INSTRUCTIONS FOR INSTALLING AND OPERATION
OF
THE GATES CARTRIDGE - M5944

4/28/61
GATES RADIO COMPANY
QUINCY, ILLINOIS
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SECTION I
SPECIFICATION

M5944 CARTRITAPE PLAYBACK UNIT

FREQUENCY RESPONSE: Standard NAB playback curve, + 2 db
50 to 12,000 cps., @ 7.5 IPS.

DISTORTION: 2% or less @ normal recording level.

NOISE: 60 db or lower below tape saturation level.

50 db or lower below normal recording level, 0 VU

WOW AND FLUTTER: 0.1% to 0.2% RMS.

Tape Speed: 7-1/2" per second.

Equalization: Standard NAB playback equalization for 7.5 IPS.

Playing Time: 1 sec. to 46 min., in three basic cartridge sizes.

Output Level: -15 dbm @ 500/600 ohms (factory connected),
may be strapped for 150/250 ohm output.
(Level set for -15 dbm at factory by R106.)

Cueing Accuracy: Within 0.1 second.

Start Time: 0.1 second or less.

Stop Time: Essentially instantaneous.

Power Source: 115 volts, 60 CPS, only.

Power Consumption: 35 watts in the "ready" position
125 watts in the "Run" position

Tube Complement: (2) 12AX7, (1) EF86, (1) 2D21, (1) 6X4.

Mechanical

Height: 7 inch rack or custom cabinet mounting.
Width: 19 inch rack or 15 inch custom cabinet mounting.
Depth: 13 inch behind panel, excluding plugs.
Mounting: Standard 19 inch rack.
Custom 15 inch cabinet.
Desk top, with or without cabinet.

Weight: Net 26 lbs., packed (domestic) 49 lbs., cubage 5.

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**AUXILIARY CONNECTIONS:**
- Remote Start - Remote Stop
- Remote Record Start - Remote Record Stop
- Remote Cue Interlock - Remote Record Interlock
- Synchronized Start Circuit
- Synchronized Cue Controlled Stop Circuit
- Synchronized Automatic Sequential Start Circuit

**SECTION II**
**INTRODUCTION**

2.1 Gates Carritape is a system that utilizes magnetic tape filled cartridges. It records and plays back using these cartridges with a quality equal to first rate reel to reel machines. The cartridge is plastic and contains a special lubricated recording tape which utilizes the principle of the endless loop. This means the tape will repeat itself if allowed to do so. This action is achieved by the tape being pulled from the center of a free turning hub by the capstan, past the heads and applied back on the outside edge of the reel of tape.

2.2 **SYSTEM UNITS** - (See Drawing 842 3246 001 for complete system diagram.)

The basic system includes:

1. Carritape Playback Unit, M5944.
2. Carritape Recording Amplifier, M5952.

Optional Accessories:

1. Automatic Switcher, M5953.
2. Remote Unit, M5960.
3. Cartridge Storage Rack, M5986

Units Needed -

To playback only
1 - M5944 Carritape

To record only or record and playback
1 - M5944 Carritape.
1 - M5952 Recording Amplifier

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NOTE
When the recording amplifier/playback combination is not in the record mode, it is automatically in the playback condition.

SECTION III
INSTALLATION

NOTE
Before operating the equipment read this Section, Section IV and Section V.

3.1 UNPACKING
The Cartritape unit will be received in one shipping carton. If the unit is to be rack mounted, the panel adaptor kit must be used. All units are shipped with the 19 inch adaptor kit. Unpack the contents carefully and examine thoroughly for shipping damage. If any such damage is found, File a claim report immediately with the Carrier.

CAUTION - Remove protective shipping fillers and shipping hardware.

To remove shipping protection -

Step 1. Remove the top cover and remove sleeve from the capstan.

Step 2. Remove the right access plate and remove the tie cord that holds down the lifter assembly.

Step 3. Remove bottom cover and remove protective filler around motor.

3.2 MOUNTING

Step 1. Assemble the adaptor plates to the front panel with the hardware provided, if 19" rack mounting is to be utilized.

Step 2. Mount the unit in a standard rack with four rack panel screws.

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The unit is complete as received. It was designed to allow its use without an external cabinet, if desired.

**NOTE**
The mounted equipment requires 7 inches of panel space and extends to a depth of 13 inches. Attention should be given to the location of the Cartritape units in the rack. Place them at a convenient height for cartridge insertion.

The recording amplifier should be mounted immediately above or below the playback unit to which it is to be interconnected. The recording amplifier requires 5-1/4 inches of panel space.

For INSTALLATION instructions for the recording amplifier, consult the Instruction Book on the Recording Amplifier, M5952.

3.3 **AUDIO OUTPUT J105**

**NOTE**
Before wiring P105 see drawing 813 5844 001 for pin numbering information. Insert plug into jack while wiring and observe above drawing.

The audio output appears between pins 2 and 3 of P105, with Pin 1 being ground. The amplifier is wired at the factory for 500/600 ohms at a -15 dbm output level from a normally recorded tape. This level is adjustable by R106, and is adjusted at the factory for 15 dbm.

Observing the schematic drawing C-79180, notice the output is balanced. It may be connected for 600 or 150 ohm, balanced or unbalanced output. (The output transformer is T102.)
3.4 **TO CONNECT T102 FOR 150 OHM OUTPUT**

   Step 1. Strap green and black/white together.
   Step 2. Strap black and yellow together.
   Step 3. The output is between the green and black leads.

3.5 **CONTROL CIRCUIT JACK - J104 (P104 MATING PLUG)**

   **NOTE**

   See Drawing 813 5844 001 for pin numbering information before wiring, shows numbering of P104.

   Cartritape has many circuits brought out to this jack. Most of the interconnections and switching contacts are made from this termination point. See Drawing 842 3246 001 for system wiring diagram.

3.6 **REMOTE STOP**

   If "Remote Stop" is desired the jumper between Pins 4 & 5 on J104 should be replaced with a N.C. switch. Normal operation, however, would be to allow the unit to recue and stop itself.

3.7 **POWER CORD**

   The power cord should be connected between J101 and the 115 VAC 60 cps. power source.

3.8 **CONNECTION FOR SYNCHRONIZED AUTOMATIC SEQUENTIAL START.**

   It is possible to interconnect the Cartritape playback units in such a manner that the stopping of one unit causes the starting of the next. This yields a form of automatic programming. See Section in Recording Amplifier Instruction Book for cartridge preparation.

   **To Interconnect Units**

   Step 1. Interconnect the units, following wiring diagram 826 7750 001. The wiring shown is required in addition to that shown on 842 3246 001.

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   M5944 Cartritape
Drawing 826 7750 001 shows four units interconnected, any number may be used, more or less. If more are used, an extra switcher (M5953) is required for each group of four or less playback units.

Step 2. A switch (not supplied) makes the combination automatic or manual, depending on the position of the switch. A suitable ganged switch would be a Centralab 1419. This switch can be obtained from Gates.

SECTION IV
PRE-OPERATION

4.1 GENERAL

The following section describes familiarization procedures that should be followed before attempting to operate the equipment.

4.2 A.C. POWER SWITCH - S101

Located on the lower right on the front panel.

Function: Turns power OFF and ON to the unit.

4.3 BAR SWITCH - S103-S104

Functions: (A) Indicates Power ON  
(B) Indicates Ready to Play  
(C) Starts Mechanism  
(D) Indicates Running Condition  
(E) Stops Mechanism.

As can be observed from the above, the switch provides the multiple functions of switching; and by use of lights, shows the operating status of the unit.

The following describes each function in detail.

4.3.1 INDICATES POWER "ON"

Step 1. Switch S101 (AC Power) to the ON position.
Step 2. Observe the center portion of the bar switch, it should glow red and green.

4.3.2 INDICATES "READY" TO PLAY

Step 1. Insert an erased cartridge into the slot, guiding to the right hand side. Push firmly forward until it comes to rest against the stop.

Step 2. Observe the bar switch, notice that the right half of the switch now glows green. This indicates the cartridge is ready to play.

4.3.3 START MECHANISM

Step 1. With the cartridge in place, press against the bar switch on the side marked "START".

Step 2. The unit will start, (the tape will begin to move) while the left side of the bar switch now glows red.

4.3.4 INDICATES RUNNING CONDITION

Step 1. As mentioned in 4.3.3 Step 2, the left side of the bar switch glows red. This indicates the unit is in the running condition.

4.3.5 STOP MECHANISM

Step 1. Press against the bar switch on the side marked STOP.

Step 2. The tape will stop, and the red light will go out.

Step 3. Notice the green light is still illuminated. This indicates the cartridge is again in the "Ready to Play" condition.

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CAUTION - when removing the cartridge from the slot, a slow firm retrieve is necessary. If it is removed with a fast or jerking motion, the pressure roller may bind in the cartridge. If this occurs, press forward and repeat removal step.

4.4 RECORD PLAYBACK FUNCTION
In order to make a test recording, first study the Instruction Book for the Recording Amplifier M5952. Study the section on INSTALLATION and PRE-OPERATION in particular.

After the installation of the recording amplifier, a test recording should be made following the steps given in the Recording Amplifier Instruction Book.

4.5 AUDIO MONITOR JACK
Located on the front panel (lower left hand side).

Function: To allow monitoring of the audio by use of crystal phones. (-15 DBM level).

CAUTION - Only crystal phones should be used in this jack. Lower impedance phones may cause excessive circuit loading and/or a lower level than can be used.

SECTION V
OPERATION

5.1 GENERAL
The operation of Cartritape M5944 is treated as a playback unit only. When the unit is connected as a record/playback combination the playback function still applies. However, all reference to the recording aspect is treated in the Recording Amplifier Instruction Book.

NOTE
It must be remembered there is a 3 second delay after "Start" is pressed before cue signals can be detected by the cue amplifier.
Therefore, recorded segments should be at least 4 - 5 seconds long.

5.2 **PLAYBACK**

5.2.1 **Playback of a Single Segment Recording**

1. Cartridge should be recorded as explained in recording Instruction Book.
2. Insert cartridge into slot until "Ready" light comes on.
3. To play, press "Start" (bar switch) on the Cartritape.
4. Upon completion of the program material, the Cartritape will continue to run until the next cue signal is detected. The tape mechanism then stops automatically. The red "Run" light is extinguished, indicating the Cartritape is again ready for operation.

5.2.2 **Multiple Segments**

1. Play first segment as explained above in 5.2.1. Since the segments are recorded end to end, the cartridge will stop all cued up after the first segment has played.

5.2.3 **Multiple Segments from More than one Cartritape, Using Single Segment Cartridges.**

1. Start the first segment as in 5.2.1.
2. As the first segment ends, start the next unit, and so on until all the units have played their segment. Of course, any unit may be reloaded with a cartridge anytime after the previous cartridge has recued.

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5.2.4 Automatic Sequential Start

A form of automatic programming can be attained by connecting the Cartritape for automatic sequential start. The cartridges are prepared such that a cue tone is applied at the end of each recorded segment. This cartridge will then cue up at the end of the recorded audio segment. This stopping will then start the next Cartritape, and so on.

The following points should be followed for correct use of this feature.

1. All cartridges must be prepared end to end as explained in the Recording Amplifier Instruction Book.
2. The Cartritape system should have the wiring complete as shown on drawing 836 7750 001 in addition to the wiring shown on 842 3246 001.

**NOTE**

842 3246 001 is a system wiring diagram for manual operation only.

It will become apparent there are many possible uses for a system such as this, tight programming, semi-automation, etc., could be used for -

1. Automatic programming of hit tunes, one, two or three on each cartridge.
2. When playing a series of spots end to end. They could be played automatically.
3. There are contacts available on K101 that could be used to start other equipment, slides, etc., (Pins 17-18 or K101).

The above is described to stimulate some ideas on how this feature could work for your programming.

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SECTION VI
THEORY OF OPERATION

6.1 PLAY AMPLIFIER

The play amplifier is a three stage amplifier (with a gain of approximately 55 DB @ 1000 cycles) which utilizes the NAB playback curve for equalization. The playback head is connected directly to the input grid of the EF86 preamplifier. This tube is connected in a standard grounded cathode amplifier configuration with shunt type equalization in the plate circuit. R105 may be adjusted to compensate for variations in the components from machine to machine. R105 has been adjusted at the factory (approximately 5000 ohms) so that the response is within published specifications. The second stage is a conventional triode amplifier with about 18 DB of negative feedback applied to the cathode (from the following stage) through R110 and C108. This feedback reduces the distortion to a very low level. The last stage is a conventional amplifier with transformer output.

The normal output level of this amplifier (when playing back a tape that has been recorded at normal level) is about -15 DBM. This level is set at the factory by level control R106. However, the distortion of the amplifier at 0 DBM out is less than .5% maximum. Output transformer T102 is connected for 600 ohm output at the factory. If it is desired to reconnect the output for 150 ohms paragraph 5.4 should be consulted in Section III - INSTALLATION.

A level control (R106) used in the playback amplifier provides level adjustment to compensate for head and component differences. The level from a properly recorded tape will produce the correct level for feeding a medium level console input (without console preamplifier).

6.2 CUE AMPLIFIER

The cue amplifier consists of V104 and V105. The cue head is connected directly to the input grid of the first stage.
V104 is a conventional amplifier connected in cascade. However, note that there is no bass equalization because the cue tone is 1000 cycles. Any equalization would cause a loss in cue gain. C111 is connected from the plate of the second stage to ground to help shunt any high frequency switching transients (from other equipment) to ground before they can be applied to the grid of V105 (2D21). The two diodes CR102 & CR103 together with C120 and R119 in the grid circuit of V105 comprise another transient suppression device. This circuit rectifies the cue tone which then overcomes the DC bias on V105, this causes K102 to be activated. The 2D21 is a thyratron with a plate relay (K102) for its load, when activated the mechanism stops. R122 is a current limiting resistor used to protect the 2D21 during the conduction cycle. The grid has approximately 12 volts of negative bias applied during STOP, and about 5 volts in the RUN condition. This bias is derived from R123 and C115 in center tap ground return of the high voltage winding of T101.

On Pin 8 of V104 (12AX7) about 5 volts of positive voltage is applied during the STOP condition. The tube is cut off for approximately 3 seconds after the bar switch is pressed to run. This time delay is caused by the voltage leaking from C102B through R117 and R131. C102B is charged through R129 from the voltage supplied through contacts 6 and 7 on K102. This 3 second delay is to allow the use of tapes recorded on other manufacturer's units that may utilize a longer cue pulse.

6.3 POWER SUPPLY

The unit utilizes two DC power sources. The first uses a special low flux density preamplifier power transformer (T101), and is a conventional full wave type. A 6X4 tube is used for the rectifier, while the filter circuit is a Pi type network. L102 is the inductive element, C101A and C101B are the capacitive elements. The first stages of both amplifiers have the DC filtered further by R108 and C101C.
The second power supply is a half-wave type and provides DC for relay activation. This supply is comprised of CR101 and C116.

6.4 CUEING CYCLE - TONE APPLIED

At the beginning of the recording cycle at the instant the START switch is depressed, a 1000 cps. tone (approximately .1 second duration) is applied to the cue head. This puts the control tone on the cue track of the tape at the beginning of the recording. Program material is recorded on the other track, immediately after the start button is depressed.

The more rapidly the program material is applied to the recording amplifier (after the START switch is pushed) the tighter the cue will be.

6.5 TONE STOPS UNIT

When the cue tone (applied at beginning of the recording on the tape) passes the cue head it causes the unit to stop.

This is accomplished by the cue signal being amplified and causing V105 to fire. This activates K101 briefly, which operates the necessary control circuits.

SECTION VII MAINTENANCE

7.1 GENERAL

Routine maintenance should be followed if the equipment is to continue to perform properly. It is recommended that a routine maintenance schedule be enforced.

NOTE

When servicing equipment pull AC line plug because a shock hazard is present, this will prevent damage to components, as one side of line is hot.

7.2 CLEANING

Clean the capstan and head surfaces daily when subjected to heavy use. Clean the pressure roller once a week.

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Use Isopropyl Alcohol or Wood Alcohol on a soft cloth.  
**CAUTION** - DO NOT USE ANY OTHER SOLVENT.  

**NOTE**
Avoid as much as possible, touching the rubber part of the pressure roller with the fingers.

7.3 **HEAD DEMAGNETIZING**

Heads may become magnetized by large unbalanced pulses through the record head, as well as from strong magnetic fields. Do not saturate the record amplifier with abnormally high input signals. (Magnetized heads produce excessive noise on recorded tapes, and if severe enough will partially erase them).

It is a good idea while cleaning the heads to demagnetize the heads to remove any permanent magnetism that they may have acquired. Demagnetize the heads at least once a week.

7.3.1 **TO DEMAGNETIZE THE HEADS**

**Step 1.** Turn the power off.

**Step 2.** Plug the demagnetizer (a suitable demagnetizer is Audio Devices Model 400.) into the power source.

**Step 3.** Bring the tips of the demagnetizer to within 1/16" of the heads, or contact them if the tips are protected to prevent scratching the head surface.

**Step 4.** Let the tips straddle the head gap and pass them up and down about 3 times.

**Step 5.** Remove the demagnetizer slowly from the head to a distance of about 3 feet.

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CAUTION - This slow removal is extremely important. Do NOT remove power from the demagnetizer while in the proximity of the heads as the collapsing field may re-magnetize them.

7.4 AZIMUTH ADJUSTMENT
This adjustment is made at the Factory. This process is given for information in case it becomes necessary to make adjustment. Having the heads aligned with the head gap perpendicular to the tape travel is extremely important. Otherwise, tapes recorded on one machine will not have adequate high frequency response when played back on another machine. To avoid this, all machines should be aligned with an azimuth test tape periodically or when the very high frequencies appear to be attenuated.

7.4.1 PROGRAM HEAD ADJUSTMENT

Step 1. Obtain a 10 KC cartridge azimuth test tape.*

Step 2. Remove Cartritape enclosure top and V105 (2D21).

Step 3. Insert the azimuth cartridge into the slot and apply power. (Press START).

Step 4. Connect an audio VTVM across the output terminals (Pins 2-3 on J105).

Step 5. Play the tape back and align head for maximum level.

* A 10 KC tape may be prepared on a reel to reel machine and then loaded into a blank cartridge. Use Minnesota Mining & Mfg. Co. Type 151A single lubricated tape.

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NOTE
The necessary azimuth wrenches are supplied with the unit. It will be observed that one wrench has very thin walls. This should be used on the head proper (next to the support bracket) after slightly loosening lock nut with the conventional wrench. Then, working the two wrenches together, rock the head until the highest level is obtained with the nut locked.

CAUTION - Do not use pliers on heads or twist head body. Do not move the entire head assembly vertically or vertical track misplacement will occur. Readjust vertical height per drawing A-34843 if this adjustment is necessary.

7.4.2 CUE HEAD
Step 1. Interchange the two head cables.
Step 2. Repeat Steps 3 & 5. (7.4.1)
Step 3. Put the head cables back into the original jacks.
Step 4. Replace the 2D21 and the top cover.

7.5 AMPLIFIER RESPONSE
Step 1. Set up equipment as shown in block diagram on drawing A-34610.
Step 2. Vary the oscillator frequency and plot the amount of attenuation (in DB) added or subtracted to obtain constant output. The NAB playback curve should be obtained when the image is re-plotted. This will be the image of the amplifier response, see Drawing A-34610.

7.6 R125 ADJUSTMENT
R125 has its slider positioned so that 60-70 volts DC appear across the solenoid L101. (The resistor is adjusted at the factory).
7.7 **TUBES**

All tubes should be checked every 2 to 6 months; and when necessary, replaced.

7.8 **RELAYS**

The relays are located under protective covers to minimize dust collection on the contacts. They should be inspected periodically (every 2 to 4 weeks) and cleaned, if necessary.

7.9 **LUBRICATION POINTS**

The following points should be lubricated every 6 months.

Oil the following points -

1. Linkage pivots. Photo DR201
2. Lifter cam shaft. Photo DR201
3. Motor (both bearings). Every 1000 hours oil. Lubrication holes are located at each end of motor shaft bearing on the same side as the motor name plate.

Only one or two drops of oil is required in each place.

Use only good quality machine oil (Gulfoil). This oil is available from Gates.

Lubricate the following points once a year with Molykote Type G which is available from Gates. Use a very small amount and rub into the metal.

1. Lifter cam surface. Photo DR201
2. Linkage slide. Photo DR202

7.10 **PRESSURE ROLLER INSPECTION**

Observe for:

1. Free turning on shaft.
2. Rubber tire not damaged, deformed or excessively dirty.

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7.11 MECHANICAL ADJUSTMENTS.

Check adjustments once a year. These adjustments were all made at the Factory. However, an understanding of them is necessary if readjustment becomes necessary.

7.11.1 CARTRIDGE INSERT TIMING.

Adjustment for proper positioning of pressure roller by cartridge insertion. The nylon rollers that the cartridge engages (as it is inserted) are adjusted by their placement on the slotted lever arm.

Adjustment - (See Photo DR202)

Step 1. When the cartridge is inserted, the pressure roller should be engaged to within 3 to 5 degrees of the capstan (about 1/16" from capstan).

Step 2. Loosen the bolt through the nylon rollers and move the rollers out (or in) to achieve this adjustment.

NOTE

If this timing is incorrectly set, the cartridge will not insert or remove from the slot correctly, and/or a binding will occur.

7.11.2 LIFTER CAM STOP (See Photo DR202)

This is the metal piece that the lifter can rests upon when no cartridge is inserted.

Adjustment:

Step 1. Do not have a cartridge inserted.

Step 2. Adjust cam stop such that the pressure roller is 1/16" to 1/8" below the motor plate surface.

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7.11.3 **TOGGLE PIVOT** — (Pressure Roller Force) 
(See Photo DR203)

This pivot is located in the lower left hand corner of the mechanism plate. It is mounted in a slot and situated at the pivot end of the linkage. The position of this pivot governs how much force is exerted on the pressure roller.

**Adjustment:**

Step 1. With no cartridge in place manually raise the pressure roller. (Raise lifter cam.)

Step 2. Move the pivot up (or down) to a point that (with the solenoid energized) the pressure roller tire is compressed 1/32" by the capstan.

**NOTE**

This is a "cut and try operation" because the pivot must be tightened for each test.

7.11.4 **TOGGLE STOP** (See Photo DR203)

This is the metal piece that stops the linkage from going over center and locking the linkage.

**Adjustment:**

Adjust the toggle stop to a point that allows about 176° - 178° angle between the two linkage arms with the solenoid energized.

7.11.5 **SOLENOID POSITION**

The solenoid is mounted over slotted holes to permit lateral positioning.

**Adjustment:**

Step 1. Loosen the screws holding the solenoid to the mechanism plate.
Step 2. Insert a cartridge to the "Ready" condition (no power on).

Step 3. Position and tighten the solenoid enough that (when the plunger is seated) it will cause the spring connected to it to be stretched about 1/16".

**NOTE**
The solenoid must be parallel to the plunger or it will bind.

7.11.6 **LIFTER ASSEMBLY**
The lifter cam assembly is mounted to the basic motor chassis with two screws. These screws are located under the two holes on the motor plate.

**Adjustment:**
Step 1. Loosen the two screws slightly. (They are in tapped holes.) (Photo DR196.)

7.11.7 **SWITCH (S102)**
This switch is located on the motor plate and is activated by the lever arm.

**Adjustment:**
Step 1. Insert cartridge (Power on).
Step 2. The "Ready" light should light and the capstan should turn. Adjust the "turn on" point of each switch, by use of the lock nuts and screws, until this action is achieved.
Step 3. Remove cartridge slightly to a point where the toggle pawl can not engage the roller lever.
Step 4. The "Ready" light should be off and the Capstan not turning.
NOTE
The switch should actuate only when the cartridge is in such a position that it can be operated when START is pressed. In all other conditions the "Ready" light and capstan should be inoperative.

7.11.8 LEAF SPRINGS
There are leaf springs used in the cartridge guide system. These springs may, after a long period of time or excessive abuse become misadjusted.

Adjustment:
Adjust to put the proper tension back into the spring.

7.12 TAPE CARTRIDGES
7.12.1 PRESSURE PADS
The ends of the pressure pads should be kept adjusted 1/8" from the cartridge edge. See drawing A-34659, Fig. 2.

7.12.2 LENGTH OF LOOP
If the tape becomes too loose in the cartridge, the following conditions will appear:
1. Tape appears to be looping out of capstan slot. Drawing A-34659, Fig. 3.
2. Tape is loose on the center hub.

To correct these faults the following procedure should be followed:

Step 1. On all sizes remove the center screw, and on the Model 1200, the four extra screws.

Step 2. Remove the plastic top, and lift out the wire guides. See Drawing A-34657, Fig. 1.

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Step 3. If the tape is too loose, cut the tape at the old splice, tighten reel of tape by pulling on the tape located on the outer edge. Tighten enough to add extra turns on the reel. Drawing A-34658, Fig. 5.

Step 4. Re-splice with Mylar base splicing tape.

Step 5. With one hand release reel brake, and pull tape from the center of the hub until slack is taken up. Drawing A-34658, Fig. 4.

Step 6. Close the cartridge by replacing the wire guides and top cover, then secure with the previously removed hardware.

Step 7. Place in the machine and allow the cartridge to complete the cycle through one to two times. In some instances, the tape will bind a bit on the hub until the slack has been taken up, and the tensions have equalized through the entire length of tape.

Step 8. If the tape is too tight in the cartridge, it will wow or even cause the tape to break.

To Lengthen Loop

Step 9. Open cartridge. Cut the tape at old splice. Remove one turn and re-splice. If the tape is still too tight, after running through once on the machine, remove another turn. The tape should pull easily from the hub but should not have slack hanging out of the capstan slot.
NOTE

If adding or removing one turn of tape is too large a step, it will be necessary to remove a 2 to 4 inch section from the tape. This, however, will change the playing time and should be avoided when possible.

CAUTION - On the large Model 1200 Cartridge, it is necessary to have a fairly loose reel of tape because of the large diameter differential between the pull hub and the outside diameter of the tape. Therefore, be careful not to tighten the tape to a point which will cause wow or breakage of the tape (because of high pulling friction.)
<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSE</th>
<th>CURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insert Cartridge&lt;br&gt;-Ready Light ON-&lt;br&gt;Tape does NOT move.</td>
<td>1. Broken belts.&lt;br&gt;2. S102 not adjusted properly - motor not running.&lt;br&gt;3. No D.C. to operate solenoid.&lt;br&gt;4. Toggle pawl not hitting roller level.</td>
<td>1. Replace belts.&lt;br&gt;2. Adjust switch or replace switch if defective.&lt;br&gt;3. Check D.C. power supply or Cr101.&lt;br&gt;4. Adjust cartridge insert timing 7.10.1</td>
</tr>
<tr>
<td>False Cues or Stops</td>
<td>1. Switching transients from other equipment.&lt;br&gt;2. Bad diodes CR102 or CR103.</td>
<td>1. Cl11 may be increased to a value to reduce amplifier sensitivity but still operate on cue tone.&lt;br&gt;2. Replace diodes CR102 &amp; CR103.</td>
</tr>
</tbody>
</table>
Since this is a destructive operation, the engineer must be reasonably sure that the part is defective before removing it. He may determine this from the D.C. and signal voltage measurements or by visual observation.

**WARNING:** The copper conductors are only .0027" thick on the printed chassis. They are easily damaged! Do not attempt to pull one component lead loose to check the component. Use only the approved procedure as outlined in the sketches and the sub-paragraphs listed below.

Use a small electric soldering iron (60 watts or less) and allow it to come up to full heat before starting the repair job. The tip must be clean and well tinned.

**CAUTION:** Do not use a soldering gun. The extremely high temperature of the tip will damage the phenolic board.

Put the iron tip on the fillet under the chassis, right beside the component lead being removed. Put a gentle, but firm pressure on all leads and components being moved while the heat is applied. Do not hold the iron to the printed chassis for long periods of time. If the lead or component is difficult to remove, make repeated short passes at it rather than one long period that may overheat the board.

1. **REMOVING PARALLEL MOUNTED COMPONENTS WITH AXIAL LEADS:**
   
   - **A** clip leads
   - **B** pliers
   - **C** iron tip

   **push wire through hole until hook can be clipped off.**

   **clip off hook that was soldered to chassis.**

   **place iron on fillet again and pull the wire out of the hole on the top side of the chassis.**

2. **REMOVING VERTICALLY MOUNTED RESISTORS AND COMPONENTS WITH AXIAL LEADS:**

   **A** clip here

   **B** pliers

   **C** iron tip

   **place iron on fillet and push wire through the hole until the hook can be clipped off.**

   **clip off hook that was soldered to chassis.**

   **remove wire as illustrated in paragraph 1. (c).**
2. (continued)

place the iron against the folded wire and rotate it away from the conductor leading into the fillet (2-c).

cut the wire as near the chassis as possible after removing as much excess solder as possible. Remove solder by carrying it away with the iron tip and wiping the tip on a clean cloth. Repeat until the hook can be clipped with small sharp diagonal cutters, illustrated in (2-D).

place iron on fillet again and push the resistor body over until the lead comes out of the hole.

3. REMOVING PRINTED WIRING TYPE CAPACITORS:

(A) hold iron tip on one of the folded leads, as soon as the solder melts – push gently but firmly on the side that will lift this lead. The capacitor should be pushed over just far enough to clear the lead from the hole.

(B) cut the lead off to prevent it from going back into the hole when removing the other lead.

(C) hold the iron tip to the other lead and push the capacitor over until it comes free.

4. REMOVING SADDLE TYPE ELECTROLYTIC CAPACITORS:

Place the iron tip on top of the folded over mounting ear. As the solder melts, slip a thin knife between the mounting ear and the copper conductor pad. DO NOT PRY THE TAB UP WITH THE KNIFE! See (4-B) for bending ears away from chassis. When the knife is completely under the ear, remove iron and let the solder cool.

Repeat on other two mounting ears.

Page 2
4. (continued)

Using a pair of small sharp diagonal cutters, bend the mounting ears up and away from the copper conductor pads. **DO NOT PRY THE MOUNTING EARS UP WITH A KNIFE OR SCREWDRIVER!**

Repeat the process on the other two mounting ears and drop the capacitor off the board.

5. **PREPARING THE HOLES FOR THE REPLACEMENT COMPONENT:**

Use a small metal twist drill (1/8" dia. or less) to clear the hole only in the fillet of solder. Twirl the drill by hand. Do not attempt to remove all of the solder in one turn, do it slowly and carefully.

Do not attempt to increase the hole size, just remove the solder. It is soft and easily removed in this way.

6. **REPLACING THE COMPONENTS:**

(A) & (B) Fold the leads on the new part to the same spacing as the mounting holes. Insert the part and fold the leads under the chassis to hold the part tightly against the top of the chassis. Clip off the excess wire.

Put the iron tip on the fillet and lead. Solder swiftly and securely. If the printed chassis is damaged by accident it is seldom necessary to scrap it. If one of the conductors is broken, lay a piece of small wire (#18 to #24 AWG) across the break and solder each end to the conductor. If a fillet is pulled loose, break it off to get rid of the loose end. Fold the new component lead toward the end of the conductor and solder the lead to the conductor. If the component lead is cut too short, lay a small piece of wire across the gap solder it in.
7. REPLACING TUBE SOCKETS:

Tube sockets are very difficult to replace and should not be replaced until you are positive that the one in question is actually defective. Resolder all of the socket pin fillets to assure that this is not the trouble. Inspect the top side to see if the tube pin sleeve is bent and can be straightened. Use a socket alignment tool to re-size. Check continuity from the top to the bottom side of the chassis. If there is a connection and the socket sleeve is not out of alignment or spread open, the socket is O.K. and should not be removed.

(A) If the socket has been damaged or is excessively corroded it must be replaced. Stand the unit so that the chassis is vertical. Hold a small iron to the hex nut in the center of the socket (if the socket is retained in this manner). After the solder has melted, unscrew the retaining screw.

(B) Remove the excess solder from all pin fillets by carrying it away with the tip of the iron. Repeat until all solder that will come loose is removed. Do not hold the iron to the chassis for long periods of time.

(C) Starting at pin 1 or pin 7 (8 or 9 on other sockets), apply the iron and push against the socket to raise it at this point. Use the thumb and fingers only to raise socket to prevent damage to the board. The socket will not move very much but any movement at all is helping. Place the iron on each pin in rotation around the socket while pushing up on the side of the socket adjacent to the pin being heated. After several passes around the socket it will no longer be held in by solder. Gently rock the socket and pull it free of the holes.

(D) Use a small metal twist drill as illustrated in paragraph 5 of these instructions to clear the fillet holes of solder.

(E) Install the new socket and put in a new retaining screw similar to the one removed (if retaining screws are used). Do not tighten the nut excessively and put a great strain on the phenolic board.

(F) Solder the screw, nut and each socket pin fillet swiftly and securely. Be sure that there is no solder bridging between adjacent fillets or conductors.

(G) If one of the fillets was damaged in the replacement operation, form a small loop on the end of a small piece of wire. Drop the loop over the socket pin and lay the wire to join the proper conductor. Flow solder on the connections and clip off the excess wire.

From the Engineering Department of
The Gates Radio Company
A Subsidiary of the Harris-Intertype Corp.
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<thead>
<tr>
<th>Symbol No.</th>
<th>Drawing No.</th>
<th>Description</th>
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<td>396 0827 000</td>
<td>Lamp, GE #12</td>
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<td>Cl01, A-B-C</td>
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<td>Cap., 30-20-20 mfd., 350-300, 250 V.</td>
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<td>Cl02a-B</td>
<td>524 0085 000</td>
<td>Cap., 30-30 mfd., 350-300 V.</td>
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<td>Cap., 100 mfd., 6 V.</td>
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<td>Cl04, Cl08, Cl10</td>
<td>506 0027 000</td>
<td>Cap., .47 mfd., 400 V.</td>
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<tr>
<td>Cl05</td>
<td>508 0184 000</td>
<td>Cap., .01 mfd., 400 V.</td>
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<tr>
<td>Cl06, Cl07</td>
<td>506 0028 001</td>
<td>Cap., .1 mfd., 400 V.</td>
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<td>Cl09</td>
<td>522 0289 000</td>
<td>Cap., 25 mfd., 25 V.</td>
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<td>Cl11</td>
<td>516 0312 000</td>
<td>Cap., 470 mfd., 500 V.</td>
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<td>Cl12, Cl13</td>
<td>508 0048 000</td>
<td>Cap., .047 mfd., 400 V.</td>
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<td>Cl14</td>
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<td>Cap., .5 mfd., 200 V.</td>
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<td>Cl15</td>
<td>522 0067 000</td>
<td>Cap., 100 mfd., 15 V.</td>
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<tr>
<td>Cl17</td>
<td>522 0083 000</td>
<td>Cap., 8 uf., 150 V.</td>
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<td>384 0018 000</td>
<td>Silicon Rectifier IN2069</td>
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<td>F102</td>
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<td>Fuse, 5 Amp., 250 V.</td>
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<td>Receptacle, 14 Terminal</td>
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<td>J107</td>
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<td>926 7064 001</td>
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<td>610 0318 000</td>
<td>Plug, 14 Terminal</td>
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<td>P105, P106</td>
<td>610 0340 000</td>
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<td>Head</td>
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<td>R103</td>
<td>540 0045 000</td>
<td>Res., 330K Ohm, 1/2 W., 1%</td>
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<td>R104</td>
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<td>Res., 1500 Ohm, 1/2 W., 1%</td>
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<td>Res., Control, 500 K</td>
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<td>R107, R130</td>
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<td>Res., 2.2K Ohm, 1/2 W., 5%</td>
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<td>R109</td>
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<td>Res., 220K Ohm, 1/2 W., 5%</td>
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<td>Res., 270K Ohm, 1/2 w., 5%</td>
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<td>Res., 18K, 1/2 w., 5%</td>
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<td>R124</td>
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<td>Control, 100 Ohm</td>
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<td>R128</td>
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5/3/61 -2- M5944 Cartritape
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<td>604 0159 000</td>
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<td>S103A/B</td>
<td>598 0019 000</td>
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<td>S104A/B</td>
<td>598 0020 000</td>
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<td>T101</td>
<td>472 0284 000</td>
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<td>T102</td>
<td>478 0118 000</td>
<td>Output Transformer</td>
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<td>V101</td>
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</table>

5/3/61
This equipment is warranted by Gates Radio Company of Quincy, Illinois to be free from defects in workmanship and material and will be repaired or replaced in accordance with the terms and conditions set forth below:

1. Gates Radio Company believes that the purchaser has every right to expect first-class quality, materials and workmanship and has created rigid inspection and test procedures to that end, and excellent packing methods to assure arrival of equipment in good condition at destination.

2. Gates Radio Company will endeavor to make emergency shipments at the earliest possible time giving consideration to all conditions.

3. Gates Radio Company warrants new equipment of its manufacture for one (1) year and (six (6) months on moving parts), against breakage or failure of parts due to imperfection of workmanship or material, its obligation being limited to repair or replacement of defective parts upon return thereof f.o.b. Gates Radio Company's factory, within the applicable period of time stated. Electron tubes shall bear only the warranty of the manufacturer thereof in effect at the time of the shipment to the purchaser. Other manufacturers' equipment covered by a purchaser's order will carry only such manufacturers' standard warranty. These warranty periods commence from the date of invoice and continue in effect as to all notices, alleging a defect covered by this warranty, received by Gates Radio Company prior to the expiration of the applicable warranty period.

The following will illustrate features of the Gates Radio Company warranty:

**Transmitter Parts:** The main power or plate transformer, modulation transformer, modulation reactor, main tank variable condensers all bear the one (1) year warranty mentioned above.

**Moving Parts:** As stated above, these are warranted for a period of six (6) months.

**Electron Tubes:** As stated, electron tubes will bear such warranty, if any, as provided by the manufacturer at the time of their shipment. Gates Radio Company will make such adjustments with purchasers as given to Gates Radio Company by the tube manufacturer.

**All other component parts (except as otherwise stated):** Warranted for one (1) year.

**Abuse:** Damage resulting from abuse, an Act of God, or by fire, wind, rain, hail, in transportation, or by reason of any other cause or condition, except normal usage, is not covered by this warranty.

4. Operational warranty - Gates Radio Company warrants that any new transmitter of its manufacture, when properly installed by purchaser and connected with a suitable electrical load, will deliver the specified radio frequency power output at the output terminal(s) of the transmitter, but Gates Radio Company makes no warranty or representation as to the
coverage or range of such apparatus. If a transmitter does not so perform, or in the event that any equipment sold by Gates Radio Company does not conform to any written statement in a contract of sale relative to its operating characteristics or capabilities, the sale liability of Gates Radio Company shall be, at the option of Gates Radio Company, either to demonstrate the operation of the equipment in conformance with its warranty, or to replace it with equipment conforming to its warranty, or to accept its return, f.o.b. purchaser's point of installation and refund to purchaser all payments made on the equipment, without interest. Gates Radio Company shall have no responsibility to the purchaser under a warranty with respect to operation of equipment unless purchaser shall give Gates Radio Company a written notice, within one (1) month after arrival of equipment at purchaser's shipping point, that the equipment does not conform to such warranty.

5. Any item alleged by a purchaser to be defective, and not in conformance with a warranty of Gates Radio Company shall not be returned to Gates Radio Company until after written permission has been first obtained from the Gates Radio Company home office for such return. Where a replacement part must be supplied under a warranty before the defective part can be returned for inspection, as might be required to determine the cause of a defect, purchaser will be invoiced in full for such part, and if it is determined that an adjustment in favor of the purchaser is required, a credit for an adjustment will be given by Gates Radio Company upon its receipt and inspection of a part so returned.

6. All shipments by Gates Radio Company under a warranty will be f.o.b. Quincy, Illinois or f.o.b. the applicable Gates Radio Company shipping point.

7. Gates Radio Company is not responsible for the loss of, or damage to, equipment during transportation or for injuries to persons or damage to property arising out of the use or operation of Gates equipment. If damage or loss during transportation occurs, or if the equipment supplied by Gates Radio Company is otherwise damaged, Gates will endeavor to make shipment of replacement parts at the earliest possible time giving consideration to all conditions. It is the responsibility of a purchaser to file any claim for loss or damage in transit with the transportation company and Gates will cooperate in the preparation of such claims to the extent feasible when so requested.

8. Gates Radio Company, in fulfilling its obligations under its warranties, shall not be responsible for delays in deliveries due to depleted stock, floods, wars, strikes, power failures, transportation delays, or failure of suppliers to deliver, acts of God, or for any condition beyond the control of Gates that may cause a delayed delivery.

9. This warranty may not be transferred by the original purchaser and no party, except the original purchaser, whether by operation of law or otherwise, shall have or acquire any rights against Gates Radio Company by virtue of this warranty.

10. Gates Radio Company reserves the right to modify or rescind, without notice, any warranty herein except that such modification or rescission shall not affect a warranty in effect on equipment at the time of its shipment. In the event of a conflict between a warranty in a proposal and acceptance and a warranty herein, the warranty in the proposal and acceptance shall prevail.

11. This warranty shall be applicable to all standard Gates catalog items sold on or after March 1, 1960.

Gates Radio Company
Quincy, Illinois
1/6/60
LIFTER ASSEMBLY
ADJUSTMENT
UNDER 2 HOLES

MOTOR PLATE

REAR VIEW SHOWING JACKS AND PARTS LOCATION
GUIDE FOR CARTRIDGE SIZE

CUE HEAD
PROGRAM HEAD
MODEL 300  MODEL 600  MODEL 1200

PRESSURE ROLLER
LEVER ARM
NYLON ROLLER TIMING ADJUSTMENT
CAPSTAN

MODEL 300 CARTRIDGE INSERTED

A-34859 (DR-198)
MODEL 1200 CARTRIDGE INSERTED
NO CARTRIDGE INSERTED
READY POSITION
RUN POSITION

A-34856
(DR-203)
FIG 2.

HORIZONTAL WITH CASE

MUST NOT EXTEND MORE THAN 1/32 BEYOND SPRG.

FIG 3.
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<td></td>
<td>OR</td>
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**LIST OF PARTS**

**PROGRAM HEAD**

**CUE HEAD**

**BOTTOM TRACK**

**TOP TRACK**

**TAPE TRAVEL**

**DUMMY TRACKS, FOR EVEN WEAR PURPOSES**

---

**STATUS**

<table>
<thead>
<tr>
<th>DEVELOPMENT</th>
<th>PRODUCTION</th>
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</thead>
<tbody>
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<td>APPRV. PRODUCTION</td>
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**TITLE**

**VERTICAL PLACEMENT OF HEADS M5744**

**CH. BY**

**MTL.**

**TITLE**

**VER. 5744**

**ENG.**

**FIN.**

**DATE**

**detalle**
COMPONENT PLACEMENT
VIEWED FROM PRINTED WIRING SIDE

PROGRAM B CUE AMPLIFIER, CARTRITAPE, M5944
NOTES:
1. SWITCH SHOWN IN MANUAL POSITION, CLOSED POSITION (AUTOMATIC OPERATION)
2. SUITABLE SWITCH, CENTRALAB 1419.
3. THIS CIRCUIT WIRING IS IN ADDITION TO THAT SHOWN ON DWG. 842 3246 001 (SYSTEM DRAWING FOR MANUAL OPERATION)
4. SEE DWG 813 5844 001 FOR PLUG & JACK PIN NUMBERING INFORMATION FOR THE CARTRITAPE M5944
5. SEE DWG 813 5852 001 FOR PLUG & JACK PIN NUMBERING INFORMATION FOR THE SWITCHER M5953

TITLE: CONT CKT INTERCONNECTION BETWEEN PLAYBACK UNIT FOR SYNCHRONIZED AUTO SEQUENTIAL START CARTRITAPE M5944
NOTES:
1. SIGNAL VOLTAGES READ ON V102-V103 ARE TAKEN WITH .0025 VOLTS ON PIN 9 OF W102 AT INC WITH R102 MAX.
2. VOLTAGES SHOWN ON V104-J105 WERE TAKEN FROM RECORDED CUE TONE ON TAPE.
3. THE VOLTAGE WILL DECAY TO .3 VOLTS IN ABOUT 3 SECONDS AFTER UNIT IS PLACED IN THE RUN CONDITION.
4. ALL D.C. MEASUREMENTS WITH 20K D/VOLT METER ALL RMS SIGNALS ( ) MEASURED WITH V.T.V.M. ALLOW 20% ERROR ON MOST READINGS.
5. R105 IS ADJUSTED FOR FLAT RESPONSE FROM N.A.B. TEST TAPE.
**USE FOR WIRING INTERCONNECTING PLUGS**

**RECEPTACLE**  
SHOWN FOR CIRCUIT TRACING ONLY

**PLUGS**  
USE FOR WIRING INTERCONNECTIONS.  
CAUTION: TO REMOVE HOUSING LOOSEN NUT ON SIDE. DO NOT REMOVE SCREW, OTHERWISE PLUG WILL COME APART.

<table>
<thead>
<tr>
<th>CHASSIS BOTTOM</th>
<th>SIDE VIEW</th>
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</thead>
<tbody>
<tr>
<td>J105 AND J106 (WIRING SIDE)</td>
<td><img src="image1" alt="J105 AND J106 Diagram" /></td>
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<td>CHASSIS BOTTOM</td>
<td>SIDE VIEW</td>
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<tr>
<td>J104 (WIRING SIDE)</td>
<td><img src="image2" alt="J104 Diagram" /></td>
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<td>PI05 AND PI06 (WIRING SIDE)</td>
<td><img src="image3" alt="PI05 AND PI06 Diagram" /></td>
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<td>CHASSIS BOTTOM</td>
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<tr>
<td>PI04 (WIRING SIDE)</td>
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**NOTES:**
1) MAKE ALL CONNECTIONS, NUMBERING FROM THE WIRING SIDE ONLY.
2) THE JACKS ARE SHOWN FOR REF., ONLY IN CIRCUIT TRACING (DO NOT WIRE TO JACKS).
INSTRUCTIONS FOR INSTALLING AND OPERATION
OF
GATES M5952 RECORDING AMPLIFIER

4/28/61
Gates Radio Company
Quincy, Illinois
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4/28/61 -2- M5952 Recording Amplifier
2.1 GENERAL
The Gates Recording Amplifier, M5952 is an integral part of the Cartritape system. It provides the recording facilities to produce a recorded tape cartridge when connected to Cartritape, M5944. (Playback Unit)

The Recording Amplifier interconnects with one of the playback units, using cables supplied, to form a record/playback combination.

NOTE
A complete Cartritape system wiring diagram consisting of 4 Cartritapes, 1 Switcher, 1 Recording Amplifier and 1 Remote Unit is shown on Drawing 842 3246 001

Units required for recording only or record/playback are -
1 - M5944 Cartritape Playback Unit
1 - M5952 Recording Amplifier

SECTION III
INSTALLATION

3.1 UNPACKING
The Recording Amplifier will be received in one shipping carton. The 19" rack mounted adaptor kit will be received with the unit. Unpack the contents carefully and examine thoroughly for shipping damage. If any such damage is found, file a claim report immediately with the Carrier.

3.2 MOUNTING (15") CUSTOM UNIT
The unit will be received as a 15" custom unit but supplied with adaptor plates to make the 19" version. The amplifier is designed to be used without an external cabinet, if desired. The other installation instructions apply to both 15" and 19" rack mounting.

4/28/61 -2- M5952 Recording Amplifier
3.3 MOUNTING THE (19") RACK UNIT

The unit will be received with an adaptor kit. These adaptors are metal extensions, which must be attached to the recorder front panel, to extend the front panel width to 19". Attach these units with the supplied hardware. The lockwasher should be placed under the screw head.

Mount the unit with four rack screws immediately above or below the Cartritape playback unit to which it is to be interconnected. The cables are long enough to reach the correct jacks and plugs.

3.4 INTERCONNECTING THE PLAYBACK UNIT AND THE RECORDING AMPLIFIER

With the units mounted in place, the following procedure should be followed. (See Drawing 842 3246 001 for system wiring diagram.)

Step 1. Use the cable harness provided. (14 pin plug on one end and a 12 pin plug on the other end.) Plug the 14 pin plug into J104 (playback unit). Plug the other end (12 pin) into J204 on the recording amplifier.

Step 2. Remove the phono plug from J102 (red) on the head mounting bracket (pgm head, playback unit). Plug into J202 on the rear of the recording amplifier.

Step 3. Insert one end of the supplied shielded cable into J102 (playback unit). Plug the other end into J206 on the rear of the recording amplifier.

Step 4. Remove the phono plug from J103 (cue head, playback unit) and plug into J203 on the rear of the recording amplifier.

4/28/61
Step 5. Use the other shielded cable supplied and insert one end into J103 (cue head, playback unit). Plug the other end into J207 on the rear of the Recording Amplifier.

Step 6. Plug the AC cord into J201 and plug the other end into the AC power source.

3.5 VU METER
The VU meter is located in the center of the front panel. This meter is for record level indication only. It does not read bias currents. Set the record level so that audio peaks read 100% or zero VU. The meter should be used for audio reference only. Do not use for frequency response tests, therefore, a gain set should be used for this testing.

3.6 RECORD INPUT FACILITIES (See Drawing 813 5911 001)
The audio input has facilities for bridging a line (-35 to +8 dbm) or mic input of 30/50-150/250 ohms at -60 to -70 dbm. These points are located on J205.

3.6.1 MIC INPUT -60 TO -70 DBM, 150/250 OHM
These input points are located on pins 1 & 3 of P205. (Pin 2 is ground.)

3.6.2 MIC INPUT -60 TO -70 DBM, 30/50 OHM
For 30/50 ohm input impedance the following procedure should be followed on T202.
Step 1. Remove jumper between red/yellow and red.
Step 2. Connect blue to red.
Step 3. Connect red/yellow to brown.
Step 4. The input is located across blue and brown. (Pins 1 and 3). P205.

3.6.3 BRIDGING INPUT -20 TO +8 DBM, 10K OHMS
This input is located between pins 4 and 6 of J205. Pin 2 is ground. Strap pins 5-3 to place 4/28/61
the 150 ohm load resistor, R219, on the pad. The transformer input must be left connected for 150/250 input as it is received from the factory.

3.6.4 BRIDGING INPUT -35 TO -20 DBM, 10K OHMS

This input appears at the same points as 3.6.3, but AT201 requires modification. Connect as explained in 3.6.3 and modify pad AT201 as follows:

1) Remove R240, 620 ohms from CKT.
2) Strap out R236 and R237, 4.7K ohm.

NOTE

If record/playback response is not to published specifications, adjust bias current as explained in paragraph 7.3 and 7.4.

SECTION IV
PRE-OPERATION

The following is a familiarization procedure that should be followed before attempting to place the equipment into operation.

4.1 POWER SWITCH (S203)

The power OFF-ON switch is located on the right hand side of the front panel.

4.2 BAR SWITCH OPERATION (S201 & S202)

The bar switch located under the VU meter performs multiple functions. They are:

1) Indicates Power ON
2) Indicates CUE TONE
3) Indicates RECORD MODE
4) Actuates RECORD START
5) Stops RECORDING

4/28/61 -5- M5952 Recording Amplifier
4.2.1 **INDICATES POWER ON**

When the power is applied to unit the right side of the bar switch will glow green.

4.2.2 **INDICATES CUE TONE**

When the record "Start" side of the bar switch is pressed, the record amplifier is set to record. The green light is extinguished. When "Start" on the playback unit is pressed the green light will come back on in the recording amplifier. This tells the operator that the cue tone has been applied.

**NOTE**

The length of time required for the light to come on after playback "Start" is pressed is the length of time the cue tone is applied to the tape.

4.2.3 **INDICATES RECORD AND ACTUATES RECORD START**

Also when the bar switch is pressed on the side marked "Start" (as in paragraph 4.2.2) the switch will glow red on the left side. This indicates the unit is ready to record; that is, the bias is applied and the cue tone is ready to be applied, etc. Also pressing the switch on the side marked "Start" switches the recording amplifier to the "Ready" position. The heads are switched, etc.

4.2.4 **STOPS RECORDING**

The recording process may be stopped at any time by pressing "Stop" on the recording amplifier. This unlatches relay, K201, which removes the recording amplifier from the head. This does not stop the Cartritape,

4/28/61
it only removes the audio from the record head. The Cartritape will continue to run until the cartridge has detected a cue tone and stops.

### 4.3 HUM Balance Adjustment

For best possible noise figure proceed as follows:

1) Remove V206 (the bias osc.) from its socket.
2) Remove V205 (the cue tone generator) from its socket.
3) Connect ground to pin 6 of J204.
4) Connect an audio VTVM across J202 the record head jack.
5) Connect power to unit and place in the record node. Be sure level control is maximum clockwise. Input circuit should be terminated with a 150 ohm resistor.
6) Adjust R201 for minimum noise and hum. It will be necessary to polarize the AC plug for minimum hum and noise, between both units.

### SECTION V

### OPERATION

#### 5.1 GENERAL

Operation of the Recording Amplifier is very similar to any high quality recording unit, however, cartridges can be made up for different applications. This section deals with different methods of tape cartridge preparation.

**NOTE**

There must be at least 4-5 seconds between cue points because of the time delay in the playback unit, otherwise, a cue point may be missed.
5.2 ERASING

The Carritape unit has no erase head. Therefore, a bulk erasing procedure should be followed.

5.2.1 TO BULK ERASE

Step 1. Plug bulk eraser into power source.
Step 2. Bring the erasing unit to the top of the cartridge and make circular motions around the top, bottom and front of the cartridge.
Step 3. Remove the eraser or cartridge to a distance of about 3 ft. with a slow steady withdrawal.
Step 4. Remove power to eraser at a 3 ft. distance from the cartridge so that its collapsing field will not re-magnetize the tape.

5.3 TO RECORD A SINGLE SEGMENT ON ONE CARTRIDGE

When one program segment is to be placed on one cartridge, the following procedure is recommended:

Step 1. Select a completely erased cartridge whose playing time is slightly more than the program time to be recorded. (Nearest standard length).
Step 2. Insert the cartridge into Carritape.
Step 3. Feed audio into the recording amplifier and adjust the gain control so that the audio peaks read 100% on the VU meter.
Step 4. Press record "Start" on the recording amplifier and preset the program material to be recorded on the cartridge.
Step 5. Press the "Start" switch on the Carritape unit and feed the program material source to be recorded as soon after the "Start switch is pressed as practical.
NOTE

The sooner audio is fed into the recording unit after the "Start" switch is pressed, the tighter the cue, because the instant the "Start" switch is pressed the cue tone is recorded on the tape.

Step 6. After the program material has been recorded, turn down the recording level and allow the cartridge to recue. This will occur when the original starting point is reduced, and will be indicated by the red "Run" light on the playback unit going out.

5.4 MULTIPLE PROGRAM SEGMENTS ON ONE CARTRIDGE

In some applications several segments may be desired on one tape, end to end.

In each case the above procedure applies, except at the end of each segment the STOP button is pressed on the Cartritape. Then the above recording procedure is followed again.

5.5 TO STOP AND START TAPE WITHOUT RECORDING THE CUE TONE

In some applications it may be desired, or necessary, to stop, then start the tape, while recording, without a cue tone being put on the tape. This is accomplished by pressing the START button on the Cartritape before pressing the record START button on the Recording Amplifier. This provision is handy for dubbing in voice and/or other program material into one continuous segment.

5.6 TAPE CARTRIDGE PREPARATION FOR SYNCHRONIZED AUTOMATIC SEQUENTIAL START OPERATION

The Cartritape units may be connected, as explained in the INSTALLATION SECTION, Paragraph 3.9 of this manual, in a
manner that results in one unit being started by the stopping of another.

To use this facility properly, the cartridges must be prepared in a certain manner.

5.5.1 The program material should be timed out (and the correct cartridge playing time selected) so there is little or no dead time between the last segment and the first cue point. "Dead" tape may be removed by editing and re-splining to insure tight program switching.

5.5.2 No time should be lost between segments. This is accomplished by stopping the tape motion immediately after the segment is recorded on the cartridge by pressing stop on the Cartritape, then proceed with next segment.

5.7 USE OF THE RECORDING AMPLIFIER

The Recording Amplifier is identical in operation (except for cue tone application) to any high quality recording amplifier. Therefore, techniques which are used with standard reel to reel amplifiers can be used with the Cartritape Recording Amplifier.

**NOTE**

If a frequency response is to be taken it should be done -10 DB down from 100% to avoid tape saturation at high frequencies.

5.8 MAKE RECORDINGS WHILE OTHER CARTRITAPES IN THE SYSTEM ARE ON THE AIR

The Recording Amplifier has been designed so that when the Recording Amplifier is in the Record Mode the starting of that Cartritape interconnected to the Recording Amplifier does not activate the switcher. This feature permits recording while the other Cartritape, in the system, are being used on the air. The only requirement is that

4/28/61 -10- M5952 Recording Amplifier
"Record Start" be pressed before "Start" is pressed on the Cartritape.

NOTE

The above explanation applies only when a switcher is included in the system. If a switcher is not used the recording process has no effect on the other Cartritapes being utilized on the air.

SECTION VI
THEORY OF OPERATION

6.1 RECORD AMPLIFIER

The Recording Amplifier is a three stage amplifier with a gain control located after the first stage to facilitate adjusting the recording level. The gain of this amplifier is high enough to record standard level on the tape from a microphone input. The microphone input is 150 ohms or 50 ohms at a level of -60 dbm. -70 dbm will produce approximately 0 or 100% on VU meter. Bridging a -35 to +8 line is possible because of the pad located on the primary side of the audio input transformer, AT201. The first stage is a low noise EF86 tube and is conventional in its configuration. It should be noted that a .005 mfd., is located across the cathode resistor of the second stage. This produces a slight boost on the extreme high end, and is part of the record equalization.

Coupled from the plate of the second stage are two tubes, V204 and V203B. V204 is the last stage of the record amplifier and is connected as a grounded cathode amplifier. However, capacitors, C209 and C213 are wired into the circuit as a part of the record equalization. They provide a boost at the high end. The grid circuit includes an LCR combination to complete the record equalization curve. V203B is the meter driver stage, note that R242 isolates this stage from the previous stage so that circuit loading does not result.
6.2 **BIAS OSCILLATOR**

V205 is a conventional plate coupled push-pull bias oscillator. It is similar to most of the common ones in use today. This produces high level bias voltage to correctly bias the record head. The push-pull action is needed to give a good sine wave output while keeping the harmonic distortion content low.

6.3 **CUE TONE GENERATOR**

V206 is a multivibrator and is used to generate the cue tone (approximately 1 KC). This tone is applied, without bias, for .1 of a second at the instant the "Start" switch is pressed on the playback unit. This signal is switched through relay K202 to the cue head. Capacitor C225, 8 mfd., across the coil provides a .1 second release time for cue tone application.

6.4 **POWER SUPPLIES**

There are two power supplies used in the Recording Amplifier. One supplies B+ to the tubes, and the other supplies power to actuate the relays.

The DC source for all the tube circuits is derived from a conventional full wave power supply, using a 6X4 rectifier. Filtering is provided by C201A and C201B. L201, the choke, smooths the ripple further. The preamp tubes have this B+ filtered to an even greater extent by the RC combination of R206 and C201C.

The DC source to actuate the relays is a conventional half-wave type, connected directly to the AC line. The DC voltage is rectified by CR201 and appears across C202. R232 is a surge current limiting resistor.

B+ to the bias oscillator is applied only when the unit is in the record mode.
7.1 **GENERAL**

The tubes should be checked every 3 to 6 months and replaced when necessary. Dust and dirt should be removed periodically to insure proper operation at all times. A soft brush will facilitate this procedure.

**NOTE**

When servicing equipment pull AC line plug because a shock hazard is present, this will prevent damage to components as one side of line is hot.

7.2 **RELAYS**

The relays should be inspected periodically for dust and cleaned when necessary. A relay burnishing tool passed between the contacts (while manually actuated) is sufficient.

7.3 **BIAS CURRENT ADJUSTMENT**

The correct bias current is necessary to produce a high quality recording. The correct bias current is .8 ma at a frequency of 50 KC to 70 KC.

7.4 **TO MEASURE BIAS CURRENT**

Step 1. Insert 100 ohm resistor into the ground return lead of the record/playback head.

Step 2. Measure the voltage drop across this resistor.

Step 3. Adjust R201 for .080 volts, measured across this 100 ohm resistor.

**NOTE - #1**

Be sure to connect the resistor in the ground lead, and connect the meter across the resistor with the ground side of the meter to the grounded side of the resistor, otherwise erroneous readings will occur.

**NOTE - #2**

HP 400 D is a suitable meter for this purpose.

4/28/61 -13- M5952 Recording Amplifier
### PARTS LIST

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<th>Symbol No.</th>
<th>Drawing No.</th>
<th>Description</th>
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<td>396 0076 000</td>
<td>Lamp, GE #12</td>
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<tr>
<td>C201</td>
<td>524 0087 000</td>
<td>Cap., 30-20-20 mfd., 350-300-250 V.</td>
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<tr>
<td>C202</td>
<td>522 0116 000</td>
<td>Cap., 40 mfd., @ 250 Volts</td>
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<td>C210</td>
<td>500 0771 000</td>
<td>Cap., Variable, 50-380 uuf.</td>
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<td>C203</td>
<td>506 0007 000</td>
<td>Cap., .5 mfd., 200 V.</td>
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<td>C204,C211,C212</td>
<td>506 0027 000</td>
<td>Cap., .47 mfd., @ 400 Volts</td>
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<td>C205,C207,C208</td>
<td>506 0028 000</td>
<td>Cap., .1 mfd., @ 400 Volts</td>
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<td>C206</td>
<td>516 0074 000</td>
<td>Cap., .005 mfd., @ 1KV</td>
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<td>C209</td>
<td>502 0071 000</td>
<td>Cap., 75 mmfd., @ 500 Volts</td>
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<td>C218,C227</td>
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<td>Cap., .001 mfd., @ 1000 Volts</td>
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<td>C219,C221</td>
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<td>C220</td>
<td>518 0011 000</td>
<td>Cap., 2.5-13 mmfd.</td>
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<td>C222</td>
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<td>Cap., .01 mfd., 400 Volts</td>
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<td>522 0288 000</td>
<td>Cap., 10 mfd., @ 150(W) Volts</td>
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<td>Cap., .25 mfd., @ 400 Volts</td>
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<td>Diode Silicon</td>
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<td>F201</td>
<td>398 0019 000</td>
<td>Fuse, 2A, 250 Volt, 3 AG</td>
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<td>Fuse, 5A, 250 Volt, 3 AG</td>
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<td>A.C. Line Cord &amp; Receptacle</td>
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5/3/61 -1- M5952 Recording Amplifier
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<td>476 0192 001</td>
<td>Toroid Choke</td>
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<td>M201</td>
<td>630 0069 000</td>
<td>VU Meter</td>
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<td>(P202,P206),</td>
<td>250 0034 000</td>
<td>Shielded Cable &amp; Phono Plug</td>
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<td>(P203,P207)</td>
<td>610 0254 000</td>
<td>Plug, 12 pin</td>
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<td>550 0213 000</td>
<td>Potentiometer, 250K ohm, 2W.</td>
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<td>Potentiometer, 100 ohm, 2W.</td>
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<td>Res., 2.2K ohm, 1/2W. 5%</td>
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<td>548 0046 000</td>
<td>Res., 180K ohm, 1/2W. 1%</td>
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<td>R205</td>
<td>540 0119 000</td>
<td>Res., 820K ohm, 1/2W. 1%</td>
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<td>R206</td>
<td>540 0492 000</td>
<td>Res., 100K ohm, 1W. 10%</td>
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<tr>
<td>R207</td>
<td>550 0048 000</td>
<td>Potentiometer, 500K ohm</td>
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<td>R208</td>
<td>540 0061 000</td>
<td>Res., 3.3K ohm, 1/2W. 5%</td>
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<tr>
<td>R209</td>
<td>540 0206 000</td>
<td>Res., 220K ohm, 1/2W. 10%</td>
</tr>
<tr>
<td>R210,R242</td>
<td>540 0214 000</td>
<td>Res., 1 megohm, 1/2W. 10%</td>
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<tr>
<td>R211,R216</td>
<td>540 0101 000</td>
<td>Res., 150K ohm, 1/2W. 5%</td>
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<td>R212,R243</td>
<td>540 0109 000</td>
<td>Res., 330K ohm, 1/2W. 5%</td>
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<td>R213</td>
<td>540 0180 000</td>
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<td>R214</td>
<td>540 0097 000</td>
<td>Res., 100K ohm, 1/2W. 5%</td>
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<td>R215</td>
<td>540 0115 000</td>
<td>Res., 560K ohm, 1/2W. 5%</td>
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<td>R217,R233</td>
<td>540 0831 000</td>
<td>Res., 270K ohm, 1/2W. 5%</td>
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<td>R218,R222</td>
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<td>Res., 2.2K ohm, 1/2W. 5%</td>
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<td>R219</td>
<td>540 0029 000</td>
<td>Res., 150 ohm, 1/2W. 5%</td>
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<tr>
<td>R220</td>
<td>540 0097 000</td>
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<td>R221</td>
<td>540 0105 000</td>
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<td>R223</td>
<td>540 0121 000</td>
<td>Res., 1 megohm, 1/2W. 5%</td>
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<td>R224,R226</td>
<td>540 0085 000</td>
<td>Res., 33K ohm, 1/2W. 5%</td>
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<td>R225</td>
<td>540 0049 000</td>
<td>Res., 1000 ohm, 1/2W. 5%</td>
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<td>R227</td>
<td>540 0054 000</td>
<td>Res., 1.6K ohm, 1/2W. 5%</td>
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<td>R228</td>
<td>540 0196 000</td>
<td>Res., 33K ohm, 1/2W. 10%</td>
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<tr>
<td>R229</td>
<td>540 0114 000</td>
<td>Res., 510K ohm, 1/2W. 5%</td>
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<td>R230,R238,R239</td>
<td>540 0067 000</td>
<td>Res., 5.6K ohm, 1/2W. 5%</td>
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<tr>
<td>R231</td>
<td>540 0073 000</td>
<td>Res., 10K ohm, 1/2W. 5%</td>
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5/3/61 -2- M5952 Recording Amplifier
<table>
<thead>
<tr>
<th>Symbol No.</th>
<th>Drawing No.</th>
<th>Description</th>
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<tr>
<td>R232</td>
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<td>Res., 150 Ohm, 2 W., 5%</td>
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<tr>
<td>R235</td>
<td>540 0599 000</td>
<td>Res., 330 Ohm, 2 W., 5%</td>
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<td>R236, R237</td>
<td>540 0065 000</td>
<td>Res., 4.7K Ohm, 1/2 W., 5%</td>
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<td>R240</td>
<td>540 0044 000</td>
<td>Res., 620 Ohm, 1/2 W., 5%</td>
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<td>R241</td>
<td>540 0079 000</td>
<td>Res., 18K ohm, 1/2 W., 5%</td>
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<tr>
<td>S201</td>
<td>598 0020 000</td>
<td>Switch Stack</td>
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<td>598 0019 000</td>
<td>Switch Stack</td>
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<td>S203</td>
<td>604 0005 000</td>
<td>Power Switch</td>
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<td>T201</td>
<td>472 0006 000</td>
<td>Power Transformer</td>
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<td>T202</td>
<td>478 0145 000</td>
<td>Input Transformer</td>
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<td>T203</td>
<td>478 0181 000</td>
<td>Oscillator Transformer</td>
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<td>V201</td>
<td>370 0105 000</td>
<td>Tube, 6X4</td>
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<td>V202, V204</td>
<td>370 0144 000</td>
<td>Tube, hF86</td>
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<td>V203, V206</td>
<td>370 0116 000</td>
<td>Tube, 12AX7</td>
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<td>V205</td>
<td>370 0195 000</td>
<td>Tube, 12AU7</td>
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<td>XA201, XA202</td>
<td>406 0264 000</td>
<td>Socket</td>
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<td>XF201, XF202</td>
<td>402 0023 000</td>
<td>Fuseholder</td>
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<td>XV201</td>
<td>404 0032 000</td>
<td>Socket, 7 Pin</td>
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<td>XV202, XV203, XV204</td>
<td>404 0059 000</td>
<td>Socket, 9 Pin</td>
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<td>XV205, XV206</td>
<td>404 0040 000</td>
<td>Socket, 9 Pin</td>
</tr>
<tr>
<td>XCR201</td>
<td>913 4478 001</td>
<td>Diode Mounting Board</td>
</tr>
</tbody>
</table>

M5952 Recording Amplifier
To make response check, set level 10 dB below zero or 100% VU indication.
## LIST OF PARTS

<table>
<thead>
<tr>
<th>QTY.</th>
<th>QTY.</th>
<th>QTY.</th>
<th>QTY.</th>
<th>ITEM</th>
<th>REFERENCE</th>
<th>PT. OR G.N.</th>
<th>FIN.</th>
<th>DESCRIPTION</th>
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</thead>
</table>

### (1) FOR MIC. INPUT
-70 DBM to -50 DBM

![Diagram of transformer T202](https://via.placeholder.com/150x150)

Transformer T202 connected for 150 ohm at factory.
T202 may be connected for 30/50 ohm by following instructions in Sec. III in Recording Amplifier Instruction Book.

### (2) BRIDGING 10K
HIGH LEVEL -20 DBM to +8 DBM

![Diagram of transformer T202](https://via.placeholder.com/150x150)

(1) High Level Input - Pins 4 & 6
(2) Jumper Pins - 3 & 5

### (3) MED. LEVEL BRIDGING
-35 to -20 DBM (P205)

(1) Input same as above
Pins 4 & 6 (See Fig. 2)

(2) Jumper Pins 3 & 5
(See Fig. 2)

(3) Jumper Out R236 & R237 (4.7K) on AT201
Remove R270, 620 ohms

---

**STATUS**

<table>
<thead>
<tr>
<th>DEVELOPMENT</th>
<th>PRODUCTION</th>
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<td>PROJ. ENG.</td>
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<td>APPROV. PRODUCTION</td>
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</table>

**TITLE**

Audio Input Connection to M5952 Recording Amplifier (P205)

**MTL.**

M-5944 Cartritape

---

**CH. BY**

[Signature]

**DATE**

3-14-61

**ENGINEER**

[Signature]

**DATE**

[Signature]
# USE FOR WIRING INTERCONNECTING PLUGS

## RECEPTACLE
**USE FOR WIRING INTERCONNECTIONS.**

**CAUTION:** TO REMOVE HOUSING LOOSEN NUT ON SIDE. DO NOT REMOVE SCREW, OTHERWISE PLUG WILL COME APART.

### J205 (WIRING SIDE)

![J205 Side View](image1)

### P205 (WIRING SIDE)

![P205 Side View](image2)

## PLUGS

### J204 (WIRING SIDE)

![J204 Side View](image3)

### P204 (WIRING SIDE)

![P204 Side View](image4)

### NOTES

1) MAKE ALL CONNECTIONS, NUMBERING FROM THE WIRING SIDE ONLY.

2) THE JACKS ARE SHOWN FOR REF., ONLY IN CIRCUIT TRACING (DO NOT WIRE TO JACKS).

---

**GR.BY:** 3-2-61  **MTL.:**  **ENG.:**  **TITLE:**

<table>
<thead>
<tr>
<th>GR.BY</th>
<th>MTL.</th>
<th>TITLE</th>
<th>TERMINAL NUMBER DESIGNATIONS FOR JACKS AND PLUGS</th>
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<td>G.A.</td>
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<td>TERMINAL NUMBER DESIGNATIONS FOR JACKS AND PLUGS</td>
<td>RECORDING AMP</td>
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</tbody>
</table>
INSTRUCTIONS FOR INSTALLING AND OPERATING OF GATES' M5953 SWITCHER

5/1/61

Gates Radio Company
Quincy, Illinois
# Switcher Index

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<td>Page 6</td>
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</tbody>
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3. Mounting The 19" Rack Model
4. Mounting the 15" Custom Model
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7. Load Resistor
8. Connecting More Than One Switcher in Series
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2. Playing Back Cartridge Using The Switcher

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6.2 Audio Switching
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SECTION VII
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SECTION VIII
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WARRANTY

DRAWINGS:
B-67174 - Wiring Diagram for Multiple Switcher Connection
D-23020 - Schematic Diagram
B-67163A - Wiring Diagram Switcher Only
842 3246 001 - System Wiring Diagram
813 5852 001 - Pin Numbering for Jacks and Plugs.

5/1/61.
800 0101 000
M5953 SWITCHER

SECTION I
SPECIFICATIONS

INPUT CHANNELS: Four, 500/600 ohms (factory connected) 150/250 ohms by changing load resistor.

CROSSTALK: More than 65 db below normal recording level.

SWITCHING TIME: 0.02 seconds or less

POWER: 115 Volts, 50/60 cps., 7 watts.

RELAYS: Short telephone type (Type "J" or equivalent).

MECHANICAL

HEIGHT: 3-1/2 inch rack or custom cabinet mounting.

WIDTH: 19 inch rack or 15 inch custom cabinet mounting.

DEPTH: 4 inches behind panel, excluding plugs.

PANEL: Hinged and secured with 1/4 turn fasteners to permit quick access to dust protected relay contacts.

WEIGHT: Net 6 lbs., packed (domestic) 10 lbs., cubage 1.

SECTION II
INTRODUCTION

2.1 GENERAL

The Gates Switcher, M5953 is a relay device that will switch four Cartritape audio outputs to one console.
input. By connecting more than one Switcher in series, any number of Cartritape outputs may be accommodated by one console input.

NOTE
It is recommended that the complete Instruction Book be read before installation of this equipment.

SECTION III
INSTALLATION

3.1 UNPACKING
The Switcher will be received in one shipping carton. Unpack the contents carefully and examine thoroughly for shipping damage. If any such damage is found, file a claim report immediately with the Carrier.

3.2 MOUNTING (ADAPTOR PLATES 15" & 19" MODEL)
The basic unit will be received for 15" custom installation. The 19" panel adaptors are enclosed. These should be installed to the panel mounting angle of the Switcher if rack mounting is planned.

3.3 MOUNTING THE 19" RACK MODEL
Mount the Switcher in a rack with four panel screws. The location of the Switcher in the rack is relatively unimportant, except that accessibility should be kept in mind to allow for routine maintenance and inspection.

3.4 MOUNTING THE 15" CUSTOM MODEL
The unit can be installed in a custom cabinet or located as a table top unit. In either case, the wiring and operation are the same.

3.5 WIRING (J303) CONTROL CIRCUITS
Study Drawing 842 3246 001, and B-67163A. Drawing 842 3246 001 is a system wiring diagram and should be used in wiring a complete Cartritape System.

5/1/61. -2- M5953 Switcher
B-67163A will be used for the Switcher wiring to an existing system.

NOTE
For ease of pin numbering identification use Drawing 813 5452 001 as reference. Insert plug into jack and observe pin numbers while wiring.
1) On each Cartritape, connect Pin 12 (J104) to the correct Pin on J503.
2) Pin 11 (J104) on each Cartritape, should be interconnected and this common point should be connected to Pin 11 on J503 of the Switcher.
3) Ground Pin 12, (J303) to the station ground.

3.6 WIRING P302 AUDIO JACK

NOTE
See Drawing 813 5852 001 for pin numbering information.
Observe diagram B-67163A, this diagram only shows Switcher wiring.
1) On each Cartritape, connect a shielded pair from Pins 1, 2, 3, (P105) to the correct terminals on P302 on the Switcher.
2) Ground Pin 14 to shield on P302.
3) Run a shielded pair from Pins 1-2 (P302) to the console input.

3.7 LOAD RESISTOR
The Switcher is wired for 500/600 ohm back at the factory. It can be changed to 150 ohm load by changing the load resistor R305 to 150 ohms.
3.8 CONNECTING MORE THAN ONE SWITCHER IN SERIES

By connecting more than one Switcher in series more than four Carritapes can be fed into one console input.

To connect two or more switchers together the following procedure should be followed (See B-67174):

Step 1. Remove jumper between Pins 3-4 (J303) on all units to be interconnected.

Step 2. Remove all jumpers between Pins 1-2 (J303) on all units to be interconnected.

Step 3. Connect Pin 4 (P303) on the first switcher to Pin 3 (P303) on the second switcher, Pin 4 on the second to Pin 3 of the third (or back to the first if only two switchers are used).

Step 4. Connect Pin 8 of the first switcher to Pin 1 of the second (and so on), until the last unit. **DO NOT** connect Pin 8 of the last unit to Pin 1 of the first unit.

Step 5. Pins 1-2 (J303) on the first unit should be jumpered. If a remote unit, M5960, is used, then the "OFF" switch will replace the jumper.

Step 6. Connect a shielded pair from Pins 9-10 (P302) of the first switcher to Pins 1-2 (J302) of the second switcher (and so on) until the last unit is reached. Ground the shield to Pin 14 (P302 on all units.)

Step 7. Diagram B-67174 shows eight audio inputs. If more than two switchers are used, the same pattern of connection should be followed.

Step 8. The 620 ohm resistor, R305, located in each Switcher between pins 9-10 (J302) should be removed on all switchers except the last switcher in the series.

5/1/61

M5953 Switcher
Step 9. The output will appear at terminals 1-2 (P302) of the first unit, and should be connected to the console.

NOTE

The jumper between Pins 1-2 (J303) is removed in all units but the first, because only the first unit's power supply is utilized.

3.9 POWER CORD

Power is supplied to the unit through J301. Connect one end of the cord to J301 and plug the other end into a 115 volt 50/60 cps source.

SECTION IV
PRE-OPERATION

The following is a familiarization procedure that should be followed before attempting to place the unit into operation.

4.1 POWER SWITCH (S301)

The power OFF-ON switch is located on the front panel. When power is applied to the unit the neon indicator glows.

4.2 PLAYING BACK CARTRITAPES USING THE SWITCHER

With the Cartritapes installed to the Switcher, the following procedure should be followed to determine if they are wired and functioning properly.

Step 1. Insert a pre-recorded tape cartridge into each playback unit connected to the Switcher.


Step 3. Start the first unit. The program material from this unit should be monitored at the Switcher output.
Step 4. Start all other Cartritapes in any order. In each case, the program material from the last unit started should be heard.

NOTE
It will be noted that this switching does not interfere with the re-cueing of the cartridges.

SECTION V
OPERATION

5.1 THE SWITCHER IN USE

Basic facts to remember about the Switcher:

1. Only one Playback unit is connected to the console input at one time through the Switcher.
2. The Cartritape that is switched to the console is the last unit started.
3. To remove all audio from the console input it is necessary to unlatch all the relays in the Switcher. Therefore, an "OFF" switch is provided as part of the remote unit, M5960.

5.2 TO PLAY BACK MULTIPLE CARTRIDGES, ONE AFTER THE OTHER

Start the first unit at the correct time in the program. When the first recorded program segment has been completed, start the next Cartritape. In each case, as the units are started, the Switcher will switch the program material from that unit to the console.

5.3 MULTIPLE SWITCHERS

If more than four Cartritapes are to feed one console input, multiple switcher operation will be necessary. (See INSTALLATION SECTION). By series connection of these switchers, any number of inputs may be handled. The operation of these units is exactly the same as for one Switcher; except, of course, more Cartritapes are handled.

5/1/61 M5953 Switcher
SECTION VI
THEORY OF OPERATION

The relay circuits perform two basic switching functions. First, the DC control circuits and, second, the audio switching.

6.1 DC CONTROL CIRCUIT

The DC control circuit encompasses the relay switching necessary to activate the necessary relay to feed the correct audio to the console.

Refer to Drawing D-23020, note that many of the contacts on the relays are wired in series. The positive side of the DC source goes to terminal 7 on K301, and (with all relays de-energized) terminal 6 on K301, terminal 7 on K302, and so on until terminal 7 is reached on K304. There is another set of series contacts from terminal 3 on K301 to terminal 4 on K302, and so on until K304 is reached. It then returns to terminal 4 on K301. These series contacts comprise the latching and releasing circuits that will allow any order of relay operation.

The contacts on terminals 6 and 7 on K301 are operated when that relay coil is activated. These contacts break the DC path to any relay energized above this relay and unlatch it.

Contacts located on terminal 3 and 4 break the DC path to any relay that is energized below the relay being activated.

This double series circuit path is necessary to allow operation of the relays in any sequence.

6.2 AUDIO SWITCHING

The audio output from the Switcher is located on terminals 10 and 13 of K301. The input of each Carritape is located on Pins 11 and 14 of the relay wired to that Carritape. When a relay is energized, the audio fed to
that relay is applied to the output line. If no relay is energized, the resistor K305 is placed on the output line to give the console a constant source impedance. This resistor may be changed to 150 ohms (1/2 watt) if the console and the Cartritapes output circuits are wired for that impedance.

6.3 POWER SUPPLY

The DC power to operate the relays is derived from a 6 volt transformer and rectified with a silicon rectifier bridge circuit with capacitor input (C305).

SECTION VII
MAINTENANCE

7.1 GENERAL

Periodic preventative maintenance will keep this piece of equipment operating satisfactorily.

7.2 RELAYS

The relays should be inspected at least once a week and cleaned, if necessary, with a burnishing tool. Do not file (or in any way damage) the contacts. Gold alloy contacts are used in circuits where insufficient current flows to remove the oxide from the contacts. The enclosure itself is constructed to act as a large dust cover for the relays.

7.3 INSPECTION

The front panel is hinged and, by turning the thumb screw at the top of the panel, it can be lowered. The relays can then be cleaned and inspected from this point. Also, most of the wiring can be observed from this panel opening. The rear of the relays can be viewed by removing the back inspection plate.
## SECTION VIII
### PARTS LIST

<table>
<thead>
<tr>
<th>Symbol No.</th>
<th>Drawing No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A301</td>
<td>406 0252 000</td>
<td>Neon Indicator</td>
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<tr>
<td>C301, C302, C303, C304</td>
<td>506 0008 000</td>
<td>Cap., 1.0 mfd., 200 V.</td>
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<td>C305</td>
<td>522 0067 000</td>
<td>Cap., 100 mfd., 15 V.</td>
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<td>CR301, CR302, CR303, CR304</td>
<td>384 0018 000</td>
<td>Rectifier</td>
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<td>F301</td>
<td>398 0019 000</td>
<td>Fuse, 2 amp., 250 V.</td>
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<td>J301</td>
<td>250 0025 000</td>
<td>Receptacle &amp; Line Cord</td>
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<td>J302</td>
<td>612 0247 000</td>
<td>Receptacle, 14 terminal</td>
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<td>612 0335 000</td>
<td>Receptacle, 12 terminal</td>
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<td>572 0097 000</td>
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<td>Plug, 14 terminal</td>
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<td>P303</td>
<td>610 0254 000</td>
<td>Plug, 12 terminal</td>
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<td>540 0170 000</td>
<td>Res., 220 ohm, 1/2 W., 10%</td>
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<td>Diode Mounting Board</td>
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5/3/61 -1- M5953 Switcher
This equipment is warranted by Gates Radio Company of Quincy, Illinois to be free from defects in workmanship and material and will be repaired or replaced in accordance with the terms and conditions set forth below:

1. Gates Radio Company believes that the purchaser has every right to expect first-class quality, materials and workmanship and has created rigid inspection and test procedures to that end, and excellent packing methods to assure arrival of equipment in good condition at destination.

2. Gates Radio Company will endeavor to make emergency shipments at the earliest possible time giving consideration to all conditions.

3. Gates Radio Company warrants new equipment of its manufacture for one (1) year and (six (6) months on moving parts), against breakage or failure of parts due to imperfection of workmanship or material, its obligation being limited to repair or replacement of defective parts upon return thereof f.o.b. Gates Radio Company's factory, within the applicable period of time stated. Electron tubes shall bear only the warranty of the manufacturer thereof in effect at the time of the shipment to the purchaser. Other manufacturers' equipment covered by a purchaser's order will carry only such manufacturers' standard warranty. These warranty periods commence from the date of invoice and continue in effect as to all notices, alleging a defect covered by this warranty, received by Gates Radio Company prior to the expiration of the applicable warranty period.

The following will illustrate features of the Gates Radio Company warranty:

**Transmitter Parts:** The main power or plate transformer, modulation transformer, modulation reactor, main tank variable condensers all bear the one (1) year warranty mentioned above.

**Moving Parts:** As stated above, these are warranted for a period of six (6) months.

**Electron Tubes:** As stated, electron tubes will bear such warranty, if any, as provided by the manufacturer at the time of their shipment. Gates Radio Company will make such adjustments with purchasers as given to Gates Radio Company by the tube manufacturer.

**All other component parts (except as otherwise stated):** Warranted for one (1) year.

**Abuse:** Damage resulting from abuse, an Act of God, or by fire, wind, rain, hail, in transportation, or by reason of any other cause or condition, except normal usage, is not covered by this warranty.

4. Operational warranty - Gates Radio Company warrants that any new transmitter of its manufacture, when properly installed by purchaser and connected with a suitable electrical load, will deliver the specified radio frequency power output at the output terminal(s) of the transmitter, but Gates Radio Company makes no warranty or representation as to the
coverage or range of such apparatus. If a transmitter does not so perform, or in the event that any equipment sold by Gates Radio Company does not conform to any written statement in a contract of sale relative to its operating characteristics or capabilities, the sale liability of Gates Radio Company shall be, at the option of Gates Radio Company, either to demonstrate the operation of the equipment in conformance with its warranty, or to replace it with equipment conforming to its warranty, or to accept its return, f.o.b. purchaser's point of installation and refund to purchaser all payments made on the equipment, without interest. Gates Radio Company shall have no responsibility to the purchaser under a warranty with respect to operation of equipment unless purchaser shall give Gates Radio Company a written notice, within one (1) month after arrival of equipment at purchaser's shipping point, that the equipment does not conform to such warranty.

5. Any item alleged by a purchaser to be defective, and not in conformance with a warranty of Gates Radio Company shall not be returned to Gates Radio Company until after written permission has been first obtained from the Gates Radio Company home office for such return. Where a replacement part must be supplied under a warranty before the defective part can be returned for inspection, as might be required to determine the cause of a defect, purchaser will be invoiced in full for such part, and if it is determined that an adjustment in favor of the purchaser is required, a credit for an adjustment will be given by Gates Radio Company upon its receipt and inspection of a part so returned.

6. All shipments by Gates Radio Company under a warranty will be f.o.b. Quincy, Illinois or f.o.b. the applicable Gates Radio Company shipping point.

7. Gates Radio Company is not responsible for the loss of, or damage to, equipment during transportation or for injuries to persons or damage to property arising out of the use or operation of Gates equipment. If damage or loss during transportation occurs, or if the equipment supplied by Gates Radio Company is otherwise damaged, Gates will endeavor to make shipment of replacement parts at the earliest possible time giving consideration to all conditions. It is the responsibility of a purchaser to file any claim for loss or damage in transit with the transportation company and Gates will cooperate in the preparation of such claims to the extent feasible when so requested.

8. Gates Radio Company, in fulfilling its obligations under its warranties, shall not be responsible for delays in deliveries due to depleted stock, floods, wars, strikes, power failures, transportation delays, or failure of suppliers to deliver, acts of God, or for any condition beyond the control of Gates that may cause a delayed delivery.

9. This warranty may not be transferred by the original purchaser and no party, except the original purchaser, whether by operation of law or otherwise, shall have or acquire any rights against Gates Radio Company by virtue of this warranty.

10. Gates Radio Company reserves the right to modify or rescind, without notice, any warranty herein except that such modification or rescission shall not affect a warranty in effect on equipment at the time of its shipment. In the event of a conflict between a warranty in a proposal and acceptance and a warranty herein, the warranty in the proposal and acceptance shall prevail.

11. This warranty shall be applicable to all standard Gates catalog items sold on or after March 1, 1960.

Gates Radio Company
Quincy, Illinois

1/6/60
OFF SWITCH LOCATED ON REMOTE UNIT M5960

LOCATED EXTERNALLY ON EACH CARTRITAPE

SHOWN ONLY TO INDICATE FUNCTION

START 1
START 2
START 3
START 4

OFF SWITCH OR JUMPER

J303 CONTROL
M5953 SWITCHER

NO JUMPER: PINS 1 & 2 OR OFF SWITCH IN ANY BUT FIRST UNIT

NO JUMPER PIN 24

REMOVE 620 susceptible RESISTORS ON ALL BUT THE LAST UNIT (LOCATED BETWEEN PINS 9-10 J302)

NOTE:
BEFORE WIRING J302 & J303 SEE DRAWING 813-5852-001 FOR PIN NUMBERING INFORMATION.

(FIRST UNIT)

(SECOND UNIT) OR LAST

WIRING DIAGRAM FOR MULTIPLE SWITCHER CONNECTION

M-5953

REDRAWN

M.L.

8-26-71

B-67174

SHEET OF
**NOTES:**

1. SEE 813-5844-001 FOR PLUG & JACK PIN NUMBERING INFORMATION FOR CARTRITAPE M5944
2. SEE 813-5851-001 FOR PLUG & JACK PIN NUMBERING INFORMATION FOR RECORDING AMPLIFIER M5952
3. SEE 813-5852-001 FOR PLUG & JACK PIN NUMBERING INFORMATION FOR SWITCHER M5953

* THESE TERMINALS UTILIZED WHEN CONNECTING MULTIPLE SWITCHERS
USE FOR WIRING INTERCONNECTING PLUGS

RECEPTACLE
SHOWN FOR CIRCUIT TRACING ONLY

PLUGS
USE FOR WIRING INTERCONNECTIONS.
CAUTION: TO REMOVE HOUSING LOOSEN NUT ON SIDE DO NOT REMOVE SCREW, OTHERWISE PLUG WILL COME APART.

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NOTES
1) MAKE ALL CONNECTIONS, NUMBERING FROM THE WIRING SIDE ONLY.
2) THE JACKS ARE SHOWN FOR REF., ONLY IN CIRCUIT TRACING (DO NOT WIRE TO JACKS).
INSTRUCTIONS FOR INSTALLING AND OPERATING

OF

GATES M5960 REMOTE UNIT

5/1/61

Gates Radio Company
Quincy, Illinois
M5960 REMOTE UNIT

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813 5856 001 Pin Numbering Jack & Plugs
M5960 REMOTE UNIT

SECTION I
SPECIFICATIONS

SWITCH CONTROLS: 4 Cartritape "Start" Playback Units (switch is illuminated when used with M5953 Switcher). Recording Amplifier "Start" (illuminated switch) and Remote "OFF".

HEIGHT: 4"
WIDTH: 6-1/2"
DEPTH: 6"

CONNECTIONS: Quick disconnect plug.

SECTION II
INTRODUCTION

2.1 GENERAL

The function of the Remote Unit, M5960, is to provide remote control facilities for the Cartritape System. The unit contains six switches, five of which are illuminated.

The operation of the remote unit is the same as the operation of the individual switches (located on each of the system units) except that they are located in one convenient remote location.

NOTE

(If not used with M5953 Switcher, switches are not illuminated.) The switching facilities include provisions for remote starting:

1. Four Cartritape Playback Units, with Switcher.
2. Three Cartritape Playback Units and one record/playback combination, with Switcher.
NOTE
It is recommended that the Instruction Book be read completely before actual installation.

SECTION III
INSTALLATION

3.1 UNPACKING
The remote unit will be received in one shipping carton. Unpack the contents carefully and examine thoroughly for shipping damage. If any such damage is found, file a claim immediately with the Carrier.

3.2 MOUNTING
The remote unit is designed to be mounted conveniently near the console. The bottom cover has two holes provided to facilitate fastening the unit to a tabletop or desk. This will prevent the unit from slipping when the switches are actuated.

3.3 WIRING P401. (See Drawing 813 5856 001 for pin numbering information.)
Study drawings 842 3246 001, and B-67161A. Drawing 842 3246 001 is a system wiring diagram and should be used in wiring up a complete Carritape system. If the wiring of just the remote unit is desired use drawing B-67161A.

NOTE
For ease of pin numbering identification:
Insert plug into jack and observe Drawing 813 5856 001 while wiring.

3.4 REMOTE "OFF" SWITCH
When the remote unit is connected to a system using a switcher, M5953, the jumper between Pins 1 & 2 should be removed from the J303 on the Switcher. This jumper is wired in at the factory.
3.5 MULTIPLE REMOTE CONNECTION

It is possible to connect remote units in parallel to provide remote functions from more than one location. Proceed as follows:

1) All remote "Start" switches (Playback and Record) can be connected in parallel between remote units.
2) The "OFF" switches must be wired in series so that pressing any "OFF" switch will open the circuit.

By keeping the above points in mind any number of units may be connected.

SECTION IV
PRE-OPERATION

4.1 GENERAL

The following is a familiarization procedure that should be followed before attempting to place the unit into operation.

4.2 BEFORE PROCEEDING THE FOLLOWING WIRING SHOULD BE COMPLETE

1. Wiring of playback units to the switcher.
2. The inter-wiring between the playback unit and the recording amplifier (if one such unit is connected).
3. The connection of the remote unit to the associated equipment.

POWER SHOULD BE APPLIED TO ALL UNITS.

4.3 PLAYBACK SWITCHES

There are four "Start" switches located on the remote unit. To determine if they are functioning correctly the following procedure should be followed.

Step 1. Place a pre-recorded cartridge into each playback unit.
Step 2. Press the "Start" switch on the remote unit marked #1. The first Cartritape should begin to play. This switch should glow green to indicate that the unit is playing.

Step 3. Follow the same procedure with #2, #3, #4 "Start" switches. In each case the switch pressed should start the correct unit playing, and should glow green to indicate same.

4.4 RECORD FUNCTION

In order to determine if the record switch is functioning correctly the following procedure should be followed.

Step 1. Insert blank cartridge (approx. 40 sec.) into the Cartritape that is interconnected to the recording amplifier.

Step 2. Press the switch on the remote unit marked "Record". It should glow red. This indicates the unit is ready to record.

Step 3. Press the correct "Start" switch. (Ref. Step 1). The tape should start to move in that unit to which the recording amplifier is connected.

NOTE
"Start switch is not illuminated, because of interlock feature (record while other units are on air).

Step 4. Allow unit to re-cue. The playback unit will stop and the red indication on "Record" switch will go out.

NOTE
Bulk erase cartridge before using again, because a cue tone has been recorded during the above tests.
4.5 **REMOTE "OFF" SWITCH**

The "OFF" switch removes the program output to the console input by releasing all the relays in the switcher. To determine if it is functioning correctly the following procedure should be followed:

- **Step 1.** Insert a previously recorded cartridge into playback unit.
- **Step 2.** Press the remote "Start" of that unit. Program material should be observed at the console.
- **Step 3.** Press the "OFF" switch on the remote unit, the program material should stop. However, the playback unit will continue running until it has re-cued. (All relays should be released in the switcher.)

**SECTION V**

**OPERATION**

5.1 **PLAYING CARTRIDGES REMOTELY**

When the time arrives in the program schedule to play a cartridge segment, press the "Start" switch connected to that desired Cartritape unit. As soon as the desired program has been played, the console selector switch can be thrown to the next program source.

If more than one cartridge is to be played "end to end", the operator presses the next "Start" switch as soon as the program ends on the previous cartridge.

**NOTE**

The starting of the next Cartritape unit does not stop the previous unit from re-cueing automatically.

5.2 **REMOTE RECORDING**

Remote recording control can be accomplished if the playback unit has been previously loaded with a cartridge (that has been bulk erased) and the recording...
amplifier level control adjusted for correct indication on the VU meter. The remote unit provides only the starting switching function.

5.3 RECORD CUE TONE

Normally a cue tone is desired on the tape in order for the cartridge to cue up. This is accomplished by pressing "Record" switch before the "Start switch located on the Cartritape unit or the Remote Unit.

5.4 TO STOP AND START T.APE WITHOUT RECORDING CUE TONE

Press "Start" (on Cartritape) first, then "Record" (on Recording Amplifier).

5.5 USE OF THE "OFF" SWITCH

The "OFF" switch is provided so that the program material can be removed from the console input at anytime. This disengages the relays on the switcher unit and permits the Cartritape unit to re-cue the cartridge.

SECTION VI
THEORY OF OPERATION

6.1 GENERAL

The remote unit theory of operation is very simple. Each remote switch operates in parallel with the switch that performs the same function on the other units.

Pressing remote "Start" causes the Cartritape to start and also provides the path for the correct switcher relay to energize and feed audio to the console. Since the switcher relays operate on a latch and unlatch principle each relay must open when the next unit is started. CR401, CR402, CR403, and CR404 isolate the switch lamps from the relay coils so that the back EMF, generated when their DC path is open, does not hold the relay closed through the lamp resistance.
7.1 **Lamps**

The lamps used in the remote unit are GE #12 lamps. They are ultra-reliable and have a long life. When it becomes necessary to replace one of these units, be sure to obtain the correct replacement part.

7.2 **Switches**

The switches used are momentary spring loaded contacts.
### PARTS LIST

<table>
<thead>
<tr>
<th>Symbol No.</th>
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<td>396 0076 000</td>
<td>Lamp, GE #12</td>
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<td>612 0336 000</td>
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<td>P401</td>
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</tr>
<tr>
<td>S402, S403, S404, S405, S406</td>
<td>598 0019 000</td>
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<td>406 0264 000</td>
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5/3/61 M5960 Remote Unit
NOTES:

1. REMOVE JUMPER BETWEEN PINS 1 & 2 ON J303 (SWITCHER)
2. SEE 813-5844-001 FOR PLUG & JACK PIN NUMBERING INFORMATION FOR CARTRITAPE M5944
3. SEE 813-5851-001 FOR PLUG & JACK PIN NUMBERING INFORMATION FOR RECORDING AMPLIFIER M5952
4. SEE 813-5852-001 FOR PLUG & JACK PIN NUMBERING INFORMATION FOR SWITCHER M5953
5. SEE 813-5856-001 FOR PLUG & JACK PIN NUMBERING INFORMATION FOR REMOTE UNIT M5960
**USE FOR WIRING INTERCONNECTING PLUGS**

**SHOWN FOR CIRCUIT TRACING ONLY**

**USE FOR WIRING INTERCONNECTIONS.**

**CAUTION:** TO REMOVE HOUSING LOOSEN NUT ON SIDE DO NOT REMOVE SCREW, OTHERWISE PLUG WILL COME APART.

---

**CHASSIS BOTTOM**

- J401 (WIRING SIDE)
  - 12 14 16 18 20
- SIDE VIEW

- P401 (WIRING SIDE)
  - 1 3 5 7 9
- SIDE VIEW

---

**NOTES**

1) **MAKE ALL CONNECTIONS, NUMBERING FROM THE WIRING SIDE ONLY.**

2) **THE JACKS ARE SHOWN FOR REF. ONLY IN CIRCUIT TRACING (DO NOT WIRE TO JACKS).**

---

**TERMINAL NUMBER DESIGNATIONS FOR JACKS AND PLUGS**

- REMOTE BOX

- **M 5960**

- CM 411 V MT L.

---

**Drawn by G.A. 3-3-61**

**Checked by**

**March 24, 1961**

**M 5960 813-5856-001**
amplifier level control adjusted for correct indication on the VU meter. The remote unit provides only the starting switching function.

5.3 RECORD CUE TONE
 Normally a cue tone is desired on the tape in order for the cartridge to cue up. This is accomplished by pressing "Record" switch before the "Start switch located on the Cartritape unit or the Remote Unit.

5.4 TO STOP AND START TAPE WITHOUT RECORDING CUE TONE
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5/3/61
-1-
M5960 Remote Unit
NOTES:

(I) REMOVE JUMPER BETWEEN PINS 1 & 2 ON J303 (SWITCHER)
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(3) SEE B13-5851-001 FOR PLUG & JACK PIN NUMBERING INFORMATION FOR RECORDING AMPLIFIER M5952
(4) SEE B13-5852-001 FOR PLUG & JACK PIN NUMBERING INFORMATION FOR SWITCHER M5953
(5) SEE B13-5856-001 FOR PLUG & JACK PIN NUMBERING INFORMATION FOR REMOTE UNIT M5960

RECORD / PLAYBACK COMBINATION

M5944
NO 1
 CARTRITAPE

M5944 NO 2
 CARTRITAPE

M5944 NO 3
 CARTRITAPE

M5944 NO 4
 CARTRITAPE

M5952
 RECORDING AMPL

M5953
 SWITCHER

M5960 REMOTE

J401

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

J303

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

M5960 REMOTE UNIT WIRING CONNECTIONS M5960 FOR CARTRITAPE M5944
USE FOR WIRING INTERCONNECTING PLUGS

RECEPTACLE
SHOWN FOR CIRCUIT TRACING ONLY

USE FOR WIRING INTERCONNECTIONS.
CAUTION: TO REMOVE HOUSING LOOSEN NUT ON SIDE. DO NOT REMOVE SCREW, OTHERWISE PLUG WILL COME APART.

J105 AND J106 (WIRING SIDE)
SIDE VIEW

P105 AND P106 (WIRING SIDE)
SIDE VIEW

J104 (WIRING SIDE)
SIDE VIEW

P104 (WIRING SIDE)
SIDE VIEW

NOTES:
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