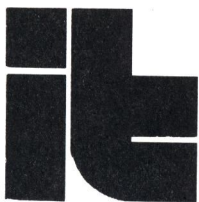


INSTRUCTION BOOK  
RA AND WRA SERIES  
RECORDING AMPLIFIERS  
INTERNATIONAL TAPETRONICS CORPORATION



**INTERNATIONAL TAPETRONICS CORPORATION**  
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## SECTION I

### GENERAL DESCRIPTION

### RA SERIES RECORDING AMPLIFIER

Tapetronics RA Series Recording Amplifiers are designed for use with WP Series Reproducers to function as RP Series "Master Recorder/Reproducers" which meet or exceed the NAB standards for cartridge tape recording and reproducing.

The Recording Amplifiers are available in either mono or stereo configurations. All units are supplied with primary (1 kHz) cue tone oscillators while the secondary (150 Hz) and tertiary (8 kHz) tone oscillators are optional.

Amplifiers, oscillators, and logic circuits are all solid state -- no relays are used in the RA Series Recording Amplifier. A primary (1 kHz) cue tone is automatically applied when the recording process is started. This tone, when reproduced, is used to stop the tape drive mechanism.

A secondary cue tone (150 Hz), when the machine is so equipped, may be applied for such functions as the indication of the "end-of-message". This is necessary in automated systems to start the next machine and can be useful in live operations to keep the operator "on cue" for live inserts or the beginning of the next material.

Tertiary cue tones (8 kHz), also optional, can be used to supply digital information in automated systems or for auxiliary switching such as the control of slide projectors in television.

The secondary and tertiary cue tones may be applied during either the recording or reproducing mode of operation.

An exclusive feature of the Tapetronics RA Series Recording Amplifier allows the manual application of the primary cue tone whenever dictated by

special production requirements. A "Defeat" control is also provided to allow the operator to manually prevent the automatic application of the primary cue tone when the recording process is initiated.

Meter switching is employed to provide a visual indication of:

1. Program Bias
2. Peak Recording Level (Meter response parallels tape saturation)
3. Normal Recording Level (VU)
4. Program Play
5. Cue Play
6. Cue Bias

## SECTION II

### SPECIFICATIONS

### RA SERIES RECORDING AMPLIFIER

**Power:** From reproducer's regulated power supply (24 vdc)

**Audio Input(s):** Line input impedance; 600 ohms balanced (two for stereo)  
-20 dBm to 0 dBm level; accepts higher level by changing  
input pad

**Metering:** Taut-band movement with "A" scale. Internal meter switch  
allows selection for metering the following levels: recording  
input; playback; bias; cue playback; or peak recording

**Distortion:** 2% or less, record to playback at 0 WU record level

**Noise:** 55 dB or better below reference of 400 Hz at 3% THD, monophonic  
50 dB or better below reference of 400 Hz at 3% THD, stereophonic

**Cross Talk Between Channels:** Better than 50 dB at 1 kHz

**Frequency Response:**  $\pm 2$  dB from 50 to 15,000 Hz

**Equalization:** NAB

**Cue Signals:** 1 kHz primary cue, standard; automatically recorded at start  
of recording (may be defeated and applied as required at  
user's option); 150 Hz and 8 kHz cues, optional (may be  
recorded during recording process or during playback);  
individual oscillators for each frequency with adjustable  
frequency and output level

**Bias Oscillator:** Push-pull operating at 82 kHz; individual gates and  
level controls for program (separate left and right in  
stereo units) and cue

**Remote Control:** All indicators and functions except meter switch

**Dimensions:** RA Series; 7" width, 5½" height, 12" depth  
WRA Series; 8 ¾" width, 5½" height (add ¾" for rubber  
feet), 12" depth

**Weight:** RA Series; 8½ pounds  
WRA Series; 13 pounds

SECTION III

UNPACKING

RA SERIES RECORDING AMPLIFIER

Remove the Tapetronics Recording Amplifier from the shipping carton and inspect the unit for damage. Claims for shipping damage must be promptly filed by you, the receiver. All packing material must be retained if a claim is to be filed.

## SECTION IV

### INSTALLATION AND OPERATION

### RA SERIES RECORDING AMPLIFIER

Tapetronics RA Series Cartridge Recording Amplifiers are normally supplied with an associated WP Series Reproducer. These units are provided in cases prepared for table top mounting. Adapter angle brackets and hardware for mounting in 19 inch equipment racks are supplied on an optional basis.

See the ventilation information provided in the Reproducer Section of this instruction book.

When the Recording Amplifier and Reproducer are supplied together as an RP Series Master Recorder, the units have been fully tested and adjusted to provide optimum performance. If the RA Series Recording Amplifier is supplied separately for use with an existing WP Series Reproducer, the Recording Amplifier has been fully tested and adjusted to operate with the recording head provided. Only head installation and adjustment (see Section 6 - Reproducer) should be required prior to putting the units into service.

#### External Connections -- Control

Remote control connections are provided on the eighteen pin socket, J301. A mating plug is supplied, and terminal information is provided in Figure I.

#### External Connections -- Audio

Audio connections are made on the six pin plug, P301, and a mating socket is supplied. Terminal information is provided in Figure I. The impedance of the audio input is normally 600 ohms. Other input impedances may be achieved by changing the audio input pad. In stereo systems, proper phasing of the audio connections must be observed.

## Controls and Indicators

- REC**            The Record Switch is used to place the unit in the recording mode. This condition can be achieved when a cartridge has been properly loaded in the Reproducer and the machine is "Ready" to be started. An indicator lamp in the Record Switch shows that the unit is in the recording mode.
- SEC**            The Secondary Cue Tone Switch is used to control the 150 Hz cue tone oscillator when the Recording Amplifier is so equipped. This "control" tone can be recorded when the unit is in either the recording or reproducing mode.
- TER**            The Tertiary Cue Tone Switch is used to control the 8 kHz cue tone oscillator when the Recording Amplifier is so equipped. This "control" tone can be recorded when the unit is in either the recording or reproducing mode.
- CAUTION:** It is suggested operators be cautioned against inadvertently actuating any control tone during playback.
- LEVEL**  
or  
**L LEVEL**  
(stereo)        The monophonic LEVEL (left channel stereo) potentiometer provides an adjustment of the input level feeding the associated program recording amplifier. A visual indication of this level is provided by the meter above this potentiometer.
- R LEVEL**  
(stereo)        The right channel stereo potentiometer provides an adjustment of the input level feeding the associated program recording amplifier. A visual indication is provided by the meter above this potentiometer.
- METER**        The Meter Switch is used to select the analog information to be displayed on the front panel meter(s). The switch is located on a support plate behind the front panel and is readily accessible to the operator when the Recorder chassis is slid a few inches from its housing. The switch positions and their functions are as follows:

1. Program Bias - In this position, the front panel meter(s) indicate the presence of program bias. The reading is provided only when the unit is in the recording mode and the tape drive mechanism is running (solenoid energized and Start Switch illuminated). When properly adjusted and calibrated, the meter(s) should provide a "zero" (100%) indication.
2. Peak Recording Level - This switch position provides a meter indication of program recording level as related to tape saturation. (Tape saturation does not occur at the same level for all frequencies.) Meter deflections exceeding "zero" (100%) indicate that the point of tape saturation is being too closely approached and that distortion is occurring. The discriminating operator can create "clean" (undistorted) recordings by observing the Peak Recording Level and adjusting the Input Level Control(s) accordingly.
3. Normal Recording Level - With the switch in this position, the meter(s) provide the VU-type indication normally used on tape recorders. The meter will provide an "average" level indication.
4. Program Play - This switch position provides an indication of the playback level at the output of the reproduce amplifier(s). A 100% level indicates "0" dBm output.
5. Cue Play - In this switch position, the meter shows the playback level of any information recorded on the cue track of a cartridge. This indication is derived from the output of the cue detector's preamplifier in the reproducer.

Note: Diode limiting is employed at this point in the cue detector. Tones exceeding the NAB standard levels may, therefore, result in erroneous readings.

A stereo recording amplifier's right channel meter does not function in this position.



6. Cue Bias - This switch position provides an indication of the presence of bias at the output of the cue tone recording amplifier. This indication will normally be present only when one of the three cue tone oscillators is keyed. When properly adjusted and calibrated, the meter should provide a "zero" (100%) indication. A stereo recording amplifier's right channel meter does not function in this position.

CUE  
RECORD

The Cue Tone (1 kHz) Record Switch, located for safety on a support plate behind the front panel, enables the operator to record a 1 kHz "stop" tone whenever required. This tone can be applied when the unit is in the recording or reproducing mode of operation. Once depressed, this pushbutton must be held "down" for a full two seconds or longer. (Faster operation and release of this switch will cause the tape transport mechanism to stop.) The cue record switch may be remote controlled if easier operator access is desired.

CUE  
DEFEAT

The Cue Tone (1 kHz) Defeat Switch is also located behind the front panel to prevent unintentional operation. To operate, (1) Place the unit in the record mode by depressing the REC Switch, (2) Depress and hold the Cue Tone Defeat Switch, (3) Start the tape transport mechanism, (4) Continue to hold the Cue Tone Defeat Switch for a full two seconds, or longer, after the transport has been started.

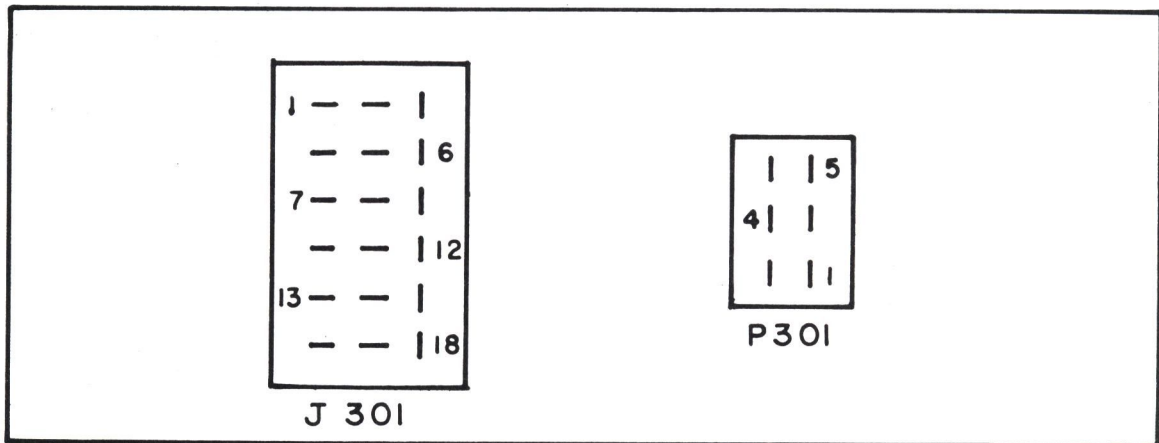


FIGURE I  
 REAR CHASSIS  
 RA SERIES RECORDING AMPLIFIER

EXTERNAL CONNECTIONS

CONNECTOR J301

<u>Terminal</u>	<u>Function</u>
1	Remote Primary (1 kHz) Cue Tone Record - Requires momentary short to ground, terminal 12, simultaneously with circuit required on terminal 6.
2	Remote Bias Control Voltage - For remote control, remove jumpers between terminals 2, 7, and 8 on the solder terminal side of J301. For normal operation, the remote switch should provide a short between terminals 2, 7, and 8. Remote control is as follows: Record Left Channel Only - Short Terminals 2 & 7 only Record Right Channel Only - Short Terminals 2 & 8 only
3	Remote Record Set Lamp Voltage - Connect remote lamp between terminal 3 and ground, terminal 12.
4	Remote Record Set - )
5	Remote Record Set (Ready Ground) - )
6	Remote Primary (1 kHz) Cue Tone Record - Requires momentary short to +24 volts, terminal 11, simultaneously with circuit required on terminal 1.
7	Remote Monophonic (left channel stereo) Bias Control
8	Remote Right Channel Stereo Bias Control
9	Cue Recording Amplifier Audio Input - Unbalanced/High Impedance

- 10 Remote Cue Bias Control - Requires short to +24 volts, terminal 11, while external cue information is being recorded.
- 11 +24 Volts (Regulated)
- 12 Ground
- 13 Remote Primary (1 kHz) Cue Tone Defeat - Requires two second short to ground, terminal 12, as the tape drive system is started.
- 14 Remote Tertiary ( 8 kHz) Cue Tone Record - Requires momentary short to +24 volts, terminal 11.
- 15 Remote Secondary (150 Hz) Cue Tone Record - Requires momentary short to +24 volts, terminal 11.

CONNECTOR P301

<u>Terminal</u>	<u>Function</u>
1	Monophonic (left channel stereo) Shield (Ground)
3	Monophonic (left channel stereo) Audio Input +
5	Monophonic (left channel stereo) Audio Input -
2	Right Channel Stereo Shield (Ground)
4	Right Channel Stereo Audio Input +
6	Right Channel Stereo Audio Input -

PARTS LISTRA & WRA SERIES RECORDING AMPLIFIERS

<u>Symbol</u>	<u>Part Number</u>	<u>Description</u>
C301	681-0050-000	Capacitor, .022 mfd, 200V
C302	681-0050-000	Capacitor, .022 mfd, 200V
C303		Not Used
C304		Not Used
C305	681-0058-000	Capacitor, .1 mfd, 200V
I301	415-0001-000	Lamp, #327, 28V. (Record Set)
I302	415-0001-000	Lamp, #327, 28V. (Secondary Tone)
I303	415-0001-000	Lamp, #327, 28V. (Tertiary Tone)
J301	380-0005-000	Socket, 18 pin (Remote Control)
J302	380-0010-000	Socket, 18 pin card edge (Program Amplifier)
J303	380-0006-000	Socket, 15 pin card edge (Bias Oscillator)
J304	380-0010-000	Socket, 18 pin card edge (Control Card)
J305	380-0006-000	Socket, 15 pin card edge (Cue Oscillator)
M301	554-0001-000	Meter, VU scale (Level or Left Level)
M302	554-0001-000	Meter, VU scale (Right Level) (Stereo Only)
P301	378-0007-000	Plug, 6 pin (Audio Input)
P302	378-0006-000	Plug, 18 pin (Interconnect to Reproducer)
R301	626-0239-000	Resistor, 100 ohm, $\frac{1}{2}$ watt, 5% (Audio Pad Bd.)
R302	626-0239-000	Resistor, 100 ohm, $\frac{1}{2}$ watt, 5% (Audio Pad Bd.)
R303	626-0239-000	Resistor, 100 ohm, $\frac{1}{2}$ watt, 5% (Audio Pad Bd.)
R304	626-0239-000	Resistor, 100 ohm, $\frac{1}{2}$ watt, 5% (Audio Pad Bd.)
R305	626-0261-000	Resistor, 820 ohm, $\frac{1}{2}$ watt, 5% (Audio Pad Bd.)
R306	626-0239-000	Resistor, 100 ohm, $\frac{1}{2}$ watt, 5% (Stereo Only) (Audio Pad Bd.)
R307	626-0239-000	Resistor, 100 ohm, $\frac{1}{2}$ watt, 5% (Stereo Only) (Audio Pad Bd.)
R308	626-0239-000	Resistor, 100 ohm, $\frac{1}{2}$ watt, 5% (Stereo Only) (Audio Pad Bd.)
R309	626-0239-000	Resistor, 100 ohm, $\frac{1}{2}$ watt, 5% (Stereo Only) (Audio Pad Bd.)
R310	626-0261-000	Resistor, 820 ohm, $\frac{1}{2}$ watt, 5% (Stereo Only) (Audio Pad Bd.)
R311	636-0001-000	Potentiometer, 1K ohm, $\frac{1}{2}$ watt (L. Program Bias) (Meter Board)
R312	636-0001-000	Potentiometer, 1K ohm, $\frac{1}{2}$ watt (Meter Board) (L. Peak Record)
R313	636-0004-000	Potentiometer, 10K ohm, $\frac{1}{2}$ watt (Meter Board) (L. Normal Record)
R314	636-0001-000	Potentiometer, 1K ohm, $\frac{1}{2}$ watt, (Meter Board) (L. Program Playback)
R315	636-0001-000	Potentiometer, 1K ohm, $\frac{1}{2}$ watt (Meter Board) (Cue Playback)
R316	636-0001-000	Potentiometer, 1K ohm, $\frac{1}{2}$ watt (Meter Board) (Cue Bias)

Symbol	Part Number	Description
R317	636-0001-000	Potentiometer, 1K ohm, ½ watt (Meter Board) (R. Program Bias) (Stereo Only)
R318	636-0001-000	Potentiometer, 1K ohm, ½ watt (Meter Board) (R. Peak Record) (Stereo Only)
R319	636-0004-000	Potentiometer, 10K ohm, ½ watt (Meter Board) (R. Normal Record) (Stereo Only)
R320	636-0001-000	Potentiometer, 1K ohm, ½ watt (Meter Board) (R. Program Playback) (Stereo Only)
R321	626-0295-000	Resistor, 22K, ½ watt, 5% (Meter Board)
R322	626-0295-000	Resistor, 22K, ½ watt, 5% (Meter Board)
R323	626-0295-000	Resistor, 22K, ½ watt, 5% (Meter Board)
R324	626-0295-000	Resistor, 22K, ½ watt, 5% (Meter Board) (Stereo Only)
R325	626-0295-000	Resistor, 22K, ½ watt, 5% (Meter Board) (Stereo Only)
R326	636-0003-000	Potentiometer, 500 ohm (Level or L. Level)
R327	636-0003-000	Potentiometer, 500 ohm (R. Level) (Stereo Only)
T301	532-0001-000	Transformer, Audio (AM-4990)
T302	532-0001-000	Transformer, Audio (AM-4990) (Stereo Only)
S301	391-0002-000	Switch, Push-Button (Record Set)
S302	391-0002-000	Switch, Push-Button (Secondary Tone)
S303	391-0002-000	Switch, Push-Button (Tertiary Tone)
S304	394-0001-000	Switch, Rotary (Meter)
S305	391-0005-000	Switch, Push-Button (1 kHz Tone Record)
S306	391-0004-000	Switch, Push-Button (1 kHz Tone Defeat)

#### PROGRAM RECORDING AMPLIFIER CARD

C401	677-0003-000	Capacitor, 300 pfd, 300V
C402	696-0110-000	Capacitor, 1 mfd, 25V
C403	696-0124-000	Capacitor, 100 mfd, 25V
C404	681-0042-000	Capacitor, .0047 mfd, 200V
C405	696-0018-000	Capacitor, 100 mfd, 3V
C406	685-0001-000	Capacitor, .47 mfd, 250V
C407	681-0040-000	Capacitor, .0033 mfd, 200V
C408	696-0110-000	Capacitor, 1 mfd, 25V
C409	677-0003-000	Capacitor, 300 pfd, 300V (Stereo Only)
C410	696-0110-000	Capacitor, 1 mfd, 25V (Stereo Only)
C411	681-0042-000	Capacitor, .0047 mfd, 200V (Stereo Only)
C412	696-0018-000	Capacitor, 100 mfd, 3V (Stereo Only)
C413	685-0001-000	Capacitor, .47 mfd, 250V (Stereo Only)
C414	681-0040-000	Capacitor, .0033 mfd, 200V (Stereo Only)
C415	696-0114-000	Capacitor, 5 mfd, 25V
C416	696-0110-000	Capacitor, 1 mfd, 25V (Stereo Only)
C417	696-0018-000	Capacitor, 100 mfd, 3V
C418	696-0114-000	Capacitor, 5 mfd, 25V

Symbol	Part Number	Description
C419	696-0114-000	Capacitor, 5 mfd, 25V (Stereo Only)
C420	696-0018-000	Capacitor, 100 mfd, 3V (Stereo Only)
C421	696-0114-000	Capacitor, 5 mfd, 25V (Stereo Only)
C422	696-0124-000	Capacitor, 100 mfd, 25V (Stereo Only)
C423	681-0034-000	Capacitor, .001 mfd, 200V
C424	681-0034-000	Capacitor, .001 mfd, 200V (Stereo Only)
C425	681-0034-000	Capacitor, .001 mfd, 200V
C426	681-0034-000	Capacitor, .001 mfd, 200V (Stereo Only)
CR401	575-0001-000	Diode, IN295
CR402	575-0001-000	Diode, IN295
CR403	575-0001-000	Diode, IN295
CR404	575-0001-000	Diode, IN295
CR405	575-0001-000	Diode, IN295 (Stereo Only)
CR406	575-0001-000	Diode, IN295 (Stereo Only)
CR407	575-0001-000	Diode, IN295 (Stereo Only)
CR408	575-0001-000	Diode, IN295 (Stereo Only)
IC401	606-0002-000	Integrated Circuit, Audio Amplifier, RCA CA3052
L401	513-0004-000	Inductor, variable, 8-20 mH
L402	513-0004-000	Inductor, variable, 8-20 mH (stereo only)
L403	513-0004-000	Inductor, variable, 8-20 mH
L404	513-0004-000	Inductor, variable, 8-20 mH (stereo only)
R401	626-0259-000	Resistor, 680 ohm, $\frac{1}{2}$ watt, 5%
R402	626-0271-000	Resistor, 2.2K ohm, $\frac{1}{2}$ watt, 5%
R403	626-0287-000	Resistor, 10K ohm, $\frac{1}{2}$ watt, 5%
R404	626-0263-000	Resistor, 1K ohm, $\frac{1}{2}$ watt, 5%
R405	626-0271-000	Resistor, 2.2K ohm, $\frac{1}{2}$ watt, 5%
R406	626-0295-000	Resistor, 22K ohm, $\frac{1}{2}$ watt, 5%
R407	626-0271-000	Resistor, 2.2K ohm, $\frac{1}{2}$ watt, 5% (stereo only)
R408	626-0287-000	Resistor, 10K ohm, $\frac{1}{2}$ watt, 5% (stereo only)
R409	626-0263-000	Resistor, 1K ohm, $\frac{1}{2}$ watt, 5% (stereo only)
R410	626-0271-000	Resistor, 2.2K ohm, $\frac{1}{2}$ watt, 5% (stereo only)
R411	626-0295-000	Resistor, 22K ohm, $\frac{1}{2}$ watt, 5% (stereo only)
R412	626-0279-000	Resistor, 4.7K ohm, $\frac{1}{2}$ watt, 5%
R413	626-0239-000	Resistor, 100 ohm, $\frac{1}{2}$ watt, 5%
R414	626-0277-000	Resistor, 3.9K ohm, $\frac{1}{2}$ watt, 5%
R415	626-0279-000	Resistor, 4.7K ohm, $\frac{1}{2}$ watt, 5% (stereo only)
R416	626-0239-000	Resistor, 100 ohm, $\frac{1}{2}$ watt, 5% (stereo only)
R417	626-0259-000	Resistor, 680 ohm, $\frac{1}{2}$ watt, 5% (stereo only)
R418	626-0277-000	Resistor, 3.9K ohm, $\frac{1}{2}$ watt, 5% (stereo only)

Symbol	Part Number	Description
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CUE OSCILLATOR CARD

C501	696-0114-000	Capacitor, 5 mfd, 25V
C502	696-0114-000	Capacitor, 5 mfd, 25V
C503	681-0054-000	Capacitor, .047 mfd, 200V
C504	696-0119-000	Capacitor, 25 mfd, 25V
C505	677-0003-000	Capacitor, 300 pfd, 300V
C506	696-0110-000	Capacitor, 1 mfd, 25V
C507	696-0114-000	Capacitor, 5 mfd, 25V
C508	685-0002-000	Capacitor, 1 mfd, 250V (150 Hz)
C509	696-0114-000	Capacitor, 5 mfd, 25V (150 Hz)
C510	696-0114-000	Capacitor, 5 mfd, 25V (150 Hz)
C511	681-0045-000	Capacitor, .0082 mfd, 200V (8 kHz)
C512	696-0110-000	Capacitor, 1 mfd, 25V (8 kHz)
C513	685-0001-000	Capacitor, .47 mfd, 250V (8 kHz)
CR501	575-0005-000	Diode, 10D4
CR502	575-0005-000	Diode, 10D4
CR503	575-0005-000	Diode, 10D4 (150 Hz)
CR504	575-0005-000	Diode, 10D4 (8 kHz)
L501	513-0002-000	Inductor, variable, 475-525 mH
L502	513-0004-000	Inductor, variable, 8-20 mH
L503	513-0003-000	Inductor, variable, 1.045-1.155 H (150 Hz)
L504	513-0001-000	Inductor, variable, 38-42 mH (8 kHz)
Q501	590-0002-000	Transistor, 2N3242A
Q502	590-0002-000	Transistor, 2N3242A
Q503	590-0002-000	Transistor, 2N3242A (150 Hz)
Q504	590-0002-000	Transistor, 2N3242A (8 kHz)
R501	626-0271-000	Resistor, 2.2K ohm, $\frac{1}{2}$ watt, 5%
R502	626-0279-000	Resistor, 4.7K ohm, $\frac{1}{2}$ watt, 5%
R503	626-0295-000	Resistor, 22K ohm, $\frac{1}{2}$ watt, 5%
R504	626-0279-000	Resistor, 4.7K ohm, $\frac{1}{2}$ watt, 5%
R505	626-0252-000	Resistor, 360 ohm, $\frac{1}{2}$ watt, 5%
R506	636-0002-000	Potentiometer, 10K ohm, $\frac{1}{2}$ watt (1 kHz Level)
R507	626-0299-000	Resistor, 33K ohm, $\frac{1}{2}$ watt, 5%
R508	626-0263-000	Resistor, 1K ohm, $\frac{1}{2}$ watt, 5%
R509	626-0271-000	Resistor, 2.2K ohm, $\frac{1}{2}$ watt, 5%
R510	626-0247-000	Resistor, 220 ohm, $\frac{1}{2}$ watt, 5%
R511	626-0271-000	Resistor, 2.2K ohm, $\frac{1}{2}$ watt, 5%
R512	626-0295-000	Resistor, 22K ohm, $\frac{1}{2}$ watt, 5%
R513	626-0279-000	Resistor, 4.7K ohm, $\frac{1}{2}$ watt, 5%
R514	626-0299-000	Resistor, 33K ohm, $\frac{1}{2}$ watt, 5%
R515	626-0299-000	Resistor, 33K ohm, $\frac{1}{2}$ watt, 5%
R516	636-0002-000	Potentiometer, 10K ohm, $\frac{1}{2}$ watt, (150 Hz Level)
R517	626-0245-000	Resistor, 180 ohm, $\frac{1}{2}$ watt, 5% (150 Hz)
R518	626-0279-000	Resistor, 4.7K ohm, $\frac{1}{2}$ watt, 5%
R519	626-0295-000	Resistor, 22K ohm, $\frac{1}{2}$ watt, 5%
R520	626-0279-000	Resistor, 4.7K ohm, $\frac{1}{2}$ watt, 5%

Symbol	Part Number	Description
R521	626-0239-000	Resistor, 100 ohm, $\frac{1}{2}$ watt, 5%
R522	626-0299-000	Resistor, 33K ohm, $\frac{1}{2}$ watt, 5% (8 kHz)
R523	636-0002-000	Potentiometer, 10K ohm, $\frac{1}{2}$ watt, (8 kHz Level)
R524	626-0252-000	Resistor, 360 ohm, $\frac{1}{2}$ watt, 5% (8 kHz)
R525	626-0279-000	Resistor, 4.7K ohm, $\frac{1}{2}$ watt, 5% (8 kHz)
R526	626-0295-000	Resistor, 22K ohm, $\frac{1}{2}$ watt, 5% (8 kHz)
R527	626-0279-000	Resistor, 4.7K ohm, $\frac{1}{2}$ watt, 5% (8 kHz)
R528	626-0275-000	Resistor, 3.3K ohm, $\frac{1}{2}$ watt, 5% (8 kHz)

#### BIAS OSCILLATOR CARDS

C601	681-0038-000	Capacitor, .0022 mfd, 200V
C602	681-0038-000	Capacitor, .0022 mfd, 200V
C603	681-0052-000	Capacitor, .033 mfd, 200V
C604	696-0119-000	Capacitor, 25 mfd, 25V
C605	688-0001-000	Capacitor, Variable, 6-30 pfd (Right Bias Adj.) (Stereo Only)
C606	688-0001-000	Capacitor, Variable, 6-30 pfd (Left Bias Adj.)
C607	688-0002-000	Capacitor, Variable, 11-75 pfd (Cue Bias Adj.)
C608	681-0046-000	Capacitor, .01 mfd, 200V
C609	696-0018-000	Capacitor, 100 mfd, 3V
C610	681-0046-000	Capacitor, .01 mfd, 200V
C611	696-0018-000	Capacitor, 100 mfd, 3V
C612	681-0046-000	Capacitor, .01 mfd, 200V (Stereo Only)
C613	696-0018-000	Capacitor, 100 mfd, 3V (Stereo Only)
CR601	575-0005-000	Diode, 10D4
CR602	575-0005-000	Diode, 10D4
Q601	590-0001-000	Transistor, 2N3053
Q602	590-0001-000	Transistor, 2N3053
Q603	590-0003-000	Transistor, 2N4402
Q604	590-0003-000	Transistor, 2N4402
Q605	590-0003-000	Transistor, 2N4402 (Stereo Only)
R601	626-0239-000	Resistor, 100 ohm, $\frac{1}{2}$ watt, 5%
R602	626-0303-000	Resistor, 47K ohm, $\frac{1}{2}$ watt, 5%
R603	626-0271-000	Resistor, 2.2K ohm, $\frac{1}{2}$ watt, 5%
R604	626-0271-000	Resistor, 2.2K ohm, $\frac{1}{2}$ watt, 5%
R605	626-0303-000	Resistor, 47K ohm, $\frac{1}{2}$ watt, 5%
R606	626-0239-000	Resistor, 100 ohm, $\frac{1}{2}$ watt, 5%
R607	626-0287-000	Resistor, 10K ohm, $\frac{1}{2}$ watt, 5% (Stereo Only)
R608	626-0287-000	Resistor, 10K ohm, $\frac{1}{2}$ watt, 5%
R609	626-0287-000	Resistor, 10K ohm, $\frac{1}{2}$ watt, 5%
R610	626-0279-000	Resistor, 4.7K ohm, $\frac{1}{2}$ watt, 5%
R611	626-0231-000	Resistor, 47 ohm, $\frac{1}{2}$ watt, 5%
R612	626-0287-000	Resistor, 10K ohm, $\frac{1}{2}$ watt, 5%
R613	626-0279-000	Resistor, 4.7K ohm, $\frac{1}{2}$ watt, 5%



Symbol	Part Number	Description
R614	626-0279-000	Resistor, 4.7K ohm, $\frac{1}{2}$ watt, 5%
R615	626-0287-000	Resistor, 10K ohm, $\frac{1}{2}$ watt, 5%
R616	626-0279-000	Resistor, 4.7K ohm, $\frac{1}{2}$ watt, 5%
R617	626-0279-000	Resistor, 4.7K ohm, $\frac{1}{2}$ watt, 5% (Stereo Only)
R618	626-0287-000	Resistor, 10K ohm, $\frac{1}{2}$ watt, 5% (Stereo Only)
R619	626-0279-000	Resistor, 4.7K ohm, $\frac{1}{2}$ watt, 5% (Stereo Only)
R620	626-0319-000	Resistor, 220K ohm, $\frac{1}{2}$ watt, 5%
R621	626-0319-000	Resistor, 220K ohm, $\frac{1}{2}$ watt, 5%
R622	626-0319-000	Resistor, 220K ohm, $\frac{1}{2}$ watt, 5% (Stereo Only)

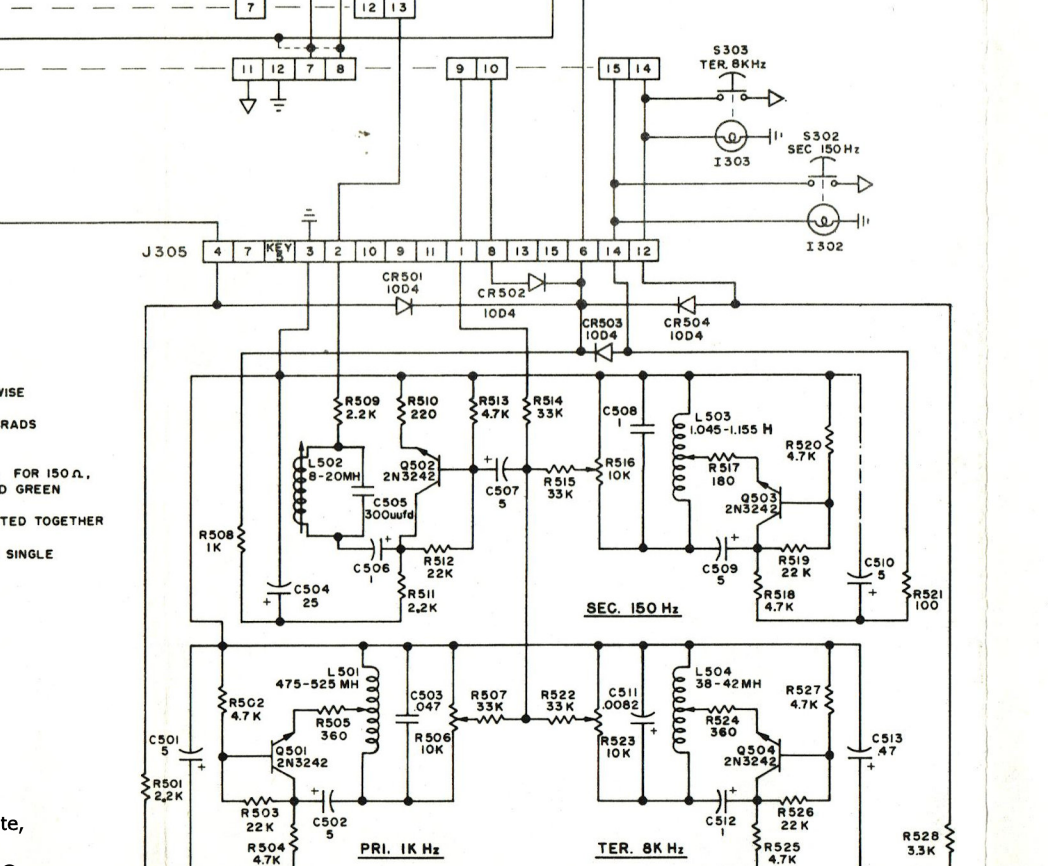
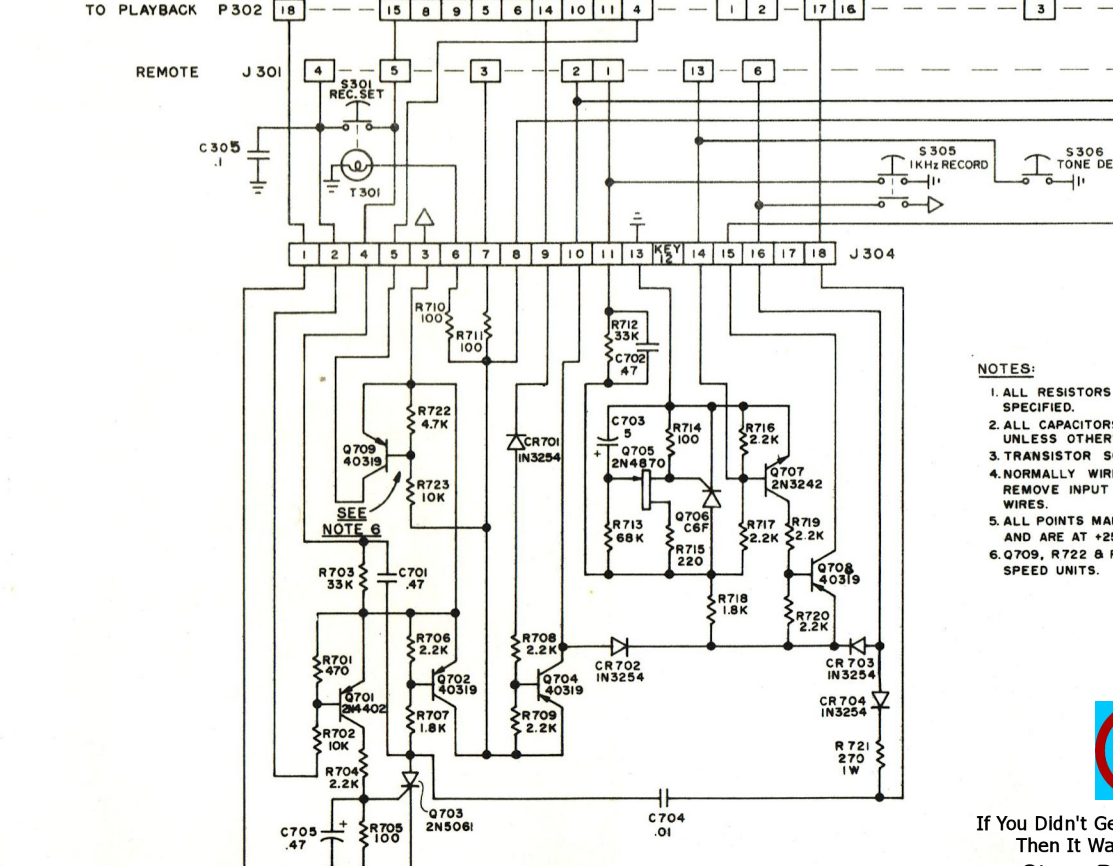
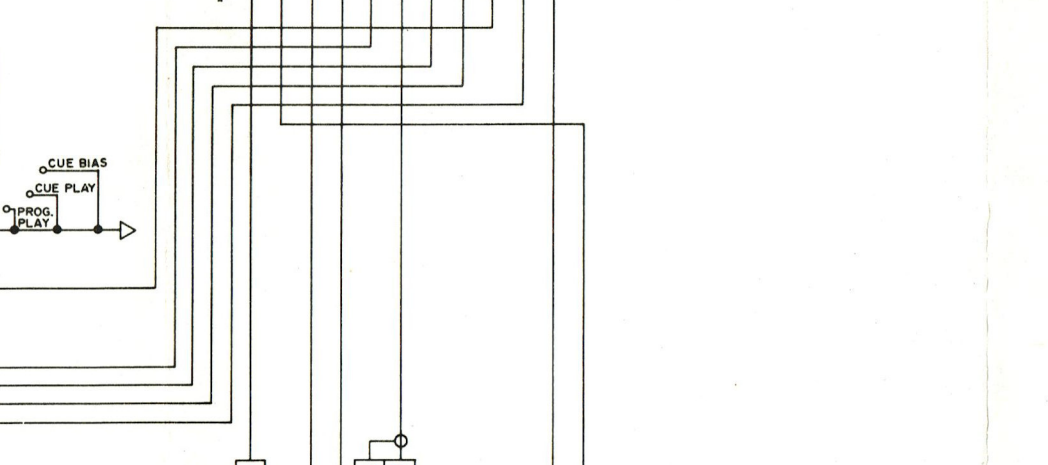
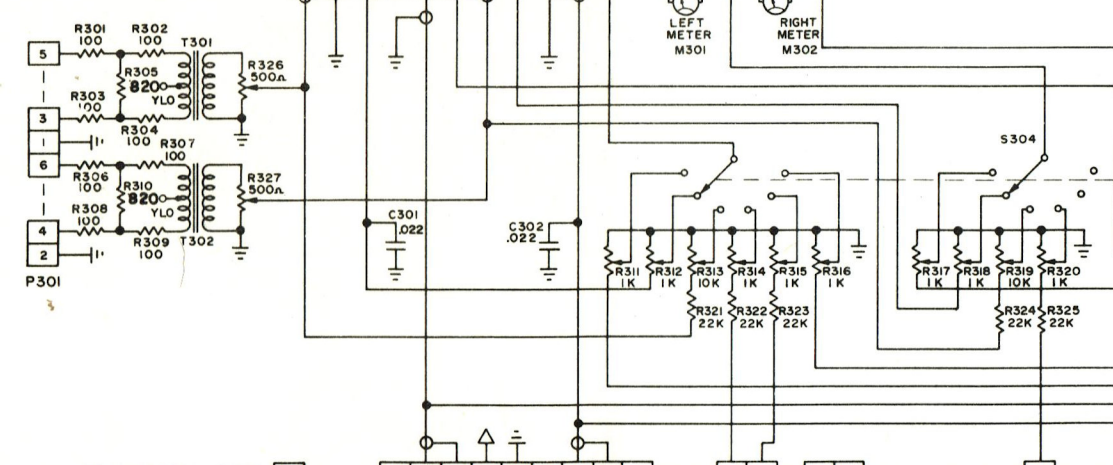
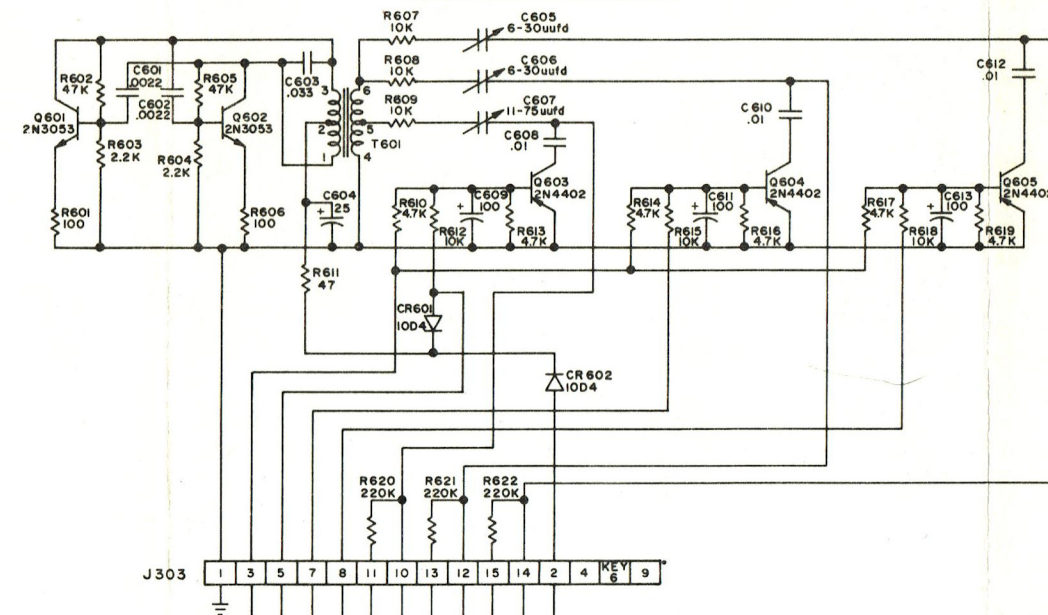
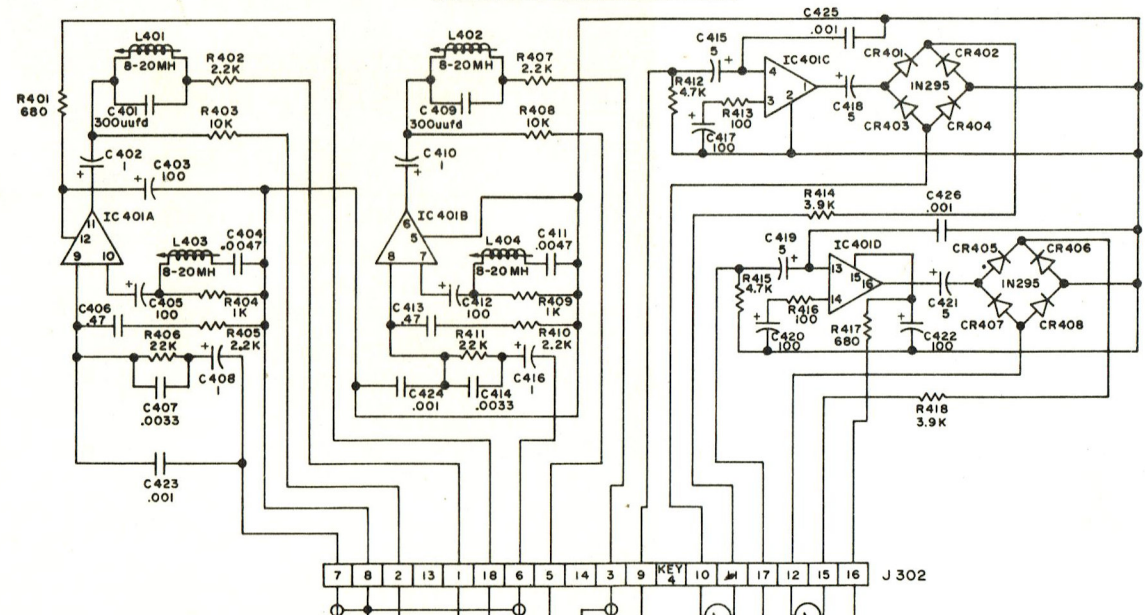
#### CONTROL CARD

C701	685-0001-000	Capacitor, .47 mfd, 250V
C702	685-0001-000	Capacitor, .47 mfd, 250V
C703	696-0114-000	Capacitor, 5 mfd, 25V
C704	681-0046-000	Capacitor, .01 mfd, 200V
C705	694-0001-000	Capacitor, .47 mfd, 50V
CR701	575-0003-000	Diode, IN3254
CR702	575-0003-000	Diode, IN3254
CR703	575-0003-000	Diode, IN3254
CR704	575-0003-000	Diode, IN3254
Q701	590-0003-000	Transistor, 2N4402
Q702	590-0004-000	Transistor, 40319
Q703	581-0001-000	Silicon Controlled Rectifier, 2N5061
Q704	590-0004-000	Transistor, 40319
Q705	601-0001-001	Unijunction Transistor, 2N4870
Q706	581-0002-000	Silicon Controlled Rectifier, C6F
Q707	590-0002-000	Transistor, 2N3242A
Q708	590-0004-000	Transistor, 40319
Q709	590-0004-000	Transistor, 40319 (Hi Speed Cue Only)
R701	626-0255-000	Resistor, 470 ohm, $\frac{1}{2}$ watt, 5%
R702	626-0287-000	Resistor, 10K ohm, $\frac{1}{2}$ watt, 5%
R703	626-0299-000	Resistor, 33K ohm, $\frac{1}{2}$ watt, 5%
R704	626-0271-000	Resistor, 2.2K ohm, $\frac{1}{2}$ watt, 5%
R705	626-0239-000	Resistor, 100 ohm, $\frac{1}{2}$ watt, 5%
R706	626-0271-000	Resistor, 2.2K ohm, $\frac{1}{2}$ watt, 5%
R707	626-0269-000	Resistor, 1.8K ohm, $\frac{1}{2}$ watt, 5%
R708	626-0271-000	Resistor, 2.2K ohm, $\frac{1}{2}$ watt, 5%
R709	626-0271-000	Resistor, 2.2K ohm, $\frac{1}{2}$ watt, 5%
R710	626-0239-000	Resistor, 100 ohm, $\frac{1}{2}$ watt, 5%
R711	626-0239-000	Resistor, 100 ohm, $\frac{1}{2}$ watt, 5%
R712	626-0299-000	Resistor, 33K ohm, $\frac{1}{2}$ watt, 5%
R713	626-0307-000	Resistor, 68K ohm, $\frac{1}{2}$ watt, 5%
R714	626-0239-000	Resistor, 100 ohm, $\frac{1}{2}$ watt, 5%
R715	626-0247-000	Resistor, 220 ohm, $\frac{1}{2}$ watt, 5%

Symbol	Part Number	Description
R716	626-0271-000	Resistor, 2.2K ohm, $\frac{1}{2}$ watt, 5%
R717	626-0271-000	Resistor, 2.2K ohm, $\frac{1}{2}$ watt, 5%
R718	626-0269-000	Resistor, 1.8K ohm, $\frac{1}{2}$ watt, 5%
R719	626-0271-000	Resistor, 2.2K ohm, $\frac{1}{2}$ watt, 5%
R720	626-0271-000	Resistor, 2.2K ohm, $\frac{1}{2}$ watt, 5%
R721	626-0449-000	Resistor, 270 ohm, 1 watt, 5%
R722	626-0279-000	Resistor, 4.7K ohm, $\frac{1}{2}$ watt, 5% (Hi Speed Cue Only)
R723	626-0287-000	Resistor, 10K ohm, $\frac{1}{2}$ watt, 5% (Hi Speed Cue Only)

PROGRAM AMPLIFIER CARD

BIAS OSCILLATOR CARD



- NOTES:
1. ALL RESISTORS 1/2 W UNLESS OTHERWISE SPECIFIED.
  2. ALL CAPACITORS SHOWN IN MICRO FARADS UNLESS OTHERWISE SPECIFIED.
  3. TRANSISTOR SOCKETS NOT SHOWN.
  4. NORMALLY WIRED FOR 600 A INPUT. FOR 150 A, REMOVE INPUT PAD, USE YELLOW AND GREEN WIRES.
  5. ALL POINTS MARKED > ARE CONNECTED TOGETHER AND ARE AT +25V.
  6. Q709, R722 & R723 ARE OMITTED ON SINGLE SPEED UNITS.



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DRAWING NUMBER		REV.