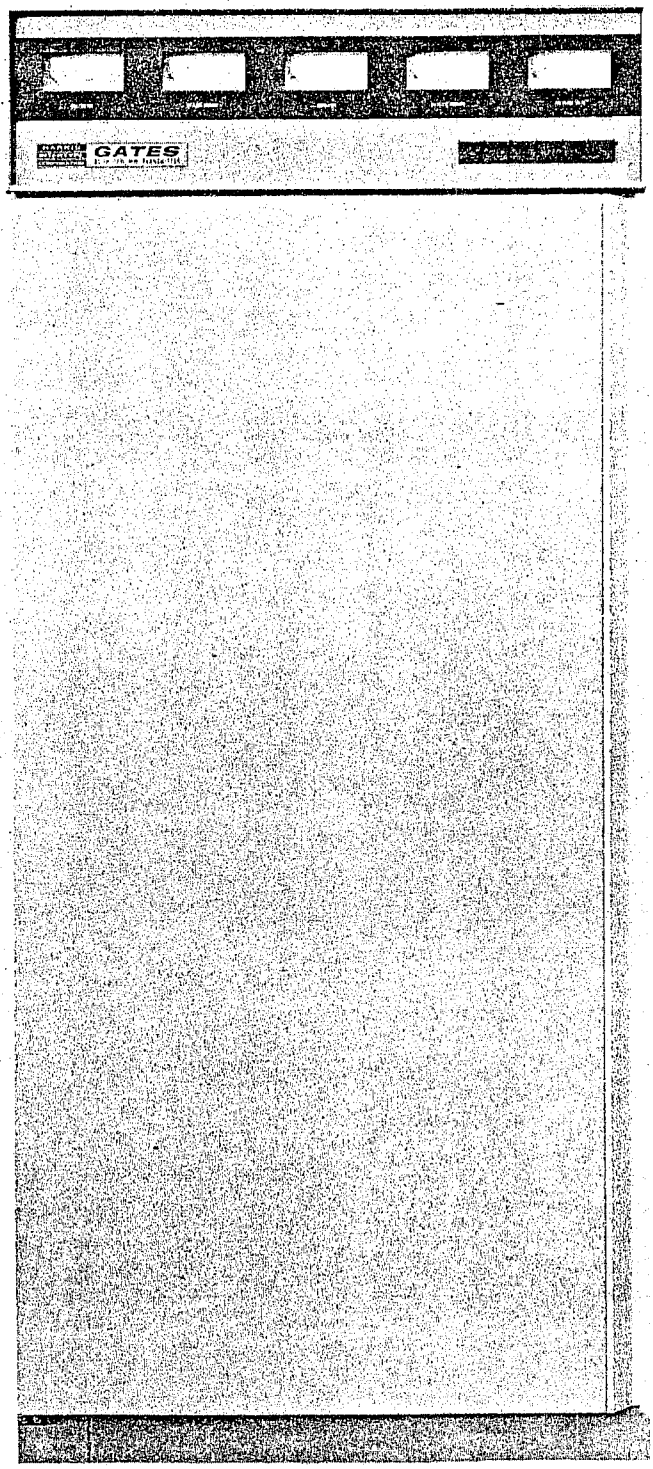
TECHNICAL MANUAL

BC-1H
AM TRANSMITTER
888-1115-001

T.M. No. 888-1115-001



BC-1H

AM TRANSMITTER

INTRODUCTION

This Technical Manual provides the necessary information for application, installation, operation, adjustment, and maintenance of the Model BC-1H, 1 kW transmitter.

WARNING

EXTREMELY DANGEROUS VOLTAGES EXIST IN THIS TRANSMITTER

Do not make adjustments inside the transmitter with the high voltage on. De-energize the transmitter when making repairs. Do not by-pass the interlocks. Do not do any servicing alone. Always ground circuits with a shorting stick before touching.

DO NOT TAKE CHANCES WITH LETHAL VOLTAGES!!

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.

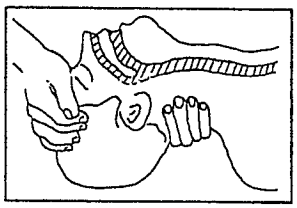
TREATMENT OF ELECTRICAL SHOCK

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

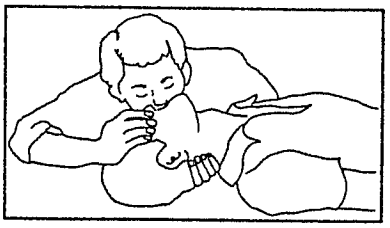
IF UNCONSCIOUS.
OPEN AIRWAY



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

(B) BREATHING

IF NOT BREATHING.
BEGIN ARTIFICIAL BREATHING

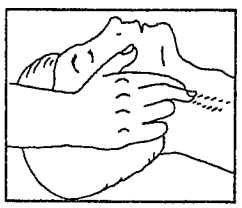


TILT HEAD
PINCH NOSTRILS
MAKE AIRTIGHT SEAL

4 QUICK FULL BREATHS

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

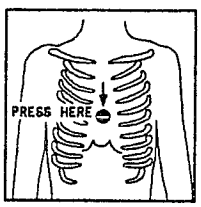
CHECK
CAROTID PULSE



IF PULSE ABSENT.
BEGIN ARTIFICIAL CIRCULATION

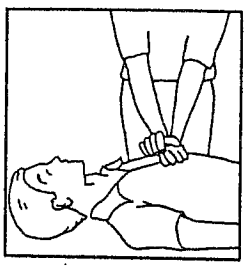
(C) CIRCULATION

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)

TABLE OF CONTENTS

SECTION 1 - DESCRIPTION

1.1 GENERAL

The BC-1H is an AM Transmitter exhibiting outstanding transmission quality and exceptional reliability. Thorough study of the Technical Manual is recommended as new circuitry and additional features have been added to this transmitter.

Some of the new features include a solid state oscillator and buffer amplifier, overload recycling usually found only in higher powered transmitters, and fixed bias on the PA stages preventing damage to the output tubes because of loss of excitation.

Additional features include a simplified control system for ease in remote controlling the transmitter, reduced audio input level requirements, and improved PA plate efficiency.

1.2 REMOTE CONTROL

The BC-1H transmitter may be operated by remote control by installing a remote control system, such as the Gates RDC-10AC. Terminations are provided on the BC-1H transmitter for remote operation.

It is important to initiate thorough inspection procedures and install means of monitoring temperature and humidity at the transmitter installation location.

TECHNICAL DATA

MECHANICAL:

Size:	72" high, 31½" wide, 31½" deep
Weight:	770 lbs. unpacked (approximate) 950 lbs. domestic packed (approximate) 1075 lbs. export packed (approximate) 68.7 Cu. Ft. cubage
Operating Temperature Range:	-20^{o} C to 50^{o} C
Operating Altitude Range:	Sea Level to 7,500 feet (Higher altitudes on special order)
Finish:	Beige – Gray

ELECTRICAL:

Power Input:	208/230 volts, 1 phase, 50 or 60 Hz 2.6 kW @ zero modulation 3.1 @ average modulation 3.85 kW @ 100% modulation
Audio Input:	600/150 ohm @ +10 dBm, ±2 dB
RF Frequency Range:	535 kHz to 1620 kHz (supplied to one frequency as ordered)
RF Frequency Stability:	±2 Hz
RF Output Impedance:	Supplied to 50 ohms (Other as specified)
RF Harmonics:	Exceeds FCC requirements
Carrier Shift:	Less than 3% @ 100% modulation
Audio Frequency Distortion:	Less than 2.5% @ 50 Hz to 10 kHz @ 95% modulation
Audio Response:	±1 dB, 50 to 10,000 Hz ±1½ dB, 30 to 12,000 Hz
Noise:	60 dB or better below 100% modulation
Power Output:	(Rated) 1,000 watts (Tested) 1,100 watts

TABLE 1.1

888 1115 001

SECTION 2 - INSTALLATION

2.1 PHYSICAL CONSTRUCTION

The BC-1H is 72" high, 31½" wide, and 31 3/4" deep. The total weight is 1,000 lbs. for a floor loading of 145 lbs. per square foot. The mounting location must be smooth and level.

2.2 POWER REQUIREMENTS

Simple phase, three-wire 50/60 Hz is required for primary power supply to the transmitter. The voltage may be either 208 or 240 volts ±5% by selecting the proper primary taps on the power and filament transformers. Three No. 8 TW wires should be used to connect the transmitter to a service disconnect switch which should be used for not more than 50 nor less than 30 amperes.

2.3 SIGNAL CONNECTIONS

The audio input is connected by means of one (1) two conductor shielded cable to terminate 29 or 30 on terminal board No. 2. The shield of this cable is connected to terminal No. 28.

The frequency monitor is connected to terminal 26 of TB-2 by means of a coaxial cable similar to RG 58 or RG 59. The modulation monitor is connected to terminal 24 on TB-2 with a similar coax line and the outer sheaths of these lines are connected to TB-2-27 and TB-2-25 respectively.

2.4 INITIAL INSTALLATION

2.4.1 Set the transmitter on a smooth, level location. Capable of supporting a load of 145 pounds per square foot.

2.4.2 Install all components which have been removed for shipment.

NOTE: Each component will have a stenciled identification number and a similar number will mark the mounting location. All necessary connections to the components will be individually marked to aid in the reassembly.

2.4.3 Connect the 208/240 volt three-wire single phase power to XF1 Fuse block with the central wire connected to the ground terminal. See Figure 2.1.

2.4.4 THIS IS A VERY IMPORTANT CONNECTION! Connect, as a minimum, a one inch copper ground strap tc the aluminum of the RF output network enclosure. Connect this ground strap directly to the main antenna ground system at the junction of the radials termination under the tower.

2.4.5 Connect the transmitter output lead to the feed thru bowl located on the top of the transmitter.

NOTE: If a coaxial cable is used, connect the outer shield of the cable securely to the metal frame of the transmitter. If an insulated, jacketed, coaxial cable is utilized, be sure that the connection is made directly to the outer metal shield. This ground connection is very important in the operation of the transmitter.

2.4.6 Mount the 807 tubes in their sockets and connect their plate leads. See Figure 2.1.

2.4.7 Install the modulator and PA tubes. Be sure that the filament connectors, and the grid and plate connectors are tightened against their respective tube prong by means of the thumb screw.

NOTE: All large transmitting tubes have a tendency to become gaseous and during this condition the tube could be destroyed under high voltage application. To prevent this, the following tube degassing procedure should be initiated.

1. After installing the transmitter tubes, turn on the filaments for a 30 minute period. (Filaments only, not the high voltage.)

2. After the tuning procedure of paragraph 3.2 has been completed, turn on the high voltage for 15 minutes with NO Modulation. (Zero audio input.) Make a thorough inspection of all electrical connections and mechanical junctions. Direct special attention to all grounding straps.

2.5 CONTROL DESCRIPTION

The following controls and indicators are illustrated in Figure 2.2.

2.5.1 TRANSMITTER START

This push-button supplies power to all filaments and, when all interlocks are closed, applies power to bias and low voltage plate supplies. This latter condition is indicated when the light comes on in either the High power or the Low Power push-button.

2.5.2 POWER—HIGH AND LOW

Two push buttons select the high or low power. The button lights red to indicate high power operation and green for low power. These switches are connected through the door interlocks. All doors must be securely closed for operation.

2.5.3 HIGH VOLTAGE ON

This push button turns on the primary voltage power supply. The button lights red to indicate operation.

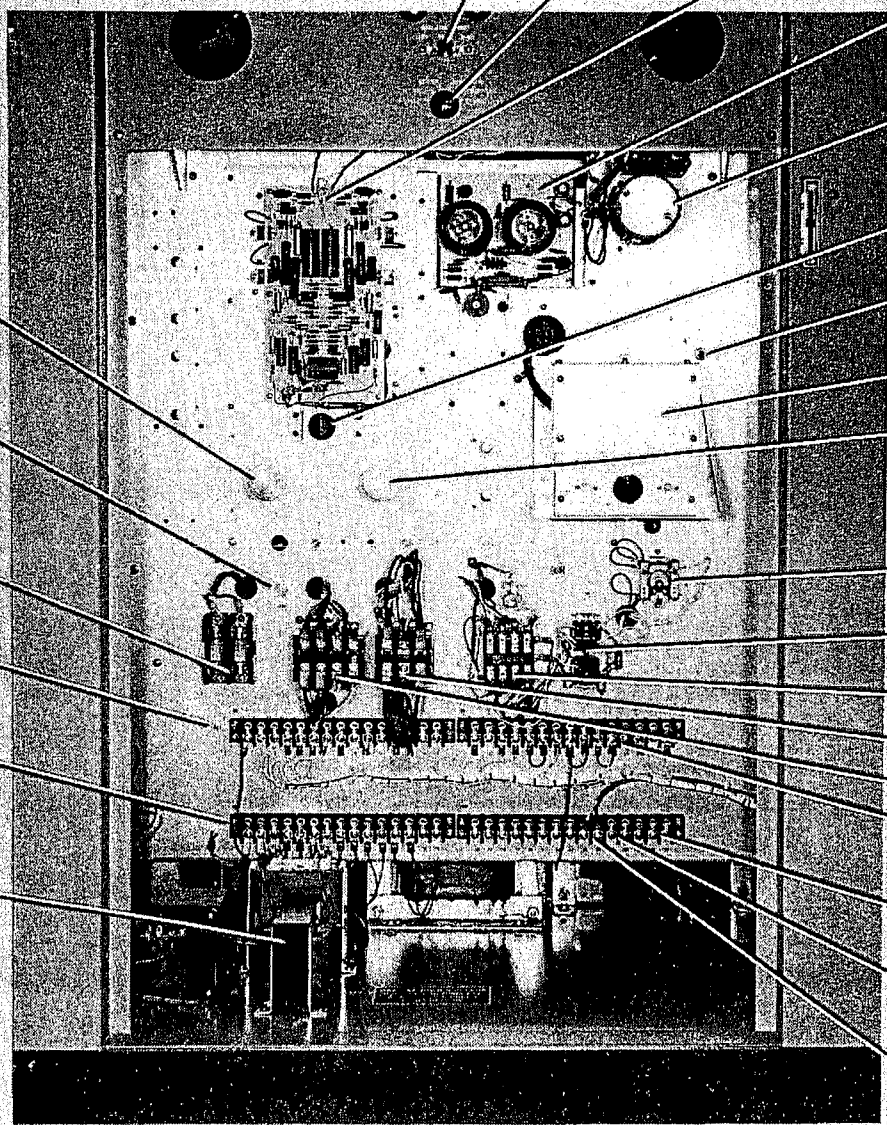
2.5.4 HIGH VOLTAGE OFF

This push button turns off the high voltage. The button does not light.

2.5.5 TRANSMITTER STOP

This push button turns off the filaments and the fan. The button does not light.

NOTE: It is recommended that two or three minutes elapse between operation of the "HIGH VOLTAGE OFF" button and the "TRANSMITTER STOP" button. This will tend to increase tube life.



LOWER FRONT SECTION
BC-1H TRANSMITTER

FIG. 2.1

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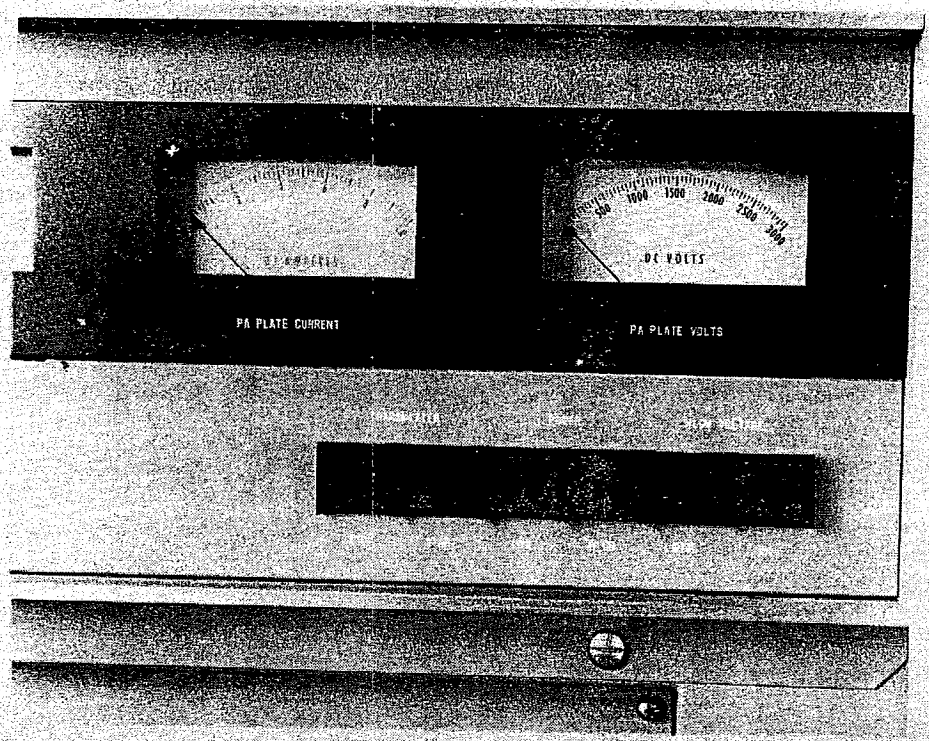

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BC-1H TRANSMITTER CONTROL
FIG. 2.2

2.6 REMOTE CONTROL INSTALLATION

2.6.1 GENERAL

Installation instructions provided here relate only to those functions within the transmitter which fulfill the requirements of the FCC. Since all remote control installations have some special considerations, it is recommended that these be carefully considered during the planning of the installation. Usually the instruction book accompanying the particular remote control equipment being used will provide many helpful hints for these special instructions. The following, however, designates the special connections for the BC-1H transmitter.

2.6.2 TRANSMITTER START

The FCC requires that the transmitter be completely under control of the remote control equipment at all times. This is accomplished by providing a contact closure across terminals TB1-28 and 29 in the transmitter that is continuously closed as long as the remote control equipment is in operation. The LOCAL—REMOTE switch, S3, see Figure 2.1, is thrown to the REMOTE position for the required Fail-Safe Operation.

When Fail-Safe Operation is not required, a remote Transmitter Stop function can be accomplished by providing a normally closed contact connection to terminals TB1-25 and 26 and removing the link between these two terminals. When this mode of operation is desired, the LOCAL—REMOTE switch is left in the LOCAL position and a momentary closure contact is connected to the Transmitter Start terminals, TB1-28 and 29.

2.6.3 POWER CHANGE

This function is accomplished by connecting momentary closure contacts from the remote control equipment to terminals TB1-9 and 13 for LOW POWER operation and terminals TB1-12 and 13 for HIGH POWER operation. Power Change by remote control is accomplished in the same manner as for local operation. Remove High voltage from the transmitter, change power and then restore the high voltage. The Power Change operation cannot be accomplished within the transmitter until the high voltage is removed.

2.6.4 HIGH VOLTAGE ON AND OFF

The High Voltage On function is accomplished by connecting momentary closure contacts to terminals TB1-15 and 17. The High Voltage Off function requires normally closed contacts connected to terminals TB1-20 and 21 with the jumper removed. The High Voltage Off function in the remote control equipment is then in series with the transmitter OFF switch.

2.6.5 P.A. PLATE CURRENT AND VOLTAGE METERING

These two essential metering samples are available from devices included in the BC-1H so that nothing needs to be added to the transmitter for these purposes. The Plate Current sample is available at terminals TB2-21 and 22 with 22 being the positive terminal. The Plate Voltage sample is available at TB2-20 and 29 with 20 being the positive connection. Both of these samples provide 1 to 3 volts d.c. that is proportional to the respective current or voltage. The remote Current sample is adjustable by means of R31 and the Voltage sample by R28 so that the remote metering may be made to agree with the transmitter meters.

2.6.6 POWER CONTROL

Remote control of the Power Output of the BC-1H may be accomplished in one of two ways: Remote operation of the Loading Control or by remote adjustment of the Plate Voltage applied to the P.A. stage. In the BC-1H, the latter method is recommended since it is the easiest to accomplish and is usually the most reliable. It requires the addition of a motor-driven rheostat such as the Gates 994-4703-003 Motor Operated Rheostat. It is installed in a convenient location in the rear of the transmitter cabinet on the right side wall (viewed from the transmitter rear). The Rheostat is connected in series with the P.A. plate voltage lead by connecting it between the insulated standoffs, PA1 and PA2. Power for operation of the motor is available at the terminals supplying power to the transmitter cooling fan located in the rear door. Control of the motor is then connected to the remote control equipment as suggested in the instruction book for this equipment.

This motor driven rheostat should provide sufficient variation of the transmitter output power to compensate for variations resulting from normal line voltage fluctuations or other minor changes in the transmitter performance. The best adjustment requires the minimum of resistance consistent with the needed range of adjustment.

SECTION 3 - OPERATION AND ADJUSTMENT

3.1 GENERAL

The BC-1H transmitter is thoroughly factory tested. Variations in primary power, antenna system, and transmission line differences may require slight adjustments.

NOTE: Certain measurements are required by FCC Regulations and the following list of test equipment, or the equivalent, is recommended.

3.1.1 A source of detected RF output signal from the transmitter, such as a high fidelity audio output from the station's modulation monitor.

3.1.2 An audio oscillator with less than 1% distortion, such as the B&W Model 210.

3.1.3 A noise and distortion meter, such as the B&W Model 410.

NOTE: Gates Radio "Proof of Performance" package, SA-131 is recommended to verify FCC proof of performance requirements.

3.2 TUNING PROCEDURE

3.2.1 Determine that all RF tuning coils have shorting clips or rotors in the positions marked during factory tune-up. (Small black marks on coil.)

3.2.2 Unfasten the meter panel and be sure that the RF line meter is connected to the transmitter output and to either the transmitter dummy load or the station's antenna system. See Figure 2.3.

3.2.3 Push the "TRANSMITTER START" button. The fan in the back door should start. The filaments should light. Also, if all interlock switches are closed (doors and panels in place), either the "HIGH" or "LOW" power push button should light.

3.2.4 Push the "LOW POWER" push button switching transmitter to the low power position.

3.2.5 Set multimeter switch (See Figure 2.4) to the "FILAMENT" position and adjust the "FILAMENT VOLTAGE" control until the meter reads to the line drawn on the meter or 10 volts.

3.2.6 Move the multimeter switch to the "PA GRID" position and adjust the "IPA TUNING" control for maximum indication on the meter. See Figure 2.4.

3.2.7 Adjust the Modulation Monitor input until an output from the transmitter is indicated on its Carrier meter. Adjust the PA "TUNING" Control until this indication reaches a maximum peak.

NOTE: If no indication can be obtained on the Modulation Monitor, couple an oscilloscope or other sensitive R.F. indicating device to the output of the transmitter.

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3.2.8 Remove the plug button on the front panel. See Figure 2.4. Using a flat blade screw driver, adjust the Neutralizing Capacitor for a minimum output indication. Replace plug button. Reduce modulation monitor pickup to prevent damage to monitor when transmitter is tuned.

3.2.9 Press "HV ON" button. An indication should now appear on the Plate Voltage Meter, the Plate Current Meter, the Modulator Plate Current, and the RF Line Current.

3.2.10 Adjust Plate "TUNING" for a resonant indication on the Plate Current meter.

3.2.11 Adjust "LOADING" control to provide the desired power output at "LOW POWER" as indicated on the RF Line Current Meter.

3.2.12 Holding the RF LINE CURRENT Meter reading constant with the "LOADING" control, turn the "TUNING" control in the direction that reduces the PA Plate Current for the same indication on the RF LINE CURRENT. Continue this adjustment until the Plate Current reaches its minimum value.

3.2.13 With the "Modulator Selector Switch" on the No. 1 Modulator position adjust the Bias control for approximately 20 mA. Switch to Modulator No. 2 and adjust its Bias to the same value.

3.2.14 Push the "HV OFF" button. Push "HIGH POWER" button. Push "HV ON" button.

3.2.15 Readjust "PA LOADING" for desired output power. Readjust "PA TUNING" according to paragraph 3.2.12. Readjust R.F. DRIVER TUNING for maximum PA Grid Current.

3.2.16 Referring to Table 6.1, Section 6, confirm that all meter readings fall within their correct ranges at both "HIGH POWER" and "LOW POWER" operation.

3.3 LOW POWER ADJUSTMENT

3.3.1 GENERAL

This transmitter has been adjusted and tested at the factory at all power levels specified on order. Adjustment steps as outlined below are not necessary for those powers requested. However, the BC-1H transmitter is FCC type accepted for operation at 1 kW, 500 watts, and 250 watts. The following procedure allows for adjustment of the transmitter to some other power reduction if desired.

3.3.2 Refer to Drawing No. 852-6714-001. Arrange jumper connections on TB-2 terminal board as indicated for the desired power reduction.

3.3.3 Adjust the Bias change resistor, R13, so that the Modulator Static Plate Currents remain the same at LOW POWER as at HIGH. R13 will require approximately 1/3 of its resistance for 500 watt operation and all of its resistance for 250 watt operation.

3.3.4 Adjust Modulation Monitor Pickup Adjustment, R34, to provide the same reading on the Modulation Monitor for both High and Low power operation.

3.3.5 The Audio Input Signal adjustment is made by modulating the transmitter 100% first with 1,000 Hz tone at the High Power operation, then adjusting R14 in the input audio pad until the same audio input level modulates the transmitter 100% in the Low Power operation.

3.4 ADJUSTMENT OF SECOND HARMONIC TRAP

3.4.1 The Second Harmonic Trap, consisting of C43 and a portion of L41, is adjusted at the factory to the Second Harmonic of the operating frequency as ordered. Normally, no additional adjustments are required unless the operating frequency is changed or the adjustment has been changed for various reasons.

3.4.2 Couple a communications receiver to the output of the transmitter very loosely making certain that the input of the receiver is not being overloaded by the transmitter at the operating frequency. Tune the receiver carefully to the Second Harmonic.

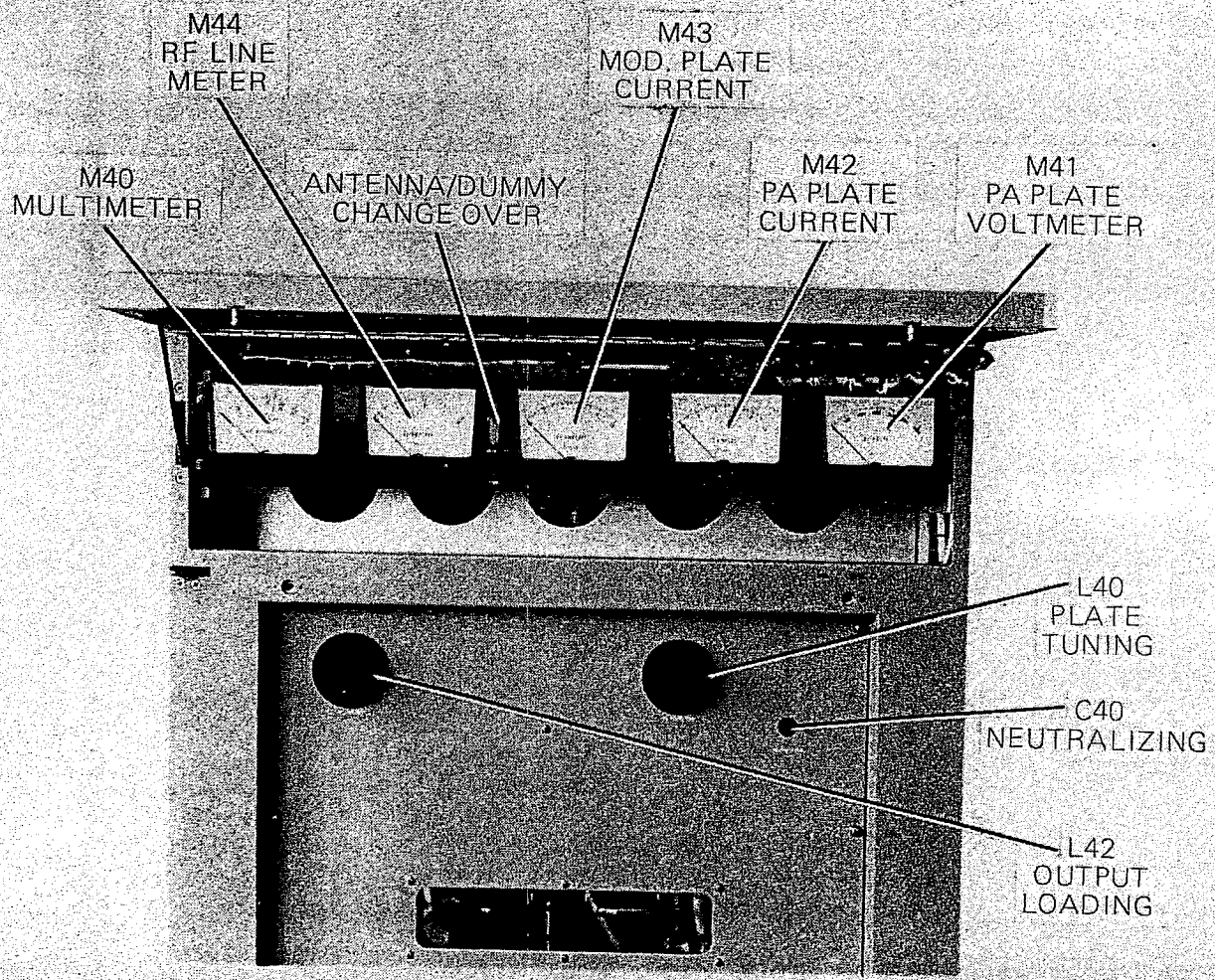
3.4.3 Turn the small tuning vane at the left end of L41 (as viewed from the back) in small steps from parallel to the axis of the coil to parallel with the end turn of the coil. This adjustment can be made in small increments by shutting down the transmitter, opening the rear door and moving the vane slightly, closing the door and re-starting the transmitter.

3.4.4 While moving the vane observe the output of the receiver as indicated on the S-meter. If the tap is on the correct turn of L41, the harmonic output will go through a very pronounced dip. If the dip does not appear, move the tap on L41 one turn either way and try again.

3.4.5 Repeat steps 3.4.4 until satisfied that the Second Harmonic energy out of the transmitter is as low as possible.

NOTE: The effectiveness of this harmonic trap depends to some extent on the impedance characteristics of the antenna system, at the Second Harmonic frequency.

To eliminate the effects of the antenna system check the harmonic output of the transmitter when operating into a dummy load.



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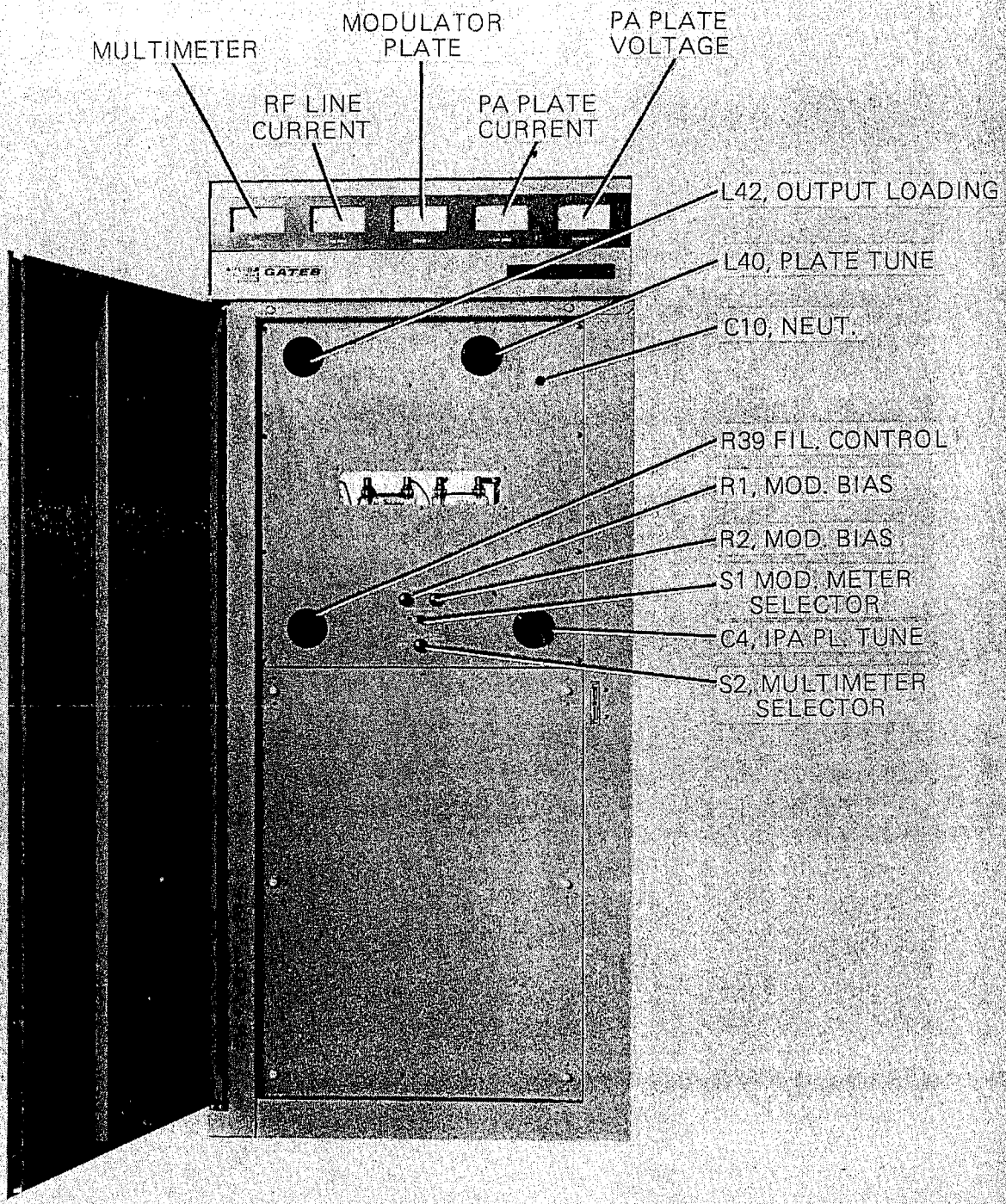
METER PANEL—RAISED
BC-1H TRANSMITTER

FIG. 3.1



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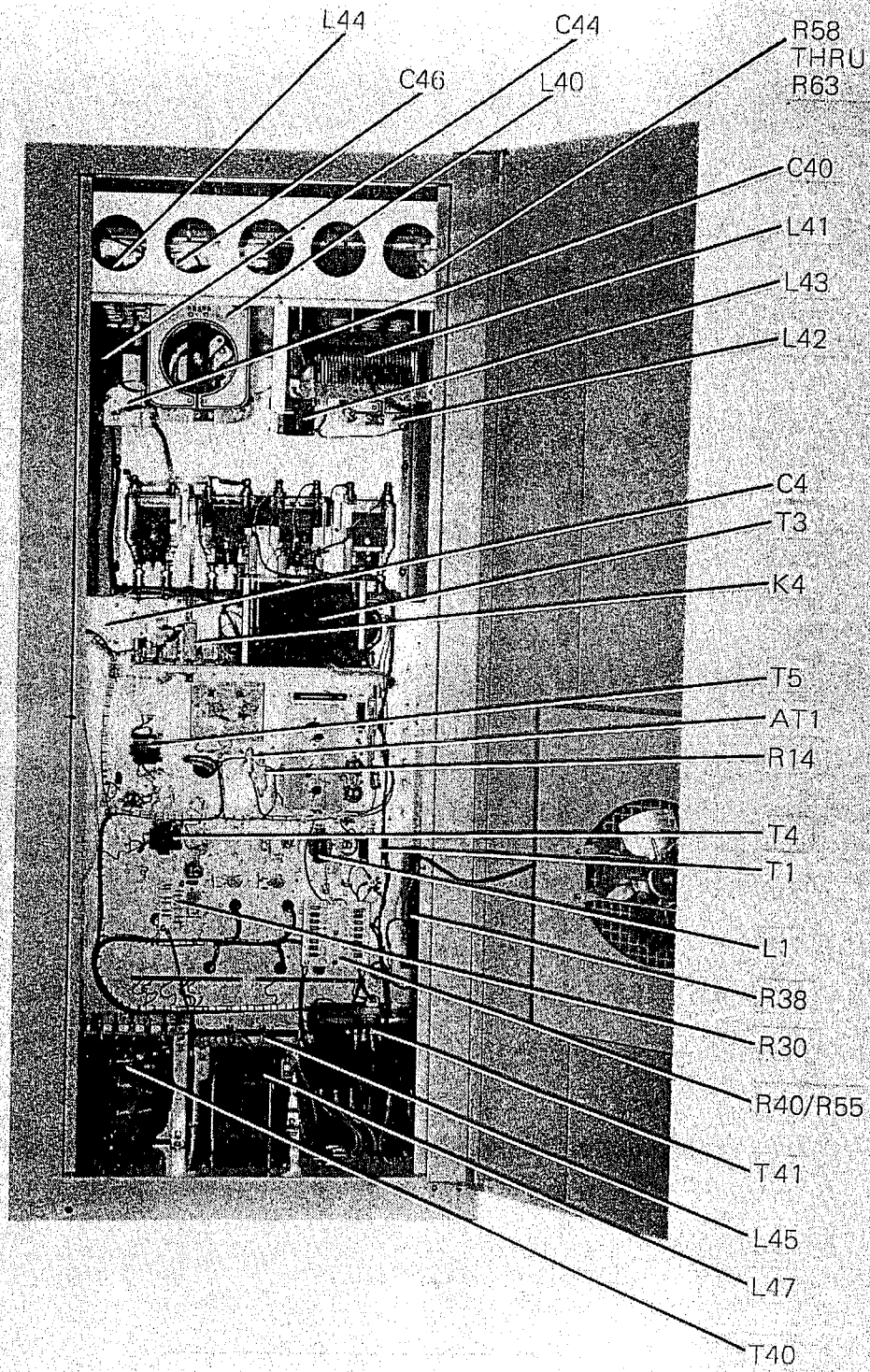
FRONT VIEW- DOOR OPEN
BC-1H

FIG. 3.2



REAR VIEW DOOR OPEN
BC-1H

FIG. 3.3

SECTION 4 - THEORY OF OPERATION

4.1 CONTROL CIRCUITS

The Control Circuits operate on 230 volts or 208 volts, 50 or 60 Hz, single phase, three wire. The grounded neutral is required only for operation of the fan and to apply half voltage to the primary of the High Voltage Plate Transformer for 250 watt operation.

4.1.1 TRANSMITTER TURN–ON

This transmitter is energized by pushing the "Transmitter Start" button. This applies power to the filament transformer. If all interlock switches are closed, power will also be applied to all Low Voltage Power Supplies. This latter condition is indicated by the appropriate Power Change pushbutton lighting.

The High Voltage may now be applied by pushing the "High Voltage On" pushbutton. This action applies power either to K2 or K3 depending upon whether high or low power has been selected for operation. These relays, in turn, apply power to the appropriate High Voltage Plate Transformer taps.

The "High Voltage On" button also energizes an auxiliary relay, K9, which disconnects the Power Change circuitry, preventing operation except when the high voltage is off.

4.1.2 POWER CHANGE

When the "Power Change" push buttons are actuated the position of a high voltage latching relay is changed. The "Power Change" push buttons also switch an audio level change pad, a modulator bias change relay, and change the modulation monitor output.

This automatically assures correct operating conditions for the two power output levels.

4.1.3 OVERLOAD RELAYS

The overload relays are small D.C. relays connected across small resistors. The resistors are adjusted to provide a sufficient voltage drop to operate the relays when the currents through the resistors exceed a prescribed value. The overload relay resistors are in series with the PA cathode return and the combined cathode return of the Modulator tubes.

4.1.4 RECYCLING

When an overload condition actuates either of the overload relays, a D.C. charge is applied to the capacitor in the recycling circuit. If the overload occurs repeatedly, sufficient charge is built up in the capacitor to operate the recycle relay, this will open the circuit to the H.V. relay and de-energize the high voltage. The number of D.C. charges required to charge the capacitor sufficiently to operate the recycling relay is dependent upon the adjustment of the resistance in series with the capacitor.

4.2 POWER SUPPLY

4.2.1 HIGH VOLTAGE

The high voltage power supply is a single phase bridge, silicon rectifier power supply. It supplies plate voltage to both the modulator tubes and the power amplifier through a single section, choke input filter.

Power reduction of the PA is accomplished by reducing the voltage of this supply in two ways. For 250 watt operation, one side of the High Voltage transformer primary is connected to ground so that only ½ the primary power voltage is applied to this winding. For 500 watt operation, the power is supplied to an extended winding tap of the transformer primary. This provides approximately 70% of the 1 kW high voltage to the plates of the PA stage.

4.2.2 INTERMEDIATE SUPPLY

The Intermediate Plate Supply is a single phase bridge, silicon rectifier supply. It supplies plate and screen voltages to the R.F. Driver stage through a single section filter, and supplies the plate and screen voltages for the audio driver through a second stage of filtering.

4.2.3 BIAS AND EXCITER SUPPLIES

Three small supplies employing full wave, silicon rectifiers are located on the middle panel and shelf assembly. These supplies provide bias voltages for the modulator tubes, the PA tubes, and operating voltages for the Solid State Exciter.

The modulator bias supply is filtered by a choke input, single section filter. The exciter supply and the PA Bias supply are adequately filtered by a single capacitor.

4.3 R.F. EXCITER

This solid state oscillator and buffer stages consist of three transistors arranged in a highly stable and reliable circuit, providing more than adequate drive to the 807 Driver stage.

The oscillator is a voltage stabilized, transistor Pierce oscillator using the time-proven vacuum crystal. The crystal operates in its series resonant mode with a small trimmer capacitor to provide zero adjustment of the frequency.

The collector voltage of the oscillator is stabilized by the zener, CR1.

A very loosely coupled, low gain transistor stage serves as a buffer between the oscillator and the output stage. Its collector voltage is also stabilized by a zener to further isolate Q3 from the oscillator as regards to changes in loading, etc., which might reflect in changes in oscillator frequency.

The output transistor operates in a Class C mode and is coupled to the grid of the 807 RF Driver through a two section "Pi" network that requires the only tuning in the exciter. The "Pi" network provides an impedance transformation from the collector of Q3 to the input of the 807 stage and is simply adjusted for most efficient coupling.

Metering of the exciter is provided on the multimeter by measuring the voltage drop across a 1 ohm resistor in series with the collector voltage of the output transistor. This reading reflects the R.F. output from the exciter.

1.4 R.F. DRIVER

This stage uses two 807 tubes connected in parallel to drive the 833 power amplifier tubes. Bias for the grids of these tubes is provided by both a fixed source and from R.F. excitation. The fixed bias is derived from a resistor across the modulator bias supply and protects the tubes against over dissipation when excitation is removed.

The screen voltage for the tubes is derived from a dropping resistor connected to the same supply as the plates. This supply to the 807 Driver stage is modulated approximately 10 to 15% by means of the tertiary winding on the modulation transformer. This auxiliary modulation is of substantial benefit in reducing carrier shift and, to a lesser extent, distortion.

The output of the R.F. Driver stage is a tuned tank circuit having its R.F. ground in approximately the center of the tank coil. Tuning is accomplished by changing a variable air capacitor which is always adjusted for maximum P.A. Grid Current.

4.5 POWER AMPLIFIER

The Power Amplifier stage uses two, long proven, extremely rugged, dependable 833 tubes in parallel operating as a Class C high level, plate modulated power amplifier. The circuitry used in the BC-1H transmitter is conventional, but incorporates a number of advances which provide many benefits in reliability, ease of adjustment, improved plate circuit efficiency and protection against unknown severe loading conditions, loss of excitation and spurious oscillations.

A fixed bias supply is provided which maintains a maximum of 200 watts plate dissipation even without R.F. excitation. This permits operation of the PA without excitation as a troubleshooting aid and also protects the tubes against damage caused by loss of excitation. This bias supply in proper relation with the excitation bias materially assists in improved modulation performance.

Neutralization of the power amplifier stage is accomplished by coupling a portion of the output back to the opposite end of the R.F. Driver Plate coil through a variable air capacitor. Good neutralization takes place when the value of this capacitor is adjusted such that the voltage fed back to the grid circuit by this capacitor is equal and opposite in phase to that fed from the output of the PA by means of the grid to plate capacitance and by means of external circuitry.

Proper operation of the Power Amplifier circuit, assuming good tubes, is always achieved, by ample R.F. Drive, proper neutralization, and proper loading of the plate circuit.

4.6 OUTPUT CIRCUIT

The Output Circuit provides optimum coupling between the PA tubes and the load by correctly matching the load to the tube plate impedances. It also assures at least 73 dB attenuation between all harmonic and spurious frequencies and the operating frequency by generating the highest possible reactance to resistance ratio at the plate of the tubes for all R.F. frequencies other than the fundamental.

Two considerations are important in selecting components for this Output Circuit. A circuit "Q" of 5 to 8 is desirable at the plate end in order to provide good plate circuit efficiency and broad enough impedance characteristics for good modulation performance. Secondly, the overall phase shift of the circuit must be near 225 electrical degrees if proper functioning of the "Load" control and the "TUNE" control is to be obtained.

Added attenuation at the second harmonic frequency is provided by resonating a small portion of the center loading coil with a capacitor. This circuit is made parallel resonant to the second harmonic of the operating frequency by adjusting the number of turns in the coil and by adjusting a small disk located in the end of the coil for fine adjustments.

A small coil across the output of the transmitter provides a sample of the output for the modulation monitor and also serves as a static drain.

A dummy load is provided consisting of six non-inductive resistors in parallel. The transmitter may be fed either to the station's transmission line or to this dummy load by simply plugging the "RF Line Current Meter" to the desired jack, located under the meter panel.

4.7 AUDIO DRIVER

The Audio Driver consists of a push pull voltage amplifier stage and a push pull cathode follower stage driving the grids of the modulator tubes.

Balance between the two halves of the push pull voltage amplifier is accomplished by adjusting the relationship of the common bias resistor to the cathodes of the two tubes.

Bias for the modulator tubes is controlled by adjusting the bias to the respective cathode follower drivers since the modulators are direct coupled to their respective driver.

Feedback of approximately 10 dB is accomplished by sampling the signal at the plates of the modulators and feeding this sample back to the secondary of the input audio transformer. The balance of the feedback voltage is adjustable by a potentiometer connecting ground to the center of the feedback voltage sampling resistors.

4.8 MODULATORS

The modulators are two 833 tubes operating Class AB. The plate impedance of these tubes is matched to the load provided by the PA by the combination of the modulation transformer, the modulation reactor, and the modulation blocking capacitor. All three are an integral part of the BC-1H modulation system.

The modulation transformer has a second winding on the secondary that provides approximately 10% modulation of the R.F. Driver. This auxiliary modulation aids on modulation peaks and when properly polarized materially improves carrier shift.

SECTION 5 - MAINTENANCE

5.1 GENERAL

It is recommended that a regular documental cleaning and inspection schedule be initiated. This is of paramount importance in remote installations.

5.2 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.

5.3 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.

5.4 DC VOLTAGE CHECK

D.C. Voltages should be measured and recorded at appropriate points throughout the overall schematic. The same voltmeter to be used for troubleshooting should be utilized.

5.5 ORDERING REPLACEMENTS PARTS

Please list the Gates stock number and parts description as tabulated in the Parts List when replacements are ordered from Gates Radio Company.

5.6 CARE OF 833 TUBES

Filaments are of thoriated-tungsten and their voltage measured at the tube base must be maintained ±5% of 10 volts. Extended life is possible by operating the filaments at 9.5 volts and gradually increasing this voltage as the tubes begin to age.

All connections to the tube must be kept tight and free of dirt to avoid excessive terminal resistance.

5.7 AIR FILTERS

The air filter mounted in the rear door must be kept clean by thoroughly brushing and washing. The frequency of washing depends upon the location and the amount of dust in the air, but it should be often enough that a free flow of clean air goes through the transmitter at all times.

5.8 MODULATOR IDLING CURRENTS

It will be found that the modulator idling currents (currents drawn by the two modulator tubes when no audio input is applied) have an effect on measured performance of distortion. As the modulator static currents rise, distortion will decrease, more heat will be developed at the modulator plates, and the transmitter will draw more current from the power line. For a reasonable balance of these factors an idling current of .20 to .40 ampere per tube is recommended; satisfactory performance may be obtained in some cases with as little as .10 ampere per tube, and there is no point in increasing the idling current past .40 ampere per tube to improve performance.

5.9 RECYCLING

Overload relays, operate to remove voltage from the main HV supply momentarily for the duration of overload, high voltage is restored automatically. In the event, of several closely-spaced overloads, the "Memory" relay will remove plate voltage, and the transmitter will have to be turned back on manually.

SECTION 6 - TROUBLESHOOTING

6.1 EXCESSIVE CARRIER SHIFT

Excessive carrier shift may be caused by poor line voltage regulation. Monitor the line voltage before and during tone modulation. If the line voltage drop is greater than 1%, insist that the power company improve the regulation.

Marginal cases may be improved by running higher modulator static currents.

Other possible causes of excessive carrier shift are:

6.1.1 Weak, or old tubes, along with low filament voltage.

6.1.2 Drive to power amplifier tube too low.

6.1.3 Mis-tuned power amplifier.

6.1.4 Poor neutralization of power amplifier.

6.1.5 Incorrect measurement of power output, resulting in excessive power output demand from transmitter.

6.2 HIGH DISTORTION AT HIGH AUDIO FREQUENCIES

Excessive distortion at high audio frequencies when distortion is near normal at mid-frequencies is usually caused by the selectivity of the antenna system 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.

Compare results achieved between operation into the dummy load against those into the antenna.

6.3 EXCESSIVE NOISE OR HUM

High noise or hum levels can be caused by a number of things which introduce these unwanted signals into the system. For this reason, the first step in determining the cause is to determine the main frequency content of the noise or hum. Be sure the noise or hum is not being introduced into the transmitter by way of the audio input from a previous piece of equipment.

High frequency noise, appearing as "grass" on the oscilloscope is caused by R.F. entering the audio system or being generated by it.

Hum of 120 Hz is the result of poor filtering in the power supplies, usually, and may point to a defective filter capacitor.

Hum that is predominantly 60 Hz is probably the result of the audio system acting in some kind of relationship with the power line.

Noise and hum is balanced out by balancing the modulator static plate currents for minimum noise and by balancing the feedback.

6.4 EXCESSIVE OVERLOAD RELAY OPERATION

Overload relays are designed only for protection of the transmitter against severe malfunctioning of some part of the system.

Overload relays should never be permitted to operate because of programming material. If they operate occasionally for no apparent reason, the resistor across which they are connected should be reduced approximately 10% less than that point which will cause an occasional operation with any kind of program material.

6.5 POOR EFFICIENCY

Plate circuit efficiency in the BC-1H should be as high as possible and will usually be between 72 and 80%. Efficiencies below these values cause excessive dissipation, shorter tube life, excessive power consumption and, possibly poor modulation characteristics.

Causes of poor efficiency are:

1. Measurement errors in measuring power input or power output.
2. Inadequate R.F. grid drive.
3. Poor tuning of the plate circuit.
4. Poor neutralization.
5. Bad tubes.
6. Low filament voltage.

A good starting point to determine cause of poor efficiency is to first tune transmitter carefully as outlined in Section 3, paragraphs 3.2.10 thru 3.2.12. Note best attainable plate circuit efficiency. reduce output by "unloading" transmitter to about 80% or 800 watts. Readjust for maximum efficiency again.

If the second efficiency figure is greater than the first by a significant percentage, it is likely that either causes 1, 2, 4, or 5 above may apply. However, if the two efficiency figures are essentially equal, in all probability there is an error in measurement in either the power input or the power output and the problem resolves to a determination of where this error occurs.

TYPICAL METER READINGS

NOTE: All readings are based on 1000 watts output into a known load.

1 kW OPERATION

METER	METER READING
Mod. Plate Current (2 Tubes)	.20 to .80 Amperes
Filaments	9.5 to 10.5 Volts
1st Audio Amp Plate Current	4.0 to 5.0 mA
R. F. Exciter	63 to 77 mA
R. F. Driver Grid Current	6.9 to 8.5 mA
R. F. Driver Plate Current	155 to 200 mA
P. A. Grid Current	85 to 120 mA
P. A. Plate Voltage	2700 to 2900 Volts
P. A. Plate Current	430 to 490 mA
R. F. Line Current (50 Ohms)	4.47 Amps

500 WATT OPERATION

P. A. Plate Voltage	1900 to 2140 Volts
P. A. Plate Current	292 to 365 mA
R. F. Line Current (50 Ohms)	3.16 Amps

250 WATT OPERATION

P. A. Plate Voltage	1300 to 1580 Volts
P. A. Plate Current	200 to 256 mA
R. F. Line Current	2.25 Amps

TABLE 6.1

SECTION 7 - PARTS LIST

BC-1H

SYMBOL	DESCRIPTION	GATES PART NO.
AT1	Audio Input Pad Assembly	992 3313 001
A1 thru A4	Lamp No. 381	396 0182 000
B40	Fan Motor	436 0004 000
	Fan Blade	430 0003 000
C1	Cap 1 uF 1 kV (Audio Filter)	510 0497 000
C2	Cap .002 uF 1200 Volt (807 Blocking)	500 0666 000
C3, C12	Cap 4 uF 600 V Audio, Decoupling & Bias	510 0345 000
C4	Cap (807 Tank Tune)	520 0068 000
C5, C6	Cap .01 uF 600 V (PA Fil. Bypass) P/O Tube Socket Assy)	500 0653 000
C7, C8	Cap .01 uF 1 kV (PA Bias Bypass)	516 0082 000
C13, C14	Cap 900 uF 100 V (Bias & Exciter Filter)	524 0146 000
C15	Cap 16 uF 450 V (Recycle Capacitor)	522 0031 000
C18	Cap (Type F2) (Det. by Freq.)	
C40	Capacitor Neutralizaing PA	992 1381 000
C41, C46	Cap PA Blocking .001 uF	504 0157 000
C42	Cap PA Tank (Det. by Freq.)	
C43	Cap 2nd Harmonic Trap (Det. by Freq.)	
C44	Cap Input Loading (Det. by Freq.)	
C45	Cap Output Loading (Det. by Freq.)	
C47	Cap 10 uF 1 kV Int. Voltage Supply	510 0501 000
C48	Cap 8 uF 3 kV H.V. Supply	510 0510 000
C49	Cap 2 uF 3 kV Mod. Blocking Capacitor	510 0517 000
C50	Cap 2200 pF 10 kV Transient Suppress	516 0397 000
C51	Cap .05 uF 1 kV Bypass	516 0087 000
CR1) CR3,) CR4) CR5,) CR6) CR7)	Diode, Fil. Voltmeter, PA Bias, Exciter Supply	384 0018 000
CR2	Bridge Rect., Mod. Bias	384 0220 000
CR40, CR41	Rectifier High Voltage	384 0322 000
CR42, CR43	Rectifier Int. Voltage	384 0323 000
F1, F2	Fuse 30 Amp	398 0221 000
F3	Fuse Mod. & PA Bias ½ Amp	398 0015 000
F4	Fuse Int. Voltage Supply 2 Amp	398 0019 000
J41 thru J43	Receptacle, Meter Connection	612 0301 000
K1	Contactor Fil. 4 pole N.O. 230 V 50/60 Hz	570 0162 000
K2	Contactor High Power	570 0163 000
K3	Contactor Low Power 4 Pole N.O.	570 0111 000
K4	Relay Overload Auxiliary	574 0012 000
K5	Relay, Memory	572 0048 000
K6, K7	Relay P.A. & Modulator Overload	574 0014 000
K8	Relay Power Change Latching	574 0062 000
K9	Relay, Lockout	574 0066 000

BC-1H

SYMBOL	DESCRIPTION	GATES PART NO
L1, L2	Choke Bias & Isolation Filter 10 H	476 0009 000
L3	Choke R.F. Driver Plate	913 0518 000
L4	Coil R.F. Driver Tank	938 5435 001
L40	Coil Variable PA Tank 105VB3735	931 6583 015
L41	Coil Input Loading	931 6138 055
L42	Coil Output Loading	931 6583 014
L43	Coil Mod Monitor Pickup	938 0503 000
L44	Choke P.A. Plate	926 7569 001
L45	Reactor High Voltage Filter	476 0295 000
L46	Reactor Int Voltage Filter	476 0305 000
L47	Reactor Modulation	476 0243 000
L48, L49	Parasitic Suppressor Assembly	915 3363 001
M40	Multimeter 0–1 MADC with 0–300 MADC, 0 to 30 MADE and 10 V AC Indicator Line	632 0461 000
M41	Meter 0–3000 V PA Plate Voltmeter	632 0462 000
M42, M43	Meter 0–1 ADC P.A. & Mod Plate Current	632 0463 000
M44	Meter 0–8 RF Amperes Int Thermo	634 0306 000
P1	Plug R.F. Exciter	612 0099 000

SYMBOL	DESCRIPTION	GATES PART NO.
R1, R2	Potentiometer Mod Bias 10 K ohms 4 W	552 0255 000
R3	Res Bias 2500 ohm 10 W	542 0083 000
R5	Res Exciter Dropping 150 ohms 10 W	542 0061 000
R6	Res Exciter Bleeder 2200 ohm 2 W	540 0619 000
R7, R28	Pot A.C. Voltmeter Adj. 10 K, 2 W	550 0067 000
R9, R10	Res Adjustable O.L. Shunt 200 ohm 10 W	552 0008 000
R11	Res Series Bias 5000 ohm 10 W	540 0088 000
R12	Res 25 K ohm 25 W	542 0149 000
R12A	Res 5 K ohm 25 W	542 0140 000
R13	Res Adj. Mod Bias Set 12 K 50 W	552 0104 000
R14	Pot Audio Pad Shunt 1000 ohm 2 W	550 0061 000
R15	Res P.A. Grid Resistor 3 K ohm 100 W	542 0300 000
R17	Res P.A. Grid Meter 1 ohm 5 W	542 0001 000
R19	Res P.A. Bias Bleeder 500 ohm 20 W	542 0127 000
R20	Res PA Voltmeter Limit 2 K ohm ½ W	540 0056 000
R21	Res Recycling 4700 ohm 2 W	540 0748 000
R22	Pot Recycle Adj. 5 K ohm	550 0065 000
R23	Res Recycle 12 K ohm 1 W	540 0481 000
R24	Res K8 Dropping 2.2 K 2W	540 0619 000

BC-1H

SYMBOL	DESCRIPTION	GATES PART NO.
R29	Res Remote P.A. Current 10 ohm 10 W	552 0006 000
R30	Meter Multiplier 3 Meg ohm	914 3422 000
R31	Pot P.A. Current 100 ohm 2 W	550 0055 000
R32, R33	Res Mod Plate Current 7.5 ohm 10 W	542 0053 000
R34	Res Mod Mon Adj 150 ohm 50 W	552 0088 000
R35 thru R37	Res Rem Plate Current & Voltage 5.1 K ohm ½ W	540 0066 000
R38	Res High Volt Bleeder 100 K	542 0346 000
R39	Rheostat Fil Adj 15 ohm 150 W	552 0405 000
R40 thru R53	Res Feedback Ladder 220 K ohm 2 W	540 0667 000
R54, R55	Res Feedback Ladder 6800 ohm 2 W	540 0631 000
R56	Pot Feedback Ladder 5 K ohm 2 W	550 0065 000
R57	Res Transient Suppressor 13 K ohm 2 W	540 0638 000
R58 thru R63	Res Dummy Load 312 ohm Non-Ind	546 0216 000
R64	Res 240 ohm 1 W	540 0317 000
S1	Switch, Mod Plate Current Sel	602 0005 000
S2	Switch Multimeter	914 9395 000
S3	Switch Local-Remote	604 0005 000
S4 thru S9	Switch Transmitter Off & On	604 0445 000
S47 thru S49	Switch Interlock	604 0380 000

SYMBOL	DESCRIPTION	GATES PART NO.
T1	Transformer Mod Bias	472 0705 000
T2	Transformer Aud Input	478 0142 000
T3	Transformer Filament	472 0452 000
T4, T5	Transformer P.A. Bias and Exc. Sup.	472 0580 000
T40	Transformer High Voltage Supply	472 0704 000
T41	Transformer Modulation	478 0084 000
T42	Transformer Intermediate Voltage	472 0703 000
TB41	Terminal Board for Fan	614 0046 000
V40 thru V43	Tube 833 PA & Mod	374 0039 000
XF1-2	Fuseblock	402 0014 000
XF3, XF4	Fuseholder	402 0021 000

R.F. SOLID STATE EXCITER

SYMBOL	DESCRIPTION	GATES PART NO.
C1, C2	Cap Variable Crystal Adj	520 0116 000
C3, C4	Cap Crystal Pad 62 pF 500 V	500 0820 000
C5	Cap 1500 pF	500 0878 000
C6	Cap 390 pF 500 V	500 0833 000
C7, C9, C10, C11, C14,	Cap .1 uF 100 mV	508 0268 000
C8, C12	Cap 5100 pF	500 0783 000
C13	Cap .04 uF	508 0253 000
C15	Cap .012 uF 600 V	508 0260 000
C16, C17	Cap (Freq. Det.)	
C19	Cap 39 pF (Freq Mon Output)	500 0815 000
CR1, CR2	Diode, Zener 15 V 1 W 1N4744	386 0092 000
J1	Receptacle	610 0047 000
L1, L2	Coil Output Matching 28–63 uH	492 0031 000
L3	Choke Q3 Plate	494 0194 000
Q1,Q2	Transistor 2N2369	380 0083 000
Q3	Transistor 2N2631	380 0093 000
R1	Res 39 K ½ W	540 0087 000
R2, R7	Res 18 K ½ W	540 0079 000
R3	Res 27 ohms ½ W	540 0011 000
R4	Res 270 ohms ½ W	540 0035 000
R5, R9	Res 1 K ohm ½ W	540 0049 000
R6	Res 510 ohm ½ W	540 0042 000

SYMBOL	DESCRIPTION	GATES PART NO.
R8	Res 560 ohm ½ W	540 0043 000
R10	Res 51 ohm ½ W	540 0018 000
R11	Res 3.6 K ½ W	540 0062 000
R12	Res 430 ohm ½ W	540 0040 000
R13	Res 3.9 1 W	540 0274 000
R14	Res 2.2 K 1 W	540 0340 000
R15	Res 2.7 K ohm 1 W	540 0342 000
R16	Res 1 ohm ½ W	540 1101 000
S1	Switch, Rotary 1 Pole, 2 Pos.	600 0487 000
XQ1 thru XQ3	Socket	404 0066 000
XY1, XY2	Socket, Octal	404 0016 000

888 1115 001

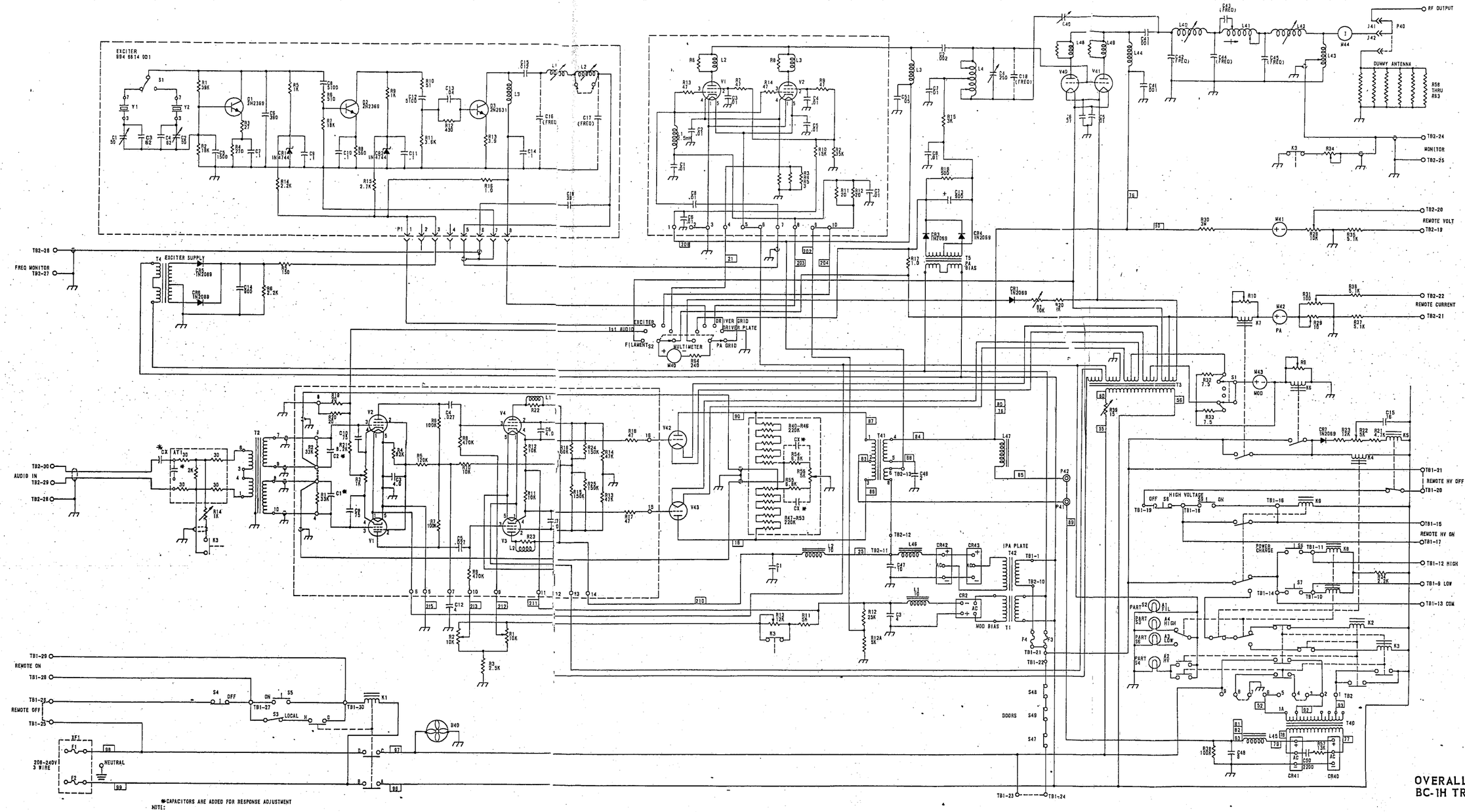
R.F. DRIVER ASSEMBLY

SYMBOL	DESCRIPTION	GATES PART NO.
C1 thru C8	Cap .01 uF 1000 V	516 0082 000
L1	Choke 2.5 mH Driver Grid	494 0033 000
(L2,L3)	Parasitic Suppressor	913 0520 001
R2	Res 35 K ohm 25 WE	542 0197 000
R3 thru R5	Res 3 ohm 1 W ±5%	540 0271 000
R6,R8	Res 47 ohm 2 W, 10%	540 0724 000
R7,R9, R13,R14	Res 47 ohm 2 W 5%	540 0579 000
R10	Res 15 K ohm 20 W	542 0147 000
R11,R12	Res 20 ohm 1 W	540 0291 000
V1,V2	Tube 807	374 0030 000

AUDIO DRIVER ASSEMBLY

SYMBOL	DESCRIPTION	GATES PART NO.
C1, C2	Cap 470 pF 500 V	500 0835 000
C3, C6, C7	Cap 4 uF 450 V	522 0129 000
C4, C5	Cap .027 uF 600 V	508 0265 000
C8	Cap .01 uF 1000 V	516 0082 000
C9, C10	Cap 75 pF 500 V	500 0822 000
(L1,L2)	Parasitic Supply	913 0531 001
R1, R2	Res 33 K ohm 2 W	540 0647 000
R3	Pot 1000 ohm Amp Balance	552 0545 000
R4	Res 82 K ohm 2 W	540 0657 000
R5	Res 120 K ohm 2 W	540 0661 000
R6, R7	Res 100 K ohm 2 W	540 0659 000
R8, R9	Res 470 K ohm 2 W	540 0675 000
R10	Res 10 K ohm 2 W	540 0635 000
R11, R12	Res 10 K ohm 10 W	540 0095 000
R13, R14	Res 47 K ohm 2 W	540 0651 000
R15, R16, R24, R25	Res 150 K ohm 2 W	540 0663 000
R17, R18	Res 47 ohm 2 W	540 0579 000
R19, R20	Res 20 ohm 1 W	540 0291 000
R21	Res 8200 ohm 2W	540 0633 000
R22,R23	Res 47 ohm 2 W (P/O L1 & L2)	540 0579 000
V1 thru V4	Tube, 807	374 0030 000
XV1 thru XV4	Socket, Tube 5 Pin	404 0012 000

888 1115 001



NOTE: *CAPACITORS ARE ADDED FOR RESPONSE ADJUSTMENT

· 852-6714-001

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OVERALL SCHEMATIC
BC-1H TRANSMITTER
852 6714 001

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