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A-35690 Remote Control of AM & FM Xntrs.
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C-79369 Schematic, Transmitter Unit
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C-78071 Rmt. Ctrl. Interconn. for ON-OFF, Fail-Safe,
AC Overload Protection.

M5862 REMOTE CONTROL SYSTEM - RDC-10-C

I SPECIFICATIONS

(A) Electrical

1. Control

- (a) Continuous D.C.
- (b) Number of Functions: Fil. On - Holding Key
Plate On - Momentary
Plate Off - Momentary
Raise - Momentary
Lower - Momentary
- (c) Additional control functions using interlocking relays.

2. Metering

- (a) Ten Metering Positions.
- (b) Voltage Standard in OFF Position
- (c) Three 4 inch meters; Dual Scales
- (d) Meters - 100 ua, 10,000 ohms per volt
- (e) Metering Selected by Switch Operating Stepper Switch.
- (f) Personnel and Telephone Line Protective Features

3. Fail Safe Provisions - Continuous DC Voltage Holds Transmitter ON (Required by the FCC)

4. Telephone Line Requirements - Two Lines - Both providing a continuous D.C. path.

5. 115 V. A.C. 60 Cycles

- (a) Studio Unit, Normal 52 Watts, Fl - 3 Amp. with stepper operating 61 watts.
- (b) Transmitter Unit - Normal 16 Watts, Fl - 1 Amp. with stepper operating 25 watts.

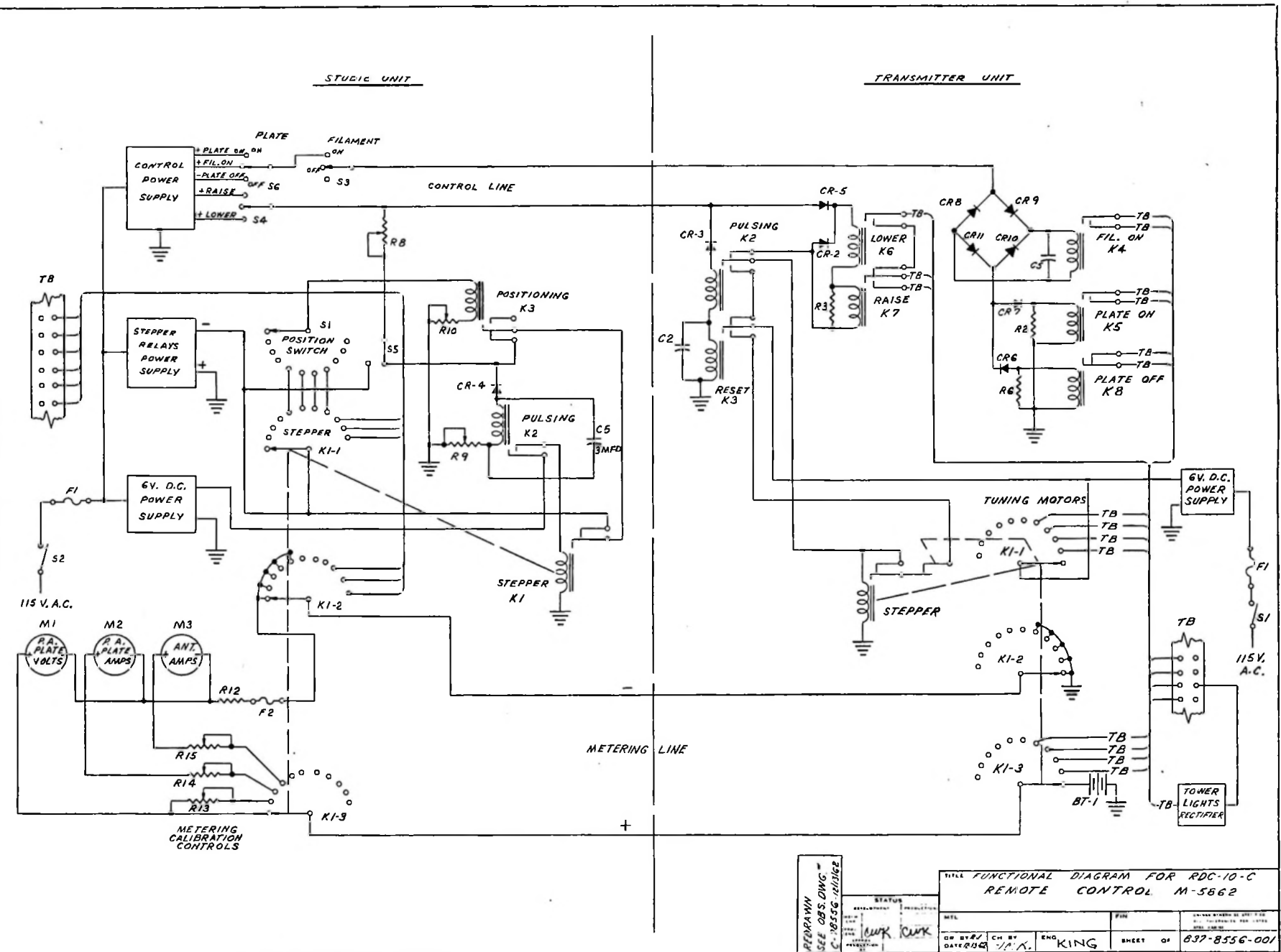
6. All electrical connections to terminal boards on rear of chassis.

(B) Mechanical

1. Rack Mounting - Standard 19" Panel Mounting.

- (a) Studio Unit 8-3/4" Panel Height
7-1/4" Depth in Rack
- (b) Transmitter Unit 8-3/4" Panel Height
7-1/4" Depth in Rack

NOTE: Front panel removable for mounting inside the transmitter.



REDRAWN
 SEE OBS. DWG.
 C-10556-REVISE

STATUS APPROVED: _____ DATE: _____ WORK WORK				TITLE FUNCTIONAL DIAGRAM FOR RDC-10-C REMOTE CONTROL M-5862			
OR BY: RDC DATE: 10/24/54	CH BY: J.A.K.	ENG: KING	SHEET OF:	637-8556-001	FIN:	DATE: 10/24/54	

INTRODUCTION

The basic M5862 remote control system was designed for controlling and metering of transmitters from a remote point.

The M5862 consists of:

- M5864 - Studio Unit
- M5863 - Transmitter Unit
- M4719A - P.A. Plate Voltage Extension Kit
- M4720A - P.A. Plate Current Extension Kit
- M5143 - Tower Light Indication Current Transformer

The M5862 remote control system consists of a voltage supply for control purposes and ten (10) metering positions. By interlocking a control function with a position on the transmitter stepper switch, it is possible to get ten (10) control functions with the Raise-Lower switch. The Plate On position may also be interlocked with a stepper position giving ten (10) functions with this position. Three positions on the stepper are set up as balanced pairs and may be used for metering, telephone or as a spare program loop.

Ten calibrating controls are provided on the studio unit to adjust meter readings. Meters are 10,000 ohms per volt (100 ua.) and normal line variations will not affect accuracy of readings. Meters are provided with dual scales so direct readings may be taken.

A mercury battery is connected in the OFF position of the position switch to provide a reference voltage to indicated sources of trouble such as low line voltage at the transmitter, defective telephone lines, or transmitter difficulties. Stepper synchronization is also accomplished in the OFF position by holding the reset button in for a couple of seconds. This sets the stepper switch on the transmitter unit only to calibrate position.

Control is accomplished by using different voltages from each leg of the control line to ground. One leg is used for FIL. ON, PLATE ON and PLATE OFF, and the other leg is used for RAISE, LOWER and pulsing voltages for the transmitter stepper operation.

The studio unit contains three (3) power supplies, a 6 V. -8 V. D.C. supply for the stepper relay and two (2) -115 V. D.C. supplies for control purposes.

The transmitter unit contains one (1) 6 - 8 V. D.C. supply for operation of the stepper switch. A current transformer is provided for remote indication of the tower lights. The voltage from the current transformer is rectified in the transmitter unit providing a D.C. voltage for remote purposes.

A P.A. plate voltage and a P.A. plate current extension kit is also provided to remote read plate voltage and plate current on the final power amplifier.

Positions 2 to 8 Metering
9 to 11 Balanced pair.

The balanced pairs may be used for some of the following purposes:

1. Telephone
2. Spare Program Loop
3. Remote Metering Kits - For Modulation
& Frequency Monitor
4. Transmitter Located Receiver Outputs
5. Air Monitor Feedback to Studio

All control relay contacts are wired to the normally open contacts. When the control switch is thrown, the relay is energized and the contacts close. Numerous methods of using the Plate On and Raise-Lower keys may be used.

INSTALLATION

The Gates Radio Company recommends that only the allowable minimum of control and metering be used, if possible, for the following reasons:

1. Non-technical personnel should not have access to the transmitter controls that could cause damage to the transmitter, or that result in the violation of FCC regulations.
2. Fewer controls result in simpler operating procedure, less transmitter modifications, less maintenance, and more reliable operation.

It is recognized that there are many differences in the large variety of transmitters now in use and the final word on which controls and meters are necessary must come from the station's Engineering Staff who know the equipment best. In any case the Engineering Department of the Gates Radio Company is always available to give advice or suggestions on special problems encountered either in the initial installation or afterwards in operation.

This instruction book is written using the knowledge gained from hundreds of previous installations of Gates' remote control equipment.

Both units should be unpacked on arrival and inspected for possible damage in shipment. In case of damage the shipping agent should be notified immediately.

I STUDIO UNIT

The studio unit may be mounted in a rack along with the R.F. amplifier, modulation monitor and frequency monitor, or with extension meters, if used, instead of an R.F. amplifier. In some installations it may be desired to use a table cabinet for the studio unit and

placing it at the operators position, mounting other items in racks. The studio unit requires an a.c. outlet for 115 volts, 60 cycles. The two telephone lines should be connected to the terminals provided on the rear of the chassis, one line to terminals 1 and 2 identified as control line and the other line to terminals 3 and 4 identified as metering line. Refer to drawing C-78485. The metering line must be properly polarized but this can be done on the installation of the transmitter unit. A driven ground rod or water piped ground should be connected to terminal 16. In some instances it is possible to use the telephone ground. Since the reliability of the equipment depends on a good ground connection, it is suggested that two different types of grounds be used at the studio unit.

II INSTALLATION OF TRANSMITTER UNIT

The transmitter unit may be mounted in available rack space at the transmitter and provided with 115 volts a.c.

All connections are to be made to the rear of the chassis. Refer to drawing C-78484. A good ground should be provided to terminal 25.

(A) Filament Contactor

The FCC requires an automatic means of removing the transmitter from the air in case of failure of the telephone line or remoting equipment. This is accomplished by controlling the transmitter's filament or P.A. plate power with a contactor that has no holding contacts and that is continuously energized by the "Filament On" key in a locking position.

For transmitters without contactors the circuit shown can be used, by adding a contactor. See drawing A-10990.

(B) Plate Contactor

To wire the plate contactor for remote control operation connect wires from terminals 29 and 30 on the transmitter unit in parallel with the plate "ON" button. Do not disconnect the holding contacts. A plate contactor must be added if one is not in the transmitter. See drawing A-10990.

(C) Motor and Rheostat Assembly

The FCC requires that means must be provided for controlling the transmitter power output from the remote control point. The Gates Radio Company provides one of the following means for controlling the transmitter power output.

- (1) Motor Rheostat Assembly M4703 to adjust the P.A. plate voltage for transmitter of 250W to 1KW.

- (2) Motor and Relay Assembly to ~~motor drive existing~~ transmitter Output Loading Coils.
- (3) Relay assembly to control existing motor driven rheostats or output loading coils.

Space can usually be found on one of the decks or sides to mount the motor rheostat assembly. In some cases, it may be necessary to strap the assembly to power components.

In all instances the rheostat must be on the power supply side of the P.A. plate voltage meter multiplier. High voltage cable should be used to connect the rheostat. Packard cable or equal.

The rheostat may be connected as shown on Fig. 1, drawing C-19233 in series with the P.A. plate voltage between the modulation reactor or transformer and the P.A. tank or choke.

If the transmitter has a rheostat for controlling the power output remove one lead and connect the remote control rheostat in series with the transmitter rheostat and set the transmitter rheostat to maximum voltage. Some transmitters have the rheostat connected in the cathode circuit and the remote control rheostat may be connected in series in this case also with the transmitter rheostat left at maximum power output position. Some transmitters meter the P.A. plate voltage on the power supply side of the modulation reactor. It is again necessary to connect the rheostat ahead of the meter multipliers.

Control wiring should be connected as follows: See drawing B-13417.

Motor Rheostat Assembly, M4703

M5241 Remote Control, TB-2

Terminals 1		26
2	115 V. A.C.	
3		28
4		15, 16 or 17 as required (See note on B-13417)
5	Ground	8 and 25
	115 V. A.C.	27

- (D) Plate Voltage Extension Kit, M-4719-A

The plate voltage extension kit, M-4719-A, should be mounted on the standoffs at a convenient point preferably near the high voltage point to which it will be connected. Packard cable or a good high voltage cable should be used to connect terminal marked H.V. to the transmitter. This connection can be made to the hot end of the existing meter multiplier, or to a lug on the high voltage rheostat, if the connection is made to the rheostat the wiring should be made to the power amplifier side of the rheostat and not the power supply side.

Terminal marked "G" should be connected to a good ground point in the transmitter. The metering terminal should be connected to terminal #1 on the remote control transmitter unit.

(E) Plate Current Metering Kit - M-4720-a

Plate current metering is accomplished by metering the voltage drop across a resistor in series with cathode return of the metered stage. Metering kit M-4720-A must be inserted at the ground end of any other metering circuits or overload relays. Resistors R1, R2 and R3 are connected into the circuit as needed. The kit as shipped was R1 and R2 connected. This value is correct for an average 1 KW final. For a 250 W final, use only R1 or R2 according to the plate current to be metered. For 5 KW finals, R1, R2 and R3 must all be used. About 4 or 5 volts should be available across R4. R4 is then adjusted to give approximately half scale deflection on the appropriate meter in the studio unit. Final calibration can then be made using the calibrating potentiometer at the studio location.

(F) Antenna Current Metering

A standard antenna diode unit is furnished, and it is installed at the tuning house in series with the present diode or thermocouple. It requires a source of continuous 115 V. A.C. connected to the terminals so marked. See Fig. 4, drawing C-19233. Two other sets of terminals are provided, one labeled "remote meter" and the other "local meter". The remote meter terminals are used in conjunction with remote control. The positive terminal is wired to terminal number 3 on the remote control unit. For further information refer to the separate instruction sheet.

(G) Tower Lights Indicator

A M-5143 current transformer is furnished to remote read tower lights current. Refer to Fig. 2, 3 or 4, drawing C-19381.

The current transformer can be installed in the power box for tower lights by feeding one leg of the tower light circuit through the transformer. The transformer can be disassembled and installed without disconnecting the tower light wiring.

It is recommended that the current transformer have its own ground return back to the remote control unit. Either lead can be connected to ground. The other lead must connect to terminal number 25. If it is desired to read the current of additional towers, a M-5145 tower light current extension kit is required.

For single small tower installations, it is recommended that the tower light feed line be looped through the opening 3 or 4 times to give additional voltage. Tighten the wing nuts snug for maximum output.

(H) D.C. Overload Relays M-5129

Overload relays are usually of three types

1. Electrical Reset
2. Magnetic Reset
3. Manual Reset

Relays of the first type are usually reset by re-energizing the plate contactor, or they reset automatically if the overload was transient.

Relays of the second type are held open by a latching device after an overload and are reset by energizing an auxiliary coil. This type requires an interlocking relay (6 V. D.C. relay) and the Raise-Lower switch can be used. All of the reset coils can be connected in parallel and energized at once, since there will be no effect on the relays that have not tripped.

Relays of the third type cannot be reset by remote control and must be replaced by one of the other two types. The first type is the best choice in this case, since it does not require an extra relay for reset, and it is more easily adapted to remote control.

Stages in which overload relays are usually used are the driver, P.A. and modulator. The relay coil is placed in the cathode circuit of each and shunted with an adjustable resistor to adjust for the desired tripping current.

It is usually recommended to set overload relays to trip with 25% overload on the P.A. and with the modulators, ~~50% overload above 100% modulation.~~ Some station engineers may prefer other settings.

The normally closed contacts of the overload relays are usually wired in series with the plate contactor. See Fig. 1 of drawing C-19381 for typical wiring of overload relays.

(I) A.C. Overload Relays

Some transmitters with manual operating circuit breakers in the A.C. line trip often and are reset manually. With remote control these circuit breakers should be replaced making it possible to electrically reset the overload. See Fig. 2 of drawing C-19233. With 220 volt filament

contactors, return the relay E4 to 115 volts or series it with a resistor to give proper operating voltage. . . With this circuit, to electrically reset after an A.C. overload, turn filament hold switch off and back on again.

OPERATION

The studio unit consists of three D.C. power supplies for control purposes. One supply consisting of T1, CR-1 and C1 provides voltages for the following operation:

<u>Function</u>	<u>Adjust</u>	<u>Normal Operation</u>	<u>Measured at</u>
Raise	R2	+80 V. D.C.	TB1-2
Lower	R4	+38 V. D.C.	TB1-2
Filament On	R3	+26 V. D.C.	TB1-1
Plate On	R2	+80 V. D.C. (same as Raise)	TB1-1
Plate Off	(From T2)	-75 V. D.C.	TB1-1

Stepper operating relay supply consisting of T2, CR-2 and C2, provided voltages for the positioning relays and the pulsing relays. Power supply T-3, CR-3 and C3 provides 6 - 8 volts D.C. for the stepper switch coils. The operating relay supply voltage is adjusted by R6 to provide approximately -75 V. D.C. to ground.

I STEPPER OPERATION

All positions of S1 are connected to corresponding positions on the front level of Stepper, K1. Positioning relay, K-3, is normally energized until S1 is switched. When K3 opens, voltage is applied to the pulsing relay, K2, through the pulsing contacts of the stepper switch. The contacts on relay K2 apply 6 - 8 volts D.C. to the coil of the stepper switch, K1. The stepper switch makes one step and opens the pulsing contacts returning the stepper to normal. If voltage is still present through relay K3, it will continue to pulse itself until this voltage is removed by K3 being energized with S1 and K1 in the same position. R10 adjusts the voltage to relay K3 and R9 to relay K2. R9 should be set at approximately 1/2 total resistance or 5,000 ohms, and R8 at approximately 1/2 or 2500 ohms. R9 is adjusted so the transmitter stepper switch follows the studio stepper compensating for telephone line resistance.

The pulsing and reset voltage for the transmitter stepper switch relays is applied through R8 to the raise-lower leg of the control line. This voltage is connected through rectifier CR3 in the transmitter unit to the reset and pulsing relays. Rectifier CR3 polarizes K2 and K3 so they operate only with a negative voltage. This system depends upon an earth ground between the two units for positive return; making a good ground essential at both ends. Reset relay, K3, is shunted with an 8 mfd. capacitor, C2, which is too large to charge up on a momentary pulse and acts as a short circuit. When the reset button is pushed, the voltage is constant charging C2 and then closing K3.

With K3 energized, voltage from power supply T1, CR5 and C1 are applied through one level of contacts on the stepper switch and to the pulsing contacts. The stepper pulses itself until it reaches "OFF" position at which position an arm opens a set of contacts on K1, always stopping it at home position when K3 is energized. By setting the studio position switch in the "OFF" position and pressing the reset button for a couple of seconds, the transmitter stepper will automatically home to "OFF" position synchronizing both stepper switches.

II CONTROL

Control functions are obtained by applying a D.C. voltage to one side of the control line to ground. Different voltages are applied to obtain more than one function on each leg of the telephone line.

On one leg of the line, 26 V. is applied for Filament On operation and this voltage is increased momentarily to 80 V. for Plate On. The Plate On relay K5 is shunted with a 2K ohm resistor to prevent it from operating at the lower voltage. The Filament Hold relay K4 is shunted with a 40 mfd., capacitor to prevent it from dropping out as switch S6 on the studio unit is returned to Center position. The contacts on this switch break before making. This assures the dropping out of relay K5. When S6 is thrown down (PLATE OFF), -75 volts is applied to the line to operate K8 in the transmitter unit through blocking diode CR6. Blocking diode CR7 prevents K5 from operating when negative voltage is applied to the line. The "bridge" diodes CR8, CR9, CR10 and CR11 supplies positive voltage to K4 whether positive or negative voltage is on the line.

On the other leg of the control line +38 V. is applied to energize "Lower" relay K6 and +80 V. is applied to energize the "Raise" relay K7. Relay K7 is shunted with a 2K ohm resistor to prevent it from operating at the lower voltage. The voltage being applied to the Raise-Lower relays is polarized by CR1 to prevent these relays from energizing with negative voltage. Rectifier CR2 is shunted across K6 and K7 to short inductive pulses from the relays in opposite polarity.

This prevents the pulsing of relay K2. The ground return for relays K6 and K7 and rectifier CR2 is through the contacts of the pulsing relay K2 and through the stepping switch coil K1 to prevent interaction of the control relays with the pulsing relays.

Provisions should be made to turn off tower lights in conjunction with Conelrad. This can be accomplished by using a 6 V. D.C. relay and a 115 V. A.C. latching relay. By interlocking the 6 V. relay with a stepper position as is done with the motor rheostat assembly, the Raise-Lower switch will then apply voltage to either coil of the latching relay turning the lights on or off. Other equipment may be switched off an on in this same manner.

METERING

A mercury battery is permanently connected in the calibrate position as a voltage standard. This gives a reference voltage to help identify sources of trouble. If all voltages vary including the voltage standard it would be an indication of possible defective telephone lines. If only transmitter voltage varied, it would be an indication of transmitter line voltage variation or possible trouble in the transmitter.

Two of the three levels on the stepper switches are used for metering. Level 2 is the negative and level 3 is the positive side. In the transmitter unit, level 2 metering positions are jumpered together and grounded. In the studio unit, level 2 is also jumpered but returns to the common of all three meters through a 50K ohm precision resistor and a meter fuse. The transmitter stepper switch selects the desired voltage to be read and the studio switch selects the desired meters.

I BASIC

The meters are 10,000 ohms per volt (100 ua) movements and with the 50K series resistor, requires 5 volts to give full scale deflection. The metering kits should be adjusted to give only a small amount of voltage larger than that required to give the proper reading on the scale more nearly matching the meter scale on the transmitter. The calibrating controls on the rear of the studio unit can then be adjusted to read the same as the transmitter meters. Normal variations in telephone line resistance will not affect meter readings.

II PLATE VOLTAGE EXTENSION KIT - M-4719-A

The plate voltage extension kit is a meter multiplier, R1 to R6 in series with dropping resistors R7 and R8. The resistance of the multiplier is calculated on the basis of 2 ma. flowing through it when used in a 6 KV circuit. R1 to R6 are 500K resistors and R7 and R8 are 15K resistors. When the 0 - 12 KV scale of M1 is used, it will be necessary to connect two extension kits in series.

III P. A. PLATE CURRENT EXTENSION KIT - M-4720-A.

Plate current metering is accomplished by metering the voltage drop across a resistor in series with cathode return of the metered stage. Metering kit M-4720-A must be inserted at the ground end of any other metering circuits or overload relays. Resistors, R1, R2 and R3 are connected into the circuit as needed. The kit as shipped has R1 and R2 connected. This value is correct for an average 1 KW final. For a 250 W final, use only R1 or R2 according to the plate current to be metered. For 5 KW finals, R1, R2 and R3 must all be used. About 4 or 5 volts should be available across R4. R4 is then adjusted to give approximately half scale deflection on the appropriate meter in the studio unit. Final calibration can be made then by using the calibrating potentiometer at the studio location.

IV TOWER LIGHTS CURRENT TRANSFORMER

A small A.C. voltage is sampled from the tower lights circuit and applied to a half wave rectifier on the transmitter unit. Control R5 is provided to adjust the D.C. voltage output of the rectifier. For one tower installations, this control should be set to maximum. If additional voltage is needed, loop the tower light lead through the opening in the current transformer as needed. Since this is only for indication of the condition of the tower lights, one or two volts is all that is necessary. The D.C. voltage is connected to position 4 of the stepper switch.

V BALANCED POSITIONS

Balanced positions on the stepper may be used for metering by grounding the uneven numbers on the transmitter unit and applying the voltage to the even number. On the studio unit, connect a lead from the uneven number to meter common, terminal 11, and a lead from the even terminal to meter plus, 12, 13 or 14 depending upon which meter scale is desired.

MAINTENANCE

I WEEKLY

All meter readings should be checked for calibration (required by FCC)

II MONTHLY

Check all relay contacts for corrosion. If necessary, clean carefully with a burnishing tool.

III QUARTERLY

Check voltages. Clean and lightly oil the stepping switch contacts with Davenol. Levels 2 and 3 are gold plate to insure stable readings. Apply a small amount of lubriplate on ratchet teeth of stepper switch if needed.

IV YEARLY

Replace mercury battery. Do not dispose of battery in incinerator. Clean positioning switch. Clean all lever key switches.

TYPICAL VOLTAGES

Line Voltage 117 A.C.

Measured with 20K ohms per volt meter to chassis ground,

<u>Transmitter Unit</u>	<u>Measured at</u>	<u>Adjust Studio Unit</u>
Fila. On /26.5 Volts	TB1 Terminal #5	R3
Plate On /80 volts *	TB1 Terminal #5	R2
Plate Off -50 V. D.C.*	TB1 Terminal #5	R6
Lower /38 Volts *	TB1 Terminal #6	R4
Raise /80 Volts *	TB1 Terminal #6	R2
Reset -35 Volts *	TB1 Terminal #6	R8
7-8 V. D.C.	C3	

*While holding momentary Key or Button on.

REMOTE CONTROL PROTECTIONS

It is realized that most remote control transmitters are located at some unattended point and additional protective devices are recommended.

Since most of the transmitter building will be locked, it is advisable to put in some type of ventilation system. An air intake at floor level on one side of the building and a fan at ceiling height on the other side of the room drawing air through the building is usually very satisfactory. An inexpensive disposal type air filter on the air intake to keep dust and dirt out of the transmitter and a building thermostat on the fan should also be used. This gives clean air movement through the transmitter building automatically, at a small cost. It will more than pay for itself in maintenance cost or replacement parts cost due to overheat or dirt.

For fire protection from grass fires and/or other sources, several carbon-tet type fire extinguisher bombs may be hung around the transmitter room. It may be desired to install a fire alarm system, the Worner Electronic Devices-Smoke Detector would be fine for this application. In case of excessive smoke, the detector would turn the transmitter and exhaust fan off, preventing the fans from drawing smoke and fire into the transmitter or building.

It may also be desirable to install a remoting kit for remoting transmitter building temperature back to the studio.

ORDERING REPLACEMENT PARTS

When ordering replacement components please refer to the parts list in this instruction book. Identify the component by its symbol number and, where given, Gates drawing number. The type of equipment in which the part is used and the serial number is also necessary.

This procedure will insure the customer receiving the correct component and at the earliest possible date.

ACCESSORY ITEMS FOR REMOTE CONTROL

EXF-1 M-4791 FM RF Amplifier

M-4703A Motor tuned plate rheostat, 1000 ohm, 100 watts for 250 watt transmitter.

M-4703B Motor tuned plate rheostat, 750 ohm, 150 watt for 500 watt transmitter

M-4703C Motor tuned plate rheostat, 400 ohm, 300 watt for 1000 watt transmitters.

M-4800 Motor only, for customer's rheostat.

M-5066 Tuning motor only, for customer's coil or capacitor (requires one M-4806).

M-4996 One RPM motor kit for panel mounting.

M-4801 Relay assembly to control one, three wire motor.

M-4801A Relay assembly to control two, three wire motors.

M-4801B Relay assembly to control three, three wire motors.

M-4806 Relay assembly to control one, five wire motor.

M-5129 D.C. overload relay assembly.

M-4719A Plate voltage extension unit.

M-4845 FM output power indicator.

M-6112 Antenna diode for all powers to 10 KW.

M-5208 Extension meter for GR-1181A or RCA-WF-48A frequency monitors.

M-5206 Extension meter for GR-1931A or RCA-WM-43A modulation monitors.

M-5837 Extension meter for Gates' M-5693 modulation monitors.

M-5631 Extension meter for Gates' M-4990 frequency monitor.

M-5207 Extension meter for RCA-66 Series modulation monitors.

M-4720A Plate current extension unit.

M-4848 Output power tuning motor assembly for Gates BC-5B and BC-10B transmitters.

M-4850 Adaptor kit for remote reading GR 25A frequency monitor.

M-4825 A.C. voltage extension unit.

M-5248 auxiliary relay assembly to provide one on-off holding switching facility.

M-5249 auxiliary relay assembly to provide one on-off momentary switching facility.

Contactor, 2 pole, 25 amperes.

Contactor, 2 pole, 45 amperes.

Contactor, 3 pole, 45 amperes.

Contactor, 3 pole, 90 amperes.

Contactor, 4 pole, 15 amperes.

Overload Relay A.C. (Fig. 2, C-19233)

Thermostat for controlling building exhaust fan.

Fire extinguisher Carbon-Tet, Bomb type - Transmitter Building.

Remote reading building temperature kit.

Smoke detector, Photoelectric Combustion Supervisor to Detect Smoke in Transmitter Building, Model 71B Worner Electronic Devices.

Time Delay Relay Assembly.

TYPICAL QUESTIONNAIRE USED BY TELEPHONE COMPANIES IN
GATHERING DATA OF CUSTOMER OWNED EQUIPMENT CONNECTED
TO TELEPHONE COMPANY FACILITIES.

THIS QUESTIONNAIRE HAS BEEN COMPLETED FOR YOUR CONVENIENCE
TO THE EXTENT OF SUPPLYING REQUIRED INFORMATION FOR THE

RDC-10-C

CUSTOMERS'S NAME _____ Tel.No. _____

Address of sending end of circuit _____

Address of receiving end of circuit _____

Number of Lines 2 A. Line #1 Control

B. Line #2 Meter

GENERAL

1. Company or Individual providing equipment and/or service.

A. Name _____ Tel.No. _____

B. Address _____

2. Who can be called for technical information on this circuit
and equipment?

A. Name _____ Tel.No. _____

3. Manufacturer of equipment.

A. At sending end Gates Radio Company

~~B. At receiving end Gates Radio Company~~

4. Trade names and/or Model Nos. of equipment.

~~A. At sending end RDC-10-C Remote Control~~

B. At receiving end RDC-10-C Remote Control

5. Will control signal be applied to the Tel. circuit Metallic
(between wires) or to Ground (earth used as a return
conductor)?

A. Line #1 Ground

B. Line #2 Metallic

6. If control signal is applied metallic
- A. Will there be a ground connection to the Tel. circuit?
- I. Line #1 Does Not Apply
- II. Line #2 Yes - Unbalanced
7. Where relay coils are connected in the Tel. circuit, what is the maximum voltage applied to the relay contacts? 95 Volts D.C.
8. Rating of customer's fuses (if any) between the equipment and Tel. line
- A. Line #1 None
- B. Line #2 1/200 A. (at studio end)
9. When the telephone company tests into the equipment from the Tel. line, approximately what will the following measurements be?
- A. Line #1
- Sending end: Voltage 30 V. D.C. Res. 1,000 ohm
- Receiving end: Voltage 0 D.C. Res. 5,000 ohm
- B. Line #2
- Sending end: Voltage 0 D.C. Res. 10,000 ohm
- Receiving end: Voltage 10 V. D.C. Res. 10,000 ohm

NOTE: The above readings are "fail-safe" on line #1 and meter sample on line #2 - No. Operating Functions.

IF DC SIGNALS ARE USED

10. Source of signal voltage rectifier
11. If rectifier, is output filtered yes
12. Maximum open circuit voltage applied to Tel. line
- A. Line #1
- I. Between wires 0 II. To ground 95 V.
- B. Line #2
- I. Between wires 10 V. II. To ground neg. grounded

13. Maximum line current on short circuit (Mils.)

A. Line #1 66 M.A.

B. Line #2 1.4 M.A.

14. Maximum operating line current (Mils.)

A. Line #1 16 M.A.

B. Line #2 .024 M.A.

15. Maximum allowable loop resistance (ohms) 2500 ohm

16. If pulses are sent, maximum impulse (interruption) rate 15 p.p.s.

IF AC SIGNALS ARE USED

(Does Not Apply)

IF TONE SIGNALS ARE USED

(Does Not Apply)

IF VOICE CHANNEL IS USED

(Does Not Apply)

ELECTRICAL PARTS LIST FOR RDC-10C

STUDIO UNIT

<u>Symbol No.</u>	<u>Gates Part No.</u>	<u>Description</u>
A1	396 0045 000	Lamp
C1	524 0041 000	Cap., 40 mfd., 150 V.
C2	522 0104 000	Cap., 40 mfd., 150 (W) V.
C3	524 0036 000	Cap., 3000 mfd., 15 (W) V.
C4	506 0007 000	Cap., .5 mfd., 200 (W) V.
C5	506 0069 000	Cap., 3 mfd., 150 V.
CR1,CR2	384 0020 000	Silicon Rectifier
CR3	913 5832 001	Rectifier Stack Assy.
CR4	384 0020 000	Silicon Rectifier
F1	398 0019 000	Fuse, 2 amp.
F2	398 0102 000	Fuse, 1/200 amp.
K1	586 0005 000	Stepper Relay
K2,K3	572 0034 000	Relay
M1	913 0567 001	P.A. Plate Voltage Meter
M2	913 0566 001	P.A. Plate Current Meter
M3	913 0568 001	Antenna Current Meter
R1	542 0058 000	Res., 50 ohm, 10 W.
R2	552 0055 000	Adj. Res., 250 ohm., 25 W.
R3,R4	552 0026 000	Adj. Res., 2000 ohm, 10 W.
R5	542 0060 000	Res., 100 ohm, 10 W.
R6	552 0029 000	Adj. Res., 3000 ohm, 10 W.
R7	542 0054 000	Res., 10 ohm, 10 W.
R8,R10	552 0070 000	Adj. Res., 5000 ohm, 25 W.
R9	552 0077 000	Adj. Res., 10K ohm, 25 W.
R11	540 0444 000	Res., 10 ohm, 1 W., 10%
R12	548 0069 000	Res., 50K ohm, 1/2W., 1%
R13,R14,R15,R16, R17,R18,R19, R20,R21,R22	550 0162 000	Control, 20K ohm
S1	600 0158 000	Selector Switch
S2	604 0001 000	Toggle Switch
S3	602 0007 000	Lever Switch
S4,S6	602 0008 000	Lever Switch, 3 position, 2 pole, spring return top and bottom.
S5	604 0180 000	Pushbutton Switch
T1,T2	472 0207 000	Isolation Transformer
T3	472 0160 000	Fil. Transformer
TB1	614 0083 000	Terminal Board
TB2	913 2529 001	Rectifier Board Assembly
W1	250 0026 000	6 ft. A.C. Line Cord

<u>Symbol No.</u>	<u>Gates Part No.</u>	<u>Description</u>
XA1	406 0143 000	Pilot Light Assy. (Red)
XF1	402 0021 000	Fuseholder
XF2	402 0025 000	Meter Fuseholder

TRANSMITTER UNIT

BT1	660 0001 000	Mercury Battery
C1	524 0036 000	Cap., 3000 mfd., 15 V.
C2	522 0083 000	Cap., 8 mfd., 150 V.
C3	506 0007 000	Cap., .5 mfd., 200 V.
C4, C5, C6	522 0104 000	Cap., 40 mfd., 150 V.
C7	516 0082 000	Cap., .01 uf., 1 KV.
CR1, CR2, CR3, CR4, CR6, CR7, CR8, CR9, CR10, CR11	384 0020 000	Rectifier
CR5	913 5832 001	Rectifier Stack Assy.
F1	398 0017 000	Fuse, 1 amp., 3 AG
K1	586 0005 000	Stepper Switch
K2, K3, K4, K5, K6, K7, K8	572 0034 000	Relay
R1	542 0054 000	Res., 10 ohms, 10W.
R2, R3, R6	540 0618 000	Res., 2000 ohms, 2 W., 5%, A-B
R4	540 0444 000	Res., 10 ohms, 1 W., 10%, A-B
R5	550 0163 000	Control, 25K ohm
S1	604 0005 000	Switch
S2, S3	602 0007 000	Switch, Lever Key
T1	472 0160 000	Filament Transformer
TB1	614 0073 000	Terminal Board
TB2	614 0083 000	Terminal Board
TB4	926 6174 001	Rectifier Board Assembly
TB5	614 0069 000	Terminal Board
XF1	402 0021 000	Fuseholder

PLATE VOLTAGE EXTENSION KIT - M4719A

R1, R2, R3, R4, R5, R6	544 1367 000	500K ohm, 2 W., 1% Res.
R7	542 0103 000	20K ohm, 10W., Res.
R8	542 0099 000	15K ohm, 10W., Res.
R9	550 0067 000	Control, 10K ohm
R10	540 0066 000	5100 ohm, 1/2 W., 5%, Res.
TB1	614 0156 000	Terminal Board

PARTS LIST

PLATE CURRENT EXTENSION KIT M4720A

<u>Symbol No.</u>	<u>Gates Part No.</u>	<u>Description</u>
E1	402 0041 000	300 V. Protector
R1	542 0056 000	Res., 20 ohm, 10 W.
R2	542 0057 000	Res., 25 ohm, 10 W.
R3	552 0082 000	Res., 5 ohm, 50 W. Adj.
R4	550 0055 000	Potentiometer, 100 ohms
R6,R7	540 0066 000	Res., 5100 ohm, 1/2 W. 5%
TB1	614 0046 000	Terminal Board

Remote Control of AM and FM Transmitters

simultaneously with RDC-10C System

The RDC-10 remote control system is readily capable of controlling FM and AM transmitters located at the same site. There is some confusion as to precisely how this can be done, and it is the purpose of this bulletin to clarify the methods which can be used to perform these functions.

In as much as AM and FM operation hours seldom coincide, it is essential that operation of the two transmitters be completely independent of each other. It is also necessary, in complying with FCC Rules and Regulations, to incorporate the "fail-safe" feature in the event of control line failure, so that either or both transmitters are removed from the air.

The filament and plate "on/off" operation of transmitters fall into two general groups:-1) Those requiring "momentary" switch operation. (All current Gates transmitters are in this category), and 2) those requiring that switch contacts remain closed for "on" operation, and opened for "off" operation.

You will note that in both cases a "fail-safe" slave relay is required. This relay, which is operated by K-4 in the RDC-10 transmitter unit, basically isolates the filament "on" control circuits of the two transmitters. For those transmitters requiring only "momentary" switch operation, Drawing A-35689 applies. Typical operation would be as follows:-

When the "Filament on" switch at the Studio Unit is operated, K4 at the transmitter will close, in turn energizing the "fail-safe" slave relay. For the purpose of illustration, assume that the filament "on" operation is assigned to Stepper Position #1. In this case, terminal #2 of TB-1 on the M-5249 relay assembly on Drawing A-35689 (Upper assembly on print) would be connected to RDC-10C transmitter unit, TB2-15.

When the selector switch on the Studio Unit is switched to position #1, the control relay in the upper M-5249 relay assembly is energized. Now, if the "Raise-Lower" switch is thrown momentarily to the "Lower" position, the FM transmitter filaments will come on. If thrown to "Raise" position, the AM transmitter filaments will come on.

Again, for purpose of illustration, assume that filament "off" operation is assigned to Stepper Position #2. In this case terminal #2 of TB-1 on the M-5249 relay assembly on Drawing A-35689 (center assembly on print) would be connected to RDC-10C transmitter unit, TB2-16.

When the selector switch on the Studio Unit is switched to position #2, the control relay in the center M-5249 relay assembly is energized. Operating the Studio Unit "Raise-Lower" switch in the "Lower" position will turn the FM transmitter filaments "off". If thrown to "Raise" position, the AM transmitter filaments will be turned off.

Operation of the AM transmitter plate "on/off" functions is normal, using the assigned switch functions on the Studio Unit for this purpose.

However, for the added FM transmitter plate "on/off" operation, an additional M-5249 relay assembly is required. This is shown as the lower assembly on Drawing A-35689. For purposes of illustration again, assume this operation is assigned to Stepper position #3.

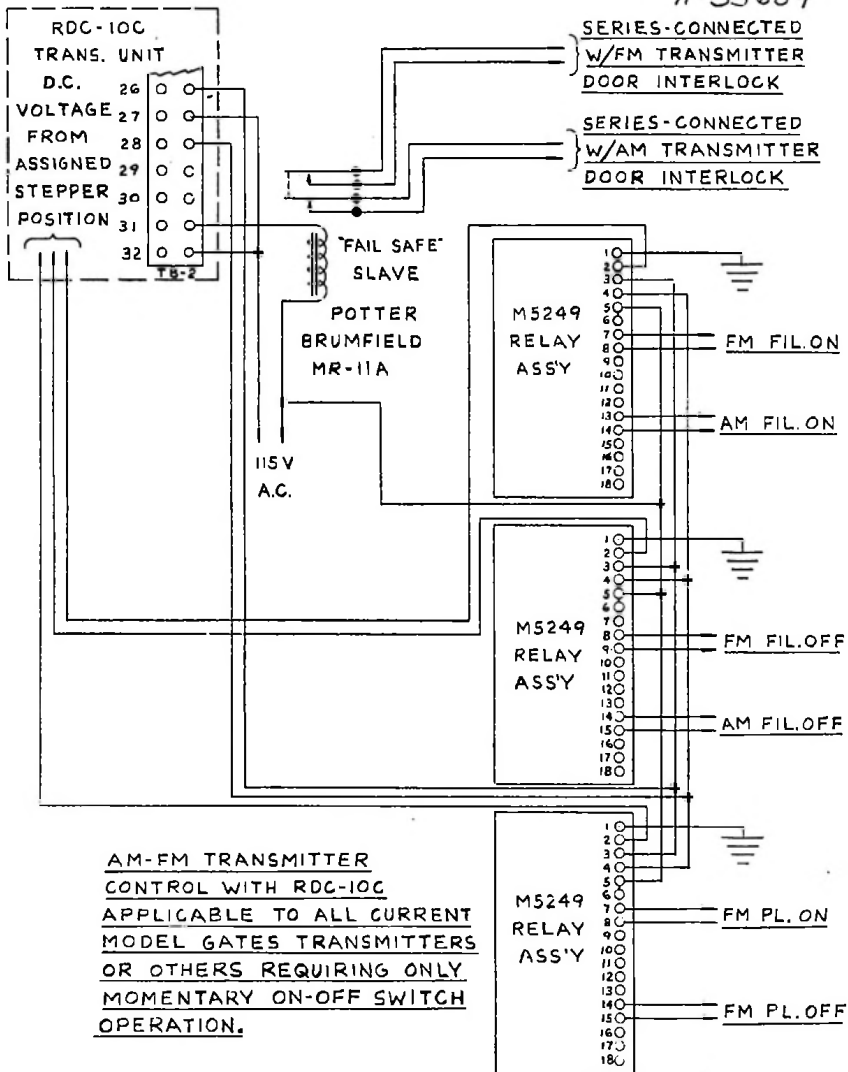
In the same general manner as outlined above, if terminal #2 of TB-1 on the lower M-5249 assembly is wired to TB-17 of the RDC-10C transmitter unit, the FM transmitter plate may be turned on and off by operation of the "Raise-Lower" switch on the Studio Unit.

Drawing A-35690 follows the same general approach except that M-5248 "Latching" type relay assemblies are used where "hold" contacts are not an integral part of the transmitter design.

It is impossible to devise a "hard and fast" rule for controlling all transmitters of every manufacture and type, however, the above should be helpful in outlining the general solution to multiple transmitter control in working out customer proposals.

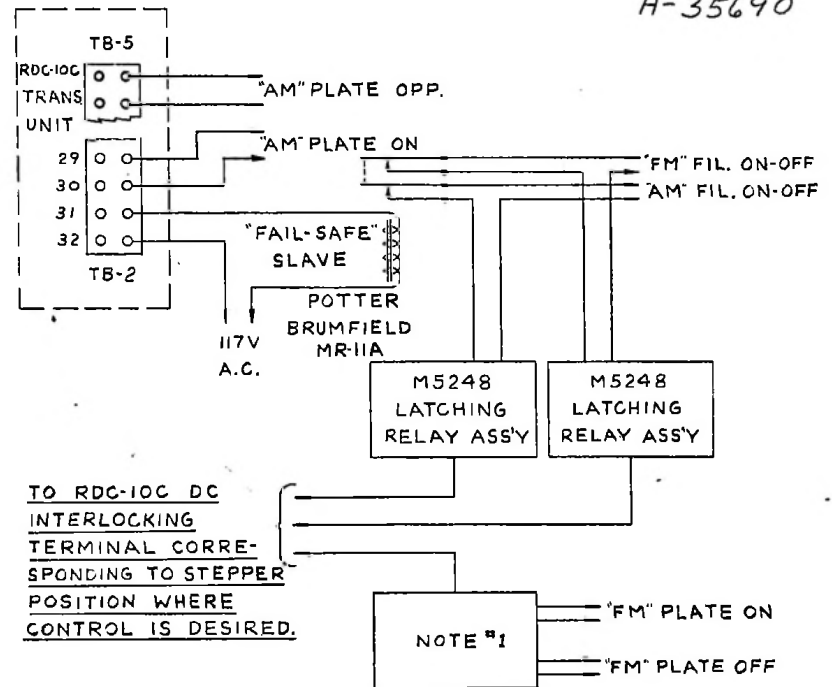
For the sake of simplicity, other control functions for loading, tuning and output have been omitted. Caution has to be exercised in some rare cases, but up to ten control functions of this general nature can be accommodated with the standard RDC-10C system. These are more than adequate in all except the most extreme cases.

It is emphasized that stepper positions #1, #2, and #3 were used above only for illustration purposes. The control functions can, of course, be assigned to any of the selector positions.



ECN 8574
RBJ 3-3-61

A-35689



GENERAL AM-FM
TRANSMITTER CONTROL
WITH RDC-10C (ALLOWS
COMPLETELY INDEPENDENT
CONTROL OF FILAMENT
AND PLATE "ON-OFF"
FUNCTIONS.)

NOTE #1: M5248 "LATCHING"
RELAY ASS'Y. REQ'D IF
"HOLDING" CONTACTS
NECESSARY FOR PLATE
CONTROL.
M5249 "MOMENTARY"
RELAY ASS'Y. REQ'D IF
MOMENTARY "ON-OFF"
SWITCHING NECESSARY
FOR PLATE CONTROL.

ECN 8574
RBJ 3-3-61

A-35690

RDC-10

M-5248 Terminal	Connect to Remote Control Xmtr. Unit
TB1-1	See Note 1.
TB1-2	To DC interlocking terminal corresponding to stepper position where control is desired
TB1-3	To TB2-26
TB1-4	To TB2-28
TB1-5 and 6	Jumper and connect to A.C. neutral of 115 A.C. Raise - lower circuit.

NOTE 1:
This terminal may be connected to station ground to pick up negative of 6 volt D.C. remote control supply.

RDC-200

M-5248 Terminal	Connect to Remote Control Xmtr. Unit
TB1-1	See Note 2.
TB1-2	To DC interlocking terminal corresponding to stepper position where control is desired
TB1-3	TB1-16
TB1-4	TB1-18
TB1-5 and 6	Jumper and connect to TB1-17

NOTE 2:
Connect to station ground to pick up negative of 10 volt D.C. remote control supply.

M-5248 Latch Relay Assembly.
Interconnections with RDC-10 and RDC-200
Remote Control Systems.

MIL.		FIN.		UNLESS OTHERWISE SPECIFIED, ALL TOLERANCES PER GATES SPEC. QM91E.
DR. BY DATE	CH. BY DATE	ENG. APR. DATE		
GATES RADIO COMPANY QUINCY, ILLINOIS				DRAWING NUMBER A-31161

ECR-8365
9/23/60 Sub. 1

RDC-10

M-5249 terminal:	Connects to Remote Control Transmitter Unit to:
TB1-1	See Note - 1
TB1-2	D.C. Interlocking Terminal corresponding to stepper position where control is desired
TB1-3	TB2-26
TB1-4	TB2-28
TB1-5 and 6	Jumper together and return to neutral of 115 V. AC Raise - lower source

NOTE 1: This terminal can be connected to station ground to pick up negative of remote control 6 V. D.C. supply.

RDC-200

M-5249 terminal:	Connects to Remote Control Transmitter Unit to:
TB1-1	See Note - 2
TB1-2	D.C. Interlocking Terminal corresponding to stepper position where control is desired.
TB1-3	TB1-16
TB1-4	TB1-18
TB1-5 and 6	Jumper together and connect to TB1-17

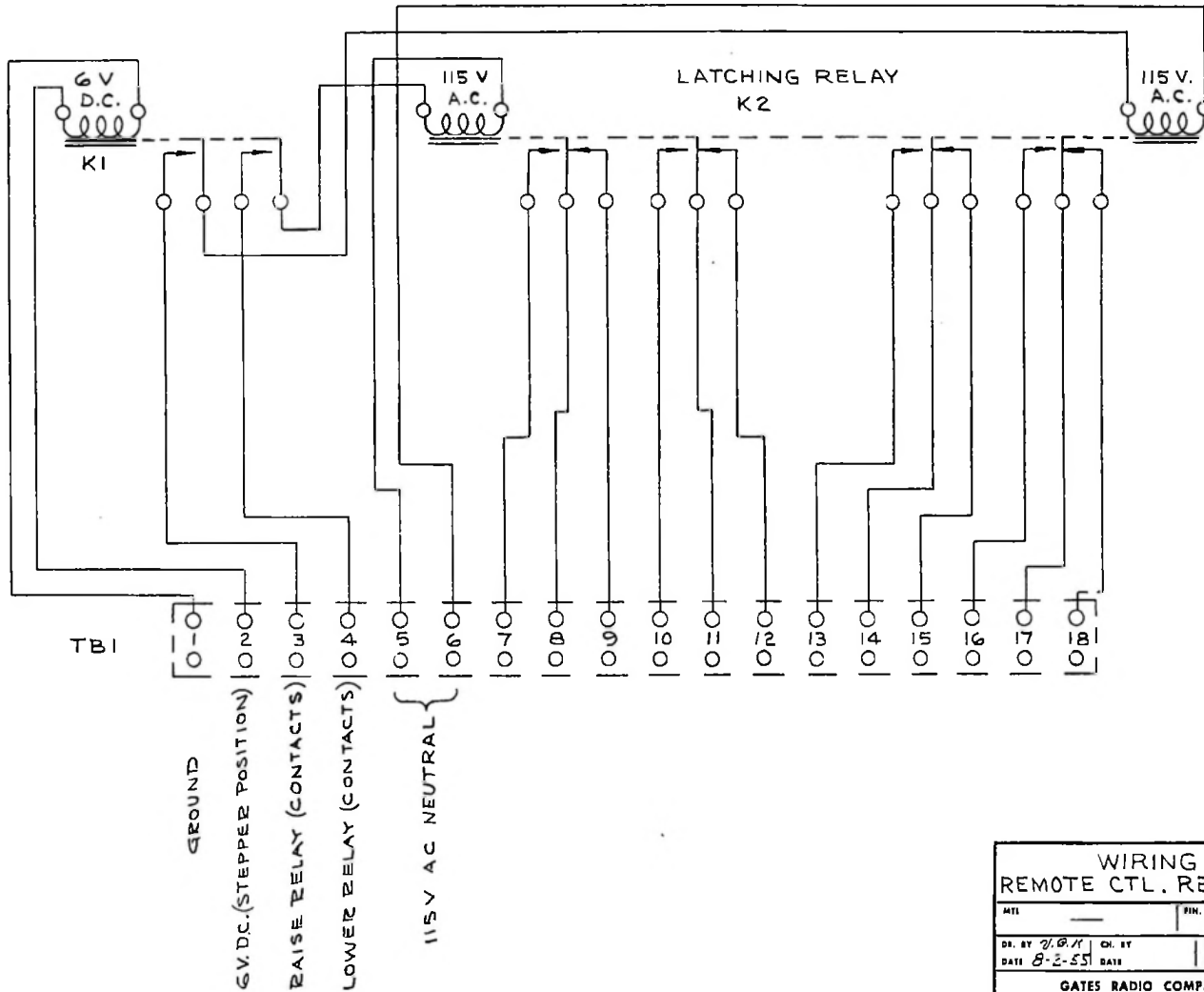
NOTE 2: This terminal can be connected to station ground to pick up negative of remote control 10 V. D.C. supply.

M-5249 Relay Assembly (Momentary) Interconnections for use with Gates RDC-10 and RDC-200 Remote Control Systems.

MIL.		FIN.		UNLESS OTHERWISE SPECIFIED, ALL TOLERANCES PER GATES SPEC. QM91E.
DR. BY DATE	CH. BY DATE	ENG. APR. DATE		
GATES RADIO COMPANY QUINCY, ILLINOIS				DRAWING NUMBER A-31168

ECR-8365
9/23/60 Sub. 1

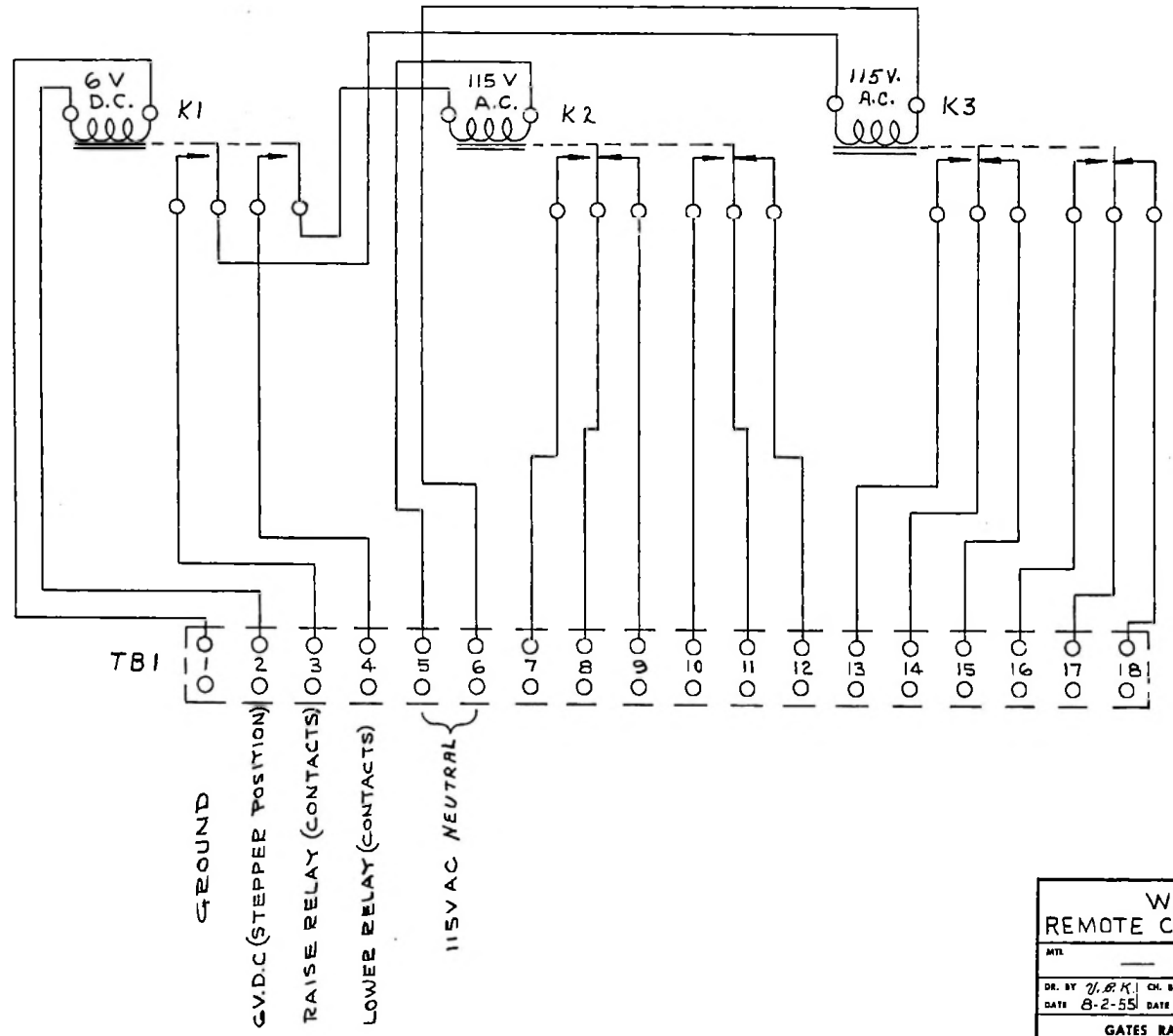
DRAWING NUMBER
B-13409



WIRING DIAGRAM
REMOTE CTL. RELAY ASS'Y. M5248

MTL	FIN.	UNLESS OTHERWISE SPECIFIED, ALL TOLERANCES PER GATES SPEC. Q&M103.	
DR. BY <i>J.P.K.</i>	CH. BY	ENGR. <i>REM</i>	DRAWING NUMBER
DATE <i>8-2-55</i>	DATE	DATE <i>9-7-55</i>	B-13409
GATES RADIO COMPANY QUINCY, ILLINOIS			

DRAWING NUMBER
B-13410



TBI

GROUND

6V D.C. (STEPPER POSITION)

RAISE RELAY (CONTACTS)

LOWER RELAY (CONTACTS)

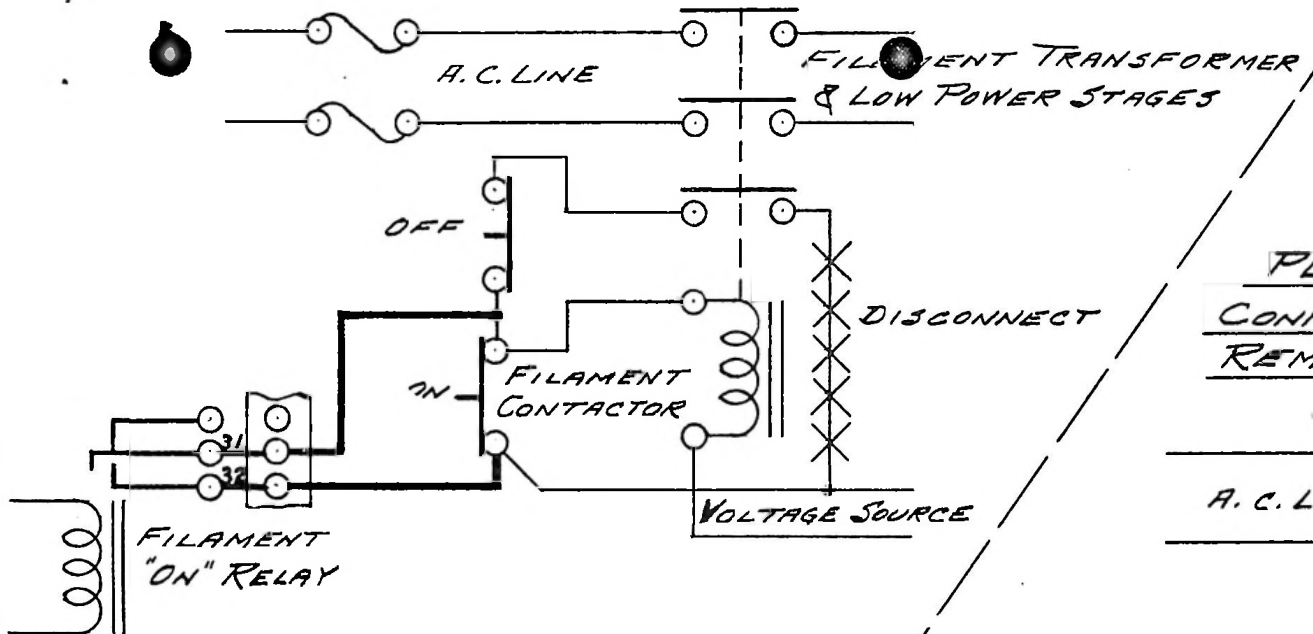
115V AC NEUTRAL

WIRING DIAGRAM
 REMOTE CTL. RELAY ASS'Y M5249

MTL	FIN.	UNLESS OTHERWISE SPECIFIED, ALL TOLERANCES PER GATES SPEC. DS1102.	
DR. BY <u>W.B.K.</u>	CHK. BY	ENG. APP. <u>REM</u>	DRAWING NUMBER
DATE <u>8-2-55</u>	DATE	DATE <u>9-7-55</u>	B-13410

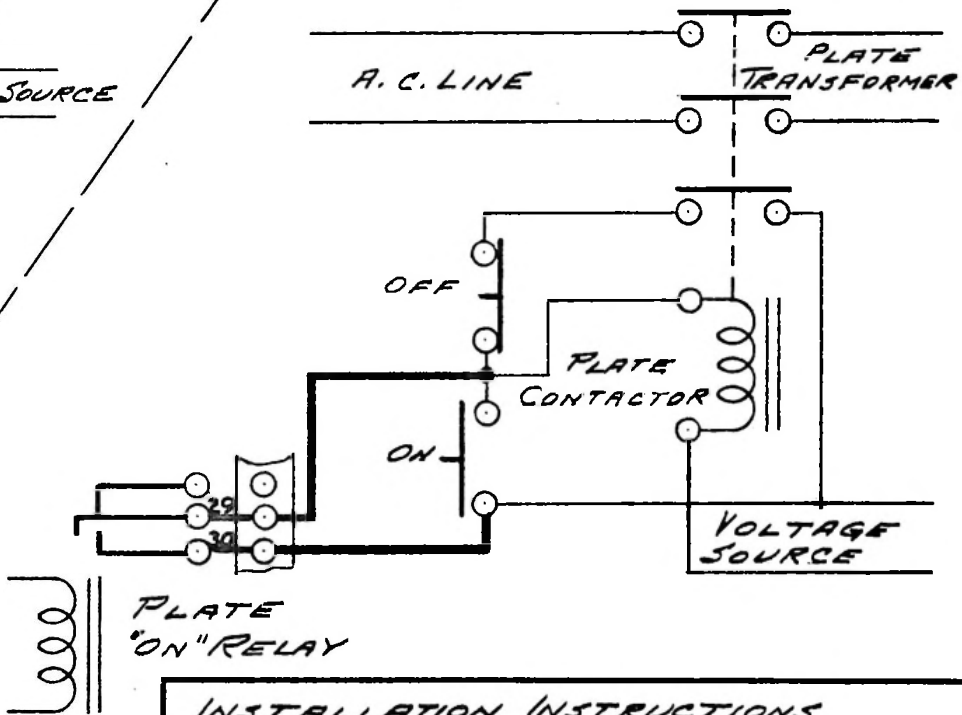
GATES RADIO COMPANY
 QUINCY, ILLINOIS

B-13410



FILAMENT CONTACTOR CONNECTIONS FOR REMOTE CONTROL

PLATE CONTACTOR CONNECTIONS FOR REMOTE CONTROL



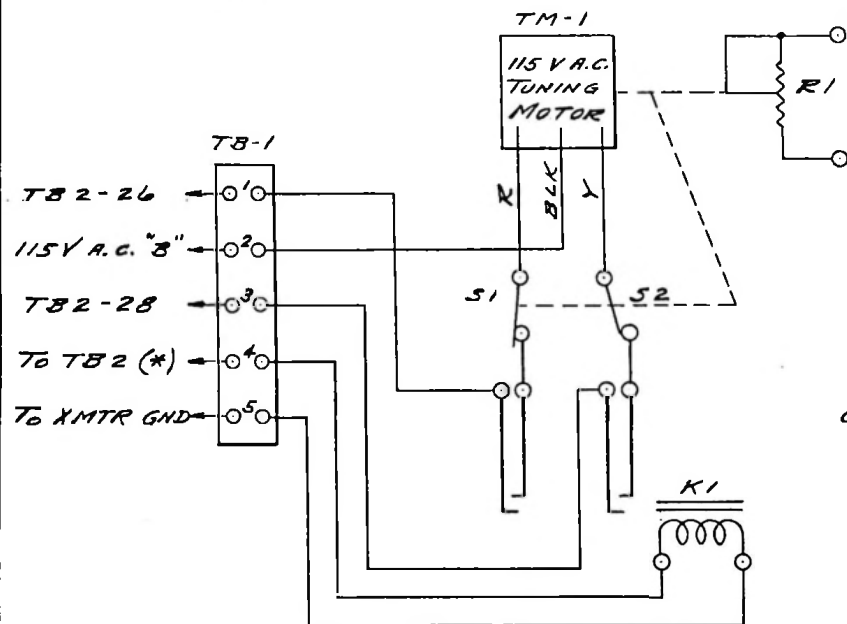
INSTALLATION INSTRUCTIONS
RDC-10 REMOTE CONTROL M5214

MTL	FIN.	UNLESS OTHERWISE SPECIFIED, ALL TOLERANCES PER GATES SPEC OSM102.
DR. BY DRA 2	CH. BY	
DATE 8-2-55	DATE	ENG. APR. REM
		DATE 8-3-55

GATES RADIO COMPANY
QUINCY, ILLINOIS

DRAWING NUMBER
A-10990

M 4703 TUNING MOTOR &
RHEOSTAT ASSEMBLY

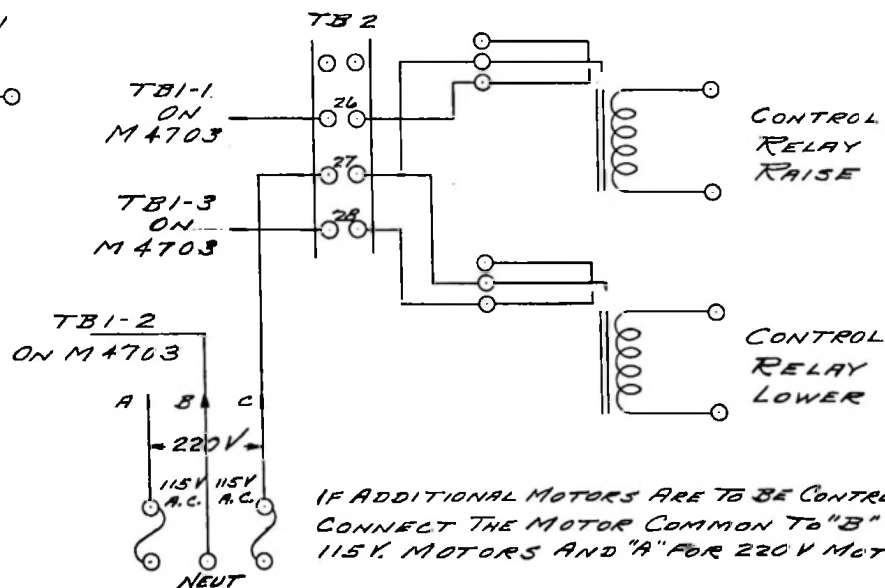


(*)

THIS SHOULD BE CONNECTED TO TERMINAL CORRESPONDING TO POSITION ON SELECTOR THAT CONTROL IS DESIRED. EXAMPLE:- IF IT IS DESIRED TO CONTROL MOTOR,

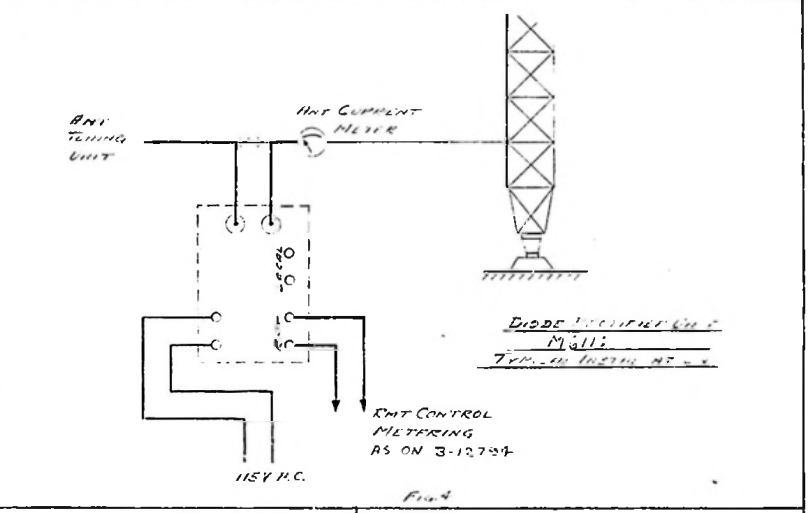
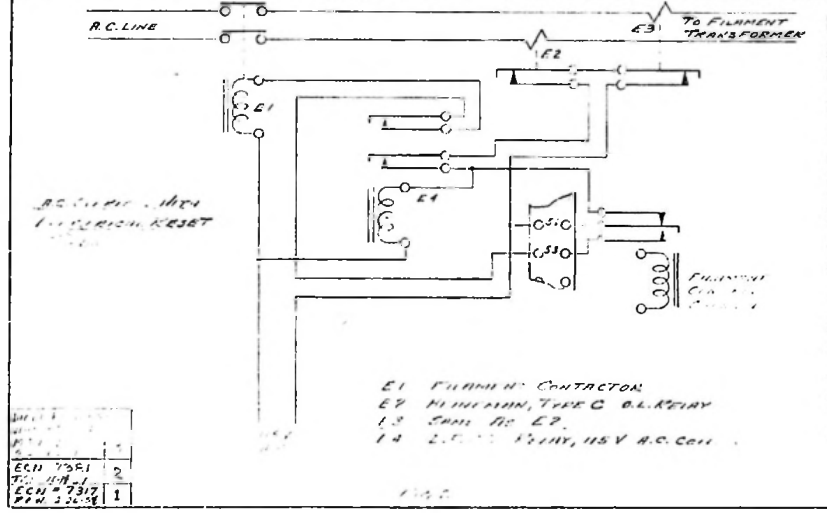
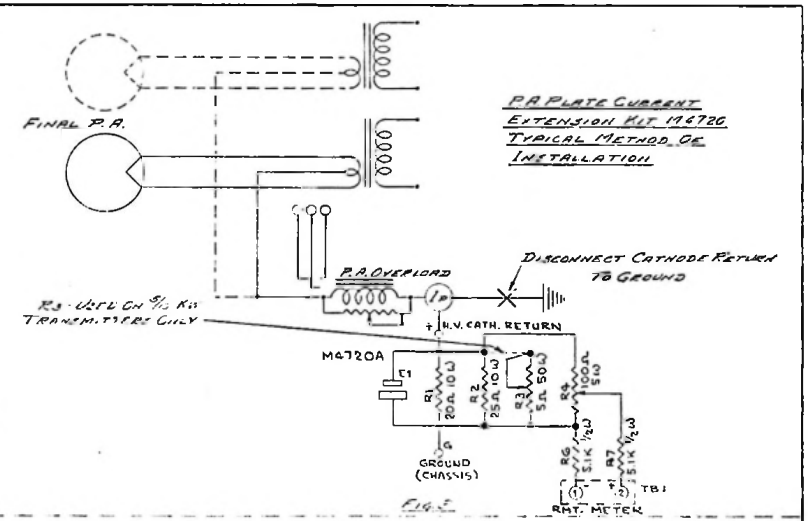
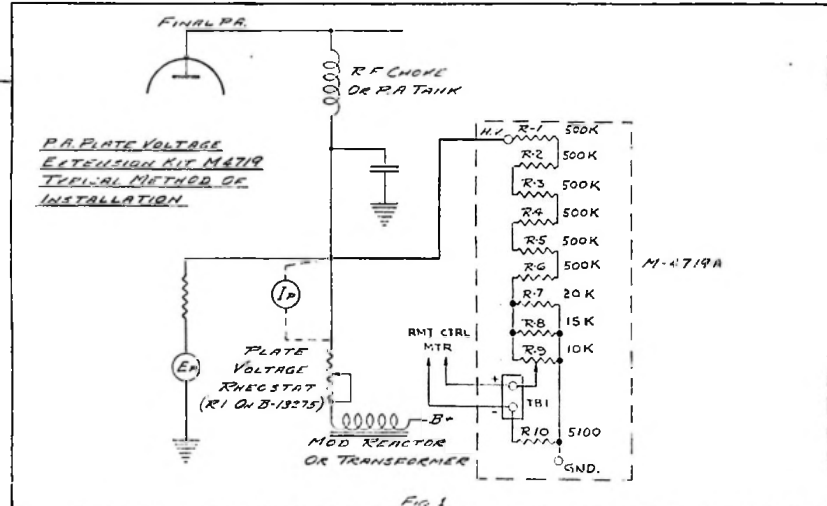
- (1) WHILE READING PLATE VOLTAGE, CONNECT TO TB2-15
- (2) WHILE READING ANT CURRENT, CONNECT TO TB2-17
- (3) IF IT IS DESIRED TO BE ABLE TO READ EITHER PLATE VOLTAGE OR ANT. CURRENT WHILE CONTROLLING THE MOTOR, JUMPER TB2-15 TO TB2-17 AND CONNECT TB1-4 ON TUNING MOTOR ASSEMBLY TO TB2-17

M 5214 REMOTE CONTROL
SYSTEM



IF ADDITIONAL MOTORS ARE TO BE CONTROLLED CONNECT THE MOTOR COMMON TO "B" FOR 115V. MOTORS AND "A" FOR 220V MOTOR

P.C.N. 7-30-57 F.G.S.	1			INSTALLATION INSTRUCTIONS FOR TUNING MOTOR & RHEOSTAT ASSEMBLY FOR M 5214	
	MTL		PNL	UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE GATES SPEC. DRAWING.	
	DR. BY <u>RAJ</u>	CHK. BY	ISS. APR. <u>REM</u>	DRAWING NUMBER	
DATE <u>8-2-55</u>	DATE	DATE <u>8-4-55</u>	B-13417		
GATES RADIO COMPANY QUINCY, ILLINOIS					



ECN 7351	2
ECN 7317	1

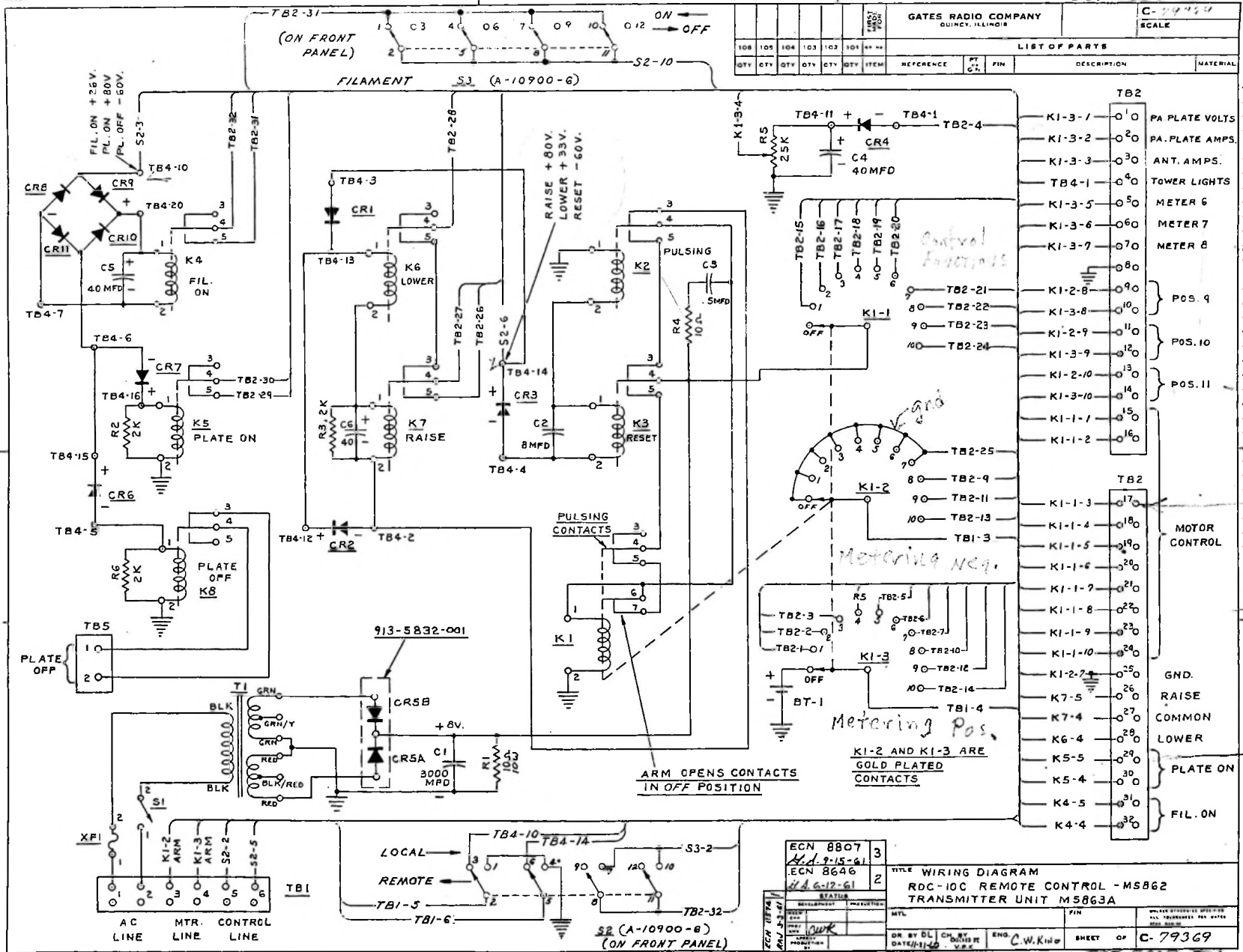
237 9369 001

GATES RADIO COMPANY
QUINCY, ILLINOIS

C-79369
SCALE

LIST OF PARTS

108	109	104	103	101	102	ITEM	REFERENCE	PT. C.T.	FIN.	DESCRIPTION	MATERIAL
QTY	QTY	QTY	QTY	QTY	QTY						



Reset
FRFQ
Mod.
Tel.

32 GND

TB5-2

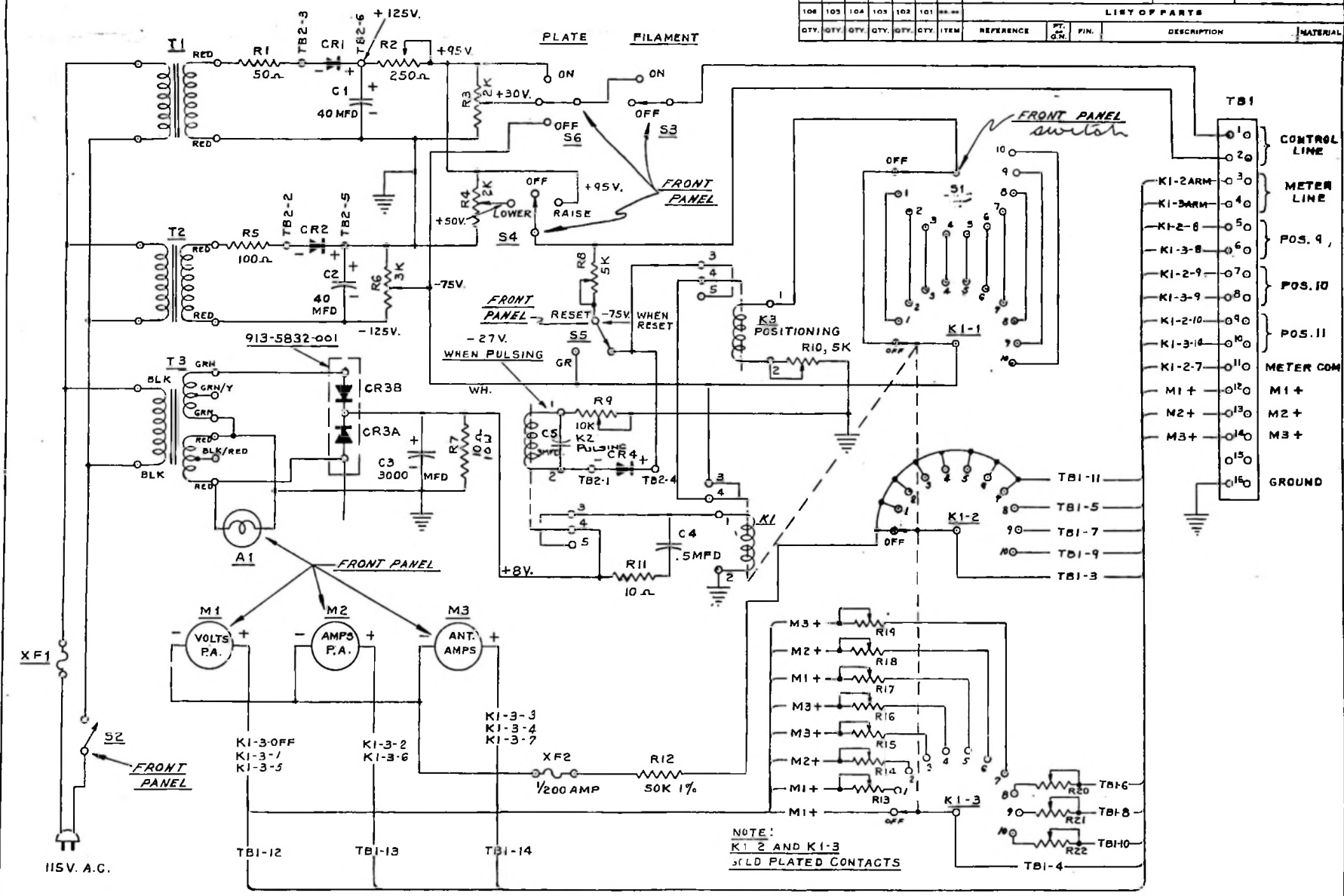
ECN 8807 3
H.A. 9-15-61
ECN 8646 2
H.A. 6-17-61

TITLE WIRING DIAGRAM
RDC-10C REMOTE CONTROL - MS862
TRANSMITTER UNIT MS863A

REV.	DATE	BY	CHK.	APP.	DATE	BY	CHK.	APP.	SHEET	OF
1		CWK							C-79369	

237 9369 001

LIST OF PARTS							REFERENCE	PT. QTY.	FIN.	DESCRIPTION	MATERIAL
106	103	104	105	102	101	84-22					
QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	ITEM					



NOTE:
K1-2 AND K1-3
SILVER PLATED CONTACTS

TITLE				STATUS		MPL	PIN	SHEET	OP	C-78485
WIRING DIAGRAM				DESIGNED BY	PRODUCED BY					
RDC-10C REMOTE CONTROL - M5862										
STUDIO UNIT M5864										
DR. BY DL. CH. BY				ENG.						
DATE: 2-19-59				V.P.P.						

ECN	REV	DATE	BY	REASON
1	1	2-19-59	DL	INITIAL
2	1	3-3-59	DL	REVISED
3	1	5-7-59	DL	REVISED

TYPICAL D.C. OVERLOAD RELAYS FOR
MODULATORS & POWER AMPLIFIER

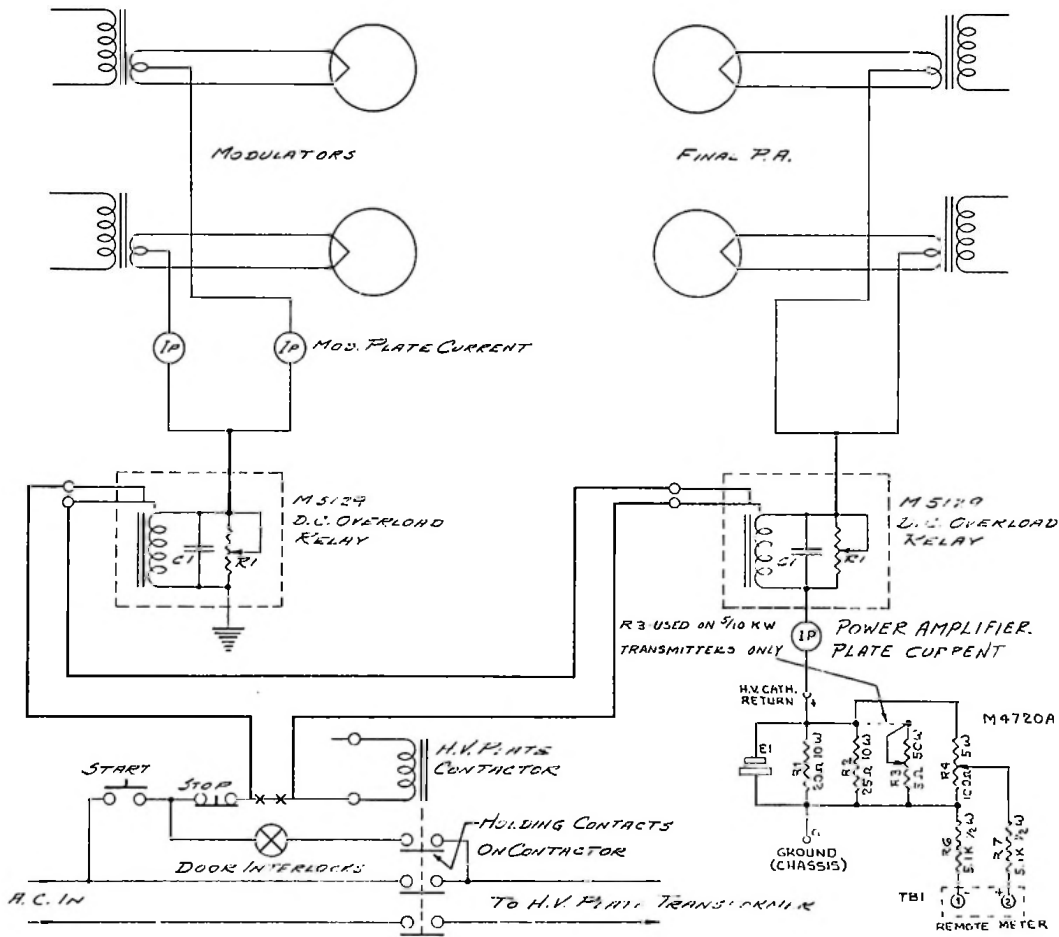


FIG 1

2 ECN 7981
1 ECN 47317
REV 2-27-54

TOWER LIGHTS CURRENT MS143
CURRENT TRANSFORMER OR MS145 TOWER LIGHT EXT. KIT
(MS145 NOT FURNISHED WITH BASIC REMOTE CONTROL)

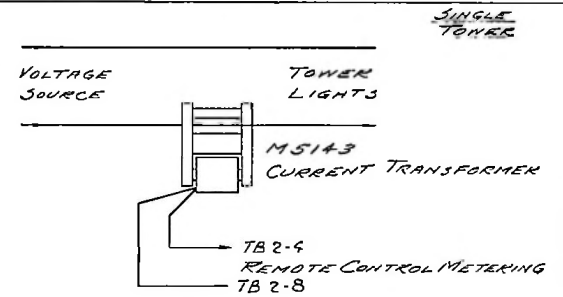


FIG 2

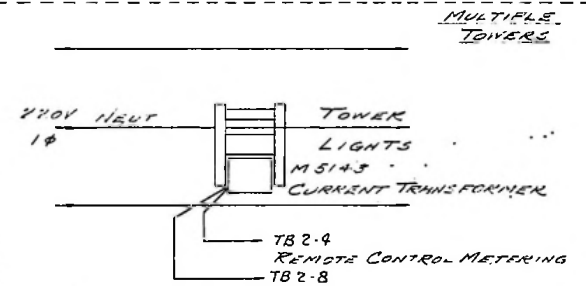


FIG 3

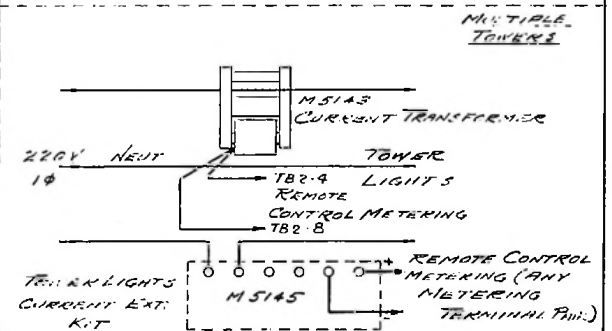
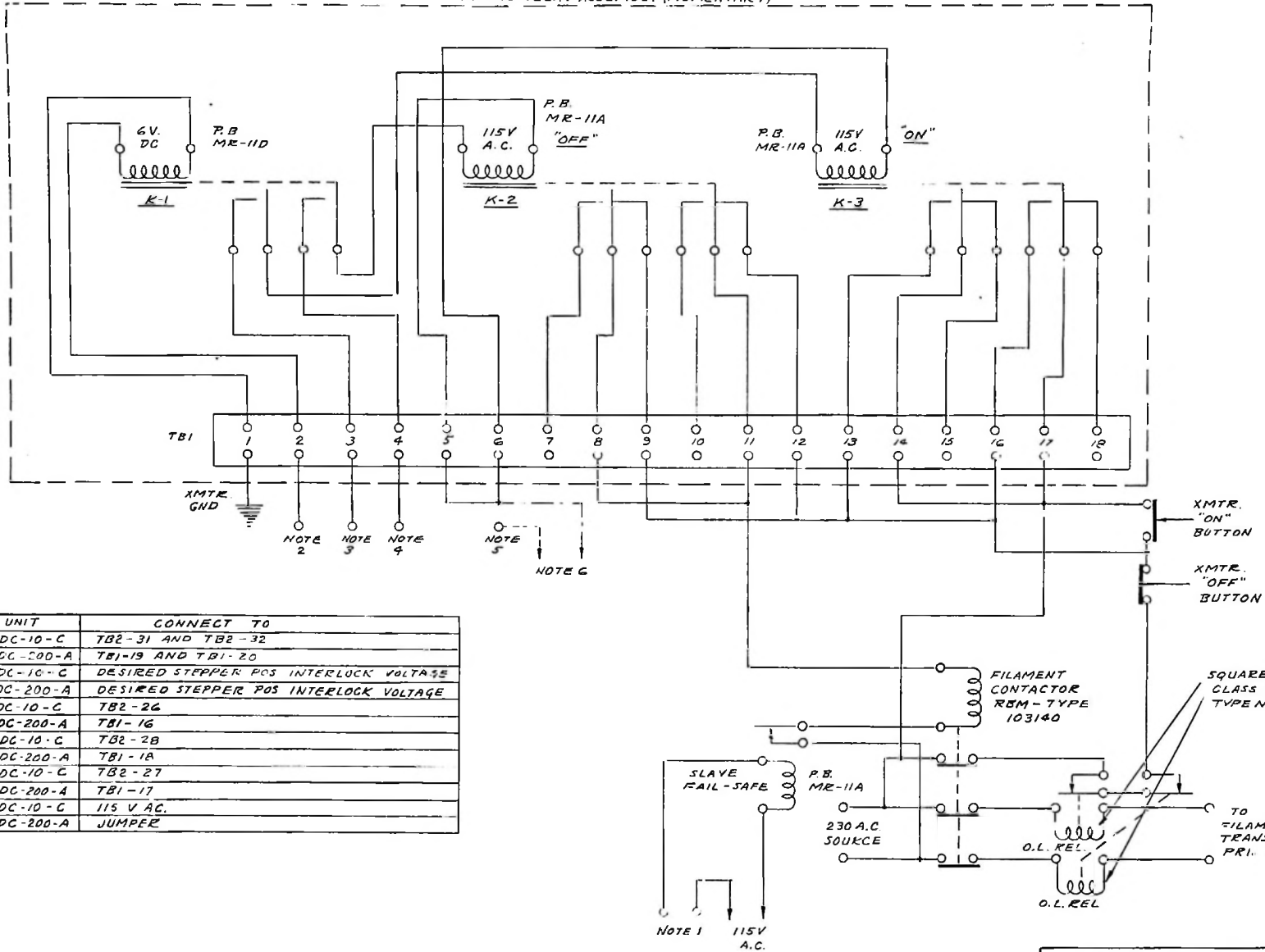


FIG 4

M 5249 RELAY ASSEMBLY (MOMENTARY)



NOTE	UNIT	CONNECT TO
1	RDC-10-C	TB2-31 AND TB2-32
	RDC-200-A	TB1-19 AND TB1-20
2	RDC-10-C	DESIRED STEPPER POS INTERLOCK VOLTAGE
	RDC-200-A	DESIRED STEPPER POS INTERLOCK VOLTAGE
3	RDC-10-C	TB2-26
	RDC-200-A	TB1-16
4	RDC-10-C	TB2-2B
	RDC-200-A	TB1-1A
5	RDC-10-C	TB2-27
	RDC-200-A	TB1-17
6	RDC-10-C	115 V AC.
	RDC-200-A	JUMPER

GATES RADIO COMPANY
QUINCY, ILLINOIS

INTERCONN. FOR REMOTE CONTROL TO
PROVIDE FILAMENT ON-OFF FAIL-SAFE &
AC O.L. PROTECTION, RDC-10-C & RDC-200A

DR BY *[Signature]* DATE 10-18-59
CH BY *[Signature]* ENG

CC-78071

TRANSMITTER READINGS

AM TRANSMITTER

CIRCUIT	METER READING	DIAL READING	REMARKS
Oscillator Plate Current			
Buffer Grid Current			
Buffer Plate or Cathode Current			
RF Driver Grid Current			
RF Driver Plate Current			
PA Grid Current			
PA Plate Current			
PA Plate Voltage			
PA Efficiency			
Filament Voltage			
Line Voltage			
Mod 1 Static Plate Current			
Mod 2 Static Plate Current			
RF Line Current			

FM TRANSMITTER

CIRCUIT	METER READING	DIAL READING	REMARKS
Driver Grid Current			
Driver Screen Current			
Driver Plate Current			
Driver Plate Voltage			
RF Output			
VSWR			
Filament Voltage			
PA Grid Current			
PA Screen Current			
PA Plate Current			
PA Plate Voltage			
PA Screen Voltage			
RF Output			
VSWR			
Efficiency			
Filament Voltage			
Line Voltage			

HARRIS
INTERTYPE
CORPORATION

GATES

GATES RADIO COMPANY
QUINC, ILLINOIS 62302

Offices in: NEW YORK, HOUSTON, LOS ANGELES,
WASHINGTON, D.C. Export: ROCKE INTERNATIONAL
CORPORATION, NEW YORK CITY. In Canada:
CANADIAN MARCONI COMPANY, MONTREAL.