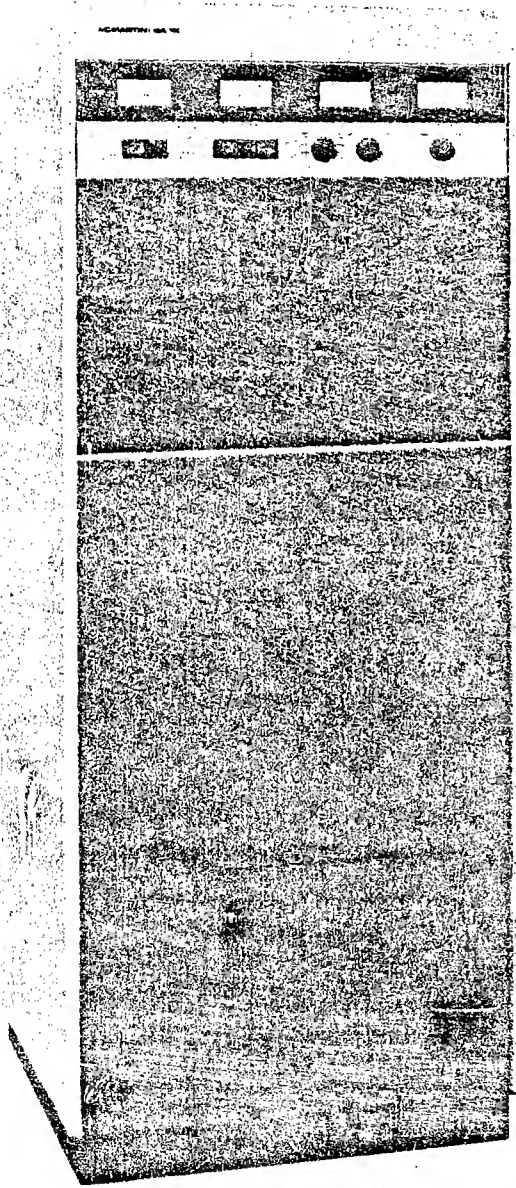


McMartin



McMartin

BA-1K

250, 500, 1000 Watt AM
TRANSMITTER

INSTRUCTION MANUAL

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INTRODUCTION

WARNING: Voltages and currents in this equipment are dangerous. Installation, operation, and servicing of this equipment must be performed only by properly licensed, trained, and experienced personnel. McMartin Industries cannot be responsible for injury or damage resulting from improper installation, operation, or servicing of this equipment.

Always disconnect primary power before opening doors, covers, enclosures, panels, or shields.

Always use grounding sticks to short out high voltage points before servicing. Never perform service on this equipment when tired or alone.

It is most important that all units be bonded together with at least 3" wide copper strap which is securely connected to the MAIN STATION GROUND. Heat and dirt are the main destroyers of good equipment. Keep yours clean and cool, and you will be rewarded by long, reliable service. Preventative maintenance is far more desirable than that done only when absolutely necessary. Follow good engineering practice in everything you do in connection with the operation of this equipment.

CAUTION: If your transmitter is supplied for use on 3 phase primary power, it is extremely important that you are provided with service from a closed-delta source. Check this with your local power company.

Minimum Unrestricted Air Flow Required for McMartin AM & FM Transmitters

Model	CFM	BTU'S Heat Output
BF-55K	5000	170000
BF-25K	2500	90000
BF-10K	2000	62000
BF-5K	1000	38000
BF-3.5K	1000	20500
BF-1K	800	6800
AM		
BA-10K	1500	44200
BA-5K	1500	24480
BA-2.5K	800	23000
BA-1K	800	10880

Ample air intake capacity to the building must be provided and the air discharge system from the building must be sufficient so that no restriction or back pressure exists. It is recommended that an exhaust fan of at least the same CFM, as that shown for the transmitter, be installed in the building air discharge system.

I. TECHNICAL SPECIFICATIONS

FREQUENCY RANGE.....	.....540 to 1600 kiloHertz (supplied on one specified frequency)
POWER OUTPUT.....	.....1000/500/250 watts. May be operated at any two specified power levels. Push-button power change standard. Maximum output capability: 1200 watts
OUTPUT IMPEDANCE.....	.....50 ohms unbalanced (Other impedance available on special order)
FREQUENCY STABILITY.....	.....±5 Hertz over ambient temperature range
CARRIER SHIFT.....	......3 percent maximum
NOISE LEVEL.....	.....60 dB or greater below 100% modulation at 1000 Hertz
MODULATION CAPABILITY.....	.....100 percent negative peaks 125 percent positive peaks
AF FREQUENCY RESPONSE.....	.....±1.0 dB, 50-10,000 Hz, 1-kw output 100% modulation
AF HARMONIC DISTORTION.....	......2.5% or less, 50-10,000 Hz, 1-kw output, 100% modulation Sine wave input
AUDIO INPUT IMPEDANCE.....	.....150-600 ohms, balanced
AUDIO INPUT LEVEL.....	.....+10, ±2 dBm
POWER SOURCE.....	..... 208/230/240 Vac, 50/60 Hz single phase
POWER CONSUMPTION.....	.....4500 watts (1200 watts output, 100% modulation)
AMBIENT TEMPERATURE RANGE.....	.....-20 to +45 degrees Celsius
ALTITUDE.....	.....up to 7500 feet AMSL
DIMENSIONS	70.5" H x 25.75" D x 28.25" W (179 cm x 65.4 dm x 71.8 cm)

II. GENERAL DESCRIPTION

The BA-1K transmitter is designed for standard AM broadcast service operating on a specified carrier frequency in the range of 540 to 1600 kiloHertz.

The transmitter low-level stages and power supply rectifiers utilize silicon solid state devices. A single tube type, the 4-500A, is used; one pair operating in parallel in the Class C RF power amplifier stage and another pair serving as Class AB-1 modulators.

The BA-1K uses plate-screen high level modulation. The two 4-500A Class C power amplifier tubes are plate modulated, and the screens are self-modulated by virtue of series resistance in the screen voltage power supply.

The BA-1K is capable of delivering 1200 watts power output, to compensate for phasor and/or transmission line losses, to provide 1000 watts to the antenna. The BA-1K may be operated at any two power level combinations of 1000, 500, or 250 watts. The power change is affected by pushbutton switch selection of appropriate power transformer primary winding taps.

The BA-1K is designed to match a 50-ohm unbalanced output load (other output impedances may be provided under special order).

The BA-1K is housed in a rugged sheet metal frame enclosure with removable side panels for access to internal wiring harnesses. Full length rear door access is provided. Located in the lower portion of the front of the unit, just below the tube observation window is a hinged-down panel. The inside of this panel accommodates the solid state RF exciter/driver, solid state audio driver and the control relay power supply.

Both this panel and the rear door, upon opening, release dual mechanical interlock switches. One of these interrupts the high-voltage plate and screen voltage power supply control relay circuit; the second shorts the high-voltage plate power supply to ground.

III. INSTALLATION

3.1 PLANNING

The degree of installation preplanning that is made will directly affect the ease of initial installation and continued reliability and long service which will be obtained from the BA-1K.

An outline dimensional drawing of the BA-1K is shown in Figure 3A.

Adequate space should be provided for rear door and hinged-down front panel clearances.

The BA-1K is completely self-contained; however, pre-consideration must be given to entrance of power cables, audio/remote control harnessing, frequency and/or modulation coaxial feeds and RF output coaxial connections.

Although cable entrances may be made through either the top or bottom of the cabinet, the preferred arrange-

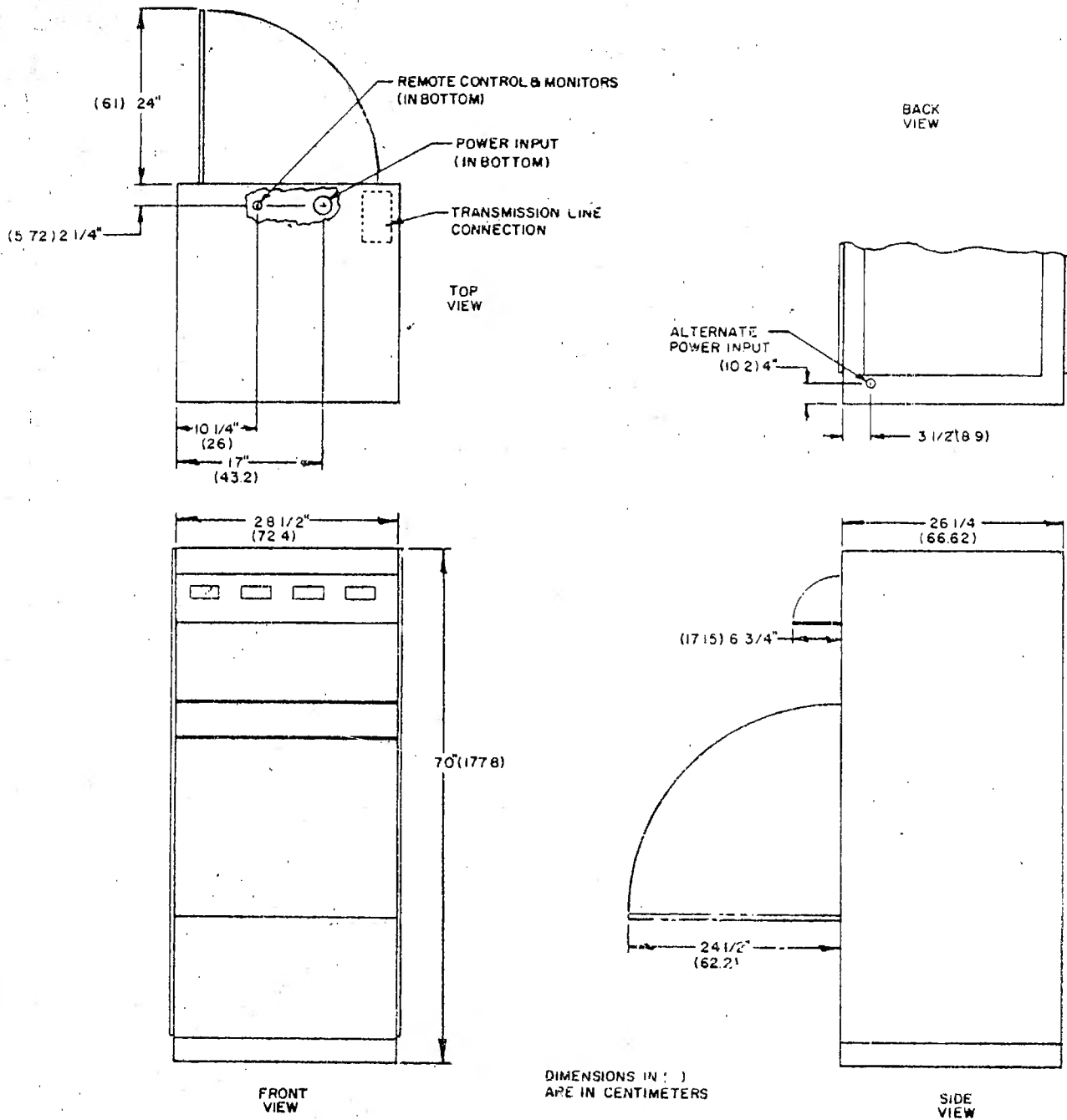


Figure 3A - BA-1K Dimensions

ment for ease of installation is through the bottom of the cabinet for all interconnections except the output coaxial transmission line.

3.2 UNPACKING

Inspect the unit for damage which might be incurred during shipment. Particularly note condition of knobs, meters, and ceramic insulators. Inspect painted surfaces for scratches or dents. If damage is detected immediately notify the carrier and report the damage. Advise McMartin of the steps you have taken.

The tubes, and for models in the lower portion of the 540-1600 kHz range, the plate tuning vacuum variable capacitor will be packed separately. Insert the four 4-500A tubes in their sockets and attach the plate cap connectors. To install the vacuum variable capacitor, proceed as follows:

1. Looking down on the cabinet top from the front, loosen the three self-tapped machine screws located along the front edge of the cabinet top grille.
2. Slide the solid filler plate, located at the front of the cabinet top, forward, and lift the filler plate out of place.
3. The coupling to the plate tuning motor will be seen to the right side of the cabinet. Make certain that the rear lock screw on the coupling is loosened enough to allow entrance of the vacuum variable capacitor shaft. (The motor shaft may be rotated manually to permit easy access to the screw head.)
4. From the rear of the cabinet, slide the vacuum variable capacitor into its mounting clamp, aligning the rotor shaft so it seats fully into the motor drive coupler. Tighten the capacitor in its clamp by securely tightening the clamp ring pressure screw (located at the right edge of the clamp).
5. From the top of the cabinet, securely tighten the motor drive coupling screws.
6. Slip the capacitor stator clamp over the end of the capacitor and securely tighten the clamp ring screw.
7. Reinstall the cabinet filler plate removed in steps 1 and 2.

NOTE: After final test of the transmitter into a 50-ohm non-reactive load, the capacitor will have been removed for packing. Avoid reorientation of the capacitor shaft position of the drive motor shaft position prior to reinstallation of the capacitor as described above. Minor reorientation of these shaft positions during installation are permissible since the total range of the capacitor drive motor is seven turns.

3.3 EXTERNAL CONNECTIONS

All external connections are made from the rear of the cabinet. (Directions given below, right or left, are based on rear view access.)

3.3-1 RF Output

The RF output termination is located at the left side of the recessed grille top of the cabinet. Locate the #12 machine screw stud toward the rear of the cabinet. Connect the inner conductor of the coaxial transmission line to this stud. The outer shield of the coaxial cable should be securely fastened to the ground stud located to the left of the output stud.

Note the three clips located to the rear of the cabinet top grille, near the left side of the cabinet. To feed the transmitter output to the transmission line the shorting bar should be located between center clip and the rear clip. Placing the shorting bar between the center

clip and the front clip connects the transmitter output to the dummy load located in the top of the transmitter cabinet.

3.3-2 Audio Input

The audio input terminal block (TB7) is located on the right cabinet wall. Jacketed, two-conductor shielded cable should be used. Connect the two inner conductors to TB7-1 and TB7-2 and connect the cable shield to ground, TB7-3.

3.3-3 Monitor Connections

The RF output connections for modulation and frequency monitors are terminated on TB7 and 8 and are labelled MOD and FQ respectively. Coaxial cable should be used for these connections. Exercise care to insure that these cables are dressed to avoid close proximity to the power transformer high voltage termination.

3.3-4 Power Connections

Before connecting power source, consult with your local utility company as to nominal voltages available at the transmitter site. The BA-1K plate and screen power transformers have primary winding taps for operation from 208, 230, or 240 volt sources. As shipped, these transformers will be connected for operation at 240 volts. If the supply voltage to be connected differs from this, the appropriate primary taps on T1, plate power transformer; T3, screen power transformer; and T6, audio amplifier power supply should be changed to the appropriate voltage tap before connections are made to the power source. NOTE: T5 and T6 have nominal 115 volt primary windings. This voltage appears across the power source neutral and one leg of the 208-240 volt service.

Three-wire service entrance cable, with a minimum wire size of #10 should be used. The power connections are made directly to the fuse block terminals at the lower left side of the cabinet. The neutral should be secured to the large screw stud terminal just to the right of the fuse block. This is also the main cabinet ground point to which a strap connection should be made from the main station ground system.

3.4 REMOTE CONTROL CONNECTIONS

If the BA-1K is to be operated from a remote point, additional interconnection wiring is required. The following functions may be controlled:

1. Filament on/off
2. Plate on/off (overload reset)
3. High/low power operation
4. PA plate tuning
5. PA loading control

The following functions may be metered:

1. PA Plate current
2. PA Plate voltage

See Figure 3B for terminal board identification.

3.5 INITIAL TUNE UP PROCEDURES

The BA-1K is now ready for tune-up.

1. Open the hinged-down front panel by loosening the twist-top knobs located on the outer edges of the panel, below the recessed control panel polystyrene cover. Left knob turns clockwise; right knob, counter-clockwise. Lower the panel to its horizontal position.
2. Attach an ac voltmeter to the bottom of the socket of the third 4-500A from the left. The filament terminals

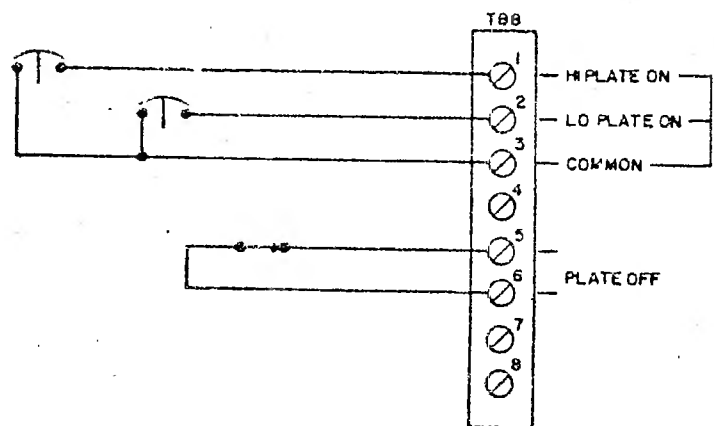
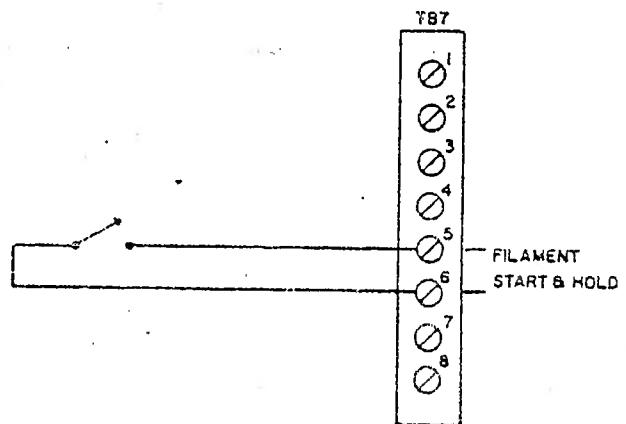
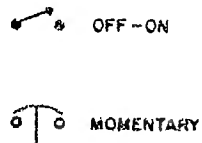
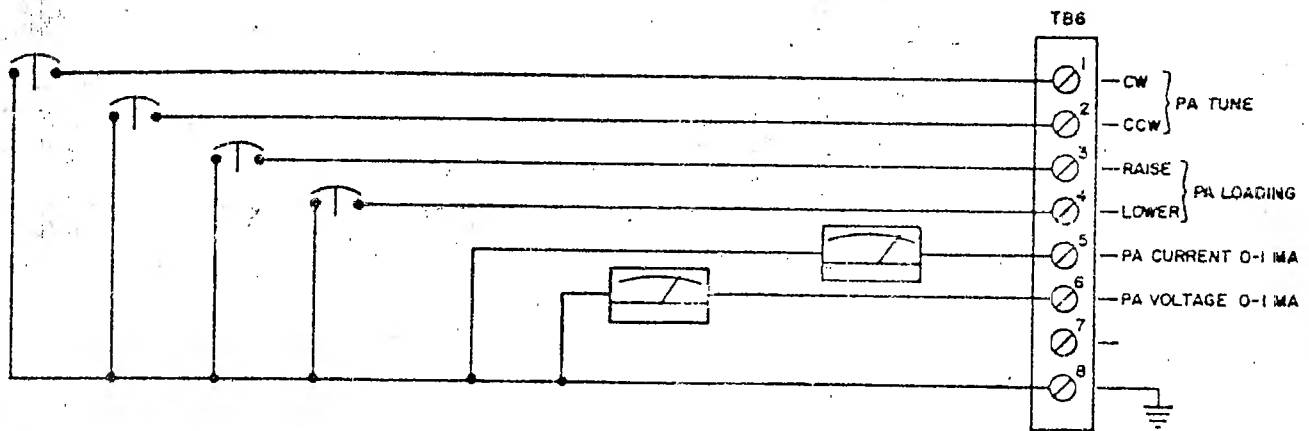


Figure 3B - Remote control connections

are along the left edge of this socket (pins 1 and 5) in a line perpendicular to the cabinet front. Set voltmeter range to measure nominally 10 volts ac.

NOTE: The next operation will turn on filament voltage; low-voltage solid state exciter/driver voltage (+28 Vdc) and also bias voltage of approximately -200 Vdc. USE CAUTION.

3. Depress the FILAMENT ON (green) pushbutton and observe the ac voltmeter reading. It should be 10. ± 0.5 volts ac. If the reading is lower than 9.5 volts or greater than 10.5 volts, depress FILAMENT OFF pushbutton. A reading outside of the specified range indicates that improper primary transformer windings are being used. Disconnect primary power source and relocate primary taps on T5 to proper locations.
4. Assuming the acceptable filament voltage is obtained, place TEST meter in E bias position. A reading of 200 volts should be obtained, on 0-500 scale.
5. Turn L-MOD, R-MOD, and PA DRIVE controls (located on recessed control panel at top of the hinged-down front panel) completely counterclockwise.
6. Place TEST meter in PA DRIVE position. Slowly rotate PA DRIVE control for a reading of approximately 30 milliamperes, on 0-50 scale.
7. Connect a suitable frequency monitor, or a frequency counter, to the frequency monitor drive termination (TB7 & 8). Adjust the FREQ VERNIER control, located to the right on the recessed control panel, to produce the specified operating frequency precisely on the monitor or counter.
8. Close and secure the hinged-down front panel.
9. From the rear, connect the transmitter output to the internal dummy load by placing the output shorting bar between the center and front clips (located at the inside top left edge of the cabinet). Close and secure the rear door.
10. Set PA DRIVE at approximately 35 milliamperes.
11. Depress LOW POWER-ON pushbutton (unless specified in your order, all transmitters are wired and tested for 1000/250 watt operation; and even though intended for normal 1000 watt operation, all transmitters have the 250 watt option as standard).
12. Observe the PA VOLTAGE meter. The reading should be approximately 1500-1700 volts.
13. Observe the PA CURRENT meter. The reading should be approximately 300 milliamperes.
14. Operate the PA TUNING motor control knob for a dip in plate current.
15. Place TEST meter in PA DRIVE position. Adjust the PA DRIVE control to produce approximately 30 milliamperes.
16. Alternately adjust the PA LOADING and PA TUNING motor drive controls to produce a plate current reading of approximately 230 milliamperes, always maintaining a 'dip' in plate current with the PA TUNING adjustment. An RF line current meter reading of 2.25 amperes represents approximately 250 watts power output to the dummy load.
17. Place TEST meter in I pa sg position. The reading should be approximately 100 milliamperes, on 0-500 scale.
18. Place TEST meter in E pa sg position. The reading should be approximately 800 volts, on 0-1000 scale.
19. Place TEST meter in L MOD position. Adjust L MOD front panel control for 100 milliamperere reading on 0-500 scale.
20. Place TEST meter in R MOD position. Adjust R MOD front panel control for 100 milliamperere reading.
21. Apply 400 Hertz tone to audio input of BA-1K and adjust audio input level to produce 100 percent modu-

lation as shown on a modulation monitor. Modulator plate currents, as observed on appropriate TEST meter position, should be approximately 180 milliamperes per tube. If the plate currents are substantially different, they may be dynamically balanced by adjustment of R-33 and R-34.

NOTE: These controls must be adjusted with plate and screen voltages applied. The high-voltage grounding switch must be blocked open and the front panel interlock switch by-passed to permit adjustment. The latter switch may be locked 'on' by pulling the plunger all the way out. CAUTION! Lethal voltages are exposed with the front panel open and switches by-passed as above. USE EXTREME CAUTION!!

- These controls are labelled, and located to the left of the vertical shelf mounted on the underside of the sloped position of the tube mounting shelf. R-33 and R-34 control the left and right modulator tubes respectively. The normal control position is fully clockwise.
22. Remove audio input signal and depress PLATE OFF pushbutton.

This completes the tune up for 250 watt power output. The following procedure should be followed to perform initial tune up for 1000-watt output operating level:

1. Depress HI POWER ON pushbutton.
2. PLATE VOLTAGE should be approximately 2800 volts and PLATE CURRENT, 465 milliamperes. RF LINE CURRENT should be approximately 4.45 amperes for 1000-watt output to the dummy load.
3. To establish the nominal 4.45 ampere RF line current, alternately adjust the PA LOADING and PA TUNING controls, always maintaining minimum plate current dip with the latter adjustment.
4. Recheck PA DRIVE with TEST meter. Adjust PA DRIVE control for approximately 30 milliamperes of PA grid current.
5. With 4.45 amperes RF line current, the following nominal readings should be obtained:

a. PA Plate Voltage	2800 Vdc
b. PA Plate Current	465 milliamperes
c. PA Screen Current (I pa sg)	130 milliamperes
d. PA Grid Current (PA drive)	30 milliamperes
e. Exciter Collector Current (I exc)	1 ampere

6. Recheck L MOD and R MOD plate current ratings on TEST meter. These should be approximately 100 milliamperes.
7. Apply 400 Hertz audio input signal and adjust for 98 percent modulation as indicated on modulation monitor. L MOD and R MOD plate current reading should be approximately 270 milliamperes. Dynamic balance may be adjusted per the procedure described in Paragraph 21 of the low power tune-up procedure. EXERCISE EXTREME CAUTION AS LETHAL VOLTAGES ARE PRESENT DURING R-33/R-34 DYNAMIC ADJUSTMENT! At 100 percent tone modulation, the RF line current reading should be 5.45 amperes.
8. Remove audio input signal and depress PLATE OFF pushbutton.

This completes the initial tune-up procedure for 1000-watt operation.

3.6 FINAL TUNE-UP PROCEDURE

The following steps assume that the antenna load has been correctly matched so that the transmission line

attached to the BA-1K presents a 50-ohm load impedance with little or no reactive component.

1. Open rear door and move output shorting bar from dummy load to output transmission line (between center and rear clips).
2. Depress LOW POWER ON pushbutton.
3. Observe RF LINE CURRENT meter. Reading should be approximately 2.25 amperes. Redip plate current with PLATE TUNING controls and adjust PLATE LOADING for 2.25 ampere line current. Note antenna current reading and adjust PA LOADING alternately maintaining minimum PA plate current with PA TUNING control until 250 watt output as determined by actual antenna current reading is obtained.
4. Depress PLATE OFF pushbutton.
5. Depress HI POWER ON pushbutton. RF LINE CURRENT reading should be approximately 4.45 amperes. Observe antenna current meter reading and alternately adjust PA LOADING and PA TUNING controls for specified antenna current for 1000-watt output power level.
6. Modulate transmitter 100 percent with 400 Hertz audio input tone.
7. Remove audio input signal and depress PLATE OFF pushbutton.

This completes the installation of the BA-1K.

IV. OPERATION

The daily operating of the BA-1K is straightforward. Start up procedure is as follows:

1. Depress FILAMENT ON pushbutton.
2. After approximately 15 seconds, depress HI POWER On pushbutton. This will place the BA-1K in operation at the higher-power level (assuming dual-power operation); either 500 or 1000 watts, whichever is specified in your order.
3. Apply programming.
4. If dual-power operation is specified, operation at the lower power level (either 500 or 250 watts; as specified in your order) is switched as follows:

Depress PLATE OFF pushbutton

Depress LOW POWER ON pushbutton

Shut down procedure is as follows:

1. Depress PLATE OFF pushbutton.
2. After approximately 60 seconds, depress FILAMENT OFF pushbutton. (The 60-second waiting period is recommended as a minimum to allow the cabinet blower to provide additional cooling after plate power is removed. This period should be extended where the transmitter environment is subject to particularly high seasonal ambient temperatures.)

V. CIRCUIT DESCRIPTION

Reference to cited drawings will be helpful in understanding of the following:

5.1 RF EXCITER/DRIVER (Drawing #554024)

The BA-1K exciter/driver design takes advantage of the improved frequency stability inherent in the frequency

spectrum immediately above the AM standard broadcast band.

A vacuum-housed crystal is used in the crystal oscillator stage, Q1. The crystal frequency is in the range of 2,160 to 4,320 kiloHertz. Vernier frequency adjustment is controlled by shunt capacitor C2 (located on the recessed front control panel). A coarse frequency adjust capacitor, C1, is located directly below the crystal socket. The output of the crystal oscillator stage is buffered, amplified, and shaped by Q2 and Q3. The RF output voltage or Q3 is essentially square-wave to drive pin 1 of the 7473 dual JK flip-flop integrated circuit. The divide-by-two and divide-by-four outputs of the 7473 appear on pins 13 and 7 respectively. For output operating frequencies from 1090 to 1600 kiloHertz output is derived from pin 13 and the crystal frequency is two times the operating frequency. For operation between 540 and 1080 kiloHertz, output is taken from pin 7 and the crystal frequency is four times the operating frequency.

Drive signal on the transmitter operating frequency is amplified by Q4 and Q5. R-18 is the PA DRIVE control (located on the recessed front control panel). It establishes drive level to Q6, the exciter power output stage. Q6, a type 2N5039 device is capable of delivering a maximum of 40 watts output. The low-impedance collector output of Q6 is inductively coupled to a high-impedance tank circuit which is resonated to the operating frequency by C15 and C16, a compression-type padder, which is located on the output inductor mounting bracket. RF drive for a frequency monitor is obtained from a two-turn link closely-coupled to the exciter output tank coil. RF output is capacitance coupled to the 4-500A RF PA grids and is fed through coaxial cable from the driver assembly to the grid coupling capacitor, C36 (Drawing #000265) mounted adjacent to the RF PA tube sockets.

Collector current to the 2N5039, Q6 amplifier is sampled by R20, a 0.27 ohm resistor. The voltage drop across R20 is measured through R21 in the I exc position on the TEST meter. +28 volts dc operating voltage for the RF exciter/driver is obtained from the control relay/driver power supply.

The RF exciter/driver assembly is physically located on the inner side of the hinged-down front panel. It is the center assembly located on the equipment deck inside the panel. The operating voltages may be checked with the assembly in operation. The bottom (etched side) of the printed circuit board is accessible by removing the four self-tapped machine screws located along the lower edge of the assembly. The assembly may then be hinged upward for inspection of its underside. C1 is the only component mounted under the assembly.

5.2 AUDIO DRIVER (Drawing #552078)

The solid state audio driver stage provides the amplification required to raise the +10 dBm line input signal to a level suitable for driving the grids of the two 4-500A Class AB1 modulators.

The 600 ohm balanced input impedance is matched to the base of Q1 by means of input transformer T1. Q2, a 2N3569 NPN device and Q3, a 2N4355 PNP device serve as a phase-splitter stage to drive the MJE 2801's, Q4 and Q5, symmetrical complementary output stage. The low impedance output of this stage is transformer-coupled by T2 (located on the vertical shelf directly below the left modulator tube) to the grids of the modulators.

The audio driver assembly is powered from an individual power supply delivering a nominal +40 volts DC.

The amplifier driver/power supply assembly is mounted at the top inner side of the hinged-down front panel. The assembly is mounted on a hinged panel. Removal of two self-tapped machine screws at the top sides of the panel, permits the complete assembly to be lifted for access to underside of the printed circuit board and other circuit components located on the underside of the panel.

5.3 RF POWER AMPLIFIER

(Main Schematic Drawing #000265)

The RF Power amplifier stage utilizes two parallel-connected type 4-500A tetrodes, V3 and V4, operating as a Class C amplifier.

The filaments of these tubes are connected to separate secondary windings of T5.

The grids receive RF drive from the exciter through coupling capacitor, C36. R55 and R56 are drive equalization resistors.

Fixed grid bias for the stage is supplied from a bias supply, and is established by a slider setting on R-63. This voltage from the supply passes through D21; parallel-connected grid current sampling voltage resistors, R61 and R62; R52; and grid choke, RFC-1. The grid current sample voltage, appearing across paralleled R61 and R62, appears on the PA DRIVE position of the TEST meter. When grid current results from RF drive, the current passes through R-63 to ground. When this current reaches a value to produce a voltage drop across R63 which exceeds the fixed dc voltage value at the anode of D21, D21 no longer conducts, and the voltage on the grids of the 4-500A's is derived solely as the result of the RF drive power applied to the stage. The value of fixed bias supply voltage appears on the Ebias position of the TEST meter.

Operating screen voltage is obtained from a dual screen voltage power supply (mounted on the left wall of the cabinet), which supplies both modulator and RF PA screen voltages. A well-filtered dc output voltage of nominally 800 volts, measured on the E pa sg position of the TEST meter, is fed to each of the screens through R57. Two slider taps on this resistor adjust the individual tube screen voltages. To permit full modulation of the stage, a small amount of self-modulation of the screens is produced by the voltage drop across the series segments of R57. Each screen is RF by-passed to ground by C27 and C28, which offer a high impedance to the audio modulating voltages.

PA plate voltage from the modulator stage (described in detail in Section 5.4) is shunt-fed through RF choke RFC-2 (series connected RFC-2 and RFC-2A for operating frequencies below 1000 kHz) and to the 4-500A plates through individual parasitic suppressor networks comprised of L14, R53, and L15, R54.

The RF output tuning/matching network is of a pi-T configuration, coupled through the plate blocking capacitor, C10, C-9, a vacuum-variable, motor-driven capacitor; L8; and C11/C11A comprise the input pi-section. The network is resonated to the operating frequency by C-9 and serves as an intermediate impedance transformation between the tube plate output impedance and the input impedance of the T-section comprised of L9; C12/C12A;

and L10. An adjustable tap on L9 permits a portion of the inductance to be series resonated with the C12/C12A combination at the second harmonic of the operating frequency. This provides a low impedance path to ground for second-harmonic energy, resulting in excellent second-harmonic attenuation at the network output. The inductance of L10, the output section of the T network is varied by the positioning of a concentrically oriented tuning slug, which is controlled by a motor-drive mechanism. This serves as the LOADING control, permitting precise adjustment for matching a 50-ohm output load.

Local plate current metering is obtained from the voltage drop across R58. R58 is series-connected with R59 which produces the remote plate current sampling voltage. R58 and R59 are connected between the center taps of the 4-500A filament windings and ground. The ground returns from the screen and bias voltage power supplies are also made to these center taps; thus the plate current reading does not include the screen and grid currents. The circuit location of the plate current meter also maintains it near ground potential to reduce high-voltage hazards in the event of a malfunction. All of the RF PA output circuit components are located in the upper half of the cabinet above the tube mounting shelf and are readily accessible for adjustment and routine maintenance.

5.4 MODULATOR STAGE

(Main Schematic Drawing #000265)

The two 4-500A modulator tubes are operated in a Class AB1 mode.

Input drive from the AF amplifier assembly is fed through the audio driver transformer, T2. T2 serves to transform the unbalanced input signal to balanced output to drive the push-pull modulator grids. R33 and R34 are the dynamic balance controls and permit adjustment to be made for modulator tube imbalance resulting from aging. Signal from the balance controls is capacity-coupled through C20 and C31 to the grids of V1 and V2 respectively. Each tube has a 47 ohm series-connected parasitic suppressor resistor, R35 or R36, in its grid lead.

Adjustable grid bias voltage is fed to each grid through individual voltage divider networks R39/R40; and R41/R42. 100K-ohm series resistors, R37 and R38, serve as high impedance isolation paths for the bias voltage.

R39 and R40 are the L MOD and R MOD controls located on the front recessed panel and are used to set static plate currents for the modulator tubes.

The filament voltages for the modulator tubes are derived from separate transformer secondaries of T5. The center taps of these windings are returned to ground through R48 and R49. The voltage drop across these resistors provides sampling voltages for measurement of individual tube plate currents and are metered in the L MOD and R MOD positions of the TEST meter. Screen voltage, nominally 800 volts, is furnished from the dual screen voltage power supply. This voltage may be measured in the E mod sg position on the TEST meter.

The plates of the modulator tubes, through parasitic suppressor networks, R46/L11 and R47/L12 are connected to the high sides of the center tapped modulation transformer, T6, primary winding. Plate supply voltage is connected to the center tap. Approximately 10 dB of AF feedback compensation is provided by RC networks connected between the modulator tube plates and the

primary of the audio input transformer on the AF audio driver assembly.

The modulation transformer secondary is dc isolated from ground by C8 and super-imposes the audio frequency voltage swing on the RF PA plate supply voltage. This AF energy is isolated from the high-voltage power supply by the modulation reactor L6.

5.5 POWER SUPPLIES

5.5-1 HV Power Supply

A common power supply for the RF PA Amplifier and modulator tubes is provided. A single phase plate transformer T1, is equipped with a number of primary winding taps. One set of taps accommodates primary power source voltages of 207, 230, or 240 volts ac. The second set functions as operating output power level taps to provide secondary voltages of 1730, 2770, or 3050 volts, ac.

The secondary winding feeds a full wave bridge rectifier, D1 through D4. The negative polarity output of the rectifier bridge is returned to ground through the overload relay coil K4 whose trip point is adjusted by variable shunt resistor, R3. The function of K4 will be discussed in greater detail in Section 5.6, Control System.

The rectified, positive polarity, dc voltage is filtered by L5 and C6. R4 is the high voltage bleeder resistor.

R5 through R8 comprise a precision voltage multiplier string for operation of the front panel PLATE VOLTAGE meter. R5R through R8R provide remote PA plate voltage sampling.

5.5-2 Dual Screen Voltage Power Supply

T3 is the power transformer for this supply. It has primary winding taps for 208, 230, or 240 Vac operation; and two secondary high voltage windings. One, for the RF PA screen requirements, delivers 750 volts; the second, for the modulator screens delivers 625 volts; the electrical circuitry for the two supplies is identical, consisting of two-section-LC filters. However, the screen current requirements for the RF PA stage are substantially greater than those for the modulator stage and the filter reactors therefore, are of higher current ratings. The complete dual screen supply assembly is mounted on the inner left wall of the cabinet.

5.5-3 RF Exciter/Driver Control Relay Power Supply

This is a straight-forward full wave bridge rectifier circuit. AC is supplied by T4 which has a 115 Vac primary winding, fed from one side of the 230 Vac line and ground, and a 28 Vac secondary. A portion of the control ladder circuitry utilizes 28 Vac and the balance, the 28 Vdc output of this power supply. These circuits will be described in detail in Section 5.6.

The RF exciter/driver circuitry described in Section 5.1 represents the major load for this power supply.

5.5-4 Bias Voltage Supply

This power supply furnishes grid bias voltages for both the RF power amplifier and the modulator stages. It is a conventional full-wave bridge rectifier supply, delivering nominally +200 volts. 200 Vac is supplied from the secondary of T7 which has a 115 Vac primary, excited from one side of the 230 Vac primary power source and the neutral ground.

5.6 CONTROL SYSTEM

(Main Schematic Drawing #000265)

See Figure 5A for simplified diagram of control ladder. The circuitry is quite fundamental. S2 and S3, the FILAMENT ON and FILAMENT OFF momentary-operation pushbutton switches energize the primary of T4 which serves the dual purpose of supplying dc voltage to the RF exciter/driver circuits and 28 Vac to the control ladder.

When S2 (FILAMENT ON) pushbutton is depressed, the 115 Vac primary of transformer T4 is energized from one side of the 220 Vac line neutral. The 28 Vac secondary of T4 energizes the coil of the filament and control power relay, K1. The holding contact 'A' of K1 maintains the 115 Vac circuit to T4 after momentary pushbutton S2 is released. This same 115 Vac circuit also energizes the blower motor, bias transformer, T1; and AF driver power transformer, T6.

Note that S3 (FILAMENT OFF) is normally closed and in series with S2. Depressing S3 releases the holding contacts 'A' of K1.

The 28 Vac from T4 serves also as supply voltage to K3 the 'low power on'; and K4, the 'high power on' control relays. One leg of this power supply is fed through the front panel door and rear door mechanical interlock switches; the air flow sensor switch (which closed as the blower started and generated air flow); the normally closed contact of the overload relay K4; and the normally closed contacts of S5 (PLATE OFF) switch.

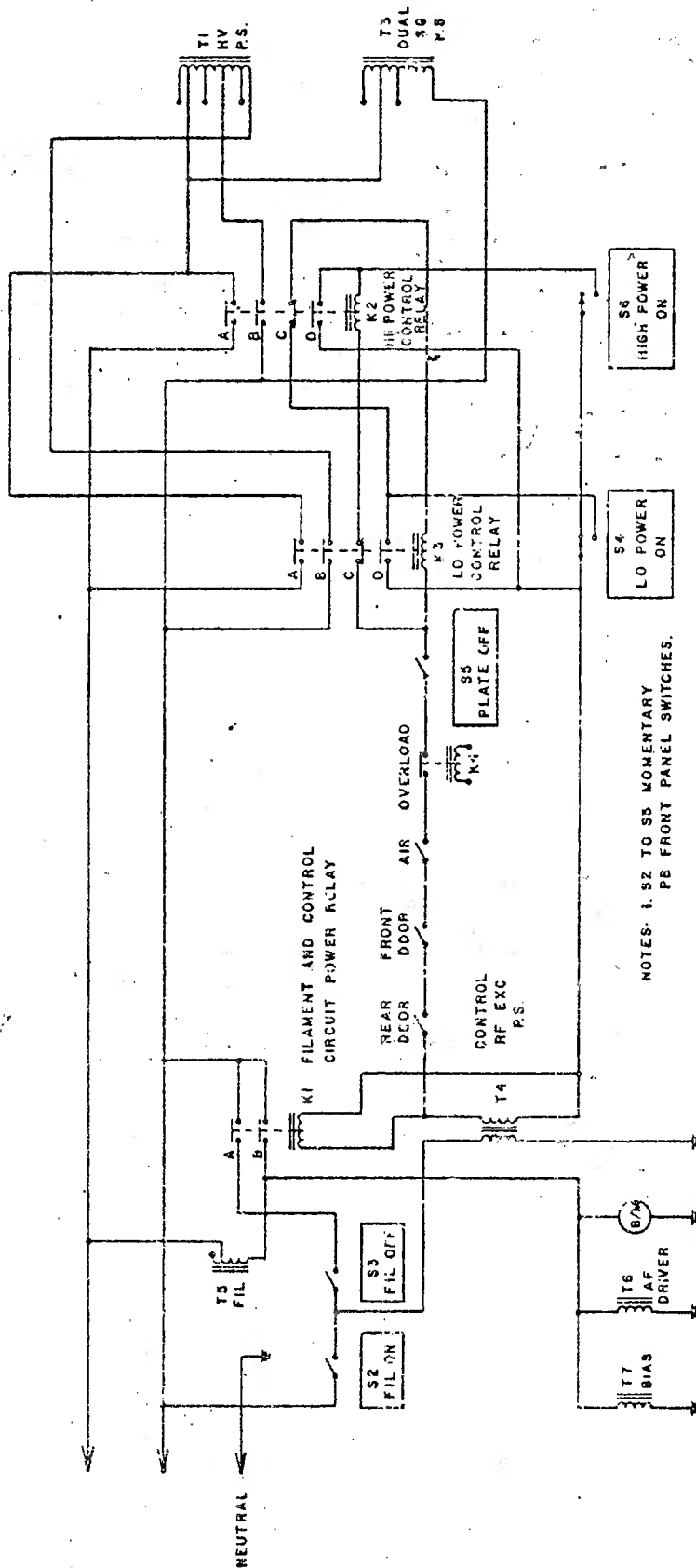
When S4 (LO POWER ON) momentary pushbutton switch is depressed, the coil of relay K3 is energized through the normally closed 'C' contacts of K2. When K2 operates, its 'D' contact 'holds' K3 on. The 'A' contacts connect one side of the 220 Vac line to one leg of T1 (High Voltage Power Supply) and one leg of T3 (Dual Screen Grid Power Supply) primaries. (The second leg of the T3 primary is wired to the other side of the 220 Vac line.) Contacts 'B' connect the other side of the 220 Vac line to the low-power voltage tap of T1. The transmitter is thus in its LO POWER ON mode.

Operation of momentary pushbutton switch, S5 (PLATE OFF) removes the 28 Vac from the coil of K3, which reverts to its 'off' condition.

Depressing S3 (HI POWER ON) momentary closure pushbutton feeds, through the normally closed contacts of S4, one side of the 28 Vac supply to the coil of relay K2. K2 is energized since the opposite side of the relay coil is connected to the other side of the 28 Vac supply through the normally closed 'C' contacts of K3.

When K2 operates, its contacts 'D' close and hold K2 'on'. The 'C' contacts open (disabling operation of S4 and K3). The 'B' contacts connect one side of the 220 Vac to the high power primary tap of T1, the high voltage power transformer. The 'A' contacts connect the other leg of the T1 primary as well as the primary of T3, dual screen grid power transformer, to the other side of the 220 Vac line. The transmitter is now in its 'HI POWER ON' mode.

Not discussed above are the operation of the overload relay, K4 and the two 'Carrier Restorer' modules associated with the low and high power relays, K2 and K3. K4, shunted by R3, is connected between the negative



NOTES: 1. S2 TO S5 MOMENTARY
PB FRONT PANEL SWITCHES.
2. FOR CLARITY, UNUSED
RELAY CONTACTS, FUSING
& PB ILLUMINATION NOT
SHOWN.

SIMPLIFIED CONTROL SYSTEM DIAGRAM

Figure 5A - Simplified control systems diagram

polarity output of the high voltage rectifier bridge and ground, thus passing the full load current of the HV power supply. Its sensitivity is adjusted by the setting of R3 which is factory set to trip at a current of 900 to 1200 milliamperes.

Refer to 'Detail A' on the Main Schematic Diagram #000265 for the circuitry of the Carrier Restorer. The two units are identical and perform the same function depending on whether the transmitter is in the high or low power operating mode.

The function of the Carrier Restorer is to automatically operate the plate 'on' relay two times if an interruption in power occurs, or a momentary overload condition causes K4, the overload relay to trip.

The operation of the circuit is as follows: The 28 Vac appearing across the coils of the plate 'on' relays, K2 or K3, is fed to input terminals A and B of the carrier restorer. This voltage is converted to dc by a full wave bridge rectifier, D-101 through D-104, and charges C-101; and C-102, in series with R-101. This energizes K-101. The contacts of K-101 close, charging C-103 through R-102 and D-105. This is the 'normal' condition of the circuit whenever the transmitter is in its PLATE ON mode.

Now assume an interruption in the primary power source. The 'plate on' control relay, K2 or K3, will drop out since its coil will lose the normal 28 Vac energizing voltage.

This results also in the loss of ac supply voltage to the 'carrier restorer' circuit. The dc voltage across the coil of K-101 decreases and K-101 releases. The charge on C-103 (which cannot return to the primary charging capacitors C-101 and C-102 because of D-105) is connected through the contacts on K-101, to K-102. The coil of K-102 is energized by the charge on C-103. The C and D contacts of K-102 are connected across the contacts of the S4 (LOW POWER ON) or the S5 (HI POWER ON) switches. Two contact closures of K-102 will occur in approximately one second. As these closures occur, the plate 'on' relay, K2 or K3, will operate restoring the transmitter to its 'on' position if the cause of the interruption has been corrected.

The circuitry of the PA loading and tuning motor assemblies is shown in Drawings #896074 and #896075.

VI. MAINTENANCE

Good, general housekeeping practice, by routinely keeping the cabinet enclosure free of dust and dirt will provide many years of service from the BA-1K.

CAUTION

Before any work is done in the internal cabinet area, disengage all primary service switches or breakers. Discharge all filter capacitors before starting work. Although the high-voltage power supply is automatically shorted to ground when doors are opened, hazardous voltages could remain on the bias supply and screen-grid voltage supplies if bleeder resistors should open.

Although dust accumulation within the cabinet will be minimal due to positive cabinet pressure during blower operation, it is recommended that at intervals of no less than 30 days, all internal surfaces and components be wiped down with a clean lint-free cloth. Collect any accumulation of wiped-down dust with a vacuum cleaner.

The intake filter mounted on the rear door is of the maintainable type. Visual inspection of the filter through the grille cover will indicate the presence of dust on the filter grid. Remove the captive fasteners located at each end of the grille. The filter may then be removed for cleaning. This may be done during normal transmitter operation.

All drive motors and the blower motor are of the permanently lubricated type and require no service.

All relay contact closures are of the wiping type and protected by covers. Contact burnishing is not required.

It is recommended that the cabinet outer surfaces be kept clean of finger marks by cleaning periodically with a mild detergent. Meter faces and the plexiglass front should be gently wiped using standard plexiglass cleaner or a mild detergent. It is essential that a clean, abrasive-free cloth be used to avoid scratching of the high-sheen plastic.

Although it is unlikely there will be a requirement for access to cable harnessing, access is possible by removal of the cabinet side panels. To remove the side panels, locate the plastic hole plugs marked A at either side of the lower rear of the cabinet. Using a Phillips-head screwdriver, remove the machine screw immediately behind the inner side pane. The side panel may then be lifted off.

VII. PARTS LIST

Many of the components, particularly in the low-level RF and AF circuits and power supplies are available from local electronic wholesalers. It is recommended that the owner make an effort to maintain a spare supply of fuses, transistors and tubes for replacement purposes. The following is a listing of replaceable parts either unique to the BA-1K, or of McMartin manufacture:

AUDIO DRIVER (Dwg. 552078)

SYMBOL	P/N	DESCRIPTION
C1	600030	Capacitor, electrolytic 2.2 mfd/64V
C3, 4	600011	Capacitor, electrolytic 47 mfd/25V
C5, 6	601031	Capacitor, electrolytic 2400 mfd/50V
D1, 2	210008	Diode, IN4006
Q1	201049	Transistor, Type SE4002
Q2	201056	Transistor, Type 2N3569
Q3	201055	Transistor, Type 2N4355
Q4, 5	201068	Transistor, Type MJE 2801
R-3	400041	Trimpot, 1K ohm, no shaft
T-1	910052	Transformer, Input 2A107

RF EXCITER (Dwg. 554024)

C1	660028	Capacitor, trimmer, 5.5-18 pf.
C2	660037	Capacitor, variable
C5, 9	660011	Capacitor, electrolytic 47 mfd/25V
C14	600024	Capacitor, electrolytic 250 mfd/64V
C16	660014	Capacitor, mica compression 100-500 pf.
IC-1	230041	Integrated circuit, Type 7473
L1	930050	Choke, RF
L2, 3	930035	Choke, RF
L4	930173	Coil assembly, driver output
Q1, 2, 3	201079	Transistor, Type 2N5179
Q4	201033	Transistor, Type 2N2102
Q5	201096	Transistor, Type 2N6179
Q6	201097	Transistor, Type 2N5039
XTAL	090037	Crystal, vacuum, NEL Type T-9A
Z-1	220007	Diode, Zener, 13V

MAIN SCHEMATIC (Dwg. 000265)

Dual Screen Grid Power Supply

C1 - 4	600015	Capacitor, 10 mfd/1000V
D5 - 12	220021	Diode, rectifier, Type MR994
L1, 2	928961	Choke, filter; 10.5H, 225 mA
L3, 4	928960	Choke, filter, 9.0H, 125 mA
R1, 2	540106	Resistor, adjustable; 50K ohm, 50 W
T3	900067	Transformer, Power; Type 2P157A

Bias Power Supply

C-35	600042	Capacitor, electrolytic 60 mfd/450V
D17-20	210008	Diode, rectifier; IN4006
R-43	540102	Resistor, adjustable; 10K ohms, 25 W
T-7	900055	Power Transformer

Audio Amp Power Supply

D21, 22	210008	Diode, Type IN4006
T6	900007	Power Transformer

Control Module

C5	600050	Capacitor, electrolytic; 15000 mfd/50V
D13 - 16	210010	Diode, Type 4D111
T4	918965	Transformer, Control, Type RT206

Audio Driver Assy

R33, 34	402009	Control, 100K ohm, 2W, C1 taper
T2	918967	Transformer, AF driver; Type 2A-112A
T5	900068	Transformer, filament; Type 2P-156

MAIN SCHEMATIC (Dwg. 000265) - Continued

SYMBOL	P/N	DESCRIPTION
Feedback Network		
C16	632008	Capacitor, paper: 1.0 mfd/400V
R9 - 23	511030	Resistor; 1.0M ohm, 2 watt, 10%
R29 - 30	502136	Resistor; 100K ohm, ½ watt, 5%
C-5	689601	Capacitor, HV filter 21 mfd/4KV
C-8	689600	Capacitor, film 1.0 mfd/4KV
C-9	660038	Capacitor, vacuum, variable 1000 pf max UCSX-1000 (.54-1.0 MHz)
C-10	658961	.001 mfd/8KV
C-18, 19	650077	Capacitor .001 mfd/2KV
C-20, 31	632008	Capacitor, paper 1.0 mfd/400V
C-21-26, 29, 30	658962	Capacitor, mica .1 mfd/250V
C-27-28, 36	658963	Capacitor 1000 pf/5KV
C-32, 34	632004	Capacitor, paper 2 mfd/400V
D1-4	210015	Rectifier diode module, HV, Type RS-15-12-12-M
F1, 2	280041	Fuse, 30A (Buss 2C30)
D-1, 2, 3	470028	Relay #2190E44EA
K4	470030	Relay, overload, (KUP11K15)
L5	918963	Reactor, HV Filter; 10H (E/S #7364)
L6	918962	Reactor, modulation 50H, 0.75A (E/S #7365)
L8 var	928964	Inductor, variable; EFJ #200-104
L9 var	928965	Inductor, variable; EFJ #200-206
L10 var	928966	Inductor, variable; EFJ #200-101
L11, 12, 14, 15	721003/521010	Choke, parasitic
R3	540100	Resistor, adjustable; 25 ohms, 50W
R4	540101	Resistor; 100K ohms, 225W
R5-8, 5R-8R	511030	Resistor, 1 meg 2W
R35, 36	521014	Resistor; 47 ohm, 2 watt, 10%
R37, 38	521006	Resistor; 100K ohm, 2W, 10%
R39, 41	402014	Control; 25K ohm, 2W
R40, 42	522007	Resistor; 10K ohm, 2W, 5%
R44, 45	540102	Resistor; 10K ohm, 25W
R46, 47, 53, 54	521010	Resistor; 100 ohm, 2W, 10%
R-48, 49	540104	Resistor; 4.0 ohm, 25W, 10%
R-52	533028	Resistor; 150 ohm, 5W, 10%
R55-56	533010	Resistor; 47 ohm, 5W, 10%
R57	540105	Resistor; adjustable; 10K ohm, 225W
R58	540103	Resistor; 2.0 ohm; 25W
R59	540107	Resistor, adjustable; 10 ohm, 50W
R60	402013	Control; 1.0K ohm, 2W, C1 taper
R63	540102	Resistor; 10K ohm, 25W
RFC 2/2A	928962	RF Choke; 2.5 mH
T-1	918961	Transformer, HV plate; (E/S #7363)
T-2	918967	Transformer, modulator driver
T-3	900067	Transformer, screen grid power (2P157A)
T-4	918965	Transformer, control/RF exc. power
T-5	900068	Transformer, Filament
T-6	900007	Transformer, power; AF driver supply; (2P59E)
T-7	900055	Transformer, power, bias supply; (2P141B)
T-8	918960	Transformer, modulation; (E/S #7361)
Z-1, 1R	220011	Zener diode, 24V
Loading Control Assy (Dwg. 896074)		
K1, 2	470013	Relay DPDT
Motor	896303	Drive motor; Hurst GA30 (w/1.0 mfd capacitor)
S1, 2	489601	Switch, limit; SPST, NC; (Microswitch V3-1)
PA Tuning Assy (Dwg. 896075/1)		
KC, 2	470013	Relay, DPDT
Motor	896300	Drive, motor; Hurst DA4 (w/9.5 mfd capacitor)
S2	492035	Switch, limit, SPDT, N.O. (Micro 842D41)

*

VIII. SCHEMATIC DIAGRAMS

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AUDIO AMPLIFIER	P/N 552078	14
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PA TUNE ASSEMBLY	P/N 896075/1	16
LOADING CONTROL ASSEMBLY	P/N 896074	17
MASTER SCHEMATIC	P/N. 000256	*

* Folded Blueprint

WARRANTY

McMartin products are warranted to be free from defects in materials and workmanship for a period of one year after shipping date, when subjected to normal usage and service. All warranties are void if (a) equipment has been altered or repaired by others without McMartin's specific prior authorization; or (b) equipment is operated under environmental conditions or circumstances other than those specifically described in McMartin literature or instruction manuals.

Upon notification within the applicable warranty period, McMartin agrees without charge, to repair, replace, or supply replacement parts for any properly maintained equipment or parts that are defective as to design, materials or workmanship and that are returned in accordance with McMartin's instructions to the Buyer. At McMartin's sole discretion, the Buyer may be requested to return the defective part or equipment to McMartin, FOB Omaha, Nebraska. Parts or equipment may be returned only with McMartin's prior authorization and must be identified by a return authorization number previously issued by McMartin's Customer Service Department. All merchandise so returned must be sent transportation prepaid, at Buyer's risk. Full details of the failure or malfunction should be included so as to expedite repair or replacement. Repair parts or repaired or replaced equipment will be returned to the Buyer, FOB factory.

The above warranty does not extend to other equipment, such as tubes, transistors, I.C.'s lamps or fuses manufactured by others, which are subject to only such adjustment as McMartin may obtain from the suppliers thereof. McMartin shall not be liable for consequential damages resulting from the use of, or the inability to use, the equipment; nor for any loss, damage or expense incurred thereby; nor from any other cause.

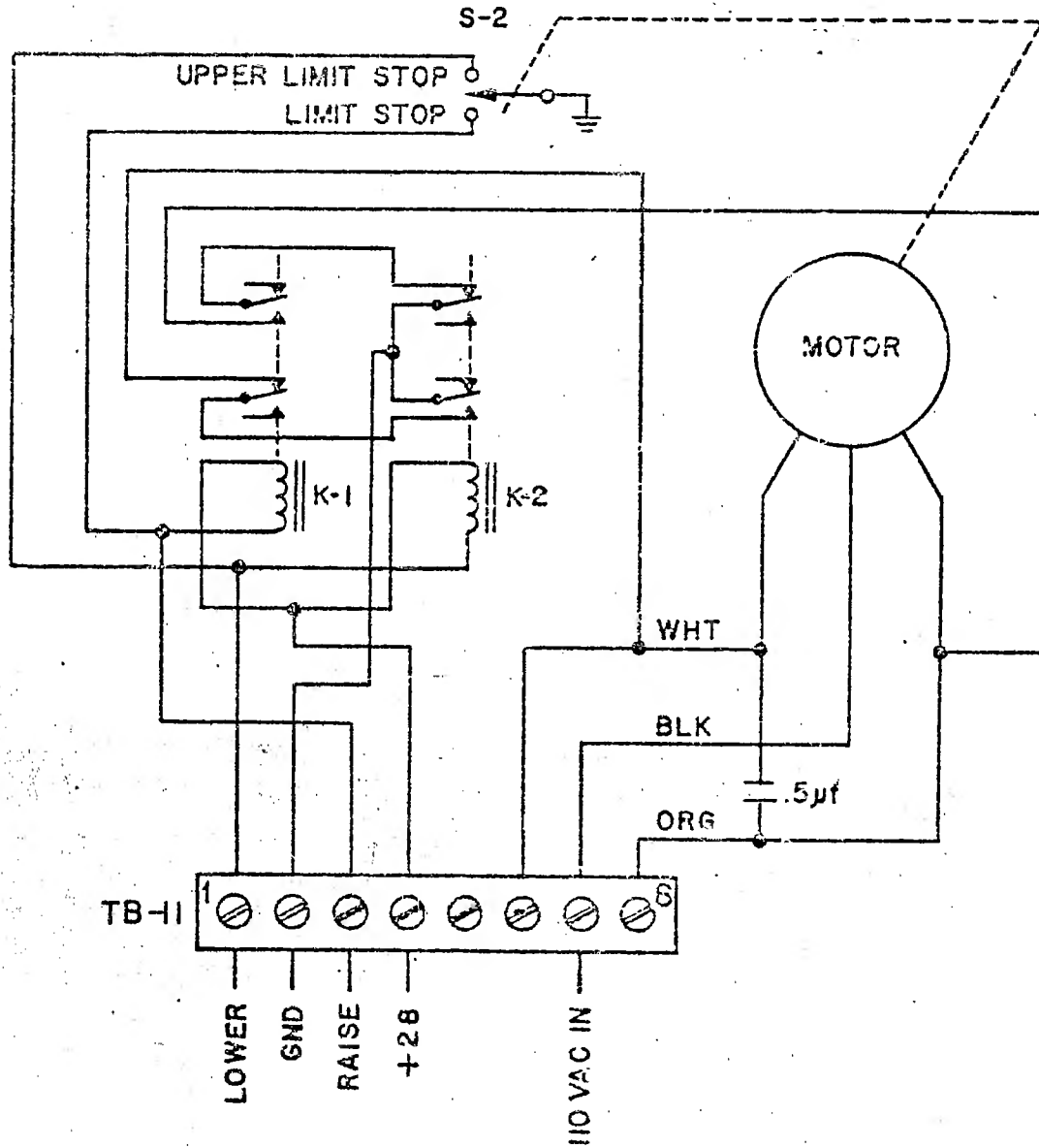
Except as set forth herein, and except as to title, there are no warranties, or any affirmations of fact or promises by McMartin, with reference to the equipment, or to merchantability, fitness, for particular application, signal coverage, infringement, or otherwise, which extend beyond the description of the equipment on the face hereof.

ANTENNA WARRANTY

On McMartin FM antennas, the warranty is extended to two years.

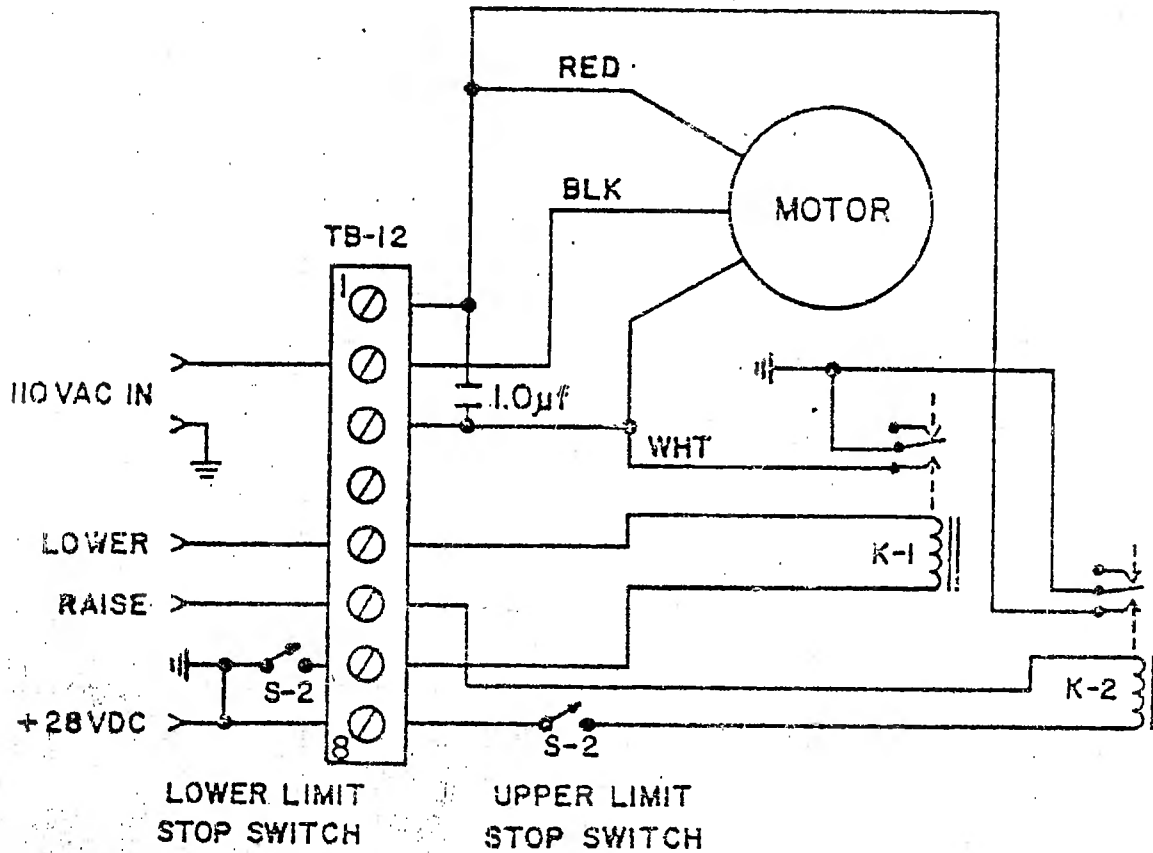
McMURDO BANK

250, 500, 1000 WATT AM
TRANSMITTER



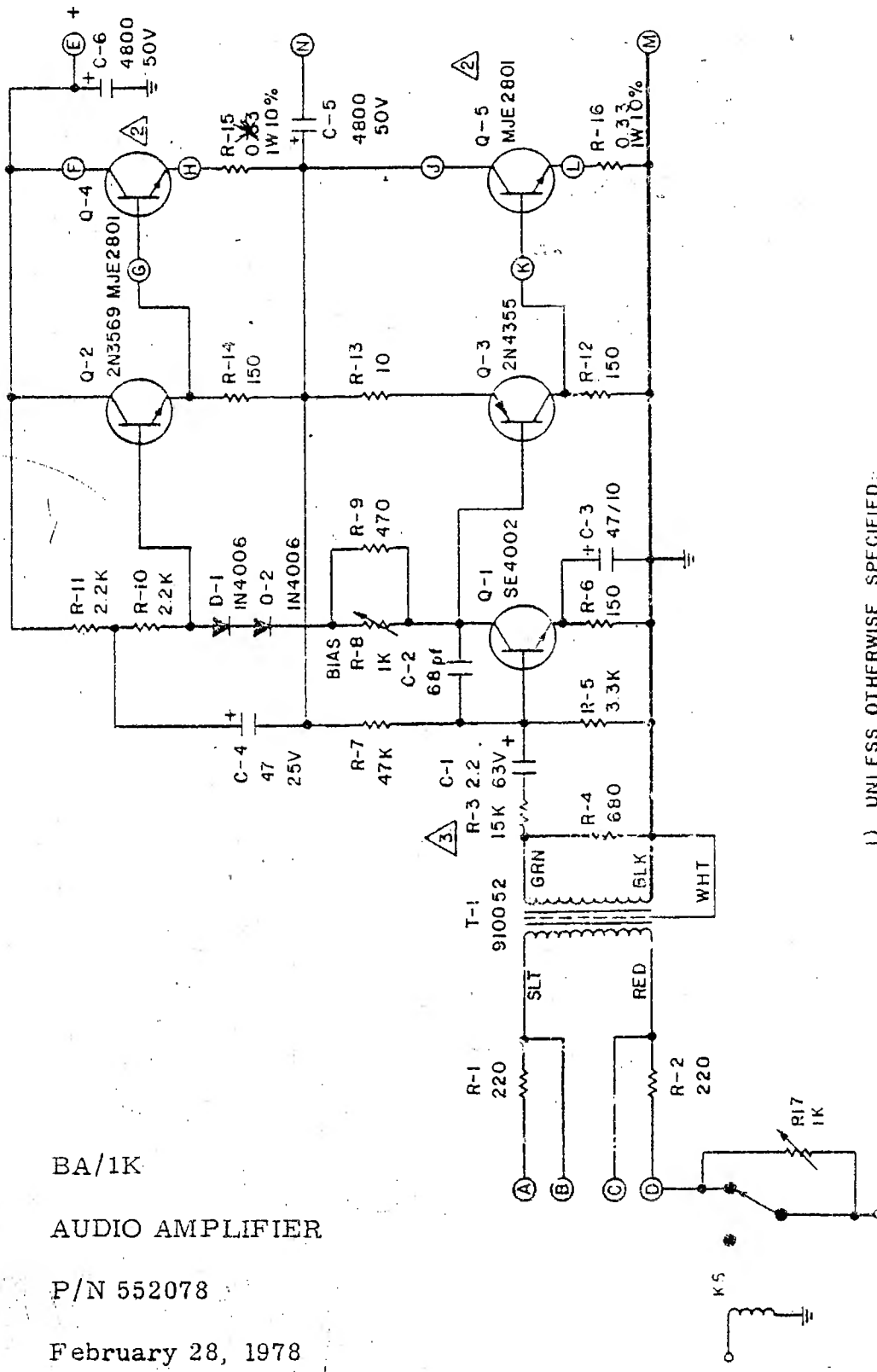
PA TUNE ASSEMBLY

P/N 896075/1



LOADING CONTROL ASSEMBLY

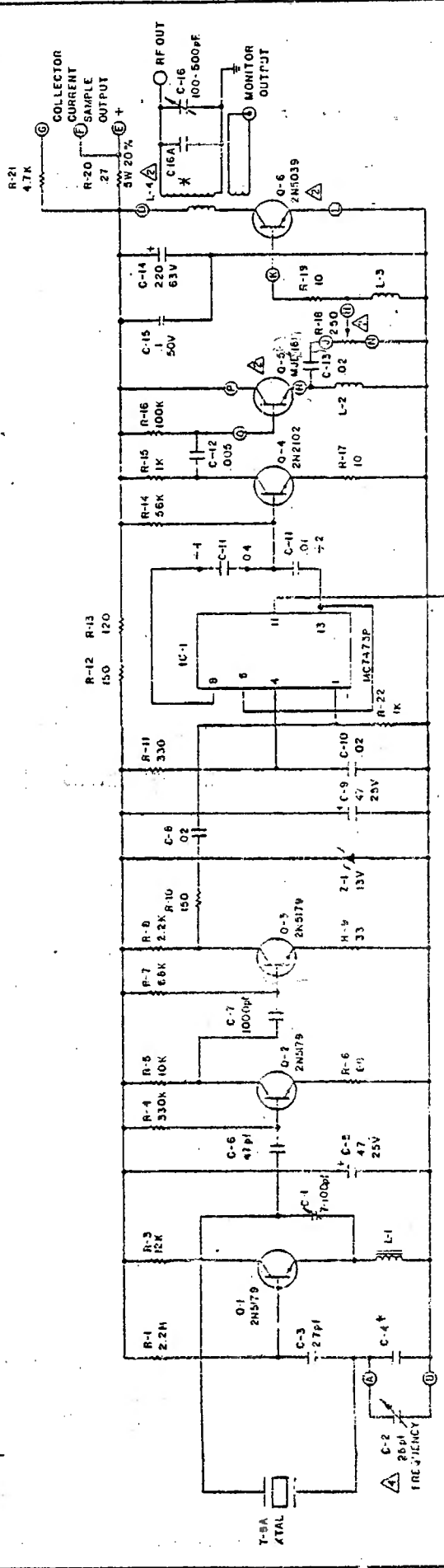
P/N 896074



BA/1K
 AUDIO AMPLIFIER
 P/N 552078
 February 28, 1978

- 1) UNLESS OTHERWISE SPECIFIED;
 ALL CAPACITORS ARE IN MFD'S,
 ALL RESISTORS ARE IN OHMS, 1/2W ±5%
- 2) NOT MOUNTED ON P.C. BOARD.
- NOTES: 3 ADJUST FOR SPECIFIED INPUT LEVEL.

DATE	1/18/70
APP'D	[Signature]
REV	1
BY	WV
CHK'D	[Signature]
DATE	1/18/70
APP'D	[Signature]



REV	1
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REV	1
BY	WV
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EXCITER
P/N 554024
JAN 8, 1970

1 LOCATED ON RECESSED CONTROL PANEL
 2 STARBUCK VALVES SELECTED IN PRODUCTION.
 3 NOT LOCATED ON PCB.
 4 ALL CAPACITORS ARE IN MFD'S.
 5 ALL RESISTORS ARE IN OHMS, 1/2W 5%

REV	1
BY	WV
CHK'D	[Signature]
DATE	1/18/70
APP'D	[Signature]
DATE	1/18/70
APP'D	[Signature]

BILL OF MATERIALS
 JPMartin Industries, Inc
 SCHEMATIC
 EXCITER
 554024/1

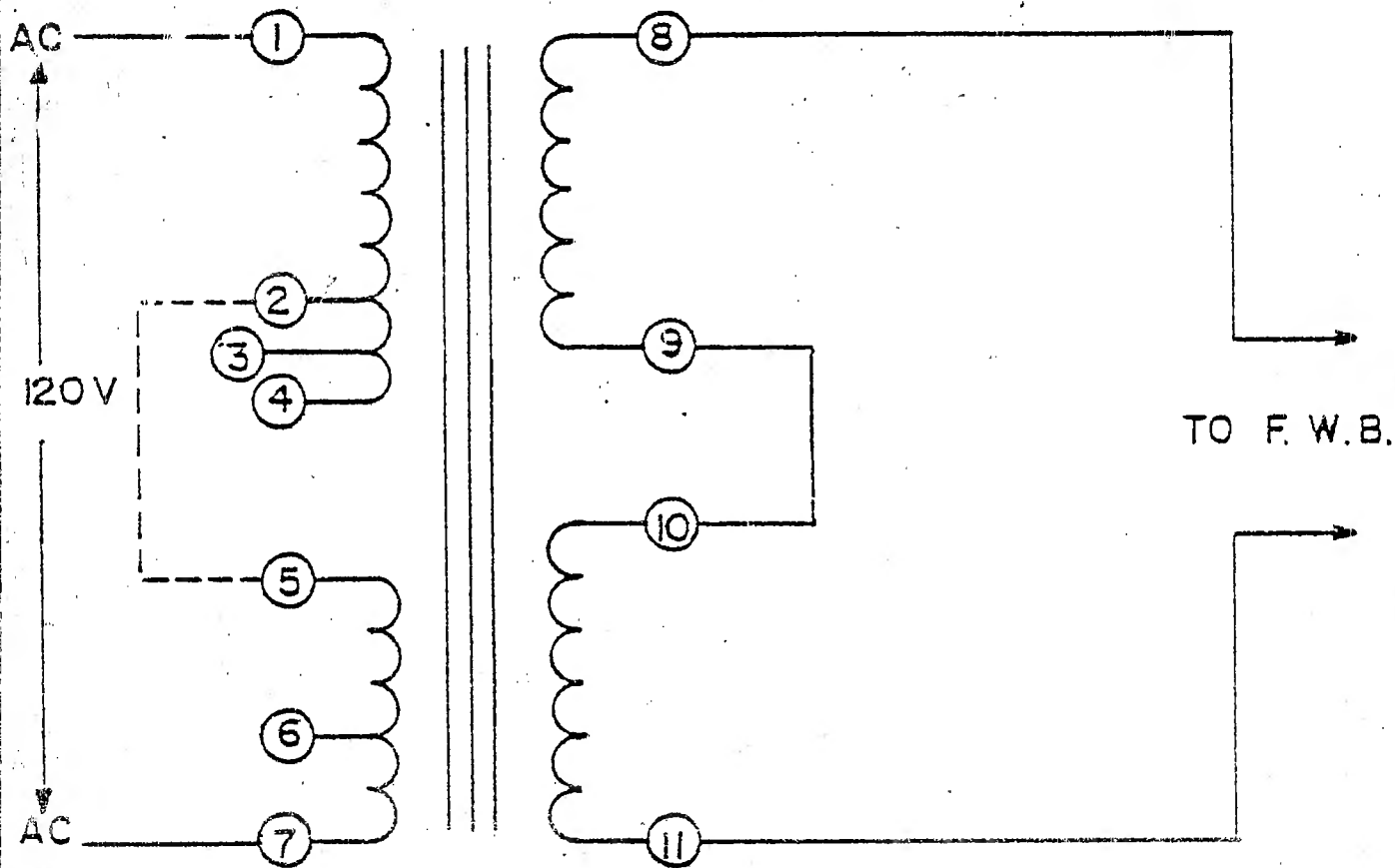
DATE: December 31, 1979

EFFECTIVE DATE: 10/77

page 1 of 1

PRODUCT: BA-1K, BA-2.5K, BA-5K, BA-10K, BF-1K, BF-3.5K, BF-5K, BF-10K, BE-25K, BF-55K

SUBJECT: Low Voltage Supply Transformer



Low voltage supply transformer used to power control ladder relays and lamps.

Shown above is the normal connection arrangement for 28 volts output. To increase or decrease output voltage, subtract or add primary turns accordingly.

FINAL APPROVAL

DATE 10/77

Schmitt/KMG

Date

Engineering

Date

CHANGE NO.:

technical bulletin

McMartin

*

TO: All BA-1K Users
All Broadcast Reps/Sales Managers

FROM: Dave Huch

DATE: January 6, 1977

SUBJECT: Modification to Carrier Restorer Circuitry

As originally wired, the carrier restorer circuits will automatically restart the transmitter 2 to 3 times when momentarily depressing the PLATE OFF button. It is necessary to hold the button down 2 or 3 seconds to allow the restorer to discharge. In an emergency situation the FILAMENT OFF button will disable the transmitter instantly.

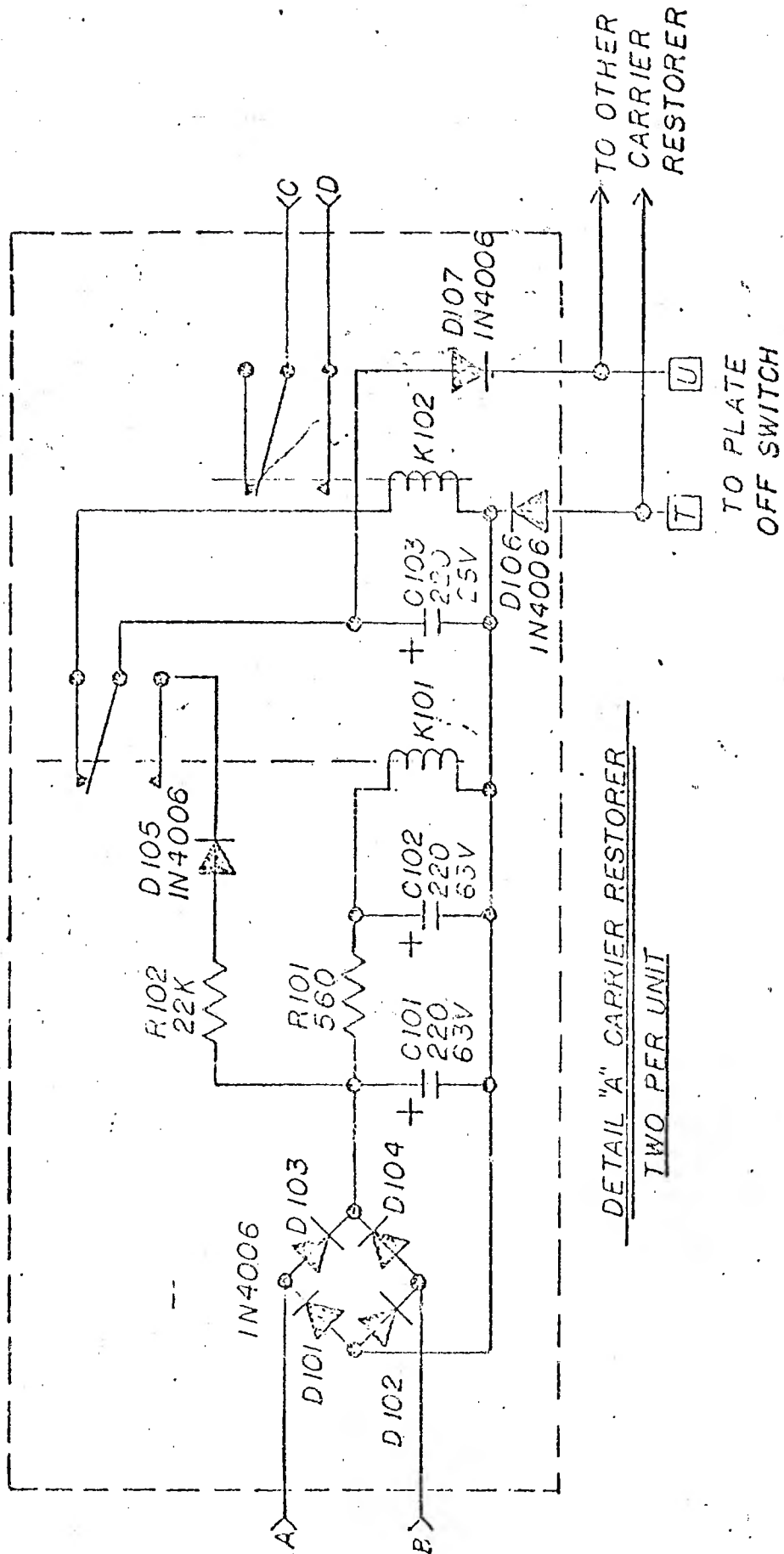
The circuit has been modified to connect the spare unused plate off contacts to C103 through IN4006 diodes (P/N 210008) as shown on the attached schematic. Capacitor C103 discharges instantly when the PLATE OFF button is depressed. The effect is to eliminate any restarting when the PLATE OFF button is used.

The diodes (four (4) required) may be obtained from the Customer Service Department upon request.



Dave Huch
Manager, Customer Service

Att.



DETAIL "A" CARRIER RESTORER
TWO PER UNIT

DATE: December 31, 1979

EFFECTIVE DATE: 6/21/79

page 1 of 1

PRODUCT: BA-1K, BA-2.5K, BA-5K

SUBJECT: Change of Transistor Type in RF Exciter

Q-5 in the RF exciter for this transmitter previously was type 2N6179. This type is no longer available from the manufacturer. Transistor type MJE-181 is now specified, so change your schematic and parts list accordingly. MJE-181 carries McMartin part number of 201129.

Electrically, the two transistors are identical, however, there is a physical difference in the pin configuration. When changing out this transistor to the MJE-181, just be sure to note how the red, yellow, and blue leads are connected to the 2N6179 and then reverse the connections of the red and yellow leads when you attach them to the MJE-181.

FINAL APPROVAL

DATE 6/78

EL

12/31/79

Salt, W/kg

Date

Engineering

Date

CHANGE NO.:

DATE: December 31, 1979

EFFECTIVE DATE: 12/77

page 1 of 1

PRODUCT: All 3 Phase Power Transmitters

SUBJECT: Three Phase Power Sources

THREE PHASE POWER SOURCES FEEDING THREE PHASE TRANSMITTER LOADS

In many installations of new equipment, power companies are supplying three phase customers with an open data connection, sometimes referred to an an open tee-pee. This connection uses only two transformers, which is an economical approach to the more desirable closed delta using three identical transformers. The two transformer system is more susceptible to transients and circulating harmonic currents which are normally cancelled in the closed system.

In a three phase transformer system, the third harmonic 180 Hz must have a path around the three transformers to flow, if not, the third harmonic content will flow through portions of the load resulting in non-sinusoidal voltages. If strong harmonics are present, the secondary voltages (being a determining factor in selecting the proper rectifier) are no longer a predictable value. Any undesirable increase in peak value of the secondary voltages is a direct reduction in the safety margin designed into the rectifier. Under certain conditions, voltages in the order of two to three times the expected values have been observed.

Another effect which can appear under varying load conditions with an open delta source is the complete cancellation of a phase resulting in quite irregular ripple content of a lower frequency than the normal 360 Hz. In general, a full wave three phase power supply is designed to reduce the 360 Hz ripple to an acceptable level. If the supply is operating unbalanced with a high 120 Hz content, the added costs to reduce this to the same acceptable value would be economically impractical.

In conclusion: The overall effects created by the open delta source are: increased noise and increased voltage stresses on the diodes, chokes and capacitors.

FINAL APPROVAL

DATE 12/77

Sams/Mkg

Date

Engineering

Date

CHANGE NO.:

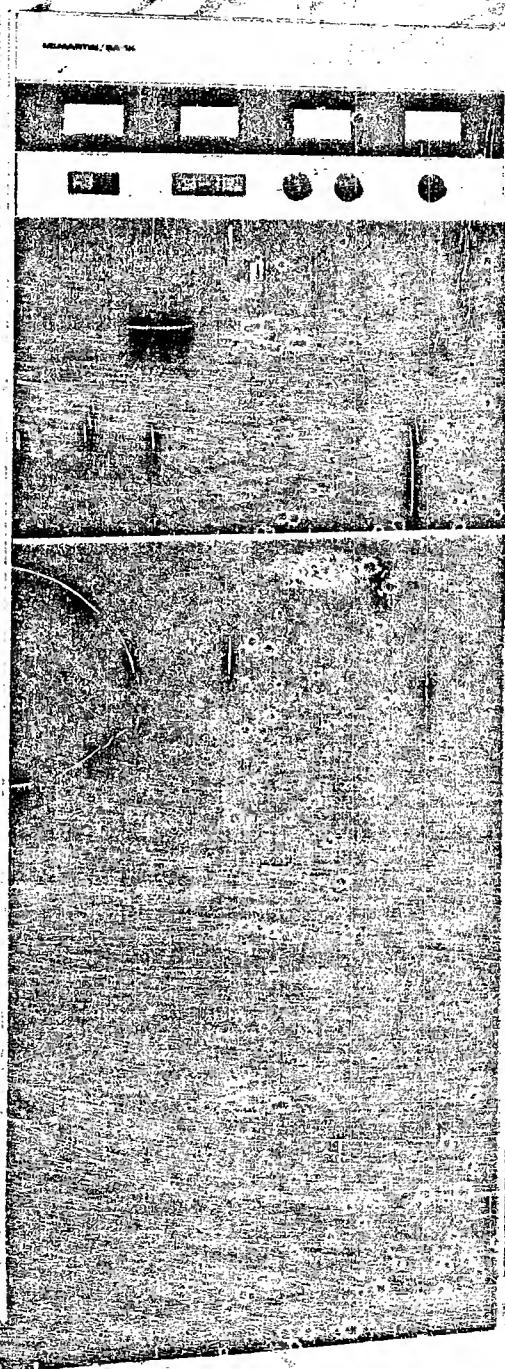
12/31/79

McMartin

1000/500/200 watt

AM
TRANSMITTER

BA-7K



excellent performance specifications for that crisp, clean sound
unique accessibility both front and rear
125% positive peak capability
power driven vacuum variable tuning/loading controls
1200 watt output with pushbutton Hi-Low power operation
full remote control/metering capability
built-in dummy load
totally solid state except for four 4-500A tubes
that provide rugged, reliable, economic operation

McMartin

DESCRIPTION

The BA-1K delivers outstanding performance and reliability. It sounds clean and crisp...and it stays on the air. Initial investment is reasonable. Operating and maintenance costs, low.

We can't do anything about your programming to attract and hold an audience, but the BA-1K makes your programming sound great ... and by selection of quality components and application of conservative design details, the BA-1K delivers reliability.

The BA-1K satisfies technical demands for ease of initial installation, tune-up and maintenance. Access to subassemblies and components is outstanding. By opening the hinge-down front panel, all solid-state low level AF and RF stages and the low-voltage control power supply are easily inspected and adjusted.

The blower assembly is mounted on the inner surface of the hinged rear door for 'out-in-the-open' maintenance.

The RF power amplifier, and the modulator stages each use a pair of highly-reliable, moderately priced 4-500A tubes. During operation these tubes are visible through the cabinet front observation window.

The RF power amplifier output consists of a tuning/matching full pi-T network. Plate tuning is by means of a motor driven vacuum capacitor. Output loading is adjusted by a motor-driven slug located concentrically in the output T-network inductor. The shunt capacitor in the output T-section, in conjunction with an adjustable tap on the input inductor of the T, permits precise adjustment for maximum second harmonic attenuation.

The BA-1K incorporates a built-in dummy load.

The modulator stage uses a high-quality, oil-filled modulation transformer, capacity-coupled to a modulation reactor to isolate RF power amplifier plate current from the modulation transformer secondary winding.

The RF exciter and AF driver stages are completely solid-state. The crystal oscillator operates in the 2160 to 4320 kiloHertz range. The operating frequency range of 540 to 1600 kHz is established by division of the crystal frequency by four for the range from 540 to 1080 kHz and by two, to cover the 1090 to 1600 kHz range.

The AF driver stages operating Class A are of solid-state design up to the grids of the 4-500A AB1 modulator tubes. Resistor-capacitor feedback networks give approximately 10 dB of feedback compensation.

The BA-1K is fully metered. Individual, eye-level 4½" panel meters display PA plate current and voltage, RF line current, plus a nine-position multimeter for measurement of secondary operating parameters.

The BA-1K may be operated by remote control. All mechanical drives for plate tuning and output loading as well as on/off/power change switching are terminated for ready interconnection to standard remote control systems.

The BA-1K has 1200-watt output capability, leaving a more-than adequate power reserve. This permits smooth 125% positive peak modulation and reflects the truly conservative design factors which contribute to BA-1K reliability.

The BA-1K is handsomely-styled in an extremely rugged steel cabinet. Removable side panels give ready access to wiring harnesses. Those within the cabinet are housed in protective channelling.

The BA-1K - a pleasure to own - a pleasure to maintain - a pleasure to listen to!

SPECIFICATIONS

FREQUENCY

RANGE.....540 to 1600 kiloHertz
(supplied on one specified frequency)

POWER OUTPUT...1000/500/250 watts.
May be operated at any two specified power levels. Pushbutton power change standard.
Maximum output capability: 1200 watts

OUTPUT

IMPEDANCE.....50 ohms unbalanced.
Other impedances available on special order

FREQUENCY

STABILITY.....±5 Hertz over ambient temperature range

CARRIER SHIFT....3% maximum

NOISE LEVEL.....60 dB or greater below 100% modulation @ 1000 Hertz

MODULATION

CAPABILITY.....100% negative peaks
125% positive peaks

AF FREQUENCY

RESPONSE.....±1.0 dB, 50-10000 Hz
1-kw output
100% modulation

AF HARMONIC

DISTORTION.....2.5% or less, 50-10000 Hz
1-kw output, 100% modulation
Sine wave input

AUDIO INPUT

IMPEDANCE.....150/600 ohms, balanced

AUDIO INPUT

LEVEL.....+10, ±2, dBm

POWER SOURCE....208/230 vac, 50/60 Hz,
single phase

POWER

CONSUMPTION.....4500 watts (1200 watts output, 100% modulation)

AMBIENT

TEMPERATURE

RANGE.....-20 to +45 degrees Celsius

ALTITUDE.....up to 7500 feet AMSL

DIMENSIONS.....70.5" h x 25.75" d x
28.25" w
(179 cm x 65.4 cm x 71.8 cm)

ORDERING INFORMATION

MODEL BA-1K.....1000/500/250 watt transmitter
(Specify operating frequency and power levels desired)

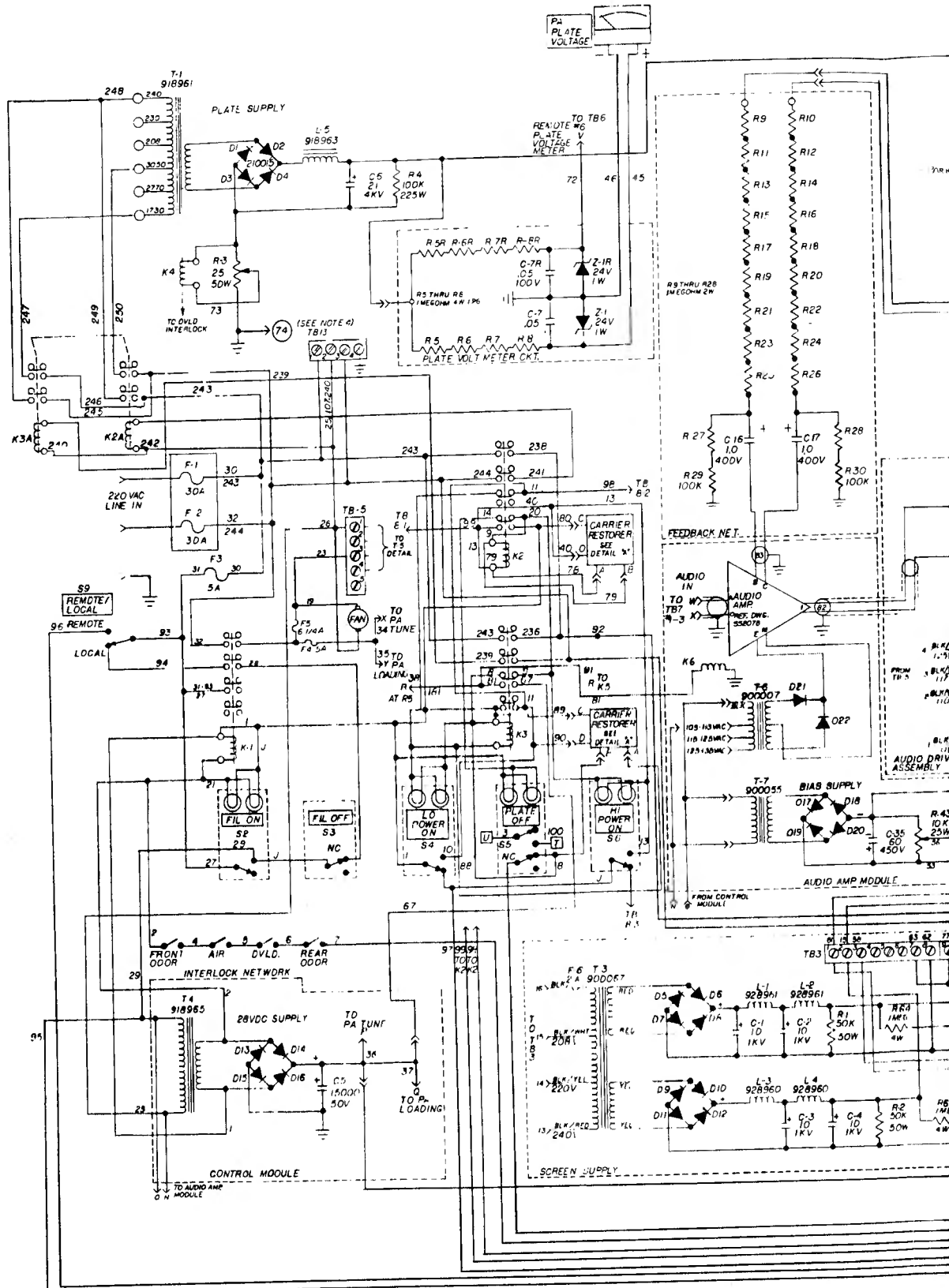
SC-AM.....Spare Vacuum Crystal

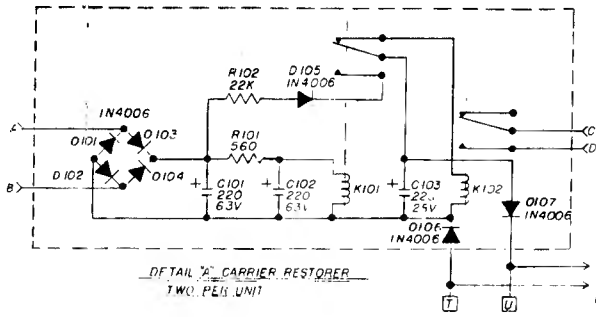
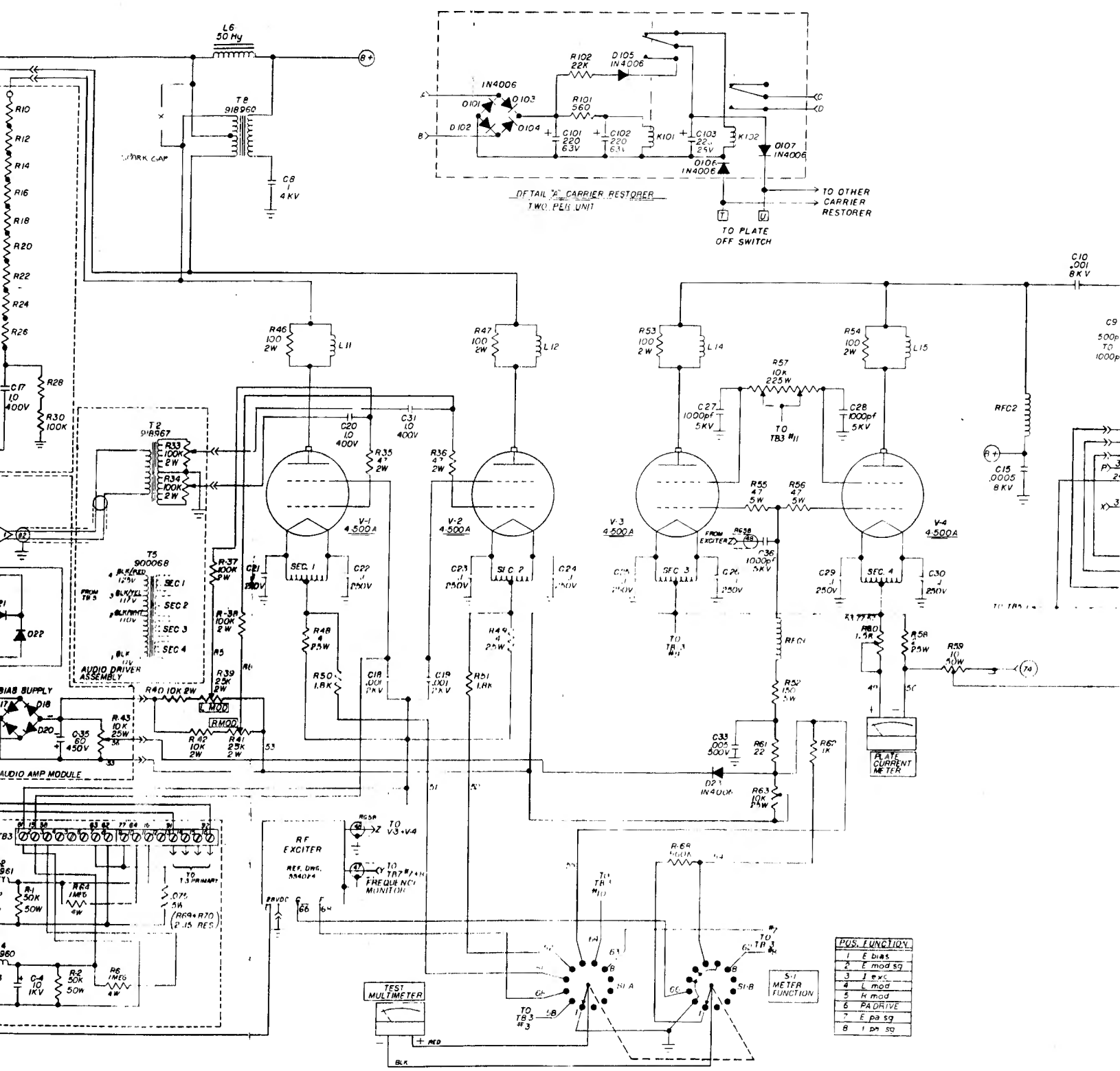
STA-1K.....100% Spare Tube Kit,
(4 Type 4-500A)

SSC-1K.....100% Spare Semiconductor Kit

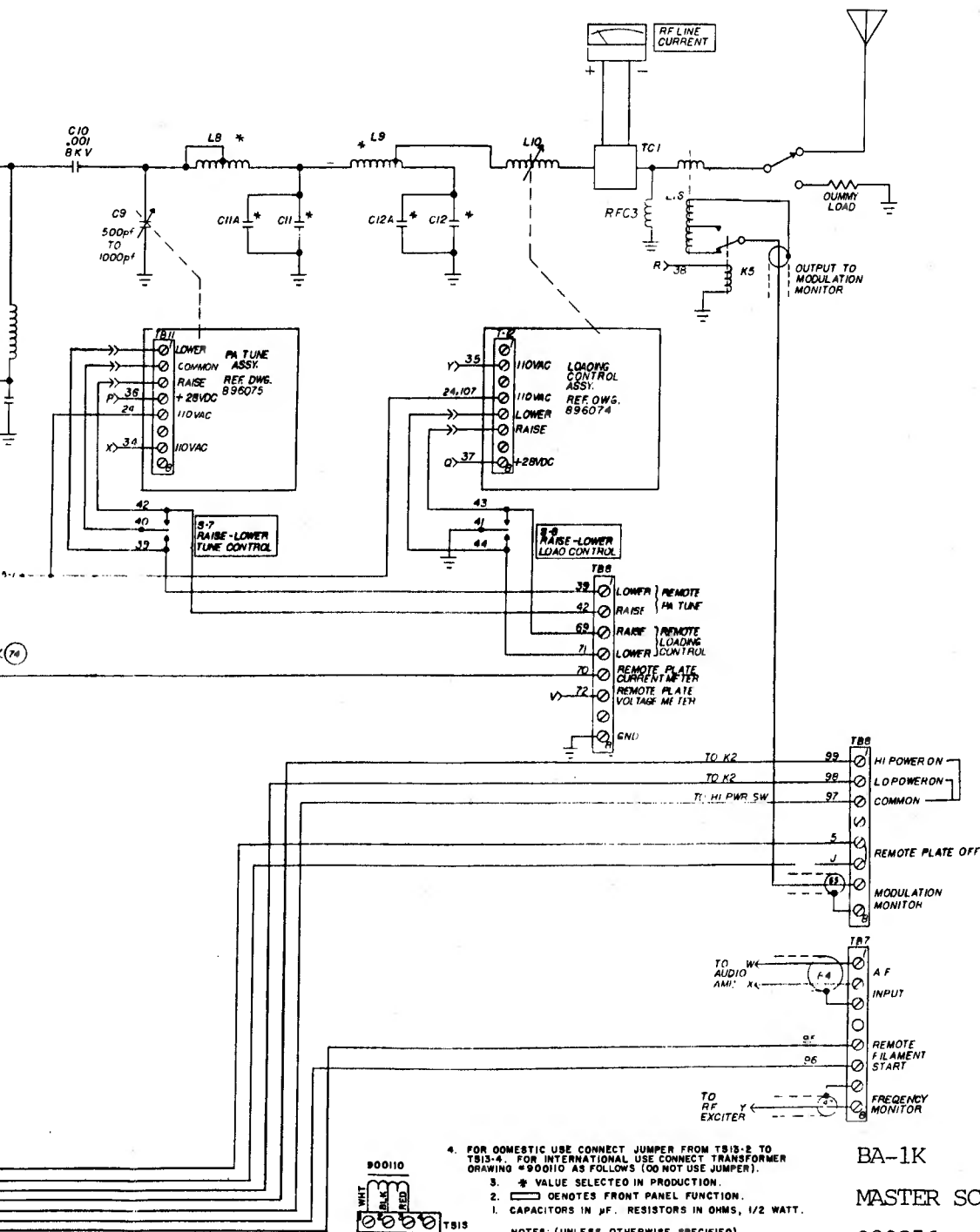
SR-1K.....Filament Voltage Regulator

RCS-1.....Remote Control Solenoid Kit





POS. FUNCTION	
1	E bias
2	E mod sq
3	I exc
4	L mod
5	A mod
6	RA DRIVE
7	E ps sq
8	I ps sq



BA-1K

MASTER SCHEMATIC

000256

June 30, 1981