Resistor, fixed, film, 2,200 ohms, ±2%, 1/2 w		RL20S222G
R118	Resistor, fixed, film, 13,000 ohms, ±2%, 1/2 w		RL20S133G
R119	Resistor, fixed, film, 100,000 ohms, ±2%, 1/2 w		RL20S104G
R120	Resistor, fixed, film, 33,000 ohms, ±2%, 1/2 w		RL20S333G
R121	Resistor, fixed, composition, 10,000 ohms, ±10% 1/2 w		RC20GF103K

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER CODE	MANUFACTURER PART NO.
R122	Resistor, fixed, composition, 620 ohms, ±5%, 1/2 w		RC20GF621J
R123	Resistor, fixed, film, 1000 ohms, +2%, 1/2 w		RL20S102G
R201	Resistor, fixed, film, 15,000 ohms, ±5%, 1/2 w		RL20AD153J
R202	Resistor, fixed, film, 22,000 ohms, ±5%, 1/2 w		RL20AD223J
R203	Resistor, variable, wirewound, 100 ohms, ±10%, 1/2 w	80294	3067P-1-101
R204	Resistor, fixed, film, 4700 ohms, ±5%, 1/2 w		RL20AD472J
R205	Resistor, fixed, film, 1200 ohms, ±5%, 1/2 w		RL20AD122J
R206	Resistor, fixed, film, 18,000 ohms, ±5%, 1/2 w		RL20S183J
R207	Resistor, fixed, film, 18,000 ohms, ±5%, 1/2 w		RL20S183J
R208	Resistor, fixed, composition, 10,000 ohms, ±10%, 1/2 w		RC20GF103K
R209	Resistor, fixed, composition, 10,000 ohms, ±10%, 1/2 w		RC20GF103K
R210	Resistor, fixed, film, 56,000 ohms, ±5%, 1/2 w		RL20S563J
R211	Resistor, variable, wirewound, 5000 ohms, ±10%, 1/2 w	80294	3067P-1-502
R212	Resistor, fixed, film, 2000 ohms, ±2%, 1/2 w		RL20S202G
R213	Resistor, fixed, film, 2000 ohms, ±2%, 1/2 w		RL20S202G
R214	Resistor, fixed, composition, 33,000 ohms, ±10%, 1/2 w		RC42GF333K
R215	Resistor, fixed, film, 1000 ohms, ±5%, 1/2 w		RL20S102J
R216	Resistor, fixed, film, 2200 ohms, ±5%, 1/2 w		RL20S222J
R217	Resistor, fixed, molded, 24,300 ohms, ±1%, 1/4w		RN60D2432F

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
R218	Not Used		
R219	Not Used		
R220	Resistor, fixed, composition, 1000 ohms, ±10%, 2 w		RC42GF102K
R221	Resistor, fixed, composition, 270,000 ohms, ±10%, 1/2 w		RC20GF274K
R222	Resistor, fixed, composition, 1000 ohms, ±10%, 1/2 w		RC20GF102K
R223	Resistor, fixed, composition, 100 ohms, ±10%, 1/2 w		RC20GF101K
R224	Resistor, fixed, molded, metal film, 1000 ohms, ±1%, 1/4 w		RN60D1001F
R225	Resistor, fixed, composition, 100,000 ohms, ±5%, 1/2 w		RC20GF104K
R226	Resistor, fixed, composition, 10 ohms, ±10%, 1/2 w		RC20GF100K
R227	Resistor, fixed, composition, 10 ohms, ±10%, 1/2 w		RC20GF100K
R228	Resistor, fixed, molded, metal film, factory selected value, 432 ohms nominal, 1/4 w		RN60D series
R229	Reserved		
R230	Resistor, fixed, composition, 1500 ohms, ±10%, 1/2 w		RC20GF152K
R231	Resistor; fixed, film, 3600 ohms, ±5%, 1/2 w		RL20S362J
R232	Resistor, fixed, molded, metal film, 46.4 ohms, ±1%, 1/4 w		RN60D46R4F
R301	Resistor, fixed, composition, 4700 ohms, ±10%, 1 w	01121	GB 4721
R302	Resistor, fixed, composition, 10,000 ohms, ±10%, 1/2 w	01121	EB 1031

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
R303	Resistor, fixed, composition, 12,000 ohms, ±10%, 1/2 w	01121	EB 1231
R304	Resistor, fixed, composition, 6800 ohms, ±10%, 1/2 w	01121	EB 6821
R305	Resistor, fixed, composition, 1200 ohms, ±10%, 1 w	01121	GB 1221
R306	Resistor, fixed, film, 1000 ohms, ±2%, 1/2 w		RL20S102G
R307	Resistor, variable, wirewound, 200 ohms, ±10%, 1/2 w	80294	3067P-1-201
R308	Resistor, fixed, film, 2400 ohms, ±2%, 1/2 w		RL20S242G
R309	Resistor, fixed, composition, 10,000 ohms, ±10%, 1/2 w	01121	EB 1031
R310	Resistor, fixed, composition, 220 ohms, ±10%, 1/2 w	01121	EB 2211
R311	Resistor, fixed, composition, 4.7 ohms, ±10%, 2 w	75042	BWH
R312	Resistor, fixed, composition, 6800 ohms, ±10%, 1/2 w	01121	EB 6821
R313	Resistor, fixed, composition, 1200 ohms, ±10%, 1 w	01121	GB 1221
R314	Not Used		
R315	Resistor, variable, wirewound, 200 ohms, ±10%, 1/2 w	80294	3067P-1-201
R316	Resistor, fixed, film, 2400 ohms, ±2%, 1/2 w		RL20S242G
R317	Resistor, fixed, composition, 82,000 ohms, ±10%, 1/2 w	01121	EB 8231

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
R318	Resistor, fixed, composition, 100 ohms, ±10%, 1/2 w	01121	EB 1011
R319	Resistor, fixed, film, 1000 ohms, ±2%, 1/2 w		RL20S102G
R320	Reserved		
R501	Resistor, fixed, composition, 10,000 ohms, ±5%, 1/2 w	01121	RC20GF103J
R502	Resistor, fixed, composition, 51,000 ohms, ±5%, 1/2 w	01121	EB 5135
R503	Resistor, fixed, composition, 22,000 ohms, ±10%, 1/2 w	01121	EB 2231
R504	Resistor, fixed, composition, 51,000 ohms, ±5%, 1/2 w	01121	EB 5135
R505	Resistor, fixed, composition, 4700 ohms, ±10%, 1/2 w	01121	EB 4721
R506	Resistor, fixed, composition, 10,000 ohms, ±10%, 1/2 w	01121	EB 1031
R507	Resistor, fixed, composition, 10,000 ohms, ±10%, 1/2 w	01121	EB 1031
R508	Resistor, variable, wirewound, 500 ohms, ±10%, 1/2 w	80294	3067P-1-501
R509	Resistor, fixed, composition, 470 ohms, ±10%, 1/2 w	01121	EB 4711
R510	Resistor, fixed, composition, 220 ohms, ±10%, 1/2 w	01121	EB2211
R511	Resistor, fixed, composition, 2700 ohms, ±10%, 1/2 w	01121	EB 2721
R512	Resistor, fixed, composition, 10,000 ohms, ±10%, 1/2 w	01121	EB 1031

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER CODE	MANUFACTURER PART NO.
R513	Resistor, fixed, composition, 2200 ohms, ±10%, 1/2 w	01121	EB 2221
R514	Resistor, fixed, composition, 22,000 ohms, ±10%, 1/2 w	01121	EB 2231
R515	Resistor, fixed, composition, 4700 ohms, ±10%, 1/2 w	01121	EB 4721
R516	Not Used		
R517	Resistor, fixed, composition, 100,000 ohms, ±10%, 1/2 w	01121	EB 1041
R518	Resistor, fixed, composition, 33,000 ohms, ±10%, 1/2 w	01121	EB 3331
R519	Resistor, fixed, composition, 4700 ohms, ±10%, 1/2 w	01121	EB 4721
R520	Resistor, fixed, composition, 39,000 ohms, ±10%, 1/2 w	01121	EB 3931
R521	Resistor, fixed, composition, 82,000 ohms, ±10%, 1/2 w	01121	EB 8231
R522	Resistor, fixed, composition, 22,000 ohms, ±10%, 1/2 w	01121	EB 2231
R523	Resistor, fixed, composition, 5600 ohms, ±10%, 1 w	01121	GB 5621
R524	Resistor, fixed, composition, 2200 ohms, ±10%, 1/2 w	01121	EB 2221
R525	Resistor, fixed, composition, 33,000 ohms, ±10%, 1/2 w	01121	EB 3331
R526	Resistor, fixed, composition, 47,000 ohms, ±10%, 1/2 w	01121	EB 4731

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
R527	Resistor, fixed, film, 100,000 ohms, ±1%, 1/2 w		RN20X1003F
R528	Resistor, fixed, film, 1 megohm, ±1%, 1/2 w		RN20X1004F
R529	Resistor, fixed, film, 301,000 ohms, ±1%, 1/2 w		RN20X3013F
R530	Resistor, fixed, composition, 3300 ohms, ±10%, 1/2 w		RC20GF332K
R531	Not Used		
R532	Resistor, fixed, film, 22,100 ohms, ±1%, 1/2 w		RN20X2212F
R533	Resistor, fixed, composition, 47,000 ohms, ±10%, 1/2 w	01121	EB 4731
R534	Not Used		
R535	Resistor, fixed, comp, 10,000 ohms, ±5%, 1/2 w	01121	RC20GF103J
R536	Resistor, fixed, composition, 18,000 ohms, ±10%, 1/2 w	01121	EB 1831
R537	Resistor, fixed, composition, 22,000 ohms, ±10%, 1/2 w	01121	EB 2231
R538	Resistor, fixed, film, 1000 ohms, ±1%, 1/2 w		RN20X1001F
R539	Resistor, fixed, film, 1000 ohms, ±1%, 1/2 w		RN20X1001F
R540	Resistor, variable, wirewound, 10,000 ohms, ±10%, 1/2 w	80294	3067P-1-103
R541	Resistor, fixed, composition, 3300 ohms, ±10%, 1/2 w		RC20GF332K
R542	Resistor, fixed, composition, 15 ohms, ±10%, 1/2 w	01121	EB 1501
R543	Resistor, fixed, composition, 15 ohms, ±10%, 1/2 w	01121	EB 1501

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
R544	Resistor, fixed, composition, 15,000 ohms, ±10%, 1/2 w .	01121	EB 1531
R545	Resistor, fixed, composition, 10,000 ohms, ±10%, 1/2 w	01121	EB 1031
R546	Resistor, fixed, composition, 1500 ohms, ±10%, 1/2 w	01121	EB 1521
R547	Resistor, fixed, film, 44,200 ohms, ±1%, 1/2 w		RN20X4422F
R548	Resistor, variable, wirewound, 500 ohms, ±10%, 1/2 w	80294	3067P-1-501
R549	Not Used		
R550	Resistor, fixed, composition, 6800 ohms, ±10%, 1/2 w	01121	EB 6821
R551	Resistor, fixed, composition, 470 ohms, ±10%, 1/2 w	01121	EB 4711
R552	Not Used		
R553	Resistor, fixed; film, 1 megohm, ±1%, 1/2 w		RN20X1004F
R554	Resistor, fixed, film, 1 megohm, ±1%, 1/2 w		RN20X1004F
R555	Not Used		
R556	Resistor, fixed, composition, 4.7 ohms, ±5%, 1/2 w		RC20GF4R7J
R557	Resistor, fixed, composition, 330,000 ohms, ±10%, 1/2 w	01121	EB 3341
R558	Not Used		
R559	Not Used		
R560	Resistor, fixed, composition, 470 ohms, ±10%, 1/2 w	01121	EB 4711

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER CODE	MANUFACTURER PART NO.
R561	Not Used		
R562	Resistor, fixed, composition, 6800 ohms, ±10%, 1/2 w	01121	EB 6821
R563	Not Used		
R564	Resistor, fixed, composition, 100 ohms, ±10%, 1/2 w	01121	EB 1011
R565	Not Used		
R566	Not Used		
R567	Not Used		
R568	Resistor, fixed, film, 470 ohms, ±5%, 1/2 w		RL20S471J
R569	Resistor, fixed, film, 3900 ohms, ±5%, 1/2 w		RL20S392J
R601	Resistor, variable, wirewound, 1000 ohms, ±10%, 1/2 w	80294	3067P-1-102
R602	Resistor, fixed, film, 100 ohms, ±2%, 1/2 w	80294	RL20S101G
R603	Resistor, variable, wirewound, 1000 ohms, ±10%, 1/2 w	80294	3067P-1-102
R604	Resistor, variable, wirewound, 200 ohms, ±10%, 1/2 w	80294	3067P-1-201
R701	Resistor, fixed, wirewound, 120 ohms, ±5%, 5 w	56289	243E1215
R702	Resistor, fixed, composition, 33 ohms, ±10%, 1/2 w	01121	EB 3301
R703	Resistor, fixed, wirewound, 0.27 ohms, ±5%, 2 w	75042	BWH
R704	Resistor, fixed, wirewound, 0.27 ohms, ±5%, 2 w	75042	BWH
R705	Resistor, fixed, composition, 100 ohms, ±10%, 1/2 w	01121	EB 1011

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
R706	Resistor, fixed, composition, 4700 ohms, ±10%, 1/2 w	01121	EB 4721
R707	Resistor, fixed, composition, 100 ohms, ±10%, 1/2 w	01121	EB 1011
R708	Resistor, fixed, wirewound, 1 ohm, ±10%, 2 w	75042	BWH
R709	Resistor, fixed, wirewound, 1 ohm, ±10%, 2 w	75042	BWH
R710	Resistor, fixed, composition, 100 ohms, ±10%, 1/2 w	01121	EB 1011
R711	Resistor, fixed, composition, 15,000 ohms, ±10%, 1/2 w	01121	EB 1531
R712	Resistor, fixed, composition, 33 ohms, ±10%, 1/2 w	01121	EB 3301
R713	Resistor, fixed, wirewound, 600 ohms, ±10%, 5 w	75042	PW-5
R714 thru R724	Not Used Not Used		
R725	Resistor, fixed, composition, 51,000 ohms, ±5%, 2 w		RC42GF513J
R726	Resistor, fixed, composition, 51,000 ohms, ±5%, 2 w		RC42GF513J
R727	Resistor, fixed, composition, 51,000 ohms, ±5%, 2 w		RC42GF513J
R728	Resistor, fixed, composition, 51,000 ohms, ±5%, 2 w		RC42GF513J
R729	Resistor, fixed, composition, 51,000 ohms, ±5%, 2 w		RC42GF513J

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
R730	Resistor, fixed, composition, 51,000 ohms, ±5%, 2 w		RC42GF513J
R731	Resistor, fixed, composition, 51,000 ohms, ±5%, 2 w		RC42GF513J
R732	Resistor, fixed, composition, 51,000 ohms, ±5%, 2 w		RC42GF513J
R733	Resistor, fixed, composition, 100,000 ohms, ±10%, 1/2 w		RC20GF104K
R734	Resistor, fixed, composition, 10,000 ohms, ±10%, 1/2 w		RC20GF103K
R735	Resistor, fixed, film, 249 ohms, ±1%, 1/2 w		RN20X2490F
R736	Resistor, variable, wirewound, 200 ohms, ±10%, 1/2 w, 15 turn	80294	3067P-1-201
R737	Not Used		
R738	Resistor, fixed, wirewound, 4000 ohms, ±10%, 5 w	75042	PW-5
R739	Not Used		
R740	Resistor, variable, wirewound, 200 ohms, ±10%, 1/2 w	80294	3067P-1-201
R741	Resistor, fixed, composition, 47 ohms, ±10%, 1 w	01121	GB 4701
R742	Resistor, fixed, composition, 10,000 ohms, ±10%, 1/2 w		RC20GF103K
R743	Resistor, variable, wirewound, 2500 ohms, ±5%, 2 w	12697	43C2-2500
R744	Resistor, fixed, composition, 220 ohms, ±10%, 1/2 w		RC20GF221F

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
R745	Not Used		
R746	Resistor, fixed, wirewound, 120 ohms, ±10%, 5 w	56289	243E1215
R761	Resistor, fixed, composition, 100 ohms, ±10%, 1/2 w	01121	EB 1011
R762	Resistor, fixed, composition, 330,000 ohms, ±10% 1 w		RC32GF334K
R763	Resistor, fixed, composition, 330,000 ohms, ±10% 1 w		RC32GF334K
R764	Resistor, fixed, composition, 15,000 ohms, ±10%, 1/2 w		RC20GF153K
R765	Resistor, fixed, composition, 330,000 ohms, ±10%, 1 w		RC32GF334K
R766	Resistor, fixed, composition, 9100 ohms, ±5%, 1 w		RC32GF912J
R767	Resistor, fixed, composition, 330,000 ohms, ±10%, 1 w		RC32GF334K
R768	Not Used		
R769	Resistor, fixed, composition, 330,000 ohms, ±10%, 1 w		RC32GF334K
R770	Resistor, fixed, composition, 330,000 ohms, ±10%, 1 w		RC32GF334K
R771	Resistor, fixed, composition, 330,000 ohms, ±10%, 1 w		RC32GF334K
R772	Resistor, fixed, film, 47,000 ohms, ±2%, 1/2 w		RL20S473G
R773	Resistor, fixed, film, 8200 ohms, ±2%, 1/2'w		RL20S822G

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
R774	Resistor, fixed, composition, 47,000 ohms, ±10%, 1/2 w		RC20GF473K
R775	Resistor, fixed, composition, 22,000 ohms, ±10%, 1/2 w		RC20GF223K
R776	Resistor, fixed, composition, 22,000 ohms, ±10%, 1/2 w		RC20GF223K
R777	Resistor, fixed, composition, 2000 ohms, ±5%, 2 w		RC42GF202J
R778	Resistor, fixed, composition, 470 ohms, ±10%, 2 w		RC42GF471K
R779	Resistor, fixed, wirewound, 10 ohms, ±3%, 50 w	91637	RH50
R780	Resistor, fixed, film, 82,000 ohms, ±2%, 1/2 w		RL20S823G
R781	Resistor, fixed, film, 10,000 ohms, ±2%, 1/2 w		RL20S103G
R782	Resistor, fixed, composition, 30,000 ohms, ±10%, 1/2 w		RC20GF303K
R783	Resistor, variable, wirewound, 1000 ohms, ±10%, 1/2 w	80294	3067P1-102
R784	Resistor, fixed, composition, 47,000 ohms, ±5%, 1/2 w		RC20GF473K
R785	Resistor, fixed, composition, 47,000 ohms, ±5%, 1/2 w		RC20GF473K
R786	Resistor, fixed, composition, 5600 ohms, ±10%, 1/2 w		RC20GF562K
R1101	Resistor, fixed, composition, 0.24 ohms, ±5%, 2 w	75042	BWH
R1102	Resistor, fixed, composition, 68 ohms, ±10%, 1 w		RC32GF680K

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
R1401	Resistor, fixed, film, 301,000 ohms, ±1%, 1/2 w		RN20X3013F
R1402	Resistor, fixed, film, 301,000 ohms, ±1%, 1/2 w		RN20X3013F
R1403	Resistor, fixed, film, 301,000 ohms, ±1%, 1/2 w		RN20X3013F
R1404	Resistor, fixed, film, 301,000 ohms, ±1%, 1/2 w		RN20X3013F
R1405	Resistor, fixed, film, 301,000 ohms, ±1%, 1/2 w		RN20X3013F
R1406	Resistor, fixed, film, 301,000 ohms, ±1%, 1/2 w		RN20X3013F
R1407	Resistor, fixed, film, 301,000 ohms, ±1%, 1/2 w		RN20X3013F
R1408	Resistor, fixed, film, 301,000 ohms, ±1%, 1/2 w		RN20X3013F
R1409	Resistor, fixed, film, 301,000 ohms, ±1%, 1/2 w		RN20X3013F
R1410	Resistor, fixed, film, 301,000 ohms, ±1%, 1/2 w		RN20X3013F
R1411	Resistor, fixed, comp, 390,000 ohms, ±5%, 1/2 w		RC20GF394J
S101	Switch, toggle, DPST	73559	2BK63-73
S102	Switch, toggle, DPST	73559	2BK63-73
S103	Switch, rotary, 2 sections, 4 pole, 5 positions	71590	PA 1013
S104	Switch and potentiometer assembly	77327	83568900
S105	Switch and potentiometer assembly	77327	83598900
S106	Switch and potentiometer assembly	77327	83598600
S701	Switch snap action, SPST	01963	E23-21A
T701	Transformer, mainpower	77327	83353400
T702	Transformer, converter driver	77327	83574100
T703	Transformer, high voltage converter output	77327	83353500
T704	Transformer, anode power	01364	64G720

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
TP701	Phone jack, high voltage	83330	1506
TP702	Phone jack, high voltage	83330	1506
TP703	Phone jack, high voltage	83330	1506
TP704	Phone jack, high voltage	83330	1506
V701	Electron tube	63060	6842
V702	Electron tube	63060	6842
VR101	Diode, zener, 6.8 Vdc, 10%		1N754
VR201	Diode, zener, 6.2 Vdc, 5 %		1N821
VR202	Diode, zener, 5.1 Vdc, 10%		1N751
VR203	Diode, zener, 10.0 Vdc, 10%		1N758
VR204	Diode, zener, 130 Vdc, 5%		1N3047B
VR205	Diode, zener, 9 Vdc, 5%		1N935
VR301	Not Used		
VR302	Not Used		
VR303	Not Used		
VR304	Not Used		
VR305	Diode, zener, 6.8 Vdc, 10%		1N754
VR306	Diode, zener, 6.8 Vdc, 10%		1N754
VR307	Diode, zener, 6.8 Vdc, 10%		1N754
VR501	Diode, zener, 9 Vdc, 5%		1N935
VR502 thru VR506	Not Used Not Used		

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
VR507	Diode, zener, 11 Vdc, 20%		1N962
VR509 thru VR514	Not Used Not Used		
VR515	Diode, zener, 22 Vdc, 5%		1N969B
VR701	Diode, zener, 9 Vdc, 1%		1N935
VR702	Diode, zener, 9 Vdc, 1%		1N935
VR703	Not Used		
VR704	Diode, zener, 62 Vdc, 20%		1N3808
VR705	Diode, zener, 62 Vdc, 20%		1N3808
VR706 thru VR710	Not Used Not Used		
VR711	Diode, zener, 3.3 Vdc, 10%		1N3821
VR712	Not Used		
VR713	Not Used		
VR714	Not Used		
VR715	Diode zener, 91 Vdc, 20%		1N3004A
VR716	Diode zener, 91 Vdc, 20%		1N3004A
VR1101	Diode, zener, 6.8 Vdc, 2%	04713	1M6.8Z2
XF101	Fuseholder	75915	322004
XF701	Fuseholder	75915	3570001
XK701	Socket, octal	72825	TS101P02

TABLE 7 (cont'd)

SYMBOL	DESCRIPTION	MANUFACTURER	
		CODE	PART NO.
XQ708	Clip, transistor	99378	100-245
XV701	Socket, miniature, 7 pin	71785	111-31-20-102
XV702	Socket, miniature, 7 pin	71785	111-31-20-102

NOTE

PARTS PROVISIONING INFORMATION

REPLACEMENT PARTS

To obtain replacement parts, find the manufacturer's part number and description in this manual and then refer to the appropriate Repair Parts and Special Tools List (RPSTL) TM. In the RPSTL, find the assembly or subassembly first and then the description which corresponds with that in this manual. Under the description in the RPSTL find the manufacturer's part number, and then order the part by the listed Federal stock number. If the part is not listed in the RPSTL, it should be requisitioned from the NICP in accordance with AR 725-50.

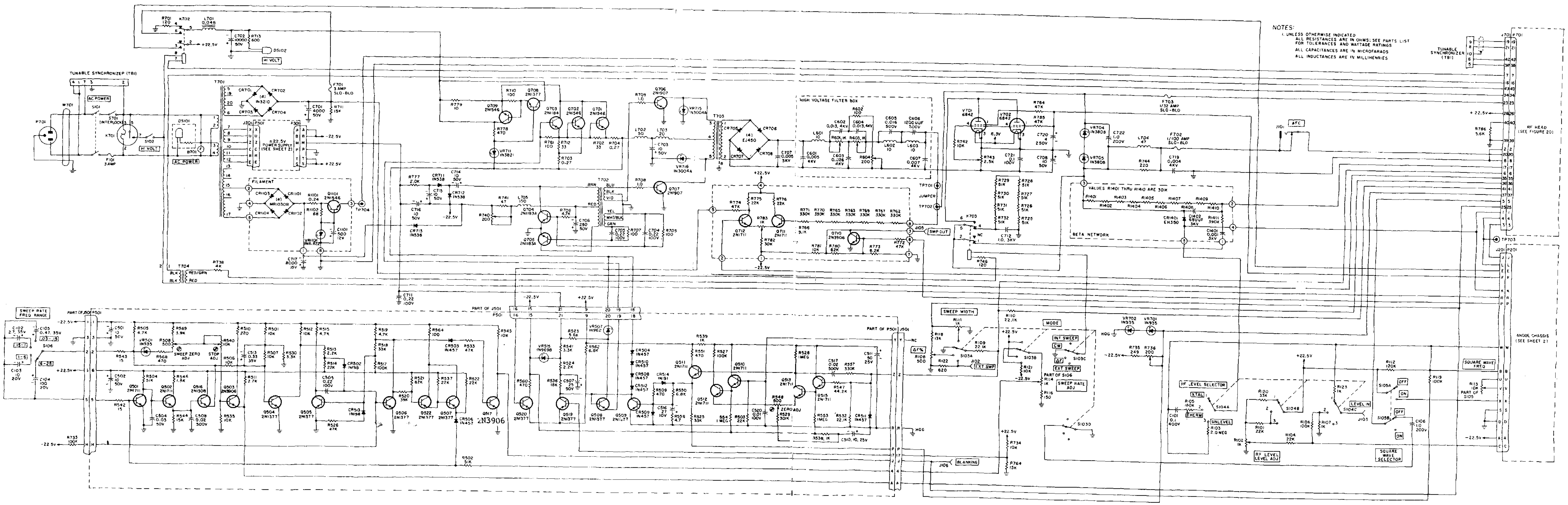
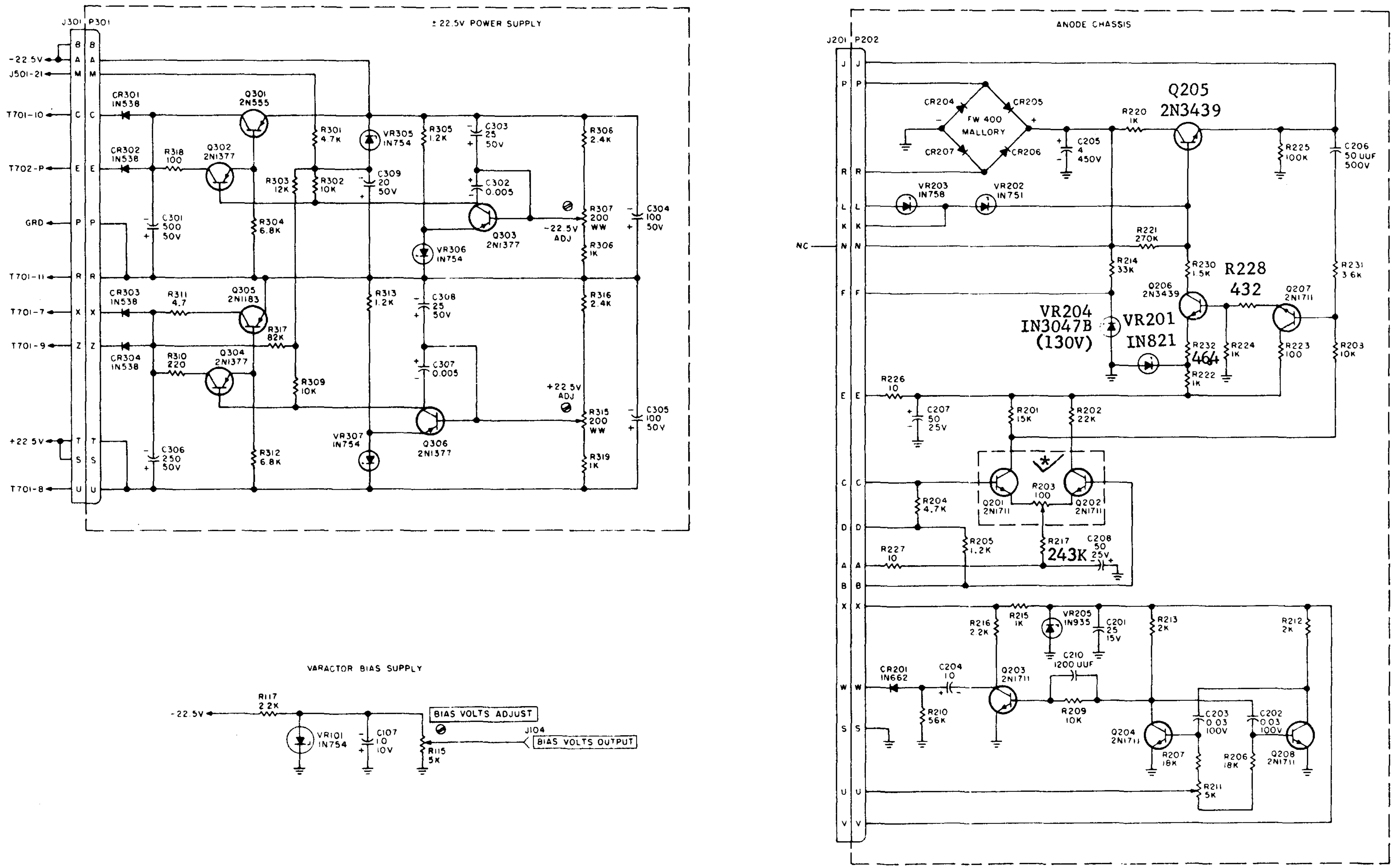
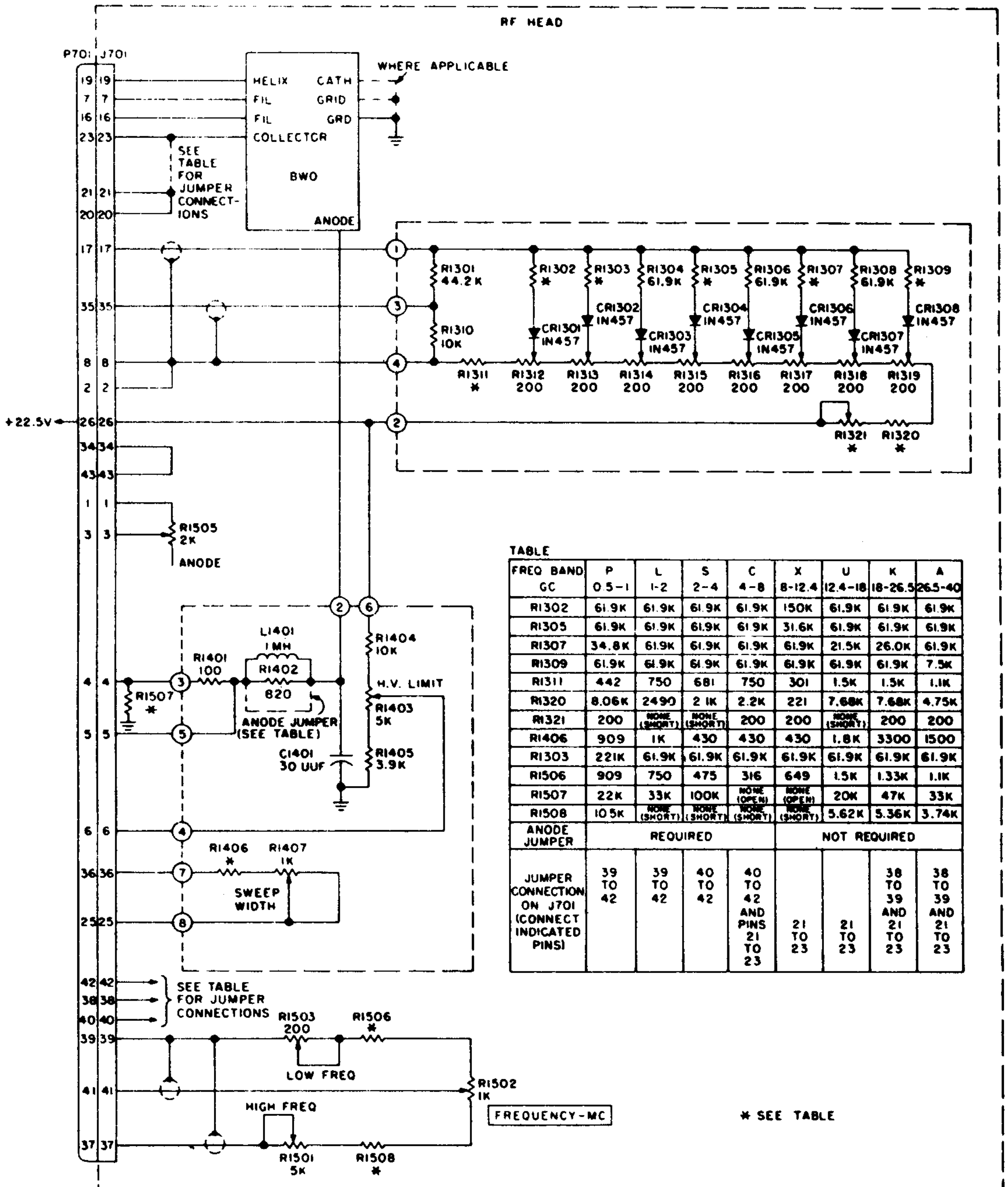


Figure 19. PRD 816-S10 Power Supply, Schematic Diagram (Sheet 1 of 2)



✓* Q201 and Q202 to be matched within 5% for hfe at 0.5 ma collector current.

Figure 19. PRD 816-S10 Power Supply, Schematic Diagram (Sheet 2 of 2)



TABLE

FREQ BAND GC	P 0.5-1	L 1-2	S 2-4	C 4-8	X 8-12.4	U 12.4-18	K 18-26.5	A 26.5-40
R1302	61.9K	61.9K	61.9K	61.9K	150K	61.9K	61.9K	61.9K
R1305	61.9K	61.9K	61.9K	61.9K	31.6K	61.9K	61.9K	61.9K
R1307	34.8K	61.9K	61.9K	61.9K	61.9K	21.5K	26.0K	61.9K
R1309	61.9K	61.9K	61.9K	61.9K	61.9K	61.9K	61.9K	7.5K
R1311	442	750	681	750	301	1.5K	1.5K	1.1K
R1320	8.06K	2490	2 1K	2.2K	221	7.68K	7.68K	4.75K
R1321	200	NONE (SHORT)	NONE (SHORT)	200	200	NONE (SHORT)	200	200
R1406	909	1K	430	430	430	1.8K	3300	1500
R1303	221K	61.9K	61.9K	61.9K	61.9K	61.9K	61.9K	61.9K
R1506	909	750	475	316	649	1.5K	1.33K	1.1K
R1507	22K	33K	100K	NONE (OPEN)	NONE (OPEN)	20K	47K	33K
R1508	10.5K	NONE (SHORT)	NONE (SHORT)	NONE (SHORT)	NONE (SHORT)	5.62K	5.36K	3.74K
ANODE JUMPER	REQUIRED				NOT REQUIRED			
JUMPER CONNECTION ON J701 (CONNECT INDICATED PINS)	39 TO 42	39 TO 42	40 TO 42	40 TO 42 AND PINS 21 TO 23	21 TO 23	21 TO 23	38 TO 39 AND 21 TO 23	38 TO 39 AND 21 TO 23

Figure 20. Circuits Physically Located in RF Head, Schematic Diagram

SECTION VI

PREVENTIVE MAINTENANCE INSTRUCTIONS

A. Scope of Maintenance

The maintenance duties assigned to the operator and organizational repairman of this equipment are listed below with a reference to the paragraphs covering the specific maintenance functions. The preventive maintenance procedures require no special tools or test equipment.

1. Daily preventive maintenance checks and services (para E).
2. Weekly preventive maintenance checks and services (para F).
3. Monthly preventive maintenance checks and services (para G).
4. Quarterly preventive maintenance checks and services (para I).
5. Cleaning (para K).
6. Touchup painting instructions (para L).

B. Materials Required For Maintenance

1. Trichloroethane (Federal stock No. 6810-292-9625).

WARNING

The fumes of trichloroethane are toxic. Provide thorough ventilation whenever used. *Do not* use near an open flame. Trichloroethane is not flammable, but exposure of the fumes to an open flame converts the fumes to highly toxic, dangerous gases.

2. Cleaning cloth.
3. Fine sandpaper.
4. Touchup paint.

C. Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and inspection of the equipment to prevent the occurrence of trouble, to reduce downtime, and to insure that the equipment is serviceable.

1. Systematic Care. The procedure given in paragraphs E through L covers routine systematic care and cleaning essential to proper upkeep and operation of the equipment.

2. Preventive Maintenance Checks and Services. The maintenance checks and services charts outline functions to be performed at specific intervals. These checks and services are to maintain equipment in a combat serviceable condition; that is, in good general (physical) condition and in good operating condition. To assist operators in maintaining combat serviceability, the charts indicate what to check, how to check, and the normal conditions. The reference column lists the paragraphs that contain additional information. If the defect cannot be found by performing the corrective action indicated, a higher category of maintenance or repair is required. Records and reports of these checks and services must be made in accordance with the requirements set forth in TM 38-750.

D. Preventive Maintenance Checks and Services Periods

Preventive maintenance checks and services of this equipment are required daily, weekly, monthly, and quarterly. Daily maintenance checks and services are specified in paragraph E. Paragraph F specifies checks and services that must be performed weekly. If the equipment is maintained in a standby condition, the daily and weekly checks should be accomplished at the same time. The maintenance checks and services that are accomplished monthly are specified in paragraph G. Quarterly maintenance checks and services are specified in paragraph I.

E. Daily Preventive Maintenance Checks and Services Chart

Sequence No.	*Items to be inspected*	*Procedure*	*Reference*
1	Completeness	See that the equipment is complete------	App B
2	Cleanliness	The exterior of the equipment must be clean and dry, and free of fungus, dirt, dust, and grease.	Para K
3	Operational check	Check for operational efficiency.	
4	Controls	See that the controls operate smoothly and are fastened in place securely.	

F. Weekly Preventive Maintenance and Services Chart

Sequence No.	*Items to be inspected*	*Procedure*	*Reference*
1	Cables	Inspect cards and cables for chafed, cracked, and frayed insulation. Replace connectors that are broken, stripped, or worn.	
2	Metal surfaces	Inspect exposed metal surface for rust and corrosion. Clean and touchup with paint as required.	Para K and L

G. Monthly Maintenance

Perform the maintenance functions indicated in the monthly preventive maintenance checks and services chart (para H) once each month. Periodic daily (para E) and weekly (para F) services constitute a part of the monthly checks.

H. Monthly Preventive Maintenance Checks and Services Chart

Sequence No.	*Items to be inspected*	*Procedure*
1	Terminations	Inspect for loose connections and cracked or broken insulation.
2	Control panel	Clean panel thoroughly and check all surfaces for chips, cracks, and abnormal wear.
3	Hardware	Inspect all hardware for possible damage

I. Quarterly Maintenance

Quarterly preventive maintenance checks and services are required for this equipment. Periodic daily, weekly, and monthly services constitute a part of the quarterly preventive maintenance checks and services and must be performed concurrently. All deficiencies or shortcomings will be recorded in accordance with the requirements of TM 38-750. Perform all the checks and services listed in the quarterly preventive maintenance checks and services chart (para J) in the sequence listed. Adjustment of the maintenance interval must be made to compensate for any unusual operating conditions.

J. Quarterly Preventive Maintenance Checks and Services Chart

Sequence No.	*Items to be inspected*	*Procedure*	*Reference*
1	Publications	See that all publications are complete, serviceable, and current.	DA Pam 310-4
2	Modifications	Check DA Pam 310-7 to determine whether new applicable MWO's have been published. All URGENT MWO's must be applied immediately. All NORMAL MWO's must be scheduled.	TM 38-750 and DA Pam 310-7

K. Cleaning

Inspect the exterior surfaces. The surfaces must be free of dust, dirt, grease, and fungus.

1. Remove dust and loose dirt with a clean, soft cloth.
2. Remove grease, fungus, and ground-in dirt. Use a damp cloth (not wet) with trichloroethane to clean terminations. If dirt on the body of the unit is difficult to remove, use mild soap and water.
3. Remove dust or dirt from the jacks and plugs with a brush.

L. Touchup Painting Instructions

Remove dust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion. Refer to applicable cleaning and refinishing practices specified in TB 746-10.

APPENDIX A

REFERENCES

Following is a list of publications available to BWO power supply operator and maintenance personnel.

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	US Army Equipment Index of Modification Work Orders.
SB 38-100	Preservation, Packaging, Packing, and Marking Materials, Supplies, and Equipment used by the Army.
TB 746-10	Field Instruction for Painting and Preserving Electronic Equipment.
TM 38-750	The Army Maintenance Management System (TAMMS).
TB 750-236	Calibration Requirements for the Maintenance of Army Materiel.

APPENDIX B

BASIC ISSUE ITEMS LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(Not Applicable)

APPENDIX C

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

C-1. General

This appendix provides a summary of the maintenance operations covered in the equipment literature for the PRD Type 816-S10. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

C-2. Maintenance Functions

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

b. Test. To verify serviceability and to detect incipient electrical or mechanical failure by use of special equipment such as gages, meters; etc. This is accomplished with external test equipment and does not include operation of the equipment and operator type tests using internal meters or indicating devices.

c. Service. To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents, and air. If it is desired that elements, such as painting and lubricating, be defined separately, they may be so listed.

d. Adjust. To rectify to the extent necessary to bring into proper operating range.

. *e. Align.* To adjust two or more components or assemblies of an electrical or mechanical system so that their functions are properly synchronized. This does not include setting the frequency control knob of radio receivers or transmitters to the desired frequency.

f. Calibrate. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

g. Install. To set up for use in an operational environment such as an encampment, site or vehicle.

h. Replace. To replace unserviceable items with serviceable like items.

i. Repair. To restore an item to a serviceable condition through correction of a specific failure or unserviceable condition. This function includes, but is not limited to welding, grinding, riveting, straightening, and replacement of parts other than the trial and error replacement of running spare type items such as fuses, lamps, or electron tubes.

j. Overhaul. Normally, the highest degree of maintenance performed by the Army in order to minimize timework in the process and is consistent with quality and economy of operation. It consists of that maintenance necessary to restore an item to a completely serviceable condition as prescribed by maintenance standards in technical publications for each item of equipment. Overhaul normally does not return an item to a like-new, zero-mileage, or zero-hour condition.

k. Rebuild. The highest degree of materiel maintenance. It consists of restoring equipment as nearly as possible to a new condition in accordance with the original manufacturing standards. Rebuild is performed only when required by operational considerations or other paramount factors and then only at the depot maintenance category. Rebuild reduces to zero the hours or miles the equipment, or component thereof, has been in use.

l. Symbols. The uppercase letter placed in the appropriate column indicates the lowest level at which that particular maintenance function is to be performed.

C-3. Explanations of Format of Section II, Maintenance Allocation Chart

a. Column 1, Group Number. Not applicable.

b. Column 2, Functional Group. Column 2 lists the noun names of components, assemblies, subassemblies, and modules on which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the maintenance category at which performance of the specific maintenance function is authorized. Authorization to perform a function at any category also includes authorization to perform that function at higher categories. The codes used represent the various maintenance categories as follows:

Code	*Maintenance Category*
C	Operator/crew
O	Organizational maintenance
F	Transfer maintenance
H	Reference maintenance
D	Depot maintenance

d. Column 4, Tools and Equipment. Column 4 specifies, by code, those tools and test equipment required to perform the designated function. The numbers appearing in this column refer to specific tools and test equipment which are identified in section III.

e. Column 5, Remarks. Self-explanatory.

C-4. Explanation of Format of Section III, Tool and Test Equipment Requirements

The columns in section III, tool and test equipment requirements, are as follows:

a. Tools and Equipment. The numbers in this column coincide with the numbers used in the tools and equipment column of the maintenance allocation chart. The numbers indicate the applicable tool for the maintenance function.

b. Maintenance Category. The codes in this column indicate the maintenance category normally allocated the facility.

c. Nomenclature. This column lists tools, test, and maintenance equipment required to perform the maintenance functions.

d. Federal Stock Number. This column lists the Federal stock number of the specific tool or test equipment.

Section II. MAINTENANCE ALLOCATION CHART

Group number	Functional group	Maintenance functions												
		a Inspect	b Test	c Service	d Adjust	e Align	f Calibrate	g Install	h Replace	i Repair	j Overhaul	k Rebuild	l Tool Reqd.	m Remarks
1	Power Supply, BWO	F	F	F				F		H	D		1	A
2	Main Frame				H					H	D		2	B
3	Circuit Board Anode and Square Wave Generator			-	H				H	H	D		3	C
4	Circuit Board 22.5 Volt Power Supply			-	H				H	H	D		3	C
5	Assembly High Voltage Filter Box			-	H				H	H	D		3	C
6	Circuit Board, Regulated Filament Supply			-	-				H	H	D		4	D
7	Circuit Board High Voltage Load			-	-				H	H	D		4	D
8	Circuit Board Beta Network				-				H	H	D		4	D
9	Circuit Board Voltage Regulator, Sweep Generator				H				H	H	D		3	C

Section III. TOOLS REQUIRED PAGE

Tool code	Category	Nomenclature	Tool number
1-b		BWO Simulator, PRD Type D7006	4931-408-4701
		AN/USM 234, Microwave Test Set	4931-949-5381
1-3, 1-g, and 1-i		Tool Kit, Calibration Technical	4935-670-7123
2-d		BWO Simulator	4931-408-4701
		Digital Voltmeter	4931-932-5034
2-i		Tool Kit, Calibration Technical	4935-670-7123
		Decade Resistor	6625-585-4915

Tool code	Category	Nomenclature	Tool number
3-d		BWO Simulator	4931-408-4701
		Digital Voltmeter	4931-932-5034
		Tool Kit, Calibrator Technical	4935-670-7123
		Graphic Display System	4935-913-3119
3-h and 3-i		Tool Kit, Calibrator Technical	4935-670-7123
4-h and 4-i		Tool Kit, Calibration Technical	4935-670-7123

Section IV. REMARKS PAGE

Remarks code	Remarks
A-b	Test in accordance with section III of TM 9-4931-459-14-1
A-c	Service in accordance with section VI of TM 9-4931-459-14-1
A-g	Install in accordance with section III of TM 9-4931-459-14-1
A-i	Repair in accordance with section IV of TM 9-4931-459-14-1
	Solder all connections in accordance with MIL-S-45743
B-d	Adjust in accordance with section IV of TM 9-4931-459-14-1
B-i	Repair in accordance with section IV of TM 9-4931-459-14-1
	Solder all connections in accordance with MIL-S-45743
C-d	Adjust in accordance with section IV of TM 9-4931-459-14-1
C-h	Replace in accordance with section IV of TM 9-4931-459-14-1
C-i	Repair in accordance with section IV of TM 9-4931-459-14-1
D-h	Replace in accordance with section IV of TM 9-4931-459-14-1
	Solder all connections in accordance with MIL-S-45743
D-i	Repair in accordance with section IV of TM 9-4931-459-14-1

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS,
General, United States Army
Chief of Staff

Official:

VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-34 (qty rqr block No. 75) Requirements for Calibration Procedures Publications.

✰U.S. GOVERNMENT PRINTING OFFICE: 1992 - 631-006/60119

PIN: 022716-000