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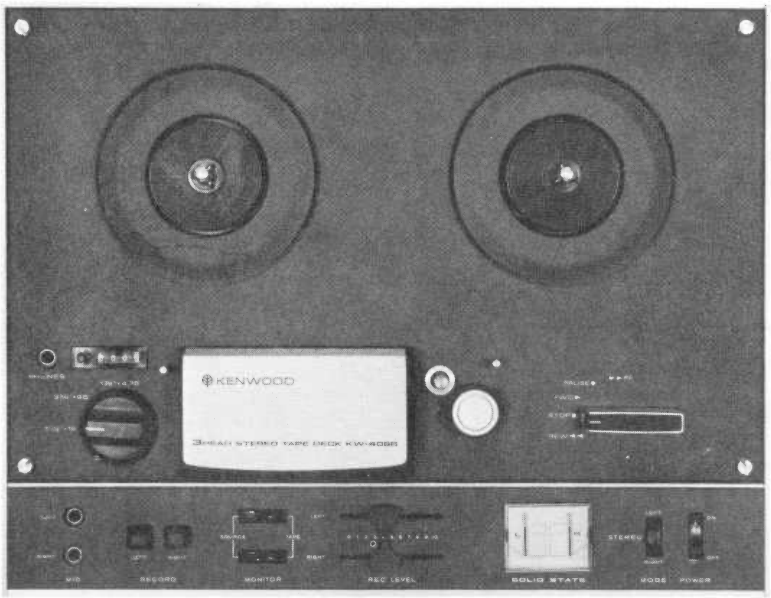
KENWOOD

HI/FI STEREO COMPONENTS

SERVICE MANUAL

KW-4066



3 HEAD SOLID STATE STEREO TAPE DECK

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INTRODUCTION AND SPECIFICATION

The KENWOOD model KW4066 Stereo Tape Deck is 1-motor, 3-heads, 3-speed, high-fidelity tape recorder. It provides facilities for recording and reproducing a tape on the 2-channel, stereo and monophonic modes of operation.

The stereo tape deck consists mainly of the separate systems of the recording and playback amplifiers and the biasing and erasing push-pull oscillators and a power supply. Its playback output may be calibrated by the potentiometer to 0 VU (0.775 V) with respect to the 0 VU signal of a standard tape and delivered through a low impedance 5 kΩ terminal to an amplifier.

The VU meter providing with independent amplifiers for the left and the right channels is operable with one channel without exerting any effect to the other channel.

The headphones circuit, as shown in the schematic diagram, feeds an output of approx. 30 mV to the headphones (as a load of 8 Ω).

The circuit is so designed that it provides a frequency response which is equivalent to that of the line output jacks.

As to the tape transport mechanism, the supply and take-up reels are driven from a 4-pole, capacitor-start, non-vibration motor with a sufficiently large flywheel and, therefore, is capable to give a substantially small value of wow and flutter.

The brake used is a simple block type, which feature easy adjustment of braking time. This prevents the tape from such trouble as loosened or irregularly expanded tape.

The major specifications of this tape deck are as listed below.

TAPE SPEED

7-1/2 ips. (19 cm/s)
3-3/4 ips. (9.5 cm/s)
1-7/8 ips. (4.75 cm/s)

FREQUENCY RESPONSE (OVERALL)

25 ~ 20,000 Hz at 7-1/2 ips.
25 ~ 12,000 Hz at 3-3/4 ips.
25 ~ 6,000 Hz at 1-7/8 ips.

SIGNAL-TO-NOISE RATIO (OVERALL)

50 dB or more at 7-1/2 ips.

Note:
Although there are various methods available for measurement of the signal-to-noise ratio, the values given above are those obtained in accordance with the following method.
A recording tape demagnetized completely is loaded on the tape deck. Then, the deck is operated to record the reference recording level of 1 kHz on the tape (0 VU recording) and then a noise level with the 1 kHz signal disconnected.
Upon completion of the recording, the tape is rewound and played back while observing their output levels in voltage. Here, the level of the 1 kHz signal is referred to the noise level (that is the level recorded with no signal input) and the ratio thus obtained is the one shown above.

The above method makes it possible to measure an overall noise, which includes reproduce bias, erase and record amplifier noises, to the signal and, therefore, may be said the most practical method for the signal-to-noise measurement.

WOW AND FLUTTER

0.15% rms or less at 7-1/2 ips.
0.25% rms or less at 3-3/4 ips.

In the wow and flutter measurement, the tape deck shall be placed in the horizontal position with the reels positioned top side. The test frequency shall be 0~250 Hz.

PLAYBACK TIME USING 7-INCH REEL (1,200 feet tape)

	Speed deviation
32 minutes at 7-1/2 ips.	±2%
64 minutes at 3-3/4 ips.	±2%
96 minutes at 1-7/8 ips.	±3%

OPERATING CONTROLS

The electrical and mechanical controls of this tape deck are all arranged on the front panel.

FWD, STOP, RWD, F.FWD, PAUSE

The five tape motions; FWD, STOP, RWD, F.FWD and PAUSE are selected by means of the control lever, a large switch located at the lower right side of the front panel.

The control lever is normally placed in the STOP position. From this position, it may be turned clockwise to the FWD, PAUSE and F.FWD positions in order and also counterclockwise to the RWD position.

In setting this control to a desired position, slowly and securely turn the control from a position to another lest it should be slipped over a position to the next.

It should be noted that this control is interlocked with the RECORD buttons, the SPEED selector, MUTING switch, etc. described later.

FWD

This is the position of the control lever for forwarding the tape under control of the speed selector. This position is available for both the playback and recording. In either case, the muting switch is turned off. For recording a tape, set the control lever at FWD while pressing the RECORD buttons (the left and right buttons for stereo recording, either the left or the right button for monophonic recording).

PAUSE

This is the position of the control lever for temporarily making the tape stationary during recording or playback to provide a pause for editing the tape and others. Under recording using this position, the RECORD buttons (or button) remain locked in the pressed position and allow the tape deck to continue recording as soon as the control lever is set to FWD again.

F.FWD

This is the position of the control lever for forwarding the tape from the supply reel to the take-up reel at a high speed. Operating this fast forwarding time, the RECORD buttons (or button) are released to normal from their locked position.

When it is desired to move the control lever from this position to the STOP, the control should be slowly and securely turned from one position to another until it is placed in the STOP position.

RWD

This is the position of the control lever for rewinding the tape from the take-up reel to the supply reel (at a high speed). During this rewinding time, the RECORD buttons are released to normal just in the same manner as in the F.FWD.

AUTOMATIC SHUT-OFF SWITCH

The automatic shut-off switch is a micro-switch connected to an actuator provided in the head cover at the left side of the erase head.

This switch is forcedly placed by the actuator in the ON position when the tape keep threaded on the tape transport. The switch is kept on by the actuator during the time when the tape is kept threaded on the tape transport and automatically turned off so shut off the motor supply as soon as the tape is run out of a reel.

Note that the above-mentioned actuator is so designed that it is damped appropriately with silicone grease and offer no trouble to tape run.

TAPE SPEED SELECTOR

Change of tape speed can be performed by the tape speed selector, a round knob located at the lower left side of the front panel. The tape speed selector, however, is interlocked with the control lever mentioned previously. So, it can not be operated when the tape motion control is in the FWD, PAUSE and F.FWD position.

This selector, operating with the playback or record equalization designed so as to be automatically coupled to it to set up for operation, provides means to select any desired speed among 3 tape speeds 7-1/2, 3-3/4 and 1-7/8 ips. depending on the purpose.

To select a desired tape speed, turn the tape speed selector with the control lever set at STOP until the white line of the selector aligns correctly to the desired position with a click.

TAPE COUNTER (with Push-Button Reseter)

The tape counter is of the four-digit. It is mounted on the front panel above the tape speed selector. It is driven by a worm gear, which in turn is connected to the spindle of the supply reel.

ELECTRICAL CONTROLS

Electrical controls of this tape deck other than the sound-on-sound switch/volume control are all arranged below the upper front panel.

POWER SWITCH

This is a seesaw switch located on the lower front panel at the extreme right side.

Pressing the upper section of this seesaw switch with white line turns the tape deck on and lights the pilot lamp within the level meters.

RECORD BUTTONS

The RECORD buttons are the red-plastic square push-button switches marked RIGHT and LEFT, located on the lower front panel at the left side.

Pressing the RECORD buttons or button for the channels to be record (the RIGHT and LEFT buttons for stereo recording, or the RIGHT or LEFT button for right or left channel recording) lights the RECORD indicator lamps located above the buttons and under the panel to indicate that the channels concerned are placed in the recording condition. (Note, however, that the recording level should be adjusted appropriately prior to pressing the RECORD buttons.)

The RECORD buttons are not locked in their pressed position and released to normal, or the playback position, unless they should be kept pressed until the control lever is set to the FWD position. This acts as a sort of safety mechanism, which prevents a pre-recorded tape and others from being erased by mistake during its playback, and is automatically released when the control lever is placed in the positions other than FWD and PAUSE.

RECORDING LEVEL CONTROL

The recording control is a slider type control located on the lower front panel at the center section. It consists of the upper and lower controls, which provide means to independently control the recording levels of the microphone and line inputs for the left and the right channels respectively. But, when the microphone is employed, the line input is automatically opened from the record circuit and, therefore, the line input cannot be mixed with the microphone input.

Because of its slider type construction, this control is not only convenient to operate but also stylish.

RECORD INDICATOR LAMPS

The record indicator, provided above the RECORD buttons and under the lower front panel as described previously, automatically light to illuminate the RECORD buttons when the buttons are pressed. Accordingly, the LEFT or RIGHT RECORD button will be illuminated under the monophonic recording.

MONITOR SWITCHES

The MONITOR switches, located on the lower front panel at the left center section, are provided respectively for the left and the right channels and provide means to switch over the recording input and the playback output independently. These switches are used when it is desired to monitor the recording signal under recording and also to calibrate the recording input, etc.

The signal under recording may be monitored by comparing the signal heard before its recording to that reproduced after its recording as practiced by placing the MONITOR switch in the SOURCE position first and then in the TAPE position.

In order to calibrate the recording level, set the MONITOR switches to SOURCE and adjust the input signals to proper levels by means of the recording level controls mentioned previously. Then, proceed to recording.

VU-METERS

The VU meters assembled to a single unit are provided for this tape deck to insure more accurate recording and playback and this makes the deck demonstrate its supreme performance for distortionless recording.

The VU meters so designed that they are calibrated to meet the NAB standards in recording and playback and also, being provided with their exclusive amplifiers, exert a negligible effect to other circuits.

When the user intend to perform a distortionless recording, proceed to recording with the input signals set to the levels for which the VU meters deflect their needless just to the red zones of the meter scales at their peaks.

Note that these meters give the indication for the recording input or the playback output, as selected by means of the MONITOR switch.

MODE SWITCH

When playing back a stereo tape under the stereo mode of operation, place this MODE switch in center position STEREO and the left and right channels are operated as the independent channels with their exclusive amplifiers.

Also, when playing back a tape on which only the left or right channel signal is recorded, slide this MODE switch to upper position LEFT or lower position RIGHT and the left or right channel signal appear as both channel outputs.

INPUT AND OUTPUT CONNECTIONS

The input and output jack except the microphone and headphones jacks are arranged on the side panel.

MIC JACKS

MIC jacks marked LEFT and RIGHT, located in a row on the lower black KW-4066 panel at the extreme left side, provide for connection of the microphone inputs. These jacks have an opening measuring 6.35 mm (1/4") in diameter. They are also so designed that they match to the so-called high-impedance with an impedance on the order of 10 kΩ to 50 kΩ. And their sensitivities to the inputs are approx. 0.6 mV.

As to the impedance, these jacks may also be used without any trouble with the microphone having an impedance of 600 Ω.

LINE INPUT JACKS

The LINE INPUT jacks, mounted on the side panel, offer a high input impedance of approx. 100 kΩ, so that they can provide sufficient impedance to any input signal. These jacks are used for recording the signal having a level more than 100 mV, such as the outputs of AM and FM tuners and other pre-amplifier.

Accordingly, a tape head or magnetic cartridge which has a small output and requires some special equalization to provide a flat frequency response can not be connected to these line input jacks. But even a cartridge may be connected to these jacks provided that it is of the ceramic type, which requires no equalizing circuit specifically and has a substantially high output.

LINE OUTPUT JACKS

The LINE OUTPUT jacks, mounted on the side panel like the LINE INPUT jacks, provide for connection to the line inputs of the pre-amplifier and power amplifier. They offer an output impedance of approx. 5 kΩ.

The external amplifier to be connected to these output jacks should have an input impedance of at least 25 kΩ (generally, approx. 100 kΩ).

Note that model KW-4066 Stereo Tape Deck is so designed that its line output voltage is calibrated internally. Hence, adjustment to the line output voltage should be performed on the external amplifier connected. In making this adjustment, however, pay attention to the sensitivity of the external amplifier for its input lest the amplifier should generate distortion and hum noise.

SOUND-ON-SOUND SWITCH/VOLUME CONTROL

The sound-on-sound switch/volume control, the knob marked S.O.S. on the side panel, provides means to feed part of the sound signal reproduced in the left channel back to the input of the right channel for recording both the left and the right channel signals on the tape at the right channel. This control may be utilized mainly for training of the musics, etc.

Example: A duet performed by one person alone

First perform monophonic recording of a song in a loudtone with accompaniment on the tape at the left channel. Rewind the recorded tape once and then, while hearing the played back song of the left channel, record the same song in an undertone on the tape at the right channel simultaneously with the song in a loudtone. Adjust mixing degree of the songs in a loudtone and

undertone through the use of the volume control section of sound-on-sound switch/volume control S.O.S.

The above steps complete recording a duet performed by one person alone on the tape at the right channel.

STEREO HEADPHONES JACK PHONES

Stereo headphones jack, provided on the upper panel at the left side, provides means for plugging the stereo headphones. This jack is so designed that it matches to a headphones having an impedance of $4 \sim 16\ \Omega$.

The jack also provides a constant output voltage of approx. 30 mV (when terminated with a $8\ \Omega$ load) during playback of the 0 VU level signal. Its frequency response is just the same as that provided by the LINE output jack for the playback signal. Note that the stereo headphones jack is not operable with a high-impedance type with an impedance on the order of $10\ k\Omega$.

POWER REQUIREMENT

The model KW-4066 is so designed that it is operated normally from an AC 117, 60 Hz source. And its power consumption is approx. 40 watts under the above condition. As to variation of the power source voltage, model KW-4066 has tolerance of ±10%.

ADJUSTMENT OF ELECTRICAL CIRCUIT

Upon completion of its repairs, the model KW-4066 should be checked and adjusted about the electrical circuit.

The following is an outline for adjustment of the electrical circuit concerning the model KW-4066.

1-1 Measuring Sets

The measuring sets for adjustment and test of the model KW-4066 are generally as listed below.

a. Audio frequency oscillator
   Frequency range 20 ~ 20,000 Hz
   Output impedance 600 Ω
b. Vacuum tube voltmeter
   Full scale 1 mV
   Input impedance 1 MΩ or more
c. Oscilloscope
   Scale 5 inch
d. Distortion factor meter
   Shall provide facilities to measure a distortion factor down to −60 dB.
e. Head demagnetizer
f. Standard tape
   Ampex #31321-04 or its equivalent

1-2 General Cautions

a. Prior to its adjustment using the standard tape, it is necessary for the stereo tape deck to demagnetize the recording, the playback and the erase heads. This is intended to protect the standard tape against such danger that the higher frequency region of the signal recorded on the standard tape might be erased by the magnetized heads. As to demagnetizing the heads, refer to per. 1-3-1.
b. Never attempt to place the control lever in the FWD position with the motor unoperated. Otherwise, the tape deck may suffer from a deformed pinch and rubber rollers, which turn into a cause of irregular rotation of the rollers.
c. Don't change tape speed during the time when the tape transport mechanism is operated with the control lever set at FWD.
d. The metallic tools to be used for repairs and adjustments should be demagnetized beforehand. Use the non-metallic or non-magnetic tools, if possible.
e. Never allow the surface of each head (where the tape comes into contact with the head) to be scratched. Also, be sure that the heads are free from any stains at all times.

1-3 Adjustment of Playback System

1-3-1 Demagnetizing heads

When the stereo tape deck is to be operated with such a tape as the standard tape which fears erase of its recorded signal or introduction of external noise, its heads must be demagnetized beforehand. This is necessary because of the following fact:

It sometimes happens that the heads of a stereo tape deck are magnetized by the lines of magnetic force during the operation of the deck, thereby turning into permanent magnets with a small magnetic force. If the magnetized heads are operated with a tape, they record noise on the tape and it follows that the higher frequency region of the signal recorded on the tape is erased. This results in a damage of an important pre-recorded tape.

To demagnetize a head, proceed as follows:

First, turn the POWER switch off. With the control lever set at position STOP, connect the head demagnetizer to an AC line. Bring the tip of the demagnetizer close to the surface of the head core while taking care not to allow the tip to strike the head and scratch the surface of the head. Slowly move up and down the tip of the demagnetizer several times along the vertical gap of the core and then gradually bring away the demagnetizer from the head in such manner that the magnetic field due to an alternating current exerted to the head is reduced by degrees. If the head is demagnetized insufficiently, repeat the above steps.

1-3-2 Adjustment of head angle

a. Angle of elevation and height adjustment
   The model KW-4066 Stereo Tape Deck is shipped after its all adjustments are completed. So, it requires no readjustment. But, when a head is replaced, it becomes necessary to make adjustment of the height, angle of elevation and azimuth angle of the head in accordance with the tape guide pin. In general, the heads have different track widths. That is, the playback head has a track width 0.1 ~ 0.2 mm narrower than the record track width, while the erase head has a track width 0.2 ~ 0.5 mm wider than the record track width. The accuracy of these tracks is on the order of 1/100 mm. The adjustment of the angle of elevation and height of a head should be made as precise as possible to eliminate an improper erasing, unwanted crosstalk and unbalanced outputs. The above adjustment should be performed on each individual head, since the left and right tape guide pins are both fixed in position.
   Use of a small-sized chronometer screwdriver demagnetized is recommendable for easier performance of the above adjustment.
b. Azimuth adjustment
   Each head is so mounted that its angle of elevation, height and azimuth angle may be adjusted through adjustment of its three mounting screws, which fix the head in position. The azimuth adjustment of each head, erase and playback head making by means of the screw at the right side of the head, and record head making at the left, upon completion of the adjustment of the angle of elevation and height. Note here that the three screws for the head must be tightened uniformly in the height adjustment in order to have the head set

to the best point in the azimuth adjustment within the range corresponding to one complete turn of the adjusting screw. If the adjusting screw is turned two or three complete turns, then it becomes necessary to make readjustment of the height. The azimuth adjustment of a head may be performed at a tape speed of either 7-1/2 or 3-3/4 ips. In case of a tape speed of 7-1/2, adjust the head about its azimuth angle using the standard pre-recorded tape with the 15 kHz signal until the tape deck the maximum output.

For a tape speed of 3-3/4 ips., proceed just in the same manner as described above using the standard pre-recorded tape with the 7.5 kHz signal.

The output level of the tape deck in this adjustment can be read on the VU meters of the deck or on VTVM connected to the LINE OUTPUT jacks.

1-3-3 Measurement of output

To make measurement of the output, proceed as follows:

Terminate across the LINE OUTPUT jack with a pure 100 kΩ resistor and connect VTVM across the resistor.

Playback the 0 VU signal recorded on the standard tape under the above condition and check to see that the tape deck delivers an output of within 0 db (0.775 V) ±1 dB.

1-3-4 Playback frequency response and its adjustments

The playback frequency response of the tape deck shall be adjusted using the frequency check sections of the standard tape upon completion of the adjustment of the angle of elevation, height and azimuth of each head described above. To accomplish this adjustment, proceed as follows:

First, adjust the output of the tape deck using the initial 3 kHz signal (0 dB) recorded on the standard tape until the output falls in the range specified in par. 1-3-3. If the output fails to fall in the range, adjust playback output controls (VR107, VR108). Then, proceed to check of the frequency response starting with the next signal of 700 Hz (−10 dB). This may be accomplished as follows:

First, determine the reference level using the 700 Hz signal. Then, adjust the high frequency region time constant controls (VR109, VR110) until the tape deck delivers its output at the same level as the reference level for the 15 kHz (−10 dB) signal of the standard tape. Here, take the readings of the output levels of the frequency signals of the standard tape playback in order and plot them on a sheet of paper to obtain a frequency response curve.

1-3-5 Standard recording level adjustment

Feed a 1 kHz (−10 dB) signal to the line input, and adjust the recording volume control so that the output voltage in the record/playback operation will be 0 dB (0.775 V). If the right and left volume controls are found out of alignment, adjustment should be made by turning with VR103 and VR104.

(Make sure that both VR103 and 104 have a minimum of 10 dB volume margin.)

During the reproduction of the 15 kHz signal mentioned above, pay sufficient attention to a drop out and level variation lest the output levels should be too raised for the recorded signals at the higher frequency region.

1-3-6 Calibration of playback meters

The playback meters may be calibrated properly when they are adjusted in such manner that they give a 0 VU indication when the 0 VU signal of the standard tape is reproduced.

To accomplish the above adjustment, adjust the semi-fixed variable resistors (VR111, VR112) until the meters read 0 VU while playback the 0 VU signal recorded at the final section of the standard tape for reproduce gain calibration.

Note that the meters deflect to the joints of the red and blue scale lines to indicate the 0 VU.

1-3-7 Signal-to-noise ratio measurement during playback

The signal-to-noise ratio during playback may be measured through the use of the 0 VU signal recorded at the final section of the standard tape for signal-to-noise ratio measurement. To accomplish this, proceed as follows:

With VTVM connected to the LINE OUTPUT jack, playback the above-mentioned 0 VU signal and take the reading of the output signal voltage from the voltmeter. Then, run a tape with no recorded signal under the playback mode of operation and take the reading of the output from the voltmeter. Take a ratio of the former reading to the latter and it gives the signal-to-noise ratio desired. Note that, in making the above adjustment, it is a general practice to use an auditory correction circuit based on the NAB standard. But, the measurement may be performed without the correction circuit provided that there is no need of using such circuit (The difference of the levels obtained with and without the auditory correction circuit is approx. 3 dB).

Note:
In the adjustment mentioned above, the MONITOR switch should be placed in the TAPE position and the MODE switch in the STEREO position before proceeding to the adjustment and measurement operations.

1-4 Adjustment of Record System

The adjustment of the record system may be generally classified into two types, the bias and the record equalization adjustments. But, these two adjustments are correlated to each other and, therefore, must be performed with the utmost care.

As a preliminary operation, this adjustment requires to make the azimuth adjustment of the record head completely. To accomplish this, record a signal with a

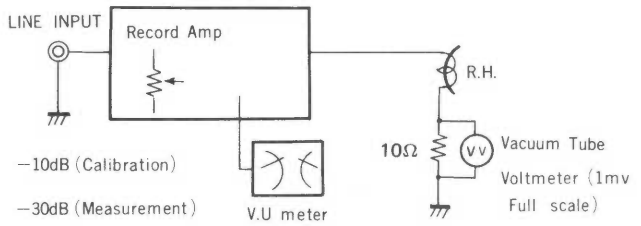
frequency as high as 15 kHz on a tape at a tape speed of 7-1/2 ips. and adjust the adjusting screw at the left side of the record head until the tape deck provides the maximum playback output. Then, fix the adjusting screw in that position.

1-4-1 Adjustment of record equalization

The adjustment of a record equalization requires to perform the following preliminary operations:

First, disconnect the green lead wire from pin No. 10 on the power supply oscillator board (UA1010K) to disable the oscillator under the recording condition. Then, with VTVM connected across a pure 10 Ω resistor inserted to the recording circuit at the earth side of the record head, measure the current flowing through the head and adjust EQ coils L101 and L102 so that the peak frequency is 12.5 kHz at a speed of 3-1/4 ips. Next, adjust VR105 and VR106 so that the output level of 15 kHz shows an increase of 12 dB over than of 1 kHz. As to the input, apply the 1 kHz (−10 dB) signal to the LINE INPUT jacks and adjust the REC LEVEL controls until the VU meters deflect to 0 VU while pressing the RECORD buttons. In this case, the MONITOR switch should naturally be placed in the SOURCE position.

Then, attenuate the input signal further by 20 dB and check the frequency response of each frequency. This is intended to prevent the signal voltage from saturating the equalizer at the peak of the equalizer characteristic curve.



Peak values are approx.: 17 kHz at 7-1/2 ips.
6 kHz at 1-7/8 ips.

1-4-2 Bias adjustment

In general, the bias of a tape recorder depends on the tape employed. But, it is often determined with respect to the output level of the 1 kHz signal.

The model KW-4066 uses adjustment of the record and playback frequency responses for this bias adjustment by making use of such fact that the bias current affects the higher frequency of the record frequency response greatly compared with the lower frequency. In other words, the bias adjustment is performed in such manner as described below.

First, with the 1 kHz (−10 dB) signal input applied to the LINE INPUT jacks, adjust the REC VOLUME controls until the VU meters indicate 0 VU. Then, lower the input signal level further by −20 dB. Thus, apply the input signal having a total level of −30 dB to the LINE INPUT jacks, and proceed to recording. (The tape used with the model KW-4066 is the Scotch #150 (3M) as a rule. Therefore, it is desirable to use the Scotch #150 (3M) for this adjustment, if possible.)

First, adjust the bias voltage adjustment semi-fixed controls (VR201, VR202) until the 10 kHz signals provide the same levels as that provided by the 1 kHz signals. Since adjustment of these controls vary the output level for the 1 kHz signal, the above adjustment should be performed twice or three times repeatedly.

When the tape deck has been adjusted so as to provide the same output levels for the 1 kHz and 10 kHz signals, sweep the input signal from 10 kHz to approx. 25 kHz and check to see that the frequency response is free from a hump or trough along its curve. If the response curve produce a hump around 15 kHz, adjust the potentiometer VR105, 106.

The adjustment described above concerns with the tape speed of 7-1/2 ips. But, the deck is automatically set to the frequency response curves for other tape speeds only by changing the tape speed. So, check the frequency response curves for other tape speeds for cautions sake.

If the response for the tape speed 3-3/4 ips. is not normal, then repeat adjustment of bias voltage adjustment semi-fixed controls VR201 and VR202 at 7-1/2 ips. and set the controls at the points where the responses at tape speeds 7-1/2 and 3-3/4 are compromized to each other.

It goes without saying that the MONITOR and MODE switches should be placed in the TAPE and STEREO positions respectively in this adjustment.

Note, as mentioned at the beginning of this paragraph, that the frequency response described above more or less differs depending on the tape employed with the tape deck.

Note:
In general, the bias adjustment shall be made as described below.
Set up the tape deck so as to record an input signal with a given frequency (normally 1 kHz).
Gradually increase the bias current under the above condition until the output assumes the maximum value. Then decrease the input. The biasing point at which the output assuming the above maximum value is decreased by 1 dB owing to the bias deepened further, is used as a standard for setting the operating bias.
The model KW-4066 is naturally set around the above-mentioned operating bias when it is adjusted in accordance with the adjustment procedure described above.

1-4-3 Calibration of recording meters

To calibrate the recording meters, proceed as follows:

With the tape speed selector set at 7-1/2 ips. position, record the 1 kHz, 0 VU signal. Adjust bias voltage adjustment semi-fixed controls VR101 and VR102 under the above condition until the record system meters give the 0 VU indications for the MONITOR switch placed in the SOURCE and TAPE positions.

Turn the MONITOR switch to the TAPE position and record the 1 kHz (−10 dB) signal applied to the LINE INPUT jacks.

Adjust the REC LEVEL controls until the meters read playback outputs of 0 dB. (The VU meters should have been so adjusted in the calibration of the playback system meters that they indicate 0 dB at this time.)

Then, with the MONITOR switch set at SOURCE, adjust the semi-fixed controls VR101 and VR102 until the meters read 0 VU.

1-4-4 Record/playback signal-to-noise ratio

Record the 1 kHz (−10 dB) signal applied to the LINE INPUT jacks and adjust the REC LEVEL controls until the VU meters, read playback outputs of 0 dB.

Then, disconnect the input signal from the LINE INPUT jacks under the above condition and measure the noise voltage. Assume this voltage to be 0 dB and then calculate the ratio of the 0 dB output in the former measurement to this 0 dB voltage. And the ratio thus obtained gives the record/playback signal-to-noise ratio.

The above measurement is a simple method for the record/playback signal-to-noise ratio and, therefore, sometimes yields the signal-to-noise ratio a little worse than the true value owing to a leaked HF bias signal. As to the normal measurement, refer to INTRODUCTION AND SPECIFICATIONS, signal-to-noise ratio.

1-4-5 Measurement of record/playback distortion factor

This measurement may be completed if the distortion factors for all frequencies at each input level are measured. But, it is rather difficult to measure the proper values of distortion factor because of irregular rotation of the tape deck. This, therefore, makes it necessary for this adjustment to employ an automatic distortion factor meter with a certain pass band.

Note:
The distortion factor on the order of 2 ~ 2.5 % obtained through the use of an ordinary distortion factor meter may be reduced to below 1 % if the above-mentioned automatic distortion factor meter is used, because the latter is capable of eliminating the error due to the irregular rotation of the tape deck.

1-4-6 Measurement of wow and flutter

The wow and flutter is a rotational phenomenon generated by the periodical variation of tape speed. The rotational phenomenon with relatively rapid period of its variation is referred to as the flutter and that with slow period of its variation is referred to the wow. The tape recorder/playback is frequently subjected to the flutter, which may be measured using a standard rotational irregularity meter. The wow and flutter appears less with faster tape speed. For this reason, it is desirable to record the musics, which is liable to subject to remarkable wow and flutter, at a speed as quick as possible.

In case of recording speeches, for which the rotational irregularity does not come to the front, the slower tape speed may be utilized.

1-5 Electrical Data

1-5-1 Table of voltages and currents of components

	Base voltage	Collector voltage	Emitter voltage	Collector current
Q101, 102	0.8V	2.5V	0.16V	0.37mA
Q103, 104	2.5V	8.4V	1.9V	1.9mA
Q105, 106	4.1V	9.4V	3.5V	3.6mA
Q107, 108	1.2V	2.4V	0.6V	0.22mA
Q109, 110	2.4V	5.3V	1.7V	0.8mA
Q111, 112	0.94V	7.2V	0.3V	2.6mA
Q113, 114	16.0V	21.1V	15V	7.4mA

■ DISASSEMBLY TAPE TRANSPORT MECHANISM

The model KW-4066 consists of the following three major components:

1. Tape transport mechanism
2. Electrical amplifier chassis
3. Wooden cabinet

2-1 Removal of Front Panel

A. Remove the set screws in the four corners of the panel.

Note:
Use a screwdriver with a wide tip in order to prevent the screw from being scratched.

B. Pull the head covers upward from their positions.
C. Remove the (+) screw within the head covers.
D. Remove the control lever.
E. Remove the tape speed selector.
F. Remove the REC-LEVEL controls.
G. Unscrew and remove the PINCH ROLLER.

2-2 Removal of Cabinet

A. Place the tape deck bottom side up and remove the (+) screws in the four corners.
B. Slowly remove the cabinet from the chassis while taking care not to allow the power cable to catch the cabinet.

2-3 Removal of Capstan Sleeve and Pinch Roller

A. Remove screw on the pinch roller. Then, remove the pinch roller.
B. Remove the screw on the capstan center. Remove the capstan sleeve.

2-4 Removal of Head Assembly

A. Remove the head covers.
B. Remove the 6 lead wires from the heads.
C. Remove the 3 screws within the head groove. (Be careful not of missing the 3 springs one each of which is provided under each screw.)

2-5 Removal of Automatic Shut-off Switch

A. Remove the front panel.
B. Disconnect two lead wires and capacitor C402.
C. Remove the 2 screw locked in position with paint.

Note:
As to adjustment after replacement of this switch, refer to Chapter 4.

2-6 Removal of Supply Reel Holder Disc

A. Remove part 24-07-11.
B. Remove 4 mm E washer from the spindle.
C. Lift up the reel holder disc while removing the belt for the tape counter.

2-7 Removal of Tape Counter

A. Remove part 25-12-13 while taking care not to allow the balls under the part to bounce out.
B. After removing the belt, remove the 2 screws at the rear side of the counter. Remove the counter.

2-8 Removal of Main Idler

A. Set the tape speed selector at position 7-1/2 ips.
B. Remove the 4 mm E washer from the top section of the idler. Lift up the idler from its shaft.

Note:
Pay attention not to allow any oily material to be applied to the rubber section. If applied, clean the oily material off from the rubber section using appropriate solvent.

2-9 Removal of Take-up Reel Holder Disc

A. Remove part 24-07-11 (right side).
B. Remove the E washer from the spindle.
C. Remove the reel holder disc upward while removing the belt.

2-10 Disassembly of Main Brake

A. Remove the two screws holding parts 24-11-14 and 24-11-02, 24-11-03 together. (Locked in position with the nut through a washer and collar).
B. Remove spring 24-11-81 connecting between the right and left brake arms.
As to adjustment after mounting the main brake, refer to Chapter 4, par. 3-1.

2-11 Removal of Flywheel

A. Remove the capstan sleeve and pinch roller in accordance with par. 3-3.
B. Remove part 25-01-01 after unscrewing 5 screws.
C. After removing the belt, remove the flywheel downward from part 25-03-01.

2-12 Removal of VU Meters

A. Remove the front panel.
B. Disconnect six lead wires soldered to the rear side of the VU meters. Lift the meters upward. When replacing the meters, pay attention to the polarities of the lead wire.

2-13 Removal of REC LEVEL Controls

A. Remove the front panel.
B. Remove 2 setscrews from each control.
C. Disconnect the 3 lead wires connected to each control at the bottom. Pull the controls downward.

2-14 Removal of MIC Jack

A. Remove the front panel.
B. Remove part A-5093 by means of the screw provided

at the left side.

C. Disconnect the lead wires soldered from the jack and remove the jack from part A-5093.

2-15 Removal of RECORD Switch

A. Remove the front panel.

B. Disconnect the lead wires soldered from the RECORD Switch.

C. Pull the RECORD button out.

D. Remove 2 screws at the both sides of the square RECORD buttons opening.

E. Remove the switch while taking care of not missing the collar attached.

ADJUSTMENT OF TAPE TRANSPORT MECHANISM

3-1 Main Brake

1. Adjust the catch angle of the brake lever to the reel holder disc in such manner that the right-hand brake exerts its braking forces of 2 : 1 to the disc rotating clockwise and counterclockwise and that the left-hand brake exerts its braking forces of 1 : 2 to the disc rotating clockwise and counterclockwise, respectively.
2. Adjust the reel and the brake lining until a gap of approx. 0.5 mm is provided between them.
3. Adjust the brake slide and the brake lever until a gap of 1 mm is provided between them.

Note:
Clean the reels and the linings so as to prevent adhesives from being applied to them.

3-2 Take-up Torque

Adjust the take-up torque by adjusting the strength of the spring engaged with the push-up lever on the take-up holder disc. That is, adjust the torque by bending that portion of the spring which engages with the lever. Adjust the spring so that it exerts a take-up torque of 200 g·cm ± 20 % to the lever at the tape speed of 7-1/2 ips.

The measurement of the take-up torque shall be made as follows:

Connect a fan type tension gauge with a full scale of 100 g to the take-up reel and measure the tension exerted to the gauge at the tape speed of 7-1/2 ips. Multiply the measured value by the radius of the tape roll loaded on the take-up reel at that time and the resultant product gives the take-up torque.

3-3 Back Tension

1. As the left side back tension, apply a friction torque of 150 g·cm ± 20 % to the supply reel holder disc by the back tension brake arm.
2. As the right side back tension, apply almost the same friction torque as that applied to the left side to the take-up reel holder disc.

3-4 Pinch Roller Contact Pressure

Adjust the screw attached to the pinch roller lever spring until the pinch roller provides a contact pressure of approx. 1.2 kg.

3-5 Thrust of Flywheel

Adjust the thrust of the flywheel by inserting a nylon washer between the wheel and metal. The wheel shall provide a specified thrust of 0.5 mm or less.

3-6 Equalizations Changeover Lever

With the tape speed selector set at position 3-3/4 ips., align the center of the lever to the switch position and fix the lever at position with screws.

3-7 Automatic Shut-off Switch

Adjust the 2 screws on the tape motion control until the control is synchronized with the automatic shut-off switch. Also, adjust the silicon grease applied to the actuator shaft to set the operating time of the shut-off switch appropriately.

3-8 Reel Holder Disc Thrust

Adjust the reel holder disc thrust through adjustment of the screw attached to the metal fittings engaging with the bottomside of the reel shaft bearing. The play thus provided shall be 0.2 mm or less.

3-9 Parallelism of the Pinch Roller to the Capstan

If the pinch roller fails to provide a parallelism to the capstan, correct the pinch roller shaft while taking care not to scratch the shaft.

3-10 Height of Motor Pulley

Adjust the height of the motor pulley in such manner that the lower part of the speed change idler does not engage with the edge of the motor pulley when the idler is brought in contact with the pulley at all speeds.

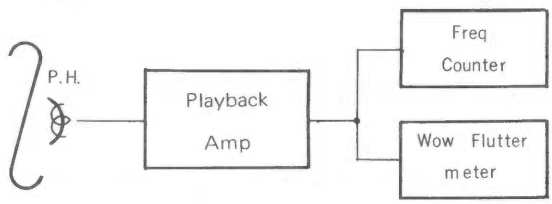
Note that if the height of the pulley is adjusted at the tape speed of 3-3/4 ips., then the height for other speeds will be automatically set by the pulley itself.

3-11 Appendix Block Diagrams for Stereo Tape Deck Measurement

1. Tape speed and wow and flutter

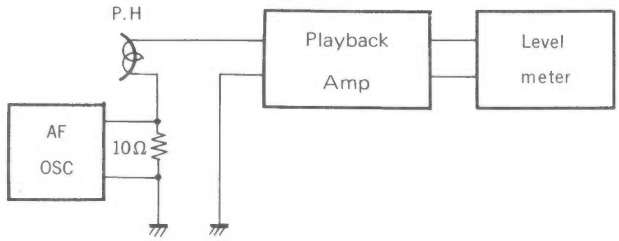
$$\text{Error (\%)} = \frac{f_1 - f_0}{f_0} \times 100$$

f_0 = Record signal frequency of the test tape.
f_1 = Frequency of the signal reproduced from the test tape.

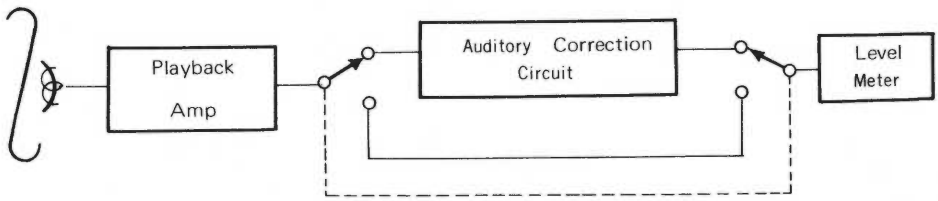


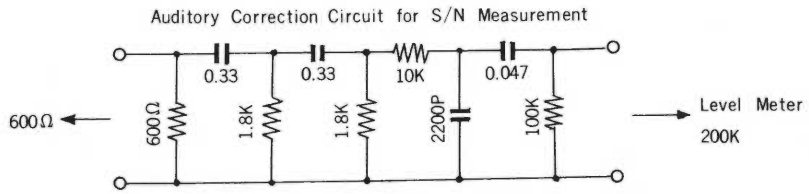
2. Measurement of playback amplifier gain and equalization characteristic

All frequencies at a level of −50 dB are used for measurement of equalizer characteristic.

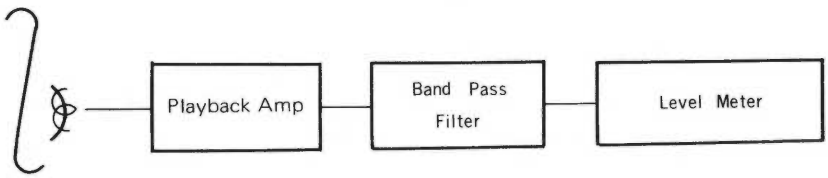


3. S/N ratio

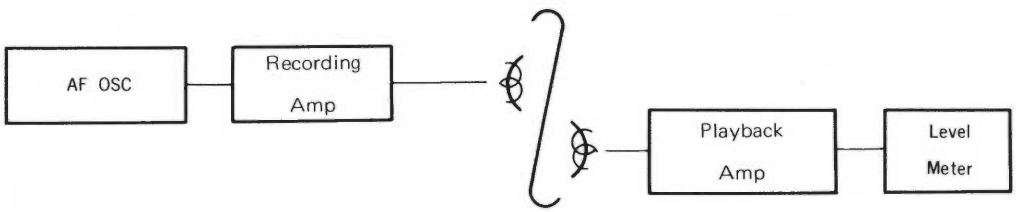




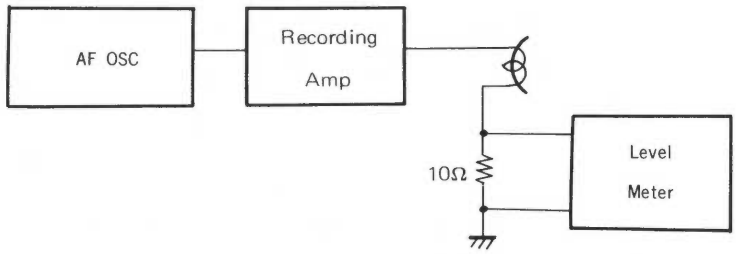
4. Crosstalk (playback)



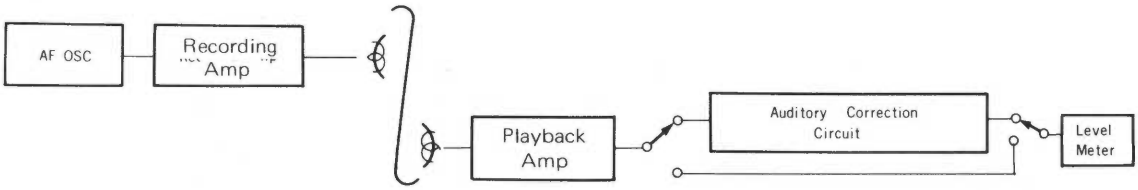
5. Record/playback frequency response



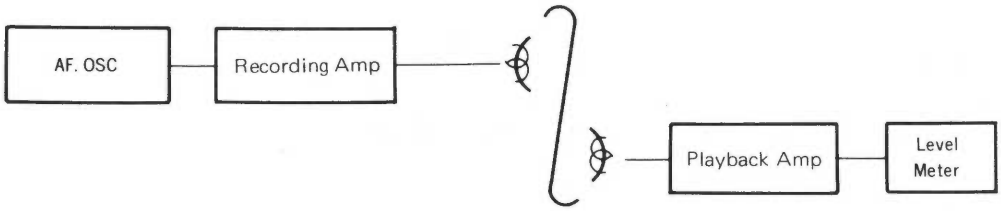
6. Recording amplifier equalizer characteristic



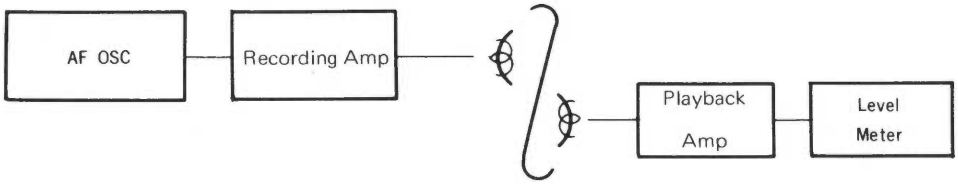
7. Record/playback S/N ratio



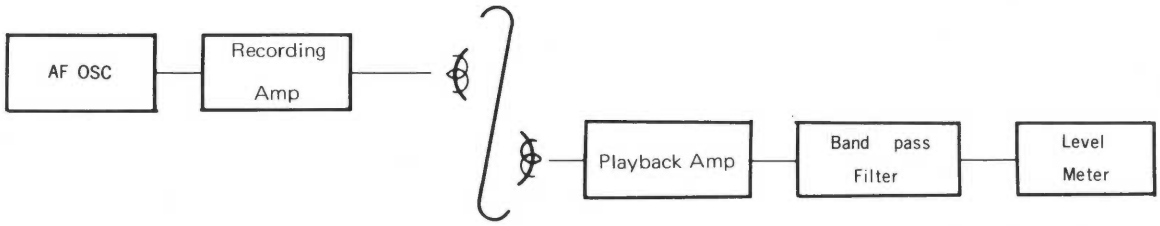
8. Record/playback crosstalk



9. Record/playback distortion factor



10. Erasing

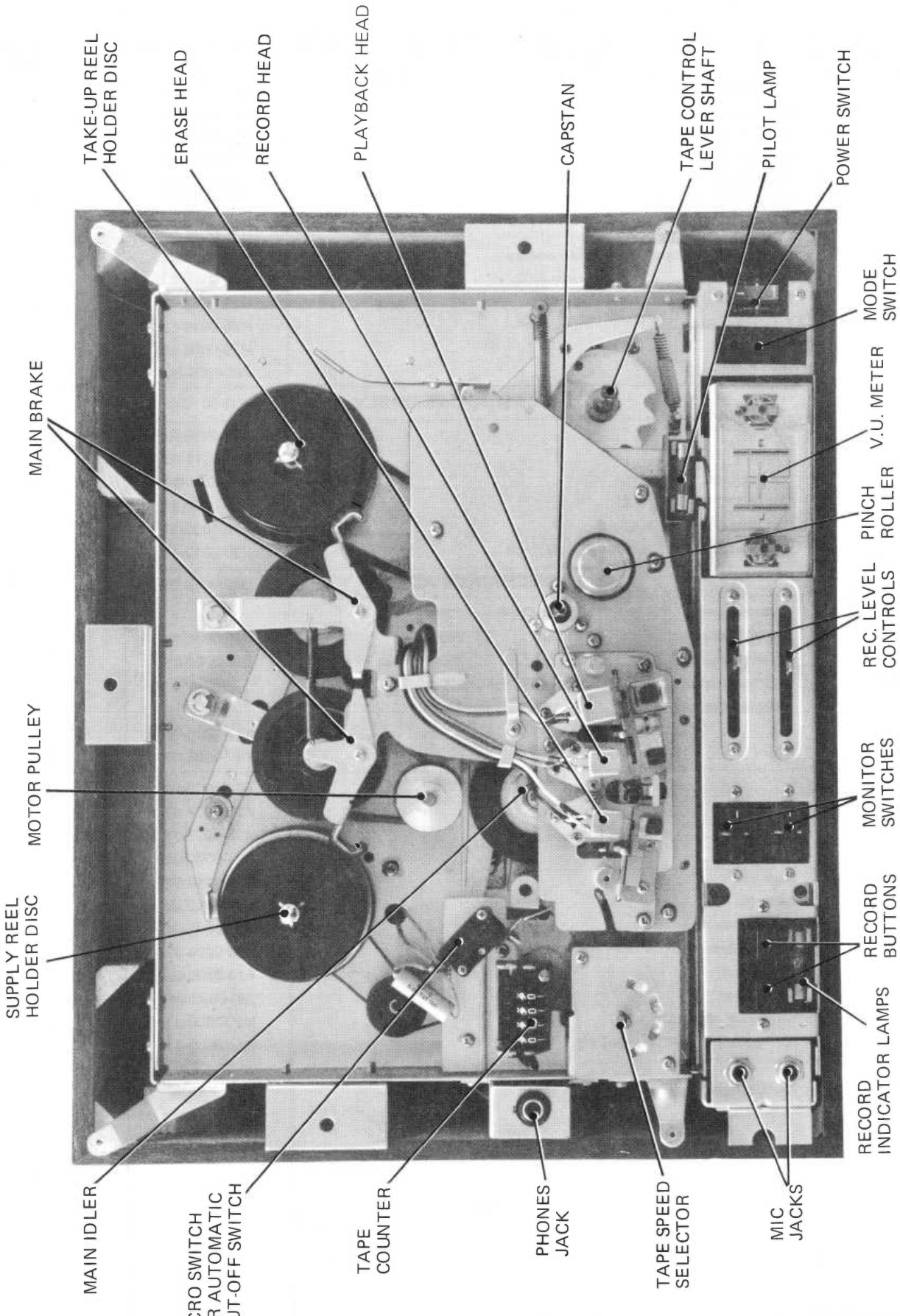


PARTS LIST

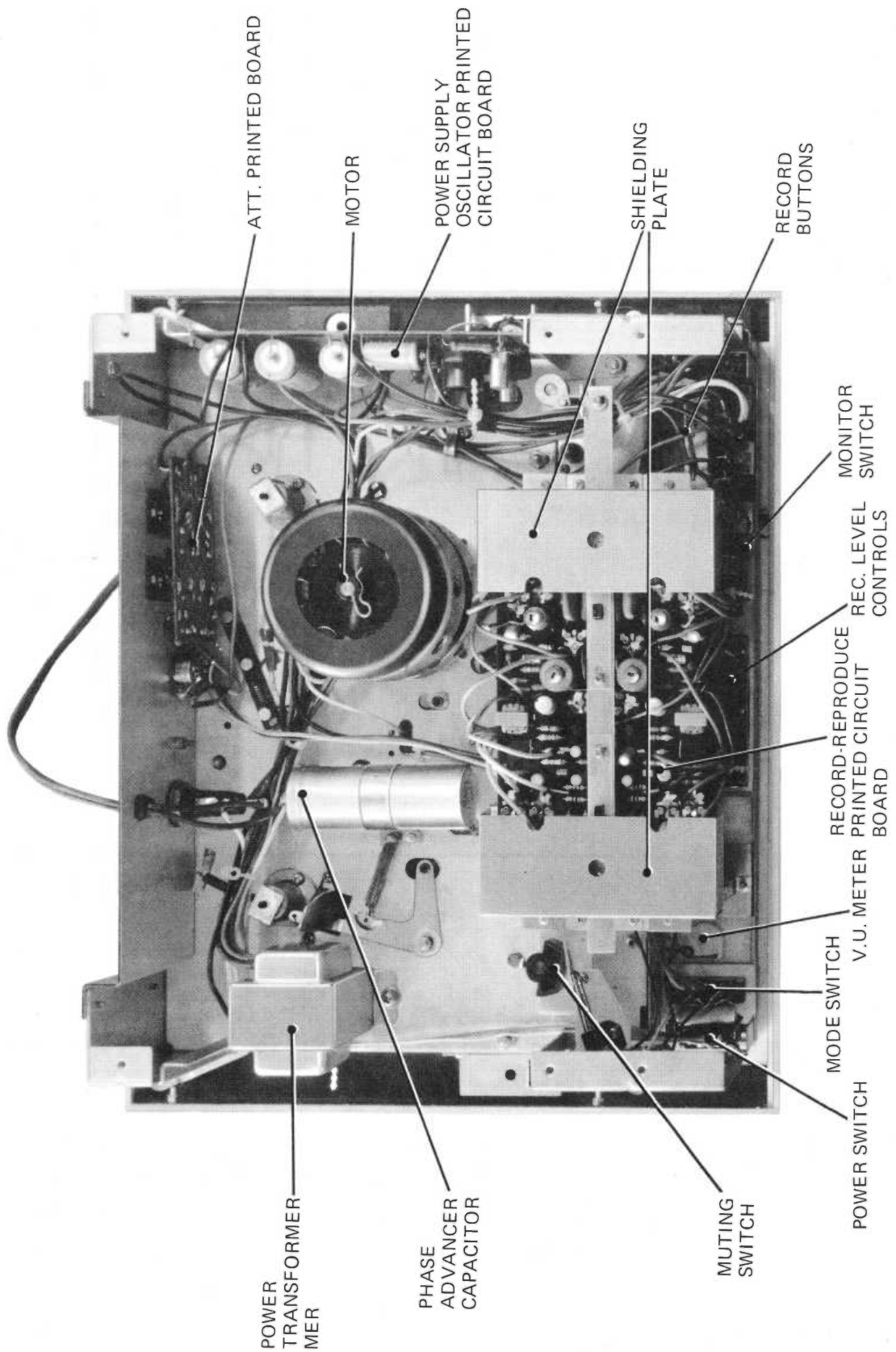
MAIN CHASSIS (FA4K) SECTION			
PRINTED CIRCUIT BOARD			
–	ATT Block (UA 2303K)		
–	REC PB Block (UA 2302K)		
–	Power & OSC Block (UA 1010K)		
Symbol No.	Description	Part No.	Remarks
CABINET ASSEMBLY ASSEMBLY (AK01-FA2JK)			
DECK ASSEMBLY			
PANEL ASSEMBLY		A20-0073-21	
–	Knob (for Control Lever)	K21-0115-05	
–	Knob (for Speed Change)	K23-0031-04	
–	Knob	K29-0037-04	
–	Special Screw	N09-0018-04	
HOUSING ASSEMBLY		F08-0007-13	
–	Housing Plate	B03-0004-03	
–	Housing	F08-0008-12	
–	Shutter x 2	F15-0045-04	
–	Sheet	G16-0022-04	
–	Phone Bushing x 3	J41-0005-04	
–	Decorated Screw x 4	N08-0096-04	
–	Flat Head Washer (103-N · NA)	N15-1030-11	
–	Nylon Washer (3ϕ x 8ϕ x 0.5t) x 4	N19-0120-00	
–	Pan Head Screw (P3 x 6-F-NA-ISO)	N30-3006-11	
–	Binding Agnet		
PUSH BUTTON ASSEMBLY		K29-0012-04	
–	Button (A) x 2	K29-0013-04	
–	Button (B) x	K29-0036-04	
–	Binding Agent		
MECHANISM ASSEMBLY		D40-0014-05	
–	AMP	CB7K	
–	Pan Head Screw (P3 x 6-F · NA-ISO)	N30-3006-11	
–	Pan Head Screw (P4 x 6-F · NA-ISO)	N30-4006-11	
–	Tapping Screw (TM3 x 6G-F · NA) x 2	N51-3006-11	
METAL FITTINGS ASSEMBLY			
–	Rubber Legs x 4	J03-0012-04	
–	Metal Fittings (E) x 3	J21-0498-04	
–	Rubber Sheet (A) x 3	G16-0015-04	
–	Flat Head Washer (W4-F · NA) x 2	N15-1040-11	
–	Spring Washer (SW4-F · NA) x 2	N16-0040-11	
–	Pan Head Screw (P3 x 6-F · NA-ISO) x 4	N30-3006-11	
–	Pan Head Screw (P4 x 6-F · NA-ISO) x 10	N30-4006-11	
–	Pan Head Screw (P4 x 20-F · NA-ISO) x 4	N30-4020-11	
–	Binding Agent		
–	Spacer (24-16-71-0.5t)		
–	Spacer (24-16-72-1t)		
–	Spacer (24-16-73-1.5t)		
PROTECTION BAG ASSEMBLY			
–	Name Plate	B40-0067-14	
–	Certification	B42-0009-04	

Symbol No.	Description			Part No.	Remarks
–	Notice Name Plate			B42-0163-04	
–	Warranty Card			B46-0004-00	
–	Instruction Manual			B50-0083-00	
–	Instructions			B58-0022-00	
–	Audio Cord			E30-0004-05	
–	Height Adjust Sheet			G16-0018-04	
–	Protection Board			H10-0044-04	
–	Corrugated Cardboard Case for Accessory			H10-0246-03	
–	Protection Cover			H20-0169-03	
–	Polyethylene Sheet			H21-0023-03	
–	Protection Bag			H25-0048-03	
–	Reel			H25-0065-05	
–	Reel Cramper			J11-0005-04	
	CABINET ASSEMBLY			A03-0010-01	
–	Cabinet			A03-0016-01	
–	Radiator			B04-0011-03	
–	Rubber Legs			J03-0011-04	
–	Nut (N3-F · NA-ISO) x 8			N10-2030-11	
–	Flat Washer (W3-F · NA) x 8			N15-1036-11	
–	Pan Head Screw (P3 x 12-F · NA-ISO) x 4			N30-3012-11	
	MECHANISM ASSEMBLY			D40-0019-05	
C402	Oil Impregnated	0.047μF	±20%		
C403	Special Capacitor	2μF	250WV	C90-0006-05	
C404	Special Capacitor	1μF	250WV	C90-0006-05	
C407	Oil Impregnated	0.047μF	±20%		
R401	Insulated Carbon Film	10kΩ	7W		
–	Lug			E22-0206-05	
M	Motor			T40-0003-25	
	PANEL ASSEMBLY			A20-0073-01	
–	Panel (A)			A20-0074-02	
–	Panel (B)			A20-0075-11	
–	Sash (A)			B01-0009-03	
–	Sash (B)			B01-0010-03	
–	Sash (C)			B01-0012-03	
–	Counter Window			B07-0045-04	
–	Housing Base			F08-0009-02	
–	Blind Patch			F14-0005-04	
–	Tape Guide			J90-0028-04	
–	Nut (N3-F · NA-ISO) x 6			N10-2030-11	
–	Spring Washer (SW3-F · NA) x 6			N16-0030-11	
–	Tip			25-16-51	
–	Binding Agnet				

TOP VIEW OF CHASSIS

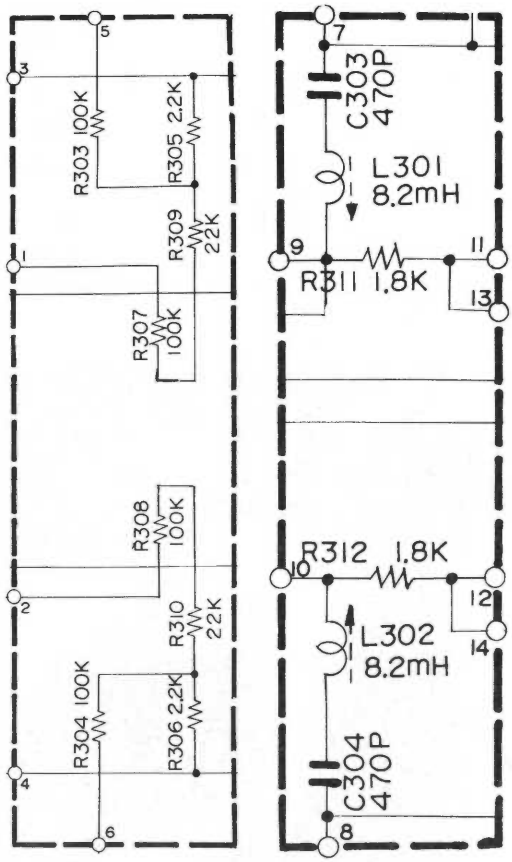


■ BOTTOM VIEW OF CHASSIS

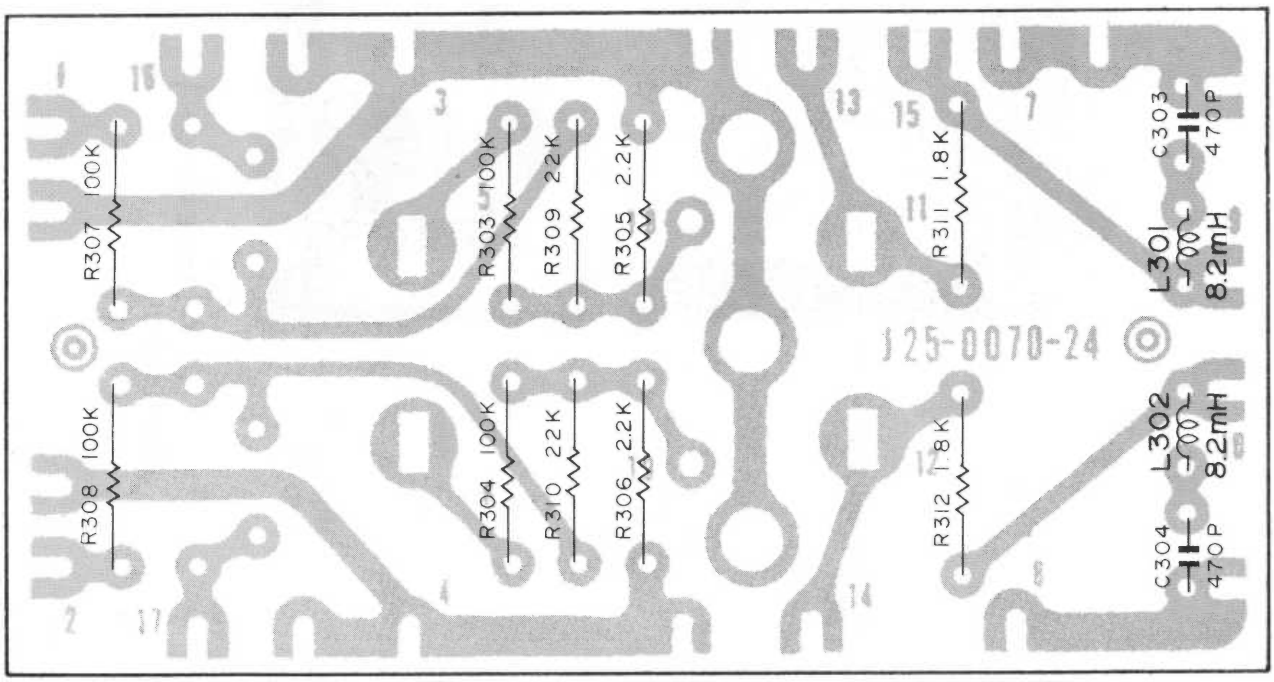


UA2302K

SCHEMATIC DIAGRAM



SEALED CIRCUIT ASSEMBLIES-PHANTOM VIEWS



PARTS DESCRIPTION LIST

Symbol No.	Description				Part No.	Remarks
			CAPACITOR			
C303, 304	Ceramic	470pF	±10%			
			RESISTOR			
R305, 306	Insulated Carbon Film	2.2kΩ	±10%	1/4W		
R307, 308	Insulated Carbon Film	100kΩ	±10%	1/4W		
R309, 310	Insulated Carbon Film	22kΩ	±10%	1/4W		
R311, 312	Insulated Carbon Film	1.8kΩ	±10%	1/4W		
			COIL			
L301, 302	Ferri-Inductor (FL-7H822J)				L33-0114-05	
			MISCELLANEOUS			
—	P. C. Board				J25-0070-24	

UA2303K

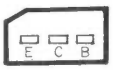
SCHEMATIC DIAGRAM

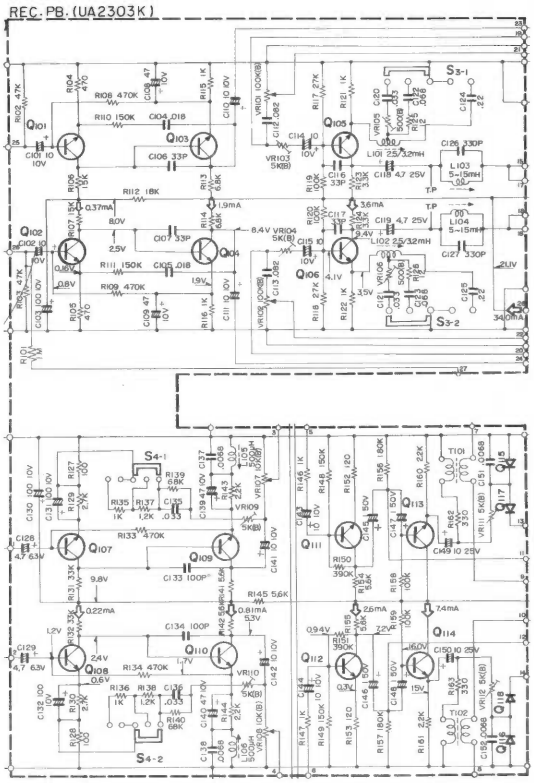
BOTTOM VIEW OF TRANSISTORS

2SC458LG

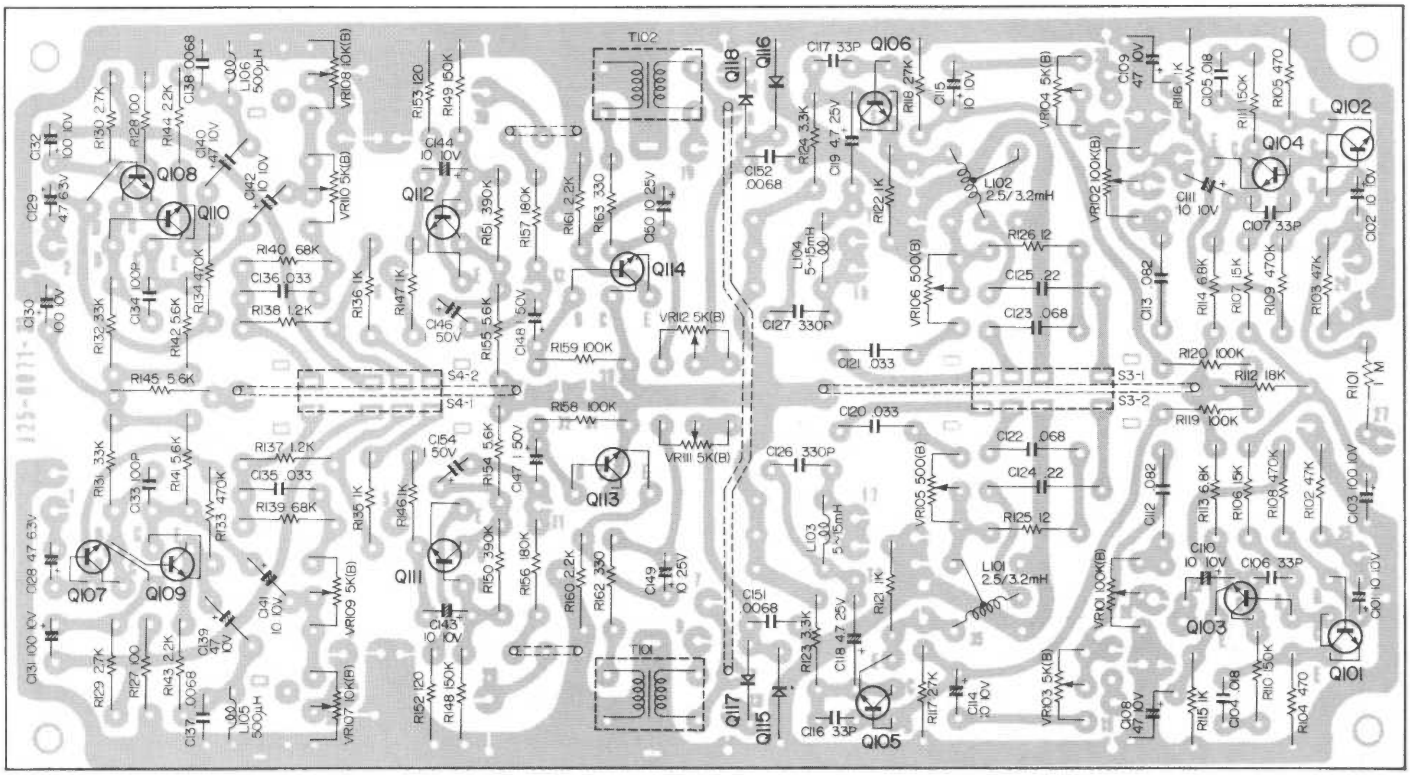
2SC733

2SC631-71





SEALED CIRCUIT ASSEMBLIES-PHANTOM VIEWS



Q101,102 ,107,108 2SC458LG(C)or 2SC631-71, Q103~106,109~112 2SC458L(C), Q113,114 2SC733, Q115~118 IN60,

PARTS DESCRIPTION LIST

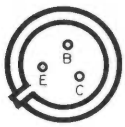
Symbol No.	Description				Part No.	Remarks
	CAPACITOR					
C101, 102	Electrolytic Tubular	10μF	10WV			
C103	Electrolytic Tubular	100μF	10WV			
C104, 105	Polyester	0.018μF	±10%			
C106, 107	Ceramic	33pF	±10%			
C108, 109	Electrolytic Tubular	47μF	10WV			
C110, 111	Electrolytic Tubular	10μF	10WV			
C112, 113	Polyester	0.082μF	±10%			
C114, 115	Electrolytic Tubular	10μF	10WV			
C116, 117	Ceramic	33pF	±10%			
C118, 119	Tantalum	4.7μF	25WV			
C120, 121	Polyester	0.033μF	±10%			
C122, 123	Polyester	0.068μF	±10%			
C124, 125	Polyester	0.22μF	±10%			
C126, 127	Ceramic	330pF	±10%			
C128, 129	Tantalum	4.7μF	6.3WV			
C130~132	Electrolytic Tubular	100μF	10WV			
C133, 134	Ceramic	100pF	±10%			
C135, 136	Polyester	0.033μF	±10%			
C137, 138	Polyester	0.0068μF	±10%			
C139, 140	Electrolytic Tubular	47μF	10WV			
C141~144	Electrolytic Tubular	10μF	10WV			
C145~148	Electrolytic Tubular	1μF	50WV			
C149, 150	Electrolytic Tubular	10μF	25WV			
C151, 152	Polyester	0.0068μF	±10%			
	RESISTOR					
R101	Insulated Carbon Film	1MΩ	±10%	1/4W		
R102, 103	Insulated Carbon Film	470kΩ	±10%	1/4W		
R104, 105	Insulated Carbon Film	470Ω	±10%	1/4W		
R106, 107	Insulated Carbon Film	15kΩ	±10%	1/4W		
R108, 109	Insulated Carbon Film	470kΩ	±10%	1/4W		
R110, 111	Insulated Carbon Film	150kΩ	±10%	1/4W		
R112	Insulated Carbon Film	18kΩ	±10%	1/4W		
R113, 114	Insulated Carbon Film	6.8kΩ	±10%	1/4W		
R115, 116	Insulated Carbon Film	1kΩ	±10%	1/4W		
R117, 118	Insulated Carbon Film	27kΩ	±10%	1/4W		
R119, 120	Insulated Carbon Film	100kΩ	±10%	1/4W		
R121, 122	Insulated Carbon Film	1kΩ	±10%	1/4W		
R123, 124	Insulated Carbon Film	3.3kΩ	±10%	1/4W		
R125, 126	Insulated Carbon Film	12Ω	±10%	1/4W		
R127, 128	Insulated Carbon Film	100Ω	±10%	1/4W		
R129, 130	Insulated Carbon Film	2.7kΩ	±10%	1/4W		
R131, 132	Insulated Carbon Film	33kΩ	±10%	1/4W		
R133, 134	Insulated Carbon Film	470kΩ	±10%	1/4W		
R135, 136	Insulated Carbon Film	1kΩ	±10%	1/4W		
R137, 138	Insulated Carbon Film	1.2kΩ	±10%	1/4W		
R139, 140	Insulated Carbon Film	68kΩ	±10%	1/4W		
R141, 142	Insulated Carbon Film	5.6kΩ	±10%	1/4W		
R143, 144	Insulated Carbon Film	2.2kΩ	±10%	1/4W		
R145	Insulated Carbon Film	5.6kΩ	±10%	1/4W		
R146, 147	Insulated Carbon Film	1kΩ	±10%	1/4W		
R148, 149	Insulated Carbon Film	150kΩ	±10%	1/4W		
R150, 151	Insulated Carbon Film	390kΩ	±10%	1/4W		
R152, 153	Insulated Carbon Film	120Ω	±10%	1/4W		
R154, 155	Insulated Carbon Film	5.6kΩ	±10%	1/4W		
R156, 157	Insulated Carbon Film	180kΩ	±10%	1/4W		
R158, 159	Insulated Carbon Film	100kΩ	±10%	1/4W		
R160, 161	Insulated Carbon Film	2.2kΩ	±10%	1/4W		
R162, 163	Insulated Carbon Film	330Ω	±10%	1/4W		
	POTENTIOMETER					
VR101, 102	Potentiometer 100kΩ (B)				R12-5011-05	
VR103, 104	Potentiometer 5kΩ (B)				R12-2006-05	
VR105, 106	Potentiometer 500Ω (B)				R12-0023-05	
VR107, 108	Potentiometer 10kΩ (B)				R12-3009-05	
	TRANSISTOR/DIODE					
Q101, 102	2SC458LG (C) or 2SC631-71					
Q103~106	2SC458LG (C)					
Q107, 108	2SC458LG (C) or 2SC631-71					
Q109~112	2SC458LG (C)					
Q113, 114	2SC733					
Q115~118	1N60					
	COIL/TRANSFORMER					
L101, 102	REC Equalizer Coil				L31-0051-05	
L103, 104	Bais Trap Coil				L31-0125-05	
L105, 106	Bais Trap Coil				L31-0049-05	
T101, 102	Output Transformer				L10-0003-05	
	MISCELLANEOUS					
–	P. C. Board				J25-0071-23	
S3	REC Equalizer SW				S32-2003-05	
S4	Playback Equalizer SW				S32-2003-05	

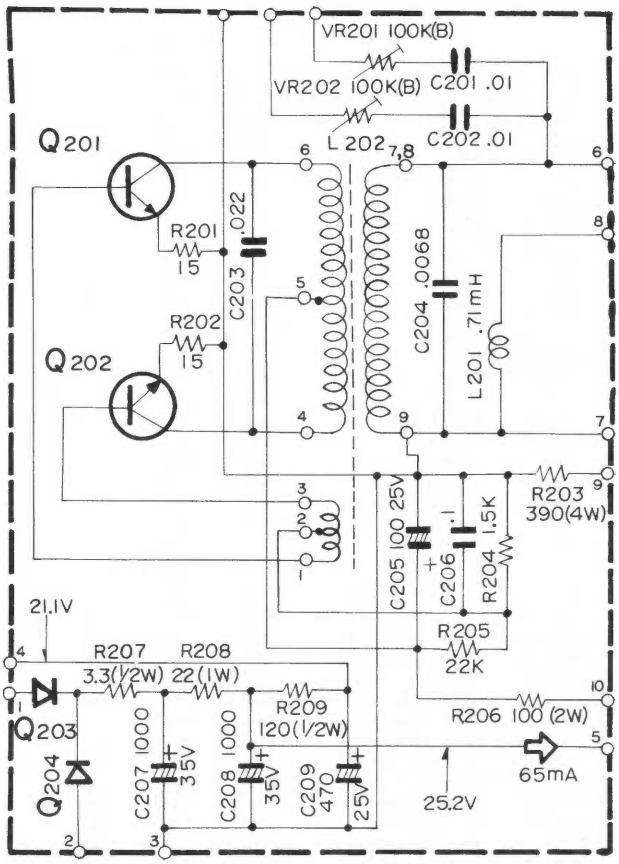
UA1010K

SCHEMATIC DIAGRAM

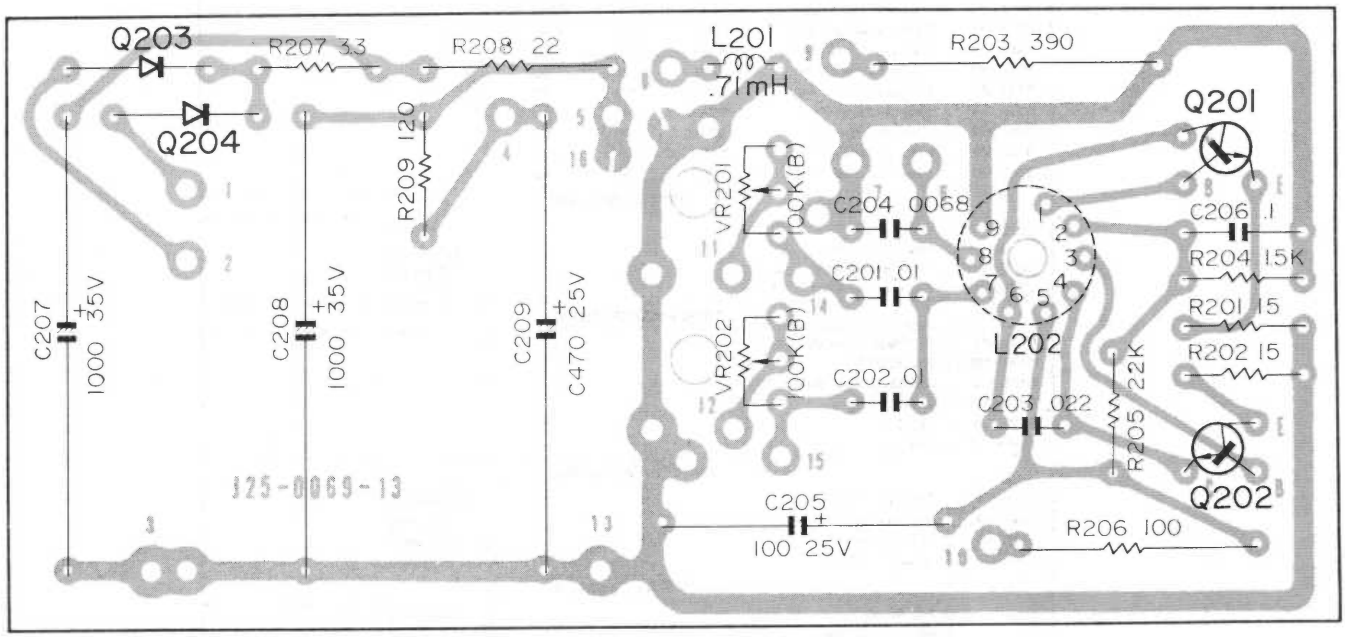
BOTTOM VIEW OF TRANSISTORS

2SC971





SEALED CIRCUIT ASSEMBLIES-PHANTOM VIEWS

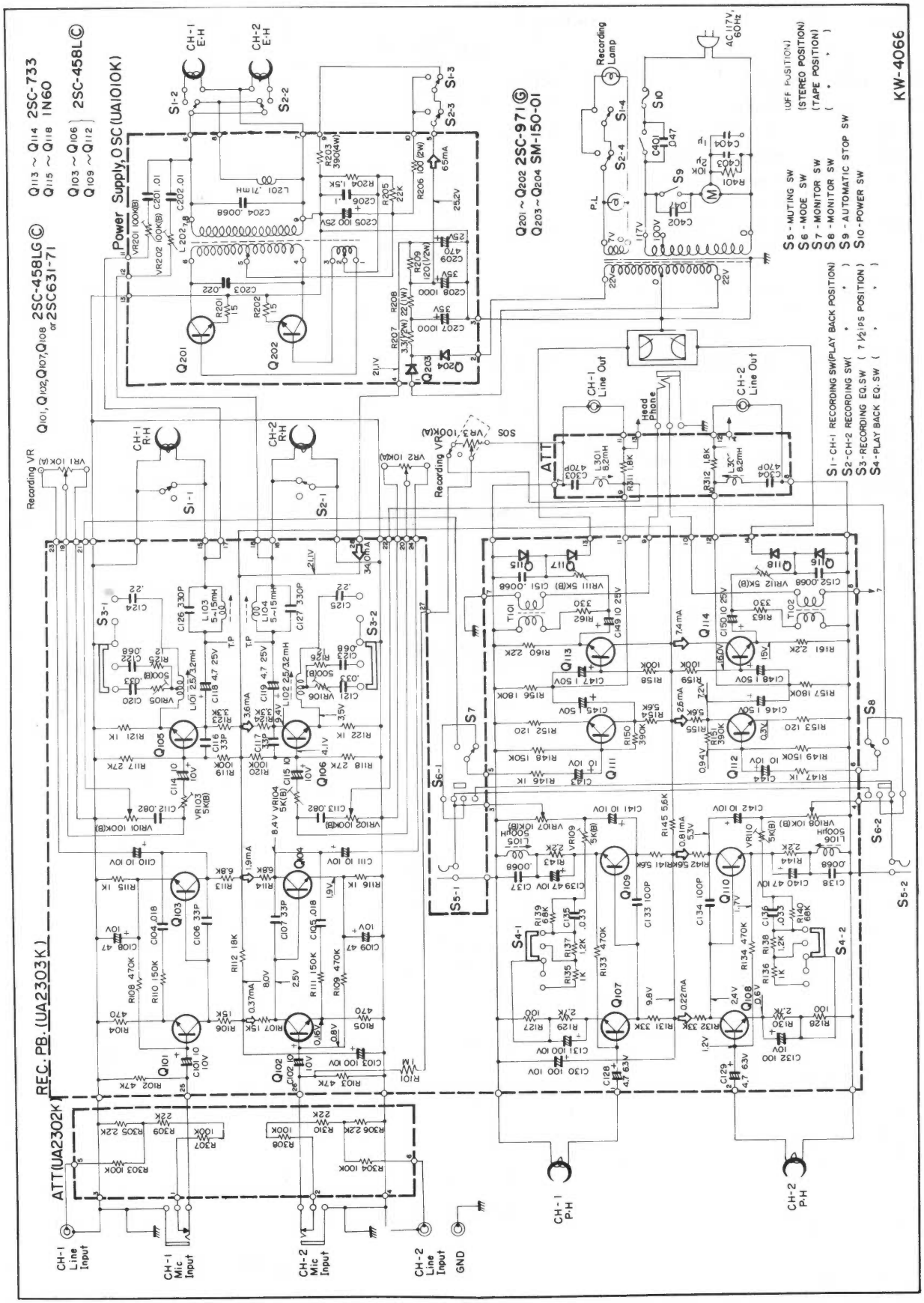


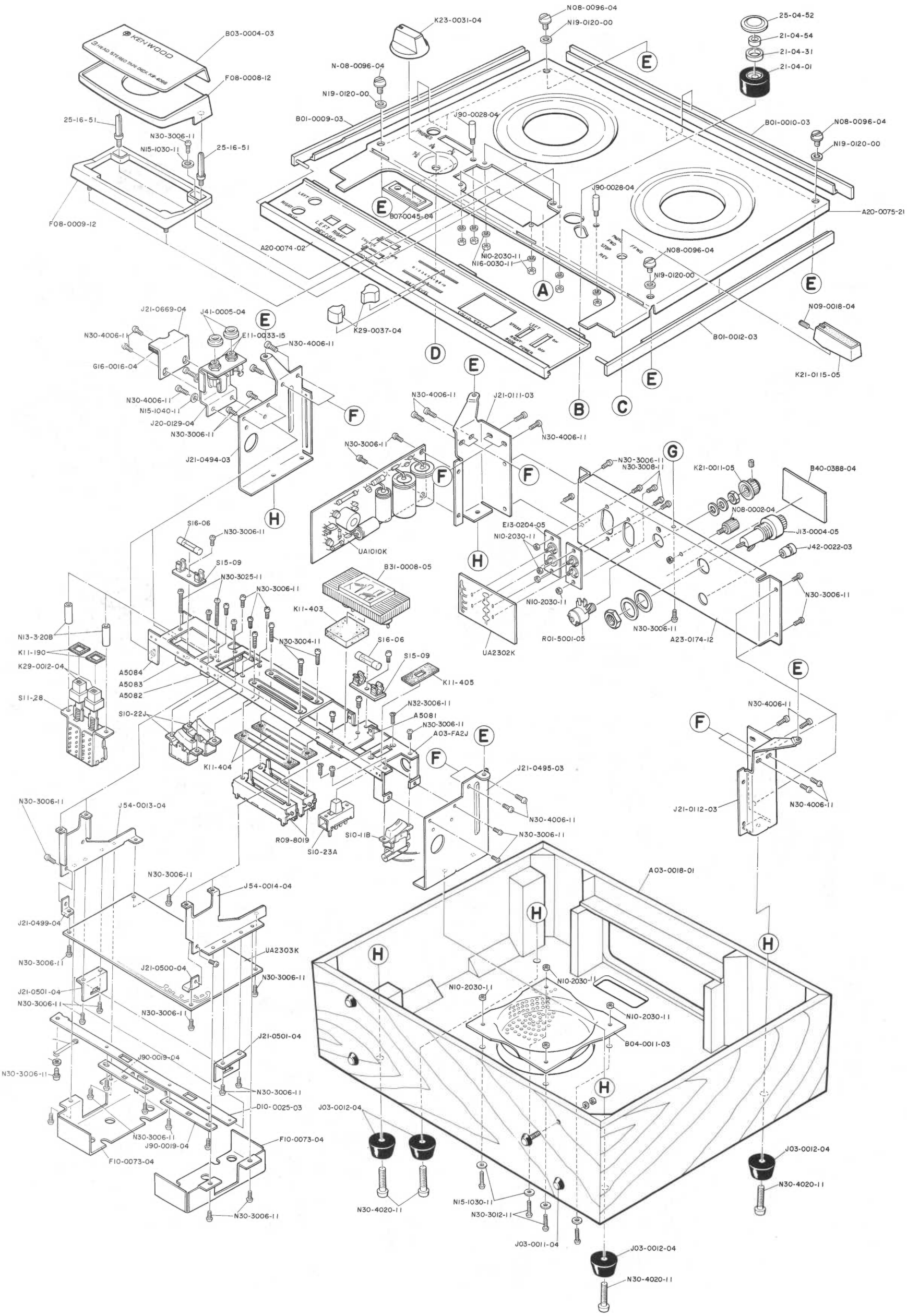
Q201, 202 2SC971(G). Q203, 204 SM-150-1.

PARTS DESCRIPTION LIST

Symbol No.	Description				Part No.	Part No.
	CAPACITOR					
C201, 202	Polyester	0.01μF	±10%			
C203	Polyester	0.022μF	±10%			
C204	Polyester	0.0068μF	±10%			
C205	Electrolytic Tubular	100μF	25WV			
C206	Polyester	0.1μF	±10%			
C207, 208	Electrolytic Tubular	100μF	35WV			
C209	Electrolytic Tubular	470μF	25WV			
	RESISTOR					
R201, 202	Insulated Carbon Film	15kΩ	±10%	1/4W		
R203	Wire Wound	390Ω	±10%	4W		
R204	Insulated Carbon Film	1.5kΩ	±10%	1/4W		
R205	Insulated Carbon Film	22kΩ	±10%	1/4W		
R206	Wire Wound	100Ω	2W			
R207	Fixed Carbon Composition	3.3Ω	±10%	1/2W		
R208	Fixed Carbon Composition	22Ω	±10%	1W		
R209	Fixed Carbon Composition	120Ω	±10%	1/2W		
VR201, 202	Potentiometer 100kΩ (B)				R12-5011-05	
	TRANSISTOR/COIL					
C201, 202	2SC971 (G)					
Q203, 204	SM-150-01					
L201	Ferri-Inductor (FL-7H-711J)				L33-0107-05	
L202	OSC Transformer				L19-0006-03	
	MISCELLANEOUS					
—	P. C. Board				J25-0069-13	

SCHEMATIC DIAGRAM

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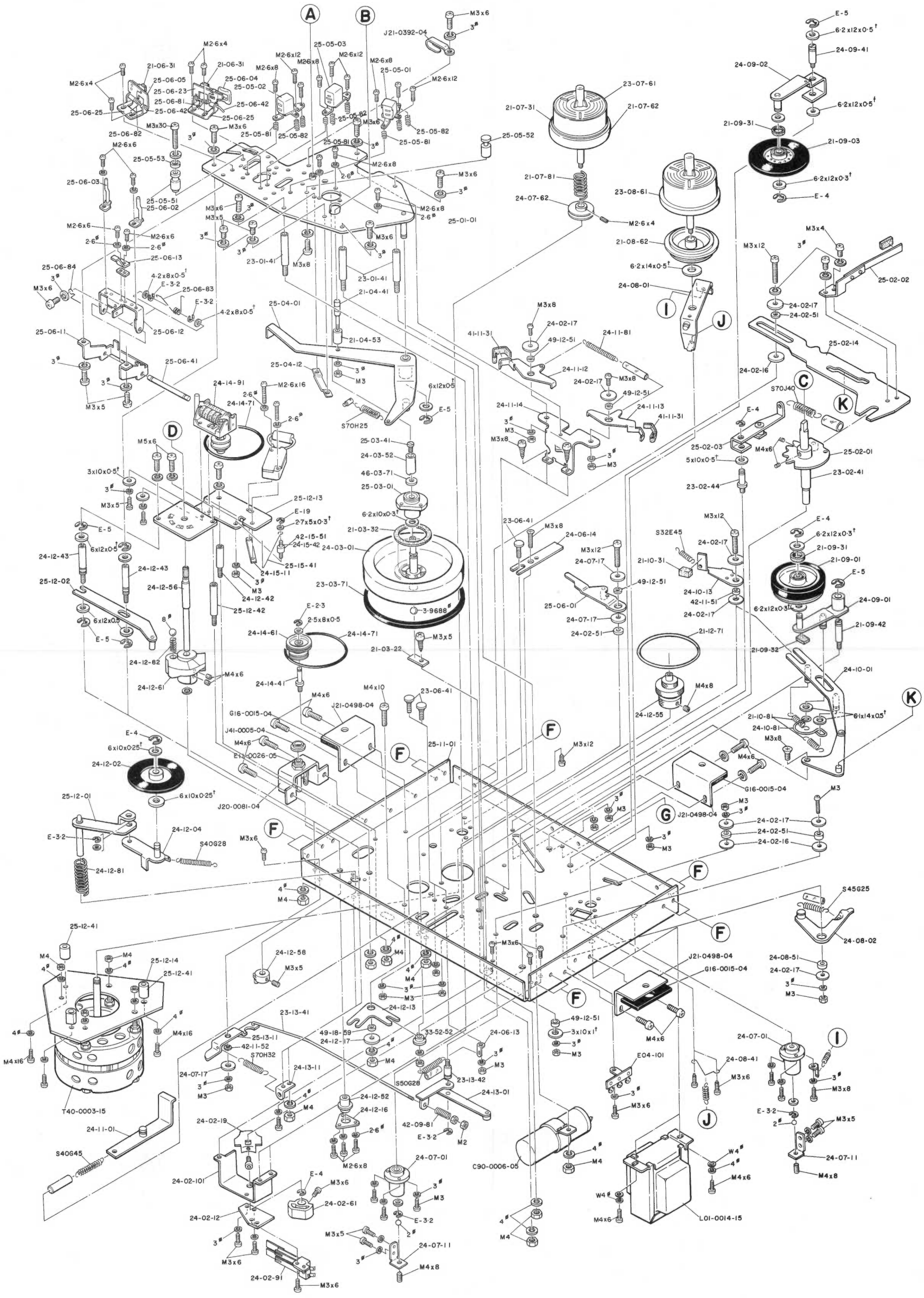
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