The management of Steam Powered Radio apologizes for the poor condition of the overall schematic diagram

ELCOM BAUER TRANSMITTERS

BROADCAST PRODUCTS

TECHNICAL MANUAL

BAUER STANDARD AM BROADCAST

T R A N S M I T T E R S

FB-5V
5000 WATTS

FB-10J
10000 WATTS

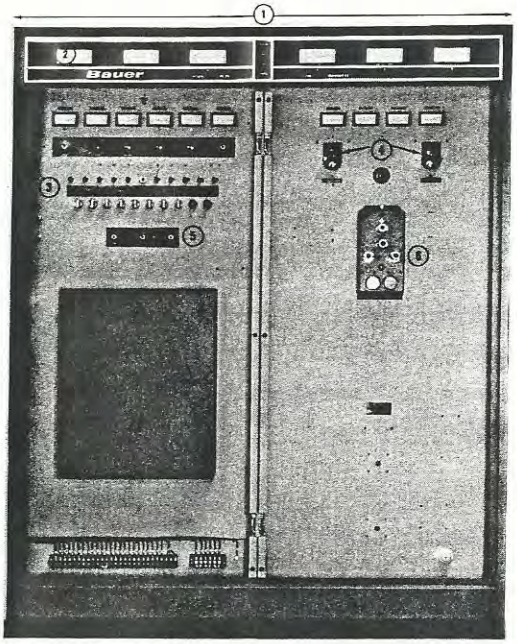
PROPRIETARY NOTICE

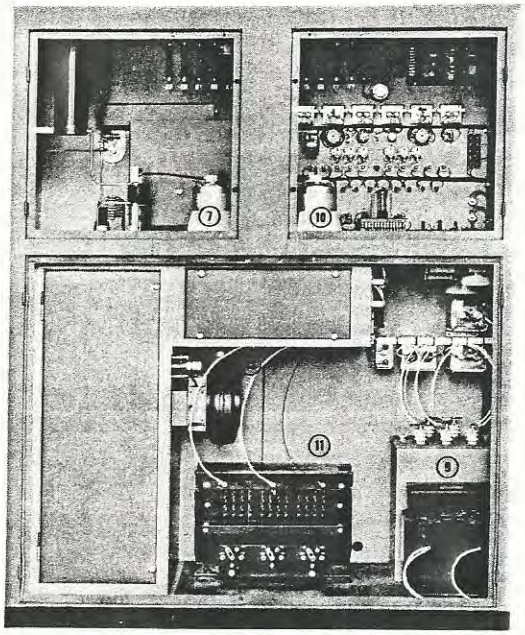
6199 WAREHOUSE WAY, SACRAMENTO, CA 95826, U.S.A. • (916) 381-3750 • TELEX 377-331 • ANS. BK. "ELCOM"

5,000 WATT AM BROADCAST TRANSMITTER
MODEL FB-5V

THE NEWEST AND MOST COMPACT 5000 WATT
AM TRANSMITTER AVAILABLE

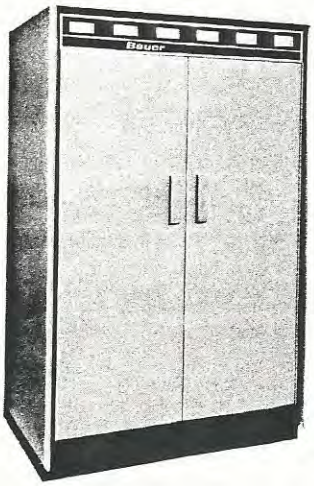
This 5 kw AM Transmitter is the latest in the popular line of Bauer™ broadcast equipment. The Model FB-5V design includes every modern development in transmitter technology that is genuinely useful and does not represent a complicated answer to a simple problem. The straight-forward circuitry is easy for station engineers to understand and service.





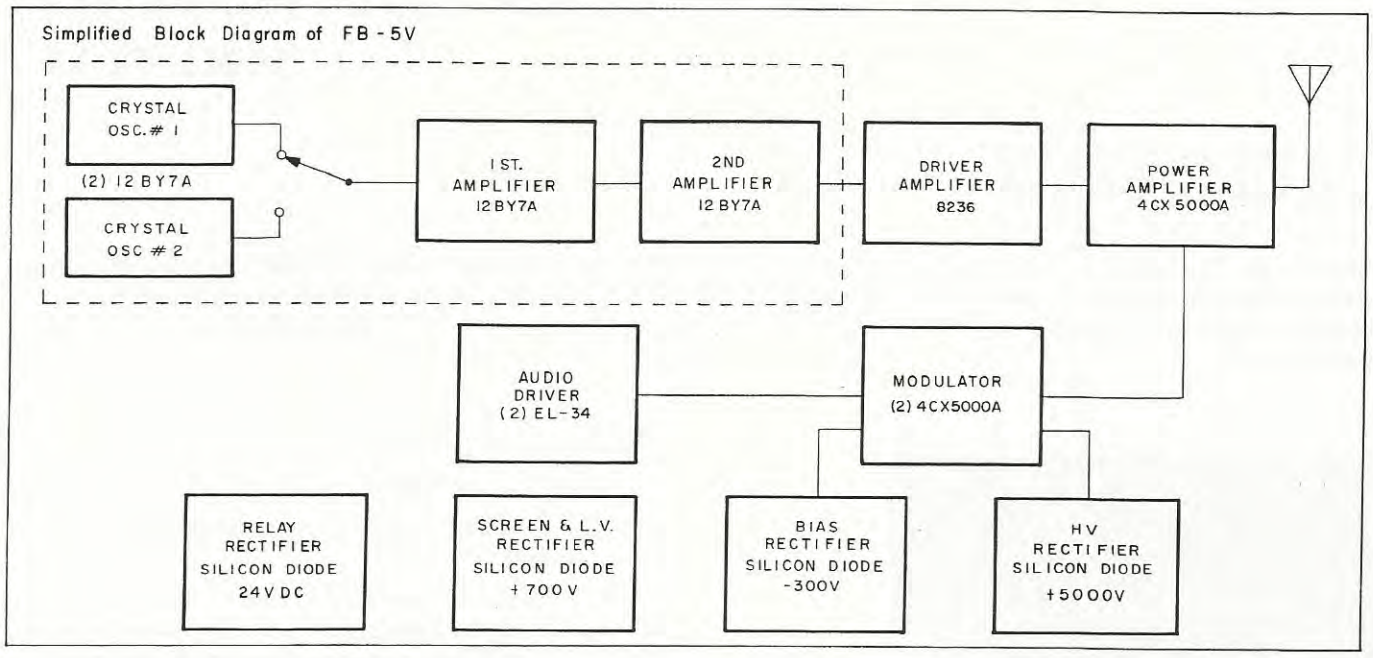
BROADCASTER BENEFITS

1. Compact, space saver -- only 60" wide, 29" deep
2. Full metering -- all functions displayed simultaneously
3. Tally light fault locating system -- reset and get back-on-the-air fast. The Bauer tally light system remembers what caused the fault (or momentary overload) so it can be corrected later
4. Easy to tune -- and tuning is seldom needed
5. Simple control system -- ready to-go-the-air in 30 seconds
6. Two vacuum crystals and two oscillators -- for long-term reliability
7. 6000-watt capability with power output to spare
8. All self-contained unit with quick accessability to all components
9. Oil-filled modulation transformer -- the latest and most reliable transformer gives dependable, long-term service
10. Top quality modulator -- square wave tested, low distortion, outstanding transient response
11. Low ripple power supply -- simple design uses no filter choke
12. Lots of air -- keeps tubes cooler for longer life



Granger Associates / BAUER BROADCAST PRODUCTS

G/A Bauer Comprehensive Catalog
February, 1969. Sec. B2, Pg. 141



SPECIFICATIONS

PERFORMANCE SPECIFICATIONS

AF input impedance. 600 ohms

AF input level. 10 dbm (100% modulation)

AF response. ± 1 db (30 - 12 KHz)

AF distortion. Less than 3% (95% mod., 50-10 KHz)

Noise. 60 db or better (Below 100% modulation)

Frequency stability. ±5 Hz

RF output. 50/70 ohms, unbalanced

Carrier shift. Less than 3% (100% modulation)

ELECTRICAL SPECIFICATIONS

Power output nominal. 5000 watts

Power output capability. 6000 watts

Power supply. 230 volts, 50/60 Hz, 3 phase

Power consumption.

0% modulation	10.6 kw
Average modulation	12.0 kw
100% modulation	15.5 kw

Power factor. 90%

Tube complement.

2 12BY7A oscillators
2 12BY7A buffers
1 8236 driver
1 4CX5000A power amplifier
2 EL-34/6CA7 audio driver
2 4CX5000A modulator

MECHANICAL SPECIFICATIONS

Height. 75 inches (190.5 cm)

Width. 60 inches (152.4 cm)

Depth. 29 inches (73.7 cm)

Weights.

Net	2000 pounds (907.2 kg)
Domestic	2400 pounds (1086.6 kg)
Export	2700 pounds (1224.7 kg)

Altitude range. To 8000 feet

Ambient operating temperature. To 113°F

ORDERING INFORMATION

G/A Bauer Model FB-5V AM transmitter, 5000/1000 or 500 watts, complete with tubes, two crystals, tuned and tested on frequency.

Optional and accessory equipment

Type TK-5V recommended set of spare tubes
Type WRC-10T remote control system
Type 440B Log Alarm® automatic logging system
Type ACU-305 antenna coupling unit

OTHER G/A BAUER AM TRANSMITTERS

Model 720 50-watt transmitter
Model 707 1000-watt AM transmitter
Model FB-3A 3000-watt AM transmitter
Model FB-10J 10,000-watt AM transmitter
Model FB-15A 15,000-watt AM transmitter
Model 725 25,000-watt AM transmitter

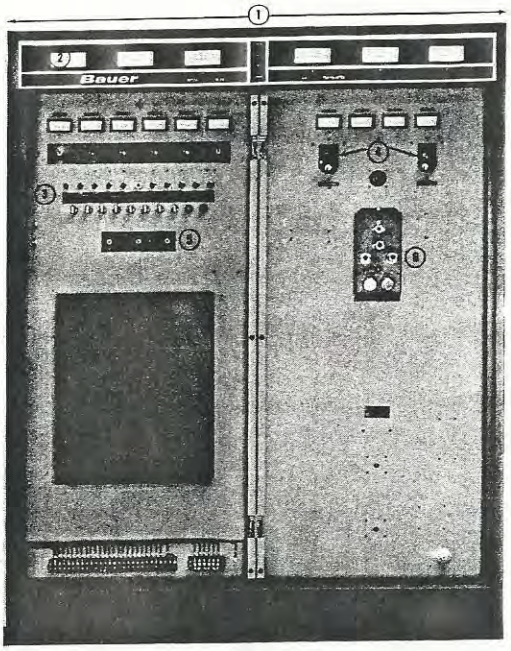
More information for you.

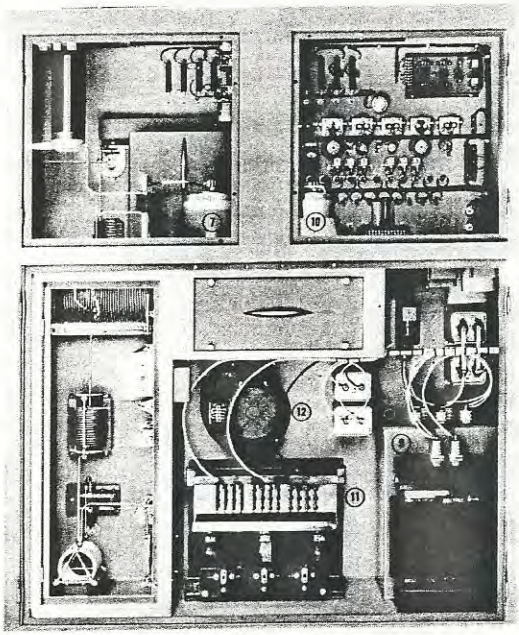
Additional information on this product is available from Granger Associates-Bauer Broadcast Products, 1601 California Avenue, Palo Alto, California 94304 or 818 18th Street NW, Washington, D. C. 20006; 1 Brooklands Road, Weybridge, Surrey, England; 1-3 Dale Street, Brookvale, NSW 2100, Australia; or from the G/A-BAUER Communication Engineering Office nearest you.

10,000 WATT AM BROADCAST TRANSMITTER
MODEL FB-10J

THE NEWEST AND MOST COMPACT 10,000 WATT
AM TRANSMITTER AVAILABLE

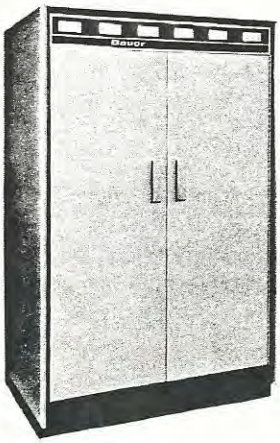
This 10-kw AM Transmitter is the latest in the popular line of Bauer™ broadcast equipment. The Model FB-10J design includes every modern development in transmitter technology that is genuinely useful and does not represent a complicated answer to a simple problem. The straight-forward circuitry is easy for station engineers to understand and service.



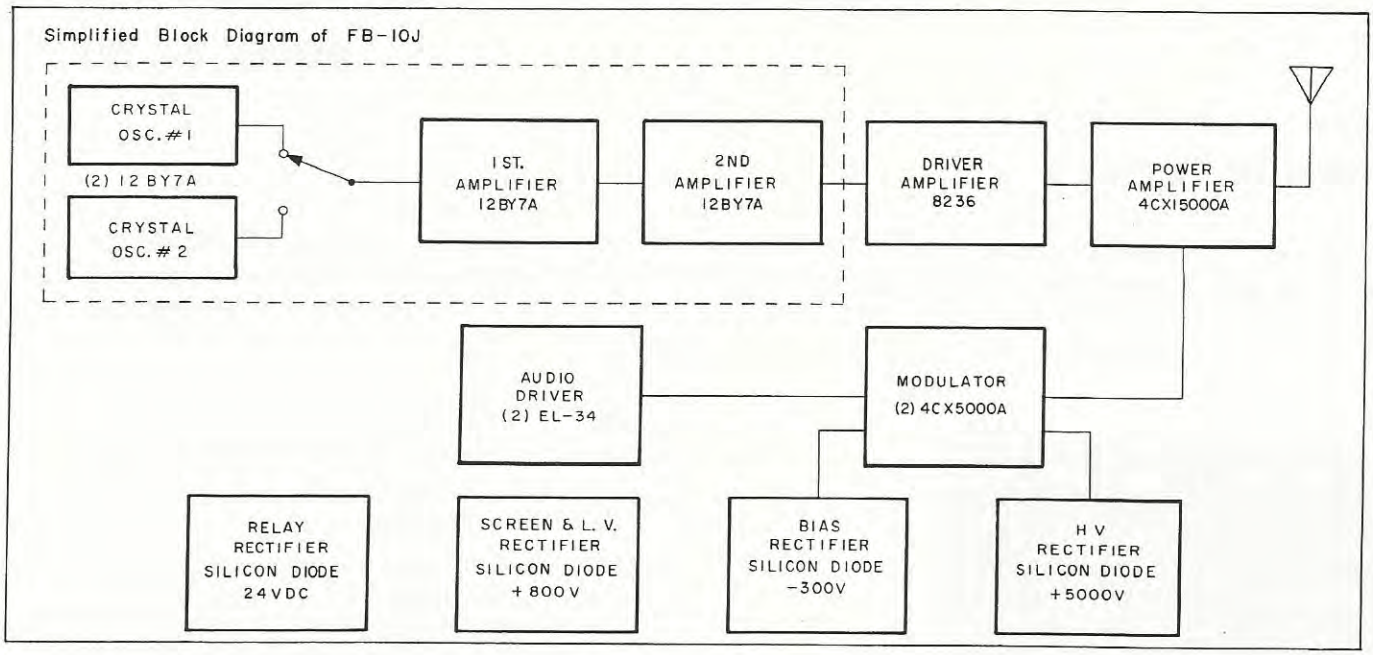


BROADCASTER BENEFITS

1. Compact, space-saving size, 60" wide, 29" deep
2. Full metering -- simultaneous display of all transmitter functions
3. Tally light fault locating system -- reset and get back on-the-air fast. The Bauer tally light system remembers what caused the fault (or momentary overload) so it can be corrected later
4. Easy to tune -- and tuning is seldom needed
5. Simple control system with a minimum of operating switches and controls
6. For long-term reliability --two vacuum crystals and two oscillators
7. 12,000 watt capability -- ample reserve for efficient asymmetrical modulation... more energy into the side band
8. All self-contained unit with quick accessibility to all components
9. Oil-filled modulation transformer -- the latest and most reliable transformer gives dependable, long-term service
10. Top quality modulator -- square wave tested, low distortion, outstanding transient response
11. Low ripple power supply -- simple, reliable design uses no filter choke
12. Lots of air movement -- keeps tubes cool for long life



Granger Associates / BAUER BROADCAST PRODUCTS



SPECIFICATIONS

PERFORMANCE SPECIFICATIONS

AF input impedance. 600 ohms

AF input level. 10 db (100% modulation)

AF response. ± 1-1/2 db (30 - 12 KHz)

AF distortion. Less than 3% (95% mod., 50 - 10 KHz)

Noise. 60 db or better (Below 100% modulation)

Frequency stability. ± 5 Hz

RF output. 50/70 ohms, unbalanced

Carrier shift. Less than 3% (100% modulation)

ELECTRICAL SPECIFICATIONS

Power output nominal. 10,000 watts

Power output capability. 12,500 watts

Power supply. 230 volts, 50/60 Hz, 3 phase

Power consumption.

0% modulation	19 kw
Average modulation	22 kw
100% modulation	27 kw

Power factor. 90%

Tube complement.

2 12BY7A oscillators
2 12 BY7A buffers
1 8236 driver → 6DQ5
1 4CX 15,000A power amplifier
2 EL-34/6CA7 audio driver
2 4CX5000A modulator

Data subject to change due to product improvements
Printed in the U.S.A.

MECHANICAL SPECIFICATIONS

Height. 75 inches (190.5 cm) Width. 60 inches (152.4 cm)
Depth. 29 inches (73.7 cm)

Weights.

Net	2500 pounds (1134.0 kg)
Domestic	2900 pounds (1315.4 kg)
Export	3100 pounds (1350.4 kg)

Altitude range. To 800 feet

Ambient operating temperature. To 113°F

ORDERING INFORMATION

G/A Bauer Model FB-10J AM transmitter, 10,000 watts, complete with tubes, two crystals, tuned and tested on frequency.

Optional and accessory equipment

Autotransformer for 208 V operation
Type TK-10J recommended set of spare tubes
Power cutback kit -- to 5000 watts
Type WRC-10T remote control system
Type 440B Log Alarm® automatic logging system
Type ACU-310 antenna coupling unit

OTHER G/A BAUER AM TRANSMITTERS

Model 720 50-watt AM transmitter
Model 707 1000-watt AM transmitter
Model FB-3A 3000-watt AM transmitter
Model FB-5V 5000-watt AM transmitter
Model FB-15A 15,000-watt AM transmitter
Model 725 25,000-watt AM transmitter

More information for you.

Additional information on this product is available from Granger Associates-Bauer Broadcast Products, 1601 California Avenue, Palo Alto, California 94304 or 818 18th Street NW, Washington, D.C. 20006; 1 Brooklands Rd., Weybridge, Surrey, England; 1-3 Dale Street, Brookvale, NSW 2100, Australia; or from the G/A-BAUER Communication Engineering Office nearest you.

TABLE OF CONTENTS

Section	
GENERAL DESCRIPTION	1
INSTALLATION INSTRUCTIONS	4
PRELIMINARY CIRCUIT CHECK	6
MAINTENANCE	7
TUNING PROCEDURE	8
TYPICAL METER READINGS - FB-5V	13
TYPICAL METER READINGS - FB-10J	14
CONTROL RELAY CIRCUIT FUNCTIONS	15
PARTS LIST	18
PARTS LIST MODIFICATION FOR FB-10J	27
CABLE TABULATION	28
PRIMARY CONNECTIONS FOR 208 voltage operation - FB-5V	36
GENERAL INSTRUCTIONS FOR FAN MOTOR	37
TUBE DATA	39

LIST OF ILLUSTRATIONS

Figure	
A	Front View
B	Front View - Meter Panel
C	Rear View - FB-5V
D	Rear View - FB-10J
1	Simplified Schematic - FB-5V
1A	Simplified Schematic - FB-10J
2	Control and Signaling Schematic
3	Base Outline and External Wiring
4	Base Outline

GENERAL DESCRIPTION

Radio Frequency Section

Oscillator

The oscillator portion of the transmitter employs a Northern Engineering Laboratories Type T-12A "room temperature" crystal and a type 12BY7A tube connected in an electron-coupled circuit. A second similar oscillator may be selected by means of a front panel switch (SW8).

The switch functions to simultaneously remove plate and screen voltage and short-circuit the output of the unused oscillator. Filament voltage is applied continuously to both oscillators.

The oscillator is followed by a type 12BY7A tube operating as a class "A" buffer for maximum isolation. The buffer drives a second type 12BY7A class "C" amplifier--the plate circuit of which is resonated by means of a small slug-tuned coil.

The entire oscillator/buffer unit is assembled on a small aluminum subchassis mounted on the front side of the right panel. By releasing a single captive thumbscrew the unit hinges downward at right angles to the panel completely exposing all components and wiring.

RF Driver

The driver assembly is mounted on the right front panel immediately behind the oscillator unit. An aluminum enclosure shields its components from the final amplifier circuitry.

It consists of a single 8236 tube operating as a low power "C" amplifier. Grid bias is obtained from a combination of fixed and self-rectified bias. The fixed bias is selected to result in class "A" dissipation in case of exitation failure.

The output of the driver stage is matched into the final power amplifier grid circuit by means of a pi network, resulting in a good efficiency and harmonic suppression. It is tuned by a high grade variable inductance operated from a front panel counter dial.

Final Power Amplifier

The final power amplifier consists of one high level plate and screen modulated tetrode type 4CX5000A, (4CX15000A in 10-J). Provisions are made to neutralize this stage for high frequency operation although this is not necessary at standard broadcast frequencies.

To compensate for line voltage variations, the power is trimmed by means of a motor driven output loading control. The final bias may be measured by operating a switch in the LV rectifier voltmeter circuit. The final plate current meter is connected in the cathode circuit where it also measures screen current. A separate screen meter permits determination of net plate current. The rectified RF grid current does not flow through the plate meter.

The final tank circuit is matched into a 51 ohm unbalanced load by means of a "Tee" network. The second harmonic is suppressed by a series resonant circuit in shunt with the output of the tank circuit. The third harmonic is suppressed by a similar circuit in shunt with the output of the "Tee" network.

The input of the "Tee" is usually adjusted to provide a resistive load of from 60 to 80 ohms to the output of the final tank to provide greater flexibility in the adjustment of the circuit, reduce circulating currents and to improve the degree of control provided by the variable output loading trimmer condenser.

Modulator

The modulator consists of an audio frequency voltage amplifier using two push-pull type EL-34 tubes resistance coupled to the grids of two push-pull type 4CX5000A tetrodes operating as class AB-1 modulators. An R-C network provides approximately 8 db of inverse feed back from the modulator plates to the audio amplifier grids.

This relatively simple and highly effective audio system is capable of supplying an excess of audio power for either the five or ten kilowatt transmitters. When used with a properly designed limiting input amplifier, high average modulation may be maintained without distortion.

Power Supplies

The high voltage power supply used in these transmitters consists of a three phase, full wave, bridge configuration having a 12 phase output with 1% ripple at 720 cycles. The remaining ripple is then brought to a negligible value with filter capacitors only--no filter chokes are used.

The rectifier consists of 12 panels each comprising 10 silicon diodes and their individual voltage equalizing capacitors and resistors. This rectifier supplies plate and screen voltage for the final RF power amplifier and plate voltage for the modulator stage.

A second, low voltage, full wave, single phase bridge rectifier supplies all other tube voltages. The output is split into positive and negative supplies with separate filters. The positive side supplies plate and screen voltage for all low power RF stages including the final driver as well as the audio voltage amplifier and the modulator screens. The negative side provides individually controlled bias for each modulator and limiting bias for the RF driver.

A third rectifier-filter supplies 24 VDC to all control relays and signal lamps. This rectifier remains on continuously and makes possible the application of auxiliary remote control equipment that handles no voltages in excess of 24 VDC as already provided.

Control

The 5V and 10J transmitters have an advanced control and tally light system not normally found on transmitters of this power category. All control relays (excepting power change) are front panel mounted on a hinged aluminum plate under a hinged dust cover. All are completely accessible for inspection during transmitter operation. Individual relay functions are described on separate pages of this brochure.

INSTALLATION INSTRUCTIONS

FB-5V FB-10J

STANDARD A.M. TRANSMITTERS

External Wiring

All components including power supply and modulation components are enclosed in one, heavy gauge, steel cabinet with aluminum compartmentation. No additional wiring between bays is required.

The only externally mounted elements are two primary safety disconnect switches, the high current primary magnetic breakers and their associated overload relays. This is done to permit visual inspection of these elements during operation, to prevent the closing mechanical shock of the breaker from disturbing other components and to eliminate as far as possible all high current wiring and terminals within the transmitter.

It is recommended that the above items be solidly mounted on a firm wall and interconnected by short length of oversized conduit. An experienced electrician, familiar with local codes, should be retained for this work.

No air exhaust ducts attached to the transmitter are required or recommended. Instead heated air is exhausted into the room from grills located in the top of the transmitter. The room should be ventilated by means of an exhaust fan with automatic louvers and controlled by a thermostat. The fan should be so located that it does not operate against prevailing winds. The air entering the room should be through a special opening fitted with air filters and so located that water vapor and spray will not be drawn into the room during rains. The passage of incoming air from this opening to the transmitter should be relatively unobstructed.

Means must also be provided to prevent transmitter components from reaching very low temperatures during inoperative periods in cold weather to prevent warm air subsequently flowing through transmitter causing moisture condensation.

After the transmitter has been placed in its final location connect the best available, low impedance radio ground to the three 1/4-20 studs provided at the lower edge of the front panel by means of a 3 or 4 inch wide copper ribbon.

Install all large components comprising T2, L22 and the T-10 power supply. Means should be provided to protect the cabinet door jamb by a wood or metal plate while lifting the heavy components over it. Place T-2 with terminals #5 and #4 facing the front of the cabinet. The hold down bolts for

these units are not provided to hold them down but to insure proper placement and grounding. No provisions are made for those that are relatively inaccessible. Connect all tagged wires to correspondingly labeled terminals on the transformers. The high current, three phase primary wires for T-10 power supply may be brought in through the 1-3/8" opening with the plastic grommet in the front panel or through a condulet installed at the same place. If this opening is not used it should be plugged to prevent incoming air from bypassing the air filter.

Next, the remaining wiring may be completed. Miniature 75 ohm coaxial cable for the modulation and frequency monitors is coiled at the extreme lower left edge of the front panel. If the frequency monitor supply is not used or terminated, the inner conductor should be shorted to the outer conductor to prevent stray pickup.

All power control wires go to terminals 1 thru 7. The three phase supply leads going to terminals 1 thru 3 should be so arranged that they can be phased in any combination pending later noise measurements.

Terminals #8 and #14 are used only for power cut-back circuits. The remaining terminals are for remote control, remote metering and the audio input. The audio input is unbalanced with internal T pads. Do not use H pads between the audio amplifier and the transmitter. If pads are required they must be of T configuration with the series legs connected to terminal #26. The AF cable sheath may be grounded either at the console or at terminal #24.

Terminals 33 and 34 may be connected to the output of the antenna current rectifier and the meter M6 calibrated against the regular antenna meter. M6 panel meter has a 1 Ma. D.C. movement with a 15 or 20 ampere linear scale.

The inner conductor of the output coax should be connected to the 1/4-20 insulated stud provided in the lower left hand corner of the front panel. The extreme end of the outer conductor should be grounded to the nearby 1/4-20 stud provided. The coax may be brought in either from above, through the side wall or up from the floor. In directional installations where the phasing cabinet is located directly against the right cabinet wall, it is recommended that the wiring from C44 be modified to a similar feedthru insulator installed directly between the transmitter RF compartment and the interior of the phasing cabinet.

Preliminary Circuit Check

Transmitters are normally shipped with all crystals and small tubes installed. Install remaining large tubes in air-sockets with very firm pressure and a slight twisting motion. *Be sure they are firmly seated as far down as they will go.* Connect all plate lead clips.

After all connections are completed and double checked and with start switch SW3 in "OFF" position close safety switch SW10. This should energize the 24 V.D.C. relay rectifier and upper panel lamp PL3 should light. Also check line voltages on M8 by means of SW6 just under the meter.

Operate SW3 to "START". This will start the blower if SW9 is closed. As soon as air flow is established air switch SW13 mounted over modulator tube #1 will close and extinguish PL4 marked "AIR". If all rear doors are closed the low voltage rectifier will also be energized. Panel light PL2 will indicate and the "BIAS" lamp will be extinguished.

At this point the only signal lamp that should still indicate is the "OSC". After about one minute the oscillator tubes will be heated which should result in final grid current. This will extinguish the "OSC" lamp.

Check all LV meter readings against the "Typical Meter Reading" tabulation. The final grid indication will be about 20% high in the absence of plate and screen voltage. Check filament voltages on M11 by means of SW7.

Check the operation of the overload signal lights associated with relays K16, K31, K32, K33 and K34 by manually tripping these relays. Extinguish lamps by pressing SP3.

If no abnormalities are encountered and a correctly terminated load is connected to the transmitter output, proceed with the application of the high voltage.

Close the HV primary safety disconnect switch SW11 and restart transmitter. All "Control Monitor" lamps should be out after final grid current is established. Press and release HV rectifier start button (red) SP2. If line voltage is indicated on M8 with SW6 on "Ter. #4" the main breaker K37 should close.

Immediately check all meter readings for reasonable agreement with "Typical Readings" tabulation. Next review all appropriate paragraphs in subsequent section entitled "Tuning Procedure" for final performance checkout.

Maintenance

After the transmitter has been in operation for 30 days, all terminals should be tightened and again checked regularly thereafter.

A soft dust brush augmented with a vacuum cleaner should be used as often as necessary to prevent any accumulation of dust within the cabinet. The permanent dust filter should be cleaned as often as necessary. This will vary depending upon local conditions.

Conditions that lead to eventual component failures can often be localized before an outage occurs. The normal operating temperatures of coils, capacitors, chokes, transformers, etc., can be established by feeling these components immediately after the transmitter is signed off. It is suggested that the major components, other than tubes and large resistors, be checked for excessive heating at sign-off once each week. Such procedure will establish familiarity with normal conditions. Too much emphasis cannot be placed on the practice of careful correction of each abnormality as it occurs to prevent a number of small defects from suddenly merging into one serious failure.

A. F. Distortion and Noise Adjustments

After all RF adjustments are completed and the transmitter is operating normally into its permanent load, the following procedure may be completed to insure optimum audio performance.

Apply plate voltage and set total modulator plate current on meter M1 to 500 Ma., by means of rheostat R58 labeled "MOD BIAS." Then adjust individual modulator plate current indications to equal values on meters M9 and M10 by means of potentiometer R60 labeled "MOD BAL."

With hum compensating potentiometer R91 rotated completely CCW and audio balance potentiometer R41 at resistance center (slot vertical) measure transmitter audio distortion at 3000 cycles at 95% modulation. If possible, improve reading by adjustment of R41. If lowest distortion is obtained with R41 at either end of rotation, try reversing positions of audio amplifier tubes EL-34 or utilize spares for different pairing.

Next, measure residual transmitter noise level below 100% modulation at 1000 cycles. Be sure measurement of noise is truly representative of transmitter by removing or disabling any possible source of noise external to transmitter. Make initial measurements with R91 at full "off" at CCW position. If noise measures between 50 and 60 Db down, try improving by reconnecting T-10 power supply primary in each of six possible combinations.

Try improving each combination with "hum bucking" suppression by rotating R91 clockwise. Record results of each test. When completed, re-establish best combination of T-10 primary and R-91 setting. If final results are well below minus 60 Db, additional suppression may be obtained by adjustment of final filament center tap resistor R-32. In general, best noise figures are obtained with highest final DC screen voltage and the three phase power supply voltages equalized within 3%.

Of course, the phasing of the hum bucking source must be correct or the noise level will be increased by the operation of R91. The noise will not be reduced in all combinations of T-10 primary connections.

In some cases, it may be necessary, for better than acceptable noise figures, to change the phasing of T-3 by connecting the line side of its primary fuse F-3 to the load side of F-2 (phase 3).

TUNING PROCEDURE

All transmitters are tuned and extensively tested on the customer's frequency and specified load. It should not be necessary, therefore, to make any significant re-adjustments or modifications in the field. Should it appear that such adjustments are necessary, consideration should first be given to the following possibilities:

1. Damage sustained in shipping or subsequent handling.

2. Failure to provide supply voltage characteristics or output load conditions originally contemplated.

3. Faulty installation practice or wiring errors.

Oscillator/Buffer and Driver Stages

To avoid the possibility of accidently energizing the main high voltage rectifier, open wall mounted safety switch SW-11. It is assumed all power, control and signal circuits have been checked out as outlined in the "Preliminary Installation Instructions".

Set SW-4 for low power operation.* Install T-12A crystal of correct frequency in only one of crystal sockets on oscillator/buffer chassis. Restart transmitter by closing "START" switch SW3. After approximately 30 seconds all tube filaments on this unit will have heated sufficiently to pass plate current. Operate crystal switch SW8 to activate oscillator with crystal installed. Adjust tuning slug of L5 for maximum "DRIVER GRID" current. This is a small screwdriver adjustment immediately above the second buffer (12BY7A) tube. If this current is not within the tabulated low power value, review plate supply voltage at oscillator terminal #5 which should be approximately 200 volts. Check oscillator tube supply voltage at oscillator/buffer unit terminal #4. This should be set at approximately 100 volts by a slider on R54.

Further control of the R.F. driver grid current may be had by selecting a different value for the 2 watt carbon resistor shunting RFC L6 or by changing the fixed bias on the driver tube** by adjusting the appropriate slider on R59.

---

* See Note #1 at end of this section.

** The selected bias, however, should not be so low that the static plate current, in the absence of grid exitation, exceeds 25 Ma.

Adjust "DRVR PLATE" current to minimum value by "dipping" with "DRVR. TUNING" control. Compare this value and "FINAL GRID" reading with tabulation for "LO" power operation. The final grid current should be approximately 15% high in the absence of final screen and plate voltage.

Operate crystal switch SW8 to activate oscillator without crystal. The driver and final grid current meters should drop to zero. The driver plate current should drop either to zero or a value no higher than 25 ma. Any other results are a certain indication of the presence of parasitic oscillation.

Plug second crystal into oscillator above activated. All readings formerly obtained with crystal #1 should now be restored using crystal #2.

If a calibrated frequency monitor is available and connected, it should now be possible to zero beat each oscillator on the correct frequency by adjusting C1 variable capacitor. This is a screwdriver adjustment just above each crystal.

The driver plate/final grid coupling circuit is a conventional pi network with a small impedance transformation. The LC ratio is not critical and good harmonic attenuation is obtained. The final neutralizing voltage is obtained from the driver plate end and is caused to "look" at one end plate of the final plate blocking capacitor C34. The adjustment is not critical though easily made by any of several conventional methods. It can be totally eliminated at broadcast frequencies without causing instability. The correct adjustment is normally made at the factory and locked and should not require correction.

FINAL POWER AMPLIFIER

The following adjustment instructions assume the installation of factory supplied frequency determining elements in the output tuning, loading and harmonic shunt circuits. The final tuning capacitor C35 is front panel controlled as are harmonic shunt inductances L15 and L16.

Terminate the output of the transmitter in a non-reactive load of 51 ohms. This may be the regular radiating load or a full power dummy load providing either is arranged to be entirely non-reactive. In the absence of these loads a combination of small 2 watt resistors having a combined R.F. resistance of 51 ohms may be substituted. Connect directly from output insulator to ground stud.

a) Disconnect 3F harmonic shunt capacitor C43 from output of L14/C44. By means of a radio frequency bridge and accessories adjust L16 until the L16/C43 combination is series resonant (non-reactive) at 3 times the operating frequency. Reconnect C43 to the output circuit.

b) Disconnect C42 from the tank output circuit and repeat above procedure with the C42/L15 combination at 2 times the operating frequency.

c) Disconnect L13 input from all other circuit elements (L12, C37, C39, C42, etc.). Connect bridge to input of L13 and adjust L13 and L14 to indicate a resistance of not less than 50 ohms or more than 90 ohms with a minimum of reactance at the operating frequency. L14 will control the resistance and L13 will tune out the reactance. This completes the bridge measurements. Reconnect all output tuning circuits.

Set "FINAL LOADING" capacitor to mid range. Rotate R64 power output trim rheostat to approximately midrange. Terminate transmitter output in full power load. Close safety switch SW-11. Operate power change switch SW4* to "LO", and start transmitter.

When final grid current is established apply modulator plate voltage and final plate and screen voltage by depressing the red HV rectifier start button SP-2. Upon releasing the button low power breaker K-38 should close. Approximately 2300 volts should be indicated by M2 "FINAL PLATE". Minimize final plate current indication on M5 "FINAL PLATE & SCRN." by adjusting C-35 with panel counter dial labeled "FINAL TUNING".

Check all meter readings for reasonable agreement with "Typical Tabulation" for low power operation.

Set total modulator plate current indication on M1 to tabulated value by adjusting panel control R58 "MOD. BIAS". Balance modulator plate current indications on M9 and M10 by adjusting R60 "MOD. BAL.".

Since the value of output coupling capacitors C37 and C38 (if used) and the LC ratio of final tank elements C35 and L12 are factory established for the specified frequency and power output, there should be no significant difference between the indicated final plate current and the tabulated value.

If a substantial difference is noted all previous adjustments and measurements should be reviewed. Particular care should be exercised to determine the exact nature of the output load, which must be as specified.

After the foregoing tests are successfully completed and no abnormalities are evident operate "POWER CHANGE" switch SW4 to "H1" position*. After a momentary carrier interruption full power voltages will be applied to all tubes. Immediately recheck resonance "dip" adjustment of both driver and final. Compare all meter readings for reasonable agreement with typical values.

Final amplifier grid current may be trimmed to proper value if necessary by adjustment of R55 controlling the DC plate input to the driver stage.

Power output is normally trimmed to compensate for line voltage variation by means of the motor driven final loading capacitor C-39.

Maximum final plate efficiency is usually obtained by detuning the final plate slightly on the high frequency side. Reduce capacity of C35 until the final plate current increases approximately 100 Ma. above the "dip" value. Reduce R.F. output to normal by increasing value of capacitor C39. A small reduction in net DC input to the final will usually result.

NOTES

1. This procedure applies to transmitters supplied with front panel controlled power cut-back facilities. For single power units, plate voltage can be reduced by moving link switch SW-12 (located on the right side of the plenum chamber). The switching of this link will provide a half voltage for test purposes. Appropriate consideration should be given to the expected resultant reduction in associated meter readings as compared to standard tabulations.

2. The entire tuning adjustment range of "RF Driver Tuning" L-7 lies between 00/00 (minimum inductance) and 36/00 (maximum inductance).

3. The entire tuning adjustment range of "Final Tuning" capacitor C-35 lies between 00/00 (maximum capacity) and 22/00 (minimum capacity). Do not attempt to turn the counter dial beyond these extremes.

TYPICAL METER READINGS

Model FB-5V
AM Transmitter

		5.4 KW	1.08 KW	.54 KW
M1	Modulator plates	500 Ma	600 Ma	650 Ma
M2	Final plate	5000-5400 V	2200-2400V	1650-1750 V
M3	Final grid	45-55 Ma	32-36 Ma	18-22 Ma
M4	Final screen	150-200 Ma	100-200 Ma	100-150 Ma
M5	Final plate & screen*	1.3-1.5 A.	700-800 Ma	500-600 Ma
M6	R. F. Output (51 ohms)	10.3 A.	4.6 A.	3.25 A.
M7	A. F. amplifier**	20-24 Ma	20-24 Ma	20-24 Ma
M8	AC Mains	235/235/235 V	235/235/235 V	235/235/235 V
M9	Modulator #1	250 Ma	300 Ma	325 Ma
M10	Modulator #2	250 Ma	300 Ma	325 Ma
M11	Filament "RF Drvr"	6.1 to 6.3V	6.1 to 6.3V	6.1 to 6.3V
	"Mod. #1"	7.2 to 7.5V	7.2 to 7.5V	7.2 to 7.5V
	"Mod. #2"	7.2 to 7.5V	7.2 to 7.5V	7.2 to 7.5V
	"Final"	7.2 to 7.5V	7.2 to 7.5V	7.2 to 7.5V
M12	LV Rectifier	700 to 800	700 to 800	700 to 800
M13	Driver Plate	80-120 Ma	50-70 Ma	35 - 50 Ma
M14	Driver grid	2-3 Ma	0-.5 Ma	0-0 Ma
M15	Buffer plate	10-20 Ma	10-20 Ma	10-20 Ma
M16	Osc. plate	2-3 Ma	2-3 Ma	2-3 Ma

---

* Subtract "final screen" indication of M4 for net plate current.

** With modulator plate voltage applied.

TYPICAL METER READINGS

Model FB-10J
AM Transmitter

			10.8 KW	5.4 KW
M1	Modulator plates		500 Ma	400 Ma
M2	Final plate		5200-5400V	3500-3700V
M3	Final grid		50-60 Ma	40-50 Ma
M4	Final screen		350-450 Ma	250-350 Ma
M5	Final plate & screen*		2.85-3.0 A.	2.1-2.25 A.
M6	R.F. Output (51 ohms)		14.55 A.	10.3 A.
M7	A.F. amplifier**		20-24 Ma	18-22 Ma
M8	AC Mains		235/235/235 V.	235/235/235 V.
M9	Modulator #1		250 Ma	200 Ma
M10	Modulator #2		250 Ma	200 Ma
M11	Filament	"RF Drvr"	6.1 to 6.3V	6.1 to 6.3V
		"Mod. #1"	7.2 to 7.5V	7.2 to 7.5V
		"Mod. #2"	7.2 to 7.5V	7.2 to 7.5V
		"Final"	6.1 to 6.3V	6.1 to 6.3V
M12	LV Rectifier		800 to 900V	800 to 900V
M13	Driver Plate		125-175 Ma	90-110 Ma
M14	Driver grid		2-3 Ma	1-2 Ma
M15	Buffer plate		10-20 Ma	10-15 Ma
M16	Osc. plate		2-3 Ma	2-3 Ma

* Subtract "final screen" indication of M4 for net plate current.

** With modulator plate voltage applied.

CONTROL RELAY CIRCUIT FUNCTIONS

BAUER TYPE FB-5V/10J

K-1 Auxiliary external control, optional.

K-2 thru K-7 Signal holding; locks up and causes signal lamps to remain illuminated upon being activated by associated overload relay.

K-8 Power change pilot control. One set contacts opens coil circuit of HV power supply primary breaker K-37. Second set contacts energizes coil of control relay K-9 thru RC delay network.*

K-9 Power change control. One set contacts controls audio input level. Second set contacts controls bias resistor in cathode of RF driver and energizes coils of HV transfer relay K-38 and control relay K-10 thru RC delay network.*

K-10 Power change control. Recloses circuit to coil of primary breaker K-37 after operation of K-8, K-9 and K-38, and thereby reapplies final and modulator plate voltage. Total carrier interruption approximately one second.

K-11 and K-12 Filament control. These relays, upon being alternately energized from panel switch SW1, control direction of rotation of R-81 filament rheostat motor and thereby raising or lowering filament voltage on final and modulator tubes.

K-13 and K-14 Output power trim control. Function similar to K-11/K-12 except controls rotation of variable capacitor in output network to adjust transmitter power output through a limited range.

K-15 Bias rectifer "no voltage" prevents operation of HV plate control relay K26 until modulator bias is established.

K-16 RF arc overload control. Prevents RF follow-up into arc to ground in output circuits due to lightning or apparatus failure.

K-17 AC overload signaling, pulsed by momentary opening of K35 or K36 which in turn locks up K2 and illuminates associated lamp.

K-18 Modulator screen protective. Prevents flow of screen current under grid exitation in absence of plate voltage.

K-19 RF final grid "no current" prevents application of final and modulator plate voltage in the absence of sufficient RF grid drive by holding K26 plate control relay open.

K-20 Overload latching. Holds open coil circuit of main HV breaker K37 after momentary interruption of this circuit by operation of K16, K31, K32, K33, K34, K35, or K36. Normally closed contacts of these relays complete circuit to K37 coil and normally short-circuit trip coil of K20. Momentary opening of any of above overload relay contacts places full line voltage across high impedance trip coil of K20 thru low impedance coil of breaker K37.

---

* RC networks delay relay operation on both pickup and release.

K-21 Overload recycling. Automatically reapplies plate voltage in case of overload in any one of seven circuits thru the action of K-20 latching relay. After the transmitter has been in normal operation about 30 seconds, C-56 will be charged by the bias rectifier thru resistor R88. If K20 trip coil is now momentarily pulsed by the opening of any overload relay in series with the coil of K37 magnetic breaker, C-56 will be partially discharged thru the coil of K21 which in turn will reset K-20. If the overload is not cleared this action will be repeated until C-56 is nearly discharged. The number of cycles and the rate at which they occur is determined by the selection of C-55 and R89.

K-22 N/A

K-23 N/A

K-24 Master start. Operated by panel switch SW-3 or by remote control.

K-25 HV plate control and K-20 latching reset. Coil energized by depressing HV "ON" SP-2 on front panel or by remote control. Left normally open contact resets K20 if tripped. Right normally open energizes coil of K-26. Left normally closed contact opens main breaker K-37 coil supply circuit from K-29 and prevents energizing HV rectifier until "ON" button is released.

K-26 HV plate control. Locks up thru SP1 "OFF" control on application of pulse from K25 provided K15 and K19 have closed.

K-27 N/A

K-28 Blower motor control. Starts blower upon closing of K-24 master start. After closing of override thermostat by heated air stream from modulator tube, K-28 will remain closed after transmitter is shut down until air stream cools to approximately 105°F.

K-29 Modulator and final tube filament supply and plate control. Controlled by air switch and over-temperature thermostat.

K-30 N/A

K-31 Modulator screen protective against excessive exitation especially at high audio frequencies and against any substantial reduction or removal of plate loading.

K-32 Modulator overcurrent in cathode circuit to protect against excessive drive, bias failure or increase in output loading due to equipment failure. 1/4 second delay prevents operation on momentary overmodulation.

K-33 Final plate overcurrent in cathode circuit. Protects against apparatus failure, excessive output loading due to plate detuning or exitation failure. 1/4 second time delay prevents operation on starting pulse.

K-34 Main HV rectifier output DC overcurrent. Protects against apparatus failure, accidental mal-functions or arcs to ground.

K-35 Main rectifier primary AC overcurrent. Operation delayed to permit passage of nominal T-10 HV primary magnetizing current without tripping.

K-36 Same as K-35.

K-37 HV primary main breaker. Normally open auxiliary contacts control K-18 and signal pilot PL-1.

K-38 HV rectifier output transfer relay. Switches plate supply to final RF amplifier from 5200V source to half-wave tap of 2600V and vice versa.

PARTS LIST - RESISTORS

Symbol	Function	Manufacturer & Description
R1	Oscillator grid	47K, 1/2W, carbon
R2	Oscillator cathode	1 K, 1/2W, carbon
R3	Oscillator screen	18K, 1/2W, carbon
R4	Oscillator #1 plate	10K, 2W, carbon
R5	Oscillator #2 plate	10K, 2W, carbon
R6	Oscillator #1 decoupling	22K, 1W, carbon
R7	Oscillator #2 decoupling	22K, 1W, carbon
R8	N/A	
R9	First RF amplifier grid	2.2K, 1W, carbon
R10	First Rf amplifier cathode	2.2K, 1W, carbon
R11	First RF amplifier screen	56K, 1W, carbon
R12	First RF amplifier plate	10K 2W, carbon
R13	Second amplifier grid	22K, 1W, carbon
R14	Second amplifier freq. mon. termination	82 ohms, 1W, carbon
R15	Second amplifier cathode	1K, 1W, carbon
R16	Second amplifier screen	15K, 2W, carbon
R17	RF driver grid suppressor	10 ohms, 2W, carbon
R18	RF driver grid loading	15 K 2W, carbon
R19	RF driver cathode, 5/1 KW*	Ohmite #1740 1.5K 10W
R20	RF driver screen series	Ohmite #1541, 3K, 5W
R21	Final grid bias	Ohmite #0413 8K 50W
R22	Final screen suppressor	Ohmite #2004, 50 ohms, 50W
R23	Final plate remote I	Ohmite #0560, 5 ohms, 50W
R24	Final cathode OL relay shunt	Ohmite #0362, 5 ohms, 25W
R25	Final grid relay shunt	Ohmite #1532, 1000 ohms, 5W
R26	Mod. screen OL relay shunt	Ohmite #1720, 100 ohms, 10W
R27	Mod. cathode OL relay shunt	Ohmite #0362, 5 ohms, 25W
R28	HV rectifier OL relay shunt	Ohmite #1802A, 1 ohm, 20W
R29	Bias rectifier NV relay shunt	Ohmite #1526, 500 ohms, 5W
R30	T-4 filament primary	Ohmite #1012, 100 ohms, 10W
R31	T-5 filament primary	Ohmite #1016, 300 ohms, 10W
R32	T-9 secondary centertap	Ohmite #0560, 5 ohms, 50W
R33	Final plate series, 5/1 KW**	Ohmite #1360B, 250 ohms,225W
R34	Final plate series, 5/1 KW***	Ohmite #0906, 250 ohms,225W
R35	N/A	
R36	Audio input T1 sec. term.	30K, 1W, carbon,5%
R37	Audio input T1 sec. term.	30K, 1W, carbon,5%
R38	Audio input grid suppressor	220 ohms, 1/4W, carbon
R39	Audio input grid suppressor	220 ohms, 1/4W, carbon
R40	Audio input cathode bias	1300 ohms, 2W, carbon
R41	Audio input AF balance	Ohmite #CLU-1511, 150 ohms
R42	Audio input screen bleeder	Ohmite #1769, 35K, 10W
R43	Audio input screen series	Ohmite #1771, 50K, 10W
R44	Audio input plate coupling	Ohmite #4864, 25K, 10W
R45	Audio input plate coupling	Ohmite #4864, 25K, 10W

N/A: Not Assigned
* Ohmite #1745, 3K, 10W for 500 watt cutback.
** Ohmite #1361, 500 ohms, 225 watts for 500 watt cutback.
*** Ohmite #0907, 500 ohms, 225 watts for 500 watt cutback 3 in series.

Symbol	Function	Manufacturer & Description
R46	Mod. #1 grid coupling	180K, 2W, carbon (2 in parallel)
R47	Mod. #2 grid coupling	180K, 2W, carbon (2 in parallel)
R48	Mod. #1 grid suppressor	560 ohms, 2W, carbon
R49	Mod. #2 grid suppressor	560 ohms, 2W, carbon
R50	Mod. #1 screen suppressor	10 ohms, 2W, carbon
R51	Mod. #2 screen suppressor	10 ohms, 2W, carbon
R52	Osc. plate supply series	Ohmite #0409, 3K, 50W
R53	Osc. plate supply series	Ohmite #0409, 3K, 50W
R54	Osc. plate supply bleeder	Ohmite #0578, 5K, 50W
R55	R.F. driver plate supply	Ohmite #0574, 2K, 50W
R56	Bias rect. input filter section	Ohmite #0409, 3K, 50W
R57	Bias rect. output filter section	Ohmite #0409, 3K, 50W
R58	Mod. bias control	Ohmite #0158, 1K, 25W
R59	Mod. bias bleeder	Ohmite #0574, 2K, 50W
R60	Mod. plate balance	Ohmite #CCU-1031, 10K,dual
R61	Mod. plate balance shunt	1.5K, 2W, carbon
R62	Mod. plate balance bleeder	Ohmite #1755, 10K, 10W
R63	LV voltmeter multiplier	2 Meg., 2W, carbon 5% (2)
R64	Final screen control	Ohmite #1271, 2.5K, 225W
R65	Final screen bleeder	Ohmite #0915, 7.5K, 200W
R66	Final screen series	Ohmite #0912, 2.5K, 200W
R67	Final screen series	Ohmite #0911, 2K, 200W
R68	Final screen series	Ohmite #0911, 2K, 200W
R69	Final screen series	Ohmite #0912, 2.5K, 200W
R70	N/A	
R71	HV rectifier condenser charging	Ohmite #0600B, 10 ohms, 100W
R72	HV rectifier condenser charging	Ohmite #0600B, 10 ohms, 100W
R73	HV voltmeter multiplier	Dale DC-5, 5 meg., 1%
R74	HV voltmeter multiplier	Dale DC-5, 5 meg., 1%
R75	HV remote multiplier	Dale DC-5, 5 meg., 1%
R76	HV remote multiplier	Dale DC-5, 4 meg., 1%
R77	HV remote protective shunt	10K, 2W, carbon
R78	Pilot PL1 protective	10K, 1W, carbon
R79	Pilot PL2 protective	10K, 1W, carbon
R80	Relay supply rectifier bleeder	Ohmite #1810, 200 ohms, 20W
R81	Mod. & final fil. rheostat	Ohmite #0652, 3 ohms,300W
R82	Final filament trim	Ohmite #0560, 5 ohms, 50W
R83	Mod. #1 filament trim	Ohmite #0560, 5 ohms, 50W
R84	Mod. #2 filament trim	Ohmite #0560, 5 ohms, 50W
R85	Remote fil. metering protective	Ohmite #1502, 3 ohms, 5W
R86	Remote fil. metering protective	Ohmite #1502, 3 ohms, 5W
R87	LV rectifier surge suppressor	Ohmite #1836, 5K, 20W
R88	Recycle C56 charge limiting	120K, 2W, carbon
R89	Recycle C56 discharge limiting	15K, 2W, carbon
R90	Hum control supply	Ohmite #1700A, 1/2 ohm, 10W

Symbol	Function	Manufacturer & Description
R91	Hum control potentiometer	Ohmite CLU-5001, 50 ohms
R92	Inverse feedback coupling	30K, 1W, carbon, 5%
R93	Inverse feedback coupling	30K, 1W, carbon, 5%
R94	Inverse feedback condenser shunts	3.9 meg., 2W, carbon, 5% (6)
R95	Inverse feedback condenser shunts	3.9 meg., 2W, carbon, 5% (6)
R96	AF input terminating	560 ohms, 2W, carbon
R97	AF input terminating 5/1 KW	82 ohms, 1W, carbon
R98	AF input control, 5/1 KW	Ohmite CLU-5011, 500 ohms
R99	N/A	
R100	K9 delay R/C, 5/1 KW	Ohmite #1517, 125 ohms 8W
R101	K10 delay R/C, 5/1 KW	Ohmite #1517, 125 Ohms 8W

PARTS LIST - CONDENSERS

Symbol	Function	Manufacturer & Description
C1	Oscillator freq. trimmer	EF Johnson, 193-10-1
C2	Oscillator grid coupling	RMC 22NPO, 22pf.
C3	Oscillator cathode coupling	Sangamo, D153E510GO
C4	Oscillator screen bypass	RMC, Z5U, .005 mfd, 600V
C5	Oscillator plate bypass	RMC, Z5U, .005 mfd, 600V
C6	Oscillator plate blocking	RMC, Z5U, .001 mfd, 600V
C7	N/A	
C8	N/A	
C9	First RF amplifier cathode bypass	CRL, DD-752, .007 mfd, 1KV
C10	First RF amplifier screen bypass	CRL, DD-752, .007 mfd, 1KV
C11	First RF amplifier plate bypass	CRL, DD-752, .007 mfd, 1KV
C12	First RF amplifier plate blocking	CRL, DD-752, .007 mfd, 1KV
C13	Second RF amplifier, grid bypass	CRL, DD-752, .007 mfd, 1KV
C14	Second RF amplifier cathode bypass	CRL, DD-752, .007 mfd, 1KV
C15	Second RF amplifier screen bypass	CRL, DD-752, .007 mfd, 1KV
C16	Second RF amplifier plate bypass	CRL, DD-752, .007 mfd, 1KV
C17	Second RF amplifier plate blocking	CRL, DD30-272, .0027 mfd, 3 KV
C18	N/A	
C19	RF driver grid RFC bypass	CRL, DD-752, .007 mfd, 1KV
C20	RF driver cathode bypass	CRL, DD-752, .007 mfd, 1KV(2)
C21	RF driver screen bypass	CRL, DD-30 .0027 mfd, 3KV
C22	RF driver plate blocking	Sangamo F2, .0008 mfd, 5KV
C23	RF driver plate tuning	Sangamo F2, as required.
C24	RF driver output loading	Sangamo F2, as required.
C25	RF driver plate RFC bypass	CRL, DD30-272, .0027 mfd, 3KV
C26	Final grid RFC bypass	CRL, DD30-272, .0027 mfd, 3KV
C27	N/A	
C28	N/A	
C29	Final filament RF bypass	CRL, DF-104, .1 mfd, 600V (2)
C30	Final filament RF bypass	CRL, DF-104, .1 mfd, 600V (2)
C31	Final filament AF bypass	Mallory HC-5005A,500 mfd, 50VDC
C32	Final screen bypass	CRL, 585S-1000,1000 pf, 5KV
C33	Final plate RFC bypass	Sprague 30DK-T5, 500 pf,30KV
C34	Final plate blocking	Sangamo 292, .001 mfd, 10KV
C35	Final tank tuning	Jennings vacuum variable UCS-500, 15KV
C36	Final Tank tuning	Jennings vacuum fixed JCS, 15 KV, as required.
C37	Final tank output loading	Sangamo type 291/292 as required.
C38	Final tank output loading	Sangamo type 291/292 if required.
C39	Final tank output loading,trim	E.F. Johnson #152-2, 7KV, or 152-17, 4.5 KV as required.
C40	Output T network shunt	Sangamo type 291 or 292, as required.

PARTS LIST - CONDENSERS (Continued)

Symbol	Function	Manufacturer & Description
C41	Output T network shunt	Sangamo type 291/292,if required
C42	Harmonic trap tuning, 2F	Sangamo 272/291, as required.
C43	Harmonic trap tuning, 3F	SangamoF2/272, as required.
C44	Final output protective DC blocking	Sangamo Type 273, .1 mfd. 2KV
C45	Output protective RFC bypass	CRL DD-30-272, .0027 mfd, 3KV (2)
C46	AF amplifier screen bypass	Sprague BP-506, .5 mfd, 600V
C47	AF amplifier plate blocking	Sangamo SBB, .1 mfd, 1KV
C48	AF amplifier plate blocking	Sangamo SBB, .1 mfd, 1KV
C49	N/A	
C50	LV rectifier surge suppressor	Sprague BP-251 .25 mfd, 1KV
C51	LV rectifier filter	Sangamo 6801, 12 mfd 1.5KV
C52	Bias rectifier filter, input	Sangamo 3001, 10 mfd, 600V
C53	Bias rectifier filter, output	Sangamo 3001, 10 mfd, 600V
C54	Oscillator supply filter	Sangamo 5006, 2 mfd, 600V
C55	OL recycle RC delay	Sangamo MT-2516, 16 mfd,250 V
C56	OL recycle supply	Sangamo 505-1057-02,50 mfd,250V
C57	Final screen filter	Sangamo 5701, 4 mfd, 2.5KV
C58	Main HV rectifier filter	Sangamo 9102, 8 mfd, 4KV
C59	Main HV rectifier filter	Sangamo 9102, 8 mfd, 4KV
C60	Modulation transformer secondary blocking	Sangamo 9003, 2 mfd, 7.5KV
C61	24V DC relay rectifier filter	Mallory HC-5005A,500 mfd, 50VDC
C62	K9 delay R/C, 5/1 KW	Sangamo #500-1963-01, 1500 MFD,50VDC
C63	K10 delay R/C, 5/1 KW	Sangamo #500-1963-01, 1500 MFD,50VDC
C64	N/A	
C65	Modulator inverse feedback coupling	Gudeman #356C563J, .056 mfd, 200V
C66	Modulator inverse feedback coupling	Gudeman #356C563J, .056 mfd, 200V
C67	Modulator inverse feedback series	Sangamo #A2-AT .00047mfd,2500V (6)
C68	Modulator inverse feedback series	Sangamo #A2-AT .00047mfd,2500V (6)

PARTS LIST - RELAYS

Symbol	Function	Manufacturer & Description
K1	Auxiliary control, optional	Signal #25AA024
K2/K7	Overload signal holding	Signal #20BA025
K8	HV rectifier prim. 5/1 pilot	Signal #22AP024
K9	Audio input level and driver cathode bias control, 5/1 KW	Signal #22AP012
K10	HV rectifier prim. 5/1 KW control	Signal #22AP012
K11/K12	Filament rheostat control	Signal #20BA025
K13/K14	Final screen control	Signal #20BA025
K15	Bias rectifier n/v control	Signal #25AA024
K16	RF output overload control	Signal #25AA024
K17	AC primary overload pilot	Signal #25AA115
K18	Modulator screen protective	Signal #25AA230
K19	Final grid n/v control	Signal #20BA025
K20	Overload latching	Signal #25BL230
K21	Automatic overload reset	Signal #20BA100
K22	N/A	
K23	N/A	
K24	Master start control	Leach #1257, 24V DC
K25	Plate control and reset	Leach #1257, 24V DC
K26	Plate control and locking	Leach #1257, 24V DC
K27	N/A	
K28	Blower motor control	Signal #25PD230
K29	Final and modulator filament	Allen Bradley #700-C400A2-B
K30	N/A	
K31	Modulator screen overload	Heinemann #BN1-522-XBX, 12 VDC
K32	Modulator plate overload	Heinemann #BN4-522-XBX, 12 VAC
K33	Final plate overload	Heinemann #BN4-522-XBX, 6 VAC
K34	Main HV rectifier overload	Heinemann #BN4-522-XBX, 6 VAC
K35	HV rectifier primary overload	Heinemann #CT1-617-XXA, 40 amps.
K36	Same as K35.	
K37	HV rectifier primary main breaker	Allen Bradley #702-DAA93K, 90 amps.
K38	HV switching, 5/1 KW	Kilovac HVS-1

PARTS LIST - INDUCTANCES

Symbol	Function	Manufacturer & Description
L1	Oscillator cathode RFC	Miller 4652, 1 mh
L2	Oscillator plate RFC	Miller 6302, 2.5 mh
L3	First amp. plate RFC	Miller 6302, 2.5 mh
L4	N/A	
L5	Second amp. plate tuning	Miller 43A-CB1
L6	RF driver grid RFC	Miller 6302, 2.5 mh
L7	RF driver plate tuning	E.F. Johnson #229-203
L8	RF driver plate tuning	Illumitronic #2408-T
L9	RF driver plate RFC	Miller #4536
L10	Final amp. grid RFC	Miller #4536
L11	Final amp. plate RFC	E.F. Johnson #101-7
L12	Final amp. plate tuning	E.F. Johnson #200-318-(308)-(302)
L13	Final output T network	E.F. Johnson #200-107
L14	Final output T network	E.F. Johnson #200-107
L15	Final harmonic filter tuning	E.F. Johnson #229-203
L16	Final harmonic filter tuning	E.F. Johnson #229-202
L17	RF output arc protection RFC	Miller **#4536.**
L18	Modulator output RFC	Miller D-7826.
L19	LV rectifier filter choke	UTC, CG-102
L20	N/A	
L21	Final amp. screen modulation	Electro, E-15883
L22	Final amp. plate modulation	Electro, E-10568
L23	24V DC relay rectifier filter	Hill #3568

TRANSFORMERS

T1	Audio input	UTC, LS-26
T2	Modulator output	Electro, E-15203
T3	24V DC relay rectifier	Hill, 1556-B
T4	Osc.& Audio amplifier fil.	UTC, CG-35
T5	RF driver filaments	UTC, CG-35
T6	LV plate and modulator bias supply	UTC, CG-302-W
T7	Modulator #1 filament	Hill, HMP-2305-A
T8	Modulator #2 filament	Hill, HMP-2305-A
T9	Final amplifier filament	Hill, HMP-2305-A
T10	Main rectifier power supply	Electro, 15082

SWITCHES

SW1	Filament voltage trim	"Micro" 11TS1-7
SW2	Power output trim	"Micro" 11TS1-7
SW3	Main start	"Micro" 11TS1-2
SW4	Power change, 5/1 KW	"Micro" 11TS1-2
SW5	Final screen voltage	"Micro" 12TS1-8
SW6	AC line selector	CRL, 2543
SW7	Filament voltage selector	CRL, 2543
SW8	Oscillator selector switch	CRL, PS-112.
SW9	Blower motor thermal control	Allen Bradley, 600TAX5
SW10	Line control, safety	Cutler-Hammer 4143H441, 30 amp
SW11	Line control, safety	Cutler-Hammer 4143H442, 60 amp
SW12	HV link test switch	
SW13	Air flow switch	Dietz, 103A
SP-1	HV control "OFF"	"Micro" 71PB1
SP-2	HV control "ON"	"Micro" 71PB2
SP-3	OL signal reset	Grayhill #4002
SD-1 thru SD-4,	Safety door switches	Arco #D05-8P

MISCELLANEOUS PARTS

Apparatus

2	Meters, Hoyt #2026
8	Meters, Hoyt #2025.
6	Meters, Hoyt #2045.
1	Hour counter, Bristol #ET-1A, #41121.
1	Thermostat, Texas Instrument, #C4344-137, 105°F, NO.
1	Thermostat, Texas Instrument, #C4344-137, 180°F, NC.
4	Parasitic suppressors, Ohmite #P-300.
3	Air sockets, Eimac #SK-300A.
3	Air chimneys, Eimac #SK-306. -316 for 15,000
8	Sockets, Octal #77-MIP-8T.
2	Sockets, #9XB with 9S3 shields.
1	Motor, trim, Hurst Type DA, 2 RPM, reversible.
1	Motor, trim, Hurst Type GA, 6 RPM, reversible
2	Rectifiers, silicon, Sarkes Tarzian #60-C.
1	Rectifiers, silicon, Solitron, #SPNHV-6, neg.
1	Rectifiers, silicon, Solitron, #SPCHV-6, pos.
2	Oscillators, International type OS-3.
2	Crystals, Northern Engineering, type T-12A.
1	Blower, Rotron Centrimax, CXH33A-3G, KS-4504, 4505 or equiv.
1	Air Filter, Goodyear type HD, 16" x 20" x 1".
7	Fuse posts, Littlefuse #344250.
1	Fuse posts, Littlefuse #344125.
2	Fuse posts, Littlefuse #344024.
9	Pilot lamp holders, E.F.J. #147-1142.
4	Pilot lamp holders, E.F.J. #147-1153.
9	Pilot lamps, G.E. #1819, incandescent.
4	Pilot lamps, G.E. #NE51H, gas.
2	Counter dials, E. F. Johnson #116-208-4.

Hardware

1	Shaft lock, Millen #10063.
2	Shaft coupling, E. F. Johnson #104-251-3
2	Shaft coupling, H.H. Smith #164.
2	Shaft coupling, National #TX-22.
3	Right angle drive, National type RAD.
3	Thumbscrews, H.H. Smith #2368.
1	Thumbscrews, captive, H.H. Smith #2375-A.
4	Flex-bolts, blower mount, Lord #J-4624-17.
5	Knobs, Ohmite #5150.
1	Knobs, Ohmite #5104.

FB-5V

MISCELLANEOUS PARTS

Terminals

5	Terminal strip, Cinch Jones #3-170.
5	Terminal strip, Cinch Jones #5-170.
2	Terminal strip, Cinch Jones #7-170.
1	Terminal strip, Cinch Jones #7-140.
1	Terminal strip, Cinch Jones #10-140-Y.
1	Terminal strip, Cinch Jones #12-140-Y.
1	Terminal strip, Cinch Jones #2-542.
1	Terminal strip, Cinch Jones #6-542.
1	Terminal strip, Cinch Jones #MSX 26-542.
1	Terminal strip, Cinch Jones #3-140-Y.

Connectors

3	Insulated jacks, E. F. Johnson #108-903.
3	Plugs, E. F. Johnson #108-753.
4	Coil Clips, E. F. Johnson #235-807 or 235-804.
2	Coil Clips, E. F. Johnson #235-808.
2	Coil clips, Illunitronic Type "A".
1	Plate connector, National #GG-24-2.
3	Plate connector, Littlefuse #129002.
4	Resistor Slider connectors, insulated, Ohmite #2165.
14	Terminal inserts, bifurcated, Litton 1310-D.
4	Terminal connectors, Cinch Jones #542-J.

Fuses

F1	Littlefuse type 3AG	5 amps.
F2	Littlefuse type 3AG	5 amps.
F3	Littlefuse type 3AG-SB	1/4 amps.
F4	Littlefuse type 3AG	1/2 amps.
F5	Littlefuse type 3AG	1/2 amps.
F6	Littlefuse type 3AG	2 amps.
F7	Littlefuse type 3AG-SB	2 amps.
F8	Littlefuse type 3AG	1/4 amps.
F9	Littlefuse type 3AG	1/4 amps.
F10	Littlefuse type 3AG	2 amps

PARTS LIST MODIFICATION
FOR FB-10J

Resistors

R21	Final grid bias	Ohmite #0965, 10 K, 100W
R23	Final plate remote I	Ohmite #0560C, 3 ohms, 50W
R24	Final cathode OL relay shunt	Ohmite #0360B, 2 ohms, 25W
R25	Final grid relay shunt	Ohmite #1526, 500 ohms, 5W
R27	Mod. cathode OL relay shunt	Ohmite #0361, 3 ohms, 25W
R28	HV rectifier OL relay shunt	Ohmite #1800A, .5 ohms, 20W
R36	Audio input T1 secondary ter.	Ohmite 39K, 1 W, carbon 5%
R37	Audio input T1 secondary ter.	Ohmite 39K, 1 W, carbon 5%
R40	Audio input cathode bias	Ohmite, carbon 1500 ohms, 2W
R52	Osc. plate supply series	Ohmite #0410, 4 K, 50W
R53	Osc. plate supply series	Ohmite #0410, 4 K, 50W
R55	RF driver plate supply	Ohmite #0572, 1000 ohms, 50W
R56	Bias rectifier filter, input	Ohmite #0407, 2 K, 50W
R57	Bias rectifier filter, output	Ohmite #0407, 2 K, 50W
R64	Final screen control	Ohmite #0668, 1200 ohms, 300W
R65	Final screen bleeder	Ohmite #0915, 7.5 K, 200W
R66	Final screen series	Ohmite #0909, 1000 ohms, 200W
R67	Final screen series	Ohmite #0908, 750 ohms, 200W
R68	Final screen series	Ohmite #0908, 750 ohms, 200W
R69	Final screen series	Ohmite #0909, 1000 ohms, 200W
R81	Final & mod. filament rheostat	Ohmite #0651, 2 ohms, 300W
R82	Final fil. trim	Ohmite #0956 3 ohms, 100W

Condensers

C34	Final plate blocking	Sangamo #292, .002 mfd, 10KV
C60	Mod. transformer secondary blocking	Sangamo #9003, 2 mfd, 7.5KV Two in parallel

Inductances

L13	Final output T network	E. F. Johnson #200-205.
L14	Final output T network	E. F. Johnson #200-205.
L22	Final amplifier plate modulation	Electro #E-15204

Transformers

T-1	Audio input	UTC #LS-12X
T-2	Modulator output	Electro #E-15119
T-9	Final amplifier filament	Hill #HMP-1555
T-10	Power supply	Electro #E-15084

Relays

K35/36	HV rectifier primary overload	Heinemann #CT1-617-XXA, 70 amps, Spec. Cat. #C-443-1

Miscellaneous

Final air chimney	Eimac #SK-316
Blower	ILG type B12, 3400 RPM, CCW or equiv.
Increased range meters	M1, M4, M5, M6, M9, M10

Switches

SW-11	Switch, line	Cutler-Hammer #4143H443, 100 amps.

CABLE TABULATION

Wire No.	Description
1	K31 coil with #2 to L19.
2	K31 coil with #1 to R26.
3	K31 coil with #4 to R26.
4	K31 coil with #3 to K18 NOC.
5	K31 NCB to K32 NCC
6	K31 NOB to K3 Sig.
7	K31 NOC to ground.
8	K31 NCC to K16 NCC.
9	K32 NOB to ground.
10	K32 coil to ground.
11	K32 coil with #12 to M1 Neg.
12	K32 coil with #11 to R27.
13	K32 NCB to K33 NCB.
14	K32 NOC to K4 Sig.
15	R27 to ground.
16	K33 coil with #17 to R24.
17	K33 coil with #16 to M5 Neg.
18	K33 coil with #19 to R23.
19	K33 coil with #18 to R24.
20	K33 NOB to K5 Sig.
21	K33 NOC to ground.
22	K33 NCC to K34 NCC.
23	N/A
24	N/A
25	K24 coil to ground.
26	K24 coil with #27, 28 to K25 NOC with #44.
27	K24 coil with #26, 28 to SW3.
28	K24 coil with #26, 27 to Ter. #11.
29	K24 NOB to F2 Load.
30	K24 NOB to F1 Load.
31	K24 NOC with #32, 33 to K18 coil.
32	K24 NOC with #31, 33 to Tie Point B.
33	K24 NOC with #31, 32 to K20 Reset Coil.
34	K24 NOC to F4 Line.
35	K25 Coil to ground.
36	K25 coil with #37 to SP2 "ON".
37	K25 coil with #36 to Ter. 13.
38	K25 NOB to K26 coil with #46.
39	K25 NCB with #40 to K29 load NOC #4.
40	K25 NCB with #39 to K21 NOC.

NOTES:
- M/C: Movable Contact
- NOC: Normally Open Contact
- NCC: Normally Closed Contact
- NOB: Normally Open Bar
- NCB: Normally Closed Bar
- CT: Center Tap
- N/A: Not Assigned

1/68
8/68

FB-5V CABLE TABULATION
(Continued)

Wire No.	Description
41	K25 NOC with #42 to K20 Reset Coil.
42	K25 NOC with #41 to K21 NOB.
43	K25 NCC to K26 NOC.
44	K25 NOC with #26 to K16 Coil.
45	K26 Coil to K15 NOC.
46	K26 Coil with #38 to K26 NOB.
47	K26 NOB to K20 NCB.
48	K26 NOC to SP1 "OFF".
49	N/A
50	N/A
51	K15 coil with 52 & R29 to K15 NCB.
52	K15 coil with 51 & $29 to ground.
53	K15 coil with R29 to R59 bias rectifier.
54	K15 NOB to K19 NOC.
55	K15 NCC to PL5.
56	K16 coil to RFC L17.
57	K16 NOB to ground.
58	K16 NCB with 59 to Ter. #4.
59	K16 NCB with 58 to K17 coil.
60	K16 NOC to K7 Signal.
61	K17 coil to K20 trip coil with #97.
62	K17 NOB to ground.
63	K17 NOC to K2 Sig.
64	K18 coil to Ter. #6.
65	K18 NOC to Mod. screens.
66	N/A
67	N/A
68	K11 coil to SW1.
69	K11 coil to ground.
70	K11 NOB with #71 to F8 Load.
71	K11 NOB with #70 to K12 NOB with #75.
72	K11 NOC to fil. trim motor. (yellow)
73	K12 coil to SW1.
74	K12 coil to ground.
75	K12 NOB with #71 to K13 NOB with #83.
76	K12 NOC to fil. trim motor. (white)
77	K19 coil with R25 to final R21.
78	K19 coil with R25 to M3.
79	K19 NCB to ground.
80	K19 NCC to PL4.
81	K13 coil to SW2.
82	K13 coil to ground.
83	K13 NOB with #75 to K14 NOB.
84	K13 NOC to power trim motor. (yellow)
85	K14 coil to SW2.
86	K14 coil to ground.
87	K14 NOC to power trim motor. (white)
88	N/A
89	N/A
90	C55 Neg. with #91 to K21 coil.

FB-5V CABLE TABULATION
(Continued)

Wire No.	Description
91	C55 Neg. with #90 to K20 NOC.
92	C55 Pos. to ground.
93	R89 to C56 Neg.
94	R89 to K20 NCB.
95	R88 to R58 M/C.
96	R88 to K20 NCC.
97	K20 Trip Coil with #61 to Ter. #5.
98	K20 Trip Coil with #99 to K34 NCC.
99	K20 Trip Coil with #98 to K20 NCC.
100	K20 NOC to PL6.
101	C56 Pos. to ground.
102	K21 Coil to ground.
103	RF driver screen to R20.
104	L21 choke to R22 (20KV wire).
105	C57 to L21 (w/#111).
106	C57 to ground
107	M1 Pos. to M9/M10 Neg.
108	M2 Neg. to ground.
109	M2 Pos. to **R74** multiplier.
110	M3 Pos. to M5 Pos.
111	M4 Neg. to L21.
112	M4 Pos. to R64 M/C with #286.
113	M5 Pos. to R32 M/C.
114	M6 Neg. to auxiliary terminal #34.
115	M6 Pos. to auxiliary terminal #33.
116	M7 Pos. to R41 M/C.
117	M7 Neg. to AF Chassis #3.
118	M8 AC to SW6 M/C "a".
119	M8 AC to SW6 M/C "b".
120	M9 Pos. to T7 CT.
121	M9 Neg. to M10 Neg.
122	M10 Pos. to T8 CT.
123	M11 AC to SW7 M/C "a".
124	M11 AC to SW7 M/C "b".
125	M12 Pos. to R63 multiplier.
126	M12 Neg. to ground.
127	M13 Pos. to
128	M13 Neg. to RFC L9/C25.
129	M14 Pos. to R59 M/C.
130	M14 Neg. to L6/C19.
131	M15 Pos. to R52.
132	M15 Pos. to Osc. #5.
133	M15 Neg. to Osc. #6.
134	M16 Pos. to R54 M/C.
135	M16 Neg.to Osc. #4.
136	NA.
137	SW5 bar to R63 mul.
138	N/A
139	N/A
140	F1 load to K28 Coil.

FB-5V CABLE TABULATION
(Continued)

Wire No.	Description
141	F1 load to T3 prim. "#1".
142	F1 line to Ter. #1.
143	F1 line to SW6, "a-3".
144	F2 load to thermostat TH2 blower override.
145	F2 line to Ter. #3.
146	F2 line to SW6, "a-2".
147	F3 load to T3 prim. "#4".
148	F3 line to SW-6 meter switch with #190 (phase #2).
149	N/A
150	F4 load to T4 primary (R30) "#6".
151	F4 line to PL7 lamp.
152	F4 line to F5 line.
153	F5 load to T5 prim. "#6", (R31).
154	F5 line to door switch SD1.
155	F5 line to K28 coil.
156	F6 load to T6 prim. "#5". (10J/F6 to #6).
157	F6 load to PL2 lamp.
158	F6 line to door switch SD4.
159	F6 line to F7 line.
160	F7 load to K29 NOC "#4".
161	F8 load to hour counter.
162	F8 line to T4 primary CT, "#3 & 4".
163	F9 load to Ter. #19.
164	F9 load to PL3 lamp.
165	F9 load to lamp reset SP3.
166	F9 load to trim switch SW2.
167	F9 line to C61 positive.
168	F9 line to F10 line.
169	F10 load to Ter. #10.
170	F10 load to start switch SW3.
171	N/A
172	R60 dual pot. to R58 M/C.
173	N/A
174	N/A
175	SW1 trim switch NOC to Ter. #17.
176	SW1 trim switch NOC to Ter. #18.
177	SW1 trim switch NOB to SW2 NOB.
178	SW2 trim switch NOC to Ter. #15.
179	SW2 trim switch NOC to Ter. #16.
180	SW3 start switch NOB to PL4 and PL5 lamps.
181	SW3 start switch NOB to SP 2 NOC.
182	SW4 power change switch load side with #314 to Ter. #14.
183	SW4 power change switch lineside to PL5 with #287.
184	N/A
185	N/A
186	SW6 AC meter switch "a-1" to "a-3".
187	SW6 AC meter switch "a-1" to "b-4".
188	SW6 AC meter switch "a-2" to "b-3".
189	SW6 AC meter switch "a-4" to Ter. #4.
190	SW6 AC meter switch "b-1" to "b-2".

FB-5V CABLE TABULATION
(Continued)

Wire No.	Description
191	SW6 AC Meter Switch "b-1" to K29 #2. (line side w/#243)
192	SW7 fil. meter switch "a-1" to RF driver filament.
193	" " " " "a-2" to #1 mod. fil.
194	" " " " "a-3" to #2 mod. fil.
195	" " " " "a-4" to final fil.
196	" " " " "b-1" to RF driver filament.
197	" " " " "b-2" to #1 mod. fil.
198	" " " " "b-3" to #2 mod. fil.
199	" " " " "b-4" to final fil.
200	" " " " M/C to R85.
201	" " " " M/C to R86.
202	R85 to Ter. #20.
203	R86 to Ter. #21.
204	Door switch SD1 to SD2.
205	Door Switch SD2 to SD3.
206	Door switch SD3 to SD4.
207	T3 sec. #7 to L23.
208	T4 prim. #6 to R30.
209	T4 prim. #3 to T4 prim. #4.
210	T4 prim. #1 to T6 prim. #1.
211	T4 sec. #7 to osc. fils. #2.
212	T4 sec. #9 to osc. fils. #3.
213	T4 sec. #7 to AF chassis #8.
214	T4 sec. #9 to AF chassis #9.
215	T5 prim. #6 to R31.
216	T5 prim. #3 to T5 prim. #4.
217	T5 prim. #1 to T6 prim. #1.
218	T5 sec. #7 to RF driver fils.
219	T5 sec. #9 to RF driver fils.
220	N/A
221	T6 primary #1 to tie point "B".
222	T6 primary #4 to T6 primary #2 (10J/4 to 3)
223	T6 secondary #8 to rectifier SR2, pos. (10J/#7)
224	T6 secondary #10 to rectifier SR2, pos. (10J/#11)
225	T6 secondary #8 to rectifier SR1, neg.
226	T6 secondary #10 to rectifier SR1, neg.
227	T6 secondary #9 to ground.
228	N/A
229	T7 primary tap to R83. (#16 wire)
230	T8 primary tap to R84. (#16 wire)
231	T9 primary tap to R82. (#14 wire)
232	T7 primary $\pm$ to T8 primary $\pm$ (#16 wire).
233	T8 primary $\pm$ to T9 primary $\pm$ (#14 wire).
234	T9 primary $\pm$ to R81 rheostat (#14 wire).
235	R81 rheostat to Ter. #32 (#14 wire).
236	R82 resistor to Ter. #30 (#14 wire).
237	R83 resistor to R84 w/#238 (#16 wire).
238	R83 resistor to Ter. #28 (#14 wire).
239	Ter. #27 to K29 load "#1", (#14 wire).
240	Ter. #29 to K29 load "#2", (#14 wire).

FB-5V CABLE TABULATION
(Continued)

Wire No.	Description
241	Ter. #31 to K29 load "#3", (#14 wire).
242	Ter. #1 to K29 line "#1", (#14 wire).
243	Ter. #2 to K29 line "#2", (#14 wire).
244	Ter. #3 to K29 line "#3", (#14 wire).
245	K29 coil to PL7 pilot lamp w/#290.
246	K29 coil to tie point "B".
247	Tie point "B" to PL6.
248	Tie point "B" to power trim motor.
249	Tie point "B" to filament trim motor.
250	Tie point "B" to PL1 and PL2 lamps.
251	R64 power trim rheostat to R66.
252	R64 power trim rheostat to R65.
253	K34 HV overload coil to ground.
254	K34 HV overload coil to HV power supply negative (#14 wire)
255	K34 HV overload coil to R28 shunt w/#254.
256	K34 HV overload NOC to K6 signal.
257	K34 HV overload NOC to ground.
258	R28 shunt to ground.
259	Cabinet Ter. #9 to ground.
260	Cabinet Ter. #24 to ground.
261	PL1 lamp to Ter. #6.
262	PL1 lamp to PL2.
263	PL3 lamp to ground.
264	C31 final AF bypass to ground.
265	C54 filter to ground.
266	R54 to C54 filter with #270.
267	R52 to R54.
268	R52 to R53.
269	R53 to R55.
270	R20 to C54 filter with #266.
271	R54 to ground.
272	R55 to C51.
273	R53 to SW5 NCC.
274	R65 to ground.
275	R21 to final grid L10/C26.
276	R23 to ground.
277	R23 M/C to Ter. #23.
278	R32 to final filament.
279	R32 to final filament.
280	R32 M/C to C31 positive.
281	R56 to SR1 negative.
282	R56 to C52.
283	R56 to R57.
284	R57 to R58 bias pot. (L)
285	R59 to R58 bias pot. (R)
286	SW5 NOC to final screen R64, M/C, with #112.
287	PL5 to PL4.
288	PL6 to hour counter.
289	PL7 to air switch SW13.
290	PL7 to over-temp thermostat TH1.

FB-5V CABLE TABULATION
(Continued)

Wire No.	Description
291	SW13 air switch to thermostat TH1.
292	SW13 air switch to blower overide thermo. TH2.
293	AF chassis frame to AF ground.
294	R58 bias control MC to C53.
295	R60 dual bias balance pot. to AF chassis #11.
296	R60 dual bias balance pot. to AF chassis #12.
297	R60 dual bias balance pot. to R62.
298	R62 to ground.
299	Push switch SP3 NCC to K2/K7 and sig. lamps.
300	Push switch SP1 to Ter. #12.
301	R76/R77 HV multiplier to Ter. #22.
302	C66/R93 Fb elements to R91 ground.
303	R41 AF "balance" pot. to AF chassis #6.
304	R41 AF "balance" pot. to AF chassis #7.
305	R91 hum control pot. to ground.
306	R91 hum control pot. to R90.
307	R91 hum control M/C to R92/C56 feedback.
308	AF chassis #4 and #5 to Fb ladder.*
309	N/A
310	5/1 power control chassis #1 to RF driver cathode.
311	" " " " #2 to SW4, line side with #183.
312	" " " " #3 and #4 to AF chassis #1 and #2*.
313	" " " " #5 and #6 to cab. ters. #26 and 25*.
314	" " " " #7 to SW4, load side with #182.
315	" " " " #8 to vacuum relay K38 coil.
316	" " " " #9 to cabinet ter. #7 (K37 coil).
317	" " " " #10 to AC 235V tie point "B".
318	K38 VR coil to SW4, line side with #183.
319	N/A
320	5/1 power control chassis #8 to cab. terminal #8.
321	N/A
322	R80 to ground.
323	R90 to ground.
324	L19 filter line side to SR2 rect. positive.
325	L19 filter line side to surge suppressor C50.
326	L19 filter load side to AF chassis #10.
327	L19 filter load side to C51.
328	C50 to R87.
329	R87 to ground.
330	C51 to ground.
331	C52 to ground.
332	C53 to ground.
333	C61 negative to ground.
334	C61 positive to L23 filter, load.
335	C61 positive to R80

* Belden "Belfoil" #8451 shielded twisted pair.

FB-5V/10J CABLE TABULATION

(Continued)

Wire No.	Description
336	K28 motor control relay NOC to Ter. #2. (#16 wire)
337	Blower motor switch SW9 line side to Ter. #1. (#16 wire)
338	Blower motor switch SW9 line side to K28 NOC. " "
339	Blower motor switch SW9 load side to motor. " "
340	Blower motor switch SW9 load side to motor.
341	N/A
342	SW12 NOC to R69/R33.
343	SW12 NCB to L22.
344	T2 mod. transformer #1 to modulator #1 plate.
345	T2 mod. transformer #3 to modulator #2 plate.
346	T2 mod. transformer #2 to C58.
347	T2 mod. transformer #2 to SW12 NCC.
348	T2 mod. transformer #4 to L22 with #350.
349	T2 mod. transformer #5 to C60.
350	L22 with 348 to L18.
351	L18 to final plate R.F.C. L11.
352	C60 to R73/R74 voltmeter multiplier.
353	C60 to ground.
354	R71 to R72.
355	C59 to ground. (#10 wire).
356	Tiepoint to R34.
357	C58 to power supply positive 5000 volts.
358	Tiepoint to power supply positive 2500 volts.
359	C58 to R71.
360	C59 to R72.
361	Tiepoint to R71/72.
362	C33 to L11.
363	R33 to R69.

1/68
8/68

FB-5V

TRANSFORMER PRIMARY CONNECTIONS FOR

208 VOLT OPERATION

	+ -	Tap	Join
T3	#1	#2	--
T4	#1	#5	#2&4
T5	#1	#5	#2&4
T6*	#1	#6	#3&4
T7	0 V.	195 V.	--
T8	0 V.	195 V.	--
T9	0 V.	195 V.	--
T10	Move all three primary link switches to "208 V."		

*Reconnect T6 secondary wires #223 and #224 for "10 KW" operation as shown on print "Fig. 7." If line voltage is less than 208 V., include wires #225 and #226 in above change.

A8500-0435

GENERAL INSTRUCTIONS FOR FAN MOTORS

CUSTOMER	UNIT
CUSTOMER ORDER	ILG G.O.

A CHECK IN THE APPROPRIATE SQUARE INDICATES THE TYPE OF BEARINGS USED IN THE MOTOR POWERING THIS EQUIPMENT.

☐ **SEALED BALL BEARINGS** - THE BEARINGS ARE FACTORY PACKED WITH A GENERAL PURPOSE BEARING LUBRICANT AND REQUIRE NO FURTHER ATTENTION. THE LIFE OF THE GREASE IS DEPENDENT UPON THE NUMBER OF OPERATING HOURS AND TEMPERATURE. UNDER NORMAL CONDITIONS OF OPERATION, (8 HOURS PER DAY, 5 DAYS PER WEEK AND AVERAGE AMBIENT TEMPERATURE OF 80°F), THE EXPECTED GREASE LIFE WILL BE APPROXIMATELY SEVEN YEARS. THE LIFE MAY BE GREATER OR LESS DEPENDING UPON THE ENCLOSURE OF THE MOTOR, RPM, TYPE OF MOUNTING, VARIATION IN AMBIENT TEMPERATURE AND OPERATING DUTY CYCLE. IN TERMS OF HOURS OF OPERATION, EXPECTED LIFE MAY BE STATED AS APPROXIMATELY 30,000 HOURS FOR OPEN MOTORS AND 20,000 HOURS FOR ENCLOSED MOTORS WHEN WORKING IN AN AVERAGE AMBIENT TEMPERATURE OF 80°F.

☐ **RELUBRICATABLE BALL BEARINGS - Ilg Built Motors**
ALL ILG MOTORS EQUIPPED WITH RELUBRICATABLE BEARINGS ARE FITTED WITH A GREASE FITTING AND AN AUTOMATIC PRESSURE AND RELIEF FITTING. THE PRESSURE RELIEF FITTING PROVIDES FOR AUTOMATIC PURGING OF THE OLD GREASE WHEN RELUBRICATING AS WELL AS INSURING AGAINST BEARING SEAL DAMAGE DUE TO EXCESSIVE GREASE PRESSURE. WHEN RELUBRICATING MOTORS OF THIS DESIGN, THE MOTOR SHOULD BE IN OPERATION AND NEW GREASE SLOWLY ADDED. THIS SHOULD BE CONTINUED UNTIL A QUANTITY OF OLD GREASE APPROXIMATELY EQUALLING THE VOLUME OF THE BEARING HOUSING IS BLED THROUGH THE AUTOMATIC RELIEF FITTING. CAUTION: USE EXTREME CARE IN INSURING CLEANLINESS DURING THIS OPERATION. MOTOR GREASE FITTINGS AND GREASE GUN SHOULD BE WIPED CLEAN BEFORE STARTING THE OPERATION. GREASE SHOULD BE STORED IN TIGHTLY CLOSED CONTAINERS AND IN AS CLEAN A LOCATION AS POSSIBLE. ILG RECOMMENDS THE USE OF CALIFORNIA OIL CO. CHEVRON OHT GREASE AS A DEPENDABLE, GENERAL PURPOSE, LONG LIFED GREASE. SINCE THE ILG COMPANY RECOMMENDS THE USE OF RELUBRICATABLE BEARINGS ONLY IN CASES OF UNUSUAL LOADS, DUTY CYCLES OR TEMPERATURES, IT IS IMPRACTICAL TO GIVE GENERAL SCHEDULES FOR RELUBRICATION. WHERE THE USE OF RELUBRICATABLE BEARINGS ARE INDICATED, ILG WILL, UPON REQUEST, FURNISH A RECOMMENDED SCHEDULE UPON RECEIPT OF THE FOLLOWING.

1. FAN SIZE, TYPE AND RPM
2. AMBIENT TEMPERATURE
3. TEMPERATURE OF THE AIR BEING HANDLED BY THE FAN
4. INDICATE WHETHER OR NOT DIRT, MOISTURE OR OTHER CONTAMINATING SUBSTANCES ARE PRESENT.
5. NUMBER OF HOURS PER DAY AND DAYS PER WEEK OF FAN OPERATION.

☐ **RELUBRICATABLE BALL BEARINGS - Motors other than Ilg Built**
AN INSTRUCTION TAG FROM THE MANUFACTURER IS INCLUDED WITH THE MOTOR AND THE RECOMMENDATIONS CONTAINED THEREIN SHOULD BE FOLLOWED.

☐ **SEALED SLEEVE BEARING** - BEARINGS OF THIS TYPE ARE PROVIDED WITH A LARGE LUBRICANT RESERVOIR AND REQUIRE NO ATTENTION. BECAUSE OF THE EXTREMELY LIGHT LOADS ON MOTORS WITH THIS TYPE OF BEARING, THE LIFE WILL COMPARE FAVORABLY WITH LARGER MOTORS HAVING SEALED BALL BEARINGS.

☐ **RELUBRICATABLE SLEEVE BEARINGS**- THE BEARING IS ESSENTIALLY THE SAME AS THE SEALED SLEEVE BEARING WITH THE EXCEPTION THAT IT MAY BE RELUBRICATED TO SECURE EXTENDED LIFE. TO OBTAIN MAXIMUM LIFE, 5 OR 6 DROPS OF SAE20 MOTOR OIL OR ELECTRIC MOTOR BEARING OIL SHOULD BE ADDED AFTER EVERY 1000 HOURS OF OPERATION.

NOTE: THE STATEMENTS REGARDING EXPECTED LIFE DO NOT CONSTITUTE A GUARANTEE, EXPRESSED OR IMPLIED, BUT ONLY SERVE AS AN INDICATION OF WHAT MAY BE EXPECTED OF THE EQUIPMENT. THE ILG COMPANY GUARANTEE WILL BE FOUND ELSEWHERE IN THESE INSTRUCTIONS.

GENERAL NOTES REGARDING FAN EQUIPMENT

1. **OVERLOAD PROTECTION**

SOME MOTORS ARE PROVIDED WITH BUILT-IN OVERLOAD PROTECTION. THIS FACT IS SO NOTED ON THE MOTOR RATING PLATE. IF THE MOTOR DOES NOT CONTAIN BUILT-IN OVERLOAD PROTECTION, IT IS MANDATORY THAT THIS PROTECTION BE PROVIDED BY STARTERS IN THE MOTOR CIRCUIT. THE STARTERS ARE TO BE EQUIPPED WITH OVERLOAD PROTECTION DEVICES OF A RATING SUITABLE FOR THE CURRENT RATING OF THE MOTOR. FAILURE TO OBSERVE THIS WILL RENDER THE GUARANTEE VOID.

2 **PERIODIC CLEANING**

PERIODIC CLEANING OF ALL FAN EQUIPMENT IS STRONGLY RECOMMENDED. DIRT AND GREASE ACCUMULATIONS ON THE IMPELLER CAUSE VIBRATION WHICH GREATLY INCREASE STRESSES AND LOADS ON THE MOTOR BEARINGS. A PROGRAM OF PREVENTATIVE MAINTENANCE WILL GREATLY INCREASE FAN AND MOTOR LIFE.

3. **CHECKING DIRECTION OF ROTATION**

CARE SHOULD BE TAKEN TO INSURE THE PROPER DIRECTION OF ROTATION. THIS IS PARTICULARLY TRUE IN THE CASE OF CENTRIFUGAL TYPE ROOF VENTILATORS. THIS TYPE OF EQUIPMENT WILL DELIVER AIR WHEN RUNNING IN EITHER DIRECTION, HOWEVER, THE LOAD IS GREATLY INCREASED WHEN OPERATION IS IN THE WRONG ROTATION. THIS IS A VERY COMMON CAUSE OF OVERLOAD TRIPPING IN CENTRIFUGAL TYPE ROOF VENTILATORS. WHEN THIS TROUBLE IS EXPERIENCED, TRY REVERSING FAN ROTATION BEFORE INCREASING THE SIZE OF THE OVERLOAD PROTECTION.

4. **MOTOR OVERLOAD**

FORWARD CURVE AND RADIAL BLADED FANS CONSUME MAXIMUM HORSEPOWER AT 0" STATIC PRESSURE. SOME FANS OF THIS TYPE ARE POWERED SO THAT OPERATION AT 0" STATIC PRESSURE WILL OVERLOAD THE MOTOR. CHECK CATALOG RATINGS TO DETERMINE MINIMUM STATIC PRESSURE OPERATION IF OVERLOADING IS EXPERIENCED WITH THIS TYPE OF EQUIPMENT.

5. **CHECKING RUNNING CLEARANCE**

TO ACHIEVE MAXIMUM PERFORMANCE AND EFFICIENCY, FANS ARE PRECISION BUILT MACHINES. UPON OCCASION, PARTS WILL SHIFT SLIGHTLY DUE TO MISHANDLING IN SHIPMENT. THIS CAN CAUSE BINDING OF THE ROTATING ASSEMBLY. BEFORE PLACING ANY FAN IN OPERATION, THE IMPELLER SHOULD BE TURNED BY HAND TO ENSURE THAT NO BINDING OR INTERFERENCE IS PRESENT.

ILG GUARANTEE

Ilg Industries Inc., guarantees its products to be free of original defects in material and workmanship for a period of one year from date of shipment from factory or from distributors stock, provided motors are properly installed with overload protection as or if required by national and/or local codes. Ilg agrees to repair or replace defective part or parts to be returned to Ilg, all transportation charges prepaid. Ilg does not guarantee against abrasion, corrosion or erosion. Ilg shall not be held responsible for any charges in connection with the removal or replacement of alleged defective equipment nor for incidental or consequential damages. Guarantees on purchased material are limited to terms of guarantee furnished by our supplier.

ILG INDUSTRIES INC.
GENERAL OFFICES
2850 North Pulaski Road, Chicago, Illinois 60641
AREA CODE 312—725—8016

CHICAGO DIVISION INTERNATIONAL DIVISION GENERAL BLOWER DIVISION

TUNG-SOL

PRODUCT BULLETIN

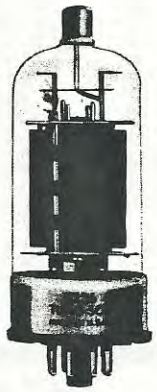
INDUSTRIAL ELECTRON TUBE TYPE 8236

FEBRUARY 1963

BEAM POWER PENTODE

DESCRIPTION — The Tung-Sol 8236 is an all service beam power pentode particularly suited for use in horizontal deflection circuits and as an R-F power amplifier up to 30 megacycles. Its carbon anode and hard glass bulb permit continuous operation at 50-watt plate dissipation.

In most cases, the 8236 will function as a high dissipation, direct plug-in replacement for the 6DQ5.

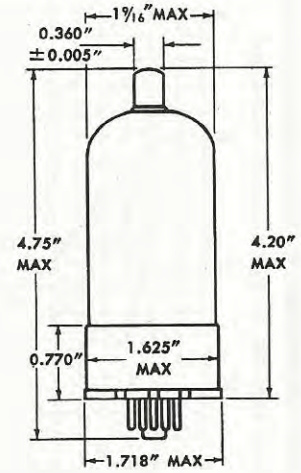


ELECTRICAL DATA

Heater Voltage	6.3 ± 10%	Volts
Heater Current — E_f = 6.3 Volts	2.5	Amperes
Transconductance	10,500	Micromhos
Mu, Grid No. 2 to Grid No. 1	3.3	
Direct Interelectrode Capacitances		
Grid No. 1 to Plate	0.5	Picofarad
Input	23	Picofarads
Output	11	Picofarads

MECHANICAL DATA

Mounting Position	Any
Bulb	JEDEC T-12
Base	Large wafer octal with sleeve, JETEC No. B8-98
Cap	JEDEC C1-1 (Small)
Maximum Net Weight	3.75 ounces



OUTLINE DRAWING

R-F POWER AMPLIFIER

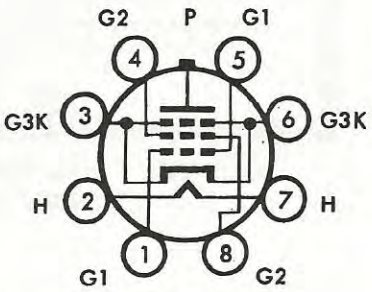
Class C Telegraphy and F-M Telephony

MAXIMUM RATINGS: (Up to 30 Mc)

	CCS	ICAS	
D-C Plate Voltage	1,000	1,200	Volts
D-C Grid No. 2 Voltage	200	200	Volts
D-C Grid No. 1 Voltage	−150	−150	Volts
D-C Plate Current	200	230	Milliamperes
D-C Grid No. 1 Current	3.5	4.0	Milliamperes
Plate Input	150	200	Watts
Grid No. 2 Input	3.2	3.2	Watts
Plate Dissipation	50	60	Watts
Peak Heater-Cathode Voltage	±135	±135	Volts
Bulb Temperature	250	250	Degrees Centigrade

TYPICAL OPERATION — As Amplifier up to 30 Megacycles

D-C Plate Voltage	700	900	Volts
D-C Grid No. 2 Voltage	140	145	Volts
from Series Resistor of	40,000	70,000	Ohms
D-C Grid No. 1 Voltage	−75	−77	Volts
from Grid No. 1 Resistor of	27,000	24,000	Ohms
Peak R-F Grid No. 1 Voltage	90	97	Volts
D-C Plate Current	200	227	Milliamperes
D-C Grid No. 2 Current	14	11	Milliamperes
D C Grid No. 1 Current—Approximate	2.8	3.3	Milliamperes
Driving Power—Approximate	0.23	0.28	Watts
Plate Power Input	140	200	Watts
Power Output	105	141	Watts



BOTTOM VIEW

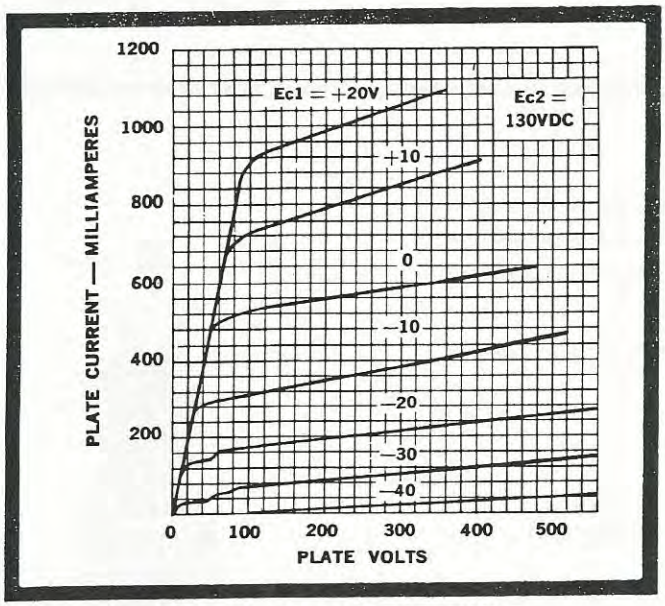


PLATE CHARACTERISTIC CURVE

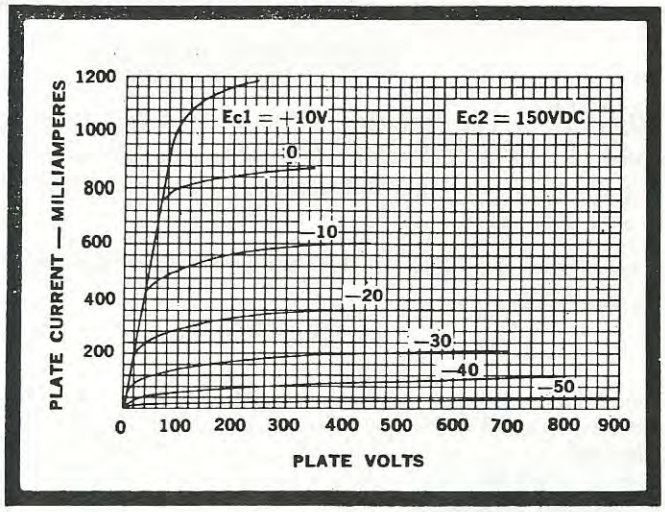
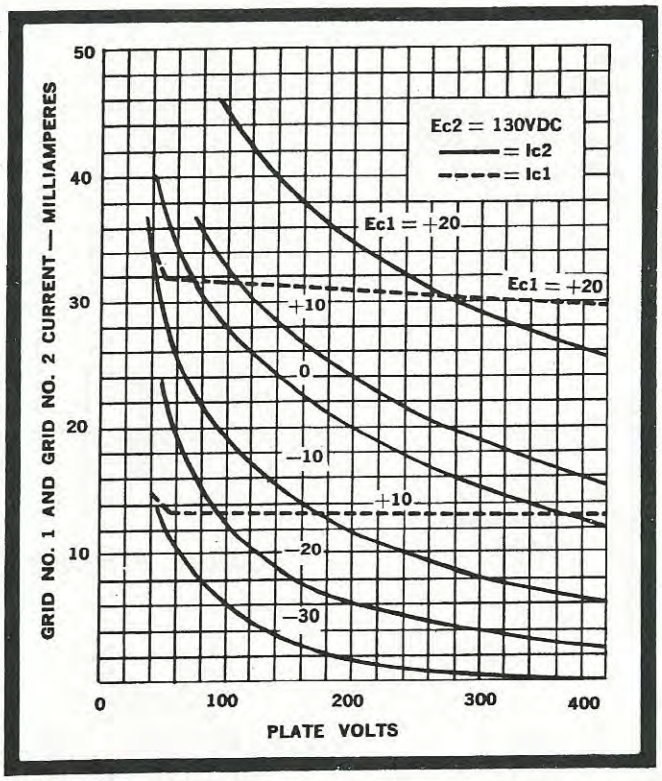
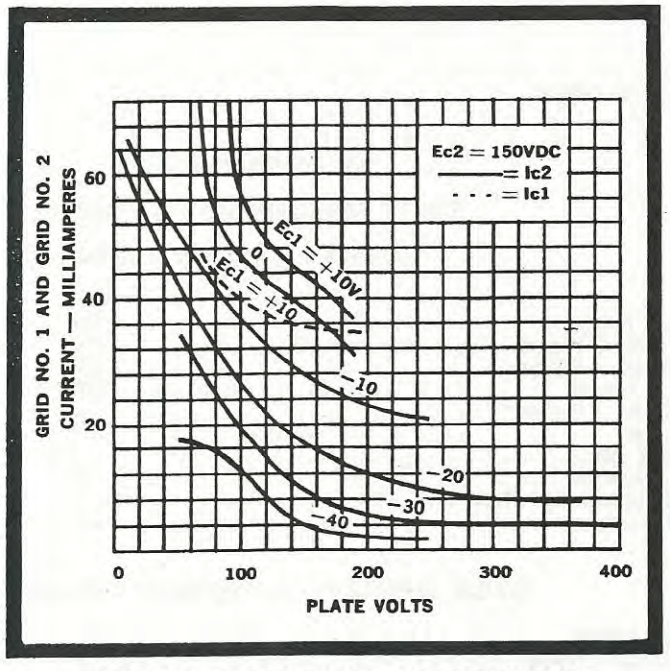


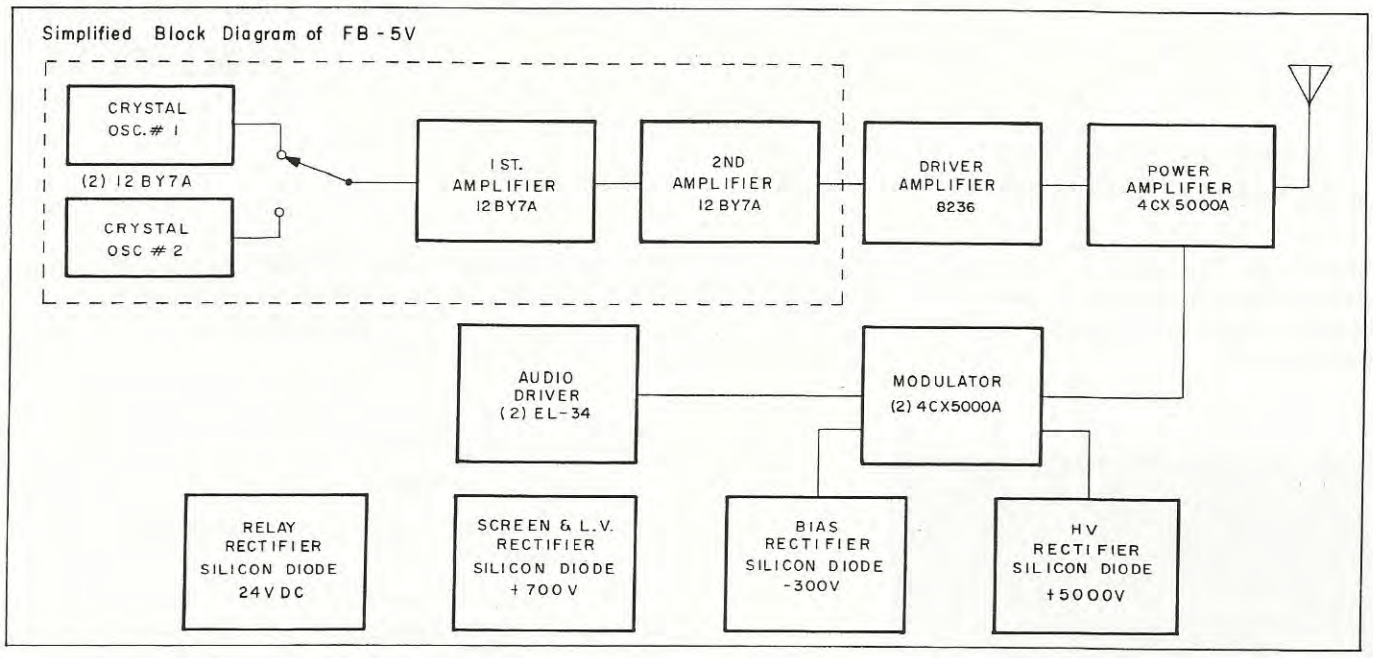
PLATE CHARACTERISTIC CURVE



GRID NO. 1 AND GRID NO. 2 CURRENT
VS. PLATE VOLTAGE



GRID NO. 1 AND GRID NO. 2 CURRENT
VS. PLATE VOLTAGE



SPECIFICATIONS

PERFORMANCE SPECIFICATIONS

AF input impedance. 600 ohms

AF input level. 10 dbm (100% modulation)

AF response. ± 1 db (30 - 12 KHz)

AF distortion. Less than 3% (95% mod., 50-10 KHz)

Noise. 60 db or better (Below 100% modulation)

Frequency stability. ±5 Hz

RF output. 50/70 ohms, unbalanced

Carrier shift. Less than 3% (100% modulation)

ELECTRICAL SPECIFICATIONS

Power output nominal. 5000 watts

Power output capability. 6000 watts

Power supply. 230 volts, 50/60 Hz, 3 phase

Power consumption.

0% modulation	10.6 kw
Average modulation	12.0 kw
100% modulation	15.5 kw

Power factor. 90%

Tube complement.

2 12BY7A oscillators
2 12BY7A buffers
1 8236 driver
1 4CX5000A power amplifier
2 EL-34/6CA7 audio driver
2 4CX5000A modulator

MECHANICAL SPECIFICATIONS

Height. 75 inches (190.5 cm)

Width. 60 inches (152.4 cm)

Depth. 29 inches (73.7 cm)

Weights.

Net	2000 pounds (907.2 kg)
Domestic	2400 pounds (1086.6 kg)
Export	2700 pounds (1224.7 kg)

Altitude range. To 8000 feet

Ambient operating temperature. To 113°F

ORDERING INFORMATION

G/A Bauer Model FB-5V AM transmitter, 5000/1000 or 500 watts, complete with tubes, two crystals, tuned and tested on frequency.

Optional and accessory equipment

Type TK-5V recommended set of spare tubes
Type WRC-10T remote control system
Type 440B Log Alarm® automatic logging system
Type ACU-305 antenna coupling unit

OTHER G/A BAUER AM TRANSMITTERS

Model 720 50-watt transmitter
Model 707 1000-watt AM transmitter
Model FB-3A 3000-watt AM transmitter
Model FB-10J 10,000-watt AM transmitter
Model FB-15A 15,000-watt AM transmitter
Model 725 25,000-watt AM transmitter

More information for you.

Additional information on this product is available from Granger Associates-Bauer Broadcast Products, 1601 California Avenue, Palo Alto, California 94304 or 818 18th Street NW, Washington, D. C. 20006; 1 Brooklands Road, Weybridge, Surrey, England; 1-3 Dale Street, Brookvale, NSW 2100, Australia; or from the G/A-BAUER Communication Engineering Office nearest you.

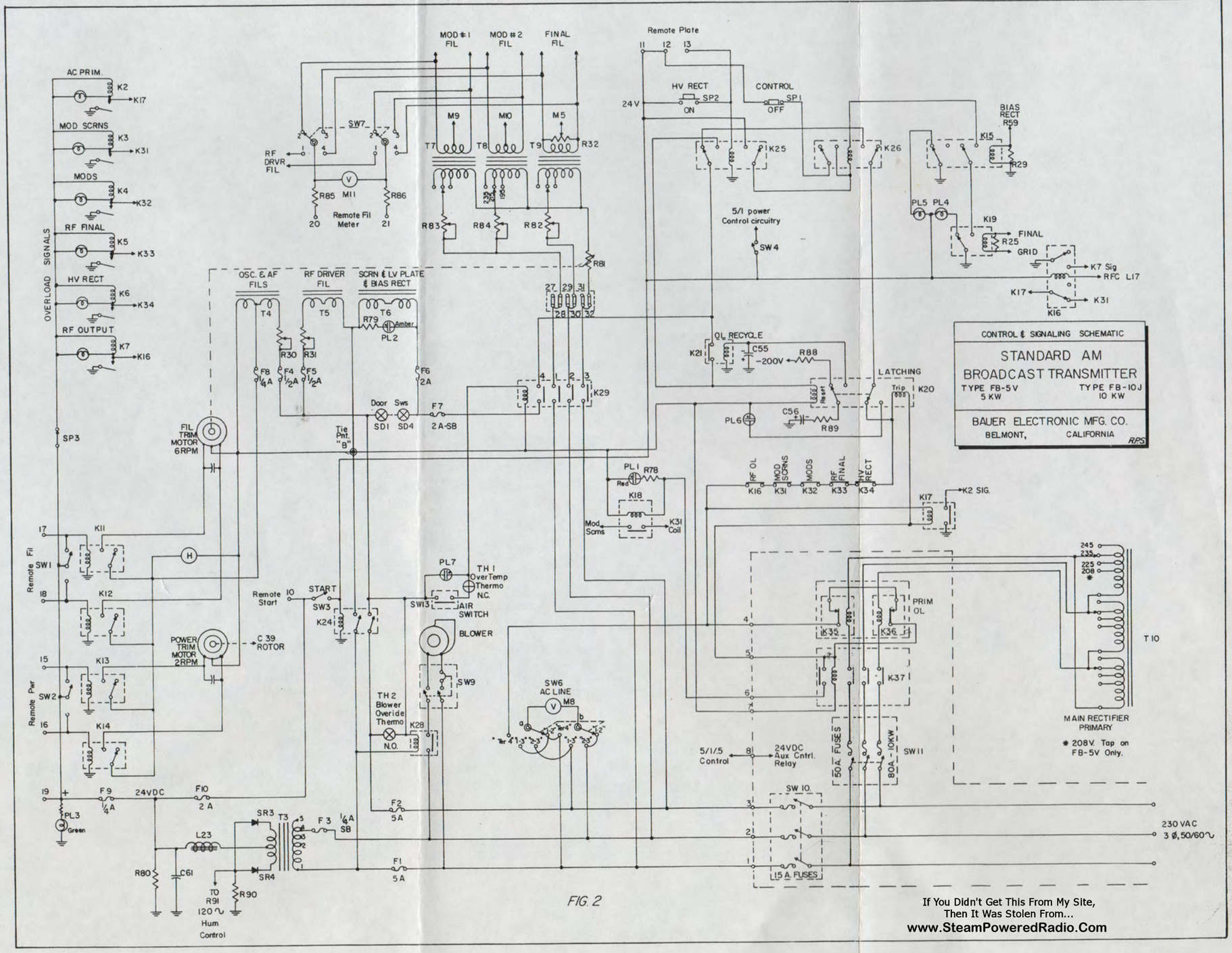


FIG. 2

CONTROL & SIGNALING SCHEMATIC

STANDARD AM BROADCAST TRANSMITTER

TYPE FB-5V 5 KW

TYPE FB-10J 10 KW

BAUER ELECTRONIC MFG. CO.

BELMONT, CALIFORNIA

RPS

FIG. 2

FIG 8.

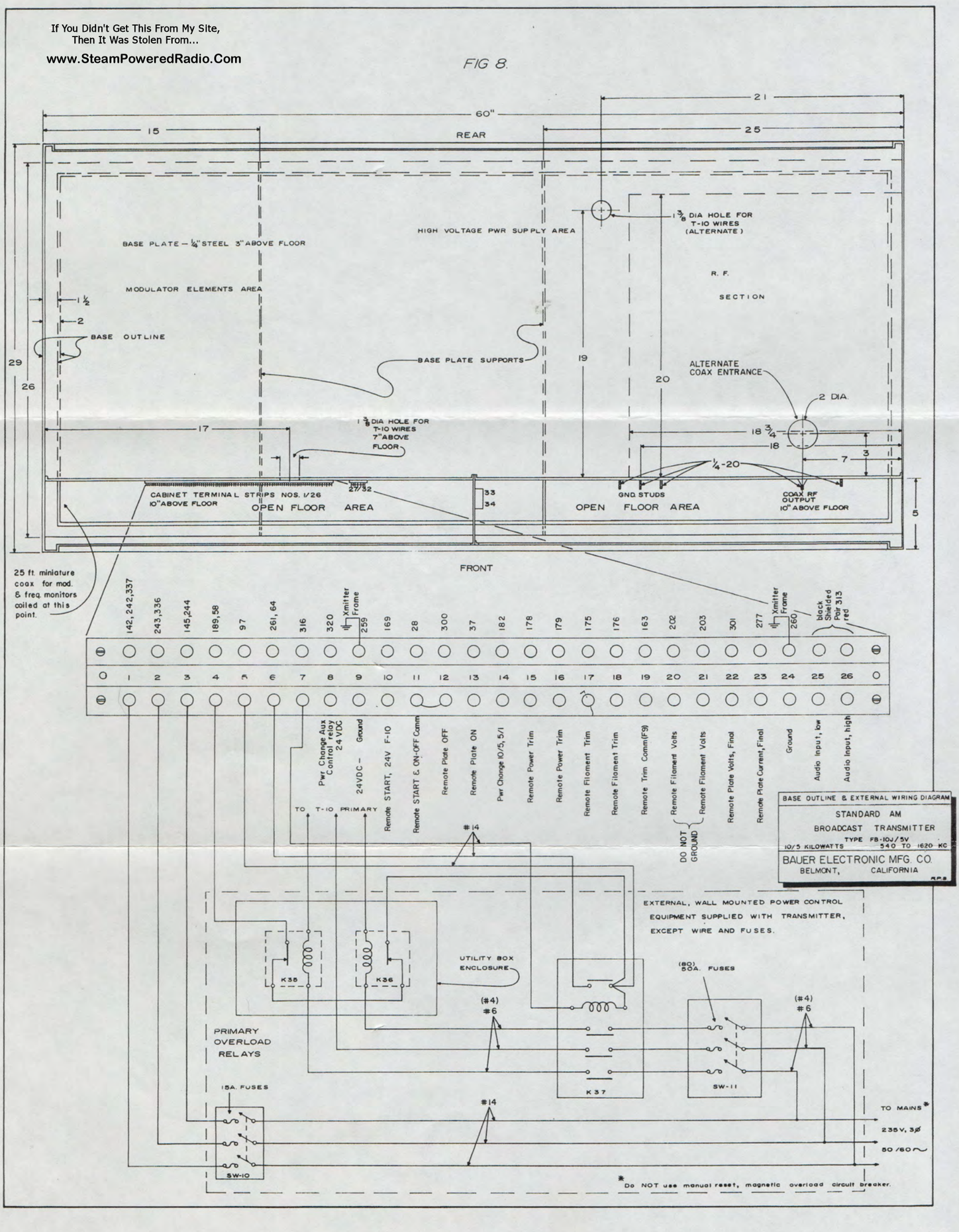
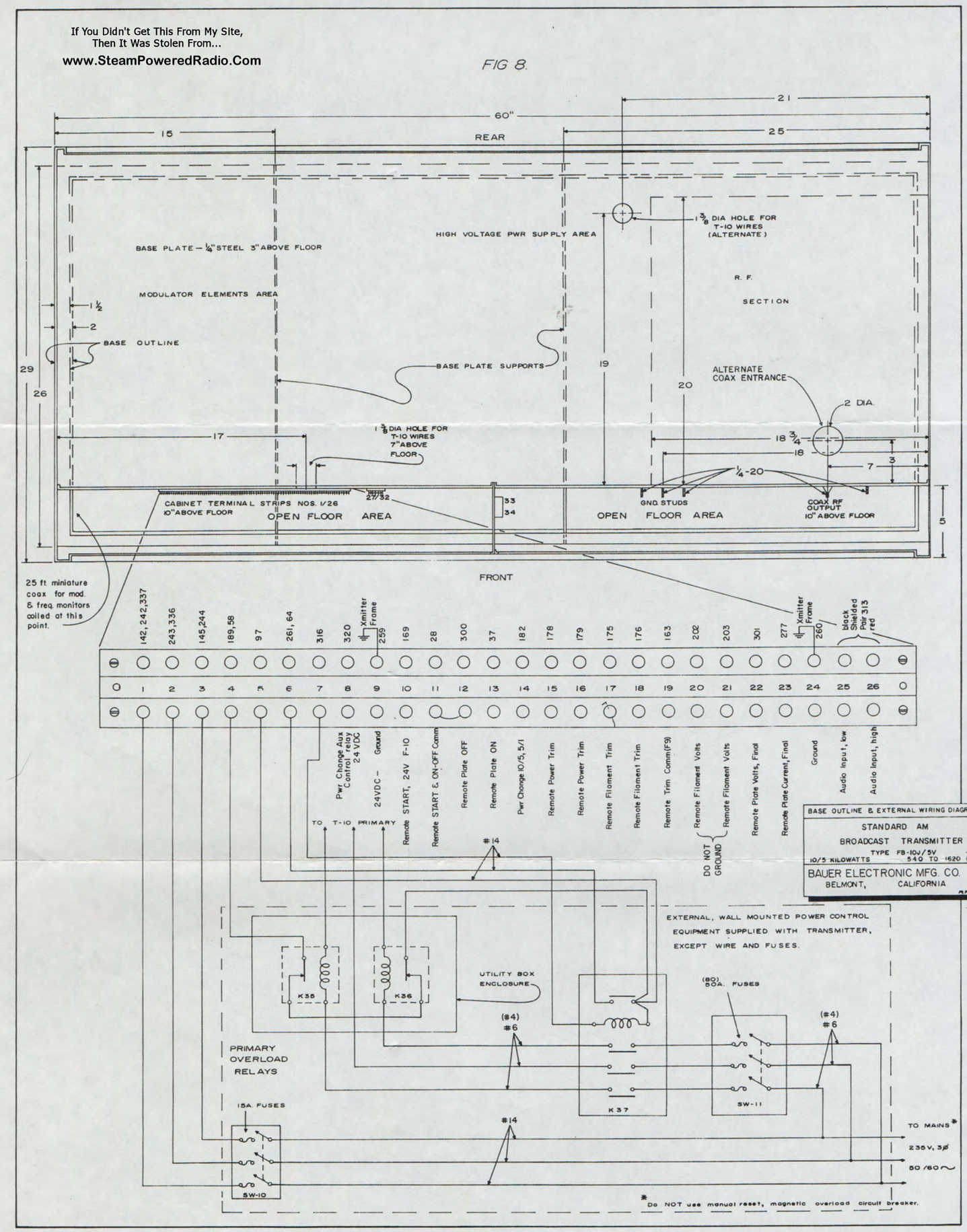


FIG 8.



SIMPLIFIED SCHEMATIC

STANDARD AM BROADCAST TRANSMITTER

TYPE FB-10J/15A

10 KILOWATTS 540 TO 1620 KC

BAUER ELECTRONIC MFG. CO

BELMONT, CALIFORNIA R.P.S.

Fig # 1.