ADDENDA SHEET

VANGUARD I, 1000/500 WATTS

This transmitter has been factory tuned and tested on the customer's operating frequency. The output power of either 1000 or 500 watts is instantly available.

All operating currents and voltages for both powers are included in the test sheets supplied with this transmitter; these sheets are at the rear of this instruction book.

2/23/65

Gates Radio Company
123 Hampshire
Quincy, Illinois

WARNING

THE CURRENTS AND VOLTAGES IN THIS EQUIPMENT ARE DANGEROUS. PERSONNEL MUST AT ALL TIMES OBSERVE SAFETY REGULATIONS.

This manual is intended as a general guide for trained and qualified personnel who are aware of the dangers inherent in handling potentially hazardous electrical/electronic circuits. It is not intended to contain a complete statement of all safety precautions which should be observed by personnel in using this or other electronic equipment.

The installation, operation, maintenance and service of this equipment involves risks both to personnel and equipment, and must be performed only by qualified personnel exercising due care. HARRIS CORPORATION shall not be responsible for injury or damage resulting from improper procedures or from the use of improperly trained or inexperienced personnel performing such tasks.

During installation and operation of this equipment, local building codes and fire protection standards must be observed. The following National Fire Protection Association (NFPA) standards are recommended as references:

- Automatic Fire Detectors, No. 72E
- Installation, Maintenance, and Use of Portable Fire Extinguishers, No. 10
- Halogenated Fire Extinguishing Agent Systems, No. 12A

WARNING

ALWAYS DISCONNECT POWER BEFORE OPENING COVERS, DOORS, ENCLOSURES, GATES, PANELS OR SHIELDS. ALWAYS USE GROUNDING STICKS AND SHORT OUT HIGH VOLTAGE POINTS BEFORE SERVICING. NEVER MAKE INTERNAL ADJUSTMENTS, PERFORM MAINTENANCE OR SERVICE WHEN ALONE OR WHEN FATIGUED.

Do not remove, short-circuit or tamper with interlock switches on access covers, doors, enclosures, gates, panels or shields. Keep away from live circuits, know your equipment and don't take chances.

WARNING

IN CASE OF EMERGENCY ENSURE THAT POWER HAS BEEN DISCONNECTED.

WARNING

IF OIL FILLED OR ELECTROLYTIC CAPACITORS ARE UTILIZED IN YOUR EQUIPMENT, AND IF A LEAK OR BULGE IS APPARENT ON THE CAPACITOR CASE WHEN THE UNIT IS OPENED FOR SERVICE OR MAINTENANCE, ALLOW THE UNIT TO COOL DOWN BEFORE ATTEMPTING TO REMOVE THE DEFECTIVE CAPACITOR. DO NOT ATTEMPT TO SERVICE A DEFECTIVE CAPACITOR WHILE IT IS HOT DUE TO THE POSSIBILITY OF A CASE RUPTURE AND SUBSEQUENT INJURY.

WARNING: Disconnect primary power prior to servicing.

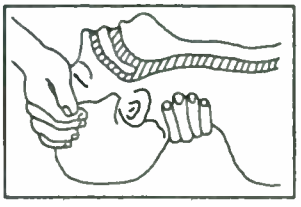
TREATMENT OF ELECTRICAL SHOCK

1. IF VICTIM IS NOT RESPONSIVE FOLLOW THE A-B-CS OF BASIC LIFE SUPPORT.

PLACE VICTIM FLAT ON HIS BACK ON A HARD SURFACE

(A) AIRWAY

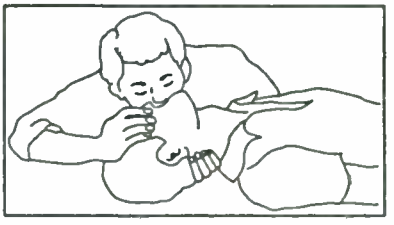
IF UNCONSCIOUS.
OPEN AIRWAY



LIFT UP NECK
PUSH FOREHEAD BACK
CLEAR OUT MOUTH IF NECESSARY
OBSERVE FOR BREATHING

(B) BREATHING

IF NOT BREATHING.
BEGIN ARTIFICIAL BREATHING

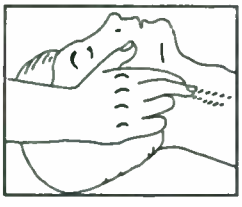


TILT HEAD
PINCH NOSTRILS
MAKE AIRTIGHT SEAL

4 QUICK FULL BREATHS

REMEMBER MOUTH TO MOUTH RESUSCITATION MUST BE COMMENCED AS SOON AS POSSIBLE

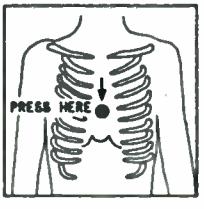
CHECK
CAROTID PULSE



IF PULSE ABSENT.
BEGIN ARTIFICIAL CIRCULATION

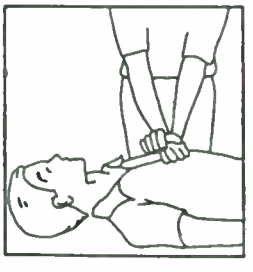
(C) CIRCULATION

DEPRESS STERNUM 1 1/2 TO 2 INCHES



APPROX. RATE OF COMPRESSIONS --80 PER MINUTE
- ONE RESCUER
- 15 COMPRESSIONS
- 2 QUICK BREATHS

APPROX. RATE OF COMPRESSIONS --60 PER MINUTE
- TWO RESCUERS
- 5 COMPRESSIONS
- 1 BREATH



NOTE: DO NOT INTERRUPT RHYTHM OF COMPRESSIONS WHEN SECOND PERSON IS GIVING BREATH

CALL FOR MEDICAL ASSISTANCE AS SOON AS POSSIBLE.

2. IF VICTIM IS RESPONSIVE.

A. KEEP THEM WARM
B. KEEP THEM AS QUIET AS POSSIBLE
C. LOOSEN THEIR CLOTHING
D. A RECLINING POSITION IS RECOMMENDED

FIRST-AID

Personnel engaged in the installation, operation, maintenance or servicing of this equipment are urged to become familiar with first-aid theory and practices. The following information is not intended to be complete first-aid procedures, it is brief and is only to be used as a reference. It is the duty of all personnel using the equipment to be prepared to give adequate Emergency First Aid and thereby prevent avoidable loss of life.

Treatment of Electrical Burns

1. Extensive burned and broken skin

   a. Cover area with clean sheet or cloth. (Cleanest available cloth article.)
   b. Do not break blisters, remove tissue, remove adhered particles of clothing, or apply any salve or ointment.
   c. Treat victim for shock as required.
   d. Arrange transportation to a hospital as quickly as possible.
   e. If arms or legs are affected keep them elevated.

NOTE

If medical help will not be available within an hour and the victim is conscious and not vomiting, give him a weak solution of salt and soda: 1 level teaspoonful of salt and 1/2 level teaspoonful of baking soda to each quart of water (neither hot or cold). Allow victim to sip slowly about 4 ounces (a half of glass) over a period of 15 minutes. Discontinue fluid if vomiting occurs. (Do not give alcohol.)

2. Less severe burns - (1st & 2nd degree)

   a. Apply cool (not ice cold) compresses using the cleanest available cloth article.
   b. Do not break blisters, remove tissue, remove adhered particles of clothing, or apply salve or ointment.
   c. Apply clean dry dressing if necessary.
   d. Treat victim for shock as required.
   e. Arrange transportation to a hospital as quickly as possible.
   f. If arms or legs are affected keep them elevated.

REFERENCE: ILLINOIS HEART ASSOCIATION

AMERICAN RED CROSS STANDARD FIRST AID AND PERSONAL SAFETY MANUAL (SECOND EDITION)

YOUR VANGUARD I

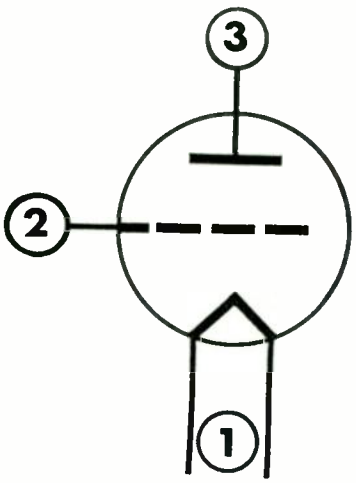
Vanguard I is a new concept in AM broadcast transmitters. When carefully installed, the broadcaster should have a transmission quality and reliability never before attained in AM broadcasting equipment. As Vanguard I is new, we urge reading this instruction book carefully. Understanding the difference between Vanguard circuitry and all other transmitters will not only make installation quicker but demonstrate to the engineer why it is better.

Dozens of innovations will be noted but three basics are obvious: (1) there is only one tube, which means Vanguard I is nearly all transistorized, (2) low level modulation replaces the high level modulation that has been universal in 1000 watt transmitters, and (3) the 1000 watt output stage is a linear amplifier instead of a Class C amplifier. Remembering these three basic differences and trying to become acquainted with them will greatly aid installation and the superb performance attainable.

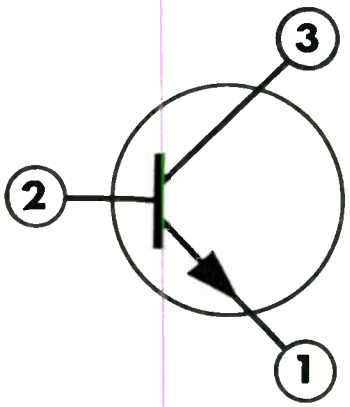
A WORD ABOUT TRANSISTORS

To most of us, transistors are less familiar than tubes. By remembering that transistors do the same thing as tubes; namely, rectify and amplify, we can immediately regain our familiarity. As we are all familiar with tube symbols, the comparison below to tube versus transistor symbols will aid in circuit diagram analysis and understanding.

TUBE SYMBOL



TRANSISTOR SYMBOL



(1.) For a tube this is known as the filament or cathode. For a transistor this is also known as the emitter.

(2.) The tube grid is likened in a transistor to what is called the "base".

(3.) The plate of a tube is known as a collector in a transistor — so:

Tube cathode is same as transistor emitter.
Tube grid is same as transistor base.
Tube plate is same as transistor collector.

THE SOLDERING IRON is to a transistor as Raid is to flies. If you must change a transistor, and there should not be a need unless mal-handling or lightning becomes a cause, use a very small pin tip type of soldering iron and do not leave heat applied any longer than to make the soldered connection.

METERING for transistors is usually provided only for tuning indications. As transistors have essentially no wear, the more elaborate metering such as with tubes that must be replaced, is not desirable with transistors.

MEASURING TRANSISTOR CIRCUITS improperly will run the danger of destroying the transistor. As a transistor is a low voltage device, the battery voltage in a volt-ohmmeter may actually be higher than the rating of the transistor. If it is necessary to check resistance or point to point continuity, always use the highest possible resistance scale on the voltohmmeter that is readable. For example: On point to point continuity readings, never use the low ohmage scale but the highest ohmage scale. This will insert more resistance between the battery and the test prods of the voltohmmeter and reduce the voltage across the transistor during a check.

BUT TRANSISTORS are a very rugged and stable device. Like a fuse, if the rating is substantially exceeded, they are destroyed. In all Gates products the transistors are rated many times their operating point and should be much more reliable than tubes and last indefinitely. --- The caution and comments are only to help in becoming acquainted with this new and wonderful technical advancement as applied to broadcasting equipment.

TUBE DEGASSING

In Vanguard I there is only one tube. This tube has been selected for long life to complement the indefinite life of transistors. All large transmitting tubes at times become gaseous when not in use such as on the shelf or even in transit. Under a gaseous condition, if the high voltage is immediately applied, the tube could be destroyed. To prevent this, follow these simple steps:

1. After initial installation of the transmitter, turn on the filaments only for 30 minutes. Do not apply the high voltage during this period.

2. Without modulation of any kind (zero audio input) operate the tube for 15 minutes with the high voltage applied. Of course the tuning procedures on the following pages have been adhered to.

3. The tube should now be degassed and ready for normal use.

NOTE: The spare tube on the shelf, to prevent gassing, should have the above procedure applied at the regular maintenance periods and at least once monthly.

LOW LEVEL MODULATION simply means that instead of modulating the power amplifier stage as in other 1000 watt transmitters, an amplifier stage between the oscillator transistor and the final amplifier is modulated. By doing this, less than one watt of audio is required for modulation instead of the about 700 watts required in other transmitters. Because of this, it can be easily understood why audio performance can be so much improved.

LINEAR AMPLIFIER: The linear amplifier differs from the Class C amplifier as it is amplifying the modulated radio frequency signal at the same time as it is developing radio frequency power. Any Class AB or Class B circuit must be correctly matched to the load for proper performance. In Vanguard I the radio frequency output impedance is very important. The correct match of Vanguard I output to the transmission line or load is a vital necessity. As a Class C amplifier, used in earlier transmitters, is not as critical to load, the engineer may discover for the first time, when changing to Vanguard I, that a load mismatch always existed and by readjusting the antenna tuning equipment for correct load, he not only has Vanguard I performance supremacy but the added performance resulting from correct matching which may have represented power loss in the past.

Learn Vanguard I thoroughly and its wonderful benefits both in performance and reliability will be an engineering satisfaction long to be enjoyed. We are now ready to start installing Vanguard I.

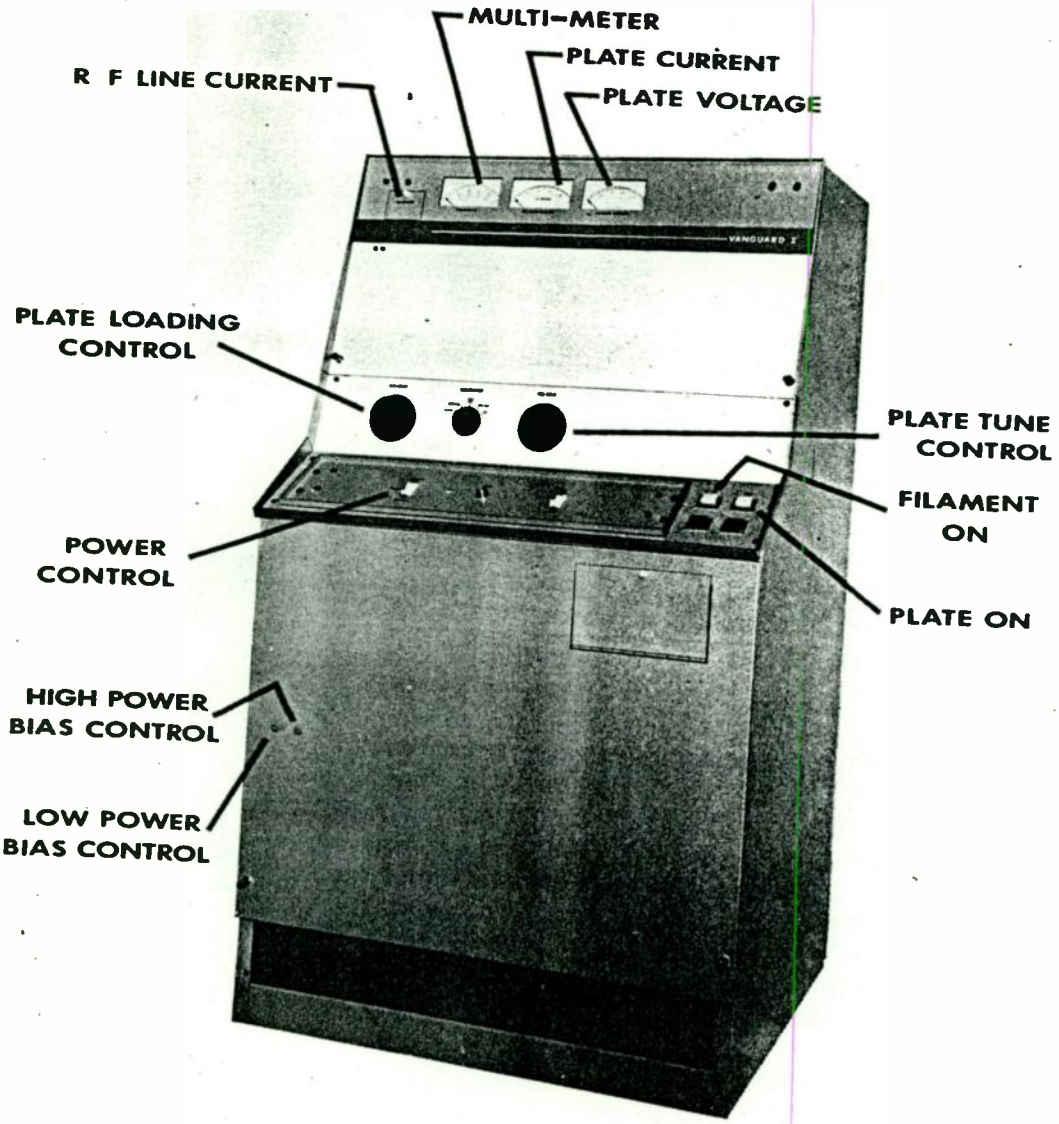


FIGURE 1

FRONT VIEW

Uncrating Transmitter:

The packing list is attached in an envelope on the outside of the transmitter crate. Check out every item. Be sure and not leave small items on the floor, they could be stepped on. Take your time in uncrating. You will find the equipment well packed. Should there be any damage, file a claim with the delivery transportation company immediately.

Preparing The Transmitter Location:

Refer to the drawing on Page 6. You will find all of the connecting wires defined to place the Vanguard I transmitter into operation, together with the recommended point at which the individual wires should enter the base of the transmitter.

Installing Transmitter:

Go over the complete transmitter carefully for tightness of bolts. Then proceed in the following manner:

1. Set the transmitter in place.

2. Connect the main transmitter power wiring to the fuseblock as shown in Fig. 2, Page 7. Make sure that the neutral wire is connected to the center terminal of the fuseblock.

3. Connect 115 volts AC to the small terminal block directly beneath the main fuseblock. It is suggested that the building lighting circuit be used as this voltage is always left on to operate the crystal oven continuously.

4. Connect at least 1" copper ground strap (see Page 7, Fig. 3). This ground strap should connect directly to the main antenna ground system where all radials terminate under the tower. This is a very important connection and should be done well and complete.

5. Connect the shielded audio line to the terminal board shown in Fig. 4, Page 7, grounding the shield to terminal #2 and connecting the two wires to terminals #1 and #3. The audio input impedance is 600 ohms and input level required is about +5 dbm. If a limiting amplifier is used adjacent to the transmitter such as the Gates SA39B, the output of the limiter is often connected to these terminals.

6. Connect the center conductor of the modulation monitor coaxial line to terminal #4 on the terminal board shown in Fig. 5, Page 7. Connect the shield of this coaxial line to terminal #3. See Page 12 for adjustments.

FIGURE 6
UPPER REAR - LEFT SIDE

7. Connect the frequency monitor coaxial line to this same terminal board, with the center conductor of this line on terminal #1 and the outer shield on terminal #2. About 5 volts RMS is provided, which will operate all modern frequency monitors such as the Gates M4990.

   It is suggested that RG59U coaxial cable be employed to connect both modulation and frequency monitors to the transmitter. In connecting the shield of the RG59U cable, trim back outer sleeve carefully and wrap a #18 wire around the shield twice and solder. This becomes the ground or shield connection as mentioned above.

8. As supplied, your Vanguard I is connected to the inbuilt dummy antenna (see Page 9, Par. 4). Attach the output coaxial transmission line. This should be at least 7/8" line, 50 ohms impedance. You will not attach the center conductor until after initial tune-up on the dummy antenna but it should be in place. The clamp provided is to secure the outer conductor both mechanically and electrically, a very important electrical connection. If an insulated jacketed coaxial cable is used, be sure and peel back the jacket so the clamp is directly to the outer metal shield.

   When you place the transmitter on the air, the dummy antenna is disconnected from the R. F. line meter and the center conductor of the coaxial cable is connected to the R. F. line meter (see Page 4, Fig. 6). However, do not make this connection at this time as we will test on the inbuilt dummy antenna.

9. Install the plate power transformer as shown in Fig. 7, Page 13. Bolt securely to the transmitter base with bolts provided. Make all connections to the transformer using the terminal wiring indicated on the cable leads as a guide.

IMPORTANT — Your transmitter comes from the factory wired for operation 230 volts, 60 cycles. If your primary power service is for 208 volt operation, refer to the over-all transmitter schematic diagram. Wires to three transformers are changed and are well noted on the drawing. Filament transformer T603 remove the wire from terminal #3 and place on terminal #2. Power transformer T601 remove the wire from terminal #3 and place on terminal #2. Bias transformer T602 refer to terminal board TS601 and remove the wire from terminal #5 and place on terminal #4. — Now refer to the diagram 842-4678-001 on the oscillator-buffer-modulator unit. On transformer T502 which connects to terminal strip TS1 remove the wire from terminal #1 and place it on terminal #2. — The blower and relays are designed for both 208 and 230 volts without wiring change.

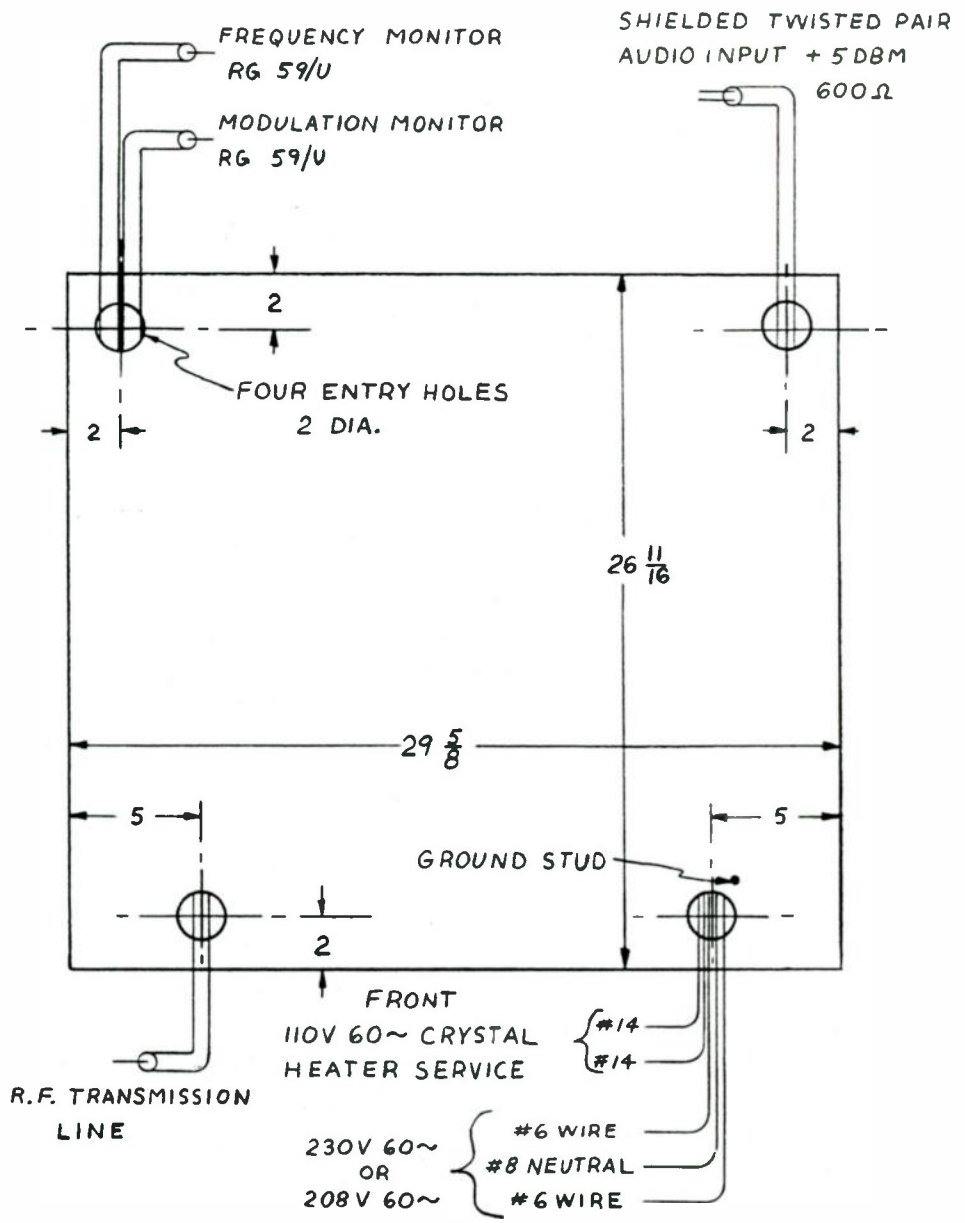
10. Install the two time delay relays, K604 and K605 in their respective sockets located just under the tube shelf on the right wall of the transmitter cabinet. These are vacuum type relays resembling a small vacuum tube.

11. Using extreme care, remove the 4CX3000A tube from its shipping carton and place in its socket, rotating a little clockwise to lock in place. Don't forget the degassing procedure earlier referred to.

12. Install the plate parasitic choke assembly, supplied separately. On one end of this assembly you will notice the connector that attaches to the tube plate. The other end is connected to a small bolt in the center of a teflon insulator on the left wall of the tube compartment.

13. Now check to see that all relays operate freely. Look over the transmitter thoroughly. Have all connections been made professionally? It is unlikely but now is the time to be sure no soldered connection has broken loose during transit. — In short, give your Vanguard I the eagle eye as you are about to turn it on.

NOTE: BINARY DIVIDER — By referring to drawing 842 4678 001, a binary divider will be found in the upper center. This is only supplied in transmitters ordered for a carrier frequency below 1000 Kc. Crystals used in Vanguard I are 1000 Kc. or above and in this case are on exact carrier frequency and the binary divider is not used. If the carrier frequency is below 1000 Kc., then a sub-multiple of the crystal frequency is employed and the binary divider is added. (Example I) If carrier frequency was 1200 Kc., a 1200 Kc. crystal would be used and no binary divider. (Example II) If carrier frequency was 600 Kc., a 1200 Kc. crystal would be supplied and a binary divider added.



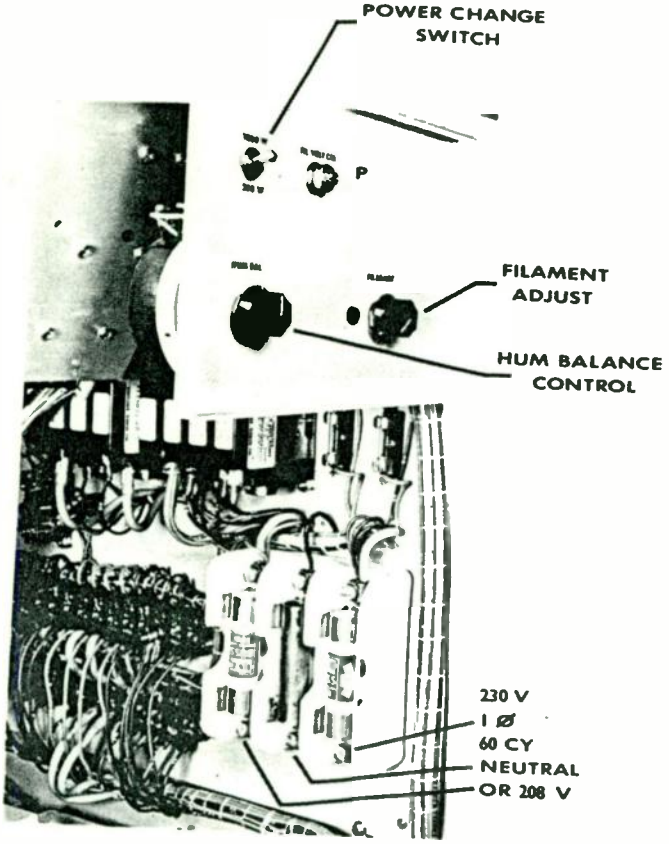


FIGURE 2

LOWER CABINET RIGHT FRONT
VANGUARD I TRANSMITTER

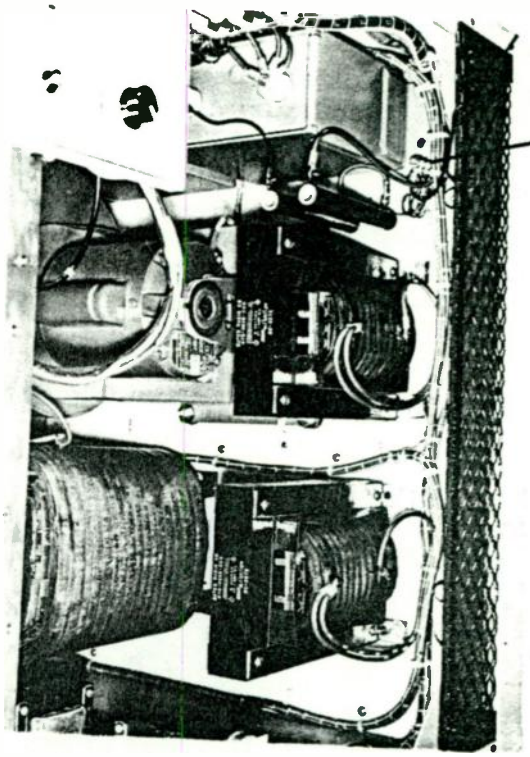


FIGURE 3
LOWER FRONT CENTER

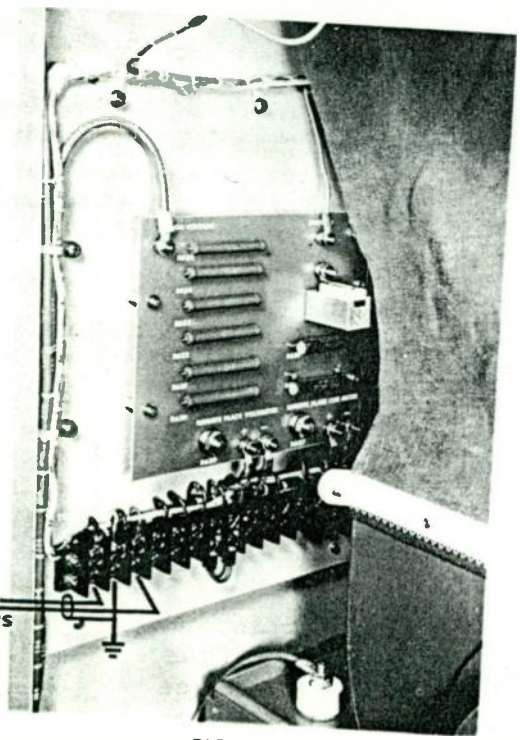


FIGURE 4
LOWER REAR RIGHT SIDE

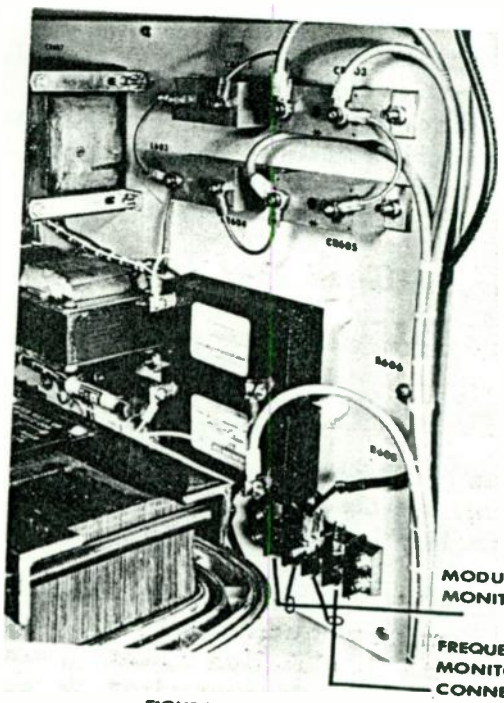


FIGURE 5
LOWER REAR-LEFT SIDE

GENERAL TUNING PROCEDURES

Your Vanguard I transmitter has been completely adjusted at the factory. The correct setting of the output network coils are marked at the factory by small black marks on the coil bar at the turn where the rotor or coil clip was placed during factory adjustments. All internal controls have been sealed to denote that the adjustments have been made. After the transmitter has been installed, adjustment of any control should probably not be required to place the transmitter into operation into its built-in dummy load. The controls, may require some readjustment, however, when the transmitter is operating into the station antenna system because of the following two possible conditions:

1. The line voltage of your power supply differs by a few volts from that of the supply used during factory tests.

2. The load impedance of the antenna system and transmission line is probably somewhat different than the impedance of the inbuilt dummy load. This includes the characteristics of the antenna impedance over the full bandwidth of the transmitter.

Factory Adjustments

Your Vanguard I is thoroughly factory tested. Other than tune-up for proper power output and loading, there should be no need of any adjustment in the exciter unit. -- If first results, after turn on, are not as you expect them to be, please do not start random turning of adjustments in the exciter. --- It is reasonable to say that if the exciter is providing drive to the final amplifier, it is probably functioning very well.

Test equipment, such as listed below, is necessary to make initial and periodic proof of performance measurements required by the Federal Communications Commission. This equipment is not mandatory for putting Vanguard I into operation. It is, however, almost indispensable for year-in and year-out maintenance, whether for Vanguard I or any broadcast transmitter and for proof of performance.

This instruction book does cover detailed adjustments. If necessary, and only if necessary, follow the readjustment instructions. Otherwise, follow the normal instructions for tune-up and final on air operation.

Required Test Equipment

The Vanguard I transmitter is primarily adjusted to achieve its superior performance characteristics. For this reason, the following test equipment is desirable before adjustments are begun:

1. A suitable source of detected R. F. output signal from the transmitter, such as, a high fidelity audio output from the station's modulation monitor, and is provided in the Gates M5693 modulation monitor, or the filtered output of a diode detector such as the Gates M3626 diode unit.

2. An audio oscillator with less than 1% distortion such as the Model 210. (Page 152, Gates catalog).

3. A noise and distortion meter such as the Model 410. (Page 152, Gates catalog).

The above test equipment or similar is normally part of most modern radio station maintenance facilities and is required for the purpose of making FCC proof of performance tests. However, if, as with a new station, it should not be immediately available, it may be obtained from stock as single items or as the complete proof of performance package SA131 shown on Page 152 in Gates catalog No. 96.

CAUTION: The Vanguard I transmitter performance characteristics exceed those of most other transmitters. Therefore, each piece of test equipment as well as the detected R. F. signal supplied for operating the test equipment must be as free from extraneous noise and distortion as possible if the performance of the Vanguard is to be correctly measured. Make sure that all leads to the test equipment are carefully shielded and the equipment itself is thoroughly grounded.

Step-By-Step Tuning Procedure

1. Slip the exciter out of the transmitter by removing the four screws in the corners of its front panel and lifting the exciter up as far as it will go. Remove its top cover.

2. Turn the HIGH POWER FEEDBACK CONTROL full counterclockwise (left). See Fig. 8, Page 13.

3. Place the POWER CHANGE SWITCH in the 1000 watt position, Fig. 2, Page 7.

4. Check to see that the P. A. output tuning coils have their shorting clip or rotors in the position marked during factory tune-up. Also check to see that the R. F. line meter is connected to the inbuilt dummy antenna. This means that the main coaxial line is disconnected.

5. Connect the test equipment to the transmitter as shown in the sketch on Page 15.

6. Start the transmitter by pressing the FILAMENT ON switch, Fig. 1, Page 3. The blower should start and the pilot light on the MULTIMETER should light. Reread the first part of these instructions on tube gassing.

7. Place the MULTIMETER switch in the BIAS position and adjust the HIGH POWER BIAS VOLTAGE CONTROL, Fig. 1, Page 3, so that the bias voltage is 195 volts.

8. Now place the MULTIMETER switch in the FILAMENT position and turn the FILAMENT ADJUST control, Fig. 2, Page 7, until the meter reads 8.5 volts.

NOTE: One of the advantages of the Vanguard I transmitter is that the final amplifier tube filaments may be operated as low as is consistent with good performance characteristics and thereby assure longer tube life. See Care of P. A. Tube, Page 16.

9. POWER CONTROL: This control on the exciter front panel is motor tuned and provided with a slip clutch arrangement so that when it reaches either extreme (high or low), it will slip rather than damage the control mechanics. It has been set in the center at the factory (halfway between high and low). This control will be used for power output adjustment.

10. Turn on the plate voltage by pressing the PLATE ON button.

11. Adjust the R. F. line current by operating the POWER CONTROL until this meter reads a full 1000 watts into the dummy antenna, or about 4.45 amperes, when output impedance is 50 ohms.

12. Read all meters. The readings obtained should fall within the ranges listed under TYPICAL METER READINGS, Page 19.

13. HIGH POWER FEEDBACK CONTROL: (See Fig. 8, Page 13. This control has been set at the factory for optimum performance and is only adjusted to further reduce the already very low distortion. As feedback relates to power, this control will have a best position for each individual station. This control never operates fully clockwise. Without test equipment, about center position is correct. With test equipment, this procedure may be followed:

    Modulate the transmitter 100% with 1000 cycle tone from the audio oscillator. Read distortion on noise and distortion meter. Adjust HIGH POWER FEEDBACK CONTROL, clockwise, until there is a noticeable jump in the distortion reading. Now with distortion meter in CALIBRATE position, adjust input to distortion meter until it reads 4 db. below full scale. Turn HIGH POWER FEEDBACK CONTROL counterclockwise until distortion meter now reads full scale. This establishes the correct feedback adjustment for high power operation of the Vanguard I transmitter.

14. Make noise and distortion measurements of the Vanguard I in the manner described in the noise and distortion meter manual. These should agree fairly well with the Typical Performance Measurements shown on Page 18. However, even though there is some variance from these readings, continue with the Adjustment Procedure as further adjustments may tend to correct them.

15. Turn the transmitter off by pushing the PLATE OFF button. Disconnect the dummy load from the R. F. line meter and connect the main coaxial line (antenna system) to the R. F. line meter at the same terminal.

16. Turn transmitter back on. Adjust POWER CONTROL to produce 1000 watts output unmodulated into the transmission line feeding the antenna system. Read all meters. They should agree substantially with the readings previously obtained with the transmitter operating into the dummy load. If they do not, it is a strong indication that the impedance of the transmission line differs substantially from the output impedance of the transmitter. If the adjustments in Par. 17, following, do not produce satisfactory performance characteristics, then the load impedance will have to be adjusted to equal this impedance.

17. With the transmitter adjusted for 1000 watts output, the PLATE CURRENT METER should read between 600 and 750 milliamperes and the SCREEN CURRENT should read less than 10 milliamperes.

    a) If the above readings are low, advance the POWER CONTROL (Fig. 1, Page 3).

    b) If the plate current is lower than suggested and the screen current is too high, the PLATE LOADING CONTROL, Fig. 1, Page 3, should be moved a little counterclockwise and the PLATE TUNING CONTROL resonated.

    c) The amplifier is too heavily loaded when the plate current is too high and the screen current is less than 5 milliamperes. Adjust the PLATE LOADING CONTROL a little clockwise, re-resonate the PLATE TUNING CONTROL and adjust the POWER CONTROL for 1000 watts output.

IMPORTANT – Unless the impedance into which the transmitter is delivering power is accurately known, it is impossible to determine the exact power output of the transmitter and the complete performance characteristics of the transmitter will be affected. This can be measured, where not known, by your consulting engineer.

18. Modulate the transmitter 100% at 1000 cycles and calibrate the distortion meter to full scale. Reduce the signal generator so that the distortion meter indication drops 1/2 db. This provides 95% modulation. Recalibrate the distortion meter and measure the distortion.

    NOTE: Distortion measurements at 100% modulation are meaningless since, at this point, distortion measurements are not repeatable.

19. The distortion measured in Step 18 above, should be substantially less than 3%. If this is not the case, increase the BIAS CONTROL a very slight amount and observe the distortion again. Each time an adjustment is made, however, assure that the transmitter power output has not changed. This step provides the optimum BIAS adjustment for the power amplifier.

20. Readjust the signal generator for 100% modulation, turn off the signal generator and measure the noise. Adjust the HUM BALANCE CONTROL, Fig. 2, Page 7 for minimum noise. Assure that test equipment leads, and power supply connections are not contributing to the measured noise.

21. Check the carrier shift of the transmitter as indicated on the station's modulation monitor. If the carrier shift is in excess of 3%, it may be improved by repeating Step 19 for a slight increase in P. A. bias; by repeating Step 17(b) for an increase in P. A. loading; or, by a slight change in P. A. tuning watching for an improvement in carrier shift while maintaining the correct power output.

Adjustments For Low Power Operation

1. Insert the POWER CHANGE SWITCH to the low power position. See Fig. 2, Page 7.

2. Repeat Step 13, Page 10, except this time adjust the LOW POWER FEEDBACK CONTROL, Fig. 8, Page 13.

3. Adjust the LOW POWER AUXILIARY CONTROL, Fig. 8, Page 13, until the correct R. F. LINE CURRENT is obtained for the lower power operation. At 250 watts into the inbuilt dummy antenna, this would be about 2.22 amperes.

4. Adjust the LOW POWER BIAS CONTROL, Fig. 1, Page 3, for minimum distortion at 95% modulation at 1000 cycles as was done in Step 19.

The above adjustments provide for operation at either power level without changing any control setting.

Adjustment of Modulation Monitor Pickup

1. Operate the transmitter in the low power position.

2. Set modulation monitor pickup coil for correct R. F. drive to the modulation monitor. See Fig. 6, Page 4.

3. Switch the transmitter to high power operation.

4. Adjust the HIGH POWER MODULATION MONITOR ADJUSTMENT slider resistor to provide the same modulation monitor R. F. drive as obtained for the low power operation.

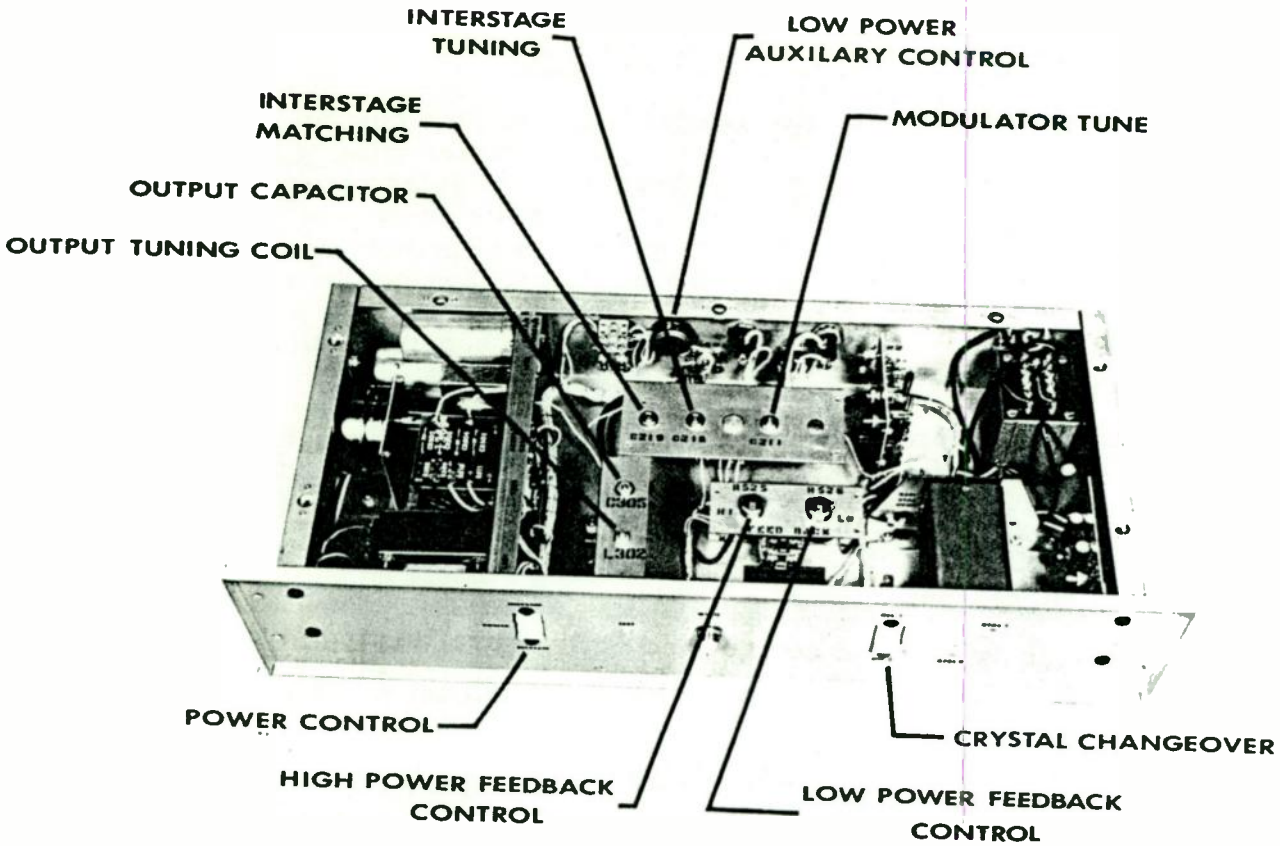


FIGURE 8
TRANSISTORIZED EXCITER

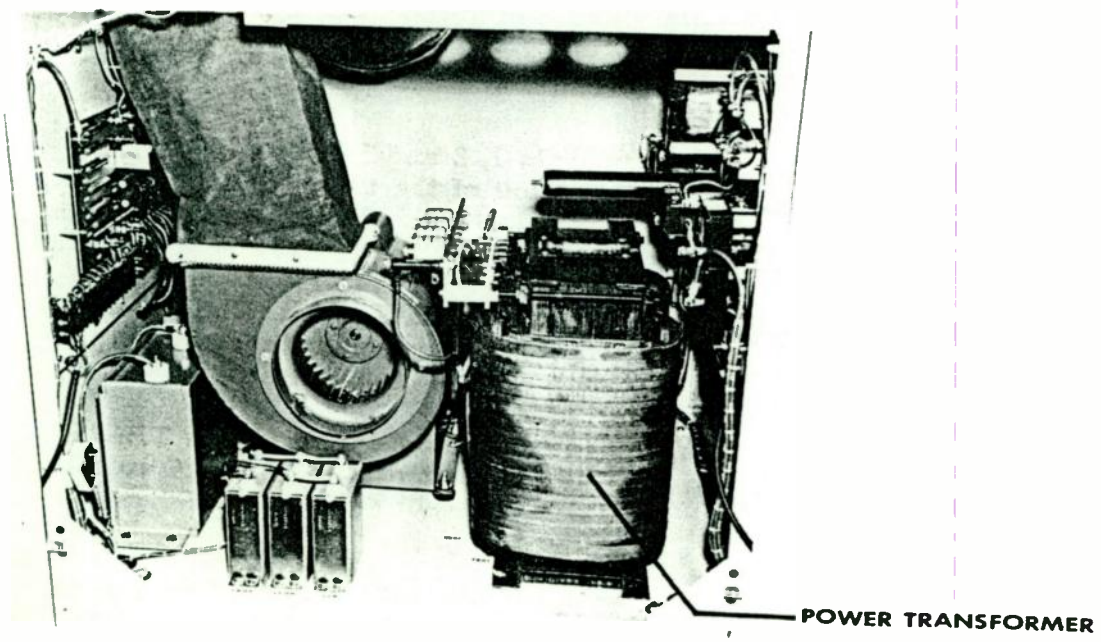


FIGURE 7
LOWER REAR-CENTER

OPERATING VANGUARD I BY REMOTE CONTROL

Where Vanguard I is operated unattended, a remote control system is used, such as the Gates RDC-10AC described on Page 61, Gates catalog No. 96. When using remote control, it is well to re-emphasize that regular maintenance is even more important, or — there is no such thing as remote control of cleaning, checking and pride of ownership. Not strangely, the premises of remote operated transmitters is often not as tidy as operator attended installations. Excessive dust on the floor or walls combined with a wide variety of temperatures and humidity will eventually be harmful to the equipment. The engineer's life will be happier with an exacting maintenance program.

Terminations are provided for all required FCC functions to remotely operate: (1) Filament On-Off with failsafe feature, (2) Plate (high voltage) On-Off, (3) Power Output raise or lower, (4) Power Change 1000 watts on low power, (5) Metering plate current, and (6) Metering plate voltage.

Remote Control Connections

Terminal boards for remote control connections are located at the lower right side wall of the transmitter facing the front. All terminal boards have their number stenciled.

FILAMENT ON: Connect to terminals 4 and 5 of terminal board TB601. See Fig. 4, Page 7. This is the same terminal board to which you have earlier connected the audio input line. — Remove the brown wire from terminal #12 on terminal board TB602 and tape the end of the wire. This removes the holding circuit of the filament relay in the transmitter to provide the failsafe feature.

SEE ADDENDA SEE ADDENDA

PLATE ON: Connect to terminals 6 and 7 of TB601. The remote control unit must provide normally open contacts which are closed momentarily for this function.

PLATE OFF: Connect to terminals 7 and 8 of TB601 and remove the jumper between these terminals. The remote control unit must provide normally closed contacts to these terminals which are opened momentarily for this function.

POWER RAISE/LOWER: Connect to terminals 1, 2 and 3 on TB603. This terminal board is behind TB601 toward the front of the transmitter. The remote control unit must close terminals 1 and 2 to lower power output and close terminals 2 and 3 to raise power output.

POWER CHANGE: Connects to terminals 9 and 10 on TB601. The remote control unit must close these terminals for low power operation and leave them open for high power operation.

PLATE CURRENT METERING: Connect to terminals 14 and 15 on TB601 with #14 the positive meter connection. This circuit provides 3 to 5 volts to operate the remote meter.

PLATE VOLTAGE METERING: Connect to terminals 12 and 13 on TB601 with #12 the positive meter connection. This circuit provides 3 to 5 volts also, to operate the remote meter.

ADDITIONAL METERING: It is of course possible to provide added metering circuits by minor wiring changes to insert a meter kit such as on Page 63 of Gates catalog No. 96. This normally is not necessary unless the buyer happens to prefer more.

REMOTE OPERATION OF MONITORS: As this is not part of the transmitter installation instructions, it is suggested that the instruction books on monitor remoting equipment be referred to.

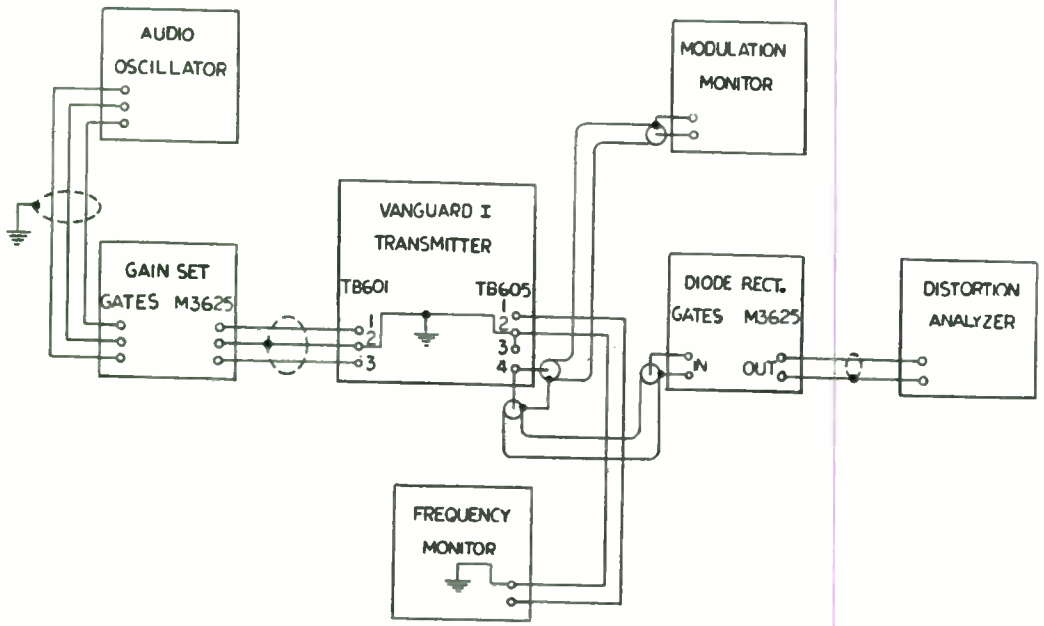


Diagram showing typical test arrangement for response, distortion and noise measurements of Vanguard I. The Gates SA131 proof of performance set listed on Page 152 of Gates catalog No. 96 is used.

TRANSMITTER MAINTENANCE

General Maintenance

Dust and dirt are always the greatest enemies of any electronic equipment. Regular and thorough cleaning of all areas inside the transmitter is imperative for trouble-free performance. Most broadcasting stations set aside a weekly period for complete maintenance which is adhered to without exception.

Relay Care

A regular and systematic check of all relay contacts should be included in the maintenance program. Use a contact burnishing tool to clean dust and dirt from the relay contacts to assure minimum contact arcing and positive relay operation.

Care of Printed Circuit Boards

Use a very soft bristled brush to remove dust and dirt from these boards periodically. Do not use a stiff brush or a dust cloth. They are apt to remove the silicon varnish that protects the printed wiring from corrosion.

Care of P. A. Tube

The 4CX3000A tube is a tetrode. Its life is dependent upon two very important operating conditions:

1. Operation of its filament at the correct voltage.

2. The free flow of air over its anode.

(Filament Voltage) One of the Vanguard I features is the ability to obtain longer tube life from the only tube employed. With a new tube, the voltage is adjusted as low as full power output can be obtained from the transmitter. This is usually between 8-1/2 and 9 volts. As the tube ages, the filament voltage is increased as necessary. The maximum filament voltage is 10-1/2 volts.

(Anode Air Cooling) At the weekly or periodic maintenance period, carefully remove the tube and wipe clean all anode fins. This assures free flow of air and longer tube life.

Be sure and follow degassing procedure prior to use of the spare tube for the first time (see Page 2).

TROUBLE-SHOOTING PROCEDURES

Trouble-shooting can cause added damage if certain specific procedures are not followed. If trouble develops either initially or after several years of service, do not start turning controls just to see what will happen. Though elementary, you must:

1. DEFINE THE PROBLEM. Most problems are small but like the chain, it is the weak link that reacts as a big problem.

2. ISOLATE THE PROBLEM. Whatever the problem is, it is in one place. There are always symptoms. For example, if you have zero R. F. drive to the power amplifier, the problem is probably not in the power amplifier but ahead of it.

3. DETERMINE THE CAUSE. Knowing what caused the problem helps solve it. Oftentimes you do not know but think of the events preceding the problem.

CAUTION: If the problem is located as a defective part, do not attempt adjustments until the defective part is replaced. Usually after replacement of the part, no adjustments are necessary, so why get it out of adjustment to begin with?

Special Problem Solutions

Below are listed three possible problem areas with recommended corrective procedures. If, after careful applications of the principles outlined, a satisfactory solution is not achieved, the reader should contact the Service Manager of the Gates Radio Company.

1. Exciter Output Low

If insufficient drive to the power amplifier occurs with POWER CONTROL fully raised, proceed as follows, referring to Fig. 8, Page 13.

a) Turn the HIGH POWER FEEDBACK CONTROL fully counterclockwise and set POWER CONTROL in approximately center of its travel.

b) Adjust MODULATOR TUNE CAPACITY very slightly in direction which increases power output.

c) Readjust FEEDBACK CONTROL as outlined in Step 13, Page 10.

d) Recheck for distortion and stability as outlined in Step 14, Page 10.

e) If satisfactory results are not achieved, adjust INTERSTAGE TUNING CONTROL in the same manner as in Step (b) above.

f) Repeat Steps (c) and (d) above.

IMPORTANT: Do not set either of the above controls at maximum power output as bandwidth, stability, and distortion will be seriously worsened.

g) If the exciter output is still insufficient, vary the OUTPUT CAPACITOR and INTERSTAGE MATCHING CAPACITOR in small increments.

h) Readjust OUTPUT TUNING COIL as OUTPUT CAPACITOR is changed to maintain minimum distortion and improved power output from transmitter. Also readjust INTERSTAGE TUNING CAPACITOR for same results.

2. High Distortion at Mid-audio Frequencies

a) Repeat adjustment procedures listed in Tuning Procedures. Start at Par. 16, Page 11.

b) Repeat adjustments for low exciter output.

3. High Distortion at High Audio Frequencies

Excessive distortion at high audio frequencies when distortion is near normal at mid-frequencies is most often caused by the selectivity of the antenna system or the radio frequency load into which the transmitter is working. For example, if the load presented to the transmitter becomes substantially reactive at any point within the bandwidth of the transmitter, high distortion will result. When this condition exists, no amount of tuning in the transmitter will correct the problem — the load itself must be corrected. (See Page 11 under "Important"). The above condition is true for any amplitude modulated transmitter but becomes especially noticeable in the Vanguard because of its extremely low distortion capabilities.

TYPICAL PERFORMANCE CHARACTERISTICS

Actual performance characteristics obtainable with the Vanguard I transmitter at any particular installation are not determined solely by the transmitter itself but are effected in a large measure by external influences, such as the line voltage, the grounding of the transmitter, and especially by the characteristics of the load impedance into which the transmitter delivers power.

The measurement of the fine performance of the Vanguard I is likewise an exacting process because some of the performance specifications approach the measuring capabilities of the test equipment used. For this reason, actual performance measurements lying within the ranges given in the following table are considered superior and of such value that further reduction would not provide detectable improvement.

Audio Response	$\pm$1 to $\pm$1.5 db., 30 to 10,000 cycles
Audio Distortion	Less than 3% at 95% modulation, 30 to 7500 cycles
Audio Noise	-50 to -60 db.
Carrier Shift	Less than 3%.

TYPICAL METER READINGS

The following table of meter readings is given as a range rather than a single value. An exact reading will differ from installation to installation because of:

a) Variations in primary line voltage.

b) Variations in exact impedance of antenna system.

c) Differences in exact tuning conditions.

Readings within these ranges generally produce satisfactory transmitter operation.

METER	METER RANGE*
R. F. Line Meter	Depends on exact line impedance (See Note)
P. A. Volts	5100 to 5400 volts
P. A. Current	600 to 750 ma.
Filament Volts	8.5 to 10.5 volts (lowest for new tube)
Exciter	35 to 50 ma.
Bias	195 to 200 volts
Screen Volts	850 to 900 volts
Screen Current	5 to 15 ma.

*Based on 1000 watts output into a known load.

NOTE: When operated into the inbuilt dummy antenna and where the transmitter output is 50 ohms, the antenna current for 1000 watts should be about 4.45 amperes.

VANGUARD I PARTS LIST

When ordering spare or replacement parts, be sure and give the full description such as Symbol No., Gates IBM Part Number and description along with "for Vanguard I". In this way, in case of an error it can be caught before shipping. To assist in quickly locating the part, Vanguard I has been sectionalized in the listing below.

Symbol No.	Gates IBM Part No.	Description
Y 1	444 XXXX 000	Crystal _____ Kc. operating frequency
V601	374 0074	Vacuum tube 4CX3000A (see note at end of Parts List)

BINARY DIVIDER

(See Page 6)

C101, C104	500 0818	Cap., 50 pf., 500 V(W), 5%
C102	500 0844	Cap., 1000 pf., 100 V(W), 5%
C103	500 0836	Cap., 500 pf., 300 V(W), 5%
C105	500 0858	Cap., 5000 pf., 300 V(W), 5%
C106	500 0761	Cap., 150 pf., 500 V(W), 5%
CR101, CR102	384 0132	Diode, Silicon
Q101, Q102, Q103	380 0030	Transistor
R101, R109, R111	540 0068	Res., 6200 ohm, 1/2W., 5%
R102, R108	540 0195	Res., 27K ohm, 1/2W., 10%
R103, R106	540 0183	Res., 2.7K ohm, 1/2W., 10%
R104	540 0178	Res., 1000 ohm, 1/2W., 10%
R105	540 0171	Res., 270 ohm, 1/2W., 10%
R107	540 0072	Res., 9100 ohm, 1/2W., 5%
R110	540 0210	Res., 470K ohm, 1/2W., 10%

MODULATOR KIT

C201	522 0330	Cap., 20 uf., 50 V.
C202 thru C207, C212, C214, C215	516 0081	Cap., .01 uf., 1KV., 20%
C208	500 0759	Cap., 100 pf., 500 V., 5%
C209	516 0054	Cap., .001 uf., 1KV., 10%
C211	500 0859	Cap., Variable, 340-65 pf.
C213	order by frequency	Cap., Fixed Mica (Det. by Oper. Freq.)

PARTS LIST

Symbol No.	Gates IBM Part No.	Description
C216	500 0849	Cap., Variable, 1600-550 pf.
C219	500 0850	Cap., Variable, 3055-1400 pf.
CR201	384 0132	Diode, Silicon
L201	494 0033	RF Choke, 2.5 Mill-hy. 4Pi
L202	494 0140	RF Choke, 75 Micro-hy.
L203	order by frequency	RF Tank Coil (Ind. det. by Oper. Freq.)
Q201	380 0028	Transistor
Q202 thru Q205	380 0029	Transistor
R201	540 0186	Res., 4.7K ohm, 1/2 W., 10%
R202	540 0189	Res., 8.2K ohm, 1/2 W., 10%
R203	540 0173	Res., 390 ohm, 1/2 W., 10%
R204	540 0174	Res., 470 ohm, 1/2 W., 10%
R205	540 0200	Res., 68K ohm, 1/2 W., 10%
R206, R207, R214, R216	540 0846	Res., 3 ohm, 1/2 W., 5%
R208, R210	540 0026	Res., 110 ohm, 1/2 W., 5%
R209	540 0180	Res., 1.5K ohm, 1/2 W., 10%
R211	540 0073	Res., 10K ohm, 1/2 W., 5%
R212	540 0190	Res., 10K ohm, 1/2 W., 10%
R213	540 0170	Res., 220 ohm, 1/2 W., 10%
R215, R217, R218	540 0166	Res., 100 ohm, 1/2 W., 10%
R219	540 0204	Res., 150K ohm, 1/2 W., 10%
RT201	559 0003	Thermistor, 1K ohm
XQ201 thru XQ205	404 0187	Transistor socket
	404 0188	Retainer Ring for socket

OUTPUT AMPLIFIER UNIT

C302, C303	516 0081	Cap., .01 uf., 1KV, 20%
C304	506 0008	Cap., 1.0 uf., 200 V.
C305	500 0861	Cap., Variable, Mica 275-970 pf.
C308	500 0838	Cap., 560 pf., 300(W) V. D.C.
C309	516 0084	Cap., .02 uf., 600 V.
L301	494 0083	RF Choke, 240 Micro-hy.
L302	order by frequency	RF Tank Coil (Ind. det. by Oper. Freq.)
Q301	380 0027	Transistor, output
R301	540 0846	Res., 3 ohm, 1/2 W., 5%
R303	540 0166	Res., 100 ohm, 1/2 W., 10%
R304	540 0008	Res., 20 ohm, 1/2 W., 5%

PARTS LIST

Symbol No.	Gates IBM Part No.	Description
	AUDIO AMPLIFIER	
C401	522 0331	Cap., 35 uf., 3 V.
C402	522 0166	Cap., 400 uf., 3 V.
C403, C404	522 0330	Cap., 20 uf., 50 V.
Q401, Q402	380 0026	Transistor
R402	540 0094	Res., 75K ohm, 1/2 W., 5%
R403	540 0060	Res., 3K ohm, 1/2 W., 5%
R404	540 0066	Res., 5.1K ohm, 1/2 W., 5%
R405	540 0166	Res., 100 ohm, 1/2 W., 10%
R406	540 0174	Res., 470 ohm, 1/2 W., 10%
R407	540 0084	Res., 30K ohm, 1/2 W., 5%
R408	540 0096	Res., 91K ohm, 1/2 W., 5%
R409	540 0162	Res., 47 ohm, 1/2 W., 10%
R410	540 0065	Res., 4.7K ohm, 1/2 W., 5%
XQ401, XQ402	404 0066	Transistor socket
	TRANSISTORIZED OSC./BUFFER, MOD. DRIVER UNIT	
A501	396 0062	Lamp, Neon, NE-51-H
B501	436 0058	Motor, Synchronous, 115V, 60 cy., Cap., .47 uf.
C501	506 0006	Cap., .25 uf., 200 V.
C502	524 0117	Cap., 400-800 uf., 100 V.
C503	524 0118	Cap., 400-800 uf., 75 V.
C504	522 0333	Cap., 150 uf., 50 V.
C505, C506	516 0084	Cap., .02 uf., 600 V.
CR501	386 0033	Zener Diode
CR502 thru CR505	384 0137	Silicon Rectifier
CR506	386 0037	Zener Diode
~~CR507~~	~~386 0038~~	~~Zener Diode~~
F501	398 0016	Fuse, 3/4 amp., 250 V., 3 AG
F502, F503	398 0015	Fuse, 1/2 amp., 250 V., 3 AG
J501, J502	612 0230	Receptacle
J503	610 0008	Receptacle, Male 15 PIN
J504	612 0372	Receptacle, Female
K501, K502	574 0123	Relay, DPDT, 115 V. AC
L501	476 0255	Reactor, 4 hy., 300 ma.
L502	476 0256	Reactor, 3.5 hy., 100 ma.
M501	632 0593	Meter

PARTS LIST

Symbol No.	Gates IBM Part No.	Description
P501, P502	610 0231	Plug, UHF
P503	612 0102	Connector, Female 15 PIN
R504, R505	540 0192	Res., 15K ohm, 1/2 W., 10%
R506	540 0178	Res., 1K ohm, 1/2 W., 10%
R508, R509	540 0001	Res., 10 ohm, 1/2 W., 5%
R510, R511	540 0846	Res., 3 ohm, 1/2 W., 5%
R512	540 0300	Res., 47 ohm, 1 W., 5%
R518, R519	540 0035	Res., 270 ohm, 1/2 W., 5%
R521	550 0067	Potentiometer, 10K ohm, 2 W.
R522	550 0260	Potentiometer, 50 ohm
R524	540 0752	Res., 10K ohm, 2 W., 10%
R525	550 0059	Pot., 500 ohm, 2 W.
R526	550 0061	Pot., 1000 ohm, 2 W.
S502	604 0289	Switch, SPDT, w/center off
S503	604 0291	Switch, SPDT, momentary w/center off
T501	478 0030	Transformer, Audio Input
T502	472 0498	Transformer, Power
TP501	612 0312	Test Point Jack
X501	404 0016	Socket, Octal
XA501	406 0347	Pilot Lamp
XF501, XF502, & XF503	402 0063	Fuseholder

CABINET PARTS

A601A, A601B, A602A, A602B, A603A, A603B	396 0045	Pilot Lamp, 6V., 150 ma., Bayonet Type #47
B601	432 0063	Blower, 1/6 HP, 1750 RPM, 230V., 60 cy., counterclockwise, Up Blast
C601, C602, C615, C619, C620	516 0381	Cap., HV. 16,000 pf., 6 KV
C603, C604	516 0382	Cap., HV. 2000 pf., 15 KV
C605A/B	order by frequency	Cap., Plate Tank, G2 (Value det. by Oper. Freq.)
C606, C607	order by frequency	Cap., Input & Output Loading, G2 (Value det. by Oper. Freq.)
C608, C609, C610	510 0073	Cap., Screen Filter, 10 uf., 1000 V.
C611, C612	522 0334	Cap., 10-10 uf., 450 V.
C613, C614	510 0422	Cap., HV. 6 uf., 6 KV.

PARTS LIST

Symbol No.	Gates IBM Part No.	Description
C616A, C622	516 0081	Cap., .01 uf., 1 KV.
C616B	516 0084	Cap., .02 uf., 600 V.
C617, C618, C621	516 0081	Cap., .01 uf., 1 KV.
C623	914 2348	Cap., Variable, 6.5-50 pf.
C624	500 0829	Cap., Mica, 180 pf., 500 V.
C625, C626, C627, C628	516 0233	Cap., Ceramic, 500 pf., 30 KV.
CR601	384 0137	Diode, Silicon, 400 PIV
CR602, CR603, CR604, CR605	384 0149	Rectifier, Silicon HV, 15 KV. PIV
CR606, CR607, CR608, CR609	914 1830	Screen Rectifier Assy.
CR610, CR611, CR612, CR613	384 0020	Diode, Silicon, 600 PIV, 1 Amp.
CR614 A/B	384 ~~0066~~ 0134	Diode, Germanium 1N914
F601, F602	398 0304	Fuse, Cartridge, 40 Amp.
F603	398 0015	Fuse, 1/2 Amp., 250 V. 3 AG
F604	398 0312	Fuse, HV. 1 Amp.
F605	398 0022	Fuse, 5 Amp., 250 V. 3 AG
F606	398 0020	Fuse, 3 Amp., 250 V. 3 AG
K601	570 0124	Contactor, Fil., 4 pole, 230V., 60 cy.
K602	570 0125	Contactor, Plate, 4 pole, 230V., 60 cy.
K603	570 0114	Contactor, Blower, 3 pole, 220/240 V., 60 cy.
K604	576 0024	Relay, Blower Time Delay
K605	576 0039	Relay, Blower Time Delay
K606	574 0014	Relay, PAOL, SPDT, 6 VDC coil
K607	574 0123	Relay, DPDT, 115 VAC
K608	574 0012	Relay, SPDT, 230 VAC Coil
L601, L602	476 0258	Reactor, Filter, HV, 5 Hy. 1 A. DC
L603, L604, L611, L612	476 0257	Reactor, 12 Hy.
L605, L616	494 0033	Choke, RF, 2.5 Mill-hy.
L606	926 7569	Choke, RF Plate, 2.65 Milli-hy.
L607	931 6583 010	Coil, Variable, PA Tank
L608	931 6138 047	Coil, Input Loading PA
L609	931 6583 009	Coil, Variable, Output Loading, PA
L610	938 0503	Coil, Mod. Monitor, Variable
L613	914 2337	Parasitic Suppressor Assy.
L614	927 1012	Parasitic Suppressor Assy.
L615	914 3393	Coil, Neut. (Ind. det. by Oper. Freq.)
M601	632 0556	Multi-meter
M602	632 0557	Ammeter, 0-1 Amp. DC
M603	632 0579	Voltmeter, 0-1 MADC movement with 0-8KV. DC Scale
M604	634 0081	Ammeter, RF. 0-8 Amps.
R601	540 0317	Res., 240 ohm, 1 W. 5%

PARTS LIST

Symbol No.	Gates IBM Part No.	Description
R602	550 0067	Potentiometer, Fil. 10K ohm
R604	548 0166	Res., Multiplier, 1 meg. 2 W. 5%
R605, R606	914 3423	Meter Multiplier, 4 megohm
R607, R608	542 0312	Res., HV Bleeder, 100K ohm, 100W.
R611	552 0255	Potentiometer, 10K ohm, 4 W.
R612	552 0006	Res., Adj. 10 ohm, 10 W.
R613	552 0258	Bias Potentiometer, 25K ohm, 4 W.
R614	552 0406	Rheostat, Fil. 25 ohm, 150 W.
R615, R616	542 0089	Res., 6K ohm, 10 W.
R617 thru R622	546 0216	Res., Dummy Antenna, Non-inductive, 312 ohm, 190 W.
R624	552 0088	Res., Adj., 150 ohm, 50 W.
R624	552 0085	Res., Adj., 50 ohm, 50 W.
R625	552 0385	Rheostat, 100 ohm, 100W.
R626	540 0271	Res., Multi-meter, 3 ohm, 1 W., 5%
R627	542 0334	Res., 7500 ohm, 160 W.
R628	548 0166	Res., 1 megohm, 2 W., .5%
R629	550 0067	Control, 10K ohm, 2 W.
R630 thru R635	548 0166	Res., 1 megohm, 2 W., .5%
R636, R640, R641	540 0066	Res., 5100 ohm, 1/2 W., 5%
R637	550 0055	Control, 100 ohm, 2 W.
R638, R639	542 0056	Res., 20 ohm, 10 W.
R642	542 0085	Res., 2500 ohm, 10 W.
R643	540 0353	Res., 7500 ohm, 1 W. 10%
R644	542 0425	Res., 35K ohm, 20 W.
S601, S603	604 0290	Switch, PB, N.O.
S602, S604	604 0286	Switch, PB, N. C.
S605, S606, S609	604 0061	Switch, Door Interlock
S607	604 0258	Switch, Air Pressure
S608	600 0415	Switch, Multi-meter
S610	604 0005	Toggle Switch
T601	472 0500	Transformer, Plate & Screen
T602	472 0499	Transformer, bias & lamps
T603	472 0501	Transformer, P.A. Filament
TB601, TB602, TB603	614 0105	Terminal Board
TB604	614 0106	Terminal Board
TB605	614 0094	Terminal Board
TB606	614 0046	Terminal Board
XA601A, XA601B, XA602A, XA602B, XA603A, XA603B	406 0348	Socket, Pilot Lamp
XF601	402 0087	Fuseblock
XF603	402 0024	Fuseholder
XF604	402 0088	Fuseblock
XF605, XF606	402 0024	Fuseholder

PARTS LIST

Symbol No.	Gates IBM Part No.	Description
XK604, XK605	404 0016	Socket, Octal
XV601	404 0177	Socket for 4CX3000A

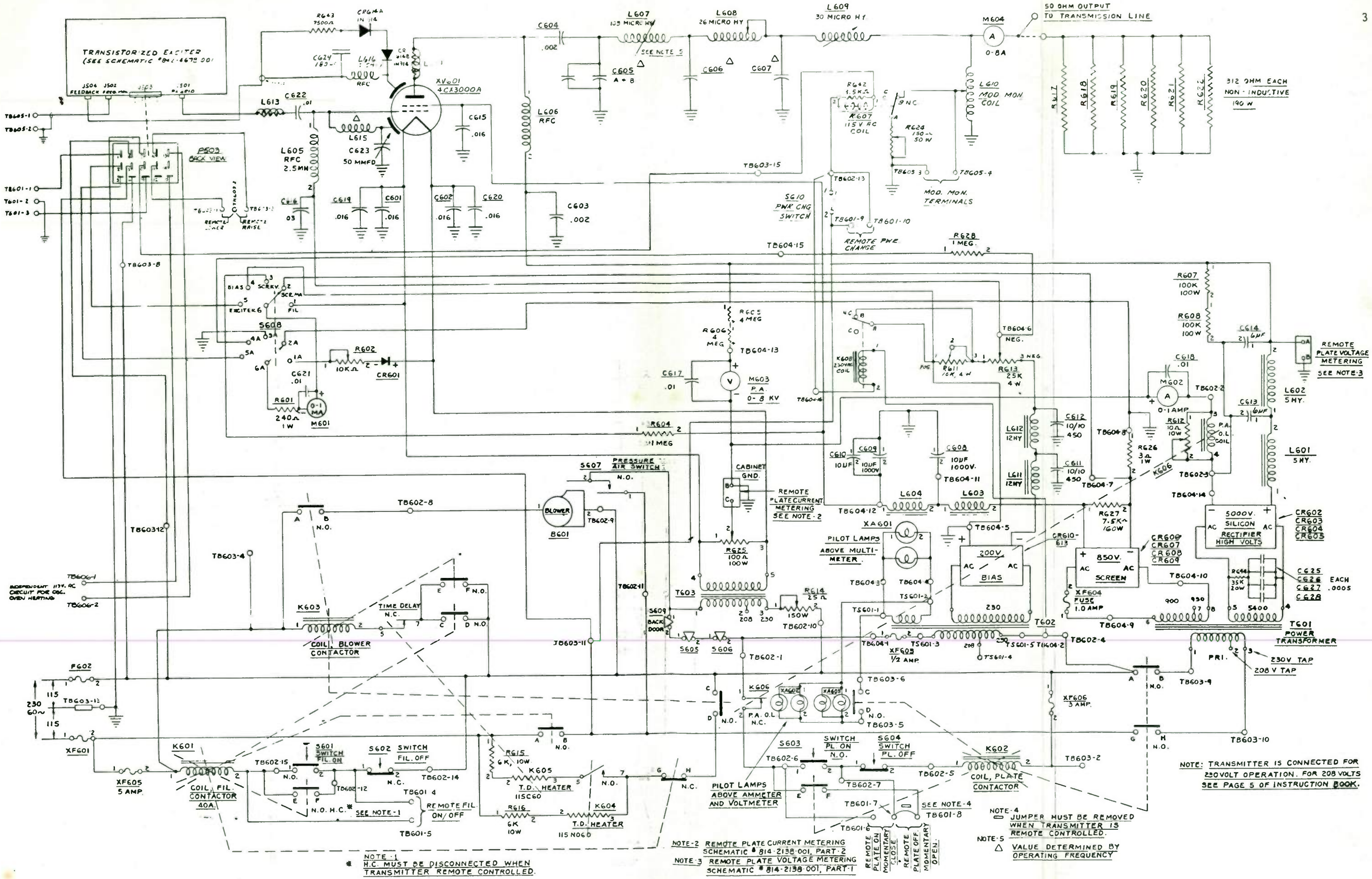
FREQ. MONITOR AMPLIFIER UNIT

C701	516 0054	Cap., .001 uf., 1KV.
C702, C703, C706, C708	516 0081	Cap., .01 uf., 1 KV.
C704	522 0268	Cap., 20 uf., 100 V.
C705	516 0084	Cap., .02 uf., 600 V.
L701	494 0155	RF Choke, 10 uhy.
Q701, Q702	380 0030	Transistor
Q703	380 0031	Transistor
R701	540 0200	Res., 68K ohm, 1/2 W., 10%
R702	540 0084	Res., 30K ohm, 1/2 W., 5%
R703	540 0162	Res., 47 ohm, 1/2 W., 10%
R704, R705	540 0190	Res., 10K ohm, 1/2 W., 10%
R706	540 0074	Res., 11K ohm, 1/2 W., 5%
R707	540 0070	Res., 7500 ohm, 1/2 W., 5%
R708	540 0184	Res., 3300 ohm, 1/2 W., 10%
R709	540 0730	Res., 150 ohm, 2 W., 10%
R710	542 1084	Res., 250 ohm, 5 W., 5%
XQ701, XQ702	404 0187	Socket, Transistor
	404 0188	Retainer Ring for Socket

LEGEND FOR PART ABBREVIATIONS:

Cap. = Capacitor or condenser
Res. = Resistor
R.F. = Radio Frequency
Pot. = Potentiometer or small rheostat
Neut. = Neutralize
PB = Push button
NO = Normally Open
NC = Normally closed
K = 000 or 6K is 6000
W = Watts
V = Volts
uf = Microfarads
pf = Micro microfarads

TUBE NOTE: Gates invites orders for the 4CX3000A replacement tube used in the Vanguard I transmitter. Due to the large use of this tube in both Vanguard I and other Gates transmitters, inventory is always fresh, which assures a non-gaseous tube at time of shipment. Same day delivery.



GATES RADIO COMPANY - QUINCY, ILLINOIS
A DIVISION OF HARRIS-INTERTYPE CORPORATION

OVERALL SCHEMATIC VANGUARD 1
1000/250W. A.M. BROAD. TRANSMITTER M6408
842 4677 001