McMartin commercial sound

BF-5K

McMartin Industries, Inc. • 4500 South 76th Street • Omaha, Nebraska 68127–1880 • (402) 331-2000 • Telex 484485

McMartin®

BF-5K

5500 Watt FM TRANSMITTER

INSTRUCTION MANUAL

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 desireable 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	FM CFM	BTU'S Heat Output
BF-35K	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.

Apr 78 - Printed in U.S.A.

I. TECHNICAL SPECIFICATIONS

OPERATING RANGE	88 to 108 MegaHertz
RF POWER OUTPUT	5,500 watts maximum
RF OUTPUT IMPEDANCE	50 ohms (termination EIA 1-5/8" flange)
CENTER FREQUENCY STABILITY	±500 Hz
MODULATION CAPABILITY	± 150 Hz
AUDIO INPUT IMPEDANCE	600 ohms, balanced
AUDIO INPUT LEVEL	+10, ±2, dBm
AUDIO FREQUENCY RESPONSE	±0.75 dB, 30-15000 Hz (Std. FCC 75 usec preemphasis)
TOTAL HARMONIC DISTORTION	0.3% of less, 30-15000 Hz, 100% modulation
FM NOISE	65 dB below 100% modulation (400 Hz)
AM NOISE	55 dB below carrier level
POWER REQUIREMENTS	208/230/240 Vac, 50/60 Hz, single phase, or 208/230/240 Vac, 3-phase 3Ø standard
POWER CONSUMPTION (Approx.)	3500 watt output, 7,200 watts 4500 watt output, 10,000 watts 5000 watt output, 11,250 watts 5500 watt output, 12,500 watts
OPERATING TEMPERATURE	0° to 50° Celsius
ALTITUDE	7,500 feet above mean sea level
MECHANICAL	34.5"W 78.5"H 31"D (87.6 X 199 X 78.7 cm) Rear Door Swing 30" (76.2 cm)
WEIGHT	1,200 pounds
FINISH	McMartin beige w/woodgrain trim

STEREO OPERATION (with B-110 Stereo Assembly)

AUDIO INPUT IMPEDANCE	600 ohms balanced, each channel
AUDIO INPUT LEVEL	+10, ±2, dBm
AUDIO FREQUENCY RESPONSE	±0.75 dB, 30-15000 Hz, Std. FCC 75 usec, preemphasis each channel
TOTAL HARMONIC DISTORTION	0.5% or less, 30-15000 Hz
STEREO SEPARATION	35 dB or greater, 50-15000 Hz
FM NOISE	60 dB or greater below 100% modulation
PILOT STABILITY	±1.0 Hertz over rated temperature range
SUBCARRIER SUPPRESSION	55 dB or greater
CROSSTALK (L+R to L-R, L-R to L+R)	42 dB or greater below 90% modulation

SCA OPERATION (with B-113 SCA Generator Module)

AUDIO INPUT IMPEDANCE	600 ohms, balanced
AUDIO INPUT LEVEL	+10, ±2, dBm
CARRIER FREQUENCY	41 or 67 kHz standard (others available on request)
CARRIER STABILITY	±500 Hz
MODULATION CAPABILITY	± 7.5 kHz
PREEMPHASIS	150 usec standard, 50 or 75 usec available on request
FREQUENCY RESPONSE	±1.5 dB, 50-5000 Hz
CROSSTALK (main to sub, sub to main)	60 dB or lower
DISTORTION (50-5000 Hz)	0.75% or less with LP output filter, 2.5% or less with BP output filter
S/N NOISE	60 dB or greater

II. GENERAL DESCRIPTION

The McMartin BF-5K transmitter is designed for FM broadcast service, operating on a specific frequency in the range of 88.0 to 108.0 MegaHertz.

The BF-5K utilizes the Model B-910 solid-state FM exciter. Full technical details pertaining to the B-910 operation are contained in Appendix A of this manual.

The RF output of the exciter is used to drive an intermediate power amplifier (IPA) stage which employs parallel-connected type 4CX250B radial beam power tetrode tubes. This stage in turn provides RF excitation to a single type 3CX3000/A7 high-mu, zero-bias triode tube in the power amplifier (PA) stage. The PA stage operates as a Class C amplifier, in a grounded-grid configuration. A low-pass RF filter mounted within the cabinet enclosure attenuates harmonically-related frequencies at the transmitter output termination.

A single high-voltage power supply provides plate voltage for the PA and IPA stages. A separate power supply provides IPA screen voltage which is adjustable by means of a motor-driven power output control from the front panel. Independent transformers provide filament voltages to the PA and IPA tubes, with a front panel FILAMENT ADJUST control.

Inasmuch as the PA tube is a high-mu power triode specifically designed for zero grid bias, its operation in a grounded-grid mode eliminates the need for screen grid and grid bias power supplies. This permits great simplification of circuitry.

Interlocked control logic permits straightforward push-button control of all start-stop functions. These, plus telemetering samples are terminated for interconnection to remote control systems.

Automatic recycling and a memory-type LED status indicator assembly senses and indicates the cause of carrier interruptions, specifically in the event of exciter RF output, IPA or PA failure, high voltage overload or or excessive VSWR. The automatic recycling sequence consists of two pulses spaced approximately one-second apart, followed by an adjustable time interval from 3 to 20 seconds after which the two pulses are repeated. If the fault still persists, the recycling sequence is terminated. An "overcount", as well as the source of the fault is shown on the indicator panel LED. If anywhere in the recycling sequence, the transmitter is restored to normal operation, the LED indicator associated with the fault remains on until the manual RESET switch is depressed.

Adequate cooling is provided by maintenance of positive cabinet pressure. The airflow routing is through the shielded IPA compartment and upward through the PA shielded enclosure. The airflow is provided by means of a rugged, permanently-lubricated, centrifugal blower, shock-mounted on the base of the transmitter cabinet. Its outlet is ducted to the bottom of the IPA enclosure. Supplemental cooling for power supply components is provided by a small exhaust fan located in the top of the cabinet. Air entering the transmitter is filtered by dual, maintainable filters mounted on the rear door of the cabinet.

The rear door opening is protected with dual mechanical interlock switches, one of which defeats the high-voltage control circuitry. The other shorts the high-voltage plate power supply to ground. An insulated "grounding stick", located just inside the cabinet at the door opening is also provided.

III. INSTALLATION

3.1 PLANNING

It is recommended that the manual be studied in its entirety prior to final installation of the BF-5K. A full understanding of the controls, circuitry and input and output terminations will assist in the preplanning stage.

Figure 1 is an outline dimensional drawing of the transmitter. Provide adequate clearances for access to the transmitter through the rear. Preplan the location of the entrances for power, audio/remote control cable harnessing, external monitoring coaxial cable feed and the RF output connection to the coaxial transmission line. The BF-5K output termination is by means of an EIA 1-5/8" flange. This flange with a short section of 1-5/8" rigid line mates with an ungassed field coupling clamped to the output of the harmonic filter. These coaxial line components are packed separately and should be assembled to ascertain the precise physical location of the output termination.

Although cable entrances may be made through either the top or bottom of the cabinet, the preferred arrangement for ease of installation is through the bottom entrances to 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 dents or scratches. If damage is detected, immediately notify the carrier and advise McMartin of steps you have taken.

The tubes will normally be packed separately. Install these in their respective sockets.

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 an EIA standard 1-5/8" coaxial end flange located at the top of the RF harmonic filter. The external coaxial line run should be terminated to this coupling. The external line should be secured so that excessive lateral or vertical pressure is not exerted on the output termination. The coaxial line output components are packaged separately and should be assembled prior to connection of the external transmission line.

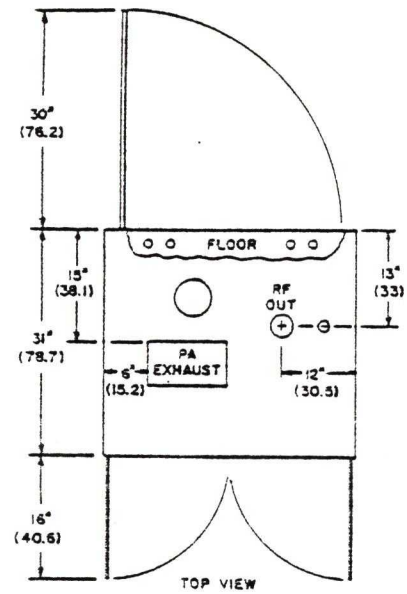
3.3-2 Audio Input

The audio input termination strip is located at the lower left of the cabinet. Jacketed, two-conducter shielded cable should be used. Monaural or left-channel stereo input should be connected to TB-12(3 & 4). Right-channel audio input should be connected to TB-3 (6 & 7). If SCA operation is used, the SCA audio input should be connected to TB-3 (1 & 2). Shield grounds should be made to TB-3 (5 or 8.)

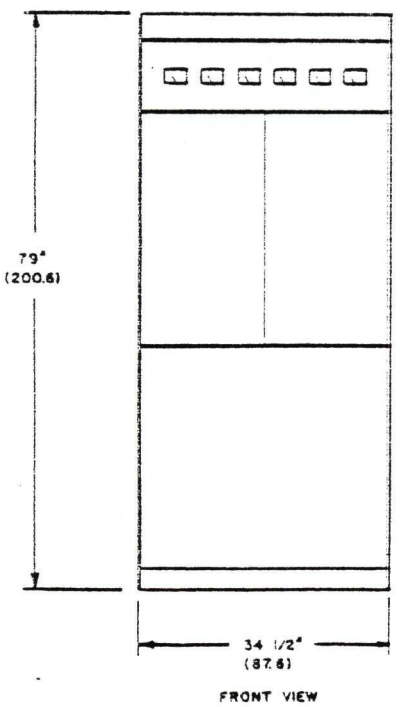
3.3-3 Monitor Connections

The RF drive for FM frequency and/or modulation monitoring equipment may be taken from either of two terminations, each of which are of the BNC type. One of these is located directly above the main housing of the RF output filter. This is a fixed-probe type pick-off point. The other is located on the left side of the PA enclosure adjacent to the coaxial feed to the RF harmonic filter input port. This is the termination of a pickup loop which may be mechanically oriented in relation to the PA output connection to the filter. This loop is readily accessible for adjustment by opening the rear door of the PA stage compartment.

The coaxial cable from the pick up point is terminated on TB-2 (5 & 6); #5 ground. The external cable should be of the flexible coaxial type.



DIMENSIONS IN ( )
GIVEN IN CENTIMETERS



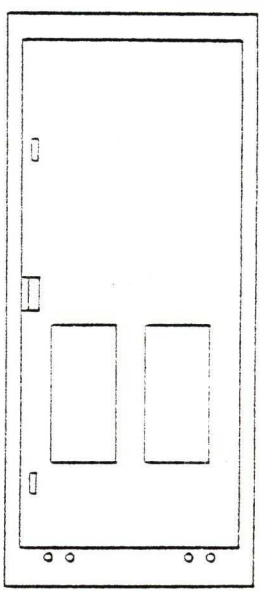


FIG. 1

FIGURE 1 ▪ DIMENSIONAL OUTLINE

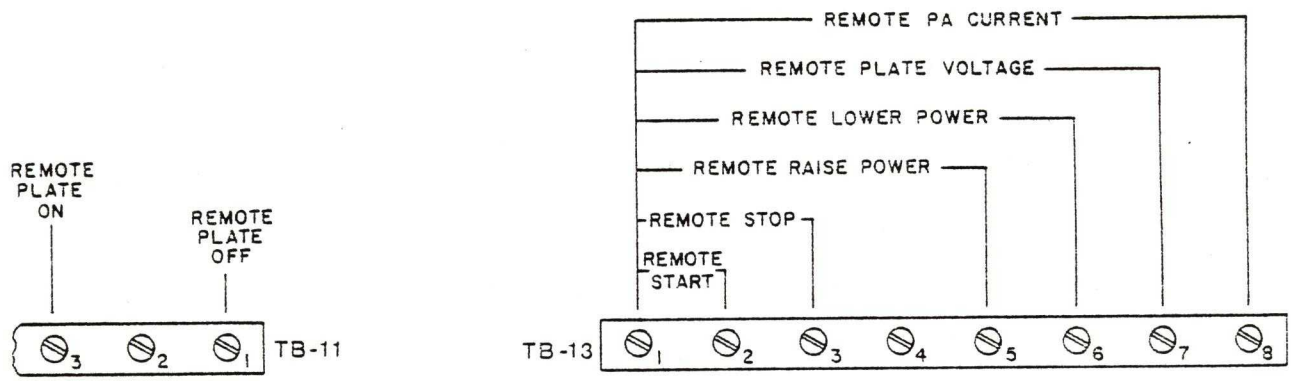


FIG. 2 REMOTE CONTROL TERMINAL BLOCKS

FIGURE 2 ■ REMOTE CONTROL TERMINAL BLOCKS

3.3-4 Power Connections

The transmitter will be equipped for either single-phase or three-phase primary power operation; whichever is specified in your order. In either case, before connecting to the power source, consult with your local utility company as to the nominal voltages available at the transmitter site.

A. Single Phase Model

Four-wire service entrance cable with minimum #8 wire size should be used. The ground lead should be secured to the ground terminal adjacent to TB-10 (located at the rear of the cabinet). Neutral lead should be connected to TB-10(7) and the remaining conductors to TB-10(8 & 9).

B. 3-Phase Model

Refer to the schematic diagram for interconnection of three-phase service. This version differs from the single-phase model only in the primary wiring for the plate transformer and the rectifier-stack arrangement.

3.4 REMOTE CONTROL CONNECTIONS

If the BF-5K is to be operated from a remote point, additional interconnection is required to TB-13. See Figure 2 for terminal board identification.

The following functions may be controlled:

1) Start
2) Stop
3) Power output

The following functions may be metered:

1) PA plate voltage
2) PA plate current
3) Power output or reflected power

3.5 INITIAL TUNE-UP PROCEDURE

The BF-5K is now ready for initial tune-up. The transmitter has been factory tested and tuned to your specified operating frequency and nominal output power level. These factory tests include operation into a 50-ohm non-reactive load; therefore all tuning control adjustments will approximate those you will encounter in the following tune-up procedure.

At this time you should calculate the exact transmitter output power you will require to satisfy the effective radiated power (ERP) specified in the station construction permit or license. This will be equivalent to the ERP, divided by your antenna power gain, plus losses incurred in the transmission line feeding the transmitter output to the antenna terminations.

As a guide for various power output operating levels, the following tabulation will be helpful in evaluating typical operating parameters for the PA output stage.

TABLE I

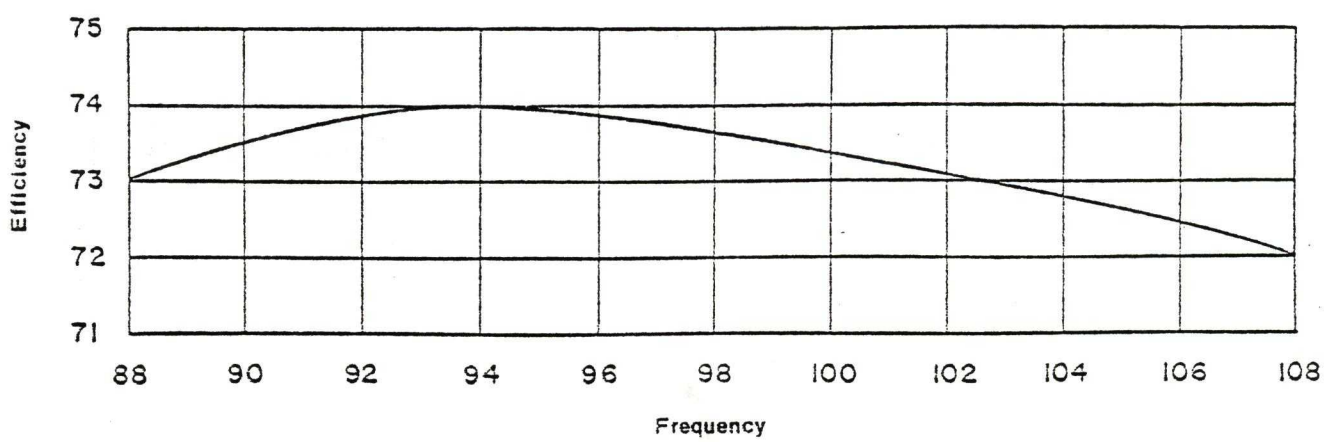
Power output:	3,500	4,500	5,000	5,500 watts
PA Plate Voltage:	4.1	4.6	4.6	4.8 KV
PA Plate Current:	1.1	1.25	1.35	1.95 A
PA Cathode (Grid & Plate) Current:	1.6	1.75	1.8	1.9 A
PA Power Input:	5,060	5,750	6,210	6,960 watts
Efficiency:	69	78	80	79 %

Precise PA efficiencies for your operating frequency and power are plotted in Figure 3. The transmitter output power where the indirect output power measurement is employed is the product of PA plate voltage and PA plate current multiplied by the appropriate effeciency factor from Figure 3.

Proceed as follows with the tune-up.

1. Refer to "Appendix A", Section V - OPERATION (page 11 of B-910 Instruction Manual) for initial operation of the exciter portion of the BF-5K.
2. Position the circuit-breaker switches located on left hand side of the horizontal ledge below the exciter to "ON".
3. Momentarily depress the START pushbutton. START indicator lamp will come on. This will provide primary ac power to the exciter and energize the cabinet blower, exhaust fan and the tube filaments. AIR, FILAMENT, BIAS, and 24 VAC indicator lamps will be

FIGURE 3 ▪ TYPICAL EFFICIENCY VS. FREQUENCY



illuminated. After approximately 2 minutes, PLATE OFF pushbutton will be illuminated. Read FILAMENT VOLTAGE panel meter and set FILAMENT ADJUST control for 7.5 volts. Confirm that correct line voltage is being supplied by operation of LINE VOLTAGE selector switch. (For single-phase installations positions 1 & 2 measure each side of the nominal 230 V supply to neutral; and for three-phase units, positions 3, 4 & 5 measure the voltage across each leg to neutral.)

4. After completing the exciter tuning procedures, turn the POWER OUTPUT control on the B-910 exciter module completely counterclockwise.

5. Place MULTIMETER select switch to IPA GRID CURRENT position. Slowly rotate the exciter POWER OUTPUT control until a reading is noted on the multimeter. Adjust IPA GRID control for a peak in the multimeter reading and adjust B-910 POWER OUTPUT control for a reading of 20 milliamperes.

6. Operate POWER OUTPUT control in LOWER position until motor drive stops. Set MULTIMETER switch to IPA 1 CATHODE CURRENT position. Apply operating voltage to the IPA and PA tubes by momentarily depressing the PLATE ON pushbutton. PLATE ON pushbutton will come on, PLATE OFF lamp will be extinguished. Confirm that PA PLATE VOLTAGE reading is in approximate agreement with the typical PA Plate Voltage Values shown in TABLE I.

7. Operate POWER OUTPUT control until IPA CATHODE CURRENT reaches approximately 100 milliamperes. Adjust IPA TUNE control for minimum cathode current. At the same time, observe the PA PLATE CURRENT meter, and during following initial adjustments, do not exceed 1.0 ampere. When PA PLATE CURRENT approaches this value, adjust PA PLATE TUNE knob for minimum PLATE CURRENT and proceed with tune-up of IPA stage.

8. Alternately adjust IPA TUNE and IPA LOAD controls so as to produce maximum PA PLATE CURRENT reading. There will be interaction between these controls. Whenever a change is made in the IPA LOAD control, readjust IPA TUNE control for minimum IPA 1 CATHODE CURRENT. As an impedance match is achieved between the IPA output and PA input circuitry, the dip in IPA cathode current will become less pronounced.

9. Place MULTIMETER switch in PA CATHODE CURRENT position. The reading will be somewhat higher in value than the PA PLATE CURRENT meter reading. The difference in value represents the PA grid current. Operate the POWER OUTPUT control until the PA CATHODE CURRENT is approximately 350 milliamperes higher than the PA PLATE CURRENT READING.

10. Place REFLECTOMETER meter switch in FWD (forward power) position. Adjust PA TUNE and PA LOAD controls for maximum reading on the REFLECTOMETER, while at all times maintaining PA PLATE CURRENT at minimum as the PA LOADING is increased. Switch REFLECTOMETER switch to REFL (reflected power) position. If the value of reflected power is more than 5% of the forward power, the external transmission line and antenna should be checked before proceeding further.

11. Operate POWER OUTPUT control in RAISE position until the PA total plate input concurs approximately with those calculated for proper operating level.

12. Check IPA operating parameters in the various pertinent MULTIMETER positions. Typical operating parameters for the Ipa stage at various transmitter output levels are:

TABLE II

Transmitter Output Levels:	3.5	4.5	5.0	5.5 KW
IPA Plate Voltage:	2.0	2.0	2.0	2.0 KV
IPA 1 Cathode Current:	170	180	190	200 milliamperes
IPA 2 Cathode Current:	170	180	190	200 milliamperes
IPA Grid Current:	20	20	20	20 milliamperes
IPA Grid Voltage:	-87	-87	-87	-87 Volts
IPA Screen Voltage:*	150	150	150	150 Volts
IPA Screen Current:	15	10	10	5 milliamperes

*The setting of the POWER OUTPUT control establishes this voltage.

3.6 FINAL TUNE-UP PROCEDURE

For optimum overall operating efficiency upon completion of the initial tune-up, readjust IPA tuning and loading until the operating parameters of the Ipa stage approximate the values shown in TABLE II.

Adjust PA TUNE and PA LOAD controls to produce the calculated PLATE VOLTAGE and PLATE CURRENT values required to produce the necessary transmitter power output. Plate voltage may be increased or decreased by moving primary power connections located on the power transformer terminal block. These may be changed in 10% steps by this procedure.

IV. OPERATION

The daily operation of the BF-5K is straightforward. Start-up procedure is as follows:

1. The circuit breaker switches at the left hand side of the horizontal ledge just below the exciter panel should be kept in their ON positions for normal operation. (These are protective devices and are placed in their OFF positions only for safety and convenience during maintenance and servicing of the transmitter).

2. Depress START button.

   (START button illuminated)

   (AIR indicator illuminated)

   (FIL indicator illuminated)

   (BIAS indicator illuminated)

   (28 Vac indicator illuminated)

3. After a time delay (adjustable approximately 30 seconds to 2 minutes by knob setting of delay relay K-6), the PLATE OFF pushbutton will be illuminated.

4. Depress PLATE ON button (PLATE ON button illuminated). (PLATE OFF button extinguished).

Normal shut-down procedure is as follows:

1. Depress STOP pushbutton.

The BF-3.5K will shut-down completely, in the proper sequence. First, the power will be removed from all portions of the transmitter except the cabinet blower. After approximately 2 minutes, this blower will be turned off, completing the shut-down.

If during tune-up, or routine maintenance schedules, only the PA plate voltage is to be removed, depressing the PLATE OFF pushbutton performs this function. Filaments, exciter, etc., remain on.

V. DETAILED CIRCUIT DESCRIPTION

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

5.1 B-910 EXCITER

Refer to Appendix A, "Section IV" (pages 4 through 11) of the B-910 Instruction Manual.

5.2 IPA STAGE (Ref: Dwg. #000270/1)

The RF output of the B-910 exciter is fed to the IPA stage by means of 50-ohm coaxial transmission cable. An RF matching network comprised of C-12, C-15 (IPA GRID control) and L-21 provides impedance transformation between the exciter and the control grids of the parallel-connected 4CX250B IPA power tubes. Fixed grid-bias for the IPA stage is fed from a separate power supply. Additional operating grid bias is provided by the voltage drop through R-13 and R-15 generated by IPA grid current. The grid voltage is sampled through R-14 and R-48 in parallel for a MULTIMETER reading in the IPA GRID CURRENT position of the MULTIMETER selector switch. The filament voltage for the two 4CX250B tubes is provided by T-3. The primary winding of T-3 incorporates RF filtering L-5 and L-6 in conjunction with C-8 and C-9. Actual filament operating voltage is determined by the setting of the front panel FIL ADJUST control. R-9 and R-10 are mechanically ganged with a similar rheostat control for the IPA and PA stage tube filaments. The individual cathodes of the IPA tubes are RF by-passed to ground. Series resistors R-17 and R-20 in the cathode to ground circuitry generate a metering voltage in the IPA-1/IPA-2 CATHODE CURRENT positions of the MULTIMETER select switch. Precise balance of these two parameters is not necessary; however, disparities in excess of 15% will usually indicate aging of one of the tubes. Before replacement, however, it is recommended that the two tubes in use be interchanged in the socket positions. If this procedure indicates that lower cathode current results for the same tube, it should be replaced.

Plate supply voltage for the IPA is provided from a full-wave bridge, center-tapped power supply which also provides PA plate voltage. The latter voltage is obtained from the full-wave bridge rectifier D-9 through D-12 configuration; therefore, the IPA supply, fed from the secondary center tap of the plate transformer provides a voltage value essentially equal to one-half the PA plate voltage value. The IPA supply is filtered by a conventional, dual choke/capacitance filter, consisting of L-19, L-20 and C-49, C-50. IPA plate voltage is metered in the IPA PLATE VOLTAGE position of the MULTIMETER selector switch. K-9 series-connected in the IPA cathode ground return, serves as the IPA overload relay.

Screen-voltage for the parallel connected 4CX250B tubes is obtained from the rotor of the front panel POWER ADJUST potentiometer, R-7, which is motor-driven. The raise/lower control relays K-11 and K-13 are operated from the front panel RAISE/LOWER control. This control provides extremely smooth control of the transmitter power output level from essentially zero to full power output. The IPA SCREEN VOLTAGE is metered in the appropriate position of the MULTIMETER switch.

The plates of the 4CX250B IPA tubes are parallel-connected with dc plate voltage fed through L-7, the plate RF choke. C-32 and C-33 serve as RF coupling/plate blocking capacitors. A pi-L network comprised of C-34 (IPA TUNE), C-36 (IPA LOAD), L-9 and L-10 provide proper impedance transformation for coupling the RF power from the IPA stage to the filament of the 3CX3000/A7 PA output stage.

5.3 PA STAGE (Ref: Dwg. #000258)

L-11 and L-12 (of open line configuration) connected in each leg of the filament supply operate as RF chokes to maintain the filament at RF potential. The end of the lines opposite the filaments are maintained at RF ground potential by C-39 through C-42. Filament voltage is obtained from T-2. The filament voltage of the PA tube is continuously metered by the panel-mounted FILAMENT VOLTAGE METER. This voltage should be maintained at 7.5 volts to insure maximum tube life. The front panel FILAMENT ADJUST control permits maintenance of the prescribed filament operating voltage. The FIL ADJUST control operates R-9, which is a series-resistance element in the primary of T-2.

The grid of the PA tube is operated at both dc and RF ground potential. A small amount of fixed bias voltage is generated by the cathode (filament) resistors R-39 and R-40 in the centertap ground return of T-2. The voltage drop across one of these resistors, R-39 appears across K-8, the PA plate overload relay, the sensitivity of which is adjusted by the slider tap position on R-39. This is normally adjusted so that the overload relay will operate when PA plate current exceeds 15% of its normal value at the various power output levels. R-41 develops a voltage drop sample for remote metering of PA plate current.

The PA plate tank consists of a shunt shorted-line element, L-15 for PA TUNE and a series shorted-line element, L-16, for PA LOAD. The front panel PA TUNE and PA LOAD controls provide mechanical drives for the positioning of the shorting bar on L-15 and L-16, respectively.

Capacitor, L-23 is a shunt-connected inductor which selects the tank circuit, so as to provide a nominally 50-ohm source impedance to the RF harmonic filter input port. The RF harmonic filter, of low-pass configuration, provides a minimum of 65 dB attenuation of all frequencies above the fundamental operating frequency.

A front panel REFLECTOMETER permits continuous metering of either relative forward or reverse power, by means of a panel-mounted selector switch.

5.4 CONTROL LADDER/OVERLOAD PROTECTION (Ref: Main Schematic #000270; Overload Protection Assy. Schematic #550209/1)

Operation of the main circuit breakers, CB1, 2, 3 located on the lower panel of the transmitter, connects the primary power service to the BF-5K system.

When the Power Supply is energized by operation of the circuit breakers, 28 Vac appears on TB-103, 1 & 2 and 28 Vdc on TB-103/3. These voltages operate the various control ladder functions.

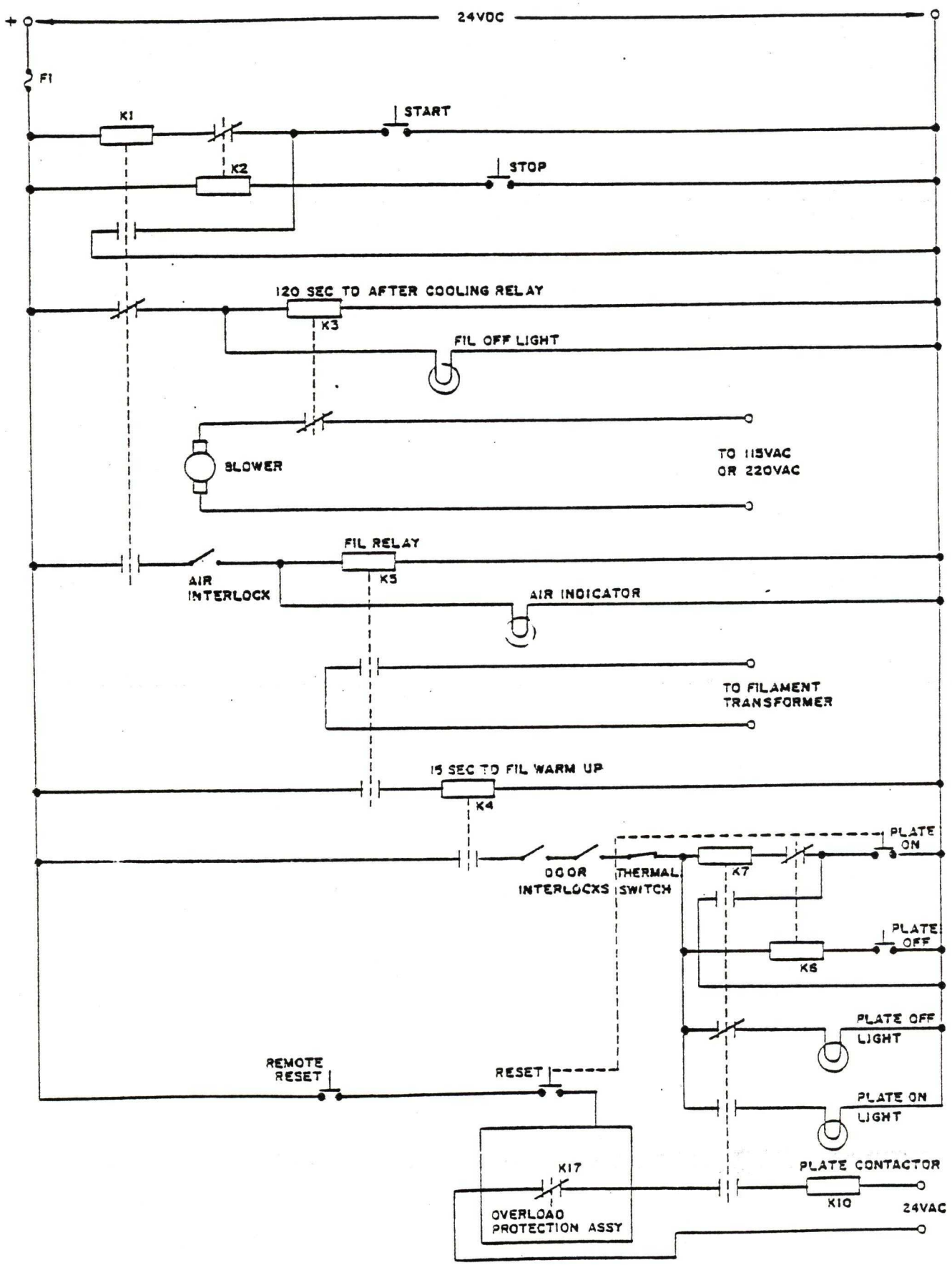


FIGURE 4 ■ SIMPLIFIED CONTROL CIRCUIT DIAGRAM

+28 Vdc is fed to the Control Ladder Assembly through TB-3 - 1, energizing K-3, a two-minute time delay relay. (Note that in a remote control operation where all primary circuit breakers would normally be left in their ON positions, the coil of K-3 is energized through the normally-closed 5/6 contacts of K-1 during the standby off-air period). Normally-closed contacts 1/7 of K-3 energize the FAN/FIL contactor K-3, starting the blowers.

A momentary closure of START switch energizes START relay, K-1. Contacts of K-1 initiate the following functions:

1. Contacts 9/10 latch K-1 in its ON position.
2. Contacts 5/6 open, defeating K-3, the two-minute delay FAN/FIL "SHUTDOWN" relay.
3. Contacts 6/7 close, supplying 28 Vdc to the balance of the Control Ladder Assembly circuits, as well as START indicator lamp.

As the blowers start, the air flow pressure sensor switch closes. These closures turn on the AIR indicator lamp, and energize the coil of relay K-5 the FILAMENT control relay, closing contacts 6/9 and 4/7 of K-5. The 6/9 closure energizes T-2 the PA filament transformer. The simultaneous 4/7 contact closure of K-5 applies 28 Vdc to the "plate ready" timing/control circuitry consisting of Q-1, Q-2, and K-4. The time delay of K-4 operation is determined by the approximately 15-second time constant of the RC combination, R-2 (82K-ohms) and C-2 (47 mfd). As the 4/7 contact closure occurs, C-2 begins to charge through R-2 and the base-emitter junction resistance of Q-1. This charging current maintains Q-1 in its "on" state, which through the voltage drop produced by Q-1 collector current through R-3, keeps Q-2 "off" by holding Q-2 base voltage close to the Q-2 grounded-emitter value. When C-2 reaches the nominal +28 volt value, Q-1 base and collector current ceases, increasing Q-2 base voltage and collector current, energizing K-4 series connected in the Q-2 collector circuit. The K-4 operation closes contacts 9/10. If the rear door is secured, the interlock switch is closed. The thermal switch is a 250° F sensor located in the output air plenum of the PA stage and is normally closed. Thus +28 Vdc is fed through the 9/10 contacts of K-4, and 7. This energizes INTERLOCK indicator, LM-3 and through normally-closed contacts 14/15 of K-7, the PLATE OFF indicator lamp.

When K-7, the PLATE ON relay, is energized by a momentary closure of the PLATE ON switch, the following occur:

1. K-7 is latched "on" by contacts 12/13.
2. Contacts 14/15 open, extinguishing PLATE OFF indicator lamp.
3. Contacts 15/16 close, energizing PLATE ON indicator lamp.
4. Contacts 9/10 close, applying +28 Vdc through the Overload Protection Assembly to the coil of relay K-10. (The plate contactor)

5.5 POWER SUPPLY (Ref: Dwg. #000258)

Plate voltages for both the PA and IPA stages are provided by a single power supply, which will have either single- or three-phase primary power source; as ordered.

The primary winding of the plate transformer, T-1, is designed to provide secondary voltages of 4 KV or 5 KV, ±10%, at three basic input line voltage values of 208, 220 or 240 Vac. These primary winding taps permit 18 selections of transformer secondary voltages by use of the appropriate primary taps.

The secondary center tapped winding feeds a full wave bridge silicon rectifier stack consisting of D-9 through D-12. The rectified PA high voltage is filtered by a dual section LC filter (L-17, L-18, C-47 and C-48). R-24 is the bleeder load for the PA plate supply. Plate voltage metering is provided by the front panel PLATE VOLTMETER. The meter multiplier resistor string for this meter consists of R-30 through R-34.

The IPA plate voltage is derived from the center-tap of the T-1 secondary winding and is filtered by L-19, L-20, C-49 and C-50.

The IPA screen voltage is obtained from a combination bias/screen supply consisting of T-4, D-1 through D-4. Filtering of the positive screen voltage is provided by L-1 and C-4. The screen voltage applied to the IPA screen grids is adjusted by a front-panel, motor driven control, R-7. Grid bias voltage for the IPA stage is derived from the same power supply. The bias voltage is filtered by R-4/R-5 and C-3/C-5.

5.6 OVERLOAD PROTECTION/STATUS INDICATION (Ref: Dwg. #550209/1)

The Overload Protection Assembly provides the sensing of overload conditions in the DRIVE and PA stages as well as abnormal VSWR load conditions.

Relays K-18, K-19, K-20, and K-21 respectively sense VSWR condition, Exciter phase lock, PA plate current and IPA cathode current. The sampling voltages are pre-set to produce relay operation when the currents exceed normal value by approximately 15%. **Note:** The exciter status light will remain on when the transmitter is off, if the exciter is operated from internal AC from the transmitter. The LED indicates the exciter is out of phase lock or has been out of phase lock. When an overload condition occurs so as to actuate K-18 through K-21, the 12/13 and 6/7 sets of contacts of the appropriate relay close. The 6/7 contacts trigger the appropriate SCR (A-7 through Q-10). The front panel light emitting diode (LED-1 through LED-4) is energized when its associated SCR triggers and latches. The normally-closed secondary contacts of the PLATE OFF pushbutton, SW-9A interrupt the anode returns of Q-7 through Q-10 providing manual reset of LED's only when SW-9A is depressed.

The closure of any of the sets of 12/13 contacts applies +28 Vdc to the balance of the time delay switching circuits and simultaneously energizes K-17, opening normally-closed contact sets 8/9 and 14/15 across TB-6, 1 & 2. As these contacts open, relay K-10, PA plate contactor is deenergized taking the transmitter off the air by removing high-voltage from the IPA and final stage.

The control voltage for K-18 operation is provided from the VSWR Detector Assembly (Dwg. #550204/1). An LM-322 (IC-1) is used as a non-inverting voltage comparator. A sample of the positive reflected voltage from the Reflectometer is fed through terminal 5, through timing network C-2, C-3, and R-1 to the R/C input of IC-1 (pin 5). The trigger voltage point for IC-1 is established by the setting of R-2. Where the "reflected" voltage exceeds the pre-set value, K-1 in the output collector circuitry of IC-1 (pin 12) is energized, closing the relay contacts across terminals 6 and 8. This applies +28 Vdc to relay K-18 of the Overload Protection Assembly,

which, as explained above, removes IPA and PA high voltage, fires LED-1 and applies +28 Vdc to the balance of the Overload Protection Assembly timing circuits. A one-second time delay circuit (Q-3, Q-4, and K-15) is energized. K-15 is latched "on" by its 12/13 contacts in series with K-16 contacts 8/9 and the normally-closed O/L RESET contacts of the PLATE ON pushbutton switch.

After approximately one second, K-14 is energized. Its normally-closed contacts 8/9, upon opening, deenergize K-17 which restores the PLATE ON condition.

Simultaneously, contacts 9/10 of K-14 close, preparing the Q-1, Q-2, K-13 circuit for a second overload condition.

NOTE: When K-15 was energized by the initial overload, its contacts 9/10 energized the 30-second timer circuitry (Q-5, Q-6, and K-16). This timer will clear the system if no subsequent overloads occur within 30 seconds after the initial overload occurence.

If a second overload does indeed occur during the 30-second period, K-16 again closes. Its 12/13 contacts again apply +28 Vdc to K-17, removing plate voltages and the one-second timer circuits (Q-1, Q-2, K-12) repeat their cycle, ultimately deenergizing K-17 again, which reapplies high voltage to the IPA, DRIVER and PA stages.

If a third overload occurs within the 30-second period, K-16 operation again deenergized K-17, placing the transmitter in its PLATE OFF condition. 28 Vdc will be applied to K-11 through contacts 9/10 of K-14 and contacts 9/10 of K-12. Relay K-11 through its 6/7 contacts will latch "on" and apply 29 Vdc to K-17 through its contacts 12/13. Thus K-17 will remain energized (PLATE OFF condition) until O/L RESET switch (PLATE OFF) is manually operated.

If after either a first or second overload, no additional overloads occur, the 30-second timer (Q-4, Q-5, K-16) will automatically "clear" the system; however, the associated LED indicator, "fired" by the fault condition, will remain on and can be extinguished only by manual operation of the PLATE OFF pushbutton switch.

VI. REMOTE CONTROL

The BF-3.5K is capable of interfacing with standard remote control systems. All interconnections for control/telemetering are made to TB-11/13. See Figure 2.

6.1 START-STOP FUNCTION

A normally-open contact closure from the remote control system should be connected to TB-13 (1 & 2) with terminal #1 as common, or ground. Momentary contact closure, initiated by operation of the remote control system, will initiate the START cycle of the BF-5K .

A normally-open contact closure wired across terminals 1 and 3 of TB-13 will initiate the STOP cycle of the BF-3.5K when a momentary closure is initiated by the remote control system.

6.1-1 PLATE ON/OFF FUNCTIONS

Plate voltages to all tubes may be switched on or off remotely, without interruption of filament/blower circuitry. Interwiring of normally-open contact closures in the remote control system to TB-11 (1 & 2) for PLATE OFF and TB-11 (1 & 3) for PLATE ON control (Terminal #1 is common, or ground) will perform these functions remotely whenever a momentary closure is initiated by the remote control system.

6.2 POWER OUTPUT-RAISE/LOWER FUNCTIONS

A normally-open contact closure from the remote control system should be wired across TB-13(1 & 5). Terminal #1 is "common", or ground. Closure of these contacts, implemented by operation of the remote control system, will energize the IPA screen voltage motor-driven control "raise" relay, K-12 as long as the closure is maintained. This will RAISE the BF-3.5K power output.

A normally-open contact closure from the remote control system should be wired across TB-13(1 & 6) with Terminal #1, "common" or ground. Closure of these contacts, implemented by operation of the remote control system, will energize the IPA screen voltage motor-driven control "lower" relay, K-13 as long as the closure is maintained. This will LOWER the BF-5K power output.

6.3 METERING FUNCTIONS

Positive-polarity samples voltage for remote metering of the PA operating parameters appear on TB-13.

6.3-1 Remote PA Plate Voltage

A voltage sample of the PA plate voltage appears across TB-13(1 & 7). Terminal #1 is negative and Terminal #7 is positive, for interconnection to remote control system telemetry inputs.

6.3-2 Remote PA Plate Current

A voltage sample, derived from the PA plate current, appears across TB-13(1 & 8). Terminal #1 is negative and Terminal #8 is positive, for interconnection to remote control system telemetry inputs.

6.3-3 Forward/Reverse Reflectometer Metering

If desired, either the "reverse" or "forward" power indication of the reflectometer may be metered remotely. If "reverse" power is to be metered remotely, operate the front panel REFLECTOMETER switch in FORWARD position. Make interconnection from remote control system telemetering input to TB-13(3 & 4). Terminal #3 is positive, Terminal #4 is negative.

If "forward" power is to be metered remotely, operate the front panel REFLECTOMETER switch in REVERSE position. Make interconnection for remote control system telemetry input to TB-14(1 & 2). Terminal #1 is positive, Terminal #2 is negative.

NOTE: If the REFLECTOMETER reading is metered remotely, as described above, the reading of the transmitter meter will not be correct unless the pertinent positive lead connection as described above is removed from TB-14.

VII. MAINTENANCE

Routine housekeeping practice in keeping the cabinet enclosure and the internal PA and IPA compartment areas free of dust and dirt will contribute to many years of service from the BF-5K .

CAUTION: PRIOR TO PERFORMING WORK WITHIN THE CABINET AREA, SWITCH OFF FRONT PANEL CIRCUIT BREAKERS AND DISENGAGE ALL PRIMARY SERVICE SWITCHES OR BREAKERS.

USING THE GROUNDING STICK PROVIDED, DISCHARGE ALL FILTER CAPACITORS BEFORE STARTING WORK. ALTHOUGH ALL HIGH VOLTAGE POWER SUPPLIES ARE EQUIPPED WITH BLEEDER RESISTORS AND THE HIGH VOLTAGE POWER SUPPLY IS AUTOMATICALLY SHORTED TO GROUND WHEN THE REAR DOOR IS OPENED, FOLLOWING THE ABOVE PROCEDURE COULD SAVE YOUR LIFE. MAKE THIS PROCEDURE A *"HABIT"!*

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

The dual intake filters mounted on the rear door are of the maintainable type. Visual inspection of the filters through the grille covers will indicate the presence of dust accumulation on the filter grids. Remove the captive fasteners at the top and bottom of each grille. The filter element may then be removed for cleaning. This may be done during normal transmitter operation, as baffle plates on the inside of the door prevent the filters from contacting any of the internal components or wiring.

All drive motors, blowers and fans 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.

Semi-annually, the IPA and PA tubes should be removed from their respective sockets. Using a soft brush, remove dust accumulation around the socket areas.

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 front plexiglass panels should be gently wiped clean using standard plexiglass cleaner or a mild detergent. Use a clean, soft cloth.

VIII. PARTS LIST

A large number of the components are of standard values and tolerances generally available through local electronics parts suppliers. Those of unusual values or tolerances are listed below. Refer to APPENDIX A for parts information on components utilized in the B-910 Exciter portion of the BF-3.5K transmitter.

Symbol	Part Number	Description
C-12	660033	Capacitor, variable, 55-300 pf
C-15	660047	Capacitor, variable, 6.5-50 pf (IPA grid)
C-23, C-44	660042	Capacitor, 200 pf, 7.5 KV
C-24, C-32, C-33, C-37, C-38	658963	Capacitor, 1000 pf, 5 KV
C-30, C-31 CB 4	650077	Capacitor, mica .001 mf, 2 KV
C-34	660043	Capacitor, variable, 9-38 pf, 4.5 KV (IPA tune)
C-36	660041	Capacitor, variable, 50 pf (IPA load)
C-43	660046	Capacitor, feed through; 1000 pf, 10 KV
C-47, C-48	660044	Capacitor, 6 MF/5 KV MYLAR
C-49, C-50	660045	Capacitor, 8 mf/3 KV MYLAR
D-1 to D-4, D-13 to D-16	210008	Diode, Rectifier, Type 1N4006
D-5 to D-8,	210010	Diode, Rectifier, Type 1N40111 (Control Voltage Supply)
D-9 to D-12	210016	Diode, Rectifier, RS-3.5-24-12S (High Voltage Supply)
L-1	928960	Choke, 9 Henry
L-17, L-18	935035	Choke, filter reactor; 10 Hy; 1.75 A dc
L-19	931010	Choke, swinging 4-20 Hy; 550 mA.
L-20	931011	Choke, 8 Hy; 550 mA.
—	700054	Meter and lens kit 0-5/0-10 scale (Multimeter)
—	700058	Meter and lens kit 0-300 Vac scale (Line Voltage)
—	700059	Meter and lens kit 0-10 Vac scale (Fil. Voltage)
—	700060	Meter and lens kit 0-2 scale (40 div) (PA Plate Current)
—	700061	Meter and lens kit 0-5 scale (50 div) (PA Plate Voltage)
—	700062	Meter, elapsed time.
R-1	533005	Resistor, bathtub; 2.5 ohms, 5-W, 10%
R-4, R-5, R-6	535009	Resistor, tubular; 3 K ohms, 10 W, 10%
R-7	404001	Resistor, variable; 7.5 K ohm; 25 W
R-9	404002	Resistor, variable; 15 ohm; 150 W

PARTS LIST, continued

Symbol	Part Number	Description
R-10	404003	Resistor, variable; 80 ohm, 25 W
R-11	402004	Resistor, variable, 2.5 K ohm, 2 W
R-13, R-15	533010	Resistor, bathtub; 47 ohm, 5 W, 10%
R-16, R-19	404004	Resistor, variable; 50 ohms, 25 W
R-17, R-20	533024	Resistor, bathtub; 0.27 ohm, 5 W, 20%
R-18, R-21	402006	Resistor, variable; 250 ohms, 2W
R-22	539003	Resistor, tubular, adj.; 100 ohm, 100 W
R-23	539006	Resistor, tubular; 50 K ohm, 225 W
R-24 R-24A	540101	Resistor, tubular; 100 K ohm 225 W
R-25 to R-34, R-42 to R-45	505183	Resistor; 1 megohm, 4 W, 1%
R-36	539007	Resistor, tubular, adj.; 10 ohm, 100 W
R-39	539004	Resistor, tubular; adj.; 5 ohm, 175 W
R-40, to R-41	540107	Resistor, tubular, adj.; 10 ohm, 50 W
R-47	539005	Resistor, tubular, adj.; 50 ohm, 225 W
T-1	920036	Transformer, High-voltage Plate supply
T-2	920037	Transformer, PA Fil.; 7.5 Vac, C.T.; 51 A
T-3	920035	Transformer, IPA Fil.; 6.3 Vac; 5 A
T-4	900013	Transformer, screen/bias supply
T-5	918965	Transformer, control voltage supply (RT-206)
Z-1	220039	Diode, Zener, Type 1N3338B
Z-2, Z-3, Z-4	220011	Diode, Zener, 24V
—	897324	PA line, shorting bar assy.
—	149012	Right angle drive assy.
—	149013	Sprocket, ladder chain
—	149015	Ladder chain
—	897315	Cabinet exhaust fan
—	897323	Cabinet centrifugal blower
—	897319	Circuit breaker, AM2-A8-A-35-3
—	897320	Circuit breaker, AM2-A8-A-6-3
—	897321	Circuit breaker, AM1-A8-A-2-3
—	897310	Motor, control, with brake
K10		Contacter, 60A

OVERLOAD PROTECTION ASSEMBLY

Q1, Q3, Q6	201022	Transistor, SE4001
Q2, Q4, Q5	201056	Transistor, 2N3569
Q7, Q10	201109	SCR C103
D1 - D10	210008	Diode, IN4004
R1, R4, R7	502104	Resistor, 5%, ½ W, 4.7K
R2, R5	502098	Resistor, 5%, ½ W, 2.7K
R3, R6, R9	502056	Resistor, 5%, ½ W, 47 ohms
R8	502128	Resistor, 5%, ½ W, 47K
R11, R13, R15, R17	502130	Resistor, 5%, ½ W, 56K
R10, R12, R14, R16	512003	Resistor, 5%, ½ W, 1.5K
C2, C4, C6, C10	640003	Capacitor, .01 100V
C1, C3, C5, C11, C12		Capacitor, 47 µF 35V
K18	470040	Relay 6V DC
K17, K11, K12, K13, K14, K15, K16, K19, K20, K21	470041	Relay 24V DC

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.

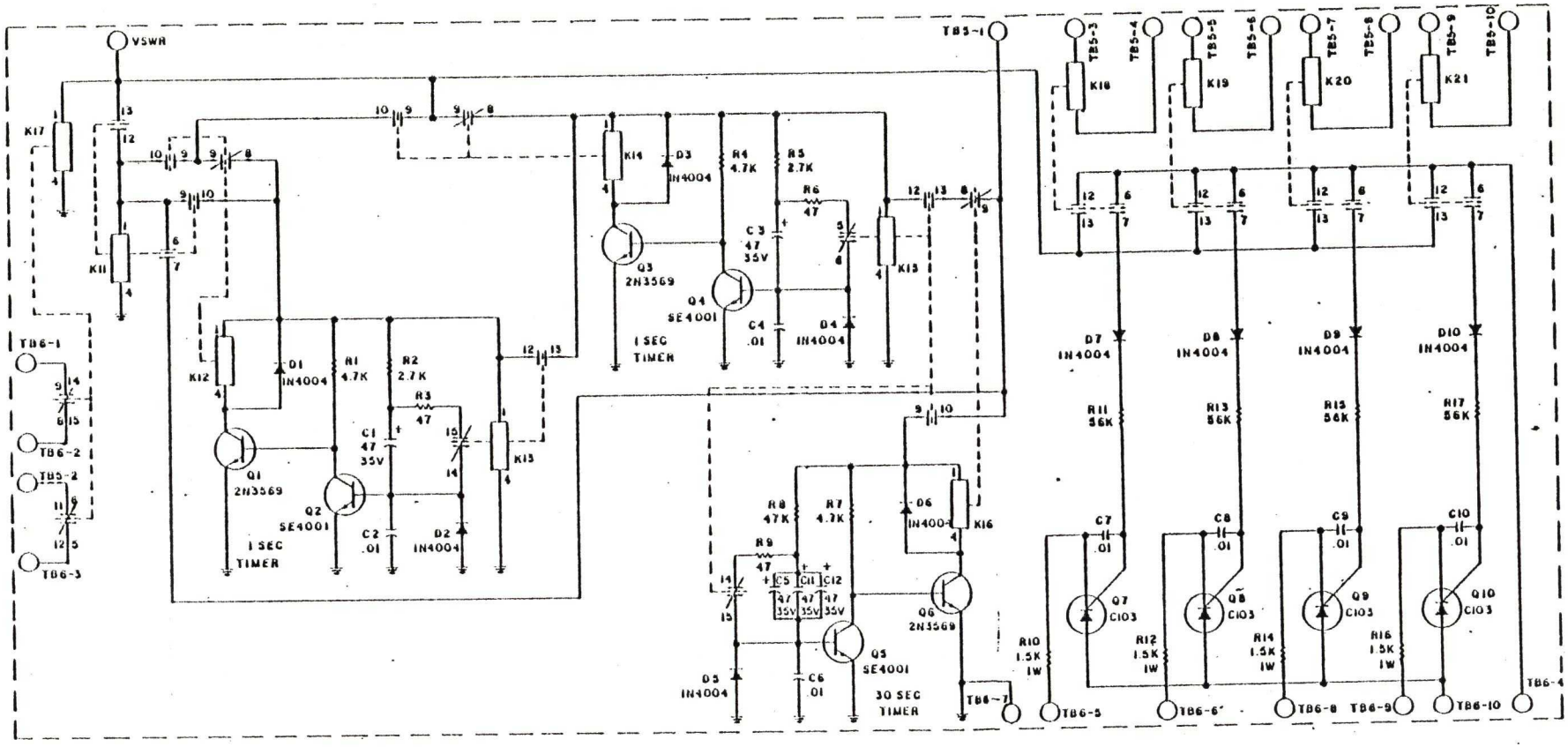
Upon notification within the applicable warranty period, McMartin agrees without charge, to repair, replace, or supply replacement parts for any properly maintained equipment or parts that are defective as to design, materials or workmanship and that are returned in accordance with McMartin's instructions 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 consequent 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.

IX. SCHEMATIC DIAGRAMS

* folded blueprint



NOTES:

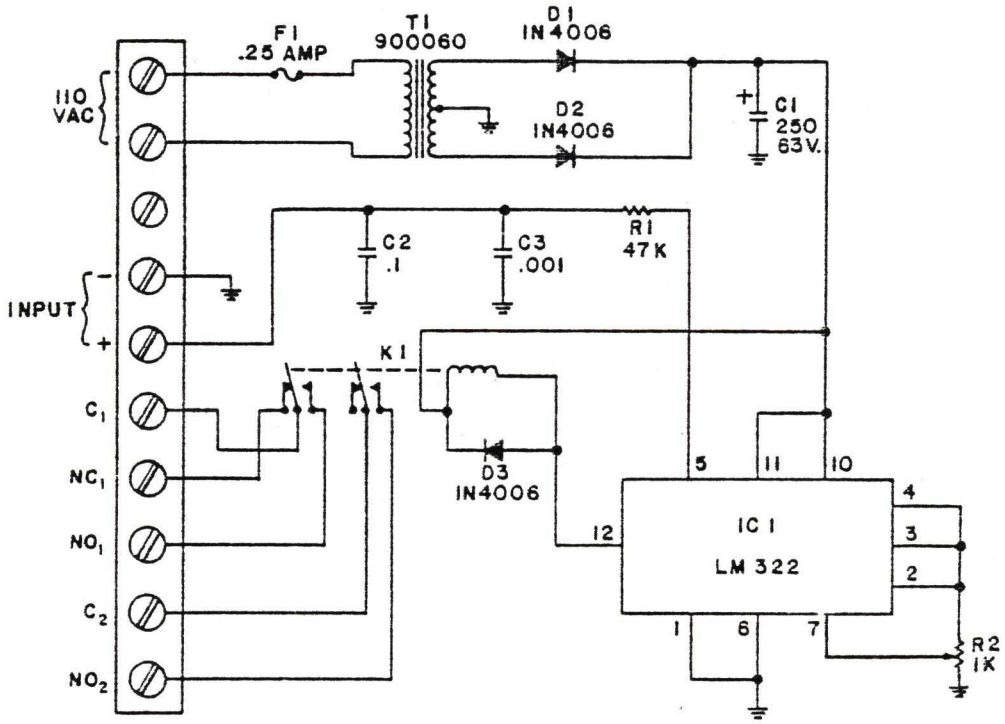
1. SCHEMATIC DATE: DEC 24, 1975
2. -|/|- DENOTES NORMALLY OPEN RELAY CONTACTS.
   -|\|- DENOTES NORMALLY CLOSED RELAY CONTACTS.
3. UNLESS OTHERWISE SPECIFIED:
   RESISTORS IN OHMS, 1/2W, 5%.
   CAPACITORS IN MFD.

QTY REQ'D	PART NUMBER	DESCRIPTION	ITEM
		BILL OF MATERIALS	

McMartin Industries, inc. — omaha, nebraska

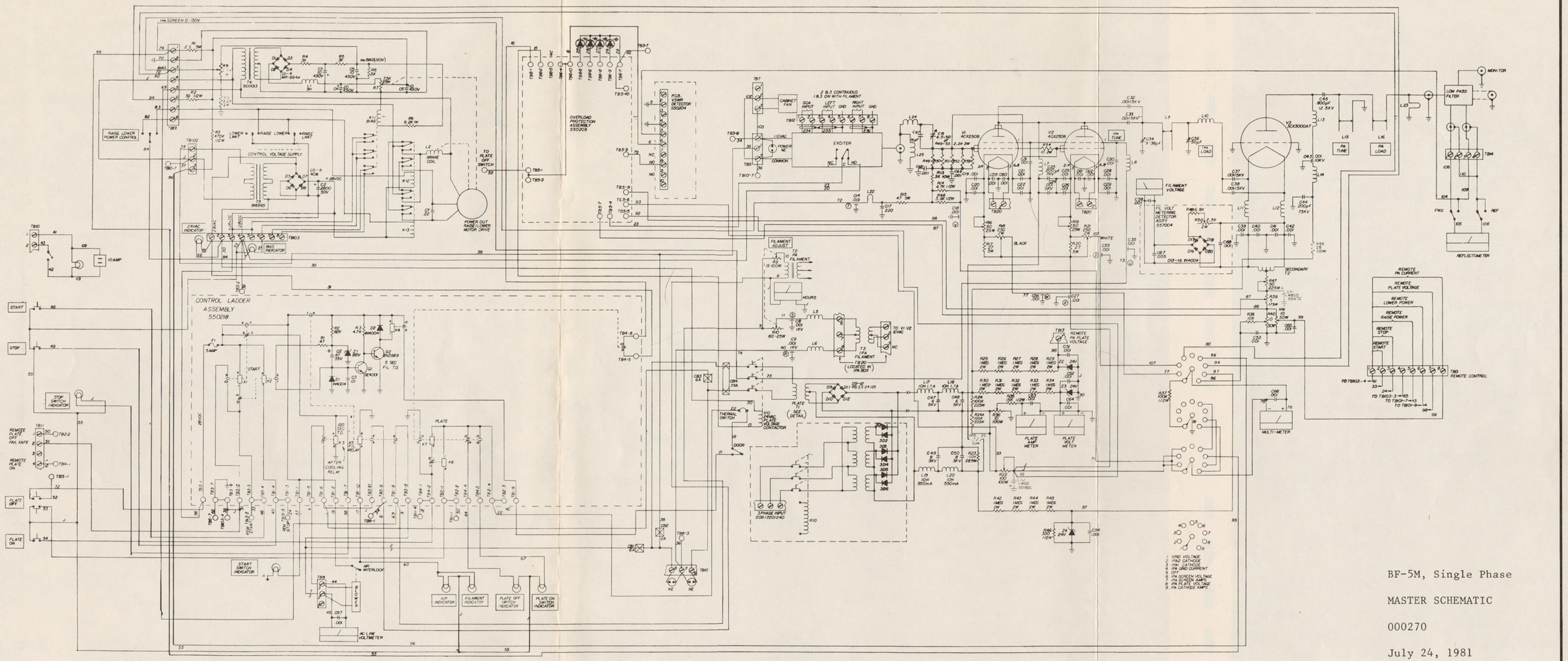
TITLE: SCHEMATIC OVERLOAD PROTECTION

SIZE: C | SHEET 1 OF 4 | DWG. 550209/1



VSWR DETECTOR
P/N 550204/1

MCMARTIN

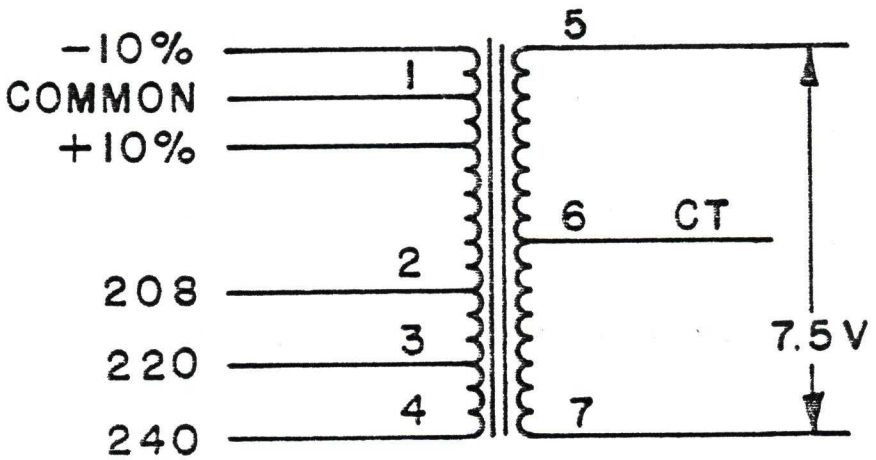


BF-5M, Single Phase

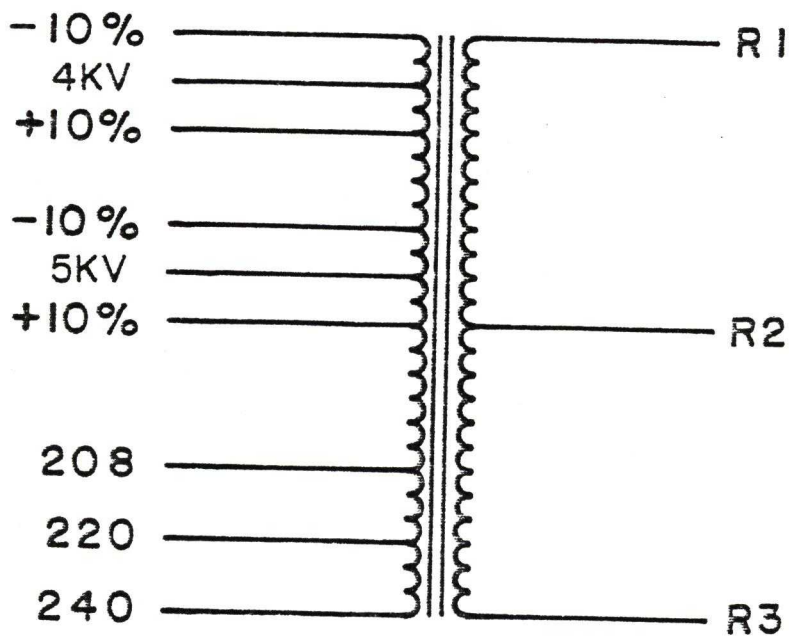
MASTER SCHEMATIC

000270

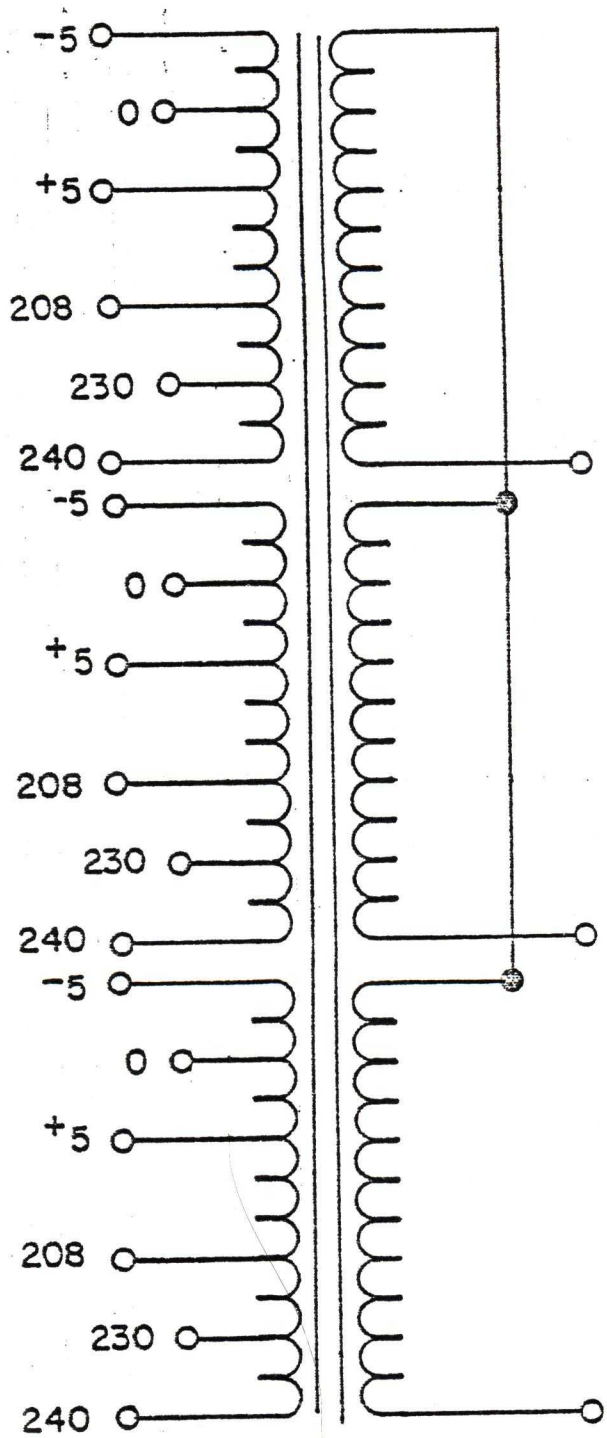
July 24, 1981



FILAMENT TRANSFORMER
P/N 920037

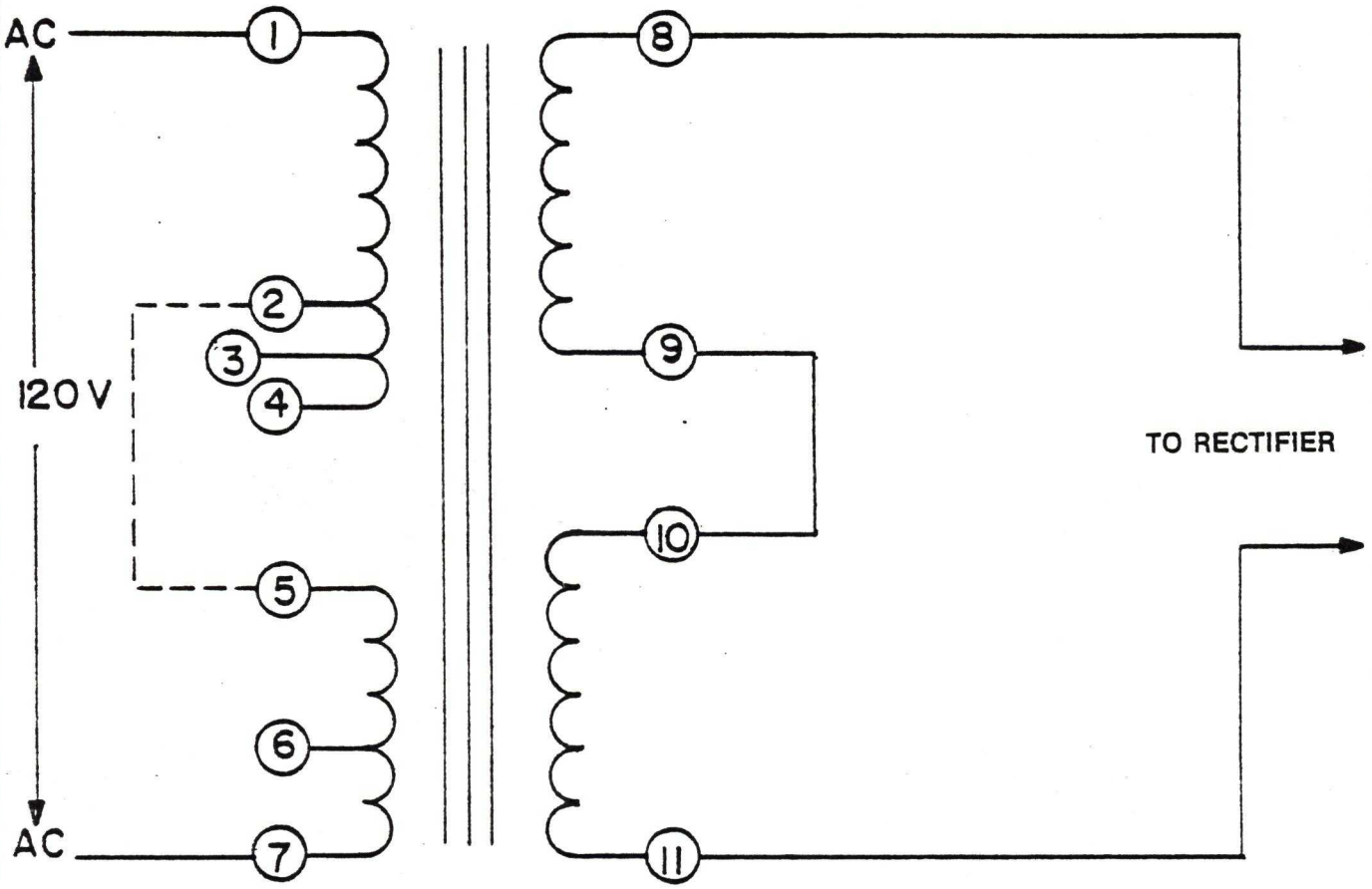


RECTIFIER TRANSFORMER
P/N 918972



RECTIFIER TRANSFORMER
P/N 918973

McMartin broadcast



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.

BA-1K, BA-2.5K, BA-5K2, BA-10K,
BF-1M, BF-3.5M, BF-5M, BF-10M,
BF-25M

Low Voltage Supply Transformer

A-3106

December 31, 1979

MCMARTIN

manual CHANGE/ADDENDUM

DATE: 17 June 1980 | EFFECTIVE DATE: 17 June 80 | page 1 of 1

PRODUCT: BF-5K

SUBJECT: Additional transformer in power supply

(Refer to Schematic Diagram 000270, Revision 'B')

The BF-5K uses several power transformers requiring 115 V line voltage. In the original design the transmitter relied on a ground connection to obtain this voltage.

To remove the need for this circuit arrangement, a separate 230 to 115 volt step-down transformer has been added, making the transmitter independent of any neutral or ground connection from the power line.

As a result, the three-phase input line can now be connected to input terminals 8,9, and 10 of terminal board TB-10 in any sequence. A new schematic, which reflects this change, is included (#000270 Revision 'B').

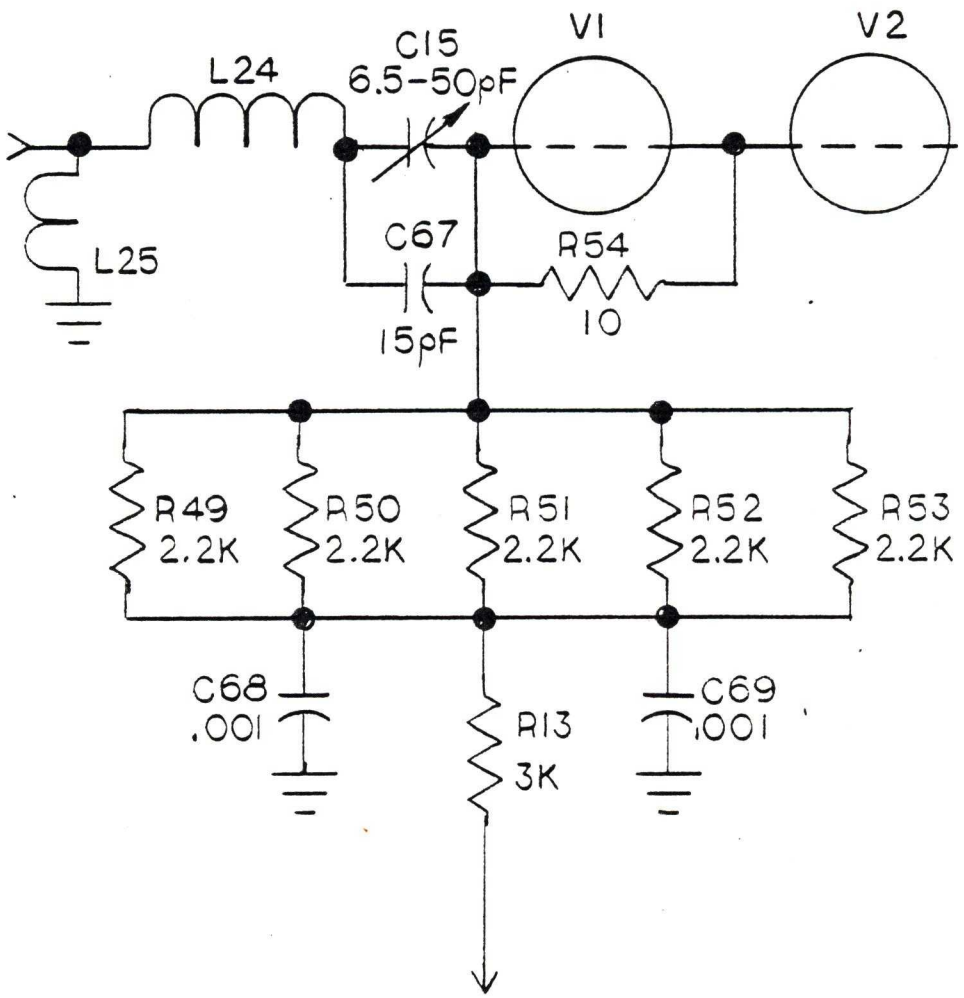
The primary tap of T6 (the 230 to 115 V step-down transformer), should correspond to the line voltage in use.

FINAL APPROVAL		DATE
	A.H. Bott A.H.B. 17 Jun 80	
Sales/Mkg Date	Engineering 17JUN80 Date	

DATE: July 21, 1981 | EFFECTIVE DATE: May 30, 1980 | page 2 of 2

PRODUCT: BF-3.5M, BF-5M, BF-10M, BF-25M

SUBJECT: Input Circuit Modifications -- Con't



NOTES: 1. RESISTORS IN OHMS, 2 WATT.
2. V2 AND R54 NOT USED IN BF-10M AND BF-25M.

FINAL APPROVAL				DATE
		R. E. Johnson	7-21-81	
Sales/Mktg	Date	Engineering	Date	CHANGE NO.:

EIMAC
division of varian
301 Industrial Way
San Carlos, Calif. 94070

WARRANTY CLAIM SERVICE REPORT

POWER GRID TUBES

PLEASE READ IMMEDIATELY UPON RECEIVING TUBE

Adjustment will not be considered unless this Warranty Claim Service Report is completed in full and returned with the tube or circuit component to the Eimac factory where manufactured.

BREAKAGE AND DAMAGE

UNDER U.S. SHIPPING REGULATIONS, DAMAGE CLAIMS MUST BE COLLECTED BY THE CONSIGNEE. UNLESS OTHERWISE INSTRUCTED, MOST SHIPMENTS ARE INSURED. DO NOT RETURN DAMAGED MATERIAL TO EIMAC.

IMPORTANT: This merchandise was carefully packed and thoroughly inspected before leaving our factory. It should be unpacked, examined, and tested immediately on receipt. Responsibility for safe delivery was assumed by the carrier upon acceptance for shipment; claims for loss or damage sustained in transit must therefore be made upon the carrier, as follows:

CONCEALED LOSS OR DAMAGE: Concealed loss or damage means loss or damage which does not become apparent until the merchandise has been unpacked or tested. The contents may be damaged in transit due to rough handling even though the carton may not show external damage. When the damage is discovered upon unpacking and/or testing, make a written request for inspection by the carrier's agent within 15 days of the delivery date. Then file a claim with the carrier since such damage is the carrier's responsibility.

VISIBLE LOSS OR DAMAGE: Any external evidence of loss or damage must be noted on the freight bill or express receipt and signed by the carrier's agent. Failure to adequately describe such external evidences of loss or damage may result in the carrier refusing to honor a damage claim. The form required to file such a claim will be supplied by the carrier.

WARRANTY

EIMAC Division of Varian warrants most tube types for 3000 hours, with prorated adjustment from 300 to 3000 hours. Warranty time for each tube is specified in the EIMAC price list; inquiries on warranty time for any product may be made to any Varian Sales Office, or to any EIMAC franchised distributor. Warranty on all tubes expires one year from date of sale to the ultimate user, or 18 months from the shipment date from EIMAC. Tubes are warranted to be free from defects in workmanship and materials only.

In the interest of conservation of scarce materials tubes may contain recycled parts which are required to meet the same high standards of quality control applied to other materials and components used. This warranty applies only to tubes which are operated within the maximum ratings specified by EIMAC for the type of service employed. The entire obligation of EIMAC under this warranty is to replace defective products, or at its option, to credit the purchaser. In no event will EIMAC be liable for breakage or damage incurred in shipment (see BREAKAGE AND DAMAGE, above), or for consequential or resulting loss or damage, whether or not due to causes covered by this warranty.

RETURN PROCEDURE FOR WARRANTY CLAIMS

Where no obvious or externally visible fault exists, be sure the tube actually is inoperable before returning it. This should be done by operating the associated equipment, first with a tube known to be good to verify the functioning of the equipment, and then attempt to operate the questionable tube in the same equipment under similar conditions.

1. If the tube was obtained from a Distributor or an Equipment Manufacturer, it should be returned to them and not EIMAC. Be sure to enclose a completed Service Report. This is important.
2. If the tube was purchased directly from the factory, the following applies:
   a. Authorization for return is required if more than 10 tubes are involved, or if the value of the shipment exceeds $500.00. Customers outside the United States must request authorization before any return is made.
   b. Complete the form on the back of this sheet giving all the data asked for. Adjustment will be considered only if this completed report accompanies the tube.
   c. Repack the tube carefully in the same way it was packaged originally for shipment, preferably using the original materials.
   d. Ship via PREPAID Express (do NOT ship by Parcel Post) to the EIMAC factory as shown on the reverse side of this report. DO NOT RETURN TUBES TO AN EIMAC SALES OFFICE OR SALES REPRESENTATIVE. Customers outside the United States should return electron tubes by Air Freight. Ocean shipments are acceptable provided the items are adequately export packed for this mode of transportation. The sender and the shipping agency must assume responsibility for damage from improper packing or handling. Insurance charges for returned goods must be borne by the sender.
3. Customer retains title to material returned for evaluation until EIMAC acknowledges adjustment responsibility in writing.
4. If EIMAC, Division of Varian, finds the tube has been returned without cause and is still serviceable, the customer will be notified and the tube returned at his expense.
5. If EIMAC, Division of Varian, finds that a replacement or credit allowance is in order, the customer will be notified. In the case of a replacement, a new tube will be shipped prepaid. Credit allowance will be made for shipping charges incurred by the customer in returning the produce provided EIMAC approved transportation methods are used.
6. It is often necessary to dismantle an inoperative tube to determine the cause of failure. In returning a tube, the customer grants permission to dismantle at the discretion of EIMAC.
7. Unserviceable tubes will be destroyed 30 days after notice of evaluation is sent to the customer. If the customer desires return of an unserviceable tube, he should notify EIMAC within that time and it will be returned at his expense. Any item for which credit is given or replacement is made under warranty becomes the property of EIMAC and will not be returned.

BE SURE TO FILL IN THE REVERSE SIDE OF THIS PAGE COMPLETELY

EIMAC
Division of Varian
301 INDUSTRIAL WAY ● SAN CARLOS, CALIFORNIA 94070

SERVICE REPORT

PLEASE READ INSTRUCTIONS ON REVERSE SIDE BEFORE FILLING IN

Tube Type_____ Serial Number_____ When Purchased_____
(The Serial Number is a digit letter combination inside the tube at the base end, or on the external radiator).

From whom purchased_____

Type of Service. Broadcast ☐, Communications ☐, Navigation, Radar, etc. ☐, Amateur ☐, Medical ☐,
General Industry ☐, Experimental ☐, Other_____

Type of Equipment in which Tube was used;_____
(Manufacturer's Name and Type Number)

Call letters of Station (if in licensed service)_____

Operating Conditions:

Total Hours of Filament Operation_____ Hours. Frequencies Used_____

How Used: RF Power Ampl.-Unmod. ☐, FM ☐, FSK ☐, AM Plate Mod. ☐, Teleg. ☐, Pulse Service ☐,
RF Power Ampl.-Linear ☐, Grid Mod. ☐, Screen Mod. ☐, Suppressor Mod. ☐, Doubler ☐, Tripler ☐.
Other Uses: Audio ☐, Pulse Ampl. or Mod. ☐, Control Ampl. ☐, Oscillator ☐.

Others_____

Voltage and Current Values PER TUBE: TUBE OPERATING, Such as Key Down, (If pulsed service give peak values) Carrier, Pulse on, or Work in Place.		TUBE NON-OPERATING, Such as Key Up Pulse Interval, or Work Removed.	
Plate Voltage ☐ DC ☐ AC	Volts		Volts
Plate Current DC Per Tube	MA		MA
Screen Voltage ☐ DC ☐ AC	Volts		Volts
Screen Current DC Per Tube	MA		MA
Total Control Grid Bias Voltage DC	Volts		Volts
Control Grid Current DC Per Tube	MA		MA
Suppressor Grid Voltage ☐ DC ☐ AC	Volts		Volts
Filament Voltage ☐ DC ☐ AC	Volts		Volts

What are extremes of filament voltage due to variations of supply lines and operating conditions?
_____ to _____ volts.

How is screen voltage obtained? _____

Is a screen bleeder used? _____

What is value of screen resistor, if any. (Note if for more than one tube)._____ Ohms

How is control grid bias voltage obtained? Resistor ☐ Supply ☐ Combination ☐ _____

Is grid bias adjustable? _____

What is value of grid resistor, if used; (Note if for more than one tube)._____ Ohms

If pulsed service: duty cycle_____; pulse width_____ Microsec.

Was plate voltage on at time of failure?_____ Was excitation off tube at time of failure?_____

Was stage being adjusted at time of failure?_____ If so what were conditions?_____

Part of Tube Air or Water Cooled	Temp. (°C.) Inlet	Temp. (°C.) Outlet	Air or Water Flow cubic feet / minute	Air or Water Flow or gallons / minute	Pressure Drop Across Tube Air: inches of H_2O or Water.	Pressure Drop Across Tube pounds / square inches

Describe what happened at time of failure_____

_____

_____

Name of Company or Person owning tube (Please Print)_____

Address_____

Date_____ Signature_____

NO TUBE CAN BE CONSIDERED FOR ADJUSTMENT UNLESS THIS FORM HAS BEEN COMPLETED AND RETURNED WITH TUBE

DO NOT RETURN TUBE BY PARCEL POST

McMartin commercial sound

McMartin Industries, Inc. • 4500 South 76th Street • Omaha, Nebraska 68127–1880 • (402) 331-2000 • Telex 484485