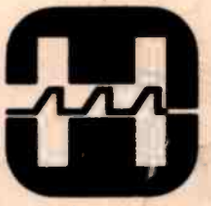
TECHNICAL MANUAL



HARRIS

COMMUNICATIONS AND INFORMATION HANDLING

CC-II

TAPE CARTRIDGE PLAYBACK

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Warning, disconnect primary power prior to servicing.

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Warning, disconnect primary power prior to servicing.

SECTION 1.0 - DESCRIPTION AND SPECIFICATIONS

1.1 General

The CC-II tape cartridge machine will accept NAB "A", "B" and "C" size cartridges. The solid state electronics utilize all silicon transistors and integrated circuits for temperature and gain stability. Plug-in circuit cards, relays, heads, switches, and motor have provisions for quick and covenient access, for ease of maintenance. Ground switching of external control functions provides protection for equipment and personnel.

The heart of the CC-II is its hysteresis, synchronous motor, with direct capstan drive. This motor assembly, mounted on the heavy half inch aluminum deck, with full swing pressure roller, offers tape accuracy comparable to the finest reel-to-reel machines.

The high quality, laminated heads are built with an all-metal hyperbolic face providing for long wear and low oxide accumulation. Three tape guides along with a dummy head* fitted into the left cartridge slot, assures the best in tape path guidance.

*On playback only Models.

1.2 Specifications (Technical Data)

Frequency Response:	±2 dB, 300 to 15,000 Hz, +3, -2 dB, 50 Hz to 300 Hz
Noise:	55 dB (Mono), 52 dB (Stereo) below THD level, at 400 Hz
Equalization:	In accordance with NAB cartridge Recording and Reproducing Standards. CCIR equalization available on special order
Output:	+18 dBm clipping point, normally 0 dBm with standard NAB level recording. 600 ohm balanced, with 150 ohm as optional connection
Cue Signals:	1000 Hz Primary Cue, 150 Hz Secondary and 8000 Hz Tertiary. Cue realys are available as optional equipment
Tape Speed:	7-1/2 inches per second, 3-3/4, or 15 inch on special order
Tape Drive System:	Direct Capstan Drive, sealed ball bearings. Tape start and stop time: Adjustable, 0.1 Sec. minimum

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Specifications Cont'd.

Tape Speed Accuracy:	0.1%, or better
Wow and Flutter:	0.2%, or less
Heads:	NAB Standard
Remote Control:	All control functions by ground switching
Power Source:	117 VAC, ± 10%, 60 Hz. 50 Hz on special order
Power Requirements:	70 Watts, maximum
Ambient Temperature:	55°C. maximum
Dimensions:	Rackmount- Height, 7 inches (17.78 cm) Width, 19 inches (48.26 cm) Depth, 12 inches (30.48 cm) Desktop Cabinet- Height, 5-1/2 inches (13.97 cm) Width, 17-1/4 inches (43.90 cm) Depth, 12-7/8 inches (32.70 cm)
Weight:	30 Pounds (13.61 kg)
External 24 Volt DC Load Current	200 mA.

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SECTION 2.0 - INSTALLATION

2.1 Unpacking and Inspection

Remove all packing material and carefully lift the unit from the box. Check the equipment against the Packing Slips. Visually inspect the unit for any apparent damage, and for missing or loose components. Check for proper operation of the front panel controls. If evidence of any damage is found, contact the delivering carrier and Gates Division - Harris-Intertype Corporation at once. After the carrier approves the damage report which indicates he will accept your billing for the damage, order new parts as necessary from Gates Division - Harris-Intertype Corp. Our billing for these parts, plus transportation expense, plus your repair labor costs, will comprise your claim to the transporting carrier.

2.2 Installation Procedure

The location in an individual station will be determined by the arrangement of the main control room facilities. The placement of equipment and wiring should be planned carefully before any installation work is started. Care should be taken to provide for adequate ventilation.

2.2.1 Playback, Monophonic

Connect a two conductor, shielded cable between the desired audio console input terminals and the 600 ohm program output terminals #3 and 5 of playback connector J2. The shield of the cable should be connected to terminal #1. See FIG. 2.2.

2.2.2 Playback, Stereophonic

Connections for the Stereo left channel are the same as for the Monophonic audio channel. The Stereo right channel is connected to terminals #4 and 6, with pin #2 for connection to the shield. Phasing should be carefully observed. Terminals #1, 3, and 5 are identical to terminals #2, 4, and 6 respectively. See Chart 2.1.

2.2.3 Program Output Impedance

The output transformers are normally connected to match a 600 ohm line. Impedance may be changed to 150 ohms by removing the jumper from terminals #6 and 7, and adding one jumper between terminals #5 and 6, and another jumper between terminals #7 and 8 of the transformer mounting card. The right program transformer, T3, when used, can be changed by following these same directions.

2.2.4 Record Amplifier, Program Input

Connect a two conductor shielded cable between the desired audio

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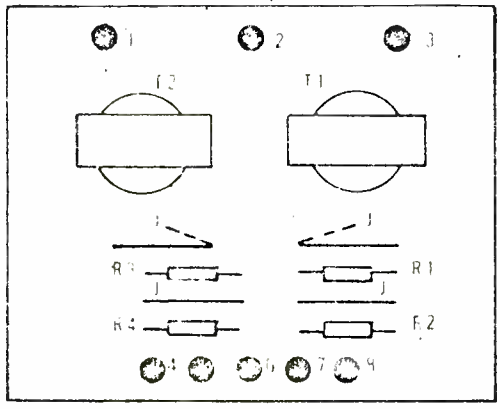
input, (Monophonic or left Stereo channel) to terminals #3 and 5 of P3, with the shield connected to terminal #1. For Stereo installations connect the right channel audio to terminals #4 and 6 of P3, and the shield to terminal #1. See Chart 2.2.

2.2.5 Record Amplifier Input Impedance

The input transformers are normally connected to match a balanced 600 ohm line. Impedance may be changed to 150 ohms by moving a jumper on the input transformer board. Change the top end of the jumper (located closest to the transformers) into the vacant hole next to the transformer. To change to 20k ohm bridging input, remove both jumpers for each transformer. See Fig. 2.1



INPUT TRANSFORMER BOARD

FIG. 2.1

2.2.6 Remote Control Connections

All control functions may be remote controlled. See Chart 2.1 and 2.2 for proper connections.

WARNING: The protective covers on the underside of the chassis are for your protection.

KEEP THEM IN PLACE

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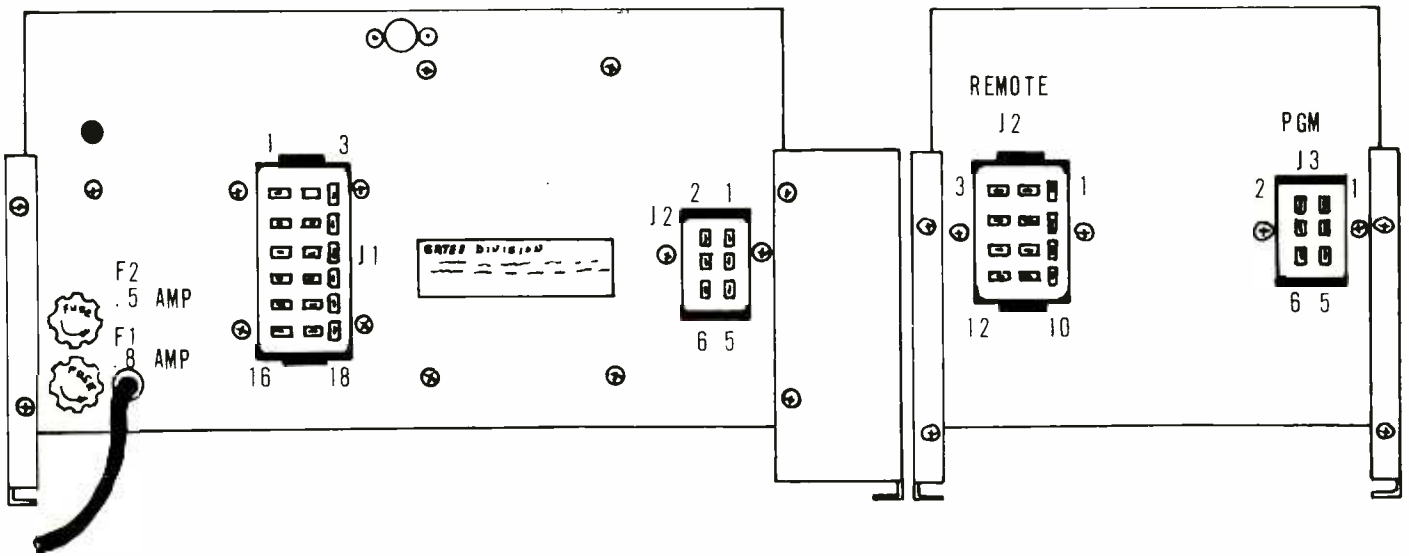

RECORD PLAYBACK, CC-II
(REAR VIEW)
FIG. 2.2

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Connector J1

Terminal	Function
1	Ground
2-3	Tertiary Cue Switching
4-5	Secondary Cue Switching
6	Primary Cue Stop
7-8	Remote STOP
8-1	Remote START
9-11	Remote READY Indication
10-11	Remote RUN Indication
15	Positive 23 Volts
16	Cue Pre-Amp. Output

Connector J2

Terminal	Function
1	Shield Ground
3-5	Monophonic, or Left Stereo Program Output
2	Shield Ground
4-6	Right Stereo Audio Output (if used)

PLAYBACK
EXTERNAL CONNECTIONS

CHART 2.1

Connector J2

Terminal	Function
1	1 kHz Cue Inhibit
2	1 kHz Cue "Add"
3	Ground
4-6	Remote 150 Hz Cue Keying
5	Not Used
6-7	Remote 8 kHz Cue Keying
8	Not Used
9-10	Remote Record SET
11	Not Used
12	Remote SET Indication

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Connector J3

Terminal	Function
1-2	Shield Ground
3-5	Monophonic, or Left Stereo Audio Input
4-6	Right Stereo Audio Input

EXTERNAL CONNECTIONS - RECORD

CHART 2.2

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SECTION 3.0 - OPERATION

3.1 Control Functions, Playback

a) Start-Run:
The START switch causes the run relay, K1, and the solenoid to be energized, and the tape set in motion. This switch is illuminated by an internal lamp when the tape is running. This lamp is brightened when the Secondary cue relay is activated.

b) Stop-Ready:
The STOP switch is used to manually stop the tape motion. This switch is illuminated by an internal lamp when a cartridge is properly inserted, and the unit is in the READY condition. This lamp is also illuminated when the Tertiary cue relay is activated.

c) Power Light:
The red power lamp operates from the DC power supply to verify that it is operational.

d) Program Gain:
Program gain controls are mounted on the PGM amplifier card, closest to the pull tab. The outermost potentiometers control high frequency equalization. Clockwise rotation increases High Frequency output.

e) Cue Sensitivity:
Cue Sensitivity controls are located on the cue card. When viewed from the front, left to right, the potentiometers control Primary, Tertiary and Secondary cue sensitivities. Clockwise rotation increases sensitivity.

3.2 Record Amplifier Control Functions

a) Gain Control:
The Recording Amplifier gain control, AT1, is used for adjusting the recording level as indicated by the VU meter, M1. Corresponding AT2 and M2 are for the Right channel on Stereo models.

b) Record SET:
The record SET pushbutton switch (SET) is used for placing the system in the recording mode.

c) 150 Hz Cue:
The Secondary cue pushbutton switch (SEC) is used for keying the 150 Hz tone generator.

d) 8 kHz Cue:
The Tertiary, or Auxilary, cue pushbutton switch (TER) is used for keying the 8000 Hz tone generator.

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3.3 Playback Procedure

The procedure for routine on-the-air playback of program material is as follows:

a) Insert a recorded tape cartridge into the right side of the cartridge slot.

b) Observe that the STOP-READY switch is illuminated, indicating that the cartridge has been properly inserted, and that the unit is ready for on-the-air playback.

c) Press the START switch. Tape motion will be started and will continue until the automatic cue tone is picked up by the cue head; the unit will stop with the tape in correct position for the next playback.

3.4 Recording Procedure

The procedure for recording one or more productions is as follows:

a) Insert an erased tape cartridge into the right side of the cartridge slot in the playback unit. Note that the STOP indicator is illuminated, indicating the cartridge is properly placed. Press the START switch on the playback unit to pre-run the cartridge for several seconds. This procedure will insure proper tape tension and travel.

b) Momentarily press the RECORD SET switch. The switch will be illuminated by the internal pilot lamp.

c) Adjust the INPUT control so the program level reads "0" on the VU meter, on program peaks.

d) Press the START switch on the playback unit and start recording immediately.

e) Upon completion of the recorded production, momentarily press the STOP switch only if more than one production is desired on the same cartridge.

f) When recording more than one production on a single tape cartridge, follow the procedure listed in Steps "c" through "e" for each recording. Upon completion of the final recorded production, allow the tape to continue running for several seconds, then push the STOP switch. Then press the START switch and allow the tape to run until it is stopped by the automatic cue tone.

The 1000 Hz Primary cue tone is recorded automatically at the beginning of the recording. If desired, the Secondary and Tertiary tones may be inserted after the message has been completely recorded. This permits monitoring and accurate placement of the tones.

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TECHNICAL MANUAL

CC-II

TAPE CARTRIDGE RECORD/PLAYBACK

INTRODUCTION

The Criterion Compact II adds recording capability to the "Compact" line of Gates Criterion tape cartridge equipment.

It is available in Record/Playback, or Playback only models, designed to handle NAB "A", "B", and "C" size cartridges.

WARNING

Observe safety regulations. Always disconnect power before opening or servicing equipment. Always ground circuits before touching them.

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888 1651 001

Price: $10.00

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SAFETY NOTICE

WARNING: THE CURRENTS AND VOLTAGES IN THIS EQUIPMENT ARE DANGEROUS AND UNDER CERTAIN CONDITIONS, COULD BE FATAL.

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

THE INSTALLATION, OPERATION, MAINTENANCE AND SERVICING OF THIS EQUIPMENT INVOLVES RISKS TO BOTH PERSONNEL AND EQUIPMENT, AND MUST BE PERFORMED ONLY BY PROPERLY TRAINED AND EXPERIENCED PERSONNEL EXERCISING DUE CARE. PERSONNEL MUST FAMILIARIZE THEMSELVES WITH SAFETY REQUIREMENTS, SAFE HANDLING AND OPERATING PRACTICE, AND RELATED FIRST-AID PROCEDURES (E.G., FOR ELECTRICAL BURNS AND ELECTRICAL SHOCK).

Gates shall not be responsible for injury or damage resulting from improper installation, operation, maintenance or servicing, or from the use of improperly trained or inexperienced personnel in the performance of such tasks, or from the failure of persons engaged in such tasks to exercise due care.

As with all electronic equipment, care should be taken to avoid electrical shock in all circuits where substantial currents or voltages may be present, either thru design or short circuit. Caution should also be observed in lifting and hoisting equipment, especially regarding large structures, during installation.

LIABILITY LIMITATION

The procedures outlined in this Manual are based on the information available at the time of publication and should permit the specified use with minimum risk. However, the manufacturer cannot assume liability with respect to technical application of the contents and shall, under no circumstances, be responsible for damage or injury (whether to person or property) resulting from its use.

The manufacturer is specifically not liable for any damage or injury arising out of failure to follow the instructions in this Manual or failure to exercise due care and caution during installation, operation, maintenance and service of this equipment.

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CAUTIONARY NOTICE

Always disconnect power before opening covers, doors, enclosures, gates, panels or shields. Always use grounding sticks and short out high voltage points before servicing. Never make internal adjustments, perform maintenance or service when alone or when tired.

Never remove, short-circuit or tamper with interlock switches on access covers, doors, enclosures, gates, panels or shields. Keep away from live circuits, know your equipment and don't take chances. Proper training of experienced personnel and observing the above guidelines will help assure safe and continued operation of this equipment.

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3.5 Recording Test Tapes For Equipment Checkout

To facilitate easy head alignment checks, and for use as a timing standard, the following tapes should be recorded immediately upon receipt of the equipment-

1) Record one cartridge with 15 kHz at a record level of -10VU. Play the cartridge back, note and keep a log of the output level. This cartridge may be used for azimuth alignment and high frequency checks.

2) Record one cartridge at 700 Hz, at a record level of "0" VU, to serve as a reference level test cartridge.

3) Using a clean 3-1/2 minute cartridge, record a single 1000 Hz cue tone (Do not record program material on this tape). The tone is recorded automatically at the beginning of the recording process. Allow the machine to run until the tape cues. Re-run the tape, and log the exact time required for playback. This tape should be kept on hand as a timing standard.

3.6 Threshold Level Test Cartridges

A valuable aid in maintenance of the cue system is a set of threshold level test cartridges. The cue sensors are factory set to trigger on tone 10 dB below the NAB cue tone levels. Test cartridges with cue tones recorded at this level may be made as follows:

1) On the playback chassis, jumper J5-2 to J4-2, and J5-3 to J4-3. Remove the cue sensor card from the playback unit. The cue playback head is now in parallel with the Left Stereo, or Mono head section. Recorded cue tones will be reproduced on the Left, or Mono program output. Monitor this output, loaded with 600 ohms.

   CAUTION: All output levels will read 6 dB lower than actual recorded level because the amplifier input is loaded with the two head sections.

2) Short capacitor C8 on the tone oscillator card, and set the recorder. This disables the automatic timer and causes the 1 kHz oscillator to run continuously. While monitoring the output level, adjust R21 for a -15 dB level. Insert a clean cartridge and record a continuous cartridge at this level. Time the recording and stop the cartridge to prevent running past the starting point. Re-adjust the 1 kHz RECORD LEVEL to -6.4 dB output from the PGM amplifier, and remove the short from capacitor C8 on the tone oscillator card.

3) For a 150 Hz test cartridge, hold the SEC button down and

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adjust R2 for a -10 dB output level. Record a cartridge at this level. Then re-adjust the RECORD LEVEL to "0" dB output from the PGM amplifier.

4) For an 8 kHz test cartridge hold the TER button down and adjust R23 for -25 dB output level. Record a cartridge at this level. Then re-adjust the RECORD LEVEL to -15 dB output from the PGM amplifier.

5) Remove jumpers from J4 and J5 on the playback unit.

6) Other brands of cueing systems may use different sensitivity or threshold level settings, and may not operate properly when set up with these test cartridges.

SECTION 4.0 - THEORY OF OPERATION

4.1 Playback Program Amplifier (Mono or Left Stereo Channel)

Transistors Q1 and Q2 are connected as a boot-strap amplifier for high DC stability. C3, R2 and R4 provide equalization, fixed for low frequencies of the NAB curve and adjustable at high frequencies, to compensate for head losses and allow the choice of operating curves to match 3-3/4, 7-1/2, or 15 IPS requirements. R1 and R4 provide local AC feedback for these stages to increase AC stability. Q3, Q4, Q5, and Q6 make up the complimentary symmetrical output amplifier, utilizing heavy feedback for stability.

The Right channel amplifier, when used, is identical to the Left.

The output transformer mounted on the rear of the chassis is normally connected for an output impedance of 600 ohms. 150 ohm output impedance is available by changing jumpers. See Section 2.0.

4.2 Cue Sensor Card

The output of the cue head is amplified by integrated circuit U1, squared by diodes CR1 and CR2, and applied to the three cue sensor circuits through the sensitivity control potentiometers.

The cue detector circuits are identical, with the exception of the frequency determining capacitors on the first two transistors of each. These circuits are tuned to provide necessary band width to respond to NAB tolerance cue oscillator frequencies.

The primary cue sensor will drop the voltage on the high side of relay K1, to stop the Playback. The Secondary and Tertiary cue sensors activate their respective relays by completing a current path to ground.

A protect timer to prevent the primary cue sensor from responding to a cue signal present on start-up, is provided by the charging of C5 through R8 and R9. Q1 will be cut off until its base voltage rises with the charge on C5.

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4.3 Record Program Amplifier

The input transformer(s) are mounted on a printed circuit board attached to the inside rear portion of the chassis. Normal connections are made to match a 600 ohm balanced line. 150 ohm and 20k ohm bridging are available by changing jumper connections. See Section 2.0.

The integrated circuit U1 contains four amplifiers. Sections 1 and 4 are used to amplify and shape the incoming signal

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material to the NAB record curve. The variable inductor circuit allows approximately 6 dB of high frequency adjustment to compensate for head and tape variations. Amplifier sections 2 and 3 are used as meter drivers. When the recorder is SET, the meters monitor the program material at the input of the amplifier card. During playback the meter driver input is switched by relay K1 to monitor the playback amplifier output. The playback signal must pass through the P/B meter calibrator first, then the RECORD LEVEL calibrator. Therefore, any change in the RECORD LEVEL calibrator will also change the P/B calibration.

4.3.1 Bias Oscillator

Transistor Q1 and Q2 operate as a push-pull oscillator, with T1 and C4 as a tuned load. The transformer output feeds trimmer capacitors C14, C15 and C16 to provide independent bias adjustments for each head section. Transistors Q3, Q4, and Q5 are saturated gates turned on (shunting bias to ground) in the playback mode, and off when recording. To achieve maximum attenuation of the bias and signal to the program tracks of the record head during playback, an LDR is located in series with each track. The LDR is turned on and off with Q4 and Q5 which acts as a high series resistance into an low shunt resistance (Q4 and Q5). The PGM inputs are brought into the bias card, passed through the bias traps to reduce the effects of high bias voltage on the program amplifier outputs. The cue bias gate is operated by voltage from the tone oscillator card whenever a tone is generated. The bias oscillator operates continuously whenever AC power is applied to the Record/Playback unit.

4.3.2 Tone Oscillator

1 kHz, 8 kHz and 150 Hz tones are generated by three similiar type oscillator circuits on this card. Q5 is a common amplifier for all tones, feeding through bias trap L4, C13, to the Record head. Power applied to any oscillator circuit is also applied to Q5 and out J6, terminal 7 (to operate the cue bias gate). The automatic 1 kHz cue tone is timed by the charging of capacitor C8, through R13. After the recorder is SET, and the START button is pressed, power is applied to J6, terminal 3, and to the 1 kHz oscillator through resistors R14, R11, and R10. When capacitor C8 is charged sufficiently, Q3 will be biased on, dropping the DC voltage across R14, and stopping the 1 kHz oscillator. The automatic cue tone may be prevented by grounding J2, terminal 1 by means of a remote switch, for a time period of a least one second, when starting a recording. A 1 kHz cue stop tone may be added at any time by momentarily grounding J2, terminal 2. This will discharge C8 and start the timing cycle. It must be noted that the length of this added cue tone will be the normal automatic tone of 1/2 to 3/4 second, plus the time J2, terminal 2 is grounded.

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4.3.3 Control Circuits

Operation of the record SET button (or External Control) will close relay K1, which will latch through contacts #8 and 12. It will remain in latched position until a grounding pulse is received through CR10 from the playback deck. The SEC (150 Hz) and TER (8 kHz) cue buttons are paralleled by connecting external controls to J2. Indicator lights may be connected across external control switches, or the cue detector indications from the playback may be used as verification of good recorded cue tones.

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SECTION 5.0 - ADJUSTMENTS AND MAINTENANCE

5.1 Adjustments and Cleaning, Playback

5.1.1 Heads-

As with any quality tape equipment, frequent checks of head alignment, condition and cleanliness are imperative for maximum performance and trouble-free operation. Cleaning should be done with a soft dry cloth, or with cotton swabs moistened with isopropyl alcohol. Degauss the heads after cleaning. Care must be exercised to prevent scratching the head face with gauges or tools. During test tape checkout azimuth is peaked by loosening the lock-screw and turning screw "C". See Fig. 5.1. Tighten the lock-screw.

5.1.2 Capstan and Pinch Roller

The capstan shaft and pinch roller should be cleaned with a soft cloth or cotton swabs moistened with isopropyl alcohol. (Care must be exercised to prevent cleaning alcohol from running down the capstan shaft, into the motor bearings) Oil the pinch roller shaft with a drop of Gulf Harmony 44,® wipe off the excess. The motor bearings are life-time lubricated and need no special attention.

5.1.3 Solenoid

The air-damped solenoid is controlled by a set-screw at the rear of the solenoid core. Tightening the screw will restrict the air flow, thereby slowing the solenoid action, and making for quieter operation.

5.1.4 Pinch Roller Cross Shaft

Occasionally lubricate the pinch roller cross shaft with Gulfway 52 ® lubricant. Alternately lay the Playback on each side and apply one drop of oil to each end of the cross shaft, at the lower side of the opening, allowing the oil to run down around the shaft. Wipe off the excess.

5.1.5 Program Amplifier

The program amplifier(s) are equalized to match the NAB reproduce curve. The level control(s) are located on the PGM card nearest the center pull tab. Routine checkout of the Playback with a test tape such as Gates FAL-1, should verify proper operation and allow one to make slight adjustments to compensate for head wear. The cue card may be removed to prevent the cue circuits from responding to the test tones, if a full track test tape is used.

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5.1.6 Cue Sensors

The cue sensor sensitivity controls are factory pre-set to barely trigger, on tones recorded 10 dB below NAB standard cue

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tone levels. If cueing difficulties are encountered, a careful check of heads, power supply voltage and recorded cue levels should be made before adjusting cue sensitivity levels.

Many cueing difficulties may be traced to head wear, or Mis-alignment. In case of cue problems a checkout of a test tape through a program channel may prove overall head condition. See Section 3.5. If the playback head appears to be good, the following procedure may be used as a sample analysis:

As an example consider a playback unit which fails to respond to the 8 kHz cue tone:

1) Insert the 8 kHz standard cue tape, as described in Section 3.6, into the machine. Determine if the unit is cueing with the standard tape. If it does not cue, check head alignment with the standard 15 kHz tape on a program channel.

2) Again insert the 8 kHz standard cue tape, and determine if the machine cues properly. Unless the heads are worn, or the cue sensitivity level is low, the Playback should now cue properly.

3) Check the output of U1 on the cue sensor card by connecting an oscilloscope to capacitor C3, located near the top left corner of the cue card. Running a blank cartridge, depress the SEC or TER button. The output should be a clipped sine wave of about 1.4 volts, peak to peak. The threshold tapes, as described in Section 3.6, should produce lower level sine waves, not clipped.

4) Ground the respective pin on the cue sensor card connector (J5 terminal #10 for 8 kHz, J5 terminal #11 for 150 Hz, or J5 terminal #9 for 1 kHz) to test the relay and wiring.

5) To troubleshoot the circuit, refer to voltage chart, Section 5.4.2.

5.2 Head Replacement

Remove head cover, cartridge spring and tape guide. Remove two screws holding the head clamp in place. Using long nose pliers, carefully remove pin clip leads from rear of head. Holding new head in same position, replace pin clip leads in the same order as removed. See Fig. 5.2. Replace head clamp and tighten screws with front face of the head approximately 3-7/16 inches from front edge of front panel. This assures correct penetration of head into the cartridge when running. See Fig. 5.7.

Replace tape guide and cartridge hold-down spring. The bottom of all three fingers of the tape guide should rest on the deck surface.

Warning, disconnect primary power prior to servicing.

Refer to Fig. 5.3. Notice the tapered top and bottom surface of the small portion of gauge #815 0842 001. These tapered surfaces are GO/NO GO limits for the height of the tape guide openings. With the gauge resting on the deck surface, move the gauge from left to right in each of the three guide openings. Each guide opening should lie somewhere between the left and right hand vertical surfaces of the gauge.

5.2.1 Height Adjustment

Fig. 5.1 shows the location of mounting screws and adjustment points. The following steps outline proper adjustment procedures:

1) Turn the lock screw counter-clockwise until the screw is well above the lock position (maximum down).

2) Adjust screw "A" for 9/16 inch height of the top of the upper track above the deck surface.

3) Adjust screw "B" for exact perpendicularity between the deck surface and pole faces. This may be done using a good quality machinist rule, 3/4 or 1 inch wide, which is know to be square. Resting one edge of the rule on the deck surface, move the rule against the face of the head. At the point of perpendicularity, no space should be visible between the head and gauge, as the gauge is resting flat on the deck.

4) As an alternate method of height adjustment, a strip of clear mylar may be prepared by removing the lubricant and oxide from a short length of 1/4 inch recording tape. Flux remover or shellac thinner will suffice to loosen the oxide (use in a well ventilated area to minimize danger from fire), so that it (oxide) may be wiped off the transparent mylar base.

5) Refer to Fig. 5.4. Position the mylar tape across the head faces and properly engage it in the tape guides. This represents the position of the tape when a cartridge is being played on the machine. In order to free one hand to make adjustments, fasten the mylar tape to the opposite side of the guide bracket from the head which is being adjusted. Proper tape postion in the tape guide is at the point where minimum distortion of the tape is observed. This distortion of the tape is due to the tape contacting the guide, and is visible as a slight crinkle at either the top or the bottom of the tape. With one hand hold the mylar in a position contacting the heads as shown.

6) While holding the mylar in this position, alternately adjust screws "A" and "B" (See Fig. 5.1) to position the tracks with respect to the tape. Screw "A" should be adjusted a small amount, then "B" should be adjusted an equal amount in the

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same direction. This procedure should be repeated until the correct height is obtained. Proper height is that at which the top of the upper pole piece is at the same level as the top of the tape, and the bottom of the lower pole piece is at the same level as the bottom of the tape.

7) Recheck perpendicularity (Step #3). On playback only machines dummy heads are used in the record head position to provide a uniform tape path. Perpendicularity should be set on this head also.

This completes the height and perpendicularity adjustments. Remove the mylar strip. After adjustments are complete, the heads should be degaussed. (Remove AC power when degaussing heads)

5.2.2 Azimuth Adjustment

1) Insert a test tape, such as Gates FAL-1, or NAB test tape No.3, (Mono only) or 15 kHz tape. See Section 3.5.1.

2) While monitoring the output of the PGM amplifier, adjust screw "C" of the playback head for maximum output level. (See Fig. 5.1)

NOTE: Three peaks can be detected while making this adjustment. There is a minor peak 10 to 15 dB down on either side of the major peak. Adjust to major peak ONLY.

3) Tighten the lock screw for this head.

5.3 Deck Adjustments

This part of the manual is a guide for maintenance of those portions of the deck assembly which affect tape drive. If wow or flutter, or other tape drive problems are encountered, it should first be determined that cartridges are not at fault, before making any mechanical adjustments.

5.3.1 Cross Shaft Assembly

The pinch roller mounting shaft is mounted on the rotating cross shaft and, therefore, occupies a fixed position with respect to the cross shaft. Because of this, the motor capstan must be adjusted relative to this assembly.

If the pinch roller shaft is removed, it will be necessary to re-check the motor position to assure correct alignment. The cross shaft clamp prevents side-to-side motion of the cross

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shaft, as well as holding the drive chain. If it is necessary to remove any of these parts, note their relative positions before loosening the screws. For quieter operation the cross shaft-to-deck bearing surfaces are factory lubricated with Gulfway 52 ®. This is a high viscousity oil, which may need to be replaced each 6 months to one year of operation.

5.3.2 Motor Position (See Fig. 5.7)

The position of the drive motor is adjustable my means of two mounting screws which are accessible from above the main deck structure. The motor assembly should be positioned to center the capstan on the pinch roller shaft and 3-5/8 inches from the front edge of the front panel. This can be set more precisely using Gates #815 0842 001 capstan adjustment gauge, or a similiar gauge made from information shown in Fig. 5.3. To use this gauge to position the motor accurately, this procedure should be followed:

1) Remove rubber pinch roller.

2) Loosen the two motor mounting screws.

3) Center the motor shaft on the pinch roller shaft, then grasp the gauge and both shafts tightly. See Fig. 5.5. This will keep both shafts parallel to each other and separated by the correct spacing (.281 inch).

4) Tighten the motor mounting screws securely.

5) Now check to be sure both shafts touch the gauge, all along their entire lengths, this will indicate proper parallel positioning.

6) Replace the rubber pinch roller.

NOTE: Do not energize the solenoid with the rubber pinch roller off its shaft.

5.3.3 Solenoid Adjustment

The adjustment of the set-screw on the rear of the solenoid controls the escape of air, thus the effective damping. The position of the screw in the front of the solenoid determines the pinch roller pressure. The pinch roller shaft should come up to a distance of .281 inch, as measured between the top of the capstan shaft and the top of the pinch roller shaft, with solenoid engaged and motor running. Use of the #815 0842 001 gauge to make this pressure adjustment is shown in Fig. 5.6.

An alternate method of checking for correct pinch roller pressure adjustment is by observing the amount of indentation of the rubber pinch roller when in contact with the motor

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capstan. There should be approximately 1/32 inch indentation of the roller. If it is determined that solenoid adjustment is required, proceed as follows:

1) Loosen lock-nut using a thin 3/8 inch open end wrench. (Hold solenoid plunger with 9/16 inch open end wrench on hex side)

2) Clip or tie deck switch closed, then push START switch to energize solenoid. Turn screw into solenoid plunger for less pinch roller pressure, out for more pressure.

3) Tighten lock-nut.

   NOTE: The solenoid plunger should not "bottom out" in the end of the bore.

4) If the pinch roller should fail to return to its rest position, this is generally an indication of a weak spring. The spring should be replaced. Un-necessary removal of solenoid plunger from bore should be avoided. Do not exchange plungers between machines.

5.4 Operating Voltages - CC-II Playback

All DC voltages measured to ground with high impedance test meter. Allow for circuit loading when using 20k ohm/per/volt V.O.M., or low impedance test meter.

5.4.1 Monophonic Program Amplifier (994 6801 001)
Stereophonic Program Amplifier (994 6802 001)

Transistor	E	B	C
Q1,Q7	.03v	0.6v	4.0v
Q2,Q8	3.4v	4.0v	8.8v
Q3,Q9	0.7v	1.3v	2.6v
Q4,Q10	2.0v	2.6v	11.0v
Q5,Q11	11.0v	11.8v	24.0v
Q6,Q12	11.0v	11.0v	0

5.4.2 Cue Sensor (994 6826 001)

Transistor	E	B	C
Q1	.02v	0.5v	23v
Q2	3.4v	4.0v	16v
Q3	25v	25v	0
Q4	0	0	25v
Q5	2.5v	3.1v	19v
Q6	3.7v	4.2v	16v
Q7	25v	25v	0
Q8	0	0	25v
Q9	2.5v	3.1v	19v
Q10	3.5v	4.1v	16v
Q11	25v	25v	0

Warning, disconnect primary power prior to servicing.

Integrated Circuit (U1, LM301A)

Pin No.	
1	1.3v
2	12v
3	10v
4	0
5	1.2v
6	4 to 14v
7	22v
8	13v

5.4.3 Power Control Board (992 3111 001)

Terminal	Voltage
1 to 15	155v
3 to 15	95v
2 to Gnd	23v
4 to Gnd	14v
5 not used	
6 not used	
7 to Gnd	23v
8 to Gnd	20v
9 to Gnd	20v
10 not used	
11 to Gnd	36v
12 to 13	44vAC
14 to 16	115vAC
16 to 17,18	115vAC

5.4.4 Q1 Voltage Regulator

E- 24v, B- 25v, C- 36v

5.4.5 Record/Program Amplifier (994 6899 001)

INTEGRATED CIRCUIT U1

Pin Number	Voltage
1	7.4
2	Gnd
3	2.1
4	2.5
5	Gnd
6	7.4
7	2.2
8	2.6

Continued on following page

Warning, disconnect primary power prior to servicing.

Integrated Circuit U1, Con'd.

Pin Number	Voltage
9	2.6
10	2.2
11	7.4
12	14.0
13	2.6
14	2.2
15	12.9
16	7.5

NOTE: Signal Out, J4 Pin 6 and Pin 14 is approximately 0.6 VPP with M1, M2 set on "0" at 700 Hz.

5.4.6 Bias Oscillator (992 4582 001)

Transistor	E	B	C	T1 (Pins)
Q1	2.65	2.4	23.1	
Q2	2.65	2.4	23.1	1-2, 40VPP AC
Q3	3.1	2.6	3.0	2-3, 40VPP AC
Q4	0.0	0.7	0.0	4-6, 360VPP AC
Q5	0.0	0.7	0.0	
C7	10.5			
C8	10.5			

Q4, Q5: 24 VPP in RUN
Q3: 24 VPP when cue bias is "on".

5.4.7 Tone Oscillator (994 6898 001)

Transistor	E	B	C
Q1	0.8 DC 1.2 VPP	1.3 DC 0.9 VPP	9.8 DC 6 VPP
Q2	0.8 DC 1.1 VPP	1.1 DC 1.1 VPP	9.0 DC 5 VPP
Q4	0.8 DC 0.9 VPP	1.1 DC 0.9 VPP	9.0 DC 6 VPP
Q5	0.9 DC	1.5 DC	10.7 DC
Q3	3.0 DC	3.6 (+18V pulse on start)	3.3 DC (18V on start)

5.5 Recording Amplifier Adjustment Controls

5.5.1 Record/Program Amplifier Alignment

When replacing record heads, it will be necessary to check the bias adjustment in order to maintain proper frequency response and output. Use the type of tape normally used since different types of tape require different bias levels for optimum performance. The following procedure should be used when bias adjustments are required:

1) Connect output of playback to console, or VU meter, with

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proper input impedance. Connect an audio oscillator set at 700 Hz to the Record amplifier input.

2) Insert an erased cartridge into the Playback unit. Erase cartridge if unit cues out. Following steps are for Mono, or Left channel. Equivalent controls are shown in parenthesis for right stereo channel.

3) While recording at 700 Hz, with -10 dB output level, adjust the middle trimmer on the bias card, C15 (C16) for maximum playback level. Use a non-metallic screw driver for making all adjustments.

4) Change audio oscillator to 7000 Hz. If the output raises, increase bias level by turning control C15 (C16) clockwise, then switch the audio frequency input back and forth, first 700 Hz, then 7000 Hz, several times to check the output levels at the two frequencies. Adjust bias until the outputs are within 1.5 dB, or less, of each other.

5) Turn RECORD LEVEL control completely off. Connect an oscilloscope, or high impedance AC voltmeter to the negative end of C6 (C14) on the Record/Program amplifier, then adjust bias trap L2 (L1), on the bias card, for minimum reading.

6) Set RECORD LEVEL control for -10 dB Playback output at 700 Hz. Change audio oscillator frequency to 15 kHz and adjust L1 (L2) on the Record/Program amplifier card for -10 dB output.

7) Set the RECORD LEVEL control for "0" dB output at 700 Hz. Adjust R1 (R19) on the PGM amplifier for "0" indication on the Left meter. Using this recording, or any other reference level test tape in the playback only mode, adjust R8 (R24) for "0" indication on the Left meter. If higher or lower playback levels are desired, the meters may be adjusted accordingly. The meter's playback calibration may be changed without affecting the record calibration, but changing the record calibration will seriously affect the playback calibration.

8) Repeat the above procedure for the Right channel for Stereo machines.

9) Short out C8 on the tone oscillator card to cause the 1 kHz oscillator to operate continuously, jumper the cue head output into the Left PGM amplifier as done in Section 3.6.1

10) SET and START the recorder. Adjust C14 on the bias card, for maximum output on the PGM channel.

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5.5.2 Cue Record Level Adjustment

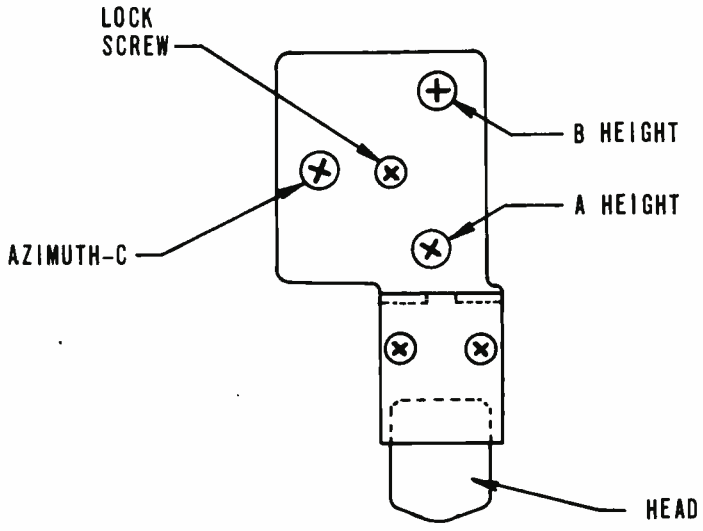
The cue record levels are adjustable by potentiometers mounted

on the tone oscillator card. So long as replacement heads are of the same type as the original, no change in cue recording levels should be necessary. Proper adjustment of the level controls should provide recovery levels from the Playback output as follows:

NAB Reference 400 Hz	0 dBm (Ref)
Primary (1 kHz)	-6.4 dBm
Secondary (150 Hz)	+0.1 dBm
Tertiary (8 kHz)	-15.4 dBm

5.5.3 Cue Frequency

The cue frequencies are adjustable by means of the slug-tuned coils on the cue oscillator card. Adjustment of these coils has been made at the factory. Re-adjustment of coils in the field should be attempted only if proper equipment is available for accurately checking the oscillator frequencies.



HEAD ADJUSTMENTS

FIG. 5.1

HEAD WIRING
(REAR VIEW)

FIG. 5.2

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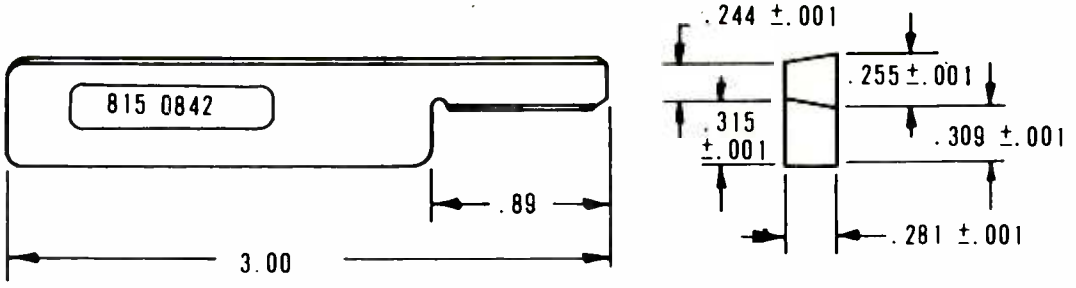
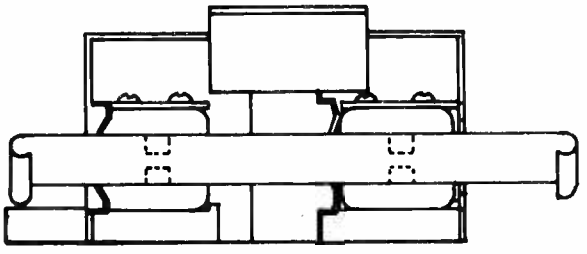
Warning, disconnect primary power prior to servicing.



HEAD/GUIDE HEIGHT GAUGE

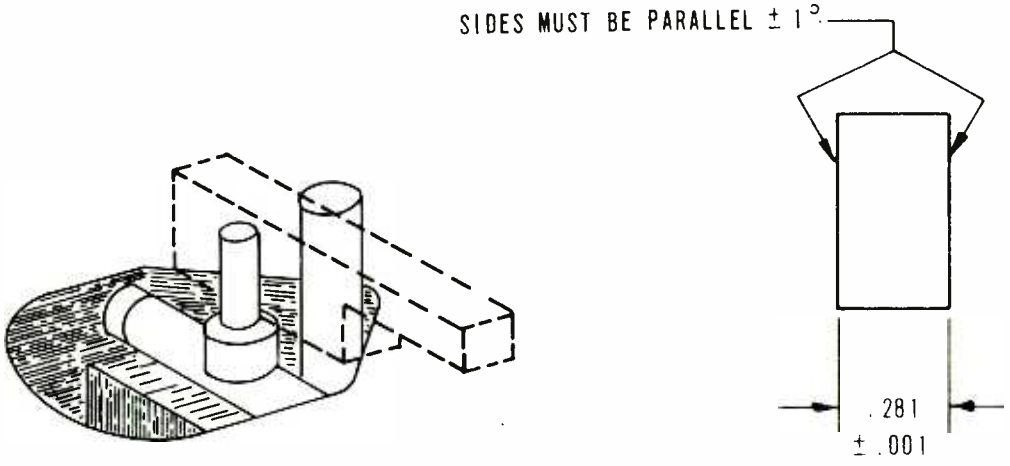
FIG. 5.3



HEAD ASSEMBLY, TAPE GUIDE

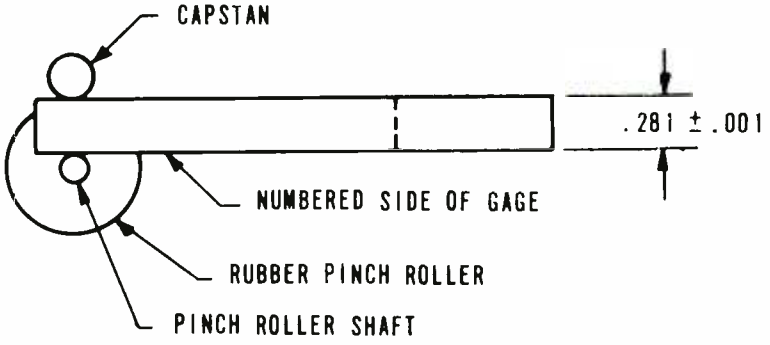
FIG. 5.4

Warning, disconnect primary power prior to servicing.



CAPSTAN ADJUSTMENT GAUGE
LARGER PORTION OF GAUGE 815 0842 001

FIG. 5.5



PINCH ROLLER ADJUSTMENT GAUGE
LARGER PORTION OF GAUGE 815 0842 001

FIG. 5.6

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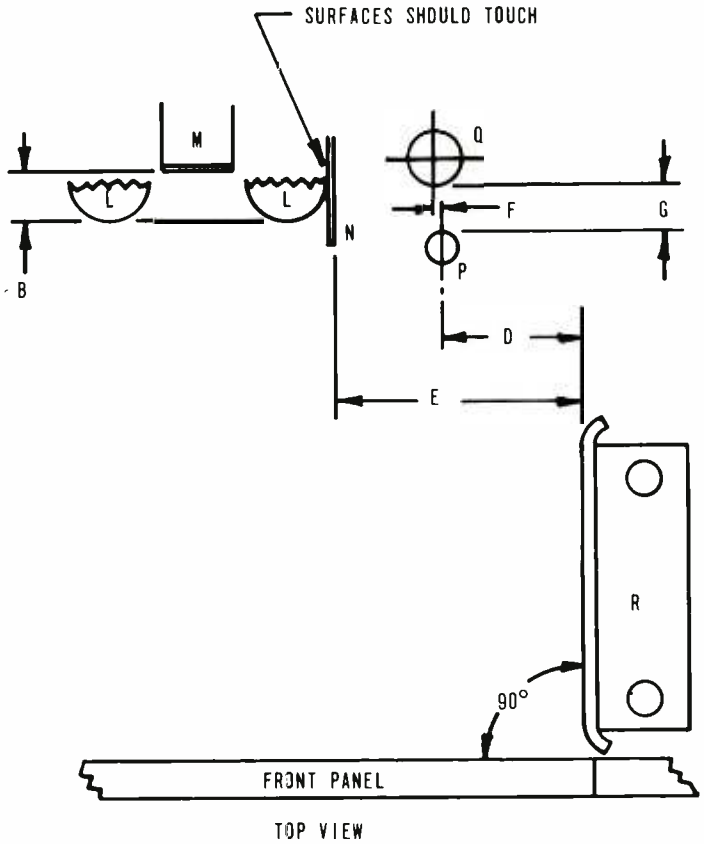
Warning, disconnect primary power prior to servicing.



B = 5.16", ± 1 32" MAXIMUM, MOVE L AND L
D = 7.8" TARGET SETTING, MOVE R
E = 1-9.16" TARGET SETTING
F = 0" TO 3 32" MAXIMUM, MOVE Q
G = 9.32" (0.281") TARGET SETTING, MOVE Q
K = 1.64" MINIMUM (REJECT CARTS WITH LESS)
L = TAPE HEADS
M = TAPE GUIDE CENTER POST
N = RIGHT TAPE GUIDE
P = PINCH ROLLER SHAFT
Q = MOTOR CAPSTAN
R = CARTRIDGE GUIDE

CRITERION COMPACT AND CC-II, CC-III

TAPE DECK DIMENSIONS

FIG. 5.7

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828 6862 001

Warning, disconnect primary power prior to servicing.

SECTION 6.0 - PARTS LIST

CC-II

MONO PROGRAM AMPLIFIER 994 6801 001
STEREO PROGRAM AMPLIFIER 994 6802 001

NOTE: MONO-Use only Left Channel Parts-Refer to Schematic

SYMBOL	DESCRIPTION	GATES PART NO.
C1	Cap. 1uF, 25v	522 0232 000
C2	Cap. 50uF, 12v	522 0208 000
C3	Cap. .015uF, 100v	508 0210 000
C4	Cap. 100uF, 25v	522 0246 000
C5	Cap. 10uF, 25v	522 0239 000
C6	Cap. 10uF, 6v	522 0175 000
C7	Cap. .001uF, 1 kV	516 0055 000
C8,C9	Cap. 50uF, 12v	522 0208 000
C10	Cap. .002uF, 1 kV	516 0063 000
C11	Cap. 50uF, 25v	522 0244 000
C12	Cap. 470pF,	500 0908 000
C13	Cap. 1uF, 25v	522 0232 000
C14	Cap. 50uF, 12v	522 0208 000
C15	Cap. .015uF, 100v	508 0210 000
C16	Cap. 100uF, 25v	522 0246 000
C17	Cap. 10uF, 25v	522 0239 000
C18	Cap. 10uF, 6v	522 0175 000
C19	Cap. .001uF 1 kV	516 0055 000
C20,C21	Cap. 50uF, 12v	522 0208 000
C22	Cap. .002, 1kV	516 0063 000
C23	Cap. 50uF, 25v	522 0244 000
C24	Cap. 470pF,	500 0908 000
C25,C26	Cap. 150pF, 500v	500 0761 000
Q1 thru Q4	Transistor, 2N5088	380 0115 000
Q5	Transistor, RCA 40317	380 0050 000
Q6	Transistor, RCA 40319	380 0044 000
Q7 thru Q10	Transistor, RCA 40397 or 2N5088	380 0115 000
Q11	Transistor, RCA 40317	380 0050 000
Q12	Transistor, RCA 40319	380 0044 000
R1	Res. 100 ohm, 1/2W, 5%	540 0025 000

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Warning, disconnect primary power prior to servicing.

Program Amplifier, Cont'd.

SYMBOL	DESCRIPTION	GATES PART NO.	SYMBOL	DESCRIPTION	GATES PART NO.
R2	Res. 1.8k ohm, 1/2W, 5%	540 0055 000	R19	Res. 33 ohm, 1/2W, 5%	540 0013 000
R3	Res. 100k ohm, 1/2W, 5%	540 0097 000	R20	Pot. 10k ohm, 1/4W	550 0272 000
R4	Res. 200 ohm, 1/2W, 5%	540 0032 000	R21	Res. 100 ohm, 1/2W, 5%	540 0025 000
R5	Res. 2.2k ohm, 1/2W, 5%	540 0057 000	R22	Res. 1.8k ohm, 1/2W, 5%	540 0055 000
R6	Res. 680 ohm, 1/2W, 5%	540 0045 000	R23	Res. 100k ohm, 1/2W, 5%	540 0097 000
R7	Res. 22k ohm, 1/2W, 5%	540 0081 000	R24	Res. 200 ohm, 1/2W, 5%	540 0032 000
R8	Res. 2.2k ohm, 1/2W, 5%	540 0057 000	R25	Res. 2.2k ohm, 1/2W, 5%	540 0057 000
R9	Pot. 10k ohm, 1/4W	550 0272 000	R26	Res. 680 ohm, 1/2W,5%	540 0045 000
R10	Res. 6.8k ohm, 1/2W, 5%	540 0069 000	R27	Res. 22k ohm 1/2W, 5%	540 0081 000
R11	Res. 12k ohm, 1/2W, 5%	540 0075 000	R28	Res. 2.2k ohm, 1/2W, 5%	540 0057 000
R12	Res. 120 ohm, 1/2W, 5%	540 0027 000	R29	Pot. 10k ohm, 1/4W	550 0272 000
R13	Res. 2.4k ohm, 1/2W, 5%	540 0058 000	R30	Res. 6.8k ohm, 1/2W, 5%	540 0069 000
R14	Res. 812k ohm, 1/2W, 5%	540 0071 000	R31	Res. 12k ohm, 1/2W, 5%	540 0075 000
R15	Res. 1.3k ohm, 1/2W, 5%	540 0052 000	R32	Res. 120 ohm, 1/2W, 5%	540 0027 000
R16	Res. 100 ohm, 1/2W, 5%	540 0025 000	R33	Res. 2.4k ohm, 1/2W, 5%	540 0058 000
R17	Res. 200 ohm, 1/2W, 5%	540 0032 000	R34	Res. 8.2k ohm, 1/2W, 5%	540 0071 000
R18	Res. 120 ohm, 1/2W, 5%	540 0027 000	R35	Res. 1.3k ohm, 1/2W, 5%	540 0052 000

Warning, disconnect primary power prior to servicing.

Program Amplifier, Cont'd.

SYMBOL	DESCRIPTION	GATES PART NO.	SYMBOL	DESCRIPTION	GATES PART NO.
R36	Res. 100 ohm, 1/2W, 5%	540 0025 000			
R37	Res. 200 ohm, 1/2W, 5%	540 0032 000			
R38	Res. 120 ohm, 1/2W, 5%	540 0027 000			
R39	Res. 33 ohm, 1/2W, 5%	540 0013 000			
R40	Pot. 10k ohm, 1/4W	550 0272 000			

CUE SENSOR BOARD

994 6826 002

SYMBOL	DESCRIPTION	GATES PART NO.	SYMBOL	DESCRIPTION	GATES PART NO.
C1,C2	Cap. 5pF, 500v	500 0803 000	C14	Cap. 1uF, 35v	526 0050 000
C3	Cap. 5uF, 25v	522 0236 000	C15	Cap. .04uF, 100v	508 0253 000
C4	Cap. 100uF, 25v	522 0246 000	C16	Cap. .1uF, 100v	508 0268 000
C5	Cap. 68uF, 10v	526 0046 000	C17,C18	Cap. 1uF, 35v	526 0050 000
C6	Cap. 1uF, 35v	526 0050 000	C19	Cap. .033uF, 100v	508 0279 000
C7	Cap. .047uF, 100v	508 0363 000	C20	Cap. .1uF, 100v	508 0268 000
C8	Cap. .82uF, 35v	526 0339 000	C21	Cap. 2uF, 25v	522 0233 000
C9,C10	Cap. 1uF, 35v	526 0050 000	C22	Cap. 1uF, 35v	526 0050 000
C11	Cap. .1uF, 100v	508 0268 000	C23	Cap. 2.7uF, 35v	526 0342 000
C12	Cap. 1uF, 35v	526 0340 000	C24	Cap. 10uF, 20v	526 0343 000
C13	Cap. 2uF, 25v	522 0233 000	C25,C26	Cap. 1uF, 35v	526 0050 000

Cue Sensor Board, Cont'd.

SYMBOL	DESCRIPTION	GATES PART NO.
C27	Cap. 2.2uF, 35v	526 0341 000
C28	Cap. 10uF, 20v	526 0343 000
C29	Cap. 10uF, 25v	522 0239 000
C30	Cap. 2uF, 25v Elect.	522 0233 000
CR1,CR2	Diode, 1N462	384 0264 000
CR3,CR4	Diode, 1N276	384 0267 000
Q1,Q2	Transistor, 2N3417	380 0111 000
Q3	Transistor, 2N5087	380 0112 000
Q4	Transistor, MPS-U45	380 0179 000
Q5,Q6	Transistor, 2N3417	380 0111 000
Q7	Transistor, 2N5087	380 0112 000
Q8	Transistor, RCA40314	380 0053 000
Q9,Q10	Transistor, 2N3417	380 0111 000
Q11	Transistor, 2N5087	380 0112 000
Q12	Transistor, RCA 40314	380 0053 000
Q13	Transistor, 2N4403	380 0126 000
R1	Res. 470 ohm,	540 0904 000
R2*	Res. (Selected)	

SYMBOL	DESCRIPTION	GATES PART NO.
R3	Res. 33k ohm, 1/4W, 5%	540 0948 000
R4	Res. 100 ohm, 1/4W, 5%	540 0888 000
R5	Res. 1k ohm, 1/4W, 5%	540 0912 000
R6	Pot. 10k ohm, 1/4W	550 0272 000
R7	Res. 10k ohm, 1/4W, 5%	540 0936 000
R8	Res. 47k ohm, 1/4W, 5%	540 0952 000
R9	Res. 4.7k ohm, 1/4W, 5%	540 0928 000
R10	Res. 2.2k ohm, 1/4W, 5%	540 0920 000
R11	Res. 10k ohm, 1/4W, 5%	540 0936 000
R12	Res. 27k ohm, 1/4W, 5%	540 0946 000
R13	Res. 4.7k ohm, 1/4W, 5%	540 0928 000
R14,R15	Res. 2.2k ohm, 1/4W, 5%	540 0920 000
R16	Res. 3.3k ohm, 1/4W, 5%	540 0924 000
R17	Res. 4.7k ohm, 1/4W, 5%	540 0928 000
R18	Res. 2.2k ohm, 1/4W, 5%	540 0920 000
R19	Res. 1k ohm, 1/4W, 5%	540 0912 000

Warning, disconnect primary power prior to servicing.

Cue Sensor Board, Cont'd.

SYMBOL	DESCRIPTION	GATES PART NO.
R20	Pot. 10k ohm, 1/4W	550 0272 000
R21	Res. 10k ohm, 1/4W, 5%	540 0936 000
R22	Res. 47k ohm, 1/4W, 5%	540 0952 000
R23	Res. 4.7k ohm, 1/4W, 5%	540 0928 000
R24	Res. 2.2k ohm, 1/4W, 5%	540 0920 000
R25	Res. 27k ohm, 1/4W, 5%	540 0946 000
R26	Res. 10k ohm, 1/4W, 5%	540 0936 000
R27	Res. 4.7k ohm, 1/4W, 5%	540 0928 000
R28,R29	Res. 2.2k ohm, 1/4W, 5%	540 0920 000
R30	Res. 3.3k ohm, 1/4W, 5%	540 0924 000
R31	Res. 4.7k ohm, 1/4W, 5%	540 0928 000
R32	Res. 2.2k ohm, 1/4W, 5%	540 0920 000
R33	Res. 10k ohm, 1/4W, 5%	540 0936 000
R34	Pot. 10k ohm, 1/4W	550 0272 000
R35	Res. 10k ohm, 1/4W, 5%	540 0936 000
R36	Res. 47k ohm, 1/4W, 5%	540 0952 000
R37	Res. 4.7k ohm, 1/4W, 5%	540 0928 000
R38	Res. 2.2k ohm, 1/4W, 5%	540 0920 000
R39	Res. 10k ohm, 1/4W, 5%	540 0936 000
R40	Res. 27k ohm, 1/4W. 5%	540 0946 000
R41	Res. 4.7k ohm, 1/4W, 5%	540 0928 000
R42,R43	Res. 2.2k ohm, 1/4W, 5%	540 0920 000
R44	Res. 3.3k ohm, 1/4W, 5%	540 0924 000
R45	Res. 4.7k ohm, 1/4W, 5%	540 0928 000
R46	Res. 2.2k ohm, 1/4W, 5%	540 0920 000
R47	Res. 7.5k ohm, 1/4W, 5%	540 0933 000
R48	Res. 15k ohm, 1/4W, 5%	540 0940 000
R49,R50	Res. 10k ohm, 1/4W, 5%	540 0936 000
R51,R52	Res. 750k ohm, 1/4W, 5%	540 0981 000
R53	Res. 1k ohm, 1/4W, 5%	540 0912 000
U1	IC (Amplifier) National LM301A	382 0056 000

* R2 is selected to cause the DC voltage reading of U1, Pin 6, to be 4 to 14 volts with no signal applied. The lower end of the voltage range is preferred

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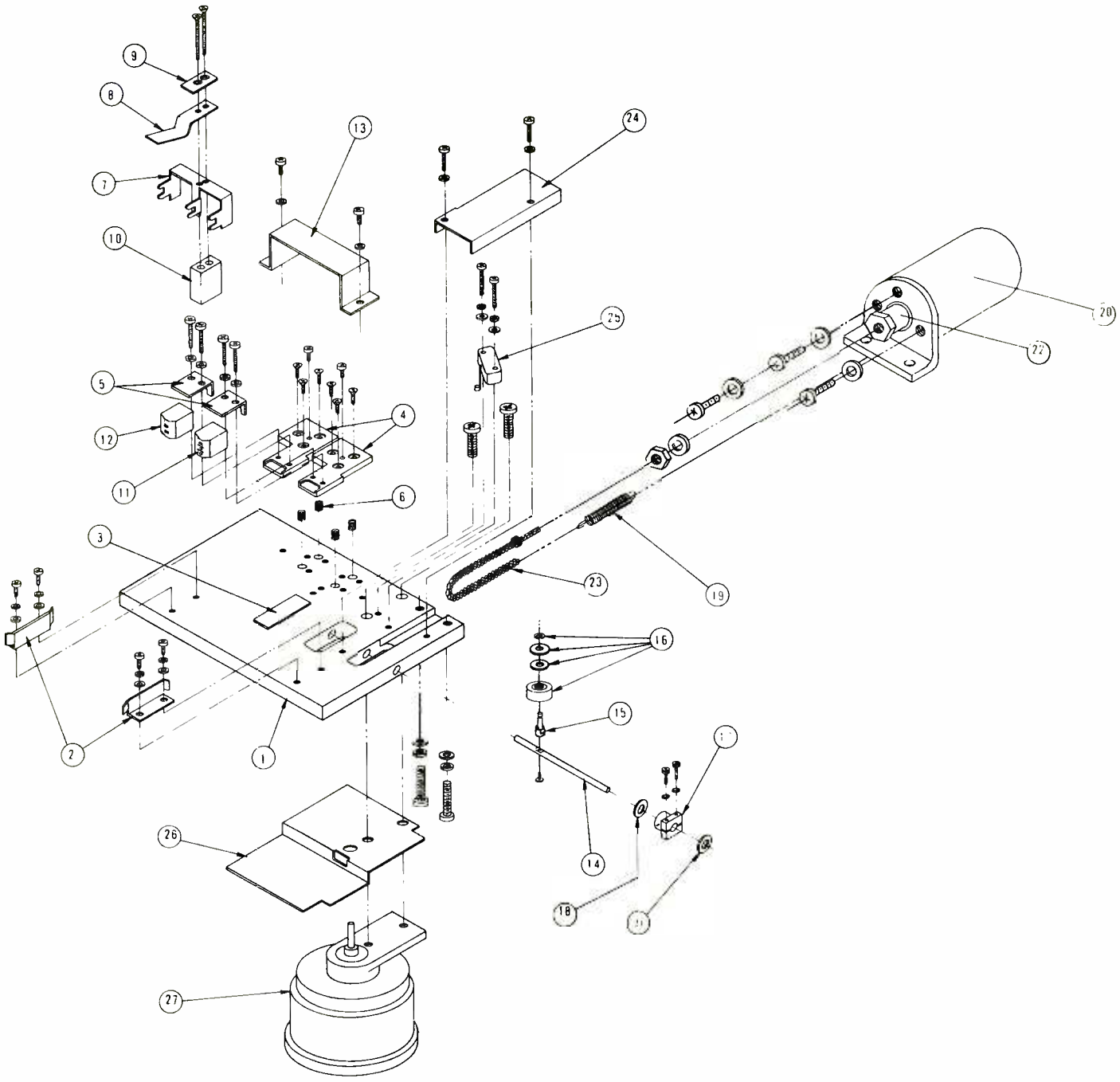
Warning, disconnect primary power prior to servicing.

DECK ASSEMBLY

REFER TO DWG. NO. 838 9902 001

SYMBOL	DESCRIPTION	GATES PART NO.
1	Deck Plate	938 5150 001
2	Cartridge Guide	815 2209 001
3	Cartridge Pad	811 0044 401
4	Head Support	827 7402 001
5	Head Clamp	815 2256 001
6	Spring	456 0082 000
7	Tape Guide	823 0041 401
8	Cartridge Spring	811 0045 401
9	Cartridge Spring Plate	811 0046 401
10	Support Post	815 2259 001
11	Monophonic Playback Head	730 1376 000
	Stereophonic Playback Head	730 1371 000
12	Monophonic Record Head	730 1429 000
	Stereophonic Record Head	730 0730 000
13	Head Shield	827 7357 001
14	Cross Shaft	815 2264 001
15	Pinch Roller Shaft	358 1626 000
16	Pinch Roller Replacement Kit	994 6886 002
17	Cross Shaft Clamp	916 3579 002
18	Nylon Washer	335 0024 000
19	Solenoid Return Spring	456 0033 000
20	Solenoid	590 0033 000
21	Nylon Washer	335 0151 000
22	Solenoid Plunger, (Part of Solenoid)	
23	Drive Chain Assembly	916 3580 002
24	Drive Cover	827 7414 001
25	S1, Deck Switch	604 0472 000
26	Motor Shield	827 7355 001
27	Motor, 60 Hz, 7-1/2 inch per second, with plug	927 7740 001
	Motor, 50 Hz, 7-1/2 inch per second, with plug	927 7740 003
28	Lubricant	073 0001 116

Warning, disconnect primary power prior to servicing.



1651

EXPLODED VIEW
CRITERION COMPACT
838 9902 001

GATES DIVISION
HARRIS-INTERTYPE CORPORATION
123 HAMPSHIRE STREET · QUINCY, ILLINOIS 62301 U.S.A.

Warning, disconnect primary power prior to servicing.

RECORD/PROGRAM AMPLIFIER

994 6899 001

SYMBOL	DESCRIPTION	GATES PART NO.
C1	Cap. 5uF, 25v	522 0236 000
C2	Cap. .003uF Disc	516 0067 000
C3	Cap. 1uF, 35v	526 0050 000
C4	Cap, 100uF, 3v	522 0160 000
C5	Cap. .0068uF, 100v	508 0191 000
C6	Cap. 5uF, 25v	522 0236 000
C7	Cap. 100uF, 25v	522 0246 000
C8	Cap. 47pF, 500v	500 0817 000
C9	Cap. 35uF, 6v	522 0180 000
C10	Cap. 100uF, 25v	522 0246 000
C11	Cap. 5uF, 25v	522 0236 000
C12	Cap. 35uF, 6v	522 0180 000
C13	Cap. 5uF, 25v	522 0236 000
C14	Cap. 5uF, 25v	522 0236 000
C15	Cap. 47uF, 500v	500 0817 000
C16	Cap. .0068uF, 100v	508 0191 000
C17	Cap. 100uF, 3v	522 0160 000
C18	Cap. .5uF, 35v	526 0050 000
C19	Cap. .003uF, Disc	516 0067 000
C20	Cap. 5uF, 25v	522 0236 000
C21,C22	Cap. 5uF, 25v	522 0236 000
C23,C24	Cap. 47pf, 500v	500 0817 000
C25,C26	Cap. 27pF, 500v	500 0811 000
CR1,CR2	Diode, 1N4246	384 0352 000
CR5 thru CR10	Diode, 1N4246	384 0352 000
L1,L2	Inductor, Var.	492 0363 000
R1	Res. 10k ohm, 1/4W, 5%	540 0936 000
R2	Res, Trimmer, 10k ohm	550 0272 000
R3	Res. 4.7k ohm, 1/4W, 5%	540 0928 000
R4	Res. 2.2k ohm, 1/4W, 5%	540 0920 000
R5	Res. 1.5k ohm, 1/4W, 5%	540 0916 000
R6	Not used	
R7	Res. 100 ohm, 1/4W, 5%	540 0888 000
R8	Res. Trimmer, 100k ohm	550 0392 000
R9	Res. 270 ohm, 1/4W, 5%	540 0898 000

1651

Warning, disconnect primary power prior to servicing.

Record/Program Amplifier, Cont'd.

SYMBOL	DESCRIPTION	GATES PART NO.	SYMBOL	DESCRIPTION	GATES PART NO.
R10	Res., 1k ohm, 1/4W, 5%	540 0912 000	R20	Res., 2.2k ohm 1/4W, 5%	540 0920 000
R11	Res., 13k ohm, 1/4W, 5%	540 0939 000	R21	Res., 1.5k ohm 1/4W, 5%	540 0916 000
R12, R13	Res., 680 ohm, 1/4W, 5%	540 0908 000	R22	Not used	
			R23	Res., 13k ohm, 1/4W, 5%	540 0939 000
R14	Res., 4.7k ohm 1/4W, 5%	540 0928 000	R24	Res., Trimmer 100k ohm	550 0392 000
R15	Res., 1k ohm, 1/4W, 5%	540 0912 000	R25, R26	Res., 51 ohm, 1/4W, 5%	540 0881 000
R16	Res., 100 ohm, 1/4W, 5%	540 0888 000	U1	IC, CA3052	382 0120 000
R17	Res., 270 ohm, 1/4W, 5%	540 0898 000	XU1	Socket, IC	404 0306 000
R18	Res., Trimmer, 10k ohm	540 0272 000			
R19	Res., 10k ohm, 1/4W, 5%	540 0936 000			

BIAS OSCILLATOR MODULE

992 4582 001

SYMBOL	DESCRIPTION	GATES PART NO.	SYMBOL	DESCRIPTION	GATES PART NO.
C1	Cap., .005 uF, 100v	508 0076 000	C6	Cap., 50 uF, 15v	522 0227 000
C2	Cap., .01 uF, 100v	508 0215 000	C7	Cap., 1000 uF, 16v	522 0391 000
C3	Cap., .005 uF, 100v	508 0076 000	C8	Cap., .01 uF, 100v	508 0215 000
C4	Cap., .025 uF, 100v	508 0271 000	C9	Cap., 1000 uF 16v	522 0391 000
C5	Cap., 50 uF, 50v	522 0258 000	C10	Cap., .01 uF, 100v	508 0215 000

1651

Warning, disconnect primary power prior to servicing.

Bias Oscillator Module, Cont'd.

SYMBOL	DESCRIPTION	GATES PART NO.
C11, C12	Cap., 47 pF, 500v	500 0817 000
C13	Cap., .01 uF, 100v	508 0215 000
C14 thru C16	Cap., Trimmer 1.5-20 pF	500 1200 000
C17	Cap., 15 uF, 20v	526 0333 000
C18, C19	Cap., 240 pF, Mica	500 0830 000
CR1	Diode, 1N4246	384 0352 000
L1,L2	Inductor,	492 0363 000
Q1,Q2	Transistor, 2N3053, NPN	380 0049 000
Q3	Transistor, MPS4356, PNP	380 0508 000
Q4,Q5	Transistor, 2N5550	380 0158 000
R1,R2	Res., 33 ohm, 1/4W, 5%	540 0876 000
R3	Res., 100 ohm, 1/4W, 5%	540 0888 000
R4,R5	Res., 10k ohm, 1/4W, 5%	540 0936 000
R6	Res., 22 ohm, 1/4W, 5%	540 0872 000
R7	Res., 10k ohm, 1/4W, 5%	540 0936 000
R8	Res., 4.7k ohm 1/4W, 5%	540 0928 000
R9	Res., 24k ohm 1/4W, 5%	540 0945 000
R10	Res., 10k ohm 1/4W, 5%	540 0936 000
R11	Res., 24k ohm, 1/4W, 5%	540 0945 000
R12	Res., 10k ohm, 1/4W, 5%	540 0936 000
R13	Res., 10k ohm, 1/4W, 5%	540 0936 000
R14, R15	Res., 20k ohm, 1/4W, 5%	540 0943 000
R16, R17	Res., 1 Megohm, 1/4W, 5%	540 0984 000
R18, R19	Res., 620 ohm, 1/2W, 5%	540 0044 000
R20, R21	Res., 2.2k ohm 1/4W, 5%	540 0920 000
T1	Transformer, Bias Oscillator	478 0319 000

1651

Warning, disconnect primary power prior to servicing.

TONE OSCILLATOR MODULE

994 6898 001

SYMBOL	DESCRIPTION	GATES PART NO.
C1	Cap. 5uF, 25v	522 0236 000
C2	Cap. 1uF, 35V	526 0340 000
C3	Cap. 5uF, 25v	522 0236 000
C4	Cap. .047uF, 200v	508 0363 000
C5 thru C7	Cap. 5uF, 25v	522 0236 000
C8	Cap. 50uF, 25v	522 0244 000
C9	Cap. 5uF, 25v	522 0236 000
C10	Cap. .0082uF, Paper, 10%	508 0399 000
C11	Cap. 5uF, 25v	522 0236 000
C12	Cap. 1uF, 25v	522 0232 000
C13	Cap. 300pF, Silver Mica	500 0784 000
C14	Cap. 25uF,25v	522 0242 000
C15	Cap. .001uF	516 0520 000
CR1 thru CR4	Diode, 1N4246	384 0352 000
CR5	Diode, Zener 3.6v	386 0081 000
L1	Inductor, Var. 1.045-1.155 H.	492 0369 000
L2	Inductor, Var. 475-525 mH.	492 0368 000
L3	Inductor, Var. 38-42 mH.	492 0367 000
L4	Inductor, Var. 8k-20k uH.	492 0363 000
Q1,Q2	Transistor, 2N3417	380 0111 000
Q3	Transistor, 2N40311	380 0143 000
Q4	Transistor, 2N3417	380 0111 000
Q5	Transistor, 2N40311	380 0143 000
R1	Res. 22k ohm, 1/4W, 5%	540 0944 000
R2	Potentiometer 10k	550 0272 000
R3	Res. 3.6k ohm, 1/4W, 5%	540 0925 000
R4	Res. 22k ohm, 1/4W, 5%	540 0944 000
R5	Res. 4.7k ohm, 1/4W, 5%	540 0928 000
R6	Res. 100 ohm, 1/4W, 5%	540 0888 000
R7	Res. 180 ohm, 1/4W, 5%	540 0894 000
R8	Res. 3.6k ohm, 1/4W, 5%	540 0925 000

1651

Warning, disconnect primary power prior to servicing.

Tone Oscillator Module, Cont'd.

SYMBOL	DESCRIPTION	GATES PART NO.
R9	Res. 22k ohm, 1/4W, 5%	540 0944 000
R10	Res. 6.2k ohm, 1/4W, 5%	540 0931 000
R11	Res. 3.3k ohm, 1/4W, 5%	540 0924 000
R12	Res. 360 ohm, 1/4W, 5%	540 0901 000
R13	Res. 100k ohm, 1/4W, 5%	540 0960 000
R14	Res. 1.8k ohm, 1/4W, 5%	540 0918 000
R15	Res. 2.2k ohm, 1/4W, 5%	540 0920 000
R16	Res. 1k ohm, 1/4W, 5%	540 0912 000
R17	Res. 4.7k ohm, 1/4W, 5%	540 0928 000
R18	Res. 22k ohm, 1/4W, 5%	540 0944 000
R19	Res. 3.6k ohm, 1/4W, 5%	540 0925 000
R20	Not used	
R21	Potentiometer, 10k ohm	550 0272 000
R22	Res. 33k ohm, 1/4W, 5%	540 0948 000
R23	Potentiometer, 10k ohm	550 0272 000
R24	Res. 4.7k ohm, 1/4W, 5%	540 0928 000
R25	Res. 22k ohm, 1/4W, 5%	540 0944 000
R26	Res. 220 ohm, 1/4W, 5%	540 0896 000
R29	Res. 4.7k ohm, 1/4W 5%	540 0928 000
R30	Res. 2.2k ohm, 1/4W, 5%	540 0920 000
R31	Res. 33k ohm, 1/4W, 5%	540 0948 000

RECORD AMPLIFIER

CHASSIS ASSEMBLY

994 6894 001

SYMBOL	DESCRIPTION	GATES PART NO.
AT1,AT2	Potentiometer, 500 ohm, 2W	550 0338 000
C1	Cap. 25uF, 25v	522 0242 000
CR1 thru CR4	Diode, 1N4246	384 0352 000
CR10	Diode, 1N4247	384 0353 000

Warning, disconnect primary power prior to servicing.

Record Amplifier Chassis Assembly, Cont'd.

SYMBOL	DESCRIPTION	GATES PART NO.	SYMBOL	DESCRIPTION	GATES PART NO.
DS1 thru DS3	Lamp (Rec.) Lamp (P.B.) #387	396 0169 000	R1	Res. 240 ohm, 1/2W, 5%	540 0034 000
			R2	Res. 100 ohm, 1/2W, 5%	540 0025 000
J1	Not used		R3,R4	Res. 200 ohm, 1/2W, 5%	540 0032 000
J2	Socket, 12 Conn.	612 0464 000			
J3	Socket, 6 Conn.	612 0461 000	S1 thru S3	Switch, (Rec.)	604 0536 000
J4	Socket, 18 Conn.	612 0521 000			
J5,J6	Socket, PC Board, 12 Conn.	612 0490 000	T1,T2	Transformer, Input	478 0315 000
K1	Relay	574 0162 000	XK1	Socket, Relay	404 0253 000
M1,M2	Meter, 0-200 micro-amp	632 0699 000			

PLAYBACK CHASSIS ASSEMBLY

MONO - 992 3305 001

STEREO - 992 3304 001

SYMBOL	DESCRIPTION	GATES PART NO.	SYMBOL	DESCRIPTION	GATES PART NO.
C1,C2	Cap. .01uF, 600v	516 0080 000	C5	Cap. Motor, 2.0uF for 50 Hz motor	510 0570 000
C3,C4	Cap. 1000uF, 50v	524 0159 000		Bracket for C5, Lower Plate	815 2760 001
C5	Cap. Motor, 1.5uF, 330vac for 60 Hz motor	510 0569 000		Bracket for C5, Top Clamp	815 2578 002

1651

Warning, disconnect primary power prior to servicing.

Playback Chassis Assembly, Cont'd.

SYMBOL	DESCRIPTION	GATES PART NO.
C6	Cap,40/40/40uF, 350v	524 0221 000
C7,8	Cap. .1uF, 200v	506 0005 000
C9	Cap. .1uF, 50v	526 0094 000
C10	Cap., .5 uf, 200v	506 0007 000
CR5	Diode, RCA, 1N3255	384 0263 000
CR6 thru CR8	Diode, RCA, 1N3254	384 0258 000
CR9	Diode, Zener, 25v, 2.5%	386 0176 000
DS1 thru DS3	Lamp, #387	396 0169 000
F1	Fuse, .8 Amp Slo-blo	398 0053 000
F2	Fuse, 1/2 Amp	398 0049 000
J1	Socket, 18 Conductor	612 0466 000
J2	Socket, 6 Conductor	612 0461 000
J4,J5	Socket, P.C. Board	612 0490 000
J6	Nylon Cap Housing	612 0504 000
K1	Relay 4PDT, 24v	574 0162 000
K2,K3	Optional	
L1,L2	RF Choke, 2.2uHy	494 0227 000
P6	Nylon Plug Housing	610 0515 000
Q1	Transistor, MJ4000	380 0187 000
R4,R5	Res. 100 ohm, 1/2W, 5%	540 0025 000
R9	Res. 10k ohm, 3W, 5%	542 1141 000
R10,R11	Res. 82 ohm, 1/2W, 5%	540 0023 000
R12	Res. 1.5k ohm, 1/4W, 5%	540 0916 000
S1	Switch, Deck	604 0472 000
S2,S3	Switch, N.O.	604 0536 000
	Lens, Green, START	598 0211 000
	Lens, Yellow, STOP	598 0212 000
T1	Transformer,	472 0714 000

1651

Warning, disconnect primary power prior to servicing.

Playback Chassis Assembly, Cont'd.

SYMBOL	DESCRIPTION	GATES PART NO.
T2,T3	Transformer, Output	478 0316 000
XDS1	Indicator, Red	406 0422 000
XF1,XF2	Fuseholder	402 0023 000
XK1 thru XK3	Socket, Relay	404 0291 000
XQ1	Socket Kit	404 0136 000

SYMBOL	DESCRIPTION	GATES PART NO.
--	Head lead Ass'y OR/RED, Short	730 1372 000
--	Head Lead Ass'y BLUE/YEL, Short	730 1373 000
--	Head Lead Ass'y WH/BLK, Short	730 1374 000
--	Head Lead Ass'y OR/RED, Long	730 1430 000
--	Head Lead Ass'y BLUE/YEL, Long	730 1431 000
--	Head Lead Ass'y WH/BLK, Long	730 1432 000

POWER CONTROL BOARD

992 3111 001

SYMBOL	DESCRIPTION	GATES PART NO.
CR2,CR3	Diode, RCA 1N4246	384 0352 000
CR9	Rectifier,	384 0319 000
R1	Res. 150 ohm, 10W, 5%	542 0061 000
R3	Res. 270 ohm, 1/2W, 5%	540 0035 000
R6	Res. 130 ohm, 1W, 5%	540 0311 000
R7	Res. 200 ohm, 1/2W, 5%	540 0032 000

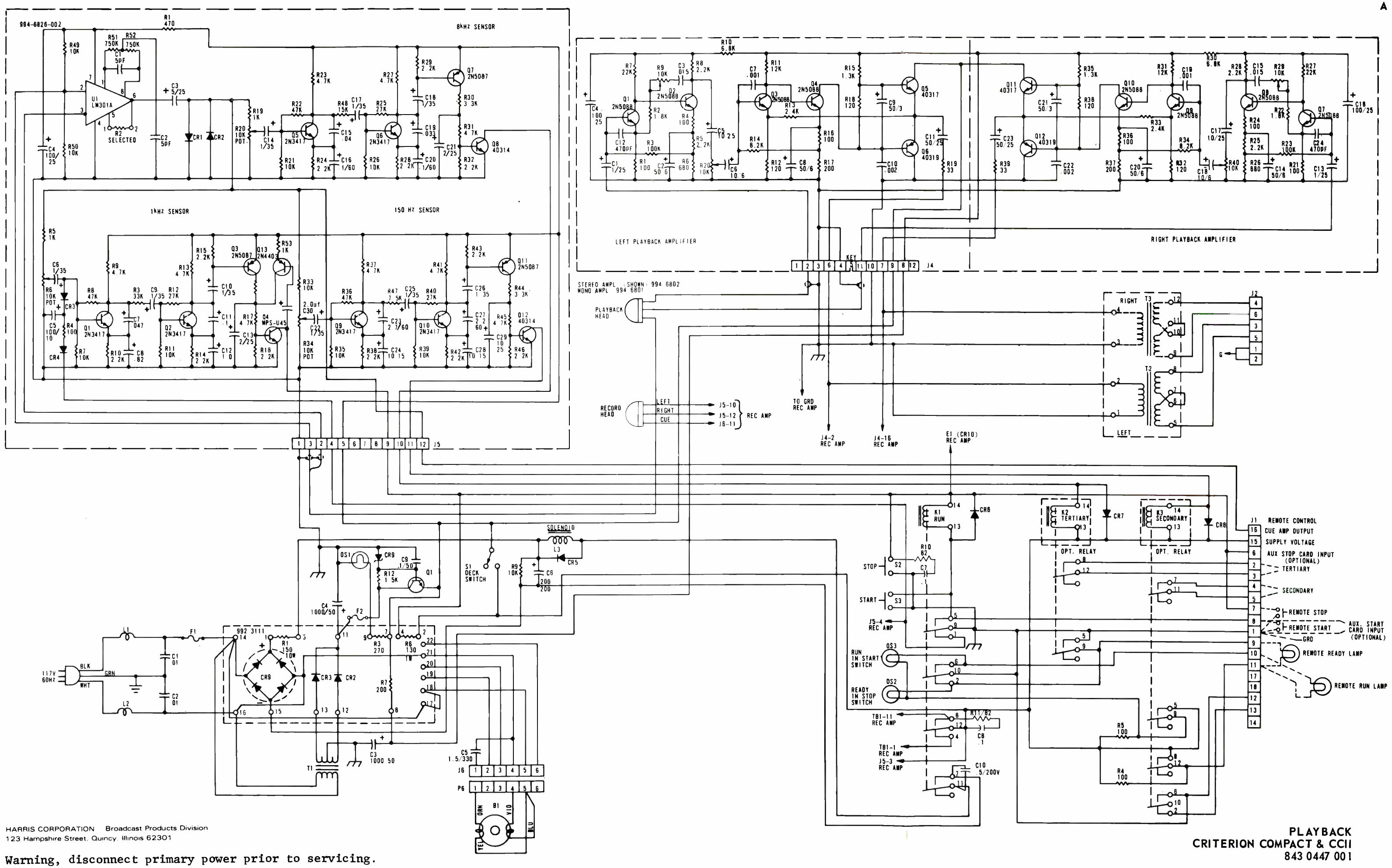
1651

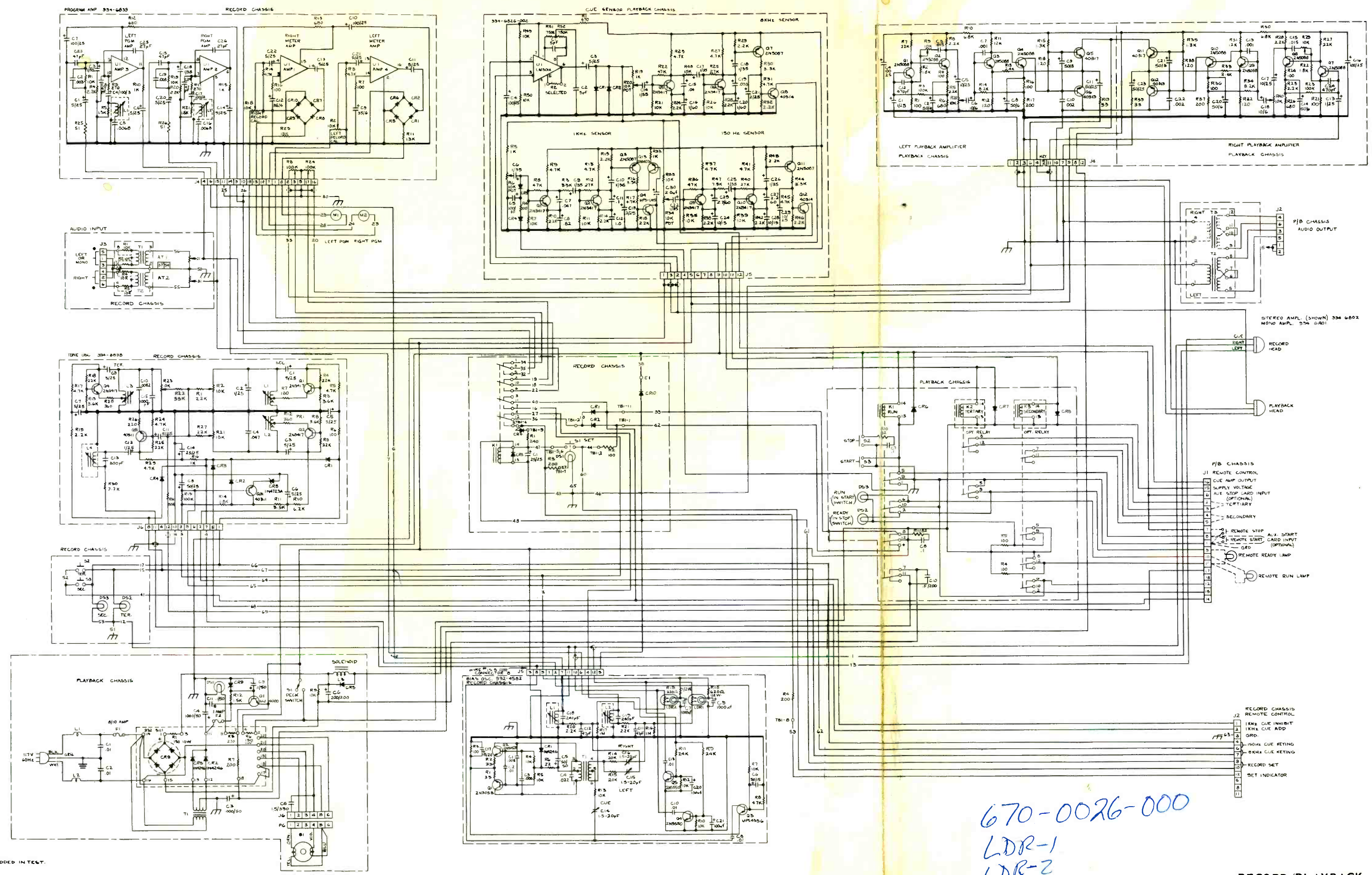
Warning, disconnect primary power prior to servicing.

SYMBOL	DESCRIPTION	GATES PART NO.
--	Case, Deskmount	938 5406 001
--	Rack Mounting Kit, 7 inch rack panel	994 7067 001
RC-II T	Remote Control with 60 Hz Timer	994 6913 001
RC-II T	Remote Control with 50 Hz Timer	994 6913 002
RC-II	Remote Control without Timer, 50/60 Hz	994 6912 001
--	Rubber Feet, Grey	424 0100 000
--	Plug, 6 pin, Latching. (Mates with J2-Playback, J3-Record Amp)	610 0482 000
--	Plug 18 pin, Latching. (Mates with J1-Playback)	610 0516 000
--	Plug, 12 pin Latching. (Mates with J2-Record Amp)	610 0484 000
--	Wing Head Screw	358 1066 000
--	Extender Card, 12 pin	915 0347 001

1651

Warning, disconnect primary power prior to servicing.


A
994-6826-002
8KHZ SENSOR
1KHZ SENSOR
150 HZ SENSOR
LEFT PLAYBACK AMPLIFIER
RIGHT PLAYBACK AMPLIFIER
STEREO AMPL SHOWN: 994 6802
MONO AMPL 994 6801
PLAYBACK HEAD
RECORD HEAD
LEFT
RIGHT
CUE
REC AMP
TO GRD REC AMP
J4-2 REC AMP
J4-16 REC AMP
E1 (CR10) REC AMP
J5-4 REC AMP
TB1-11 REC AMP
TB1-1 REC AMP
J5-3 REC AMP
SOLENOID
DECK SWITCH
STOP
START
RUN IN START SWITCH
READY IN STOP SWITCH
OPT. RELAY
OPT. RELAY
J1 REMOTE CONTROL
CUE AMP OUTPUT
SUPPLY VOLTAGE
AUX STOP CARD INPUT (OPTIONAL)
TERTIARY
SECONDARY
REMOTE STOP
REMOTE START
AUX. START CARD INPUT (OPTIONAL)
GRD
REMOTE READY LAMP
REMOTE RUN LAMP
117V 60HZ
BLK
GRN
WHT
REC
BLU
HARRIS CORPORATION Broadcast Products Division
123 Hampshire Street, Quincy, Illinois 62301
Warning, disconnect primary power prior to servicing.
PLAYBACK
CRITERION COMPACT & CCII
843 0447 001



670-0026-000
LDR-1
LDR-2

1. 0 - CAPACITOR MAY BE ADDED IN TEST.
NOTES:

HARRIS CORPORATION Broadcast Products Division
123 Hampshire Street, Quincy, Illinois 62301

Warning, disconnect primary power prior to servicing.

RECORD/PLAYBACK
CC-II
852 7896 001

WARRANTY

Seller warrants new equipment manufactured by Harris Corporation, Gates Broadcast Equipment Division against defects in material or workmanship at the time for delivery thereof, that develop under normal use within a period of one year (6 months on moving parts) from the date of shipment, of which Purchaser gives Seller prompt written notice. Other manufacturers' equipment, if any, including electron tubes, and towers shall carry only such manufacurers' standard warranty.

Seller's sole responsibility for any breach of the foregoing provision of this contract, with respect to any equipment or parts not conforming to the warranty or the description herein contained, is at its option, (a) to repair or replace such equipment or parts upon the return thereof f.o.b. Seller's foctory within the period aforesaid, or (b) to accept the return thereof f.o.b. Purchaser's point of installation, whereupon Seller shall either (1) issue a credit to Purchaser's account hereunder in an amount equal to on equitable portion of the total contract price, without interest, or (2) if the total contract price has been paid, refund to Purchaser an equitoble portion thereof, without interest.

If the Equipment is described as used, it is sold as is and where is. If the contract covers equipment not owned by Seller at this date it is sold subject to Seller's acquisition of possession and title.

Seller assumes no respansibility for design characteristics of special equipment manufactured to specifications supplied by or on behalf of Purchaser.

Seller shall not be liable for any expense whether for repairs, replacements, material, service or otherwise, incurred by Purchaser or modifications made by Purchaser to the Equipment without prior written consent of Seller.

EXCEPT AS SET FORTH HEREIN, AND EXCEPT AS TO TITLE, THERE ARE NO WARRANTIES, OR ANY AFFIRMATIONS OF FACT OR PROMISES BY SELLER, WITH REFERENCE TO THE EQUIPMENT, OR TO MERCHANTABILITY, INFRINGEMENT, OR OTHERWISE, WHICH EXTEND BEYOND THE DESCRIPTION OF THE EQUIPMENT ON THE FACE HEREOF.

RETURNS AND EXCHANGES

Do not return any merchandise without our written approval and Return Authorization. We will provide special shipping instructions and a code number that will assure proper handling and prompt issuance of credit. Please furnish complete detoils os to circumstances and reasons when requesting return of merchandise. Custom built equipment or merchandise specially ordered for you is not returnable. Where return is at the reauest of, or for the convenience of the customer, a restocking fee of 15% will be charged. All returned merchandise must be sent freight prepaid and properly insured by the customer. When writing to Harris Corporation, Gates Broadcast Equipment Division about your order, it will be helpful if you specify the Harris/Gates Factory Order Number or Invoice Number.

WARRANTY ADJUSTMENTS

In the event of equipment failure during the warranty period, replacement or repair parts may be provided in accordance with the provisions of the Harris/Gates Warranty. In most cases you will be required to return the defective merchandise or part to Harris/Gotes f.o.b. Quincy, Illinois for replacement or repair. Cost of repair parts or replacement merchandise will be billed to your account at the time of shipment and compensating credit will be issued to offset the charge when the defective items are returned.

MODIFICATIONS

Harris/Gates reserves the right to modify the design and specifications of the equipment shown in this manual without notice or to withdraw any item from sale provided, however, that any modification shall not adversely affect the performance of the equipment so modified.

DAMAGES AND RISK OF LOSS

Purchaser assumes all responsibility for and risk of loss of, or domage to, the Equipment upon delivery at Seller's shipping point, notwithstanding the fact that Seller may have selected the carrier.

In no event shall Seller be liable under any provision of this contract for loss of business or of anticipated profits by Purchaser, outlays by Purchaser in anticipation of business, other incidental or consequential damages on account of negligence.

Purchaser agrees to indemnify Seller against all claims, whether on account of negligence or otherwise, except those asserted by Seller's employees, arising out of or resulting from the erection, operation or use of the Equipment.

WARRANTY

Seller warrants new equipment manufactured by Harris Corporation, Gates Broadcast Equipment Division against defects in material or workmanship at the time for delivery thereof, that develop under normal use within a period of one year (6 months on moving parts) from the date of shipment, of which Purchaser gives Seller prompt written notice. Other manufacturers' equipment, if any, including electron tubes, and towers shall carry only such manufacurers' standard warranty.

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